

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

| PRODUCT SUMMARY |                     |                                    |                    |
|-----------------|---------------------|------------------------------------|--------------------|
|                 | V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω)            | I <sub>D</sub> (A) |
| N-Channel       | 20                  | 0.090 at V <sub>GS</sub> = 4.5 V   | 3.28               |
|                 |                     | 0.110 at V <sub>GS</sub> = 2.5 V   | 2.13               |
|                 |                     | 0.130 at V <sub>GS</sub> = 1.8 V   | 1.50               |
| P-Channel       | - 20                | 0.155 at V <sub>GS</sub> = - 4.5 V | - 2.80             |
|                 |                     | 0.190 at V <sub>GS</sub> = - 2.5 V | - 1.81             |
|                 |                     | 0.220 at V <sub>GS</sub> = - 1.8 V | - 1.15             |

### FEATURES

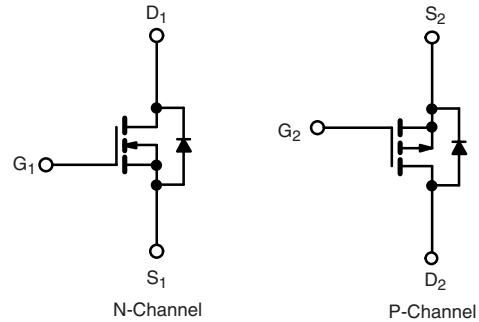
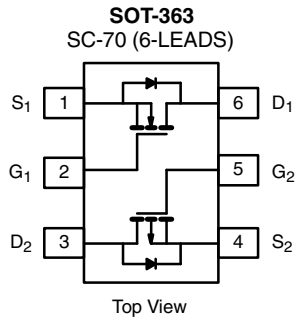
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFETs: 1.8 V Rated
- Thermally Enhanced SC-70 Package
- Fast Switching
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Load Switch for Portable Devices



| ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted |                                   |                        |              |           |              |        |   |
|---|-----------------------------------|------------------------|--------------|-----------|--------------|--------|---|
| Parameter   | Symbol                            | N-Channel              |              | P-Channel |              | Unit   |   |
|   |                                   | 5 s                    | Steady State | 5 s       | Steady State |        |   |
| Drain-Source Voltage  | V <sub>DS</sub>                   | 20                     |              | - 20      |              | V      |   |
| Gate-Source Voltage   | V <sub>GS</sub>                   | ± 20                   |              | ± 20      |              | V      |   |
| Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>         | I <sub>D</sub>                    | T <sub>A</sub> = 25 °C | 3.28         | 3.03      | - 2.80       | - 2.58 | A |
|   |                                   | T <sub>A</sub> = 85 °C | 2.12         | 1.81      | - 1.72       | - 1.53 |   |
| Pulsed Drain Current  | I <sub>DM</sub>                   | 9.5                    |              | - 8.5     |              |        |   |
| Continuous Source Current (Diode Conduction) <sup>a</sup>               | I <sub>S</sub>                    | 2.61                   | 2.48         | - 1.61    | -1.48        |        |   |
| Maximum Power Dissipation <sup>a</sup>                                  | P <sub>D</sub>                    | T <sub>A</sub> = 25 °C | 1.24         | 1.17      | 1.10         | 0.97   | W |
|   |                                   | T <sub>A</sub> = 85 °C | 0.88         | 0.75      | 0.66         | 0.5    |   |
| Operating Junction and Storage Temperature Range                        | T <sub>J</sub> , T <sub>stg</sub> | - 55 to 150            |              |           |              | °C     |   |

| THERMAL RESISTANCE RATINGS               |              |                   |         |         |      |
|--|--------------|-------------------|---------|---------|------|
| Parameter                                |              | Symbol            | Typical | Maximum | Unit |
| Maximum Junction-to-Ambient <sup>a</sup> | t ≤ 5 s      | R <sub>thJA</sub> | 130     | 170     | °C/W |
|  | Steady State |                   | 170     | 220     |      |
| Maximum Junction-to-Foot (Drain)         | Steady State | R <sub>thJF</sub> | 80      | 100     |      |

Notes:

a. Surface mounted on 1" x 1" FR4 board.

