

## Small Signal MOSFET

### 20 V, 238 mA, Single, N-Channel, Gate ESD Protection

#### Features

- Low Gate Charge for Fast Switching
- Small 1.6 x 1.6 mm Footprint
- ESD Protected Gate
- Pb-Free Package is Available
- ESD Protected:2000V
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

#### Applications

- Power Management Load Switch
- Level Shift
- Portable Applications such as Cell Phones, Media Players, Digital Cameras, PDA's, Video Games, Hand Held Computers, etc.

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	20	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 10$	V	
Continuous Drain Current (Note 1)	$I_D$	Steady State = $25^\circ\text{C}$	238	mA
Power Dissipation (Note 1)		Steady State = $25^\circ\text{C}$	300	mW
Pulsed Drain Current	$I_{DM}$	$t_p \leq 10 \mu\text{s}$	714	mA
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Continuous Source Current (Body Diode)	$I_{SD}$	238	mA	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	$^\circ\text{C}$	

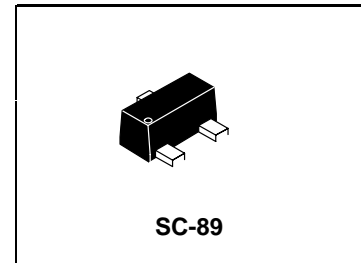
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	416	$^\circ\text{C}/\text{W}$

1. Surface-mounted on FR4 board using 1 in sq. pad size (Cu area = 1.127 in sq. [1 oz] including traces).

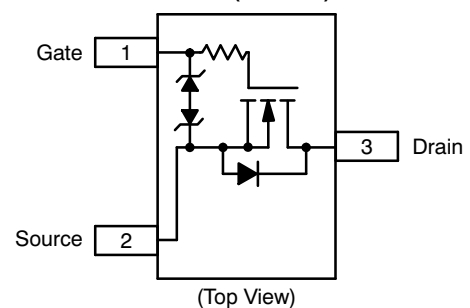
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S-LNTA4001NT1G



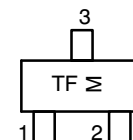
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ @ $V_{GS}$	$I_D$ MAX (Note 1)
20 V	1.5 $\Omega$ @ 4.5 V	238 mA
	2.2 $\Omega$ @ 2.5 V	

#### PIN CONNECTIONS

##### SC-89 (3-Leads)



#### MARKING DIAGRAM



TF = Specific Device Code  
M = Month Code

#### ORDERING INFORMATION

Device	Package	Shipping
LNTA4001NT1G S-LNTA4001NT1G	SC-89	3000 Tape & Reel
LNTA4001NT3G S-LNTA4001NT3G	SC-89	10000 Tape & Reel

**LNTA4001NT1G , S-LNTA4001NT1G**
**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$			1.0	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			$\pm 100$	$\mu\text{A}$
<b>ON CHARACTERISTICS</b> (Note 2)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = 3\text{ V}, I_D = 100\ \mu\text{A}$	0.5	1.0	1.5	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 10\text{ mA}$		1.5	3.0	$\Omega$
		$V_{GS} = 2.5\text{ V}, I_D = 10\text{ mA}$		2.2	3.5	
Forward Transconductance	$g_{FS}$	$V_{DS} = 3\text{ V}, I_D = 10\text{ mA}$		50		mS
<b>CAPACITANCES</b>						
Input Capacitance	$C_{ISS}$	$V_{DS} = 5\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$		11.5	20	$\text{pF}$
Output Capacitance	$C_{OSS}$			10	15	
Reverse Transfer Capacitance	$C_{RSS}$			3.5	6.0	
<b>SWITCHING CHARACTERISTICS</b> (Note 3)						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}, I_D = 10\text{ mA}, R_G = 10\ \Omega$		13		ns
Rise Time	$t_r$			15		
Turn-Off Delay Time	$t_{d(OFF)}$			98		
Fall Time	$t_f$			60		
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 10\text{ mA}$		0.66	0.8	V

