

## Silicon Carbide Power Mosfet

### 1. Product Information

#### Features

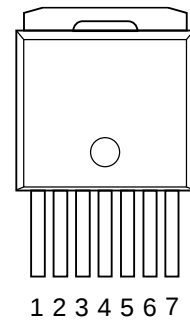
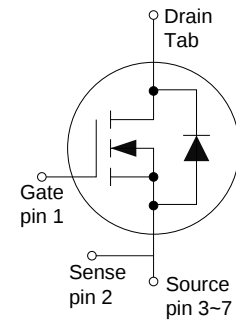
- 1700V, 570mΩ, 6A
- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low  $R_{DS(on)}$
- Easy to parallel
- Simple to drive
- RoHS Compliant

#### Benefits

- Increased Power Density Faster Operating Frequency
- Reduction of Heat Sink Requirements
- Higher Efficiency
- Reduced EMI

#### Applications

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters



**Top View**  
**TO263-7L**

#### Package Marking and Ordering Information

| Product Name  | Package  | Marking       | Form        | Quantity (PCS) |
|---------------|----------|---------------|-------------|----------------|
| KJSC170R570D7 | TO263-7L | KJSC170R570D7 | Reel & Tape | 800            |

### 2. Absolute Maximum Ratings ( $T_J=25^{\circ}\text{C}$ unless otherwise noted)

| Symbol          | Parameter                                                   | Values  | Unit                        |
|-----------------|-------------------------------------------------------------|---------|-----------------------------|
| $V_{DS}$        | Drain-Source Voltage                                        | 1700    | V                           |
| $I_D$           | Continuous Drain Current, $T_C=25^{\circ}\text{C}$          | 6       | A                           |
|                 | Continuous Drain Current, $T_C=100^{\circ}\text{C}$         | 4       | A                           |
| $I_{DM}$        | Peak Drain Current, Pulse width $t_p$ limited by $T_{jmax}$ | 12      | A                           |
| $V_{GSmax}$     | Gate-Source Voltage (Absolute maximum values)               | -8/+22  | V                           |
| $V_{GSop}$      | Gate-Source Voltage (Recommended operational values)        | -4/+18  | V                           |
| $P_D$           | Power Dissipation, $T_C=25^{\circ}\text{C}$                 | 69      | W                           |
|                 | Power Dissipation, $T_C=100^{\circ}\text{C}$                | 27      | W                           |
| $T_J, T_{STG}$  | Operating Junction and Storage Temperature                  | -40~150 | $^{\circ}\text{C}$          |
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case                         | 1.8     | $^{\circ}\text{C}/\text{W}$ |

