# Complementary 20-V (D-S) Low-Threshold MOSFET

| PRODUCT SUMMARY | | | |
|---|---|---|---|
| | $V_{DS}$ (V) | $r_{DS(on)}$ (Ω) | $I_D$ (A) |
| N-Channel | 20 | 0.280 @ $V_{GS}$ = 4.5 V | 1.28 |
| | | 0.360 @ $V_{GS}$ = 2.5 V | 1.13 |
| | | 0.450 @ $V_{GS}$ = 1.8 V | 1.00 |
| P-Channel | –20 | 0.490 @ $V_{GS}$ = –4.5 V | –1.00 |
| | | 0.750 @ $V_{GS}$ = –2.5 V | –0.81 |
| | | 1.10 @ $V_{GS}$ = –1.8 V | –0.67 |

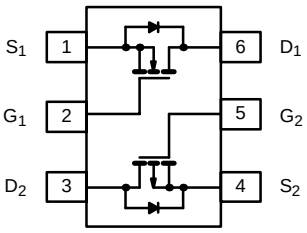
## FEATURES

- TrenchFET® Power MOSFETS: 1.8-V Rated
- ESD Protected: 2000 V
- Thermally Enhanced SC-70 Package

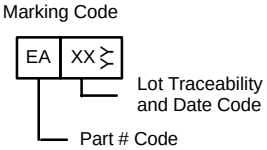
## APPLICATIONS

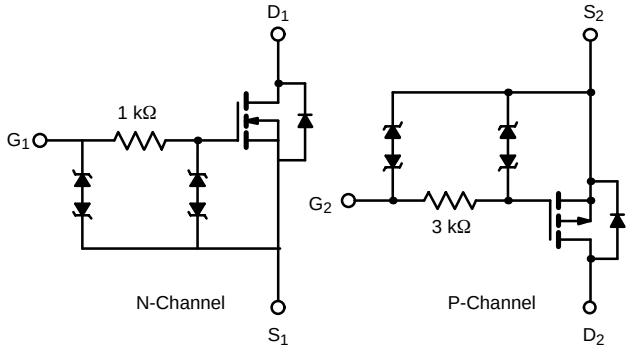
- Load Switching
- PA Switch
- Level Switch

**SOT-363**
**SC-70 (6-LEADS)**




Top View




| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | | Symbol | N-Channel | | P-Channel | | Unit |
| | | | 5 secs | Steady State | 5 secs | Steady State | |
| Drain-Source Voltage | | $V_{DS}$ | 20 | | –20 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±12 | | ±12 | | |
| Continuous Drain Current ($T_J$ = 150°C)[a] | $T_A$ = 25°C | $I_D$ | 1.28 | 1.13 | –1.00 | –0.88 | A |
| | $T_A$ = 85°C | | 0.92 | 0.81 | –0.72 | –0.63 | |
| Pulsed Drain Current | | $I_{DM}$ | 4.0 | | –3.0 | | |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | 0.61 | 0.48 | –0.61 | –0.48 | |
| Maximum Power Dissipation[a] | $T_A$ = 25°C | $P_D$ | 0.74 | 0.57 | 0.30 | 0.57 | W |
| | $T_A$ = 85°C | | 0.38 | 0.30 | 0.16 | 0.3 | |
| 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 sec | $R_{thJA}$ | 130 | 170 | °C/W |
| | Steady State | | 170 | 220 | |
| Maximum Junction-to-Foot (Drain) | Steady State | $R_{thJF}$ | 80 | 100 | |

Notes
a. Surface Mounted on 1” x 1” FR4 Board.

