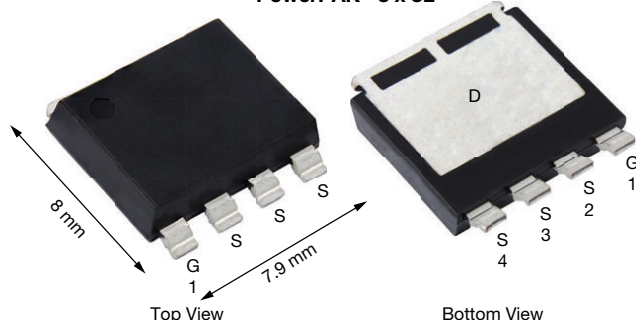


Automotive P-Channel 60 V (D-S) 175 °C MOSFET

PowerPAK® 8 x 8L

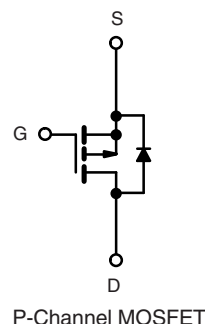


FEATURES

- 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



RoHS
COMPLIANT
HALOGEN
FREE



PRODUCT SUMMARY	
V_{DS} (V)	-60
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	0.0035
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	0.0062
I_D (A) ^g	-222
Configuration	Single

ORDERING INFORMATION	
Package	PowerPAK 8 x 8L
Lead (Pb)-free and Halogen-free	SQJQ161EL-T1_GE3

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V _{DS}	-60	V
Gate-source voltage ^a		V _{GS}	± 20	
Continuous drain current ^g	T _C = 25 °C ^b	I _D	-222	A
	T _C = 125 °C		-128	
Continuous source current (diode conduction) ^{b, g}		I _S	-317	
Pulsed drain current ^{c, g}		I _{DM}	-717	
Single pulse avalanche current	L = 0.1 mH	I _{AS}	-83	
Single pulse avalanche energy		E _{AS}	348	
Maximum power dissipation ^{c, g}	T _C = 25 °C	P _D	348	W
	T _C = 125 °C		116	
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	R_{thJA}	42	°C/W	
Junction-to-case (drain) ^f	R_{thJC}	0.43		

Notes

- Not intended for continuous use with positive gate voltage > 5.0 V
- Package limited
- When mounted on 1" square PCB (FR4 material)
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %
- Using thermal characterization methods based on JESD51-14
- 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		-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	-30	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = -10 V	I _D = -15 A	-	0.0029	0.0035	Ω
		V _{GS} = -10 V	I _D = -15 A, T _J = 125 °C	-	-	0.0058	
		V _{GS} = -10 V	I _D = -15 A, T _J = 175 °C	-	-	0.0072	
		V _{GS} = -4.5 V	I _D = -15 A	-	0.0049	0.0062	
Forward transconductance ^b	g _{fs}	V _{DS} = -15 V, I _D = -50 A		-	150	-	S
Dynamic ^b							
Input capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = -25 V, f = 1 MHz	-	8946	12 525	pF
Output capacitance	C _{oss}			-	4246	5945	
Reverse transfer capacitance	C _{rss}			-	195	273	
Total gate charge ^c	Q _g	V _{GS} = -10 V	V _{DS} = -30 V, I _D = -50 A	-	136	204	nC
Gate-source charge ^c	Q _{gs}			-	36	-	
Gate-drain charge ^c	Q _{gd}			-	15	-	
Gate resistance	R _g	f = 1 MHz		0.6	1.9	3.8	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = -30 V, R _L = 3 Ω, I _D ≅ -10 A, V _{GEN} = -10 V, R _g = 1 Ω		-	18	27	ns
Rise time ^c	t _r			-	10	15	
Turn-off delay time ^c	t _{d(off)}			-	68	102	
Fall time ^c	t _f			-	16	24	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed current ^a	I _{SM}			-	-	-717	A
Forward voltage	V _{SD}	I _F = -10 A, V _{GS} = 0 V		-	-0.76	-1.2	V
Body diode reverse recovery time	t _{rr}	I _F = -10 A, di/dt = 100 A/μs		-	93	186	ns
Body diode reverse recovery charge	Q _{rr}			-	149	298	nC
Reverse recovery fall time	t _a			-	47	-	ns
Reverse recovery rise time	t _b			-	43	-	
Body diode peak reverse recovery current	I _{RM(REC)}			-	-2.7	-	A

