

**15N40K-MT****Power MOSFET****15A, 400V N-CHANNEL  
POWER MOSFET****DESCRIPTION**

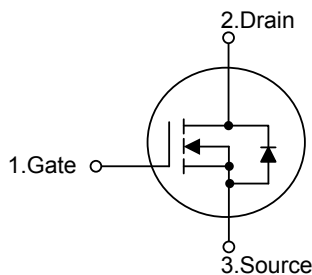
The UTC **15N40K-MT** is an N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology allows a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **15N40K-MT** is generally applied in high efficiency switch mode power supplies.

**FEATURES**

\*  $R_{DS(ON)} \leq 0.30 \Omega$  @  $V_{GS} = 10V$ ,  $I_D = 7.5A$

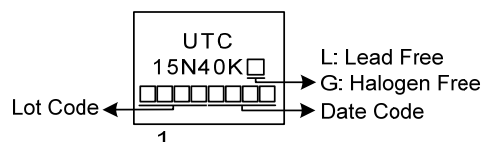
\* High Switching Speed

**SYMBOL****ORDERING INFORMATION**

| Ordering Number |               | Package  | Pin Assignment |   |   | Packing |
|-----------------|---------------|----------|----------------|---|---|---------|
| Lead Free       | Halogen Free  |          | 1              | 2 | 3 |         |
| 15N40KL-TF1-T   | 15N40KG-TF1-T | TO-220F1 | G              | D | S | Tube    |
| 15N40KL-TF2-T   | 15N40KG-TF2-T | TO-220F2 | G              | D | S | Tube    |
| 15N40KL-TF3-T   | 15N40KG-TF3-T | TO-220F  | G              | D | S | Tube    |

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

|                                                                                               |                                                                                                                                 |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <p>15N40KG-TF2-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> | <p>(1) T: Tube</p> <p>(2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F</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.) (Note 5)

| PARAMETER                                      |                        |                          | SYMBOL    | RATINGS    | UNIT |
|------------------------------------------------|------------------------|--------------------------|-----------|------------|------|
| Drain to Source Voltage                        |                        |                          | $V_{DSS}$ | 400        | V    |
| Gate-Source Voltage                            |                        |                          | $V_{GSS}$ | ±30        | V    |
| Drain Current                                  | Continuous             | $T_C=25^{\circ}\text{C}$ | $I_D$     | 15         | A    |
|                                                | Pulsed (Note 2)        |                          | $I_{DM}$  | 30         | A    |
| Avalanche Energy                               | Single Pulsed (Note 3) |                          | $E_{AS}$  | 756        | mJ   |
| Peak Diode Recovery dv/dt (Note 4)             |                        |                          | dv/dt     | 2.01       | V/ns |
| Power Dissipation ( $T_C=25^{\circ}\text{C}$ ) |                        |                          | $P_D$     | 38         | W    |
| Junction Temperature                           |                        |                          | $T_J$     | +150       | °C   |
| Storage Temperature                            |                        |                          | $T_{STG}$ | -55 ~ +150 | °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.  $L=30\text{mH}$ ,  $I_{AS}=7.1\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$

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

5. Drain current limited by maximum junction temperature.

### ■ THERMAL DATA

| PARAMETER           | SYMBOL        | RATINGS | UNIT                        |
|---------------------|---------------|---------|-----------------------------|
| Junction to Ambient | $\theta_{JA}$ | 62.5    | $^{\circ}\text{C}/\text{W}$ |
| Junction to Case    | $\theta_{JC}$ | 3.28    | $^{\circ}\text{C}/\text{W}$ |

