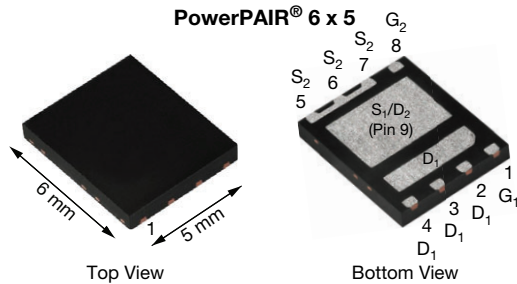


Dual N-Channel 30 V (D-S) MOSFET with Schottky Diode



FEATURES

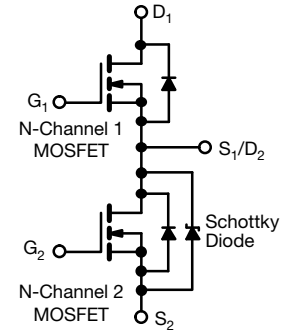
- TrenchFET® Gen IV power MOSFET
- SkyFET® low side MOSFET with integrated Schottky
- Very low $R_{DS(on)}$ x Q_g FOM improves efficiency
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

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. (Ω) at $V_{GS} = 10$ V	0.00439	0.00106
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.00712	0.00172
Q_g typ. (nC)	5.7	24.2
I_D (A) ^a	54.8	197
Configuration	Dual plus integrated Schottky (SkyFET)	

ORDERING INFORMATION	
Package	PowerPAIR 6 x 5
Lead (Pb)-free and halogen-free	SiZ980BDT-T1-GE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	CHANNEL-1	CHANNEL-2	UNIT
Drain-source voltage	V_{DS}	30	30	V
Gate-source voltage	V_{GS}	+20, -16	+20, -16	V
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	54.8	197
		$T_C = 70$ °C	43.8	158
		$T_A = 25$ °C	23.7 ^{b, c}	54.3 ^{b, c}
		$T_A = 70$ °C	19 ^{b, c}	43.4 ^{b, c}
Pulsed drain current ($t = 100$ μ s)	I_{DM}	90	130	A
Continuous source-drain diode current	I_S	$T_C = 25$ °C	16.7	85.4
		$T_A = 25$ °C	3.2 ^{b, c}	4.1 ^{b, c}
Single pulse avalanche current	I_{AS}	15	25	A
Single pulse avalanche energy	E_{AS}	11.2	31	mJ
Maximum power dissipation	P_D	$T_C = 25$ °C	20	66
		$T_C = 70$ °C	12.9	42
		$T_A = 25$ °C	3.8 ^{b, c}	5 ^{b, c}
		$T_A = 70$ °C	2.4 ^{b, c}	3.2 ^{b, c}
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150		°C
Soldering recommendations (peak temperature) ^{c, d}		260		°C

THERMAL RESISTANCE RATINGS							
PARAMETER	SYMBOL	CHANNEL-1		CHANNEL-2		UNIT	
		TYP.	MAX.	TYP.	MAX.		
Maximum junction-to-ambient ^{b, f}	$t \leq 10$ s	R_{thJA}	26	33	20	25	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	4.7	6.2	1.5	1.9	°C/W

Notes

- $T_C = 25$ °C
- Surface mounted on 1" x 1" FR4 board
- $t = 10$ s
- See solder profile (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 68 °C/W for channel-1 and 57 °C/W for channel-2



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}	$V_{GS} = 0\text{ V}, I_D = 5\text{ mA}$	Ch-1	30	-	-	V		
			Ch-2	30	-	-			
Drain-source breakdown voltage (transient) ^c	V_{DSt}	$V_{GS} = 0\text{ V}, t_{\text{transient}} \leq 1\text{ }\mu\text{s}$	Ch-1	36	-	-			
			Ch-2	36	-	-			
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	Ch-1	1.2	-	2.2			
			Ch-2	1.1	-	2.2			
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = +20\text{ V}, -16\text{ V}$	Ch-1	-	-	± 100	nA		
			Ch-2	-	-	± 100			
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch-1	-	-	1	μA		
			Ch-2	-	50	250			
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	Ch-1	-	-	5			
			Ch-2	-	250	2500			
On-state drain current ^b	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	Ch-1	20	-	-	A		
			Ch-2	20	-	-			
Drain-source on-state resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$	Ch-1	-	0.00338	0.00439	Ω		
			Ch-2	-	0.000817	0.00106			
			$V_{GS} = 4.5\text{ V}, I_D = 12\text{ A}$	Ch-1	-	0.00547		0.00712	
				Ch-2	-	0.00133		0.00172	
Forward transconductance ^b	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 15\text{ A}$	Ch-1	-	55	-	S		
			Ch-2	-	230	-			
Dynamic^a									
Input capacitance	C_{iss}	Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1	-	790	-	pF		
			Ch-2	-	3655	-			
Output capacitance	C_{oss}		Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1	-	390		-	
				Ch-2	-	2290		-	
Reverse transfer capacitance	C_{rss}			Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch-1	-		38	-
					Ch-2	-		170	-
C_{rss}/C_{iss} ratio		Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$			Ch-1	-	0.046	0.092	
					Ch-2	-	0.046	0.092	
Total gate charge	Q_g		$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 19\text{ A}$		Ch-1	-	12	18	nC
					Ch-2	-	52.2	79	
				$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$	Ch-1	-	5.7	8.6	
					Ch-2	-	24.2	37	
Gate-source charge	Q_{gs}	Channel-1 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$	Ch-1	-	3	-			
			Ch-2	-	11.7	-			
Gate-drain charge	Q_{gd}		Channel-2 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$	Ch-1	-	1.4	-		
				Ch-2	-	5.1	-		
Output charge	Q_{oss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}$		Ch-1	-	10	-		
				Ch-2	-	70	-		
Gate resistance	R_g	$f = 1\text{ MHz}$	Ch-1	0.2	1.1	2.2	Ω		
			Ch-2	0.16	0.8	1.6			



SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Dynamic ^a							
Turn-on delay time	t _{d(on)}	Channel-1 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω	Ch-1	-	20	40	ns
Rise time	t _r		Ch-2	-	35	70	
Turn-off delay time	t _{d(off)}	Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω	Ch-1	-	100	200	
			Ch-2	-	90	180	
Fall time	t _f	Channel-1	Ch-1	-	15	30	
			Ch-2	-	35	70	
Turn-on delay time	t _{d(on)}	Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω	Ch-1	-	12	24	
			Ch-2	-	20	40	
Rise time	t _r	Channel-1 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	Ch-1	-	10	20	
			Ch-2	-	10	20	
Turn-off delay time	t _{d(off)}	Channel-2 V _{DD} = 15 V, R _L = 1.5 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω	Ch-1	-	20	40	
			Ch-2	-	35	70	
Fall time	t _f	Channel-1	Ch-1	-	10	20	
			Ch-2	-	10	20	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I _S	T _C = 25 °C	Ch-1	-	-	16.7	A
			Ch-2	-	-	85.4	
Pulse diode forward current ^a	I _{SM}		Ch-1	-	-	90	
			Ch-2	-	-	130	
Body diode voltage	V _{SD}	I _S = 10 A, V _{GS} = 0 V	Ch-1	-	0.8	1.2	V
			Ch-2	-	0.51	0.77	
Body diode reverse recovery time	t _{rr}	Channel-1 I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C	Ch-1	-	18	36	ns
Body diode reverse recovery charge	Q _{rr}		Ch-2	-	42	84	
			Reverse recovery fall time	t _a	Ch-1	-	18
Ch-2	-				39	78	
Reverse recovery Rise time	t _b	Channel-2 I _F = 10 A, di/dt = 100 A/μs, T _J = 25 °C	Ch-1	-	10	-	ns
			Ch-2	-	21	-	
			Ch-1	-	8	-	
			Ch-2	-	21	-	

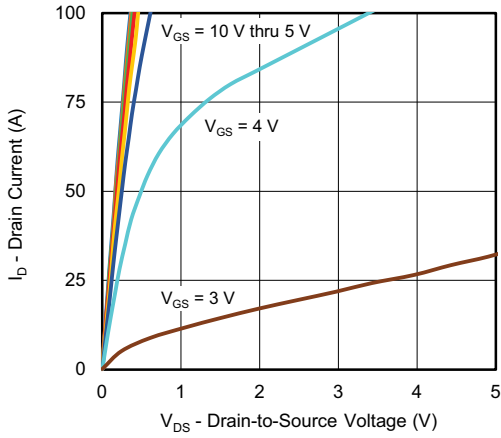
Notes

- a. Guaranteed by design, not subject to production testing
- b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- c. Derived from UIS characterization data at time of product release. Production data log is not available

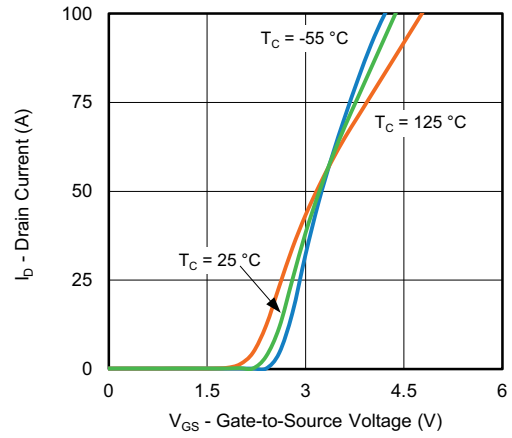
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



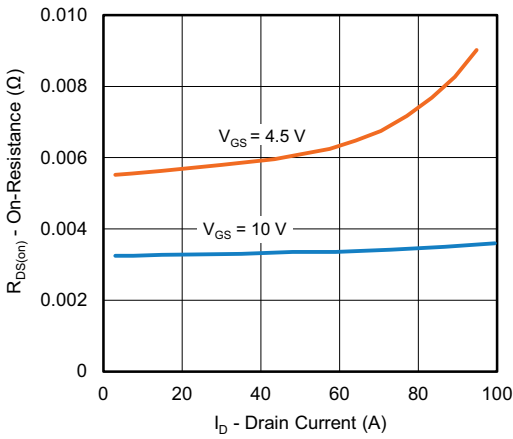
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



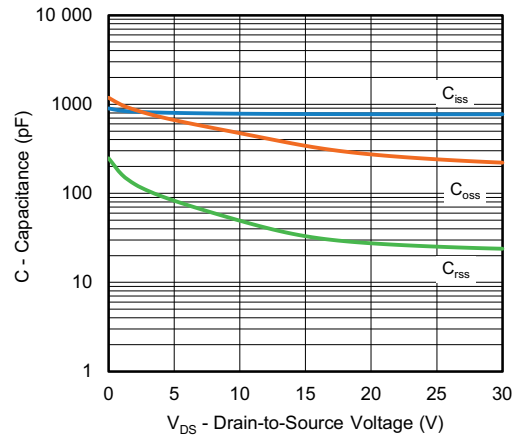
Output Characteristics



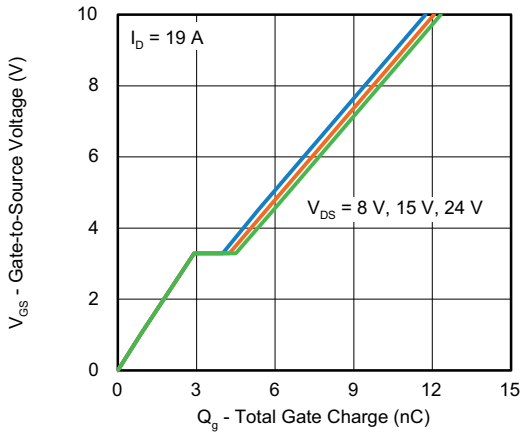
Transfer Characteristics



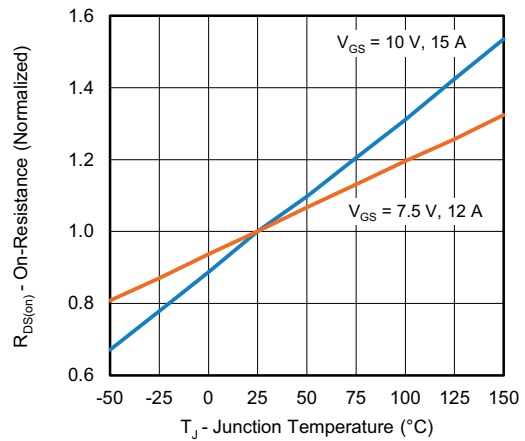
On-Resistance vs. Drain Current



Capacitance



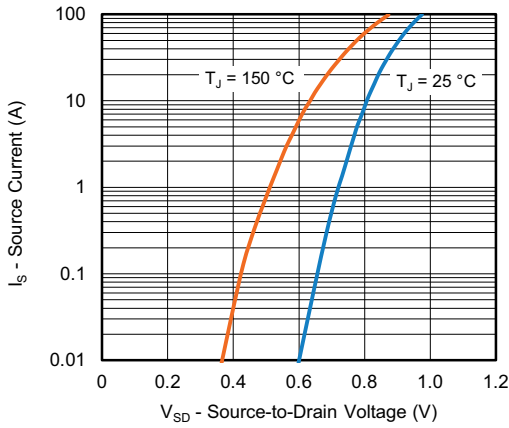
Gate Charge



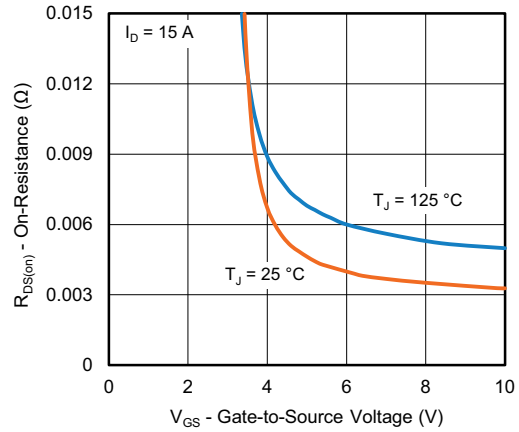
On-Resistance vs. Junction Temperature



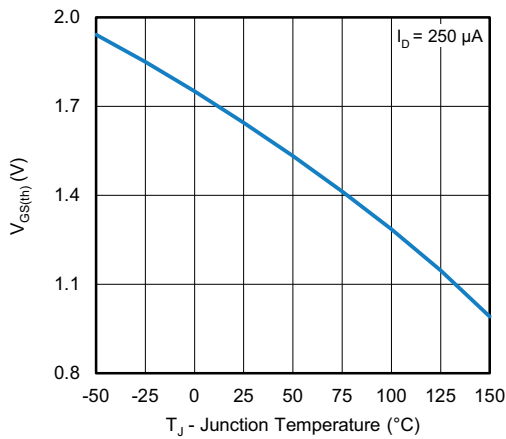
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



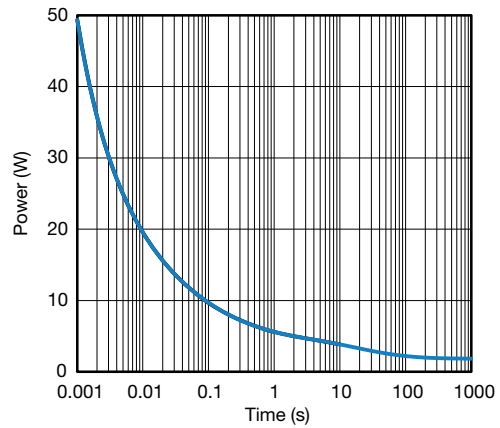
Source-Drain Diode Forward Voltage



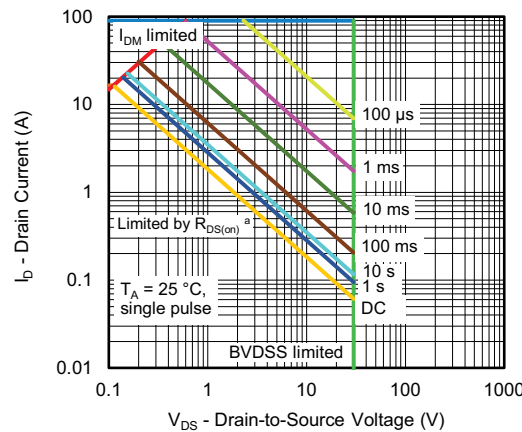
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



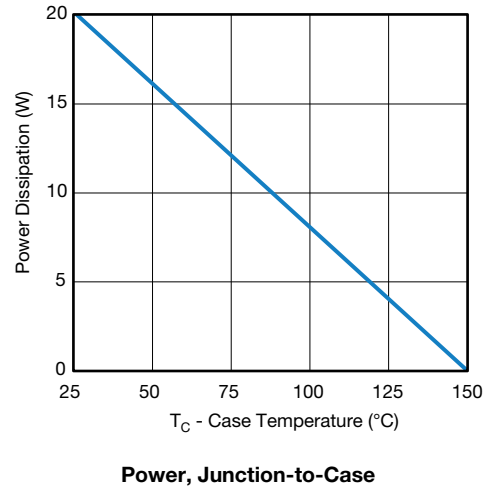
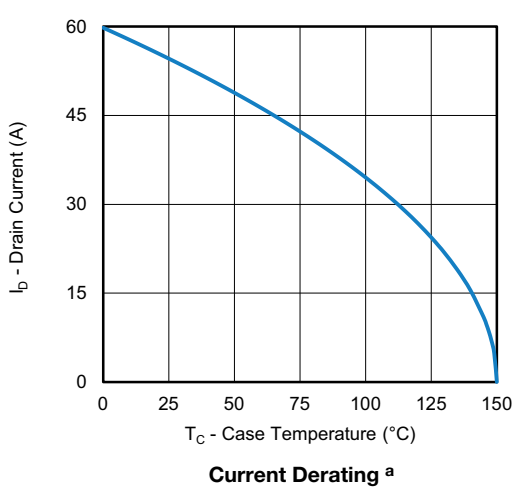
Safe Operating Area, Junction-to-Ambient

Note

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



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

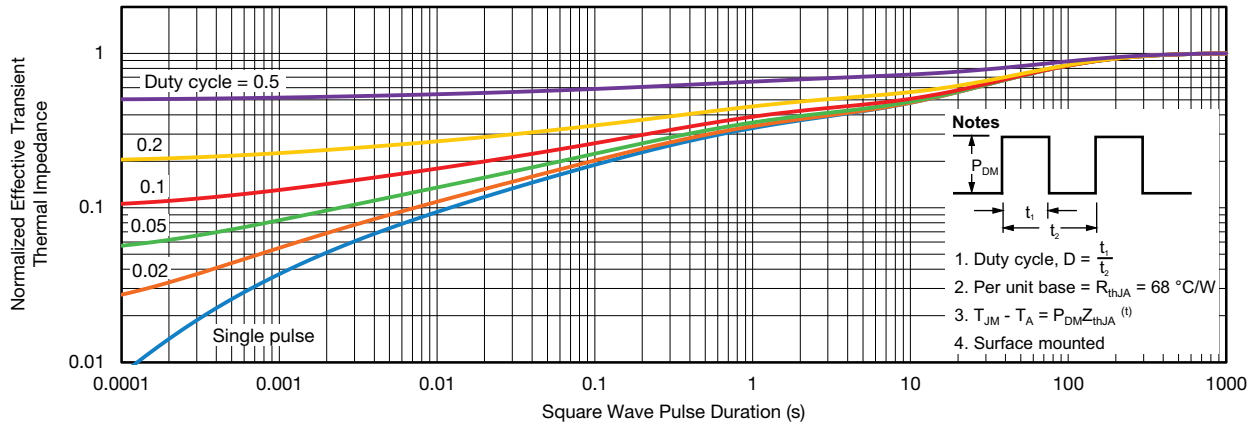


Note

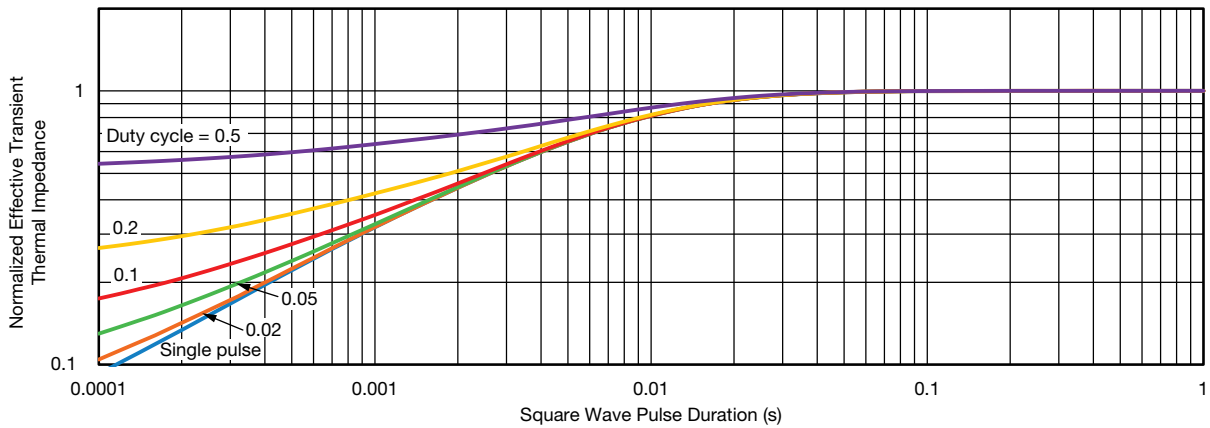
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



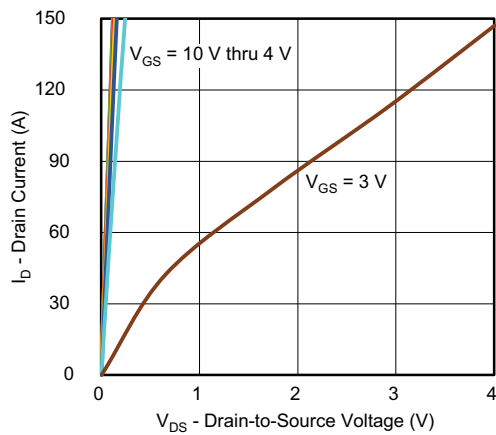
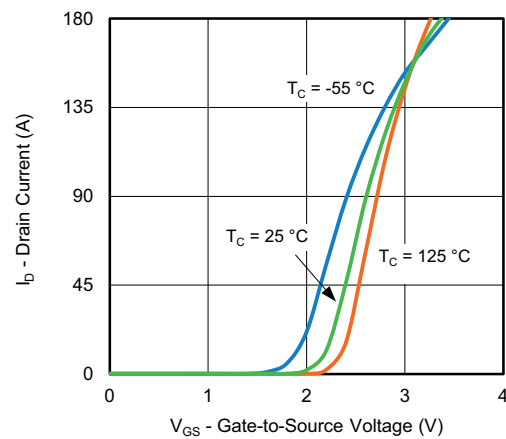
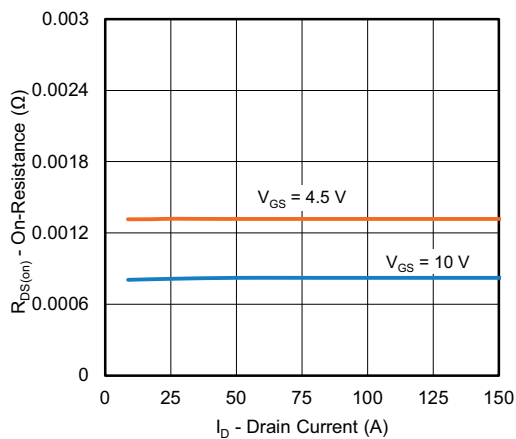
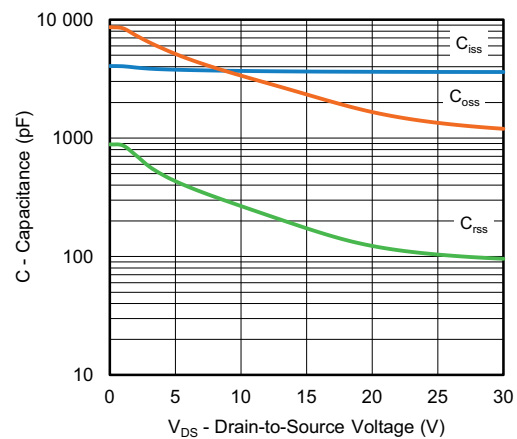
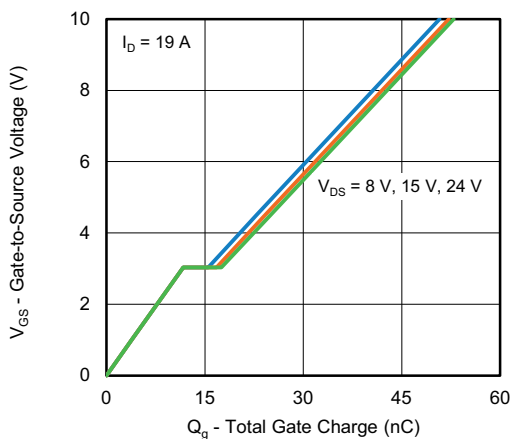
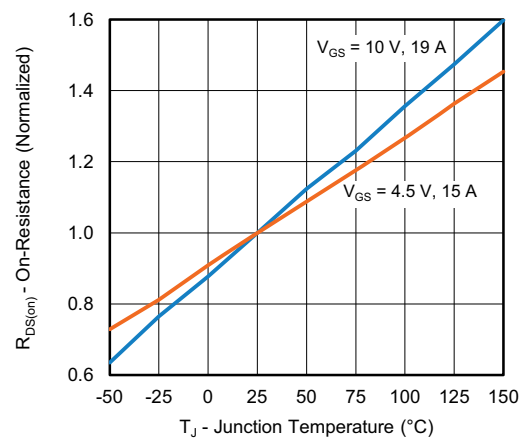
CHANNEL-1 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

