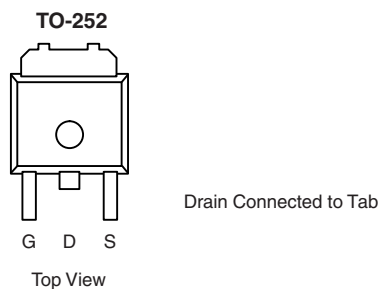
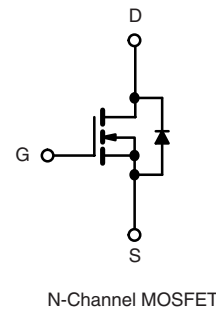


N-Channel 40-V (D-S), 175 °C MOSFET

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

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)	I_D	$T_C = 25$ °C	A	
		$T_C = 100$ °C		
Pulsed Drain Current	I_{DM}	100		
Avalanche Current	I_{AS}	35		
Single Avalanche Energy ^a	E_{AS}	61.25		
Power Dissipation	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	R_{thJA}	$t \leq 10$ sec	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.

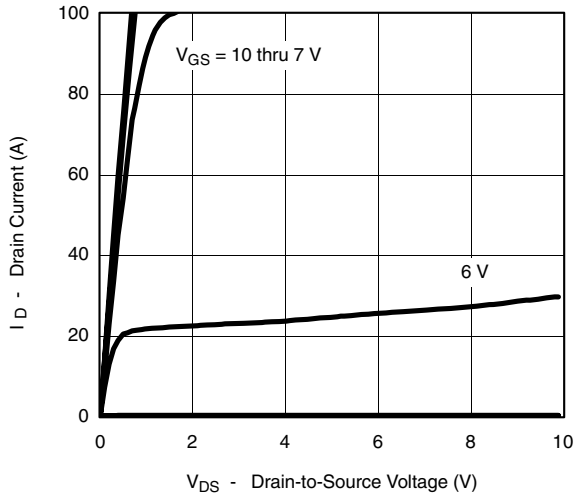
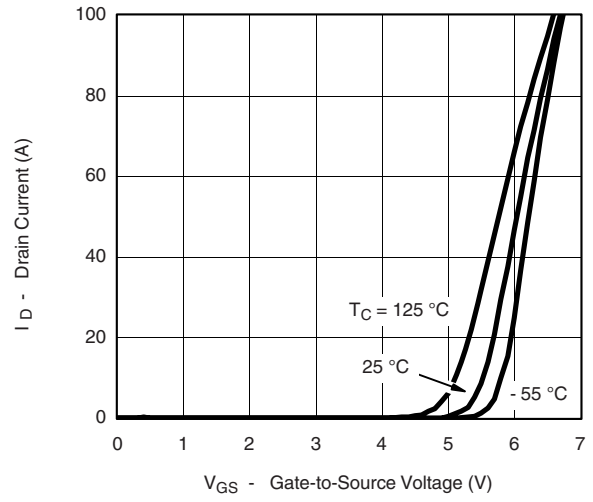
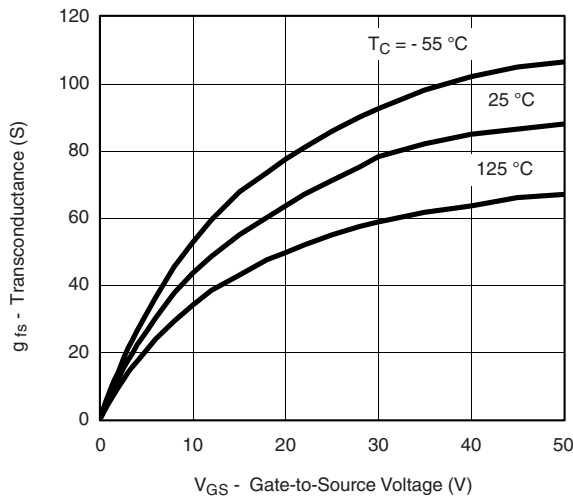
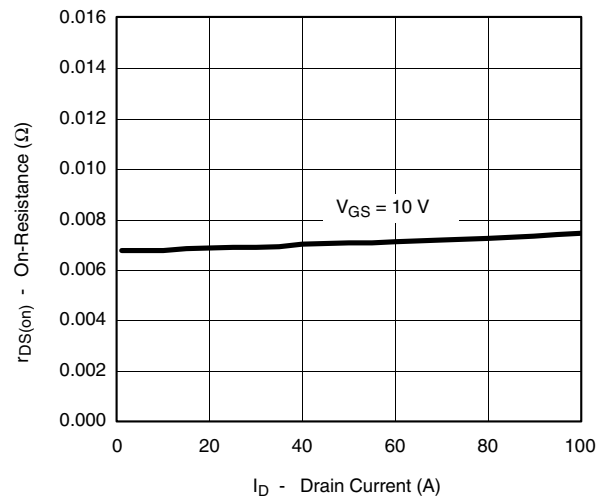
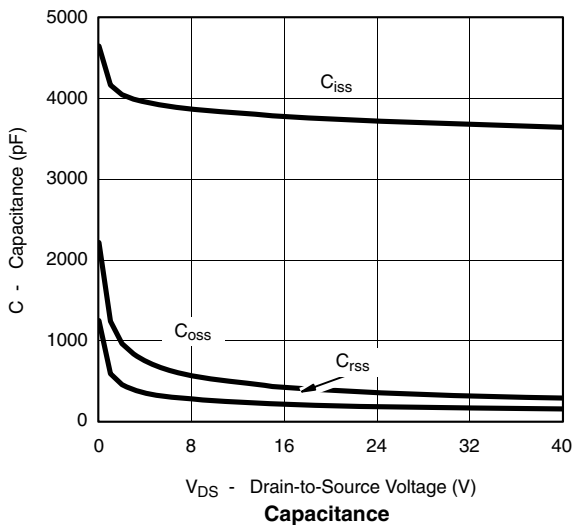
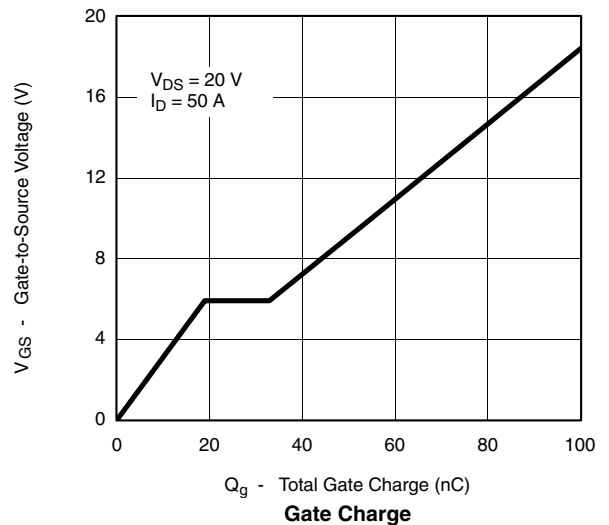
c. Based on maximum allowable Junction Temperature. Package limitation current is 50 A.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.4		5.0	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			150	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0072	0.009	Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.014	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.018	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$	20	57		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		3700		μF
Output Capacitance	C_{oss}			340		
Reverse Transfer Capacitance	C_{rss}			175		
Total Gate Charge ^c	Q_g	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		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	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.4\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		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 ($T_C = 25\text{ }^\circ\text{C}$) ^b						
Continuous Current	I_S				50	A
Pulsed Current	I_{SM}				100	
Forward Voltage ^a	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

