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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: [info@chipsmall.com](mailto:info@chipsmall.com) Web: [www.chipsmall.com](http://www.chipsmall.com)

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



**40V PNP SILICON LOW SATURATION TRANSISTOR IN SOT23**
**Features**

- $BV_{CEO} > -40V$
- $I_C = -1.5A$  Continuous Collector Current
- $I_{CM} = -4A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < -220mV @ -1A$
- $R_{CE(sat)} = 163m\Omega$  for a low equivalent on-resistance
- 625mW power dissipation
- $h_{FE}$  characterised up to -3A for high current gain hold-up
- Complementary NPN Type: FMMT619
- **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 
- Weight 0.008 grams (approximate)

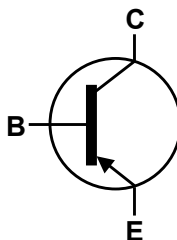
**Applications**

- Gate Driving MOSFETs and IGBTs
- DC-DC Converters
- Charging circuit
- Power switches

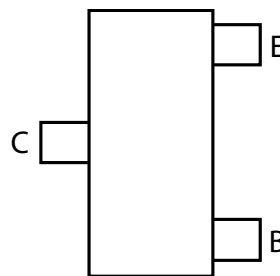
SOT23



Top View



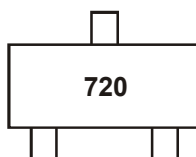
Device Symbol


 Top View  
Pin-Out

**Ordering Information** (Note 5)

| Product    | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------|------------|---------|--------------------|-----------------|-------------------|
| FMMT720TA  | AEC-Q101   | 720     | 7                  | 8               | 3,000             |
| FMMT720QTA | Automotive | 720     | 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> 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**


720 = Product Type Marking Code

**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>   | -1.5  | A    |
| Peak Pulse Current           | I <sub>CM</sub>  | -4    | A    |
| Base Current                 | I <sub>B</sub>   | -500  | mA   |

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

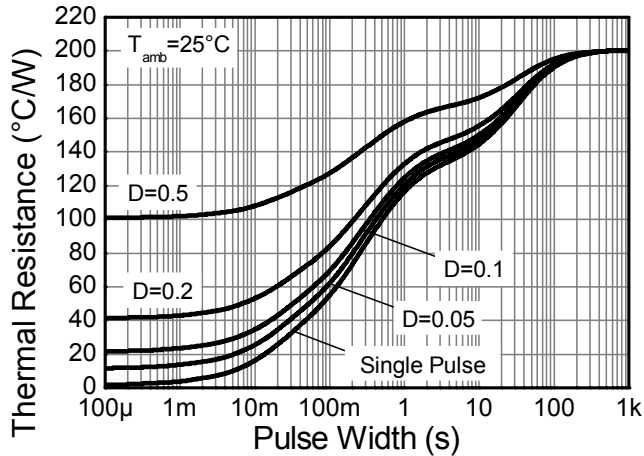
| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 6)                       | P <sub>D</sub>                    | 625         | mW   |
| Power Dissipation (Note 7)                       | P <sub>D</sub>                    | 806         | mW   |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 200         | °C/W |
| Thermal Resistance, Junction to Ambient (Note 7) | R <sub>θJA</sub>                  | 155         | °C/W |
| Thermal Resistance, Junction to Leads (Note 8)   | R <sub>θJL</sub>                  | 194         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 9)

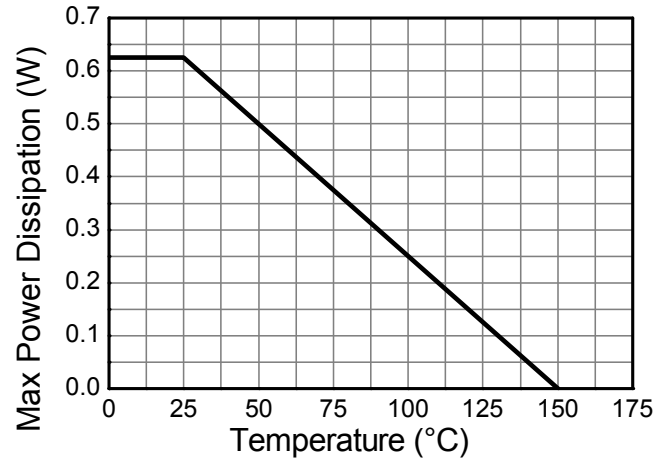
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--------------------------------------------|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model 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

