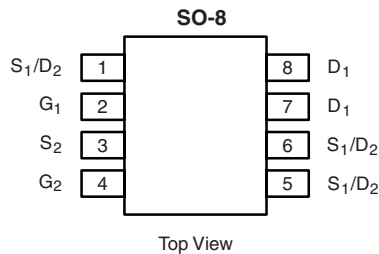


Dual N-Channel 25-V (D-S) MOSFET with Schottky Diode

| PRODUCT SUMMARY | | | | |
|-----------------|---------------------|----------------------------------|------------------------------------|-----------------------|
| | V _{DS} (V) | R _{DS(on)} (Ω) | I _D (A) ^{a, e} | Q _g (Typ.) |
| Channel-1 | 25 | 0.023 at V _{GS} = 10 V | 8.0 | 5.5 |
| | | 0.028 at V _{GS} = 4.5 V | 8.0 | |
| Channel-2 | 25 | 0.023 at V _{GS} = 10 V | 8.0 | 5.5 |
| | | 0.028 at V _{GS} = 4.5 V | 8.0 | |

| SCHOTTKY PRODUCT SUMMARY | | |
|--------------------------|--|---------------------------------|
| V _{DS} (V) | V _{SD} (V) Diode Forward Voltage | I _F (A) ^a |
| 25 | 0.43 V at 1.0 A | 2.3 |



Ordering Information: Si4670DY-T1-E3 (Lead (Pb)-free)
Si4670DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

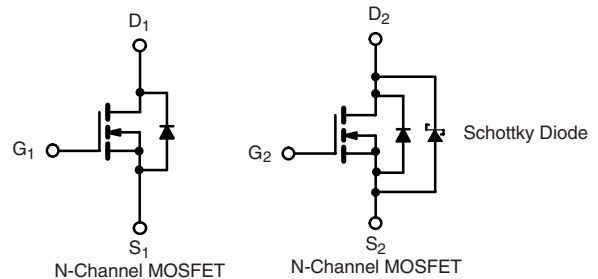
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- PWM Optimized
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Synchronous Buck Converter
- Game Machine
- Notebook



| ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted | | | | |
|---|-----------------------------------|---------------------|---------------------|------|
| Parameter | Symbol | Channel-1 | Channel-2 | Unit |
| Drain-Source Voltage | V _{DS} | 25 | 25 | V |
| Gate-Source Voltage | V _{GS} | ± 16 | ± 16 | |
| Continuous Drain Current (T _J = 150 °C) | T _C = 25 °C | 8.0 ^e | 8.0 ^e | A |
| | T _C = 70 °C | 7 | 7 | |
| | T _A = 25 °C | 7 ^{b, c} | 7 ^{b, c} | |
| | T _A = 70 °C | 5.6 ^{b, c} | 5.6 ^{b, c} | |
| Pulsed Drain Current (10 μs Pulse Width) | I _{DM} | 30 | 30 | |
| Source-Drain Current Diode Current | T _C = 25 °C | 2.3 | 2.3 | |
| | T _A = 25 °C | 1.5 ^{b, c} | 1.5 ^{b, c} | |
| Maximum Power Dissipation | T _C = 25 °C | 2.8 | 2.8 | W |
| | T _C = 70 °C | 1.8 | 1.8 | |
| | T _A = 25 °C | 1.8 ^{b, c} | 1.8 ^{b, c} | |
| | T _A = 70 °C | 1.1 ^{b, c} | 1.1 ^{b, c} | |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | - 55 to 150 | | °C |

| THERMAL RESISTANCE RATINGS | | | | | | | |
|---|--------------|-------------------|------|-----------|------|------|------|
| Parameter | Symbol | Channel-1 | | Channel-2 | | Unit | |
| | | Typ. | Max. | Typ. | Max. | | |
| Maximum Junction-to-Ambient ^{b, d} | t ≤ 10 s | R _{thJA} | 57 | 70 | 57 | 70 | °C/W |
| Maximum Junction-to-Foot (Drain) | Steady State | R _{thJF} | 36 | 44 | 36 | 44 | |

- Notes:
- Based on T_C = 25 °C.
 - Surface Mounted on 1" x 1" FR4 board.
 - t = 10 s.
 - Maximum under Steady State conditions is 110 °C/W (Channel-1 and Channel-2).
 - Package limited.

| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | | |
|--|-------------------------|--|--|-------------------|-------|----------------------|-------|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit | |
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | Ch-1 | 25 | | V | |
| | | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | Ch-2 | 25 | | | |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = 250\text{ }\mu\text{A}$ | Ch-1 | | 25 | mV/ $^\circ\text{C}$ | |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | $I_D = 250\text{ }\mu\text{A}$ | Ch-1 | | - 4.7 | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | Ch-1 | 1 | | 2.2 | |
| | | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | Ch-2 | 1 | | 2.2 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$ | Ch-1 | | | 100 | |
| | | $V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$ | Ch-2 | | | 100 | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$ | Ch-1 | | | 0.001 | |
| | | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$ | Ch-2 | | 0.07 | 0.5 | |
| | | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$ | Ch-1 | | | | 0.025 |
| | | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$ | Ch-2 | | 5 | 20 | |
| On-State Drain Current ^b | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | Ch-1 | 20 | | A | |
| | | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | Ch-2 | 20 | | | |
| Drain-Source On-State Resistance ^b | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 7\text{ A}$ | Ch-1 | | 0.019 | 0.023 | |
| | | $V_{GS} = 10\text{ V}, I_D = 7\text{ A}$ | Ch-2 | | 0.019 | 0.023 | |
| | | $V_{GS} = 4.5\text{ V}, I_D = 6.3\text{ A}$ | Ch-1 | | 0.023 | 0.028 | |
| | | $V_{GS} = 4.5\text{ V}, I_D = 6.3\text{ A}$ | Ch-2 | | 0.023 | 0.028 | |
| Forward Transconductance ^b | g_{fs} | $V_{DS} = 10\text{ V}, I_D = 7\text{ A}$ | Ch-1 | | 23 | S | |
| | | $V_{DS} = 10\text{ V}, I_D = 7\text{ A}$ | Ch-2 | | 23 | | |
| Dynamic^a | | | | | | | |
| Input Capacitance | C_{iss} | Channel-1 $V_{DS} = 13\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | Ch-1 | | 680 | pF | |
| | | | Ch-2 | | 680 | | |
| Output Capacitance | C_{oss} | | Channel-2 $V_{DS} = 13\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | Ch-1 | | | 120 |
| | | | | Ch-2 | | | 180 |
| Reverse Transfer Capacitance | C_{rss} | Ch-1 | | | 55 | | |
| | | Ch-2 | | | 70 | | |
| Total Gate Charge | Q_g | $V_{DS} = 13\text{ V}, V_{GS} = 10\text{ V}, I_D = 7\text{ A}$ | Ch-1 | | 12 | 18 | |
| | | | Ch-2 | | 12 | 18 | |
| | | Channel-1 $V_{DS} = 13\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$ | Ch-1 | | 5.5 | 8.5 | |
| | | | Ch-2 | | 5.5 | 8.5 | |
| Gate-Source Charge | Q_{gs} | Channel-2 $V_{DS} = 13\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$ | Ch-1 | | 2 | nC | |
| Ch-2 | | | 2 | | | | |
| Gate-Drain Charge | Q_{gd} | Channel-1 $V_{DS} = 13\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7\text{ A}$ | Ch-1 | | 1.5 | | |
| | | | Ch-2 | | 1.5 | | |
| Gate Resistance | R_g | $f = 1\text{ MHz}$ | Ch-1 | | 2.5 | Ω | |
| | | | Ch-2 | | 3.2 | | |

