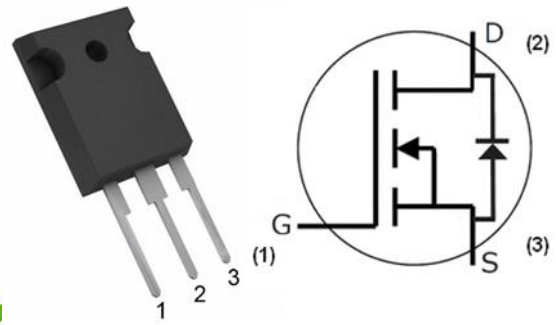


Product Summary

$V_{DS} = 1200\text{ V}$
 $I_D@25^\circ\text{C} = 40\text{ A}$
 $R_{DS(ON)} = 73\text{ m}\Omega$



TO-247-3

Features

- High Blocking Voltage
- High Frequency Operation
- Low on-resistance
- Fast intrinsic diode with low reverse recovery

Benefits

- Higher System Efficiency
- Parallel Device Convenience without thermal runaway
- High Temperature Application
- Hard Switching & Higher Reliability
- Easy to drive

Applications

- Motor Drives
- Solar / Wind Inverters
- EV Charging Station
- AC/DC converters
- DC/DC converters
- Uninterruptable power supplies

Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test conditions | Value | Unit |
|---------------------------------|----------------|--|------------|------------------|
| Drain - Source Voltage | V_{DSmax} | $V_{GS}=0\text{V}, I_D=100\mu\text{A}$ | 1200 | V |
| Gate - Source Voltage (dynamic) | V_{GSmax} | AC ($f>1\text{ Hz}$) | -10 / +25 | V |
| Gate - Source Voltage (static) | V_{GSop} | static | -5 / +20 | V |
| Continuous Drain Current | I_D | $V_{GS} = 20\text{V}, T_C=25^\circ\text{C}$ | 40 | A |
| | | $V_{GS} = 20\text{V}, T_C=100^\circ\text{C}$ | 28 | |
| Pulsed Drain Current | $I_{D(pulse)}$ | $T_C=25^\circ\text{C}$ | 85 | A |
| Short Circuit Capability | t_{SC} | $V_{DD}=800\text{V}, V_{GS}=20\text{V}$ | 3.5 | μS |
| Short Circuit Capability | I_{DS} | $V_{DD}=800\text{V}, V_{GS}=20\text{V}$ | 300 | A |
| Total power dissipation | P_D | $T_C=25^\circ\text{C}$ | 240 | W |
| Operating Junction Temperature | T_J | | -55 to 175 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | | -55 to 175 | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Electrical Characteristics (T_C=25°C unless otherwise specified)

| Parameter | Symbol | Test conditions | Min | Typ | Max | Unit |
|----------------------------------|----------------------|---|------|------|-----|------|
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0V, I _D = 100μA | 1200 | | | V |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 5mA | 1.8 | 2.6 | 3.7 | V |
| | | V _{DS} = V _{GS} , I _D = 5mA, T _J = 150°C | | 1.85 | | |
| | | V _{DS} = V _{GS} , I _D = 5mA, T _J = 175°C | | 1.75 | | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 1200V, V _{GS} = 0V | 0 | 5 | 100 | μA |
| Gate-Source Leakage Current | I _{GSS} | V _{GS} = 20V, V _{DS} = 0V | 0 | 10 | 200 | nA |
| Gate-Source Leakage Current | I _{GSS} | V _{GS} = -5V, V _{DS} = 0V | -200 | -10 | 0 | nA |
| Drain-Source On-State Resistance | R _{DS(on)} | V _{GS} = 20V, I _D = 20 A | | 73 | 98 | mΩ |
| | | V _{GS} = 20V, I _D = 20 A, T _J = 150°C | | 110 | | |
| | | V _{GS} = 20V, I _D = 20 A, T _J = 175°C | | 124 | | |
| Transconductance | g _{fs} | V _{DS} = 20V, I _D = 20 A, | | 9.8 | | S |
| | | V _{DS} = 20V, I _D = 20 A, T _J = 150°C | | 9.6 | | |
| | | V _{DS} = 20V, I _D = 20 A, T _J = 175°C | | 8.9 | | |
| Input capacitance | C _{iss} | V _{DS} = 1000V, V _{GS} = 0V f = 1MHz | | 1410 | | pF |
| Output capacitance | C _{oss} | | | 72 | | |
| Reverse transfer capacitance | C _{rss} | | | 7.7 | | |
| C _{oss} Stored Energy | E _{oss} | | | 46 | | μJ |
| Total gate charge | Q _g | V _{DS} = 800V, V _{GS} = -5V / 20V I _D = 20 A, | | 78 | | nC |
| Gate-source charge | Q _{gs} | | | 20 | | |
| Gate-drain charge | Q _{gd} | | | 42 | | |
| Internal gate input resistance | R _{g(int)} | f = 1MHz, I _D = 0A | | 2.2 | | Ω |
| Turn-On Switching Energy | E _{ON} | V _{DS} = 800 V, V _{GS} = -5V/20V, I _D = 20A, R _{G(ext)} = 1Ω, L=200μH | | 450 | | μJ |
| Turn-Off Switching Energy | E _{OFF} | | | 60 | | |
| Turn-On Delay Time | t _{d(on)} | | | 12 | | ns |
| Rise Time | t _r | | | 30 | | |
| Turn-Off Delay Time | t _{d(off)} | | | 41 | | |
| Fall Time | t _f | | | 11 | | |
| Avalanche Capability | E _{AS} | V _{DD} = 100V, V _{GS} =20V, L=2mH | | 225 | | mJ |
| Avalanche Capability | I _{AV} | V _{DD} = 100V, V _{GS} =20V, L=2mH | | 15 | | A |

