# Dual N-Channel 30-V (D-S) MOSFET with Schottky Diode

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| | $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) | $I_D$ (A) |
| Channel-1 | 30 | 0.022 at $V_{GS}$ = 10 V | 6.3 |
| | | 0.030 at $V_{GS}$ = 4.5 V | 5.4 |
| Channel-2 | | 0.013 at $V_{GS}$ = 10 V | 10 |
| | | 0.0185 at $V_{GS}$ = 4.5 V | 8.6 |

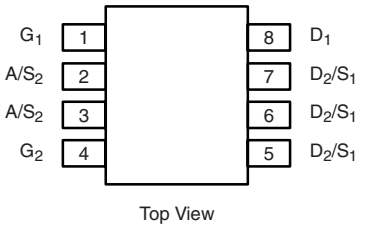
| SCHOTTKY PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | $V_{SD}$ (V) Diode Forward Voltage | $I_F$ (A) |
| 30 | 0.50 V at 1.0 A | 2.0 |

## FEATURES

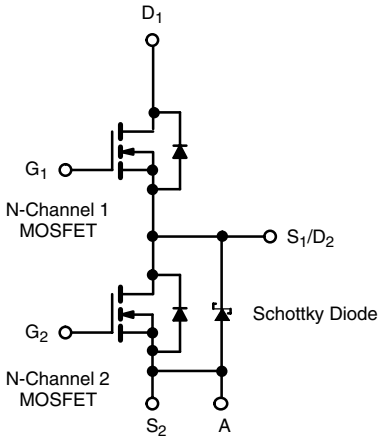
- **Halogen-free According to IEC 61249-2-21 Definition**
- LITTLE FOOT® *Plus* Power MOSFET
- 100 % $R_g$ Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

SO-8




Top View




**Ordering Information:** Si4816DY-T1-E3 (Lead (Pb)-free)
Si4816DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

**ABSOLUTE MAXIMUM RATINGS** $T_A$ = 25 °C, unless otherwise noted

| Parameter | | Symbol | Channel-1 | | Channel-2 | | Unit |
|---|---|---|---|---|---|---|---|
| | | | 10 s | Steady State | 10 s | Steady State | |
| Drain-Source Voltage | | $V_{DS}$ | 30 | | | | V |
| Gate-Source Voltage | | $V_{GS}$ | 20 | | | | |
| Continuous Drain Current ($T_J$ = 150 °C)[a] | $T_A$ = 25 °C | $I_D$ | 6.3 | 5.3 | 10 | 7.7 | A |
| | $T_A$ = 70 °C | | 5.4 | 4.2 | 8.2 | 6.2 | |
| Pulsed Drain Current | | $I_{DM}$ | 30 | | 40 | | |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | 1.3 | 0.9 | 2.2 | 1.15 | |
| Avalanche Current[b] | L = 0.1 mH | $I_{AS}$ | 12 | | 25 | | |
| Single Pulse Avalanche Energy[b] | | $E_{AS}$ | 7.2 | | 31.25 | | mJ |
| Maximum Power Dissipation[a] | $T_A$ = 25 °C | $P_D$ | 1.4 | 1.0 | 2.4 | 1.25 | W |
| | $T_A$ = 70 °C | | 0.9 | 0.64 | 1.5 | 0.8 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to 150 | | | | °C |

**THERMAL RESISTANCE RATINGS**

| Parameter | | Symbol | Channel-1 | | Channel-2 | | Schottky | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Typ. | Max. | Typ. | Max. | Typ. | Max. | |
| Maximum Junction-to-Ambient[a] | t ≤ 10 s | $R_{thJA}$ | 72 | 90 | 43 | 53 | 48 | 60 | °C/W |
| | Steady State | | 100 | 125 | 82 | 100 | 80 | 100 | |
| Maximum Junction-to-Foot (Drain) | Steady State | $R_{thJC}$ | 51 | 63 | 25 | 30 | 28 | 35 | |

Notes:
a. Surface Mounted on 1" x 1" FR4 board.
b. Starting date code W46BAA.

