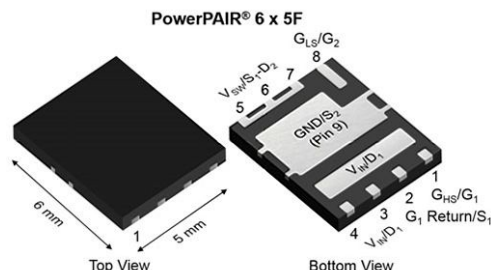


# Dual N-Channel 30 V (D-S) MOSFET with Schottky Diode



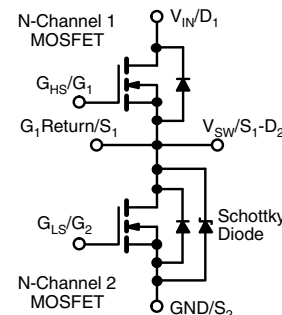
**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## FEATURES

- TrenchFET® Gen IV power MOSFET
- SkyFET® low-side MOSFET with integrated Schottky
- 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)

## APPLICATIONS

- CPU core power
- Computer / server peripherals
- POL
- Synchronous buck converter
- Telecom DC/DC



PRODUCT SUMMARY		
	CHANNEL-1	CHANNEL-2
$V_{DS}$ (V)	30	30
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.00307	0.00105
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.00530	0.00145
$Q_g$ typ. (nC)	9	38.6
$I_D$ (A) <sup>a</sup>	76	197
Configuration	Dual	

ORDERING INFORMATION	
Package	PowerPAIR 6 x 5F
Lead (Pb)-free and halogen-free	SiZF920DT-T1-GE3

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)					
PARAMETER		SYMBOL	CHANNEL-1	CHANNEL-2	UNIT
Drain-source voltage		V <sub>DS</sub>	30	30	V
Gate-source voltage		V <sub>GS</sub>	+20, -16	+16, -12	
Continuous drain current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	76	197	A
	T <sub>C</sub> = 70 °C		61	158	
	T <sub>A</sub> = 25 °C		28 <sup>b, c</sup>	49 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		23 <sup>b, c</sup>	39 <sup>b, c</sup>	
Pulsed drain current (t = 100 μs)		I <sub>DM</sub>	130	130	
Continuous source-drain diode current	T <sub>C</sub> = 25 °C	I <sub>S</sub>	26	122	
	T <sub>A</sub> = 25 °C		3.6 <sup>b, c</sup>	7.4 <sup>b, c</sup>	
Single pulse avalanche current	L = 0.1 mH	I <sub>AS</sub>	16	28	mJ
Single pulse avalanche energy		E <sub>AS</sub>	13	39	
Maximum power dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	28	74	W
	T <sub>C</sub> = 70 °C		18	47	
	T <sub>A</sub> = 25 °C		3.9 <sup>b, c</sup>	4.5 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		2.5 <sup>b, c</sup>	2.9 <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		

THERMAL RESISTANCE RATINGS							
PARAMETER		SYMBOL	CHANNEL-1		CHANNEL-2		UNIT
			TYP.	MAX.	TYP.	MAX.	
Maximum junction-to-ambient <sup>b, f</sup>	$t \leq 10$ s	$R_{thJA}$	25	32	22	28	°C/W
Maximum junction-to-case (source)	Steady state	$R_{thJC}$	3.5	4.4	1.3	1.7	

### Notes

- $T_C = 25$  °C
- 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 PowerPAIR 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 65 °C/W for channel-1 and 65 °C/W for channel-2



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	Ch-1	30	-	-	V
			Ch-2	30	-	-	
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	Ch-1	1.1	-	2.4	
			Ch-2	1.1	-	2.2	
Gate-source leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = +20 V, -16 V	Ch-1	-	-	± 100	nA
		V <sub>DS</sub> = 0 V, V <sub>GS</sub> = +16 V, -12 V	Ch-2	-	-	± 100	
Zero Gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V	Ch-1	-	-	1	μA
			Ch-2	-	60	400	
		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C	Ch-1	-	-	5	
			Ch-2	-	350	4000	
On-state drain current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V	Ch-1	20	-	-	A
			Ch-2	20	-	-	
Drain-source on-state resistance <sup>b</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A	Ch-1	-	0.00230	0.00307	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A	Ch-2	-	0.00070	0.00105	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5 A	Ch-1	-	0.00380	0.00530	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5 A	Ch-2	-	0.00095	0.00145	
Forward transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 25 A	Ch-1	-	65	-	S
		V <sub>DS</sub> = 15 V, I <sub>D</sub> = 25 A	Ch-2		135	-	
Dynamic <sup>a</sup>							
Input capacitance	C <sub>iss</sub>	Channel-1 V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz  Channel-2 V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz	Ch-1	-	1300	-	pF
Output capacitance	C <sub>oss</sub>		Ch-2	-	5230	-	
			Ch-1	-	700	-	
Reverse transfer capacitance	C <sub>rss</sub>		Ch-2	-	2920	-	
			Ch-1	-	35	-	
C <sub>rss</sub> /C <sub>iss</sub> ratio			Ch-2	-	360	-	
			Ch-1	-	0.027	0.054	
Total gate charge	Q <sub>g</sub>		V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz	Ch-2	-	0.069	0.140
		Ch-1		-	0.027	0.054	
		Ch-2		-	0.069	0.140	
		Ch-1		-	0.027	0.054	
Gate-source charge	Q <sub>gs</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A	Ch-1	-	19	29	nC
			Ch-2	-	83	125	
			Ch-1	-	9	14	
			Ch-2	-	38.6	58	
Gate-drain charge	Q <sub>gd</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 10 A	Ch-1	-	4.4	-	
			Ch-2	-	17	-	
Output charge	Q <sub>oss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V	Ch-1	-	2	-	
			Ch-2	-	9.2	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	Ch-1	-	17	-	Ω
			Ch-2	-	46	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	Ch-1	0.2	1	2	Ω
			Ch-2	0.1	0.4	0.8	



SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)								
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Dynamic <sup>a</sup>								
Turn-on delay time	t <sub>d(on)</sub>	Channel-1 V <sub>DD</sub> = 15 V, R <sub>L</sub> = 1.5 Ω I <sub>D</sub> ≅ 10 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω	Ch-1	-	18	35	ns	
			Ch-2	-	34	70		
Rise time	t <sub>r</sub>		Ch-1	-	95	190		
			Ch-2	-	116	230		
Turn-off delay time	t <sub>d(off)</sub>	Channel-2 V <sub>DD</sub> = 15 V, R <sub>L</sub> = 3 Ω I <sub>D</sub> ≅ 5 A, V <sub>GEN</sub> = 4.5 V, R <sub>g</sub> = 1 Ω	Ch-1	-	17	35		
			Ch-2	-	45	90		
Fall time	t <sub>f</sub>		Ch-1	-	10	20		
			Ch-2	-	27	50		
Turn-on delay time	t <sub>d(on)</sub>	Channel-1 V <sub>DD</sub> = 15 V, R <sub>L</sub> = 3 Ω I <sub>D</sub> ≅ 5 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω	Ch-1	-	11	20		
			Ch-2	-	17	35		
Rise time	t <sub>r</sub>		Ch-1	-	5	10		
			Ch-2	-	70	150		
Turn-off delay time	t <sub>d(off)</sub>	Channel-2 V <sub>DD</sub> = 15 V, R <sub>L</sub> = 3 Ω I <sub>D</sub> ≅ 5 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω	Ch-1	-	20	40		
			Ch-2	-	43	85		
Fall time	t <sub>f</sub>		Ch-1	-	5	10		
			Ch-2	-	10	20		
Drain-Source Body Diode Characteristics								
Continuous source-drain diode current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	Ch-1	-	-	26	A	
			Ch-2	-	-	122		
Pulse diode forward current <sup>a</sup>	I <sub>SM</sub>		Ch-1	-	-	130		
			Ch-2	-	-	130		
Body diode voltage	V <sub>SD</sub>	I <sub>S</sub> = 10 A, V <sub>GS</sub> = 0 V	Ch-1	-	0.77	1.1	V	
		I <sub>S</sub> = 3 A, V <sub>GS</sub> = 0 V	Ch-2	-	0.36	0.60		
Body diode reverse recovery time	t <sub>rr</sub>	Channel-1 I <sub>F</sub> = 10 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C	Ch-1	-	27	50	ns	
			Ch-2	-	55	110		
Body diode reverse recovery charge	Q <sub>rr</sub>		Channel-2 I <sub>F</sub> = 10 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C	Ch-1	-	15	30	nC
				Ch-2	-	66	130	
Reverse recovery fall time	t <sub>a</sub>			Ch-1	-	16	-	ns
				Ch-2	-	30	-	
Reverse recovery rise time	t <sub>b</sub>		Ch-1	-	11	-		
			Ch-2	-	25	-		

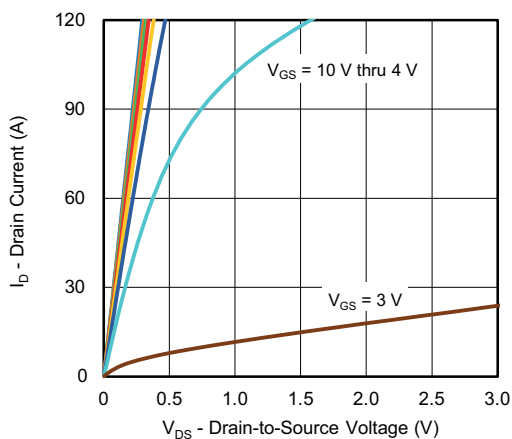
**Notes**

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

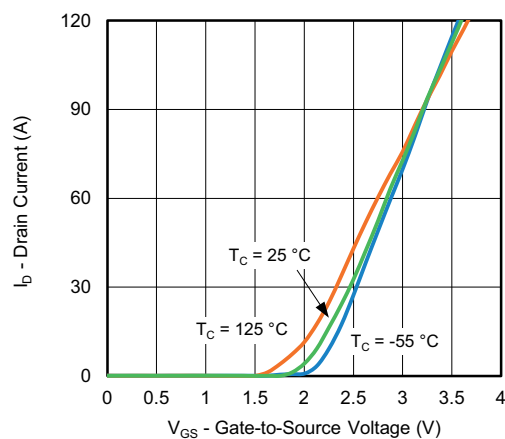
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



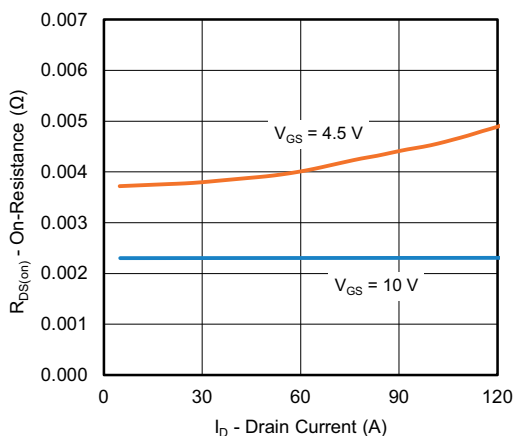
**CHANNEL-1 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



