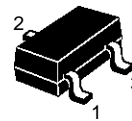


## SMALL SIGNAL NPN TRANSISTORS

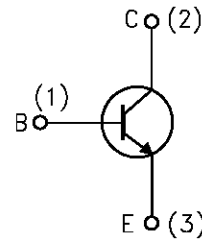
Type	Marking
SO2222	N13
SO2222A	N20

- SILICON EPITAXIAL PLANAR NPN TRANSISTORS
- MINIATURE PLASTIC PACKAGE FOR APPLICATION IN SURFACE MOUNTING CIRCUITS
- MEDIUM CURRENT AF AMPLIFICATION AND SWITCHING
- PNP COMPLEMENTS ARE RESPECTIVELY SO2907 AND SO2907A



**SOT-23**

### INTERNAL SCHEMATIC DIAGRAM



SC08960

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		SO2222	SO2222A	
$V_{CE0}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	60	75	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	30	40	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	5	6	V
$I_{CM}$	Collector Peak Current	0.8		A
$P_{tot}$	Total Dissipation at $T_c = 25^\circ\text{C}$	350		mW
$T_{stg}$	Storage Temperature	-65 to 150		$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150		$^\circ\text{C}$

## SO2222/SO2222A

### THERMAL DATA

$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	350	$^{\circ}\text{C/W}$
$R_{thj-SR}$	Thermal Resistance Junction-Substrate	Max	290	$^{\circ}\text{C/W}$

• Mounted on a ceramic substrate area = 15 x 15 x 0.6 mm

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CEX}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 60\text{ V}$ $V_{BE} = -3\text{ V}$ for <b>SO2222A</b>			10	nA
$I_{BEX}$	Base Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 60\text{ V}$ $V_{BE} = -3\text{ V}$ for <b>SO2222A</b>			20	nA
$I_{CBO}$	Collector Cut-off Current ( $I_E = 0$ )	$V_{CB} = \text{rated } V_{CBO}$ $V_{CB} = \text{rated } V_{CBO}$ $T_j = 150^{\circ}\text{C}$			10 10	nA $\mu\text{A}$
$I_{EBO}$	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 3\text{ V}$ for <b>SO2222</b> for <b>SO2222A</b>			30 15	nA nA
$V_{(BR)CEO}^*$	Collector-Emitter Breakdown Voltage ( $I_B = 0$ )	$I_C = 10\text{ mA}$ for <b>SO2222</b> for <b>SO2222A</b>	30 40			V V
$V_{(BR)CBO}^*$	Collector-Base Breakdown Voltage ( $I_B = 0$ )	$I_C = 10\text{ }\mu\text{A}$ for <b>SO2222</b> for <b>SO2222A</b>	60 75			V V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ( $I_C = 0$ )	$I_E = 10\text{ }\mu\text{A}$ for <b>SO2222</b> for <b>SO2222A</b>	5 6			V V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ for <b>SO2222</b> for <b>SO2222A</b> $I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$ for <b>SO2222</b> for <b>SO2222A</b>			0.4 0.3 1.6 1	V V V V
$V_{BE(sat)}^*$	Collector-Base Saturation Voltage	$I_C = 150\text{ mA}$ $I_B = 15\text{ mA}$ for <b>SO2222</b> for <b>SO2222A</b> $I_C = 500\text{ mA}$ $I_B = 50\text{ mA}$ for <b>SO2222</b> for <b>SO2222A</b>	0.6		1.3 1.2 2.6 2	V V V V
$h_{FE}^*$	DC Current Gain	$I_C = 0.1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 1\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 10\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 10\text{ V}$ $I_C = 150\text{ mA}$ $V_{CE} = 1\text{ V}$ $I_C = 500\text{ mA}$ $V_{CE} = 10\text{ V}$ for <b>SO2222</b> for <b>SO2222A</b>	35 50 75 100 50 30 40		300	
$f_T$	Transition Frequency	$I_C = 20\text{ mA}$ $V_{CE} = 20\text{ V}$ $f = 100\text{ MHz}$ for <b>SO2222</b> for <b>SO2222A</b>	250 300			MHz MHz
$C_{CB}$	Collector Base Capacitance	$I_E = 0$ $V_{CB} = 10\text{ V}$ $f = 1\text{ MHz}$			8	pF

\* Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$

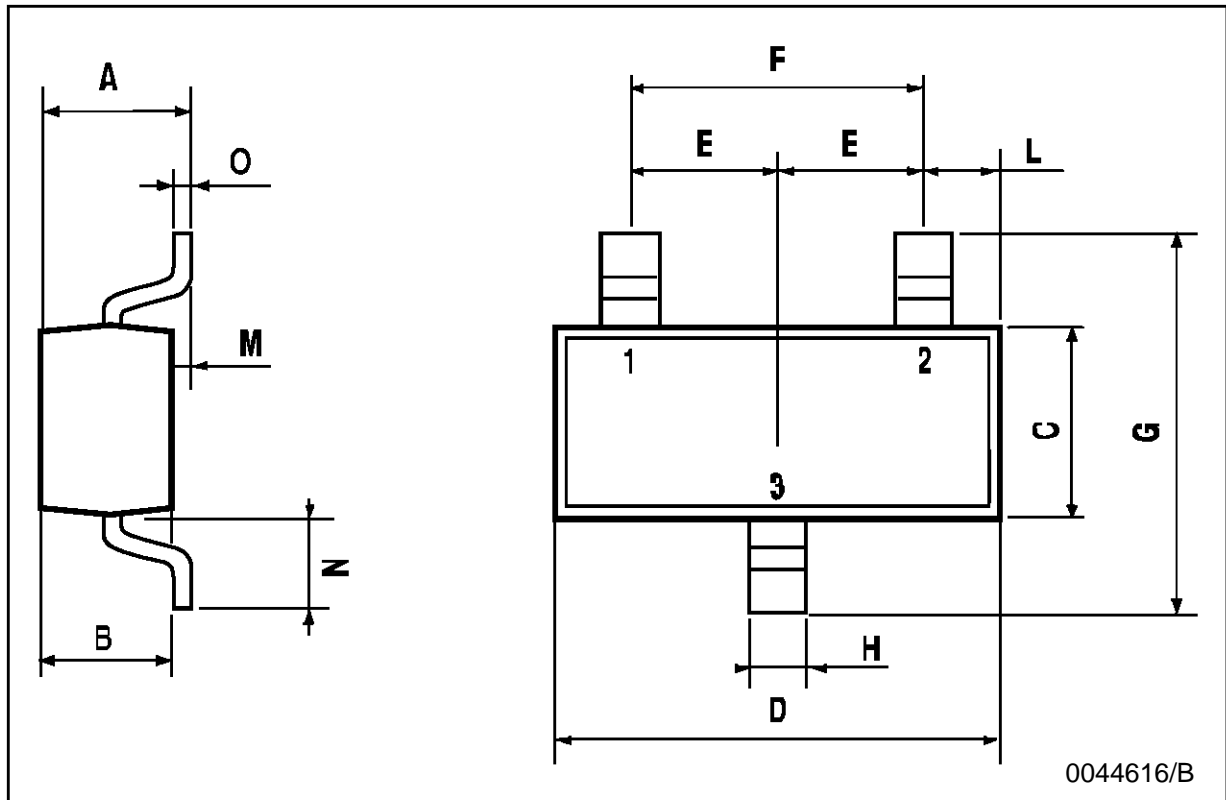
## ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$C_{EB}$	Emitter Base Capacitance	$I_E = 0$ $V_{EB} = 0.5$ V $f = 1$ MHz for <b>SO2222</b> for <b>SO2222A</b>			30 25	pF pF
NF	Noise Figure	$I_C = 0.1$ mA $V_{CE} = 10$ V $f = 1$ KHz $\Delta f = 200$ Hz $R_G = 1$ K $\Omega$ for <b>SO2222A only</b>			4	dB
$h_{ie}^*$	Input Impedance	$V_{CE} = 10$ V $I_C = 1$ mA $f = 1$ KHz $V_{CE} = 10$ V $I_C = 10$ mA $f = 1$ KHz for <b>SO2222A only</b>	2 0.25		8 1.25	K $\Omega$ K $\Omega$
$h_{re}^*$	Reverse Voltage Ratio	$V_{CE} = 10$ V $I_C = 1$ mA $f = 1$ KHz $V_{CE} = 10$ V $I_C = 10$ mA $f = 1$ KHz for <b>SO2222A only</b>			8 4	$10^{-4}$ $10^{-4}$
$h_{fe}^*$	Small Signal Current Gain	$V_{CE} = 10$ V $I_C = 1$ mA $f = 1$ KHz $V_{CE} = 10$ V $I_C = 10$ mA $f = 1$ KHz for <b>SO2222A only</b>	50 75		300 375	
$h_{oe}^*$	Output Admittance	$V_{CE} = 10$ V $I_C = 1$ mA $f = 1$ KHz $V_{CE} = 10$ V $I_C = 10$ mA $f = 1$ KHz for <b>SO2222A only</b>	5 25		35 200	$\mu$ S $\mu$ S
$t_d$	Delay Time	$I_C = -150$ mA $V_{BE} = -0.5$ V for <b>SO2222A only</b>			10	ns
$t_r$	Rise Time				25	ns
$t_s$	Storage Time	$I_C = 150$ mA $I_{B1} = -I_{B2} = 15$ mA for <b>SO2222A only</b>			225	ns
$t_f$	Fall Time				60	ns

\* Pulsed: Pulse duration = 300  $\mu$ s, duty cycle  $\leq$  2 %

**SOT-23 MECHANICAL DATA**

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.85		1.1	33.4		43.3
B	0.65		0.95	25.6		37.4
C	1.20		1.4	47.2		55.1
D	2.80		3	110.2		118
E	0.95		1.05	37.4		41.3
F	1.9		2.05	74.8		80.7
G	2.1		2.5	82.6		98.4
H	0.38		0.48	14.9		18.8
L	0.3		0.6	11.8		23.6
M	0		0.1	0		3.9
N	0.3		0.65	11.8		25.6
O	0.09		0.17	3.5		6.7



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