



# 25N10

**Power MOSFET**

## N-CHANNEL ENHANCEMENT MODE POWER MOSFET

■ DESCRIPTION

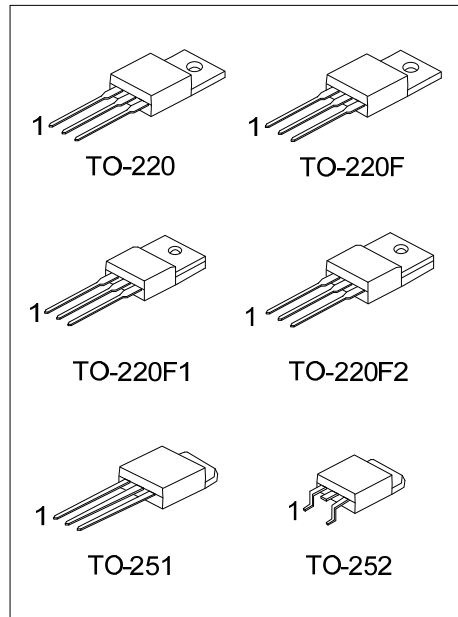
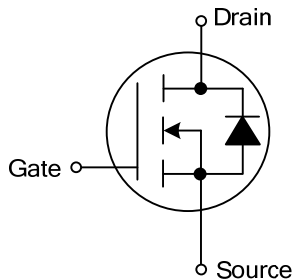
The UTC **25N10** is an N-channel enhancement mode power MOSFET and it uses UTC's perfect technology to provide designers with fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

It is generally suitable for all commercial-industrial applications and DC/DC converters requiring low voltage.

■ FEATURES

- \* Single Drive Requirement
- \* Low Gate Charge
- \* RoHS Compliant

■ SYMBOL



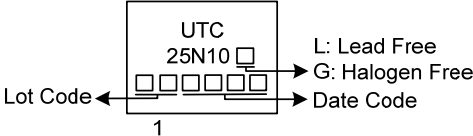
■ ORDERING INFORMATION

| Ordering Number |              | Package  | Pin Assignment |   |   | Packing   |
|-----------------|--------------|----------|----------------|---|---|-----------|
| Lead Free       | Halogen Free |          | 1              | 2 | 3 |           |
| 25N10L-TA3-T    | 25N10G-TA3-T | TO-220   | G              | D | S | Tube      |
| 25N10L-TF1-T    | 25N10G-TF1-T | TO-220F1 | G              | D | S | Tube      |
| 25N10L-TF2-T    | 25N10G-TF2-T | TO-220F2 | G              | D | S | Tube      |
| 25N10L-TF3-T    | 25N10G-TF3-T | TO-220F  | G              | D | S | Tube      |
| 25N10L-TM3-T    | 25N10G-TM3-T | TO-251   | G              | D | S | Tube      |
| 25N10L-TN3-R    | 25N10G-TN3-R | TO-252   | G              | D | S | Tape Reel |

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

|   |  |
|---|--|
| <p>25N10G-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, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, 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                                |                         | $V_{DSS}$ | 100        | V                |
| Gate Source Voltage                                 |                         | $V_{GSS}$ | $\pm 20$   | V                |
| Continuous Drain Current<br>( $V_{GS}=10\text{V}$ ) | $T_C=25^\circ\text{C}$  | $I_D$     | 23         | A                |
|   | $T_C=100^\circ\text{C}$ | $I_D$     | 14.6       | A                |
| Pulsed Drain Current (Note 2)                       |                         | $I_{DM}$  | 80         | A                |
| Single Pulsed Avalanche Energy (Note 3)             |                         | $E_{AS}$  | 480        | mJ               |
| Peak Diode Recovery dv/dt (Note 4)                  |                         | dv/dt     | 4.58       | V/ns             |
| Power Dissipation                                   | TO-220                  | $P_D$     | 125        | W                |
|   | TO-220F/TO-220F1        |           | 41         |                  |
|   | TO-220F2                |           |            |                  |
|   | TO-251/TO-252           |           | 50         |                  |
| Operating Junction Temperature                      |                         | $T_J$     | -55 ~ +150 | $^\circ\text{C}$ |
| 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.  $L=10\text{mH}$ ,  $I_{AS}=9.8\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$

