

N-Channel 30-V (D-S) MOSFET

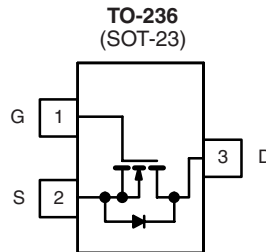
| PRODUCT SUMMARY | | | |
|-----------------|---------------------------|-----------|--------------|
| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) | Q_g (Typ.) |
| 30 | 0.070 at $V_{GS} = 10$ V | 3.2 | 2.6 |
| | 0.105 at $V_{GS} = 4.5$ V | 2.6 | |

FEATURES

- Halogen-free Option Available



RoHS
COMPLIANT



Top View
Si2304BDS (L4)*
* Marking Code

Ordering Information: Si2304BDS-T1-E3 (Lead (Pb)-free)
Si2304BDS-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} | 30 | | V | |
| Gate-Source Voltage | V_{GS} | ± 20 | | | |
| Continuous Drain Current ($T_J = 150$ °C) ^{a, b} | I_D | $T_A = 25$ °C | 3.2 | 2.6 | A |
| | | $T_A = 70$ °C | 2.5 | 2.1 | |
| Pulsed Drain Current | I_{DM} | 10 | | | |
| Continuous Source Current (Diode Conduction) ^{a, b} | I_S | 0.9 | 0.62 | | |
| Maximum Power Dissipation ^{a, b} | P_D | $T_A = 25$ °C | 1.08 | 0.75 | W |
| | | $T_A = 70$ °C | 0.69 | 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 | R_{thJA} | $t \leq 5$ s | 90 | 115 | °C/W |
| | | Steady State | 130 | 166 | |
| Maximum Junction-to-Foot (Drain) | R_{thJF} | 60 | 75 | | |

Notes:

- Surface Mounted on FR4 board, $t \leq 5$ s.
- Pulse width limited by maximum junction temperature.
- Surface Mounted on FR4 board.

For SPICE model information via the Worldwide Web: <http://www.vishay.com/www/product/spice.htm>

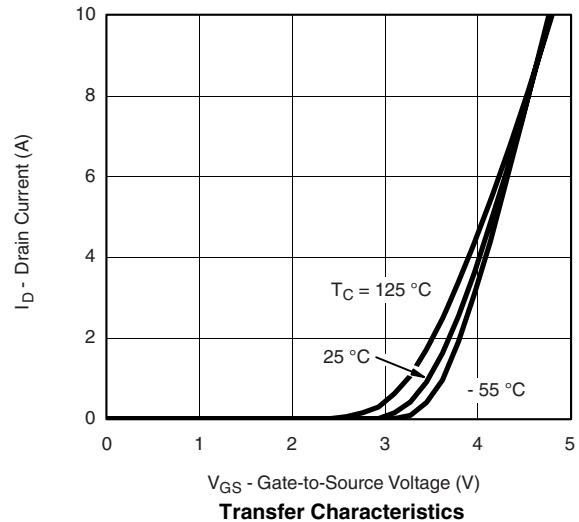
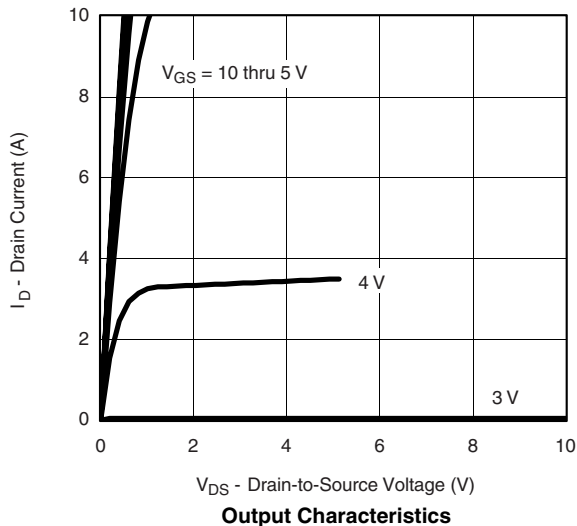
| SPECIFICATIONS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | |
|--|---------------|--|--------|-------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Limits | | | Unit |
| | | | Min. | Typ. | Max. | |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 30 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 1.5 | | 3.0 | 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} | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$ | | | 0.5 | μA |
| | | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$ | | | 10 | |
| | | $V_{DS} = 30\text{ V}, V_{GS} = 1.0\text{ V}, T_J = 25\text{ }^\circ\text{C}$ | | | 1 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 4.5\text{ V}, V_{GS} = 10\text{ V}$ | 6 | | | A |
| Drain-Source On-Resistance ^a | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$ | | 0.055 | 0.070 | Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 2.0\text{ A}$ | | 0.080 | 0.105 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 4.5\text{ V}, I_D = 2.5\text{ A}$ | | 6.0 | | S |
| Diode Forward Voltage | V_{SD} | $I_S = 1.25\text{ A}, V_{GS} = 0\text{ V}$ | | 0.8 | 1.2 | V |
| Dynamic | | | | | | |
| Gate Charge | Q_g | $V_{DS} = 15\text{ V}, V_{GS} = 5\text{ V}, I_D = 2.5\text{ A}$ | | 2.6 | 4 | nC |
| Total Gate Charge | Q_{gt} | $V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$ | | 4.6 | 7 | |
| Gate-Source Charge | Q_{gs} | | | 0.8 | | |
| Gate-Drain Charge | Q_{gd} | | | 1.15 | | |
| Gate Resistance | R_g | $f = 1.0\text{ MHz}$ | | 3.0 | | Ω |
| Input Capacitance | C_{iss} | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 225 | | pF |
| Output Capacitance | C_{oss} | | | 50 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 28 | | |
| Switching | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 15\text{ V}, R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 10\text{ V}, R_g = 6\text{ }\Omega$ | | 7.5 | 12 | ns |
| Rise Time | t_r | | | 12.5 | 20 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 19 | 30 | |
| Fall Time | t_f | | | 15 | 25 | |

Notes:

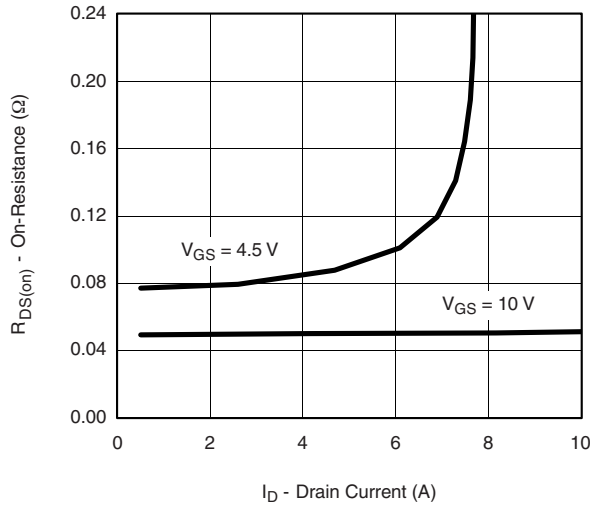
a. Pulse test: $PW \leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

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.

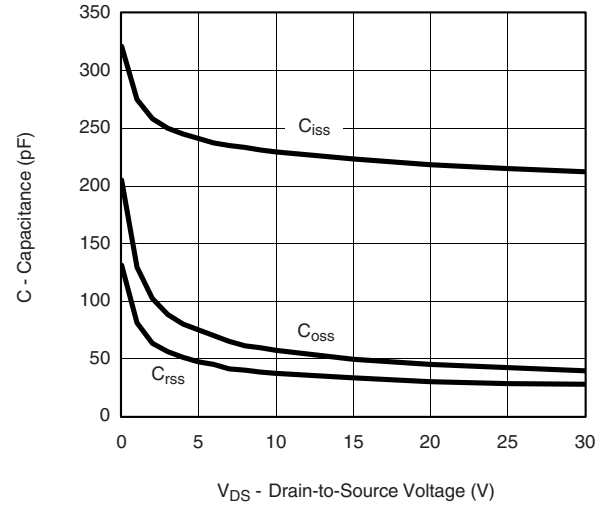
TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$, unless otherwise noted



