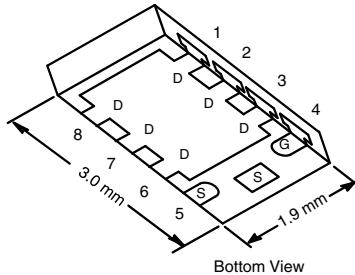


P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) (Max.)	I _D (A) ^a	Q _g (Typ.)
- 20	0.0098 at V _{GS} = - 4.5 V	- 25	43 nC
	0.0114 at V _{GS} = - 3.7 V	- 25	
	0.0143 at V _{GS} = - 2.5 V	- 25	
	0.0250 at V _{GS} = - 1.8 V	- 7	

PowerPAK ChipFET Single



Ordering Information:
Si5415EDU-T1-GE3 (Lead (Pb)-free and Halogen-free)

FEATURES

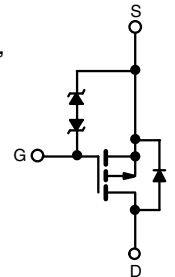
- TrenchFET® Power MOSFET
- Thermally Enhanced PowerPAK® ChipFET Package
 - Small Footprint Area
 - Low On-Resistance
- 100 % R_g and UIS Tested
- Typical ESD Protection: 5500 V (HBM)
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

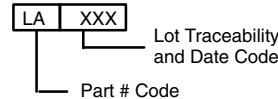
APPLICATIONS

- Portable Devices such as Smart Phones, Tablet PCs and Mobile Computing
 - Battery Switch
 - Load Switch
 - Power Management



P-Channel MOSFET

Marking Code



ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	- 20	V
Gate-Source Voltage	V _{GS}	± 8	
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 25 ^a
		T _C = 70 °C	- 25 ^a
		T _A = 25 °C	- 15 ^{b, c}
		T _A = 70 °C	- 12 ^{b, c}
Pulsed Drain Current (t = 300 μs)	I _{DM}	- 70	A
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	
		T _A = 25 °C	- 2.6 ^{b, c}
Single Avalanche Current	I _{AS}	- 15	mJ
Single Avalanche Energy	E _{AS}	11	
Maximum Power Dissipation	P _D	T _C = 25 °C	31
		T _C = 70 °C	20
		T _A = 25 °C	3.1 ^{b, c}
		T _A = 70 °C	2 ^{b, c}
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 50 to 150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, f}	R _{thJA}	34	40	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	3	4	

Notes

- Package limited.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- See solder profile (www.vishay.com/doc?73257). The PowerPAK ChipFET 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 90 °C/W.



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}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-11		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4		-1	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 2	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 0.2	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-10			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$		0.0081	0.0098	Ω
		$V_{GS} = -3.7\text{ V}, I_D = -5\text{ A}$		0.0094	0.0114	
		$V_{GS} = -2.5\text{ V}, I_D = -5\text{ A}$		0.0116	0.0143	
		$V_{GS} = -1.8\text{ V}, I_D = -2\text{ A}$		0.0200	0.0250	
Forward Transconductance ^a	g_{fs}	$V_{GS} = -10\text{ V}, I_D = -10\text{ A}$		47		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		4300		pF
Output Capacitance	C_{oss}			445		
Reverse Transfer Capacitance	C_{rss}			400		
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -14\text{ A}$		80	120	nC
				43	65	
Gate-Source Charge	Q_{gs}	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -14\text{ A}$		7		
Gate-Drain Charge	Q_{gd}			11.4		
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.6	3.3	6.6	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -10\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		30	60	ns
Rise Time	t_r			45	90	
Turn-Off Delay Time	$t_{d(off)}$			75	150	
Fall Time	t_f			25	50	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -10\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$		12	25	
Rise Time	t_r			5	10	
Turn-Off Delay Time	$t_{d(off)}$			80	160	
Fall Time	t_f			20	40	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-25	A
Pulse Diode Forward Current	I_{SM}				-70	
Body Diode Voltage	V_{SD}	$I_S = -10\text{ A}, V_{GS} = 0\text{ V}$		-0.8	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -10\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		35	70	ns
Body Diode Reverse Recovery Charge	Q_{rr}			21	40	nC
Reverse Recovery Fall Time	t_a			20		ns
Reverse Recovery Rise Time	t_b			15		

