

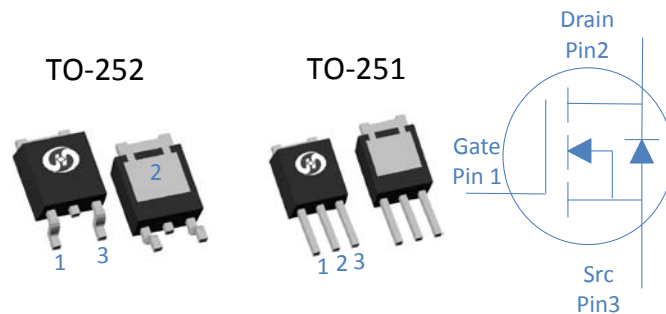
60V N-Ch Power MOSFET
Feature

- ◇ High Speed Power Switching, Logic Level
- ◇ Enhanced Body diode dv/dt capability
- ◇ Enhanced Avalanche Ruggedness
- ◇ 100% UIS Tested, 100% Rg Tested
- ◇ Lead Free, Halogen Free

| | | |
|-------------------------|---------------|--------|
| V_{DS} | 60 | V |
| $R_{DS(on),typ}$ | $V_{GS}=10V$ | 4.1 mΩ |
| $R_{DS(on),typ}$ | $V_{GS}=4.5V$ | 5.6 mΩ |
| I_D (Silicon Limited) | 105 | A |
| I_D (Package Limited) | 70 | A |

Application

- ◇ Synchronous Rectification in SMPS
- ◇ Hard Switching and High Speed Circuit
- ◇ DC/DC in Telecoms and Industrial



| Part Number | Package | Marking |
|-------------|---------|------------|
| HGD053N06SL | TO-252 | GD053N06SL |
| HGI053N06SL | TO-251 | GI053N06SL |

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

| Parameter | Symbol | Conditions | Value | Unit |
|--|----------------|--|------------------------|------------------|
| Continuous Drain Current (Silicon Limited) | I_D | $T_C=25^\circ\text{C}$ | 105 | A |
| | | $T_C=100^\circ\text{C}$ | 74 | |
| | | Continuous Drain Current (Package Limited) | $T_C=25^\circ\text{C}$ | |
| Drain to Source Voltage | V_{DS} | - | 60 | V |
| Gate to Source Voltage | V_{GS} | - | ± 20 | V |
| Pulsed Drain Current | I_{DM} | - | 250 | A |
| Avalanche Energy, Single Pulse | E_{AS} | $L=0.4\text{mH}, T_C=25^\circ\text{C}$ | 80 | mJ |
| Power Dissipation | P_D | $T_C=25^\circ\text{C}$ | 125 | W |
| Operating and Storage Temperature | T_J, T_{stg} | - | -55 to 175 | $^\circ\text{C}$ |

Absolute Maximum Ratings

| Parameter | Symbol | Max | Unit |
|-------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance Junction-Ambient | $R_{\theta JA}$ | 50 | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case | $R_{\theta JC}$ | 1.2 | $^\circ\text{C/W}$ |

Electrical Characteristics at $T_J=25^{\circ}\text{C}$ (unless otherwise specified)
Static Characteristics

| Parameter | Symbol | Conditions | Value | | | Unit |
|-----------------------------------|---------------|--|-------|-----|-----------|------------|
| | | | min | typ | max | |
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$ | 60 | - | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.0 | 1.6 | 2.4 | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS}=0V, V_{DS}=60V, T_J=25^{\circ}\text{C}$ | - | - | 1 | μA |
| | | $V_{GS}=0V, V_{DS}=60V, T_J=100^{\circ}\text{C}$ | - | - | 100 | |
| Gate to Source Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| Drain to Source on Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=20A$ | - | 4.1 | 5.3 | m Ω |
| | | $V_{GS}=4.5V, I_D=20A$ | - | 5.6 | 7.5 | |
| Transconductance | g_{fs} | $V_{DS}=5V, I_D=20A$ | - | 48 | - | S |
| Gate Resistance | R_G | $V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$ | - | 1.5 | - | Ω |

