

6367254 MOTOROLA SC (XSTRS/R F)

96D 82056 D

T-29-15

## MAXIMUM RATINGS

Rating	Symbol	MMBTA05	MMBTA06	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	60	80	V <sub>dc</sub>
Collector-Base Voltage	V <sub>CBO</sub>	60	80	V <sub>dc</sub>
Emitter-Base Voltage	V <sub>EB0</sub>	4.0		V <sub>dc</sub>
Collector Current — Continuous	I <sub>C</sub>	500		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	mW
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	mW
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.

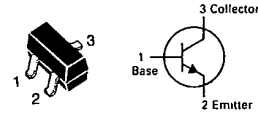
## DEVICE MARKING

MMBTA05 = 1H; MMBTA06 = 1G

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage(1) (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	60 80	—	V <sub>dc</sub>
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μA <sub>dc</sub> , I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	4.0	—	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 60 V <sub>dc</sub> , I <sub>B</sub> = 0)	I <sub>CEO</sub>	—	0.1	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 60 V <sub>dc</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = 80 V <sub>dc</sub> , I <sub>E</sub> = 0)	I <sub>CBO</sub>	—	0.1 0.1	μA <sub>dc</sub>
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )	h <sub>FE</sub>	50 50	—	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 10 mA <sub>dc</sub> )	V <sub>CE(sat)</sub>	—	0.25	V <sub>dc</sub>
Base-Emitter On Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )	V <sub>BE(on)</sub>	—	1.2	V <sub>dc</sub>
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product(2) (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 2.0 V, f = 100 MHz)	f <sub>T</sub>	100	—	MHz

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

(2) f<sub>T</sub> is defined as the frequency at which |h<sub>fe</sub>| extrapolates to unity.MMBTA05  
MMBTA06CASE 318-02/03, STYLE 6  
SOT-23 (TO-236AA/AB)

DRIVER TRANSISTOR

NPN SILICON

6367254 MOTOROLA SC (XSTRS/R F)

96D 82057 D

T-29-29

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CES</sub>	30	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	30	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	10	Vdc
Collector Current — Continuous	I <sub>C</sub>	300	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	mW
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	mW
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.

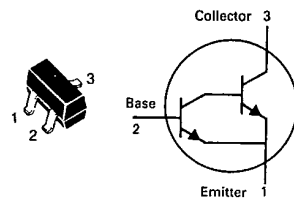
\*\*Alumina = 0.4 x 0.3 x 0.024 in, 99.5% alumina.

**DEVICE MARKING**

MMBTA13 = 1M; MMBTA14 = 1N
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**MMBTA13**  
**MMBTA14**

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



**DARLINGTON AMPLIFIER  
TRANSISTOR**

NPN SILICON

Refer to 2N6426 for graphs.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 100 μAdc, I <sub>B</sub> = 0)	V <sub>(BR)CES</sub>	30	—	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 30 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	—	100	nAdc
Emitter Cutoff Current (V <sub>BE</sub> = 10 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	100	nAdc
<b>ON CHARACTERISTICS(1)</b>				
DC Current Gain (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc)	h <sub>FE</sub>	5000 10,000	—	—
(I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 5.0 Vdc)	MMBTA13 MMBTA14	10,000 20,000	—	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 0.1 mAdc)	V <sub>CE(sat)</sub>	—	1.5	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 5.0 Vdc)	V <sub>BE</sub>	—	2.0	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product(2) (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc, f = 100 MHz)	f <sub>T</sub>	125	—	MHz

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

(2) f<sub>T</sub> = |h<sub>fe</sub>| • f<sub>test</sub>.

6367254 MOTOROLA SC (XSTRS/R F)

96D 82058 D

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CE0}$	40	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current — Continuous	$I_C$	100	mAdc

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225	mW
		1.8	mW/ $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{mW}$
Total Device Dissipation Alumina Substrate,** $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300	mW
		2.4	mW/ $^\circ\text{C}$
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{mW}$
Junction and Storage Temperature	$T_J, T_{stg}$	150	$^\circ\text{C}$

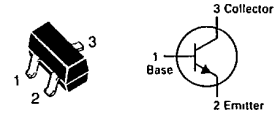
\*FR-5 = 1.0 x 0.75 x 0.62 in.

