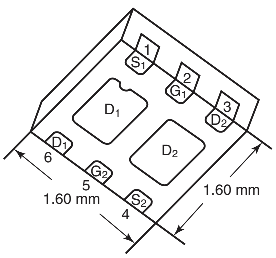
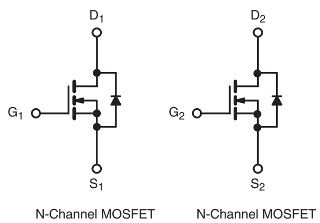
Dual N-Channel 20 V (D-S) MOSFET

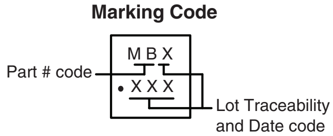
PRODUCT SUMMARY	
V_{DS} (V)	20
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.216
$R_{DS(on)}$ (Ω) at V_{GS} = 2.5 V	0.268
$R_{DS(on)}$ (Ω) at V_{GS} = 1.8 V	0.375
I_D (A)[a]	1.5
Configuration	Dual

PowerPAK SC75-6L-Dual





Marking Code



FEATURES

- High Quality Manufacturing Process Using SMM Process Flow
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- New Thermally Enhanced PowerPAK® SC-75 Package
  - Small Footprint Area
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC
- Find out more about Vishay's Medical Products at: www.vishay.com/medical-mosfets

Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATION EXAMPLES

- Medical Implantable Applications Including
  - Drug Delivery Systems
  - Defibrillators
  - Pacemakers
  - Hearing Aids
  - Other Implantable Devices
- Load Switch, PA Switch and Battery Switch for Portable Devices
- DC/DC Converter

ORDERING INFORMATION	
Package	PowerPAK SC-75
Lead (Pb)-free and Halogen-free	SMMB912DK-T1-GE3

ABSOLUTE MAXIMUM RATINGS T_A = 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)	T_C = 25 °C[a]	I_D	1.5	A
	T_C = 70 °C[a]		1.5	
	T_A = 25 °C[b, c]		1.5	
	T_A = 70 °C[b, c]		1.4	
Pulsed Drain Current		I_{DM}	5	
Continuous Source-Drain Diode Current	T_C = 25 °C[a]	I_S	1.5	
	T_A = 25 °C[b, c]		0.9	
Maximum Power Dissipation	T_C = 25 °C	P_D	3.1	W
	T_C = 70 °C		2.0	
	T_A = 25 °C[b, c]		1.1	
	T_A = 70 °C[b, c]		0.7	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)[c, d]			260	

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Ambient[b, f]	$t \leq 5$ s	R_{thJA}	90	115	°C/W
Junction-to-Case (Drain)	Steady State	R_{thJC}	32	40	