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

■ THERMAL DATA

| PARAMETER           |                   | SYMBOL        | RATINGS    | UNIT                      |
|---------------------|-------------------|---------------|------------|---------------------------|
| Junction to Ambient | TO-220/TO-220F    | $\theta_{JA}$ | 62.5       | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F1/TO-220F2 |               |            |                           |
|                     | TO-251/TO-252     |               |            |                           |
| Junction to Case    | TO-220            | $\theta_{JC}$ | 1          | $^\circ\text{C}/\text{W}$ |
|                     | TO-220F/TO-220F1  |               | 3.04       |                           |
|                     | TO-220F2          |               |            |                           |
|                     | TO-251/TO-252     |               | 2.5 (Note) |                           |

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

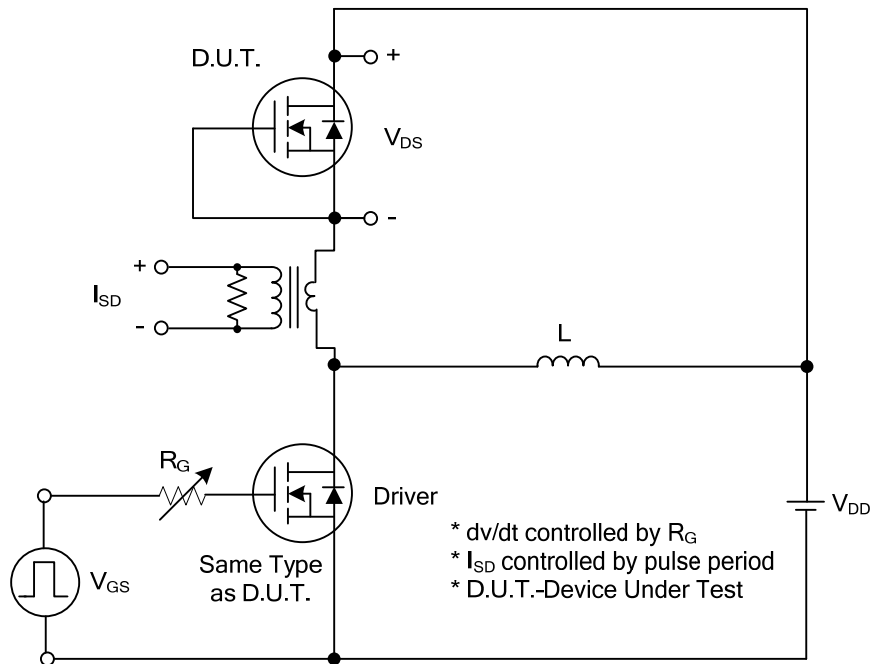
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER  | SYMBOL       | TEST CONDITIONS   | MIN | TYP  | MAX       | UNIT          |
|--|--------------|---|-----|------|-----------|---------------|
| <b>OFF CHARACTERISTICS</b>                             |              |   |     |      |           |               |
| Drain-Source Breakdown Voltage                         | $BV_{DSS}$   | $V_{GS}=0V, I_D=1mA$  | 100 |      |           | V             |
| Drain-Source Leakage Current                           | $I_{DSS}$    | $V_{DS}=100V, V_{GS}=0V, T_J=25^\circ\text{C}$                  |     |      | 25        | $\mu\text{A}$ |
|  |              | $V_{DS}=80V, V_{GS}=0V, T_J=150^\circ\text{C}$                  |     |      | 100       | $\mu\text{A}$ |
| Gate-Source Leakage Current                            | $I_{GSS}$    | $V_{GS}=\pm 20V$  |     |      | $\pm 100$ | nA            |
| <b>ON CHARACTERISTICS</b>                              |              |   |     |      |           |               |
| Gate Threshold Voltage                                 | $V_{GS(TH)}$ | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$                             | 2.0 |      | 4.0       | V             |
| Static Drain-Source On-Resistance (Note)               | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=16A$   |     |      | 80        | m $\Omega$    |
| <b>DYNAMIC PARAMETERS</b>                              |              |   |     |      |           |               |
| Input Capacitance                                      | $C_{ISS}$    | $V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$                        |     | 762  |           | pF            |
| Output Capacitance                                     | $C_{OSS}$    |   |     | 196  |           | pF            |
| Reverse Transfer Capacitance                           | $C_{RSS}$    |   |     | 22   |           | pF            |
| Gate Resistance  | $R_G$        | $f=1.0\text{MHz}$   |     | 1.5  | 2.3       | $\Omega$      |
| <b>SWITCHING PARAMETERS</b>                            |              |   |     |      |           |               |
| Total Gate Charge (Note)                               | $Q_G$        | $V_{GS}=10V, V_{DS}=100V, I_D=25A$                              |     | 28.5 |           | nC            |
| Gate Source Charge                                     | $Q_{GS}$     |   |     | 6.0  |           | nC            |
| Gate Drain Charge                                      | $Q_{GD}$     |   |     | 7.5  |           | nC            |
| Turn-ON Delay Time <sup>1</sup>                        | $t_{D(ON)}$  | $V_{DD}=100V, I_D=25A, R_G=25\Omega, V_{GS}=10V, R_D=4.0\Omega$ |     | 16   |           | ns            |
| Turn-ON Rise Time                                      | $t_R$        |   |     | 26   |           | ns            |
| Turn-OFF Delay Time                                    | $t_{D(OFF)}$ |   |     | 34   |           | ns            |
| Turn-OFF Fall-Time                                     | $t_F$        |   |     | 19   |           | ns            |
| <b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |              |   |     |      |           |               |
| Maximum Body-Diode Continuous Current                  | $I_S$        |   |     |      | 25        | A             |
| Maximum Body-Diode Pulsed Current                      | $I_{SM}$     |   |     |      | 50        | A             |
| Drain-Source Diode Forward Voltage (Note)              | $V_{SD}$     | $I_S=25A, V_{GS}=0V$  |     |      | 1.3       | V             |
| Reverse Recovery Time                                  | $t_{rr}$     | $I_S=25A, V_{GS}=0V, di/dt=100A/\mu\text{s}$                    |     | 96   |           | ns            |
| Reverse Recovery Charge                                | $Q_{rr}$     |   |     | 342  |           | nC            |

