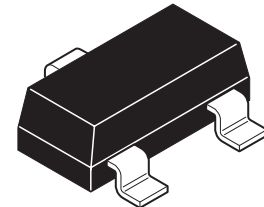


# FMMT459

## 500V Silicon NPN high voltage switching transistor

### Summary

$V_{(BR)CEV} > 500V$   
 $V_{(BR)ECV} > 6V$   
 $I_{c(cont)} = 150\text{ mA}$   
 $V_{ce(sat)} = 70\text{ mV @ } 50\text{ mA}$



### Description

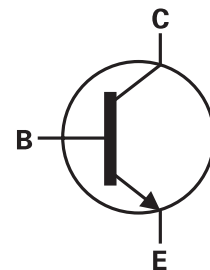
This new high voltage transistor provides users with very efficient performance, combining low  $V_{CE(SAT)}$  high  $H_{fe}$  to give extremely low on state losses at 500V operation, making it ideal for use in high efficiency Telecom and protected line switching applications.

### Features

- 6V reverse blocking capability
- Low saturation voltage - 90mV @ 50mA
- $H_{fe} > 50 @ 30\text{ mA}$
- $I_C=150\text{mA}$  continuous
- SOT23 package with  $P_{tot} 625\text{mW}$
- Specification can be supplied in other package outlines

### Applications

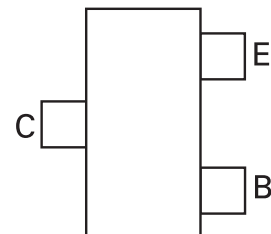
- Electronic test equipment
- Offline switching circuits
- Piezo actuators
- RCD circuits



### Ordering information

| Device    | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-----------|--------------------|-----------------|-------------------|
| FMMT459TA | 7                  | 8               | 3,000             |
| FMMT459TC | 13                 | 8               | 10,000            |

### Pin out - top view



### Device marking

459

## Absolute maximum ratings

| Parameter  | Symbol        | Limit          | Unit        |
|--|---------------|----------------|-------------|
| Collector-base voltage   | $V_{CBO}$     | 500            | V           |
| Collector-emitter voltage  | $V_{CEV}$     | 500            | V           |
| Collector-emitter voltage  | $V_{CEO}$     | 450            | V           |
| Emitter-base voltage   | $V_{EBO}$     | 6              | V           |
| Emitter-collector voltage  | $V_{ECV}$     | 6              | V           |
| Peak pulse current   | $I_{CM}$      | 0.5            | A           |
| Continuous collector current*  | $I_C$         | 0.15           | A           |
| Base current   | $I_B$         | 0.2            | A           |
| Power dissipation @ $T_A=25^\circ\text{C}^*$<br>Linear derating factor       | $P_D$         | 625<br>5       | mW<br>mW/°C |
| Power dissipation @ $T_A=25^\circ\text{C}^\dagger$<br>Linear derating factor | $P_D$         | 806<br>6.4     | mW<br>mW/°C |
| Operating and storage temperature range                                      | $T_j:T_{stg}$ | -55 to<br>+150 | °C          |

## Thermal resistance

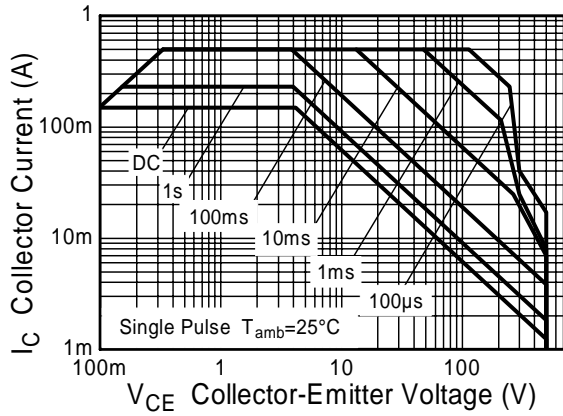
| Parameter            | Symbol          | Value | Unit |
|----------------------|-----------------|-------|------|
| Junction to ambient* | $R_{\theta JA}$ | 200   | °C/W |
| Junction to ambient† | $R_{\theta JA}$ | 155   | °C/W |

