N-Channel 20-V (D-S) 175°C MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]
20	0.0095 @ V_{GS} = 10 V	20
	0.017 @ V_{GS} = 4.5 V	15

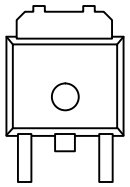
FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- PWM Optimized for High Efficiency
- 100% R_g Tested

APPLICATIONS

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

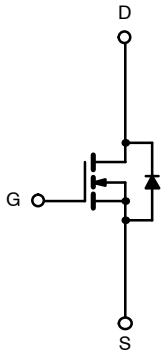
TO-252



Drain Connected to Tab

Top View

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



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current[a]	T_A = 25°C	I_D	20	A
	T_C= 100°C		14	
Pulsed Drain Current		I_{DM}	100	
Continuous Source Current (Diode Conduction)[a]		I_S	4.3	
Avalanche Current	L = 0.1 mH	I_{AS}	29	
Single Pulse Avalanche Energy		E_{AS}	42	mJ
Maximum Power Dissipation	T_A = 25°C	P_D	6.5[a]	W
	T_C = 25°C		39.5	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 175	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[a]	t ≤ 10 sec	R_{thJA}	19	23	°C/W
	Steady State		40	50	
Maximum Junction-to-Case		R_{thJC}	3.1	3.8	

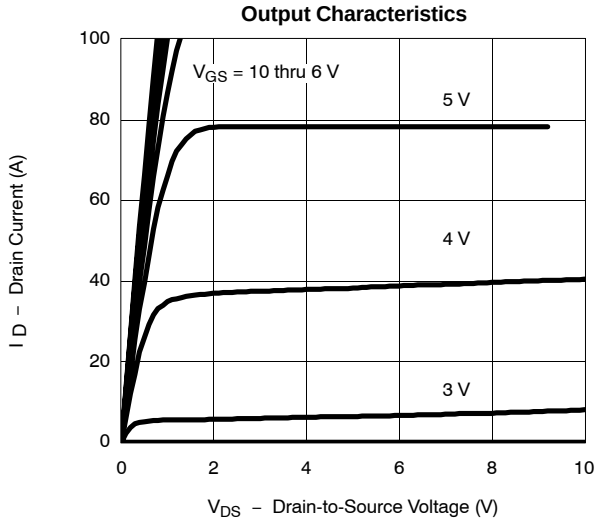
Notes
a. Surface Mounted on FR4 Board, t ≤ 10 sec.
b. Limited by package

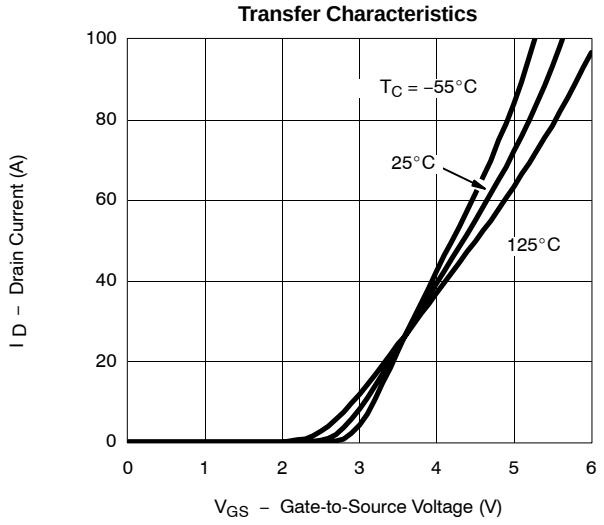
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ[a]	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA	20			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	0.8		3.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	μA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 125°C			50	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	50			A
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.008	0.0095	Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125°C			0.014	
		V_{GS} = 4.5 V, I_D = 20 A		0.0135	0.017	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 20 A	15			S
Dynamic[a]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 10 V, f = 1 MHz		1300		pF
Output Capacitance	C_{oss}			470		
Reverse Transfer Capacitance	C_{rss}			275		
Total Gate Charge[c]	Q_g	V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 50 A		10.5	16	nC
Gate-Source Charge[c]	Q_{gs}			4.2		
Gate-Drain Charge[c]	Q_{gd}			4.0		
Gate Resistance	R_g		1.6	4.0	6	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 10 V, R_L = 0.2 Ω I_D ≅ 50 A, V_{GEN} = 10 V, R_g = 2.5 Ω		8	12	ns
Rise Time[c]	t_r			10	15	
Turn-Off Delay Time[c]	$t_{d(off)}$			25	40	
Fall Time[c]	t_f			12	20	
Source-Drain Diode Ratings and Characteristic (T_C = 25°C)						
Pulsed Current	I_{SM}				100	A
Diode Forward Voltage[b]	V_{SD}	I_F = 50 A, V_{GS} = 0 V		1.2	1.5	V
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 50 A, di/dt = 100 A/μs		35	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.

