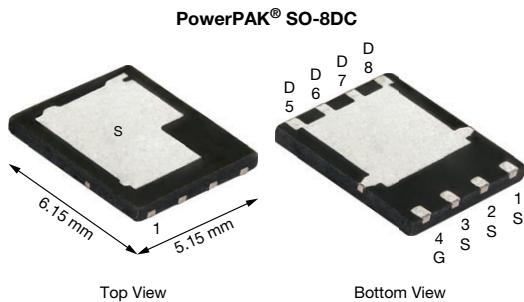


## N-Channel 25 V (D-S) MOSFET



### FEATURES

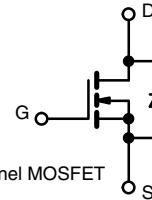
- TrenchFET® Gen IV power MOSFET
- Optimized  $Q_g$ ,  $Q_{gd}$ , and  $Q_{gd}/Q_{gs}$  ratio reduces switching related power loss
- Top side cooling feature provides additional venue for thermal transfer
- 100 %  $R_g$  and UIS tested
- Material categorization: for definitions of compliance please see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



### PRODUCT SUMMARY

$V_{DS}$ (V)	25
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.00058
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.00082
$Q_g$ typ. (nC)	61
$I_D$ (A)	100 <sup>a, g</sup>
Configuration	Single

### ORDERING INFORMATION

Package	PowerPAK SO-8DC
Lead (Pb)-free and halogen-free	SiDR220DP-T1-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	25	
Gate-source voltage	$V_{GS}$	+16 / -12	V
Continuous drain current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	A
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	500	
Continuous source-drain diode current	$I_S$	$T_C = 25$ °C	
		$T_A = 25$ °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	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Operating junction and storage temperature range	$T_J$ , $T_{stg}$	-55 to +150	
Soldering recommendations (peak temperature) <sup>c</sup>		260	°C

### THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient <sup>b</sup>	$R_{thJA}$	15	20	°C/W
Maximum junction-to-case (drain)	$R_{thJC}$	0.8	1	
Maximum junction-to-case (source)	$R_{thJC}$	1.1	1.4	