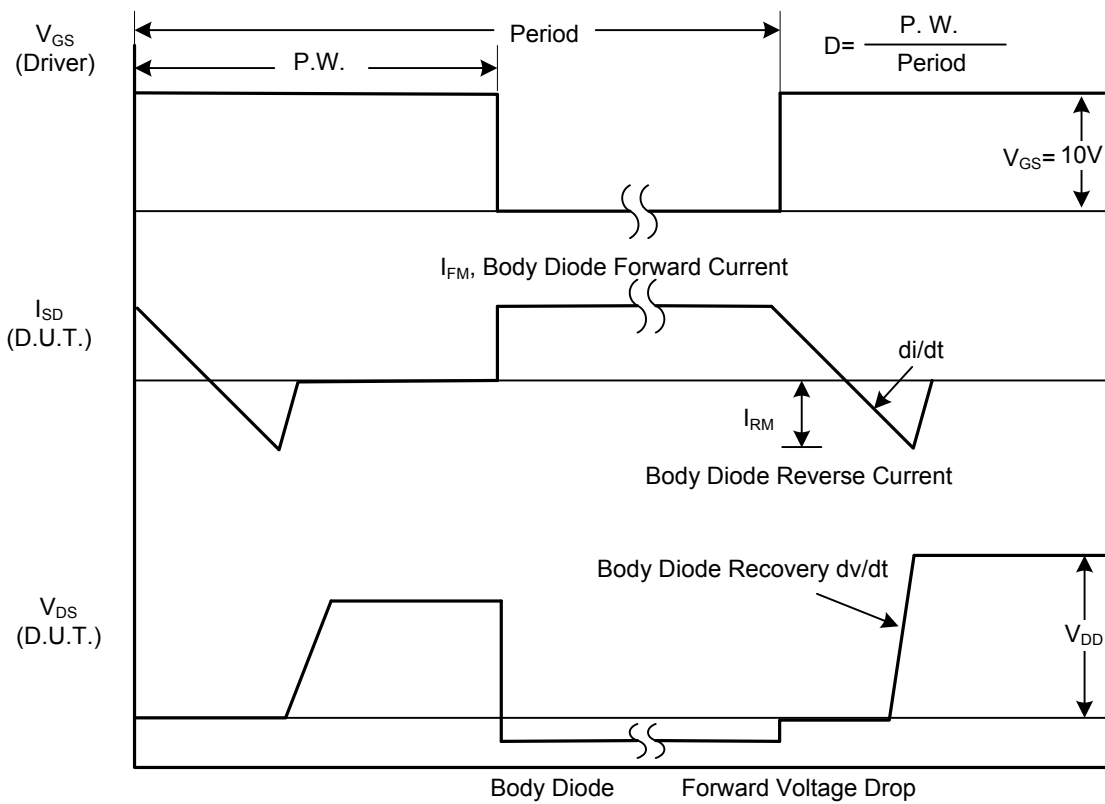
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

