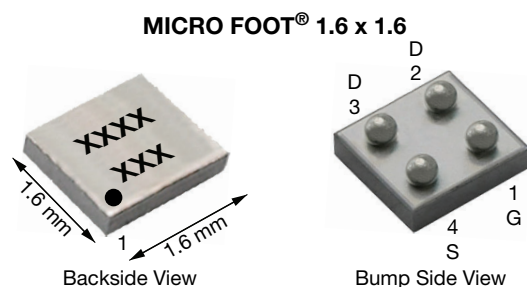


P-Channel 20 V (D-S) MOSFET



FEATURES

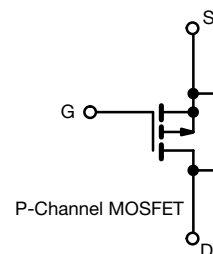
- TrenchFET® Gen III p-channel power MOSFET
- Low 0.6 mm maximum height
- Low on-resistance
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load switch
 - With low voltage drop
- Power management in battery-operated, mobile, and wearable devices



| PRODUCT SUMMARY | |
|---|-------------------|
| V_{DS} (V) | -20 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = -4.5$ V | 0.021 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = -2.5$ V | 0.025 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = -1.8$ V | 0.039 |
| Q_g typ. (nC) | 31.2 |
| I_D (A) | -9.7 ^a |
| Configuration | Single |

| ORDERING INFORMATION | |
|---------------------------------|----------------|
| Package | MICRO FOOT |
| Lead (Pb)-free and halogen-free | Si8481DB-T1-E1 |

| ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted) | | | | |
|---|------------------------|-----------------------------------|--------------------|------|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-source voltage | | V _{DS} | -20 | V |
| Gate-source voltage | | V _{GS} | ± 8 | |
| Continuous drain current (T _J = 150 °C) | T _A = 25 °C | I _D | -9.7 ^a | A |
| | T _A = 70 °C | | -7.8 ^a | |
| | T _A = 25 °C | | -6.2 ^b | |
| | T _A = 70 °C | | -5 ^b | |
| Pulsed drain current (t = 100 μs) | | I _{DM} | -30 | |
| Continuous source-drain diode current | T _A = 25 °C | I _S | -2.3 ^a | |
| | T _A = 70 °C | | -0.92 ^b | |
| Maximum power dissipation | T _A = 25 °C | P _D | 2.8 ^a | W |
| | T _A = 70 °C | | 1.8 ^a | |
| | T _A = 25 °C | | 1.1 ^b | |
| | T _A = 70 °C | | 0.73 ^b | |
| Operating junction and storage temperature range | | T _J , T _{stg} | -55 to +150 | |
| Package reflow conditions ^c | | VPR | 260 | °C |
| | | IR / convection | | |

| THERMAL RESISTANCE RATINGS | | | | |
|---|---------|------------|---------|---------|
| PARAMETER | | SYMBOL | TYPICAL | MAXIMUM |
| Maximum junction-to-ambient ^{a, f} | t = 5 s | R_{thJA} | 35 | 45 |
| Maximum junction-to-ambient ^{b, g} | | | 85 | 110 |

Notes

- Surface mounted on 1" x 1" FR4 board with full copper, t = 5 s.
- Surface mounted on 1" x 1" FR4 board with minimum copper, t = 5 s.
- Refer to IPC / JEDEC® (J-STD-020), no manual or hand soldering.
- In this document, any reference to case represents the body of the MICRO FOOT device and foot is the bump.
- Based on $T_A = 25^\circ\text{C}$.
- Maximum under steady state conditions is 85°C/W .
- Maximum under steady state conditions is 175°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 | -20 | - | - | V |
| V _{DS} temperature coefficient | ΔV _{DS} /T _J | I _D = -250 μA | - | -13 | - | mV/°C |
| V _{GS(th)} temperature coefficient | ΔV _{GS(th)} /T _J | | - | 2.5 | - | |
| Gate-source threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = -250 μA | -0.4 | - | -0.9 | V |
| Gate-source leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 8 V | - | - | ± 100 | nA |
| Zero gate voltage drain current | I _{DSS} | V _{DS} = -20 V, V _{GS} = 0 V | - | - | -1 | μA |
| | | V _{DS} = -20 V, V _{GS} = 0 V, T _J = 55 °C | - | - | -10 | |
| On-state drain current ^a | I _{D(on)} | V _{DS} ≤ -5 V, V _{GS} = -4.5 V | -5 | - | - | A |
| Drain-source on-state resistance ^a | R _{DS(on)} | V _{GS} = -4.5 V, I _D = -3 A | - | 0.017 | 0.021 | Ω |
| | | V _{GS} = -2.5 V, I _D = -3 A | - | 0.020 | 0.025 | |
| | | V _{GS} = -1.8 V, I _D = -1 A | - | 0.026 | 0.039 | |
| Forward transconductance ^a | g _{fs} | V _{DS} = -5 V, I _D = -3 A | - | 22 | - | S |
| Dynamic ^b | | | | | | |
| Input capacitance | C _{iss} | V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz | - | 2500 | - | pF |
| Output capacitance | C _{oss} | | - | 320 | - | |
| Reverse transfer capacitance | C _{rss} | | - | 260 | - | |
| Total gate charge | Q _g | V _{DS} = -10 V, V _{GS} = -8 V, I _D = -3 A | - | 54 | 81 | nC |
| | | V _{DS} = -10 V, V _{GS} = -4.5 V, I _D = -3 A | - | 31.2 | 47 | |
| Gate-source charge | Q _{gs} | V _{DS} = -10 V, V _{GS} = -4.5 V, I _D = -3 A | - | 2.7 | - | |
| Gate-drain charge | Q _{gd} | | - | 6.3 | - | |
| Gate resistance | R _g | f = 1 MHz | - | 17 | - | Ω |
| Turn-on delay time | t _{d(on)} | V _{DD} = -10 V, R _L = 3.3 Ω, I _D ≅ -3 A, V _{GEN} = -4.5 V, R _g = 1 Ω | - | 16 | 30 | ns |
| Rise time | t _r | | - | 25 | 50 | |
| Turn-off delay time | t _{d(off)} | | - | 300 | 600 | |
| Fall time | t _f | | - | 110 | 220 | |
| Turn-on delay time | t _{d(on)} | V _{DD} = -10 V, R _L = 3.3 Ω, I _D ≅ -3 A, V _{GEN} = -8 V, R _g = 1 Ω | - | 7 | 15 | |
| Rise time | t _r | | - | 20 | 40 | |
| Turn-off delay time | t _{d(off)} | | - | 400 | 800 | |
| Fall time | t _f | | - | 110 | 220 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous source-drain diode current | I _S | T _A = 25 °C | - | - | -2.3 ^c | A |
| Pulse diode forward current | I _{SM} | | - | - | -15 | |
| Body diode voltage | V _{SD} | I _S = -3 A, V _{GS} = 0 V | - | -0.8 | -1.2 | V |
| Body diode reverse recovery time | t _{rr} | I _F = -3 A, dI/dt = 100 A/μs, T _J = 25 °C | - | 150 | 300 | ns |
| Body diode reverse recovery charge | Q _{rr} | | - | 235 | 470 | nC |
| Reverse recovery fall time | t _a | | - | 47 | - | ns |
| Reverse recovery rise time | t _b | | - | 103 | - | |

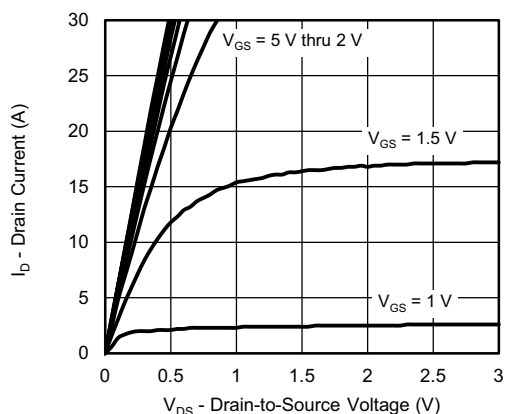
Notes

- Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Guaranteed by design, not subject to production testing.
- Surface mounted on 1" x 1" FR4 board with full copper, $t = 5\text{ s}$.

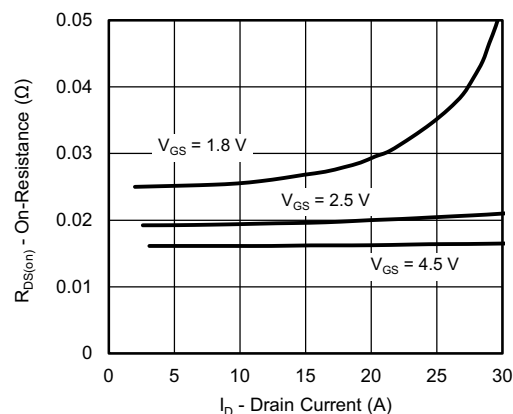
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



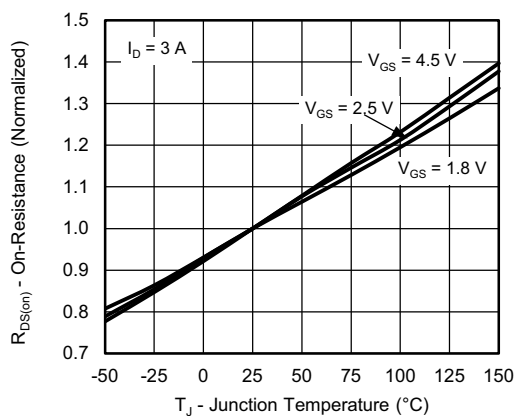
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



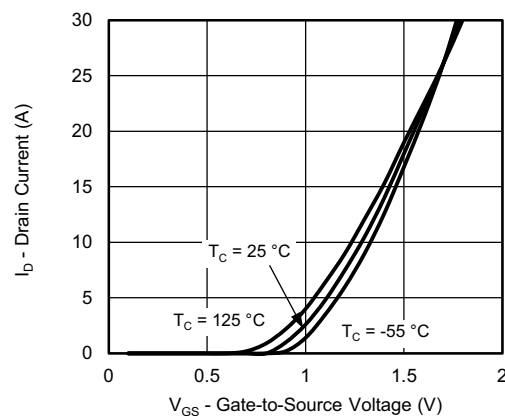
Output Characteristics



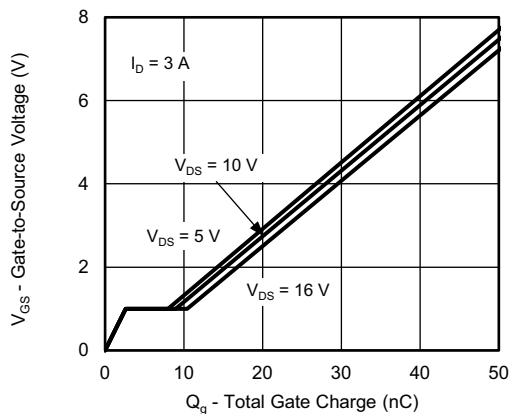
On-Resistance vs. Drain Current and Gate Voltage



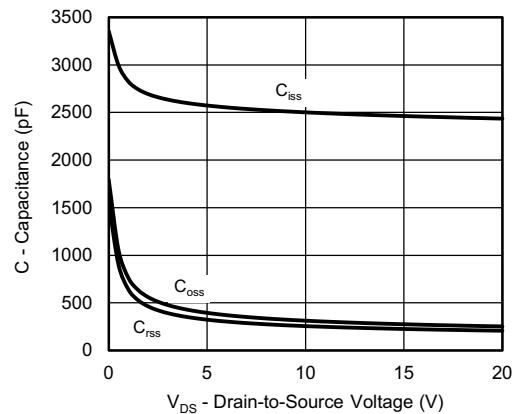
On-Resistance vs. Junction Temperature



Transfer Characteristics



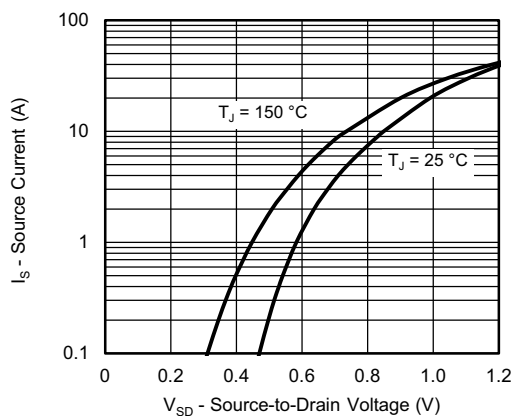
Gate Charge



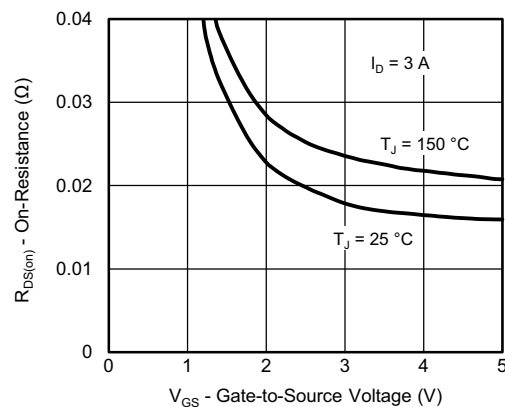
Capacitance



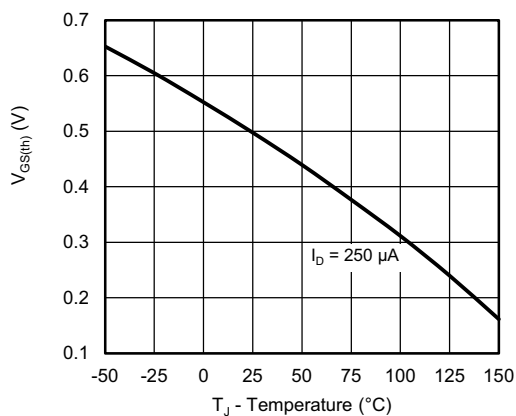
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



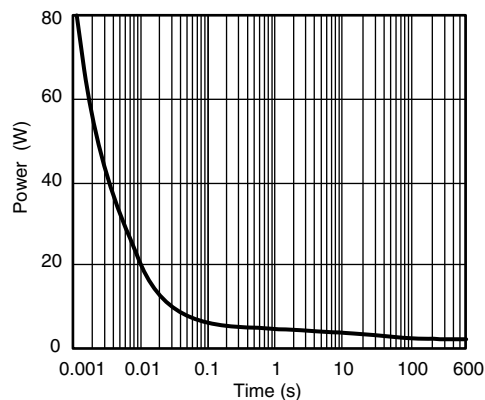
Source-Drain Diode Forward Voltage



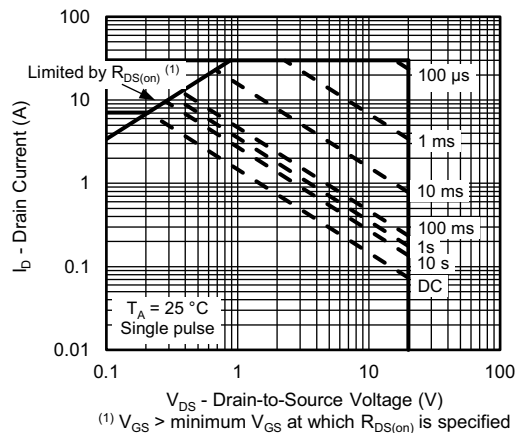
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



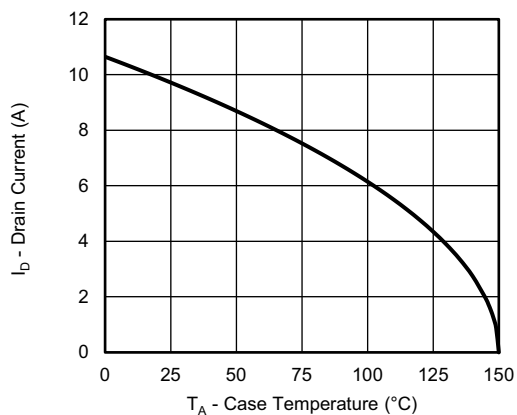
Single Pulse Power, Junction-to-Ambient



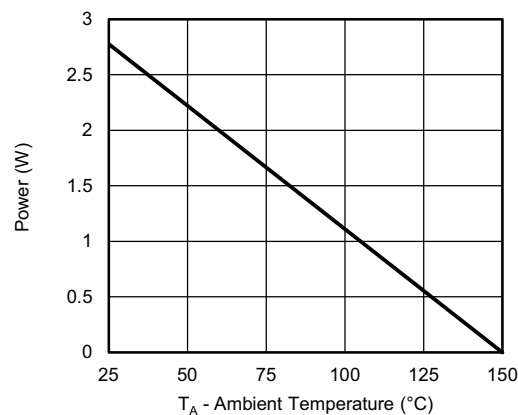
Safe Operating Area, Junction-to-Ambient



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



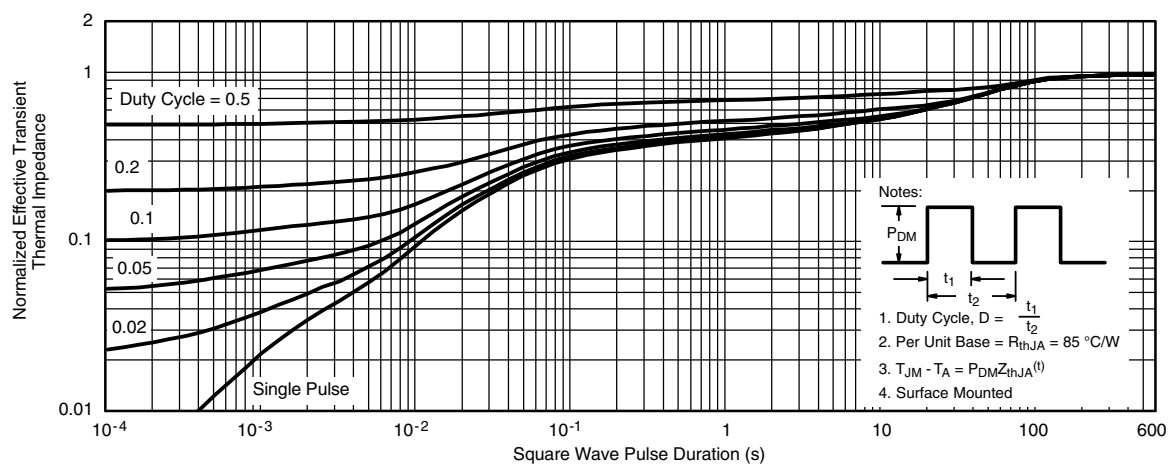
Current Derating ^a



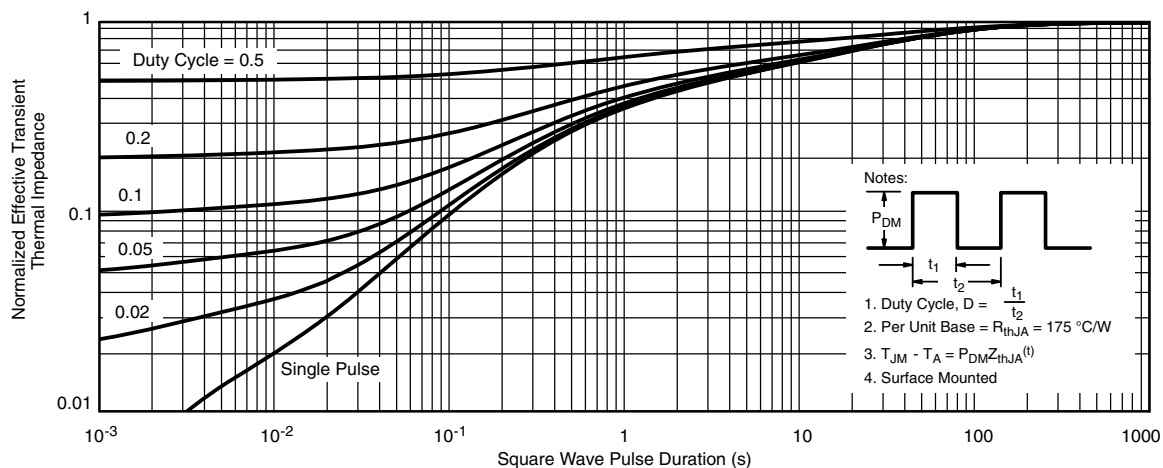
Power, Junction-to-Ambient ^a

Note

a. When surface mounted on 1" x 1" FR4 board with full copper, $t = 5$ s.



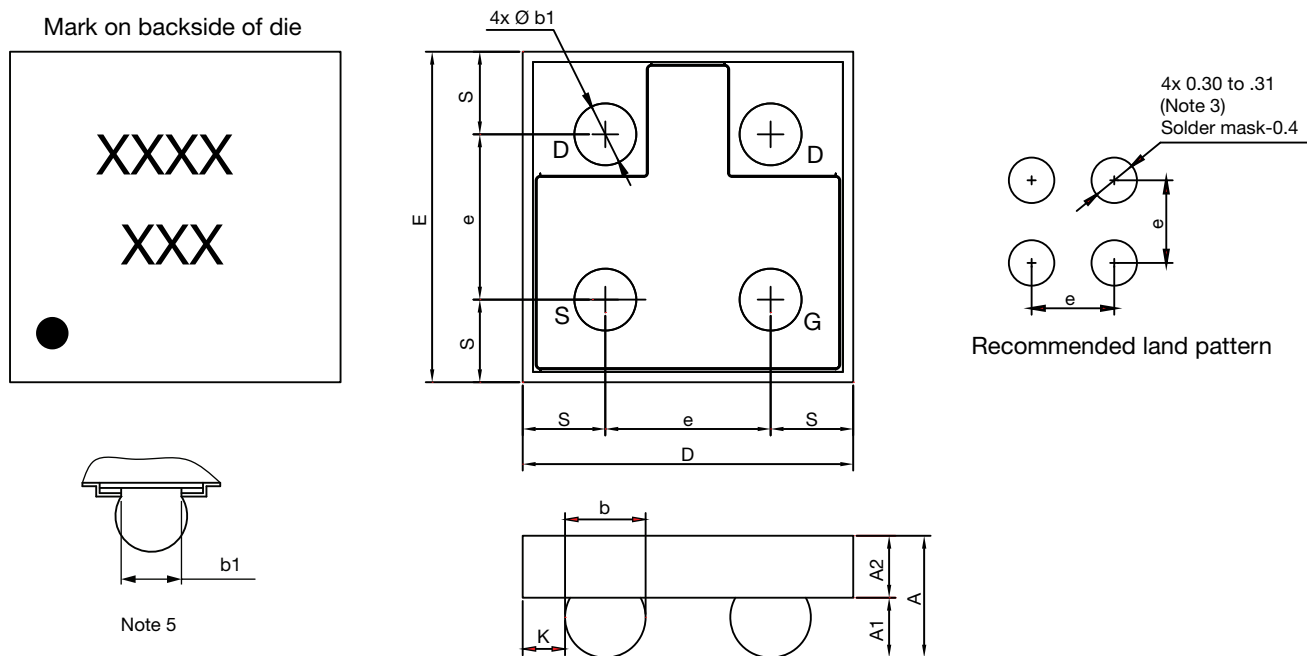
Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with maximum copper)

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with minimum copper)

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MICRO FOOT®: 4-Bumps (1.6 mm x 1.6 mm, 0.8 mm Pitch, 0.290 mm Bump Height)



Notes

- Bumps are 95.5/3.8/0.7 Sn/Ag/Cu.
- Backside surface is coated with a Ti/Ni/Ag layer.
- Non-solder mask defined copper landing pad.
- Laser marks on the silicon die back.
- "b1" is the diameter of the solderable substrate surface, defined by an opening in the solder resist layer solder mask defined.
- is the location of pin 1

| DIM. | MILLIMETERS | | | INCHES | | |
|------|-------------|-------|-------|--------|--------|--------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 0.550 | 0.575 | 0.600 | 0.0217 | 0.0226 | 0.0236 |
| A1 | 0.260 | 0.275 | 0.290 | 0.0102 | 0.0108 | 0.0114 |
| A2 | 0.290 | 0.300 | 0.310 | 0.0114 | 0.0118 | 0.0122 |
| b | 0.370 | 0.390 | 0.410 | 0.0146 | 0.0153 | 0.0161 |
| b1 | 0.300 | | | 0.0118 | | |
| e | 0.800 | | | 0.0314 | | |
| s | 0.360 | 0.380 | 0.400 | 0.0141 | 0.0150 | 0.0157 |
| D | 1.520 | 1.560 | 1.600 | 0.0598 | 0.0614 | 0.0630 |
| E | 1.520 | 1.560 | 1.600 | 0.0598 | 0.0614 | 0.0630 |
| K | 0.155 | 0.185 | 0.215 | 0.0061 | 0.0073 | 0.0085 |

Note

- Use millimeters as the primary measurement.

ECN: T15-0175-Rev. A, 27-Apr-15
DWG: 6038



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