



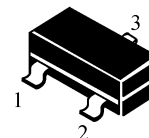
**THE DATASHEET OF**  
**SL3904**



## NPN Switching Transistor

**SOT-23**

- 1. BASE
- 2. EMITTER
- 3. COLLECTOR



### ■ MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	Vdc
Collector-Base Voltage	$V_{CBO}$	60	Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current-Continuous	$I_c$	200	mAdc

### ■ THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board(1) Derate above 25°C	$P_D$	225	mW
		1.8	mW/°C
Total Device Dissipation Alumina Substrate, Derate above 25°C	$P_D$	300	mW
		2.4	mW/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	°C/W
Solder Temperature/Solder Time	T/t	260/10	°C/S
Junction and Storage Temperature	$T_J, T_{stg}$	150°C, -55to+150°C	

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

Characteristic	Symbol	Min	Max	Unit
Collector-Emitter Breakdown Voltage(3) ( $I_C=1.0\text{mA}$ , $I_B=0$ )	$V_{(BR)CEO}$	40	—	Vdc
Collector-Base Breakdown Voltage ( $I_C=10\ \mu\text{A}$ , $I_E=0$ )	$V_{(BR)CBO}$	60	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E=10\ \mu\text{A}$ , $I_C=0$ )	$V_{(BR)EBO}$	6.0	—	Vdc
Base Cutoff Current ( $V_{CE}=30\text{Vdc}$ , $V_{EB}=3.0\text{Vdc}$ )	$I_{BEX}$	—	50	nAdc
Collector Cutoff Current ( $V_{CE}=30\text{Vdc}$ , $V_{EB}=3.0\text{Vdc}$ )	$I_{CEX}$	—	50	nAdc

**■ ON CHARACTERISTICS(2)**

Characteristic	Symbol	Min	Max	Unit
DC Current Gain	$h_{FE}$			—
( $I_C=0.1\text{mA}$ , $V_{CE}=1.0\text{Vdc}$ )		40	—	
( $I_C=1.0\text{mA}$ , $V_{CE}=1.0\text{Vdc}$ )		70	—	
( $I_C=10\text{mA}$ , $V_{CE}=1.0\text{Vdc}$ )		100	300	
( $I_C=50\text{mA}$ , $V_{CE}=1.0\text{Vdc}$ )		60	—	
( $I_C=100\text{mA}$ , $V_{CE}=1.0\text{Vdc}$ )		30	—	
Collector-Emitter Saturation Voltage ( $I_C=10\text{mA}$ , $I_B=1.0\text{mA}$ ) ( $I_C=50\text{mA}$ , $I_B=5.0\text{mA}$ )	$V_{CE(sat)}$	— —	0.25 0.4	Vdc
Base-Emitter Saturation Voltage ( $I_C=10\text{mA}$ , $I_B=1.0\text{mA}$ ) ( $I_C=50\text{mA}$ , $I_B=5.0\text{mA}$ )	$V_{BE(sat)}$	0.65 —	0.85 0.95	Vdc

