

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

## PRODUCT SUMMARY

|           | $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ )   | $I_D$ (A) |
|-----------|--------------|-----------------------------|-----------|
| N-Channel | 20           | 0.280 at $V_{GS} = 4.5$ V   | 1.28      |
|           |              | 0.360 at $V_{GS} = 2.5$ V   | 1.13      |
|           |              | 0.450 at $V_{GS} = 1.8$ V   | 1         |
| P-Channel | - 20         | 0.490 at $V_{GS} = - 4.5$ V | - 1       |
|           |              | 0.750 at $V_{GS} = - 2.5$ V | - 0.81    |
|           |              | 1.10 at $V_{GS} = - 1.8$ V  | - 0.67    |

## FEATURES

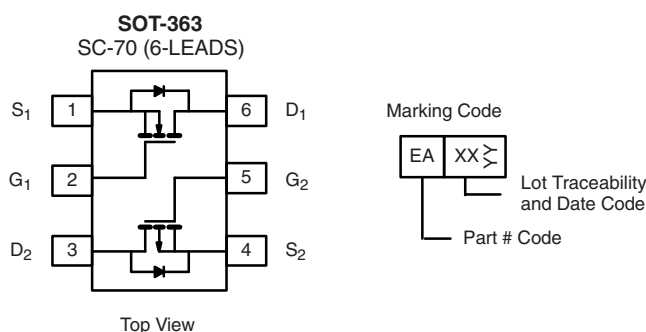
- TrenchFET® Power MOSFETS: 1.8 V Rated
- ESD Protected: 2000 V
- Thermally Enhanced SC-70 Package
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



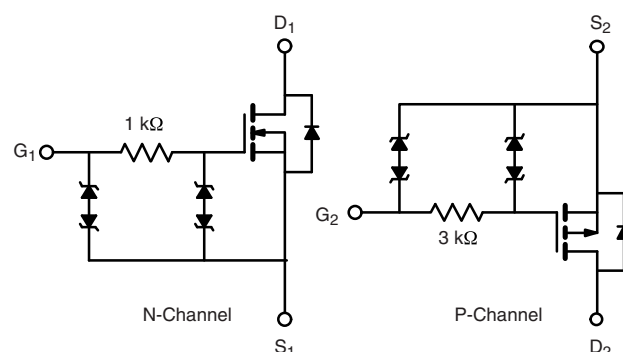
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

## APPLICATIONS

- Load Switching
- PA Switch
- Level Switch



**Ordering Information:** Si1563EDH-T1-E3 (Lead (Pb)-free)  
Si1563EDH-T1-GE3 (Lead (Pb)-free and Halogen-free)



## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)

| Parameter                                                 | Symbol         | N-Channel   |              | P-Channel |              | Unit |
|-----------------------------------------------------------|----------------|-------------|--------------|-----------|--------------|------|
|                                                           |                | 5 s         | Steady State | 5 s       | Steady State |      |
| Drain-Source Voltage                                      | $V_{DS}$       | 20          |              | - 20      |              | V    |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 12$    |              | $\pm 12$  |              | V    |
| Continuous Drain Current ( $T_J = 150$ °C)                | $I_D$          | 1.28        | 1.13         | - 1       | - 0.88       | A    |
|                                                           |                | 0.92        | 0.81         | - 0.72    | - 0.63       |      |
| Pulsed Drain Current                                      | $I_{DM}$       | 4           |              | - 3       |              | A    |
| Continuous Source Current (Diode Conduction) <sup>a</sup> | $I_S$          | 0.61        | 0.48         | - 0.61    | - 0.48       | A    |
| Maximum Power Dissipation <sup>a</sup>                    | $P_D$          | 0.74        | 0.57         | 0.30      | 0.57         | W    |
|                                                           |                | 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 <sup>a</sup> | $t \leq 5$ s | $R_{thJA}$ | 130     | 170     | °C/W |
|                                          | Steady State |            | 170     | 220     |      |
| Maximum Junction-to-Foot (Drain)         | Steady State | $R_{thJF}$ | 80      | 100     | °C/W |

