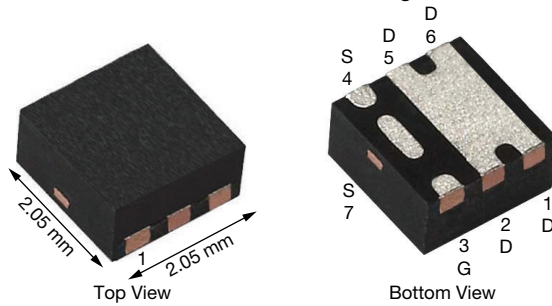


N-Channel 40 V (D-S) MOSFET

PowerPAK® SC-70-6L Single


Marking code: A1

PRODUCT SUMMARY	
V_{DS} (V)	40
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0110
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0150
Q_g typ. (nC)	5.3
I_D (A)	31 ^a
Configuration	Single

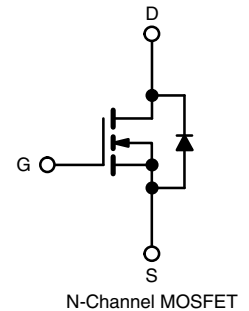
FEATURES

- TrenchFET® Gen IV power MOSFET
- Tuned for the lowest R_{DS} - Q_{oss} FOM
- Thermally enhanced PowerPAK® SC-70 package - Small footprint area
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE

APPLICATIONS

- DC/DC converters
- Synchronous rectification
- Motor drive control
- Battery management and protection
- Load switch



ORDERING INFORMATION	
Package	PowerPAK SC-70
Lead (Pb)-free and halogen-free	SiA4446DJ-T1-GE3

ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V_{DS}	40	V	
Gate-source voltage	V_{GS}	+20 / -16		
Continuous drain current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	31	A
		$T_C = 70$ °C	25	
		$T_A = 25$ °C	13 ^{b, c}	
		$T_A = 70$ °C	10.6 ^{b, c}	
Pulsed drain current ($t = 100$ μ s)	I_{DM}	80		
Continuous source-drain diode current	I_S	$T_C = 25$ °C	17.5	
		$T_A = 25$ °C	3.2 ^{b, c}	
Single-pulse avalanche current	I_{AS}	13		
Single-pulse avalanche energy	E_{AS}	8.5	mJ	
Maximum power dissipation	P_D	$T_C = 25$ °C	19.2	W
		$T_C = 70$ °C	12.3	
		$T_A = 25$ °C	3.5 ^{b, c}	
		$T_A = 70$ °C	2.2 ^{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 ^{b, f}	R_{thJA}	28	36	°C/W	
Maximum junction-to-case (drain)	R_{thJC}	5.3	6.5		

