A Product Line of
Diodes Incorporated

Lead-free Green

FMMT459Q

500V NPN HIGH VOLTAGE TRANSISTOR IN SOT23

Description

This Bipolar Junction Transistor (BJT) has been designed to meet the stringent requirements of Automotive Applications.

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
- **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

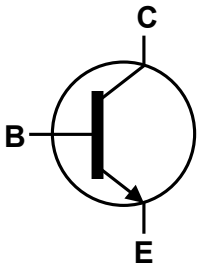
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight 0.008 grams (approximate)

Applications

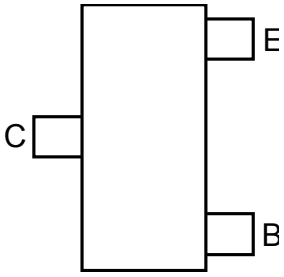
- Automotive
- Off-line switching applications
- RCD circuits
- PFC disable switch in PSU
- Emergency lighting
- Piezo actuators
- Telecom protected line switching

SOT23

Top View



Device Symbol



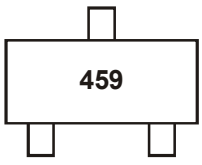
Top View
Pin-Out

Ordering Information (Notes 4 & 5)

Part Number	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
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/quality/lead_free.html 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. For more information, please refer to http://www.diodes.com/quality/product_compliance_definitions/.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html

Marking Information



459 = Product Type Marking Code

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	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}	7	V
Emitter-Collector Voltage	V_{ECV}	6	V
Continuous Collector Current	I_C	150	mA
Peak Pulse Current	I_{CM}	500	mA
Base Current	I_B	200	mA

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

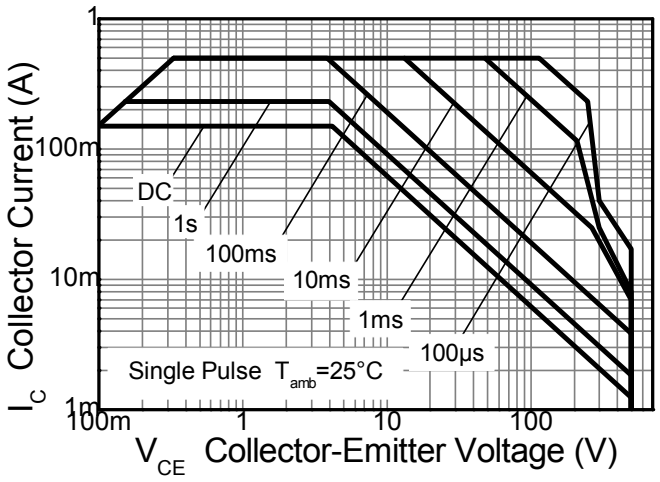
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	P_D	625	mW
Power Dissipation (Note 7)	P_D	806	mW
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction to Ambient (Note 7)	$R_{\theta JA}$	155	°C/W
Thermal Resistance, Junction to Leads (Note 8)	$R_{\theta JL}$	194	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 9)

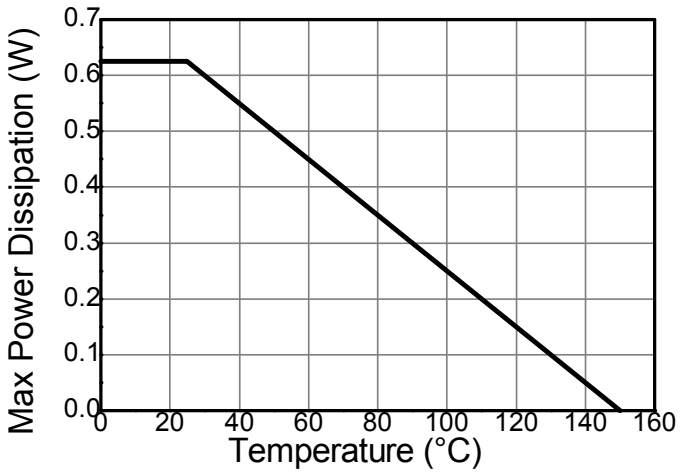
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

Notes:
6. For a device mounted with the collector lead on 25mm x 25mm 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
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.

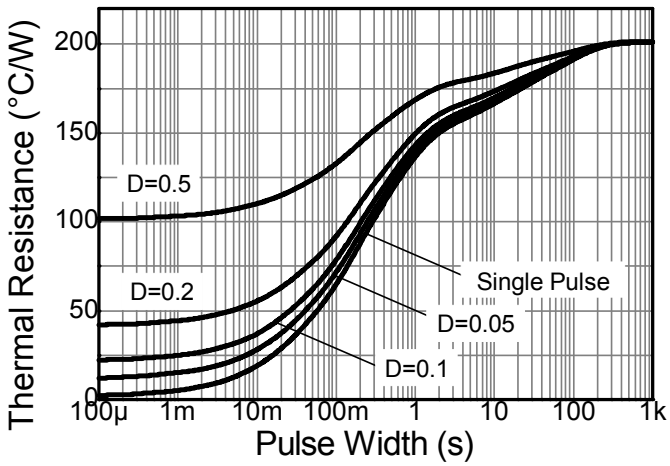
Thermal Characteristics and Derating Information