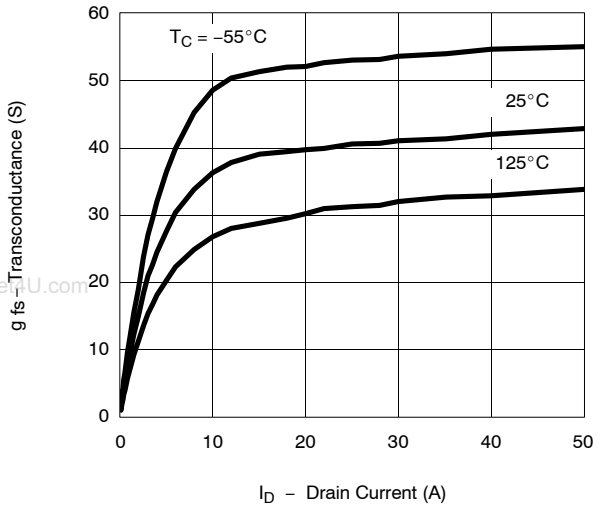
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



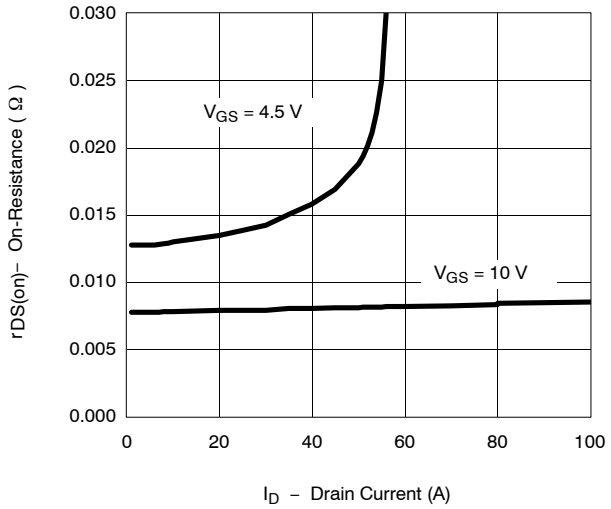


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

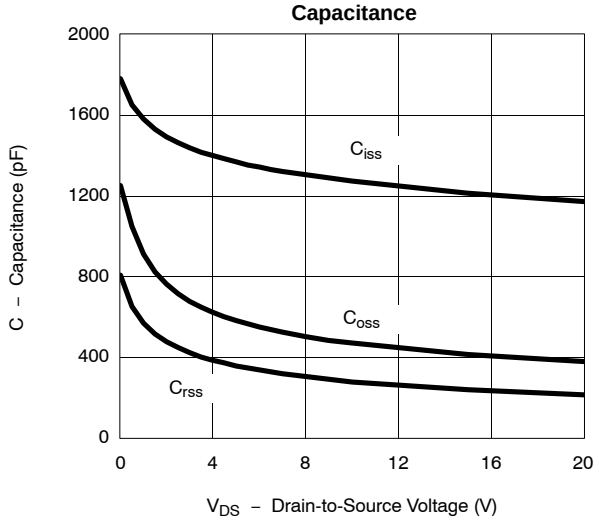
Transconductance



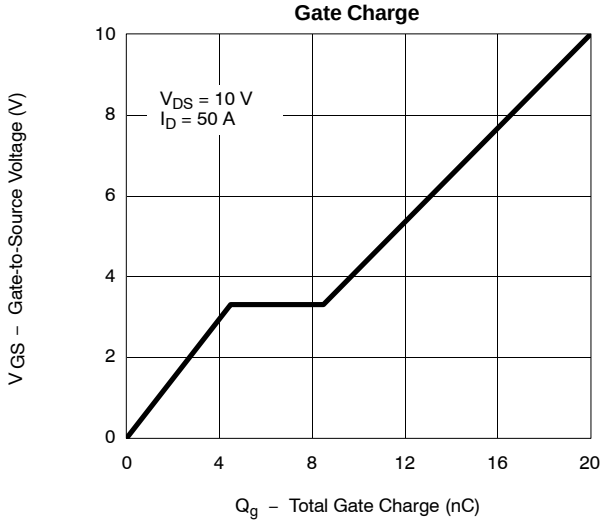
On-Resistance vs. Drain Current



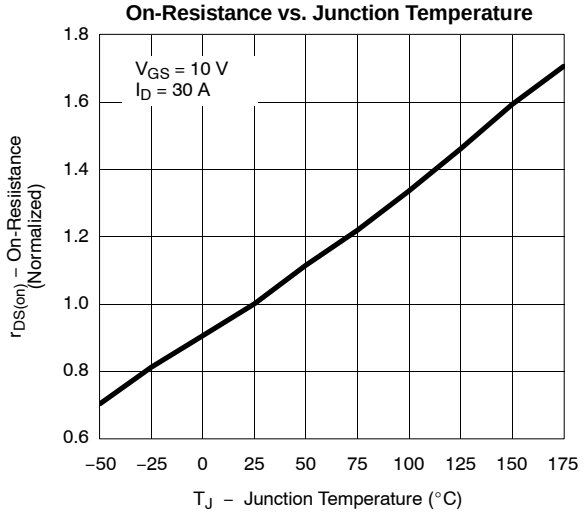
