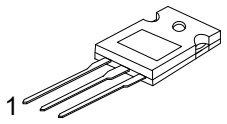
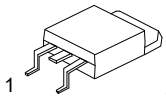
# 30NM90-Q

*Power MOSFET*

## 30A, 900V N-CHANNEL SUPER-JUNCTION MOSFET




TO-247




TO-263

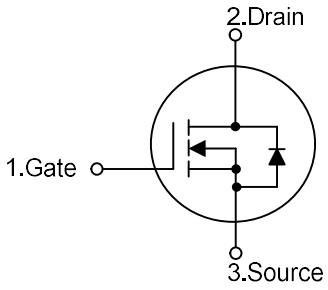
### ■ DESCRIPTION

The **UTC 30NM90-Q** 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

* $R_{DS(ON)}$ ≤ 320 mΩ @ $V_{GS}$=10V, $I_D$=15A
* High Switching Speed
* 100% Avalanche Tested

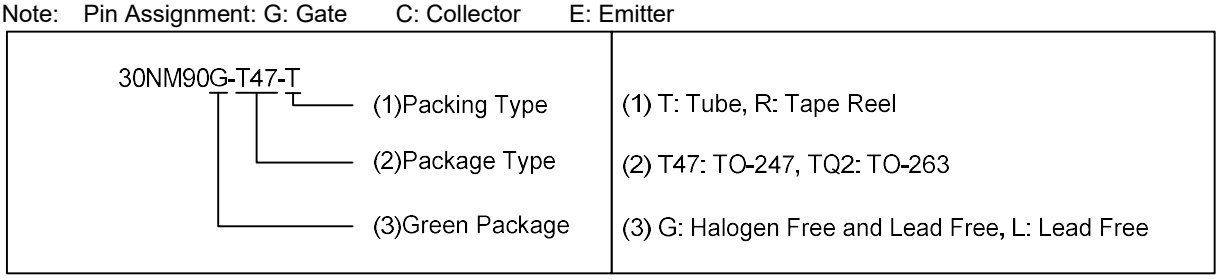
### ■ SYMBOL



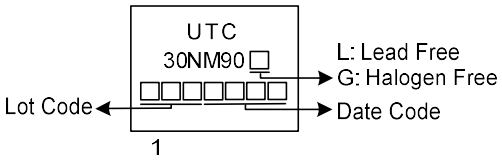

### ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| 30NM90L-T47-T | 30NM90G-T47-T | TO-247 | G | D | S | Tube |
| 30NM90L-TQ2-T | 30NM90G-TQ2-T | TO-263 | G | D | S | Tube |
| 30NM90L-TQ2-R | 30NM90G-TQ2-R | TO-263 | G | D | S | Tape Reel |

Note: Pin Assignment: G: Gate C: Collector E: Emitter




### ■ MARKING



## ■ ABSOLUTE MAXIMUM RATINGS ($T_C$=25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 900 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±30 | V |
| Drain Current | Continuous | $I_D$ | 30 | A |
| | Pulsed (Note 2) | $I_{DM}$ | 60 | A |
| Avalanche Energy | Single Pulsed (Note 3) | $E_{AS}$ | 375 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 8.1 | V/nS |
| Power Dissipation | TO-247 | $P_D$ | 280 | W |
| | TO-263 | | 130 | 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 mH, $I_{AS}$ = 5.0A, $V_{DD}$ = 50V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
4. $I_{SD}$ ≤ 30A, di/dt ≤ 200A/μs, $V_{DD}$ ≤ $BV_{DSS}$, Starting $T_J$ = 25°C

## ■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | TO-247 | $\theta_{JA}$ | 50 | °C/W |
| | TO-263 | | 62.5 | °C/W |
| Junction to Case | TO-247 | $\theta_{JC}$ | 0.44 | °C/W |
| | TO-263 | | 0.96 (Note) | °C/W |

