# ACM120R042TD

N-Channel Silicon Carbide Power MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$@25℃ |
|---|---|---|
| 1200V | 60mΩ@15V | 66A |

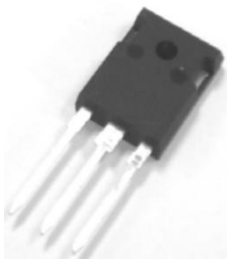
## Feature

- Wide bandgap SiC MOSFET technology
- Low On-Resistance with high blocking voltage
- Low capacitances with High-Speed switching
- Low reverse recovery(Qrr)

## Application

- Switch mode power supplies
- Renewable energy
- Motor drives
- High voltage DC/DC converters

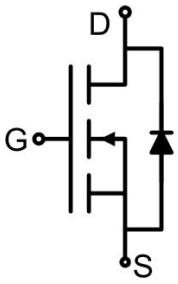
## Package



TO-247-3L

## Marking


## Circuit diagram




## Absolute maximum ratings ($T_C$=25℃ unless otherwise noted)

| Parameter | Symbol | Test Condition | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DSmax}$ | $V_{GS}$ =0V, $I_D$ =100μA | 1200 | V |
| Gate-Source Voltage | $V_{GSmax}$ | AC (f > 1 Hz) | -10/+25 | V |
| Gate-Source Voltage | $V_{GSOP}$ | Static | -4/+15 | V |
| Continuous Drain Current | $I_D$ | $V_{GS}$=15V | 66 | A |
| | $I_D$ | $V_{GS}$=15V, $T_C$=100℃ | 47 | A |
| Pulsed Drain Current | $I_{D,pulse}$ | Pulse with $t_p$ limited by $T_{jmax}$ | 107 | A |
| Power Dissipation | $P_D$ | $T_J$ = 175℃ | 288 | W |
| Thermal Resistance（Typ） | $R_{\theta JC}$ | Junction-to-Case | 0.52 | ℃/W |
| | $R_{\theta JA}$ | Junction-to-Ambient | 45 | ℃/W |
| Junction Temperature | $T_J$ | | 175 | ℃ |
| Storage Temperature | $T_{STG}$ | | -55 ~ +175 | ℃ |

## Electrical characteristics ($T_J$=25 °C, unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ =100μA | 1200 | | | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =1200V,$V_{GS}$ = 0V | | | 50 | μA |
| Gate-Source leakage current | $I_{GSS}$ | $V_{GS}$ =15V, $V_{DS}$ = 0V | | | 250 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =10mA | | 2.7 | | V |
| | | $V_{DS}$ =$V_{GS}$, $I_D$ =10mA ,$T_J$=175℃ | | 1.9 | | |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =15V, $I_D$ =40A | | 42 | 60 | mΩ |
| | | $V_{GS}$ =18V, $I_D$ =40A | | 33 | | |
| | | $V_{GS}$ =15V, $I_D$ =40A,$T_J$=175℃ | | 64 | 96 | |
| | | $V_{GS}$ =18V, $I_D$ =40A,$T_J$=175℃ | | 60 | | |
| Transconductance | $g_{fs}$ | $V_{DS}$ =15V, $I_D$ =40A | | 23 | | S |
| | | $V_{DS}$ =15V, $I_D$ =40A,$T_J$= 175℃ | | 21 | | |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =1000V,$V_{GS}$ =0V,f =100KHz $V_{AC}$=25mV | | 2691 | | pF |
| Output Capacitance | $C_{oss}$ | | | 121 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 14 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ =800V,$V_{GS}$ =-4V/15V, $I_D$ =40A | | 65 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 28.8 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 22.6 | | |
| Internal Gate Resistance | $R_{G(int)}$ | f=1 MHz, $V_{AC}$ = 25mV | | 1.1 | | Ω |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward Current | $I_S$ | $V_{GS}$ =-4V,$T_C$=25℃ | | 64 | | A |
| Diode Forward voltage | $V_{SD}$ | $V_{GS}$ =-4V, $I_{SD}$=20A | | 4.0 | | V |
| | | $V_{GS}$ =-4V, $I_{SD}$=20A,$T_J$=175℃ | | 3.5 | | |
| Diode pulse Current | $I_{S,pulse}$ | $V_{GS}$ =-4V, pulse width $t_p$ limited by $T_{jmax}$ | | 107 | | A |