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  |    |
|-----------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|-------|-------|----|
| Static                                        |                     |                                                                                                                                                                                                                                                                                        |      |        |       |       |    |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 100 μA                                                                                                                                                                                                                            | N-Ch | 0.45   | 1     | V     |    |
|                                               |                     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 100 μA                                                                                                                                                                                                                          | P-Ch | - 0.45 | - 1   |       |    |
| Gate-Body Leakage                             | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 4.5 V                                                                                                                                                                                                                                       | N-Ch |        | ± 1   | μA    |    |
|                                               |                     |                                                                                                                                                                                                                                                                                        | P-Ch |        | ± 1   |       |    |
|                                               |                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 12 V                                                                                                                                                                                                                                        | N-Ch |        | ± 10  | mA    |    |
|                                               |                     |                                                                                                                                                                                                                                                                                        | P-Ch |        | ± 10  |       |    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> = 16 V, V <sub>GS</sub> = 0 V                                                                                                                                                                                                                                          | N-Ch |        | 1     | μA    |    |
|                                               |                     | V <sub>DS</sub> = - 16 V, V <sub>GS</sub> = 0 V                                                                                                                                                                                                                                        | P-Ch |        | - 1   |       |    |
|                                               |                     | V <sub>DS</sub> = 16 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C                                                                                                                                                                                                                  | N-Ch |        | 5     |       |    |
|                                               |                     | V <sub>DS</sub> = - 16 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C                                                                                                                                                                                                                | P-Ch |        | - 5   |       |    |
| On-State Drain Current <sup>a</sup>           | I <sub>D(on)</sub>  | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 4.5 V                                                                                                                                                                                                                                         | N-Ch | 2      |       | A     |    |
|                                               |                     | V <sub>DS</sub> ≤ - 5 V, V <sub>GS</sub> = - 4.5 V                                                                                                                                                                                                                                     | P-Ch | - 2    |       |       |    |
| Drain-Source On-State Resistance <sup>a</sup> | R <sub>DS(on)</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1.13 A                                                                                                                                                                                                                                       | N-Ch |        | 0.220 | 0.280 | Ω  |
|                                               |                     | V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 0.88 A                                                                                                                                                                                                                                   | P-Ch |        | 0.400 | 0.490 |    |
|                                               |                     | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.99 A                                                                                                                                                                                                                                       | N-Ch |        | 0.281 | 0.360 |    |
|                                               |                     | V <sub>GS</sub> = - 2.5 V, I <sub>D</sub> = - 0.71 A                                                                                                                                                                                                                                   | P-Ch |        | 0.610 | 0.750 |    |
|                                               |                     | V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 0.20 A                                                                                                                                                                                                                                       | N-Ch |        | 0.344 | 0.450 |    |
|                                               |                     | V <sub>GS</sub> = - 1.8 V, I <sub>D</sub> = - 0.20 A                                                                                                                                                                                                                                   | P-Ch |        | 0.850 | 1.10  |    |
| Forward Transconductance <sup>a</sup>         | g <sub>fs</sub>     | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.13 A                                                                                                                                                                                                                                        | N-Ch |        | 2.6   |       | S  |
|                                               |                     | V <sub>DS</sub> = - 10 V, I <sub>D</sub> = - 0.88 A                                                                                                                                                                                                                                    | P-Ch |        | 1.5   |       |    |
| Diode Forward Voltage <sup>a</sup>            | V <sub>SD</sub>     | I <sub>S</sub> = 0.48 V, V <sub>GS</sub> = 0 V                                                                                                                                                                                                                                         | N-Ch |        | 0.8   | 1.2   | V  |
|                                               |                     | I <sub>S</sub> = - 0.48 V, V <sub>GS</sub> = 0 V                                                                                                                                                                                                                                       | P-Ch |        | - 0.8 | - 1.2 |    |
| Dynamic <sup>b</sup>                          |                     |                                                                                                                                                                                                                                                                                        |      |        |       |       |    |
| Total Gate Charge                             | Q <sub>g</sub>      | N-Channel<br>V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1.13 A<br><br>P-Channel<br>V <sub>DS</sub> = - 10 V, V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 0.88 A                                                                                               | N-Ch |        | 0.65  | 1     | nC |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                                                                                                                                                                                                                        | P-Ch |        | 1.2   | 1.8   |    |
|                                               |                     |                                                                                                                                                                                                                                                                                        | N-Ch |        | 0.2   |       |    |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                                                                                                                                                                                                                        | P-Ch |        | 0.3   |       |    |
|                                               |                     | N-Ch                                                                                                                                                                                                                                                                                   |      | 0.23   |       |       |    |
| Turn-On Delay Time                            | t <sub>d(on)</sub>  | N-Channel<br>V <sub>DD</sub> = 10 V, R <sub>L</sub> = 20 Ω<br>I <sub>D</sub> ≅ 0.5 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 6 Ω<br><br>P-Channel<br>V <sub>DD</sub> = - 10 V, R <sub>L</sub> = 20 Ω<br>I <sub>D</sub> ≅ - 0.5 A, V <sub>GEN</sub> = - 4.5 V, R <sub>g</sub> = 6 Ω | P-Ch |        | 0.3   |       |    |
|                                               |                     |                                                                                                                                                                                                                                                                                        | N-Ch |        | 45    | 70    | ns |
| P-Ch                                          |                     |                                                                                                                                                                                                                                                                                        | 150  | 230    |       |       |    |
| Rise Time                                     | t <sub>r</sub>      |                                                                                                                                                                                                                                                                                        | N-Ch |        | 85    | 130   |    |
|                                               |                     |                                                                                                                                                                                                                                                                                        | P-Ch |        | 480   | 720   |    |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |                                                                                                                                                                                                                                                                                        | N-Ch |        | 350   | 530   |    |
|                                               |                     |                                                                                                                                                                                                                                                                                        | P-Ch |        | 840   | 1200  |    |
| Fall Time                                     | t <sub>f</sub>      |                                                                                                                                                                                                                                                                                        | N-Ch |        | 210   | 320   |    |
|                                               |                     | P-Ch                                                                                                                                                                                                                                                                                   |      | 850    | 1200  |       |    |