Notes

a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. See Solder Profile (www.vishay.com/ppg?73257). The PowerPAK SC-75 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 125 °C/W.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		20	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		-	22	-	mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-	- 2	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA		0.4	-	1	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 20 V	-	-	1	µA
		V_{GS} = 0 V	V_{DS} = 20 V, T_J = 55 °C	-	-	10	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = 4.5 V	$V_{DS} \geq 5$ V	5	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 4.5 V	I_D = 1.8 A	-	0.180	0.216	Ω
		V_{GS} = 2.5 V	I_D = 1.6 A	-	0.223	0.268	
		V_{GS} = 1.8 V	I_D = 0.3 A	-	0.300	0.375	
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 1.8 A		-	3	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 10 V, f = 1 MHz	-	95	-	pF
Output Capacitance	C_{oss}			-	24	-	
Reverse Transfer Capacitance	C_{rss}			-	11	-	
Total Gate Charge	Q_g	V_{GS} = 8 V	V_{DS} = 10 V, I_D = 1.8 A	-	2	3	nC
		V_{GS} = 4.5 V	V_{DS} = 10 V, I_D = 1.8 A	-	1.2	1.8	
Gate-Source Charge	Q_{gs}			-	0.3	-	
Gate-Drain Charge	Q_{gd}			-	0.15	-	
Gate Resistance	R_g	f = 1 MHz		0.5	2.5	5	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 7.1 Ω $I_D \cong 1.4$ A, V_{GEN} = 4.5 V, R_g = 1 Ω		-	5	10	ns
Rise Time	t_r			-	10	20	
Turn-Off Delay Time	$t_{d(off)}$			-	24	36	
Fall Time	t_f			-	8	16	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 7.1 Ω $I_D \cong 1.4$ A, V_{GEN} = 8 V, R_g = 1 Ω		-	2	4	
Rise Time	t_r			-	9	18	
Turn-Off Delay Time	$t_{d(off)}$			-	8	16	
Fall Time	t_f			-	7	14	
Source-Drain Body Diode Characteristics							
Continuous Source-Drain Diode Current[c]	I_S	T_C = 25 °C		-	-	1.5	A
Pulse Diode Forward Current	I_{SM}			-	-	5	
Body Diode Voltage	V_{SD}	I_S = 1.4 A, V_{GS} = 0 V		-	0.7	1.2	V

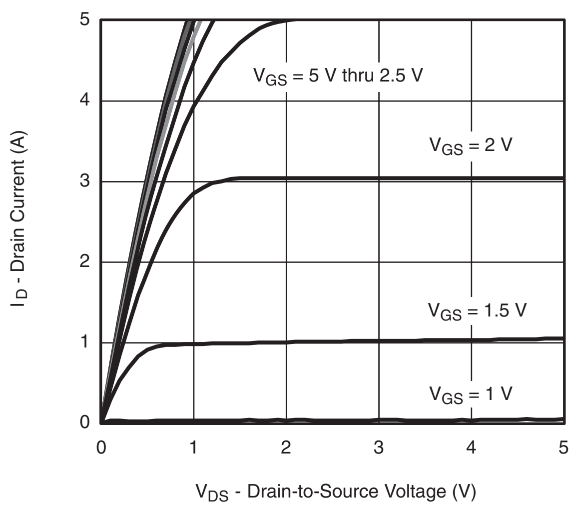
SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Source-Drain Body Diode Characteristics						
Body Diode Reverse Recovery Time	t_{rr}	I_F = 1.4 A, dI/dt = 100 A/µs, T_J = 25 °C	-	9	18	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	3	6	nC
Reverse Recovery Fall Time	t_a		-	6	-	ns
Reverse Recovery Rise Time	t_b		-	3	-	

Notes

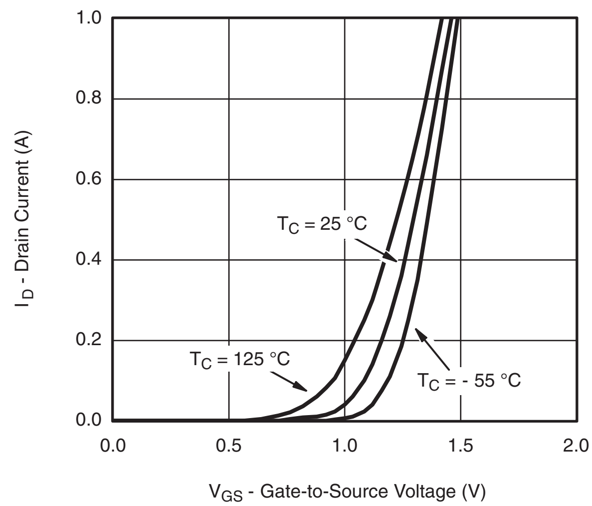
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Package limited.

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.

