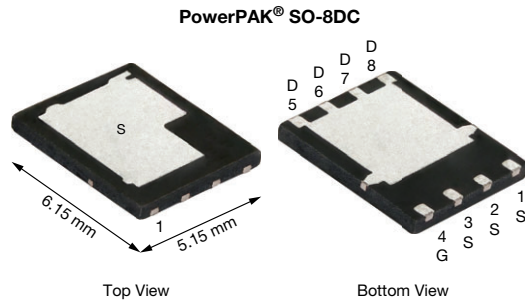


N-Channel 25 V (D-S) 175 °C MOSFET



FEATURES

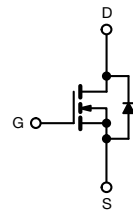
- TrenchFET® Gen IV power MOSFET
- Optimized Q_g , Q_{gd} , and Q_{gd}/Q_{gs} ratio reduces switching related power loss
- Top side cooling feature provides additional venue for thermal transfer
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- High power density DC/DC
- Synchronous buck converter
- OR-ing
- Load switching
- Battery management



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	25
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.00058
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.00082
Q_g typ. (nC)	61
I_D (A)	415
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK SO-8DC
Lead (Pb)-free and halogen-free	SiDR220EP-T1-RE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	25	V
Gate-source voltage	V_{GS}	+16 / -12	V
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	415
		$T_C = 70$ °C	347
		$T_A = 25$ °C	92.8 ^{b, c}
		$T_A = 70$ °C	77.6 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	500	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	136
		$T_A = 25$ °C	6.8 ^{b, c}
Single pulse avalanche current	I_{AS}	60	
Single pulse avalanche energy	E_{AS}	180	mJ
Maximum power dissipation	P_D	$T_C = 25$ °C	150
		$T_C = 70$ °C	105
		$T_A = 25$ °C	6.25 ^{b, c}
		$T_A = 70$ °C	4 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) ^c		260	°C

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient ^b	$t \leq 10$ s	R_{thJA}	15	20	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	0.8	1	
Maximum junction-to-case (source)	Steady state	R_{thJC}	1.1	1.4	

Notes

- Package limited
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (www.vishay.com/doc?73257). The PowerPAK SO-8DC 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
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- Maximum under steady state conditions is 54 °C/W
- $T_C = 25$ °C



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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	25	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 10\text{ mA}$	-	21	-	mV/ $^\circ\text{C}$
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-4.8	-	
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1	-	2.1	V
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = +16 / -12\text{ V}$	-	-	100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$	-	-	15	
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	-	0.00048	0.00058	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$	-	0.00065	0.00082	
Forward transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	-	110	-	S
Dynamic ^b						
Input capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	10 850	-	pF
Output capacitance	C_{oss}		-	3360	-	
Reverse transfer capacitance	C_{rss}		-	720	-	
Total gate charge	Q_g	$V_{DS} = 10\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	-	134	200	nC
		$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$	-	61	92	
Gate-source charge	Q_{gs}		-	24	-	
Gate-drain charge	Q_{gd}		-	9.2	-	
Gate resistance	R_g	$f = 1\text{ MHz}$	0.1	0.38	0.75	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 0.5\text{ }\Omega, I_D \cong 20\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	-	19	38	ns
Rise time	t_r		-	24	48	
Turn-off delay time	$t_{d(off)}$		-	53	105	
Fall time	t_f		-	9	18	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 0.5\text{ }\Omega, I_D \cong 20\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	51	100	
Rise time	t_r		-	95	190	
Turn-off delay time	$t_{d(off)}$		-	47	94	
Fall time	t_f		-	16	32	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	136	A
Pulse diode forward current	I_{SM}		-	-	500	
Body diode voltage	V_{SD}	$I_S = 5\text{ A}, V_{GS} = 0\text{ V}$	-	0.71	1.1	V
Body diode reverse recovery time	t_{rr}	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	63	126	ns
Body diode reverse recovery charge	Q_{rr}		-	87	174	nC
Reverse recovery fall time	t_a		-	27	-	ns
Reverse recovery rise time	t_b		-	36	-	

