

SOT-23 Plastic-Encapsulate Transistors

S9013 TRANSISTOR (NPN)

FEATURES

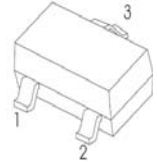
- High Collector Current.
- Complementary to S9012.
- Excellent h_{FE} Linearity.

MARKING: J3

MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-Base Voltage	40	V
V_{CEO}	Collector-Emitter Voltage	25	V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current	500	mA
P_C	Collector Power Dissipation	300	mW
$R_{\theta JA}$	Thermal Resistance From Junction To Ambient	416	$^\circ\text{C}/\text{W}$
T_j	Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature	-55~+150	$^\circ\text{C}$

SOT - 23



1. BASE
2. EMITTER
3. COLLECTOR

ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$ unless otherwise specified)

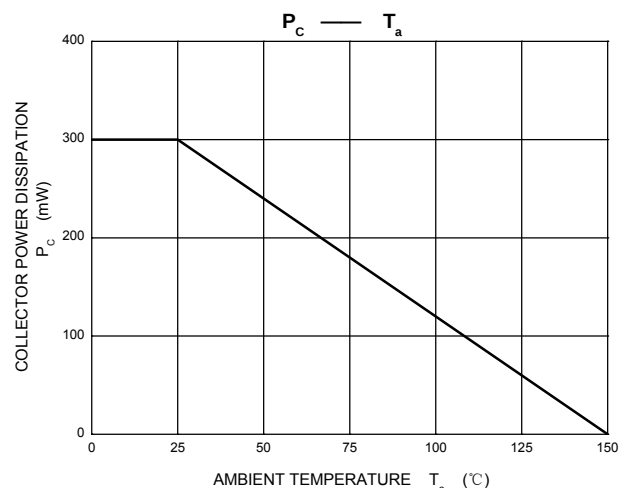
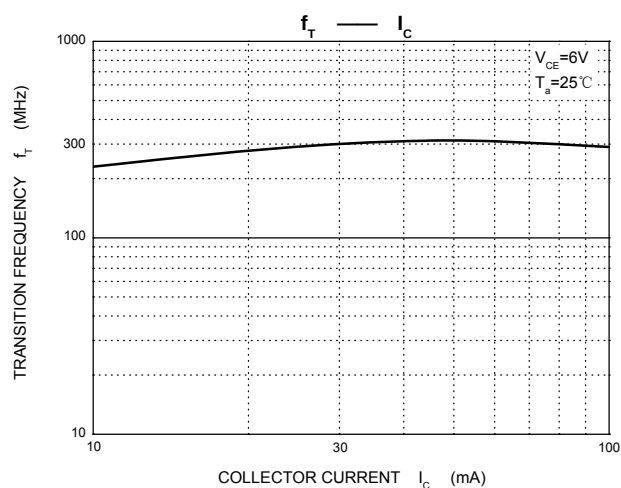
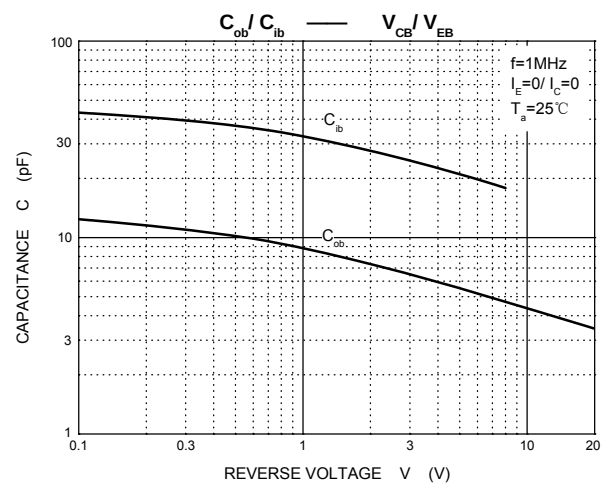
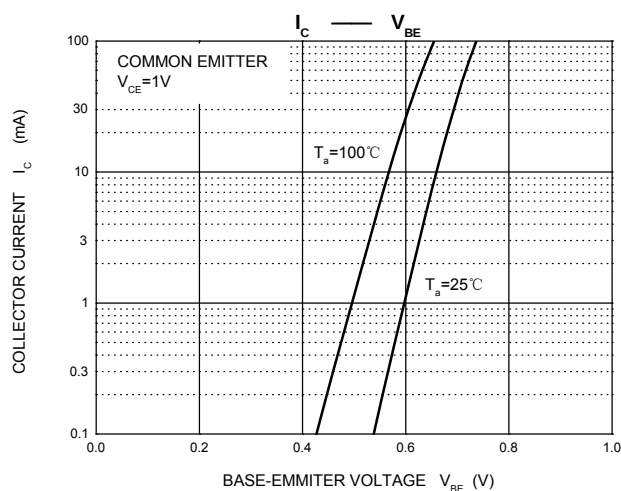
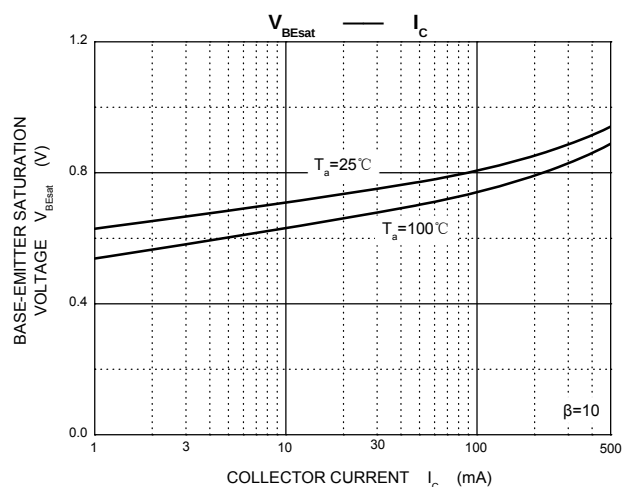
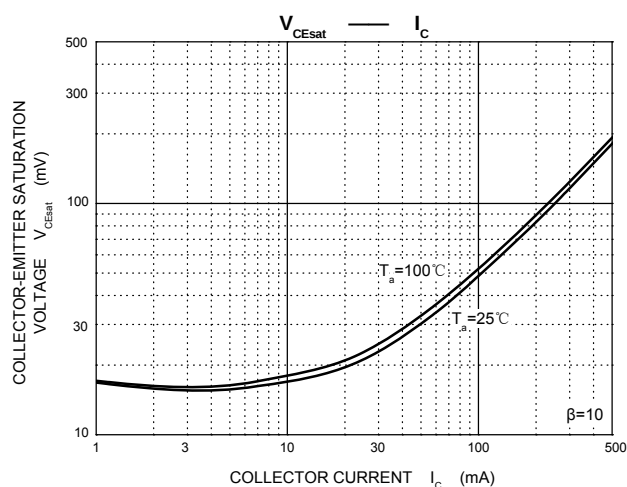
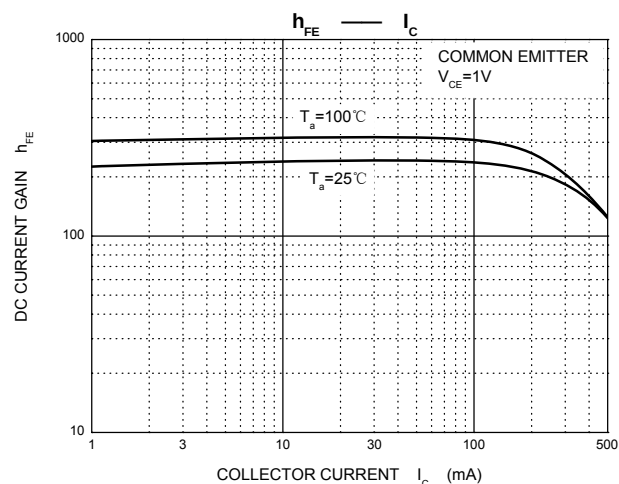