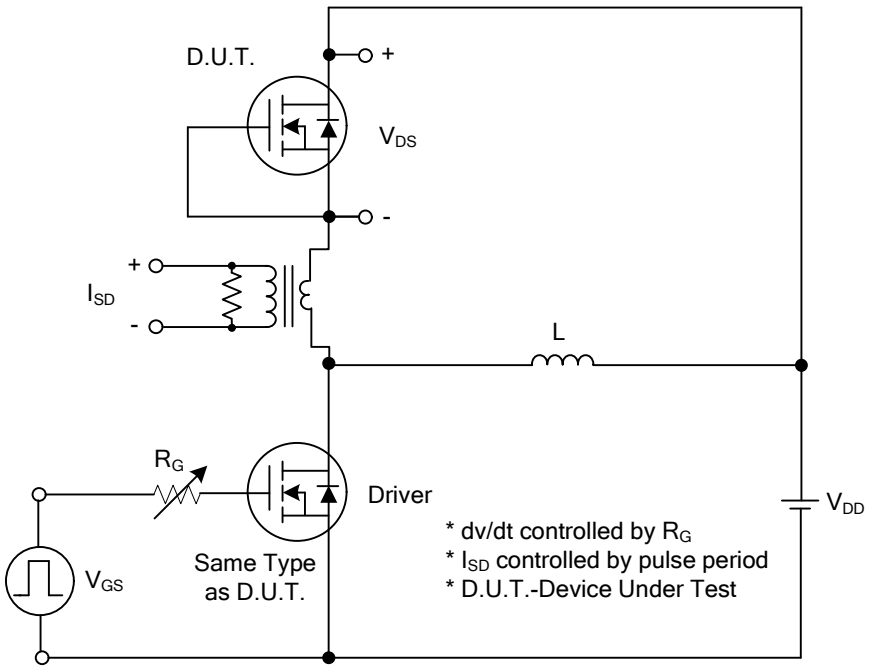
Note: Device mounted on FR-4 substrate $P_C$ board, 2oz copper, with 1inch square copper plate.

