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 × 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°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°C	I_D	220	mA
		T_A = 85°C		158	
	t ≤ 5 s	T_A = 25°C		253	
P−Channel Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	−127	mA
		T_A = 85°C		−91	
	t ≤ 5 s	T_A = 25°C		−146	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	125	mW
	t ≤ 5 s			166	
Pulsed Drain Current	NMOS	t_p = 10 μs	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	°C
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°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.

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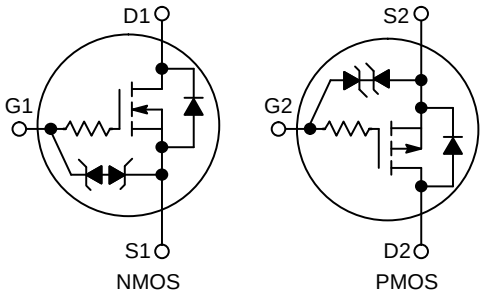
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D Max
N−Channel 20 V	1.5 Ω @ 4.5 V	220 mA
	2.0 Ω @ 2.5 V	
	3.0 Ω @ 1.8 V	
	4.5 Ω @ 1.5 V	
P−Channel −20 V	5.0 Ω @ −4.5 V	−127 mA
	6.0 Ω @ −2.5 V	
	7.0 Ω @ −1.8 V	
	10.0 Ω @ −1.5 V	

DEVICE SYMBOL

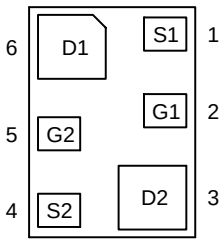


XLLGA6
Case 713AC

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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient (Note 2) Steady State t ≤ 5 s	$R_{\theta JA}$	 998 751	°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°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 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°C			50	nA
				T_J = 85°C			200	
			V_{GS} = 0 V, V_{DS} = 16 V	T_J = 25°C			100	
		P	V_{GS} = 0 V, V_{DS} = −5 V	T_J = 25°C			−50	
				T_J = 85°C			−200	
			V_{GS} = 0 V, V_{DS} = −16 V	T_J = 25°C			−100	
Gate-to-Source Leakage Current	I_{GSS}	N	V_{GS} = 0 V, V_{DS} = ±5 V				±100	nA
		P	V_{GS} = 0 V, V_{DS} = ±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.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	FET	Test Condition	Min	Typ	Max	Unit
CAPACITANCES							
Input Capacitance	C_{ISS}	N	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V		12.3		pF
Output Capacitance	C_{OSS}				3.4		
Reverse Capacitance	C_{RSS}				2.5		
Input Capacitance	C_{ISS}	P	V_{GS} = 0 V, f = 1 MHz, V_{DS} = −15 V		12.8		
Output Capacitance	C_{OSS}				2.8		
Reverse Capacitance	C_{RSS}				2.0		
SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V							
Turn-On Delay Time	$t_{d(ON)}$	N	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 200 mA, R_G = 2 Ω		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 V, V_{DS} = −15 V, I_D = −200 mA, R_G = 2 Ω		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

