A Product Line of
Diodes Incorporated

Lead-free Green

FMMT591A

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} = 350mΩ 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

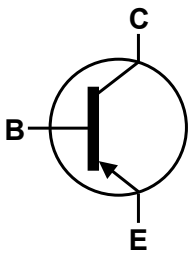
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.008 grams (approximate)

Application

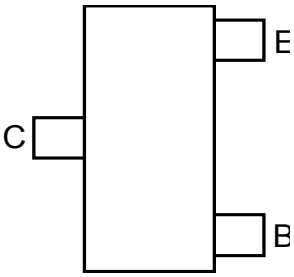
- Power MOSFET gate driving
- Low loss power switching

SOT23

Top View



Device Symbol



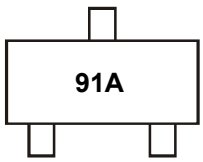
Top View
Pin-Out

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 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



91A = Product Type Marking Code

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

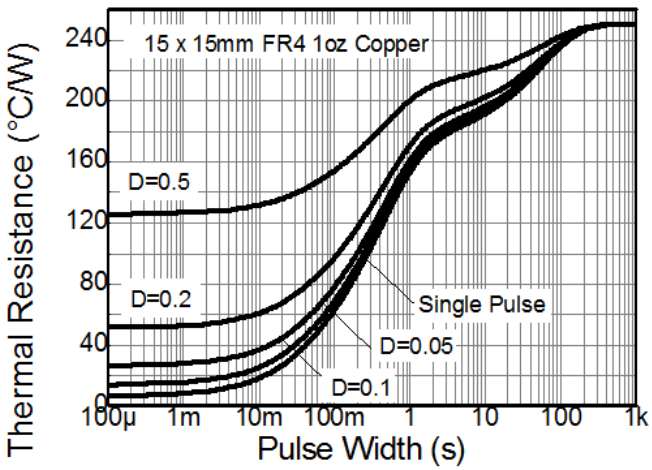
Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 6)	P_D	500	mW
Thermal Resistance, Junction to Ambient	(Note 6)	$R_{\theta JA}$	250	°C/W
Thermal Resistance, Junction to Lead	(Note 7)	$R_{\theta JL}$	197	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 8)

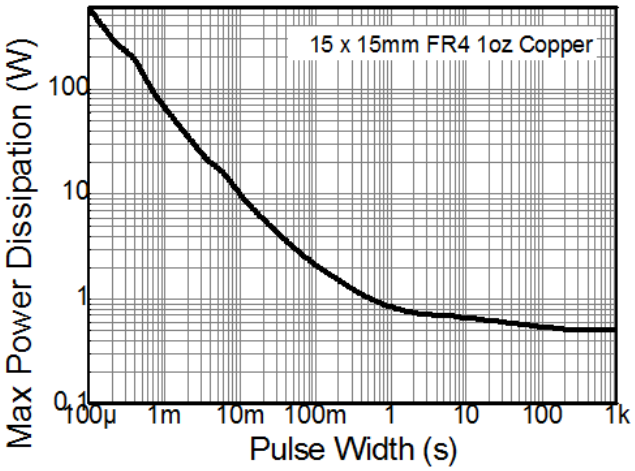
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

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.

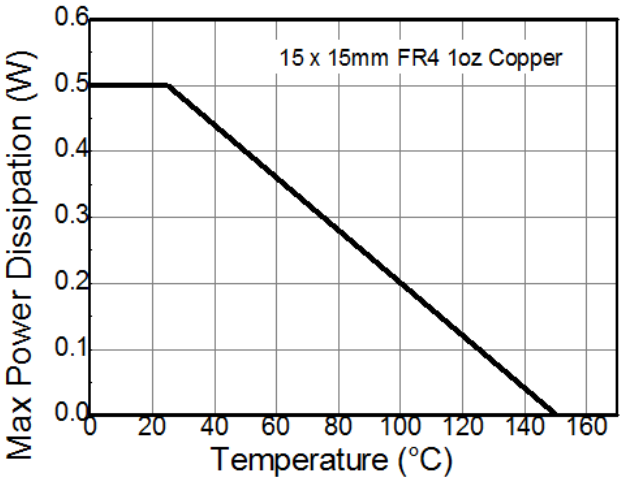
Thermal Characteristics and Derating Information



