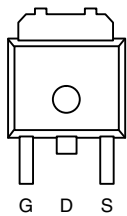


## N-Channel 20 V (D-S) 175 °C MOSFET

### PRODUCT SUMMARY

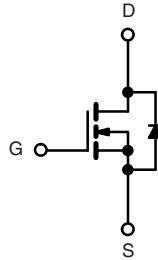
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a</sup>
20	0.0043 at V <sub>GS</sub> = 10 V	34
	0.006 at V <sub>GS</sub> = 4.5 V	28

#### TO-252



Top View

Drain Connected to Tab



N-Channel MOSFET

**Ordering Information:**  
SUD50N02-04P-E3 (Lead (Pb)-free)

### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 175 °C Junction Temperature
- PWM Optimized for High Efficiency
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### APPLICATIONS

- Synchronous Buck Converter
  - Low-Side
  - Desktop, Servers, Desknote
- Synchronous Rectification
  - POL

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	20	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	34 <sup>a</sup>
		T <sub>C</sub> = 25 °C	50 <sup>b</sup>
Pulsed Drain Current	I <sub>DM</sub>	100	A
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	8.3 <sup>a</sup>	
Avalanche Current <sup>c</sup>	I <sub>AS</sub>	50	
Avalanche Energy <sup>c</sup>	E <sub>AS</sub>	125	mJ
Maximum Power Dissipation	P <sub>D</sub>	T <sub>A</sub> = 25 °C	8.3 <sup>a</sup>
		T <sub>C</sub> = 25 °C	136
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
Maximum Junction-to-Ambient <sup>a</sup>	R <sub>thJA</sub>	t ≤ 10 s	15	°C/W
		Steady State	40	
Maximum Junction-to-Case	R <sub>thJC</sub>	0.85	1.1	

Notes:

- Surface mounted on FR4 board, t ≤ 10 s.
- Limited by package.
- Single pulse.

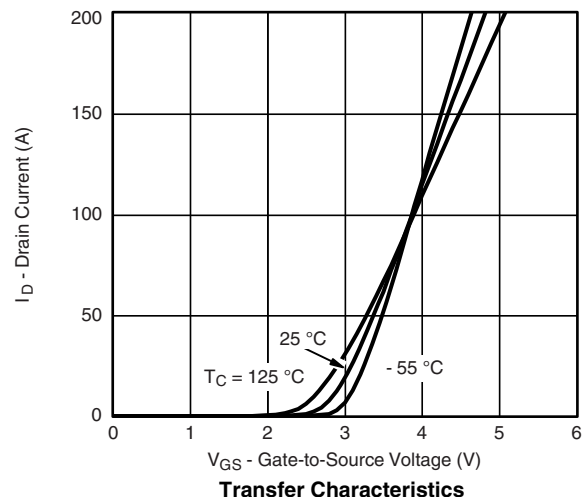
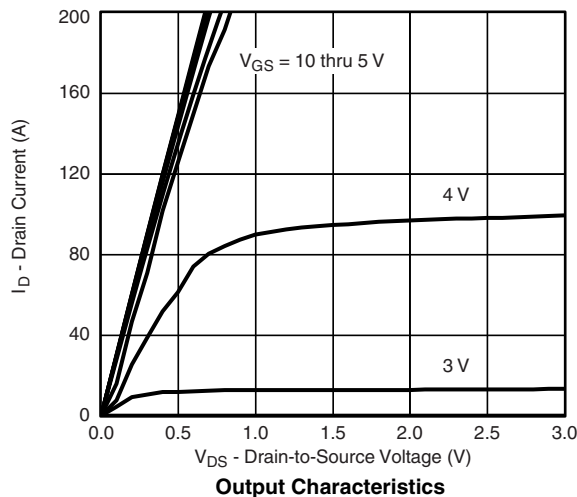
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	20			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	0.8		3.0	V
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50	
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V	50			A
Drain-Source On-State Resistance <sup>b</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.0035	0.0043	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C			0.0061	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A		0.0048	0.006	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A	15			S
<b>Dynamic<sup>a</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 10 V, f = 1 MHz		5000		pF
Output Capacitance	C <sub>oss</sub>			1650		
Reverse Transfer Capacitance	C <sub>rss</sub>			770		
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.6		Ω
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 50 A		40	60	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			14		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			13		
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, R <sub>L</sub> = 0.2 Ω I <sub>D</sub> ≅ 50 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω		20	30	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			20	30	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			50	75	
Fall Time <sup>c</sup>	t <sub>f</sub>			15	25	
<b>Source-Drain Diode Ratings and Characteristics</b> T <sub>C</sub> = 25 °C						
Pulsed Current	I <sub>SM</sub>				100	A
Diode Forward Voltage <sup>b</sup>	V <sub>SD</sub>	I <sub>F</sub> = 50 A, V <sub>GS</sub> = 0 V		0.9	1.5	V
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs		45	70	ns