Notes

- $T_C = 25$ °C.
- Surface mounted on 1" x 1" FR4 board
- $t = 5$ s
- See solder profile (www.vishay.com/doc?73257). The PowerPAK SC-70 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 80 °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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	40	-	-	V	
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	$I_D = 10\text{ mA}$	-	24	-	mV/ $^\circ\text{C}$	
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	-5	-		
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1.1	-	2.4	V	
Gate-source leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = +20\text{ V} / -16\text{ V}$	-	-	± 100	nA	
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA	
		$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^\circ\text{C}$	-	-	10		
Drain-source on-state resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	-	0.0086	0.0110	Ω	
		$V_{GS} = 4.5\text{ V}$, $I_D = 5\text{ A}$	-	0.0110	0.0150		
Forward transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}$, $I_D = 20\text{ A}$	-	51	-	S	
Dynamic ^b							
Input capacitance	C_{iss}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	-	915	-	pF	
Output capacitance	C_{oss}		-	180	-		
Reverse transfer capacitance	C_{rss}		-	28	-		
C_{rss}/C_{iss} ratio			-	0.031	0.064		
Total gate charge	Q_g	$V_{DS} = 20\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	-	12.6	19	nC	
			$V_{DS} = 20\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 10\text{ A}$	-	5.9		8
				-	3		-
Gate-source charge	Q_{gs}		-	1.2	-		
Gate-drain charge	Q_{gd}		-	6	-		
Output charge	Q_{oss}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$	-	6	-		
Gate resistance	R_g	$f = 1\text{ MHz}$	0.5	2.5	5.0	Ω	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}$, $R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$	-	14	30	ns	
Rise time	t_r		-	54	110		
Turn-off delay time	$t_{d(off)}$		-	14	30		
Fall time	t_f		-	6	15		
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}$, $R_L = 2\text{ }\Omega$ $I_D \cong 10\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$	-	9	20		
Rise time	t_r		-	5	10		
Turn-off delay time	$t_{d(off)}$		-	16	35		
Fall time	t_f		-	5	10		
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	17.5	A	
Pulse diode forward current ($t = 100\text{ }\mu\text{s}$)	I_{SM}		-	-	60		
Body diode voltage	V_{SD}	$I_S = 5\text{ A}$, $V_{GS} = 0\text{ V}$	-	0.85	1.1	V	
Body diode reverse recovery time	t_{rr}	$I_F = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$	-	15	30	ns	
Body diode reverse recovery charge	Q_{rr}		-	3.1	10	nC	
Reverse recovery fall time	t_a		-	8	-	ns	
Reverse recovery rise time	t_b		-	7	-		

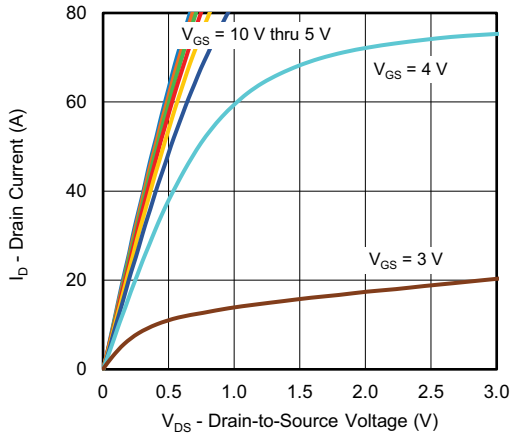
Notes

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

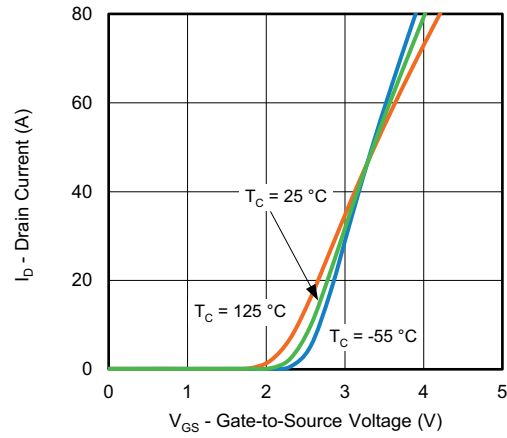
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



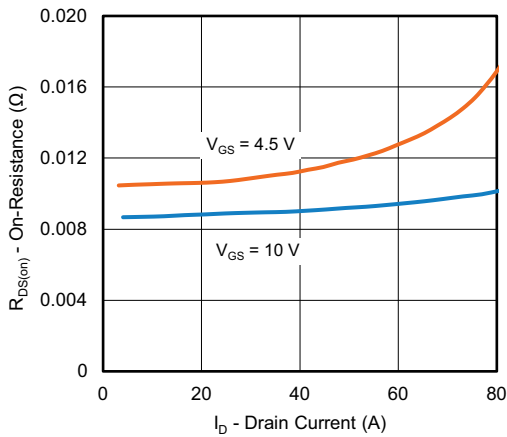
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