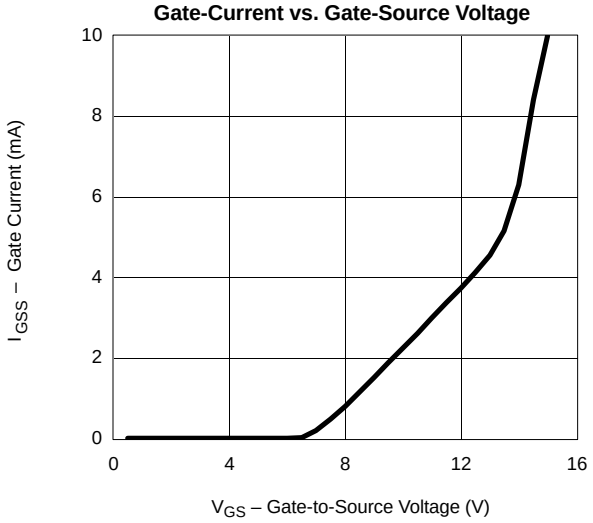
## SPECIFICATIONS ($T_J$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 100 µA | N-Ch | 0.45 | | | V |
| | | $V_{DS}$ = $V_{GS}$, $I_D$ = –100 µA | P-Ch | –0.45 | | | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±4.5 V | N-Ch | | | ±1 | µA |
| | | | P-Ch | | | ±1 | |
| | | $V_{DS}$ = 0 V, $V_{GS}$ = ±12 V | N-Ch | | | ±10 | mA |
| | | | P-Ch | | | ±10 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 16 V, $V_{GS}$ = 0 V | N-Ch | | | 1 | µA |
| | | $V_{DS}$ = –16 V, $V_{GS}$ = 0 V | P-Ch | | | –1 | |
| | | $V_{DS}$ = 16 V, $V_{GS}$ = 0 V, $T_J$ = 85°C | N-Ch | | | 5 | |
| | | $V_{DS}$ = –16 V, $V_{GS}$ = 0 V, $T_J$ = 85°C | P-Ch | | | –5 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ ≥ 5 V, $V_{GS}$ = 4.5 V | N-Ch | 2 | | | A |
| | | $V_{DS}$ ≤ –5 V, $V_{GS}$ = –4.5 V | P-Ch | –2 | | | |
| Drain-Source On-State Resistance[a] | $r_{DS(on)}$ | $V_{GS}$ = 4.5 V, $I_D$ = 1.13 A | N-Ch | | 0.220 | 0.280 | Ω |
| | | $V_{GS}$ = –4.5 V, $I_D$ = –0.88 A | P-Ch | | 0.400 | 0.490 | |
| | | $V_{GS}$ = 2.5 V, $I_D$ = 0.99 A | N-Ch | | 0.281 | 0.360 | |
| | | $V_{GS}$ = –2.5 V, $I_D$ = –0.71 A | P-Ch | | 0.610 | 0.750 | |
| | | $V_{GS}$ = 1.8 V, $I_D$ = 0.20 A | N-Ch | | 0.344 | 0.450 | |
| | | $V_{GS}$ = –1.8 V, $I_D$ = –0.20 A | P-Ch | | 0.850 | 1.10 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = 10 V, $I_D$ = 1.13 A | N-Ch | | 2.6 | | S |
| | | $V_{DS}$ = –10 V, $I_D$ = –0.88 A | P-Ch | | 1.5 | | |
| Diode Forward Voltage[a] | $V_{SD}$ | $I_S$ = 0.48 A, $V_{GS}$ = 0 V | N-Ch | | 0.8 | 1.2 | V |
| | | $I_S$ = –0.48 A, $V_{GS}$ = 0 V | P-Ch | | –0.8 | –1.2 | |
| **Dynamic[b]** | | | | | | | |
| Total Gate Charge | $Q_g$ | N-Channel $V_{DS}$ = 10 V, $V_{GS}$ = 4.5 V, $I_D$ = 1.13 A<br>P-Channel $V_{DS}$ = –10 V, $V_{GS}$ = –4.5 V, $I_D$ = –0.88 A | N-Ch | | 0.65 | 1.0 | nC |
| | | | P-Ch | | 1.2 | 1.8 | |
| Gate-Source Charge | $Q_{gs}$ | | N-Ch | | 0.2 | | |
| | | | P-Ch | | 0.3 | | |
| Gate-Drain Charge | $Q_{gd}$ | | N-Ch | | 0.23 | | |
| | | | P-Ch | | 0.3 | | |
| Turn-On Delay Time | $t_{d(on)}$ | N-Channel $V_{DD}$ = 10 V, $R_L$ = 20 Ω, $I_D$ ≅ 0.5 A, $V_{GEN}$ = 4.5 V, $R_G$ = 6 Ω<br>P-Channel $V_{DD}$ = –10 V, $R_L$ = 20 Ω, $I_D$ ≅ –0.5 A, $V_{GEN}$ = –4.5 V, $R_G$ = 6 Ω | N-Ch | | 45 | 70 | ns |
| | | | P-Ch | | 150 | 230 | |
| Rise Time | $t_r$ | | N-Ch | | 85 | 130 | |
| | | | P-Ch | | 480 | 720 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | N-Ch | | 350 | 530 | |
| | | | P-Ch | | 840 | 1200 | |
| Fall Time | $t_f$ | | N-Ch | | 210 | 320 | |
| | | | P-Ch | | 850 | 1200 | |

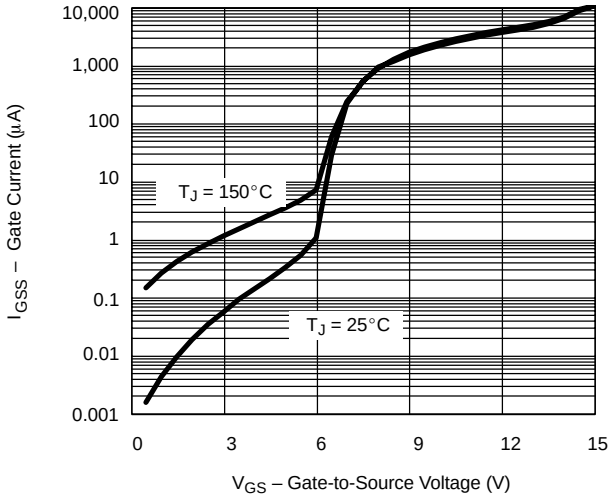
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