Dynamic Characteristics

| | | | | | | |
|-------------------------------|--------------|---|---|------|---|----|
| Input Capacitance | C_{iss} | $V_{GS}=0V, V_{DS}=30V, f=1\text{MHz}$ | - | 2274 | - | pF |
| Output Capacitance | C_{oss} | | - | 793 | - | |
| Reverse Transfer Capacitance | C_{rss} | | - | 35 | - | |
| Total Gate Charge | $Q_g(10V)$ | $V_{DD}=30V, I_D=20A, V_{GS}=10V$ | - | 36 | - | nC |
| Total Gate Charge | $Q_g(4.5V)$ | | - | 18 | - | |
| Gate to Source Charge | Q_{gs} | | - | 4.5 | - | |
| Gate to Drain (Miller) Charge | Q_{gd} | | - | 7.5 | - | |
| Turn on Delay Time | $t_{d(on)}$ | $V_{DD}=30V, I_D=20A, V_{GS}=10V,$ $R_G=10\Omega,$ | - | 11 | - | ns |
| Rise time | t_r | | - | 7 | - | |
| Turn off Delay Time | $t_{d(off)}$ | | - | 35 | - | |
| Fall Time | t_f | | - | 10 | - | |

Reverse Diode Characteristics

| | | | | | | |
|-------------------------|----------|--|---|-----|-----|----|
| Diode Forward Voltage | V_{SD} | $V_{GS}=0V, I_F=20A$ | - | 0.9 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $V_R=30V, I_F=20A, dI_F/dt=300A/\mu s$ | - | 30 | - | ns |
| Reverse Recovery Charge | Q_{rr} | | - | 53 | - | nC |

