



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

0755-83047638

ysbdt@szyoushang.cn

www.szyoushang.cn



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## Features

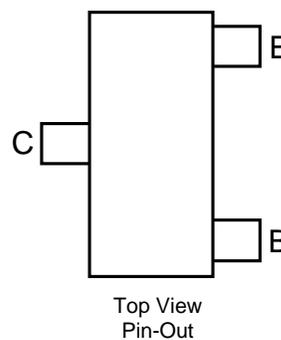
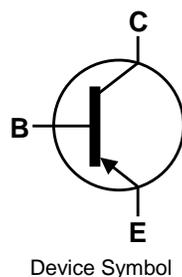
- $BV_{CEO} > -12V$
- $I_C = -2.5A$  Continuous Collector Current
- $I_{CM} = -10A$  Peak Pulse Current
- Low Saturation Voltage E.g.  $-17mV$  Max @  $I_C = -100mA$ .
- $R_{CE(sat)} = 72m\Omega$  at 2.5A for a low equivalent on-resistance
- 625mW power dissipation
- $h_{FE}$  characterized up to -10A for high current gain hold-up
- Complementary NPN Type: NK-FMMT617

## Mechanical Data

- Package: SOT23
- Package 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

- Gate-driving MOSFETs and IGBTs
- Load switches
- Battery charging
- DC-DC conversion



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

| Characteristic               | Symbol    | Value | Unit |
|------------------------------|-----------|-------|------|
| Collector-Base Voltage       | $V_{CB0}$ | -12   | V    |
| Collector-Emitter Voltage    | $V_{CEO}$ | -12   | V    |
| Emitter-Base Voltage         | $V_{EBO}$ | -7    | V    |
| Continuous Collector Current | $I_C$     | -2.5  | A    |
| Peak Pulse Current           | $I_{CM}$  | -10   | A    |
| Base Current                 | $I_B$     | -500  | mA   |

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

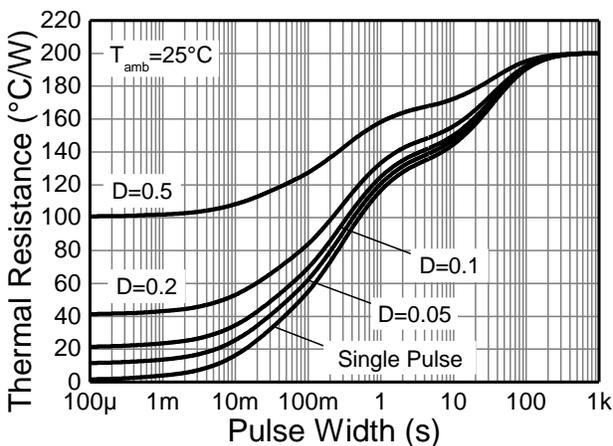
| Characteristic                                   | Symbol          | Value       | Unit                 |
|--|-----------------|-------------|----------------------|
| Power Dissipation (Note 5)                       | $P_D$           | 625         | mW                   |
| Power Dissipation (Note 6)                       | $P_D$           | 806         | mW                   |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 200         | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 155         | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction to Leads (Note 7)   | $R_{\theta JL}$ | 194         | $^{\circ}\text{C/W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150 | $^{\circ}\text{C}$   |

**ESD Ratings** (Note 8)

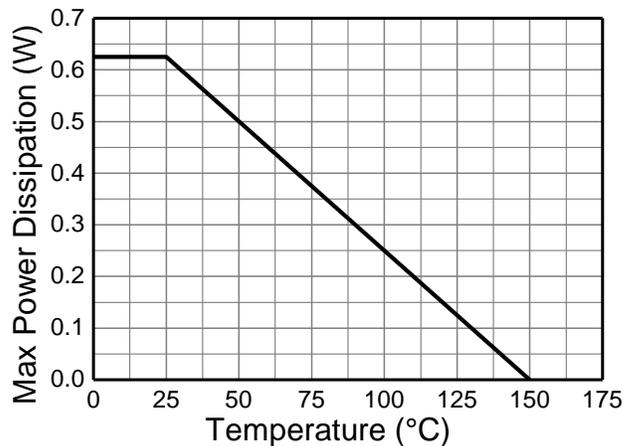
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
5. 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.
  6. Same as note 5, except the device is measured at  $t \leq 5$  sec.
  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.