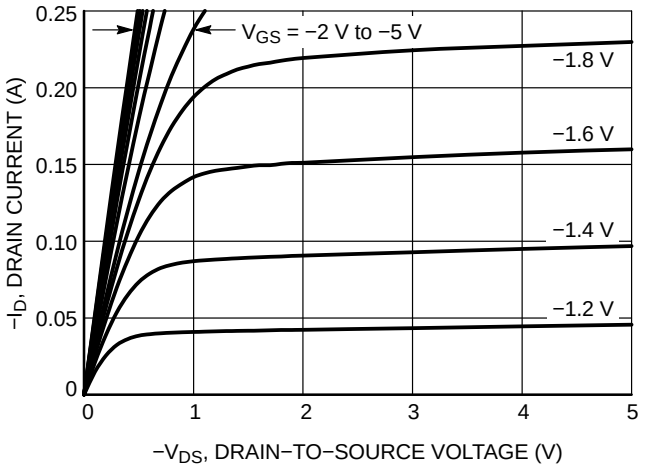


Figure 1. On−Region Characteristics

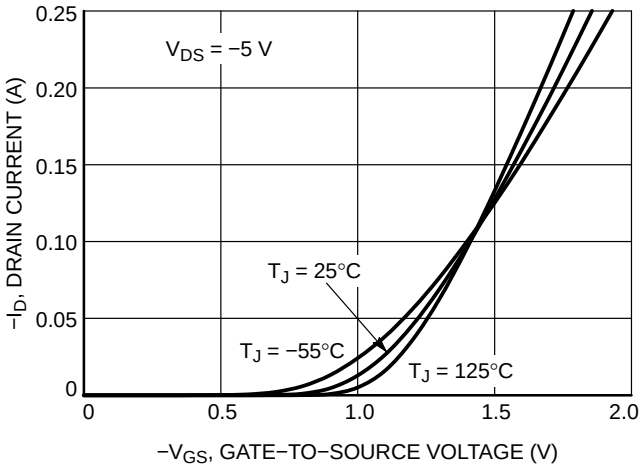


Figure 2. Transfer Characteristics

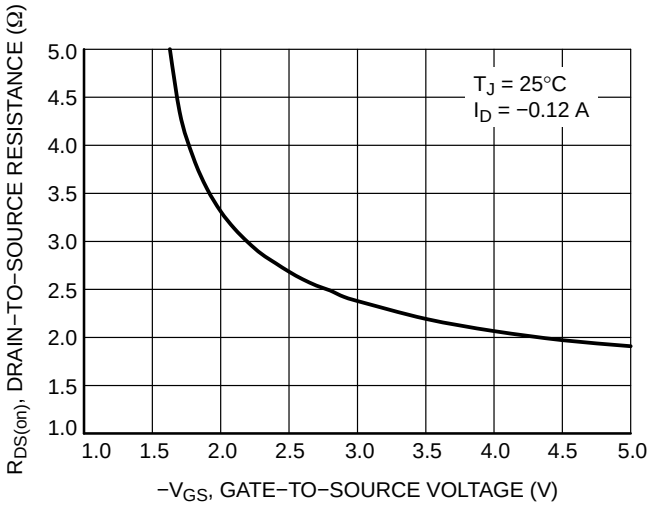


Figure 3. On−Resistance vs. Gate−to−Source Voltage

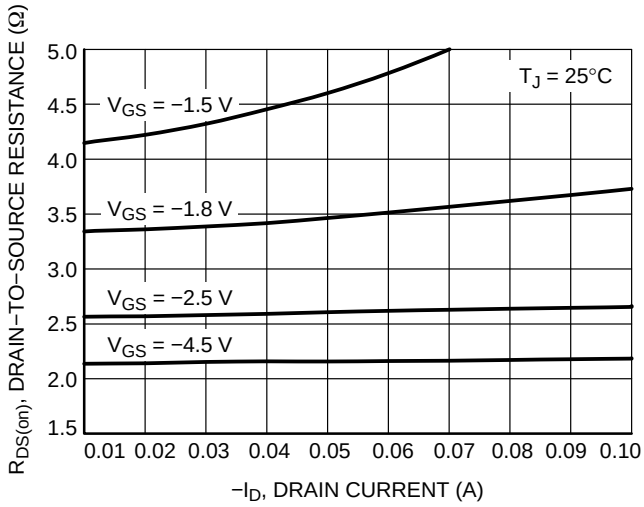


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

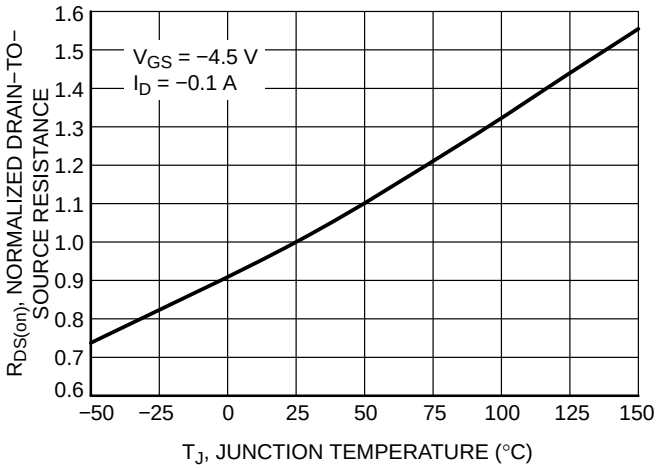