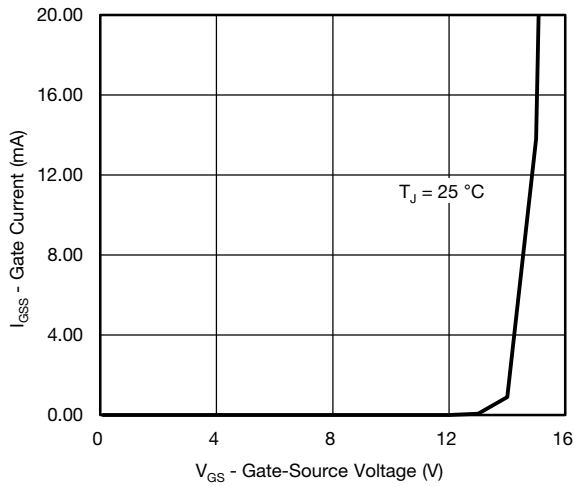
Notes

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

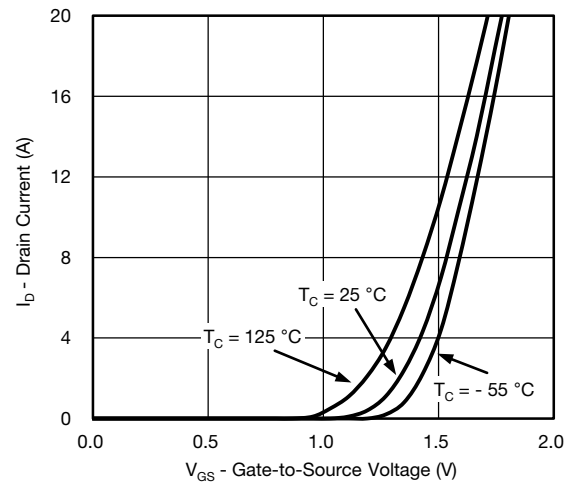
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



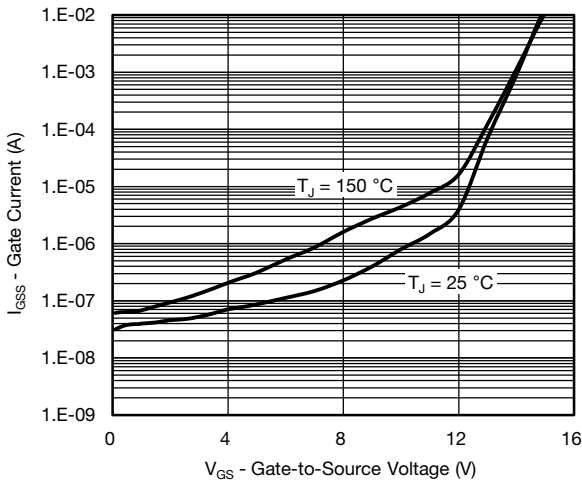
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



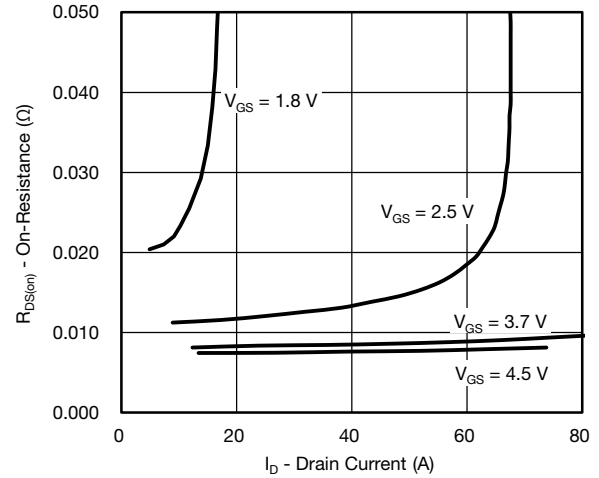
Gate Current vs. Gate-Source Voltage



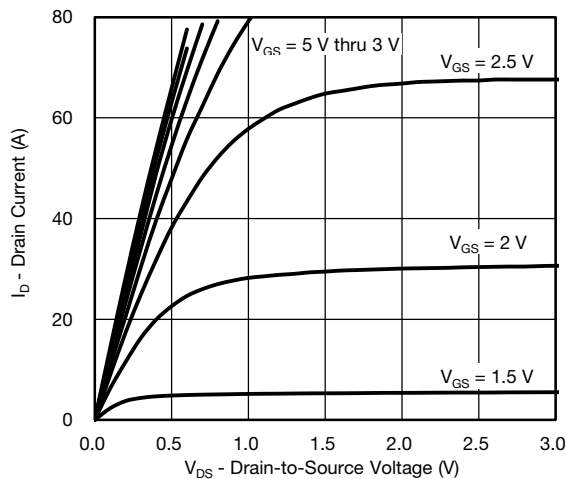
Transfer Characteristics



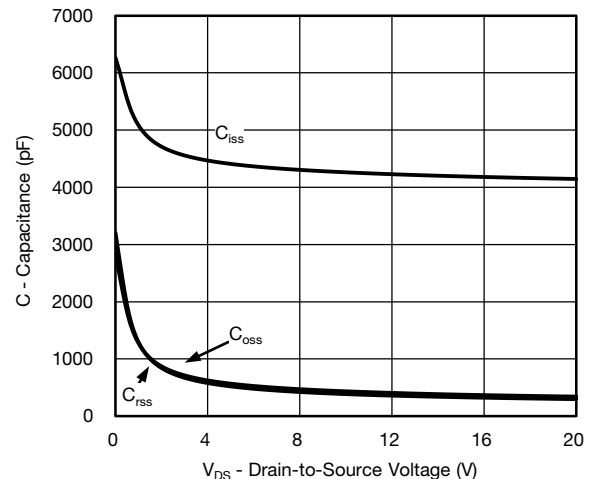
Gate Current vs. Gate-Source Voltage



On-Resistance vs. Drain Current and Gate Voltage

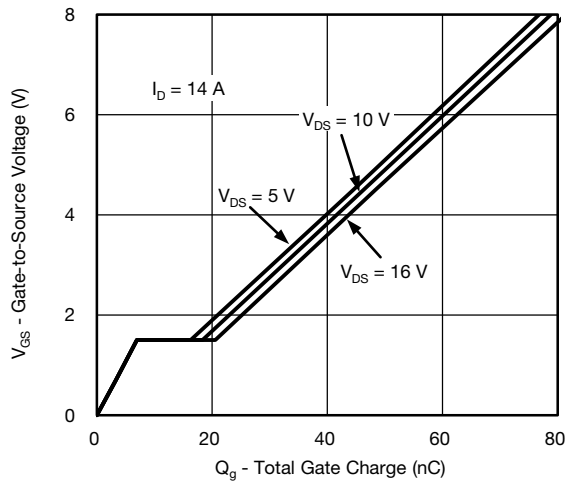


Output Characteristics

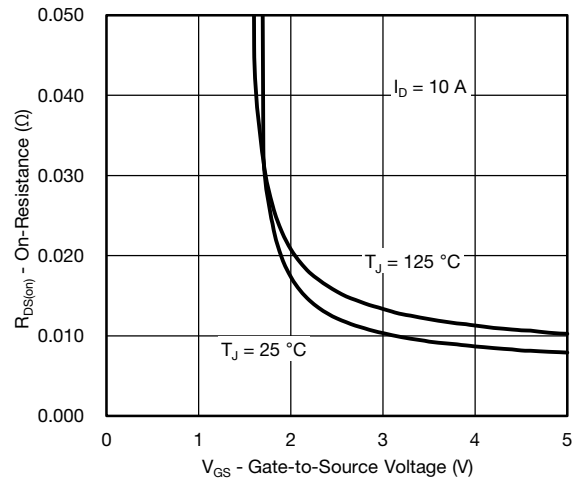


Capacitance

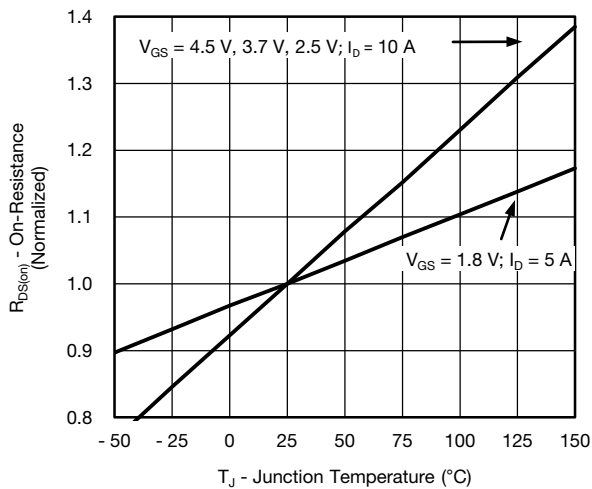
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



