

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

**Features**

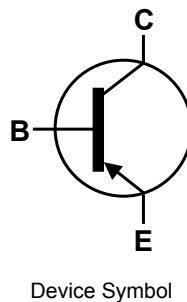
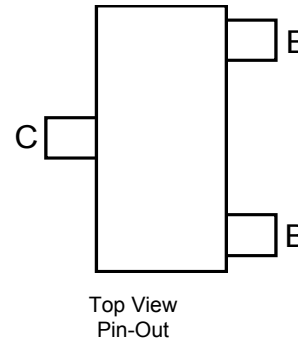
- $BV_{CEO} > -40V$
- $I_C = -1A$  High Continuous Current
- $I_{CM} = -2A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < -500mV @ -1A$
- $R_{SAT} = 350m\Omega$  for a Low Equivalent On-resistance
- Complementary NPN type: FMMT491A
- **Totally Lead-Free & Fully RoHS compliant (Notes 1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

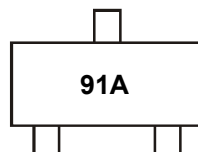


**Ordering Information** (Notes 4 & 5)

| 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<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | -40   | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | -40   | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | -7    | V    |
| Continuous Collector Current | I <sub>C</sub>   | -1    | A    |
| Peak Pulse Current           | I <sub>CM</sub>  | -2    | A    |
| Base Current                 | I <sub>B</sub>   | -200  | mA   |
| Peak Base Current            | I <sub>BM</sub>  | -1    | A    |

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

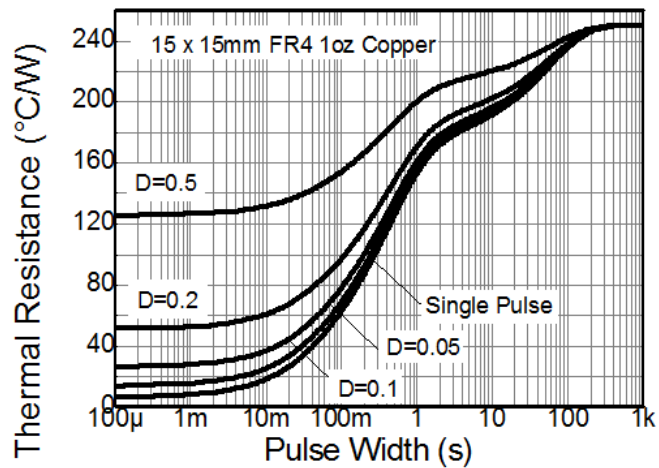
| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 6)                       | P <sub>D</sub>                    | 500         | mW   |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 250         | °C/W |
| Thermal Resistance, Junction to Lead (Note 7)    | R <sub>θJL</sub>                  | 197         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 8)

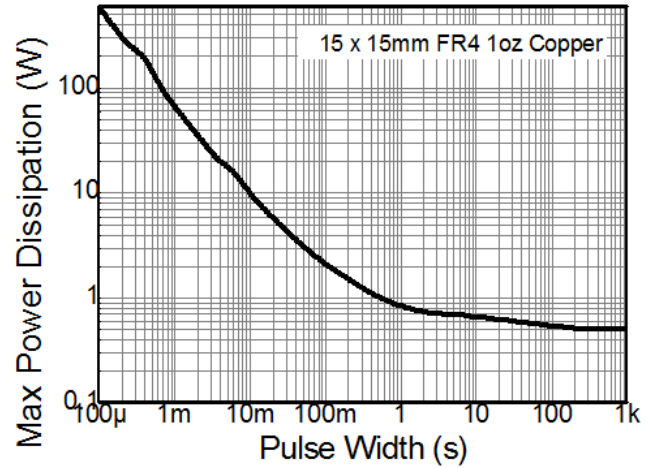
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--------------------------------------------|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model 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

