

150V N-Ch Power MOSFET

Feature

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

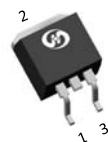
Application

- ◇ Synchronous Rectification in SMPS
- ◇ Hard Switching and High Speed Circuit
- ◇ Power Tools
- ◇ UPS
- ◇ Motor Control

| | | | |
|-------------------------|--------|-----|----|
| V_{DS} | | 150 | V |
| $R_{DS(on),typ}$ | TO-263 | 8.5 | mΩ |
| $R_{DS(on),typ}$ | TO-247 | 8.7 | mΩ |
| $R_{DS(on),typ}$ | TO-220 | 8.8 | mΩ |
| I_D (Silicon Limited) | | 120 | A |

| Part Number | Package | Marking |
|-------------|---------|-----------|
| HGB105N15M | TO-263 | GB105N15M |
| HGK105N15M | TO-247 | GK105N15M |
| HGP105N15M | TO-220 | GP105N15M |

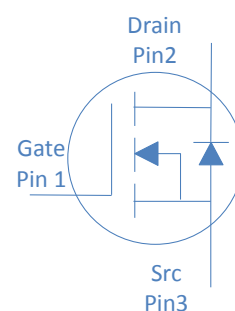
TO-263



TO-220



TO-247



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 | $T_C=25^{\circ}\text{C}$ | 120 | A |
| | | $T_C=100^{\circ}\text{C}$ | 85 | |
| Drain to Source Voltage | V_{DS} | - | 150 | V |
| Gate to Source Voltage | V_{GS} | - | ± 20 | V |
| Pulsed Drain Current | I_{DM} | - | 400 | A |
| Avalanche Energy, Single Pulse | E_{AS} | $L=0.4\text{mH}, T_C=25^{\circ}\text{C}$ | 845 | mJ |
| Power Dissipation | P_D | $T_C=25^{\circ}\text{C}$ | 333 | 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-Case | $R_{\theta JC}$ | 0.45 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance Junction-Ambient | $R_{\theta JA}$ | 60 | $^{\circ}\text{C}/\text{W}$ |

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 | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$ | 150 | - | - | V | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 2 | 3 | 4 | | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS}=0V, V_{DS}=150V, T_j=25^\circ\text{C}$ | - | - | 1 | μA | |
| | | $V_{GS}=0V, V_{DS}=150V, T_j=100^\circ\text{C}$ | - | - | 100 | | |
| Gate to Source Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA | |
| Drain to Source on Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=20A$ | TO-263 | - | 8.5 | 10.2 | m Ω |
| | | | TO-247 | - | 8.7 | 10.4 | |
| | | | TO-220 | - | 8.8 | 10.5 | |
| Transconductance | g_{fs} | $V_{DS}=5V, I_D=20A$ | - | 90 | - | S | |
| Gate Resistance | R_G | $V_{GS}=0V, V_{DS}$ Open, $f=1\text{MHz}$ | - | 0.7 | - | Ω | |

Dynamic Characteristics

| | | | | | | |
|-------------------------------|--------------|--|---|------|---|----|
| Input Capacitance | C_{iss} | $V_{GS}=0V, V_{DS}=75V, f=1\text{MHz}$ | - | 4800 | - | pF |
| Output Capacitance | C_{oss} | | - | 350 | - | |
| Reverse Transfer Capacitance | C_{rss} | | - | 95 | - | |
| Total Gate Charge | Q_g | $V_{DD}=75V, I_D=20A, V_{GS}=10V$ | - | 74 | - | nC |
| Gate to Source Charge | Q_{gs} | | - | 15 | - | |
| Gate to Drain (Miller) Charge | Q_{gd} | | - | 28 | - | |
| Turn on Delay Time | $t_{d(on)}$ | $V_{DD}=75V, I_D=20A, V_{GS}=10V, R_G=10\Omega,$ | - | 20 | - | ns |
| Rise time | t_r | | - | 58 | - | |
| Turn off Delay Time | $t_{d(off)}$ | | - | 32 | - | |
| Fall Time | t_f | | - | 31 | - | |

Reverse Diode Characteristics

| | | | | | | |
|-------------------------|----------|--|---|-----|-----|----|
| Diode Forward Voltage | V_{SD} | $V_{GS}=0V, I_F=20A$ | - | 0.9 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $V_R=75V, I_F=30A, di_F/dt=100A/\mu s$ | - | 120 | - | ns |
| Reverse Recovery Charge | Q_{rr} | | - | 380 | - | nC |

