

# N-Channel 60 V (D-S), 175 °C MOSFET, Logic Level

## PRODUCT SUMMARY

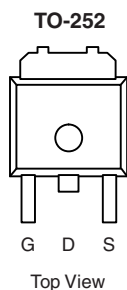
$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
60	0.031 at $V_{GS} = 10$ V	23
	0.045 at $V_{GS} = 4.5$ V	19.5

## FEATURES

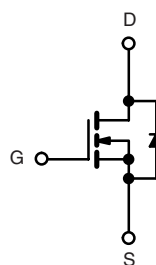
- TrenchFET® Power MOSFET
- 175 °C Junction Temperature



Available  
**RoHS\***  
COMPLIANT



Drain Connected to Tab



N-Channel MOSFET

Ordering Information: SUD23N06-31L  
SUD23N06-31L-E3 (Lead (Pb)-free)

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

Parameter	Symbol	Limit	Unit
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_J = 175$ °C) <sup>b</sup>	$I_D$	$T_C = 25$ °C	23
		$T_C = 100$ °C	16.5
Pulsed Drain Current	$I_{DM}$	50	A
Continuous Source Current (Diode Conduction)	$I_S$	23	
Avalanche Current	$I_{AS}$	20	
Single Avalanche Energy (Duty Cycle $\leq 1$ %)	$E_{AS}$	20	mJ
Maximum Power Dissipation	$P_D$	$T_C = 25$ °C	100
		$T_A = 25$ °C	3 <sup>a</sup>
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	$t \leq 10$ sec	18	°C/W
		Steady State	40	
Maximum Junction-to-Case	$R_{thJC}$	3.2	4	

Notes:

a. Surface Mounted on 1" x 1" FR4 board,  $t \leq 10$  sec.

