

NPN AVALANCHE TRANSISTOR IN SOT23

Features

- Avalanche Transistor
- 60A Peak Avalanche Current (Pulse width = 20ns)
- $BV_{CES} > 260V$ (415) & $320V$ (417)
- $BV_{CEO} > 100V$
- Specifically designed for Avalanche mode operation
- **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**

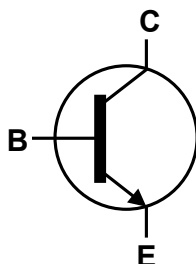
Description

The FMMT415/417 are NPN silicon planar bipolar transistors designed for operating in avalanche mode. Tight process control and low inductance packaging combine to produce high current pulses with fast edges.

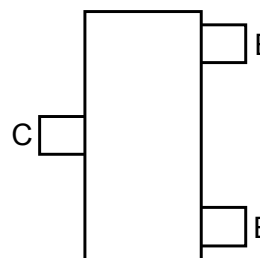
SOT23



Top View



Device Symbol



Top View
Pin-Out

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

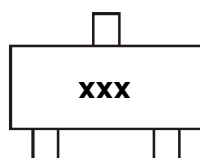
- Laser Diode Drivers for Ranging and Measurement (LIDAR)
- Automotive Radar Systems
 - Adaptive Cruise Control
 - Collision Avoidance System
- Fast Edge Switch Generator
- High Speed Pulse Generators

Ordering Information (Note 4)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
FMMT415TD	AEC-Q101	415	7	8	500
FMMT417TD	AEC-Q101	417	7	8	500

- 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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



xxx = Product Type Marking Code
(See Ordering Information)

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

Characteristic	Symbol	FMMT415	FMMT417	Unit
Collector-Base Voltage	V _{CBO}	260	320	V
Collector-Emitter Voltage	V _{CES}	260	320	V
Collector-Emitter Voltage	V _{CEO}	100	100	V
Emitter-Base Voltage	V _{EBO}	6		V
Continuous Collector Current	I _C	500		mA
Peak Collector Current (Pulse Width = 20ns)	I _{CM}	60		A

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

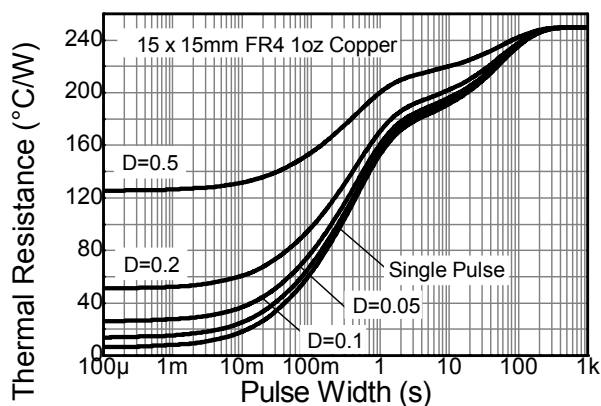
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P _D	500	mW
Thermal Resistance, Junction to Ambient (Note 5)	R _{θJA}	250	°C/W
Thermal Resistance, Junction to Lead (Note 6)	R _{θJL}	197	°C/W
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C

ESD Ratings (Note 7)

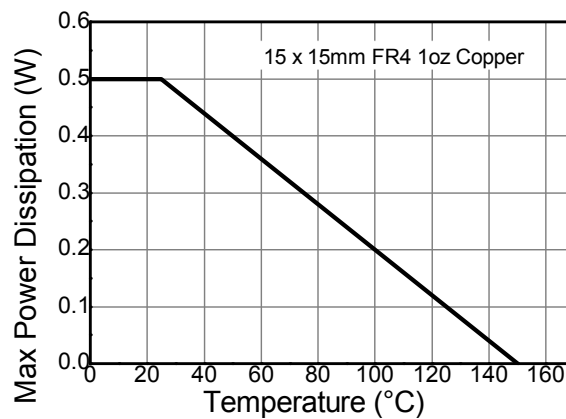
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
- For a device mounted with the collector lead on 15mm x 15mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
 - Thermal resistance from junction to solder-point (at the end of the collector lead).
 - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

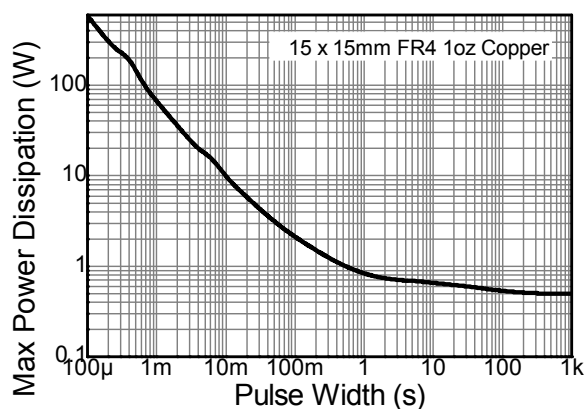
Thermal Characteristics and Derating Information



