



P-Channel 20-V (D-S) MOSFET

TrenchFET®
MOSFETs
1.5-V Rated



**ESD Protected
2000 V**

| PRODUCT SUMMARY | | |
|---------------------|-------------------------------|---------------------|
| V _{DS} (V) | r _{DS(on)} (Ω) | I _D (mA) |
| -20 | 8 @ V _{GS} = -4.5 V | -150 |
| | 12 @ V _{GS} = -2.5 V | -125 |
| | 15 @ V _{GS} = -1.8 V | -100 |
| | 20 @ V _{GS} = -1.5 V | -30 |

FEATURES

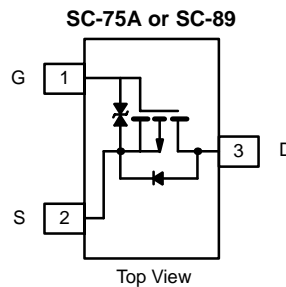
- High-Side Switching
- Low On-Resistance: 8 Ω
- Low Threshold: 0.9 V (typ)
- Fast Switching Speed: 45 ns
- 1.8-V Operation
- Gate-Source ESD Protection

BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation

APPLICATIONS

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Cell Phones, Pagers



SC-75A (SOT- 416): Si1031R
SC-89 (SOT- 490): Si1031X

Marking Code: H

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C UNLESS OTHERWISE NOTED) | | | | | | | |
|--|-----------------------------------|------------------------|--------------|---------|--------------|------|----|
| Parameter | Symbol | Si1031R | | Si1031X | | Unit | |
| | | 5 secs | Steady State | 5 secs | Steady State | | |
| Drain-Source Voltage | V _{DS} | -20 | | | | V | |
| Gate-Source Voltage | V _{GS} | ±6 | | | | | |
| Continuous Drain Current (T _J = 150 °C) ^a | I _D | T _A = 25 °C | -150 | -140 | -165 | -155 | mA |
| | | T _A = 85 °C | -110 | -100 | -150 | -125 | |
| Pulsed Drain Current ^a | I _{DM} | -500 | | -600 | | | |
| Continuous Source Current (diode conduction) ^a | I _S | -250 | -200 | -340 | -240 | | |
| Maximum Power Dissipation ^a | P _D | T _A = 25 °C | 280 | 250 | 340 | 300 | mW |
| | | T _A = 85 °C | 145 | 130 | 170 | 150 | |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | -55 to 150 | | | | °C | |
| Gate-Source ESD Rating (HBM, Method 3015) | ESD | 2000 | | | | V | |

Notes

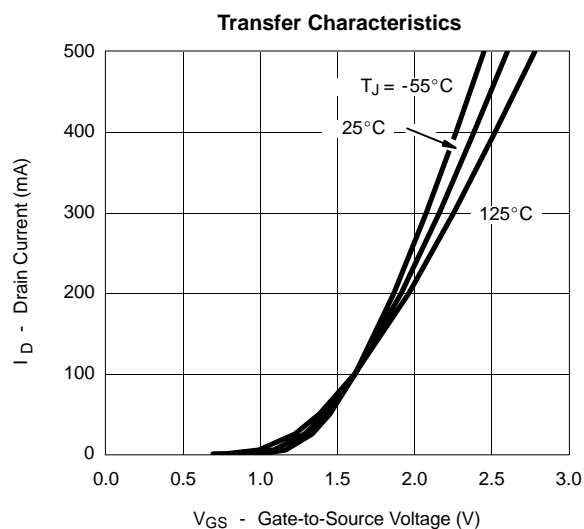
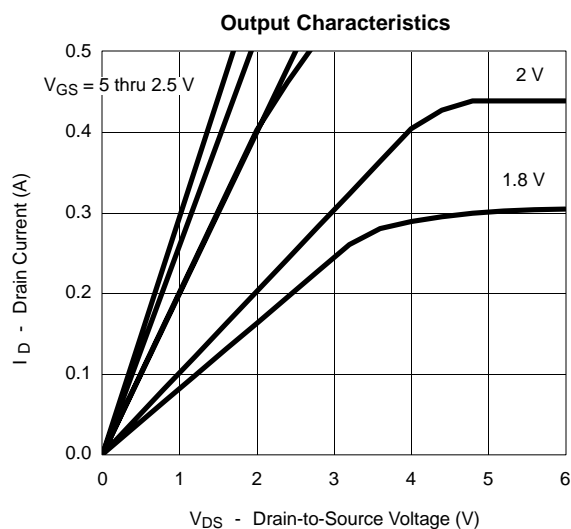
a. Surface Mounted on FR4 Board.