#### Notes

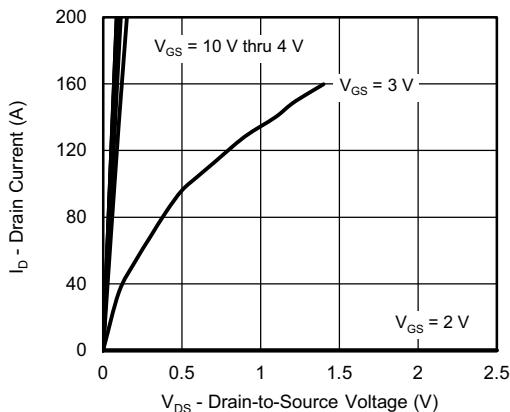
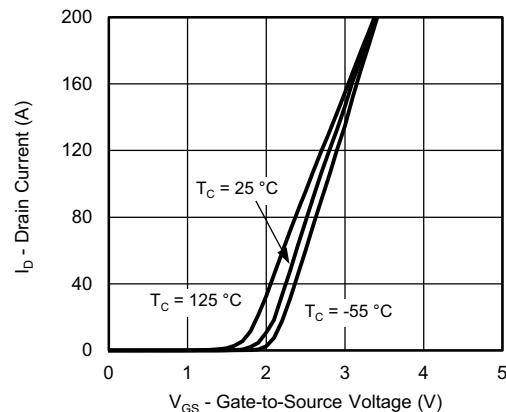
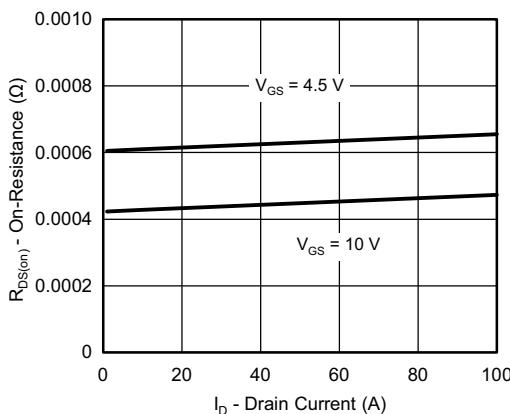
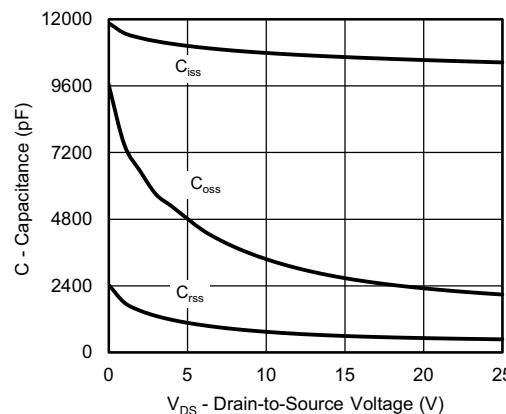
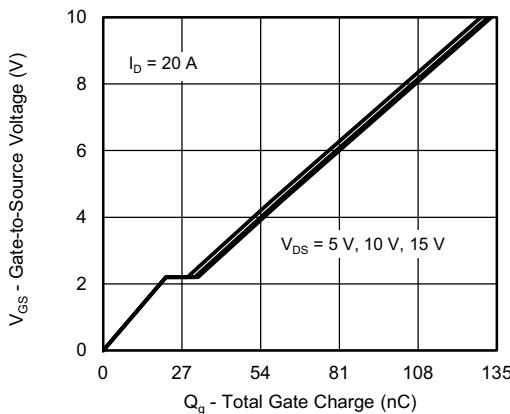
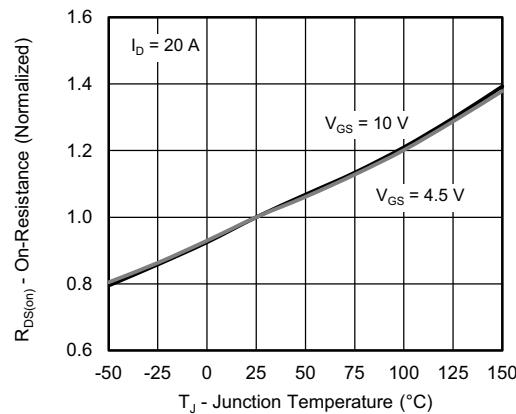
- a. Package limited
- b. Surface mounted on 1" x 1" FR4 board
- c.  $t = 10$  s
- d. See solder profile ([www.vishay.com/doc?73257](http://www.vishay.com/doc?73257)). The PowerPAK SO-8DC is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation 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
- e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components
- f. Maximum under steady state conditions is 54 °C/W
- g.  $T_C = 25$  °C