Transient Thermal Impedance



Derating Curve



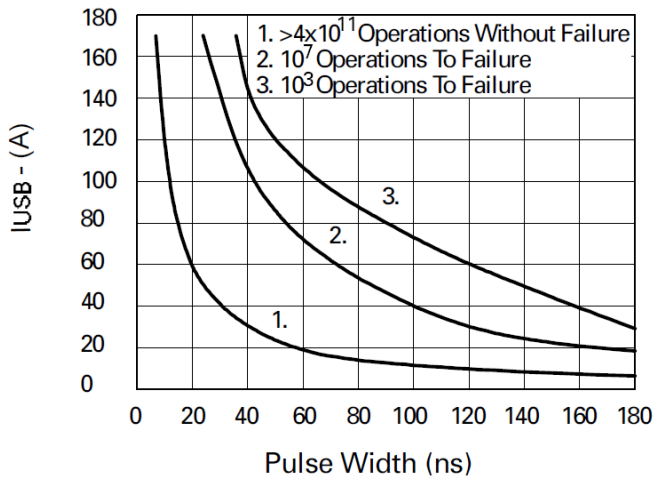
Pulse Power Dissipation

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

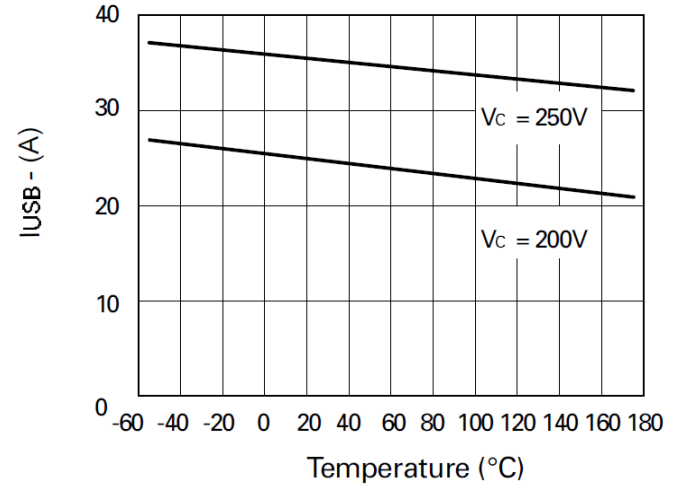
Characteristic		Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Emitter Breakdown Voltage	FMMT415	BV _{CES}	260	—	—	V	I _C = 1mA T _J = -55 to +150°C
	FMMT417		320	—	—		I _C = 1mA
Collector-Emitter Breakdown Voltage (Note 8)		BV _{CEO}	100	—	—	V	I _C = 100μA
Emitter-Base Breakdown Voltage		BV _{EBO}	6	—	—	V	I _E = 100μA
Collector Cutoff Current		I _{CBO}	—	—	100 10	nA μA	V _{CB} = 180V V _{CB} = 180V, T _J = +100°C
Emitter Cutoff Current		I _{EBO}	—	—	100	nA	V _{EB} = 4V
Static Forward Current Transfer Ratio (Note 8)		h _{FE}	25	—	—	—	I _C = 10mA, V _{CE} = 10V
Collector-Emitter Saturation Voltage (Note 8)		V _{CE(sat)}	—	—	500	mV	I _C = 10mA, I _B = 1mA
Base-Emitter Saturation Voltage (Note 8)		V _{BE(sat)}	—	—	900	mV	I _C = 10mA, I _B = 1mA
Pulsed Current in Second Breakdown		I _{USB}	15	—	—	A	V _C = 200V, C _{CE} = 620pF
			25	—	—	A	V _C = 250V, C _{CE} = 620pF
Collector-emitter inductance		L _{ce}	—	2.5	—	nH	Standard SOT23 leads
Output Capacitance		C _{obo}	—	—	8	pF	V _{CB} = 20V, I _E = 0 f = 100MHz
Transition Frequency		f _T	40	—	—	MHz	V _{CE} = 20V, I _C = 10mA, f = 20MHz

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

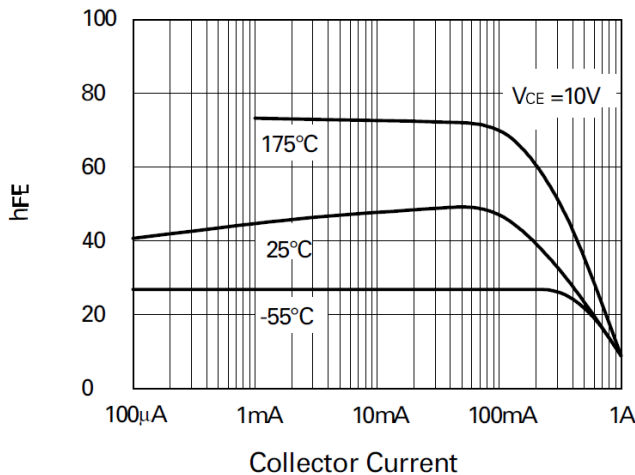
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