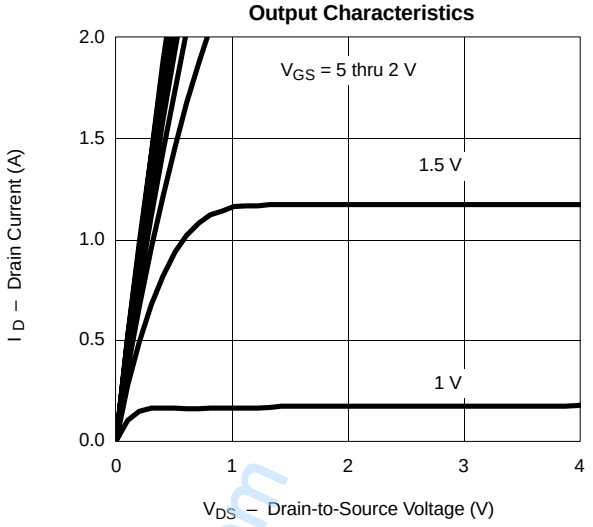
### Gate-Current vs. Gate-Source Voltage



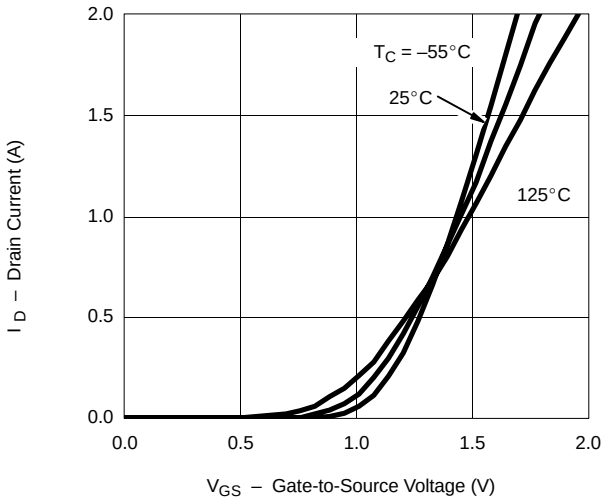

### Gate Current vs. Gate-Source Voltage



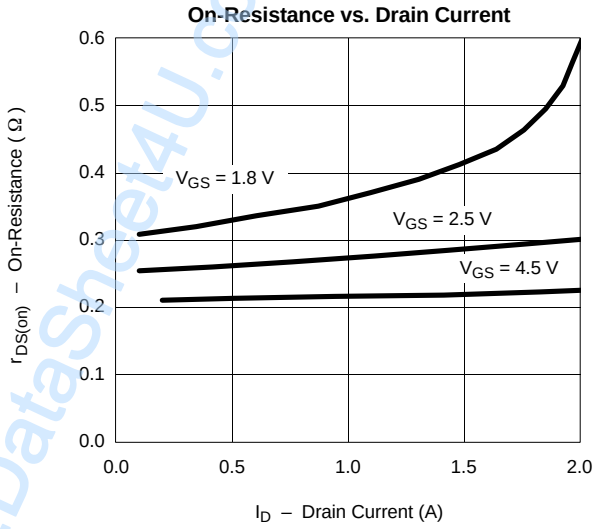

### Output Characteristics



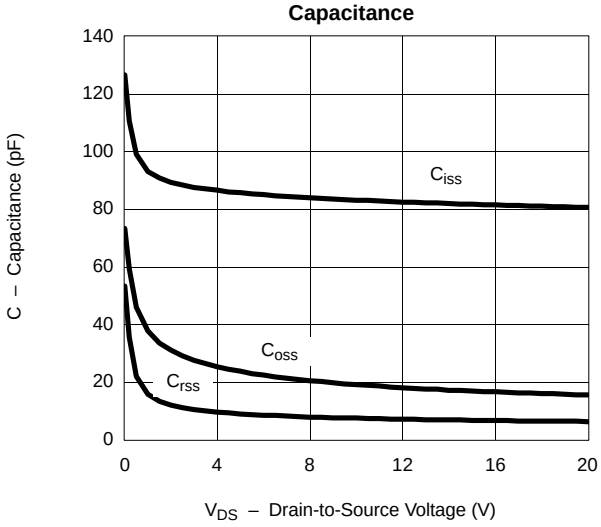

### Transfer Characteristics




### On-Resistance vs. Drain Current

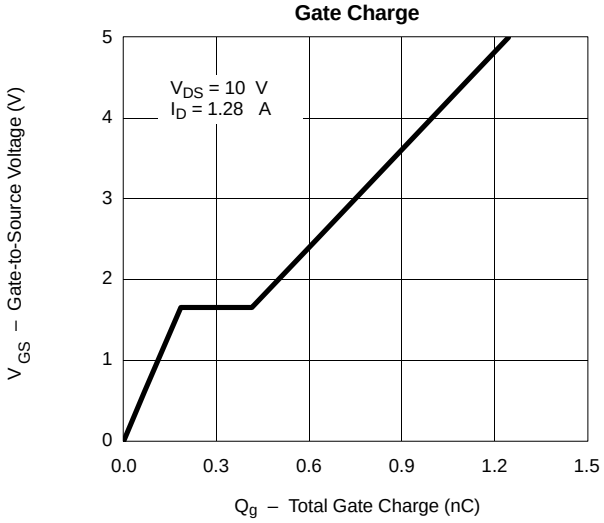



