

# N-Channel 40-V (D-S), 175 °C MOSFET

## PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.0074 at $V_{GS} = 10$ V	65
	0.011 at $V_{GS} = 4.5$ V	54

## FEATURES

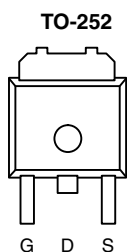
- TrenchFET® Power MOSFETS
- 175 °C Junction Temperature
- Low Threshold



RoHS  
COMPLIANT

## APPLICATIONS

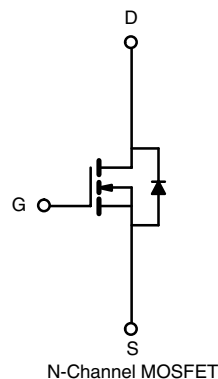
- Motor Control
- Automotive
- 12 V Boardnet



Top View

Drain Connected to Tab

Ordering Information: SUD50N04-07-E3 (Lead (Pb)-free)



N-Channel MOSFET

## ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	65 <sup>c</sup>	A
		46 <sup>c</sup>	
Pulsed Drain Current	$I_{DM}$	100	
Avalanche Current	$I_{AR}$	40	
Repetitive Avalanche Energy <sup>a</sup>	$E_{AR}$	80	mJ
Power Dissipation <sup>a</sup>	$P_D$	65	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 <sup>b</sup>	$R_{thJA}$	18	22	°C/W
		40	50	
Junction-to-Case	$R_{thJC}$	1.9	2.3	

Notes:

a. Duty cycle  $\leq 1$  %.

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	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1		3	
Gate Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 32\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$			150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}$ , $V_{GS} = 10\text{ V}$	65			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$		0.006	0.0074	$\Omega$
		$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$			0.012	
		$V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$			0.015	
		$V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$		0.0085	0.011	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 15\text{ A}$	20	57		S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		2800		pF
Output Capacitance	$C_{oss}$			320		
Reverse Transfer Capacitance	$C_{rss}$			190		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 50\text{ A}$		50	75	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			10		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			10		
Gate Resistance	$R_g$			2.0		$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}$ , $R_L = 0.4\text{ }\Omega$ $I_D \equiv 50\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$		11	20	ns
Rise Time <sup>c</sup>	$t_r$			20	30	
Turn-Off DelayTime <sup>c</sup>	$t_{d(off)}$			40	60	
Fall Time <sup>c</sup>	$t_f$			15	25	
Source-Drain Diode Ratings and Characteristics ( $T_C = 25\text{ }^{\circ}\text{C}$ ) <sup>b</sup>						
Continous Current	$I_S$				43	A
Pulsed Current	$I_{SM}$				100	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 30\text{ A}$ , $V_{GS} = 0\text{ V}$		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

