

## P-Channel 1.8 V (G-S) MOSFET with Schottky Diode

### MOSFET PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ )   | $I_D$ (A) |
|--------------|-----------------------------|-----------|
| - 20         | 0.110 at $V_{GS} = - 4.5$ V | - 3.6     |
|              | 0.160 at $V_{GS} = - 2.5$ V | - 3.0     |
|              | 0.240 at $V_{GS} = - 1.8$ V | - 2.4     |

### SCHOTTKY PRODUCT SUMMARY

| $V_{KA}$ (V) | $V_f$ (V)<br>Diode Forward Voltage | $I_F$ (A) |
|--------------|------------------------------------|-----------|
| 20           | 0.375 V at 1 A                     | 1.0       |

### FEATURES

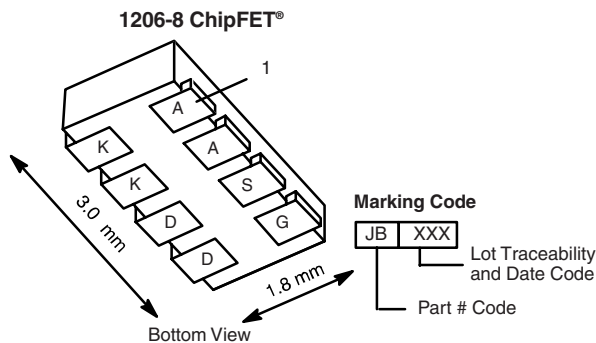
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFETs
- Ultra Low  $V_f$  Schottky
- Si5853DC Pin Compatible
- Compliant to RoHS Directive 2002/95/EC



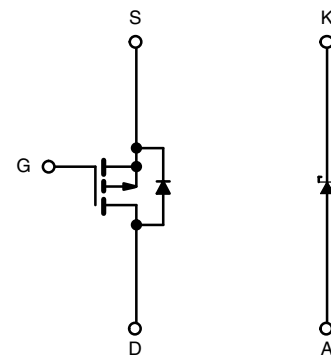
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Charging Circuit in Portable Devices



**Ordering Information:** Si5855DC-T1-E3 (Lead (Pb)-free)  
Si5855DC-T1-GE3 (Lead (Pb)-free and Halogen-free)



P-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                                                              |                                    | Symbol         | 5 s         | Steady State | Unit               |
|----------------------------------------------------------------------------------------|------------------------------------|----------------|-------------|--------------|--------------------|
| Drain-Source Voltage (MOSFET)                                                          |                                    | $V_{DS}$       | - 20        |              | V                  |
| Reverse Voltage (Schottky)                                                             |                                    | $V_{KA}$       | 20          |              |                    |
| Gate-Source Voltage (MOSFET)                                                           |                                    | $V_{GS}$       | $\pm 8$     |              |                    |
| Continuous Drain Current ( $T_J = 150\text{ }^{\circ}\text{C}$ ) (MOSFET) <sup>a</sup> | $T_A = 25\text{ }^{\circ}\text{C}$ | $I_D$          | - 3.6       | - 2.7        | A                  |
|                                                                                        | $T_A = 85\text{ }^{\circ}\text{C}$ |                | - 2.6       | - 1.9        |                    |
| Pulsed Drain Current (MOSFET)                                                          |                                    | $I_{DM}$       | - 10        |              |                    |
| Continuous Source Current (MOSFET Diode Conduction) <sup>a</sup>                       |                                    | $I_S$          | - 1.8       | - 0.9        |                    |
| Average Forward Current (Schottky)                                                     |                                    | $I_F$          | 1.0         |              |                    |
| Pulsed Forward Current (Schottky)                                                      |                                    | $I_{FM}$       | 7           |              |                    |
| Maximum Power Dissipation (MOSFET) <sup>a</sup>                                        | $T_A = 25\text{ }^{\circ}\text{C}$ | $P_D$          | 2.1         | 1.1          | W                  |
|                                                                                        | $T_A = 85\text{ }^{\circ}\text{C}$ |                | 1.1         | 0.6          |                    |
| Maximum Power Dissipation (Schottky) <sup>a</sup>                                      | $T_A = 25\text{ }^{\circ}\text{C}$ |                | 1.9         | 1.1          |                    |
|                                                                                        | $T_A = 85\text{ }^{\circ}\text{C}$ |                | 1.0         | 0.56         |                    |
| Operating Junction and Storage Temperature Range                                       |                                    | $T_J, T_{stg}$ | - 55 to 150 |              | $^{\circ}\text{C}$ |
| Soldering Recommendations (Peak Temperature) <sup>b, c</sup>                           |                                    |                | 260         |              |                    |

