

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

**Feature**

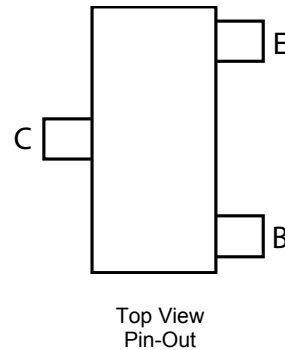
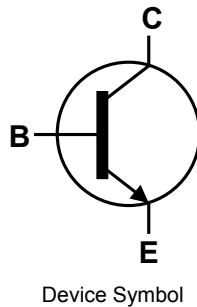
- $BV_{CEV} > 500V$
- $BV_{ECV} > 6V$  reverse blocking
- $I_C = 150mA$  high Continuous Collector Current
- $I_{CM}$  Up to 500mA Peak Pulse Current
- 625mW Power Dissipation
- Low Saturation Voltage  $< 90mV @ 50mA$
- Excellent  $h_{FE}$  Characteristics Up To 120mA
- Complementary PNP Type: FMMT559
- **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 <sup>Ⓔ</sup>
- 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

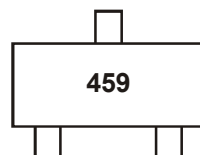


**Ordering Information (Note 5)**

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**



459 = Product Type Marking Code

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</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	I <sub>C</sub>	150	mA
Peak Pulse Current	I <sub>CM</sub>	500	mA
Base Current	I <sub>B</sub>	200	mA

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

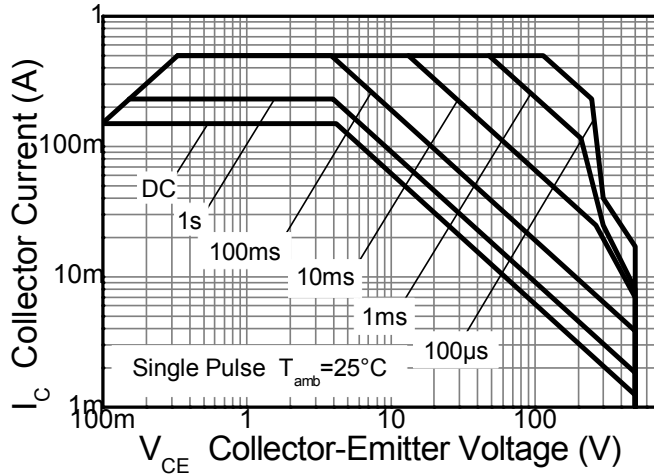
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P <sub>D</sub>	625	mW
Power Dissipation (Note 7)	P <sub>D</sub>	806	mW
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	200	°C/W
Thermal Resistance, Junction to Ambient (Note 7)	R <sub>θJA</sub>	155	°C/W
Thermal Resistance, 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)

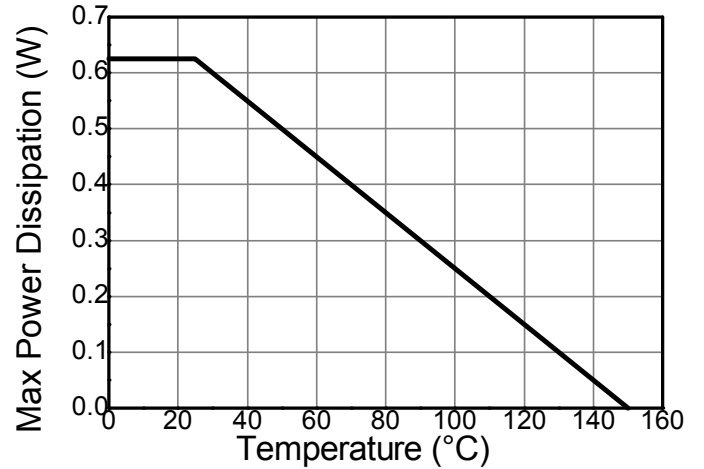
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	C

- Notes:
6. 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 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.

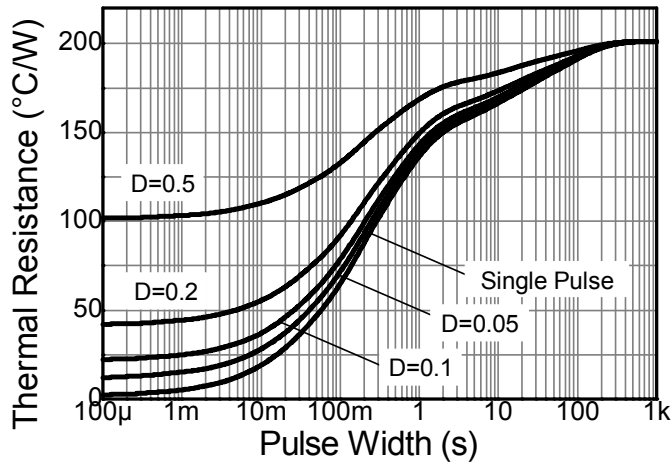
**Thermal Characteristics and Derating Information**