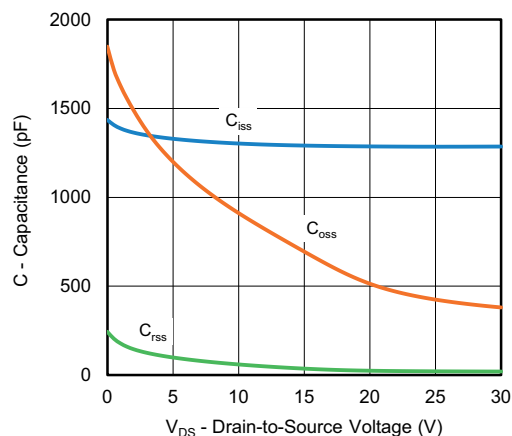
**Output Characteristics**



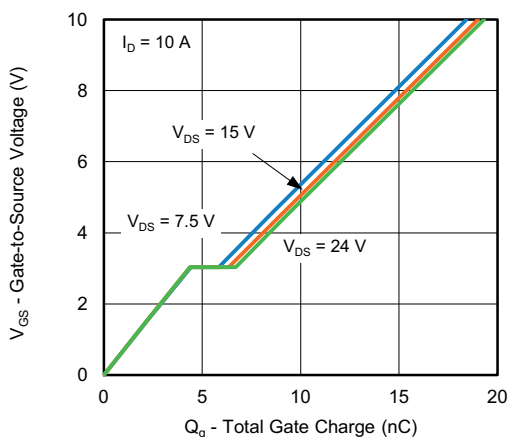
**Transfer Characteristics**



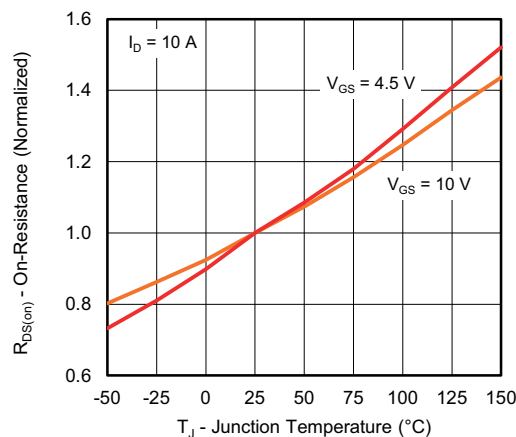
**On-Resistance vs. Drain Current**



**Capacitance**



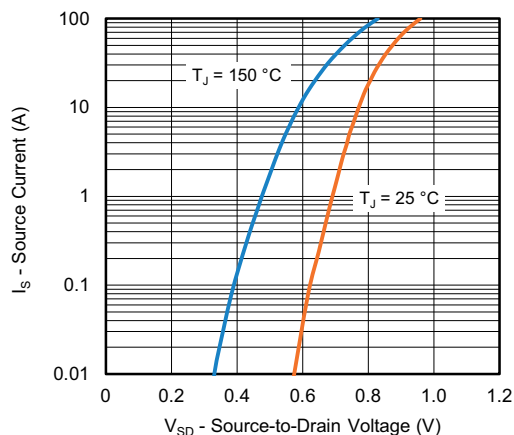
**Gate Charge**



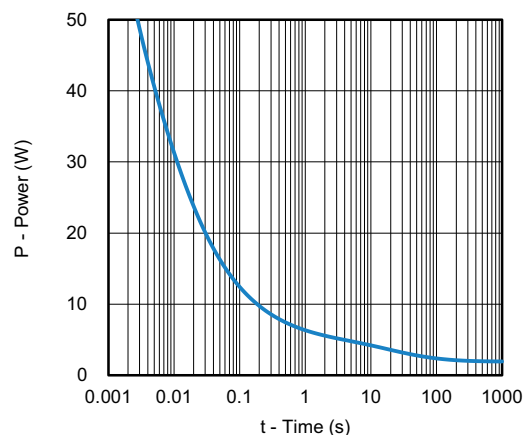
**On-Resistance vs. Junction Temperature**



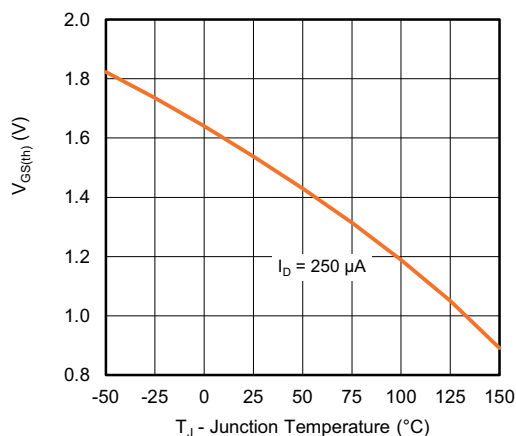
**CHANNEL-1 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