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

## DEVICE MARKING

MMBTA20 = 1C

## MMBTA20

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

## GENERAL PURPOSE AMPLIFIER

NPN SILICON

Refer to MPS3904 for graphs.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage ( $I_C = 1.0 \text{ mAdc}, I_B = 0$ )	$V_{(BR)CEO}$	40	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 100 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}, I_E = 0$ )	$I_{CBO}$	—	100	nAdc
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = 5.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$ )	$h_{FE}$	40	400	—
Collector-Emitter Saturation Voltage ( $I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$ )	$V_{CE(sat)}$	—	0.25	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product ( $I_C = 5.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 100 \text{ MHz}$ )	$f_T$	125	—	MHz
Output Capacitance ( $V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 100 \text{ kHz}$ )	$C_{obo}$	—	4.0	pF

6367254 MOTOROLA SC (XSTRS/R F)

96D 82059 D

T-29-15

## MAXIMUM RATINGS

Rating	Symbol	MMBTA42	MMBTA43	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	300	200	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	300	200	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	6.0	6.0	Vdc
Collector Current — Continuous	I <sub>C</sub>	500		mAdc

## THERMAL CHARACTERISTICS

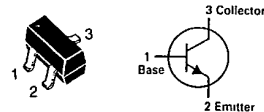
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board,* T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	225	mW
Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	556	°C/mW
Total Device Dissipation Alumina Substrate,** T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	300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

MMBTA42 = 1D; MMBTA43 = 1E

MMBTA42  
MMBTA43CASE 318-02/03, STYLE 6  
SOT-23 (TO-236AA/AB)

## HIGH VOLTAGE TRANSISTOR

NPN SILICON

Refer to MPSA42 for graphs.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage(1) (I <sub>C</sub> = 1.0 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	300 200	—	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 100 μAdc, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	300 200	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	6.0	—	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 200 Vdc, I <sub>E</sub> = 0) (V <sub>CB</sub> = 160 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	—	0.1 0.1	μAdc
Emitter Cutoff Current (V <sub>BE</sub> = 6.0 Vdc, I <sub>C</sub> = 0) (V <sub>BE</sub> = 4.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	0.1 0.1	μAdc
<b>ON CHARACTERISTICS(1)</b>				
DC Current Gain (I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 10 Vdc) (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 10 Vdc)  (I <sub>C</sub> = 30 mAdc, V <sub>CE</sub> = 10 Vdc)	h <sub>FE</sub>	25 40	—	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 20 mAdc, I <sub>B</sub> = 2.0 mAdc)	V <sub>CE(sat)</sub>	—	0.5 0.5	Vdc
Base-Emitter Saturation Voltage (I <sub>C</sub> = 20 mAdc, I <sub>B</sub> = 2.0 mAdc)	V <sub>BE(sat)</sub>	—	0.9	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 20 Vdc, f = 100 MHz)	f <sub>T</sub>	50	—	MHz
Collector-Base Capacitance (V <sub>CB</sub> = 20 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>cb</sub>	—	3.0 4.0	pF

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

6367254 MOTOROLA SC (XSTRS/R F)

96D 82060 D

## MAXIMUM RATINGS

Rating	Symbol	MMBTA55	MMBTA56	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	60	80	V <sub>dc</sub>
Collector-Base Voltage	V <sub>CBO</sub>	60	80	V <sub>dc</sub>
Emitter-Base Voltage	V <sub>EBO</sub>	4.0		V <sub>dc</sub>
Collector Current — Continuous	I <sub>C</sub>	500		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	mW
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	mW
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

MMBTA55 = 2H; MMBTA56 = 2G

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

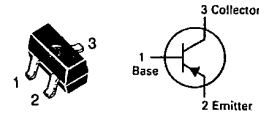
Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage(1) (I <sub>C</sub> = 1.0 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	60 80	—	V <sub>dc</sub>
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	4.0	—	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	—	0.1	μAdc
Collector Cutoff Current (V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0) (V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	— —	0.1 0.1	μAdc
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	50 50	— —	—
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 10 mAdc)	V <sub>CE(sat)</sub>	—	0.25	V <sub>dc</sub>
Base-Emitter On Voltage (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 1.0 Vdc)	V <sub>BE(on)</sub>	—	1.2	V <sub>dc</sub>
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current-Gain — Bandwidth Product(2) (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 1.0 Vdc, f = 100 MHz)	f <sub>T</sub>	50	—	MHz

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

(2) f<sub>T</sub> is defined as the frequency at which |h<sub>fe</sub>| extrapolates to unity.

T-29-15  
MMBTA55  
MMBTA56

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



DRIVER TRANSISTOR

PNP SILICON