



P-Channel 20-V (D-S) MOSFET with Schottky Diode

| PRODUCT SUMMARY | | | |
|-----------------|----------------------------|------------------------|--------------|
| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) ^d | Q_g (Typ.) |
| - 20 | 0.108 at $V_{GS} = -4.5$ V | - 4.1 | 4 nC |
| | 0.175 at $V_{GS} = -2.5$ V | - 3.3 | |

| SCHOTTKY PRODUCT SUMMARY | | |
|--------------------------|------------------------------------|------------------------|
| V_{KA} (V) | V_f (V) Diode Forward Voltage | I_F (A) ^a |
| 30 | 0.5 at 1 A | 2 |

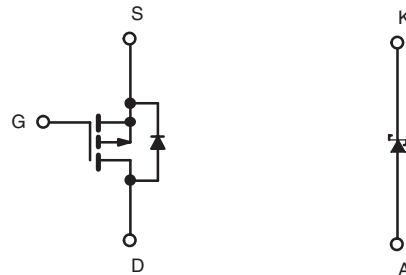
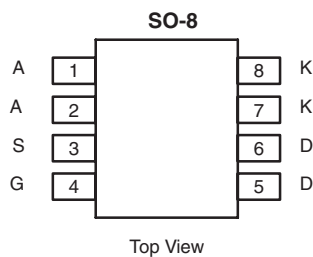
FEATURES

- LITTLE FOOT[®] Plus Schottky
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC


RoHS
 COMPLIANT

APPLICATIONS

- Portable Devices
 - Ideal for Boost Circuits
 - Ideal for Book Circuits



Ordering Information: Si4823DY-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} | - 20 | V | |
| Reverse Voltage (Schottky) | V_{KA} | 30 | | |
| Gate-Source Voltage (MOSFET) | V_{GS} | ± 12 | | |
| Continuous Drain Current ($T_J = 150$ °C) (MOSFET) | I_D | $T_C = 25$ °C | - 4.1 | |
| | | $T_C = 70$ °C | - 3.3 | |
| | | $T_A = 25$ °C | - 3.3 ^{b, c} | |
| | | $T_A = 70$ °C | - 2.6 ^{b, c} | |
| Pulsed Drain Current (MOSFET) | I_{DM} | - 15 | A | |
| Continuous Source-Drain Diode Current (MOSFET Diode Conduction) | I_S | $T_C = 25$ °C | | - 2.3 |
| | | $T_A = 25$ °C | | - 1.4 ^{b, c} |
| Average Forward Current (Schottky) | I_F | - 2 ^b | A | |
| Pulsed Forward Current (MOSFET) | I_{FM} | - 3 | | |
| Maximum Power Dissipation (MOSFET) | P_D | $T_C = 25$ °C | 2.8 | |
| | | $T_C = 70$ °C | 1.8 | |
| | | $T_A = 25$ °C | 1.7 ^{b, c} | |
| | | $T_A = 70$ °C | 1.1 ^{b, c} | |
| Maximum Power Dissipation (Schottky) | P_D | $T_C = 25$ °C | 2.7 | |
| | | $T_C = 70$ °C | 1.7 | |
| | | $T_A = 25$ °C | 1.6 ^{b, c} | |
| | | $T_A = 70$ °C | 1.0 ^{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) ^{b, e} | R_{thJA} | 60 | 71.5 | °C/W |
| Maximum Junction-to-Foot (Drain) (MOSFET) | R_{thJF} | 35 | 45 | |
| Maximum Junction-to-Ambient (Schottky) ^{b, f} | R_{thJA} | 63 | 78 | |
| Maximum Junction-to-Foot (Drain) (Schottky) | R_{thJF} | 39 | 47 | |

Notes:

- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Based on $T_C = 25$ °C.
- Maximum under Steady State conditions is 110 °C/W.
- Maximum under Steady State conditions is 115 °C/W.

