

Automotive P-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® SC-70-6L Single

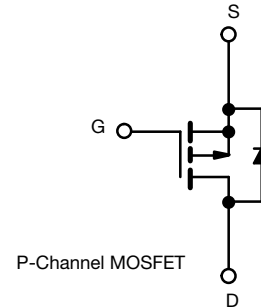
Marking Code: QEXXXX

PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	0.035
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	0.050
I_D (A)	-10
Configuration	Single
Package	PowerPAK SC-70

FEATURES

- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

 AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE


ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	-40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current	$T_C = 25$ °C	I_D	-10	A
	$T_C = 125$ °C		-10	
Continuous source current (diode conduction) ^a		I_S	10	
Pulsed drain current ^b		I_{DM}	-40	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	-15	
Single pulse avalanche energy		E_{AS}	11.25	
Maximum power dissipation ^b	$T_C = 25$ °C	P_D	13.6	W
	$T_C = 125$ °C		4.5	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount ^c	R_{thJA}	90	°C/W
Junction-to-case (drain)		R_{thJF}	11	

Notes

- Package limited
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)



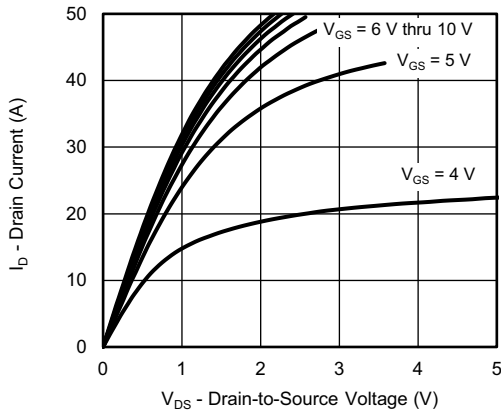
SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0, I_D = -250\text{ }\mu\text{A}$		-40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$		-1.5	-2.0	-2.5	
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = -30\text{ V}$	-	-	-1	μA
		$V_{GS} = 0\text{ V}$	$V_{DS} = -40\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	-50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = -40\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	-150	
On-state drain current ^a	$I_{D(on)}$	$V_{GS} = -10\text{ V}$	$V_{DS} \geq 5\text{ V}$	-8	-	-	A
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$	$I_D = -5\text{ A}$	-	0.027	0.035	Ω
		$V_{GS} = -10\text{ V}$	$I_D = -5\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.067	
		$V_{GS} = -10\text{ V}$	$I_D = -5\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	-	0.080	
		$V_{GS} = -4.5\text{ V}$	$I_D = -4\text{ A}$	-	0.038	0.050	
Forward transconductance ^b	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -7\text{ A}$		-	18	-	S
Dynamic ^b							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$	$V_{DS} = -25\text{ V}, f = 1\text{ MHz}$	-	1450	1815	pF
Output capacitance	C_{oss}			-	105	131	
Reverse transfer capacitance	C_{rss}			-	92	115	
Total gate charge ^c	Q_g	$V_{GS} = -10\text{ V}$	$V_{DS} = -20\text{ V}, I_D = -8\text{ A}$	-	26	33	nC
Gate-source charge ^c	Q_{gs}			-	4.1	-	
Gate-drain charge ^c	Q_{gd}			-	4.8	-	
Gate resistance	R_g	f = 1 MHz		4.4	7.4	11.8	Ω
Turn-on delay time ^c	$t_{d(on)}$	$V_{DD} = -20\text{ V}, R_L = 8\text{ }\Omega$ $I_D \cong -2.5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		-	9	15	ns
Rise time ^c	t_r			-	4	8	
Turn-off delay time ^c	$t_{d(off)}$			-	36	55	
Fall time ^c	t_f			-	10	16	
Source-Drain Diode Ratings and Characteristics							
Pulsed current ^a	I_{SM}			-	-	-40	A
Forward voltage	V_{SD}	$I_F = -5\text{ A}, V_{GS} = 0$		-	-0.84	-1.2	V

