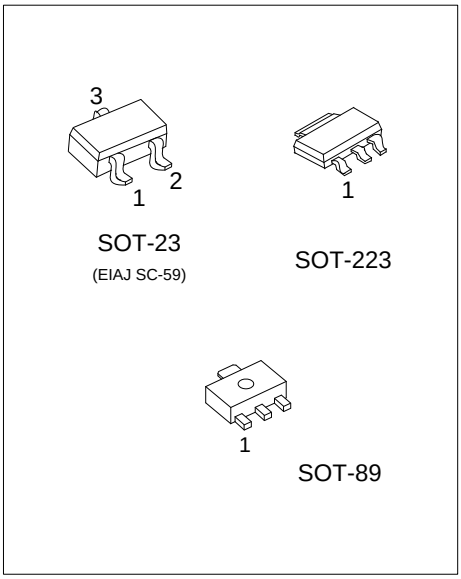
# UT5N06

*Power MOSFET*

## 5A, 60V N-CHANNEL POWER MOSFET




### ■ DESCRIPTION

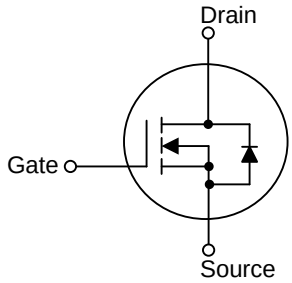
The UTC **UT5N06** is an N-channel power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance and superior switching performance.

The UTC **UT5N06** is generally applied in low power switching mode power appliances and electronic ballast.

### ■ FEATURES

* $R_{DS(ON)}$ ≤ 65 mΩ @ $V_{GS}$=10V, $I_D$=2.5A
  $R_{DS(ON)}$ ≤ 90 mΩ @ $V_{GS}$=4.5V, $I_D$=2.5A
* High Switching Speed
* 100% Avalanche Tested

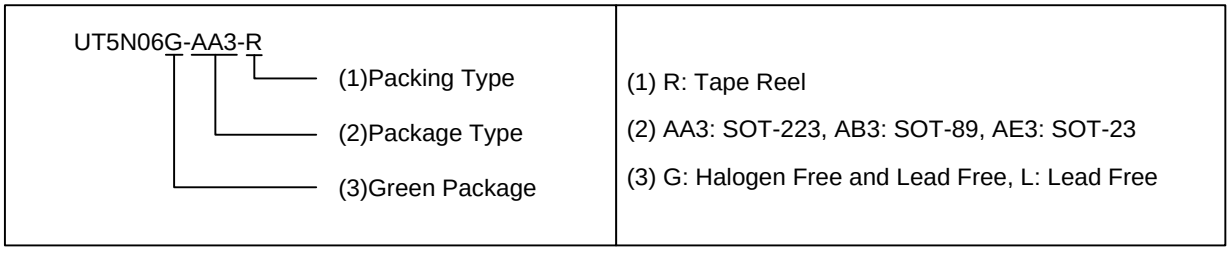
### ■ SYMBOL



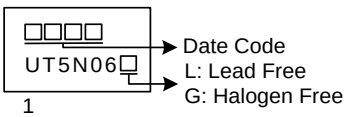
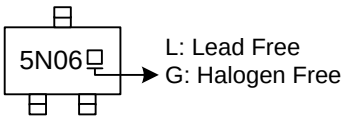
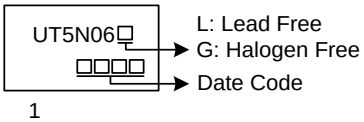

### ■ ORDERING INFORMATION

| Ordering Number | | Package | Pin Assignment | | | Packing |
|---|---|---|---|---|---|---|
| Lead Free | Halogen Free | | 1 | 2 | 3 | |
| UT5N06L-AA3-R | UT5N06G-AA3-R | SOT-223 | G | D | S | Tape Reel |
| UT5N06L-AB3-R | UT5N06G-AB3-R | SOT-89 | G | D | S | Tape Reel |
| UT5N06L-AE3-R | UT5N06G-AE3-R | SOT-23 | G | S | D | Tape Reel |

