

P-Channel 20 V (D-S) MOSFET

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

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- High-Side Switching
- Low On-Resistance: 8 Ω
- Low Threshold: 0.9 V (typ.)
- Fast Switching Speed: 45 ns
- TrenchFET® Power MOSFETs: 1.5 V Rated
- ESD Protected: 2000 V
- Compliant to RoHS Directive 2002/95/EC



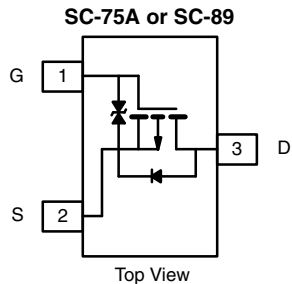
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

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

BENEFITS

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



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

Marking Code: H

Ordering Information:

Si1031R-T1-GE3 (SC-75A, Lead (Pb)-free and Halogen-free)
Si1031X-T1-GE3 (SC-89, Lead (Pb)-free and Halogen-free)

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted) | | | | | | | |
|---|-----------------------------------|------------------------|--------------|---------|--------------|-------|----|
| Parameter | Symbol | Si1031R | | Si1031X | | Unit | |
| | | 5 s | Steady State | 5 s | 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 | | mW | |
| 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 °C, unless otherwise noted) | | | | | | |
|---|---------------------|---|--------|-------------------|-------|------|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit |
| Static | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = - 250 μA | - 0.40 | | - 1.2 | V |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 2.8 V | | ± 0.5 | ± 1.0 | μA |
| | | V _{DS} = 0 V, V _{GS} = ± 4.5 V | | ± 1.0 | ± 2.0 | |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = - 16 V, V _{GS} = 0 V | | - 1 | - 500 | nA |
| | | V _{DS} = - 16 V, V _{GS} = 0 V, T _J = 85 °C | | | - 10 | μA |
| On-State Drain Current ^a | I _{D(on)} | V _{DS} = - 5 V, V _{GS} = - 4.5 V | - 200 | | | mA |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | V _{GS} = - 4.5 V, I _D = - 150 mA | | | 8 | Ω |
| | | V _{GS} = - 2.5 V, I _D = - 125 mA | | | 12 | |
| | | V _{GS} = - 1.8 V, I _D = - 100 mA | | | 15 | |
| | | V _{GS} = - 1.5 V, I _D = - 30 mA | | | 20 | |
| Forward Transconductance ^a | g _{fs} | V _{DS} = - 10 V, I _D = 150 mA | | 0.4 | | S |
| Diode Forward Voltage ^a | V _{SD} | I _S = - 150 mA, V _{GS} = 0 V | | | - 1.2 | V |
| Dynamic^b | | | | | | |
| Total Gate Charge | Q _g | V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 150 mA | | 1500 | | pC |
| Gate-Source Charge | Q _{gs} | | | 150 | | |
| Gate-Drain Charge | Q _{gd} | | | 450 | | |
| Turn-On Delay Time | t _{d(on)} | V _{DD} = - 10 V, R _L = 65 Ω I _D ≅ - 150 mA, V _{GEN} = - 4.5 V, R _g = 10 Ω | | | 55 | ns |
| Rise Time | t _r | | | | 30 | |
| Turn-Off Delay Time | t _{d(off)} | | | | 60 | |
| Fall Time | t _f | | | | 30 | |

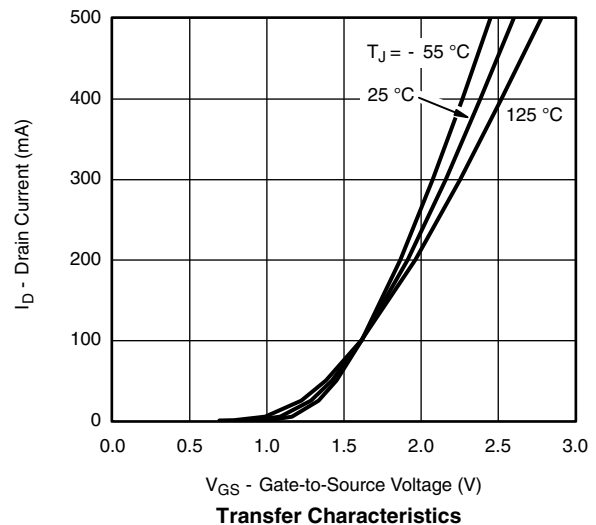
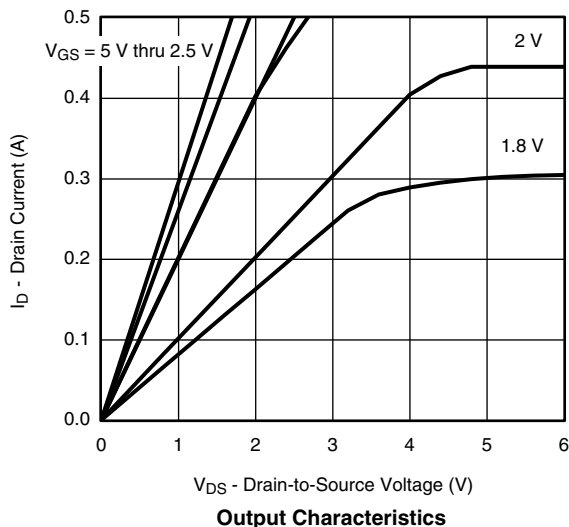
Notes:

a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.

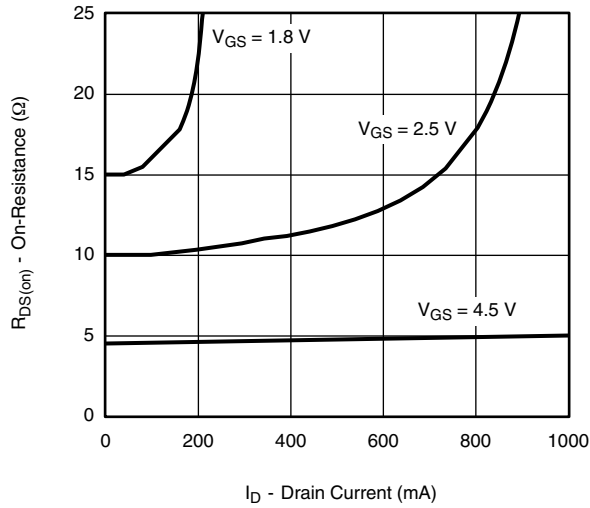
b. Guaranteed by design, not subject to production testing.

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.

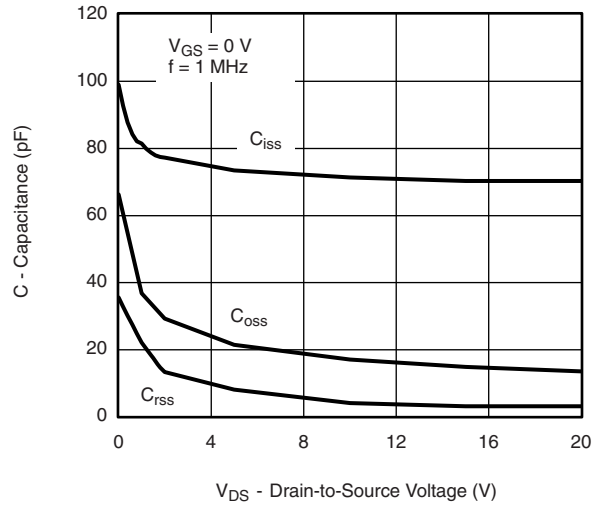
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



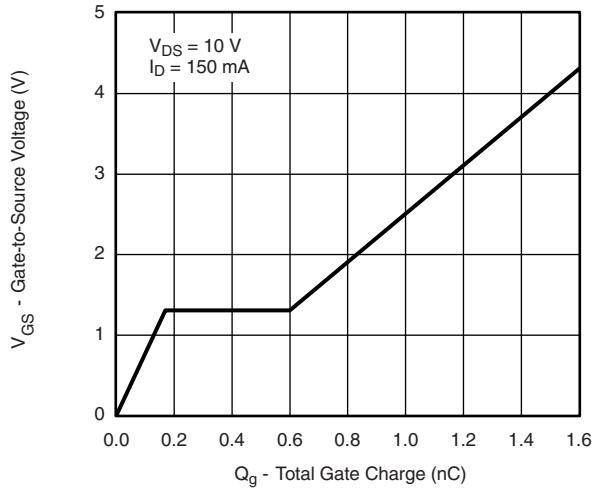
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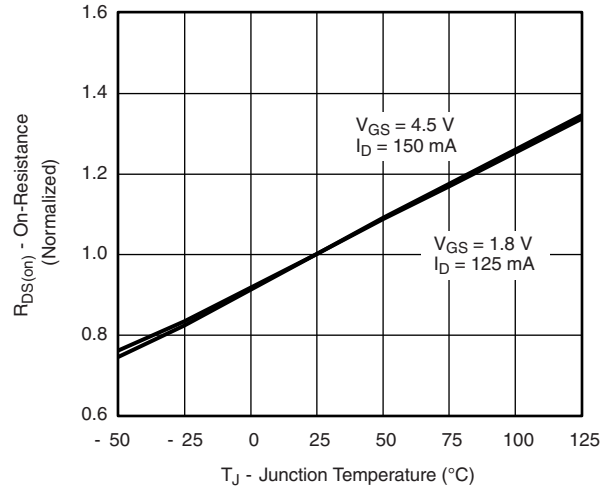
On-Resistance vs. Drain Current