Notes

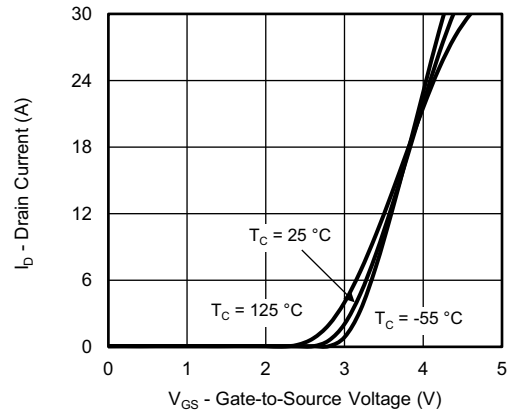
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

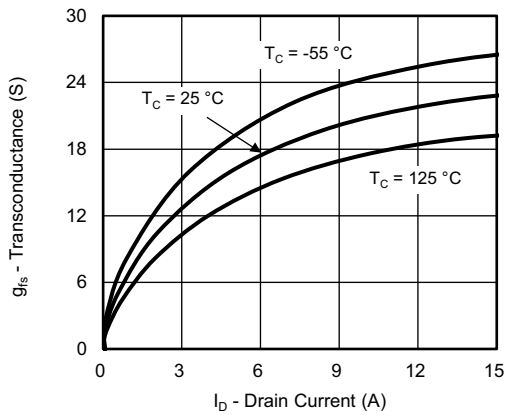
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



