

FMMT459

#### **500V NPN HIGH VOLTAGE TRANSISTOR IN SOT23**

## **Feature**

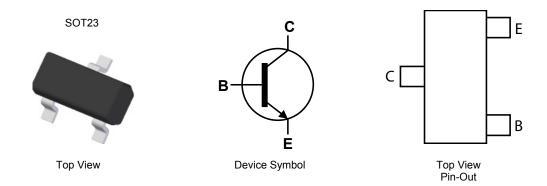
- BV<sub>CFV</sub> > 500V
- BV<sub>ECV</sub> > 6V reverse blocking
- I<sub>C</sub> = 150mA high Continuous Collector Current
- I<sub>CM</sub> Up to 500mA Peak Pulse Current
- 625mW Power Dissipation
- Low Saturation Voltage <-90mV @ 50mA</li>
- Excellent h<sub>FE</sub> Characteristics Up To 120mA
- Complementary PNP Type: FMMT559
- Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP capable (Note 4)

## **Mechanical Data**

- Case: SOT23
- Case Material: molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 @3
- Weight 0.008 grams (approximate)

### **Applications**

- Off-line switching applications
- RCD circuits
- PFC disable switch in PSU
- Emergency lighting
- Piezo actuators
- Telecom protected line switching



# Ordering Information (Note 5)

Part Number	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
FMMT459TA	AEC-Q101	459	7	8	3,000
FMMT459QTA	Automotive	459	7	8	3,000

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen and Antimony free, "Green" and Lead-Free.
- 3. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
- 5. For packaging details, go to our website at http://www.diodes.com

# **Marking Information**







Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	500	V
Collector-Emitter Voltage	V <sub>CEV</sub>	500	V
Collector-Emitter Voltage	V <sub>CEO</sub>	450	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Emitter-Collector Voltage	V <sub>ECV</sub>	6	V
Continuous Collector Current	Ic	150	mA
Peak Pulse Current	I <sub>CM</sub>	500	mA
Base Current	I <sub>B</sub>	200	mA

## Thermal Characteristics (@TA = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	625	mW
Power Dissipation (Note 7)	P <sub>D</sub>	806	mW
Thermal Resistance, Junction to Ambient (Note 6)	$R_{ heta JA}$	200	°C/W
Thermal Resistance, Junction to Ambient (Note 7)	R <sub>0JA</sub>	155	°C/W
Thermal Resistance, Junction to Leads (Note 8)	R <sub>θJL</sub>	194	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

## ESD Ratings (Note 9)

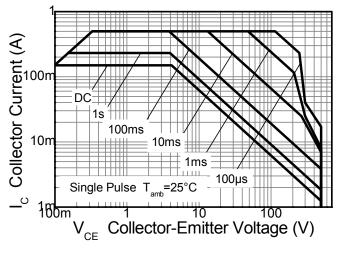
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	С

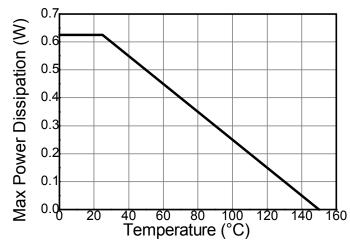
Notes:

<sup>6.</sup> For a device surface mounted on 25mm X 25mm FR4 PCB with high coverage of single sided 1 oz copper, in still air conditions; the device is measured 6. For a device surface modified on 25mm x 25mm FR4 PCB with high coverage of when operating in a steady-state condition.
7. Same as note 6, except the device is measured at t ≤ 5 sec.
8. Thermal resistance from junction to solder-point (at the end of the collector lead).
9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.



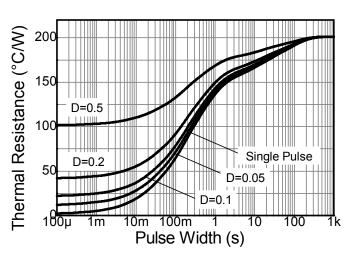
# **Thermal Characteristics and Derating Information**

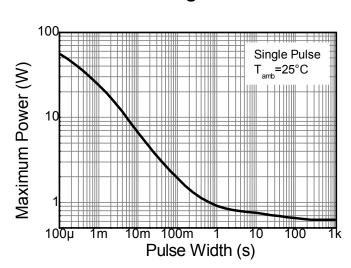




# **Safe Operating Area**

**Derating Curve** 





**Transient Thermal Impedance** 

**Pulse Power Dissipation** 





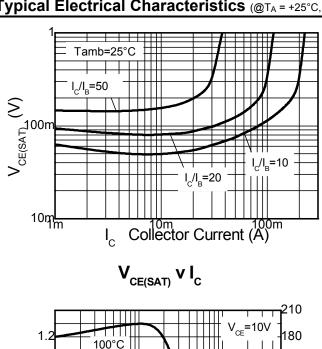
# **Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