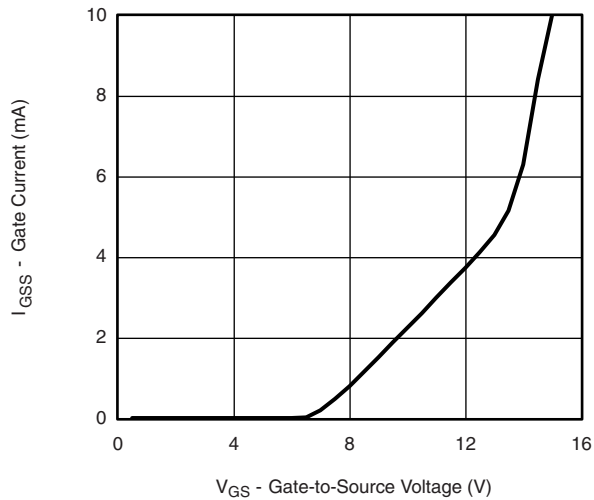
Notes:

a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

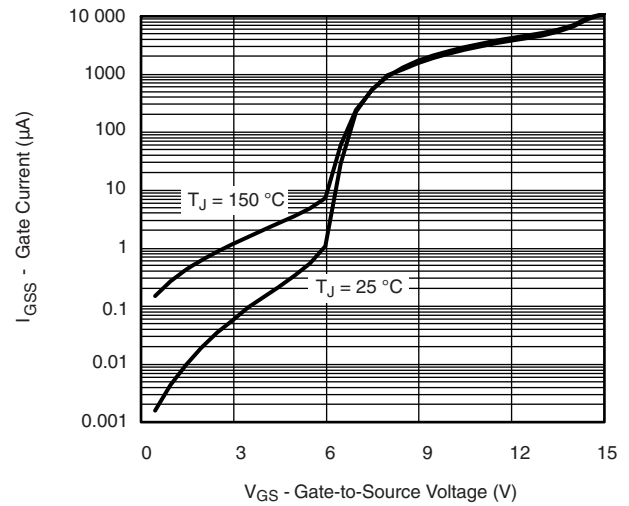
b. Guaranteed by design, not subject to production testing.

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.

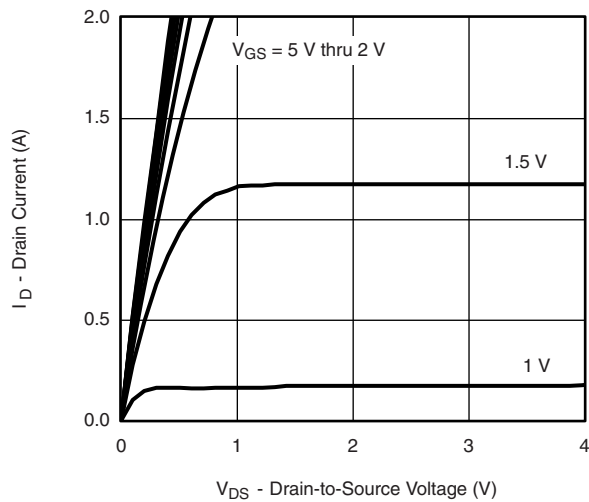
## N-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