Fig 1. Typical Output Characteristics

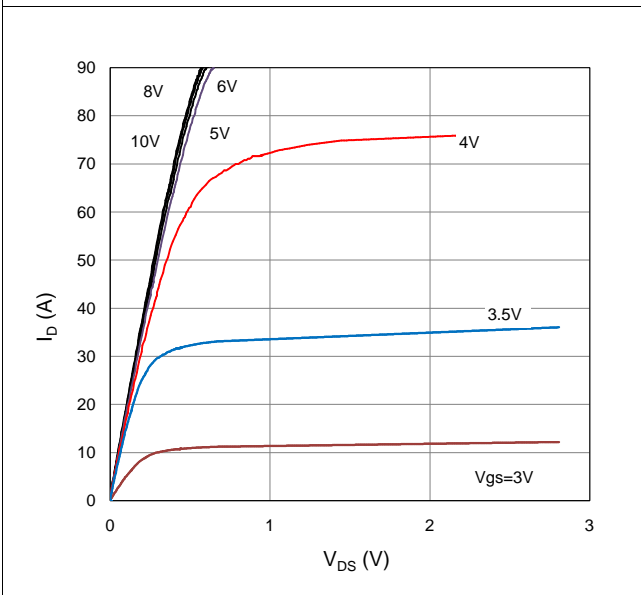


Figure 2. On-Resistance vs. Gate-Source Voltage

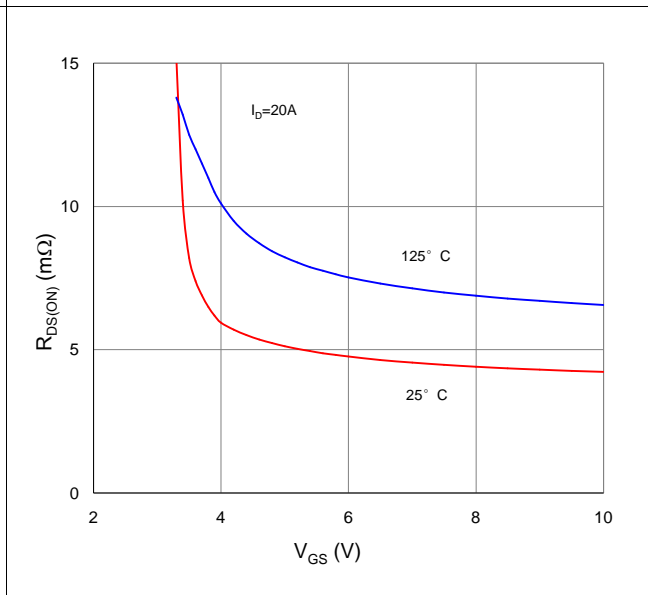


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

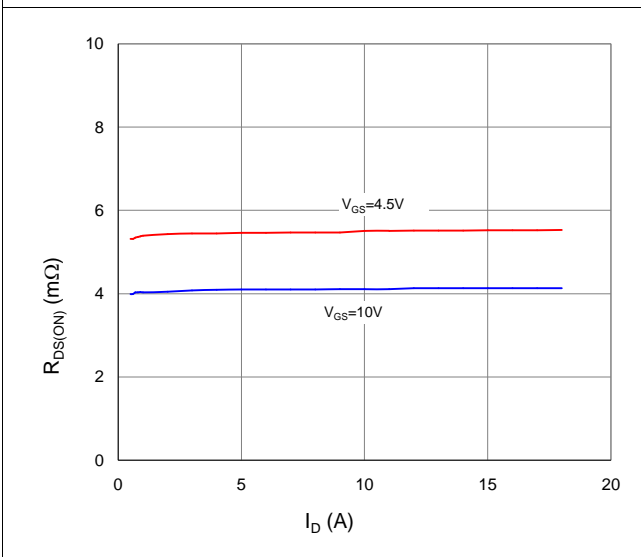


Figure 4. Normalized On-Resistance vs. Junction Temperature

