



15NM70-U2

Power MOSFET

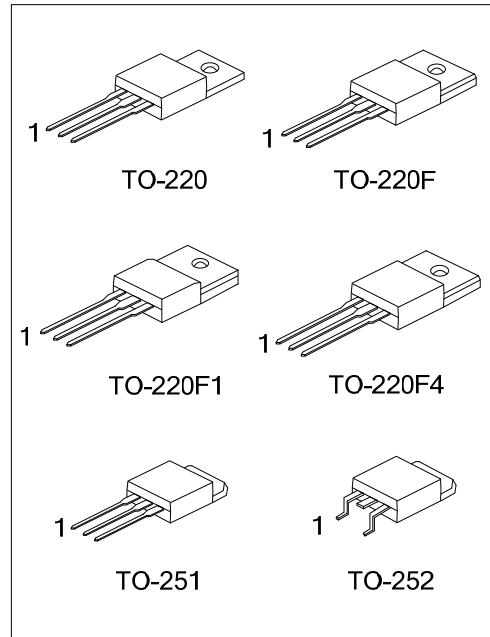
15A, 700V N-CHANNEL SUPER-JUNCTION MOSFET

■ DESCRIPTION

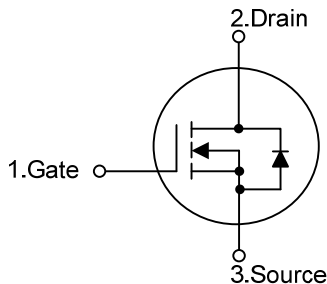
The **UTC 15NM70-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

■ FEATURES

- * $R_{DS(ON)} \leq 0.45 \Omega @ V_{GS}=10V, I_D=7.5A$
- * By using Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested



■ SYMBOL



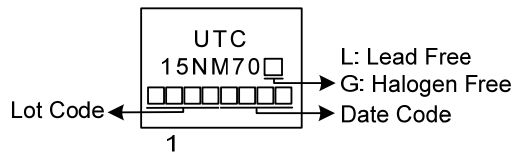
■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|-----------------|----------------|----------|----------------|---|---|-----------|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| 15NM70L-TA3-T | 15NM70G-TA3-T | TO-220 | G | D | S | Tube |
| 15NM70L-TF3-T | 15NM70G-TF3-T | TO-220F | G | D | S | Tube |
| 15NM70L-TF1-T | 15NM70G-TF1-T | TO-220F1 | G | D | S | Tube |
| 15NM70L-TF34-T | 15NM70G-TF34-T | TO-220F4 | G | D | S | Tube |
| 15NM70L-TM3-T | 15NM70G-TM3-T | TO-251 | G | D | S | Tube |
| 15NM70L-TN3-R | 15NM70G-TN3-R | TO-252 | G | D | S | Tape Reel |

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

| | |
|---|---|
| <p>15NM70G-TA3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TF34: TO-220F4, TM3: TO-251, TN3: TO-252</p> <p>(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} | 700 | V |
| Gate-Source Voltage | | V_{GSS} | ± 30 | V |
| Continuous Drain Current | Continuous | I_D | 15 | A |
| Pulsed Drain Current | Pulsed (Note 2) | I_{DM} | 30 | A |
| Avalanche Current (Note 3) | | I_{AR} | 2.4 | A |
| Avalanche energy | Single Pulsed (Note 3) | E_{AS} | 202.1 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 2.7 | V/nS |
| Power Dissipation | TO-220 | P_D | 94 | W |
| | TO-220F/TO-220F1 | | 32 | W |
| | TO-220F4 | | | |
| | TO-251/TO-252 | | 77 | W |
| Junction Temperature | | T_J | +150 | $^\circ\text{C}$ |
| Storage Temperature Range | | 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. $L=66\text{mH}$, $I_{AS}=2.4\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J = 25^\circ\text{C}$.

4. $I_{SD} \leq 15\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J = 25^\circ\text{C}$.

