



4N150

Power MOSFET

4.0A, 1500V N-CHANNEL POWER MOSFET

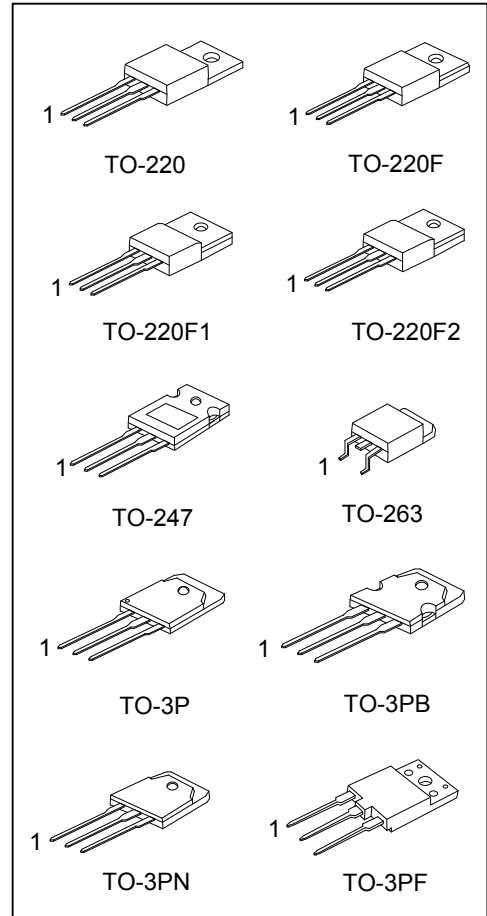
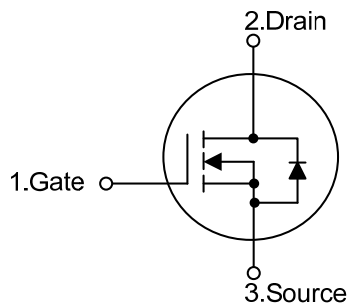
DESCRIPTION

The UTC **4N150** is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient AC to DC converters and bridge circuits.

FEATURES

- * $R_{DS(ON)} \leq 6.5 \Omega @ V_{GS}=10V, I_D=2.0A$
- * High Switching Speed
- * 100% Avalanche Tested

SYMBOL



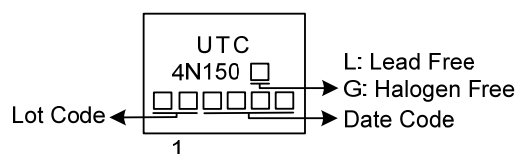
ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|--------------|----------|----------------|---|---|-----------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| 4N150L-TA3-T | 4N150G-TA3-T | TO-220 | G | D | S | Tube |
| 4N150L-TF1-T | 4N150G-TF1-T | TO-220F1 | G | D | S | Tube |
| 4N150L-TF2-T | 4N150G-TF2-T | TO-220F2 | G | D | S | Tube |
| 4N150L-TF3-T | 4N150G-TF3-T | TO-220F | G | D | S | Tube |
| 4N150L-TQ2-T | 4N150G-TQ2-T | TO-263 | G | D | S | Tube |
| 4N150L-TQ2-R | 4N150G-TQ2-R | TO-263 | G | D | S | Tape Reel |
| 4N150L-T3B-T | 4N150G-T3B-T | TO-3PB | G | D | S | Tube |
| 4N150L-T3F-T | 4N150G-T3F-T | TO-3PF | G | D | S | Tube |
| 4N150L-T3N-T | 4N150G-T3N-T | TO-3PN | G | D | S | Tube |
| 4N150L-T3P-T | 4N150G-T3P-T | TO-3P | G | D | S | Tube |
| 4N150L-T47-T | 4N150G-T47-T | TO-247 | G | D | S | Tube |

