# FDY4000CZ-VB Datasheet

## N-and P-Channel 20V (D-S) MOSFET

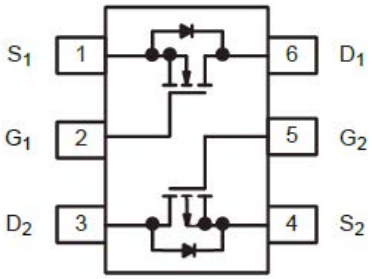
| PRODUCT SUMMARY | | | |
|---|---|---|---|
| | $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) | $I_D$ (A) |
| N-Channel | 20 | 0.270 at $V_{GS}$ = 4.5 V | 0.60 |
| | | 0.410 at $V_{GS}$ = 2.5 V | 0.55 |
| P-Channel | - 20 | 0.660 at $V_{GS}$ = - 4.5 V | - 0.30 |
| | | 0.840 at $V_{GS}$ = - 2.5 V | - 0.25 |

### FEATURES

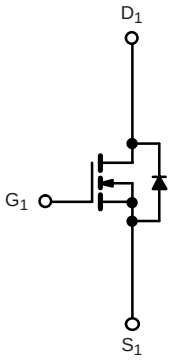
- **Halogen-free According to IEC 61249-2-21 Definition**
- Trench Power MOSFET
- 100 % $R_g$ Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

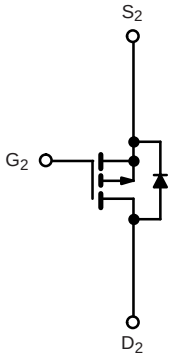
SC-75-6




Top View




N-Channel MOSFET




P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_A$ = 25 °C, unless otherwise noted | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **N-Channel** | **P-Channel** | **Unit** |
| Drain-Source Voltage | | $V_{DS}$ | 20 | - 20 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | ± 20 | |
| Continuous Drain Current ($T_J$ = 150 °C)[a, b] | $T_A$ = 25 °C | $I_D$ | 0.6 | - 0.3 | A |
| | $T_A$ = 70 °C | | 0.55 | - 0.25 | |
| Pulsed Drain Current | | $I_{DM}$ | 3 | - 2 | |
| Continuous Source Current (Diode Conduction)[a, b] | | $I_S$ | 1.05 | - 1.05 | |
| Maximum Power Dissipation[a, b] | $T_A$ = 25 °C | $P_D$ | 1.15 | | W |
| | $T_A$ = 70 °C | | 0.73 | | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to 150 | | °C |

| THERMAL RESISTANCE RATINGS | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Typical** | **Maximum** | **Unit** |
| Maximum Junction-to-Ambient[a] | t ≤ 5 s | $R_{thJA}$ | 93 | 110 | °C/W |
| | Steady State | | 130 | 150 | |
| Maximum Junction-to-Lead | Steady State | $R_{thJL}$ | 75 | 90 | |

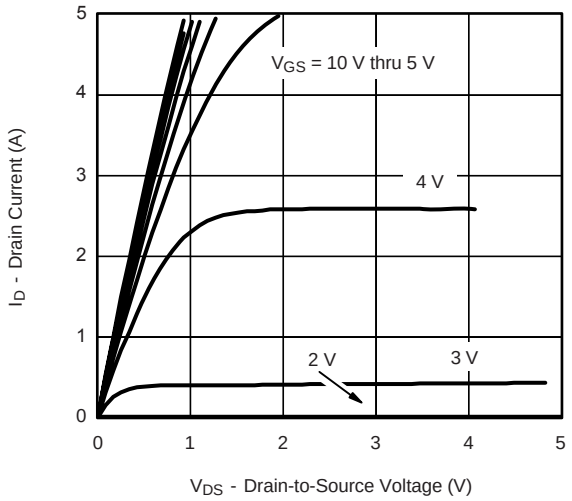
Notes:
a. Surface Mounted on FR4 board.
b. t ≤ 5 s.

