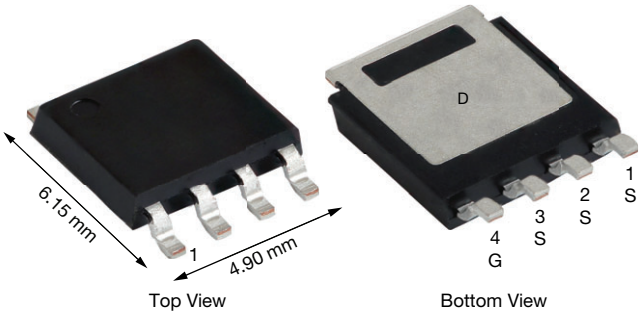
Automotive P-Channel 40 V (D-S) 175 °C MOSFET

PowerPAK® SO-8L



Top View | Bottom View

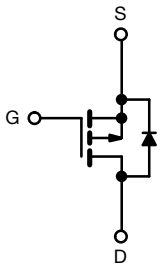
FEATURES

- 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

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE



P-Channel MOSFET

PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at V_{GS} = -10 V	0.0048
$R_{DS(on)}$ (Ω) at V_{GS} = -4.5 V	0.0069
I_D (A)	-232
Configuration	Single
Package	PowerPAK SO-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 [a]		V_{GS}	± 20	
Continuous drain current	T_C = 25 °C [b]	I_D	-232	A
	T_C = 125 °C		-134	
Continuous source current (diode conduction) [b]		I_S	-232	
Pulsed drain current [c]		I_{DM}	-322	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	-55	
Single pulse avalanche energy		E_{AS}	154	mJ
Maximum power dissipation [c]	T_C = 25 °C	P_D	500	W
	T_C = 125 °C		166	
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 [e]	R_{thJA}	44	°C/W
Junction-to-case (drain)		R_{thJC}	0.3	

Notes

a. Not intended for continuous use with positive gate voltage > 5.0 V
b. Package limited
c. When mounted on 1" square PCB (FR4 material)
d. See solder profile (www.vishay.com/doc?73257). For PowerPAK SO-8L, 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. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %

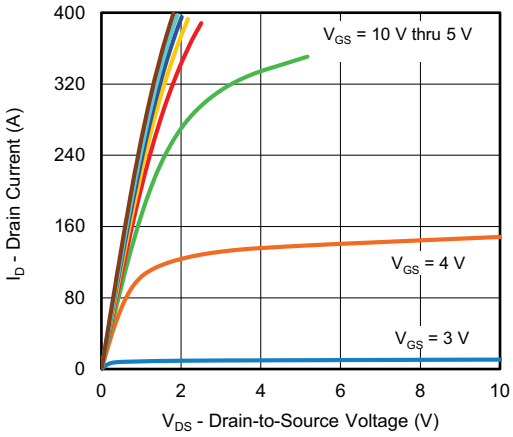
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0, I_D = -250 µA		-40	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 µA		-1.5	-2.0	-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} = -40 V	-	-	-1	µA
		V_{GS} = 0 V	V_{DS} = -40 V, T_J = 125 °C	-	-	-50	
		V_{GS} = 0 V	V_{DS} = -40 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 = -10 A	-	0.0037	0.0048	Ω
		V_{GS} = -10 V	I_D = -10 A, T_J = 125 °C	-	-	0.0078	
		V_{GS} = -10 V	I_D = -10 A, T_J = 175 °C	-	-	0.0094	
		V_{GS} = -4.5 V	I_D = -8 A	-	0.0053	0.0069	
Forward transconductance [b]	g_{fs}	V_{DS} = -15 V, I_D = -10 A		-	70	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = -25 V, f = 1 MHz	-	11 705	15 390	pF
Output capacitance	C_{oss}			-	849	1189	
Reverse transfer capacitance	C_{rss}			-	738	1034	
Total gate charge [c]	Q_g	V_{GS} = -10 V	V_{DS} = -20 V, I_D = -10 A	-	219	329	nC
Gate-source charge [c]	Q_{gs}			-	41	-	
Gate-drain charge [c]	Q_{gd}			-	38	-	
Gate resistance	R_g	f = 1 MHz		1.1	2.3	3.5	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = -20 V, R_L = 1.33 Ω, I_D ≅ -15 A, V_{GEN} = -10 V, R_g = 1 Ω		-	15	23	ns
Rise time [c]	t_r			-	24	36	
Turn-off delay time [c]	$t_{d(off)}$			-	100	150	
Fall time [c]	t_f			-	25	38	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed current [a]	I_{SM}			-	-	-600	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		-	31	62	ns
Body diode reverse recovery charge	Q_{rr}			-	28	56	nC
Reverse recovery fall time	t_a			-	17	-	ns
Reverse recovery rise time	t_b			-	14	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1.7	-	A