**■ SMALL-SIGNAL CHARACTERISTICS**

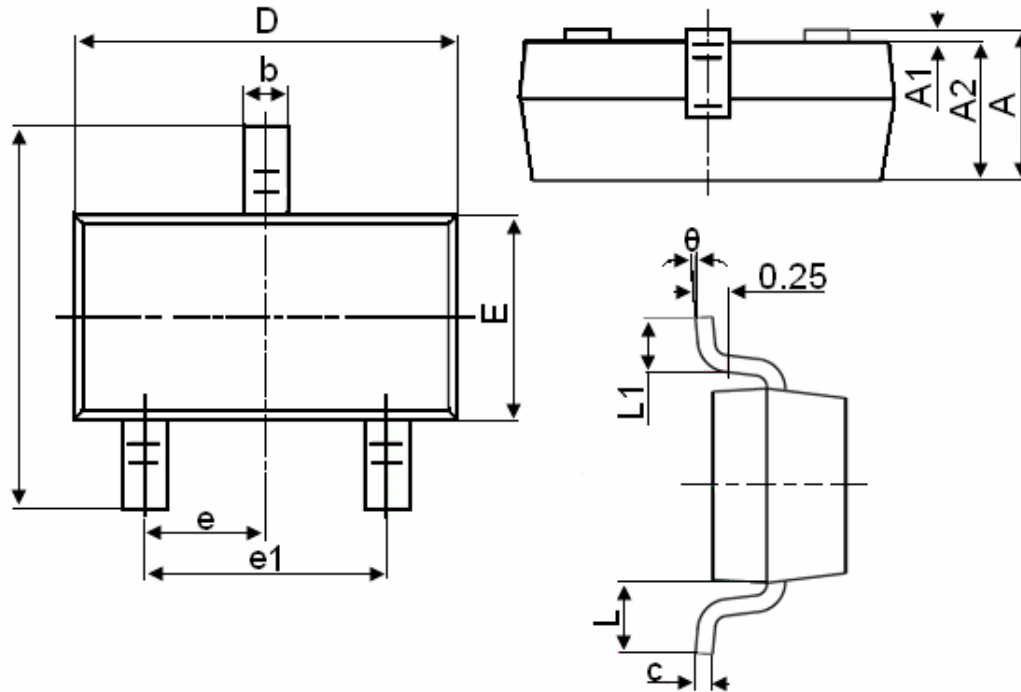
Characteristic	Symbol	Min	Max	Unit
Current-Gain-Bandwidth Product ( $I_C=10\text{mA dc}$ , $V_{CE}=-20\text{V dc}$ , $f=100\text{MHz}$ )	$f_T$	300	—	MHz
Output Capacitance ( $V_{CB}=5.0\text{V dc}$ , $I_E=0$ , $f=1.0\text{MHz}$ )	$C_{obo}$	—	4.0	pF
Input Capacitance ( $V_{EB}=0.5\text{V dc}$ , $I_C=0$ , $f=1.0\text{MHz}$ )	$C_{ibo}$	—	8.0	pF
Input Impedance ( $V_{CE}=10\text{V dc}$ , $I_C=1.0\text{mA dc}$ , $f=1.0\text{KHz}$ )	$h_{ie}$	1.0	10	$k\Omega$
Voltage Feedback Ratio ( $V_{CE}=10\text{V dc}$ , $I_C=1.0\text{mA dc}$ , $f=1.0\text{KHz}$ )	$h_{re}$	0.5	8.0	$\times 10^{-4}$
Small-Signal Current Gain ( $V_{CE}=10\text{V dc}$ , $I_C=1.0\text{mA dc}$ , $f=1.0\text{KHz}$ )	$h_{fe}$	100	400	—
Output Admittance ( $V_{CE}=10\text{V dc}$ , $I_C=1.0\text{mA dc}$ , $f=1.0\text{KHz}$ )	$h_{oe}$	1.0	40	$\mu\text{ mhos}$
Noise Figure ( $V_{CE}=5.0\text{V dc}$ , $I_C=100\mu\text{A dc}$ , $R_S=1.0\text{ k}\Omega$ , $f=1.0\text{KHz}$ )	NF	—	5.0	dB

**■ SWITCHING CHARACTERISTICS**

Characteristic	Symbol	Min	Max	Unit
Delay Time	$t_d$	—	35	ns
Rise Time				
Storage Time	$t_s$	—	225	ns
Fall Time				

$(V_{CC}=3.0\text{V dc}, V_{BE}=0.5\text{V dc}, I_C=10\text{mA dc}, I_{B1}=1.0\text{mA dc})$   
 $(V_{CC}=3.0\text{V dc}, I_C=10\text{mA dc}, I_{B1}=I_{B2}=1.0\text{mA dc})$

1. FR-5=1.0×0.75×0.062in.
2. Alumina=0.4×0.3×0.024in.99.5%alumina.
3. Pulse Width≤300us;Duty Cycle≤2.0%.
4. Pulse Test: Pulse Width≤300us;Duty Cycle≤2.0%.

**SOT-23 Package Information**


Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

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