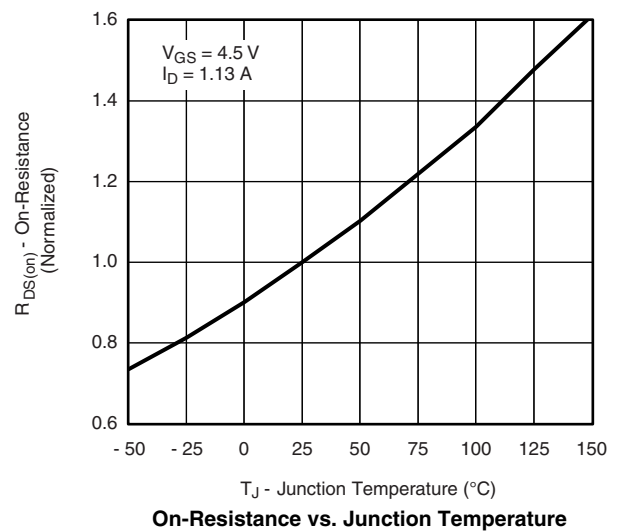
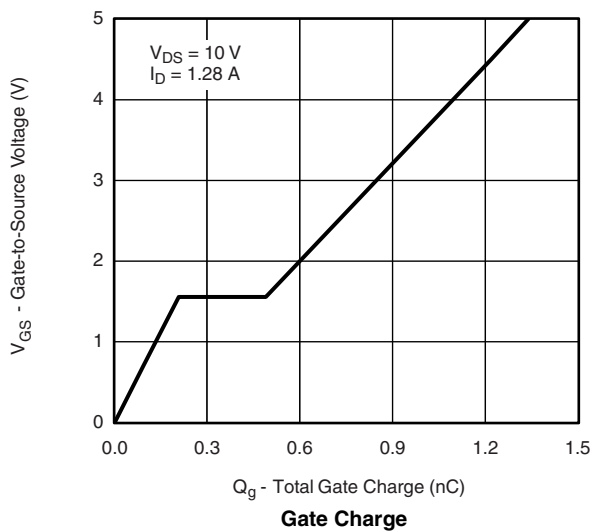
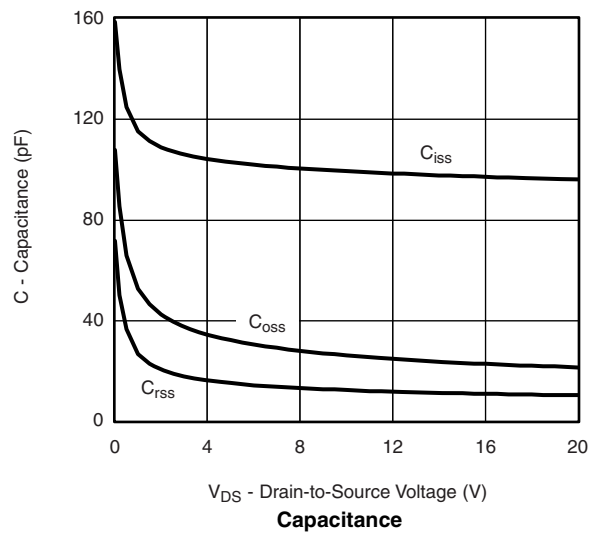
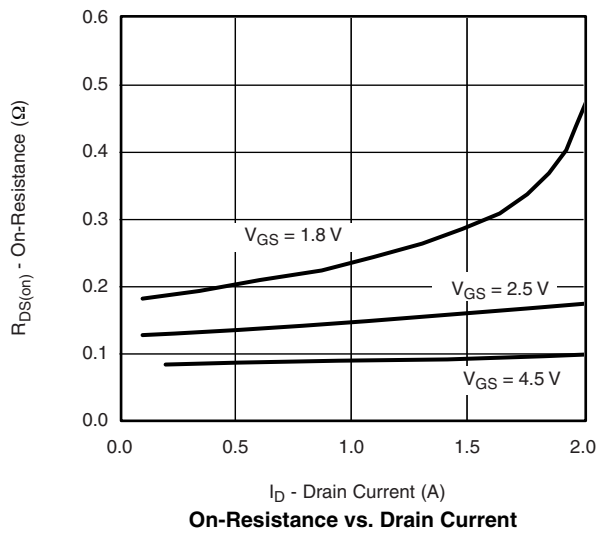
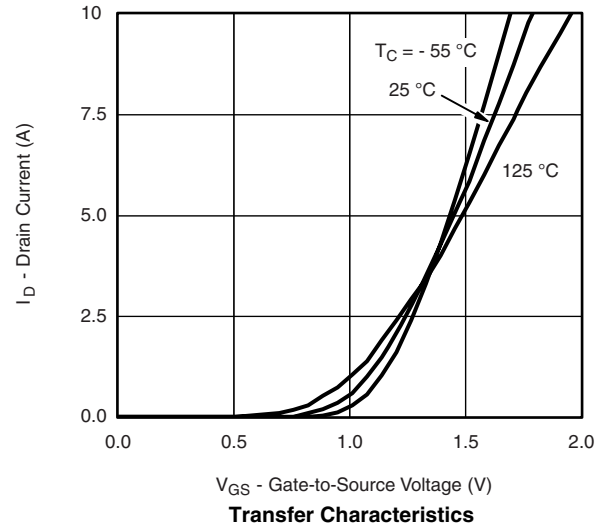
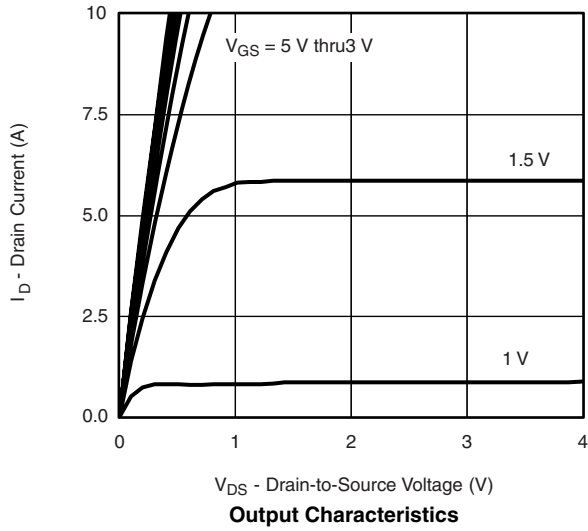
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted |              |   |   |       |       |                        |               |    |
|--|--------------|---|---|-------|-------|------------------------|---------------|----|
| Parameter  | Symbol       | Test Conditions   |   | Min.  | Typ.  | Max.                   | Unit          |    |
| <b>Static</b>  |              |   |   |       |       |                        |               |    |
| Gate Threshold Voltage   | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 100\text{ }\mu\text{A}$   | N-Ch  | 0.45  |       | 1                      | V             |    |
|  |              | $V_{DS} = V_{GS}, I_D = -100\text{ }\mu\text{A}$  | P-Ch  | -0.45 |       | 1                      |               |    |
| Gate-Body Leakage  | $I_{GSS}$    | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$  | N-Ch<br>P-Ch  |       |       | $\pm 100$<br>$\pm 100$ | nA            |    |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$   | N-Ch  |       |       | 1                      | $\mu\text{A}$ |    |
|  |              | $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$  | P-Ch  |       |       | -1                     |               |    |
|  |              | $V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$   | N-Ch  |       |       | 5                      |               |    |
|  |              | $V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$  | P-Ch  |       |       | -5                     |               |    |
| On-State Drain Current <sup>a</sup>                                      | $I_{D(on)}$  | $V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$   | N-Ch  | 2     |       |                        | A             |    |
|  |              | $V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$   | P-Ch  | -2    |       |                        |               |    |
| Drain-Source On-State Resistance <sup>a</sup>                            | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}, I_D = 2.55\text{ A}$  | N-Ch  |       | 0.090 |                        | $\Omega$      |    |
|  |              | $V_{GS} = -4.5\text{ V}, I_D = -1.85\text{ A}$  | P-Ch  |       | 0.155 |                        |               |    |
|  |              | $V_{GS} = 2.5\text{ V}, I_D = 1.55\text{ A}$  | N-Ch  |       | 0.110 |                        |               |    |
|  |              | $V_{GS} = -2.5\text{ V}, I_D = -1.35\text{ A}$  | P-Ch  |       | 0.190 |                        |               |    |
|  |              | $V_{GS} = 1.8\text{ V}, I_D = 0.50\text{ A}$  | N-Ch  |       | 0.130 |                        |               |    |
|  |              | $V_{GS} = -1.8\text{ V}, I_D = -0.50\text{ A}$  | P-Ch  |       | 0.220 |                        |               |    |