Transient Thermal Impedance



Pulse Power Dissipation



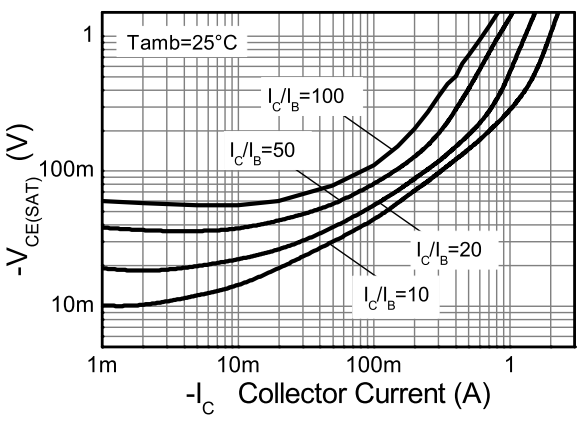
Derating Curve

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

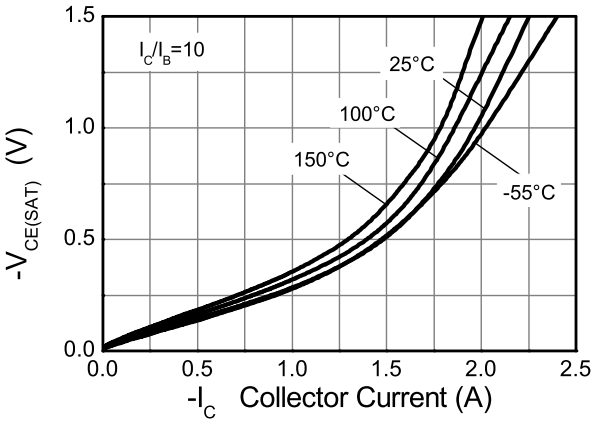
Characteristic		Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage		BV_{CBO}	-40	—	—	V	I_C = -100μA
Collector-Emitter Breakdown Voltage (Note 9)		BV_{CEO}	-40	—	—	V	I_C = -10mA
Emitter-Base Breakdown Voltage		BV_{EBO}	-7	—	—	V	I_E = -100μA
Collector Cutoff Current		I_{CBO}	—	—	-100	nA	V_{CB} = -30V
Collector-Emitter Cutoff Current		I_{CES}	—	—	-100	nA	V_{CES} = -30V
Emitter Cutoff Current		I_{EBO}	—	—	-100	nA	V_{EB} = -5.6V
Collector-Emitter Saturation Voltage (Note 9)		$V_{CE(sat)}$	— — —	—	-200 -350 -500	mV	I_C = -100mA, I_B = -1mA I_C = -500mA, I_B = -20mA I_C = -1A, I_B = -100mA
Base-Emitter Saturation Voltage (Note 9)		$V_{BE(sat)}$	—	—	-1.1	V	I_C = -1A, I_B = -100mA
Base-Emitter Turn-On Voltage (Note 9)		$V_{BE(on)}$	—	—	-1.0	V	I_C = -1A, V_{CE} = -5V
Static Forward Current Transfer Ratio (Note 9)		h_{FE}	300 300 250 160 30	—	— 800 — — —	—	I_C = -1mA, V_{CE} = -5V I_C = -100mA, V_{CE} = -5V I_C = -500mA, V_{CE} = -5V I_C = -1A, V_{CE} = -5V I_C = -2A, V_{CE} = -5V
Transition Frequency		f_T	150	□00	—	MHz	V_{CE} = -10V, I_C = -50mA, f = 100MHz
Output Capacitance		C_{obo}	—	—	10	pF	V_{CB} = -10V, f = 1MHz
Switching Time	Delay Time	$t_{(d)}$	—	34.9	—	ns	V_{CC} = -10V, I_C = -500mA, I_{B1} = -I_{B2} =-25mA
	Rise Time	$t_{(r)}$	—	19.2	—		
	Storage Time	$t_{(s)}$	—	249	—		
	Fall Time	$t_{(f)}$	—	62	—		