Notes:

- Surface mounted on 1" x 1" FR4 board.
- See reliability manual for profile. The ChipFET is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

**THERMAL RESISTANCE RATINGS**

| Parameter                        |                      | Device   | Symbol     | Typical | Maximum | Unit |
|----------------------------------|----------------------|----------|------------|---------|---------|------|
| Junction-to-Ambient <sup>a</sup> | $t \leq 5 \text{ s}$ | MOSFET   | $R_{thJA}$ | 50      | 60      | °C/W |
|                                  |                      | Schottky |            | 54      | 65      |      |
|                                  | Steady State         | MOSFET   |            | 90      | 110     |      |
|                                  |                      | Schottky |            | 95      | 115     |      |
| Junction-to-Foot                 | Steady State         | MOSFET   | $R_{thJF}$ | 30      | 40      |      |
|                                  |                      | Schottky |            | 30      | 40      |      |

Notes:

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

**MOSFET SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                     | Symbol       | Test Conditions                                                                                                           | Min.  | Typ.  | Max.      | Unit          |
|-----------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------|-------|-------|-----------|---------------|
| <b>Static</b>                                 |              |                                                                                                                           |       |       |           |               |
| Gate Threshold Voltage                        | $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = -250 \mu\text{A}$                                                                              | -0.45 |       | -1.0      | V             |
| Gate-Body Leakage                             | $I_{GSS}$    | $V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 8 \text{ V}$                                                                       |       |       | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current               | $I_{DSS}$    | $V_{DS} = -20 \text{ V}$ , $V_{GS} = 0 \text{ V}$                                                                         |       |       | -1        | $\mu\text{A}$ |
|                                               |              | $V_{DS} = -20 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 85^\circ\text{C}$                                              |       |       | -5        |               |
| On-State Drain Current <sup>a</sup>           | $I_{D(on)}$  | $V_{DS} \leq -5 \text{ V}$ , $V_{GS} = -4.5 \text{ V}$                                                                    | -10   |       |           | A             |
| Drain-Source On-State Resistance <sup>a</sup> | $R_{DS(on)}$ | $V_{GS} = -4.5 \text{ V}$ , $I_D = -2.7 \text{ A}$                                                                        |       | 0.095 | 0.110     | $\Omega$      |
|                                               |              | $V_{GS} = -2.5 \text{ V}$ , $I_D = -2.2 \text{ A}$                                                                        |       | 0.137 | 0.160     |               |
|                                               |              | $V_{GS} = -1.8 \text{ V}$ , $I_D = -1 \text{ A}$                                                                          |       | 0.205 | 0.240     |               |
| Forward Transconductance <sup>a</sup>         | $g_{fs}$     | $V_{DS} = -10 \text{ V}$ , $I_D = -2.7 \text{ A}$                                                                         |       | 7     |           | S             |
| Diode Forward Voltage <sup>a</sup>            | $V_{SD}$     | $I_S = -0.9 \text{ A}$ , $V_{GS} = 0 \text{ V}$                                                                           |       | -0.8  | -1.2      | V             |
| <b>Dynamic<sup>b</sup></b>                    |              |                                                                                                                           |       |       |           |               |
| Total Gate Charge                             | $Q_g$        | $V_{DS} = -10 \text{ V}$ , $V_{GS} = -4.5 \text{ V}$ , $I_D = -2.7 \text{ A}$                                             |       | 5.1   | 7.7       | nC            |
| Gate-Source Charge                            | $Q_{gs}$     |                                                                                                                           |       | 1.2   |           |               |
| Gate-Drain Charge                             | $Q_{gd}$     |                                                                                                                           |       | 1.0   |           |               |
| Turn-On Delay Time                            | $t_{d(on)}$  | $V_{DD} = -10 \text{ V}$ , $R_L = 10 \Omega$<br>$I_D \equiv -1 \text{ A}$ , $V_{GEN} = -4.5 \text{ V}$ , $R_g = 6 \Omega$ |       | 16    | 25        | ns            |
| Rise Time                                     | $t_r$        |                                                                                                                           |       | 30    | 45        |               |
| Turn-Off Delay Time                           | $t_{d(off)}$ |                                                                                                                           |       | 30    | 45        |               |
| Fall Time                                     | $t_f$        |                                                                                                                           |       | 27    | 40        |               |
| Source-Drain Reverse Recovery Time            | $t_{rr}$     | $I_F = -0.9 \text{ A}$ , $dI/dt = 100 \text{ A}/\mu\text{s}$                                                              |       | 20    | 40        |               |