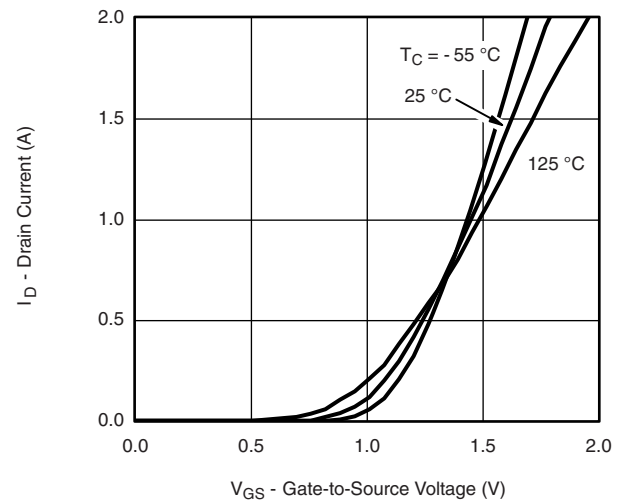
Gate-Current vs. Gate-Source Voltage



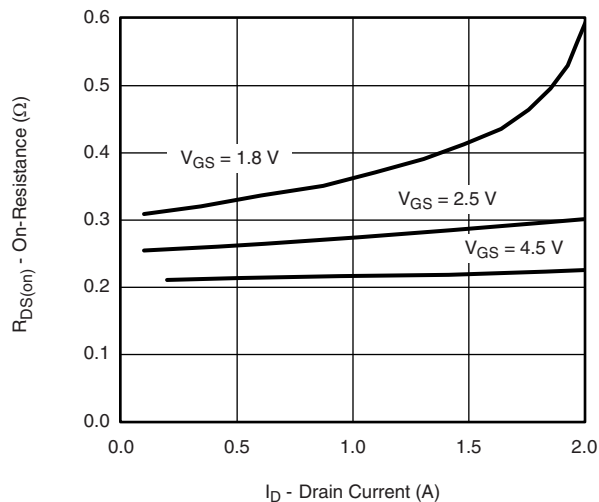
Gate-Current vs. Gate-Source Voltage



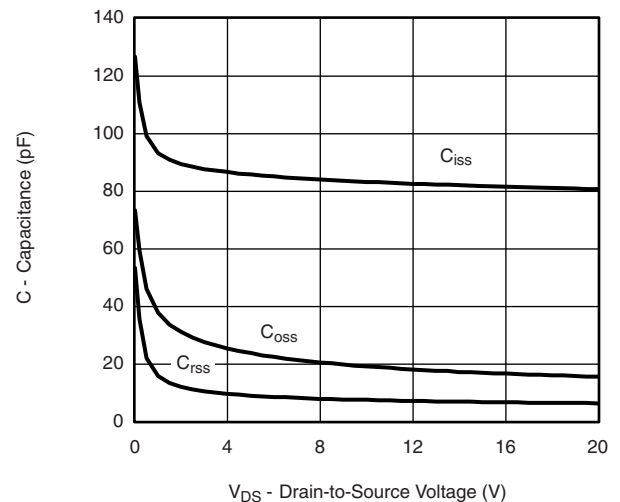
Output Characteristics



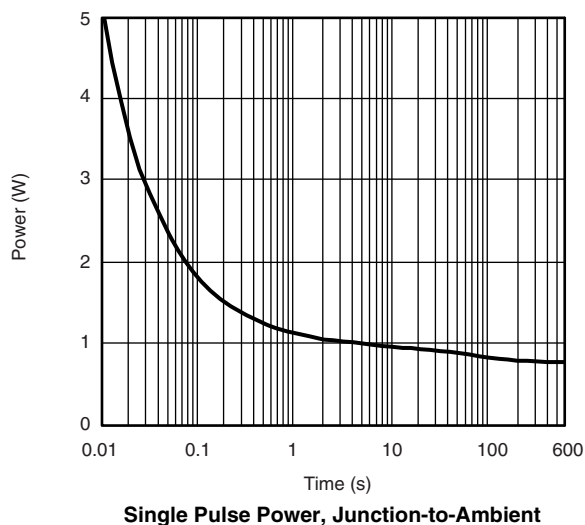
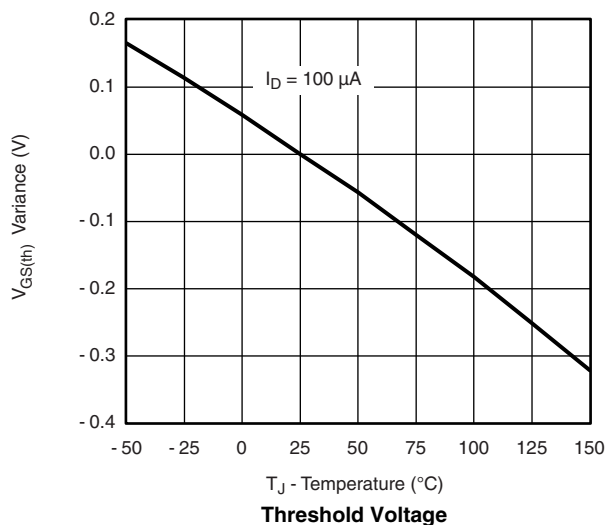
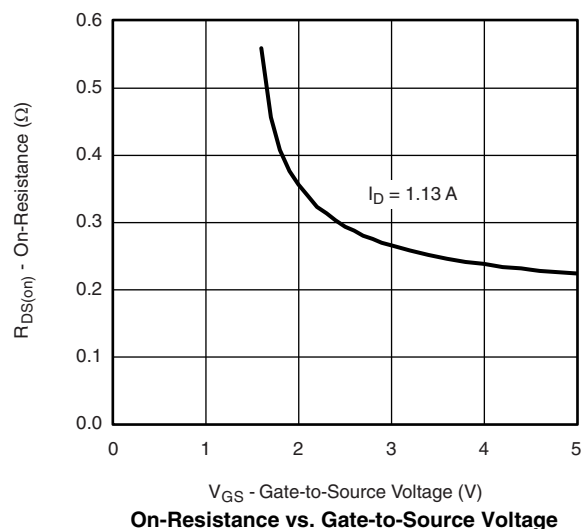
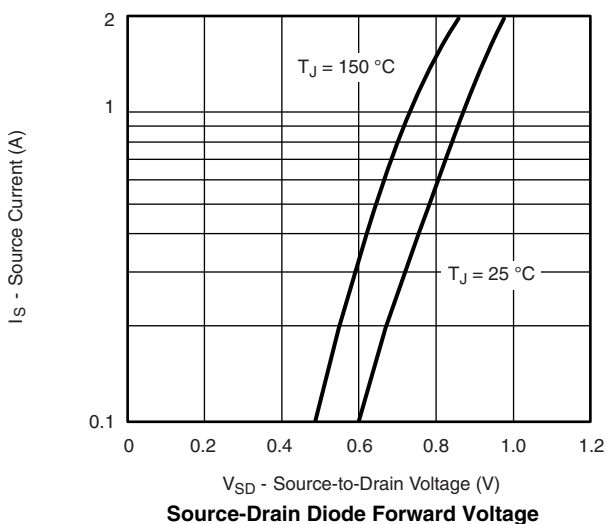
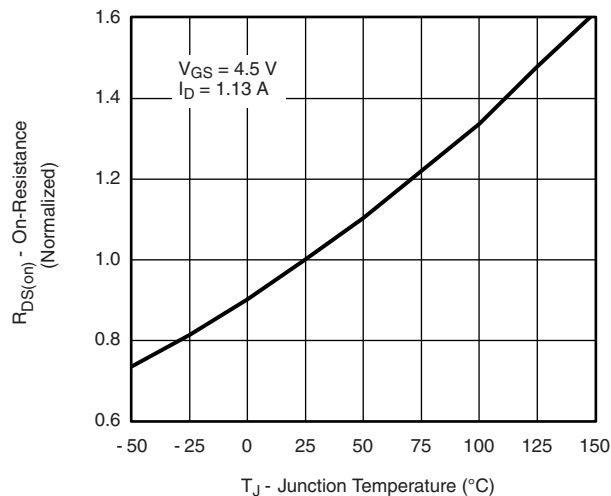
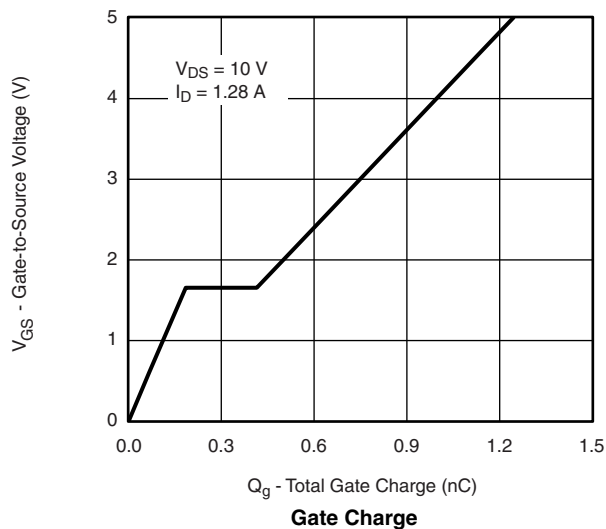
Transfer Characteristics



