

N-Channel 20-V (D-S) MOSFET with Trench Schottky Diode

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
20	0.225 at $V_{GS} = 4.5$ V	1.5	1.1 nC
	0.270 at $V_{GS} = 2.5$ V	1.5	
	0.345 at $V_{GS} = 1.8$ V	1.5	
	0.960 at $V_{GS} = 1.5$ V	0.5	

SCHOTTKY PRODUCT SUMMARY

V_{KA} (V)	V_F (V) Diode Forward Voltage	I_F (A) ^a
30	0.29 at 10 mA	0.4

FEATURES

- Halogen-free According to IEC 61249-2-21
- LITTLE FOOT® Plus Schottky Power MOSFET
- New Thermally Enhanced PowerPAK® SC-75 Package
 - Small Footprint Area
 - Low On-Resistance
 - Thin 0.75 mm profile
- Typical ESD Protection 2800 V

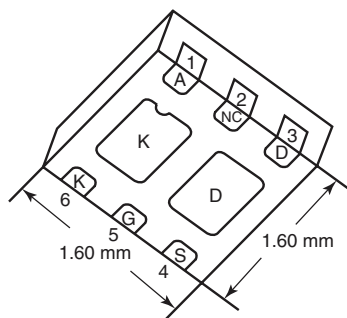


RoHS
COMPLIANT
HALOGEN
FREE

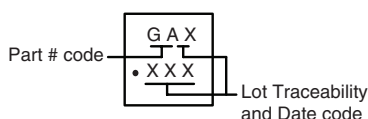
APPLICATIONS

- Portable Devices
- DC/DC Converters

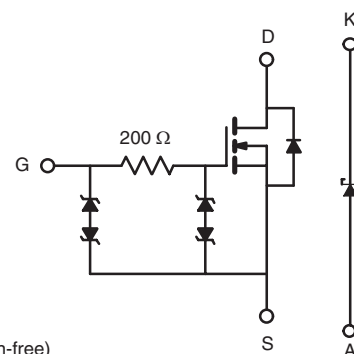
PowerPAK SC75-6L-Dual



Marking Code



Ordering Information: SiB800EDK-T1-GE3 (Lead (Pb)-free and Halogen-free)



ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage (MOSFET)		V _{DS}	20	V
Reverse Voltage (Schottky)		V _{KA}	30	
Gate-Source Voltage (MOSFET)		V _{GS}	± 6	
Continuous Drain Current (T _J = 150 °C) (MOSFET)	T _C = 25 °C	I _D	1.5 ^a	A
	T _C = 70 °C		1.5 ^a	
	T _A = 25 °C		1.5 ^{a, b, c}	
	T _A = 70 °C		1.3 ^{b, c}	
Pulsed Drain Current (MOSFET)		I _{DM}	4	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	T _C = 25 °C	I _S	1.5 ^a	
	T _A = 25 °C		0.9 ^{b, c}	
Average Forward Current (Schottky)		I _F	0.4 ^b	
Pulsed Forward Current (Schottky)		I _{FM}	0.8	
Maximum Power Dissipation (MOSFET)	T _C = 25 °C	P _D	3.1	W
	T _C = 70 °C		2	
	T _A = 25 °C		1.1 ^{b, c}	
	T _A = 70 °C		0.7 ^{b, c}	
Maximum Power Dissipation (Schottky)	T _C = 25 °C		3.1	
	T _C = 70 °C		2	
	T _A = 25 °C		1.1 ^{b, c}	
	T _A = 70 °C		0.7 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}			260	

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET) ^{b, f}	$t \leq 5$ s	R_{thJA}	90	115	°C/W
Maximum Junction-to-Case (Drain) (MOSFET)	Steady State	R_{thJC}	32	40	
Maximum Junction-to-Ambient (Schottky) ^{b, f}	$t \leq 5$ s	R_{thJA}	90	115	
Maximum Junction-to-Case (Drain) (Schottky)	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	ΔV _{DS} /T _J	I _D = 250 μA		21		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 2.3		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.4		1.0	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 3 V			± 1	μA
		V _{DS} = 0 V, V _{GS} = ± 6 V			± 1	mA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	μA
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 4.5 V	4			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 1.6 A		0.183	0.225	Ω
		V _{GS} = 2.5 V, I _D = 1.5 A		0.220	0.270	
		V _{GS} = 1.8 V, I _D = 1.3 A		0.275	0.345	
		V _{GS} = 1.5 V, I _D = 0.3 A		0.320	0.960	
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 1.6 A		3.5		S
Dynamic ^b						
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 1.7 A		1.1	1.7	nC
Gate-Source Charge	Q _{gs}			0.2		
Gate-Drain Charge	Q _{gd}			0.1		
Gate Resistance	R _g	f = 1 MHz		200		Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 7.7 Ω I _D ≅ 1.3 A, V _{GEN} = 4.5 V, R _g = 1 Ω		20	30	ns
Rise Time	t _r			12	20	
Turn-Off DelayTime	t _{d(off)}			70	105	
Fall Time	t _f			20	30	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			1.5	A
Pulse Diode Forward Current	I _{SM}				4	
Body Diode Voltage	V _{SD}	I _S = 1.3 A, V _{GS} = 0 V		0.9	1.2	V