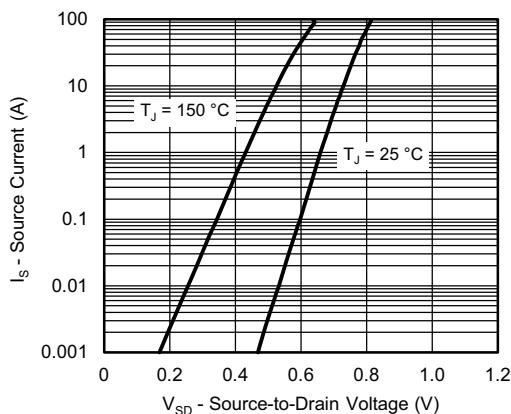
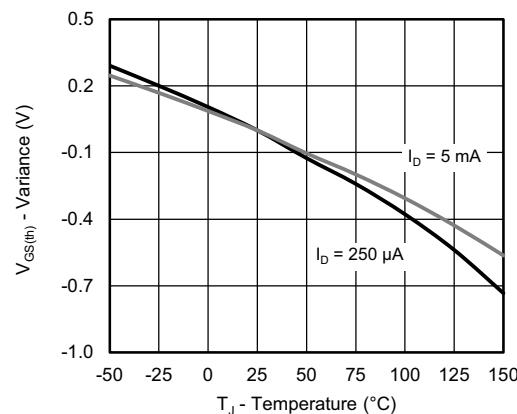
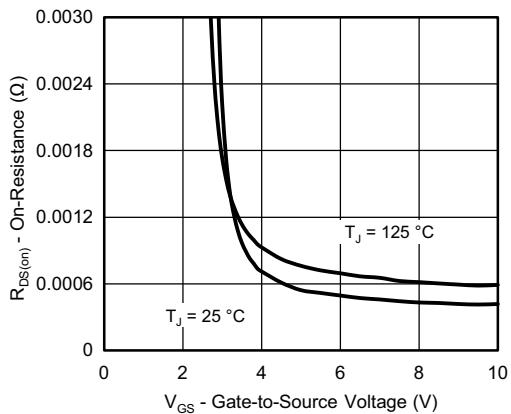
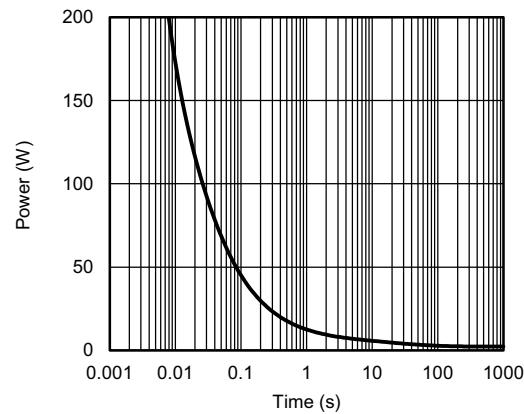
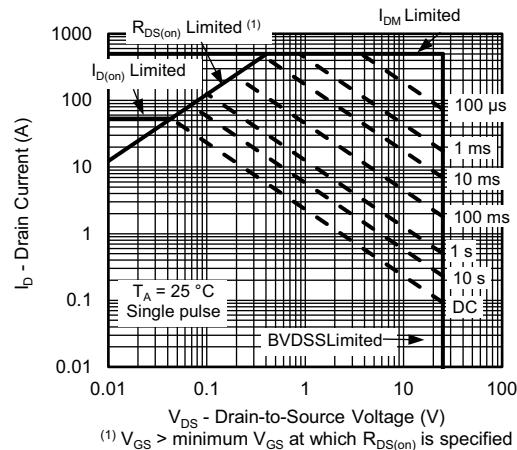
<b>SPECIFICATIONS</b> ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	25	-	-	V
$V_{DS}$ temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 10 \text{ mA}$	-	21	-	$\text{mV}/^\circ\text{C}$
$V_{GS(\text{th})}$ temperature coefficient	$\Delta V_{GS(\text{th})}/T_J$	$I_D = 250 \mu\text{A}$	-	-4.8	-	
Gate-source threshold voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	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	$\mu\text{A}$
		$V_{DS} = 25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 70^\circ\text{C}$	-	-	15	
On-state drain current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 10 \text{ V}$ , $V_{GS} = 10 \text{ V}$	40	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$	-	0.00048	0.00058	$\Omega$
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 20 \text{ A}$	-	0.00065	0.00082	
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 20 \text{ A}$	-	110	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	$C_{iss}$	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	-	10 850	-	$\text{pF}$
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	$\text{nC}$
Gate-source charge	$Q_{gs}$	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ , $I_D = 20 \text{ A}$	-	61	92	
Gate-drain charge	$Q_{gd}$		-	24	-	
Gate resistance	$R_g$	$f = 1 \text{ MHz}$	0.1	0.38	0.75	$\Omega$
Turn-on delay time	$t_{d(\text{on})}$	$V_{DD} = 10 \text{ V}$ , $R_L = 0.5 \Omega$ , $I_D \geq 20 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$	-	19	38	$\text{ns}$
Rise time	$t_r$		-	24	48	
Turn-off delay time	$t_{d(\text{off})}$		-	53	105	
Fall time	$t_f$		-	9	18	
Turn-on delay time	$t_{d(\text{on})}$		-	51	100	
Rise time	$t_r$		-	95	190	
Turn-off delay time	$t_{d(\text{off})}$	$V_{DD} = 10 \text{ V}$ , $R_L = 0.5 \Omega$ , $I_D \geq 20 \text{ A}$ , $V_{GEN} = 4.5 \text{ V}$ , $R_g = 1 \Omega$	-	47	94	$\text{ns}$
Fall time	$t_f$		-	16	32	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous source-drain diode current	$I_S$	$T_C = 25^\circ\text{C}$	-	-	94.5	$\text{A}$
Pulse diode forward current	$I_{SM}$		-	-	300	
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	$t_{rr}$	$I_F = 20 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$	-	63	126	$\text{ns}$
Body diode reverse recovery charge	$Q_{rr}$		-	87	174	$\text{nC}$
Reverse recovery fall time	$t_a$		-	27	-	
Reverse recovery rise time	$t_b$		-	36	-	$\text{ns}$