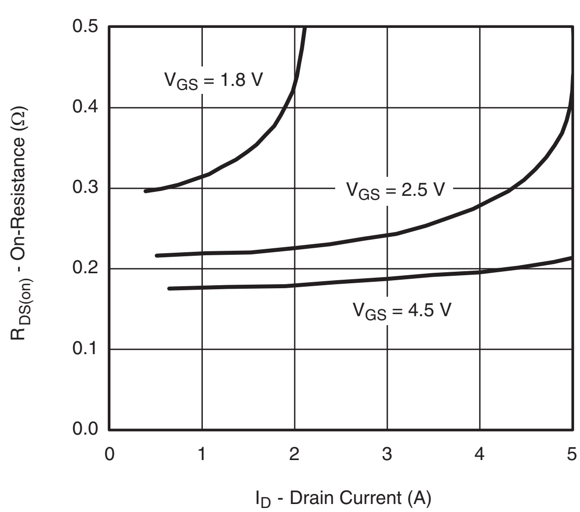
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



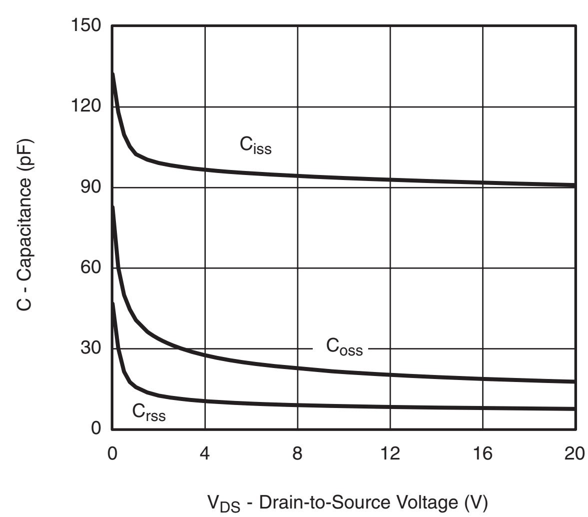
Output Characteristics



Transfer Characteristics

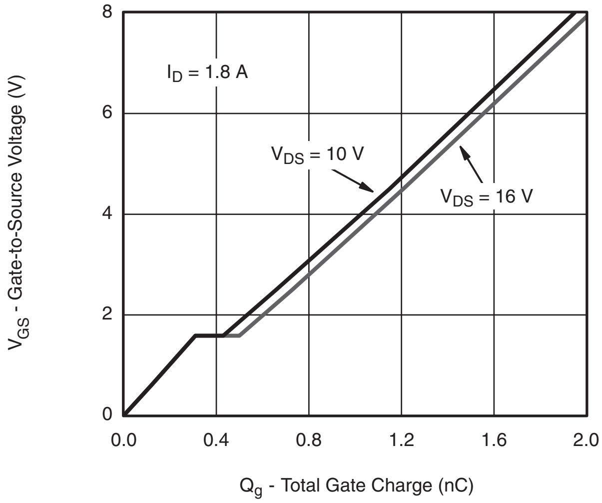


On-Resistance vs. Drain Current and Gate Voltage

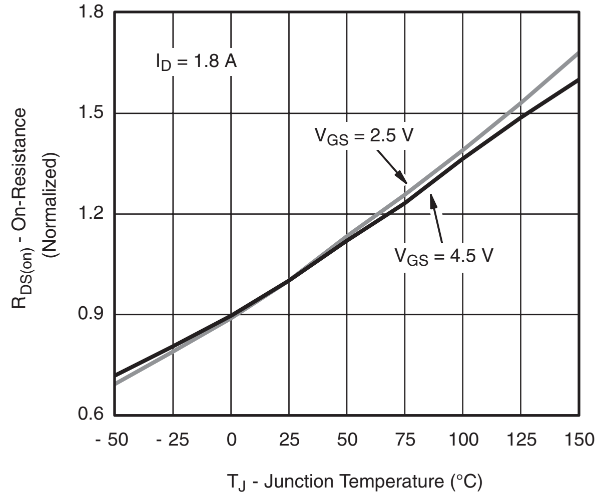


Capacitance

