



## USG15R065H-N

## POWER MOSFET

### 200A, 150V N-CHANNEL POWER MOSFET

#### DESCRIPTION

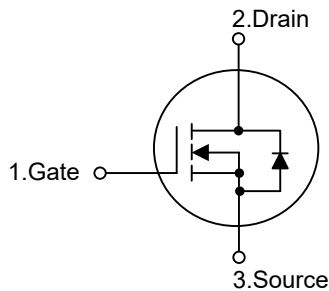
The UTC **USG15R065H-N** is a Silicon N-channel Power MOSFET, it are designed with fast reverse recovery times that enhance efficiency in high-speed switching applications by reducing the delay between the turn-off and turn-on states. The low drain-source on-resistance  $R_{DS(ON)}$  contributes to minimal power losses and improved thermal management, making them ideal for applications requiring high current handling with low energy dissipation.

The UTC **USG15R065H-N** have better characteristics, including fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics.

#### FEATURES

- \*  $R_{DS(ON)} \leq 6.5 \text{ m}\Omega$  @  $V_{GS}=10\text{V}$ ,  $I_D=30\text{A}$
- \* High ruggedness
- \* Improved dv/dt Capability
- \* 100% Avalanche Tested

#### SYMBOL

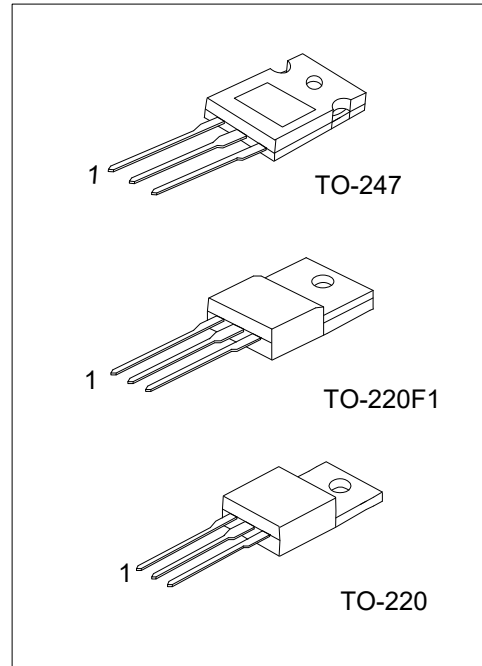


#### ORDERING INFORMATION

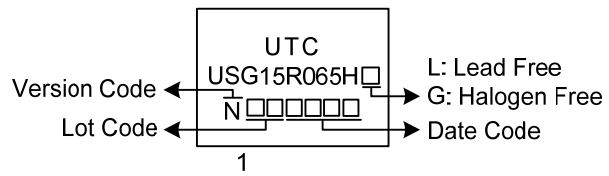
| Ordering Number     |                     | Package  | Pin Assignment |   |   | Packing |
|---------------------|---------------------|----------|----------------|---|---|---------|
| Lead Free           | Halogen Free        |          | 1              | 2 | 3 |         |
| USG15R065HL-N-TA3-T | USG15R065HG-N-TA3-T | TO-220   | G              | D | S | Tube    |
| USG15R065HL-N-TF1-T | USG15R065HG-N-TF1-T | TO-220F1 | G              | D | S | Tube    |
| USG15R065HL-N-T47-T | USG15R065HG-N-T47-T | TO-247   | G              | D | S | Tube    |

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

|                     |                  |                                                 |
|---------------------|------------------|-------------------------------------------------|
| USG15R065HG-N-TA3-T | (1)Packing Type  | (1) T: Tube                                     |
|                     | (2)Package Type  | (2) TA3: TO-220, TF1: TO-220F1, T47: TO-247     |
|                     | (3)Version Code  | (3) Version N                                   |
|                     | (4)Green Package | (4) G: Halogen Free and Lead Free, L: Lead Free |



