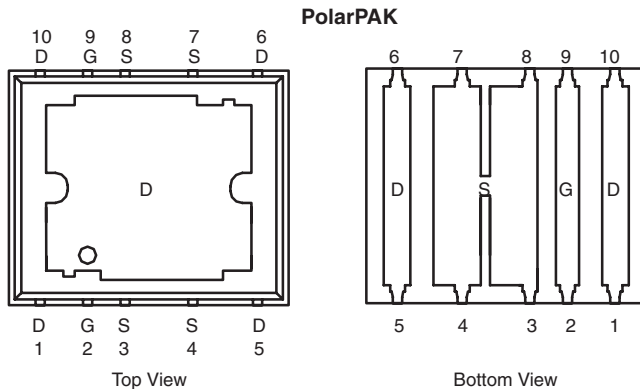


## N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY				
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a</sup>		Q <sub>g</sub> (Typ.)
		Silicon Limit	Package Limit	
20	0.0034 at V <sub>GS</sub> = 10 V	138	50	24 nC
	0.0055 at V <sub>GS</sub> = 4.5 V	108	50	

Package Drawing  
[www.vishay.com/doc?73398](http://www.vishay.com/doc?73398)



Top surface is connected to pins 1, 5, 6, and 10

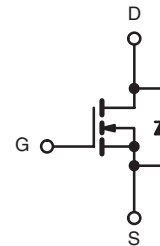
Ordering Information: SiE822DF-T1-E3 (Lead (Pb)-free)  
SiE822DF-T1-GE3 (Lead (Pb)-free and Halogen-free)

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- Ultra Low Thermal Resistance Using Top-Exposed PolarPAK<sup>®</sup> Package for Double-Sided Cooling
- Leadframe-Based New Encapsulated Package
  - Die Not Exposed
  - Same Layout Regardless of Die Size
- Low Q<sub>gd</sub>/Q<sub>gs</sub> Ratio Helps Prevent Shoot-Through
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS directive 2002/95/EC

### APPLICATIONS

- VRM
- DC-DC Conversion
- Synchronous Rectification



N-Channel MOSFET

For Related Documents  
[www.vishay.com/ppg?74451](http://www.vishay.com/ppg?74451)



ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	20	V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	138 (Silicon Limit)	A
			50 <sup>a</sup> (Package Limit)	
		T <sub>C</sub> = 70 °C	50 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	31 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C	24.8 <sup>b, c</sup>		
Pulsed Drain Current	I <sub>DM</sub>	80		
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	50 <sup>a</sup>	
		T <sub>A</sub> = 25 °C	4.3 <sup>b, c</sup>	
Single Pulse Avalanche Current	I <sub>AS</sub>	30		
Avalanche Energy	E <sub>AS</sub>	45	mJ	
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	104	W
		T <sub>C</sub> = 70 °C	66	
		T <sub>A</sub> = 25 °C	5.2 <sup>b, c</sup>	
		T <sub>A</sub> = 70 °C	3.3 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C	
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>		260		

Notes:

- Package limited is 50 A.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- See Solder Profile ([www.vishay.com/doc?73257](http://www.vishay.com/doc?73257)). The PolarPAK 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.

**THERMAL RESISTANCE RATINGS**

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, b</sup>	$t \leq 10$ s	$R_{thJA}$	20	24	°C/W
Maximum Junction-to-Case (Drain Top) <sup>a</sup>	Steady State	$R_{thJC}$ (Drain)	1	1.2	
Maximum Junction-to-Case (Source) <sup>a, c</sup>		$R_{thJC}$ (Source)	2.8	3.4	

Notes:

- a. Surface Mounted on 1" x 1" FR4 board.  
b. Maximum under Steady State conditions is 68 °C/W.  
c. Measured at source pin (on the side of the package).