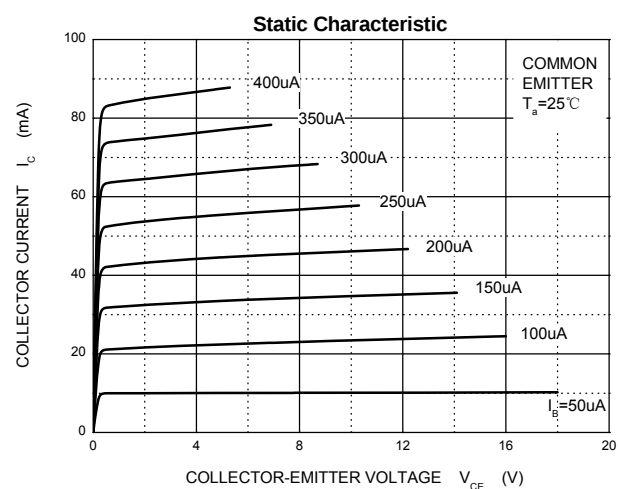
Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=0.1\text{mA}, I_E=0$	40			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C=1\text{mA}, I_B=0$	25			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=0.1\text{mA}, I_C=0$	5			V
Collector cut-off current	I_{CBO}	$V_{CB}=40\text{V}, I_E=0$			0.1	μA
Collector cut-off current	I_{CEO}	$V_{CE}=20\text{V}, I_B=0$			0.1	μA
Emitter cut-off current	I_{EBO}	$V_{EB}=5\text{V}, I_C=0$			0.1	μA
DC current gain	$h_{FE(1)}$	$V_{CE}=1\text{V}, I_C=50\text{mA}$	120		400	
	$h_{FE(2)}$	$V_{CE}=1\text{V}, I_C=500\text{mA}$	40			
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C=500\text{mA}, I_B=50\text{mA}$			0.6	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C=500\text{mA}, I_B=50\text{mA}$			1.2	V
Base-emitter voltage	V_{BE}	$V_{CB}=1\text{V}, I_C=10\text{mA}$			0.7	V
Transition frequency	f_T	$V_{CE}=6\text{V}, I_C=20\text{mA}, f=30\text{MHz}$	150			MHz
Collector output capacitance	C_{ob}	$V_{CB}=6\text{V}, I_E=0, f=1\text{MHz}$			8	pF

