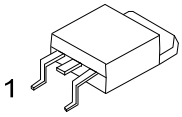
# UTD408

**Power MOSFET**

## N-CHANNEL ENHANCEMENT MODE



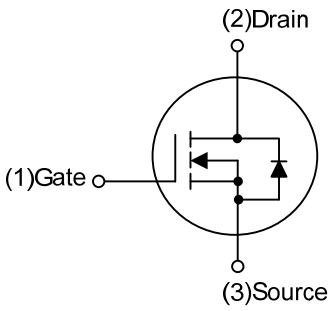

TO-252


PDFN3×3

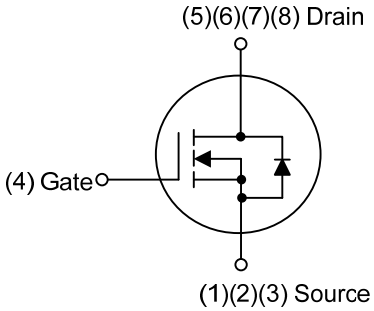
## ■ FEATURES

* $R_{DS(ON)}$ ≤ 18 mΩ @ $V_{GS}$ =10V, $I_D$ =18A
  $R_{DS(ON)}$ ≤ 27 mΩ @ $V_{GS}$ =4.5V, $I_D$ =10A
* Low capacitance
* Optimized gate charge
* Fast switching capability
* Avalanche energy specified

## ■ SYMBOL




TO-252




PDFN3×3

## ■ ORDERING INFORMATION

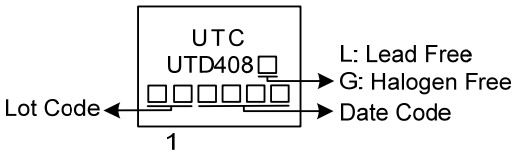
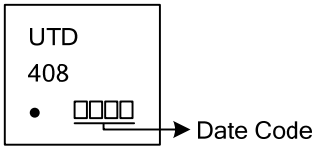
| Ordering Number | | Package | Pin Assignment | | | | | | | | Packing |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| UTD408L-TN3-R | UTD408G-TN3-R | TO-252 | G | D | S | - | - | - | - | - | Tape Reel |
| UTD408L-P3030-R | UTD408G-P3030-R | PDFN3×3 | S | S | S | G | D | D | D | D | Tape Reel |

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

UTD408G-TN3-R

| | |
|---|---|
| (1)Packing Type | (1) R: Tape Reel |
| (2)Package Type | (2) TN3: TO-252, P3030: PDFN3×3 |
| (3)Green Package | (3) G: Halogen Free and Lead Free, L: Lead Free |

## ■ MARKING

| TO-252 | PDFN3×3 |
|---|---|
|  |  |

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

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current ($T_C$=25°C) | | $I_D$ | 18 | A |
| Pulsed Drain Current (Note 2) | | $I_{DM}$ | 40 | A |
| Avalanche Energy, Single Pulse(Note 3) | | $E_{AS}$ | 1.5 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 1.1 | V/ns |
| Power Dissipation( $T_C$=25°C) | TO-252 | $P_D$ | 32 | W |
| | PDFN3×3 | | 20 | W |
| Junction Temperature | | $T_J$ | +150 | °C |
| Strong 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 = 0.1mH, $I_{AS}$ =5.5A, $V_{DD}$ = 50V, $R_G$ = 25 Ω, Starting $T_J$ = 25°C
4. $I_{SD}$ ≤ 18.0A, di/dt ≤ 200A/μs, $V_{DD}$ ≤ $BV_{DSS}$, Starting $T_J$ = 25°C

## ■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | TO-252 | $\theta_{JA}$ | 50 | °C/W |
| | PDFN3×3 | | 75 | °C/W |
| Junction to Case | TO-252 | $\theta_{JC}$ | 3.9 | °C/W |
| | PDFN3×3 | | 6.25 | °C/W |

