

6367254 MOTOROLA SC (XSTRS/R F)

96D 82039 D

T-29-15

MAXIMUM RATINGS

Rating	Symbol	Value	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,* T _A = 25°C Derate above 25°C	P _D	225 1.8	mW mW/°C
Thermal Resistance Junction to Ambient	R _{θJA}	556	°C/mW
Total Device Dissipation Alumina Substrate,** T _A = 25°C Derate above 25°C	P _D	300 2.4	mW mW/°C
Thermal Resistance Junction to Ambient	R _{θJA}	417	°C/mW
Junction and Storage Temperature	T _J , T _{stg}	150	°C

*FR-5 = 1.0 x 0.75 x 0.62 in.

**Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

DEVICE MARKING

MMBT3903 = 1Y; MMBT3904 = 1A

MMBT3903 MMBT3904

CASE 318-03, STYLE 6
SOT-23 (TO-236AA/AB)

GENERAL PURPOSE TRANSISTOR

NPN SILICON

Refer to 2N3903 for graphs.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage(1) (I _C = 1.0 mAdc, I _B = 0)	V _{(BR)CEO}	40	—	Vdc
Collector-Base Breakdown Voltage (I _C = 10 μAdc, I _E = 0)	V _{(BR)CBO}	60	—	Vdc
Emitter-Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0)	V _{(BR)EBO}	6.0	—	Vdc
Base Cutoff Current (V _{CE} = 30 Vdc, V _{EB} = 3.0 Vdc)	I _{BL}	—	50	nAdc
Collector Cutoff Current (V _{CE} = 30 Vdc, V _{EB} = 3.0 Vdc)	I _{CEX}	—	50	nAdc
ON CHARACTERISTICS				
DC Current Gain(1) (I _C = 0.1 mAdc, V _{CE} = 1.0 Vdc)	h _{FE}	20 40	— —	—
(I _C = 1.0 mAdc, V _{CE} = 1.0 Vdc)	h _{FE}	35 70	— —	—
(I _C = 10 mAdc, V _{CE} = 1.0 Vdc)	h _{FE}	50 100	150 300	—
(I _C = 50 mAdc, V _{CE} = 1.0 Vdc)	h _{FE}	30 60	— —	—
(I _C = 100 mAdc, V _{CE} = 1.0 Vdc)	h _{FE}	15 30	— —	—
Collector-Emitter Saturation Voltage(1) (I _C = 10 mAdc, I _B = 1.0 mAdc) (I _C = 50 mAdc, I _B = 5.0 mAdc)	V _{CE(sat)}	— —	0.2 0.3	Vdc
Base-Emitter Saturation Voltage(1) (I _C = 10 mAdc, I _B = 1.0 mAdc) (I _C = 50 mAdc, I _B = 5.0 mAdc)	V _{BE(sat)}	0.65 —	0.85 0.95	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Current-Gain — Bandwidth Product (I _C = 10 mAdc, V _{CE} = 20 Vdc, f = 100 MHz)	f _T	250 300	— —	MHz

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82040 D

MMBT3903, MMBT3904

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ELECTRICAL CHARACTERISTICS (continued) ($T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
Output Capacitance ($V_{CB} = 5.0\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	—	4.0	pF
Input Capacitance ($V_{BE} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	—	8.0	pF
Input Impedance ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{ie}	1.0 1.0	8.0 10	k ohms
Voltage Feedback Ratio ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{re}	0.1 0.5	5.0 8.0	$\times 10^{-4}$
Small-Signal Current Gain ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	50 100	200 400	—
Output Admittance ($I_C = 1.0\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{oe}	1.0	40	μmhos
Noise Figure ($I_C = 100\text{ }\mu\text{A}$, $V_{CE} = 5.0\text{ Vdc}$, $R_S = 1.0\text{ k ohms}$, $f = 10\text{ Hz to }15.7\text{ kHz}$)	NF	— —	6.0 5.0	dB

SWITCHING CHARACTERISTICS

Delay Time	($V_{CC} = 3.0\text{ Vdc}$, $V_{BE} = 0.5\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $I_{B1} = 1.0\text{ mAdc}$)	t_d	—	35	ns
Rise Time		t_r	—	35	ns
Storage Time	($V_{CC} = 3.0\text{ Vdc}$, $I_C = 10\text{ mAdc}$, $I_{B1} = I_{B2} = 1.0\text{ mAdc}$)	t_s	—	175 200	ns
Fall Time		t_f	—	50	ns

(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

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