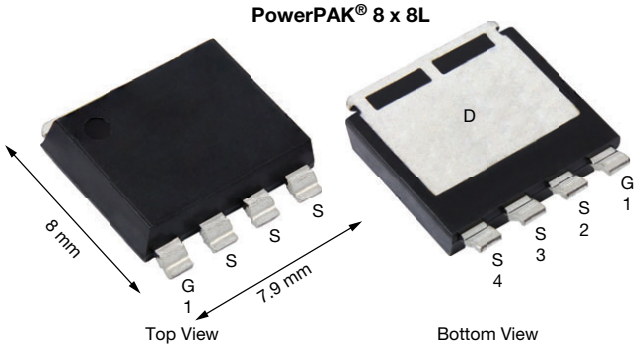
Automotive N-Channel 40 V (D-S) 175 °C MOSFET



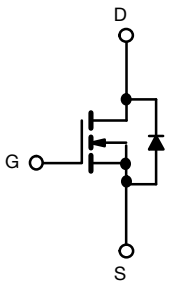
FEATURES

- TrenchFET® Gen IV power MOSFET
- AEC-Q101 qualified
- 100 % R_g 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

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE



N-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	40
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0007
I_D (A) [e]	487
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK 8 x 8L
Lead (Pb)-free and halogen-free	SQJQ146E (for detailed order number please see www.vishay.com/doc?79776)

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

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current [e]	T_C = 25 °C	I_D	487	A
	T_C = 125 °C		281	
Continuous source current (diode conduction) [e]		I_S	272	
Pulsed drain current [a, e]		I_{DM}	1166	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	70	
Single pulse avalanche energy		E_{AS}	245	mJ
Maximum power dissipation [e]	T_C = 25 °C	P_D	300	W
	T_C = 125 °C		100	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [c]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [c]	R_{thJA}	44	°C/W
Junction-to-case (drain) [d]		R_{thJC}	0.5	

Notes

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. When mounted on 1" square PCB (FR4 material)
c. See solder profile (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
d. As per JESD51-14
e. Values based on R_{thJC} and T_C of 25 °C. Actual values achievable will be dependent on the thermal characteristics of the complete system

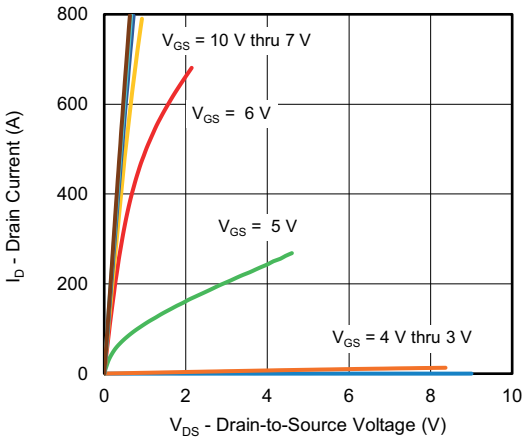
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = 250 µA		40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.2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

Notes

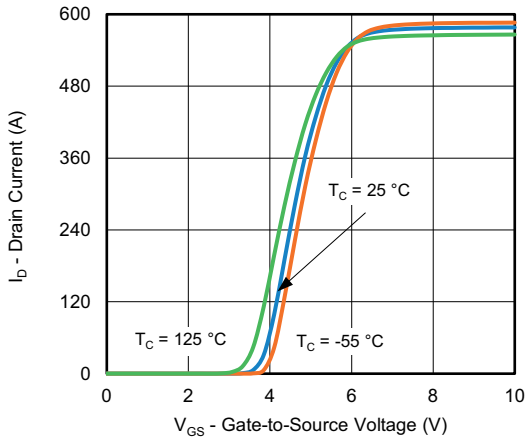
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

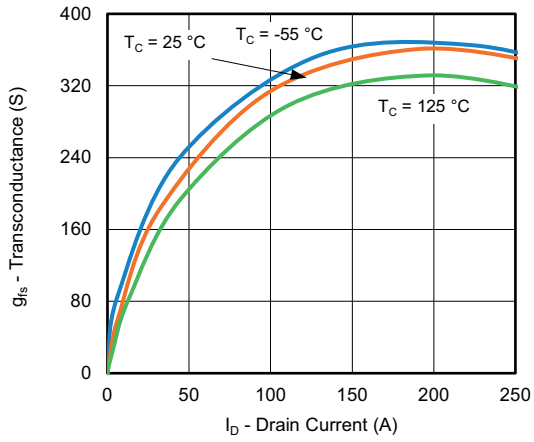
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



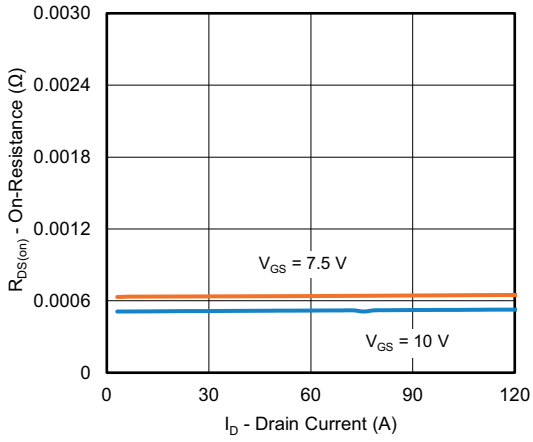
Output Characteristics



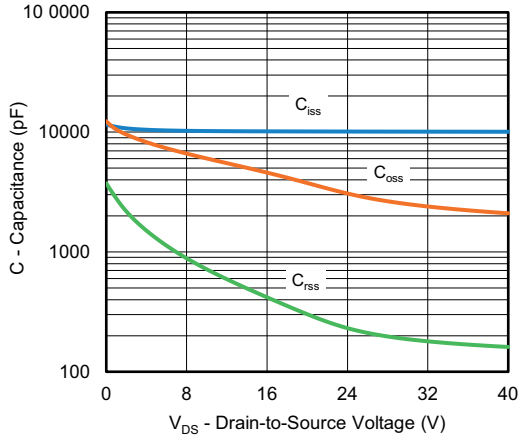
Transfer Characteristics



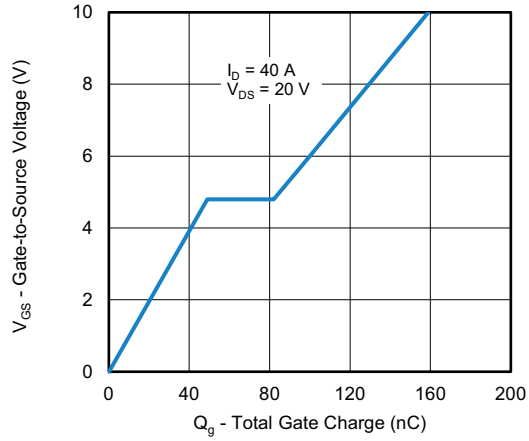
Transconductance



On-Resistance vs. Drain Current

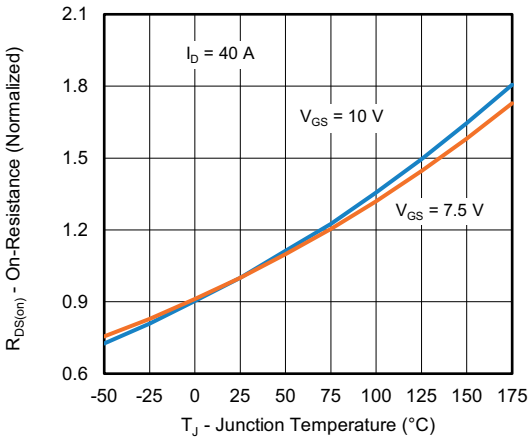


Capacitance

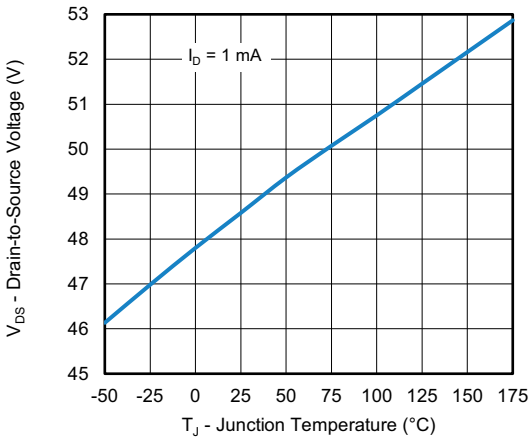


Gate Charge

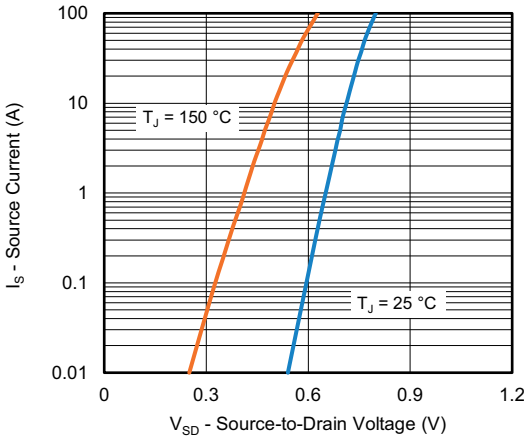
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



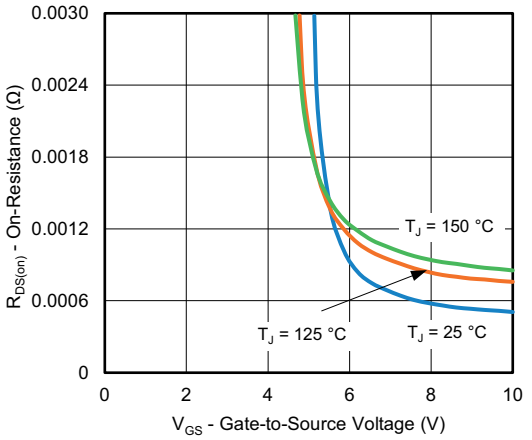
On-Resistance vs. Junction Temperature



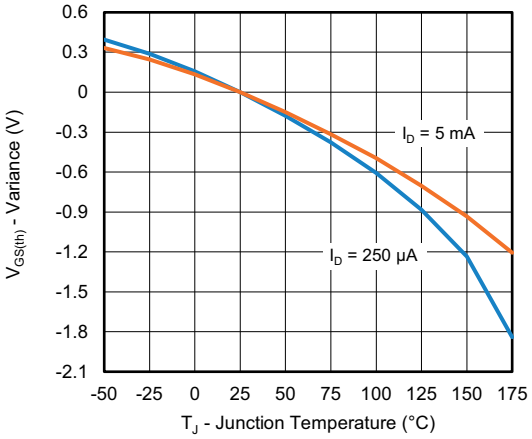
Drain Source Breakdown vs. Junction Temperature



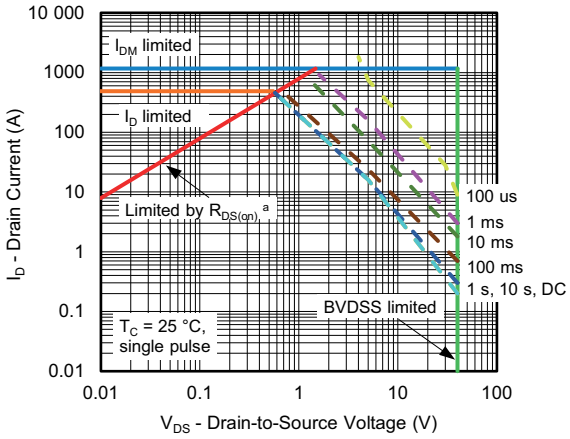
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

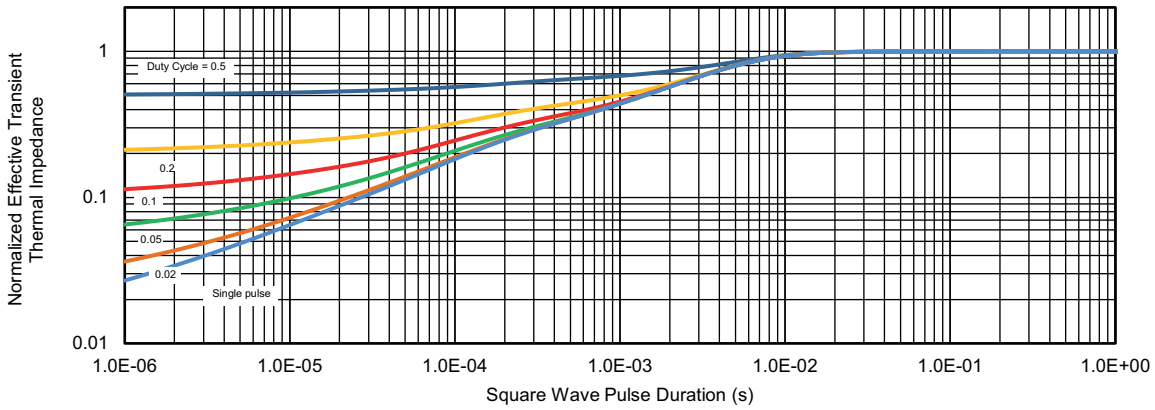


Safe Operating Area

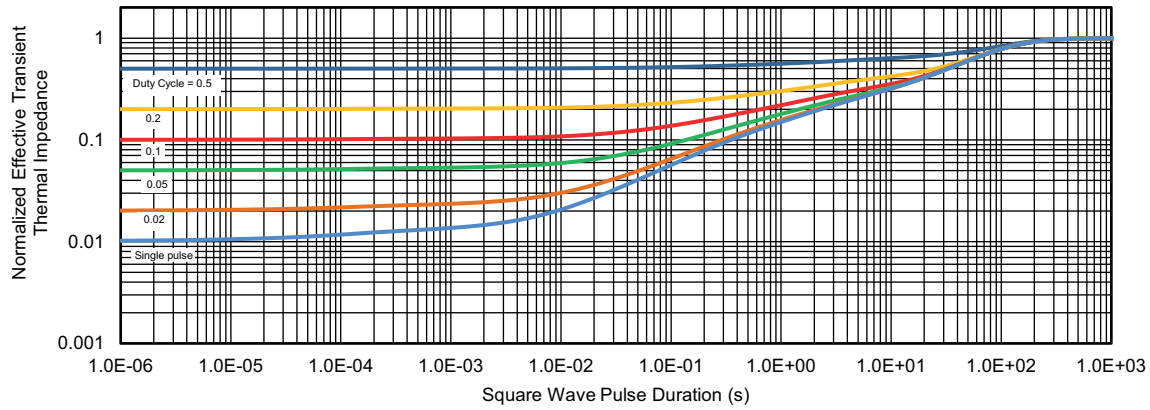
Note

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

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



Normalized Thermal Transient Impedance, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Ambient

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