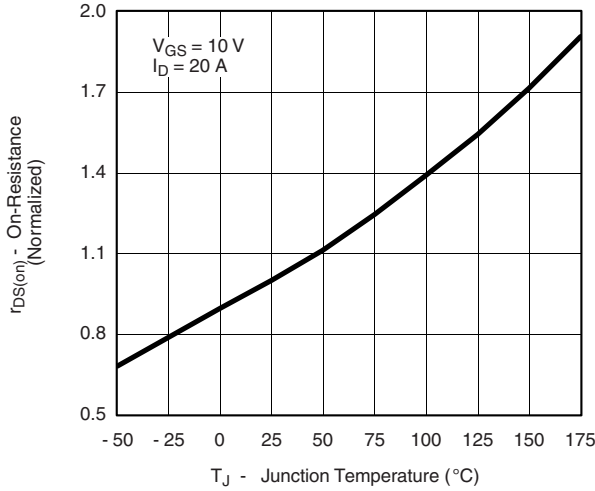
Notes:

- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

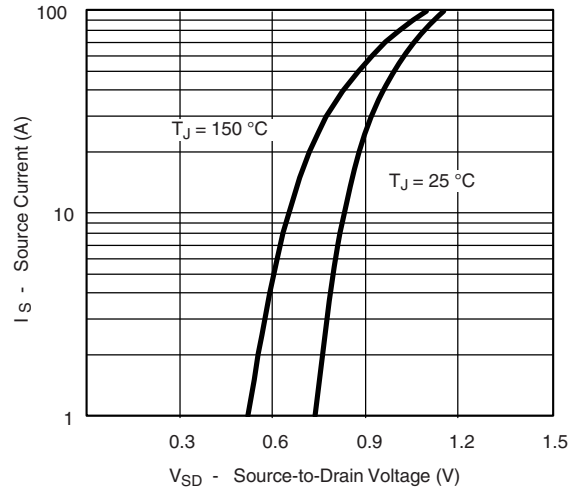
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

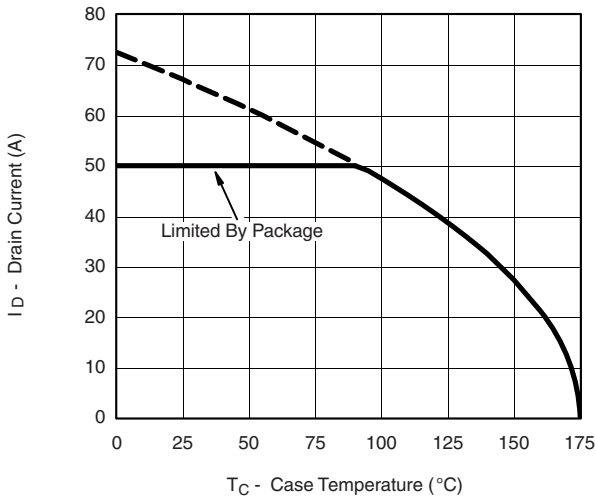


On-Resistance vs. Junction Temperature

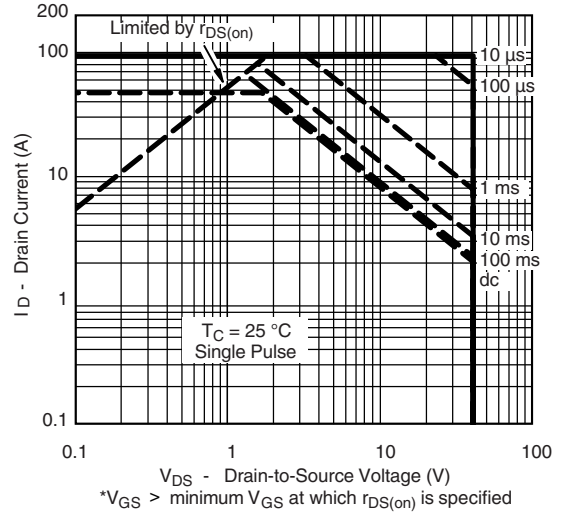


Source-Drain Diode Forward Voltage

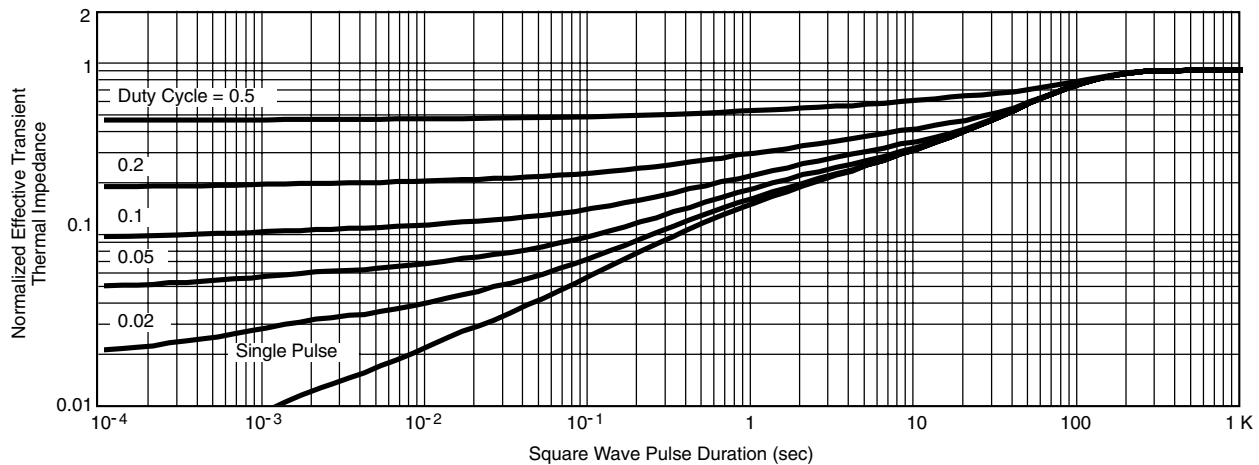
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature

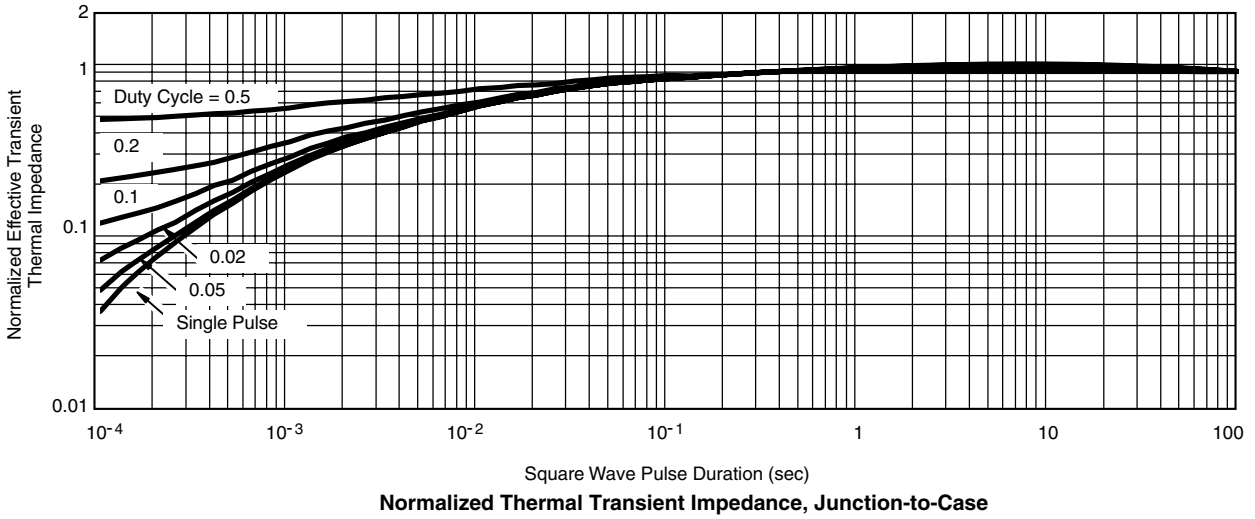


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS



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