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

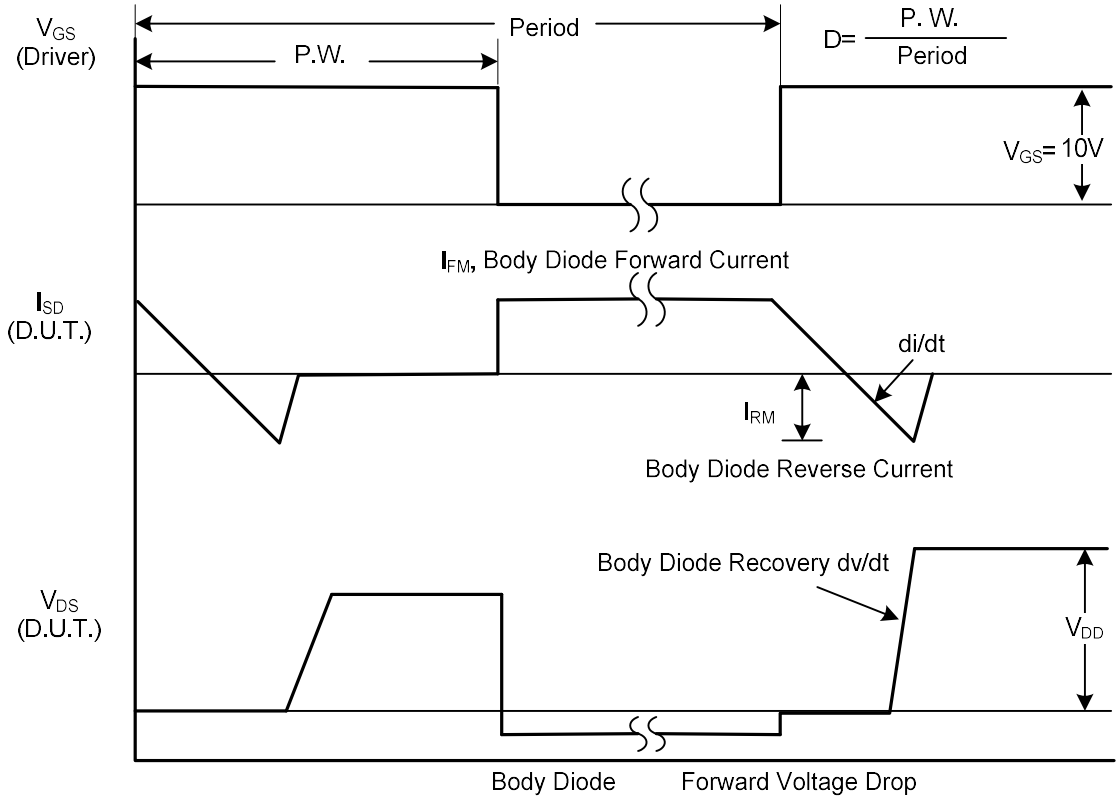
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 900 | | | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=900V, $V_{GS}$=0V | | | 10 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=+30V, $V_{DS}$=0V | | | +100 | nA |
| | Reverse | | $V_{GS}$=-30V, $V_{DS}$=0V | | | -100 | nA |
| **ON CHARACTERISTICS** | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 2.5 | | 4.5 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=15A | | | 320 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=50V, f=1.0MHz | | 2600 | | pF |
| Output Capacitance | | $C_{OSS}$ | | | 140 | | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 1.8 | | pF |
| **SWITCHING PARAMETERS** | | | | | | | |
| Total Gate Charge (Note 1) | | $Q_G$ | $V_{DS}$=720V, $V_{GS}$=10V, $I_D$=30A $I_G$=1mA (Note1, 2) | | 92 | | nC |
| Gate to Source Charge | | $Q_{GS}$ | | | 24 | | nC |
| Gate to Drain Charge | | $Q_{GD}$ | | | 38 | | nC |
| Turn-ON Delay Time (Note 1) | | $t_{D(ON)}$ | $V_{DS}$=100V, $V_{GS}$=10V, $I_D$=30A, $R_G$=25Ω (Note1, 2) | | 35 | | ns |
| Rise Time | | $t_R$ | | | 25 | | ns |
| Turn-OFF Delay Time | | $t_{D(OFF)}$ | | | 220 | | ns |
| Fall-Time | | $t_F$ | | | 58 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | | |
| Maximum Body-Diode Continuous Current | | $I_S$ | | | | 30 | A |
| Maximum Body-Diode Pulsed Current | | $I_{SM}$ | | | | 60 | A |
| Drain-Source Diode Forward Voltage (Note 1) | | $V_{SD}$ | $I_S$=30A, $V_{GS}$=0V | | | 1.4 | V |
| Body Diode Reverse Recovery Time (Note 1) | | $t_{rr}$ | $I_S$=30A, $V_{GS}$=0V, $dI_F/dt$=100A/μs | | 960 | | ns |
| Body Diode Reverse Recovery Charge | | $Q_{rr}$ | | | 23.1 | | μC |

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating ambient temperature.

## ■ TEST CIRCUITS AND WAVEFORMS



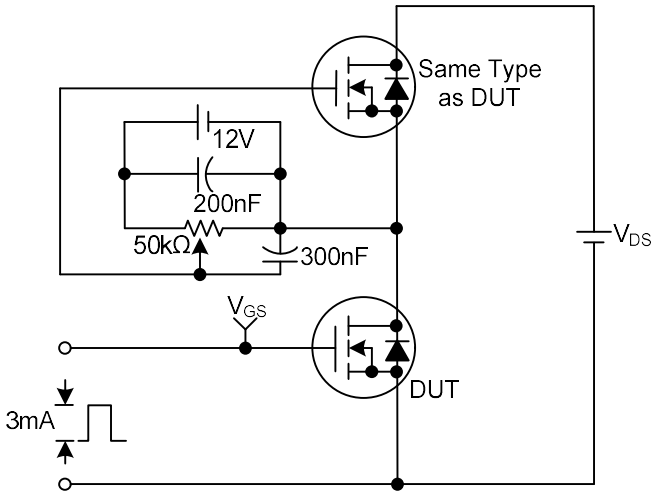

**Peak Diode Recovery dv/dt Test Circuit**



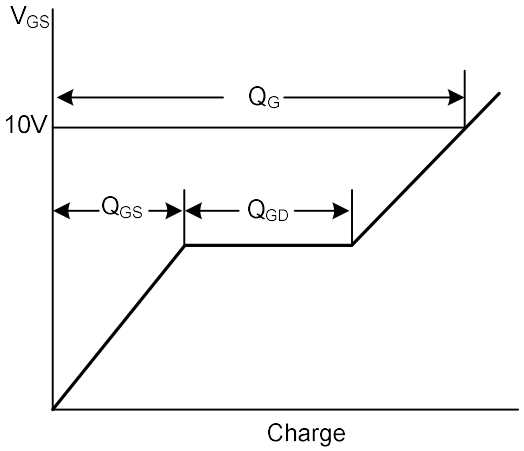

**Peak Diode Recovery dv/dt Waveforms**

## ■ TEST CIRCUITS AND WAVEFORMS

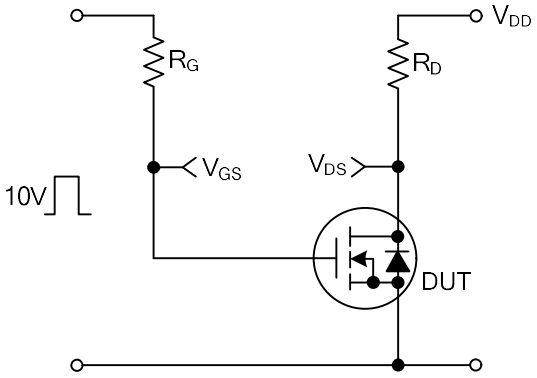
Gate Charge Test Circuit



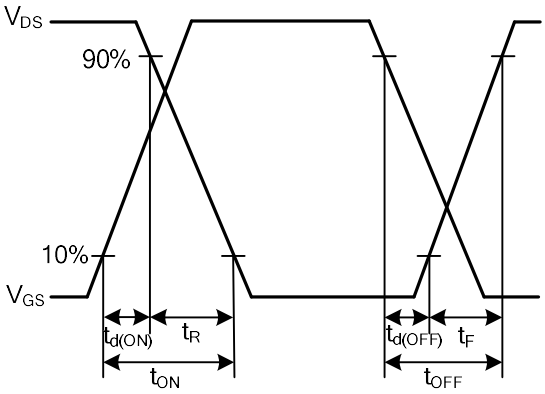

Gate Charge Waveforms



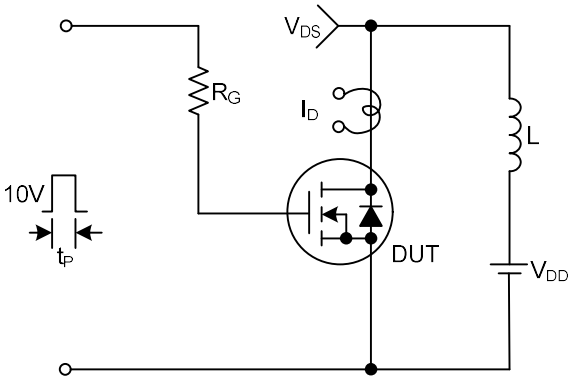