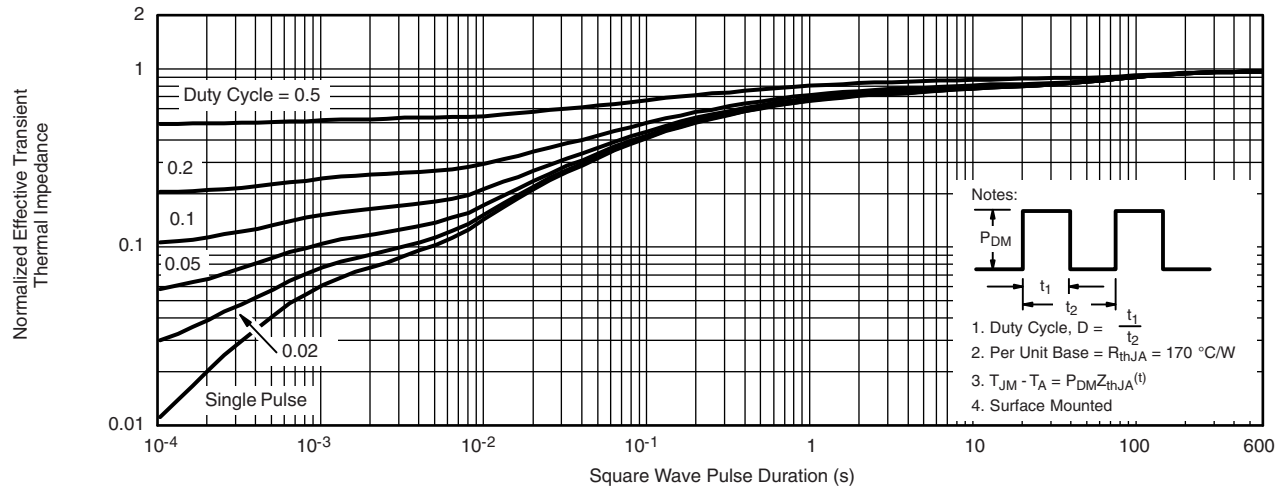
On-Resistance vs. Drain Current



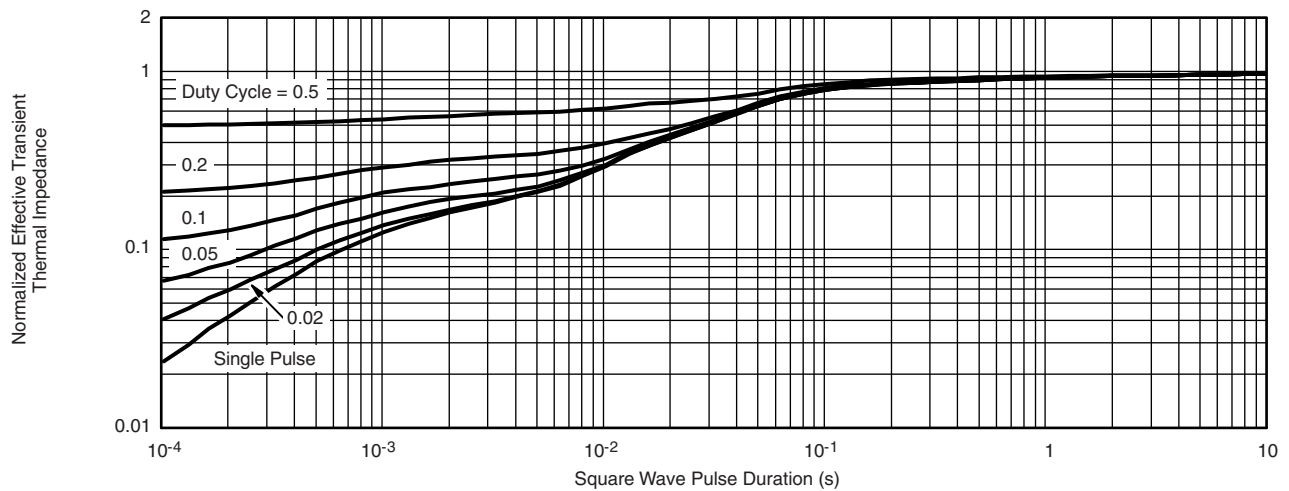
Capacitance

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

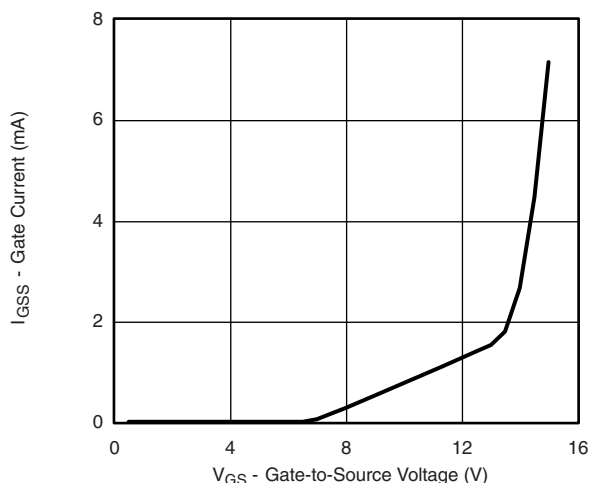