**SPECIFICATIONS  $T_J = 25$  °C, unless otherwise noted**

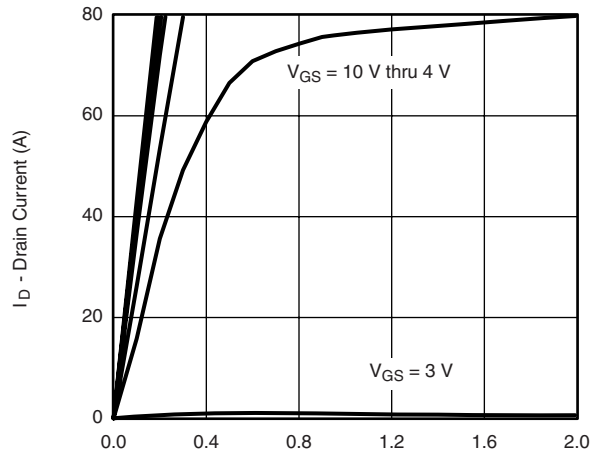
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0$ V, $I_D = 250$ $\mu$ A	20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250$ $\mu$ A		24.1		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-7.1			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250$ $\mu$ A	1.5	2.3	3.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20$ V, $V_{GS} = 0$ V			1	$\mu$ A
		$V_{DS} = 20$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5$ V, $V_{GS} = 10$ V	25			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 18.3$ A		0.0028	0.0034	$\Omega$
		$V_{GS} = 4.5$ V, $I_D = 14.5$ A		0.0045	0.0055	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15$ V, $I_D = 18.3$ A		90		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 10$ V, $V_{GS} = 0$ V, $f = 1$ MHz		4200		pF
Output Capacitance	$C_{oss}$		1000			
Reverse Transfer Capacitance	$C_{rss}$		320			
Total Gate Charge	$Q_g$	$V_{DS} = 10$ V, $V_{GS} = 10$ V, $I_D = 20$ A		52	78	nC
		$V_{DS} = 10$ V, $V_{GS} = 4.5$ V, $I_D = 20$ A		24	36	
			13			
			5			
Gate-Source Charge	$Q_{gs}$					
Gate-Drain Charge	$Q_{gd}$					
Gate Resistance	$R_g$	$f = 1$ MHz		1.0	1.5	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10$ V, $R_L = 1$ $\Omega$ $I_D \cong 10$ A, $V_{GEN} = 4.5$ V, $R_g = 1$ $\Omega$		50	75	ns
Rise Time	$t_r$			220	330	
Turn-Off Delay Time	$t_{d(off)}$			35	55	
Fall Time	$t_f$			20	30	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20$ V, $R_L = 1$ $\Omega$ $I_D \cong 10$ A, $V_{GEN} = 10$ V, $R_g = 1$ $\Omega$		15	25	
Rise Time	$t_r$			25	40	
Turn-Off Delay Time	$t_{d(off)}$			35	55	
Fall Time	$t_f$			10	15	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25$ °C			50	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				80	
Body Diode Voltage	$V_{SD}$	$I_S = 10$ A		0.8	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 10$ A, $di/dt = 100$ A/ $\mu$ s, $T_J = 25$ °C		40	60	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			36	60	nC
Reverse Recovery Fall Time	$t_a$			19		ns
Reverse Recovery Rise Time	$t_b$			21		

Notes:

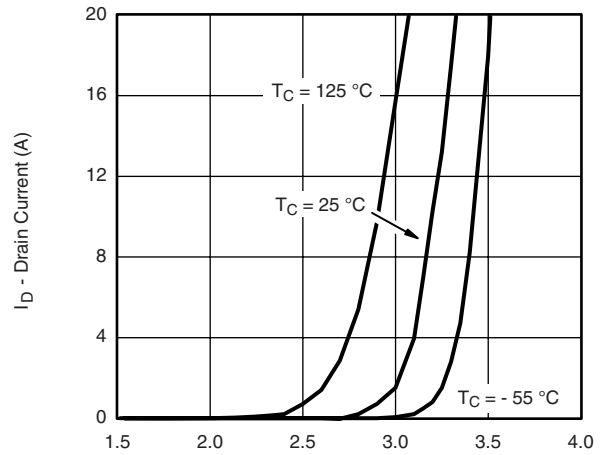
- a. Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %  
b. Guaranteed by design, not subject to production testing.

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.

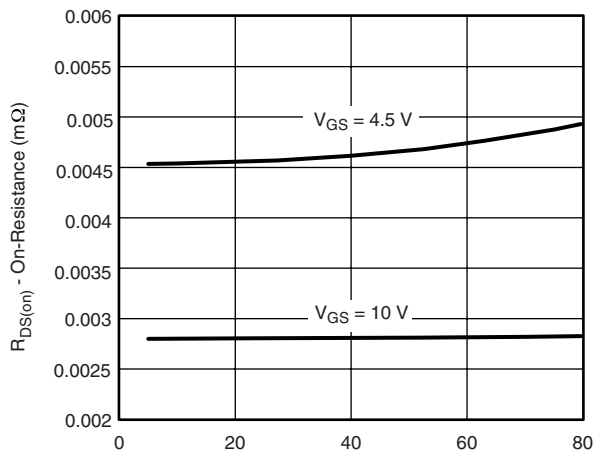
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



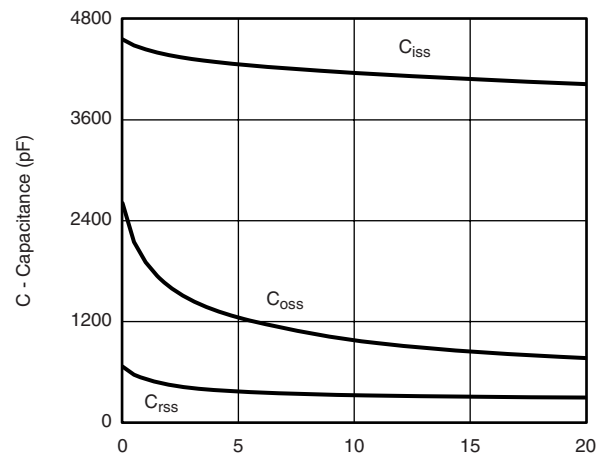
**Output Characteristics**



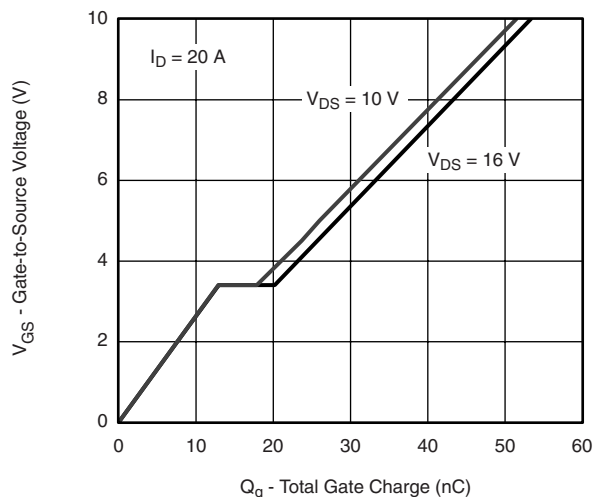
**Transfer Characteristics**



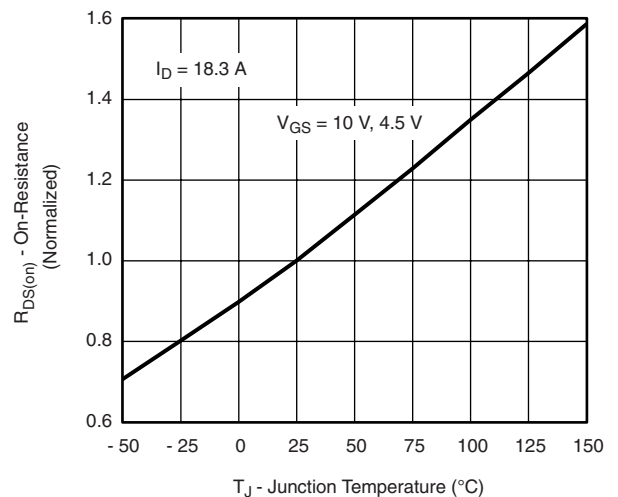
**On-Resistance vs. Drain Current**



**Capacitance**

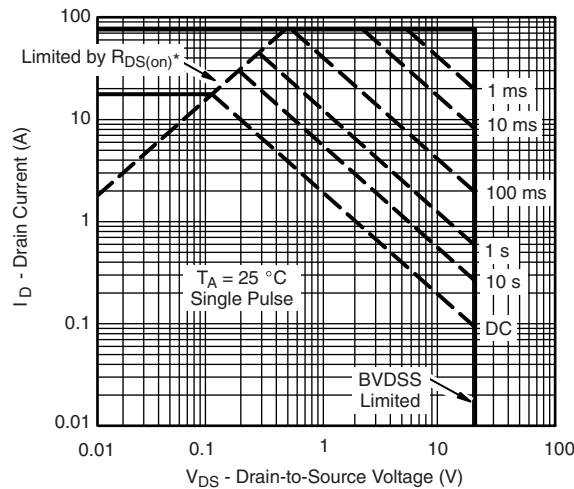
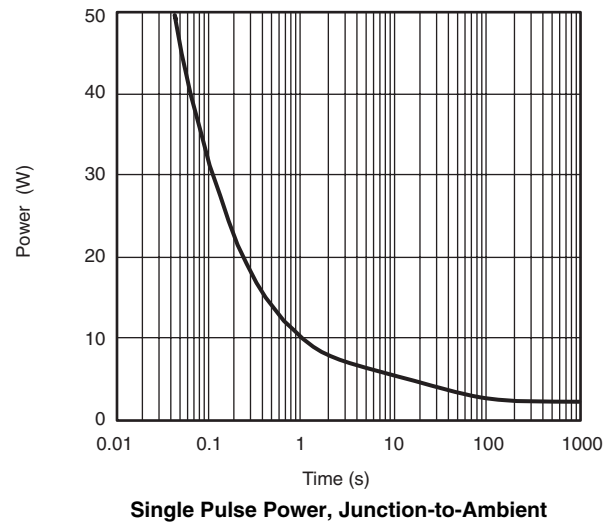
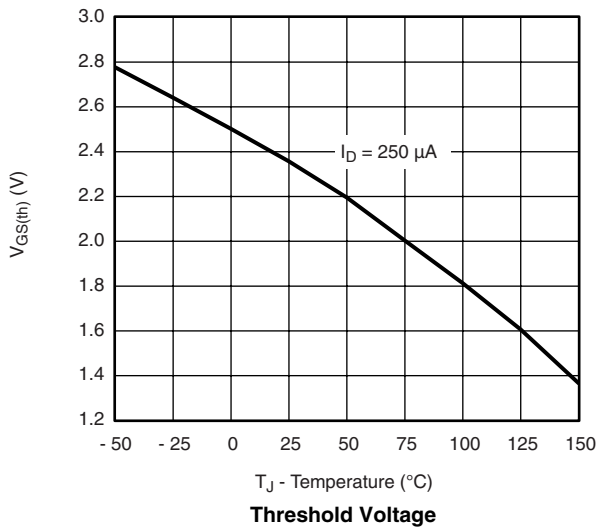
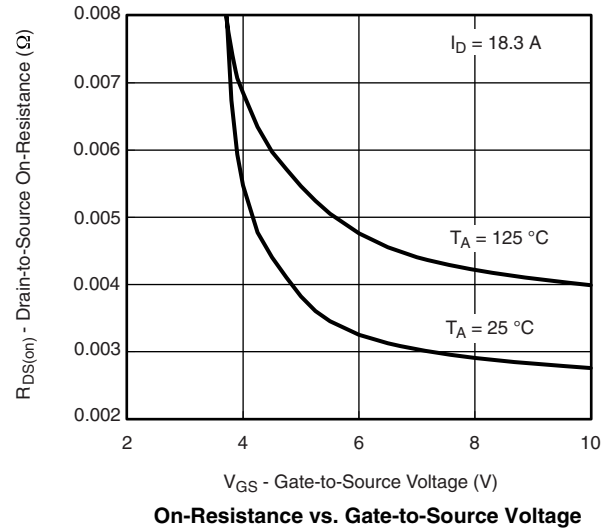
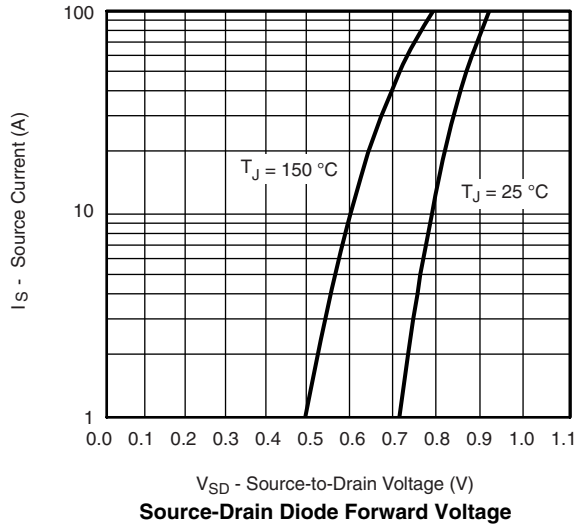


**Gate Charge**



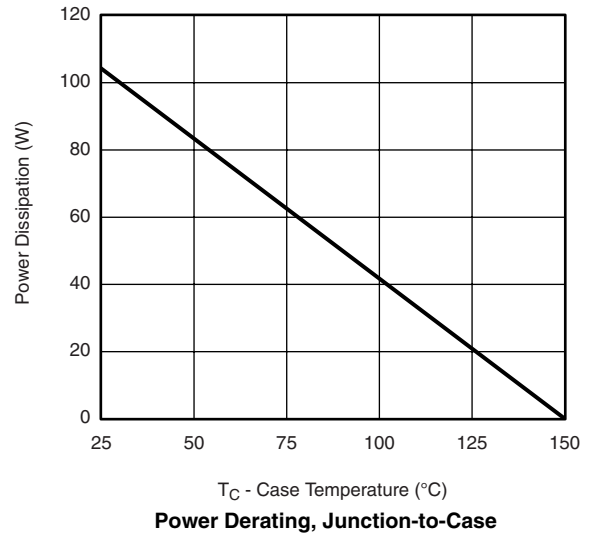
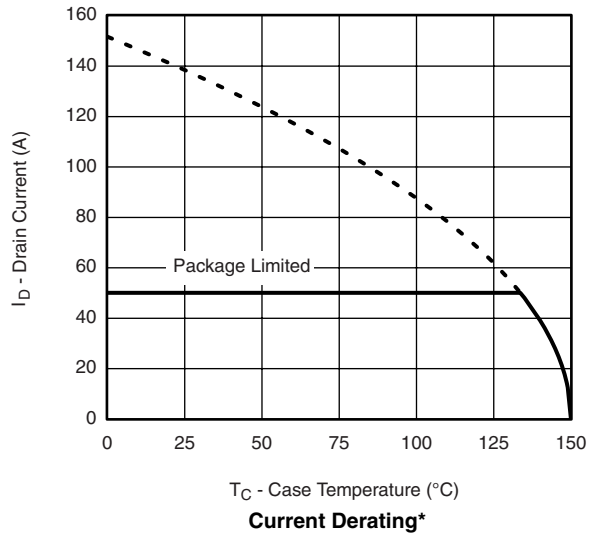
**On-Resistance vs. Junction Temperature**

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



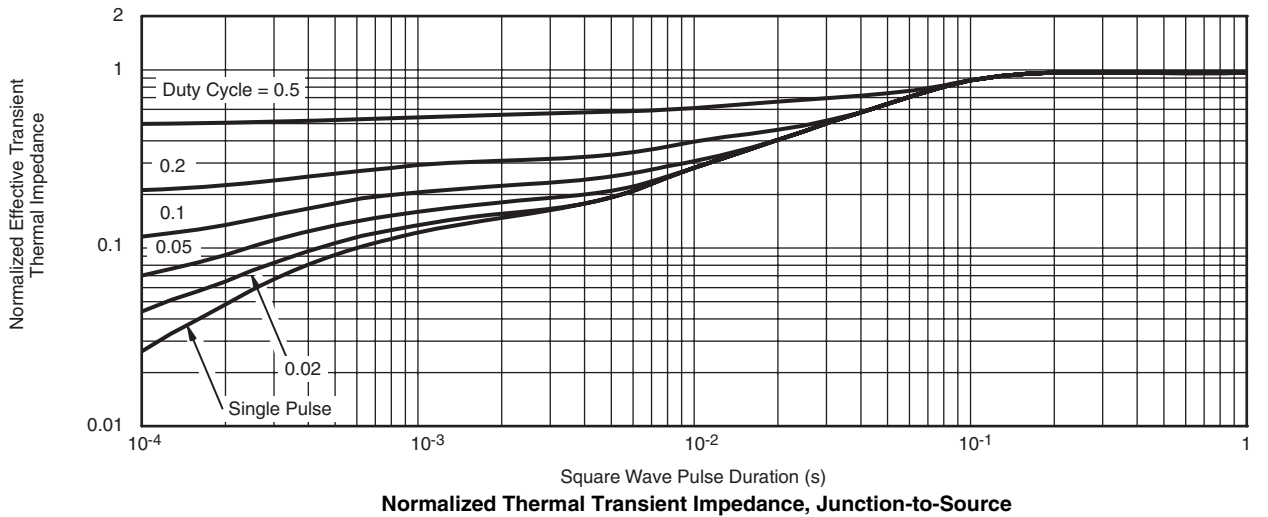
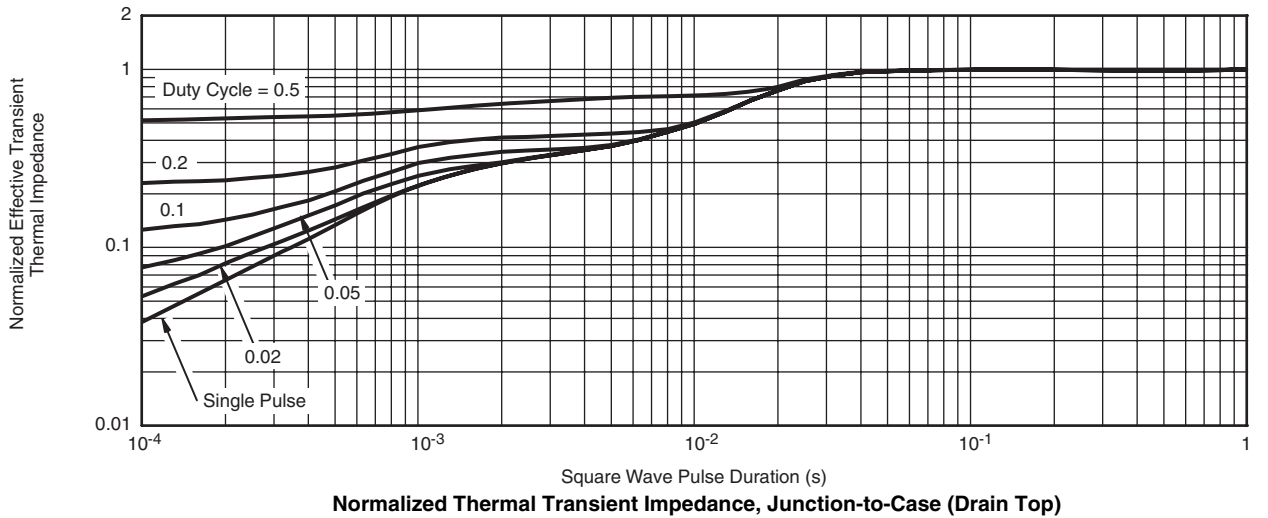
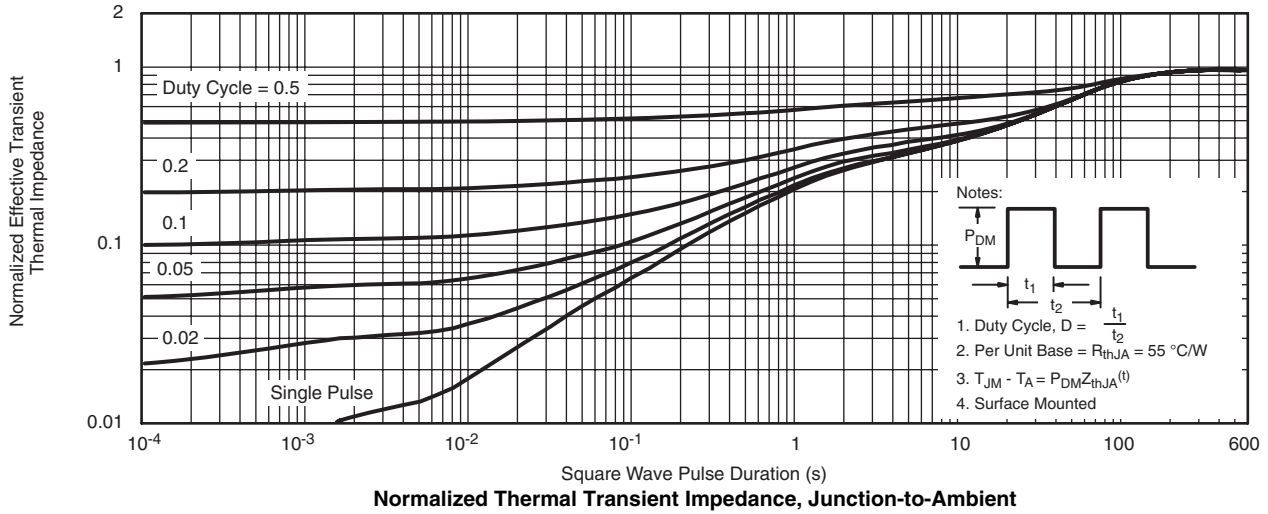
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

