

## 60V NPN MEDIUM POWER TRANSISTOR IN SOT23

**Feature**

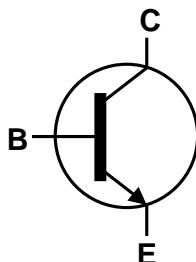
- $BV_{CEO} > 60V$
- $I_C = 1A$  Continuous Collector Current
- $I_{CM} = 2A$  Peak Pulse Current
- $R_{CE(sat)} = 195m\Omega$  for a low equivalent On-Resistance
- 500mW Power Dissipation
- $h_{FE}$  characterised up to 2A for high current gain hold up
- Complementary PNP Type: FMMT591
- **Totally Lead-Free & 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**

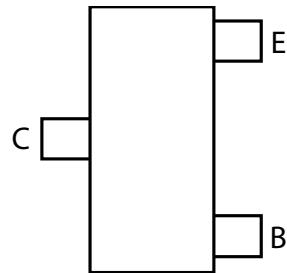
- Case: SOT23
- Case Material: molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (E3)
- Weight 0.008 grams (approximate)



Top View



Device Symbol

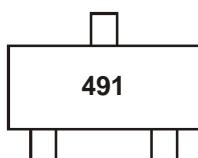

Top View  
Pin-Out

**Ordering Information** (Notes 4 & 5)

Part Number	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
FMMT491TA	AEC-Q101	491	7	8	3,000
FMMT491TC	AEC-Q101	491	13	8	10,000
FMMT491QTA	Automotive	491	7	8	3,000
FMMT491QTC	Automotive	491	13	8	10,000

## 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**


491 = Product Type Marking Code

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	80	V
Collector-Emitter Voltage	$V_{CEO}$	60	V
Emitter-Base Voltage	$V_{EBO}$	7	V
Continuous Collector Current	$I_C$	1	A
Peak Pulse Current	$I_{CM}$	2	A
Base Current	$I_B$	200	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	$P_D$	500	mW
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	250	°C/W
Thermal Resistance, Junction to Lead (Note 7)	$R_{\theta JL}$	197	°C/W
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

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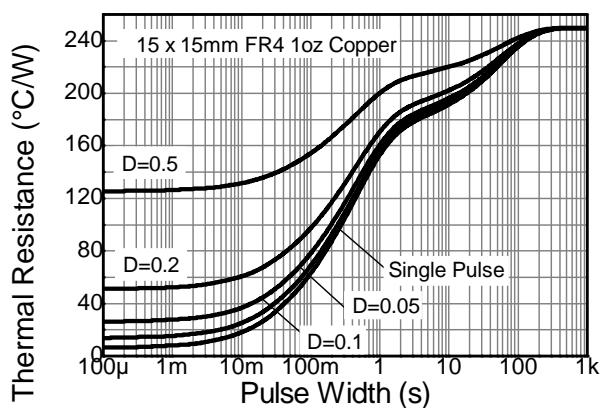
**ESD Ratings** (Note 8)

Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	$\geq 8,000$	V	3B
Electrostatic Discharge - Machine Model	ESD MM	$\geq 400$	V	C

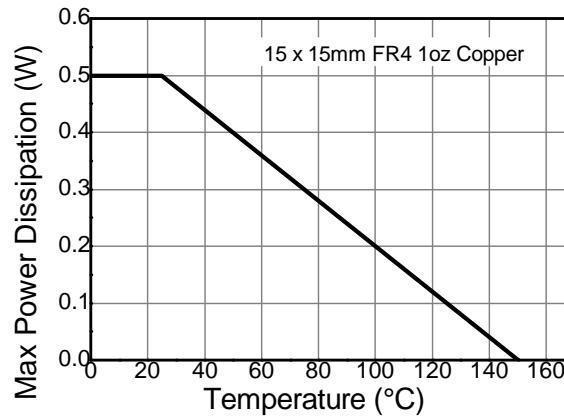
Notes:

6. For a device surface mounted on 15mm X 15mm 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. Thermal resistance from junction to solder-point (at the end of the collector lead).
8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

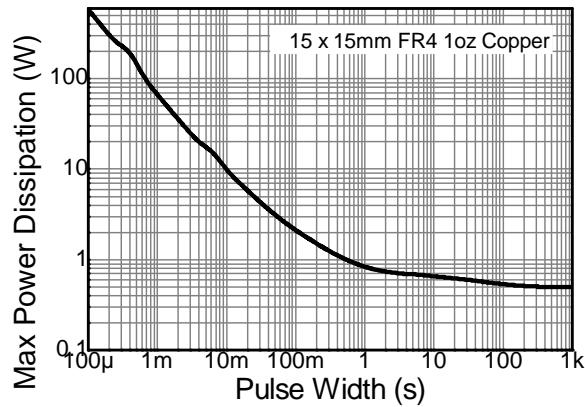
## Thermal Characteristics and Derating Information