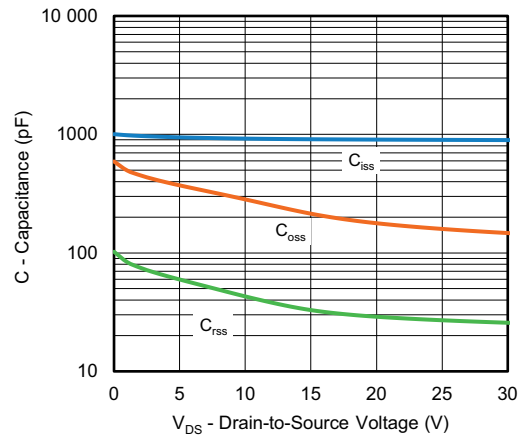
Output Characteristics



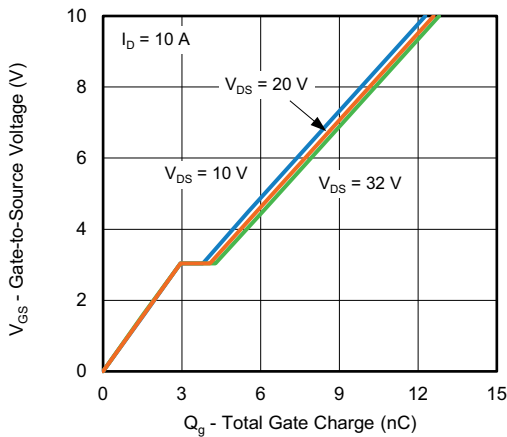
Transfer Characteristics



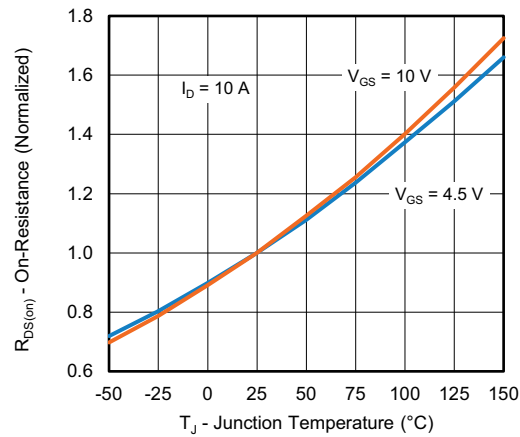
On-Resistance vs. Drain Current



Capacitance



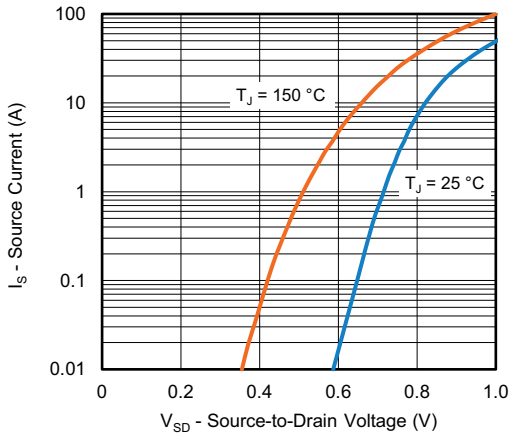
Gate Charge



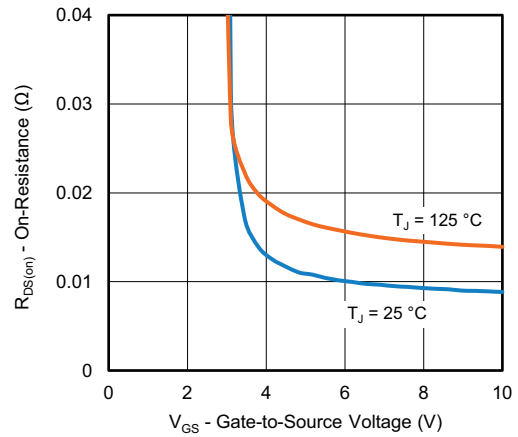
On-Resistance vs. Junction Temperature



