

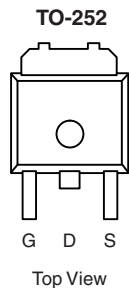


# P-Channel 40-V (D-S), 175 °C MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	r <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>d</sup>
- 40	0.0094 at V <sub>GS</sub> = - 10 V	- 50
	0.0145 at V <sub>GS</sub> = - 4.5 V	- 50

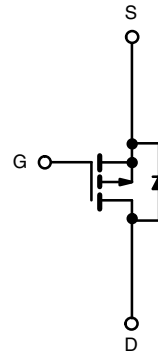
## FEATURES

- TrenchFET<sup>®</sup> Power MOSFETS
- 175 °C Junction Temperature



Drain Connected to Tab

Ordering Information: SUD50P04-09L  
SUD50P04-09L (Lead (Pb)-free)



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	- 40	V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		
Continuous Drain Current (T <sub>J</sub> = 175 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	- 50 <sup>d</sup>	A
	T <sub>C</sub> = 125 °C		- 50 <sup>d</sup>	
Pulsed Drain Current	I <sub>DM</sub>	- 100		
Avalanche Current	I <sub>AS</sub>	- 50		
Single Avalanche Energy <sup>a</sup>	L = 0.1 mH	E <sub>AS</sub>	125	mJ
Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	136 <sup>c</sup>	W
	T <sub>A</sub> = 25 °C		3 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient <sup>b</sup>	t ≤ 10 sec	R <sub>thJA</sub>	15	18	°C/W
	Steady State		40	50	
Junction-to-Case		R <sub>thJC</sub>	0.82	1.1	

Notes:

- a. Duty cycle ≤ 1 %.
- b. When Mounted on 1" square PCB (FR-4 material).
- c. See SOA curve for voltage derating.
- d. Package limited.

\* Pb containing terminations are not RoHS compliant, exemptions may apply.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 1		- 3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -32\text{ V}, V_{GS} = 0\text{ V}$			- 1	$\mu\text{A}$
		$V_{DS} = -32\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			- 50	
		$V_{DS} = -32\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			- 150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -10\text{ V}$	- 50			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -24\text{ A}$		0.0075	0.0094	$\Omega$
		$V_{GS} = -10\text{ V}, I_D = -50\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.014	
		$V_{GS} = -10\text{ V}, I_D = -50\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.017	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{GS} = -4.5\text{ V}, I_D = -18\text{ A}$		0.0115	0.0145	S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = -25\text{ V}, f = 1\text{ MHz}$		4800		$\text{pF}$
Output Capacitance	$C_{oss}$			700		
Reverse Transfer Capacitance	$C_{rss}$			550		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = -20\text{ V}, V_{GS} = -10\text{ V}, I_D = -50\text{ A}$		102	150	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			18.5		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			27		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = -20\text{ V}, R_L = 0.4\text{ }\Omega$ $I_D \cong -50\text{ A}, V_{GEN} = -10\text{ V}, R_G = 6\text{ }\Omega$		10	15	$\text{ns}$
Rise Time <sup>c</sup>	$t_r$			60	90	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			145	220	
Fall Time <sup>c</sup>	$t_f$			140	220	
<b>Source-Drain Diode Ratings and Characteristics</b> ( $T_C = 25\text{ }^\circ\text{C}$ ) <sup>b</sup>						
Continuous Current	$I_S$				- 50	A
Pulsed Current	$I_{SM}$				- 100	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = -50\text{ A}, V_{GS} = 0\text{ V}$		- 1.0	- 1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = -50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		55	85	ns