### NOTES:

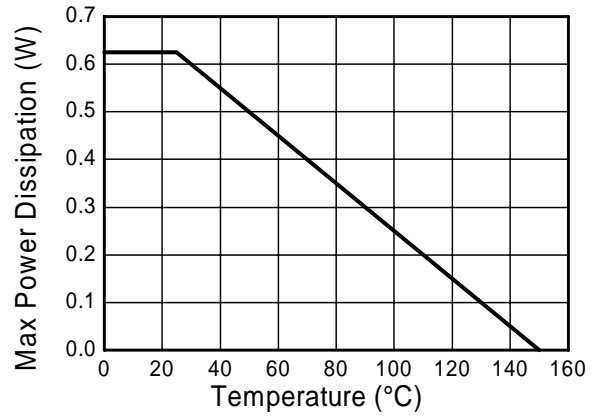
\* For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of 1oz copper, in still air conditions

† as above measured at  $t < 5$ secs.

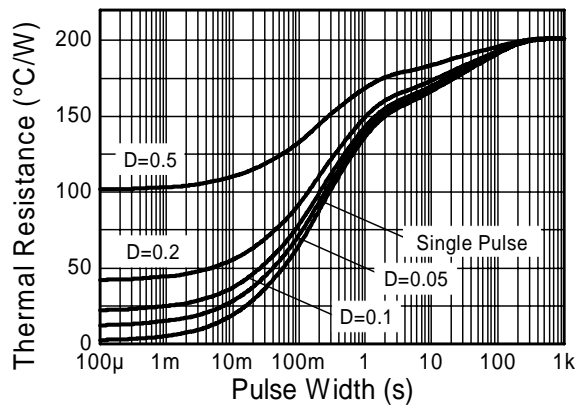
## Thermal characteristics



**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**

## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

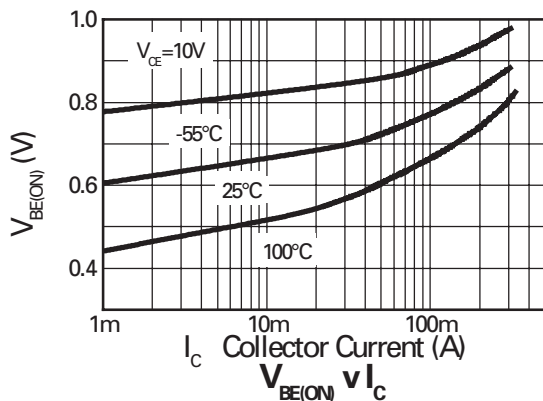
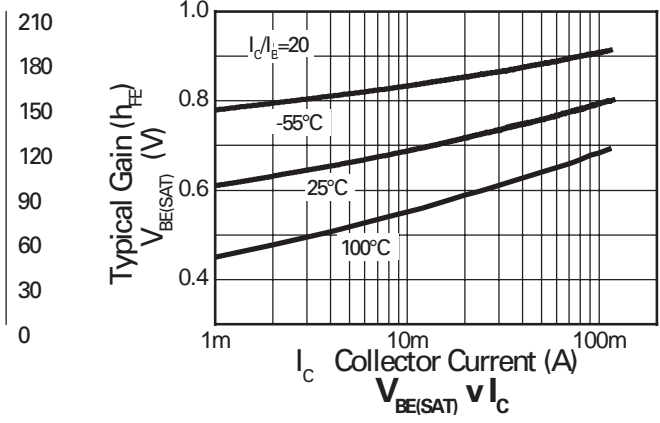
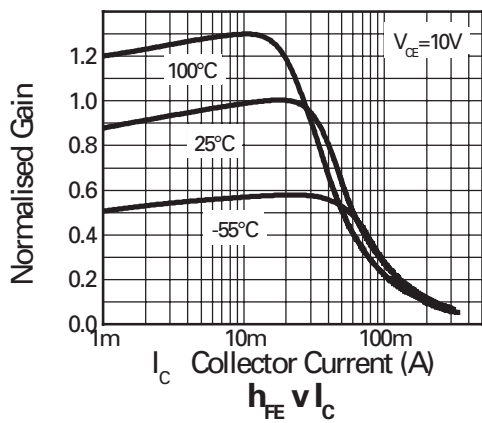
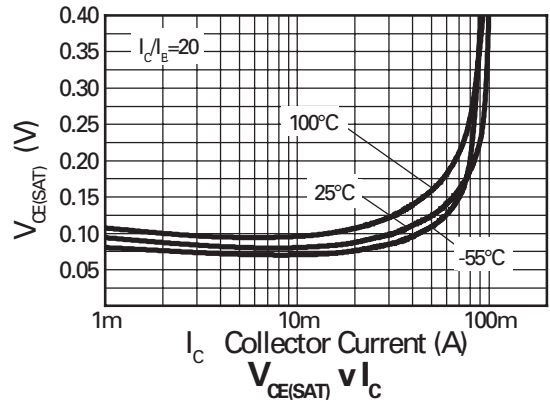
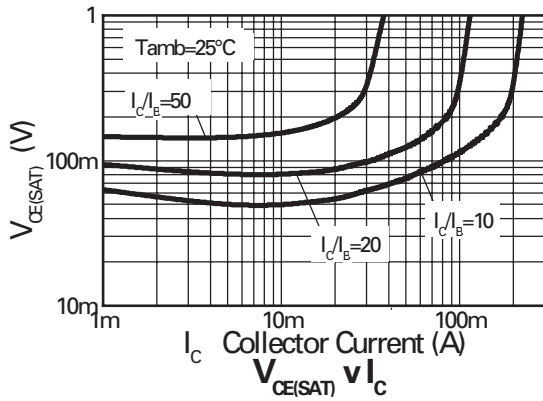
| Parameter   | Symbol        | Min. | Typ.      | Max.     | Unit     | Conditions   |
|---|---------------|------|-----------|----------|----------|--|
| Collector-base breakdown voltage                  | $BV_{CBO}$    | 500  | 700       |          | V        | $I_C = 100\mu\text{A}$   |
| Collector-emitter breakdown voltage               | $BV_{CEV}$    | 500  | 700       |          | V        | $I_C = 10\mu\text{A}$ ,<br>$0.3\text{V} > V_{BE} > -1\text{V}$                               |
| Collector-emitter breakdown voltage               | $BV_{CEO}$    | 450  | 500       |          | V        | $I_C = 10\text{mA}^*$  |
| Emitter-base breakdown voltage                    | $BV_{EBO}$    | 6    | 8.1       |          | V        | $I_E = 100\mu\text{A}$   |
| Emitter-base breakdown voltage (reverse blocking) | $BV_{ECV}$    | 6    | 8.1       |          | V        | $I_C = 1\mu\text{A}$ ,<br>$0.3\text{V} > V_{BC} > -6\text{V}$                                |
| Collector-emitter cut-off current                 | $I_{CES}$     |      |           | 100      | nA       | $V_{CE}=450\text{V}$   |
