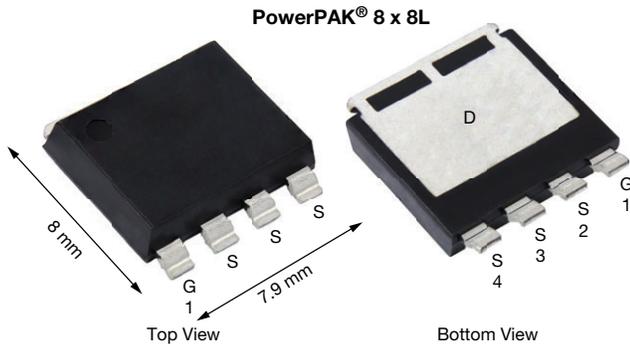


# Automotive N-Channel 40 V (D-S) 175 °C MOSFET

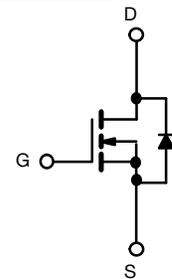


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**



## FEATURES

- TrenchFET® Gen IV power MOSFET
- AEC-Q101 qualified
- 100 % R<sub>g</sub> and UIS tested
- Thin 1.6 mm package
- Very low thermal resistance
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



N-Channel MOSFET

PRODUCT SUMMARY	
V <sub>DS</sub> (V)	40
R <sub>DS(on)</sub> (Ω) at V <sub>GS</sub> = 10 V	0.0007
I <sub>D</sub> (A) <sup>e</sup>	487
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK 8 x 8L
Lead (Pb)-free and halogen-free	SQJQ146E (for detailed order number please see <a href="http://www.vishay.com/doc?79776">www.vishay.com/doc?79776</a> )

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V <sub>DS</sub>	40	V
Gate-source voltage		V <sub>GS</sub>	± 20	
Continuous drain current <sup>e</sup>	T <sub>C</sub> = 25 °C	I <sub>D</sub>	487	A
	T <sub>C</sub> = 125 °C		281	
Continuous source current (diode conduction) <sup>e</sup>		I <sub>S</sub>	272	
Pulsed drain current <sup>a, e</sup>		I <sub>DM</sub>	1166	
Single pulse avalanche current	L = 0.1 mH	I <sub>AS</sub>	70	
Single pulse avalanche energy		E <sub>AS</sub>	245	mJ
Maximum power dissipation <sup>e</sup>	T <sub>C</sub> = 25 °C	P <sub>D</sub>	300	W
	T <sub>C</sub> = 125 °C		100	
Operating junction and storage temperature range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Soldering recommendations (peak temperature) <sup>c</sup>			260	

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount <sup>c</sup>	R <sub>thJA</sub>	44	°C/W
Junction-to-case (drain) <sup>d</sup>		R <sub>thJC</sub>	0.5	

### Notes

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)
- See solder profile ([www.vishay.com/doc?73257](http://www.vishay.com/doc?73257)). 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
- As per JESD51-14
- Values based on R<sub>thJC</sub> and T<sub>C</sub> of 25 °C. Actual values achievable will be dependent on the thermal characteristics of the complete system



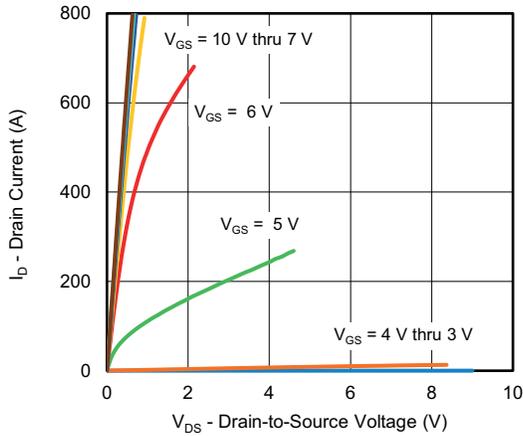
<b>SPECIFICATIONS</b> ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$		40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.2	2.8	3.2	
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	200	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 40\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	800	
On-state drain current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	100	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}$	-	0.00055	0.0007	$\Omega$
		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.00105	
		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	-	0.00128	
Forward transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 100\text{ A}$		-	310	-	S
<b>Dynamic <sup>b</sup></b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	-	10 038	14 054	$\text{pF}$
Output capacitance	$C_{oss}$			-	3014	4220	
Reverse transfer capacitance	$C_{rss}$			-	219	307	
Total gate charge <sup>c</sup>	$Q_g$	$V_{GS} = 10\text{ V}$	$V_{DS} = 20\text{ V}, I_D = 40\text{ A}$	-	159	239	nC
Gate-source charge <sup>c</sup>	$Q_{gs}$			-	49	-	
Gate-drain charge <sup>c</sup>	$Q_{gd}$			-	33	-	
Gate resistance	$R_g$	f = 1 MHz		0.6	1.6	3.2	$\Omega$
Turn-on delay time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.5\text{ }\Omega$ $I_D \equiv 40\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		-	21	32	ns
Rise time <sup>c</sup>	$t_r$			-	18	27	
Turn-off delay time <sup>c</sup>	$t_{d(off)}$			-	55	83	
Fall time <sup>c</sup>	$t_f$			-	22	33	
<b>Source-Drain Diode Ratings and Characteristics <sup>b</sup></b>							
Reverse recovery time	$t_{rr}$	$V_{DD} = 32\text{ V}, I_{FM} = 40\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s}$		-	75	150	ns
Reverse recovery charge	$Q_{rr}$			-	107	214	nC
Reverse recovery current	$I_{RM}$			-	-2.6	-	A
Pulsed current <sup>a</sup>	$I_{SM}$			-	-	719	A
Forward voltage	$V_{SD}$	$I_F = 50\text{ A}, V_{GS} = 0$		-	0.8	1.1	V