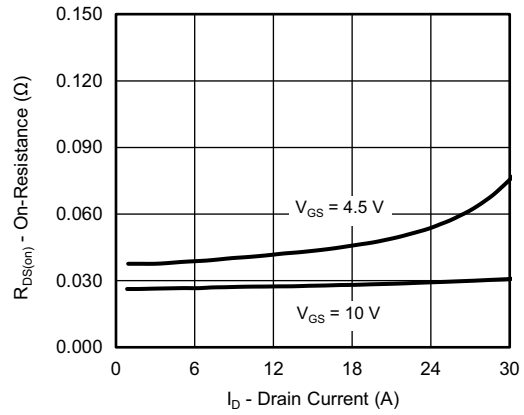
Output Characteristics



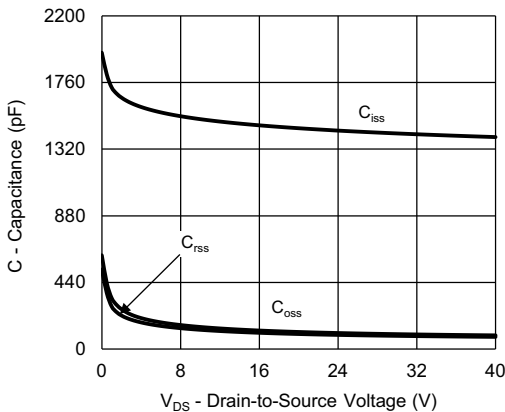
Transfer Characteristics



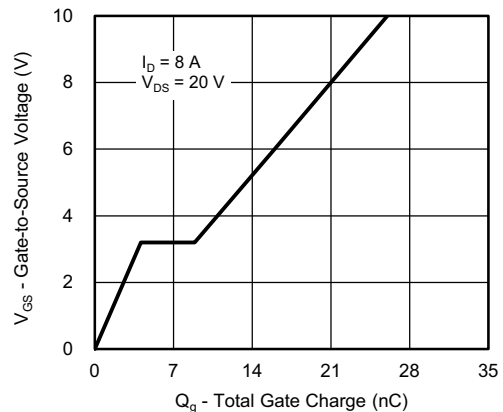
Transconductance



On-Resistance vs. Drain Current

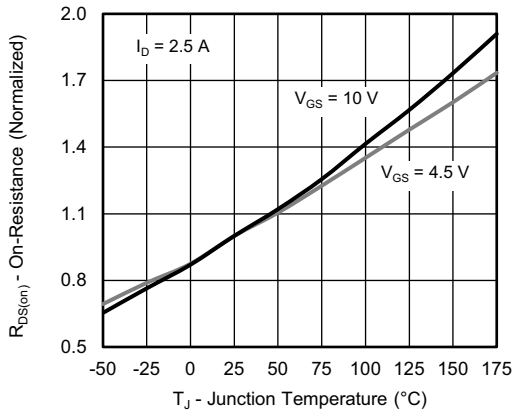


Capacitance

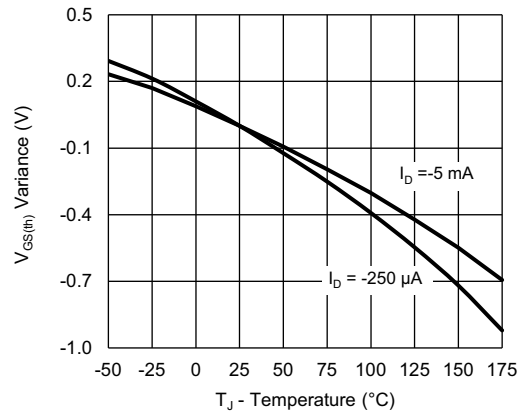


Gate Charge

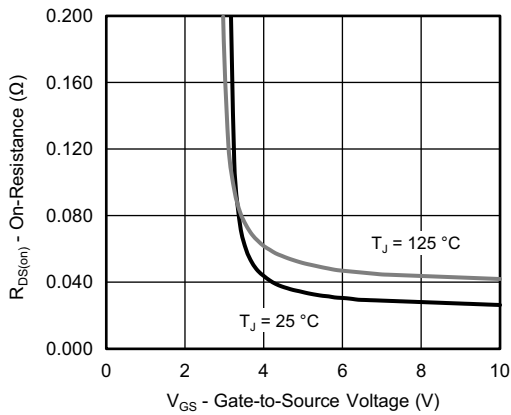
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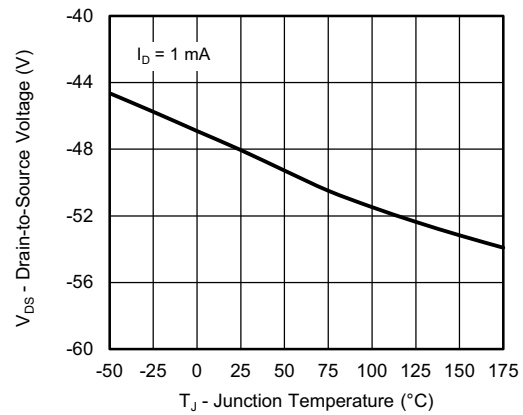
On-Resistance vs. Junction Temperature



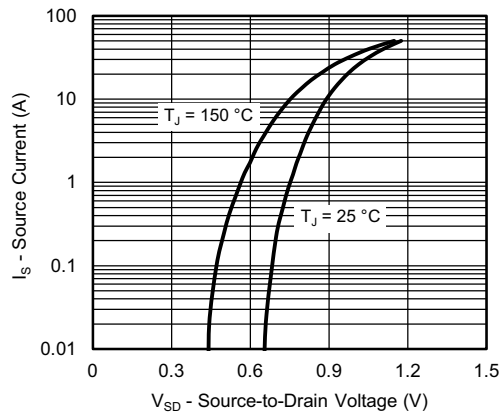
Threshold Voltage



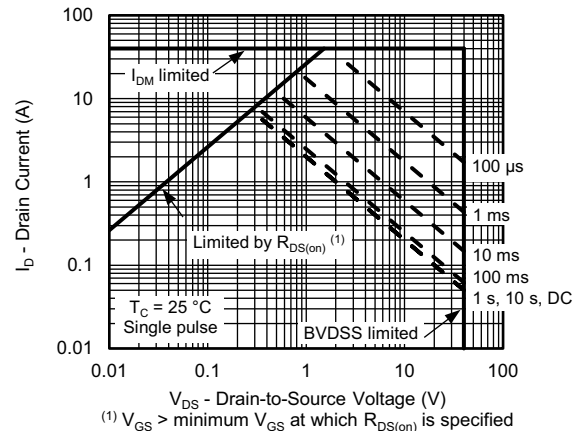
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



