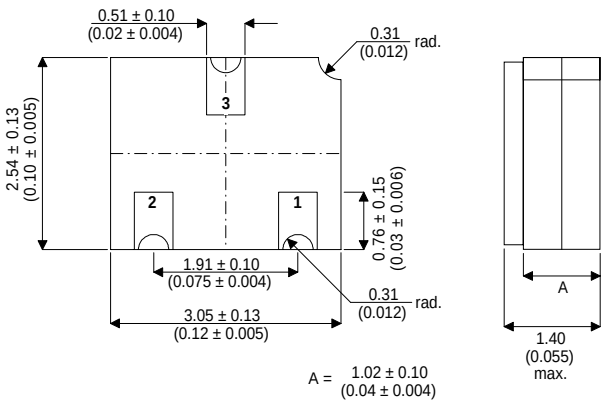
2N3904CSM

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°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°C	500mW
		Derate above 25°C	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

SEME LAB

2N3904CSM

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise stated)

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

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

SMALL SIGNAL CHARACTERISTICS (T_A = 25°C unless otherwise stated)

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

SWITCHING CHARACTERISTICS (T_A = 25°C unless otherwise stated)

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