Fig 1. Typical Output Characteristics

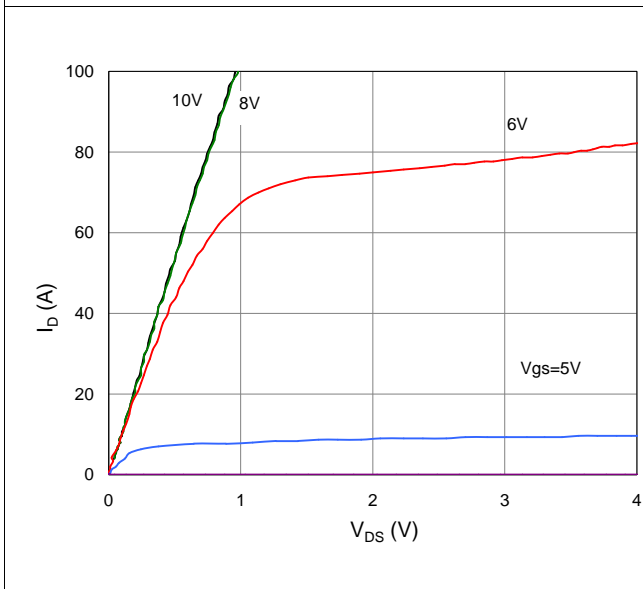


Figure 2. On-Resistance vs. Gate-Source Voltage

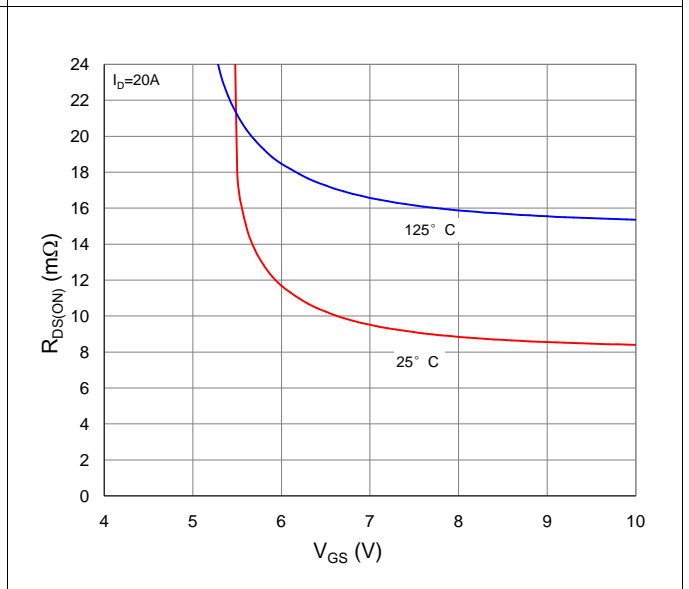


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

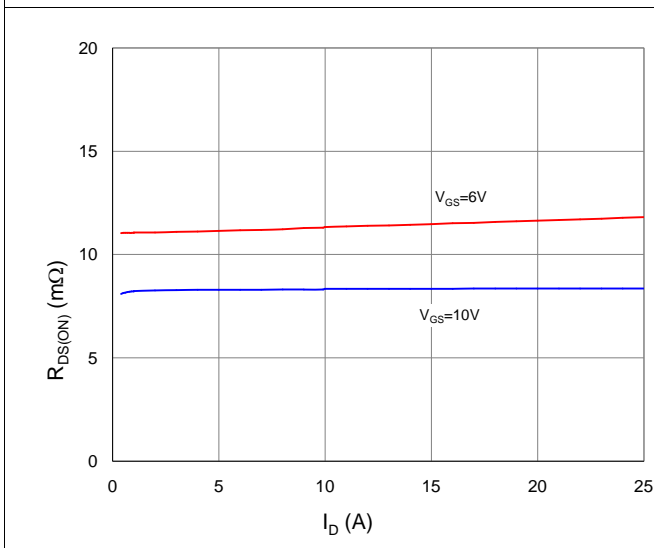