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




### ■ MARKING

| SOT-89 | SOT-23 | SOT-223 |
|---|---|---|
|  |  |  |

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

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±30 | V |
| Drain Current | Continuous | $I_D$ | 5 | A |
| | Pulsed (Note 2) | $I_{DM}$ | 15 | A |
| Avalanche Energy | Single Pulsed (Note 3) | $E_{AS}$ | 76 | mJ |
| Peak Diode Recovery dv/dt (Note 4) | | dv/dt | 16 | V/ns |
| Power Dissipation ($T_A$=25°C) | SOT-223 | $P_D$ | 2 | W |
| | SOT-23 | | 0.7 | W |
| | SOT-89 | | 1 | 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 = 10mH, $I_{AS}$ = 3.9A, $V_{DD}$ = 25V, $R_G$ = 25Ω, Starting $T_J$ = 25°C
4. $I_{SD}$ ≤ 5.0A, di/dt ≤ 200A/μs, $V_{DD}$ ≤ $BV_{DSS}$, Starting $T_J$ = 25°C

## ■ THERMAL DATA

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Junction to Ambient | SOT-223 | $\theta_{JA}$ | 62.5 | °C/W |
| | SOT-23 | | 177 | °C/W |
| | SOT-89 | | 125 | °C/W |

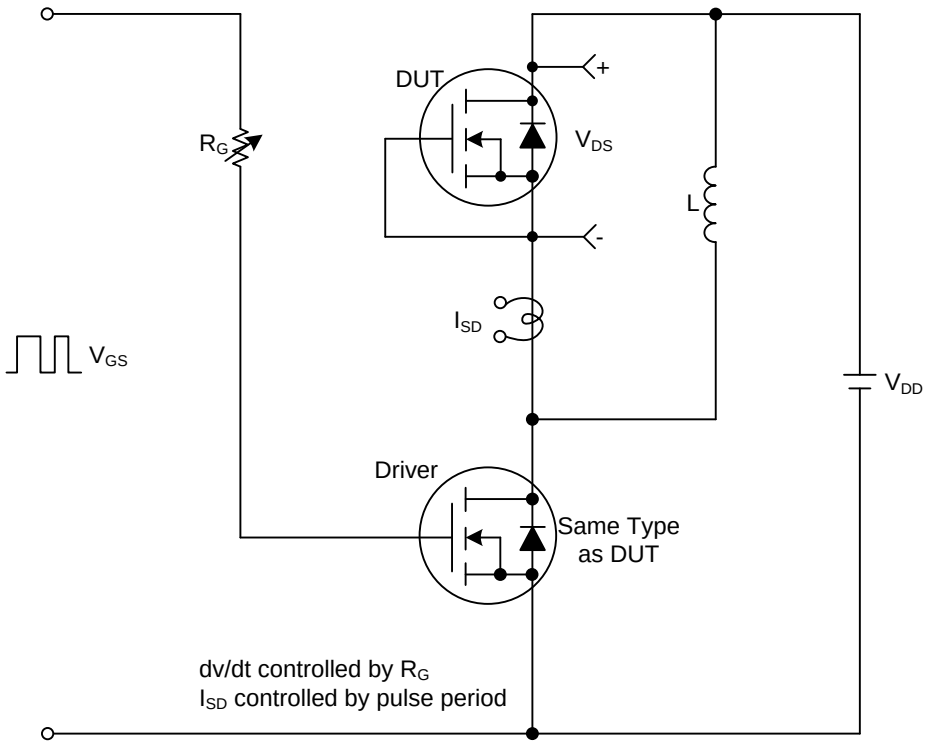
Note: Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.