SPECIFICATIONS $T_J = 25$ °C, unless otherwise noted

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|--|-------------------------|--|------|-------|-----------|----------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0$ V, $I_D = -250$ μ A | -20 | | | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = -250$ μ A | | -20 | | mV/°C |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | 3 | | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D = -250$ μ A | -0.6 | | -1.5 | V |
| Gate-Source Leakage | I_{GSS} | $V_{DS} = 0$ V, $V_{GS} = \pm 12$ V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -20$ V, $V_{GS} = 0$ V | | | -1 | μ A |
| | | $V_{DS} = -20$ V, $V_{GS} = 0$ V, $T_J = 55$ °C | | | -10 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \leq 5$ V, $V_{GS} = -4.5$ V | -15 | | | A |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = -4.5$ V, $I_D = -3.3$ A | | 0.090 | 0.108 | Ω |
| | | $V_{GS} = -2.5$ V, $I_D = -2.6$ A | | 0.140 | 0.175 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -10$ V, $I_D = -3.3$ A | | 6 | | S |
| Dynamic^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = -10$ V, $V_{GS} = 0$ V, $f = 1$ MHz | | 330 | 660 | pF |
| Output Capacitance | C_{oss} | | 80 | 160 | | |
| Reverse Transfer Capacitance | C_{rss} | | 57 | 114 | | |
| Total Gate Charge | Q_g | $V_{DS} = -10$ V, $V_{GS} = -10$ V, $I_D = -3.3$ A | | 8 | 12 | nC |
| | | | | 4 | 6 | |
| | | | | 0.8 | | |
| Gate-Source Charge | Q_{gs} | $V_{DS} = -10$ V, $V_{GS} = -4.5$ V, $I_D = -3.3$ A | | 1.4 | | Ω |
| Gate-Drain Charge | Q_{gd} | | | | | |
| Gate Resistance | R_g | $f = 1$ MHz | 1.2 | 6 | 12 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -10$ V, $R_L = 3.8$ Ω $I_D \cong -2.6$ A, $V_{GEN} = -10$ V, $R_g = 1$ Ω | | 3 | 6 | ns |
| Rise Time | t_r | | | 10 | 20 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 16 | 24 | |
| Fall Time | t_f | | | 8 | 15 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -10$ V, $R_L = 3.8$ Ω $I_D \cong -2.6$ A, $V_{GEN} = -4.5$ V, $R_g = 1$ Ω | | 18 | 27 | |
| Rise Time | t_r | | | 40 | 60 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 18 | 27 | |
| Fall Time | t_f | | | 10 | 15 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25$ °C | | | -6.2 | A |
| Pulse Diode Forward Current | I_{SM} | | | | -15 | |
| Body Diode Voltage | V_{SD} | $I_S = -2.6$ A, $V_{GS} = 0$ V | | -0.8 | -1.2 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F = -2.6$ A, $di/dt = 100$ A/ μ s, $T_J = 25$ °C | | 23 | 35 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 14 | 21 | nC |
| Reverse Recovery Fall Time | t_a | | | 11 | | ns |
| Reverse Recovery Rise Time | t_b | | | 12 | | |

Notes:

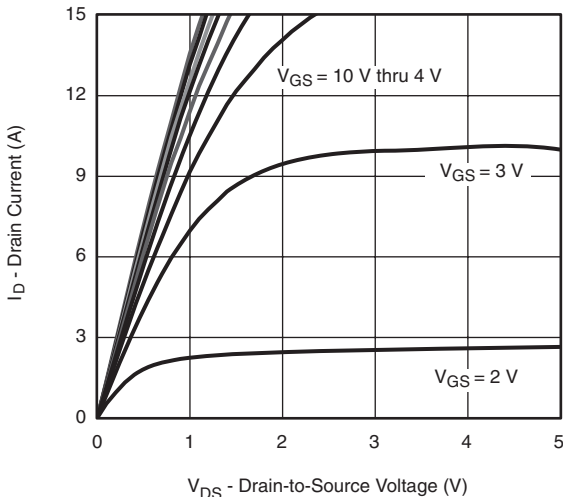
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.
- Guaranteed by design, not subject to production testing.