Notes

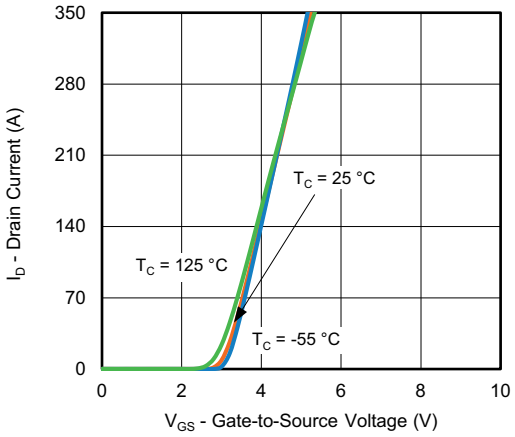
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
b. Guaranteed by design, not subject to production testing
c. Independent of operating temperature

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.

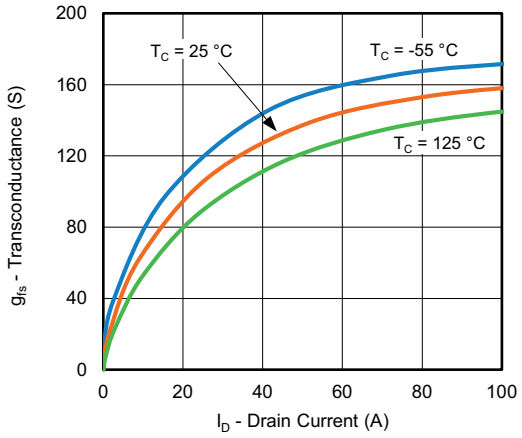
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



