

MOSFET - Small Signal, Single N-Channel, XLLGA3 20 V, 253 mA

NTNS1K1N021Z

Features

- Single N-Channel MOSFET
- Ultra Small and Thin Package (0.62 x 0.62 x 0.4 mm)
- Low $R_{DS(on)}$ Solution in 0.62 x 0.62 mm Package
- 1.5 V Gate Voltage Rating
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

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

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

Parameter		Symbol	Value	Units
Drain-to-Source Voltage		V_{DSS}	20	V
Gate-to-Source Voltage		V_{GS}	± 8.0	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	253	mA
		$T_A = 85^\circ\text{C}$	182	
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	272	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	120	mW
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$	139	
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	673	mA
Operating Junction and Storage Temperature		T_J, T_{STG}	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)		I_S	120	mA
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.

THERMAL RESISTANCE RATINGS

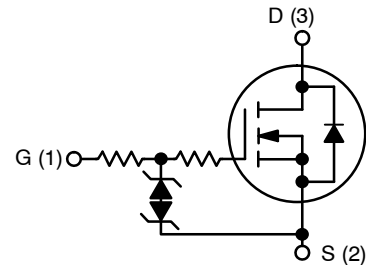
Parameter	Symbol	Max	Units
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	1040	$^\circ\text{C/W}$
Junction-to-Ambient – $t \leq 5 \text{ s}$ (Note 1)	$R_{\theta JA}$	900	

1. Surface Mounted on FR4 Board using the minimum recommended pad size, (or 2 mm²), 1 oz Cu.
2. Pulse Test: pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

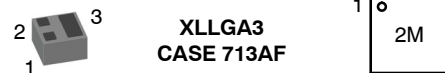
MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
20 V	1.1 Ω @ 4.5 V	253 mA
	1.9 Ω @ 2.5 V	
	2.2 Ω @ 1.8 V	
	4.3 Ω @ 1.5 V	

N-Channel MOSFET



MARKING DIAGRAM



2 = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping [†]
NTNS1K1N021ZT5G	XLLGA3 (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.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J	I _D = -250 μA, ref to 25°C		22.6		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 20 V	T _J = 25°C		1.0	μA
		V _{GS} = 0 V, V _{DS} = 2 V			50	nA
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±8.0 V			±2.0	μA
		V _{DS} = 0 V, V _{GS} = ±2.0 V			±100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	0.4		1.0	V
Negative Gate Threshold Temperature Coefficient	V _{GS(TH)} /T _J			1.9		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 100 mA		0.69	1.1	Ω
		V _{GS} = 2.5 V, I _D = 50 mA		0.9	1.9	
		V _{GS} = 1.8 V, I _D = 20 mA		1.17	2.2	
		V _{GS} = 1.5 V, I _D = 10 mA		1.45	4.3	
Forward Transconductance	g _{FS}	V _{DS} = 5 V, I _D = 100 mA		0.49		S
Source-Drain Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 10 mA		0.54	1.0	V
Source-Drain Diode Voltage + Gate Threshold Voltage	V _{SD} + V _{GS(TH)}	V _{SD} @ (I _S = 10 μA) + V _{GS(TH)} (@ V _{GS} = V _{DS} , I _D = 10 μA) (Note 4)			1.40	V

CHARGES & CAPACITANCES

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V		13.3		pF
Output Capacitance	C _{OSS}			3.3		
Reverse Transfer Capacitance	C _{RSS}			2.2		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 15 V, I _D = 200 mA		0.74		nC
Threshold Gate Charge	Q _{G(TH)}			0.06		
Gate-to-Source Charge	Q _{GS}			0.17		
Gate-to-Drain Charge	Q _{GD}			0.09		

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 3)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DD} = 15 V, I _D = 200 mA, R _G = 2 Ω		16		ns
Rise Time	t _r			35		
Turn-Off Delay Time	t _{d(OFF)}			190		
Fall Time	t _f			112		

3. Switching characteristics are independent of operating junction temperatures.

4. For T_J = -25°C to +75°C; V_{SD} @ (I_S = 10 μA) + V_{GS(TH)} (@ V_{GS} = V_{DS}, I_D = 10 μA) < 1.62 V is guaranteed by design.