Resistive Switching Test Circuit




Resistive Switching Waveforms

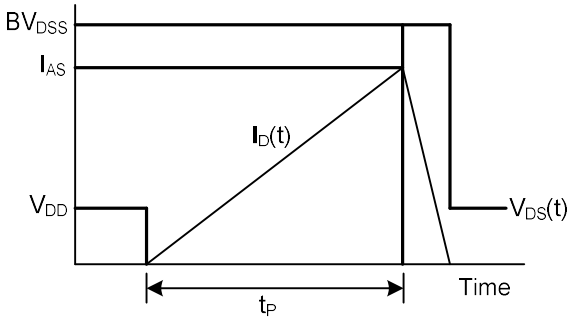



Unclamped Inductive Switching Test Circuit

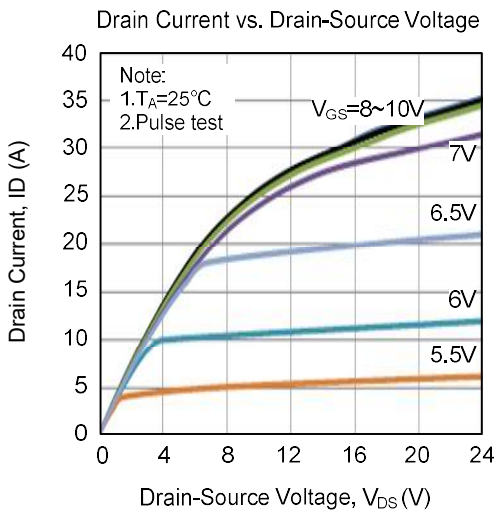


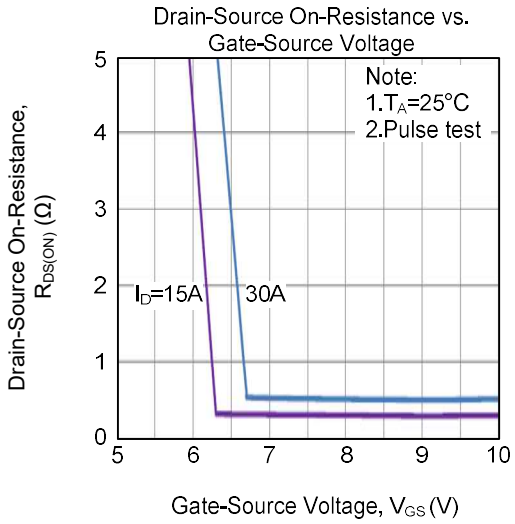

Unclamped Inductive Switching Waveforms

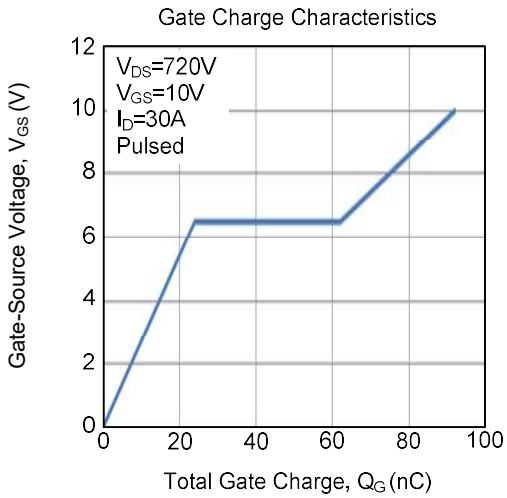
$$E_{AS}=\frac{1}{2}LI_{AS}^{2}\frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$