## 3. Electrical Characteristics (T<sub>c</sub>=25°C, unless otherwise noted)

| Symbol                             | Parameter                        | Test Conditions                                                                               | Min  | Type | Max | Unit |
|------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------|------|------|-----|------|
| Static Characteristics             |                                  |                                                                                               |      |      |     |      |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =100μA                                                    | 1700 | -    | -   | V    |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =1700V, V <sub>GS</sub> =0V                                                   | -    | 1    | -   | μA   |
| I <sub>GSS</sub>                   | Gate-Source Leakage Current      | V <sub>DS</sub> =0V, V <sub>GS</sub> =18V,                                                    | -    | -    | 250 | nA   |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.5mA, T <sub>J</sub> =25°C                | 2.0  | 2.8  | 4.0 | V    |
|                                    |                                  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.5mA, T <sub>J</sub> =150°C               | -    | 1.7  | -   | V    |
| R <sub>DS(ON)</sub>                | Drain-Source On-State Resistance | V <sub>GS</sub> =18V, I <sub>D</sub> =2A, T <sub>J</sub> =25°C                                | -    | 570  | -   | mΩ   |
|                                    |                                  | V <sub>GS</sub> =18V, I <sub>D</sub> =2A, T <sub>J</sub> =150°C                               | -    | 850  | -   | mΩ   |
| Dynamic Characteristics            |                                  |                                                                                               |      |      |     |      |
| C <sub>iss</sub>                   | Input Capacitance                | V <sub>DS</sub> =1000V, V <sub>GS</sub> =0V, F=100kHz                                         | -    | 294  | -   | pF   |
| C <sub>oss</sub>                   | Output Capacitance               |                                                                                               | -    | 20   | -   | pF   |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance     |                                                                                               | -    | 3.2  | -   | pF   |
| Q <sub>g</sub>                     | Total Gate Charge                | V <sub>DD</sub> =900V, I <sub>D</sub> =2A, V <sub>GS</sub> =-4/+18V                           | -    | 27   | -   | nC   |
| Q <sub>gs</sub>                    | Gate-Source Charge               |                                                                                               | -    | 6    | -   | nC   |
| Q <sub>gd</sub>                    | Gate-Drain Charge                |                                                                                               | -    | 15   | -   | nC   |
| Switching Characteristics          |                                  |                                                                                               |      |      |     |      |
| t <sub>d(on)</sub>                 | Turn-on Delay Time               | V <sub>DD</sub> =900V, I <sub>D</sub> =2A, V <sub>GS</sub> =-4/+18V, R <sub>G</sub> =2.5Ω     | -    | 6    | -   | ns   |
| t <sub>r</sub>                     | Turn-on Rise Time                |                                                                                               | -    | 21   | -   | ns   |
| t <sub>d(off)</sub>                | Turn-off Delay Time              |                                                                                               | -    | 13   | -   | ns   |
| t <sub>f</sub>                     | Turn-off Fall Time               |                                                                                               | -    | 61   | -   | ns   |
| E <sub>ON</sub>                    | Turn-on Energy                   |                                                                                               | -    | 92   | -   | mJ   |
| E <sub>OFF</sub>                   | Turn-off Fall Time Energy        |                                                                                               | -    | 12   | -   | mJ   |
| Source-Drain Diode Characteristics |                                  |                                                                                               |      |      |     |      |
| V <sub>SD</sub>                    | Diode Forward Voltage            | V <sub>GS</sub> =-4V, I <sub>S</sub> =2A, T <sub>J</sub> =25°C                                | -    | 4.7  | -   | V    |
|                                    |                                  | V <sub>GS</sub> =-4V, I <sub>S</sub> =2A, T <sub>J</sub> =150°C                               | -    | 4.2  | -   | V    |
| I <sub>S</sub>                     | Continuous Diode Forward Current | V <sub>GS</sub> =-4V, T <sub>J</sub> =25°C                                                    | -    | 8    | -   | A    |
|                                    |                                  | V <sub>GS</sub> =-4V, T <sub>J</sub> =100°C                                                   | -    | 4    | -   | A    |
| I <sub>rrm</sub>                   | Peak Reverse Recovery Current    | V <sub>GS</sub> =-4V, I <sub>SD</sub> =2A, V <sub>R</sub> =900V, di <sub>F</sub> /dt=1100A/μs | -    | 35   | -   | A    |
| T <sub>rr</sub>                    | Reverse Recovery Time            |                                                                                               | -    | 3.3  | -   | ns   |
| Q <sub>rr</sub>                    | Reverse Recovery Charge          |                                                                                               | -    | 40   | -   | nC   |

