POWER SEMICONDUCTOR

DATABOOK

SGS ATES

POWER TRANSISTORS
THYRISTORS
1973/74

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INTRODUCTION

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SGS-ATES Professional Semiconductor Databook 1 (discrete devices)

SGS-ATES Professional Semiconductor Databook 2 (integrated circuits)

SGS-ATES Consumer Semiconductor Databook (discrete devices & integrated circuits)

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GENERAL INFORMATION

GERMANIUM TRANSISTORS

GERMANIUM DIODES

SILICON TRANSISTORS

SILICON THYRISTORS

ACCESSORIES AND MOUNTING INSTRUCTIONS

GENERAL INFORMATION

1. LETTER SYMBOLS FOR SEMICONDUCTOR DEVICES	Page	VI
1.1. QUANTITY SYMBOLS	»	VI
1.2. SUBSCRIPTS FOR QUANTITY SYMBOLS	»	VI
1.3. CONVENTIONS FOR SUBSCRIPT SEQUENCE	»	VIII
1.4. ELECTRICAL PARAMETER SYMBOLS	»	IX
1.5. SUBSCRIPTS FOR PARAMETER SYMBOLS	»	X
2. ALPHABETICAL LIST OF SYMBOLS	Page	XI
3. RATING SYSTEMS FOR ELECTRONIC DEVICES	Page	XV
3.1. DEFINITIONS OF TERMS USED	»	XV
3.2. ABSOLUTE MAXIMUM RATING SYSTEM	»	XVI
3.3. DESIGN - MAXIMUM RATING SYSTEM	»	XVI
3.4. DESIGN - CENTRE RATING SYSTEM	»	XVI
4. TYPE DESIGNATION CODE	Page	XVII
5. ALPHANUMERICAL LIST OF TYPES	Page	XIX

1. LETTER SYMBOLS FOR SEMICONDUCTOR DEVICES

(referred to diodes, transistors and linear integrated circuits)

1.1. QUANTITY SYMBOLS

a. Instantaneous values of current, voltage and power, which vary with time are represented by the appropriate lower case letter.

Examples: i, v, p

b. Maximum (peak), average, d.c. and root-mean-square values are represented by appropriate upper case letter.

Examples: I, V, P

1.2. SUBSCRIPTS FOR QUANTITY SYMBOLS

a. Total values are indicated by upper case subscripts.

Examples: I_C, i_C, V_{EB}, P_C, p_C

b. Values of varying components are indicated by lower case subscripts.

Examples: i_c, I_c, v_{eb}, p_c, P_c

c. To distinguish between maximum (peak), average, d.c. and root-mean-square values, it is possible to represent maximum and average values adding the subscripts m or M and respectively av or AV.

Examples: I_{cm}, I_{CM}, I_{cav}, I_{CAV}

It is possible to represent R.M.S. values by adding the subscripts (rms) and (RMS)

Examples: $I_{c\ (rms)}$, $I_{C\ (RMS)}$

d. List of subscripts (for examples see figure 1 and the fundamental symbols schedule e.)

A, a = Anode terminal

K, k = Cathode terminal

E, e	=	Emitter terminal
B, b	=	Base terminal
C, c	=	Collector terminal
J, j	=	Generic terminal
(BR)	=	Primary break-down
X, x	=	Specified circuit
M, m	=	Maximum (peak) value
Min, min	=	Minimum value
AV, av	=	Average value
(RMS), (rms)	=	R.M.S. value
F, f	=	Forward
R, r	=	As first subscript: Reverse. As second subscript: Repetitive
O, o	=	As third subscript: The terminal not mentioned is open circuited
S, s	=	As second subscript: Non repetitive. As third subscript: Short circuit between the terminal not mentioned and the reference terminal
Z	=	Zener. (Replaces R to indicate the actual zener voltage, current or power of voltage reference or voltage regulator diodes)

e. Fundamental symbols schedule (meaning of symbol with subscript)

	i v p	I V P
e b c	istantaneus value of the variable component	R.M.S. value of the variable component, or (with appropriate supplementary subscripts) the maximum or average value (direct current) of the variable component
E B C	istantaneus total value	average value (direct current and without signal) or (with appropriate supplementary subscripts) the total average value (with signal), or the total maximum value

f. Examples of the application of the rules:

Figure 1 represents a transistor collector current, consisting of a direct current and a variable component as a function of time.

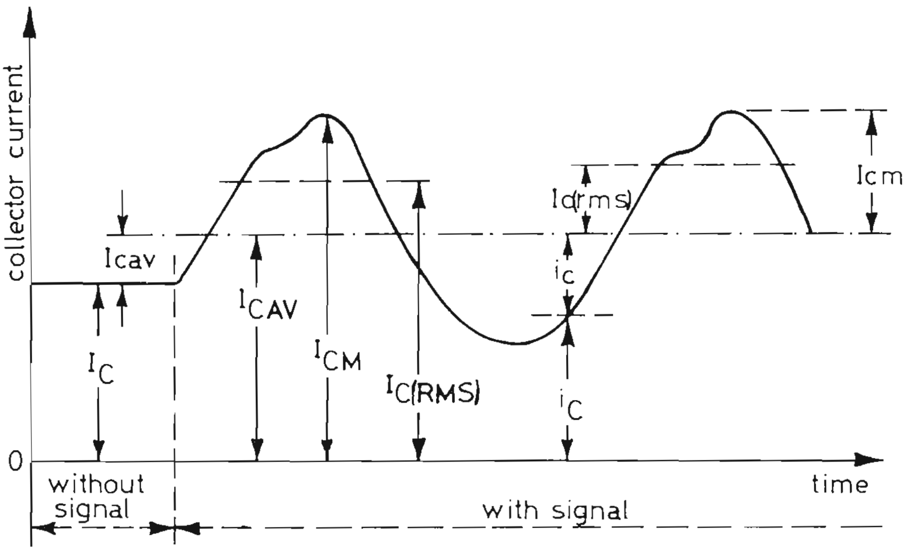

fig. 1

I_C	-	DC value, no signal
I_{CAV}	-	Average total value
I_{CM}	-	Maximum total value
$I_{C(RMS)}$	-	R.M.S. total value
I_{cav}	-	Average value of the variable component
$I_{c(rms)}$	-	R.M.S. value of the variable component
I_{cm}	-	Maximum value of the variable component
i_C	-	Instantaneous total value
i_c	-	Instantaneous volue of the variable component

1.3. CONVENTIONS FOR SUBSCRIPT SEQUENCE

a. Currents

For transistor the first subscript indicates the terminal carrying the current (conventional current flow from the external circuit into the terminal is positive).
Instead for diodes a forward current (conventional current flow into the

anode terminal) is represented by the subscript F or f; a reverse current (conventional current flow out of the anode terminal) is represented by the subscript R or r.

b. Voltages

For transistors normally, two subscripts are used to indicate the points between which the voltage is measured. The first subscript indicates one terminal point and the second the reference terminal.
Where there is no possibility of confusion, the second subscript may be omitted.
Instead for diodes a forward voltage (anode positive with respect to cathode) is represented by the subscript F or f and a reverse voltage (anode negative with respect to cathode) by the subscript R or r.

c. Supply voltages
Supply voltages may be indicated by repeating the terminal subscript.

Examples: V_{EE}, V_{CC}, V_{BB}

The reference terminal may then be indicated by a third subscript.

Examples: V_{EEB}, V_{CCB}, V_{BBC}

d. In devices having more than one terminal of the same type, the terminal subscripts are modified by adding a number following the subscript and on the same line.

Example: B_{B2-E} voltage between second base and emitter

In multiple unit devices, the terminal subscripts are modified by a number preceding the terminal subscripts:

Example: V_{1B-2B} voltage between the base of the first unit and that of the second one.

1.4. ELECTRICAL PARAMETER SYMBOLS

a. The values of four pole matrix parameters or other resistances, impedances admittances, etc., inherent in the device, are represented by the lower case symbol with the appropriate subscripts.

Examples: h_{ib}, z_{fb}, y_{oc}, h_{FE}

Note: The symbol of the capacitances that is represented by the upper case (C) is an exception to this rule.

b. The four pole matrix parameters of external circuits and of circuits in which the device forms only a part are represented by the upper case symbols with the appropriate subscripts.

Examples: H_i, Z_o, H_F, Y_R

1.5. SUBSCRIPTS FOR PARAMETER SYMBOLS

a. The static values of parameters are indicated by upper case subscripts.

Examples: h_{IB}, h_{FE}

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

b. The small-signal volues of parameters are indicated by lower case subscripts.

Examples: h_{ib}, Z_{ob}

c. The first subscript, in matrix notation identifies the element of the four pole matrix.

i (for 11) = input

o (for 22) = output

f (for 21) = forward transfer

r (for 12) = reverse transfer

Examples: $V_1 = h_i I_1 + h_r V_2$
$I_2 = h_f I_1 + h_o V_2$

Notes

1 - The voltage and current symbols in matrix notation are indicated by a single digit subscript.
The subscript 1 = input; the subscript 2 = output.

2 - The voltages and currents in these equations may be complex quantities.

d. The second subscript identifies the circuit configuration.

e = common emitter

b = common base

c = common collector

j = common terminal, general

Examples: (common base)

$$I_1 = y_{ib} V_{1b} + y_{rb} V_{2b}$$
$$I_2 = y_{fb} V_{1b} + y_{ob} V_{2b}$$

When the common terminal is understood, the second subscript may be omitted.

e. If it is necessary to distinguish between real and imaginary parts of the four pole parameters, the following notations may be used.

$Re(h_{ib})$ etc... for the real part

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1. LETTER SYMBOLS FOR SEMICONDUCTOR DEVICES	Page	VI
1.1. QUANTITY SYMBOLS	»	VI
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1.3. CONVENTIONS FOR SUBSCRIPT SEQUENCE	»	VIII
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1.5. SUBSCRIPTS FOR PARAMETER SYMBOLS	»	X
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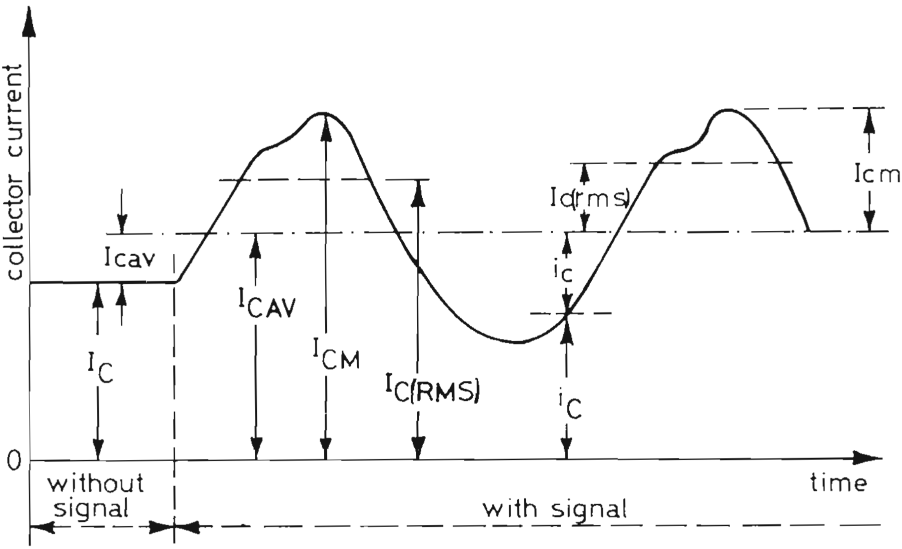

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e. If it is necessary to distinguish between real and imaginary parts of the four pole parameters, the following notations may be used.

$Re(h_{ib})$ etc... for the real part

$Im(h_{ib})$ etc... for the imaginary part

2. ALPHABETICAL LIST OF SYMBOLS

B	Bandwidth
C_{CBO}	Collector-base capacitance (emitter open to a.c. and d.c.)
d	Distortion
$\frac{di}{dt}$	Rate of change of forward current
$\frac{di_T}{dt}$	Rate of change of on-state current
$\frac{dv}{dt}$	Critical rate of applied forward voltage
$E_{s/b}$	Second breakdown energy (with base-emitter junction reverse biased)
f	Frequency
f_{hfe}	Common emitter, cut-off frequency
f_T	Transition frequency
G_v	Voltage gain
h_{fe}	Common emitter, small-signal value of the short-circuit forward current transfer ratio
h_{FE}	Common emitter, static value of the forward current transfer ratio
h_{FE1}/h_{FE2}	Common emitter, static value of the forward current transfer
I_B	Base current matched pair ratio
I_{B1}	Turn-on-current
I_{B2}	Turn-off-current
I_{BF}	Base forward current
I_{BFM}	Base forward peak current
I_{BM}	Base peak current
I_{BR}	Base reverse current
I_{BRM}	Base reverse peak current
I_C	Collector current
I_{CBO}	Collector cut-off current with emitter open
I_{CEO}	Collector cut-off current with base open

I_{CER}	Collector cut-off current with specified resistance between emitter and base
I_{CES}	Collector cut-off current with emitter short-circuited to base
I_{CEV}	Collector cut-off current with specified reserve voltage between emitter and base
I_{CM}	Collector peak current
I_d	Drain current
I_{DOM}	Peak off-state current (open gate)
I_E	Emitter current
I_{EBO}	Emitter cut-off current with collector open
I_F	Continuous DC forward current
I_{FM}	Peak forward current
I_{GT}	Average trigger current
i_{HO}	Istantaneous holding current
I_R	Continuous DC reverse current
I_{RROM}	Repetitive peak reverse current (open gate)
$I_{s/b}$	Second breakdown collector current (with base-emitter junction forward biased)
$I_{T\,(AV)}$	Average on-state current
I_{TRM}	Peak repetitive on-state current
$I_{T\,(RMS)}$	RMS on-state current
I_{TSM}	Peak surge (non repetitive) on-state current
$I_{TS}{}^2{}_{(RMS).t}$	Sub-cycle surge current (non repetitive) for a period
$P_{G\,(AV)}$	Average on-state or off-state gate power dissipation
P_{GM}	Peak on-state or off-state gate power dissipation
P_o	Output power of a specified circuit
PRT	Power rating test
P_{tot}	Total power dissipation
R_{BB}	Base dropping resistance
R_{BE}	Resistance between base and emitter
R_{CC}	Collector dropping resistance

R_{EE}	Emitter dropping resistance
R_L	Load resistance
R_{th}	Thermal resistance
$R_{th\ j\text{-}amb}$ ($R_{th\ j\text{-}a}$)	Thermal resistance junction-to-ambient
$R_{th\ j\text{-}case}$ ($R_{th\ j\text{-}c}$)	Thermal resistance junction-to-case
t	Time
T_{amb} (T_a)	Ambient temperature
T_{case} (T_c)	Case temperature
t_f	Fall time
t_{gt}	Gate controlled turn-on-time
T_j	Junction temperature
t_{off}	Turn-off-time
t_{on}	Turn-on-time
t_q	Circuit commulated turn-off-time
t_r	Rise time
t_s	Storage time
T_{stg} (T_s)	Storage temperature
V_{BE}	Base-emitter voltage
$V_{BE\ (sat)}$	Base-emitter saturation voltage
$V_{(BR)\ CBO}$	Collector-base breakdown voltage with emitter open
$V_{(BR)\ CEO}$	Collector-emitter breakdown voltage with base open
$V_{(BR)\ CER}$	Collector-emitter breakdown voltage with specified resistance
$V_{(BR)\ CES}$	Collector-emitter breakdown voltage with emitter short-circuited to base
$V_{(BR)\ CEV}$	Collector-emitter breakdown voltage with specified reverse voltage between emitter and base
$V_{(BR)\ EBO}$	Emitter-base breakdown voltage with collector open
V_{CB}	Collector-base voltage
V_{CBO}	Collector-base voltage with emitter open
V_{CE}	Collector-emitter voltage

V_{CEK}	Knee voltage at specified condition
V_{CEO}	Collector-emitter voltage with base open
$V_{CEO\,(sus)}$	Collector-emitter sustaining voltage with base open
V_{CER}	Collector-emitter voltage with specified resistance between emitter and base
$V_{CER\,(sus)}$	Collector-emitter sustaining voltage with specified resistance between emitter and base
$V_{CE\,(sat)}$	Collector-emitter saturation voltage
V_{CES}	Collector-emitter voltage with emitter short-circuited to base
V_{CEV}	Collector-emitter voltage with specified reverse voltage between emitter and base
$V_{CEV\,(sus)}$	Collector-emitter sustaining voltage with specified reverse voltage between emitter and base
$V_{CEX\,(sus)}$	Collector-emitter sustaining voltage with specified circuit between emitter and base
V_D	Istantaneous off-state voltage
V_{DROM}	Repetitive peak off-state voltage (open gate)
V_{DSOM}	Non-repetitive peak forward voltage (open gate)
V_{EB}	Emitter-base voltage
V_{EBO}	Emitter-base voltage with collector open
V_F	Continuous DC forward voltage
$V_{F(BO)O}$	Istantaneous forward breakover voltage (open gate)
V_{GT}	DC gate trigger voltage
V_i	Input voltage of a specified circuit
V_R	Continuous DC reverse voltage
V_{RM}	Peak reverse voltage
V_{RSOM}	Non-repetitive peak reverse voltage (open gate)
V_{RROM}	Repetitive peak reverse voltage (open gate)
v_T	Istantaneous on-state voltage
Z_{BE}	Impedance between base and emitter
Z_i	Input impedance

3. RATING SYSTEMS FOR ELECTRONIC DEVICES

3.1. DEFINITIONS OF TERMS USED

a. **Electronic device.** An electronic tube or valve, transistor or other semiconductor device.
Note: This definition excludes inductors, capacitors, resistors and similar components.

b. **Characteristic.** A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

c. **Bogey electronic device.** An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

d. **Rating.** A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determinated for specified values of environment and operation, and may be stated in any suitable terms.
Note: Limiting conditions may be either maxima or minima.

e. **Rating system.** The set of principles upon which ratings are established and which determins their interpretation.
Note: The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

3.2. ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.
These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.
The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

3.3. DESIGN - MAXIMUM RATING SYSTEM

Design-maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

3.4. DESIGN - CENTRE RATING SYSTEM

Design-centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design-centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply-voltage.

The Absolute Maximum Rating System is commonly used for semiconductor devices.

4. TYPE DESIGNATION CODE

The type number for "discrete" semiconductor devices consists of:
TWO LETTERS FOLLOWED BY A SERIAL NUMBER

The first letter gives information about the **material** used for the active part of the devices:

A Material with a band gap of 0.6 to 1.0eV, such as germanium

B Material with a band gap of 1.0 to 1.3eV, such as silicon

C Material with a band gap of 1,3eV and more, such as gallium arsenide

D Material with a band gap of less than 0.6eV, such as indium antimonide

R Compound material as employed in Hall generators and photoconductive cells, such as cadmium-sulphide, lead-selenide

The second letter indicates the **function** according with the applications and the construction:

A Detection diode, switching diode, mixer diode

B Variable capacitance diode

C Transistor for a.f. applications (Rth j-c>15°C/W)

D Power transistor for a.f. applications (Rth j-c≤15°C/W)

E Tunnel diode

F Transistor for h.f. applications (Rth j-c>15°C/W)

G Multiple of dissimilar devices (1); Miscellaneous

H Magnetic sensitive diode; Field probe

K Hall generator in an open magnetic circuit, e.g. magnetogram or signal probe

L Power transistor for h.f. applications (Rth j-c≤15°C/W)

M Hall generator in a closed electrically energised magnetic circuit, e.g. Hall modulator or multiplier

P Radiation sensitive device

Q Radiation generating device

R Electrically triggered controlling and switching device having a breakdown characteristic (Rth j-c>15°C/W)

S Transistor for switching applications (Rth j-c>15°C/W)

T Electrically, or by means of light, triggered controlling and switching power device having a breakdown characteristic (Rth j-c≤15°C/W)

U Power transistor for switching applications (Rth j-c≤15°C/W)

X Multiplier diode, e.g. varactor, step recovery diode

Y Rectifying diode, booster diode, efficiency diode

Z Voltage reference or voltage regulator diode

1) A multiple device is defined as a combination of similar or dissimilar active devices, contained in a common encapsulation that cannot be dismantled, and of which all electrodes of the individual devices are accessible from the outside.
Multiples of similar devices as well as multiples consisting of a main device and an auxiliary device are designated according to the code for the discrete devices described above.
Multiples of dissimilar devices of other nature are designated by the second letter G.

The serial number is formed by:

Three figures for semiconductor devices which are primarily intended for use in domestic equipment.
Two figures and a letter (this letter starts back from z through y, x, etc. bears no signification).

Version letter

A version letter can be used, for instance, for a diode with up-rated voltage, for a sub-division of a transistor type in different gain ranges, a low noise version of an existing transistor and for a diode, transistor, or thyristor with minor mechanical differences, such as finish of the leads, length of the leads etc. The letters never have a fixed meaning, the only exception being the letter R which indicates reverse polarity.

Examples

BC 107 Silicon low power audio frequency transistor primarily intended for domestic equipment
BUY 46 Silicon power transistor for switching applications in professional equipment

5. ALPHANUMERICAL LIST OF TYPES

Type	Page
AD142	3
AD143	7
AD143R	11
AD262	15
AD263	19
AL100	23
AL102	27
AL103	31
AL112	35
AL113	39
AU106	43
AU107	47
AU108	51
AU108F	55
AU110	59
AU111	63
AU112	67
AU113	71
AY102	77
AY103K	79
AY104	81
AY105K	83
AY106	85
BD111A	89
BD117	91
BD141	93
BD142	97
BD162	101
BD163	105
BD215	109
BD216	111
BD260	113
BD261	113
BD281	115
BD282	121
BD283	115
BD284	121
BD285	115
BD286	121
BD433	127
BD434	133
BDX10/2N3055	139
BDX11/2N3442	145
BDX12/2N4347	149
BDX13/40251	153
BDX23/40636	157
BDX24/40250	159
BDX40/2N3772	163
BDX41/2N3771	169
BDX50/2N3773	175
BDX51/2N4348	181
BDX60/2N3055U	187
BDX61/2N3055V	195
BDX70/2N6098	203
BDX71/2N6099	203
BDX72/2N6100	203
BDX73/2N6101	203
BDX74/2N6102	203
BDX75/2N6103	203
BU100A	219
BU102	221
BU120	225
BU121	231
BU122	237
BU125	239
BU127	247
BU128	249
BUY18	251
BUY24	253
BUY38/2N3054	255
BUY46	261
BUY47	265
BUY48	267
BUY68	269
2N3228	277
2N3525	277
2N4101	277
40654	285
40655	285
40833	285

GERMANIUM TRANSISTORS

GERMANIUM ALLOY PNP

AD 142

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The AD 142 is a germanium alloy junction PNP transistor in a Jedec TO-3 metal case. It is designed specifically for use in class A power amplifier and in push-pull class B amplifiers.

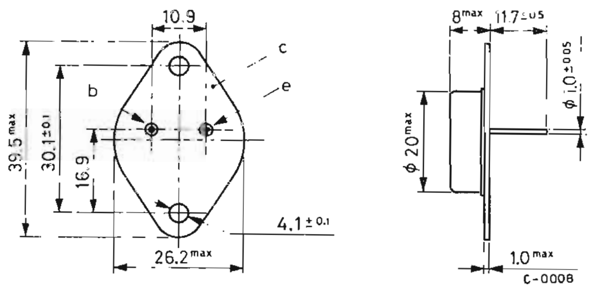
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-80	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-80	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-10	V
I_C	Collector current	-10	A
I_B	Base current	-3	A
P_{tot}	Total power dissipation at $T_c \leq 55\,°C$	30	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AD 142

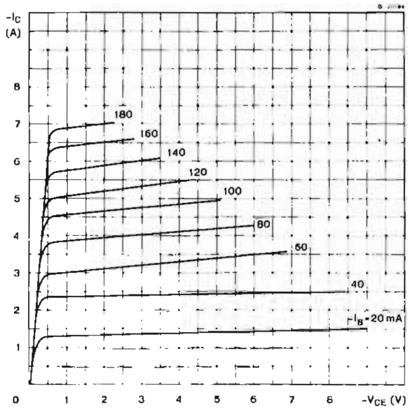
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

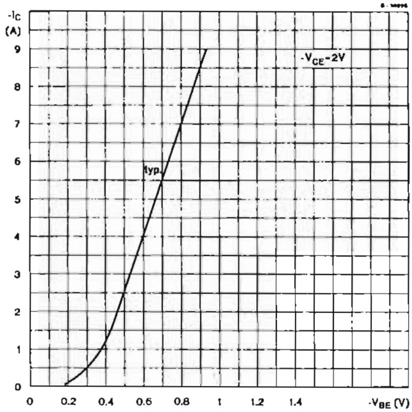
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -0.5 V				-0.1	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -10 V				-2	mA
V_{CBO}	Collector-base voltage (I_E = 0)	I_C = -5 mA		-80			V
V_{CEO}	Collector-emitter voltage (I_B = 0)	I_C = -600 mA		-50			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = -5 A I_B = -250 mA			-0.3		V
h_{FE}	DC current gain Gr. 4	I_C = -1 A	V_{CE} = -2 V	30		60	—
	Gr. 5	I_C = -1 A	V_{CE} = -2 V	50		110	—
	Gr. 6	I_C = -1 A	V_{CE} = -2 V	100		200	—
		I_C = -5 A	V_{CE} = -2 V		45		—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = -1 A	V_{CE} = -2 V			1.4	—
f_T	Transition frequency	I_C = -0.5 A	V_{CE} = -2 V		450		kHz

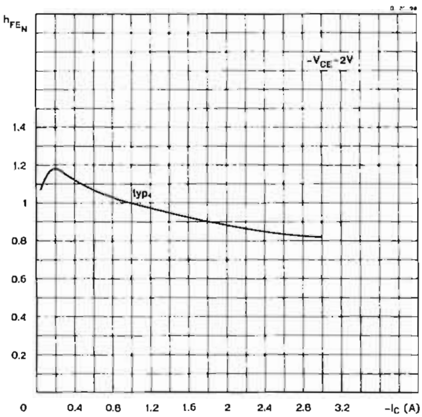
Typical output characteristics



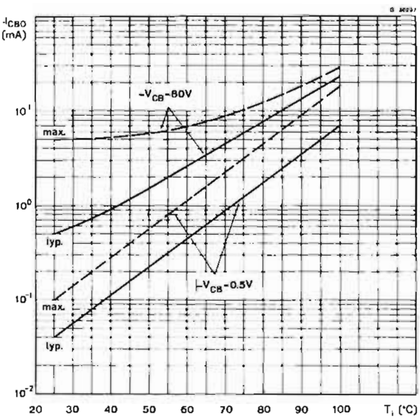
DC transconductance



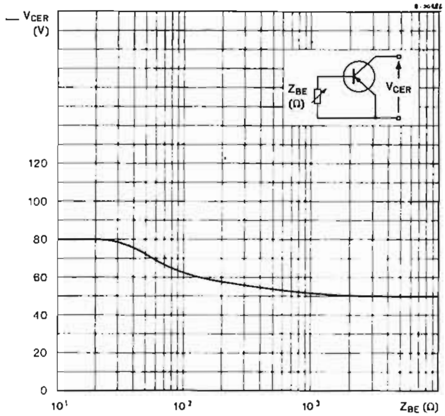
DC normalized current gain



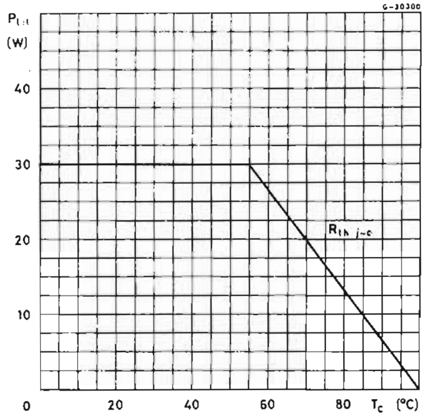
Collector cutoff current



Collector-emitter breakdown voltage



Rating chart



AD 143

GERMANIUM ALLOY PNP

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The AD 143 is a germanium alloy junction PNP transistor in a Jedec TO-3 metal case. It is designed specifically for use in class A power amplifiers and in push-pull class B amplifiers.

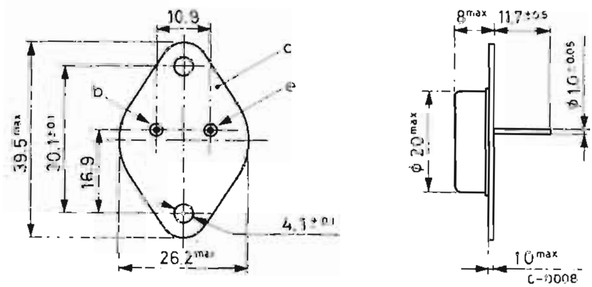
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-40	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-40	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-10	V
I_C	Collector current	-10	A
I_B	Base current	-3	A
P_{tot}	Total power dissipation at $T_c \leq 55\,°C$	30	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AD 143

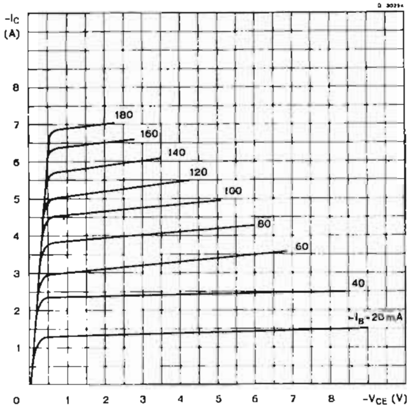
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

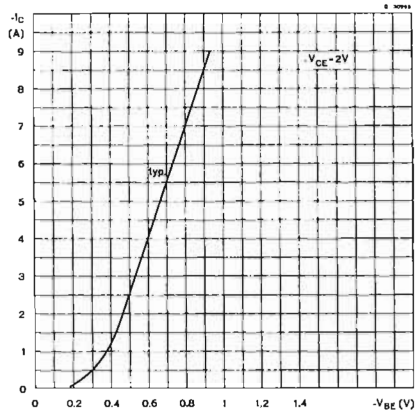
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter			Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)		V_{CB} = -0.5 V			-0.1	mA
I_{EBO}	Emitter cutoff current (I_C = 0)		V_{EB} = -10 V			-2	mA
V_{CBO}	Collector-base voltage (I_E = 0)		I_C = -5 mA	-40			V
V_{CEO}	Collector-emitter voltage (I_B = 0)		I_C = -0.6 A	-35			V
$V_{CE(sat)}$	Collector-emitter saturation voltage		I_C = -5 A I_B = -250 mA		-0.3		V
h_{FE}	DC current gain	Gr. 4	I_C = -1 A V_{CE} = -2 V	30		60	—
		Gr. 5	I_C = -1 A V_{CE} = -2 V	50		110	—
		Gr. 6	I_C = -1 A V_{CE} = -2 V	100		200	—
			I_C = -5 A V_{CE} = -2 V		45		—
h_{FE_1}/h_{FE_2}	Matched pair		I_C = -1 A V_{CE} = -2 V			1.4	—
f_T	Transition frequency		I_C = -0.5 A V_{CE} = -2 V		450		KHz

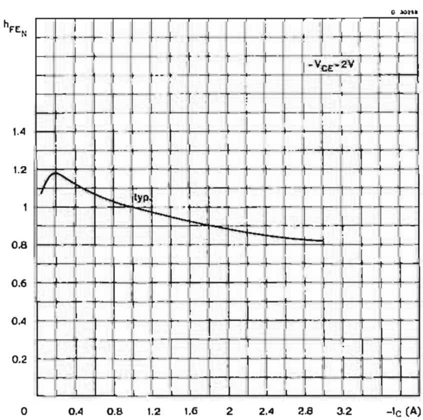
Typical output characteristics



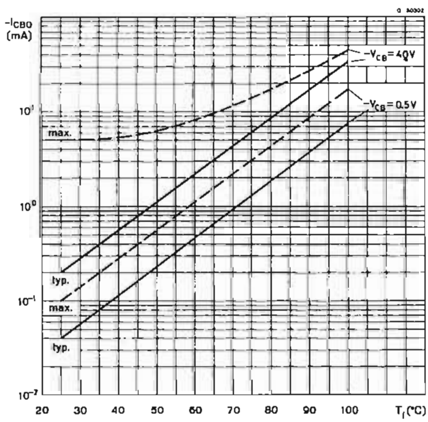
DC transconductance



DC normalized current gain

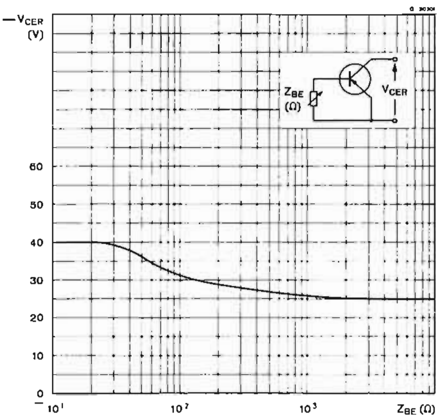


Collector cutoff current

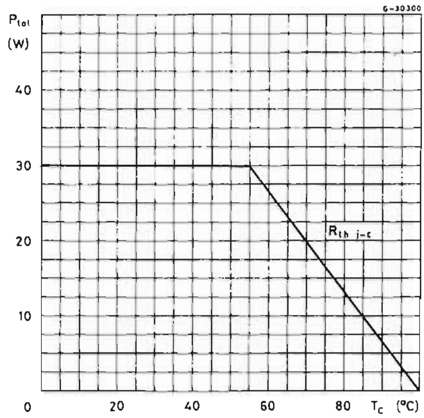


AD 143

Collector-emitter breakdown voltage



Rating chart



AD 143R

GERMANIUM ALLOY PNP

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The AD 143R is a germanium alloy PNP transistor in a Jedec TO-3 metal case. It is intended for use as AF power amplifier with low voltage supply.

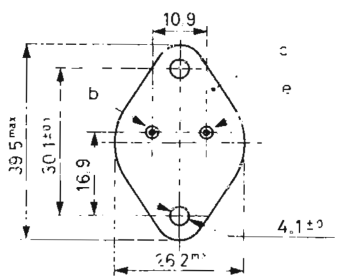
ABSOLUTE MAXIMUM RATINGS

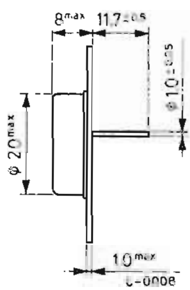
→ V_{CBO}	Collector-base voltage ($I_E = 0$)	-35	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	-25	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-10	V
I_C	Collector current	-10	A
I_B	Base current	-3	A
P_{tot}	Total power dissipation at $T_c \leq 55\,°C$	30	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case





(sim. to **TO-3**)

AD 143R

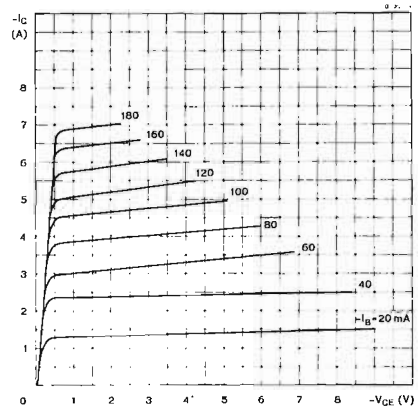
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

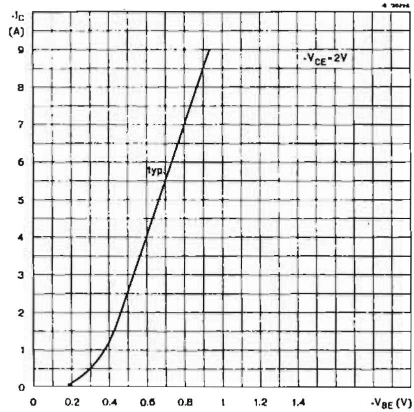
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)		V_{CB} = -0.5 V			-50	-160	μA
I_{EBO}	Emitter cutoff current (I_C = 0)		V_{EB} = -10 V				-2	mA
→ V_{CBO}	Collector-base voltage (I_E = 0)		I_C = -5 mA		-35			V
V_{CEO}	Collector-emitter voltage (I_B = 0)		I_C = -0.6 A		-25			V
→ $V_{CE\,(sat)}$	Collector-emitter saturation voltage		I_C = -5 A I_B = -250 mA			-0.3		V
h_{FE}	DC current gain	Gr. 4	I_C = -1 A	V_{CE} = -2 V	30		60	—
		Gr. 5	I_C = -1 A	V_{CE} = -2 V	50		110	—
		Gr. 6	I_C = -1 A	V_{CE} = -2 V	100		200	—
			I_C = -5 A	V_{CE} = -2 V		45		—
h_{FE_1}/h_{FE_2}	Matched pair		I_C = -1 A	V_{CE} = -2 V			1.4	—
f_T	Transition frequency		I_C = -0.5 A	V_{CE} = -2 V		450		KHz

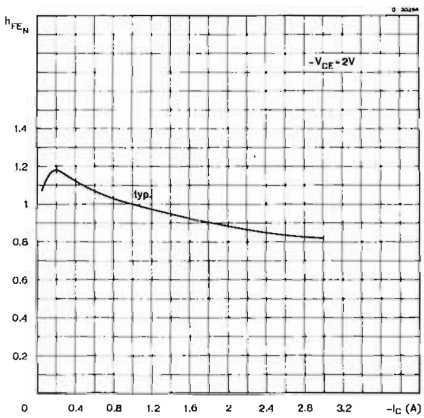
Typical output characteristics



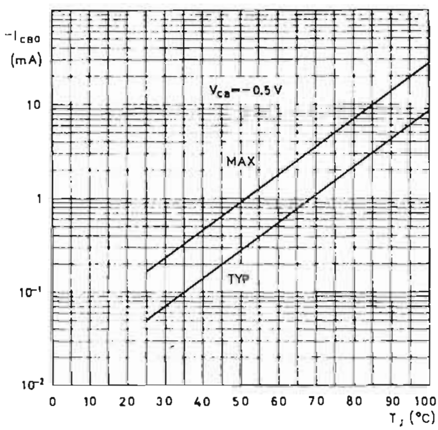
DC transconductance



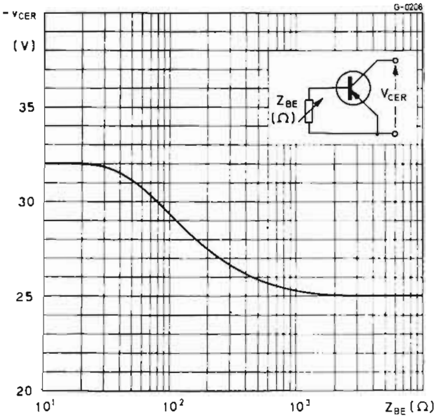
DC normalized current gain



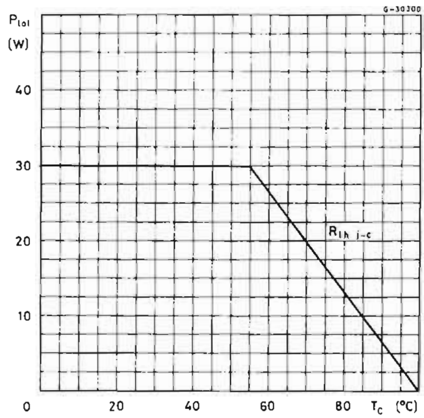
Collector cutoff current



Collector-emitter breakdown voltage



Rating chart



AD 262

GERMANIUM ALLOY PNP

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The AD 262 is a germanium alloy junction PNP transistor in a SOT-9 metal case. It is designed specifically for series and shunt regulators, driver and output stages and, for use in class A and in class B, AF amplifiers.
The complementary NPN type is the BD 162.

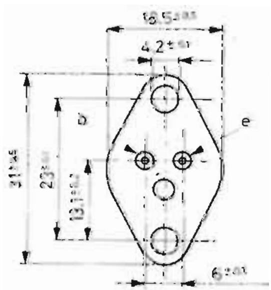
ABSOLUTE MAXIMUM RATINGS

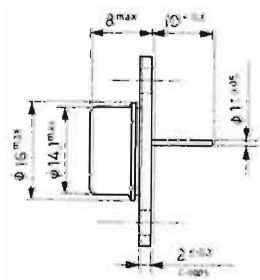
V_{CBO}	Collector-base voltage ($I_E = 0$)	-35	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	-20	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-10	V
I_C	Collector current	-4	A
I_B	Base current	-2	A
P_{tot}	Total power dissipation at $T_c \leq 60$ °C	10	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case





SOT-9

AD 262

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	4	°C/W

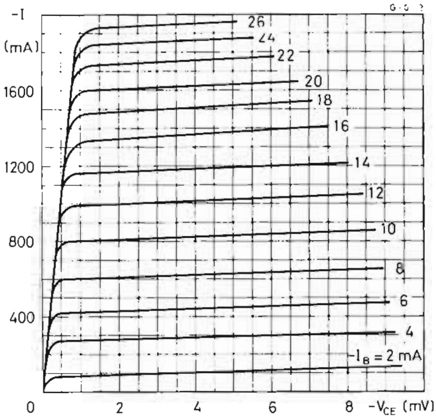
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -35$ V $V_{CB} = -0.5$ V			-5 -0.1	mA mA
I_{CEO}	Collector cutoff current ($I_B = 0$)	$V_{CE} = -13$ V			-15	mA
V_{EBO}	Emitter-base voltage ($I_C = 0$)	$I_{EBO} = -2$ mA	-10			V
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	$I_C = -0.6$ A	-20			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	$I_C = -1.5$ A $I_B = -0.15$ A			-0.2	V
V_{CEK}*(1)	Collector-emitter knee voltage	$I_C = -1.5$ A		-0.3		V
V_{BE}*	Base-emitter voltage	$I_C = -1.5$ A $V_{CE} = -2$ V			-0.9	V
h_{FE}*	DC current gain	$I_C = -1.5$ A $V_{CE} = -2$ V $I_C = -0.5$ A $V_{CE} = -2$ V	30 40		 180	— —
→ f_T	Transition frequency	$I_C = -0.2$ A $V_{CE} = -2$ V	200	315		kHz

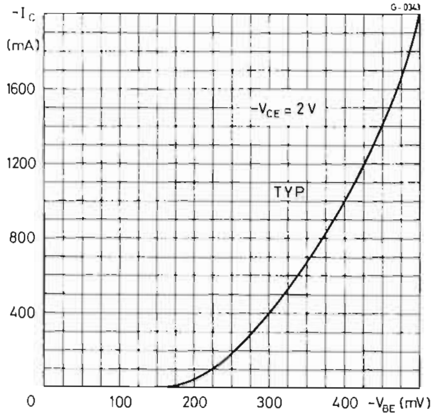
* Pulsed; pulse duration = 300 µs, duty factor = 1.5%.

(1) Choose the characteristic (I_C, V_{CE}) passing through the point $I_C = -1.65$ A, $V_{CE} = -1$ V and read the V_{CE} value at $I_C = -1.5$ A

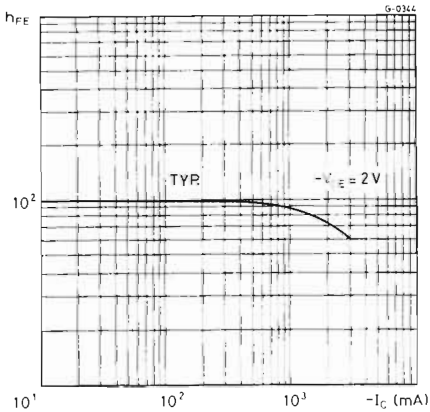
Typical output characteristics



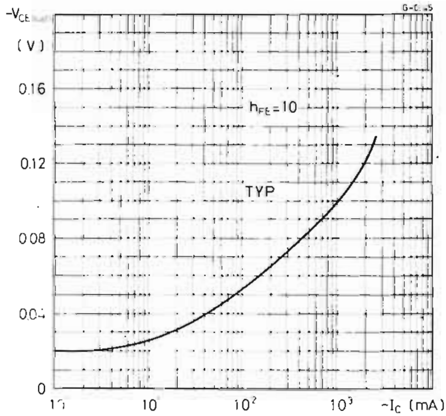
DC transconductance



DC current gain

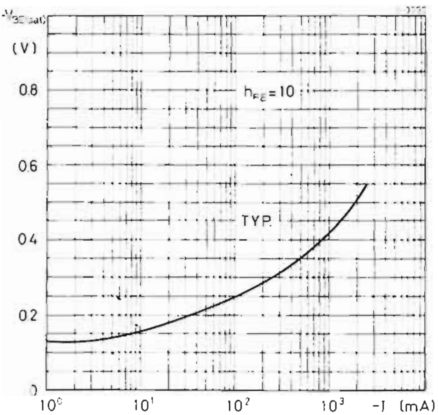


Collector-emitter breakdown voltage

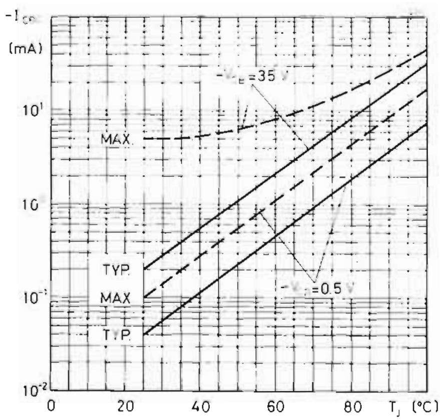


AD 262

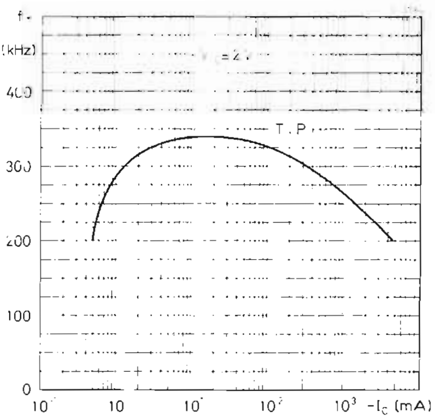
Base-emitter saturation voltage



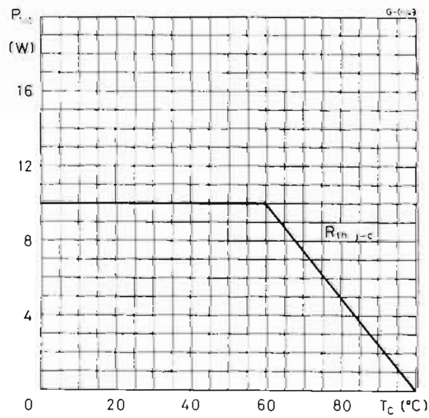
Collector cutoff current



Transition frequency



Power rating chart



GERMANIUM ALLOY PNP

AUDIO POWER AMPLIFIER

The AD 263 is a germanium alloy junction PNP transistor in a SOT-9 metal case. It is designed specifically for series and shunt regulators, driver and output stages and, for use in class A and in class B, AF amplifiers.
The complementary NPN type is the BD 163.

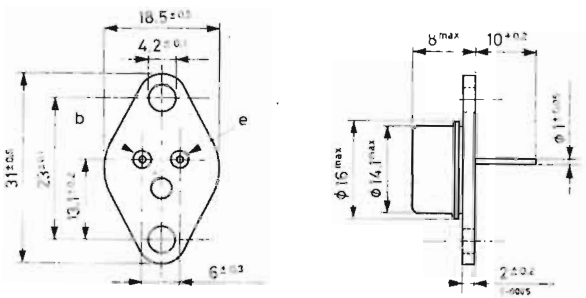
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-60	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	-40	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-10	V
I_C	Collector current	-4	A
I_B	Base current	-2	A
P_{tot}	Total power dissipation at $T_{case} \leq 60\ °C$	10	W
T_{stg}	Storage temperature	-65 to 100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



SOT-9

AD 263

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	4	°C/W

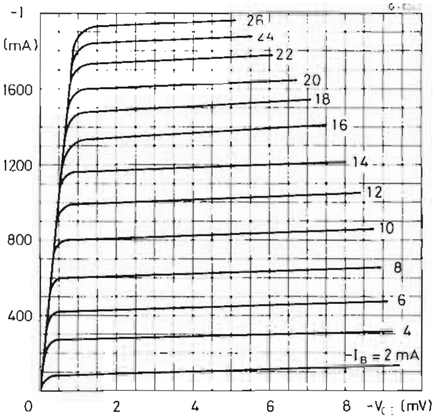
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -60 V V_{CB} = -0.5 V			-5 -0.1	mA mA
I_{CEO}	Collector cutoff current (I_B = 0)	V_{CE} = -28 V			-15	mA
V_{EBO}	Emitter-base voltage (I_C = 0)	I_{EBO} = -2 mA	-10			V
$V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = -0.6 A	-40			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = -1.5 A I_B = -0.15 A			-0.2	V
V_{CEK}*(¹)	Collector-emitter knee voltage	I_C = -1.5 A		-0.3		V
→ V_{BE}*	Base-emitter voltage	I_C = -1.5 A V_{CE} = -2 V			-0.9	V
→ h_{FE}	DC current gain	I_C = -1.5 A V_{CE} = -2 V I_C = -0.5 A V_{CE} = -2 V	20 25		 180	— —
→ f_T	Transition frequency	I_C = -0.2 A V_{CE} = -2 V	200	315		kHz

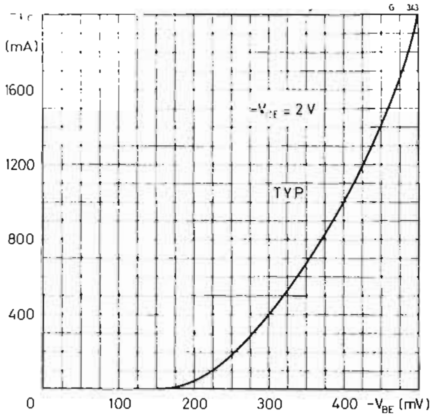
* Pulsed; pulse duration = 300 μs, duty factor = 1.5%.

(¹) Chose the characteristic (I_C, V_{CE}) passing through the point I_C = -1.65 A, V_{CE} = -1 V and read the V_{CE} value at I_C = -1.5 A

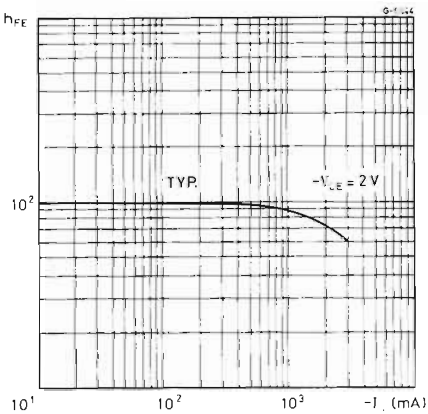
Typical output characteristics



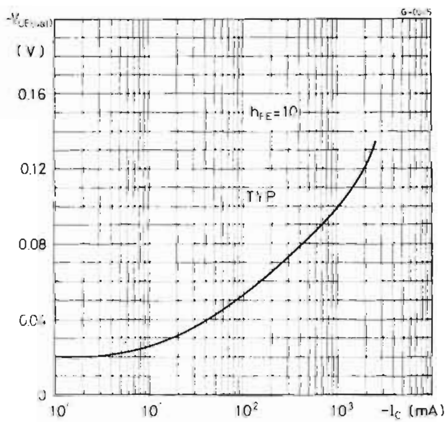
DC transconductance



DC current gain

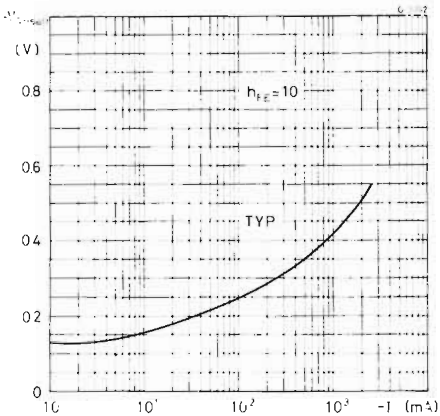


Collector-emitter saturation voltage

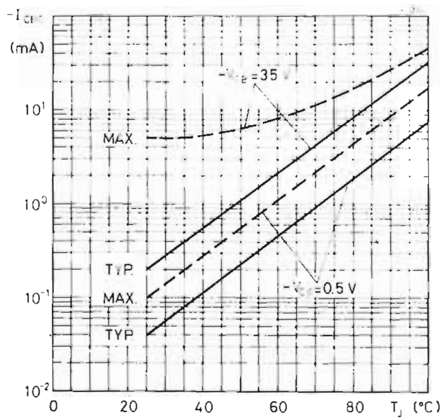


AD 263

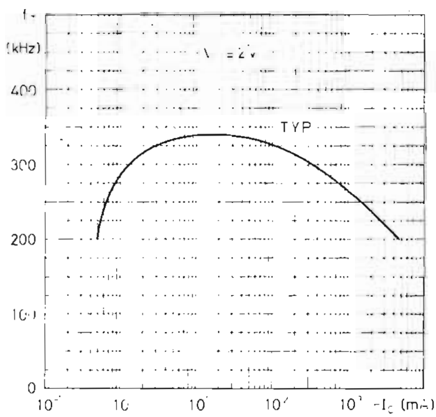
Base-emitter saturation voltage



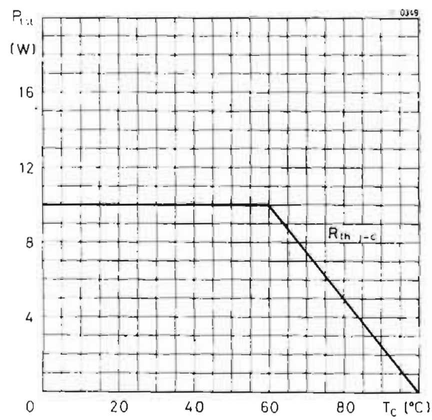
Collector cutoff current



Transition frequency



Power rating chart



AL 100

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH POWER AMPLIFIER

The AL 100/2N 1906 is a germanium diffused-collector, graded-base, PNP transistor in a Jedec TO-3 metal case. It is intended for use in output stages of high fidelity power amplifiers where wide frequency response, linear gain characteristics and high voltage rating are required. This transistor is also particularly indicated for applications requiring high speed, high current switching.

ABSOLUTE MAXIMUM RATINGS

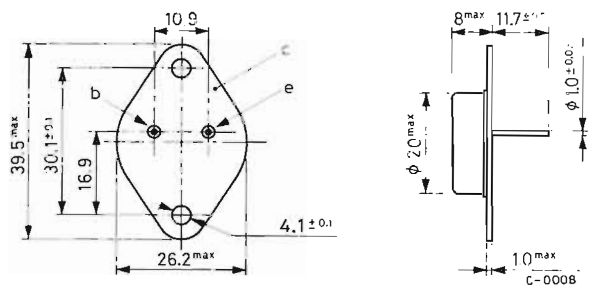
V_{CBO}	Collector-base voltage ($I_E = 0$)	-130	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-130	V
V_{EBO}*	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-10	A
I_{CM}	Collector peak current	-13	A
I_B	Base current	-3	A
P_{tot}	Total power dissipation at $T_c \leq 55$ °C	30	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

* Momentary operation in excess of these values is permissible.

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AL 100

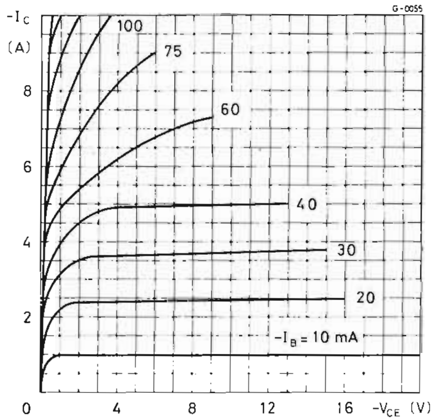
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

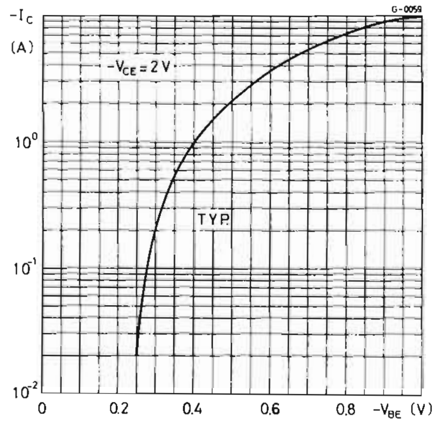
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -0.5$ V				-0.1	mA
		$V_{CB} = -40$ V				-1	mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = -2$ V				-7	mA
V_{CBO}	Collector-base voltage ($I_E = 0$)	$I_C = -10$ mA		-130			V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	$I_C = -100$ mA		-60			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_C = -5$ A $I_B = -250$ mA				-0.5	V
$V_{BE(sat)}$	Base-emitter saturation voltage	$I_C = -5$ A $I_B = -250$ mA			-0.7		V
h_{FE}	DC current gain Gr. 4	$I_C = -1$ A	$V_{CE} = -2$ V	40		70	—
	Gr. 5	$I_C = -1$ A	$V_{CE} = -2$ V	60		140	—
	Gr. 6	$I_C = -1$ A	$V_{CE} = -2$ V	120		250	—
f_T	Transition frequency	$I_C = -0.5$ A	$V_{CE} = -5$ V		4		MHz

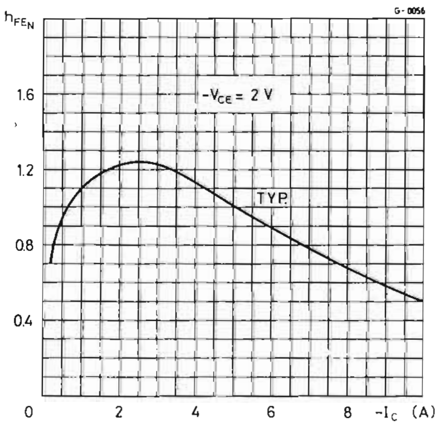
Typical output characteristics



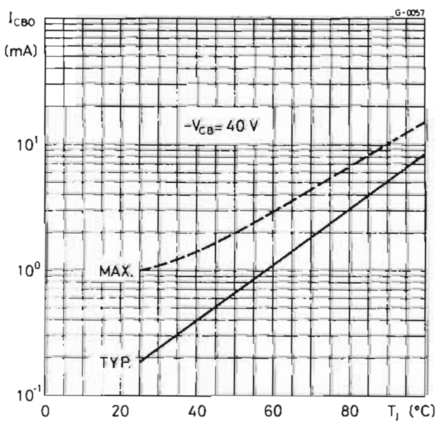
DC transconductance



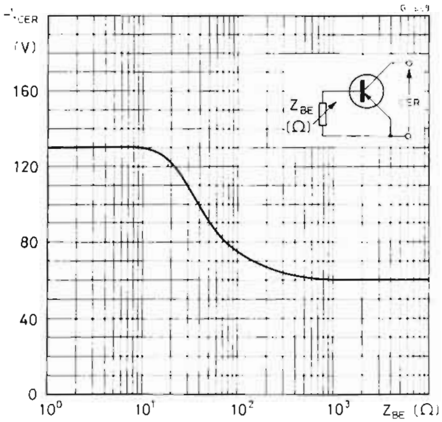
DC normalized current gain



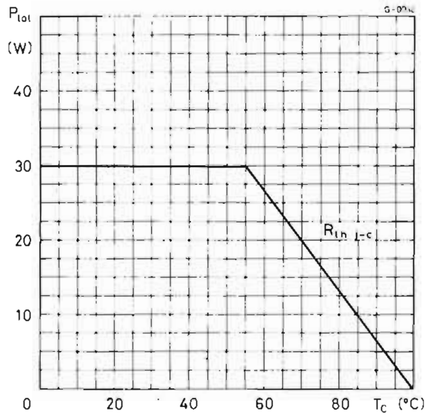
Collector cutoff current



Collector-emitter breakdown voltage



Rating chart



AL 102

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HI-FI HIGH POWER AMPLIFIER

The AL 102 is a germanium diffused-collector, graded-base, PNP transistor in a Jedec TO-3 metal case. It is particularly indicated for use in output stages of high fidelity power amplifiers where wide frequency response, linear power gain characteristics and high voltage rating are required.

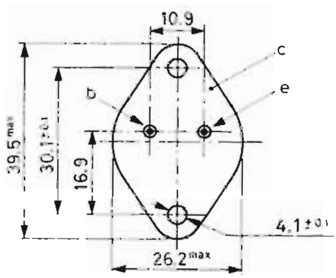
ABSOLUTE MAXIMUM RATINGS

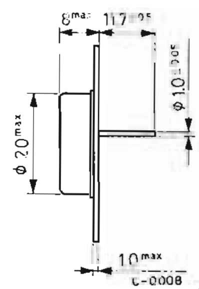
V_{CBO}	Collector-base voltage ($I_E = 0$)	-130	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-130	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-6	A
I_{CM}	Collector peak current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 55\,°C$	30	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case





(sim. to TO-3)

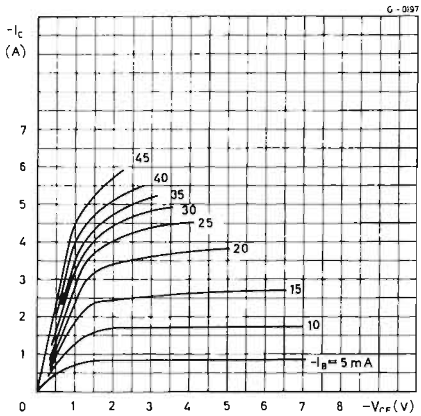
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

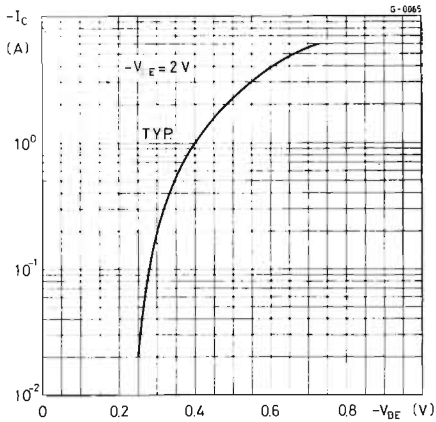
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -0.5 V			-0.1	mA
		V_{CB} = -40 V			-1	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -2 V			-7	mA
V_{CBO}	Collector-base voltage (I_E = 0)	I_C = -10 mA	-130			V
V_{CEO}	Collector-emitter voltage (I_B = 0)	I_C = -100 mA	-60			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = -5 A, I_B = -250 mA			-0.5	V
$V_{BE(sat)}$	Base-emitter saturation voltage	I_C = -5 A, I_B = -250 mA		-0.7		V
h_{FE}	DC current gain Gr. 4	I_C = -1 A V_{CE} = -2 V	40		70	—
	Gr. 5	I_C = -1 A V_{CE} = -2 V	60		140	—
	Gr. 6	I_C = -1 A V_{CE} = -2 V	120		250	—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = -1 A V_{CE} = -2 V			1.4	—
f_T	Transition frequency	I_C = -0.5 A V_{CE} = -5 V		4		MHz

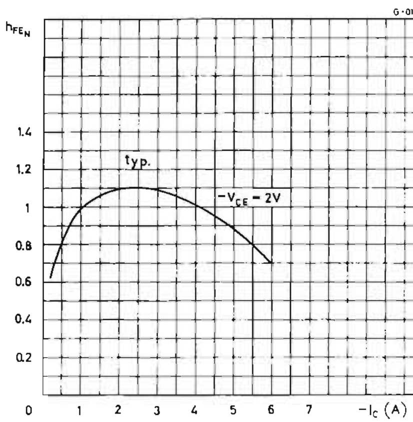
Typical output characteristics



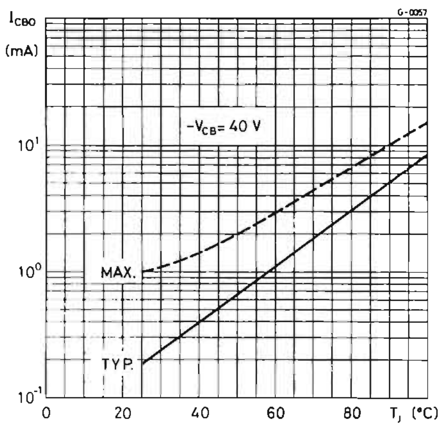
DC transconductance



DC normalized current gain

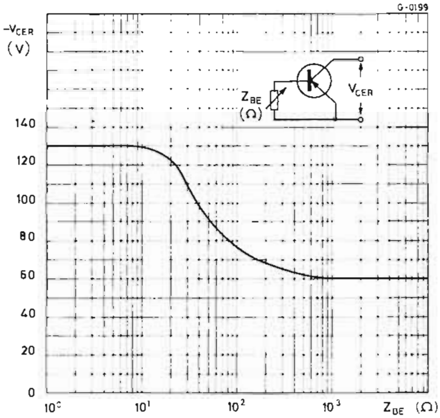


Collector cutoff current

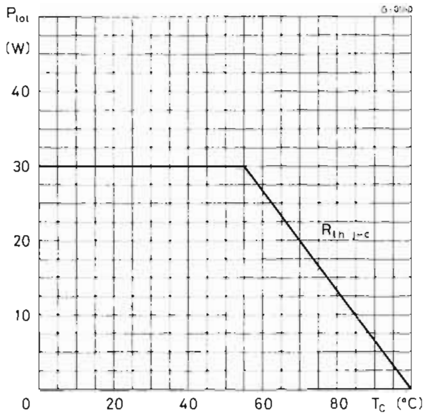


AL 102

Collector-emitter breakdown voltage



Rating chart



AL 103

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HI-FI HIGH POWER AMPLIFIER

The AL 103 is a germanium diffused-collector, graded-base, PNP transistor in a Jedec TO-3 metal case. It is particularly indicated for use in output stages of high fidelity power amplifiers where wide frequency response and linear gain characteristics are required.