Figure 5. On−Resistance Variation with Temperature

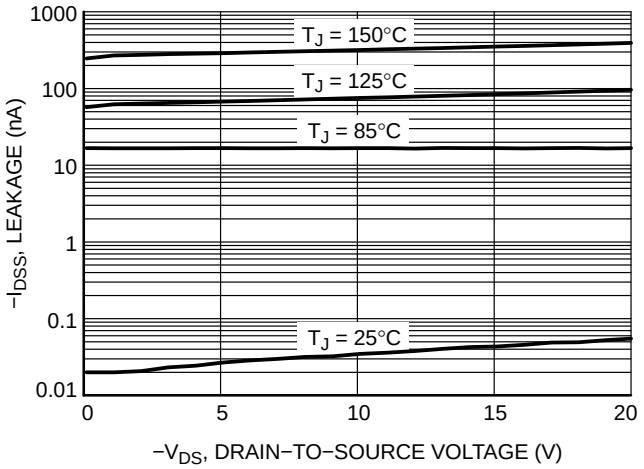


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS − P−CHANNEL

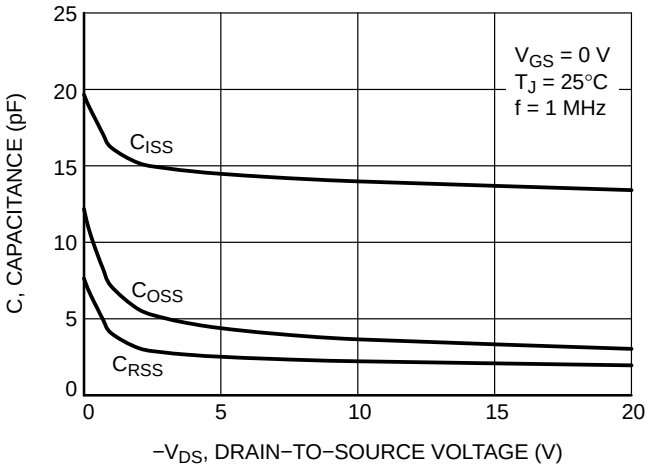


Figure 7. Capacitance Variation

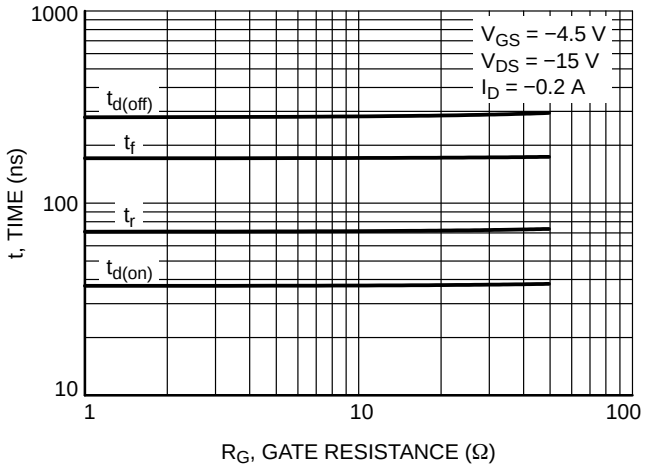


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

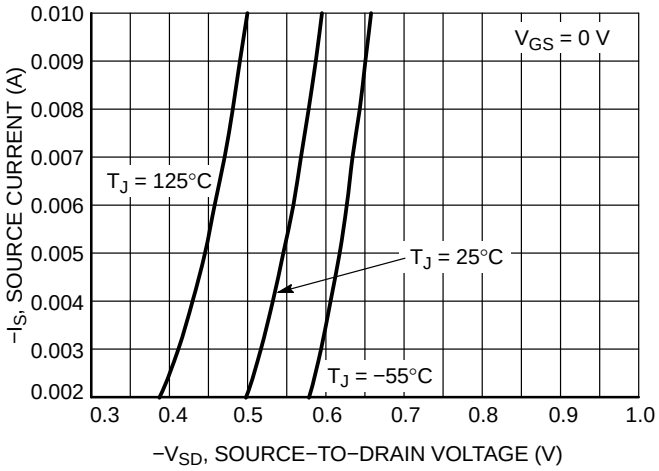


Figure 9. Diode Forward Voltage vs. Current

