N-Channel 40-V (D-S), 175 °C MOSFET

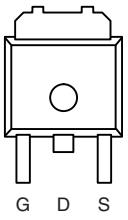
PRODUCT SUMMARY			
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)[c]	Q_g (Typ)
40	0.009 at V_{GS} = 10 V	50	55

FEATURES

- TrenchFET® Power MOSFETS
- 175 °C Junction Temperature
- High Threshold Voltage At High Temperature

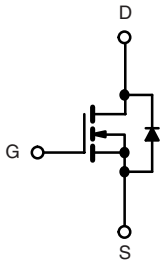
RoHS COMPLIANT

TO-252



Top View

Drain Connected to Tab



N-Channel MOSFET

Ordering Information: SUD50N04-09H-E3 (Lead (Pb)-free)

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}	± 20	
Continuous Drain Current (T_J = 175 °C)	T_C = 25 °C	I_D	50[c]	A
	T_C = 100 °C		48[c]	
Pulsed Drain Current		I_{DM}	100	
Avalanche Current		I_{AS}	35	
Single Avalanche Energy[a]	L = 0.1 mH	E_{AS}	61.25	mJ
Power Dissipation	T_C = 25 °C	P_D	83.3	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[b]	t ≤ 10 sec	R_{thJA}	18	22	°C/W
	Steady State		40	50	
Junction-to-Case		R_{thJC}	1.5	1.8	

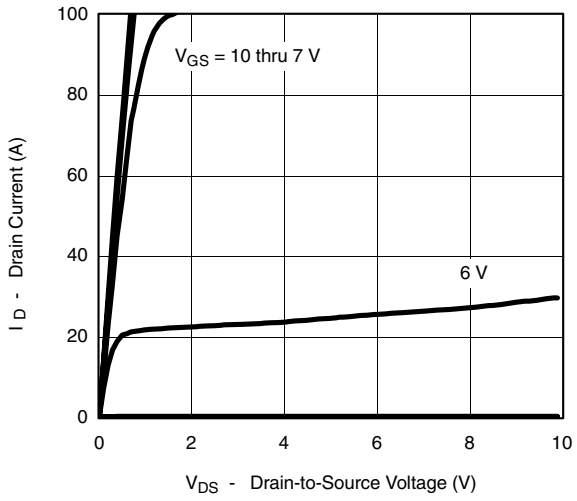
Notes:
a. Duty cycle ≤ 1 %.
b. Surface Mounted on 1" FR4 board.
c. Based on maximum allowable Junction Temperature. Package limitation current is 50 A.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min**	**Typ**	**Max**	**Unit**
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA	40			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	3.4		5.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V			1	µA
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 125 °C			50	
		V_{DS} = 40 V, V_{GS} = 0 V, T_J = 175 °C			150	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	50			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0072	0.009	Ω
		V_{GS} = 10 V, I_D = 20 A, T_J = 125 °C			0.014	
		V_{GS} = 10 V, I_D = 20 A, T_J = 175 °C			0.018	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 15 A	20	57		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		3700		pF
Output Capacitance	C_{oss}			340		
Reverse Transfer Capacitance	C_{rss}			175		
Total Gate Charge[c]	Q_g	V_{DS} = 20 V, V_{GS} = 10 V, I_D = 50 A		55	85	nC
Gate-Source Charge[c]	Q_{gs}			19		
Gate-Drain Charge[c]	Q_{gd}			13		
Gate Resistance	R_g			1.3		Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 20 V, R_L = 0.4 Ω I_D ≅ 50 A, V_{GEN} = 10 V, R_g = 2.5 Ω		12	20	ns
Rise Time[c]	t_r			20	30	
Turn-Off Delay Time[c]	$t_{d(off)}$			35	55	
Fall Time[c]	t_f			11	20	
Source-Drain Diode Ratings and Characteristics (T_C = 25 °C)[b]						
Continuous Current	I_S				50	A
Pulsed Current	I_{SM}				100	
Forward Voltage[a]	V_{SD}	I_F = 30 A, V_{GS} = 0 V		0.90	1.50	V
Reverse Recovery Time	t_{rr}	I_F = 30 A, di/dt = 100 A/µs		30	45	ns