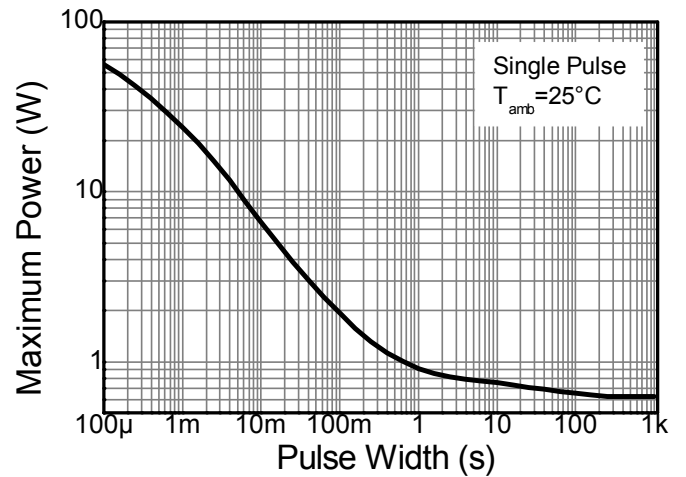
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



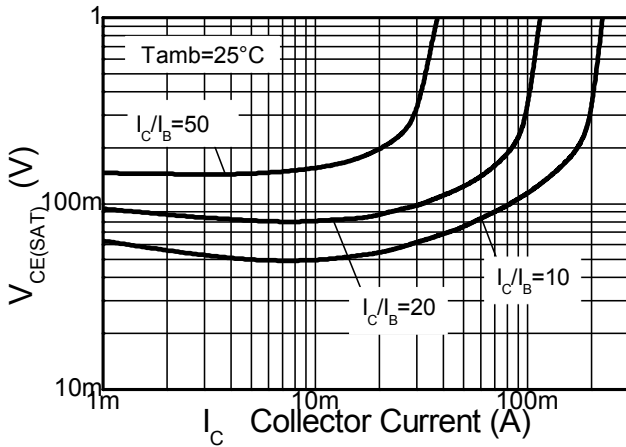
**Pulse Power Dissipation**

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

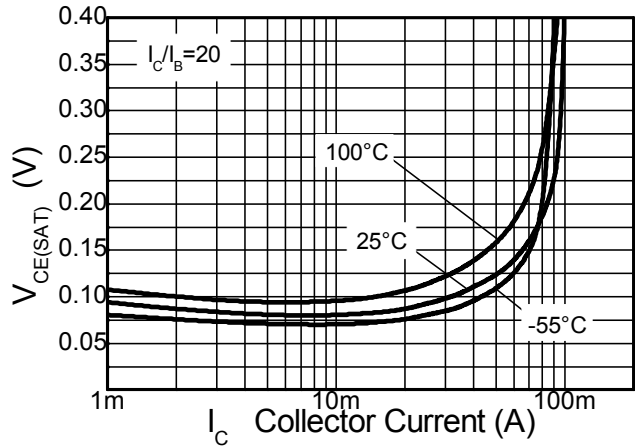
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	500	700	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage	BV <sub>CEV</sub>	500	700	—	V	I <sub>C</sub> = 10μA; 0.3V > V <sub>BE</sub> > -1V
Collector-Emitter Breakdown Voltage (Note 10)	BV <sub>CEO</sub>	450	500	—	V	I <sub>C</sub> = 1mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	8.1	—	V	I <sub>E</sub> = 100μA
Emitter-Base Breakdown Voltage (Reverse Blocking)	BV <sub>ECV</sub>	6	8.1	—	V	I <sub>C</sub> = 1μA; 0.3V > V <sub>BC</sub> > -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 <sub>FE</sub>	50	120	—	—	I <sub>C</sub> = 30mA, V <sub>CE</sub> = 10V I <sub>C</sub> = 50mA, V <sub>CE</sub> = 10V
Collector-Emitter Saturation Voltage (Note 10)	V <sub>CE(sat)</sub>	—	60	75	mV	I <sub>C</sub> = 20mA, I <sub>B</sub> = 2mA
		—	70	90	mV	I <sub>C</sub> = 50mA, I <sub>B</sub> = 6mA
Base-Emitter Turn-On Voltage (Note 10)	V <sub>BE(on)</sub>	—	0.71	0.9	V	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 10V
Base-Emitter Saturation Voltage (Note 10)	V <sub>BE(sat)</sub>	—	0.76	0.9	V	I <sub>C</sub> = 50mA, I <sub>B</sub> = 5mA
Output Capacitance	C <sub>obo</sub>	—	—	5	pF	V <sub>CB</sub> = 20V, f = 1MHz
Transition Frequency	f <sub>T</sub>	50	—	—	MHz	V <sub>CE</sub> = 20V, I <sub>C</sub> = 10mA, f = 20MHz
Turn-On Time	t <sub>on</sub>	—	113	—	ns	V <sub>C</sub> = 100V, I <sub>C</sub> = 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 ≤ 300 μs. Duty cycle ≤ 2%.