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

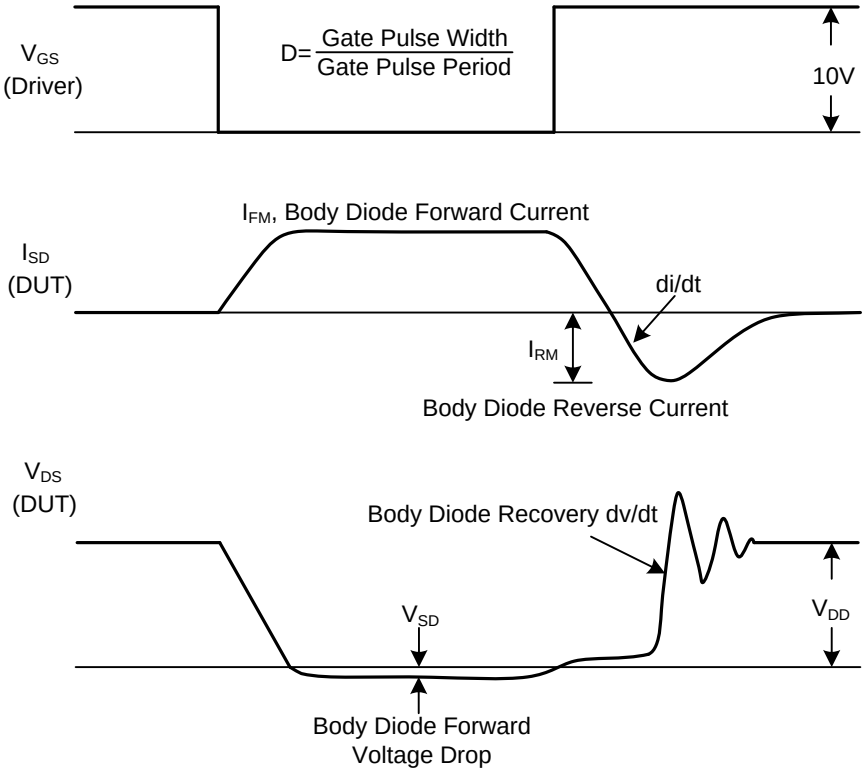
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $I_D$=250μA, $V_{GS}$=0V | 60 | | | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=60V, $V_{GS}$=0V | | | 1 | 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 | 1.0 | | 3.0 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=2.5A | | | 65 | mΩ |
| | | | $V_{GS}$=4.5V, $I_D$=2.5A | | | 90 | mΩ |
| **DYNAMIC PARAMETERS** | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{GS}$=0V, $V_{DS}$=25V, f=1.0MHz | | 650 | | pF |
| Output Capacitance | | $C_{OSS}$ | | | 50 | | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | | 32 | | pF |
| **SWITCHING PARAMETERS** | | | | | | | |
| Total Gate Charge (Note 1) | | $Q_G$ | $V_{DS}$=30V, $V_{GS}$=10V, $I_D$=5.0A , $I_G$=1mA (Note 1, 2) | | 15 | | nC |
| Gate to Source Charge | | $Q_{GS}$ | | | 3 | | nC |
| Gate to Drain Charge | | $Q_{GD}$ | | | 2.5 | | nC |
| Turn-ON Delay Time (Note 1) | | $t_{D(ON)}$ | $V_{DD}$=30V, $V_{GS}$=10V, $I_D$=5.0A, $R_G$=25Ω (Note 1, 2) | | 10 | | ns |
| Rise Time | | $t_R$ | | | 15 | | ns |
| Turn-OFF Delay Time | | $t_{D(OFF)}$ | | | 50 | | ns |
| Fall-Time | | $t_F$ | | | 25 | | ns |
| **SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS** | | | | | | | |
| Maximum Body-Diode Continuous Current | | $I_S$ | | | | 5 | A |
| Maximum Body-Diode Pulsed Current (Note 1) | | $I_{SM}$ | | | | 15 | A |
| Drain-Source Diode Forward Voltage (Note 1) | | $V_{SD}$ | $V_{GS}$=0V, $I_S$=5.0A | | | 1.4 | V |
| Reverse Recovery Time | | $t_{rr}$ | $V_{GS}$=0V, $I_S$=5.0A dI$_F$/dt=100A/μs (Note 1) | | 124 | | ns |
| Reverse Recovery Charge | | $Q_{rr}$ | | | 171 | | nC |

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

## ■ TEST CIRCUITS AND WAVEFORMS

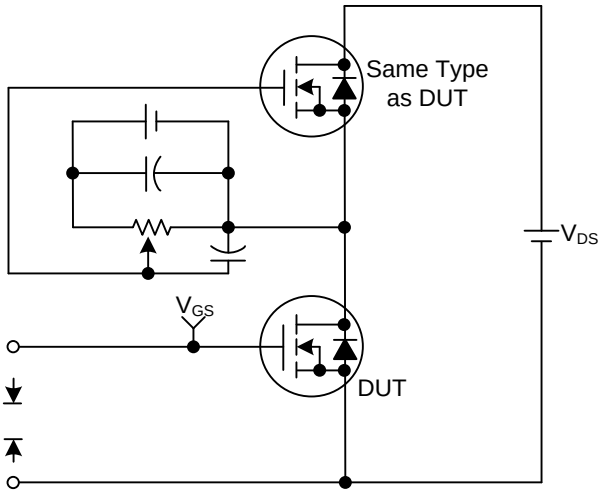



**Peak Diode Recovery dv/dt Test Circuit & Waveforms**

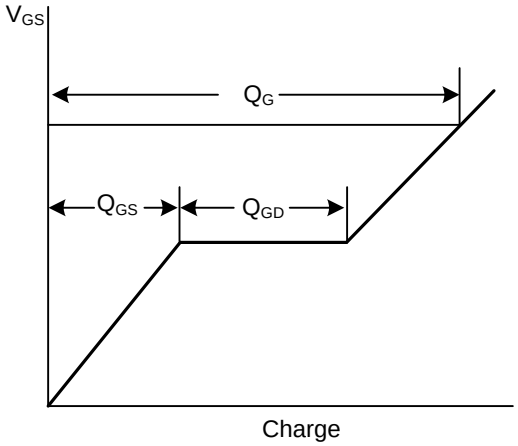



**Peak Diode Recovery dv/dt Waveforms**

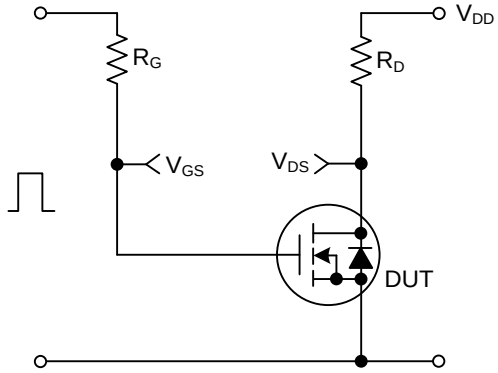
## ■ TEST CIRCUITS AND WAVEFORMS



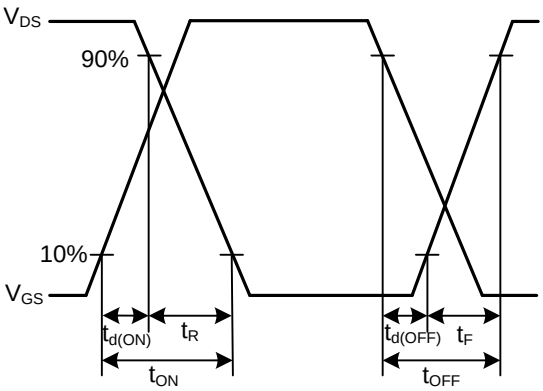

Gate Charge Test Circuit



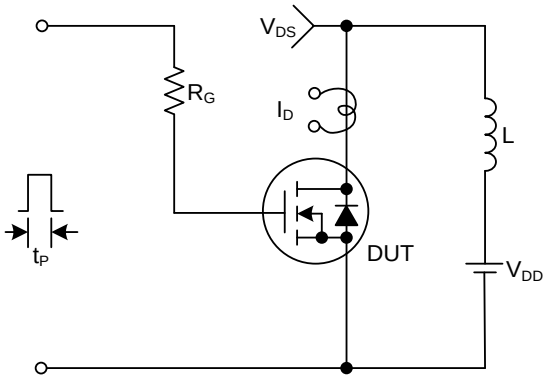

Gate Charge Waveforms



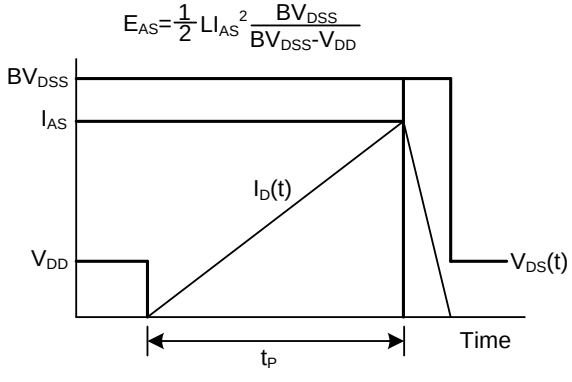

Resistive Switching Test Circuit




Resistive Switching Waveforms

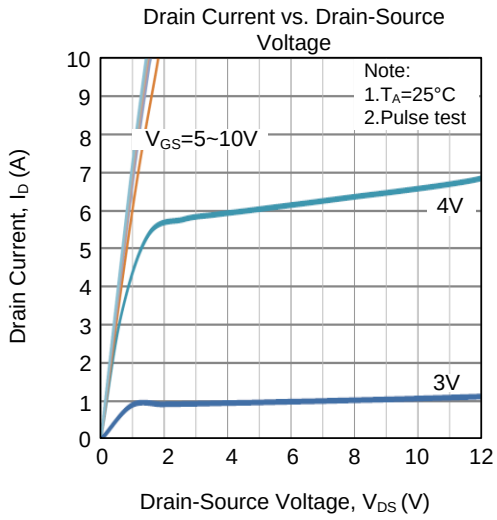


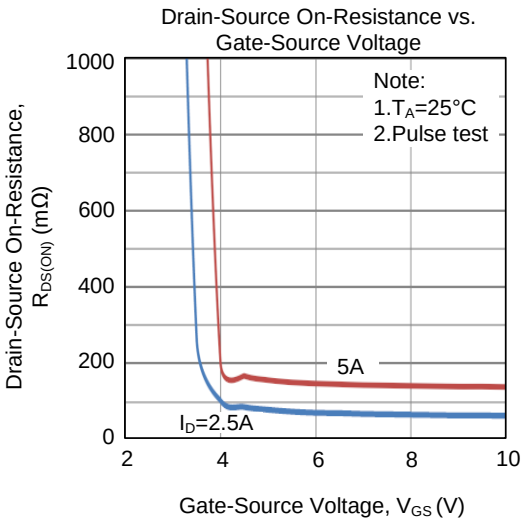

Unclamped Inductive Switching Test Circuit

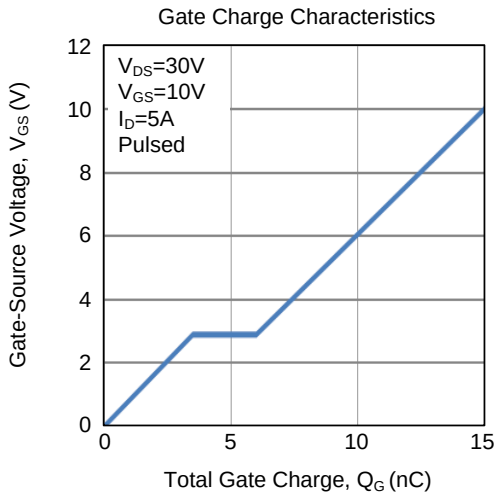