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



\* 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

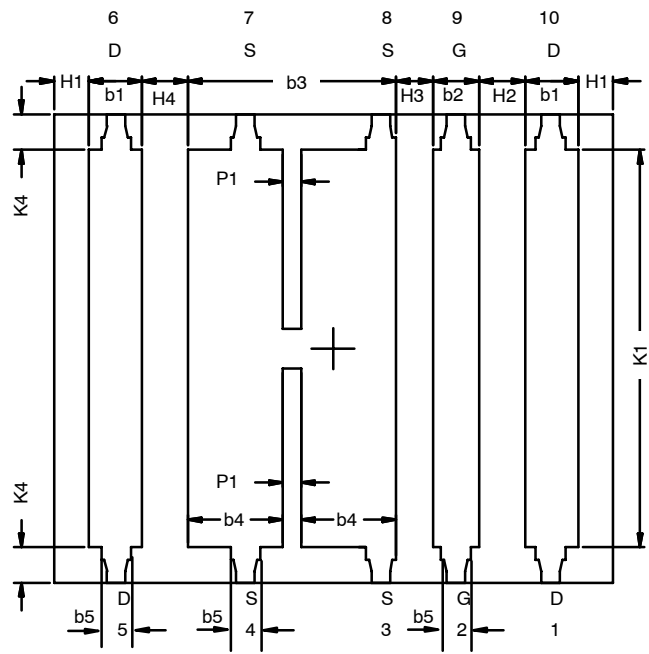
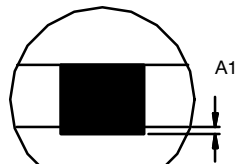
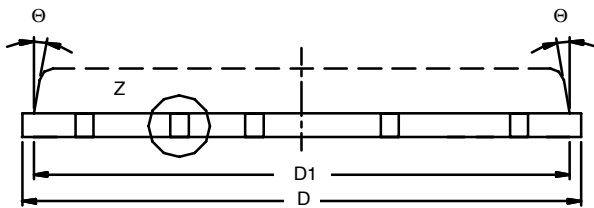
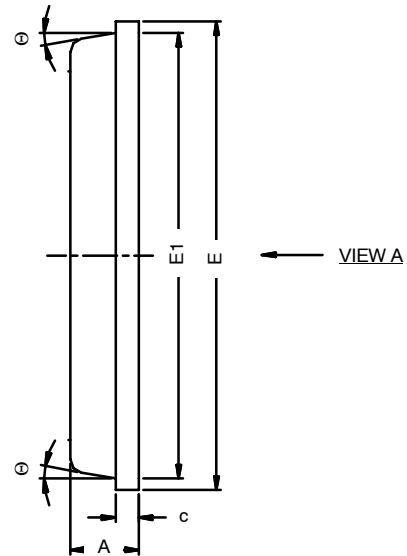
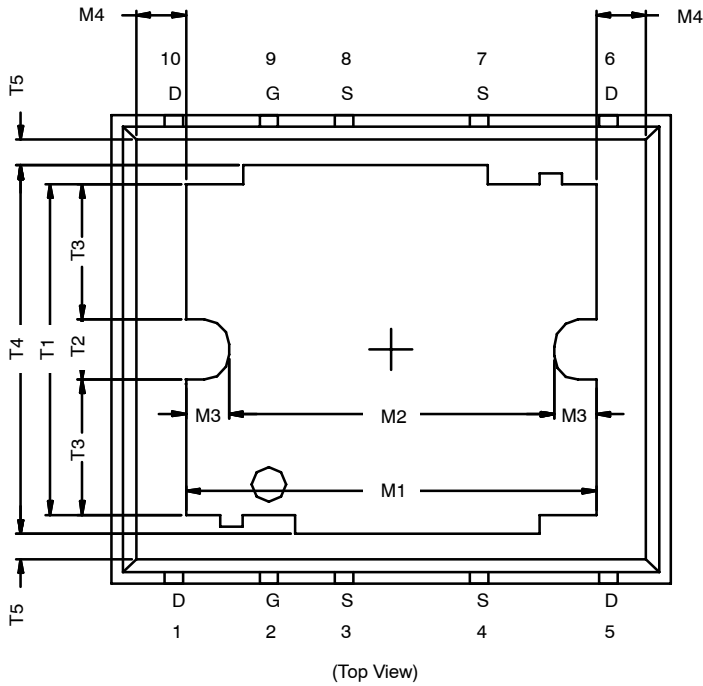


Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppq?74451](http://www.vishay.com/ppq?74451).



**PolarPAK™ (Option S)**

Product datasheet/information page contain links to applicable package drawing.