## Typical Characteristics

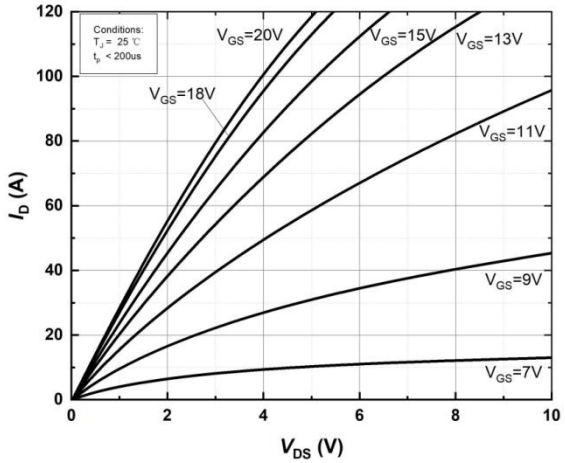



Figure 1. Output characteristics at Tj=25°C

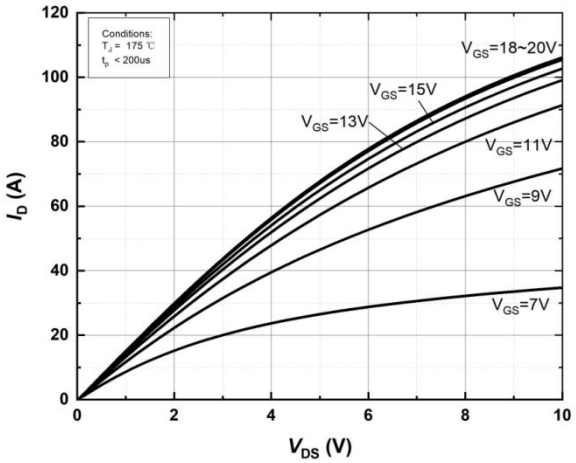



Figure 2. Output characteristics at Tj=175°C

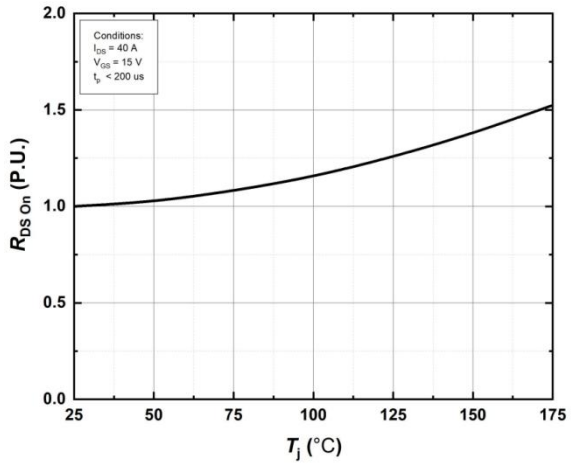



Figure 3. Normalized On-Resistance vs. Temperature

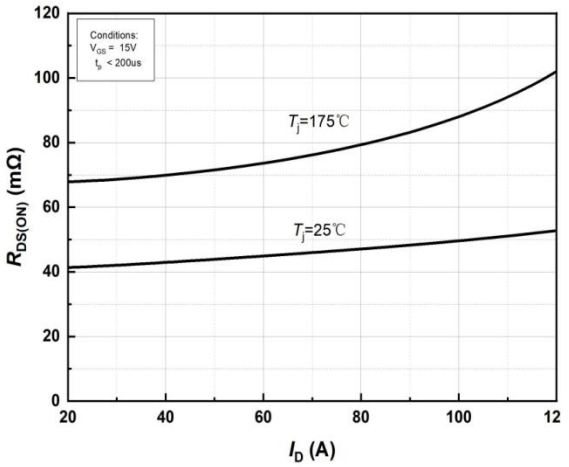



Figure 4. On-Resistance vs. Drain current for Various Temperature

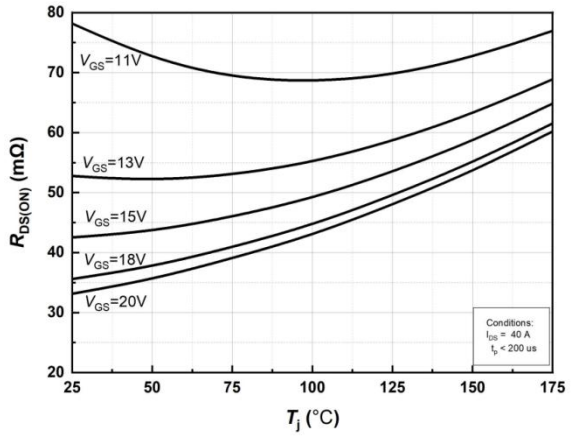



Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

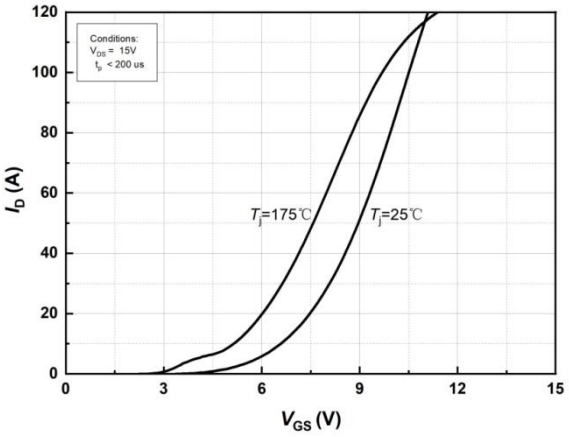



Figure 6. Transfer Characteristics for Various Junction Temperatures

## Typical Characteristics

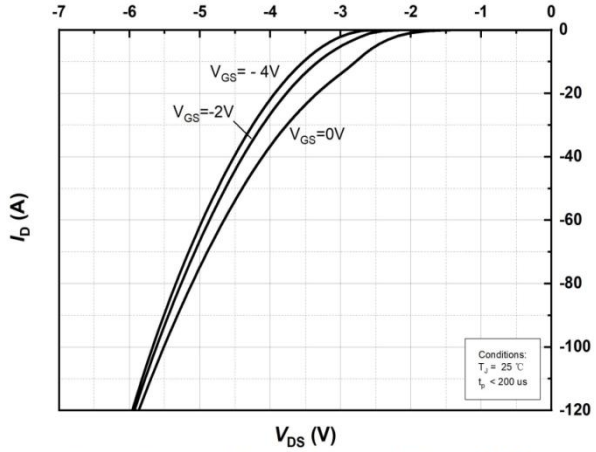



Figure 7. Body Diode Characteristics at Tj=25°C

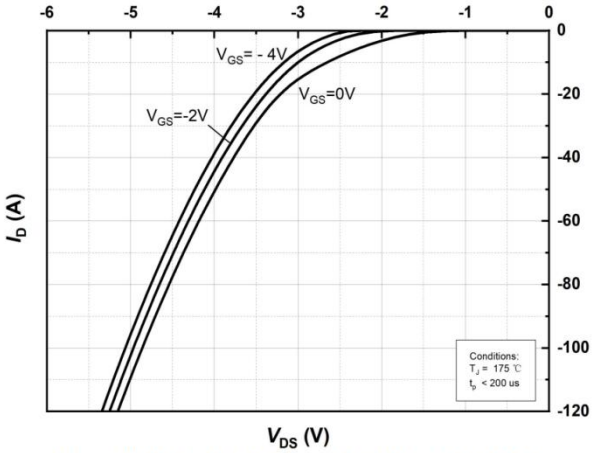



Figure 8. Body Diode Characteristics at Tj=175°C

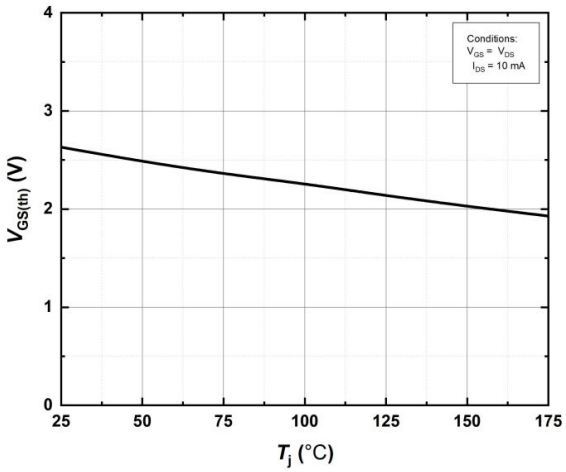



