

P-Channel 30-V (D-S) MOSFET with Schottky Diode

| MOSFET PRODUCT SUMMARY | | | |
|------------------------|-----------------------------|------------------------|-------------|
| V_{DS} (V) | $r_{DS(on)}$ (Ω) | I_D (A) ^a | Q_g (Typ) |
| - 30 | 0.072 at $V_{GS} = - 10$ V | - 4.6 | - 4.6 |
| | 0.110 at $V_{GS} = - 4.5$ V | - 3.4 | |

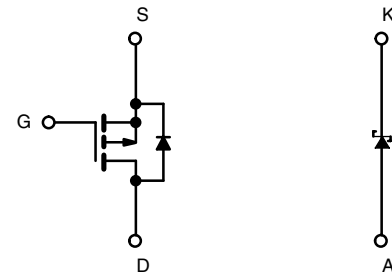
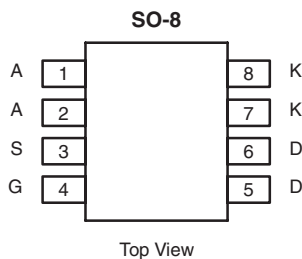
| SCHOTTKY PRODUCT SUMMARY | | |
|--------------------------|------------------------------------|------------------------|
| V_{KA} (V) | V_f (V) Diode Forward Voltage | I_D (A) ^a |
| 30 | 0.50 V at 1 A | 2.4 |

FEATURES

- LITTLE FOOT[®] Plus Power MOSFET



RoHS
COMPLIANT



Ordering Information: Si4833ADY-T1-E3 (Lead (Pb)-free)

P-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted | | | | |
|----------------------------------------------------------------|---------------|----------------|------------------------|------|
| Parameter | | Symbol | Limit | Unit |
| Drain-Source Voltage (MOSFET) | | V_{DS} | - 30 | V |
| Reverse Voltage (Schottky) | | V_{KA} | - 30 | |
| Gate-Source Voltage (MOSFET) | | V_{GS} | ± 20 | |
| Continuous Drain Current ($T_J = 150$ °C) (MOSFET) | $T_C = 25$ °C | I_D | - 4.6 | A |
| | $T_C = 70$ °C | | - 3.6 | |
| | $T_A = 25$ °C | | - 3.85 ^{b, c} | |
| | $T_A = 70$ °C | | - 3.08 ^{b, c} | |
| Pulsed Drain Current (MOSFET) | | I_{DM} | - 20 | A |
| Continuous Source Current (MOSFET Diode Conduction) | | I_S | - 2.3 | |
| | | | - 1.4 ^{b, c} | |
| Average Forward Current (Schottky) | | I_F | - 1.4 ^b | A |
| Pulsed Forward Current (Schottky) | | I_{FM} | - 20 | |
| Maximum Power Dissipation (MOSFET and Schottky) | $T_C = 25$ °C | P_D | 2.75 | W |
| | $T_C = 70$ °C | | 1.75 | |
| | $T_A = 25$ °C | | 1.93 ^{b, c} | |
| | $T_A = 70$ °C | | 1.23 ^{b, c} | |
| 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 (MOSFET and Schottky) ^{b, c, d} | R_{thJA} | 60 | 65 | °C/W |
| Maximum Junction-to-Foot (Drain) (MOSFET and Schottky) | R_{thJF} | 35 | 45 | |

Notes:

- Based on $T_C = 25$ °C.
- Surface Mounted on FR4 Board.
- $t \leq 10$ sec.
- Maximum under Steady State conditions is 120 °C/W.

