



# N-Channel 40-V (D-S), 175 °C MOSFET

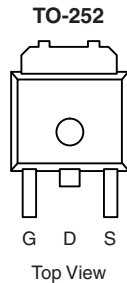
PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>c</sup>
40	0.0054 at $V_{GS} = 10$ V	115
	0.0069 at $V_{GS} = 4.5$ V	102

### FEATURES

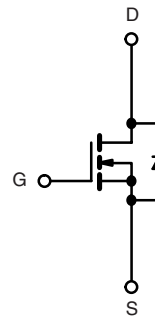
- TrenchFET<sup>®</sup> Power MOSFETS
- 175 °C Junction Temperature



RoHS COMPLIANT



Drain Connected to Tab



Ordering Information: SUD50N04-05L-E3 (Lead (Pb)-free)

N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	115 <sup>c</sup>
		$T_C = 100$ °C	81 <sup>c</sup>
Pulsed Drain Current	$I_{DM}$	100	A
Single Pulse Avalanche Current	$I_{AS}$	50	
Single Pulse Repetitive Avalanche Energy <sup>a</sup>	$E_{AS}$	125	
Power Dissipation	$P_D$	136	W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Junction-to-Ambient <sup>b</sup>	$R_{thJA}$	$t \leq 10$ sec	15	18	°C/W
		Steady State	40	50	
Junction-to-Case	$R_{thJC}$	0.85	1.1		

Notes:

- Duty cycle  $\leq 1$  %.
- Surface Mounted on 1" FR4 board.
- Based on maximum allowable Junction Temperature. Package limitation current is 50 A.

<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	$I_{DSS}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0044	0.0054	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0083	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.0130	
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0055	0.0069	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$	20	80		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		5600		$\text{pF}$
Output Capacitance	$C_{oss}$			590		
Reverse Transfer Capacitance	$C_{rss}$			365		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		90	135	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			19		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			19		
Gate Resistance	$R_g$			1.6		$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.4\text{ }\Omega$ $I_D \equiv 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		15	25	ns
Rise Time <sup>c</sup>	$t_r$			20	30	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			65	100	
Fall Time <sup>c</sup>	$t_f$			11	20	
<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>	$V_{SD}$	$I_F = 30\text{ A}, V_{GS} = 0\text{ V}$		0.90	1.50	V
Reverse Recovery Time	$t_{rr}$	$I_F = 30\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		30	45	ns