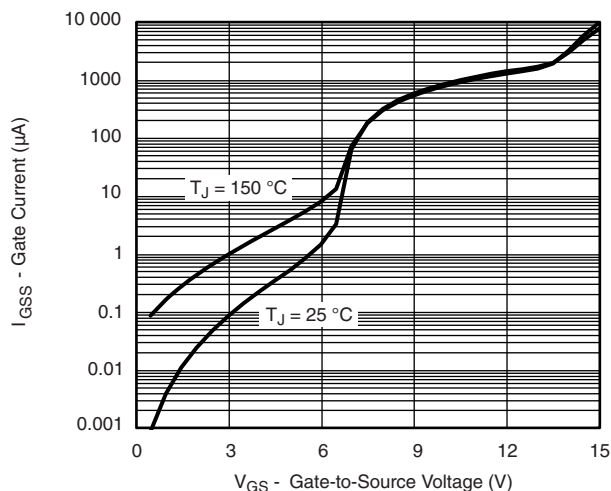
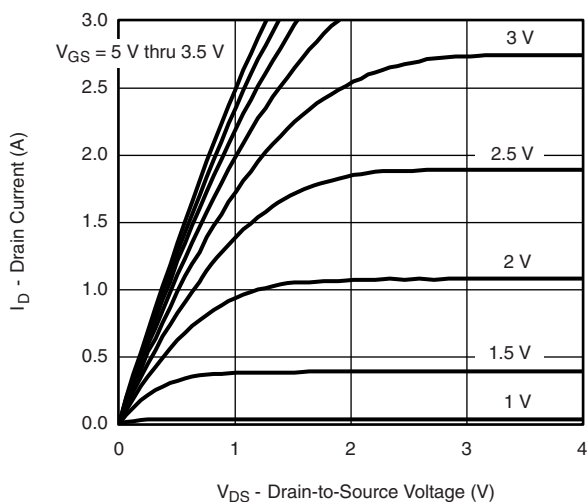
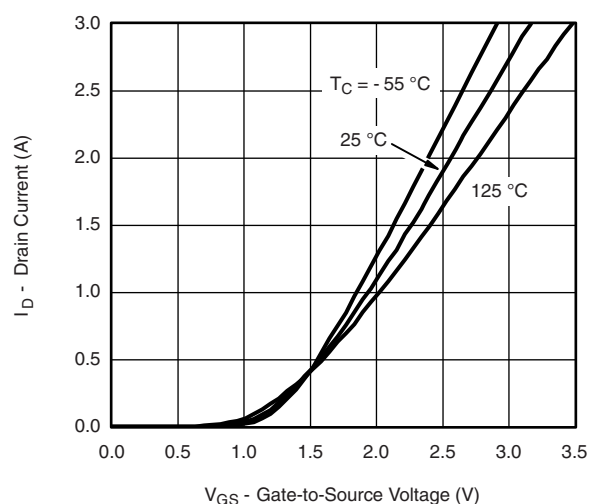
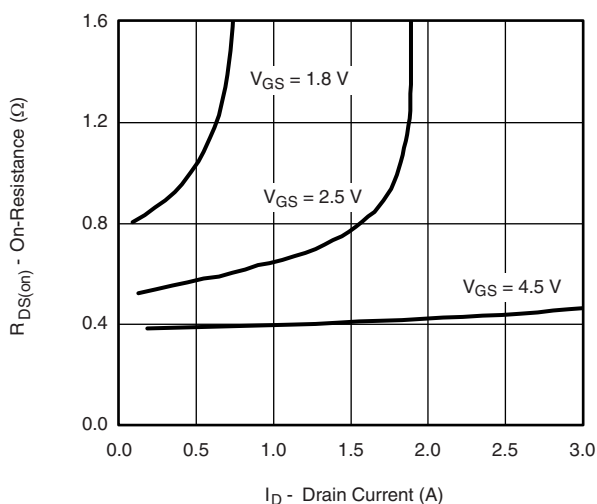
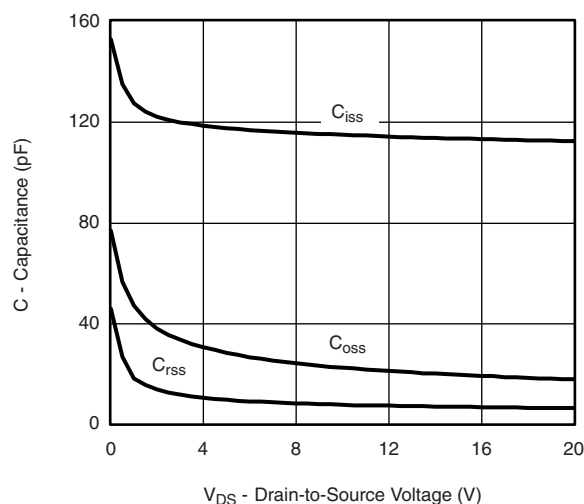
## N-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