Notes:

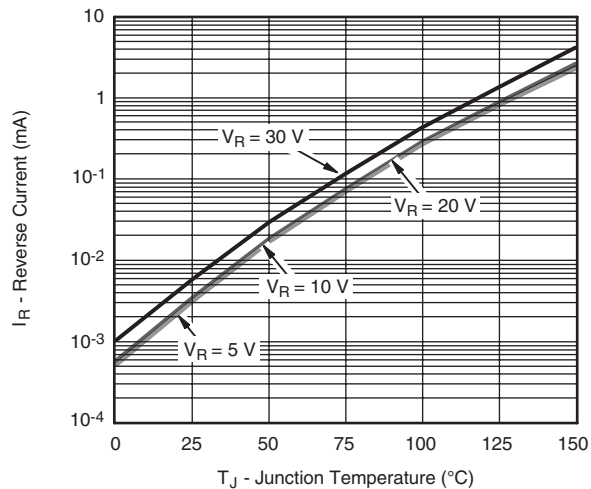
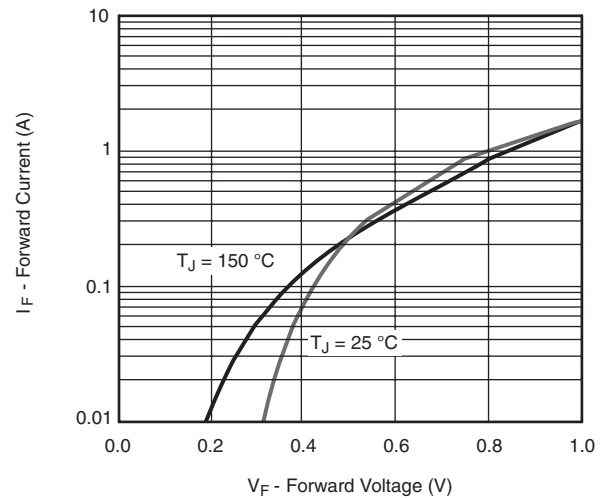
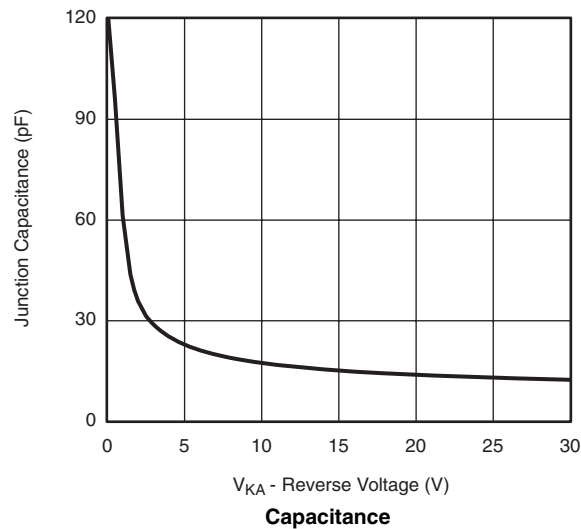
a. Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %.