## 4. Typical Characteristics

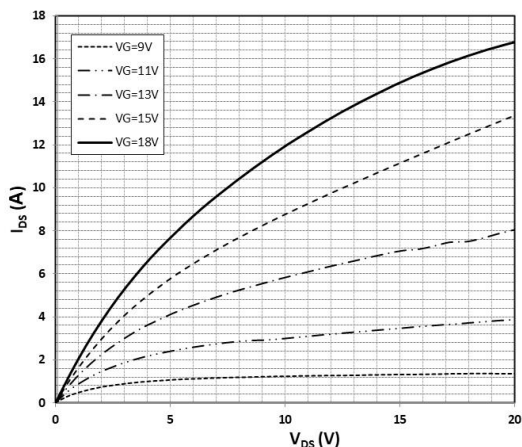


Figure 1. Output Characteristics

$T_J=25^{\circ}\text{C}$

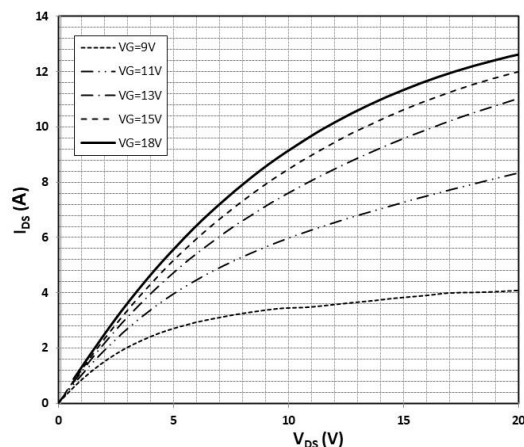


Figure 2. Output Characteristics

$T_J=150^{\circ}\text{C}$

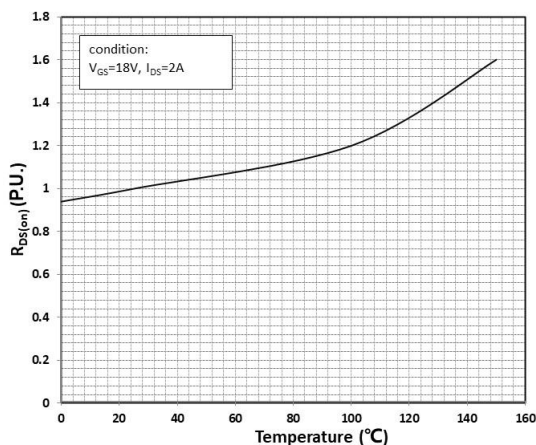


Figure 3. Normalized On-Resistance vs. Temperature

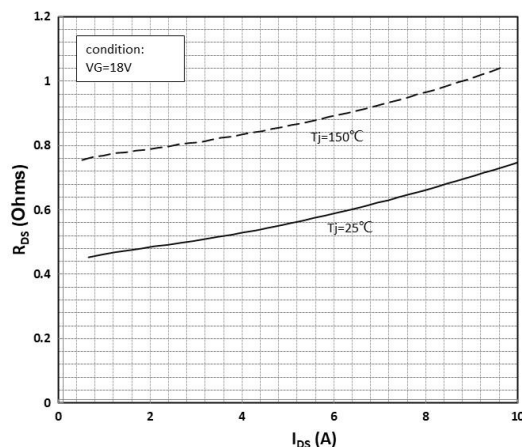


Figure 4. On-Resistance vs. Drain Current For Various Temperatures

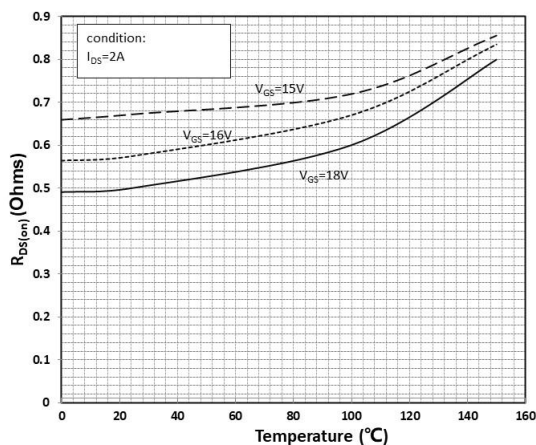


