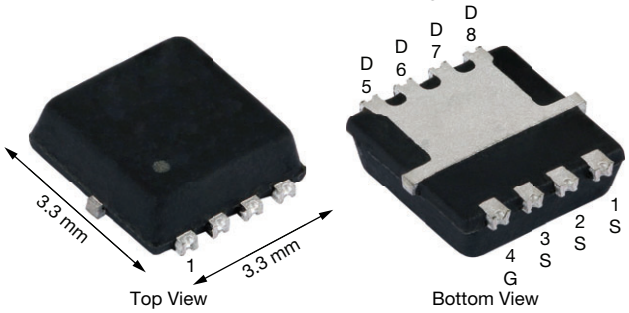
Automotive N-Channel 60 V (D-S) 175 °C MOSFET

PowerPAK® 1212-8W Single



Top View

Bottom View

Marking code: Q056

FEATURES

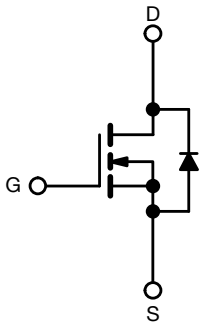
- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

HALOGEN FREE



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0300
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.0410
I_D (A)	8
Configuration	Single
Package	PowerPAK 1212-8W

ORDERING INFORMATION	
Package	PowerPAK 1212-8W
Lead (Pb)-free and halogen-free	SQS460CENW

ABSOLUTE MAXIMUM RATINGS (T_C = 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 [a]	T_C = 25 °C	I_D	8	A
	T_C = 125 °C		8	
Continuous source current (diode conduction) [a]		I_S	8	
Pulsed drain current [b]		I_{DM}	32	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	13.5	
Single pulse avalanche energy		E_{AS}	9.11	mJ
Maximum power dissipation	T_C = 25 °C	P_D	27	W
	T_C = 125 °C		9	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [d, e]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [c]	R_{thJA}	81	°C/W
Junction-to-case (drain)		R_{thJC}	5.5	

Notes

a. Package limited
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
c. When mounted on 1" square PCB (FR4 material)
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK1212-8W package may have visible exposed Cu at the end of the lead terminals due to the singulation process. However, the leads also have plated indents on the top and bottom surfaces that promote the formation of a solder filet compatible with automated optical inspection methods
e. Rework conditions: manual soldering with a soldering iron is not recommended

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SPECIFICATIONS (T_C = 25 °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 µA		60	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		1.5	2.0	2.5	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 60 V	-	-	1	µA
		V_{GS} = 0 V	V_{DS} = 60 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 60 V, T_J = 175 °C	-	-	150	
On-state drain current [a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} ≥ 5 V	20	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 5.3 A	-	0.0240	0.0300	Ω
		V_{GS} = 10 V	I_D = 5.3 A, T_J = 125 °C	-	-	0.0480	
		V_{GS} = 10 V	I_D = 5.3 A, T_J = 175 °C	-	-	0.0590	
		V_{GS} = 4.5 V	I_D = 4 A	-	0.0330	0.0410	
Forward transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 5.3 A		-	19	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	493	580	pF
Output capacitance	C_{oss}			-	226	290	
Reverse transfer capacitance	C_{rss}			-	13	20	
Total gate charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 30 V, I_D = 4.5 A	-	7.2	11	nC
Gate-source charge [c]	Q_{gs}			-	2.15	-	
Gate-drain charge [c]	Q_{gd}			-	0.55	-	
Gate resistance	R_g	f = 1 MHz		0.63	1.27	1.90	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 30 Ω I_D ≅ 1 A, V_{GEN} = 10 V, R_g = 1 Ω		-	9	14	ns
Rise time [c]	t_r			-	3	5	
Turn-off delay time [c]	$t_{d(off)}$			-	16	24	
Fall time [c]	t_f			-	15	23	
Source-Drain Diode Ratings and Characteristic [b]							
Pulsed current [a]	I_{SM}			-	-	32	A
Forward voltage	V_{SD}	I_F = 6 A, V_{GS} = 0 V		-	0.845	1.1	V
Body diode reverse recovery time	t_{rr}	I_F = 5 A, di/dt = 100 A/µs		-	15	30	ns
Body diode reverse recovery charge	Q_{rr}			-	8	16	nC
Reverse recovery fall time	t_a			-	9	-	ns
Reverse recovery rise time	t_b			-	6	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1	-	A