Figure 9. Threshold Voltage vs. Temperature

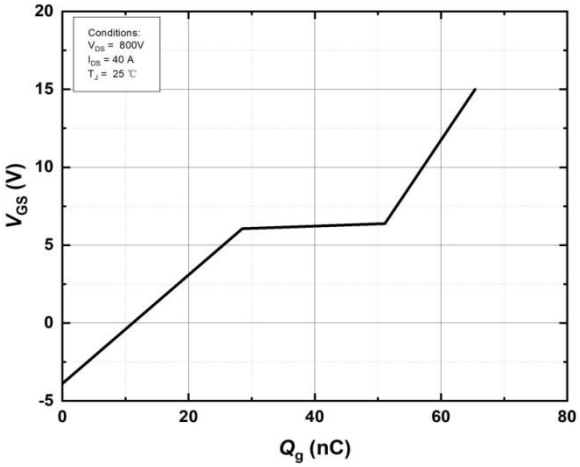



Figure 10 Gate Charge Characteristics

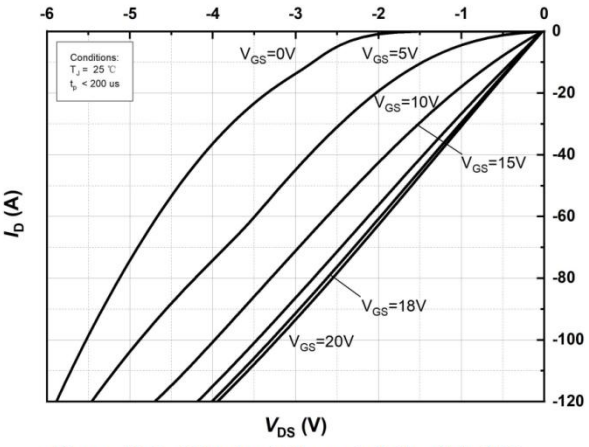



Figure 11. 3rd Quadrant Characteristic at Tj=25°C

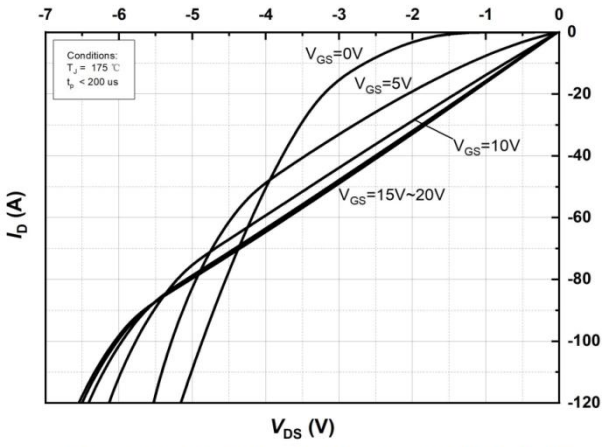



Figure 12. 3rd Quadrant Characteristic at Tj=175°C

## Typical Characteristics

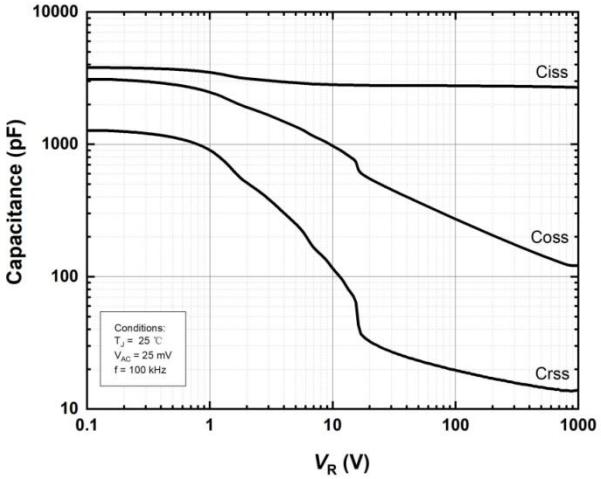



Figure 13. Capacitances vs. Drain-Source Voltage (0 – 1000V)