### Capacitance

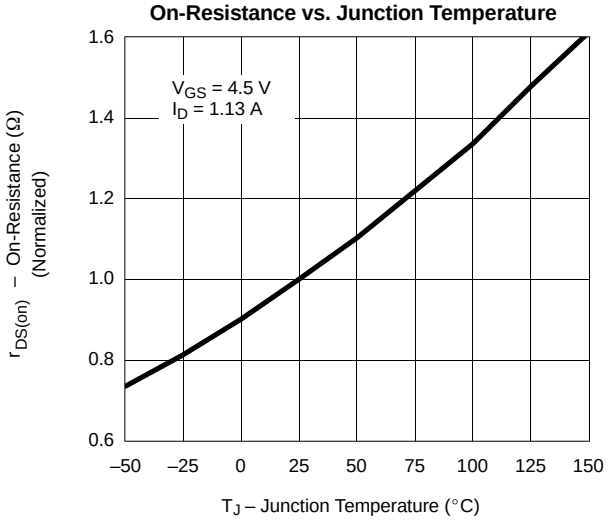


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

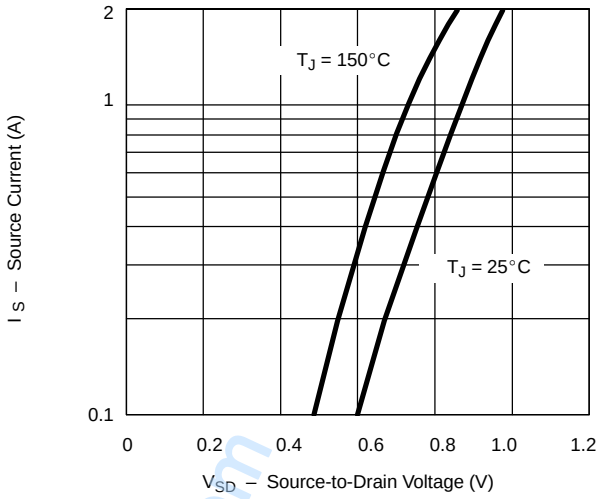
### Gate Charge



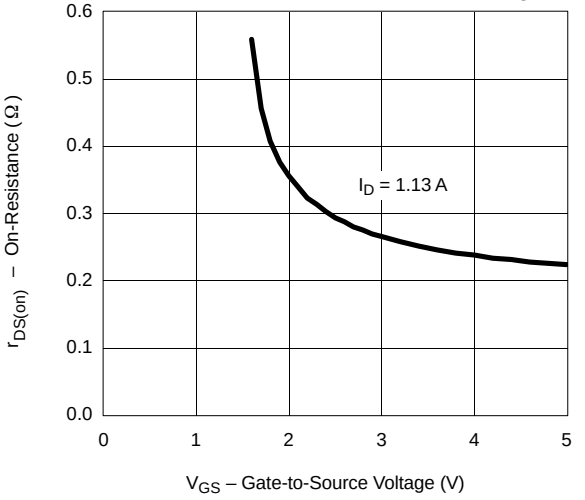

### On-Resistance vs. Junction Temperature



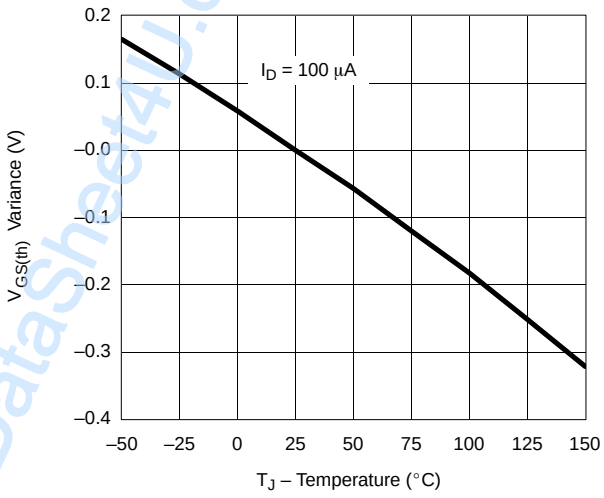

### Source-Drain Diode Forward Voltage



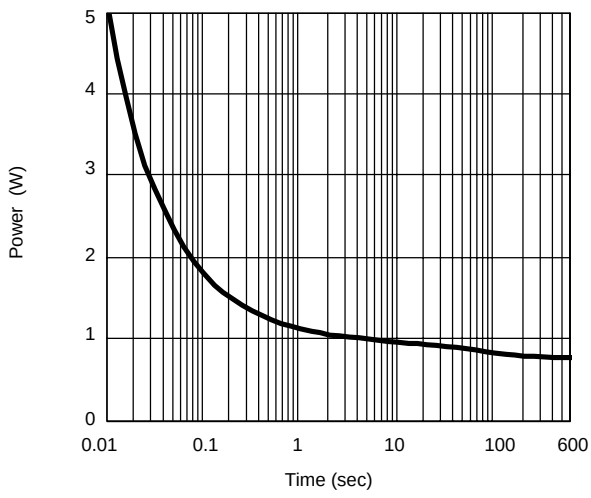

