# Excellent Integrated System Limited

Stocking Distributor

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Vishay/Siliconix
SI2309DS-T1-E3

For any questions, you can email us directly:
sales@integrated-circuit.com

# P-Channel 60-V (D-S) MOSFET

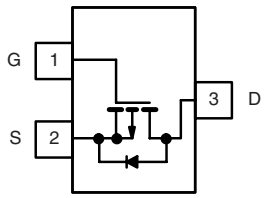
| PRODUCT SUMMARY | | |
|---|---|---|
| $V_{DS}$ (V) | $R_{DS(on)}$ (Ω) | $I_D$ (A) |
| - 60 | 0.340 at $V_{GS}$ = - 10 V | - 1.25 |
| | 0.550 at $V_{GS}$ = - 4.5 V | - 1 |

## FEATURES

- **Halogen-free According to IEC 61249-2-21 Available**
- TrenchFET® Power MOSFET

Pb-free Available
RoHS* COMPLIANT
HALOGEN FREE Available

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




Top View
Si2309DS (A9)*
* Marking Code

**Ordering Information:** Si2309DS-T1
Si2309DS-T1-E3 (Lead (Pb)-free)
Si2309DS-T1-GE3 (Lead (Pb)-free and Halogen-free)

| ABSOLUTE MAXIMUM RATINGS $T_A$ = 25 °C, unless otherwise noted | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Limit** | **Unit** |
| Drain-Source Voltage | | $V_{DS}$ | - 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 20 | |
| Continuous Drain Current ($T_J$ = 150 °C)[a, b] | $T_A$ = 25 °C | $I_D$ | - 1.25 | A |
| | $T_A$ = 70 °C | | - 0.85 | |
| Pulsed Drain Current | | $I_{DM}$ | - 8 | |
| Avalanche Current | L = 0.1 mH | $I_{AS}$ | - 5 | |
| Maximum Power Dissipation[a, b] | $T_A$ = 25 °C | $P_D$ | 1.25 | W |
| | $T_A$ = 70 °C | | 0.8 | |
| 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 | $R_{thJA}$ | | 100 | °C/W |
| | Steady State | | 130 | 166 | |
| Maximum Junction-to-Lead[a] | Steady State | $R_{thJL}$ | 45 | 60 | |

Notes:
a. Surface Mounted on FR4 board.
b. t ≤ 5 s.

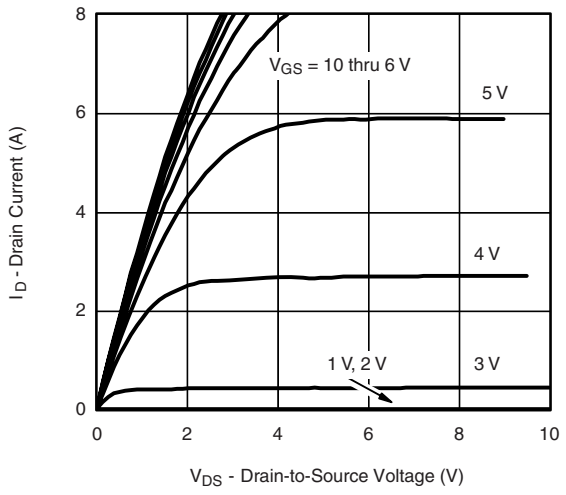
* Pb containing terminations are not RoHS compliant, exemptions may apply.