Figure 5. On-Resistance vs. Temperature For Various Gate Voltage

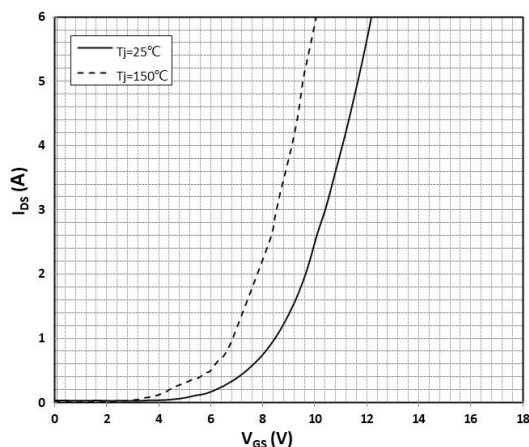
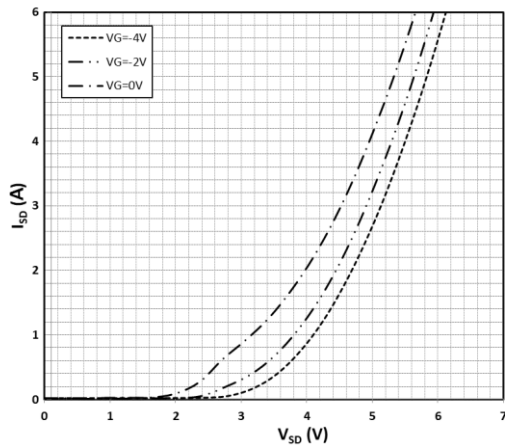
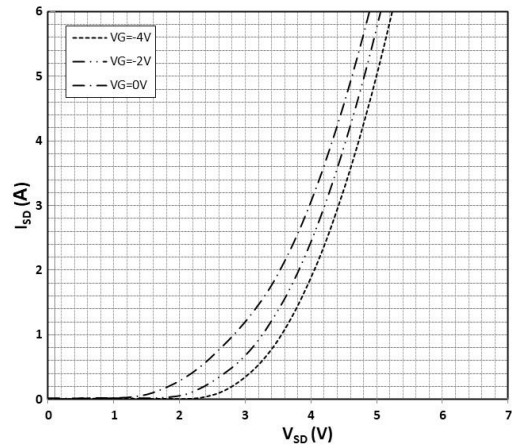


Figure 6. Transfer Characteristic for Various Junction Temperatures  
 $V_{DS}=20\text{V}$

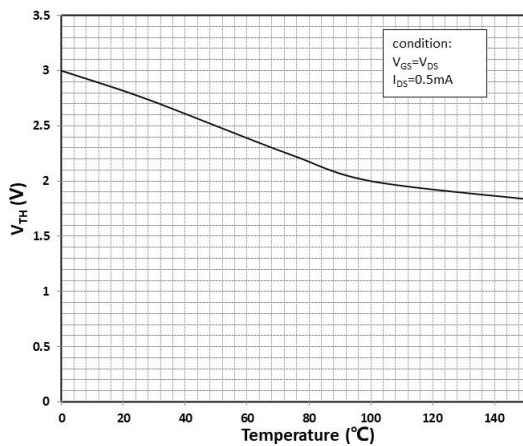
## 4. Typical Characteristics(cont.)



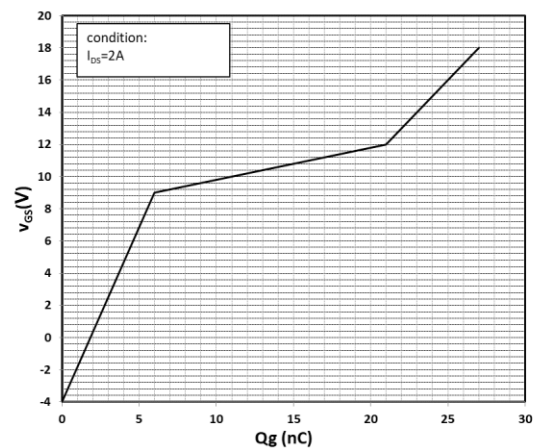
**Figure 7. Body Diode Characteristics**  
 $T_J=25^{\circ}\text{C}$