| Forward Transconductance <sup>a</sup>                                    | $g_{fs}$     | $V_{DS} = 10\text{ V}, I_D = 1.13\text{ A}$   | N-Ch  |       | 2.6   |                        | S             |    |
|  |              | $V_{DS} = -10\text{ V}, I_D = -0.88\text{ A}$   | P-Ch  |       | 1.5   |                        |               |    |
| Diode Forward Voltage <sup>a</sup>                                       | $V_{SD}$     | $I_S = 0.48\text{ A}, V_{GS} = 0\text{ V}$  | N-Ch  |       | 0.8   | 1.2                    | V             |    |
|  |              | $I_S = -0.48\text{ A}, V_{GS} = 0\text{ V}$   | P-Ch  |       | -0.8  | -1.2                   |               |    |
| <b>Dynamic<sup>b</sup></b>   |              |   |   |       |       |                        |               |    |
| Total Gate Charge  | $Q_g$        | N-Channel<br>$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 2.55\text{ A}$<br><br>P-Channel<br>$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -0.88\text{ A}$   | N-Ch  |       | 1.25  | 2                      | nC            |    |
|  |              |   | P-Ch  |       | 1.2   | 1.8                    |               |    |
| Gate-Source Charge   | $Q_{gs}$     |   | N-Ch  |       | 0.21  |                        |               |    |
|  |              |   | P-Ch  |       | 0.3   |                        |               |    |
| Gate-Drain Charge  | $Q_{gd}$     |   | N-Ch  |       | 0.3   |                        |               |    |
|  |              |   | P-Ch  |       | 0.21  |                        |               |    |
| Turn-On Delay Time   | $t_{d(on)}$  | N-Channel<br>$V_{DD} = 10\text{ V}, R_L = 20\text{ }\Omega$<br>$I_D \cong 0.5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 6\text{ }\Omega$<br><br>P-Channel<br>$V_{DD} = -10\text{ V}, R_L = 20\text{ }\Omega$<br>$I_D \cong -0.5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$ | N-Ch  |       | 15    | 25                     | ns            |    |
|  |              |   | P-Ch  |       | 18    | 30                     |               |    |
| Rise Time  | $t_r$        |   | N-Ch  |       | 22    | 35                     |               |    |
|  |              |   | P-Ch  |       | 25    | 40                     |               |    |
| Turn-Off Delay Time  | $t_{d(off)}$ |   | N-Ch  |       | 25    | 40                     |               |    |
|  |              |   | P-Ch  |       | 15    | 25                     |               |    |
| Fall Time  | $t_f$        |   | N-Ch  |       | 12    | 20                     |               |    |
|  |              |   | P-Ch  |       | 12    | 20                     |               |    |
| Reverse Recovery Time  | $t_{rr}$     |   | $I_F = 0.48\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | N-Ch  |       | 30                     |               | 60 |
|  |              |   |   | P-Ch  |       | 30                     |               | 60 |

