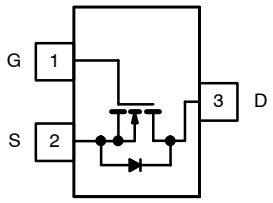
| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{DS}$ (V) | $r_{DS(on)}$ (Ω) | $I_D$ (A) | $Q_g$ (Typ) |
| 20 | 0.031 @ $V_{GS}$ = 4.5 V | 5.0 | 7.5 |
| | 0.037 @ $V_{GS}$ = 2.5 V | 4.6 | |
| | 0.047 @ $V_{GS}$ = 1.8 V | 4.1 | |

**TO-236**
**(SOT-23)**




Top View

Si2312BDS (M2)*

*Marking Code

Ordering Information: Si2312BDS-T1—E3

| ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C UNLESS OTHERWISE NOTED) | | | | | |
|---|---|---|---|---|---|
| Parameter | | Symbol | 5 sec | Steady State | Unit |
| Drain-Source Voltage | | $V_{DS}$ | 20 | | V |
| Gate-Source Voltage | | $V_{GS}$ | ±8 | | |
| Continuous Drain Current ($T_J$ = 150°C)[a] | $T_A$= 25°C | $I_D$ | 5.0 | 3.9 | A |
| | $T_A$= 70°C | | 4.0 | 3.1 | |
| Pulsed Drain Current[b] | | $I_{DM}$ | 15 | | |
| Avalanche Current[b] | L = 0.1 mH | $I_{AS}$ | 13 | | |
| Single Avalanche Energy | | $E_{AS}$ | 8.45 | | mJ |
| Continuous Source Current (Diode Conduction)[a] | | $I_S$ | 1.0 | 0.63 | A |
| Power Dissipation[a] | $T_A$= 25°C | $P_D$ | 1.25 | 0.75 | W |
| | $T_A$= 70°C | | 0.80 | 0.48 | |
| 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[a] | t ≤ 5 sec | $R_{thJA}$ | 80 | 100 | °C/W |
| | Steady State | | 120 | 166 | |
| Maximum Junction-to-Foot | Steady State | $R_{thJF}$ | 50 | 60 | |

Notes
a. Surface Mounted on 1" x 1" FR4 Board.
b. Pulse width limited by maximum junction temperature

## SPECIFICATIONS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

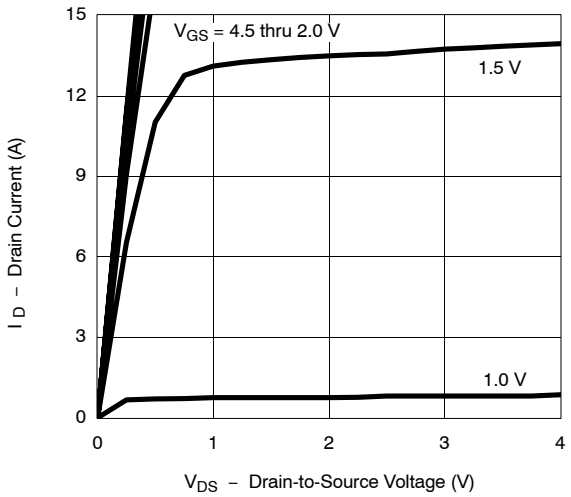
| Parameter | Symbol | Test Conditions | Limits Min | Limits Typ | Limits Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 20 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 0.45 | | 0.85 | V |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±8 V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 20 V, $V_{GS}$ = 0 V | | | 1 | µA |
| | | $V_{DS}$ = 20 V, $V_{GS}$ = 0 V, $T_J$ = 70°C | | | 75 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ ≥ 10 V, $V_{GS}$ = 4.5 V | 15 | | | A |
| Drain-Source On-Resistance[a] | $r_{DS(on)}$ | $V_{GS}$ = 4.5 V, $I_D$ = 5.0 A | | 0.025 | 0.031 | Ω |
| | | $V_{GS}$ = 2.5 V, $I_D$ = 4.6 A | | 0.030 | 0.037 | |
| | | $V_{GS}$ = 1.8 V, $I_D$ = 4.1 A | | 0.036 | 0.047 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 5.0 A | | 30 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 1.0 A, $V_{GS}$ = 0 V | | 0.8 | 1.2 | V |
| **Dynamic[b]** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 10 V, $V_{GS}$ = 4.5 V, $I_D$ = 5.0 A | | 7.5 | 12 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 1.4 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 1.2 | | |
| Gate Resistance | $R_g$ | f = 1.0 MHz | 1.1 | 2.2 | 3.3 | Ω |
| **Switching** | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = 10 V, $R_L$ = 10 Ω<br>$I_D$ ≅ 1.0 A, $V_{GEN}$ = 4.5 V, $R_g$ = 6 Ω | | 9 | 15 | ns |
| Rise Time | $t_r$ | | | 30 | 45 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 35 | 55 | |
| Fall-Time | $t_f$ | | | 10 | 15 | |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F$ = 1.0 A, di/dt = 100 A/µs | | 13 | 25 | |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | | 4.5 | 7 | nC |