Notes:

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

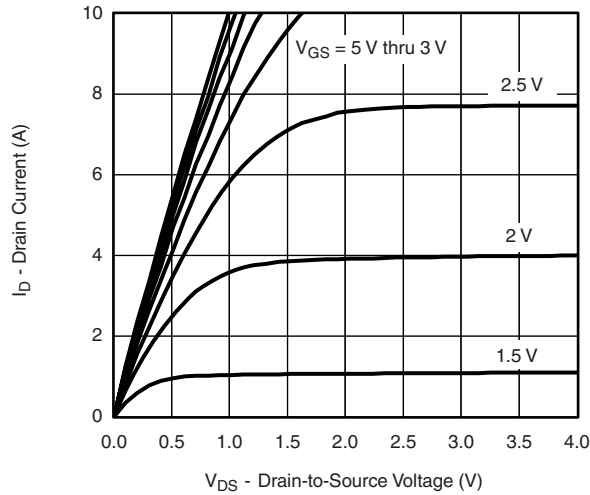
b. Guaranteed by design, not subject to production testing.

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.

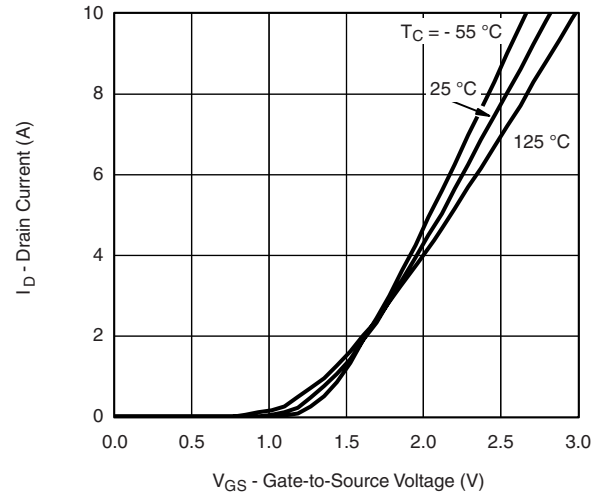
**SCHOTTKY SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                       | Symbol   | Test Conditions                                  | Min. | Typ.  | Max.  | Unit |
|---------------------------------|----------|--------------------------------------------------|------|-------|-------|------|
| Forward Voltage Drop            | $V_F$    | $I_F = 1 \text{ A}$                              |      | 0.34  | 0.375 | V    |
|                                 |          | $I_F = 1 \text{ A}$ , $T_J = 125^\circ\text{C}$  |      | 0.255 | 0.290 |      |
| Maximum Reverse Leakage Current | $I_{rm}$ | $V_r = 20 \text{ V}$                             |      | 0.05  | 0.500 | mA   |
|                                 |          | $V_r = 20 \text{ V}$ , $T_J = 85^\circ\text{C}$  |      | 2     | 20    |      |
|                                 |          | $V_r = 20 \text{ V}$ , $T_J = 125^\circ\text{C}$ |      | 10    | 100   |      |
| Junction Capacitance            | $C_T$    | $V_r = 10 \text{ V}$                             |      | 90    |       | pF   |