**Transient Thermal Impedance**



**Derating Curve**



**Pulse Power Dissipation**

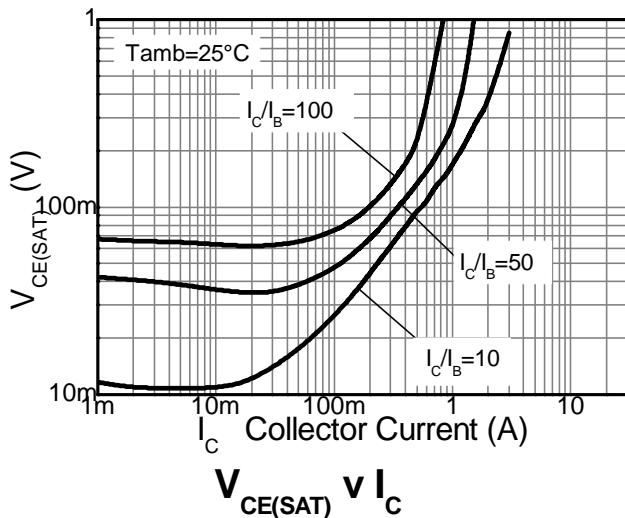
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**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

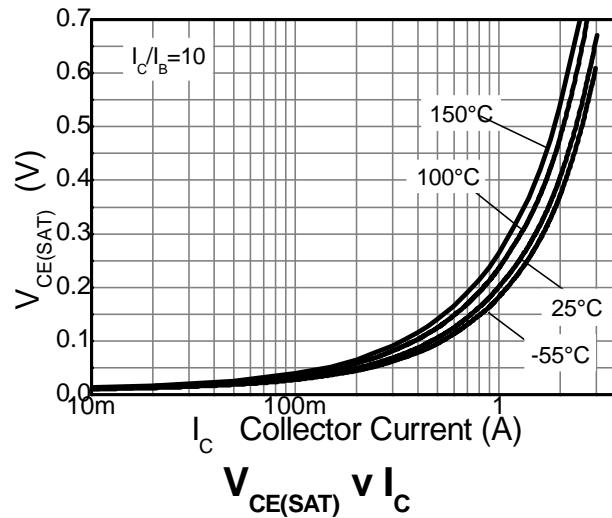
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$\text{BV}_{\text{CBO}}$	80	—	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 9)	$\text{BV}_{\text{CEO}}$	60	—	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$\text{BV}_{\text{EBO}}$	7	8.1	—	V	$I_E = 100\mu\text{A}$
Collector Cutoff Current	$I_{\text{CBO}}$	—	<1	100	nA	$V_{\text{CB}} = 60\text{V}$
Emitter Cutoff Current	$I_{\text{EBO}}$	—	<1	100	nA	$V_{\text{EB}} = 5.6\text{V}$
Collector Emitter Cutoff Current	$I_{\text{CES}}$	—	<1	100	nA	$V_{\text{CE}} = 60\text{V}, V_{\text{CES}} = 60\text{V}$
Static Forward Current Transfer Ratio (Note 9)	$h_{\text{FE}}$	100	140	—	—	$I_C = 1\text{mA}, V_{\text{CE}} = 5\text{V}$
		100	150	300		$I_C = 500\text{mA}, V_{\text{CE}} = 5\text{V}$
		80	120	—		$I_C = 1\text{A}, V_{\text{CE}} = 5\text{V}$
		30	40	—		$I_C = 2\text{A}, V_{\text{CE}} = 5\text{V}$
Collector-Emitter Saturation Voltage (Note 9)	$V_{\text{CE}(\text{sat})}$	—	100	150	V	$I_C = 500\text{mA}, I_B = 50\text{mA}$
		—	160	250		$I_C = 1\text{A}, I_B = 100\text{mA}$
Base-Emitter Turn-On Voltage (Note 9)	$V_{\text{BE}(\text{on})}$	—	830	1000	mV	$I_C = 1\text{A}, V_{\text{CE}} = 5\text{V}$
Base-Emitter Saturation Voltage (Note 9)	$V_{\text{BE}(\text{sat})}$	—	965	1100	mV	$I_C = 1\text{A}, I_B = 100\text{mA}$
Output Capacitance	$C_{\text{obo}}$	—	—	10	pF	$V_{\text{CB}} = 10\text{V}, f = 1\text{MHz}$
Transition Frequency	$f_T$	150	—	—	MHz	$V_{\text{CE}} = 10\text{V}, I_C = 50\text{mA}, f = 100\text{MHz}$

Notes: 9. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

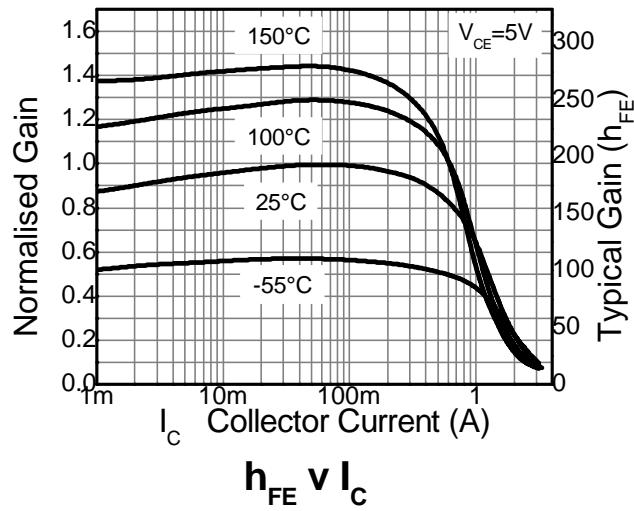
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



