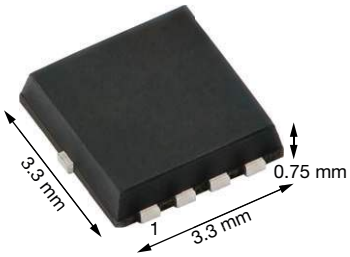
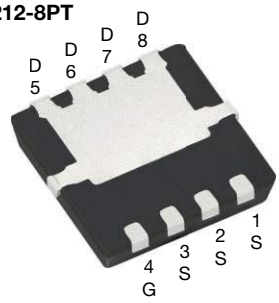
# N-Channel 30 V (D-S) MOSFET

**PowerPAK® 1212-8PT**




Top View




Bottom View

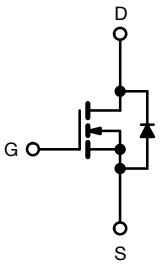
## FEATURES

- TrenchFET® Gen IV 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

- High power density DC/DC
- Synchronous rectification
- VRMs and embedded DC/DC
- Battery protection




N-Channel MOSFET

| PRODUCT SUMMARY | |
|---|---|
| $V_{DS}$ (V) | 30 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS}$ = 10 V | 0.0036 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS}$ = 4.5 V | 0.0050 |
| $Q_g$ typ. (nC) | 11.7 |
| $I_D$ (A) | 104 [a] |
| Configuration | Single |

| ORDERING INFORMATION | |
|---|---|
| Package | PowerPAK 1212-8PT |
| Lead (Pb)-free and halogen-free | SiSA10BDN-T1-GE3 |

**ABSOLUTE MAXIMUM RATINGS** ($T_A$ = 25 °C, unless otherwise noted)

| PARAMETER | | SYMBOL | LIMIT | UNIT |
|---|---|---|---|---|
| Drain-source voltage | | $V_{DS}$ | 30 | V |
| Gate-source voltage | | $V_{GS}$ | +20, -16 | |
| Continuous drain current ($T_J$ = 150 °C) | $T_C$ = 25 °C | $I_D$ | 104 | A |
| | $T_C$ = 70 °C | | 83 | |
| | $T_A$ = 25 °C | | 26 [b, c] | |
| | $T_A$ = 70 °C | | 21 [b, c] | |
| Pulsed drain current (t = 100 µs) | | $I_{DM}$ | 150 | |
| Continuous source-drain diode current | $T_C$ = 25 °C | $I_S$ | 57 | |
| | $T_A$ = 25 °C | | 3.4 [b, c] | |
| Single pulse avalanche current | L = 0.1 mH | $I_{AS}$ | 20 | |
| Single pulse avalanche energy | | $E_{AS}$ | 20 | mJ |
| Maximum power dissipation | $T_C$ = 25 °C | $P_D$ | 63 | W |
| | $T_C$ = 70 °C | | 40 | |
| | $T_A$ = 25 °C | | 3.8 [b, c] | |
| | $T_A$ = 70 °C | | 2.4 [b, c] | |
| Operating junction and storage temperature range | | $T_J$, $T_{stg}$ | -55 to +150 | °C |
| Soldering recommendations (peak temperature) [d, e] | | | 260 | |

**Notes**

a. Based on $T_C$ = 25 °C
b. Surface mounted on 1" x 1" FR4 board
c. t = 10 s
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK 1212-8PT is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection
e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components

| THERMAL RESISTANCE RATINGS | | | | | |
|---|---|---|---|---|---|
| **PARAMETER** | | **SMYBOL** | **TYPICAL** | **MAXIMUM** | **UNIT** |
| Maximum junction-to-ambient [a, b] | t ≤ 10 s | $R_{thJA}$ | 26 | 33 | °C/W |
| Maximum junction-to-case (drain) | Steady state | $R_{thJC}$ | 1.6 | 2 | |