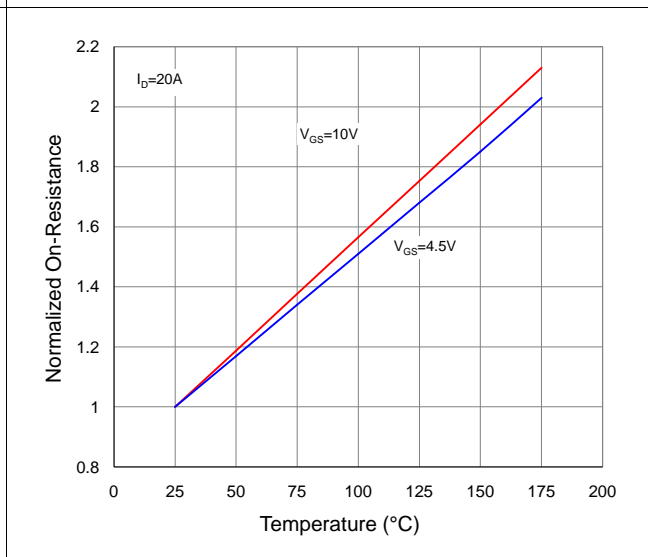


Figure 5. Typical Transfer Characteristics

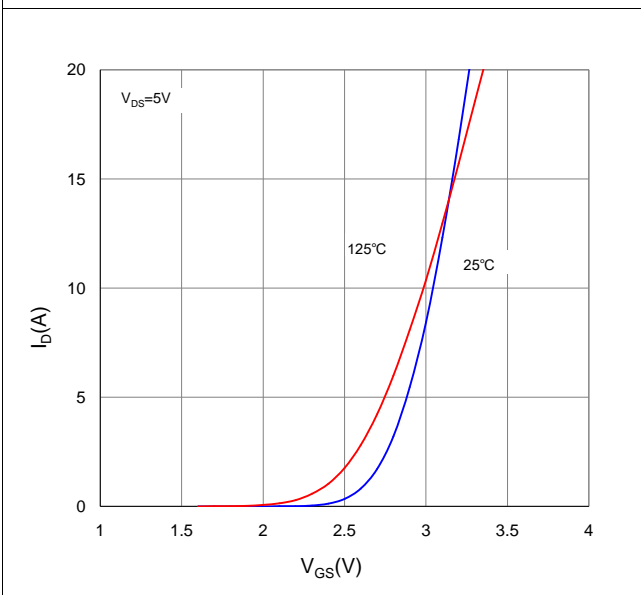


Figure 6. Typical Source-Drain Diode Forward Voltage

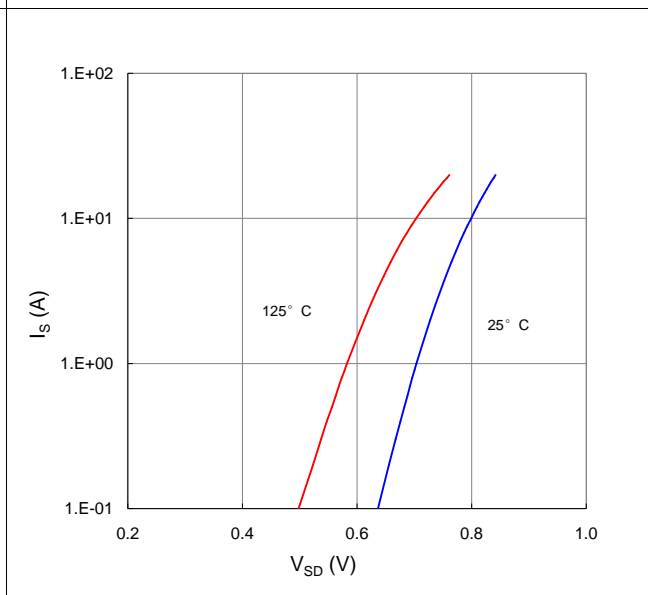


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

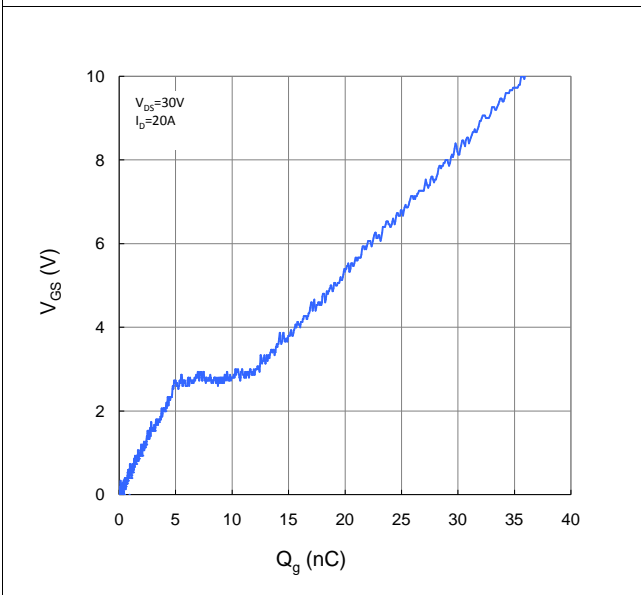


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

