

## N-Channel 20 V (D-S) 175 °C MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>
20	0.0060 at $V_{GS} = 10$ V	26
	0.0095 at $V_{GS} = 4.5$ V	21

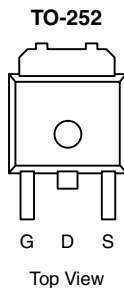
### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 175 °C Junction Temperature
- PWM Optimized for High Efficiency
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC

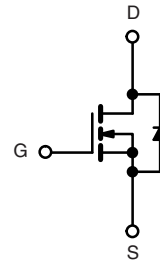

**RoHS**  
COMPLIANT

### APPLICATIONS

- Synchronous Buck DC/DC Conversion
  - Desktop
  - Server



Drain Connected to Tab

**Ordering Information:** SUD50N02-06P-E3 (Lead (Pb) free)


N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	20	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current <sup>a</sup>	$I_D$	$T_A = 25$ °C	26 <sup>a</sup>	A
		$T_C = 25$ °C	50 <sup>b</sup>	
Pulsed Drain Current	$I_{DM}$	100		
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	26		
Avalanche Current	$I_{AS}$	L = 0.1 mH	45	
Single Pulse Avalanche Energy			$E_{AS}$	101
Maximum Power Dissipation	$P_D$	$T_A = 25$ °C	6.8 <sup>a</sup>	W
		$T_C = 25$ °C	65	
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>	$R_{thJA}$	$t \leq 10$ s	18	22	°C/W
		Steady State	40	50	
Maximum Junction-to-Case	$R_{thJC}$	1.9	2.3		

Notes:

 a. Surface mounted on FR4 board,  $t \leq 10$  s.

b. Limited by package.

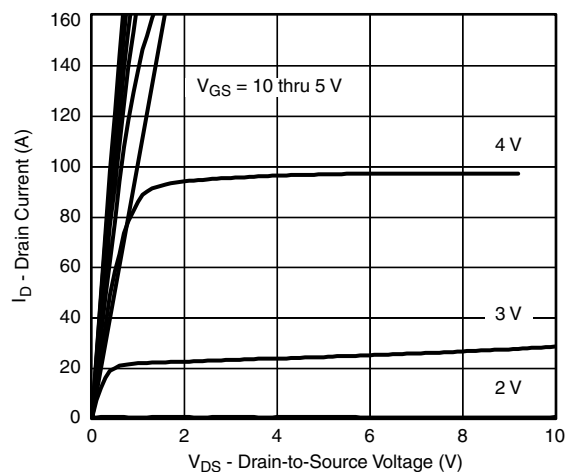
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.8		3	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.0046	0.006	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0084	
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0073	0.0095	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$	15			S
<b>Dynamic<sup>a</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 10\text{ V}, f = 1\text{ MHz}$		2550		pF
Output Capacitance	$C_{oss}$			900		
Reverse Transfer Capacitance	$C_{rss}$			415		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$		19	30	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			7.5		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			6		
Gate Resistance	$R_g$		0.5	1.5	2.4	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 0.2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_G = 2.5\text{ }\Omega$		11	20	ns
Rise Time <sup>c</sup>	$t_r$			10	15	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			24	35	
Fall Time <sup>c</sup>	$t_f$			9	15	
<b>Source-Drain Diode Ratings and Characteristic</b> ( $T_C = 25\text{ }^\circ\text{C}$ )						
Pulsed Current	$I_{SM}$				100	A
Diode Forward Voltage <sup>b</sup>	$V_{SD}$	$I_F = 50\text{ A}, V_{GS} = 0\text{ V}$		1.2	1.5	V
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		35	70	ns

Notes:

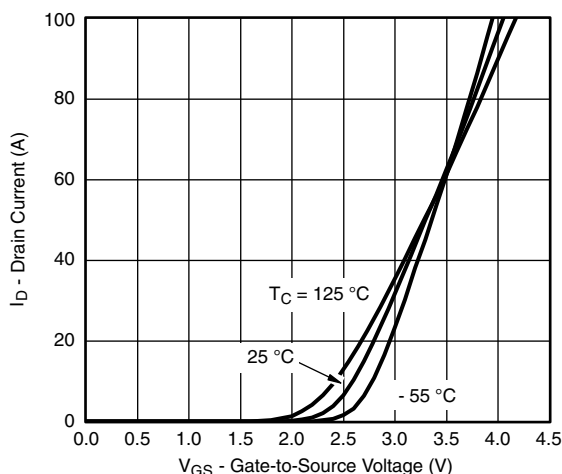
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- c. Independent of operating temperature.

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.

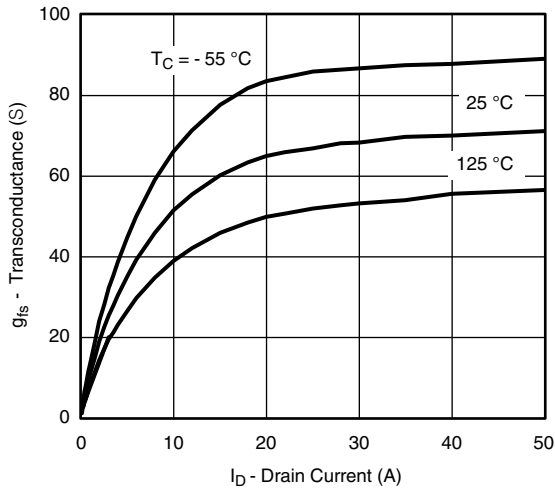
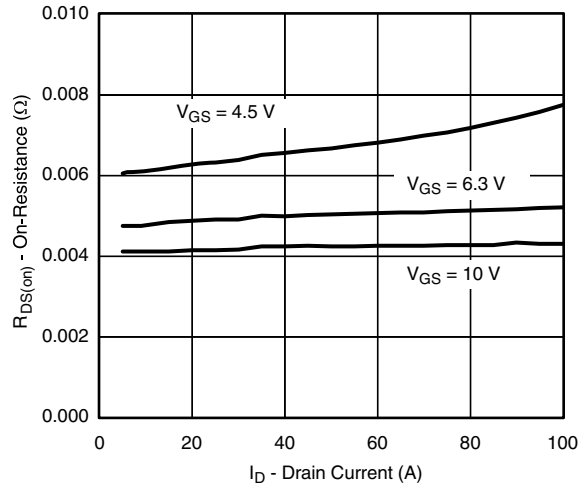
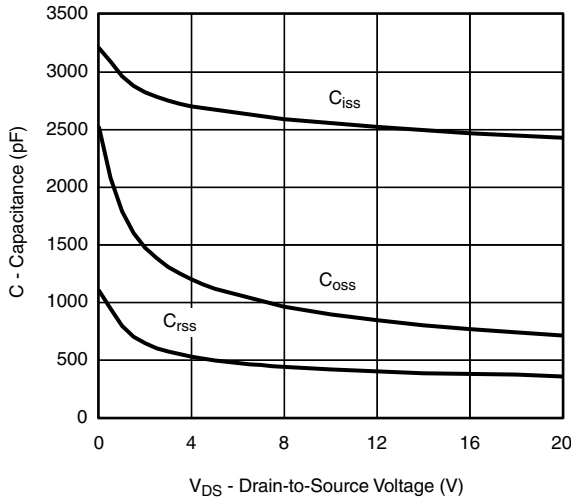
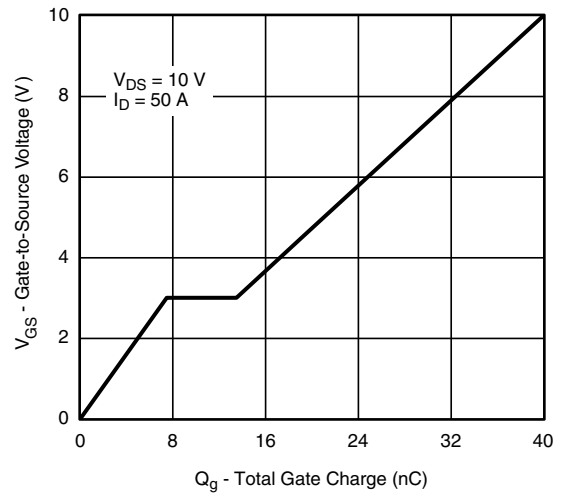
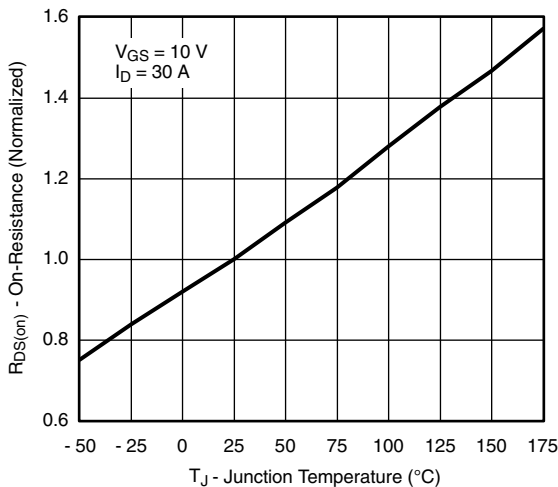
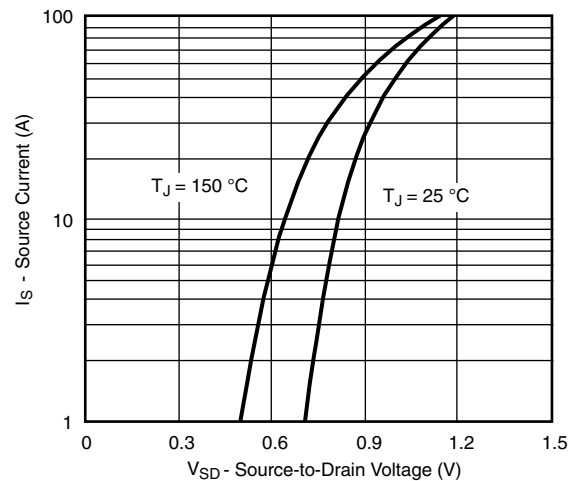
### TYPICAL CHARACTERISTICS (25 °C unless noted)