## ■ MARKING



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

| PARAMETER                               |                 |                       | SYMBOL           | RATINGS    | UNIT |
|-----------------------------------------|-----------------|-----------------------|------------------|------------|------|
| Drain-Source Voltage                    |                 |                       | V <sub>DSS</sub> | 150        | V    |
| Gate-Source Voltage                     |                 |                       | V <sub>GSS</sub> | ±20        | V    |
| Drain Current                           | Continuous      | T <sub>C</sub> =25°C  | I <sub>D</sub>   | 200        | A    |
|                                         |                 | T <sub>C</sub> =100°C |                  | 154        | A    |
|                                         | Pulsed (Note 2) |                       | I <sub>DM</sub>  | 800        | A    |
| Single Pulsed Avalanche Energy (Note 4) |                 |                       | E <sub>AS</sub>  | 400        | mJ   |
| Peak Diode Recovery dv/dt (Note 5)      |                 |                       | dv/dt            | 5.5        | V/ns |
| Power Dissipation                       | TO-220          |                       | P <sub>D</sub>   | 463        | W    |
|                                         | TO-220F1        |                       |                  | 48         | W    |
|                                         | TO-247          |                       |                  | 517        | W    |
| Junction Temperature                    |                 |                       | T <sub>J</sub>   | +150       | °C   |
| Storage Temperature Range               |                 |                       | T <sub>STG</sub> | -20 ~ +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. Drain current is limited by junction temperature.

4.  $L=0.5\text{mH}$ ,  $I_{AS}=40\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .

5.  $I_{SD}\leq 30\text{A}$ ,  $di/dt\leq 100\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^{\circ}\text{C}$

■ THERMAL DATA

| PARAMETER           |                  | SYMBOL        | RATINGS | UNIT                        |
|---------------------|------------------|---------------|---------|-----------------------------|
| Junction to Ambient | TO-220/ TO-220F1 | $\theta_{JA}$ | 62.5    | $^{\circ}\text{C}/\text{W}$ |
|                     | TO-247           |               | 40      | $^{\circ}\text{C}/\text{W}$ |
| Junction to Case    | TO-220           | $\theta_{JC}$ | 0.27    | $^{\circ}\text{C}/\text{W}$ |
|                     | TO-220F1         |               | 2.6     | $^{\circ}\text{C}/\text{W}$ |
|                     | TO-247           |               | 0.24    | $^{\circ}\text{C}/\text{W}$ |