**Notes**

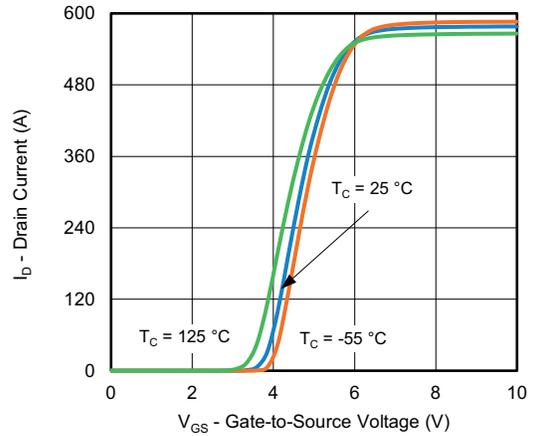
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$
- b. Guaranteed by design, not subject to production testing
- c. Independent of operating temperature

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.

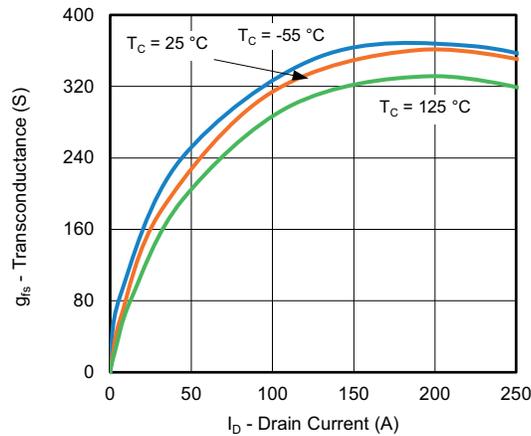
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