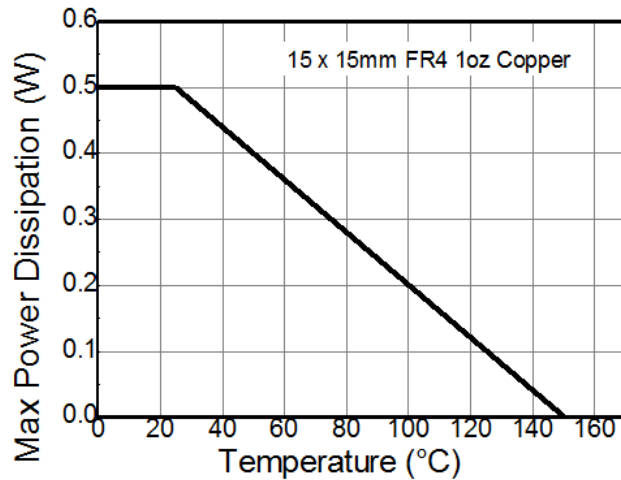
## Thermal Characteristics and Derating Information



**Transient Thermal Impedance**



**Pulse Power Dissipation**



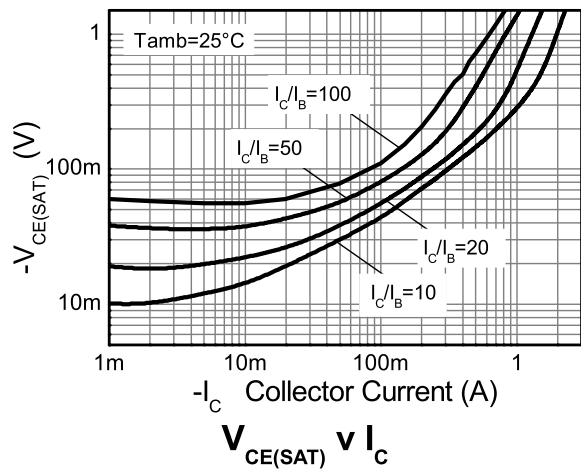
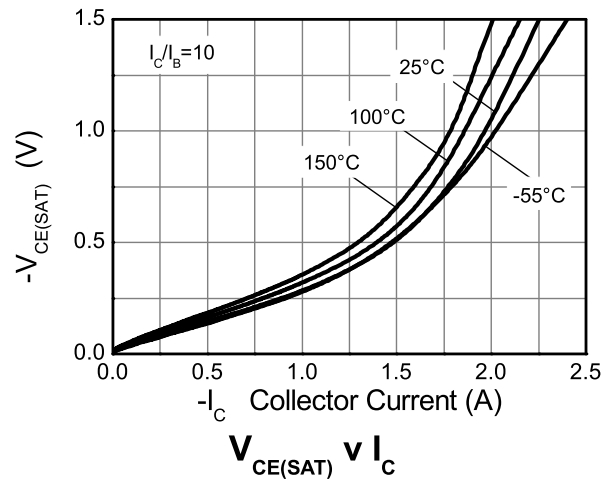
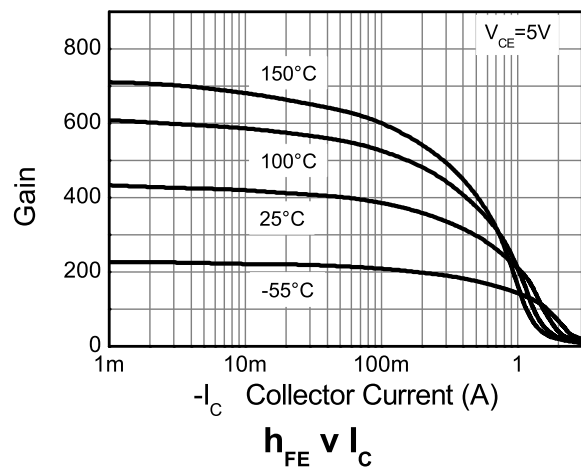
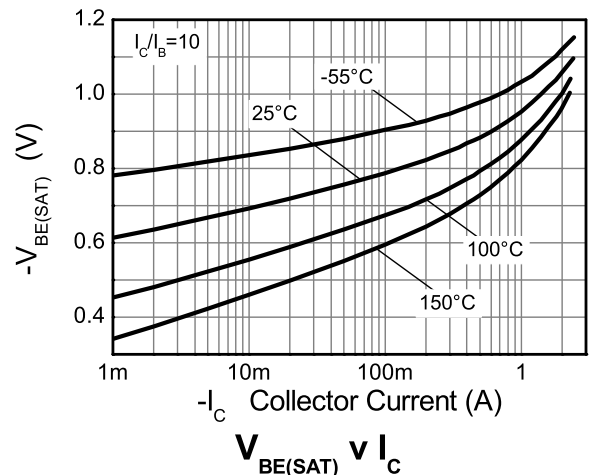
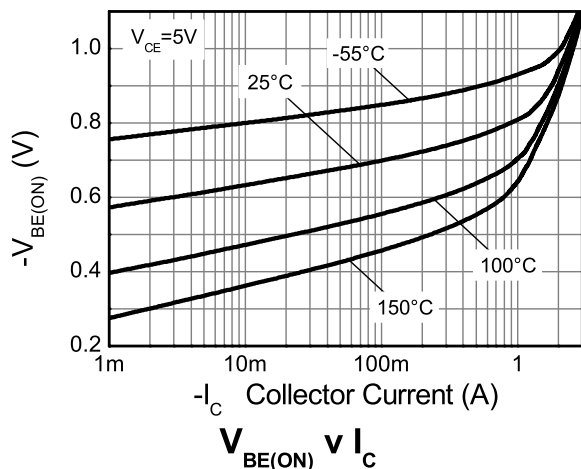
**Derating Curve**