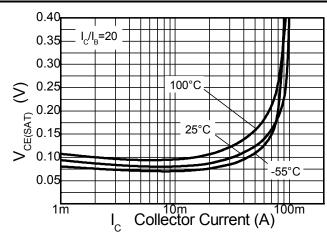
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_CBO$	500	700	_	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage	$BV_CEV$	500	700	_	V	$I_C = 10\mu A; 0.3V > V_{BE} > -1V$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_CEO$	450	500	_	V	$I_C = 1mA$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	8.1	_	V	I <sub>E</sub> = 100μA
Emitter-Base Breakdown Voltage (Reverse Blocking)	$BV_{ECV}$	6	8.1	_	V	$I_C = 1\mu A$ ; 0.3V > $V_{BC}$ > -6V
Collector Cutoff Current	I <sub>CBO</sub>	_	<10	100	nA	V <sub>CB</sub> = 450V
Emitter Cutoff Current	I <sub>EBO</sub>	_	<10	100	nA	V <sub>EB</sub> = 5.6V
Collector Emitter Cutoff Current	I <sub>CES</sub>	_	<10	100	nA	V <sub>CE</sub> = 450V
Static Forward Current Transfer Ratio (Note 10)	h	50	120	_		I <sub>C</sub> = 30mA, V <sub>CE</sub> = 10V
Static Folward Current Harister Natio (Note 10)	h <sub>FE</sub>	_	70	_		$I_C = 50 \text{mA}, V_{CE} = 10 \text{V}$
Collector-Emitter Saturation Voltage (Note 10)	Vor.		60	75	mV	$I_C = 20$ mA, $I_B = 2$ mA
Concetor-Enritter Catalation Voltage (Note 10)	V <sub>CE(sat)</sub>	_	70	90	mV	$I_C = 50$ mA, $I_B = 6$ mA
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	_	0.71	0.9	V	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 10V
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	_	0.76	0.9	V	$I_C = 50$ mA, $I_B = 5$ mA
Output Capacitance	$C_{obo}$	_		5	pF	V <sub>CB</sub> = 20V, f = 1MHz
Transition Frequency	$f_T$	50		_	MHz	V <sub>CE</sub> = 20V, I <sub>C</sub> = 10mA, f = 20MHz
Turn-On Time	t <sub>on</sub>		113	_	ns	$V_C = 100V, I_C = 50mA$
Turn-Off Time	t <sub>off</sub>	_	3450	_	ns	I <sub>B1</sub> = 5mA, I <sub>B2</sub> = -10mA

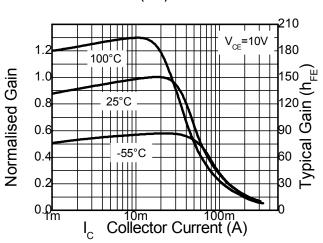
Notes: 10. Measured under pulsed conditions. Pulse width  $\leq$  300  $\mu$ s. Duty cycle  $\leq$  2%.

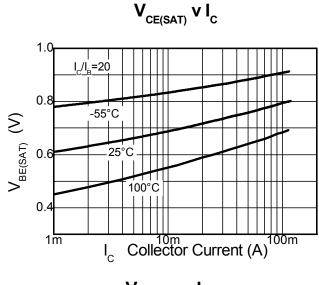


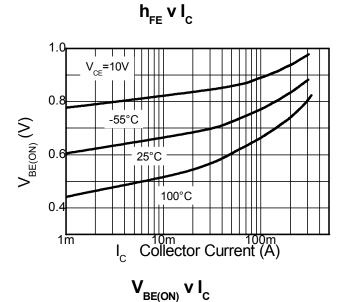
Typical Electrical Characteristics (@TA = +25°C, unless otherwise specified.)







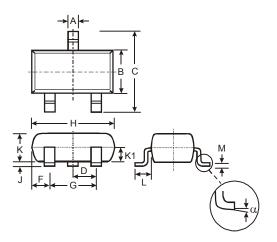






# **Package Outline Dimensions**

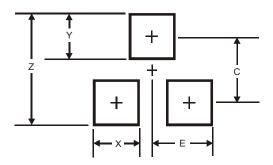
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



SOT23				
Dim	Min	Max	Тур	
Α	0.37	0.51	0.40	
В	1.20	1.40	1.30	
С	2.30	2.50	2.40	
D	0.89	1.03	0.915	
F	0.45	0.60	0.535	
G	1.78	2.05	1.83	
Н	2.80	3.00	2.90	
J	0.013	0.10	0.05	
K	0.903	1.10	1.00	
K1	-	-	0.400	
L	0.45	0.61	0.55	
М	0.085	0.18	0.11	
α	0°	8°	-	
All	All Dimensions in mm			

# **Suggested Pad Layout**

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



Dimensions	Value (in mm)			
Z	2.9			
Х	0.8			
Υ	0.9			
С	2.0			
E	1.35			

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





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