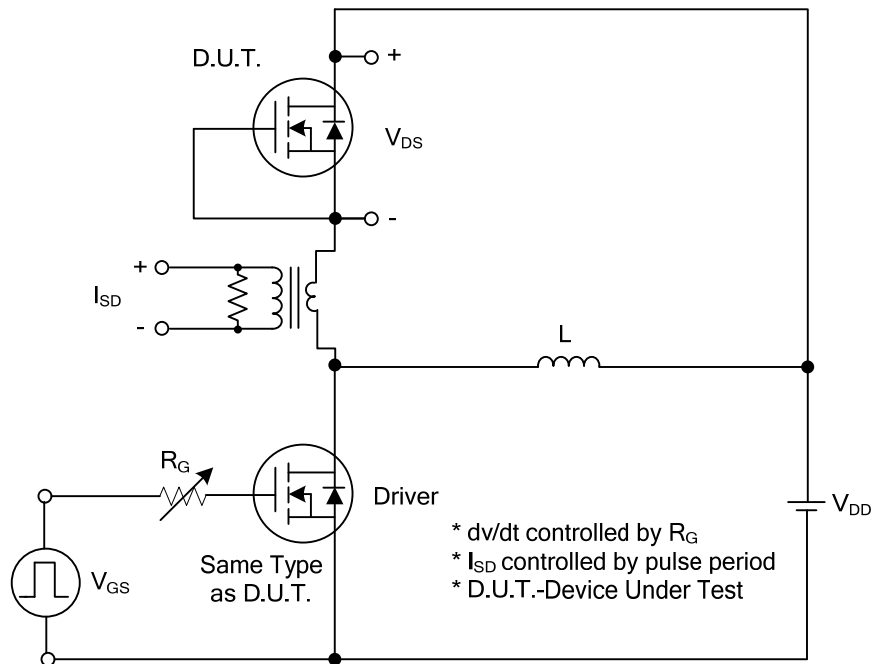
■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| 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                                                      | 150 |       |      | V    |
| Drain-Source Leakage Current                    |         | I <sub>DSS</sub>    | V <sub>DS</sub> =150V, V <sub>GS</sub> =0V                                                      |     |       | 1    | μA   |
| Gate-Source Leakage Current                     | Forward | I <sub>GSS</sub>    | V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V                                                      |     |       | +100 | nA   |
|                                                 | Reverse |                     | V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V                                                      |     |       | -100 | nA   |
| ON CHARACTERISTICS                              |         |                     |                                                                                                 |     |       |      |      |
| Gate Threshold Voltage                          |         | V <sub>GS(TH)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA                                       | 2.5 |       | 4.5  | V    |
| Static Drain-Source On-State Resistance         |         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =30A                                                       |     | 4.1   | 6.5  | mΩ   |
| DYNAMIC PARAMETERS                              |         |                     |                                                                                                 |     |       |      |      |
| Input Capacitance                               |         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =50V, f=1MHz                                               |     | 10450 |      | pF   |
| Output Capacitance                              |         | C <sub>OSS</sub>    |                                                                                                 |     | 2350  |      | pF   |
| Reverse Transfer Capacitance                    |         | C <sub>RSS</sub>    |                                                                                                 |     | 54    |      | pF   |
| SWITCHING PARAMETERS                            |         |                     |                                                                                                 |     |       |      |      |
| Total Gate Charge                               |         | Q <sub>G</sub>      | V <sub>DS</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =30A, (Note 1, 2)                   |     | 190   |      | nC   |
| Gate to Source Charge                           |         | Q <sub>GS</sub>     |                                                                                                 |     | 68    |      | nC   |
| Gate to Drain Charge                            |         | Q <sub>GD</sub>     |                                                                                                 |     | 50    |      | nC   |
| Turn-on Delay Time                              |         | t <sub>D(ON)</sub>  | V <sub>DD</sub> =75V, V <sub>GS</sub> =10V, I <sub>D</sub> =30A, R <sub>G</sub> =3Ω (Note 1, 2) |     | 37    |      | ns   |
| Rise Time                                       |         | t <sub>R</sub>      |                                                                                                 |     | 36    |      | ns   |
| Turn-off Delay Time                             |         | t <sub>D(OFF)</sub> |                                                                                                 |     | 78    |      | ns   |
| Fall-Time                                       |         | t <sub>F</sub>      |                                                                                                 |     | 30    |      | ns   |
| SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS |         |                     |                                                                                                 |     |       |      |      |
| Maximum Body-Diode Continuous Current           |         | I <sub>S</sub>      |                                                                                                 |     |       | 200  | A    |
| Maximum Body-Diode Pulsed Current               |         | I <sub>SM</sub>     |                                                                                                 |     |       | 800  | A    |
| Drain-Source Diode Forward Voltage              |         | V <sub>SD</sub>     | I <sub>S</sub> =50A, V <sub>GS</sub> =0V                                                        |     |       | 1.4  | V    |
| Reverse Recovery Time                           |         | t <sub>rr</sub>     | I <sub>S</sub> =30A, V <sub>GS</sub> =0V,                                                       |     | 119   |      | ns   |
| Reverse Recovery Charge                         |         | Q <sub>rr</sub>     | dI <sub>F</sub> /dt =100A/μs                                                                    |     | 540   |      | nC   |