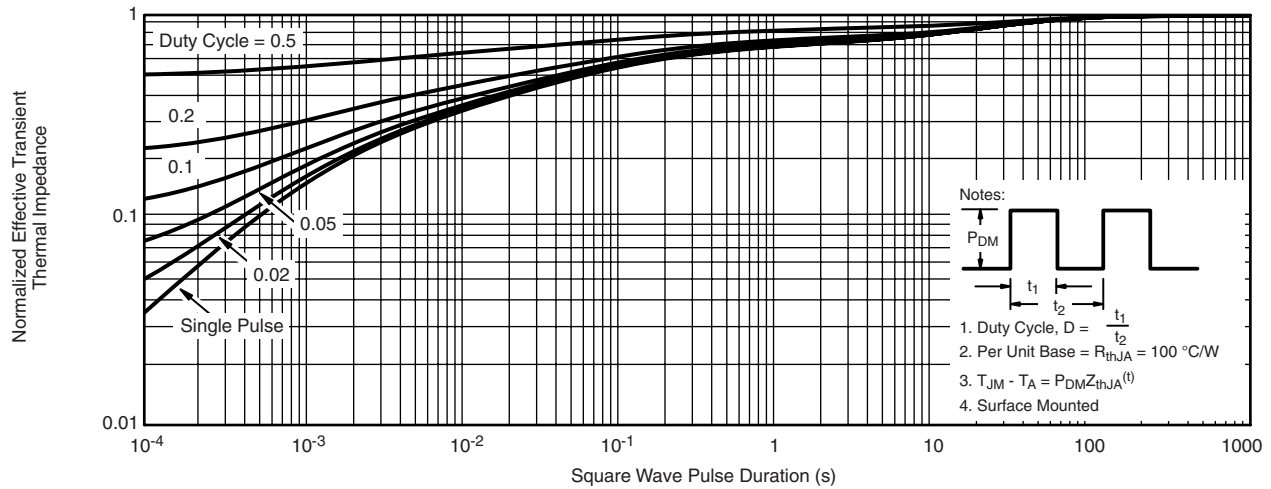
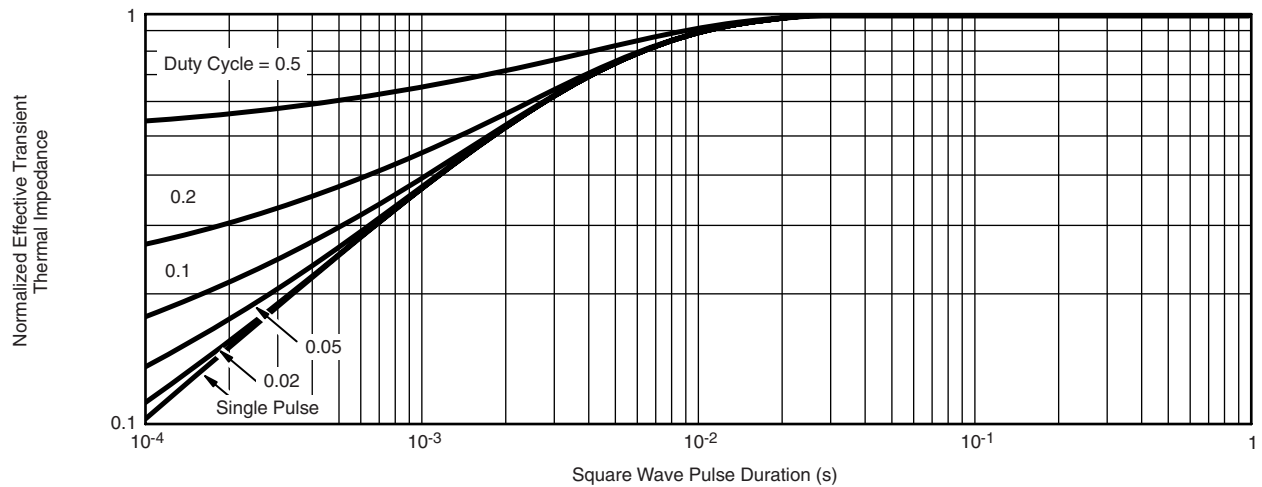
b. Guaranteed by design, not subject to production testing.