Notes:

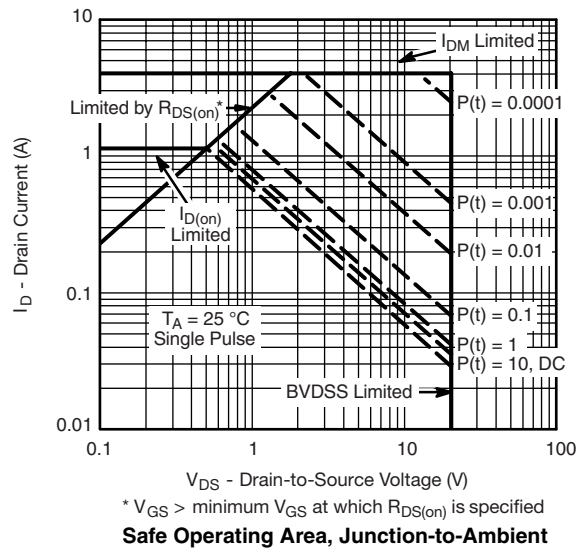
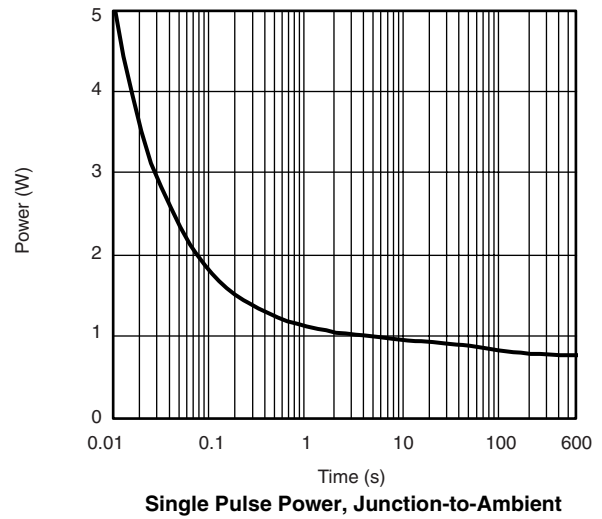
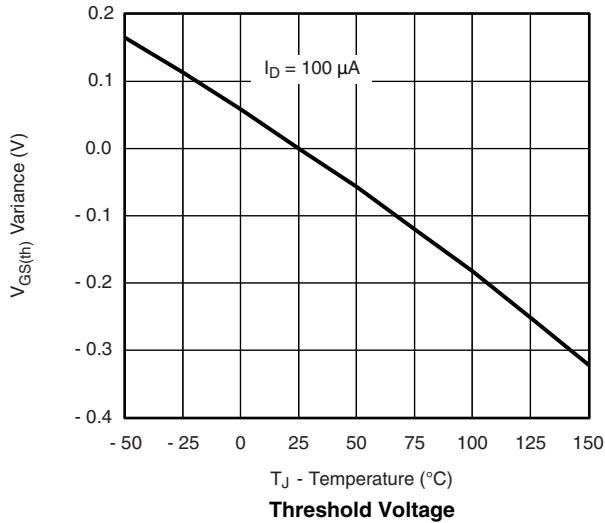
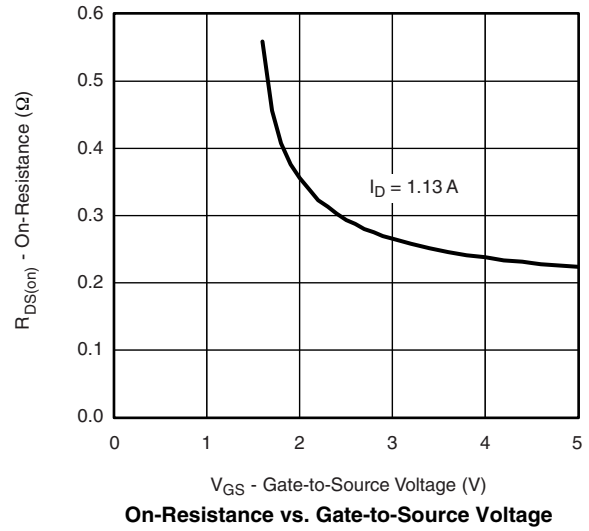
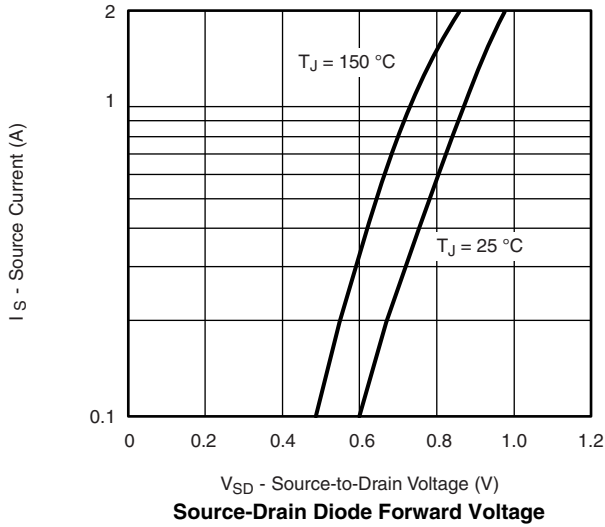
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