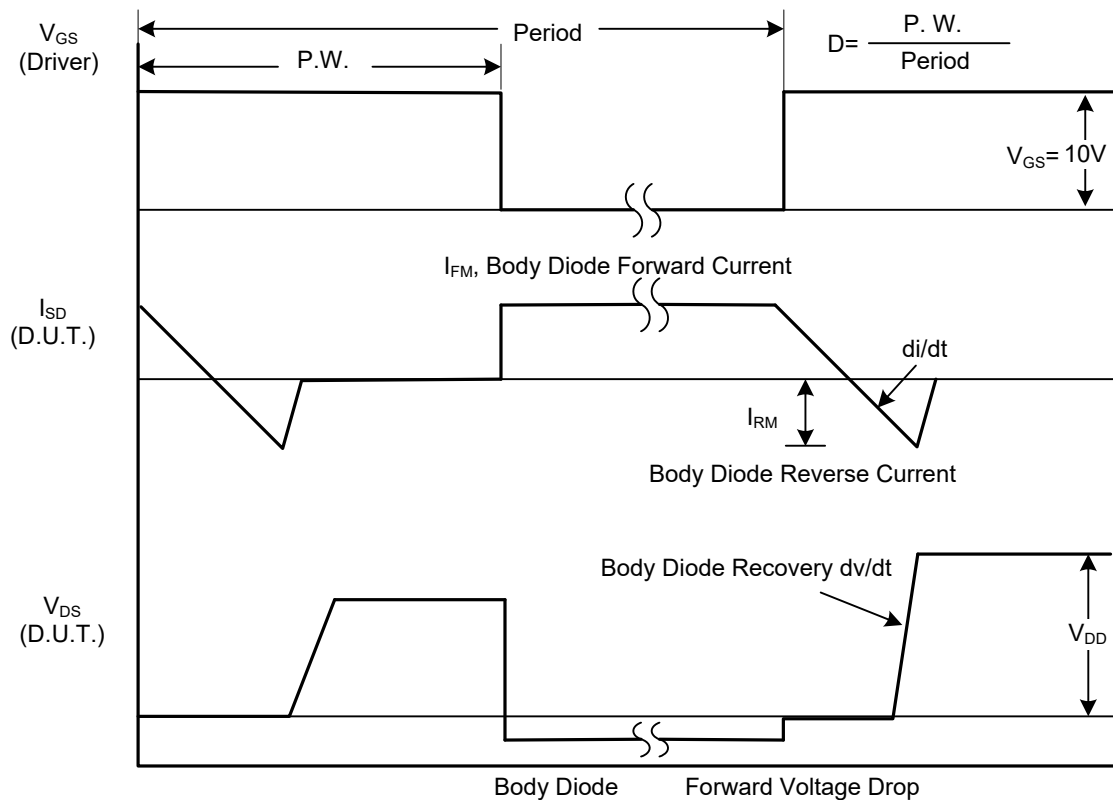
Notes: 1. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