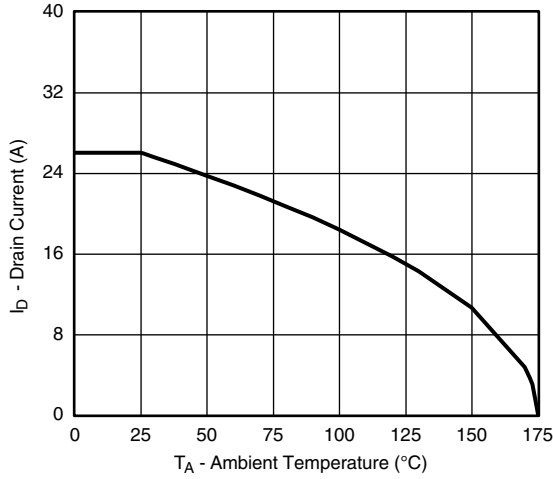
Output Characteristics



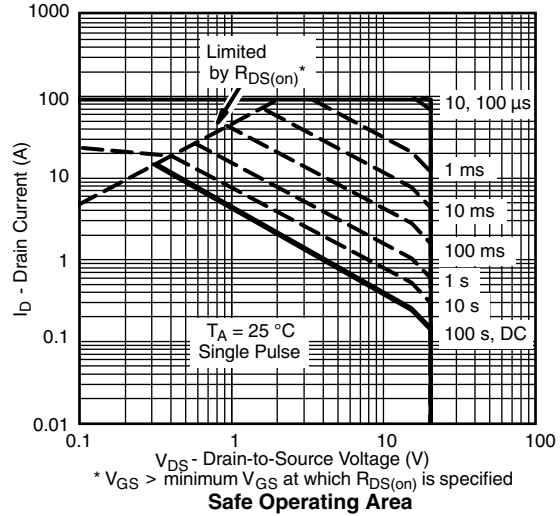
Transfer Characteristics

**TYPICAL CHARACTERISTICS** (25 °C unless noted)

**Transconductance**

**On-Resistance vs. Drain