Notes:

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

b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.



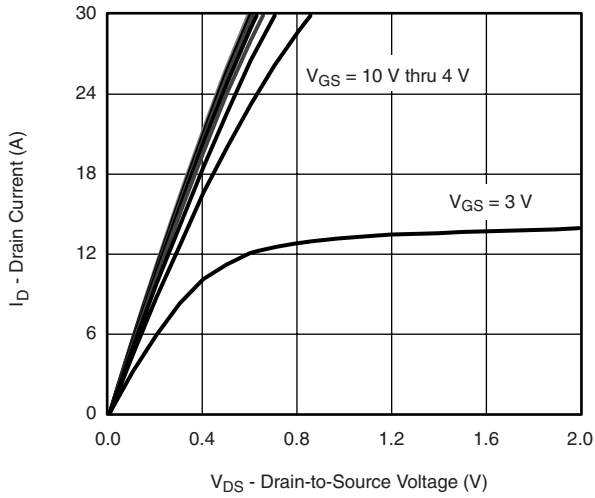
| SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted | | | | | | | |
|---|--------------|--|------|-------------------|------|------|----|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit | |
| Dynamic^a | | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | Channel-1 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$ | Ch-1 | | 15 | 25 | ns |
| | | | Ch-2 | | 15 | 25 | |
| Rise Time | t_r | | Ch-1 | | 50 | 75 | |
| | | | Ch-2 | | 50 | 75 | |
| Turn-Off Delay Time | $t_{d(off)}$ | Channel-2 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\ \Omega$ | Ch-1 | | 20 | 30 | |
| | | | Ch-2 | | 20 | 30 | |
| Fall Time | t_f | | Ch-1 | | 10 | 15 | |
| | | | Ch-2 | | 10 | 15 | |
| Turn-On Delay Time | $t_{d(on)}$ | Channel-1 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$ | Ch-1 | | 10 | 15 | |
| | | | Ch-2 | | 10 | 15 | |
| Rise Time | t_r | | Ch-1 | | 12 | 20 | |
| | | | Ch-2 | | 12 | 20 | |
| Turn-Off Delay Time | $t_{d(off)}$ | Channel-2 $V_{DD} = 13\text{ V}$, $R_L = 2.3\ \Omega$ $I_D \cong 5.6\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\ \Omega$ | Ch-1 | | 15 | 25 | |
| | | | Ch-2 | | 15 | 25 | |
| Fall Time | t_f | | Ch-1 | | 10 | 15 | |
| | | | Ch-2 | | 10 | 15 | |
| Drain-Source Body Diode Characteristics | | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^\circ\text{C}$ | Ch-1 | | | 2.3 | A |
| | | | Ch-2 | | | 2.3 | |
| Pulse Diode Forward Current ^a | I_{SM} | | Ch-1 | | | 30 | |
| | | | Ch-2 | | | 30 | |
| Body Diode Voltage | V_{SD} | $I_S = 5.6\text{ A}$ | Ch-1 | | 0.8 | 1.2 | V |
| | | $I_S = 1\text{ A}$ | Ch-2 | | 0.37 | 0.43 | |
| Body Diode Reverse Recovery Time | t_{rr} | Channel-1 $I_F = 5.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$ | Ch-1 | | 15 | 30 | ns |
| | | | Ch-2 | | 15 | 30 | |
| Body Diode Reverse Recovery Charge | Q_{rr} | | Ch-1 | | 8 | 16 | nC |
| | | | Ch-2 | | 8 | 16 | |
| Reverse Recovery Fall Time | t_a | Channel-2 $I_F = 5.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$ | Ch-1 | | 8.5 | | ns |
| | | | Ch-2 | | 8.5 | | |
| Reverse Recovery Rise Time | t_b | | Ch-1 | | 6.5 | | |
| | | | Ch-2 | | 6.5 | | |

Notes:

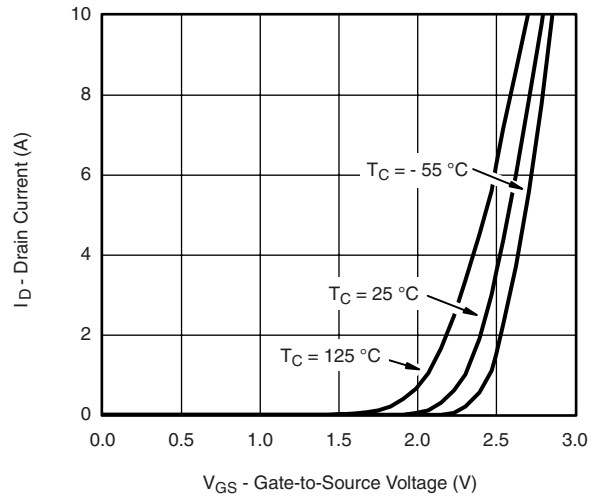
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

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.