### On-Resistance vs. Gate-to-Source Voltage




### Threshold Voltage

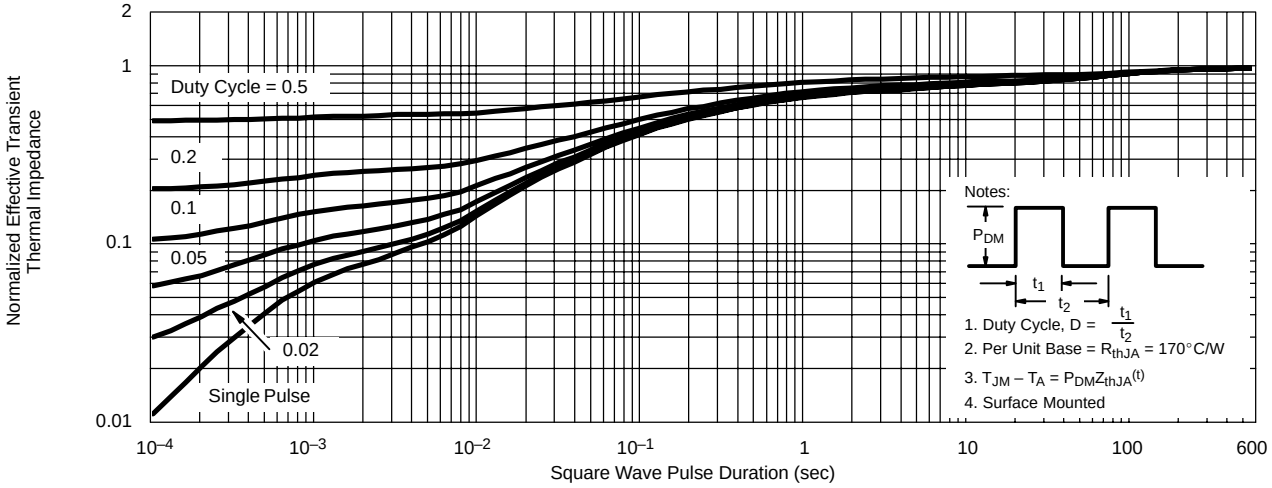



### Single Pulse Power, Junction-to-Ambient

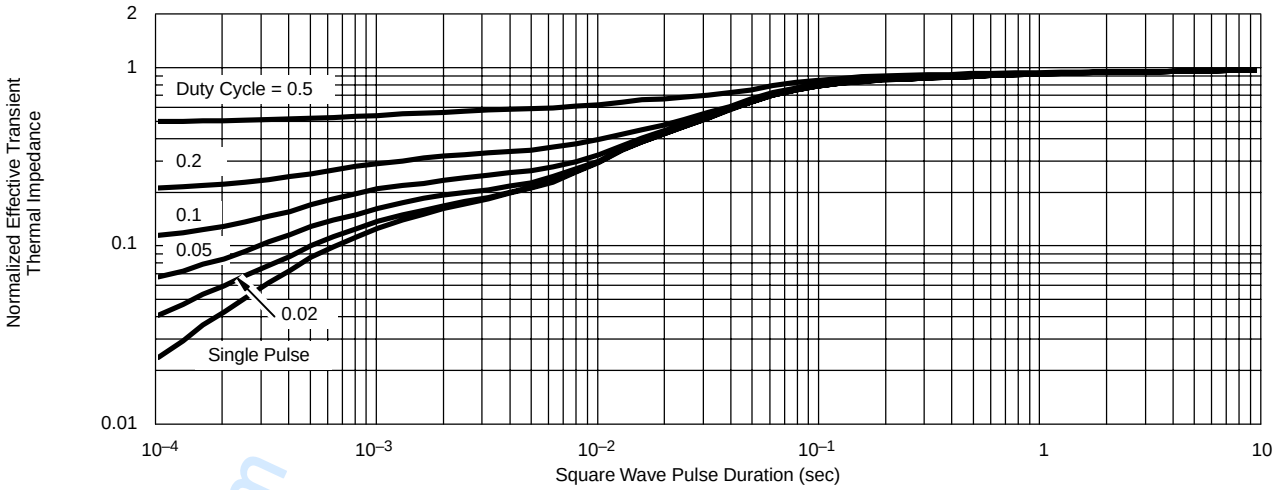


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

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

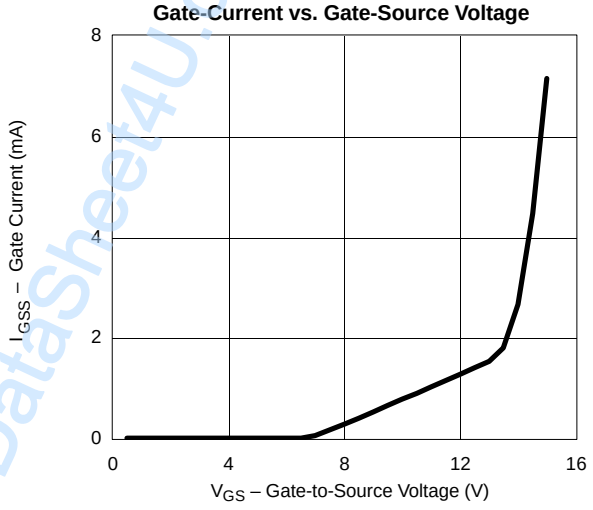



**Normalized Thermal Transient Impedance, Junction-to-Foot**

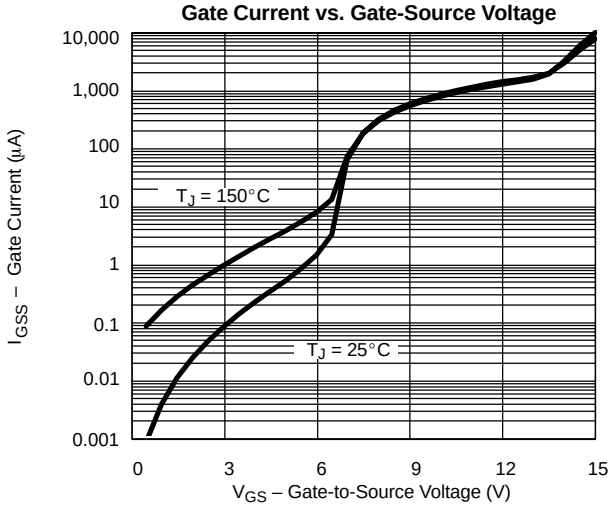



## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

**Gate Current vs. Gate-Source Voltage**

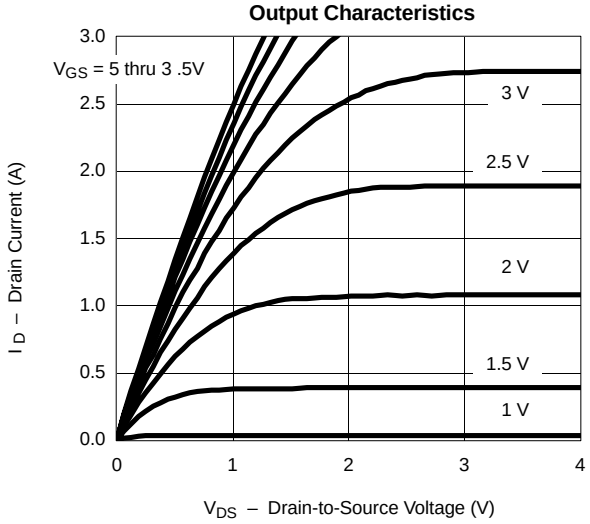



**Gate Current vs. Gate-Source Voltage**

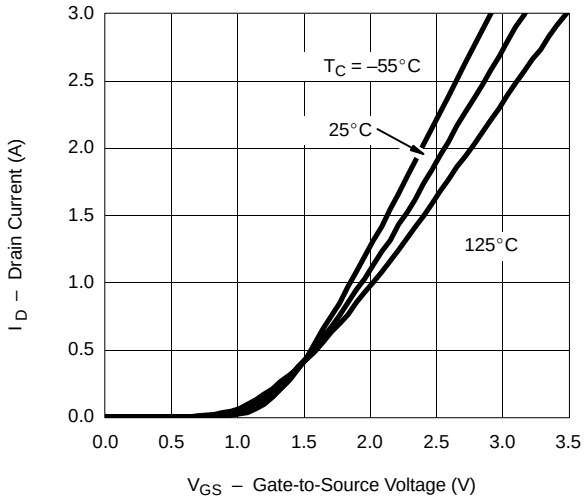


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

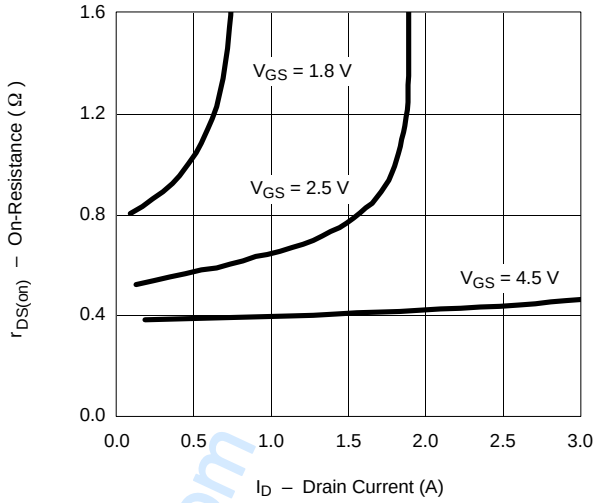
### Output Characteristics



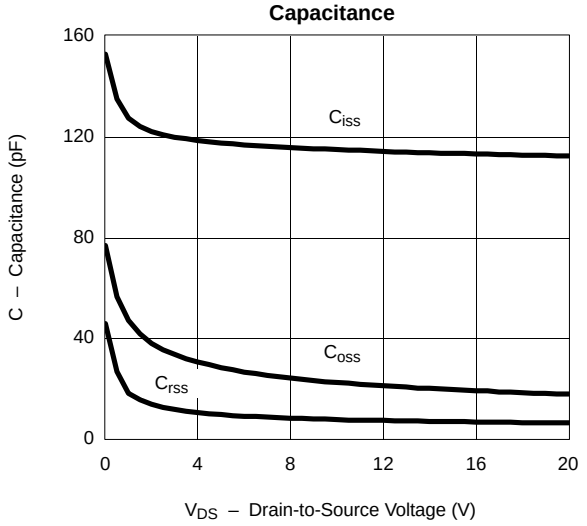

