

Product Summary

| | | |
|---------------|-------------------|-------------------|
| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D@25^{\circ}C$ |
| 650V | 100m $\Omega@18V$ | 21A |

Feature

- Optimized RDS(on) with Rapid Switching Behavior
- Low Profile & Low Parasitic Inductance Packaging
- Compatible with Standard Gate Drivers
- Optimized for High Power Density Applications

Application

- Switching Mode Power Supply
- PFC & DC/DC Converter
- Charging Station
- Motor Driver
- Renewable Energy
- Power Inverter

Package

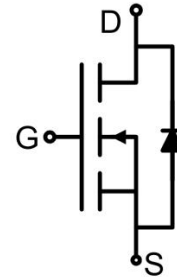


TO-247-3

Marking



Circuit diagram



Absolute maximum ratings ($T_J=25^{\circ}C$ unless otherwise noted)

| Parameter | Symbol | Test Condition | Value | Unit |
|--------------------------|-----------------|--|------------|---------------|
| Drain-Source Voltage | V_{DSS} | $V_{GS} = 0V, I_D = 100\mu A$ | 650 | V |
| Gate-Source Voltage | $V_{GS,OP}$ | Recommended operational values | -8/+18 | V |
| Gate-Source Voltage | $V_{GS,tran}$ | Transient operating limit (AC $f > 1Hz$, pulse width $< 100ns$) | -10/+22 | V |
| Continuous Drain Current | I_D | $V_{GS} = 18V, T_C = 25^{\circ}C$ | 21 | A |
| | I_D | $V_{GS} = 18V, T_C = 100^{\circ}C$ | 15.6 | A |
| Pulse Drain Current | $I_{D,pulse}$ | | 67 | A |
| Power Dissipation | P_D | $T_C = 25^{\circ}C$ | 88 | W |
| Thermal Resistance(Typ) | $R_{\theta JC}$ | Junction-to-Case | 1.7 | $^{\circ}C/W$ |
| Junction Temperature | T_J | | -55 ~ +175 | $^{\circ}C$ |
| Storage Temperature | T_{STG} | | -55 ~ +175 | $^{\circ}C$ |

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 | 650 | | | V |
| Zero gate voltage drain current | I _{DSS} | V _{DS} = 650V, V _{GS} = 0V | | 1 | | μA |
| Gate-Source leakage current | I _{GSS} | V _{GS} = 18V, V _{DS} = 0V | | | 100 | nA |
| Gate threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 14mA | | 2.2 | | V |
| Drain-source on-resistance | R _{DS(on)} | V _{GS} = 18V, I _D = 10A | | 100 | | mΩ |
| | | V _{GS} = 18V, I _D = 10A, T _J = 100°C | | 115 | | |
| Dynamic characteristics | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} = 400V, V _{GS} = 0V, f = 250kHz V _{AC} = 25mV | | 1000 | | pF |
| Output Capacitance | C _{oss} | | | 74 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 9 | | |
| Total Gate Charge | Q _g | V _{DS} = 400V, V _{GS} = 0V/15V, I _D = 5A | | 43 | | nC |
| Gate-Source Charge | Q _{gs} | | | 6.4 | | |
| Gate-Drain Charge | Q _{gd} | | | 8.5 | | |
| Turn-on delay time | t _{d(on)} | V _{DS} = 400V, V _{GS} = -3V/+15V, I _D = 13.5A, R _{G(ext)} = 2.7Ω, External SiC Diode as an FWD | | 24 | | nS |
| Turn-on rise time | t _r | | | 33 | | |
| Turn-off delay time | t _{d(off)} | | | 23 | | |
| Turn-off fall time | t _f | | | 11 | | μJ |
| Turn-on Switching Energy | E _{on} | | | 107 | | |
| Turn-off Switching Energy | E _{off} | | | 26 | | |
| Internal Gate Resistance | R _{G(int)} | f = 1MHz V _{AC} = 25mV | | 6 | | Ω |
| Source-Drain Diode characteristics | | | | | | |
| Diode Forward Current | I _S | V _{GS} = 0V, T _C = 25°C | | | 16 | A |
| Diode Forward voltage | V _{SD} | V _{GS} = 0V, I _S = 5A | | 2.95 | | V |
| | | V _{GS} = 0V, I _S = 5A, T _J = 175°C | | 2.65 | | |
| Reverse Recovery Time | t _{rr} | V _{GS} = 0V, I _S = 5A, V _{DS} = 400V, di/dt = 300A/μs Q _{rr} herein excluded the Q _{oss} value | | 43 | | nS |
| Reverse Recovery Charge | Q _{rr} | | | 47 | | nC |
| Peak Reverse Recovery Current | I _{rrm} | | | 1.95 | | A |