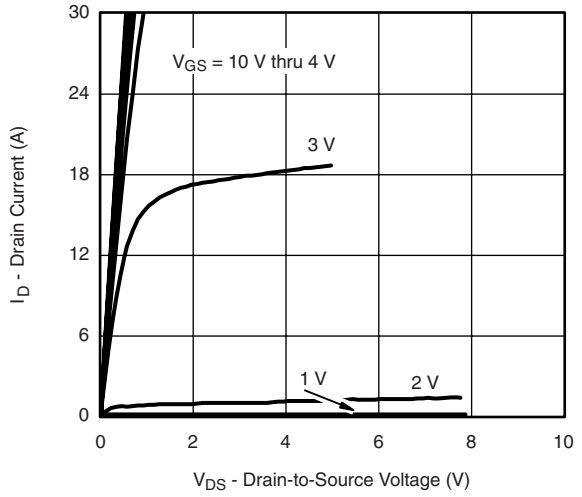
| **MOSFET SPECIFICATIONS** $T_J$ = 25 °C, unless otherwise noted | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | | **Min.** | **Typ.[a]** | **Max.** | **Unit** |
| **Static** | | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | Ch-1 | 0.8 | | 2 | V |
| | | | Ch-2 | 1.0 | | 3 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 20 V | Ch-1 | | | 100 | nA |
| | | | Ch-2 | | | 100 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V | Ch-1 | | | 1 | µA |
| | | | Ch-2 | | | 100 | |
| | | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V, $T_J$ = 85 °C | Ch-1 | | | 15 | |
| | | | Ch-2 | | | 2000 | |
| On-State Drain Current[b] | $I_{D(on)}$ | $V_{DS}$ = 5 V, $V_{GS}$ = 10 V | Ch-1 | 20 | | | A |
| | | | Ch-2 | 30 | | | |
| Drain-Source On-State Resistance[b] | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 6.3 A | Ch-1 | | 0.018 | 0.022 | Ω |
| | | $V_{GS}$ = 10 V, $I_D$ = 10 A | Ch-2 | | 0.0105 | 0.013 | |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 5.4 A | Ch-1 | | 0.024 | 0.030 | |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 8.6 A | Ch-2 | | 0.015 | 0.0185 | |
| Forward Transconductance[b] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 6.3 A | Ch-1 | | 17 | | S |
| | | $V_{DS}$ = 15 V, $I_D$ = 10 A | Ch-2 | | 28 | | |
| Diode Forward Voltage[b] | $V_{SD}$ | $I_S$ = 1.3 A V, $V_{GS}$ = 0 V | Ch-1 | | 0.7 | 1.1 | V |
| | | $I_S$ = 1 A V, $V_{GS}$ = 0 V | Ch-2 | | 0.47 | 0.5 | |
| **Dynamic[a]** | | | | | | | |
| Total Gate Charge | $Q_g$ | Channel-1<br>$V_{DS}$ = 15 V, $V_{GS}$ = 5 V, $I_D$ = 6.3 A<br><br>Channel-2<br>$V_{DS}$ = 15 V, $V_{GS}$ = 5 V, $I_D$ = - 10 A | Ch-1 | | 8.0 | 12 | nC |
| | | | Ch-2 | | 15 | 23 | |
| Gate-Source Charge | $Q_{gs}$ | | Ch-1 | | 1.75 | | |
| | | | Ch-2 | | 5.3 | | |
| Gate-Drain Charge | $Q_{gd}$ | | Ch-1 | | 3.2 | | |
| | | | Ch-2 | | 4.6 | | |
| Gate Resistance | $R_g$ | | Ch-1 | 1.5 | | 6.1 | Ω |
| | | | Ch-2 | 0.5 | | 2.6 | |
| Turn-On Delay Time | $t_{d(on)}$ | Channel-1<br>$V_{DD}$ = 15 V, $R_L$ = 15 Ω<br>$I_D \cong$ 1 A, $V_{GEN}$ = 10 V, $R_g$ = 6 Ω<br><br>Channel-2<br>$V_{DD}$ = 15 V, $R_L$ = 15 Ω<br>$I_D \cong$ 1 A, $V_{GEN}$ = 10 V, $R_g$ = 6 Ω | Ch-1 | | 10 | 20 | ns |
| | | | Ch-2 | | 15 | 30 | |
| Rise Time | $t_r$ | | Ch-1 | | 5 | 10 | |
| | | | Ch-2 | | 5 | 10 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | Ch-1 | | 26 | 50 | |
| | | | Ch-2 | | 44 | 80 | |
| Fall Time | $t_f$ | | Ch-1 | | 8 | 16 | |
| | | | Ch-2 | | 12 | 24 | |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F$ = 1.3 A, dI/dt = 100 A/µs | Ch-1 | | 30 | 60 | |
| | | $I_F$ = 2.2 A, dI/dt = 100 µA/µs | Ch-2 | | 32 | 70 | |

Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

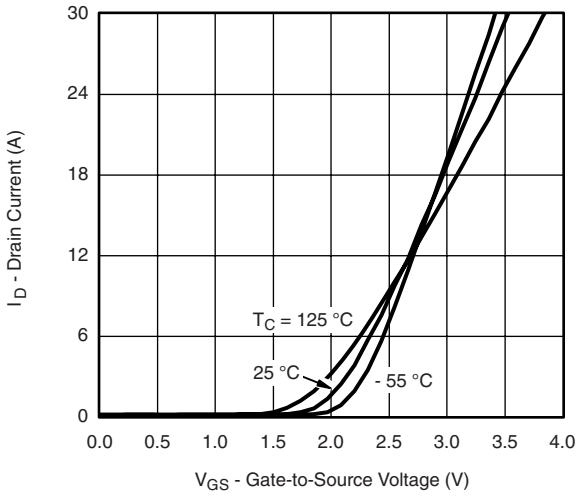
| **SCHOTTKY SPECIFICATIONS** $T_J$ = 25 °C, unless otherwise noted | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Min.** | **Typ.** | **Max.** | **Unit** |
| Forward Voltage Drop | $V_F$ | $I_F$ = 1.0 A | | 0.47 | 0.50 | V |
| | | $I_F$ = 1.0 A, $T_J$ = 125 °C | | 0.36 | 0.42 | |
| Maximum Reverse Leakage Current | $I_{rm}$ | $V_R$ = 30 V | | 0.004 | 0.100 | mA |
| | | $V_R$ = 30 V, $T_J$ = 100 °C | | 0.7 | 10 | |
| | | $V_R$ = - 30 V, $T_J$ = 125 °C | | 3.0 | 20 | |
| Junction Capacitance | $C_T$ | $V_R$ = 10 V | | 50 | | pF |

