# AS2M020065N

N-Channel Silicon Carbide Power MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$@25℃ |
|---|---|---|
| 650V | 30mΩ@18V | 92A |

## Feature

- High Blocking Voltage With Low On-Resistance
- High Speed Switching With Low Capacitance
- Easy to Parallel and Simple to Drive

## Application

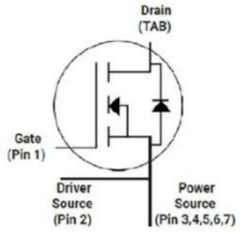
- Renewable Energy
- EV Battery Chargers
- High Voltage DC/DC Converters
- Switch Mode Power Supplies

## Package


TO-263-7

## 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 | 650 | V |
| Gate-Source Voltage | $V_{GSmax}$ | Absolute maximum values | -8/+22 | V |
| Gate-Source Voltage | $V_{GSOP}$ | Recommended operational values | -4/+18 | V |
| Continuous Drain Current | $I_D$ | $V_{GS}$=18V, $T_C$=25℃ | 92 | A |
| | $I_D$ | $V_{GS}$=18V, $T_C$=100℃ | 64 | A |
| Power Dissipation | $P_D$ | $T_C$=25℃ | 312 | W |
| Thermal Resistance（Typ） | $R_{\theta JC}$ | Junction-to-Case | 0.48 | ℃/W |
| Junction Temperature | $T_J$ | | -55 ~ +175 | ℃ |
| Storage Temperature | $T_{STG}$ | | -55 ~ +175 | ℃ |

## Electrical characteristics ($T_c$=25℃ 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 | 650 | | | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =650V,$V_{GS}$ = 0V | | 1 | 100 | μA |
| Gate-Source leakage current | $I_{GSS+}$ | $V_{GS}$ =22V, $V_{DS}$ = 0V | | 10 | 250 | nA |
| Gate-Source leakage current | $I_{GSS-}$ | $V_{GS}$ =-8V, $V_{DS}$ = 0V | | 10 | 250 | |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =15mA | 1.9 | 2.6 | 4.0 | V |
| | | $V_{DS}$ =$V_{GS}$, $I_D$ =15mA ,$T_J$=175℃ | | 1.8 | | |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =18V, $I_D$ =50A | | 20 | 30 | mΩ |
| | | $V_{GS}$ =18V, $I_D$ =50A,$T_J$=175℃ | | 28 | | |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =600V,$V_{GS}$ =0V,f =1MHz $V_{AC}$=25mV | | 3180 | | pF |
| Output Capacitance | $C_{oss}$ | | | 281 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 33 | | |
| Turn-on Switching Energy | $E_{on}$ | $V_{DS}$=400V,$V_{GS}$=-4V/18V, $I_D$ =40A,$R_{G(ext)}$=2.5Ω,L=100μH | | 0.52 | | mJ |
| Turn-off Switching Energy | $E_{off}$ | | | 0.7 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ =400V,$V_{GS}$ =-4V/18V, $I_D$ =40A | | 187 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 49 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 31 | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$=400V,$V_{GS}$=-4V/18V, $I_D$ =40A,$R_{G(ext)}$=2.5Ω,$R_L$=20Ω | | 17 | | nS |
| Turn-on rise time | $t_r$ | | | 15 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 65 | | |
| Turn-off fall time | $t_f$ | | | 14 | | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward Current | $I_S$ | $T_C$=25℃ | | | 92 | A |
| Diode Forward voltage | $V_{SD}$ | $V_{GS}$ =-4V, $I_{SD}$=25A | | 4.2 | | V |
| | | $V_{GS}$ =-4V, $I_{SD}$=25A,$T_J$=175℃ | | 3.9 | | |
| Reverse Recovery Time | $t_{rr}$ | $I_{SD}$=40A,$V_R$=400V | | 26 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 58 | | nC |
| Peak Reverse Recovery Current | $I_{rrm}$ | | | 3.4 | | A |