Figure 4. Normalized On-Resistance vs. Junction Temperature

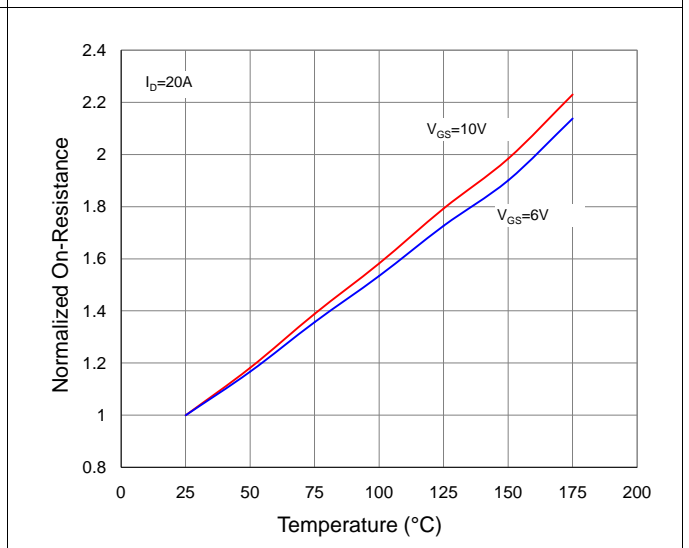


Figure 5. Typical Transfer Characteristics

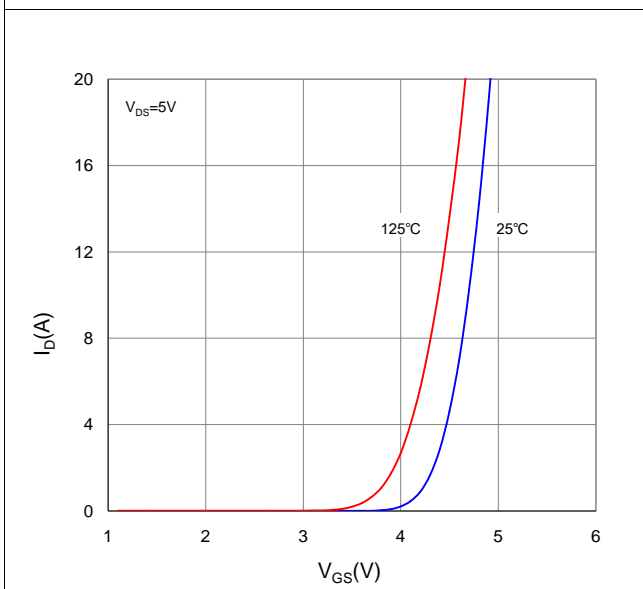


Figure 6. Typical Source-Drain Diode Forward Voltage