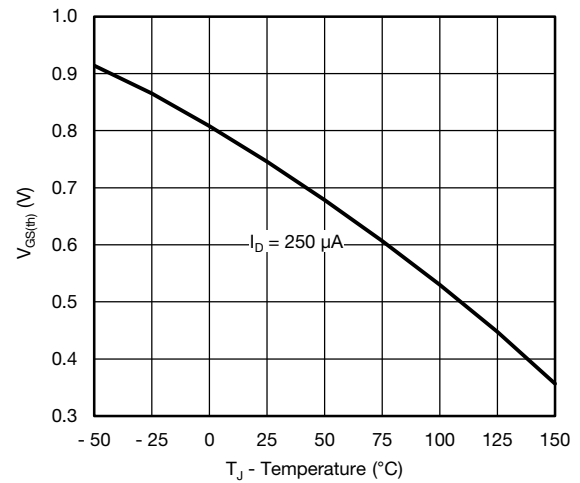
Gate Charge



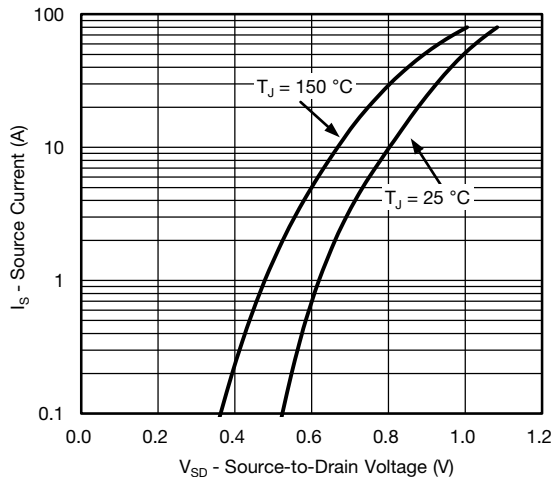
On-Resistance vs. Gate-to-Source Voltage



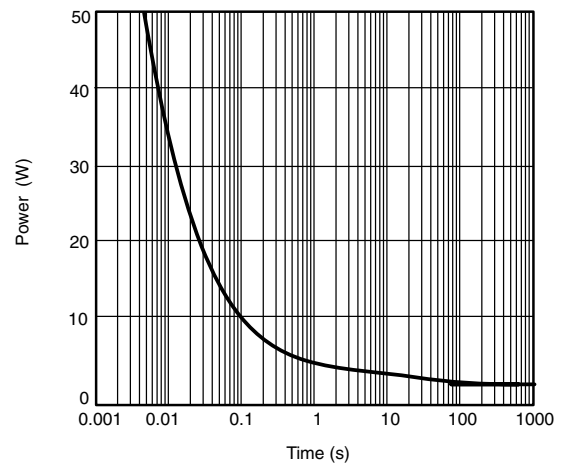
On-Resistance vs. Junction Temperature



Threshold Voltage



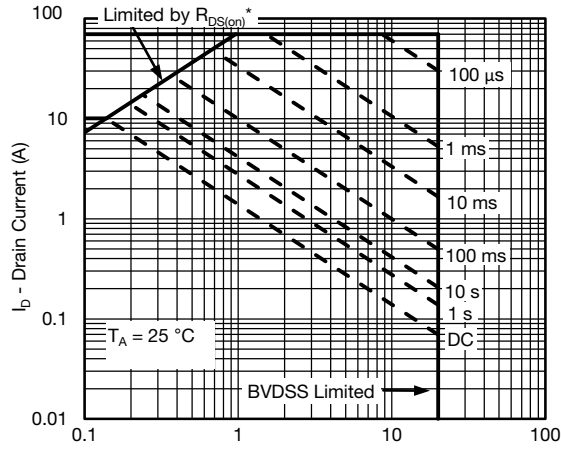
Source-Drain Diode Forward Voltage



Single Pulse Power, Junction-to-Ambient

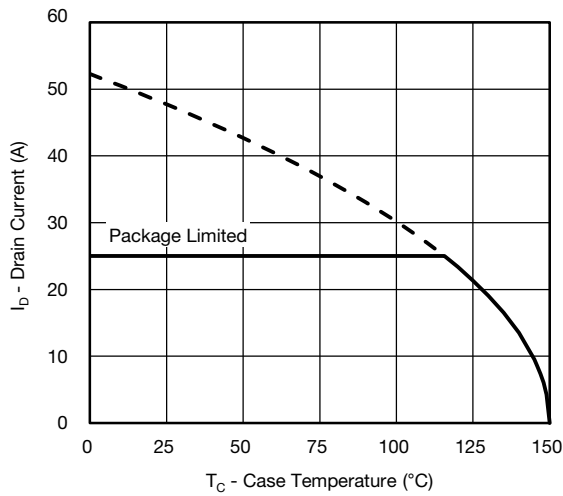


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

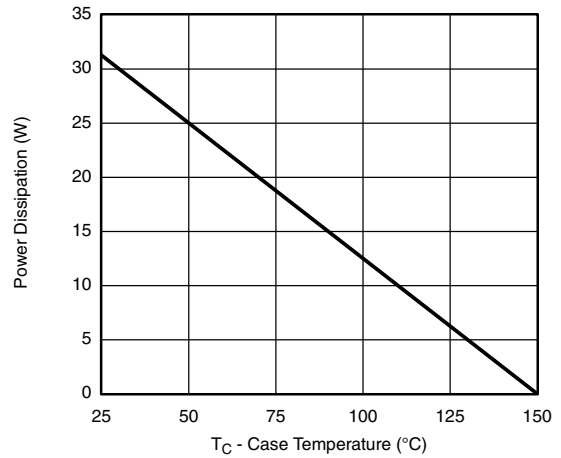


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient



Current Derating*

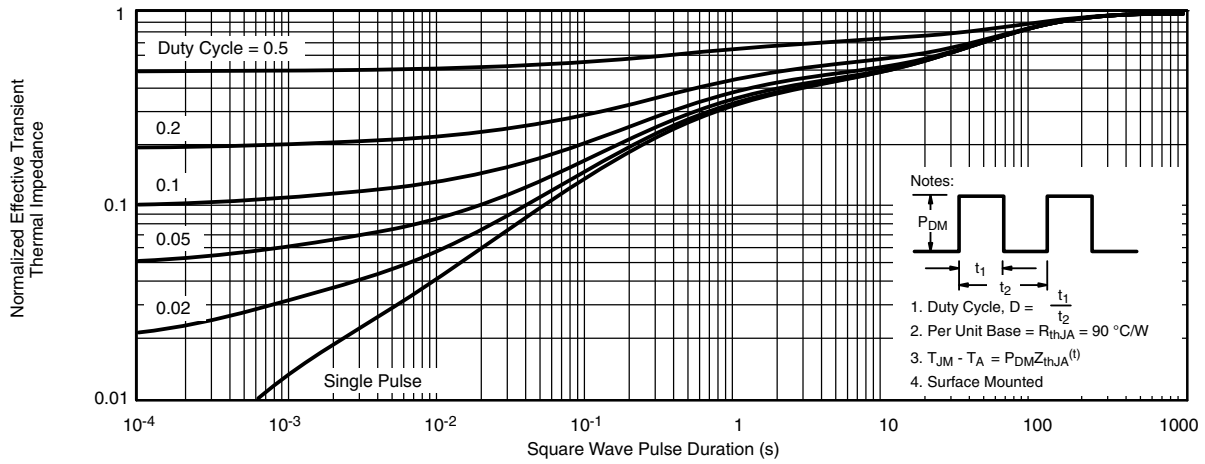


Power Derating

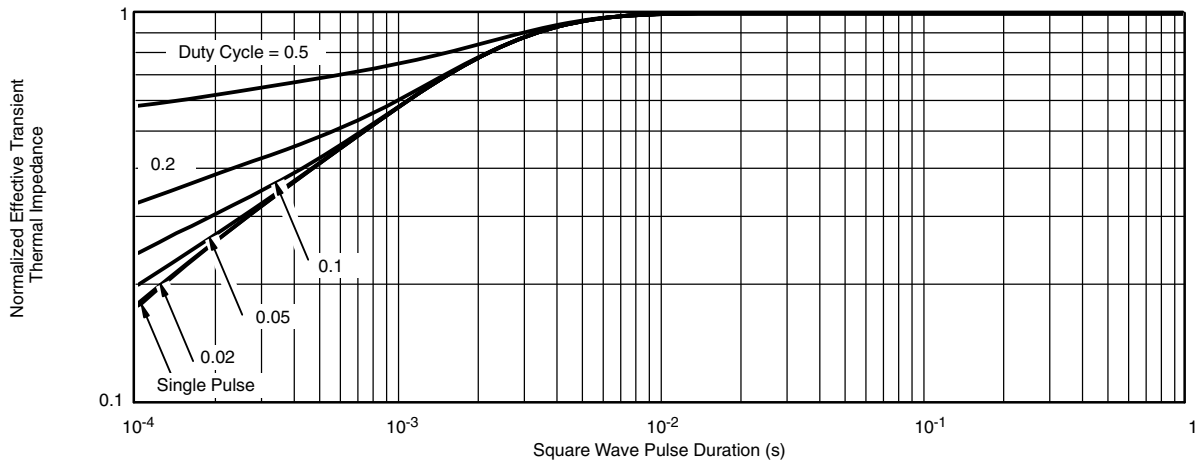
* The power dissipation P_D is based on $T_{J(max.)} = 150\text{ }^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