TYPICAL CHARACTERISTICS

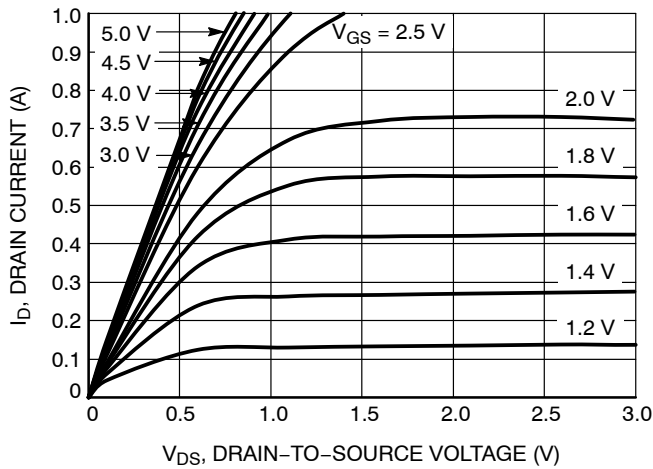


Figure 1. On-Region Characteristics

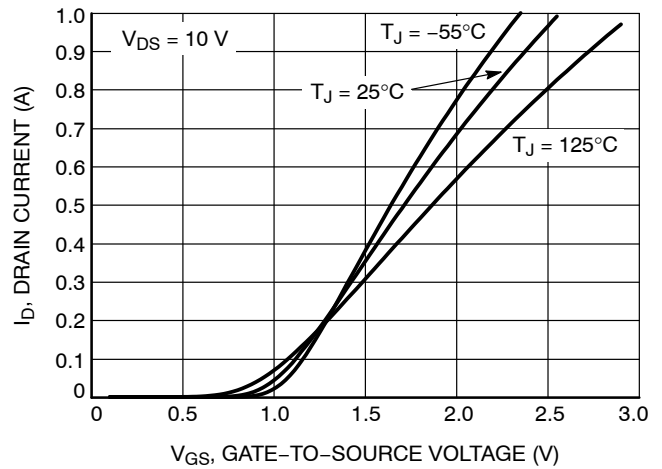


Figure 2. Transfer Characteristics

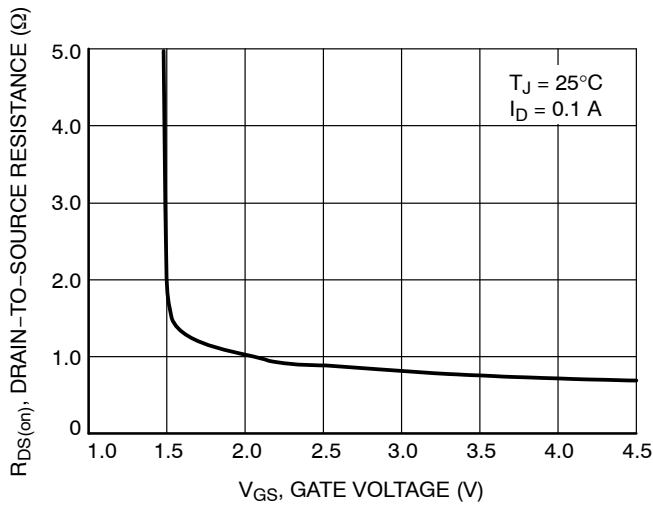


Figure 3. On-Resistance vs. Gate-to-Source Voltage

