



## N-Channel 40-V (D-S), 175°C MOSFET

## PRODUCT SUMMARY

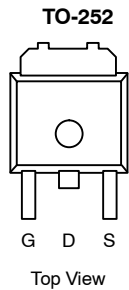
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>c</sup>
40	0.0054 @ $V_{GS} = 10$ V	115
	0.0069 @ $V_{GS} = 4.5$ V	102

## FEATURES

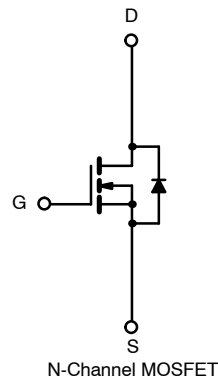
- TrenchFET® Power MOSFETS
- 175°C Junction Temperature

## APPLICATIONS

- Automotive Such As:
  - High-Side Switch
  - Motor Drives
  - Valve Drives



Ordering Information: SUD50N04-05L—E3

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175^\circ\text{C}$ )	$T_C = 25^\circ\text{C}$	$I_D$	115 <sup>c</sup>	A
	$T_C = 100^\circ\text{C}$		81 <sup>c</sup>	
Pulsed Drain Current		$I_{DM}$	100	
Single Pulse Avalanche Current		$I_{AS}$	50	
Single Pulse Repetitive Avalanche Energy <sup>a</sup>		$E_{AS}$	125	mJ
Power Dissipation		$P_D$	136	W
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$

## THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient <sup>b</sup>	$t \leq 10$ sec	$R_{thJA}$	15	18	$^\circ\text{C/W}$
	Steady State		40	50	
Junction-to-Case		$R_{thJC}$	0.85	1.1	

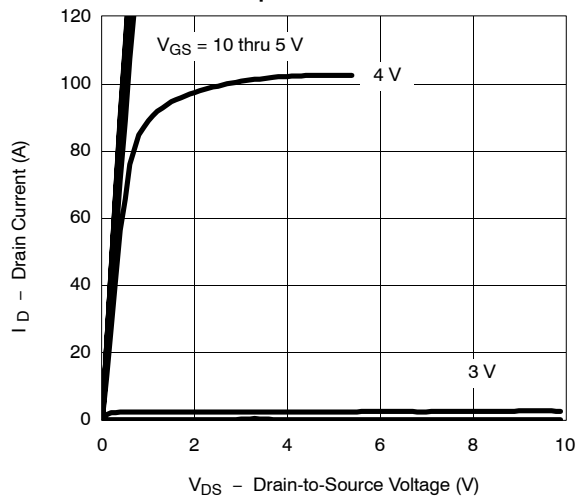
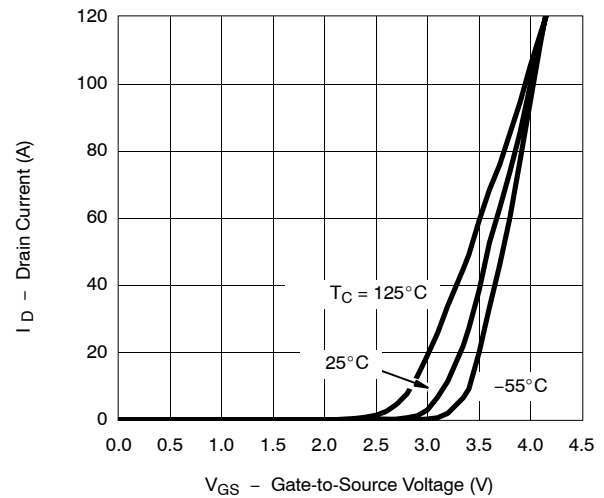
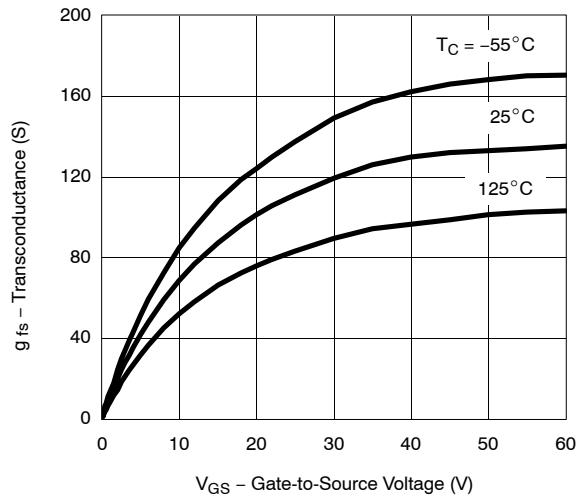
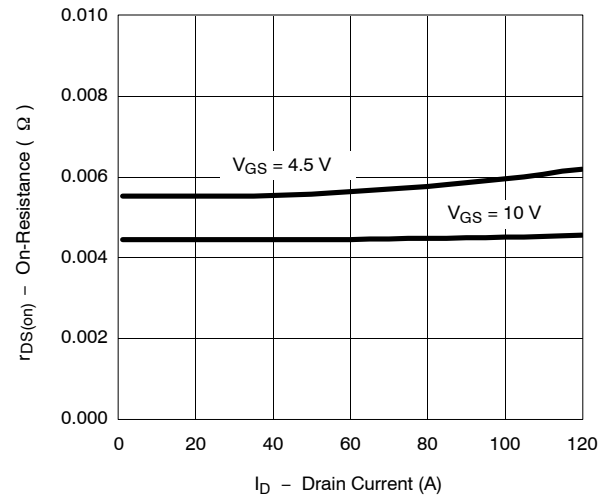
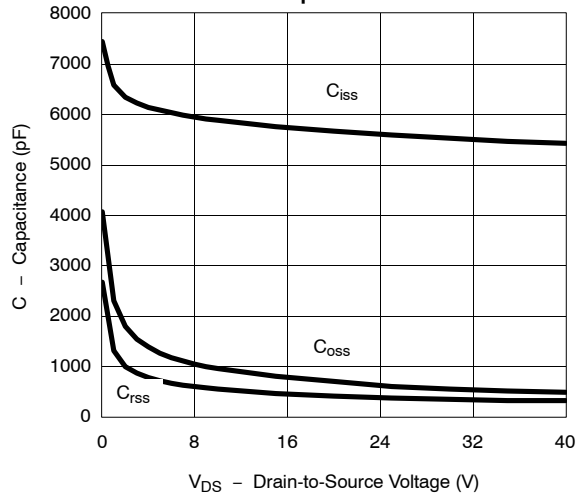
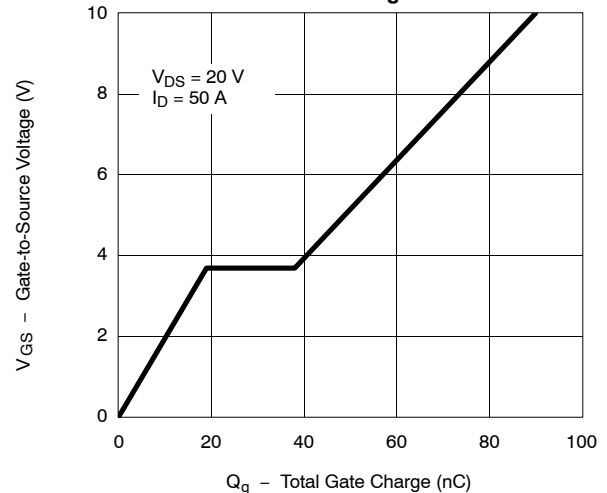
## Notes:

- Duty cycle  $\leq 1\%$ .
- Surface mounted on 1" FR4 board.
- Based on maximum allowable Junction Temperature. Package limitation current is 50 A.

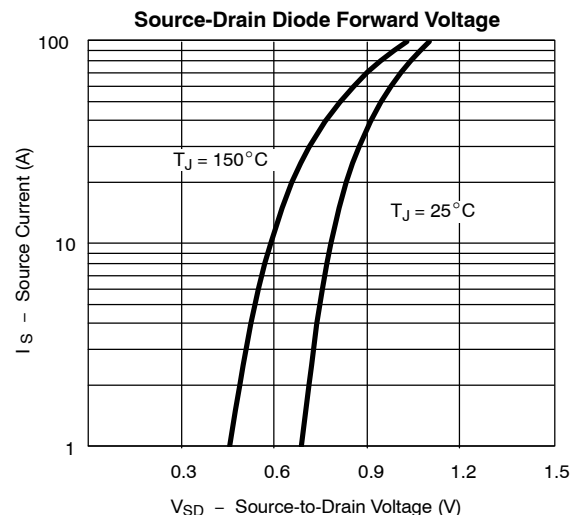
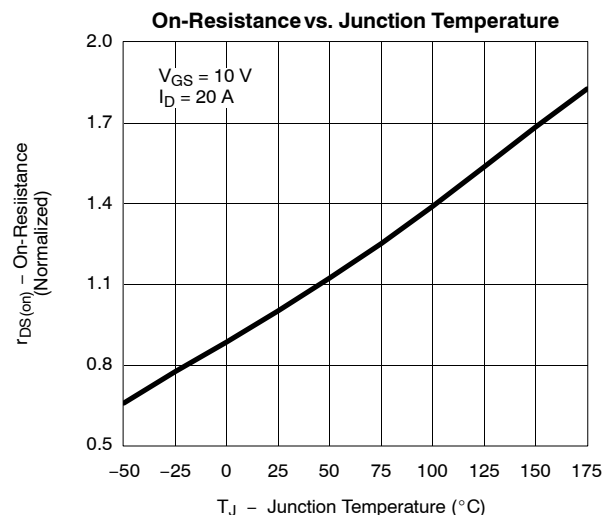
SPECIFICATIONS (T <sub>J</sub> = 25°C UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	40			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA	1		3	
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> = 40 V, V <sub>GS</sub> = 0 V			1	μA
		V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C			50	
		V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175°C			150	
On-State Drain Current <sup>a</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>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.0044	0.0054	Ω
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125°C			0.0083	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 175°C			0.0130	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 20 A		0.0055	0.0069	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 15 A	20	80		S
Dynamic <sup>b</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz		5600		pF
Output Capacitance	C <sub>oss</sub>			590		
Reversen Transfer Capacitance	C <sub>rss</sub>			365		
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A		90	135	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			19		
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			19		
Gate Resistance	R <sub>g</sub>			1.6		Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 20 V, R <sub>L</sub> = 0.4 Ω I <sub>D</sub> = 50 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 2.5 Ω		15	25	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			20	30	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			65	100	
Fall Time <sup>c</sup>	t <sub>f</sub>			11	20	
Source-Drain Ciode Ratings and Characteristics (T <sub>C</sub> = 25°C) <sup>b</sup>						
Continuous Current	I <sub>s</sub>				50	A
Pulsed Current	I <sub>SM</sub>				100	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = 30 A, V <sub>GS</sub> = 0 V		0.90	1.50	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 30 A, di/dt = 100 A/μs		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.

**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)



## THERMAL RATINGS