| MOSFET SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|----------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----|-------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{DS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -30 | | | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = 250\text{ }\mu\text{A}$ | | -28 | | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | 3.5 | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -1 | | -2.5 | V |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$ | | | -1 | μA |
| | | $V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 75\text{ }^\circ\text{C}$ | | | -10 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq -5\text{ V}, V_{GS} = -10\text{ V}$ | -5 | | | A |
| Drain-Source On-State Resistance ^a | $r_{DS(on)}$ | $V_{GS} = -10\text{ V}, I_D = -3.6\text{ A}$ | | 0.059 | 0.072 | Ω |
| | | $V_{GS} = -4.5\text{ V}, I_D = -2.8\text{ A}$ | | 0.090 | 0.110 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -15\text{ V}, I_D = -3.6\text{ A}$ | | 7 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 380 | 750 | pF |
| Output Capacitance | C_{oss} | | 100 | | | |
| Reverse Transfer Capacitance | C_{rss} | | 75 | | | |
| Total Gate Charge | Q_g | $V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -3\text{ A}$ | | 9.8 | 15 | nC |
| | | $V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -3\text{ A}$ | | 4.6 | 7.0 | |
| Gate-Source Charge | Q_{gs} | | | 1.4 | | |
| Gate-Drain Charge | Q_{gd} | | 2.4 | | | |
| Gate Resistance | R_g | $f = 1\text{ MHz}$ | | 8 | 16 | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -15\text{ V}, R_L = 7.5\text{ }\Omega$ $I_D \cong -2\text{ A}, V_{GEN} = -4.5\text{ V}, R_G = 1\text{ }\Omega$ | | 20 | 30 | ns |
| Rise Time | t_r | | | 59 | 90 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 26 | 40 | |
| Fall Time | t_f | | | 19 | 30 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -15\text{ V}, R_L = 7.5\text{ }\Omega$ $I_D \cong -2\text{ A}, V_{GEN} = -10\text{ V}, R_G = 1\text{ }\Omega$ | | 7 | 14 | |
| Rise Time | t_r | | | 11 | 17 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 19 | 30 | |
| Fall Time | t_f | | | 8 | 15 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | | | -4.6 | A |
| Pulse Diode Forward Current ^a | I_{SM} | | | | -20 | |
| Body Diode Voltage | V_{SD} | $I_S = -1.4\text{ A}, V_{GS} = 0\text{ V}$ | | -0.8 | -1.2 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F = -2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$ | | 23 | 40 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 12 | 20 | nC |
| Reverse Recovery Fall Time | t_a | | | 10 | | ns |
| Reverse Recovery Rise Time | t_b | | | 13 | | |

Notes:

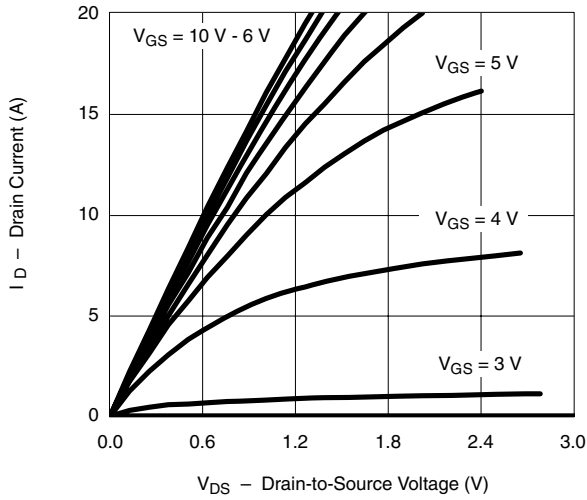
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.



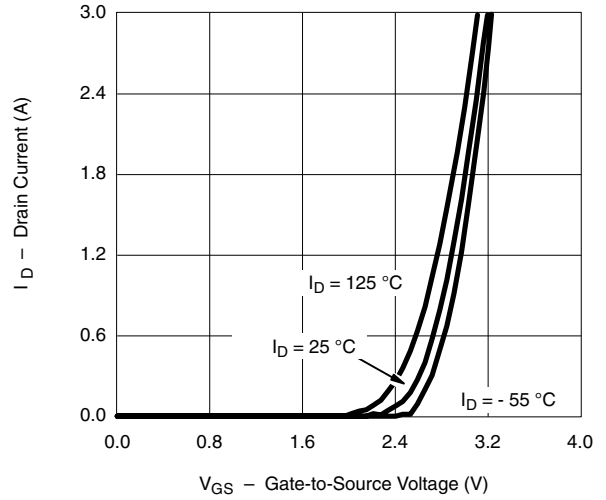
| SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|------------------------------------------------------------------------------------------|----------|------------------------------------------------------|-----|-------|------|------|
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
| Forward Voltage Drop | V_F | $I_F = 1\text{ A}$ | | 0.45 | 0.50 | V |
| | | $I_F = 1\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | 0.36 | 0.42 | |
| Maximum Reverse Leakage Current | I_{rm} | $V_r = 30\text{ V}$ | | 0.004 | 0.1 | mA |
| | | $V_r = 30\text{ V}, T_J = 75\text{ }^\circ\text{C}$ | | 0.1 | 2 | |
| | | $V_r = 30\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | 3 | 20 | |
| Junction Capacitance | C_T | $V_r = 10\text{ V}$ | | 62 | | pF |

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.