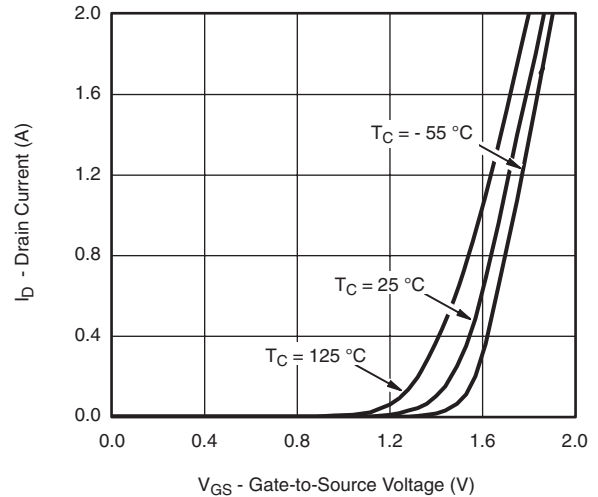
| SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|---|----------|--|------|-------|------|------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Forward Voltage Drop | V_F | $I_F = 1\text{ A}$ | | 0.46 | 0.50 | V |
| | | $I_F = 1\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | 0.41 | 0.50 | |
| Maximum Reverse Leakage Current | I_{rm} | $V_R = 30\text{ V}$ | | 0.025 | 0.1 | mA |
| | | $V_R = 30\text{ V}, T_J = 85\text{ }^\circ\text{C}$ | | 0.6 | 6 | |
| | | $V_R = 30\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | 5 | 25 | |
| Junction Capacitance | C_T | $V_R = 15\text{ V}$ | | 35 | | 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.

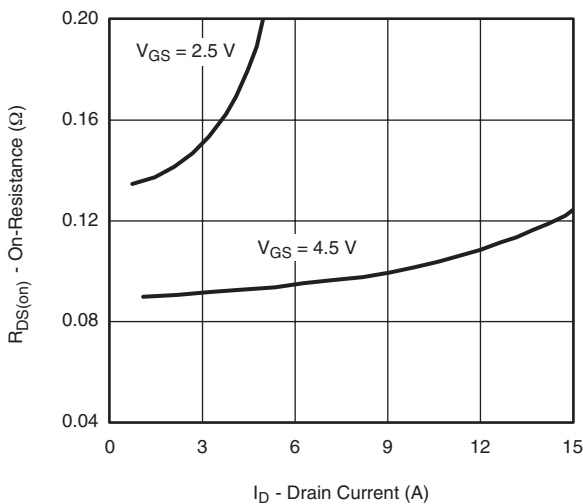
MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