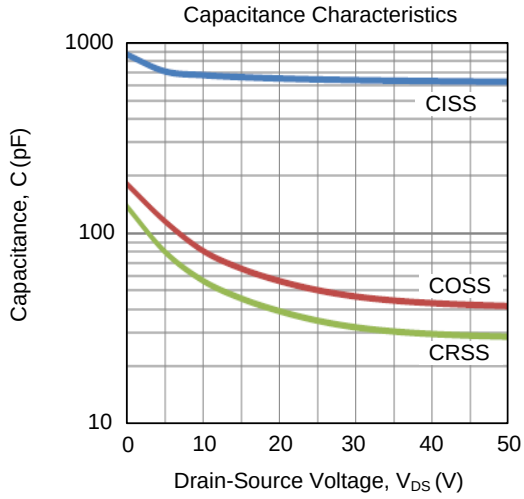

Unclamped Inductive Switching Waveforms

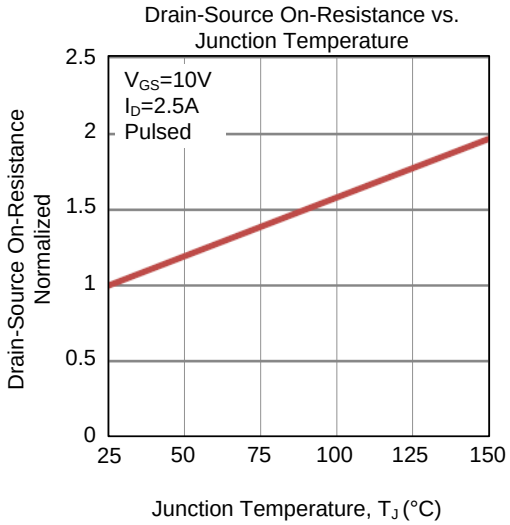
## ■ TYPICAL CHARACTERISTICS

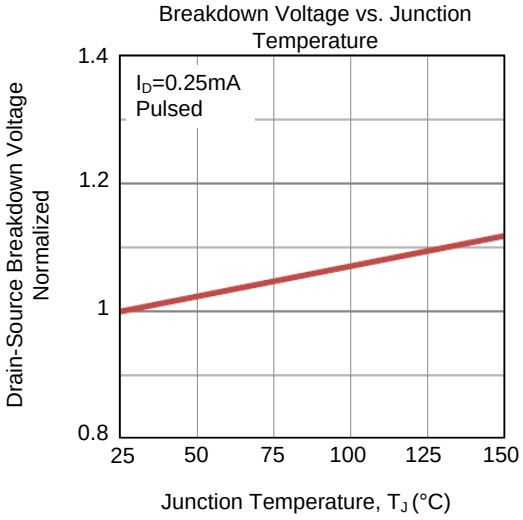


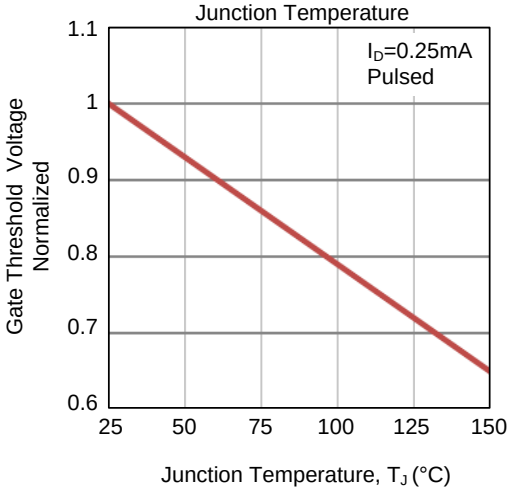



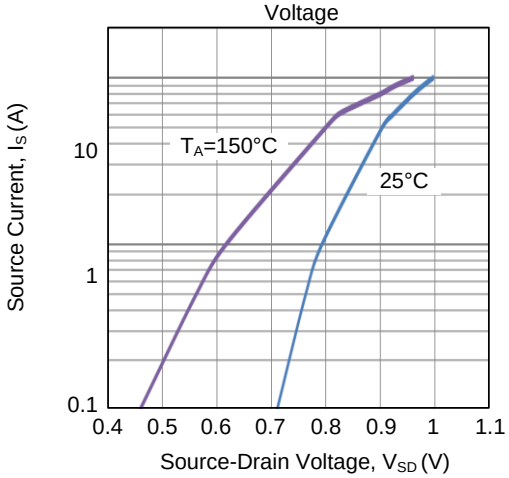



## ■ TYPICAL CHARACTERISTICS (Cont.)

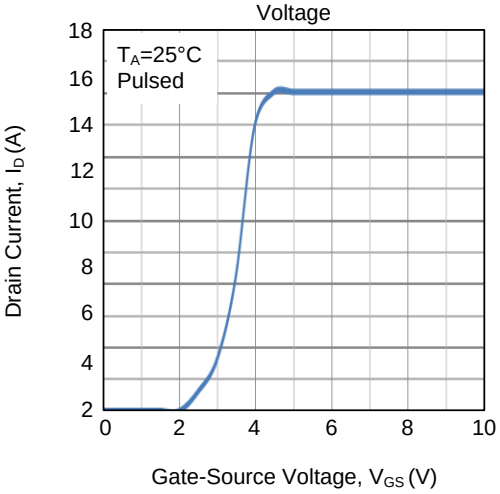
Gate Threshold Voltage vs. Junction Temperature