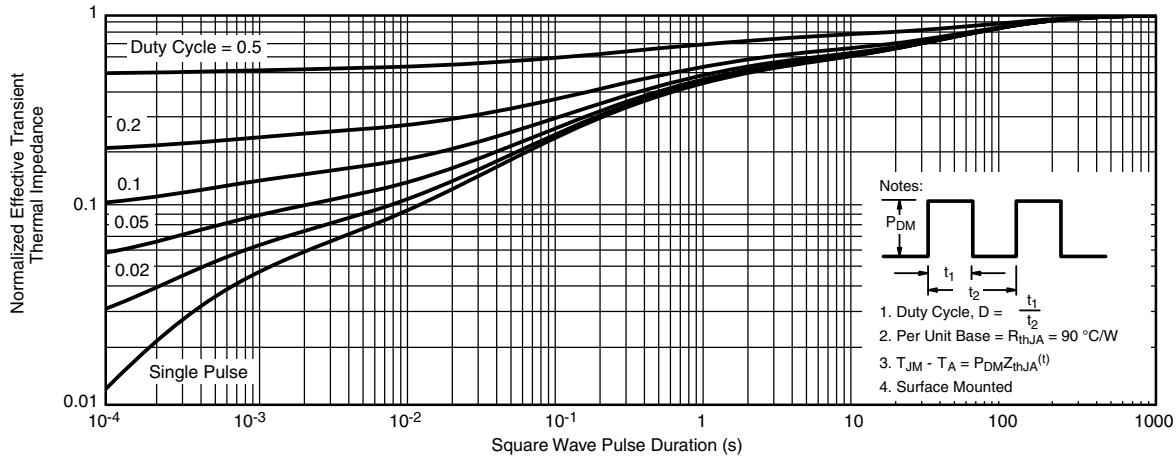
Source-Drain Diode Forward Voltage



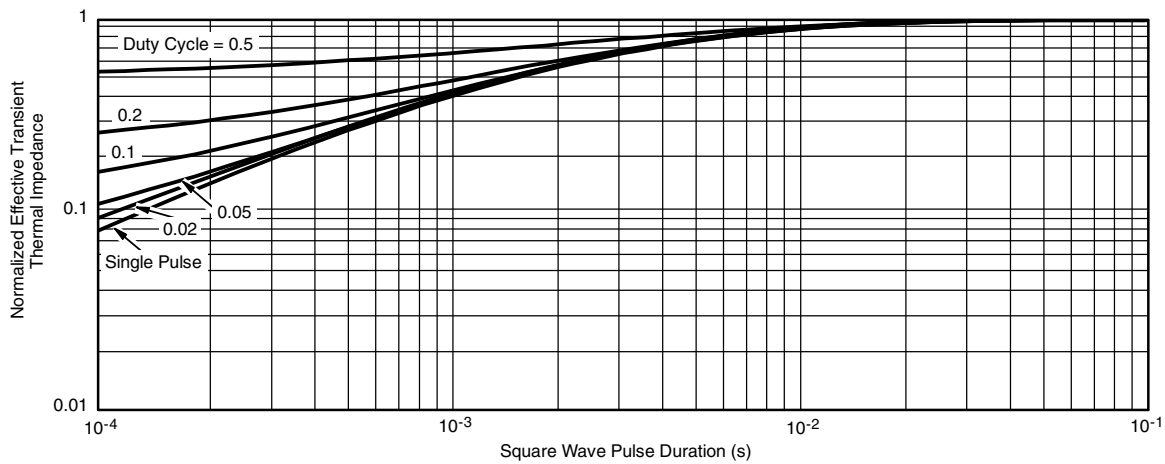
Safe Operating Area



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

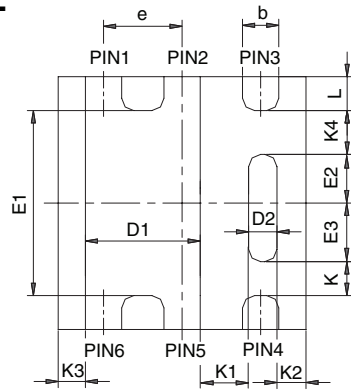
Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
 - Normalized Transient Thermal Impedance Junction-to-Foot (25 °C)
- are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

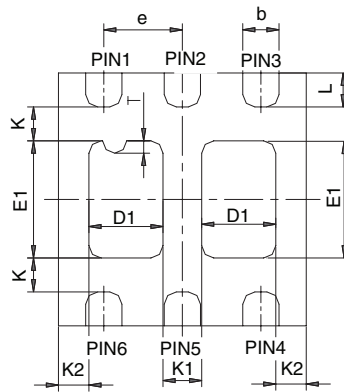
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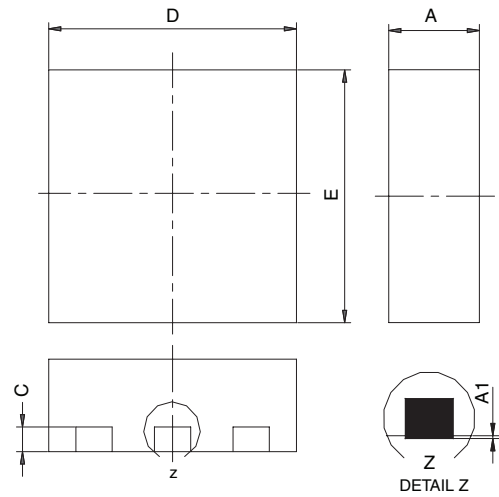
PowerPAK® SC70-6L



BACKSIDE VIEW OF SINGLE



BACKSIDE VIEW OF DUAL



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	0.23	0.30	0.38	0.009	0.012	0.015	0.23	0.30	0.38	0.009	0.012	0.015
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	1.98	2.05	2.15	0.078	0.081	0.085	1.98	2.05	2.15	0.078	0.081	0.085