Note: Pin Assignment: G: Gate D: Drain S: Source

| | |
|--|---|
| <p>4N150G-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF2: TO-220F2, TQ2: TO-263, T3B: TO-3PB, T3F: TO-3PF, T3N: TO-3PN, T3P: TO-3P, T47: TO-247 (3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---------------------------|------------------------------|-----------|------------|------------------|
| Drain-Source Voltage | | V_{DSS} | 1500 | V |
| Gate-Source Voltage | | V_{GSS} | ± 30 | V |
| Drain Current | Continuous | I_D | 4 | A |
| | Pulsed (Note 2) | I_{DM} | 8 | A |
| Avalanche Energy | | E_{AS} | 721 | mJ |
| Peak Diode Recovery dv/dt | | dv/dt | 2 | V/ns |
| Power Dissipation | TO-220/TO-263 | P_D | 110 | W |
| | TO-220F/TO-220F1 TO-220F2 | | 45 | W |
| | TO-247 | | 140 | W |
| | TO-3P/TO-3PB TO-3PN | | 150 | W |
| | TO-3PF | | 60 | W |
| | Junction Temperature | | T_J | +150 |
| Storage Temperature | | T_{STG} | -55 ~ +150 | $^\circ\text{C}$ |

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating: Pulse width limited by maximum junction temperature.

3. $L = 150\text{mH}$, $I_{AS} = 3.1\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD} \leq 4\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|------------------------------|---|---------------------------|---------------|---------------------------|
| Junction to Ambient | TO-220/TO-220F TO-220F1/TO-220F2 TO-263 | θ_{JA} | 62.5 | $^\circ\text{C}/\text{W}$ |
| | TO-247 | | 50 | $^\circ\text{C}/\text{W}$ |
| | TO-3P/TO-3PB TO-3PF/TO-3PN | | 50 | $^\circ\text{C}/\text{W}$ |
| | Junction to Case | | θ_{JC} | 1.14 |
| TO-220/TO-263 | 2.77 | $^\circ\text{C}/\text{W}$ | | |
| TO-220F/TO-220F1 TO-220F2 | 0.89 | $^\circ\text{C}/\text{W}$ | | |
| TO-247 | 0.83 | $^\circ\text{C}/\text{W}$ | | |
| TO-3P/TO-3PB TO-3PN | 2.08 | $^\circ\text{C}/\text{W}$ | | |
| TO-3PF | | | | |

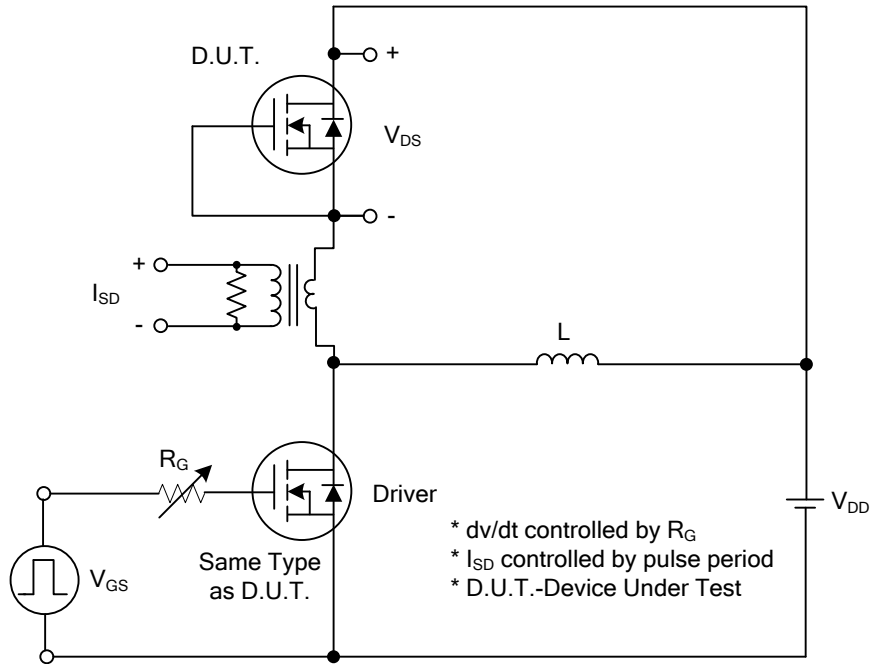
■ ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|--------------|---|------|------|------|---------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$ | 1500 | | | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=1500\text{V}$, $V_{GS}=0\text{V}$ | | | 10 | μA |
| Gate- Source Leakage Current | Forward | I_{GSS} | | | +100 | nA |
| | Reverse | | | | -100 | nA |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$ | 3.0 | | 5.0 | V |
| Static Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10\text{V}$, $I_D=2.0\text{A}$ | | | 6.5 | Ω |
| DYNAMIC PARAMETERS | | | | | | |
| Input Capacitance | C_{ISS} | $V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1.0\text{MHz}$ | | 1310 | | pF |
| Output Capacitance | C_{OSS} | | | 95 | | pF |
| Reverse Transfer Capacitance | C_{RSS} | | | 17 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Total Gate Charge | Q_G | $V_{DS}=1200\text{V}$, $V_{GS}=10\text{V}$, $I_D=4\text{A}$ $I_G=1\text{mA}$ (Note 1, 2) | | 40 | | nC |
| Gate to Source Charge | Q_{GS} | | | 11 | | nC |
| Gate to Drain Charge | Q_{GD} | | | 16 | | nC |
| Turn-ON Delay Time | $t_{D(ON)}$ | $V_{DS}=100\text{V}$, $V_{GS}=10\text{V}$, $I_D=4\text{A}$, $R_G=25\Omega$ (Note 1, 2) | | 32 | | ns |
| Rise Time | t_R | | | 39 | | ns |
| Turn-OFF Delay Time | $t_{D(OFF)}$ | | | 125 | | ns |
| Fall-Time | t_F | | | 47 | | ns |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Continuous Current | I_S | | | | 4 | A |
| Maximum Body-Diode Pulsed Current | I_{SM} | | | | 8 | A |
| Drain-Source Diode Forward Voltage | V_{SD} | $I_S=4\text{A}$, $V_{GS}=0\text{V}$ | | | 1.4 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_S=4\text{A}$, $V_{GS}=0\text{V}$, $di_F/dt=100\text{A}/\mu\text{s}$ (Note 1) | | 1.2 | | μs |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 13.1 | | μC |

