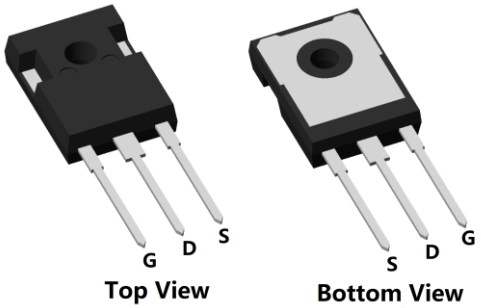
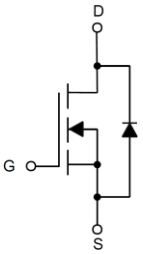
# N-Channel Enhancement Mode Field Effect Transistor




TO-247




## Product Summary

- $V_{DS}$ 600V
- $I_D$ 33.8A
- $R_{DS(ON)}$( at $V_{GS}$=10V) ＜99mΩ
- 100% EAS Tested
- 100% ▽$V_{DS}$ Tested
- ESD Level(HBM) H2

## General Description

- Super Junction High Voltage MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

## Applications

- Microinverter
- Charging pile

## ■ Limiting Values

| Parameter | Conditions | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-source Voltage | | | $V_{DS}$ | - | 600 | V |
| Gate-source Voltage | | | $V_{GS}$ | -20 | 20 | |
| Continuous Drain Current (Note 1,2) | Steady-State | $T_A$=25℃,$V_{GS}$=10V | $I_D$ | - | 3.3 | A |
| | | $T_A$=100℃,$V_{GS}$=10V | | - | 2.1 | |
| Continuous Drain Current (Note 1,3) | Steady-State | $T_C$=25℃,$V_{GS}$=10V | | - | 33.8 | |
| | | $T_C$ =100℃,$V_{GS}$=10V | | - | 21.3 | |
| Pulsed Drain Current | $T_C$=25℃,$t_p$≤10μs | | $I_{DM}$ | - | 135.2 | |
| Maximum Body-Diode Continuous Current | $T_C$=25℃ | | $I_S$ | | 33.8 | |
| Maximum Body-Diode Pulsed Current | $T_C$=25℃,$t_p$≤10μs | | $I_{SM}$ | - | 135.2 | |
| Avalanche Energy (non-repetitive ) | $T_J$=25℃,$V_G$=10V,$R_G$=25Ω,L=30mH,$I_{AS}$=7.05A | | EAS | - | 745.5 | mJ |
| Total Power Dissipation (Note 1,2) | Steady-State | $T_A$=25℃ | $P_D$ | - | 2.84 | W |
| | | $T_A$=100℃ | | - | 1.13 | |
| Total Power Dissipation (Note 1,3) | Steady-State | $T_C$=25℃ | | - | 290.6 | |
| | | $T_C$ =100℃ | | - | 116.2 | |
| MOSFET dv/dt Ruggedness | $V_{DS}$=0…325V,ID=13A,Rg=0Ω | | dv/dt | - | 50 | V/ns |
| Reverse Diode dv/dt | $V_{DS}$=0…325V,ID=13A,di/dt=100A/us | | dv/dt | - | 50 | |
| Junction and Storage Temperature Range | | | $T_J$ ,$T_{STG}$ | -55 | 150 | ℃ |

## ■Thermal Resistance

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Thermal Resistance Junction-to-Ambient (Note 2) | Steady-State | $R_{\theta JA}$ | - | 44 | ℃/W |
| Thermal Resistance Junction-to-Case | Steady-State | $R_{\theta JC}$ | - | 0.43 | |