Reverse Diode Characteristics (T_C=25°C unless otherwise specified)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------------------|------------------|--|-----|-----|-----|------|
| Diode Forward Voltage | V _{SD} | V _{GS} = -5V, I _{SD} = 10A, | | 4.0 | | V |
| | | V _{GS} = -5V, I _{SD} = 10A, T _J = 150°C | | 3.7 | | |
| | | V _{GS} = -5V, I _{SD} = 10A, T _J = 175°C | | 3.6 | | |
| Continuous Diode Forward Current | I _S | V _{GS} = -5V | | 43 | | A |
| Reverse Recovery time | t _{rr} | V _{GS} = -5V, I _{SD} = 20A, V _R = 800V, dif/dt = 3000 A/μs | | 18 | | ns |
| Reverse Recovery Charge | Q _{rr} | | | 220 | | nC |
| Peak Reverse Recovery Current | I _{rrm} | | | 21 | | A |

Thermal Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------------|----------------------|---------------|-----|------|------|------|
| Thermal Resistance (per device) | R _{th(j-c)} | junction-case | | 0.52 | 0.62 | °C/W |

Typical Performance

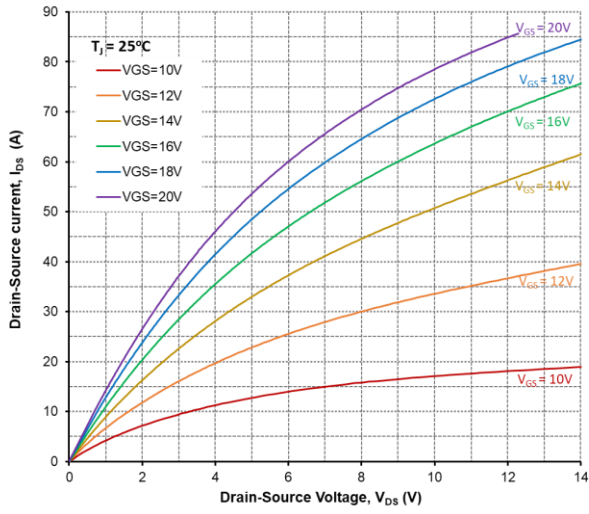


Figure 1. Output Characteristics, $T_J = 25^\circ\text{C}$

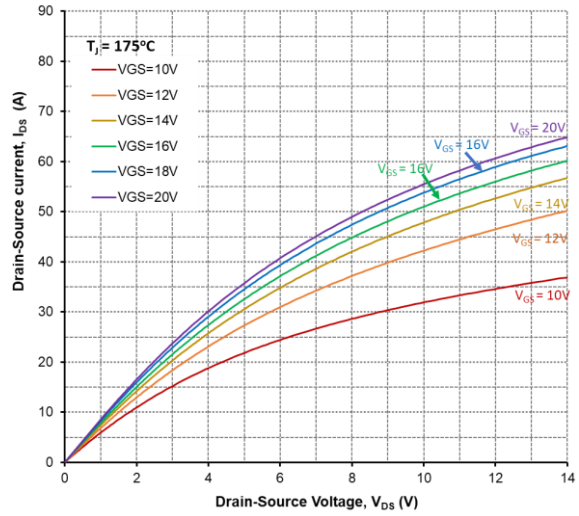


Figure 2. Output Characteristics, $T_J = 175^\circ\text{C}$

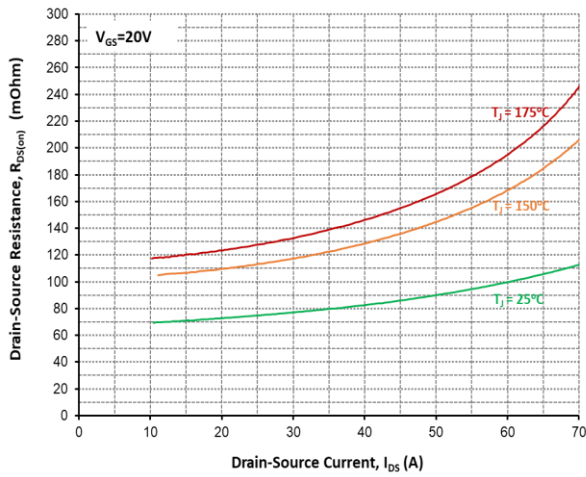


Figure 3. On-Resistance vs. Drain Current For Various Temperatures

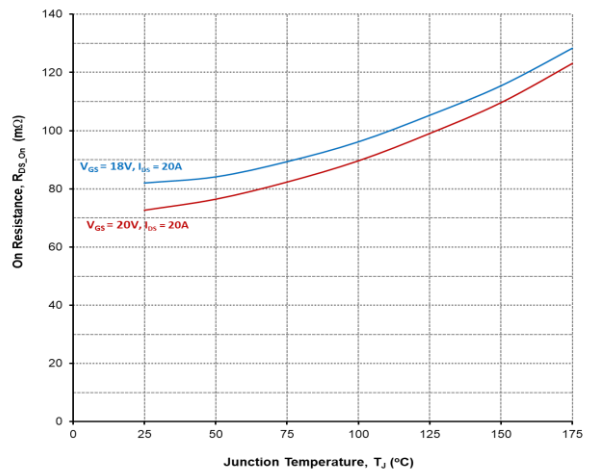


Figure 4. On-Resistance vs. Temperature

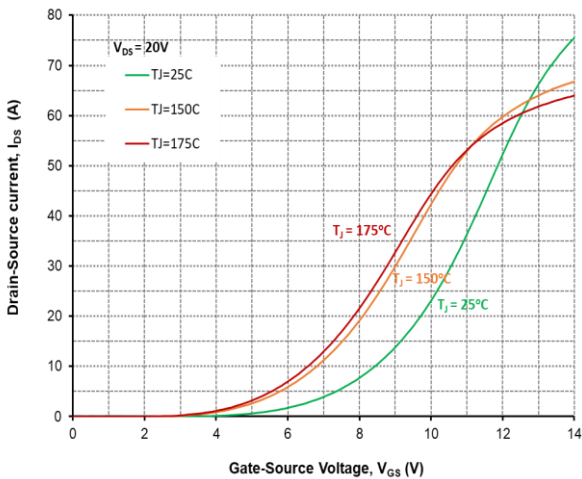


Figure 5. Transfer Characteristic For Various Junction Temperatures

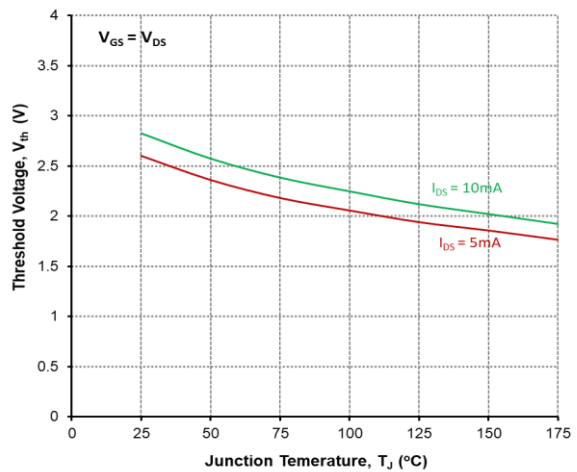


Figure 6. Threshold Voltage vs. Temperature

Typical Performance

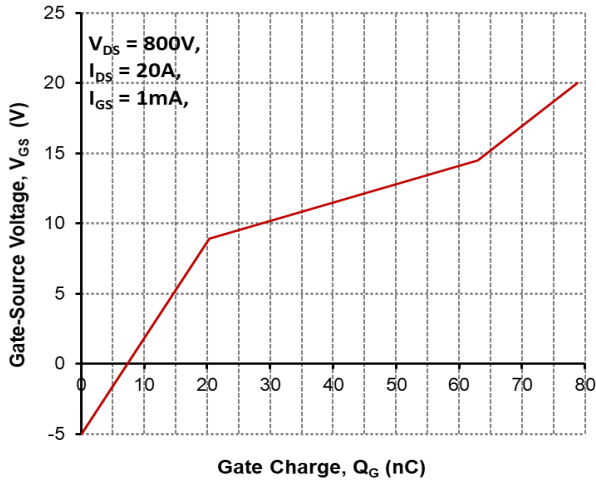


Figure 7. Gate Charge Characteristics

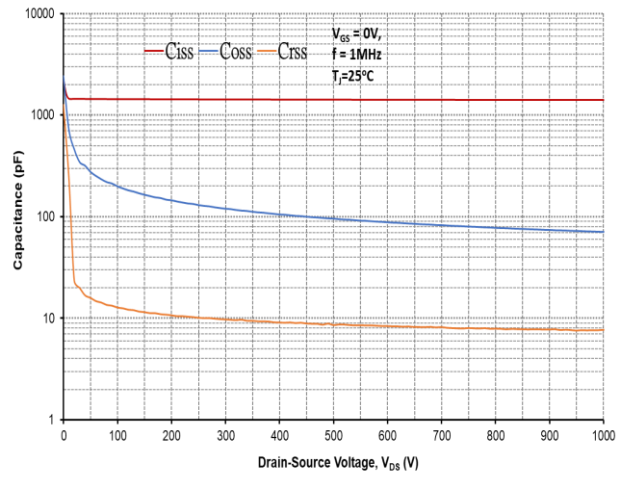


Figure 8. Capacitances vs. Drain-Source Voltage (0-1000V)

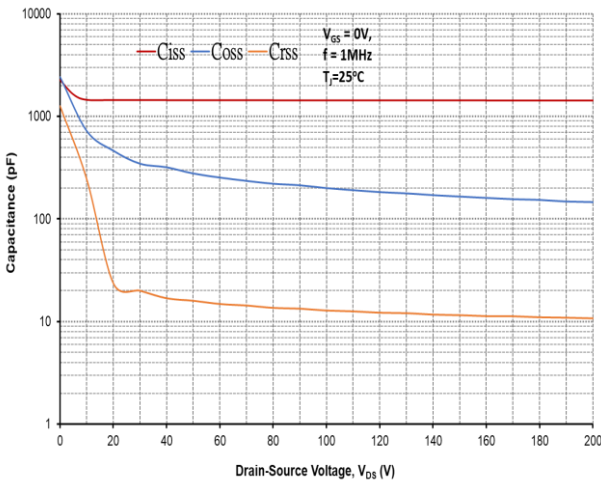


Figure 9. Capacitances vs. Drain-Source Voltage (0-200V)