## Typical Characteristics

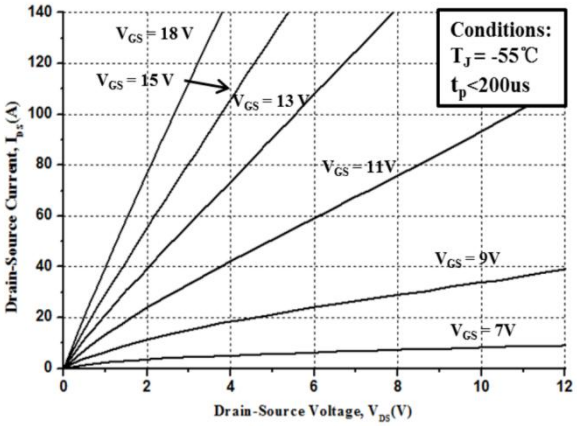



Figure 1. Output Characteristics $T_J$ = -55℃

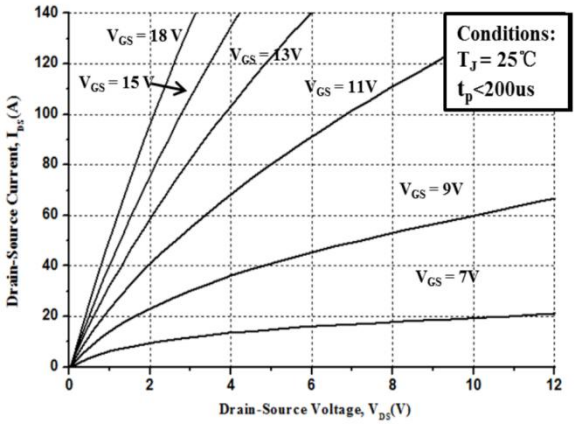



Figure 2. Output Characteristics $T_J$ = 25℃

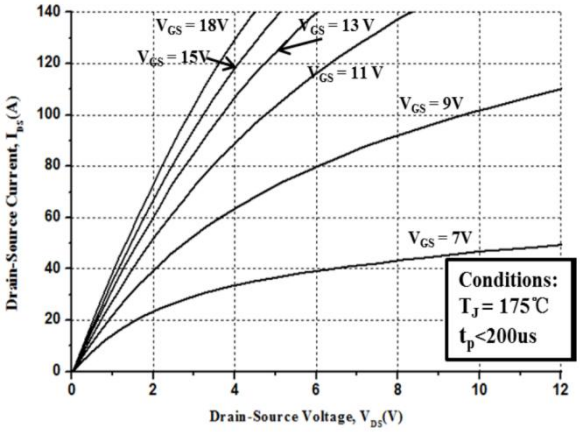



Figure 3. Output Characteristics $T_J$ = 175℃

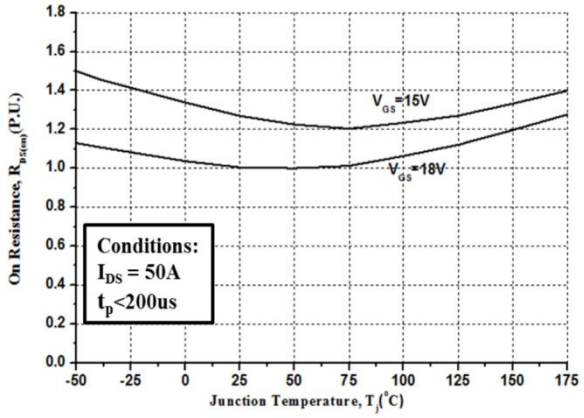



Figure 4. Normalized On-Resistance vs. Temperature

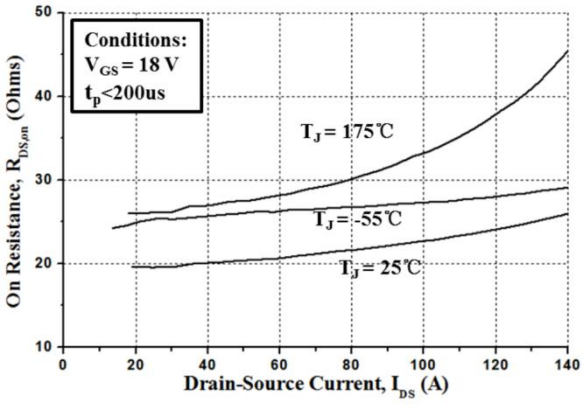



Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

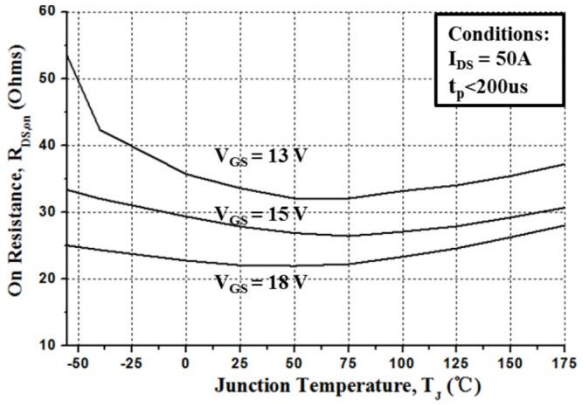



Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

