

MOSFET – Small Signal, Complementary, XLLGA6, 0.65mm x 0.90mm x 0.4mm

20 V

NTND31225CZ

Features

- Advanced Trench Complementary MOSFET
- Offers a Low $R_{DS(ON)}$ Solution in the Ultra Small 0.65 mm x 0.90 mm Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Small Signal Load Switch with Level Shift
- Analog Switch
- High Speed Interfacing
- Optimized for Power Management in Ultra Portable Products

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

Symbol	Parameter			Value	Unit
V_{DSS}	Drain-to-Source Voltage		NMOS	20	V
			PMOS	−20	
V_{GSS}	Gate-to-Source Voltage		NMOS	±8	V
			PMOS	±8	
I_D	N–Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	220	mA
			$T_A = 85^{\circ}\text{C}$	158	
		$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$	253	
I_D	P–Channel Continuous Drain Current (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	−127	mA
			$T_A = 85^{\circ}\text{C}$	−91	
		$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$	−146	
P_D	Power Dissipation (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	125	mW
		$t \leq 5\text{ s}$		166	
I_{DM}	Pulsed Drain Current	NMOS	$t_p = 10\text{ }\mu\text{s}$	846	mA
		PMOS		−488	
I_S	Source Current (Body Diode)			200	mA
				−200	
T_J , T_{STG}	Operating Junction and Storage Temperature			−55 to 150	$^{\circ}\text{C}$
T_L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			260	$^{\circ}\text{C}$

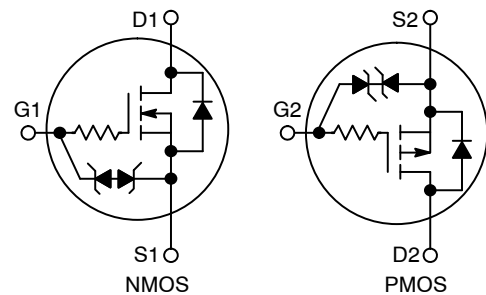
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- Surface-mounted on FR4 board using the minimum recommended pad size, 1 oz Cu.

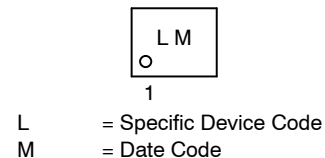
$V_{(BR)DS}$	$R_{DS(ON)}$ MAX	I_D Max
N-Channel 20 V	1.5 Ω @ 4.5 V	220 mA
	2.0 Ω @ 2.5 V	
	3.0 Ω @ 1.8 V	
	4.5 Ω @ 1.5 V	
P-Channel -20 V	5.0 Ω @ -4.5 V	-127 mA
	6.0 Ω @ -2.5 V	
	7.0 Ω @ -1.8 V	
	10.0 Ω @ -1.5 V	


XLLGA6
Case 713AC

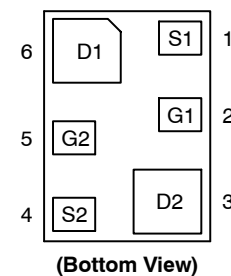
DEVICE SYMBOL



MARKING DIAGRAM



PINOUT DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

NTND31225CZ

THERMAL RESISTANCE RATINGS

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Junction-to-Ambient (Note 2) Steady State $t \leq 5$ s	998 751	$^{\circ}\text{C/W}$

2. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq), 1 oz copper

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	FET	Test Condition	Min	Typ	Max	Unit
--------	-----------	-----	----------------	-----	-----	-----	------

OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
		P	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			
I_{DSS}	Zero Gate Voltage Drain Current	N	$V_{GS} = 0\text{ V}, V_{DS} = 5\text{ V}$	$T_J = 25^{\circ}\text{C}$		50	nA
				$T_J = 85^{\circ}\text{C}$		200	
			$V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$	$T_J = 25^{\circ}\text{C}$		100	
		P	$V_{GS} = 0\text{ V}, V_{DS} = -5\text{ V}$	$T_J = 25^{\circ}\text{C}$		-50	
				$T_J = 85^{\circ}\text{C}$		-200	
			$V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$	$T_J = 25^{\circ}\text{C}$		-100	
I_{GSS}	Gate-to-Source Leakage Current	N	$V_{GS} = 0\text{ V}, V_{DS} = \pm 5\text{ V}$			± 100	nA
		P	$V_{GS} = 0\text{ V}, V_{DS} = \pm 5\text{ V}$			± 100	

ON CHARACTERISTICS

$V_{GS(TH)}$	Gate Threshold Voltage	N	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	0.4		1.0	V
		P	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-0.4		-1.0	
$R_{DS(ON)}$	Drain-to-Source On Resistance	N	$V_{GS} = 4.5\text{ V}, I_D = 100\text{ mA}$		0.8	1.5	Ω
			$V_{GS} = 2.5\text{ V}, I_D = 50\text{ mA}$		1.1	2.0	
			$V_{GS} = 1.8\text{ V}, I_D = 20\text{ mA}$		1.4	3.0	
			$V_{GS} = 1.5\text{ V}, I_D = 10\text{ mA}$		1.8	4.5	
		P	$V_{GS} = -4.5\text{ V}, I_D = -100\text{ mA}$		2.1	5.0	
			$V_{GS} = -2.5\text{ V}, I_D = -50\text{ mA}$		2.7	6.0	
			$V_{GS} = -1.8\text{ V}, I_D = -20\text{ mA}$		3.6	7.0	
			$V_{GS} = -1.5\text{ V}, I_D = -10\text{ mA}$		4.2	10.0	
g_{FS}	Forward Transconductance	N	$V_{DS} = 5\text{ V}, I_D = 125\text{ mA}$		0.48		S
		P	$V_{DS} = -5\text{ V}, I_D = -125\text{ mA}$		0.35		
V_{SD}	Forward Diode Voltage	N	$V_{GS} = 0\text{ V}, I_S = 10\text{ mA}$		0.6	1.0	V
		P	$V_{GS} = 0\text{ V}, I_S = -10\text{ mA}$		-0.6	-1.0	

CAPACITANCES

C_{ISS}	Input Capacitance	N	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		12.3		pF
C_{OSS}	Output Capacitance				3.4		
C_{RSS}	Reverse Capacitance				2.5		
C_{ISS}	Input Capacitance	P	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -15\text{ V}$		12.8		
C_{OSS}	Output Capacitance				2.8		
C_{RSS}	Reverse Capacitance				2.0		

NTND31225CZ

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified) (continued)

Symbol	Parameter	FET	Test Condition	Min	Typ	Max	Unit
--------	-----------	-----	----------------	-----	-----	-----	------

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$

$t_{d(ON)}$	Turn-On Delay Time	N	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 200\text{ mA}, R_G = 2\ \Omega$		16.5		ns
t_r	Rise Time				25.5		
$t_{d(OFF)}$	Turn-Off Delay Time				142		
t_f	Fall Time				80		
$t_{d(ON)}$	Turn-On Delay Time	P	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V},$ $I_D = -200\text{ mA}, R_G = 2\ \Omega$		37		
t_r	Rise Time				71		
$t_{d(OFF)}$	Turn-Off Delay Time				280		
t_f	Fall Time				171		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS – P-CHANNEL

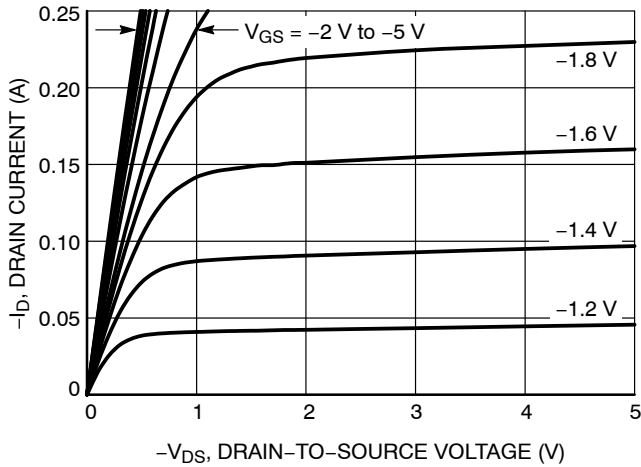


Figure 1. On-Region Characteristics

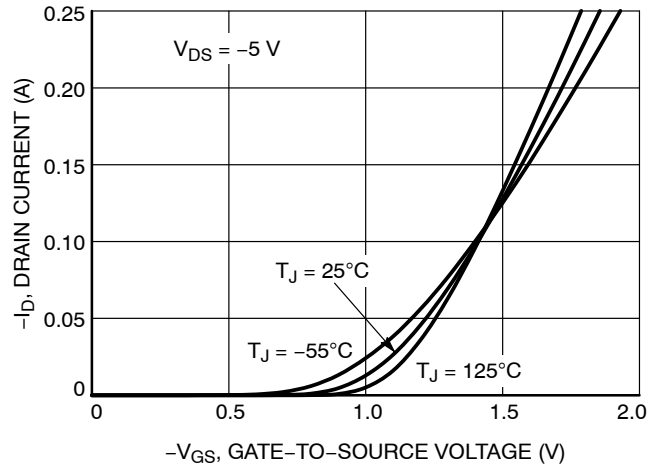


Figure 2. Transfer Characteristics

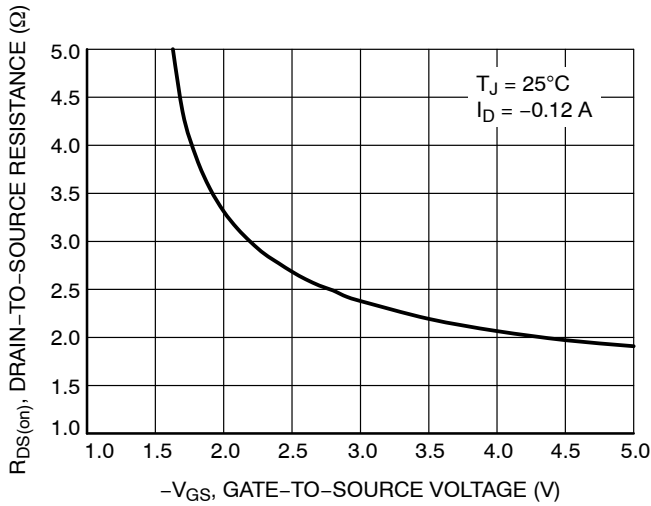


Figure 3. On-Resistance vs. Gate-to-Source Voltage

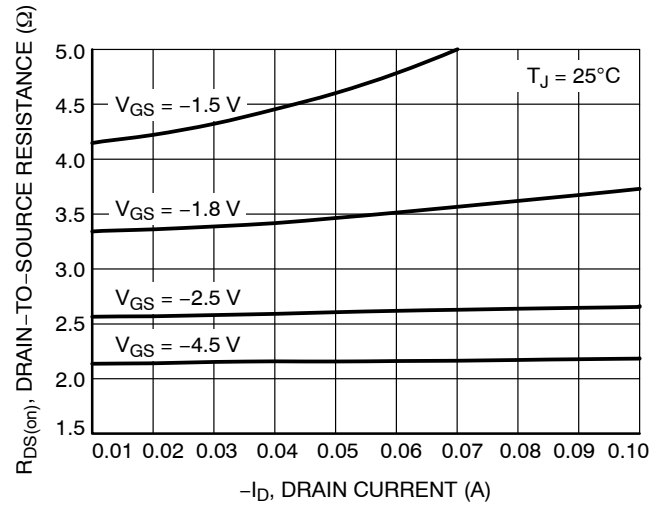


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

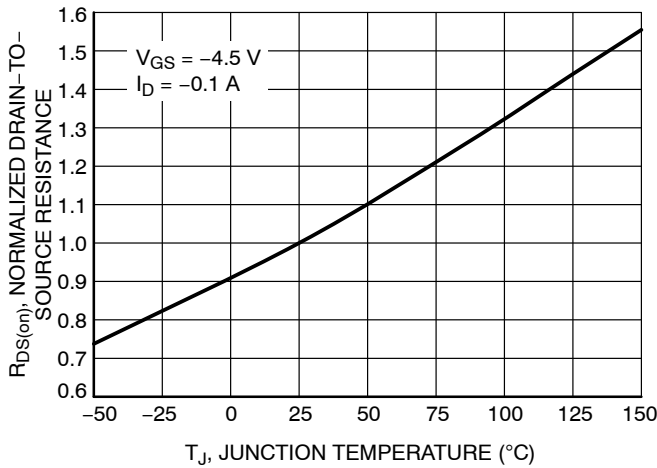


Figure 5. On-Resistance Variation with Temperature

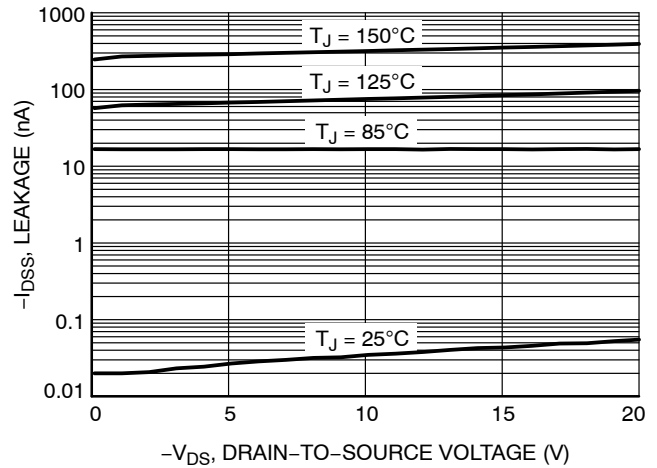


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – P-CHANNEL (continued)

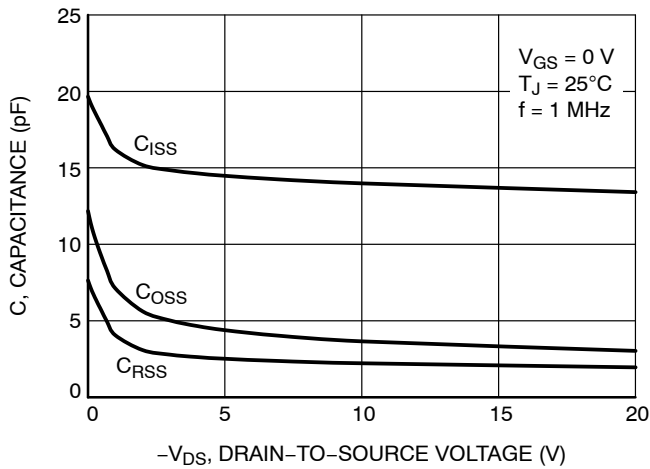


Figure 7. Capacitance Variation

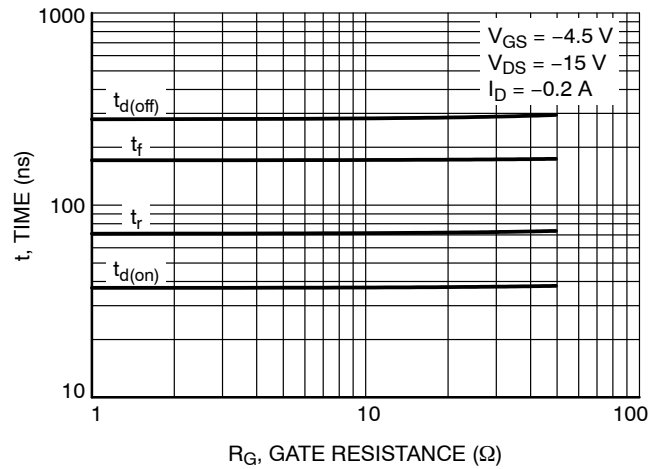


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

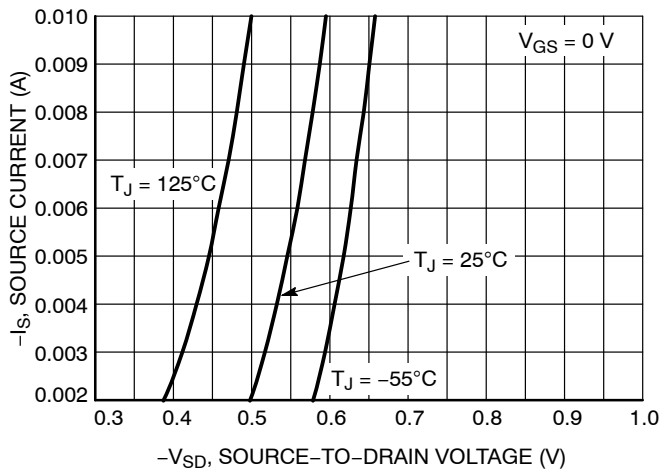


Figure 9. Diode Forward Voltage vs. Current

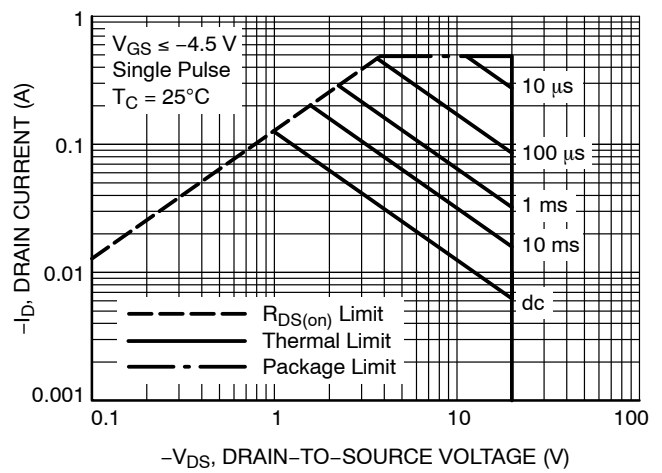


Figure 10. Maximum Rated Forward Biased Safe Operating Area

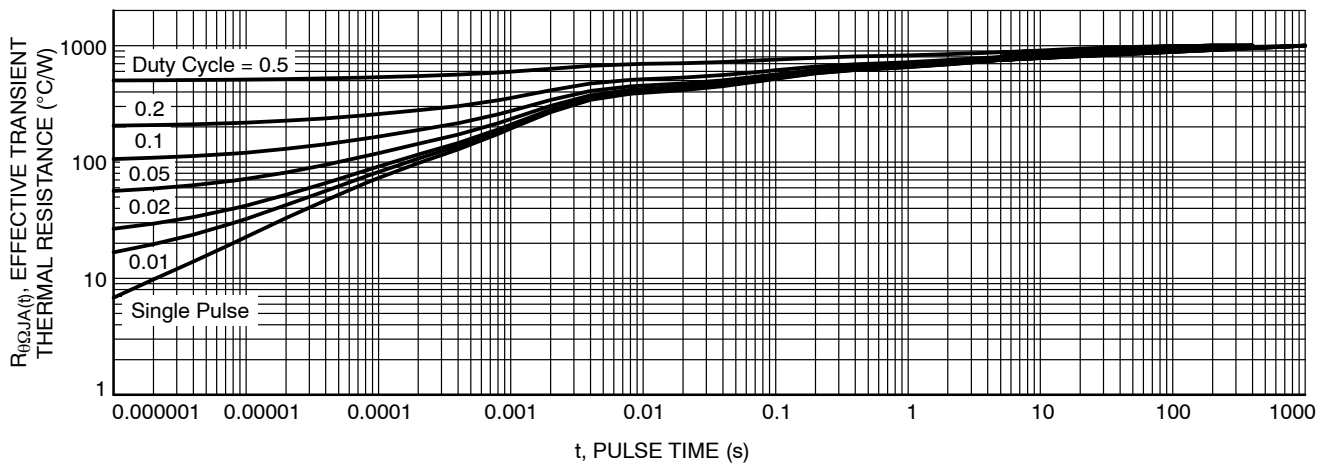


Figure 11. Thermal Response

TYPICAL CHARACTERISTICS – N-CANNEL

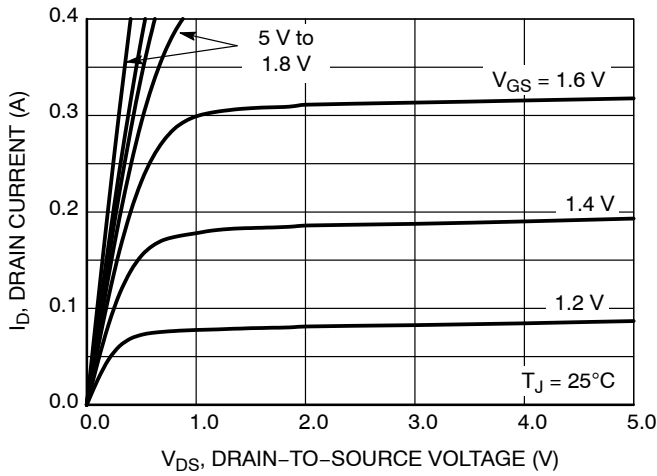


Figure 12. On-Region Characteristics

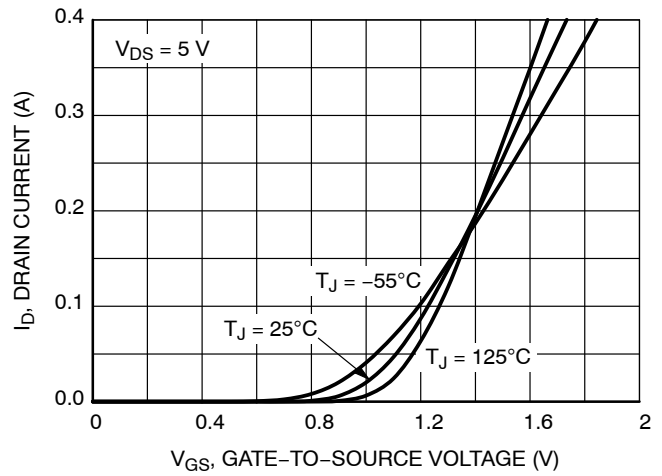


Figure 13. Transfer Characteristics

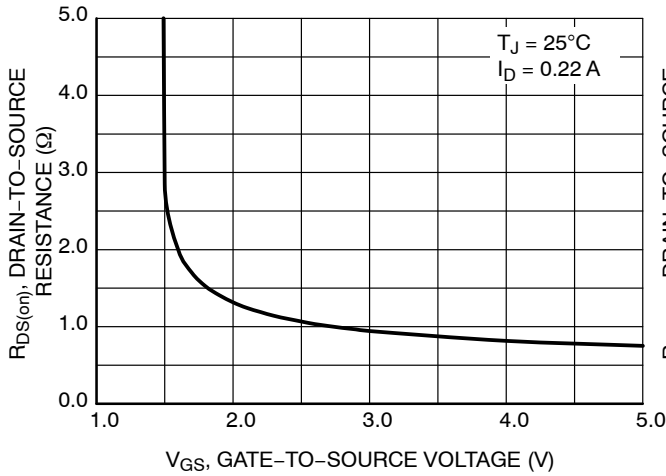


Figure 14. On-Resistance vs. Gate-to-Source Voltage

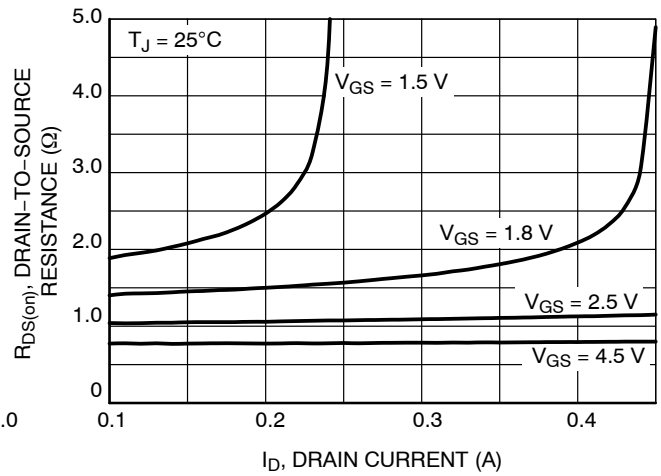


Figure 15. On-Resistance vs. Drain Current and Gate Voltage

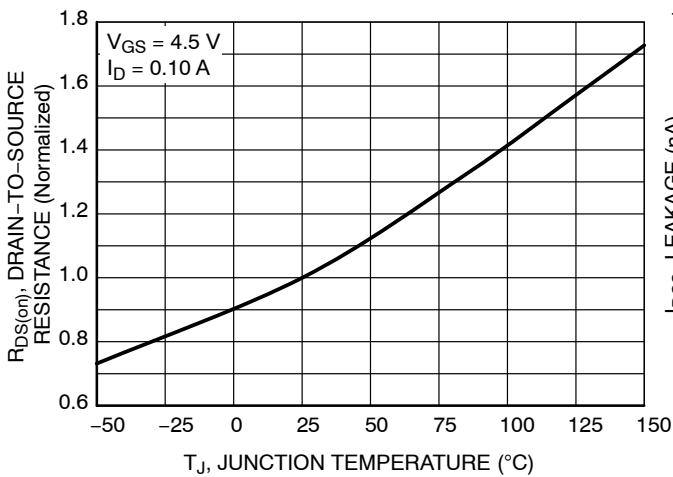


Figure 16. On-Resistance Variation with Temperature

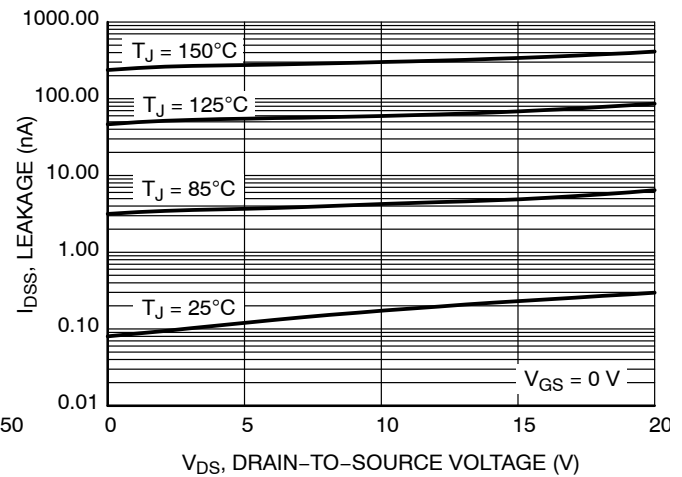


Figure 17. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – N-CHANNEL (continued)

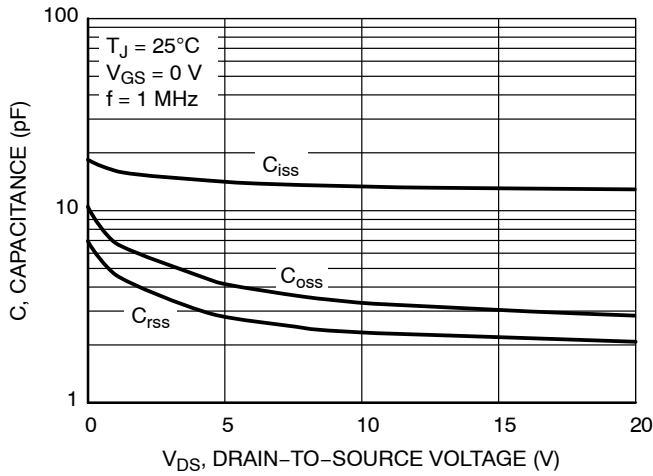


Figure 18. Capacitance Variation

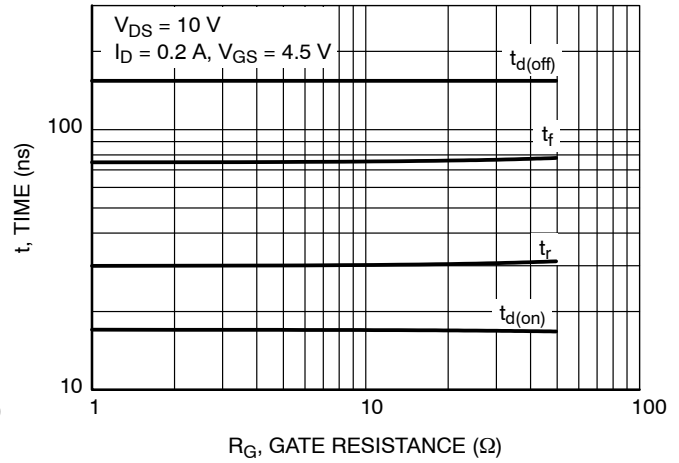


Figure 19. Resistive Switching Time Variation vs. Gate Resistance

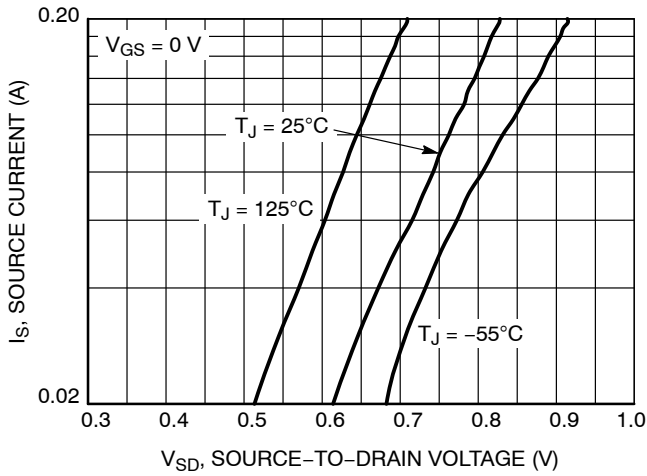


Figure 20. Diode Forward Voltage vs. Current

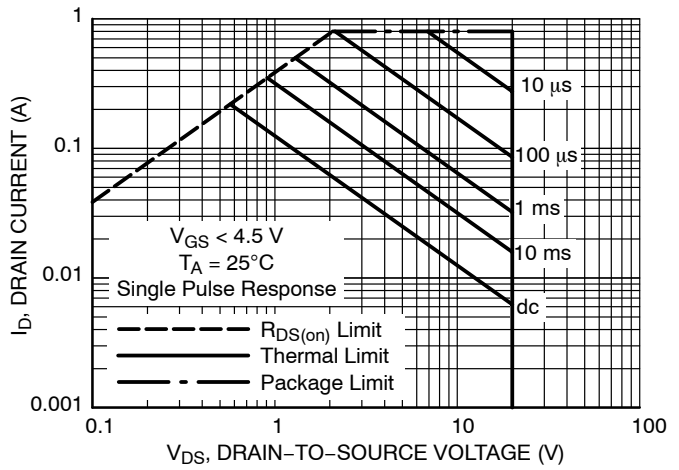


Figure 21. Maximum Rated Forward Biased Safe Operating Area

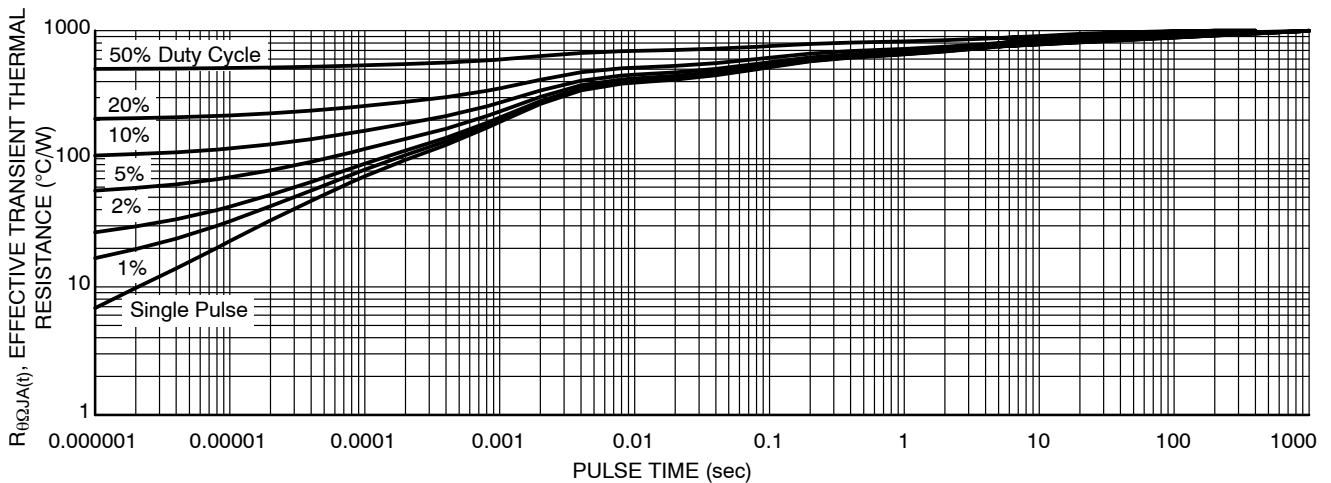


Figure 22. Thermal Response

NTND31225CZ

ORDERING INFORMATION

Device	Package	Shipping†
NTND31225CZTAG	XLLGA6 (Pb-Free)	8,000 / Tape & Reel

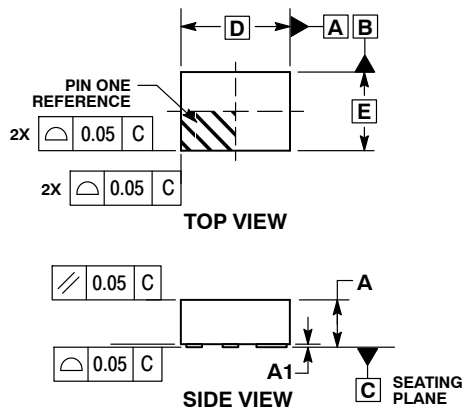
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).



SCALE 8:1

XLLGA6 0.90x0.65
CASE 713AC
ISSUE O

DATE 19 JUN 2014



NOTES:

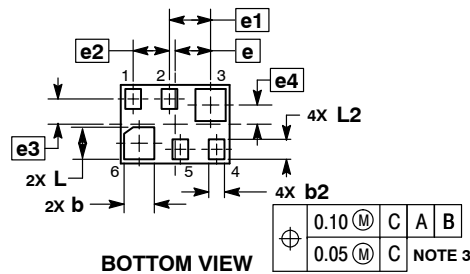
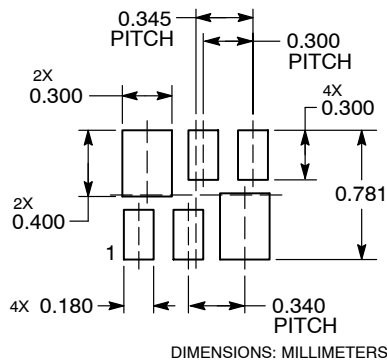
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. POSITIONAL TOLERANCE APPLIES TO ALL SIX LEADS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.340	0.440
A1	0.000	0.050
b	0.200	0.300
b2	0.080	0.180
D	0.900 BSC	
E	0.650 BSC	
e	0.295 BSC	
e1	0.340 BSC	
e2	0.300 BSC	
e3	0.208 BSC	
e4	0.158 BSC	
L	0.215	0.315
L2	0.115	0.215

GENERIC MARKING DIAGRAM*

X = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking.
Pb-Free indicator, "G" or microdot "▪", may or may not be present.


RECOMMENDED SOLDERING FOOTPRINT*


*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, [SOLDDRRM/D](#).

DOCUMENT NUMBER:	98AON86873F	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	XLLGA6 0.90X0.65	PAGE 1 OF 1

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales