



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**

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## Features

- $BV_{CEO} > -100V$
- $I_C = -1A$  High Continuous Collector Current
- $I_{CM} = -2.5A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < -330mV @ -1A$
- $R_{CE(SAT)} = 210m\Omega$  for a Low Equivalent On-Resistance
- 625mW Power Dissipation
- $h_{FE}$  Characterized up to -1.5A for High Current Gain Hold-Up
- Complementary NPN Type: NK-FMMT624

## Mechanical Data

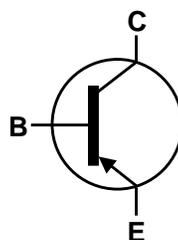
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 
- Weight 0.008 grams (Approximate)

## Applications

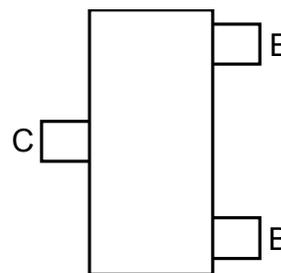
- High-Side Driver
- Load Disconnect Switch
- Motor Drive



Top View



Device Symbol



Top View  
Pin-Out

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

| Characteristic               | Symbol    | Value | Unit |
|------------------------------|-----------|-------|------|
| Collector-Base Voltage       | $V_{CBO}$ | -100  | V    |
| Collector-Emitter Voltage    | $V_{CEO}$ | -100  | V    |
| Emitter-Base Voltage         | $V_{EBO}$ | -7    | V    |
| Continuous Collector Current | $I_C$     | -1    | A    |
| Peak Pulse Current           | $I_{CM}$  | -2.5  | A    |
| Base Current                 | $I_B$     | -500  | mA   |

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

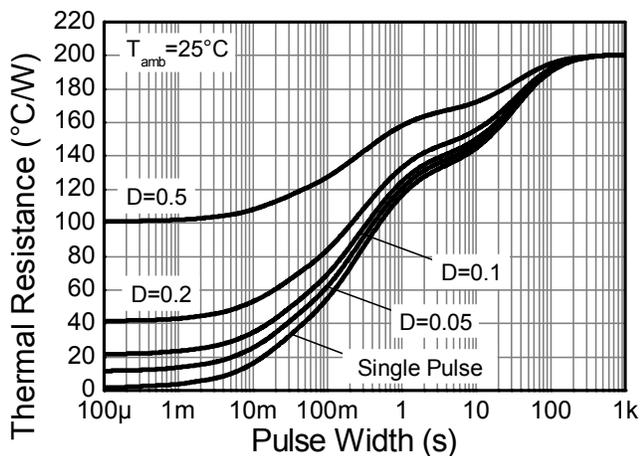
| Characteristic                                   | Symbol          | Value       | Unit                      |
|--|-----------------|-------------|---------------------------|
| Power Dissipation (Note 6)                       | $P_D$           | 625         | mW                        |
| Power Dissipation (Note 7)                       | $P_D$           | 806         | mW                        |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | 200         | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Ambient (Note 7) | $R_{\theta JA}$ | 155         | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction to Leads (Note 8)   | $R_{\theta JL}$ | 194         | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$          |

### ESD Ratings (Note 9)

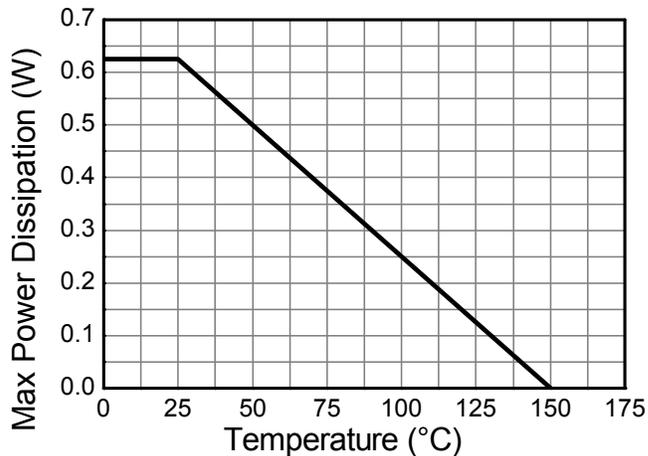
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
6. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz 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  $t \leq 5$  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.

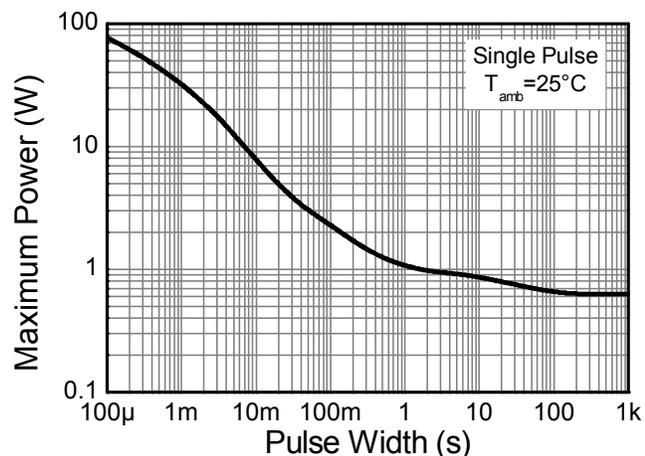
**Thermal Characteristics and Derating information**



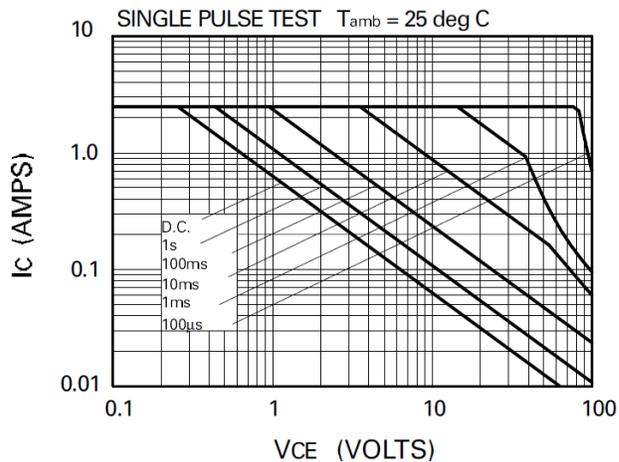
**Transient Thermal Impedance**



**Derating Curve**



**Pulse Power Dissipation**



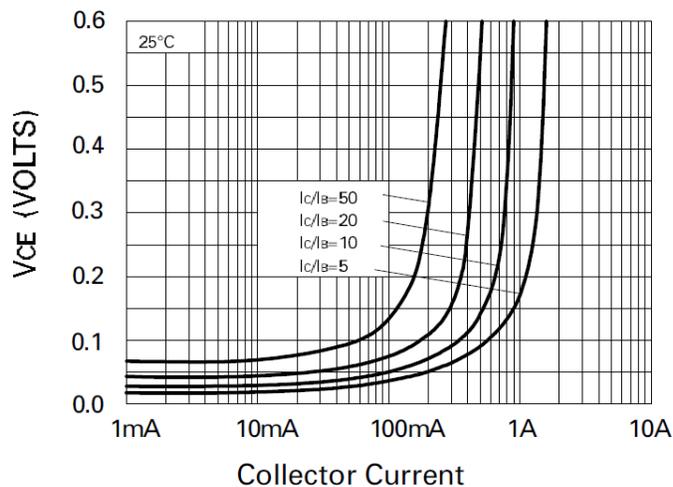
**Safe Operating Area**

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

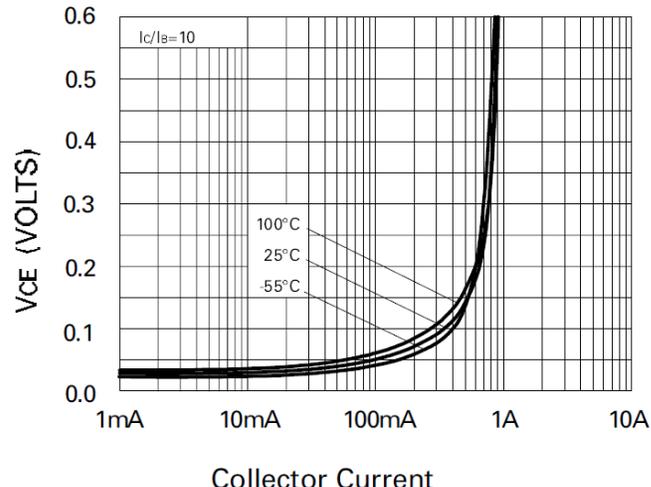
| Characteristic                                  | Symbol               | Min  | Typ   | Max  | Unit | Test Condition   |
|---|----------------------|------|-------|------|------|--|
| Collector-Base Breakdown Voltage                | BV <sub>CBO</sub>    | -100 | -200  | -    | V    | I <sub>C</sub> = -100μA                                    |
| Collector-Emitter Breakdown Voltage (Note 10)   | BV <sub>CEO</sub>    | -100 | -160  | -    | 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> = -80V                                     |
| 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> = -80V                                     |
| Static Forward Current Transfer Ratio (Note 10) | h <sub>FE</sub>      | 300  | 475   | -    | -    | I <sub>C</sub> = -10mA, V <sub>CE</sub> = -10V             |
|   |                      | 300  | 450   | -    |      | I <sub>C</sub> = -0.1A, V <sub>CE</sub> = -10V             |
|   |                      | 250  | 375   | -    |      | I <sub>C</sub> = -0.5A, V <sub>CE</sub> = -10V             |
|   |                      | -    | 250   | -    |      | I <sub>C</sub> = -1A, V <sub>CE</sub> = -10V               |
|   |                      | -    | 30    | -    |      | I <sub>C</sub> = -1.5A, V <sub>CE</sub> = -10V             |
| Collector-Emitter Saturation Voltage (Note 10)  | V <sub>CE(sat)</sub> | -    | -50   | -80  | mV   | I <sub>C</sub> = -0.1A, I <sub>B</sub> = -10mA             |
|   |                      | -    | -125  | -200 |      | I <sub>C</sub> = -0.5A, I <sub>B</sub> = -50mA             |
|   |                      | -    | -210  | -330 |      | I <sub>C</sub> = -1A, I <sub>B</sub> = -150mA              |
| Base-Emitter Turn-On Voltage (Note 10)          | V <sub>BE(on)</sub>  | -    | -0.71 | -1.0 | V    | I <sub>C</sub> = -1A, V <sub>CE</sub> = -10V               |
| Base-Emitter Saturation Voltage (Note 10)       | V <sub>BE(sat)</sub> | -    | -0.89 | -1.0 | V    | I <sub>C</sub> = -1A, I <sub>B</sub> = -150mA              |
| Output Capacitance                              | C <sub>obo</sub>     | -    | 13    | 20   | pF   | V <sub>CB</sub> = -10V, f = 1MHz                           |
| Transition Frequency                            | f <sub>T</sub>       | 150  | 200   | -    | MHz  | V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz |
| Turn-On Time                                    | t <sub>on</sub>      | -    | 50    | -    | ns   | V <sub>CC</sub> = -50V, I <sub>C</sub> = -0.5A             |
| Turn-Off Time                                   | t <sub>off</sub>     | -    | 760   | -    | ns   | I <sub>B1</sub> = I <sub>B2</sub> = -50mA                  |

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

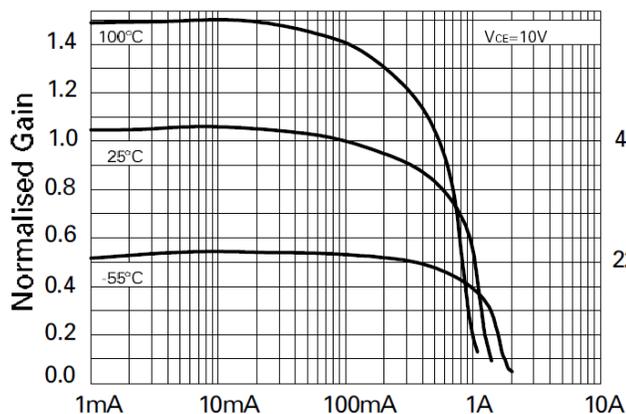
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



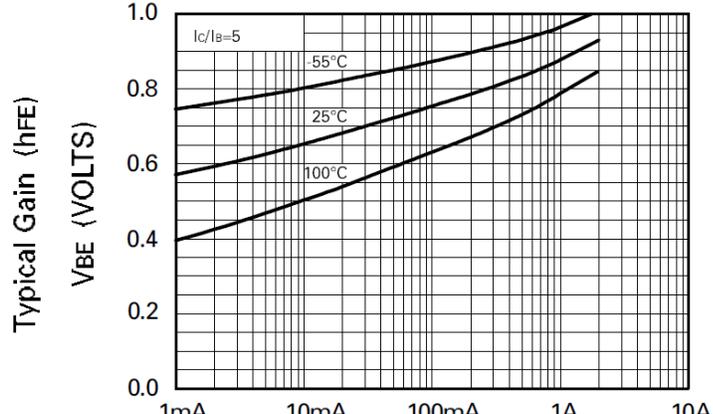
**$V_{CE(SAT)}$  vs  $I_C$**



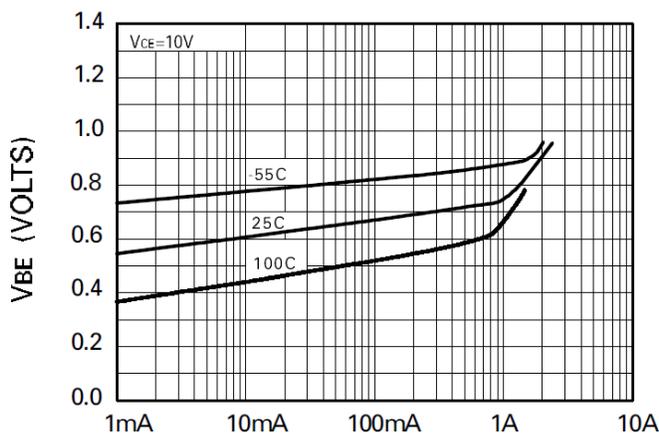
**$V_{CE(SAT)}$  vs  $I_C$**



**hFE vs  $I_C$**

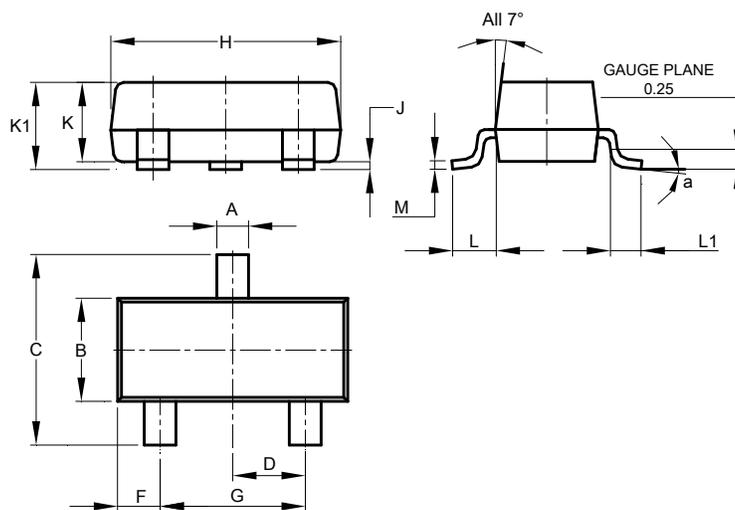


**$V_{BE(SAT)}$  vs  $I_C$**



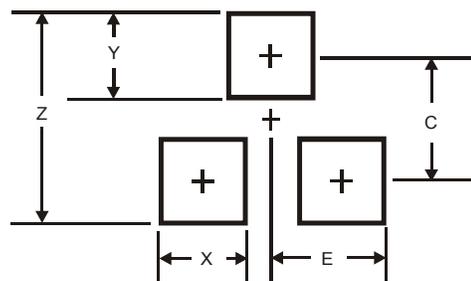
**$V_{BE(ON)}$  vs  $I_C$**

## Package Outline Dimensions



| 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

**SOT23**


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

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device terminals and PCB tracking.