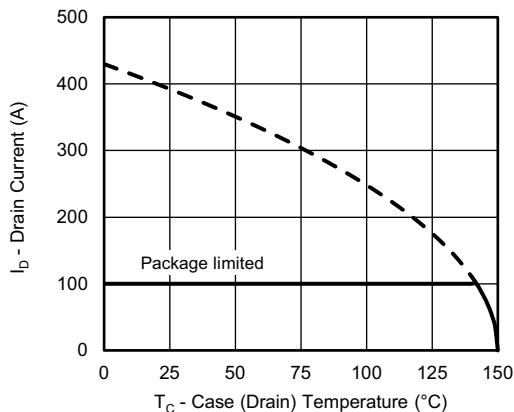
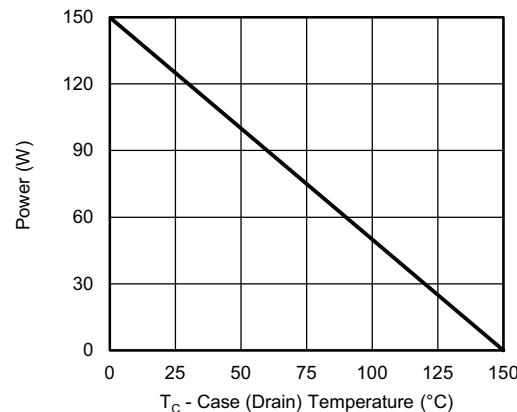
**Notes**

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

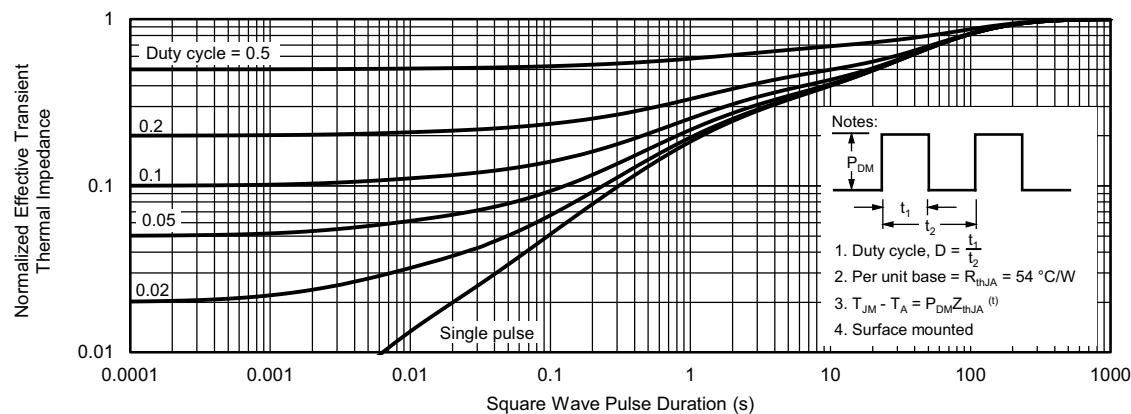
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

