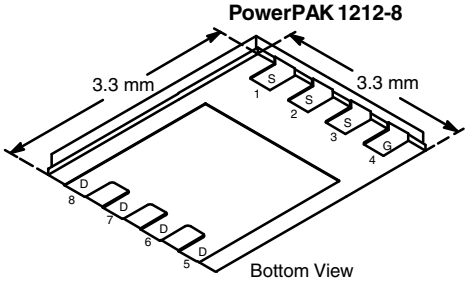
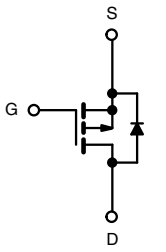
Automotive P-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	- 60
$R_{DS(on)}$ (Ω) at V_{GS} = - 10 V	0.065
$R_{DS(on)}$ (Ω) at V_{GS} = - 4.5 V	0.110
I_D (A)	- 5.7
Configuration	Single



Part Marking Code: Q002



P-Channel MOSFET

FEATURES

- TrenchFET® Power MOSFET
- PowerPAK® Package
  - Low Thermal Resistance, R_{thJC}
  - Low 1.07 mm Profile
- Fast Switching
- AEC-Q101 Qualified
- 100 % R_g Tested
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

Pb-free

RoHS COMPLIANT

ORDERING INFORMATION	
Package	PowerPAK 1212-8
Lead (Pb)-free	SQ7415EN-T1-E3

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

PARAMETER		SYMBOL	10 s	STEADY STATE	UNIT
Drain-Source Voltage		V_{DS}	- 60	- 60	V
Gate-Source Voltage		V_{GS}	± 20	± 20	
Continuous Drain Current[a]	T_A = 25 °C	I_D	- 5.7	- 3.6	A
	T_A = 70 °C		- 4.6	- 2.9	
Continuous Source Current (Diode Conduction)[a]		I_S	- 3.2	- 1.3	
Pulsed Drain Current[b]		I_{DM}	- 30	- 30	
Maximum Power Dissipation[b]	T_A = 25 °C	P_D	3.8	1.5	W
	T_A = 70 °C		2	0.8	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to + 175	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature)[d, e]			260	260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Junction-to-Ambient		R_{thJA}	26	33	°C/W
	PCB Mount[c]		65	81	
Junction-to-Case (Drain)		R_{thJC}	1.9	2.4	

Notes

a. Package limited.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
c. When mounted on 1" square PCB (FR-4 material).
d. See solder profile (www.vishay.com/doc?73257). The PowerPAK 1212-8 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.

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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 V, I_D = - 250 µA	- 60	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 1.5	-	- 3	
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	-	-	- 5	
		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 = - 5.7 A	-	0.054	0.065	Ω
		V_{GS} = - 4.5 V, I_D = - 4.4 A	-	0.090	0.110	
		V_{GS} = - 10 V, I_D = - 5.7 A, T_j = 125 °C	-	-	0.104	
		V_{GS} = - 10 V, I_D = - 5.7 A, T_j = 175 °C	-	-	0.127	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 5.7 A	11	-	-	S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	-	940	1175	pF
Output Capacitance	C_{oss}		-	151	189	
Reverse Transfer Capacitance	C_{rss}		-	54	68	
Total Gate Charge[c]	Q_g	V_{GS} = - 10 V, V_{DS} = - 30 V, I_D = - 5.7 A	-	15	25	nC
Gate-Source Charge[c]	Q_{gs}		-	4	-	
Gate-Drain Charge[c]	Q_{gd}		-	3.2	-	
Gate Resistance	R_g	f = 1 MHz	0.8	1.8	2.8	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = - 30 V, R_L = 30 Ω	-	12	20	ns
Rise Time[c]	t_r		-	12	20	
Turn-Off Delay Time[c]	$t_{d(off)}$		-	22	35	
Fall Time[c]	t_f		-	16	25	
Source-Drain Diode Ratings and Characteristics T_C = 25 °C[b]						
Pulsed Current[a]	I_{SM}		-	-	- 30	A
Forward Voltage	V_{SD}	I_F = 85 A, V_{GS} = 0 V	-	-	- 1.2	V
Reverse Recovery Time	t_{rr}	I_F = 3.2 A, dI/dt = 100 A/µs	-	45	90	ns

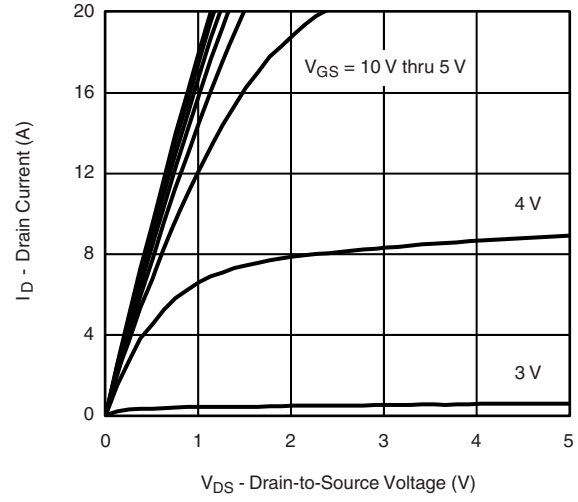
Notes

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

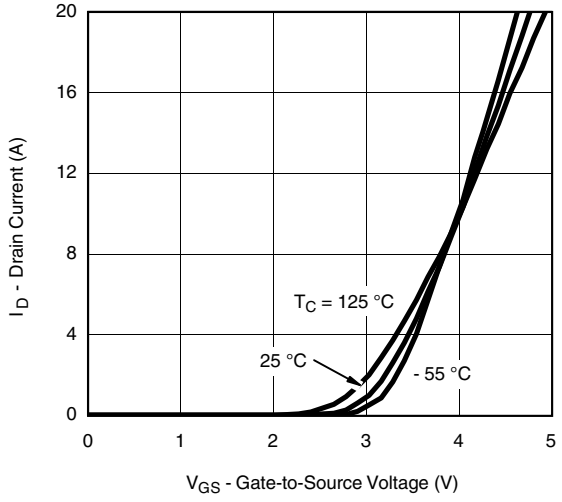
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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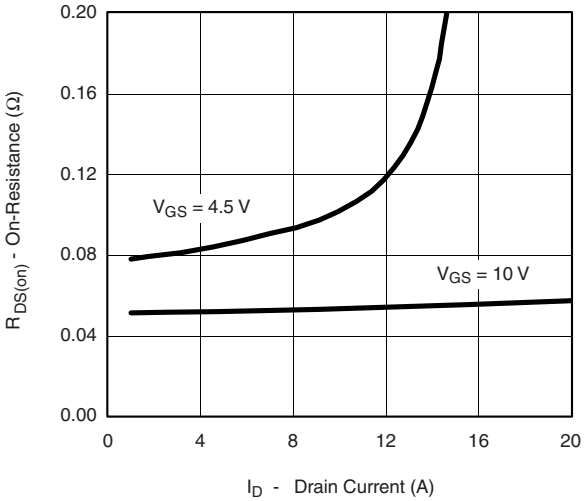
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



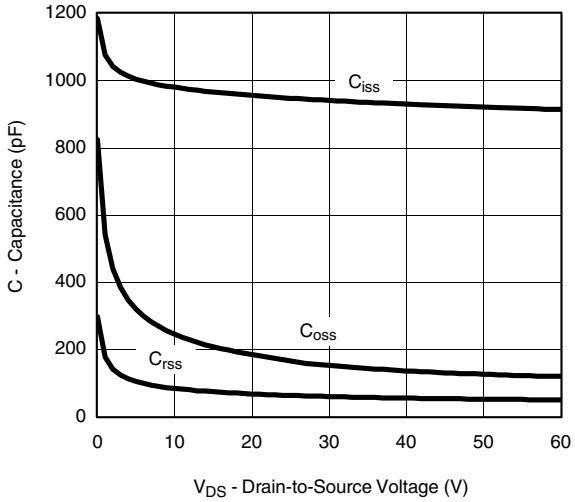
Output Characteristics



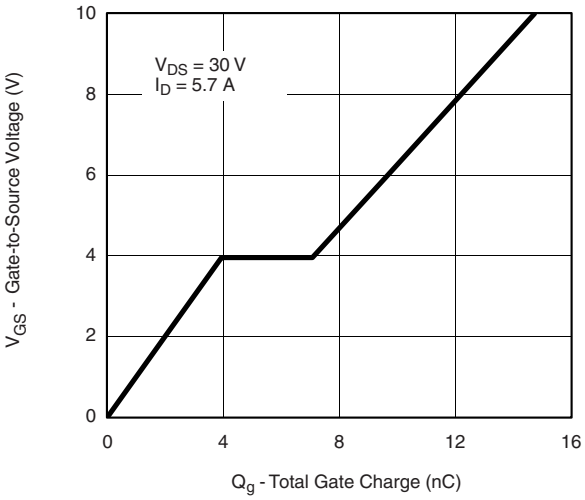
Transfer Characteristics



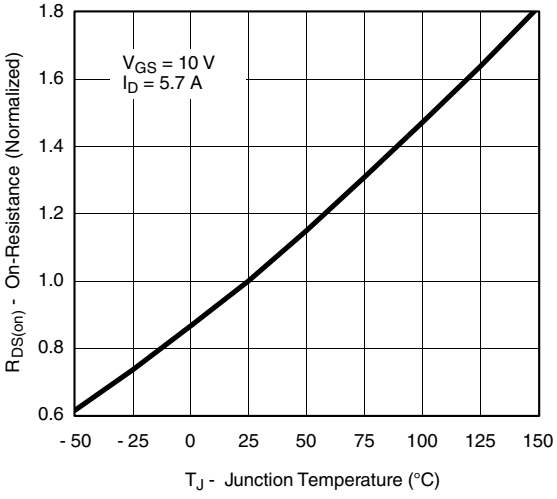
On-Resistance vs. Drain Current



Capacitance



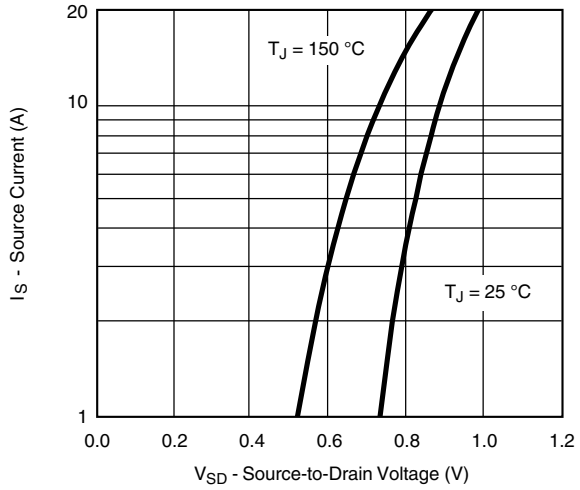
Gate Charge



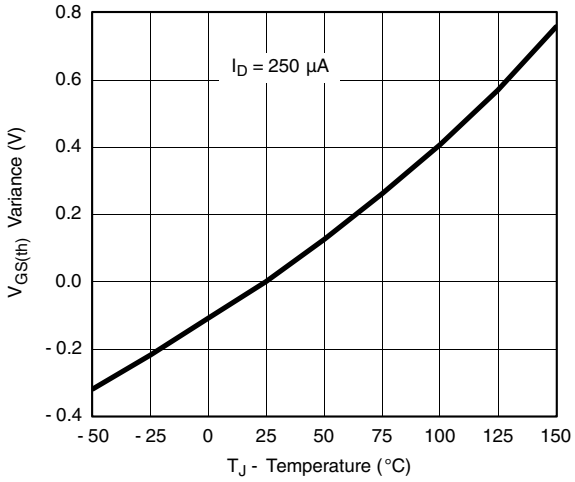
On-Resistance vs. Junction Temperature

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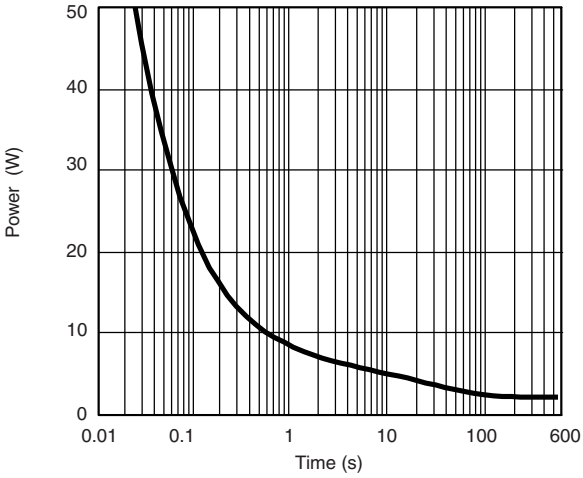
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



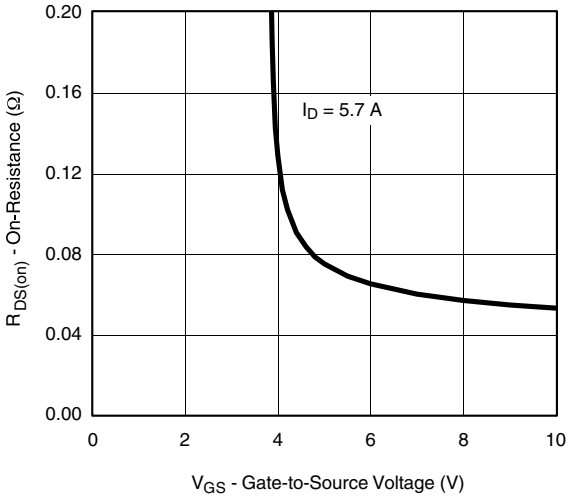
Source Drain Diode Forward Voltage



Threshold Voltage



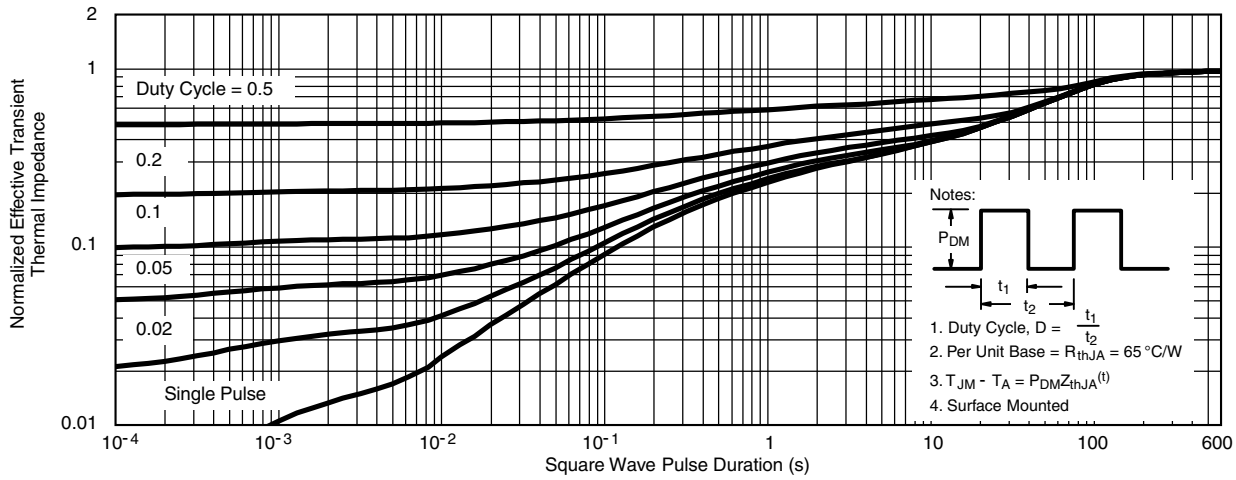
Single Pulse Power, Junction-to-Ambient



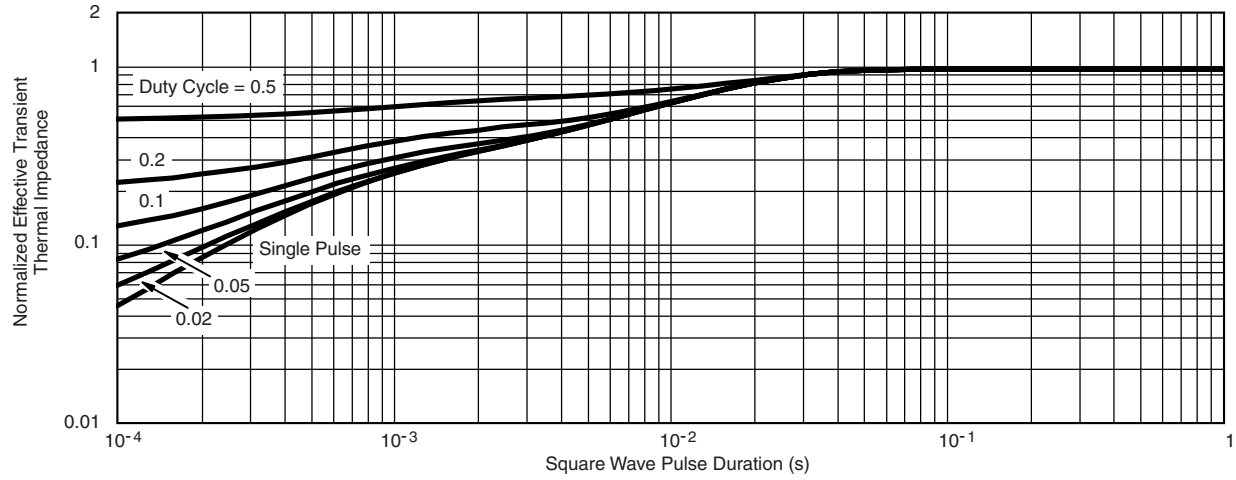
On-Resistance vs. Gate-to-Source Voltage

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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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