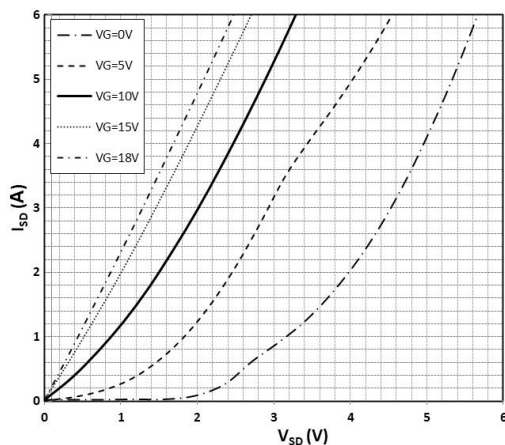
**Figure 8. Body Diode Characteristics**  
 $T_J=25^{\circ}\text{C}$



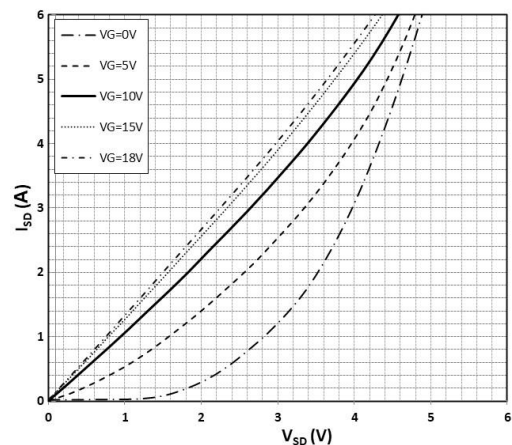
**Figure 9. Threshold Voltage vs. Temperature**