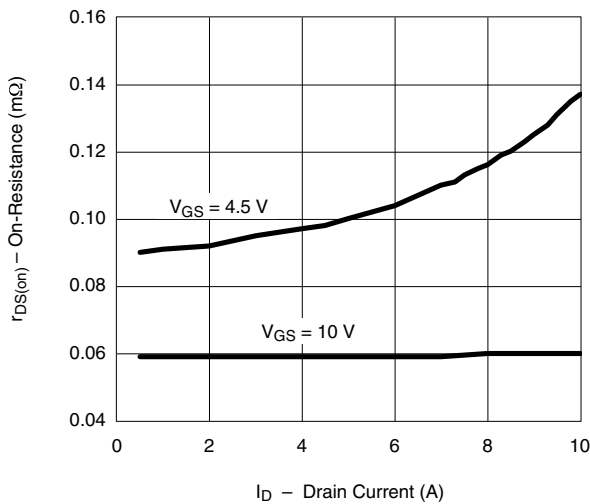
MOSFET TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



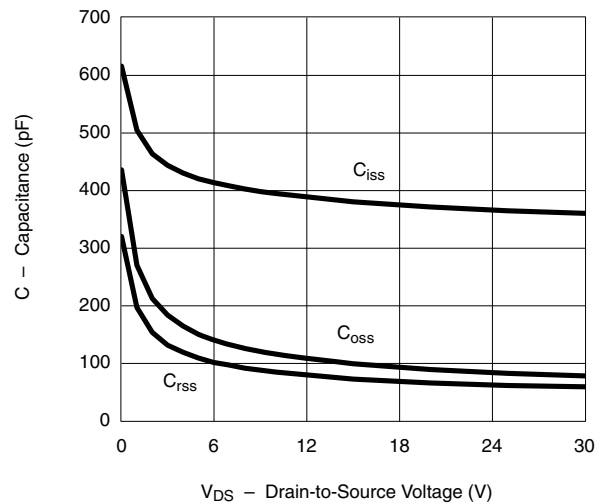
Output Characteristics



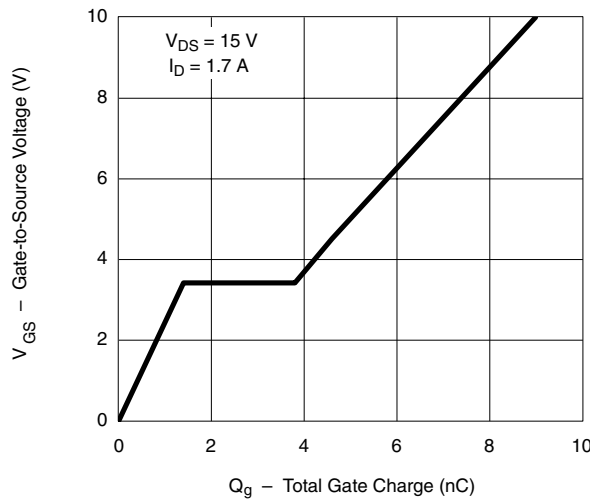
Transfer Characteristics



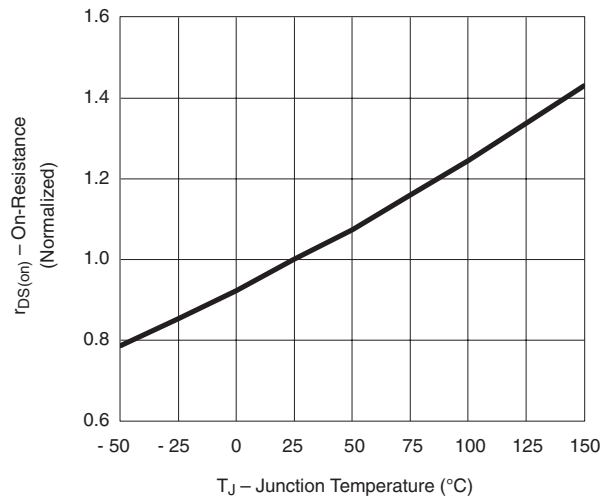
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