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

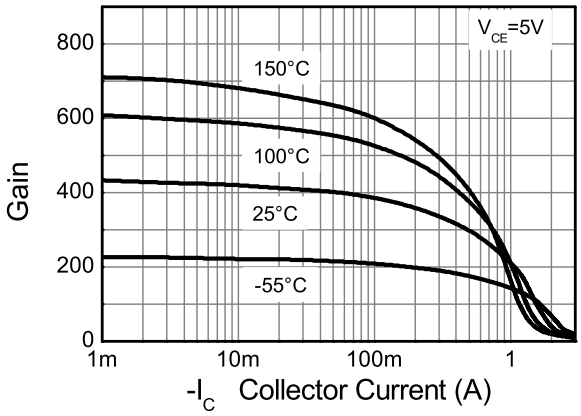
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



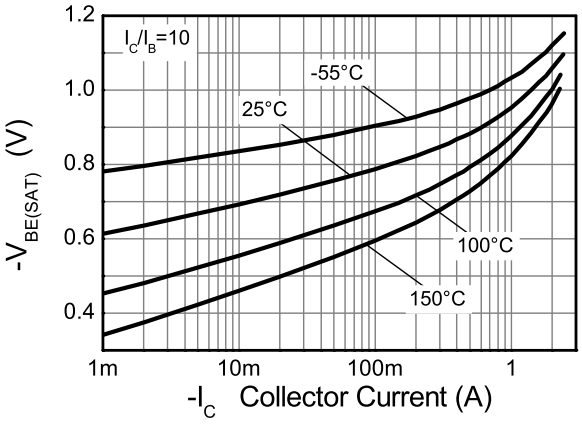
$V_{CE(SAT)}$ v I_C



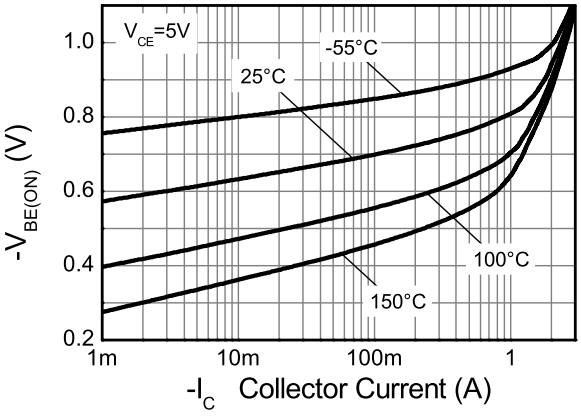
$V_{CE(SAT)}$ v I_C



h_{FE} v I_C



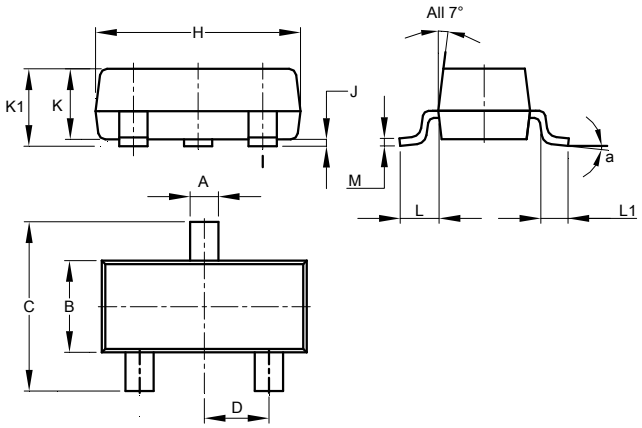
$V_{BE(SAT)}$ v I_C



$V_{BE(ON)}$ v I_C

Package Outline Dimensions

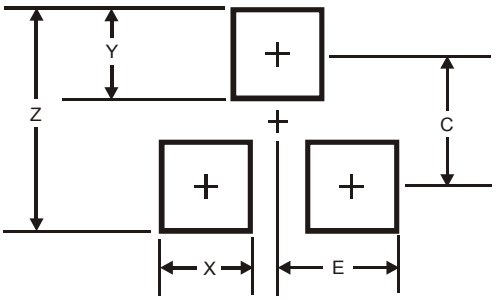
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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

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