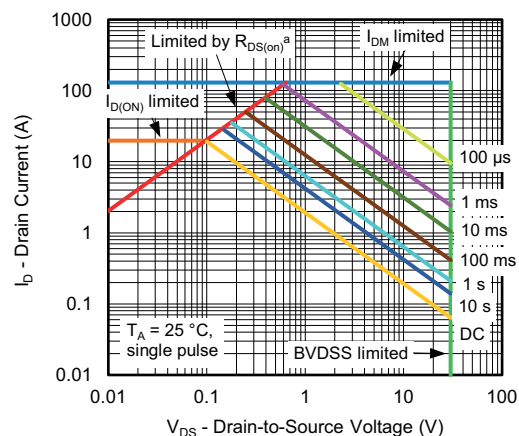
**Source-Drain Diode Forward Voltage**



**Single Pulse Power, Junction-to-Ambient**



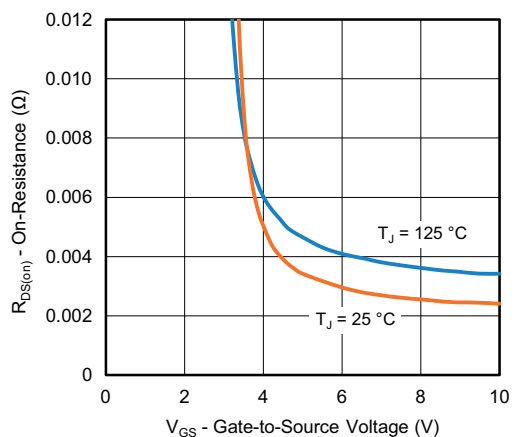
**Threshold Voltage**



**Safe Operating Area, Junction-to-Ambient**

**Note**

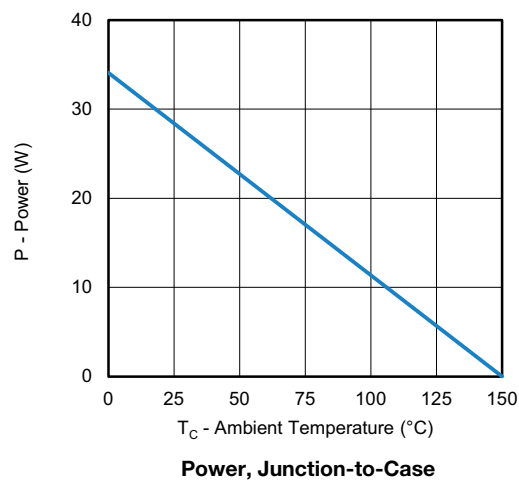
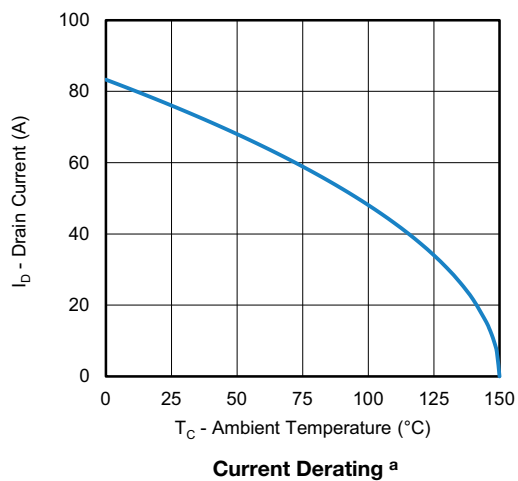
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



**On-Resistance vs. Gate-to-Source Voltage**



**CHANNEL-1 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

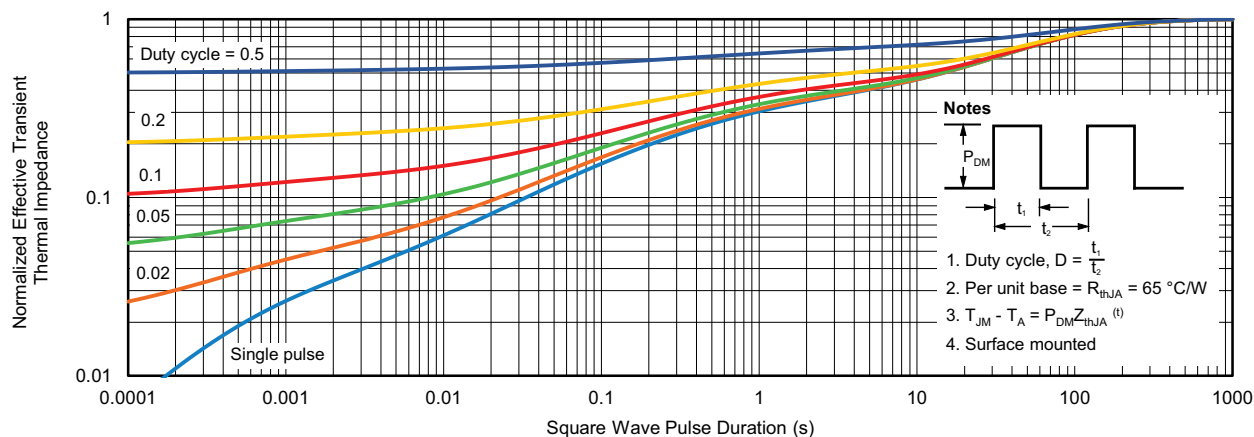


**Note**

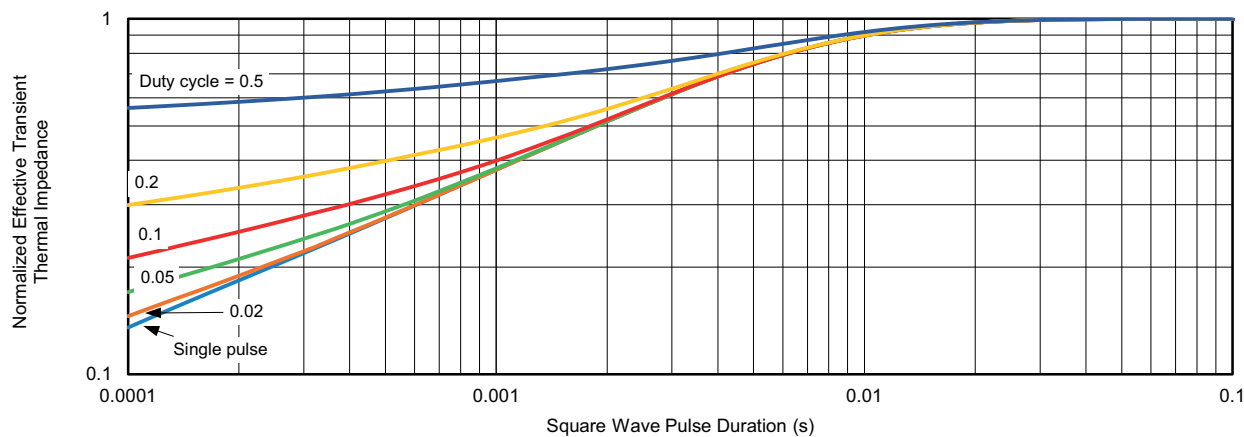
- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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