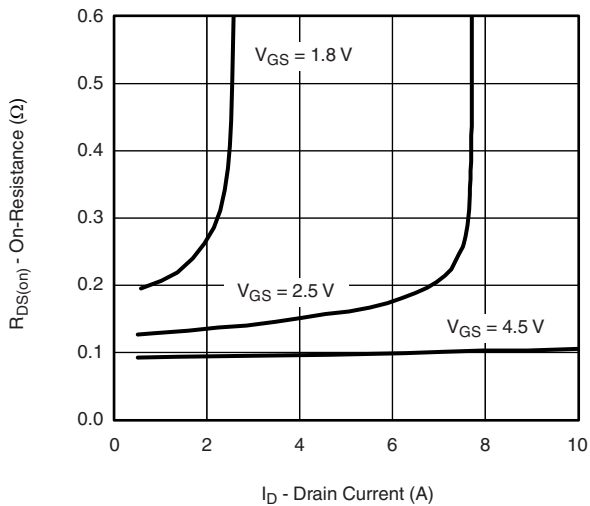
## MOSFET TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



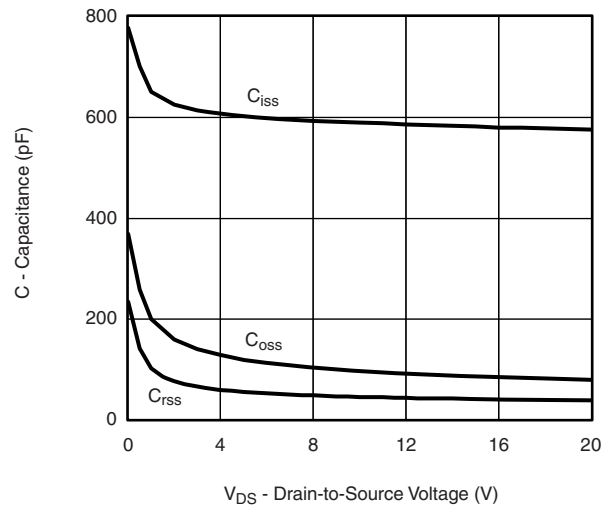
Output Characteristics



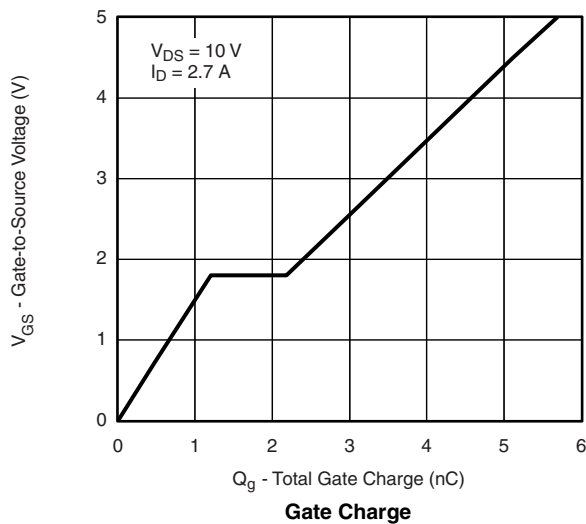
Transfer Characteristics



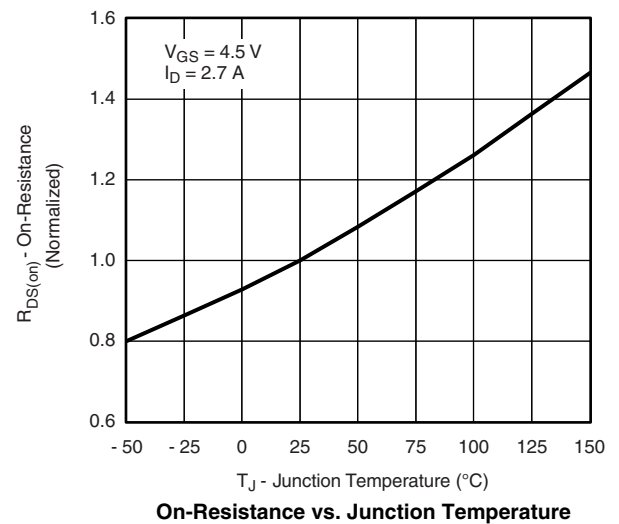
