

NTND31225CZ

Small Signal MOSFET

20 V, Complementary 0.65 mm x 0.90 mm
x 0.4 mm XLLGA6 Package

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}	±8	V
		PMOS		±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	
	$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$		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	
	$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$		−146	
Power Dissipation (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	P_D	125	mW
	$t \leq 5\text{ s}$			166	
Pulsed Drain Current	NMOS	$t_p = 10\text{ }\mu\text{s}$	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.

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

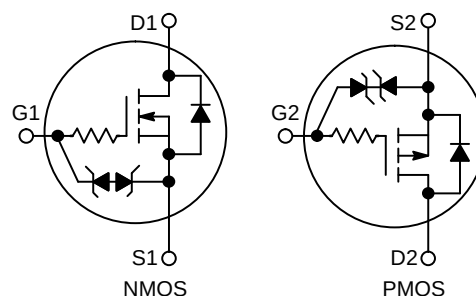


ON Semiconductor®

www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(ON)}$ 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	

DEVICE SYMBOL



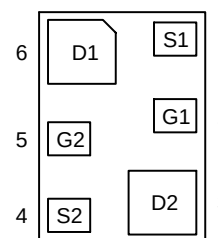
XLLGA6
Case 713AC

MARKING DIAGRAM



L = Specific Device Code
M = Date Code

PINOUT DIAGRAM



(Bottom View)

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

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
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	N	$V_{GS} = 0$ V, $I_D = 250$ μA	20			V
		P	$V_{GS} = 0$ V, $I_D = -250$ μA	-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			± 100	nA
		P	$V_{GS} = 0$ V, $V_{DS} = \pm 5$ V			± 100	

ON CHARACTERISTICS

Gate Threshold Voltage	$V_{GS(TH)}$	N	$V_{GS} = V_{DS}$, $I_D = 250$ μA	0.4		1.0	V
		P	$V_{GS} = V_{DS}$, $I_D = -250$ μA	-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	Ω
			$V_{GS} = 2.5$ 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
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CAPACITANCES

