

6367254 MOTOROLA SC (XSTRS/R F)

96D 82047 D

T-29-15

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|------------------|-------|------|
| Collector-Emitter Voltage | V _{CEO} | 50 | Vdc |
| Collector-Base Voltage | V _{CBO} | 50 | Vdc |
| Emitter-Base Voltage | V _{EBO} | 3.0 | Vdc |
| Collector Current — Continuous | I _C | 50 | mAdc |

THERMAL CHARACTERISTICS

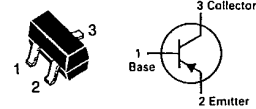
| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------------------------------------|-----------------------------------|-----|-------|
| Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C | P _D | 225 | mW |
| Thermal Resistance Junction to Ambient | R _{θJA} | 556 | °C/mW |
| Total Device Dissipation Alumina Substrate,** T _A = 25°C Derate above 25°C | P _D | 300 | mW |
| 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

MMBT5086 = 2P; MMBT5087 = 2Q

MMBT5086
MMBT5087CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)

LOW NOISE TRANSISTOR

PNP SILICON

Refer to 2N5086 for graphs.

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

| Characteristic | Symbol | Min | Max | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------|------------|------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (I _C = 1.0 mAdc, I _B = 0) | V _{(BR)CEO} | 50 | — | Vdc |
| Collector-Base Breakdown Voltage (I _C = 100 μAdc, I _E = 0) | V _{(BR)CBO} | 50 | — | Vdc |
| Collector Cutoff Current (V _{CB} = 10 Vdc, I _E = 0) (V _{CB} = 35 Vdc, I _E = 0) | I _{CBO} | — | 10 50 | nAdc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (I _C = 100 μAdc, V _{CE} = 5.0 Vdc) | h _{FE} | 150 250 | 500 800 | — |
| (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc) | MMBT5086 MMBT5087 | 150 250 | — — | — |
| (I _C = 10 mAdc, V _{CE} = 5.0 Vdc) | MMBT5086 MMBT5087 | 150 250 | — — | — |
| Collector-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 1.0 mAdc) | V _{CE(sat)} | — | 0.3 | Vdc |
| Base-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 1.0 mAdc) | V _{BE(sat)} | — | 0.85 | Vdc |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current-Gain — Bandwidth Product (I _C = 500 μAdc, V _{CE} = 5.0 Vdc, f = 20 MHz) | f _T | 40 | — | MHz |
| Output Capacitance (V _{CB} = 5.0 Vdc, I _E = 0, f = 100 kHz) | C _{obo} | — | 4.0 | pF |
| Small-Signal Current Gain (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 1.0 kHz) (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 1.0 kHz) | h _{fe} | 150 250 | 600 900 | — |
| Noise Figure (I _C = 20 mAdc, V _{CE} = 5.0 Vdc, R _S = 10 kΩ, f = 10 Hz to 15.7 kHz) | NF | — — | 3.0 2.0 | dB |
| (I _C = 100 μAdc, V _{CE} = 5.0 Vdc, R _S = 3.0 kΩ, f = 1.0 kHz) | MMBT5086 MMBT5087 | — — | 3.0 2.0 | dB |

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82048 D

T-29-15

MAXIMUM RATINGS

| Rating | Symbol | Value | | Unit |
|--------------------------------|------------------|----------|----------|------------------|
| | | MMBT5088 | MMBT5089 | |
| Collector-Emitter Voltage | V _{CEO} | 30 | 25 | Vdc |
| Collector-Base Voltage | V _{CBO} | 35 | 30 | Vdc |
| Emitter-Base Voltage | V _{EBO} | 4.5 | | Vdc |
| Collector Current — Continuous | I _C | 50 | | mA _{dc} |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------------------------------------|-----------------------------------|-----|-------|
| Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C | P _D | 225 | mW |
| 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 | mW |
| 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.