■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---------------------|-------------------|---------------|---------|---------------------------|
| Junction to Ambient | TO-220/TO-220F | θ_{JA} | 62.5 | $^\circ\text{C}/\text{W}$ |
| | TO-220F1/TO-220F4 | | | |
| | TO-251/TO-252 | | 110 | $^\circ\text{C}/\text{W}$ |
| Junction to Case | TO-220 | θ_{JC} | 1.32 | $^\circ\text{C}/\text{W}$ |
| | TO-220F/TO-220F1 | | 3.9 | $^\circ\text{C}/\text{W}$ |
| | TO-220F4 | | | |
| | TO-251/TO-252 | | 1.62 | $^\circ\text{C}/\text{W}$ |

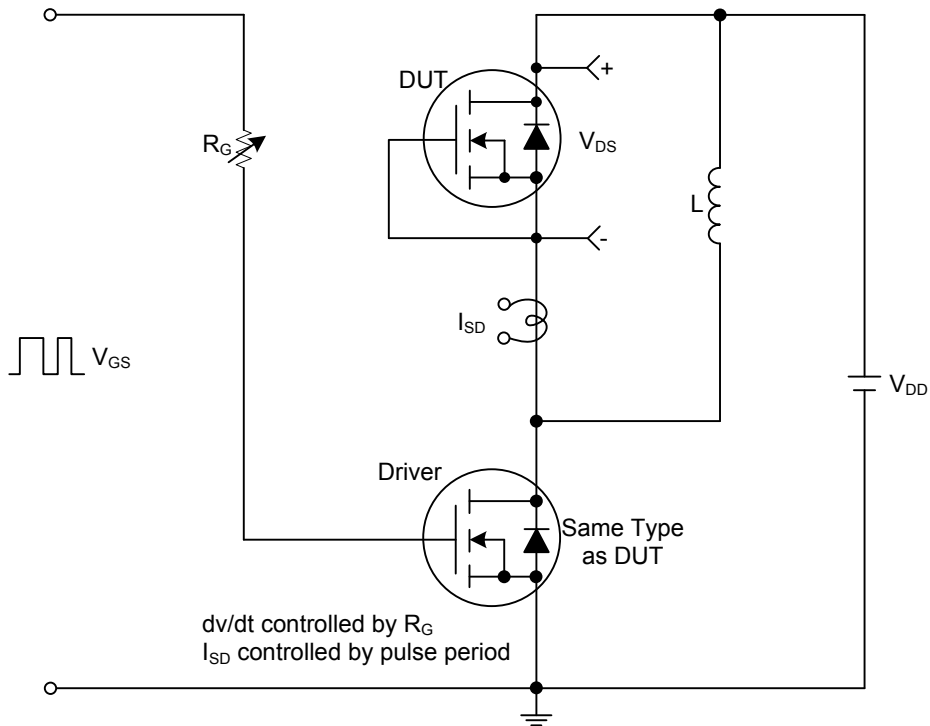
■ ELECTRICAL CHARACTERISTICS (T_J =25°C, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|---------------------|--|--|-------|------|------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 700 | | | V |
| Drain-Source Leakage Current | I _{DSS} | V _{DS} =700V, V _{GS} =0V | | | 10 | μA |
| Gate-Source Leakage Current | Forward | V _{DS} =0V, V _{GS} =+30V | | | +100 | nA |
| | Reverse | | V _{DS} =0V, V _{GS} =-30V | | | -100 |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | V _{DS} = V _{GS} , I _D =250μA | 2.5 | | 4.5 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =7.5A | | | 0.45 | Ω |
| DYNAMIC PARAMETERS | | | | | | |
| Input Capacitance | C _{ISS} | V _{GS} =0V, V _{DS} =25V, f=1.0MHz | | 933.7 | | pF |
| Output Capacitance | C _{OSS} | | | 594.7 | | pF |
| Reverse Transfer Capacitance | C _{RSS} | | | 52.8 | | pF |
| SWITCHING PARAMETERS | | | | | | |
| Total Gate Charge (Note 1) | Q _G | V _{DS} =560V, V _{GS} =10V, I _D =15A, I _G =1mA (Note 1, 2) | | 32.4 | 45 | nC |
| Gate to Source Charge | Q _{GS} | | | 9 | | nC |
| Gate to Drain Charge | Q _{GD} | | | 11.4 | | nC |
| Turn-on Delay Time (Note 1) | t _{D(ON)} | V _{DD} =100V, V _{GS} =10V, I _D =15A, R _G =25Ω (Note 1, 2) | | 10.6 | | ns |
| Rise Time | t _R | | | 23.6 | | ns |
| Turn-off Delay Time | t _{D(OFF)} | | | 110.6 | | ns |
| Fall-Time | t _F | | | 59.3 | | ns |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS | | | | | | |
| Maximum Body-Diode Pulsed Current | I _S | | | | 15 | A |
| Maximum Body-Diode Continuous Current | I _{SM} | | | | 60 | A |
| Drain-Source Diode Forward Voltage (Note 1) | V _{SD} | I _S =15A, V _{GS} =0V | | | 1.4 | V |
| Reverse Recovery Time (Note 1) | t _{rr} | I _S =15A, V _{GS} =0V, dI _F /dt=100A/μs | | 410.6 | | ns |
| Reverse Recovery Charge | Q _{rr} | | | | 13.1 | |