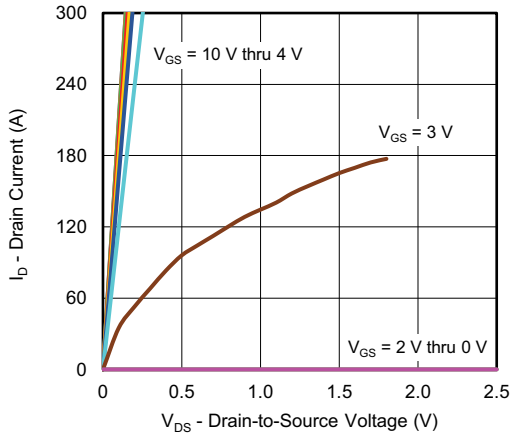
Notes

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

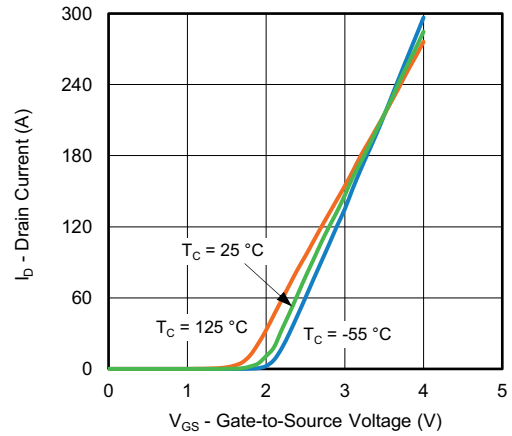
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



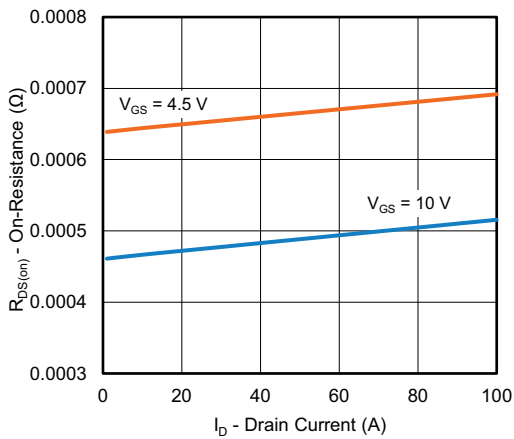
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