SPECIFICATIONS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Condition | Min | Typ ^a | Max | Unit |
|---|--------------|---|-------|------------------|---------|---------------|
| Static | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$ | -0.40 | | -1.20 | V |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\ \text{V}, V_{GS} = \pm 2.8\ \text{V}$ | | ± 0.5 | ± 1 | μA |
| | | $V_{DS} = 0\ \text{V}, V_{GS} = \pm 4.5\ \text{V}$ | | ± 1 | ± 2 | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -16\ \text{V}, V_{GS} = 0\ \text{V}$ | | -1 | -500 | nA |
| | | $V_{DS} = -16\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85^\circ\text{C}$ | | | -10 | μA |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} = -5\ \text{V}, V_{GS} = -4.5\ \text{V}$ | -200 | | | mA |
| Drain-Source On-State Resistance ^a | $r_{DS(on)}$ | $V_{GS} = -4.5\ \text{V}, I_D = -150\ \text{mA}$ | | | 8 | Ω |
| | | $V_{GS} = -2.5\ \text{V}, I_D = -125\ \text{mA}$ | | | 12 | |
| | | $V_{GS} = -1.8\ \text{V}, I_D = -100\ \text{mA}$ | | | 15 | |
| | | $V_{GS} = -1.5\ \text{V}, I_D = -30\ \text{mA}$ | | | 20 | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = -10\ \text{V}, I_D = -150\ \text{mA}$ | | 0.4 | | S |
| Diode Forward Voltage ^a | V_{SD} | $I_S = -150\ \text{mA}, V_{GS} = 0\ \text{V}$ | | | -1.2 | V |
| Dynamic^b | | | | | | |
| Total Gate Charge | Q_g | $V_{DS} = -10\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -150\ \text{mA}$ | | 1500 | | μC |
| Gate-Source Charge | Q_{gs} | | | 150 | | |
| Gate-Drain Charge | Q_{gd} | | | 450 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = -10\ \text{V}, R_L = 65\ \Omega$ $I_D \cong -150\ \text{mA}, V_{GEN} = -4.5\ \text{V}, R_G = 10\ \Omega$ | | | 55 | ns |
| Rise Time | t_r | | | | 30 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | | 60 | |
| Fall Time | t_f | | | | 30 | |

Notes

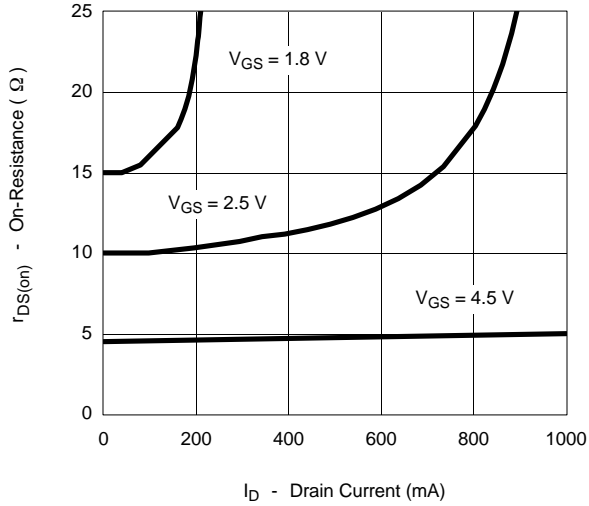
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS NOTED)

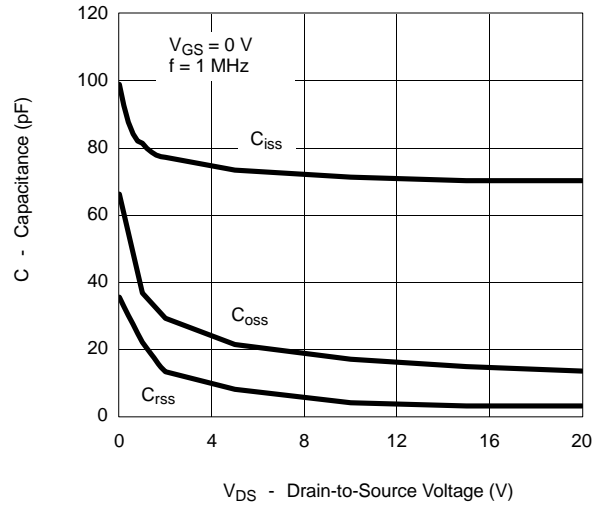


TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS NOTED)