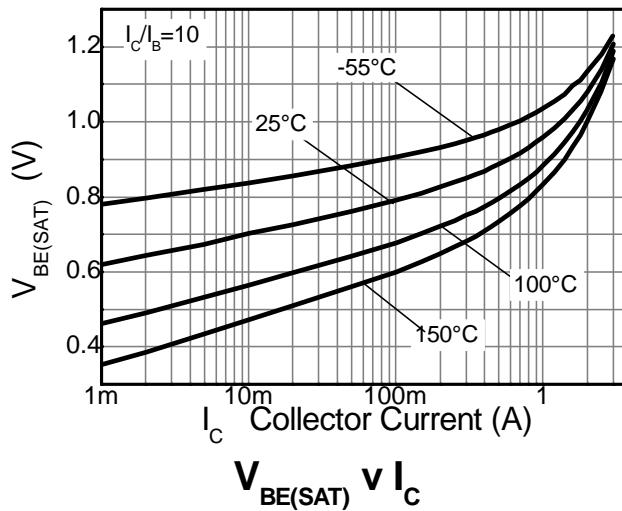
$V_{CE(SAT)}$  v  $I_C$



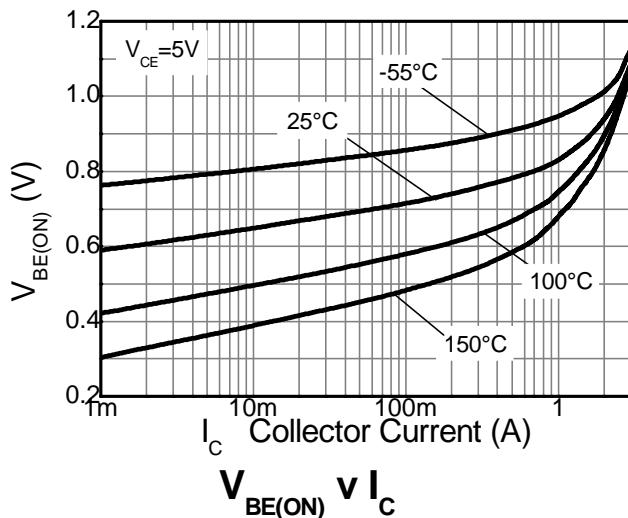
$V_{CE(SAT)}$  v  $I_C$



$h_{FE}$  v  $I_C$



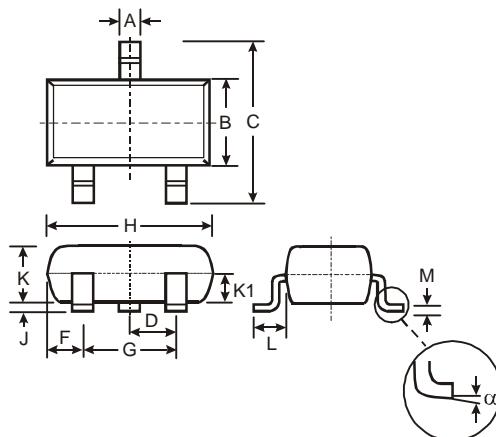
$V_{BE(SAT)}$  v  $I_C$



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

## Package Outline Dimensions

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

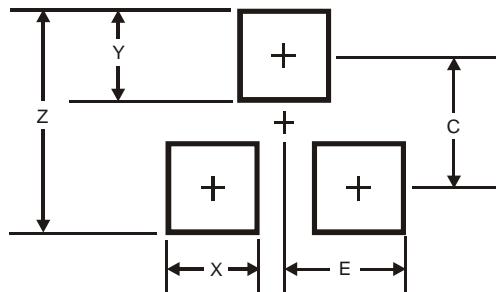


SOT23			
Dim	Min	Max	Typ
<b>A</b>	0.37	0.51	0.40
<b>B</b>	1.20	1.40	1.30
<b>C</b>	2.30	2.50	2.40
<b>D</b>	0.89	1.03	0.915
<b>F</b>	0.45	0.60	0.535
<b>G</b>	1.78	2.05	1.83
<b>H</b>	2.80	3.00	2.90
<b>J</b>	0.013	0.10	0.05
<b>K</b>	0.903	1.10	1.00
<b>K1</b>	-	-	0.400
<b>L</b>	0.45	0.61	0.55
<b>M</b>	0.085	0.18	0.11
<b>α</b>	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)
<b>Z</b>	2.9
<b>X</b>	0.8
<b>Y</b>	0.9
<b>C</b>	2.0
<b>E</b>	1.35

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