



N-Channel 40-V (D-S), 175°C MOSFET

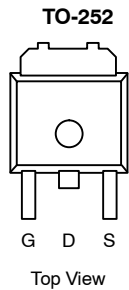
PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^c
40	0.0054 @ $V_{GS} = 10$ V	115
	0.0069 @ $V_{GS} = 4.5$ V	102

FEATURES

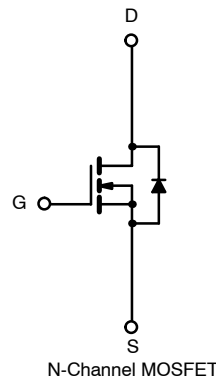
- TrenchFET® Power MOSFETS
- 175°C Junction Temperature

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}	± 20	
Continuous Drain Current ($T_J = 175^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	115 ^c
		$T_C = 100^\circ\text{C}$	81 ^c
Pulsed Drain Current	I_{DM}	100	A
Single Pulse Avalanche Current	I_{AS}	50	
Single Pulse Repetitive Avalanche Energy ^a	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 ^b	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:

- 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 ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_{DS} = 250\ \mu\text{A}$	1		3	
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
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$			50	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175^\circ\text{C}$			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	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0044	0.0054	Ω
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125^\circ\text{C}$			0.0083	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175^\circ\text{C}$			0.0130	
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0055	0.0069	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$	20	80		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		5600		pF
Output Capacitance	C_{oss}			590		
Reverse Transfer Capacitance	C_{rss}			365		
Total Gate Charge ^c	Q_g	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		90	135	nC
Gate-Source Charge ^c	Q_{gs}			19		
Gate-Drain Charge ^c	Q_{gd}			19		
Gate Resistance	R_g			1.6		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.4\ \Omega$ $I_D = 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\ \Omega$		15	25	ns
Rise Time ^c	t_r			20	30	
Turn-Off Delay Time ^c	$t_{d(off)}$			65	100	
Fall Time ^c	t_f			11	20	
Source-Drain Ciode Ratings and Characteristics ($T_C = 25^\circ\text{C}$)^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

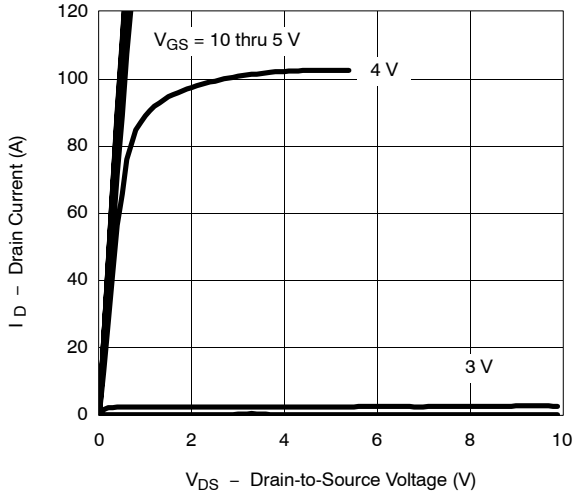
Notes:

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

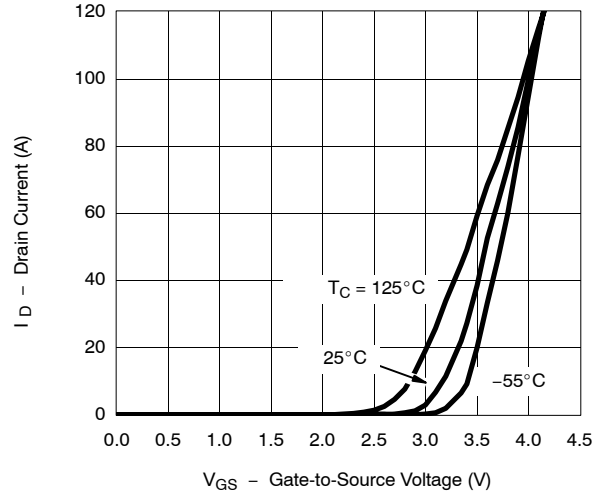


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

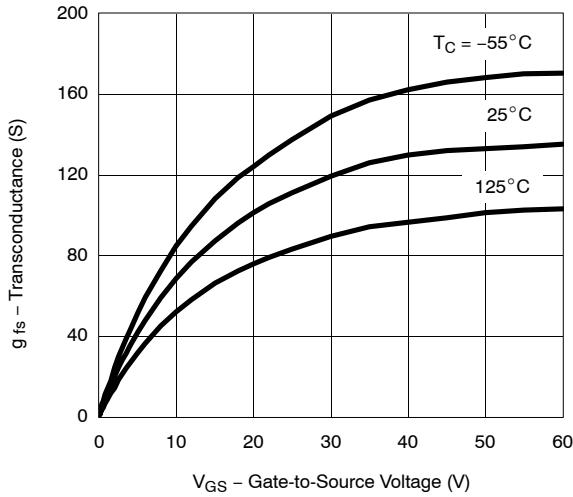
Output Characteristics



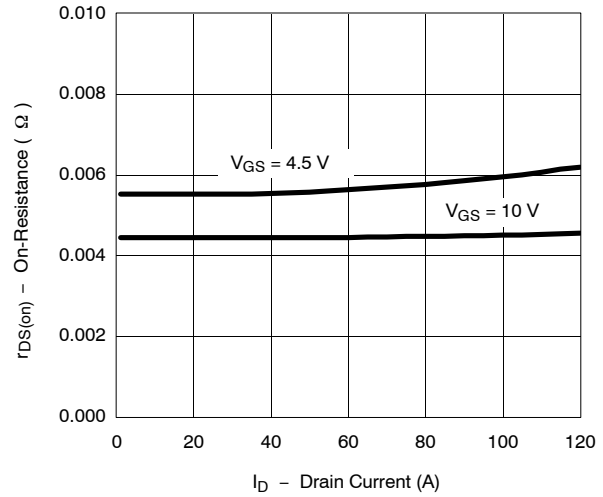
Transfer Characteristics



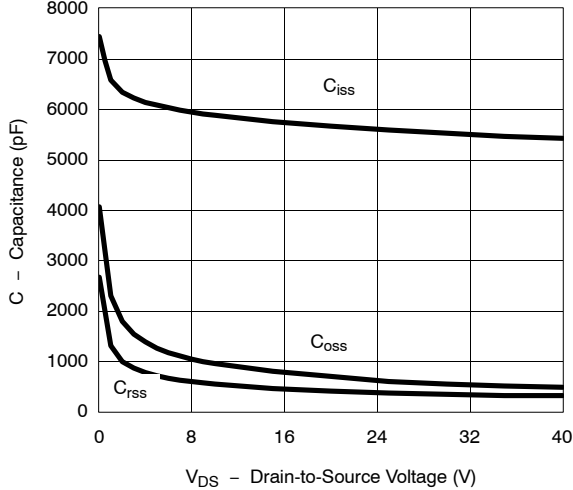
Transconductance



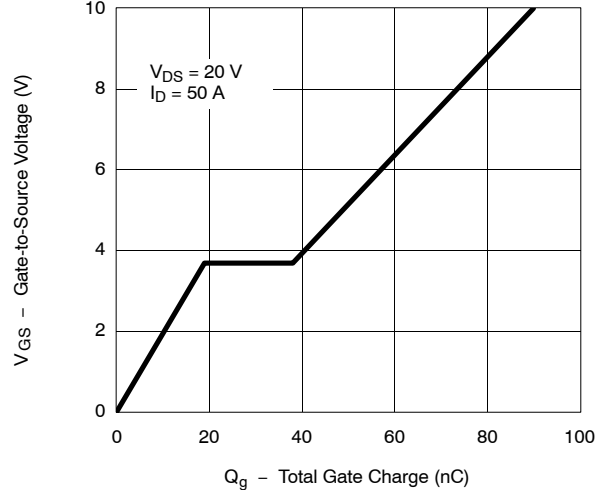
On-Resistance vs. Drain Current



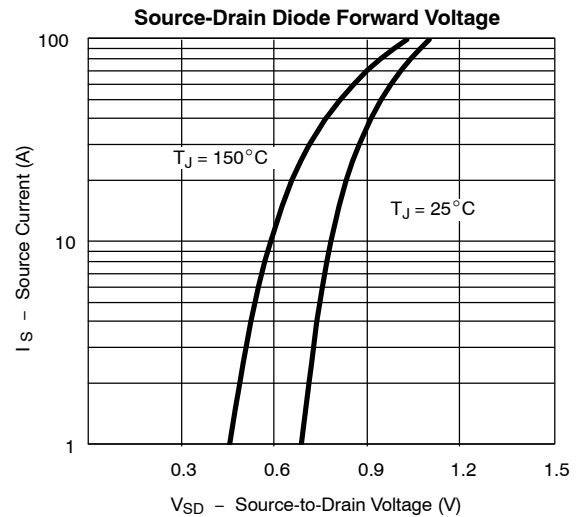
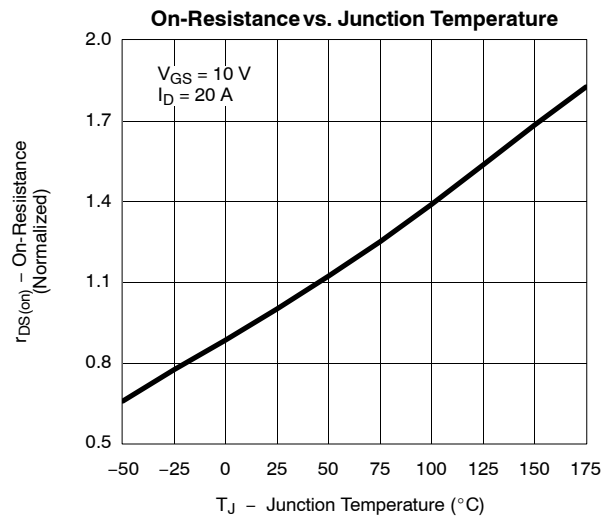
Capacitance



Gate Charge



TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)



THERMAL RATINGS

