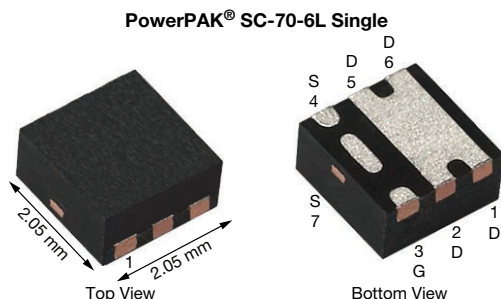


N-Channel 20 V (D-S) MOSFET



Marking code: A6

PRODUCT SUMMARY	
V_{DS} (V)	20
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V	0.0047
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 4.5$ V	0.0059
$R_{DS(on)}$ max. (Ω) at $V_{GS} = 2.5$ V	0.0162
Q_g typ. (nC)	10.2
I_D (A) ^a	52
Configuration	Single

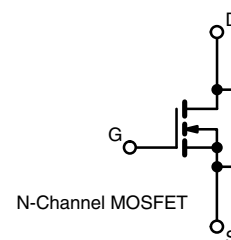
FEATURES

- TrenchFET® Gen IV power MOSFET
- Very low $R_{DS(on)}$ and excellent $R_{DS} \times Q_g$ Figure-of-Merit (FOM) in an ultra compact package footprint
- Compact and thermally enhanced package
- Provides exceptional versatility for power management design
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Synchronous rectification
- Half-bridge power stage
- DC/DC converters
- Battery management
- Load switch



N-Channel MOSFET

ORDERING INFORMATION	
Package	PowerPAK SC-70
Lead (Pb)-free and halogen-free	SiAA02DJ-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}	+12 / -8		
Continuous drain current ($T_J = 150$ °C)	$T_C = 25$ °C	52	A	
	$T_C = 70$ °C	42		
	$T_A = 25$ °C	22 ^{b, c}		
	$T_A = 70$ °C	18 ^{b, c}		
Pulsed drain current	I_{DM}	100		
Continuous source-drain diode current	$T_C = 25$ °C	16		
	$T_A = 25$ °C	2.9 ^{b, c}		
Maximum power dissipation	$T_C = 25$ °C	19	W	
	$T_C = 70$ °C	12		
	$T_A = 25$ °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

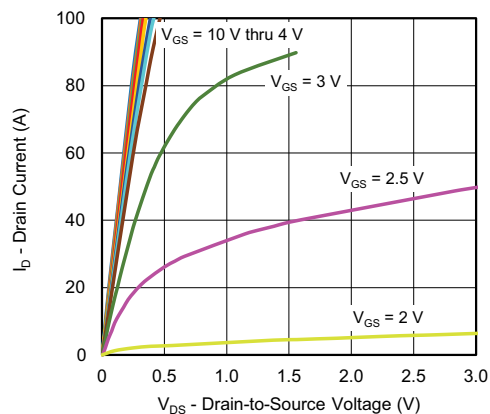
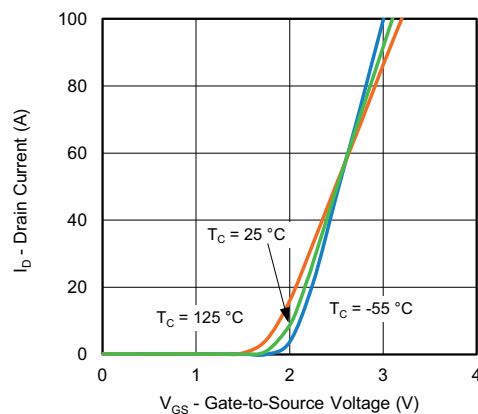
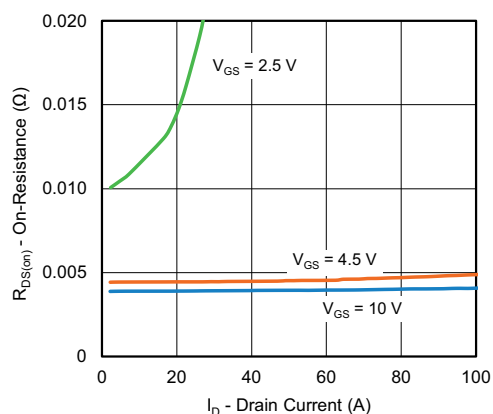
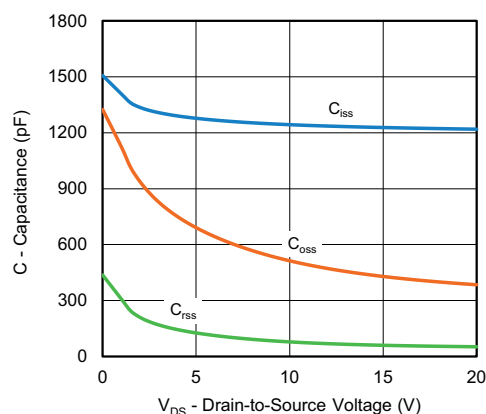
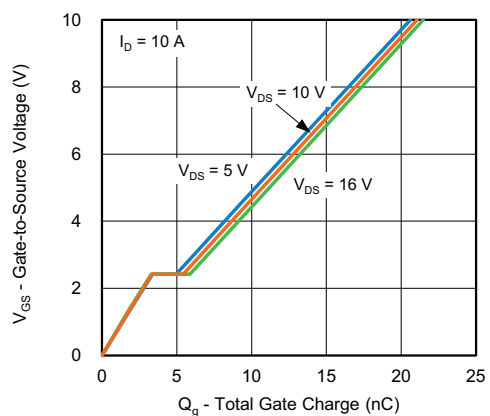
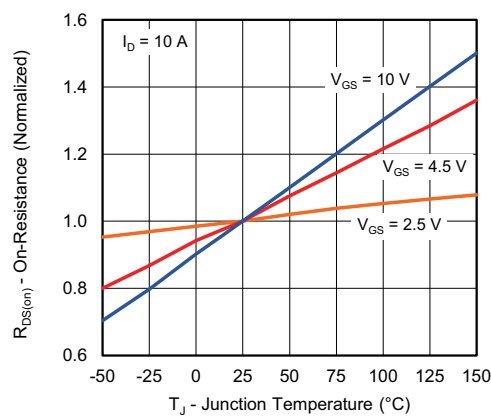


SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	20	-	-	V
V _{DS} temperature coefficient	ΔV _{DS} /T _J	I _D = 250 μA	-	14	-	mV/°C
V _{GS(th)} temperature coefficient	ΔV _{GS(th)} /T _J		-	3.4	-	
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.6	-	1.6	V
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = +12 V / -8 V	-	-	± 100	nA
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} = 10 V	10	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 8 A	-	0.0035	0.0047	Ω
		V _{GS} = 4.5 V, I _D = 5 A	-	0.0044	0.0059	
		V _{GS} = 2.5 V, I _D = 3 A	-	0.0110	0.0162	
Forward transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 20 A	-	80	-	S
Dynamic ^b						
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	-	1250	-	pF
Output capacitance	C _{oss}		-	505	-	
Reverse transfer capacitance	C _{rss}		-	75	-	
Total gate charge	Q _g	V _{DS} = 10 V, V _{GS} = 10 V, I _D = 10 A	-	22	33	nC
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 10 A	-	10.2	16	
Gate-source charge	Q _{gs}		-	3.2	-	
Gate-drain charge	Q _{gd}		-	2.6	-	
Gate resistance	R _g	f = 1 MHz	0.2	1.2	2.4	Ω
Turn-on delay time	t _{d(on)}	V _{DD} = 10 V, R _L = 1 Ω I _D ≅ 5 A, V _{GEN} = 4.5 V, R _g = 1 Ω	-	15	30	ns
Rise time	t _r		-	24	50	
Turn-off delay time	t _{d(off)}		-	22	45	
Fall time	t _f		-	7	15	
Turn-on delay time	t _{d(on)}	V _{DD} = 10 V, R _L = 1 Ω I _D ≅ 5 A, V _{GEN} = 10 V, R _g = 1 Ω	-	8	20	
Rise time	t _r		-	5	10	
Turn-off delay time	t _{d(off)}		-	21	40	
Fall time	t _f		-	5	10	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I _S	T _C = 25 °C	-	-	16	A
Pulse diode forward current	I _{SM}		-	-	100	
Body diode voltage	V _{SD}	I _S = 5 A, V _{GS} = 0 V	-	0.76	1.2	V
Body diode reverse recovery time	t _{rr}	I _F = 5 A, di/dt = 100 A/μs, T _J = 25 °C	-	20	40	ns
Body diode reverse recovery charge	Q _{rr}		-	7	15	nC
Reverse recovery fall time	t _a		-	10	-	ns
Reverse recovery rise time	t _b		-	10	-	