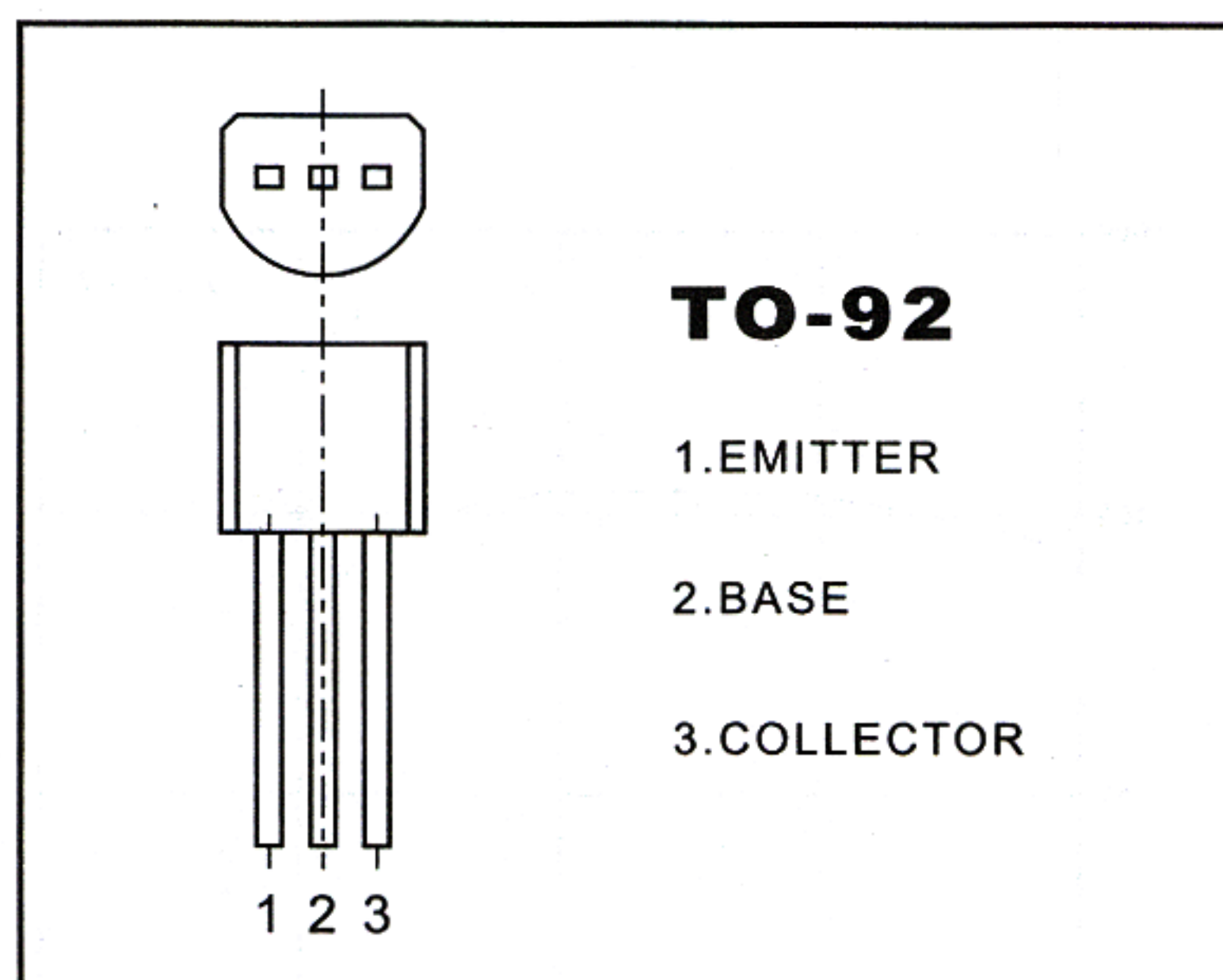
CLASSIFICATION OF $h_{FE(1)}$

RANK	L	H	J
RANGE	120-200	200-350	300-400

Typical Characteristics

S9013





FEATURES

Power dissipation

P_{CM} : 0.625W ($T_{amb}=25^{\circ}C$)

