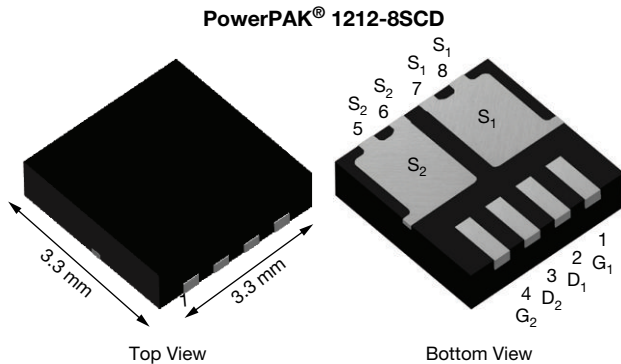


## Common Drain Dual N-Channel 12 V (S1-S2) MOSFET



### FEATURES

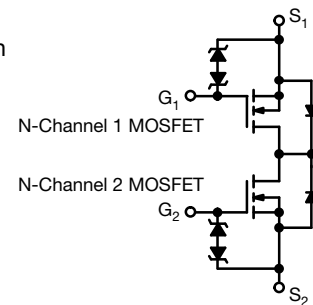
- TrenchFET® Gen IV power MOSFET
- Very low source-to-source on resistance
- Integrated common-drain n-channel MOSFETs in a compact and thermally enhanced package
- 100 %  $R_g$  and UIS tested
- Optimizes circuit layout for bi-directional current flow
- Typical ESD protection: 4500 V (HBM)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### APPLICATIONS

- Battery protection switch
- Bi-directional switch
- Load switch



PRODUCT SUMMARY	
$V_{S1S2}$ (V)	12
$R_{S1S2(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.0036
$R_{S1S2(on)}$ max. ( $\Omega$ ) at $V_{GS} = 3.8$ V	0.0041
$R_{S1S2(on)}$ max. ( $\Omega$ ) at $V_{GS} = 2.5$ V	0.0050
$R_{S1S2(on)}$ max. ( $\Omega$ ) at $V_{GS} = 1.8$ V	0.0074
$Q_g$ typ. (nC) at $V_{GS} = 2.5$ V	25
$I_{S1S2}$ (A) <sup>a</sup>	109
Configuration	Common drain

ORDERING INFORMATION	
Package	PowerPAK 1212-8SCD
Lead (Pb)-free and halogen-free	SiSF12EDN-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{S1S2}$	12	V
Gate-source voltage	$V_{GS}$	$\pm 8$	
Continuous drain current ( $V_{GS} = 5$ V, $T_J = 150$ °C)	$T_C = 25$ °C	109	A
	$T_C = 70$ °C	87	
	$T_A = 25$ °C	30 <sup>b, c</sup>	
	$T_A = 70$ °C	24 <sup>b, c</sup>	
Pulsed drain current ( $t = 100$ $\mu$ s, $V_{GS} = 5$ V)	$I_{S1S2M}$	200	
Single pulse avalanche current, $L = 0.1$ mH		15	
Single pulse avalanche energy, $L = 0.1$ mH		11.25	mJ
Maximum power dissipation	$T_C = 25$ °C	69.4	W
	$T_C = 70$ °C	44.4	
	$T_A = 25$ °C	5.2 <sup>b, c</sup>	
	$T_A = 70$ °C	3.3 <sup>b, c</sup>	
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	°C
Soldering recommendations (peak temperature) <sup>c</sup>		260	

#### Notes

- $T_C = 25$  °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$  s



THERMAL RESISTANCE RATINGS						
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT	
Maximum junction-to-ambient <sup>a</sup>	$t \leq 10$ s	$R_{thJA}$	19	24	°C/W	
Maximum junction-to-case (drain)	Steady state	$R_{thJC}$	1.4	1.8		