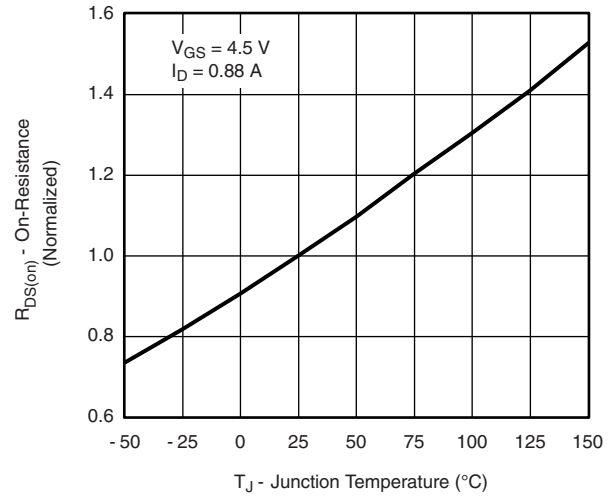
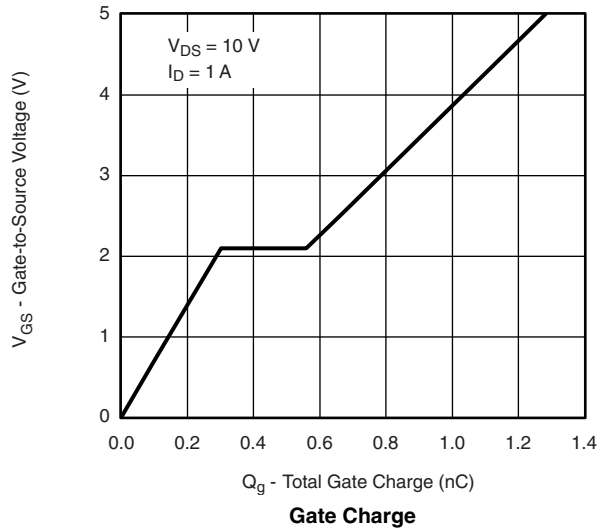
Normalized Thermal Transient Impedance, Junction-to-Ambient



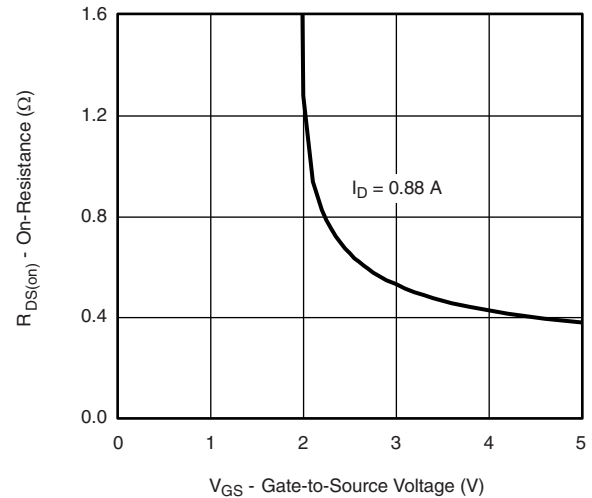
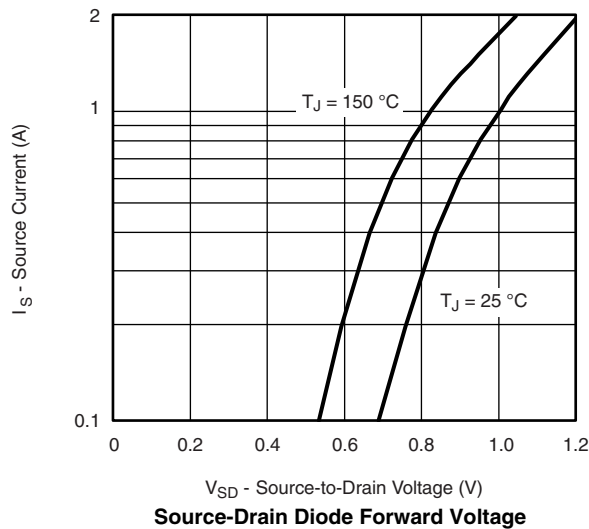
Normalized Thermal Transient Impedance, Junction-to-Foot

**P-CHANNEL TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)**Gate-Current vs. Gate-Source Voltage****Gate-Current vs. Gate-Source Voltage****Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current****Capacitance**