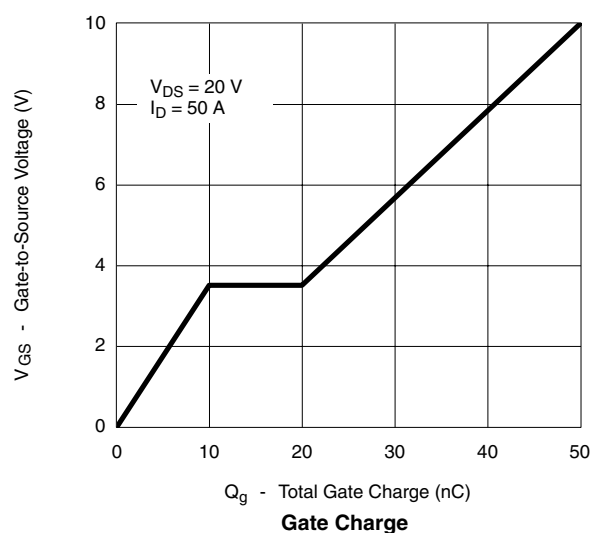
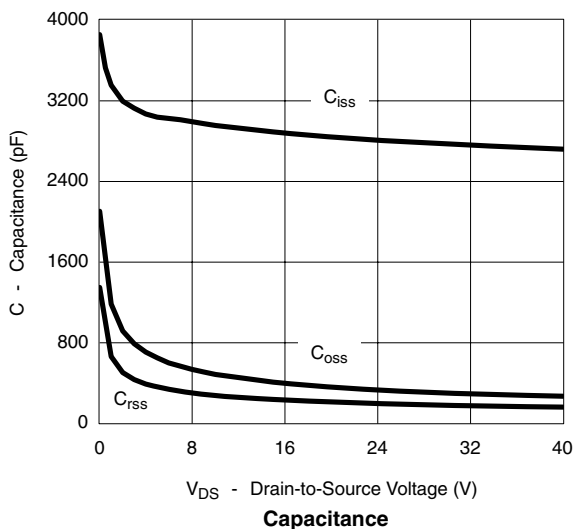
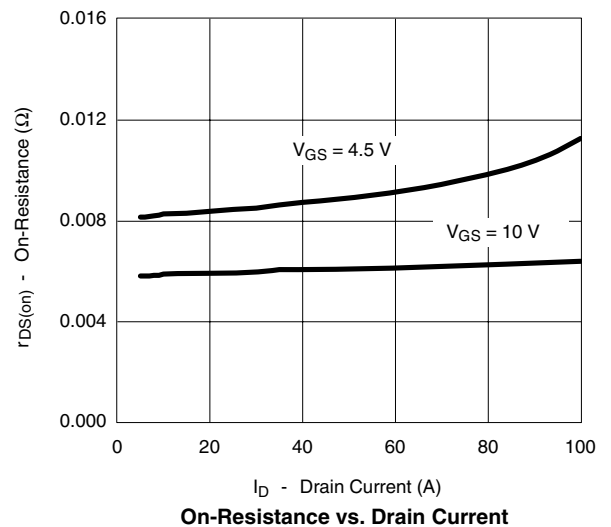
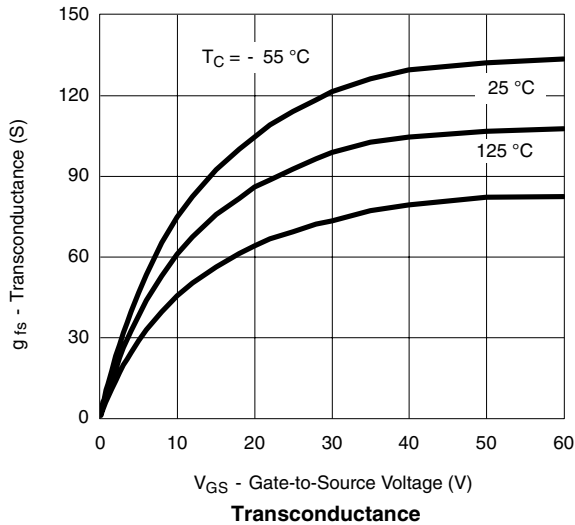
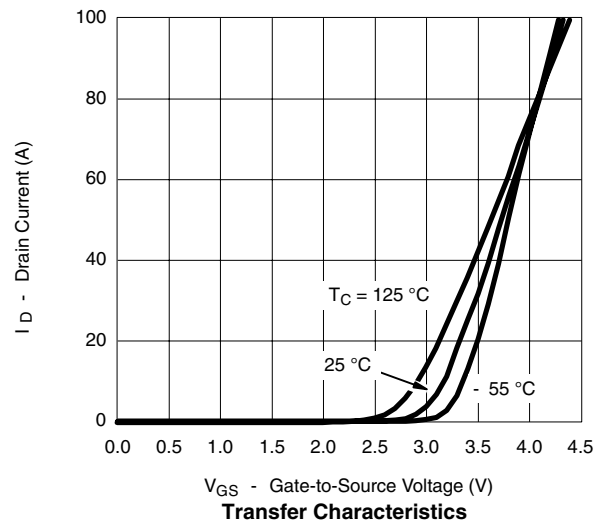
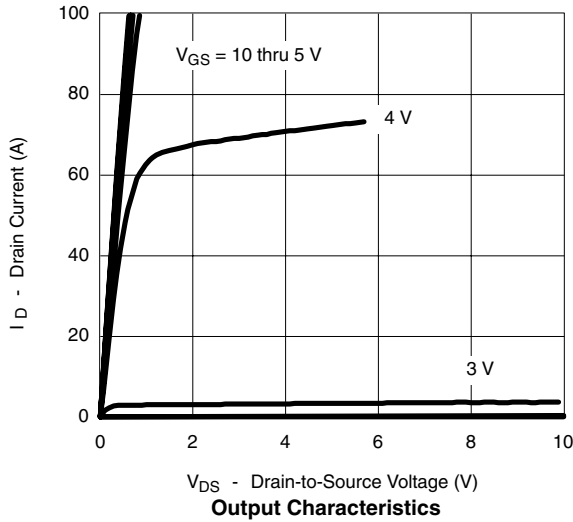
Notes:

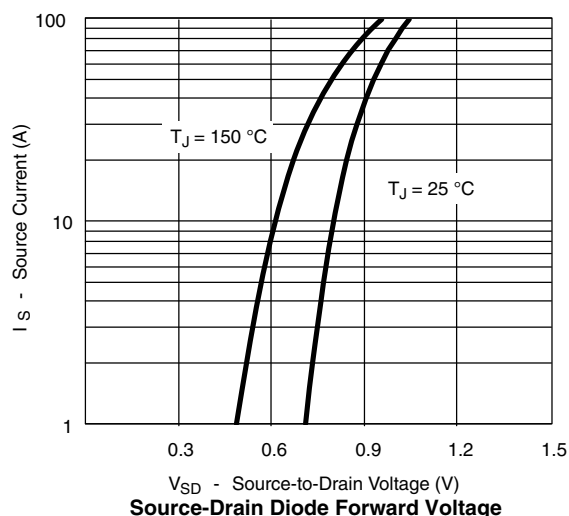
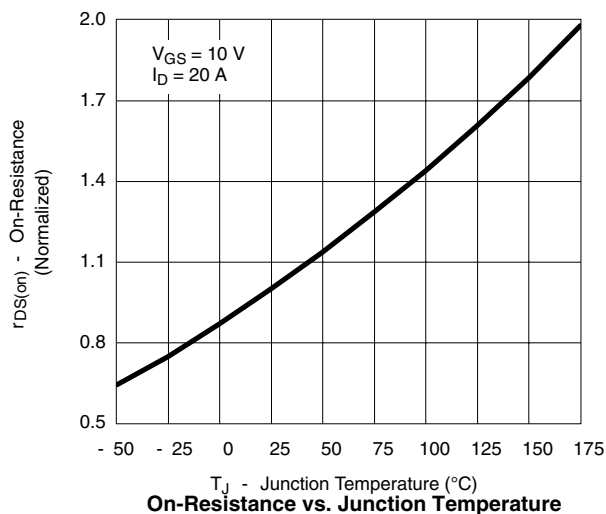
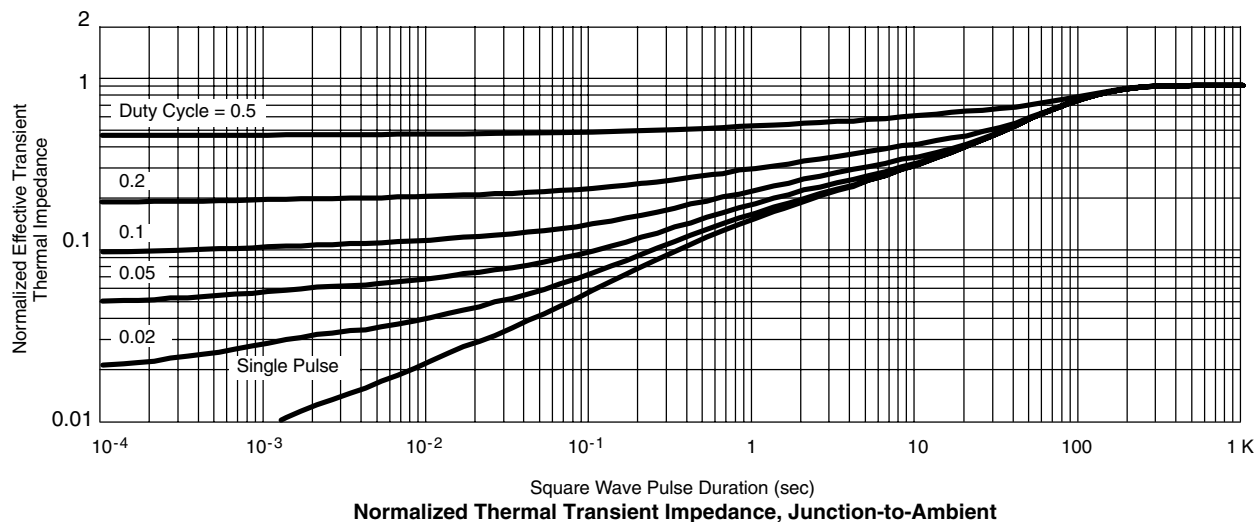
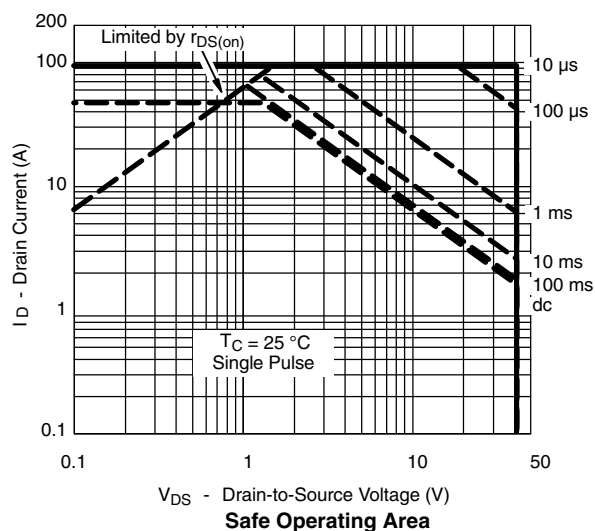
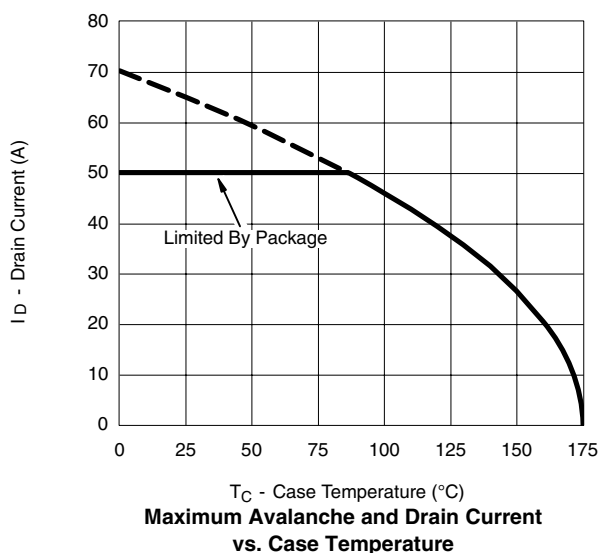
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.  
c. Independent of operating temperature.