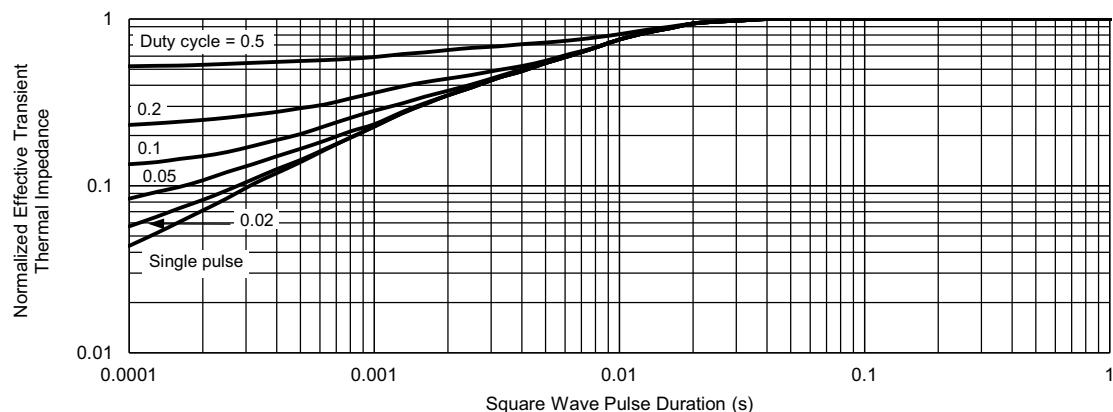
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**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**

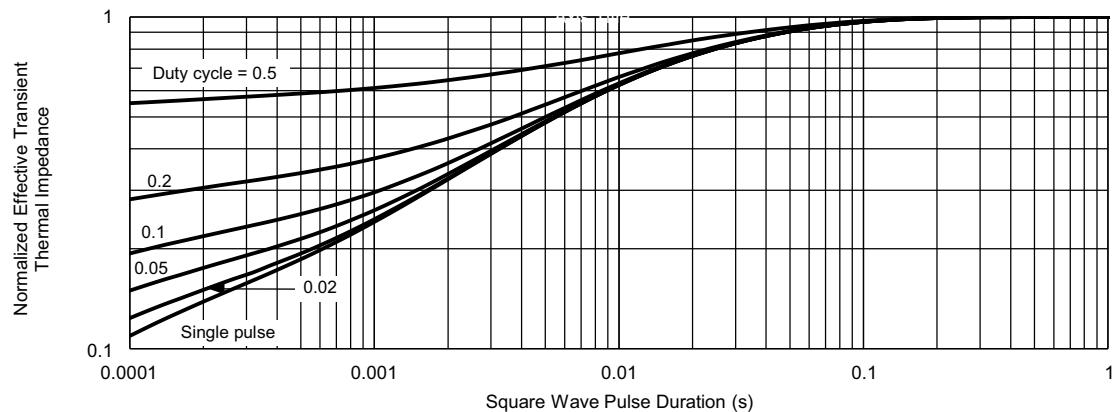
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

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

**Power, Junction-to-Case**
**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


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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