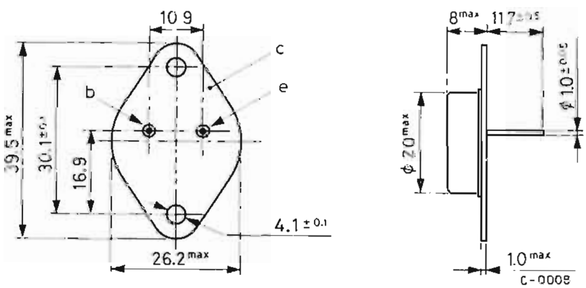
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-100	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-100	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-1.5	V
I_C	Collector current	-6	A
I_{CM}	Collector peak current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 55$ °C	30	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

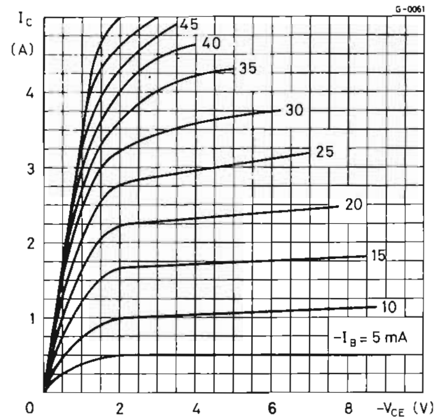
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

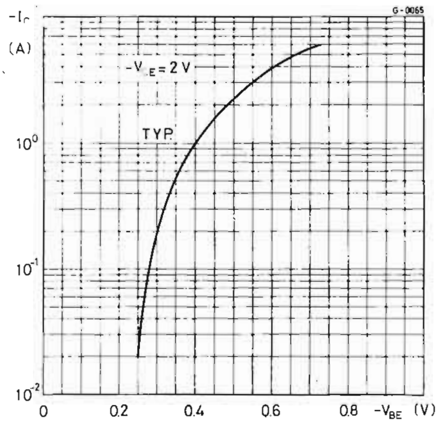
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -0.5$ V $V_{CB} = -40$ V			-0.1 -1	mA mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = -1.5$			-25	mA
V_{CBO}	Collector-base voltage ($I_E = 0$)	$I_C = -10$ mA	-100			V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	$I_C = -100$ mA	-40			V
$V_{BE(sat)}$	Base-emitter saturation voltage	$I_C = -5$ A $I_B = -250$ mA		-0.7		V
h_{FE}	DC current gain Gr. 4 Gr. 5 Gr. 6	$I_C = -1$ A $V_{CE} = -2$ V $I_C = -1$ A $V_{CE} = -2$ V $I_C = -1$ A $V_{CE} = -2$ V	40 60 120		70 140 250	— — —
h_{FE_1}/h_{FE_2}	Matched pair	$I_C = -1$ A $V_{CE} = -2$ V			1.4	—
f_T	Transition frequency	$I_C = -0.5$ A $V_{CE} = -5$ V		3		MHz

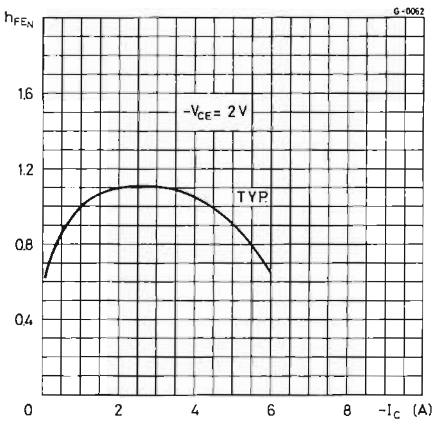
Typical output characteristics



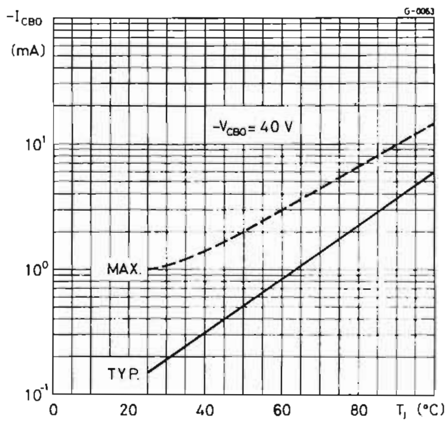
DC transconductance



DC normalized current gain

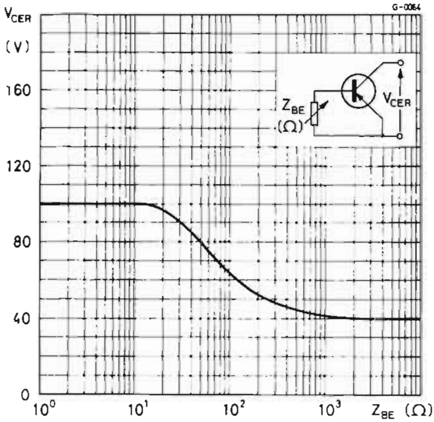


Collector cutoff current

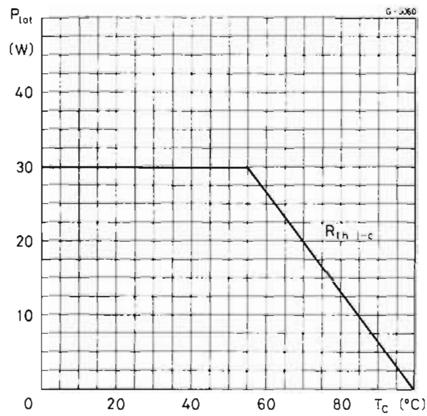


AL 103

Collector-emitter breakdown voltage



Rating chart



AL 112

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HI-FI POWER AMPLIFIER

The AL 112 is a germanium diffused-collector, graded-base, PNP transistor in a SOT-9 metal case. It is intended for use in output stages of Hi-Fi power amplifiers where wide frequency response and linear gain characteristics are required.

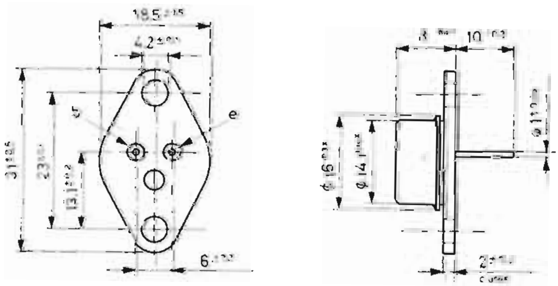
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-130	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-130	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	-60	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-6	A
I_{CM}	Collector peak current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 60$ °C	10	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



SOT-9

AL 112

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	4	°C/W

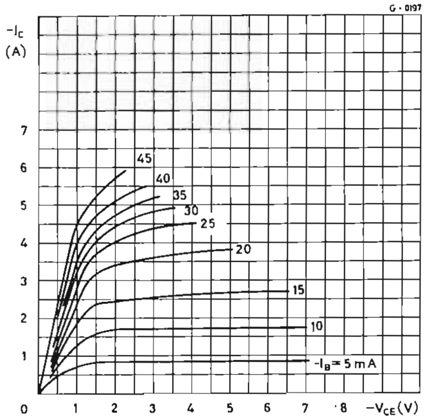
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter		Test conditions	Min.	Typ.	Max.	Unit
→	I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = -0.5 V V_{CB} = -40 V V_{CB} = -130 V			-120 -1 -10	μA mA mA
→	I_{EBO}	Emitter cutoff current ($I_C = 0$)	V_{EB} = -3 V			-70	mA
	V_{CBO}*	Collector-base voltage ($I_E = 0$)	I_C = -10 mA	-130			V
	$V_{CEO\,(sus)}$*	Collector-emitter voltage ($I_B = 0$)	I_C = -100 mA	-60			V
	$V_{CE\,(sat)}$*	Collector-emitter saturation voltage	I_C = -1.5 A I_B = -0.15 A			-0.25	V
	V_{CEK}*(1)	Collector-emitter knee voltage	I_C = -1.5 A		-0.3		V
	V_{BE}*	Base-emitter voltage	I_C = -1.5 A V_{CE} = -2 V			-0.9	V
→	h_{FE}*	DC current gain	I_C = -500 mA V_{CE} = -2 V I_C = -1.5 A V_{CE} = -2 V	20 40		220	— —
→	f_T	Transition frequency	I_C = -0.5 A V_{CE} = -5 V		3		MHz

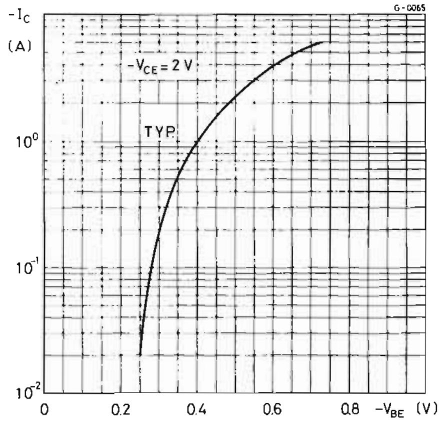
* Pulsed: pulse duration = 300 μs, duty factor = 1.5%

(1) Choose the characteristic (I_C; V_{CE}) passing through the point I_C = -1.65 A, V_{CE} = -1 V and read the V_{CE} value at I_C = -1.5 A

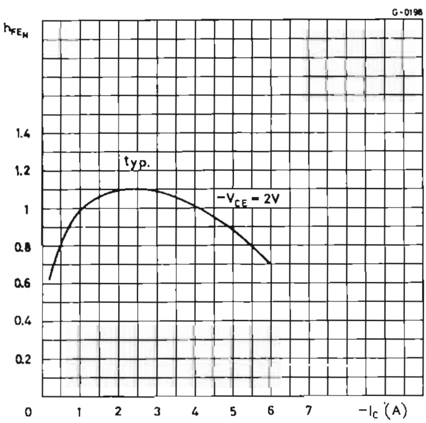
Typical output characteristics



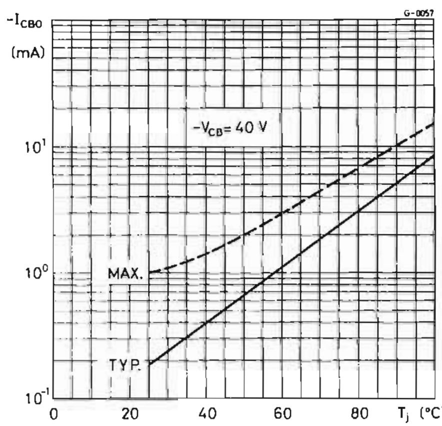
DC transconductance



DC normalized current gain

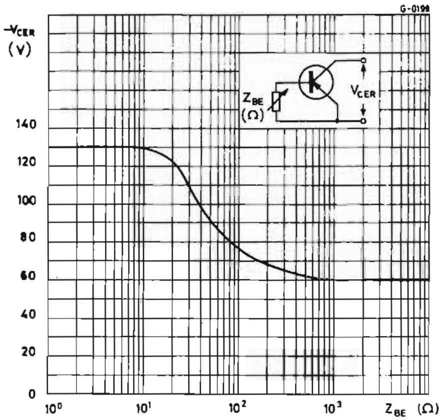


Collector cutoff current

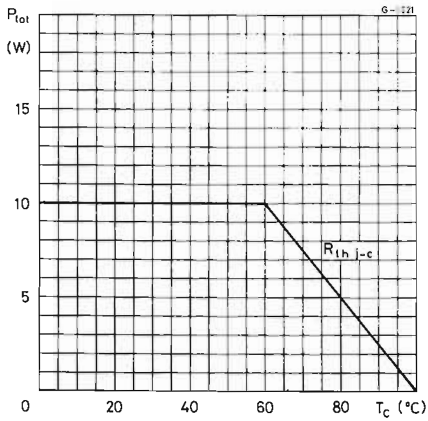


AL 112

Collector-emitter breakdown voltage



Power rating chart



AL 113

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HI-FI POWER AMPLIFIER

The AL 113 is a germanium diffused-collector, graded base, PNP transistor in a SOT-9 metal case. It is intended for use in output stages of Hi-Fi power amplifiers where wide frequency response and linear gain characteristics are required.

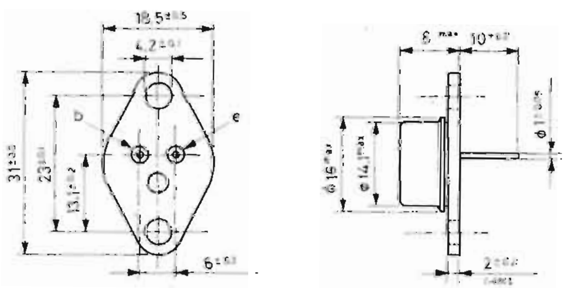
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-100	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-100	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	-40	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-1.5	V
I_C	Collector current	-6	A
I_{CM}	Collector peak current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 60$ °C	10	W
T_s	Storage temperature	-65÷100	°C
T_j	Junction temperature	100	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



SOT-9

AL 113

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	4	°C/W

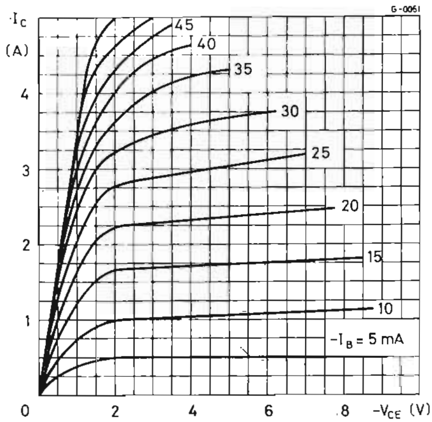
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter		Test conditions	Min.	Typ.	Max.	Unit
→	I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -0.5$ V $V_{CB} = -40$ V $V_{CB} = -100$ V			-120 -1 -10	µA mA mA
	I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = -1.5$ V			-25	mA
	V_{CBO}*	Collector-base voltage ($I_E = 0$)	$I_C = -10$ mA	-100			V
	V_{CEO}*$_{(sus)}$	Collector-emitter voltage ($I_B = 0$)	$I_C = -100$ mA	-40			V
	V_{CE}*$_{(sat)}$	Collector emitter saturation voltage	$I_C = -1.5$ A $I_B = -0.15$ A			-0.25	V
	V_{CEK}*(1)	Collector-emitter knee voltage	$I_C = -1.5$ A		-0.3		V
	V_{BE}*	Base-emitter voltage	$I_C = -1.5$ A $V_{CE} = -2$ V			-0.9	V
→	h_{FE}*	DC current gain	$I_C = -500$ mA $V_{CE} = -2$ V $I_C = -1.5$ A $V_{CE} = -2$ V	40 50		220	— —
→	f_T	Transition frequency	$I_C = -0.5$ A $V_{CE} = -5$ V		3		MHz

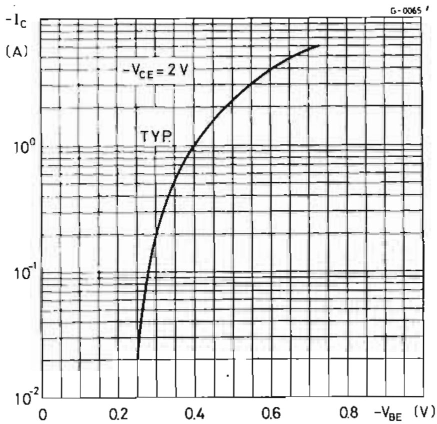
* Pulsed: pulse duration = 300 µs, duty factor = 1.5%.

(1) Choose the characteristic (I_C; V_{CE}) passing through the point $I_C = -1.65$ A, $V_{CE} = -1$ V and read the V_{CE} value at $I_C = -1.5$ A.

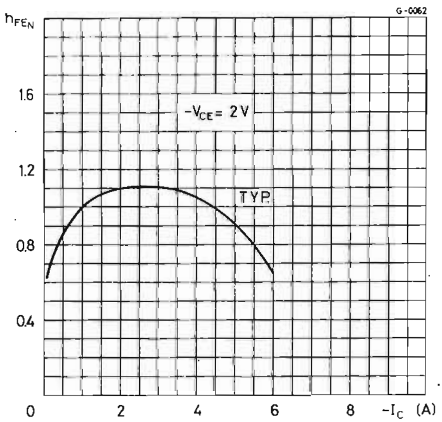
Typical output characteristics



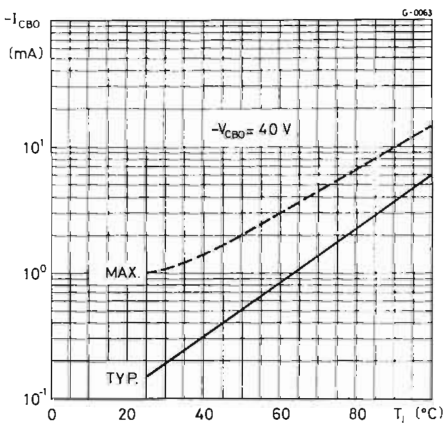
DC transconductance



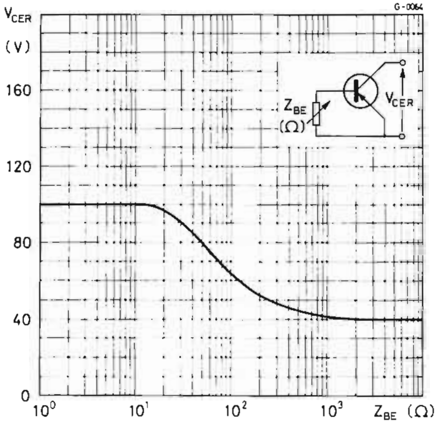
DC normalized current gain



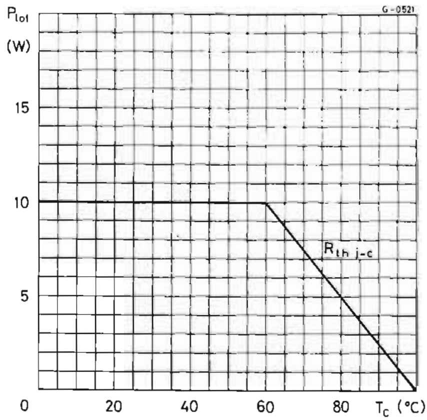
Collector cutoff current



Collector-emitter breakdown voltage



Power rating chart



AU 106

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HORIZONTAL LARGE SCREEN TV DEFLECTOR

The AU 106 is a germanium diffused-collector, graded-base, PNP power transistor in a Jedec TO-3 metal case. It is primarily intended for use as horizontal output amplifier in high energy systems of picture tubes having deflection angles up to 114°, anode voltage ratings up to 18 kV and neck diameter up to 28 mm. This transistor is also suitable for use as high voltage and high speed switch.

ABSOLUTE MAXIMUM RATINGS

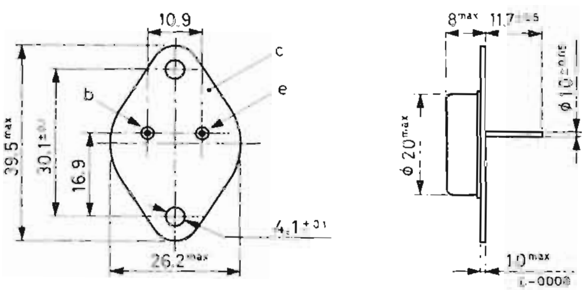
V_{CBO}	Collector-base voltage ($I_E = 0$)	-320	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-320	V
V_{EBO}*	Emitter-base voltage ($I_C = 0$)	-2	V
I_{BR}	Base reverse current	4	A
I_{BF}	Base forward current	-1	A
I_C	Collector current	-10	A
P_{tot}**	Total power dissipation at $T_c \leq 55$ °C	5	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

* Momentary operation in excess of these values is permissible.
** In horizontal output stages.

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 106

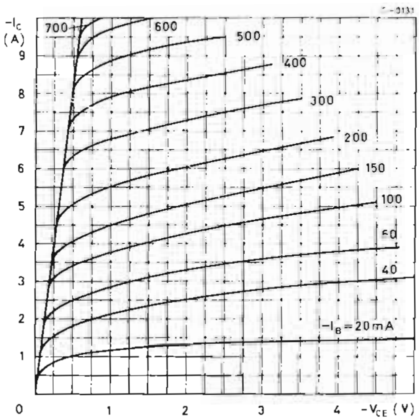
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

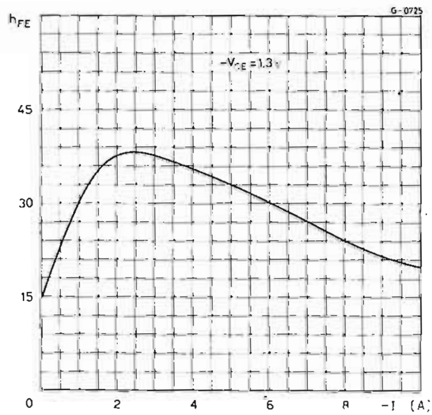
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -10$ V				-0.2	mA
		$V_{CB} = -320$ V				-15	mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = -2$ V				-200	mA
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_C = -6$ A	$I_B = -0.4$ A			-1	V
$V_{BE(sat)}$	Base-emitter saturation voltage	$I_C = -6$ A	$I_B = -0.4$ A			-1.5	V
f_T	Transition frequency	$I_C = -0.5$ A	$V_{CE} = -2$ V		2		MHz
t_{off}	Turn off time	See test circuit				0.75	μs

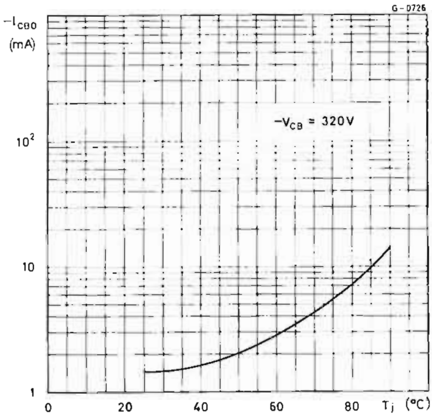
Typical output characteristics



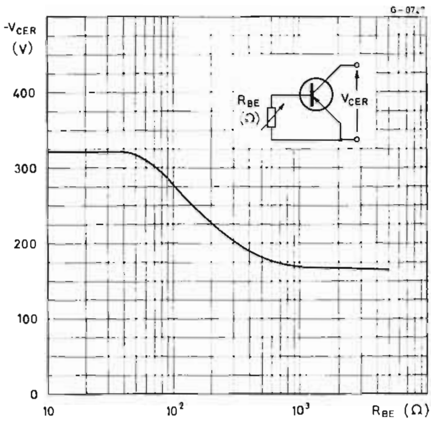
Typical DC current gain



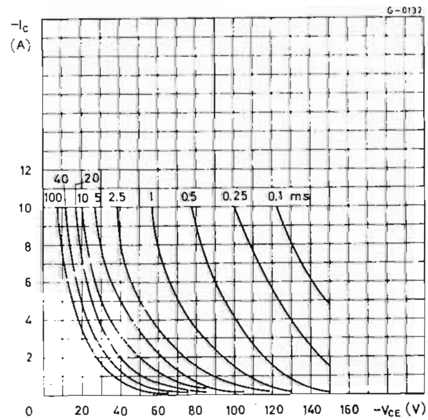
Typical collector cutoff current



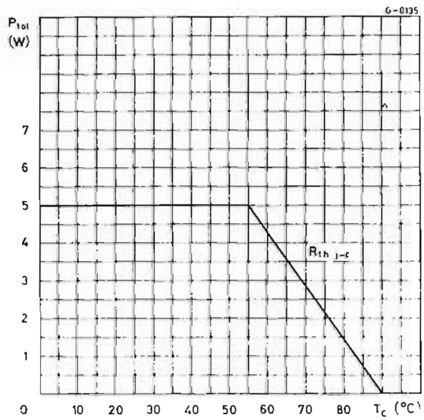
Collector-emitter breakdown voltage



Safe operating areas

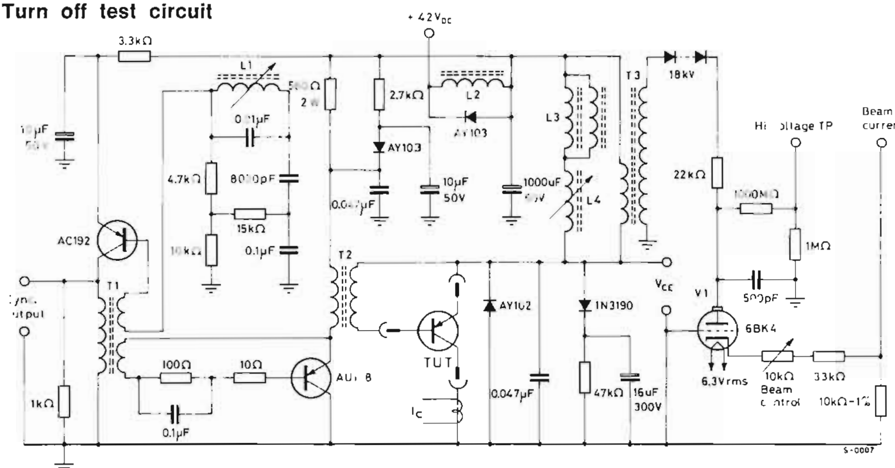


Power rating chart



TEST CIRCUIT

Turn off test circuit



T_1 = blocking-oscillator transformer: SAREA type TOT-2 or equivalent. T_2 = driver transformer: SAREA type TDT-5, ARCO type 259004-004. T_3 = EAT transformer: SAREA type 6049, ARCO type 249020020. L_1 = sine wave coil: 1.38 to 1.87 mH. L_2 = blocking coil: 2 mH. L_3 = horizontal yoke: 200 μH. L_4 = linearity coil 8 to 35 μH. "Turn off time" is the time required for the collector current I_C to decrease to 100 mA after the collector to emitter voltage V_{CE} has risen 2 volts into its "flyback" excursion.

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: VERTICAL LARGE SCREEN TV DEFLECTOR

The AU 107 is a germanium diffused-collector, graded-base, PNP power transistor in a Jedec TO-3 metal case. It is primarily intended for use as vertical output amplifier in high energy deflection systems of large screen television receivers. This transistor is also suitable for use as high speed switch.

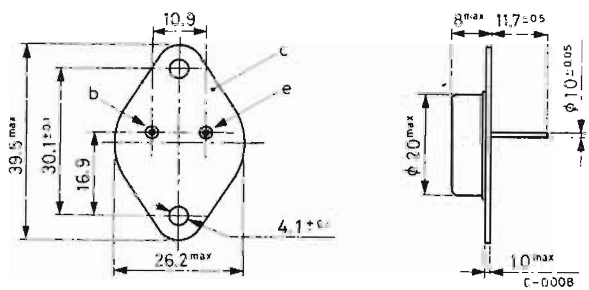
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-200	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-200	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 45$ °C	30	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 107

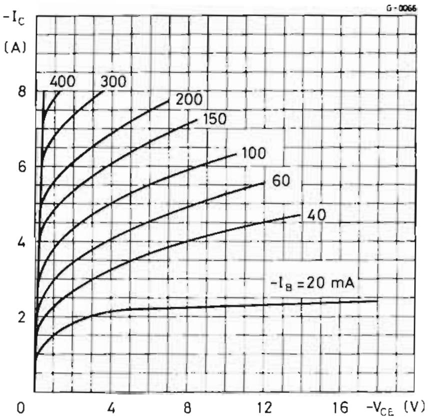
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

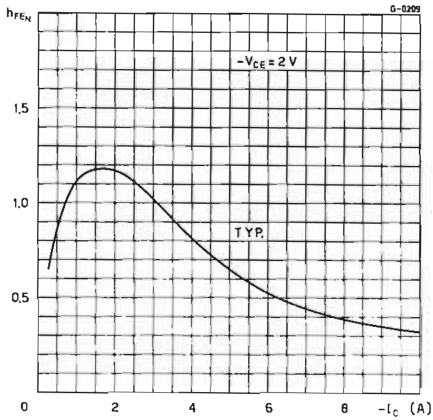
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
→ I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = -10 V			-0.2	mA
		V_{CB} = -200 V			-5	mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	V_{EB} = -2 V			-200	mA
h_{FE}	DC current gain	I_C = -50 mA V_{CE} = -1 V	10			–
		I_C = -0.7 A V_{CE} = -2 V	35		120	–
→ f_T	Transition frequency	I_C = -0.5 A V_{CE} = -2 V		2		MHz

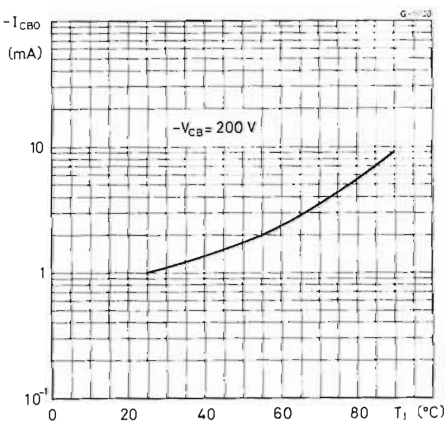
Typical output characteristics



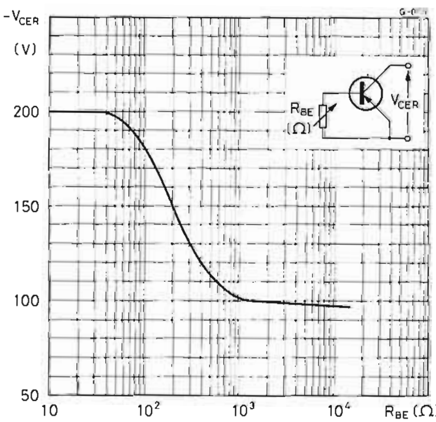
Typical DC normalized current gain



Typical collector cutoff current



Collector-emitter breakdown voltage



AU 108

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HORIZONTAL LARGE SCREEN TV DEFLECTION DRIVER

The AU 108 is a germanium diffused-collector, graded-base, PNP transistor in a Jedec TO-3 metal case. It is intended for use in the driver stages of horizontal deflection circuits of television receivers. This transistor is also particularly indicated for high current switching applications.

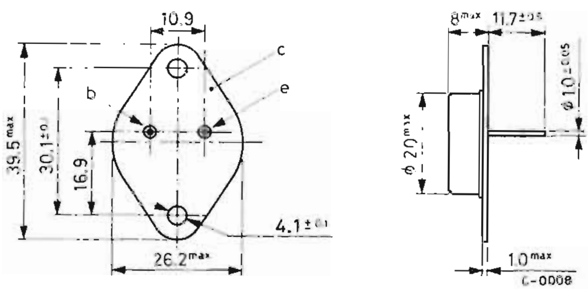
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-100	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-100	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 45$ °C	30	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

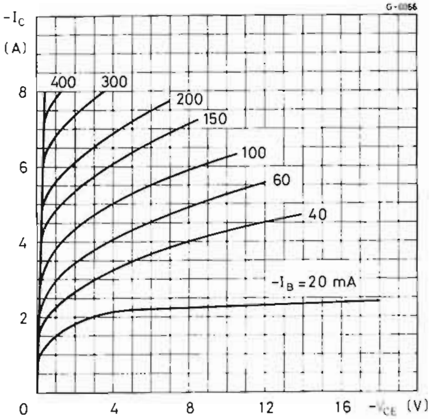
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

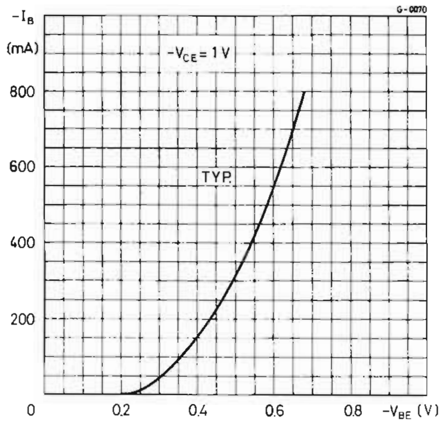
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
→ I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -10$ V			-0.2	mA
		$V_{CB} = -100$ V			-5	mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = -2$ V			-200	mA
h_{FE}	DC current gain	$I_C = 0.7$ A $V_{CE} = -2$ V	35		200	–

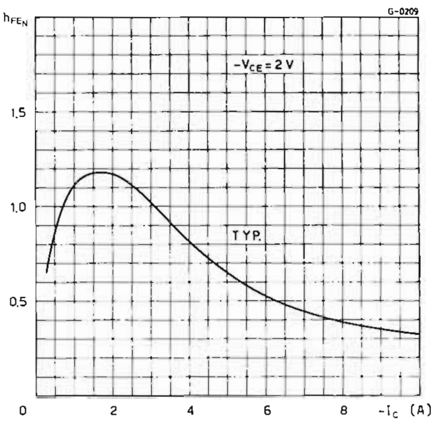
Typical output characteristics



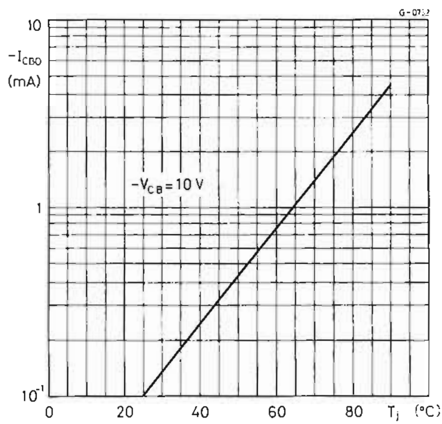
Typical input characteristics



Typical DC normalized current gain



Typical collector cutoff current



AU 108F

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HORIZONTAL LARGE SCREEN TV DEFLECTION DRIVER

The AU 108F is a germanium diffused-collector, graded-base, power PNP transistor in a Jedec TO-3 metal case. It is intended for use in the driver stages of horizontal deflection circuits of television receivers. This transistor is also particularly indicated for high current switching applications.

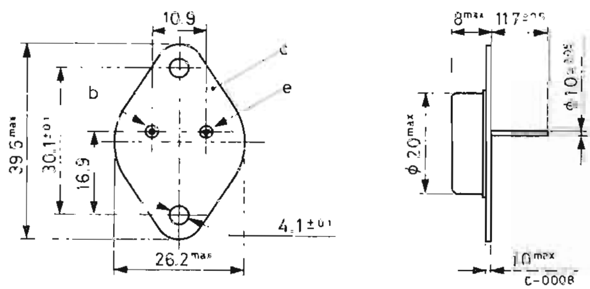
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-100	V
V_{CES}	Collector-emtter voltage ($V_{BE} = 0$)	-100	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-10	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_c \leq 45\,°C$	30	W
T_s	Storage temperature	-60÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 108F

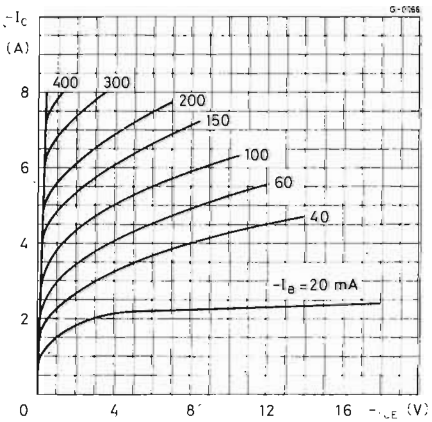
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

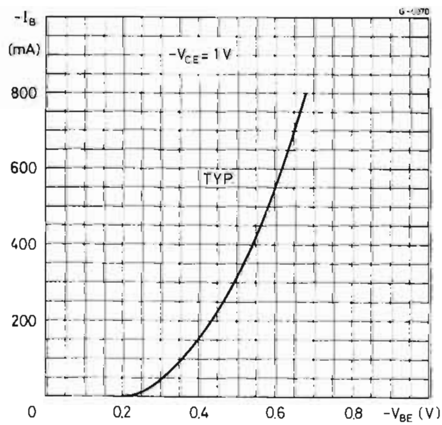
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
→ I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -10 V			-0.2	mA
		V_{CB} = -100 V			-5	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -2 V			-200	mA
h_{FE}	DC current gain	I_C = -1 A V_{CE} = -2 V	120		250	–
t_r	Rise time	See test circuit			0.7	µs

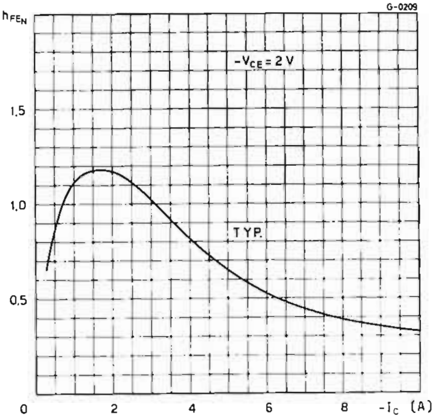
Typical output characteristics



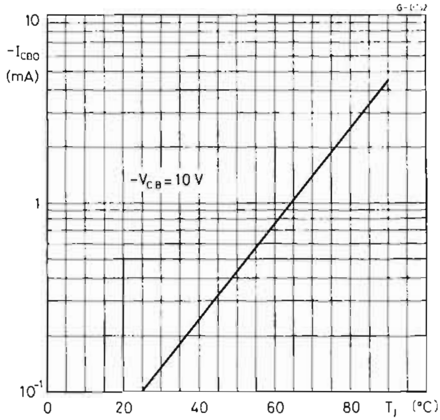
Typical input characteristics



Typical DC normalized current gain

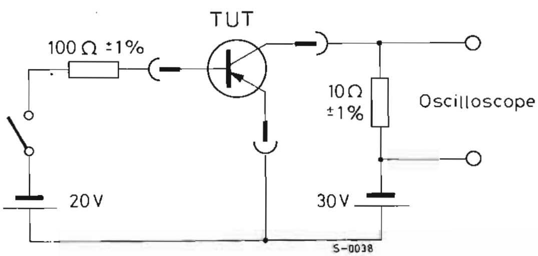


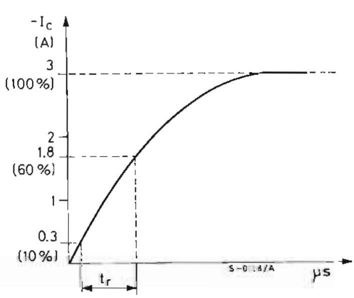
Typical collector cutoff current



TEST CIRCUIT

Rise time test circuit





AU 110

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: TV OUTPUT AMPLIFIER

The AU 110 is a germanium diffused - collector, graded - base PNP transistor in a Jedec TO-3 metal case. It is primarily intended for use in horizontal deflection stages with 90° deflection angle.

ABSOLUTE MAXIMUM RATINGS

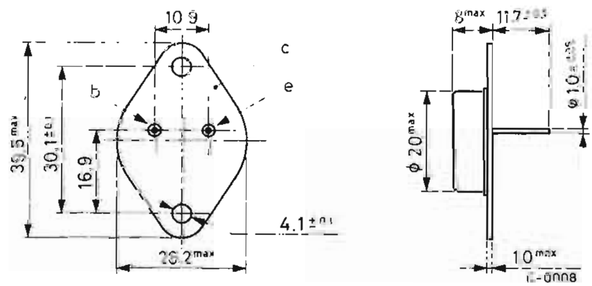
→	V_{CBO}	Collector-base voltage ($I_E = 0$)	-140	V
→	V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-140	V
	V_{EBO}*	Emitter-base voltage ($I_C = 0$)	-2	V
	I_C*	Collector current	-10	A
	I_B	Base current	-3	A
→	P_{tot}	Total power dissipation at $T_c \leq 45\ ^\circ C$	30	W
→	T_s	Storage temperature	-65 ÷ 90	°C
→	T_j	Junction temperature	90	°C

* Momentary operation in excess of these values is permissible.

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 110

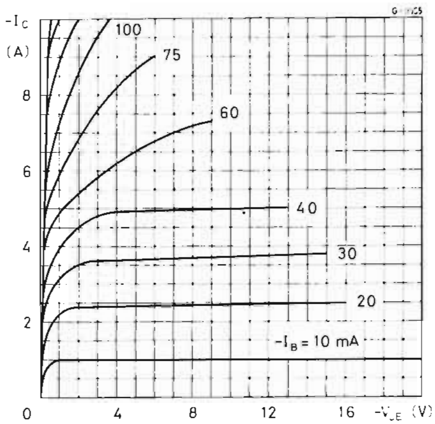
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

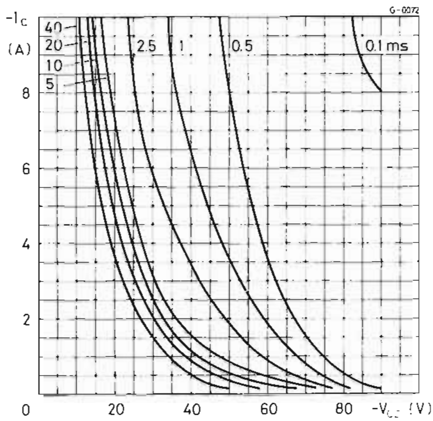
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
→ I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -10 V			-0.2	mA
		V_{CB} = -140 V			4	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -2 V			-200	mA
→ $V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = -5A I_B = -0.4 A			-0.5	V
→ $V_{BE(sat)}$	Base-emitter saturation voltage	I_C = -5 A I_B = -0.4 A			1.1	V
t_{off}	Turn off time	See test circuit			2	μs

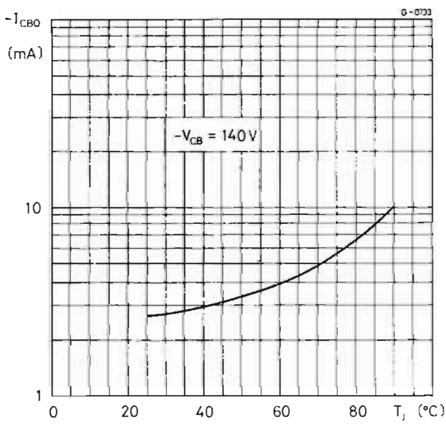
Typical output characteristics



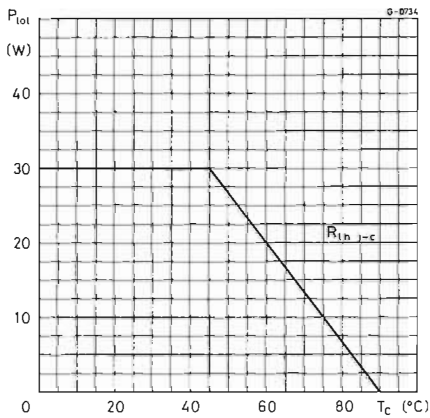
Safe operating areas



Typical collector cutoff current

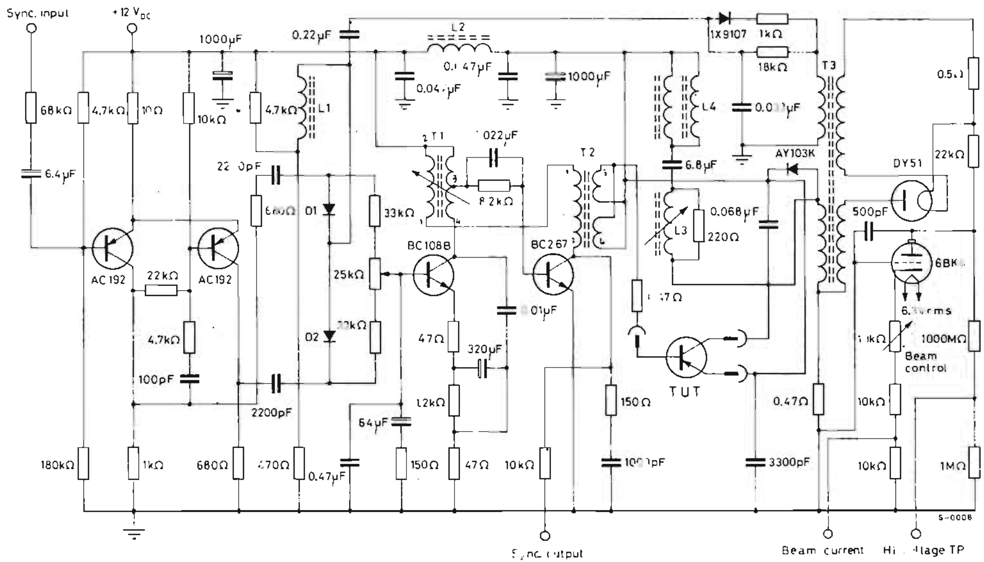


Power rating chart



TEST CIRCUIT

Turn off test circuit



T_1 = oscillator transformer: 1-4 = 10 Ω, 1-4 = 1.6 ÷ 15 mH; 1-2 = 2 Ω, 1-2 = 6.5 ÷ 13 μH; 2-3 = 5 Ω, 2-3 = 0.4 ÷ 3.5 mH; 3-4 = 5 Ω, 3-4 = 0.4 ÷ 3.5 mH. T_2 = driver transformer : 1-2 = 7.5 Ω, 1-2 = 18.5 mH; 3-4 = 2.2 Ω, 3-4 = 5.1 mH. T_3 = EAT transformer: S A R E A type 6088 or equivalent. L_1 = choke coil: 60 mH. L_2 = 150 μH. L_3 = amplitude control coil: 3 ÷ 12 μH. L_4 = horizontal yoke: 85 μH.

N.B. All inductance measurements are made at 1000 Hz.

"Turn off time" is the time required for the collector current I_C to decrease to 100 mA after the collector to emitter voltage V_{CE} has risen 2 volts into its "flyback" excursion. Adjusted L_3 so that the collector current of the transistor under test is 5 A peak and beam control so that the cathode current of 6 BK4 tube is 200 μA.

GERMANIUM DIFFUSED COLLECTOR PNP

AU 111

GENERAL INFORMATION

TYPICAL APPLICATION: HORIZONTAL TV DEFLECTOR

The AU 111 is a germanium diffused-collector, graded-base, PNP transistor in a Jedec TO-3 metal case. It is primarily intended for use as horizontal output amplifier in high energy deflection systems for TV receivers. This transistor is also suitable for use as high voltage and high speed switch.

ABSOLUTE MAXIMUM RATINGS

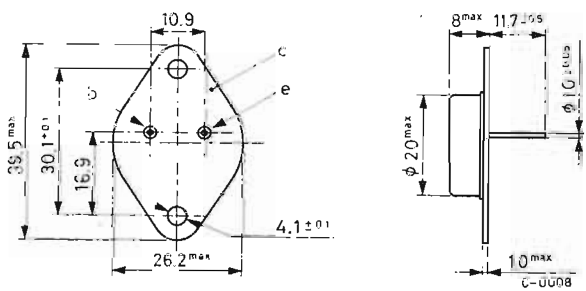
V_{CBO}	Collector-base voltage ($I_E = 0$)	-320	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-320	V
V_{EBO}*	Emitter-base voltage ($I_C = 0$)	-2	V
I_{BR}	Base reverse current	4	A
I_{BF}	Base forward current	-1	A
I_C	Collector current	-10	A
P_{tot}**	Total power dissipation at $T_c \leq 55$ °C	5	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

* Momentary operation in excess of these values is permissible.
** In horizontal output stages.

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 111

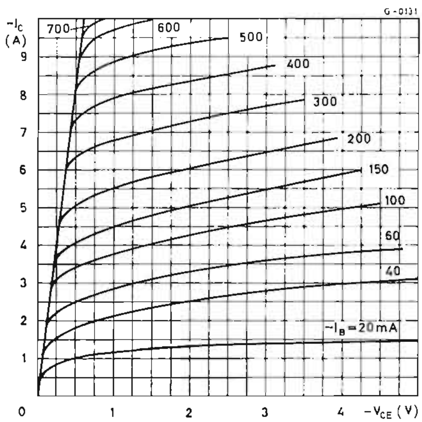
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

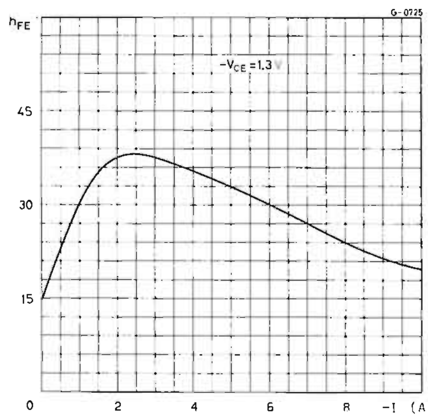
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -10 V			-0.2	mA
		V_{CB} = -320 V			-15	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -2 V			-200	mA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = -6 A I_B = -0.4 A			-1	V
$V_{BE(sat)}$	Base-emitter saturation voltage	I_C = -6 A I_B = -0.4 A			-1.5	V
f_T	Transition frequency	I_C = -0.5 A V_{CE} = -2 V		2		MHz
t_{off}	Turn off time	See test circuit			1.2	μs

Typical output characteristics

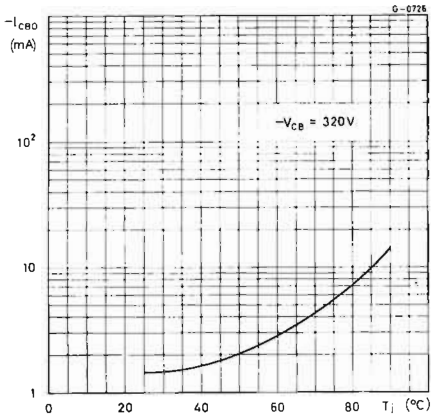


Typical DC current gain

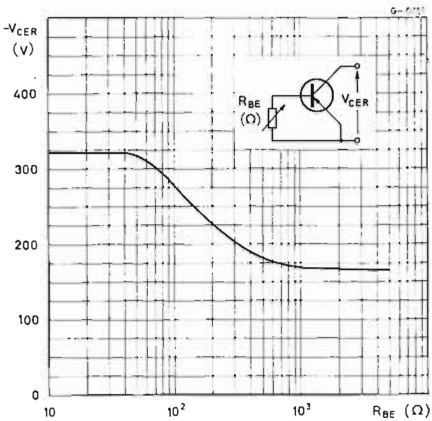


AU 111

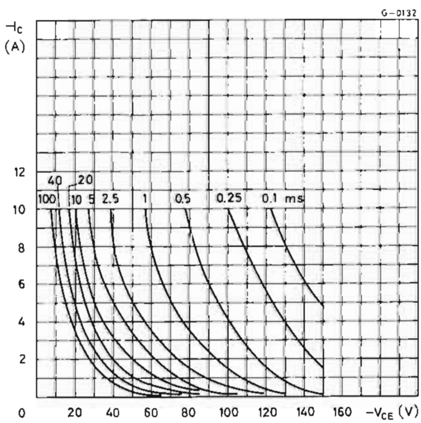
Typical collector cutoff current



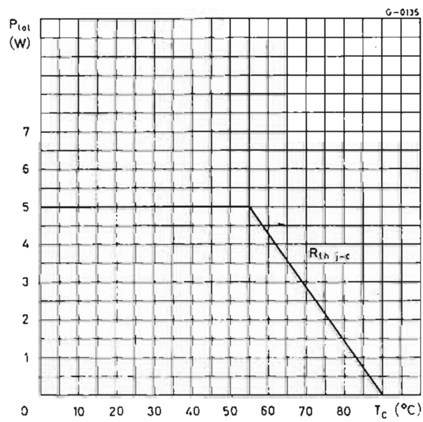
Collector-emitter breakdown voltage



Safe operating areas

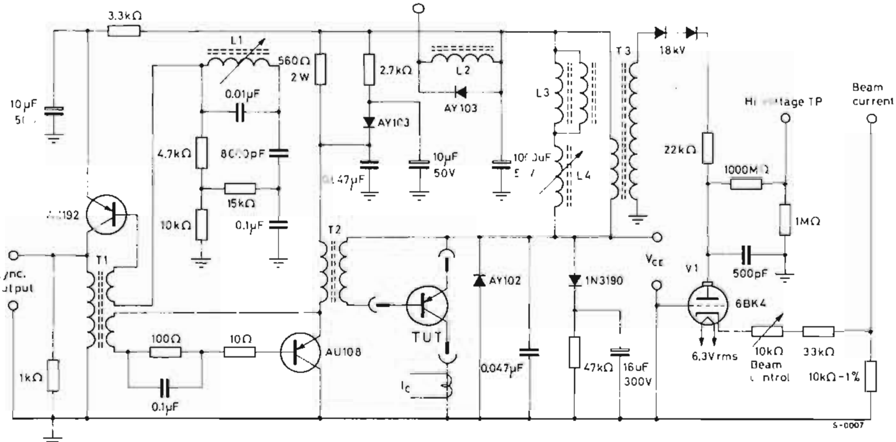


Power rating chart



TEST CIRCUIT

Turn off test circuit



T_1 = blocking-oscillator transformer: SAREA type TOT-2 or equivalent. T_2 = driver transformer: SAREA type TDT-5, ARCO type 259004-004. T_3 = EAT transformer: SAREA type 6049, ARCO type 249020020. L_1 = sine wave coil: 1.38 to 1.87 mH. L_2 = blocking coil: 2 mH. L_3 = horizontal yoke: 200 μH. L_4 = linearity coil 8 to 35 μH. "Turn off time" is the time required for the collector current I_C to decrease to 100 mA after the collector to emitter voltage V_{CE} has risen 2 volts into its "flyback" excursion.

AU 112

GERMANIUM DIFFUSED COLLECTOR PNP

GENERAL INFORMATION

TYPICAL APPLICATION: HORIZONTAL TV DEFLECTOR

The AU 112 is a germanium diffused-collector, graded-base, PNP transistor in a Jedec TO-3 metal case. It is primarily intended for use in horizontal deflection stages of television receivers utilizing large screen picture tubes up to 110° 23" with high supply voltage.

ABSOLUTE MAXIMUM RATINGS

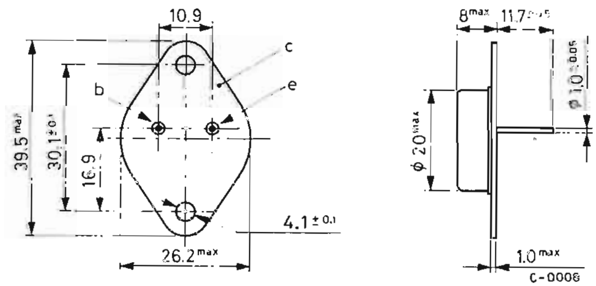
V_{CBO}	Collector-base voltage ($I_E = 0$)	-320	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-320	V
V_{EBO}*	Emitter-base voltage ($I_C = 0$)	-2	V
I_C	Collector current	-10	A
I_{BR}	Base reverse current	4	A
I_{BF}	Base forward current	-1	A
P_{tot}**	Total power dissipation at $T_c \leq 55$ °C	5	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

* Momentary operation in breakdown is permissible.
** In horizontal output stages.

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 112

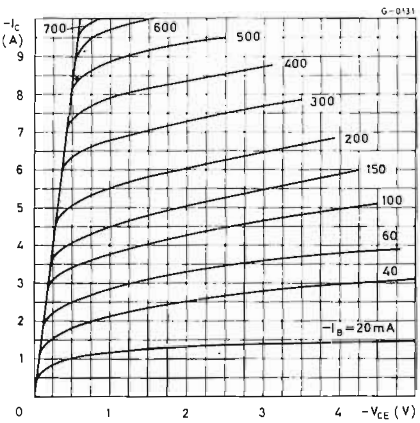
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

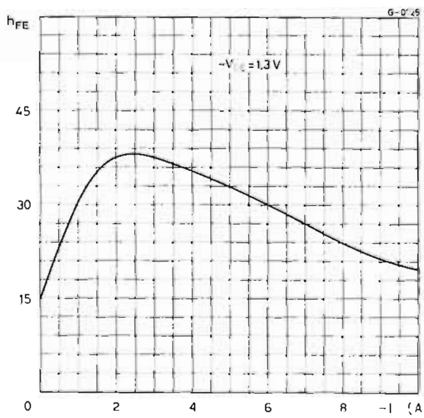
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
→ I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -10 V				-0.2	mA
		V_{CB} = -320 V				-15	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -2 V				-200	mA
→ $V_{CE(sat)}$	Collector emitter saturation voltage	I_C = -6 A	I_B = -0.4 A			-1	V
→ $V_{BE(sat)}$	Base-emitter saturation voltage	I_C = -6 A	I_B = -0.4 A			-1.5	V
→ f_T	Transition frequency	I_C = 0.5 A	V_{CE} = -2 V		2		MHz
t_{off}	Turn off time	See test circuit				0.75	µs

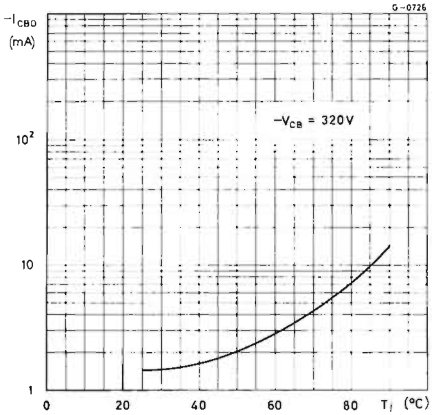
Typical output characteristics



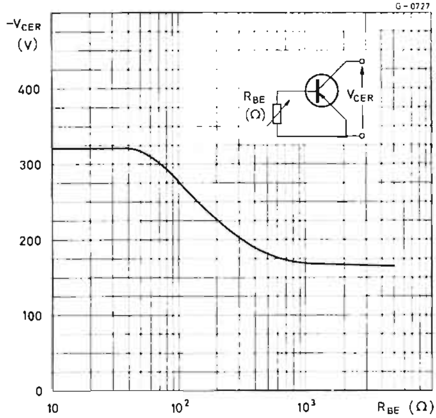
Typical DC current gain



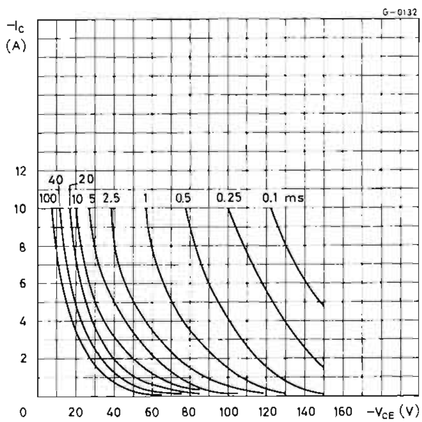
Typical collector cutoff current



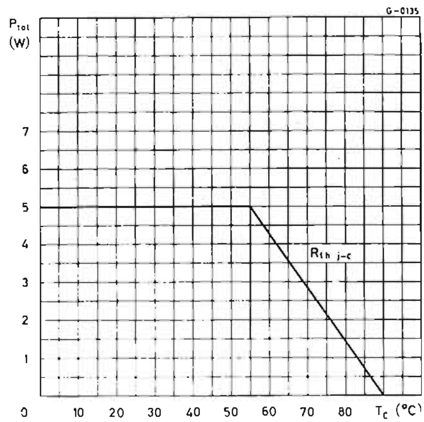
Collector-emitter breakdown voltage



Safe operating areas



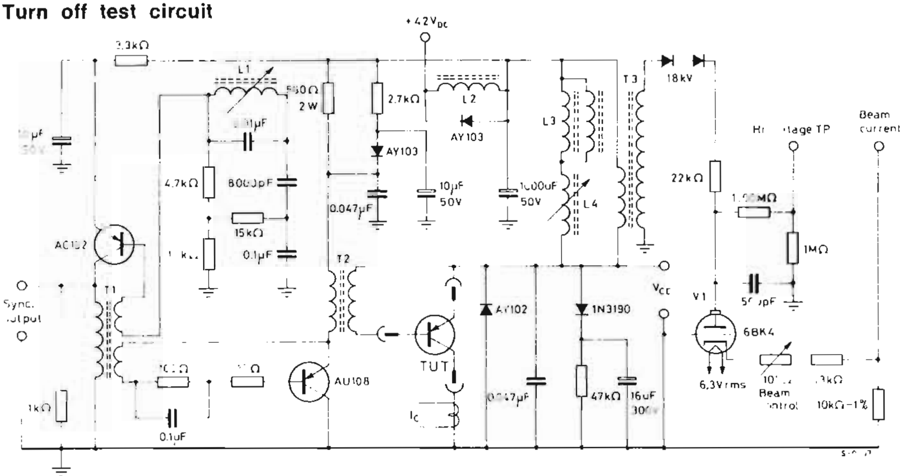
Power rating chart



AU 112

TEST CIRCUIT

Turn off test circuit



T_1 = blocking-oscillator transformer: SAREA type TOT-2 or equivalent. T_2 = driver transformer: SAREA type TDT-5, ARCO type 259004-004. T_3 = EAT transformer: SAREA type 6049, ARCO type 249020020. L_1 = sine wave coil: 1.38 to 1.87 mH. L_2 = blocking coil: 2 mH. L_3 = horizontal yoke: 200 µH. L_4 = linearity coil 8 to 35 µH. "Turn off time" is the time required for the collector current I_C to decrease to 100 mA after the collector to emitter voltage V_{CE} has risen 2 volts into its "flyback" excursion.

GERMANIUM DIFFUSED COLLECTOR PNP

AU 113

GENERAL INFORMATION

TYPICAL APPLICATION: HORIZONTAL TV DEFLECTOR

The AU 113 is a germanium diffused-collector, graded base, power PNP transistor in a Jedec TO-3 metal case. It is primarily intended for use in horizontal deflection systems of television receivers using picture tubes with deflection angles up to 110°, neck diameters up to 20 mm, and anode voltages up to 12 kV.