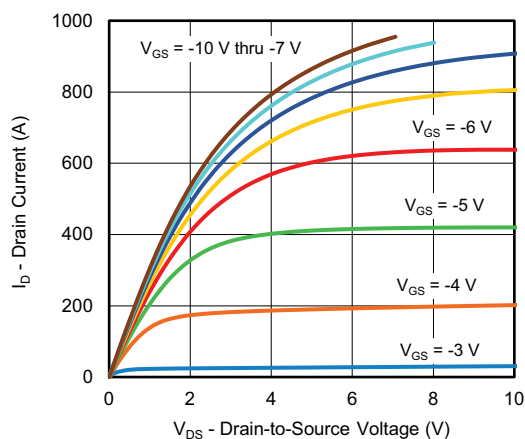
Notes

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

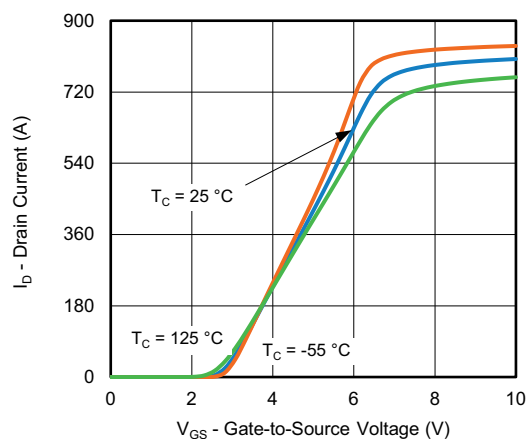
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



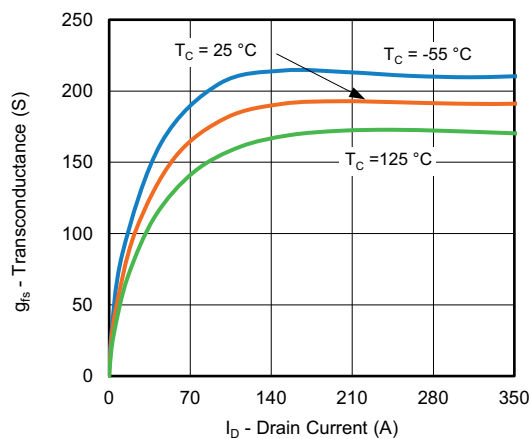
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