| **SPECIFICATIONS** $T_J$ = 25 °C, unless otherwise noted | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | | **Min.** | **Typ.** | **Max.** | **Unit** |
| **Static** | | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | N-Ch | 0.7 | | | V |
| | | $V_{DS}$ = $V_{GS}$, $I_D$ = - 250 µA | P-Ch | - 0.8 | | | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | N-Ch | | | ± 100 | nA |
| | | | P-Ch | | | ± 100 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V | N-Ch | | | 1 | µA |
| | | $V_{DS}$ = - 24 V, $V_{GS}$ = 0 V | P-Ch | | | - 1 | |
| | | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V, $T_J$ = 55 °C | N-Ch | | | 5 | |
| | | $V_{DS}$ = - 24 V, $V_{GS}$ = 0 V, $T_J$ = 55 °C | P-Ch | | | - 5 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ = 5 V, $V_{GS}$ = 10 V | N-Ch | 3.7 | | | A |
| | | $V_{DS}$ = - 5 V, $V_{GS}$ = - 10 V | P-Ch | - 3 | | | |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = 2.5 V, $I_D$ = 0.6 A | N-Ch | | 0.410 | | Ω |
| | | $V_{GS}$ = - 2.5 V, $I_D$ = - 0.3A | P-Ch | | 0.840 | | |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 0.6A | N-Ch | | 0.270 | | |
| | | $V_{GS}$ = - 4.5 V, $I_D$ = - 0.3 A | P-Ch | | 0.660 | | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = 10 V, $I_D$ = 2.5 A | N-Ch | | 4.3 | | S |
| | | $V_{DS}$ = - 15 V, $I_D$ = - 1.8 A | P-Ch | | 2.4 | | |
| Diode Forward Voltage[a] | $V_{SD}$ | $I_S$ = 1.05 A, $V_{GS}$ = 0 V | N-Ch | | 0.81 | 1.10 | V |
| | | $I_S$ = - 1.05 A, $V_{GS}$ = 0 V | P-Ch | | - 0.83 | - 1.10 | |
| **Dynamic[b]** | | | | | | | |
| Total Gate Charge | $Q_g$ | N-Channel $V_{DS}$ = 15 V, $V_{GS}$ = 5 V, $I_D$ = 1.8 A<br>P-Channel $V_{DS}$ = - 15 V, $V_{GS}$ = - 5 V, $I_D$ = - 1.8 A | N-Ch | | 2.1 | 3.2 | nC |
| | | | P-Ch | | 2.4 | 3.6 | |
| Gate-Source Charge | $Q_{gs}$ | | N-Ch | | 0.7 | | |
| | | | P-Ch | | 0.9 | | |
| Gate-Drain Charge | $Q_{gd}$ | | N-Ch | | 0.7 | | |
| | | | P-Ch | | 0.8 | | |
| Gate Resistance | $R_g$ | | N-Ch | 0.5 | | 2.4 | Ω |
| | | | P-Ch | 3 | | 11 | |
| Turn-On Delay Time | $t_{d(on)}$ | N-Channel $V_{DD}$ = 15 V, $R_L$ = 15 Ω $I_D$ ≅ 1 A, $V_{GEN}$ = 10 V, $R_g$ = 6 Ω<br>P-Channel $V_{DD}$ = - 15 V, $R_L$ = 15 Ω $I_D$ ≅ - 1 A, $V_{GEN}$ = - 10 V, $R_g$ = 6 Ω | N-Ch | | 7 | 11 | ns |
| | | | P-Ch | | 8 | 12 | |
| Rise Time | $t_r$ | | N-Ch | | 9 | 14 | |
| | | | P-Ch | | 12 | 18 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | N-Ch | | 13 | 20 | |
| | | | P-Ch | | 12 | 18 | |
| Fall Time | $t_f$ | | N-Ch | | 5 | 8 | |
| | | | P-Ch | | 7 | 11 | |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F$ = 1.05 A, dI/dt = 100 A/µs | N-Ch | | 35 | 60 | |
| | | $I_F$ = - 1.05 A, dI/dt = 100 A/µs | P-Ch | | 30 | 60 | |

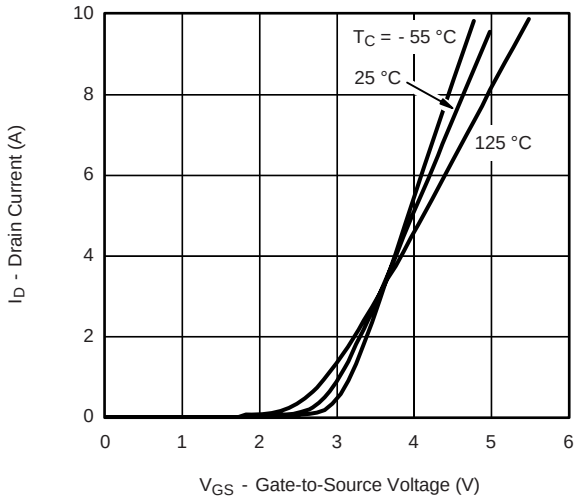
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