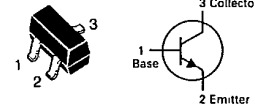
**Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

DEVICE MARKING

MMBT5088 = 1Q; MMBT5089 = 1R

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------|--------------|------------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (I _C = 1.0 mA _{dc} , I _B = 0) | V _{(BR)CEO} | 30 25 | — | Vdc |
| Collector-Base Breakdown Voltage (I _C = 100 μA _{dc} , I _E = 0) | V _{(BR)CBO} | 35 30 | — | Vdc |
| Collector Cutoff Current (V _{CB} = 20 Vdc, I _E = 0) (V _{CB} = 15 Vdc, I _E = 0) | I _{CBO} | — | 50 50 | nA _{dc} |
| Emitter Cutoff Current (V _{EB(off)} = 3.0 Vdc, I _C = 0) (V _{EB(off)} = 4.5 Vdc, I _C = 0) | I _{EBO} | — | 50 100 | nA _{dc} |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (I _C = 100 μA _{dc} , V _{CE} = 5.0 Vdc) | h _{FE} | 300 400 | 900 1200 | — |
| (I _C = 1.0 mA _{dc} , V _{CE} = 5.0 Vdc) | | 350 450 | — | — |
| (I _C = 10 mA _{dc} , V _{CE} = 5.0 Vdc) | | 300 400 | — | — |
| Collector-Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc}) | V _{CE(sat)} | — | 0.5 | Vdc |
| Base-Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc}) | V _{BE(sat)} | — | 0.8 | Vdc |
| SMALL SIGNAL CHARACTERISTICS | | | | |
| Current-Gain — Bandwidth Product (I _C = 500 μA _{dc} , V _{CE} = 5.0 Vdc, f = 20 MHz) | f _T | 50 | — | MHz |
| Collector-Base Capacitance (V _{CB} = 5.0 Vdc, I _E = 0, f = 100 kHz emitter guarded) | C _{cb} | — | 4.0 | pF |
| Emitter-Base Capacitance (V _{BE} = 0.5 Vdc, I _C = 0, f = 100 kHz collector guarded) | C _{eb} | — | 10 | pF |
| Small Signal Current Gain (I _C = 1.0 mA _{dc} , V _{CE} = 5.0 Vdc, f = 1.0 kHz) | h _{fe} | 350 450 | 1400 1800 | — |
| Noise Figure (I _C = 100 μA _{dc} , V _{CE} = 5.0 Vdc, R _S = 10 kΩ, f = 10 Hz to 15.7 Hz) | NF | — | 3.0 2.0 | dB |

MMBT5088
MMBT5089CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)

LOW NOISE TRANSISTOR

NPN SILICON

Refer to MPSA18 for graphs.

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82049 D

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage | V_{CE0} | 150 | Vdc |
| Collector-Base Voltage | V_{CBO} | 160 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5.0 | Vdc |
| Collector Current — Continuous | I_C | 500 | mAdc |

THERMAL CHARACTERISTICS

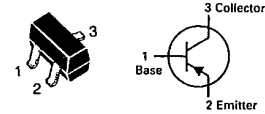
| Characteristic | Symbol | Max | Unit |
|--------------------------------------------------------------------------------------------------------------|-----------------|-----|----------------------------|
| Total Device Dissipation FR-5 Board,* $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 | mW |
| 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°C | P_D | 300 | mW |
| 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

MMBT5401 = 2L

T 29-15
MMBT5401CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)

HIGH VOLTAGE TRANSISTOR

PNP SILICON

Refer to 2N5401 for graphs.

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

| Characteristic | Symbol | Min | Max | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|---------------|-------------------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage ($I_C = 1.0 \text{ mAdc}, I_B = 0$) | $V_{(BR)CEO}$ | 150 | — | Vdc |
| Collector-Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}, I_E = 0$) | $V_{(BR)CBO}$ | 160 | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$) | $V_{(BR)EBO}$ | 5.0 | — | Vdc |
| Collector Cutoff Current ($V_{CB} = 100 \text{ Vdc}, I_E = 0$) ($V_{CB} = 100 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$) | I_{CBO} | — | 50 | nAdc μAdc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 1.0 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 10 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 50 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$) | h_{FE} | 50 60 50 | — 240 — | — |
| Collector-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$) ($I_C = 50 \text{ mAdc}, I_B = 5.0 \text{ mAdc}$) | $V_{CE(sat)}$ | — | 0.20 0.5 | Vdc |
| Base-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$) ($I_C = 50 \text{ mAdc}, I_B = 5.0 \text{ mAdc}$) | $V_{BE(sat)}$ | — | 1.0 1.0 | Vdc |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current-Gain — Bandwidth Product ($I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 100 \text{ MHz}$) | f_T | 100 | 300 | MHz |
| Output Capacitance ($V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$) | C_{obo} | — | 6.0 | pF |
| Small Signal Current Gain ($I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$) | h_{fe} | 40 | 200 | — |
| Noise Figure ($I_C = 200 \mu\text{Adc}, V_{CE} = 5.0 \text{ Vdc}, R_S = 10 \text{ ohms}$, $f = 10 \text{ Hz to } 15.7 \text{ kHz}$) | NF | — | 8.0 | dB |