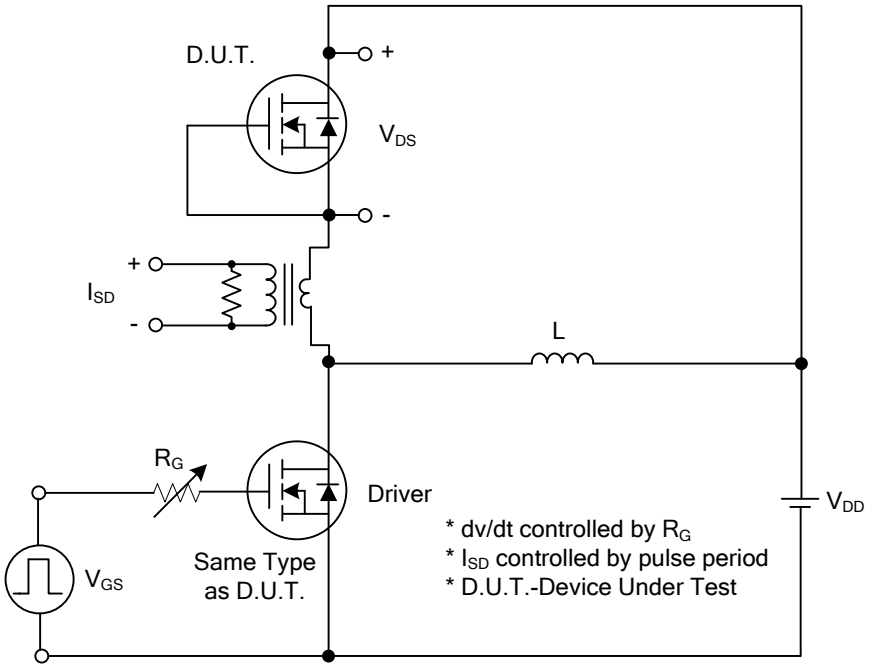
Notes: Device mounted on 1in 2 FR-4 board with 2oz. Copper, and the maximum temperature of 150°C may be used if the PCB or heat-sink allows it.

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

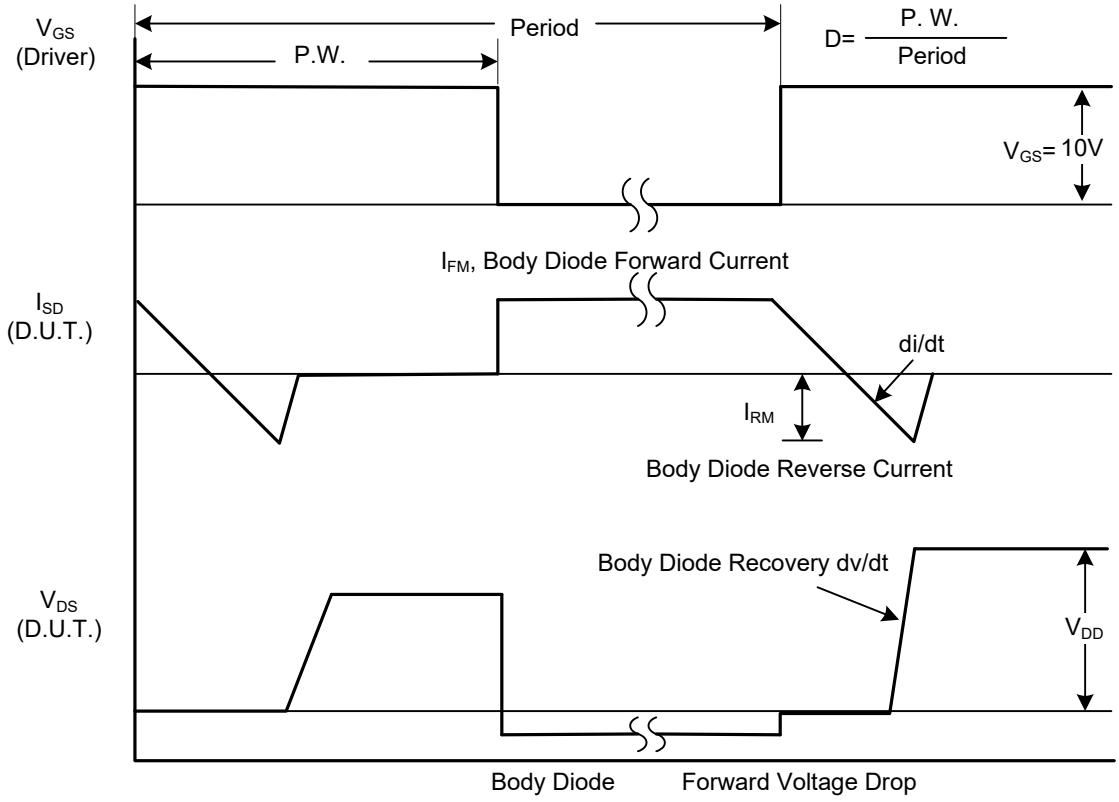
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V, $I_D$=250μA | 30 | | | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=24V, $V_{GS}$=0V | | | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±20V | | | 100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$, $I_D$=250μA | 1.0 | 1.8 | 2.5 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=18A | | | 18 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=10A | | | 27 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{DS}$15V, $V_{GS}$=0V, f=1MHz | | 580 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 151 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 132 | | pF |
| **SWITCHING PARAMETERS** | | | | | | |
| Total Gate Charge | $Q_G$ | $V_{DD}$=24V, $V_{GS}$=10V, $I_D$=18A (Note 1, 2) | | 25 | | nC |
| Gate Source Charge | $Q_{GS}$ | | | 4.3 | | nC |
| Gate Drain Charge | $Q_{GD}$ | | | 6.2 | | nC |
| Turn-ON Delay Time | $t_{D(ON)}$ | $V_{DD}$=15V, $V_{GS}$=10V, $I_D$=18A, $R_G$ =3Ω (Note 1, 2) | | 6 | | ns |
| Turn-ON Rise Time | $t_R$ | | | 15 | | ns |
| Turn-OFF Delay Time | $t_{D(OFF)}$ | | | 18 | | ns |
| Turn-OFF Fall-Time | $t_F$ | | | 21 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$ | | | | 18 | A |
| Drain-Source Diode Forward Voltage | $V_{SD}$ | $I_S$=18A,$V_{GS}$=0V | | | 1.4 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$=18A, dI/dt=100A/μs | | 300 | | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | | 737 | | nC |