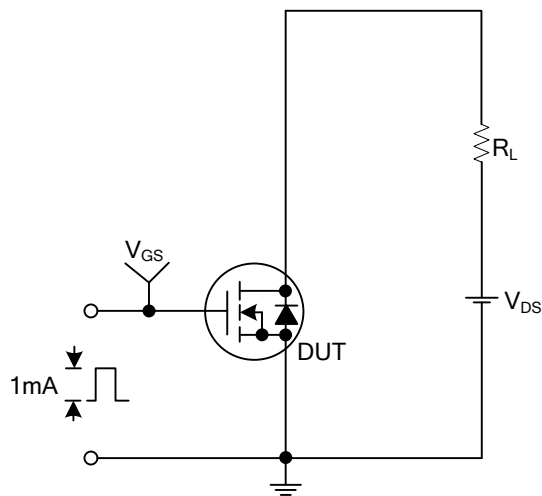
### ■ ELECTRICAL CHARACTERISTICS

| PARAMETER                                       |         | SYMBOL              | TEST CONDITIONS                                                                 | MIN | TYP  | MAX  | UNIT |
|-------------------------------------------------|---------|---------------------|---------------------------------------------------------------------------------|-----|------|------|------|
| OFF CHARACTERISTICS                             |         |                     |                                                                                 |     |      |      |      |
| Drain-Source Breakdown Voltage                  |         | BV <sub>DSS</sub>   | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                | 400 |      |      | V    |
| Drain-Source Leakage Current                    |         | I <sub>DSS</sub>    | V <sub>DS</sub> =400V, V <sub>GS</sub> =0V                                      |     |      | 10   | μA   |
|                                                 |         |                     | V <sub>DS</sub> =320V, T <sub>C</sub> =125°C                                    |     |      | 10   | μA   |
| Gate- Source Leakage Current                    | Forward | I <sub>GSS</sub>    | V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V                                      |     |      | +100 | nA   |
|                                                 | Reverse |                     | V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V                                      |     |      | -100 | nA   |
| ON CHARACTERISTICS                              |         |                     |                                                                                 |     |      |      |      |
| Gate Threshold Voltage                          |         | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA                        | 2.0 |      | 4.0  | V    |
| Static Drain-Source On-State Resistance         |         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A                                      |     | 0.23 | 0.30 | Ω    |
| DYNAMIC PARAMETERS                              |         |                     |                                                                                 |     |      |      |      |
| Input Capacitance                               |         | C <sub>ISS</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz                             |     | 1720 |      | pF   |
| Output Capacitance                              |         | C <sub>OSS</sub>    |                                                                                 |     | 220  |      | pF   |
| Reverse Transfer Capacitance                    |         | C <sub>RSS</sub>    |                                                                                 |     | 13   |      | pF   |
| SWITCHING PARAMETERS                            |         |                     |                                                                                 |     |      |      |      |
| Total Gate Charge                               |         | Q <sub>G</sub>      | V <sub>DS</sub> =320V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A<br>(Note 1, 2) |     | 45   |      | nC   |
| Gate to Source Charge                           |         | Q <sub>GS</sub>     |                                                                                 |     | 14   |      | nC   |
| Gate to Drain ("Miller") Charge                 |         | Q <sub>GD</sub>     |                                                                                 |     | 12   |      | nC   |
| Turn-ON Delay Time                              |         | t <sub>D(ON)</sub>  | V <sub>DS</sub> =100V, I <sub>D</sub> =15A, R <sub>G</sub> =25Ω<br>(Note 1, 2)  |     | 22   |      | ns   |
| Rise Time                                       |         | t <sub>R</sub>      |                                                                                 |     | 25   |      | ns   |
| Turn-OFF Delay Time                             |         | t <sub>D(OFF)</sub> |                                                                                 |     | 130  |      | ns   |
| Fall-Time                                       |         | t <sub>F</sub>      |                                                                                 |     | 33   |      | ns   |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS |         |                     |                                                                                 |     |      |      |      |
| Maximum Body-Diode Continuous Current           |         | I <sub>S</sub>      |                                                                                 |     |      | 15   | A    |
| Maximum Body-Diode Pulsed Current               |         | I <sub>SM</sub>     |                                                                                 |     |      | 30   | A    |
| Drain-Source Diode Forward Voltage              |         | V <sub>SD</sub>     | I <sub>SD</sub> =15A, V <sub>GS</sub> =0V                                       |     |      | 1.4  | V    |
| Reverse Recovery Time (Note 1)                  |         | t <sub>rr</sub>     | I <sub>S</sub> =15A, V <sub>GS</sub> =0V,                                       |     | 250  |      | nS   |
| Reverse Recovery Charge                         |         | Q <sub>rr</sub>     | dl <sub>F</sub> /dt =100A/μs                                                    |     | 7.8  |      | μC   |

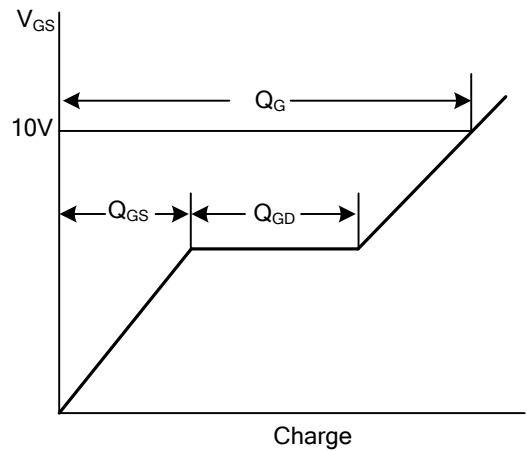
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ ; Duty Cycle  $\leq 2\%$ .

2. Essentially Independent of Operating Temperature Typical Characteristics.

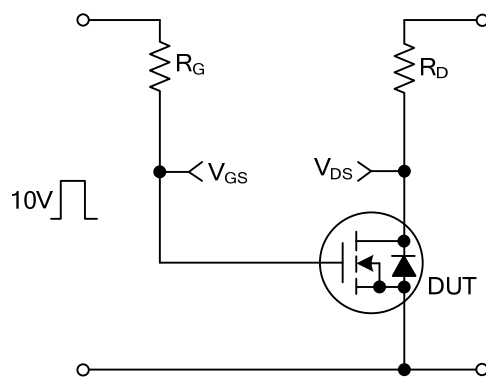
### ■ TEST CIRCUITS AND WAVEFORMS



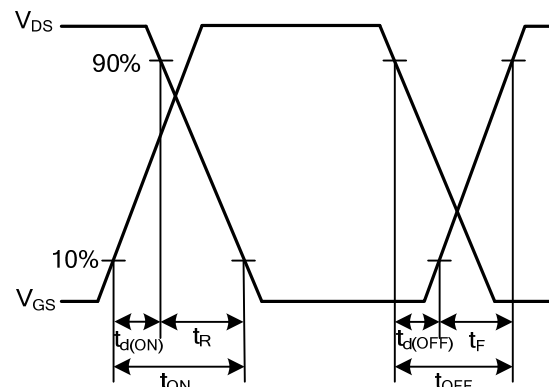
Gate Charge Test Circuit



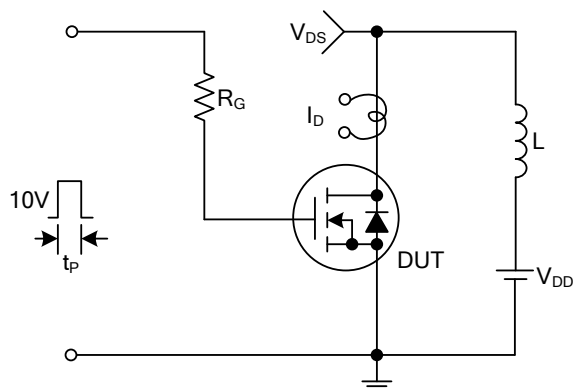
Gate Charge Waveforms



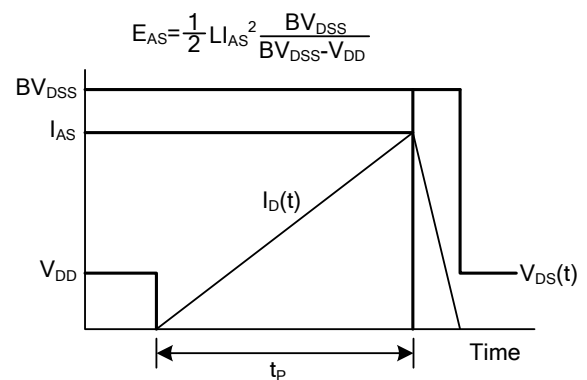
Resistive Switching Test Circuit



Resistive Switching Waveforms



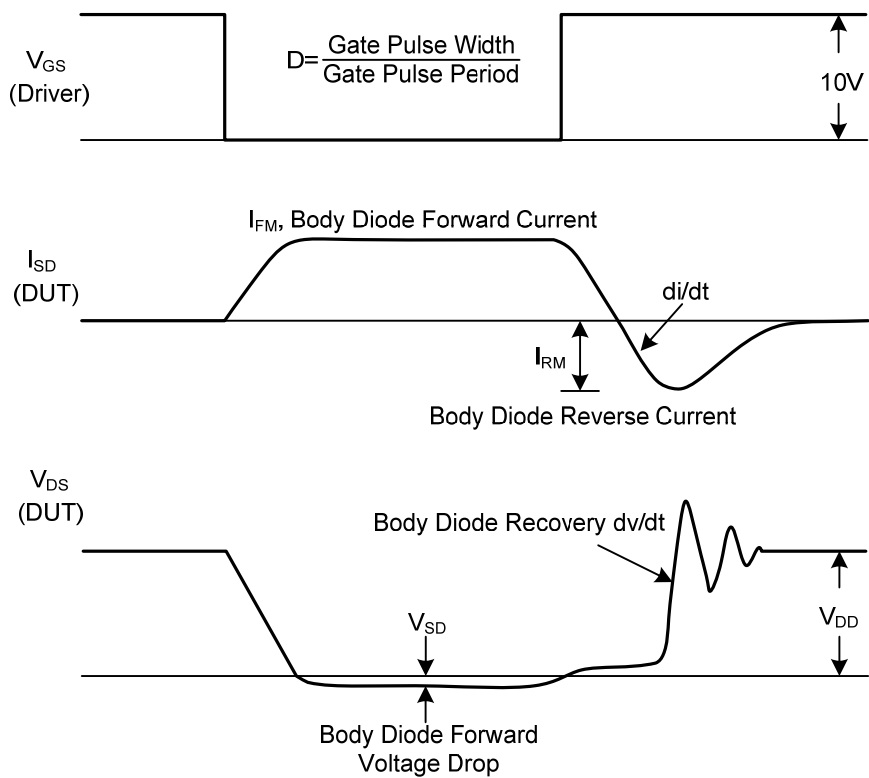
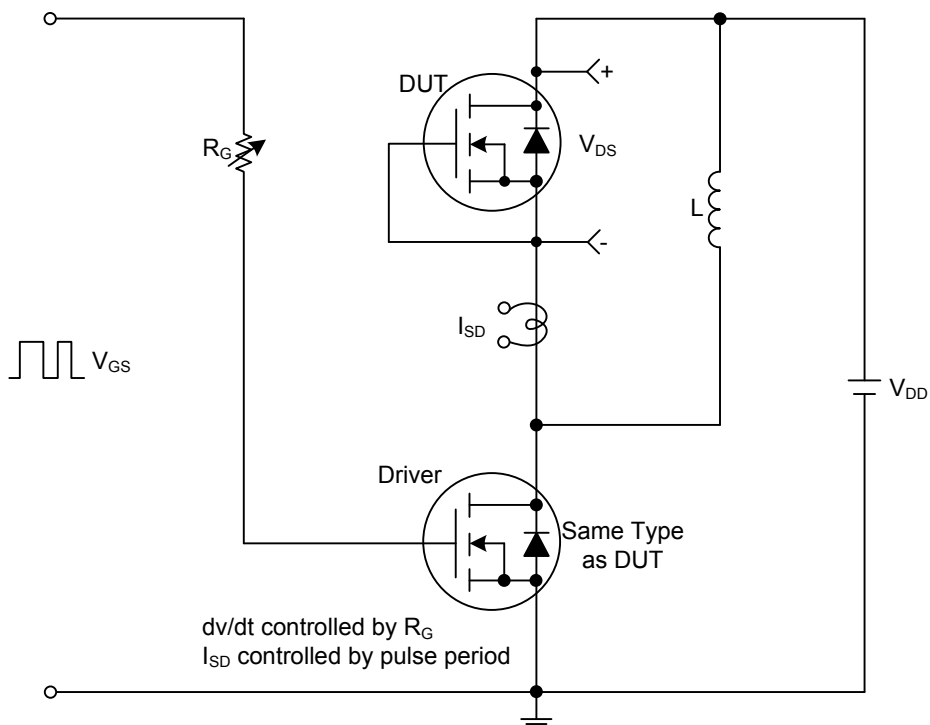
Unclamped Inductive Switching Test Circuit



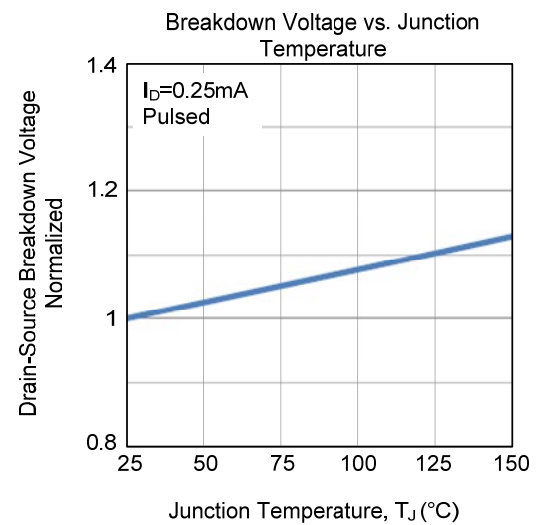
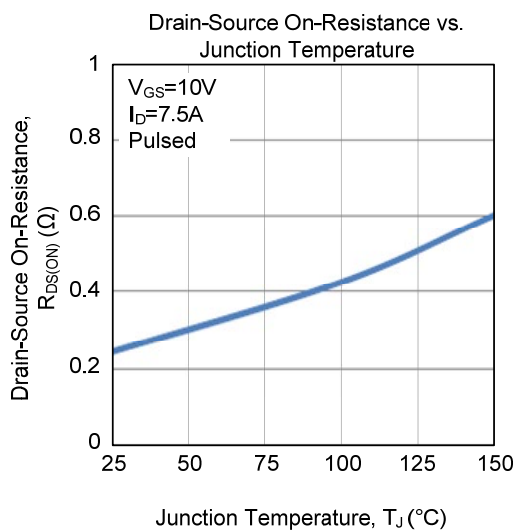
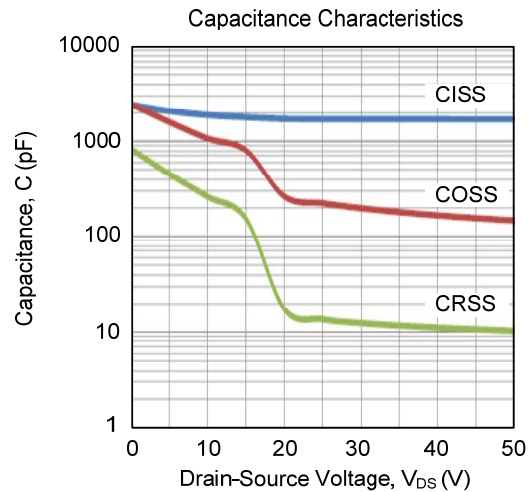
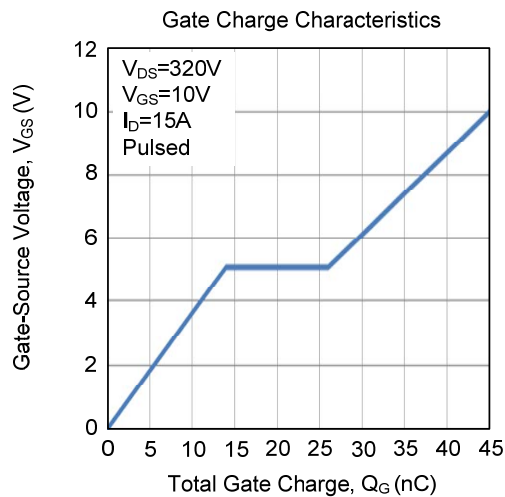
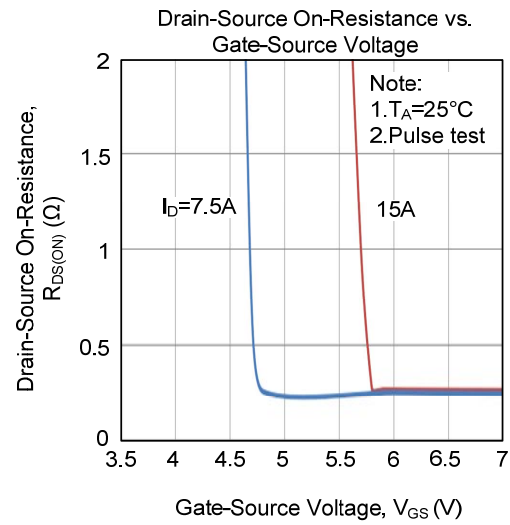
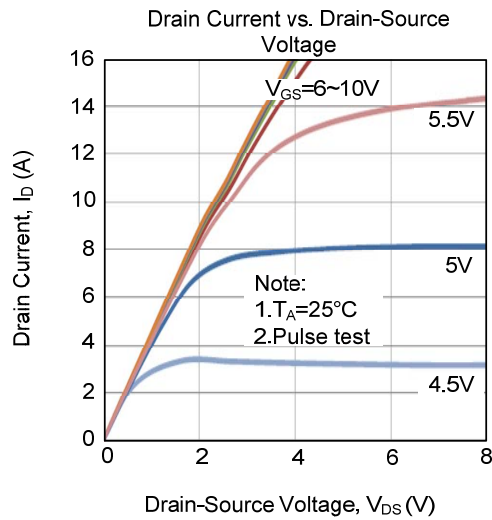
Unclamped Inductive Switching Waveforms

## ■ TEST CIRCUITS AND WAVEFORMS

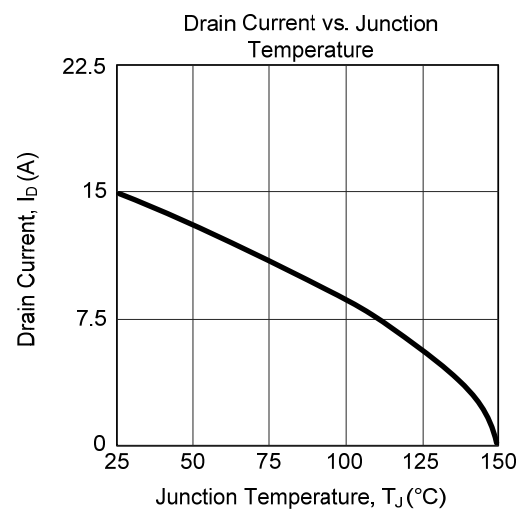
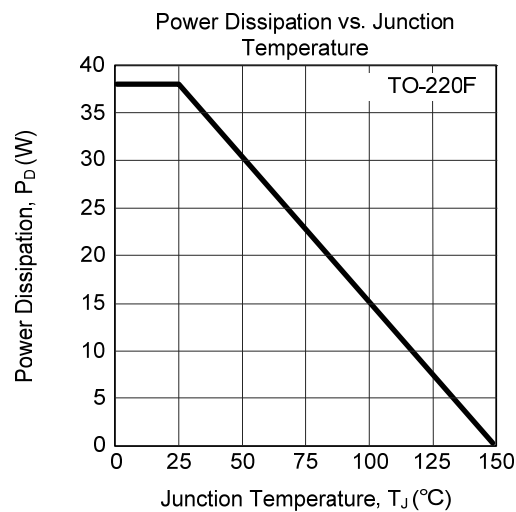
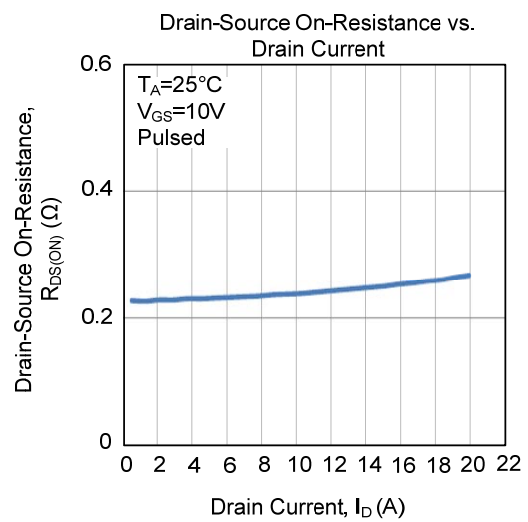
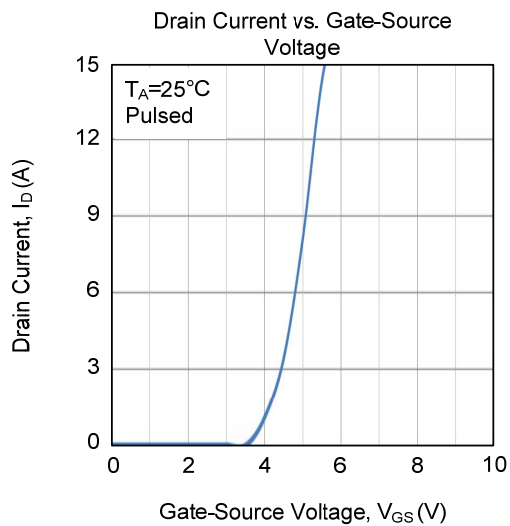
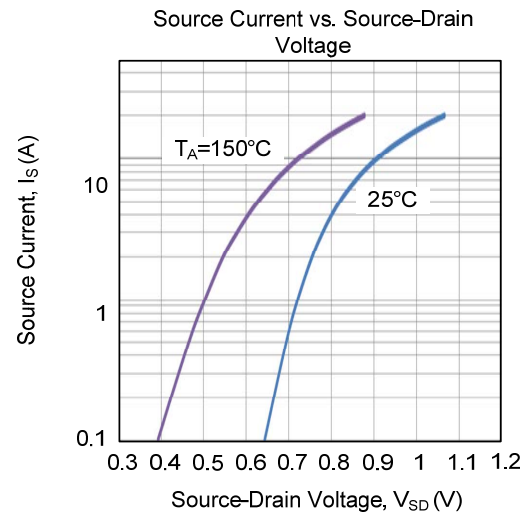
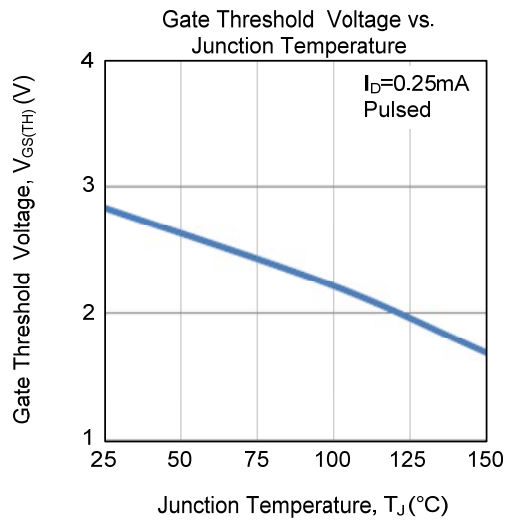
## Peak Diode Recovery dv/dt Test Circuit & Waveforms



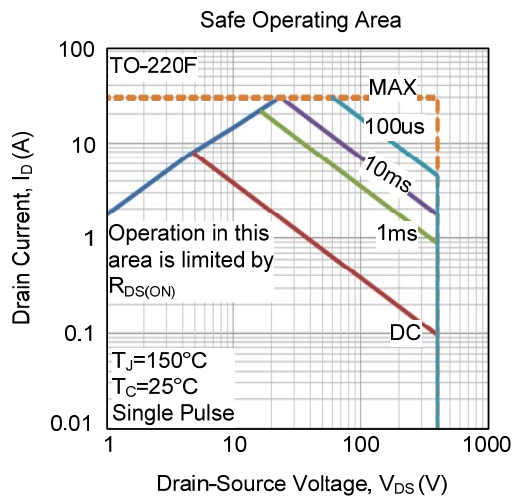
### ■ TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS (Cont.)



## ■ TYPICAL CHARACTERISTICS (Cont.)



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