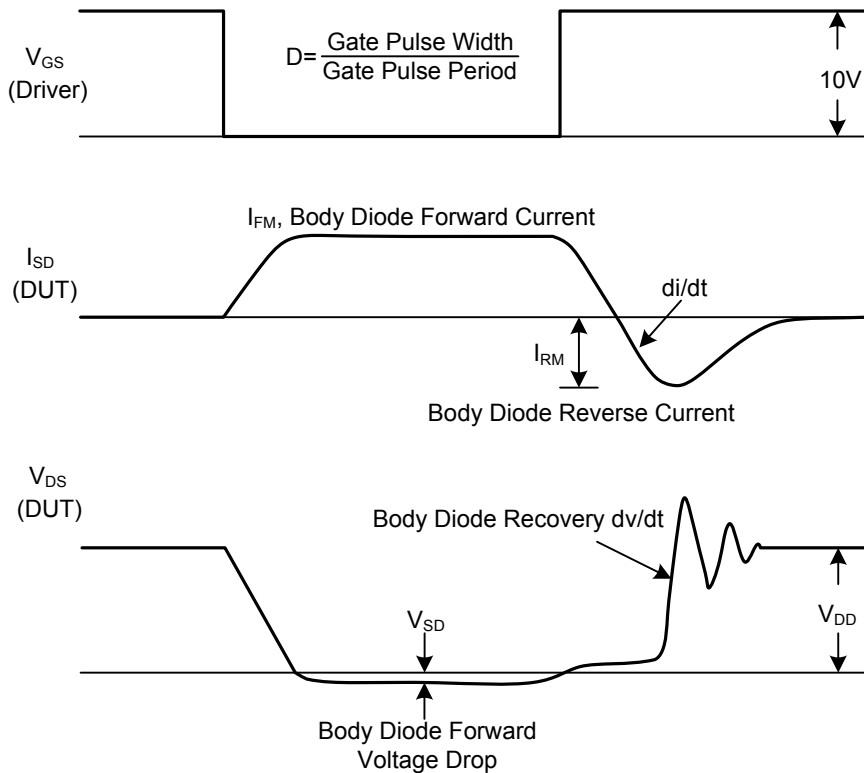
Note: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS



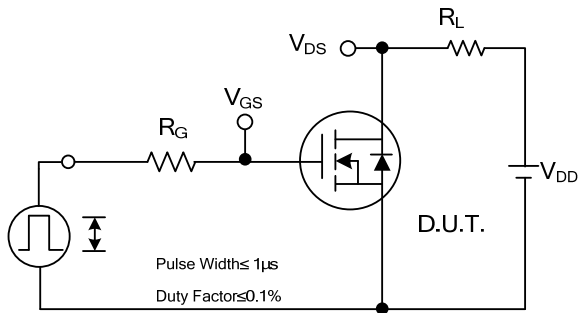
Peak Diode Recovery dv/dt Test Circuit



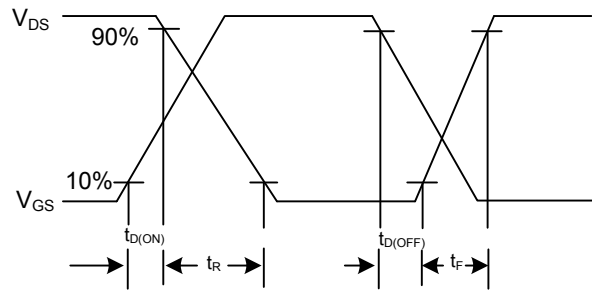
Peak Diode Recovery dv/dt Test Circuit and Waveforms