## ■ Electrical Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Static Parameter** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=250μA,Tj=25℃ | 600 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=600V,$V_{GS}$=0V,Tj=25℃ | - | - | 1 | μA |
| | | $V_{DS}$=600V,$V_{GS}$=0V,Tj=125℃ | - | - | 100 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V,Tj=25℃ | - | - | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA,Tj=25℃ | 2.4 | 3.4 | 4.4 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V,$I_D$=15A,Tj=25℃ | - | 75 | 99 | mΩ |
| | | $V_{GS}$=10V,$I_D$=15A,Tj=150℃ | - | 193 | 254 | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=15A,$V_{GS}$=0V,Tj=25℃ | - | 0.83 | 1.2 | V |
| Gate Resistance | $R_G$ | f=1MHz,Tj=25℃ | - | 2 | - | Ω |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=325V,$V_{GS}$=0V,f=100kHz,Tj=25℃ | - | 2496 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 61 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 1.7 | - | |
| Effective Output capacitance, Energy Related | $C_{o(er)}$ | $V_{DS}$=0…325V,$V_{GS}$=0V,f=100kHz, Tj=25℃ | - | 106 | - | |
| Effective Output Capacitance, Time Related | $C_{o(tr)}$ | | - | 657 | - | |
| **Switching Parameters** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=10V,$V_{DS}$=400V,$I_D$=9.7A,Tj=25℃ | - | 47.3 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 11.3 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 14.6 | - | |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$=9.7A,di/dt=100A/μs,$V_{GS}$=0V, $V_R$=400V,Tj=25℃ | - | 3267 | - | nC |
| Reverse Recovery Time | $t_{rr}$ | | - | 231 | - | ns |
| Peak Reverse Recovery Current | $I_{rrm}$ | | - | 27.7 | - | A |
| Turn-on Delay Time | $t_{D(on)}$ | $V_{GS}$=13V,$V_{DS}$=400V,$I_D$=9.7A, $R_{GEN}$=5.1Ω,Tj=25℃ | - | 26.9 | - | ns |
| Turn-on Rise Time | $t_r$ | | - | 13.1 | - | |
| Turn-off Delay Time | $t_{D(off)}$ | | - | 61.4 | - | |
| Turn-off Fall Time | $t_f$ | | - | 17.6 | - | |

Note：

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. The value of $R_{\theta JA}$ is measured in the still air environment with $T_A$ =25℃.The maximum allowed junction temperature of 150℃.
3. Thermal resistance from junction to soldering point (on the exposed drain pad).