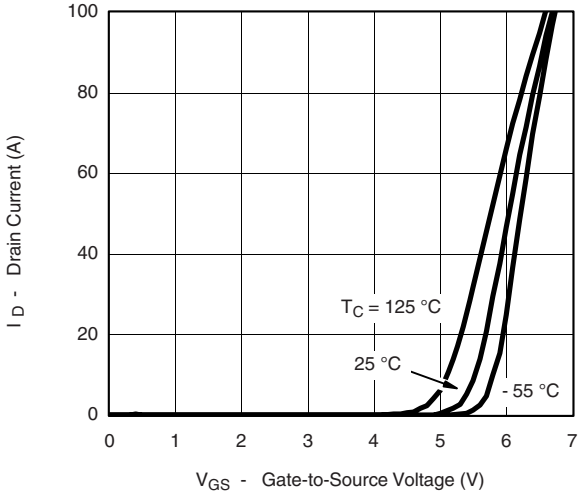
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

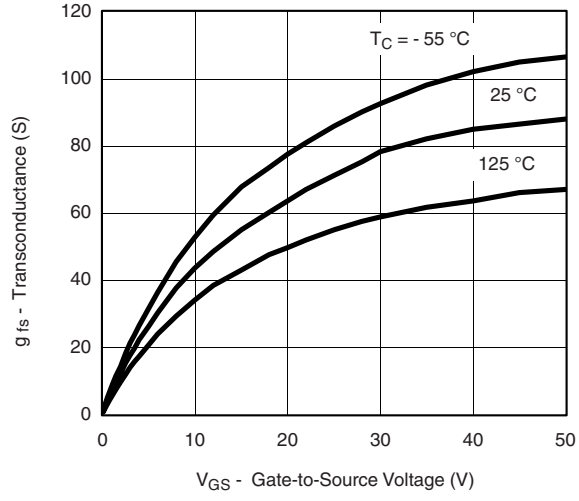
TYPICAL CHARACTERISTICS 25 °C unless noted