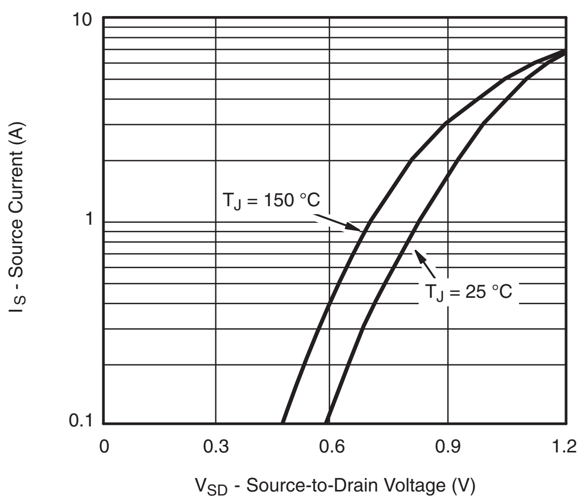
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



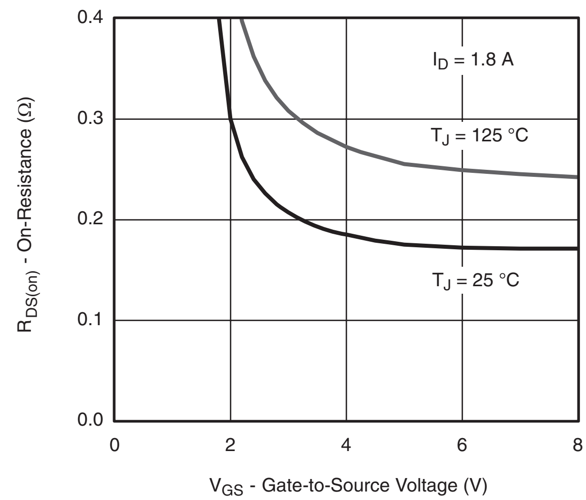
Gate Charge



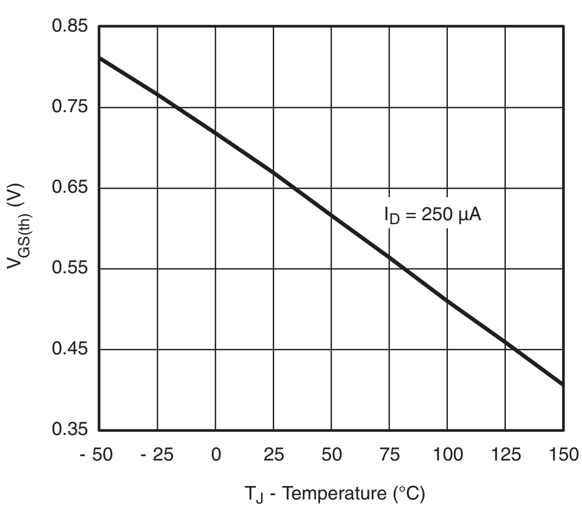
On-Resistance vs. Junction Temperature



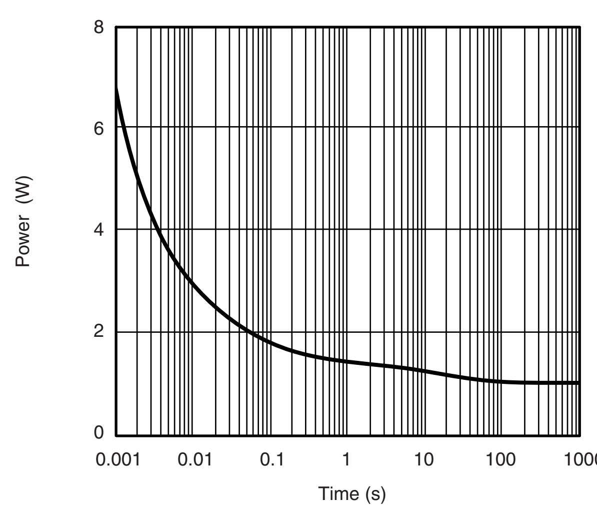
Soure-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