*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.*

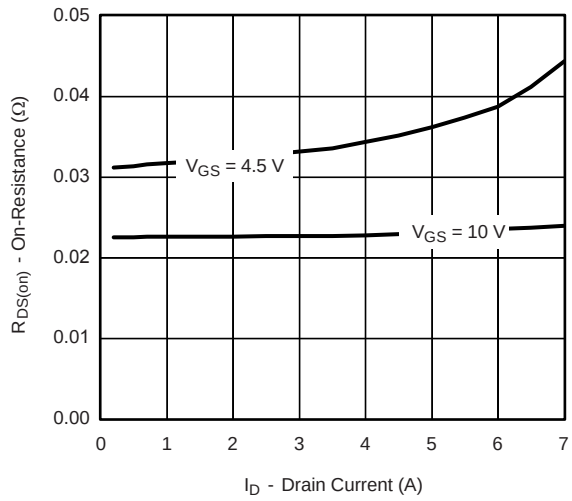
## N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



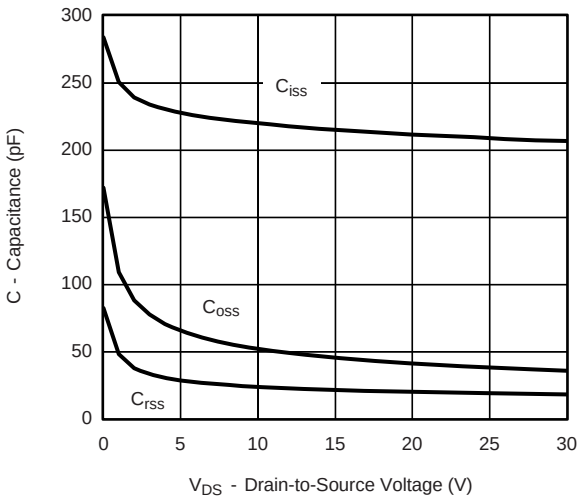

**Output Characteristics**



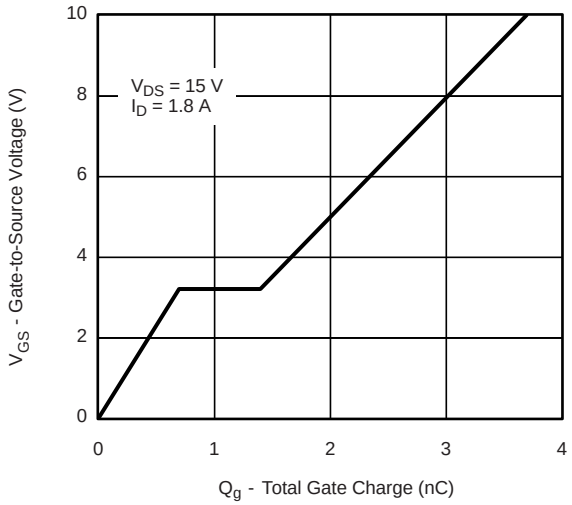

**Transfer Characteristics**



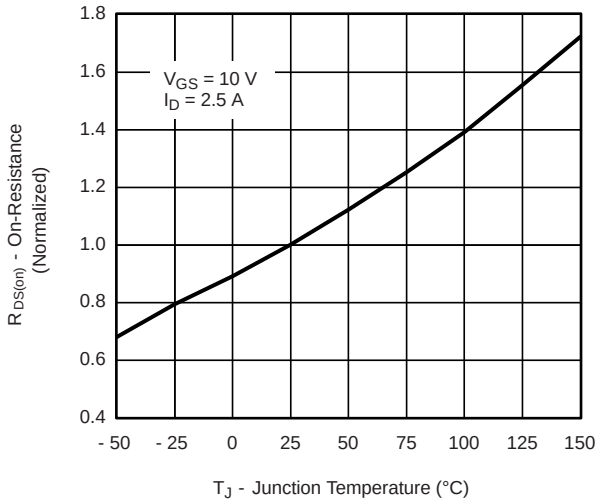