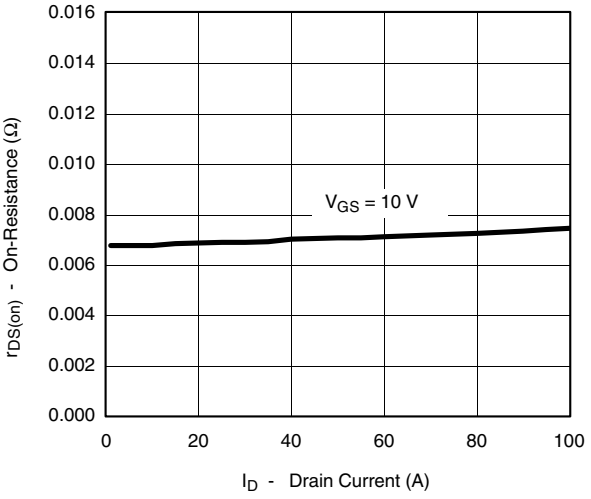
Output Characteristics



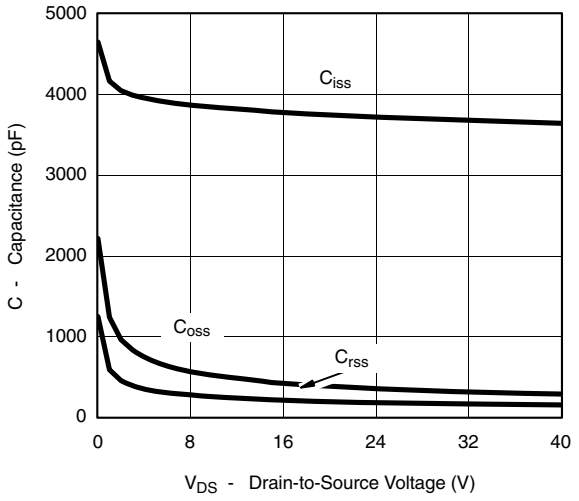
Transfer Characteristics



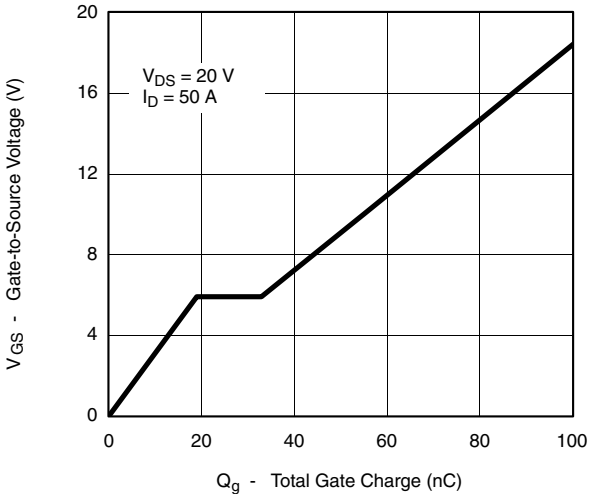
Transconductance



On-Resistance vs. Drain Current

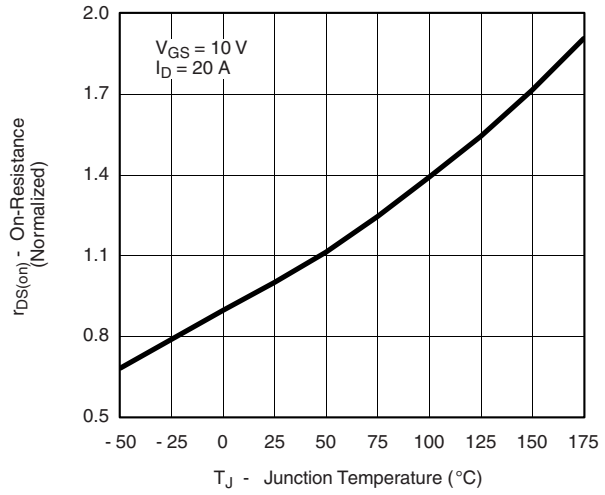


Capacitance

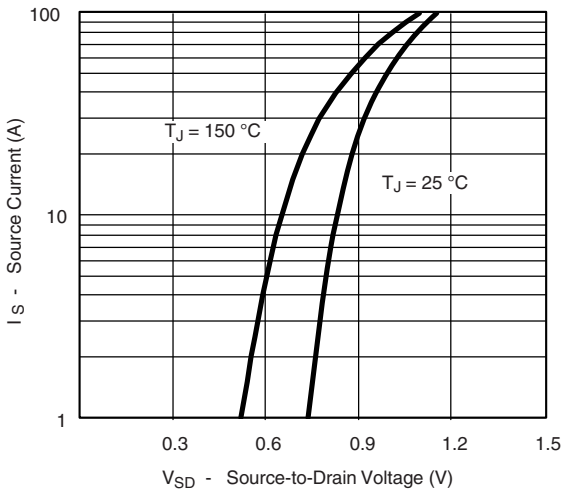


Gate Charge

TYPICAL CHARACTERISTICS 25 °C unless noted

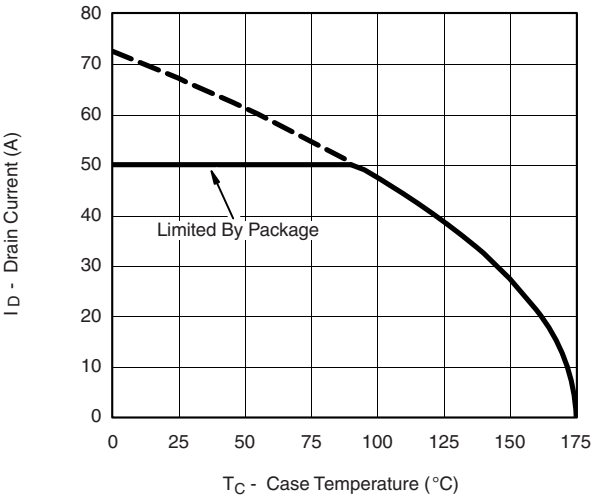