## ■ TEST CIRCUITS AND WAVEFORMS

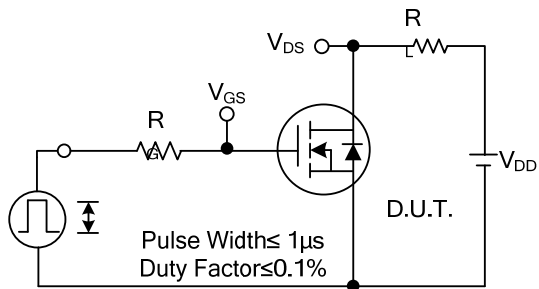


**Peak Diode Recovery  $dv/dt$  Test Circuit**

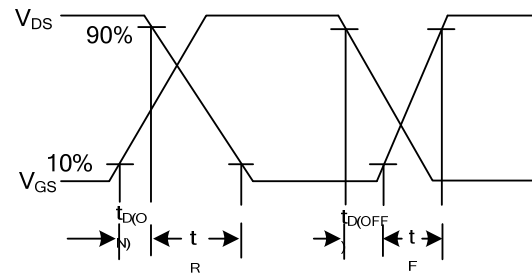


**Peak Diode Recovery  $dv/dt$  Waveforms**

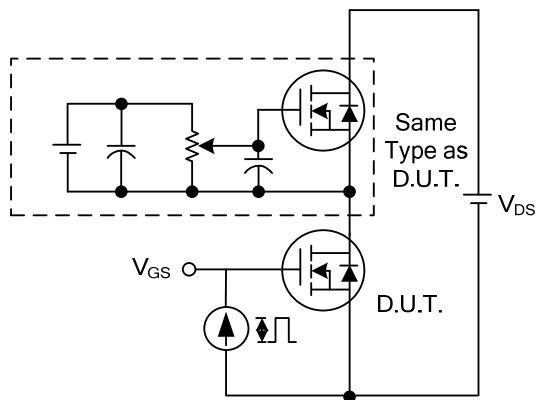
### ■ TEST CIRCUITS AND WAVEFORMS



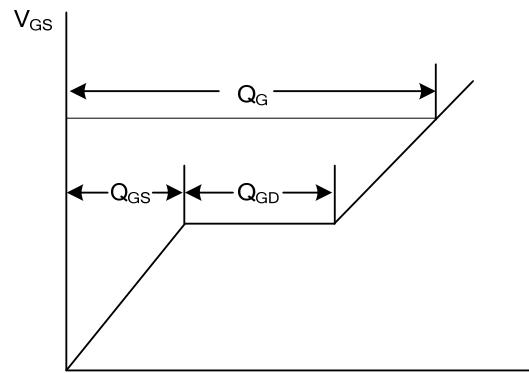
Switching Test Circuit



Switching Waveforms