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

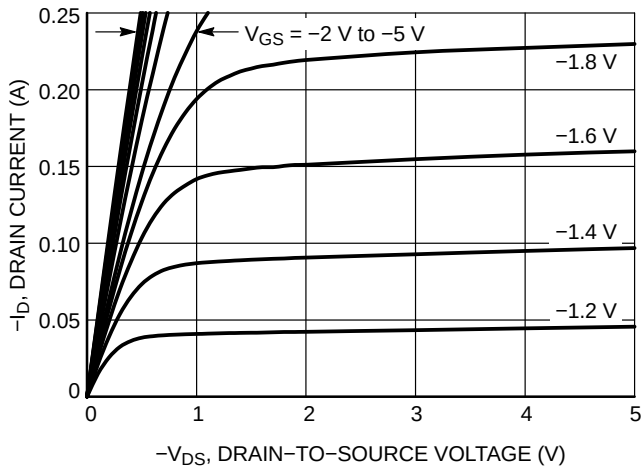


Figure 1. On-Region Characteristics

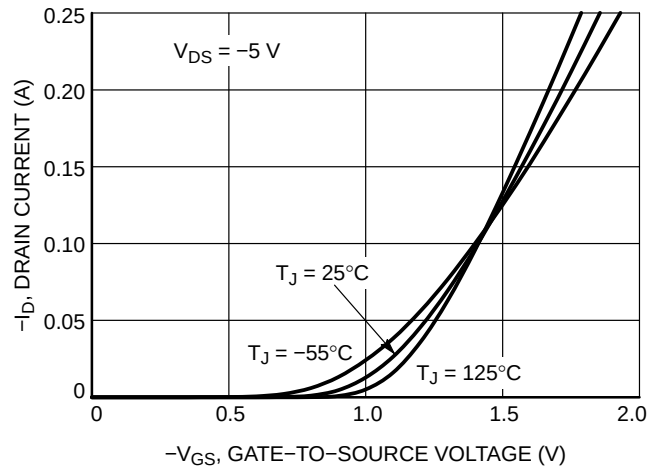


Figure 2. Transfer Characteristics

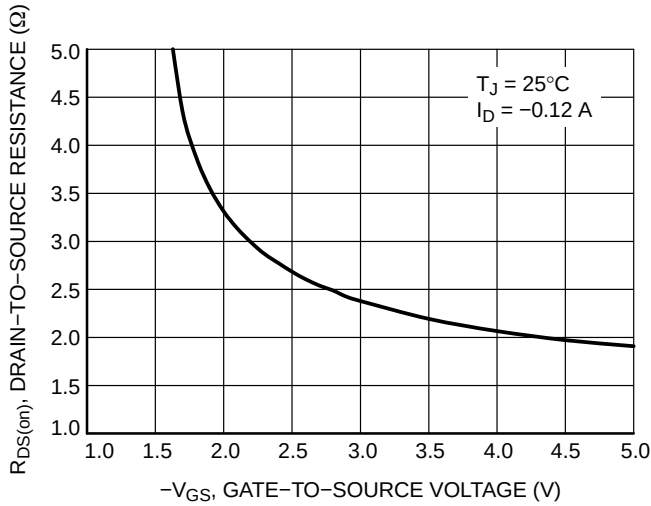


Figure 3. On-Resistance vs. Gate-to-Source Voltage

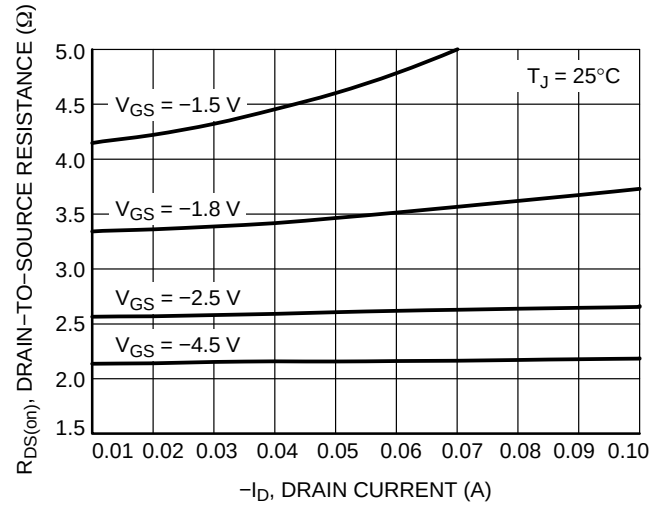


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

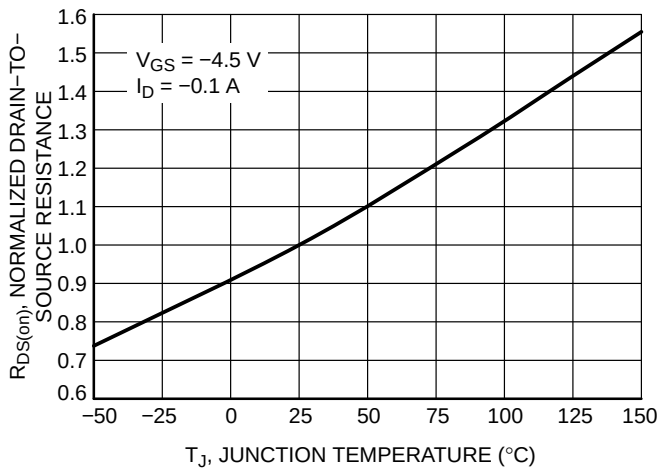


Figure 5. On-Resistance Variation with Temperature

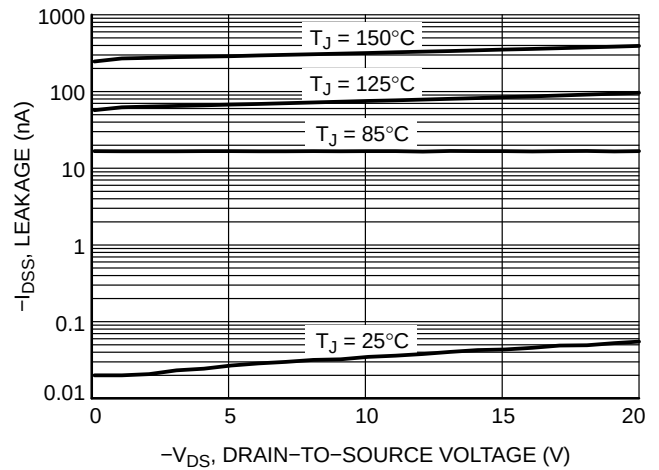


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – P-CHANNEL

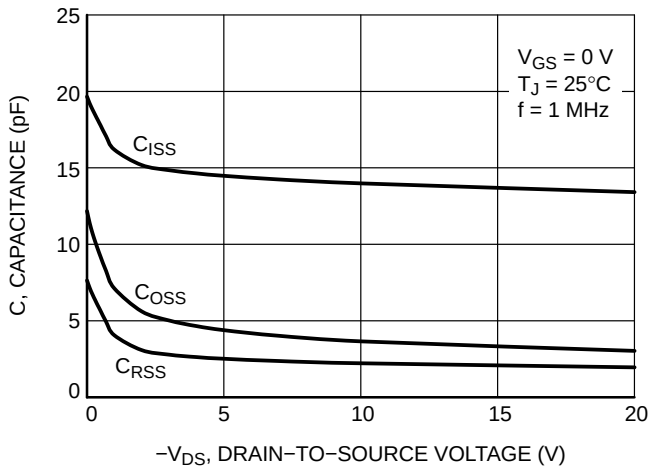


Figure 7. Capacitance Variation

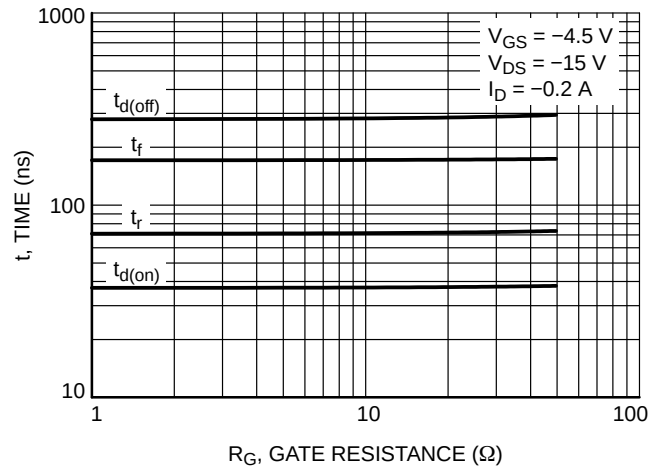


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

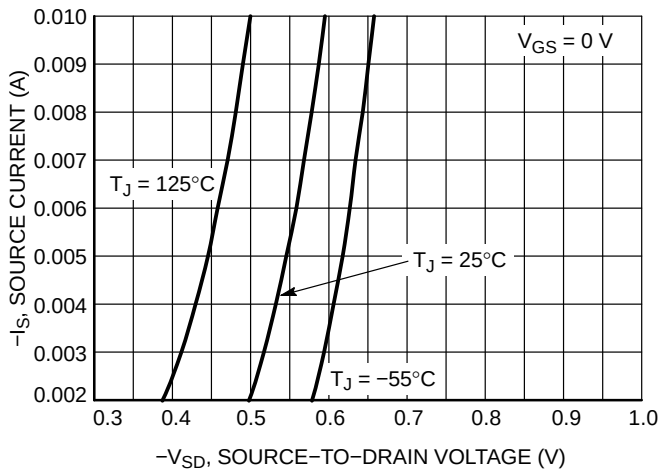


Figure 9. Diode Forward Voltage vs. Current

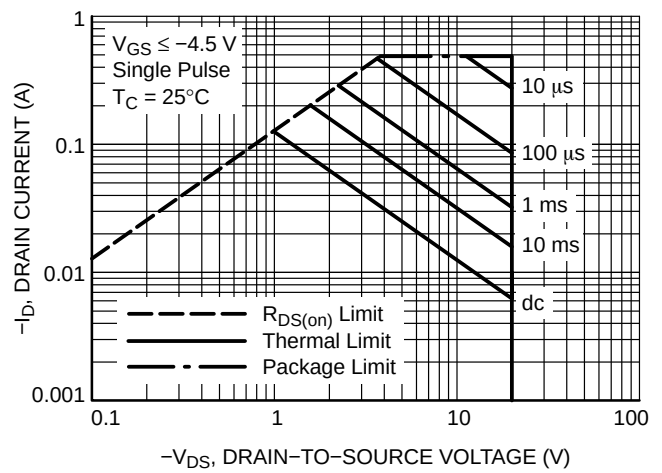


Figure 10. Maximum Rated Forward Biased Safe Operating Area

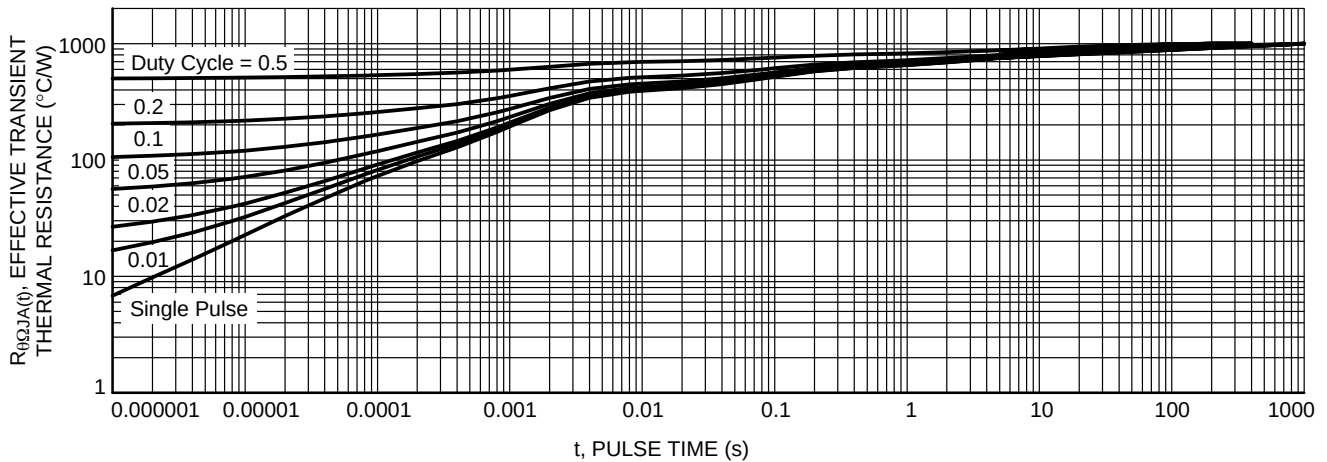


Figure 11. Thermal Response

TYPICAL CHARACTERISTICS – N-CANNEL

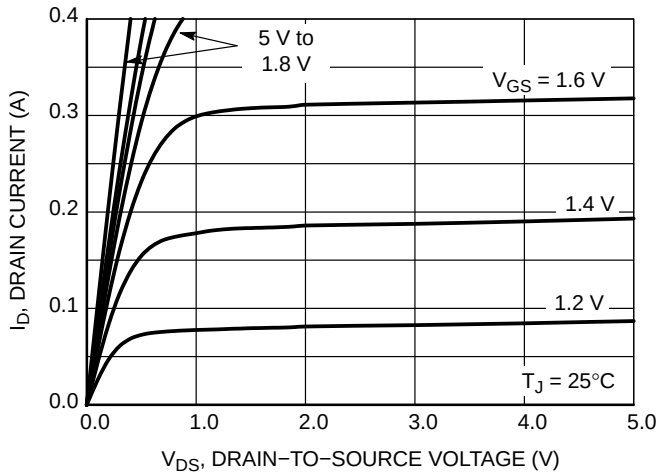


Figure 12. On-Region Characteristics

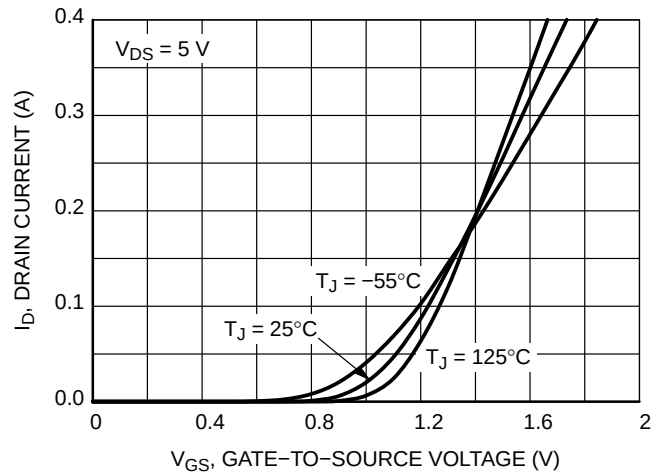


Figure 13. Transfer Characteristics

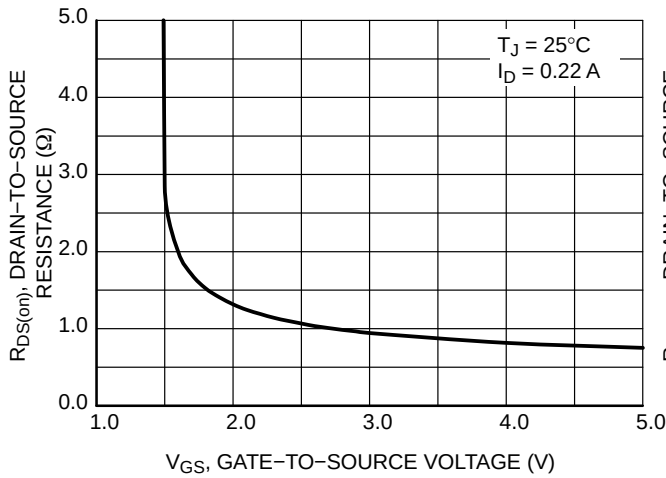


Figure 14. On-Resistance vs. Gate-to-Source Voltage

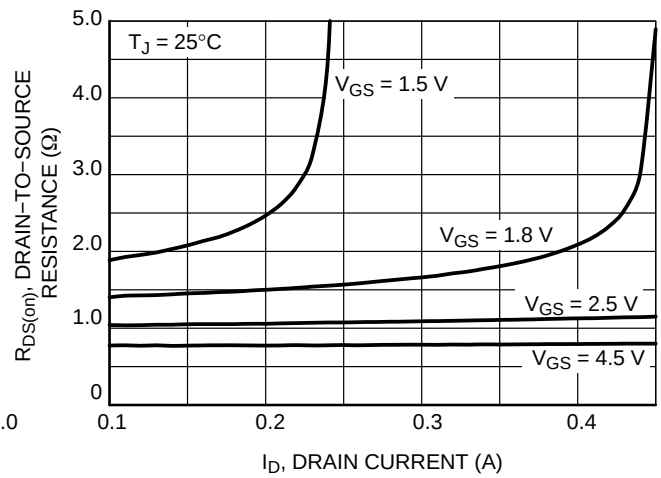


Figure 15. On-Resistance vs. Drain Current and Gate Voltage

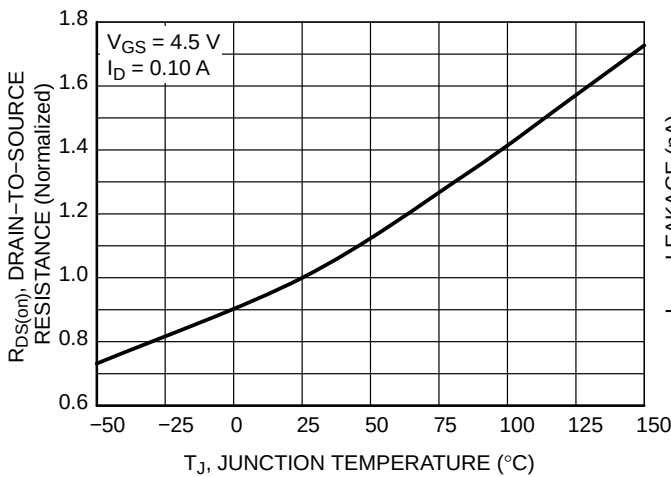


Figure 16. On-Resistance Variation with Temperature

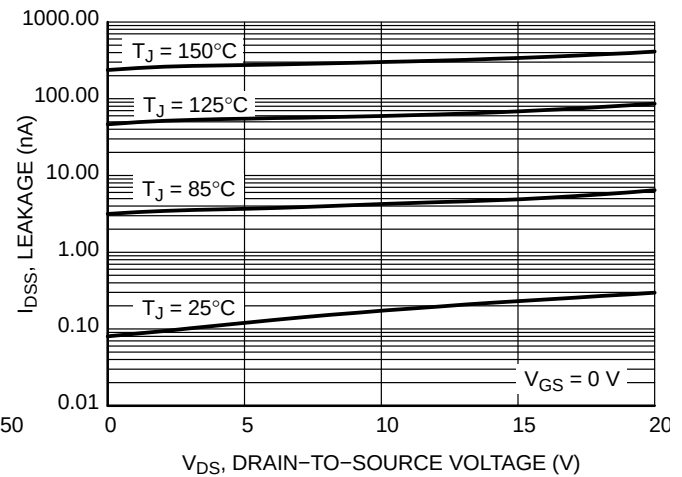


Figure 17. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – N-CANNEL