| **SPECIFICATIONS** $T_J$ = 25 °C, unless otherwise noted | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Min.** | **Typ.** | **Max.** | **Unit** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{DS}$ = 0 V, $I_D$ = - 250 µA | - 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = - 250 µA | - 1 | | | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = - 48 V, $V_{GS}$ = 0 V | | | - 1 | µA |
| | | $V_{DS}$ = - 48 V, $V_{GS}$ = 0 V, $T_J$ = 125 °C | | | - 50 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS} \geq$ - 4.5 V, $V_{GS}$ = - 10 V | - 6 | | | A |
| Drain-Source On-State Resistance[a] | $R_{DS(on)}$ | $V_{GS}$ = - 10 V, $I_D$ = - 1.25 A | | 0.275 | 0.340 | Ω |
| | | $V_{GS}$ = - 4.5 V, $I_D$ = - 1 A | | 0.406 | 0.550 | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = - 4.5 V, $I_D$ = - 1 A | | 1.9 | | S |
| **Dynamic[b]** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = - 30 V, $V_{GS}$ = - 10 V, $I_D$ = - 1.25 A | | 5.4 | 12 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 1.15 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 0.92 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = - 30 V, $R_L$ = 30 Ω<br>$I_D \cong$ - 1 A, $V_{GEN}$ = - 4.5 V, $R_G$ = 6 Ω | | 10.5 | 20 | ns |
| Rise Time | $t_r$ | | | 11.5 | 20 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 15.5 | 30 | |
| Fall Time | $t_f$ | | | 7.5 | 15 | |
| **Source-Drain Rating Characteristics[b]** | | | | | | |
| Continuous Current | $I_S$ | | | | - 1.25 | A |
| Pulsed Current | $I_{SM}$ | | | | - 8 | |
| Diode Forward Voltage[a] | $V_{SD}$ | $I_S$ = - 1.25 A, $V_{GS}$ = 0 V | | - 0.82 | - 1.2 | V |
| Source-Drain Reverse Recovery Time | $t_{rr}$ | $I_F$ = - 1.25 A, dI/dt = 100 A/µs | | 30 | 55 | ns |

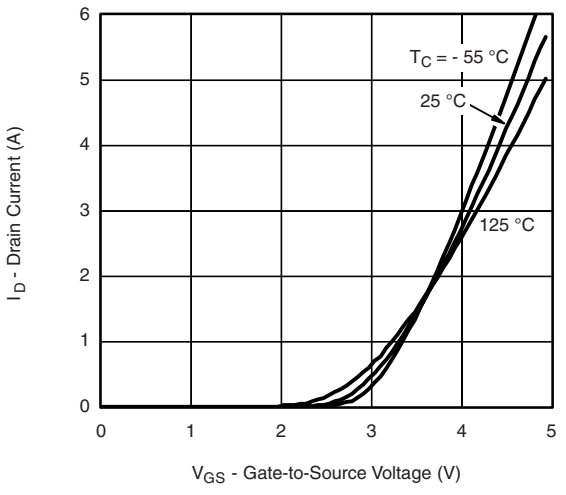
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

*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 otherwise noted

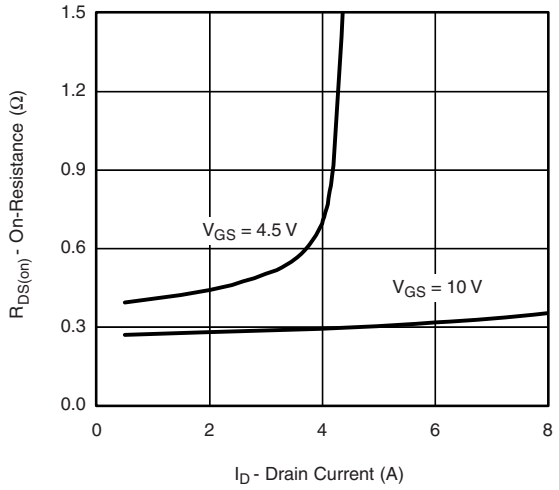



**Output Characteristics**

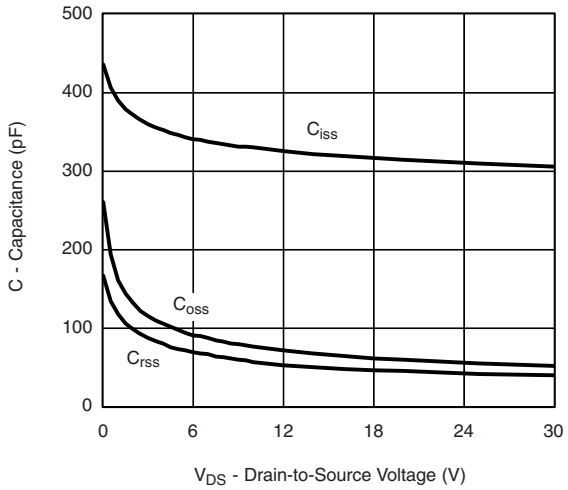



**Transfer Characteristics**

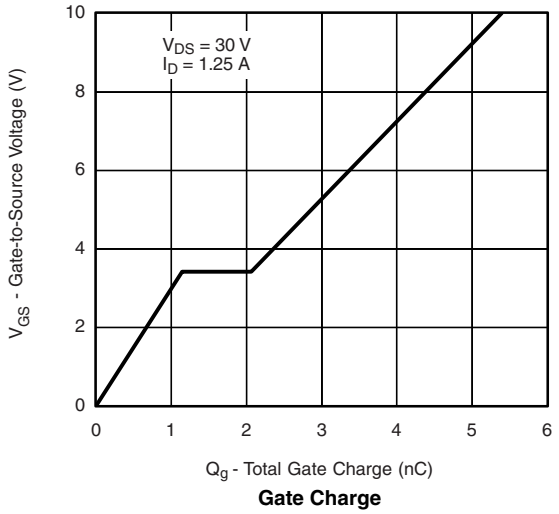
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