Typical Characteristics

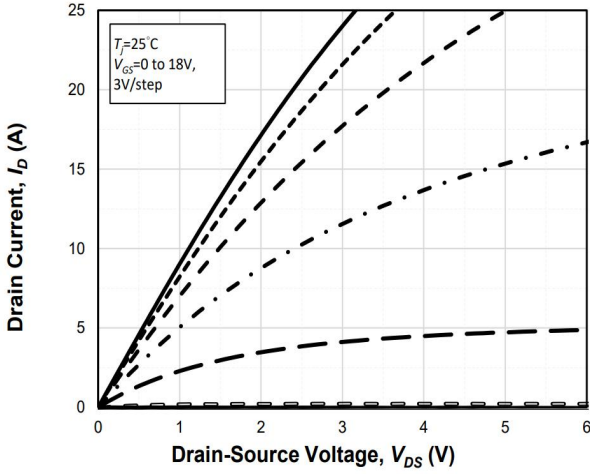


Fig. 1 Typical Output Characteristics at $T_j=25^\circ\text{C}$

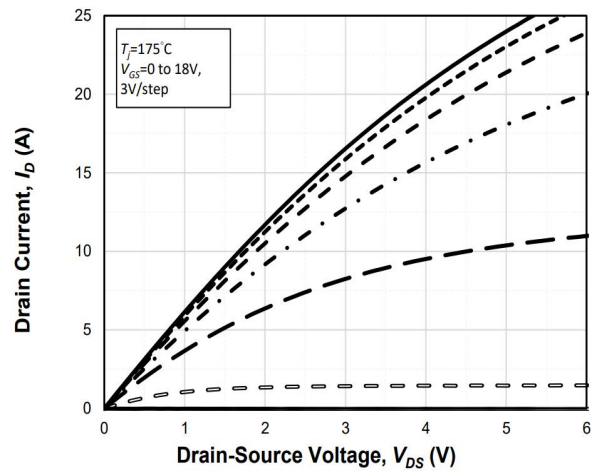


Fig. 2 Typical Output Characteristics at $T_j=175^\circ\text{C}$

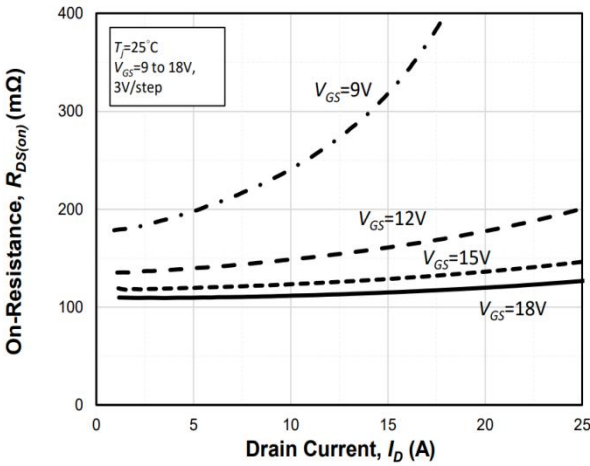


Fig. 3 Typ. $R_{DS(on)}$ vs. I_D with Various V_{GS}

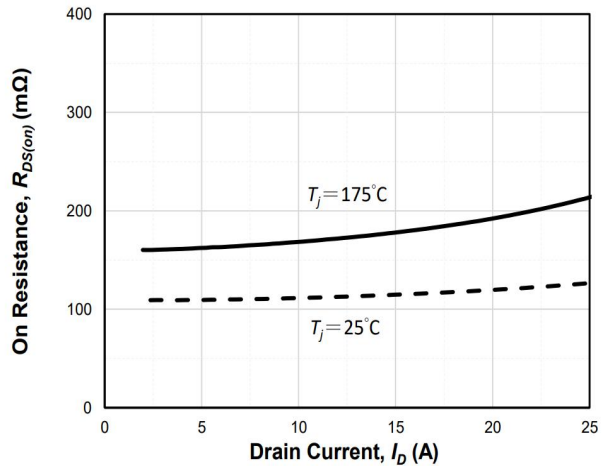