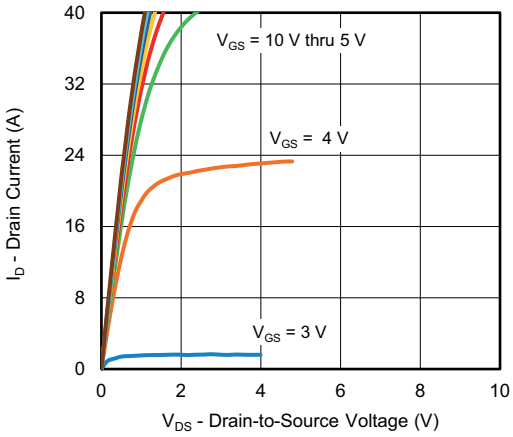
Notes

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

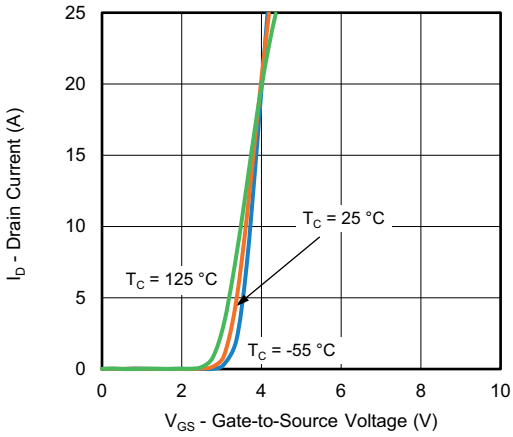
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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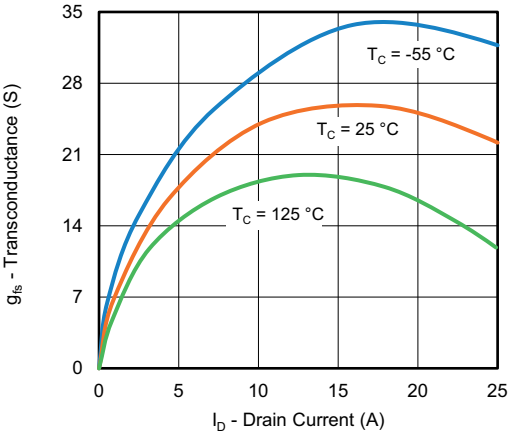
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



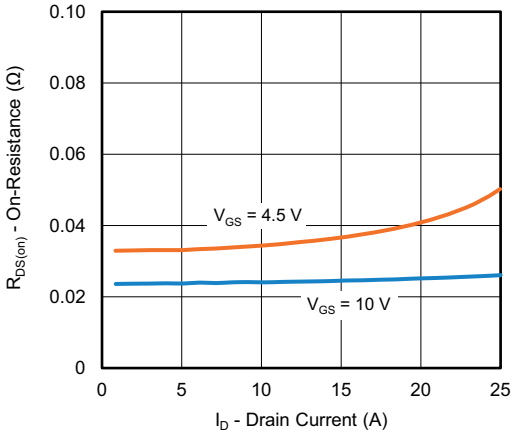
Output Characteristics



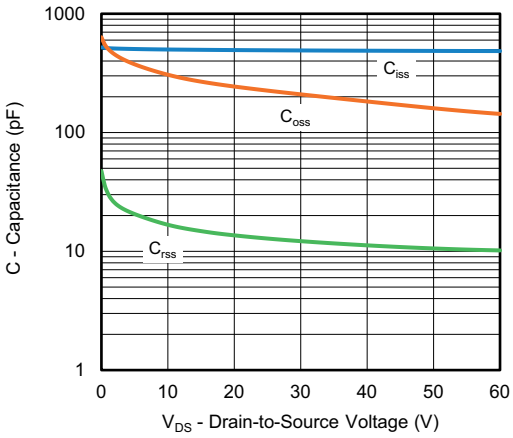
Transfer Characteristics



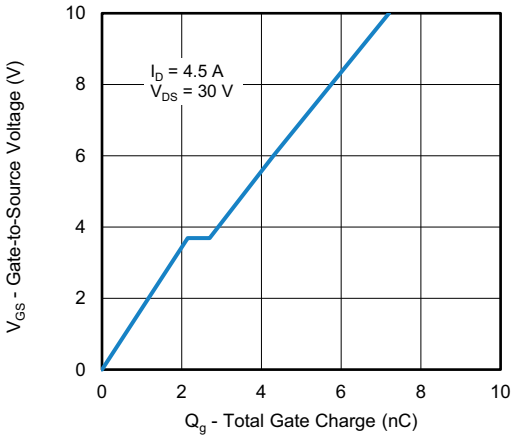
Transconductance



On-Resistance vs. Drain Current



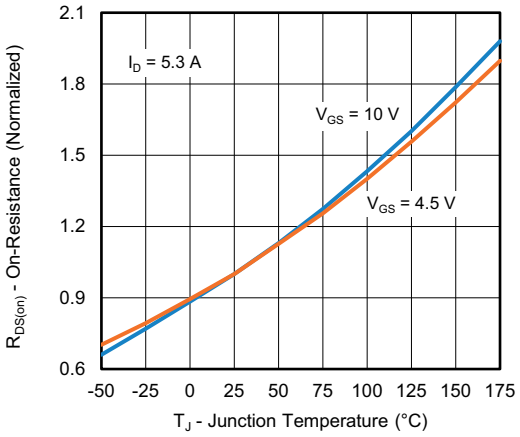
Capacitance



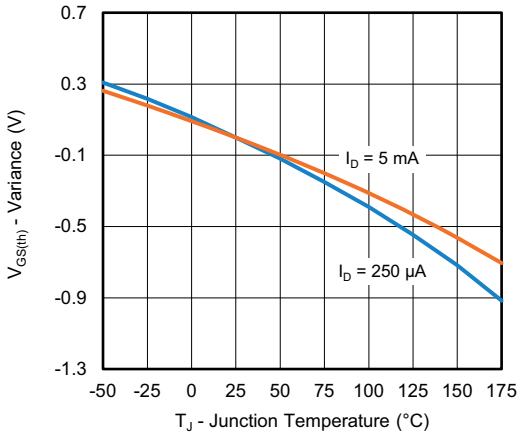
Gate Charge

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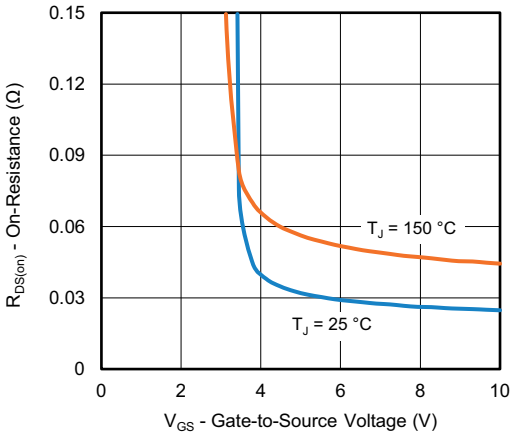
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



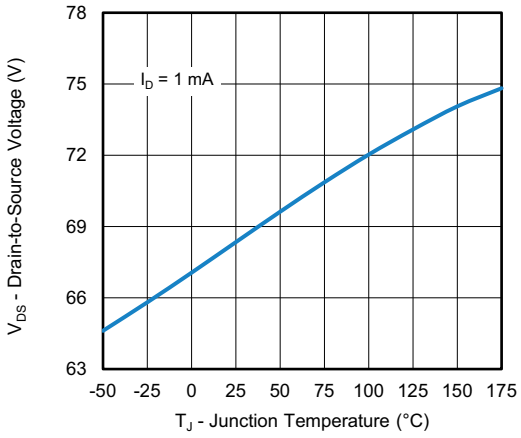
On-Resistance vs. Junction Temperature



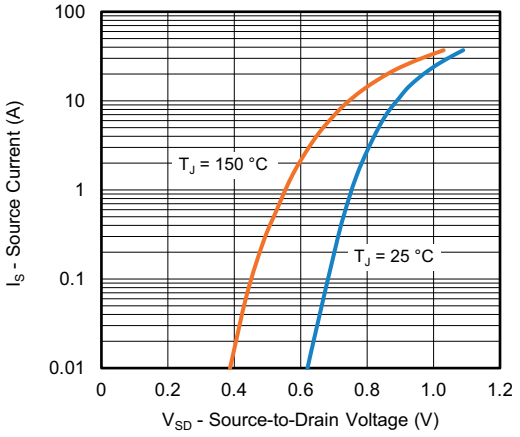
Threshold Voltage



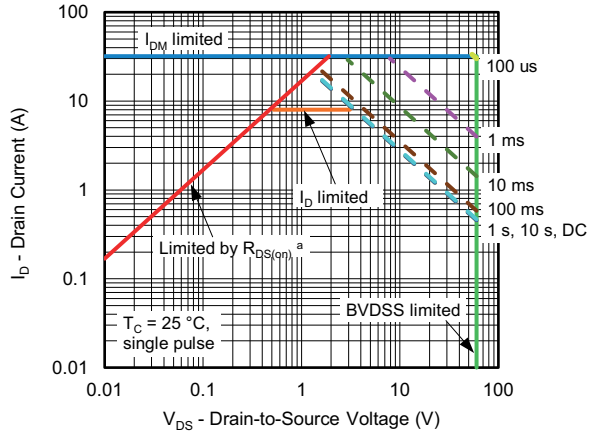
On-Resistance vs. Gate-to-Source Voltage



Drain Source Breakdown vs. Junction Temperature



Source Drain Diode Forward Voltage



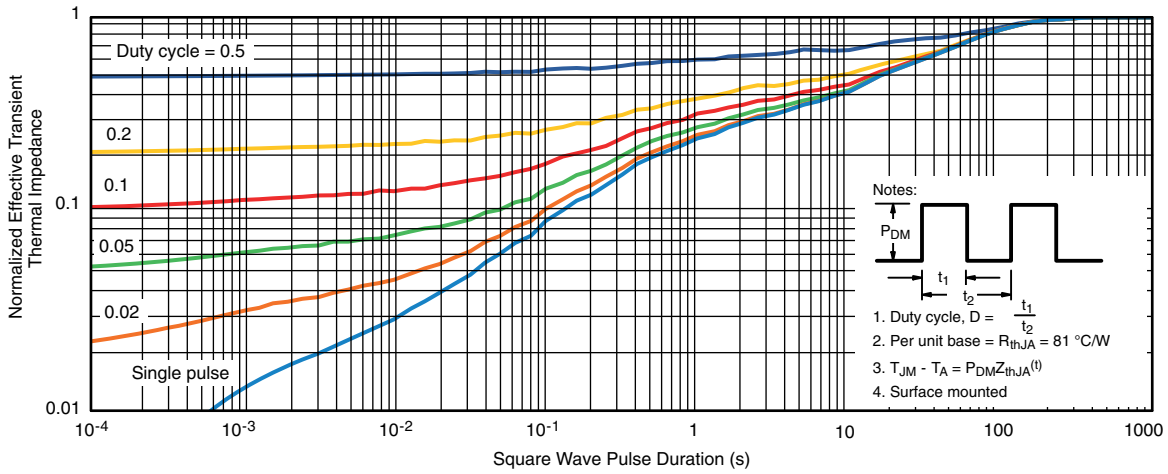
Safe Operating Area

Note

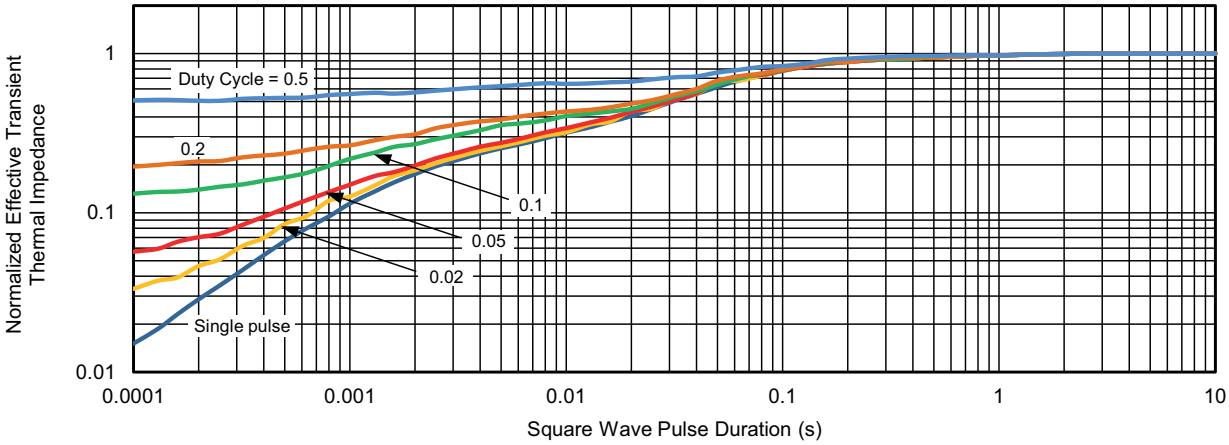
a. V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Note

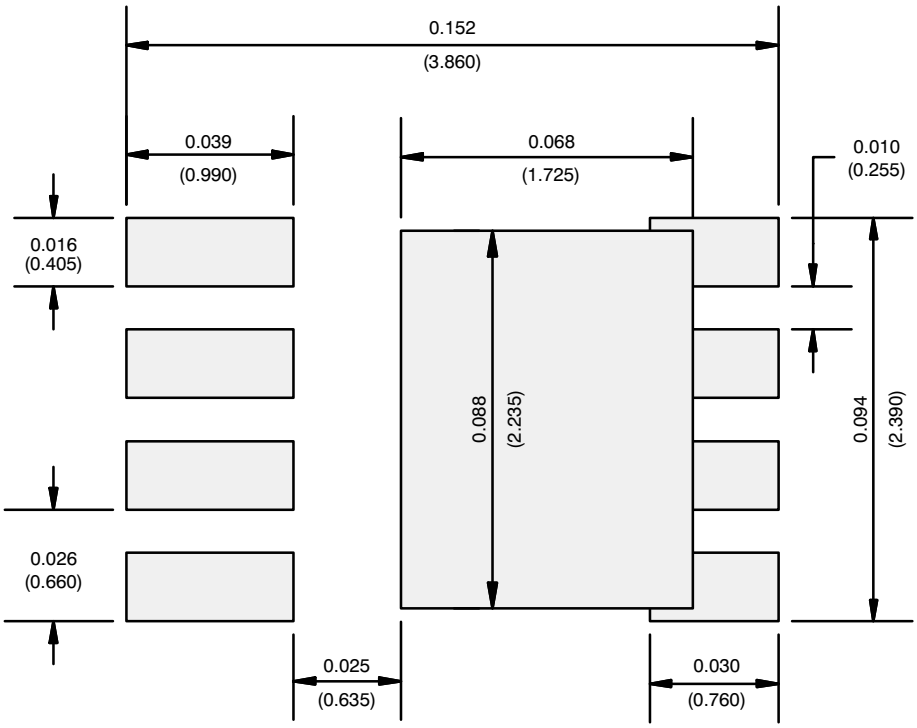
- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °C)

  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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RECOMMENDED MINIMUM PADS FOR PowerPAK® 1212-8 Single



Recommended Minimum Pads
Dimensions in Inches/(mm)

Return to Index

APPLICATION NOTE

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