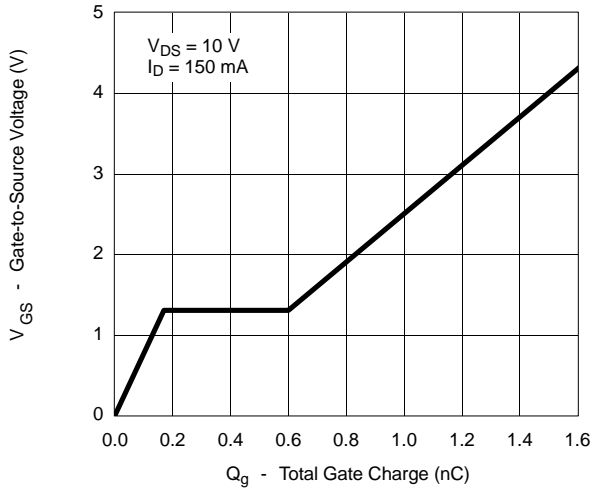
On-Resistance vs. Drain Current



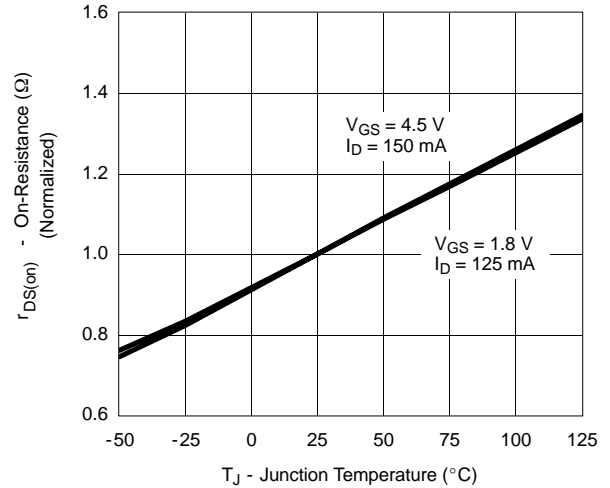
Capacitance



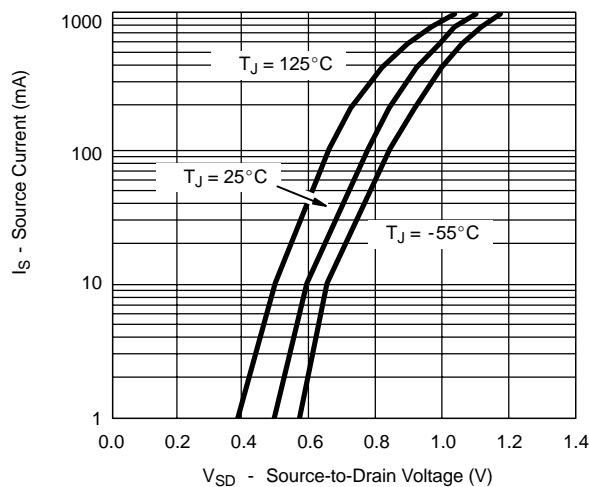
Gate Charge



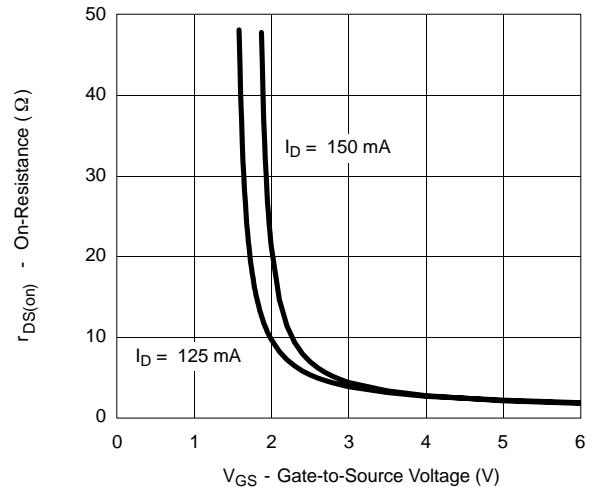
On-Resistance vs. Junction Temperature