Fig. 4 Typ. $R_{DS(on)}$ vs. I_D with Various T_j , $V_{GS}=18\text{V}$

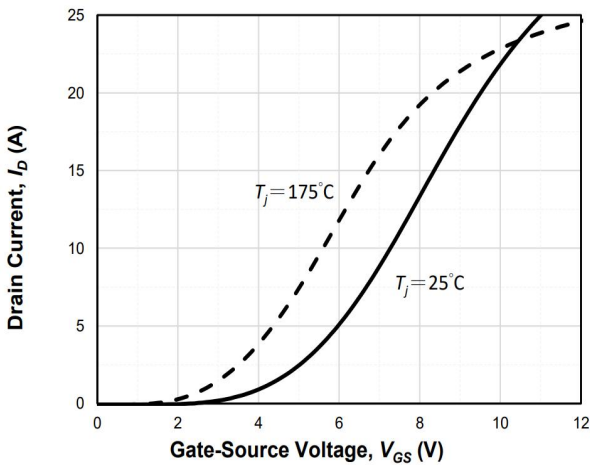


Fig. 5 Typ. I_D vs. V_{GS} with Various T_j , $V_{DS}=10\text{V}$

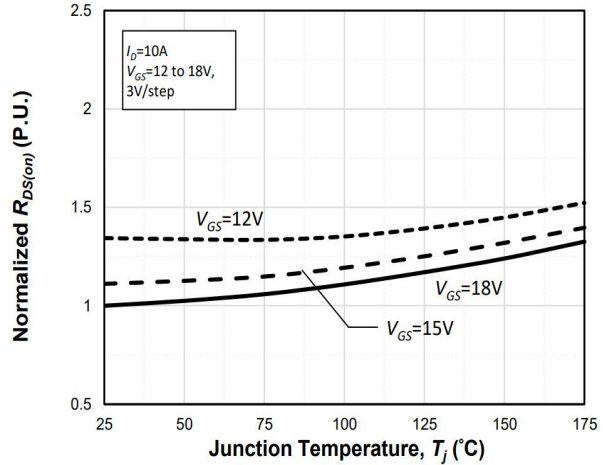


Fig. 6 Normalized $R_{DS(on)}$ vs. T_j with Various V_{GS}

Typical Characteristics

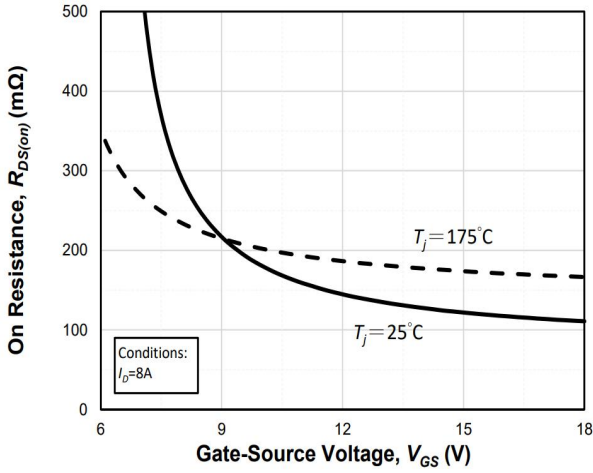


Fig. 7 Typ. $R_{DS(on)}$ vs. V_{GS} with Various T_j

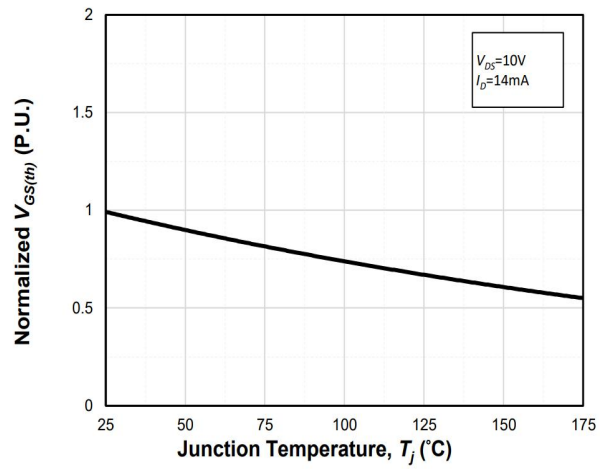