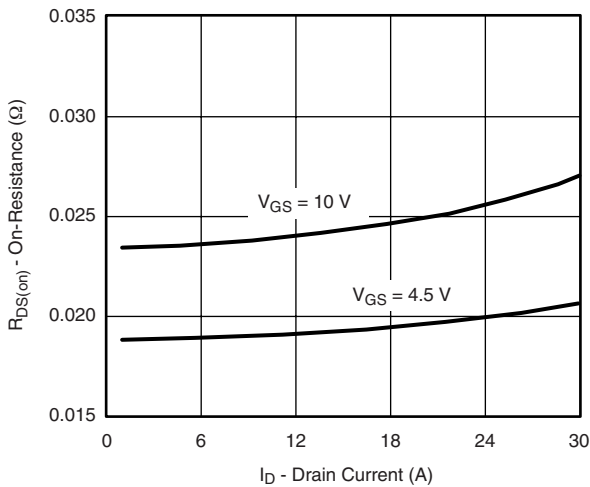
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



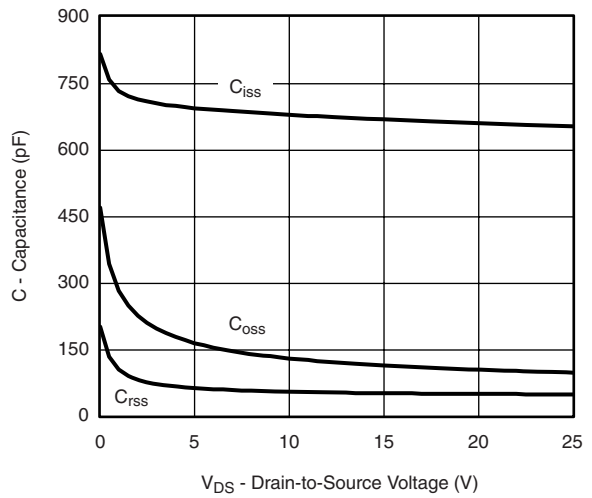
Output Characteristics



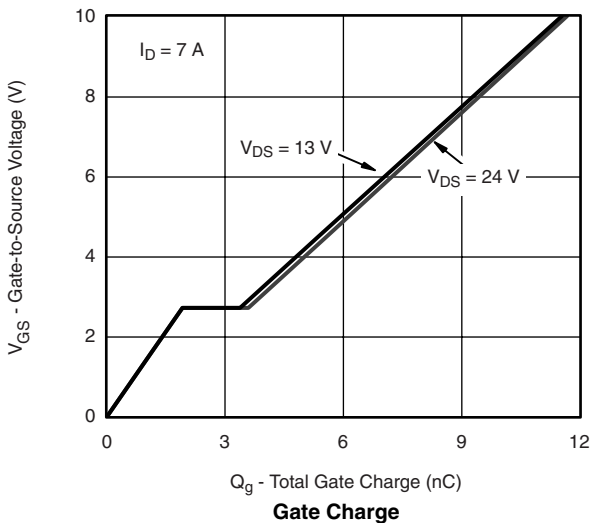
Transfer Characteristics



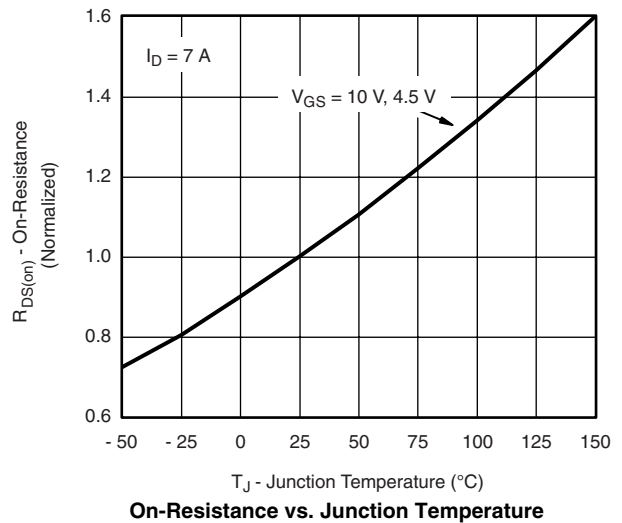
On-Resistance vs. Drain Current



Capacitance

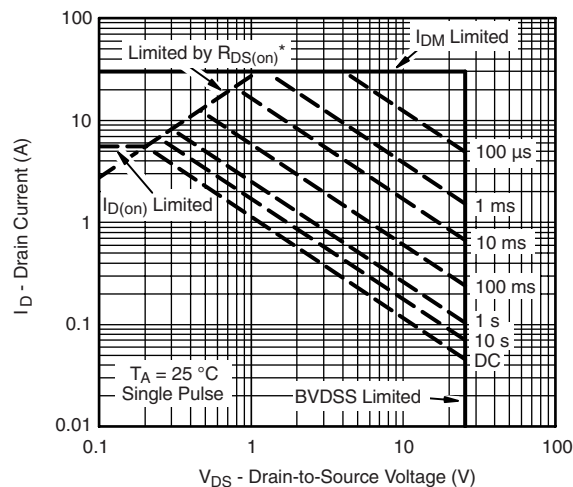
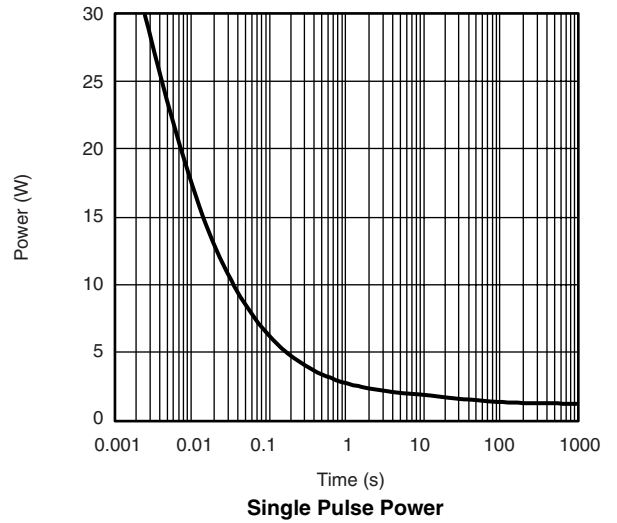
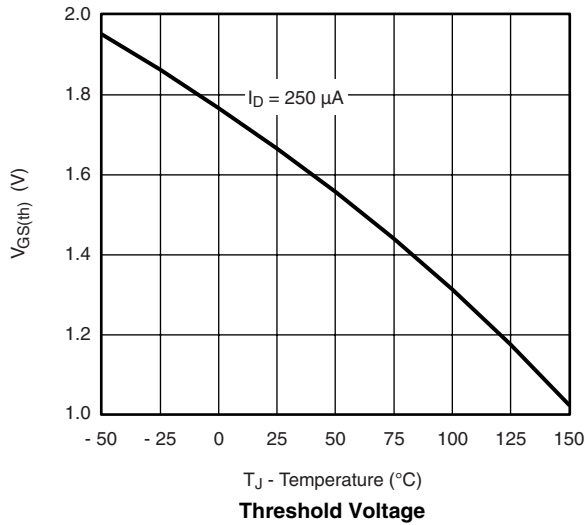
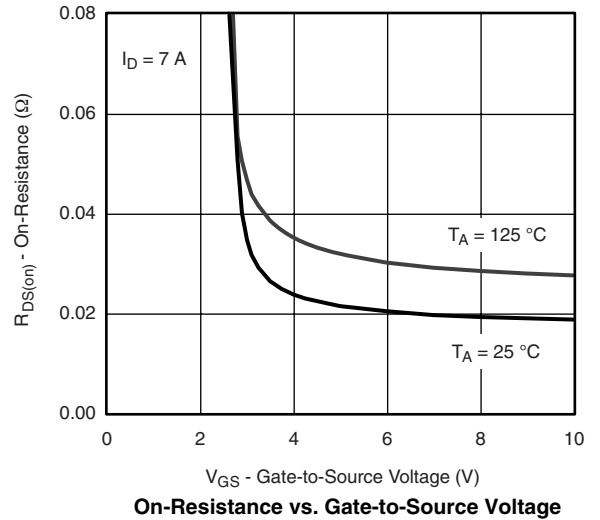
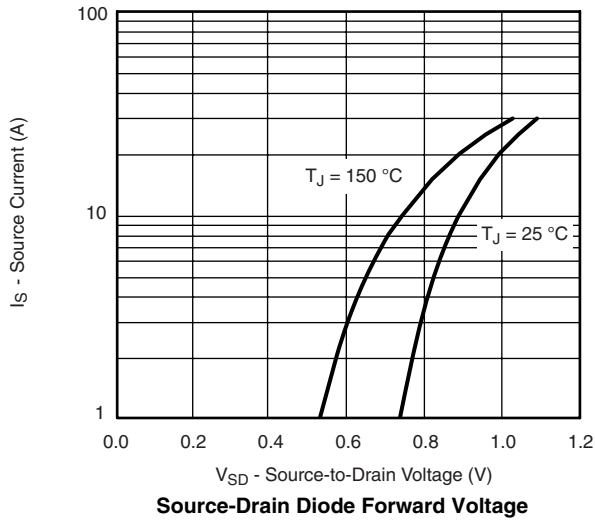


Gate Charge



On-Resistance vs. Junction Temperature

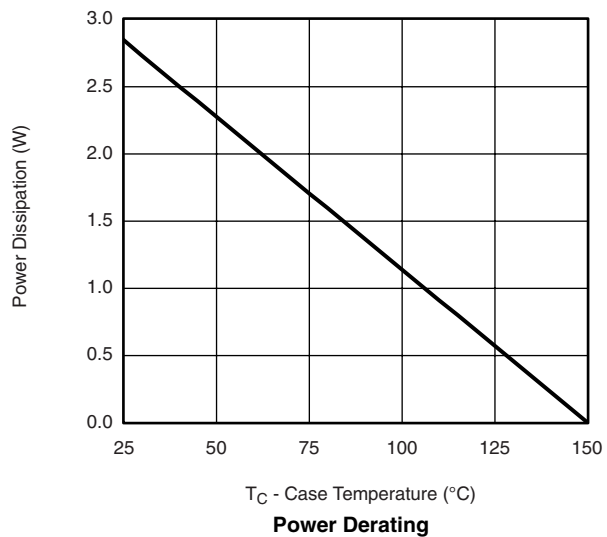
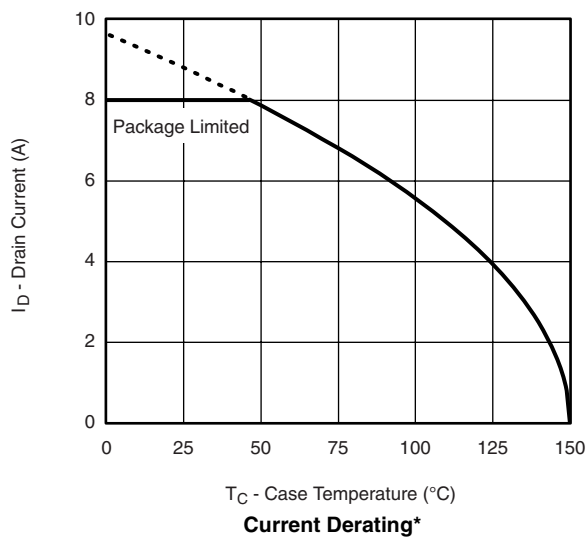
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