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82050 D

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|-----------|-------|------|
| Collector-Emitter Voltage | V_{CE0} | 140 | Vdc |
| Collector-Base Voltage | V_{CBO} | 160 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 6.0 | Vdc |
| Collector Current — Continuous | I_C | 600 | mAdc |

THERMAL CHARACTERISTICS

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

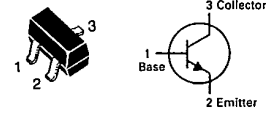
*FR-5 = 1.0 x 0.75 x 0.62 in.

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

DEVICE MARKING

MMBT5550 = 1F; MMBT5551 = G1

T-29-15
MMBT5550
MMBT5551

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

HIGH VOLTAGE TRANSISTOR

NPN SILICON

Refer to 2N5550 for graphs.

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

| Characteristic | Symbol | Min | Max | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------|------------------------|-----------------------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage(2) ($I_C = 1.0 \text{ mAdc}, I_B = 0$) | MMBT5550 MMBT5551 $V_{(BR)CEO}$ | 140 160 | — | Vdc |
| Collector-Base Breakdown Voltage ($I_C = 100 \mu\text{Adc}, I_E = 0$) | MMBT5550 MMBT5551 $V_{(BR)CBO}$ | 160 180 | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = 10 \mu\text{Adc}, I_C = 0$) | $V_{(BR)EBO}$ | 6.0 | — | Vdc |
| Collector Cutoff Current ($V_{CB} = 100 \text{ Vdc}, I_E = 0$) ($V_{CB} = 120 \text{ Vdc}, I_E = 0$) ($V_{CB} = 100 \text{ Vdc}, I_E = 0, T_A = 100^\circ\text{C}$) ($V_{CB} = 120 \text{ Vdc}, I_E = 0, T_A = 100^\circ\text{C}$) | MMBT5550 MMBT5551 MMBT5550 MMBT5551 I_{CBO} | — — — — | 100 50 100 50 | nAdc μAdc |
| Emitter Cutoff Current ($V_{EB} = 4.0 \text{ Vdc}, I_C = 0$) | I_{EBO} | — | 50 | nAdc |
| ON CHARACTERISTICS(2) | | | | |
| DC Current Gain ($I_C = 1.0 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 10 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$) ($I_C = 50 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$) | MMBT5550 MMBT5551 MMBT5550 MMBT5551 MMBT5550 MMBT5551 h_{FE} | 60 80 60 80 20 30 | — — 250 250 | — |
| Collector-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$) ($I_C = 50 \text{ mAdc}, I_B = 5.0 \text{ mAdc}$) | Both Types MMBT5550 MMBT5551 $V_{CE(sat)}$ | — — — | 0.15 0.25 0.20 | Vdc |
| Base-Emitter Saturation Voltage ($I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$) ($I_C = 50 \text{ mAdc}, I_B = 5.0 \text{ mAdc}$) | Both Types MMBT5550 MMBT5551 $V_{BE(sat)}$ | — — — | 1.0 1.2 1.0 | Vdc |

(2) Pulse Test; Pulse Width = 300 μs , Duty Cycle = 2.0%.

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82051 D
T-29-29

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|------------------|-------|-----------------|
| Collector-Emitter Voltage | V _{CEO} | 40 | V _{dc} |
| Collector-Base Voltage | V _{CBO} | 40 | V _{dc} |
| Emitter-Base Voltage | V _{EBO} | 12 | V _{dc} |
| Collector Current — Continuous | I _C | 500 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------------------------------------|-----------------------------------|-----|-------|
| Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C | P _D | 225 | mW |
| 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 | mW |
| Thermal Resistance Junction to Ambient | R _{θJA} | 417 | °C/mW |
| Junction and Storage Temperature | T _J , T _{stg} | 150 | °C |

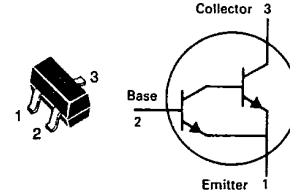
*FR-5 = 1.0 x 0.75 x 0.62 in.