Fig. 8 Normalized V_{th} vs. T_j

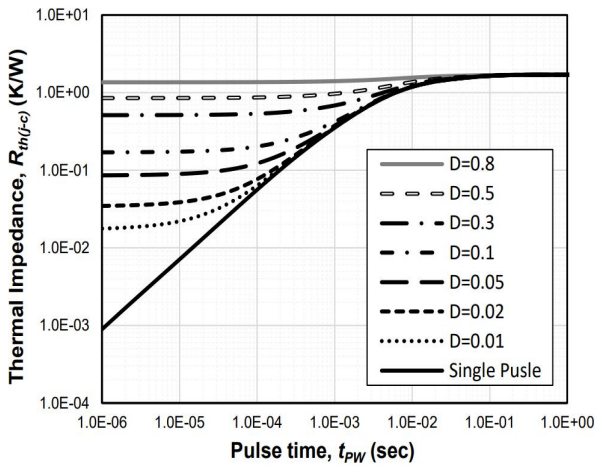


Fig. 9 Typ. Transient Thermal Impedance R_{th-jc}

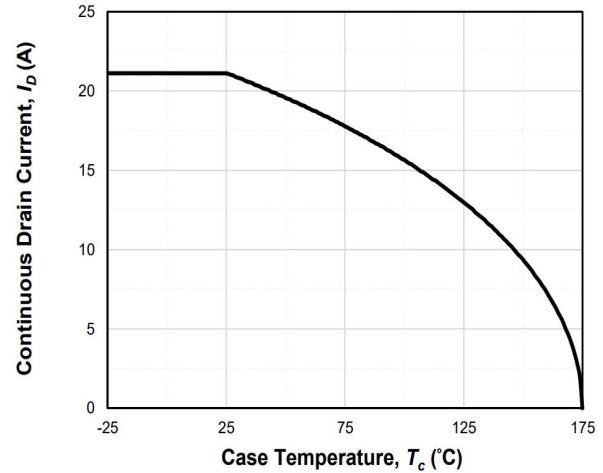


Fig. 10 Continuous I_D De-rating at $V_{GS}=18V$, $T_j \leq 175^\circ C$

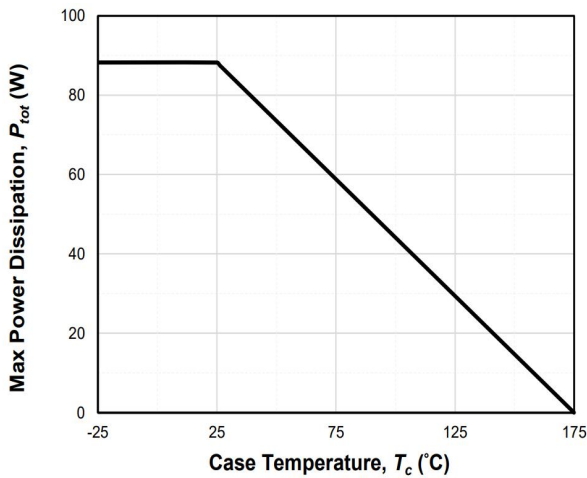


Fig. 11 Power Dissipation at $V_{GS}=18V$, $T_j \leq 175^\circ C$

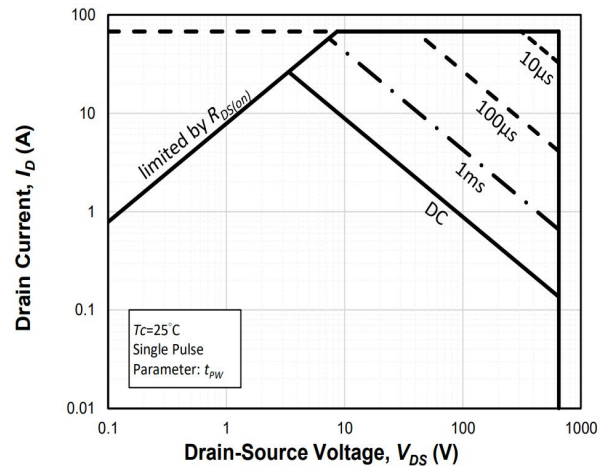