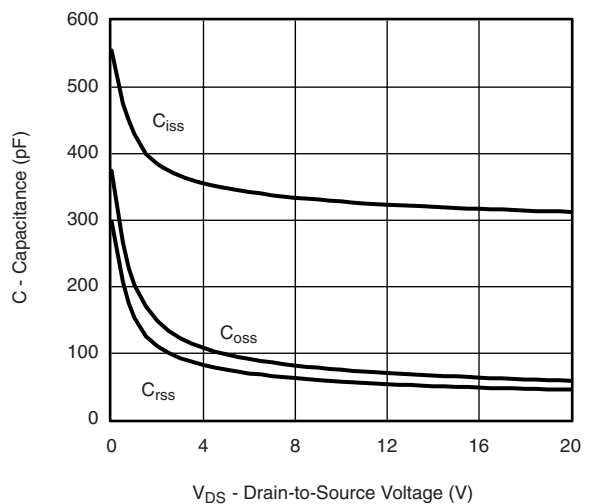
Output Characteristics



Transfer Characteristics



On-Resistance vs. Drain Current and Gate Voltage



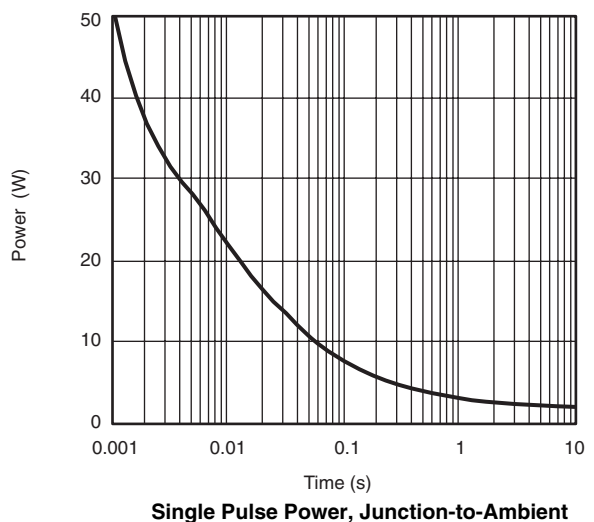
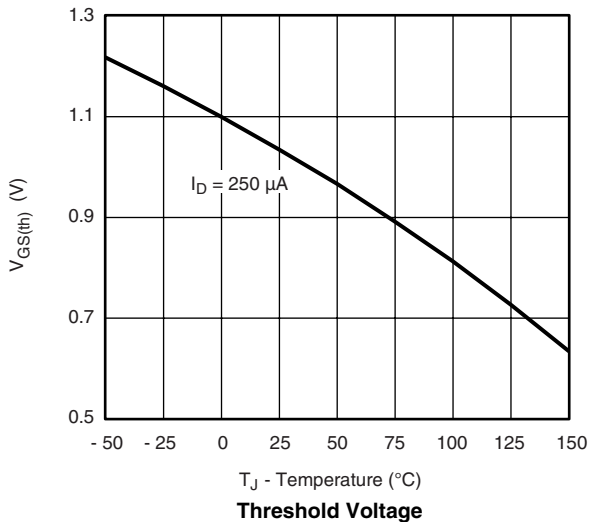
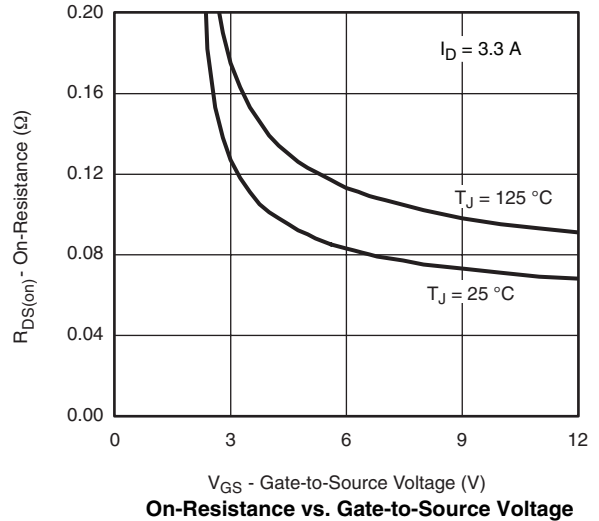
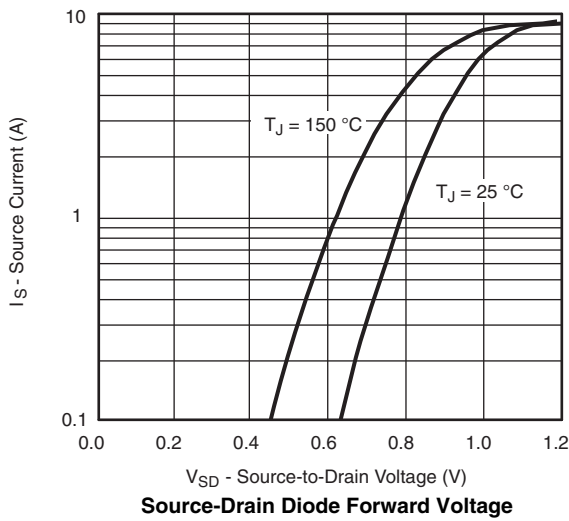
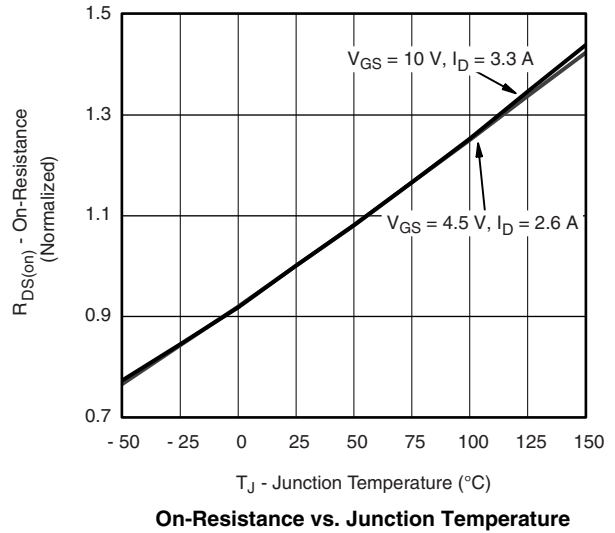
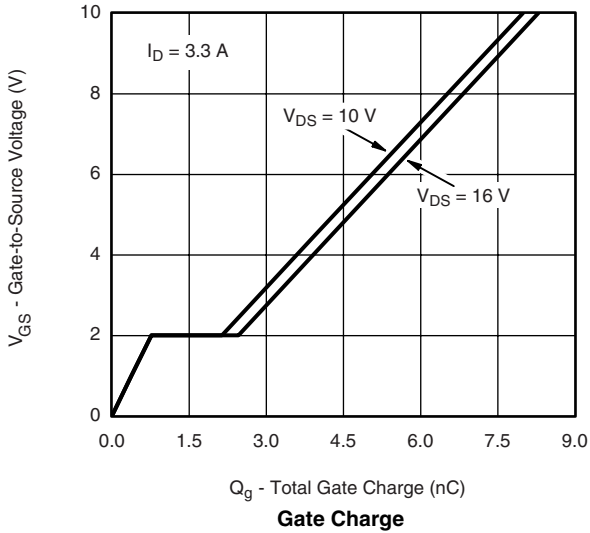
Capacitance