**Note**

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

SPECIFICATIONS ( $T_J = 25$ °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0$ V, $I_D = 1$ mA	12	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{S1S2} = V_{GS}$ , $I_D = 250$ $\mu$ A	0.4	-	1.0	
Gate-source leakage	$I_{GSS}$	$V_{S1S2} = 0$ V, $V_{GS} = \pm 4.5$ V	-	-	$\pm 1$	$\mu$ A
		$V_{S1S2} = 0$ V, $V_{GS} = \pm 8$ V	-	-	$\pm 30$	
Zero gate voltage drain current	$I_{DSS}$	$V_{S1S2} = 12$ V, $V_{GS} = 0$ V	-	-	1	
		$V_{S1S2} = 12$ V, $V_{GS} = 0$ V, $T_J = 70$ °C	-	-	15	
Drain-source on-state resistance <sup>a</sup>	$R_{S1S2(on)}$	$V_{GS} = 4.5$ V, $I_{S1S2} = 10$ A	-	0.0030	0.0036	$\Omega$
		$V_{GS} = 3.8$ V, $I_{S1S2} = 10$ A	-	0.0033	0.0041	$\Omega$
		$V_{GS} = 2.5$ V, $I_{S1S2} = 10$ A	-	0.0039	0.0050	$\Omega$
		$V_{GS} = 1.8$ V, $I_{S1S2} = 10$ A	-	0.0058	0.0074	$\Omega$
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{S1S2} = 6$ V, $I_{S1S2} = 10$ A	-	75	-	S
<b>Dynamic <sup>b, c</sup></b>						
Input capacitance	$C_{iss}$	$V_{DS} = 6$ V, $V_{GS} = 0$ V, $f = 1$ MHz	-	5950	-	pF
Output capacitance	$C_{oss}$		-	940	-	
Reverse transfer capacitance	$C_{rss}$		-	895	-	
Total gate charge	$Q_g$	$V_{DS} = 6$ V, $V_{GS} = 4.5$ V, $I_D = 10$ A	-	45.5	70	nC
Gate-source charge	$Q_{gs}$	$V_{DS} = 6$ V, $V_{GS} = 2.5$ V, $I_D = 10$ A	-	25	38	
Gate-drain charge	$Q_{gd}$		-	7.8	-	
Gate resistance	$R_g$		$f = 1$ MHz	0.4	1.0	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 6$ V, $R_L = 0.6$ $\Omega$ , $I_{S1S2} \approx 10$ A, $V_{GEN} = 4.5$ V, $R_g = 1$ $\Omega$	-	22	45	ns
Rise time	$t_r$		-	197	395	
Turn-off delay time	$t_{d(off)}$		-	50	100	
Fall time	$t_f$		-	45	90	
<b>Drain-Source Body Diode Characteristics <sup>c</sup></b>						
Continuous source-drain diode current	$I_{S1S2}$	$T_C = 25$ °C	-	-	63	A
Pulse diode forward current	$I_{S1S2M}$		-	-	200	
Body diode reverse recovery time	$t_{rr}$	$I_F = 10$ A, $di/dt = 100$ A/ $\mu$ s, $T_J = 25$ °C	-	23	46	ns
Body diode reverse recovery charge	$Q_{rr}$		-	12	25	nC
Reverse recovery fall time	$t_a$		-	12	-	ns
Reverse recovery rise time	$t_b$		-	11	-	

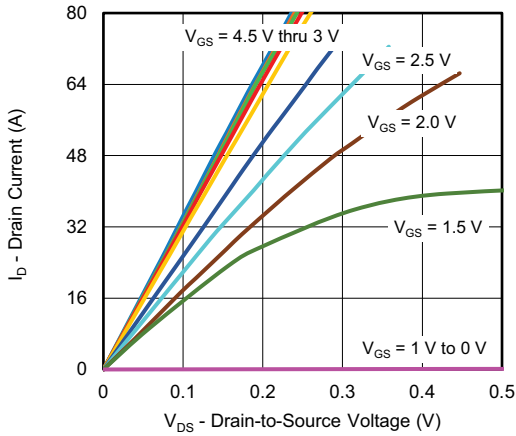
**Notes**

- a. Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %
- b. Guaranteed by design, not subject to production testing
- c. On single MOSFET

