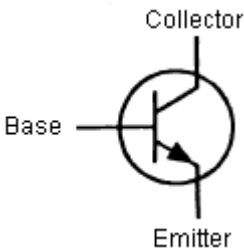


# NPN Bipolar Transistor

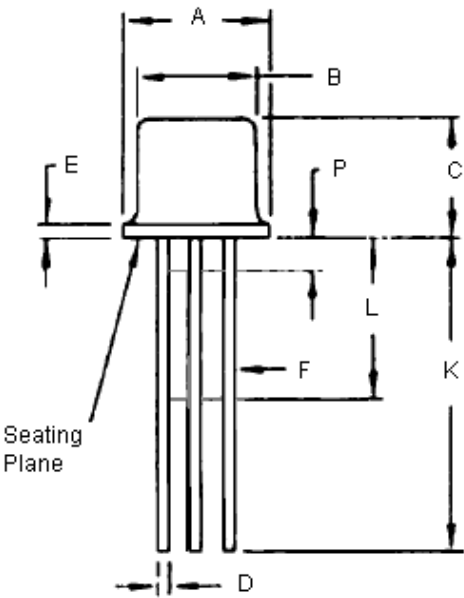


### Features:

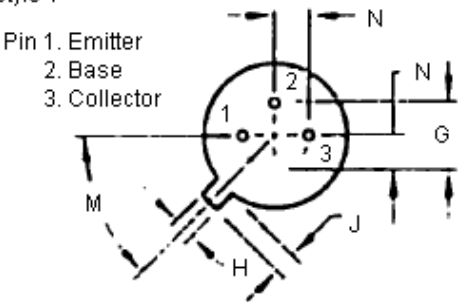
- Collector Emitter Breakdown Voltage :  $BV_{CEO} = 60\text{ V dc}$  (minimum) at  $I_C = 10\text{ mA dc}$
- DC Current Gain :  $1\text{ }\mu\text{A dc to } 10\text{ mA dc}$
- Current Gain Bandwidth Product :  $f_T = 100\text{ MHz}$  (Typical) at  $I_C = 500\text{ }\mu\text{A dc}$
- Low Noise Figure :  $NF = 8\text{ dB}$  (Typical) at  $I_C = 10\text{ }\mu\text{A dc}$ ,  $f = 100\text{ Hz}$



TO-18



Style 1



Dimension	Millimetres		Inches	
	Minimum	Maximum	Minimum	Maximum
A	5.31	5.84	0.209	0.23
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.17	0.21
D	0.406	0.533	0.016	0.021
E	-	0.762	-	0.03
F	0.406	0.483	0.016	0.019
G	2.54 BSC		0.1 BSC	
H	0.914	1.17	0.036	0.046
J	0.711	1.22	0.028	0.048
K	12.7	-	0.5	-
L	6.35	-	0.25	-
M	45° BSC		45° BSC	
N	1.27 BSC		0.05 BSC	
P	-	1.27	-	0.05



# NPN Bipolar Transistor



## Maximum Ratings

Rating	Symbol	Value	Unit
Collector Emitter Voltage	$V_{CEO}$	60	V dc
Collector Base Voltage	$V_{CB}$	60	V dc
Emitter Base Voltage	$V_{EB}$	6	V dc
Collector Current Continuous	$I_C$	50	mA dc
Total Power Dissipation at $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	360 2.06	mW mW/ $^\circ\text{C}$
Total Power Dissipation at $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.2 6.85	Watts mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$

## Thermal Characteristics

Characteristics	Symbol	Maximum	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA} (1)$	485	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	146	$^\circ\text{C/W}$
Lead Temperature 1/16 inches from Case for 10 s	$T_L$	300	$^\circ\text{C}$

(1)  $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board

## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Characteristic	Symbol	Minimum	Typical	Maximum	Unit
OFF Characteristic					
Collector Emitter Breakdown Voltage (1) ( $I_C = 10 \text{ mA dc}$ , $I_B = 0$ )	$BV_{CEO}$	60	-	-	V dc
Collector Base Breakdown Voltage ( $I_C = 10 \mu\text{A dc}$ , $I_E = 0$ )	$BV_{CBO}$	60	-	-	V dc
Emitter Base Breakdown Voltage ( $I_E = 10 \mu\text{A dc}$ , $I_C = 0$ )	$BV_{EBO}$	6	-	-	V dc
Collector Cut off Current ( $V_{CB} = 45 \text{ V dc}$ , $I_E = 0$ ) ( $V_{CB} = 45 \text{ V dc}$ , $I_E = 0$ , $T_A = 150^\circ\text{C}$ )	$I_{CBO}$	- -	- -	10 10	nA dc $\mu\text{A dc}$
Emitter Cut off Current ( $V_{BE} = 5 \text{ V dc}$ , $I_C = 0$ )	$I_{EBO}$	-	-	10	nA dc

