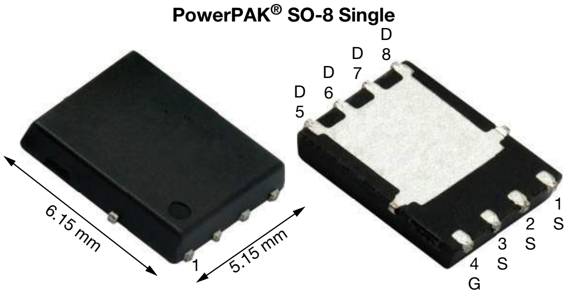
N-Channel 100 V (D-S) MOSFET

PowerPAK® SO-8 Single



Top View Bottom View

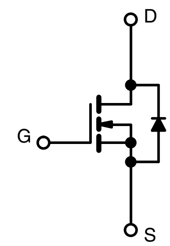
FEATURES

- TrenchFET® Gen IV power MOSFET
- Very low R_{DS} x Q_g figure-of-merit (FOM)
- Tuned for the lowest R_{DS} x Q_{oss} FOM
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT HALOGEN FREE

APPLICATIONS

- Synchronous rectification
- Primary side switch
- DC/DC converters
- Power supplies
- Motor drive control
- Battery and load switch



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	100
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.0061
$R_{DS(on)}$ max. (Ω) at V_{GS} = 4.5 V	0.0077
Q_g typ. (nC)	33
I_D (A)	81
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK® SO-8
Lead (Pb)-free and halogen-free	SiR870BDP-T1-RE3

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	100	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current (T_J = 150 °C)	T_C = 25 °C	I_D	81	A
	T_C = 70 °C		64.8	
	T_A = 25 °C		18.8 [b, c]	
	T_A = 70 °C		14.9 [b, c]	
Pulsed drain current (t = 100 μs)		I_{DM}	200	
Continuous source-drain diode current	T_C = 25 °C	I_S	90	
	T_A = 25 °C		4.9 [b, c]	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	40	
Single pulse avalanche energy		E_{AS}	80	mJ
Maximum power dissipation	T_C = 25 °C	P_D	100	W
	T_C = 70 °C		64	
	T_A = 25 °C		5.4 [b, c]	
	T_A = 70 °C		3.4 [b, c]	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient [b]	t ≤ 10 s	R_{thJA}	18	23	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	1	1.25	
Maximum junction-to-case (source)	Steady state	R_{thJC}	1.4	1.75	

Notes

a. Package limited
b. Surface mounted on 1" x 1" FR4 board
c. t = 10 s
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8 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
f. Maximum under steady state conditions is 65 °C/W
g. T_C = 25 °C