On-Resistance vs. Drain Current



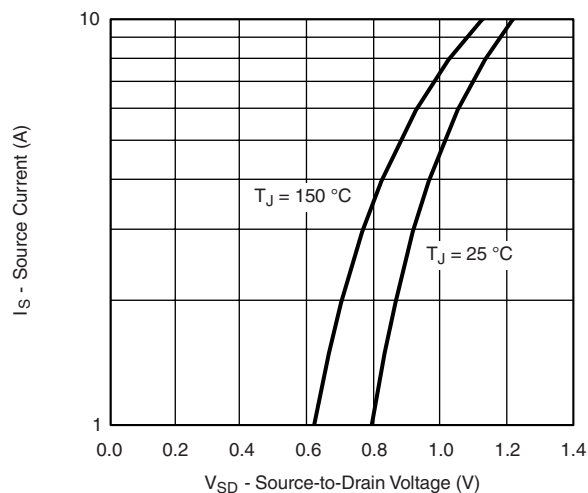
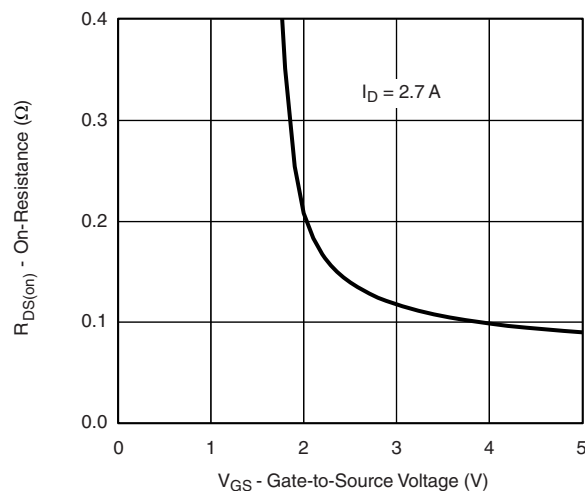
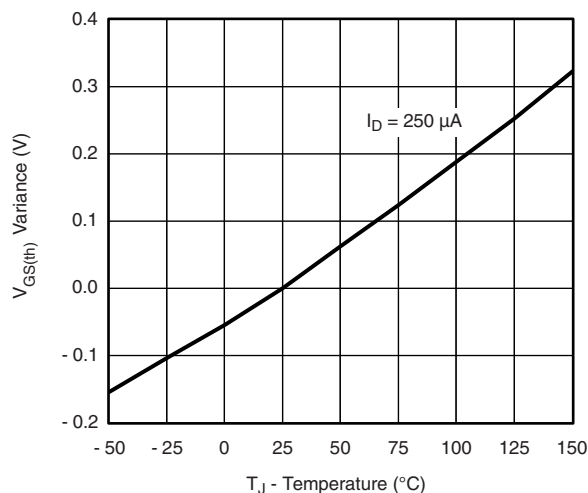
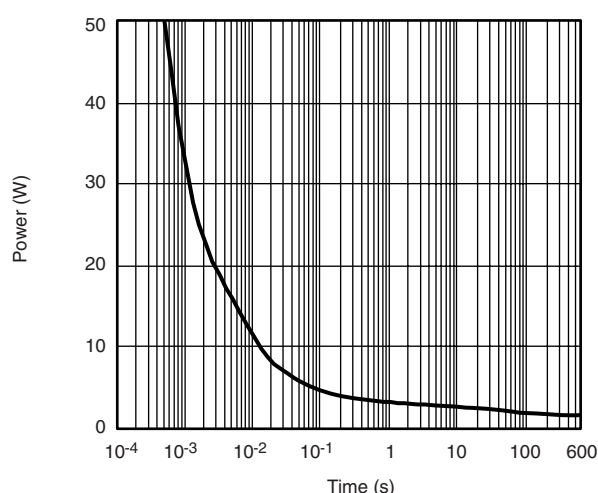
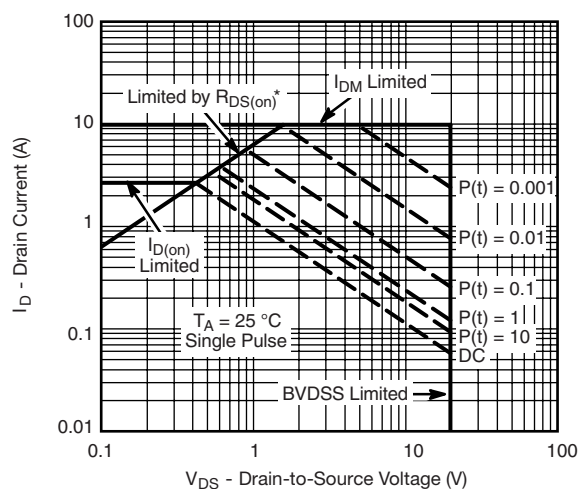
Capacitance