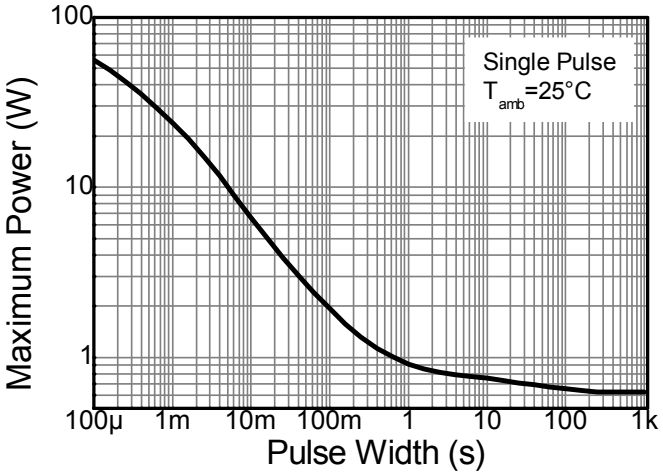
Safe Operating Area



Derating Curve



Transient Thermal Impedance



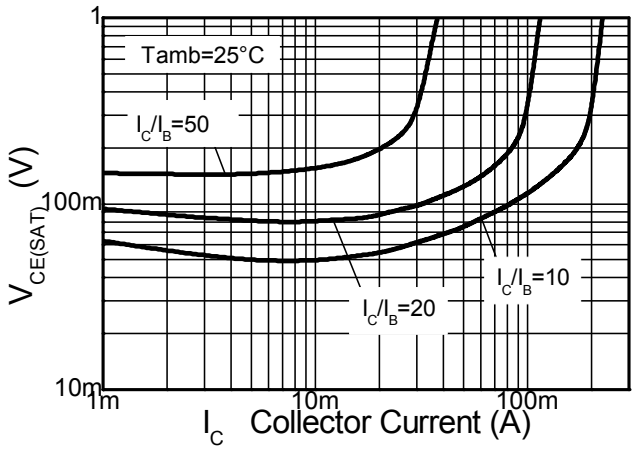
Pulse Power Dissipation

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

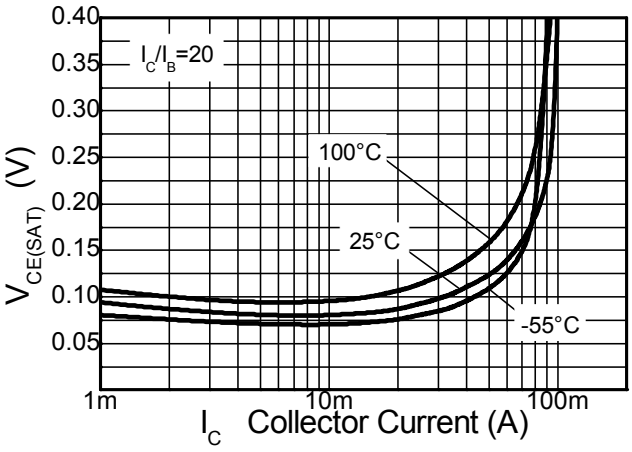
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	500	700	—	V	I_C = 100µA
Collector-Emitter Breakdown Voltage	BV_{CEV}	500	700	—	V	I_C = 10µA; 0.3V > V_{BE} > -1V
Collector-Emitter Breakdown Voltage (Note 10)	BV_{CEO}	450	500	—	V	I_C = 1mA
Emitter-Base Breakdown Voltage	BV_{EBO}	7	8.1	—	V	I_E = 100µA
Emitter-Base Breakdown Voltage (Reverse Blocking)	BV_{ECV}	6	8.1	—	V	I_C = 1µA; 0.3V > V_{BC} > -6V
Collector Cutoff Current	I_{CBO}	—	<10	100	nA	V_{CB} = 450V
Emitter Cutoff Current	I_{EBO}	—	<10	100	nA	V_{EB} = 5.6V
Collector Emitter Cutoff Current	I_{CES}	—	<10	100	nA	V_{CE} = 450V
Static Forward Current Transfer Ratio (Note 10)	h_{FE}	50 —	120 70	— —	—	I_C = 30mA, V_{CE} = 10V I_C = 50mA, V_{CE} = 10V
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	— —	60 70	75 90	mV mV	I_C = 20mA, I_B = 2mA I_C = 50mA, I_B = 6mA
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	—	0.71	0.9	V	I_C = 50mA, V_{CE} = 10V
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	—	0.76	0.9	V	I_C = 50mA, I_B = 5mA
Output Capacitance	C_{obo}	—	—	5	pF	V_{CB} = 20V, f = 1MHz
Transition Frequency	f_T	50	—	—	MHz	V_{CE} = 20V, I_C = 10mA, f = 20MHz
Turn-On Time	t_{on}	—	113	—	ns	V_C = 100V, I_C = 50mA
Turn-Off Time	t_{off}	—	3450	—	ns	I_{B1} = 5mA, I_{B2} = -10mA

