

## N-Channel 40-V (D-S), 175°C MOSFET

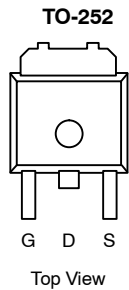
PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>c</sup>
40	0.0054 @ $V_{GS} = 10$ V	115
	0.0069 @ $V_{GS} = 4.5$ V	102

### FEATURES

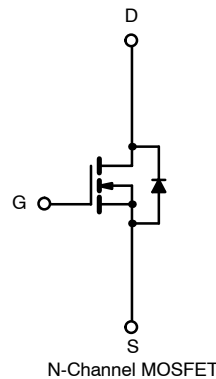
- TrenchFET® Power MOSFETS
- 175°C Junction Temperature

### 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 ( $T_J = 175^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	115 <sup>c</sup>
		$T_C = 100^\circ\text{C}$	81 <sup>c</sup>
Pulsed Drain Current	$I_{DM}$	100	A
Single Pulse Avalanche Current	$I_{AS}$	50	
Single Pulse Repetitive Avalanche Energy <sup>a</sup>	$E_{AS}$	125	
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>	$R_{thJA}$	$t \leq 10$ sec	15	18
		Steady State	40	50
Junction-to-Case	$R_{thJC}$	0.85	1.1	$^\circ\text{C/W}$

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)**

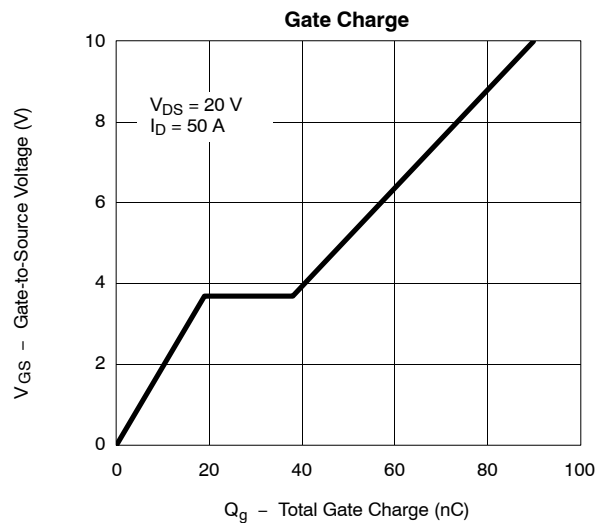
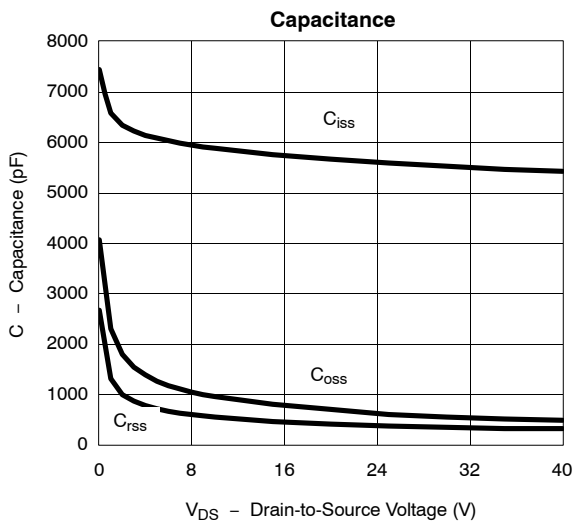
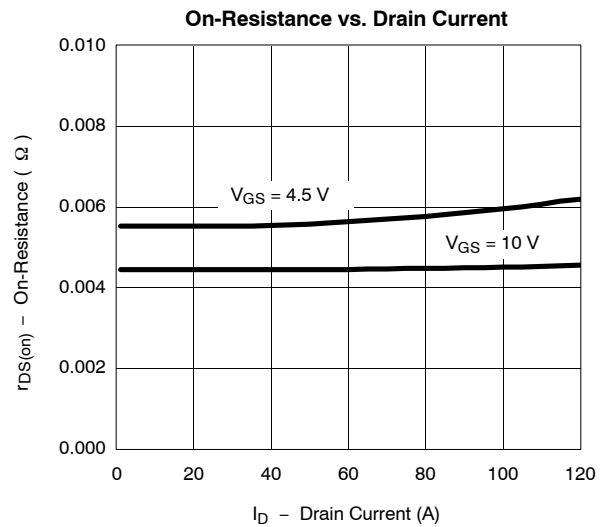
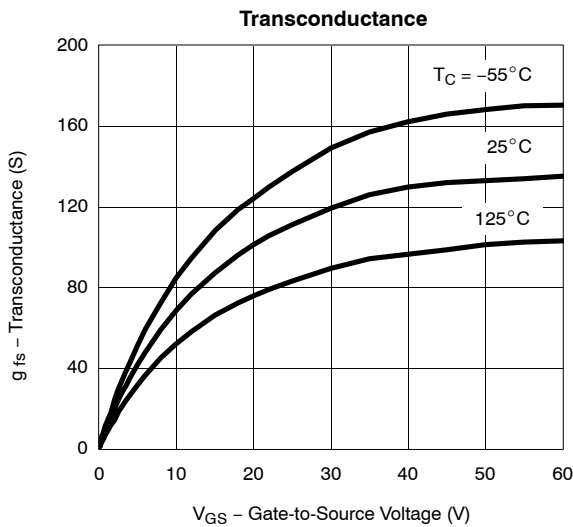
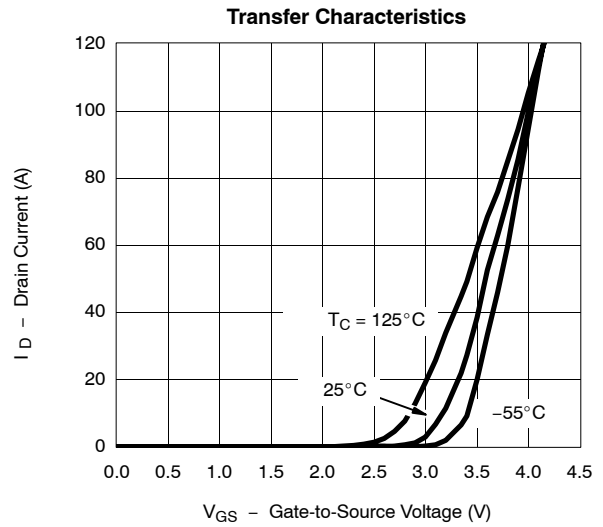
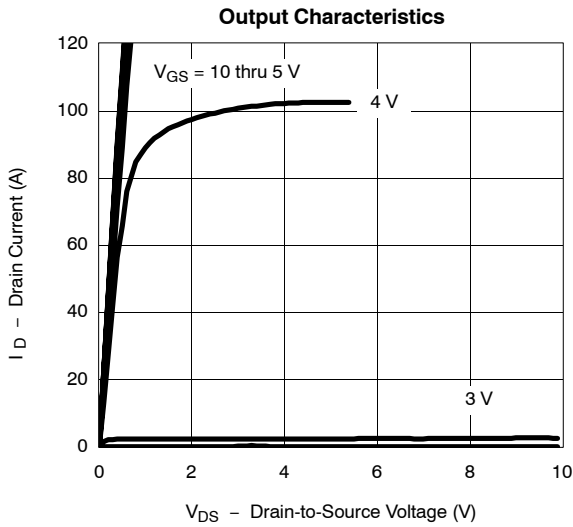
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	40			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA	1		3	
Gate-Body Leakage	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
<b>Dynamic<sup>b</sup></b>						
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		
Reverse 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	
<b>Source-Drain Ciode Ratings and Characteristics (T<sub>C</sub> = 25 °C)<sup>b</sup></b>						
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:

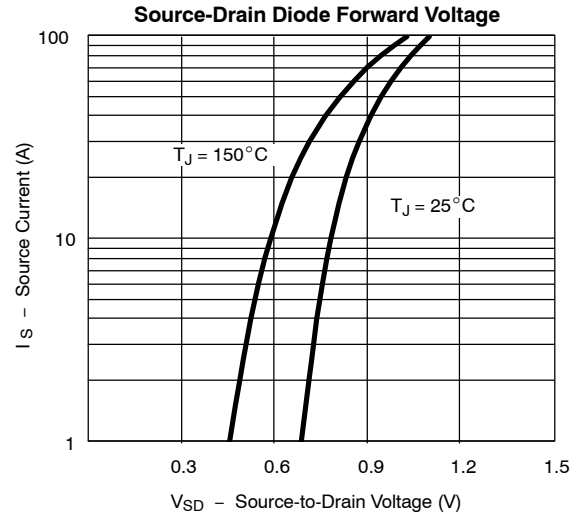
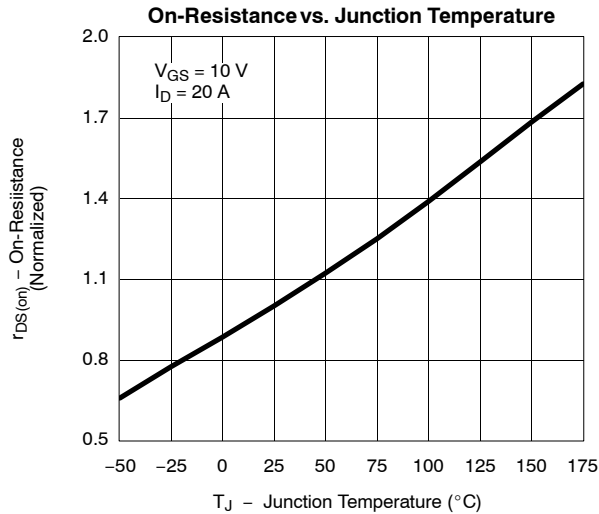
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.



TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



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### THERMAL RATINGS