**On-Resistance vs. Drain Current**




**Capacitance**

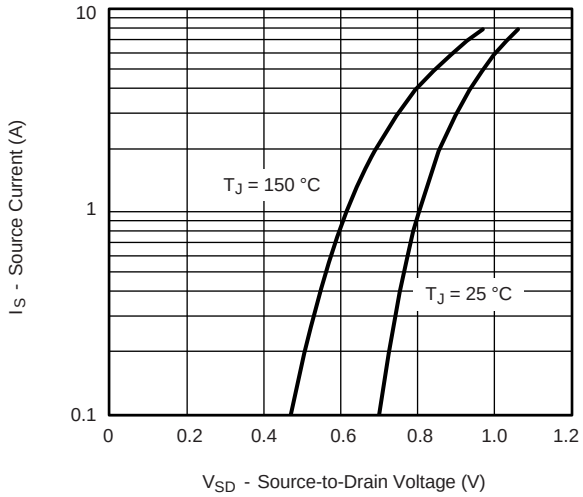



**Gate Charge**

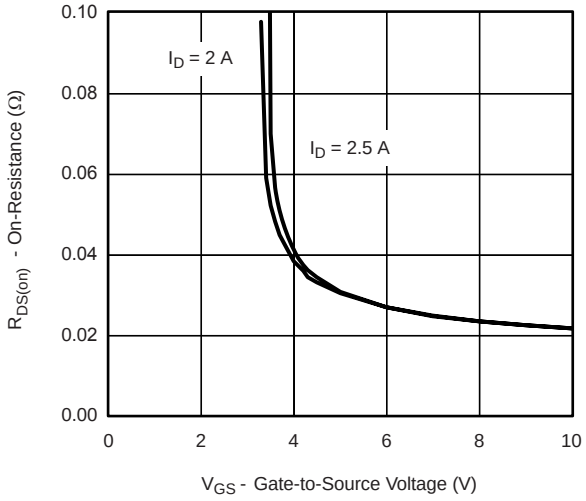



**On-Resistance vs. Junction Temperature**

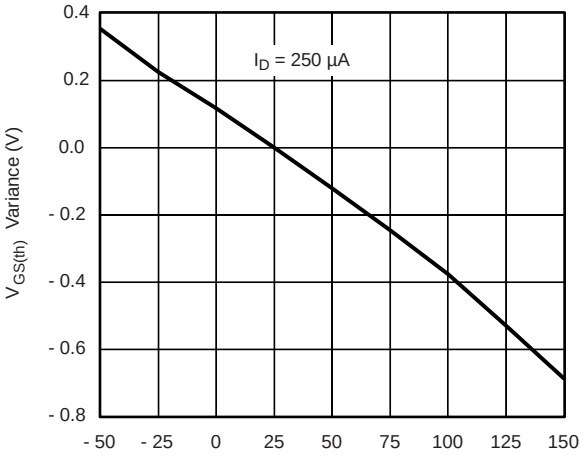
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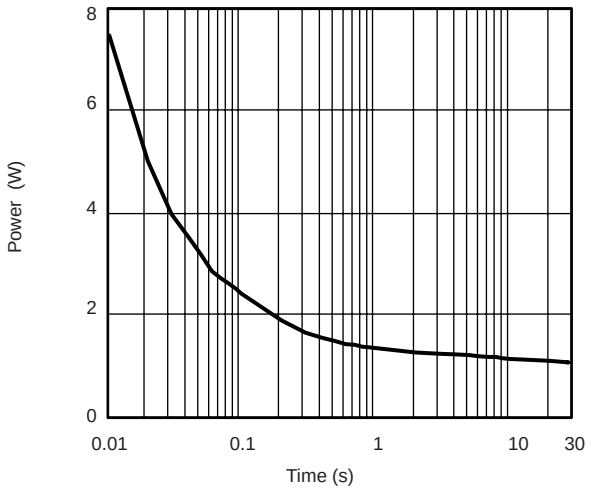