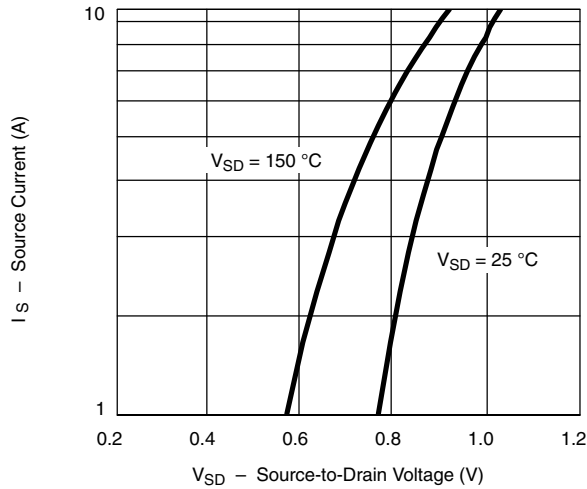


Gate Charge

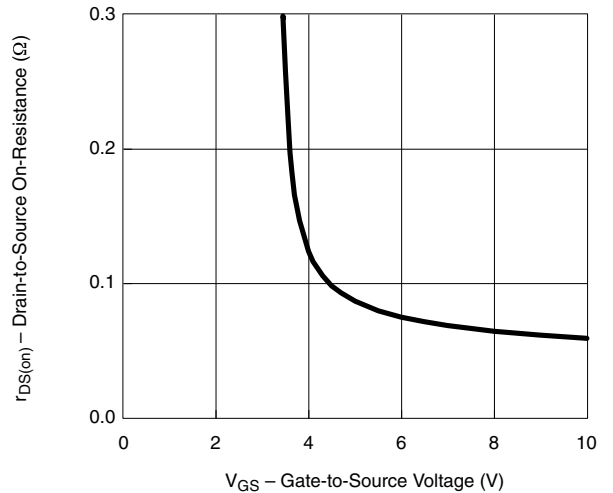


On-Resistance vs. Junction Temperature

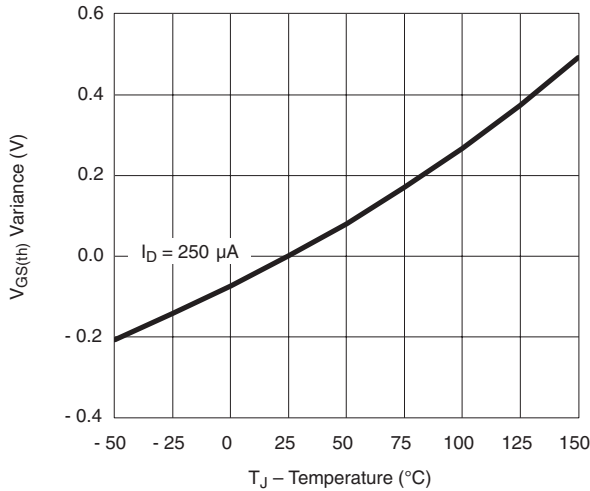
MOSFET TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