# NPN Bipolar Transistor



## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

Characteristic	Symbol	Minimum	Typical	Maximum	Unit
<b>ON Characteristic</b>					
DC Current Gain	$h_{FE}$	-	-	-	-
( $I_C = 1\ \mu\text{A}$ dc, $V_{CE} = 5\ \text{V}$ dc) ( $I_C = 10\ \mu\text{A}$ dc, $V_{CE} = 5\ \text{V}$ dc)	-	30 100	190 250	- 500	-
( $I_C = 10\ \mu\text{A}$ dc, $V_{CE} = 5\ \text{V}$ dc, $T_A = 55^\circ\text{C}$ )	-	20	40	-	-
( $I_C = 100\ \mu\text{A}$ dc, $V_{CE} = 5\ \text{V}$ dc)	-	175	275	-	-
( $I_C = 500\ \mu\text{A}$ dc, $V_{CE} = 5\ \text{V}$ dc)	-	200	300	-	-
( $I_C = 1\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc)	-	250	350	-	-
( $I_C = 10\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc) (1)	-	-	400	800	-
Collector Emitter Saturation Voltage ( $I_C = 1\ \text{mA}$ dc, $I_B = 0.1\ \text{mA}$ dc)	$V_{CE(sat)}$	-	0.25	0.35	V dc
Base Emitter On Voltage ( $I_C = 0.1\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc)	$V_{BE(on)}$	0.5	0.65	0.7	V dc
<b>Dynamic Characteristics</b>					
Current Gain Bandwidth Product ( $I_C = 0.05\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc, $f = 5\ \text{MHz}$ ) ( $I_C = 0.5\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc, $f = 30\ \text{MHz}$ )	$f_T$	15 60	50 100	- -	MHz
Output Capacitance ( $V_{CB} = 5\ \text{V}$ dc, $I_E = 0$ , $f = 140\ \text{kHz}$ )	$C_{ob}$	-	3	6	pF
Input Capacitance ( $V_{BE} = 5\ \text{V}$ dc, $I_E = 0$ , $f = 140\ \text{kHz}$ )	$C_{ib}$	-	4	6	pF
Input Impedance ( $I_C = 1\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc, $f = 1\ \text{kHz}$ )	$h_{ie}$	3.5	-	24	$k\Omega$
Voltage Feedback Ratio ( $I_C = 1\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc, $f = 1\ \text{kHz}$ )	$h_{re}$	-	-	800	$\times 10^{-6}$
Small Signal Current Gain ( $I_C = 1\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc, $f = 1\ \text{kHz}$ )	$h_{fe}$	150	-	900	-
Output Admittance ( $I_C = 1\ \text{mA}$ dc, $V_{CE} = 5\ \text{V}$ dc, $f = 1\ \text{kHz}$ )	$h_{oe}$	-	-	40	$\mu\text{mhos}$

# NPN Bipolar Transistor



Electrical Characteristics (T <sub>A</sub> = 25°C Unless Otherwise Noted)					
Characteristic	Symbol	Minimum	Typical	Maximum	Unit
Dynamic Characteristics					
Noise Figure	NF	-	-	-	dB
(I <sub>C</sub> = 10 µA dc, V <sub>CE</sub> = 5 V dc, R <sub>S</sub> = 10 kΩ, f = 100 Hz, BW = 20 Hz)		-	8	10	
(I <sub>C</sub> = 10 µA dc, V <sub>CE</sub> = 5 V dc, R <sub>S</sub> = 10 kΩ, f = 1 kHz, BW = 200 Hz)		-	-	3	
(I <sub>C</sub> = 10 µA dc, V <sub>CE</sub> = 5 V dc, R <sub>S</sub> = 10 kΩ, f = 10 kHz, BW = 2 kHz)		-	-	2	
(I <sub>C</sub> = 10 µA dc, V <sub>CE</sub> = 5 V dc, R <sub>S</sub> = 10 kΩ, f = 10 Hz to 15.7 kHz, BW = 15.7 kHz)		-	-	3	

(1) Pulse Test : Pulse Width ≤ 300 µs, Duty Cycle ≤ 2%

## Part Number Table

Description	Part Number
NPN Bipolar Transistor	2N2484

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