Collector current

I_{CM} : -0.5 A

Collector-base voltage

$V_{(BR)CBO}$: 40 V

Operating and storage junction temperature range

T_J, T_{stg} : $-55^{\circ}C$ to $+150^{\circ}C$

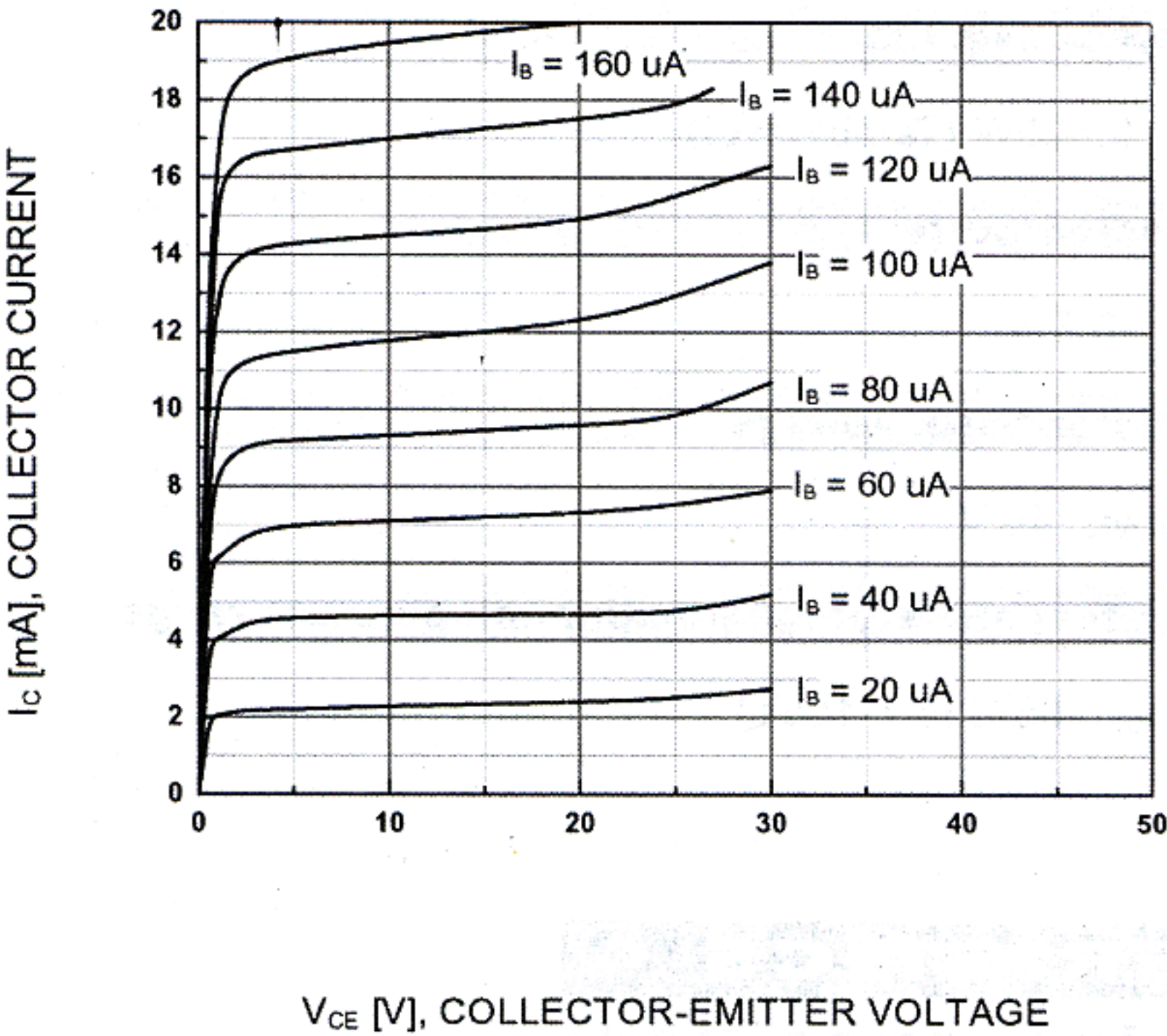
ELECTRICAL CHARACTERISTICS

($T_{amb}=25^{\circ}C$ unless otherwise specified)

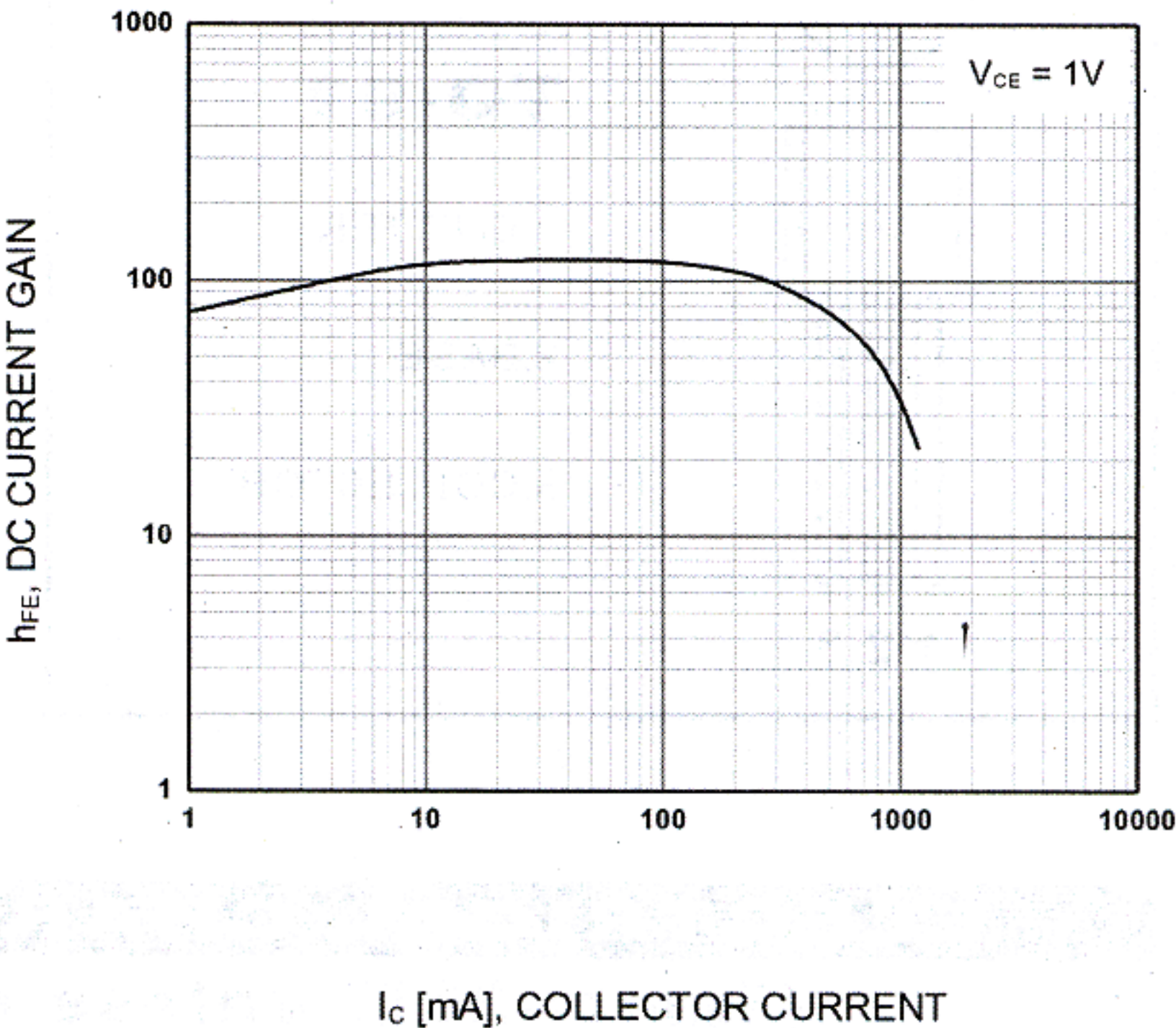
Parameter	Symbol	Test conditions	MIN	MAX	UNIT
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = 100 \mu A, I_E = 0$	45		V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.1 mA, I_B = 0$	25		V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 100 \mu A, I_C = 0$	5		V
Collector cut-off current	I_{CBO}	$V_{CB} = 40 V, I_E = 0$		0.1	μA
Collector cut-off current	I_{CEO}	$V_{CE} = 20 V, I_B = 0$		0.1	μA
Emitter cut-off current	I_{EBO}	$V_{EB} = 5 V, I_C = 0$		0.1	μA
DC current gain	$h_{FE(1)}$	$V_{CE} = 1 V, I_C = 50 mA$	64	300	
	$h_{FE(2)}$	$V_{CE} = 1 V, I_C = 500 mA$	40		
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 500 mA, I_B = 50 mA$		0.6	V
Base-emitter saturation voltage	V_{BEsat}	$I_C = 500 mA, I_B = 50 mA$		1.2	V
Base-emitter voltage	V_{BE}	$I_E = 100 mA$		1.4	V
Transition frequency	f_T	$V_{CE} = 6 V, I_C = -20 mA$ $f = 30 MHz$	150		MHz