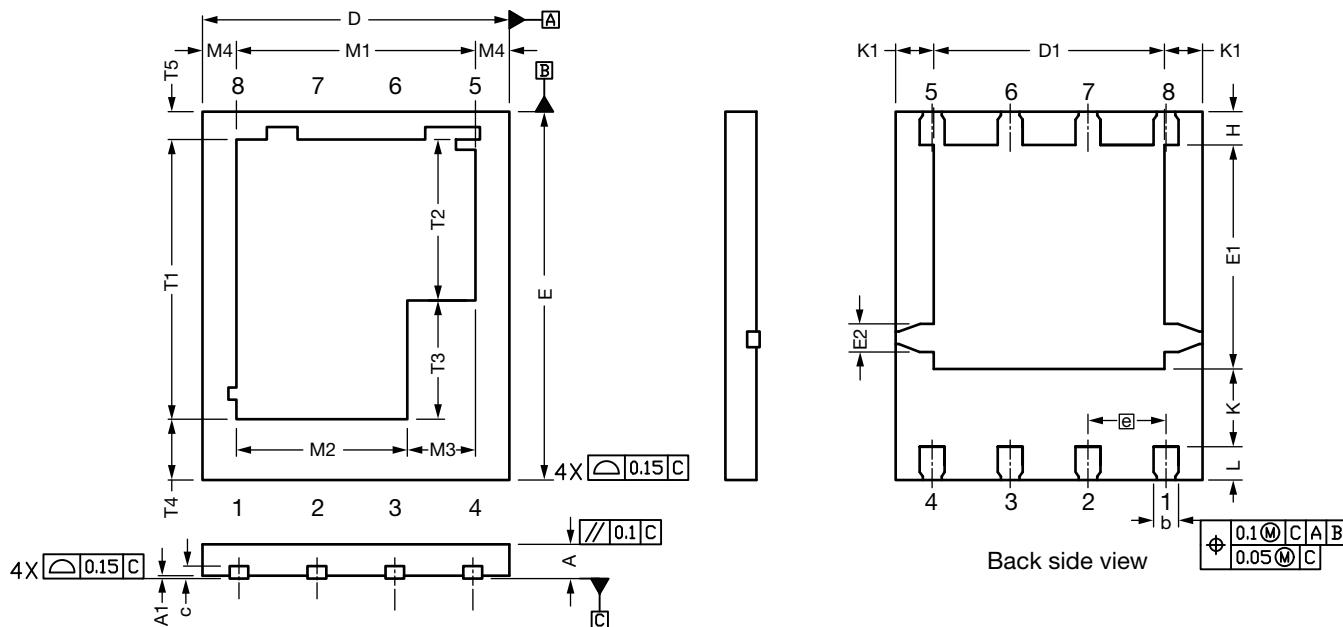
Normalized Thermal Transient Impedance, Junction-to-Case (Drain)



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?75639](http://www.vishay.com/ppg?75639).

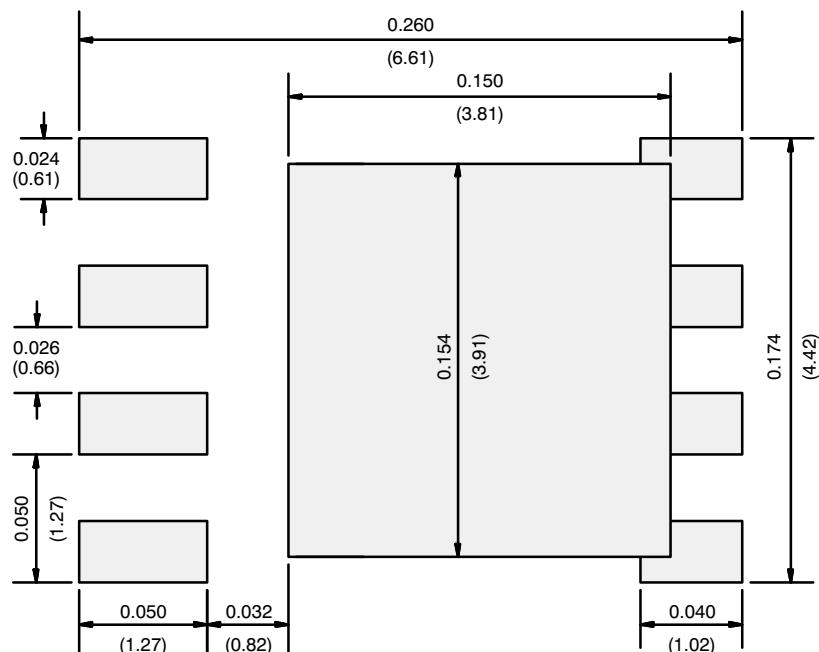
## PowerPAK® SO-8 Double Cooling Case Outline



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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