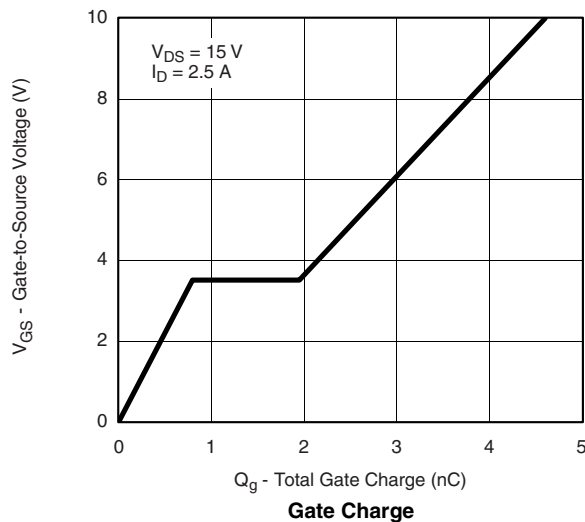
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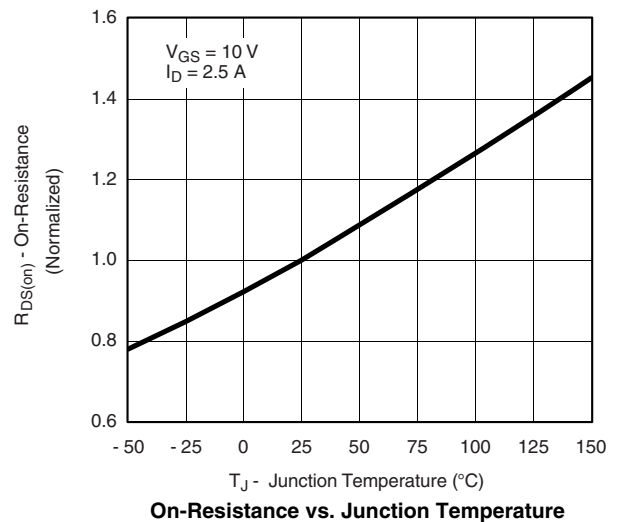
On-Resistance vs. Drain Current