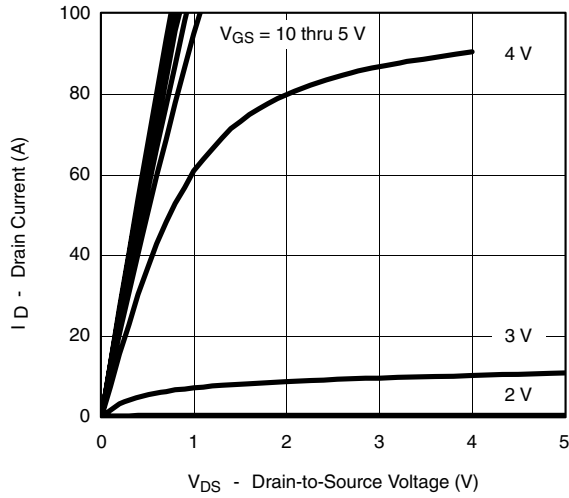
## Notes:

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

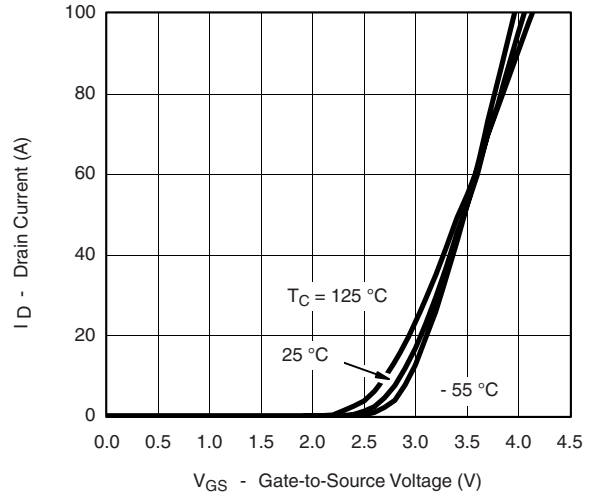
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



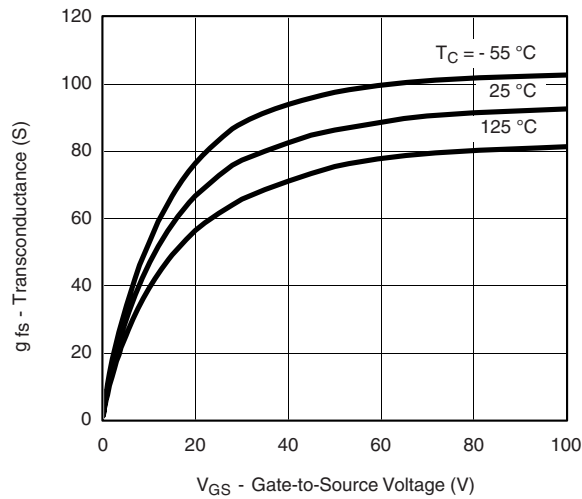
**TYPICAL CHARACTERISTICS** 25 °C unless noted



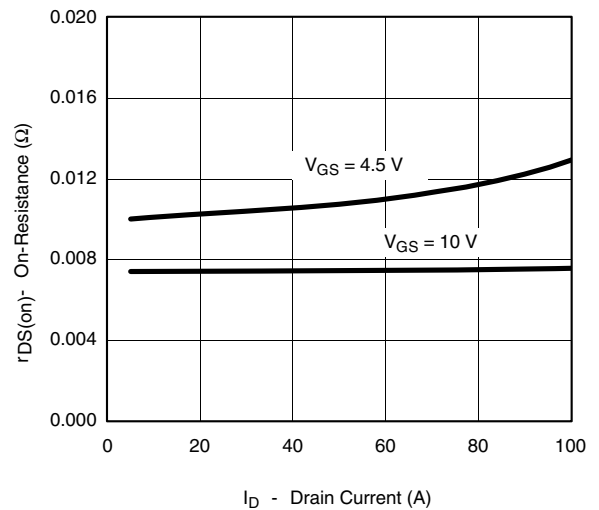
**Output Characteristics**



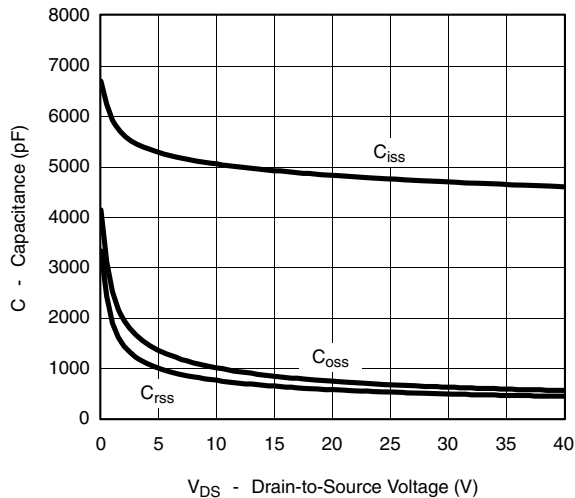
**Transfer Characteristics**



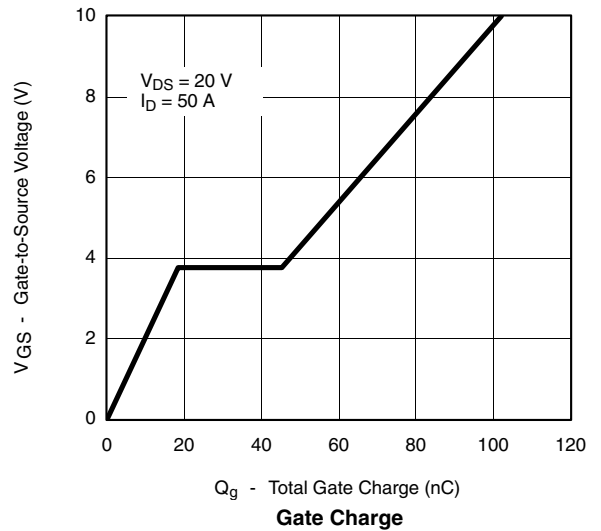
**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**



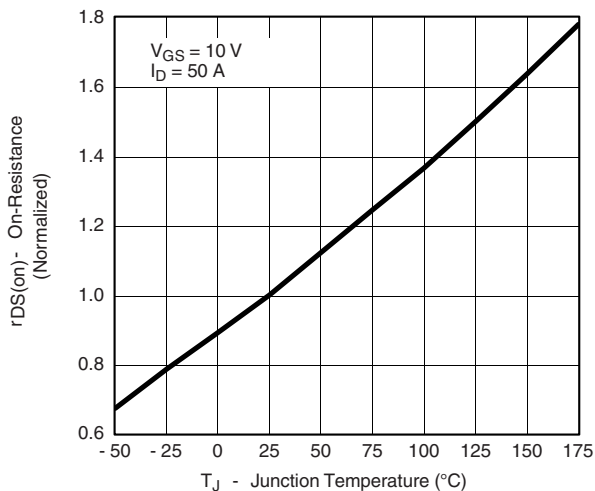
**Gate Charge**

# SUD50P04-09L

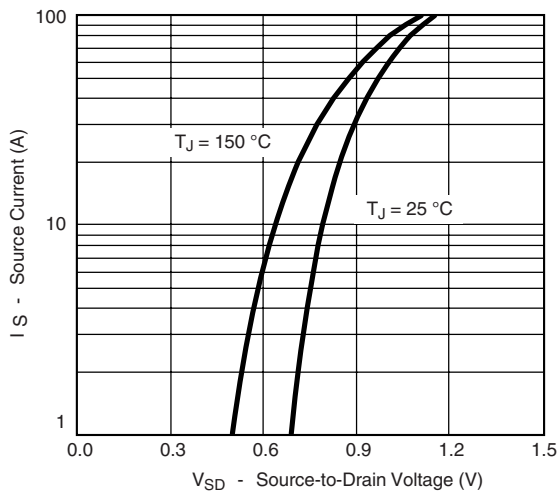


Vishay Siliconix

## TYPICAL CHARACTERISTICS 25 °C unless noted

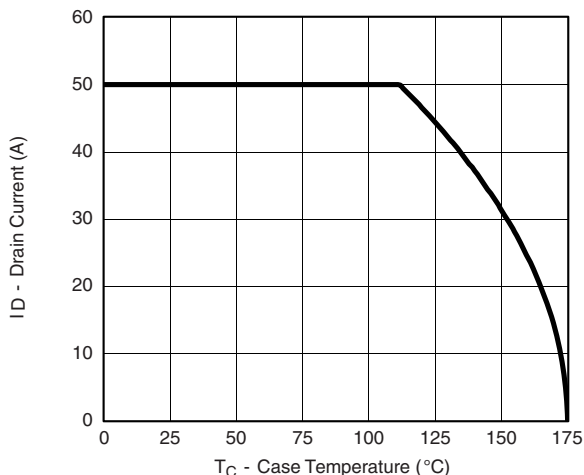


On-Resistance vs. Junction Temperature

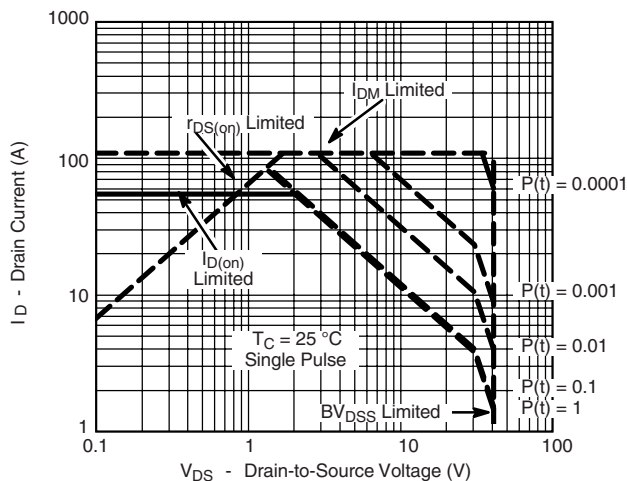


Source-Drain Diode Forward Voltage

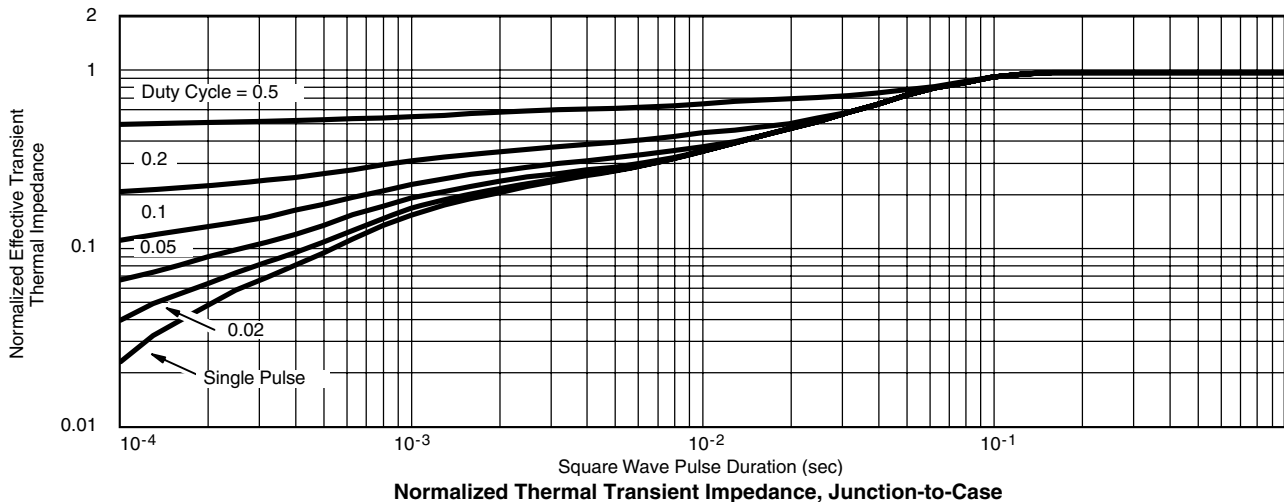
## THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?72243>.



## Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.