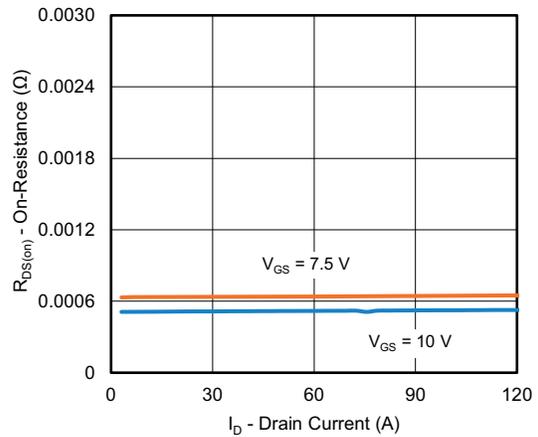
**Output Characteristics**



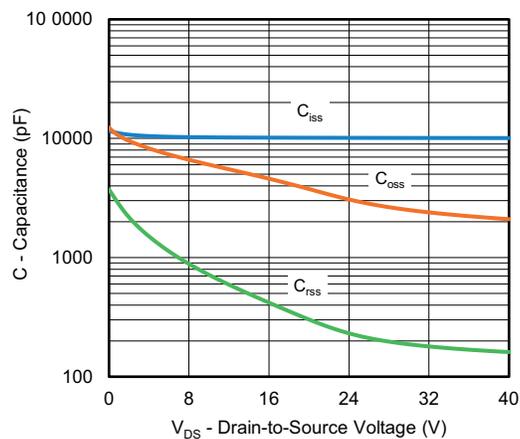
**Transfer Characteristics**



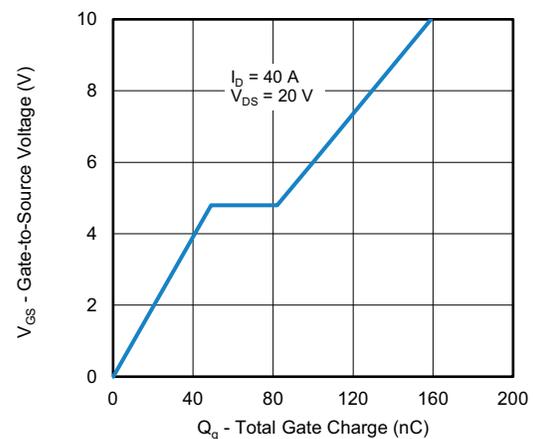
**Transconductance**



**On-Resistance vs. Drain Current**



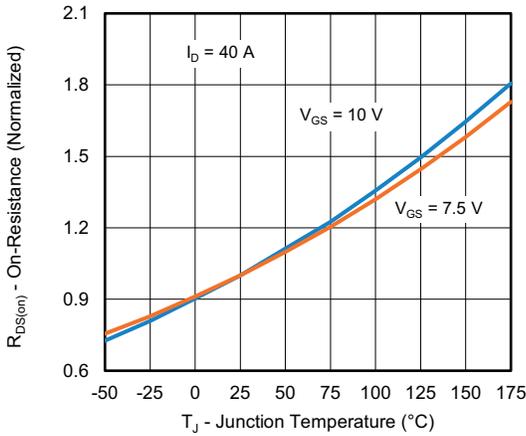
**Capacitance**



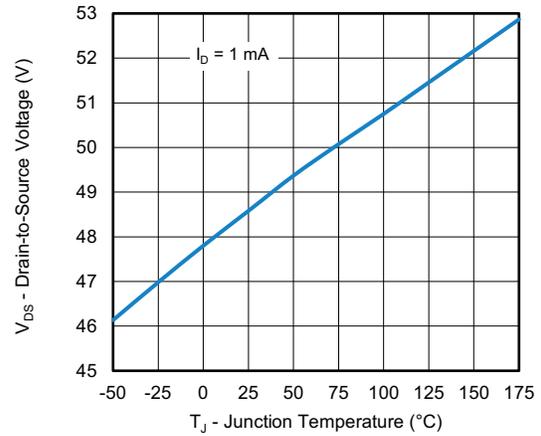
**Gate Charge**



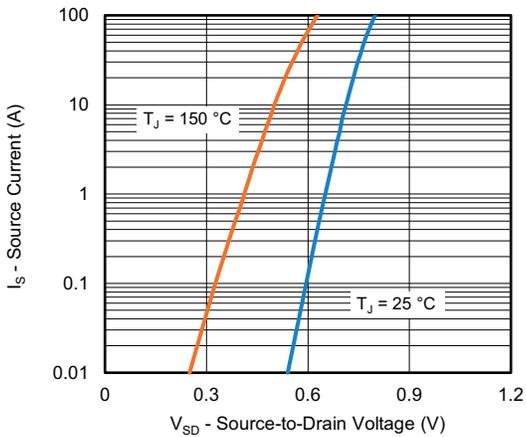
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



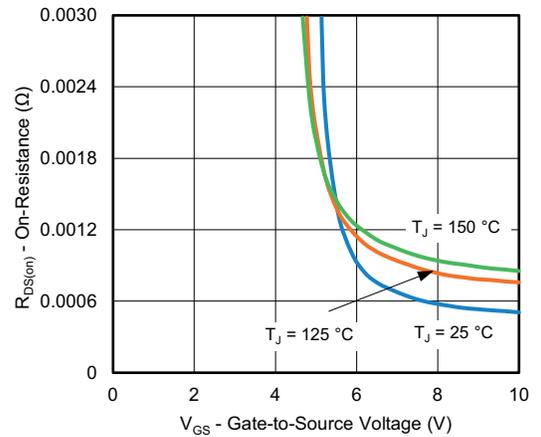
On-Resistance vs. Junction Temperature



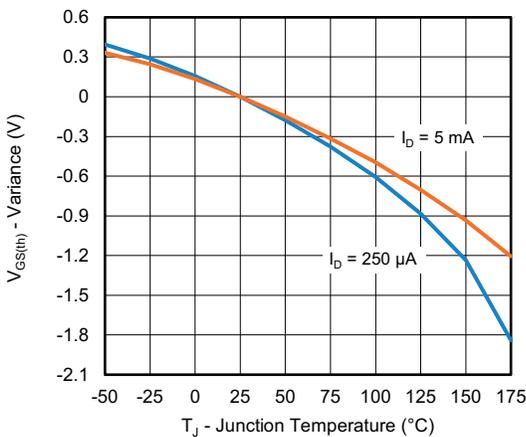
Drain Source Breakdown vs. Junction Temperature