ABSOLUTE MAXIMUM RATINGS

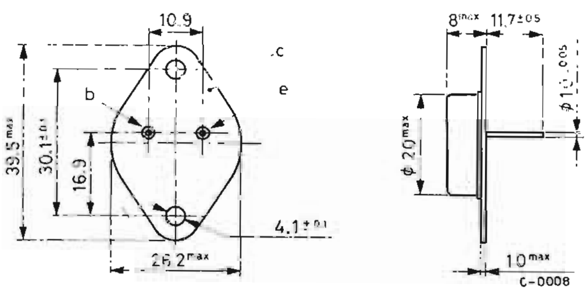
V_{CBO}	Collector-base voltage ($I_E = 0$)	-250	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-250	V
→ V_{EBO}*	Emitter-base voltage ($I_C = 0$)	-2	V
I_{BRM}	Base reverse peak current	4	A
I_{BFM}	Base forward peak current	-1	A
I_{CM}	Collector peak current	-10	A
P_{tot}**	Total power dissipation at $T_c \leq 55$ °C	5	W
T_s	Storage temperature	-60÷90	°C
T_j	Junction temperature	90	°C

* Momentary operation in excess of these values is permissible.
** In horizontal output stages.

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

AU 113

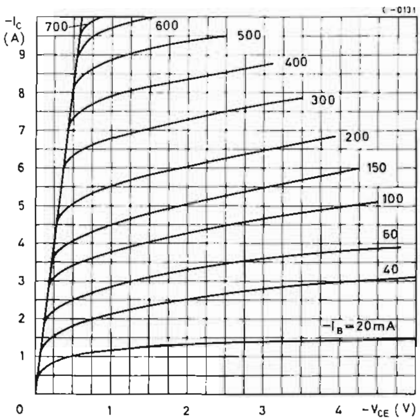
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

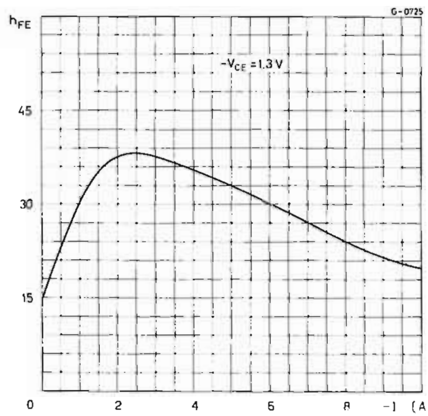
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
→ I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = -10 V			-0.2	mA
		V_{CB} = -250 V			-15	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = -2 V			-200	mA
→ $V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = -5 A I_B = -0.4 A			-0.8	V
→ $V_{BE(sat)}$	Base-emitter saturation voltage	I_C = -5 A I_B = -0.4 A			-1.4	V
t_{off}	Turn off time	See test circuit			1.5	μs

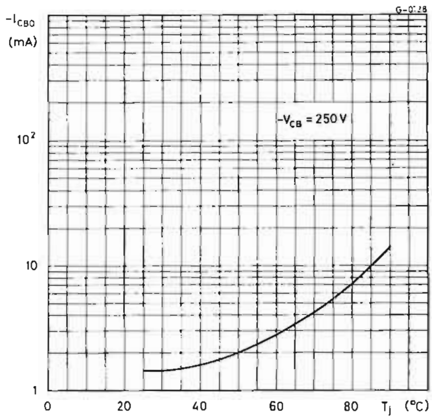
Typical output characteristics



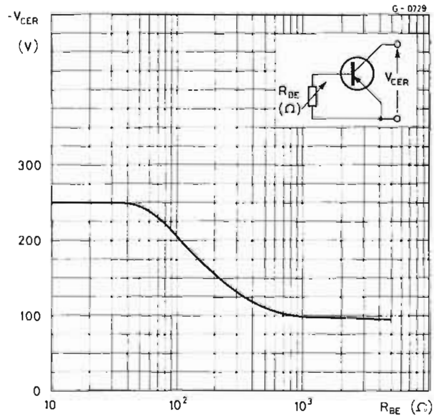
Typical DC current gain



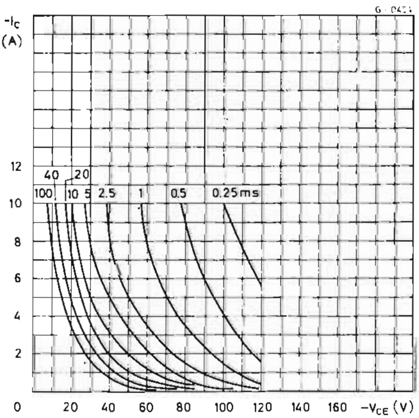
Typical collector cutoff current



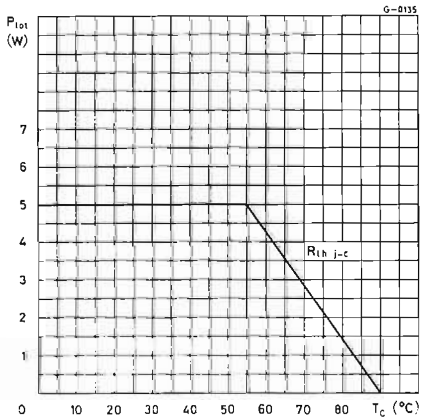
Collector-emitter breakdown voltage



Safe operating areas



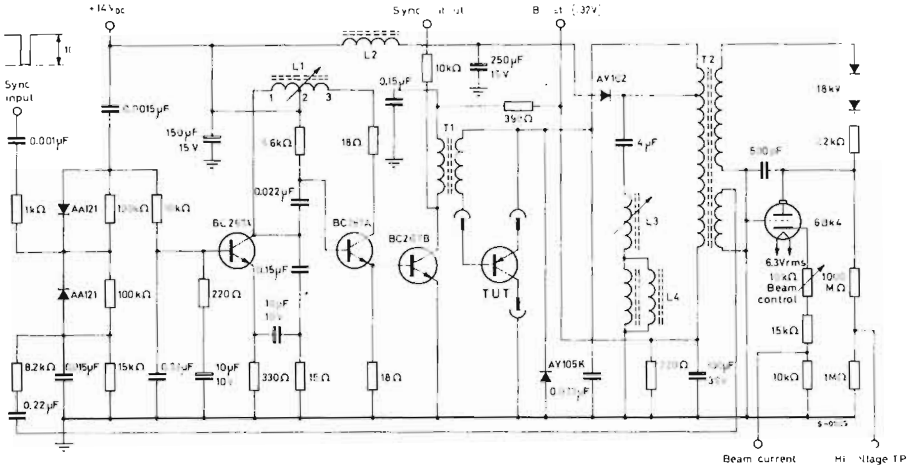
Power rating chart



AU 113

TEST CIRCUIT

Turn off test circuit



T_1 = driver transformer: SAREA type TDT 16 or ARCO type 259-004-011. T_2 = EAT transformer: SAREA type 7005 or ARCO type 241037. L_1 = 1 to 2: 369 turns Ø 0.18 mm, 1to3: 453 turns Ø 0.18 mm, 1 to 3 = 770 µH to 1.24 mH. L_2 = 50 µH 0.1 Ω. L_3 = linearity coil: SAREA type BL 0103 or equivalent. L_4 = horizontal yoke: 105 µH. "Turn-off time" is the time required for the collector I_C to decrease to 100 mA after the collector to emitter voltage V_{CE} has risen 2 volts into its "flyback" escursion. Adjust L_3 so that the collector current of the transistor under test is 5 A peak and beam control so that the catode current of 6BK4 tube is 200 µA.

GERMANIUM DIODES

AY 102

GERMANIUM DIFFUSED DIODE

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH VOLTAGE TV DAMPER DIODE

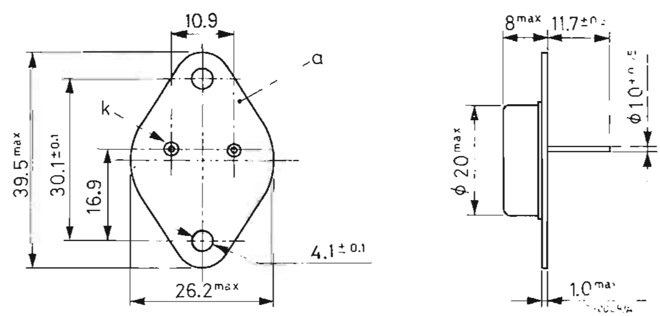
The AY 102 is a diffused germanium diode in a Jedec TO-3 metal case. It is particularly designed as damper diode in horizontal TV deflection stages coupled with AU 106, AU 112 and AU 111 transistors.

ABSOLUTE MAXIMUM RATINGS

V_{RM}	Peak reverse voltage	320	V
V_R	Reverse voltage	60	V
I_{FM}	Peak forward current	10	A
I_F	Forward current	7	A
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm



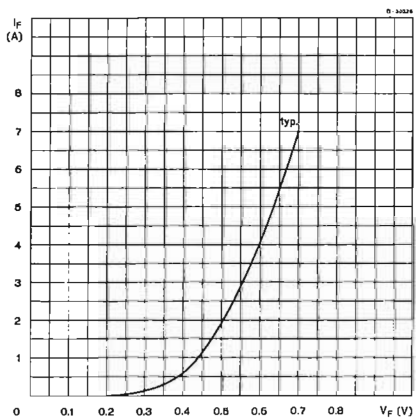
(sim. to **TO-3**)

AY 102

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
V_{RM}	Peak reverse voltage	I_R = 1 mA	320			V
V_R	Reverse voltage	I_R = 0.3 mA	175			V
I_R	Reverse current	V_R = 10 V			150	µA
V_F	Forward voltage	I_F = 7 A		0.7	0.77	V

Forward characteristics



GERMANIUM DIFFUSED DIODE

AY 103K

GENERAL INFORMATION

TYPICAL APPLICATION: TV DAMPER DIODE

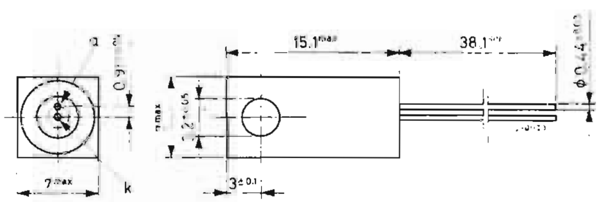
The AY 103K is a diffused germanium diode, in a prismatic metal case. It is primarily intended as damper diode in horizontal deflection systems for 90° TV sets.

ABSOLUTE MAXIMUM RATINGS

V_{RM}	Peak reverse voltage	200	V
V_R	Reverse voltage	80	V
I_F	Forward current	(limited by max. dissipation)	
P_{tot}	Total power dissipation at $T_c \leq 45$ °C	1.1	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm



AY 103K

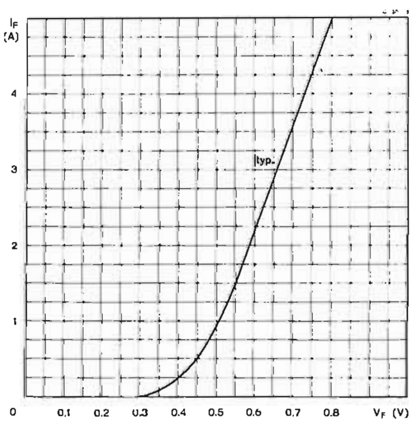
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	40	°C/W
$R_{th\ j-a}$	Thermal resistance junction-ambient	max	250	°C/W

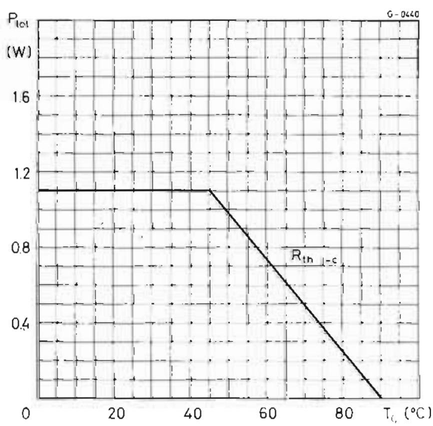
ELECTRICAL CHARACTERISTICS (T$_c$ = 25 °C unless otherwise specified)

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{RM}	Peak reverse voltage	I_R = 500 μA	200			V
I_R	Reverse current	V_R = 10 V			60	μA
V_F	Forward voltage	I_F = 3 A		0.65	1	V

Forward characteristics



Rating chart



GERMANIUM DIFFUSED DIODE

AY 104

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH SPEED DIODE

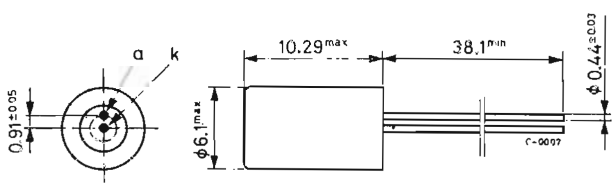
The AY 104 is a diffused germanium diode in a Jedec TO-1 metal case. It is particularly intended for high speed, high current applications.

ABSOLUTE MAXIMUM RATINGS

V_R	Reverse voltage	90	V
I_F	Forward current	(limited by max. dissipation)	
P_{tot}	Total power dissipation at $T_c \leq 45\,°C$	1.1	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm



TO-1

AY 104

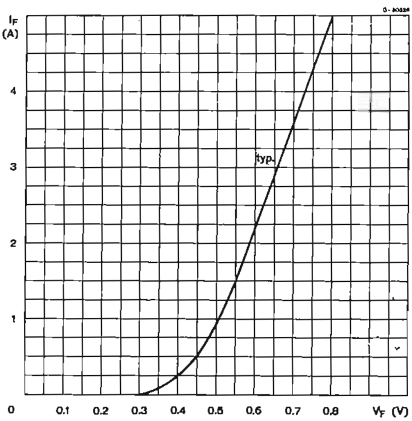
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	40	°C/W
$R_{th\ j-a}$	Thermal resistance junction-ambient	max	300	°C/W

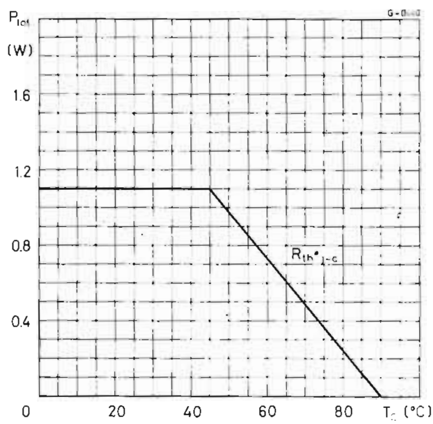
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
V_R	Reverse voltage	I_R = 100 μA	90			V
V_F	Forward voltage	I_F = 15 mA			0.3	V

Forward characteristic



Rating chart



GERMANIUM DIFFUSED DIODE

AY 105K

GENERAL INFORMATION

TYPICAL APPLICATION: TV DAMPER DIODE

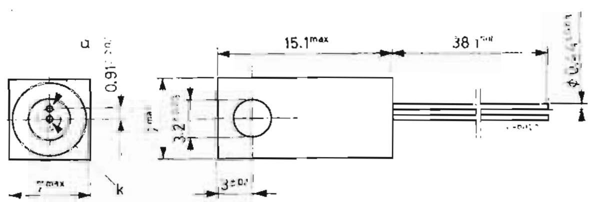
The AY 105 K is a germanium diffused diode, in a prismatic metal case. It is primarily intended as damper diode in horizontal deflection systems of television receivers using picture tubes with deflection angles up to 110°, neck diameters up to 20 mm and anode voltages up to 12 kV.

ABSOLUTE MAXIMUM RATINGS

V_{RM}	Peak reverse voltage	250	V
V_R	Continuous reverse voltage	80	V
I_F	Average forward current	(limited by max. dissipation)	
P_{tot}	Total power dissipation at $T_c \leq 45$ °C	1.1	W
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm



AY 105K

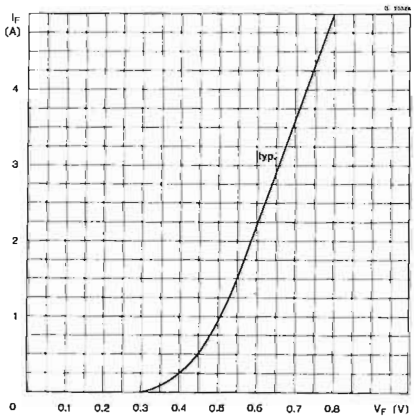
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	40	°C/W
$R_{th\ j-a}$	Thermal resistance junction-ambient	max	250	°C/W

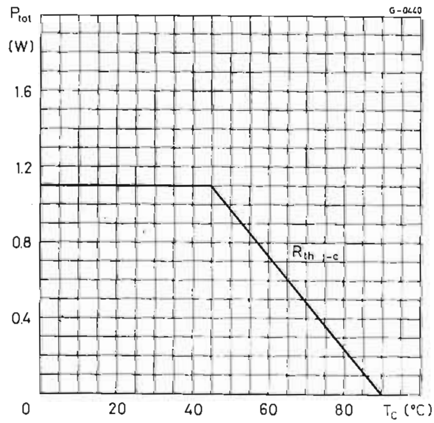
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
V_{RM}	Peak reverse voltage	I_R = 500 µA	250			V
I_R	Reverse current	V_R = 10 V			60	µA
V_F	Forward voltage	I_F = 3 A		0.65	1	V

Forward characteristic



Rating chart



AY 106

GERMANIUM DIFFUSED DIODE

GENERAL INFORMATION

TYPICAL APPLICATION: TV BOOSTER DIODE

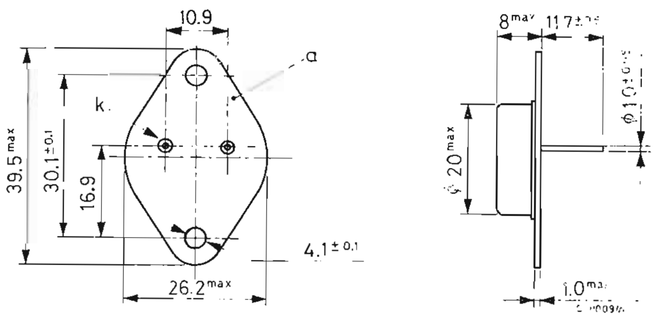
The AY 106 is a germanium diffused diode, in a Jedec TO-3 metal case. It is primarily intended as booster diode in horizontal deflection systems of television receivers using picture tubes with deflection angles up to 110°, neck diameters up to 20 mm and anode voltages up to 12 kV.

ABSOLUTE MAXIMUM RATINGS

V_{RM}	Peak reverse voltage	200	V
V_R	Continuos reverse voltage	60	V
I_{FM}	Peak forward current	10	A
I_F	Average forward current	7	A
T_s	Storage temperature	-65÷90	°C
T_j	Junction temperature	90	°C

MECHANICAL DATA

Dimensions in mm



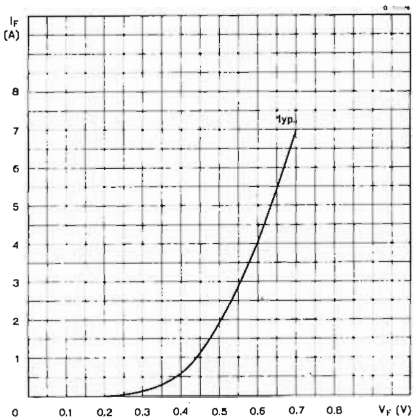
(similar to **TO-3**)

AY 106

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
V_{RM}	Peak reverse voltage	I_R = 1 mA	200			V
V_F	Forward voltage	I_F = 7 A			0.77	V
I_R	Reverse current	V_R = 10 V			150	μA

Forward characteristic



SILICON TRANSISTORS

BD 111A

SILICON PLANAR NPN

TV VERTICAL DEFLECTION OUTPUT TRANSISTOR

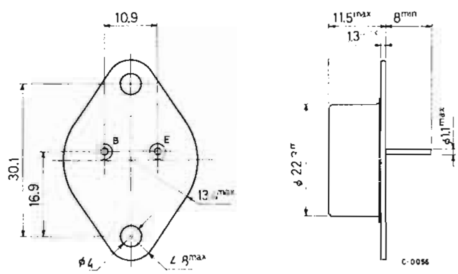
The BD 111A is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is designed for use in TV vertical deflection circuits.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	60	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	60	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 25\ °C$	62	W
	at $T_{case} \leq 100\ °C$	25	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BD 111A

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	2	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = 40$ V $V_{CB} = 40$ V $T_{amb} = 125$ °C			10 1	µA mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	$I_C = 50$ mA	60			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	$I_C = 1$ mA	60			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	$I_E = 1$ mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	$I_C = 1$ A $I_B = 0.1$ A $I_C = 5$ A $I_B = 0.5$ A		0.1 0.3	 1	V V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	$I_C = 1$ A $I_B = 0.1$ A $I_C = 5$ A $I_B = 0.5$ A		0.85 1.1	 1.5	V V
h_{FE}*	DC current gain	$I_C = 0.5$ A $V_{CE} = 5$ V $I_C = 2$ A $V_{CE} = 5$ V $I_C = 5$ A $V_{CE} = 5$ V	40 10	100 90 40		— — —
f_T	Transition frequency	$I_C = 0.5$ A $V_{CE} = 5$ V		100		MHz
C_{CBO}	Collector-base capacitance	$I_E = 0$ $V_{CB} = 10$ V		80		pF
t_{on}	Turn-on time	$I_C = 5$ A $I_{B1} = 0.5$ A		0.5		µs
t_f	Fall time	$I_C = 5$ A $I_{B1} = I_{B2} = 0.5$ A		0.4		µs

* Pulsed: pulse duration = 300 µs, duty factor = 1%.

BD 117

SILICON PLANAR NPN

AUDIO POWER TRANSISTOR

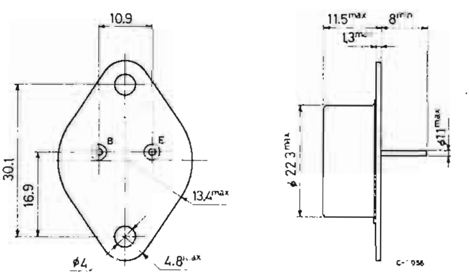
The BD 117 is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is intended for audio power applications.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	100	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	60	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_{CM}	Collector peak current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 25\,°C$	30	W
	at $T_{case} \leq 100\,°C$	15	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BD 117

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	4.16	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = 30$ V				10	µA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	$I_C = 50$ mA		60			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	$I_C = 2$ mA		100			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	$I_E = 1$ mA		5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	$I_C = 2$ A	$I_B = 0.2$ A			0.6	V
		$I_C = 5$ A	$I_B = 0.5$ A			1.5	V
V_{BE}	Base-emitter voltage	$I_C = 2$ A	$V_{CE} = 5$ V		0.9		V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	$I_C = 2$ A	$I_B = 0.2$ A			1.3	V
		$I_C = 5$ A	$I_B = 0.5$ A			2.2	V
h_{FE}*	DC current gain	$I_C = 50$ mA	$V_{CE} = 5$ V	20	70		—
		$I_C = 1$ A	$V_{CE} = 5$ V	30	110		—
		$I_C = 2$ A	$V_{CE} = 5$ V	30	110		—
		$I_C = 5$ A	$V_{CE} = 5$ V	20	70		—
f_T	Transition frequency	$I_C = 0.1$ A	$V_{CE} = 10$ V		50		MHz
C_{CBO}	Collector-base capacitance	$I_E = 0$	$V_{CB} = 20$ V			120	pF

* Pulsed: pulse duration = 300 µs, duty factor = 1%.

BD 141

SILICON HOMETAXIAL* NPN

GENERAL INFORMATION

TYPICAL APPLICATION: AF OUTPUT AMPLIFIER

The BD 141 is a high voltage "hometaxial" silicon NPN transistor in a Jedec TO-3 metal case. It is intended for a wide variety of intermediate and high power applications and particularly used as AF power amplifier, where high voltage is required.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

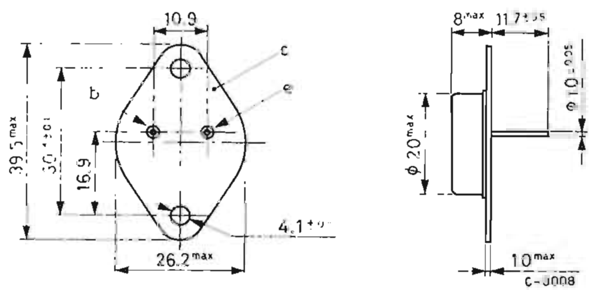
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	140	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	120	V
V_{CEV}	Collector-emitter voltage ($V_{BE} = -1.5$ V)	140	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	8	A
I_{CM}	Collector peak current	13	A
I_B	Base current	5	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	117	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

THERMAL DATA

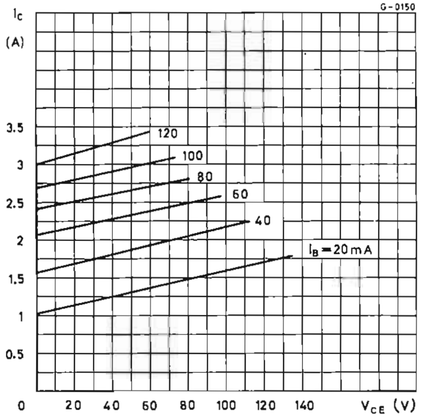
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

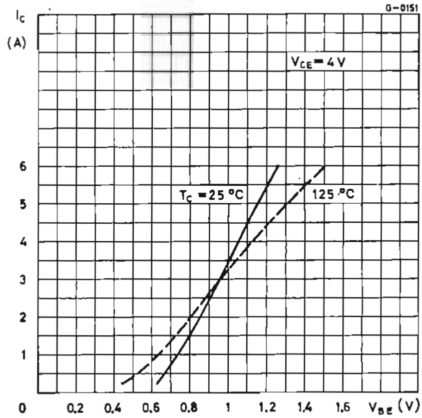
	Parameter		Test conditions		Min.	Typ.	Max.	Unit
	I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 120 V				2	mA
	I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V				5	mA
→	V_{CEO}*	Collector-emitter voltage (I_B = 0)	I_C = 200 mA		120			V
	$V_{CE\ (sat)}$	Collector-emitter saturation voltage	I_C = 2 A	I_B = 0.2 A			1	V
→	V_{CEV}*	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 100 mA		140			V
	V_{BE}	Base-emitter voltage	I_C = 2 A	V_{CE} = 4 V			2	V
	h_{FE}	DC current gain	I_C = 2 A	V_{CE} = 4 V	20		70	—
→	P.R.T.	Power rating test	I_C = 1.5 A	V_{CE} = 67 V	1			s

* Pulsed; pulse duration = 300 μs, duty factor = 1.5%.

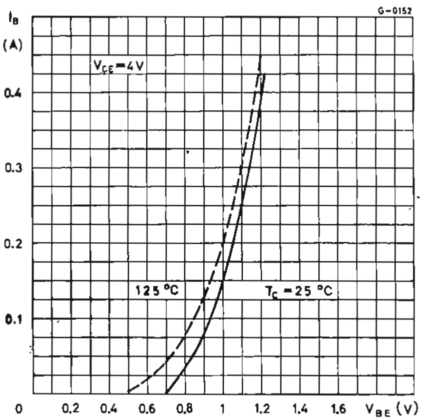
Typical output characteristics



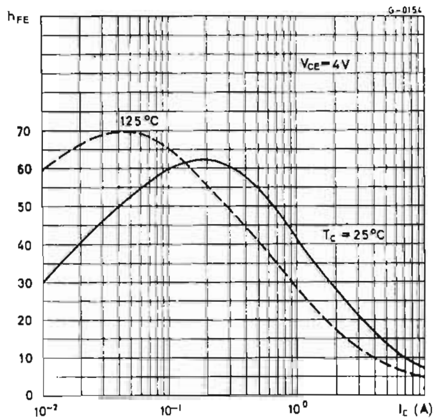
Typical DC transconductance



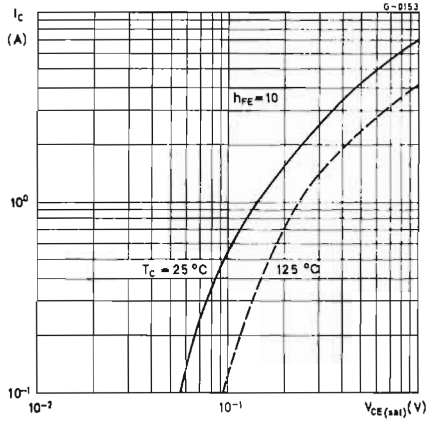
Typical input characteristics



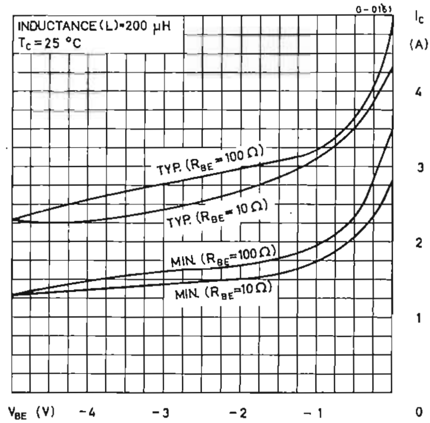
Typical DC current gain



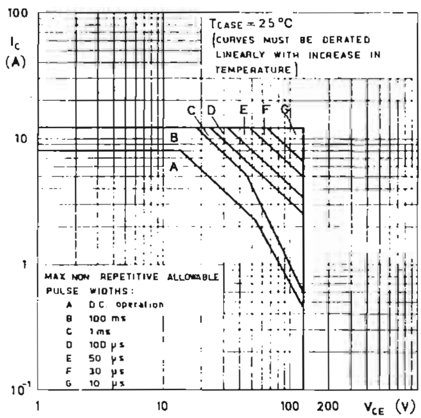
Typical collector-emitter saturation voltage



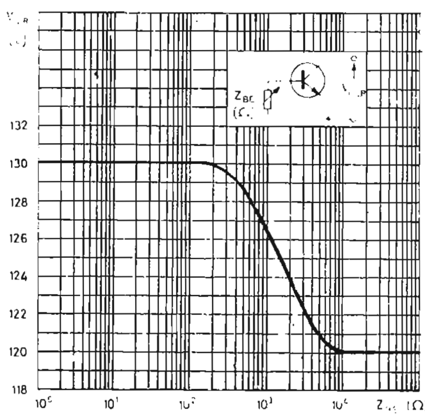
Reverse-bias, second breakdown characteristics



Maximum operating areas



Collector-emitter breakdown voltage



SILICON HOMETAXIAL* NPN

BD 142

GENERAL INFORMATION

TYPICAL APPLICATION: AF OUTPUT AMPLIFIER

The BD 142 is a single diffused "hometaxial" silicon NPN transistor in a Jedec TO-3 metal case. It is intended for a wide variety of intermediate and high power applications and particularly used as AF power amplifier.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

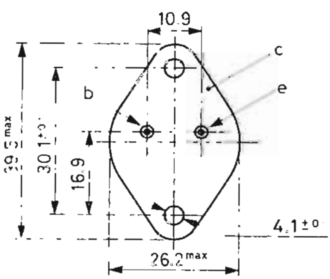
ABSOLUTE MAXIMUM RATINGS

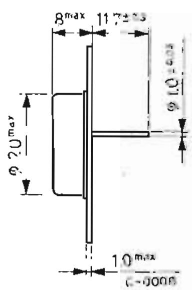
V_{CBO}	Collector-base voltage ($I_E = 0$)	50	V
→ V_{CEO}	Collector-emitter voltage ($I_B = 0$)	45	V
V_{CEV}	Collector-emitter voltage ($V_{BE} = -1.5$ V)	50	V
→ V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	15	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	117	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case





(sim. to **TO-3**)

BD 142

THERMAL DATA

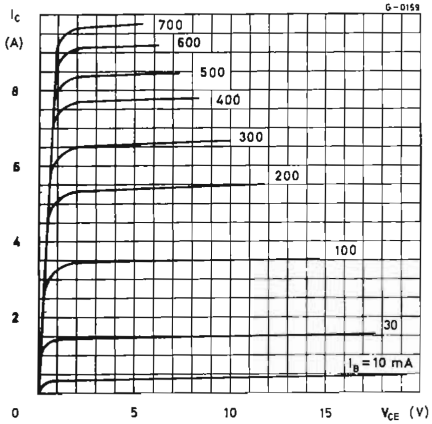
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

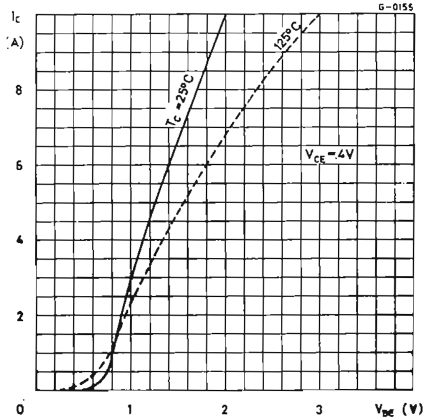
	Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current		V_{CE} = 40 V				2	mA
→ I_{EBO}	Emitter cutoff current (I_C = 0)		V_{EB} = 7 V				1	mA
→ V_{CEO}*	Collector-emitter voltage (I_B = 0)		I_C = 200 mA		45			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage		I_C = 4 A	I_B = 400 mA			1.1	V
V_{CEV}*	Collector-emitter voltage (V_{BE} = -1.5 V)		I_C = 100 mA		50			V
→ V_{BE}*	Base-emitter voltage		I_C = 4 A	V_{CE} = 4 V			1.5	V
h_{FE}	DC current gain	Gr. 4	I_C = 500 mA	V_{CE} = 4 V	20		50	—
		Gr. 5	I_C = 500 mA	V_{CE} = 4 V	35		75	—
		Gr. 6	I_C = 500 mA	V_{CE} = 4 V	60		145	—
		Gr. 7	I_C = 500 mA	V_{CE} = 4 V	120		250	—
		*	I_C = 4 A	V_{CE} = 4 V	12.5	35	160	—
h_{FE_1}/h_{FE_2}	Matched pair		I_C = 500 mA	V_{CE} = 4 V			1.6	—
f_T	Transition frequency		I_C = 500 mA	V_{CE} = 4 V		1.3		MHz
P.R.T.	Power rating test		I_C = 3 A	V_{CE} = 39 V	1			s

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

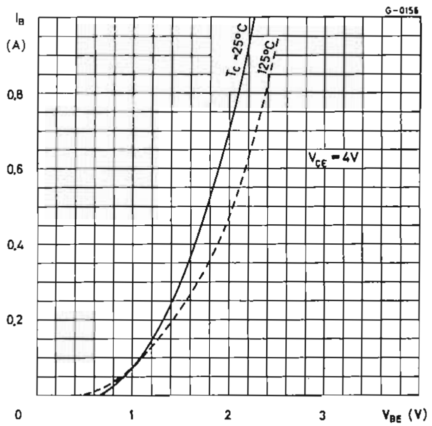
Typical output characteristics



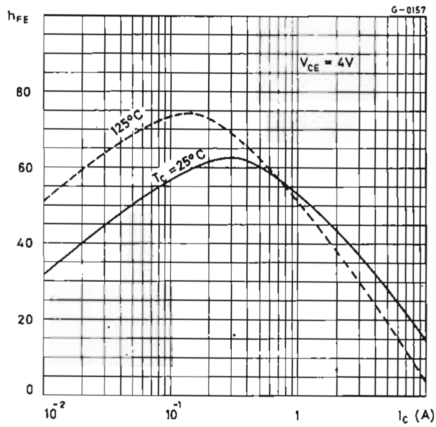
Typical DC transconductance



Typical input characteristics

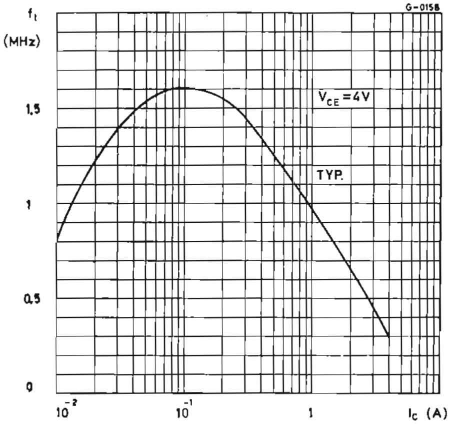


Typical DC current gain

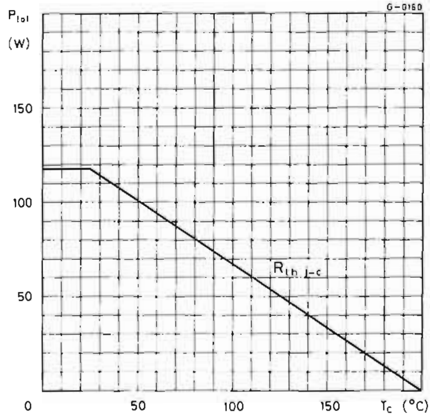


BD 142

Transition frequency



Rating chart



BD 162

SILICON HOMETAXIAL* NPN

GENERAL INFORMATION

TYPICAL APPLICATION: POWER AF AMPLIFIER

The BD 162 is a silicon "Hometaxial" NPN transistor in a SOT-9 metal case. It is suitable for power switching circuits, series and shunt regulators, driver and output stages and for use in class A and in class B AF amplifiers.
The complementary PNP type is the AD 262.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

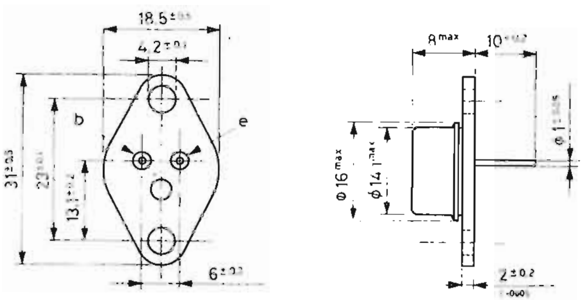
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	40	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	20	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	4	A
I_B	Base current	2	A
P_{tot}	Total power dissipation at $T_c \leq 60$ °C	23	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



SOT-9

BD 162

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	6	°C/W

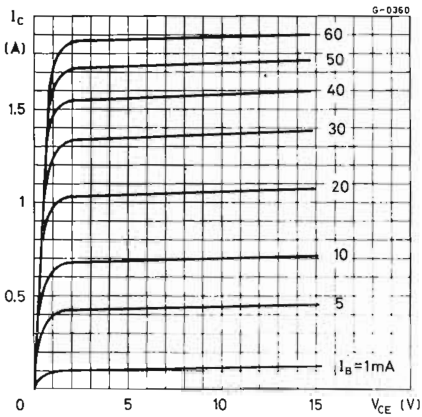
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 40 V V_{CB} = 40 V T_c = 150 °C			1 5	mA mA
I_{CEO}	Collector cutoff current ($I_B = 0$)	V_{CE} = 20 V			2.5	mA
V_{EBO}	Emitter base voltage ($I_C = 0$)	I_E = 1 mA	7			V
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	I_C = 100 mA	20			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_B = 0.15 A I_C = 1.5 A			0.5	V
V_{CEK}*(1)	Collector-emitter knee voltage	I_C = 1.5 A		0.3		V
V_{BE}*	Base-emitter voltage	I_C = 1.5 A V_{CE} = 2 V			1.2	V
h_{FE}*	DC current gain	I_C = 500 mA V_{CE} = 2 V I_C = 1.5 A V_{CE} = 2 V	40 30		180	— —
f_T	Transition frequency	I_C = 0.2 A V_{CE} = 4 V	0.8	1.75		MHz

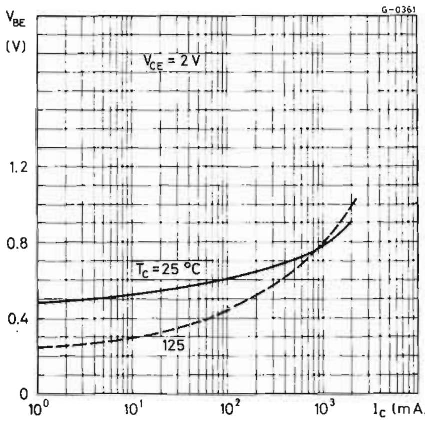
* Pulsed; pulse duration = 300 μs, duty factor = 1.5%.

(1) Choose the characteristic (I_C, V_{CE}) passing through the point I_C = 1.65 A, V_{CE} = 1 V and read the V_{CE} value at I_C = 1.5 A.

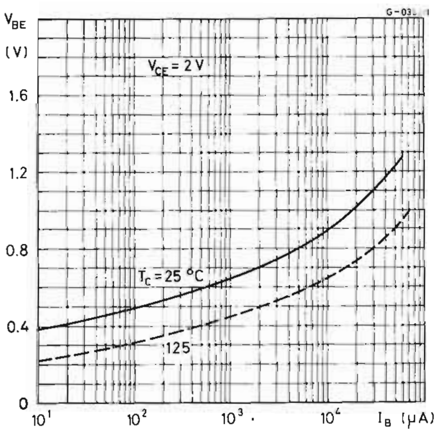
Typical output characteristics



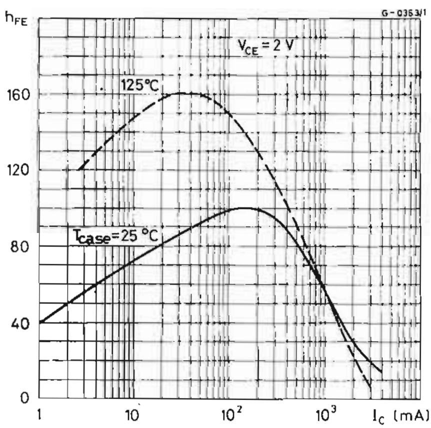
Typical DC transconductance



Typical input characteristics

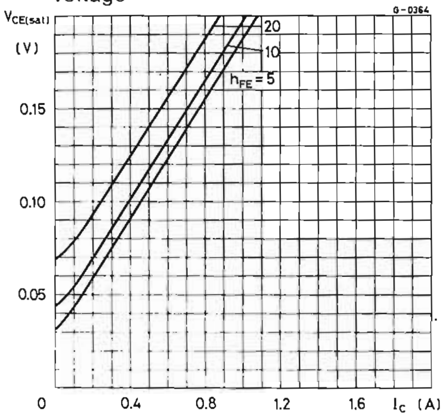


Typical DC current gain

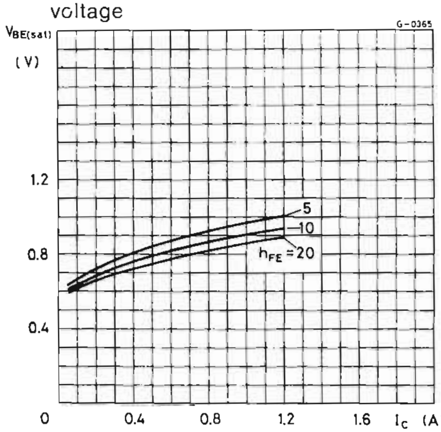


BD 162

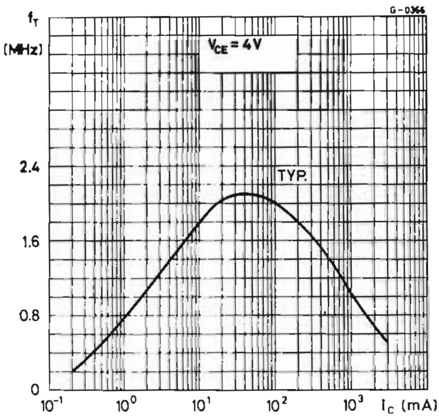
Typical collector-emitter saturation voltage



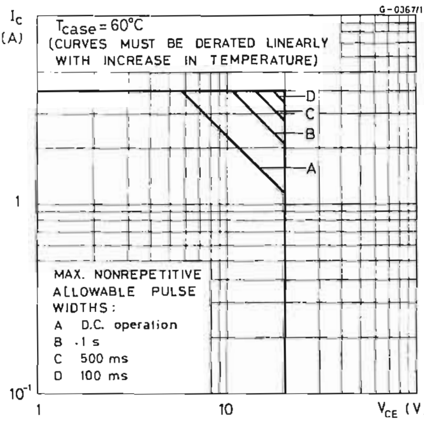
Typical base-emitter saturation voltage



Transition frequency



Maximum operating areas



BD 163

SILICON HOMETAXIAL* NPN

AUDIO POWER AMPLIFIER

The BD 163 is a silicon "Hometaxial" NPN transistor in a SOT-9 metal case. It is suitable for power switching circuits, series and shunt regulators, driver and output stages and for use in class A and class B AF amplifiers.
The complementary PNP type is the AD 263.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

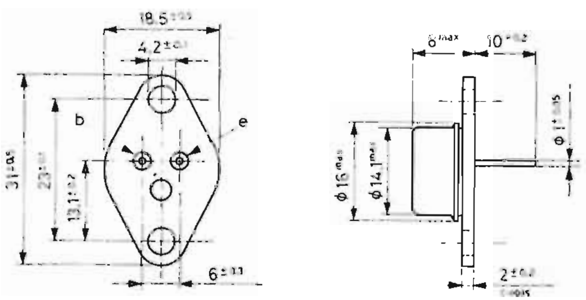
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	60	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	40	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	4	A
I_B	Base current	2	A
P_{tot}	Total power dissipation at $T_{case} \leq 60\ °C$	23	W
T_{stg}	Storage temperature	-65 to 200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



SOT-9

BD 163

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	6	°C/W

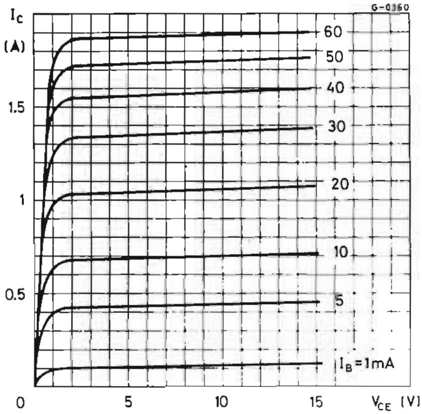
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 60 V V_{CB} = 60 V T_{case} = 150 °C			1 5	mA mA
I_{CEO}	Collector cutoff current ($I_B = 0$)	V_{CE} = 50 V			2.5	mA
V_{EBO}	Emitter base voltage ($I_C = 0$)	I_E = 1 mA	7			V
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	I_C = 100 mA	40			V
V_{CEK}*(1)	Collector-emitter knee voltage	I_C = 1.5 A		0.3		V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 1.5 A I_B = 0.15 A			0.5	V
V_{BE}*	Base-emitter voltage	I_C = 1.5 A V_{CE} = 2 V			1.2	V
→ h_{FE}*	DC current gain	I_C = 0.5 A V_{CE} = 2 V I_C = 1.5 A V_{CE} = 2 V	25 20		180	— —
f_T	Transition frequency	I_C = 0.2 A V_{CE} = 4 V	0.8	1.75		MHz

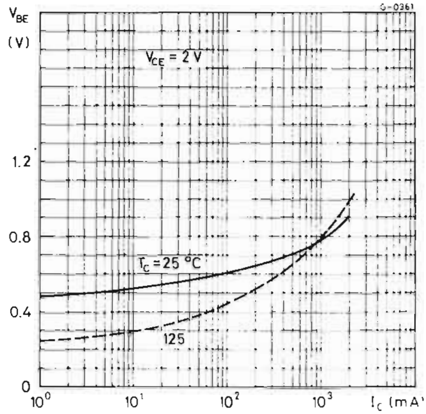
* Pulsed; pulse duration = 300 µs, duty factor = 1.5%.

(1) Choose the characteristic (I_C, V_{CE}) passing through the point I_C = 1.65 A, V_{CE} = 1 V and read the V_{CE} value at I_C = 1.5 A.

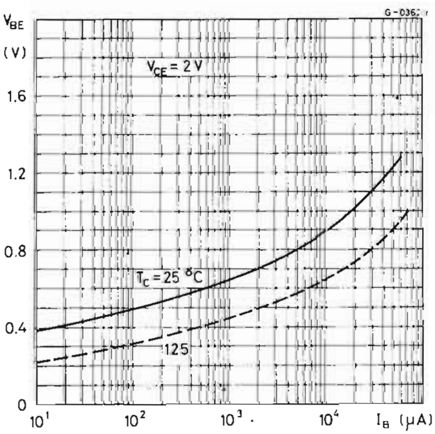
Typical output characteristics



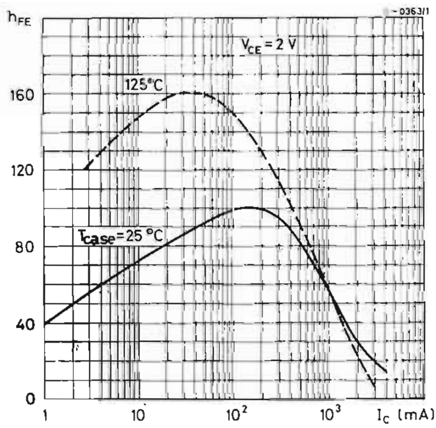
Typical DC transconductance



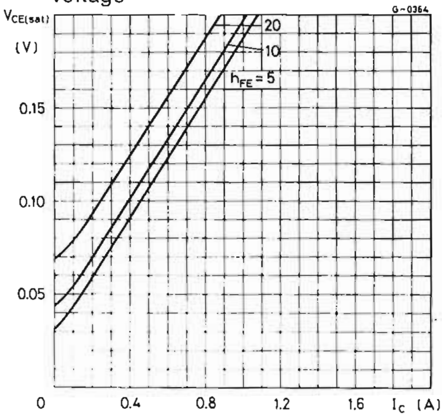
Typical input characteristics



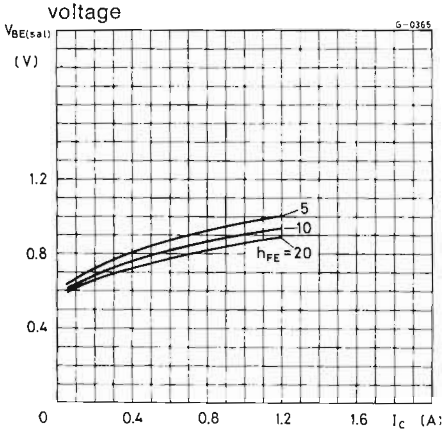
Typical DC current gain



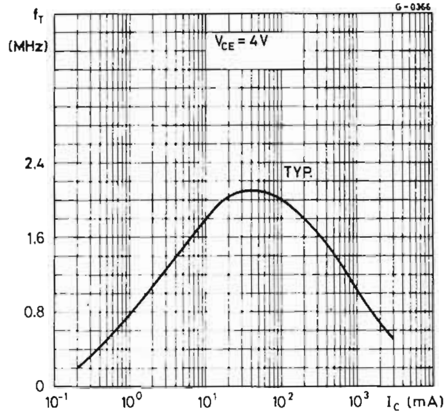
Typical collector-emitter saturation voltage



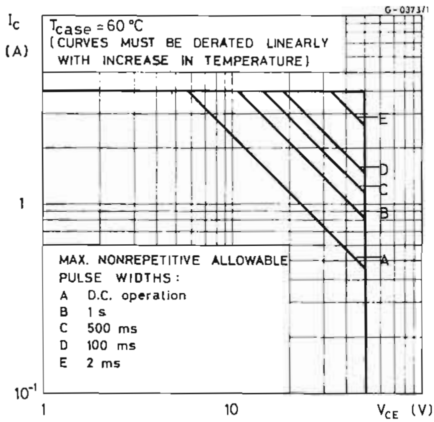
Typical base-emitter saturation voltage



Transition frequency



Maximum operating areas



BD 215

SILICON MESA NPN

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH VOLTAGE AF POWER AMPLIFIER

The BD 215 is a silicon triple diffused NPN transistor in a SOT-9 metal case. It is particularly designed for use in high voltage 4 W class A output stages of AF amplifiers in B/W and colour TV sets directly operated from the mains.

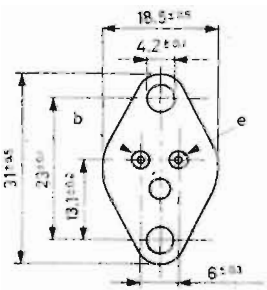
ABSOLUTE MAXIMUM RATINGS

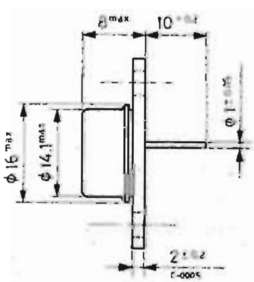
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	300	V
→ V_{CEV}	Collector-emitter voltage ($V_{BE} = -1.5$ V)	500	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	6	V
I_C	Collector current	0.5	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	21.5	W
T_s	Storage temperature	-65÷175	°C
T_j	Junction temperature	175	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case





SOT-9

BD 215

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	7	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

		Parameter	Test conditions	Min.	Typ.	Max.	Unit
→	I_{CEO}	Collector cutoff current ($I_B = 0$)	$V_{CE} = 250$ V			5	mA
→	I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 6$ V			2	mA
→	h_{FE}	DC current gain	$I_C = 500$ mA $V_{CE} = 10$ V	30		270	—
	f_T	Transiton frequency	$I_C = 100$ mA $V_{CE} = 10$ V		10		MHz
→	I_{CEV}	Collector cutoff current ($V_{BE} = -1.5$ V)	$V_{CE} = 500$ V			1	mA
→	$I_{s/b}$*	Second breakdown collector current	$V_{CE} = 150$ V	100			mA

* Pulsed: 1 s, non repetitive pulse.

BD 216

SILICON MESA NPN

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH VOLTAGE AF POWER AMPLIFIER

The BD 216 is a silicon triple diffused NPN transistor in a SOT-9 metal case. It is suitable for use in class A output stages of AF amplifiers and as vertical output amplifier in the deflection systems of television receivers.

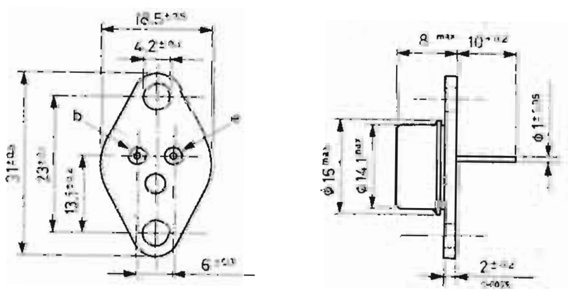
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	300	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	200	V
V_{CEV}	Collector-emitter voltage ($V_{BE} = -1.5$ V)	300	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	6	V
I_C	Collector current	1	A
I_B	Base current	0.5	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	21.5	W
T_s	Storage temperature	-65÷175	°C
T_j	Junction temperature	175	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



SOT-9

BD 216

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	7	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

	Parameter		Test conditions	Min.	Typ.	Max.	Unit
	I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 300 V			1	mA
	I_{CEO}	Collector cutoff current (I_B = 0)	V_{CE} = 150 V			5	mA
	I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 300 V			1	mA
	I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 6 V			2	mA
	$V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 100 mA	200			V
→	$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 300 mA I_B = 30 mA			1	V
→	h_{FE}	DC current gain	I_C = 5 mA V_{CE} = 10 V * I_C = 100 mA V_{CE} = 10 V * I_C = 500 mA V_{CE} = 10 V	30 40 30		 150 	— — —
→	f_T	Transition frequency	I_C = 100 mA V_{CE} = 10 V		10		MHz
→	$I_{S/B}$**	Second breakdown collector current	V_{CE} = 150 V	100			mA

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%

** Pulsed: 1 s, non repetitive pulse.

SILICON MESA NPN

BD 260
BD 261

PRELIMINARY DATA

GENERAL INFORMATION

TYPICAL APPLICATION: MEDIUM POWER SWITCH AND LINEAR AMPLIFIER

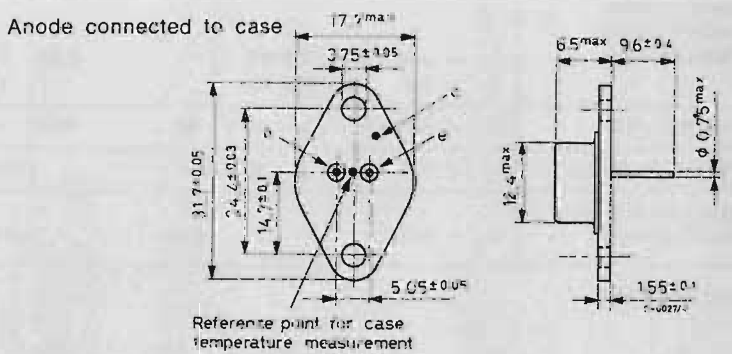
The BD 260 and BD 261 are silicon triple diffused NPN transistors in Jedec TO-66 metal case. They are intended for power-switching circuits, for series and shunt - regulators, driver and output stages.

ABSOLUTE MAXIMUM RATINGS

		BD 260	BD 261
V_{CEV}	Collector-emitter voltage (V_{BE} = -1.5 V)	200 V	300 V
I_C	Collector current	2 A	5 A
I_B	Base current	1 A	2 A
$V_{CEO\ (sus)}$	Collector-emitter voltage (I_B = 0)	105 V	
V_{EBO}	Emitter-base voltage (I_C = 0)	6 V	
P_{tot}	Total power dissipation at T_c = 25 °C	30 W	
T_s	Storage temperature	-65 to 175 °C	
T_j	Junction temperature	175 °C	

MECHANICAL DATA

Dimensions in mm



TO-66

BD 260
BD 261

THERMAL DATA

$R_{th\ j-c}$	Thermal junction-case	max	5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector-emitter current (V_{BE} = -1.5 V) (for **BD 260** only)	V_{CE} = 200 V			1	mA
I_{CEV}	Collector-emitter current (V_{BE} = -1.5 V) (for **BD 261** only)	V_{CE} = 300 V			1	mA
$V_{CEO(sus)}$	Collector-emitter voltage (I_B = 0)	I_C = 100 mA	105			V
I_{EBO}	Emitter-base current (I_C = 0)	V_{EB} = 6 V			2	mA
→ $V_{CE(sat)}$	Collector-emitter saturation voltage (for **BD 260** only)	I_C = 500 mA I_B = 10 mA			2	V
$V_{CE(sat)}$	Collector-emitter saturation voltage (for **BD 261** only)	I_C = 1 A I_B = 100 mA I_C = 2 A I_B = 400 mA			0.75 1	V V
h_{FE}	DC current gain	I_C = 500 mA V_{CE} = 10 V	50		300	—
f_T	Transition frequency	I_C = 200 mA V_{CE} = 10 V	10			MHz
→ $I_{S/B}$*	Second breakdown collector current	V_{CE} = 70 V	200			mA

* 1 s, non repetitive pulse

SILICON EPIBASE NPN

BD 281
BD 283
BD 285

PRELIMINARY DATA

MEDIUM POWER LINEAR AND SWITCHING CIRCUITS

The BD 281, BD 283 and BD 285 are silicon epitaxial-base NPN power transistors in Jedec TO-126 plastic package, intended for use in medium power linear and switching applications.

The BD 281 is especially suitable for use in output stages of car radios.

The BD 283 and BD 285 are especially suitable for use in output stages of high-fidelity amplifiers with output power up to 15 W.

The complementary PNP types are respectively the BD 282, BD 284, BD 286.

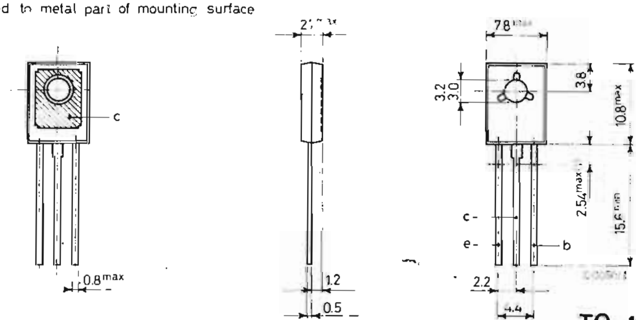
ABSOLUTE MAXIMUM RATINGS

		BD 281	BD 283	BD 285
V_{CBO}	Collector-base voltage ($I_E = 0$)	22 V	32 V	45 V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	22 V	32 V	45 V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	22 V	32 V	45 V
V_{EBO}	Emitter-base voltage ($I_C = 0$)		5 V	
I_C	Collector current		4 A	
I_{CM}	Collector peak current		7 A	
I_B	Base current		1 A	
P_{tot}	Total power dissipation at $T_{case} \leq 25\,°C$		36 W	
T_{stg}	Storage temperature		-55 to 150 °C	
T_j	Junction temperature		150 °C	

MECHANICAL DATA

Dimensions in mm

Collector connected to metal part of mounting surface



TO-126 (SOT 32)

1) Within this region the cross-section of the leads is uncontrolled

BD 281
BD 283
BD 285

THERMAL DATA

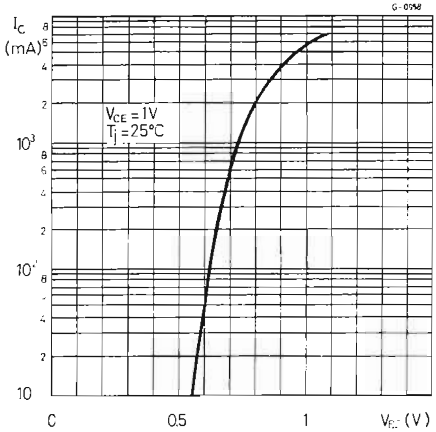
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	3.5	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	100	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

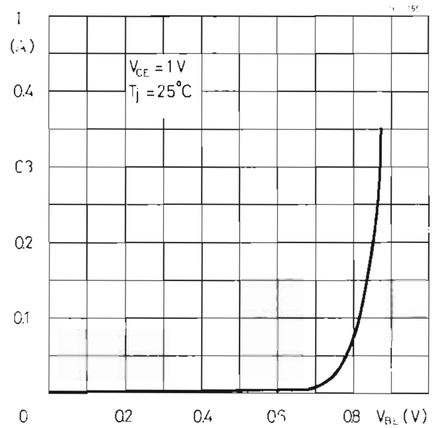
Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	for **BD 281**	$V_{CB} = 22$ V			100	μA
		for **BD 283**	$V_{CB} = 32$ V			100	μA
		for **BD 285**	$V_{CB} = 45$ V			100	μA
I_{CES}	Collector cutoff current ($V_{BE} = 0$)	for **BD 281**	$V_{CB} = 22$ V			100	μA
		for **BD 283**	$V_{CB} = 32$ V			100	μA
		for **BD 285**	$V_{CB} = 45$ V			100	μA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 5$ V				1	mA
$V_{CEO(sus)}$*	Collector-emitter sustaining voltage ($I_B = 0$)	$I_C = 100$ mA					
			for **BD 281**	22			V
			for **BD 283**	32			V
			for **BD 285**	45			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	$I_C = 3$ A	$I_B = 0.3$ A			0.5	V
V_{BE}*	Base-emitter voltage	$I_C = 10$ mA	$V_{CE} = 5$ V		0.58		V
		$I_C = 3$ A	$V_{CE} = 1$ V			1.3	V
h_{FE}*	DC current gain	$I_C = 500$ mA	$V_{CE} = 1$ V				
			for **BD 281**	85		350	—
			for **BD 283**	60		350	—
		$I_C = 2$ A	$V_{CE} = 1$ V				
			for **BD 281**	50			—
		$I_C = 3$ A	$V_{CE} = 1$ V				
			for **BD 281**	40			—
			for **BD 283**	30			—
			for **BD 285**	20			—
f_T	Transition frequency	$I_C = 250$ mA	$V_{CE} = 1$ V	3			MHz

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

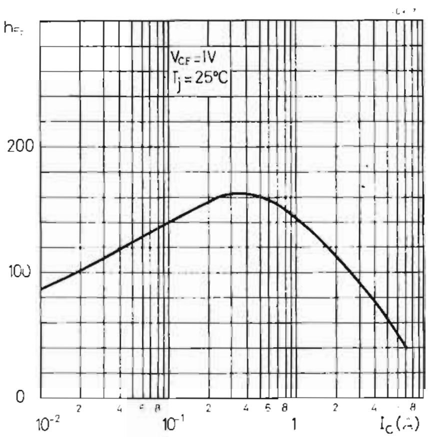
Typical DC transconductance



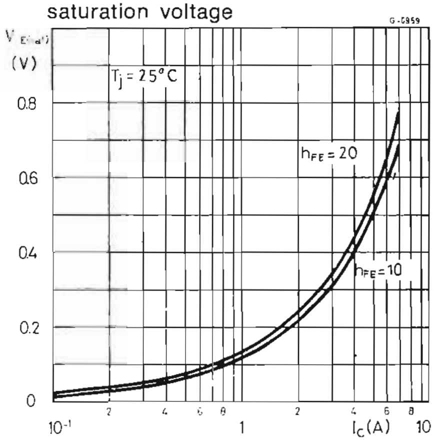
Typical input characteristics



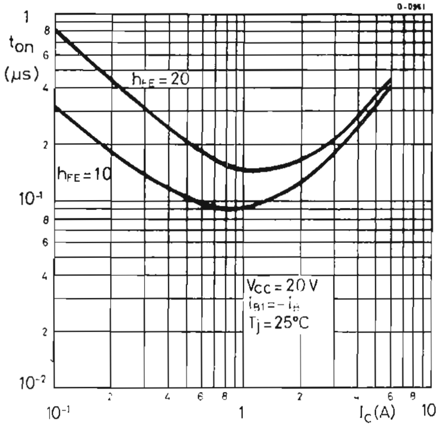
Typical DC current gain



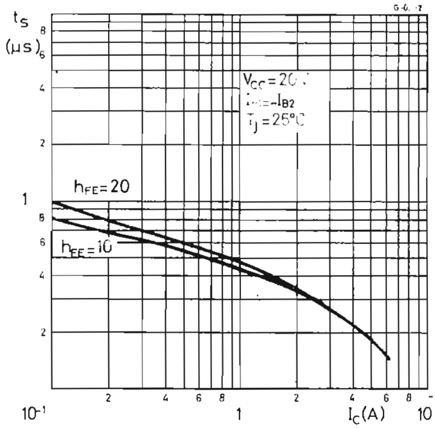
Typical collector-emitter saturation voltage



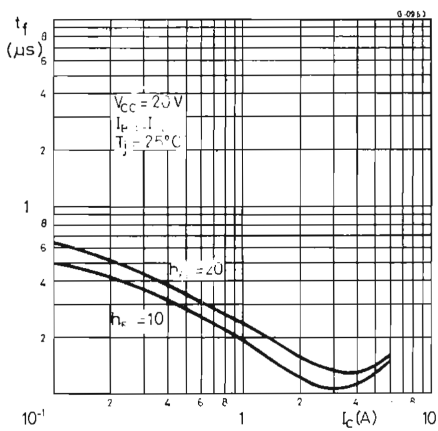
Typical turn-on time characteristics



Typical storage time characteristics

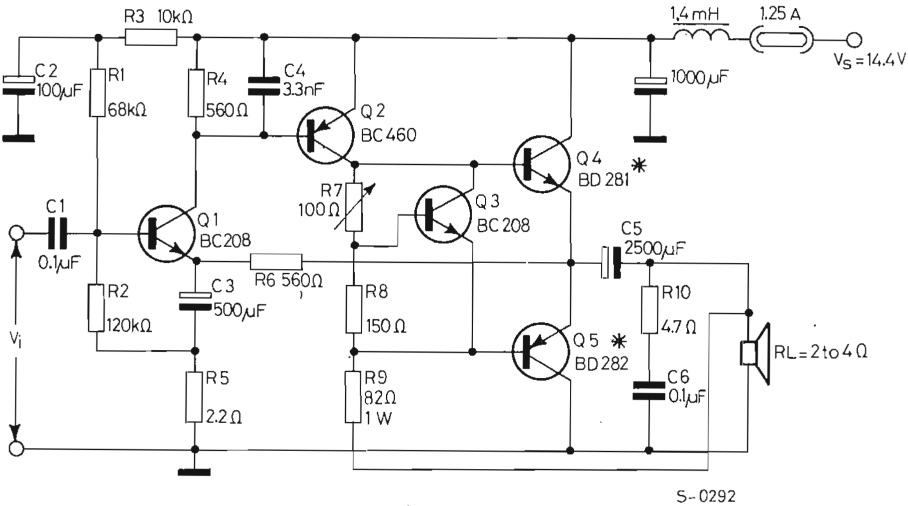


Typical fall time characteristics



APPLICATION INFORMATION

Typical application circuit for 14.4 V, 6.5 W, 2 to 4 Ω car-radio audio amplifier



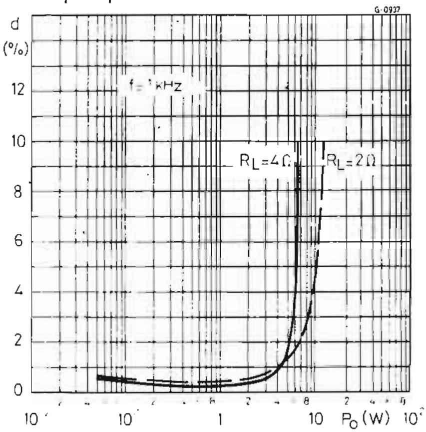
* Mounted on heatsink having $R_{th} \leq 16\ ^{\circ}C/W$

Typical performance

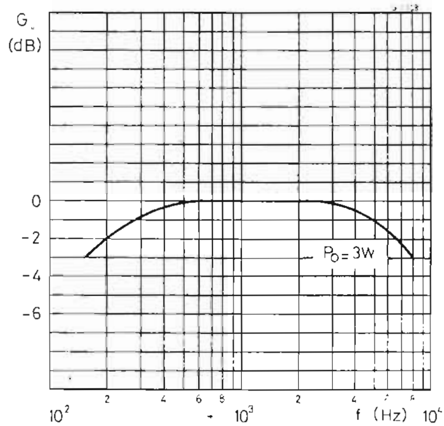
P_o	Output power	at d = 10% with $R_L = 4Ω$	> 6	W
		with $R_L = 2Ω$	12	W
V_i	Input voltage	for $P_o = 5$ W with $R_L = 4Ω$	24	mV
		with $R_L = 2Ω$	20	mV
Z_i	Input impedance		20	kΩ
I_d	Output transistors quiescent drain current		10	mA
I_d	BC 460 drain current		80	mA
I_d	Total drain current	at $P_o = 6.5$ W	660	mA
B	-3 dB frequency response	at $P_o = 3$ W	15 to 8000	Hz

Stable continuous operation is ensured up to an ambient temperature of 60 °C.

Typical distortion versus output power



Typical frequency response



BD 282
BD 284
BD 286

SILICON EPIBASE PNP

PRELIMINARY DATA

MEDIUM POWER LINEAR AND SWITCHING CIRCUITS

The BD 282, BD 284, BD 286 are silicon epitaxial-base PNP power transistors in Jedec TO-126 plastic package, intended for use in medium power linear and switching applications.

The BD 282 are especially suitable for use in output stages of car radios.

The BD 284 and BD 286 are especially suitable for use in output stages of high-fidelity amplifiers with output power up to 15 W.

The complementary NPN types are respectively the BD 281, BD 283, BD 285.

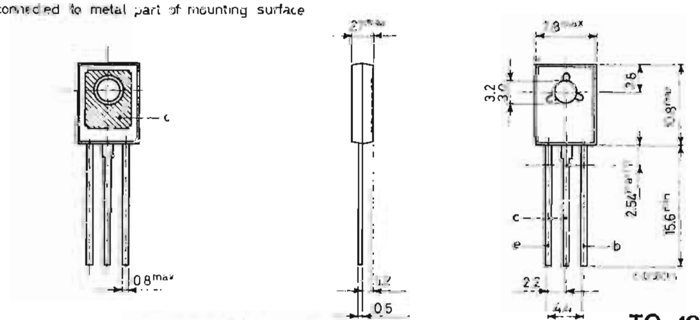
ABSOLUTE MAXIMUM RATINGS

		BD 282	BD 284	BD 286
V_{CBO}	Collector-base voltage ($I_E = 0$)	-22 V	-32 V	-45 V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-22 V	-32 V	-45 V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	-22 V	-32 V	-45 V
V_{EBO}	Emitter-base voltage ($I_C = 0$)		-5 V	
I_C	Collector current		-4 A	
I_{CM}	Collector peak current		-7 A	
I_B	Base current		-1 A	
P_{tot}	Total power dissipation at $T_{case} \leq 25\,°C$		36 W	
T_{stg}	Storage temperature		-55 to 150 °C	
T_j	Junction temperature		150 °C	

MECHANICAL DATA

Dimensions in mm

Collector connected to metal part of mounting surface



TO-126 (SOT 32)

(1) Within this region the cross-section of the leads is uncontrolled

BD 282
BD 284
BD 286

THERMAL DATA

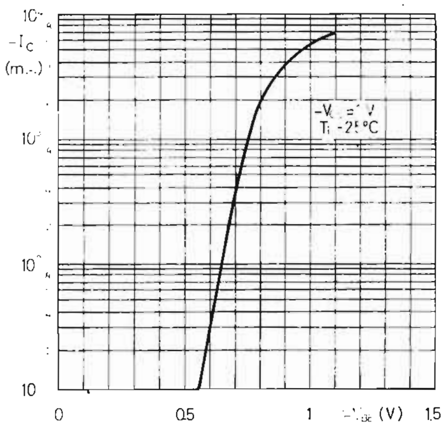
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	3.5	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	100	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

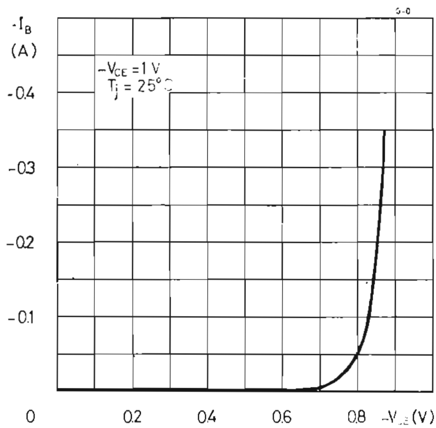
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	for **BD 282** V_{CB} = -22 V			-100	µA
		for **BD 284** V_{CB} = -32 V			-100	µA
		for **BD 286** V_{CB} = -45 V			-100	µA
I_{CES}	Collector cutoff current ($V_{BE} = 0$)	for **BD 282** V_{CB} = -22 V			-100	µA
		for **BD 284** V_{CB} = -32 V			-100	µA
		for **BD 286** V_{CB} = -45 V			-100	µA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	V_{EB} = -5 V			-1	mA
$V_{CEO(sus)}$*	Collector-emitter sustaining voltage ($I_B = 0$)	I_C = -100 mA				
		for **BD 282**	-22			V
		for **BD 284**	-32			V
		for **BD 286**	-45			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = -3 A I_B = -0.3 A			-0.5	V
V_{BE}*	Base-emitter voltage	I_C = -10 mA V_{CE} = -5 V		-0.58		V
		I_C = -3 A V_{CE} = -1 V			-1.3	V
h_{FE}*	DC current gain	I_C = -500 mA V_{CE} = -5 V				
		for **BD 282**	85		350	—
		for **BD 284**	60		350	—
		I_C = -2 A V_{CE} = -1 V				
		for **BD 282**	50			—
		I_C = -3 A V_{CE} = -1 V				
		for **BD 282**	40			—
		for **BD 284**	30			—
		for **BD 286**	20			—
f_T	Transition frequency	I_C = -250 mA V_{CE} = -1 V	3			MHz

* Pulsed: pulse duration = 300 µs, duty factor = 1.5%.

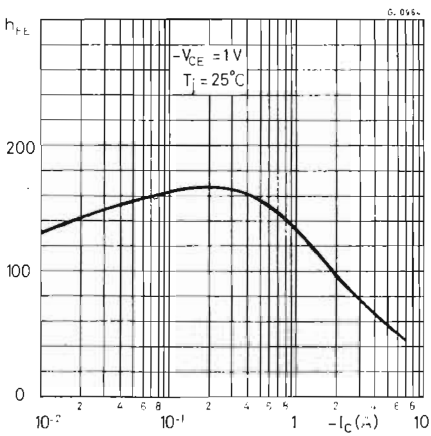
Typical DC transconductance



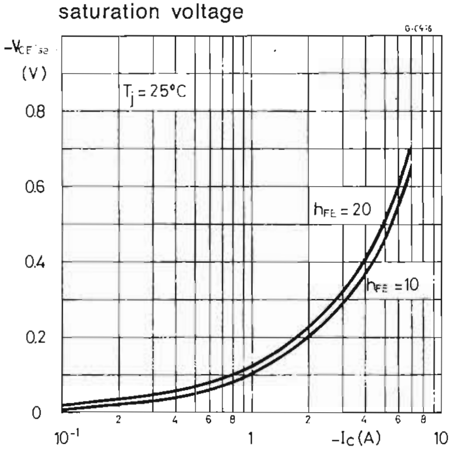
Typical input characteristics



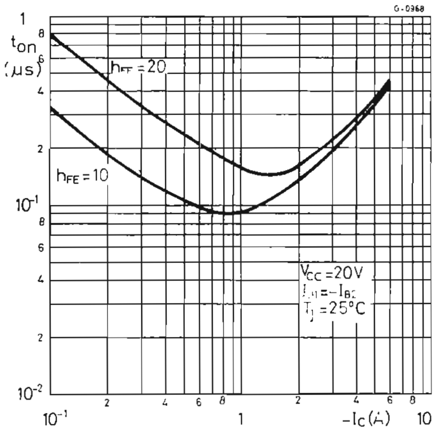
Typical DC current gain



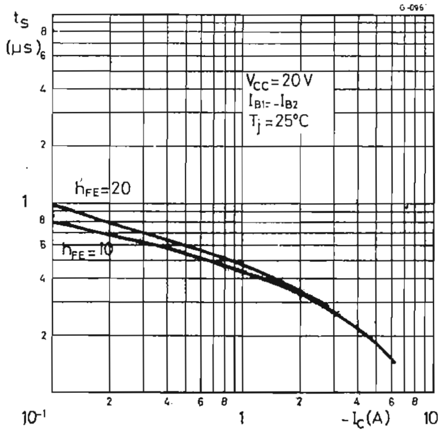
Typical collector-emitter saturation voltage



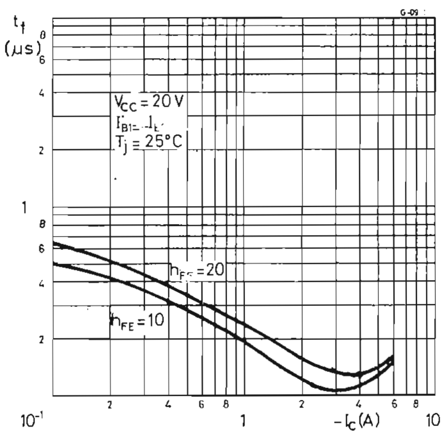
Typical turn-on time characteristics



Typical storage time characteristics

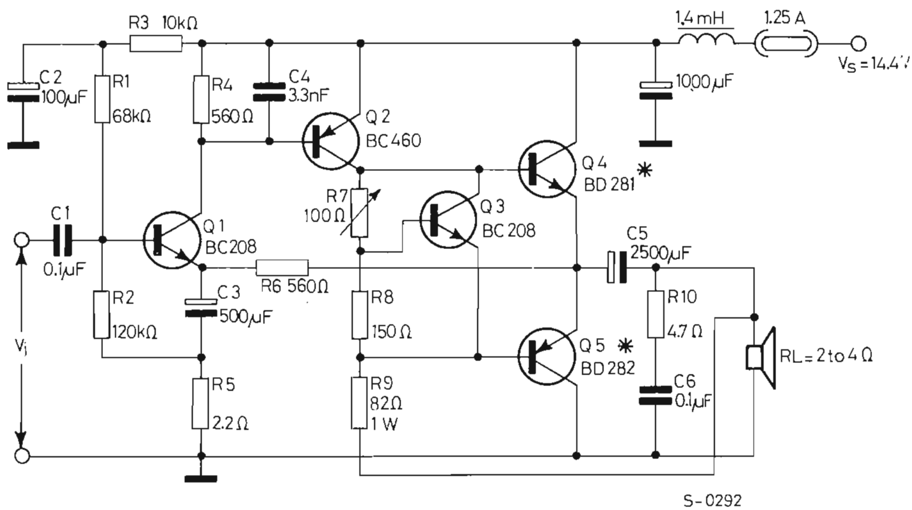


Typical fall time characteristics



APPLICATION INFORMATION

Typical application circuit for 14.4 V, 6.5 W, 2 to 4 Ω car-radio audio amplifier



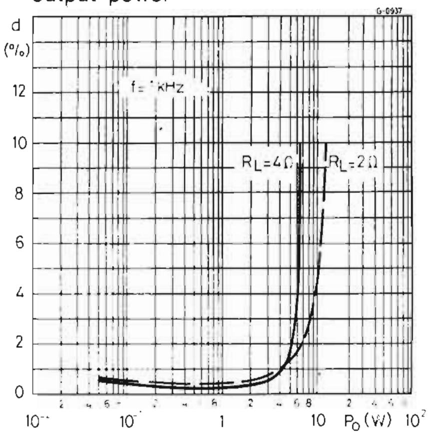
* Mounted on heatsink having $R_{th} \leq 16\ ^{\circ}C/W$

Typical performance

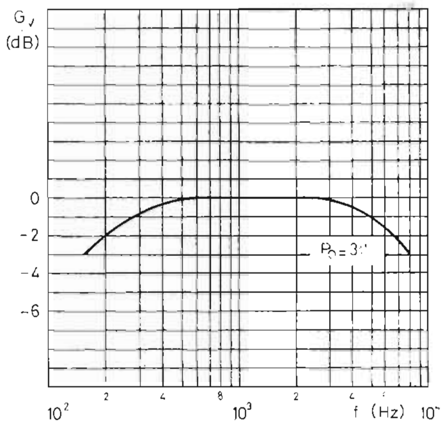
P_o	Output power	at d = 10% with $R_L = 4\Omega$	> 6	W
		with $R_L = 2\Omega$	12	W
V_i	Input voltage	for $P_o = 5$ W with $R_L = 4\Omega$	24	mV
		with $R_L = 2\Omega$	20	mV
Z_i	Input impedance		20	kΩ
I_d	Output transistors quiescent drain current		10	mA
I_d	BC 460 drain current		80	mA
I_d	Total drain current	at $P_o = 6.5$ W	660	mA
B	-3 dB frequency response	at $P_o = 3$ W	15 to 8000	Hz

Stable continuous operation is ensured up to an ambient temperature of 60 °C.

Typical distortion versus output power



Typical frequency response



BD 433

SILICON EPIBASE NPN

PRELIMINARY DATA

MEDIUM POWER AUDIO AMPLIFIER

The BD 433 is a silicon epitaxial-base NPN power transistor in Jedec TO-126 plastic package, intended for use in medium power audio applications.
It is especially suitable for use in output stages of car radios.
The complementary PNP type is the BD 434.

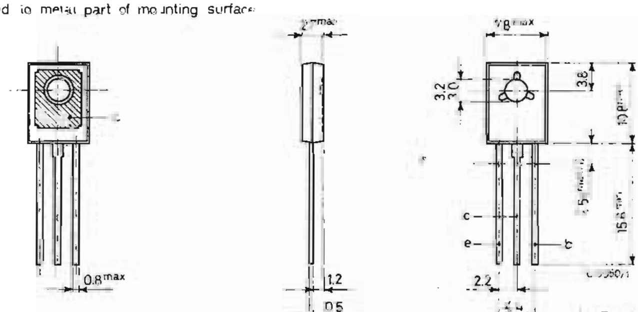
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	22	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	22	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	22	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	4	A
I_{CM}	Collector peak current	7	A
I_B	Base current	1	A
P_{tot}	Total power dissipation at $T_{case} \leq 25\ °C$	36	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to metal part of mounting surface



(1) Within this region the cross-section of the leads is uncontrolled

TO-126 (SOT 32)

BD 433

THERMAL DATA

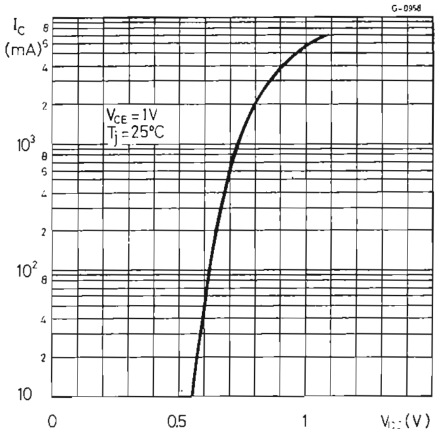
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	3.5	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	100	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

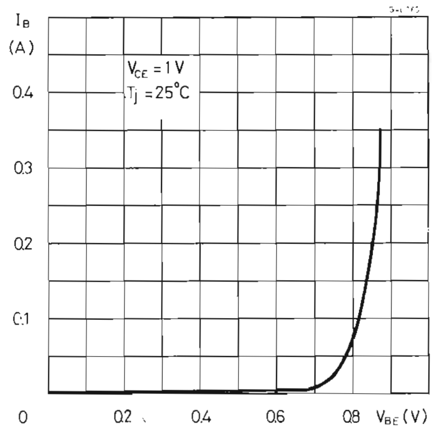
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = 22$ V			100	μA
I_{CES}	Collector cutoff current ($V_{BE} = 0$)	$V_{CE} = 22$ V			100	μA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 5$ V			1	mA
$V_{CEO(sus)}$*	Collector-emitter sustaining voltage ($I_B = 0$)	I_C = 100 mA	22			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 3 A I_B = 0.3 A			0.5	V
V_{BE}*	Base-emitter voltage	I_C = 10 mA V_{CE} = 5 V I_C = 3 A V_{CE} = 1 V		0.58	 1.3	V V
h_{FE}*	DC current gain	I_C = 500 mA V_{CE} = 1 V I_C = 2 A V_{CE} = 1 V I_C = 3 A V_{CE} = 1 V	85 50 40		350	— — —
f_T	Transition frequency	I_C = 250 mA V_{CE} = 1 V	3			MHz

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

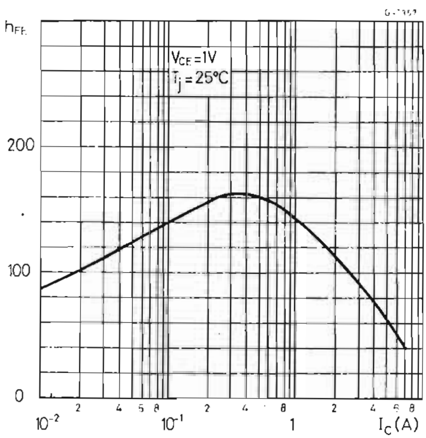
Typical DC transconductance



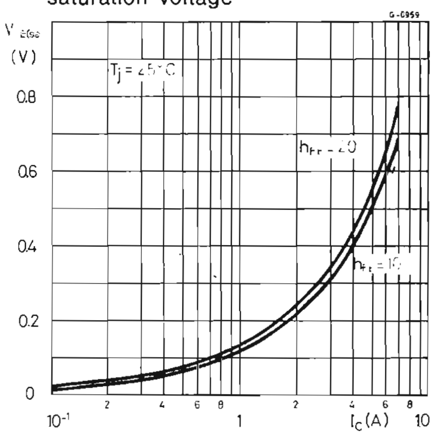
Typical input characteristics



Typical DC current gain

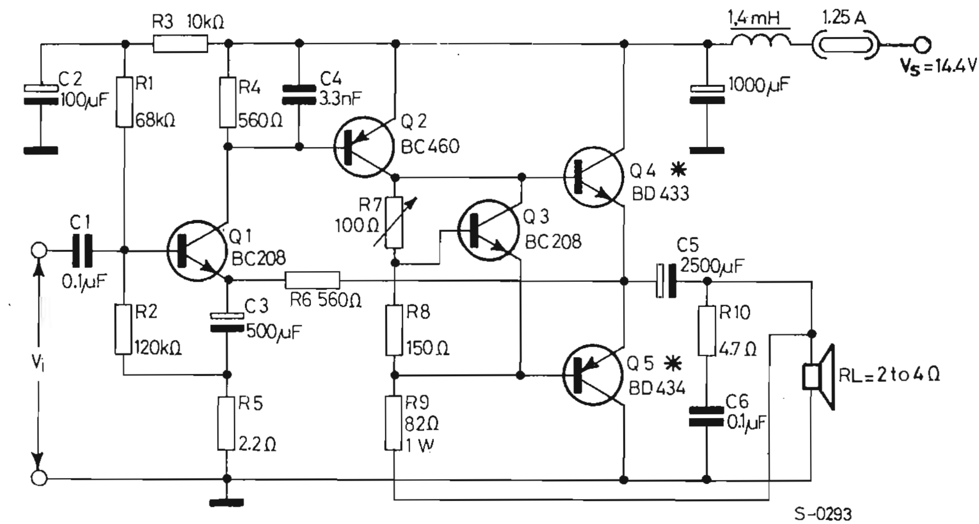


Typical collector-emitter saturation voltage



APPLICATION INFORMATION

Typical application circuit for 14.4 V, 6.5 W, 2 to 4 Ω car-radio audio amplifier



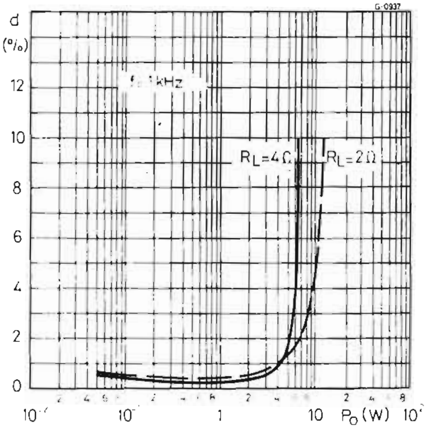
✱ Mounted on heatsink having $R_{th} \leq 16$ °C/W

Typical performance

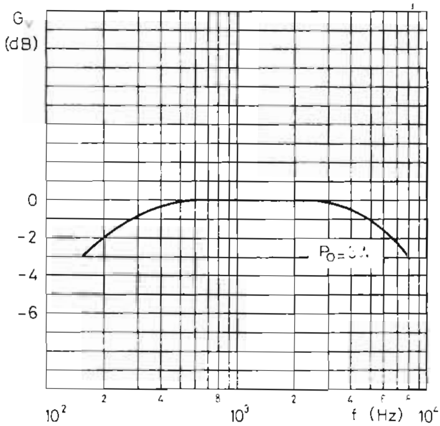
P_o	Output power	at d = 10% with $R_L = 4\Omega$	> 6	W
		with $R_L = 2\Omega$	12	W
V_i	Input voltage	for $P_o = 5$ W with $R_L = 4\Omega$	24	mV
		with $R_L = 2\Omega$	20	mV
Z_i	Input impedance		20	kΩ
I_d	Output transistors quiescent drain current		10	mA
I_d	BC 460 drain current		80	mA
I_d	Total drain current	at $P_o = 6.5$ W	660	mA
B	-3 dB frequency response	at $P_o = 3$ W	15 to 8000	Hz

Stable continuous operation is ensured up to an ambient temperature of 60 °C.

Typical distortion versus output power



Typical frequency response



BD 434

SILICON EPIBASE PNP

PRELIMINARY DATA

MEDIUM POWER AUDIO AMPLIFIER

The BD 434 is a silicon epitaxial-base PNP power transistor in Jedec TO-126 plastic package, intended for use in medium power audio applications.
It is especially suitable for use in output stages of car radios.
The complementary NPN type is the BD 433.

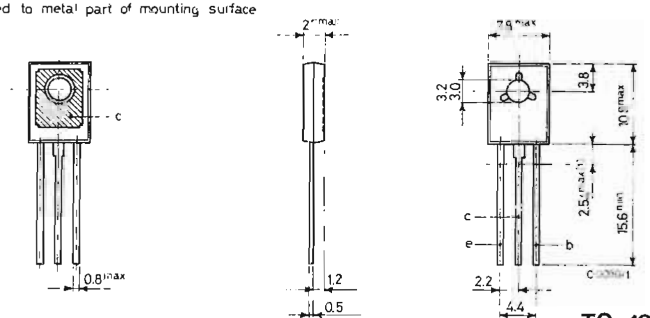
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	-22	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	-22	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	-22	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	-5	V
I_C	Collector current	-4	A
I_{CM}	Collector peak current	-7	A
I_B	Base current	-1	A
P_{tot}	Total power dissipation at $T_{case} \leq 25$ °C	36	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to metal part of mounting surface



(1) Within this region the cross-section of the leads is uncontrolled

TO-126 (SOT 32)

BD 434

THERMAL DATA

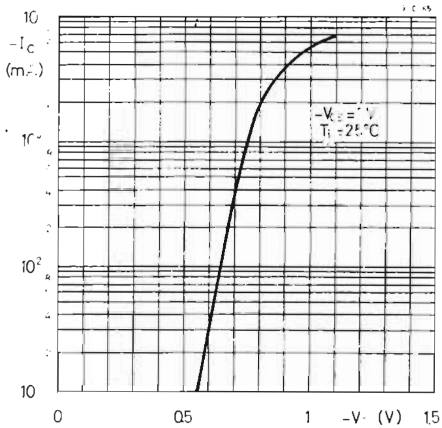
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	3.5	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	100	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

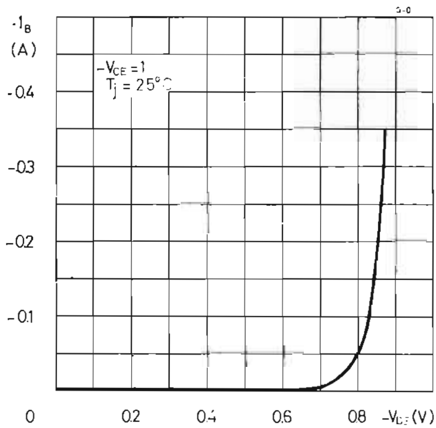
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = -22$ V			-100	μA
I_{CES}	Collector cutoff current ($V_{BE} = 0$)	$V_{CE} = -22$ V			-100	μA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = -5$ V			-1	mA
$V_{CEO(sus)}$*	Collector-emitter sustaining voltage ($I_B = 0$)	$I_C = -100$ mA	-22			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	$I_C = -3$ A $I_B = -0.3$ A			-0.5	V
V_{BE}*	Base-emitter voltage	$I_C = -10$ mA $V_{CE} = -5$ V		-0.58		V
		$I_C = -3$ A $V_{CE} = -1$ V			-1.3	V
h_{FE}*	DC current gain	$I_C = -500$ mA $V_{CE} = -1$ V	85		350	—
		$I_C = -2$ A $V_{CE} = -1$ V	50			—
		$I_C = -3$ A $V_{CE} = -1$ V	40			—
f_T	Transition frequency	$I_C = -250$ mA $V_{CE} = -1$ V	3			MHz

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

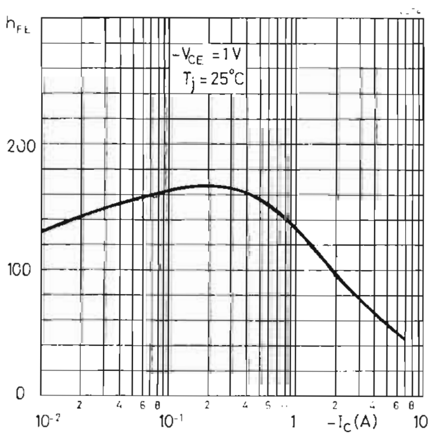
Typical DC transconductance



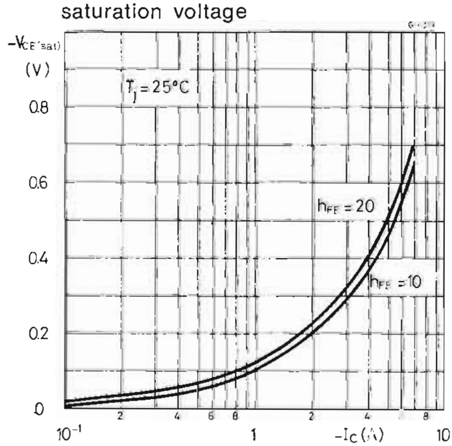
Typical input characteristics



Typical DC current gain



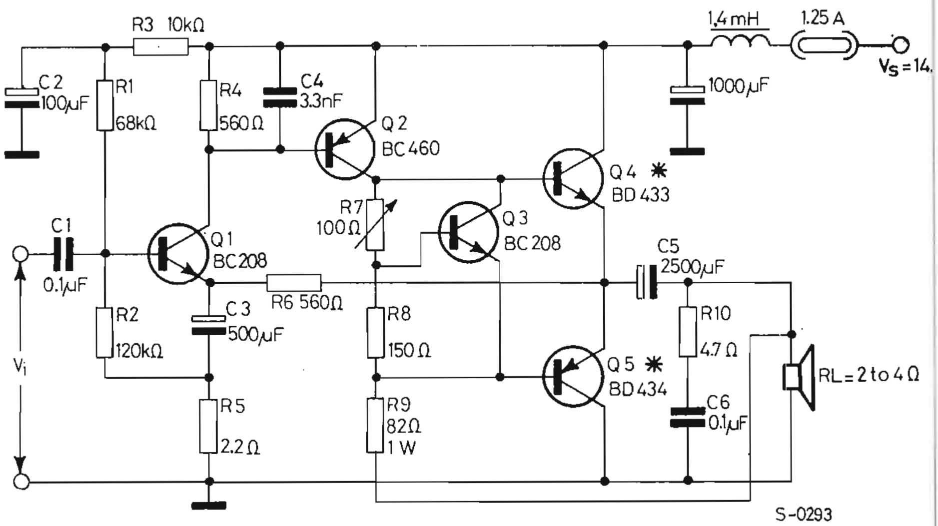
Typical collector-emitter saturation voltage



BD 434

APPLICATION INFORMATION

Typical application circuit for 14.4 V, 6.5 W, 2 to 4 Ω car-radio audio amplifier



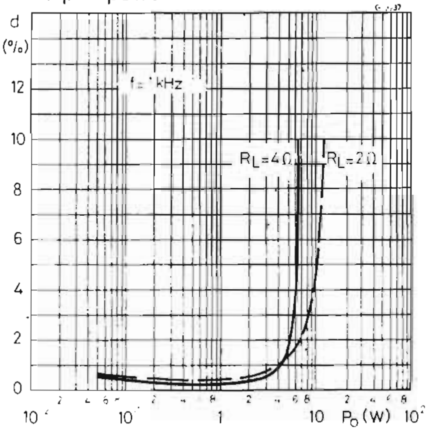
✱ Mounted on heatsink having $R_{th} \leq 16$ °C/W

Typical performance

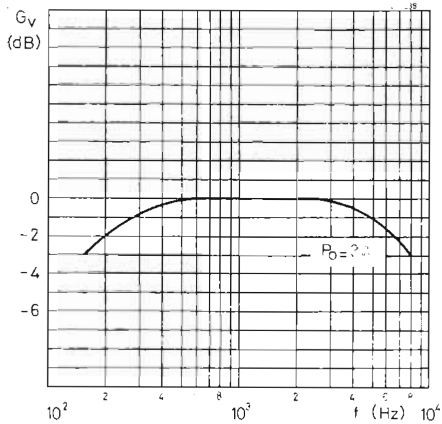
P_o	Output power	at d = 10% with $R_L = 4\Omega$	>6	W
		with $R_L = 2\Omega$	12	W
V_i	Input voltage	for $P_o = 5$ W with $R_L = 4\Omega$	24	mV
		with $R_L = 2\Omega$	20	mV
Z_i	Input impedance		20	kΩ
I_d	Output transistors quiescent drain current		10	mA
I_d	BC 460 drain current		80	mA
I_d	Total drain current	at $P_o = 6.5$ W	660	mA
B	-3 dB frequency response	at $P_o = 3$ W	15 to 8000	Hz

Stable continuous operation is ensured up to an ambient temperature of 60 °C.

Typical distortion versus output power



Typical frequency response



SILICON HOMETAXIAL* NPN

BDX 10
2N3055

GENERAL INFORMATION

TYPICAL APPLICATION: AF OUTPUT AMPLIFIER

The BDX 10/2N 3055 is a single diffused "hometaxial" silicon NPN transistor in a Jedec TO-3 metal case. It is useful for power switching circuits, series and shunt regulator output stages and high fidelity amplifiers. **Designed to assure freedom from second breakdown at maximum ratings.**

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

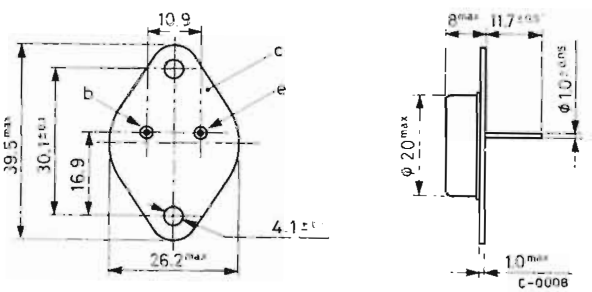
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	100	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	60	V
$V_{CER\ (sus)}$	Collector-emitter voltage ($R_{BE} \leq 100\ \Omega$)	70	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	90	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	15	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	117	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

· Collector connected to case



(sim. to **TO-3**)

BDX 10
2N3055

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

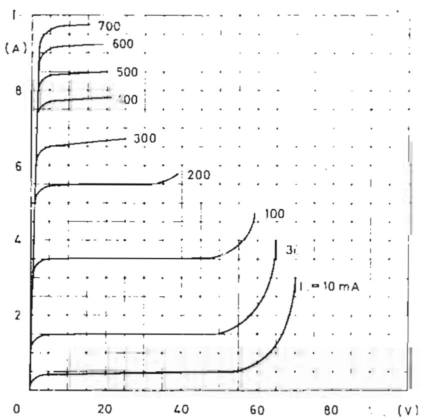
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEO}	Collector cutoff current ($I_B = 0$)	$V_{CE} = 30$ V			0.7	mA
→ I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 7$ V			1	mA
I_{CEV}	Collector cutoff current ($V_{BE} = -1.5$ V)	$V_{CE} = 100$ V $V_{CE} = 100$ V $T_c = 150$ °C			5 30	mA mA
$V_{CEV(sus)}$*	Collector-emitter voltage ($V_{BE} = -1.5$ V)	$I_C = 100$ mA	90			V
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	$I_C = 200$ mA	60			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	$I_C = 4$ A $I_B = 400$ mA $I_C = 10$ A $I_B = 3.3$ A			1 3	V V
$V_{CER(sus)}$*	Collector-emitter voltage ($R_{BE} = 100\ \Omega$)	$I_C = 200$ mA	70			V
V_{BE}*	Base-emitter voltage	$I_C = 4$ A $V_{CE} = 4$ V			1.5	V
→ h_{FE}	DC current gain Gr. 4 Gr. 5 Gr. 6 Gr. 7	$I_C = 500$ mA $V_{CE} = 4$ V $I_C = 500$ mA $V_{CE} = 4$ V $I_C = 500$ mA $V_{CE} = 4$ V $I_C = 500$ mA $V_{CE} = 4$ V $I_C = 4$ A $V_{CE} = 4$ V $I_C = 10$ A $V_{CE} = 4$ V	20 35 60 120 20 5		50 75 145 250 70 	— — — — — —
h_{FE_1}/h_{FE_2}	Matched pair	$I_C = 500$ mA $V_{CE} = 4$ V			1.6	—

* Pulsed; pulse duration = 300 μs, duty factor = 1.5%.

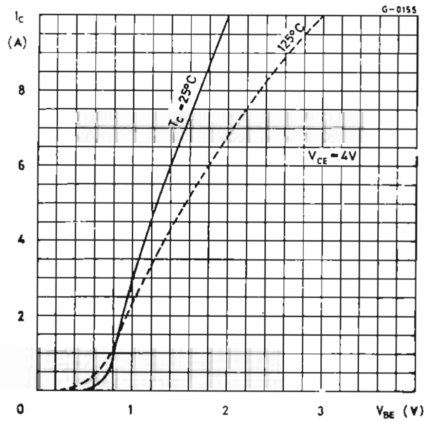
ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
h_{fe}	Small signal current gain	I_C = 1 A V_{CE} = 4 V f = 1 kHz	15		120	—
f_T	Transition frequency	I_C = 1 A V_{CE} = 4 V	800			kHz
f_{hfe}	Cutoff frequency	I_C = 1 A V_{CE} = 4 V	10			kHz
$I_{S/B}$	Second breakdown collector current	I_C = 1.95 A V_{CE} = 60 V	1			s

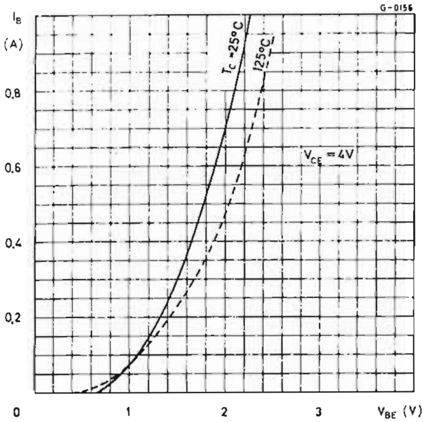
Typical output characteristics



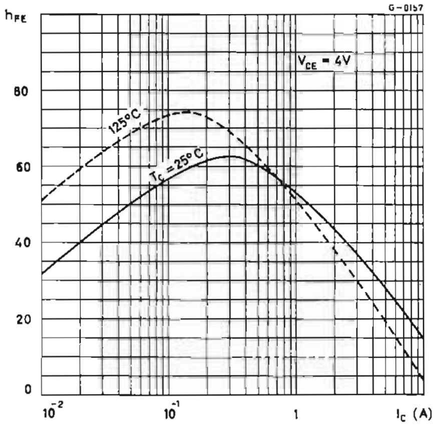
Typical DC transconductance



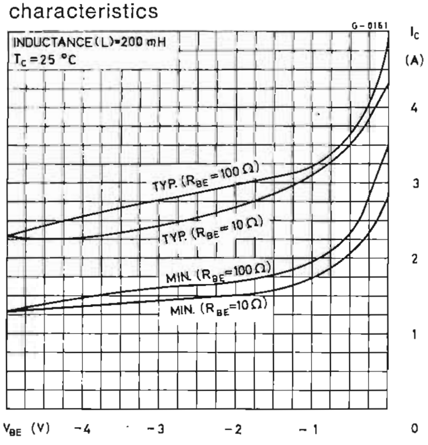
Typical input characteristics



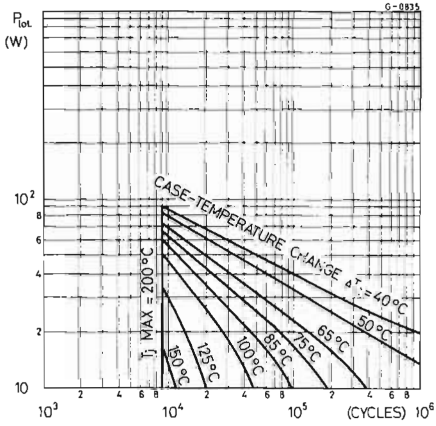
Typical DC current gain



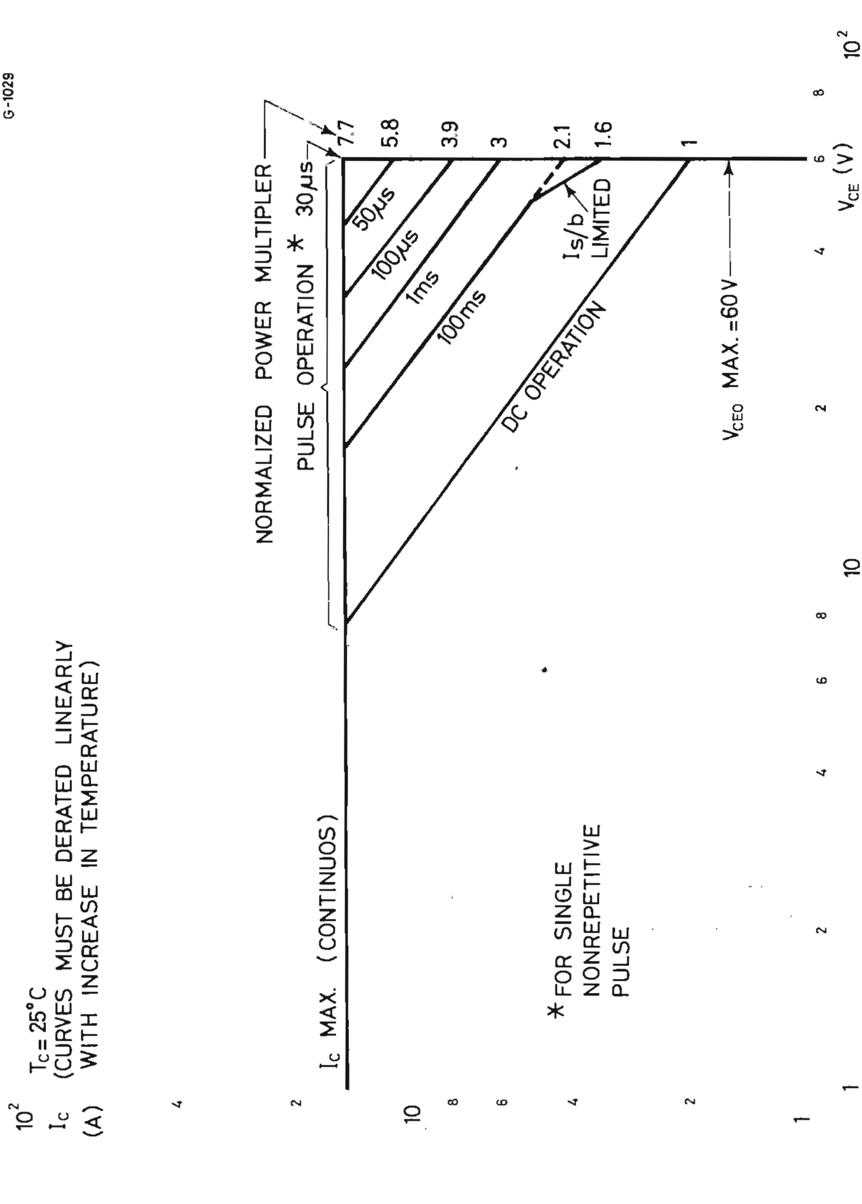
Reverse-bias, second breakdown characteristics



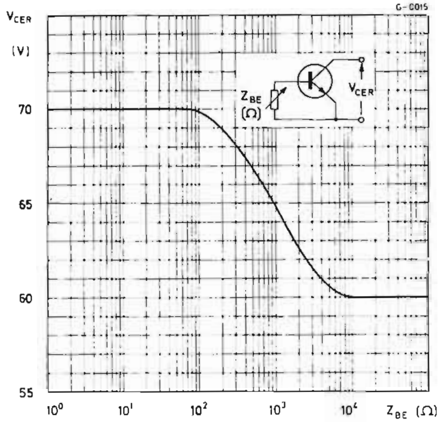
Thermal-cycle rating chart



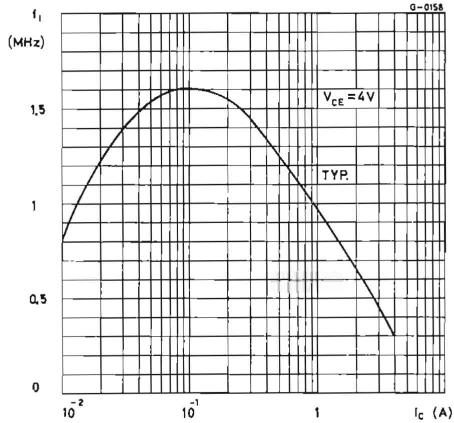
Safe operating areas



Collector-emitter breakdown voltage



Transition frequency



SILICON HOMETAXIAL* NPN

BDX 11
2N3442

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH POWER HIGH VOLTAGE SWITCH

The BDX 11/2N 3442 is a high voltage, "hometaxial" NPN transistor in a Jedec TO-3 metal case. It is intended for use as power switch, regulator, dc-dc converter and inverter, in high reliability industrial and professional applications.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

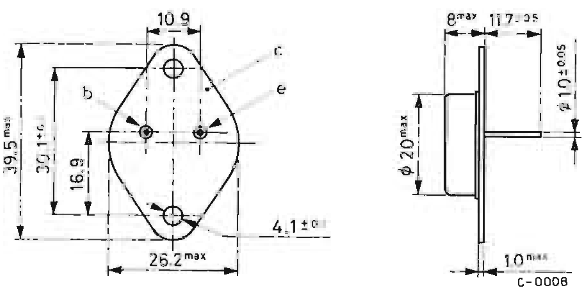
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	160	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	140	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	160	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	10	A
I_{CM}	Collector peak current	15	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	117	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

THERMAL DATA

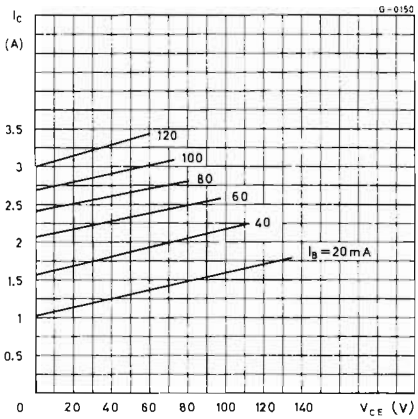
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

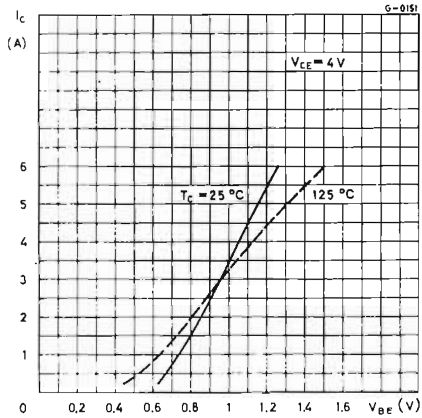
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = 140$ V			1	mA
I_{CEV}	Collector cutoff current ($V_{BE} = -1.5$ V)	$V_{CE} = 140$ V $V_{CE} = 140$ V $T_C = 150$ °C			1 10	mA mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 7$ V			5	mA
→ $V_{CEV(sus)}$*	Collector-emitter voltage ($V_{BE} = -1.5$ V)	$I_C = 100$ mA	160			V
→ $V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	$I_C = 200$ mA	140			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	$I_C = 3$ A $I_B = 0.3$ A			1	V
V_{BE}*	Base-emitter voltage	$I_C = 3$ A $V_{CE} = 4$ V			1.7	V
h_{FE}*	DC current gain Gr. 4	$I_C = 0.5$ A $V_{CE} = 4$ V	20		50	—
	Gr. 5	$I_C = 0.5$ A $V_{CE} = 4$ V	35		75	—
	Gr. 6	$I_C = 0.5$ A $V_{CE} = 4$ V	60		145	—
	Gr. 7	$I_C = 0.5$ A $V_{CE} = 4$ V	120		250	—
		$I_C = 3$ A $V_{CE} = 4$ V	20		70	—
h_{FE_1}/h_{FE_2}	Matched pair	$I_C = 0.5$ A $V_{CE} = 4$ V			1.6	—
$I_{S/B}$	Second breakdown collector current	$I_C = 1.5$ A $V_{CE} = 78$ V	1			s

* Pulsed; pulse duration = 300 μs, duty factor = 1.5%.

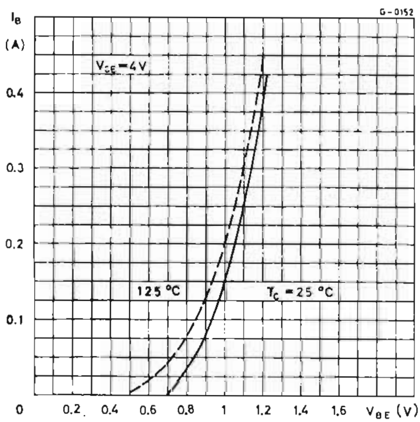
Typical output characteristics



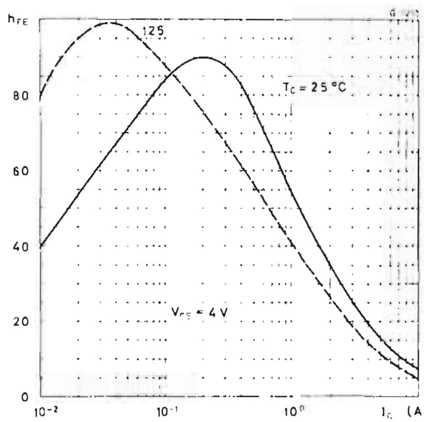
Typical DC transconductance



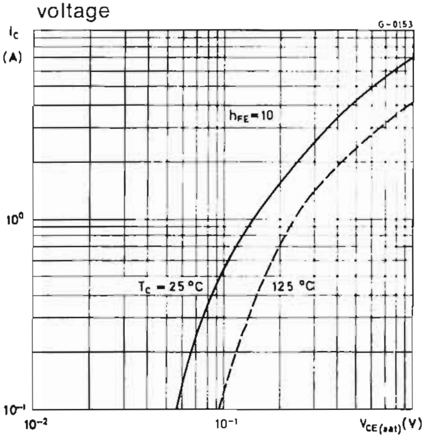
Typical input characteristics



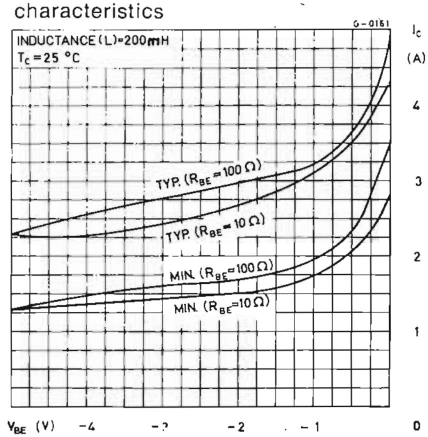
Typical DC current gain



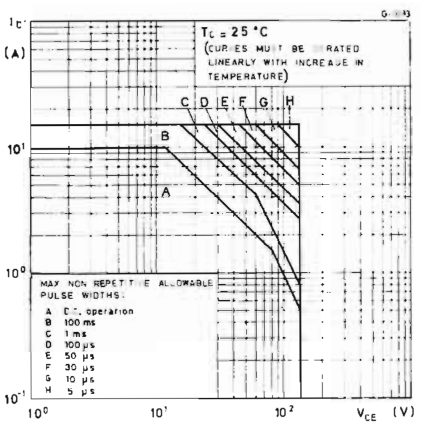
Typical collector-emitter saturation voltage



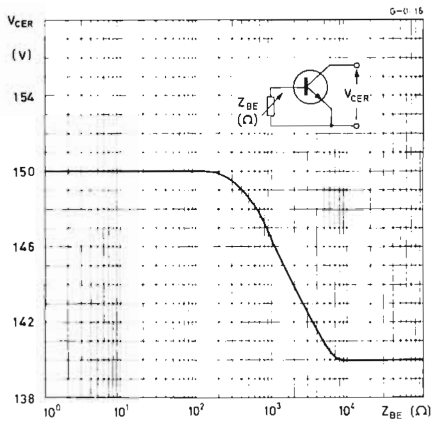
Reverse-bias, second breakdown characteristics



Maximum operating areas



Collector-emitter breakdown voltage



SILICON HOMETAXIAL* NPN

BDX 12
2N4347

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH VOLTAGE AMPLIFIER

The BDX 12/2N 4347 is a "hometaxial" silicon NPN transistor in a Jedec TO-3 metal case. It is intended for use as high power, high voltage amplifier, power switch, regulator, dc-dc converter, inverter in high reliability industrial and professional applications.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

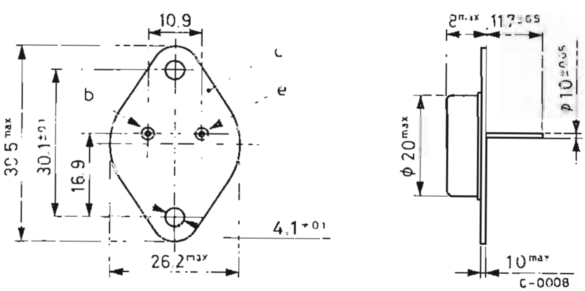
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	140	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	120	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	140	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	5	A
I_{CM}	Collector peak current	10	A
I_B	Base current	3	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	100	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

BDX 12
2N4347

THERMAL DATA

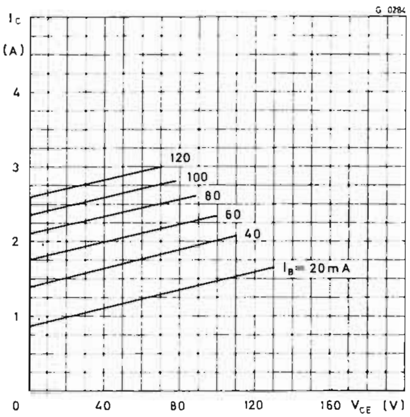
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.75	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

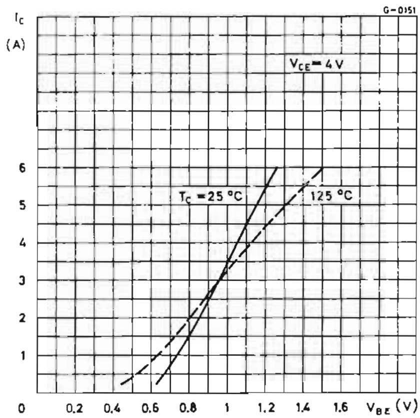
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 120 V			2	mA
		V_{CE} = 120 V T_C = 150 °C			10	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V			5	mA
→ $V_{CEV}{}^{*}{}_{(sus)}$	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 100 mA	140			V
→ $V_{CEO}{}^{*}{}_{(sus)}$	Collector-emitter voltage (I_B = 0)	I_C = 200 mA	120			V
$V_{CE\,(sat)}$*	Collector-emitter saturation voltage	I_C = 2 A I_B = 0.2 A			1	V
V_{BE}*	Base-emitter voltage	I_C = 2 A V_{CE} = 4 V			2	V
h_{FE}*	DC current gain	I_C = 2 A V_{CE} = 4 V	20		70	—
$I_{S/B}$	Second breakdown collector current	I_C = 1.5 A V_{CE} = 67 V	1			s

* Pulsed; pulse duration = 300 µs, duty factor = 1.5%.

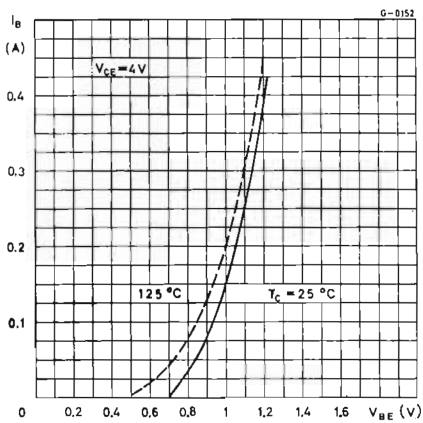
Typical output characteristics



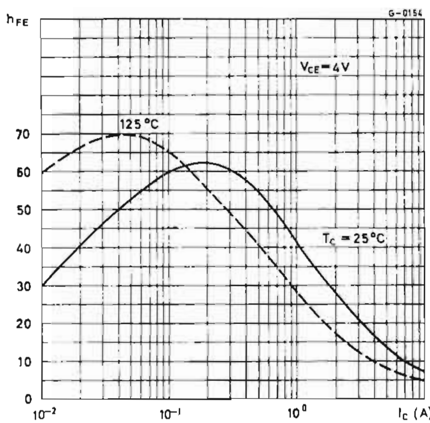
Typical DC transconductance



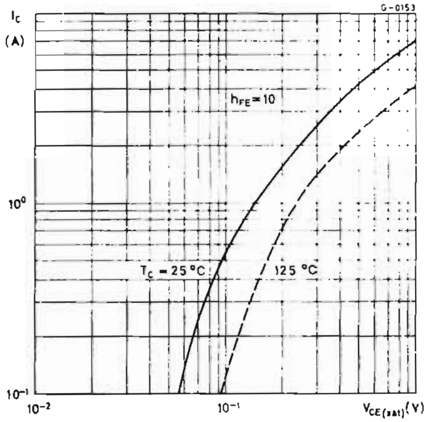
Typical input characteristics



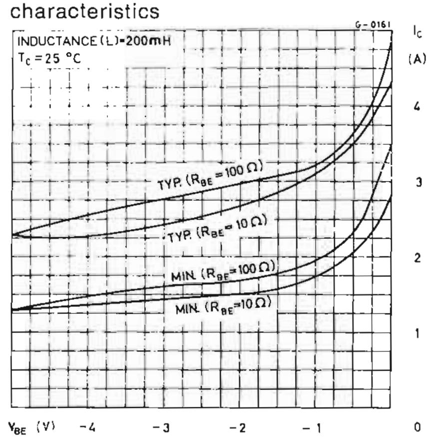
Typical DC current gain



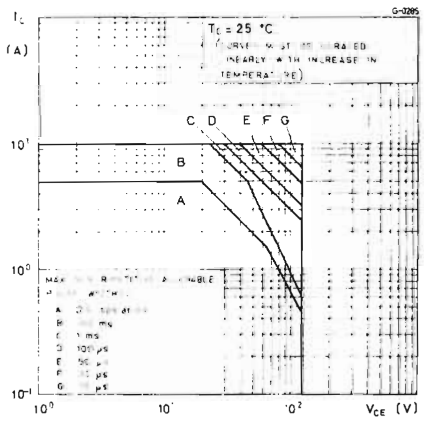
Collector-emitter saturation voltage



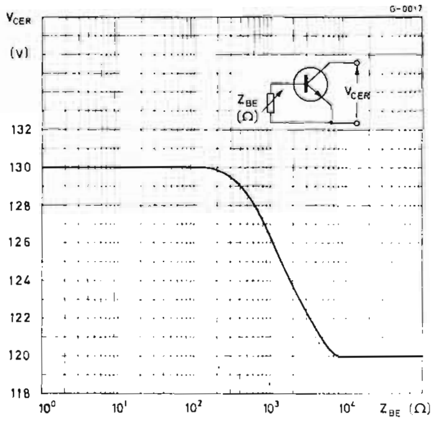
Reverse-bias, second breakdown characteristics



Maximum operating areas



Collector-emitter breakdown voltage



SILICON HOMETAXIAL* NPN

BDX 13
40251

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The BDX 13/40251 is a single diffused "hometaxial" silicon NPN transistor in a Jedec TO-3 metal case. It is intended for a wide variety of intermediate and high power applications and specially used as AF power amplifier.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

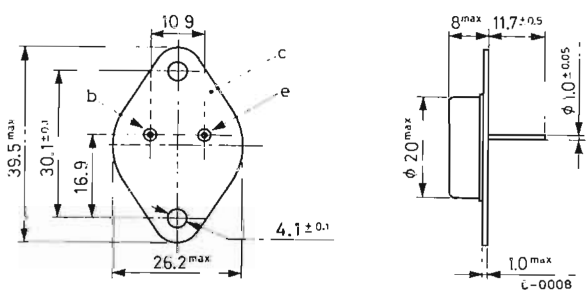
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	50	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	40	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	50	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	15	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	117	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

BDX 13
40251

THERMAL DATA

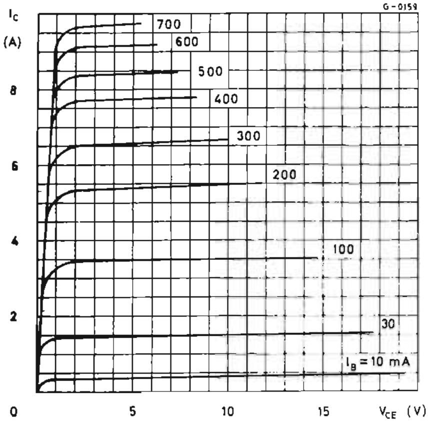
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

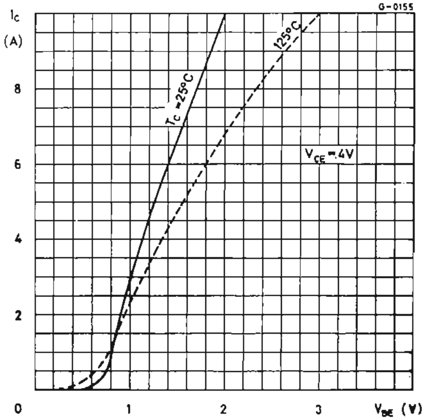
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 40 V			2	mA
		V_{CE} = 40 V T_C = 150 °C			10	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 5 V			10	mA
V_{CBO}*	Collector-base voltage (I_E = 0)	I_C = 50÷100 mA	50			V
→ V_{CEV}*$_{(sus)}$	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 100 mA	50			V
→ V_{CEO}*$_{(sus)}$	Collector-emitter voltage (I_B = 0)	I_C = 200 mA	40			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 8 A I_B = 0.8 A			1.5	V
V_{BE}*	Base-emitter voltage	I_C = 8 A V_{CE} = 4 V			2.2	V
h_{FE}*	DC current gain Gr. 4	I_C = 500 mA V_{CE} = 4 V	20		50	—
	Gr. 5	I_C = 500 mA V_{CE} = 4 V	35		75	—
	Gr. 6	I_C = 500 mA V_{CE} = 4 V	60		145	—
	Gr. 7	I_C = 500 mA V_{CE} = 4 V	120		250	—
		I_C = 8 A V_{CE} = 4 V	15		60	—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 500 mA V_{CE} = 4 V			1.6	—
f_T	Transition frequency	I_C = 1 A V_{CE} = 4 V		0.5		MHz
$I_{S/B}$	Second breakdown collector current	I_C = 3 A V_{CE} = 39 V	1			s

* Pulsed; pulse duration = 300 μs, duty factor = 1.5%.

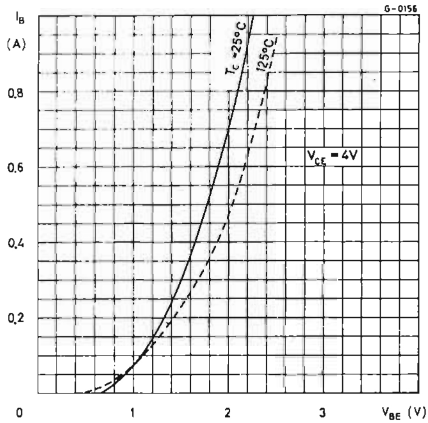
Typical output characteristics



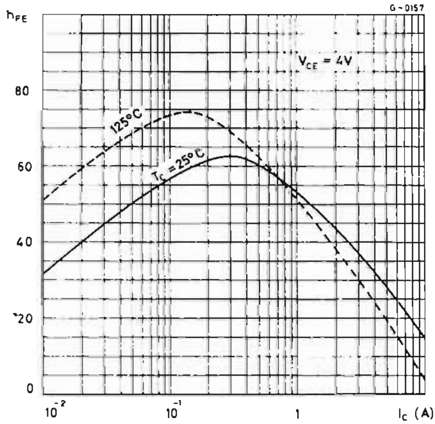
Typical DC transconductance



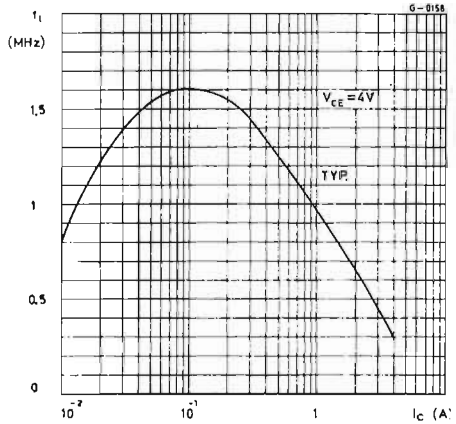
Typical input characteristics



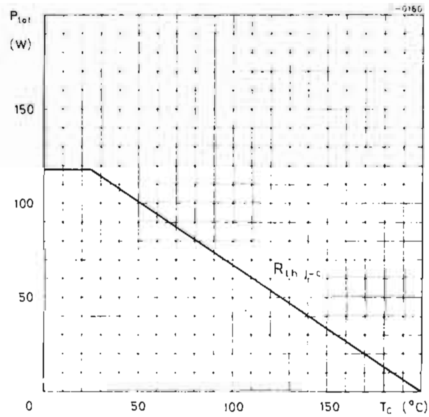
Typical DC current gain



Transition frequency



Power rating chart



SILICON HOMETAXIAL* NPN

BDX 23
40636

GENERAL INFORMATION

TYPICAL APPLICATION: HI-FI POWER AMPLIFIER

The BDX 23/40636 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case. It is particularly intended for output stages in high fidelity amplifier circuits.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

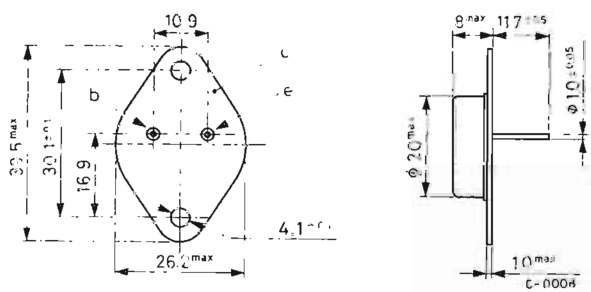
ABSOLUTE MAXIMUM RATINGS

V_{CER}	Collector-emitter voltage ($R_{BE} \leq 100\ \Omega$)	95	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	15	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25\ °C$	117	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to TO-3)

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CER}	Collector cutoff current (R_{BE} = 100 Ω)	V_{CE} = 85 V			0.5	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 4 V			1	mA
V_{CER}	Collector-emitter voltage (R_{BE} = 100 Ω)	I_C = 200 mA	95			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 4 A I_B = 0.4 V			1	V
→ V_{BE}	Base-emitter voltage	I_C = 4 A V_{CE} = 4 V			1.5	V
h_{FE}	DC current gain Gr. 4	I_C = 500 mA V_{CE} = 4 V	20		50	—
	Gr. 5	I_C = 500 mA V_{CE} = 4 V	35		75	—
	Gr. 6	I_C = 500 mA V_{CE} = 4 V	60		145	—
	Gr. 7	I_C = 500 mA V_{CE} = 4 V	120		250	—
		I_C = 4 A V_{CE} = 4 V	20		70	—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 500 mA V_{CE} = 4 V			1.6	—
→ $I_{S/B}$*	Second breakdown collector current	V_{CE} = 60 V	1.95			A

* Pulsed: 1 s, non repetitive pulse.

BDX 24
40250

SILICON HOMETAXIAL* NPN

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The BDX 24/40250 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-66 metal case. It is intended for a wide variety of intermediate and high power applications. It is especially suitable for use in high fidelity amplifiers.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

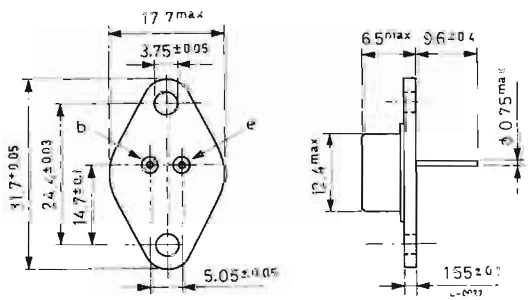
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	50	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	40	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	50	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	4	A
I_B	Base current	2	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	29	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



TO-66

THERMAL DATA

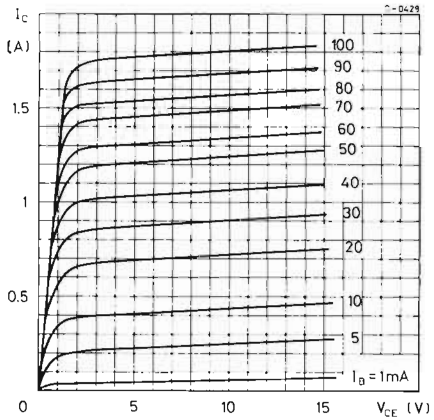
$R_{th\ j-c}$	Thermal resistance junction-case	max	6	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

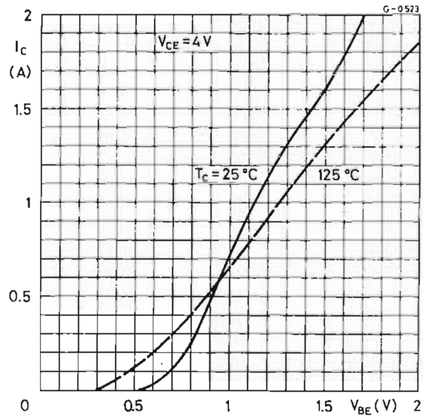
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 30 V			1	mA
		V_{CB} = 30 V T_c = 150 °C			5	mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	V_{EB} = 5 V			5	mA
V_{CBO}	Collector-base voltage ($I_E = 0$)	I_C = 50 mA	50			V
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	I_C = 0.1÷2 A	40			V
$V_{CEV(sus)}$*	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 0.05÷1 A	50			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 1.5 A I_B = 0.15 A			1.5	V
V_{BE}*	Base-emitter voltage	I_C = 1.5 A V_{CE} = 4 V			2.2	V
h_{FE}	DC current gain Gr. 4	I_C = 100 mA V_{CE} = 4 V	20		50	—
	Gr. 5	I_C = 100 mA V_{CE} = 4 V	35		75	—
	Gr. 6	I_C = 100 mA V_{CE} = 4 V	60		145	—
	Gr. 7	I_C = 100 mA V_{CE} = 4 V	120		250	—
	*	I_C = 1.5 A V_{CE} = 4 V	25		100	—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 100 mA V_{CE} = 4 V			1.6	—
$I_{S/B}$	Second breakdown collector current	V_{CE} = 40 V I_C = 725 mA	1			s

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

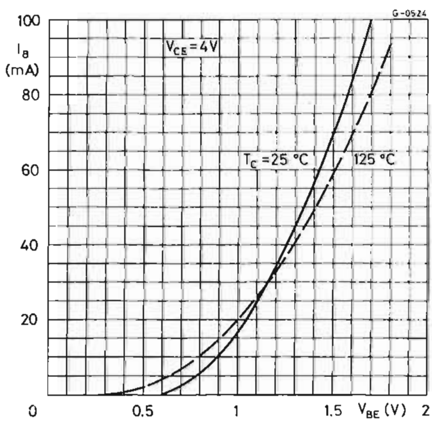
Typical output characteristics



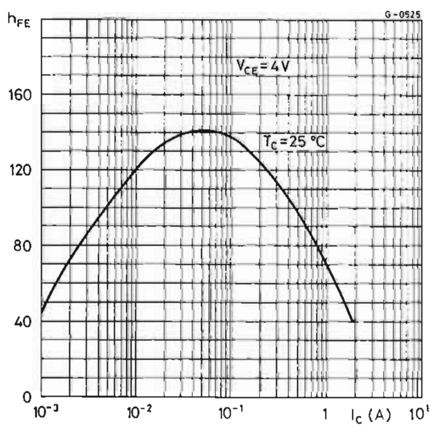
Typical DC transconductance



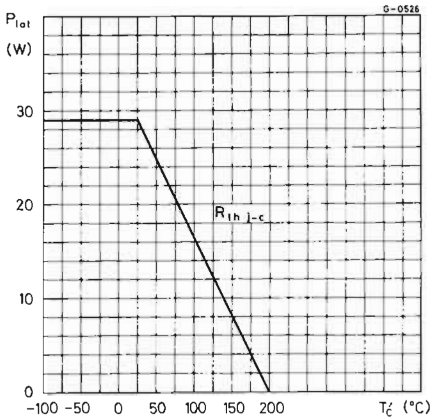
Typical input characteristics



Typical DC current gain



Power rating chart



SILICON HOMETAXIAL* NPN

BDX 40
2N3772

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH CURRENT, HIGH POWER AMPLIFIER

The BDX 40/2N3772 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case. It is useful for high power switching circuits, series and shunt regulators, DC-DC converters, inverters and high fidelity amplifiers.

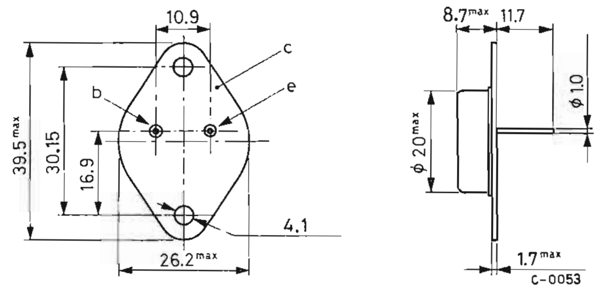
* Hometaxial types employ a structure in which the base a region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	100	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	60	V
$V_{CER\ (sus)}$	Collector-emitter voltage ($R_{BE} \leq 100\ \Omega$)	70	V
$V_{CEX\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V; $R_{BE} = 100\ \Omega$)	90	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	20	A
I_{CM}	Collector peak current	30	A
I_B	Base current	5	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	150	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BDX 40
2N3772

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.17	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 100 V			5	mA
		V_{CB} = 30 V T_c = 150 °C			10	mA
I_{CEO}	Collector cutoff current (I_B = 0)	V_{CE} = 50 V			10	mA
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 100 V			5	mA
		V_{CE} = 30 V T_c = 150 °C			10	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V			5	mA
$V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 200 mA	60			V
$V_{CER(sus)}$*	Collector-emitter voltage (R_{BE} = 100 Ω)	I_C = 200 mA	70			V
$V_{CEX(sus)}$*	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 200 mA R_{BE} = 100 Ω	80			V
		I_C = 3 A R_{BE} = 100 Ω	90			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 10 A I_B = 1 A			1.4	V
		I_C = 20 A I_B = 4 A			4	V
V_{BE}*	Base-emitter voltage	I_C = 10 A V_{CE} = 4 V			2.2	V
h_{FE}*	DC current gain Gr. 4	I_C = 0.5 A V_{CE} = 4 V	20		50	—
	Gr. 5	I_C = 0.5 A V_{CE} = 4 V	35		75	—
	Gr. 6	I_C = 0.5 A V_{CE} = 4 V	60		145	—
	Gr. 7	I_C = 0.5 A V_{CE} = 4 V	120		250	—
		I_C = 10 A V_{CE} = 4 V	15		60	—
		I_C = 20 A V_{CE} = 4 V	5			—

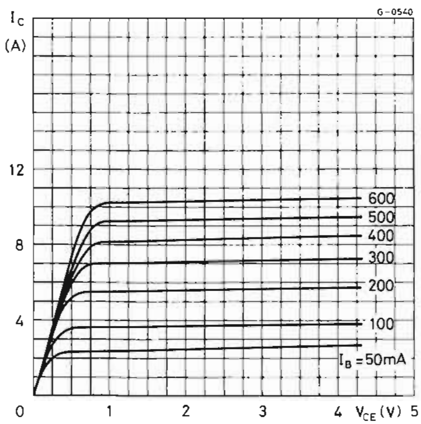
* Pulsed: pulse duration = 300 μs, duty factor = 1.5%

ELECTRICAL CHARACTERISTICS (continued)

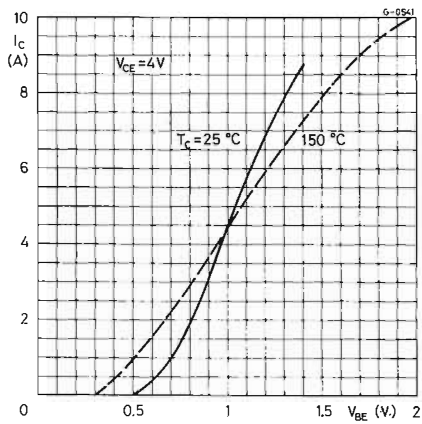
Parameter		Test conditions	Min. Typ. Max.	Unit
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 0.5 A V_{CE} = 4 V	1.6	—
f_T	Transition frequency	I_C = 1 A V_{CE} = 4 V	800	kHz
→ $I_{S/B}$**	Second breakdown collector current	V_{CE} = 60 V	2.5	A

** Pulsed: 1 s, non repetitive pulse.

Typical output characteristics

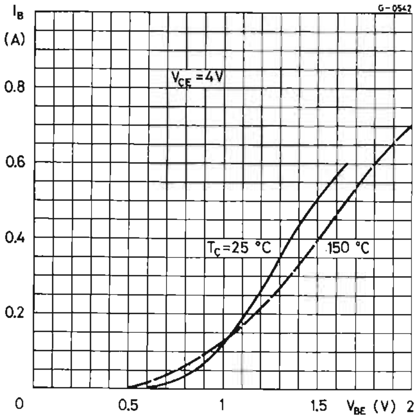


Typical DC transconductance

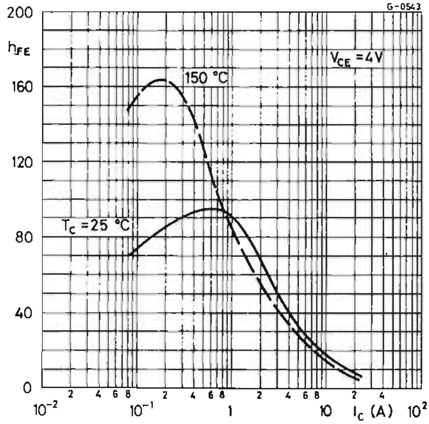


BDX 40
2N3772

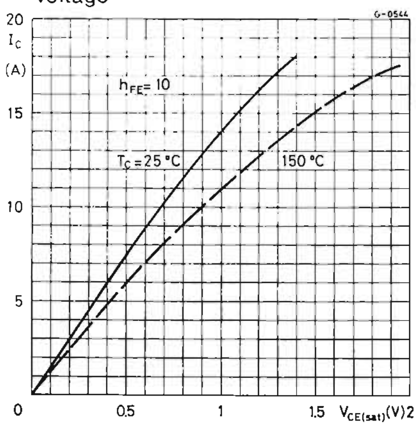
Typical input characteristics



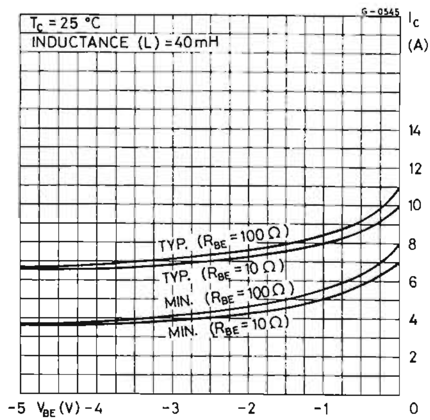
Typical DC current gain



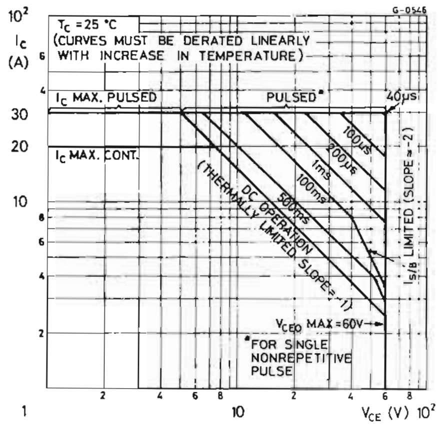
Typical collector-emitter saturation voltage



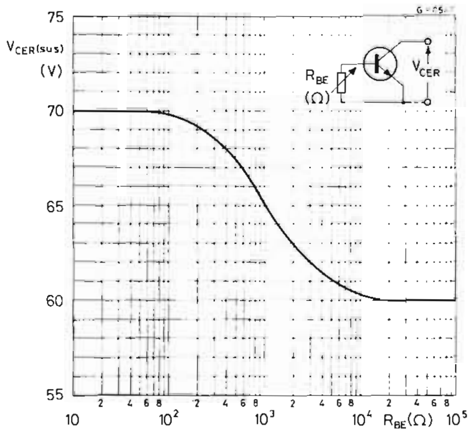
Reverse-bias, second breakdown characteristics



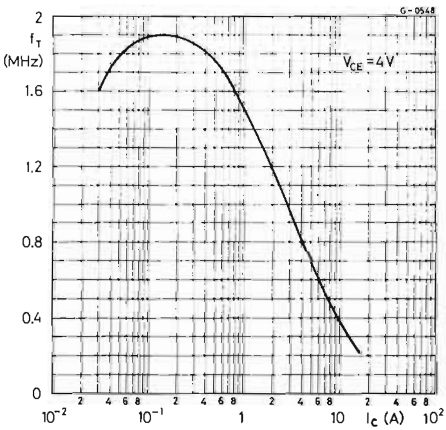
Maximum operating areas



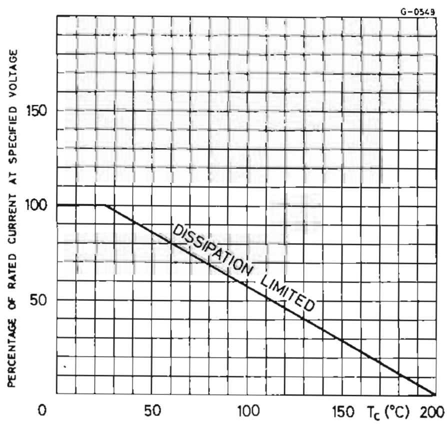
Collector-emitter breakdown voltage



Typical transition frequency



Current rating chart



BDX 41
2N3771

SILICON HOMETAXIAL* NPN

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH CURRENT, HIGH POWER AMPLIFIER

The BDX 41/2N3771 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case. It is intended for a wide variety of high-power, high-current applications and specially used as AF amplifier.

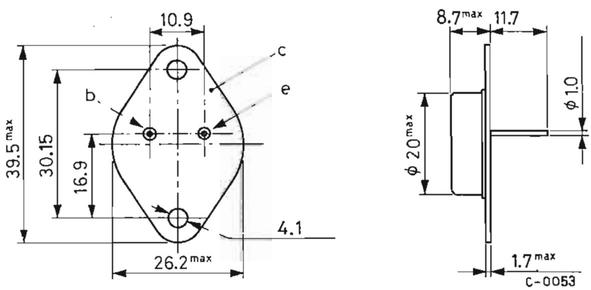
* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	50	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	40	V
$V_{CER\ (sus)}$	Collector-emitter voltage ($R_{BE} \leq 100\ \Omega$)	45	V
$V_{CEX\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5\ V$; $R_{BE} = 100\ \Omega$)	50	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	30	A
I_{CM}	Collector peak current	30	A
I_B	Base current	7.5	A
P_{tot}	Total power dissipation at $T_c \leq 25\ °C$	150	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.17	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = 50$ V			2	mA
		$V_{CB} = 30$ V $T_c = 150$ °C			10	mA
I_{CEO}	Collector cutoff current ($I_B = 0$)	$V_{CE} = 30$ V			10	mA
I_{CEV}	Collector-cutoff current ($V_{BE} = -1.5$ V)	$V_{CE} = 50$ V			2	mA
		$V_{CE} = 30$ V $T_c = 150$ °C			10	mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 5$ V			5	mA
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	$I_C = 200$ mA	40			V
$V_{CER(sus)}$*	Collector-emitter voltage ($R_{BE} = 100\ \Omega$)	$I_C = 200$ mA	45			V
$V_{CEX(sus)}$*	Collector-emitter voltage ($V_{BE} = -1.5$ V)	$I_C = 0.2 \div 3$ A $R_{BE} = 100\ \Omega$	50			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	$I_C = 15$ A $I_B = 1.5$ A			2	V
		$I_C = 30$ A $I_B = 6$ A			4	V
V_{BE}*	Base-emitter voltage	$I_C = 15$ A $V_{CE} = 4$ V			2.7	V
h_{FE}*	DC current gain Gr. 4	$I_C = 0.5$ A $V_{CE} = 4$ V	20		50	—
	Gr. 5	$I_C = 0.5$ A $V_{CE} = 4$ V	35		75	—
	Gr. 6	$I_C = 0.5$ A $V_{CE} = 4$ V	60		145	—
	Gr. 7	$I_C = 0.5$ A $V_{CE} = 4$ V	120		250	—
		$I_C = 15$ A $V_{CE} = 4$ V	15		60	—
		$I_C = 30$ A $V_{CE} = 4$ V	5			—

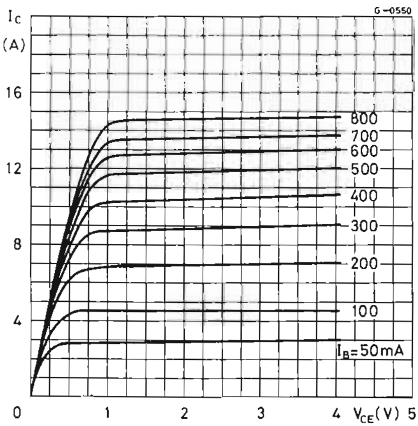
* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

ELECTRICAL CHARACTERISTICS (continued)

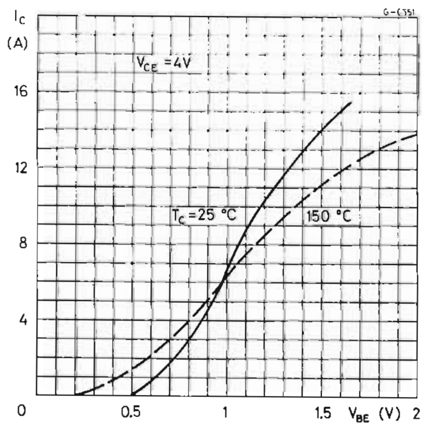
Parameter		Test conditions	Min. Typ. Max.	Unit
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 0.5 A V_{CE} = 4 V	1.6	—
f_T	Transition frequency	I_C = 1 A V_{CE} = 4 V	800	kHz
→ $I_{S/B}$**	Second breakdown collector current	V_{CE} = 40 V	3.75	A

** Pulsed: 1 s, non repetitive pulse.

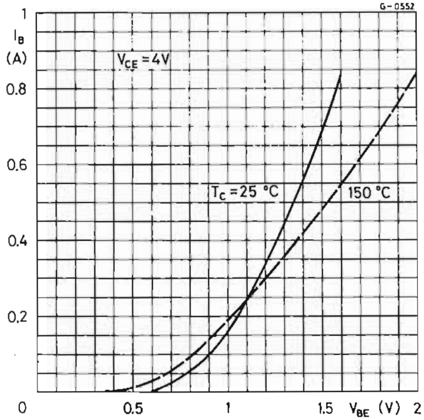
Typical output characteristics



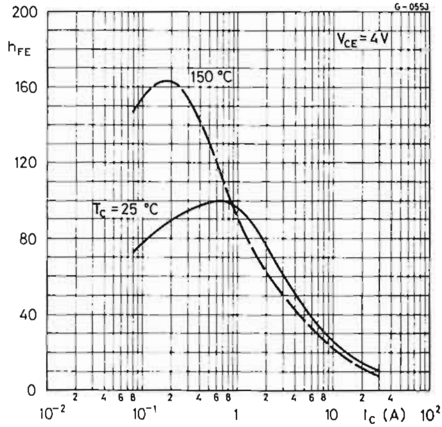
Typical DC transconductance



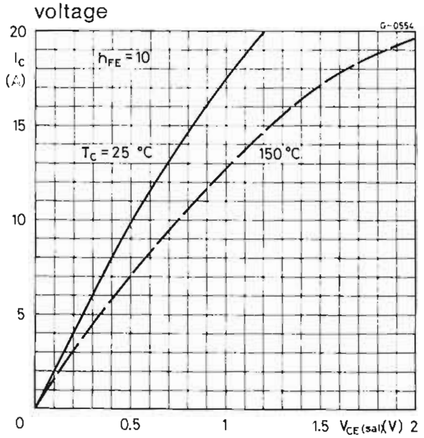
Typical input characteristics



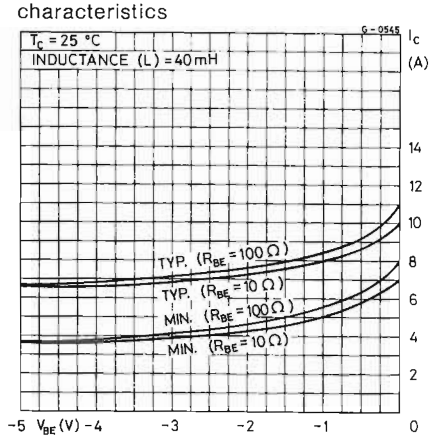
Typical DC current gain



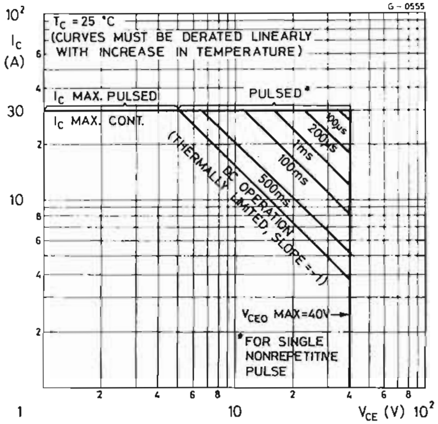
Typical collector-emitter saturation voltage



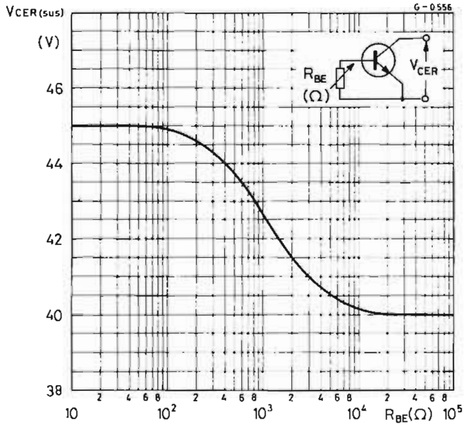
Reverse-bias, second breakdown characteristics



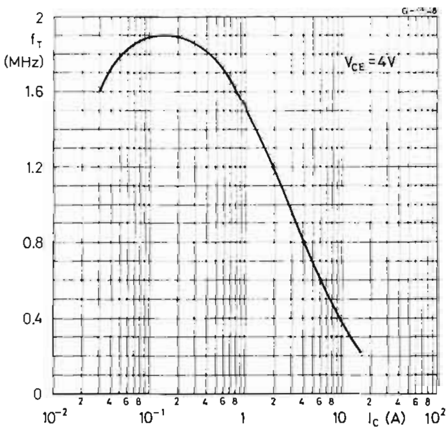
Maximum operating areas



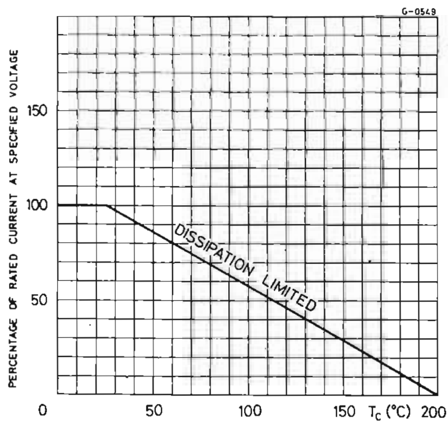
Collector-emitter breakdown voltage



Typical transition frequency



Current rating chart



BDX 50
2N3773

SILICON HOMETAXIAL* NPN

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH CURRENT, HIGH VOLTAGE SWITCH

The BDX 50/2N3773 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case, useful for a wide variety of high-voltage, high-current applications. It is intended for use as power switch, regulator, DC-DC converter and inverter in high reliability industrial and professional applications.

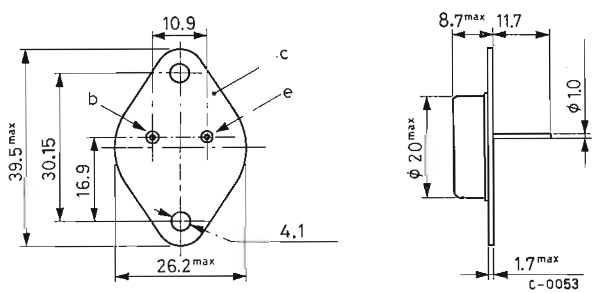
* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	160	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	140	V
$V_{CEX\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V; $R_{BE} = 100\ \Omega$)	160	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	16	A
I_{CM}	Collector peak current	30	A
I_B	Base current	4	A
I_{BM}	Base peak current	15	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	150	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BDX 50
2N3773

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.17	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 140 V			2	mA
I_{CEO}	Collector cutoff current (I_B = 0)	V_{CE} = 120 V			10	mA
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 140 V			2	mA
		V_{CE} = 140 V T_c = 150 °C			10	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V			5	mA
$V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 0.2÷3 A	140			V
$V_{CEX(sus)}$*	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 0.1÷1.5 A R_{BE} = 100 Ω	160			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 8 A I_B = 0.8 A			1.4	V
		I_C = 16 A I_B = 3.2 A			4	V
V_{BE}*	Base-emitter voltage	I_C = 8 A V_{CE} = 4 V			2.2	V
h_{FE}*	DC current gain Gr. 4	I_C = 0.5 A V_{CE} = 4 V	20		50	—
	Gr. 5	I_C = 0.5 A V_{CE} = 4 V	35		75	—
	Gr. 6	I_C = 0.5 A V_{CE} = 4 V	60		145	—
	Gr. 7	I_C = 0.5 A V_{CE} = 4 V	120		250	—
		I_C = 8 A V_{CE} = 4 V	15		60	—
		I_C = 16 A V_{CE} = 4 V	5			—

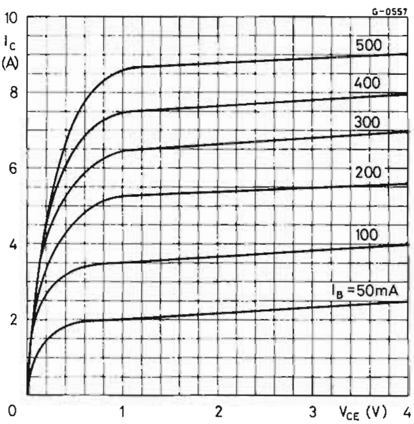
* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

ELECTRICAL CHARACTERISTICS (continued)

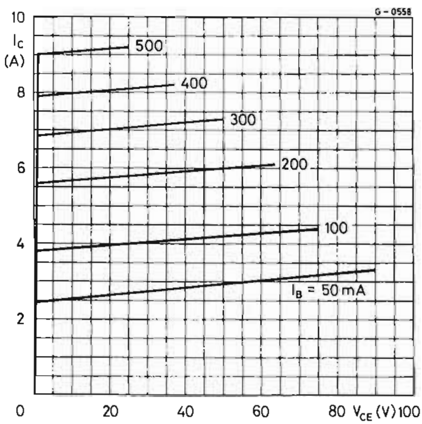
Parameter		Test conditions	Min.	Typ.	Max.	Unit
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 0.5 mA V_{CE} = 4 V			1.6	—
f_{hfe}	Cutoff frequency	V_{CE} = 4 V I_C = 1 A f = 1 kHz	40			kHz
→ $I_{S/B}$**	Second breakdown collector current	V_{CE} = 100 V	1.5			A

** Pulsed: 1 s, non repetitive pulse.

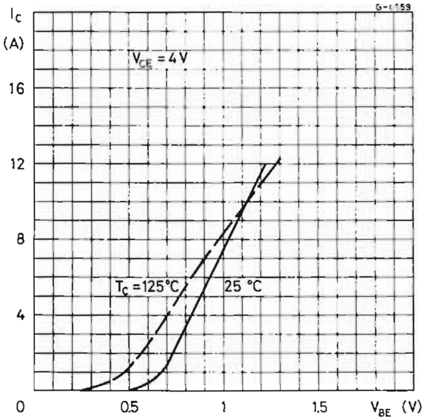
Typical output characteristics



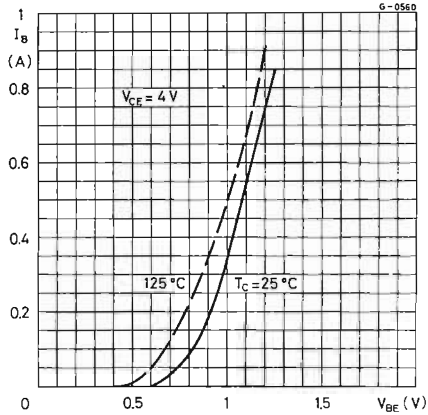
Typical output characteristics



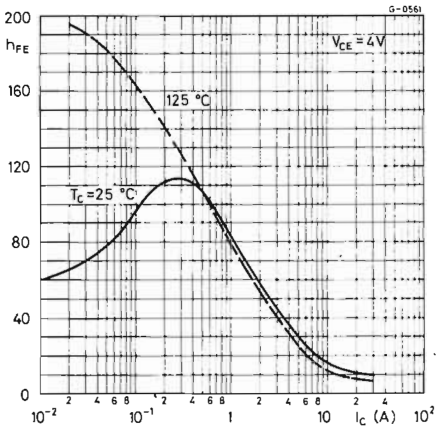
Typical DC transconductance



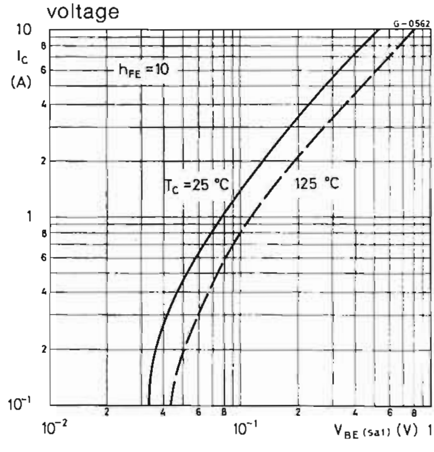
Typical input characteristics



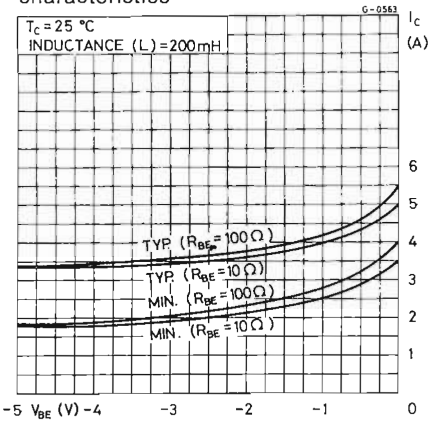
Typical DC current gain



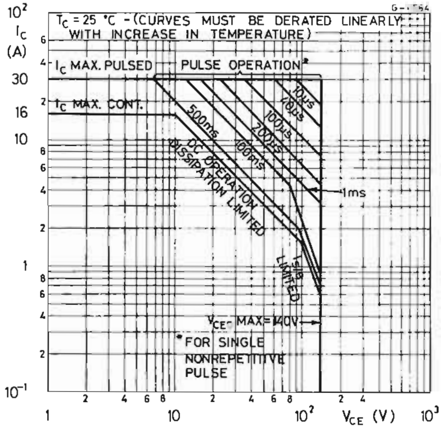
Typical collector-emitter saturation voltage



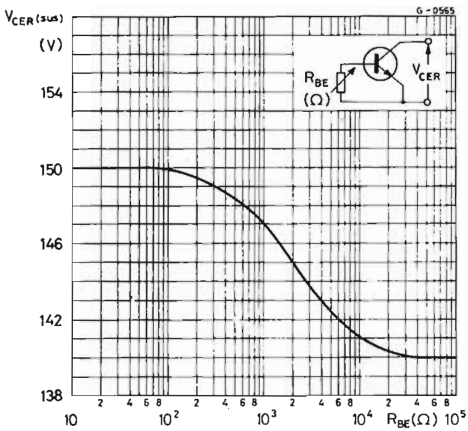
Reverse-bias, second breakdown characteristics



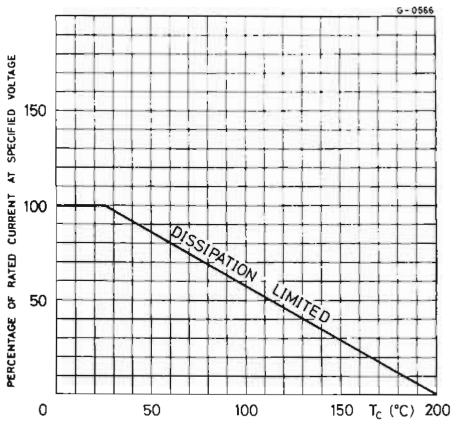
Maximum operating areas



Collector-emitter breakdown voltage



Current rating chart



SILICON HOMETAXIAL* NPN

BDX 51
2N4348

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH CURRENT, HIGH VOLTAGE AMPLIFIER

The BDX 51/2N4348 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case. It is intended for use as high-power, high-voltage amplifier, power switch, regulator, DC-DC converter and inverter in high reliability industrial and professional applications.

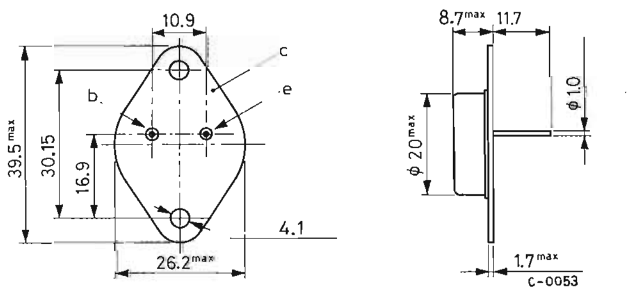
* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	140	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	120	V
$V_{CEX\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V; $R_{BE} = 100\ \Omega$)	140	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	10	A
I_{CM}	Collector peak current	30	A
I_B	Base current	4	A
I_{BM}	Base peak current	15	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	120	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BDX 51
2N4348

THERMAL DATA

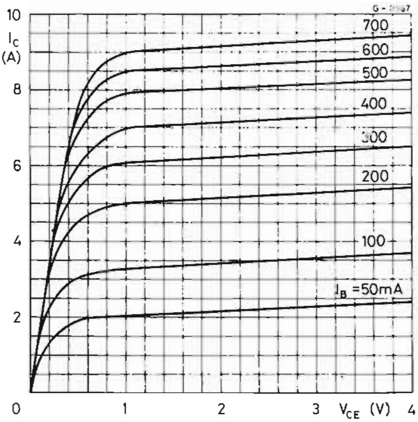
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.46	°C/W

ELECTRICAL CHARACTERISTICS ($T_c = 25\ °C$ unless otherwise specified)

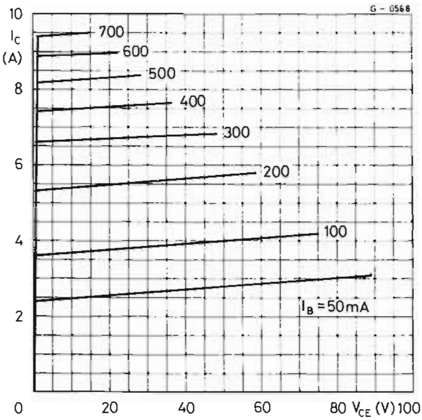
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current ($V_{BE} = -1.5$ V)	$V_{CE} = 120$ V $V_{CE} = 120$ V $T_c = 150\ °C$			2 10	mA mA
I_{EBO}	Emitter cutoff current ($I_C = 0$)	$V_{EB} = 7$ V			5	mA
$V_{CEO(sus)}$*	Collector-emitter voltage ($I_B = 0$)	$I_C = 0.2 \div 3$ A	120			V
$V_{CEX(sus)}$*	Collector-emitter voltage ($V_{BE} = -1.5$ V)	$I_C = 0.1 \div 1.5$ A $R_{BE} = 100\ \Omega$	140			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	$I_C = 5$ A $I_B = 0.5$ A $I_C = 10$ A $I_B = 1.25$ A			1 2	V V
V_{BE}*	Base-emitter voltage	$I_C = 5$ A $V_{CE} = 4$ V			2	V
h_{FE}*	DC current gain	$I_C = 5$ A $V_{CE} = 4$ V $I_C = 10$ A $V_{CE} = 4$ V	15 10		60	— —
f_{hfe}	Cutoff frequency	$V_{CE} = 4$ V $I_C = 1$ A $f = 1$ kHz	40			kHz
→ $I_{S/B}$**	Second breakdown collector current	$V_{CE} = 80$ V	1.5			A

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.
** Pulsed: 1 s, non repetitive pulse.

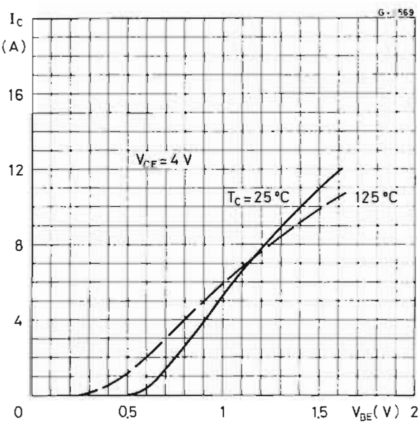
Typical output characteristics



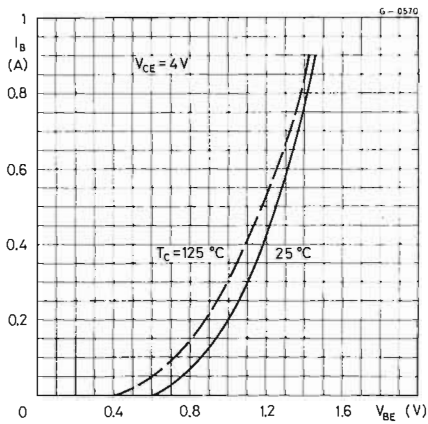
Typical output characteristics



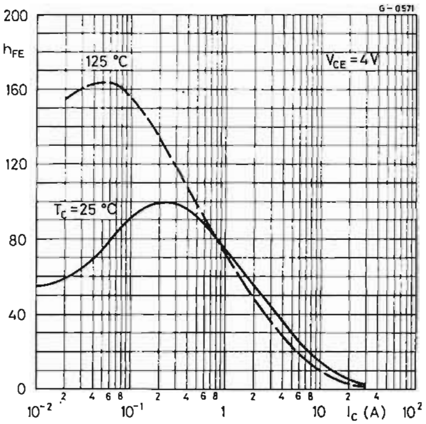
Typical DC transconductance



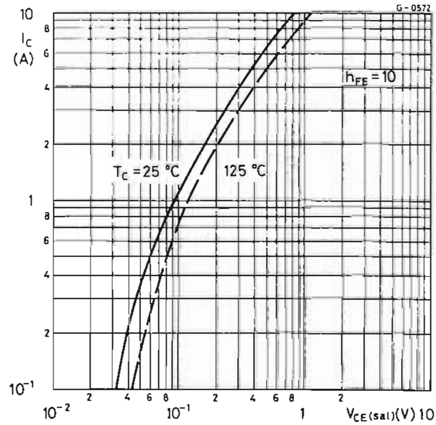
Typical input characteristics



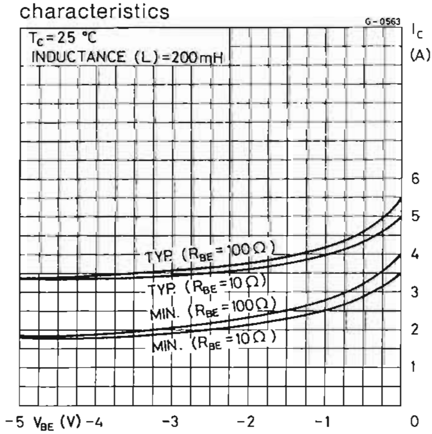
Typical DC current gain



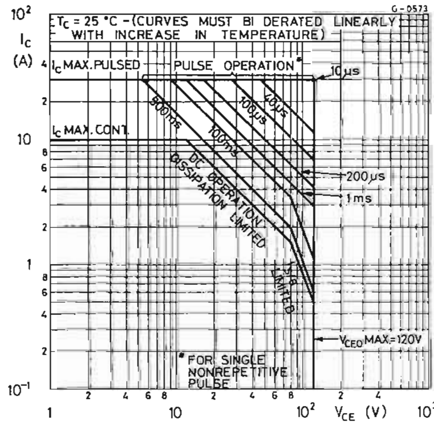
Typical collector-emitter saturation voltage



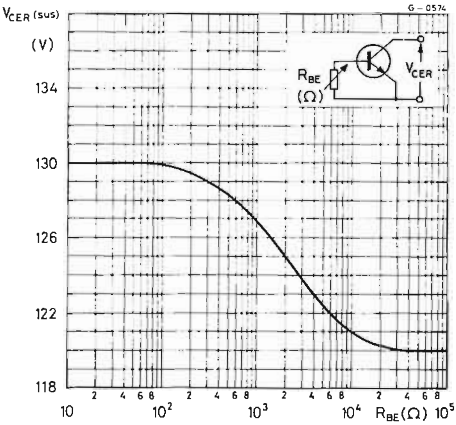
Reverse-bias, second breakdown characteristics



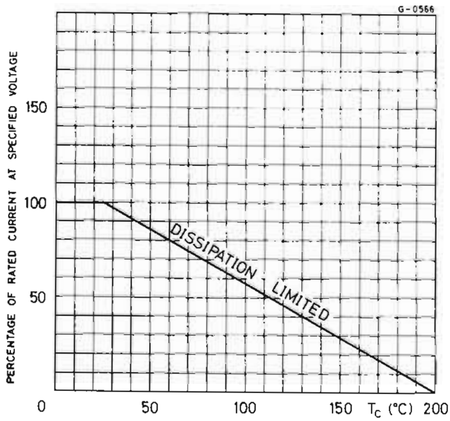
Maximum operating areas



Collector-emitter breakdown voltage



Current rating chart



SILICON HOMETAXIAL* NPN

BDX 60
2N3055U

PRELIMINARY DATA

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH CURRENT, HIGH POWER AMPLIFIER

The BDX 60/2N 3055U is a single diffused "hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case, with high gain, low saturation voltage at high collector current (up to 15 A) and high breakdown voltage. It is intended for a wide variety of high-power applications. **Designed to assure freedom from second breakdown at maximum ratings.**

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

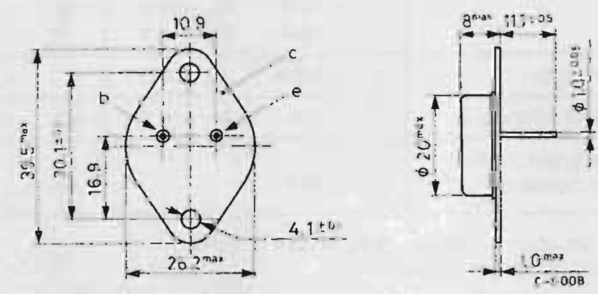
V_{CBO}	Collector-base voltage ($I_E = 0$)	100	V
$V_{CEO\,(sus)}$	Collector-emitter voltage ($I_B = 0$)	80	V
$V_{CEV\,(sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	100	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C*	Collector current	15	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	150	W
T_s	Storage temperature	-65 ÷ 200	°C
T_j	Junction temperature	200	°C

* The emitter current may reach 30 A peak with collector-base junction short-circuited

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

BDX 60
2N3055U

THERMAL DATA

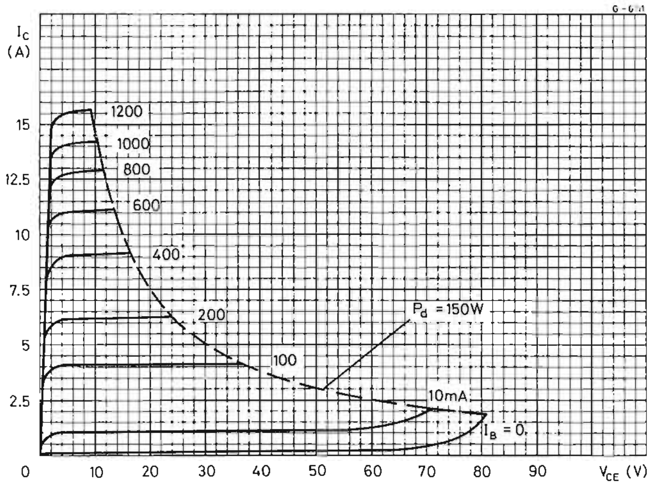
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.17	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

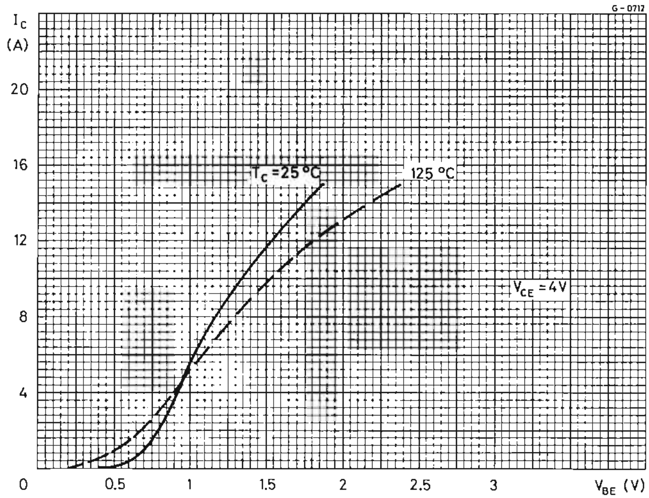
Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 80 V				1.5	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V				1	mA
→ $V_{CEV(sus)}$*	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 100 mA		100			V
→ $V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 200 mA		80			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 4 A	I_B = 0.4 A			0.5	V
		I_C = 10 A	I_B = 2 A			1.5	V
		I_C = 15 A	I_B = 3 A			4	V
$V_{BE(sat)}$*	Base-emitter saturation voltage	I_C = 4 A	I_B = 0.4 A			1.6	V
		I_C = 10 A	I_B = 2 A			3	V
		I_C = 15 A	I_B = 3 A			5.5	V
V_{BE}*	Base emitter voltage	I_C = 4 A	V_{CE} = 4 V			1.2	V
h_{FE}*	DC current gain	I_C = 0.5 A	V_{CE} = 4 V	20		250	—
		I_C = 4 A	V_{CE} = 4 V	20		70	—
		I_C = 10 A	V_{CE} = 4 V	10			—
		I_C = 15 A	V_{CE} = 4 V	5			—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 0.5 A	V_{CE} = 4 V			1.6	—
f_T	Transition frequency	I_C = 1 A	V_{CE} = 4 V	0.8			MHz
$I_{s/b}$**	Second breakdown collector current	V_{CE} = 80 V		1.88			A

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.
** Pulsed: 1 s, non repetitive pulse.

Typical output characteristics

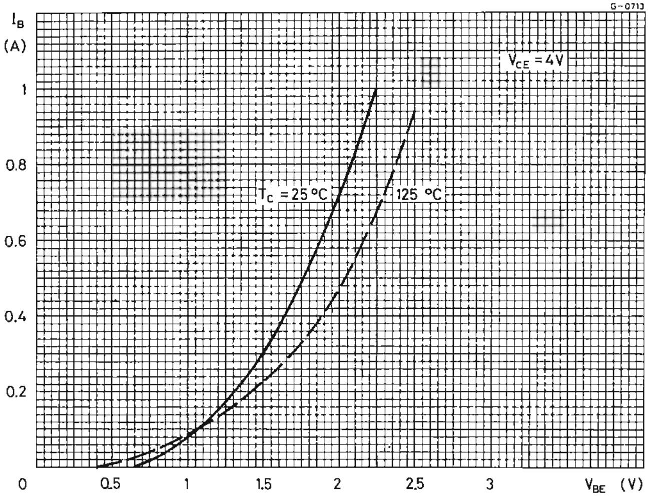


Typical DC transconductance

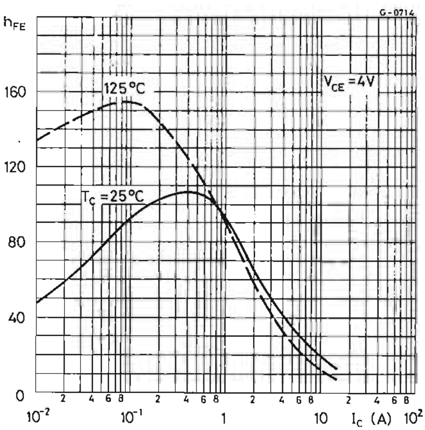


BDX 60
2N3055U

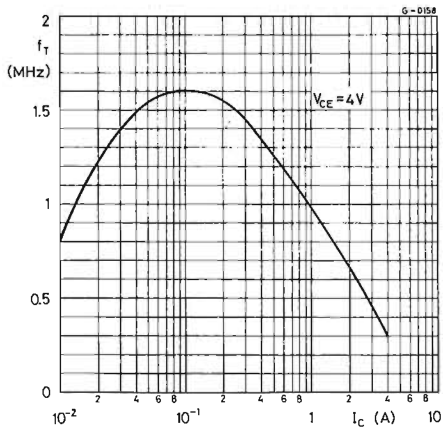
Typical input characteristics



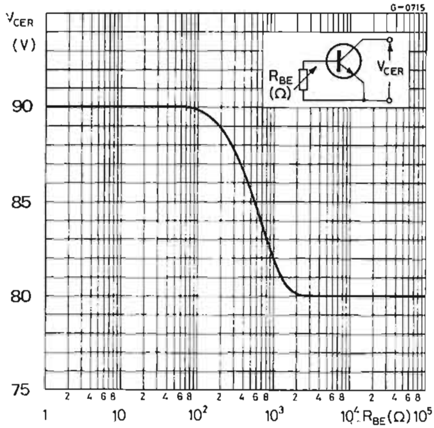
Typical DC current gain



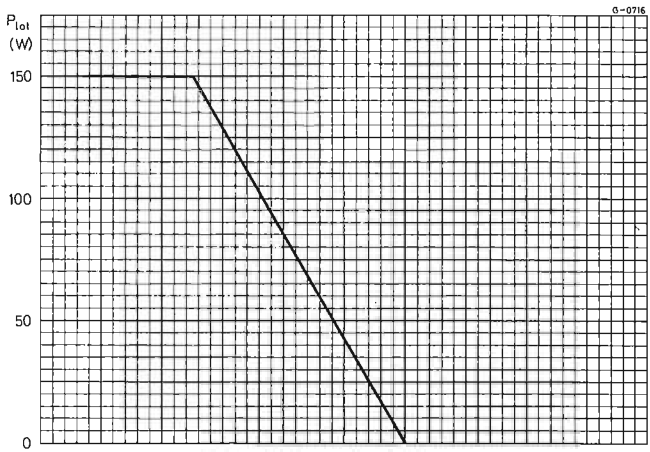
Typical transition frequency



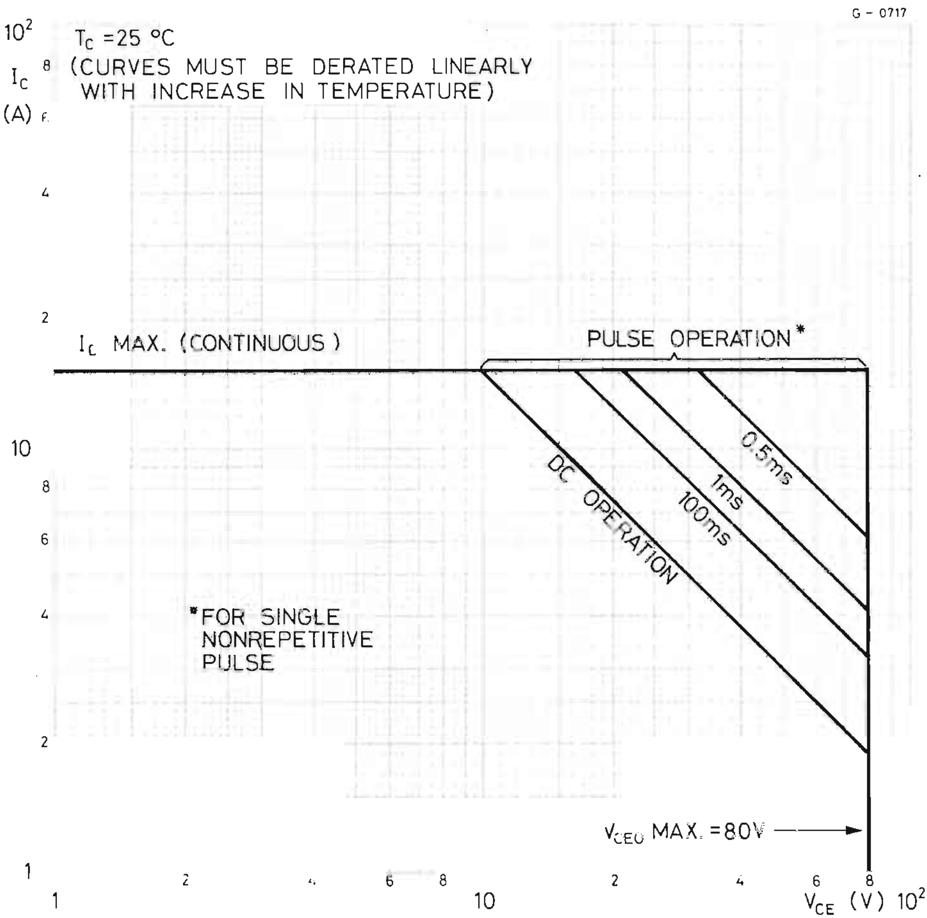
Collector-emitter breakdown voltage



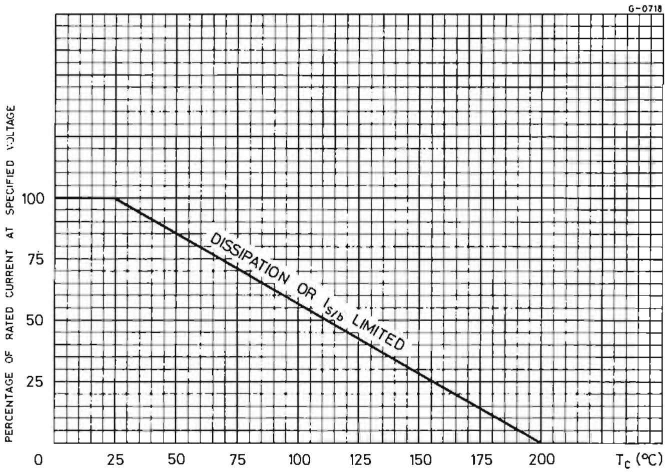
Power rating chart



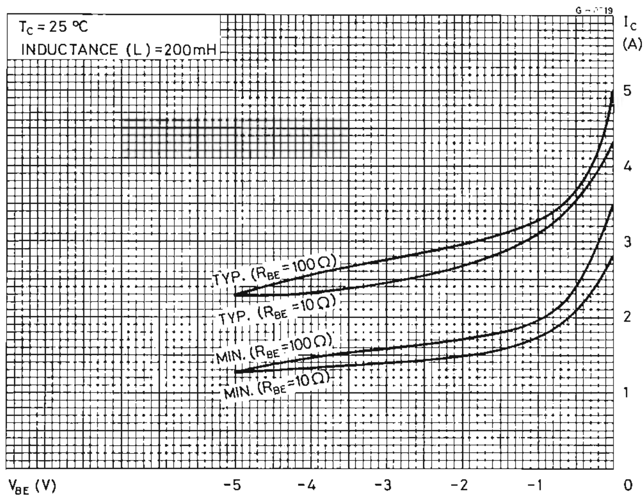
Maximum operating areas



Current rating chart



Reverse-bias, second breakdown characteristics



SILICON HOMETAXIAL* NPN

BDX 61
2N3055V

PRELIMINARY DATA

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH CURRENT, HIGH POWER AMPLIFIER

The BDX 61/2N 3055V is a single diffused "hometaxial*" silicon NPN transistor in a Jedec TO-3 metal case, with high gain and low saturation voltage at high collector current (up to 20 A). It is intended for a wide variety of high-power applications. **Designed to assure freedom from second breakdown at maximum ratings.**

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

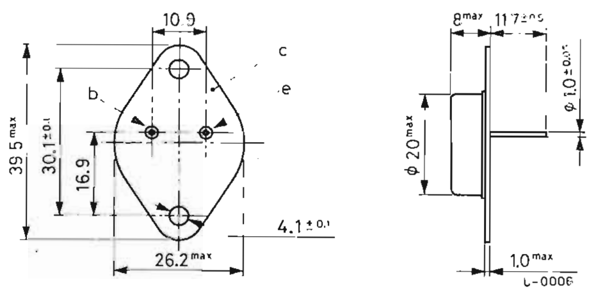
V_{CBO}	Collector-base voltage ($I_E = 0$)	80	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	60	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	80	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C*	Collector current	20	A
I_B	Base current	7	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	150	W
T_s	Storage temperature	-65 ÷ 200	°C
T_j	Junction temperature	200	°C

* The emitter current may reach 30 A peak with collector-base junction short-circuited

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

BDX 61
2N3055V

THERMAL DATA

$R_{th\ j\text{-}c}$	Thermal resistance junction-case	max	1.17	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 60 V				1.5	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V				1	mA
→ $V_{CEV(sus)}$*	Collector-emitter voltage (V_{BE} = -1.5 V)	I_C = 100 mA		80			V
→ $V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 200 mA		60			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 4 A	I_B = 0.4 A			0.5	V
		I_C = 10 A	I_B = 2 A			1.5	V
		I_C = 15 A	I_B = 3 A			2	V
		I_C = 20 A	I_B = 4 A			4	V
$V_{BE(sat)}$*	Base-emitter saturation voltage	I_C = 4 A	I_B = 0.4 A			1.6	V
		I_C = 10 A	I_B = 2 A			3	V
		I_C = 15 A	I_B = 3 A			3.5	V
		I_C = 20 A	I_B = 4 A			5.5	V
V_{BE}*	Base-emitter voltage	I_C = 4 A	V_{CE} = 4 V			1.2	V
h_{FE}*	DC current gain	I_C = 0.5 A	V_{CE} = 4 V	20		250	—
		I_C = 4 A	V_{CE} = 4 V	20		70	—
		I_C = 10 A	V_{CE} = 4 V	16			—
		I_C = 20 A	V_{CE} = 4 V	5			—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 0.5 A	V_{CE} = 4 V			1.6	—
f_T	Transition frequency	I_C = 1 A	V_{CE} = 4 V	0.8			MHz

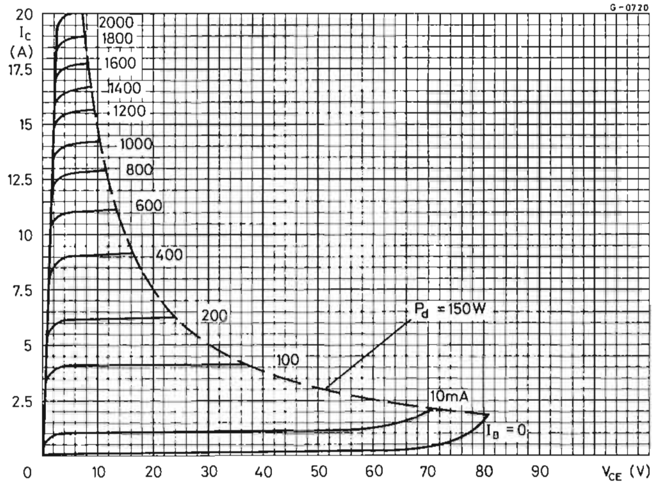
* Pulsed: pulse duration = 300 μs, duty factor = 1.5%.

ELECTRICAL CHARACTERISTICS (continued)

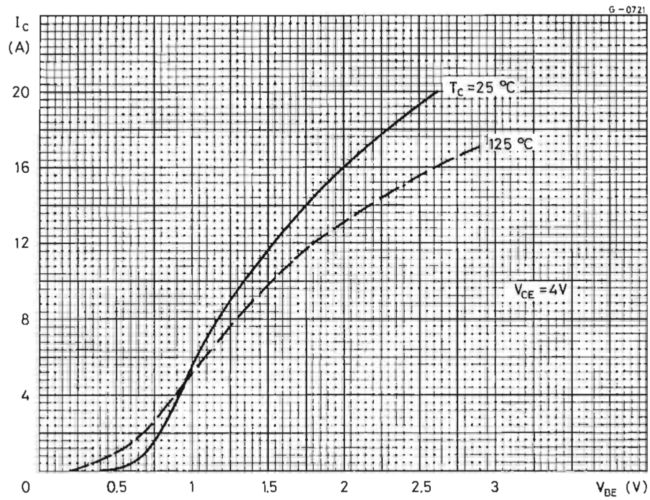
Parameter		Test conditions	Min. Typ. Max.	Unit
$I_{s/b}$**	Second breakdown collector current	$V_{CE} = 60$ V	2.5	A

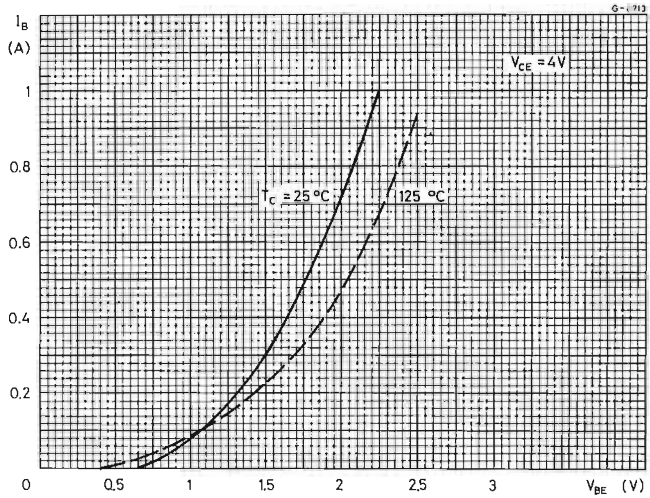
** Pulsed: 1 s, non repetitive pulse.

Typical output characteristics



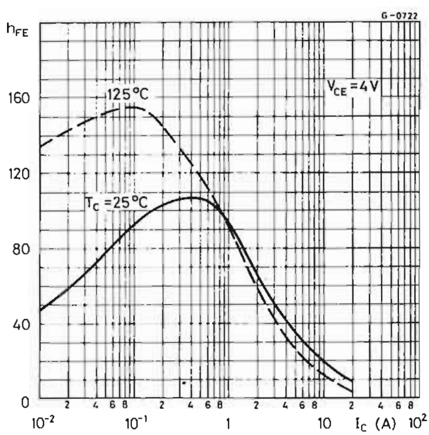
Typical DC transconductance



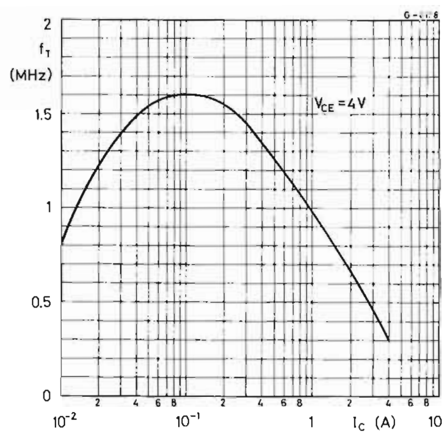


Typical input characteristics

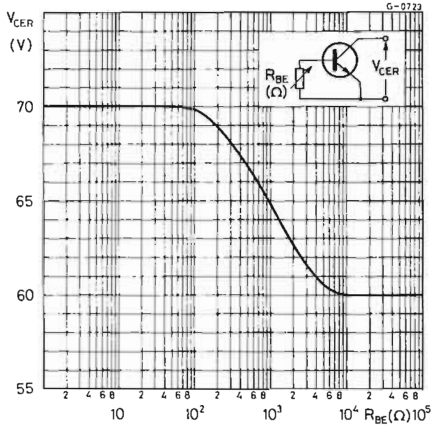
Typical DC current gain



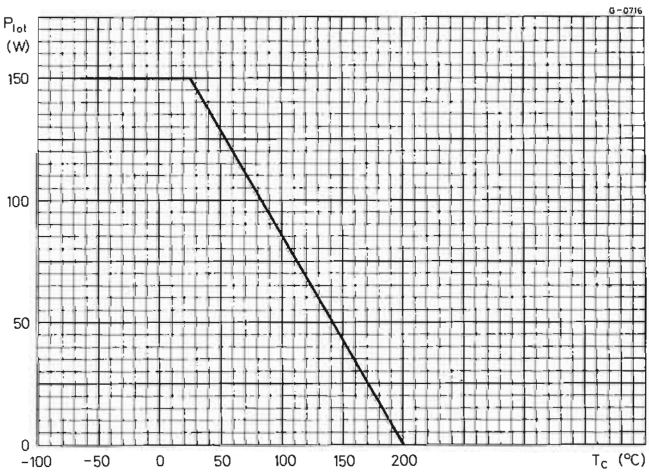
Typical transition frequency



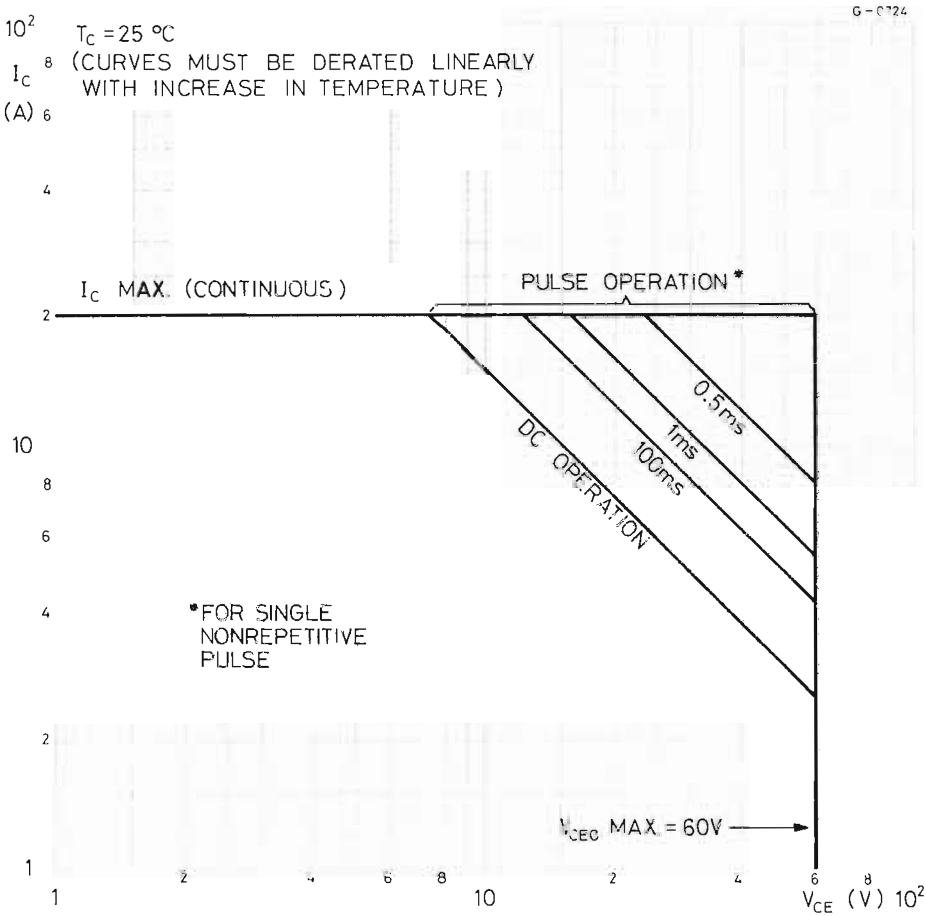
Collector-emitter breakdown voltage



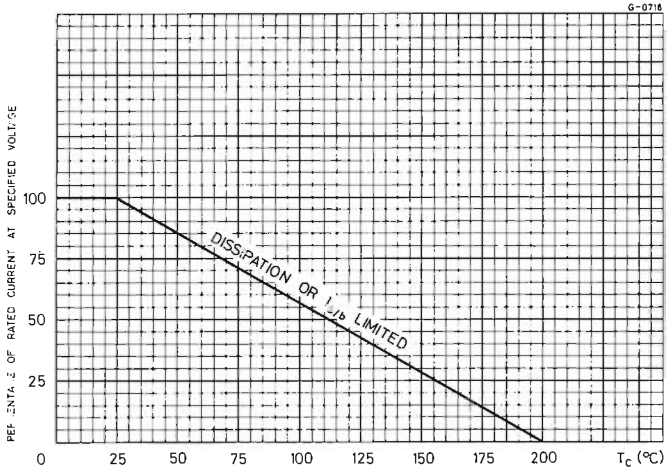
Power rating chart



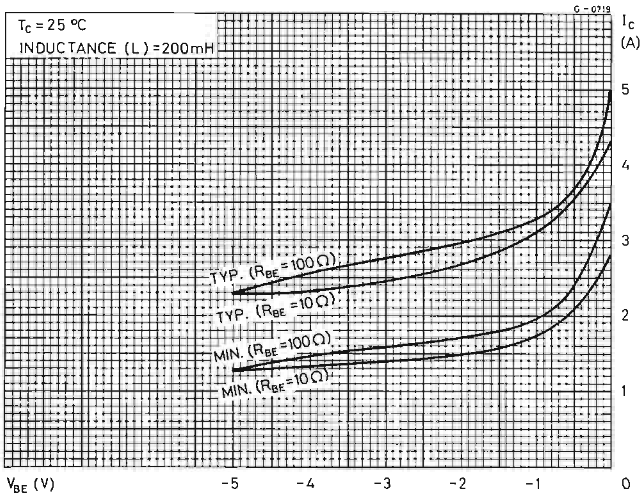
Maximum operating areas



Current rating chart



Reverse-bias, second breakdown characteristics



SILICON HOMETAXIAL* NPN

BDX 70 to 75
2N6098 to 6103

MEDIUM POWER LINEAR AND SWITCHING APPLICATIONS

The BDX 70/2N 6098, BDX 71/2N 6099, BDX 72/2N 6100, BDX 73/2N 6101, BDX 74/2N 6102 and BDX 75/2N 6103 are single diffused "hometaxial" silicon NPN transistors. Even type numbers are in Jedec TO-220 AA plastic case; odd type numbers are in Jedec TO-220 AB plastic case. All types are intended for a wide variety of medium-power switching and linear applications, such as series and shunt regulators, solenoid drivers, motor-speed controllers and driver and output stages of high-fidelity amplifiers.

The design ensures freedom from second breakdown at maximum ratings.

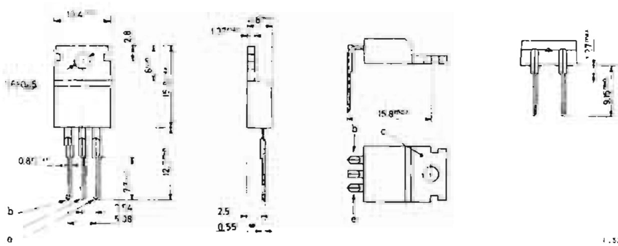
* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

ABSOLUTE MAXIMUM RATINGS

		BDX 70 BDX 71	BDX 72 BDX 73	BDX 74 BDX 75
V_{CBO}	Collector-base voltage ($I_E = 0$)	70 V	80 V	45 V
$V_{CEO\,(sus)}$	Collector-emitter voltage ($I_B = 0$)	60 V	70 V	40 V
$V_{CER\,(sus)}$	Collector-emitter voltage ($R_{BE} \leqq 100\ \Omega$)	65 V	75 V	45 V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	8 V	8 V	5 V
I_C	Collector current	10 A	10 A	16 A
I_B	Base current	4 A		
P_{tot}	Total power dissipation at $T_{amb} \leqq 25\ °C$	1.8 W		
	at $T_{case} \leqq 25\ °C$	75 W		
T_{stg}	Storage temperature	-65 to +150 °C		
T_j	Junction temperature	150 °C		

MECHANICAL DATA

Dimensions in mm



Collector connected to tab

TO-220 AB **TO-220 AA**

THERMAL DATA

$R_{th\ j-case}$	Thermal resistance junction-case	max	1.67	°C/W
$R_{th\ j-amb}$	Thermal resistance junction-ambient	max	70	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	for **BDX 70-71**				
		V_{CE} = 65 V			2	mA
		V_{CE} = 65 V T_{case} = 150 °C			10	mA
		for **BDX 72-73**				
		V_{CE} = 75 V			2	mA
		V_{CE} = 75 V T_{case} = 150 °C			10	mA
		for **BDX 74-75**				
		V_{CE} = 40 V			2	mA
		V_{CE} = 40 V T_{case} = 150 °C			10	mA
I_{CEO}	Collector cutoff current (I_B = 0)	for **BDX 70-71**				
		V_{CE} = 50 V			2	mA
		for **BDX 72-73**				
		V_{CE} = 60 V			2	mA
		for **BDX 74-75**				
		V_{CE} = 30 V			2	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	for **BDX 70-71**				
		V_{EB} = 8 V			1	mA
		for **BDX 72-73**				
		V_{EB} = 8 V			1	mA
		for **BDX 74-75**				
		V_{EB} = 5 V			1	mA
$V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 200 mA				
		for **BDX 70-71**	60			V
		for **BDX 72-73**	70			V
		for **BDX 74-75**	40			V

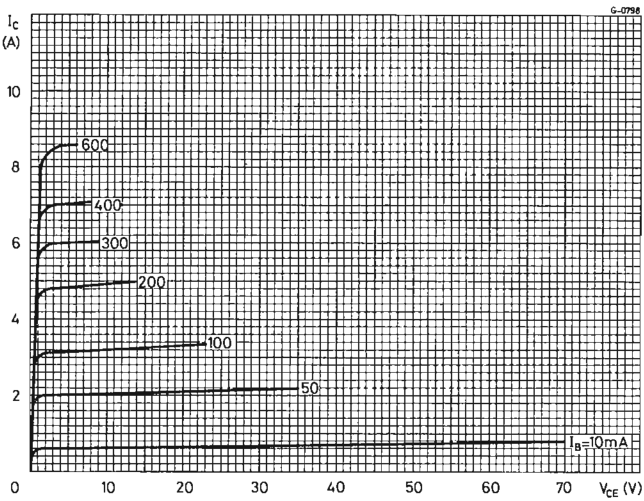
* Pulsed: pulse duration = 300 μs, duty factor = 0.018

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
$V_{CER(sus)}$*	Collector-emitter voltage (R_{BE} = 100 Ω)	I_C = 200 mA				
		for **BDX 70-71**	65			V
		for **BDX 72-73**	75			V
		for **BDX 74-75**	45			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	for **BDX 70-71**				
		I_C = 10 A I_B = 2 A			2.5	V
		for **BDX 72-73**				
		I_C = 10 A I_B = 2 A			2.5	V
		for **BDX 74-75**				
		I_C = 16 A I_B = 3.2 A			2.5	V
V_{BE}*	Base-emitter voltage	for **BDX 70-71**				
		I_C = 4 A V_{CE} = 4 V			1.7	V
		for **BDX 72-73**				
		I_C = 5 A V_{CE} = 4 V			1.7	V
		for **BDX 74-75**				
		I_C = 8 A V_{CE} = 4 V			1.7	V
h_{FE}*	DC current gain	for **BDX 70-71**				
		I_C = 4 A V_{CE} = 4 V	20		80	—
		I_C = 10 A V_{CE} = 4 V	5			—
		for **BDX 72-73**				
		I_C = 5 A V_{CE} = 4 V	20		80	—
		I_C = 10 A V_{CE} = 4 V	5			—
		for **BDX 74-75**				
		I_C = 8 A V_{CE} = 4 V	15		60	—
		I_C = 16 A V_{CE} = 4 V	5			—
h_{fe}	Small signal current gain	I_C = 500 mA V_{CE} = 4 V f = 1 kHz	15			—
$\|h_{fe}\|$	Magnitude of small signal current gain	I_C = 500 mA V_{CE} = 4 V f = 100 kHz	8		28	—

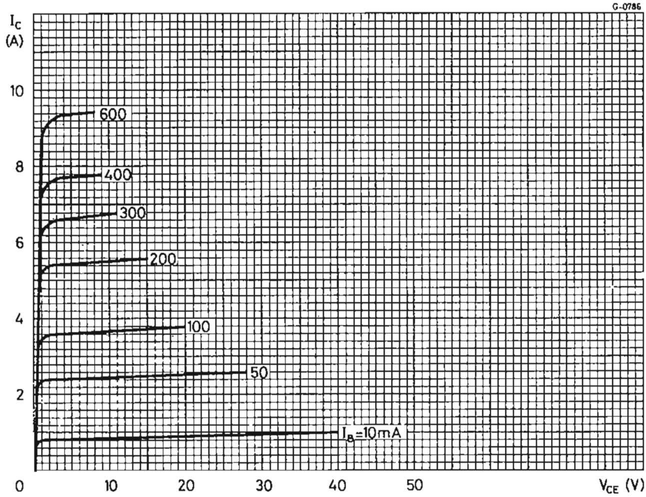
* Pulsed: pulse duration = 300 μs, duty factor = 0.018

Typical output characteristics (for **BDX 70-71** only)

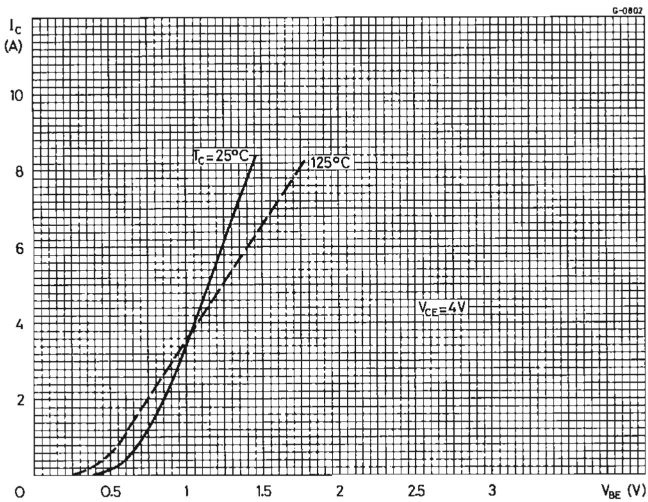


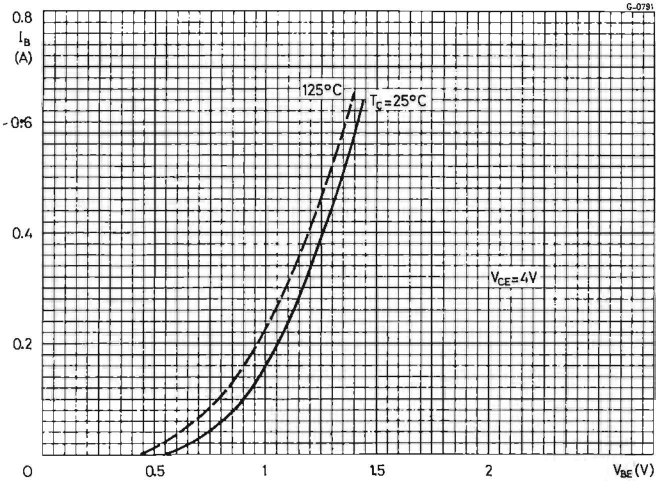
Typical output characteristics (for **BDX 72-73** only)

Typical output characteristics (for **BDX 74-75** only)

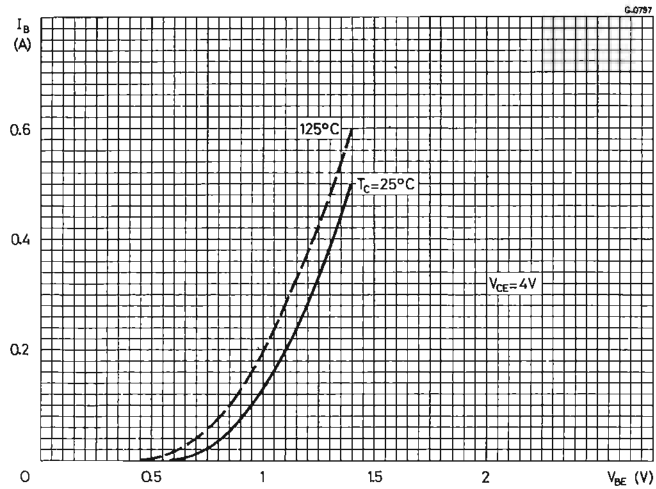


Typical DC transconductance



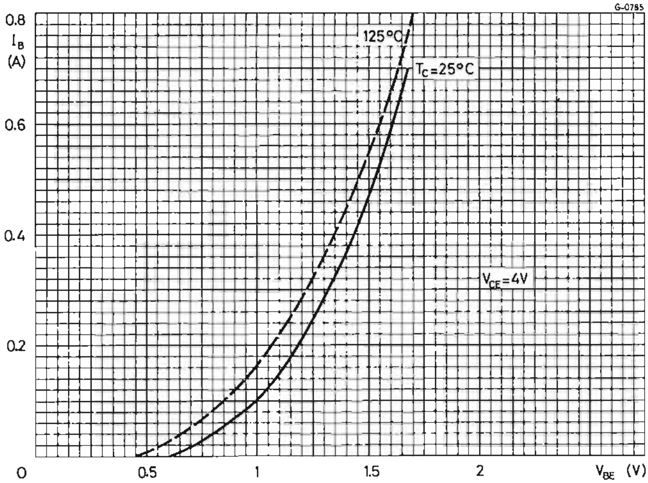


Typical input characteristics (for **BDX 70-71** only)

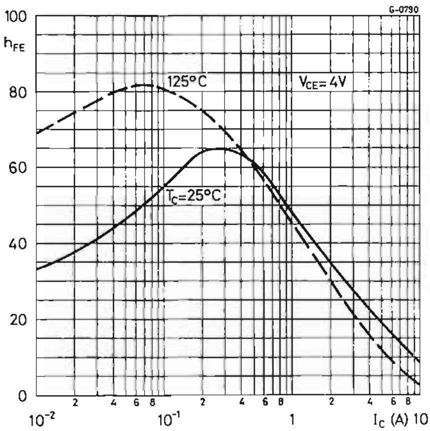


Typical input characteristics (for **BDX 72-73** only)

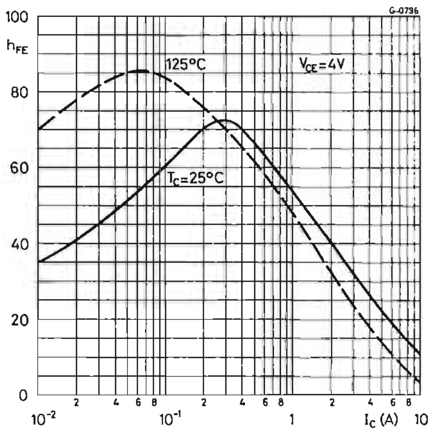
Typical input characteristics (for **BDX 74-75** only)



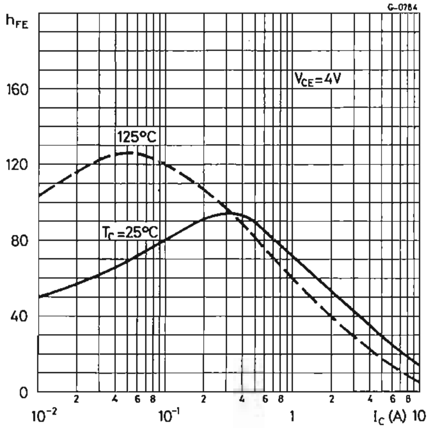
Typical DC current gain (for **BDX 70-71** only)



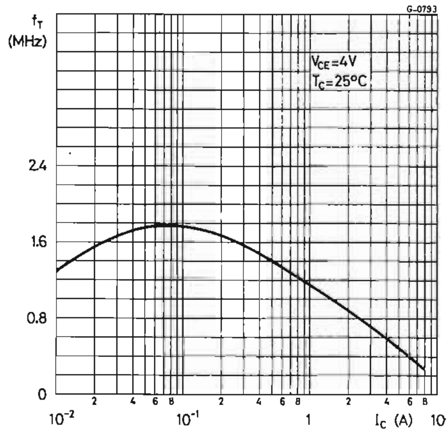
Typical DC current gain (for **BDX 72-73** only)



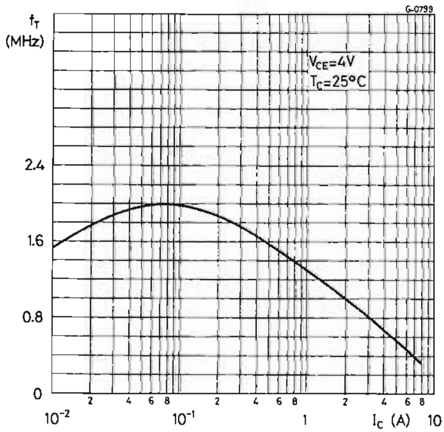
Typical DC current gain
(for **BDX 74-75** only)



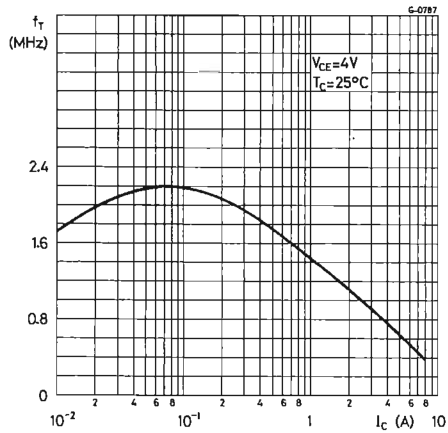
Typical transition frequency
(for **BDX 70-71** only)



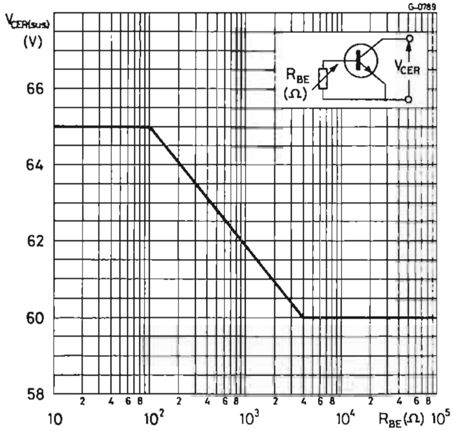
Typical transition frequency
(for **BDX 72-73** only)



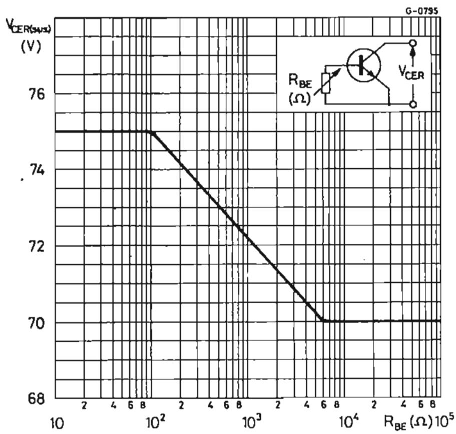
Typical transition frequency
(for **BDX 74-75** only)



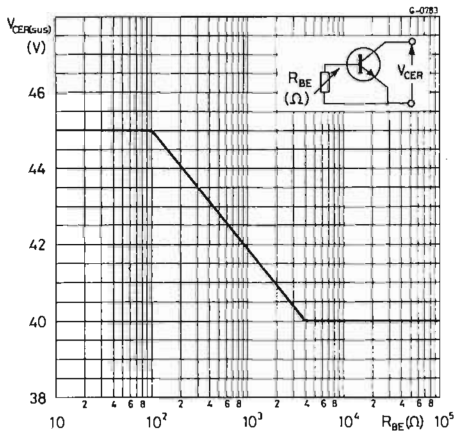
Collector-emitter breakdown voltage
(for **BDX 70-71** only)

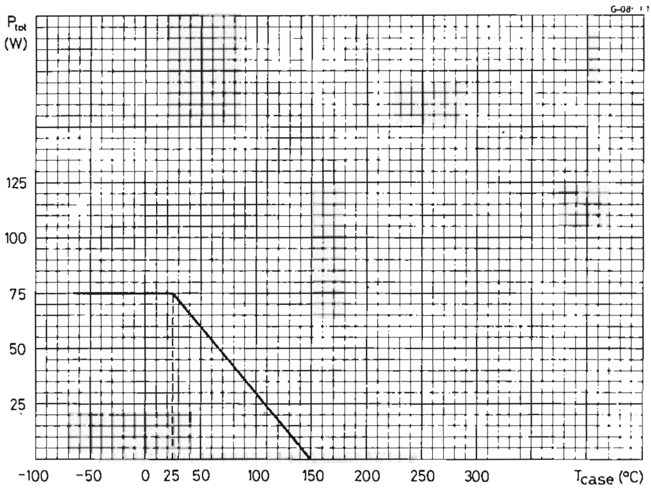


Collector-emitter breakdown voltage
(for **BDX 72-73** only)

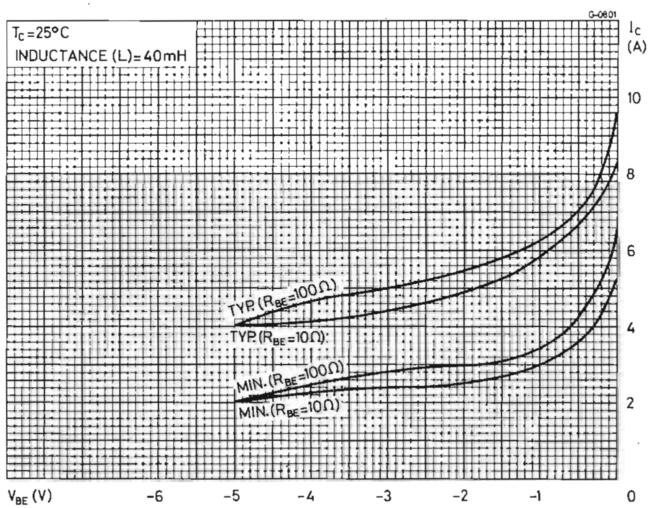


Collector-emitter breakdown voltage
(for **BDX 74-75** only)



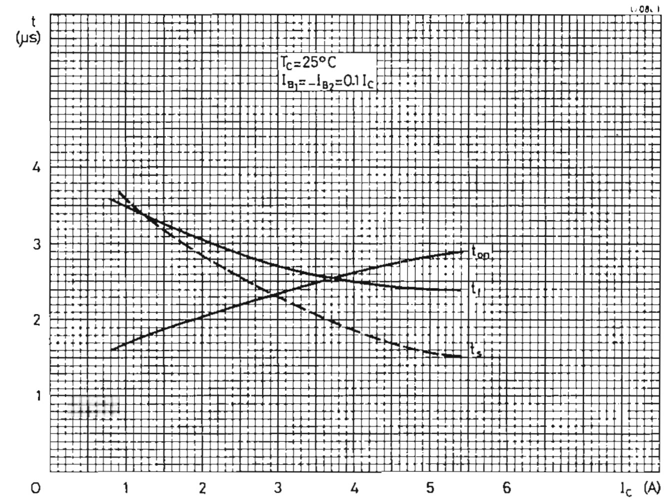


Power rating chart

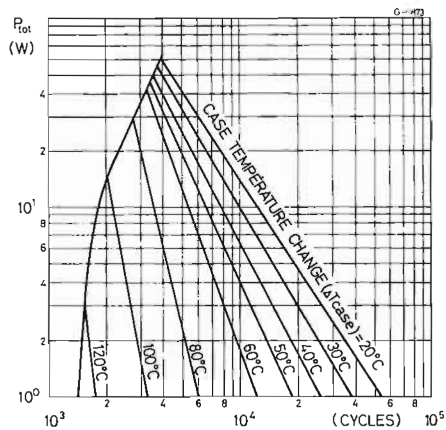


Reverse-bias second breakdown characteristics

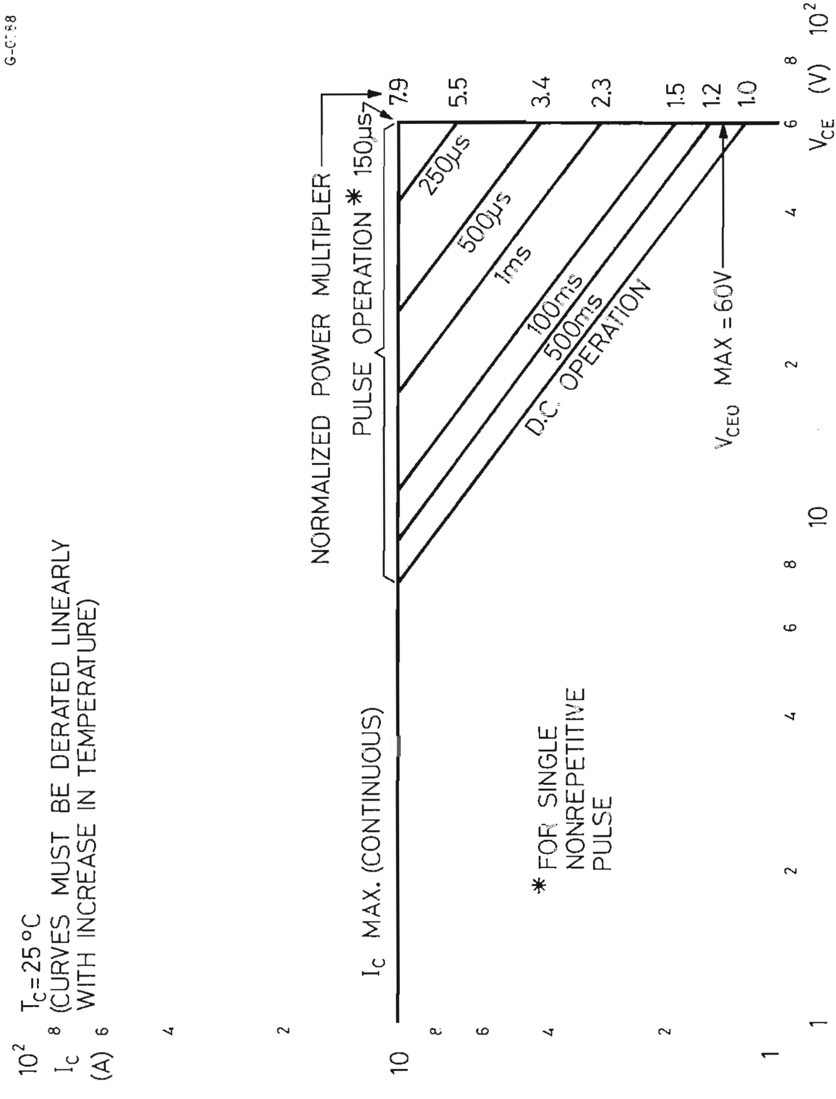
Typical saturated switching characteristics



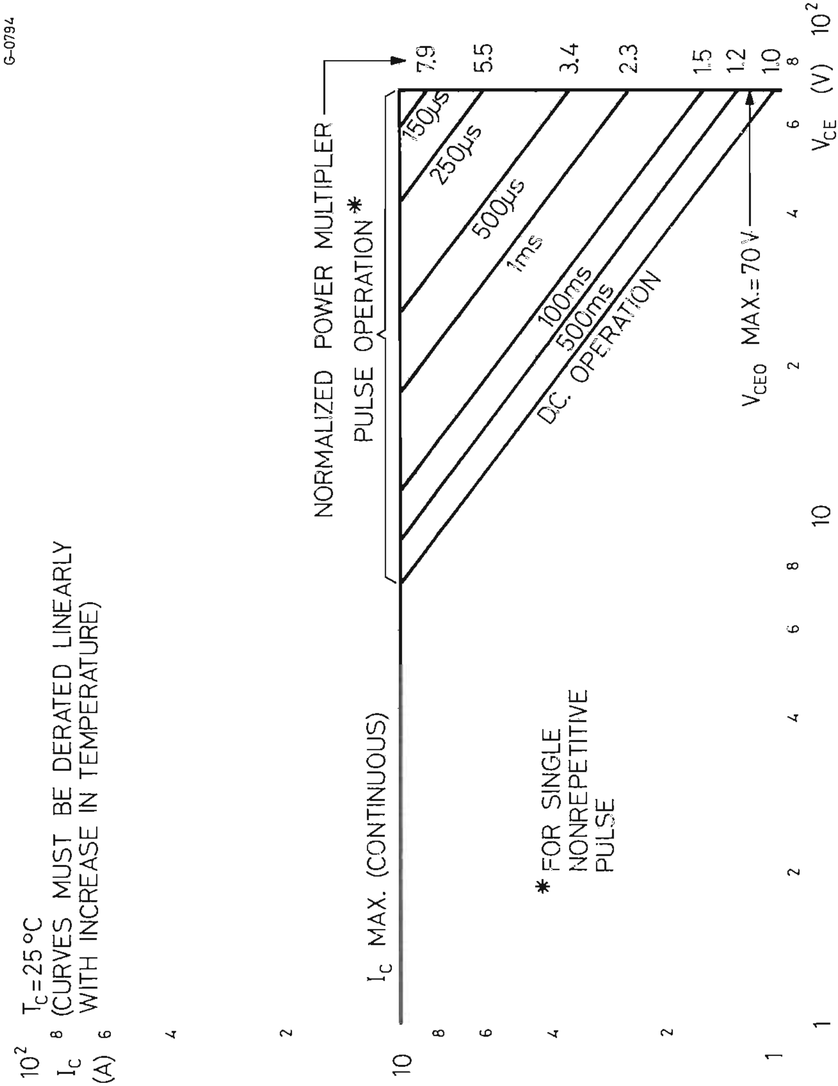
Thermal-cycle rating chart



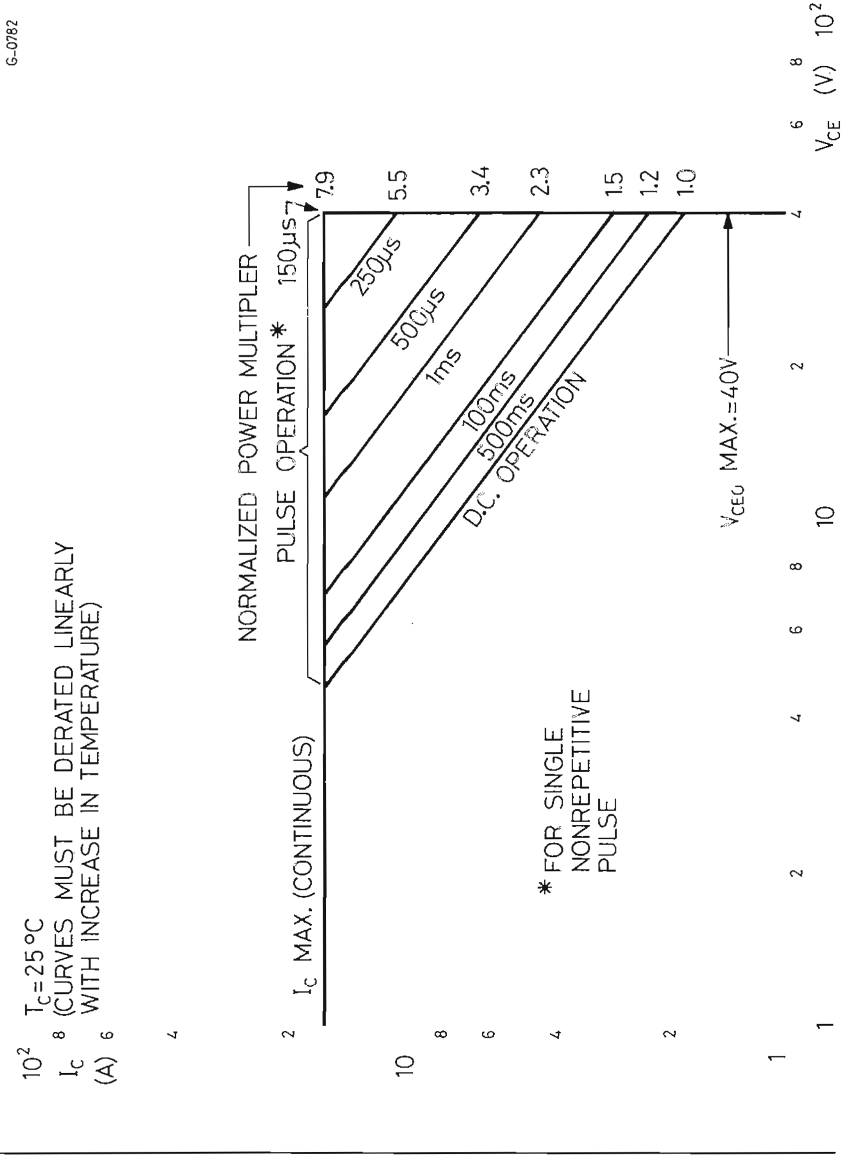
Maximum operating areas (for **BDX 70-71** only)



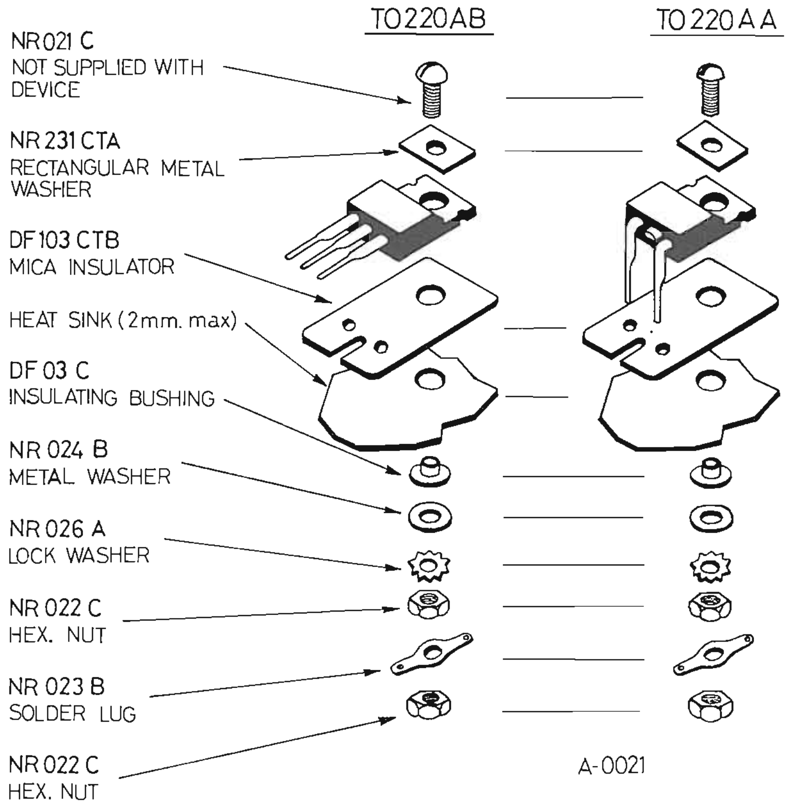
Maximum operating areas (for **BDX 72-73** only)



Maximum operating areas (for **BDX 74-75** only)



Mounting arrangement for VERSAWATT transistors



BU 100A

SILICON PLANAR NPN

TV HORIZONTAL DEFLECTION OUTPUT TRANSISTOR

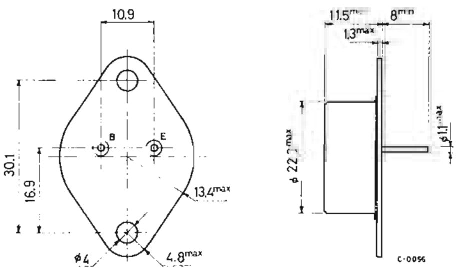
The BU 100A is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is designed for use in horizontal deflection circuits.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	150	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	100	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 25\,°C$	62	W
	at $T_{case} \leq 100\,°C$	25	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BU 100 A

THERMAL DATA

$R_{th\ j-case}$	Thermal resistance junction-case	max	2	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 100 V V_{CB} = 100 V T_{amb} = 100 °C			10 1	µA mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	I_C = 50 mA	100			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	I_c = 1 mA	150			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	I_E = 1 mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 1 A I_B = 0.1 A I_C = 5 A I_B = 0.5 A		0.1 0.3	 1	V V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 1 A I_B = 0.1 A I_C = 5 A I_B = 0.5 A		0.85 1.1	 1.5	V V
h_{FE}*	DC current gain	I_C = 0.5 A V_{CE} = 5 V I_C = 2 A V_{CE} = 5 V I_C = 5 A V_{CE} = 5 V	45 40 	100 90 40		— — —
f_T	Transition frequency	I_C = 0.5 A V_{CE} = 5 V		100		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 10 V		80		pF
t_{on}	Turn-on time	I_C = 5 A I_{B1} = 0.5 A		0.5	1	µs
t_f	Fall time	I_C = 5 A I_{B1} = I_{B2} = 0.5 A		0.4	1	µs

* Pulsed: pulse duration = 300 µs, duty factor = 1%.

BU 102

SILICON PLANAR **NPN**

TV HORIZONTAL DEFLECTOR

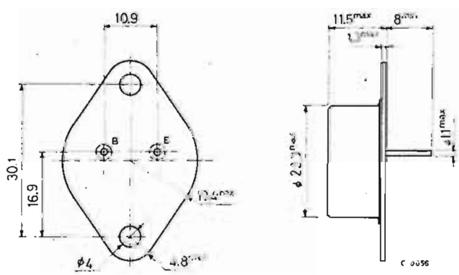
The BU 102 is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is intended for use in horizontal deflection circuits.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	400	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	150	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	7	A
I_{CM}	Collector peak current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 50\,°C$	50	W
	at $T_{case} \leq 100\,°C$	25	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BU 102

THERMAL DATA

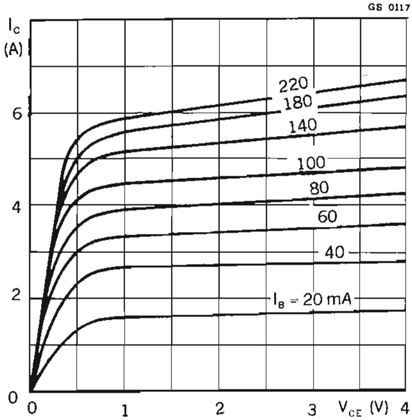
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	2	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

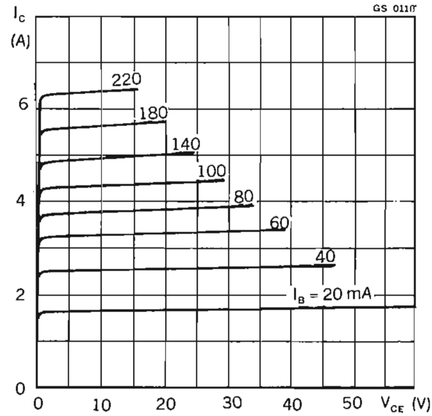
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 200 V V_{CB} = 200 V T_{amb} = 125 °C			10 1	μA mA
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	I_C = 1 mA	400			V
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	I_C = 20 mA	150			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	I_E = 1 mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 7 A I_B = 0.7 A		0.7	1.3	V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 7 A I_B = 0.7 A		1.3	1.8	V
h_{FE}*	DC current gain	I_C = 1 A V_{CE} = 5 V I_C = 7 A V_{CE} = 2 V	30 10	110 25		— —
f_T	Transition frequency	I_C = 0.1 A V_{CE} = 5 V		80		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 50 V			80	pF
t_{on}	Turn-on time	I_C = 7 A I_{B1} = 0.7 A		0.66	1	μs
t_{off}	Turn-off time	I_C = 7 A I_{B1} = I_{B2} = 0.7 A		1.1	3	μs

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

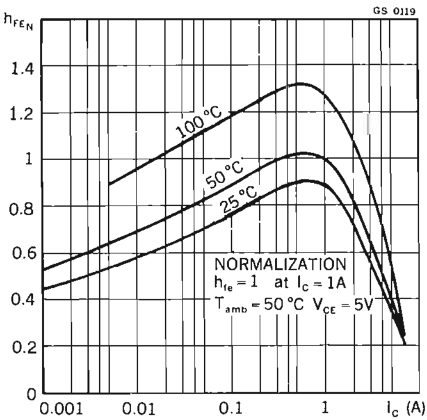
Typical output characteristics



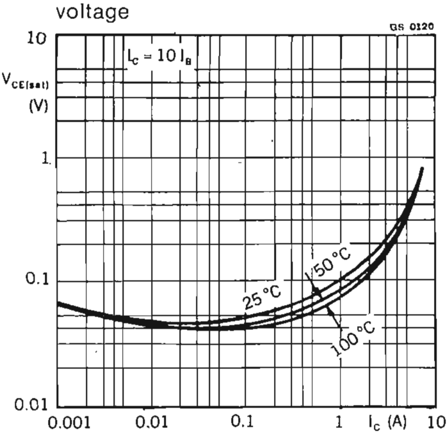
Typical output characteristics



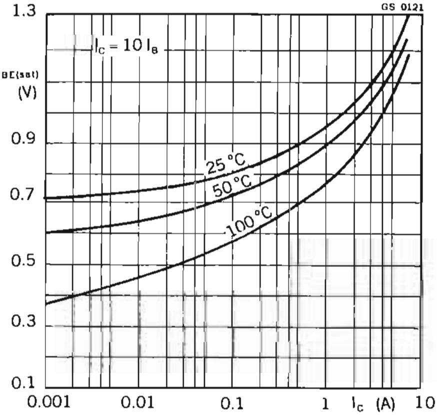
Normalized DC current gain



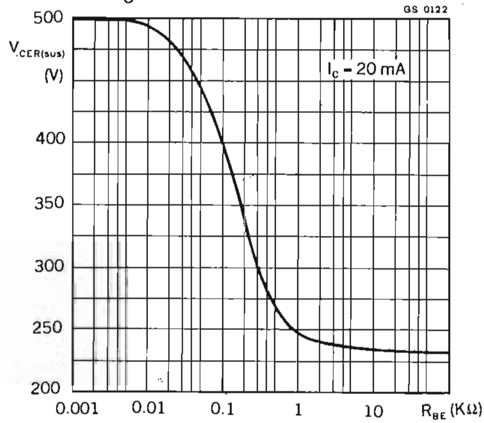
Typical collector-emitter saturation voltage



Typical base-emitter saturation voltage

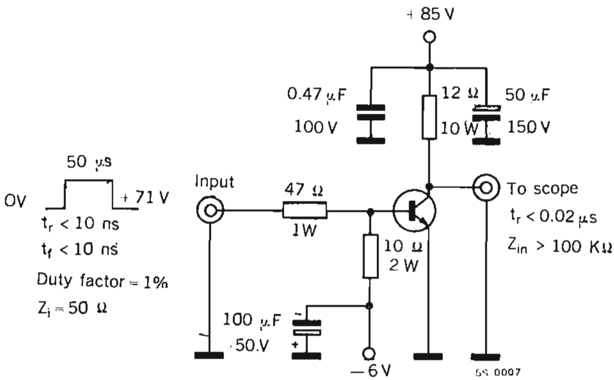


Typical collector-emitter breakdown voltage



SWITCHING TIMES

Test circuit



BU 120

SILICON MESA NPN

GENERAL INFORMATION

TYPICAL APPLICATION: HIGH VOLTAGE AND POWER SWITCHING APPLICATIONS

The BU 120 is a silicon triple diffused mesa NPN power transistor in a Jedec TO-3 metal case. It is intented for use as switching regulator for high voltage ond power-supply applications.

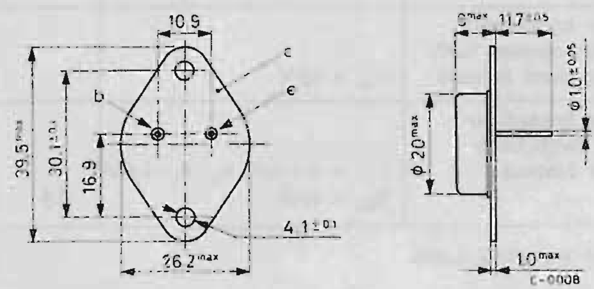
ABSOLUTE MAXIMUM RATINGS

→	V_{CBO}	Collector-base voltage ($I_E = 0$)	400	V
	V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	400	V
→	V_{CEO} (sus)	Collector-emitter voltage ($I_B = 0$)	200	V
	V_{EBO}	Emitter-base voltage ($I_C = 0$)	8	V
→	I_C	Collector current	10	A
→	I_{CM}	Collector peak current	15	A
	I_B	Base current	5	A
	P_{tot}	Total power dissipation at $T_c \leq 25$ °C	100	W
	T_s	Storage temperature	-65 to 175	°C
	T_j	Junction temperature	175	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

THERMAL DATA

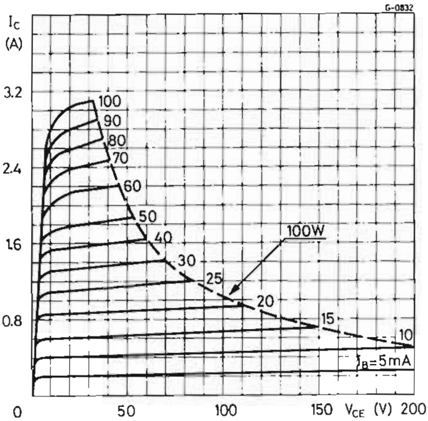
$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

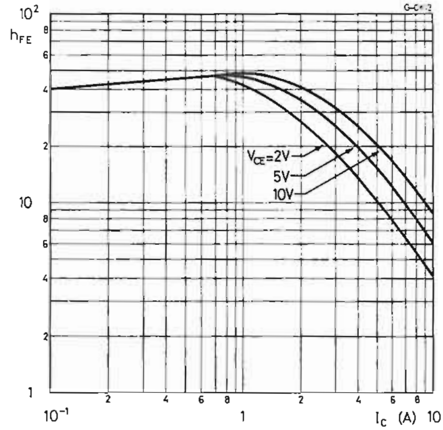
	Parameter		Test conditions	Min.	Typ.	Max.	Unit
	I_{CES}	Collector cutoff current (V_{BE} = 0)	V_{CE} = 400 V			2	mA
	I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 8 V			10	mA
→	$V_{CEO(sus)}$	Collector-emitter voltage (I_B = 0)	I_C = 200 mA	200			V
→	$V_{CE\ (sat)}$	Collector-emitter saturation voltage	I_C = 4 A I_B = 0.8 A			1	V
→	$V_{BE\ (sat)}$	Base-emitter saturation voltage	I_C = 4 A I_B = 0.8 A			2	V
→	h_{FE}	DC current gain	I_C = 1 A V_{CE} = 5 V	30		100	—
→	f_T	Transition frequency	I_C = 0.5 A V_{CE} = 5 V		6		MHz
→	$I_{s/b}$*	Second breakdown collector current (with base forward biased)	V_{CE} = 50 V	1			A
→	$E_{s/b}$	Second breakdown energy (with base reverse biased)	L = 0.4 mH V_{BE} = -1.5 V R_{BE} = 50 Ω	2.4			mJ

* Pulsed: 1s, non repetitive pulse

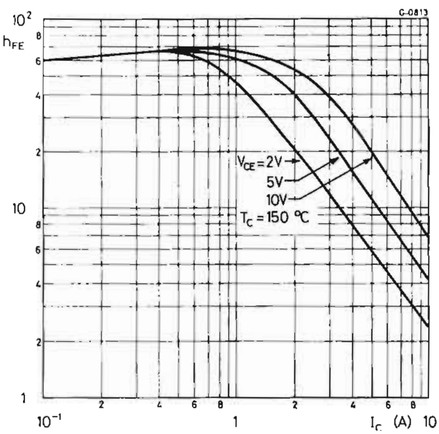
Typical output characteristics



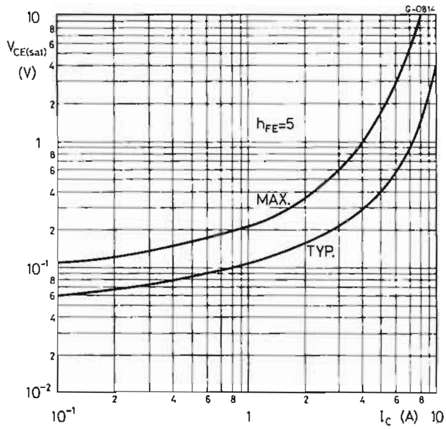
Typical DC current gain



Typical DC current gain (T_c=150°C)

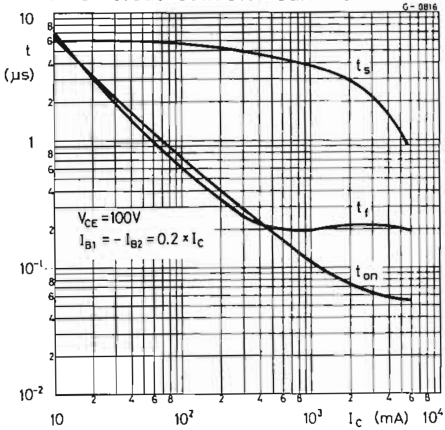


Collector-emitter saturation voltage

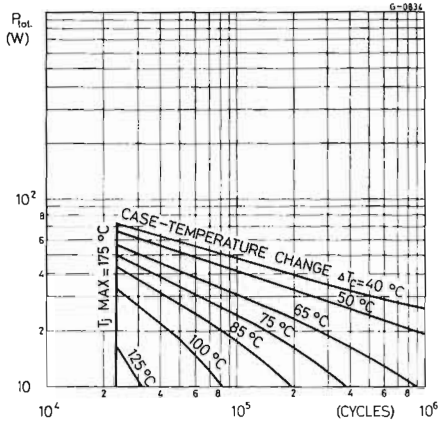


BU 120

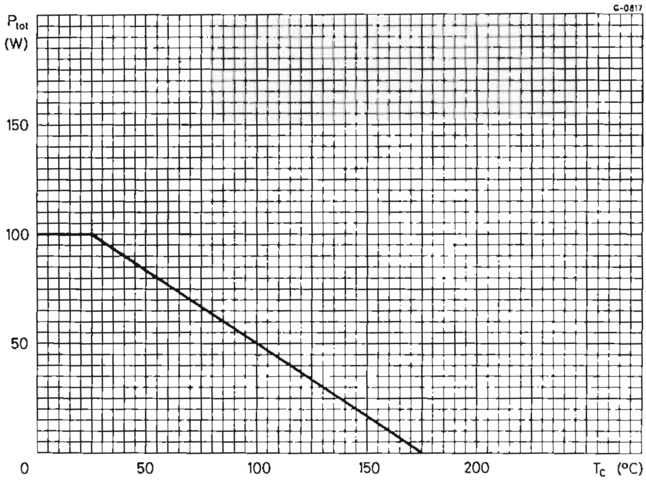
Typical storage, fall and turn-on time versus collector current



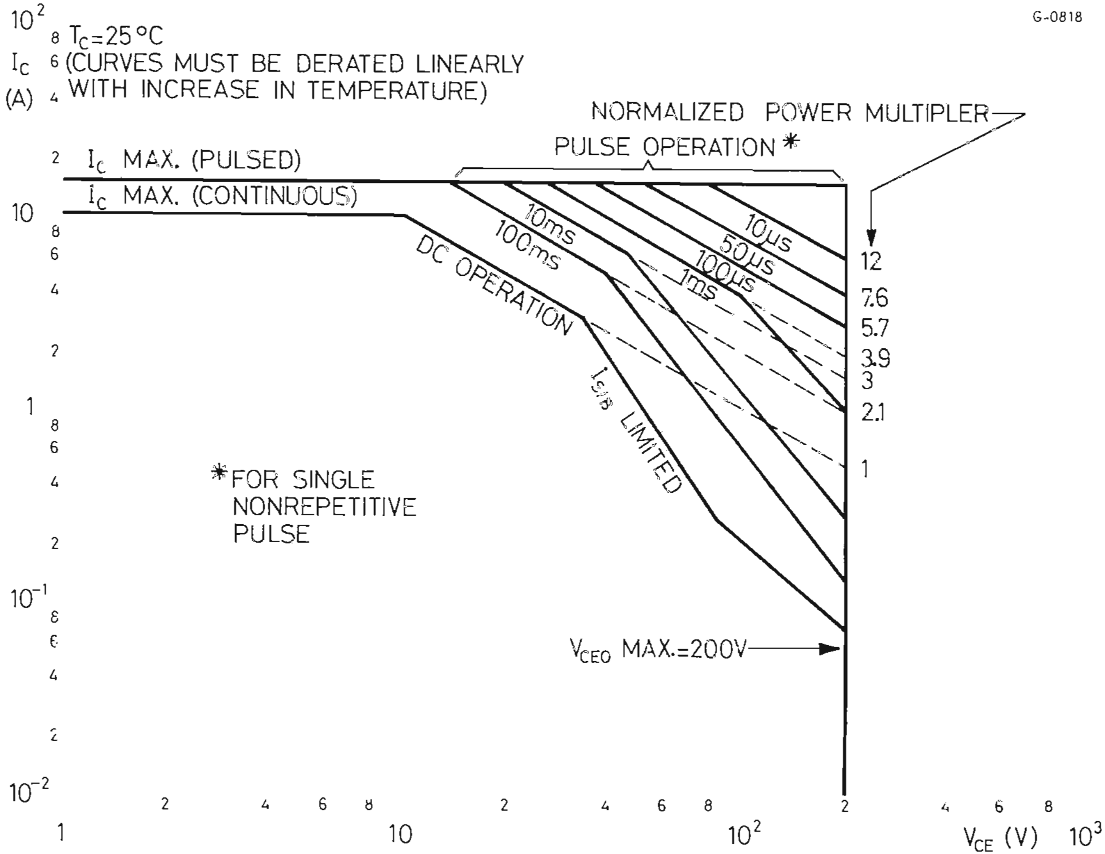
Thermal-cycle rating chart



Derating curves



Maximum operating areas



BU 121

SILICON MESA NPN

GENERAL INFORMATION

TYPICAL APPLICATION: TV HORIZONTAL DEFLECTOR

The BU 121 is a silicon triple diffused mesa NPN power transistor in a Jedec TO-3 metal case. It is designed specifically for use as horizontal deflection TV output switch.

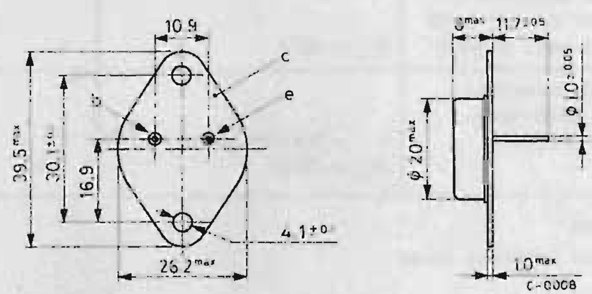
ABSOLUTE MAXIMUM RATINGS

→ V_{CBO}	Collector-base voltage ($I_E = 0$)	400	V
V_{CES}	Collector-emitter voltage ($V_{BE} = 0$)	400	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	8	V
I_C	Collector current	10	A
I_{CM}	Collector peak current	15	A
I_B	Base current	5	A
→ P_{tot}	Total power dissipation at $T_c \leq 25$ °C	100	W
T_s	Storage temperature	-65 to 175	°C
T_j	Junction temperature	175	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim to **TO-3**)

BU 121

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

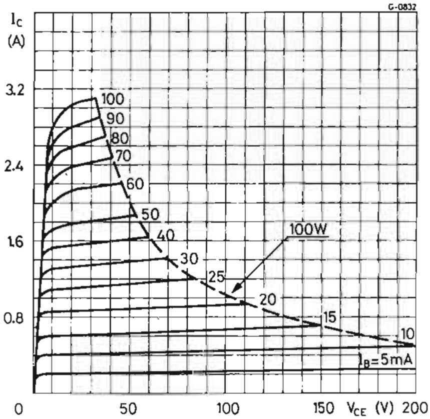
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cutoff current (V_{BE} = 0)	V_{CE} = 400 V			2	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 8 V			10	mA
$V_{CE\ (sat)}$	Collector-emitter saturation voltage	I_C = 6 A I_B = 1.2 A			1.2	V
$V_{BE\ (sat)}$	Base-emitter saturation voltage	I_C = 6 A I_B = 1.2 A			2	V
f_T	Transition frequency	I_C = 0.5 A V_{CE} = 5 V		6		MHz
t_{off}*	Turn off time	I_C = 6 A I_B = 1.2 A			1.2	μs
→ $I_{s/b}$**	Second breakdown collector current (with base forward biased)	V_{CE} = 50 V	1			A
→ $E_{s/b}$	Second breakdown energy (with base reverse biased)	L = 0.4 mH V_{BE} = -1.5 V R_{BE} = 50 Ω	2.4			mJ

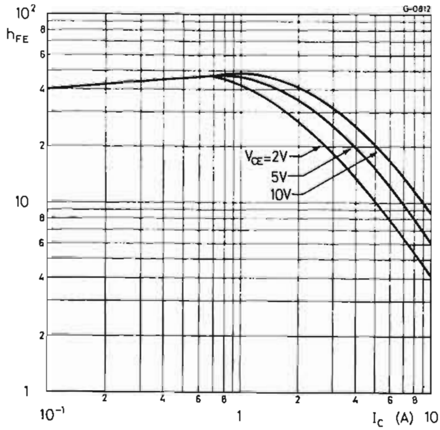
* See test circuit

** Pulsed: 1s, non repetitive pulse

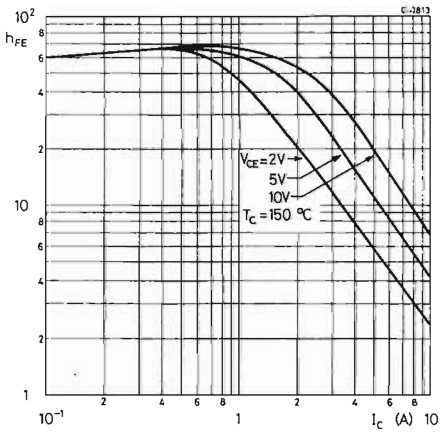
Typical output characteristics



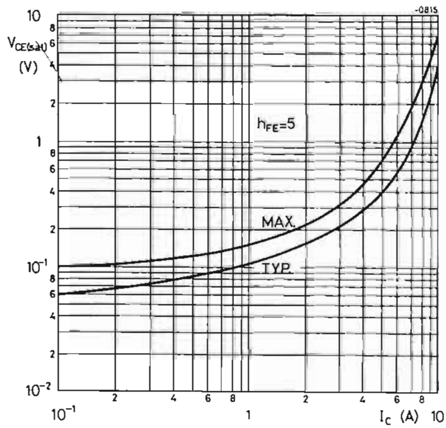
Typical DC current gain



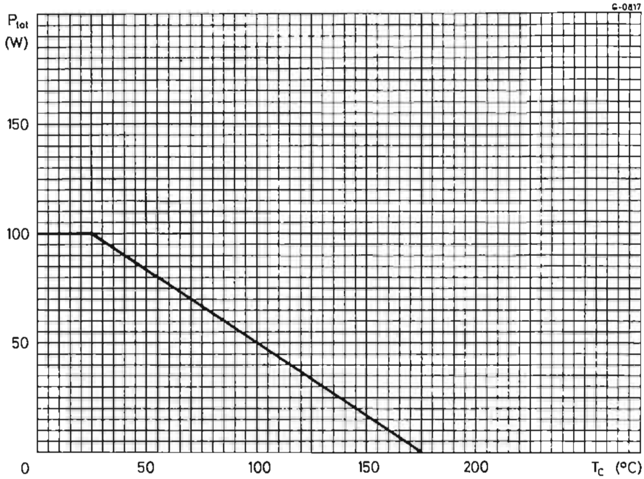
Typical DC current gain (T_c=150°C)



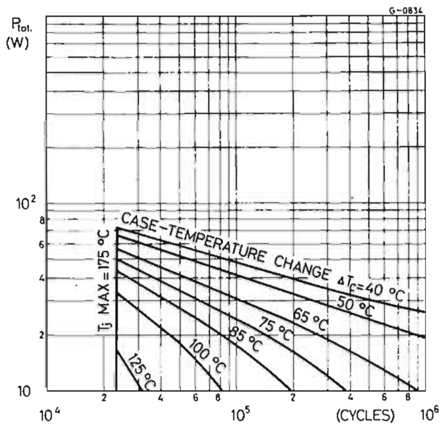
Collector-emitter saturation voltage



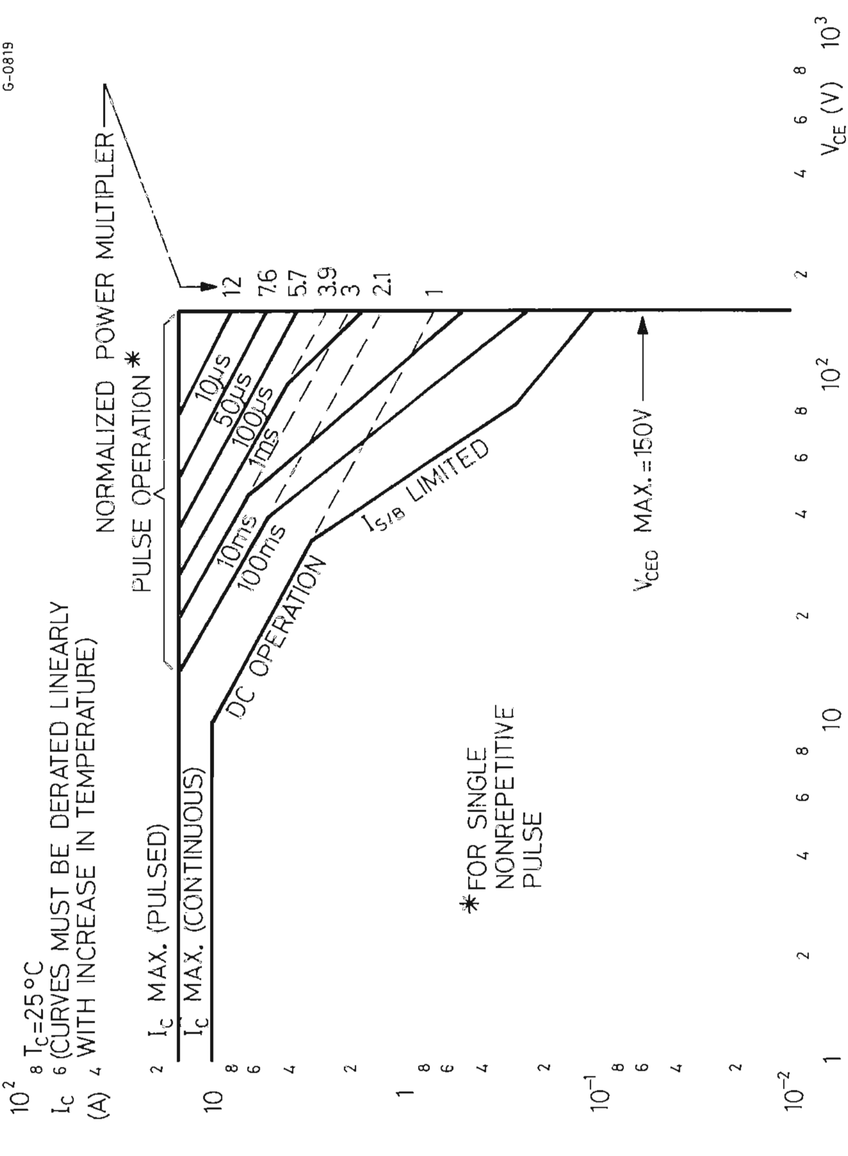
Derating curves



Thermal-cycle rating chart

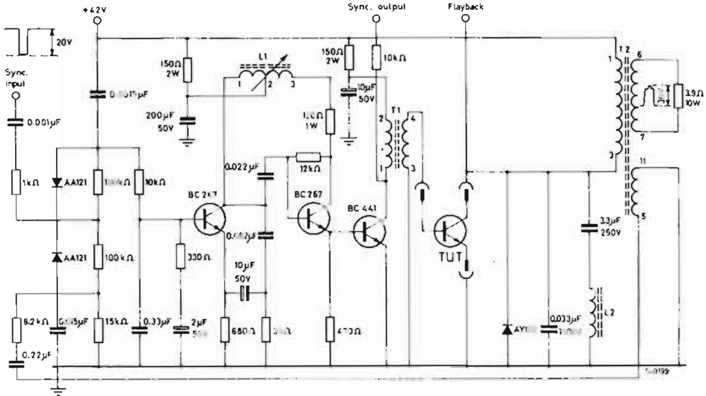


Maximum operating areas



TEST CIRCUIT

Turn off time*



L_1 horizontal hold coil: Pins 1-2 = 75 turns Ø 0.2 mm; R = 1.5 Ω; L min = 0.62 mH;
Pins 2-3 = 293 turns Ø 0,2 mm; R = 4.8 Ω; L max = 4.1 mH;
Core: siferrit B62120 25x4x2

L_2 horizontal yoke manufacturer SAREA type GD-TR 5 (300 μH)

T_1 driver transformer: Pins 1-2 = 180 turns Ø 0.2 mm; R = 3.47 Ω; L = 7.23 mH;
Pins 3-4 = 25 turns Ø 0,4 mm; R = 0.115 Ω; L = 147 μH;
Core: ferrox cube 3L5 double E 19x15x5

T_2 EHT transformer manufacturer ARCO type 249 · 065/035

* "Turn off time" is the time required for the collector current I_C to decrease to 100 mA after the collector to emitter voltage V_{CE} has risen 3 V into its flyback excursion.

SILICON MESA NPN

BU 122

PRELIMINARY DATA

GENERAL INFORMATION

TYPICAL APPLICATION: TV VERTICAL DEFLECTOR

The BU 122 is a silicon triple diffused mesa NPN power transistor in a Jedec TO-3 metal case. It is intended for general high voltage applications, particularly for use as vertical deflection TV output amplifier.

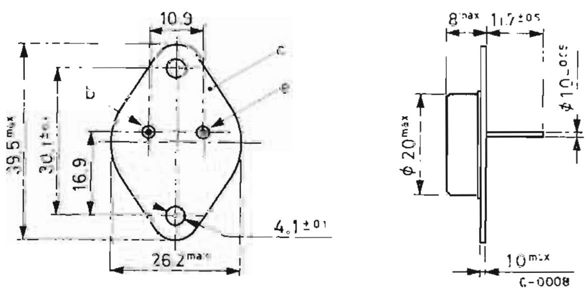
ABSOLUTE MAXIMUM RATINGS

V_{CES}	Collector-emitter voltage (V_{BE} = 0)	250	V
$V_{CEO\ (sus)}$	Collector-emitter voltage (I_B = 0)	150	V
V_{EBO}	Emitter-base voltage (I_C = 0)	8	V
I_C	Collector current	5	A
→ P_{tot}	Total power dissipation at $T_c \leq 75$ °C	67	W
→ T_s	Storage temperature	-65 ÷ 175	°C
→ T_j	Junction temperature	175	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



(sim. to **TO-3**)

10/71

BU 122

THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	1.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_c = 25$ °C unless otherwise specified)

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
	I_{CES} Collector cutoff current ($V_{BE} = 0$)	$V_{CE} = 250$ V			2	mA
	I_{EBO} Emitter cutoff current ($I_C = 0$)	$V_{EB} = 8$ V			10	mA
→	$V_{CEO\ (sus)}$ Collector-emitter voltage ($I_B = 0$)	$I_C = 200$ mA	150			V
→	$V_{CE\ (sat)}$ Collector-emitter saturation voltage	$I_C = 4$ A $I_B = 0.8$ A			1	V
→	$V_{BE\ (sat)}$ Base-emitter saturation voltage	$I_C = 4$ A $I_B = 0.8$ A			2	V
→	h_{FE} DC current gain	$I_C = 1$ A $V_{CE} = 5$ V $I_C = 50$ mA $V_{CE} = 5$ V	30 20		200	— —
	f_T Transition frequency	$I_C = 0.5$ A $V_{CE} = 5$ V		10		MHz

BU 125

SILICON PLANAR NPN

HIGH CURRENT, GENERAL PURPOSE TRANSISTOR

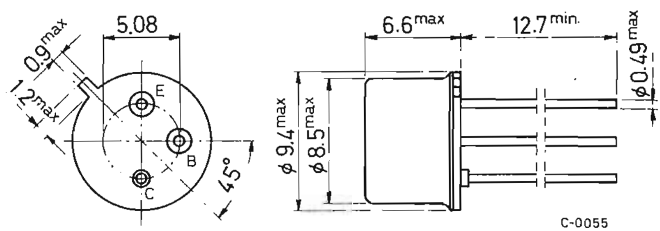
The BU 125 is a silicon planar epitaxial NPN transistor in a TO-39 metal case. It is used in TV horizontal output and general purpose applications.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	130	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	60	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	5	A
P_{tot}	Total power dissipation at $T_{amb} \leq 25$ °C	0.8	W
	at $T_{amb} \leq 45$ °C	0.7	W
	at $T_{case} \leq 25$ °C	7	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-39**)

BU 125

THERMAL DATA

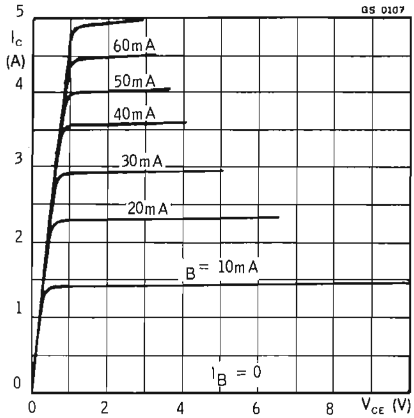
$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	25	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	220	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

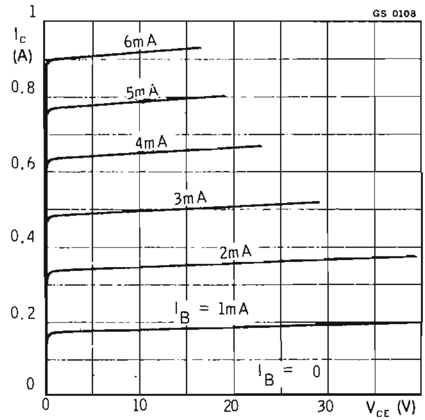
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 100 V		0.02	10	μA
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	I_C = 1 mA	130			V
$V_{(BR)CES}$*	Collector-emitter breakdown voltage ($V_{BE} = 0$)	I_C = 1 mA	130			V
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	I_C = 50 mA	60			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	I_E = 1 mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 1 A I_B = 0.1 A I_C = 5 A I_B = 0.5 A		0.1 0.4	0.2 1	V V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 1 A I_B = 0.1 A I_C = 5 A I_B = 0.5 A		0.8 1.3	1 1.6	V V
h_{FE}*	DC current gain	I_C = 0.1 A V_{CE} = 2 V I_C = 5 A V_{CE} = 2 V	40 15	170 70		— —
f_T	Transition frequency	I_C = 0.5 A V_{CE} = 5 V		100		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 10 V			80	pF
t_{off}	Turn-off time	I_C = 5 A I_{B1} = I_{B2} = 0.5 A			0.65	μs

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

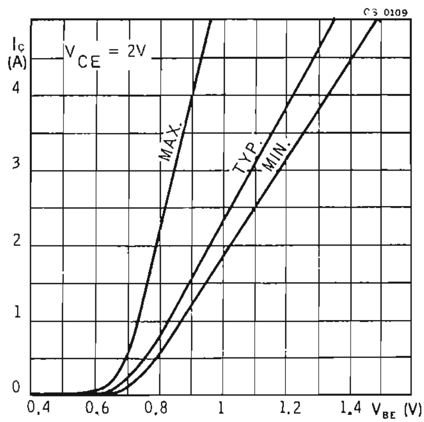
Typical output characteristics



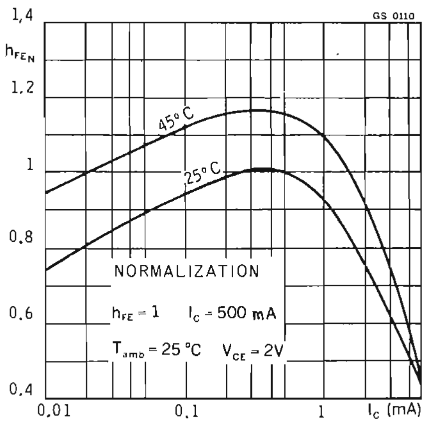
Typical output characteristics



DC transconductance

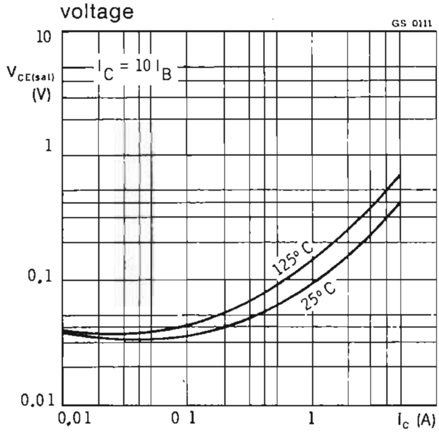


Normalized DC current gain

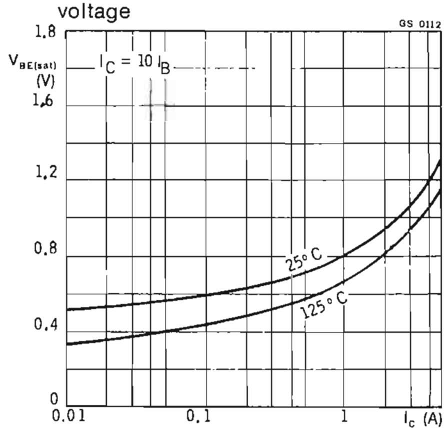


BU 125

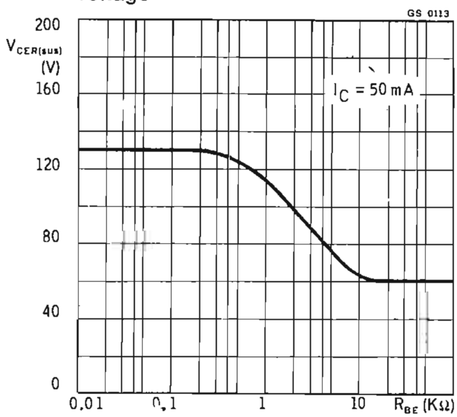
Typical collector-emitter saturation voltage



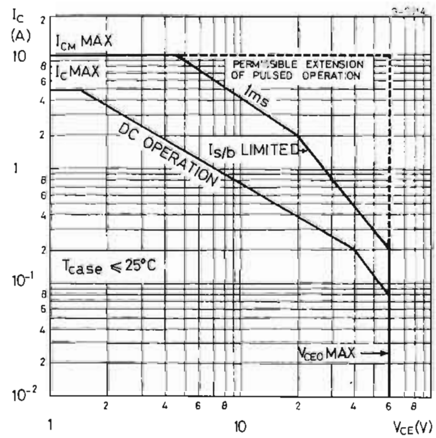
Typical base-emitter saturation voltage



Typical collector-emitter breakdown voltage

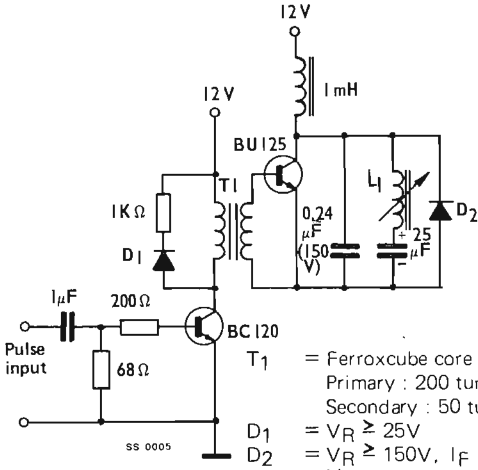


Safe operating areas



SWITCHING TIMES

Test circuit



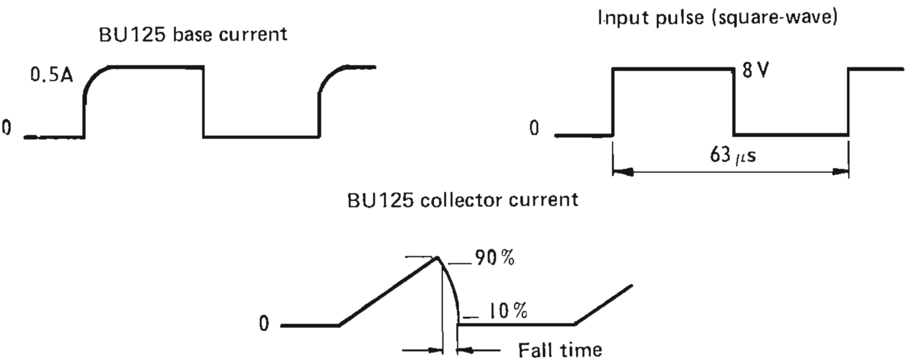
T_1 = Ferroxcube core type 2213-3139
Primary : 200 turns
Secondary : 50 turns

D_1 = $V_R \geq 25V$

D_2 = $V_R \geq 150V$, I_F (max) = 5A

L_1 = $\cong$ 40 μH (adjust for BU125 collector peak current of 5A)

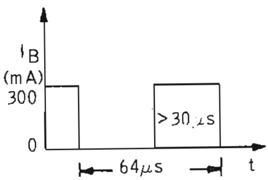
Waveforms

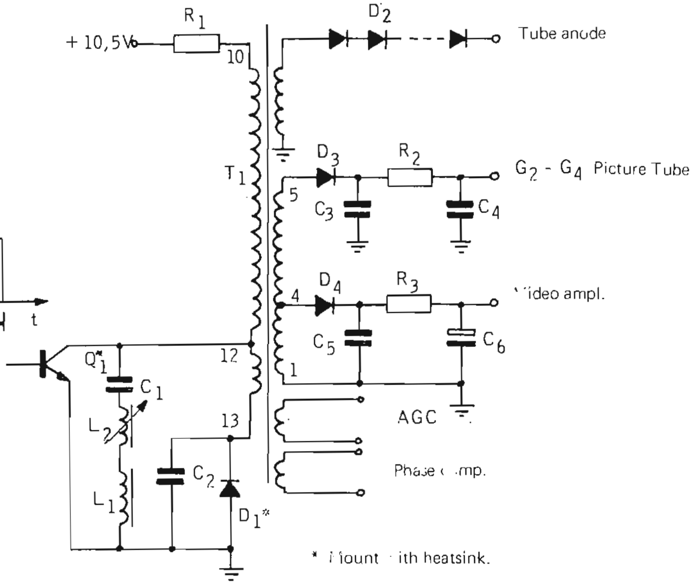


BU 125

TYPICAL APPLICATION

Horizontal deflection circuit





List of components

R_1 = 0.2 Ω
R_2 = 22 kΩ
R_3 = 1 kΩ
C_1 = 6.8 µF paper
C_2 = 68 nF
C_3 = 1 nF 630 V
C_4 = 0.1 µF 630 V
C_5 = 1 nF 250 V
C_6 = 50 µF 250 V
V_S = +10.5 V
$I_{defl.}$ = 5.5 A
I_S = 500 mA

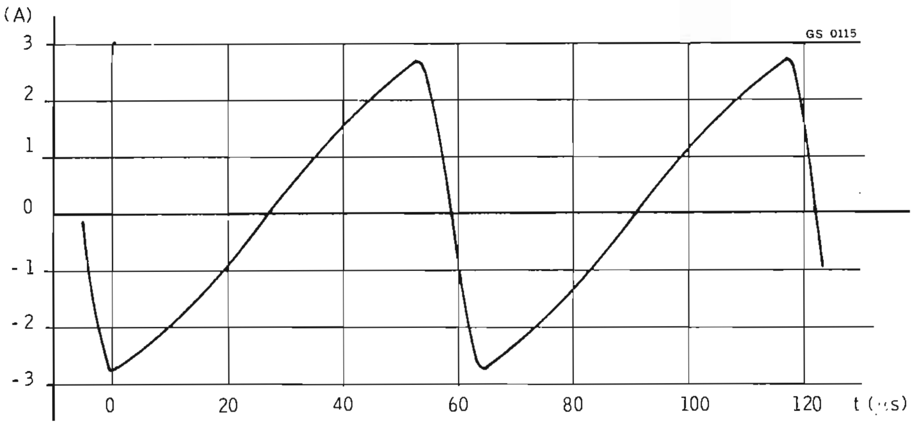
Q_1 = BU 125
D_1 = BY 186
D_2 = 10 kV EAT rectif.
D_3 = 400 V rectif.
D_4 = BA 129

T_1 = EAT transformer

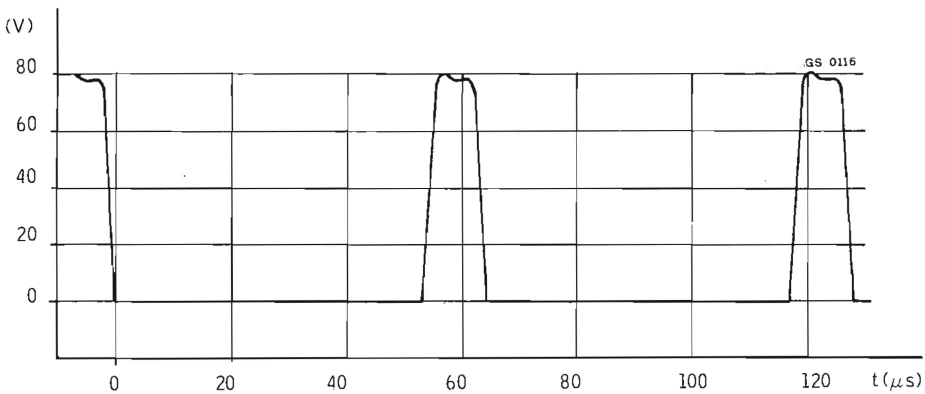
L_1 = Deflection coil
A - yoke 90 µH R = 0.2 Ω
B - yoke 105 µH R = 0.2 Ω

L_2 = Linearity and amplitude coil

Waveforms



CURRENT IN HORIZONTAL DEFLECTION COIL



COLLECTOR-EMITTER VOLTAGE OF HORIZONTAL DEFLECTION OUTPUT TRANSISTOR

BU 127

SILICON PLANAR NPN

HIGH VOLTAGE POWER TRANSISTOR

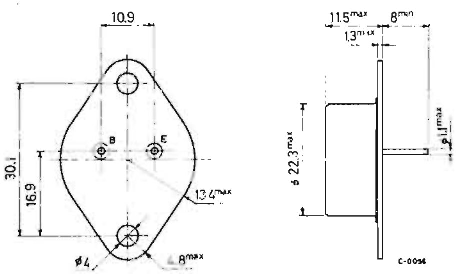
The BU 127 is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is used in high voltage power applications.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	200	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	120	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 25\,°C$	62	W
	at $T_{case} \leq 100\,°C$	25	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BU 127

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	2	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 150 V			10	μA
		V_{CB} = 150 V T_{amb} = 125 °C			1	mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage (I_B = 0)	I_C = 20 mA	120			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage (I_E = 0)	I_C = 1 mA	200			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage (I_C = 0)	I_E = 1 mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 1 A I_B = 0.1 A		0.1		V
		I_C = 5 A I_B = 0.5 A		0.3	0.7	V
		I_C = 7 A I_B = 0.7 A		0.6		V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 1 A I_B = 0.1 A		0.85		V
		I_C = 5 A I_B = 0.5 A		1.1	1.5	V
		I_C = 7 A I_B = 0.7 A		1.2		V
h_{FE}*	DC current gain	I_C = 0.1 A V_{CE} = 5 V		95		—
		I_C = 1 A V_{CE} = 5 V	40	120		—
		I_C = 5 A V_{CE} = 5 V	15	45		—
		I_C = 7 A V_{CE} = 5 V		25		—
f_T	Transition frequency	I_C = 0.1 A V_{CE} = 10 V		70		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 50 V		45	80	pF
t_{on}	Turn-on time	I_C = 7 A I_{B1} = 0.7 A		0.5	1	μs
t_f	Fall time	I_C = 7 A I_{B1} = I_{B2} = 0.7 A		0.4	1	μs

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

BU 128

SILICON PLANAR NPN

HIGH VOLTAGE POWER TRANSISTOR

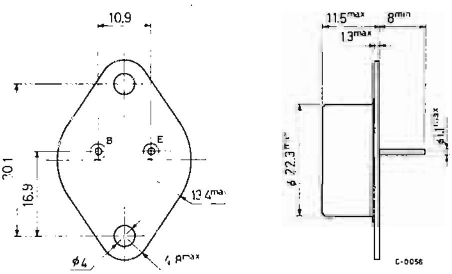
The BU 128 is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is intended for high voltage power applications.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	300	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	200	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 25\ °C$	62	W
	at $T_{case} \leq 100\ °C$	25	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

2/73

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	2	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 200 V			10	μA
		V_{CB} = 200 V T_{amb} = 125 °C			1	mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage (I_B = 0)	I_C = 20 mA	200			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage (I_E = 0)	I_C = 1 mA	300			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage (I_C = 0)	I_E = 1 mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 1 A I_B = 0.1 A		0.1		V
		I_C = 5 A I_B = 0.5 A		0.3	0.7	V
		I_C = 7 A I_B = 0.7 A		0.6		V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 1 A I_B = 0.1 A		0.85		V
		I_C = 5 A I_B = 0.5 A		1.1	1.5	V
		I_C = 7 A I_B = 0.7 A		1.2		V
h_{FE}*	DC current gain	I_C = 0.1 A V_{CE} = 5 V		95		—
		I_C = 1 A V_{CE} = 5 V	40	125		—
		I_C = 5 A V_{CE} = 5 V	15	45		—
		I_C = 7 A V_{CE} = 5 V		25		—
f_T	Transition frequency	I_C = 0.1 A V_{CE} = 10 V		80		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 50 V		45	80	pF
t_{on}	Turn-on time	I_C = 7 A I_{B1} = 0.7 A		0.5	1	μs
t_f	Fall time	I_C = 7 A, I_{B1} = I_{B2} = 0.7 A		0.4	1	μs

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

BUY 18

SILICON PLANAR NPN

HIGH VOLTAGE POWER TRANSISTOR

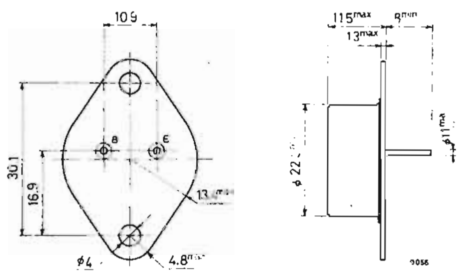
The BUY 18 is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is used for high-voltage power applications.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	300	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	150	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{case} \leq 25$ °C	62	W
	at $T_{case} \leq 100$ °C	25	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BUY 18

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	2	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 200 V V_{CB} = 200 V T_{amb} = 100 °C			10 2	µA mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage (I_B = 0)	I_C = 20 mA	150			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage (I_E = 0)	I_C = 1 mA	300			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage (I_C = 0)	I_E = 1 mA	5			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 5 A I_B = 0.5 A I_C = 7 A I_B = 0.7 A		 0.6	0.65 1.25	V V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 5 A I_B = 0.5 A I_C = 7 A I_B = 0.7 A		 1.2	1.4 1.6	V V
h_{FE}*	DC current gain	I_C = 1 A V_{CE} = 5 V	30			—
f_T	Transition frequency	I_C = 100 mA V_{CE} = 10 V		50		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 50 V		55		pF
t_{on}	Turn-on time	I_C = 7 A I_{B1} = 0.7 A		0.4	1	µs
t_{off}	Turn-off time	I_C = 7 A I_{B1} = I_{B2} = 0.7 A		0.9	2.5	µs

* Pulsed: pulse duration = 300 µs, duty factor = 1%.

BUY 24

SILICON MESA NPN

POWER SWITCH

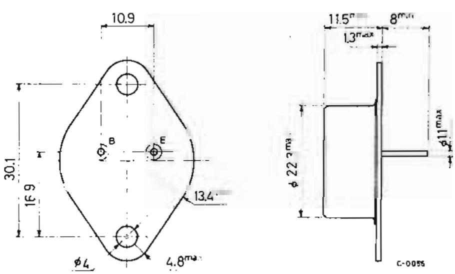
The BUY 24 is a silicon planar epitaxial NPN transistor in a TO-3 metal case. It is suitable for switching applications up to 5 A.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	120	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	60	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	6	V
I_C	Collector current	5	A
P_{tot}	Total power dissipation at $T_{case} \leq 75\ °C$	15	W
	at $T_{case} \leq 100\ °C$	10	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Junction temperature	150	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-3**)

BUY 24

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	5	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current (I_E = 0)	V_{CB} = 60 V V_{CB} = 60 V T_{case} = 125 °C			10 1	μA mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage (I_B = 0)	I_C = 50 mA	60			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage (I_E = 0)	I_C = 1 mA	120			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage (I_C = 0)	I_E = 1 mA	6			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 2 A I_B = 0.2 A I_C = 5 A I_B = 0.5 A		0.15 0.4	0.6 1	V V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 2 A I_B = 0.2 A I_C = 5 A I_B = 0.5 A		0.9 1.1	1.2 1.3	V V
h_{FE}*	DC current gain	I_C = 0.5 A V_{CE} = 2 V I_C = 2 A V_{CE} = 2 V I_C = 5 A V_{CE} = 2 V	45 40	100 85 40		— — —
f_T	Transition frequency	I_C = 0.5 A V_{CE} = 5 V		100		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 10 V		35	80	pF
t_{on}	Turn-on time	I_C = 5 A I_{B1} = 0.5 A		150	350	ns
t_{off}	Turn-off time	I_C = 5 A I_{B1} = I_{B2} = 0.5 A		350	650	ns
h_{fe}	Small signal current gain	I_C = 0.5 A V_{CE} = 5 V f = 20 MHz	2.5	5		—

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

SILICON HOMETAXIAL* NPN

BUY 38
2N3054

GENERAL INFORMATION

TYPICAL APPLICATION: MEDIUM POWER SWITCH

The BUY 38/2N3054 is a single diffused "Hometaxial*" silicon NPN transistor in a Jedec TO-66 metal case. It is intended for power-switching circuits, for series- and shunt- regulators, driver and output stages, and for high-fidelity amplifiers.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

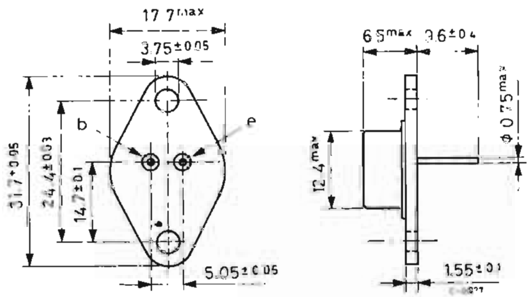
ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	90	V
$V_{CEO\ (sus)}$	Collector-emitter voltage ($I_B = 0$)	55	V
$V_{CER\ (sus)}$	Collector-emitter voltage ($R_{BE} \leq 100\ \Omega$)	60	V
$V_{CEV\ (sus)}$	Collector-emitter voltage ($V_{BE} = -1.5$ V)	90	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	4	A
I_B	Base current	2	A
P_{tot}	Total power dissipation at $T_c \leq 25$ °C	25	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case



TO-66

3/71

BUY 38
2N3054

THERMAL DATA

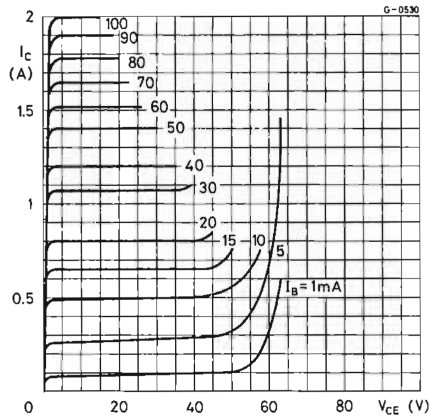
$R_{th\ j-c}$	Thermal resistance junction-case	max	7	°C/W

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

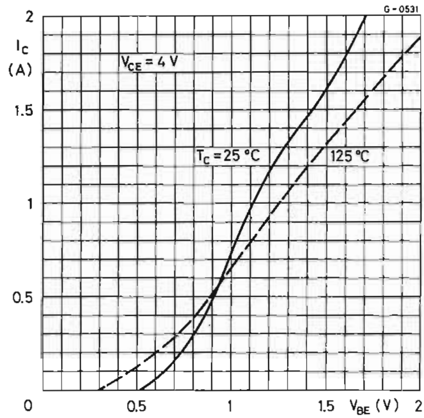
Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEO}	Collector cutoff current (I_B = 0)	V_{CE} = 30 V			0.5	mA
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 90 V			1	mA
		V_{CE} = 90 V T_c = 150 °C			6	mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V			1	mA
$V_{CEO(sus)}$*	Collector-emitter voltage (I_B = 0)	I_C = 100 mA	55			V
$V_{CER(sus)}$*	Collector-emitter voltage (R_{BE} = 100 Ω)	I_C = 100 mA	60			V
$V_{CE(sat)}$*	Collector-emitter saturation voltage	I_C = 0.5 A I_B = 0.05 A			1	V
		I_C = 3 A I_B = 1 A			3	V
V_{BE}*	Base-emitter voltage	I_C = 0.5 A V_{CE} = 4 V			1.7	V
h_{FE}	DC current gain Gr. 4	I_C = 100 mA V_{CE} = 4 V	20		50	—
	Gr. 5	I_C = 100 mA V_{CE} = 4 V	35		75	—
	Gr. 6	I_C = 100 mA V_{CE} = 4 V	60		145	—
	Gr. 7	I_C = 100 mA V_{CE} = 4 V	120		250	—
	*	I_C = 0.5 A V_{CE} = 4 V	25		100	—
	*	I_C = 3 A V_{CE} = 4 V	5			—
h_{FE_1}/h_{FE_2}	Matched pair	I_C = 100 mA V_{CE} = 4 V			1.6	—
h_{fe}	Small signal current gain	I_C = 100 mA V_{CE} = 4 V, f = 1 kHz	25			—
f_T	Transition frequency	I_C = 200 mA V_{CE} = 4 V	800			kHz
f_{hfe}	Cutoff frequency	I_C = 100 mA V_{CE} = 4 V	30			kHz

* Pulsed: pulse duration = 300 μs, duty factor = 1.5%

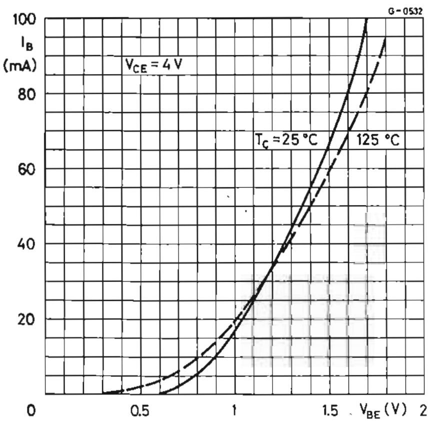
Typical output characteristics



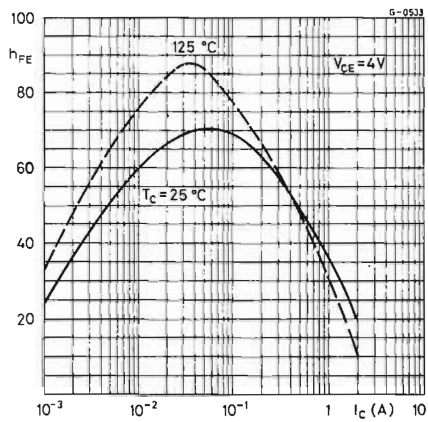
Typical DC transconductance



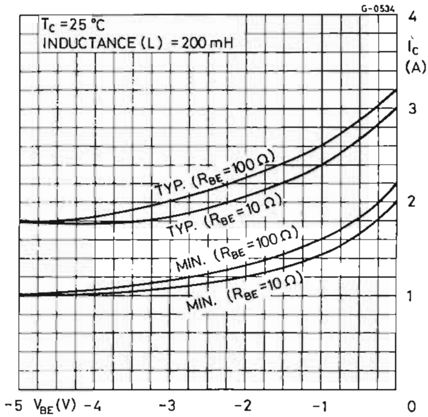
Typical input characteristics



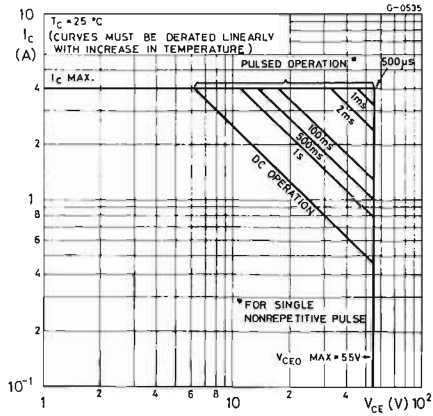
Typical DC current gain



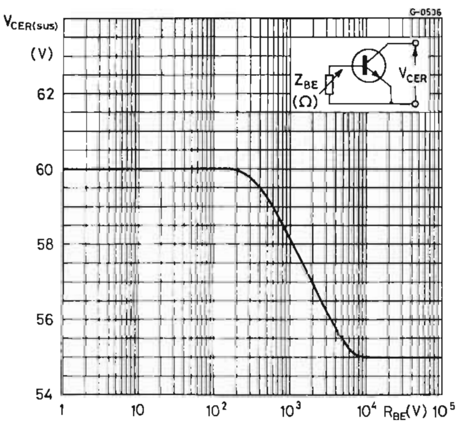
Reverse-bias, second breakdown characteristics



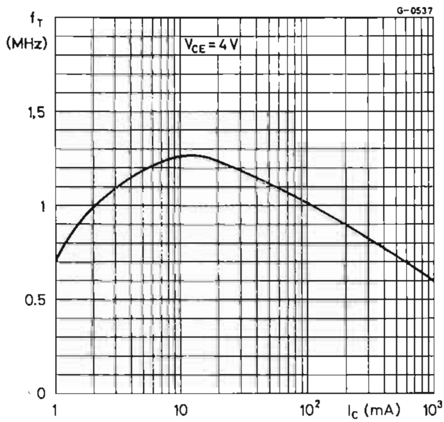
Maximum operating areas



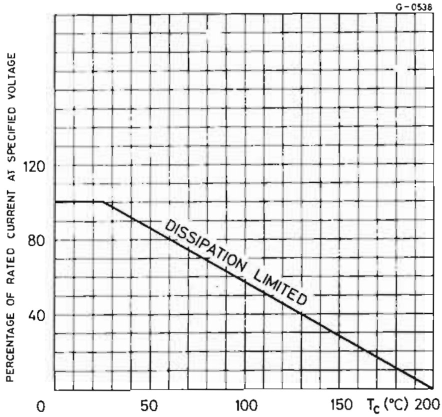
Collector-emitter breakdown voltage



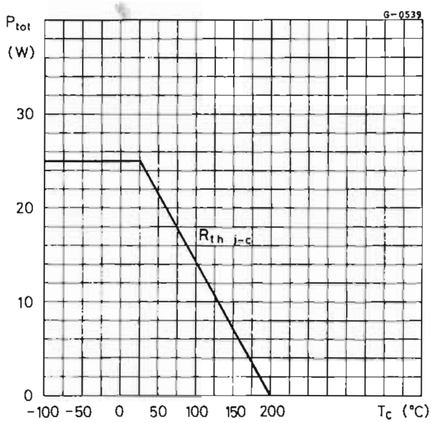
Transition frequency



Current rating chart



Power rating chart



SILICON HOMETAXIAL* NPN

BUY 46

PRELIMINARY DATA

GENERAL INFORMATION

TYPICAL APPLICATION: AF POWER AMPLIFIER

The BUY 46 is a silicon "Hometaxial"* NPN transistor in a SOT-9 metal case. It is intended for power - switching circuits, for series - and shunt - regulators, driver and output stages, and for high - fidelity amplifiers. This type is similar to 2N 3054.

* Hometaxial types employ a structure in which the base region has homogeneous resistivity silicon material in the axial direction (emitter-to-collector).

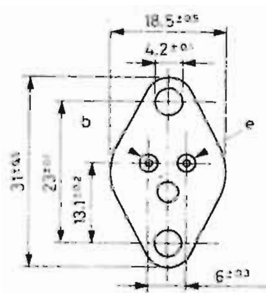
ABSOLUTE MAXIMUM RATINGS

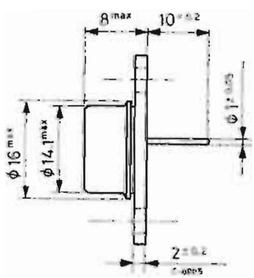
V_{CBO}	Collector-base voltage ($I_E = 0$)	90	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	55	V
V_{CER}	Collector-emitter voltage ($R_{BE} \leq 100\ \Omega$)	60	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	4	A
I_B	Base current	2	A
P_{tot}	Total power dissipation at $T_c \leq 45$ °C	24	W
T_s	Storage temperature	-65÷200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm

Collector connected to case





SOT-9

9/70

BUY 46

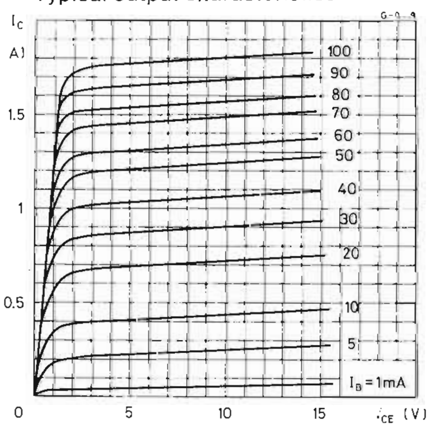
THERMAL DATA

$R_{th\ j-c}$	Thermal resistance junction-case	max	6	°C/W

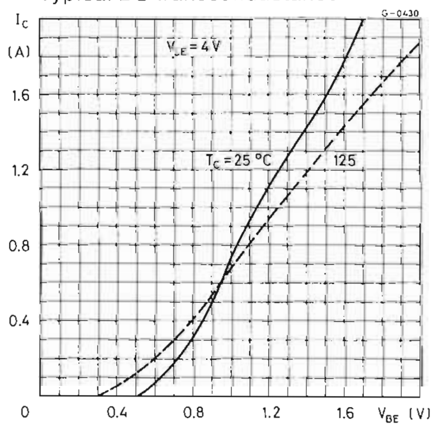
ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CEV}	Collector cutoff current (V_{BE} = -1.5 V)	V_{CE} = 90 V T_c = 25 °C V_{CE} = 90 V T_c = 125 °C			1 5	mA mA
I_{EBO}	Emitter cutoff current (I_C = 0)	V_{EB} = 7 V			1	mA
$V_{CEO\ (sus)}$	Collector-emitter voltage (I_B = 0)	I_C = 100 mA	55			V
$V_{CE\ (sat)}$	Collector-emitter saturation voltage	I_C = 500 mA I_B = 50 mA			1	V
$V_{CER\ (sus)}$	Collector-emitter voltage (R_{BE} = 100 Ω)	I_C = 100 mA	60			V
V_{BE}	Base-emitter voltage	I_C = 500 mA V_{CE} = 4 V			1.7	V
h_{FE}	DC current gain	I_C = 500 mA V_{CE} = 4 V	25		100	—
f_T	Transition frequency	I_C = 200 mA V_{CE} = 4 V	800			kHz

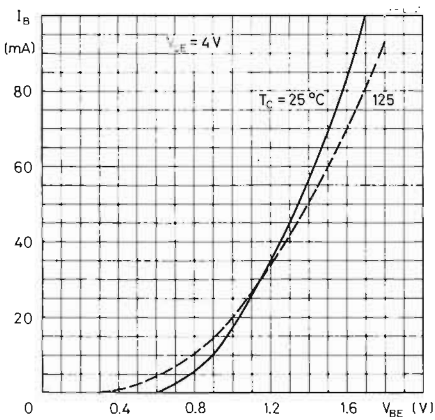
Typical output characteristics



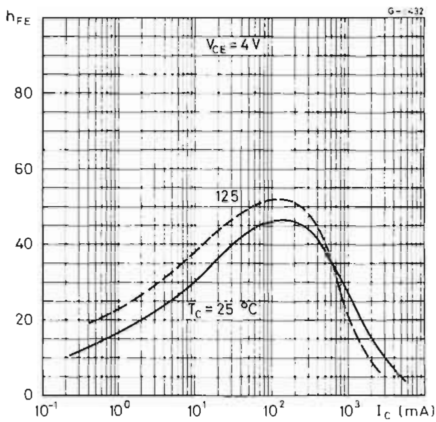
Typical DC transconductance



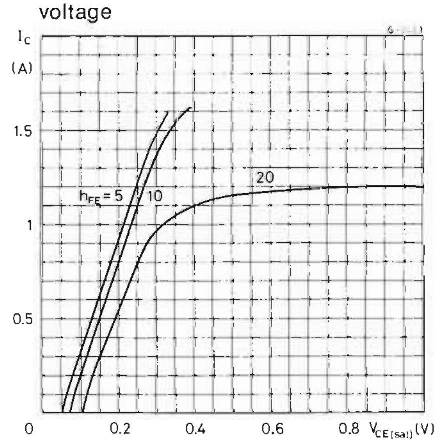
Typical input characteristics



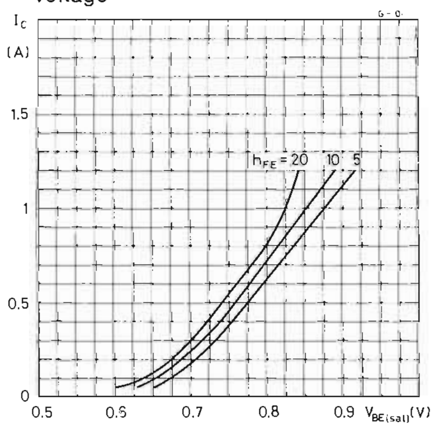
Typical DC current gain



Typical collector-emitter saturation voltage

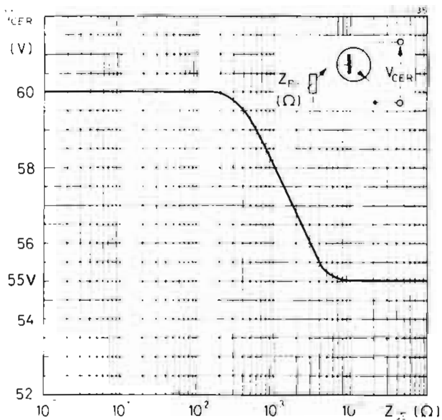


Typical base-emitter saturation voltage

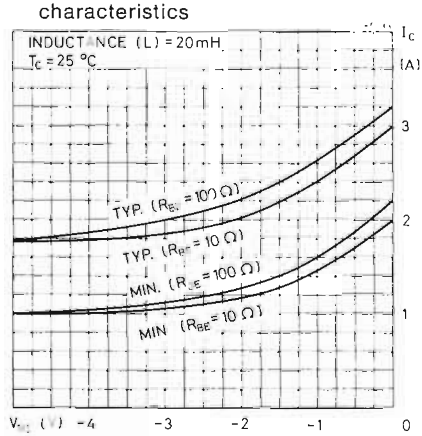


BUY 46

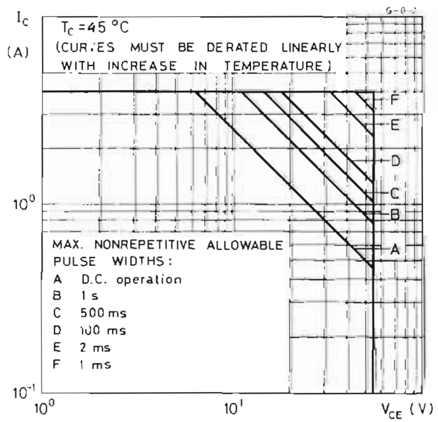
Collector-emitter breakdown voltage



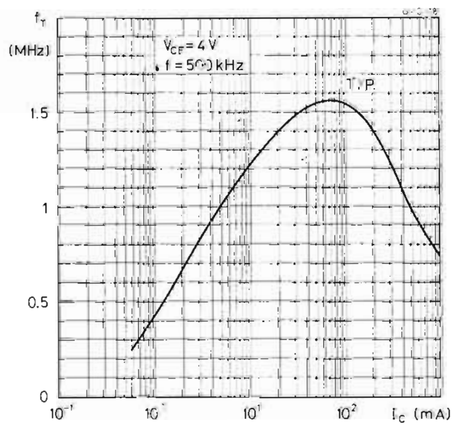
Reverse-bias, second breakdown characteristics



Maximum operating areas



Transition frequency



SILICON PLANAR NPN

BUY 47

HIGH VOLTAGE, HIGH CURRENT SWITCH

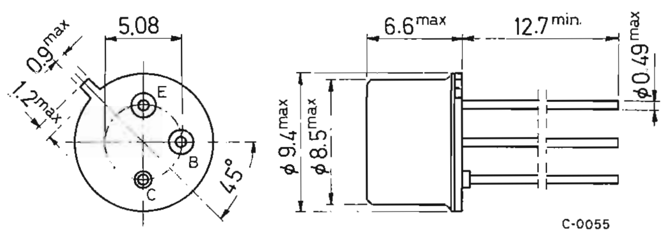
The BUY 47 is a silicon planar epitaxial NPN transistor in a TO-39 metal case. It is used in high-voltage, high-current switching applications up to 5 A.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	150	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	120	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	6	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{amb} \leq 25$ °C	1	W
	at $T_{case} \leq 25$ °C	7	W
T_{stg}	Storage temperature	-55 to 200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-39**)

BUY 47

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	25	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	175	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	$V_{CB} = 80$ V $V_{CB} = 80$ V $T_{amb} = 125$ °C			10 1	μA mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	I_C = 20 mA	120			V
$V_{(BR)CBO}$	Collector-base breakdown voltage ($I_E = 0$)	I_C = 1 mA	150			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	I_E = 1 mA	6			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 0.5 A I_B = 50 mA I_C = 2 A I_B = 0.2 A I_C = 5 A I_B = 0.5 A		0.1 0.2 0.55	 0.45 1	V V V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 0.5 A I_B = 50 mA I_C = 2 A I_B = 0.2 A I_C = 5 A I_B = 0.5 A		0.75 1 1.15	 1.1 1.5	V V V
h_{FE}*	DC current gain	I_C = 50 mA V_{CE} = 5 V I_C = 0.5 A V_{CE} = 5 V I_C = 2 A V_{CE} = 5 V I_C = 5 A V_{CE} = 5 V	 40 40 15	130 150 130 45		— — — —
f_T	Transition frequency	I_C = 100 mA V_{CE} = 10 V		90		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 50 V		45	80	pF
t_{on}	Turn-on time	I_C = 5 A I_{B1} = 0.5 A		0.1	1	μs
t_{off}	Turn-off time	I_C = 5 A $I_{B1} = I_{B2}$ = 0.5 A		1.2	2	μs

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

BUY 48

SILICON PLANAR NPN

HIGH VOLTAGE, HIGH CURRENT SWITCH

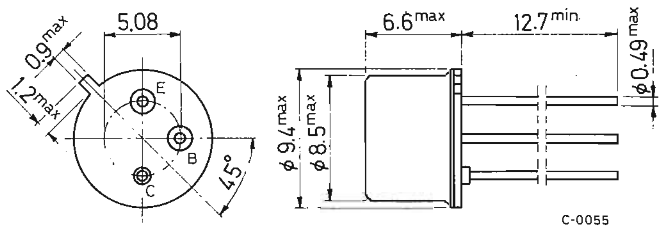
The BUY 48 is a silicon planar epitaxial NPN transistor in a TO-39 metal case. It is used in high-voltage, high-current switching applications up to 5 A.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	200	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	170	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	6	V
I_C	Collector current	10	A
P_{tot}	Total power dissipation at $T_{amb} \leq 25$ °C	1	W
	at $T_{case} \leq 25$ °C	7	W
T_{stg}	Storage temperature	-55 to 200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-39**)

BUY 48

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	25	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	175	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 100 V			10	μA
		V_{CB} = 100 V T_{amb} = 125 °C			1	mA
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	I_C = 20 mA	170			V
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	I_C = 1 mA	200			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	I_E = 1 mA	6			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 0.5 A I_B = 50 mA		0.1		V
		I_C = 2 A I_B = 0.2 A		0.2	0.45	V
		I_C = 5 A I_B = 0.5 A		0.55	1	V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 0.5 A I_B = 50 mA		0.75		V
		I_C = 2 A I_B = 0.2 A		1	1.1	V
		I_C = 5 A I_B = 0.5 A		1.15	1.5	V
h_{FE}*	DC current gain	I_C = 50 mA V_{CE} = 5 V		130		—
		I_C = 0.5 A V_{CE} = 5 V	40	150		—
		I_C = 2 A V_{CE} = 5 V	40	130		—
		I_C = 5 A V_{CE} = 5 V	15	45		—
f_T	Transition frequency	I_C = 100 mA V_{CE} = 10 V		90		MHz
C_{CBO}	Collector-base capacitance	I_E = 0 V_{CB} = 50 V		45	80	pF
t_{on}	Turn-on time	I_C = 5 A I_{B1} = 0.5 A		0.5	1	μs
t_{off}	Turn-off time	I_C = 5 A I_{B1} = I_{B2} = 0.5 A		1.2	2	μs

* Pulsed: pulse duration = 300 μs, duty factor = 1%.

BUY 68

SILICON PLANAR **NPN**

HIGH CURRENT, GENERAL PURPOSE TRANSISTOR

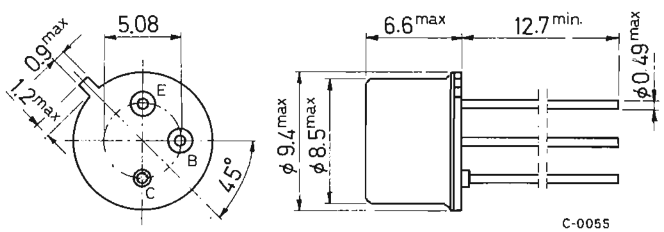
The BUY 68 is a silicon planar epitaxial NPN transistor in a TO-39 metal case. It is used for high-current switching applications and in power amplifiers. The BUY 68 is available in 3 h_{FE} gain bands.

ABSOLUTE MAXIMUM RATINGS

V_{CBO}	Collector-base voltage ($I_E = 0$)	100	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	60	V
V_{CER}	Collector-emitter voltage ($R_{BE} \leq 10\ \Omega$)	80	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	6	V
I_C	Collector current	5	A
P_{tot}	Total power dissipation at $T_{amb} \leq 25\ °C$	0.8	W
	at $T_{case} \leq 25\ °C$	7	W
T_{stg}	Storage temperature	-55 to 200	°C
T_j	Junction temperature	200	°C

MECHANICAL DATA

Dimensions in mm



(sim. to **TO-39**)

2/73

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	25	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	220	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cutoff current ($I_E = 0$)	V_{CB} = 60 V			1	μA
$V_{(BR)CBO}$*	Collector-base breakdown voltage ($I_E = 0$)	I_C = 1 mA	100			V
$V_{(BR)CEO}$*	Collector-emitter breakdown voltage ($I_B = 0$)	I_C = 50 mA	60			V
$V_{CER(sus)}$*	Collector-emitter sustaining voltage (R_{BE} = 10 Ω)	I_C = 50 mA	80			V
$V_{(BR)EBO}$*	Emitter-base breakdown voltage ($I_C = 0$)	I_E = 1 mA	6			V
$V_{CE\ (sat)}$*	Collector-emitter saturation voltage	I_C = 2 A I_B = 0.2 A		0.2	0.6	V
		I_C = 5 A I_B = 0.5 A		0.4	1	V
$V_{BE\ (sat)}$*	Base-emitter saturation voltage	I_C = 2 A I_B = 0.2 A		1	1.3	V
		I_C = 5 A I_B = 0.5 A		1.2	1.6	V

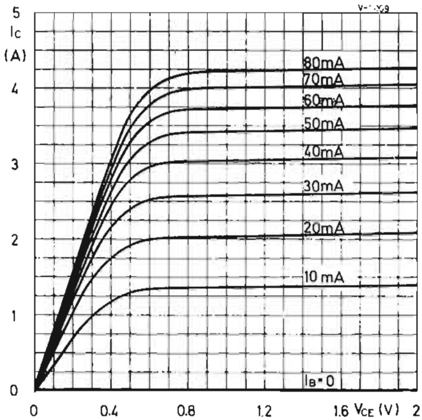
ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
h_{FE}*	DC current gain	I_C = 0.1 A	V_{CE} = 1 V	40	130		—
			Group 6	40	70		—
			Group 10	63	110		—
			Group 16	100	170		—
		I_C = 1 A	V_{CE} = 1 V	40	130	250	—
			Group 6	40	70	100	—
			Group 10	63	110	160	—
			Group 16	100	170	250	—
		I_C = 5 A	V_{CE} = 5 V		70		—
			Group 6		38		—
			Group 10		60		—
			Group 16		90		—
f_T	Transition frequency	I_C = 0.5 A	V_{CE} = 5 V	50	100		MHz
C_{CBO}	Collector-base capacitance	I_E = 0	V_{CB} = 10 V		40	80	pF
t_{on}	Turn-on time	I_C = 5 A	I_{B1} = 0.5 A		0.1	0.35	µs
t_{off}	Turn-off time	I_C = 5 A I_{B1} = I_{B2} = 0.5 A			0.55	0.75	µs

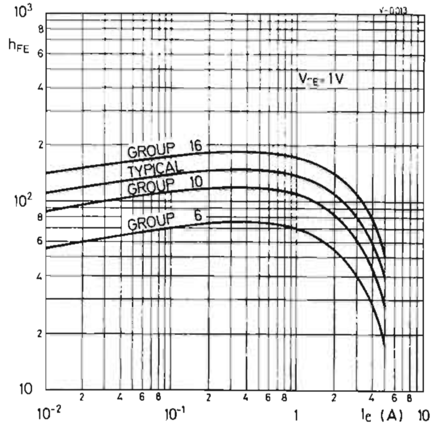
* Pulsed: pulse duration = 300 µs, duty factor = 1%.

BUY 68

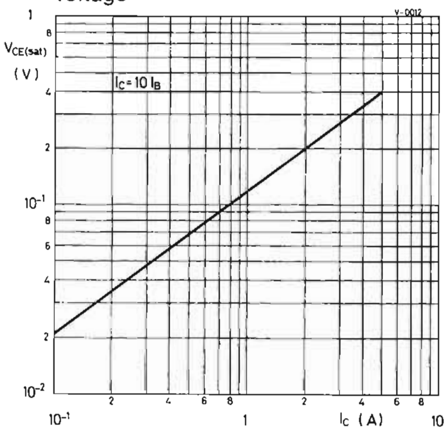
Typical output characteristics



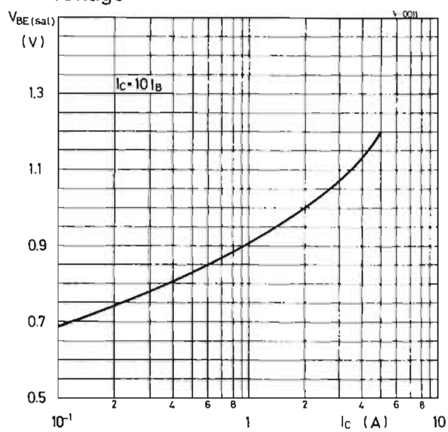
Typical DC current gain



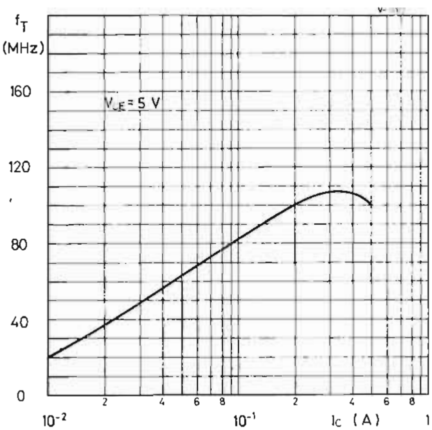
Typical collector-emitter saturation voltage



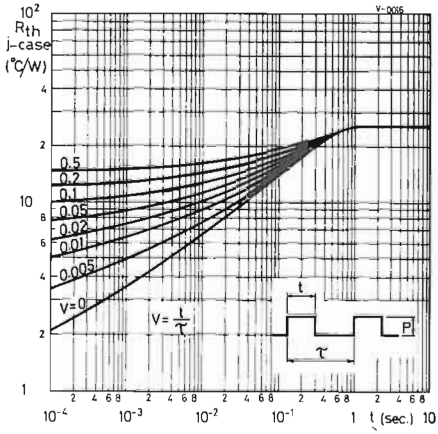
Typical base-emitter saturation voltage



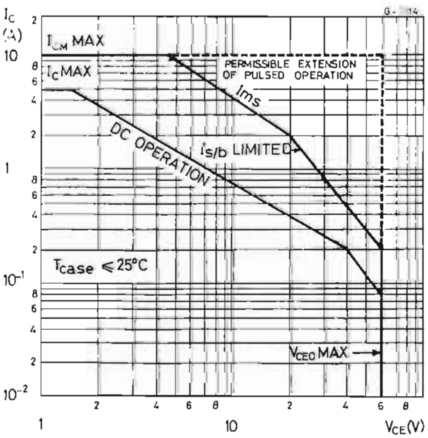
Typical transition frequency



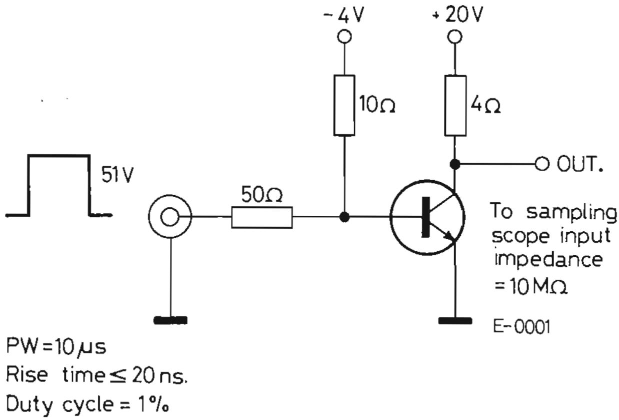
Typical thermal response



Safe operating areas



TEST CIRCUIT
Switching times



SILICON THYRISTORS

SILICON ALL-DIFFUSED SCRs

2N3228
2N3525
2N4101

GENERAL INFORMATION

TYPICAL APPLICATION: 120-240 V LINE OPERATION, HIGH VOLTAGE POWER SUPPLIES

The **2N3228, 2N3525** and **2N4101** are all-diffused, three-junction silicon controlled rectifiers in a Jedec TO-66 metal case.

The **2N3228** and **2N3525** are intended for power switching applications and for line operation. The **2N3228** is to be used with 120 V lines whereas the **2N3525** is for 240 V lines. The **2N4101** is particularly suited for high voltage power supplies.

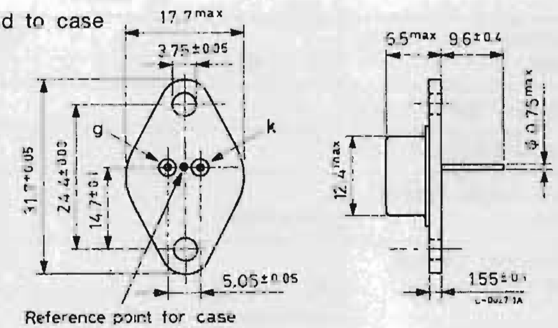
ABSOLUTE MAXIMUM RATINGS

		2N3228	2N3525	2N4101
V_{RSOM}	Non repetitive peak reverse voltage (open gate)	330 V	660 V	700 V
V_{RROM}	Repetitive peak reverse voltage (open gate)	200 V	400 V	600 V
V_{DROM}	Repetitive peak off-state voltage (open gate)	600 V	600 V	700 V
$I_{T\ (AV)}$	Average on-state current for a conduction angle of 180°, T_{case} = 75 °C with heat sink	3.2 A		
$I_{T(RMS)}$	RMS on-state current for a conduction angle of 180°, T_{case} = 75 °C with heat sink	5 A		
I_{TSM}	Peak surge (non repetitive) on-state current for one cycle of applied voltage (f = 60 Hz)	60 A		
$I^2 \cdot t$	Sub-cycle surge (non repetitive) for a period of 1 ms to 8.3 ms	15 A^2s		
$\frac{di_T}{dt}$	Rate of change of forward current $V_D = V_{F\ (BO)O}$ I_{GT} = 200 mA, 0.5 µs rise time	200 A/µs		
P_{GM}	Peak forward or reverse gate, power dissipation for 10 µs duration	13 W		
$P_{G\ (AV)}$	Average gate power dissipation	0.5 W		
T_s	Storage temperature	-40 to 125 °C		
T_c	Case operating temperature	-40 to 100 °C		

MECHANICAL DATA

Dimensions in mm

Anode connected to case



TO-66

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	4	°C/W

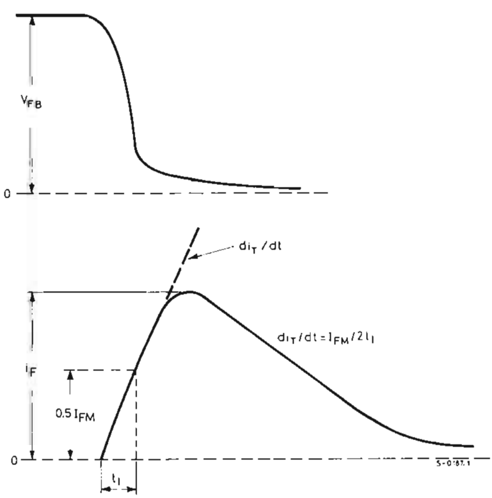
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
$v_{F(BO)O}$	Instantaneous forward breakover voltage	Gate open T_{case} = 100 °C for **2N3228** for **2N3525** for **2N4101**	 200 400 600			 V V V
I_{DOM}	Peak off-state current	Gate open T_{case} = 100 °C $V_{DO} = v_{F(BO)O}$ for **2N3228** for **2N3525** for **2N4101**		 0.1 0.2 0.4	 1.5 3 4	 mA mA mA
I_{RROM}	Repetitive peak reverse current	Gate open T_{case} = 100 °C $V_{RO} = V_{RROM}$ for **2N3228** for **2N3525** for **2N4101**		 0.05 0.1 0.2	 0.75 1.5 2	 mA mA mA
v_T	Instantaneous on-state voltage	i_T = 30 A		2.15	2.8	V
I_{GT}	DC gate-trigger current			8	15	mA
V_{GT}	DC gate-trigger voltage			1.2	2	V
i_{HO}	Instantaneous holding current	Gate open		10	20	mA
$\frac{dv}{dt}$	Critical rate-of-rise of off-state voltage	$V_{DO} = v_{F(BO)O}$ exponential rise T_{case} = 100 °C	10	200		V/µs

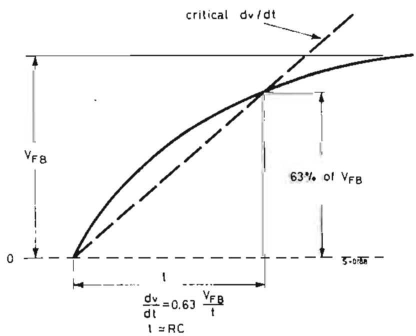
ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
t_{gt}	Gate controlled turn-on time	$V_D = V_{F(BO)O}$ $i_T = 4.5$ A $I_{GT} = 200$ mA 0.1 μs rise time	0.75	1.5		μs
→ t_q	Circuit commutated turn-off time	$V_D = V_{F(BO)O}$ $i_T = 2$ A 50 μs pulse width $\frac{dv}{dt} = 20$ V/μs $\frac{di}{dt} = -30$ A/μs $I_{GT} = 200$ mA $T_c = 75$ °C		15	50	μs

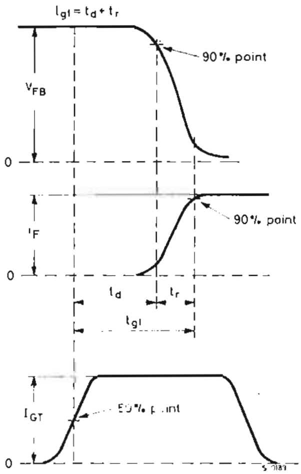
Waveshape of di_T/dt rating test



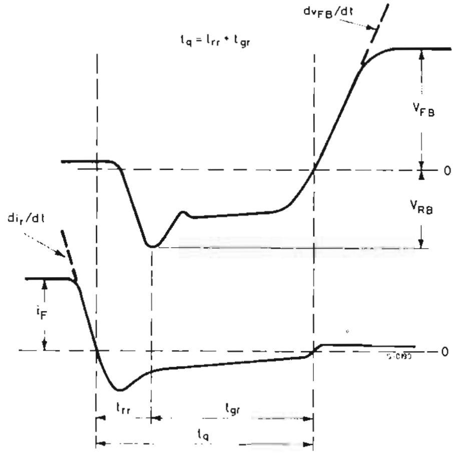
Waveshape of critical dv/dt rating test

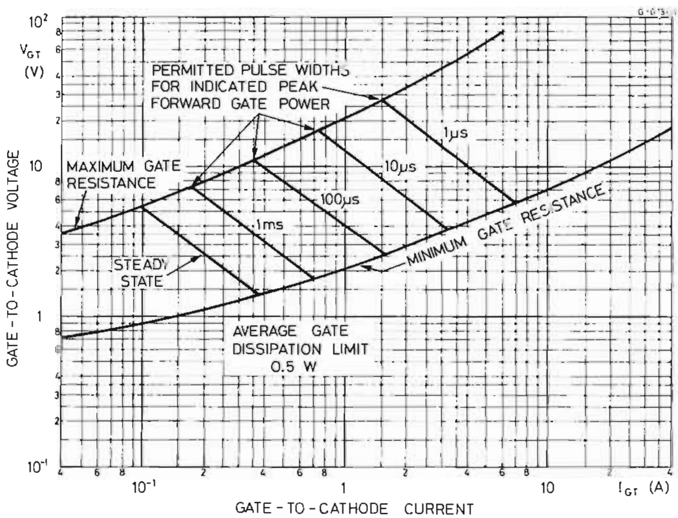


Waveshape of t_{gt} rating test



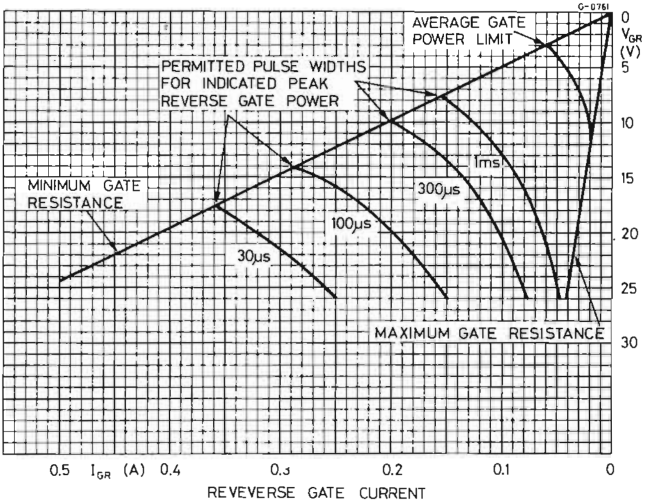
Waveshape of t_q rating test



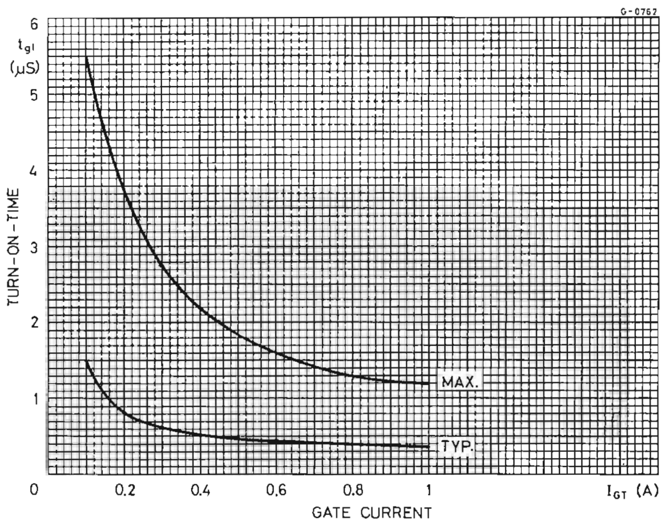


Forward gate characteristics

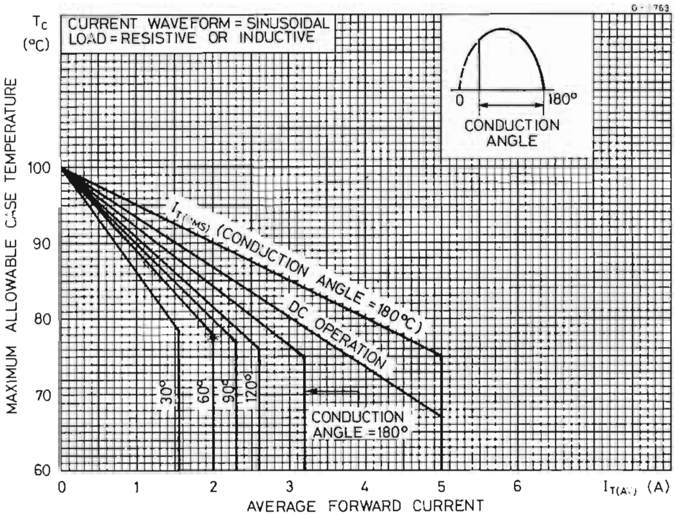
Reverse gate characteristics



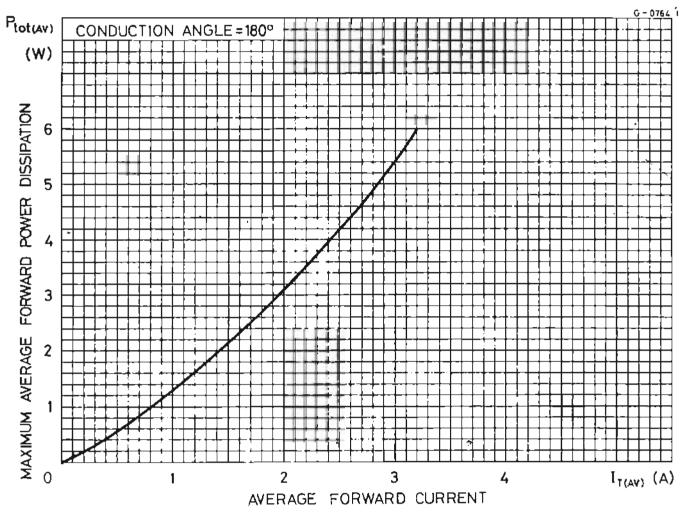
Turn-on time characteristics



2N3228
2N3525
2N4101

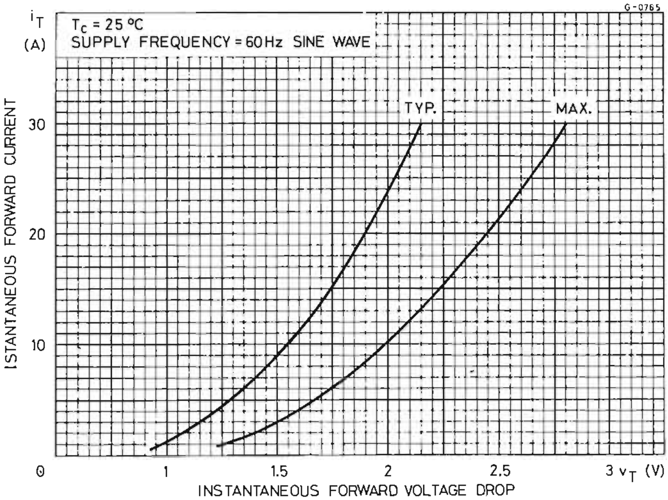


Rating chart
(case temperature)

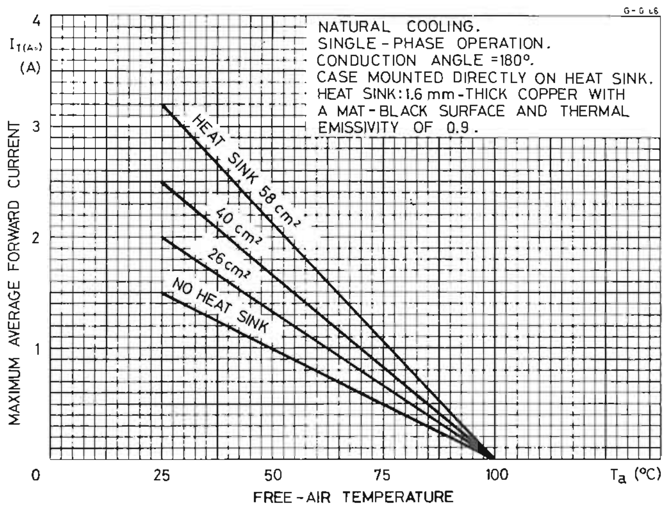


Power
dissipation chart

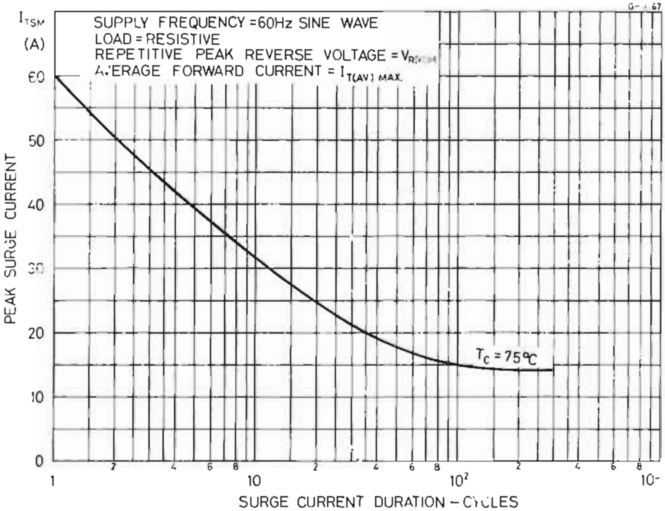
Forward characteristics



Operation guidance chart



2N3228
2N3525
2N4101



Surge current rating chart

SILICON ALL-DIFFUSED SCRs

40654
40655
40833

GENERAL INFORMATION

TYPICAL APPLICATION: CAPACITOR DISCHARGE IGNITION SYSTEMS

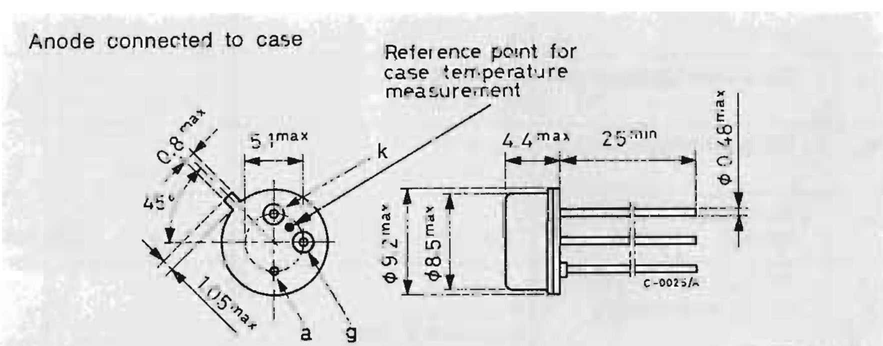
The **40654, 40655** and **40833** are all-diffused, three-junction silicon controlled rectifiers in a 3 lead, low profile metal case (similar to the Jedec TO-5). The **40654** and **40655** are intended for use in capacitor discharge ignition systems, power control and power switching circuits and for line operation. The **40654** is to be used with 120 V lines whereas the **40655** is for 240 V lines. The **40833** is intended for power switching, power control applications and particularly for high voltage generators.

ABSOLUTE MAXIMUM RATINGS

		40654	40655	40833
V_{RSOM}	Non repetitive peak reverse voltage (open gate)	250 V	500 V	700 V
V_{DSOM}	Non repetitive peak forward voltage (open gate)	250 V	500 V	700 V
V_{RROM}	Repetitive peak reverse voltage (open gate)	200 V	400 V	600 V
V_{DROM}	Repetitive peak off-state voltage (open gate)	200 V	400 V	600 V
I_{TSM}	Peak surge (non repetitive) on-state current for one cycle of applied principal voltage: at f = 60 Hz		100 A	
	at f = 50 Hz		85 A	
I_{TRM}	Peak repetitive on-state current, duty factor 0.1%, T_{case} = 75 °C max, pulse duration of 5 μs min, 20 μs max		100 A	
$I_{T\ (RMS)}$	RMS on-state current for a conduction angle of 180°, T_{case} = 60 °C		7 A	
$\frac{di_T}{dt}$	Rate of change of forward current $V_D = V_{DROM}$ I_{GT} = 200 mA, 0.5 μs rise time		200 A/μs	
P_{GM}	Peak forward gate power dissipation for 1 μs max		40 W	
$P_{G\ (AV)}$	Average gate power dissipation (averaging time = 10 ms max)		0.5 W	
T_s	Storage temperature		-65 to 150 °C	
T_c	Case operating temperature		-65 to 100 °C	
T_l	Lead temperature (during soldering) for 10 s max for case or leads		225 °C	

MECHANICAL DATA

Dimensions in mm



TO-5 LP

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	5	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	120	°C/W

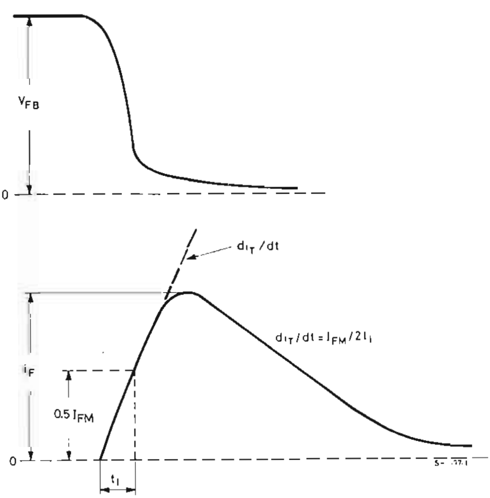
ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{DOM}	Peak off-state current	Gate open T_{case} = 100 °C $V_{DO} = V_{DROM}$		0.1	0.5	mA
I_{RROM}	Repetitive peak reverse current	Gate open T_{case} = 100 °C $V_{RO} = V_{RROM}$		0.05	0.5	mA
V_T	Instantaneous on-state voltage	i_T = 30 A		1.9	2.6	V
I_{GT}	DC gate-trigger current	V_D = 12 V R_L = 30 Ω		6	15	mA
V_{GT}	DC gate-trigger voltage	V_D = 12 V R_L = 30 Ω		0.65	1.5	V
I_{HO}	Instantaneous holding current	Gate open		9	20	mA
$\frac{dv}{dt}$	Critical rate-of-rise of off-state voltage	$V_{DO} = V_{DROM}$ exponential rise T_{case} = 100 °C	20	200		V/µs

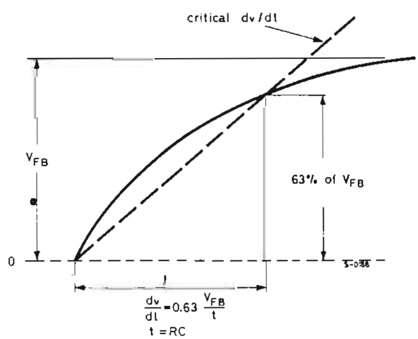
ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
t_{gt}	Gate controlled turn-on time	$V_D = V_{DROM}$ $i_T = 4.5$ A $I_{GT} = 200$ mA 0.1 µs rise time		1	2	µs
t_q	Circuit commutated turn-off time	$V_D = V_{DROM}$ $i_T = 2$ A pulse duration = 50 µs $\frac{dv}{dt} = 20$ V/µs $\frac{di}{dt} = -30$ A/µs $I_{GT} = 200$ mA at turn-on, $T_{case} = 75$ °C		15	50	µs

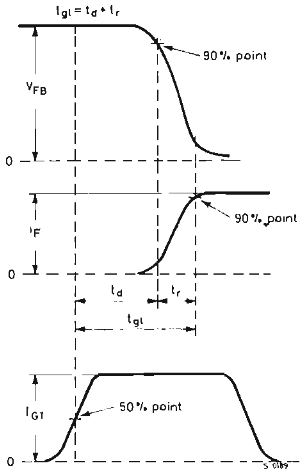
Waveshape of di_T/dt rating test



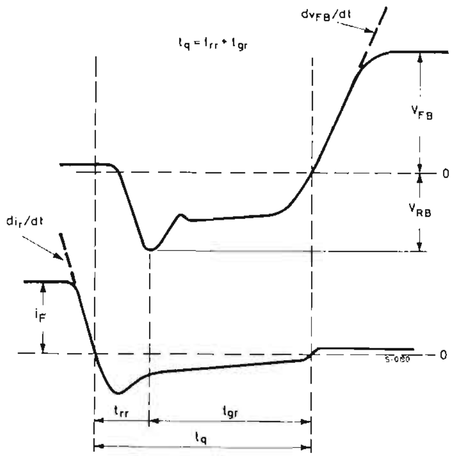
Waveshape of critical dv/dt rating test

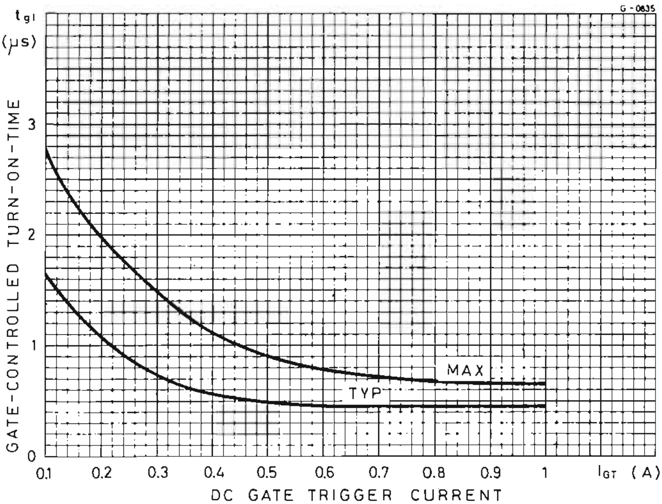


Waveshape of t_{gt} rating test



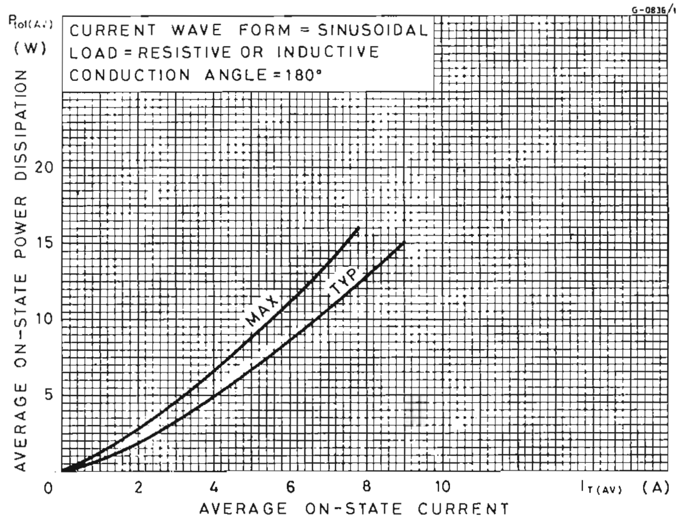
Waveshape of t_q rating test



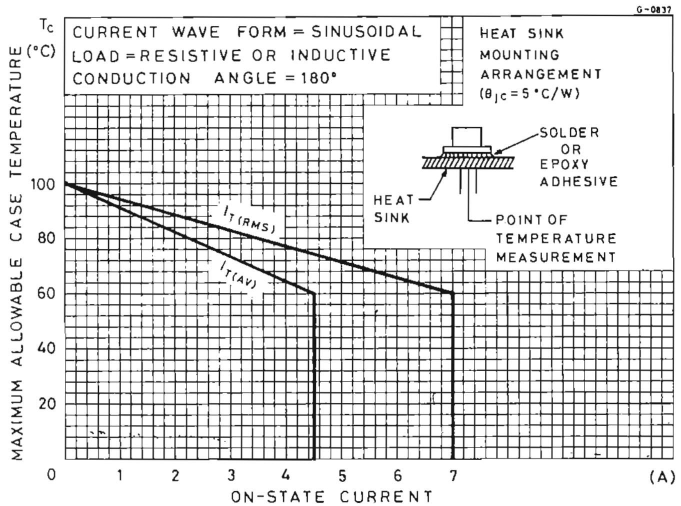


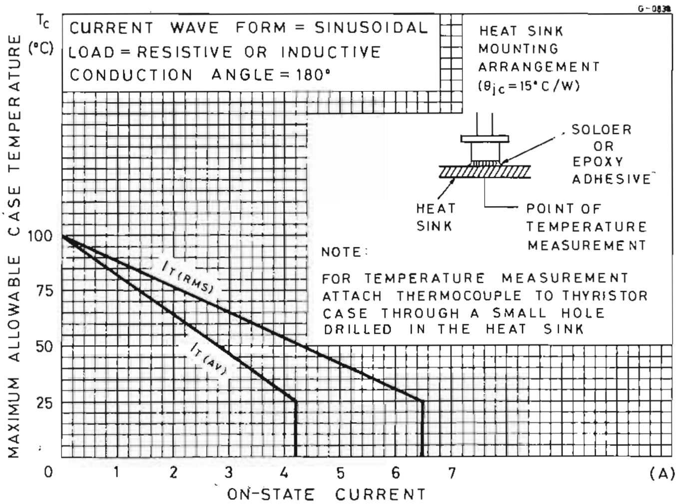
Turn-on time characteristics

Power dissipation chart

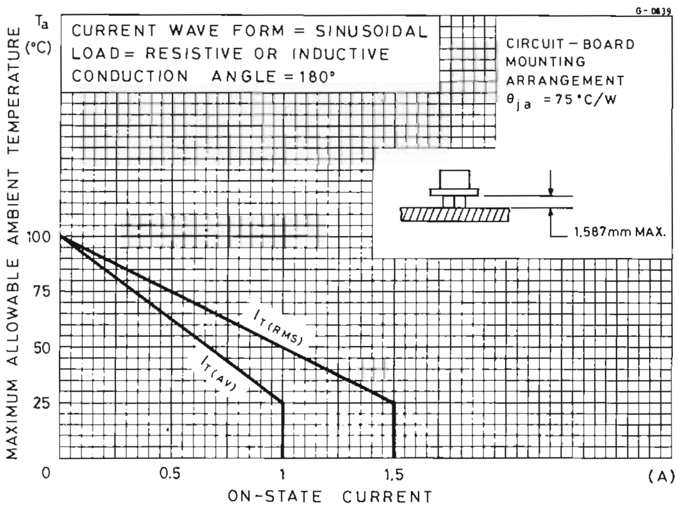


Maximum allowable case temperature



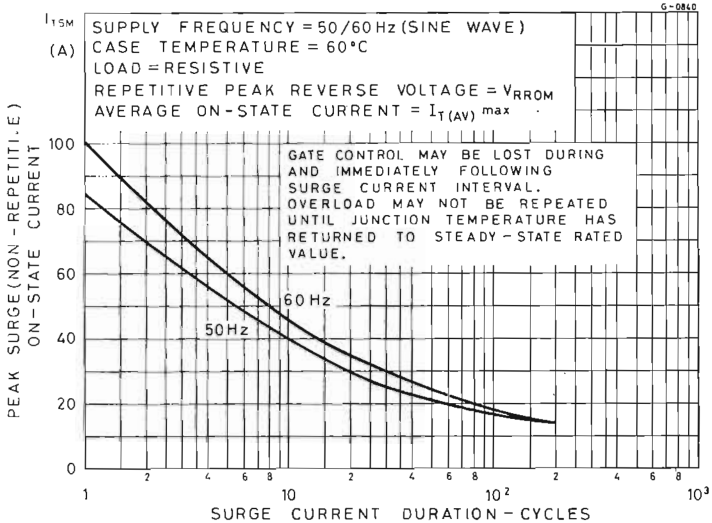


Maximum allowable case temperature

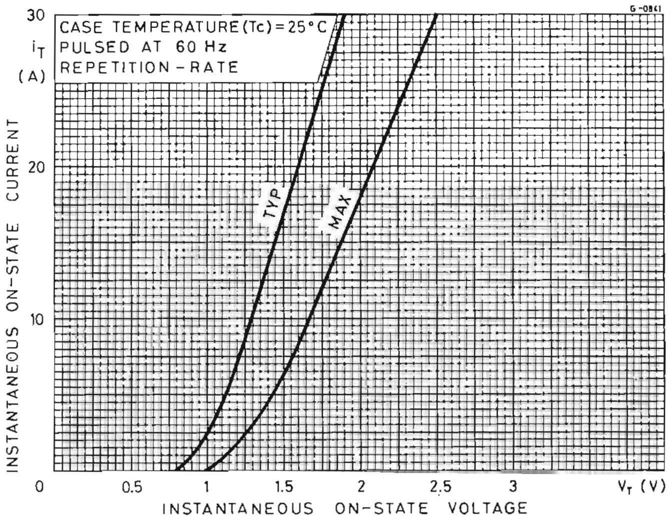


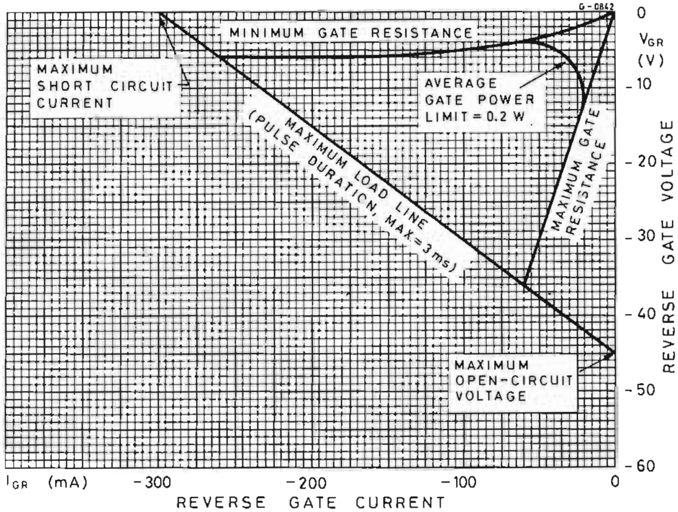
Maximum allowable ambient temperature

Peak surge on-state current

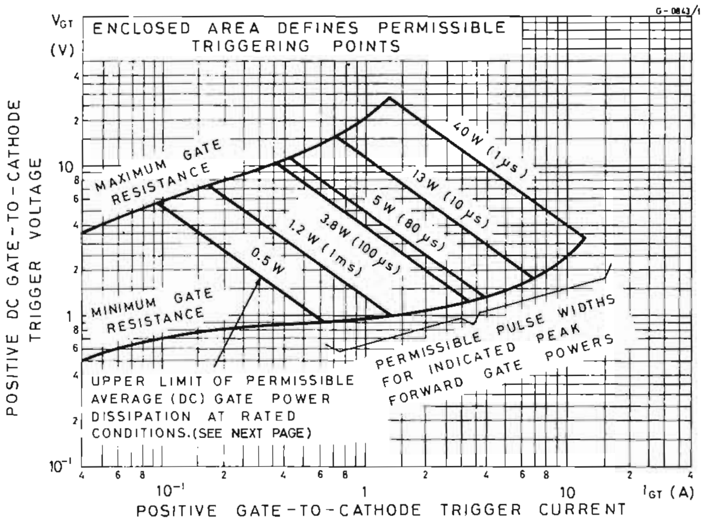


Forward characteristics



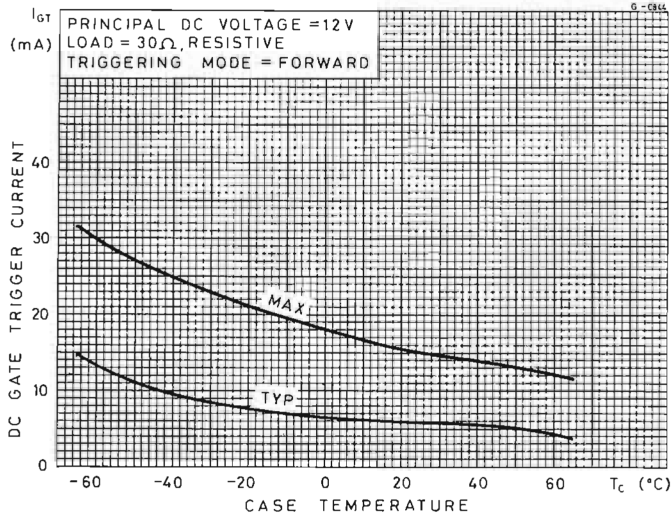


Reverse gate characteristics

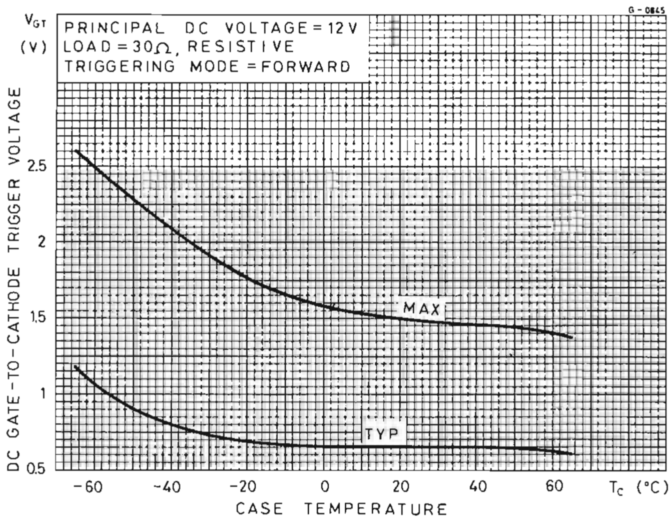


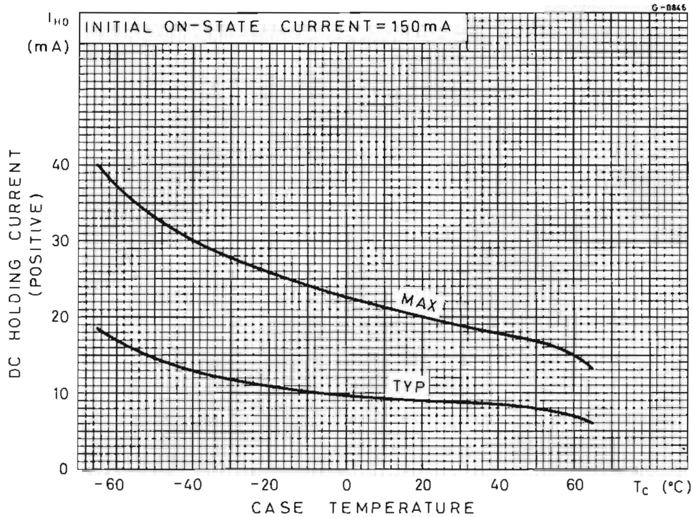
Forward gate characteristics

DC gate-trigger current



DC gate-trigger voltage

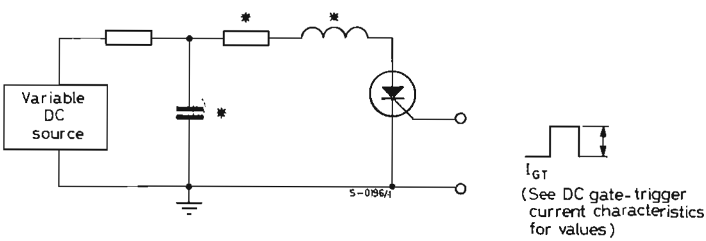




DC holding current

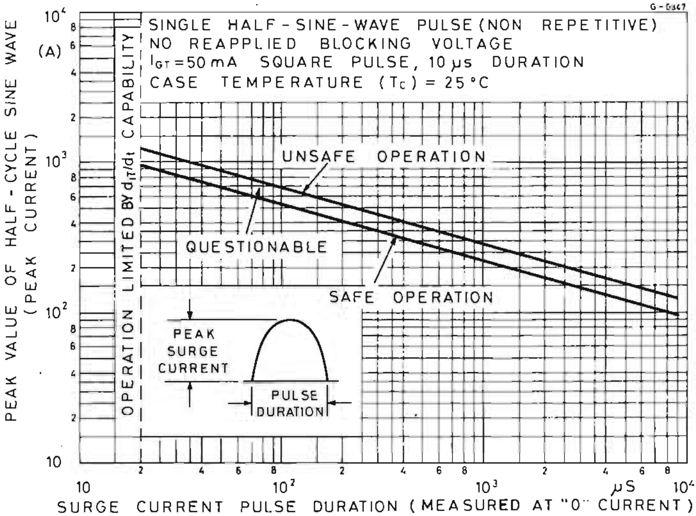
Sub-cycle surge capability test circuit

* Vary as required to obtain current level and pulse duration

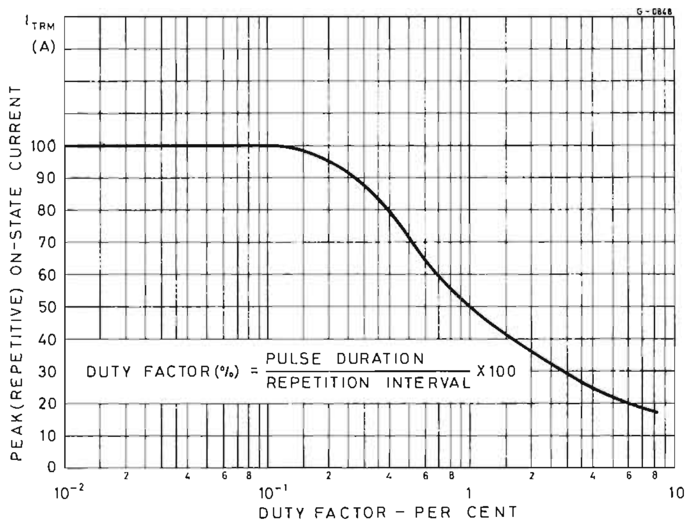


* Vary as required to obtain current level and pulse duration

Sub-cycle surge capability

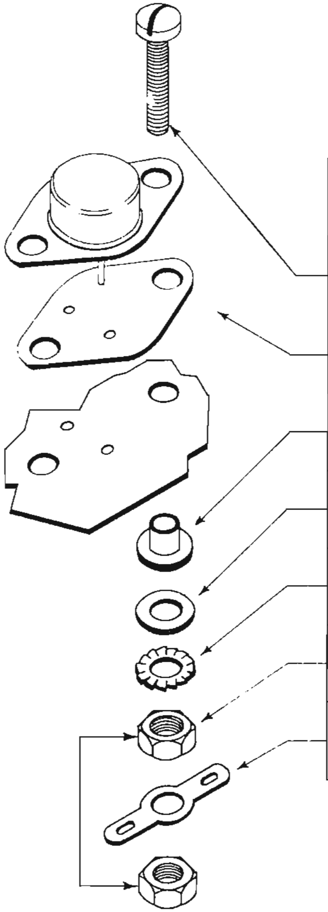


Derating curve for peak pulse current (repetitive) for the ignition circuit



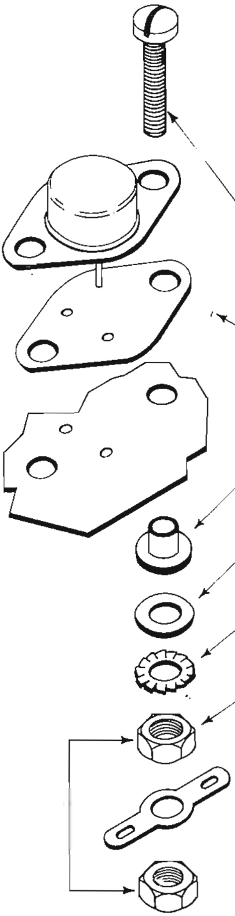
ACCESSORIES AND MOUNTING INSTRUCTIONS

SOT-9



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER KIT 1	KIT 2	UNI-CODE	MATERIAL	MECH. DATA Page
CHEESE HEAD SCREWS SLOTTED	2	NR 021D		M4x14 UNI 242	STEEL NICKEL PLATED	
MICA WASHER	1	DF 05 A	DF 05 A		MICA	305
INSULATING BUSHES	2	DF 03B	DF 03B		NYLON	304
WASHERS	2	NR 024A			STEEL NICKEL PLATED	307
LOCK WASHERS	2	NR 026 B		4UNI 3703	STEEL NICKEL PLATED	
HEXAGON NUTS	4	NR 022D		M4 UNI 5590	STEEL NICKEL PLATED	
SOLDER LUG	1	NR 023A			BRASS TIN PLATED	306

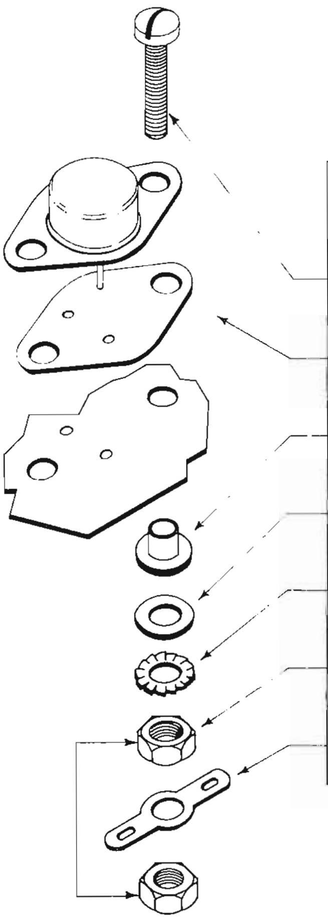
S-0328



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER KIT 1	KIT 2	UNI-CODE	MATERIAL	MECH. DATA Page
CHEESE HEAD SCREWS SLOTTED	2	NR 021 D		M4x14 UNI 242	STEEL NICKEL PLATED	
MICA WASHER	1	495320-CT2	495320-CT2		MICA	308
INSULATING BUSHES	2	DF 03 B	DF 03 B		NYLON	304
WASHERS	2	NR 024 A			STEEL NICKEL PLATED	307
LOCK WASHERS	2	NR 026 B		4 UNI 3703	STEEL NICKEL PLATED	
HEXAGON NUTS	4	NR 022 D		M4 UNI 5590	STEEL NICKEL PLATED	
SOLDER LUG	1	NR 023 A			BRASS TIN PLATED	306

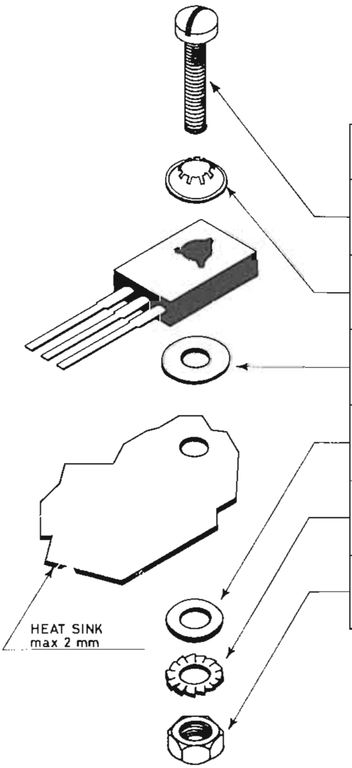
S-0375

TO-66



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER KIT 1	KIT 2	UNI-CODE	MATERIAL	MECH. DATA Page
CHEESE HEAD SCREWS SLOTTED	2	NR 021 C		M3x14 UNI 242	STEEL NICKEL PLATED	
MICA WASHER	1	DF 31 CTA	DF 31 CTA		MICA	305
INSULATING BUSHES	2	DF 03 C	DF 03 C		NYLON	304
WASHERS	2	NR 024 B			STEEL NICKEL PLATED	307
LOCK WASHERS	2	NR 026 A		3 UNI 3703	STEEL NICKEL PLATED	
HEXAGON NUTS	4	NR 022 C		M3 UNI 5590	STEEL NICKEL PLATED	
SOLDER LUG	1	NR 023 B			BRASS TIN PLATED	306

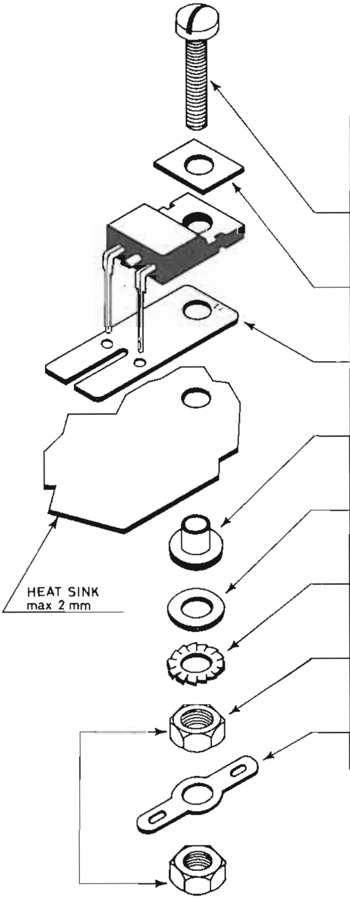
TO-126 (SOT-32)



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER KIT 1	KIT 2	UNI-CODE	MATERIAL	MECH. DATA Page
CHEESE HEAD SCREW SLOTTED	1	NR 021C		M3 x 14 UNI 242	STEEL NICKEL PLATED	
LOCK WASHER	1	NR 026E			STEEL C72 UNI 3545	307
INSULATING BUSH	1	DF 02 A	DF 02 A		MICA	304
WASHER	1	NR 024 B			STEEL NICKEL PLATED	307
LOCK WASHER	1	NR 026 A		3 UNI 3703	STEEL NICKEL PLATED	
HEXAGON NUT	1	NR 022 C		M3 UNI 5590	STEEL NICKEL PLATED	

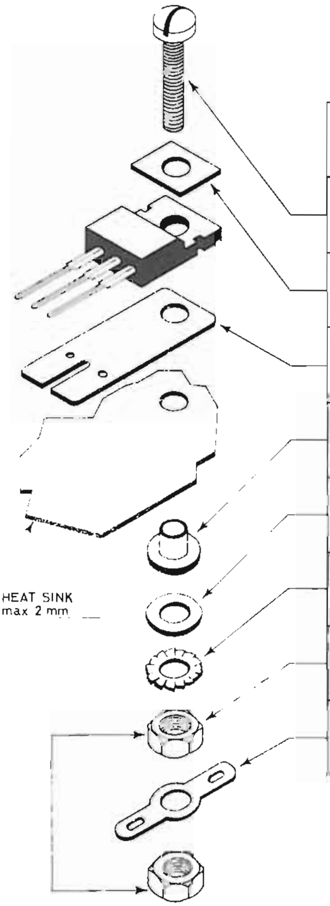
S-0340

TO-220AA



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER KIT 1	KIT 2	UNI-CODE	MATERIAL	MECH. DATA Page
CHEESE HEAD SCREW SLOTTED	1	NR 021 C		M3x14 UNI 242	STEEL NICKEL PLATED	
RECTANGULAR WASHER	1	NR 231 CTA			STEEL NICKEL PLATED	308
MICA WASHER	1	DF 103 CTB	DF 103 CTB		MICA	306
INSULATING BUSH	1	DF 03 C	DF 03 C		NYLON	304
WASHER	1	NR 024 B			STEEL NICKEL PLATED	307
LOCK WASHER	1	NR 026 A		3UNI 3703	STEEL NICKEL PLATED	
HEXAGON NUTS	2	NR 022 C		M3 UNI 5590	STEEL NICKEL PLATED	
SOLDER LUG	1	NR 023 B			BRASS TIN PLATED	306

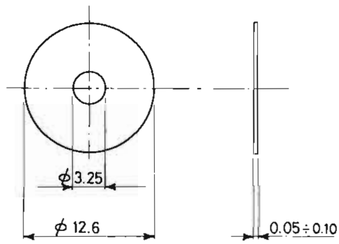
S-0387



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER KIT 1	KIT 2	UNI-CODE	MATERIAL	MECH. DATA Page
CHEESE HEAD SCREW SLOTTED	1	NR 021 C		M3x14 UNI 242	STEEL NICKEL PLATED	
RECTANGULAR WASHER	1	NR 231 CTA			STEEL NICKEL PLATED	308
MICA WASHER	1	DF 103 CTB	DF 103 CTB		MICA	306
INSULATING BUSH	1	DF 03 C	DF 03 C		NYLON	304
WASHER	1	NR 024 B			STEEL NICKEL PLATED	307
LOCK WASHER	1	NR 026 A		3 UNI 3703	STEEL NICKEL PLATED	
HEXAGON NUTS	2	NR 022 C		M3 UNI 5590	STEEL NICKEL PLATED	
SOLDER LUG	1	NR 023 B			BRASS TIN PLATED	306

S-0368

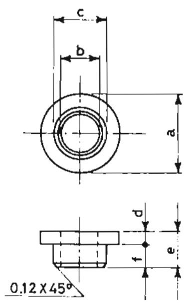
DF 02 A



A-0025

TYPE	MATERIAL	NOTE
DF 02 A	MICA	

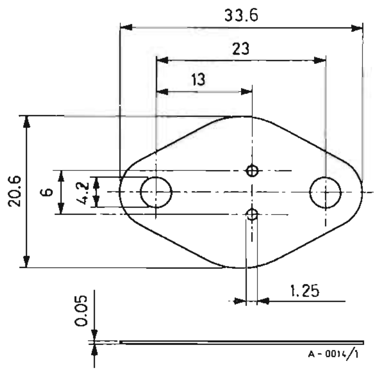
DF 03



A-0024

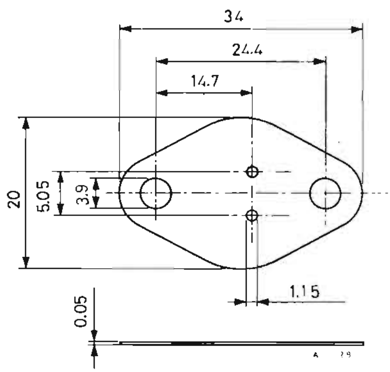
TYPE	MATERIAL	a	b	c	d	e		NOTE
DF 03 B	Nylon	8 max	4.1	5.6	1.1 max	1.6		
DF 03 C	Nylon	8 max	3.1	4.1	1.1 max	1.6		

DF 05 A



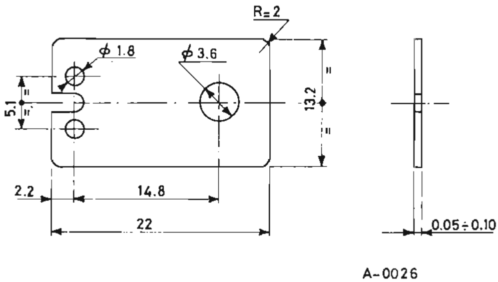
TYPE	MATERIAL	NOTE
DF 05 A	Mica ASTM D351-57T(V5)	-

DF 31 CTA



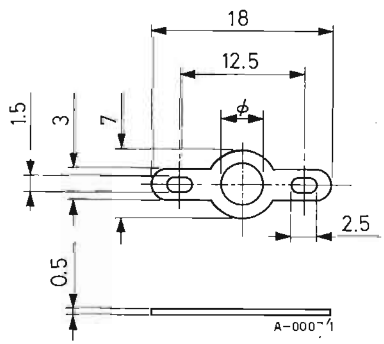
TYPE	MATERIAL	NOTE
DF 31CTA	Mica ASTM D351-57T (V5)	-

DF 103 CTB



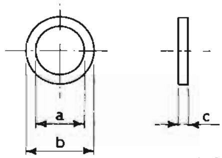
TYPE	MATERIAL	NOTE
DF 103 CTB	MICA	

NR 023



TYPE	MATERIAL	ϕ	NOTE
NR 023 A	Brass Tin plated	4.2	
NR 023 B	" "	3.2	

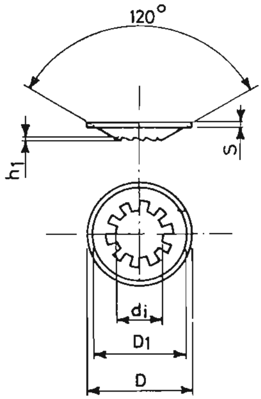
NR 024



A-0027

TYPE	MATERIAL	a	b	c	NOTE
NR 024 A	Steel nickel plated	4,10	6,5	1	
NR 024 B	" " "	3,10	5,3	1	

NR 026 E



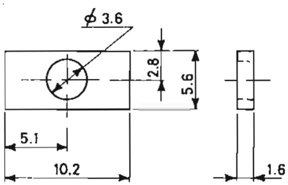
A-0022

TYPE	max di	min di	max D	min D	D_1	S	h_1	NOTE
NR 026 E	3.3	3.1	7.1	6.8	5.2	0.4	0.8	

MATERIAL: Steel nickel plated

ACCESSORIES

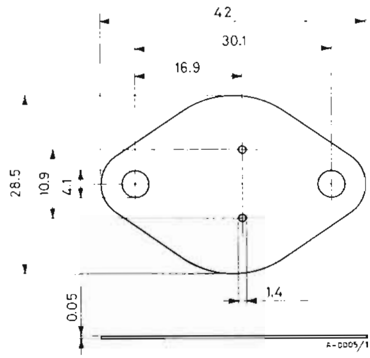
NR 231 CTA



A-0023

TYPE	MATERIAL	NOTE
NR 231 CTA	Steel nickel plated	

495320 CT 2



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