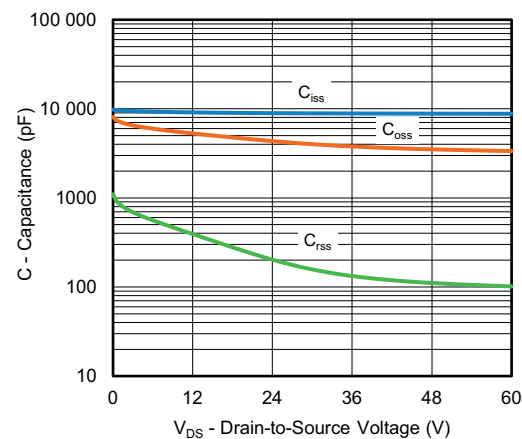
Output Characteristics



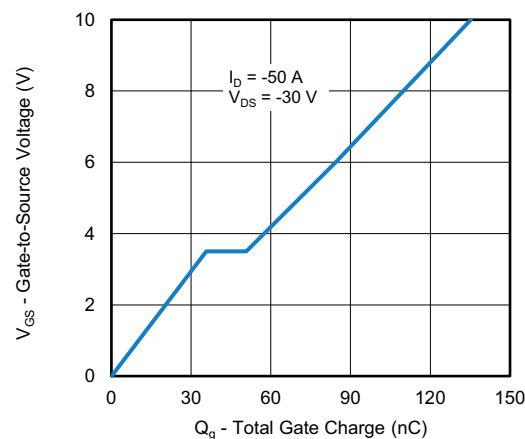
Transfer Characteristics



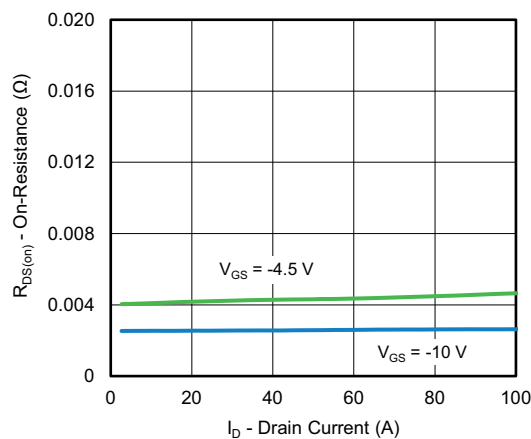
Transconductance



Capacitance



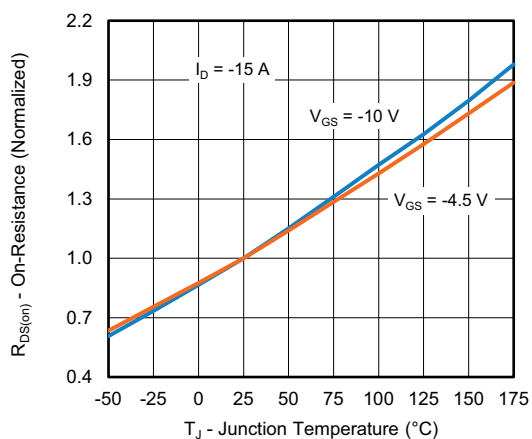
Gate Charge



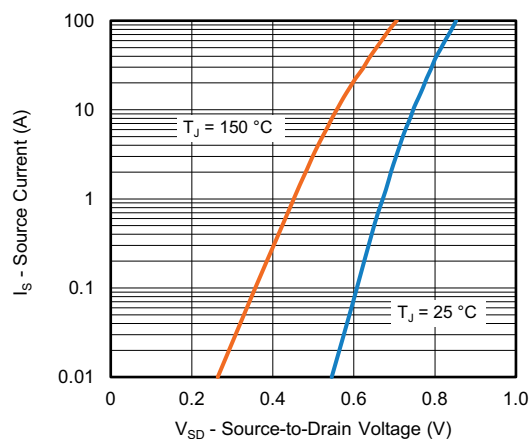
On-Resistance vs. Drain Current



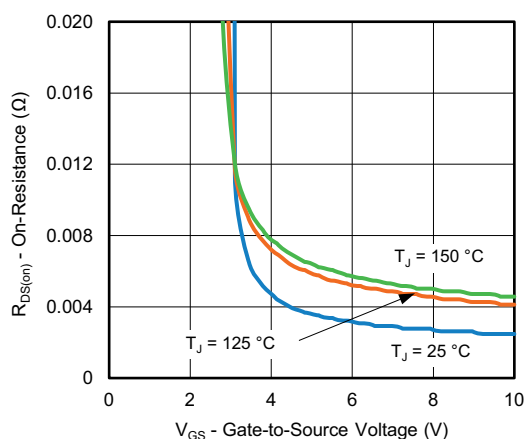
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)