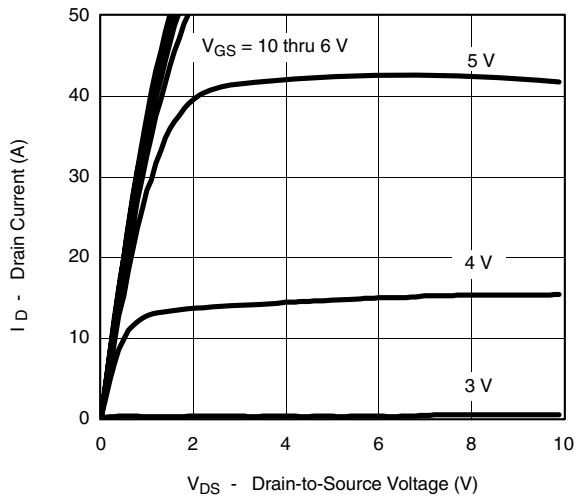
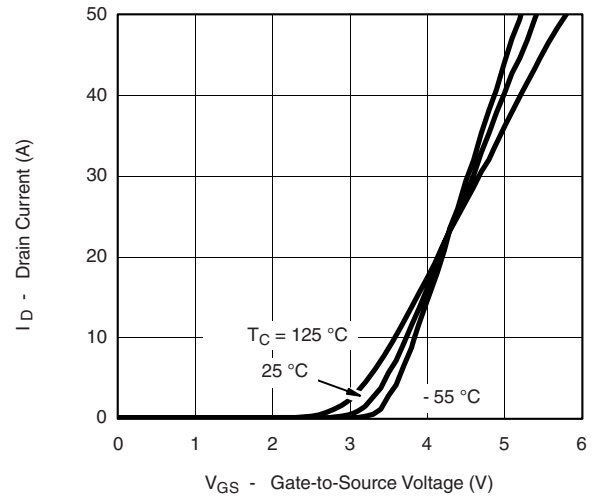
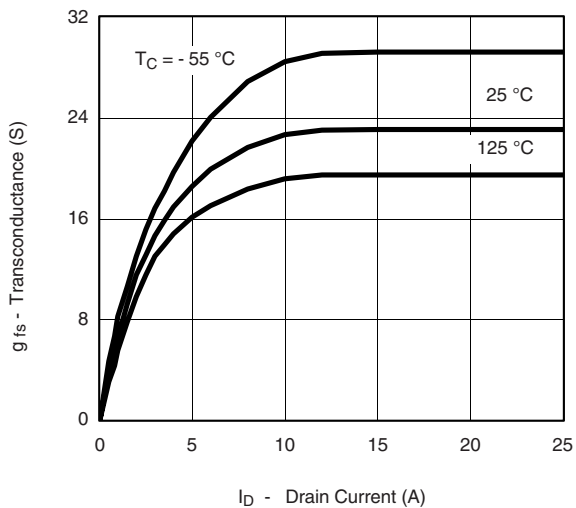
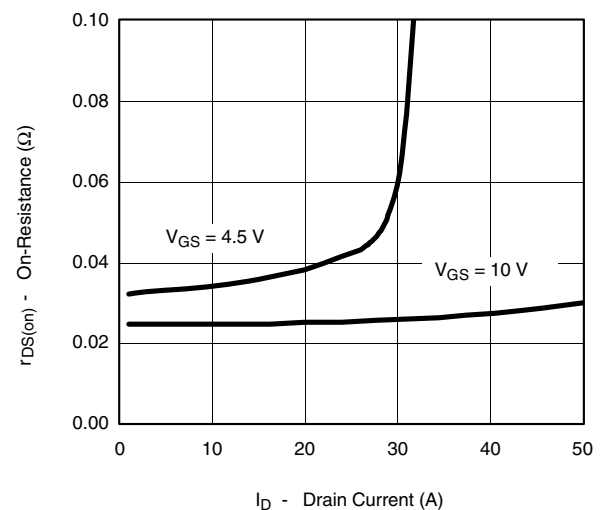
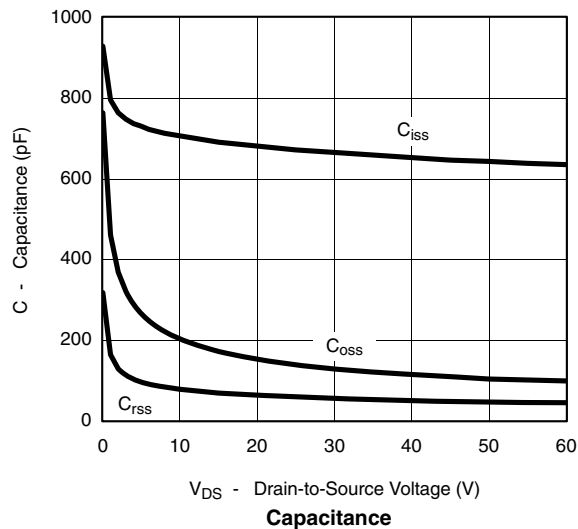
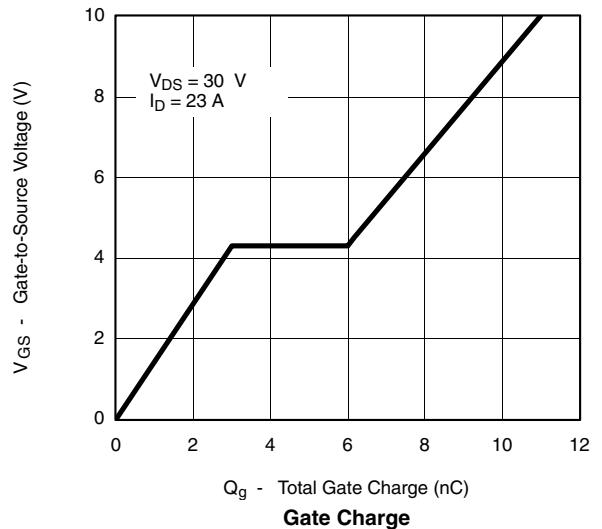
\* Pb containing terminations are not RoHS compliant, exemptions may apply.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ <sup>a</sup>	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	2.0	3.0	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}$ , $V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance <sup>b</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$		0.025	0.031	$\Omega$
		$V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$			0.055	
		$V_{GS} = 10\text{ V}$ , $I_D = 15\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$			0.069	
		$V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$		0.037	0.045	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 15\text{ A}$		20		S
Dynamic <sup>a</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		670		pF
Output Capacitance	$C_{oss}$			140		
Reverse Transfer Capacitance	$C_{rss}$			60		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 23\text{ A}$		11	17	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			3		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			3		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 1.3\text{ }\Omega$ $I_D \cong 23\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$		8	15	ns
Rise Time <sup>c</sup>	$t_r$			15	25	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			30	45	
Fall Time <sup>c</sup>	$t_f$			25	40	
Source-Drain Diode Ratings and Characteristics ( $T_C = 25\text{ }^{\circ}\text{C}$ )						
Pulsed Current	$I_{SM}$				50	A
Diode Forward Voltage	$V_{SD}$	$I_F = 15\text{ A}$ , $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 15\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		30	60	ns

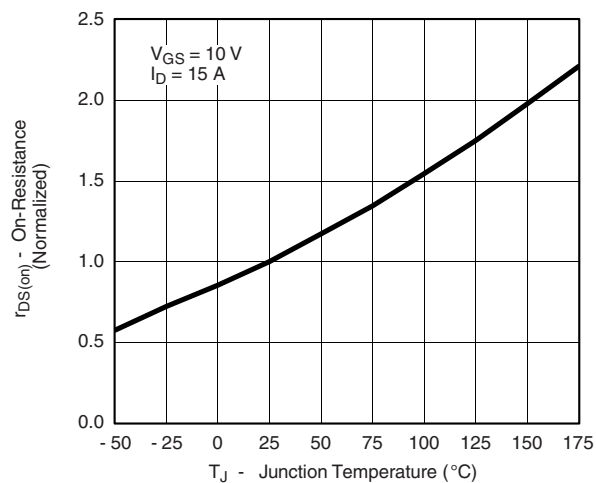
## Notes:

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

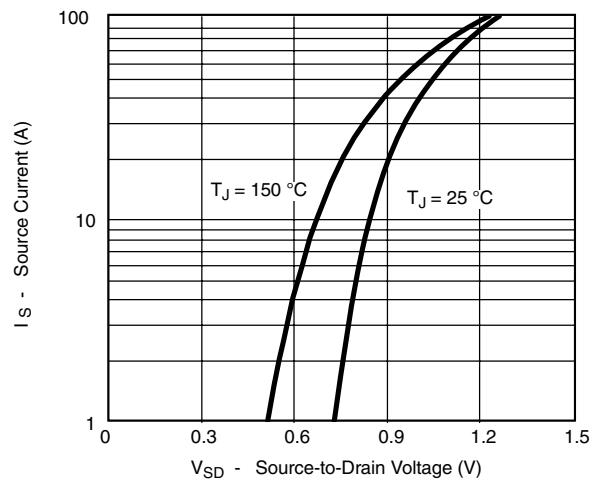
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

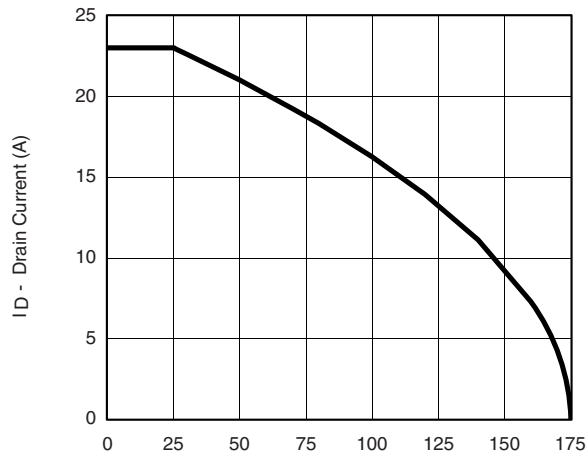
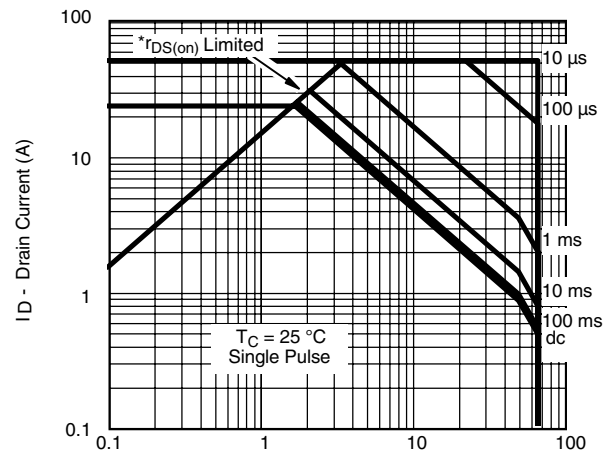
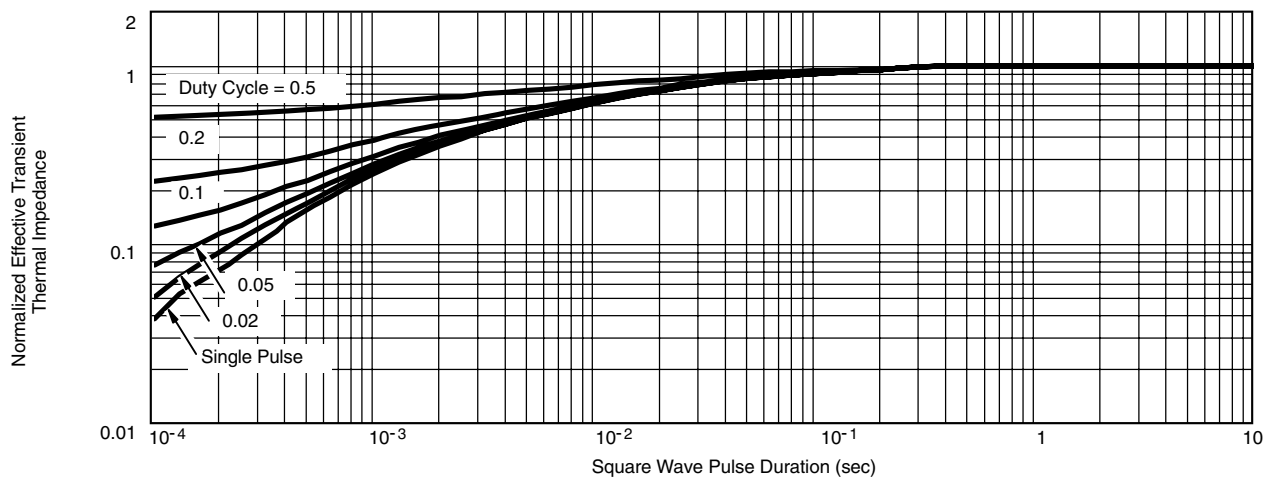
## TYPICAL CHARACTERISTICS 25 °C unless noted



On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage

**THERMAL RATINGS** $T_A$  - Ambient Temperature (°C)**Maximum Drain Current  
vs. Ambient Temperature** $V_{DS}$  - Drain-to-Source Voltage (V)\* $V_{GS}$  > minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified**Safe Operating Area****Normalized Thermal Transient Impedance, Junction-to-Case**

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