D1	0.85	0.95	1.05	0.033	0.037	0.041	0.513	0.613	0.713	0.020	0.024	0.028
D2	0.135	0.235	0.335	0.005	0.009	0.013						
E	1.98	2.05	2.15	0.078	0.081	0.085	1.98	2.05	2.15	0.078	0.081	0.085
E1	1.40	1.50	1.60	0.055	0.059	0.063	0.85	0.95	1.05	0.033	0.037	0.041
E2	0.345	0.395	0.445	0.014	0.016	0.018						
E3	0.425	0.475	0.525	0.017	0.019	0.021						
e	0.65 BSC			0.026 BSC			0.65 BSC			0.026 BSC		
K	0.275 TYP			0.011 TYP			0.275 TYP			0.011 TYP		
K1	0.400 TYP			0.016 TYP			0.320 TYP			0.013 TYP		
K2	0.240 TYP			0.009 TYP			0.252 TYP			0.010 TYP		
K3	0.225 TYP			0.009 TYP								
K4	0.355 TYP			0.014 TYP								
L	0.175	0.275	0.375	0.007	0.011	0.015	0.175	0.275	0.375	0.007	0.011	0.015
T							0.05	0.10	0.15	0.002	0.004	0.006

ECN: C-07431 – Rev. C, 06-Aug-07
DWG: 5934

RECOMMENDED PAD LAYOUT FOR PowerPAK® SC70-6L Single



Dimensions in mm/(Inches)

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