## ■Typical Electrical and Thermal Characteristics Diagrams

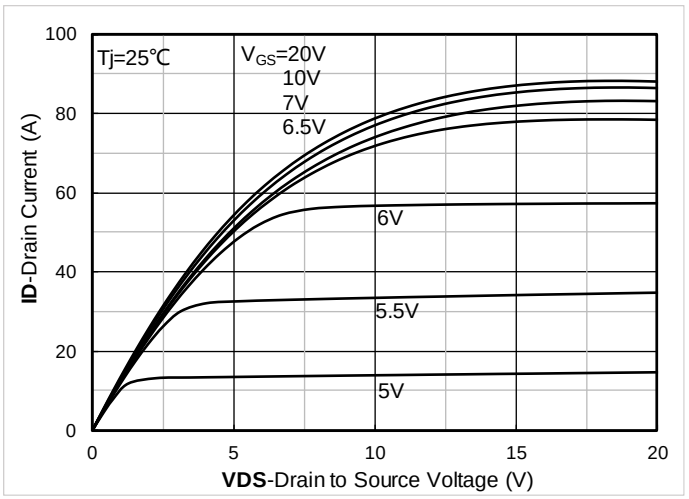



Figure 1. Output Characteristics; typical values

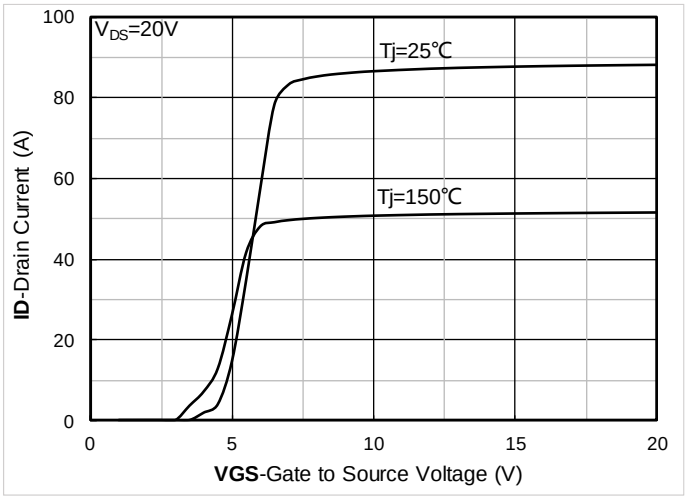



Figure 2. Transfer Characteristics; typical values

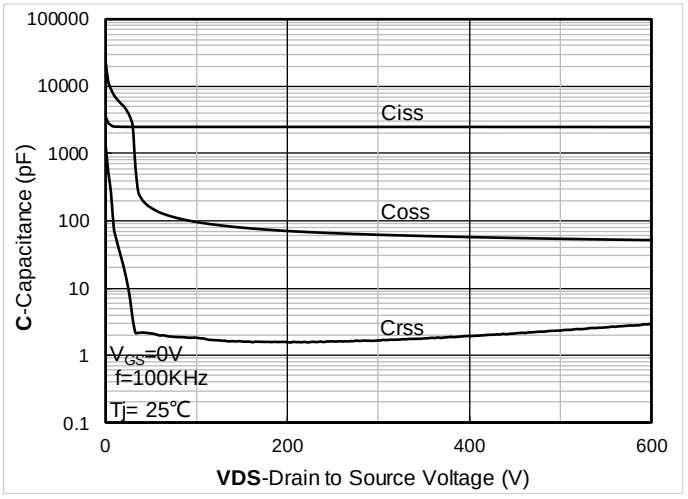



Figure 3. Capacitance Characteristics; typical values

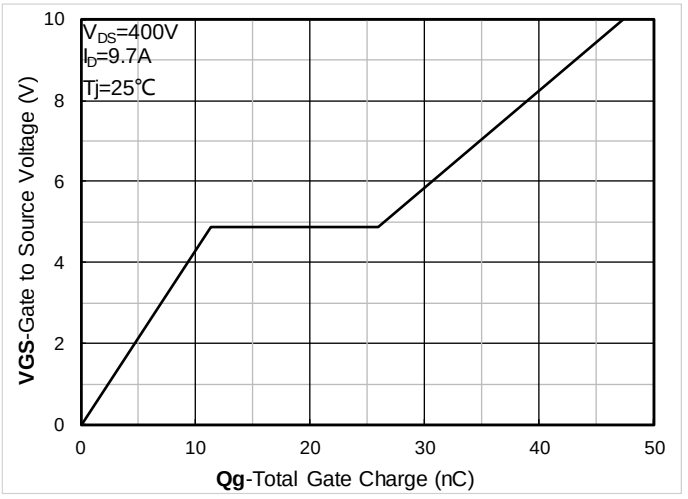



Figure 4. Gate Charge; typical values

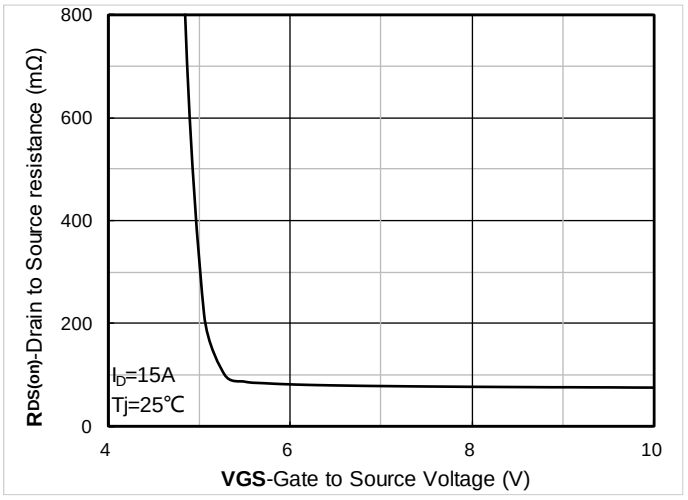



Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

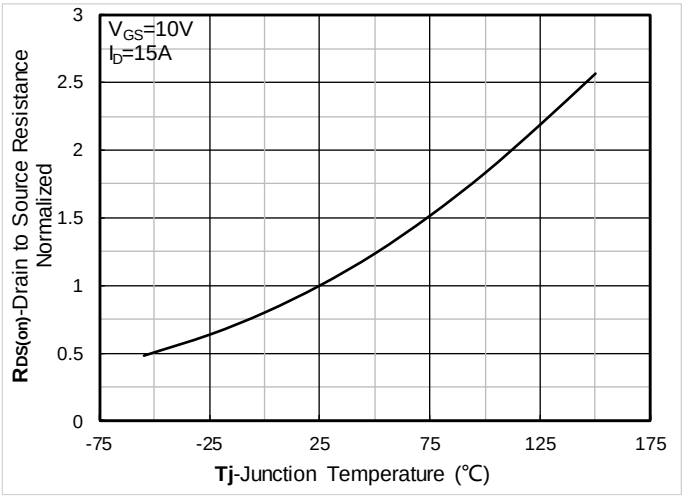



Figure 6. Normalized On-Resistance

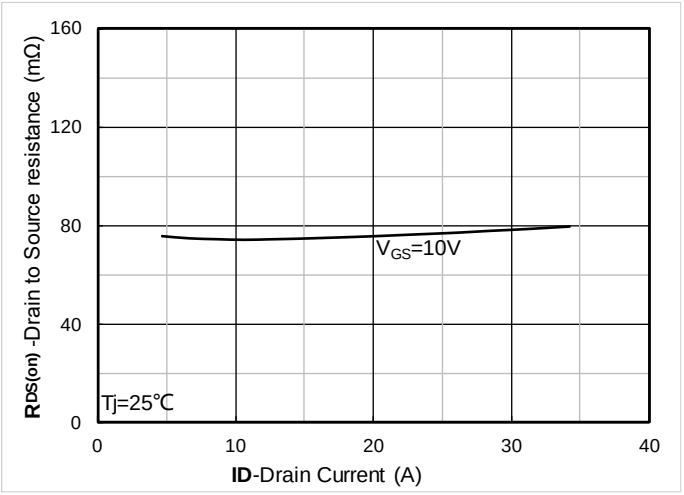



Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

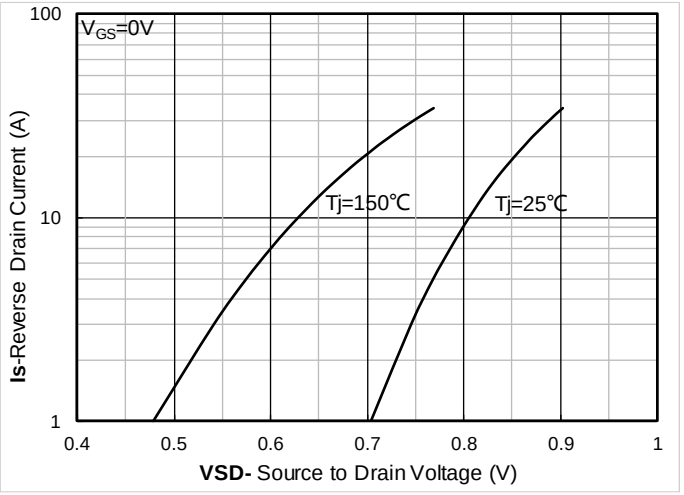



Figure 8. Forward characteristics of reverse diode; typical values

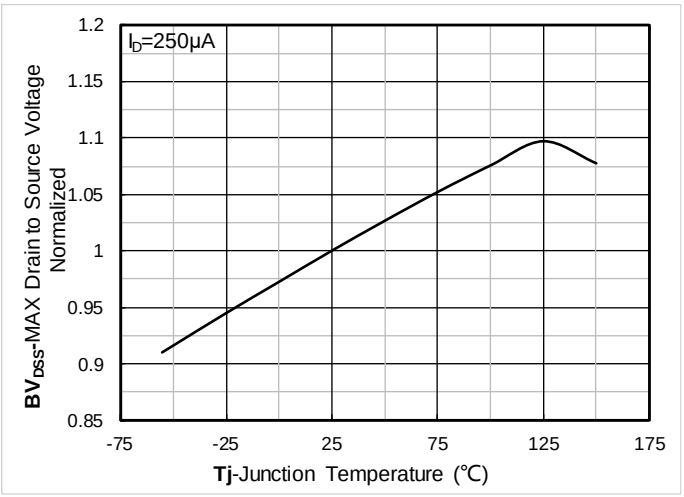



Figure 9. Normalized breakdown voltage

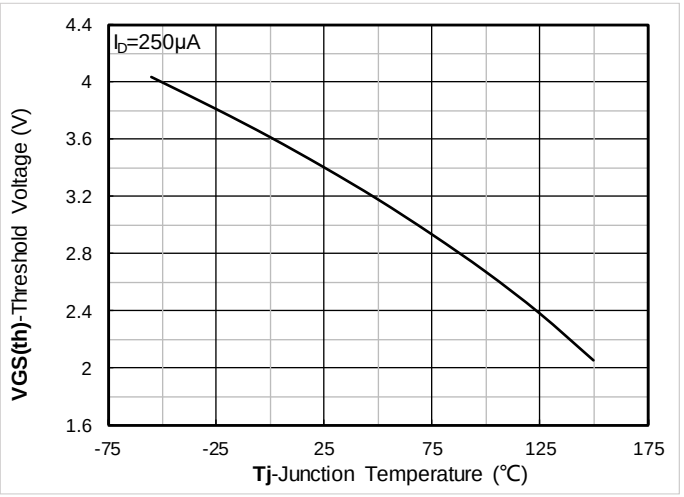