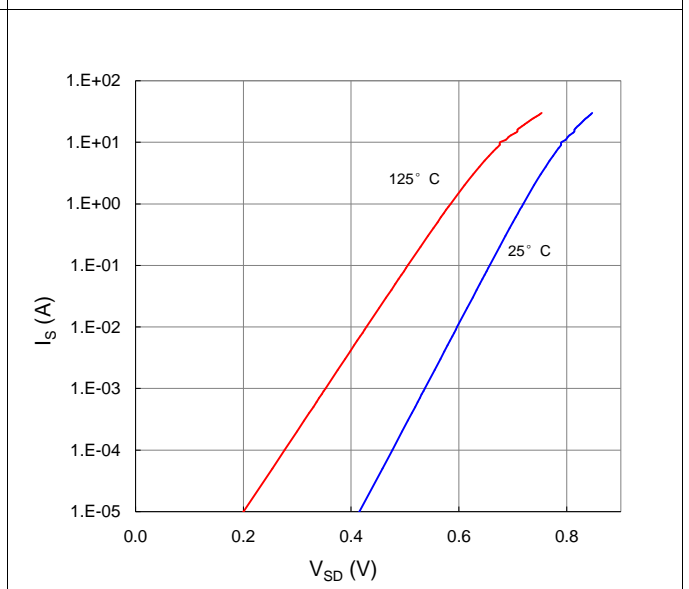


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

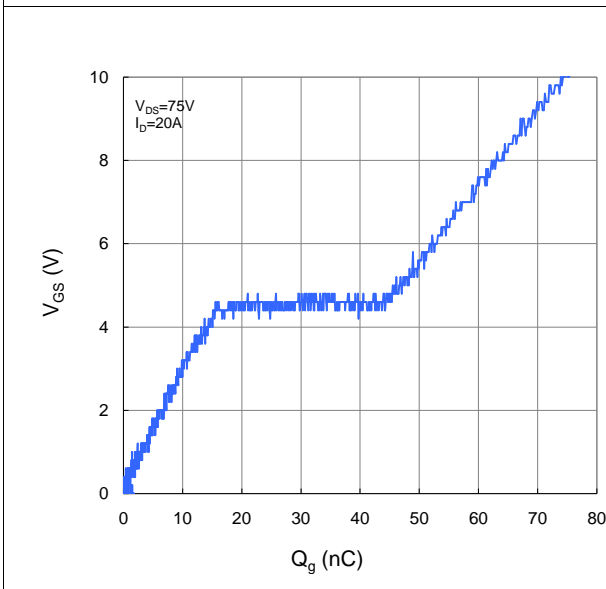


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

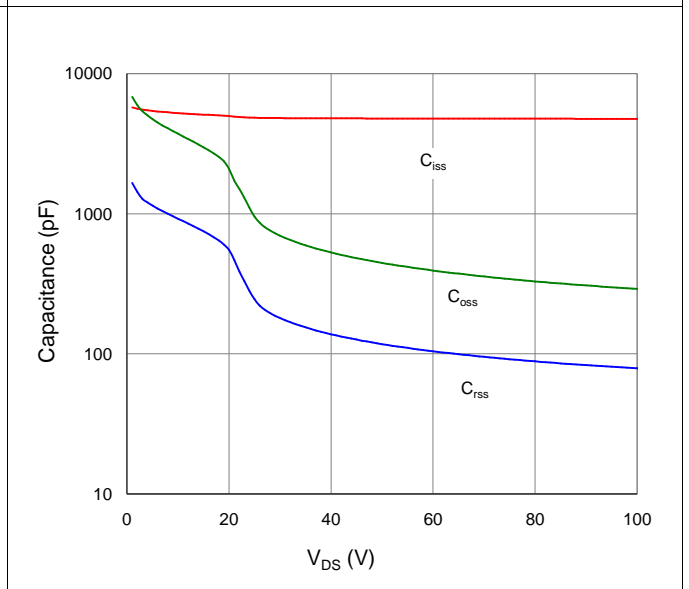


Figure 9. Maximum Safe Operating Area