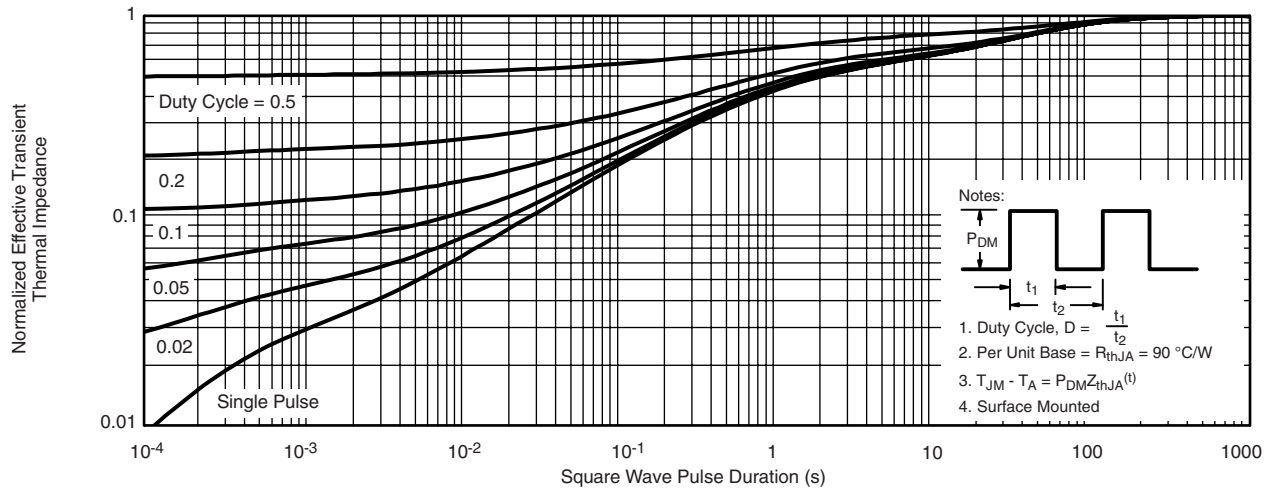
Safe Operating Area, Junction-to-Ambient

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

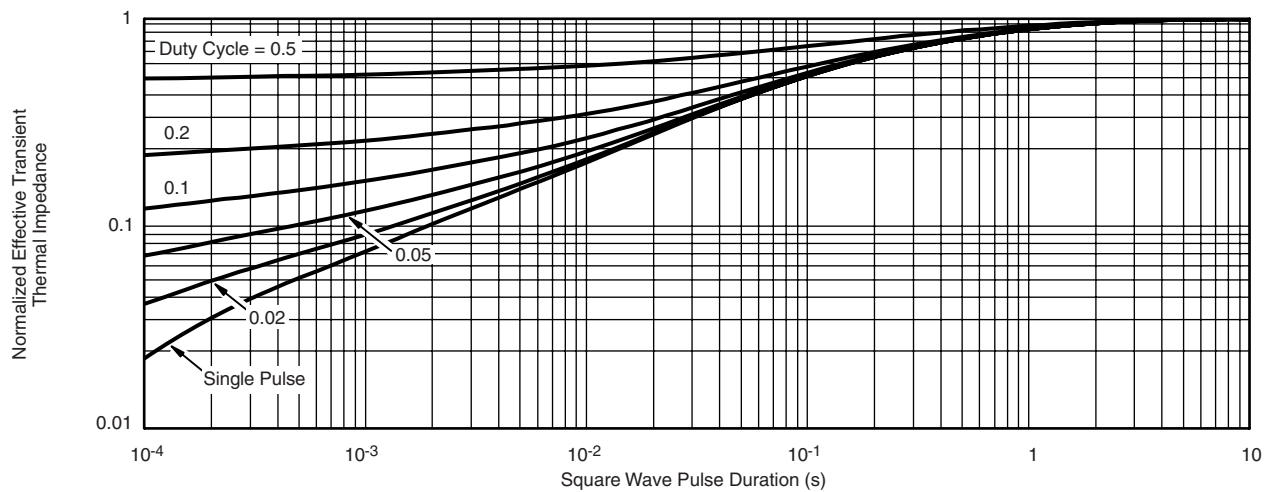


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

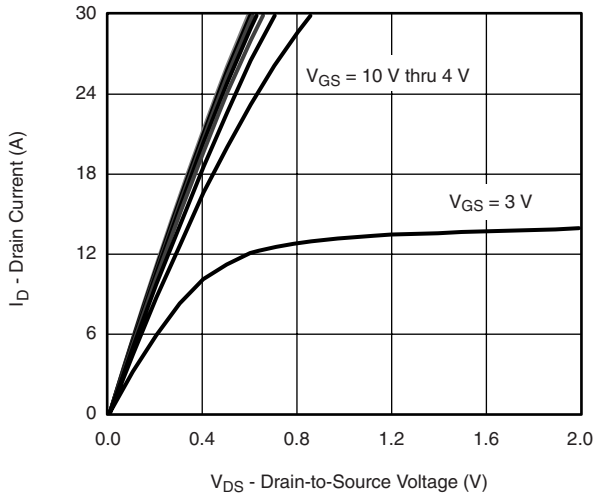


Normalized Thermal Transient Impedance, Junction-to-Ambient

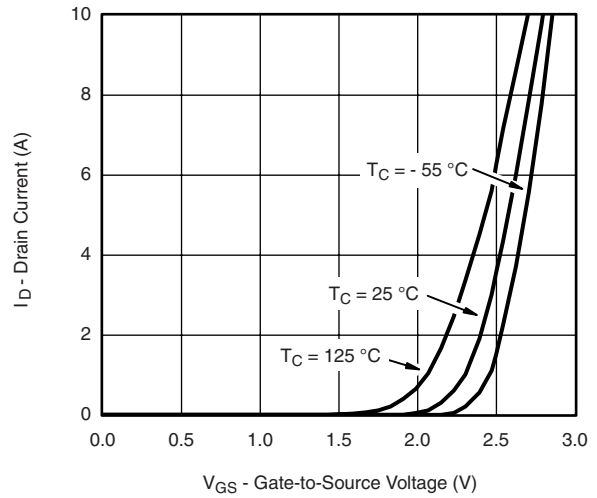


Normalized Thermal Transient Impedance, Junction-to-Foot

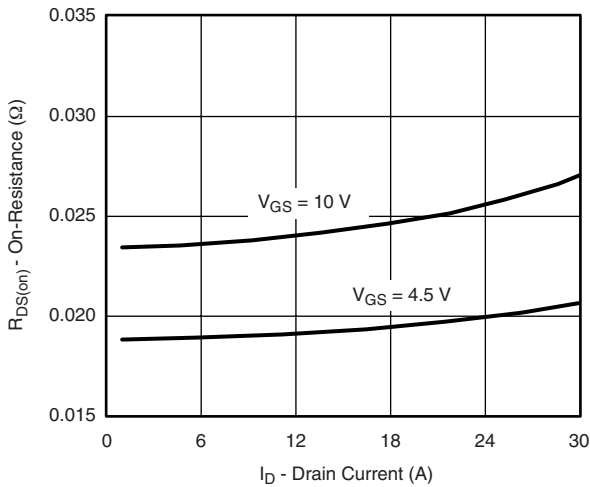
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



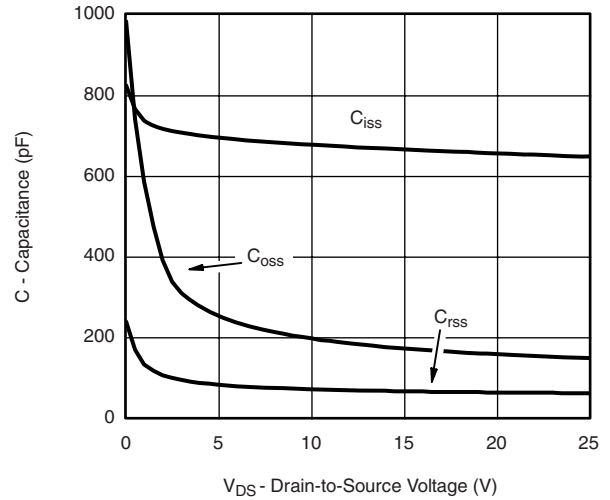
Output Characteristics



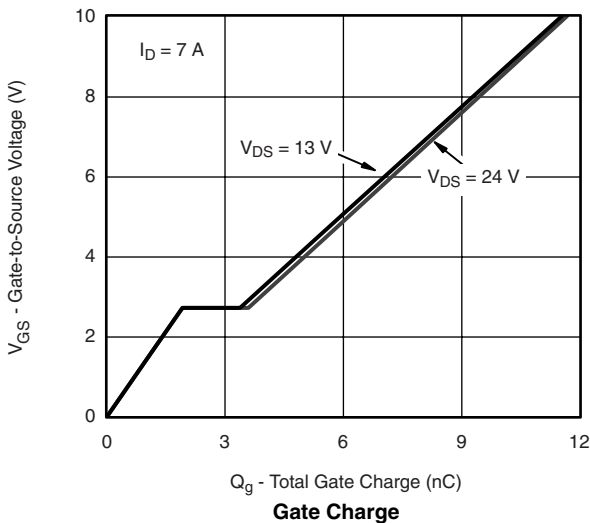
Transfer Characteristics



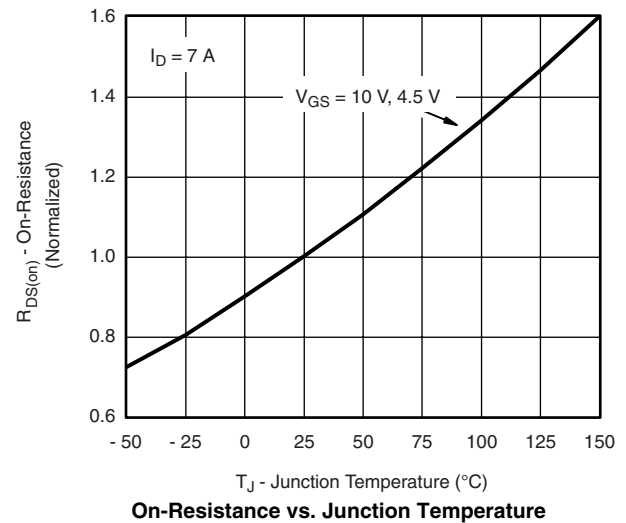
On-Resistance vs. Drain Current



Capacitance

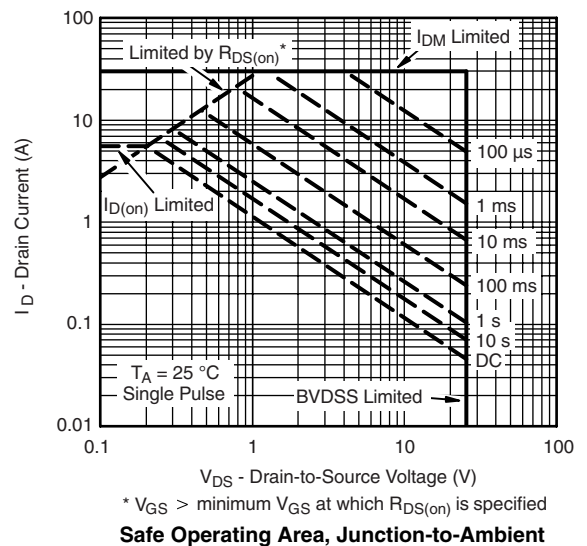
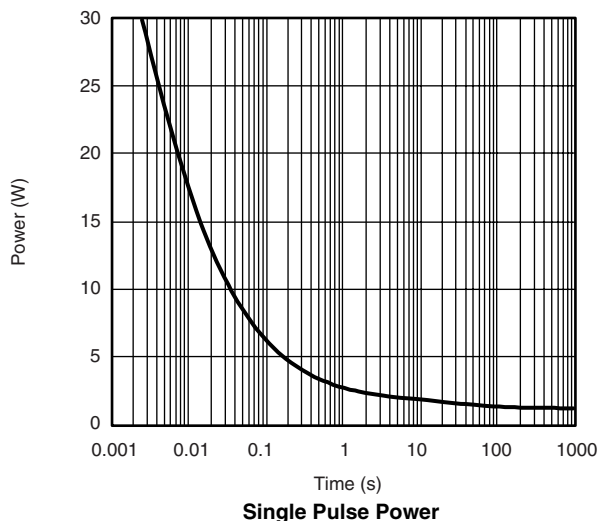
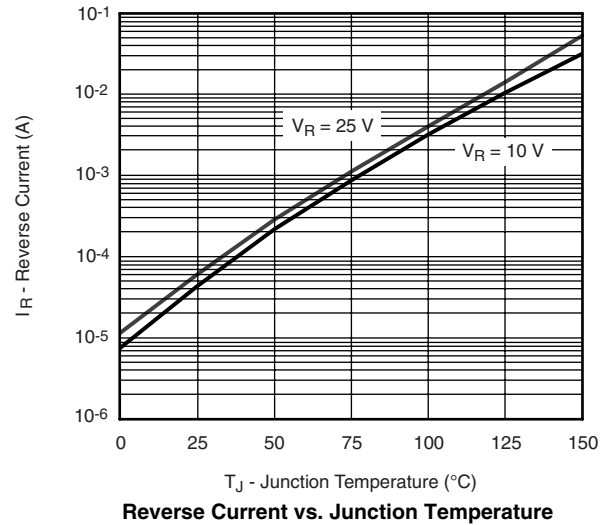
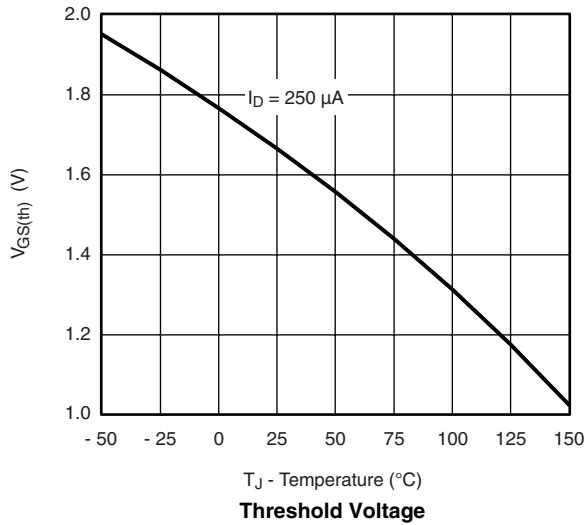
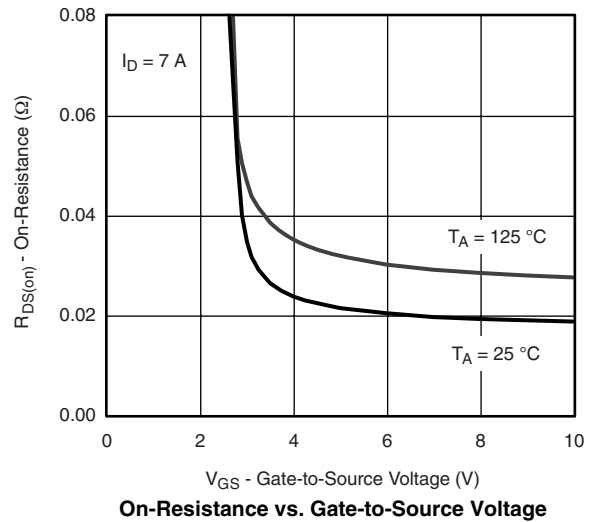
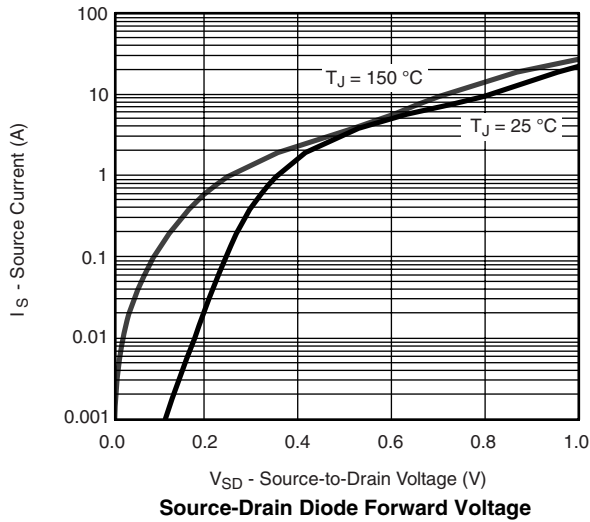


Gate Charge

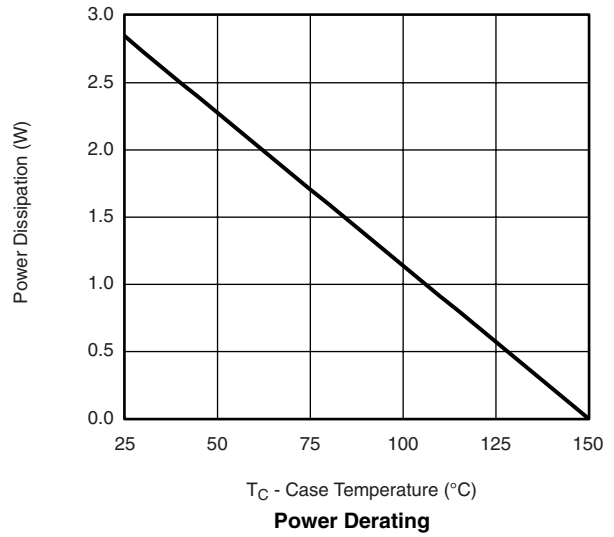
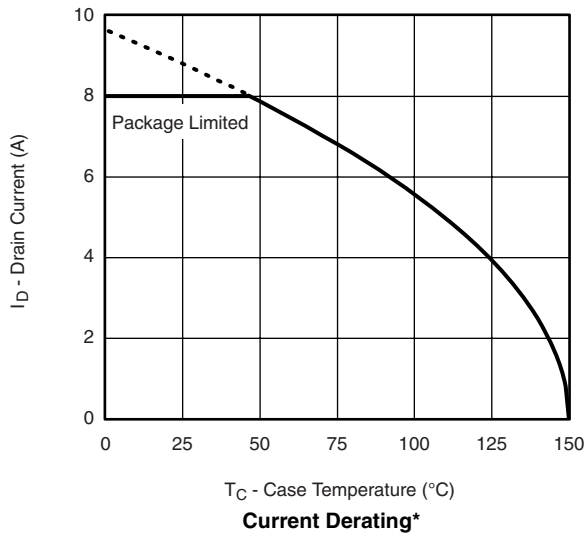


On-Resistance vs. Junction Temperature

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

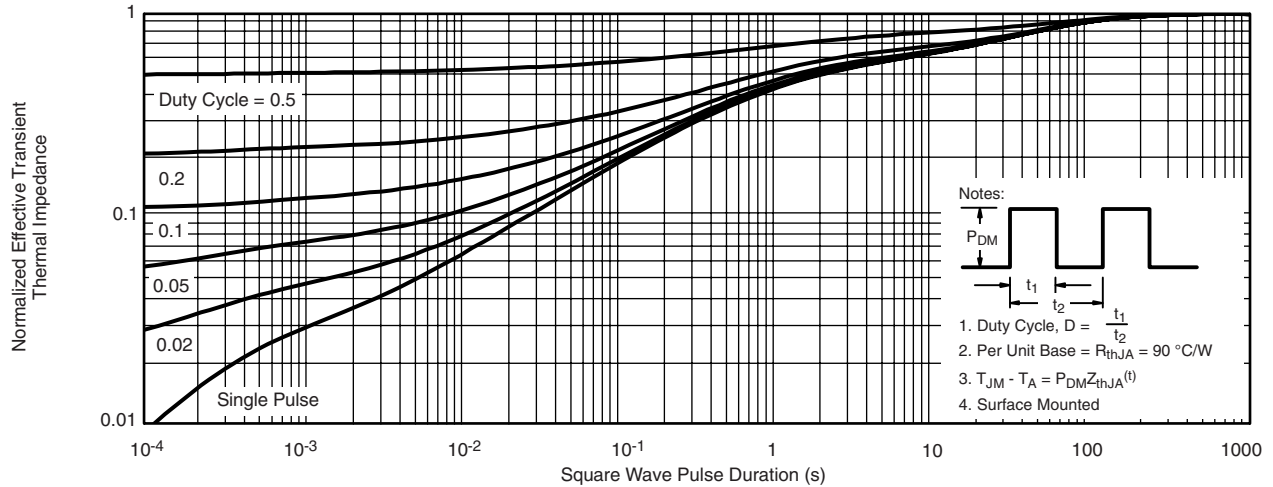


CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

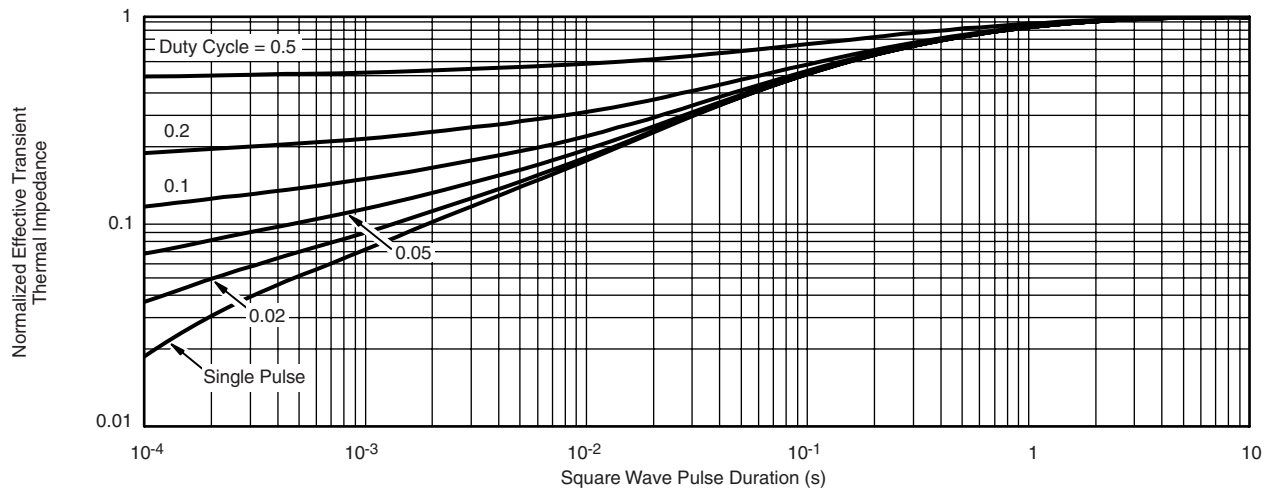


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?69595.

SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



| DIM | MILLIMETERS | | INCHES | |
|--------------------------------|-------------|------|-----------|-------|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | 0.053 | 0.069 |
| A ₁ | 0.10 | 0.20 | 0.004 | 0.008 |
| B | 0.35 | 0.51 | 0.014 | 0.020 |
| C | 0.19 | 0.25 | 0.0075 | 0.010 |
| D | 4.80 | 5.00 | 0.189 | 0.196 |
| E | 3.80 | 4.00 | 0.150 | 0.157 |
| e | 1.27 BSC | | 0.050 BSC | |
| H | 5.80 | 6.20 | 0.228 | 0.244 |
| h | 0.25 | 0.50 | 0.010 | 0.020 |
| L | 0.50 | 0.93 | 0.020 | 0.037 |
| q | 0° | 8° | 0° | 8° |
| S | 0.44 | 0.64 | 0.018 | 0.026 |
| ECN: C-06527-Rev. I, 11-Sep-06 | | | | |
| DWG: 5498 | | | | |

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

[Return to Index](#)



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