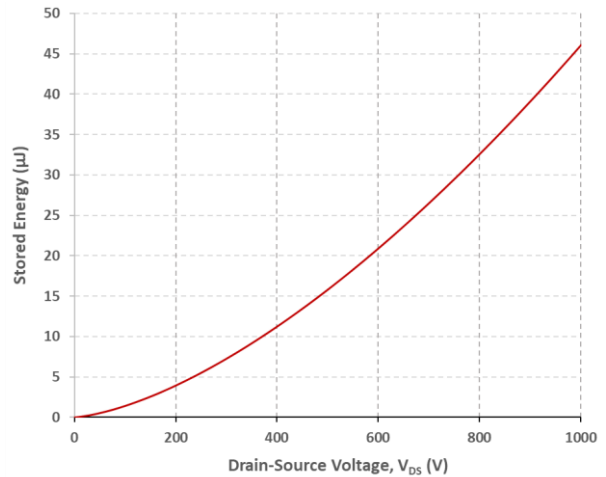


Figure 10. Output Capacitor Stored Energy

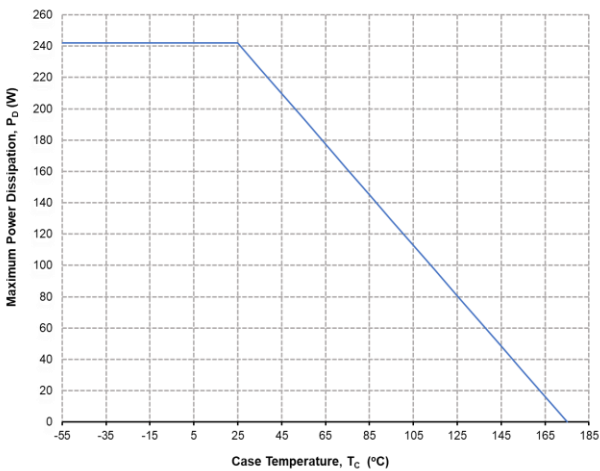


Figure 11. Maximum Power Dissipation Derating vs. Case Temperature

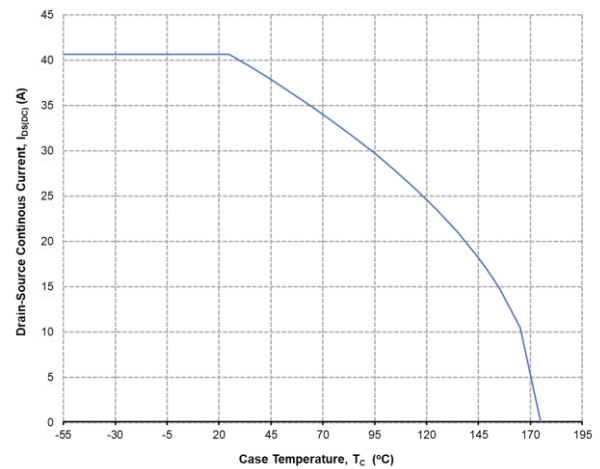