Notes
a. Pulse test: PW ≤300 µs duty cycle ≤2%.
b. Guaranteed by design, not subject to production testing.

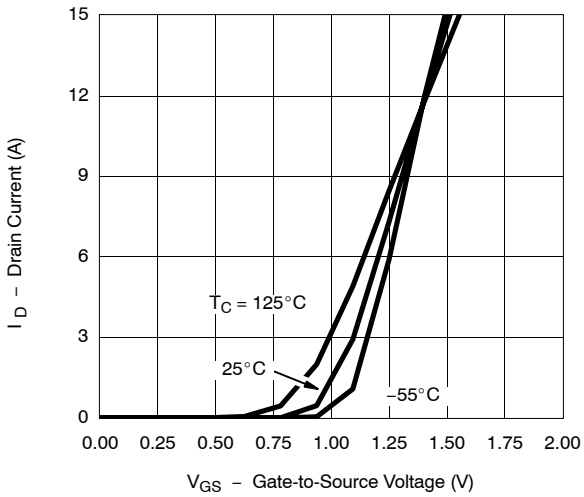
*Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.*

## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**Output Characteristics**

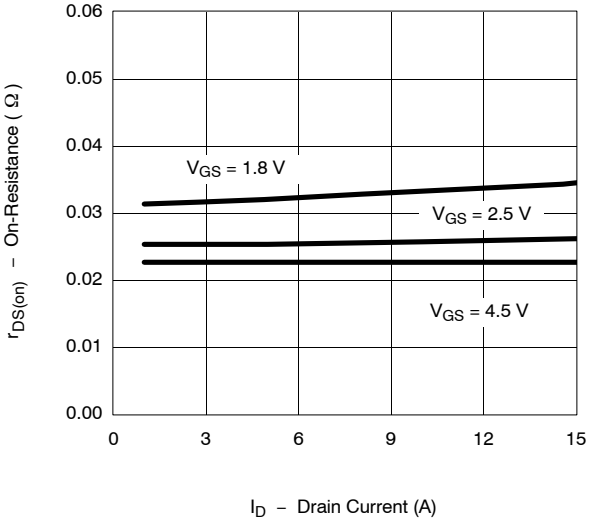



**Transfer Characteristics**

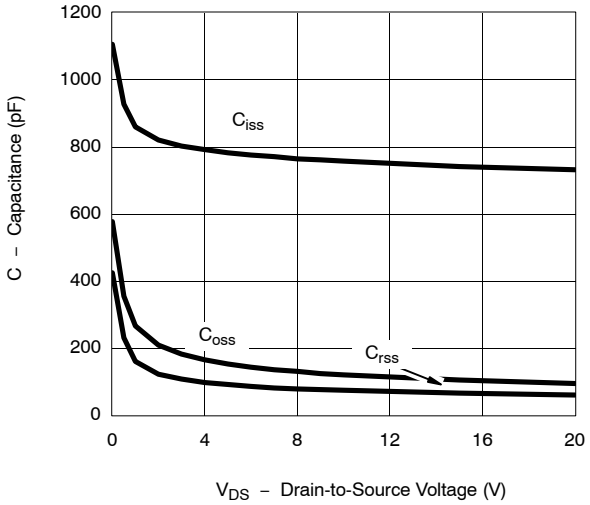


