



**THE DATASHEET OF  
FMMT591ATA**



**40V PNP MEDIUM POWER HIGH PERFORMANCE TRANSISTOR IN SOT23**

**Features**

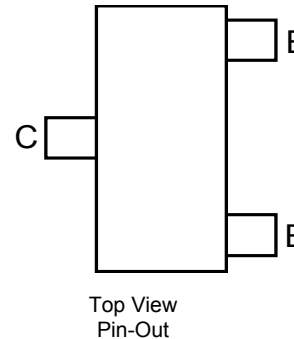
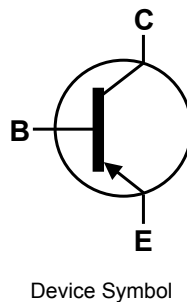
- $BV_{CEO} > -40V$
- $I_C = -1A$  High Continuous Current
- $I_{CM} = -2A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < -500mV @ -1A$
- $R_{SAT} = 350m\Omega$  for a Low Equivalent On-resistance
- Complementary NPN type: FMMT491A
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 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)

**Application**

- Power MOSFET gate driving
- Low loss power switching

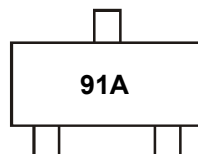


**Ordering Information** (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
FMMT591ATA	AEC-Q101	91A	7	8	3,000
FMMT591ATC	AEC-Q101	91A	13	8	10,000
FMMT591AQTA	Automotive	91A	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](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/](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**



91A = Product Type Marking Code

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-40	V
Collector-Emitter Voltage	$V_{CEO}$	-40	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
Peak Base Current	$I_{BM}$	-1	A

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

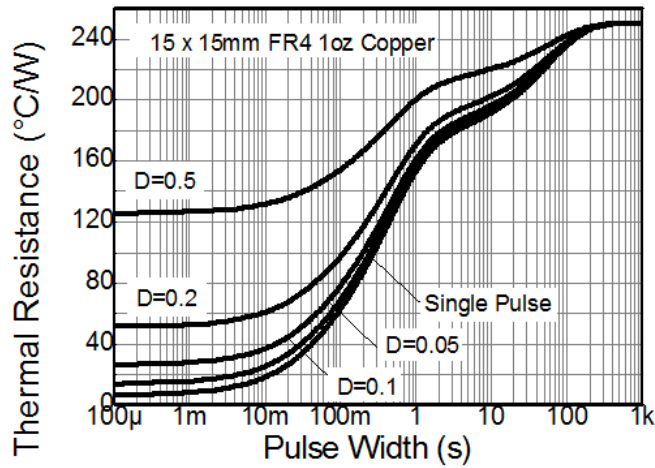
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6)	$P_D$	500	mW
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	250	$^\circ\text{C/W}$
Thermal Resistance, Junction to Lead (Note 7)	$R_{\theta JL}$	197	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$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

**ESD Ratings** (Note 8)

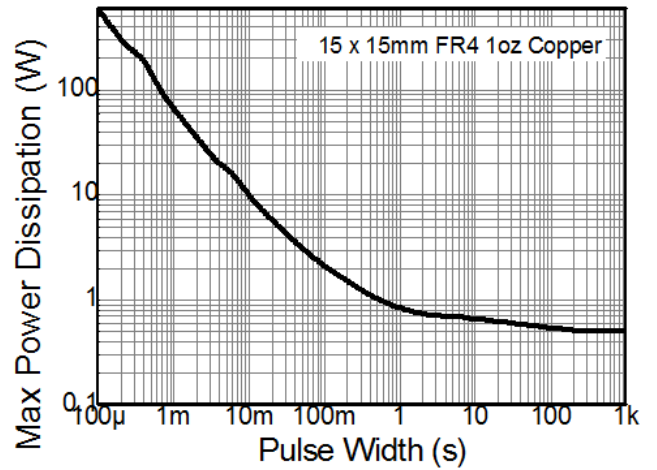
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
6. For a device mounted with the collector lead on 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.
  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.