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

DEVICE MARKING

MMBT6427 = 1V

MMBT6427

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

DARLINGTON TRANSISTOR

NPN SILICON

Refer to 2N6426 for graphs.

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

| Characteristic | Symbol | Min | Max | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------|-------------------------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (I _C = 10 mAdc, I _B = 0) | V _{(BR)CEO} | 40 | — | V _{dc} |
| Collector-Base Breakdown Voltage (I _C = 100 μAdc, I _E = 0) | V _{(BR)CBO} | 40 | — | V _{dc} |
| Emitter-Base Breakdown Voltage (I _C = 10 μAdc, I _C = 0) | V _{(BR)EBO} | 12 | — | V _{dc} |
| Collector Cutoff Current (V _{CE} = 25 V _{dc} , I _B = 0) | I _{CEO} | — | 1.0 | μAdc |
| Collector Cutoff Current (V _{CB} = 30 V _{dc} , I _E = 0) | I _{CBO} | — | 50 | nAdc |
| Emitter Cutoff Current (V _{BE} = 10 V _{dc} , I _C = 0) | I _{EBO} | — | 50 | nAdc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (I _C = 10 mAdc, V _{CE} = 5.0 V _{dc}) (I _C = 100 mAdc, V _{CE} = 5.0 V _{dc}) (I _C = 500 mAdc, V _{CE} = 5.0 V _{dc}) | h _{FE} | 10,000 20,000 14,000 | 100,000 200,000 140,000 | — |
| Collector-Emitter Saturation Voltage (I _C = 50 mAdc, I _B = 0.5 mAdc) (I _C = 500 mAdc, I _B = 0.5 mAdc) | V _{CE(sat)} | — — | 1.2 1.5 | V _{dc} |
| Base-Emitter Saturation Voltage (I _C = 500 mAdc, I _B = 0.5 mAdc) | V _{BE(sat)} | — | 2.0 | V _{dc} |
| Base-Emitter On Voltage (I _C = 50 mAdc, V _{CE} = 5.0 V _{dc}) | V _{BE(on)} | — | 1.75 | V _{dc} |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f = 1.0 MHz) | C _{obo} | — | 7.0 | pF |
| Input Capacitance (V _{BE} = 0.5, I _C = 0, f = 1.0 MHz) | C _{ibo} | — | 15 | pF |
| Current Gain — High Frequency (I _C = 10 mAdc, V _{CE} = 5.0 V _{dc} , f = 100 MHz) | h _{fe} | 1.3 | — | V _{dc} |
| Noise Figure (I _C = 1.0 mAdc, V _{CE} = 5.0 V _{dc} , R _S = 100 kΩ, f = 1.0 kHz to 15.7 kHz) | NF | — | 10 | dB |

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82052

D

T-29-15

MAXIMUM RATINGS

| Rating | Symbol | Value | | Unit |
|--------------------------------|------------------|----------|----------|------|
| | | MMBT6428 | MMBT6429 | |
| Collector-Emitter Voltage | V _{CEO} | 50 | 45 | Vdc |
| Collector-Base Voltage | V _{CBO} | 60 | 55 | Vdc |
| Emitter-Base Voltage | V _{EBO} | 6.0 | | Vdc |
| Collector Current — Continuous | I _C | 200 | | mAdc |

THERMAL CHARACTERISTICS

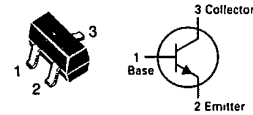
| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------------------------------------|-----------------------------------|-----|-------|
| Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C | P _D | 225 | mW |
| Thermal Resistance Junction to Ambient | R _{θJA} | 556 | °C/mW |
| Total Device Dissipation Alumina Substrate,** T _A = 25°C Derate above 25°C | P _D | 300 | mW |
| 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

MMBT6428 = 1K; MMBT6429 = 1L

MMBT6428
MMBT6429CASE 318-02/03, STYLE 6
SOT-23 (TO-236AA/AB)

AMPLIFIER TRANSISTOR

NPN SILICON

Refer to MPSA18 for graphs.