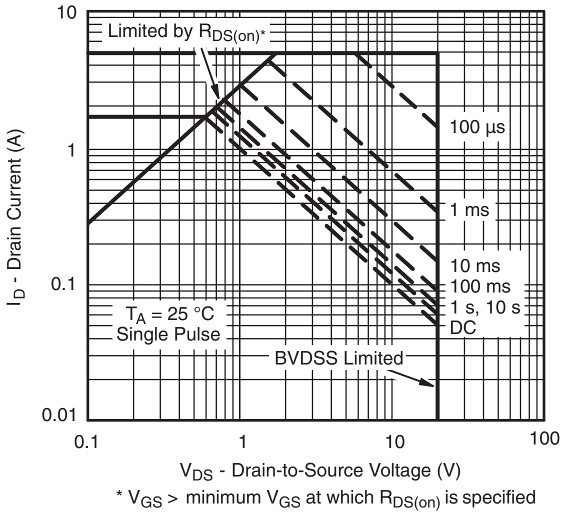


Threshold Voltage

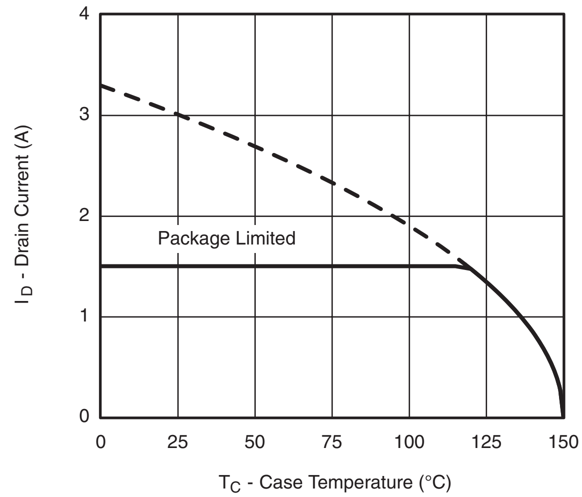


Single Pulse Power, Junction-to-Ambient

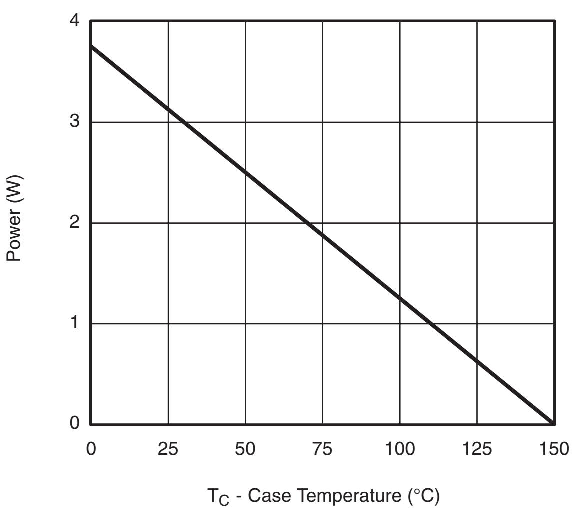
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