Notes

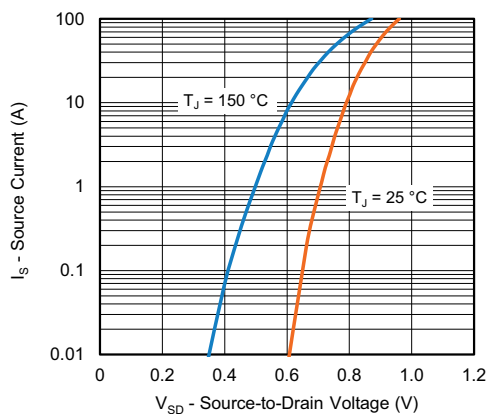
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
b. Guaranteed by design, not subject to production testing

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.

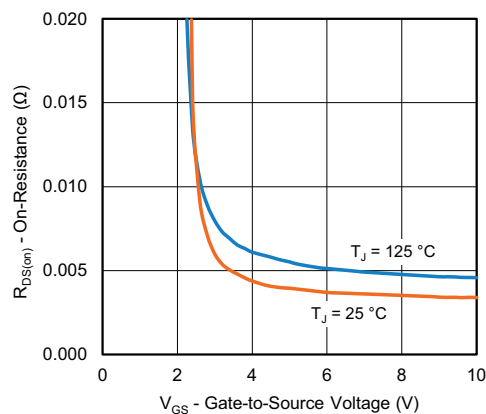
TYPICAL CHARACTERISTICS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature



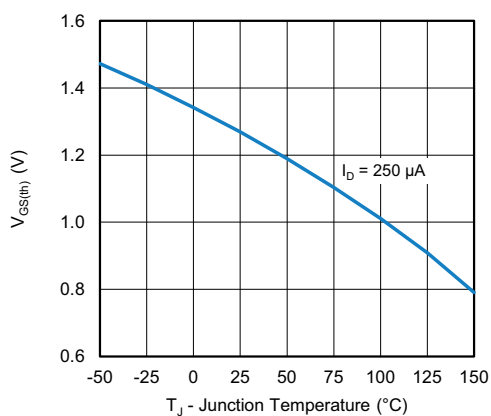
TYPICAL CHARACTERISTICS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



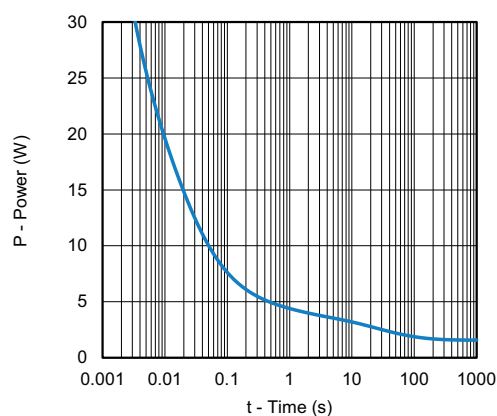
Source-Drain Diode Forward Voltage



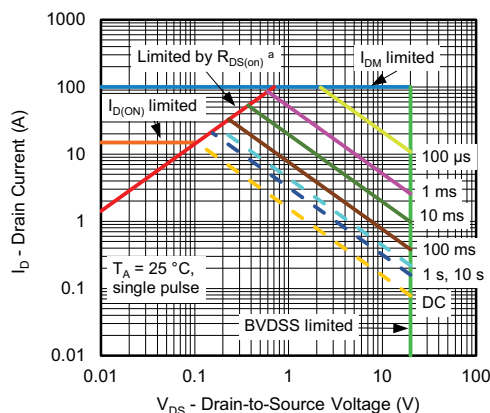
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power (Junction-to-Ambient)



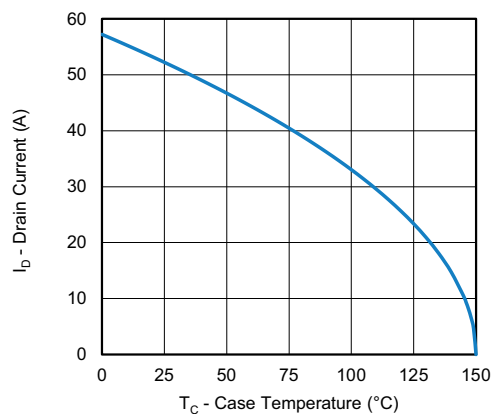
Safe Operating Area, Junction-to-Ambient

Note

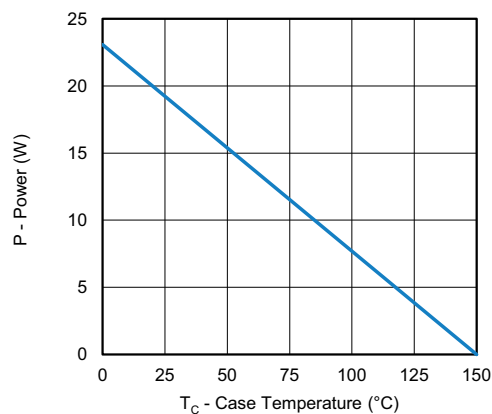
a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



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



Current Derating ^a



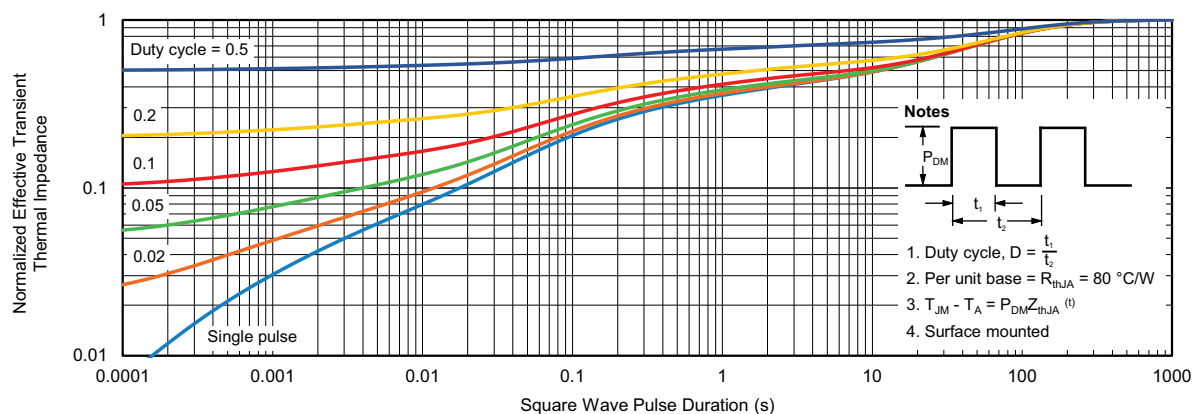
Power Derating

Note

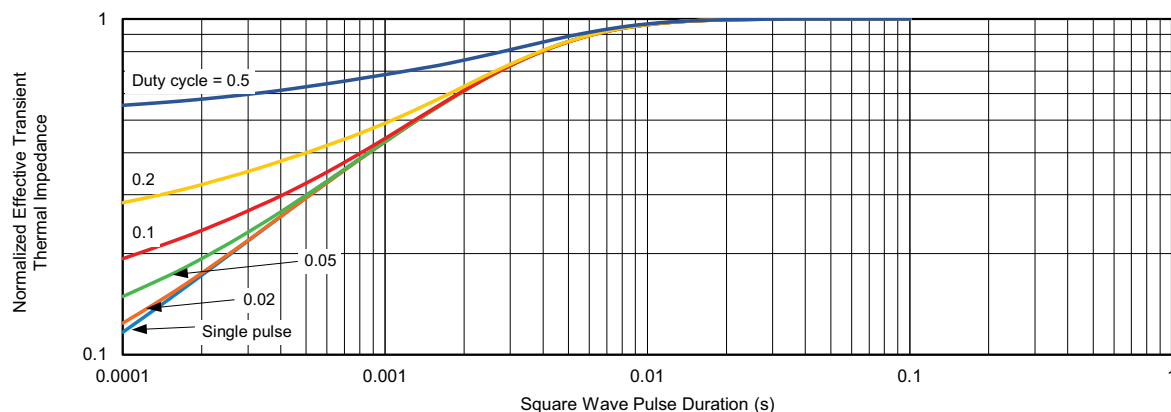
- a. The power dissipation P_D is based on T_J max. = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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