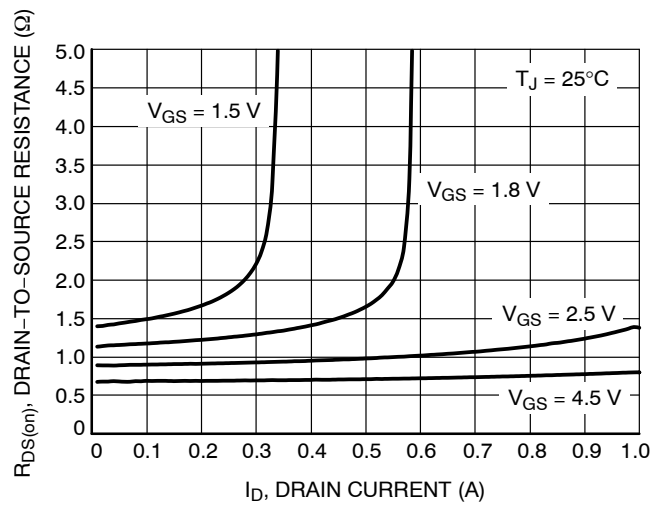


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

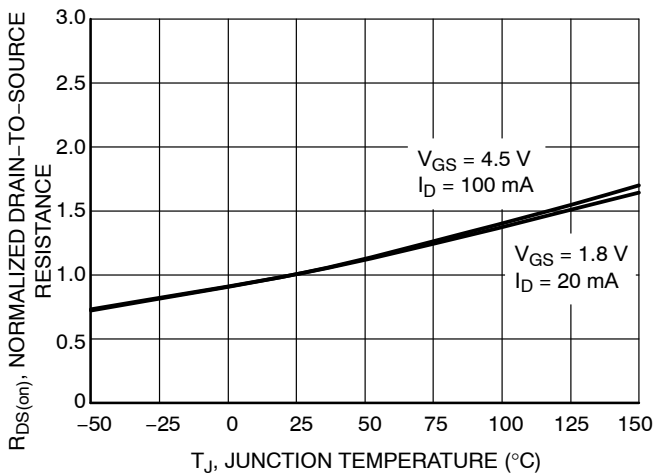


Figure 5. On-Resistance Variation with Temperature

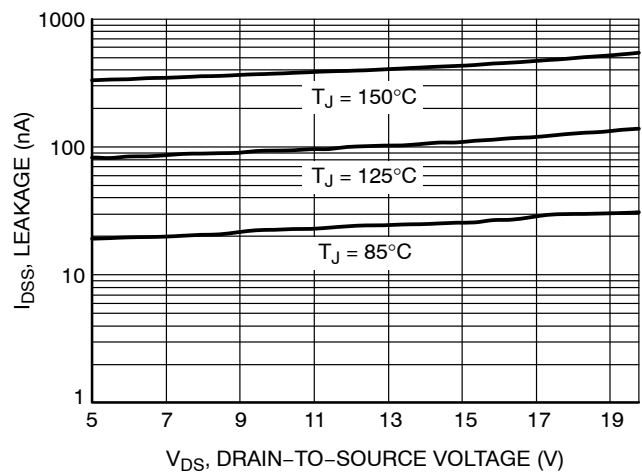