**Notes**

a. Surface mounted on 1" x 1" FR4 board

b. Maximum under steady state conditions is 67 °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 | 30 | - | - | V |
| Drain-source breakdown voltage [c] (transient) | $V_{DSt}$ | $V_{GS}$ = 0 V, $I_{D(aval)}$ = 70 A, $t_{transcient}$ ≤ 50 ns | 36 | - | - | |
| $V_{DS}$ temperature coefficient | $\Delta V_{DS}/T_J$ | $I_D$ = 250 µA | - | 18 | - | mV/°C |
| $V_{GS(th)}$ temperature coefficient | $\Delta V_{GS(th)}/T_J$ | | - | -3.8 | - | |
| Gate-source threshold voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 1.2 | - | 2.4 | V |
| Gate-source leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = +20, -16 V | - | - | ± 100 | nA |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V | - | - | 1 | µA |
| | | $V_{DS}$ = 30 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 | 25 | - | - | A |
| Drain-source on-state resistance [a] | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 10 A | - | 0.0023 | 0.0036 | Ω |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 7 A | - | 0.0035 | 0.0050 | |
| Forward transconductance [a] | $g_{fs}$ | $V_{DS}$ = 10 V, $I_D$ = 20 A | - | 68 | - | S |
| **Dynamic [b]** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | - | 1710 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 655 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 68 | - | |
| $C_{rss}/C_{iss}$ ratio | | | - | 0.040 | 0.080 | |
| Total gate charge | $Q_g$ | $V_{DS}$ = 15 V, $V_{GS}$ = 10 V, $I_D$ = 10 A | - | 24.1 | 36.2 | nC |
| | | $V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_D$ = 10 A | - | 11.7 | 17.6 | |
| Gate-source charge | $Q_{gs}$ | | - | 4.2 | - | |
| Gate-drain charge | $Q_{gd}$ | | - | 2.8 | - | |
| Output charge | $Q_{oss}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V | - | 18 | - | |
| Gate resistance | $R_g$ | f = 1 MHz | 0.3 | 1.3 | 2.6 | Ω |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 15 V, $R_L$ = 1.5 Ω, $I_D$ ≅ 10 A, $V_{GEN}$ = 10 V, $R_g$ = 1 Ω | - | 7 | 15 | ns |
| Rise time | $t_r$ | | - | 20 | 40 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 25 | 50 | |
| Fall time | $t_f$ | | - | 10 | 20 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 15 V, $R_L$ = 1.5 Ω, $I_D$ ≅ 10 A, $V_{GEN}$ = 4.5 V, $R_g$ = 1 Ω | - | 17 | 35 | |
| Rise time | $t_r$ | | - | 35 | 70 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 30 | 60 | |
| Fall time | $t_f$ | | - | 15 | 30 | |

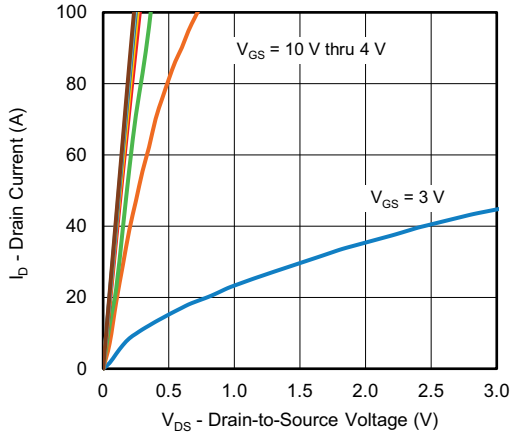
| **SPECIFICATIONS** ($T_J$ = 25 °C, unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNIT** |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous source-drain diode current | $I_S$ | $T_C$ = 25 °C | - | - | 57 | A |
| Pulse diode forward current [a] | $I_{SM}$ | | - | - | 150 | |
| Body diode voltage | $V_{SD}$ | $I_S$ = 10 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 | - | 38 | 70 | ns |
| Body diode reverse recovery charge | $Q_{rr}$ | | - | 36 | 70 | nC |
| Reverse recovery fall time | $t_a$ | | - | 20 | - | ns |
| Reverse recovery rise time | $t_b$ | | - | 18 | - | |

**Notes**

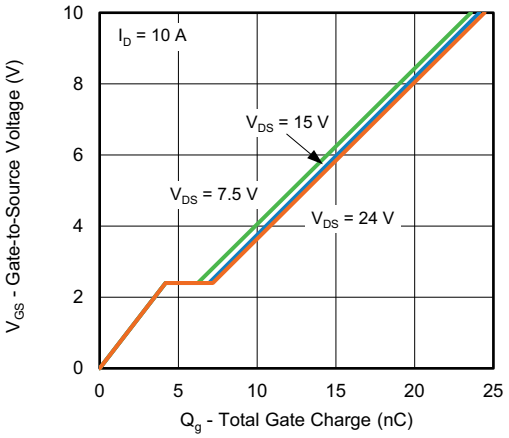
a. Pulse test: pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Based on characterization, not subject to production testing

*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.*

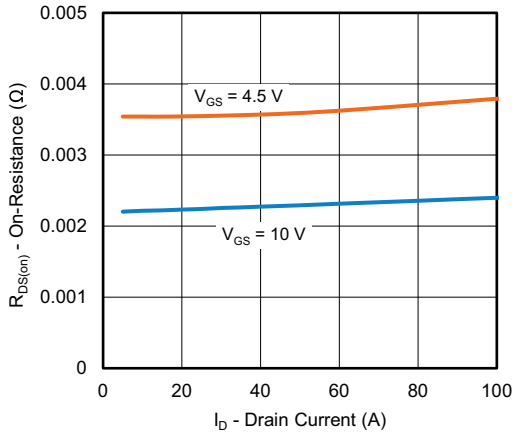
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



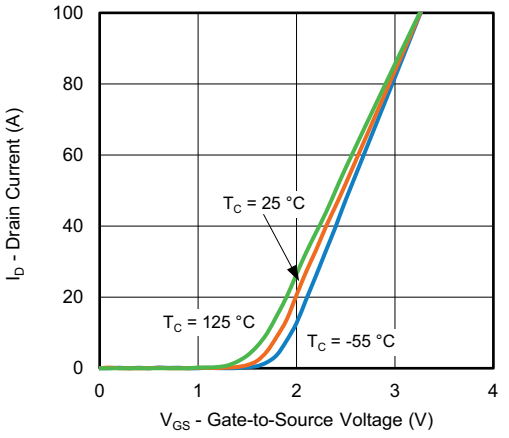

**Output Characteristics**




**Gate Charge**

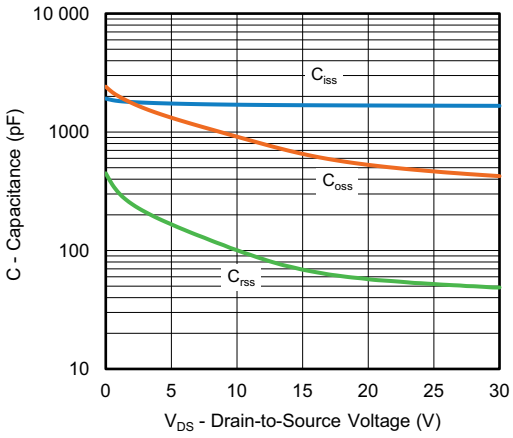



**On-Resistance vs. Drain Current**

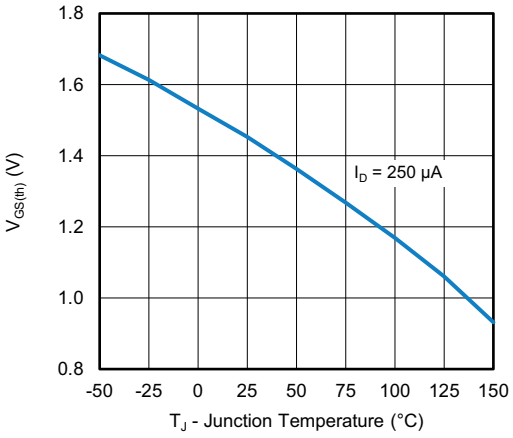



**Transfer Characteristics**

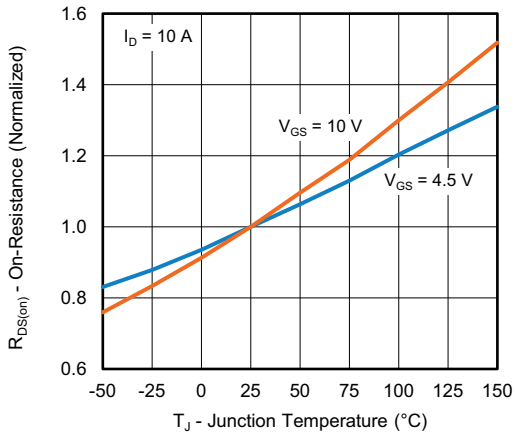
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



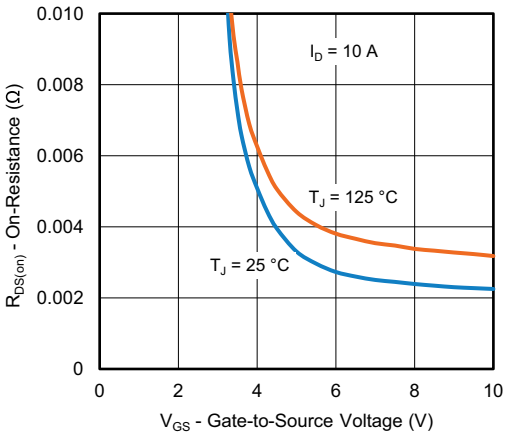

**Capacitance**



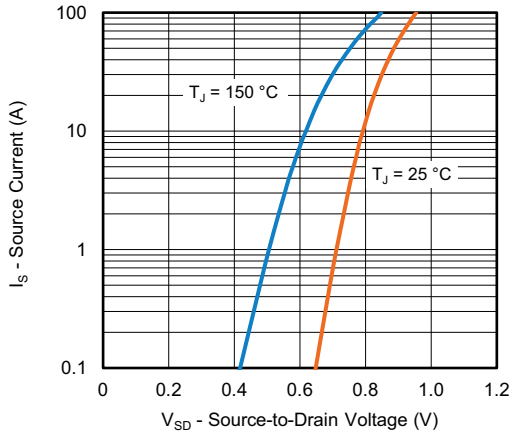

**Threshold Voltage**



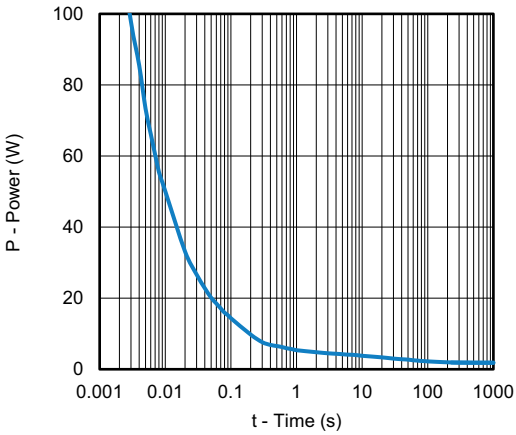

**On-Resistance vs. Junction Temperature**




**On-Resistance vs. Gate-to-Source Voltage**

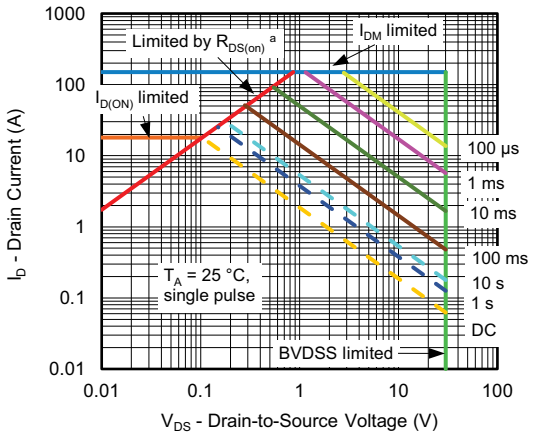



**Source-Drain Diode Forward Voltage**

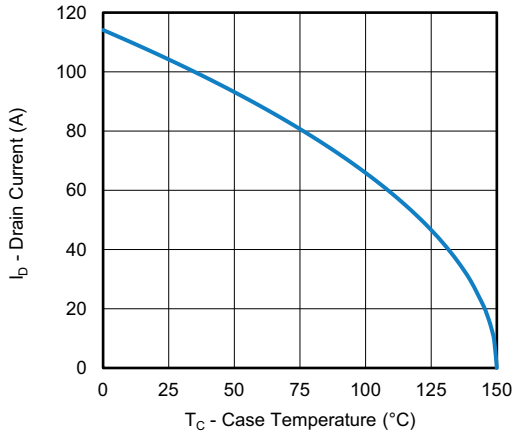



**Single Pulse Power, Junction-to-Ambient**

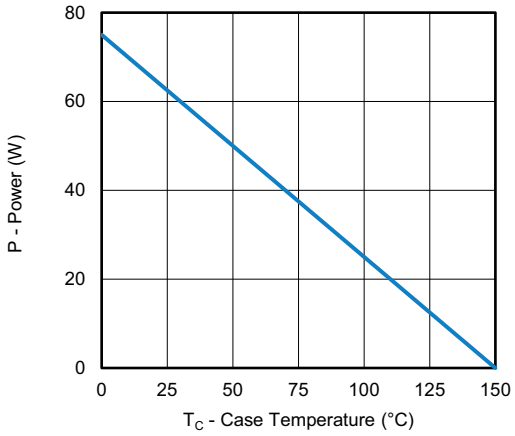
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)




**Safe Operating Area**




**Current Derating a**

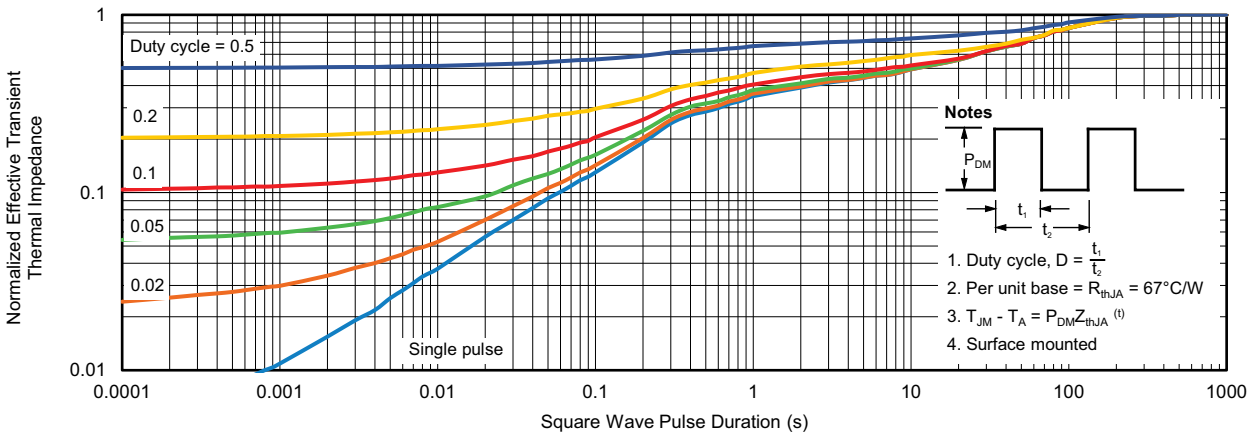



**Power, Junction-to-Case**

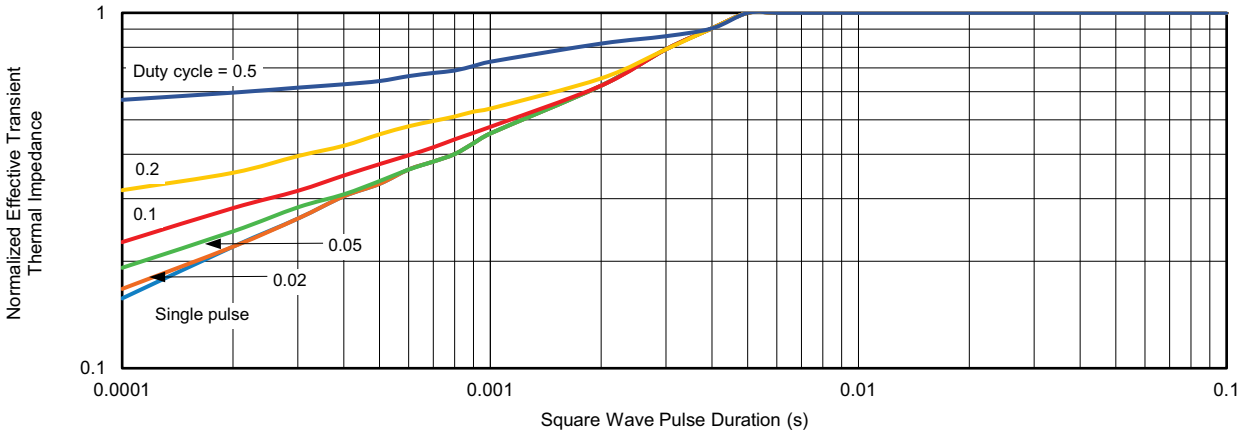
**Note**

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)




**Normalized Thermal Transient Impedance, Junction-to-Ambient**




**Normalized Thermal Transient Impedance, Junction-to-Case**

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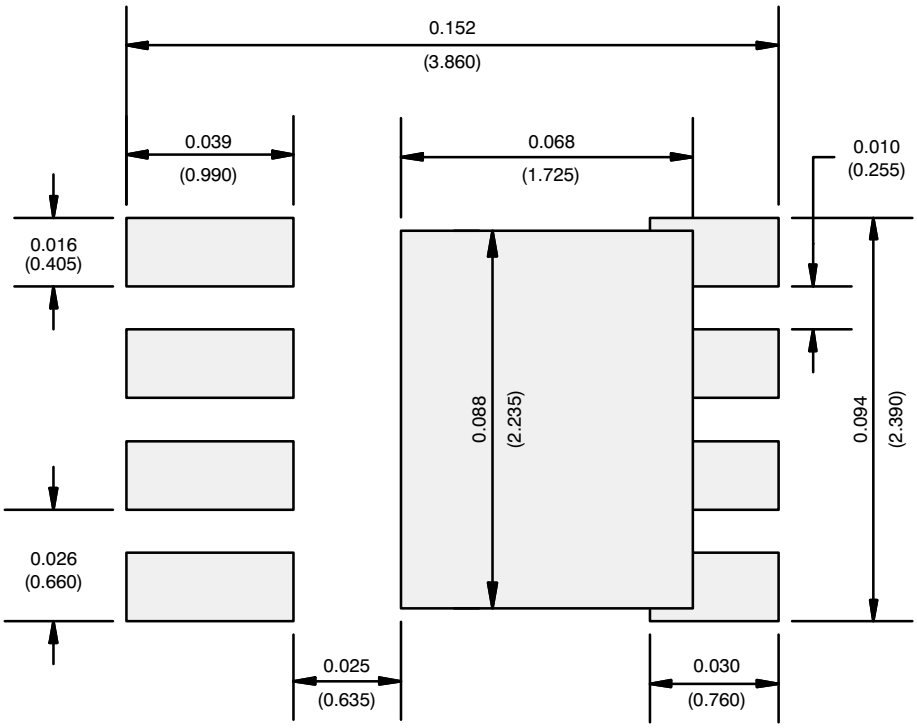
## RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single




Recommended Minimum Pads
Dimensions in Inches/(mm)

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