### Transfer Characteristics



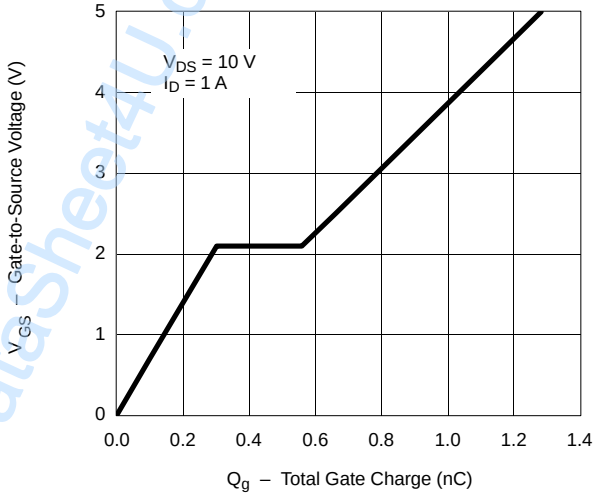

### On-Resistance vs. Drain Current



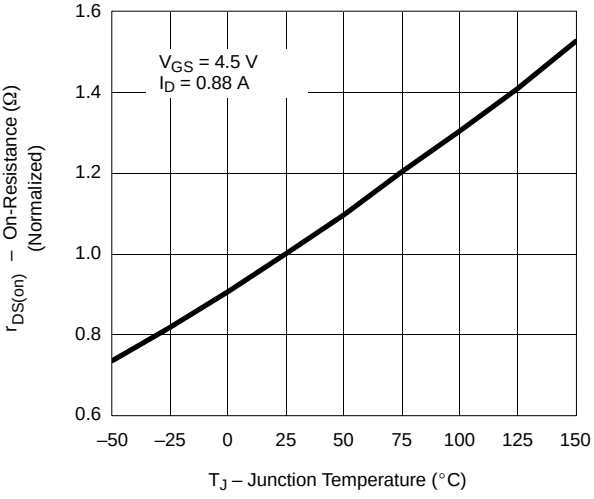

### Capacitance




### Gate Charge

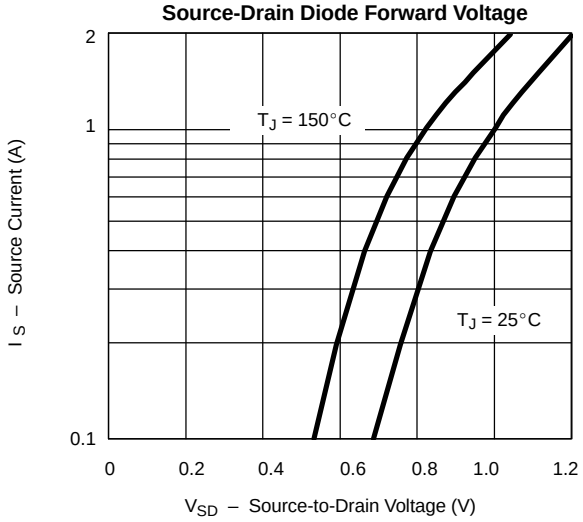



### On-Resistance vs. Junction Temperature

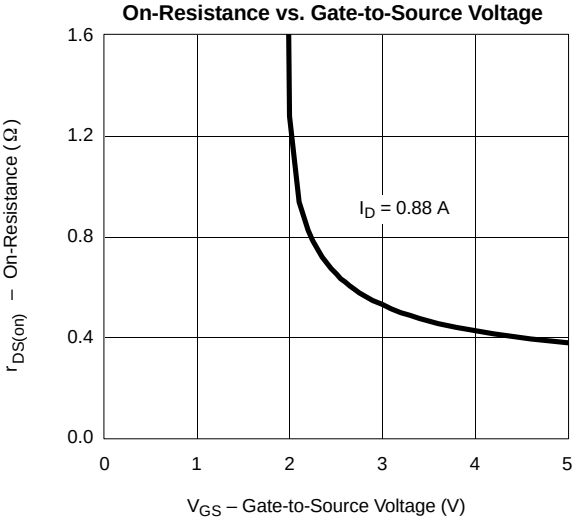


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

