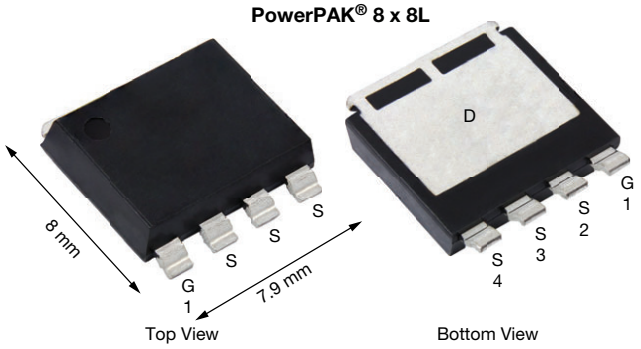
Automotive P-Channel 40 V (D-S) 175 °C MOSFET



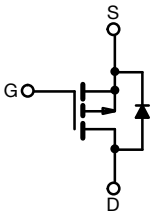
FEATURES

- 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



P-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at V_{GS} = -10 V	0.0020
I_D (A)	-390
Configuration	Single
Package	PowerPAK 8 x 8L

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	T_C = 25 °C	I_D	-390	A
	T_C = 125 °C		-226	
Continuous source current (diode conduction)		I_S	545	
Pulsed drain current [b]		I_{DM}	-489	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	66	
Single pulse avalanche energy		E_{AS}	218	mJ
Maximum power dissipation	T_C = 25 °C	P_D	600	W
	T_C = 125 °C		200	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C
Soldering recommendations (peak temperature) [d]			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [c]	R_{thJA}	44	°C/W
Junction-to-case (drain)		R_{thJC}	0.25	

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 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

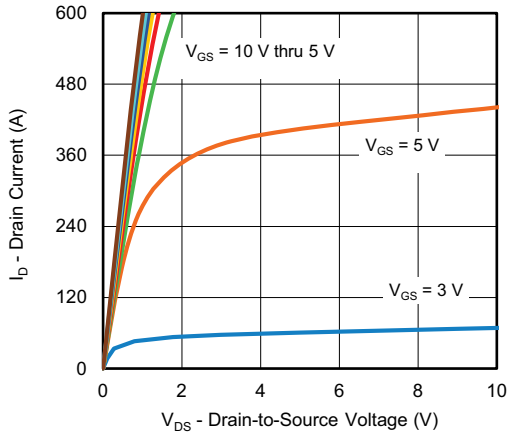
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = 250 µA		-40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		-1.5	-2	-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} = -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	-	-	330	
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} = -4.5 V	I_D = 8 A	-	0.0020	0.0029	Ω
		V_{GS} = -10 V	I_D = -10 A	-	0.0014	0.0020	
		V_{GS} = -10 V	I_D = -10 A, T_J = 125 °C	-	-	0.0035	
		V_{GS} = 10 V	I_D = -10 A, T_J = 175 °C	-	-	0.0040	
Forward transconductance [b]	g_{fs}	V_{DS} = -15 V, I_D = -50 A		-	180	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	44 421	62 190	pF
Output capacitance	C_{oss}			-	1633	2287	
Reverse transfer capacitance	C_{rss}			-	1476	2067	
Total gate charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = -20 V, I_D = -30 A	-	487	731	nC
Gate-source charge [c]	Q_{gs}			-	89	-	
Gate-drain charge [c]	Q_{gd}			-	82	-	
Gate resistance	R_g	f = 1 MHz		1.1	2.2	3.3	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 0.67 Ω I_D ≅ -30 A, V_{GEN} = -10 V, R_g = 1 Ω		-	22	33	ns
Rise time [c]	t_r			-	30	45	
Turn-off delay time [c]	$t_{d(off)}$			-	196	294	
Fall time [c]	t_f			-	64	96	
Source-Drain Diode Ratings and Characteristics [b]							
Reverse recovery time	t_a	V_{DD} = -32 V, I_{FM} = -20 A, di/dt = 100 A/µs		-	21	-	ns
	t_b			-	19	-	
	t_{rr}			-	40	80	
Reverse recovery charge	Q_{rr}			-	42	84	nC
Reverse recovery current	I_{RM}			-	-	2.0	A
Pulsed current [a]	I_{SM}			-	-	1100	A
Forward voltage	V_{SD}	I_F = -50 A, V_{GS} = 0		-	-0.8	-1.1	V