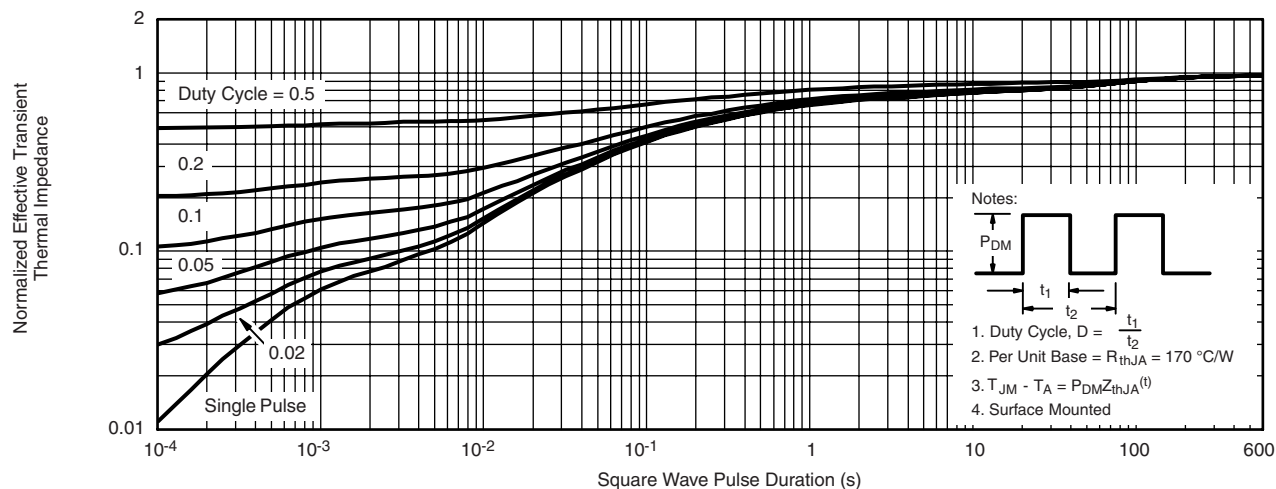
**N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



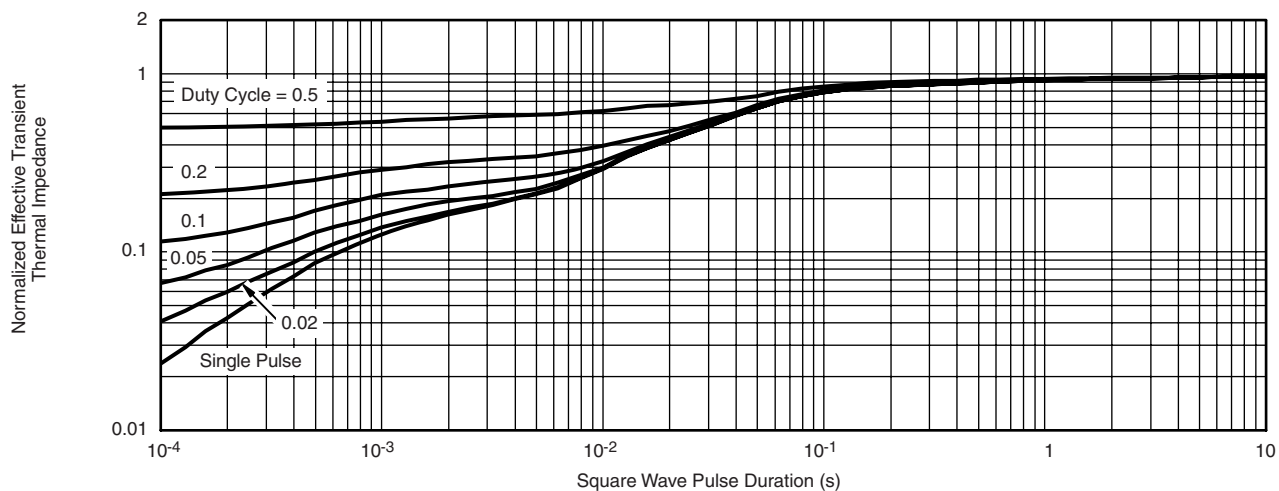
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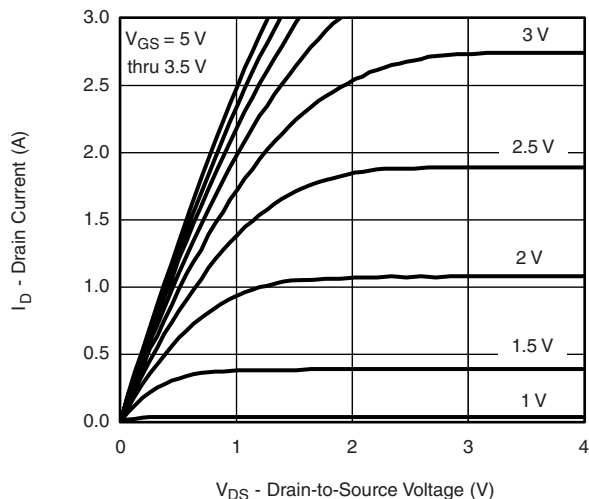


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

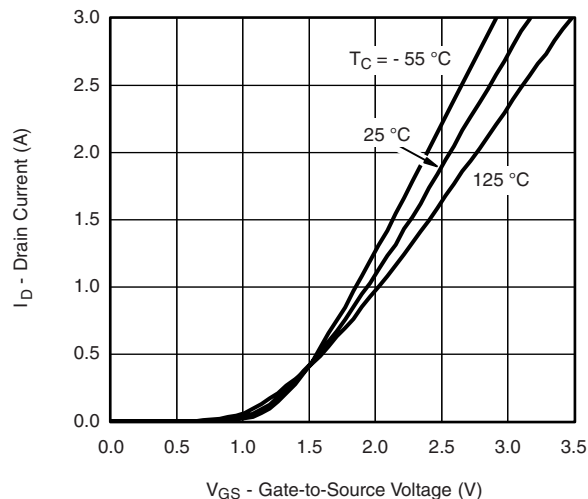


**Normalized Thermal Transient Impedance, Junction-to-Foot**

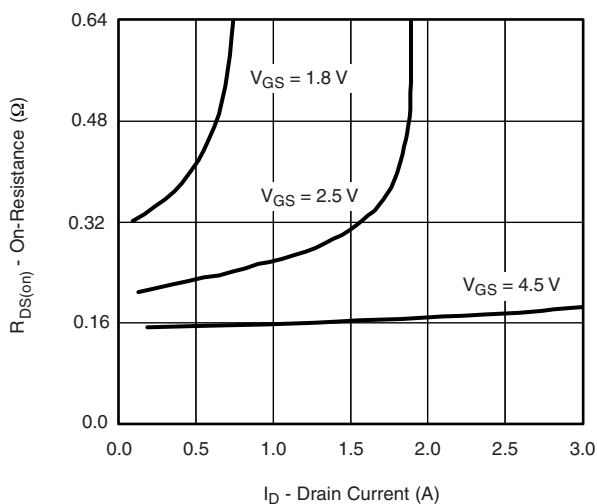
**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