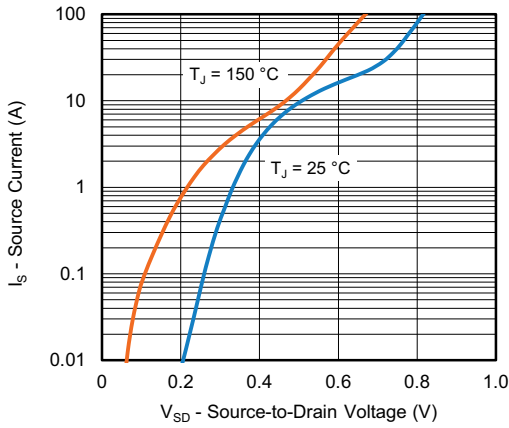


Normalized Thermal Transient Impedance, Junction-to-Case

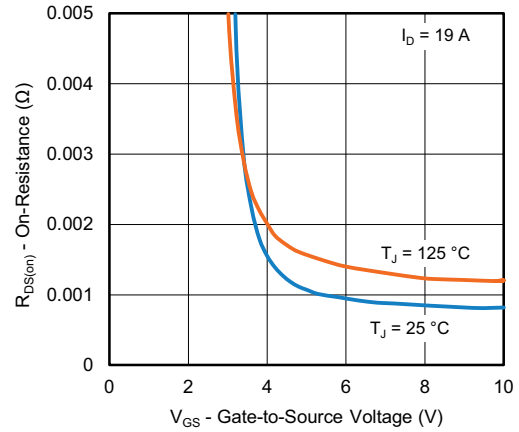
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature



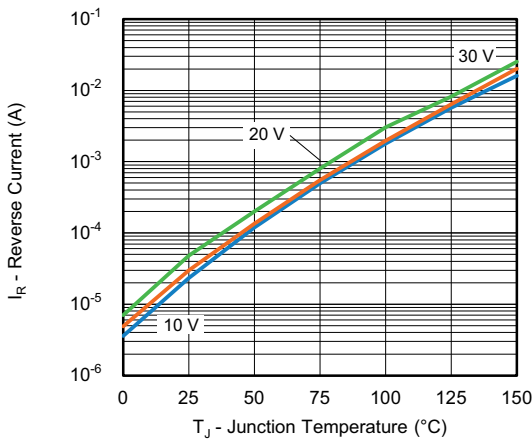
CHANNEL-2 TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



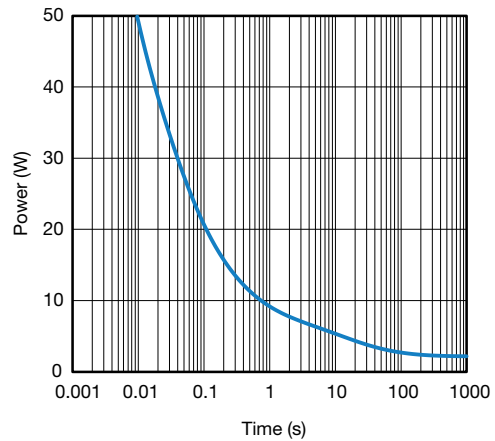
Source-Drain Diode Forward Voltage



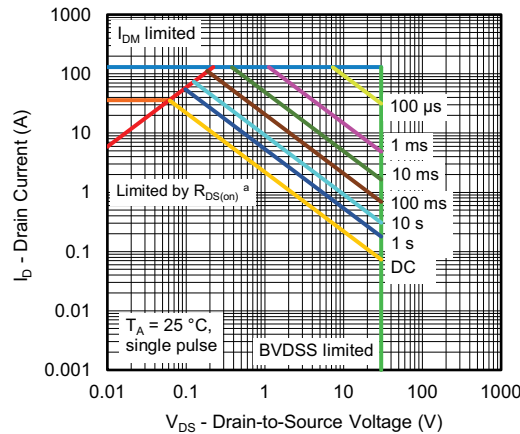
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