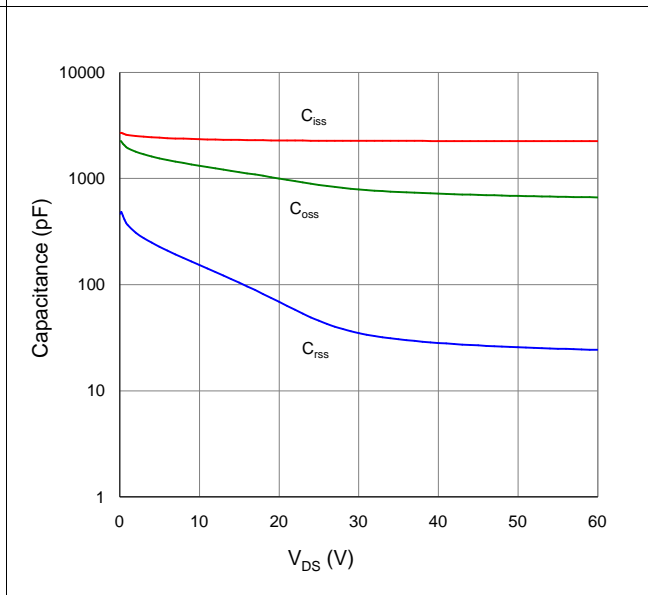


Figure 9. Maximum Safe Operating Area

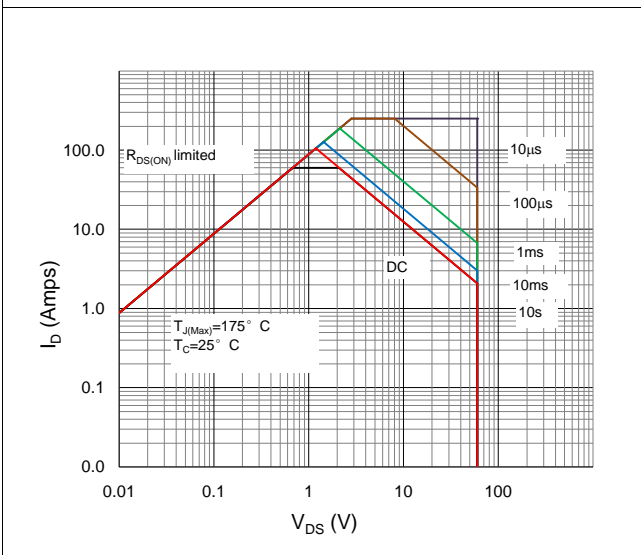


Figure 10. Maximum Drain Current vs. Case Temperature

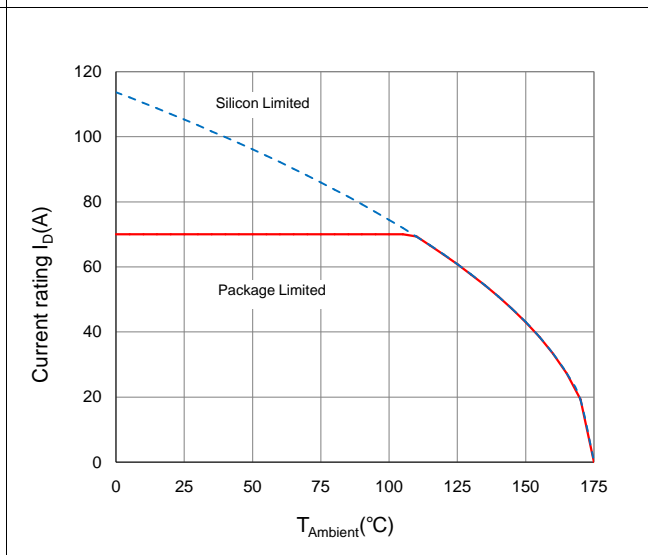
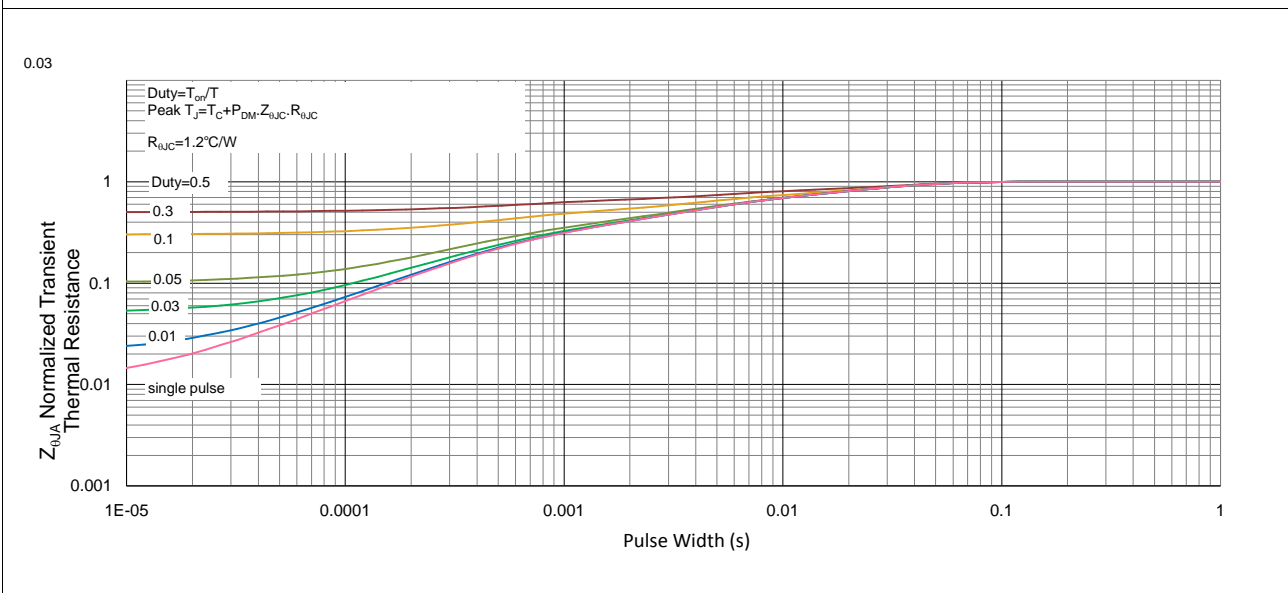
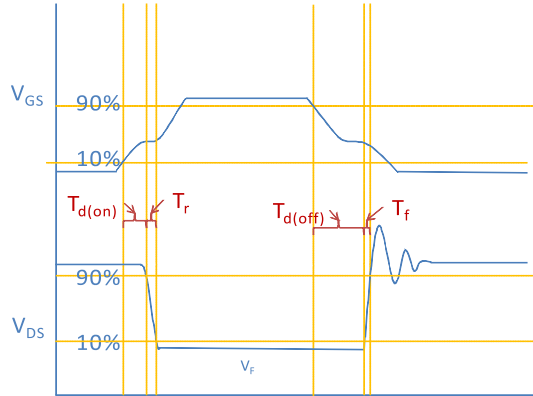
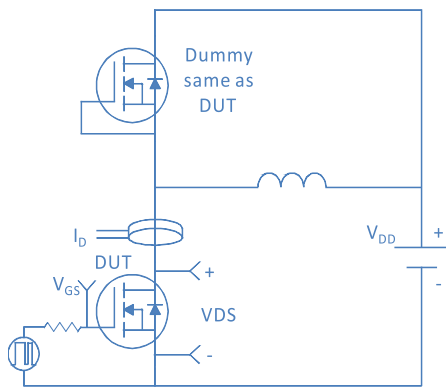