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

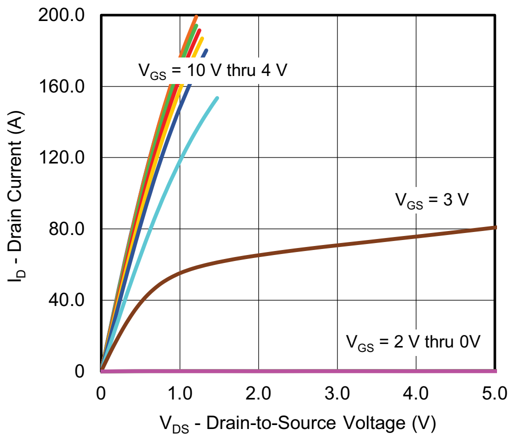
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 1 mA	100	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	I_D = 1 mA	-	69	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 μA	-	-5.1	-	
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	1	-	3	V
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 100 V, V_{GS} = 0 V, T_J = 70 °C	-	-	15	
On-state drain current [a]	$I_{D(on)}$	V_{DS} ≥ 10 V, V_{GS} =10 V	40	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A	-	0.0048	0.0061	Ω
		V_{GS} = 4.5 V, I_D = 15 A	-	0.0062	0.0077	
Forward transconductance [a]	g_{fs}	V_{DS} = 15 V, I_D = 15 A	-	75	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	-	4870	-	pF
Output capacitance	C_{oss}		-	338	-	
Reverse transfer capacitance	C_{rss}		-	19	-	
Total gate charge	Q_g	V_{DS} = 50 V, V_{GS} = 10 V, I_D = 15 A	-	73	110	nC
		V_{DS} = 50 V, V_{GS} = 4.5 V, I_D = 15 A	-	33	50	
Gate-source charge	Q_{gs}		-	13.8	-	
Gate-drain charge	Q_{gd}		-	6.5	-	
Output charge	Q_{oss}	V_{DS} = 50 V, V_{GS} = 0 V	-	66	-	
Gate resistance	R_g	f = 1 MHz	0.3	0.9	1.5	Ω
Turn-on delay time	$t_{d(on)}$	V_{DD} = 50 V, R_L = 3.33 Ω, I_D ≅ 15 A, V_{GEN} = 10 V, R_g = 1 Ω	-	13	26	ns
Rise time	t_r		-	17	34	
Turn-off delay time	$t_{d(off)}$		-	41	80	
Fall time	t_f		-	9	18	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 50 V, R_L = 3.33 Ω, I_D ≅ 15 A, V_{GEN} = 4.5 V, R_g = 1 Ω	-	24	48	
Rise time	t_r		-	58	115	
Turn-off delay time	$t_{d(off)}$		-	40	80	
Fall time	t_f		-	15	30	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	T_C = 25 °C	-	-	90	A
Pulse diode forward current	I_{SM}		-	-	200	
Body diode voltage	V_{SD}	I_S = 5 A, V_{GS} = 0 V	-	0.74	1.1	V
Body diode reverse recovery time	t_{rr}	I_F = 15 A, di/dt = 100 A/μs, T_J = 25 °C	-	48	96	ns
Body diode reverse recovery charge	Q_{rr}		-	81	162	nC
Reverse recovery fall time	t_a		-	36	-	ns
Reverse recovery rise time	t_b		-	12	-	

Notes

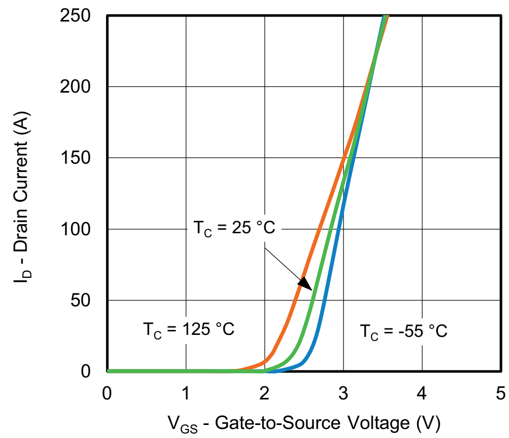
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing

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.

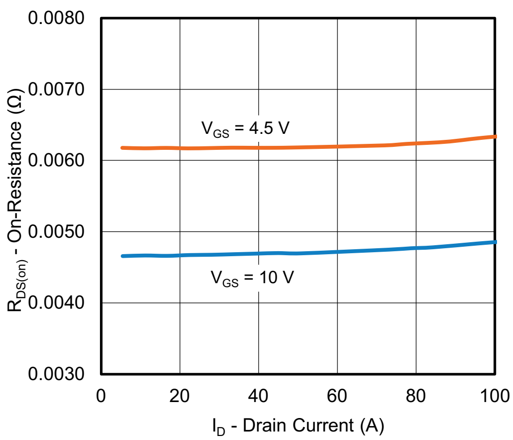
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