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Pulse width ≤ 300us, duty cycle ≤ 2%.

## ■ TEST CIRCUITS AND WAVEFORMS

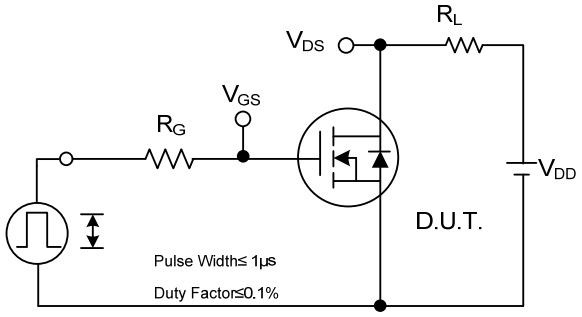



**Peak Diode Recovery dv/dt Test Circuit**

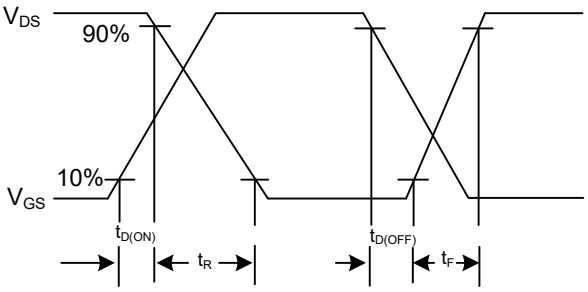



**Peak Diode Recovery dv/dt Waveforms**

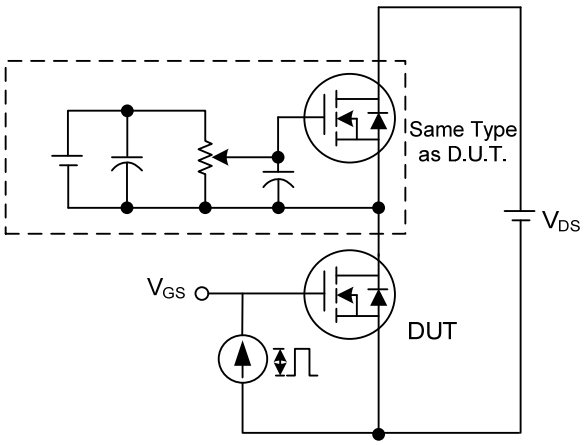
## ■ TEST CIRCUITS AND WAVEFORMS



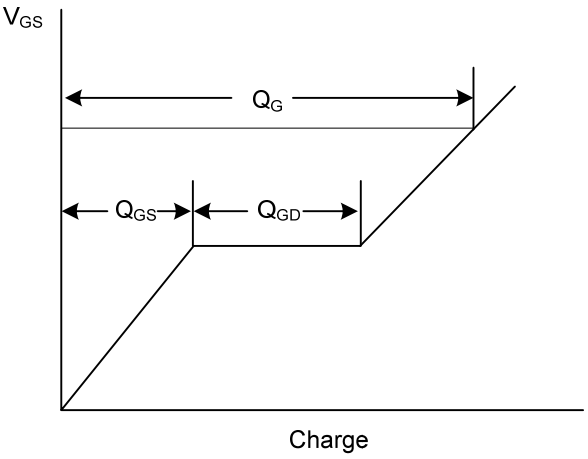

**Switching Test Circuit**



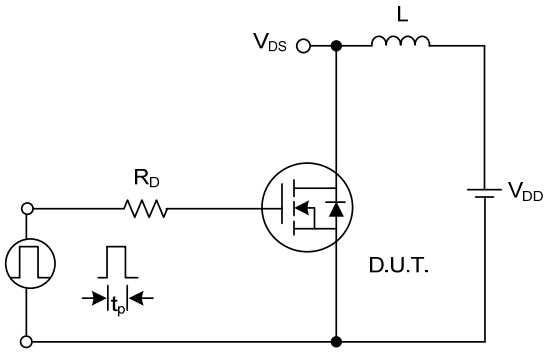