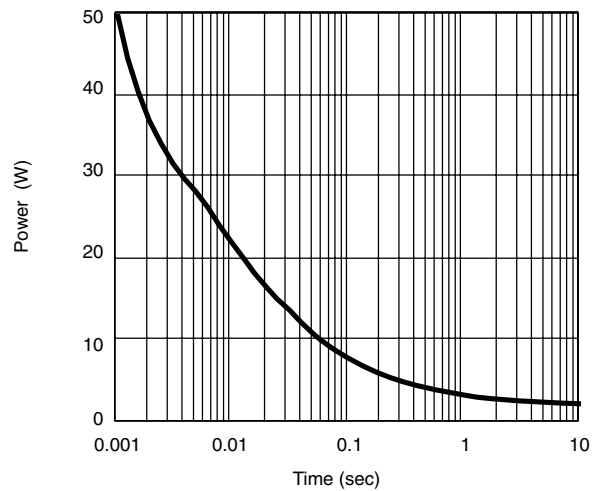
Source-Drain Diode Forward Voltage



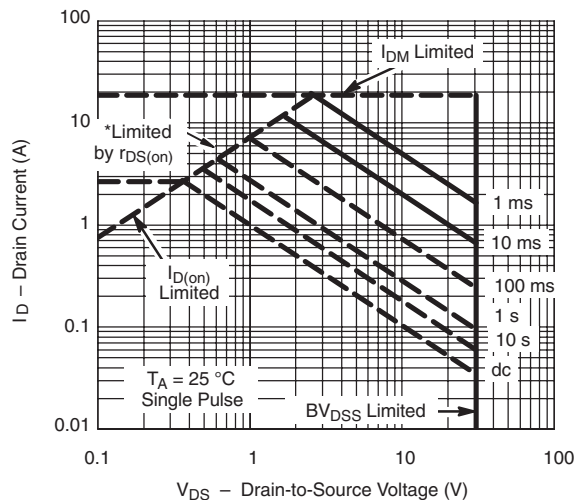
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



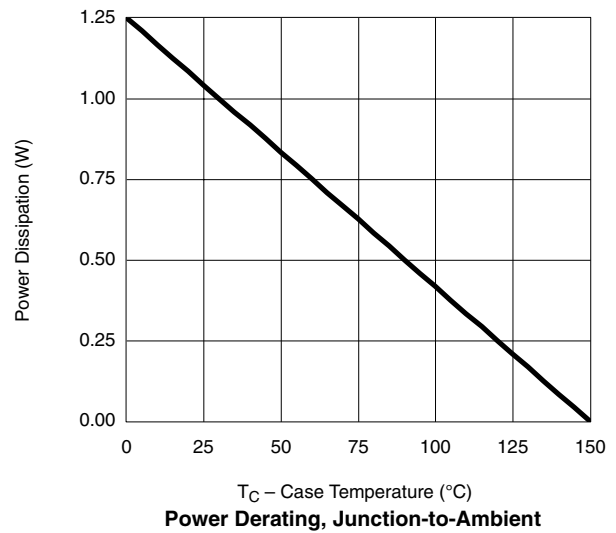
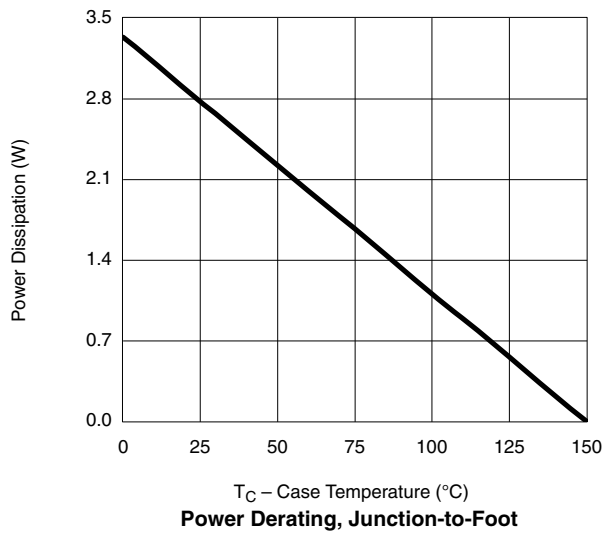
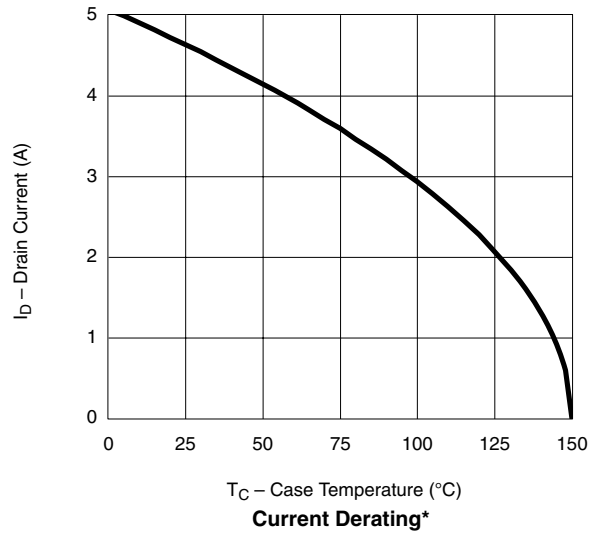
Single Pulse Power, Junction-to-Ambient