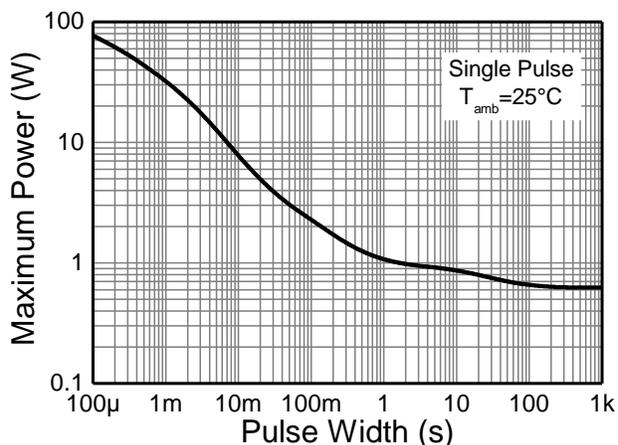
**Thermal Characteristics and Derating information**



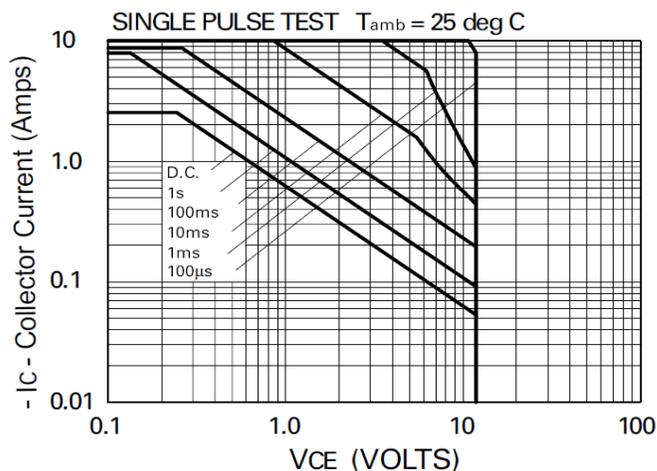
**Figure 1. Transient Thermal Impedance**