 2. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

3. Switching characteristics are independent of operating junction temperatures.

### LNTA4001NT1G , S-LNTA4001NT1G TYPICAL PERFORMANCE CURVES

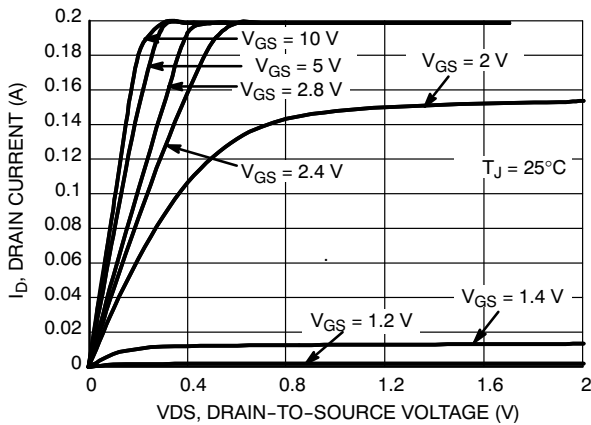


Figure 1. On-region Characteristics

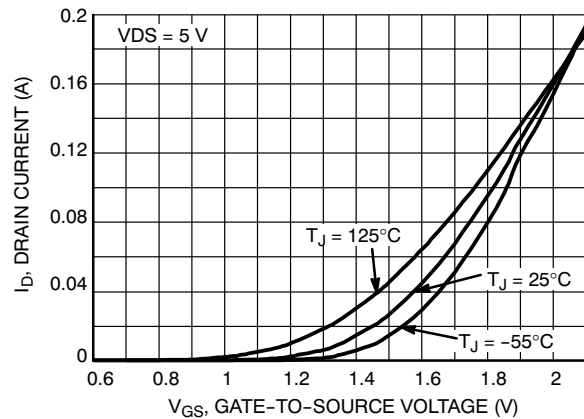


Figure 2. Transfer Characteristics

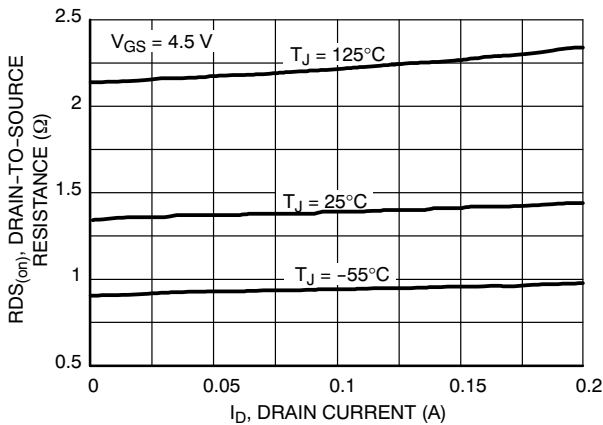


Figure 3. On-resistance versus Drain Current and Temperature

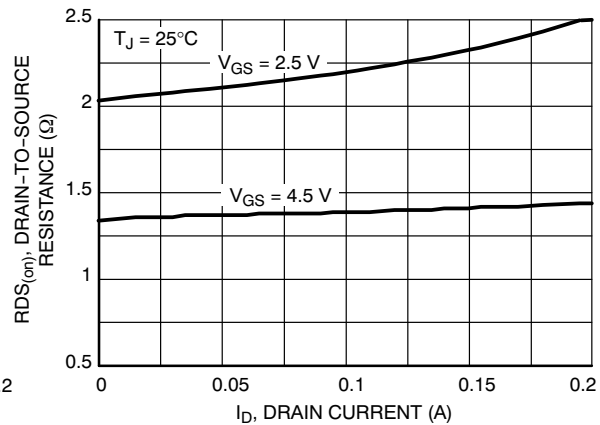


Figure 4. On-resistance versus Drain Current and Gate Voltage

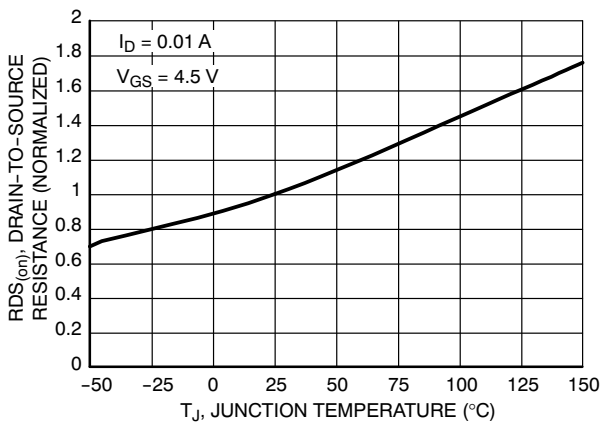


Figure 5. On-resistance Variation with Temperature

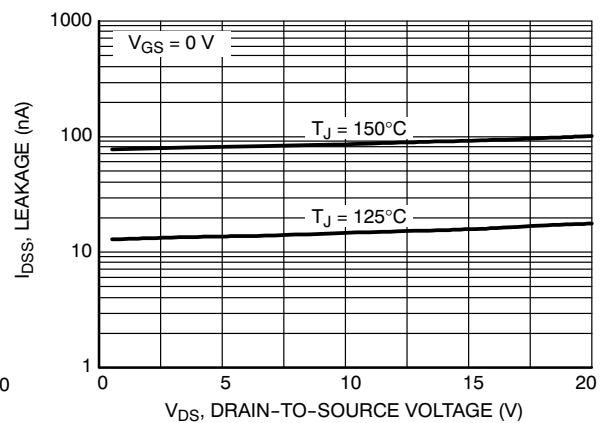


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL PERFORMANCE CURVES