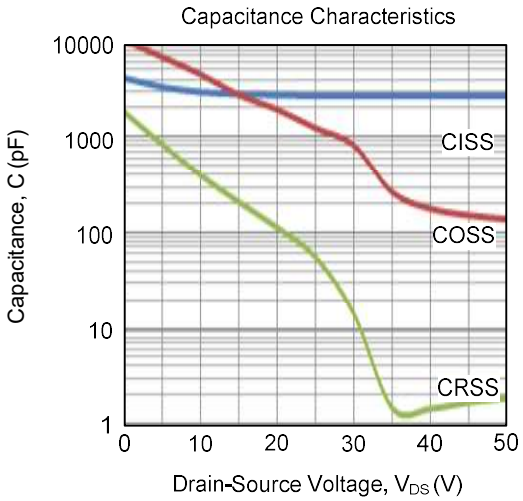


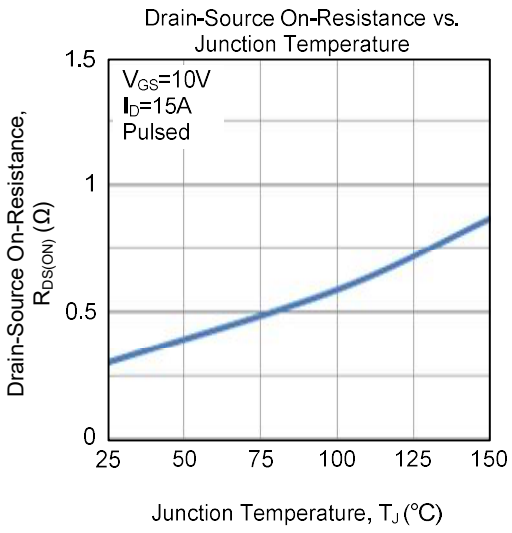
## ■ TYPICAL CHARACTERISTICS

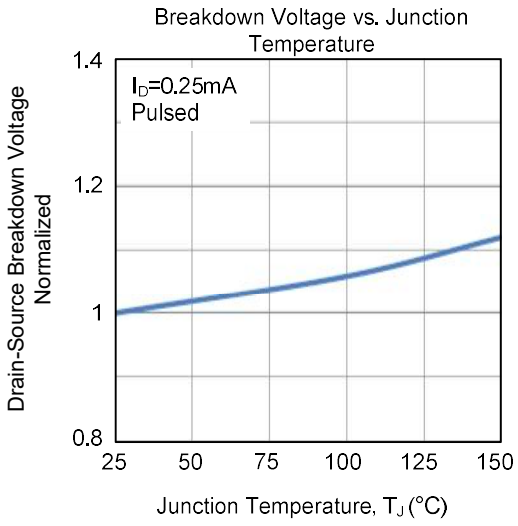


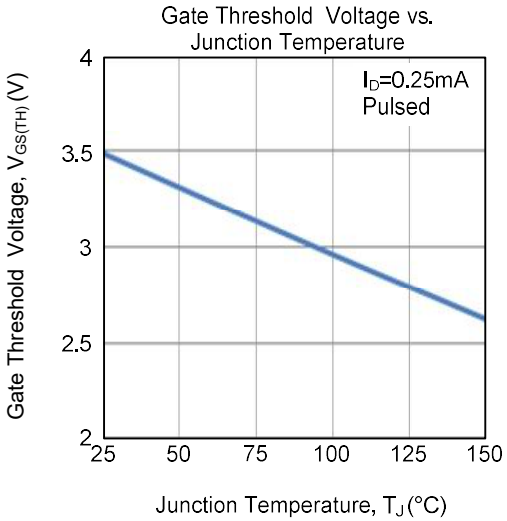



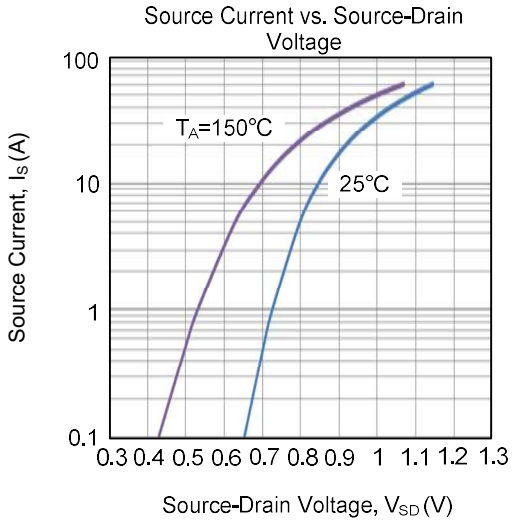