Si4823DY

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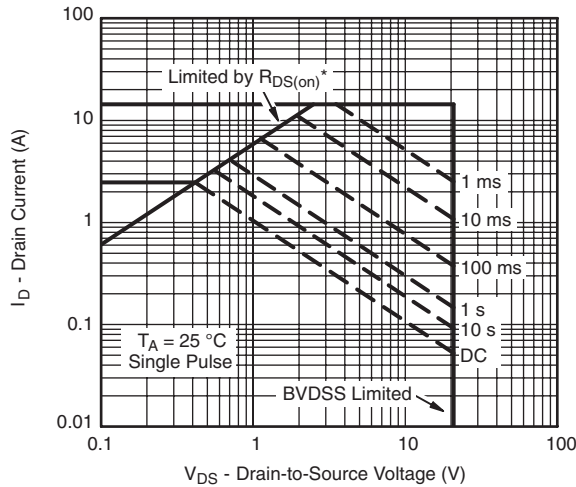


MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



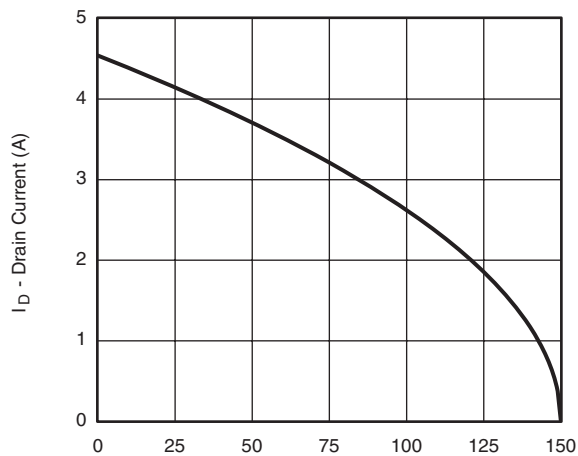


MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



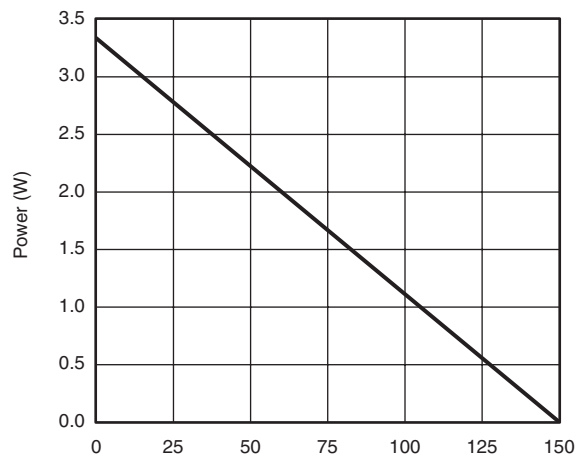
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