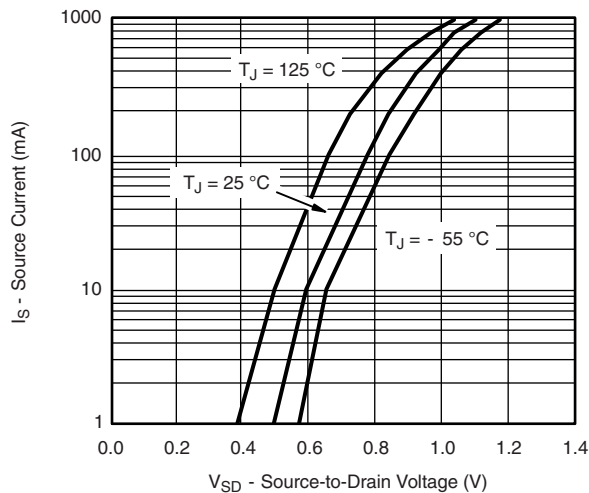
Capacitance



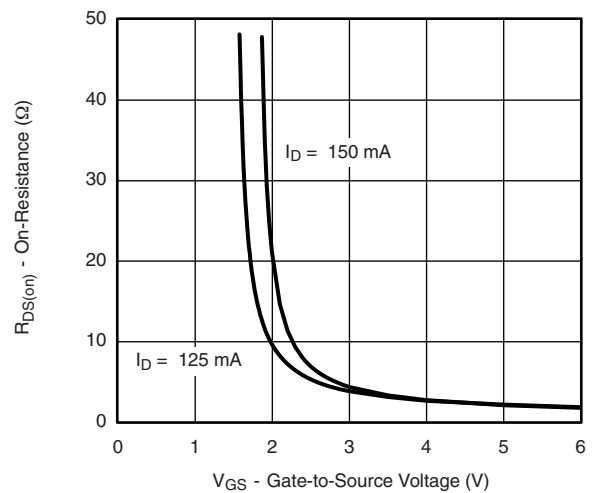
Gate Charge



On-Resistance vs. Junction Temperature

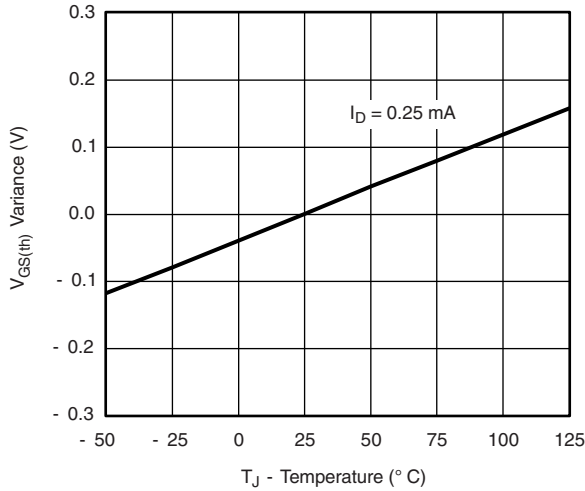


Surge-Drain Diode Forward Voltage

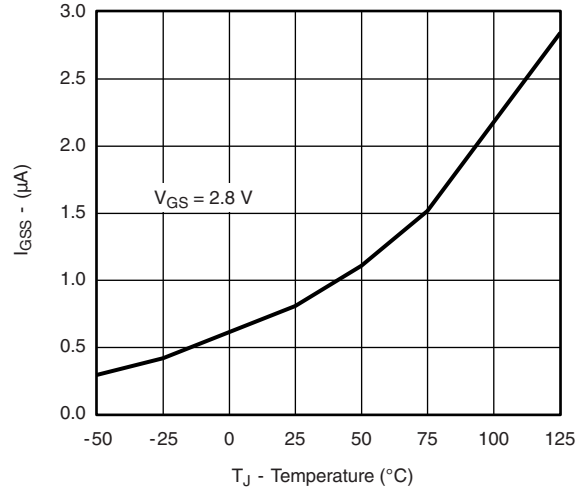


On-Resistance vs. Gate-to-Source Voltage

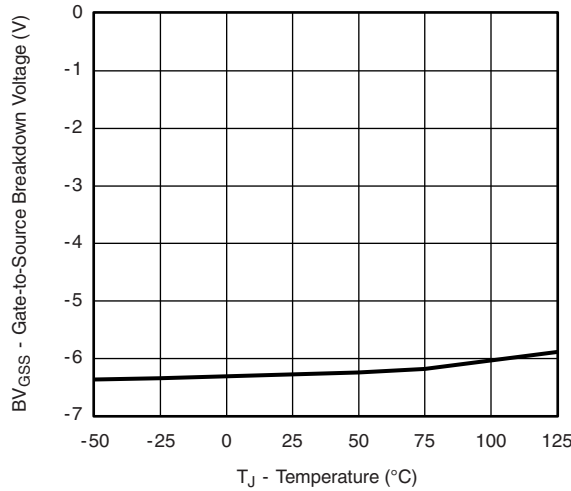
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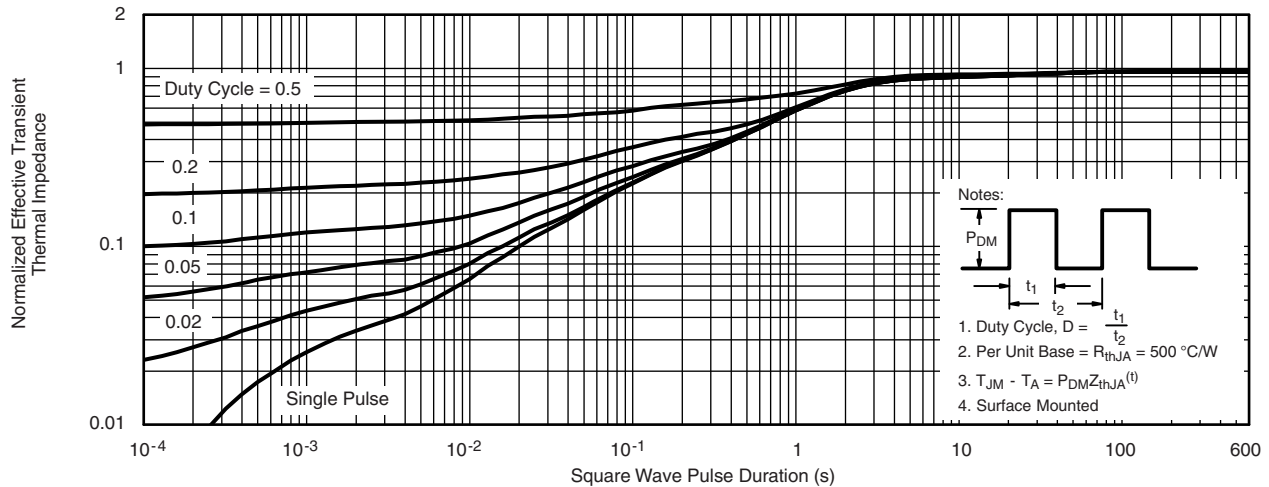
Threshold Voltage Variance vs. Temperature



I_{GSS} vs. Temperature



BV_{GSS} vs. Temperature



Normalized Thermal Transient Impedance, Junction-to-Ambient (SC-75A, Si1031R Only)

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SC-75A: 3 Leads



DWG: 5868

Notes

Dimensions in millimeters will govern.

- 1. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash protrusions or gate burrs shall not exceed 0.10 mm per end. Dimension E1 does not include Interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.10 mm per side.
- 2. Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
- 3. Datums A, B and D to be determined 0.10 mm from the lead tip.
- 4. Terminal positions are shown for reference only.
- 5. These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

| DIMENSIONS | TOLERANCES |
|------------|------------|
| aaa | 0.10 |
| bbb | 0.10 |
| ccc | 0.10 |
| ddd | 0.10 |

| DIM. | MILLIMETERS | | | NOTE |
|------|-------------|-------|------|------|
| | MIN. | NOM. | MAX. | |
| A | - | - | 0.80 | |
| A1 | 0.00 | - | 0.10 | |
| A2 | 0.65 | 0.70 | 0.80 | |
| B1 | 0.19 | - | 0.24 | 5 |
| b1 | 0.17 | - | 0.21 | |
| c | 0.13 | - | 0.15 | 5 |
| c1 | 0.10 | - | 0.12 | 5 |
| D | 1.48 | 1.575 | 1.68 | 1, 2 |
| E | 1.50 | 1.60 | 1.70 | |
| E1 | 0.66 | 0.76 | 0.86 | 1, 2 |
| e1 | 0.50 BSC | | | |
| e2 | 1.00 BSC | | | |
| e3 | 0.50 BSC | | | |
| L | 0.15 | 0.205 | 0.30 | |
| L1 | 0.40 ref. | | | |
| L2 | 0.15 BSC | | | |
| q | 0° | - | 8° | |
| q1 | 4° | - | 10° | |

RECOMMENDED MINIMUM PADS FOR SC-75A: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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