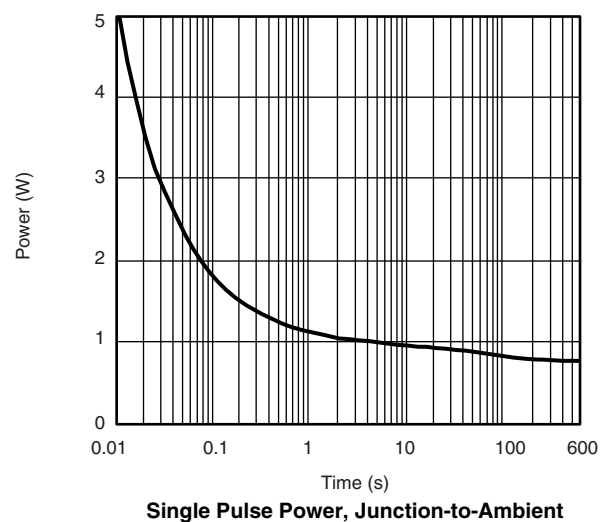
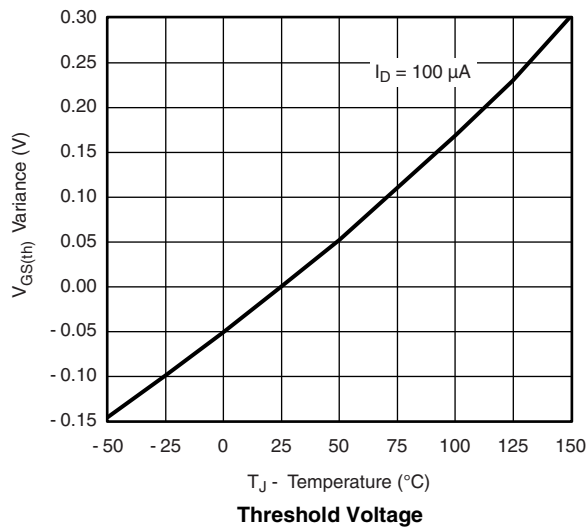
## P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

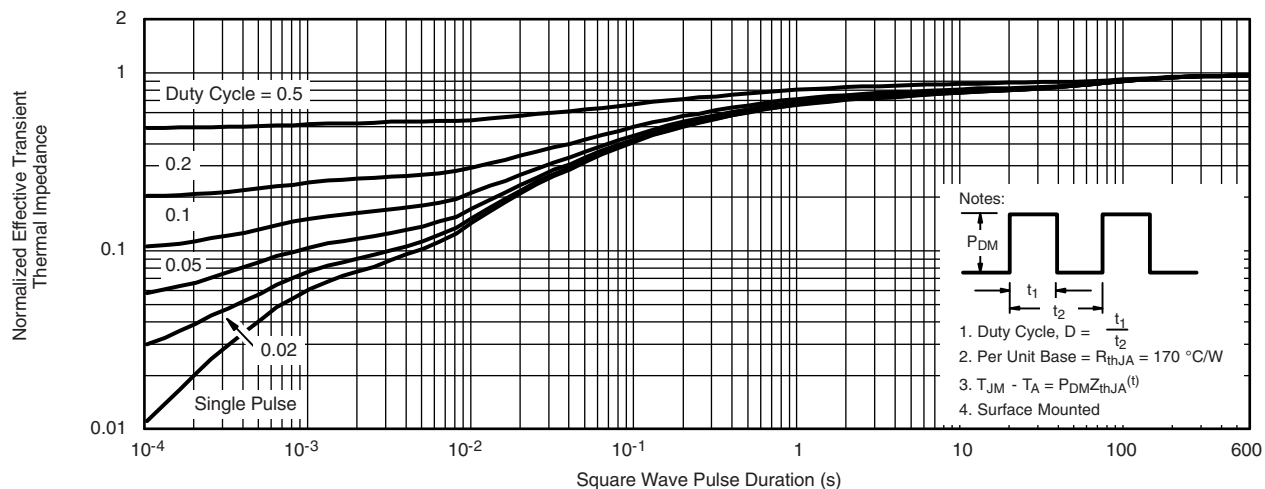
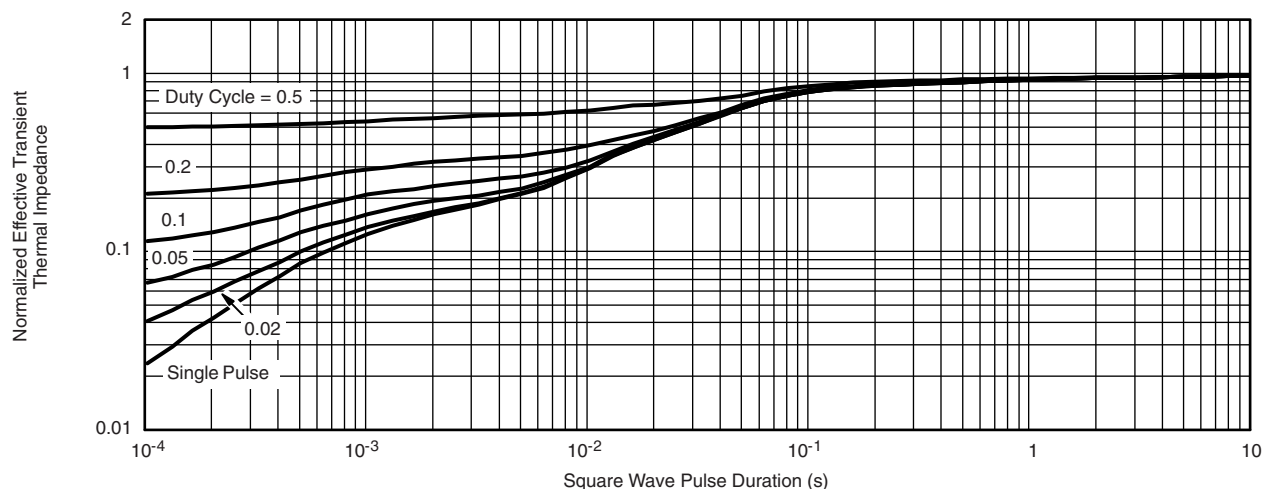


On-Resistance vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage



**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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