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.



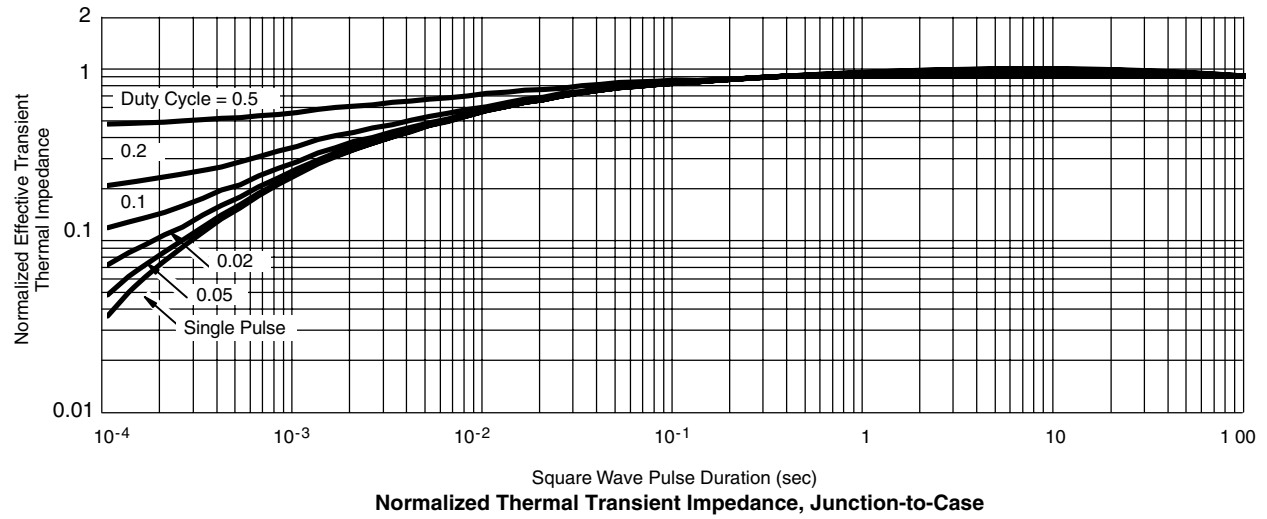
**TYPICAL CHARACTERISTICS**  $T_A = 25^\circ\text{C}$ , unless noted



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**THERMAL RATINGS**




## THERMAL RATINGS



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