CLASSIFICATION OF $h_{FE(1)}$

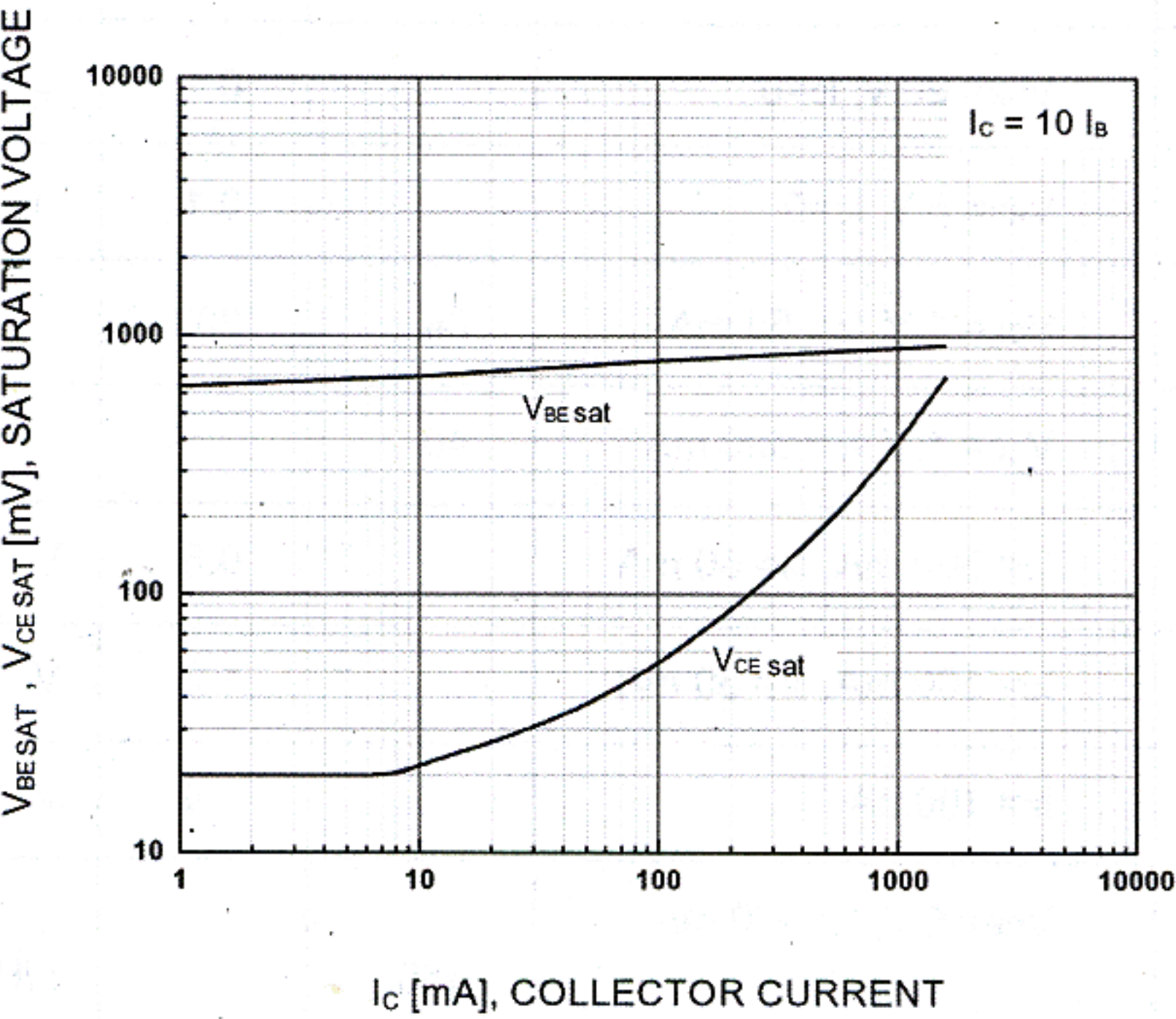
Rank	D	E	F	G	H	I
Range	64-91	78-112	96-135	112-166	144-202	190-300