Notes

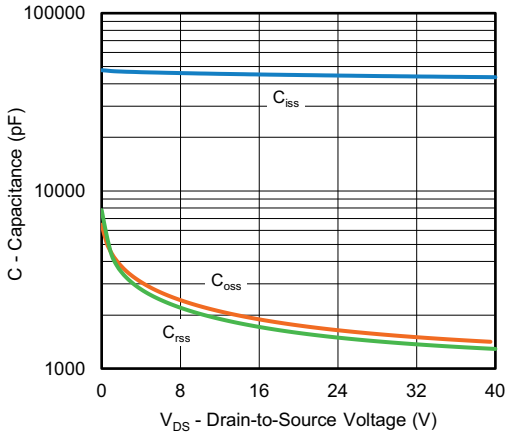
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

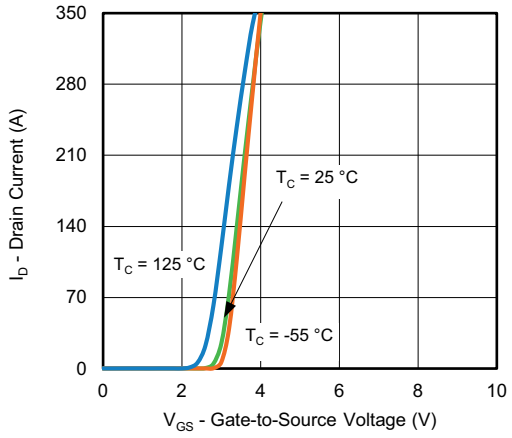
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



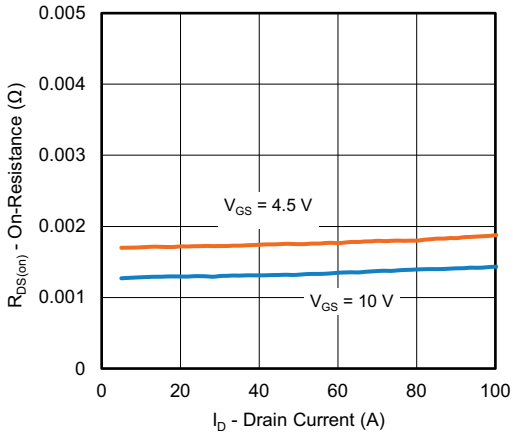
Output Characteristics



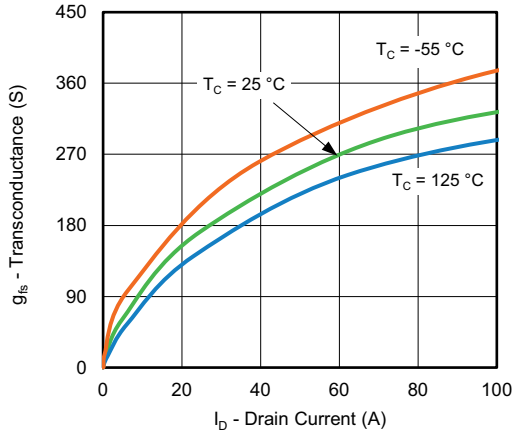
Capacitance



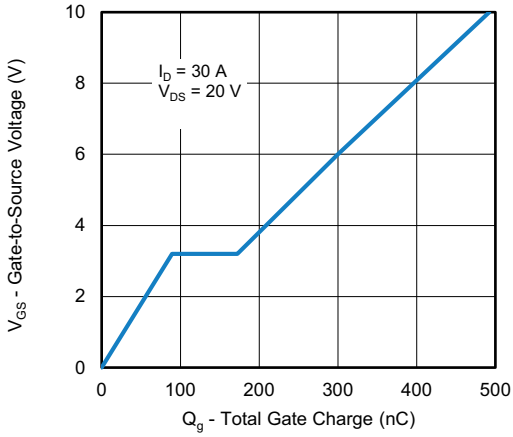
Transfer Characteristics



On-Resistance vs. Drain Current

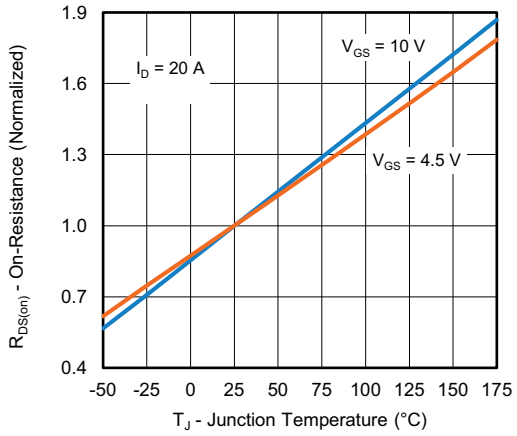


Transconductance

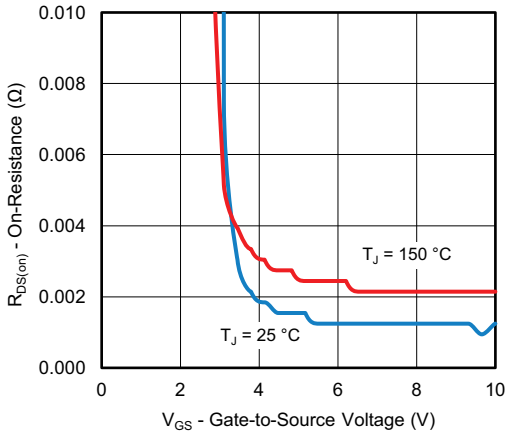


Gate Charge

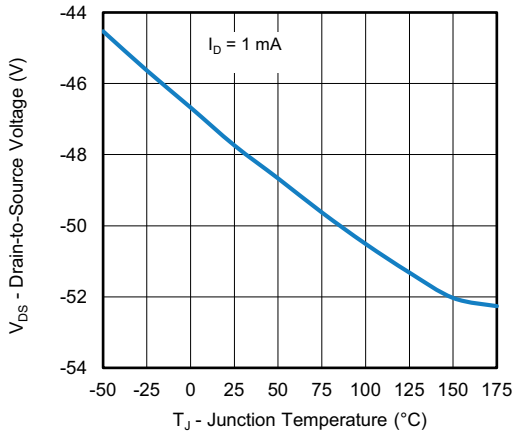
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



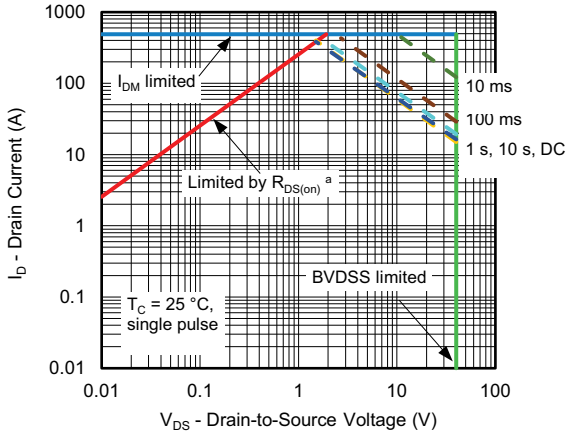
On-Resistance vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage



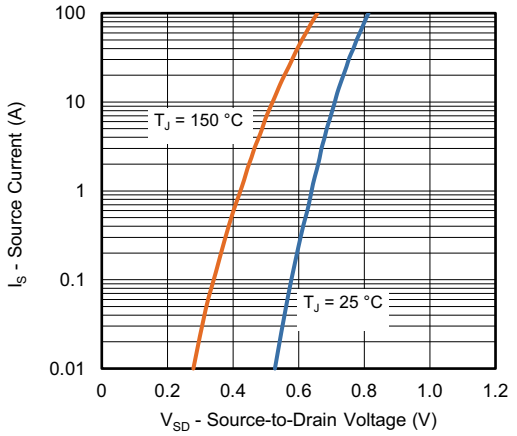
Drain Source Breakdown vs. Junction Temperature



