

AO4904-VB Datasheet

Dual N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

PRODUCT SUMMARY

| V_{DS} (V) | $R_{DS(on)}$ (Ω) | I_D (A) | Q_g (Typ.) |
|--------------|---------------------------|-----------|--------------|
| 30 | 0.008 at $V_{GS} = 10$ V | 8 | 15 nC |
| | 0.012 at $V_{GS} = 4.5$ V | 6.8 | |

FEATURES

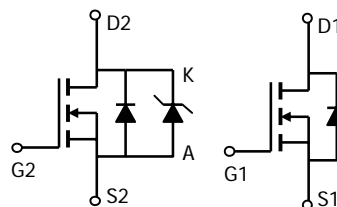
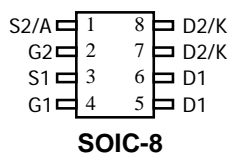
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % UIS Tested
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Set Top Box
- Low Current DC/DC

**Absolute Maximum Ratings** $T_A=25^\circ\text{C}$ unless otherwise noted

| Parameter | Symbol | MOSFET | Schottky | Units |
|---|------------------------|------------|------------|------------------|
| Drain-Source Voltage | V_{DS} | 30 | | V |
| Gate-Source Voltage | V_{GS} | ± 12 | | V |
| Continuous Drain Current ^A | $T_A=25^\circ\text{C}$ | 8 | | A |
| | $T_A=70^\circ\text{C}$ | 6.8 | | |
| Pulsed Drain Current ^B | I_{DM} | 40 | | |
| Schottky reverse voltage | V_{KA} | | 30 | V |
| Continuous Forward Current ^A | $T_A=25^\circ\text{C}$ | | 3 | A |
| | $T_A=70^\circ\text{C}$ | | 2 | |
| Pulsed Forward Current ^B | I_{FM} | | 40 | |
| Power Dissipation | $T_A=25^\circ\text{C}$ | 2 | 2 | W |
| | $T_A=70^\circ\text{C}$ | 1.44 | 1.44 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | -55 to 150 | $^\circ\text{C}$ |

| Parameter: Thermal Characteristics MOSFET | | Symbol | Typ | Max | Units |
|---|--------------|------------------|------|------|-------|
| Maximum Junction-to-Ambient ^A | t ≤ 10s | R _{θJA} | 48 | 62.5 | °C/W |
| Maximum Junction-to-Ambient ^A | Steady-State | | 74 | 110 | |
| Maximum Junction-to-Lead ^C | Steady-State | R _{θJL} | 35 | 40 | |
| Thermal Characteristics Schottky | | | | | |
| Maximum Junction-to-Ambient ^A | t ≤ 10s | R _{θJA} | 47.5 | 62.5 | °C/W |
| Maximum Junction-to-Ambient ^A | Steady-State | | 71 | 110 | |
| Maximum Junction-to-Lead ^C | Steady-State | R _{θJL} | 32 | 40 | |

| SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted | | | | | | |
|--|-------------------------|--|------|-------|-----------|------------------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 30 | | | V |
| V_{DS} Temperature Coefficient | $\Delta V_{DS}/T_J$ | $I_D = 250\text{ }\mu\text{A}$ | | 32 | | mV/ $^{\circ}\text{C}$ |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | | | - 5.0 | | |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 1.0 | | 2.5 | V |
| Gate-Source Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$ | | | 10 | |
| On-State Drain Current ^a | $I_{D(on)}$ | $V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$ | 10 | | | A |
| Drain-Source On-State Resistance ^a | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 5\text{ A}$ | | 0.008 | | Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 4\text{ A}$ | | 0.012 | | |
| Forward Transconductance ^a | g_{fs} | $V_{DS} = 10\text{ V}, I_D = 5\text{ A}$ | | 16 | | S |
| Dynamic ^b | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | | 586 | | pF |
| Output Capacitance | C_{oss} | | | 117 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 55 | | |
| Total Gate Charge | Q_g | $V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$ | | 15 | | nC |
| Gate-Source Charge | Q_{gs} | $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$ | | 3.7 | 5.6 | |
| Gate-Drain Charge | Q_{gd} | | | 1.4 | | |
| | | | | 1.05 | | |
| Gate Resistance | R_g | $f = 1\text{ MHz}$ | 0.8 | 4.3 | 8.6 | Ω |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$ | | 12 | 24 | ns |
| Rise Time | t_r | | | 55 | 100 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 11 | 22 | |
| Fall Time | t_f | | | 8 | 16 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$ | | 4 | 8 | |
| Rise Time | t_r | | | 9 | 18 | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 10 | 20 | |
| Fall Time | t_f | | | 6 | 12 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source-Drain Diode Current | I_S | $T_C = 25\text{ }^{\circ}\text{C}$ | | | 2.25 | A |
| Pulse Diode Forward Current | I_{SM} | | | | 24 | |
| Body Diode Voltage | V_{SD} | $I_S = 2\text{ A}, V_{GS} = 0\text{ V}$ | | 0.8 | 1.2 | V |
| Body Diode Reverse Recovery Time | t_{rr} | $I_F = 5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$ | | 11 | 20 | ns |
| Body Diode Reverse Recovery Charge | Q_{rr} | | | 4 | 8 | nC |
| Reverse Recovery Fall Time | t_a | | | 7 | | ns |
| Reverse Recovery Rise Time | t_b | | | 4 | | |

Notes:

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

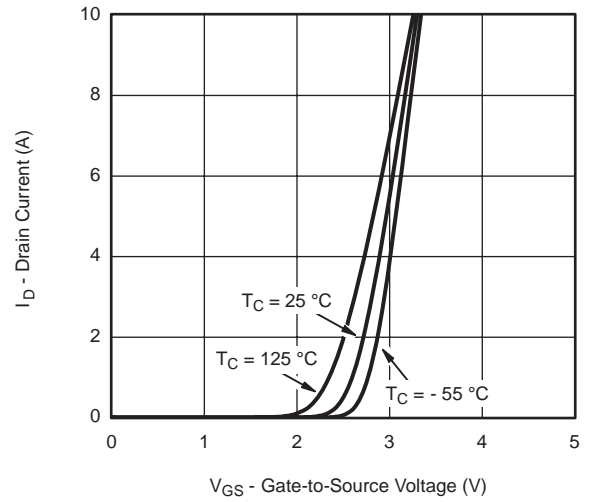
b. Guaranteed by design, not subject to production testing.

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.

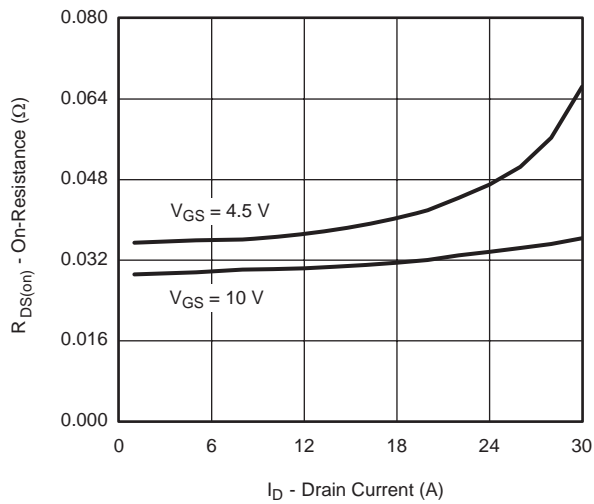
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



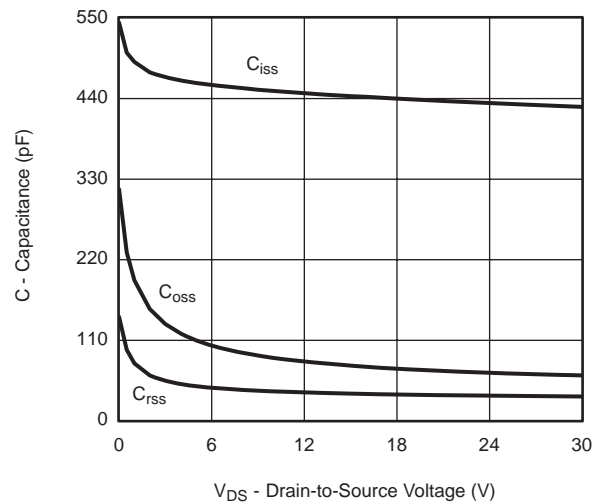
Output Characteristics



Transfer Characteristics



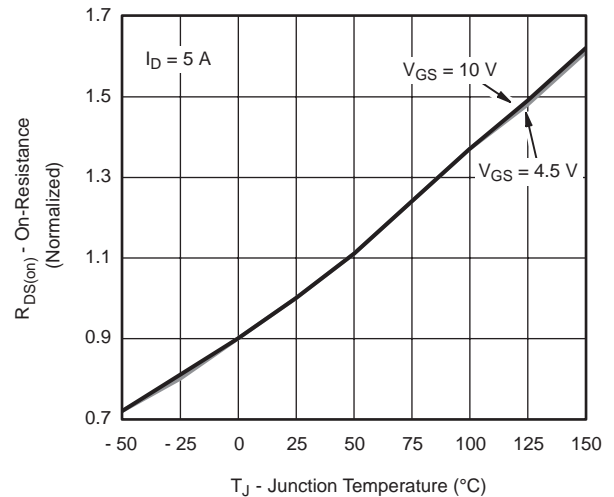
On-Resistance vs. Drain Current



Capacitance

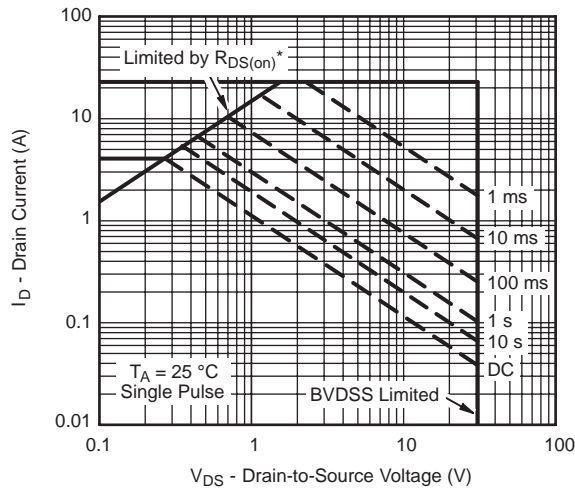
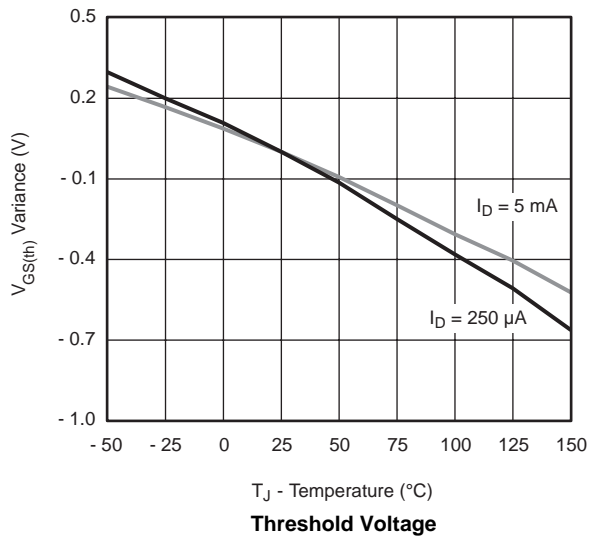
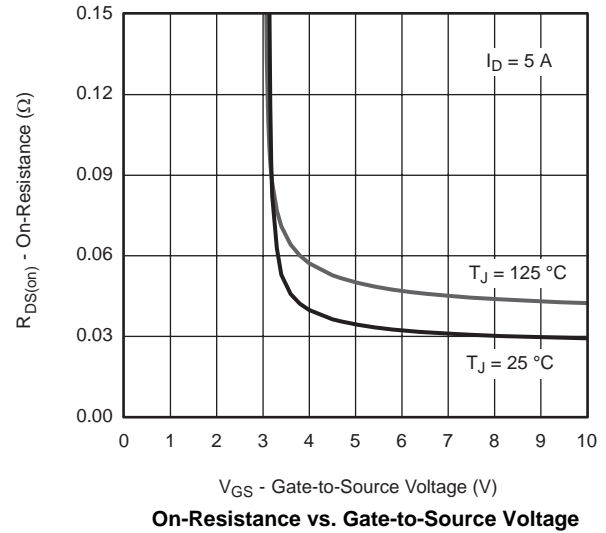
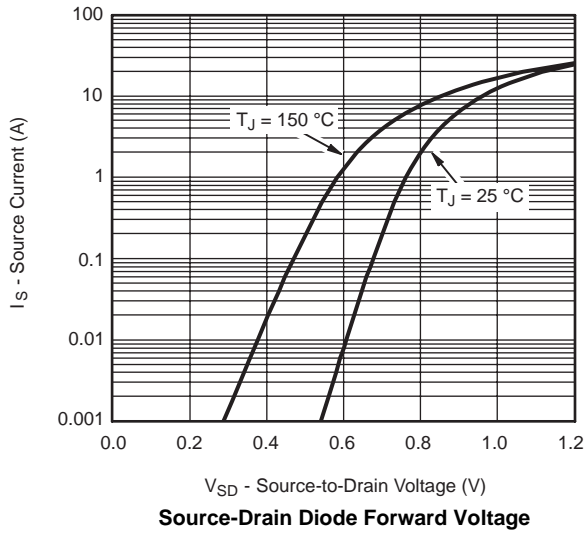


Gate Charge



On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

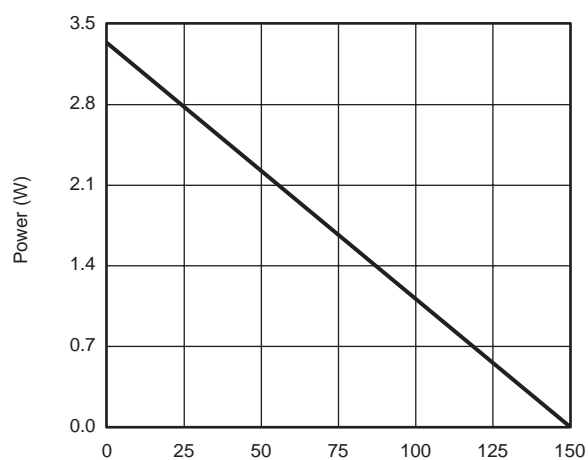


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

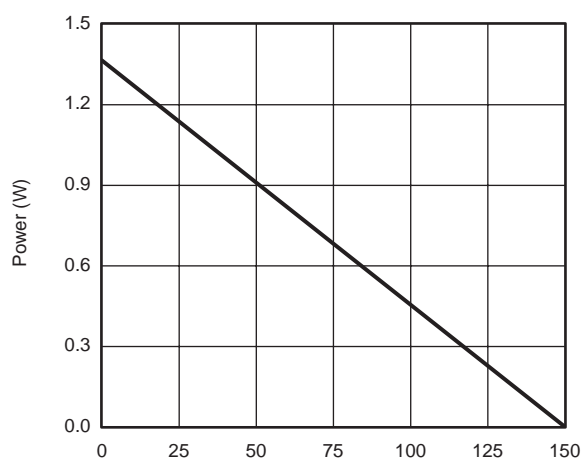
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


T_C - Case Temperature (°C)
Current Derating*

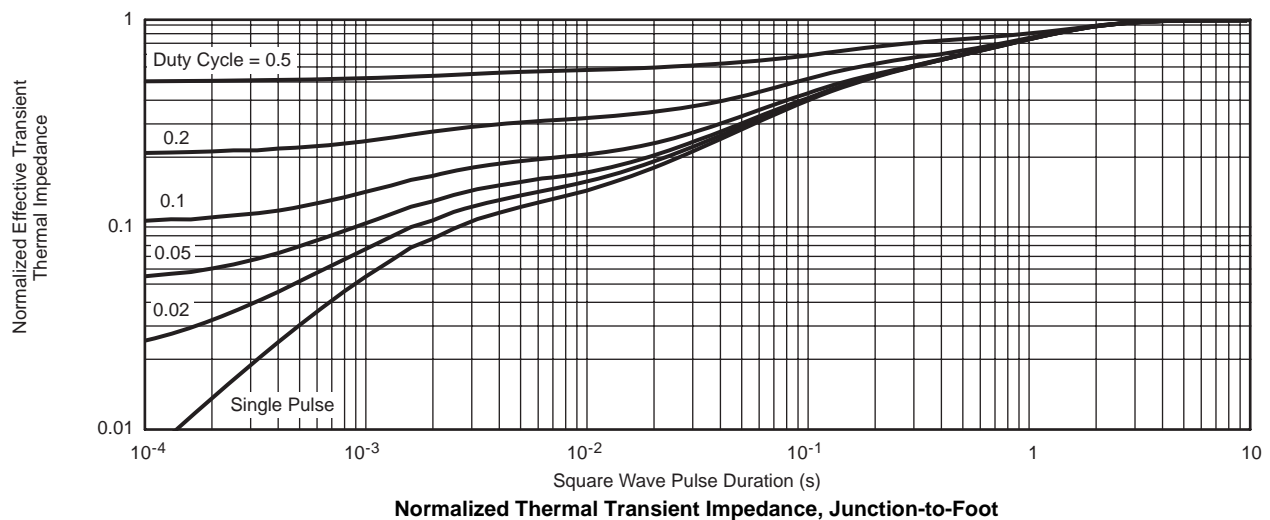
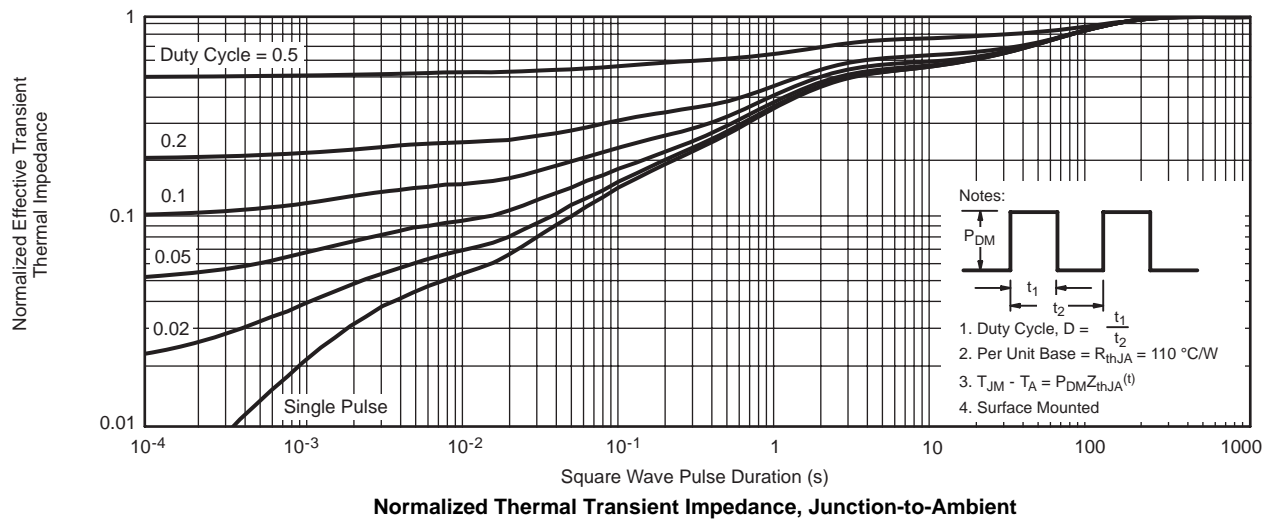


T_C - Case Temperature (°C)
Power, Junction-to-Foot

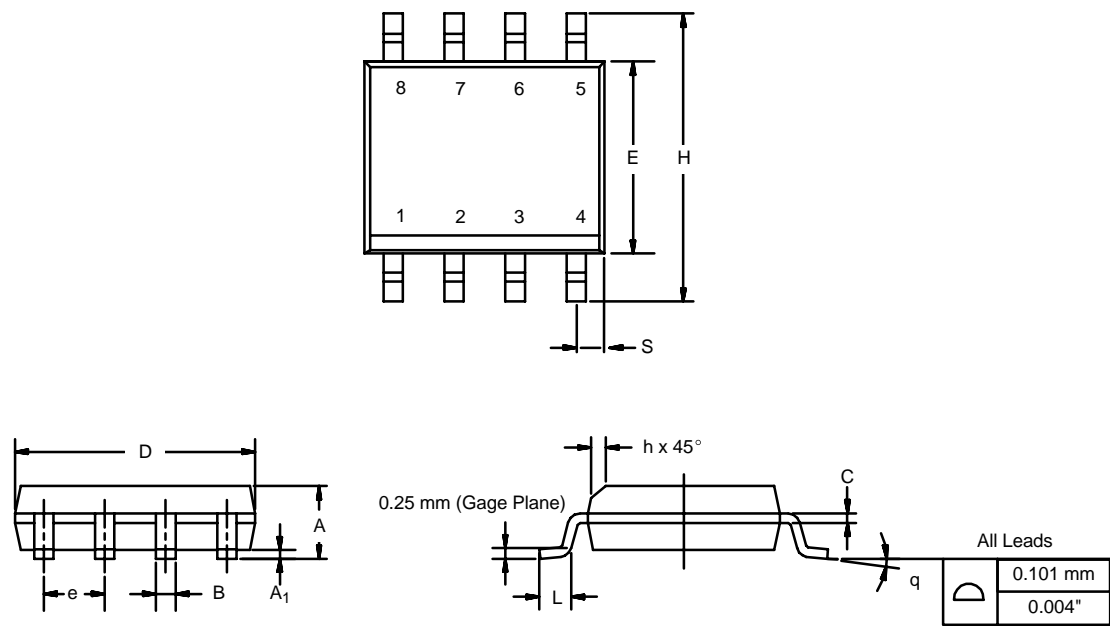


T_A - Ambient Temperature (°C)
Power, Junction-to-Ambient

* 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.

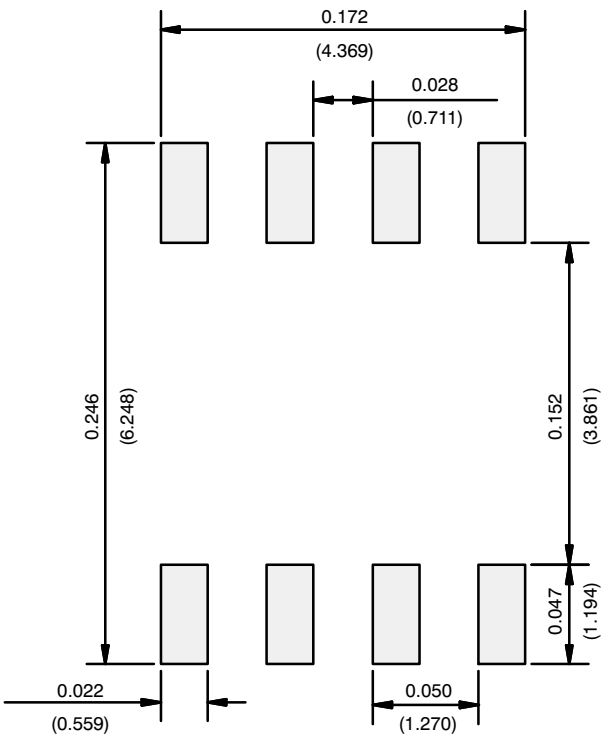
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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)

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