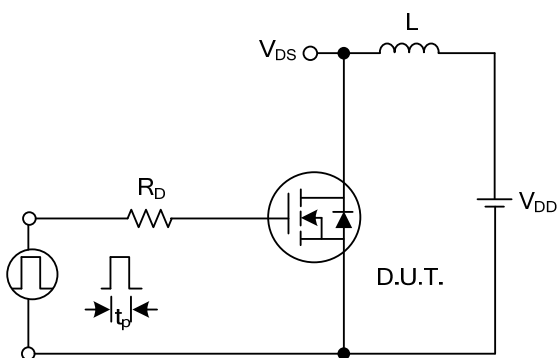


Gate Charge Test Circuit

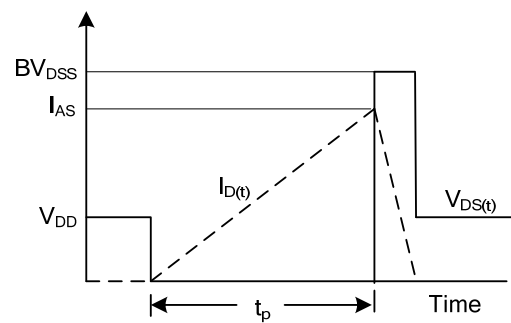


Charge

Gate Charge Waveform

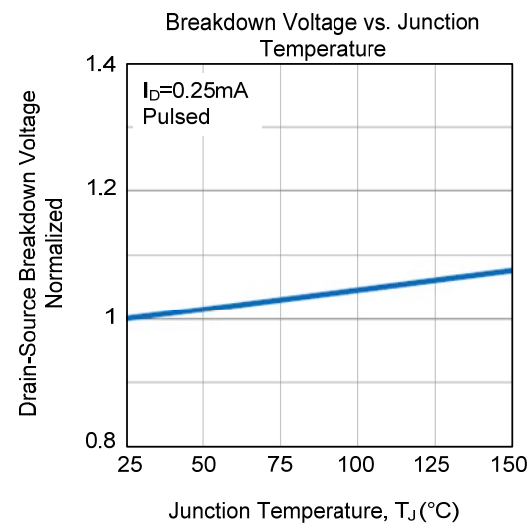
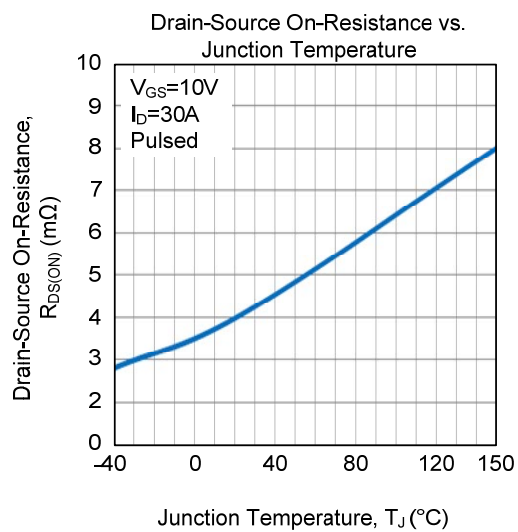
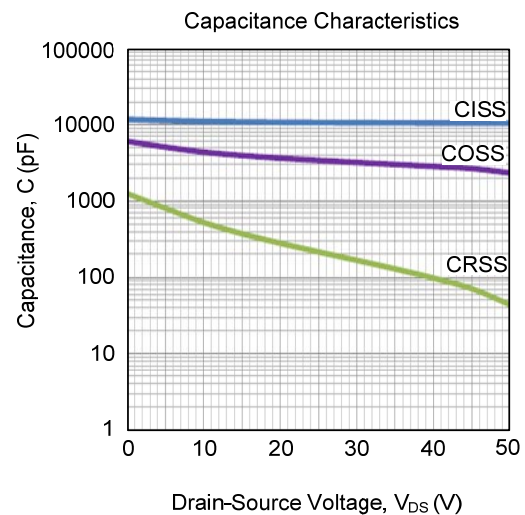
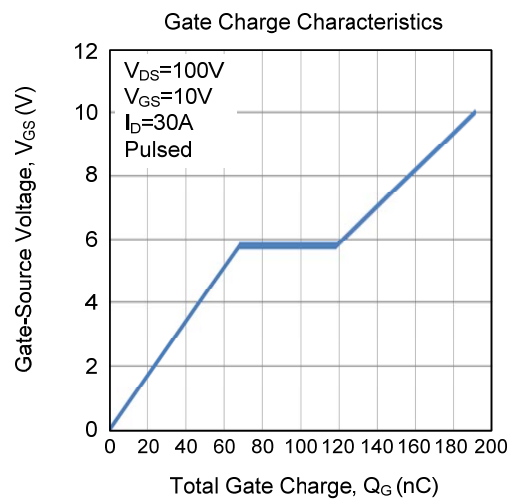
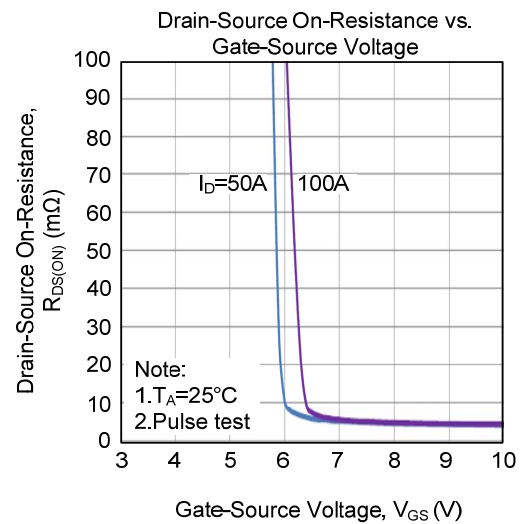
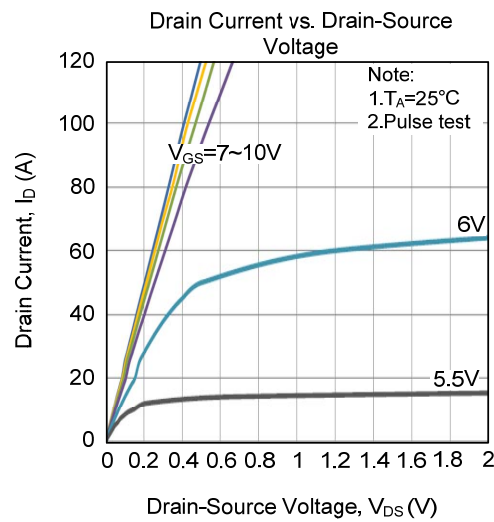