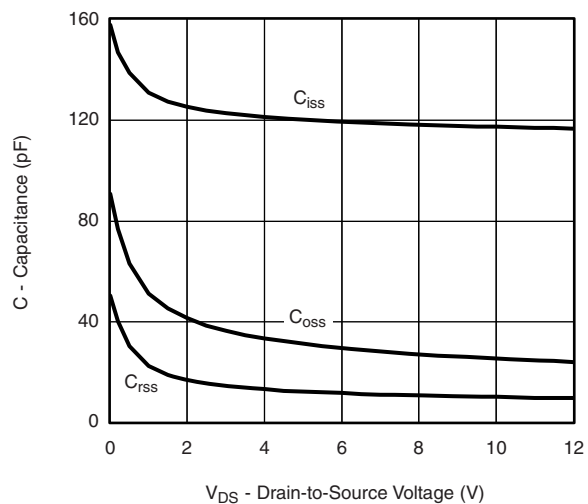
$V_{DS}$  - Drain-to-Source Voltage (V)  
**Output Characteristics**



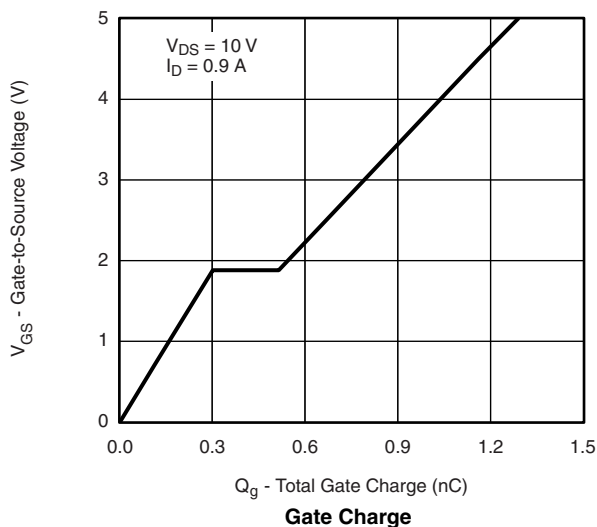
$V_{GS}$  - Gate-to-Source Voltage (V)  
**Transfer Characteristics**



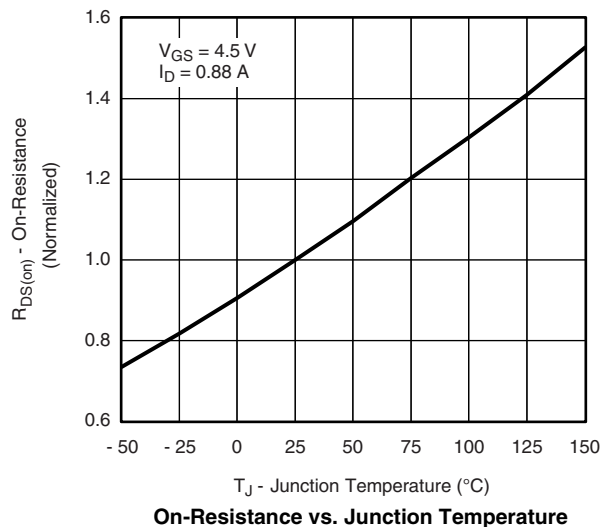
$I_D$  - Drain Current (A)  
**On-Resistance vs. Drain Current**