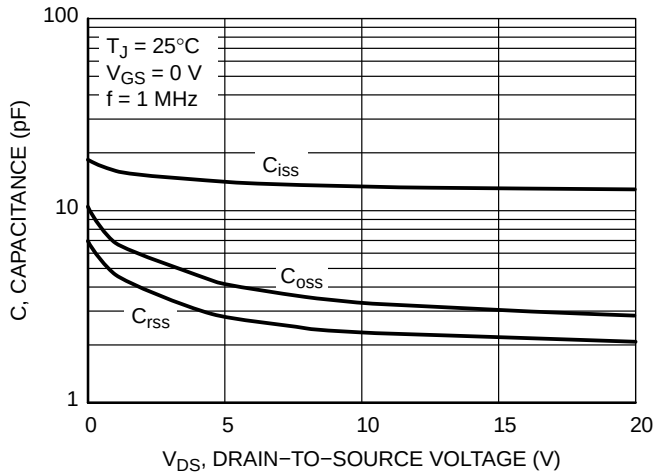


Figure 18. Capacitance Variation

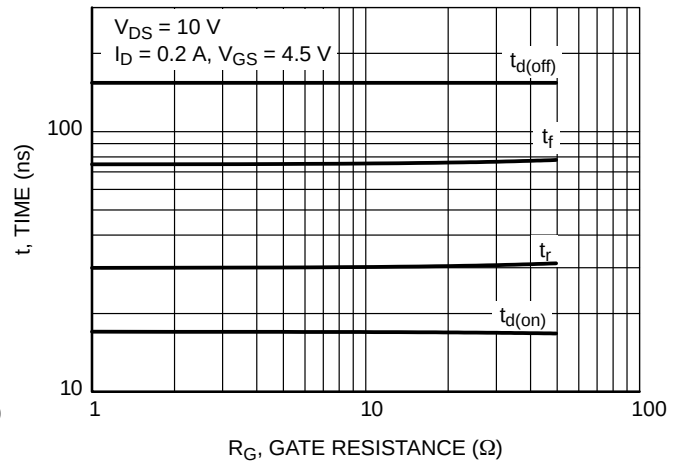


Figure 19. Resistive Switching Time Variation vs. Gate Resistance

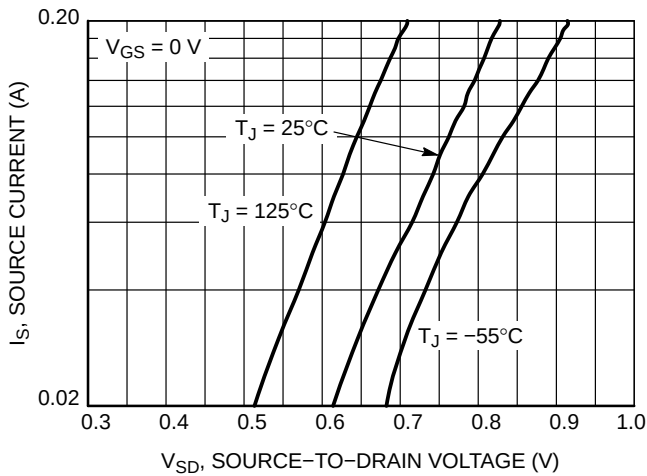


Figure 20. Diode Forward Voltage vs. Current

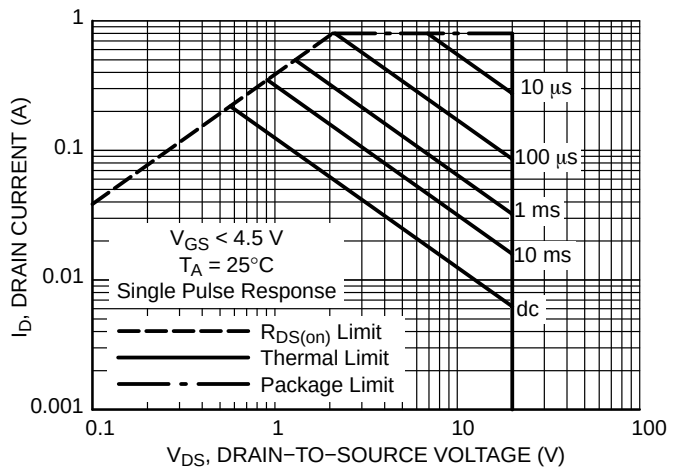


Figure 21. Maximum Rated Forward Biased Safe Operating Area

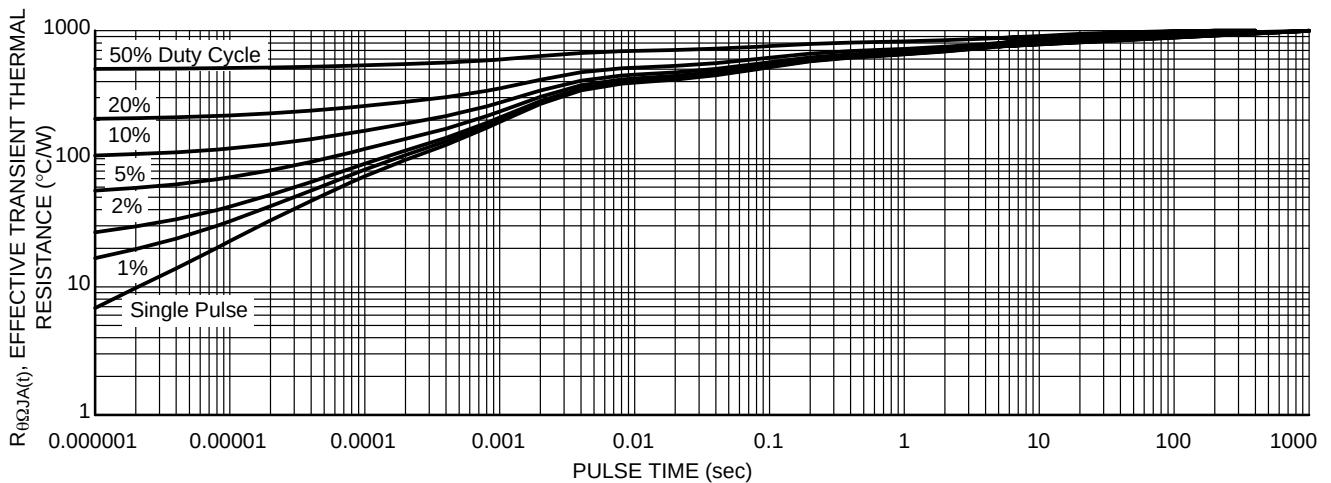
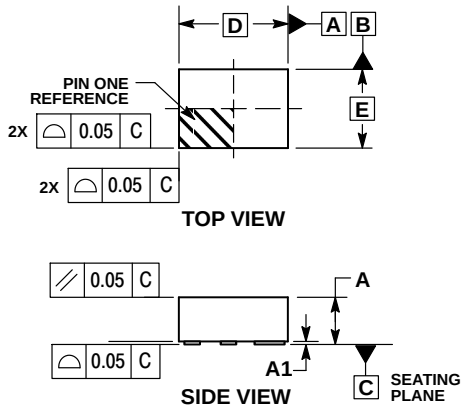


Figure 22. Thermal Response

NTND31225CZ

PACKAGE DIMENSIONS

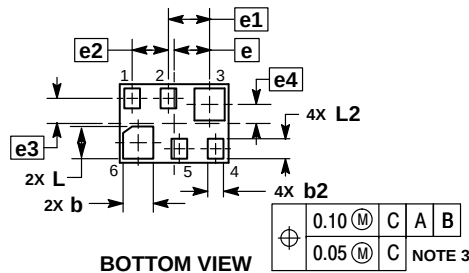
XLLGA6 0.90x0.65 CASE 713AC ISSUE O



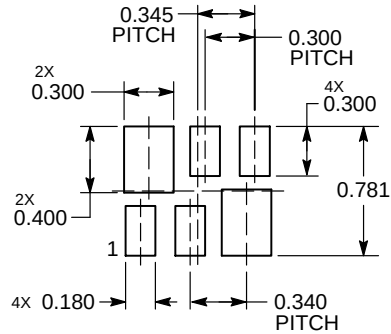
NOTES:

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



RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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