Figure 12. Continuous Drain Current Derating vs. Case Temperature

Typical Performance

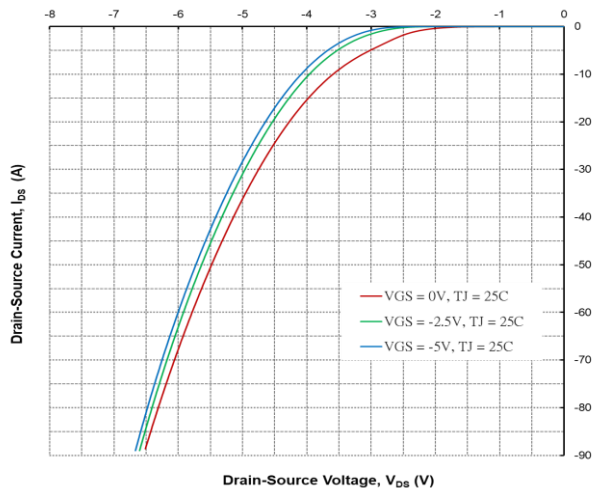


Figure 13. Body Diode Characteristics @ 25°C

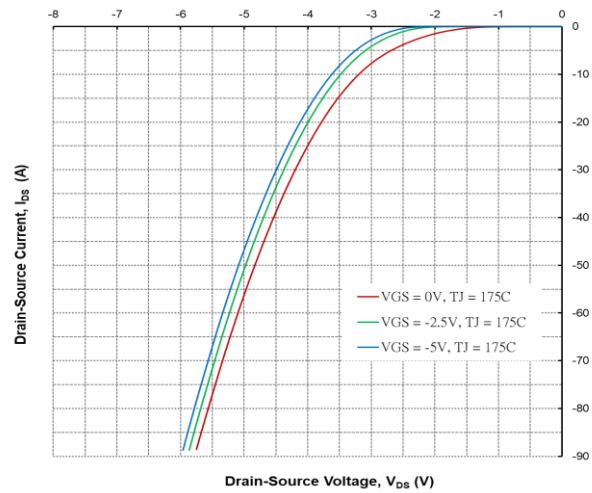