$V_{DS}$  - Drain-to-Source Voltage (V)  
**Capacitance**

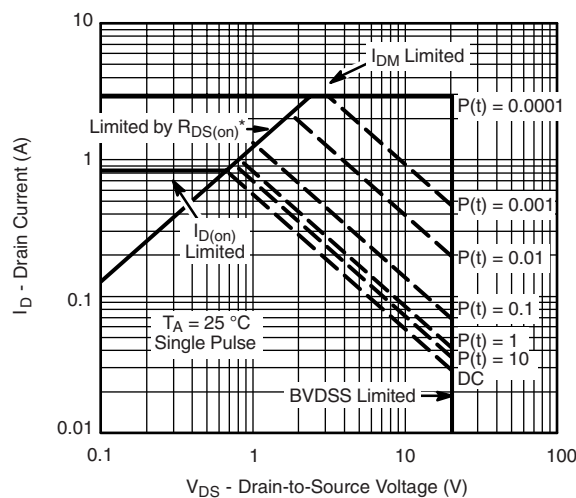
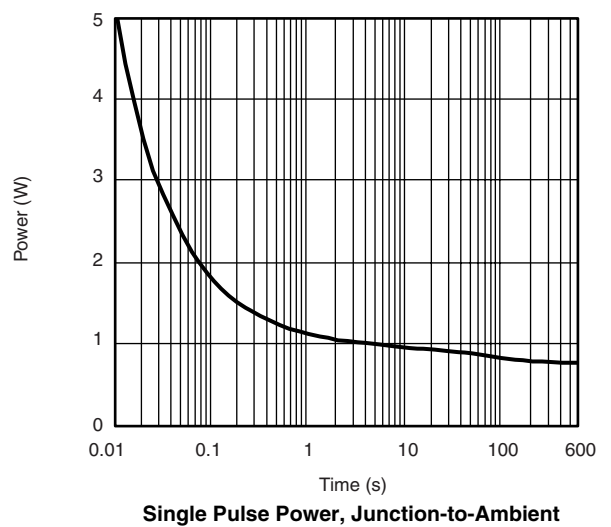
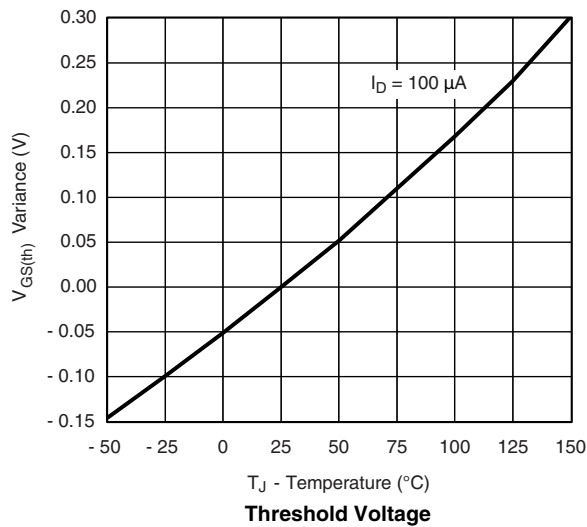
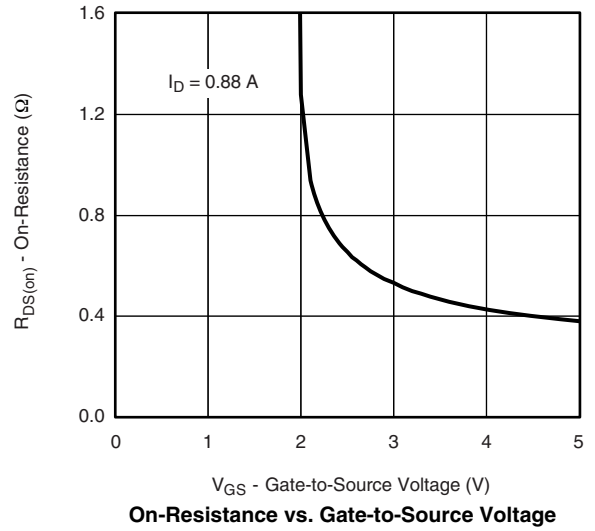
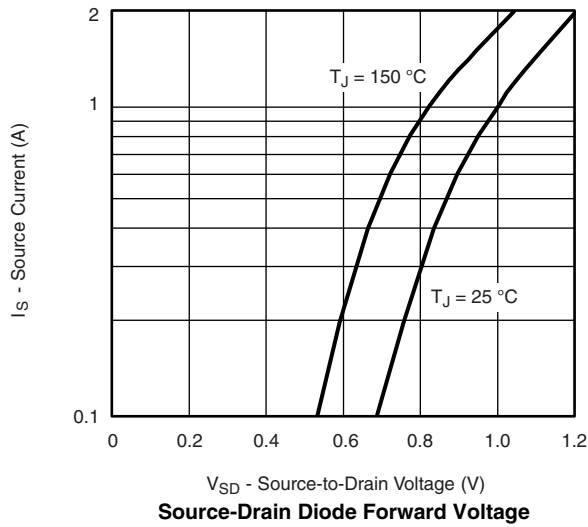


$Q_g$  - Total Gate Charge (nC)  
**Gate Charge**



$T_J$  - Junction Temperature ( $^\circ C$ )  
**On-Resistance vs. Junction Temperature**