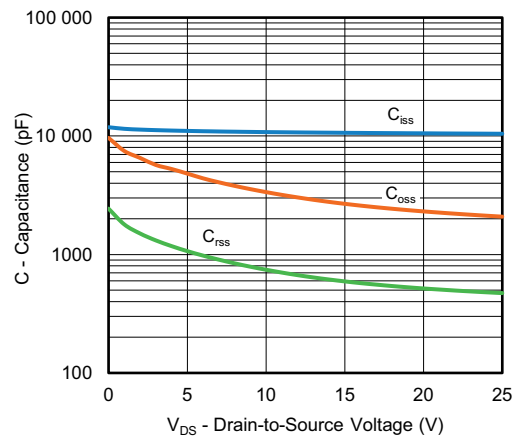
Output Characteristics



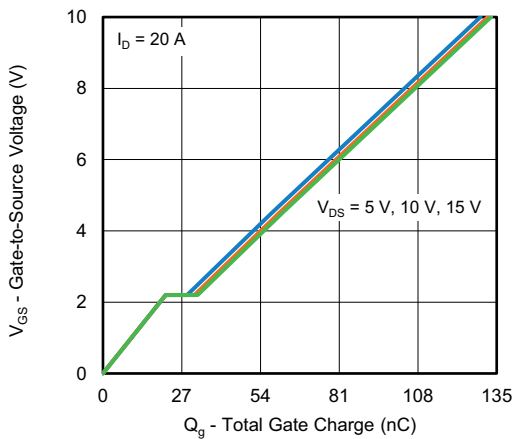
Transfer Characteristics



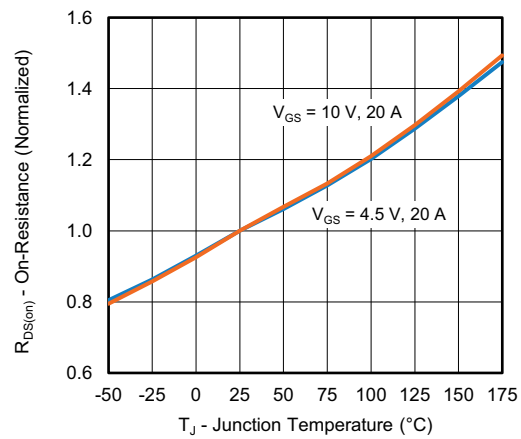
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



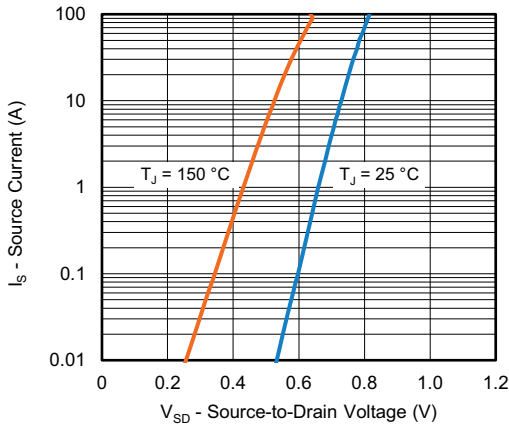
Gate Charge



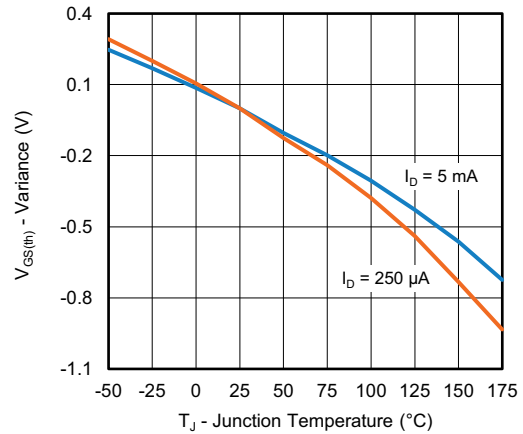
On-Resistance vs. Junction Temperature



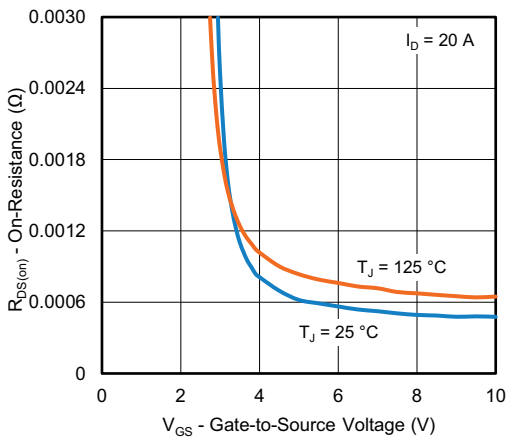
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