Notes: 10. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

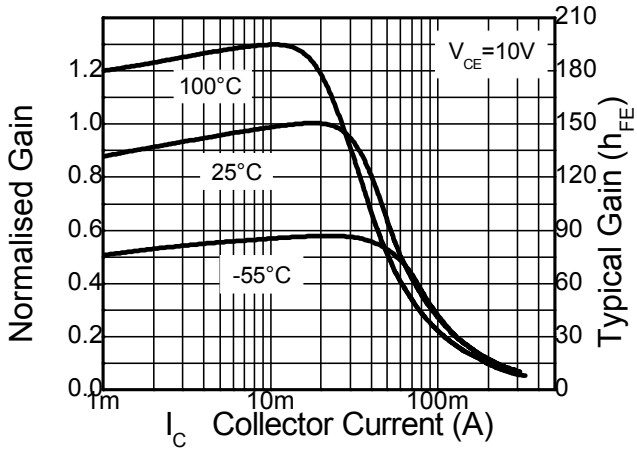
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



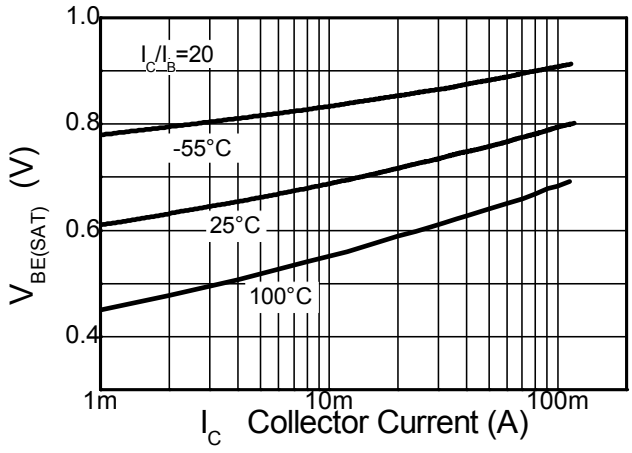
$V_{CE(SAT)}$ v I_C



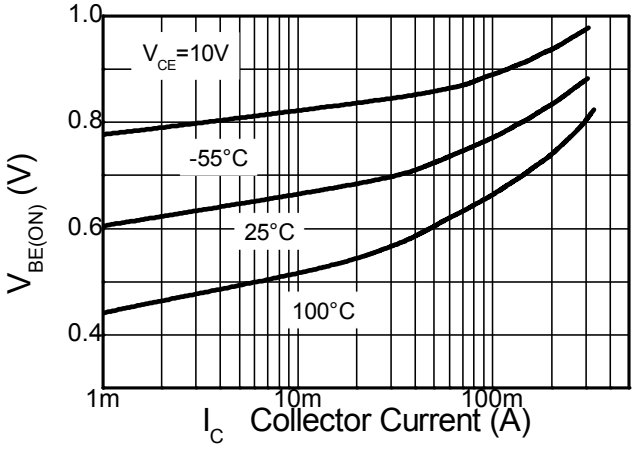
$V_{CE(SAT)}$ v I_C



h_{FE} v I_C



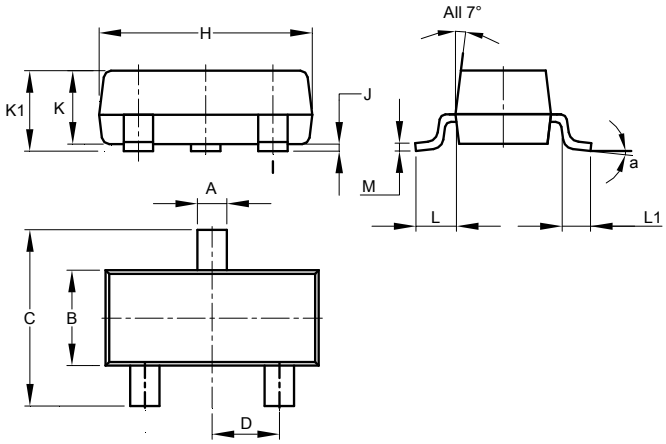
$V_{BE(SAT)}$ v I_C



$V_{BE(ON)}$ v I_C

Package Outline Dimensions

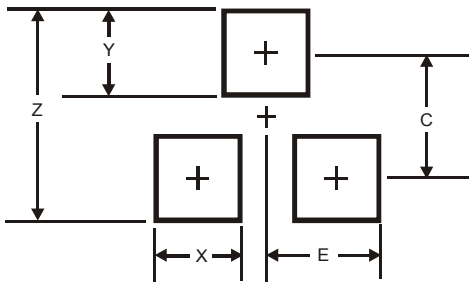
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	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 creepage and clearance distances between device Terminals and PCB tracking.

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