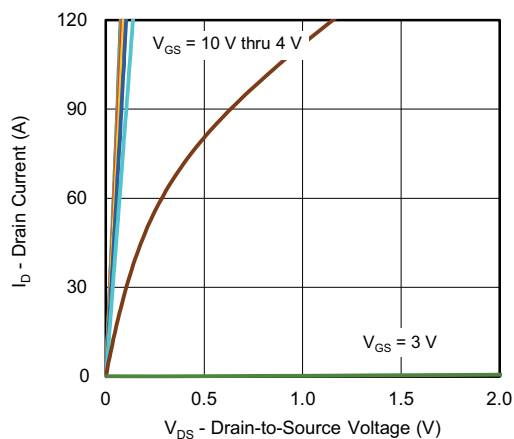
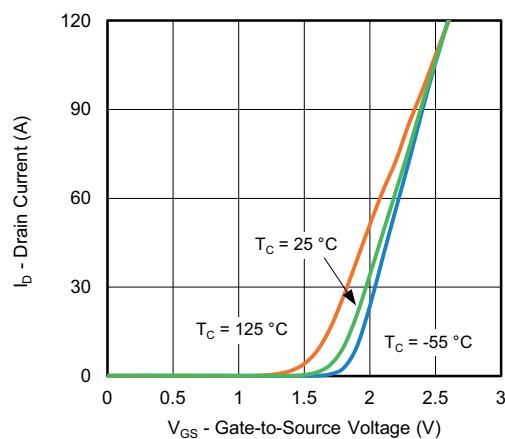
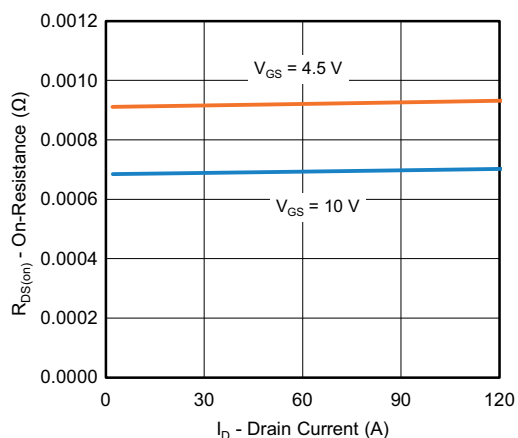
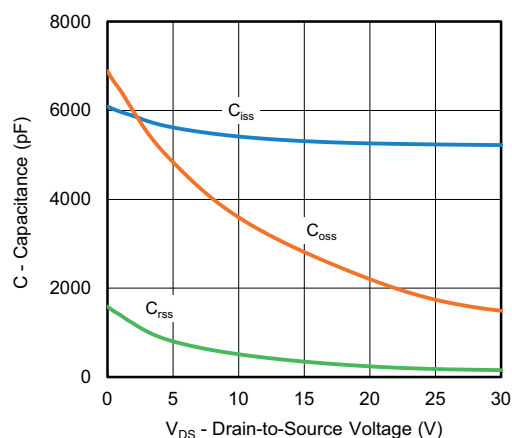
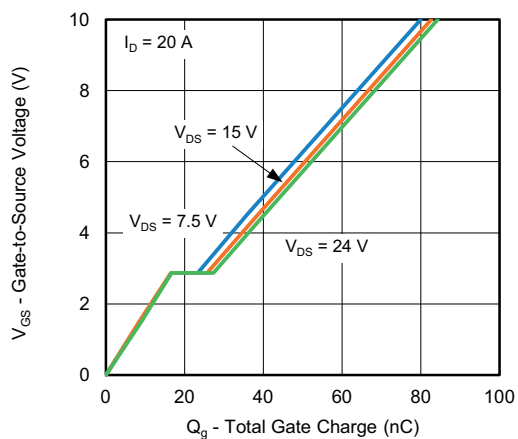
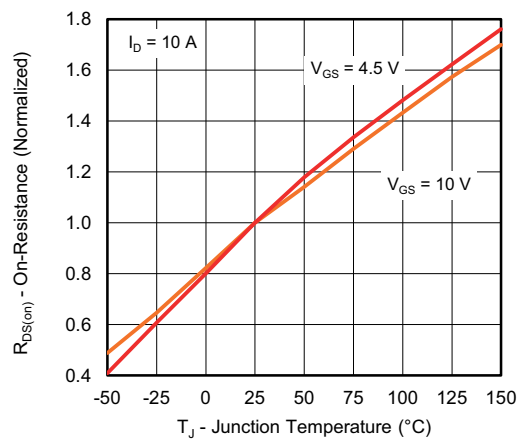
**CHANNEL-1 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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