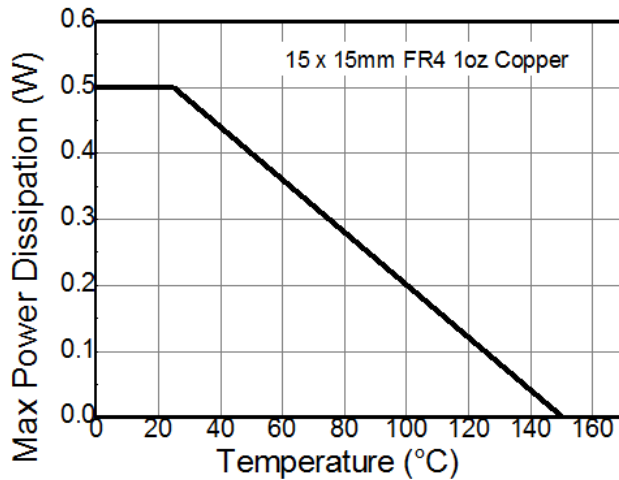
**Thermal Characteristics and Derating Information**



**Transient Thermal Impedance**



**Pulse Power Dissipation**



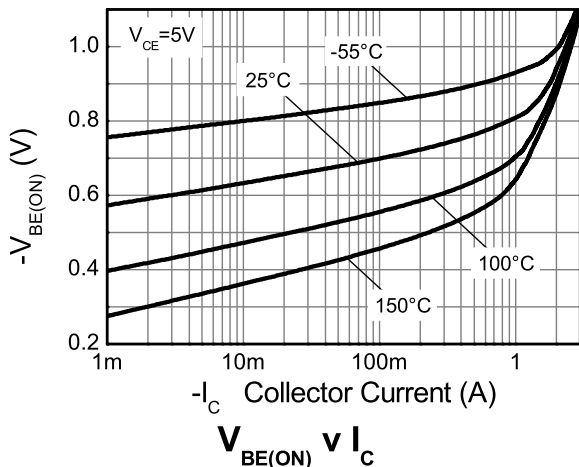
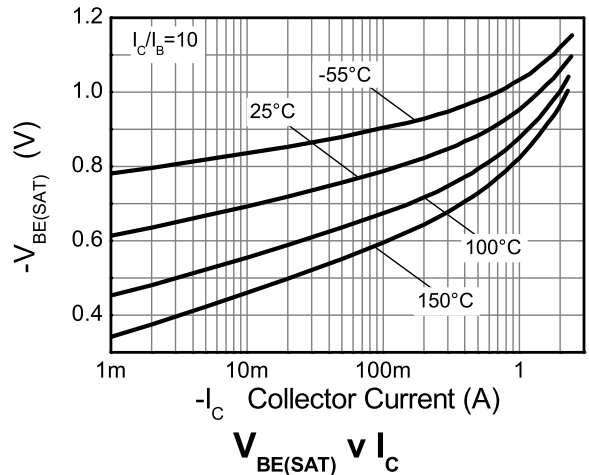
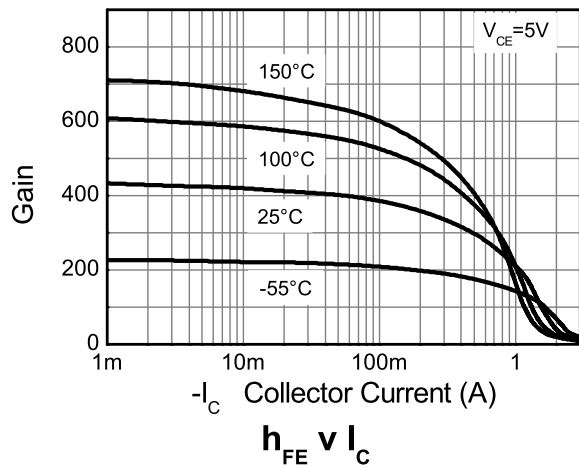
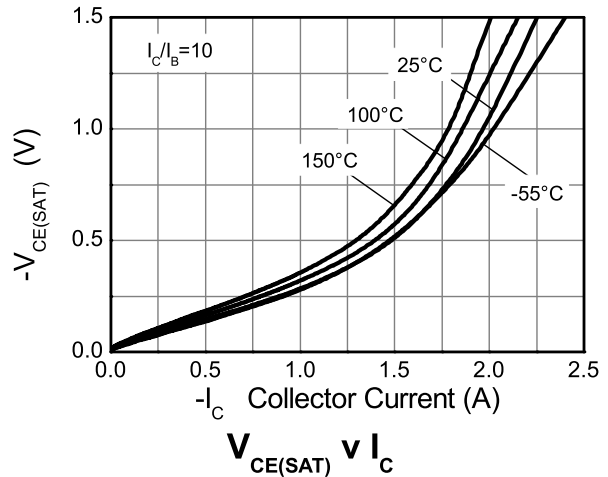
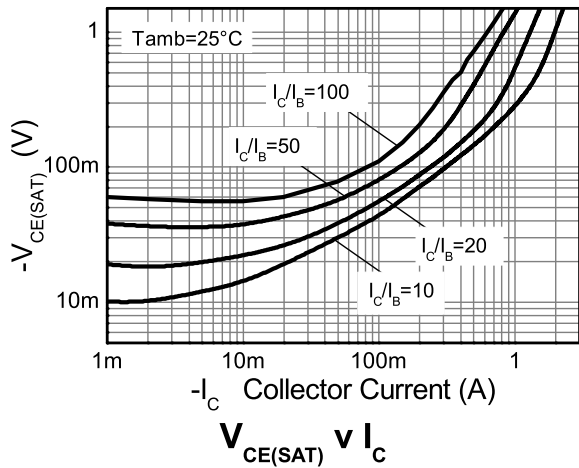
**Derating Curve**