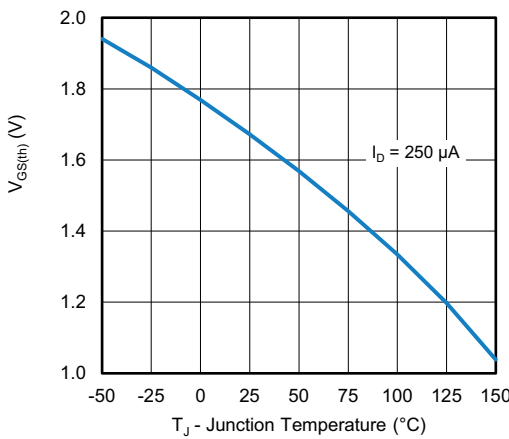
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



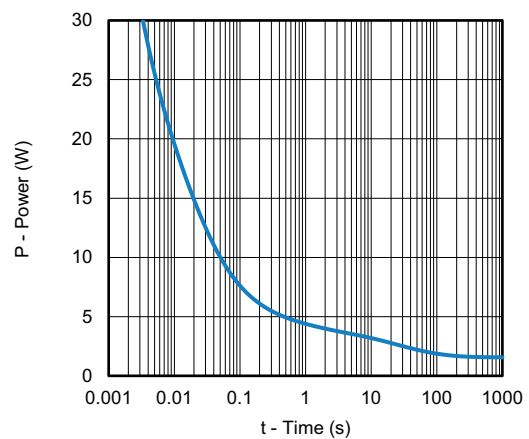
Source-Drain Diode Forward Voltage



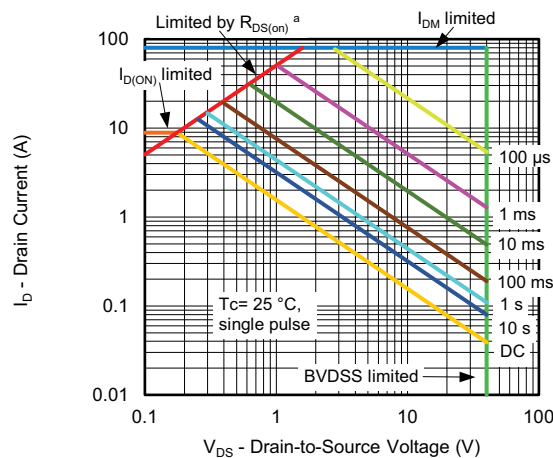
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



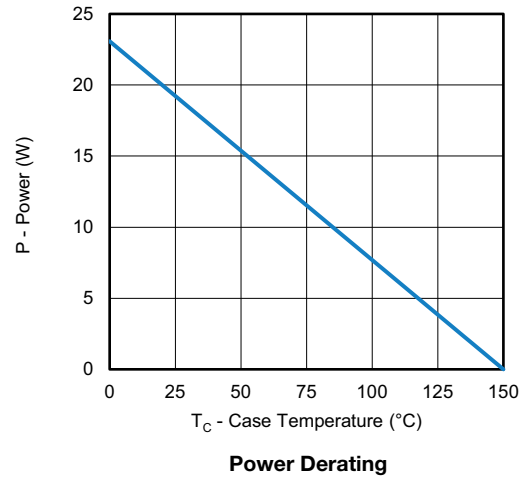
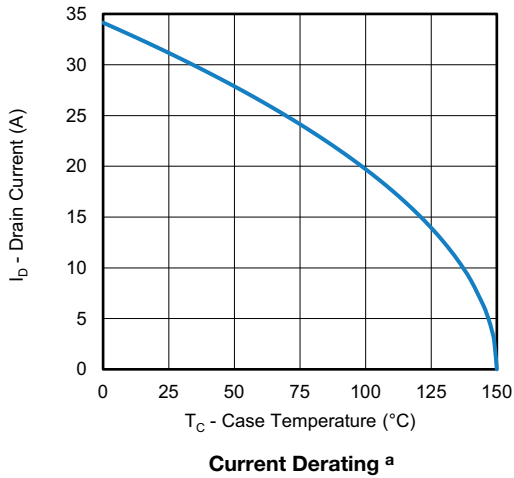
Single Pulse Power, Junction-to-Ambient