Fig. 12 Safe Operating Area at $T_c=25^\circ C$

Typical Characteristics

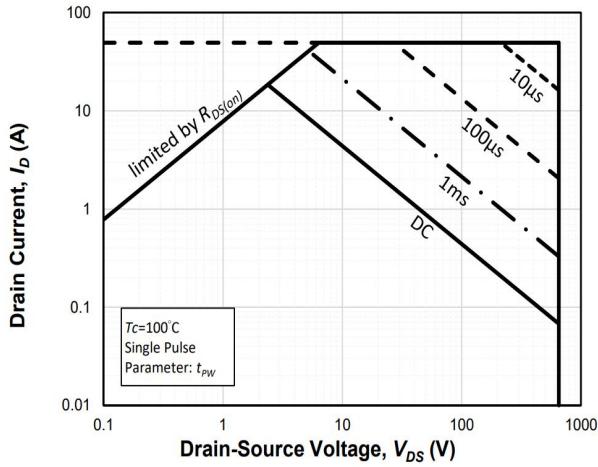


Fig. 13 Safe Operating Area at $T_c=100^\circ\text{C}$

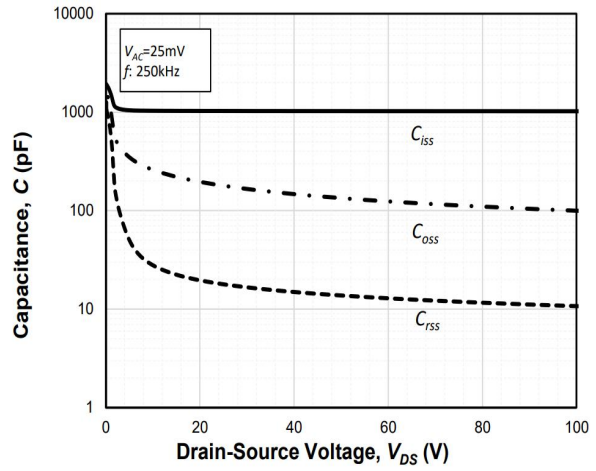


Fig. 14 Typ. Capacitance vs. V_{DS} at $f_{sw}=250\text{kHz}$, $V_{DS}\leq 100\text{V}$

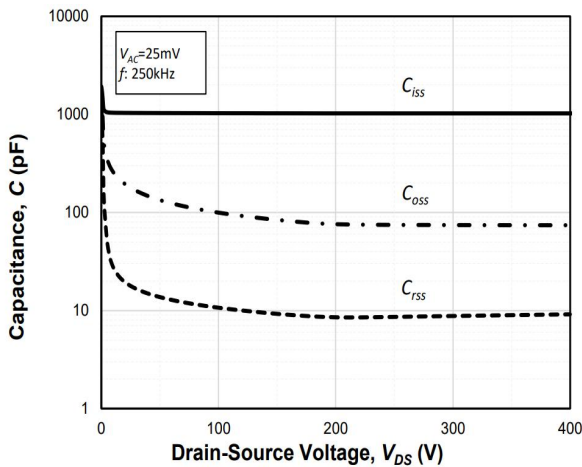


Fig. 15 Typ. Capacitance vs. V_{DS} at $f_{sw}=250\text{kHz}$, $V_{DS}\leq 400\text{V}$