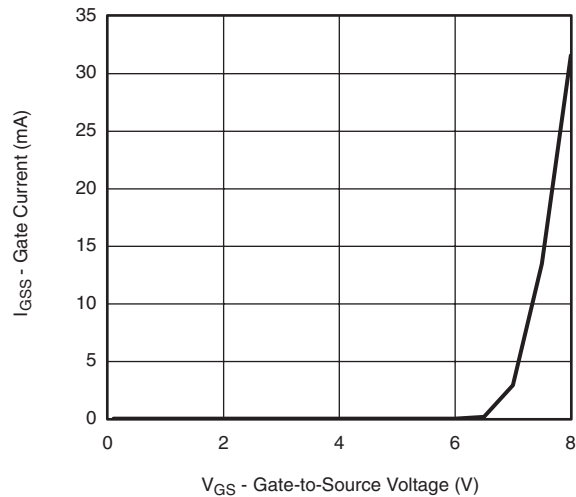
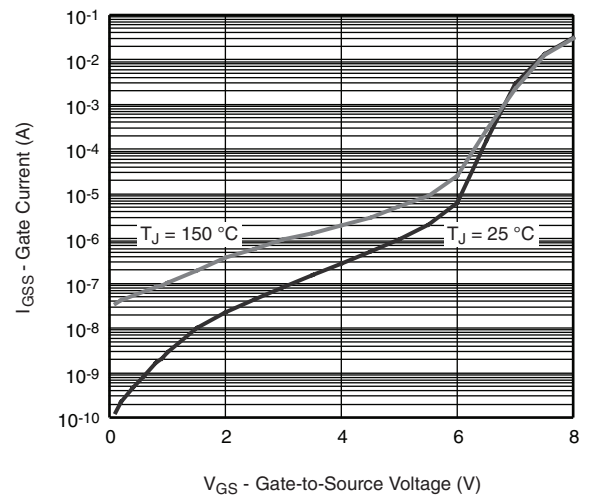
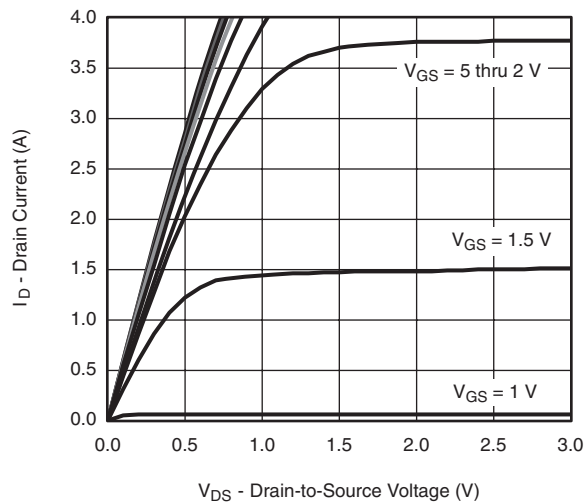
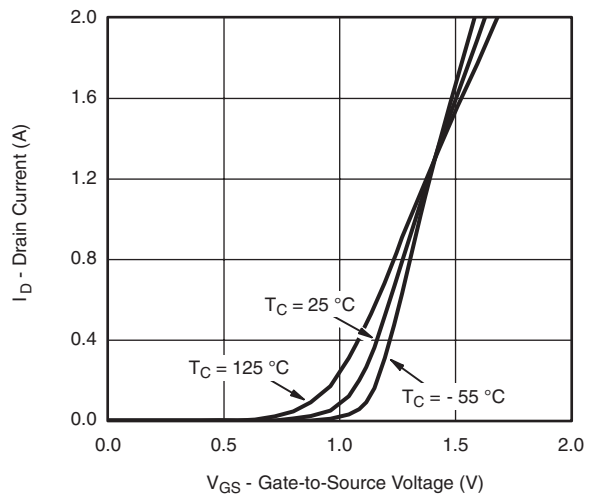
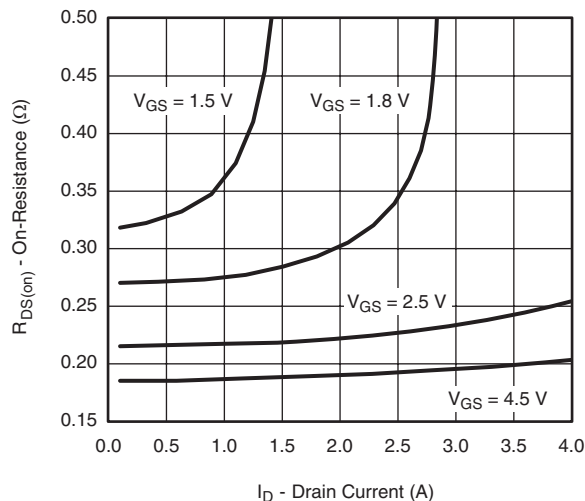
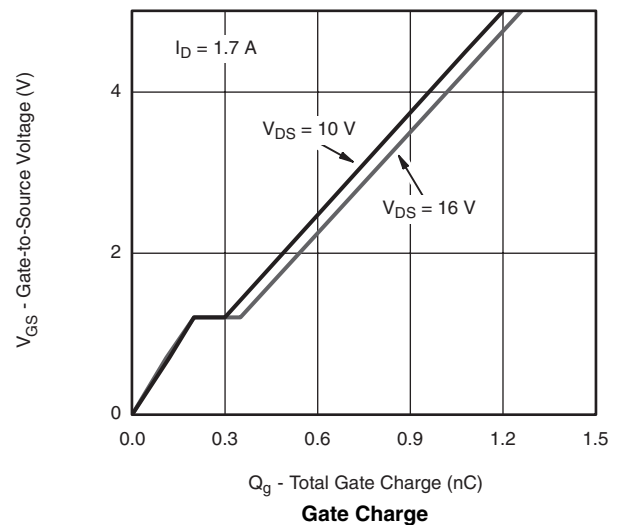
**SCHOTTKY SPECIFICATIONS** $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