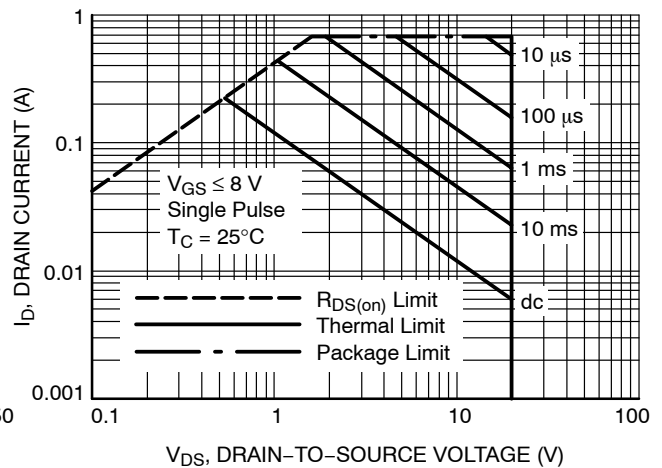
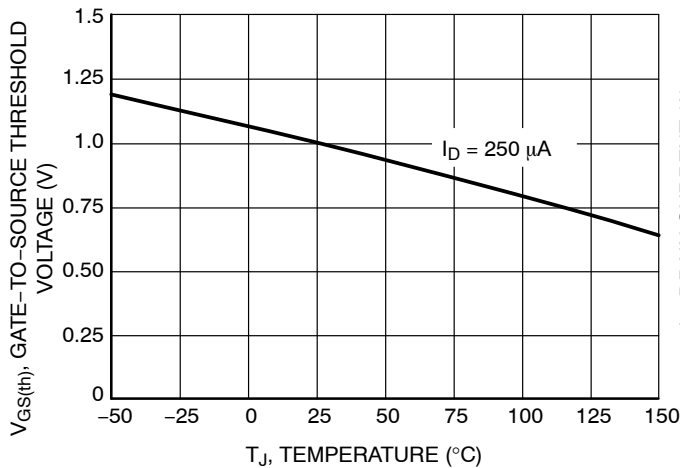
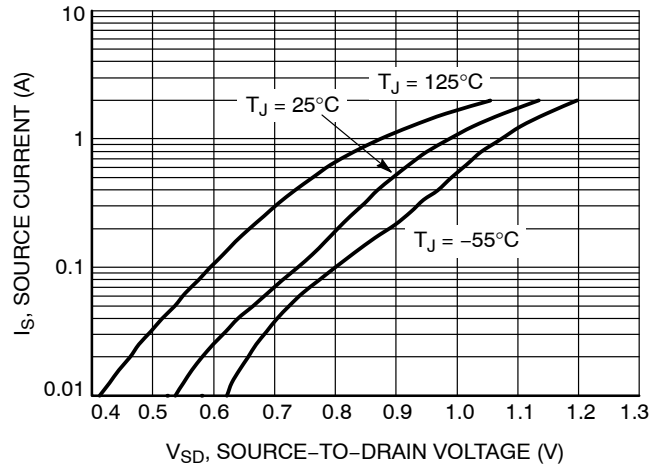
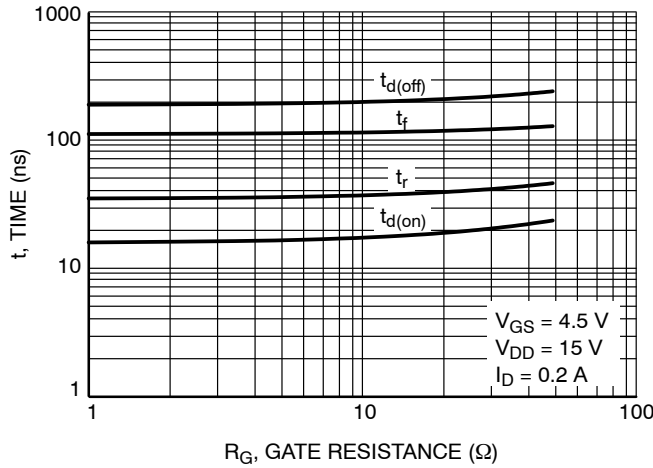
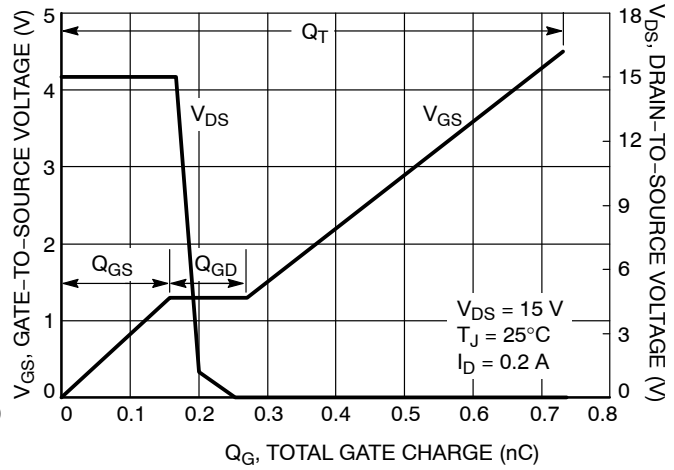
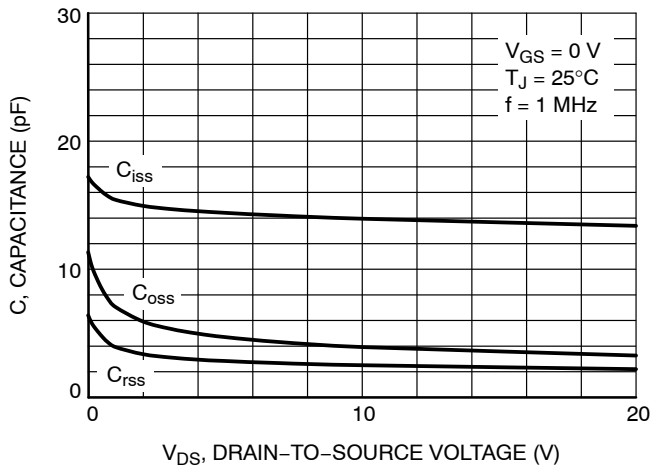


