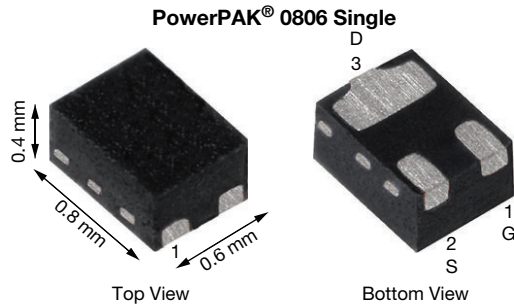


N-Channel 12 V (D-S) MOSFET



FEATURES

- TrenchFET® power MOSFET
- Ultra small 0.8 mm x 0.6 mm outline
- Ultra thin 0.4 mm max. height
- Typical ESD protection 1500 V (HBM)
- 1.2 V rated $R_{DS(on)}$
- 100 % R_g tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

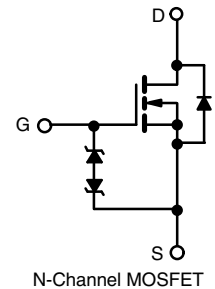


RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY	
V_{DS} (V)	12
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.34
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 2.5$ V	0.4
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 1.8$ V	0.55
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 1.5$ V	1.2
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 1.2$ V	2.5
Q_g typ. (nC)	0.47
I_D (A)	0.5 ^{a, f}
Configuration	Single

APPLICATIONS

- Load switch
- High speed switching
- DC/DC converters
- Battery-operated and mobile devices



ORDERING INFORMATION	
Package	PowerPAK 0806
Lead (Pb)-free and halogen-free	SiUD412ED-T1-GE3

Note

- The lead finish is NiPdAu and classed as E4 finish

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V_{DS}	12	V	
Gate-source voltage	V_{GS}	± 5	V	
Continuous drain current / $T_J = 150$ °C)	I_D	$T_A = 25$ °C	0.5 ^{a, f}	A
		$T_A = 70$ °C	0.5 ^{a, f}	
		$T_A = 25$ °C	0.5 ^b	
		$T_A = 70$ °C	0.5 ^b	
Pulsed drain current ($t = 100$ μ s)	I_{DM}	1.5	A	
Continuous source-drain diode current	I_S	$T_A = 25$ °C	0.5 ^{a, f}	A
		$T_A = 70$ °C	0.37 ^b	
Maximum power dissipation	P_D	$T_A = 25$ °C	1.25 ^a	W
		$T_A = 70$ °C	0.8 ^a	
		$T_A = 25$ °C	0.37 ^b	
		$T_A = 70$ °C	0.24 ^b	
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C	
Soldering recommendations (peak temperature) ^c		260	°C	

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^{a, d}	R_{thJA}	80	100	°C/W
Maximum junction-to-ambient ^{b, e}	R_{thJA}	265	335	

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
- Maximum under steady state conditions is 135 °C/W
- Maximum under steady state conditions is 400 °C/W
- Package limited