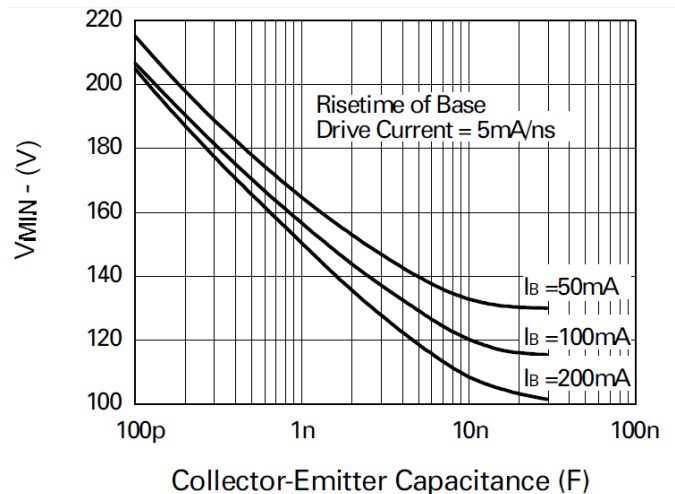
**Maximum Avalanche Current
v Pulse Width**



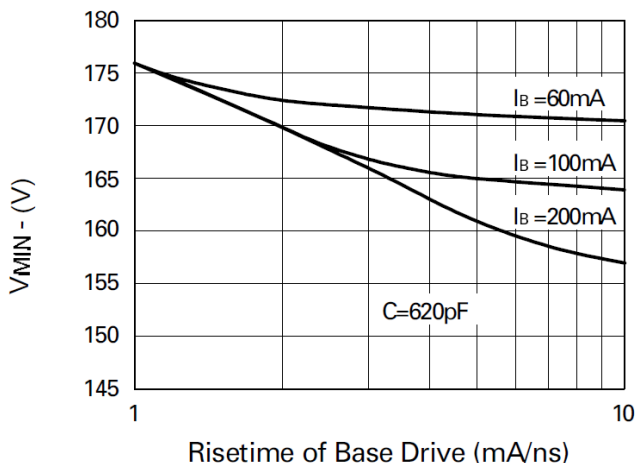
**IUSB v Temperature
for the specified conditions**



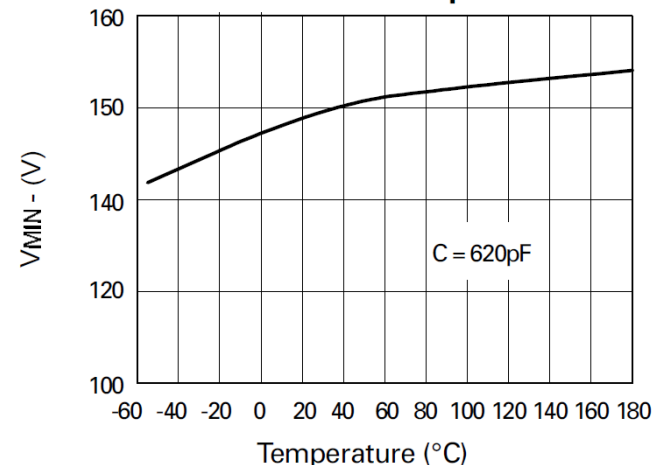
hFE v I_C



**Minimum starting voltage
as a function of capacitance**



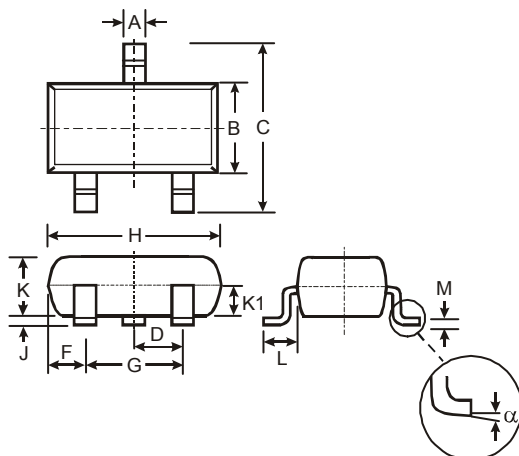
**Minimum starting voltage
as a function of drive current**



**Minimum starting voltage
as a function of temperature**

Package Outline Dimensions

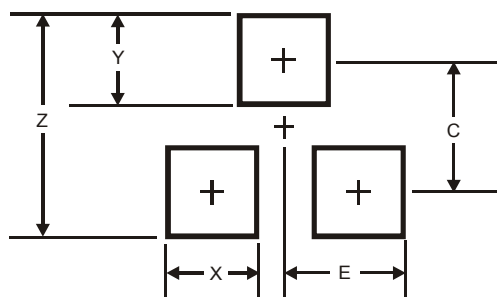
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



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 creepage and clearance distances between device terminals and PCB tracking.

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