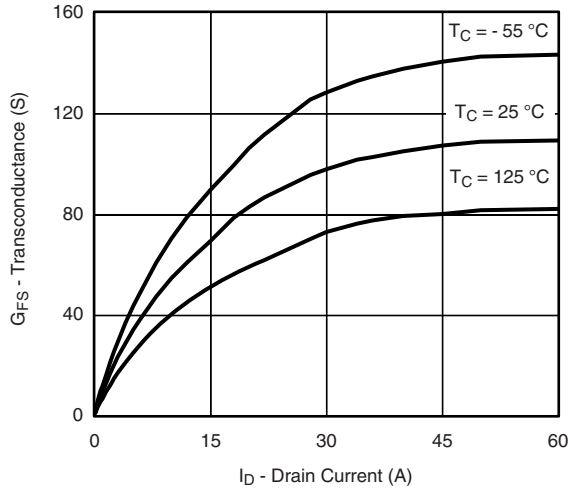
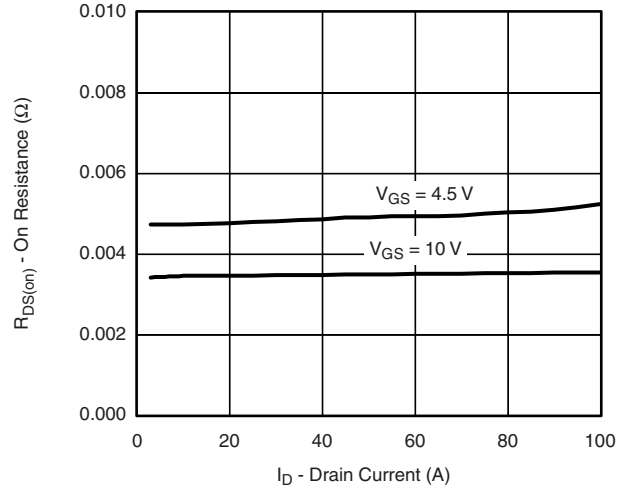
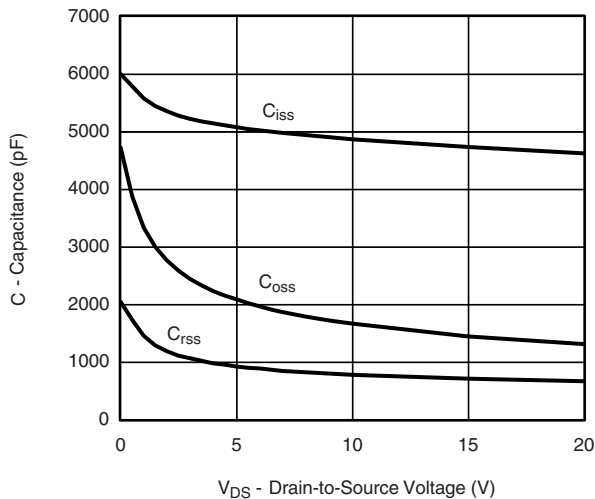
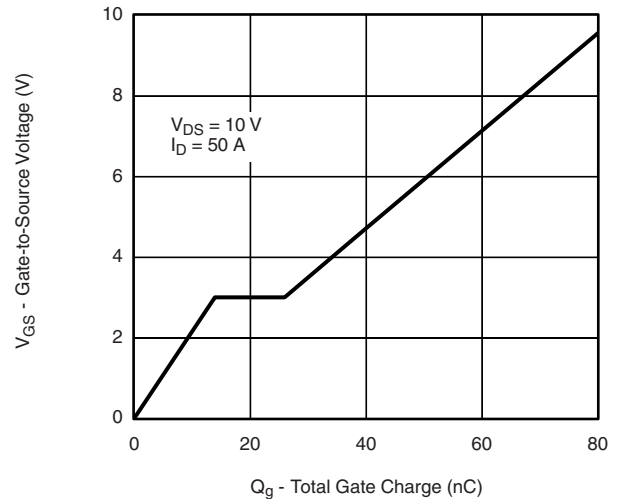
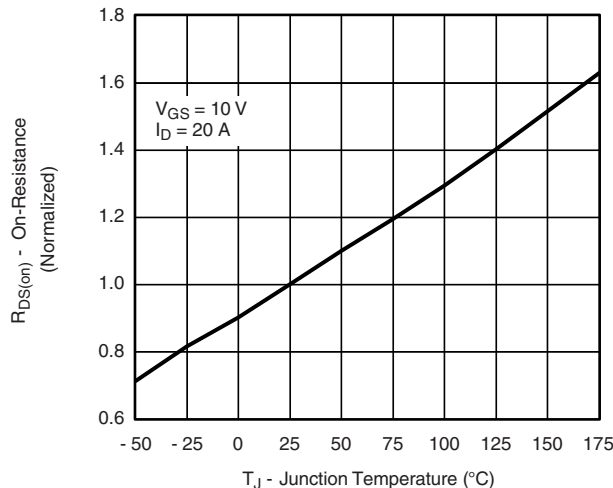
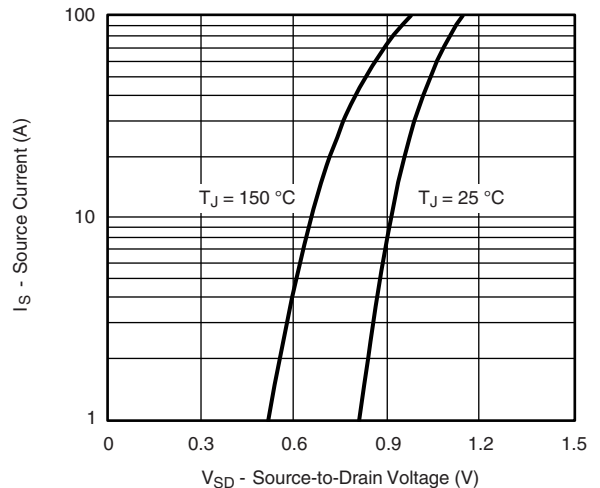
Notes:

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

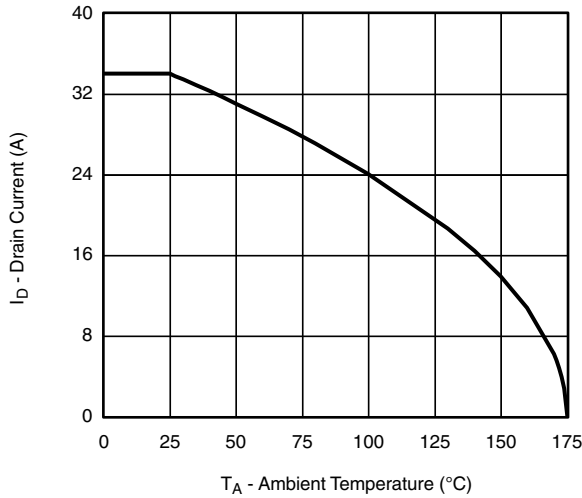
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

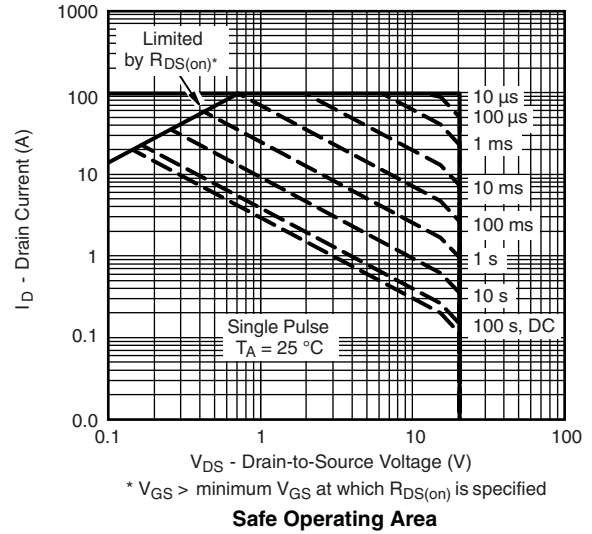


**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

**Transconductance**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

**Source-Drain Diode Forward Voltage**

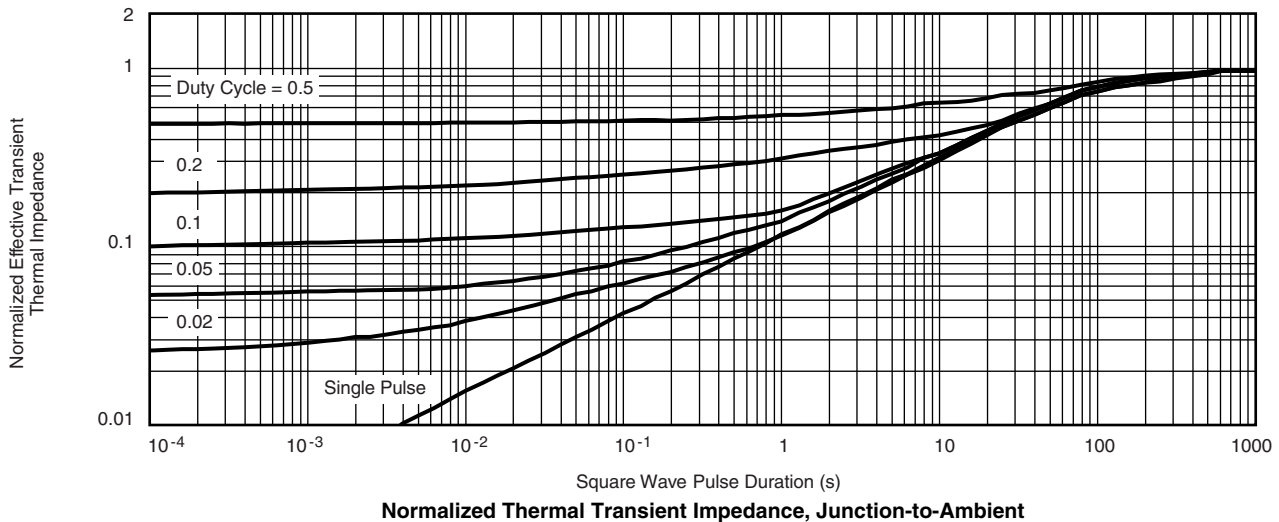
## THERMAL RATINGS



**Max. Avalanche and Drain Current vs. Ambient Temperature**



**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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