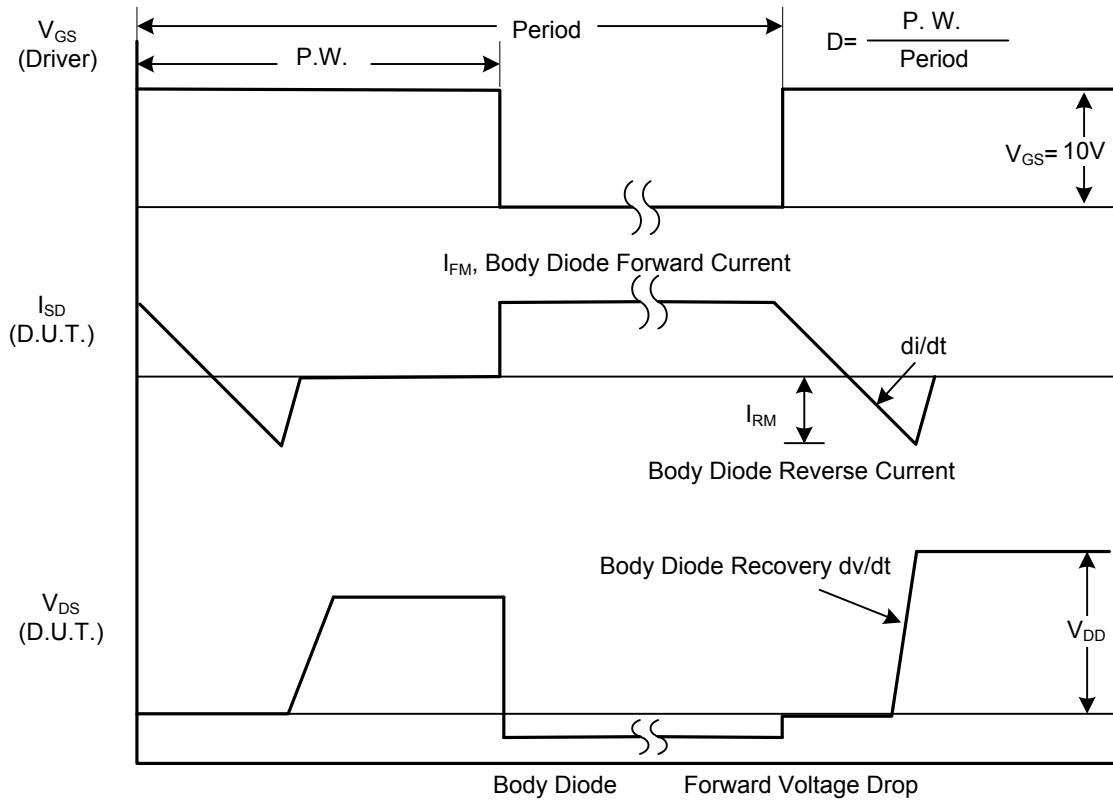
Notes: 1. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS



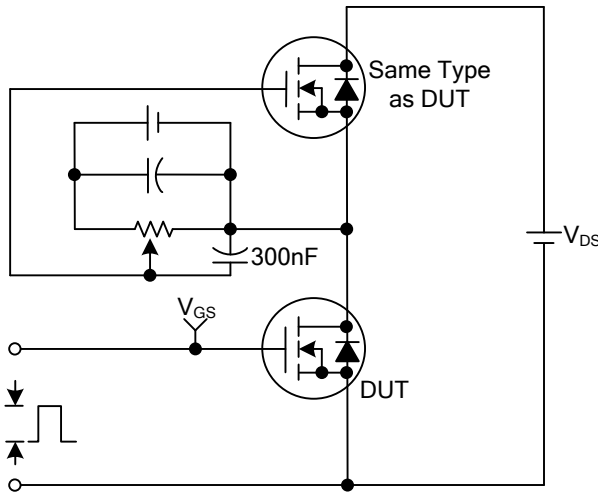
Peak Diode Recovery dv/dt Test Circuit



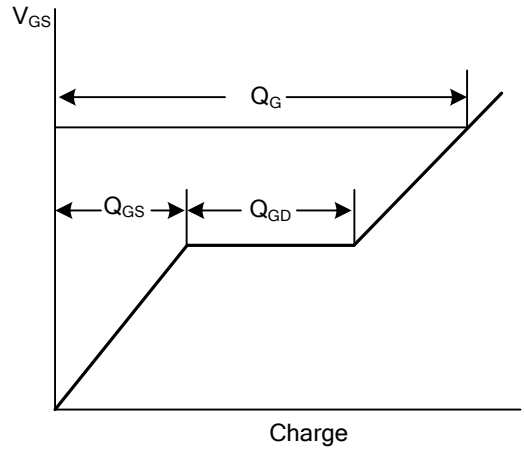
Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS

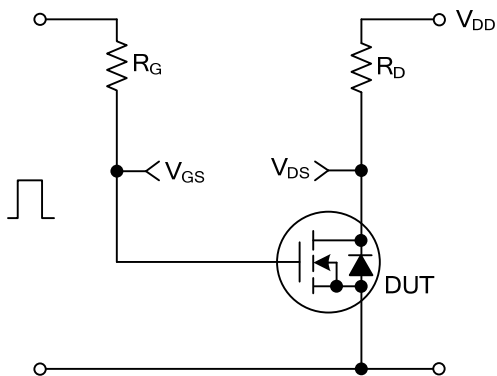
Gate Charge Test Circuit



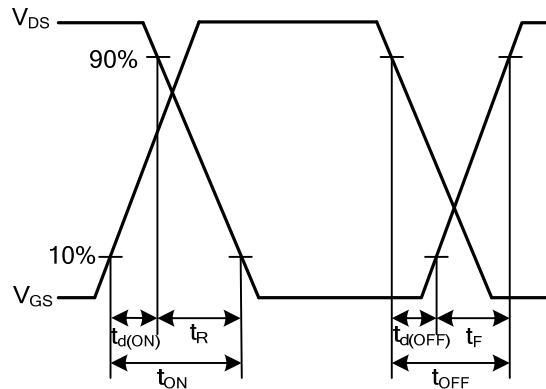
Gate Charge Waveforms



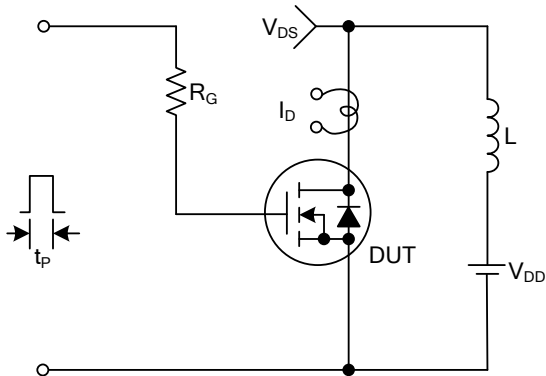
Resistive Switching Test Circuit



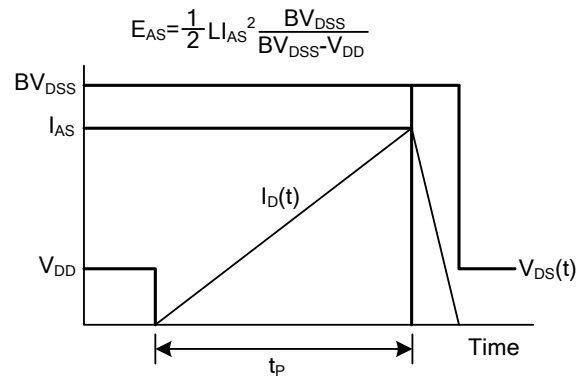
Resistive Switching Waveforms