Peak Diode Recovery dv/dt Waveforms

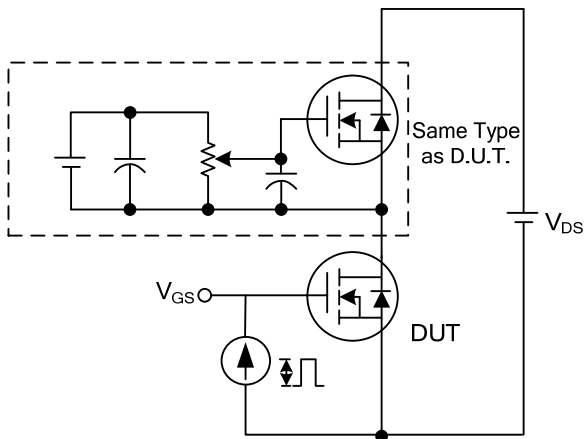
TEST CIRCUITS AND WAVEFORMS



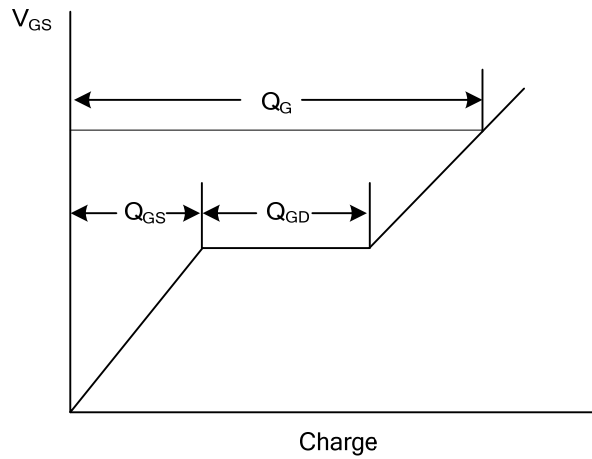
Switching Test Circuit



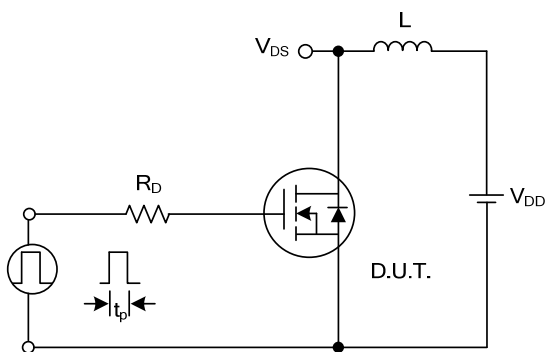
Switching Waveforms



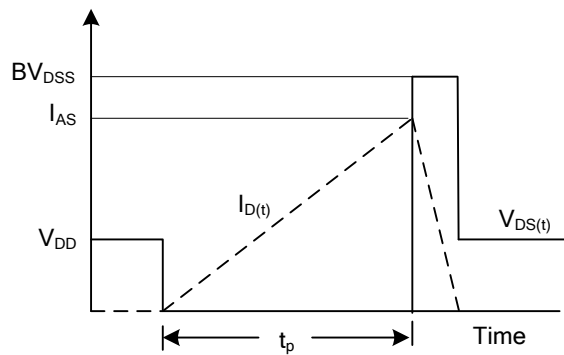
Gate Charge Test Circuit



Gate Charge Waveform

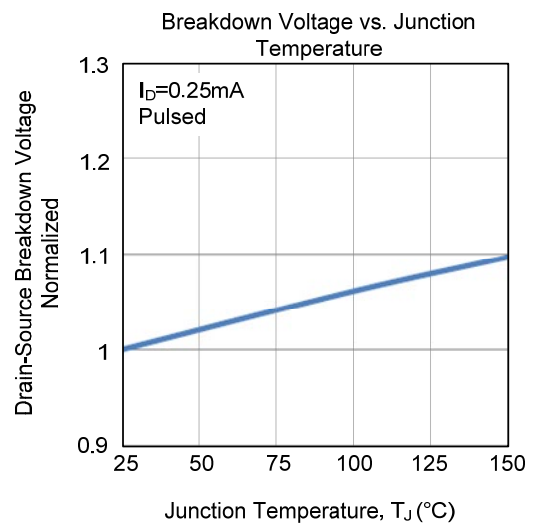
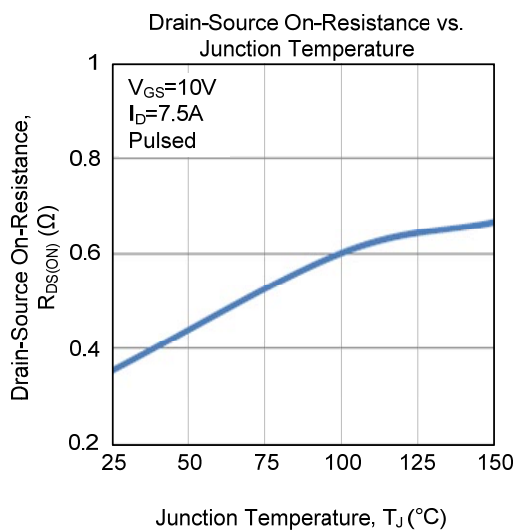
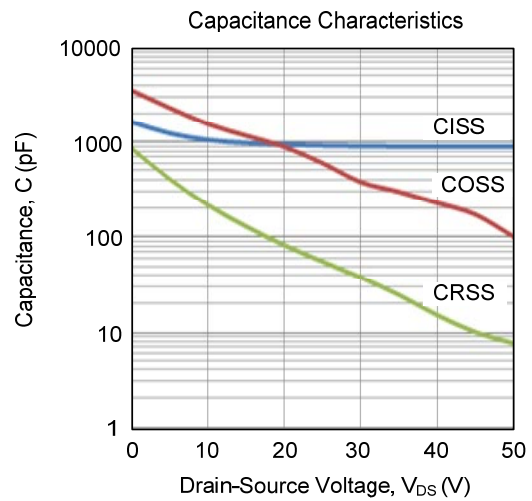
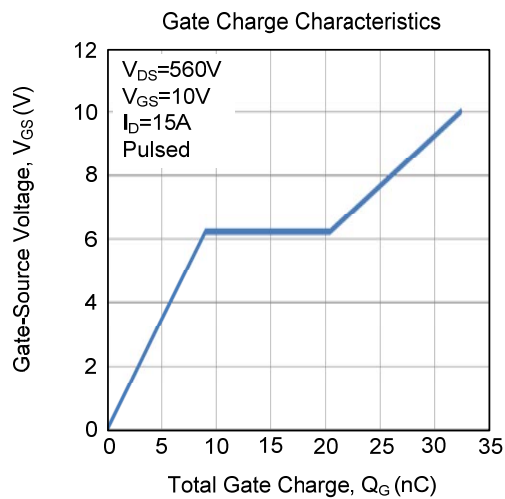
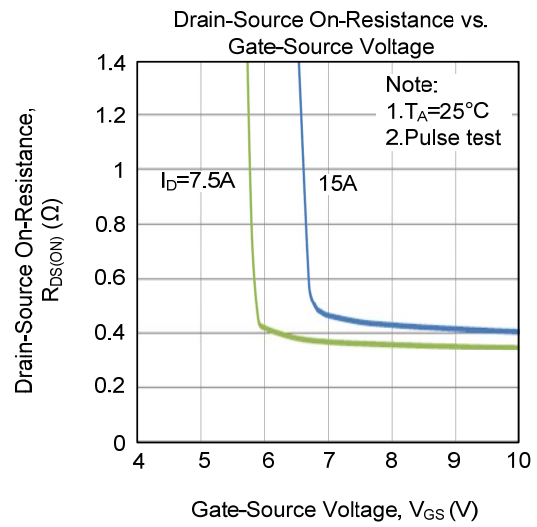
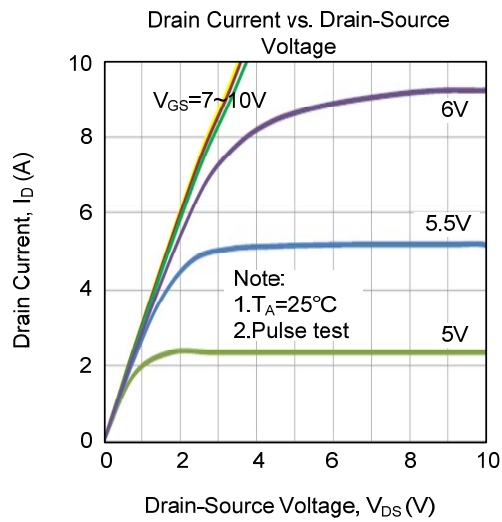


Unclamped Inductive Switching Test Circuit

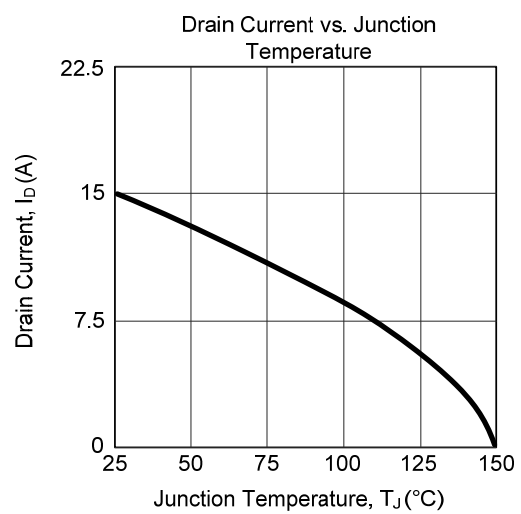
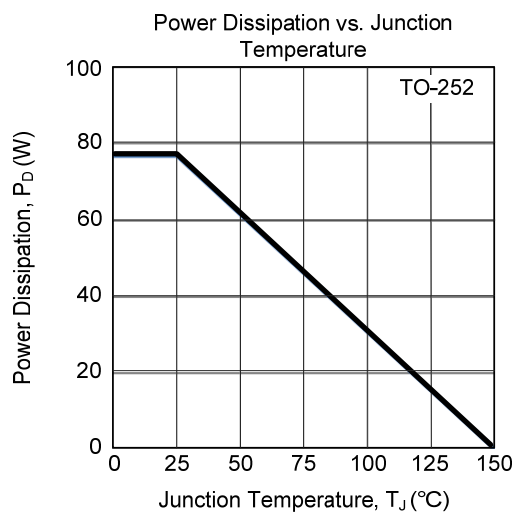
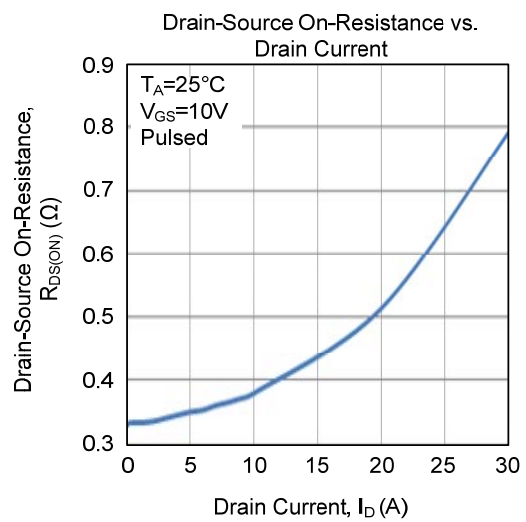
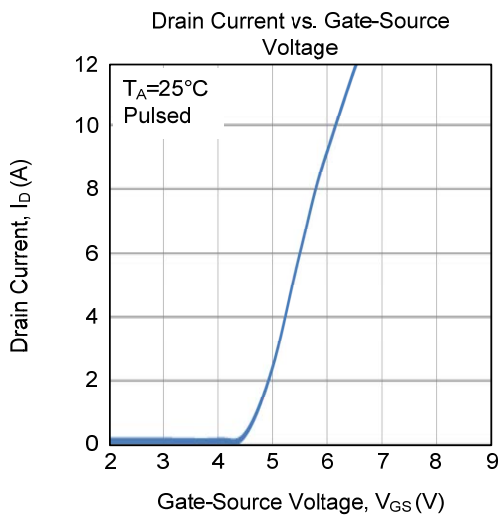
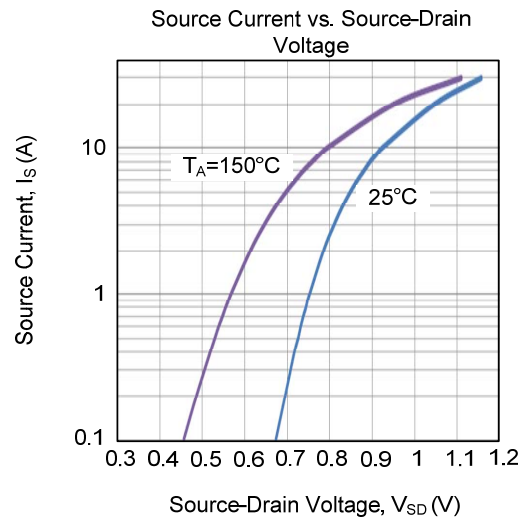
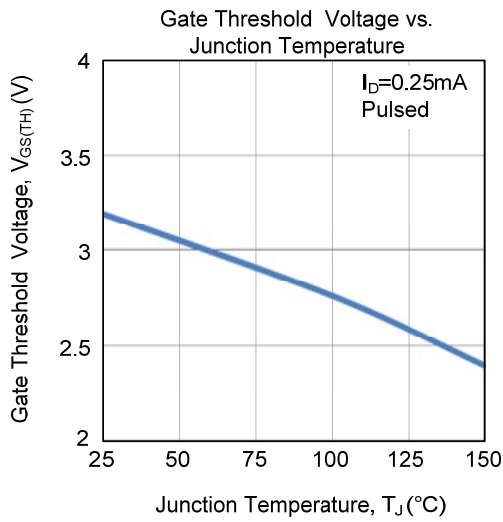


Unclamped Inductive Switching Waveforms

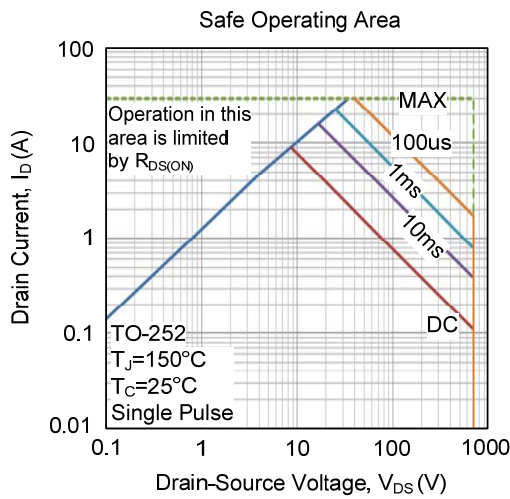
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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