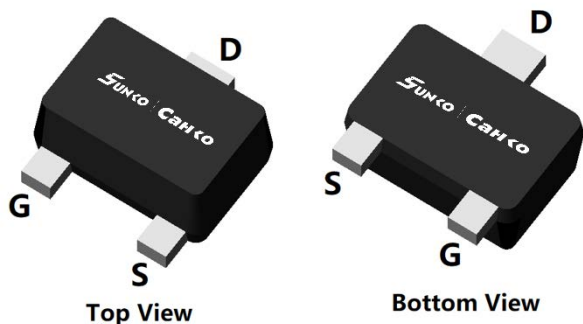
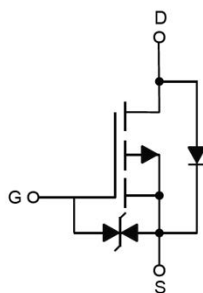


## P-Channel Enhancement Mode Field Effect Transistor



**SOT-723**



### Product Summary

|                                      |          |
|--------------------------------------|----------|
| • $V_{DS}$                           | -20 V    |
| • $I_D$                              | -0.5 A   |
| • $R_{DS(ON)}$ ( at $V_{GS}=-4.5V$ ) | <850 mΩ  |
| • $R_{DS(ON)}$ ( at $V_{GS}=-2.5V$ ) | <1200 mΩ |
| • $R_{DS(ON)}$ ( at $V_{GS}=-1.8V$ ) | <2000 mΩ |

### General Description

- Trench Power LV MOSFET technology
- Extremely low switching loss
- Excellent stability and uniformity
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

### Applications

- PWM application
- Portable equipment

### ■ Absolute Maximum Ratings ( $T_A=25^{\circ}C$ unless otherwise noted)

| Parameter                              |                    | Symbol         | Limit    | Unit |
|----------------------------------------|--------------------|----------------|----------|------|
| Drain-source Voltage                   |                    | $V_{DS}$       | -20      | V    |
| Gate-source Voltage                    |                    | $V_{GS}$       | ±10      | V    |
| Drain Current                          | $T_A=25^{\circ}C$  | $I_D$          | -0.5     | A    |
|                                        | $T_A=100^{\circ}C$ |                | -0.3     |      |
| Pulsed Drain Current <sup>A</sup>      |                    | $I_{DM}$       | -2.5     | A    |
| Total Power Dissipation <sup>B</sup>   | $T_A=25^{\circ}C$  | $P_D$          | 0.28     | W    |
|                                        | $T_A=100^{\circ}C$ |                | 0.1      |      |
| Junction and Storage Temperature Range |                    | $T_J, T_{STG}$ | -55~+150 | °C   |

### ■ Thermal resistance

| Parameter                                           |              | Symbol          | Typ | Max | Units |
|-----------------------------------------------------|--------------|-----------------|-----|-----|-------|
| Thermal Resistance Junction-to-Ambient <sup>C</sup> | Steady-State | $R_{\theta JA}$ | 350 | 450 | °C/W  |

### ■ Ordering Information (Example)

| PREFERED P/N | PACKING CODE | Marking | MINIMUM PACKAGE(pcs) | INNER BOX QUANTITY(pcs) | OUTER CARTON QUANTITY(pcs) | DELIVERY MODE |
|--------------|--------------|---------|----------------------|-------------------------|----------------------------|---------------|
| SCL3139KAT   | F2           | KA      | 8000                 | 80000                   | 320000                     | 7" reel       |

## ■ Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

| Parameter                             | Symbol              | Conditions                                                           | Min   | Typ   | Max  | Units |
|---------------------------------------|---------------------|----------------------------------------------------------------------|-------|-------|------|-------|
| Static Parameter                      |                     |                                                                      |       |       |      |       |
| Drain-Source Breakdown Voltage        | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> =-250μA                         | -20   | -     | -    | V     |
| Zero Gate Voltage Drain Current       | I <sub>DSS</sub>    | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                           | -     | -     | -1   | μA    |
|                                       |                     | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>j</sub> =150°C    | -     | -     | -100 |       |
| Gate-Body Leakage Current             | I <sub>GSS</sub>    | V <sub>GS</sub> = ±10V, V <sub>DS</sub> =0V                          | -     | -     | ±10  | μA    |
| Gate Threshold Voltage                | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =-250μA           | -0.35 | -0.7  | -1.1 | V     |
| Static Drain-Source On-Resistance     | R <sub>DS(on)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-0.5A                        | -     | 650   | 850  | mΩ    |
|                                       |                     | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-0.3A                        |       | 900   | 1200 |       |
|                                       |                     | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-0.2A                        | -     | 1400  | 2000 |       |
| Diode Forward Voltage                 | V <sub>SD</sub>     | I <sub>S</sub> =-0.5A, V <sub>GS</sub> =0V                           | -     | -0.95 | -1.2 | V     |
| Maximum Body-Diode Continuous Current | I <sub>S</sub>      |                                                                      | -     | -     | -0.5 | A     |
| Dynamic Parameters                    |                     |                                                                      |       |       |      |       |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz                   | -     | 40    | -    | pF    |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                      | -     | 15    | -    |       |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                      | -     | 10    | -    |       |
| Switching Parameters                  |                     |                                                                      |       |       |      |       |
| Total Gate Charge                     | Q <sub>g</sub>      | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, I <sub>D</sub> =-0.5A | -     | 1.24  | -    | nC    |
| Gate-Source Charge                    | Q <sub>gs</sub>     |                                                                      | -     | 0.37  | -    |       |
| Gate-Drain Charge                     | Q <sub>gd</sub>     |                                                                      | -     | 0.27  | -    |       |
| Reverse Recovery Charge               | Q <sub>rr</sub>     | I <sub>F</sub> =-0.5A, di/dt=100A/us                                 | -     | 0.97  | -    | nC    |
| Reverse Recovery Time                 | t <sub>rr</sub>     |                                                                      | -     | 26    | -    | ns    |
| Turn-on Delay Time                    | t <sub>D(on)</sub>  | V <sub>GS</sub> =-4.5V, V <sub>DD</sub> =-10V, ID=-0.5A<br>RGEN=3Ω   | -     | 4     | -    | ns    |
| Turn-on Rise Time                     | t <sub>r</sub>      |                                                                      | -     | 19    | -    |       |
| Turn-off Delay Time                   | t <sub>D(off)</sub> |                                                                      | -     | 16    | -    |       |
| Turn-off fall Time                    | t <sub>f</sub>      |                                                                      | -     | 25    | -    |       |

A. Repetitive rating; pulse width limited by max. junction temperature.

B. P<sub>d</sub> is based on max. junction temperature, using junction-case and junction-ambient thermal resistance.

C. The value of RθJA is measured with the device mounted on the minimum recommend pad size, in the still air environment with T<sub>A</sub> =25°C. The maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

■ Typical Electrical and Thermal Characteristics Diagrams

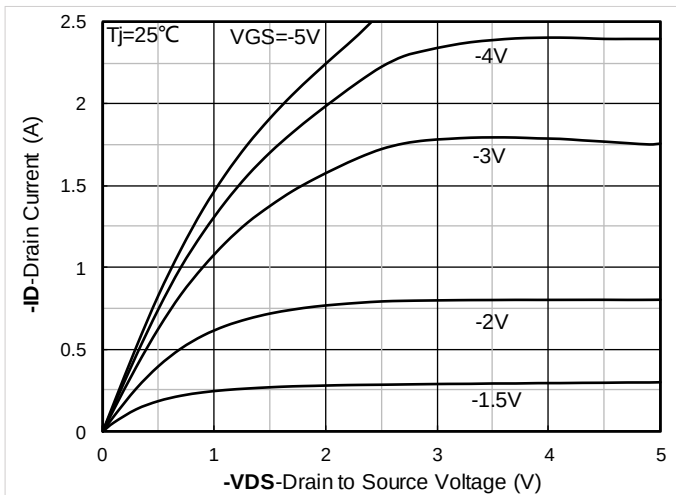


Figure 1. Output Characteristics

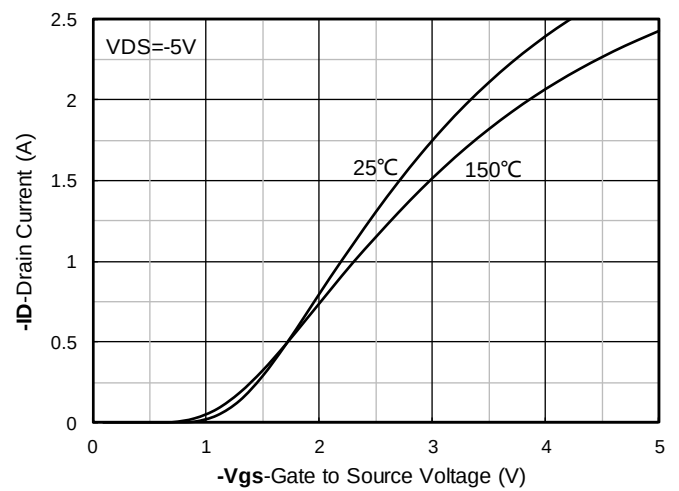


Figure 2. Transfer Characteristics

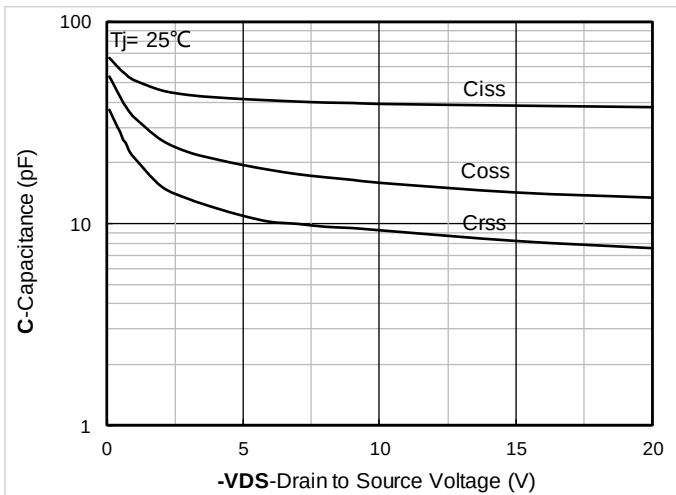


Figure 3. Capacitance Characteristics

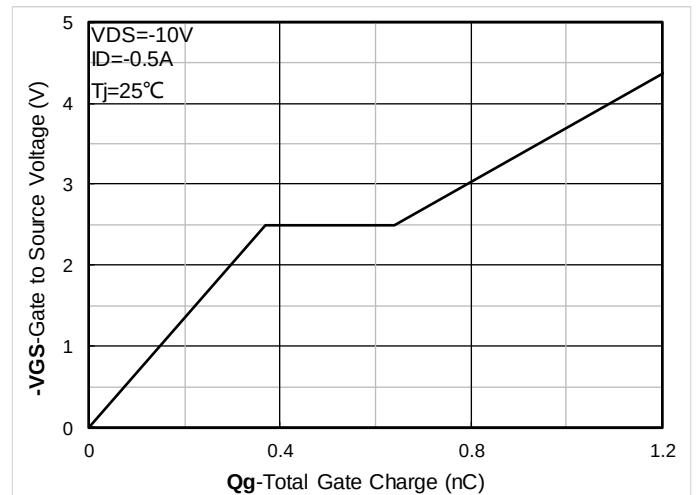


Figure 4. Gate Charge

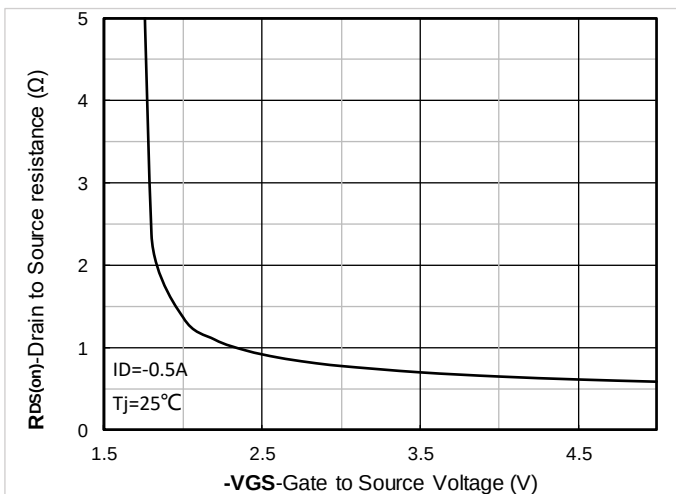


Figure 5. On-Resistance vs Gate to Source Voltage

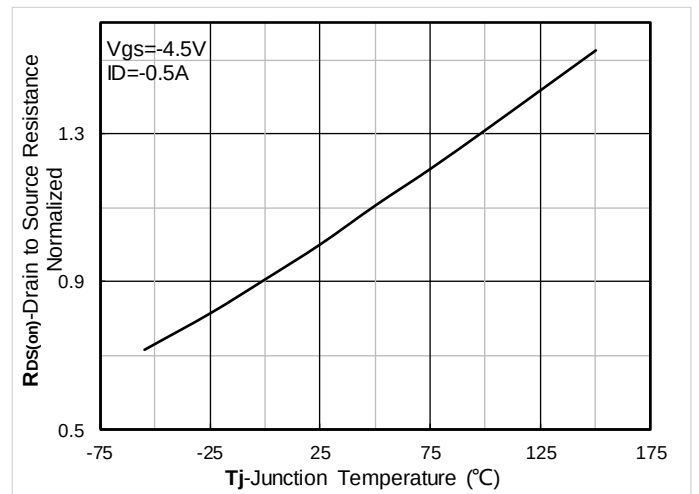


Figure 6. Normalized On-Resistance

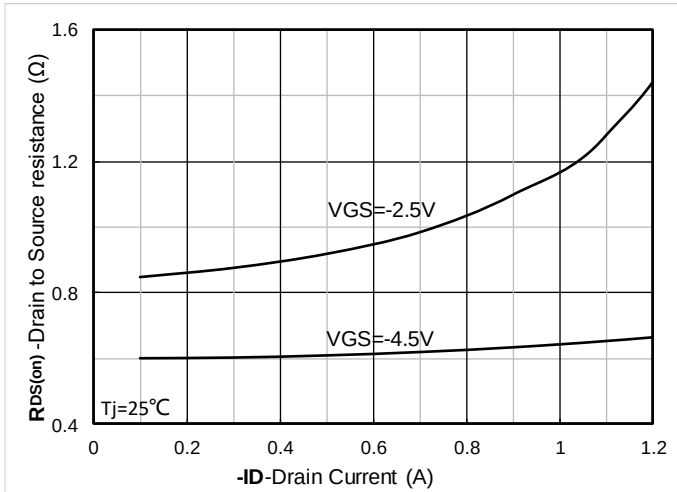


Figure 7.  $R_{DS(on)}$  VS Drain Current

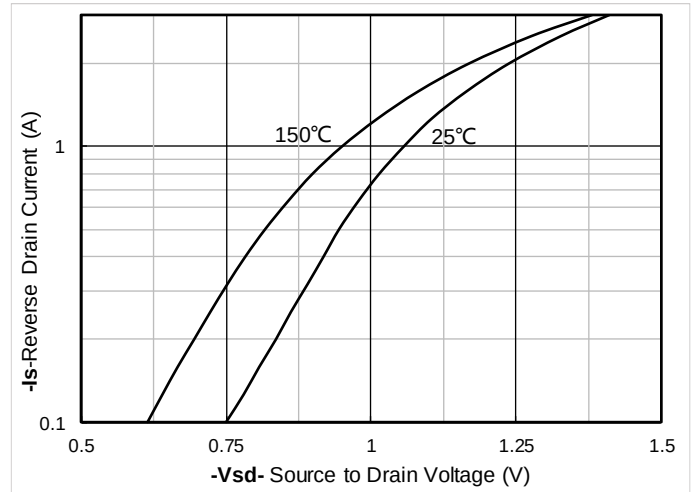


Figure 8. Forward characteristics of reverse diode

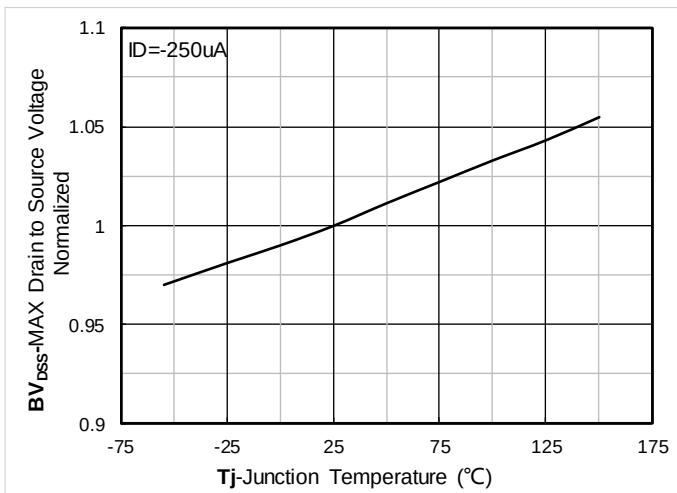


Figure 9. Normalized breakdown voltage

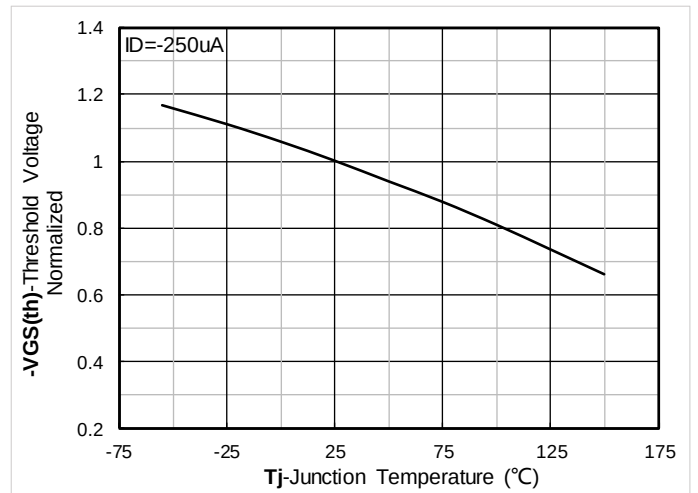


Figure 10. Normalized Threshold voltage

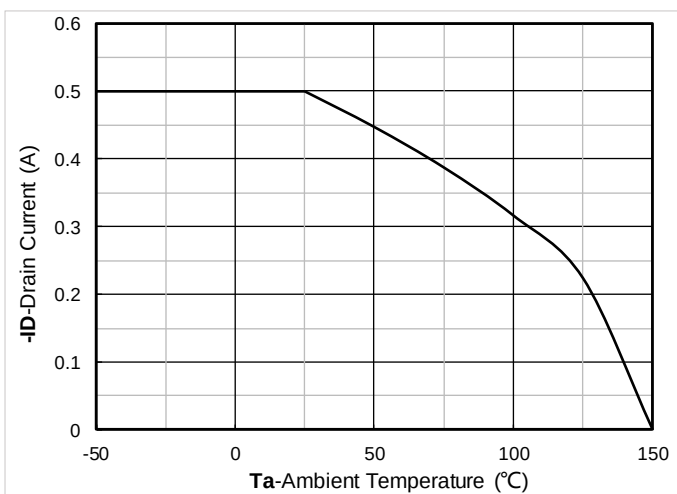


Figure 11. Current dissipation

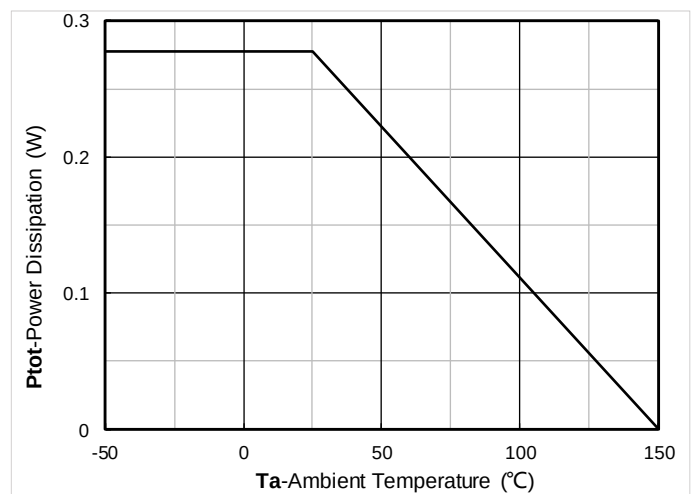


Figure 12. Power dissipation

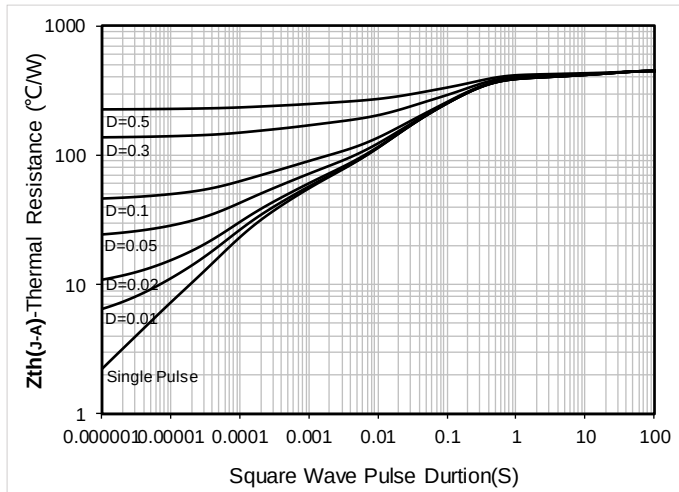


Figure 13. Maximum Transient Thermal Impedance

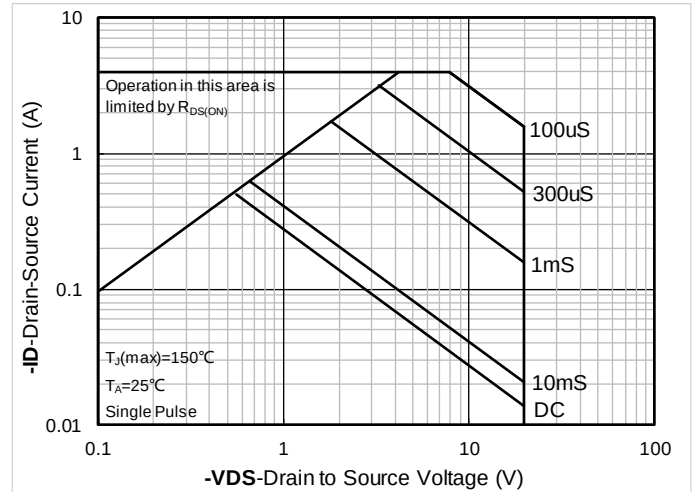
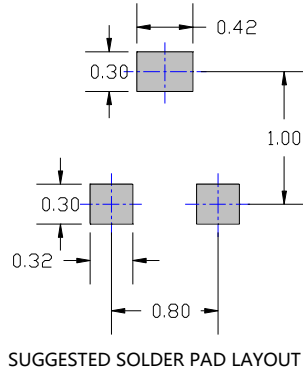
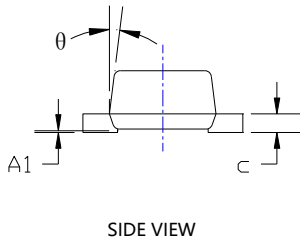
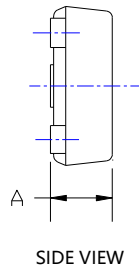
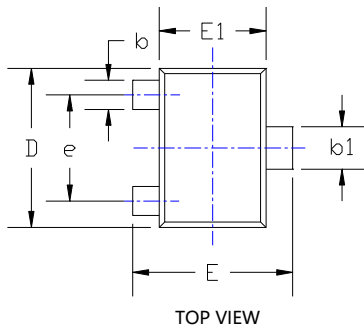


Figure 14. Safe Operation Area

■ SOT-723 Package information



| SYMBOL | DIMENSIONS |       |            |       |
|--------|------------|-------|------------|-------|
|        | INCHES     |       | Millimeter |       |
|        | MIN.       | MAX.  | MIN.       | MAX.  |
| A      | 0.017      | 0.022 | 0.430      | 0.550 |
| A1     | 0.000      | 0.002 | 0.000      | 0.050 |
| b      | 0.007      | 0.011 | 0.170      | 0.270 |
| b1     | 0.011      | 0.015 | 0.270      | 0.370 |
| c      | 0.003      | 0.008 | 0.080      | 0.200 |
| D      | 0.045      | 0.049 | 1.150      | 1.250 |
| E      | 0.045      | 0.049 | 1.150      | 1.250 |
| E1     | 0.030      | 0.033 | 0.750      | 0.850 |
| e      | 0.031 TYP. |       | 0.800 TYP. |       |
| θ      | 7° REF.    |       | 7° REF.    |       |

NOTE:  
 1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.  
 2. TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.  
 3. THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.

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