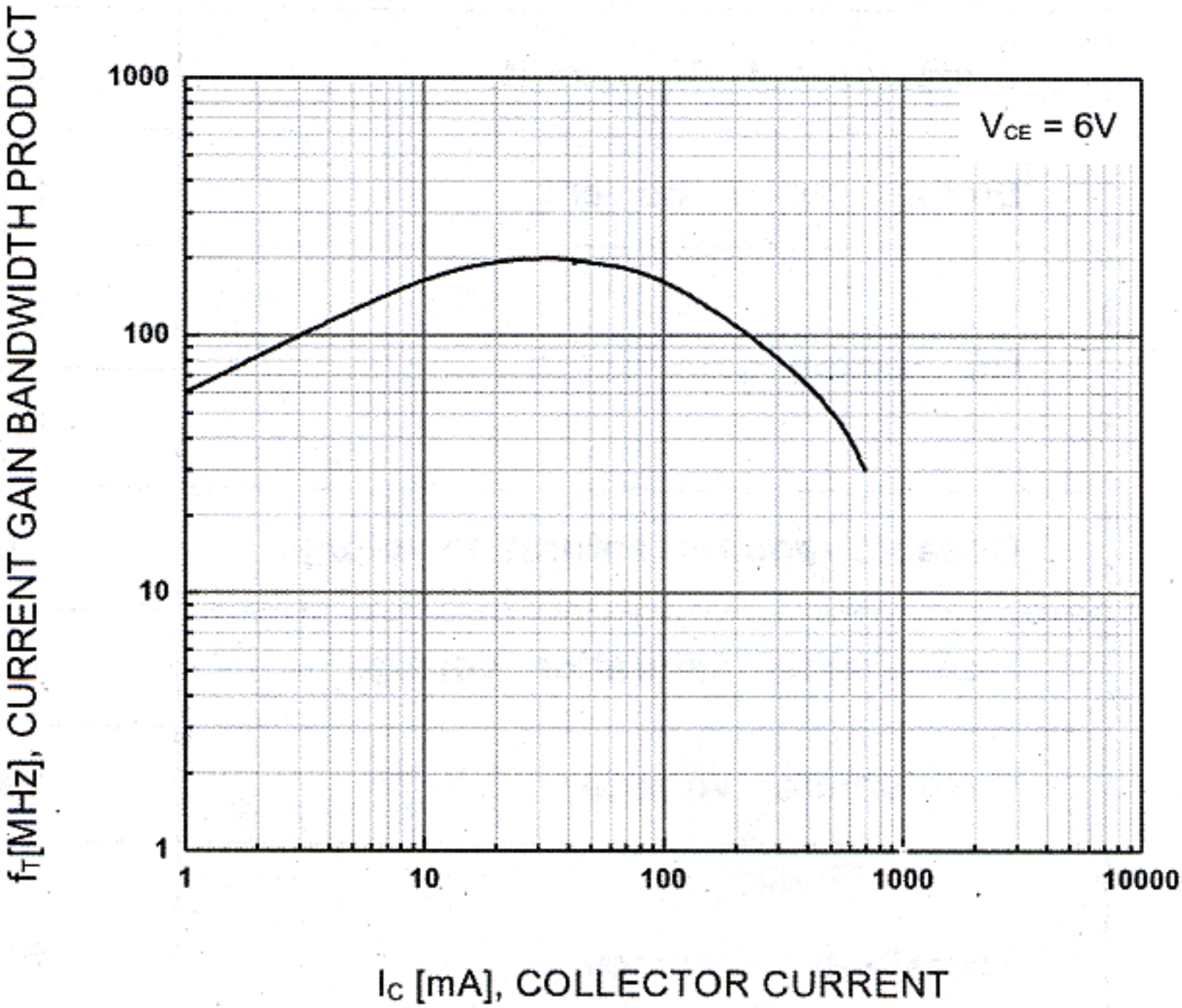
Static Characteristic



DC current Gain



Base-Emitter Saturation Voltage
Collector-Emitter Saturation Voltage



Current Gain Bandwidth Product



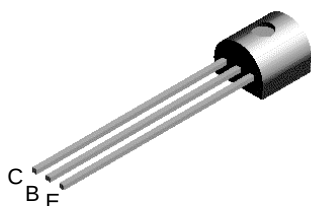
Micro Commercial Components
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S9013

Features

- TO-92 Plastic-Encapsulate Transistors
- Capable of 0.625Watts($T_{amb}=25^{\circ}\text{C}$) of Power Dissipation.
- Collector-current 0.5A
- Collector-base Voltage 40V
- Operating and storage junction temperature range: -55°C to $+150^{\circ}\text{C}$
- Marking Code: S9013

Pin Configuration



Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Max	Units
OFF CHARACTERISTICS				
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_C=100\mu\text{A}$, $I_E=0$)	40	---	Vdc
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage ($I_C=0.1\text{mA}$, $I_E=0$)	25	---	Vdc
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ($I_E=100\mu\text{A}$, $I_C=0$)	5.0	---	Vdc
I_{CBO}	Collector Cutoff Current ($V_{CB}=40\text{Vdc}$, $I_E=0$)	---	0.1	μA
I_{CEO}	Collector Cutoff Current ($V_{CE}=20\text{Vdc}$, $I_B=0$)	---	0.1	μA
