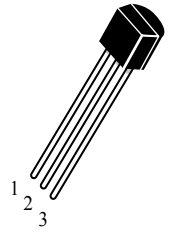


### NPN Transistors

 Lead(Pb)-Free

TO-92



1. EMITTER  
2. COLLECTOR  
3. BASE

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector-Base Voltage	$V_{CBO}$	60	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current-Continuous	$I_C$	150	mAdc
Total Device Dissipation $T_A=25^{\circ}\text{C}$	$P_D$	0.4	W
Junction Temperature	$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature	$T_{STG}$	-40 to + 150	$^{\circ}\text{C}$

### ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C=100\ \mu\text{Adc}$ , $I_B=0$ )	$V_{(BR)CEO}$	50	-	Vdc
Collector-Base Breakdown Voltage ( $I_C=1\ \text{mAdc}$ , $I_E=0$ )	$V_{(BR)CBO}$	60	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E=100\ \mu\text{Adc}$ , $I_C=0$ )	$V_{(BR)EBO}$	5.0	-	Vdc
Collector Cutoff Current ( $V_{CE}=60\ \text{Vdc}$ , $I_E=0$ )	$I_{CEO}$	-	0.1	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CB}=45\ \text{Vdc}$ , $I_E=0$ )	$I_{CBO}$	-	0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB}=5.0\ \text{Vdc}$ , $I_C=0$ )	$I_{EBO}$	-	0.1	$\mu\text{Adc}$

**ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continued)

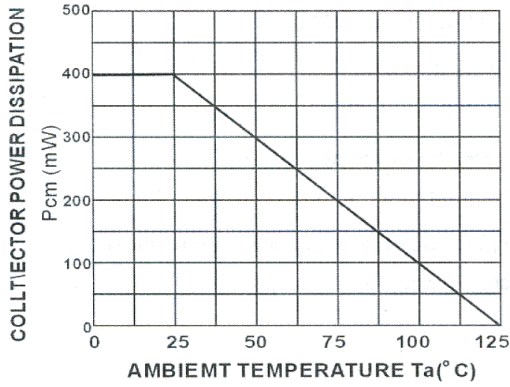
Characteristics	Symbol	Min	Typ	Max	Unit
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**ON CHARACTERISTICS**

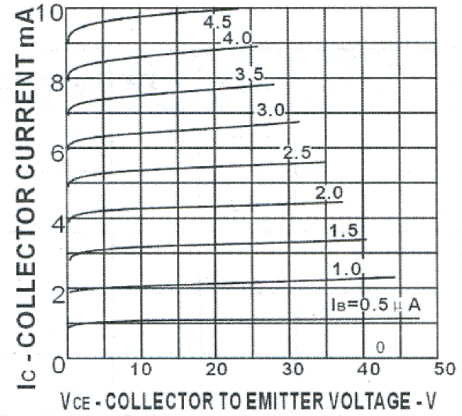
DC Current Gain $V_{CE}=6.0\text{V}$ , $I_C=1\text{mA}$ $V_{CE}=6.0\text{V}$ , $I_C=0.1\text{mA}$	$h_{FE1}$ $h_{FE2}$	70 40	-	700	-
Collector-Emitter Saturation Voltage $I_C=100\text{mA}$ , $I_B=10\text{mA}$	$V_{CE(sat)}$	-	-	0.3	V
Base-Emitter Voltage $I_C=100\text{mA}$ , $I_B=10\text{mA}$	$V_{BE(sat)}$	-	-	1.0	V
Transition Frequency $V_{CE} = 6\text{V}$ , $I_C = 10\text{mA}$ , $f = 30\text{MHz}$	$f_T$	200	-	-	MHz
Collector Output Capacitance $V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 1\text{MHz}$	$C_{ob}$	-	-	3.0	pF
Noise figure $V_{CE} = 6\text{V}$ , $I_C = 0.1\text{mA}$ , $R_g = 10\text{k}\Omega$ , $f = 1\text{KHz}$	NF	-	4.0	10	dB

**CLASSIFICATION OF  $h_{FE1}$** 

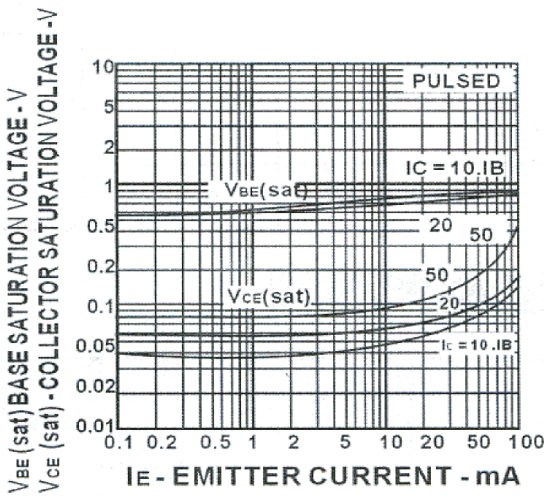
Rank	O	Y	GR	BL
Range	70-140	120-240	200-400	350-700



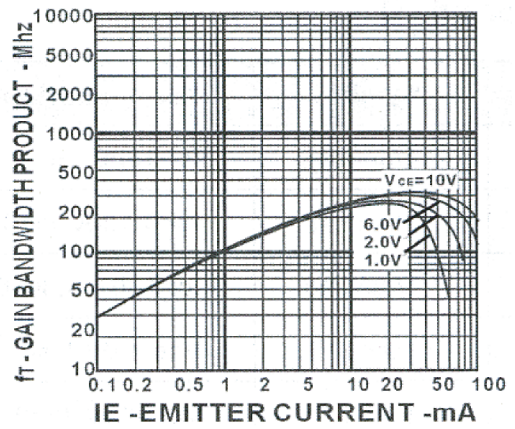
**FIG1. Total Power Dissipation vs Ambient Temperature**



**FIG.2 Collector Current vs Collector to Emitter Voltage**



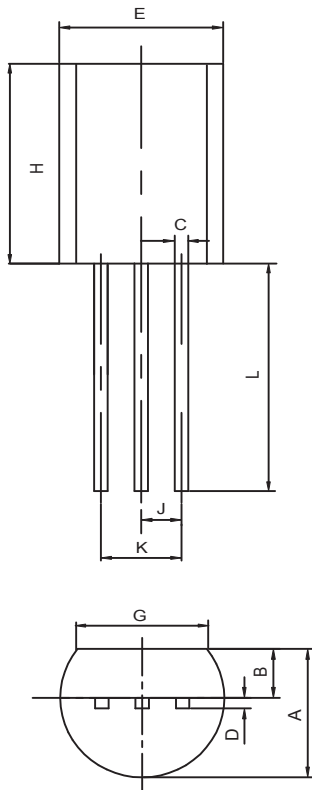
**FIG.3 Collector and Base Saturation Voltage vs Collector Current**



**FIG.4 Gain Bandwidth Product vs Emitter Current**

**TO-92 Outline Dimensions**

unit:mm



<b>TO-92</b>		
<b>Dim</b>	<b>Min</b>	<b>Max</b>
<b>A</b>	3.30	3.70
<b>B</b>	1.10	1.40
<b>C</b>	0.38	0.55
<b>D</b>	0.36	0.51
<b>E</b>	4.40	4.70
<b>G</b>	3.43	-
<b>H</b>	4.30	4.70
<b>J</b>	1.270TYP	
<b>K</b>	2.44	2.64
<b>L</b>	14.10	14.50