**Source-Drain Diode Forward Voltage**



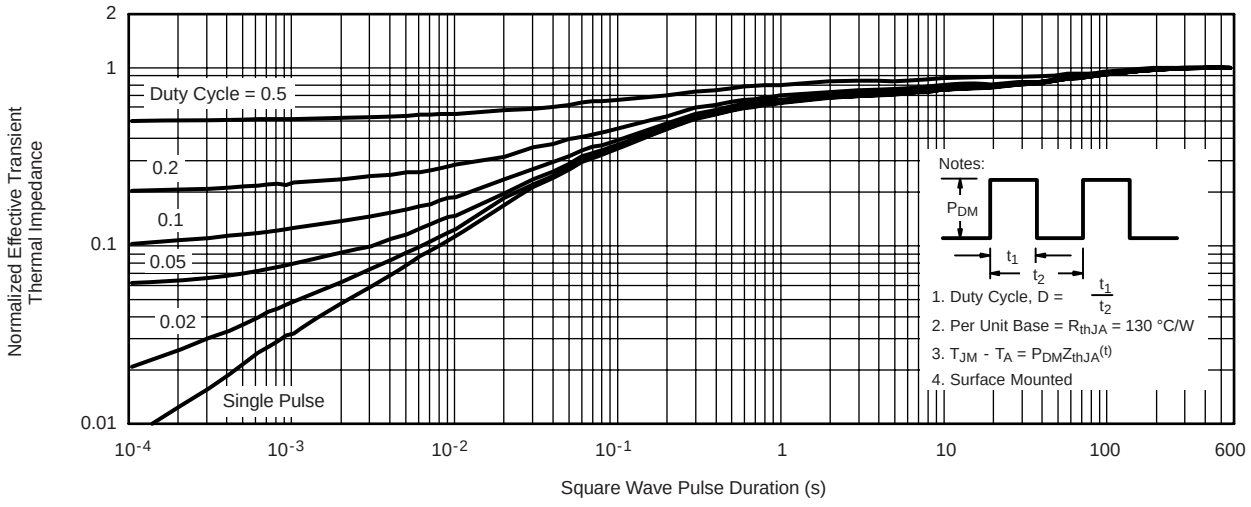

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage**

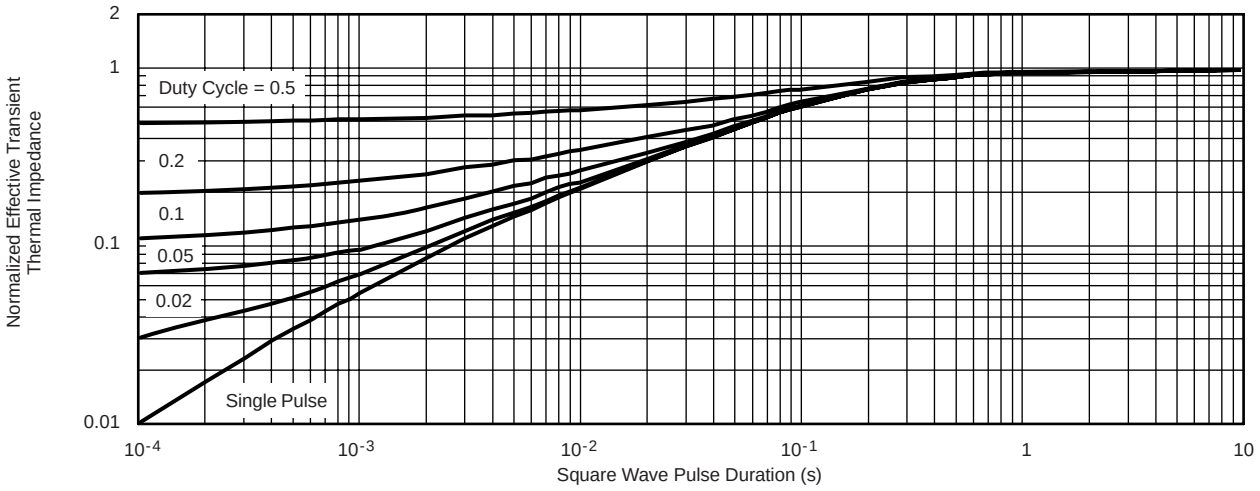



**Single Pulse Power (Junction-to-Ambient)**



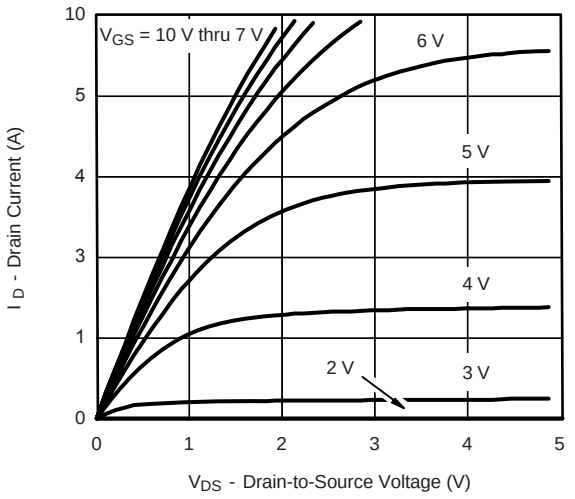

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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