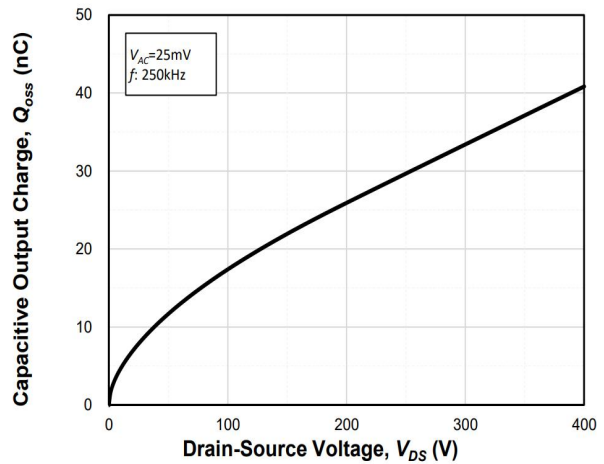


Fig. 16 Typ. Capacitive Output Charge at $f_{sw}=250\text{kHz}$

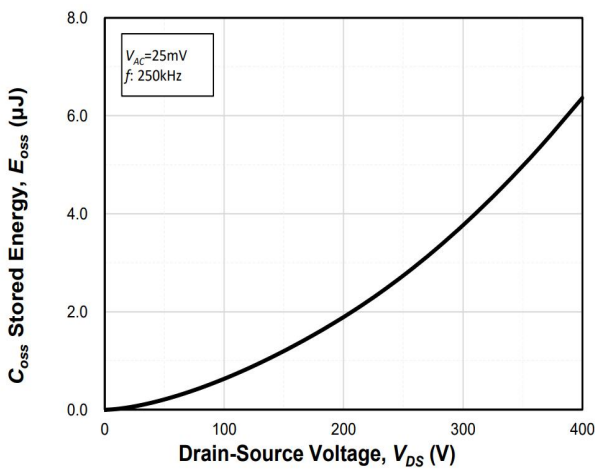


Fig. 17 Typ. C_{oss} Stored Energy at $f_{sw}=250\text{kHz}$

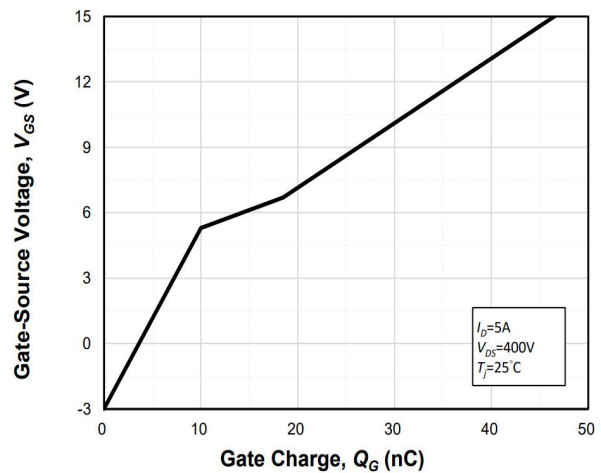


Fig. 18 Typ. Gate Charge at $V_{DS}=400\text{V}$, $I_D=5\text{A}$

Typical Characteristics

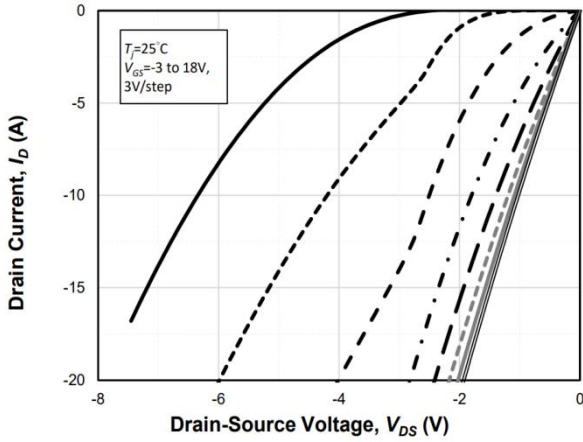


Fig. 19 Typical Forward Characteristics of Reverse Conduction at $T_j=25^\circ\text{C}$