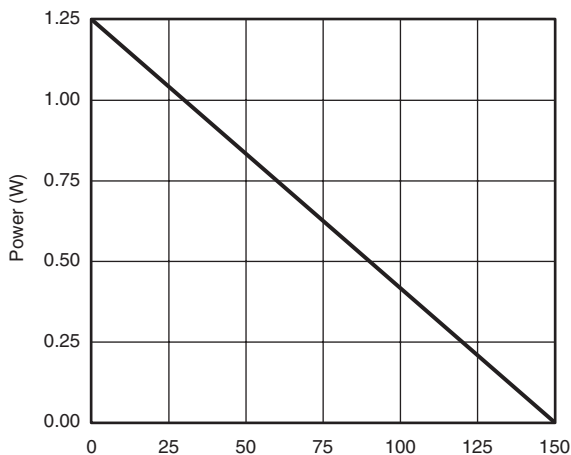
T_C - Case Temperature ($^\circ\text{C}$)

Current Derating*



T_C - Case Temperature ($^\circ\text{C}$)

Power Derating, Junction-to-Case



T_A - Ambient Temperature ($^\circ\text{C}$)

Power Derating, Junction-to-Ambient

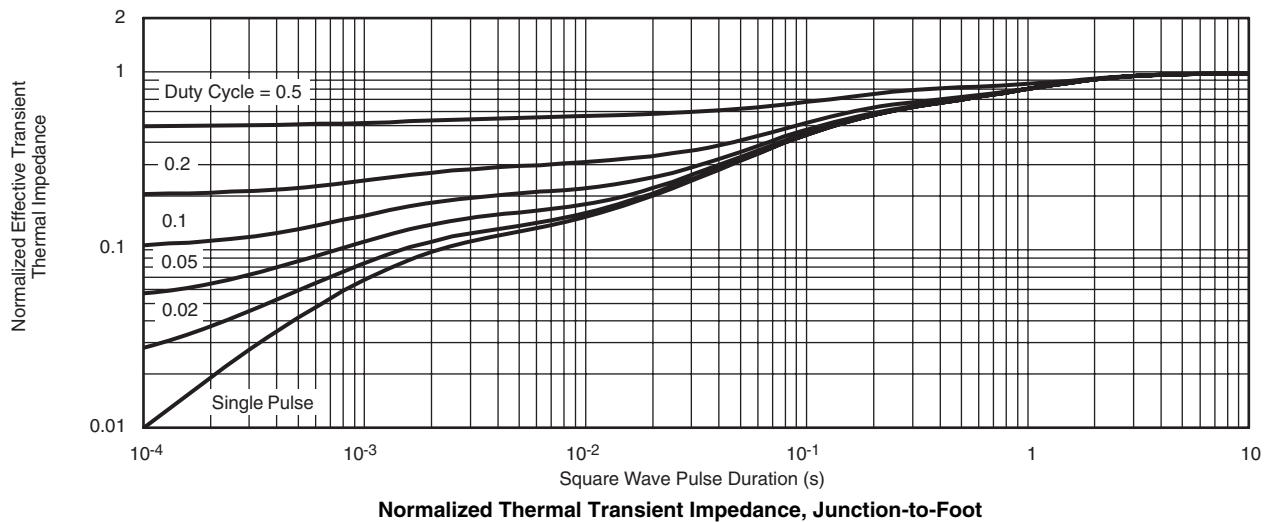
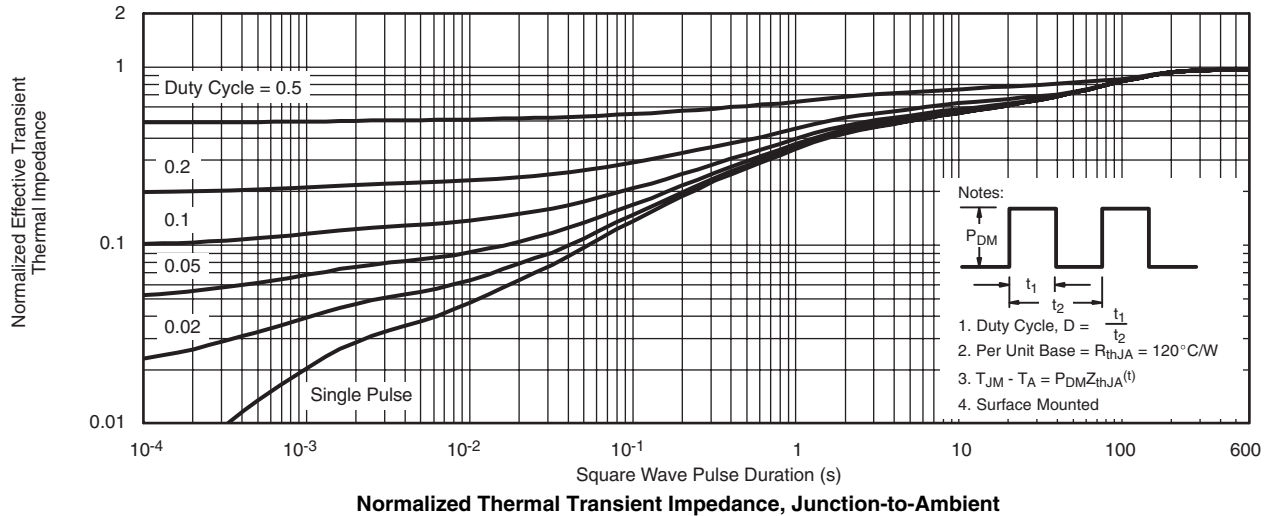
* The power dissipation P_D is based on $T_{J(max)} = 150\text{ }^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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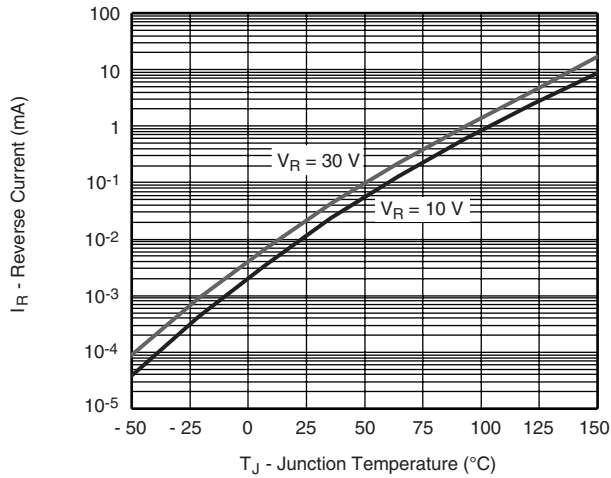


MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted

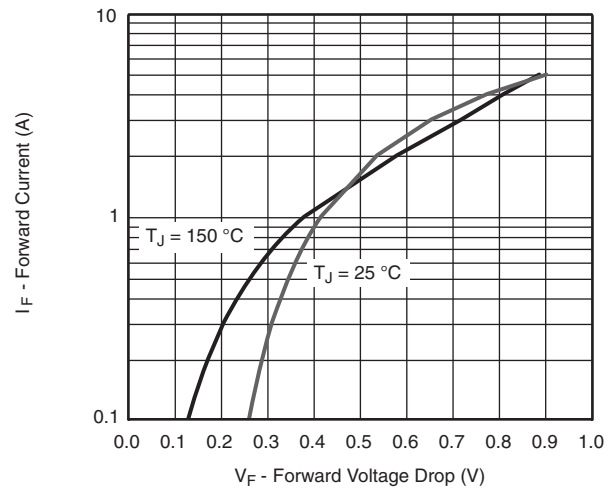




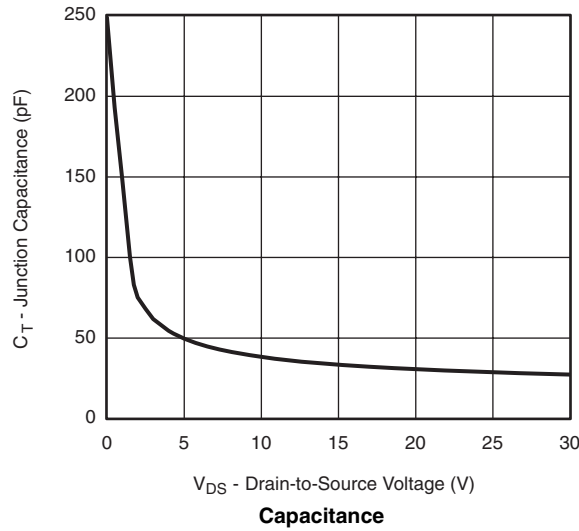
SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