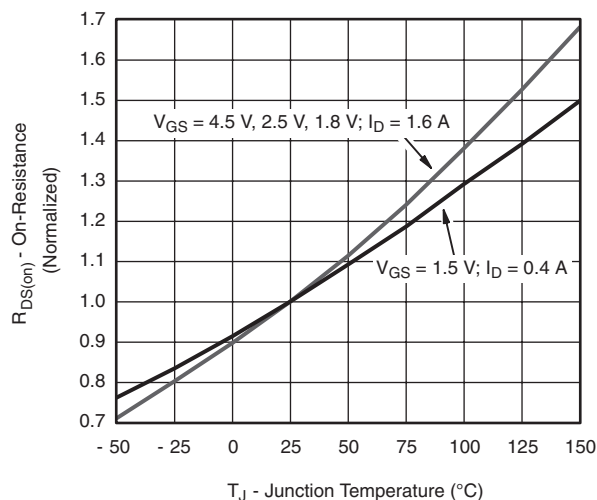
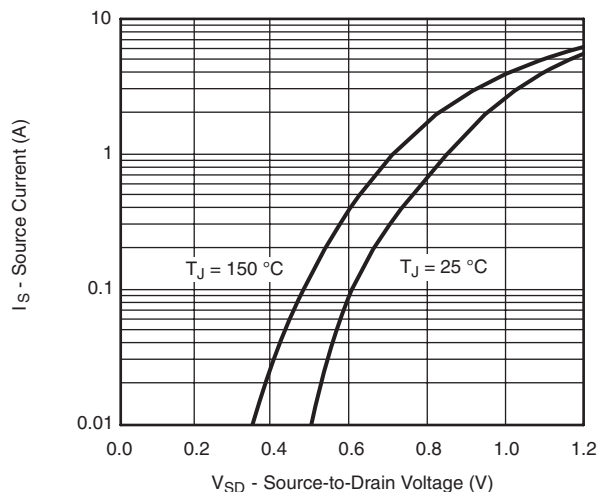
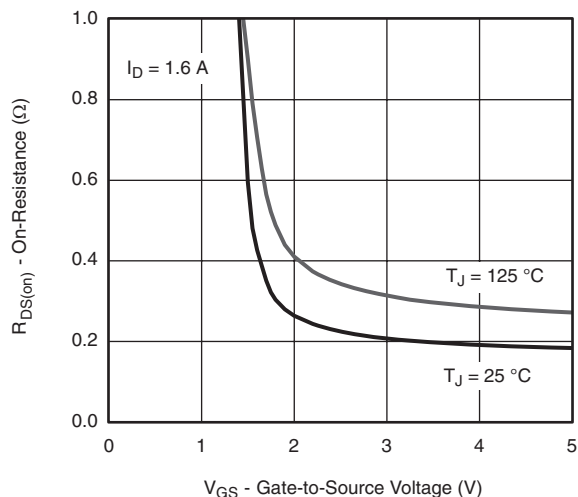
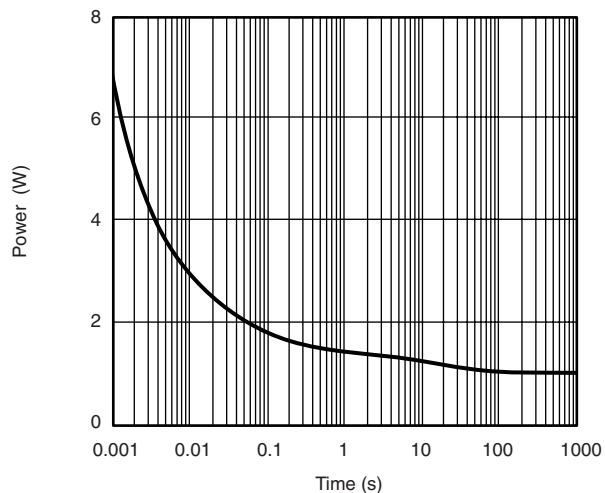
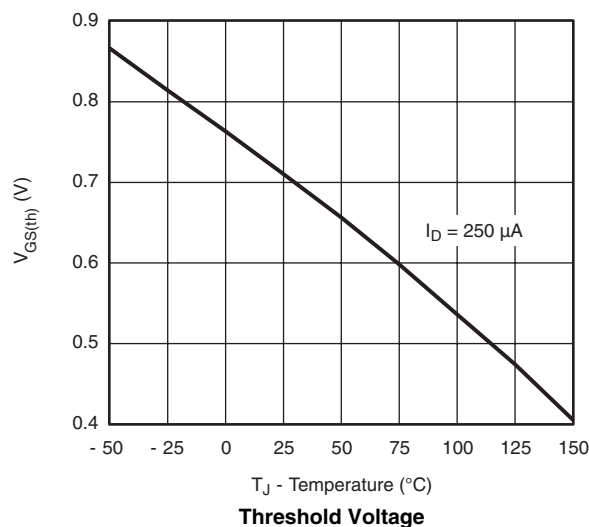
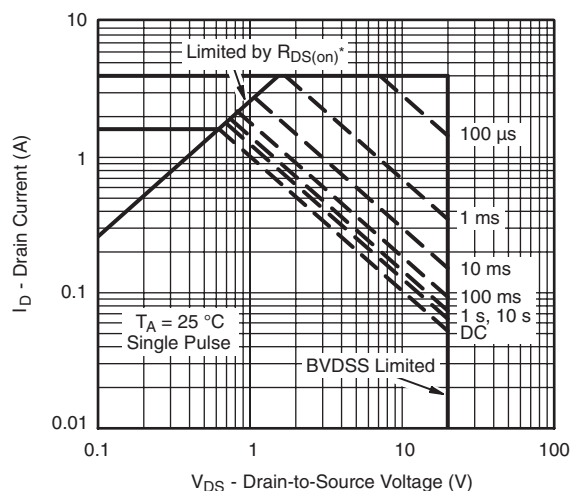
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	V_F	$I_F = 10\text{ mA}$		0.23	0.29	V
		$I_F = 10\text{ mA}$, $T_J = 125\text{ }^{\circ}\text{C}$		0.11	0.14	
		$I_F = 0.1\text{ A}$		0.32	0.38	
Maximum Reverse Leakage Current	I_{rm}	$V_r = 20\text{ V}$		0.005	0.050	mA
		$V_r = 20\text{ V}$, $T_J = 85\text{ }^{\circ}\text{C}$		0.150	1.5	
Junction Capacitance	C_T	$V_r = 15\text{ V}$		16		pF

