# AS2M060065L

N-Channel Silicon Carbide Power MOSFET

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$ |
|---|---|---|
| 650V | 79mΩ@18V | 41A |

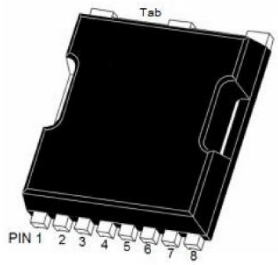
## Feature

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode with Low Reverse Recovery (Qrr)

## Application

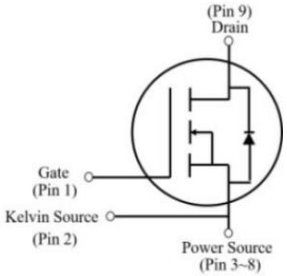
- EV Charging
- Server Power Supplies
- Solar PV Inverters
- UPS
- DC/DC Converters

## Package

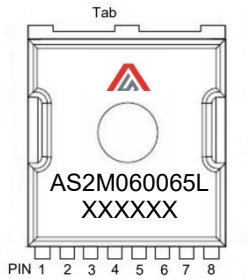



**TOLL**

## Circuit diagram




## Marking



# AS2M060065L

N-Channel Silicon Carbide Power MOSFET

## Absolute maximum ratings (Tc=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℃ | 41 | A |
| | $I_D$ | $V_{GS}$=18V, $T_C$=100℃ | 31 | A |
| Power Dissipation | $P_D$ | $T_C$=25℃ | 166 | W |
| Thermal Resistance（Typ） | $R_{\theta JC}$ | Junction-to-Case | 0.9 | ℃/W |
| Junction Temperature | $T_J$ | | -40 ~ +175 | ℃ |
| Storage Temperature | $T_{STG}$ | | -40 ~ +175 | ℃ |

## Electrical characteristics (Tc=25℃ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ =100uA | 650 | | | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =650V,$V_{GS}$ = 0V | | 1 | 50 | μA |
| Gate-body leakage current | $I_{GSS+}$ | $V_{GS}$ =18V, $V_{DS}$ = 0V | | 10 | 250 | nA |
| | $I_{GSS-}$ | $V_{GS}$ =-4V, $V_{DS}$ = 0V | | 10 | 250 | |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =5mA | 1.8 | 2.6 | 4.0 | V |
| | | $V_{DS}$ =$V_{GS}$, $I_D$ =5mA ,$T_J$=175℃ | | 1.8 | | |
| Drain-source on-resistance | $R_{DS(on)}$ | $V_{GS}$ =18V, $I_D$ =13.2A | 42 | 60 | 79 | mΩ |
| | | $V_{GS}$ =18V, $I_D$ =13.2A,$T_J$=175℃ | | 75 | | |
| **Dynamic characteristics**[2)] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =600V,$V_{GS}$ =0V,f =1MHz $V_{AC}$=25mV | | 830 | | pF |
| Output Capacitance | $C_{oss}$ | | | 82 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 14 | | |
| Turn-on Switching Energy | $E_{on}$ | $V_{DS}$=400V,$V_{GS}$=-4V/18V, $I_D$ =13.2A,$R_{G(ext)}$=2.5Ω, L=200μH | | 140 | | μJ |
| Turn-off Switching Energy | $E_{off}$ | | | 52 | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ =400V,$V_{GS}$ =-4V/18V, $I_D$ =13.2A | | 50 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 13 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 12 | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DS}$=400V,$V_{GS}$=-4V/18V, $I_D$ =13.2A,$R_{G(ext)}$=2.5Ω,$R_L$=30Ω | | 8 | | nS |
| Turn-on rise time | $t_r$ | | | 9 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 21 | | |
| Turn-off fall time | $t_f$ | | | 8 | | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward Current | $I_S$ | $V_{GS}$ =-4V | | | 23 | A |
| Diode Forward voltage | $V_{SD}$ | $V_{GS}$ =-4V, $I_{SD}$=6.6A | | 4.2 | | V |
| | | $V_{GS}$ =-4V, $I_{SD}$=6.6A,$T_J$=175℃ | | 3.8 | | |
| Reverse Recovery Time | $t_{rr}$ | $I_{SD}$=13.2A,$V_R$=400V | | 28 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 47 | | nC |
| Peak Reverse Recovery Current | $I_{rrm}$ | | | 3 | | A |