- Notes:
6. For a device surface mounted on 25mm X 25mm 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. Same as note 6, except the device is measured at t ≤ 5 sec.
  8. Thermal resistance from junction to solder-point (at the end of the collector lead).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

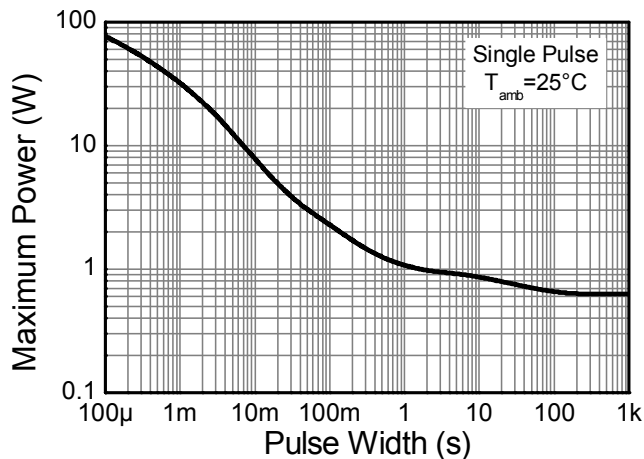
## Thermal Characteristics and Derating information



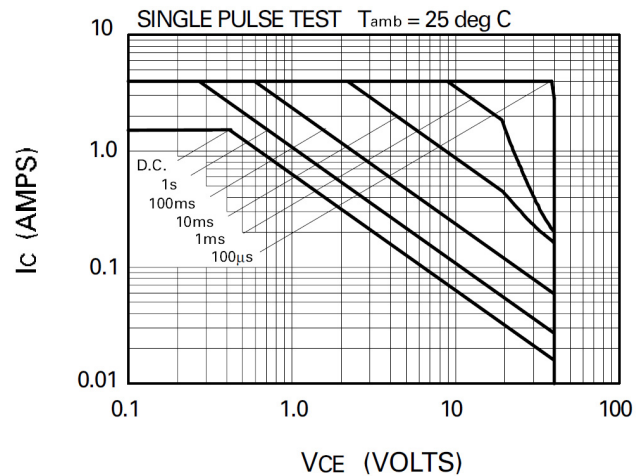
**Transient Thermal Impedance**



**Derating Curve**



**Pulse Power Dissipation**



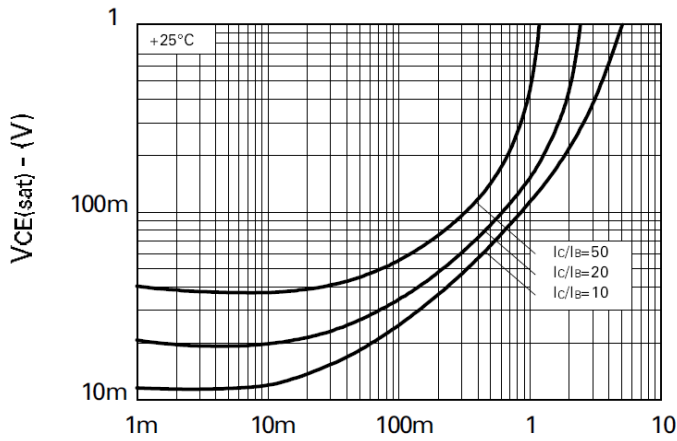
**Safe Operating Area**

**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 | -95   | -    | V    | I <sub>C</sub> = -100μA                                    |
| Collector-Emitter Breakdown Voltage (Note 10)   | BV <sub>CEO</sub>    | -40 | -85   | -    | V    | I <sub>C</sub> = -10mA                                     |
| Emitter-Base Breakdown Voltage                  | BV <sub>EBO</sub>    | -7  | -8.8  | -    | V    | I <sub>E</sub> = -100μA                                    |
| Collector Cutoff Current                        | I <sub>CBO</sub>     | -   | <1    | -100 | nA   | V <sub>CB</sub> = -35V                                     |
| Emitter Cutoff Current                          | I <sub>EBO</sub>     | -   | <1    | -100 | nA   | V <sub>EB</sub> = -5.6V                                    |
| Collector Emitter Cutoff Current                | I <sub>CES</sub>     | -   | <1    | -100 | nA   | V <sub>CE</sub> = -35V                                     |
| Static Forward Current Transfer Ratio (Note 10) | h <sub>FE</sub>      | 300 | 480   | -    | -    | I <sub>C</sub> = -10mA, V <sub>CE</sub> = -2V              |
|                                                 |                      | 300 | 450   | -    |      | I <sub>C</sub> = -0.1A, V <sub>CE</sub> = -2V              |
|                                                 |                      | 180 | 290   | -    |      | I <sub>C</sub> = -1A, V <sub>CE</sub> = -2V                |