**Figure 10. Gate Charge Characteristics**



**Figure 11. 3rd Quadrant Characteristics**  
 $T_J=25^{\circ}\text{C}$



**Figure 12. 3rd Quadrant Characteristics**  
 $T_J=150^{\circ}\text{C}$

## 4. Typical Characteristics(cont.)

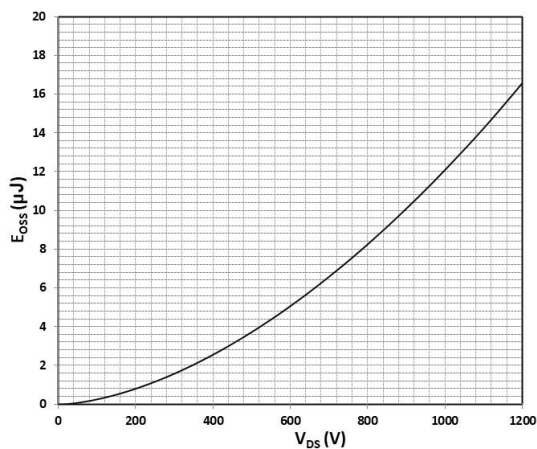


Figure 13. Output Capacitor Stored Energy

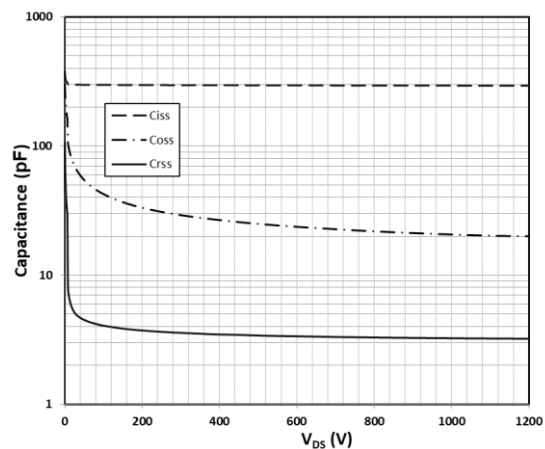


Figure 14. Capacitances vs. Drain-Source

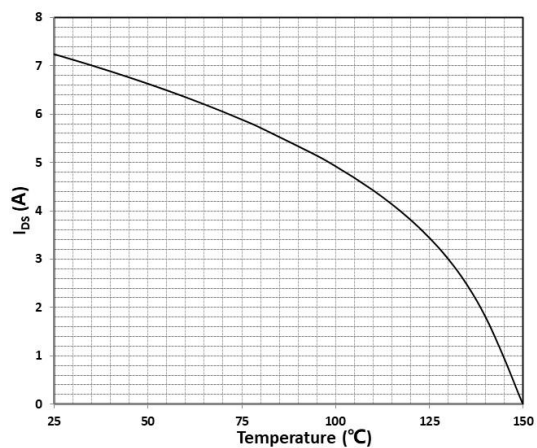


Figure 15. Continuous Drain Current Derating vs. Case Temperature

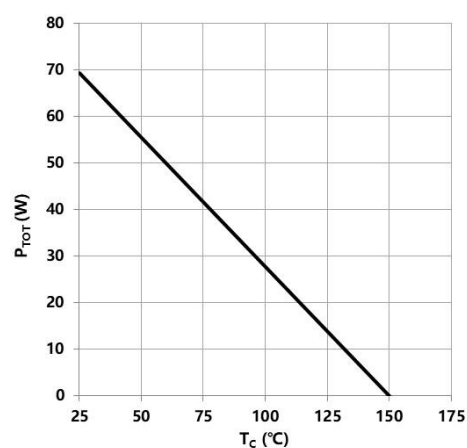


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

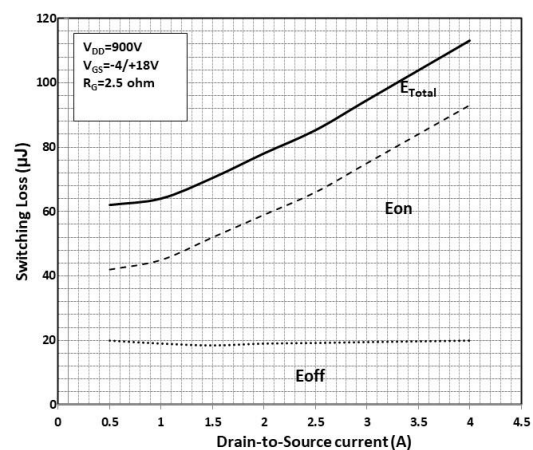


Figure 17. Clamped Inductive Switching Energy vs. Drain Current

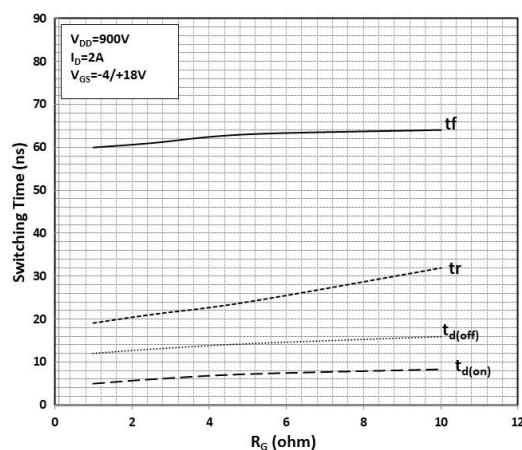


Figure 18. Switching Times vs.  $R_G$

## 4. Typical Characteristics(cont.)

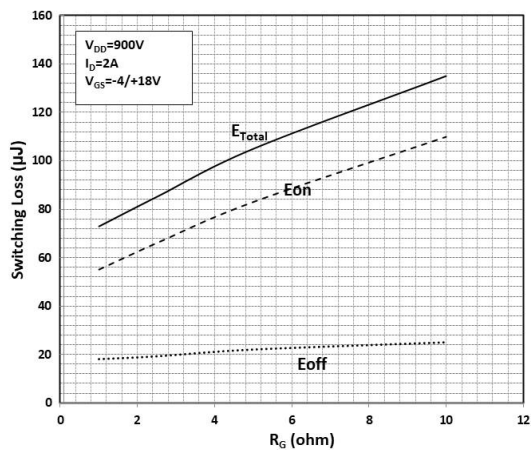


Figure 19. Clamped Inductive Switching Energy vs.  $R_G$

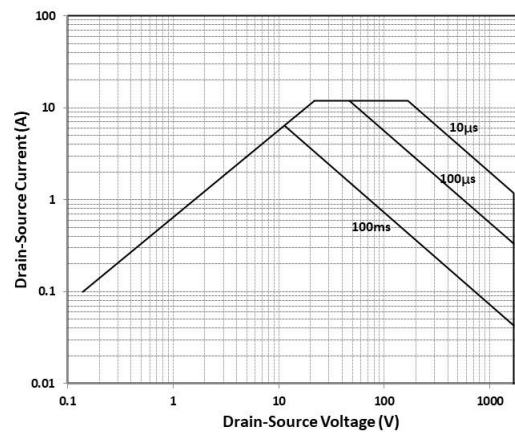
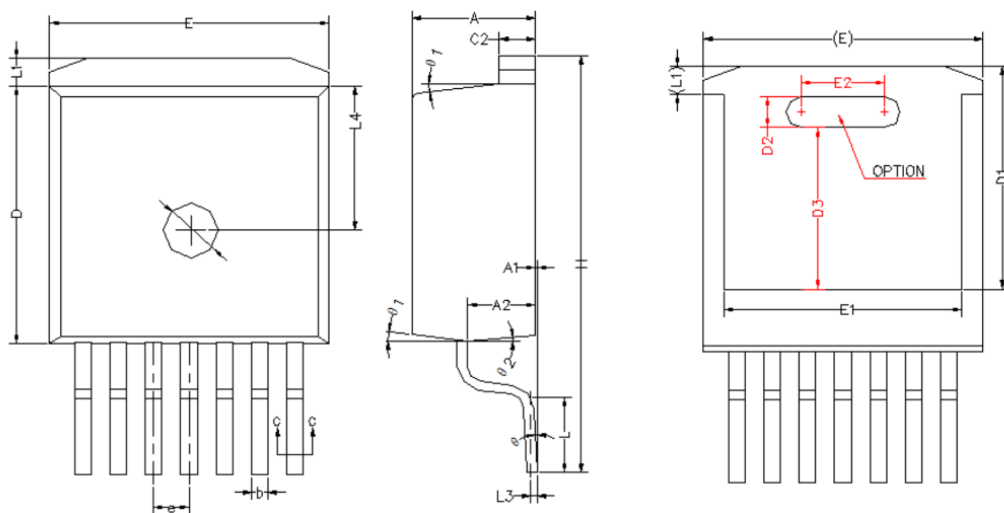


Figure 21. Safe Operating Area

## 5. Package Mechanical Data

### TO263-7L Package



| Symbol | Dimensions in Millimeters |          |       |
|--------|---------------------------|----------|-------|
|        | MIN.                      | NOM.     | MAX.  |
| A      | 4.30                      | 4.40     | 4.50  |