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

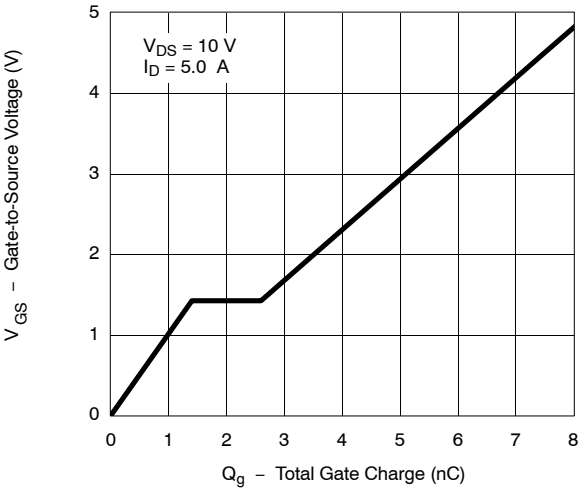
**On-Resistance vs. Drain Current**



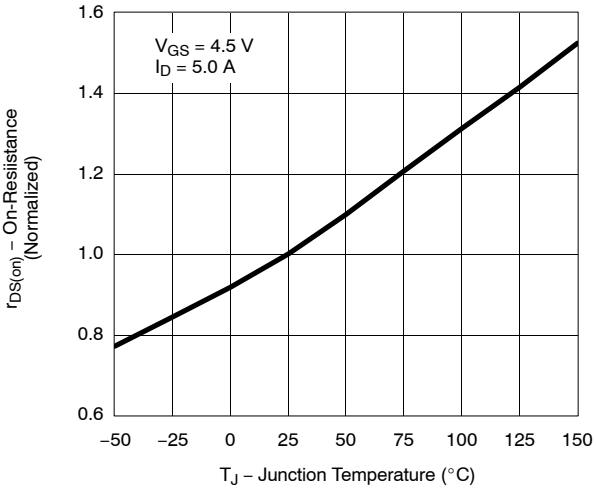

**Capacitance**



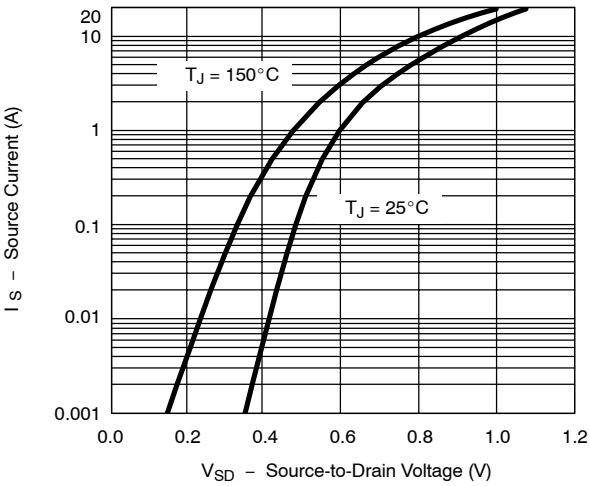

**Gate Charge**



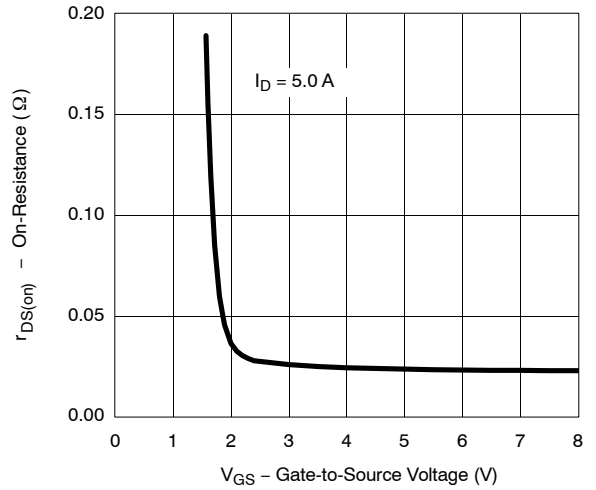

**On-Resistance vs. Junction Temperature**




**Source-Drain Diode Forward Voltage**

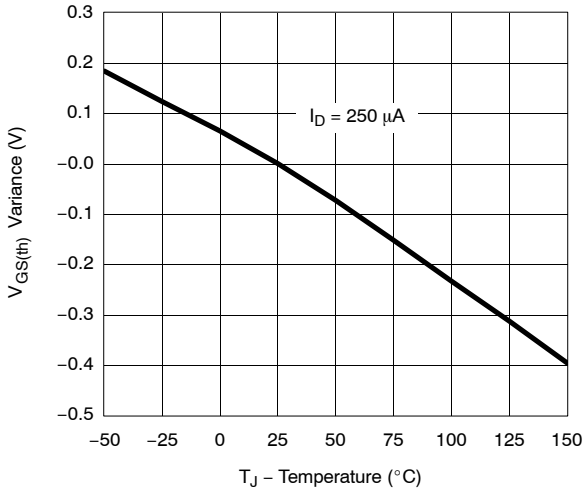