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

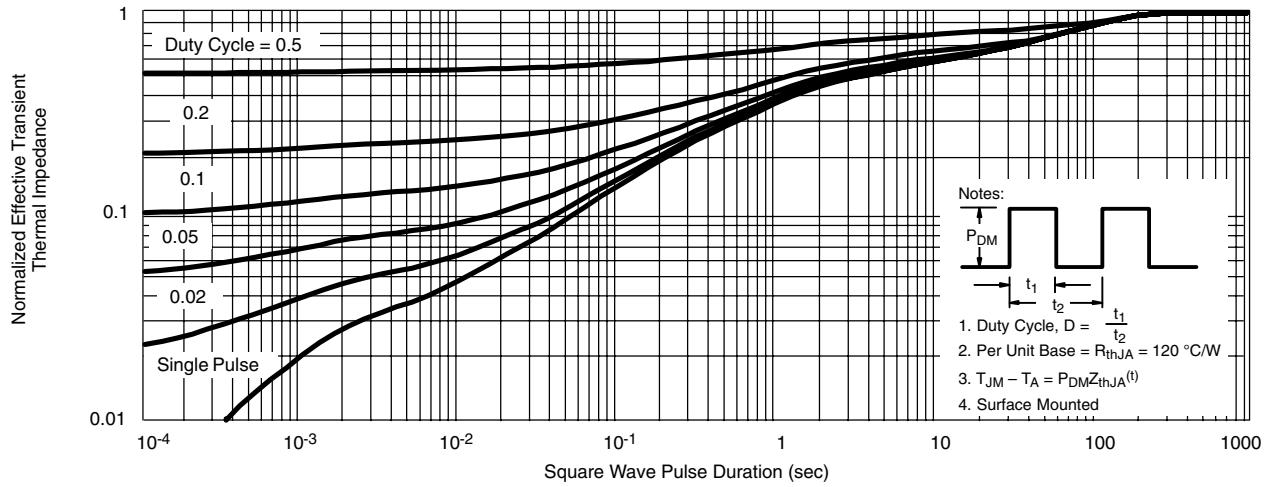
Safe Operating Area, Junction-to-Case

MOSFET TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

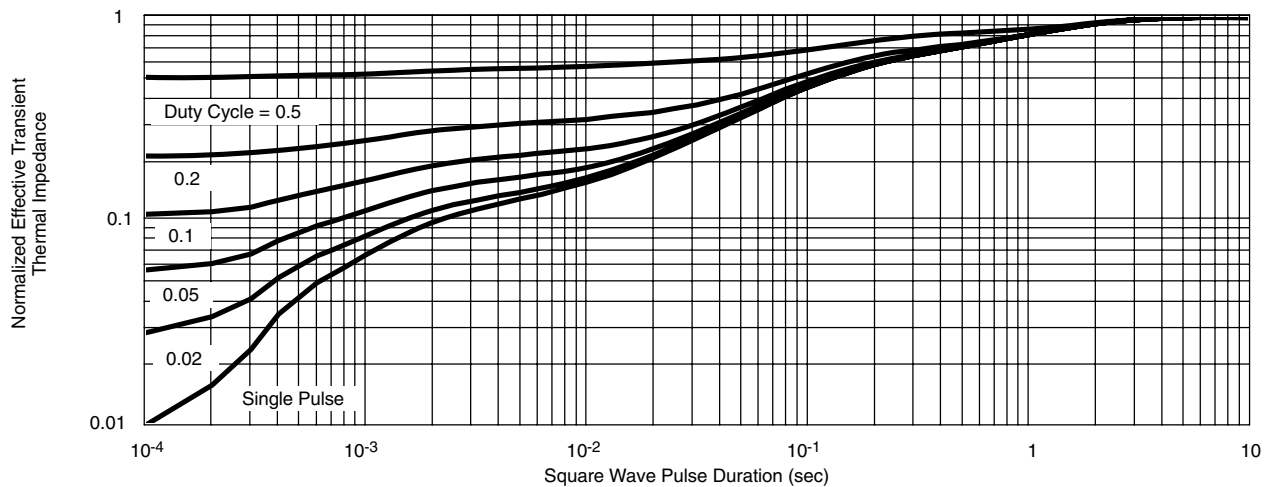


*The power dissipation P_D is based on $T_{J(max)} = 175$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

MOSFETS TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



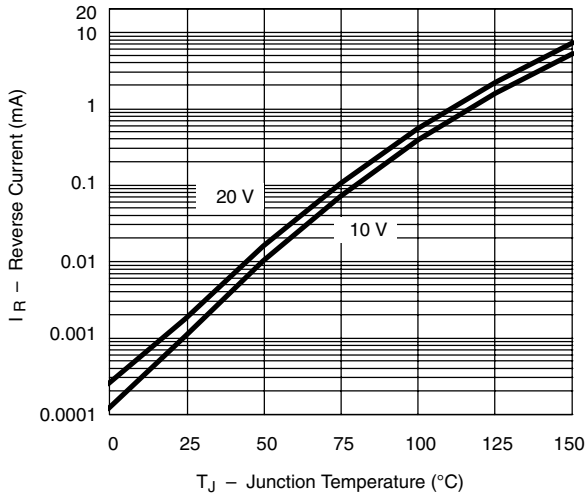