## Typical Characteristics

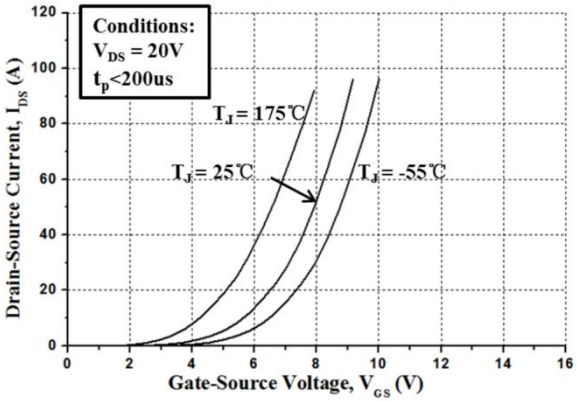



Figure 7. Transfer Characteristic for Various Junction Temperatures

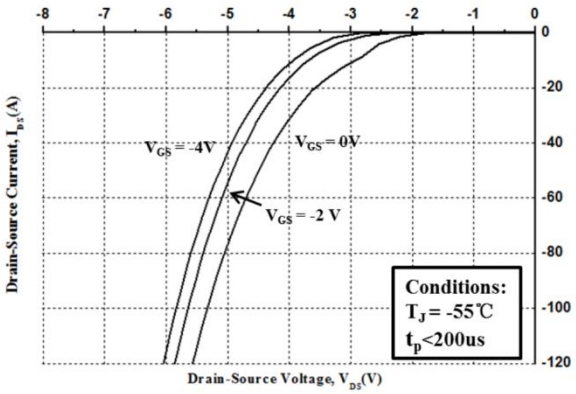



Figure 8. Body Diode Characteristic at -55℃

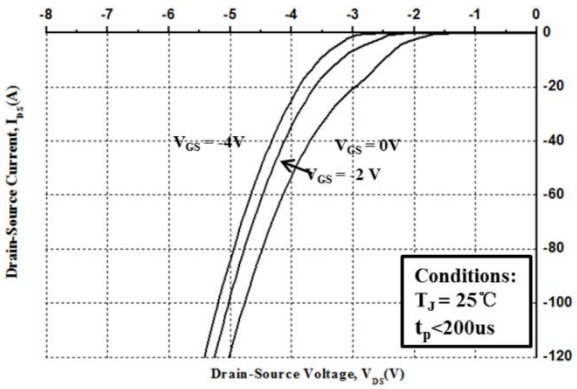



Figure 9. Body Diode Characteristic at 25℃

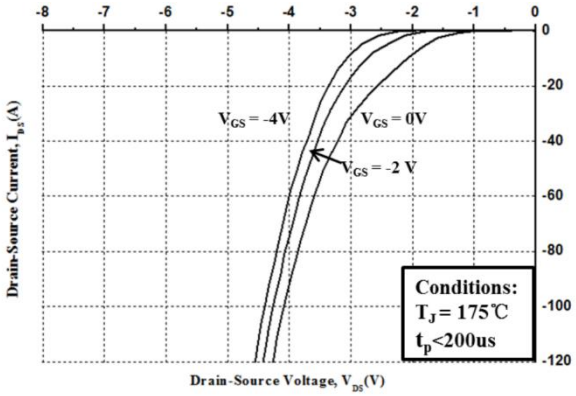



Figure 10. Body Diode Characteristic at 175℃

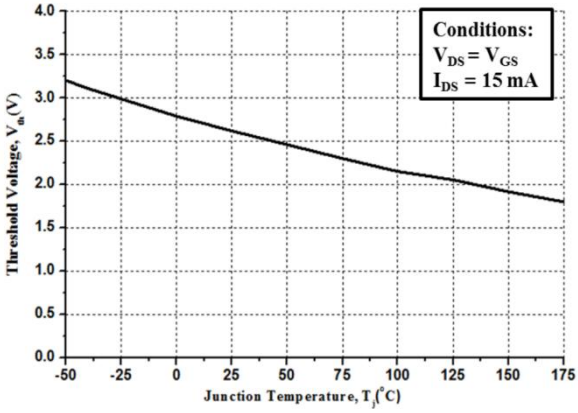



Figure 11. Threshold Voltage vs. Temperature

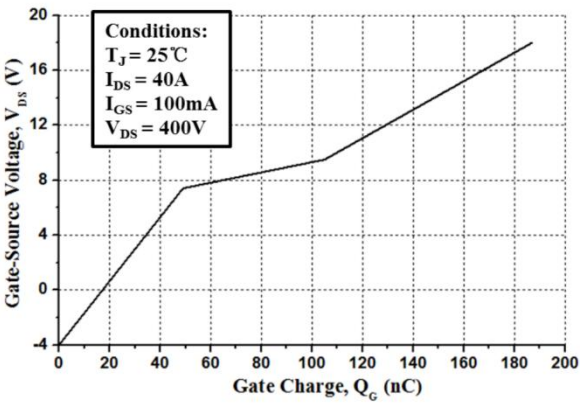