*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

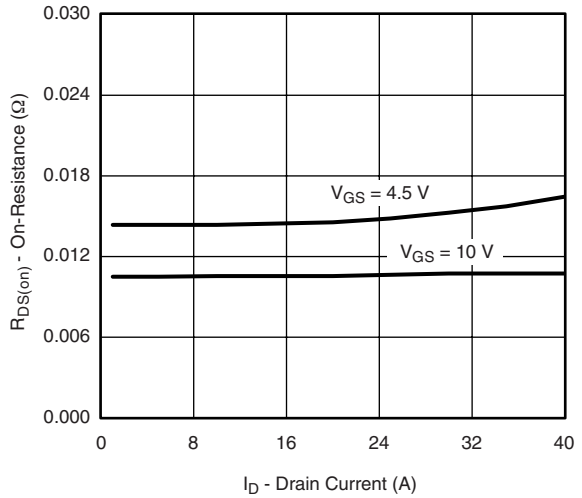
## CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



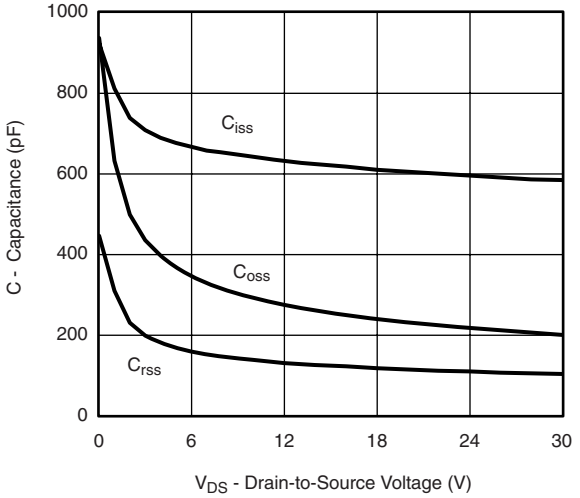

**Output Characteristics**



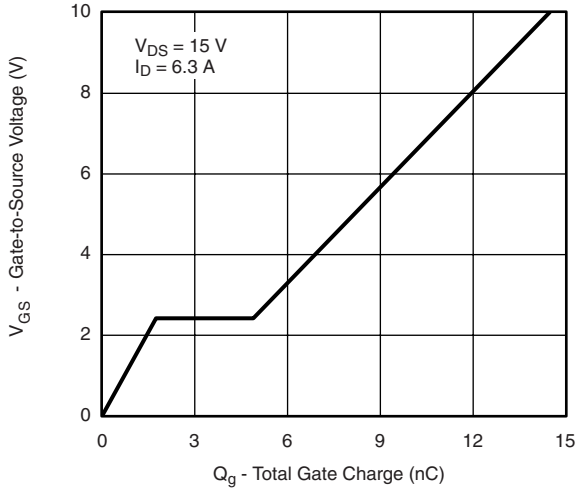

**Transfer Characteristics**



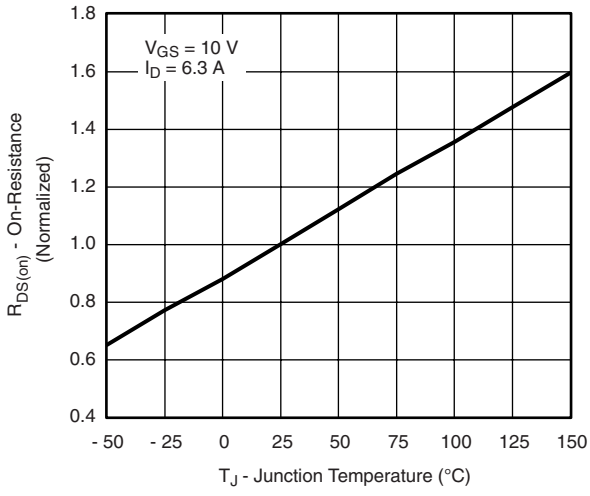

**On-Resistance vs. Drain Current**




**Capacitance**

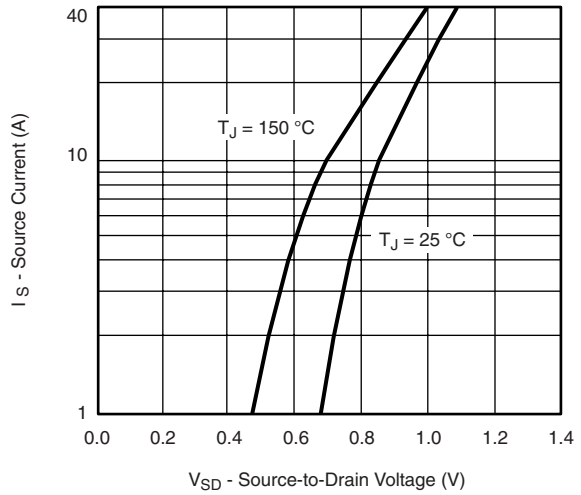



**Gate Charge**

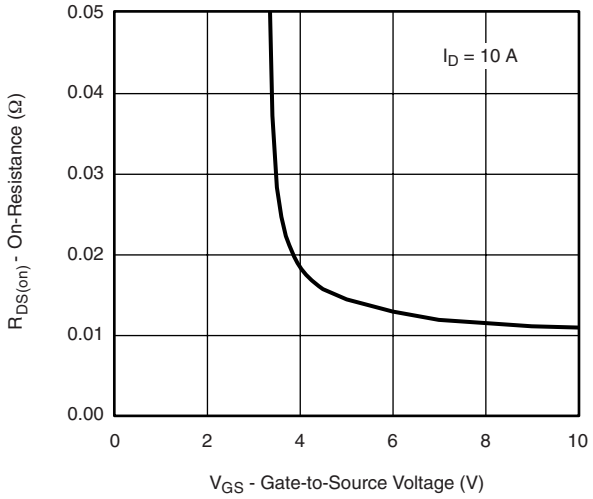



**On-Resistance vs. Junction Temperature**

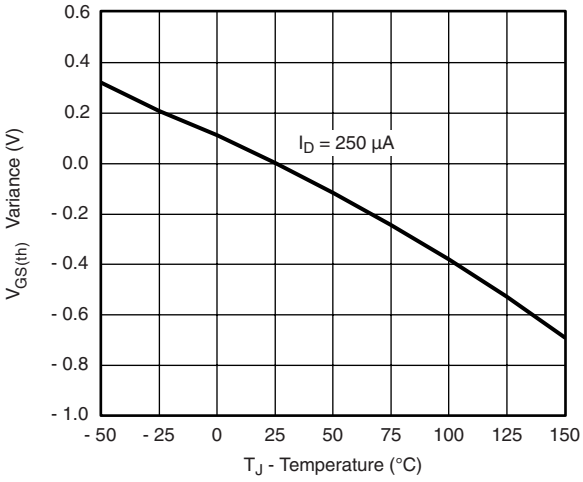
## CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