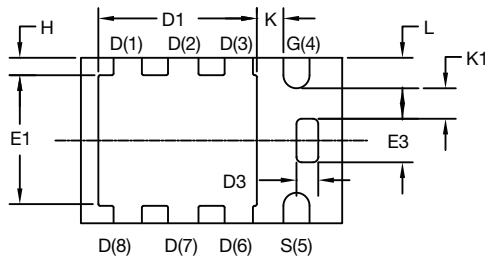
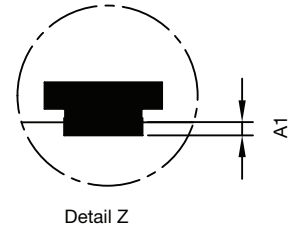
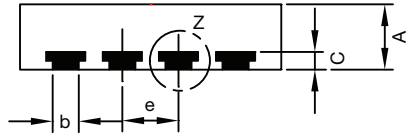
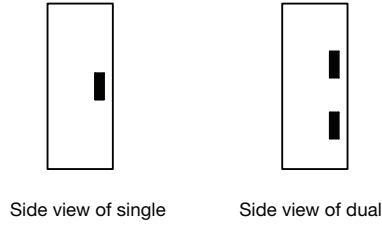
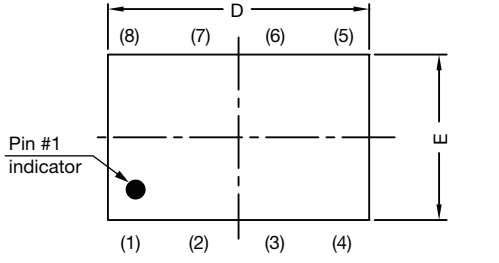


Normalized Thermal Transient Impedance, Junction-to-Case

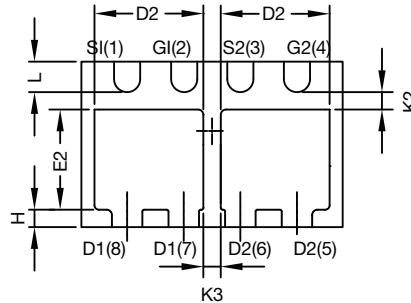
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PowerPAK® ChipFET® Case Outline



Backside view of single pad



Backside view of dual pad

DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.85	0.028	0.030	0.033
A1	0	-	0.05	0	-	0.002
b	0.25	0.30	0.35	0.010	0.012	0.014
C	0.15	0.20	0.25	0.006	0.008	0.010
D	2.92	3.00	3.08	0.115	0.118	0.121
D1	1.75	1.87	2.00	0.069	0.074	0.079
D2	1.07	1.20	1.32	0.042	0.047	0.052
D3	0.20	0.25	0.30	0.008	0.010	0.012
E	1.82	1.90	1.98	0.072	0.075	0.078
E1	1.38	1.50	1.63	0.054	0.059	0.064
E2	0.92	1.05	1.17	0.036	0.041	0.046
E3	0.45	0.50	0.55	0.018	0.020	0.022
e	0.65 BSC			0.026 BSC		
H	0.15	0.20	0.25	0.006	0.008	0.010
K	0.25	-	-	0.010	-	-
K1	0.30	-	-	0.012	-	-
K2	0.20	-	-	0.008	-	-
K3	0.20	-	-	0.008	-	-
L	0.30	0.35	0.40	0.012	0.014	0.016

C14-0630-Rev. E, 21-Jul-14
DWG: 5940

Note

- Millimeters will govern

RECOMMENDED MINIMUM PADS FOR PowerPAK® ChipFET® Single



Recommended Minimum Pads
Dimensions in mm/(Inches)

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