Reverse Current vs. Junction Temperature



Forward Voltage Drop



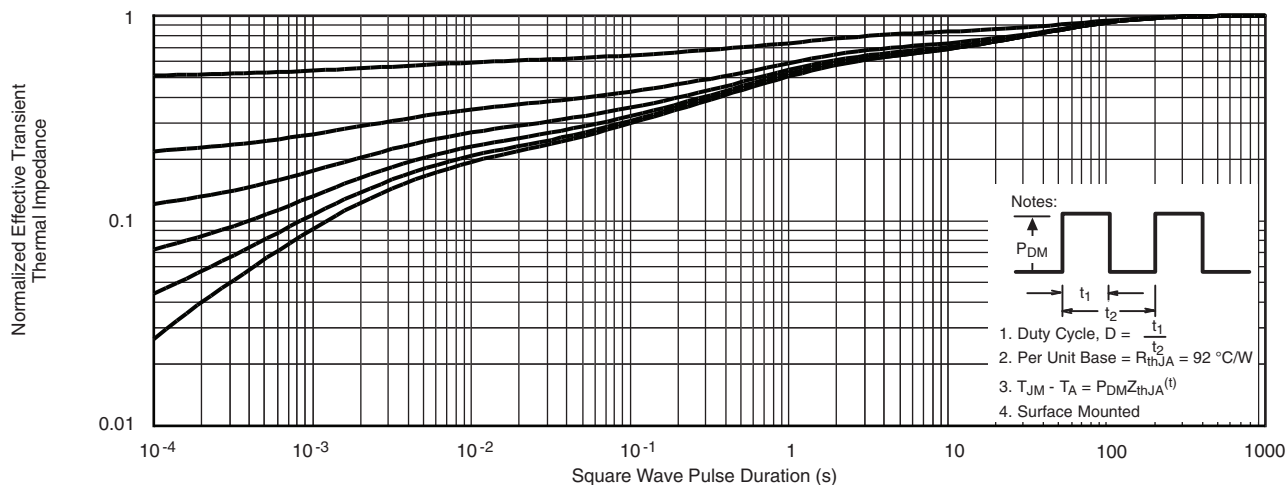
Capacitance

Si4823DY

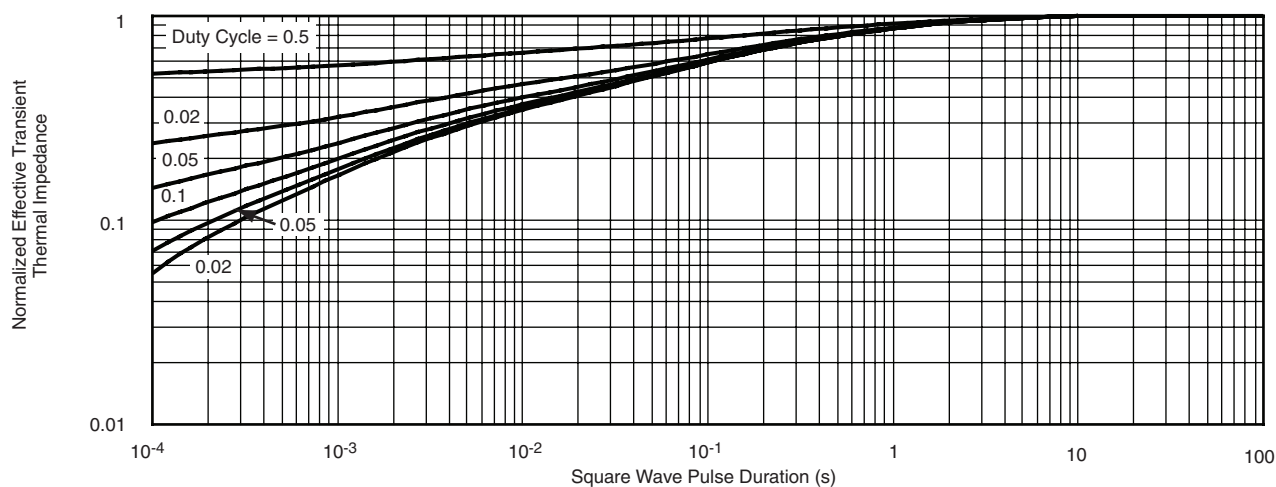
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SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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