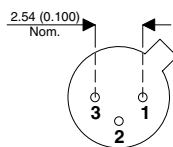
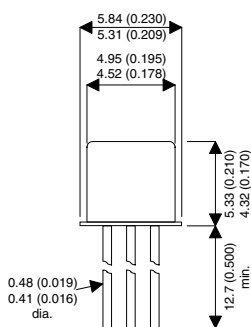


## NPN SILICON AMPLIFIER TRANSISTOR

### MECHANICAL DATA

Dimensions in mm (inches)



**TO18**

### FEATURES

- SILICON PLANAR EPITAXIAL NPN TRANSISTOR

PIN 1 = Emitter    PIN 2 = Base    PIN 3 = Collector

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise stated)

$V_{CBO}$	Collector – Base Voltage	60V
$V_{CEO}$	Collector – Emitter Voltage	60V
$V_{EBO}$	Emitter – Base Voltage	6V
$I_C$	Collector Current Continuous	50mA
$P_D$	Total Device Dissipation @ $T_A = 25^\circ\text{C}$	360mW
	Derate above $25^\circ\text{C}$	2.06mW / $^\circ\text{C}$
$P_D$	Total Device Dissipation @ $T_C = 25^\circ\text{C}$	1.2W
	Derate above $25^\circ\text{C}$	6.85mW / $^\circ\text{C}$
$T_{STG}, T_J$	Operating and Storage Temperature Range	-65 to +200 $^\circ\text{C}$

Semelab Plc reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by Semelab is believed to be both accurate and reliable at the time of going to press. However Semelab assumes no responsibility for any errors or omissions discovered in its use. Semelab encourages customers to verify that datasheets are current before placing orders.

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

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>OFF CHARACTERISTICS</b>					
$V_{(BR)CBO}^*$ Collector – Base Breakdown Voltage	$I_C = 10\mu\text{A}$ $I_B = 0$	60			V
$V_{(BR)CEO}$ Collector – Emitter Breakdown Voltage	$I_C = 10\text{mA}$ $I_E = 0$	60			
$V_{(BR)EBO}$ Emitter – Base Breakdown Voltage	$I_E = 10\mu\text{A}$ $I_C = 0$	6			
$I_{CBO}$ Collector Cut-off Current	$V_{CB} = 45\text{V}$ $I_E = 0$ $T_A = 150^\circ\text{C}$			10	nA
				10	$\mu\text{A}$
$I_{EBO}$ Emitter Cut-off Current	$V_{BE} = 5\text{V}$ $I_C = 0$			10	nA
<b>ON CHARACTERISTICS</b>					
$V_{CE(sat)}$ Collector – Emitter Saturation Voltage	$I_C = 1\text{mA}$ $I_B = 0.1\text{mA}$		0.25	0.35	V
$V_{BE(on)}$ Base – Emitter On Voltage	$I_C = 0.1\text{mA}$ $V_{CE} = 5\text{V}$	0.5	0.65	0.7	V
$h_{FE}$ DC Current Gain	$I_C = 1\mu\text{A}$ $V_{CE} = 5\text{V}$ $I_C = 10\mu\text{A}$ $V_{CE} = 5\text{V}$ $T_A = 55^\circ\text{C}$	30	190		—
		100	250	500	
	20	40			
	$I_C = 100\mu\text{A}$ $V_{CE} = 5\text{V}$	175	275		
	$I_C = 500\mu\text{A}$ $V_{CE} = 5\text{V}$	200	300		
	$I_C = 1\text{mA}$ $V_{CE} = 5\text{V}$ $I_C = 10\text{mA}$ $V_{CE} = 5\text{V}$	250	350	400	
<b>SMALL SIGNAL CHARACTERISTICS</b>					
$f_T$ Current Gain Bandwidth Product	$I_C = 0.05\text{mA}$ $V_{CE} = 5\text{V}$ $f = 5\text{MHz}$ $I_C = 0.05\text{mA}$ $V_{CE} = 5\text{V}$ $f = 30\text{MHz}$	15	50		MHz
		60	100		
$C_{obo}$ Output Capacitance	$V_{CB} = 5\text{V}$ $I_E = 0$		3	6	pF
$C_{ibo}$ Input Capacitance	$f = 140\text{KHz}$ $I_C = 0.5\text{mA}$		4	6	
$h_{ie}$ Input Impedance		3.5		24	k $\Omega$
$h_{re}$ Voltage Feedback Ratio	$I_C = 1.0\text{mA}$ $V_{CE} = 5\text{V}$			800	$\times 10^{-6}$
$h_{fe}$ Small Signal Current Gain	$f = 1.0\text{KHz}$	150		900	—
$h_{oe}$ Small Signal Current Gain				40	$\mu\text{mhos}$

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

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>SMALL SIGNAL CHARACTERISTICS</b>					
$N_F$ Noise Figure	$I_C = 10\mu\text{A}$ $V_{CE} = 5\text{V}$ $RS = 10\text{K}\Omega$ $f = 100\text{Hz}$ $BW = 20\text{Hz}$		8.0	10	dB
	$I_C = 10\mu\text{A}$ $V_{CE} = 5\text{V}$ $RS = 10\text{K}\Omega$ $f = 1.0\text{kHz}$ $BW = 200\text{Hz}$			3.0	
	$I_C = 10\mu\text{A}$ $V_{CE} = 5\text{V}$ $RS = 10\text{K}\Omega$ $f = 10\text{kHz}$ $BW = 2.0\text{kHz}$			2.0	
	$I_C = 10\mu\text{A}$ $V_{CE} = 5\text{V}$ $RS = 10\text{K}\Omega$ $f = 10\text{Hz to } 15.7\text{kHz}$ $BW = 15.7\text{kHz}$			3.0	

**THERMAL CHARACTERISTICS**

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{\theta JC}$ Thermal Resistance, Junction to Case				146	$^\circ\text{C/W}$
$R_{\theta JA(1)}$ Thermal Resistance, Junction to Case				485	
$T_L$ Lead Temperature 1/16 from Case for 10 seconds				300	$^\circ\text{C}$

\* Pulse Test:  $t_p \leq 300\mu\text{s}$ ,  $\delta \leq 2\%$ .