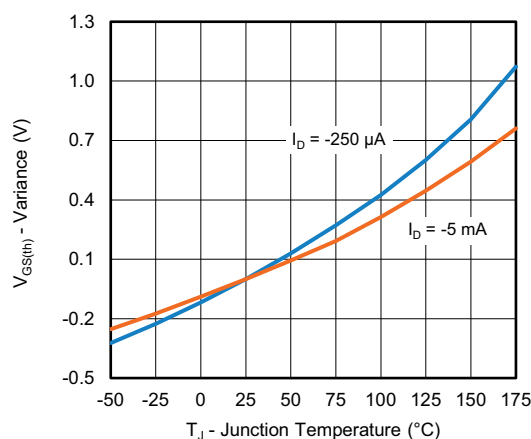
On-Resistance vs. Junction Temperature



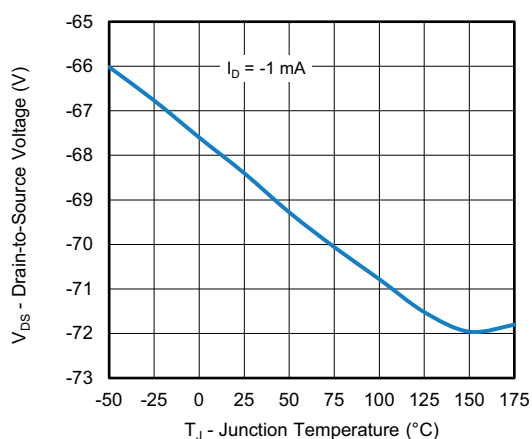
Source Drain Diode Forward Voltage



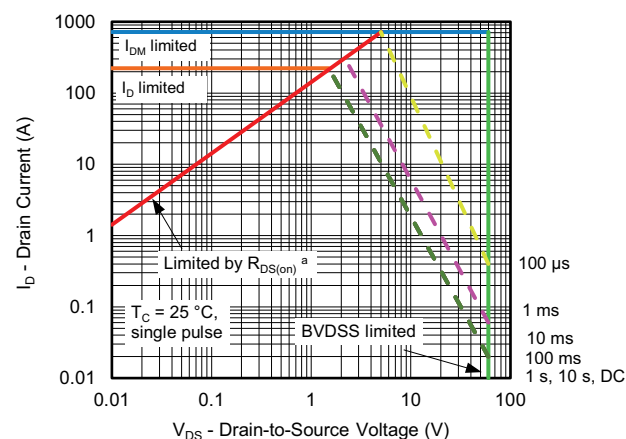
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Drain-Source Breakdown vs. Junction Temperature



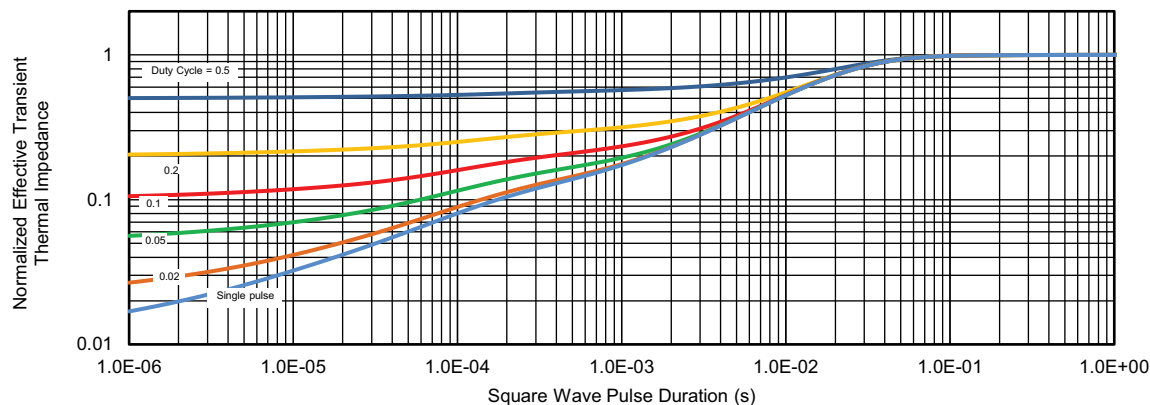
Safe Operating Area

Note

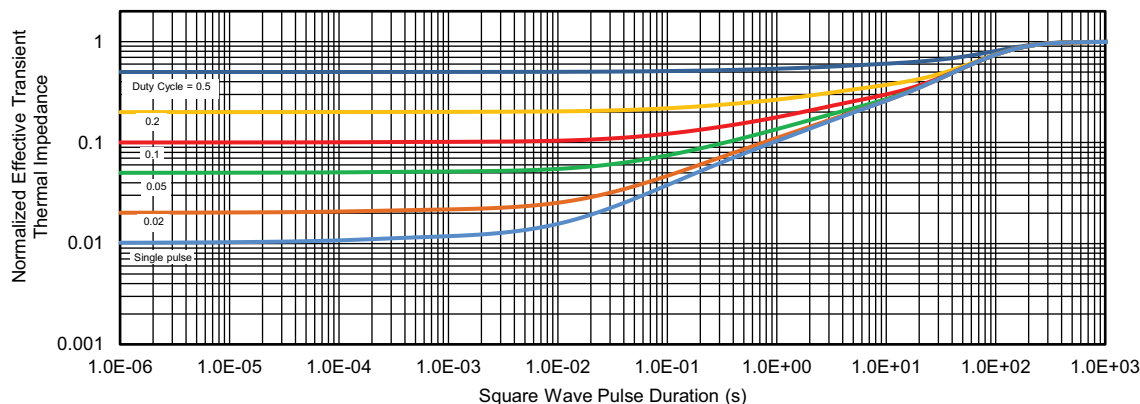
- a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified



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



Normalized Thermal Transient Impedance, Junction-to-Case



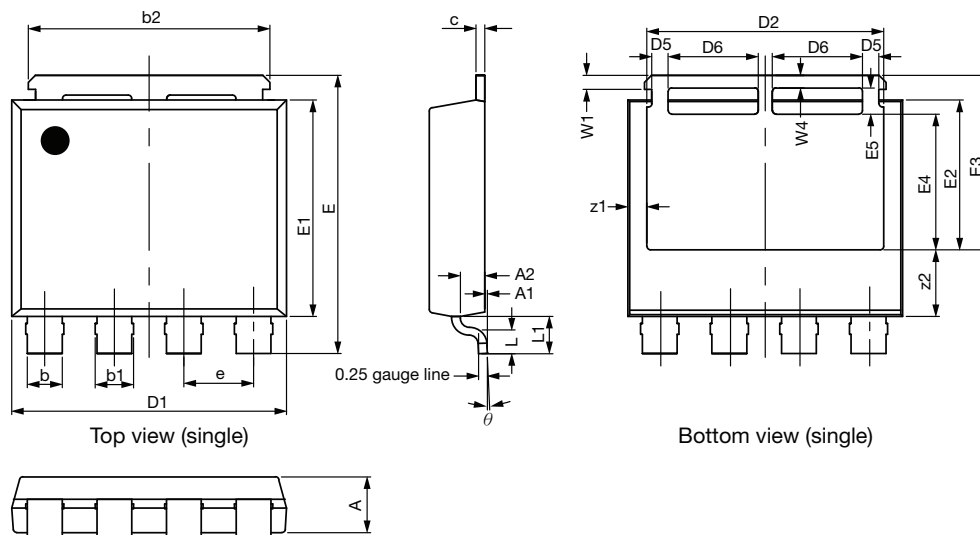
Normalized Thermal Transient Impedance, Junction-to-Ambient

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction-to-Ambient ($25\text{ }^{\circ}\text{C}$)
 - Normalized Transient Thermal Impedance Junction-to-Case ($25\text{ }^{\circ}\text{C}$)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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PowerPAK® 8 x 8L BWL Case Outline 2



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.50	1.60	1.70	0.059	0.063	0.067
A1	0.00	-	0.127	0.000	-	0.005
A2	0.655	0.705	0.755	0.026	0.028	0.030
b	0.92	1.00	1.08	0.036	0.039	0.043
b1	1.02	1.10	1.18	0.040	0.043	0.046
b2	6.84	6.94	7.04	0.269	0.273	0.277
c	0.20	0.25	0.30	0.008	0.010	0.012
D1	7.80	7.90	8.00	0.307	0.311	0.315
D2	6.70	6.80	6.90	0.264	0.268	0.272
D5	0.37	0.47	0.57	0.015	0.019	0.022
D6	2.49	2.59	2.69	0.098	0.102	0.106
e	1.97	2.00	2.03	0.078	0.079	0.080
E	7.90	8.00	8.10	0.311	0.315	0.319
E1	6.12	6.22	6.32	0.241	0.245	0.249
E2	4.21	4.31	4.41	0.166	0.170	0.174
E3	4.92	5.02	5.12	0.194	0.198	0.202
E4	3.80	3.90	4.00	0.150	0.154	0.157
E5	0.65	0.75	0.85	0.026	0.030	0.033
L	0.61	0.68	0.75	0.024	0.027	0.030
L1	1.00	1.07	1.15	0.039	0.042	0.045
W1	0.30	0.40	0.50	0.012	0.016	0.020
W4	0.32	0.37	0.42	0.013	0.015	0.017
z1	0.45	0.55	0.65	0.018	0.022	0.026
z2	1.81	1.91	2.01	0.071	0.075	0.079
θ	0°	-	5°	0°	-	5°

ECN: S19-0643-Rev. B, 05-Aug-2019
DWG: 6073

Note

- Millimeter will govern



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