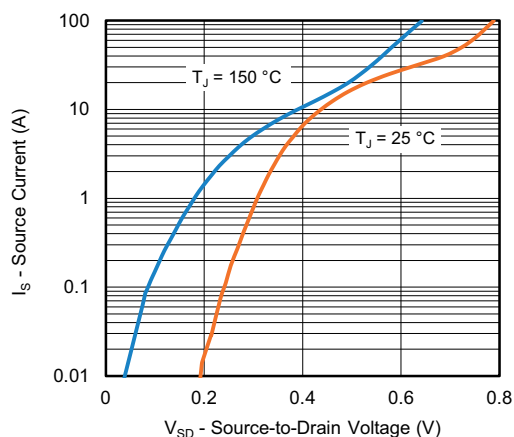
**Normalized Thermal Transient Impedance, Junction-to-Case**

**CHANNEL-2 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

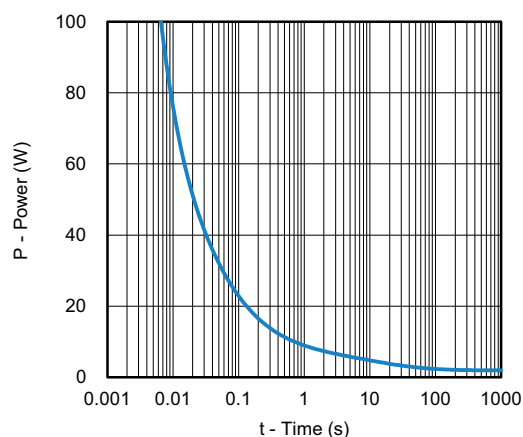




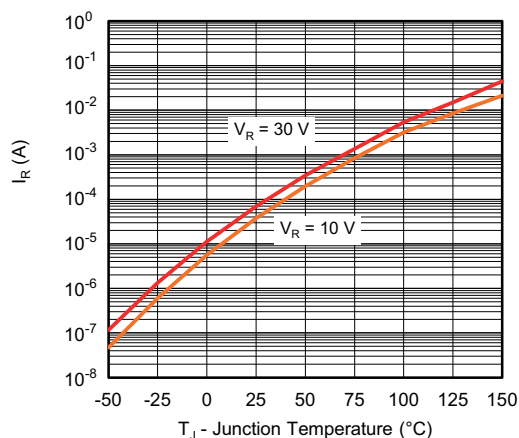
**CHANNEL-2 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



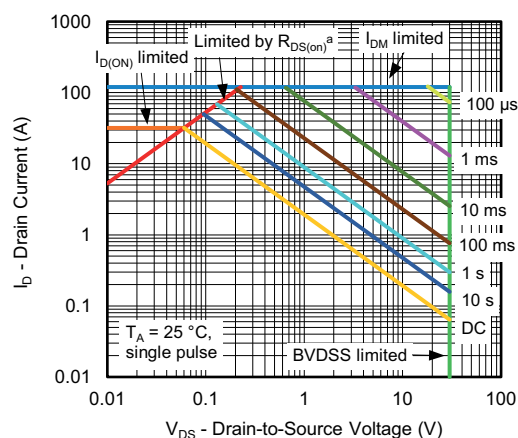
**Source-Drain Diode Forward Voltage**



**Single Pulse Power, Junction-to-Ambient**



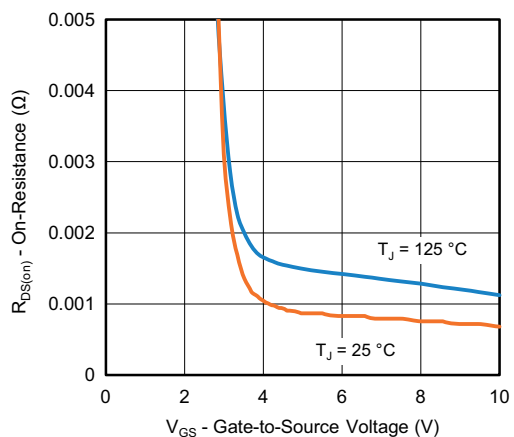
**Reverse Current (Schottky)**



**Safe Operating Area, Junction-to-Ambient**

**Note**

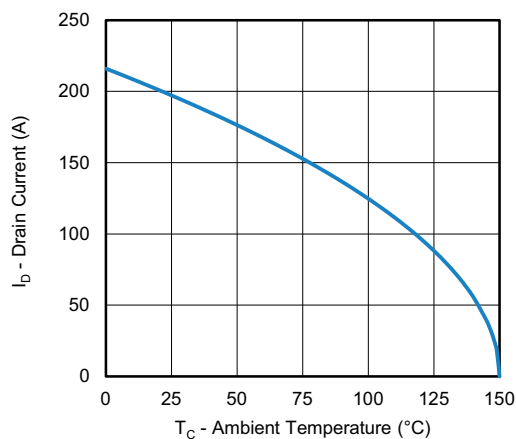
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



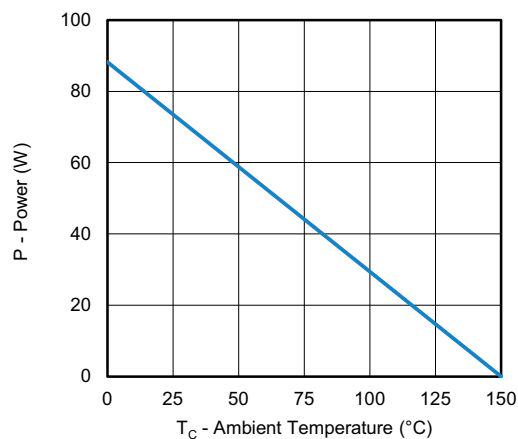
**On-Resistance vs. Gate-to-Source Voltage**



**CHANNEL-2 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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



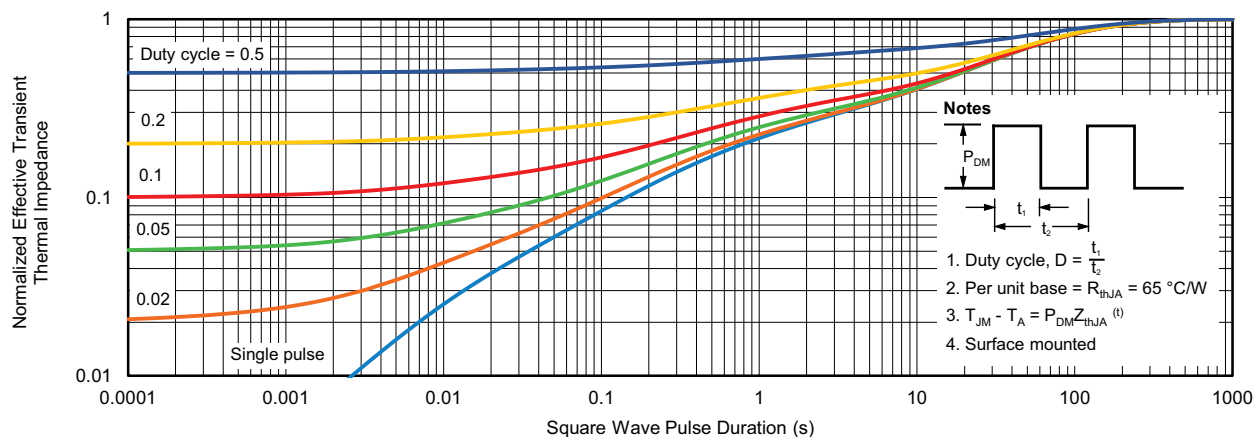
**Power, Junction-to-Case**

**Note**

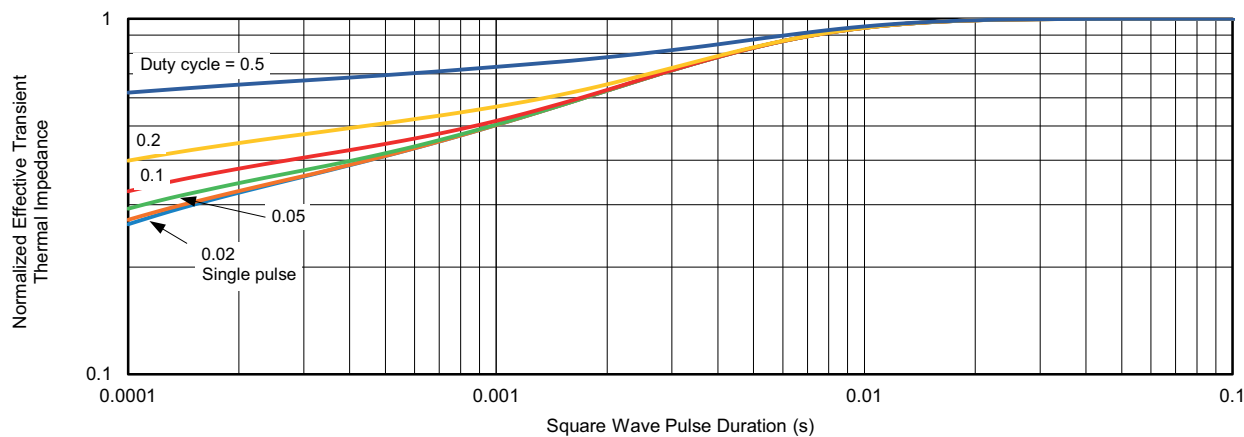
- a. The power dissipation  $P_D$  is based on  $T_J$  max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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



**CHANNEL-2 TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



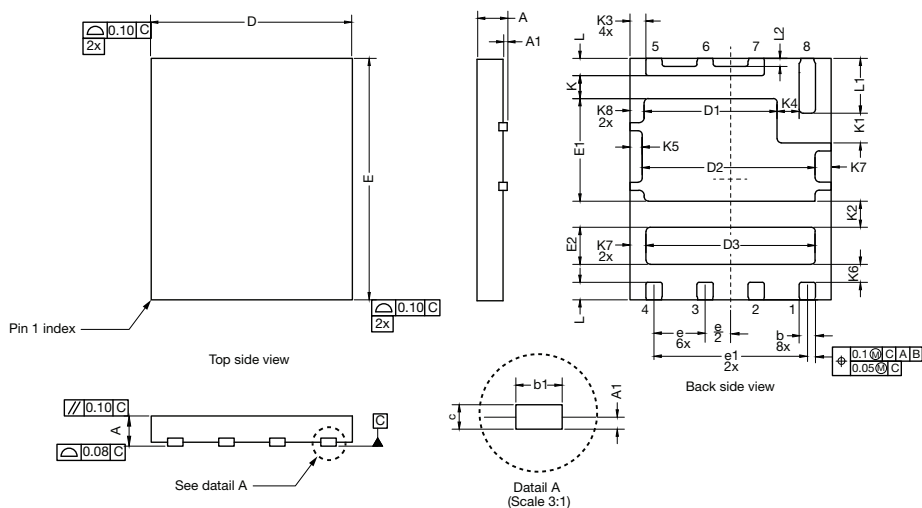
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**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?79595](http://www.vishay.com/ppg?79595).

## PowerPAIR® 6 x 5 F Case Outline

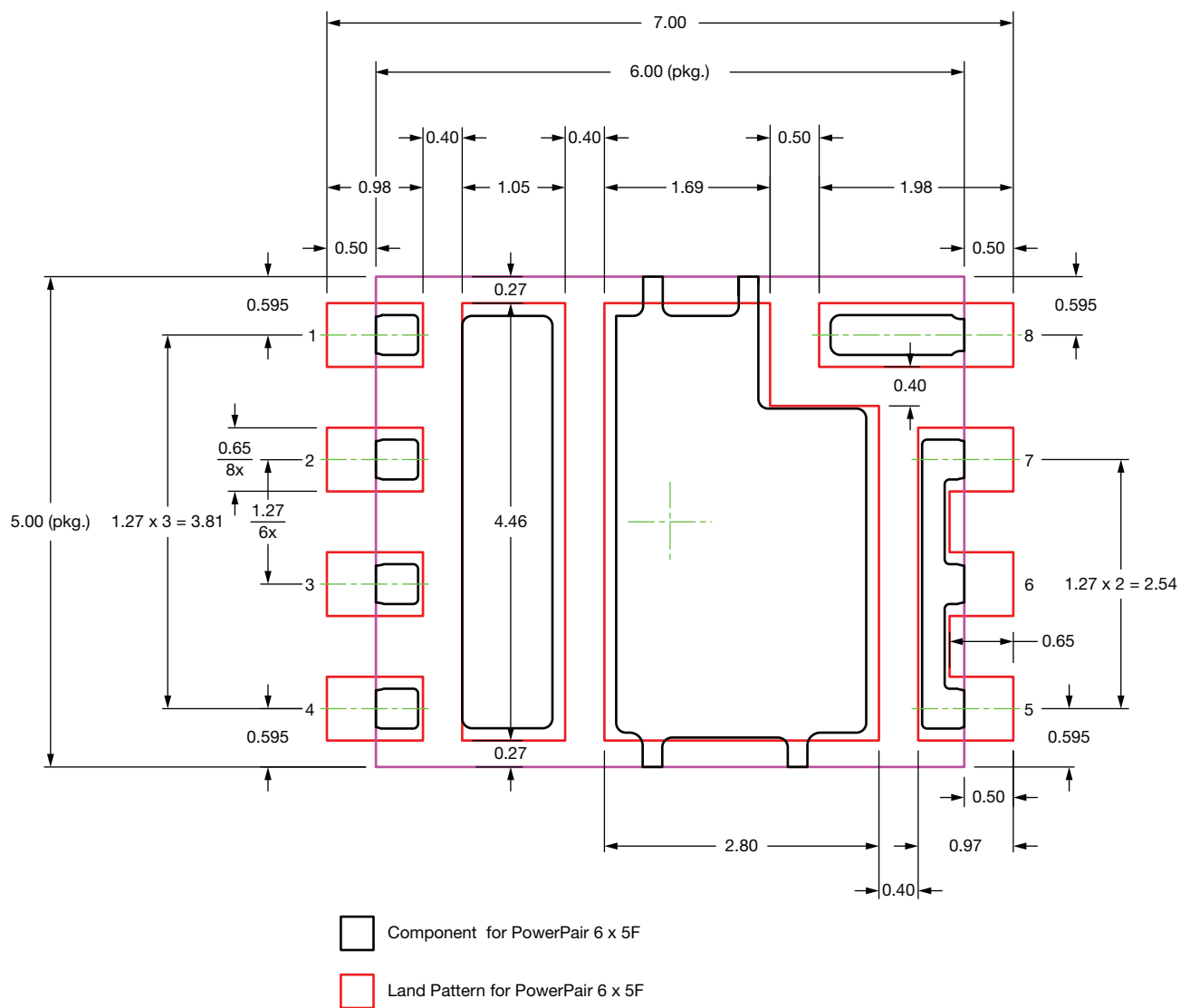


DIMENSION	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	-	0.10	0.000	-	0.004
b	0.35	0.41	0.46	0.014	0.016	0.018
b1	0.38 ref.			0.015 ref.		
c	0.15	0.20	0.25	0.006	0.008	0.010
D	4.90	5.00	5.10	0.193	0.197	0.201
D1	3.26	3.31	3.36	0.128	0.130	0.132
D2	4.20	4.30	4.40	0.165	0.169	0.173
D3	4.15	4.20	4.25	0.163	0.165	0.167
E	5.90	6.00	6.10	0.232	0.236	0.240
E1	2.50	2.55	2.60	0.098	0.100	0.102
E2	0.87	0.92	0.97	0.034	0.036	0.038
e	1.27 BSC			0.050 BSC		
e1	3.81 BSC			0.150 BSC		
K	0.52	0.57	0.62	0.020	0.022	0.024
K1	0.69	0.74	0.79	0.027	0.029	0.031
K2	0.60	0.65	0.70	0.024	0.026	0.028
K3	0.39 BSC			0.015 BSC		
K4	0.50	0.55	0.60	0.020	0.022	0.024
K5	0.25	0.30	0.35	0.010	0.012	0.014
K6	0.40	0.45	0.50	0.016	0.018	0.020
K7	0.35	0.40	0.45	0.014	0.016	0.018
K8	0.30	0.35	0.40	0.012	0.014	0.016
L	0.33	0.43	0.53	0.013	0.017	0.021
L1	1.31	1.36	1.41	0.052	0.054	0.056
L2	0.20 ref.			0.008 ref.		
ECN: T20-0097-Rev. C, 25-Feb-2020						
DWG: 6043						

### Note

- Millimeters will govern

## Recommended Minimum PADs for PowerPAIR® 6 x 5F



### Note

- Dimensions in millimeters



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