**Switching Waveforms**



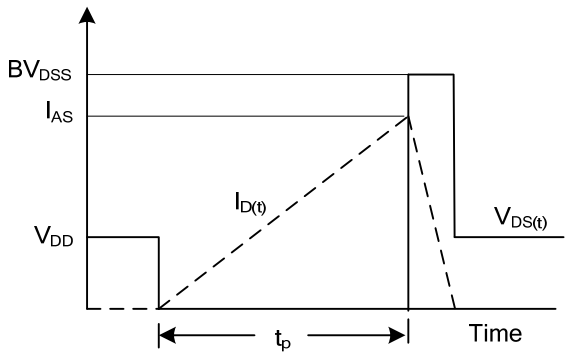

**Gate Charge Test Circuit**




**Gate Charge Waveform**



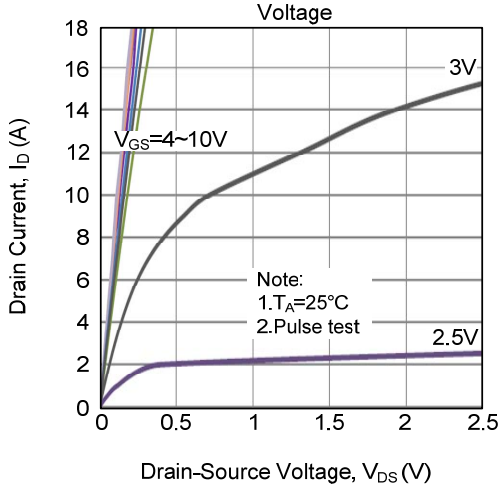

**Unclamped Inductive Switching Test Circuit**



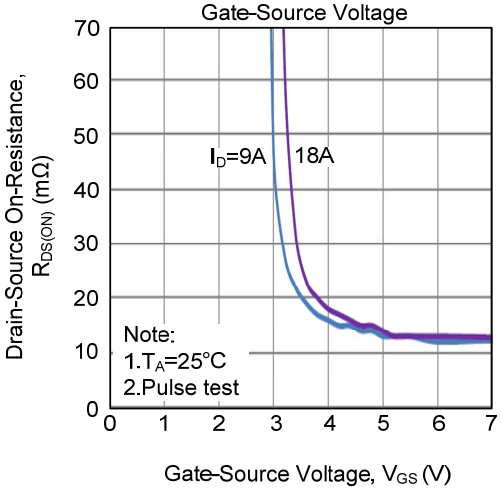

**Unclamped Inductive Switching Waveforms**

## ■ TYPICAL CHARACTERISTICS

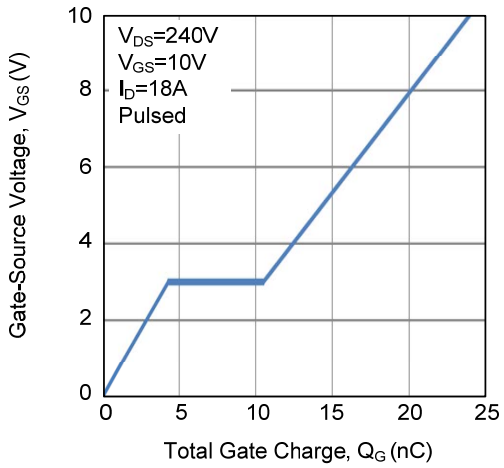
Drain Current vs. Drain-Source Voltage



