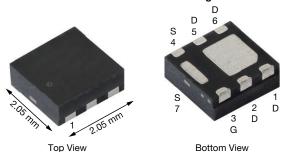
www.vishay.com

Vishay Siliconix

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

### PowerPAK® SC-70W-6L Single



Marking Code: QTXXXX

**ORDERING INFORMATION** 

Lead (Pb)-free and halogen-free

PRODUCT SUMMARY				
V <sub>DS</sub> (V)	40			
$R_{DS(on)}(\Omega)$ at $V_{GS} = 10 \text{ V}$	0.0144			
$R_{DS(on)}(\Omega)$ at $V_{GS} = 4.5 \text{ V}$	0.0200			
I <sub>D</sub> (A)	9			
Configuration	Single			

### **FEATURES**

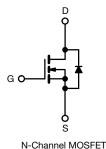
PowerPAK SC-70W SQA440CEJW

- TrenchFET® power MOSFET
- AEC-Q101 qualified
- Wettable flank terminals
- 100 % R<sub>a</sub> and UIS tested
- · Material categorization: for definitions of compliance please see www.vishav.com/doc?99912





HALOGEN FREE



(for detailed order number please see www.vishay.com/doc?79776)

/-6L		

<b>ABSOLUTE MAXIMUM RATINGS</b> (T <sub>C</sub> = 25 °C, unless PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-source voltage		V <sub>DS</sub>	40	,,	
Gate-source voltage		V <sub>GS</sub>	± 20	V	
Continuous drain current a	T <sub>C</sub> = 25 °C	ı	9		
	T <sub>C</sub> = 125 °C	I <sub>D</sub>	9		
Continuous source current (diode conduction) <sup>a</sup>		Is	9	А	
Pulsed drain current <sup>a</sup>		I <sub>DM</sub>	36		
Single pulse avalanche current	L = 0.1 mH	I <sub>AS</sub>	12.5		
Single pulse avalanche energy	L=0.11III	E <sub>AS</sub>	7.81	mJ	
Maximum power dissipation	T <sub>C</sub> = 25 °C	D	13.6	W	
	T <sub>C</sub> = 125 °C	P <sub>D</sub>	4.5		
Operating junction and storage temperature range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C	
Soldering recommendations (peak temperature) d, e			260	C	

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	LIMIT	UNIT	
Junction-to-ambient PC	CB mount c	$R_{thJA}$	90	°C/W	
Junction-to-case (drain)		R <sub>thJC</sub>	11	C/VV	

#### Notes

- a. Package limited
- b. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %
- c. When mounted on 1" square PCB (FR4 material)
- See solder profile (<a href="https://www.vishay.com/doc?73257">www.vishay.com/doc?73257</a>). The PowerPAK SC-70W-6L is a leadless package and features wettable flank terminals. The end of the lead terminal is plated with tin.
- e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components



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PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Static								
Drain-source breakdown voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		40	-	-	V	
Gate-source threshold voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$		1.2	1.7	2.2		
Gate-source leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$		-	-	± 100	nA	
Zero gate voltage drain current		$V_{GS} = 0 V$	V <sub>DS</sub> = 40 V	-	-	1		
	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 40 V, T <sub>J</sub> = 125 °C	-	-	50	μΑ	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 40 V, T <sub>J</sub> = 175 °C	-	-	250		
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> ≥ 5 V	8	-	-	Α	
Drain-source on-state resistance a	• •	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 5 A	-	0.0116	0.0144	Ω	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 5 A, T <sub>J</sub> = 125 °C	-	-	0.0224		
	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 5 A, T <sub>J</sub> = 175 °C	-	-	0.0263		
		V <sub>GS</sub> = 4.5 V	I <sub>D</sub> = 4 A	-	0.0161	0.0200		
Forward transconductance b	9 <sub>fs</sub>	$V_{DS}$	= 15 V, I <sub>D</sub> = 5 A	-	28	-	S	
Dynamic <sup>b</sup>		•						
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 25 V, f = 1 MHz	-	608	880	pF	
Output capacitance	Coss			-	167	245		
Reverse transfer capacitance	C <sub>rss</sub>	1		-	20	29		
Total gate charge c	Qg			-	11.4	17.5	nC	
Gate-source charge <sup>c</sup>	Q <sub>gs</sub>	V <sub>GS</sub> = 10 V	$V_{DS} = 20 \text{ V}, I_{D} = 5 \text{ A}$	-	2.1	-		
Gate-drain charge c	Q <sub>gd</sub>	1		-	2.0	-		
Gate resistance	$R_g$	f = 1 MHz		1.2	2.4	3.6	Ω	
Turn-on delay time <sup>c</sup>	t <sub>d(on)</sub>	$V_{DD} = 20 \text{ V, } R_L = 4 \Omega$ $I_D \cong 5 \text{ A, } V_{GEN} = 10 \text{ V, } R_g = 1 \Omega$		-	8	12	- ns	
Rise time <sup>c</sup>	t <sub>r</sub>			-	4	6		
Turn-off delay time c	t <sub>d(off)</sub>			-	17	26		
Fall time <sup>c</sup>	t <sub>f</sub>			-	3	5		
Source-Drain Diode Ratings and Charact	eristics <sup>b</sup>	•						
Pulsed current a	I <sub>SM</sub>			-	-	9	Α	
Forward voltage	V <sub>SD</sub>	I <sub>F</sub> = 5 A, V <sub>GS</sub> = 0 V		-	0.81	1.2	V	
Body diode reverse recovery time	t <sub>rr</sub>			-	15	30	ns	
Body diode reverse recovery charge	Q <sub>rr</sub>	I <sub>F</sub> = 2 A, di/dt = 100 A/μs		-	7	14	nC	
Reverse recovery fall time	ta			-	8	-		
Reverse recovery rise time	t <sub>b</sub>			-	7	-	ns	
Body diode peak reverse recovery current	I <sub>RM(REC)</sub>			-	-0.8	-	Α	

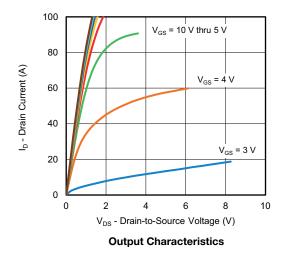
#### Notes

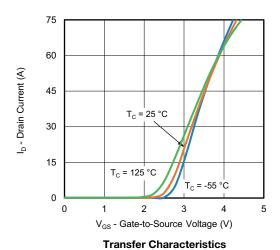
- a. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %
- b. Guaranteed by design, not subject to production testing
- c. Independent of operating temperature

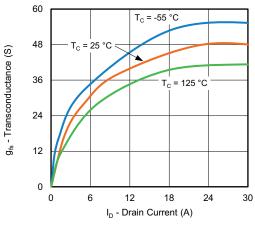
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

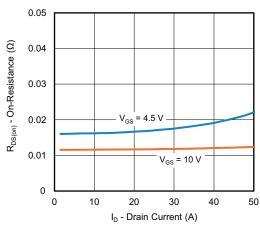


### **TYPICAL CHARACTERISTICS** (T<sub>A</sub> = 25 °C, unless otherwise noted)

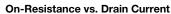


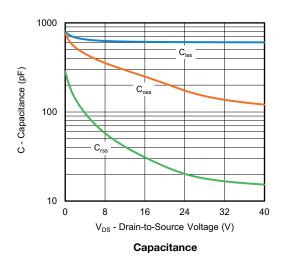


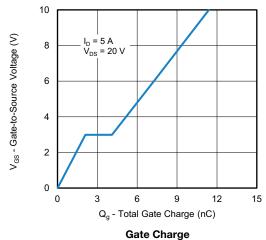






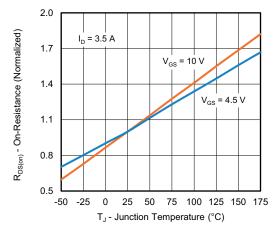




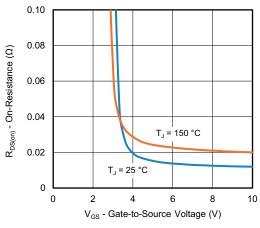




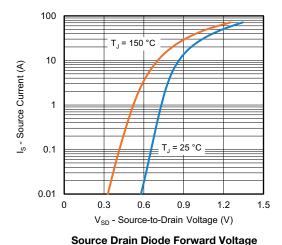
### **TYPICAL CHARACTERISTICS** (T<sub>A</sub> = 25 °C, unless otherwise noted)



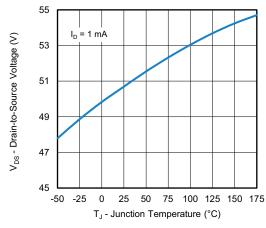
On-Resistance vs. Junction Temperature



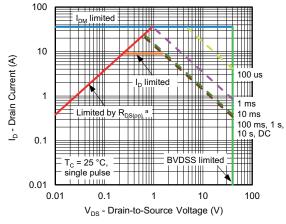
On-Resistance vs. Gate-to-Source Voltage



0.5
0.2
0.1
-0.1  $I_D = 5 \text{ mA}$ -0.7
-1.0
-50 -25 0 25 50 75 100 125 150 175



**Drain Source Breakdown vs. Junction Temperature** 



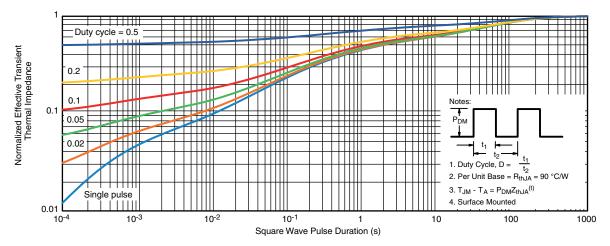
Safe Operating Area

### Note

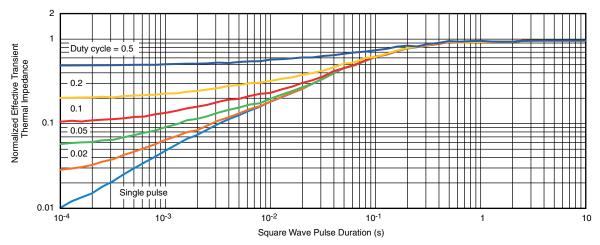
a.  $V_{GS}$  > minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



### **THERMAL RATINGS** (T<sub>A</sub> = 25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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