**On-Resistance vs. Gate-to-Source Voltage**

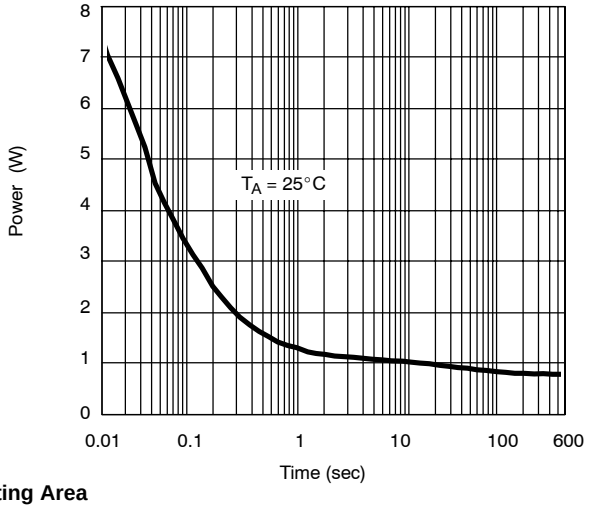


## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

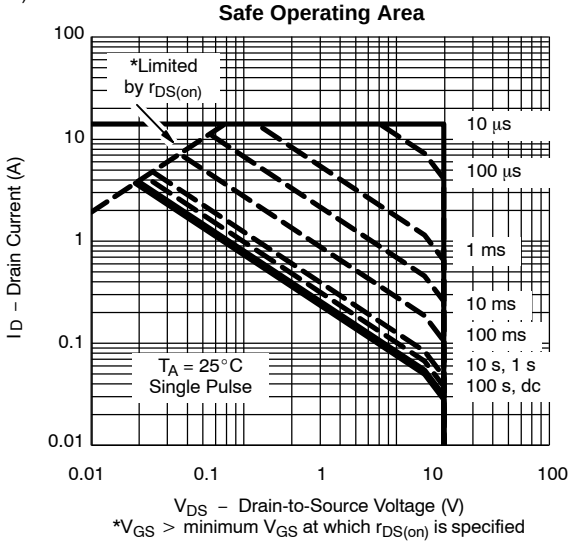
**Threshold Voltage**




**Single Pulse Power**




**Safe Operating Area**




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

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