**Electrical Characteristics** (@T<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>CES</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 | mV   | I <sub>C</sub> = -100mA, I <sub>B</sub> = -1mA                                              |
|                                                |              |                      | —   | —    | -350 |      | I <sub>C</sub> = -500mA, I <sub>B</sub> = -20mA                                             |
|                                                |              |                      | —   | —    | -500 |      | 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 | —    | —    | —    | I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V                                                |
|                                                |              |                      | 300 | —    | 800  |      | I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V                                              |
|                                                |              |                      | 250 | —    | —    |      | I <sub>C</sub> = -500mA, V <sub>CE</sub> = -5V                                              |
|                                                |              |                      | 160 | —    | —    |      | I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V                                                 |
|                                                |              |                      | 30  | —    | —    |      | 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   | —    |      |                                                                                             |

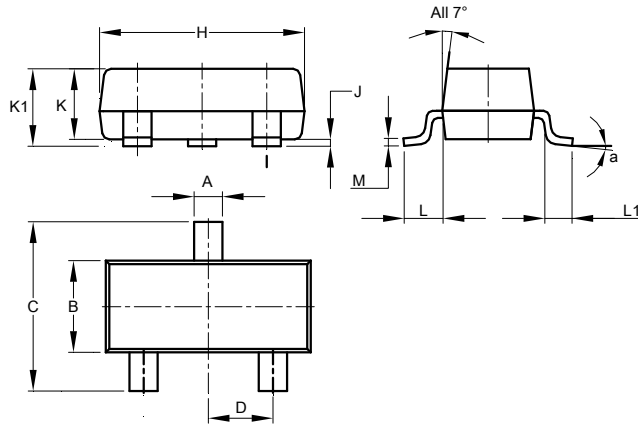
Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

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



## Package Outline Dimensions

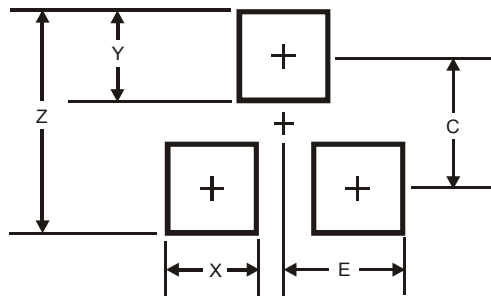
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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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