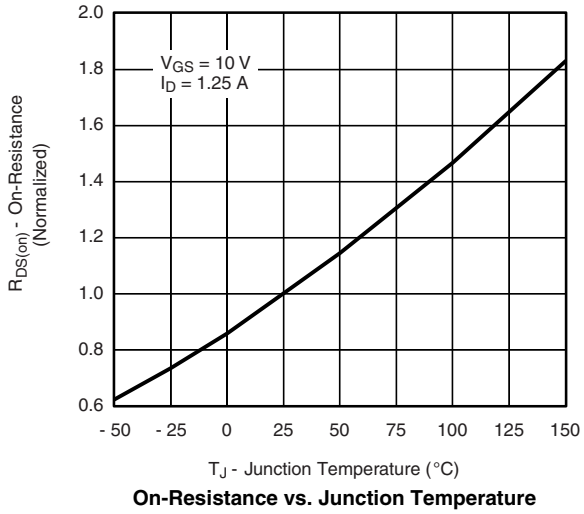

**On-Resistance vs. Drain Current**



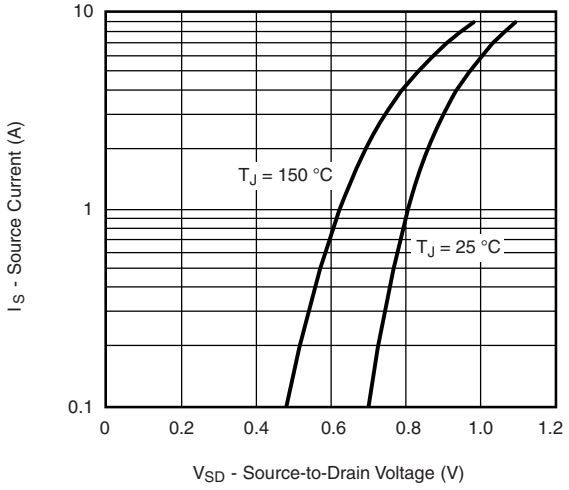

**Capacitance**



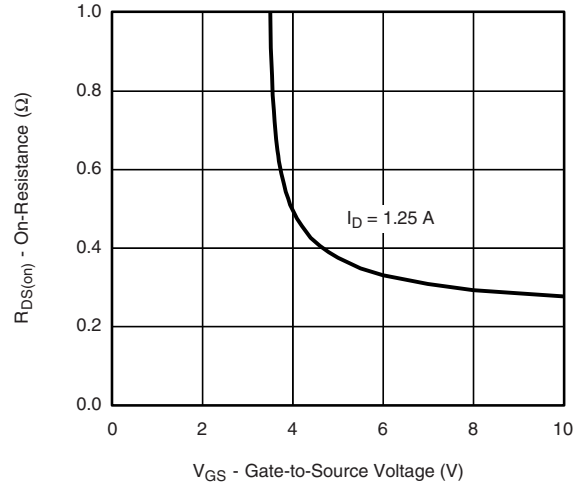

**Gate Charge**




**On-Resistance vs. Junction Temperature**




**Source-Drain Diode Forward Voltage**

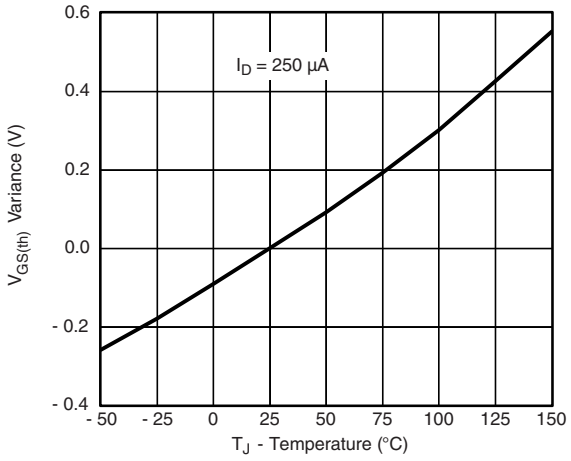



**On-Resistance vs. Gate-to-Source Voltage**

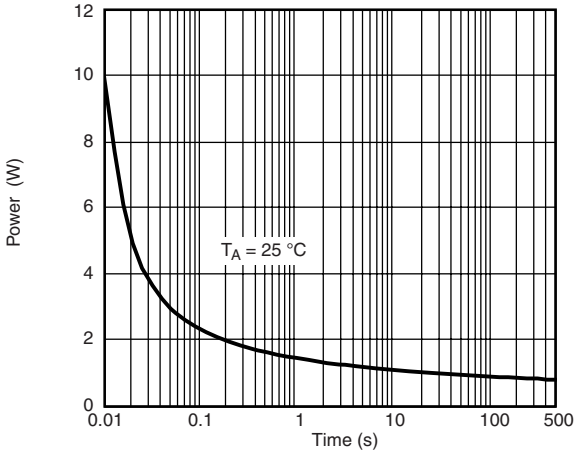
# Si2309DS

Vishay Siliconix

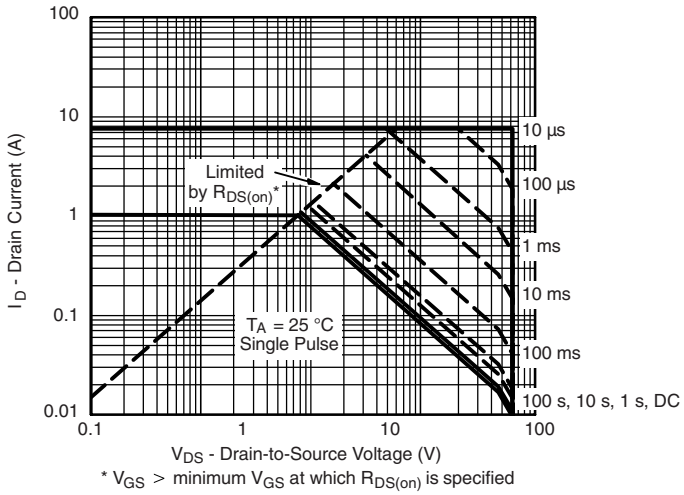
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



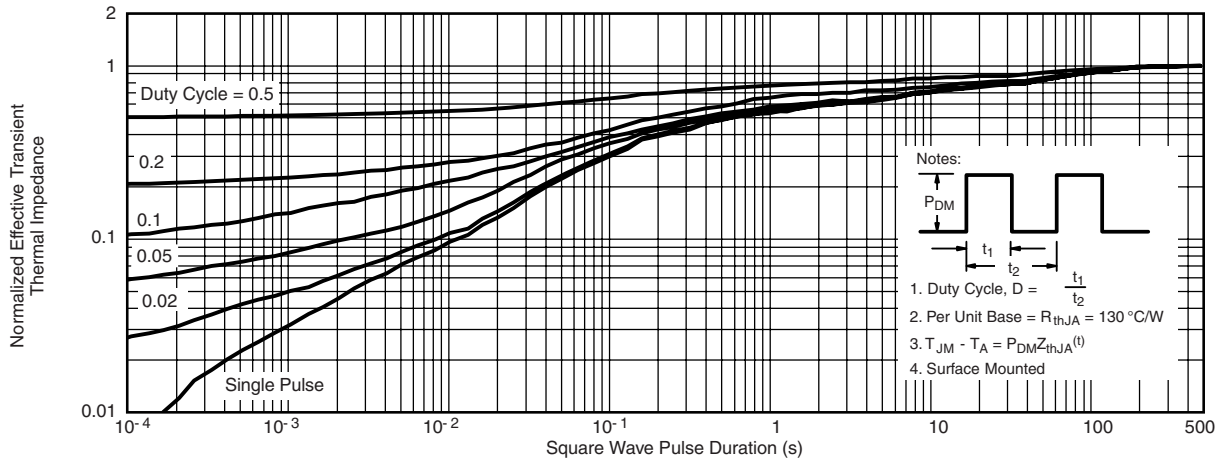

**Threshold Voltage**




**Single Pulse Power**




**Safe Operating Area, Junction-to-Ambient**




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

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