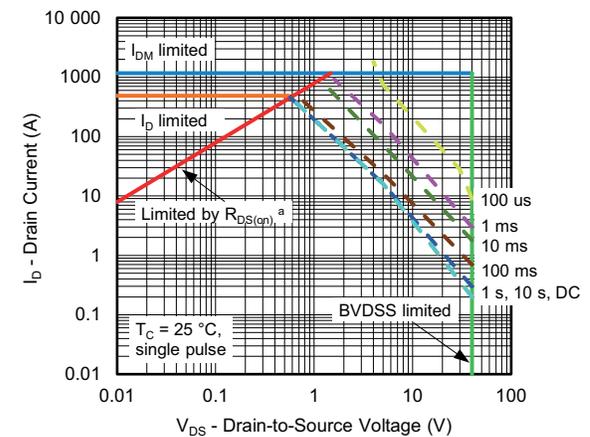
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



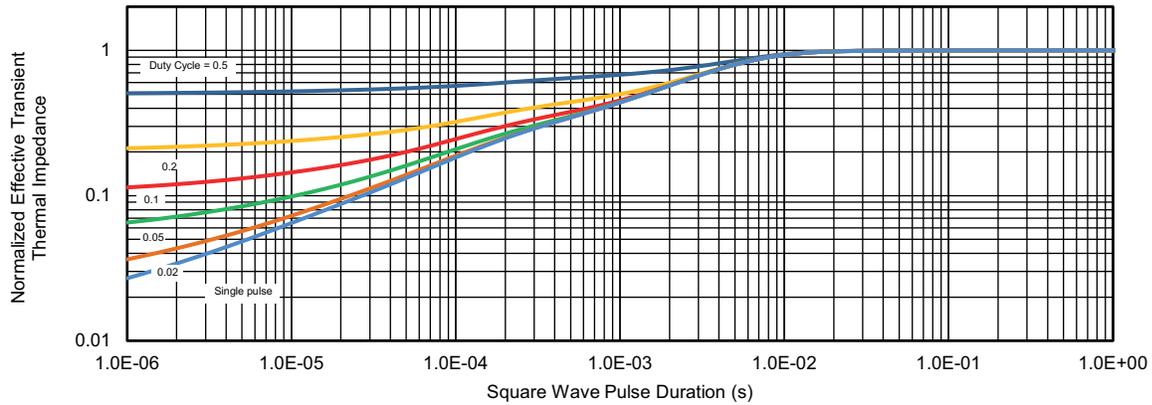
Safe Operating Area

Note

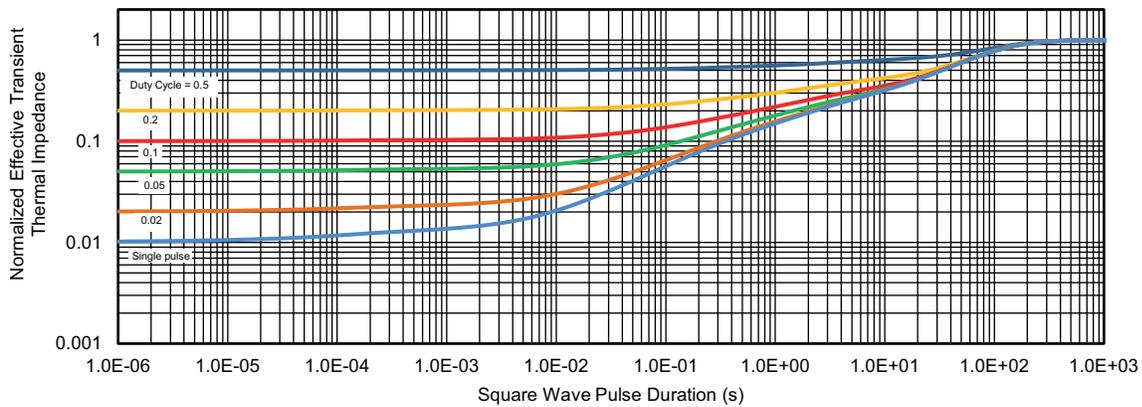
a. V<sub>GS</sub> > minimum V<sub>GS</sub> at which R<sub>DS(on)</sub> is specified



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**Normalized Thermal Transient Impedance, Junction-to-Case**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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