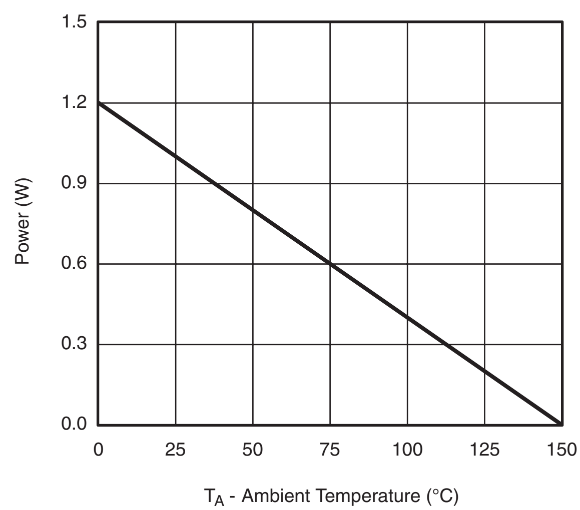
Safe Operating Area, Junction-to-Ambient



Current Derating*



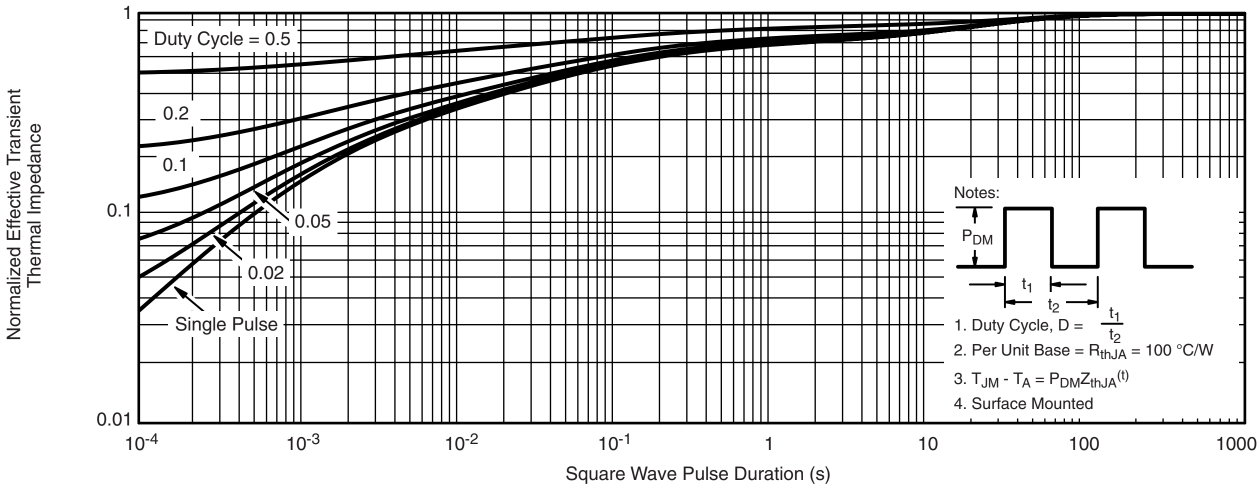
Power Derating, Junction-to-Case



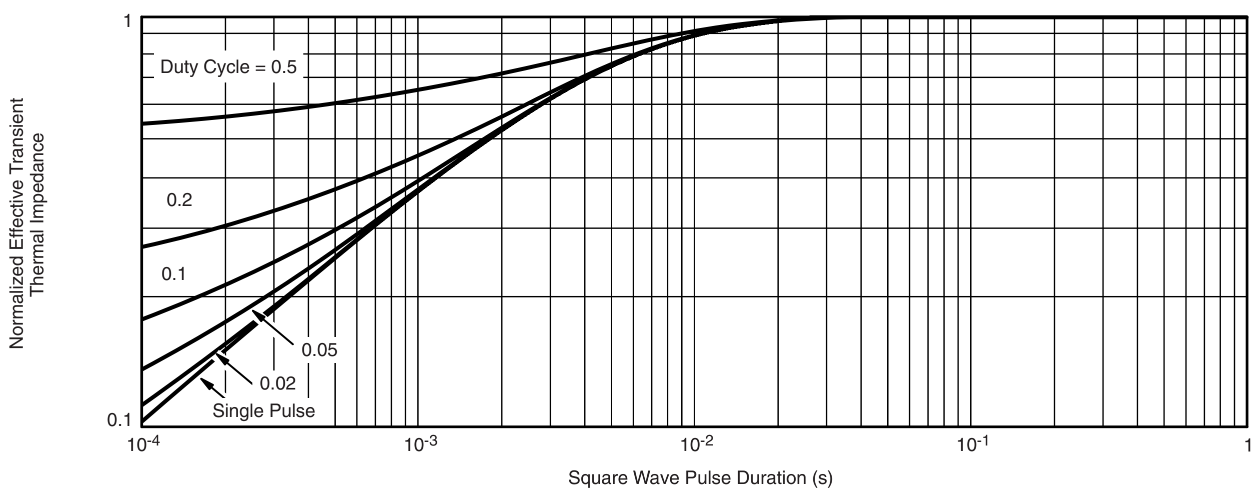
Power Derating, Junction-to-Ambient