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

| Characteristic | Symbol | Min | Max | Unit |
|---------------------------------------------------------------------------------------------------------|----------------------|------|------|------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (I _C = 1.0 mAdc, I _B = 0) | V _{(BR)CEO} | 50 | — | Vdc |
| (I _C = 1.0 mAdc, I _B = 0) | | 45 | — | |
| Collector-Base Breakdown Voltage (I _C = 0.1 mAdc, I _E = 0) | V _{(BR)CBO} | 60 | — | Vdc |
| (I _C = 0.1 mAdc, I _E = 0) | | 55 | — | |
| Collector Cutoff Current (V _{CE} = 30 Vdc) | I _{CEO} | — | 0.1 | μAdc |
| Collector Cutoff Current (V _{CB} = 30 Vdc, I _E = 0) | I _{CBO} | — | 0.01 | μAdc |
| Emitter Cutoff Current (V _{EB} = 5.0 Vdc, I _C = 0) | I _{EBO} | — | 0.01 | μAdc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (I _C = 0.01 mAdc, V _{CE} = 5.0 Vdc) | h _{FE} | 250 | — | — |
| | | 500 | — | |
| (I _C = 0.1 mAdc, V _{CE} = 5.0 Vdc) | MMBT6428 MMBT6429 | 250 | 650 | — |
| | | 500 | 1250 | |
| (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc) | MMBT6428 MMBT6429 | 250 | — | — |
| | | 500 | — | |
| (I _C = 10 mAdc, V _{CE} = 5.0 Vdc) | MMBT6428 MMBT6429 | 250 | — | — |
| | | 500 | — | |
| Collector-Emitter Saturation Voltage (I _C = 10 mAdc, I _B = 0.5 mAdc) | V _{CE(sat)} | — | 0.2 | Vdc |
| (I _C = 100 mAdc, I _B = 5.0 mAdc) | | — | 0.6 | |
| Base-Emitter On Voltage (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc) | V _{BE(on)} | 0.56 | 0.66 | Vdc |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current-Gain — Bandwidth Product (I _C = 1.0 mAdc, V _{CE} = 5.0 Vdc, f = 100 MHz) | f _T | 100 | 700 | MHz |
| Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz) | C _{obo} | — | 3.0 | pF |
| Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz) | C _{ibo} | — | 8.0 | pF |

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

6367254 MOTOROLA SC (XSTRS/R F)

96D 82053 D

T-29-15

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|------------------|-------|-----------------|
| Collector-Emitter Voltage | V _{CEO} | 350 | V _{dc} |
| Collector-Base Voltage | V _{CBO} | 350 | V _{dc} |
| Emitter-Base Voltage | V _{EBO} | 5.0 | V _{dc} |
| Base Current | I _B | 250 | mA |
| Collector Current — Continuous | I _C | 500 | mA |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------------------------------------|-----------------------------------|-----|-------|
| Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C | P _D | 225 | mW |
| 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 | mW |
| 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.

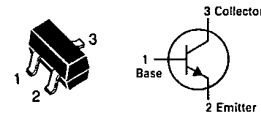
DEVICE MARKING

MMBT6517 = 1Z

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

| Characteristic | Symbol | Min | Max | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------|-----------------------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (I _C = 1.0 mA) | V _{(BR)CEO} | 350 | — | V _{dc} |
| Collector-Base Breakdown Voltage (I _C = 100 μA) | V _{(BR)CBO} | 350 | — | V _{dc} |
| Emitter-Base Breakdown Voltage (I _E = 10 μA) | V _{(BR)EBO} | 6.0 | — | V _{dc} |
| Collector Cutoff Current (V _{CB} = 250 V) | I _{CBO} | — | 50 | nA |
| Emitter Cutoff Current (V _{EB} = 5.0 V) | I _{EBO} | — | 50 | nA |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (I _C = 1.0 mA, V _{CE} = 10 V) (I _C = 10 mA, V _{CE} = 10 V) (I _C = 30 mA, V _{CE} = 10 V) (I _C = 50 mA, V _{CE} = 10 V) (I _C = 100 mA, V _{CE} = 10 V) | h _{FE} | 20 30 30 20 15 | — — 200 200 — | — |
| Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 1.0 mA) (I _C = 20 mA, I _B = 2.0 mA) (I _C = 30 mA, I _B = 3.0 mA) (I _C = 50 mA, I _B = 5.0 mA) | V _{CE(sat)} | — | 0.30 0.35 0.50 1.0 | V _{dc} |
| Base-Emitter Saturation Voltage (I _C = 10 mA, I _B = 1.0 mA) (I _C = 20 mA, I _B = 2.0 mA) (I _C = 30 mA, I _B = 3.0 mA) | V _{BE(sat)} | — | 0.75 0.85 0.90 | V _{dc} |
| Base-Emitter On Voltage (I _C = 100 mA, V _{CE} = 10 V) | V _{BE(on)} | — | 2.0 | V _{dc} |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current-Gain — Bandwidth Product (I _C = 10 mA, V _{CE} = 20 V, f = 20 MHz) | f _T | 40 | 200 | MHz |
| Collector-Base Capacitance (V _{CB} = 20 V, f = 1.0 MHz) | C _{cb} | — | 6.0 | pF |
| Emitter-Base Capacitance (V _{EB} = 0.5 V, f = 1.0 MHz) | C _{eb} | — | 80 | pF |