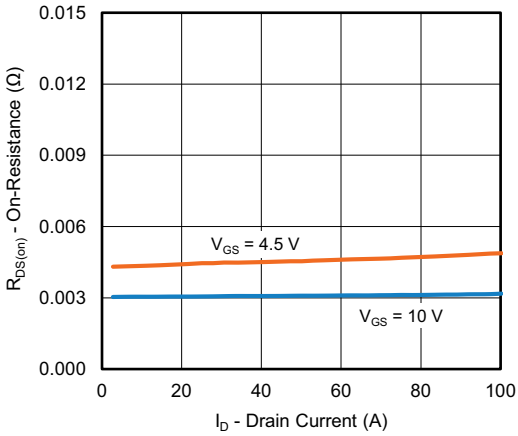
Output Characteristics



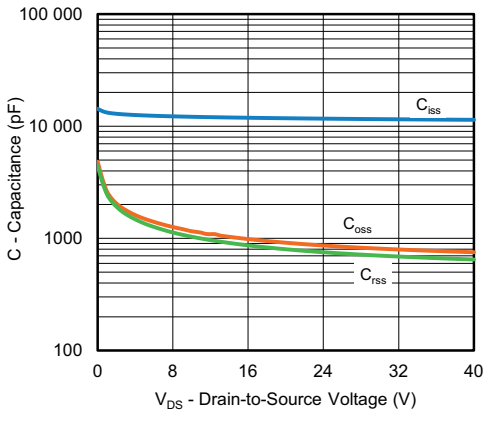
Transfer Characteristics



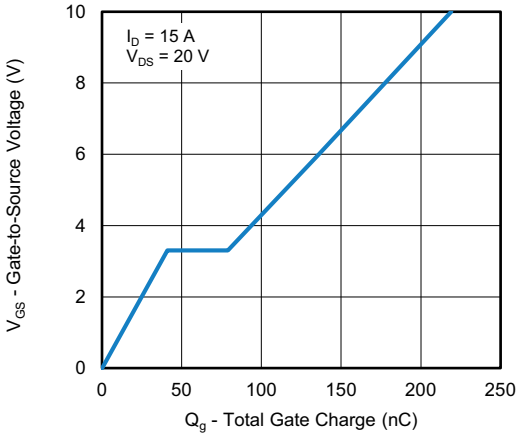
Transconductance



On-Resistance vs. Drain Current

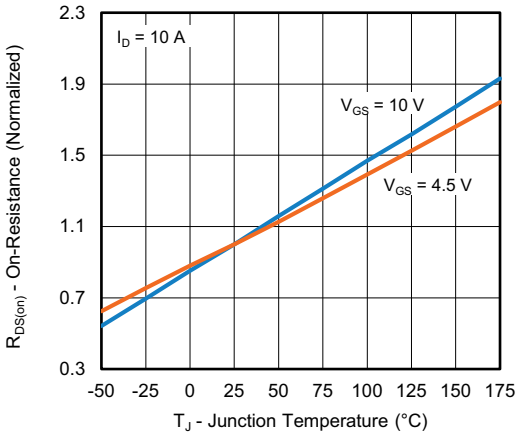


Capacitance

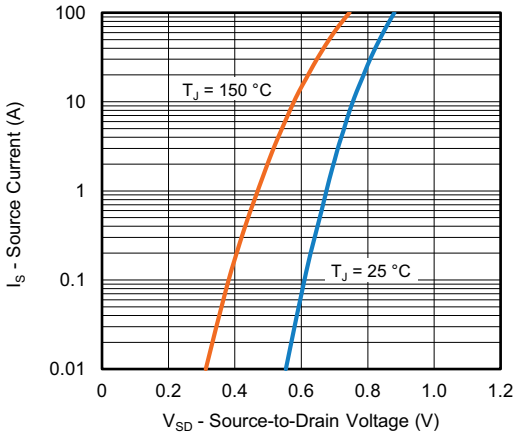


Gate Charge

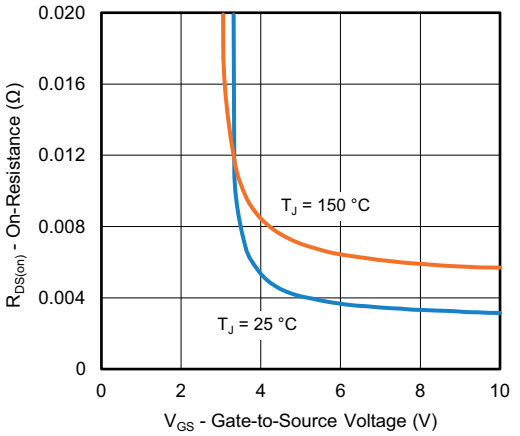
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



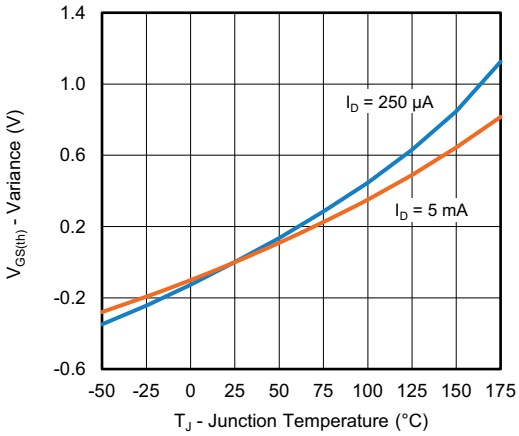
On-Resistance vs. Junction Temperature



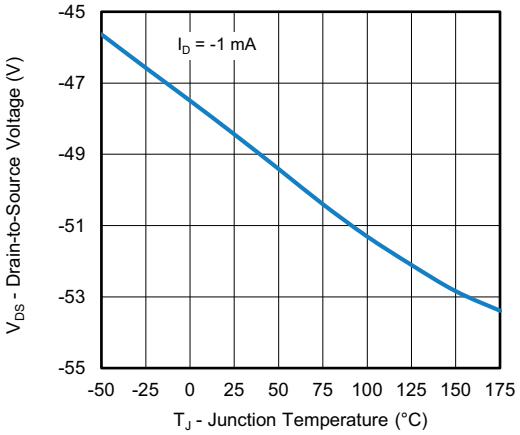
Source Drain Diode Forward Voltage



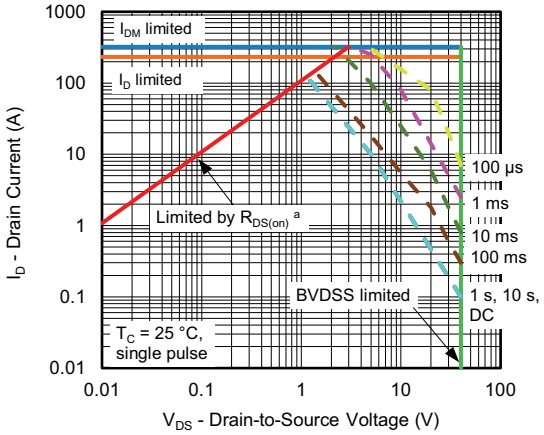
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Drain-Source Breakdown vs. Junction Temperature

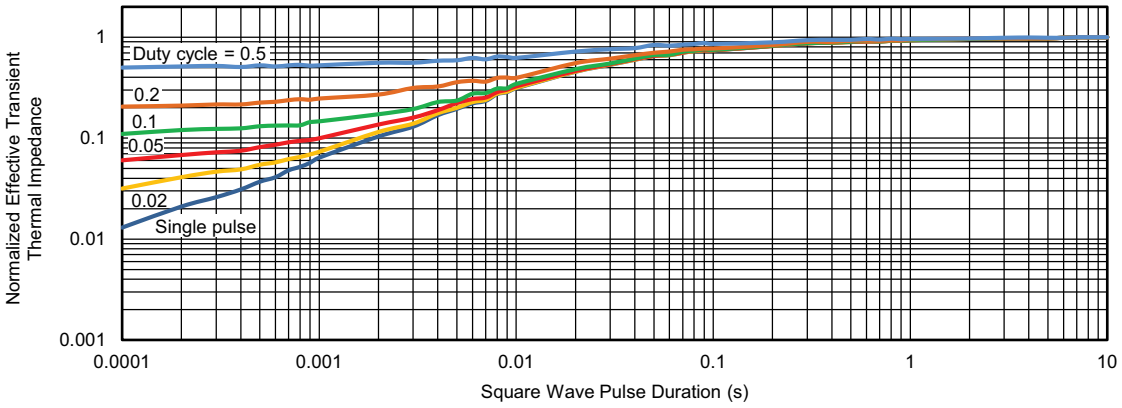


Safe Operating Area

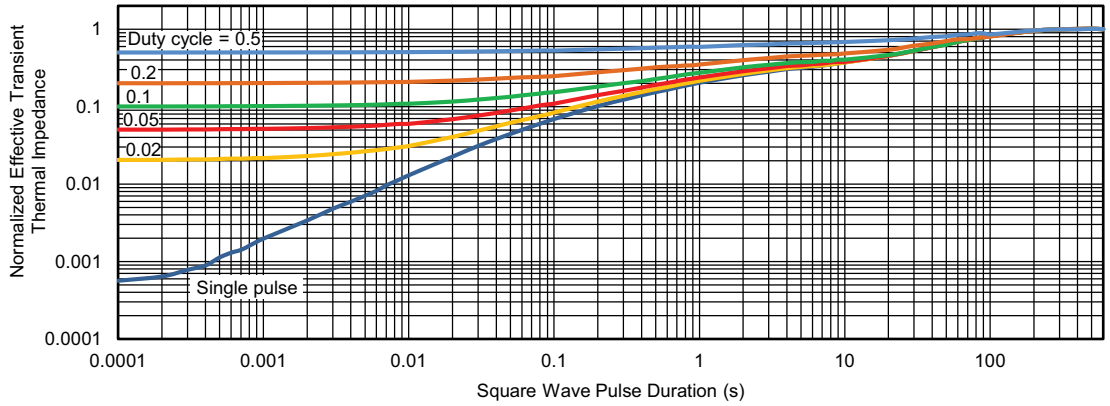
Note

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

THERMAL RATINGS (T_C = 25 °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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