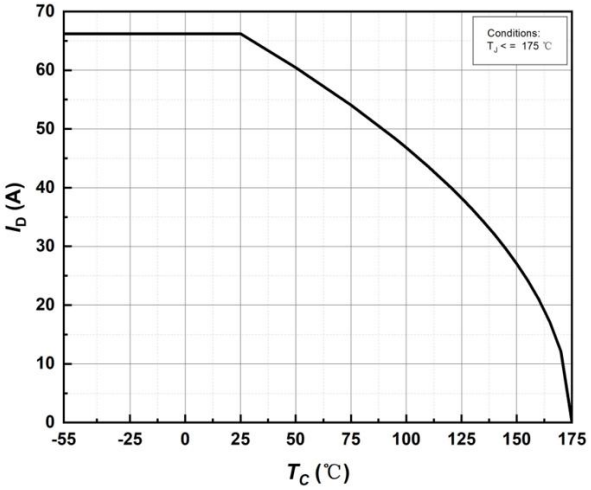



Figure 14. Continuous Drain Current

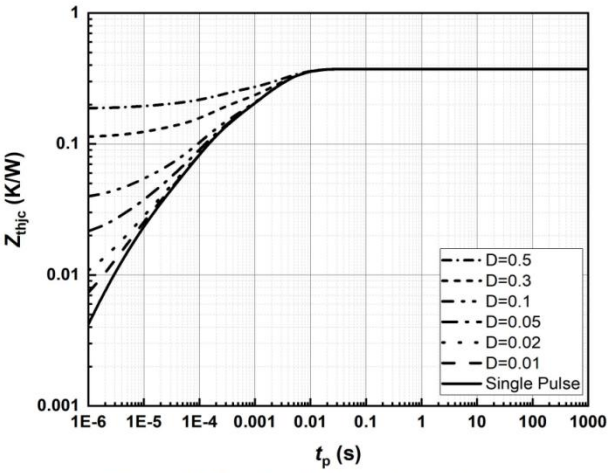



Figure 15.Transient Thermal Impedance (Junction – Case)