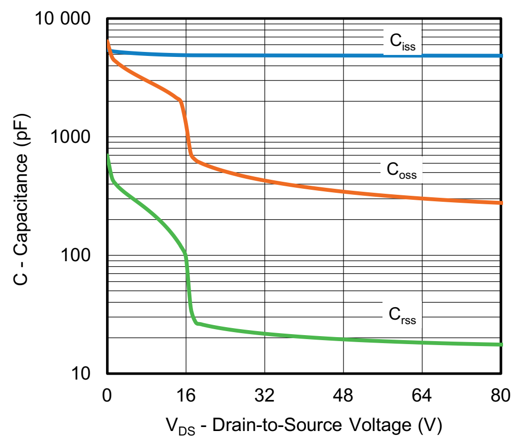
Output Characteristics



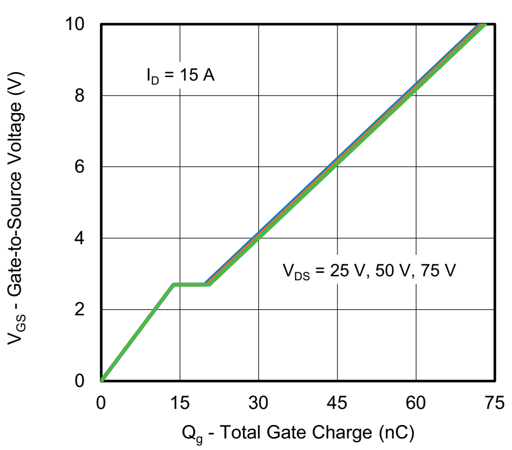
Transfer Characteristics



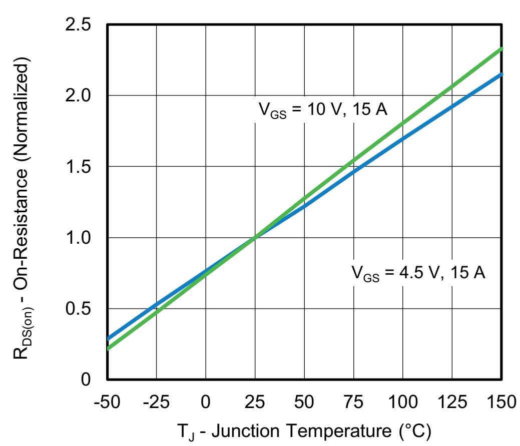
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

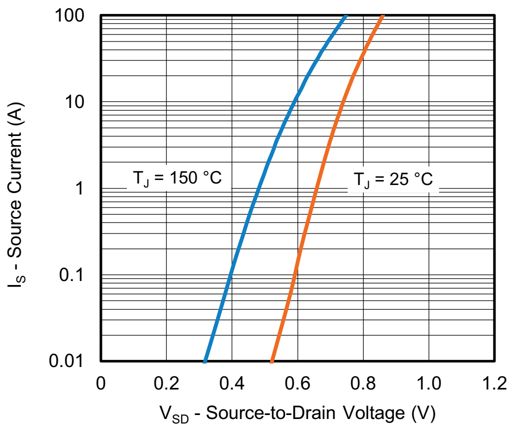


Gate Charge

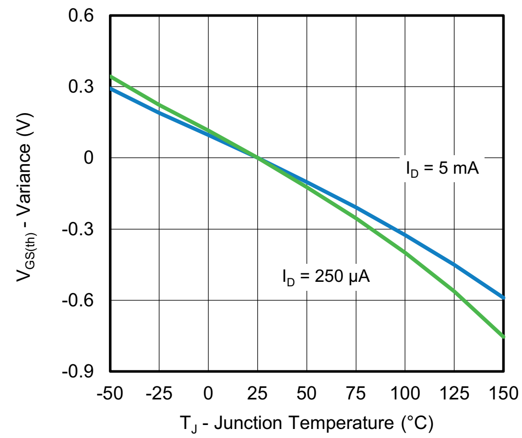


On-Resistance vs. Junction Temperature

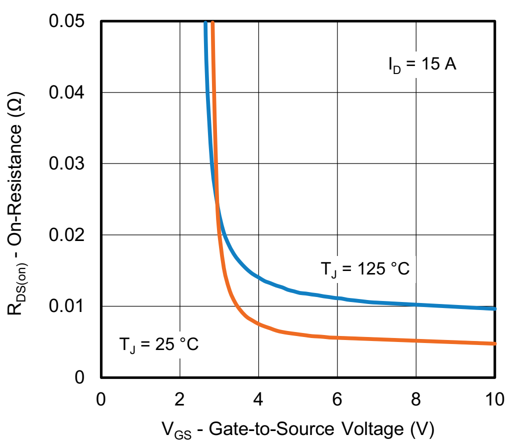
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



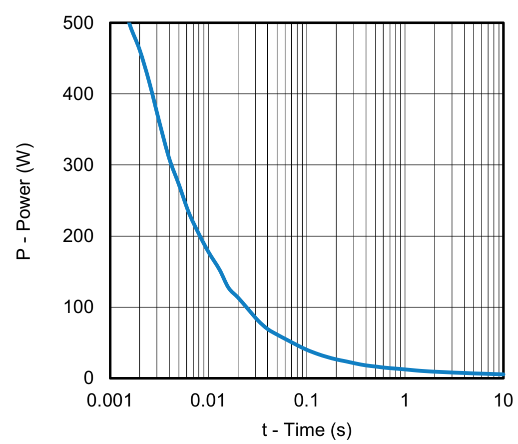
Source-Drain Diode Forward Voltage



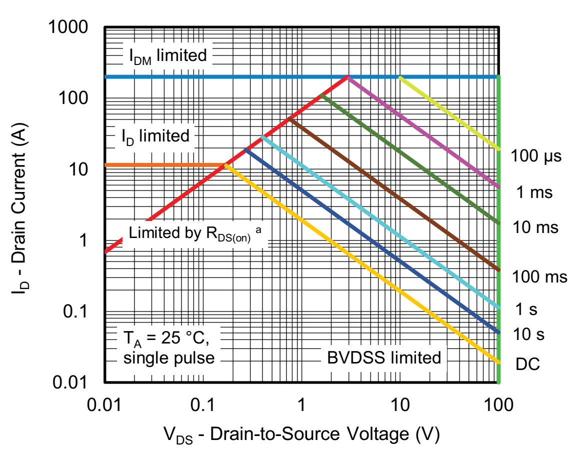
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient

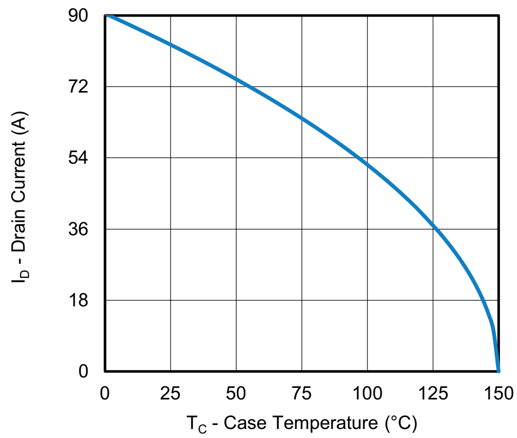


Safe Operating Area, Junction-to-Ambient

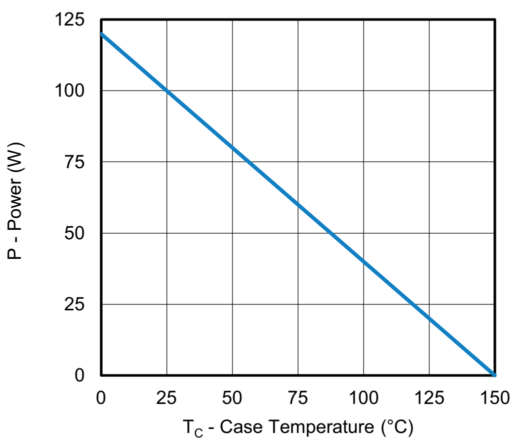
Note

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

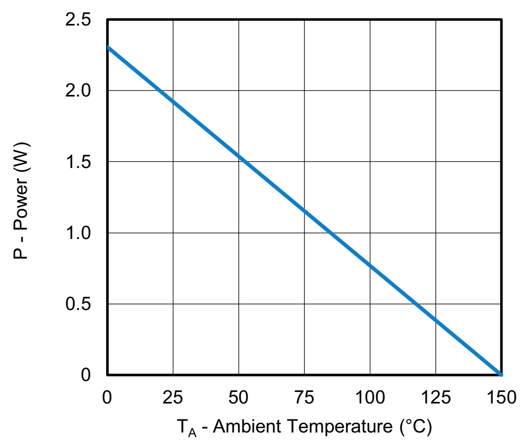
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating [a]



Power, Junction-to-Case

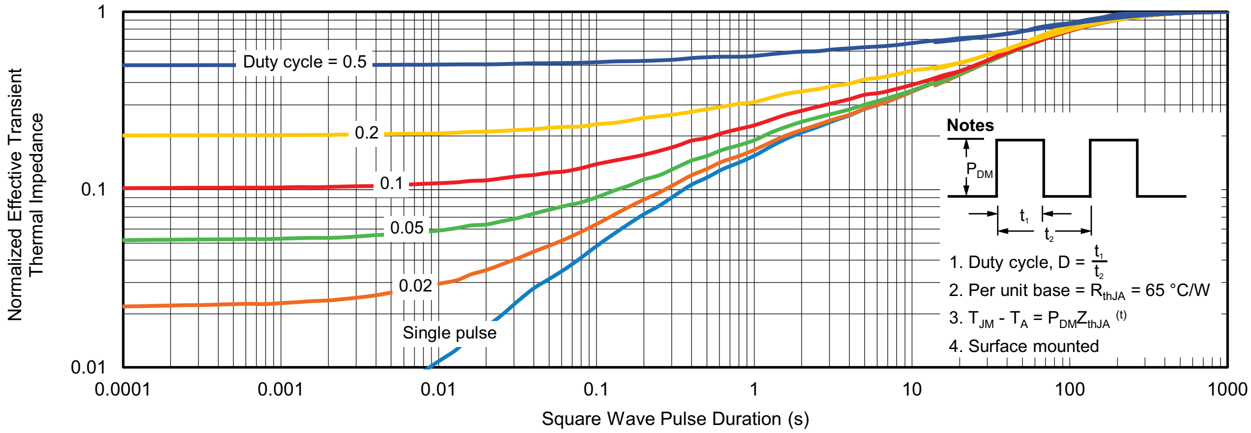


Power, Junction-to-Ambient

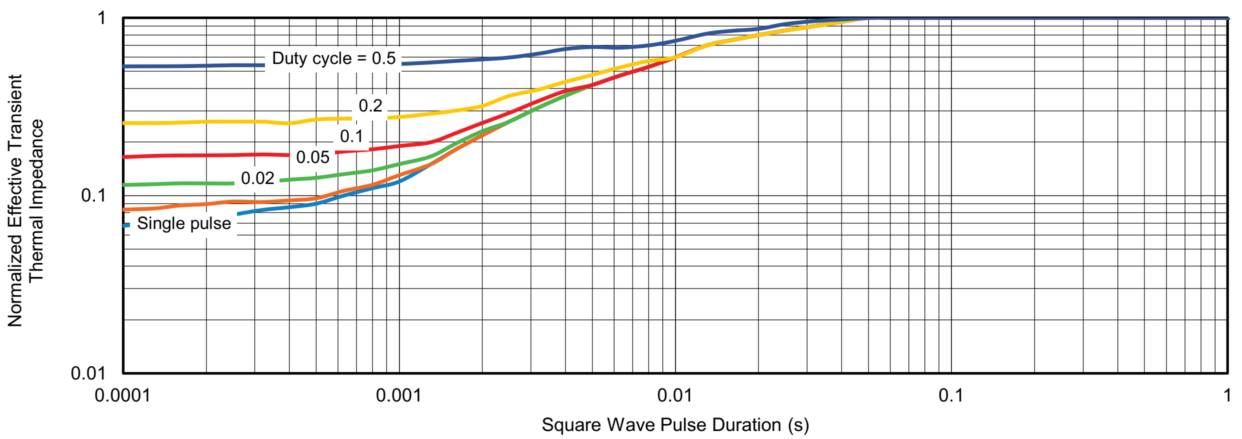
Note

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)



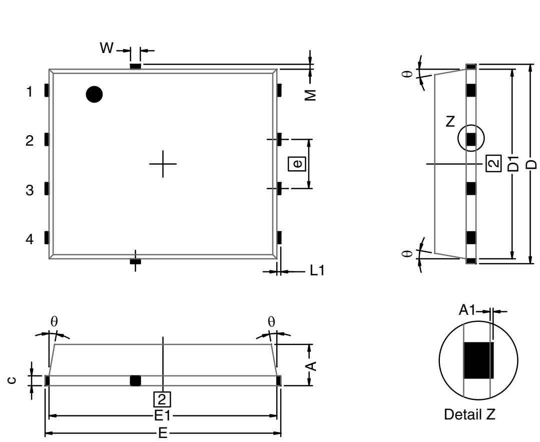
Normalized Thermal Transient Impedance, Junction-to-Ambient

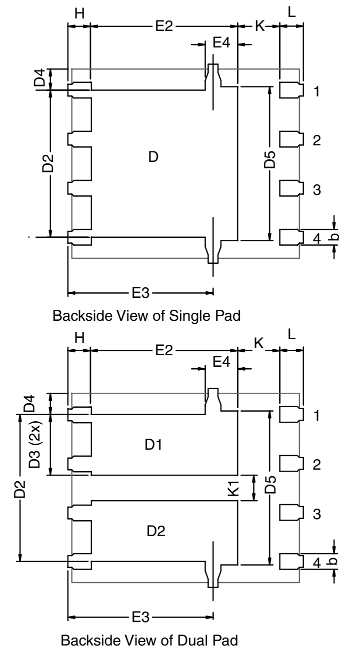


Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package / tape drawings, part marking, and reliability data, see www.vishay.com/ppg?77383.

PowerPAK® SO-8, (Single/Dual)





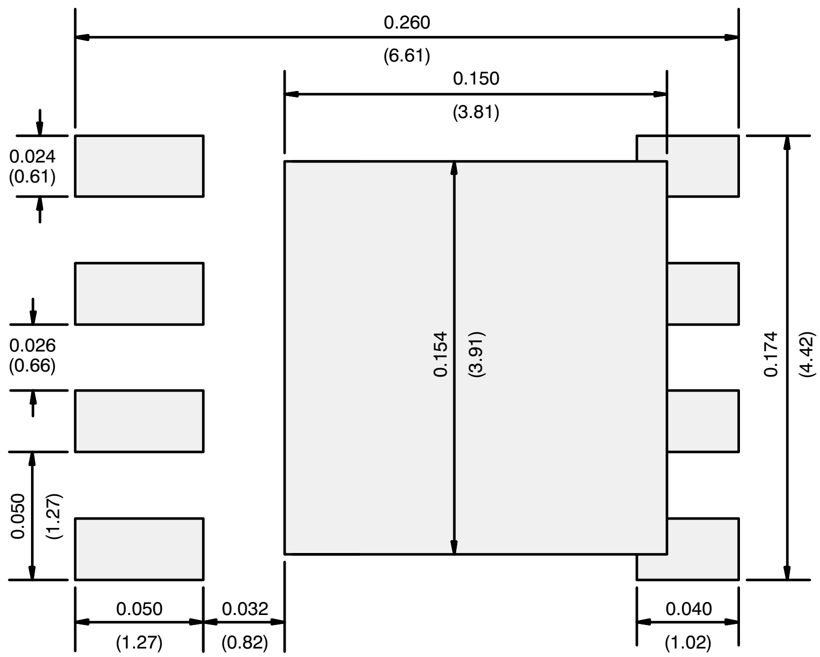
Notes

1. Inch will govern.
2. Dimensions exclusive of mold gate burrs.
3. Dimensions exclusive of mold flash and cutting burrs.

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.97	1.04	1.12	0.038	0.041	0.044
A1		-	0.05	0	-	0.002
b	0.33	0.41	0.51	0.013	0.016	0.020
c	0.23	0.28	0.33	0.009	0.011	0.013
D	5.05	5.15	5.26	0.199	0.203	0.207
D1	4.80	4.90	5.00	0.189	0.193	0.197
D2	3.56	3.76	3.91	0.140	0.148	0.154
D3	1.32	1.50	1.68	0.052	0.059	0.066
D4		0.57 typ.			0.0225 typ.	
D5		3.98 typ.			0.157 typ.	
E	6.05	6.15	6.25	0.238	0.242	0.246
E1	5.79	5.89	5.99	0.228	0.232	0.236
E2	3.48	3.66	3.84	0.137	0.144	0.151
E3	3.68	3.78	3.91	0.145	0.149	0.154
E4		0.75 typ.			0.030 typ.	
e		1.27 BSC			0.050 BSC	
K		1.27 typ.			0.050 typ.	
K1	0.56	-	-	0.022	-	-
H	0.51	0.61	0.71	0.020	0.024	0.028
L	0.51	0.61	0.71	0.020	0.024	0.028
L1	0.06	0.13	0.20	0.002	0.005	0.008
θ	0°	-	12°	0°	-	12°
W	0.15	0.25	0.36	0.006	0.010	0.014
M		0.125 typ.			0.005 typ.	

ECN: S17-0173-Rev. L, 13-Feb-17
DWG: 5881

RECOMMENDED MINIMUM PADS FOR PowerPAK® SO-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

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