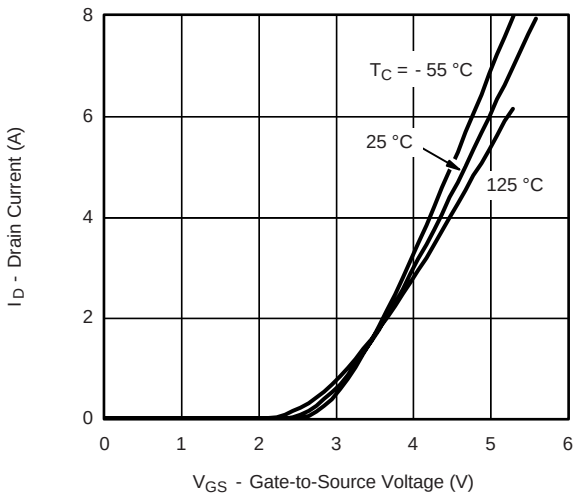



**Normalized Thermal Transient Impedance, Junction-to-Foot**

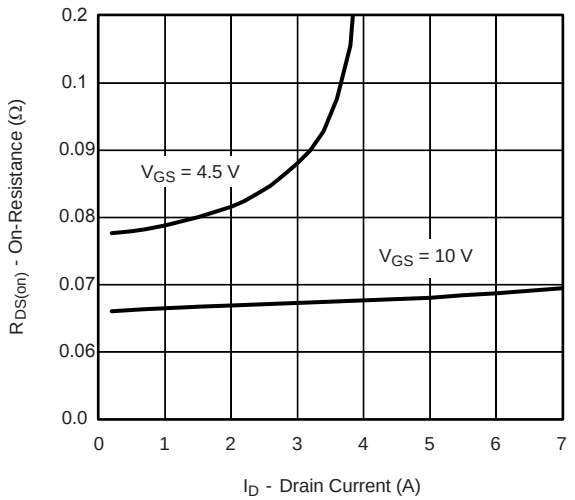
## P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