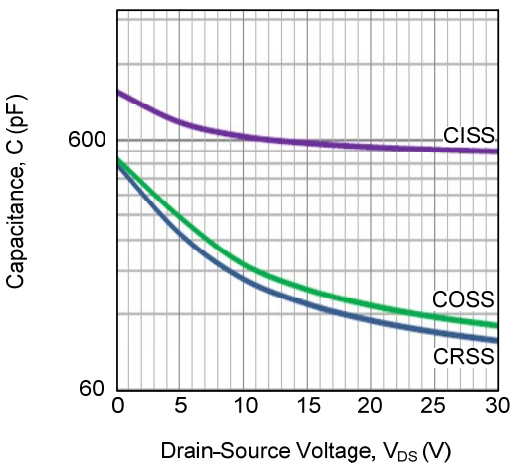

Drain-Source On-Resistance vs. Gate-Source Voltage



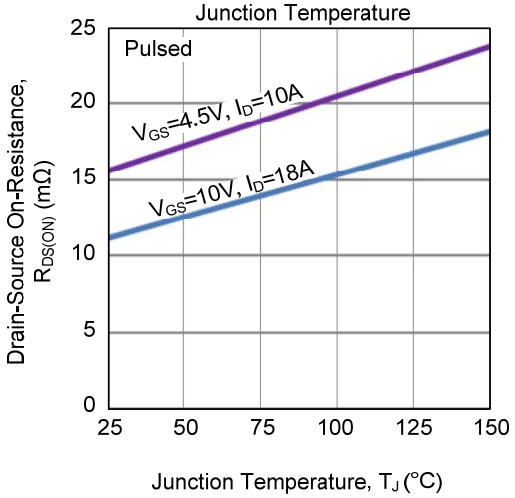

Gate Charge Characteristics



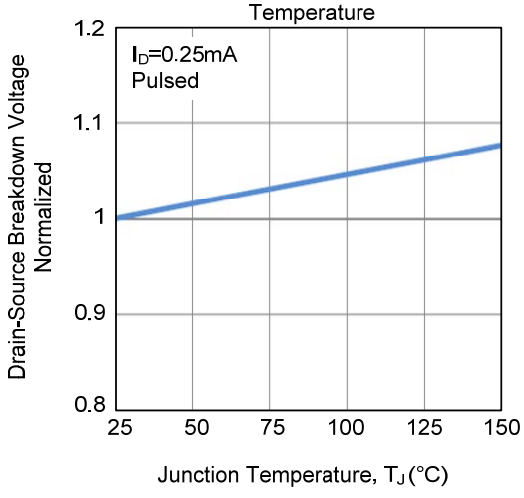

Capacitance Characteristics




Drain-Source On-Resistance vs. Junction Temperature

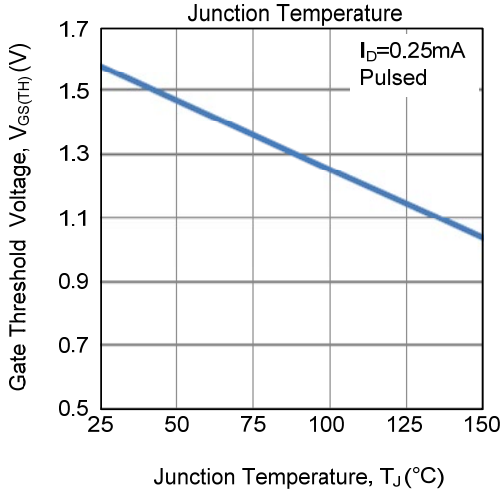



Breakdown Voltage vs. Junction Temperature

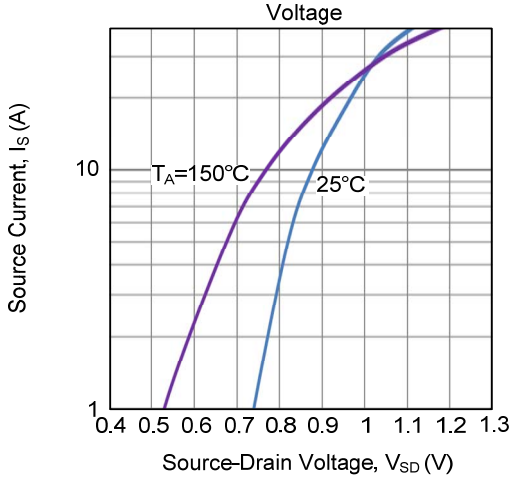


## ■ TYPICAL CHARACTERISTICS (Cont.)

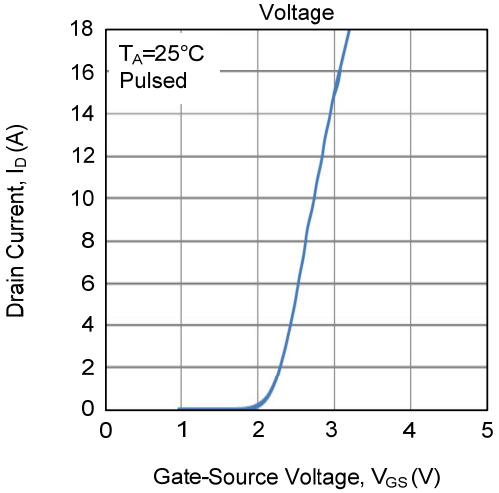