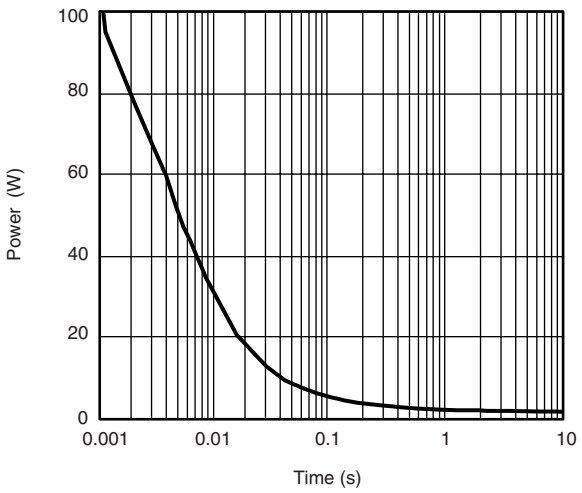

**Source-Drain Diode Forward Voltage**



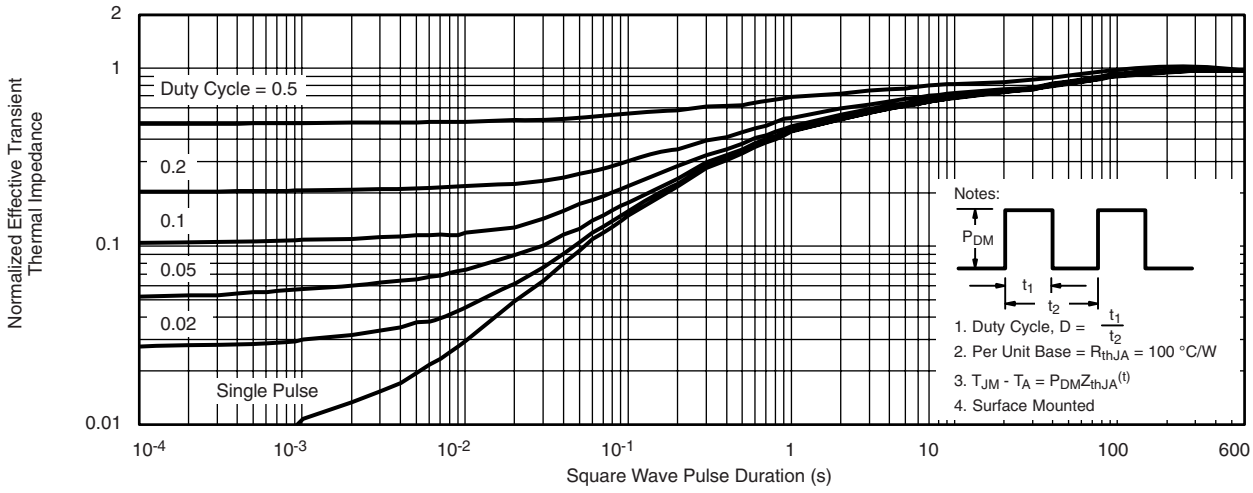

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage**

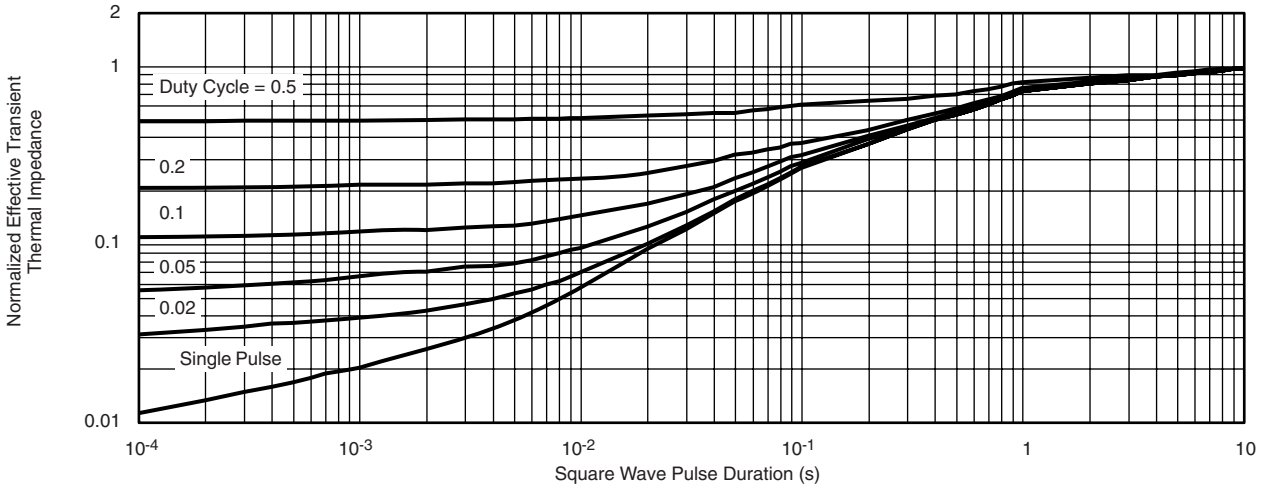



**Single Pulse Power, Junction-to-Ambient**



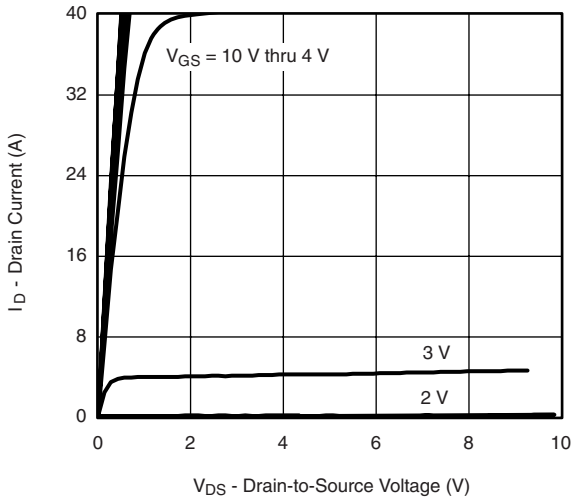