|                                                 |                      | 60  | 130   | -    |      | I <sub>C</sub> = -1.5A, V <sub>CE</sub> = -2V              |
|                                                 |                      | 12  | 22    | -    |      | I <sub>C</sub> = -3A, V <sub>CE</sub> = -2V                |
| Collector-Emitter Saturation Voltage (Note 10)  | V <sub>CE(sat)</sub> | -   | -26   | -40  | mV   | I <sub>C</sub> = -0.1A, I <sub>B</sub> = -10mA             |
|                                                 |                      | -   | -150  | -220 | mV   | I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA               |
|                                                 |                      | -   | -245  | -330 | mV   | I <sub>C</sub> = -1.5A, I <sub>B</sub> = -100mA            |
| Base-Emitter Turn-On Voltage(Note 10)           | V <sub>BE(on)</sub>  | -   | -0.80 | -1.0 | V    | I <sub>C</sub> = -1.5A, V <sub>CE</sub> = -2V              |
| Base-Emitter Saturation Voltage(Note 10)        | V <sub>BE(sat)</sub> | -   | -0.89 | -1.0 | V    | I <sub>C</sub> = -1.5A, I <sub>B</sub> = -75mA             |
| Output Capacitance                              | C <sub>obo</sub>     | -   | 19    | 25   | pF   | V <sub>CB</sub> = -10V, f = 1MHz                           |
| Transition Frequency                            | f <sub>T</sub>       | 150 | 180   | -    | MHz  | V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz |
| Turn-On Time                                    | t <sub>on</sub>      | -   | 40    | -    | ns   | V <sub>CC</sub> = -15V, I <sub>C</sub> = -0.75A            |
| Turn-Off Time                                   | t <sub>off</sub>     | -   | 435   | -    | ns   | I <sub>B1</sub> = I <sub>B2</sub> = -15mA                  |

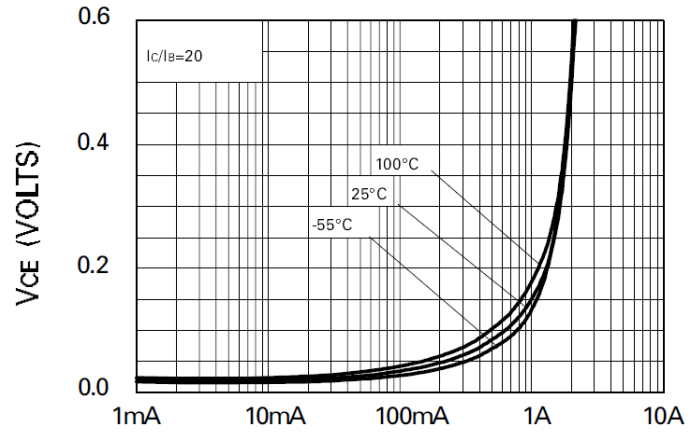
Notes: 10. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