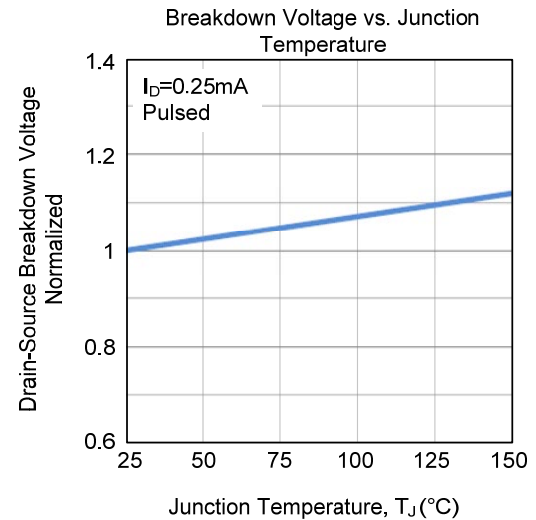
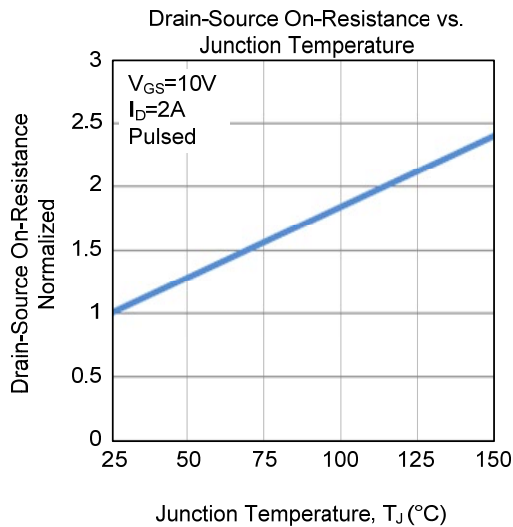
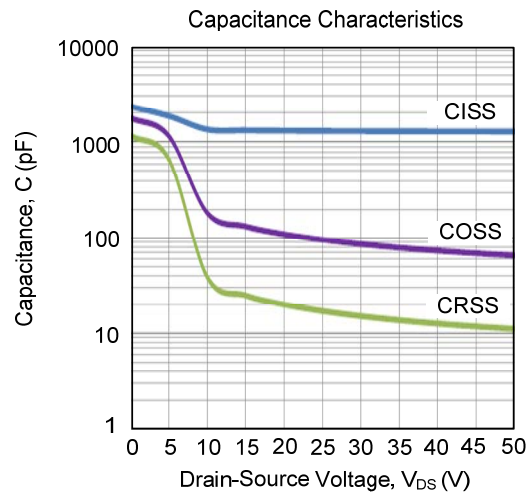
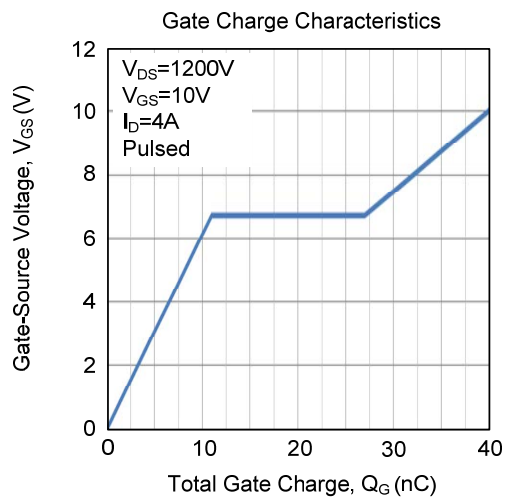
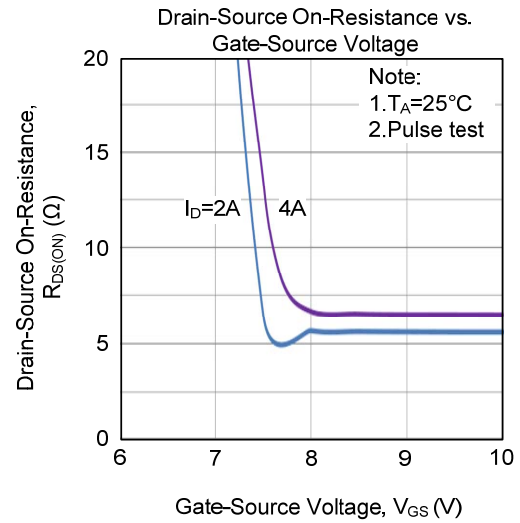
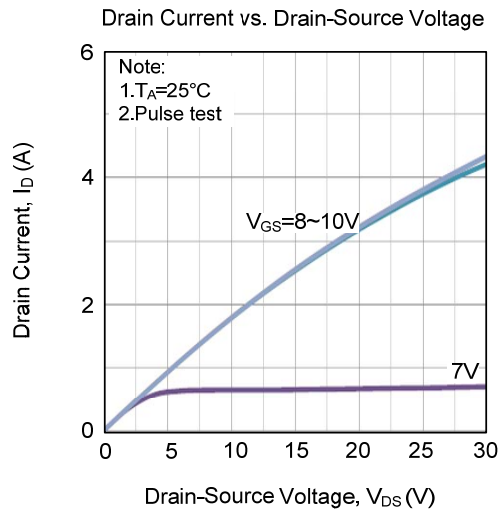
Unclamped Inductive Switching Test Circuit