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

## CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

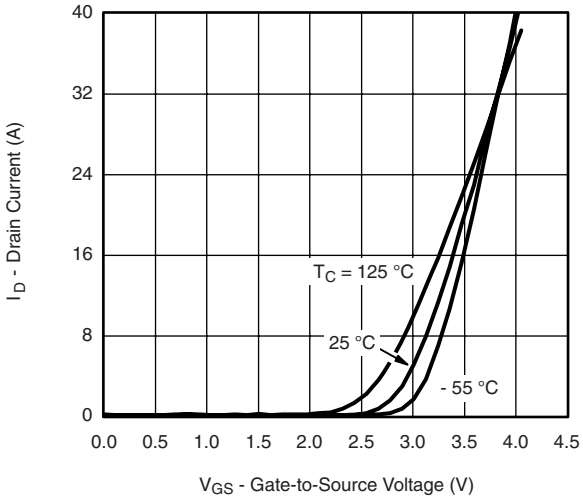



**Normalized Thermal Transient Impedance, Junction-to-Foot**

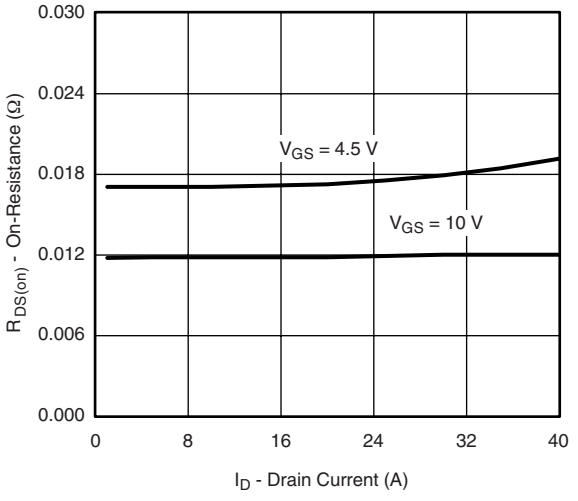
## CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