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.

SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted**Reverse Current vs. Junction Temperature****Forward Voltage Drop****Capacitance**

SCHOTTKY TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

**MOSFET TYPICAL CHARACTERISTICS** $T_A = 25^\circ\text{C}$, unless otherwise noted**Gate Current vs. Gate-to-Source Voltage****Gate Current vs. Gate-to-Source Voltage****Output Characteristics****Transfer Characteristics****On-Resistance vs. Drain Current****Gate Charge**

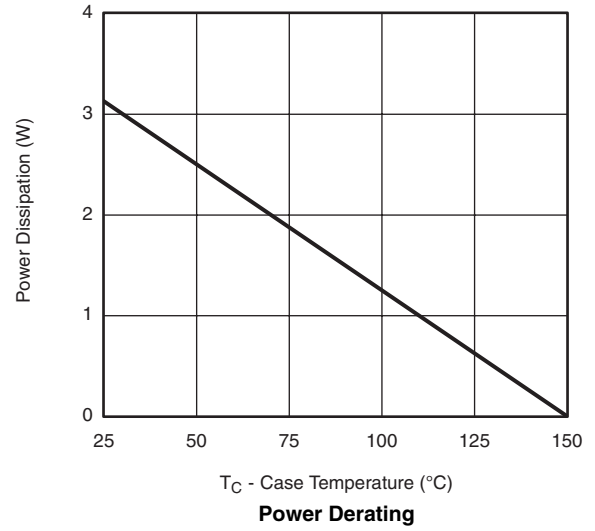
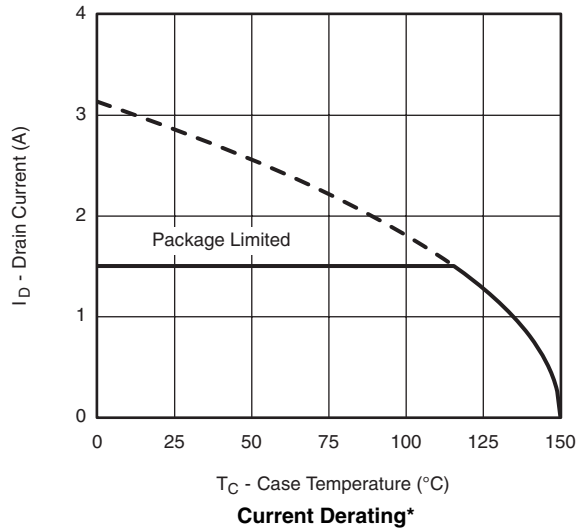
MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

Normalized On-Resistance vs. Junction Temperature

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Single Pulse Power, Junction-to-Ambient