Unclamped Inductive Switching Test Circuit

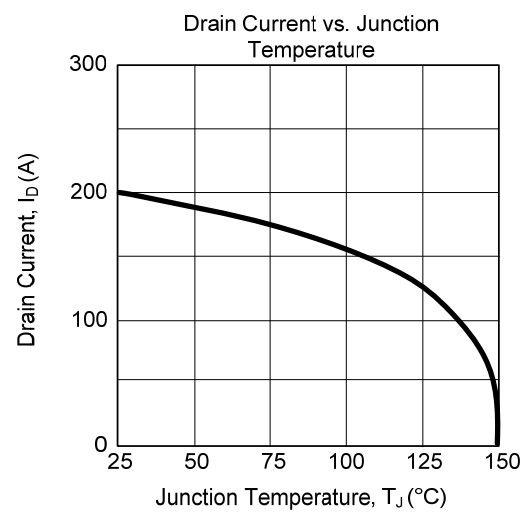
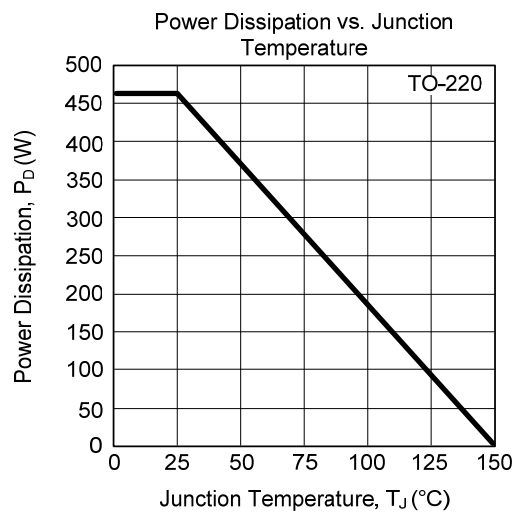
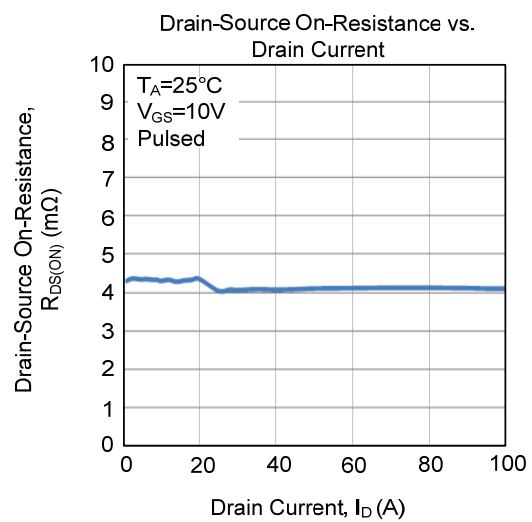
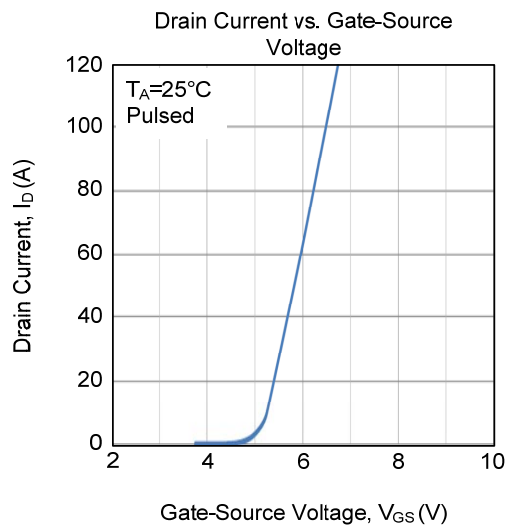
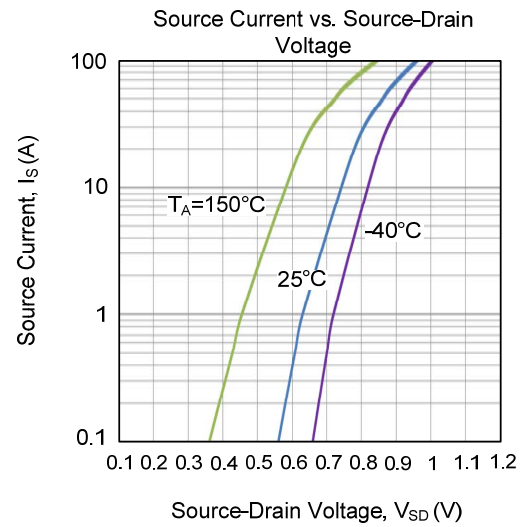
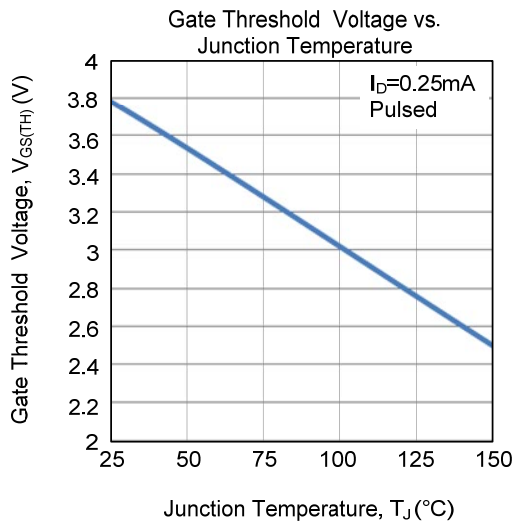


Unclamped Inductive Switching Waveforms

# TYPICAL CHARACTERISTICS

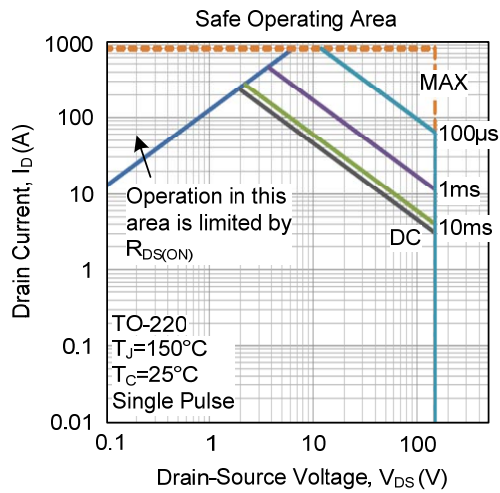


# ■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.