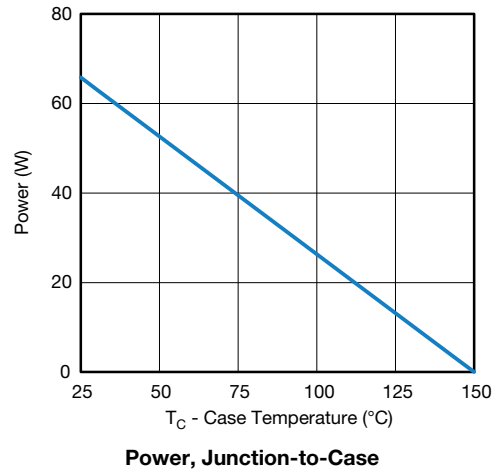
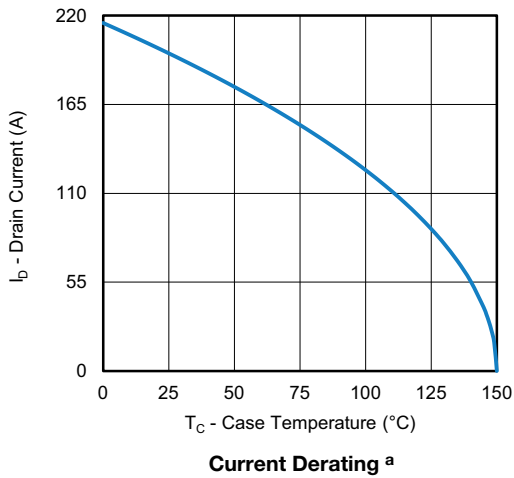
Safe Operating Area, Junction-to-Ambient

Note

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



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

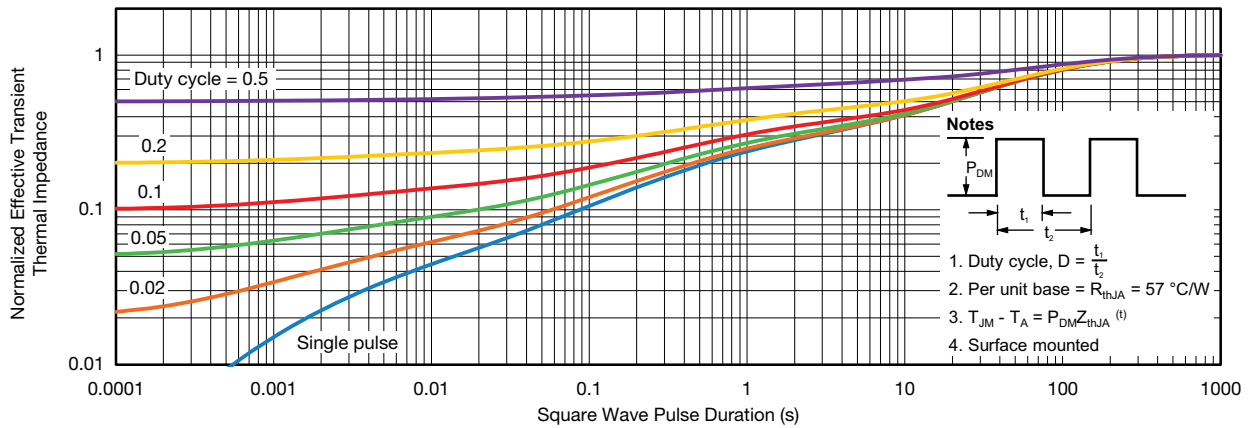


Note

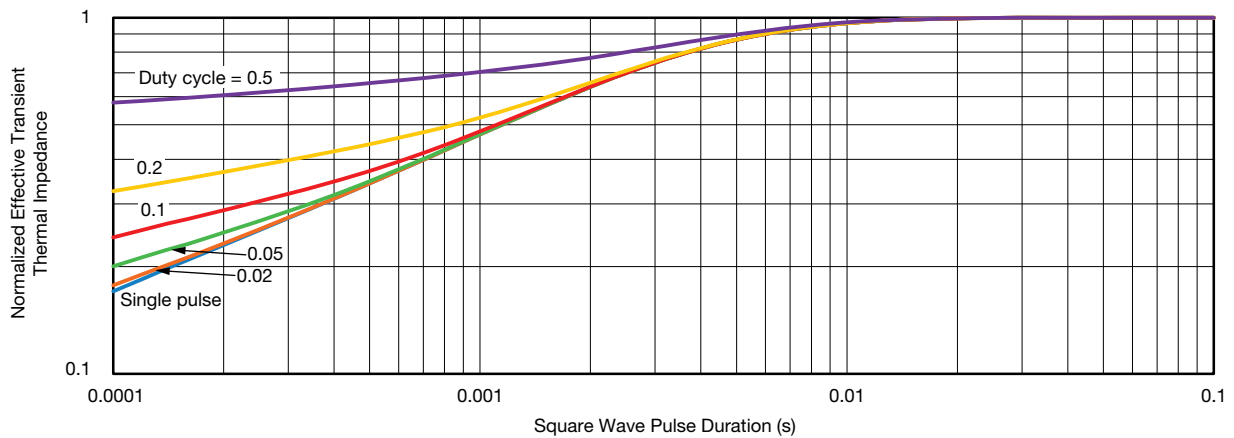
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit



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



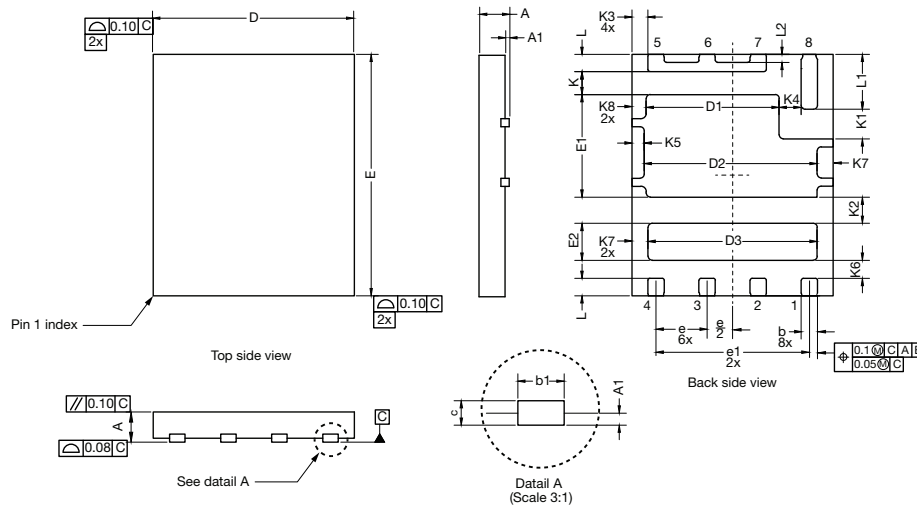
Normalized Thermal Transient Impedance, Junction-to-Ambient



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?77251.

PowerPAIR® 6 x 5 F Case Outline

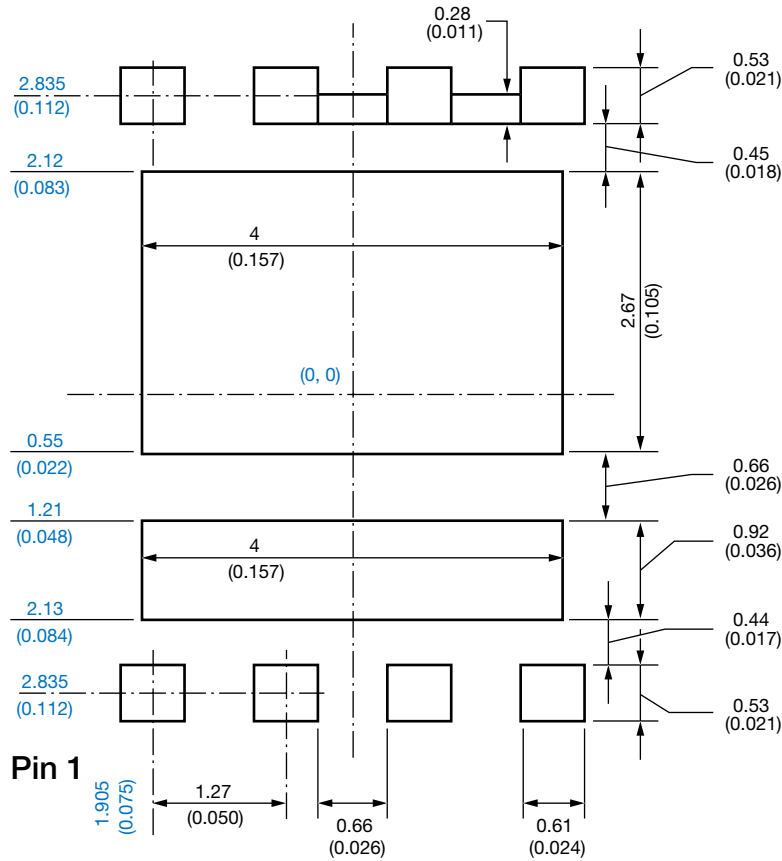


DIMENSION	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	-	0.10	0.000	-	0.004
b	0.35	0.41	0.46	0.014	0.016	0.018
b1	0.38 ref.			0.015 ref.		
c	0.15	0.20	0.25	0.006	0.008	0.010
D	4.90	5.00	5.10	0.193	0.197	0.201
D1	3.26	3.31	3.36	0.128	0.130	0.132
D2	4.20	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 PAD for PowerPAIR® 6 x 5



Dimensions in millimeters (inch)

Note

- Linear dimensions are in black, the same information is provided in ordinate dimensions which are in blue.



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