Figure 14. Body Diode Characteristics @ 175°C

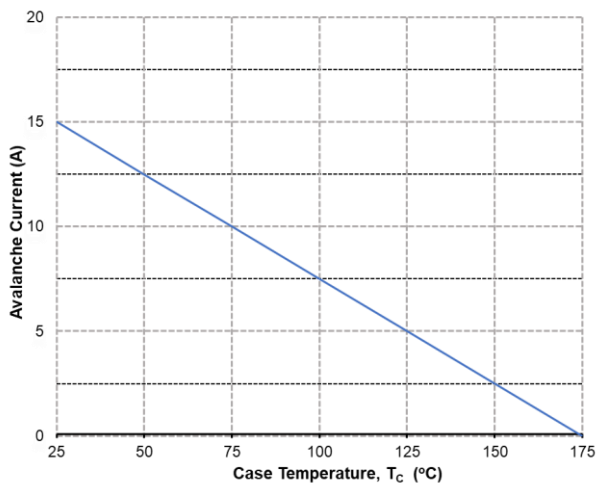


Figure 15. Single Avalanche vs. Temperature

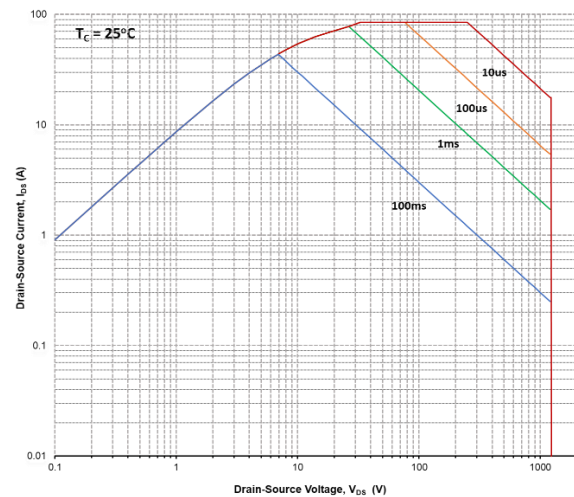
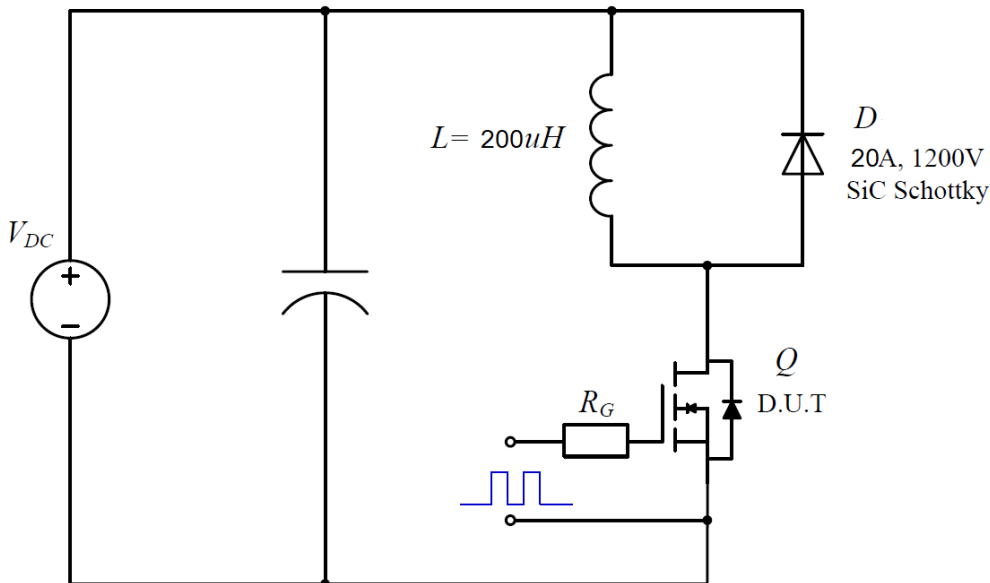
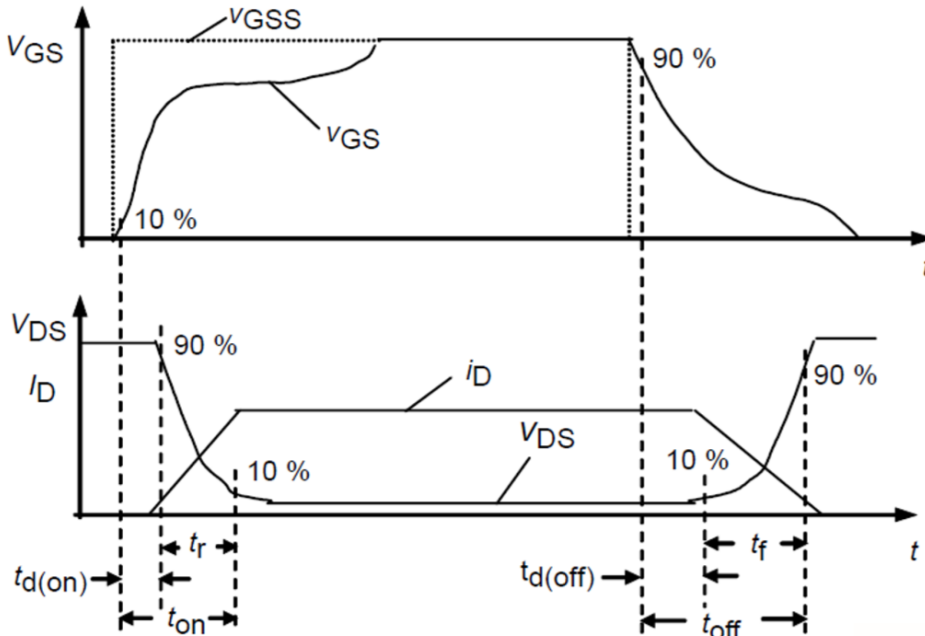