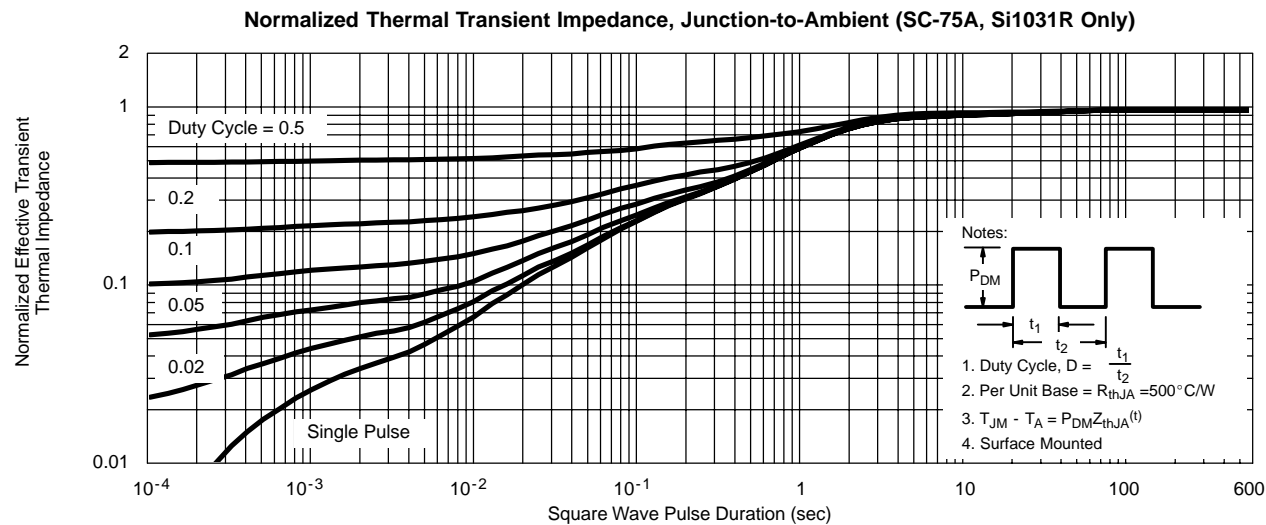
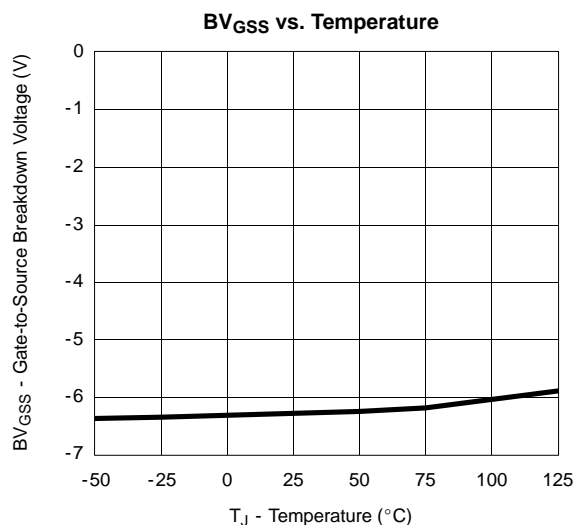
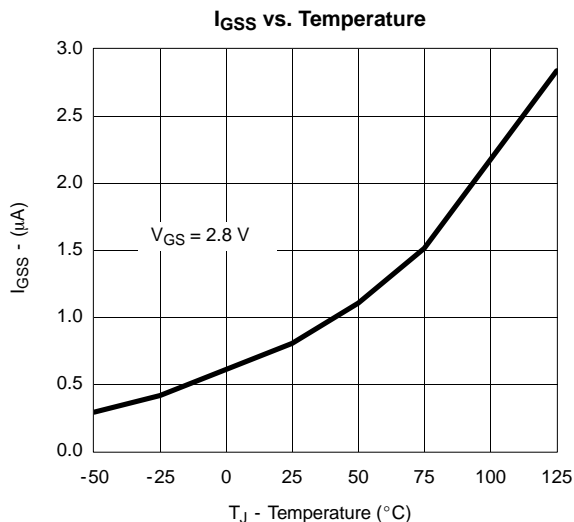
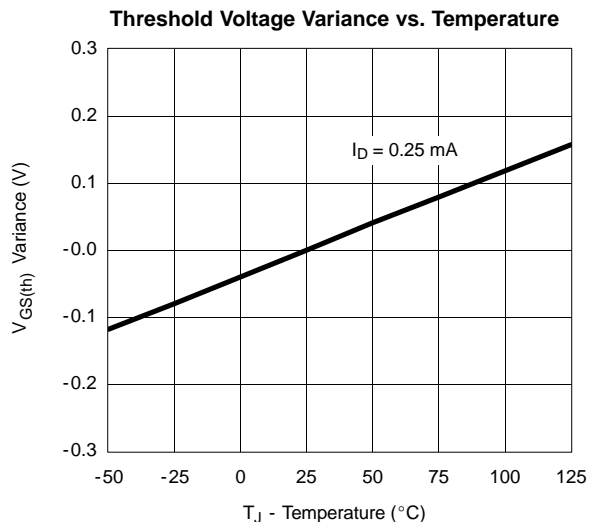
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS NOTED)





Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.