Normalized Thermal Transient Impedance, Junction-to-Ambient



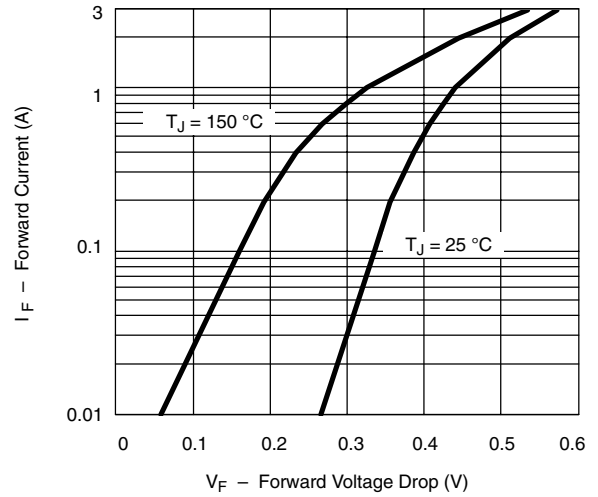
Normalized Thermal Transient Impedance, Junction-to-Foot

*The power dissipation PD is based on $T_{J(max)} = 175\text{ °C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

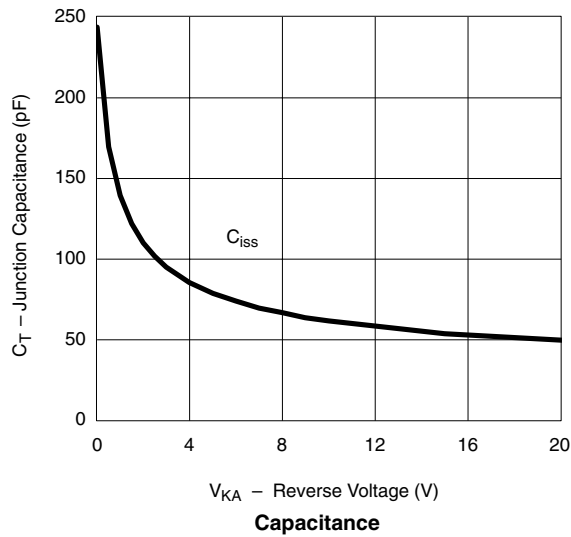
SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Reverse Current vs. Junction Temperature



Forward Voltage Drop



Capacitance

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