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS



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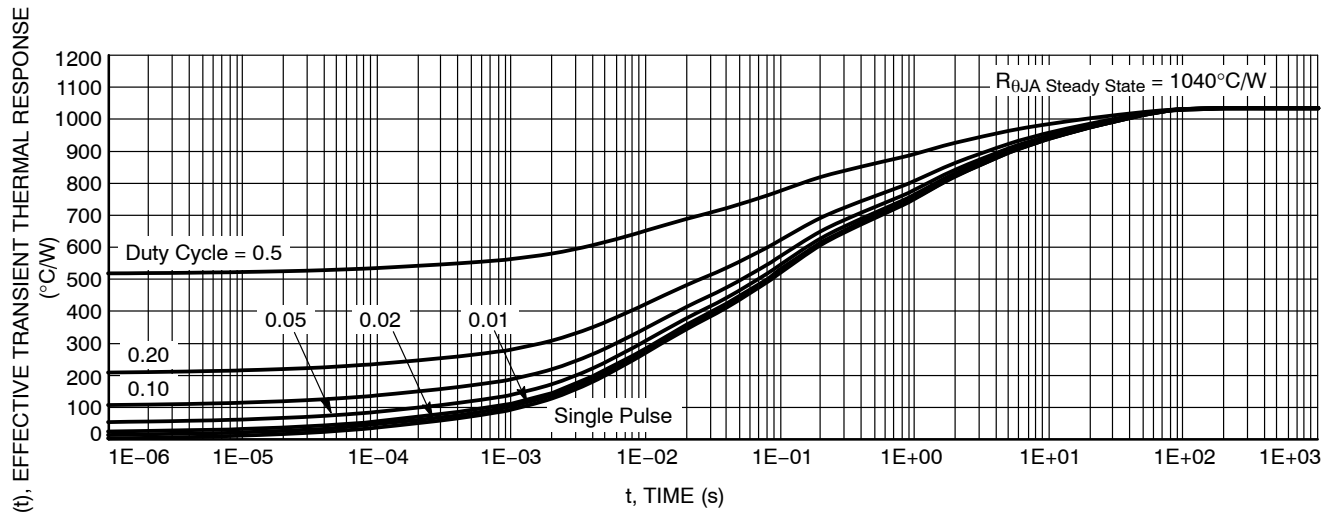
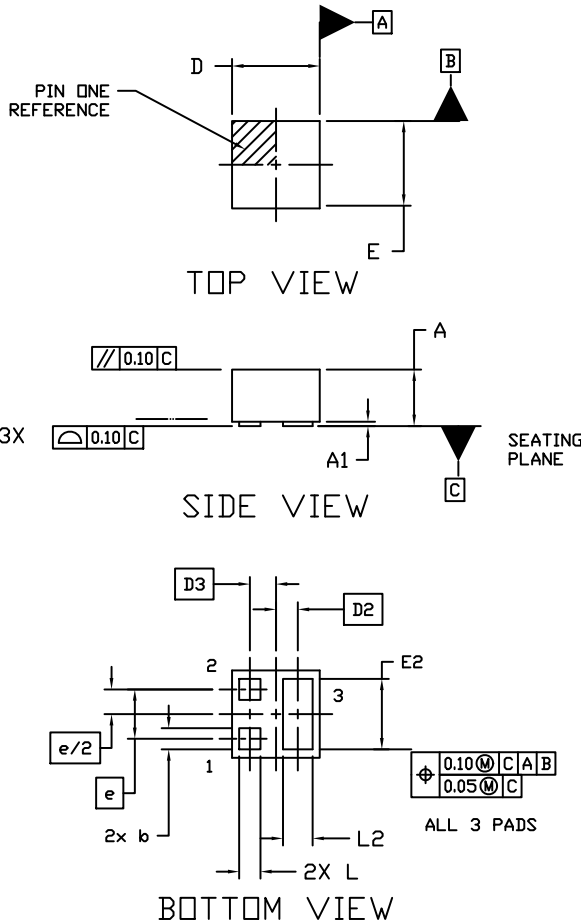


Figure 13. FET Thermal Response

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PACKAGE DIMENSIONS

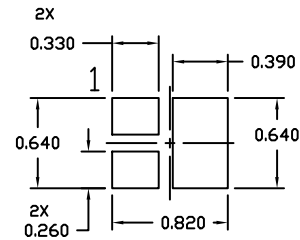
XLLGA3, 0.62x0.62, 0.35P
CASE 713AF
ISSUE O



NOTES:

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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.340	0.390	0.440
A1	0.000	----	0.030
b	0.100	0.150	0.200
D	0.570	0.620	0.670
D2	0.155 BSC		
D3	0.185 BSC		
E	0.570	0.620	0.670
E2	0.400	0.500	0.600
e	0.350 BSC		
L	0.100	0.150	0.200
L2	0.110	0.210	0.310



RECOMMENDED MOUNTING 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.

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