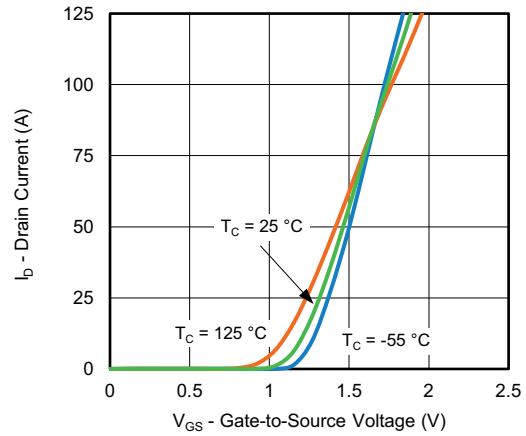
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



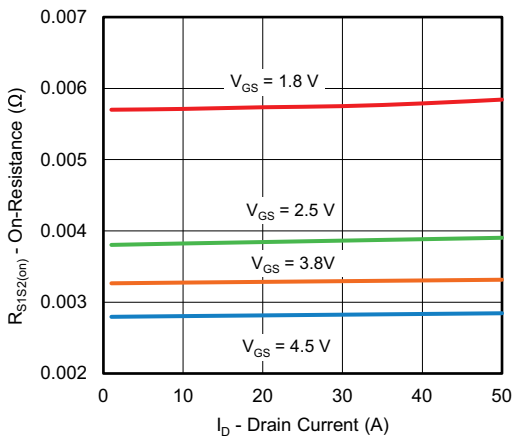
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



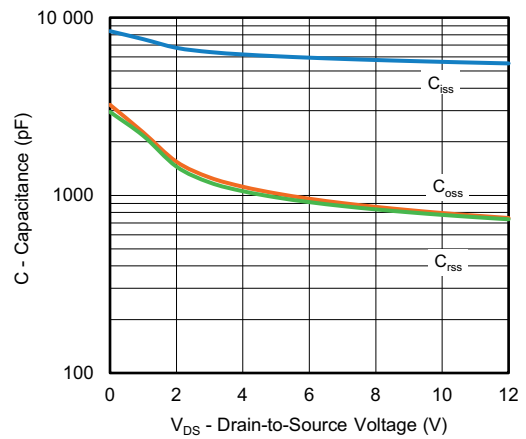
**Output Characteristics**



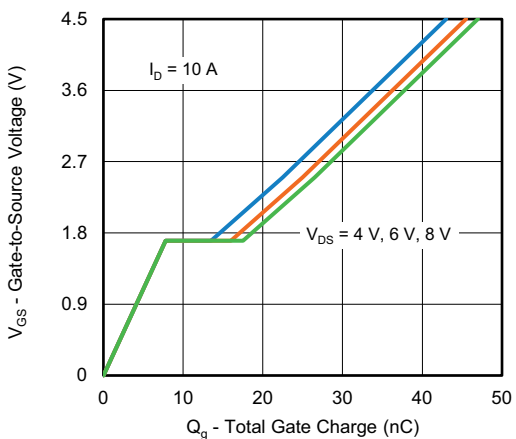
**Transfer Characteristics**



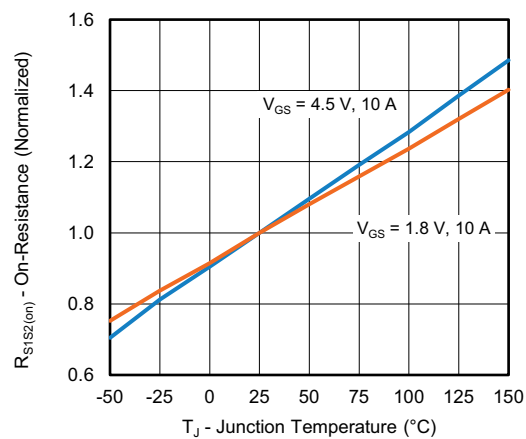
**On-Resistance vs. Source Current and Gate Voltage**