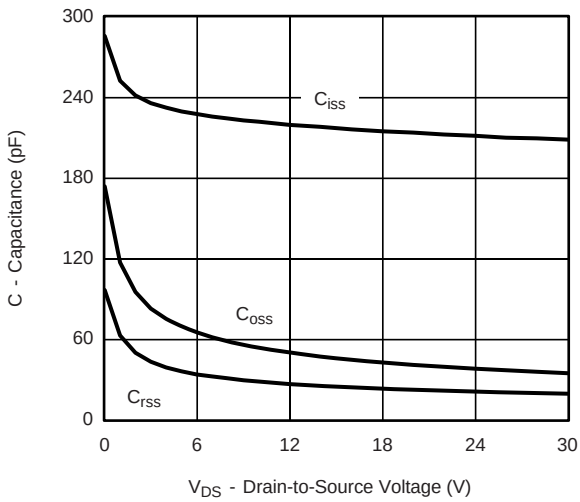

**Output Characteristics**




**Transfer Characteristics**

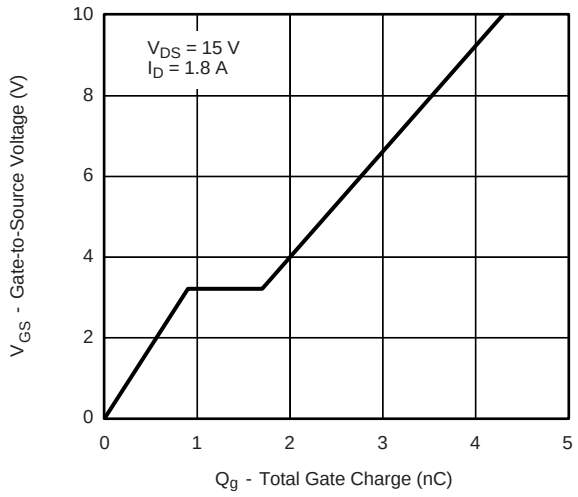



**On-Resistance vs. Drain Current**

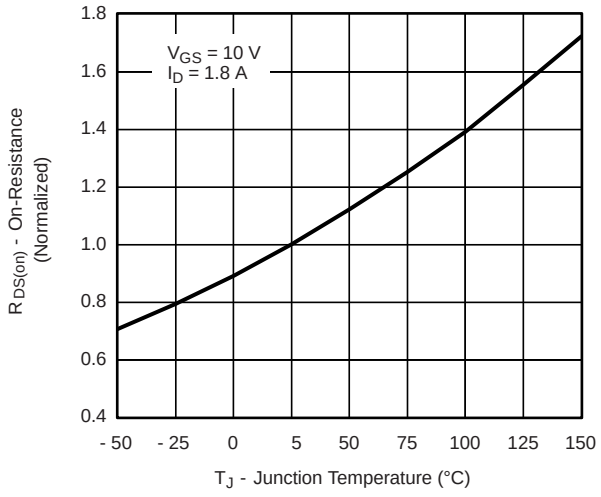



**Capacitance**

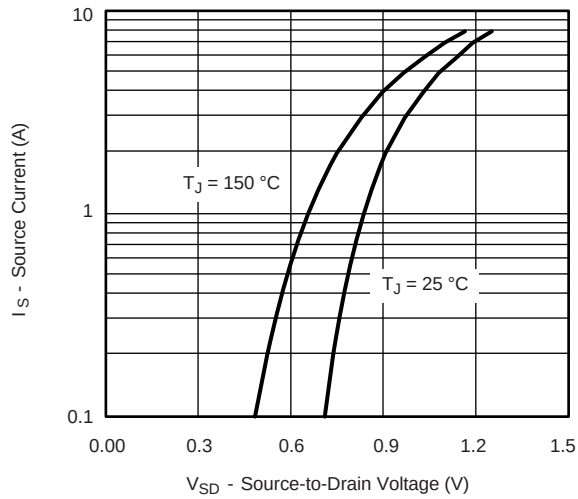
## P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