* 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 T_A = 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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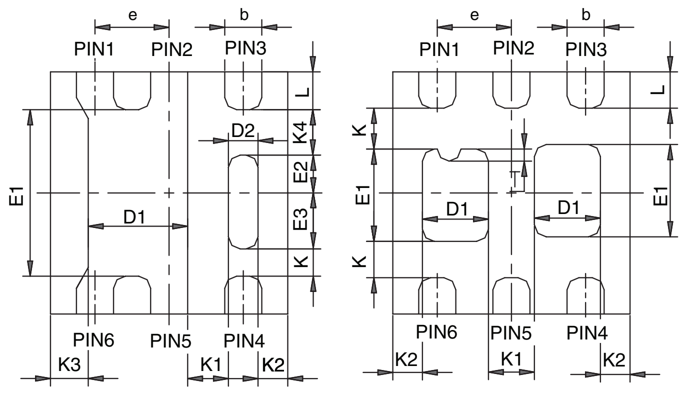
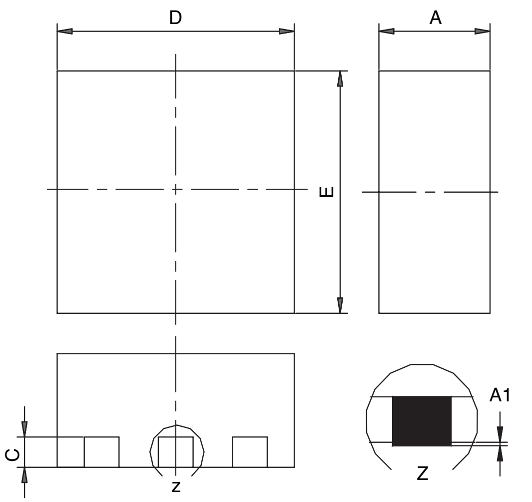
PowerPAK® SC75-6L



