

6367254 MOTOROLA SC (XSTRS/R F)

96D 82045 D

T-35-17

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	40	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	60	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	6.0	Vdc
Collector Current — Continuous	I <sub>C</sub>	600	mAdc

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	225 1.8	mW mW/°C
Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	556	°C/mW
Total Device Dissipation Alumina Substrate,** T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	300 2.4	mW mW/°C
Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	417	°C/mW
Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	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**

MMBT4401 = 2X

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted.)**

Refer to 2N4401 for graphs.

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Breakdown Voltage(1) (I <sub>C</sub> = 1.0 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	40	—	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 0.1 mAdc, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	60	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 0.1 mAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	6.0	—	Vdc
Base Cutoff Current (V <sub>CE</sub> = 35 Vdc, V <sub>EB</sub> = 0.4 Vdc)	I <sub>BEV</sub>	—	0.1	μAdc
Collector Cutoff Current (V <sub>CE</sub> = 35 Vdc, V <sub>EB</sub> = 0.4 Vdc)	I <sub>CEX</sub>	—	0.1	μAdc

**ON CHARACTERISTICS(1)**

DC Current Gain (I <sub>C</sub> = 0.1 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 150 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 600 mAdc, V <sub>CE</sub> = 2.0 Vdc)	h <sub>FE</sub>	20 40 80 100 40	— — — 300 —	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 150 mAdc, I <sub>B</sub> = 15 mAdc) (I <sub>C</sub> = 600 mAdc, I <sub>B</sub> = 50 mAdc)	V <sub>CE(sat)</sub>	—	0.4 0.75	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 150 mAdc, I <sub>B</sub> = 15 mAdc) (I <sub>C</sub> = 600 mAdc, I <sub>B</sub> = 50 mAdc)	V <sub>BE(sat)</sub>	0.75	0.95 1.2	Vdc

**SMALL-SIGNAL CHARACTERISTICS**

Current-Gain — Bandwidth Product (I <sub>C</sub> = 20 mAdc, V <sub>CE</sub> = 10 Vdc, f = 100 MHz)	f <sub>T</sub>	250	—	MHz
Collector-Base Capacitance (V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0, f = 100 kHz)	C <sub>cb</sub>	—	6.5	pF
Emitter-Base Capacitance (V <sub>BE</sub> = 0.5 Vdc, I <sub>C</sub> = 0, f = 100 kHz)	C <sub>eb</sub>	—	30	pF
Input Impedance (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>ie</sub>	1.0	15	k ohms
Voltage Feedback Ratio (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>re</sub>	0.1	8.0	X 10 <sup>-4</sup>
Small-Signal Current Gain (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>fe</sub>	40	500	—
Output Admittance (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 10 Vdc, f = 1.0 kHz)	h <sub>oe</sub>	1.0	30	μmhos

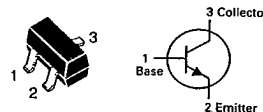
**SWITCHING CHARACTERISTICS**

Delay Time (V <sub>CC</sub> = 30 Vdc, V <sub>EB</sub> = 2.0 Vdc, I <sub>C</sub> = 150 mAdc, I <sub>B1</sub> = 15 mAdc)	t <sub>d</sub>	—	15	ns
Rise Time	t <sub>r</sub>	—	20	ns
Storage Time	t <sub>s</sub>	—	225	ns
Fall Time (I <sub>B1</sub> = I <sub>B2</sub> = 15 mAdc)	t <sub>f</sub>	—	30	ns

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

**MMBT4401**

CASE 318-02/03, STYLE 6  
SOT-23 (TO-236AA/AB)



**SWITCHING TRANSISTOR**

NPN SILICON

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

3-110