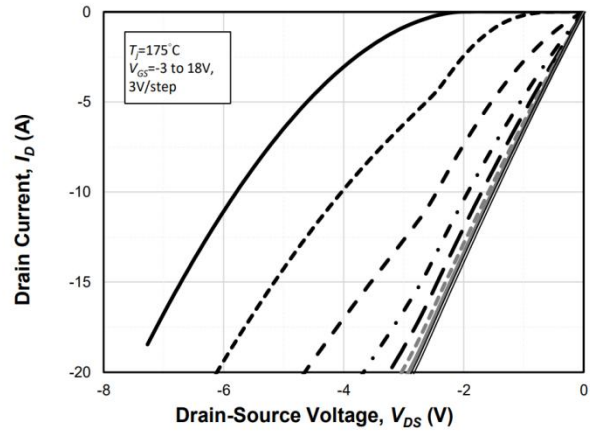


Fig. 20 Typical Forward Characteristics of Reverse Conduction at $T_j=175^\circ\text{C}$

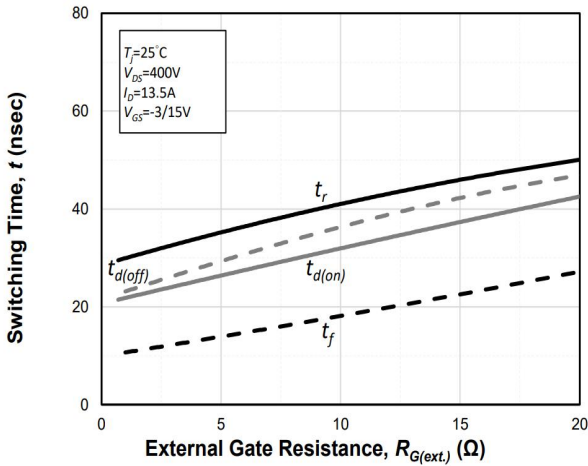


Fig. 21 Typ. Switching Time vs. $R_{G(ext.)}$

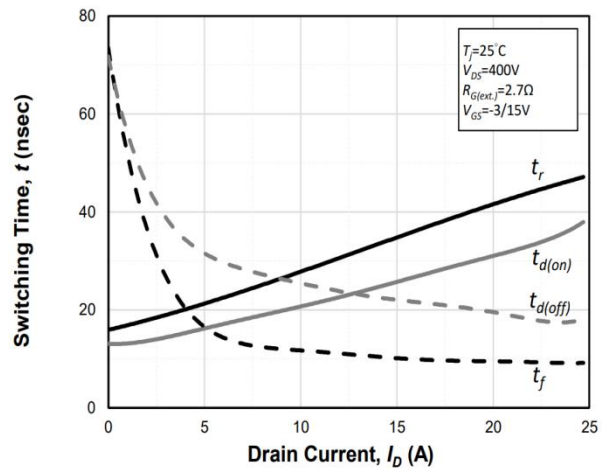


Fig. 22 Typ. Switching Time vs. I_D

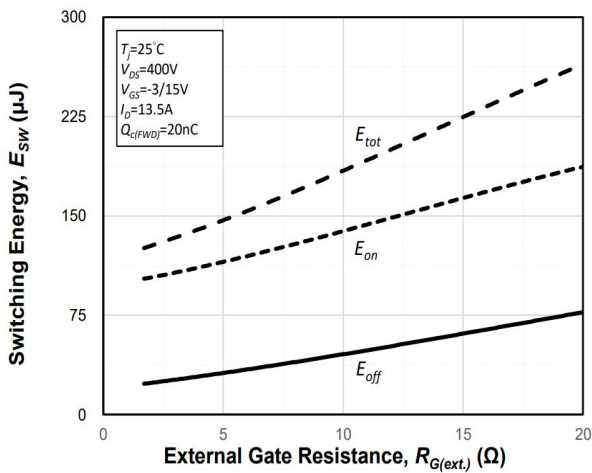


Fig. 23 Typ. Switching Energy vs. $R_{G(ext.)}$

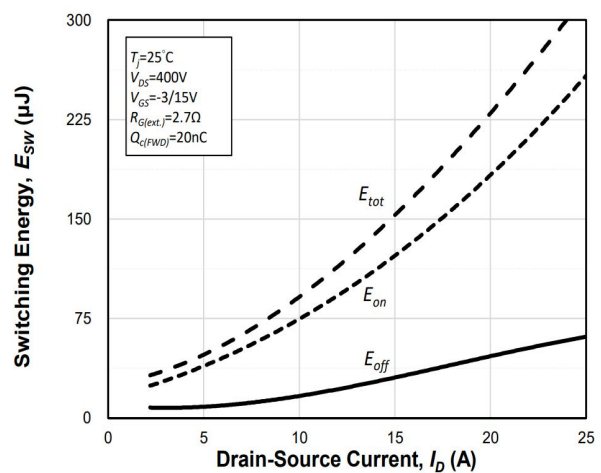
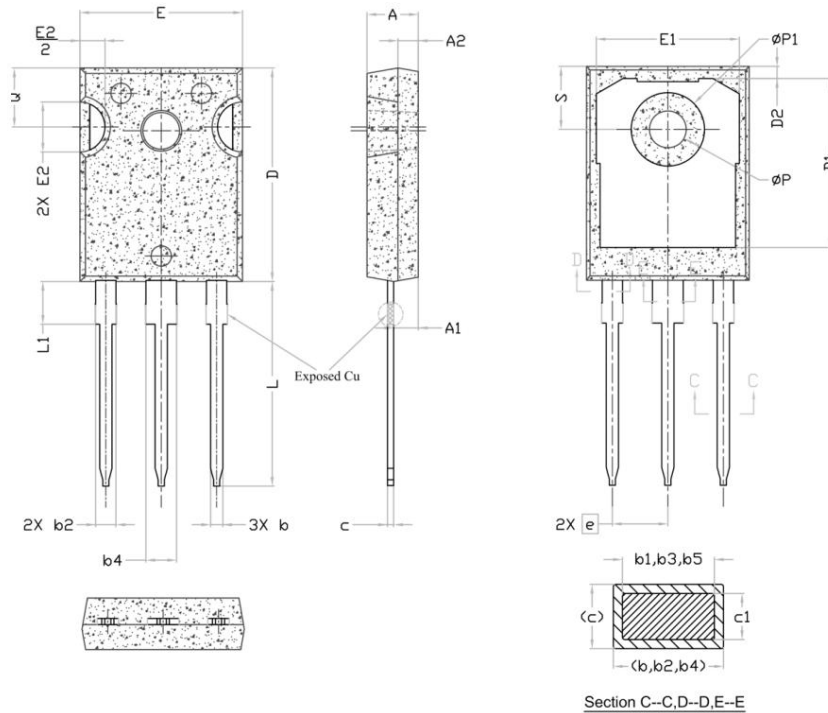


Fig. 24 Typ. Switching Energy vs. I_D

TO-247-3 Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.83 | 5.21 | 0.190 | 0.205 |
| A1 | 2.29 | 2.55 | 0.090 | 0.100 |
| A2 | 1.50 | 2.49 | 0.059 | 0.098 |
| b | 1.12 | 1.33 | 0.044 | 0.052 |