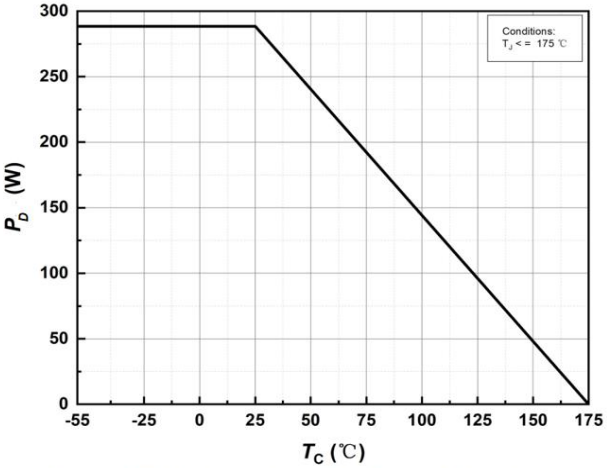



Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

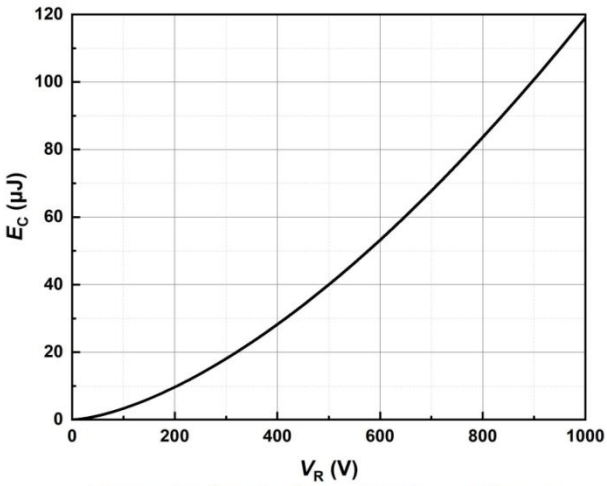



Figure 17. Output Capacitor Stored Energy

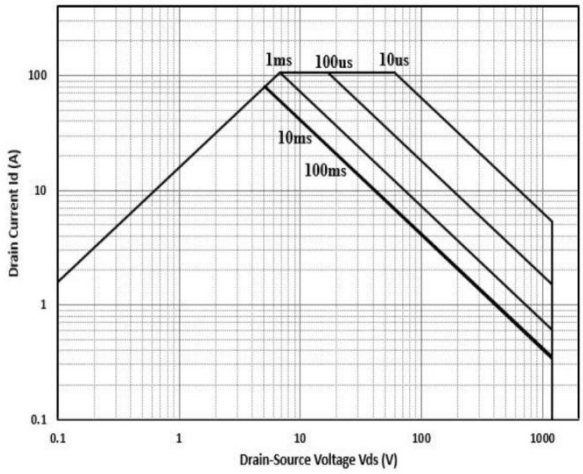
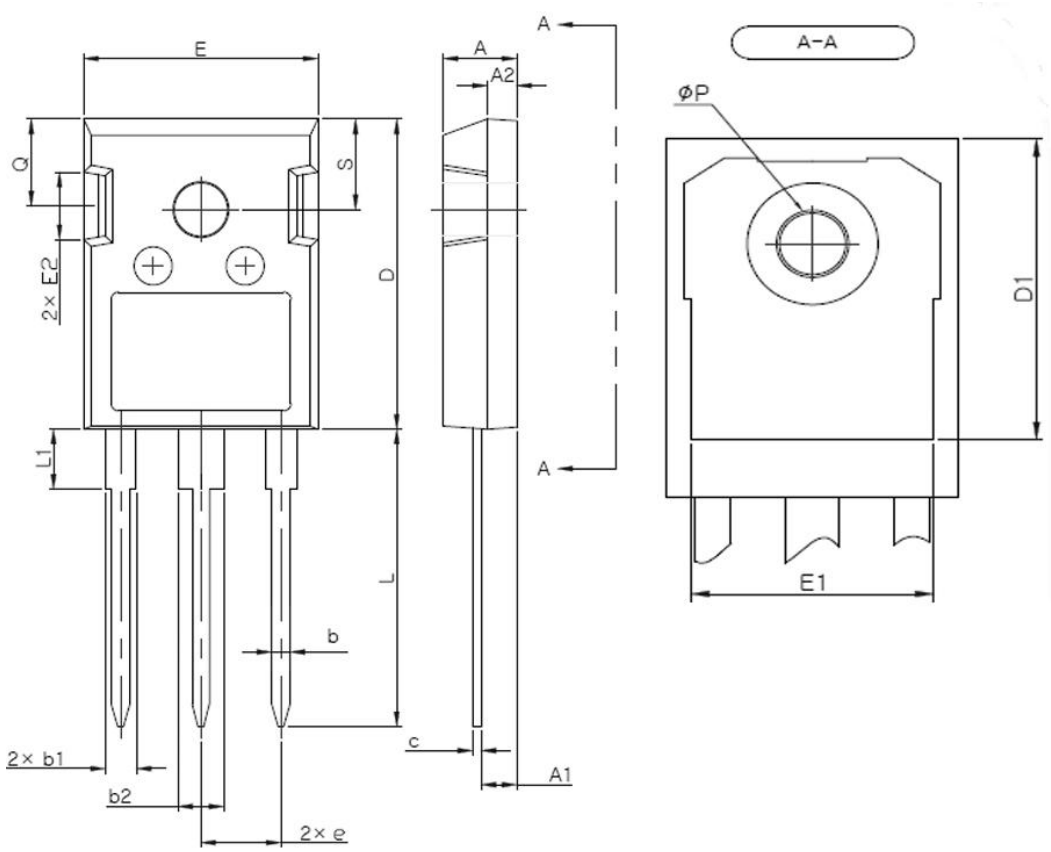



Figure 18. Safe Operating Area

## TO-247-3L Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.700 | 5.300 | 0.185 | 0.209 |
| A1 | 2.240 | 2.580 | 0.088 | 0.102 |
| A2 | 1.800 | 2.200 | 0.071 | 0.087 |
| b | 1.000 | 1.400 | 0.039 | 0.055 |
| b1 | 1.600 | 2.600 | 0.063 | 0.102 |
| b2 | 2.600 | 3.600 | 0.102 | 0.142 |
| c | 0.400 | 0.800 | 0.016 | 0.031 |
| D | 20.000 | 22.000 | 0.787 | 0.866 |
| D1 | 15.240 | 17.240 | 0.600 | 0.679 |
| E | 15.500 | 16.010 | 0.610 | 0.630 |
| E1 | 13.060 | 13.460 | 0.514 | 0.530 |
| E2 | 4.300 | 4.900 | 0.169 | 0.193 |
| e | 5.440 BSC. | | 0.214 BSC. | |
| L | 19.700 | 20.200 | 0.776 | 0.795 |
| L1 | 3.850 | 4.450 | 0.152 | 0.175 |
| ϕP | 3.550 | 3.650 | 0.140 | 0.144 |
| Q | 5.890 | 6.400 | 0.232 | 0.252 |
| S | 6.170 BSC. | | 0.243 BSC. | |