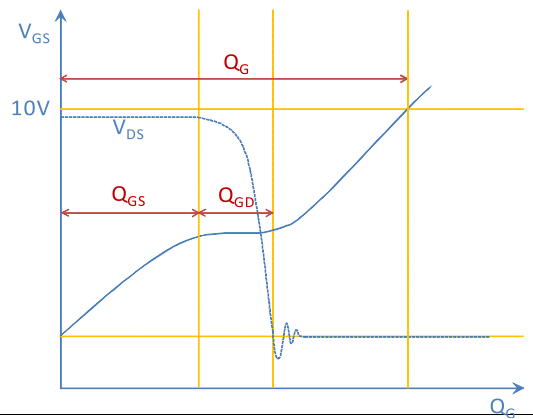
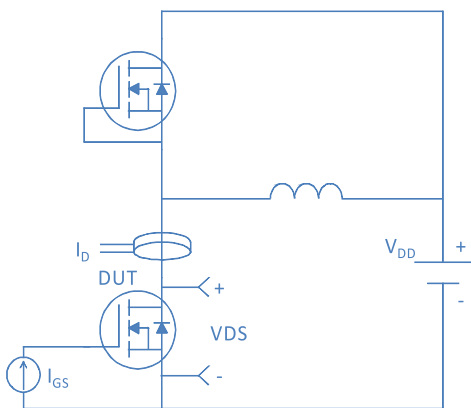
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Ambient



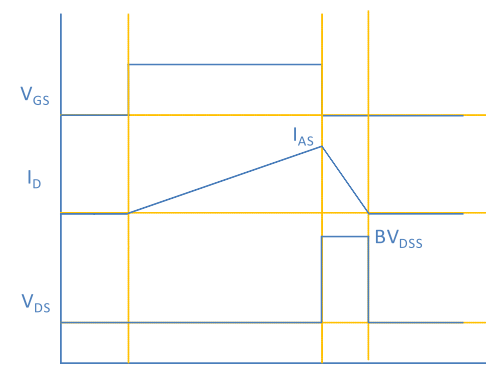
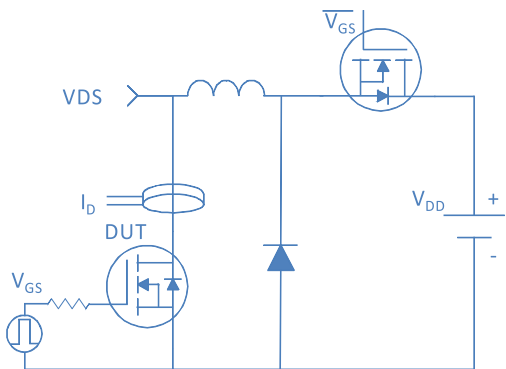
Inductive switching Test



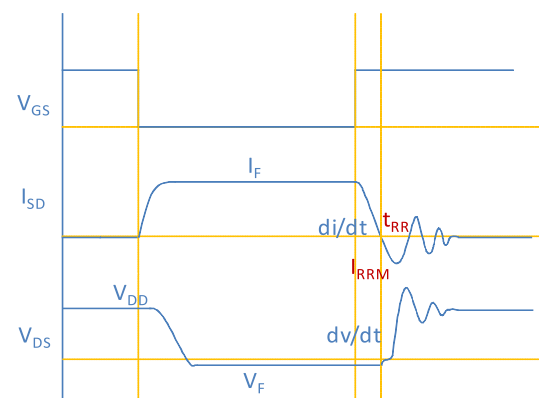
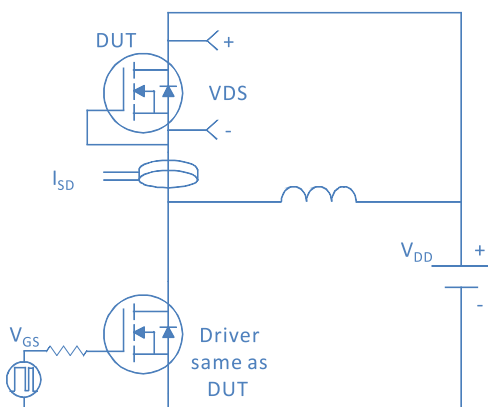
Gate Charge Test



Uclamped Inductive Switching (UIS) Test

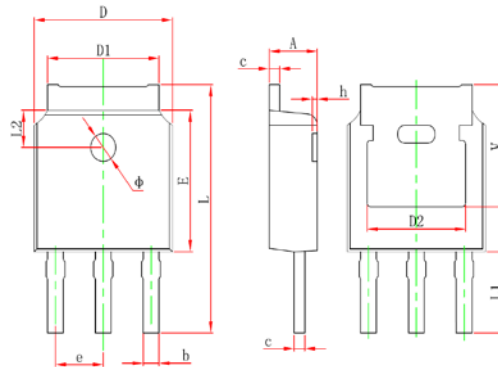


Diode Recovery Test



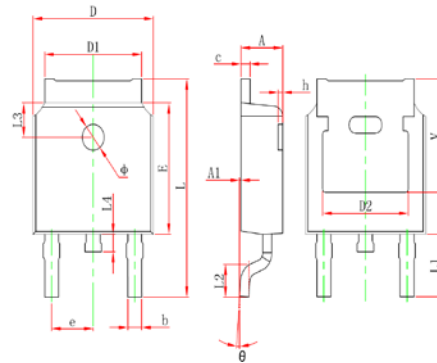
Package Outline

TO-251, 3leads



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| b | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 REF. | | 0.190 REF. | |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 10.400 | 11.000 | 0.409 | 0.433 |
| L1 | 3.500 REF. | | 0.138 REF. | |
| L2 | 1.600 REF. | | 0.063 REF. | |
| φ | 1.100 | 1.300 | 0.043 | 0.051 |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.350 REF. | | 0.211 REF. | |

TO-252, 2 leads



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|--------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| b | 0.660 | 0.860 | 0.026 | 0.034 |
| c | 0.460 | 0.580 | 0.018 | 0.023 |
| D | 6.500 | 6.700 | 0.256 | 0.264 |
| D1 | 5.100 | 5.460 | 0.201 | 0.215 |
| D2 | 4.830 REF. | | 0.190 REF. | |
| E | 6.000 | 6.200 | 0.236 | 0.244 |
| e | 2.186 | 2.386 | 0.086 | 0.094 |
| L | 9.800 | 10.400 | 0.386 | 0.409 |
| L1 | 2.900 REF. | | 0.114 REF. | |
| L2 | 1.400 | 1.700 | 0.055 | 0.067 |
| L3 | 1.600 REF. | | 0.063 REF. | |
| L4 | 0.600 | 1.000 | 0.024 | 0.039 |
| φ | 1.100 | 1.300 | 0.043 | 0.051 |
| θ | 0° | 8° | 0° | 8° |
| h | 0.000 | 0.300 | 0.000 | 0.012 |
| V | 5.350 REF. | | 0.211 REF. | |