| b1 | 1.12 | 1.28 | 0.044 | 0.050 |
| b2 | 1.91 | 2.39 | 0.075 | 0.094 |
| b3 | 1.91 | 2.34 | 0.075 | 0.092 |
| b4 | 2.87 | 3.22 | 0.113 | 0.127 |
| b5 | 2.87 | 3.18 | 0.113 | 0.125 |
| c | 0.55 | 0.69 | 0.022 | 0.027 |
| c1 | 0.55 | 0.65 | 0.022 | 0.026 |
| D | 20.80 | 21.10 | 0.819 | 0.831 |
| D1 | 16.25 | 17.65 | 0.640 | 0.695 |
| D2 | 0.51 | 1.35 | 0.020 | 0.053 |
| E | 15.75 | 16.13 | 0.620 | 0.635 |
| E1 | 13.46 | 14.16 | 0.530 | 0.557 |
| E2 | 4.32 | 5.49 | 0.170 | 0.216 |
| e | 5.44 BSC | | 0.214 BSC | |
| L | 19.81 | 20.32 | 0.780 | 0.800 |
| L1 | 4.10 | 4.40 | 0.161 | 0.173 |
| ΦP | 3.56 | 3.65 | 0.140 | 0.144 |
| ΦP1 | 7.19 REF | | 0.283 REF | |
| Q | 5.39 | 6.20 | 0.212 | 0.244 |
| S | 6.04 | 6.30 | 0.238 | 0.248 |