| Collector-base cut-off current                    | $I_{CBO}$     |      |           | 100      | nA       | $V_{CB}=450\text{V}$   |
| Emitter-base cut-off current                      | $I_{EBO}$     |      |           | 100      | nA       | $V_{EB}=5\text{V}$   |
| Static forward current transfer ratio             | $H_{FE}$      | 50   | 120<br>70 |          |          | $I_C = 30\text{mA}$ , $V_{CE} = 10\text{V}$<br>$I_C = 50\text{mA}^*$ , $V_{CE} = 10\text{V}$ |
| Collector-emitter saturation voltage              | $V_{CE(sat)}$ |      | 60<br>70  | 75<br>90 | mV<br>mV | $I_C = 20\text{mA}$ , $I_B = 2\text{mA}^*$<br>$I_C = 50\text{mA}$ , $I_B = 6\text{mA}^*$     |
| Base-emitter saturation voltage                   | $V_{BE(sat)}$ |      | 0.76      | 0.9      | V        | $I_C = 50\text{mA}$ , $I_B = 5\text{mA}^*$   |
| Base-emitter turn-on voltage                      | $V_{BE(on)}$  |      | 0.71      | 0.9      | V        | $I_C = 50\text{mA}$ , $V_{CE} = 10\text{V}^*$  |
| Transition frequency                              | $f_T$         | 50   |           |          | MHz      | $I_C = 10\text{mA}$ , $V_{CE} = 20\text{V}$<br>$f = 20\text{MHz}$                            |
| Output capacitance                                | $C_{obo}$     |      |           | 5        | pF       | $V_{CB} = 20\text{V}$ , $f = 1\text{MHz}$  |
| Turn-on time                                      | $t_{(ON)}$    |      | 113       |          | ns       | $I_C = 50\text{mA}$ , $V_C = 100\text{V}$<br>$I_{B1} = 5\text{mA}$ , $I_{B2} = 10\text{mA}$  |
| Turn-off time                                     | $t_{(OFF)}$   |      | 3450      |          | ns       | $I_C = 50\text{mA}$ , $V_C = 100\text{V}$<br>$I_{B1} = 5\text{mA}$ , $I_{B2} = 10\text{mA}$  |