Figure 12. Gate Charge Characteristics

## Typical Characteristics

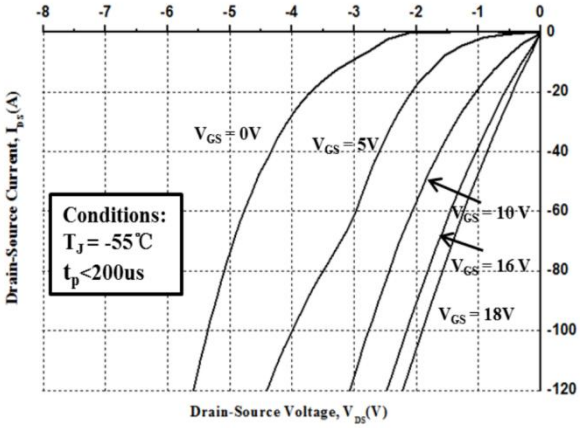



Figure 13. 3rd Quadrant Characteristic at -55℃

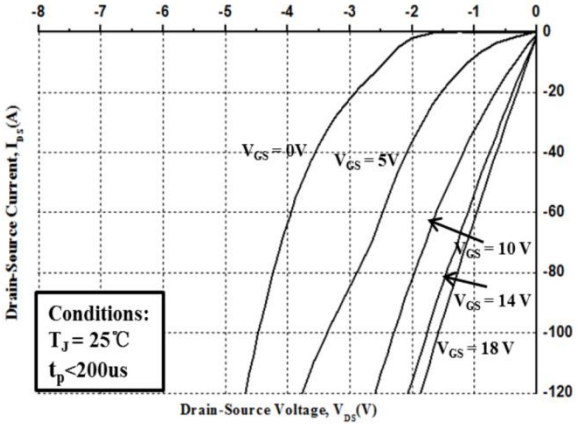



Figure 14. 3rd Quadrant Characteristic at 25℃

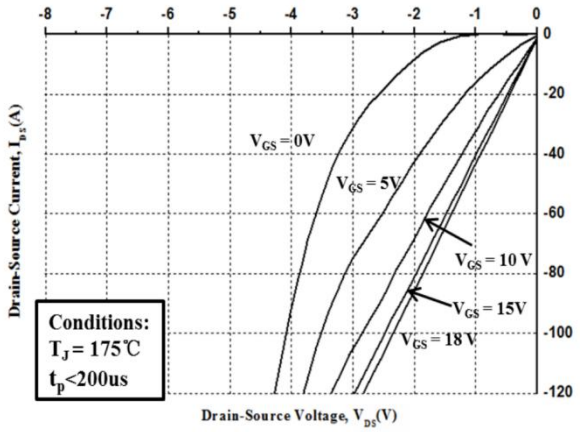



Figure 15. 3rd Quadrant Characteristic at 175 ℃

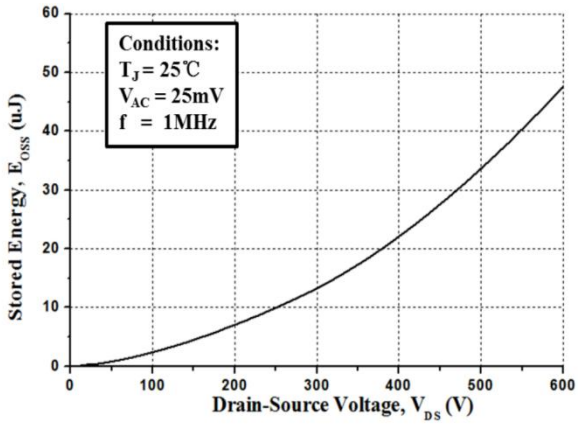



Figure16. Output Capacitor Stored Energy

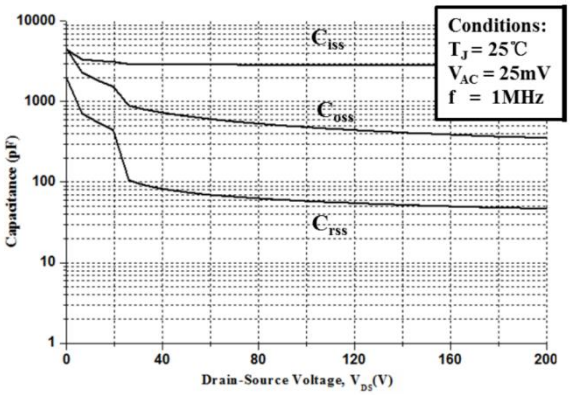



Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

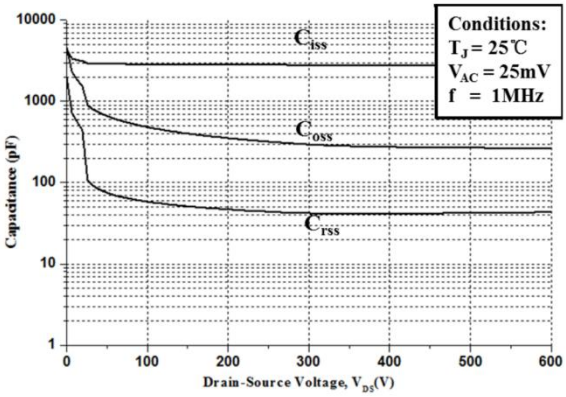



Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

## Typical Characteristics

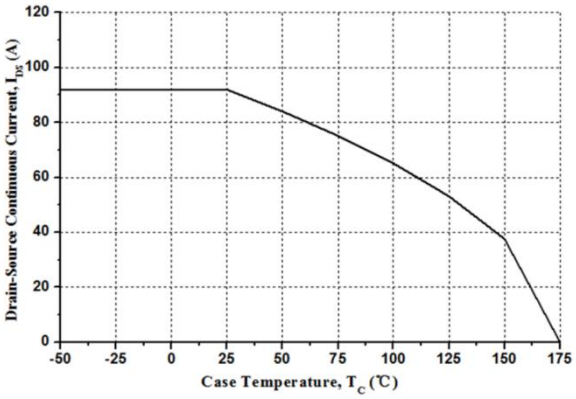



Figure 19. Continuous Drain Current Derating vs. Case Temperature

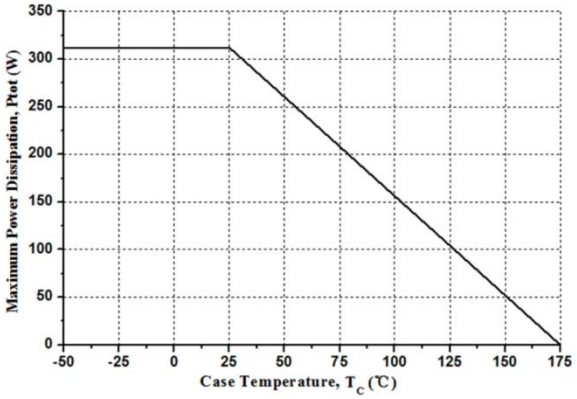



Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

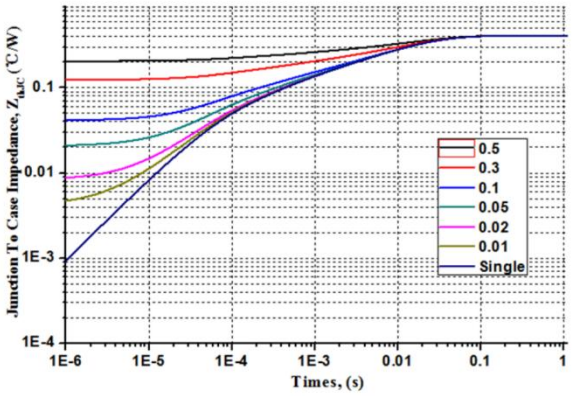



Figure 21. Transient Thermal Impedance (Junction - Case)

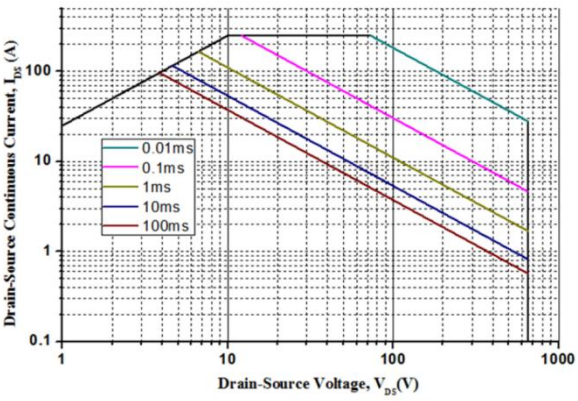
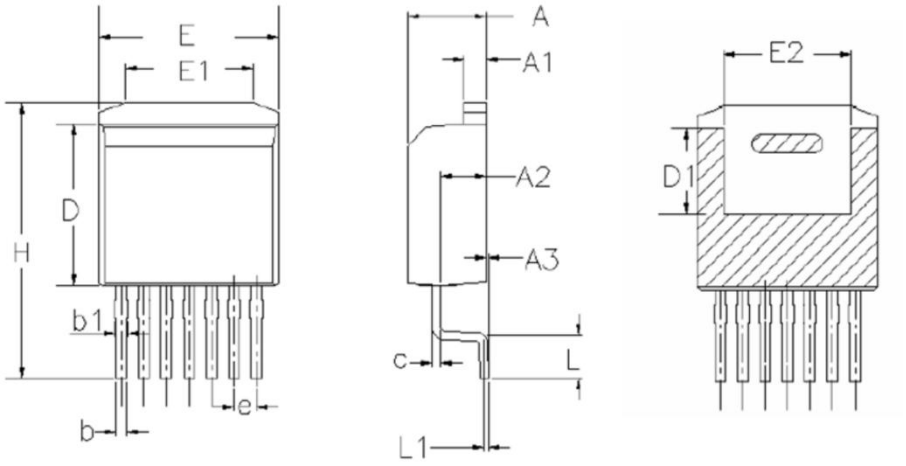



Figure22. Safe Operating Area

## TO-263-7 Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.300 | 4.600 | 0.169 | 0.181 |
| A1 | 1.200 | 1.400 | 0.047 | 0.055 |
| A2 | 2.400 | 2.700 | 0.094 | 0.106 |
| A3 | 0.000 | 0.250 | 0.000 | 0.010 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.600 | 0.900 | 0.024 | 0.035 |
| c | 0.400 | 0.600 | 0.016 | 0.024 |
| D | 8.880 | 9.280 | 0.350 | 0.365 |
| D1 | 4.650 | 6.650 | 0.183 | 0.262 |
| e | 1.270 BSC | | 0.050 BSC | |
| E | 10.080 | 10.280 | 0.397 | 0.405 |
| E1 | 6.500 | 8.300 | 0.256 | 0.327 |
| E2 | 6.820 | 7.97 | 0.269 | 0.314 |
| H | 14.800 | 16.000 | 0.583 | 0.630 |
| L | 1.900 | 2.750 | 0.075 | 0.108 |