## Typical Characteristics

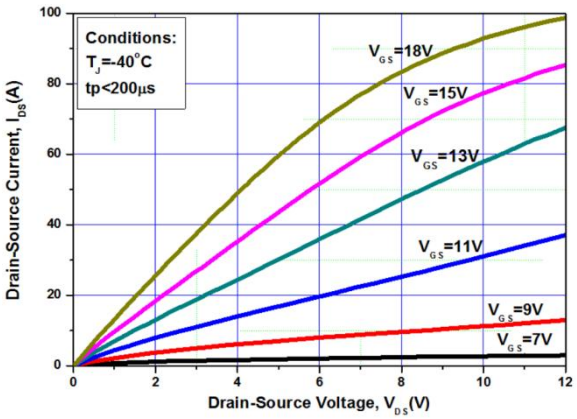



Figure 1. Output Characteristics $T_J$ = -40℃

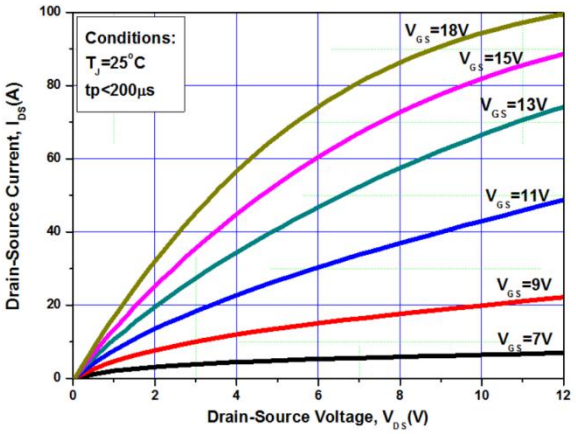



Figure 2. Output Characteristics $T_J$ = 25℃

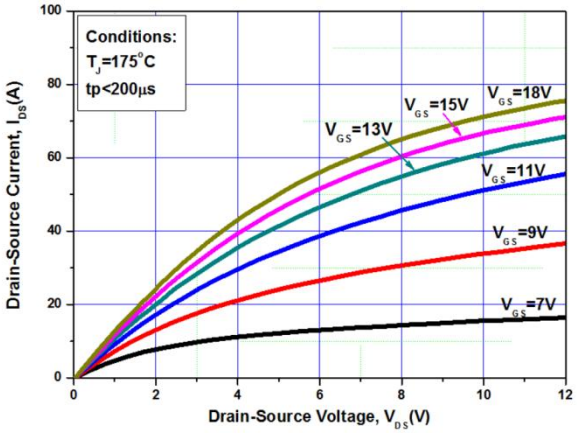



Figure 3. Output Characteristics $T_J$ = 175℃

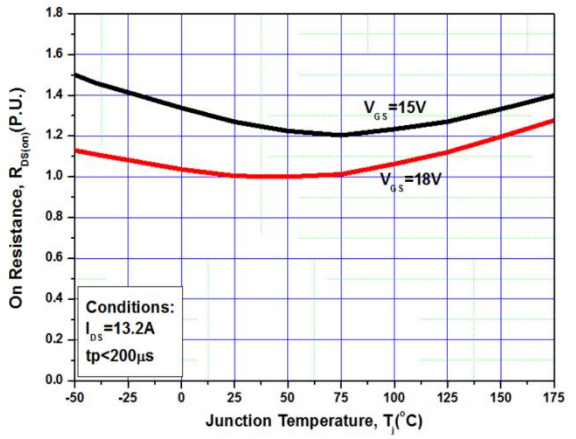



Figure 4. Normalized On-Resistance vs. Temperature

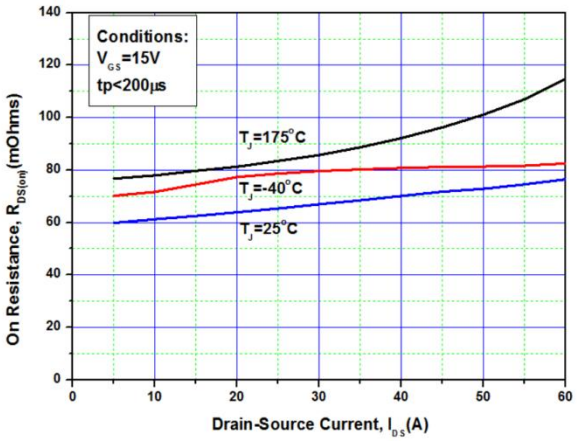



Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

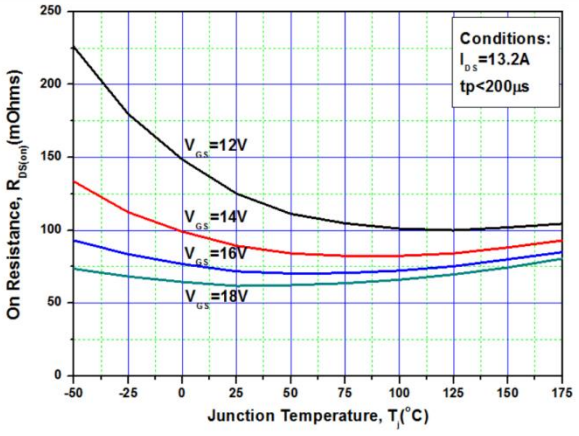



Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

## Typical Characteristics

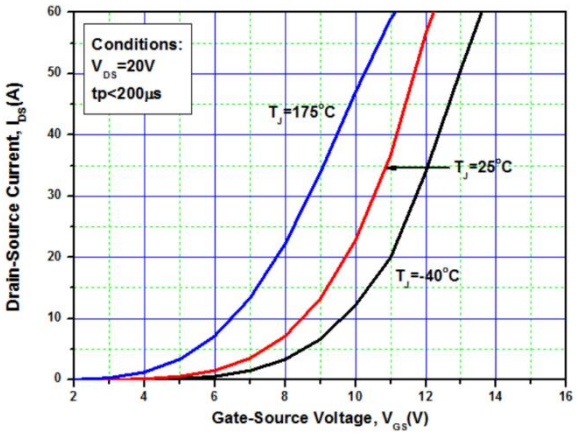



Figure 7. Transfer Characteristic for Various Junction Temperatures

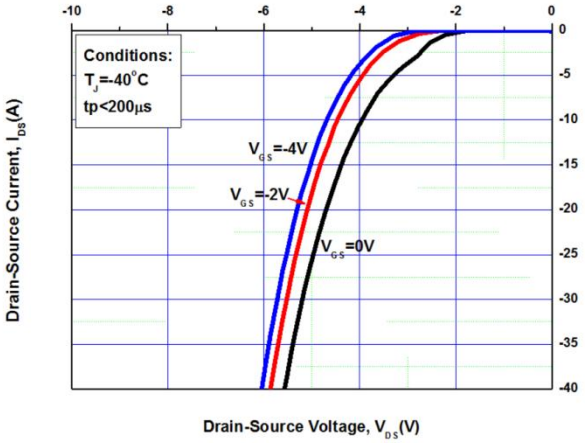



Figure 8. Body Diode Characteristic at -40°C