| A1     | -                         | 0.10     | 0.25  |
| A2     | 2.30                      | 2.40     | 2.50  |
| b      | 0.56                      | -        | 0.69  |
| b1     | 0.55                      | 0.60     | 0.65  |
| c      | 0.37                      | -        | 0.44  |
| c1     | 0.36                      | 0.38     | 0.40  |
| c2     | 1.22                      | 1.27     | 1.32  |
| D      | 9.15                      | 9.25     | 9.35  |
| D1     | 7.90                      | 8.00     | 8.10  |
| D2     | 1.00                      | 1.11     | 1.20  |
| D3     | 5.70                      | 5.80     | 5.90  |
| E      | 9.90                      | 10.00    | 10.10 |
| E1     | 8.40                      | 8.50     | 8.60  |
| E2     | 2.90                      | 3.00     | 3.10  |
| e      | 1.17                      | 1.27     | 1.37  |
| H      | 14.60                     | 14.95    | 15.35 |
| L      | 2.40                      | 2.70     | 2.90  |
| L1     | 0.90                      | 1.00     | 1.10  |
| L3     |                           | 0.25 BSC |       |
| L4     |                           | 2.50 REF |       |
| θ      | 0°                        | -        | 8°    |
| θ1     | 5°                        | 7°       | 9°    |
| θ2     | 3°                        | 5°       | 7°    |