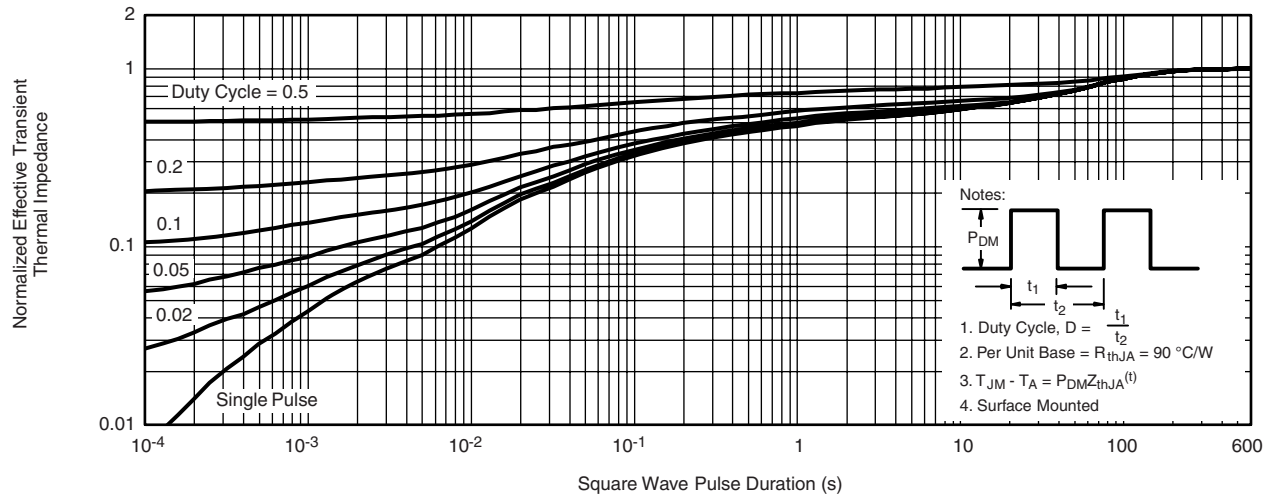
Gate Charge



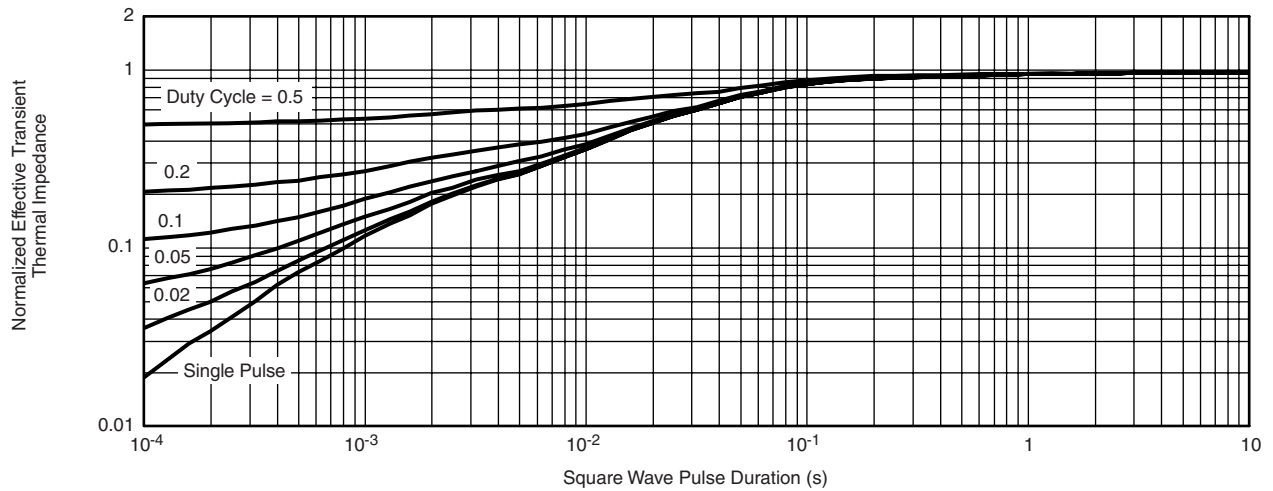
On-Resistance vs. Junction Temperature

**MOSFET TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Source-Drain Diode Forward Voltage****On-Resistance vs. Gate-to-Source