### NOTES:

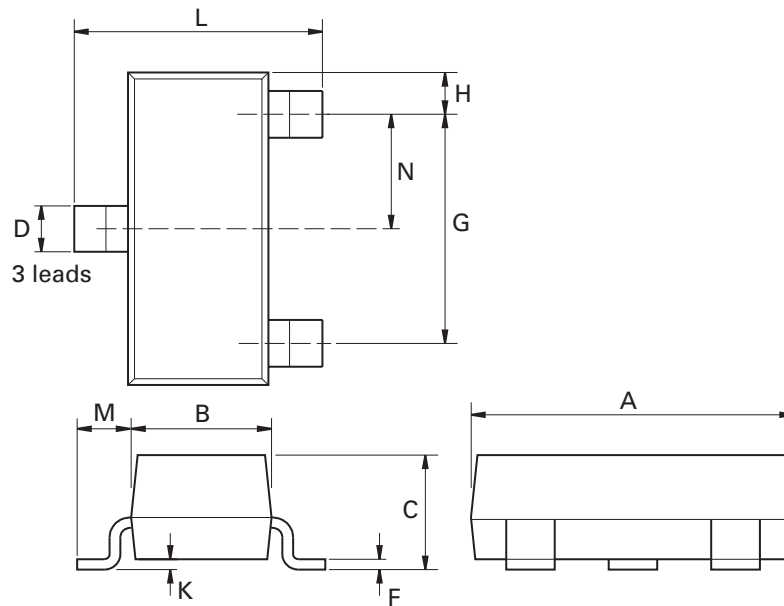
\* Measured under pulsed conditions. Pulse width =  $300\mu\text{s}$ ; duty cycle  $<2\%$

**Note:** For high voltage applications, the appropriate industry sector guidelines should be considered with regards to voltage spacing between Terminals.

Electrical characteristics



## Packaging details - SOT23



## Package dimensions

Dimensions in inches are control dimensions, dimensions in millimeters are approximate.

| Dim. | Millimeters |      | Inches     |        | Dim. | Millimeters |      | Inches      |        |
|------|-------------|------|------------|--------|------|-------------|------|-------------|--------|
|      | Min.        | Max. | Min.       | Max.   |      | Min.        | Max. | Max.        | Max.   |
| A    | 2.67        | 3.05 | 0.105      | 0.120  | H    | 0.33        | 0.51 | 0.013       | 0.020  |
| B    | 1.20        | 1.40 | 0.047      | 0.055  | K    | 0.01        | 0.10 | 0.0004      | 0.004  |
| C    | -           | 1.10 | -          | 0.043  | L    | 2.10        | 2.50 | 0.083       | 0.0985 |
| D    | 0.37        | 0.53 | 0.015      | 0.021  | M    | 0.45        | 0.64 | 0.018       | 0.025  |
| F    | 0.085       | 0.15 | 0.0034     | 0.0059 | N    | 0.95 Nom.   |      | 0.0375 Nom. |        |
| G    | 1.90 Nom.   |      | 0.075 Nom. |        | -    | -           | -    | -           | -      |

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