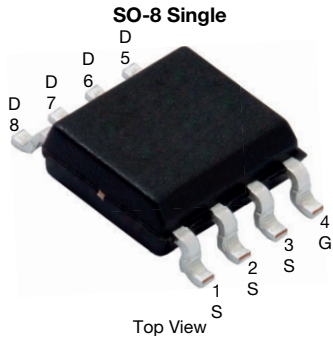


N-Channel 100 V (D-S) MOSFET



FEATURES

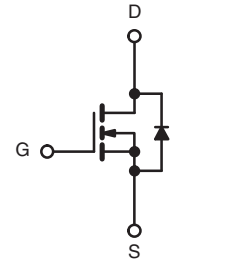
- TrenchFET® power MOSFET
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- DC/DC primary side switch
- Telecom / server
- Motor drive control
- Synchronous rectification



N-Channel MOSFET

| PRODUCT SUMMARY | |
|---|--------|
| V _{DS} (V) | 100 |
| R _{DS(on)} max. (Ω) at V _{GS} = 10 V | 0.0100 |
| R _{DS(on)} max. (Ω) at V _{GS} = 7.5 V | 0.0106 |
| R _{DS(on)} max. (Ω) at V _{GS} = 6 V | 0.0113 |
| Q _g typ. (nC) | 28 |
| I _D (A) ^a | 18.7 |
| Configuration | Single |

| ORDERING INFORMATION | |
|---------------------------------|------------------|
| Package | SO-8 |
| Lead (Pb)-free and halogen-free | SI4090BDY-T1-GE3 |

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted) | | | | |
|---|------------------------|-----------------------------------|----------------------|------|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-source voltage | | V _{DS} | 100 | V |
| Gate-source voltage | | V _{GS} | ± 20 | |
| Continuous drain current (T _J = 150 °C) | T _C = 25 °C | I _D | 18.7 | A |
| | T _C = 70 °C | | 15 | |
| | T _A = 25 °C | | 12.2 ^{b, c} | |
| | T _A = 70 °C | | 9.8 ^{b, c} | |
| Pulsed drain current (t = 300 μs) | | I _{DM} | 80 | |
| Continuous source-drain diode current | T _C = 25 °C | I _S | 6.7 | |
| | T _A = 25 °C | | 2.8 ^{b, c} | |
| Single pulse avalanche current | L = 0.1 mH | I _{AS} | 35 | |
| Avalanche energy | | E _{AS} | 61.25 | mJ |
| Maximum power dissipation | T _C = 25 °C | P _D | 7.4 | W |
| | T _C = 70 °C | | 4.7 | |
| | T _A = 25 °C | | 3.1 ^{b, c} | |
| | T _A = 70 °C | | 2.0 ^{b, c} | |
| 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 ^{b, d} | t ≤ 10 s | R _{thJA} | 33 | 40 | °C/W |
| Maximum junction-to-foot (drain) | Steady state | R _{thJF} | 15 | 17 | |

Notes

- Based on T_C = 25 °C
- Surface mounted on 1" x 1" FR4 board
- t = 10 s
- Maximum under steady state conditions is 90 °C/W



| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | |
|---|--------------------------------------|---|------|--------|--------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | |
| Drain-source breakdown voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | 100 | - | - | V |
| V _{DS} temperature coefficient | ΔV _{DS} /T _J | I _D = 10 mA | - | 70 | - | mV/°C |
| V _{GS(th)} temperature coefficient | ΔV _{GS(th)} /T _J | I _D = 250 μA | - | -7.6 | - | |
| Gate-source threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 2 | - | 4 | V |
| Gate-source leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | - | - | ± 100 | nA |
| Zero gate voltage drain current | I _{DSS} | V _{DS} = 100 V, V _{GS} = 0 V | - | - | 1 | μA |
| | | V _{DS} = 100 V, V _{GS} = 0 V, T _J = 55 °C | - | - | 10 | |
| On-state drain current ^a | I _{D(on)} | V _{DS} ≥ 5 V, V _{GS} = 10 V | 20 | - | - | A |
| Drain-source on-state resistance ^a | R _{DS(on)} | V _{GS} = 10 V, I _D = 12.2 A | - | 0.0084 | 0.0100 | Ω |
| | | V _{GS} = 7.5 V, I _D = 11.8 A | - | 0.0088 | 0.0106 | |
| | | V _{GS} = 6 V, I _D = 11.5 A | - | 0.0094 | 0.0113 | |
| Forward transconductance ^a | g _{fs} | V _{DS} = 15 V, I _D = 12.2 A | - | 98 | - | S |
| Dynamic ^b | | | | | | |
| Input capacitance | C _{ISS} | V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz | - | 3570 | - | pF |
| Output capacitance | C _{OSS} | | - | 250 | - | |
| Reverse transfer capacitance | C _{RSS} | | - | 10 | - | |
| Total gate charge | Q _g | V _{DS} = 50 V, V _{GS} = 10 V, I _D = 12.2 A | - | 46.5 | 70 | nC |
| | | V _{DS} = 50 V, V _{GS} = 6 V, I _D = 12.2 A | - | 28 | 42 | |
| Gate-source charge | Q _{gs} | | - | 17 | - | |
| Gate-drain charge | Q _{gd} | | - | 5 | - | |
| Gate resistance | R _g | f = 1 MHz | 0.12 | 0.6 | 1.2 | Ω |
| Turn-on delay time | t _{d(on)} | V _{DD} = 50 V, R _L = 5 Ω I _D ≅ 10 A, V _{GEN} = 7.5 V, R _g = 1 Ω | - | 18 | 36 | ns |
| Rise time | t _r | | - | 6 | 12 | |
| Turn-off delay time | t _{d(off)} | | - | 30 | 60 | |
| Fall time | t _f | | - | 8 | 16 | |
| Turn-on delay time | t _{d(on)} | V _{DD} = 50 V, R _L = 5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω | - | 22 | 44 | |
| Rise time | t _r | | - | 8 | 16 | |
| Turn-off delay time | t _{d(off)} | | - | 32 | 64 | |
| Fall time | t _f | | - | 10 | 20 | |
| Drain-source Body Diode Characteristics | | | | | | |
| Continuous source-drain diode current | I _S | T _C = 25 °C | - | - | 7 | A |
| Pulse diode forward current ^a | I _{SM} | | - | - | 70 | |
| Body diode voltage | V _{SD} | I _S = 5 A | - | 0.75 | 1.1 | V |
| Body diode reverse recovery time | t _{rr} | I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C | - | 44 | 88 | ns |
| Body diode reverse recovery charge | Q _{rr} | | - | 90 | 180 | nC |
| Reverse recovery fall time | t _a | | - | 37 | - | ns |
| Reverse recovery rise time | t _b | | - | 7 | - | |

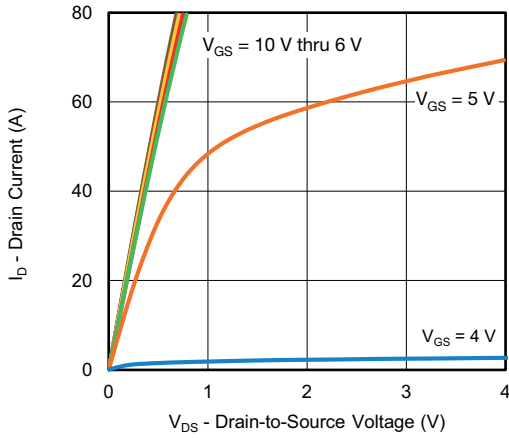
Notes

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

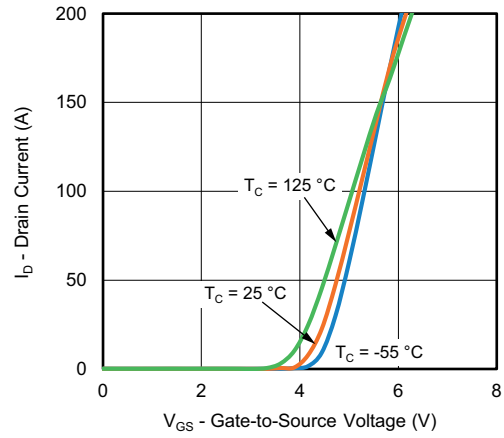
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



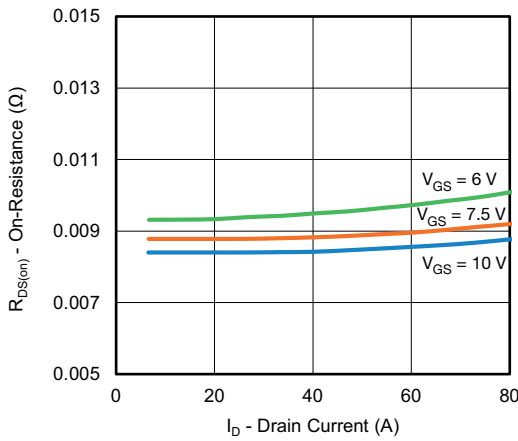
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



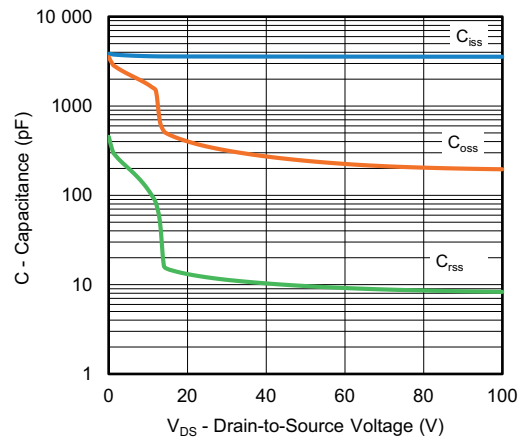
Output Characteristics



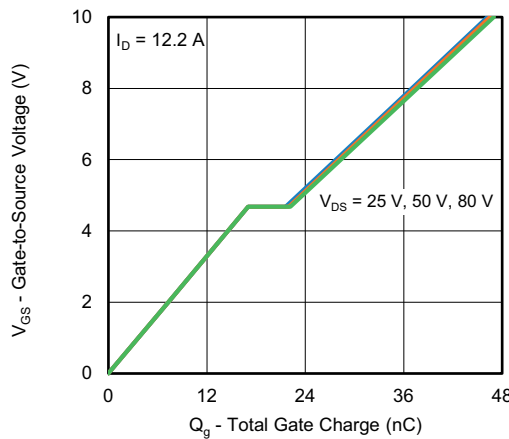
Transfer Characteristics



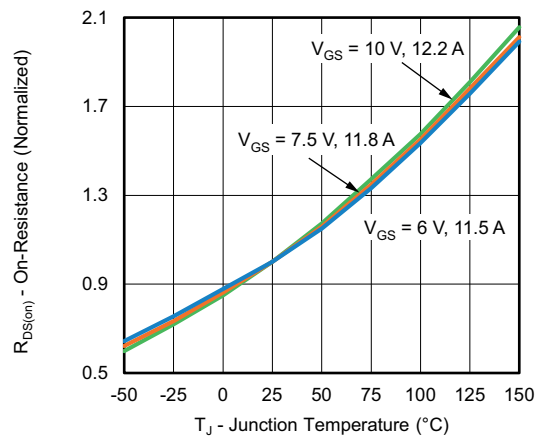
On-Resistance vs. Drain Current



Capacitance



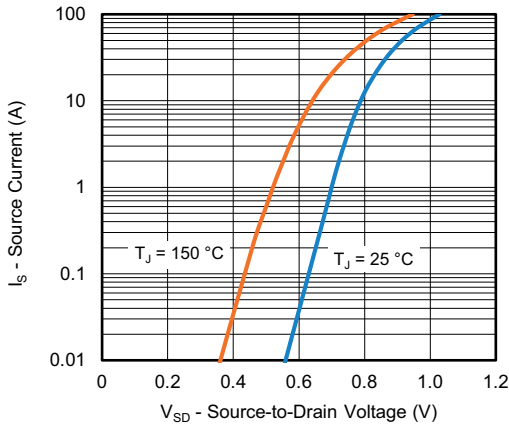
Gate Charge



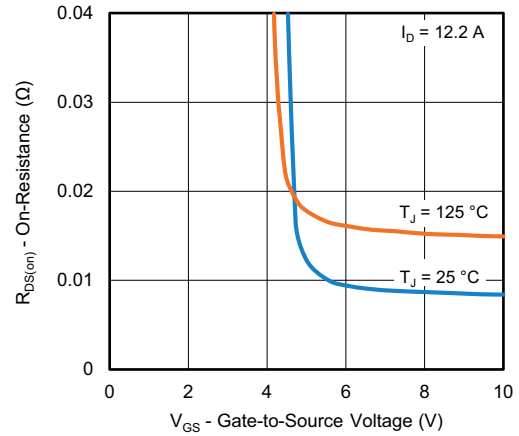
On-Resistance vs. Junction Temperature



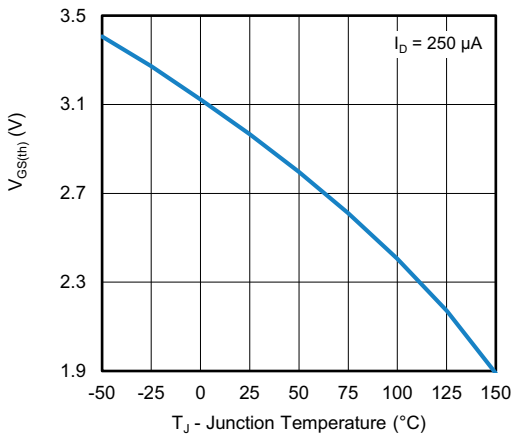
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



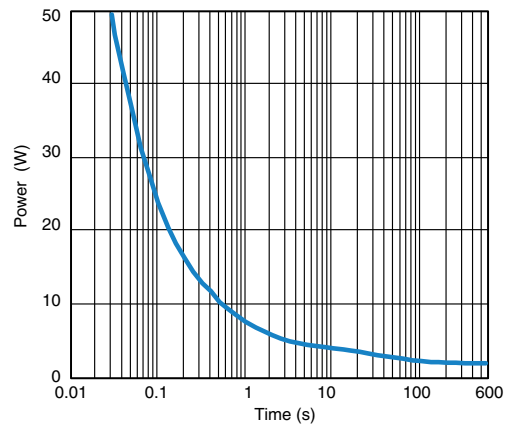
Source-Drain Diode Forward Voltage



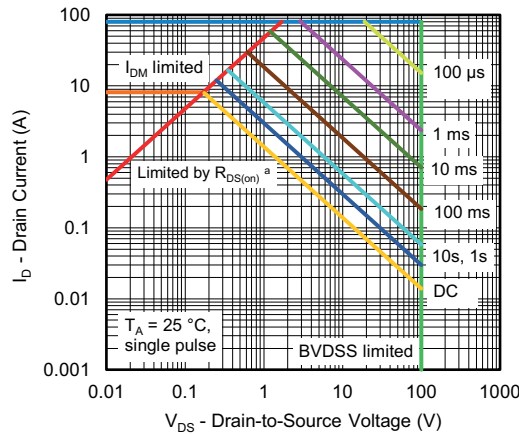
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



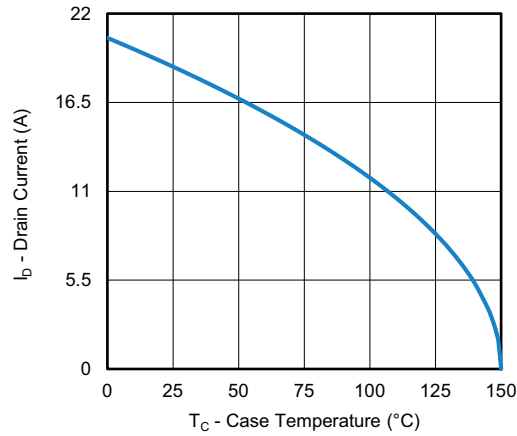
Safe Operating Area, Junction-to-Ambient

Note

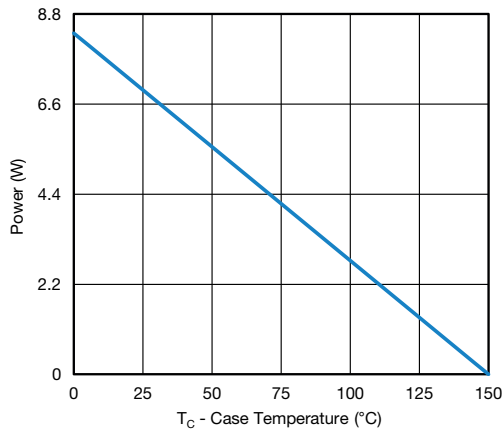
a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



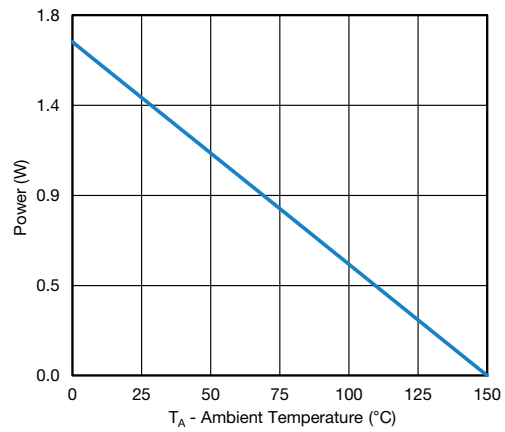
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Foot



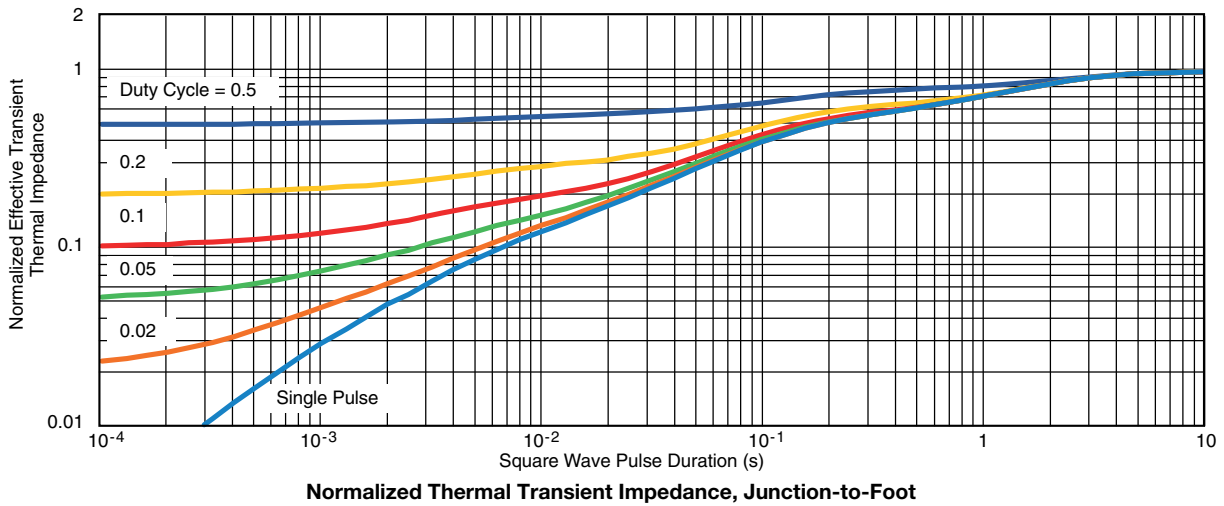
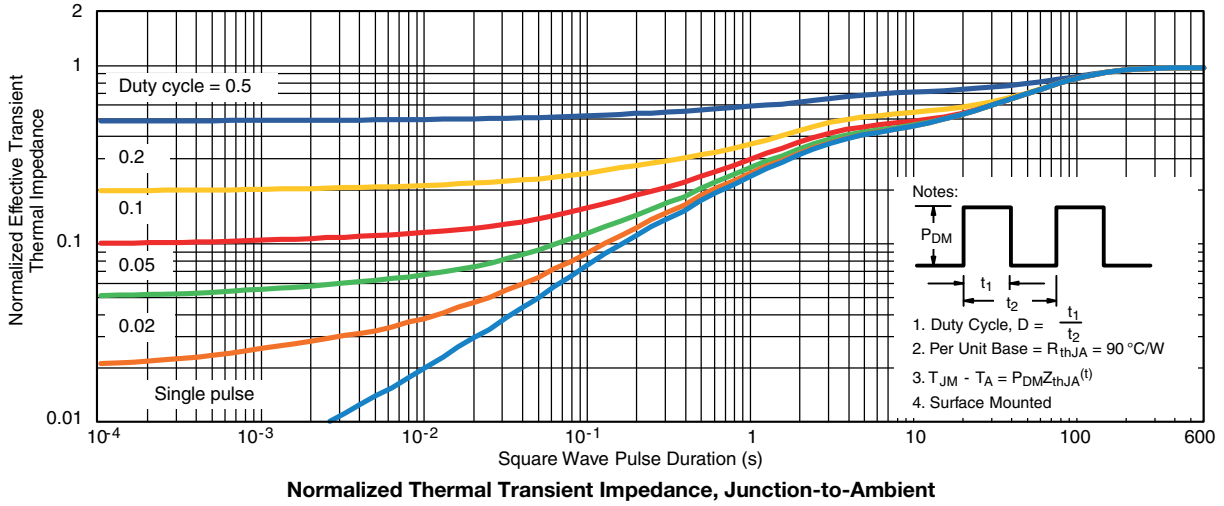
Power, Junction-to-Ambient

Note

- a. 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



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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?63035.

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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