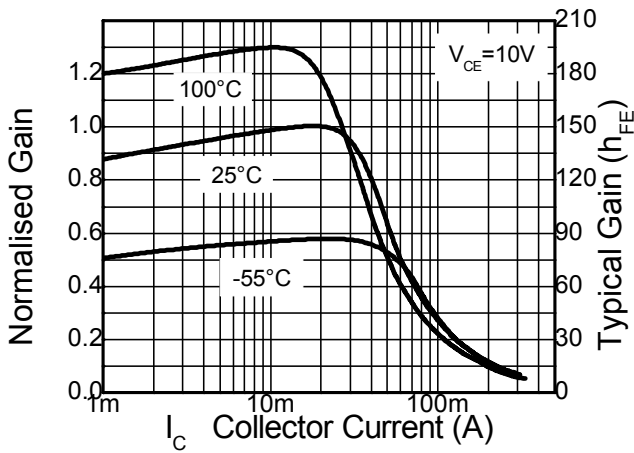
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



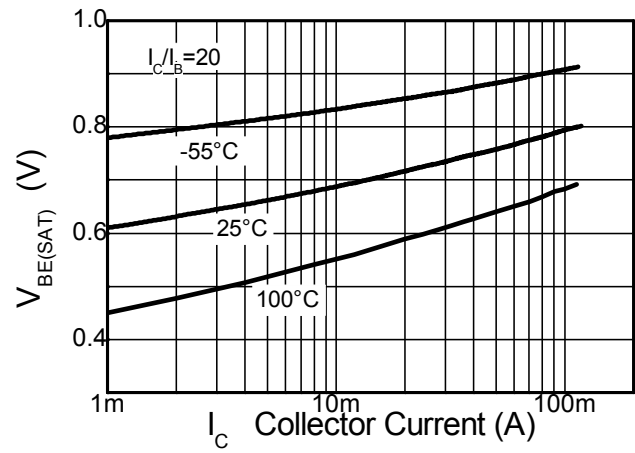
$V_{CE(SAT)} \text{ v } I_C$



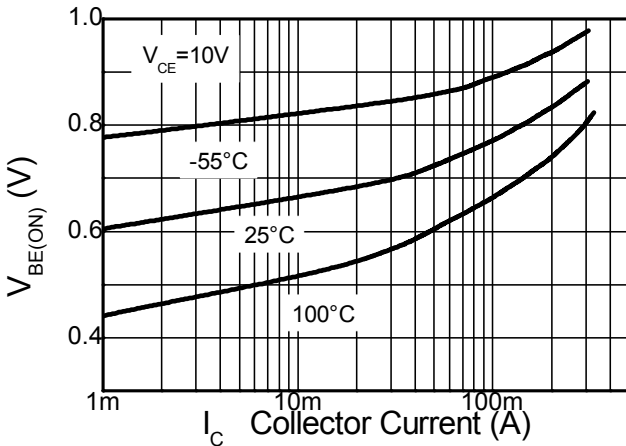
$V_{CE(SAT)} \text{ v } I_C$



$h_{FE} \text{ v } I_C$



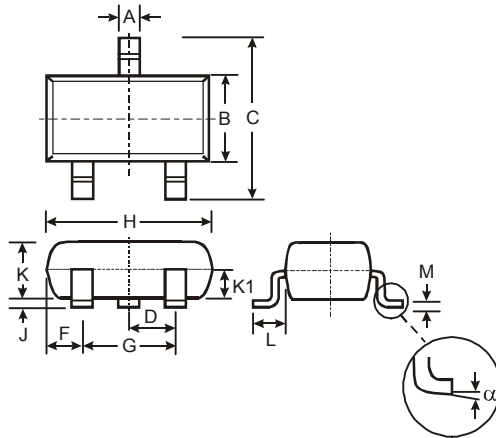
$V_{BE(SAT)} \text{ v } I_C$



$V_{BE(ON)} \text{ v } I_C$

### Package Outline Dimensions

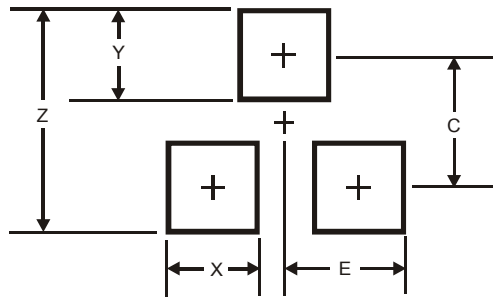
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	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
H	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
M	0.085	0.18	0.11
α	0°	8°	-
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
X	0.8
Y	0.9
C	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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