

N-Channel 20 V (D-S) MOSFET

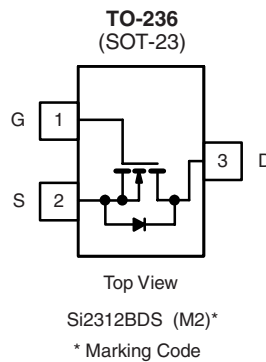
| PRODUCT SUMMARY | | | |
|---------------------|----------------------------------|--------------------|-----------------------|
| V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) | Q _g (Typ.) |
| 20 | 0.031 at V _{GS} = 4.5 V | 5.0 | 7.5 |
| | 0.037 at V _{GS} = 2.5 V | 4.6 | |
| | 0.047 at V _{GS} = 1.8 V | 4.1 | |

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available



Ordering Information: Si2312BDS-T1-E3 (Lead (Pb)-free)
Si2312BDS-T1-GE3 (Lead (Pb)-free and Halogen-free)

| ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted | | | | |
|---|-----------------------------------|-------------|--------------|------|
| Parameter | Symbol | 5 s | 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 | 5.0 | 3.9 | A |
| | T _A = 70 °C | 4.0 | 3.1 | |
| Pulsed Drain Current ^b | I _{DM} | 15 | | |
| Avalanche Current ^b | 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 | 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 s | 80 | 100 | °C/W |
| | Steady State | 120 | 166 | |
| Maximum Junction-to-Foot | Steady State | 50 | 60 | |

Notes:

- Surface mounted on 1" x 1" FR4 board.
- Pulse width limited by maximum junction temperature.

SPECIFICATIONS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted

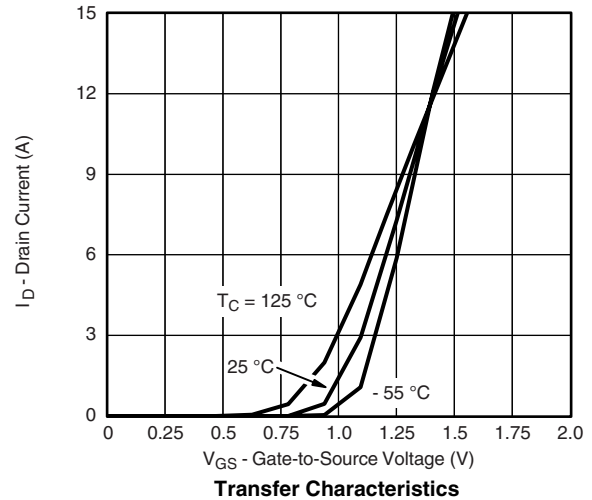
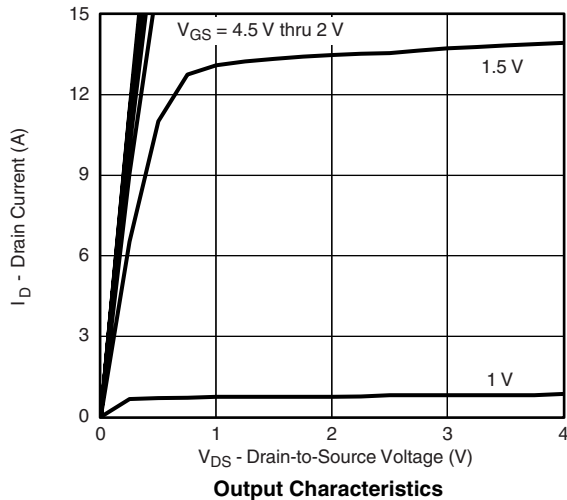
| Parameter | Symbol | Test Conditions | Limits | | | Unit |
|---|--------------|---|--------|-------|-----------|---------------|
| | | | Min. | Typ. | Max. | |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 20 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 0.45 | | 0.85 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$ | | | 75 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 10\text{ V}, V_{GS} = 4.5\text{ V}$ | 15 | | | A |
| Drain-Source On-Resistance ^a | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}, I_D = 5.0\text{ A}$ | | 0.025 | 0.031 | Ω |
| | | $V_{GS} = 2.5\text{ V}, I_D = 4.6\text{ A}$ | | 0.030 | 0.037 | |
| | | $V_{GS} = 1.8\text{ V}, I_D = 4.1\text{ A}$ | | 0.036 | 0.047 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 5.0\text{ A}$ | | 30 | | S |
| Diode Forward Voltage | V_{SD} | $I_S = 1.0\text{ A}, V_{GS} = 0\text{ V}$ | | 0.8 | 1.2 | V |
| Dynamic^b | | | | | | |
| Total Gate Charge | Q_g | $V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5.0\text{ A}$ | | 7.5 | 12 | nC |
| Gate-Source Charge | Q_{gs} | | | 1.4 | | |
| Gate-Drain Charge | Q_{gd} | | | 1.2 | | |
| Gate Resistance | R_g | $f = 1.0\text{ MHz}$ | 1.1 | 2.2 | 3.3 | Ω |
| Switching | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong 1.0\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 6\text{ }\Omega$ | | 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} | $I_F = 1.0\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}$ | | 13 | 25 | nC |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 4.5 | 7 | |

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.