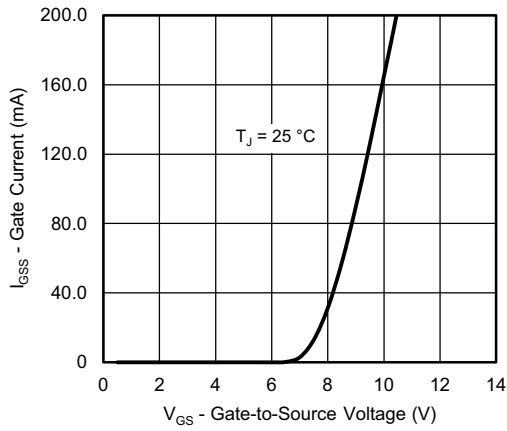
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	12	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	9	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	-1	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	0.35	-	0.9	V
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 4.5\text{ V}$	-	-	± 10	μA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	
		$V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^\circ\text{C}$	-	-	10	
On-state drain current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 4.5\text{ V}$	1	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}$, $I_D = 0.5\text{ A}$	-	0.27	0.34	Ω
		$V_{GS} = 2.5\text{ V}$, $I_D = 0.2\text{ A}$	-	0.31	0.4	
		$V_{GS} = 1.8\text{ V}$, $I_D = 0.1\text{ A}$	-	0.37	0.55	
		$V_{GS} = 1.5\text{ V}$, $I_D = 0.1\text{ A}$	-	0.42	1.2	
		$V_{GS} = 1.2\text{ V}$, $I_D = 0.05\text{ A}$	-	0.55	2.5	
Forward transconductance ^a	g_{fs}	$V_{DS} = 6\text{ V}$, $I_D = 0.5\text{ A}$	-	1.6	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{DS} = 6\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	-	21	-	μF
Output capacitance	C_{oss}		-	13	-	
Reverse transfer capacitance	C_{rss}		-	7	-	
Total gate charge	Q_g	$V_{DS} = 6\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 0.5\text{ A}$	-	0.47	0.71	nC
Gate-source charge	Q_{gs}	$V_{DS} = 6\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 0.5\text{ A}$	-	0.04	-	
Gate-drain charge	Q_{gd}		-	0.09	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	3	15	30	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 6\text{ V}$, $R_L = 12\text{ }\Omega$, $I_D \cong 0.5\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	-	2	5	ns
Rise time	t_r		-	20	40	
Turn-off delay time	$t_{d(off)}$		-	17	35	
Fall time	t_f		-	10	20	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_A = 25\text{ }^\circ\text{C}$	-	-	0.5 ^c	A
Pulse diode forward current	I_{SM}		-	-	1.5	
Body diode voltage	V_{SD}	$I_S = 0.5\text{ A}$, $V_{GS} = 0\text{ V}$	-	0.7	1.2	V
Body diode reverse recovery time	t_{rr}	$I_F = 0.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	-	15	30	ns
Body diode reverse recovery charge	Q_{rr}		-	3	6	nC
Reverse recovery fall time	t_a		-	12.5	-	ns
Reverse recovery rise time	t_b		-	2.5	-	

Notes

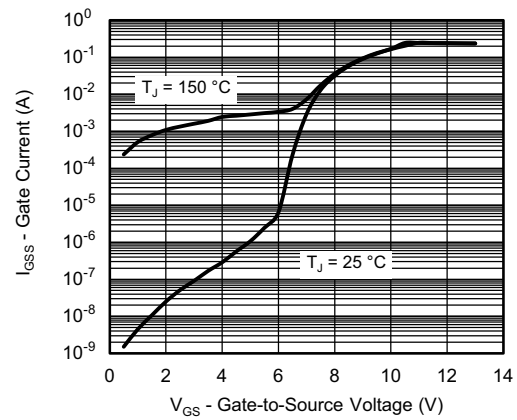
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing
c. Surface mounted on 1" x 1" FR4 board with full copper, $t = 5\text{ s}$

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.

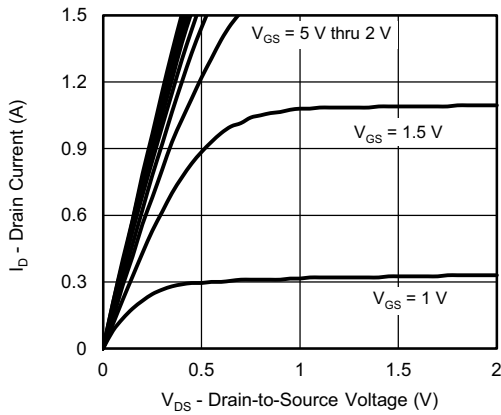
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