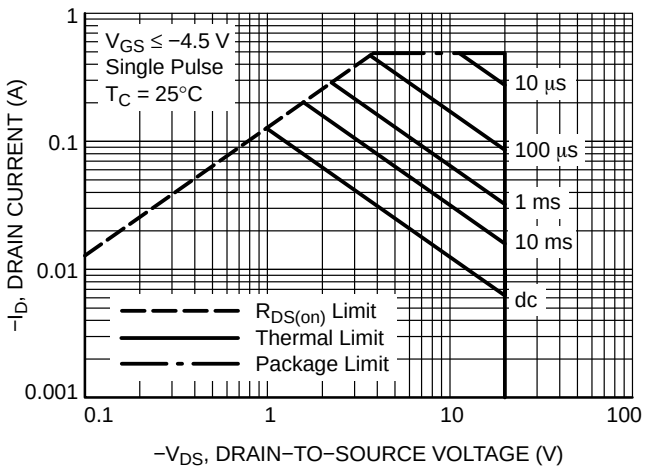


Figure 10. Maximum Rated Forward Biased Safe Operating Area

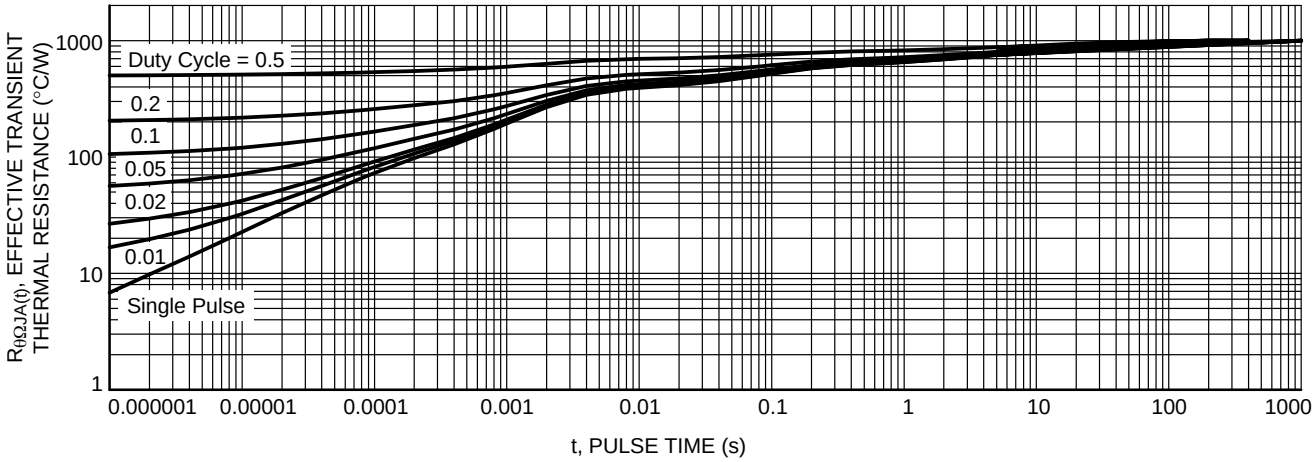


Figure 11. Thermal Response

TYPICAL CHARACTERISTICS − N−CHANNEL

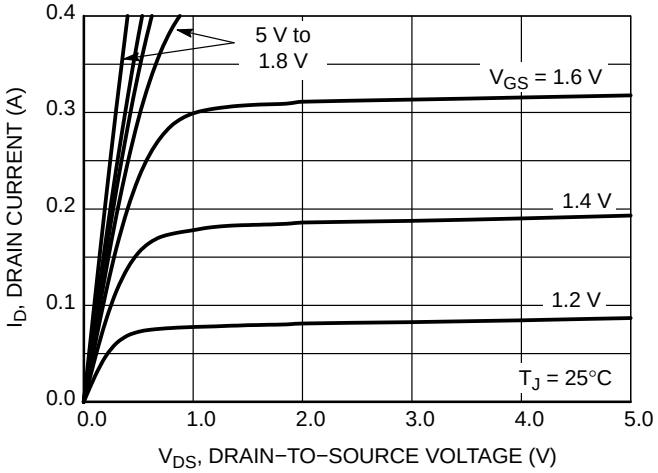


Figure 12. On−Region Characteristics

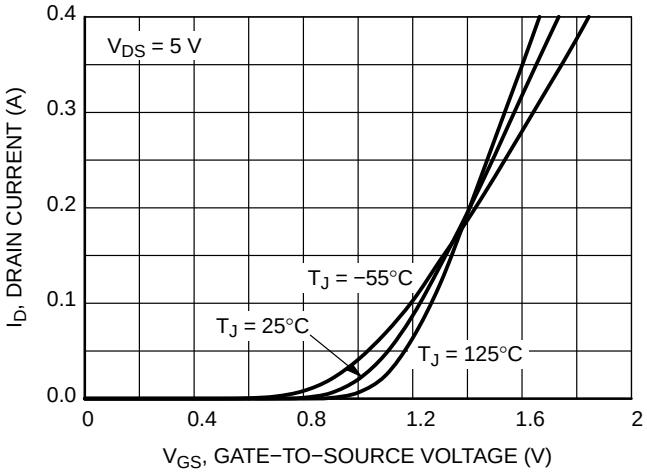


Figure 13. Transfer Characteristics