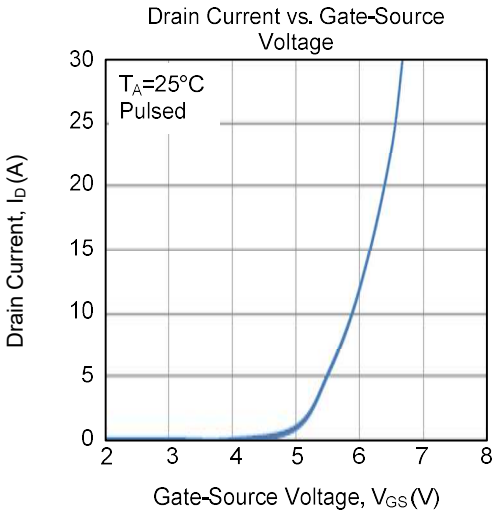



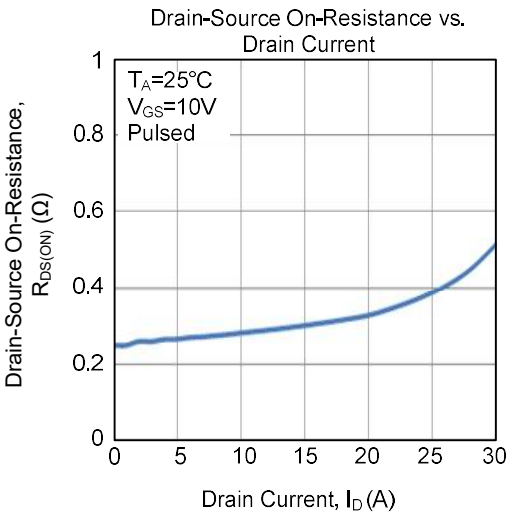



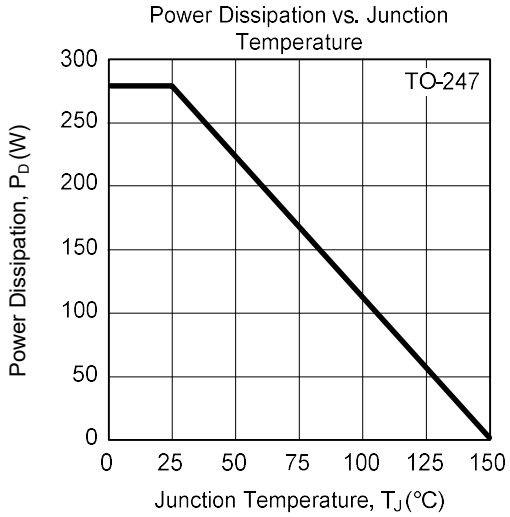
## ■ TYPICAL CHARACTERISTICS (Cont.)

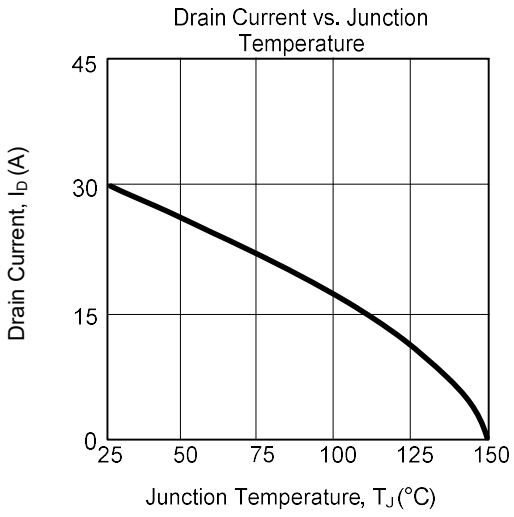


## ■ TYPICAL CHARACTERISTICS (Cont.)