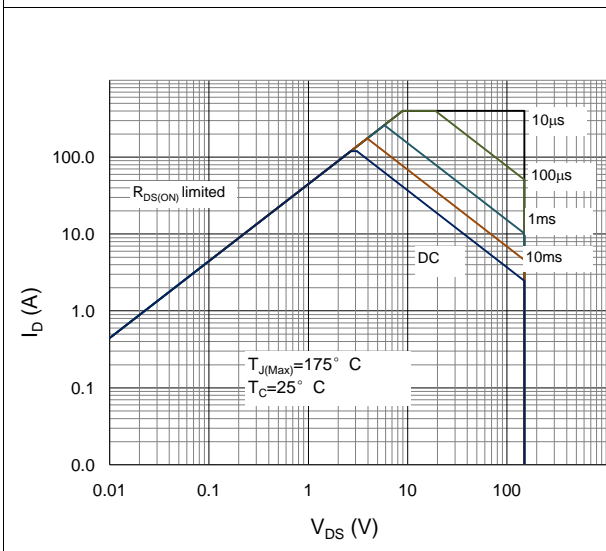


Figure 10. Maximum Drain Current vs. Case Temperature

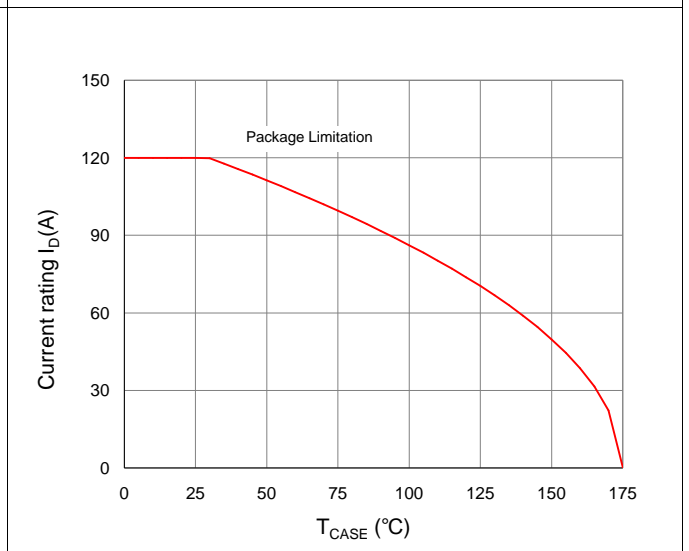
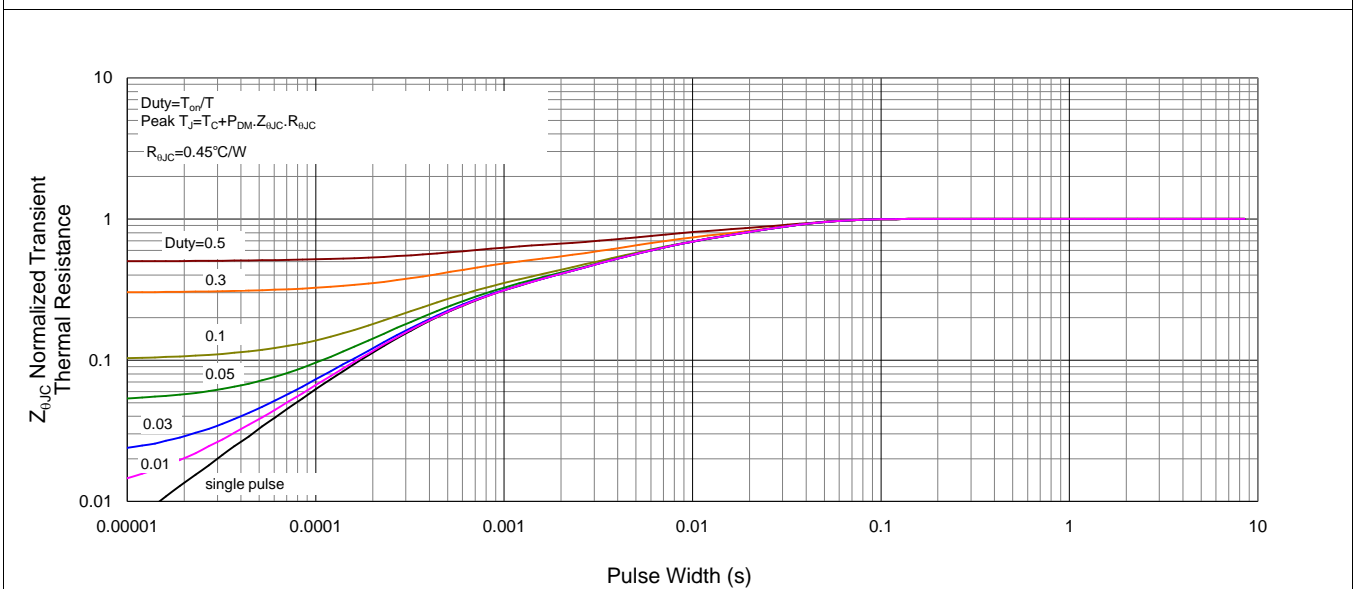
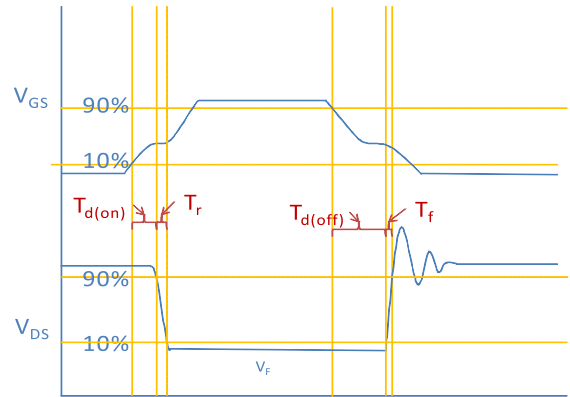
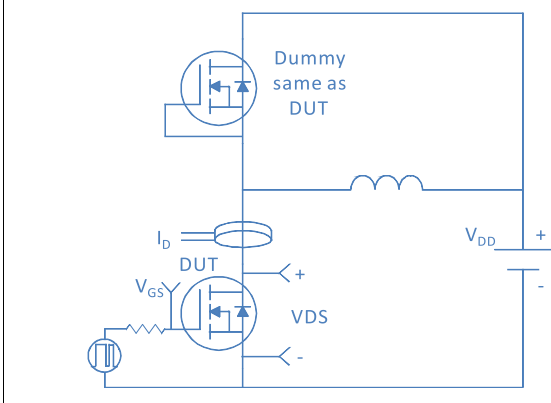