Safe Operating Area, Junction-to-Ambient



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

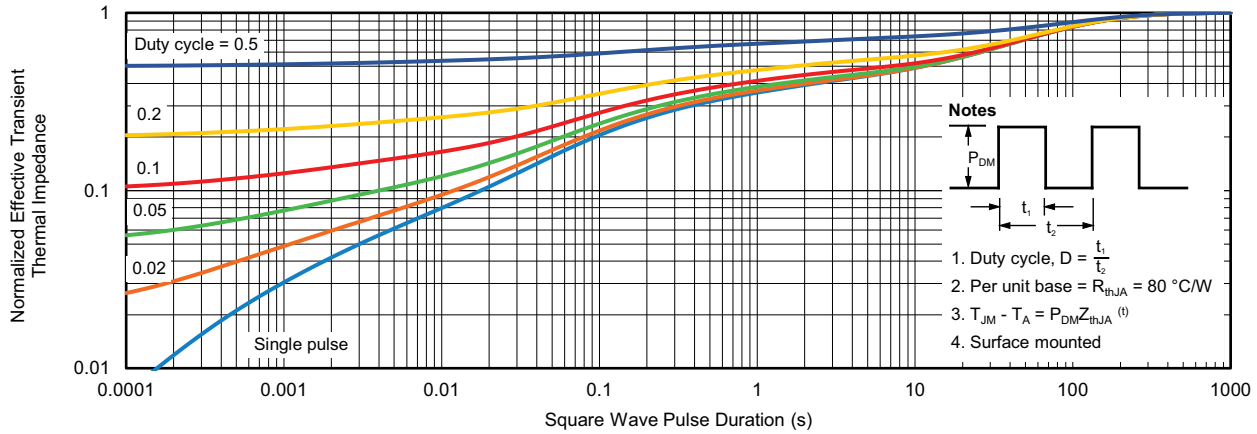


Note

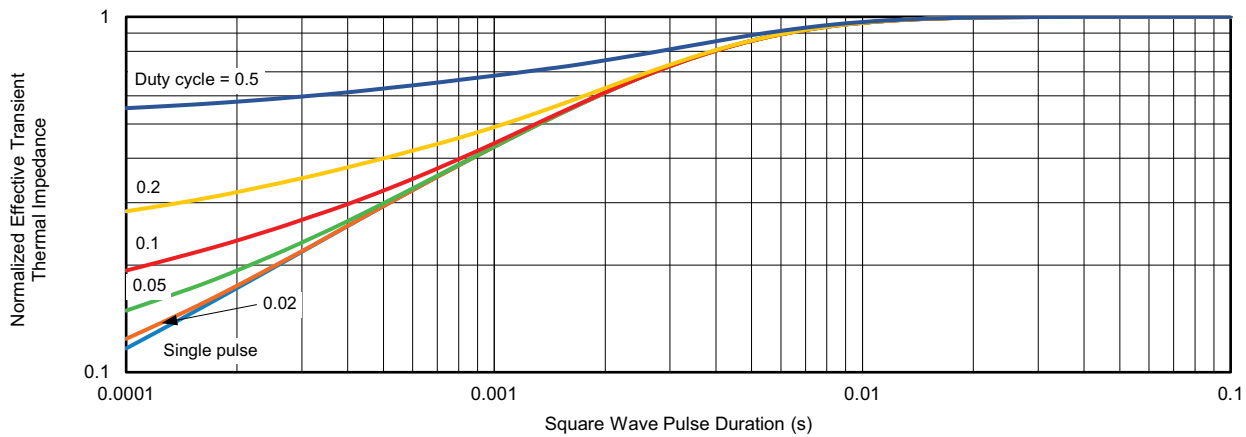
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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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