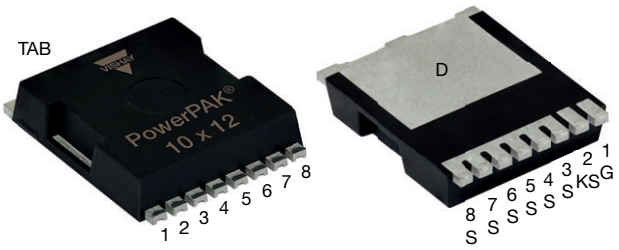
N-Channel 60 V (D-S) MOSFET

PowerPAK® 10 x 12



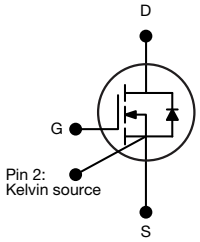
FEATURES

- TrenchFET® Gen IV power MOSFET
- Leadership $R_{DS(on)}$ minimizes power loss from conduction
- 100 % R_g and UIS tested
- Kelvin connection for reduced gate noise
- Enhance power dissipation and lower R_{thJC}
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Synchronous rectification
- Automation
- OR-ing and hot swap switch
- Power supplies
- Motor drive control
- Battery management



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ max. (Ω) at V_{GS} = 10 V	0.0012
$R_{DS(on)}$ max. (Ω) at V_{GS} = 7.5 V	0.0014
Q_g typ. (nC)	162
I_D (A) [a]	461
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK® 10 x 12
Lead (Pb)-free and halogen-free	SiJK4610-T1-GE3

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	60	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current (T_J = 175 °C)	T_C = 25 °C	I_D	461	A
	T_C = 100 °C		291	
	T_A = 25 °C		77 [b, c]	
	T_A = 100 °C		49 [b, c]	
Pulsed drain current (V_{GS} = 10 V, t = 100 µs)		I_{DM}	700	
Continuous source-drain diode current	T_C = 25 °C	I_S	406	
	T_A = 25 °C		11.4 [b, c]	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	90	
Single pulse avalanche energy		E_{AS}	405	mJ
Maximum power dissipation	T_C = 25 °C	P_D	446	W
	T_C = 100 °C		179	
	T_A = 25 °C		12.5 [b, c]	
	T_A = 100 °C		5 [b, c]	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient [b]	t ≤ 10 s	R_{thJA}	7.8	10	°C/W
Maximum junction-to-case (drain)	Steady state	R_{thJC}	0.21	0.28	

Notes

a. T_C = 25 °C
b. Surface mounted on 1" x 1" FR4 board
c. t = 10 s
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK 10 x 12 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 42 °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	60	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	I_D = 10 mA	-	32	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	-	-8.4	-	
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2	-	3.5	V
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 55 °C	-	-	10	
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A	-	0.00088	0.0012	Ω
		V_{GS} = 7.5 V, I_D = 20 A	-	0.00094	0.0014	
Forward transconductance [a]	g_{fs}	V_{DS} = 25 V, I_D = 30 A	-	105	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz	-	15 550	-	pF
Output capacitance	C_{oss}		-	3540	-	
Reverse transfer capacitance	C_{rss}		-	101	-	
Total gate charge	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 20 A	-	214	321	nC
Gate-source charge	Q_{gs}		-	66	-	
Gate-drain charge	Q_{gd}		-	28	-	
Total gate charge	Q_g	V_{DS} = 30 V, V_{GS} = 7.5 V, I_D = 20 A	-	162	243	
Output charge	Q_{oss}	V_{DS} = 30 V, V_{GS} = 0 V	-	220	-	
Gate resistance	R_g	f = 1 MHz	0.2	1.0	2.0	Ω
Turn-on delay time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 3 Ω, $I_D \cong$ 10 A, V_{GEN} = 10 V, R_g = 1 Ω	-	30	60	ns
Rise time	t_r		-	20	40	
Turn-off delay time	$t_{d(off)}$		-	77	160	
Fall time	t_f		-	27	60	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 30 V, R_L = 3 Ω, $I_D \cong$ 10 A, V_{GEN} = 7.5 V, R_g = 1 Ω	-	37	75	ns
Rise time	t_r		-	24	50	
Turn-off delay time	$t_{d(off)}$		-	69	140	
Fall time	t_f		-	30	60	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	T_C = 25 °C	-	-	406	A
Pulse diode forward current	I_{SM}		-	-	700	
Body diode voltage	V_{SD}	I_S = 10 A, V_{GS} = 0 V	-	0.7	1.1	V
Body diode reverse recovery time	t_{rr}	I_F = 10 A, di/dt = 100 A/µs, T_J = 25 °C	-	110	220	ns
Body diode reverse recovery charge	Q_{rr}		-	260	520	nC
Reverse recovery fall time	t_a		-	56	-	ns
Reverse recovery rise time	t_b		-	54	-	

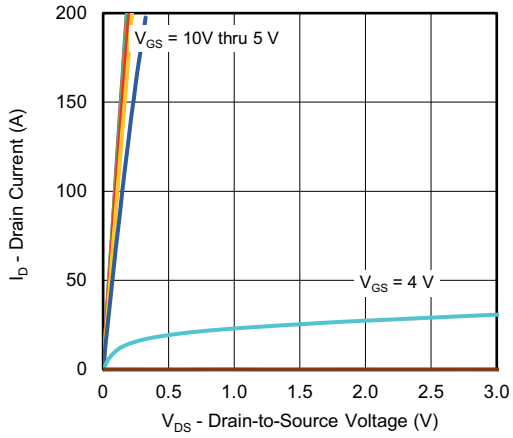
Notes

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

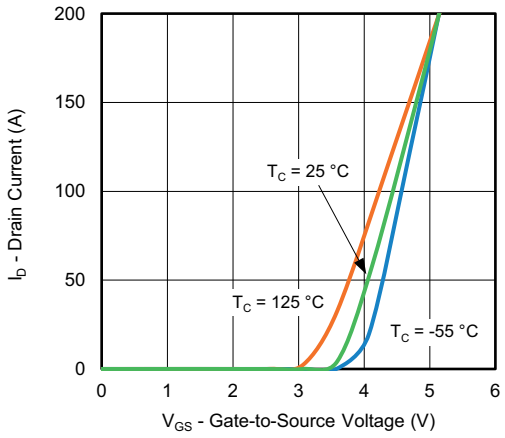
b. Guaranteed by design, not subject to production testing

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.

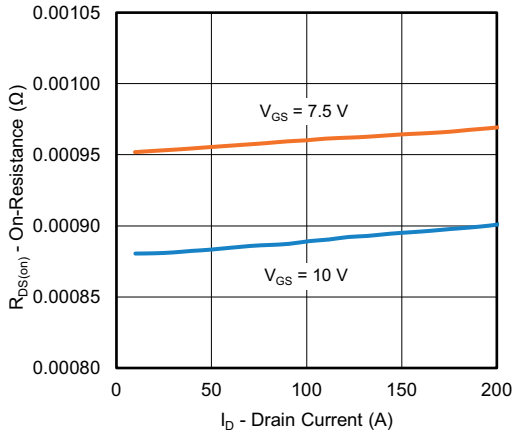
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



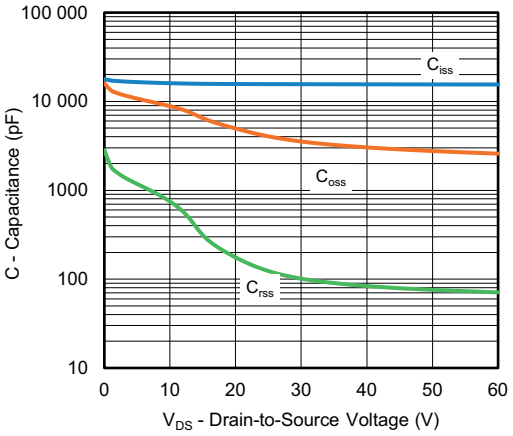
Output Characteristics



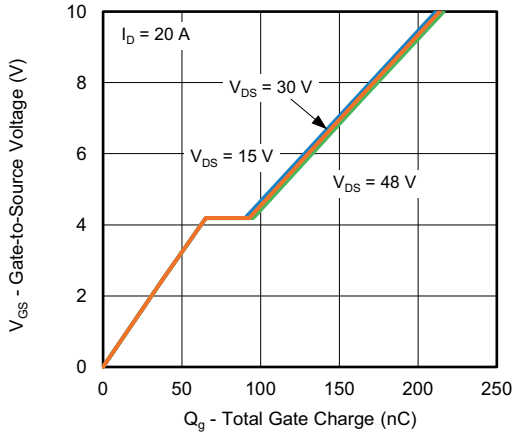
Transfer Characteristics



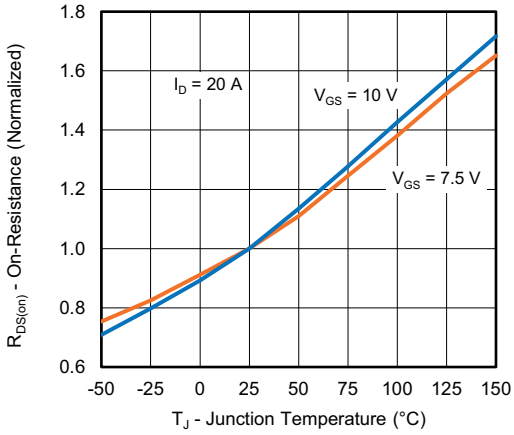
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

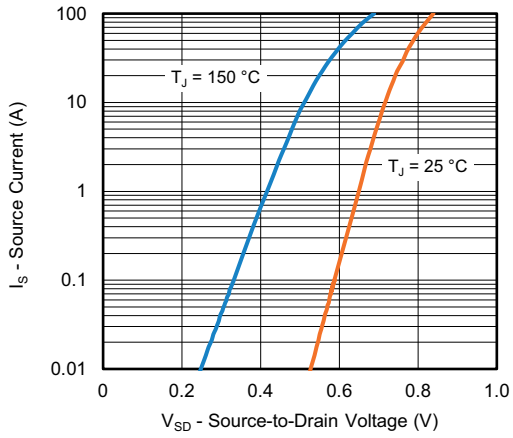


Gate Charge

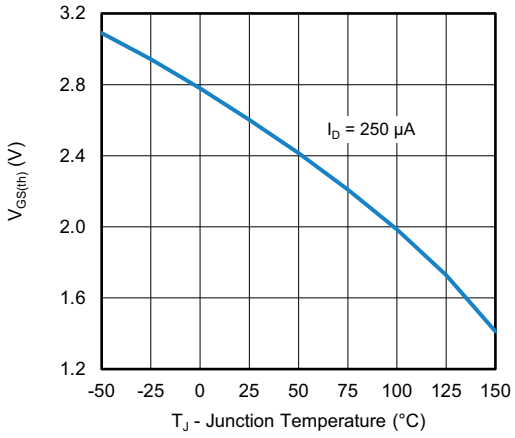


On-Resistance vs. Junction Temperature

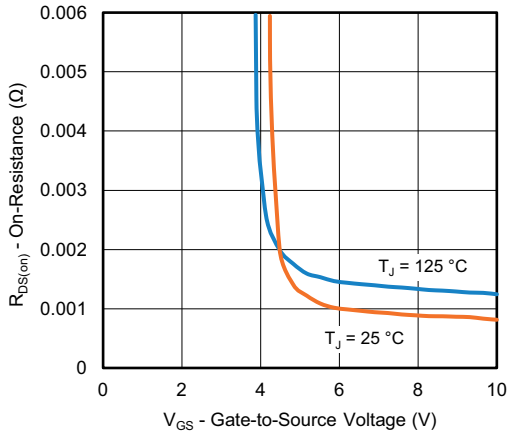
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



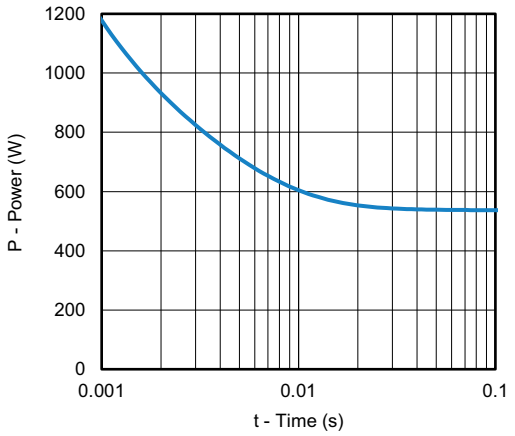
Source-Drain Diode Forward Voltage



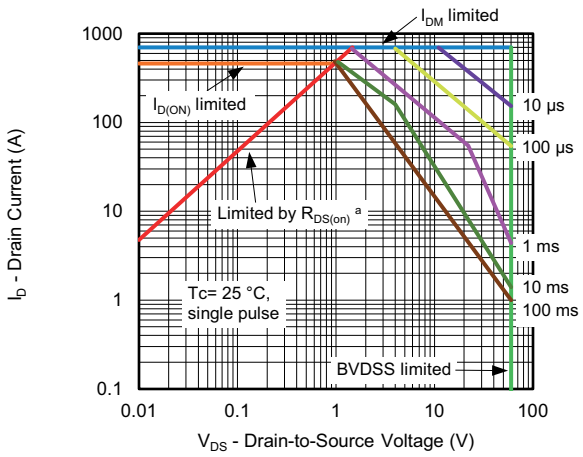
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Case

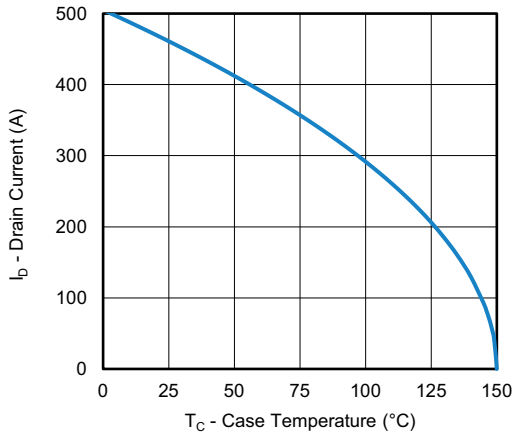


Safe Operating Area, Junction-to-Ambient

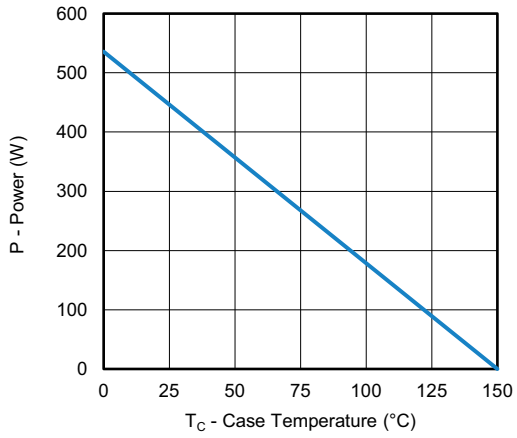
Note

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

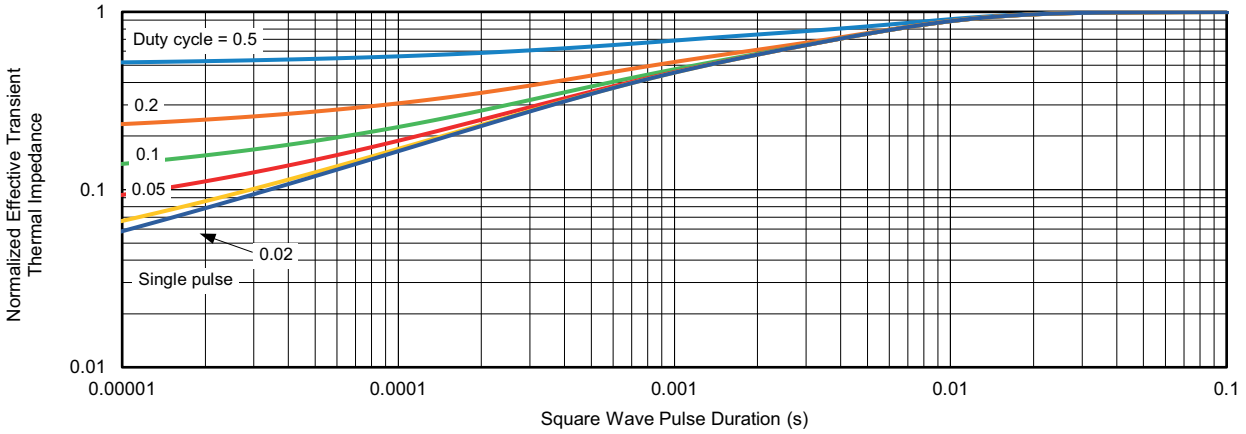
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating [a]



Power, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Case

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

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