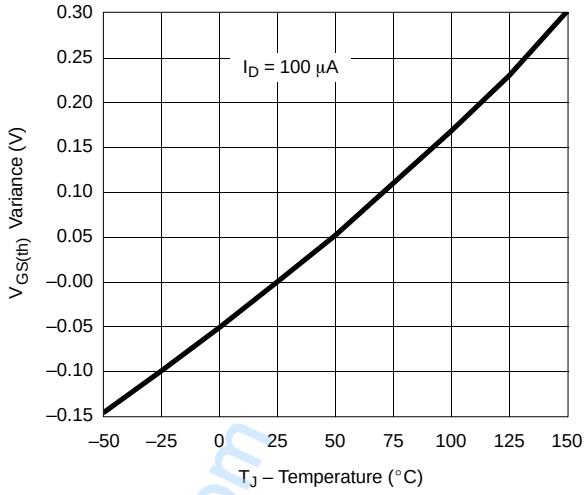
### Source-Drain Diode Forward Voltage



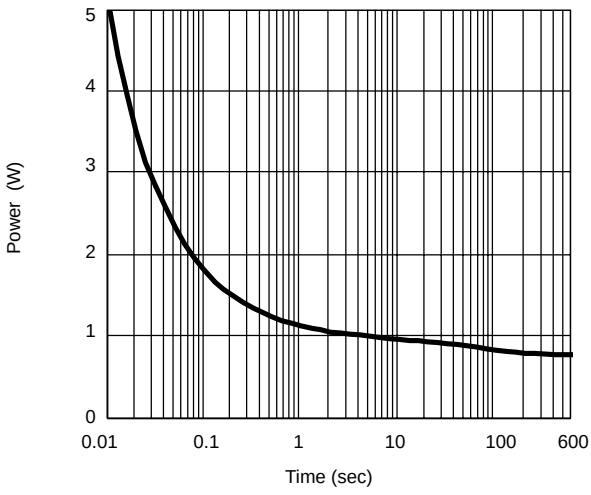

### On-Resistance vs. Gate-to-Source Voltage



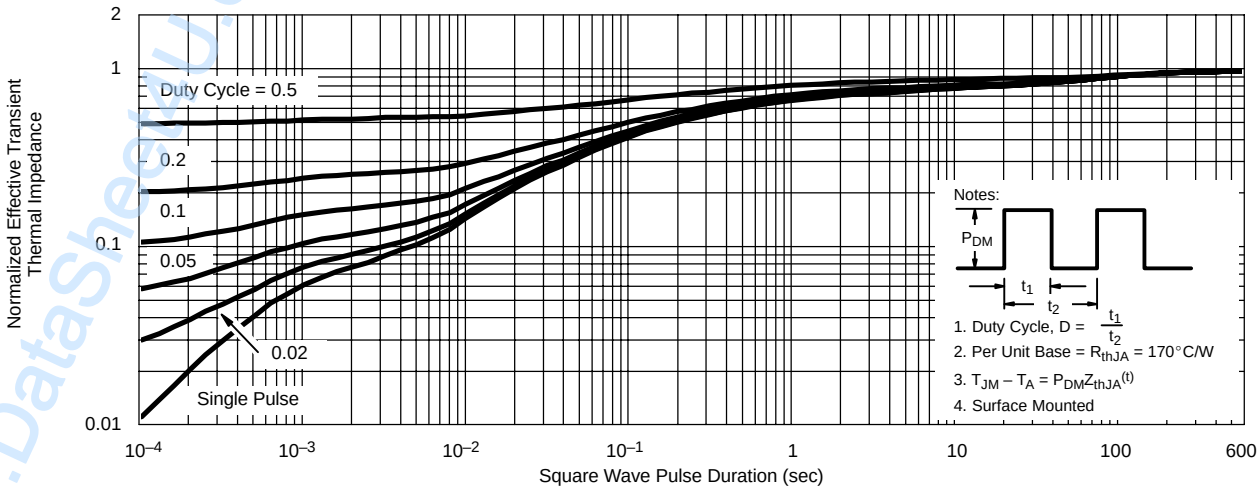

### Threshold Voltage




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




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



## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)