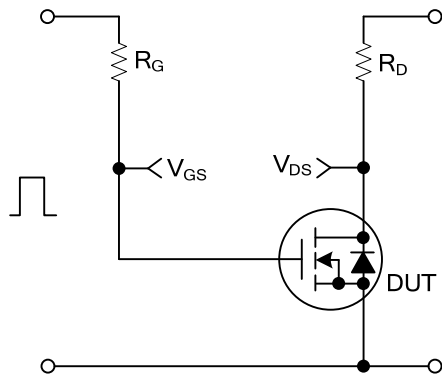


Peak Diode Recovery  $dv/dt$  Test Circuit

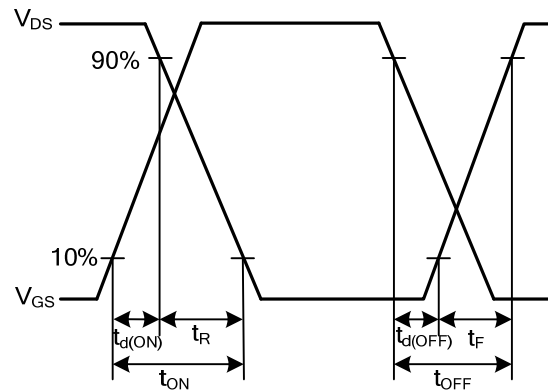


Peak Diode Recovery  $dv/dt$  Waveforms

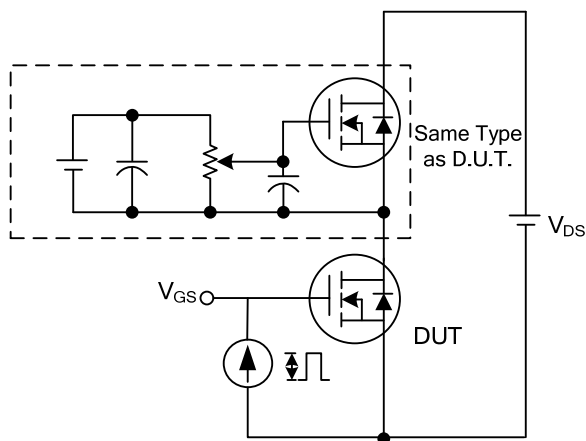
## TEST CIRCUITS AND WAVEFORMS



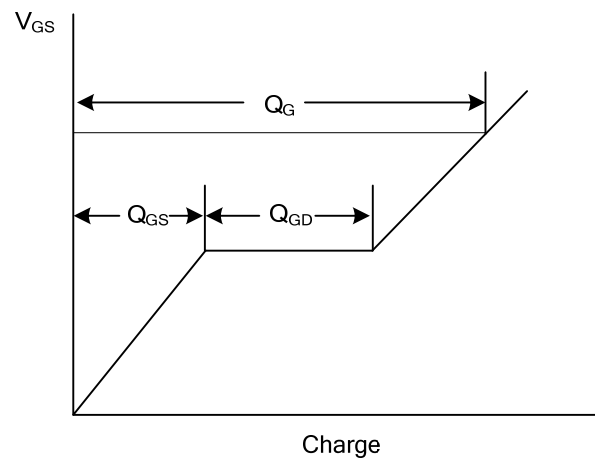
**Switching Test Circuit**



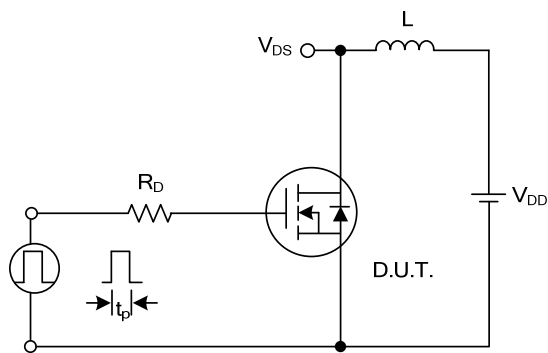