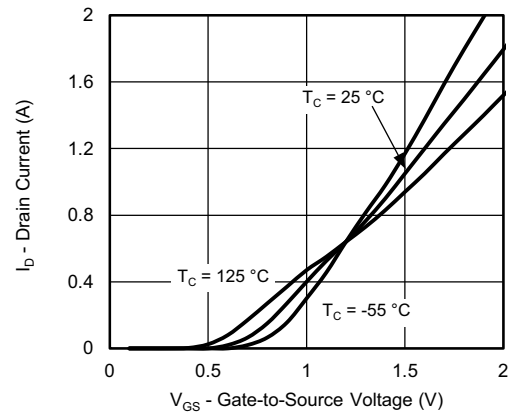
Gate-Current vs. Gate-Source Voltage



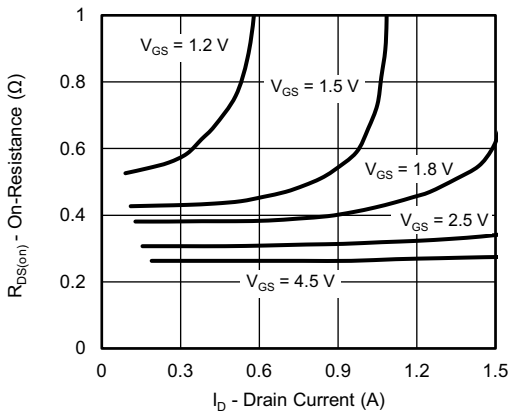
Gate-Current vs. Gate-Source Voltage



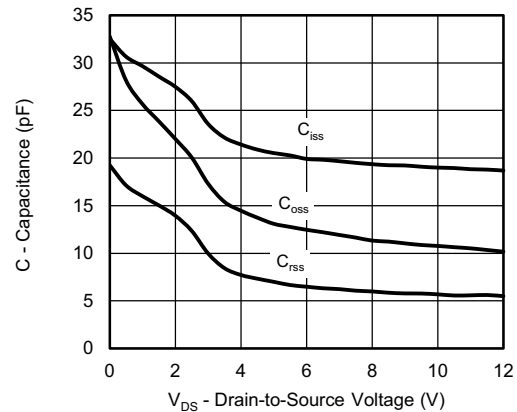
Output Characteristics



Transfer Characteristics

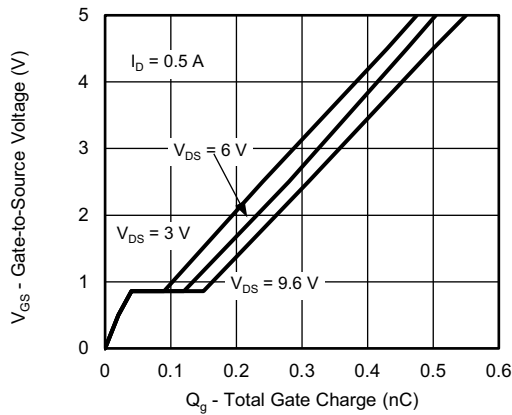


On-Resistance vs. Drain Current and Gate Voltage

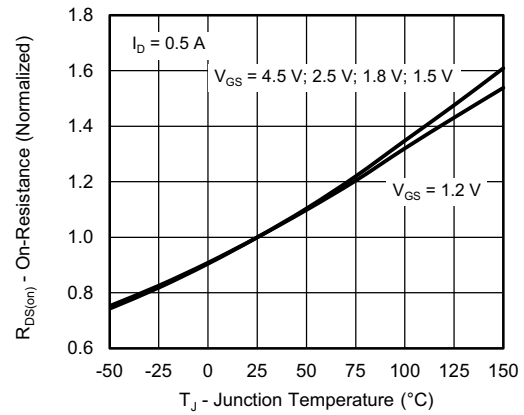


Capacitance

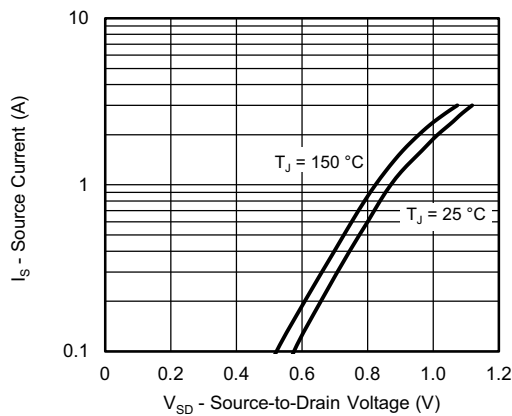
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