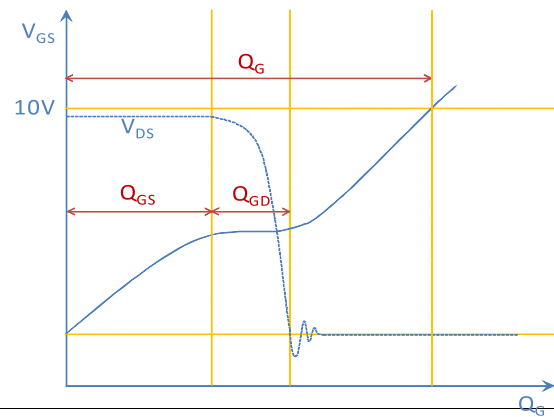
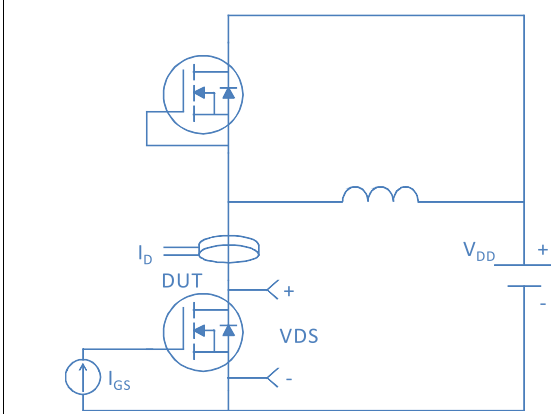
Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case



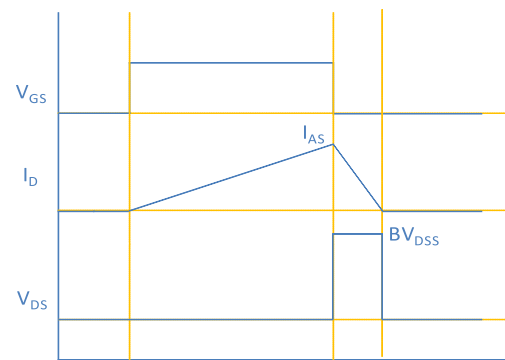
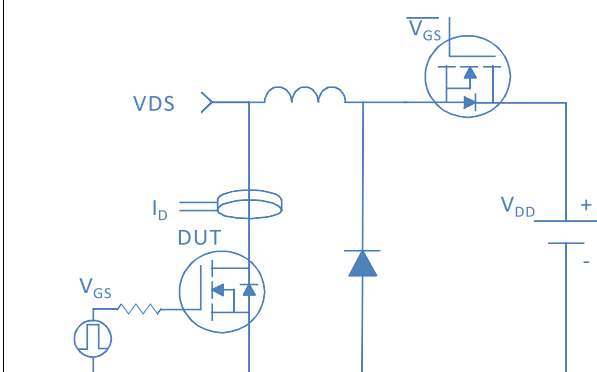
Inductive switching Test



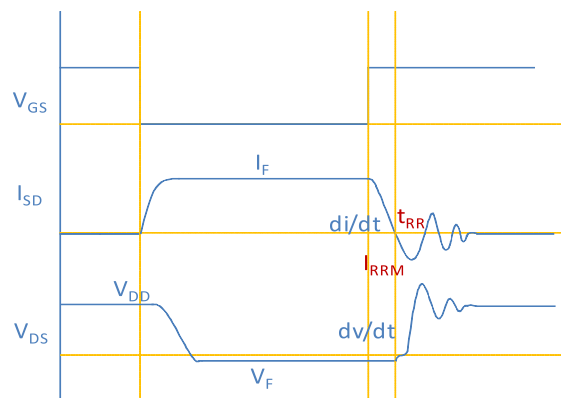
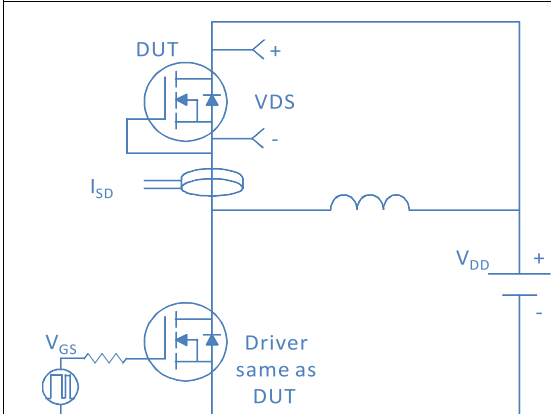
Gate Charge Test



Uclamped Inductive Switching (UIS) Test

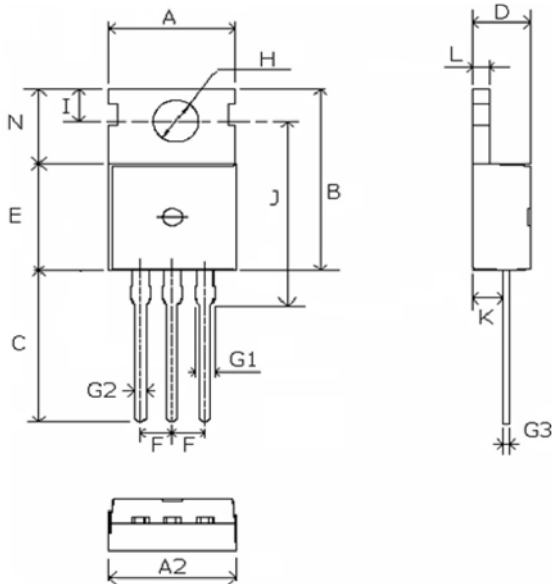


Diode Recovery Test



TO-220, 3 leads

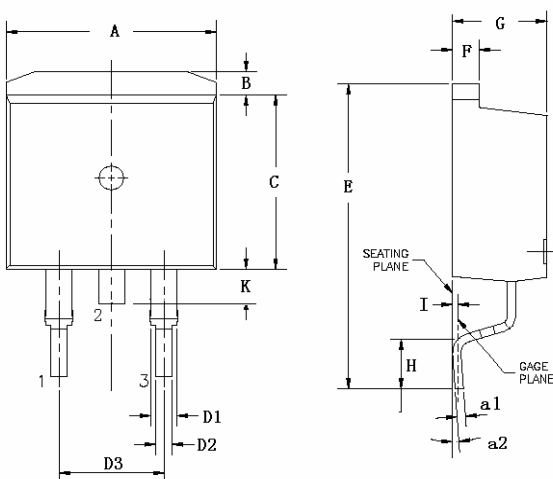
Dimensions in mm unless otherwise specified



| Symbol | Min | Nom | Max |
|--------|-------|-------|-------|
| A | 9.66 | 9.97 | 10.28 |
| A2 | 9.80 | 10.00 | 10.20 |
| B | 15.60 | 15.70 | 15.80 |
| C | 12.70 | 13.48 | 14.27 |
| D | 4.30 | 4.50 | 4.70 |
| E | 9.00 | 9.20 | 9.40 |
| F | | 2.54 | |
| G1 | 1.32 | 1.52 | 1.72 |
| G2 | 0.70 | 0.82 | 0.95 |
| G3 | 0.45 | 0.52 | 0.60 |
| H | 3.50 | 3.60 | 3.70 |
| I | 2.70 | 2.80 | 2.90 |
| J | 15.70 | 15.97 | 16.25 |
| K | 2.20 | 2.40 | 2.60 |
| L | 1.15 | 1.27 | 1.40 |
| N | 6.40 | 6.60 | 6.80 |

TO-263, 2 leads

Dimensions in mm unless otherwise specified



| Symbol | Min | Nom | Max |
|------------|-------|-------|-------|
| A | 9.66 | 9.97 | 10.28 |
| B | 1.02 | 1.17 | 1.32 |
| C | 8.59 | 9.00 | 9.40 |
| D1 | 1.14 | 1.27 | 1.40 |
| D2 | 0.70 | 0.83 | 0.95 |
| D3 | | 5.08 | |
| E | 15.09 | 15.24 | 15.39 |
| F | 1.15 | 1.28 | 1.40 |
| G | 4.30 | 4.50 | 4.70 |
| H | 2.29 | 2.54 | 2.79 |
| I | | 0.25 | |
| K | 1.30 | 1.45 | 1.60 |
| a1 | 0.45 | 0.55 | 0.65 |
| a2(degree) | 0° | | 8° |

TO-247, 3 leads