Voltage****Threshold Voltage****Single Pulse Power**\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified**Safe Operating Area**

**MOSFET TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

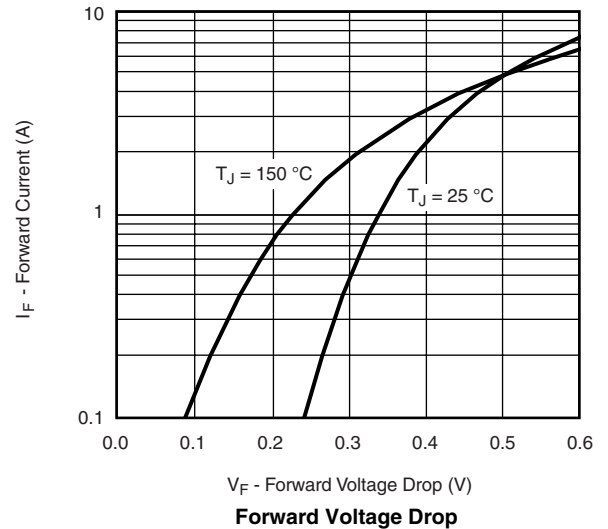
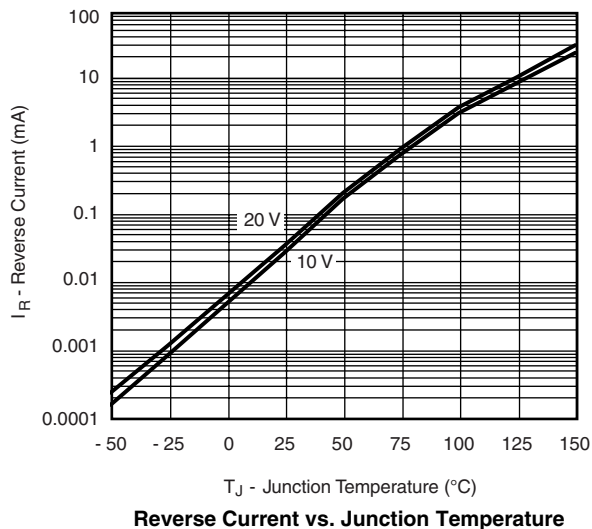