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



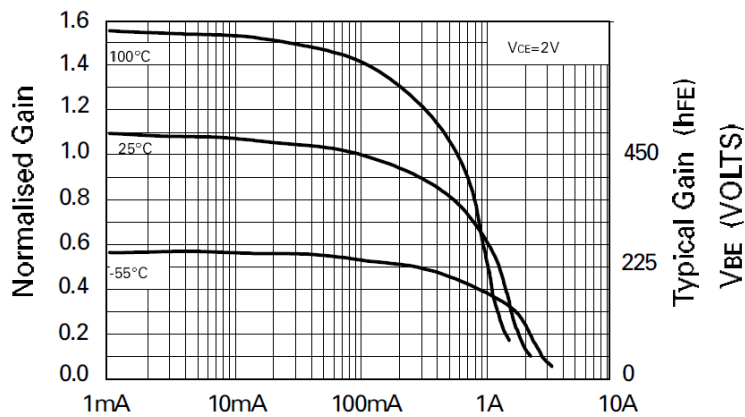
$I_C$  - Collector Current (A)

**$V_{CE(sat)}$  v  $I_C$**



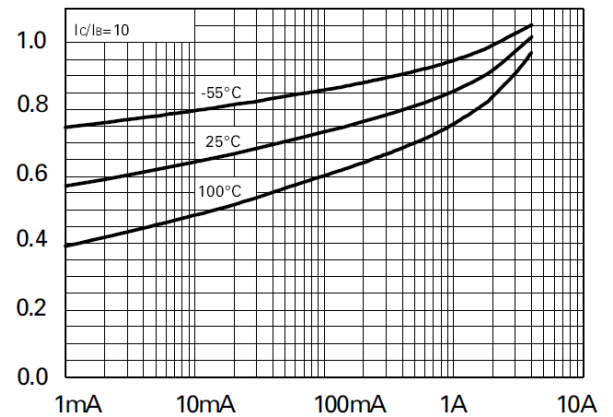
Collector Current

**$V_{CE(sat)}$  vs  $I_C$**



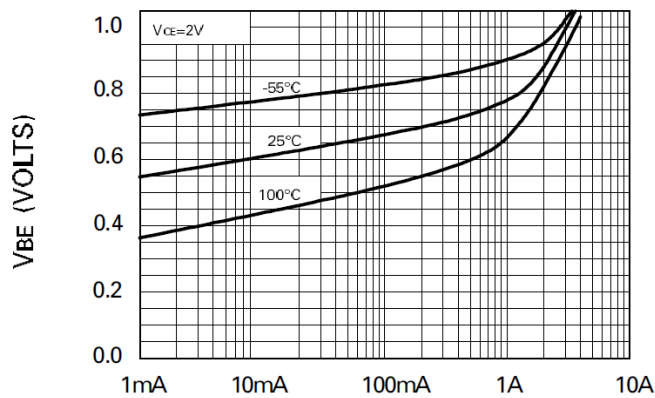
Collector Current

**$h_{FE}$  vs  $I_C$**



Collector Current

**$V_{BE(sat)}$  vs  $I_C$**

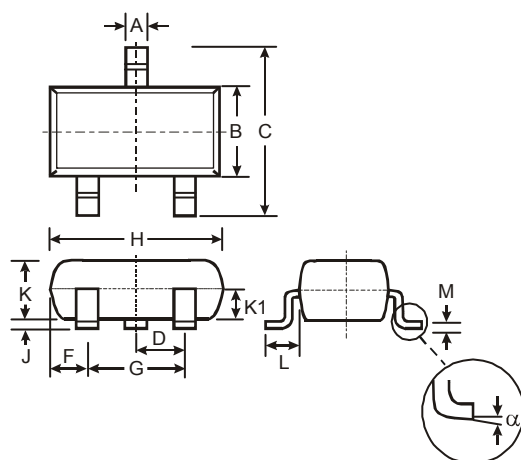


Collector Current

**$V_{BE(ON)}$  vs  $I_C$**

## Package Outline Dimensions

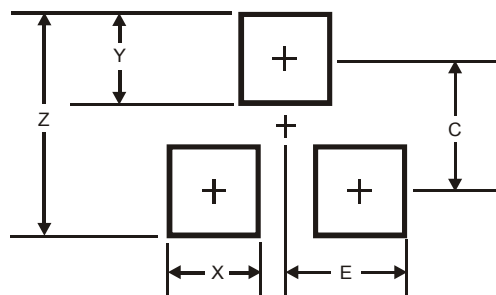
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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                    | 0.903 | 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          |

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