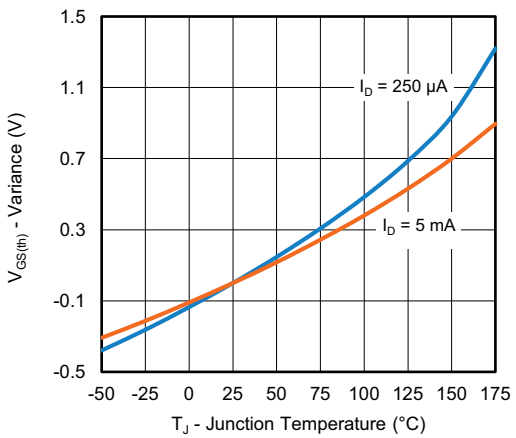
Safe Operating Area

Note

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

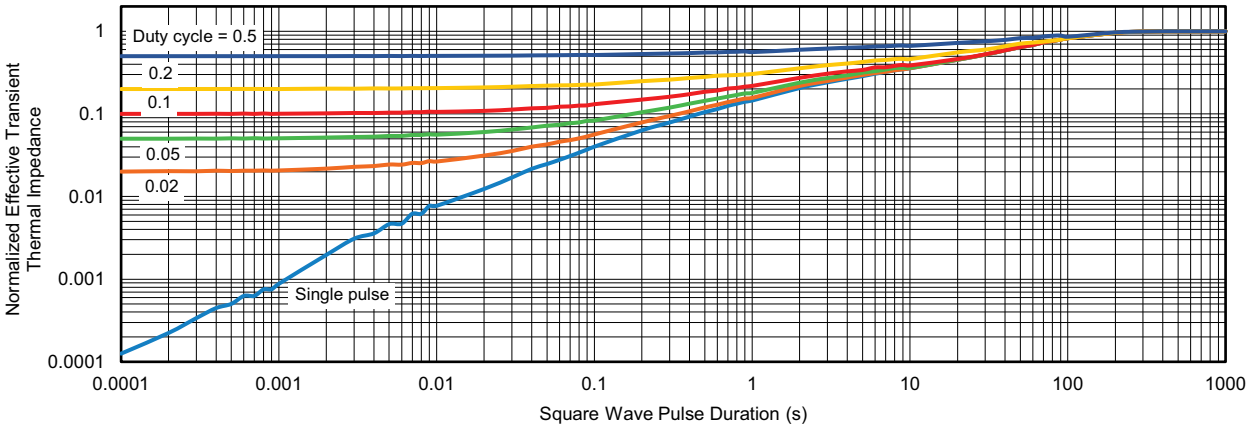


Source Drain Diode Forward Voltage

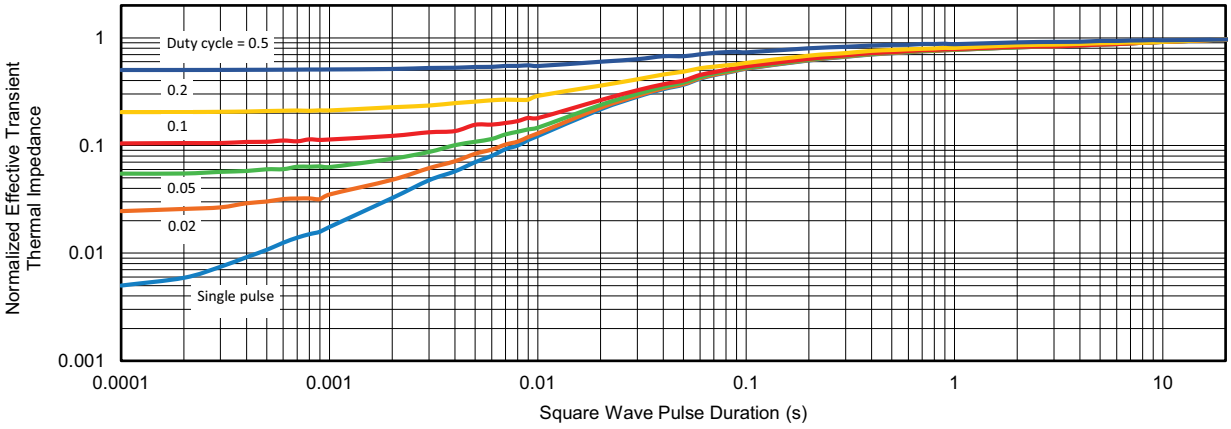


Threshold Voltage

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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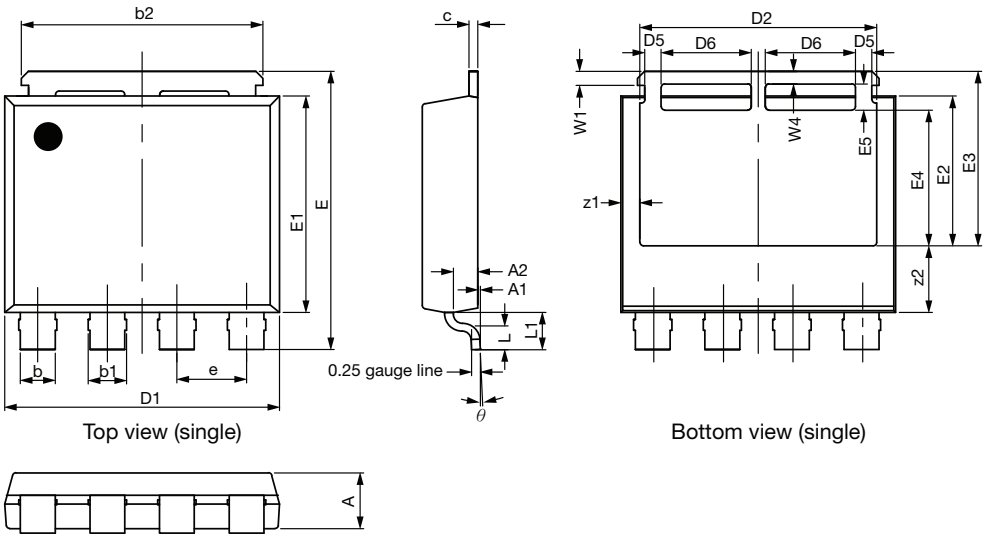
PowerPAK® 8 x 8L BWL Case Outline 2



Top view (single)

Bottom view (single)

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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