Threshold Voltage


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

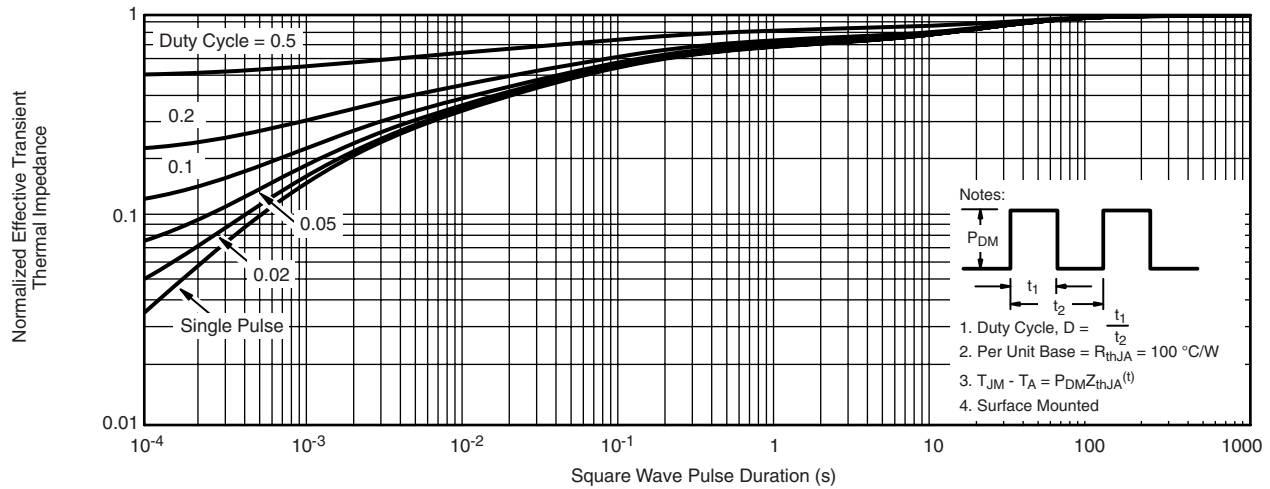
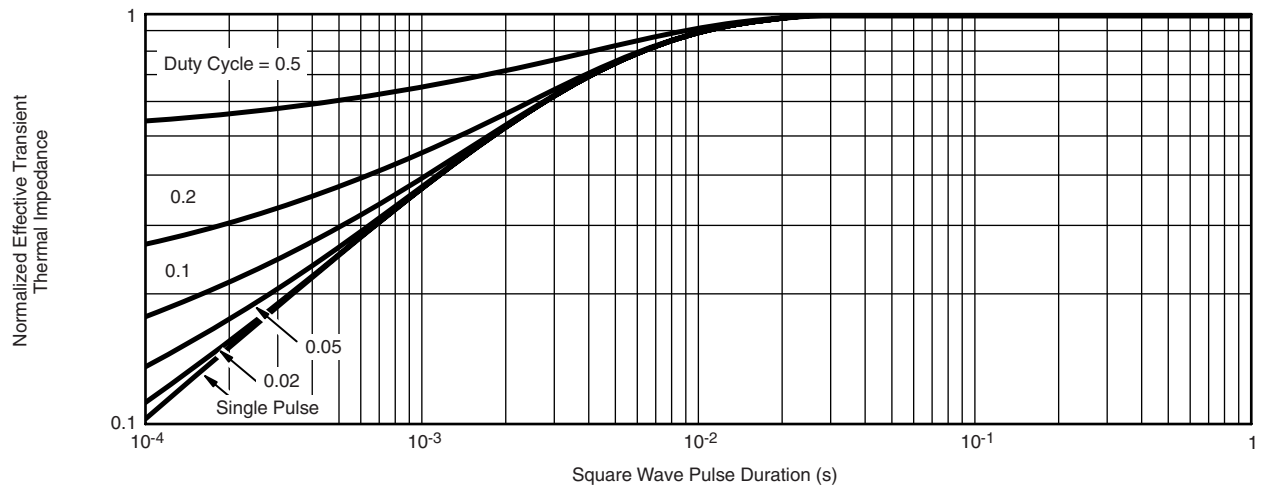
Safe Operating Area, Junction-to-Ambient



MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted



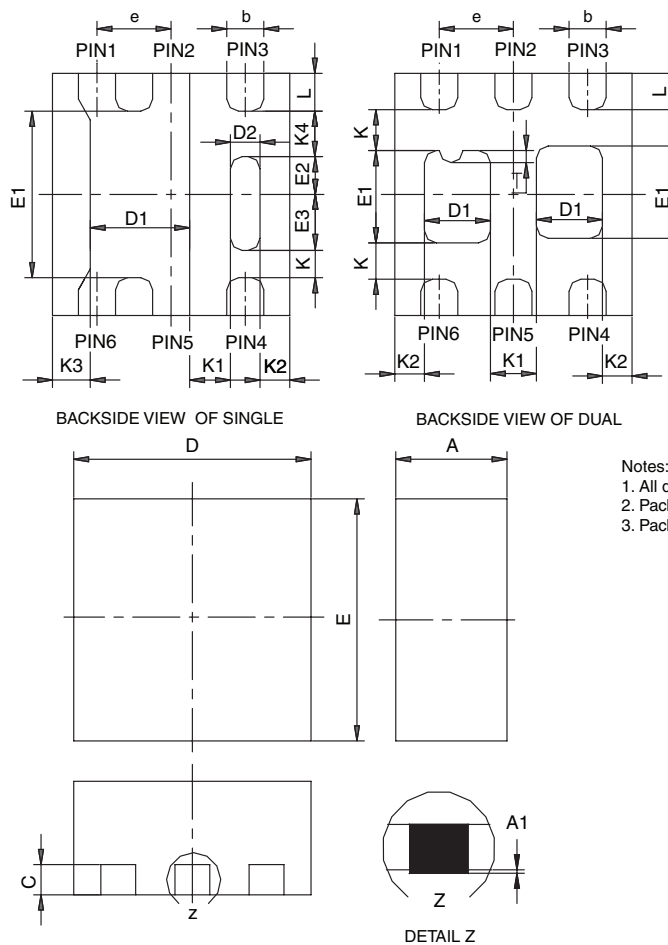
* The power dissipation P_D is based on $T_{J(max)} = 150\text{ }^{\circ}\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls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

MOSFET TYPICAL CHARACTERISTICS $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Case

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PowerPAK® SC75-6L

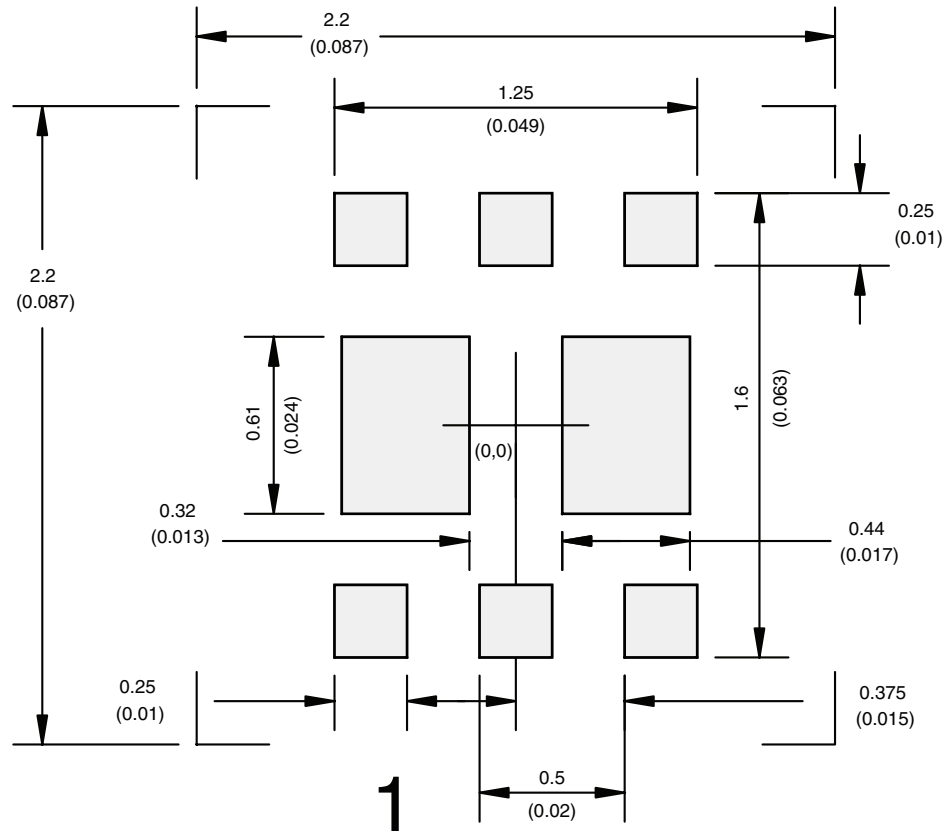


- Notes:
1. All dimensions are in millimeters
 2. Package outline exclusive of mold flash and metal burr
 3. Package outline inclusive of plating

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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