Current**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

**Source-Drain Diode Forward Voltage**

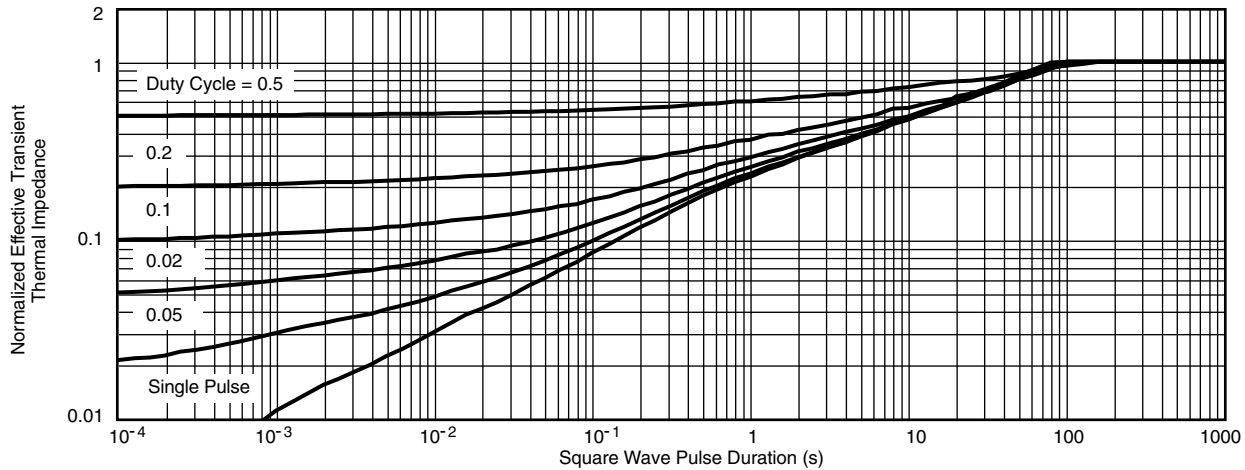
### THERMAL RATINGS



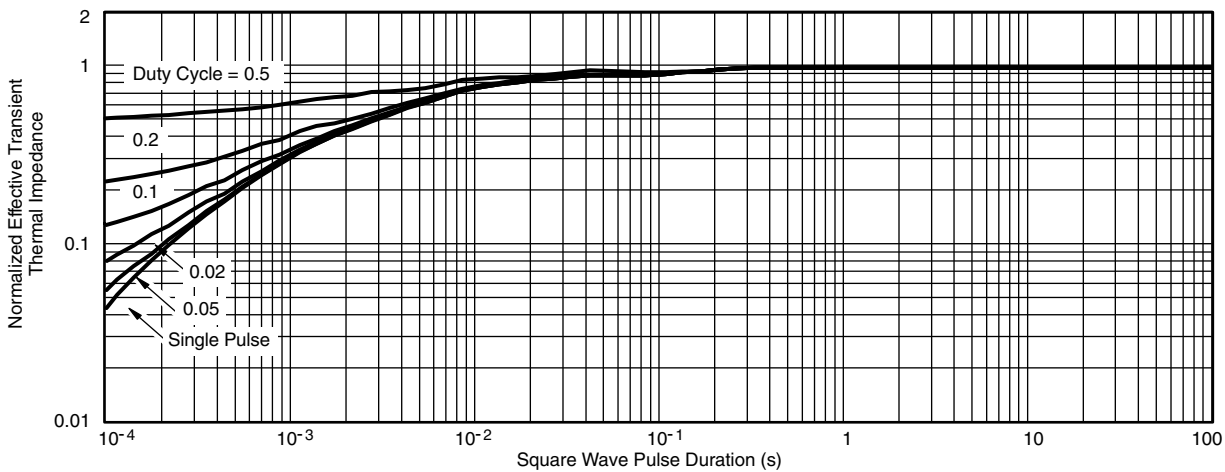
**Maximum Drain Current vs. Ambient Temperature**