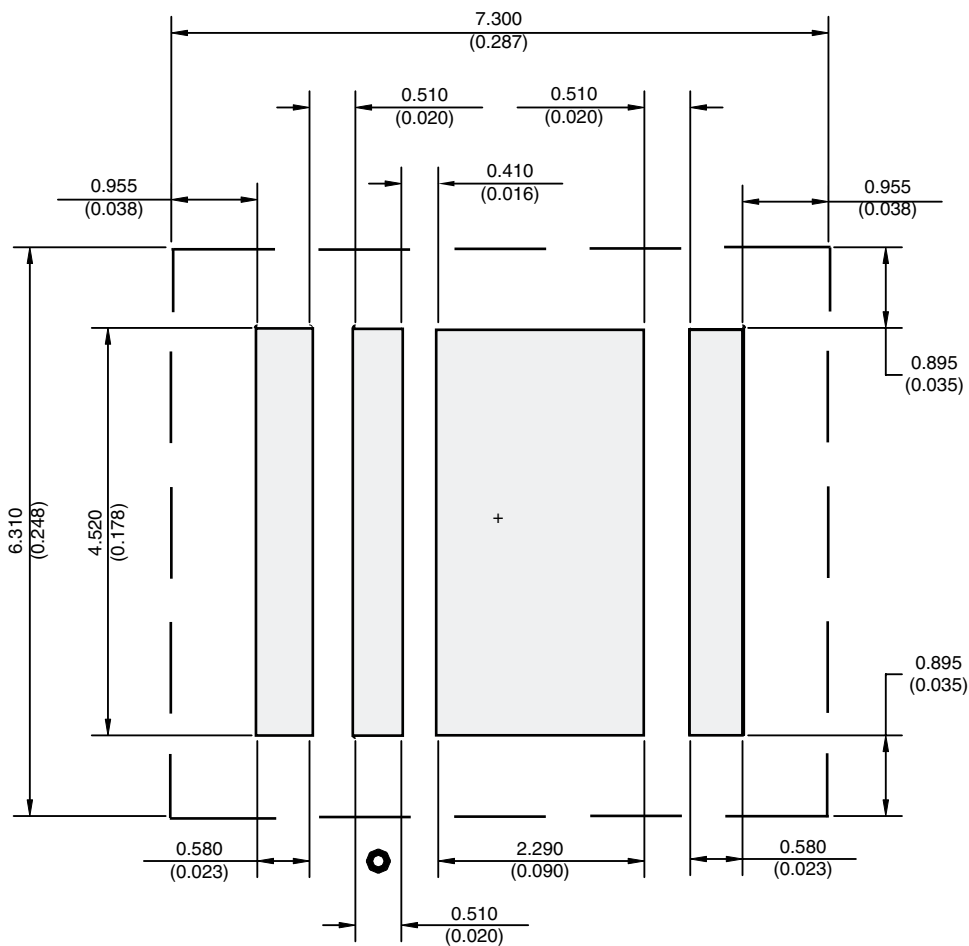


Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
<b>A</b>	0.75	0.80	0.85	0.030	0.031	0.033
<b>A1</b>	0.00	-	0.05	0.000	-	0.002
<b>b1</b>	0.48	0.58	0.68	0.019	0.023	0.027
<b>b2</b>	0.41	0.51	0.61	0.016	0.020	0.024
<b>b3</b>	2.19	2.29	2.39	0.086	0.090	0.094
<b>b4</b>	0.89	1.04	1.19	0.035	0.041	0.047
<b>b5</b>	0.23	0.33	0.43	0.009	0.013	0.017
<b>c</b>	0.20	0.25	0.30	0.008	0.010	0.012
<b>D</b>	6.00	6.15	6.30	0.236	0.242	0.248
<b>D1</b>	5.74	5.89	6.04	0.226	0.232	0.238
<b>E</b>	5.01	5.16	5.31	0.197	0.203	0.209
<b>E1</b>	4.75	4.90	5.05	0.187	0.193	0.199
<b>H1</b>	0.23	-	-	0.009	-	-
<b>H2</b>	0.45	-	0.56	0.020	-	0.022
<b>H3</b>	0.31	0.41	0.51	0.012	0.016	0.020
<b>H4</b>	0.45	-	0.56	0.020	-	0.022
<b>K1</b>	4.22	4.37	4.52	0.166	0.172	0.178
<b>K4</b>	0.24	-	-	0.009	-	-
<b>M1</b>	4.30	4.50	4.70	0.169	0.177	0.185
<b>M2</b>	3.43	3.58	3.73	0.135	0.141	0.147
<b>M3</b>	0.22	-	-	0.009	-	-
<b>M4</b>	0.05	-	-	0.002	-	-
<b>P1</b>	0.15	0.20	0.25	0.006	0.008	0.010
<b>T1</b>	3.48	3.64	4.10	0.137	0.143	0.150
<b>T2</b>	0.56	0.76	0.95	0.22	0.030	0.037
<b>T3</b>	1.20	-	-	0.051	-	-
<b>T4</b>	3.90	-	-	0.154	-	-
<b>T5</b>	0	0.18	0.36	0.000	0.007	0.014
<b>Θ</b>	0°	10°	12°	0°	10°	12°
ECN: S-51049—Rev. B, 13-Jun-05 DWG: 5947						

Note: Millimeters govern over inches



## RECOMMENDED MINIMUM PADS FOR PolarPAK® Option L and S



Recommended Minimum for PolarPAK Option L and S  
Dimensions in mm/(Inches)  
No External Traces within Broken Lines  
Dot indicates Gate Pin (Part Marking)



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**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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Факс: 8 (812) 320-03-32

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