**Switching Waveforms**



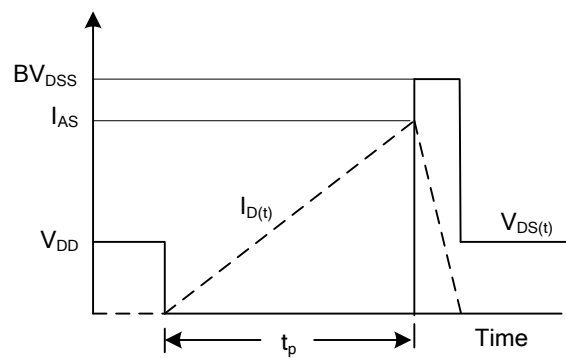
**Gate Charge Test Circuit**



**Gate Charge Waveform**

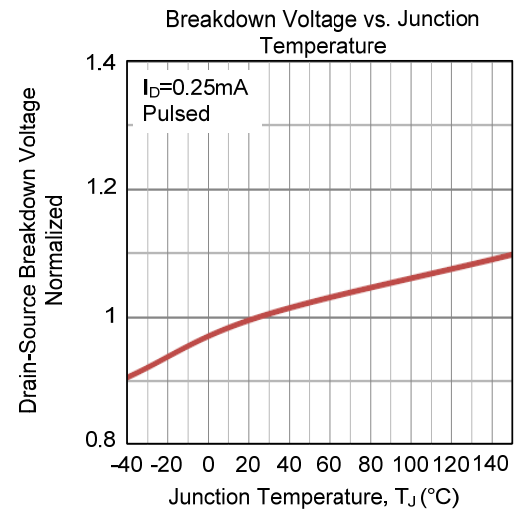
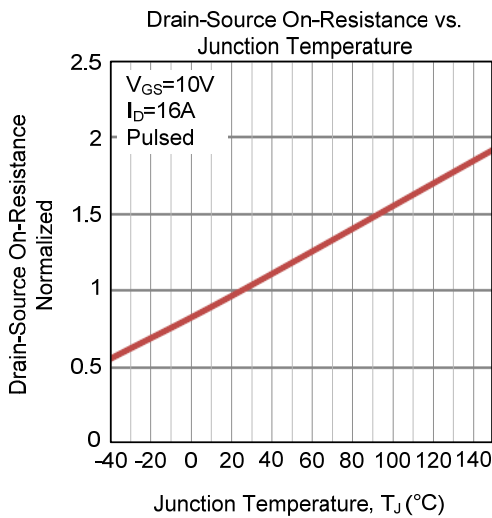
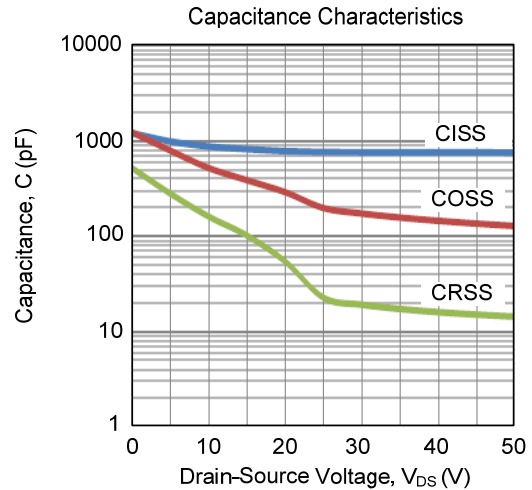
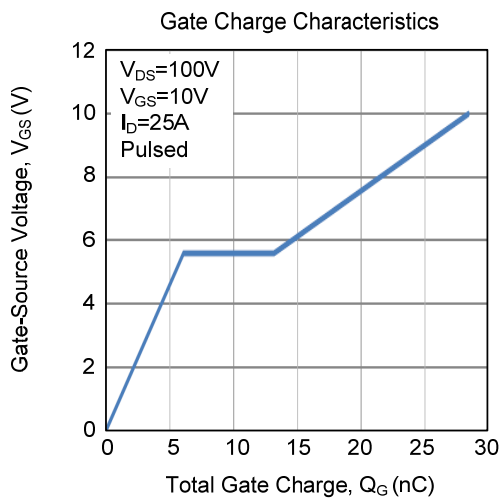
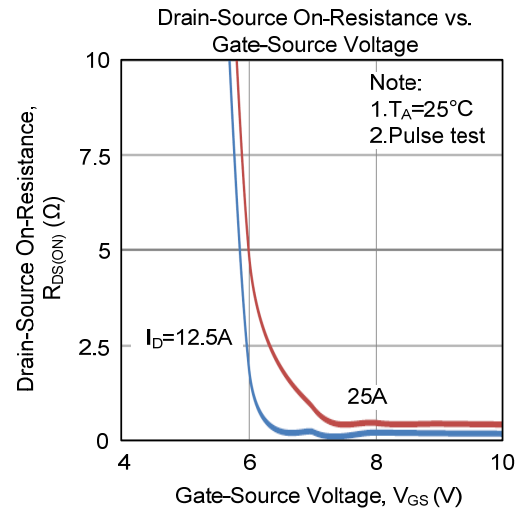
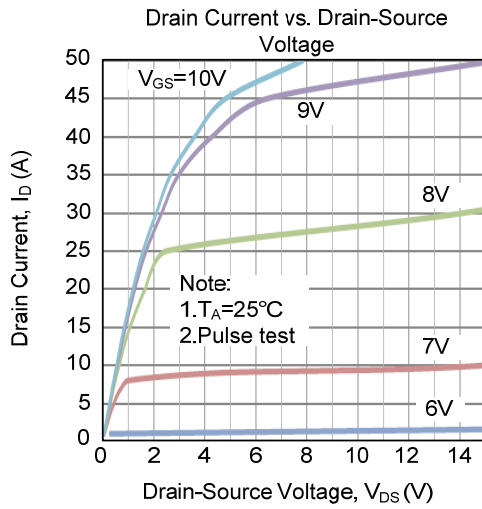