**Capacitance <sup>a</sup>**



**Gate Charge <sup>a</sup>**



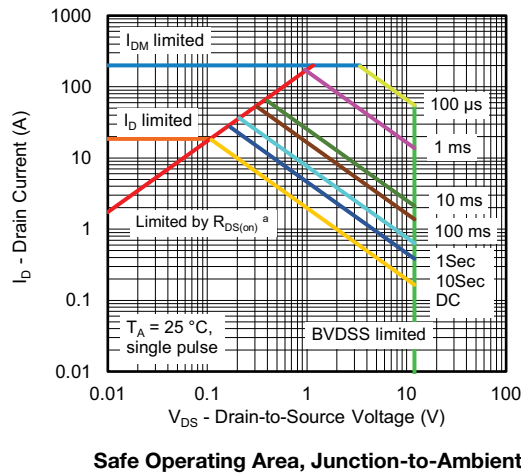
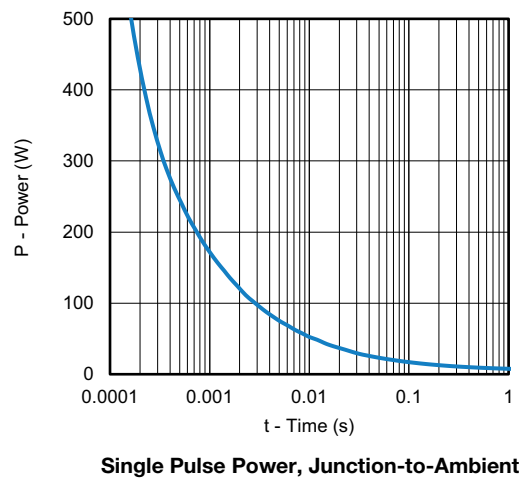
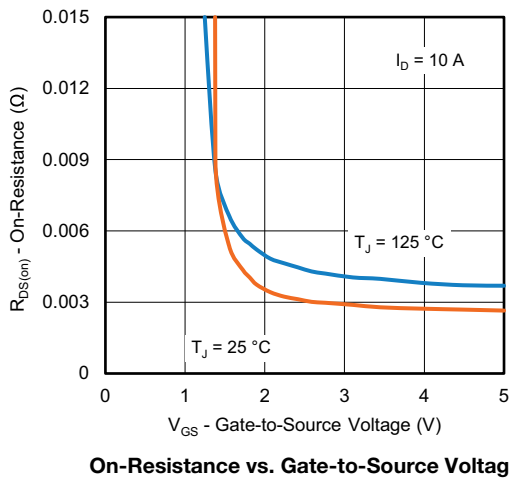
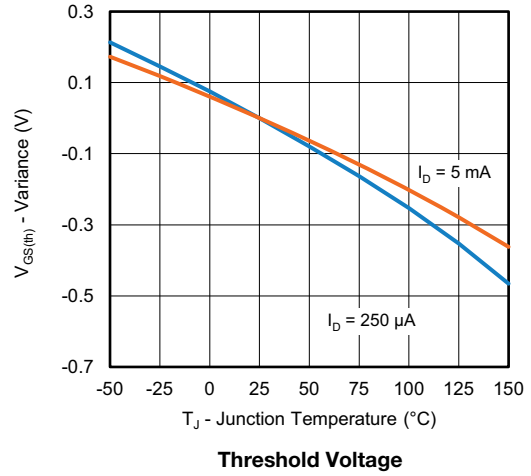
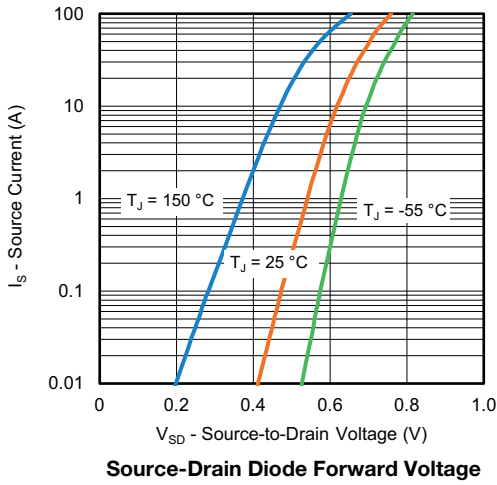
**On-Resistance vs. Junction Temperature**

**Note**

a. For one channel only



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

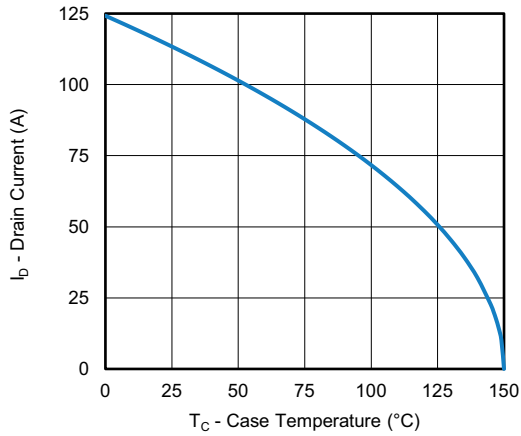


Note

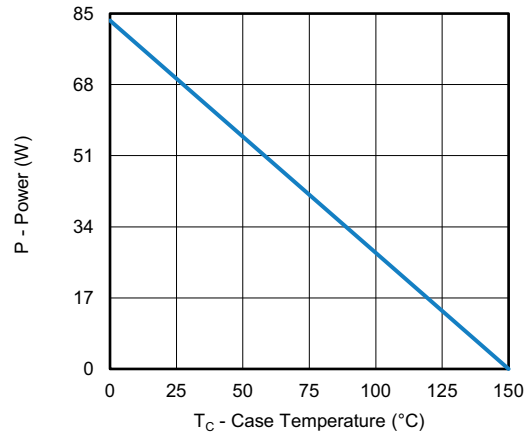
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



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



**Current Derating <sup>a</sup>**



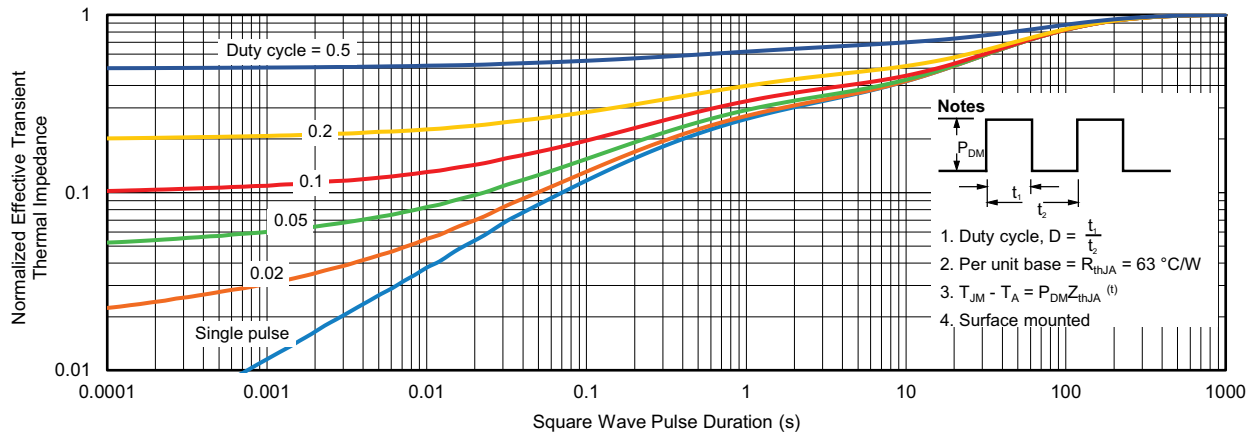
**Power, Junction-to-Case**

**Notes**

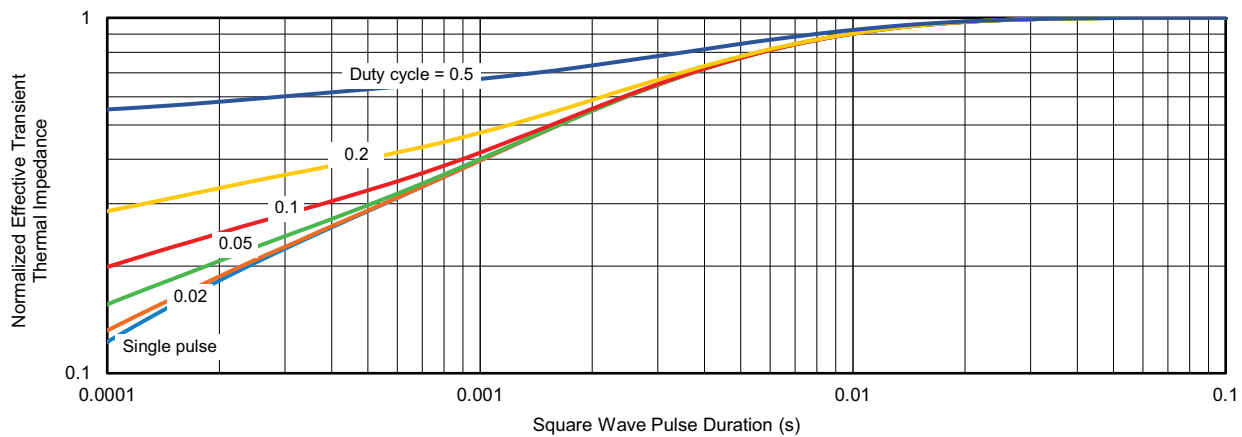
- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

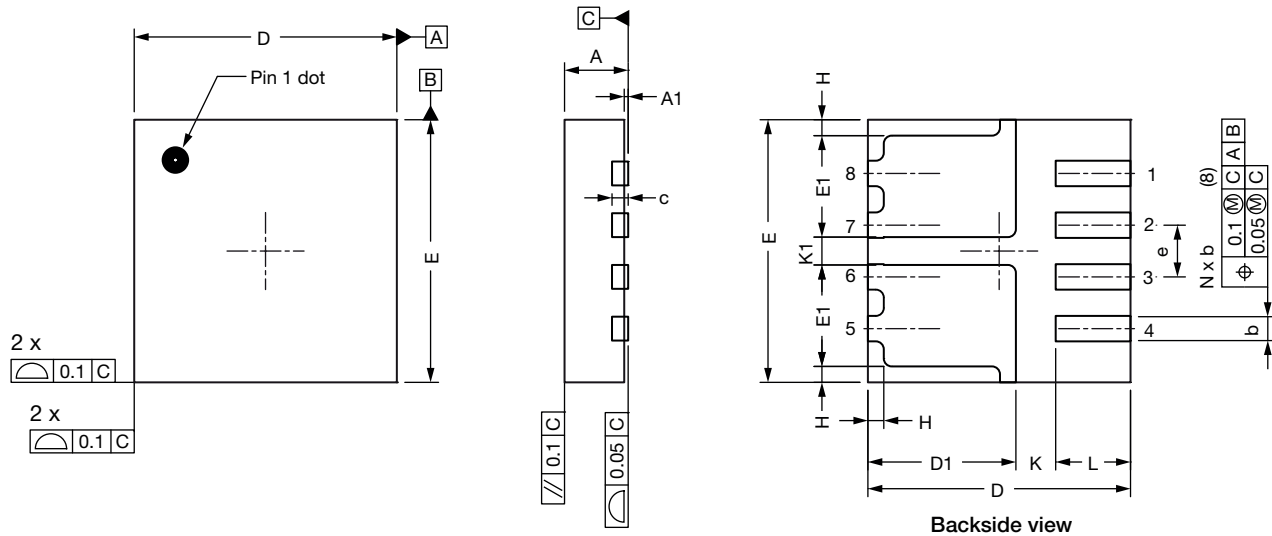


Normalized Thermal Transient Impedance, Junction-to-Case

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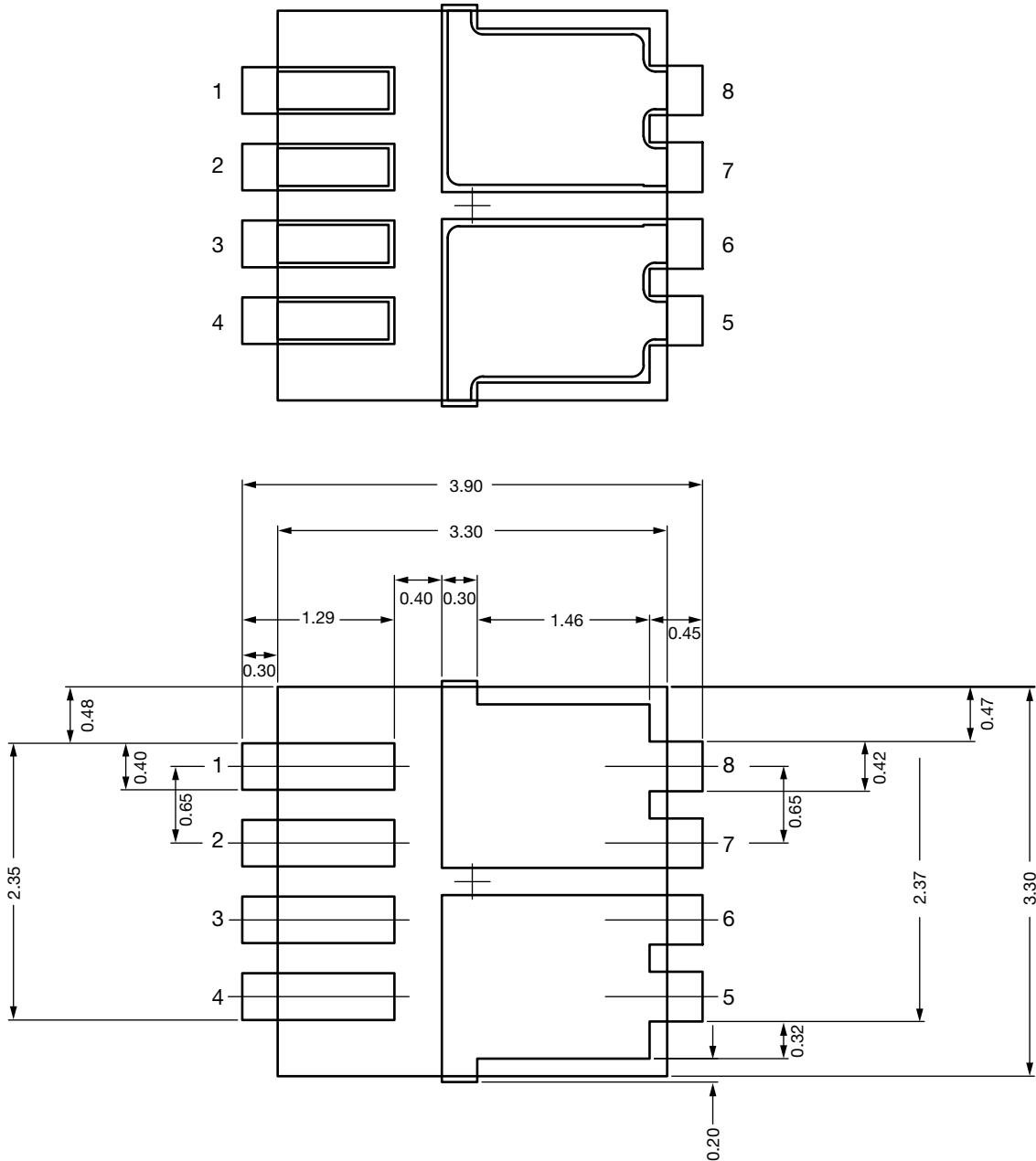
# PowerPAK® 1212-8S CD with Flip Chip



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.027	0.029	0.031
A1	0	0.02	0.05	0	0.001	0.002
b	0.27	0.32	0.37	0.011	0.013	0.015
c	-	0.20 ref.	-	-	0.008 ref.	-
D	3.20	3.30	3.40	0.126	0.130	0.134
D1	1.76	1.86	1.96	0.069	0.073	0.077
E	3.20	3.30	3.40	0.126	0.130	0.134
E1	1.18	1.28	1.38	0.046	0.050	0.054
e	0.60	0.65	0.70	0.024	0.026	0.028
K	0.50 typ.			0.020 typ.		
K1	0.35 typ.			0.014 typ.		
H	0.10	0.20	0.30	0.006	0.008	0.010
L	0.84	0.94	1.04	0.033	0.037	0.041

ECN: C17-1732-Rev. A, 18-Dec-17  
DWG: 6061

## Recommended Land Pattern PowerPAK® 1212-8S CD





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