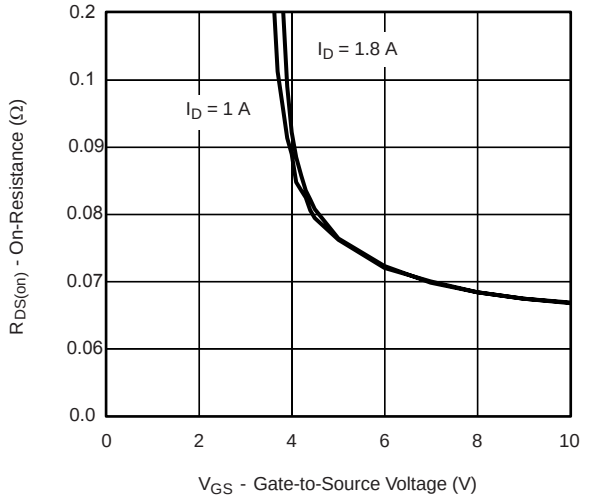

**Gate Charge**



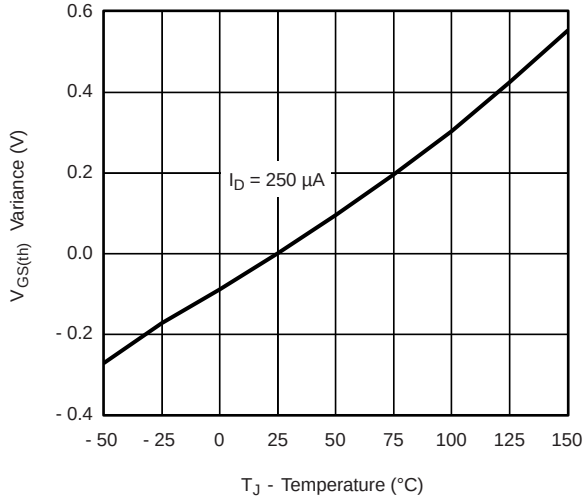

**On-Resistance vs. Junction Temperature**



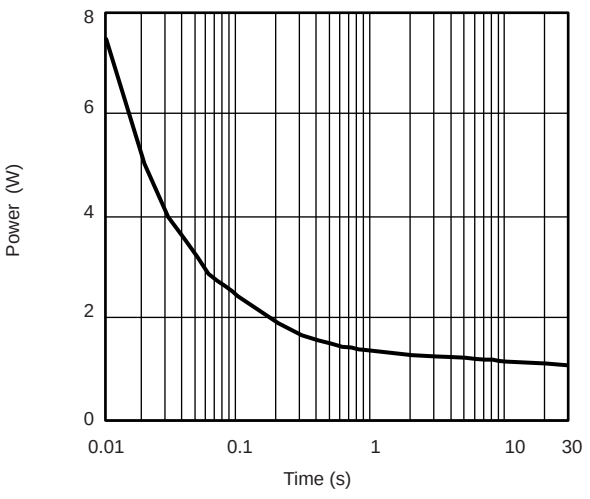

**Source-Drain Diode Forward Voltage**




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

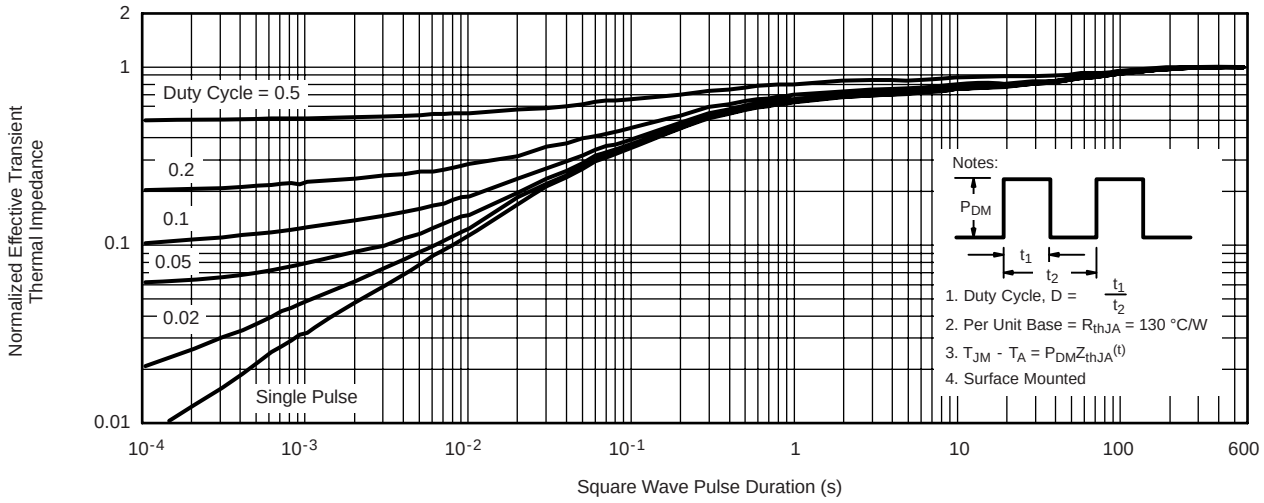



**Threshold Voltage**

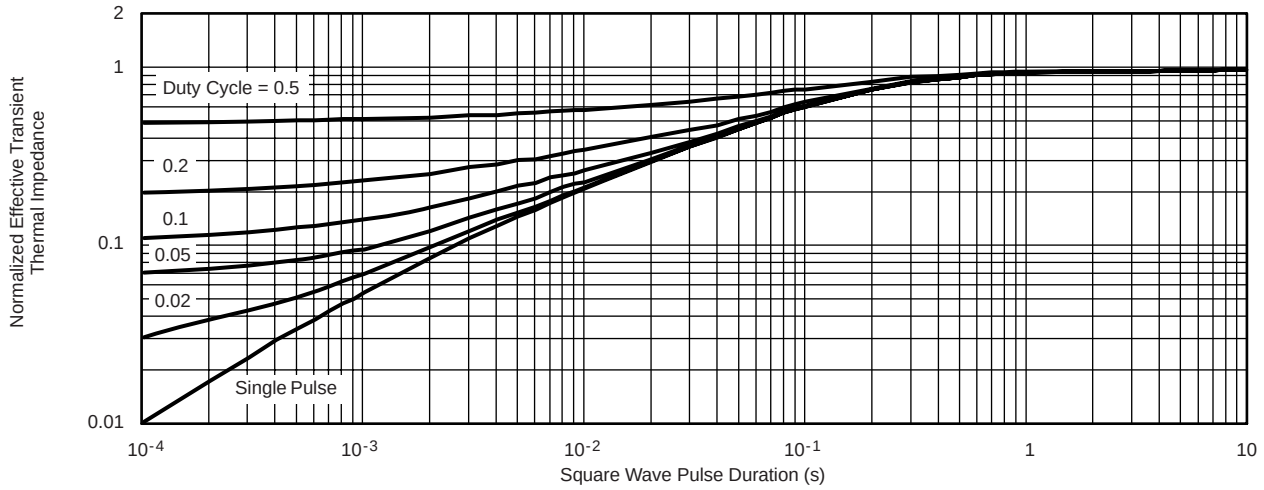



**Single Pulse Power (Junction-to-Ambient)**

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




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




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

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