Figure 10. Gate Threshold voltage; typical values

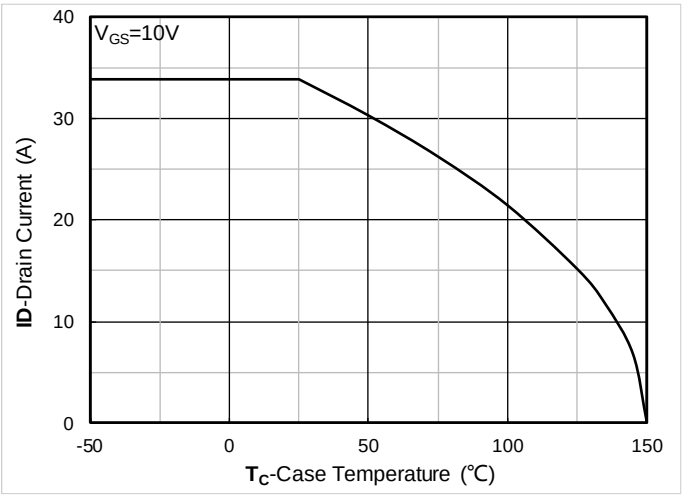



Figure 11. Current dissipation

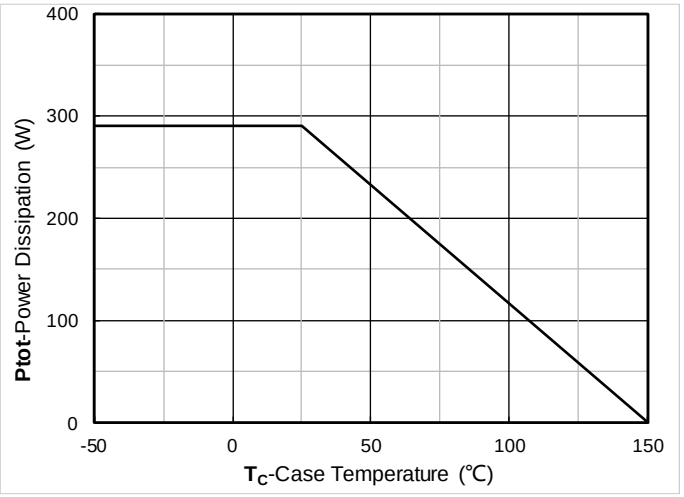



Figure 12. Power dissipation

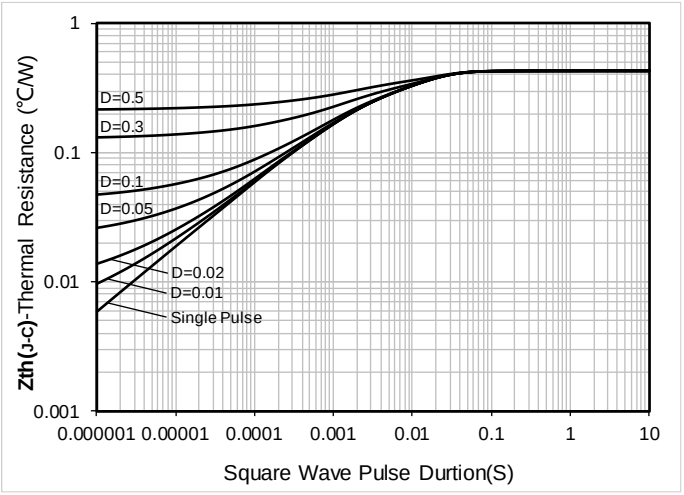



Figure 13. Maximum Transient Thermal Impedance

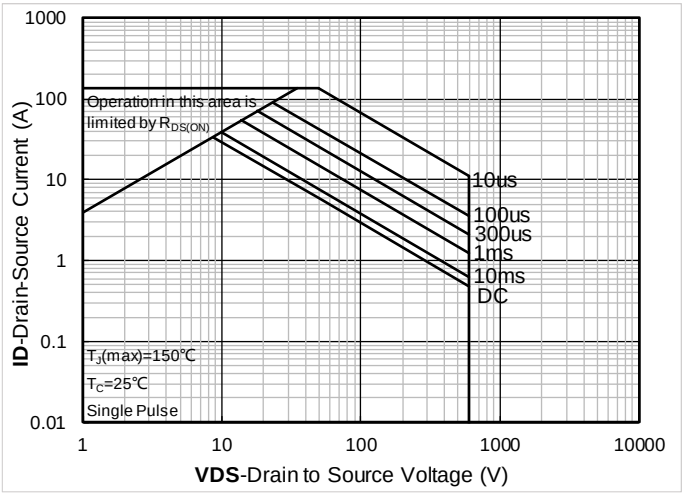
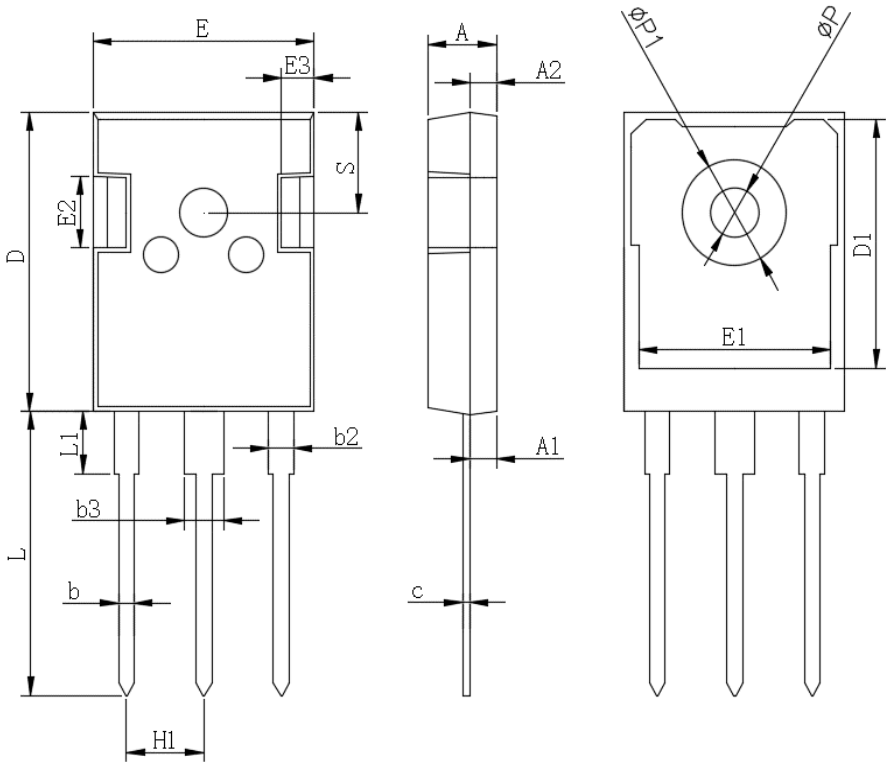



Figure 14. Safe Operation Area

## ■ TO-247AB Package information

**TO-247AB**




| TO-247AB | | |
|---|---|---|
| Dim | Min | Max |
| A | 4.80 | 5.20 |
| A1 | 2.21 | 2.61 |
| A2 | 1.85 | 2.15 |
| b | 1.0 | 1.4 |
| b2 | 1.91 | 2.21 |
| c | 0.5 | 0.7 |
| D | 20.70 | 21.30 |
| D1 | 16.25 | 16.85 |
| E | 15.50 | 16.10 |
| E1 | 13.0 | 13.6 |
| E2 | 4.80 | 5.20 |
| E3 | 2.30 | 2.70 |
| L | 19.62 | 20.22 |
| L1 | - | 4.30 |
| ΦP | 3.40 | 3.80 |
| ΦP1 | - | 7.30 |
| S | 6.15TYP | |
| H1 | 5.44TYP | |
| b3 | 2.80 | 3.20 |

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