**Figure 2. Derating Curve**



**Figure 3. Pulse Power Dissipation**



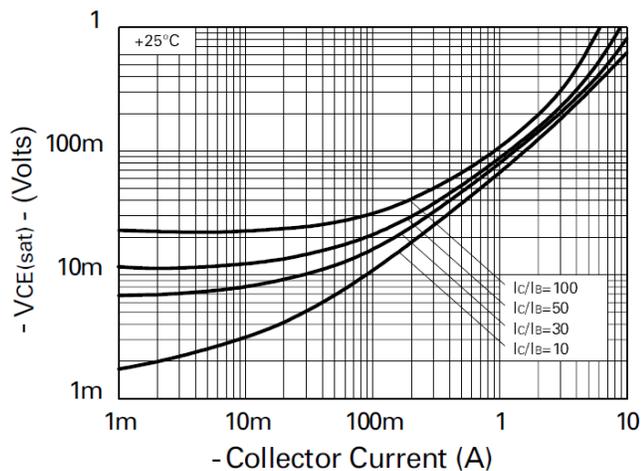
**Figure 4. Safe Operating Area**

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

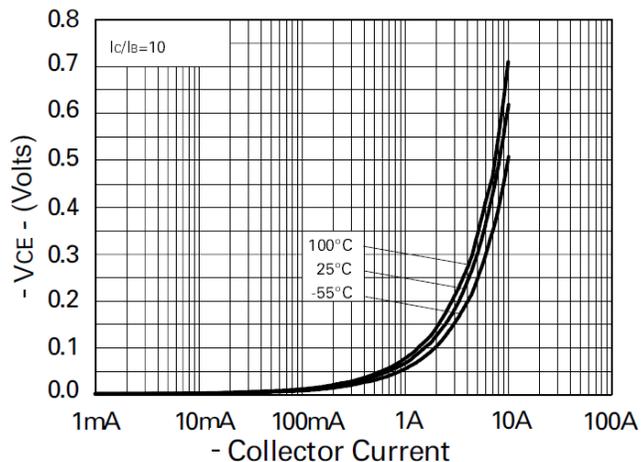
| Characteristic                                 | Symbol        | Min | Typ  | Max  | Unit | Test Condition  |
|--|---------------|-----|------|------|------|---|
| Collector-Base Breakdown Voltage               | $BV_{CBO}$    | -12 | -35  | -    | V    | $I_C = -100\mu\text{A}$                                       |
| Collector-Emitter Breakdown Voltage (Note 9)   | $BV_{CEO}$    | -12 | -25  | -    | V    | $I_C = -10\text{mA}$  |
| Emitter-Base Breakdown Voltage                 | $BV_{EBO}$    | -7  | -8.5 | -    | V    | $I_E = -100\mu\text{A}$                                       |
| Collector Cutoff Current                       | $I_{CBO}$     | -   | -    | -100 | nA   | $V_{CB} = -10\text{V}$  |
| Emitter Cutoff Current                         | $I_{EBO}$     | -   | -    | -100 | nA   | $V_{EB} = -5\text{V}$   |
| Collector Emitter Cutoff Current               | $I_{CES}$     | -   | -    | -100 | nA   | $V_{CE} = -10\text{V}$  |
| Static Forward Current Transfer Ratio (Note 9) | $h_{FE}$      | 300 | 475  | -    | -    | $I_C = -10\text{mA}, V_{CE} = -2\text{V}$                     |
|  |               | 300 | 450  | -    |      | $I_C = -100\text{mA}, V_{CE} = -2\text{V}$                    |
|  |               | 180 | 275  | -    |      | $I_C = -2.5\text{A}, V_{CE} = -2\text{V}$                     |
|  |               | 60  | 100  | -    |      | $I_C = -8\text{A}, V_{CE} = -2\text{V}$                       |
|  |               | 45  | 70   | -    |      | $I_C = -10\text{A}, V_{CE} = -2\text{V}$                      |
| Collector-Emitter Saturation Voltage (Note 9)  | $V_{CE(sat)}$ | -   | -10  | -17  | mV   | $I_C = -0.1\text{A}, I_B = -10\text{mA}$                      |
|  |               | -   | -100 | -140 |      | $I_C = -1\text{A}, I_B = -10\text{mA}$                        |
|  |               | -   | -110 | -170 |      | $I_C = -1.5\text{A}, I_B = -50\text{mA}$                      |
|  |               | -   | -180 | -220 |      | $I_C = -2.5\text{A}, I_B = -50\text{mA}$                      |
| Base-Emitter Turn-On Voltage (Note 9)          | $V_{BE(on)}$  | -   | -0.8 | -1.0 | V    | $I_C = -2.5\text{A}, V_{CE} = -2\text{V}$                     |
| Base-Emitter Saturation Voltage (Note 9)       | $V_{BE(sat)}$ | -   | -0.9 | -1.0 | V    | $I_C = -2.5\text{A}, I_B = -50\text{mA}$                      |
| Output Capacitance                             | $C_{obo}$     | -   | 40   | 50   | pF   | $V_{CB} = -10\text{V}, f = 1\text{MHz}$                       |
| Transition Frequency                           | $f_T$         | 80  | 110  | -    | MHz  | $V_{CE} = -10\text{V}, I_C = -50\text{mA}, f = 100\text{MHz}$ |
| Turn-On Time                                   | $t_{on}$      | -   | 70   | -    | ns   | $V_{CC} = -6\text{V}, I_C = -2\text{A}$                       |
| Turn-Off Time                                  | $t_{off}$     | -   | 130  | -    | ns   | $I_{B1} = I_{B2} = 50\text{mA}$                               |

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

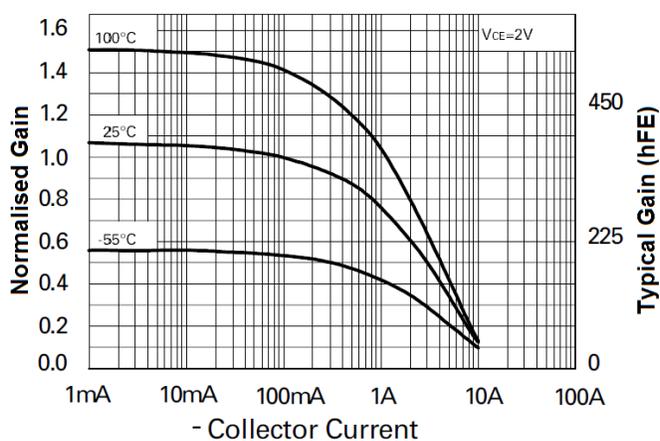
**Typical Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)



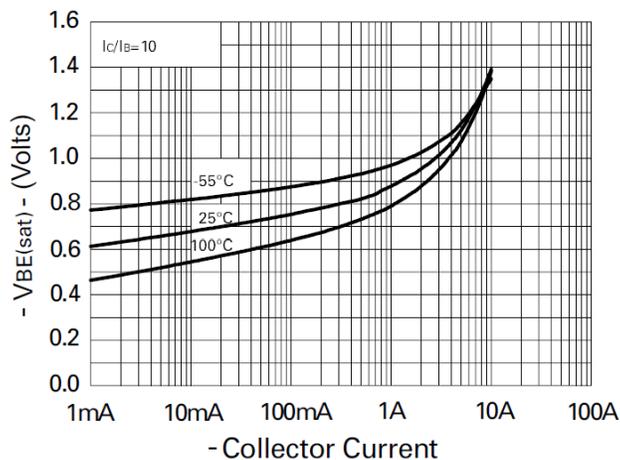
**Figure 5.  $V_{CE(sat)}$  v  $I_C$**



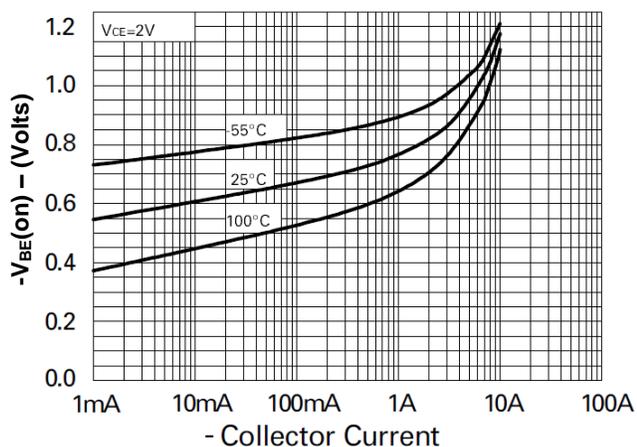
**Figure 6.  $V_{CE(sat)}$  v  $I_C$**



**Figure 7.  $H_{FE}$  v  $I_C$**



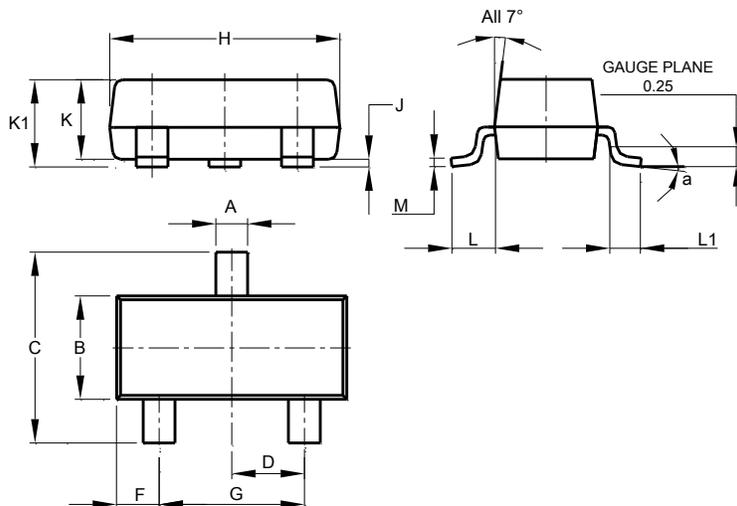
**Figure 8.  $V_{BE(sat)}$  v  $I_C$**



**Figure 9.  $V_{BE(on)}$  vs  $I_C$**

## Package Outline Dimensions

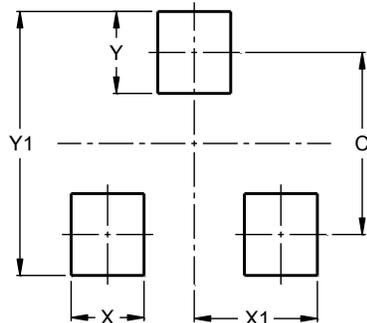
SOT23



| 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                    | 0°    | 8°    | --    |
| All Dimensions in mm |       |       |       |

## Suggested Pad Layout

SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.0           |
| X          | 0.8           |
| X1         | 1.35          |
| Y          | 0.9           |
| Y1         | 2.9           |