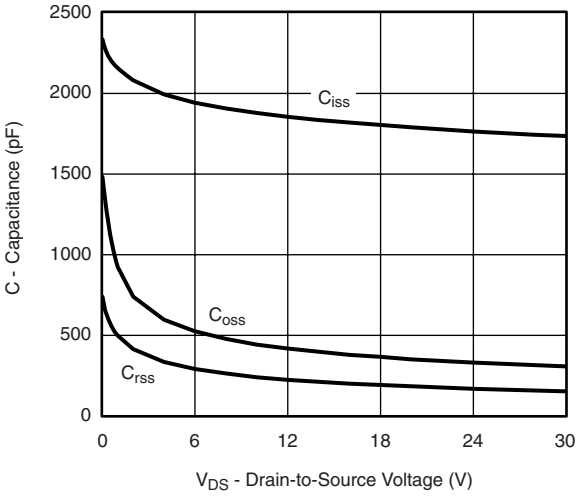

**Output Characteristics**




**Transfer Characteristics**

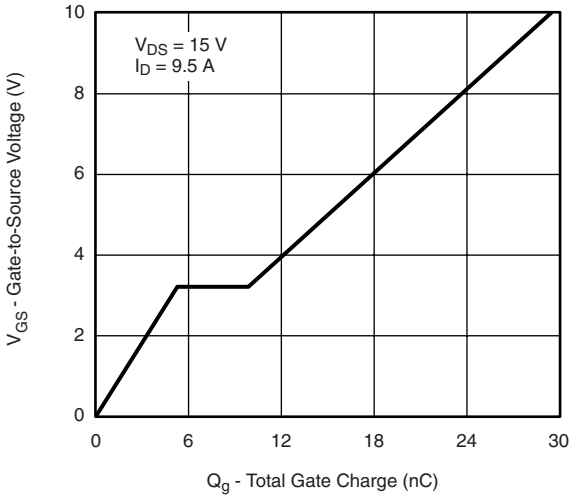



**On-Resistance vs. Drain Current**

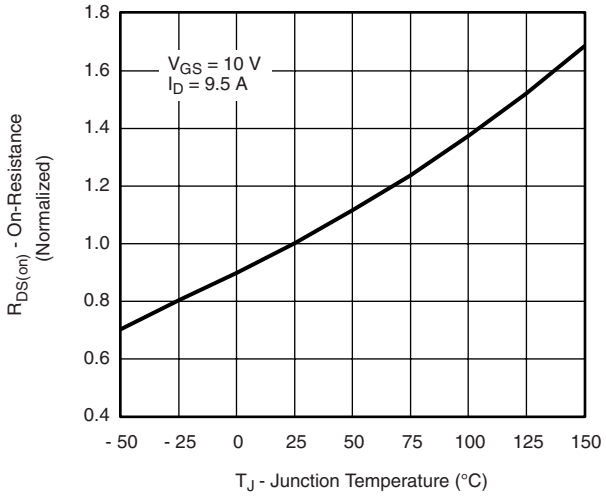



**Capacitance**

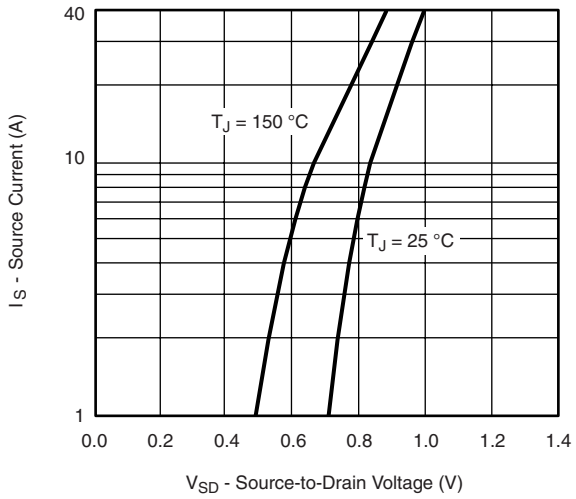
## CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