Gate Threshold Voltage vs. Junction Temperature



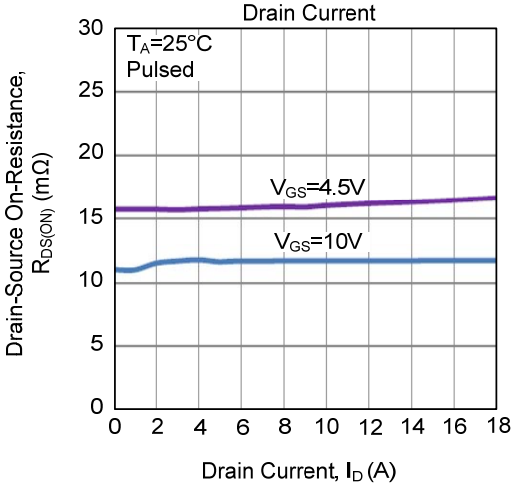

Source Current vs. Source-Drain Voltage



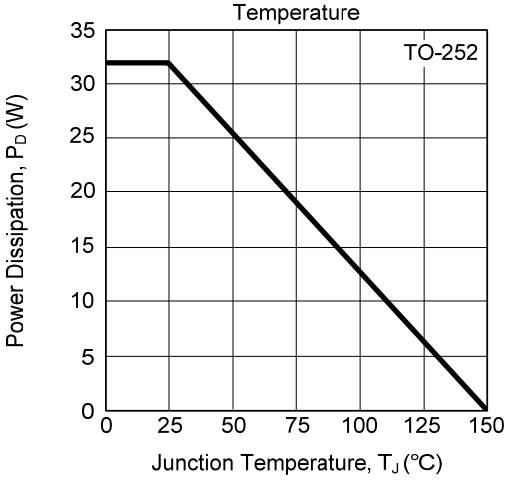

Drain Current vs. Gate-Source Voltage



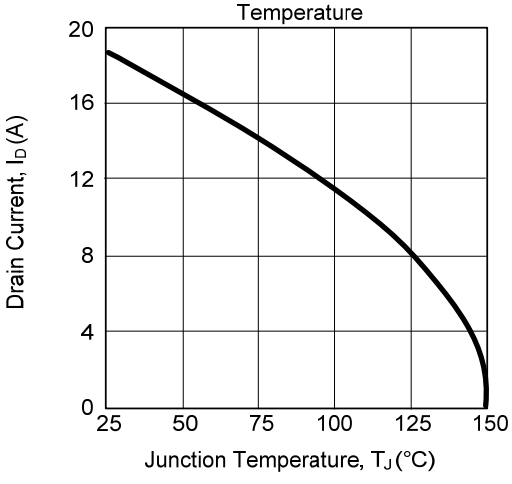

Drain-Source On-Resistance vs. Drain Current




Power Dissipation vs. Junction Temperature




Drain Current vs. Junction Temperature



## ■ TYPICAL CHARACTERISTICS (Cont.)