**Unclamped Inductive Switching Test Circuit**

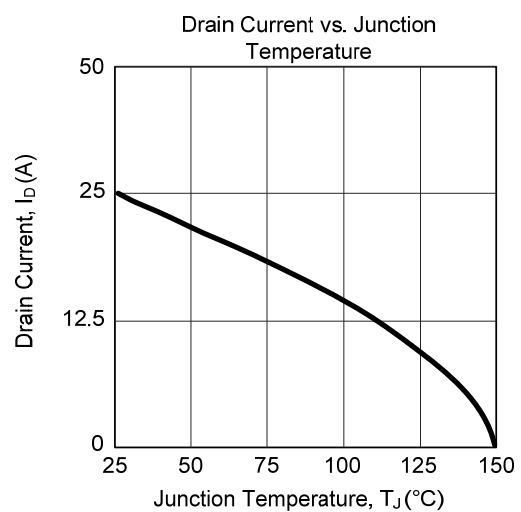
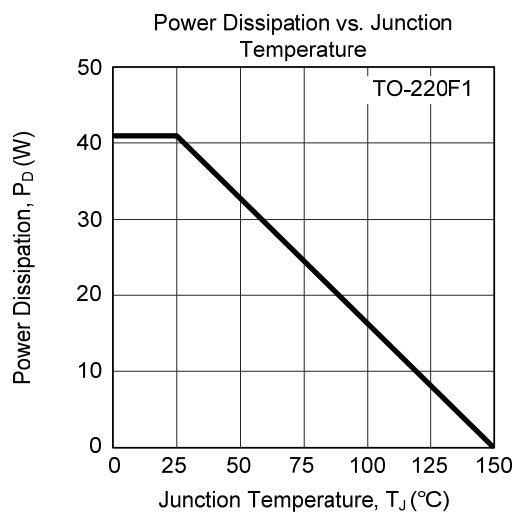
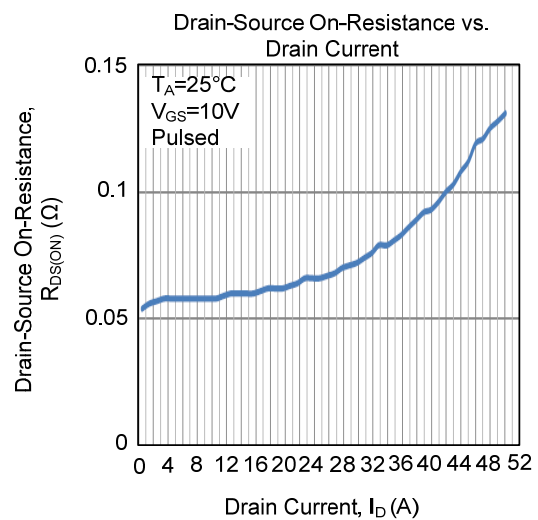
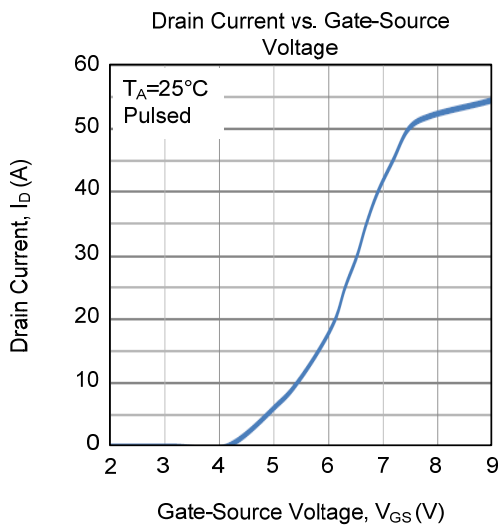
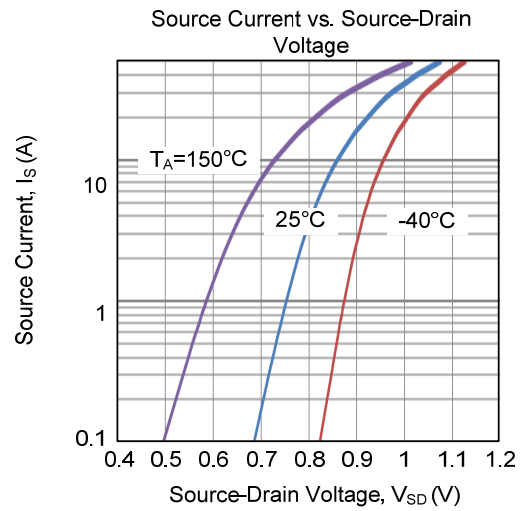