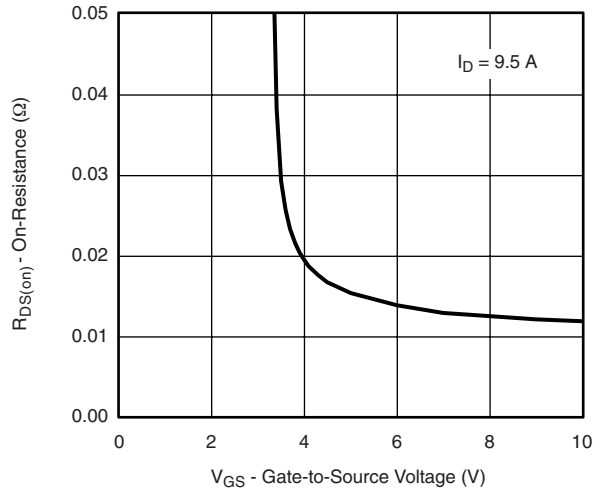

**Gate Charge**



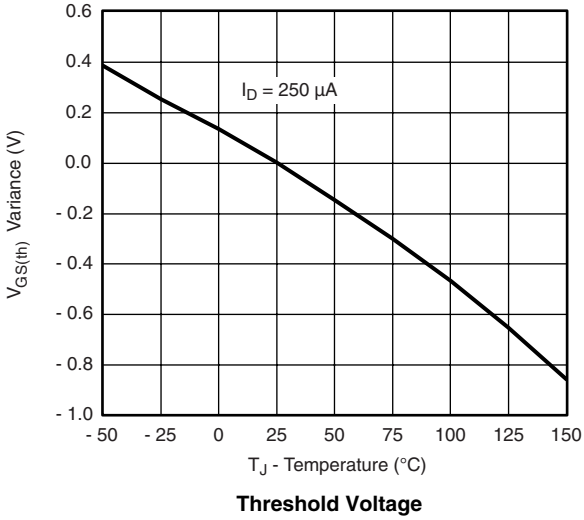

**On-Resistance vs. Junction Temperature**



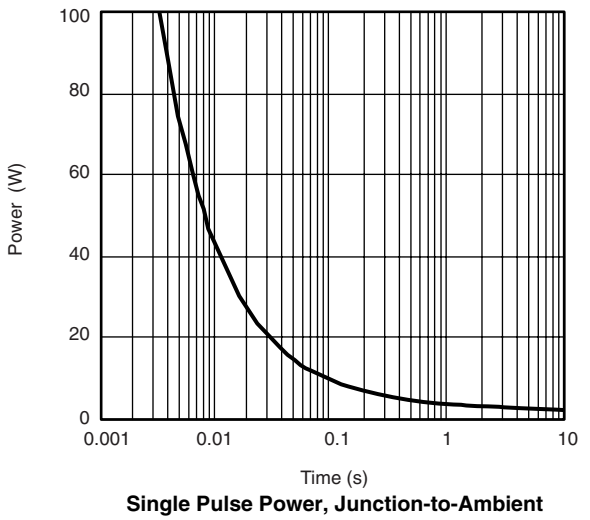

**Source-Drain Diode Forward Voltage**




**On-Resistance vs. Gate-to-Source Voltage**

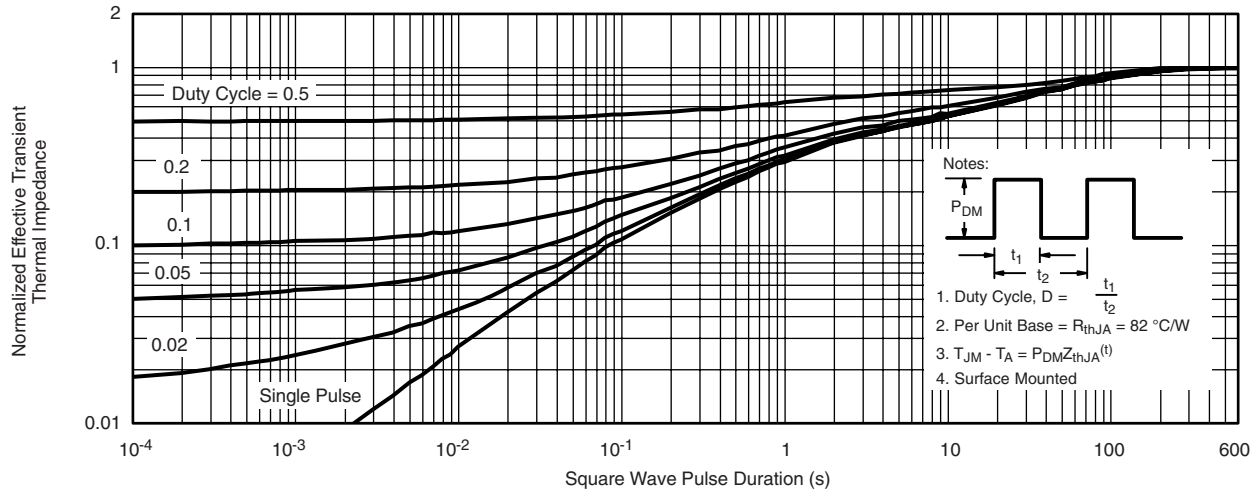



**Threshold Voltage**

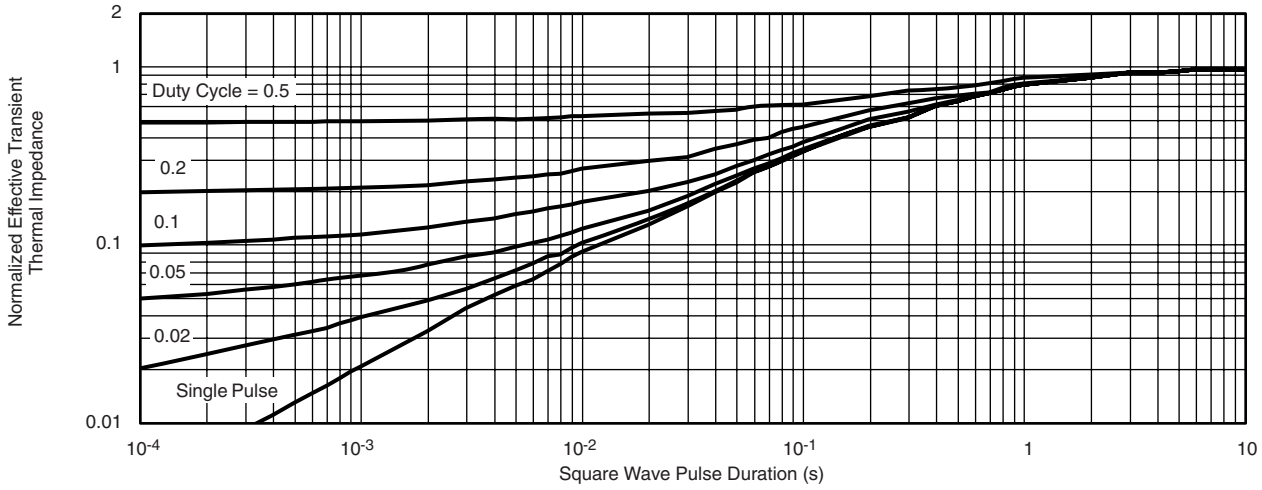



**Single Pulse Power, Junction-to-Ambient**

## CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

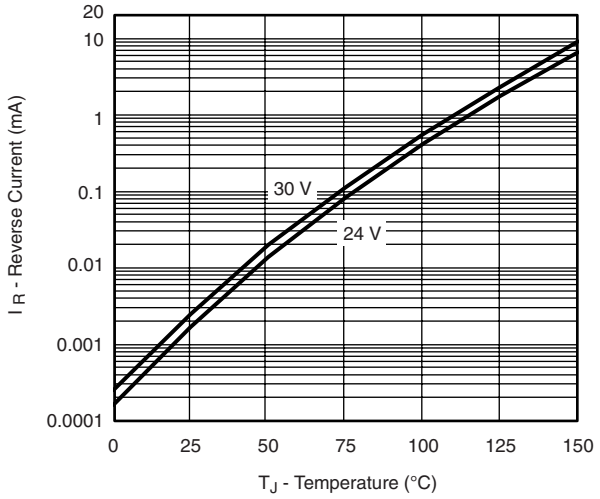