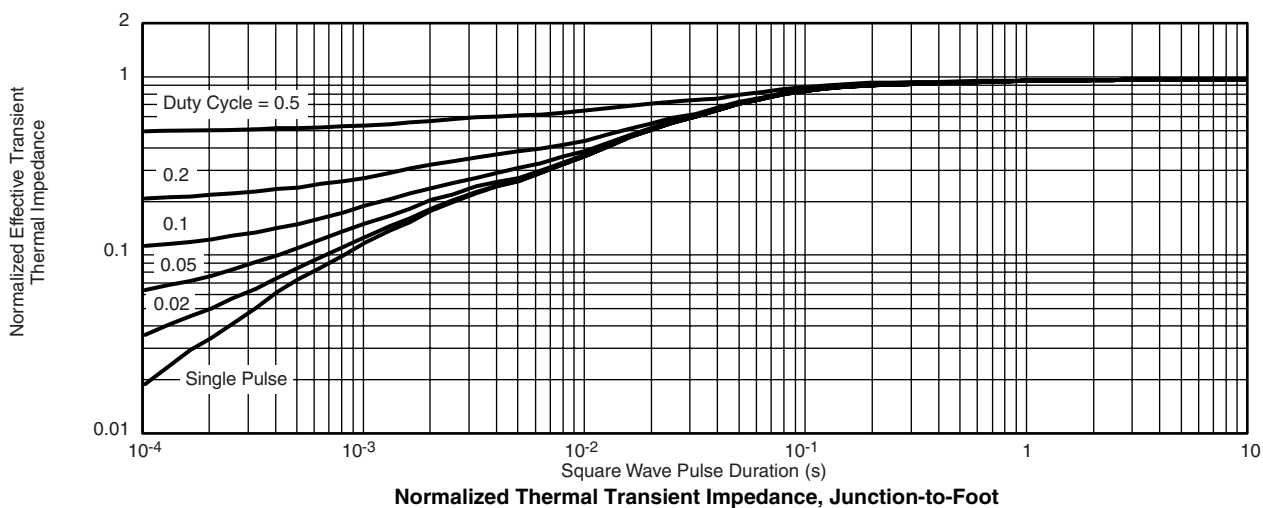
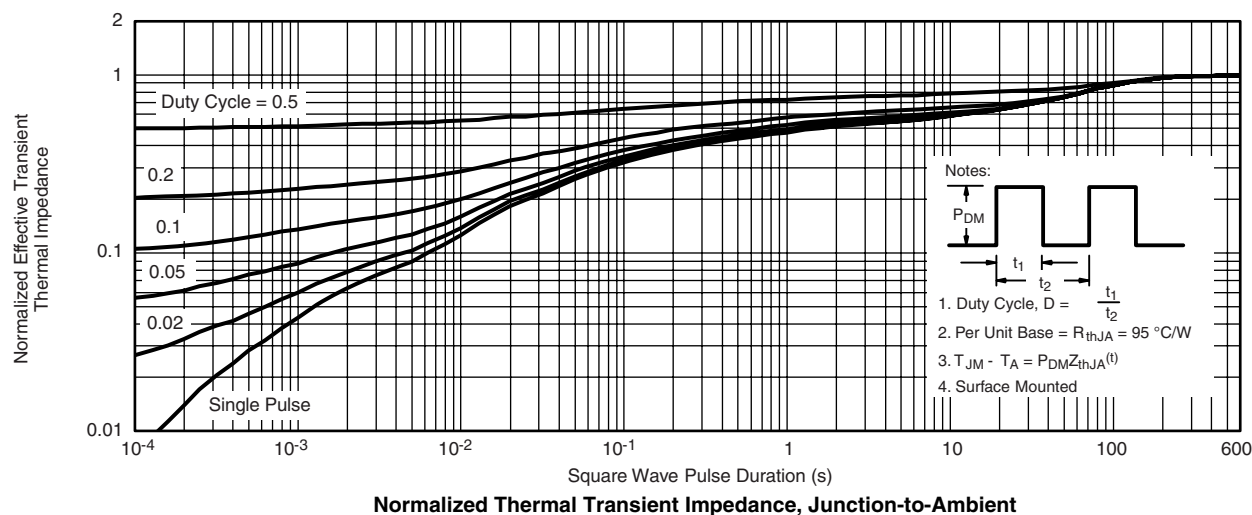
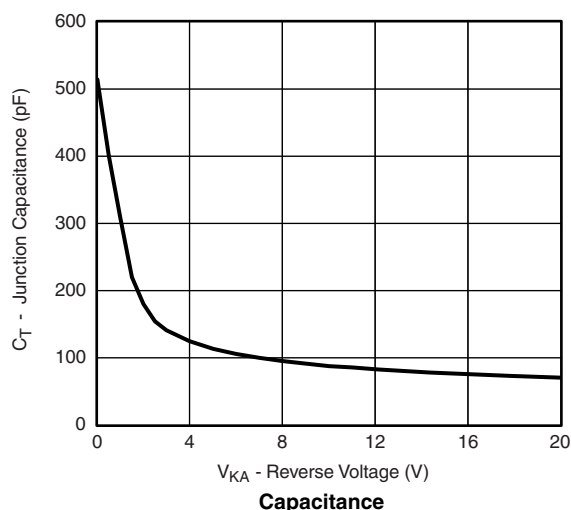
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



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

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



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

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