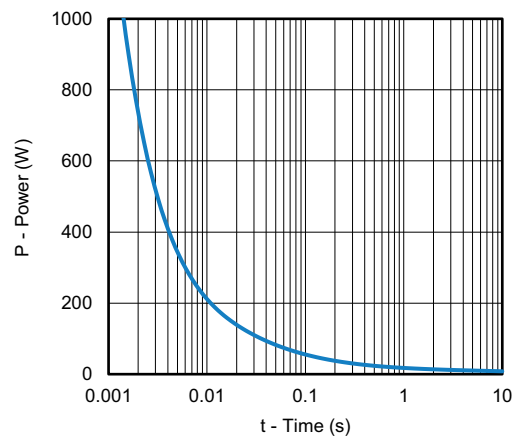
Source-Drain Diode Forward Voltage



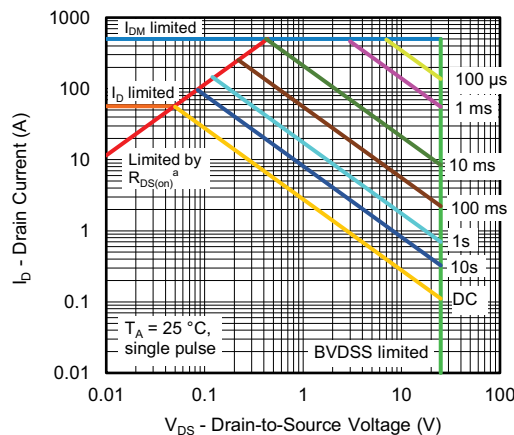
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient



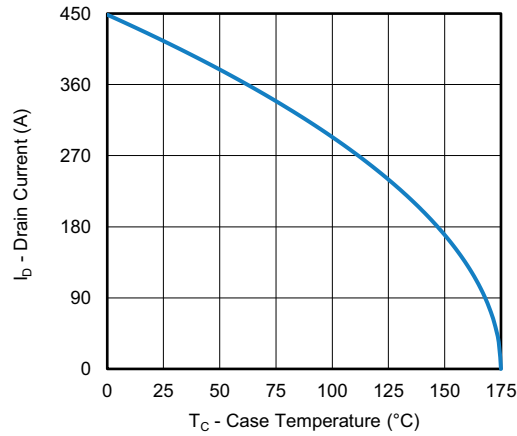
Safe Operating Area, Junction-to-Ambient

Note

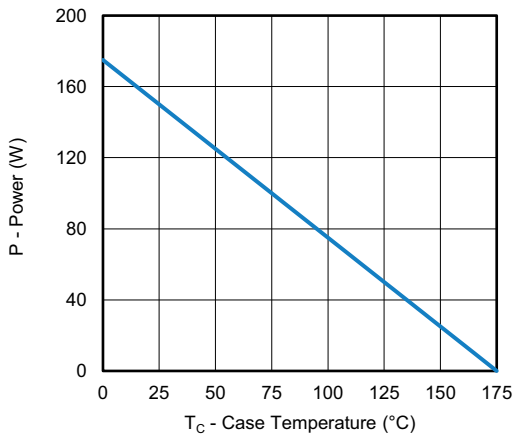
a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



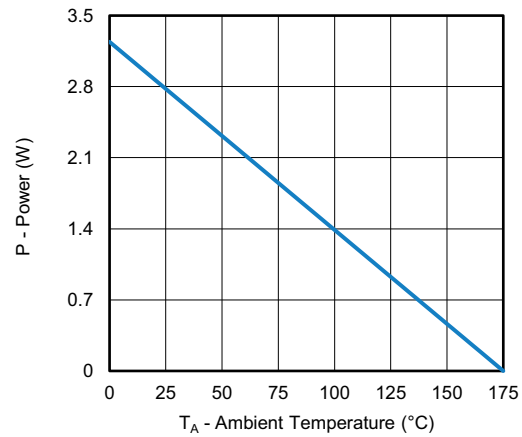
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Power, Junction-to-Case