**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



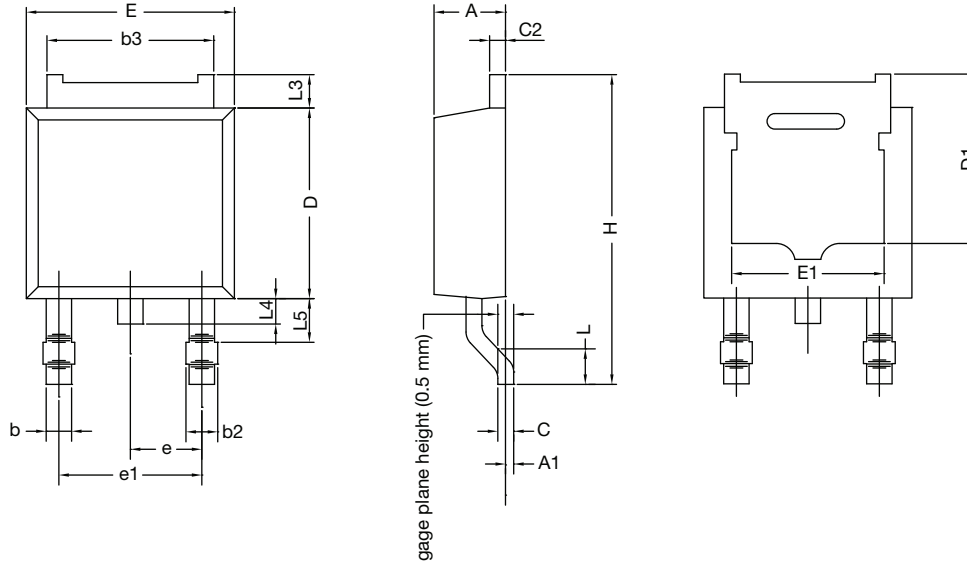
**Normalized Thermal Transient Impedance, Junction-to-Case**

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# TO-252AA Case Outline

## VERSION 1: FACILITY CODE = Y



MILLIMETERS		
DIM.	MIN.	MAX.
A	2.18	2.38
A1	-	0.127
b	0.64	0.88
b2	0.76	1.14
b3	4.95	5.46
C	0.46	0.61
C2	0.46	0.89
D	5.97	6.22
D1	4.10	-
E	6.35	6.73
E1	4.32	-
H	9.40	10.41
e	2.28 BSC	
e1	4.56 BSC	
L	1.40	1.78
L3	0.89	1.27
L4	-	1.02
L5	1.01	1.52

### Note

- Dimension L3 is for reference only



VERSION 2: FACILITY CODE = N



MILLIMETERS		
DIM.	MIN.	MAX.
A	2.18	2.39
A1	-	0.13
b	0.65	0.89
b1	0.64	0.79
b2	0.76	1.13
b3	4.95	5.46
c	0.46	0.61
c1	0.41	0.56
c2	0.46	0.60
D	5.97	6.22
D1	5.21	-
E	6.35	6.73
E1	4.32	-
e	2.29 BSC	
H	9.94	10.34

MILLIMETERS		
DIM.	MIN.	MAX.
L	1.50	1.78
L1	2.74 ref.	
L2	0.51 BSC	
L3	0.89	1.27
L4	-	1.02
L5	1.14	1.49
L6	0.65	0.85
θ	0°	10°
θ1	0°	15°
θ2	25°	35°

Notes

- Dimensioning and tolerance confirm to ASME Y14.5M-1994
- All dimensions are in millimeters. Angles are in degrees
- Heat sink side flash is max. 0.8 mm
- Radius on terminal is optional

ECN: E19-0649-Rev. Q, 16-Dec-2019  
 DWG: 5347

## RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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