BACKSIDE VIEW OF SINGLE

BACKSIDE VIEW OF DUAL



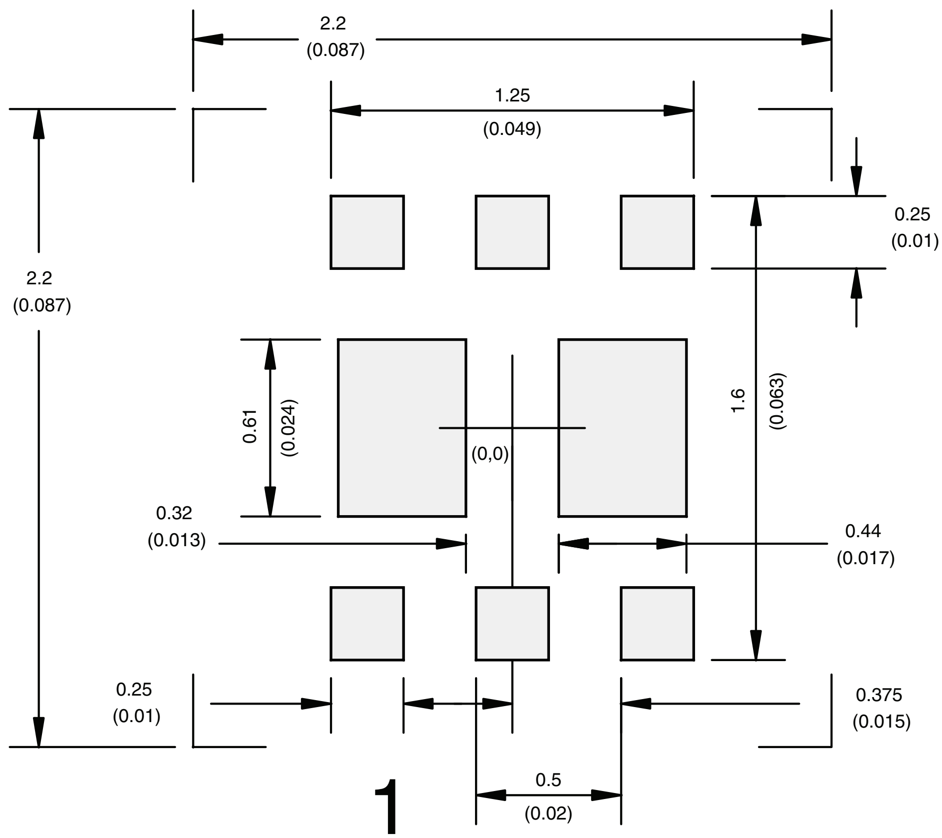
DETAIL Z

Notes:
1. All dimensions are in millimeters
2. Package outline exclusive of mold flash and metal burr
3. Package outline inclusive of plating

DIM	SINGLE PAD						DUAL PAD					
	MILLIMETERS			INCHES			MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
A	0.675	0.75	0.80	0.027	0.030	0.032	0.675	0.75	0.80	0.027	0.030	0.032
A1	0	-	0.05	0	-	0.002	0	-	0.05	0	-	0.002
b	0.18	0.25	0.33	0.007	0.010	0.013	0.18	0.25	0.33	0.007	0.010	0.013
C	0.15	0.20	0.25	0.006	0.008	0.010	0.15	0.20	0.25	0.006	0.008	0.010
D	1.53	1.60	1.70	0.060	0.063	0.067	1.53	1.60	1.70	0.060	0.063	0.067
D1	0.57	0.67	0.77	0.022	0.026	0.030	0.34	0.44	0.54	0.013	0.017	0.021
D2	0.10	0.20	0.30	0.004	0.008	0.012						
E	1.53	1.60	1.70	0.060	0.063	0.067	1.53	1.60	1.70	0.060	0.063	0.067
E1	1.00	1.10	1.20	0.039	0.043	0.047	0.51	0.61	0.71	0.020	0.024	0.028
E2	0.20	0.25	0.30	0.008	0.010	0.012						
E3	0.32	0.37	0.42	0.013	0.015	0.017						
e	0.50 BSC			0.020 BSC			0.50 BSC			0.020 BSC		
K	0.180 TYP			0.007 TYP			0.245 TYP			0.010 TYP		
K1	0.275 TYP			0.011 TYP			0.320 TYP			0.013 TYP		
K2	0.200 TYP			0.008 TYP			0.200 BSC			0.008 TYP		
K3	0.255 TYP			0.010 TYP								
K4	0.300 TYP			0.012 TYP								
L	0.15	0.25	0.35	0.006	0.010	0.014	0.15	0.25	0.35	0.006	0.010	0.014
T							0.03	0.08	0.13	0.001	0.003	0.005

ECN: C-07431 – Rev. C, 06-Aug-07
DWG: 5935

RECOMMENDED PAD LAYOUT FOR PowerPAK® SC75-6L Dual



Dimensions in mm/(Inches)

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