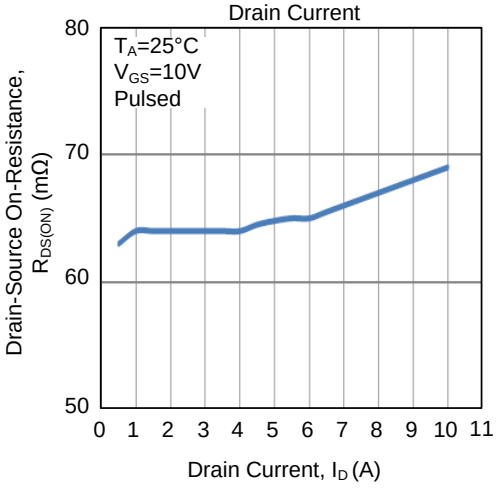

Source Current vs. Source-Drain Voltage



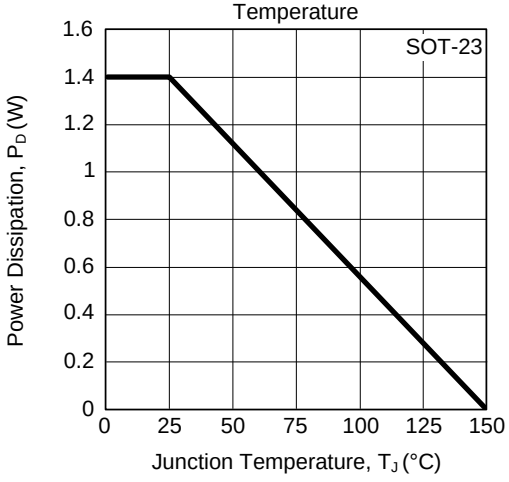

Drain Current vs. Gate-Source Voltage



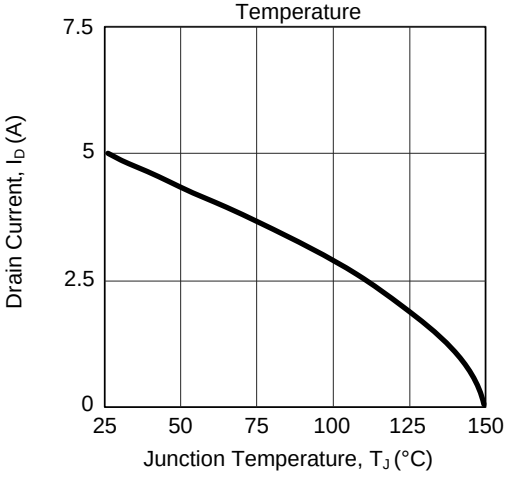

Drain-Source On-Resistance vs. Drain Current




Power Dissipation vs. Junction Temperature




Drain Current vs. Junction Temperature



## ■ TYPICAL CHARACTERISTICS (Cont.)