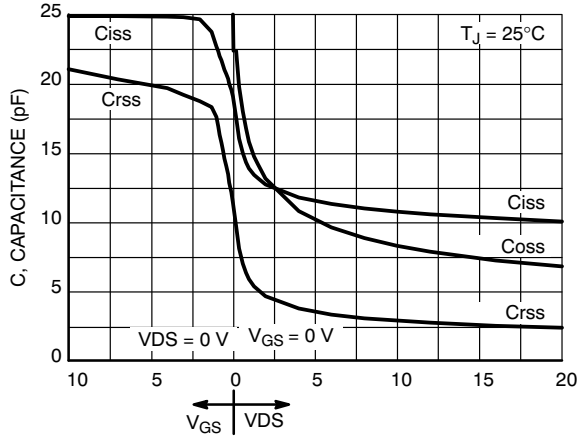


Figure 7. Capacitance Variation

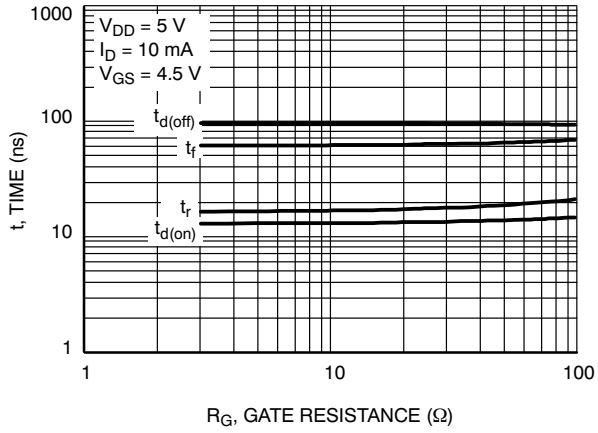


Figure 8. Resistive Switching Time Variation versus Gate Resistance

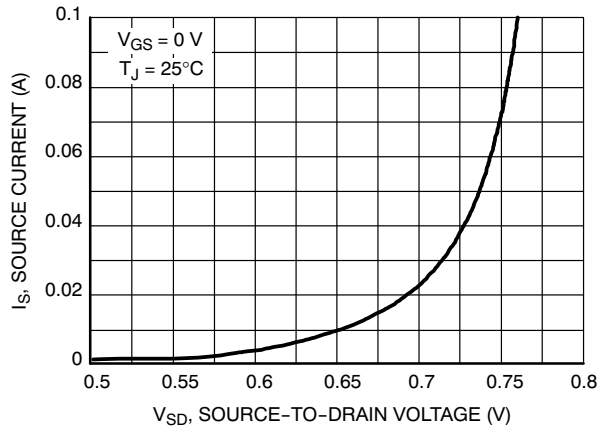
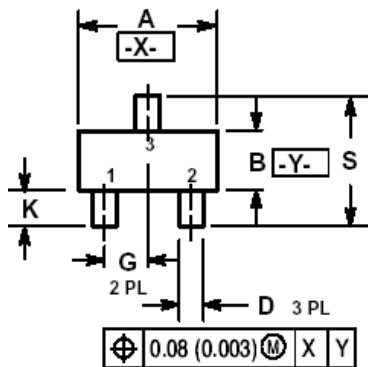


Figure 9. Diode Forward Voltage versus Current

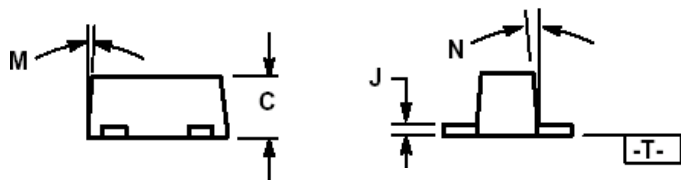
LNTA4001NT1G , S-LNTA4001NT1G

SC-89



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.



DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G	0.50 BSC			0.020 BSC		
H	0.53 REF			0.021 REF		
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L	1.10 REF			0.043 REF		
M	---	---	10 °	---	---	10 °
N	---	---	10 °	---	---	10 °
S	1.50	1.60	1.70	0.059	0.063	0.067