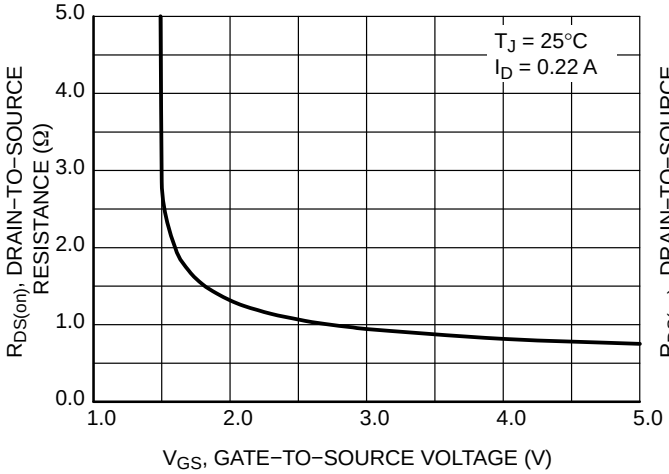


Figure 14. On−Resistance vs. Gate−to−Source Voltage

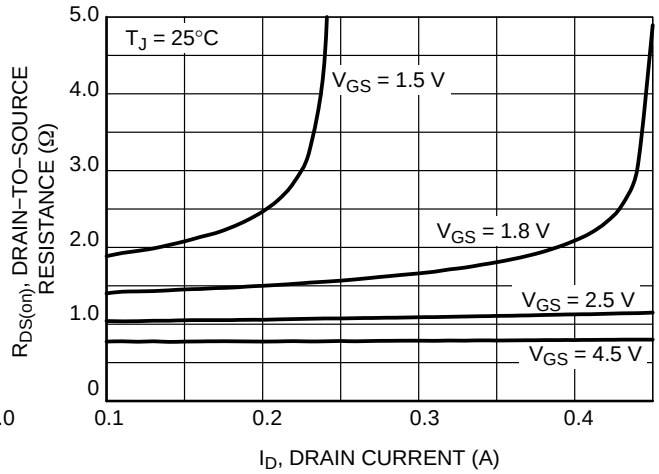


Figure 15. On−Resistance vs. Drain Current and Gate Voltage

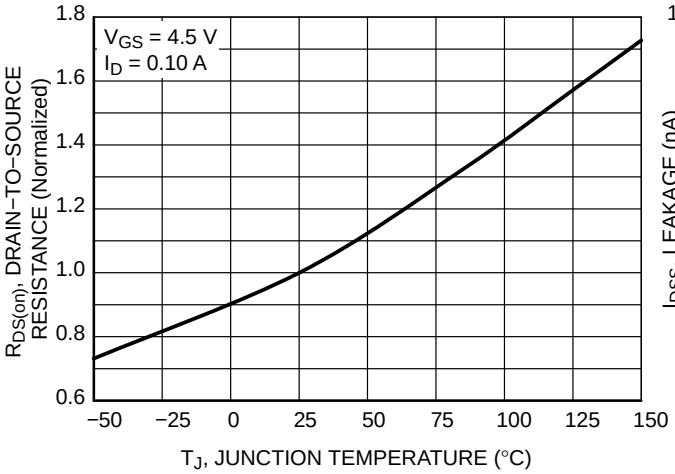


Figure 16. On−Resistance Variation with Temperature

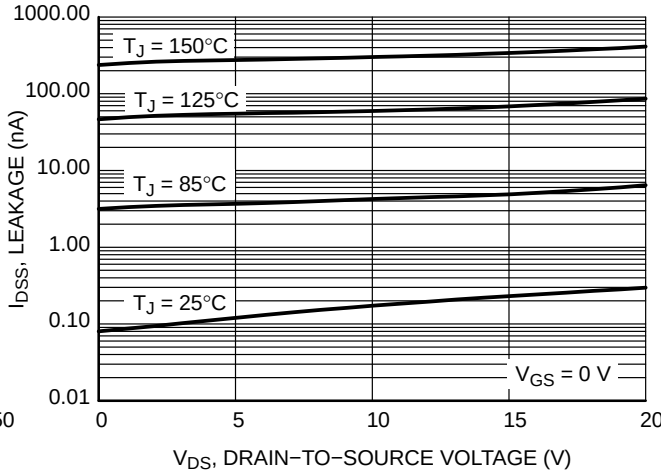


Figure 17. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS − N−CHANNEL

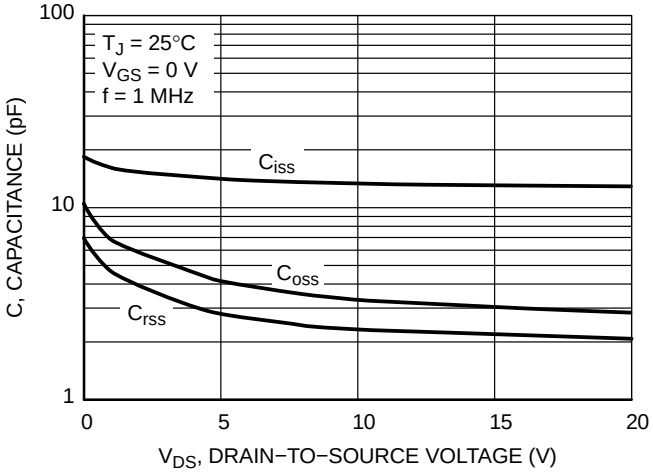


Figure 18. Capacitance Variation

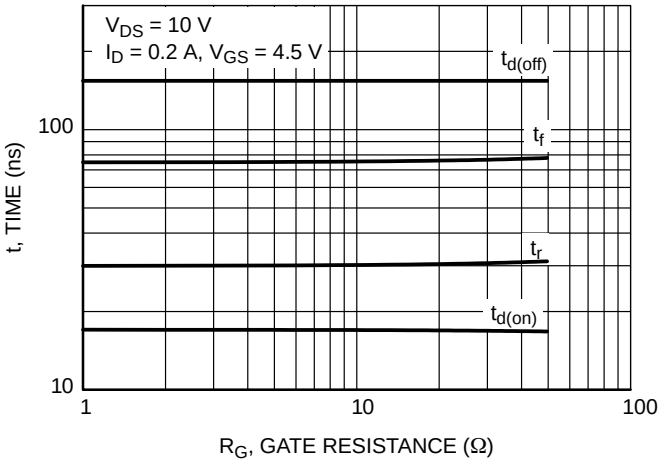


Figure 19. Resistive Switching Time Variation vs. Gate Resistance

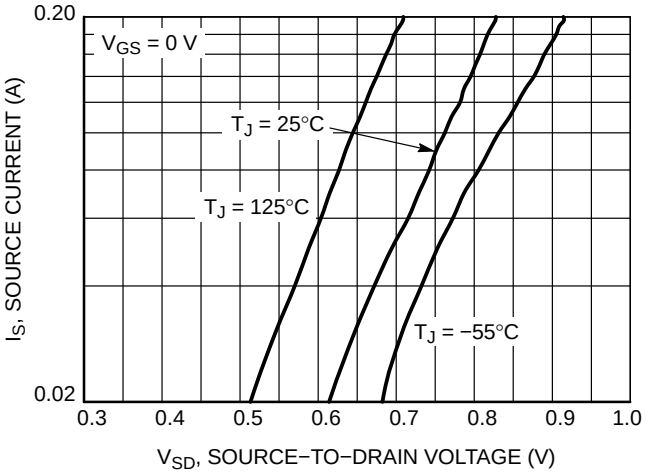


Figure 20. Diode Forward Voltage vs. Current

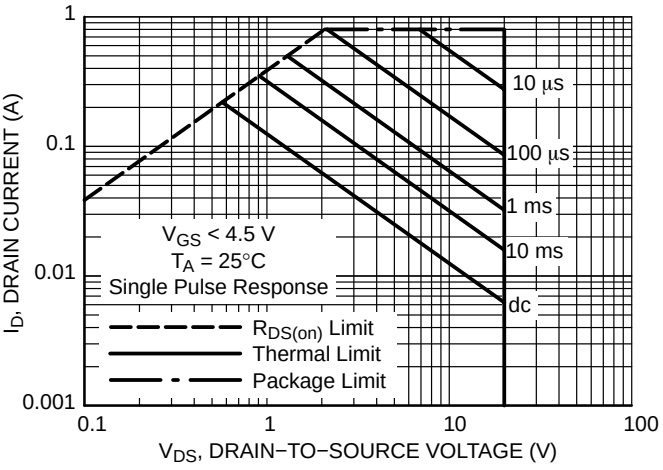


Figure 21. Maximum Rated Forward Biased Safe Operating Area

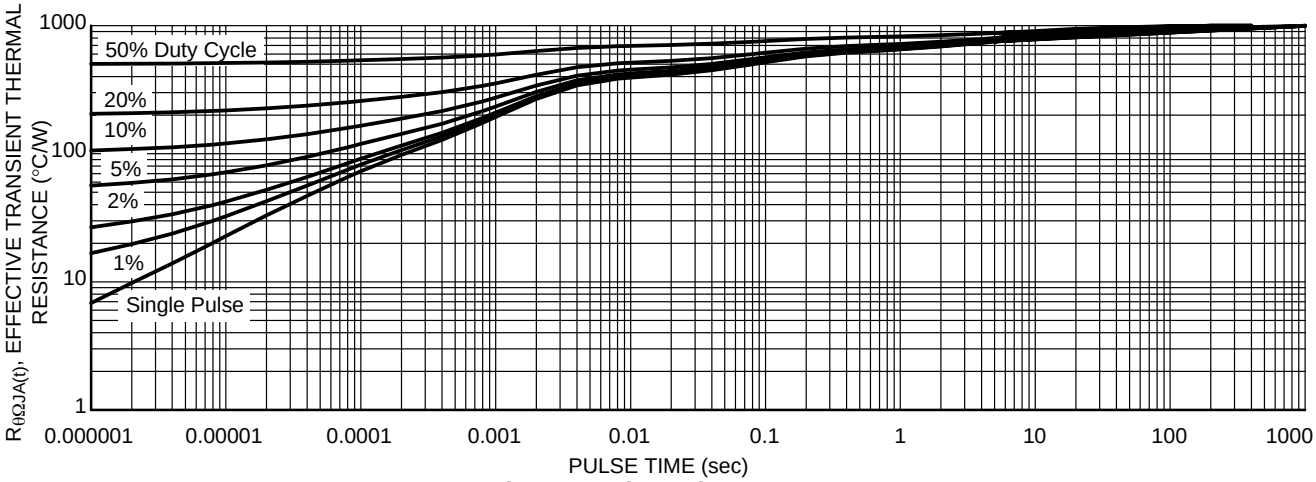
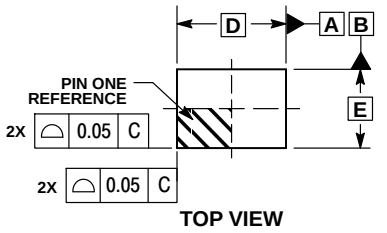


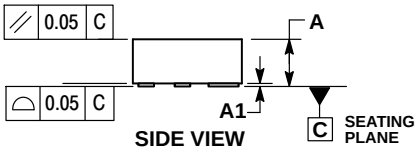
Figure 22. Thermal Response

PACKAGE DIMENSIONS

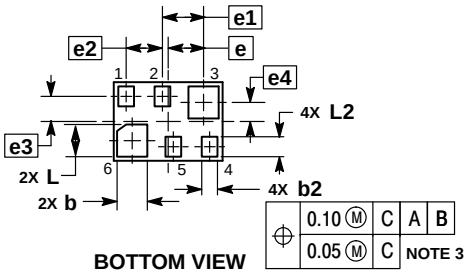
XLLGA6 0.90x0.65
CASE 713AC
ISSUE O



TOP VIEW



SIDE VIEW

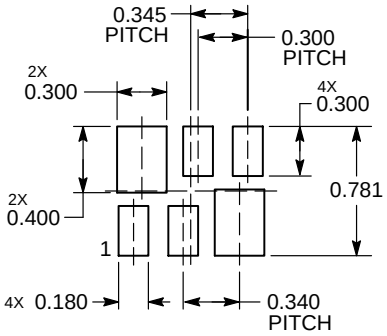


BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994 .
2. CONTROLLING DIMENSION: MILLIMETERS.
3. POSITIONAL TOERANCE 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

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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
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Email: orderlit@onsemi.com

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ON Semiconductor Website: **www.onsemi.com**

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