I_{EBO}	Emitter Cutoff Current ($V_{EB}=5.0\text{Vdc}$, $I_C=0$)	---	0.1	μA

ON CHARACTERISTICS

$h_{FE(1)}$	DC Current Gain ($I_C=50\text{mA}$, $V_{CE}=1.0\text{Vdc}$)	64	300	---
$h_{FE(2)}$	DC Current Gain ($I_C=500\text{mA}$, $V_{CE}=1.0\text{Vdc}$)	40	---	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ($I_C=500\text{mA}$, $I_B=50\text{mA}$)	---	0.6	Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage ($I_C=500\text{mA}$, $I_B=50\text{mA}$)	---	1.2	Vdc
V_{EB}	Base- Emitter Voltage ($I_E=100\text{mA}$)	---	1.4	Vdc

SMALL-SIGNAL CHARACTERISTICS

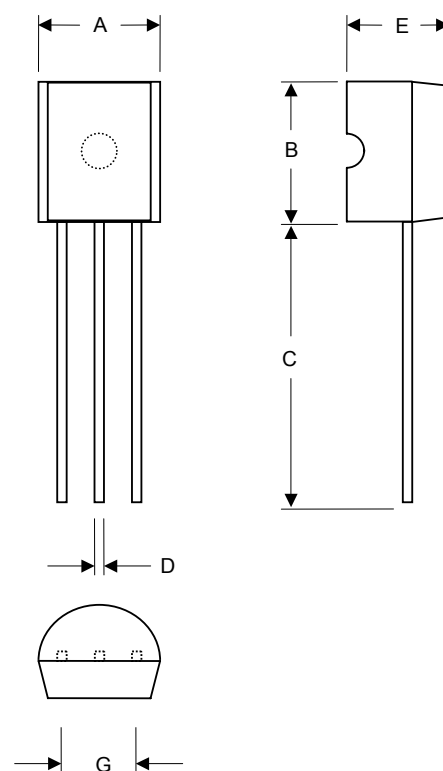
f_T	Transistor Frequency ($I_C=20\text{mA}$, $V_{CE}=6.0\text{Vdc}$, $f=30\text{MHz}$)	150	---	MHz
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CLASSIFICATION OF $h_{FE(1)}$

Rank	E	F	G	H	H1	I
Range	78-112	96-135	115-150	150-180	180-200	190-300

NPN Silicon Transistors

TO-92



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.175	.185	4.45	4.70	
B	.175	.185	4.46	4.70	
C	.500	---	12.7	---	
D	.016	.020	0.41	0.63	
E	.135	.145	3.43	3.68	
G	.095	.105	2.42	2.67	

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