**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>	-40	—	—	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 9)	BV <sub>CEO</sub>	-40	—	—	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	—	—	V	I <sub>E</sub> = -100μA
Collector Cutoff Current	I <sub>CBO</sub>	—	—	-100	nA	V <sub>CB</sub> = -30V
Collector-Emitter Cutoff Current	I <sub>CES</sub>	—	—	-100	nA	V <sub>CE</sub> = -30V
Emitter Cutoff Current	I <sub>EBO</sub>	—	—	-100	nA	V <sub>EB</sub> = -5.6V
Collector-Emitter Saturation Voltage (Note 9)	V <sub>CE(sat)</sub>	—	—	-200 -350 -500	mV	I <sub>C</sub> = -100mA, I <sub>B</sub> = -1mA I <sub>C</sub> = -500mA, I <sub>B</sub> = -20mA I <sub>C</sub> = -1A, I <sub>B</sub> = -100mA
Base-Emitter Saturation Voltage (Note 9)	V <sub>BE(sat)</sub>	—	—	-1.1	V	I <sub>C</sub> = -1A, I <sub>B</sub> = -100mA
Base-Emitter Turn-On Voltage (Note 9)	V <sub>BE(on)</sub>	—	—	-1.0	V	I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V
Static Forward Current Transfer Ratio (Note 9)	h <sub>FE</sub>	300 300 250 160 30	—	— 800 — — —	—	I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -500mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V I <sub>C</sub> = -2A, V <sub>CE</sub> = -5V
Transition Frequency	f <sub>T</sub>	150	□00	—	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz
Output Capacitance	C <sub>obo</sub>	—	—	10	pF	V <sub>CB</sub> = -10V, f = 1MHz
Switching Time	Delay Time	t <sub>(d)</sub>	—	34.9	—	ns V <sub>CC</sub> = -10V, I <sub>C</sub> = -500mA, I <sub>B1</sub> = -I <sub>B2</sub> = -25mA
	Rise Time	t <sub>(r)</sub>	—	19.2	—	
	Storage Time	t <sub>(s)</sub>	—	249	—	
	Fall Time	t <sub>(f)</sub>	—	62	—	

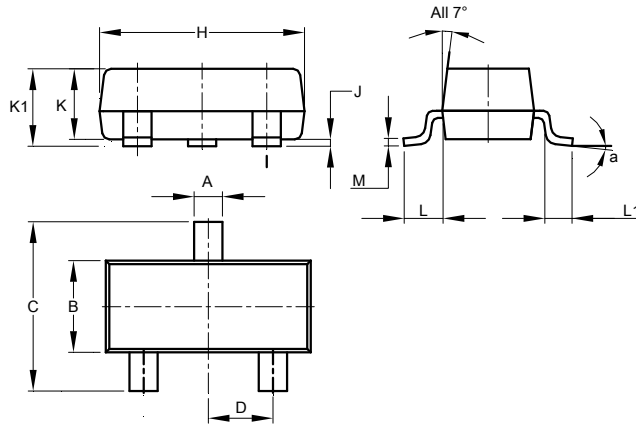
Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

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



## Package Outline Dimensions

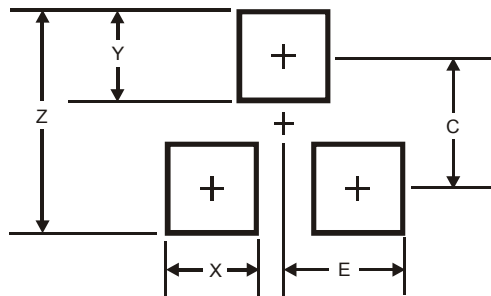
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



SOT23			
Dim	Min	Max	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

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