



## 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	0.0095 @ V <sub>GS</sub> = 10 V	20
	0.017 @ V <sub>GS</sub> = 4.5 V	15

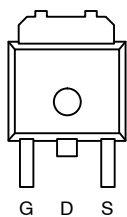
### FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- PWM Optimized for High Efficiency
- 100% R<sub>g</sub> Tested

### APPLICATIONS

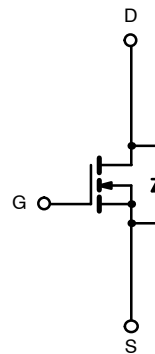
- High-Side Synchronous Buck DC/DC Conversion
  - Desktop
  - Server

TO-252



Top View

Drain Connected to Tab



N-Channel MOSFET

Ordering Information: SUD50N02-09P  
SUD50N02-09P—E3 (Lead Free)

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>	T <sub>A</sub> = 25°C	I <sub>D</sub>	20	A
	T <sub>C</sub> = 100°C		14	
Pulsed Drain Current		I <sub>DM</sub>	100	
Continuous Source Current (Diode Conduction) <sup>a</sup>		I <sub>S</sub>	4.3	
Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	29	
Single Pulse Avalanche Energy		E <sub>AS</sub>	42	mJ
Maximum Power Dissipation	T <sub>A</sub> = 25°C	P <sub>D</sub>	6.5 <sup>a</sup>	W
	T <sub>C</sub> = 25°C		39.5	
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>	t ≤ 10 sec	R <sub>thJA</sub>	19	23	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R <sub>thJC</sub>	3.1	3.8	

Notes

- Surface Mounted on FR4 Board, t ≤ 10 sec.
- Limited by package



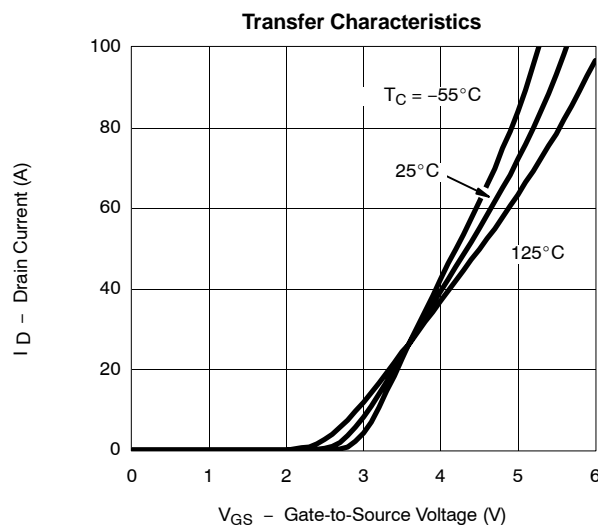
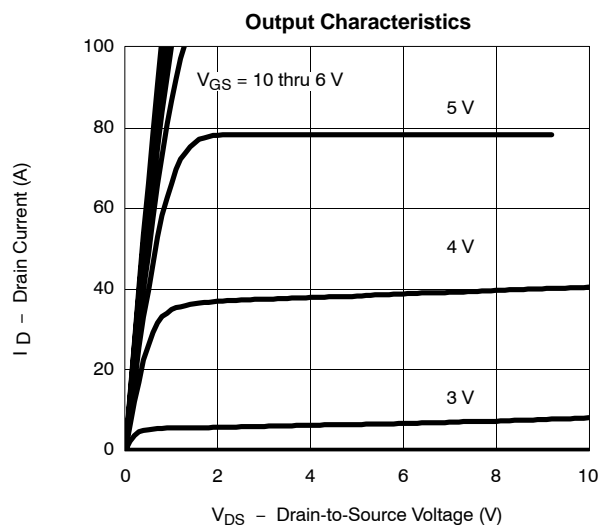
### SPECIFICATIONS (T<sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	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	
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		0.008	0.0095	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C			0.014	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A		0.0135	0.017	
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		1300		pF
Output Capacitance	C <sub>oss</sub>			470		
Reverse Transfer Capacitance	C <sub>rss</sub>			275		
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		10.5	16	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			4.2		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			4.0		
Gate Resistance	R <sub>g</sub>		1.6	4.0	6	
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		8	12	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			10	15	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			25	40	
Fall Time <sup>c</sup>	t <sub>f</sub>			12	20	
<b>Source-Drain Diode Ratings and Characteristic (T<sub>C</sub> = 25 °C)</b>						
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		1.2	1.5	V
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 50 A, di/dt = 100 A/μs		35	70	ns

#### Notes

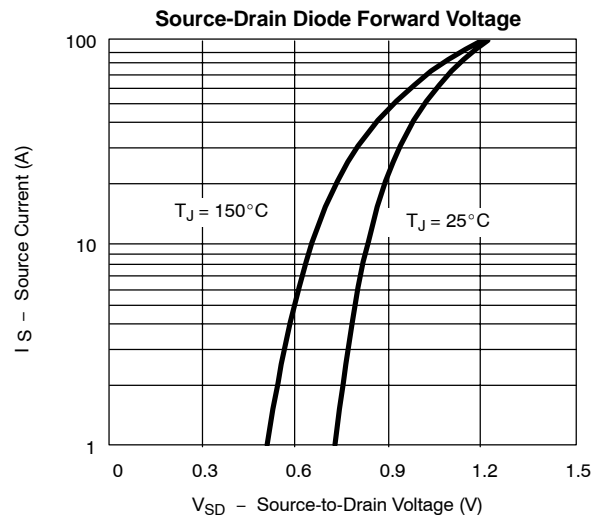
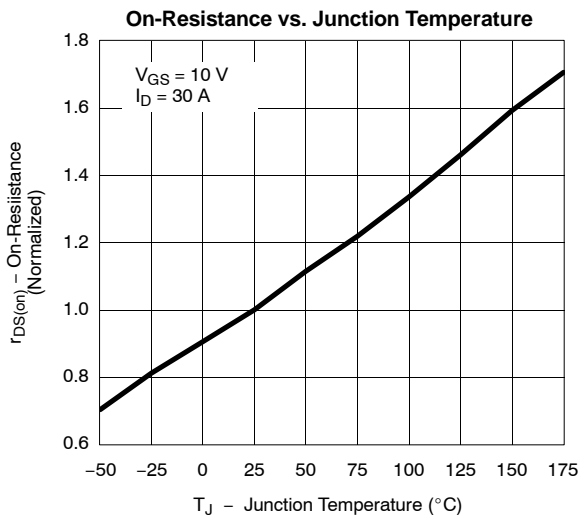
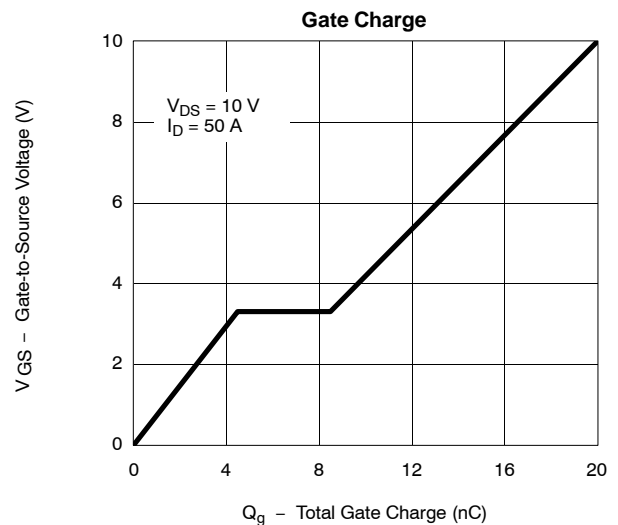
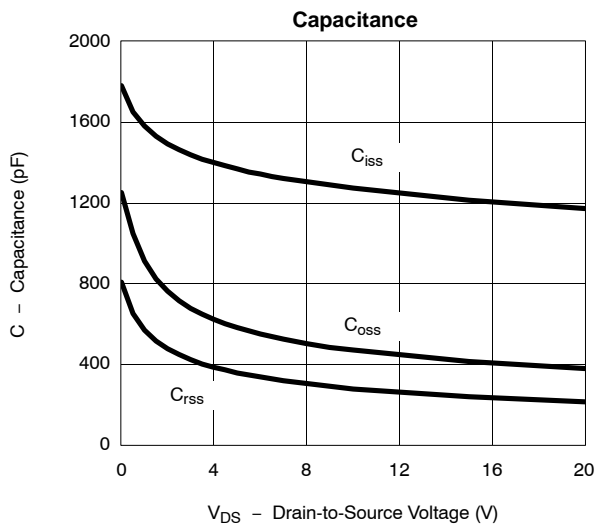
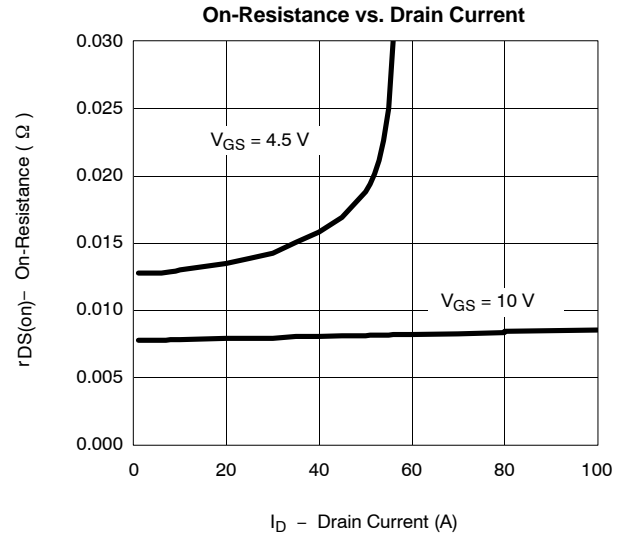
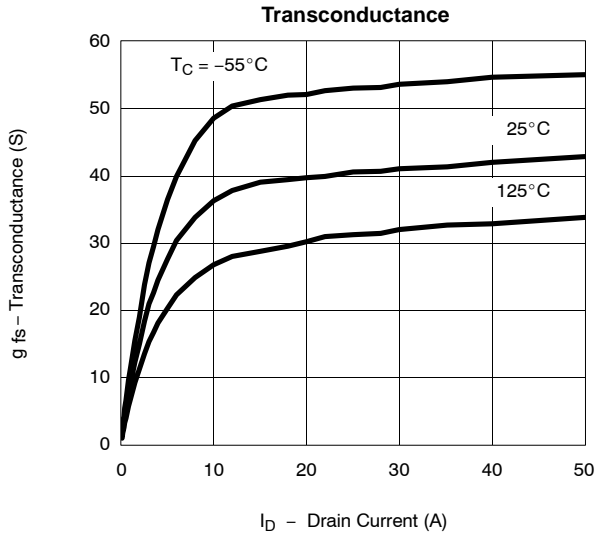
- Guaranteed by design, not subject to production testing.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Independent of operating temperature.

### TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)





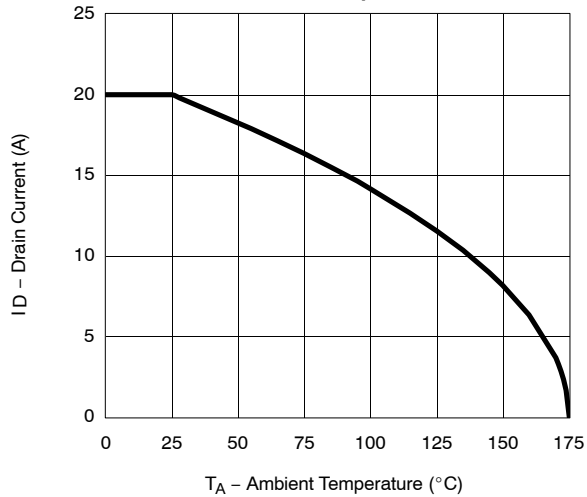
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**



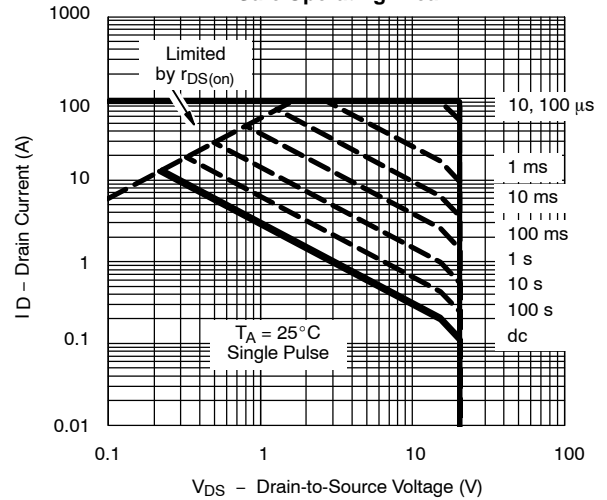


**THERMAL RATINGS**

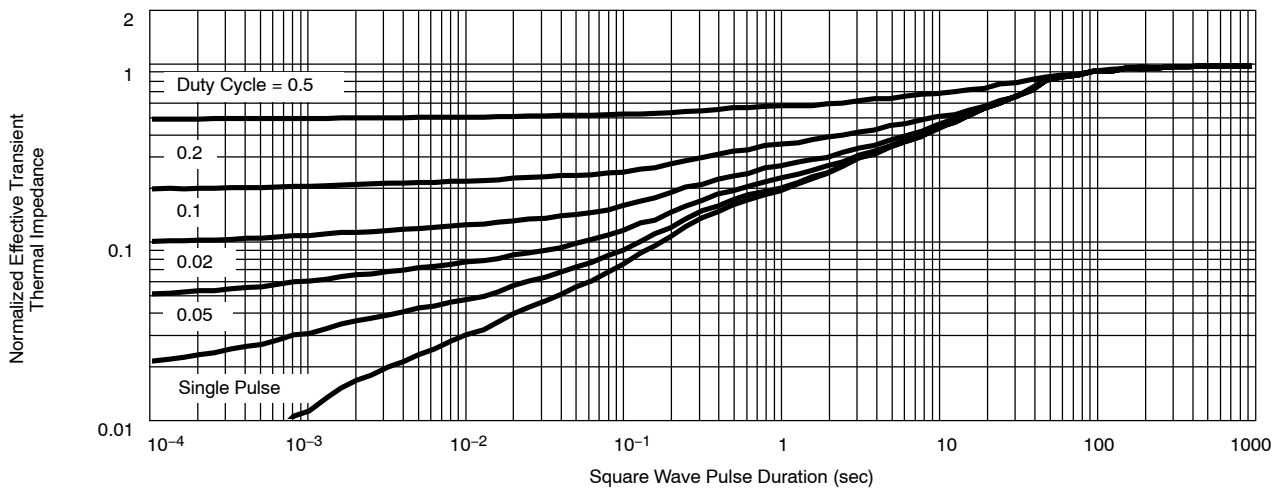
Maximum Drain Current vs. Ambient Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient





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