Capacitance



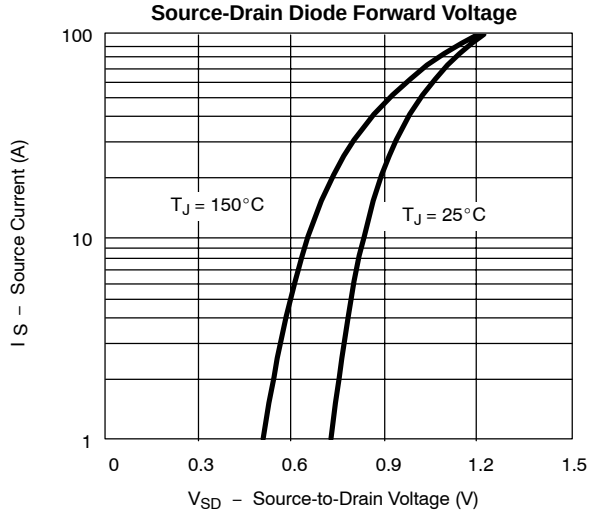
Gate Charge



On-Resistance vs. Junction Temperature

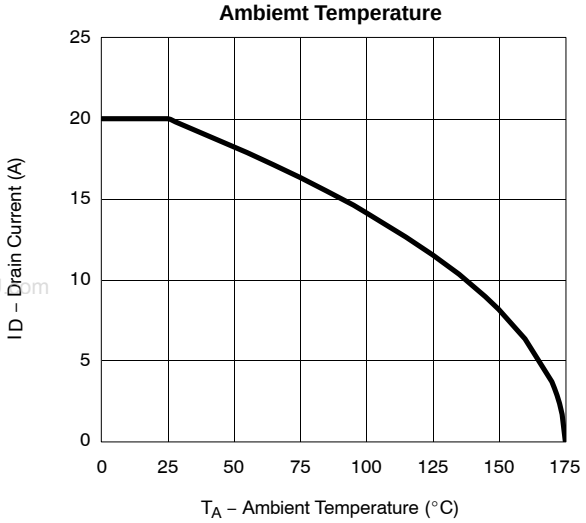


Source-Drain Diode Forward Voltage

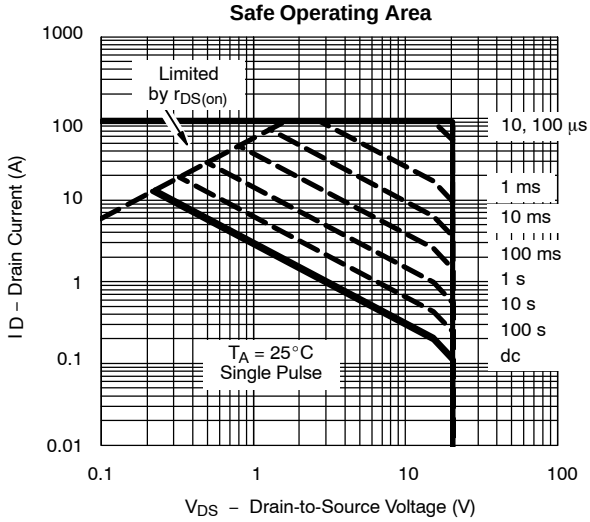


THERMAL RATINGS

Maximum Drain Current vs. Ambiemt Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient