

# NTND31225CZ

## MOSFET – Small Signal, Complementary, XLLGAS6, 0.65mm x 0.90mm x 0.4mm 20 V



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

### 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

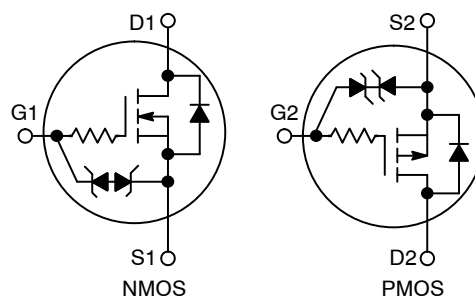
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

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

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

### DEVICE SYMBOL



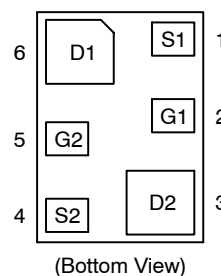
XLLGA6  
Case 713AC

### MARKING DIAGRAM



L = Specific Device Code  
M = Date Code

### PINOUT DIAGRAM



### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

## NTND31225CZ

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

# NTND31225CZ

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient (Note 2) Steady State $t \leq 5$ s	$R_{\theta JA}$	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)

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

### OFF CHARACTERISTICS

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

### ON CHARACTERISTICS

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

3. Switching characteristics are independent of operating junction temperatures.

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.

# NTND31225CZ

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

Parameter	Symbol	FET	Test Condition	Min	Typ	Max	Unit
<b>CAPACITANCES</b>							
Input Capacitance	$C_{ISS}$	N	$V_{GS} = 0\text{ V}, f = 1\text{ MHz},$ $V_{DS} = 15\text{ V}$		12.3		pF
Output Capacitance	$C_{OSS}$				3.4		
Reverse Capacitance	$C_{RSS}$				2.5		
Input Capacitance	$C_{ISS}$	P	$V_{GS} = 0\text{ V}, f = 1\text{ MHz},$ $V_{DS} = -15\text{ V}$		12.8		
Output Capacitance	$C_{OSS}$				2.8		
Reverse Capacitance	$C_{RSS}$				2.0		

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

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

3. Switching characteristics are independent of operating junction temperatures.

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.

## ORDERING INFORMATION

Device	Package	Shipping†
NTND31225CZTAG	XLLGA6 (Pb-Free)	8000 / 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.

TYPICAL CHARACTERISTICS – P-CHANNEL

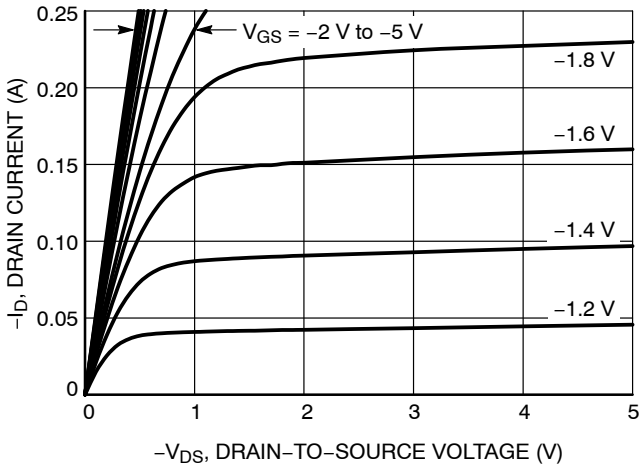


Figure 1. On-Region Characteristics

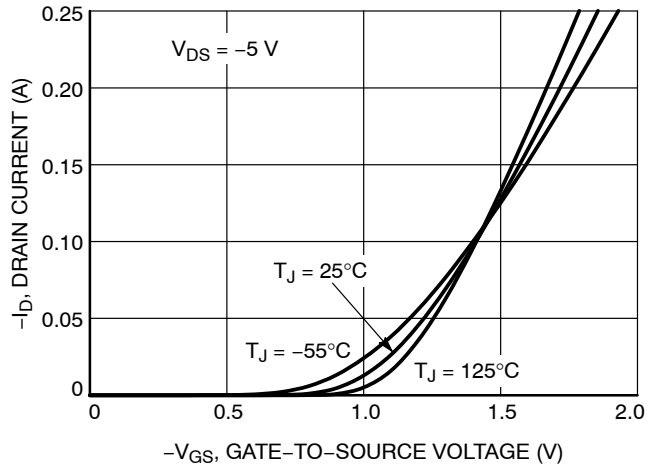


Figure 2. Transfer Characteristics

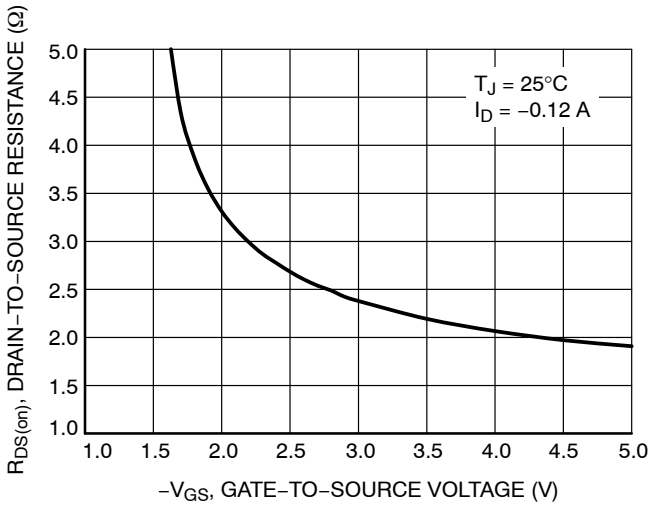


Figure 3. On-Resistance vs. Gate-to-Source Voltage

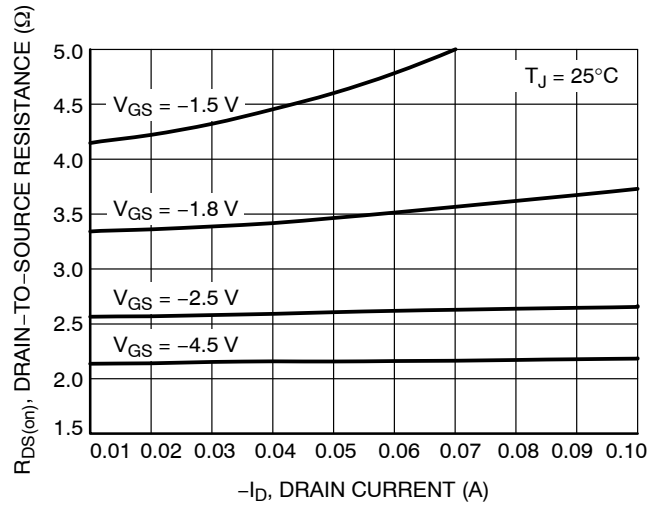


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

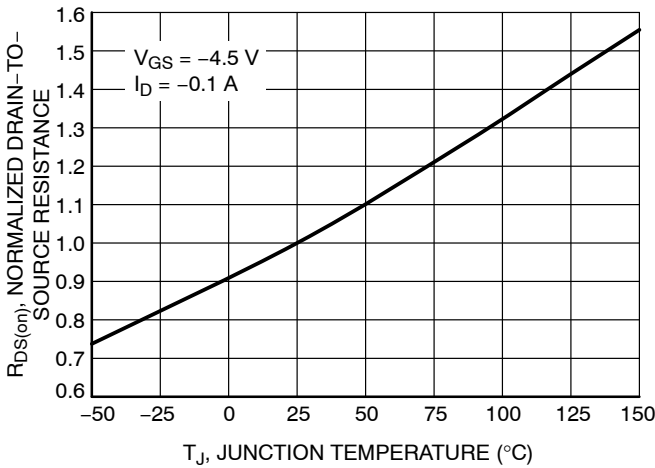


Figure 5. On-Resistance Variation with Temperature

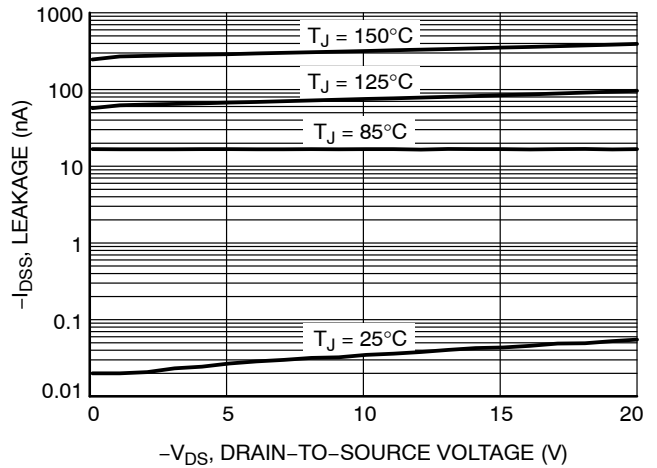


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTND31225CZ

## TYPICAL CHARACTERISTICS – P-CHANNEL

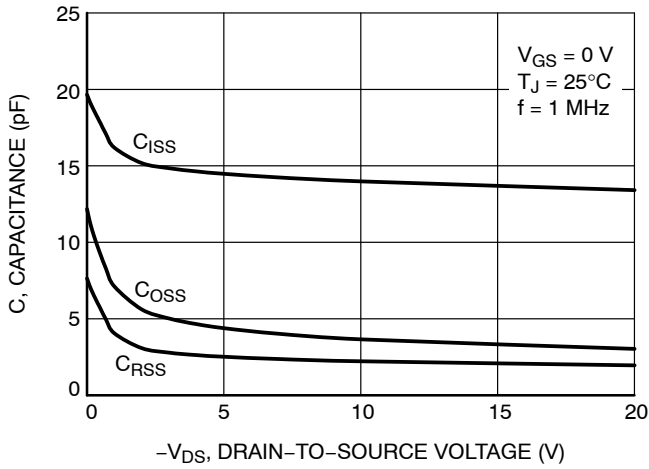


Figure 7. Capacitance Variation

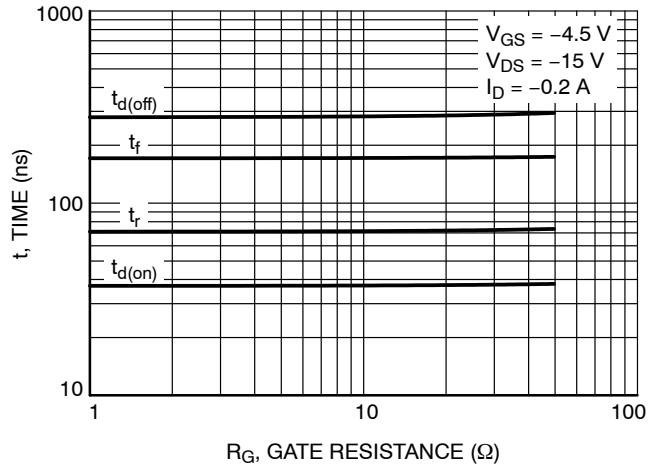


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

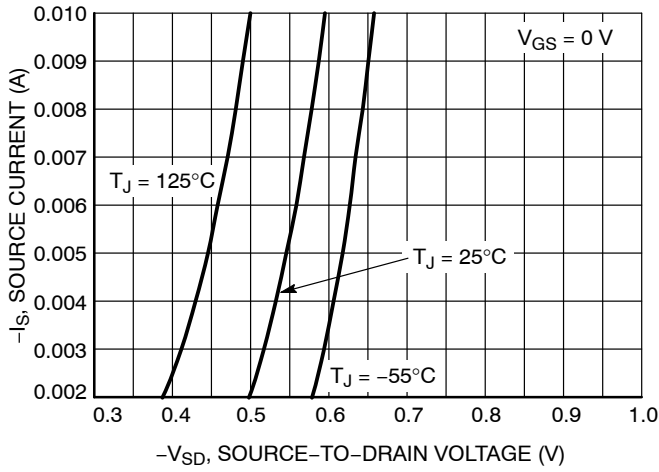


Figure 9. Diode Forward Voltage vs. Current

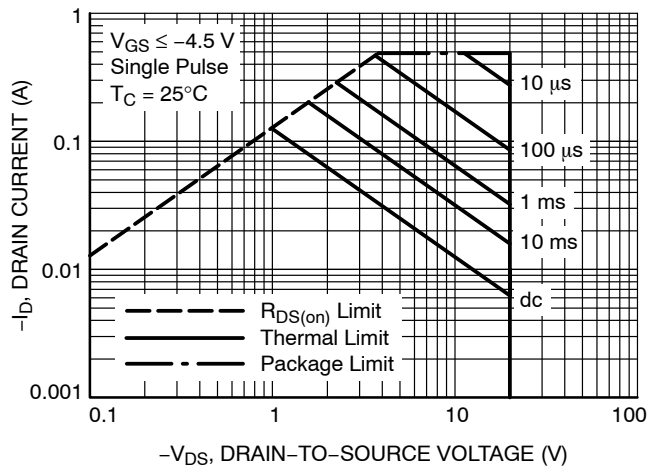


Figure 10. Maximum Rated Forward Biased Safe Operating Area

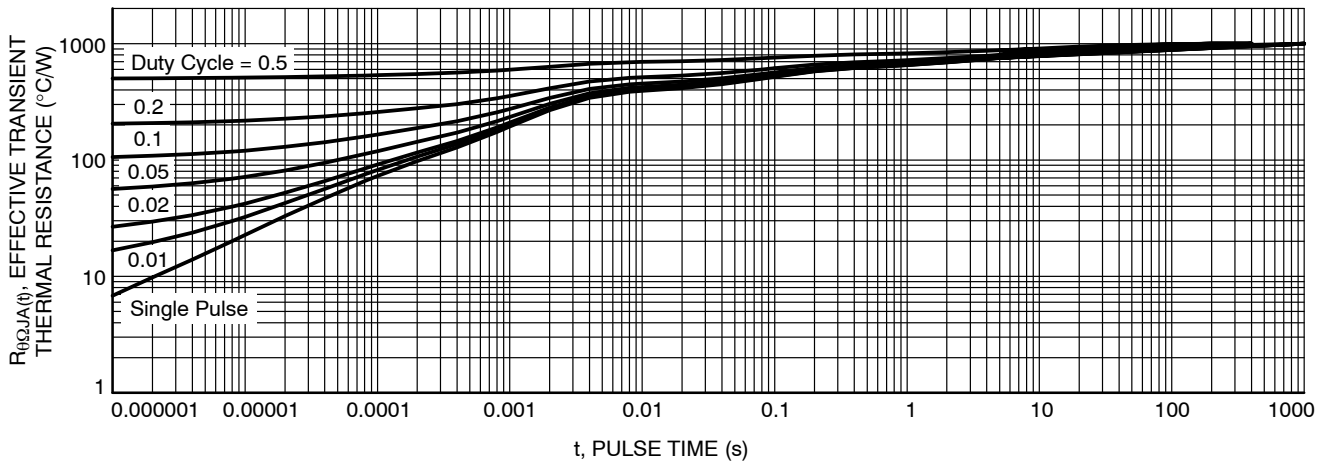


Figure 11. Thermal Response

# NTND31225CZ

## TYPICAL CHARACTERISTICS – N-CHANNEL

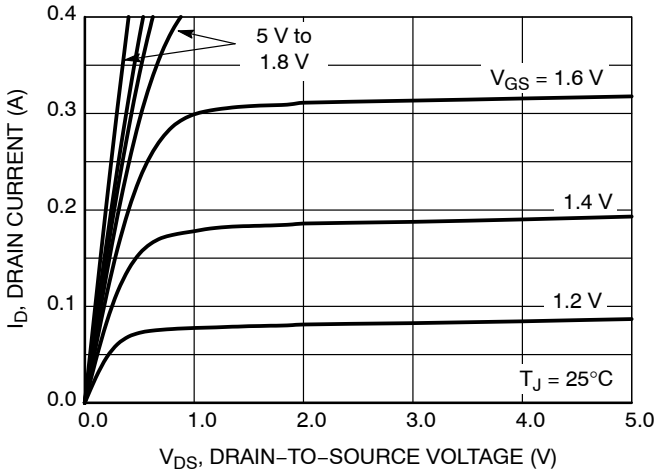


Figure 12. On-Region Characteristics

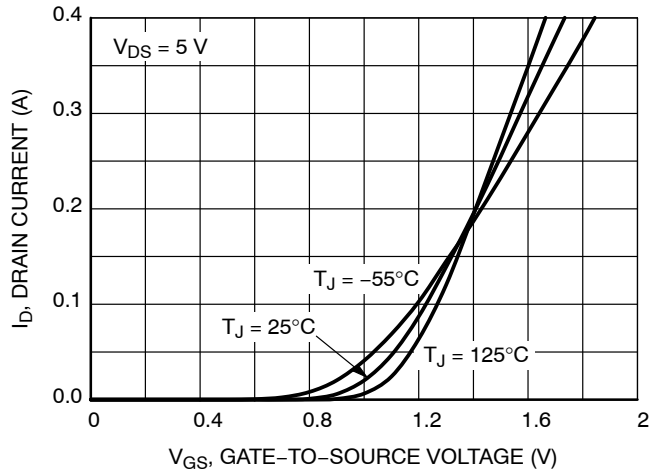


Figure 13. Transfer Characteristics

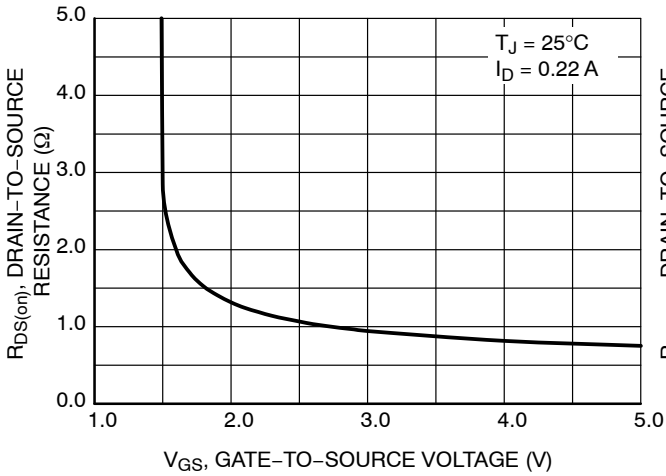


Figure 14. On-Resistance vs. Gate-to-Source Voltage

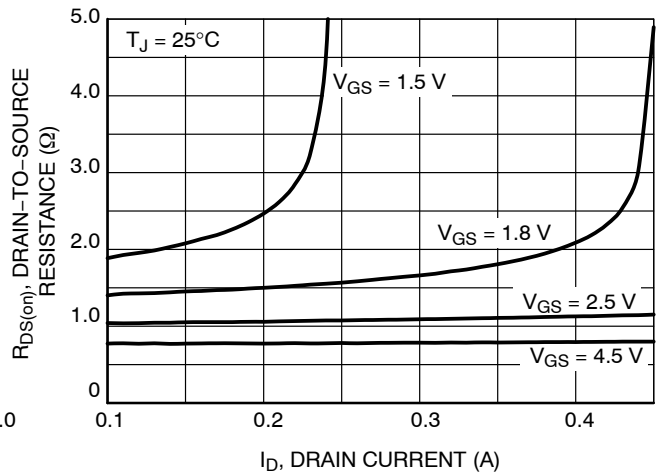


Figure 15. On-Resistance vs. Drain Current and Gate Voltage

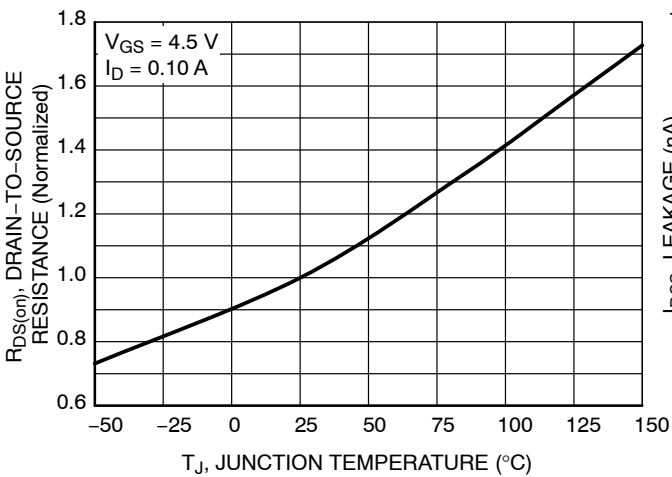


Figure 16. On-Resistance Variation with Temperature

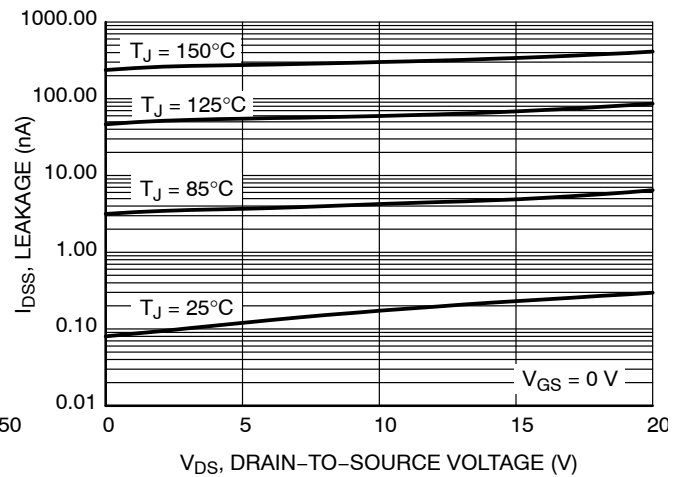


Figure 17. Drain-to-Source Leakage Current vs. Voltage

# NTND31225CZ

## TYPICAL CHARACTERISTICS – N-CANNEL

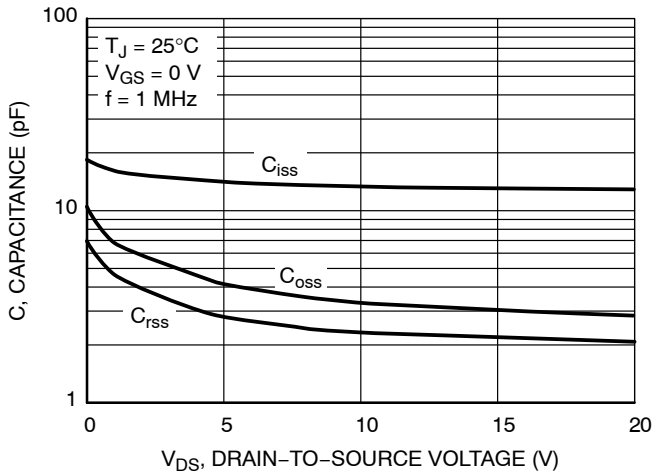


Figure 18. Capacitance Variation

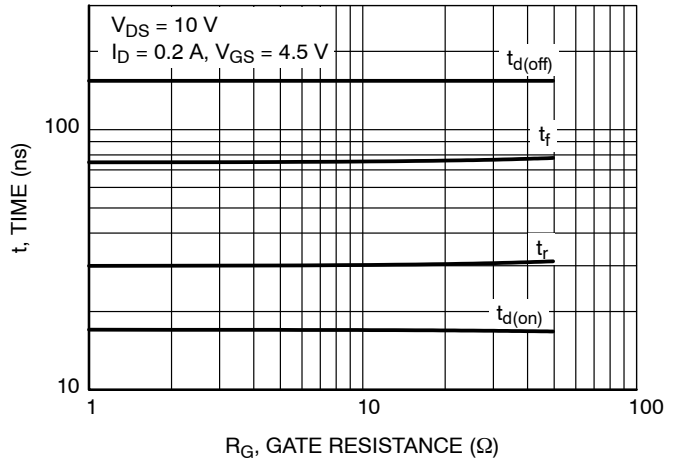


Figure 19. Resistive Switching Time Variation vs. Gate Resistance

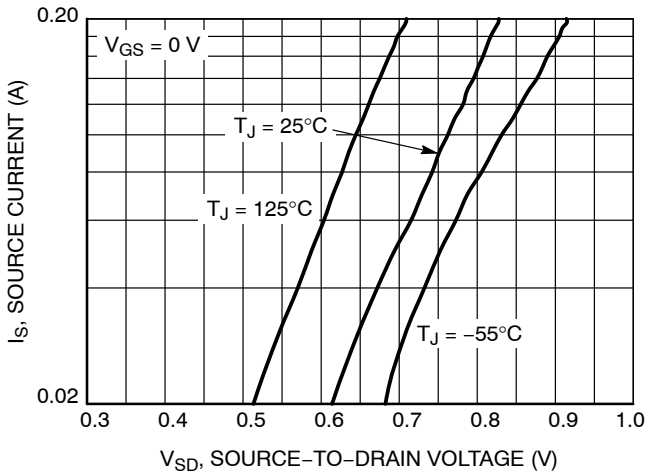


Figure 20. Diode Forward Voltage vs. Current

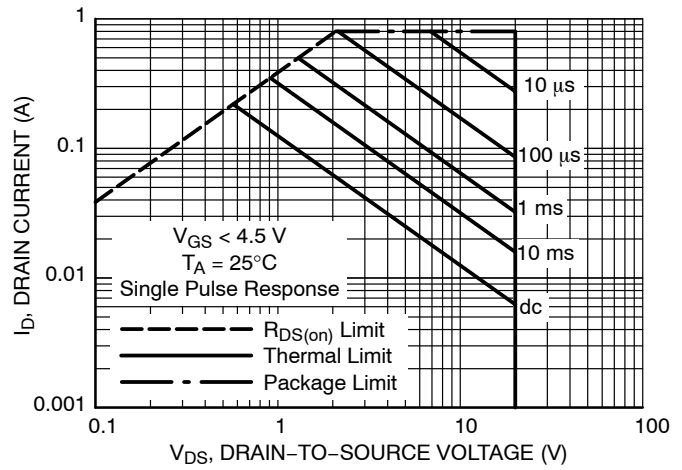


Figure 21. Maximum Rated Forward Biased Safe Operating Area

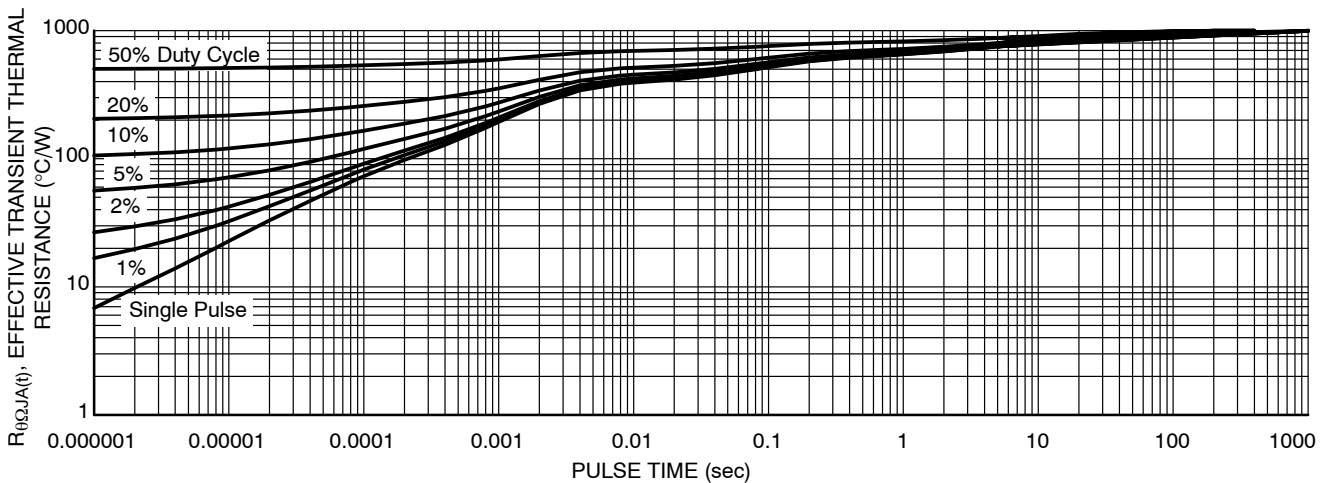


Figure 22. Thermal Response



# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

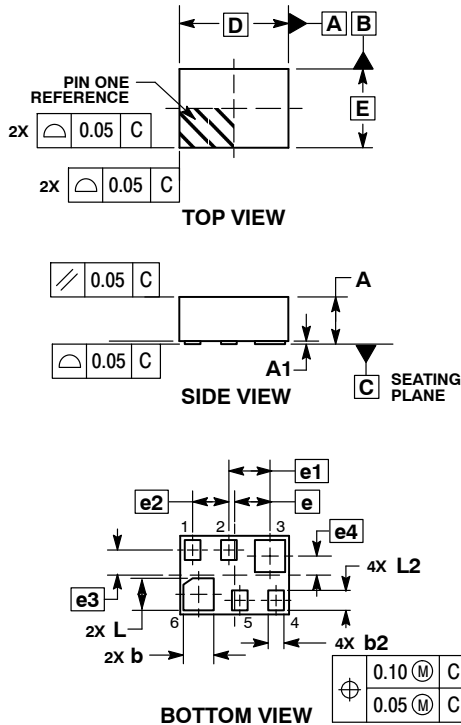
ON Semiconductor®



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.

MILLIMETERS		
DIM	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

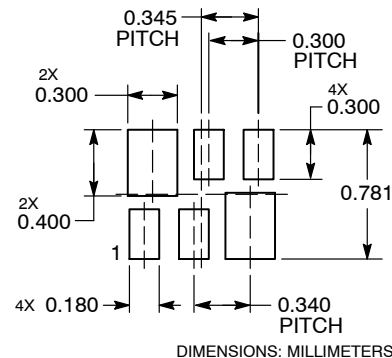
### GENERIC MARKING DIAGRAM\*



- 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 "μ", may or may not be present.

### RECOMMENDED SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor 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](http://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.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**onsemi Website:** [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

**North American Technical Support:**  
Voice Mail: 1 800-282-9855 Toll Free USA/Canada  
Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [MOSFET](#) category:*

*Click to view products by [ON Semiconductor](#) manufacturer:*

Other Similar products are found below :

[614233C](#) [648584F](#) [IRFD120](#) [JANTX2N5237](#) [FCA20N60\\_F109](#) [FDZ595PZ](#) [2SK2545\(Q,T\)](#) [405094E](#) [423220D](#) [TPCC8103,L1Q\(CM](#)  
[MIC4420CM-TR](#) [VN1206L](#) [SBVS138LT1G](#) [614234A](#) [715780A](#) [NTNS3166NZT5G](#) [SSM6J414TU,LF\(T](#) [751625C](#) [BUK954R8-60E](#)  
[NTE6400](#) [SQJ402EP-T1-GE3](#) [2SK2614\(TE16L1,Q\)](#) [2N7002KW-FAI](#) [DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [ECH8691-TL-W](#)  
[FCAB21350L1](#) [P85W28HP2F-7071](#) [DMN1053UCP4-7](#) [NTE221](#) [NTE222](#) [NTE2384](#) [NTE2903](#) [NTE2941](#) [NTE2945](#) [NTE2946](#) [NTE2960](#)  
[NTE2967](#) [NTE2969](#) [NTE2976](#) [NTE455](#) [NTE6400A](#) [NTE2910](#) [NTE2916](#) [NTE2956](#) [NTE2911](#) [DMN2080UCB4-7](#) [TK10A80W,S4X\(S](#)  
[SSM6P69NU,LF](#) [DMP22D4UFO-7B](#)