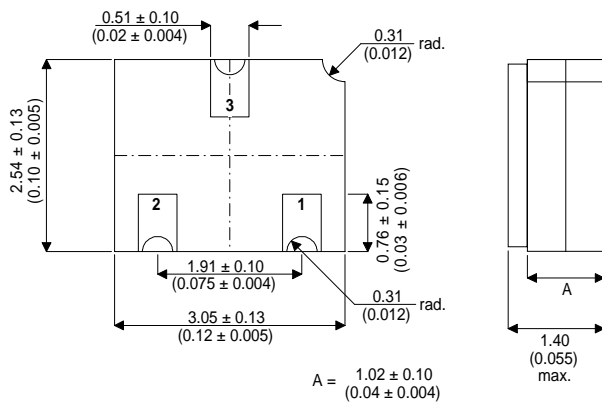


**GENERAL PURPOSE  
NPN TRANSISTOR IN A  
HERMETICALLY SEALED  
CERAMIC SURFACE MOUNT PACKAGE  
FOR HIGH RELIABILITY APPLICATIONS**

**MECHANICAL DATA**  
Dimensions in mm (inches)



**SOT23 CERAMIC  
(LCC1 PACKAGE)**

**Underside View**

PAD 1 – Base    PAD 2 – Emitter    PAD 3 – Collector

**FEATURES**

- SILICON PLANAR EPITAXIAL NPN TRANSISTOR
- HERMETIC CERAMIC SURFACE MOUNT PACKAGE (SOT23 COMPATIBLE)
- CECC SCREENING OPTIONS
- SPACE QUALITY LEVELS OPTIONS
- HIGH SPEED SATURATED SWITCHING

**APPLICATIONS:**

Hermetically sealed surface mount version of the popular 2N3904 for high reliability / space applications requiring small size and low weight devices.

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

$V_{CBO}$	Collector – Base Voltage	60V
$V_{CEO}$	Collector – Emitter Voltage	40V
$V_{EBO}$	Emitter – Base Voltage	6V
$I_C$	Collector Current	200mA
$P_D$	Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	500mW 2.86mW / °C
$R_{\theta JA}$	Thermal Resistance Junction – Ambient	350°C/W
$T_{STG}, T_J$	Operating and Storage Temperature Range	-55 to +200°C

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

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CEO}^*$ Collector – Emitter Breakdown Voltage	$I_C = 1\text{mA}$ $I_B = 0$	40			V
$V_{(BR)CBO}$ Collector – Base Breakdown Voltage	$I_C = 10\mu\text{A}$ $I_E = 0$	60			
$V_{(BR)EBO}$ Emitter – Base Breakdown Voltage	$I_E = 10\mu\text{A}$ $I_C = 0$	6			
$I_{CEX}$ Collector – Emitter Cut-off Current	$V_{CE} = 30\text{V}$ $V_{EB} = 3\text{V}$			50	nA
$V_{CE(sat)}$ Collector – Emitter Saturation Voltage	$I_C = 10\text{mA}$ $I_B = 1\text{mA}$			0.2	V
	$I_C = 50\text{mA}$ $I_B = 5\text{mA}$			0.3	
$V_{BE(sat)}^*$ Base – Emitter Saturation Voltage	$I_C = 10\text{mA}$ $I_B = 1\text{mA}$	0.65		0.85	V
	$I_C = 50\text{mA}$ $I_B = 5\text{mA}$			0.95	
$h_{FE}^*$ DC Current Gain	$V_{CE} = 1\text{V}$	$I_C = 0.1\text{mA}$	40		—
		$I_C = 1\text{mA}$	70		
		$I_C = 10\text{mA}$	100	300	
		$I_C = 50\text{mA}$	60		
		$I_C = 100\text{mA}$	30		

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

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

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$f_t$ Current Gain Bandwidth Product	$V_{CE} = 20\text{V}$ $I_C = 10\text{mA}$ $f = 100\text{MHz}$	300			MHz
$C_{ob}$ Output Capacitance	$V_{CB} = 5\text{V}$ $I_E = 0$ $f = 1\text{MHz}$			4	pF
$C_{ib}$ Input Capacitance	$V_{BE} = 0.5\text{V}$ $I_C = 0$ $f = 1\text{MHz}$			8	pF
$h_{ie}$ Input Impedance	$V_{CE} = 10\text{V}$ $I_C = 1\text{mA}$ $f = 1\text{kHz}$	1		10	k $\Omega$
$h_{oe}$ Output Admittance		1		40	$\mu\text{mhos}$
$h_{re}$ Voltage Feedback Ratio		0.5		8	$\times 10^{-4}$
$h_{fe}$ Small Signal Current Gain		100		400	—
$N_F$ Noise Figure		$V_{CE} = 5\text{V}$ $I_C = 100\mu\text{A}$ $f = 1\text{kHz}$ $R_S = 1\text{k}\Omega$			5

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

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_d$ Delay Time	$V_{CC} = 3\text{V}$ $V_{BE} = 0.5\text{V}$			35	ns
$t_r$ Rise Time	$I_C = 10\text{mA}$ $I_{B1} = 1\text{mA}$			35	
$t_s$ Storage Time	$V_{CC} = 3\text{V}$ $V_{BE} = 0.5\text{V}$			200	
$t_f$ Fall Time	$I_{B1} = I_{B2} = 1\text{mA}$			50	