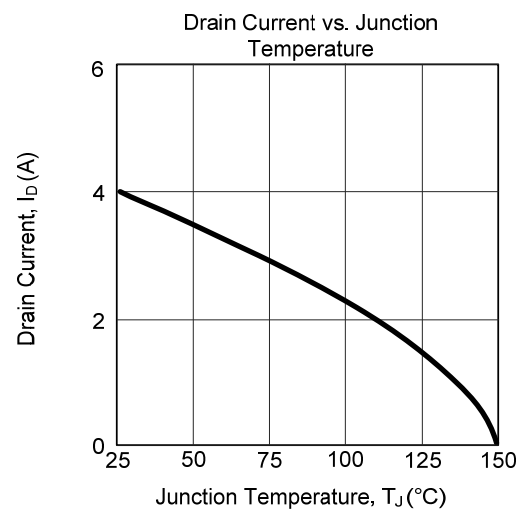
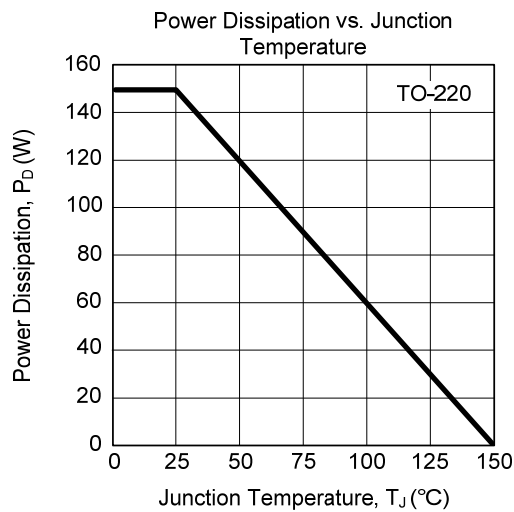
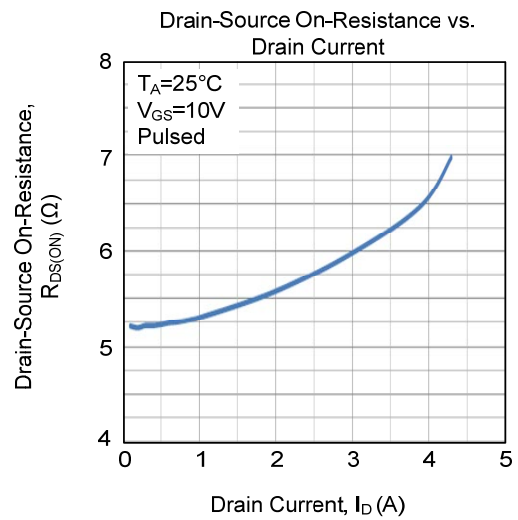
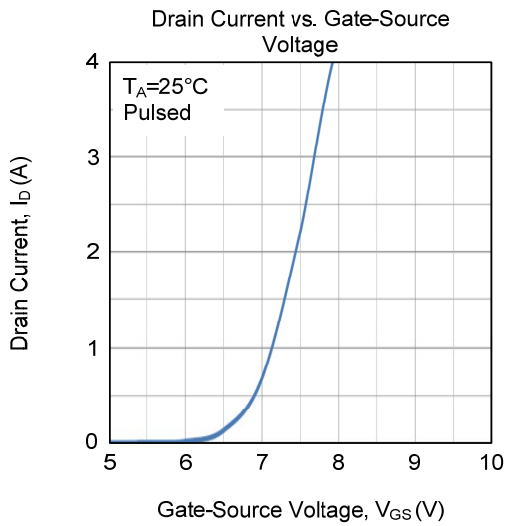
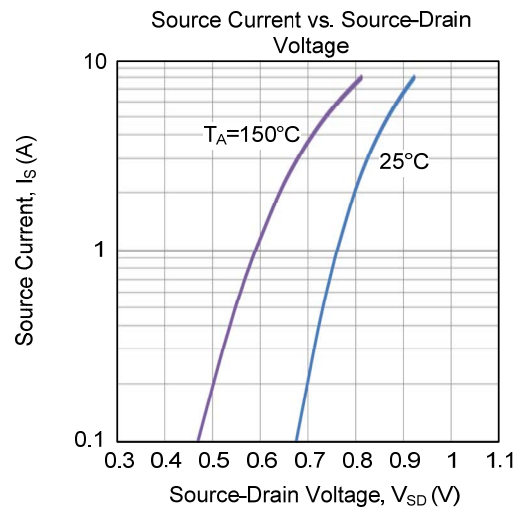
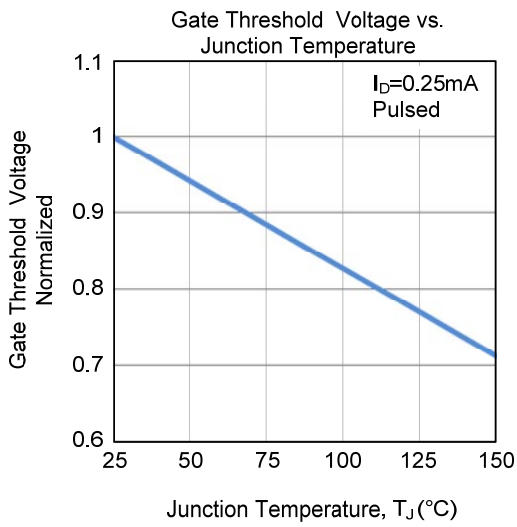
Unclamped Inductive Switching Waveforms



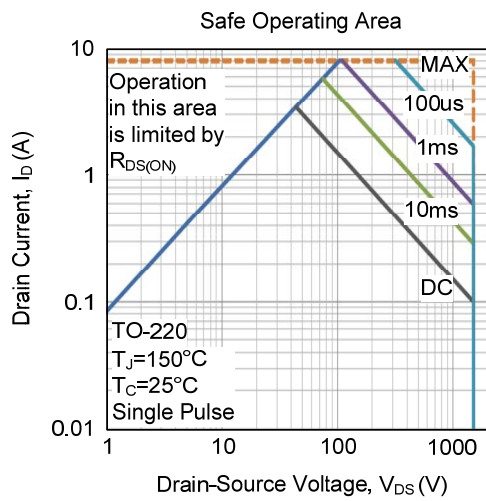
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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