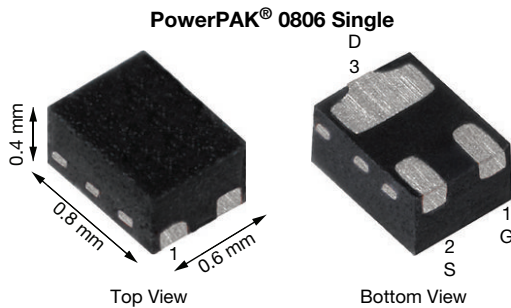


## N-Channel 20 V (D-S) MOSFET


**Marking Code: C**

PRODUCT SUMMARY	
$V_{DS}$ (V)	20
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.73
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 2.5$ V	0.87
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 1.8$ V	1.10
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 1.5$ V	1.80
$Q_g$ typ. (nC)	0.5
$I_D$ (A) <sup>a</sup>	1
Configuration	Single

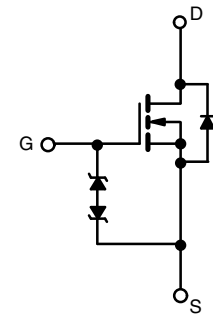
### FEATURES

- TrenchFET® power MOSFET
- Ultra small 0.8 mm x 0.6 mm outline
- Ultra thin 0.4 mm max. height
- 100 %  $R_g$  tested
- Typical ESD protection 2000 V (HBM)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
 COMPLIANT  
 HALOGEN  
**FREE**

### APPLICATIONS

- Load switch
- High speed switching
- DC/DC converters
- For smart phones, tablet PCs and mobile computing
- Small signal switching



N-Channel MOSFET

ORDERING INFORMATION	
Package	PowerPAK 0806
Lead (Pb)-free and halogen-free	SiUD402ED-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	$V_{DS}$	20	V
Gate-source voltage	$V_{GS}$	$\pm 8$	V
Continuous drain current ( $T_J = 150$ °C)	$I_D$	$T_A = 25$ °C	1 <sup>a</sup>
		$T_A = 70$ °C	0.8 <sup>a</sup>
		$T_A = 25$ °C	0.35 <sup>b</sup>
		$T_A = 70$ °C	0.28 <sup>b</sup>
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	1.4	A
Continuous source-drain diode current	$I_S$	$T_A = 25$ °C	1 <sup>a</sup>
		$T_A = 25$ °C	0.37 <sup>b</sup>
Maximum power dissipation	$P_D$	$T_A = 25$ °C	1.25 <sup>a</sup>
		$T_A = 70$ °C	0.8 <sup>a</sup>
		$T_A = 25$ °C	0.37 <sup>b</sup>
		$T_A = 70$ °C	0.24 <sup>b</sup>
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	°C
Soldering recommendations (peak temperature) <sup>c</sup>		260	°C

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum junction-to-ambient <sup>a, d</sup>	$R_{thJA}$	80	100	°C/W
Maximum junction-to-ambient <sup>b, e</sup>		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

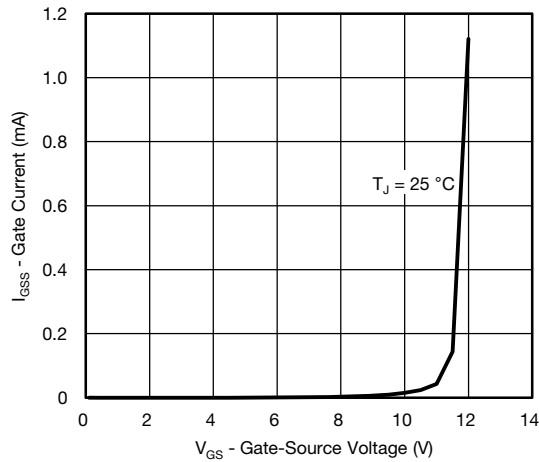
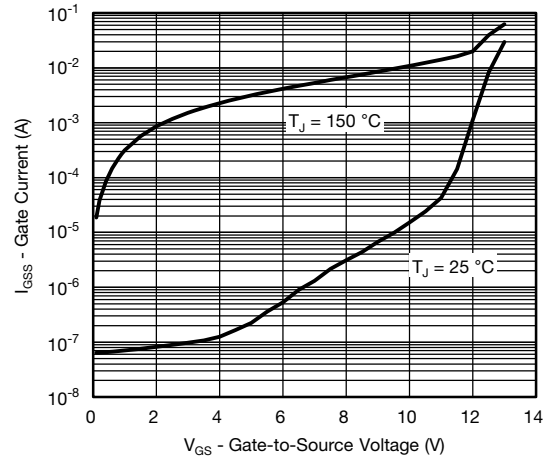
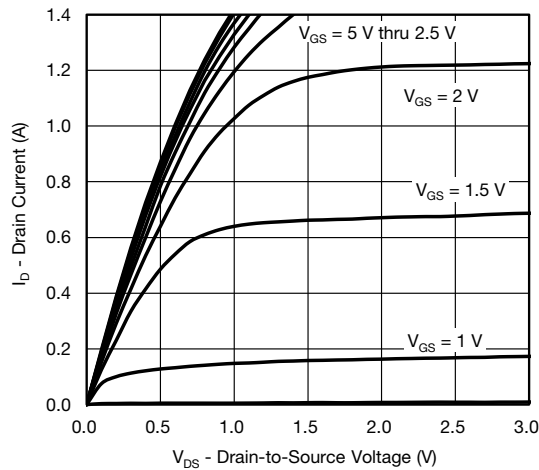
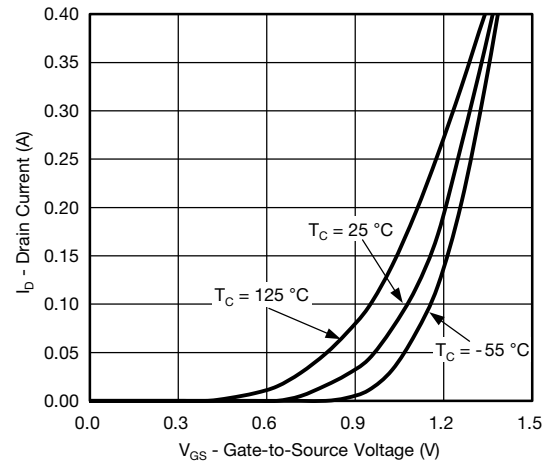
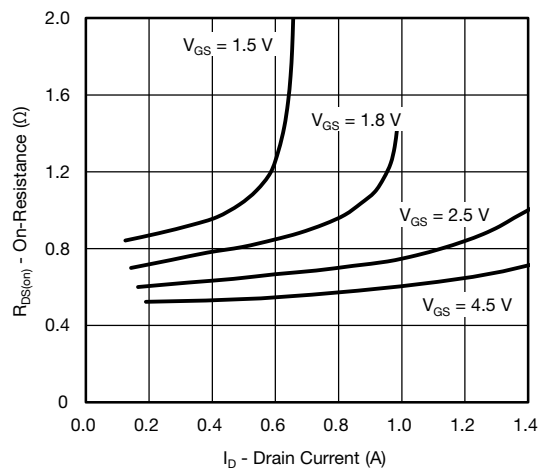
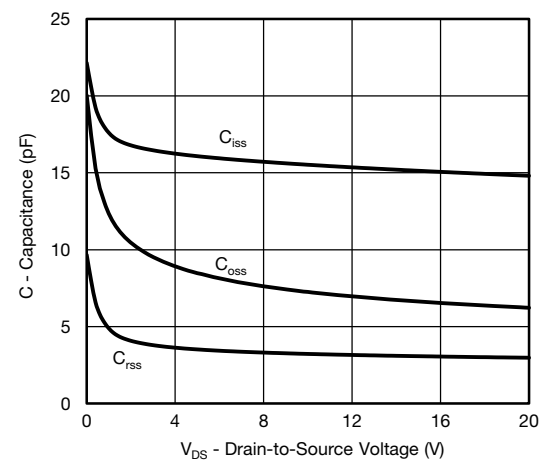


<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	18	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	-1.9	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.4	-	0.9	V
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$	-	-	$\pm 0.5$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	-	-	$\pm 10$	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	10	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	1	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$	-	0.57	0.73	$\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 0.1\text{ A}$	-	0.67	0.87	
		$V_{GS} = 1.8\text{ V}, I_D = 0.02\text{ A}$	-	0.80	1.10	
		$V_{GS} = 1.5\text{ V}, I_D = 0.01\text{ A}$	-	0.90	1.80	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 0.2\text{ A}$	-	1.2	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	16	-	pF
Output capacitance	$C_{oss}$		-	7.5	-	
Reverse transfer capacitance	$C_{rss}$		-	3.5	-	
Total gate charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 8\text{ V}, I_D = 0.2\text{ A}$	-	0.75	1.20	nC
			$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 0.2\text{ A}$	-	0.50	
$Q_{gs}$	-	0.09		-		
$Q_{gd}$	-	0.09		-		
Gate resistance	$R_g$	$f = 1\text{ MHz}$	3	24	50	$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 50\text{ }\Omega$ $I_D \cong 0.2\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	7	15	ns
Rise time	$t_r$		-	10	20	
Turn-off delay time	$t_{d(off)}$		-	23	50	
Fall time	$t_f$		-	7	15	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 15\text{ }\Omega$ $I_D \cong 0.2\text{ A}, V_{GEN} = 8\text{ V}, R_g = 1\text{ }\Omega$	-	5	10	
Rise time	$t_r$		-	5	10	
Turn-off delay time	$t_{d(off)}$		-	11	25	
Fall time	$t_f$		-	5	10	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$	-	-	1 <sup>c</sup>	A
Pulse diode forward current	$I_{SM}$		-	-	1.4	
Body diode voltage	$V_{SD}$	$I_S = 0.2\text{ A}, V_{GS} = 0\text{ V}$	-	0.8	1.2	V
Body diode reverse recovery time	$t_{rr}$	$I_F = 0.2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	11	25	ns
Body diode reverse recovery charge	$Q_{rr}$		-	3.5	7	nC
Reverse recovery fall time	$t_a$		-	5.3	-	ns
Reverse recovery rise time	$t_b$		-	5.7	-	

**Note**

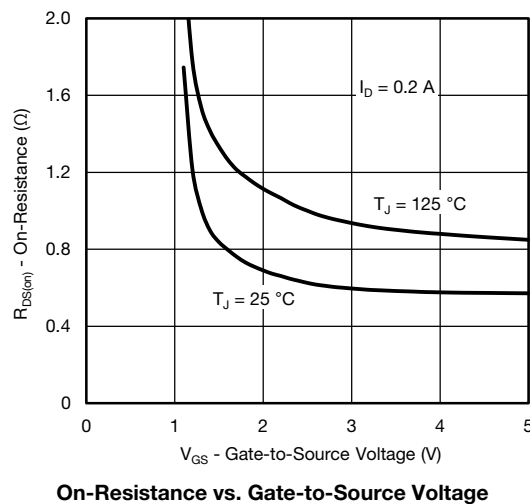
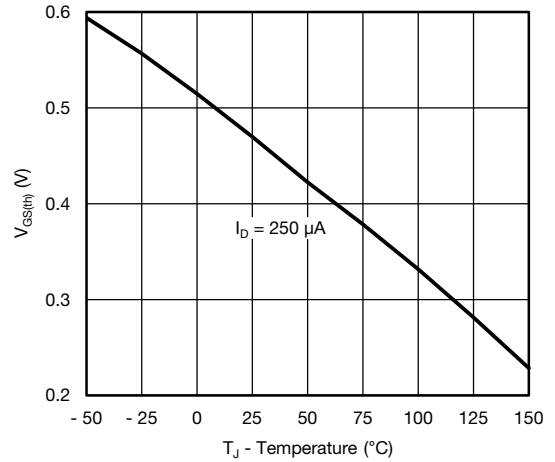
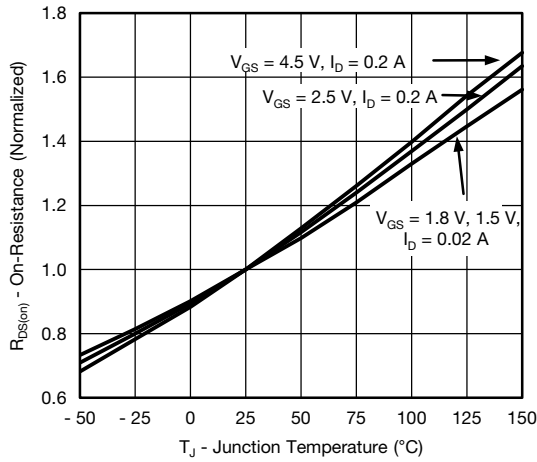
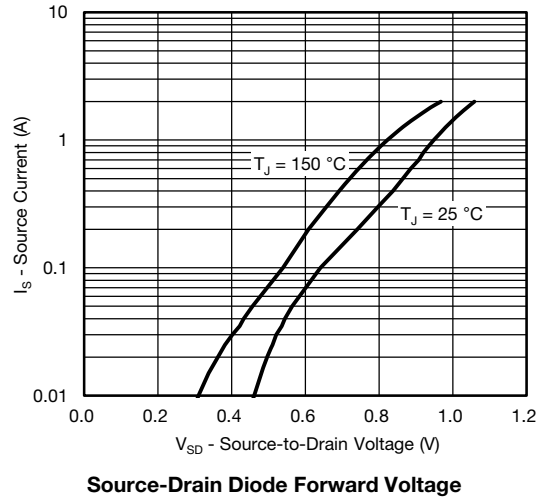
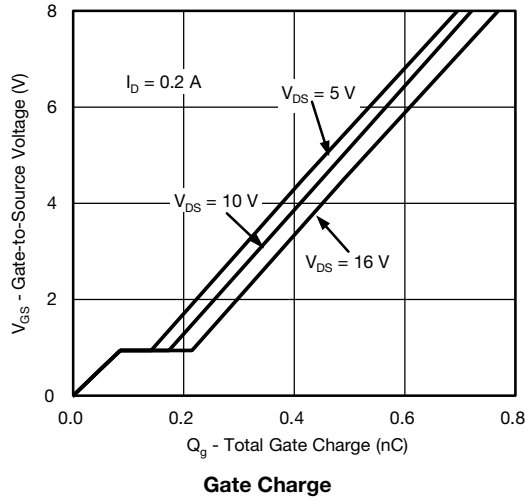
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$
- b. Guaranteed by design, not subject to production testing
- c. Surface mounted on 1" x 1" FR4 board with full copper,  $t = 5\text{ s}$

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**

**Capacitance vs. Drain-to-Source Voltage**

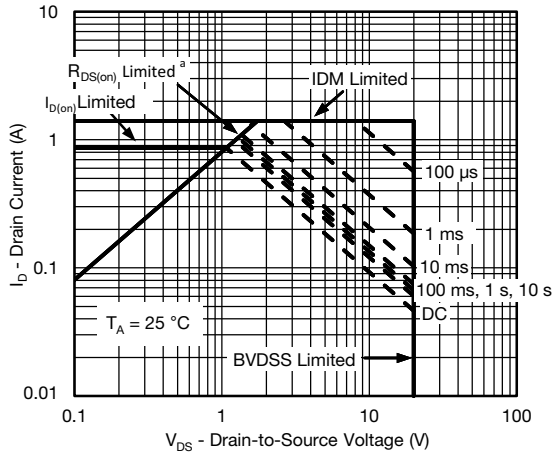


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

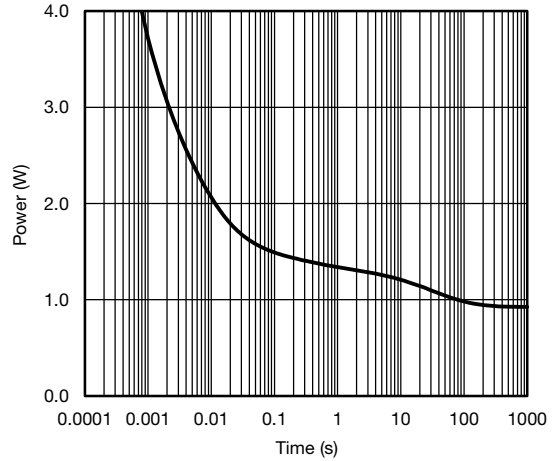




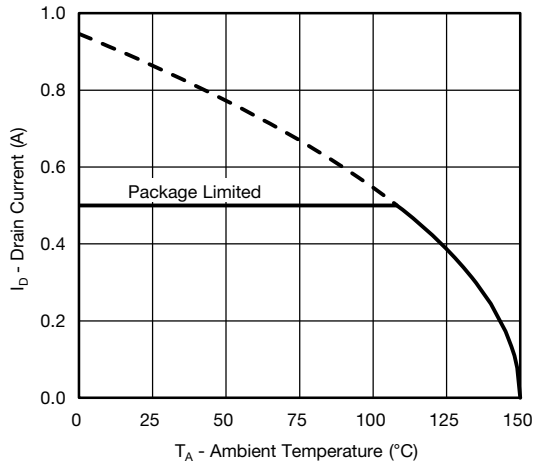
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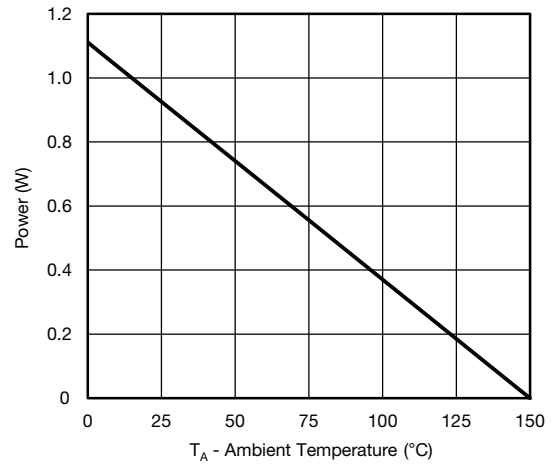
Safe Operating Area (Junction-to-Ambient) <sup>b</sup>



Single Pulse Power, Junction-to-Ambient <sup>b</sup>



Current Derating <sup>b, c</sup>

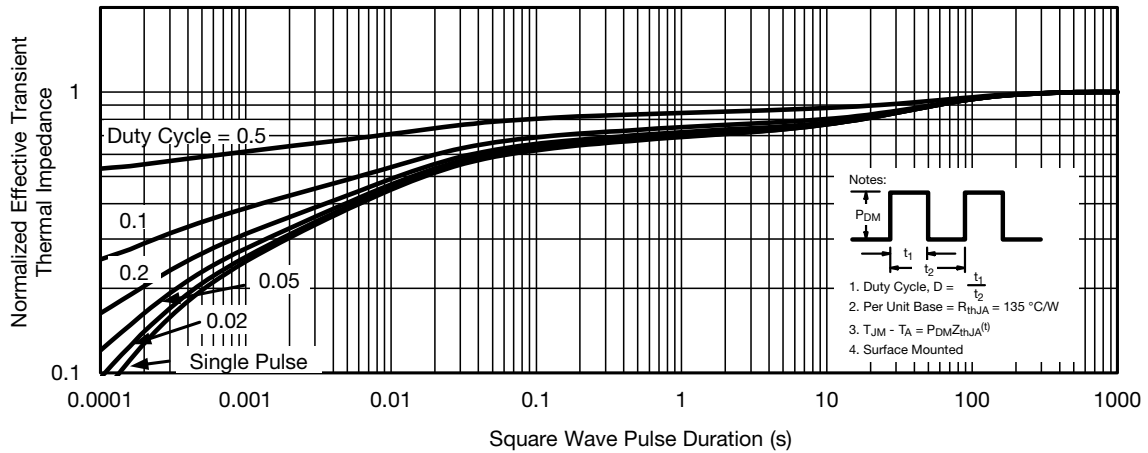


Power Derating <sup>b</sup>

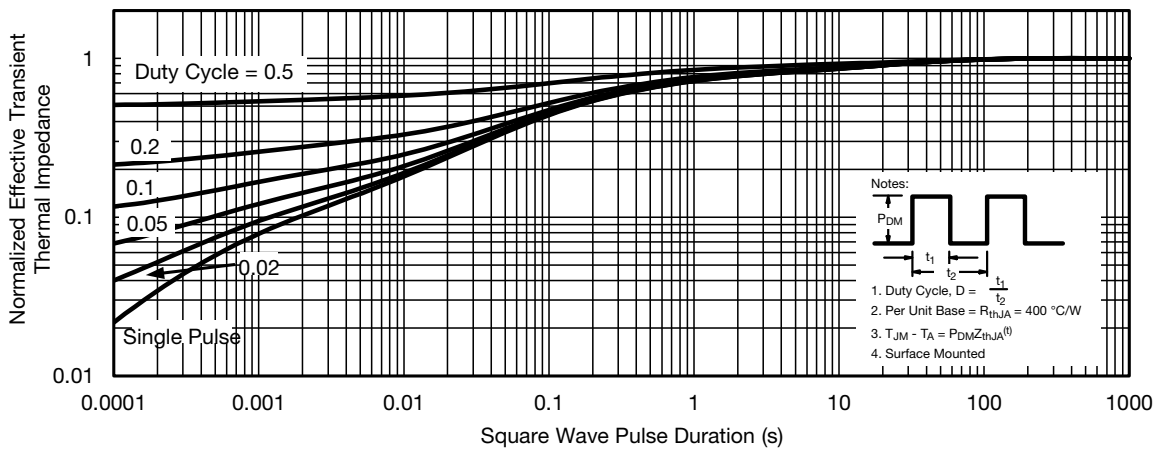
Note

- a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified
- b. When mounted on 1" x 1" FR4 with full copper
- c. The power dissipation  $P_D$  is based on  $T_J$  (max.) = 150  $^\circ\text{C}$ , 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 <sup>a</sup>**



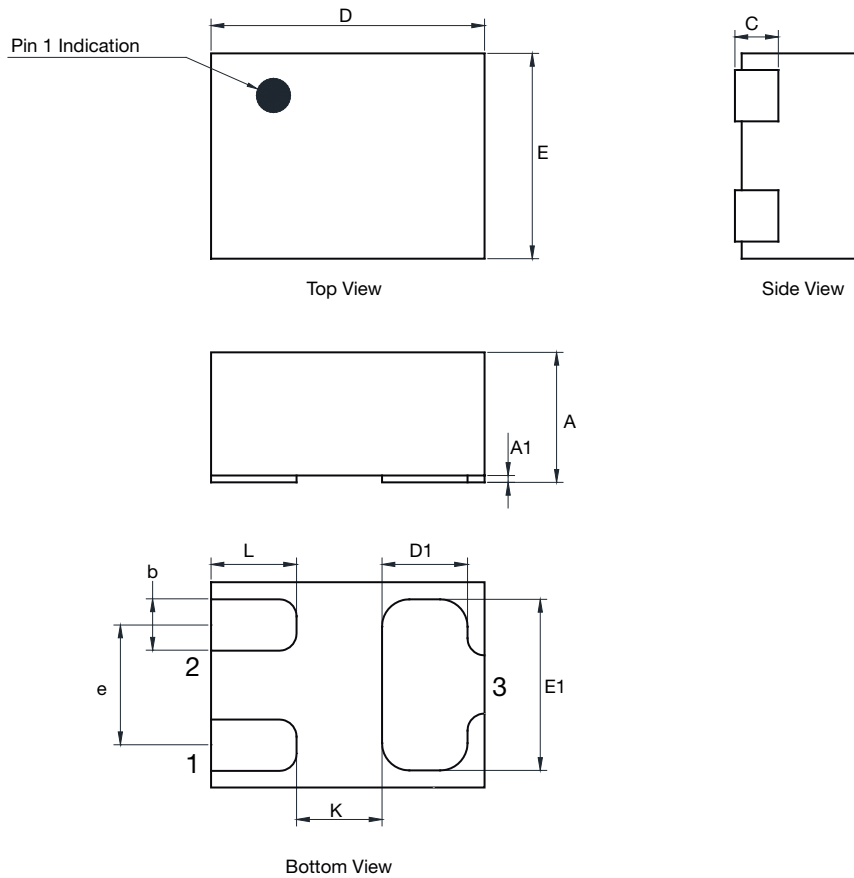
**Normalized Thermal Transient Impedance, Junction-to-Ambient <sup>a</sup>**

**Note**

a. When mounted on 1" x 1" FR4 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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