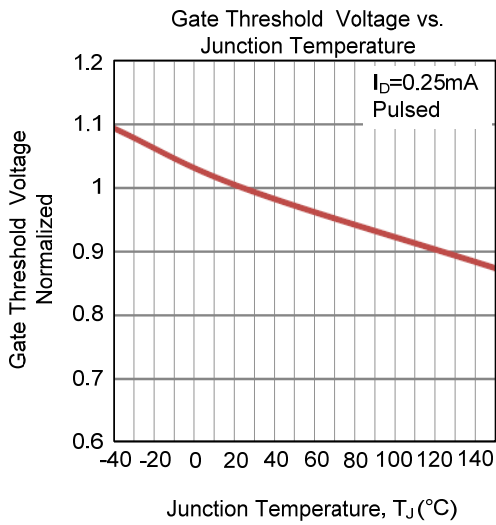


**Unclamped Inductive Switching Waveforms**

## ■ TYPICAL CHARACTERISTICS

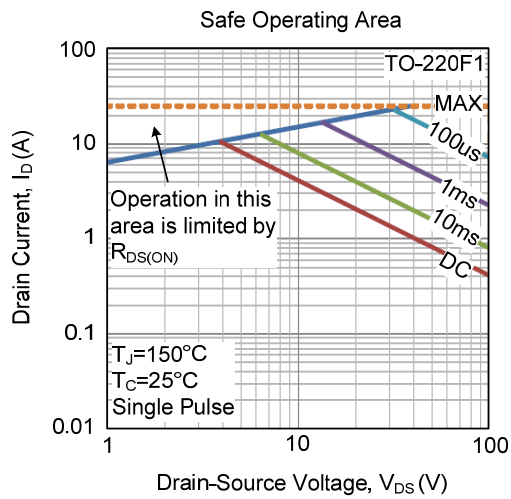


## ■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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