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

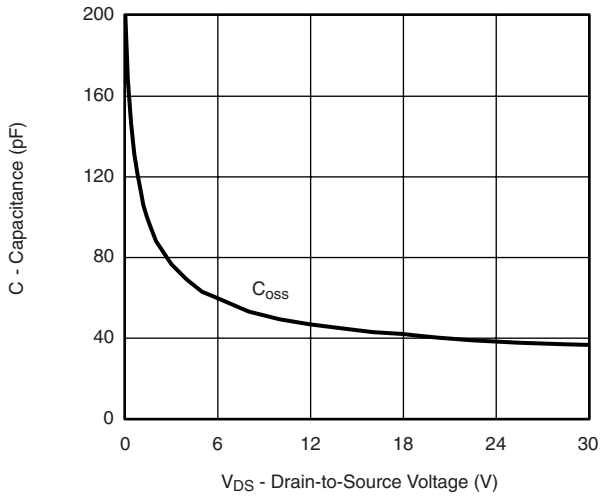



**Normalized Thermal Transient Impedance, Junction-to-Foot**

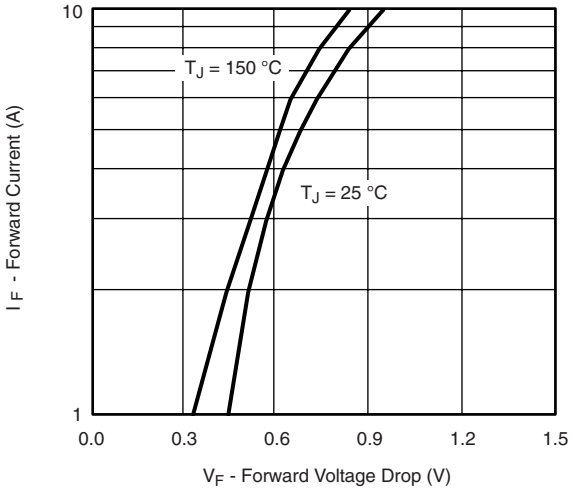
## SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted




**Reverse Current vs. Junction Temperature**




**Capacitance**




**Forward Voltage Drop**

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