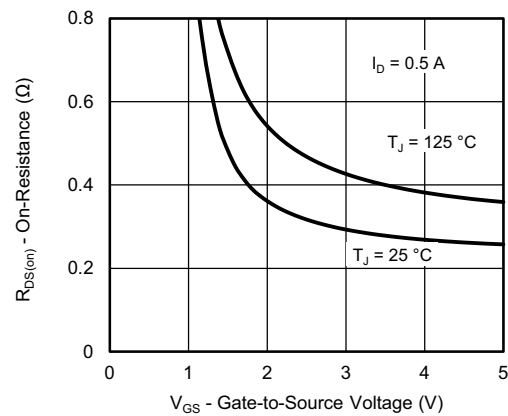
Gate Charge



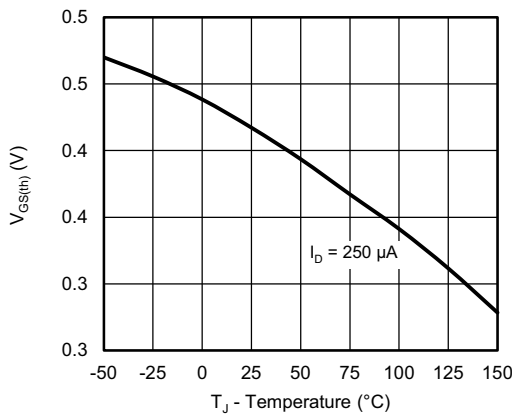
On-Resistance vs. Junction Temperature



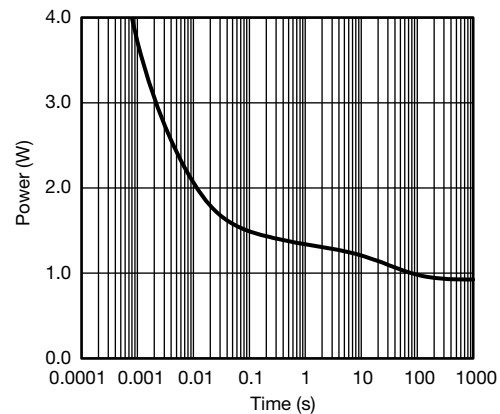
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



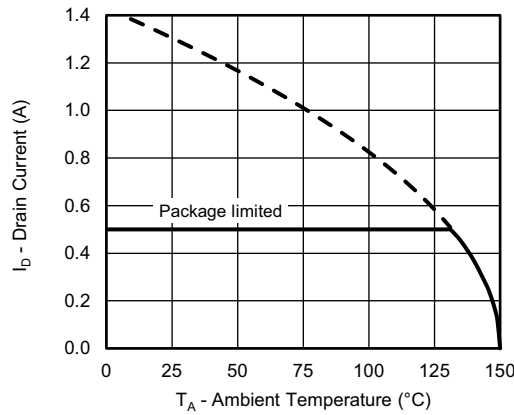
Threshold Voltage



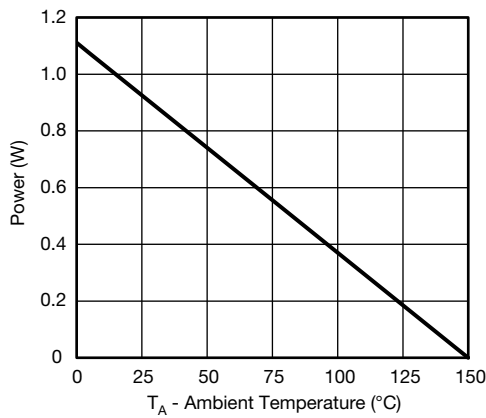
Single Pulse Power, Junction-to-Ambient



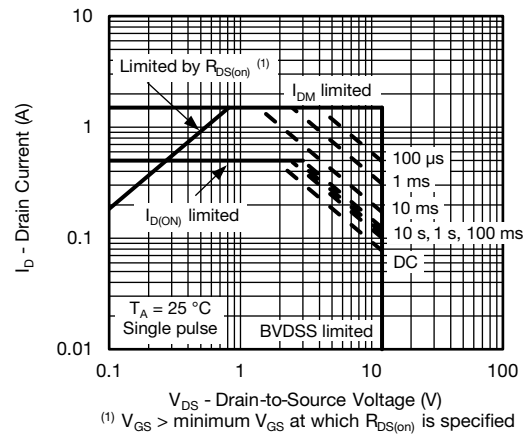
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Ambient

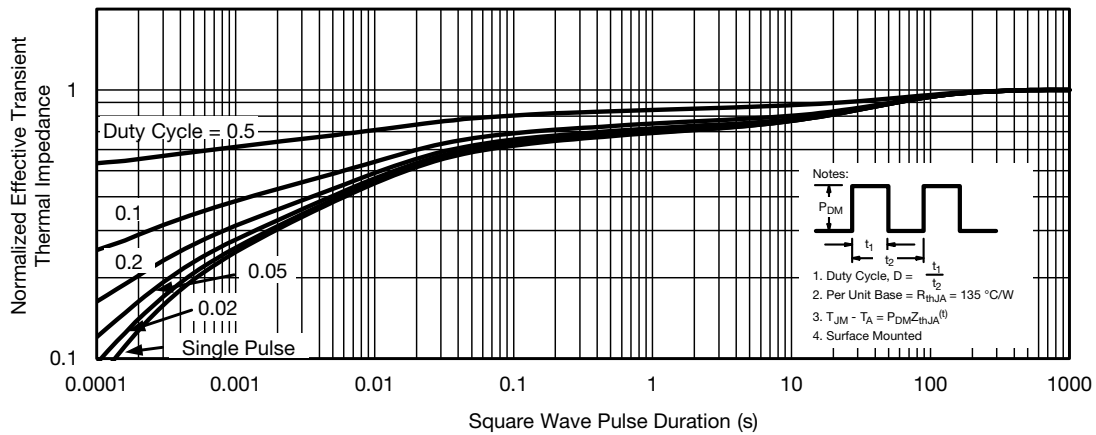


Safe Operating Area, Junction-to-Ambient

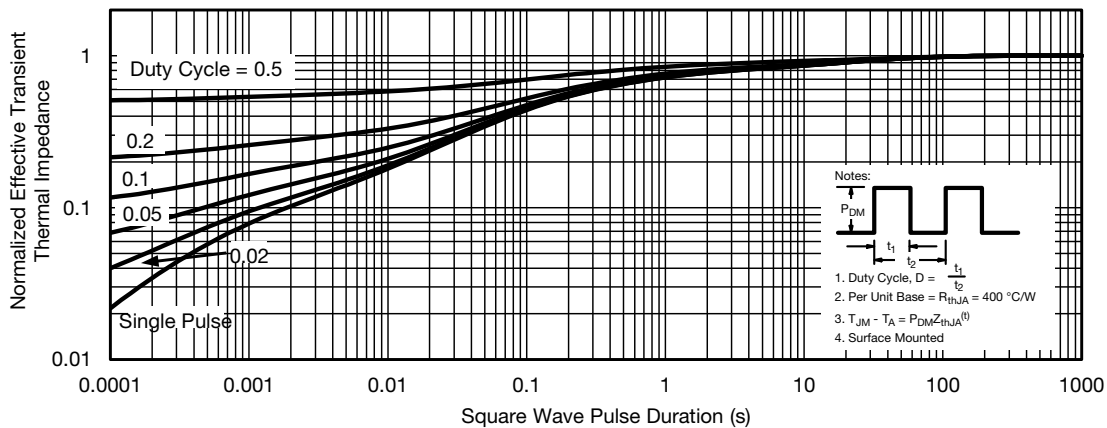
Note

- a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-ambient 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)



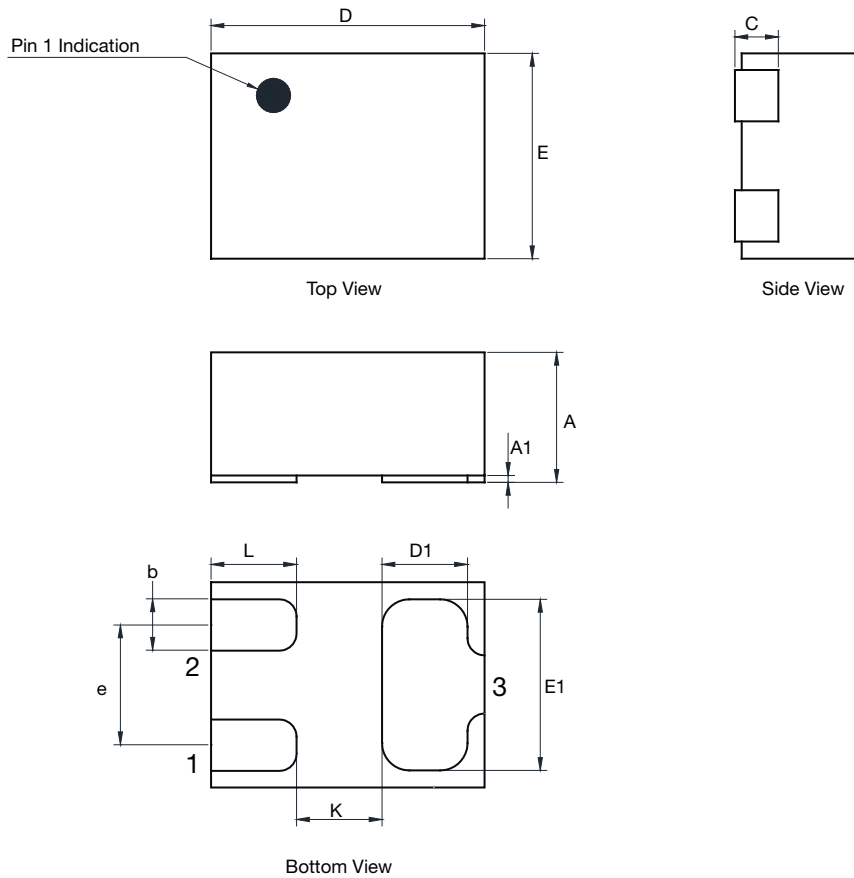
Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with maximum copper)



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

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Case Outline for PowerPAK 0.8 mm x 0.6 mm



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.350	0.380	0.400	0.0138	0.0150	0.0157
A1	0	-	0.020	0	-	0.0008
b	0.120	0.150	0.180	0.0047	0.0059	0.0071
C	0.119	0.127	0.135	0.0047	0.0050	0.0053
D	0.750	0.800	0.850	0.0295	0.0315	0.0335
D1	0.200	0.250	0.300	0.0078	0.0098	0.0118
E	0.550	0.600	0.650	0.0217	0.0236	0.0256
E1	0.450	0.500	0.550	0.0177	0.0197	0.0217
e	0.300	0.350	0.400	0.0118	0.0138	0.0158
K	0.150	0.250	0.350	0.0058	0.0098	0.0138
L	0.200	0.250	0.300	0.0078	0.0098	0.0118

ECN: C13-1574-Rev. A, 23-Dec-13
 DWG: 6020



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