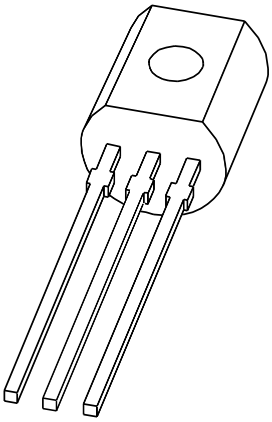
DATA SHEET



2N5550; 2N5551
NPN high-voltage transistors

Product specification
Supersedes data of 1997 Apr 09

1999 Apr 23

Philips
Semiconductors

PHILIPS

FEATURES

- Low current (max. 300 mA)
- High voltage (max. 160 V).

APPLICATIONS

- Switching and amplification in high voltage applications such as telephony.

DESCRIPTION

NPN high-voltage transistor in a TO-92; SOT54 plastic package. PNP complements: 2N5400 and 2N5401.

PINNING

PIN	DESCRIPTION
1	collector
2	base
3	emitter

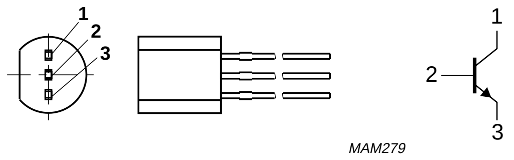


Fig.1 Simplified outline (TO-92; SOT54) and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter			
	2N5550		–	160	V
	2N5551		–	180	V
V_{CEO}	collector-emitter voltage	open base			
	2N5550		–	140	V
	2N5551		–	160	V
V_{EBO}	emitter-base voltage	open collector	–	6	V
I_C	collector current (DC)		–	300	mA
I_{CM}	peak collector current		–	600	mA
I_{BM}	peak base current		–	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	630	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	200	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current				
	2N5550	$I_E = 0$; $V_{CB} = 100$ V	–	100	nA
		$I_E = 0$; $V_{CB} = 100$ V; $T_{amb} = 100$ °C	–	100	μA
	collector cut-off current				
	2N5551	$I_E = 0$; $V_{CB} = 120$ V	–	50	nA
		$I_E = 0$; $V_{CB} = 120$ V; $T_{amb} = 100$ °C	–	50	μA
I_{EBO}	emitter cut-off current	$I_C = 0$; $V_{EB} = 4$ V	–	50	nA
h_{FE}	DC current gain	$I_C = 1$ mA; $V_{CE} = 5$ V; see Fig.2			
	2N5550		60	–	
	2N5551		80	–	
	DC current gain	$I_C = 10$ mA; $V_{CE} = 5$ V; see Fig.2			
	2N5550		60	250	
	2N5551		80	250	
	DC current gain	$I_C = 50$ mA; $V_{CE} = 5$ V; see Fig.2			
	2N5550		20	–	
	2N5551		30	–	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10$ mA; $I_B = 1$ mA	–	150	mV
	collector-emitter saturation voltage	$I_C = 50$ mA; $I_B = 5$ mA			
	2N5550		–	250	mV
	2N5551		–	200	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10$ mA; $I_B = 1$ mA	–	1	V
		$I_C = 50$ mA; $I_B = 5$ mA	–	1	V
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 10$ V; f = 1 MHz	–	6	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 0.5$ V; f = 1 MHz	–	30	pF
f_T	transition frequency	$I_C = 10$ mA; $V_{CE} = 10$ V; f = 100 MHz	100	300	MHz
F	noise figure	$I_C = 200$ μA; $V_{CE} = 5$ V; $R_S = 2$ kΩ; f = 10 Hz to 15.7 kHz			
	2N5550		–	10	dB
	2N5551		–	8	dB

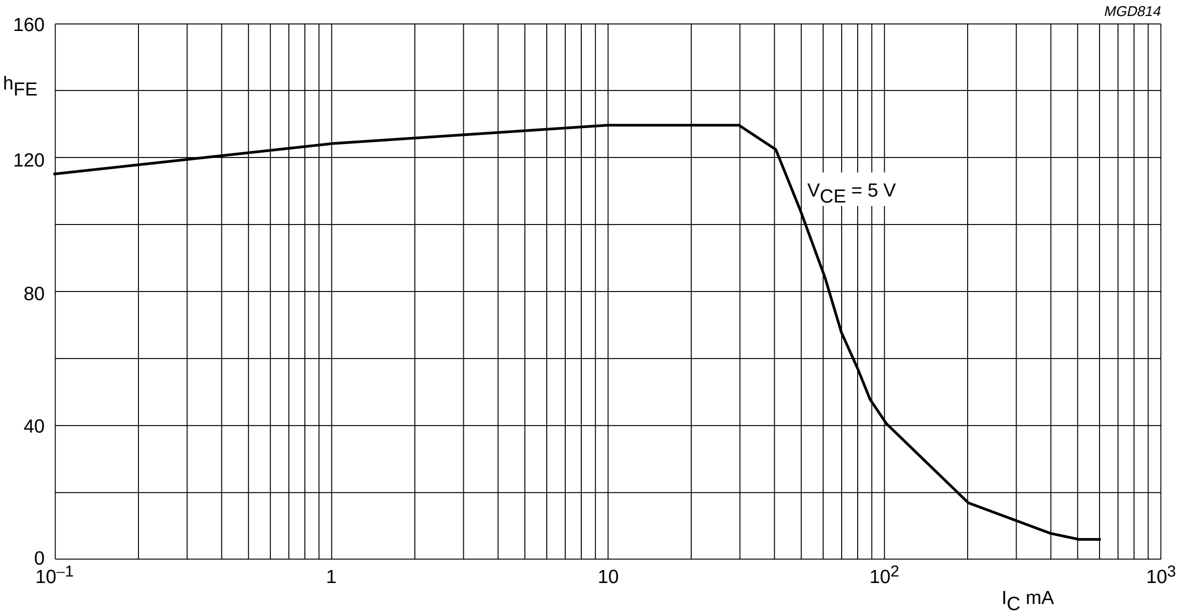
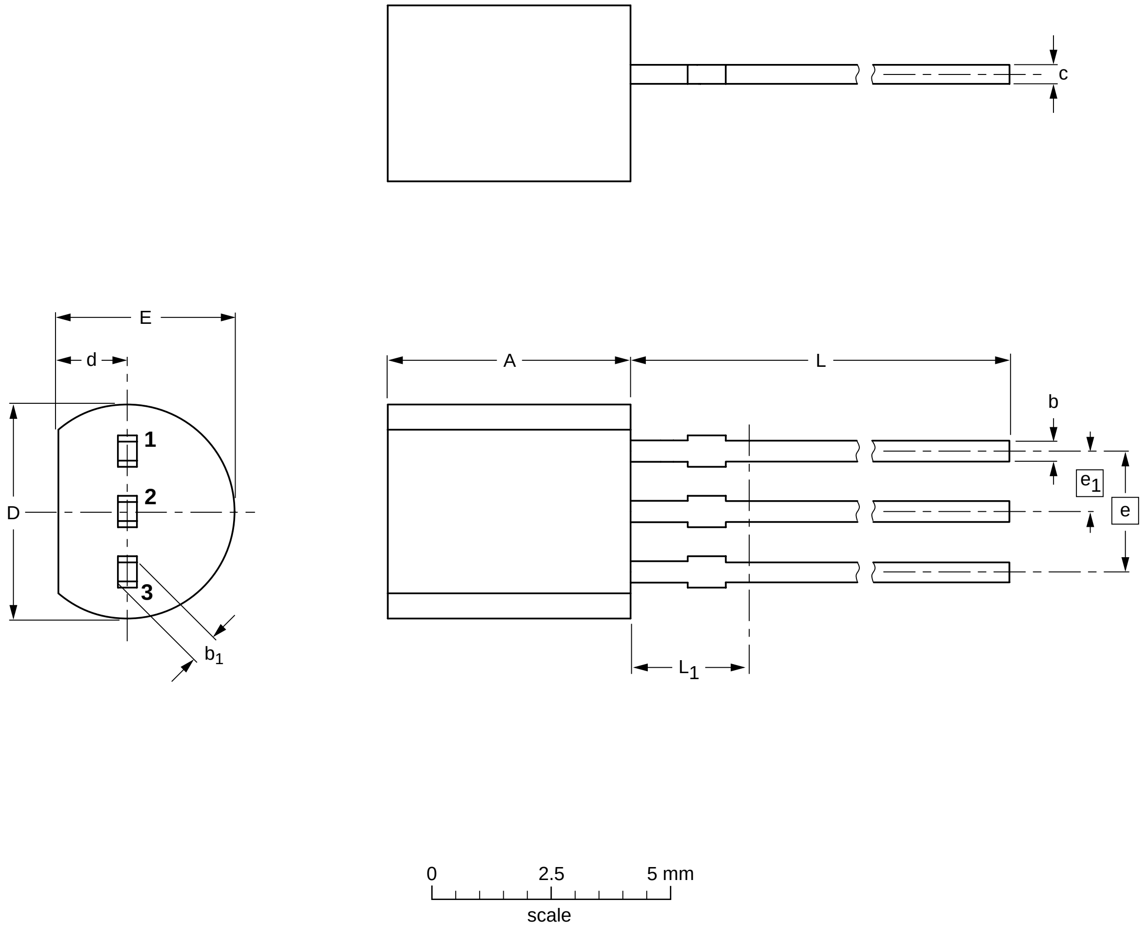


Fig.2 DC current gain; typical values.

PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	$L_1^{(1)}$
mm	5.2 5.0	0.48 0.40	0.66 0.56	0.45 0.40	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT54		TO-92	SC-43			97-02-28

2N5550, 2N5551

Preferred Device

Amplifier Transistors

NPN Silicon

Features

- These are Pb−Free Devices*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector − Emitter Voltage 2N5550 2N5551	V_{CEO}	 140 160	Vdc
Collector − Base Voltage 2N5550 2N5551	V_{CBO}	 160 180	Vdc
Emitter − Base Voltage	V_{EBO}	6.0	Vdc
Collector Current − Continuous	I_C	600	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.5 12	W mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	83.3	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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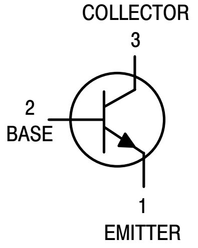
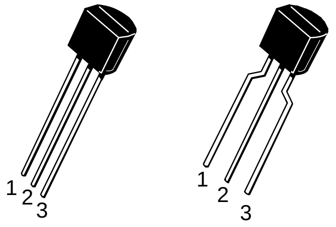


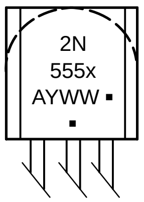
TO−92
CASE 29
STYLE 1



STRAIGHT LEAD
BULK PACK

BENT LEAD
TAPE & REEL
AMMO PACK

MARKING DIAGRAM



x = 0 or 1
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (Note 1)		$V_{(BR)CEO}$			
(I_C = 1.0 mAdc, I_B = 0)	2N5550		140	−	Vdc
	2N5551		160	−	
Collector−Base Breakdown Voltage		$V_{(BR)CBO}$			
(I_C = 100 μAdc, I_E = 0)	2N5550		160	−	Vdc
	2N5551		180	−	
Emitter−Base Breakdown Voltage		$V_{(BR)EBO}$			
(I_E = 10 μAdc, I_C = 0)			6.0	−	Vdc
Collector Cutoff Current		I_{CBO}			
(V_{CB} = 100 Vdc, I_E = 0)	2N5550		−	100	nAdc
(V_{CB} = 120 Vdc, I_E = 0)	2N5551		−	50	
(V_{CB} = 100 Vdc, I_E = 0, T_A = 100°C)	2N5550		−	100	μAdc
(V_{CB} = 120 Vdc, I_E = 0, T_A = 100°C)	2N5551		−	50	
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0)		I_{EBO}	−	50	nAdc
ON CHARACTERISTICS (Note 1)					
DC Current Gain		h_{FE}			
(I_C = 1.0 mAdc, V_{CE} = 5.0 Vdc)	2N5550		60	−	−
	2N5551		80	−	
(I_C = 10 mAdc, V_{CE} = 5.0 Vdc)	2N5550		60	250	
	2N5551		80	250	
(I_C = 50 mAdc, V_{CE} = 5.0 Vdc)	2N5550		20	−	
	2N5551		30	−	
Collector−Emitter Saturation Voltage		$V_{CE(sat)}$			
(I_C = 10 mAdc, I_B = 1.0 mAdc)	Both Types		−	0.15	Vdc
(I_C = 50 mAdc, I_B = 5.0 mAdc)	2N5550		−	0.25	
	2N5551		−	0.20	
Base−Emitter Saturation Voltage		$V_{BE(sat)}$			
(I_C = 10 mAdc, I_B = 1.0 mAdc)	Both Types		−	1.0	Vdc
(I_C = 50 mAdc, I_B = 5.0 mAdc)	2N5550		−	1.2	
	2N5551		−	1.0	
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain — Bandwidth Product (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)		f_T	100	300	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)		C_{obo}	−	6.0	pF
Input Capacitance		C_{ibo}			pF
(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	2N5550		−	30	
	2N5551		−	20	
Small−Signal Current Gain (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)		h_{fe}	50	200	−
Noise Figure		NF			dB
(I_C = 250 μAdc, V_{CE} = 5.0 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	2N5550		−	10	
	2N5551		−	8.0	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

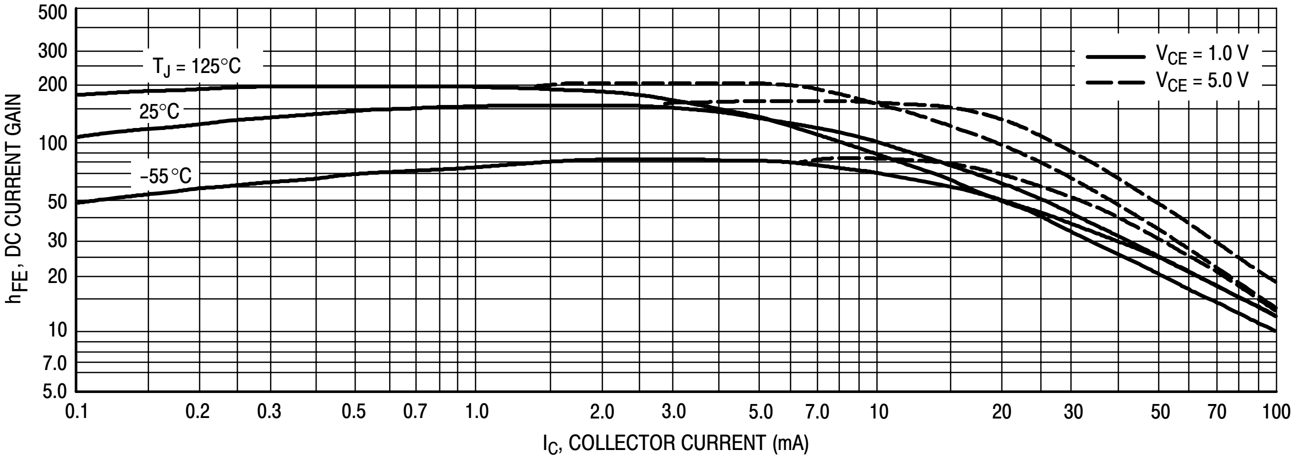


Figure 1. DC Current Gain

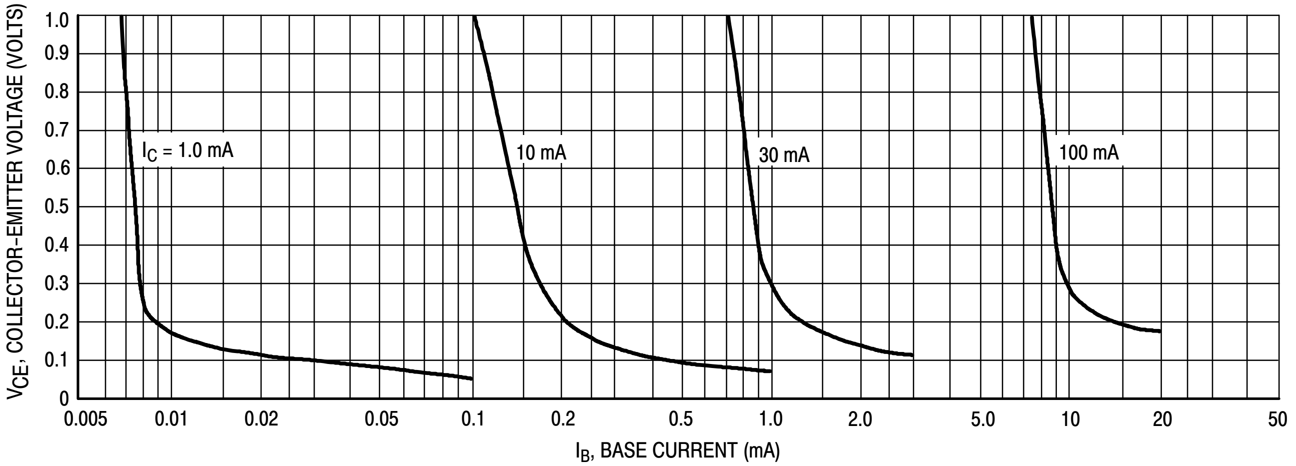


Figure 2. Collector Saturation Region

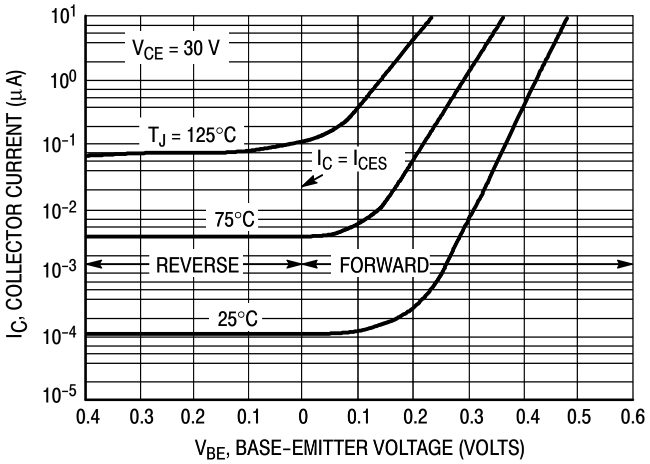


Figure 3. Collector Cut−Off Region

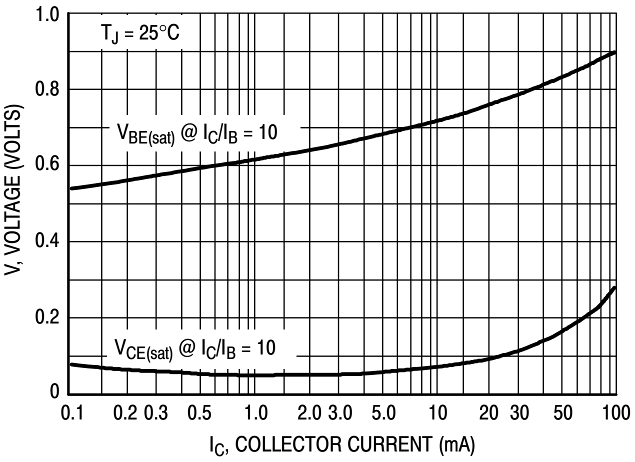


Figure 4. “On” Voltages

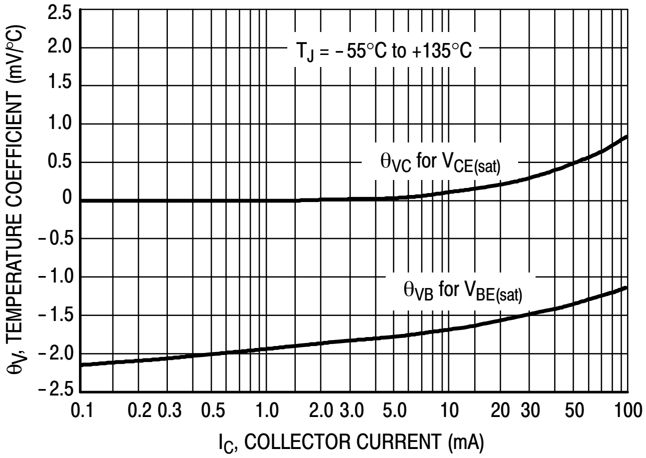
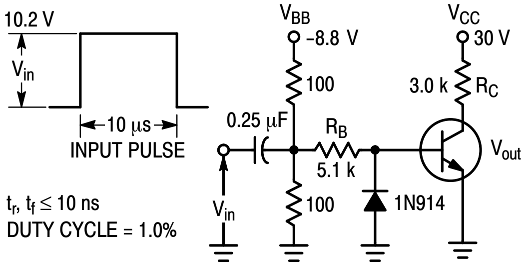


Figure 5. Temperature Coefficients



Values Shown are for I_C @ 10 mA

Figure 6. Switching Time Test Circuit

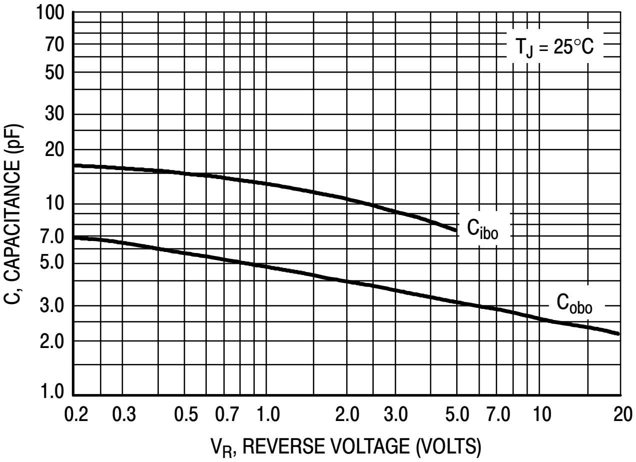


Figure 7. Capacitances

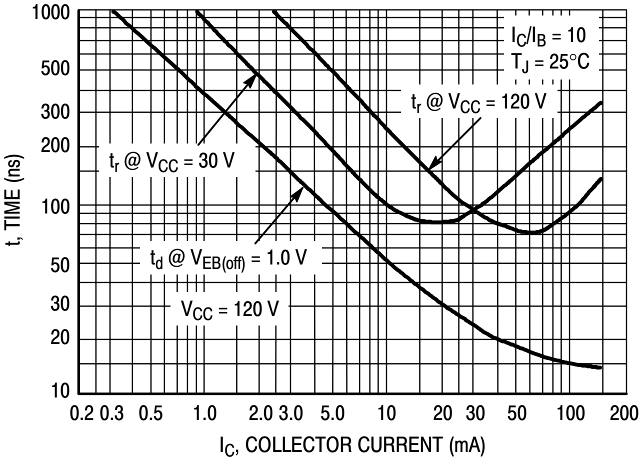


Figure 8. Turn−On Time

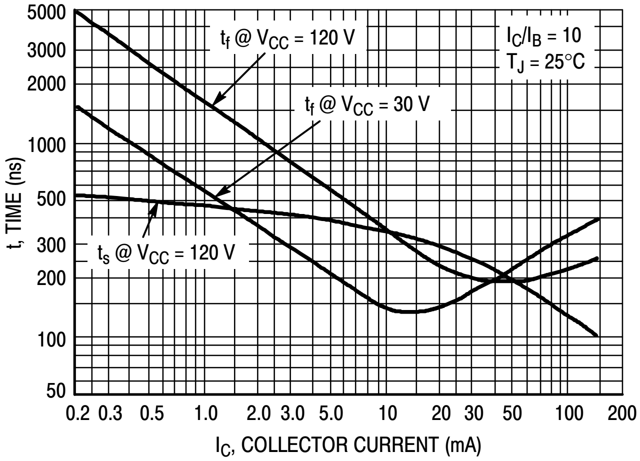


Figure 9. Turn−Off Time

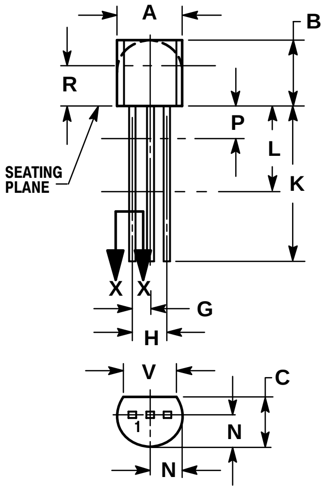
ORDERING INFORMATION

Device	Package	Shipping[†]
2N5550G	TO−92 (Pb−Free)	5000 Units / Bulk
2N5550RLRPG	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
2N5551G	TO−92 (Pb−Free)	5000 Units / Bulk
2N5551RL1G	TO−92 (Pb−Free)	2000 / Tape & Reel
2N5551RLRAG	TO−92 (Pb−Free)	
2N5551RLRPG	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
2N55551ZL1G	TO−92 (Pb−Free)	

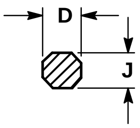
[†] For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO−92 (TO−226)
CASE 29−11
ISSUE AM



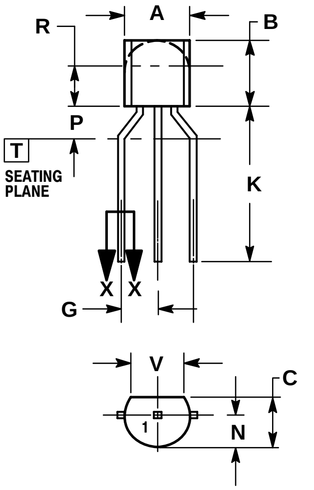
STRAIGHT LEAD
BULK PACK



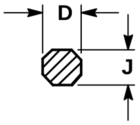
SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD
TAPE & REEL
AMMO PACK



SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	MILLIMETERS	
DIM	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

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