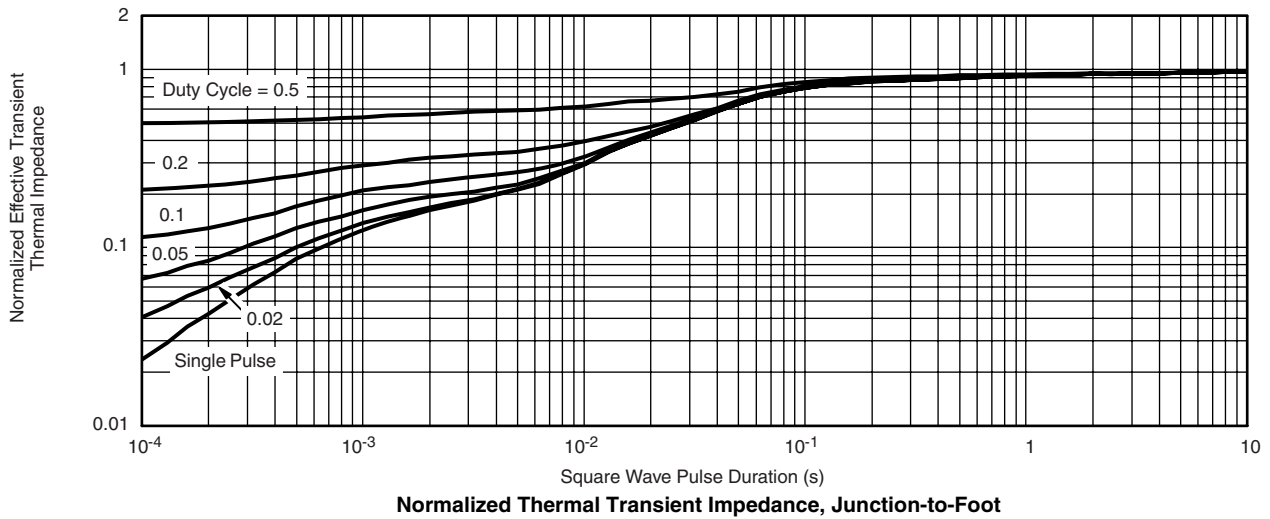
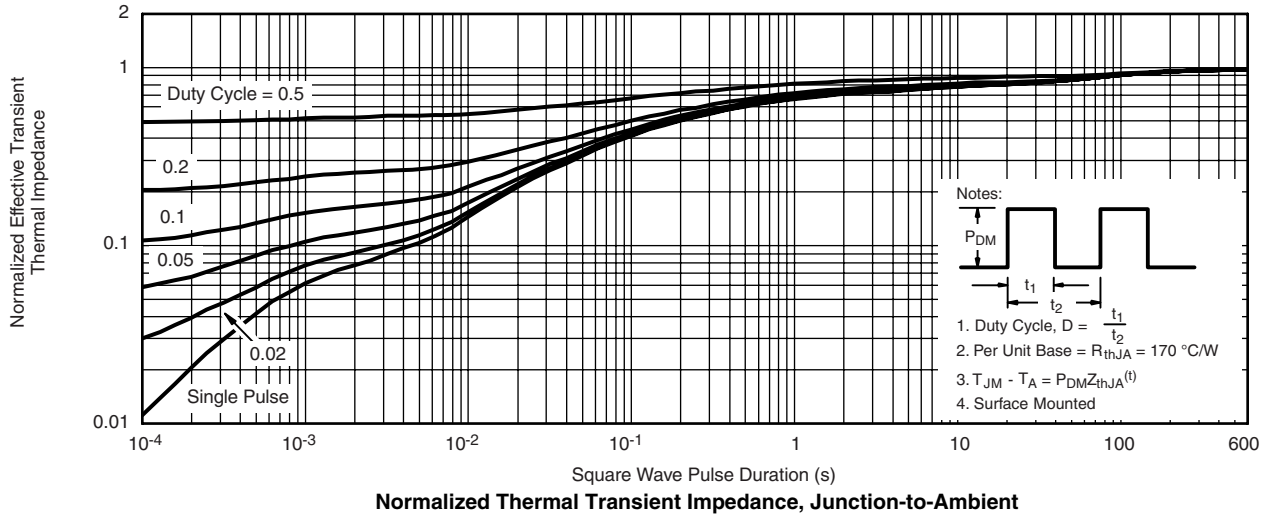
**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

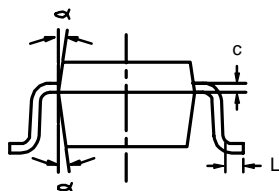
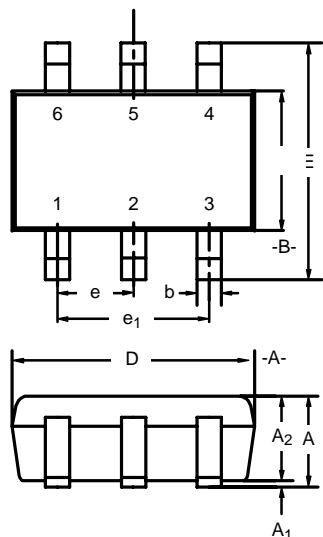
**Safe Operating Area, Junction-to-Ambient**

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





**SC-70: 6-LEADS**



| Dim            | MILLIMETERS |      |      | INCHES   |       |       |
|----------------|-------------|------|------|----------|-------|-------|
|                | Min         | Nom  | Max  | Min      | Nom   | Max   |
| A              | 0.90        | -    | 1.10 | 0.035    | -     | 0.043 |
| A <sub>1</sub> | -           | -    | 0.10 | -        | -     | 0.004 |
| A <sub>2</sub> | 0.80        | -    | 1.00 | 0.031    | -     | 0.039 |
| b              | 0.15        | -    | 0.30 | 0.006    | -     | 0.012 |
| c              | 0.10        | -    | 0.25 | 0.004    | -     | 0.010 |
| D              | 1.80        | 2.00 | 2.20 | 0.071    | 0.079 | 0.087 |
| E              | 1.80        | 2.10 | 2.40 | 0.071    | 0.083 | 0.094 |
| E <sub>1</sub> | 1.15        | 1.25 | 1.35 | 0.045    | 0.049 | 0.053 |
| e              | 0.65BSC     |      |      | 0.026BSC |       |       |
| e <sub>1</sub> | 1.20        | 1.30 | 1.40 | 0.047    | 0.051 | 0.055 |
| L              | 0.10        | 0.20 | 0.30 | 0.004    | 0.008 | 0.012 |
| α              | 7°Nom       |      |      | 7°Nom    |       |       |

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[DMN2990UFB-7B](#) [SSM3K35CT,L3F](#) [IPLK60R1K0PFD7ATMA1](#) [2N7002W-G](#) [MCAC30N06Y-TP](#) [IPWS65R035CFD7AXKSA1](#)  
[MCQ7328-TP](#) [SSM3J143TU,LXHF](#) [DMN12M3UCA6-7](#) [PJMF280N65E1\\_T0\\_00201](#) [PJMF380N65E1\\_T0\\_00201](#)  
[PJMF280N60E1\\_T0\\_00201](#) [PJMF600N65E1\\_T0\\_00201](#) [PJMF900N65E1\\_T0\\_00201](#)