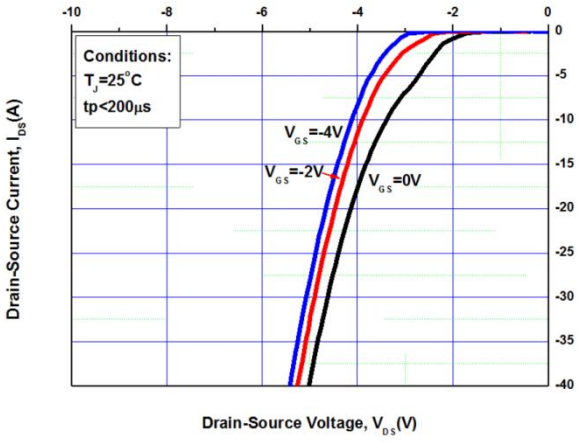



Figure 9. Body Diode Characteristic at 25°C

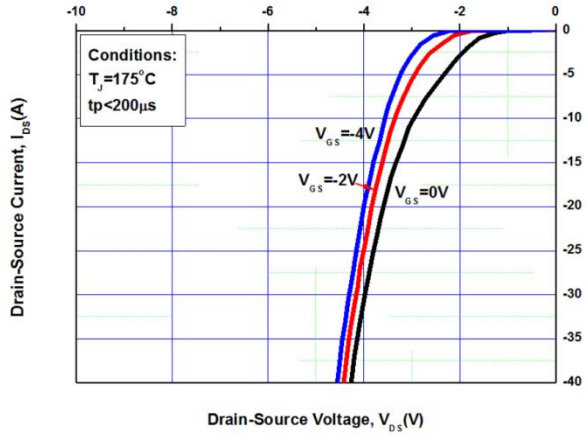



Figure 10. Body Diode Characteristic at 150°C

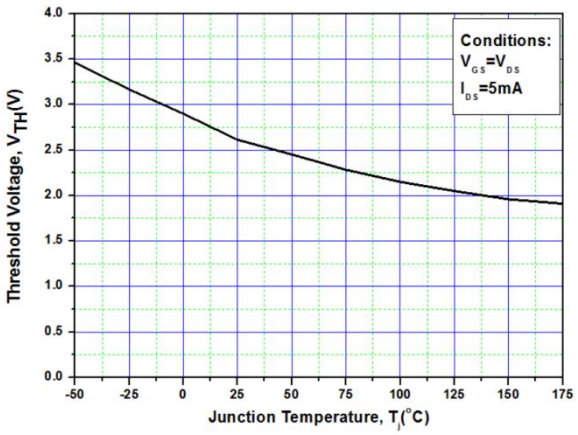



Figure 11. Threshold Voltage vs. Temperature

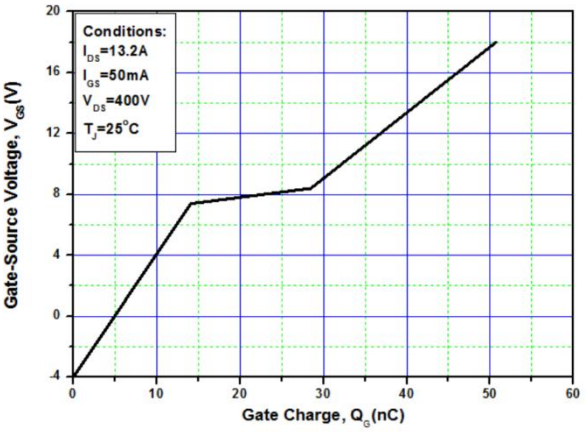



Figure 12. Gate Charge Characteristics

## Typical Characteristics

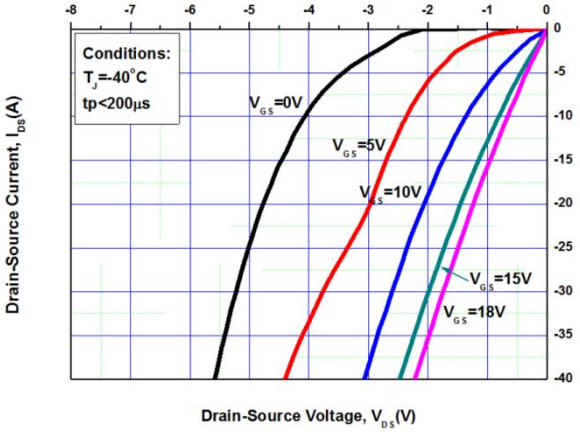



Figure 13. 3rd Quadrant Characteristic at -40˚C

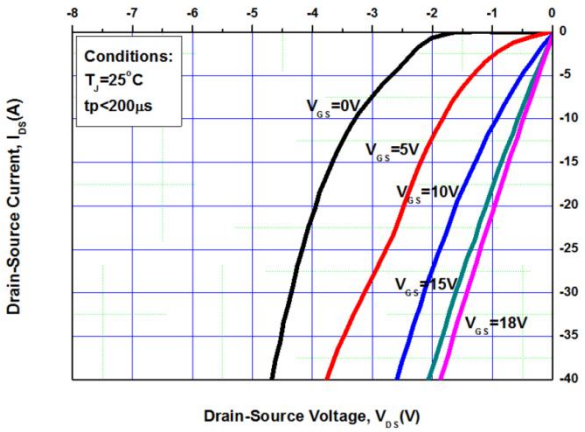



Figure 14. 3rd Quadrant Characteristic at 25˚C

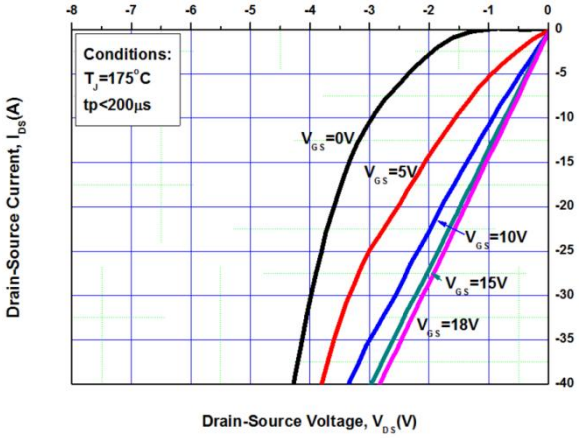



Figure 15. 3rd Quadrant Characteristic at 175˚C

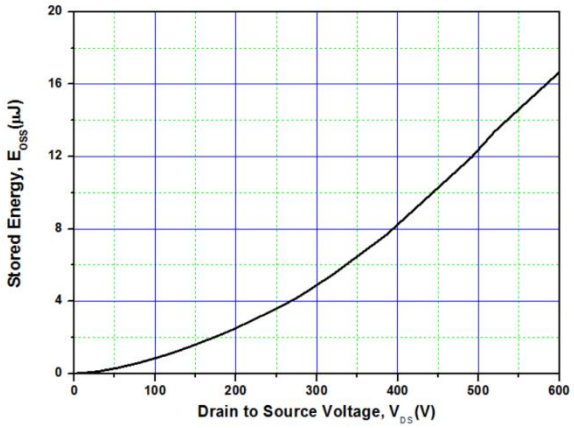



Figure16. Output Capacitor Stored Energy

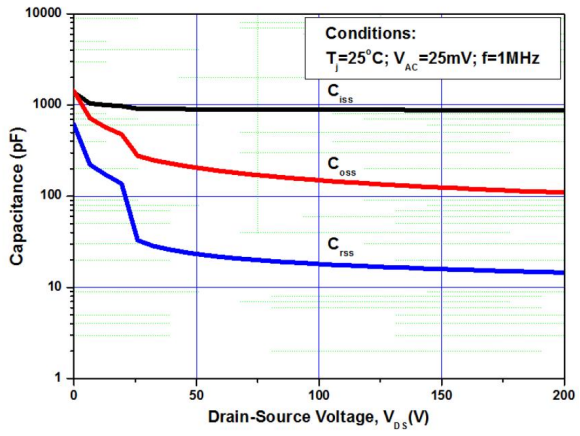



Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

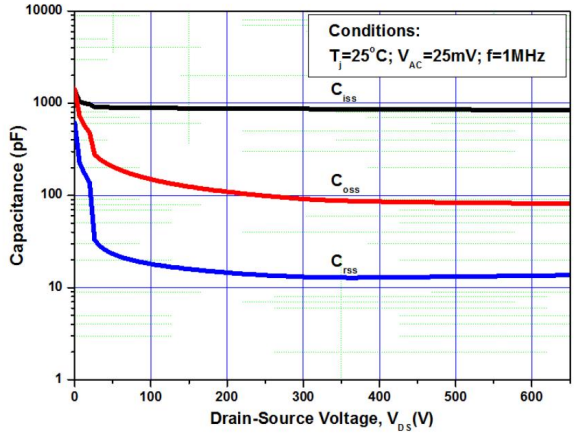



Figure 18. Capacitances vs. Drain-Source Voltage (0 - 650V)

## Typical Characteristics

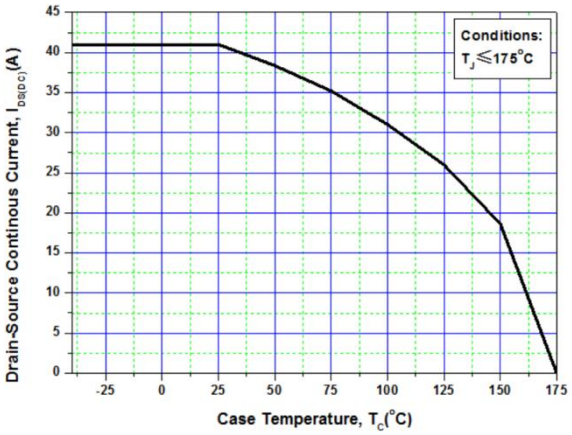



Figure 19. Continuous Drain Current Derating vs. Case Temperature

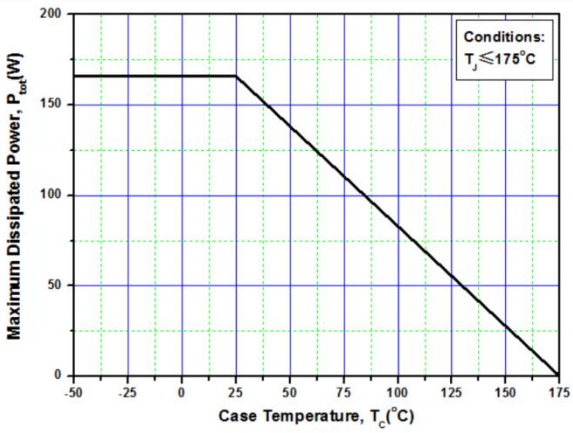



Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

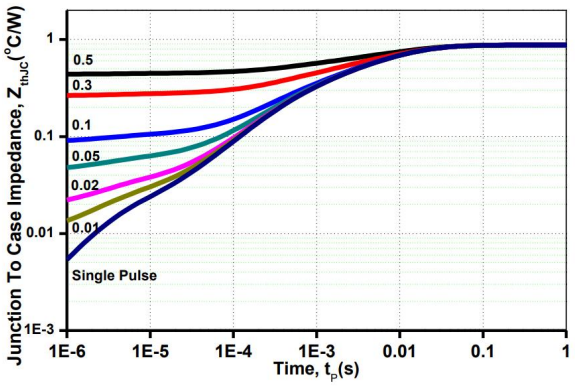



Figure 21. Transient Thermal Impedance (Junction - Case)

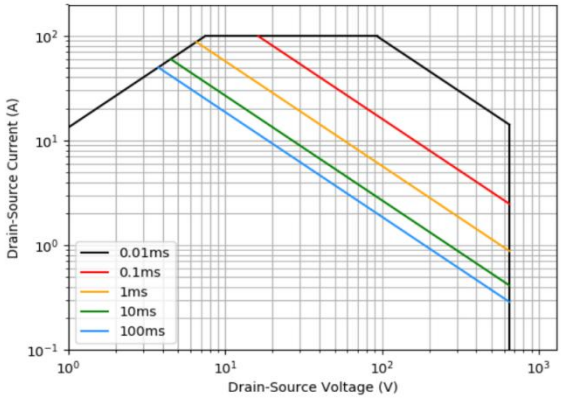
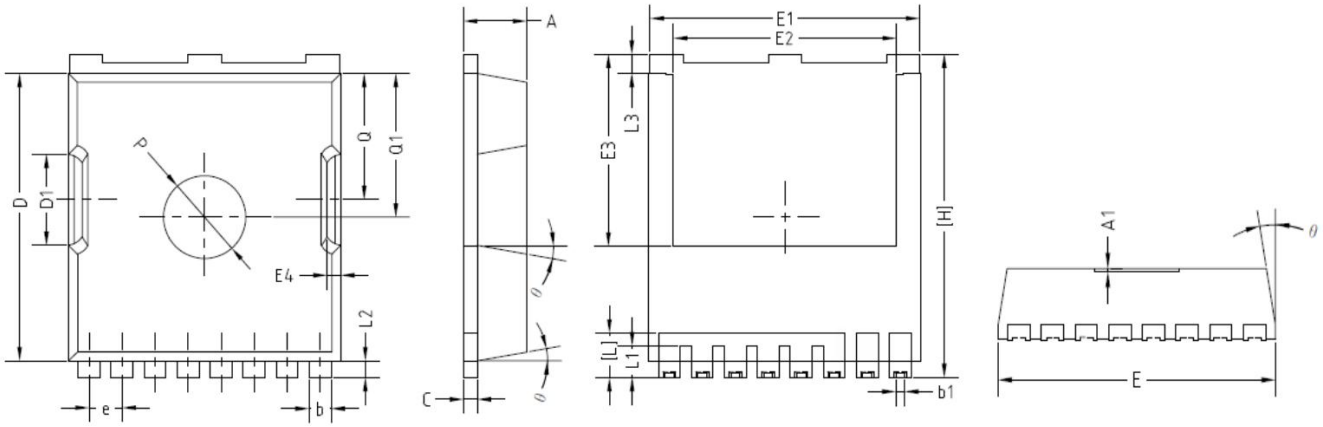



Figure22. Safe Operating Area

## TOLL Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.050 | 0.150 | 0.002 | 0.006 |
| b | 0.700 | 0.900 | 0.028 | 0.035 |
| b1 | 0.350 | 0.450 | 0.014 | 0.018 |
| C | 0.400 | 0.650 | 0.016 | 0.026 |
| D | 10.400 | 10.700 | 0.409 | 0.421 |
| D1 | 3.200 | 3.400 | 0.126 | 0.134 |
| E | 9.800 | 10.000 | 0.386 | 0.394 |
| E1 | 9.700 | 9.900 | 0.382 | 0.390 |
| E2 | 7.950 | 8.250 | 0.313 | 0.325 |
| E3 | 6.800 | 7.200 | 0.268 | 0.283 |
| E4 | 0.300 | 0.750 | 0.012 | 0.030 |
| e | 1.150 | 1.250 | 0.045 | 0.049 |
| L | 1.400 | 1.800 | 0.055 | 0.071 |
| L1 | 1.050 | 1.350 | 0.041 | 0.053 |
| L2 | 0.500 | 0.700 | 0.020 | 0.028 |
| L3 | 0.600 | 0.800 | 0.024 | 0.031 |
| θ | $8^0$ | $12^0$ | $8^0$ | $12^0$ |
| P | 2.900 | 3.100 | 0.114 | 0.122 |
| Q | 4.500 | 4.700 | 0.177 | 0.185 |
| Q1 | 5.100 | 5.300 | 0.201 | 0.209 |
| H | 11.550 | 11.900 | 0.455 | 0.469 |