MMBT6517

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

HIGH VOLTAGE TRANSISTOR

NPN SILICON

Refer to 2N6517 for graphs.

6367254 MOTOROLA SC (XSTRS/R F)

96D 82054 D

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--------------------------------|------------------|-------|-----------------|
| Collector-Emitter Voltage | V _{CEO} | 350 | V _{dc} |
| Collector-Base Voltage | V _{CBO} | 350 | V _{dc} |
| Emitter-Base Voltage | V _{EBO} | 5.0 | V _{dc} |
| Base Current | I _B | 250 | mA |
| Collector Current — Continuous | I _C | 500 | mAdc |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---------------------------------------------------------------------------------------------|-----------------------------------|-----|-------|
| Total Device Dissipation FR-5 Board,* T _A = 25°C Derate above 25°C | P _D | 225 | mW |
| 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 | mW |
| Thermal Resistance Junction to Ambient | R _{θJA} | 2.4 | mW/°C |
| 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

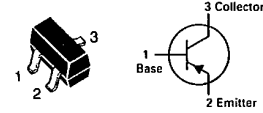
MMBT6520 = 2Z

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

| Characteristic | Symbol | Min | Max | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------|-----------------------------|-----------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage (I _C = 1.0 mA) | V _{(BR)CEO} | 350 | — | V _{dc} |
| Collector-Base Breakdown Voltage (I _C = 100 μA) | V _{(BR)CBO} | 350 | — | V _{dc} |
| Emitter-Base Breakdown Voltage (I _E = 10 μA) | V _{(BR)EBO} | 5.0 | — | V _{dc} |
| Collector Cutoff Current (V _{CB} = 250 V) | I _{CBO} | — | 50 | nA |
| Emitter Cutoff Current (V _{EB} = 4.0 V) | I _{EBO} | — | 50 | nA |
| ON CHARACTERISTICS | | | | |
| DC Current Gain (I _C = 1.0 mA, V _{CE} = 10 V) (I _C = 10 mA, V _{CE} = 10 V) (I _C = 30 mA, V _{CE} = 10 V) (I _C = 50 mA, V _{CE} = 10 V) (I _C = 100 mA, V _{CE} = 10 V) | h _{FE} | 20 30 30 20 15 | — — 200 200 — | — |
| Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 1.0 mA) (I _C = 20 mA, I _B = 2.0 mA) (I _C = 30 mA, I _B = 3.0 mA) (I _C = 50 mA, I _B = 5.0 mA) | V _{CE(sat)} | — — — — | 0.30 0.35 0.50 1.0 | V _{dc} |
| Base-Emitter Saturation Voltage (I _C = 10 mA, I _B = 1.0 mA) (I _C = 20 mA, I _B = 2.0 mA) (I _C = 30 mA, I _B = 3.0 mA) | V _{BE(sat)} | — — — | 0.75 0.85 0.90 | V _{dc} |
| Base-Emitter On Voltage (I _C = 100 mA, V _{CE} = 10 V) | V _{BE(on)} | | | V _{dc} |
| SMALL-SIGNAL CHARACTERISTICS | | | | |
| Current-Gain — Bandwidth Product (I _C = 10 mA, V _{CE} = 20 V, f = 20 MHz) | f _T | 40 | 200 | MHz |
| Collector-Base Capacitance (V _{CB} = 20 V, f = 1.0 MHz) | C _{cb} | — | 6.0 | pF |
| Emitter-Base Capacitance (V _{EB} = 0.5 V, f = 1.0 MHz) | C _{eb} | — | 100 | pF |

T-29-15

MMBT6520

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

HIGH VOLTAGE TRANSISTOR

PNP SILICON

Refer to 2N6520 for graphs.

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