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



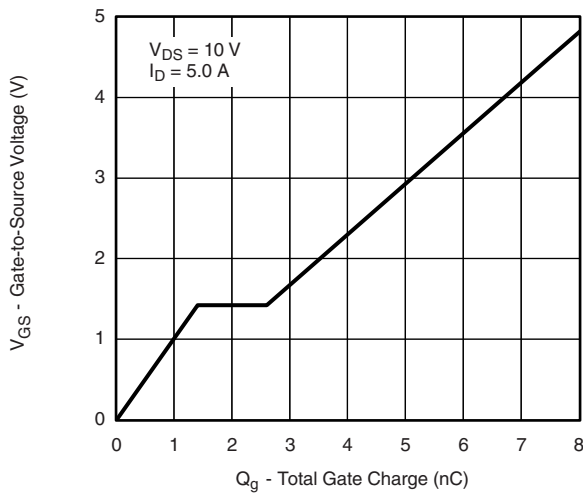
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



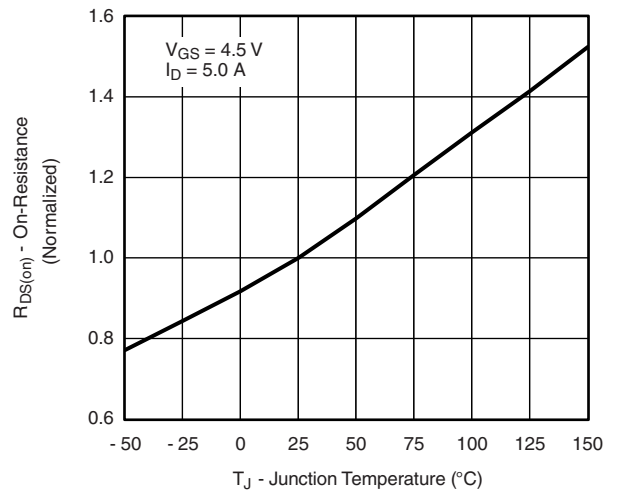
On-Resistance vs. Drain Current



Capacitance



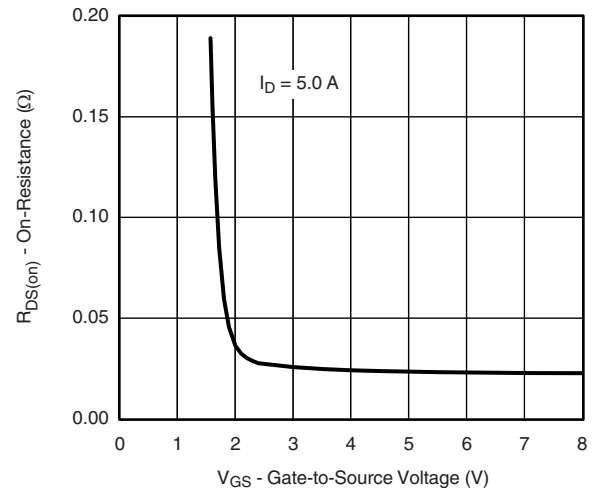
Gate Charge



On-Resistance vs. Junction Temperature

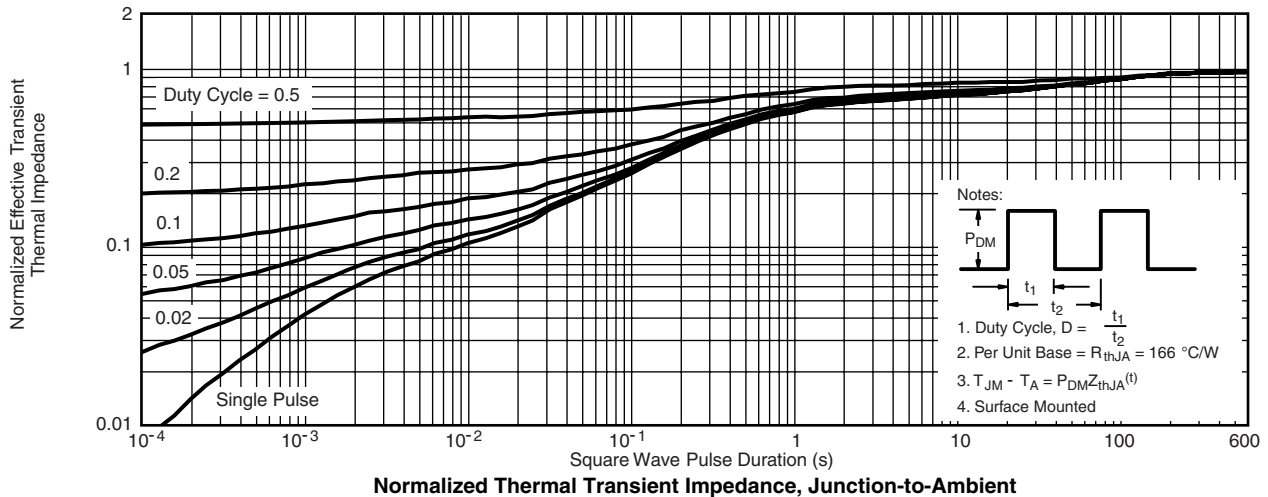
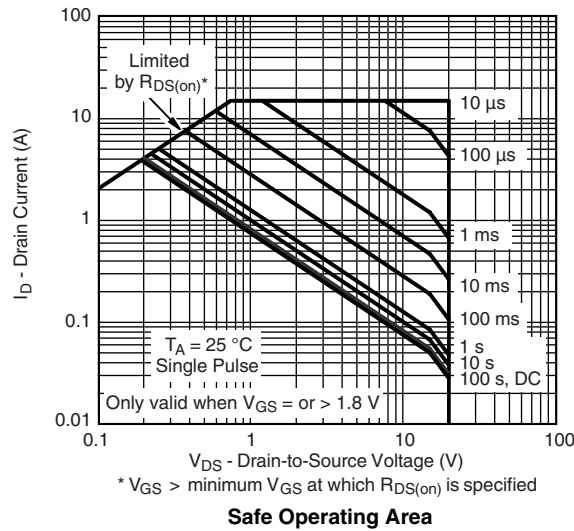
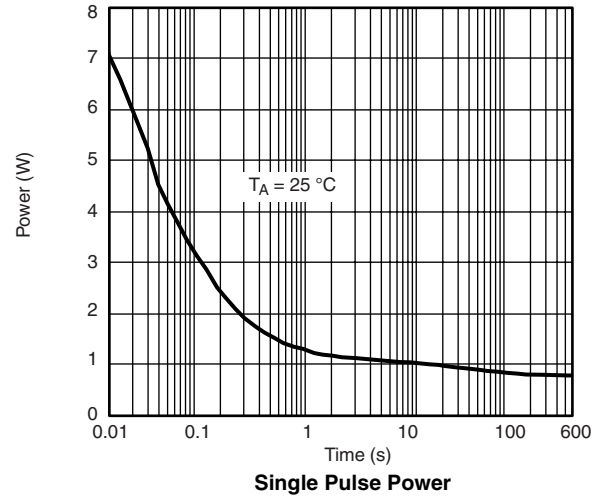


Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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SOT-23 (TO-236): 3-LEAD



| Dim | MILLIMETERS | | INCHES | |
|----------------|-------------|------|------------|-------|
| | Min | Max | Min | Max |
| A | 0.89 | 1.12 | 0.035 | 0.044 |
| A ₁ | 0.01 | 0.10 | 0.0004 | 0.004 |
| A ₂ | 0.88 | 1.02 | 0.0346 | 0.040 |
| b | 0.35 | 0.50 | 0.014 | 0.020 |
| c | 0.085 | 0.18 | 0.003 | 0.007 |
| D | 2.80 | 3.04 | 0.110 | 0.120 |
| E | 2.10 | 2.64 | 0.083 | 0.104 |
| E ₁ | 1.20 | 1.40 | 0.047 | 0.055 |
| e | 0.95 BSC | | 0.0374 Ref | |
| e ₁ | 1.90 BSC | | 0.0748 Ref | |
| L | 0.40 | 0.60 | 0.016 | 0.024 |
| L ₁ | 0.64 Ref | | 0.025 Ref | |
| S | 0.50 Ref | | 0.020 Ref | |
| q | 3° | 8° | 3° | 8° |

ECN: S-03946-Rev. K, 09-Jul-01
 DWG: 5479

RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads
Dimensions in Inches/(mm)

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