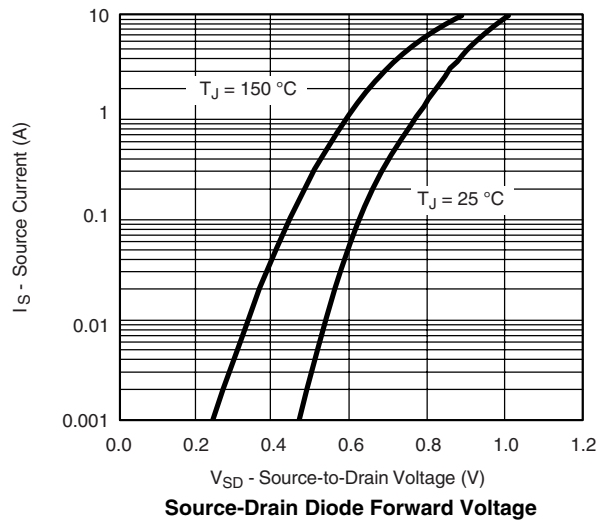
Capacitance



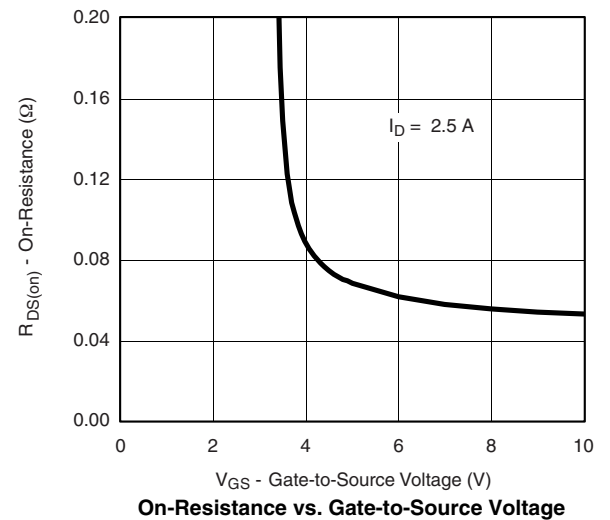
Gate Charge



On-Resistance vs. Junction Temperature

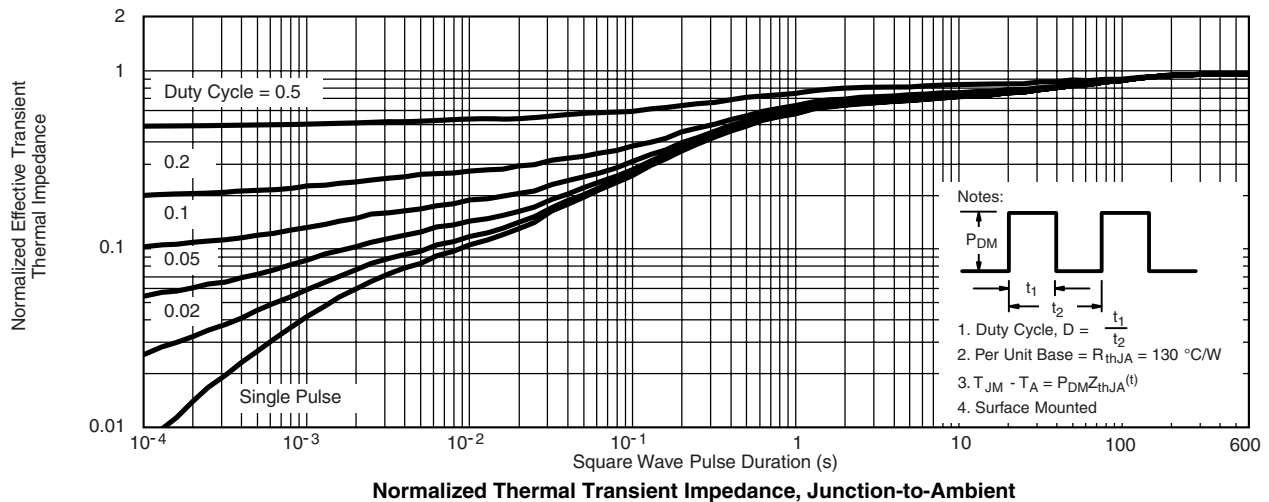
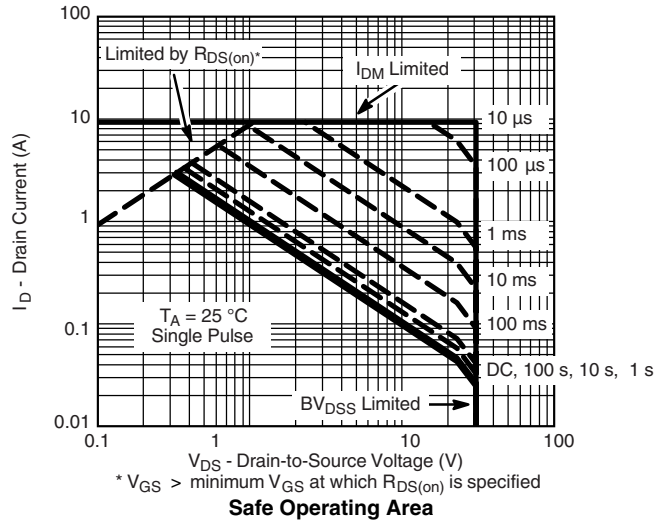
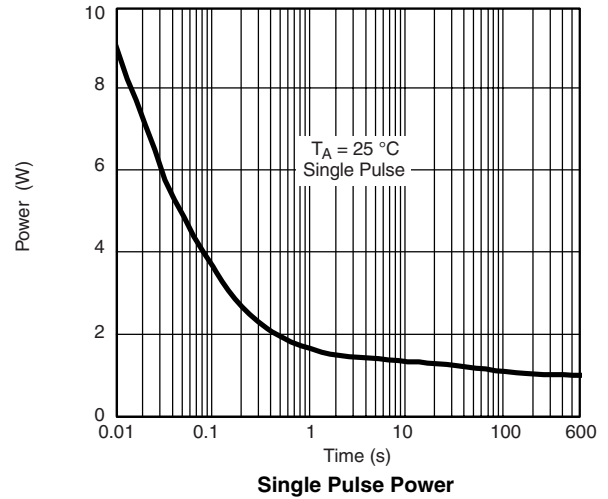
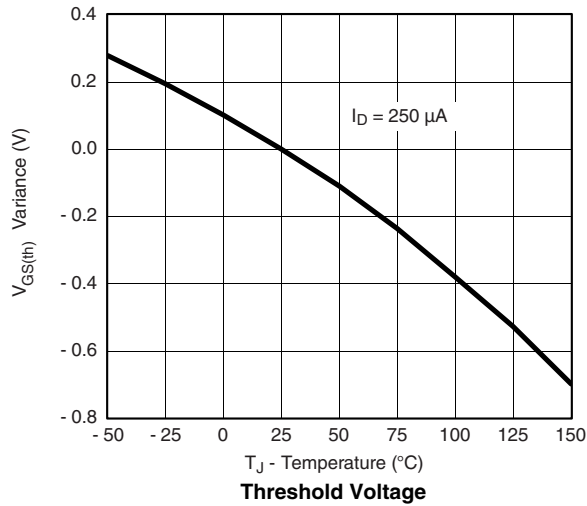


Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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