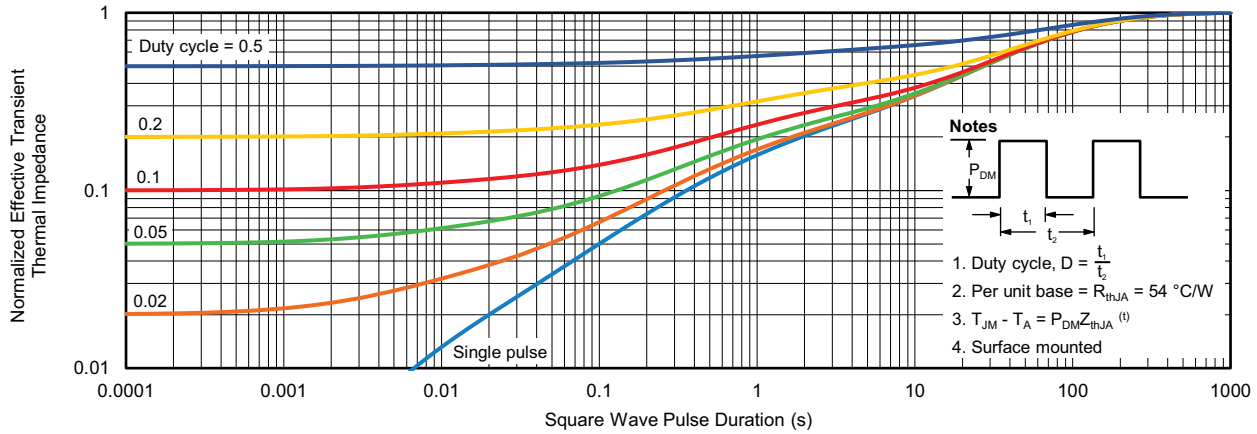
Power, Junction-to-Ambient

Note

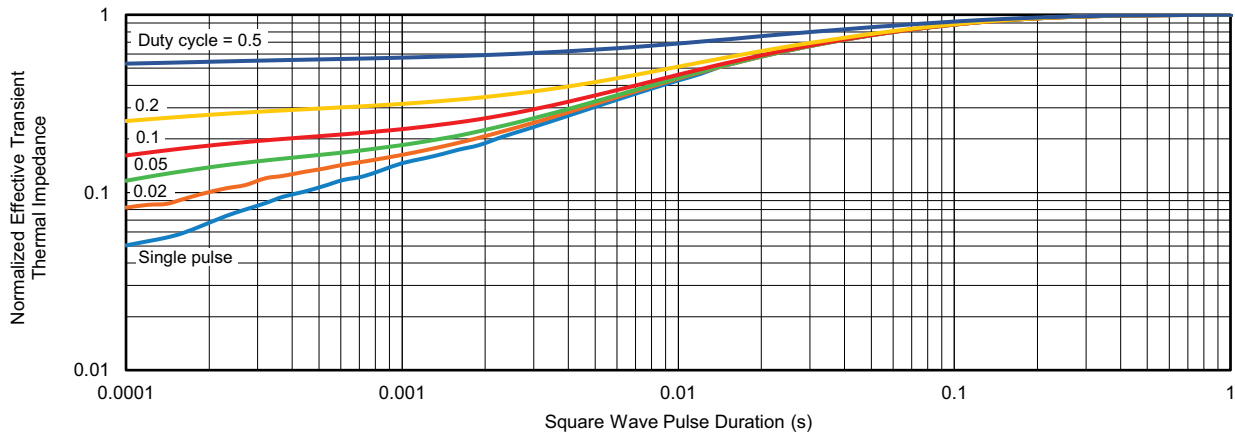
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case (Drain)

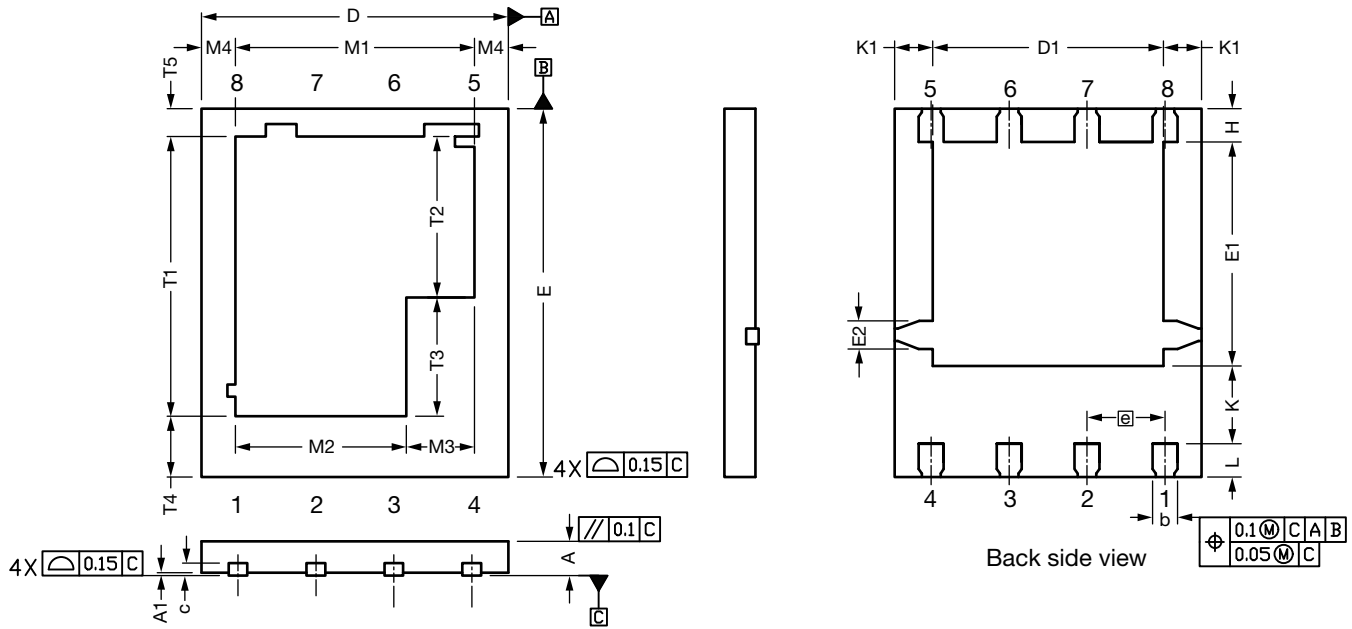


Normalized Thermal Transient Impedance, Junction-to-Case (Source)

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?63083.



PowerPAK[®] SO-8 Double Cooling Case Outline



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.51	0.56	0.61	0.020	0.022	0.024
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.36	0.41	0.46	0.014	0.016	0.018
c	0.15	0.20	0.25	0.006	0.008	0.010
D	4.90	5.00	5.10	0.193	0.197	0.201
D1	3.71	3.76	3.81	0.146	0.148	0.150
e	1.27 BSC			0.050 BSC		
E	5.90	6.00	6.10	0.232	0.236	0.240
E1	3.60	3.65	3.70	0.142	0.144	0.146
E2	0.46 typ.			0.018 typ.		
H	0.49	0.54	0.59	0.019	0.021	0.023
K	1.22	1.27	1.32	0.048	0.050	0.052
K1	0.64 typ.			0.025 typ.		
L	0.49	0.54	0.59	0.019	0.021	0.023
M1	3.85	3.90	3.95	0.152	0.154	0.156
M2	2.74	2.79	2.84	0.108	0.110	0.112
M3	1.06	1.11	1.16	0.042	0.044	0.046
M4	0.56 typ.			0.022 typ.		
N	8			8		
T1	4.51	4.56	4.61	0.178	0.180	0.182
T2	2.58	2.63	2.68	0.102	0.104	0.106
T3	1.88	1.93	1.98	0.074	0.076	0.078
T4	0.97 typ.			0.038 typ.		
T5	0.48 typ.			0.019 typ.		

ECN: T21-0014-Rev. B, 08-Feb-2021
DWG: 6048

RECOMMENDED MINIMUM PADS FOR PowerPAK® SO-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

[Return to Index](#)



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