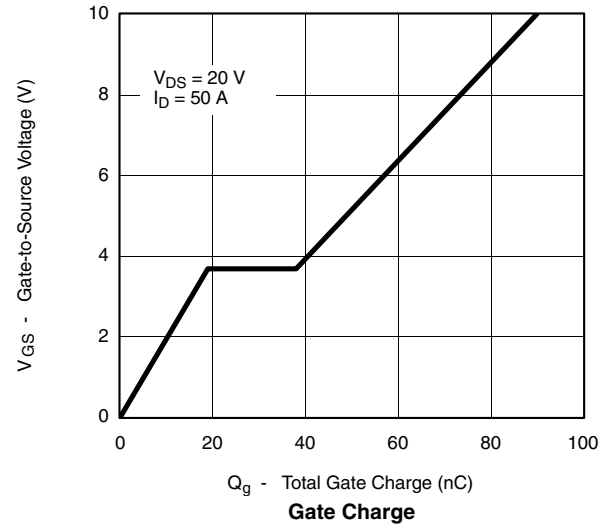
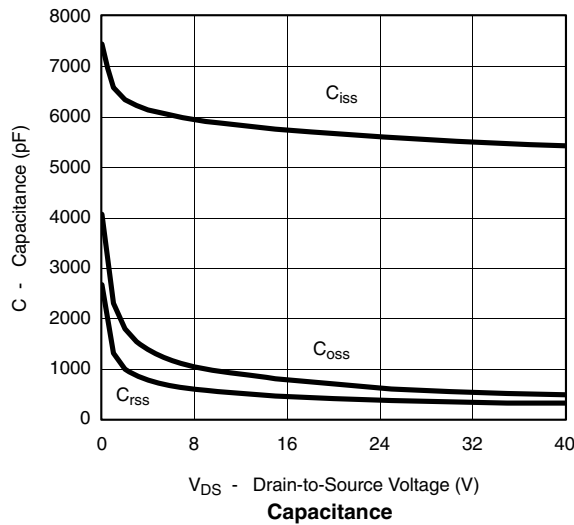
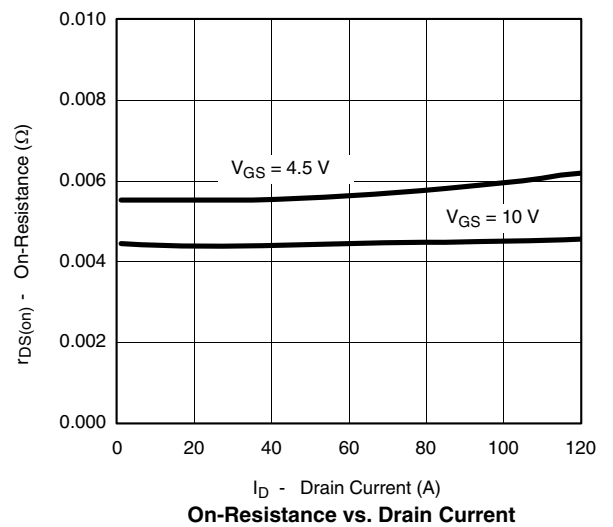
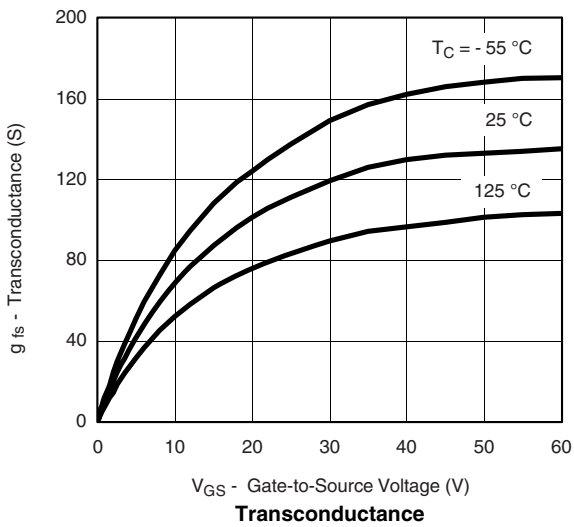
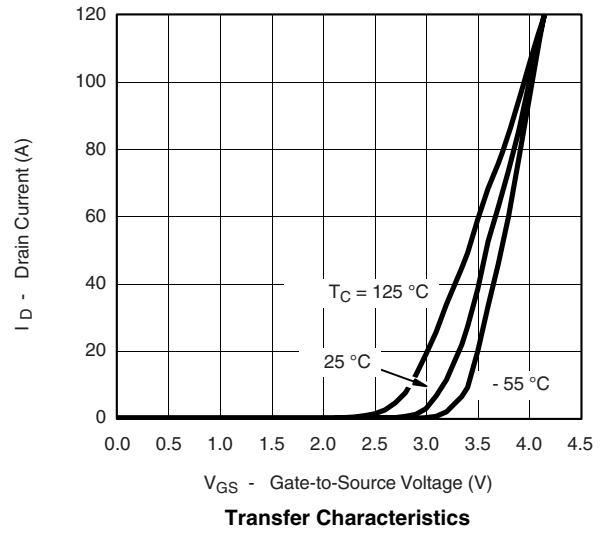
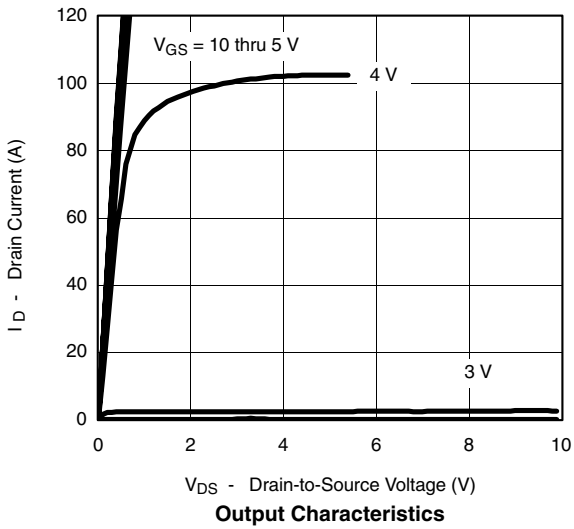
## Notes:

- 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

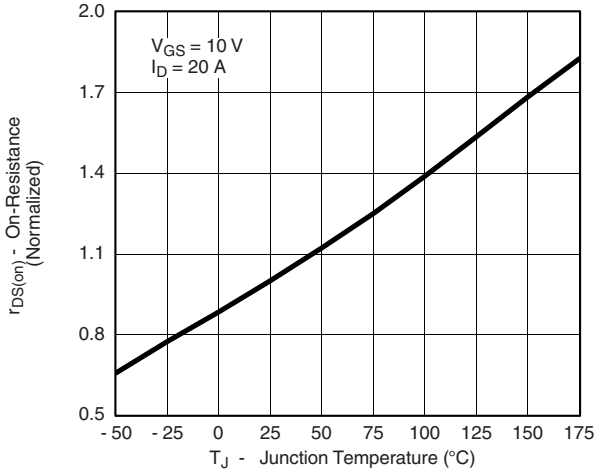


# SUD50N04-05L

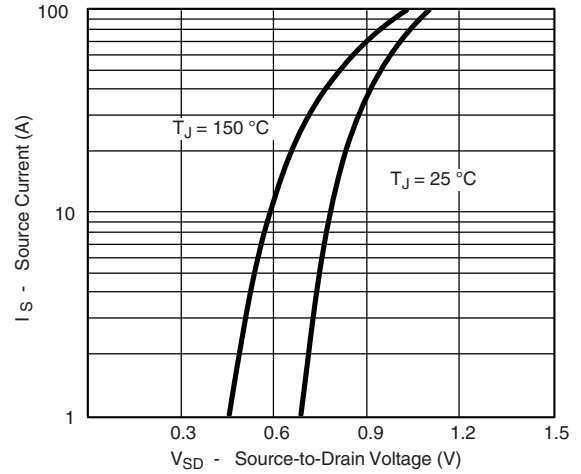


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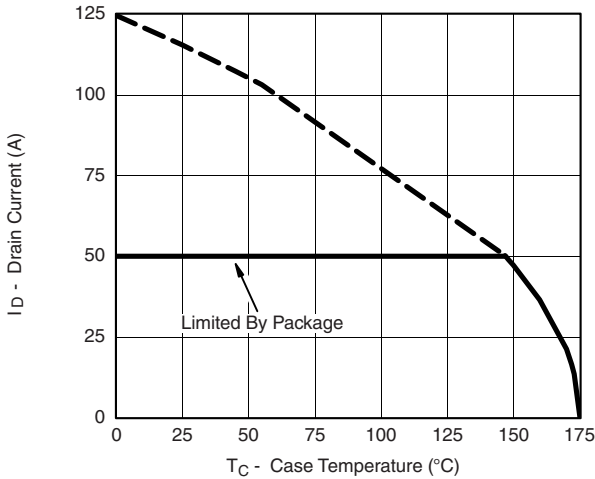


On-Resistance vs. Junction Temperature

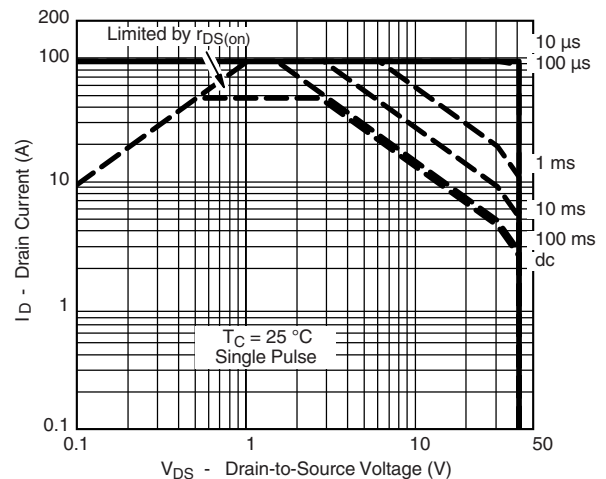


Source-Drain Diode Forward Voltage

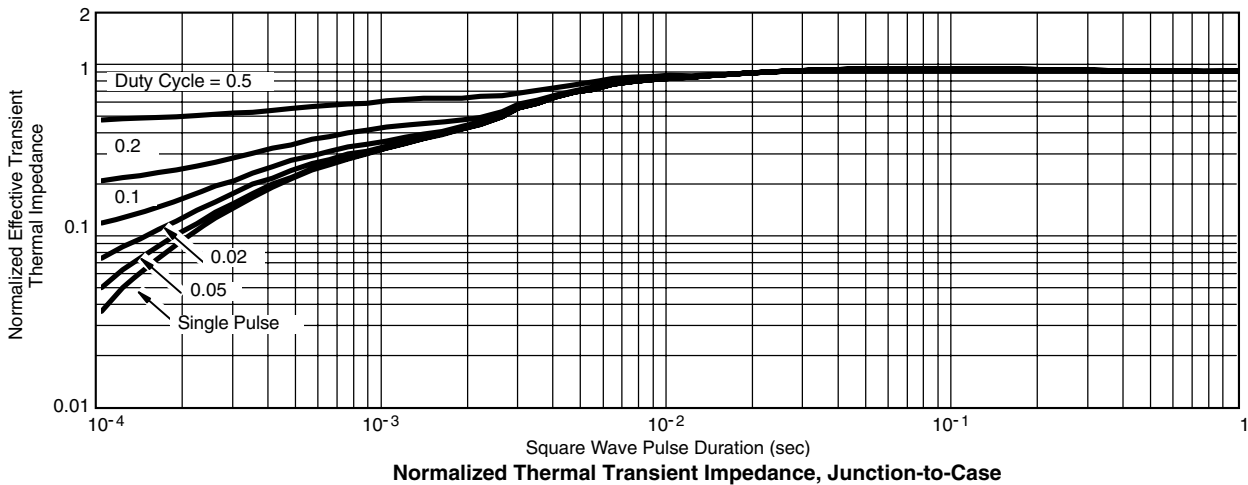
## THERMAL RATINGS



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?72786>.



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