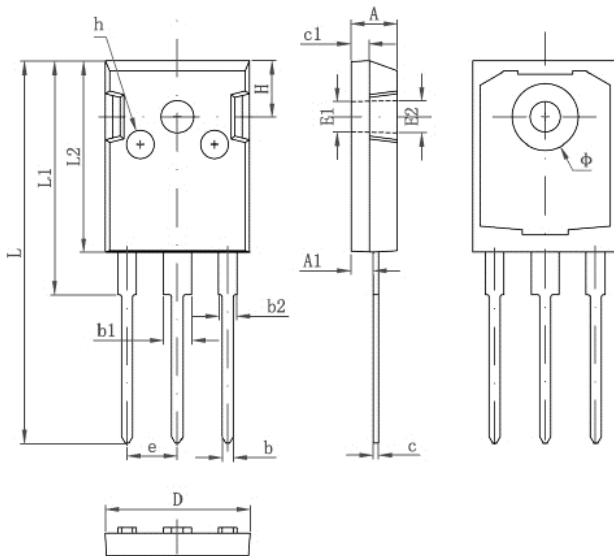
Figure 16. Safe Operating Area

Switching Times Definition and Test Circuit



Package Dimensions

(TO-247-3 Package)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 4.850 | 5.150 | 0.191 | 0.200 |
| A1 | 2.200 | 2.600 | 0.087 | 0.102 |
| b | 1.000 | 1.400 | 0.039 | 0.055 |
| b1 | 2.800 | 3.200 | 0.110 | 0.126 |
| b2 | 1.800 | 2.200 | 0.071 | 0.087 |
| c | 0.500 | 0.700 | 0.020 | 0.028 |
| c1 | 1.900 | 2.100 | 0.075 | 0.083 |
| D | 15.450 | 15.750 | 0.608 | 0.620 |
| E1 | 3.500 REF | | 0.138 REF | |
| E2 | 3.600 REF | | 0.142 REF | |
| L | 40.900 | 41.300 | 1.610 | 1.626 |
| L1 | 24.800 | 25.100 | 0.976 | 0.988 |
| L2 | 20.300 | 20.600 | 0.799 | 0.811 |
| Φ | 7.100 | 7.300 | 0.280 | 0.287 |
| e | 5.450 TYP | | 0.215 TYP | |
| H | 5.980 REF | | 0.235 REF | |
| h | 0.000 | 0.300 | 0.000 | 0.012 |