On-Resistance vs. Junction Temperature

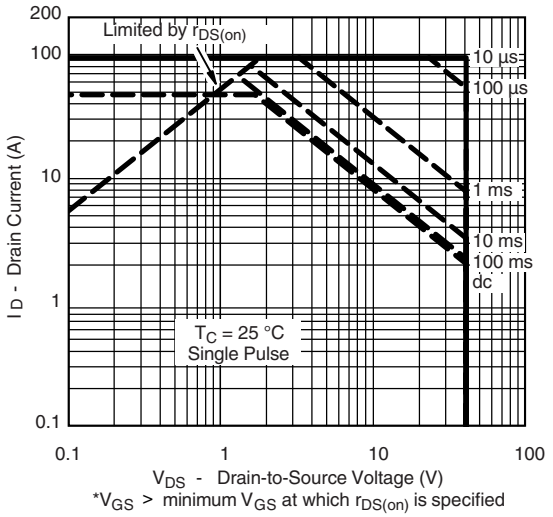


Source-Drain Diode Forward Voltage

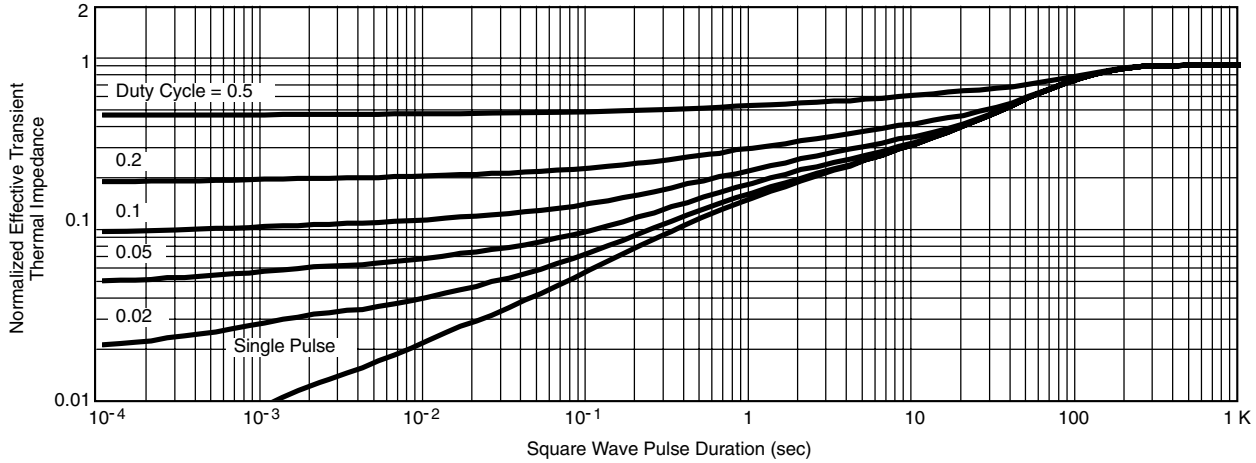
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature

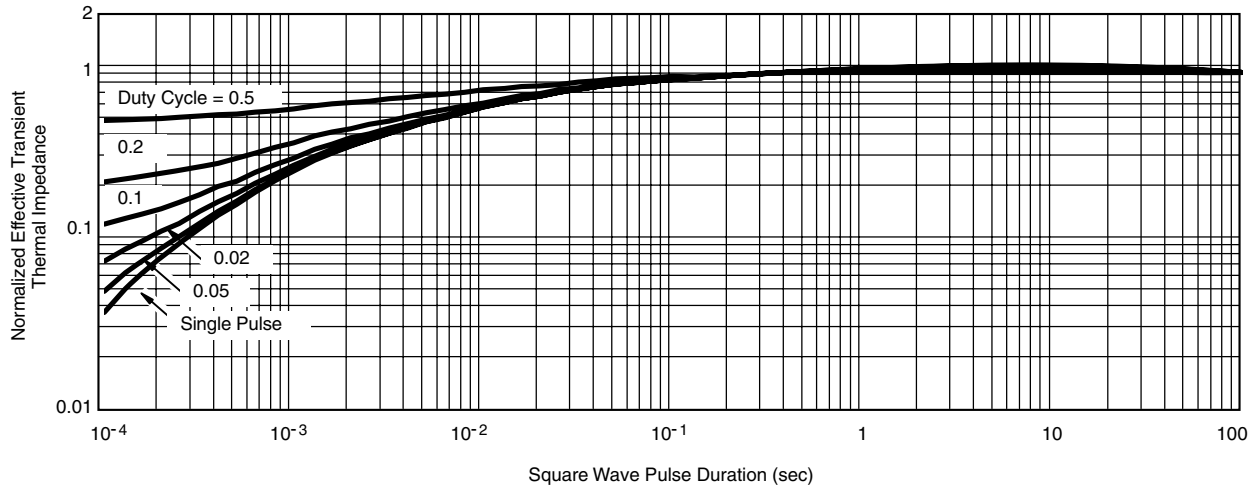


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS



Normalized Thermal Transient Impedance, Junction-to-Case

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