

NTLJS4159N

Power MOSFET

30 V, 7.8 A, Single N-Channel, 2x2 mm
WDFN Package

Features

- WDFN Package Provides Exposed Drain Pad for Excellent Thermal Conduction
- 2x2 mm Footprint Same as SC-88
- Lowest $R_{DS(on)}$ in 2x2 mm Package
- 1.8 V $R_{DS(on)}$ Rating for Operation at Low Voltage Logic Level Gate Drive
- Low Profile (< 0.8 mm) for Easy Fit in Thin Environments
- This is a Pb-Free Device

Applications

- DC-DC Conversion
- Boost Circuits for LED Backlights
- Optimized for Battery and Load Management Applications in Portable Equipment such as, Cell Phones, PDA's, Media Players, etc.
- Low Side Load Switch

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	30	V
Gate-to-Source Voltage			V_{GS}	± 8.0	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	6.0	A
		$T_A = 85^{\circ}\text{C}$		4.4	
	$t \leq 5\text{ s}$	$T_A = 25^{\circ}\text{C}$		7.8	
Power Dissipation (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	P_D	1.92	W
	$t \leq 5\text{ s}$			3.3	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	3.6	A
		$T_A = 85^{\circ}\text{C}$		2.6	
Power Dissipation (Note 2)			$T_A = 25^{\circ}\text{C}$	P_D	0.70
Pulsed Drain Current	$t_p = 10\text{ }\mu\text{s}$		I_{DM}	28	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$
Source Current (Body Diode) (Note 2)			I_S	3.0	A
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.

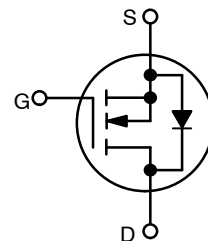
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
2. Surface Mounted on FR4 Board using the minimum recommended pad size of 30 mm², 2 oz Cu.



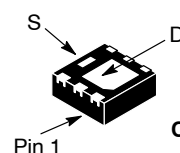
ON Semiconductor®

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$V_{(BR)DS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
30 V	35 m Ω @ 4.5 V	7.8 A
	45 m Ω @ 2.5 V	
	55 m Ω @ 1.8 V	



N-CHANNEL MOSFET



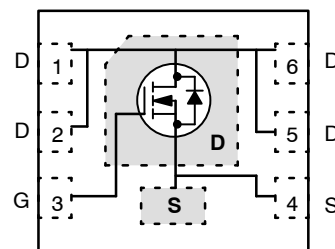
WDFN6
CASE 506AP

MARKING DIAGRAM

1	JB	6
2	M	5
3	■	4

JB = Specific Device Code
M = Date Code
■ = Pb-Free Package
(Note: Microdot may be in either location)

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

Device	Package	Shipping†
NTLJS4159NT1G	WDFN6 (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	65	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	38	
Junction-to-Ambient – Steady State Min Pad (Note 4)	$R_{\theta JA}$	180	

3. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
4. Surface Mounted on FR4 Board using the minimum recommended pad size (30 mm², 2 oz Cu).

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\text{ }\mu\text{A}$, Ref to 25°C		20		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 65^\circ\text{C}$		1.0	
			$T_J = 85^\circ\text{C}$		5.0	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	0.4	0.7	1.0	V
Negative Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			3.18		mV/°C
Drain-to-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 2.0\text{ A}$		20.3	35	m Ω
		$V_{GS} = 2.5\text{ V}, I_D = 2.0\text{ A}$		25.8	45	
		$V_{GS} = 1.8\text{ V}, I_D = 1.8\text{ A}$		35.2	55	
Forward Transconductance	g_{FS}	$V_{DS} = 16\text{ V}, I_D = 2.0\text{ A}$		5.3		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 15\text{ V}$		1045		pF
Output Capacitance	C_{OSS}			115.5		
Reverse Transfer Capacitance	C_{RSS}			45.3		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 2.0\text{ A}$		12.1	13	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.2		
Gate-to-Source Charge	Q_{GS}			1.9		
Gate-to-Drain Charge	Q_{GD}			2.7		
Gate Resistance	R_G			3.65		Ω

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 15\text{ V}, I_D = 2.0\text{ A}, R_G = 3.0\text{ }\Omega$		6.8		ns
Rise Time	t_r			12.4		
Turn-Off Delay Time	$t_{d(OFF)}$			26		
Fall Time	t_f			5.1		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Recovery Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 2.0\text{ A}$	$T_J = 25^\circ\text{C}$		0.71	1.2	V
			$T_J = 125^\circ\text{C}$		0.58		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, d_{ISD}/d_t = 100\text{ A}/\mu\text{s}, I_S = 1.0\text{ A}$			15	35	ns
Charge Time	t_a				9.0		
Discharge Time	t_b				6.0		
Reverse Recovery Time	Q_{RR}				7.0		nC

5. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.
6. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

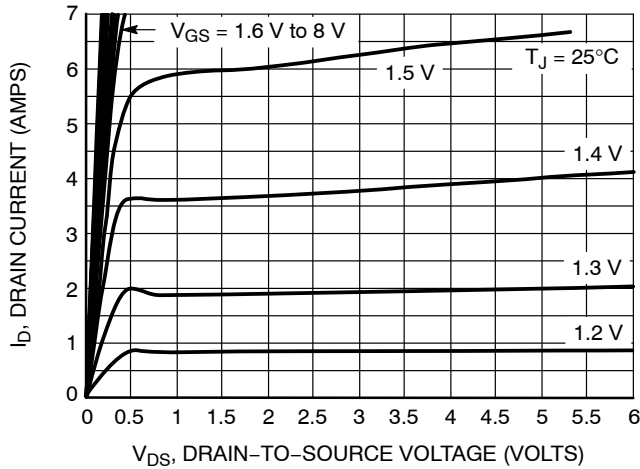


Figure 1. On-Region Characteristics

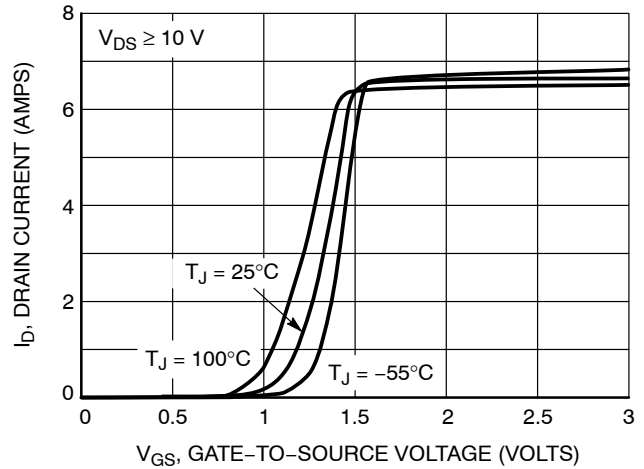


Figure 2. Transfer Characteristics

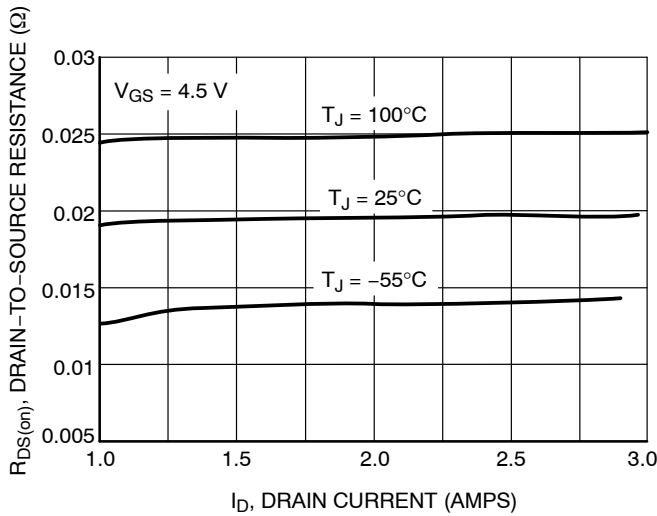


Figure 3. On-Resistance versus Drain Current

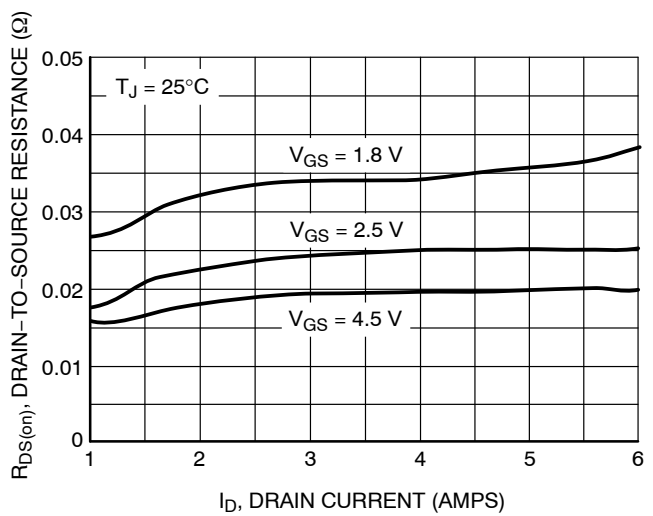


Figure 4. On-Resistance versus Drain Current and Gate Voltage

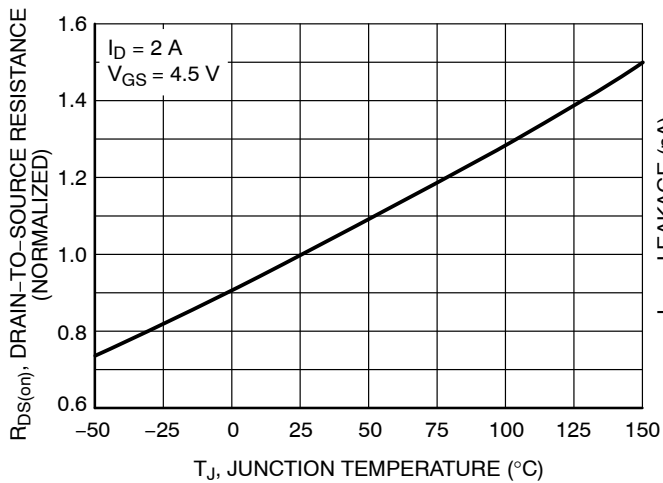


Figure 5. On-Resistance Variation with Temperature

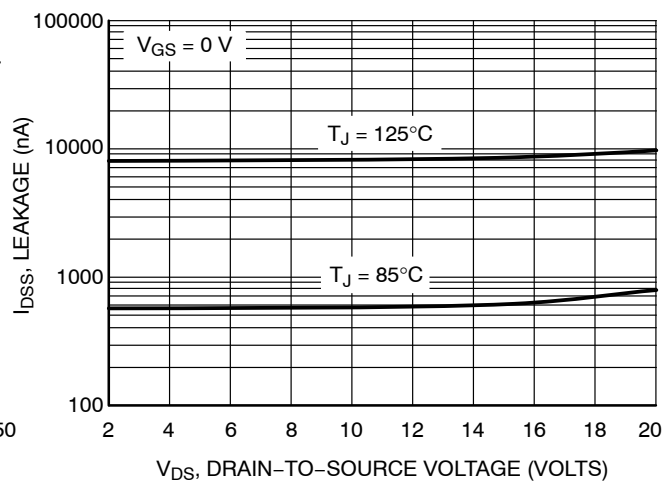


Figure 6. Drain-to-Source Leakage Current versus Voltage

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

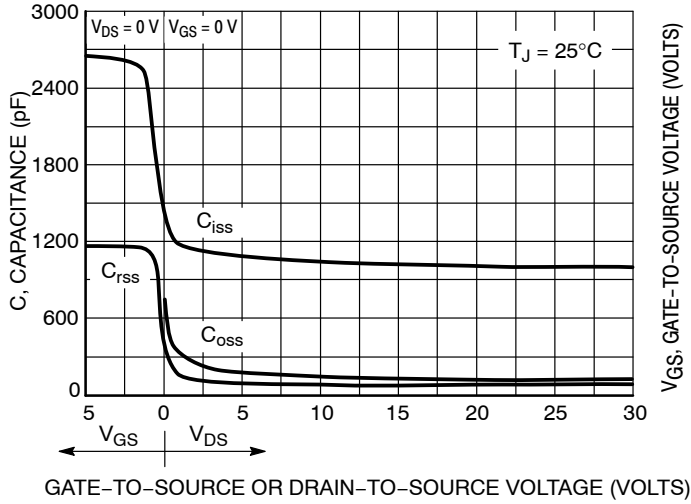


Figure 7. Capacitance Variation

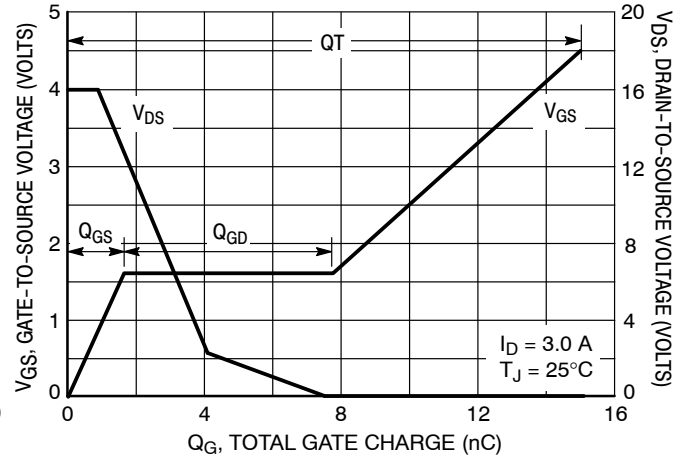


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

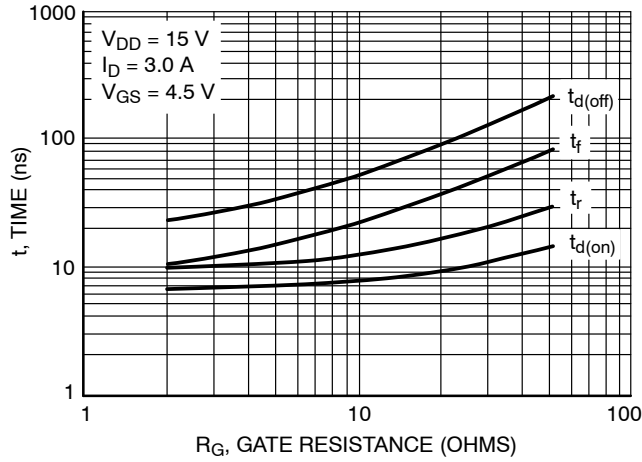


Figure 9. Resistive Switching Time Variation versus Gate Resistance

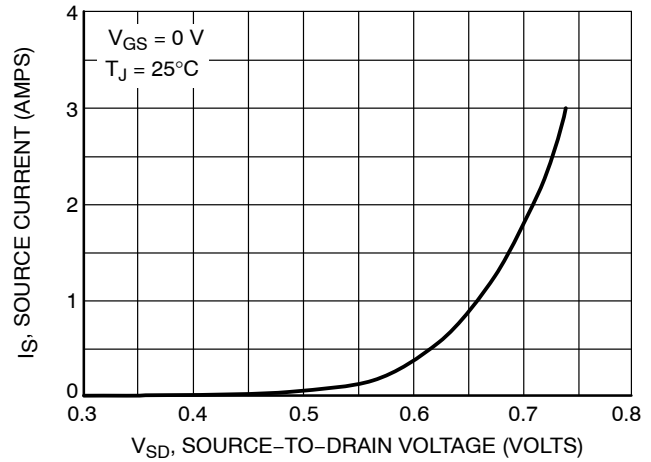


Figure 10. Diode Forward Voltage versus Current

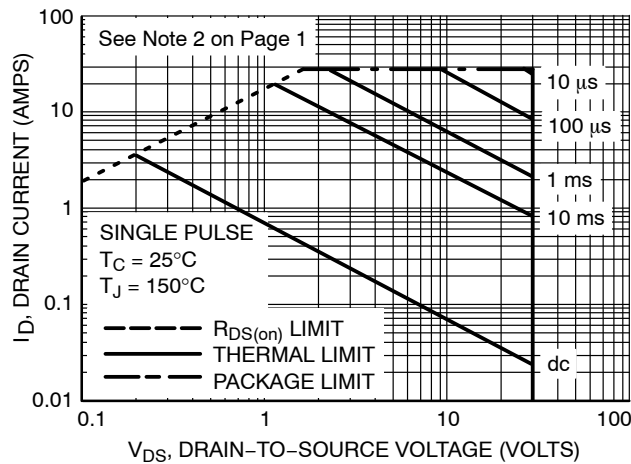


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

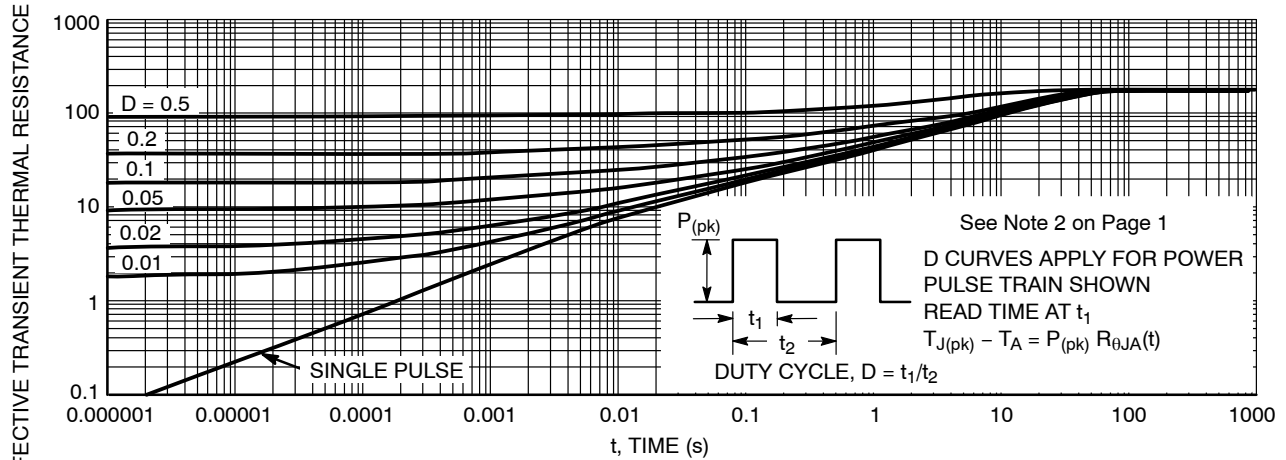


Figure 12. Thermal Response



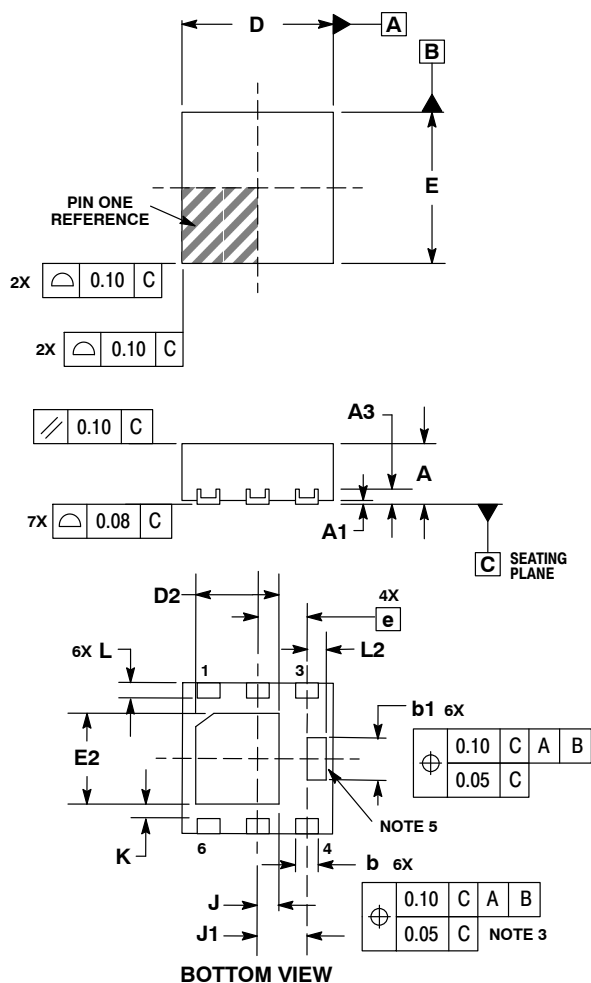
SCALE 4:1

WDFN6 2x2

CASE 506AP-01

ISSUE B

DATE 26 APR 2006

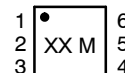


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
1. CENTER TERMINAL LEAD IS OPTIONAL. TERMINAL LEAD IS CONNECTED TO TERMINAL LEAD # 4.
2. PINS 1, 2, 5 AND 6 ARE TIED TO THE FLAG.

DIM	MILLIMETERS	
	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
b1	0.51	0.61
D	2.00 BSC	
D2	1.00	1.20
E	2.00 BSC	
E2	1.10	1.30
e	0.65 BSC	
K	0.15 REF	
L	0.20	0.30
L2	0.20	0.30
J	0.27 REF	
J1	0.65 REF	

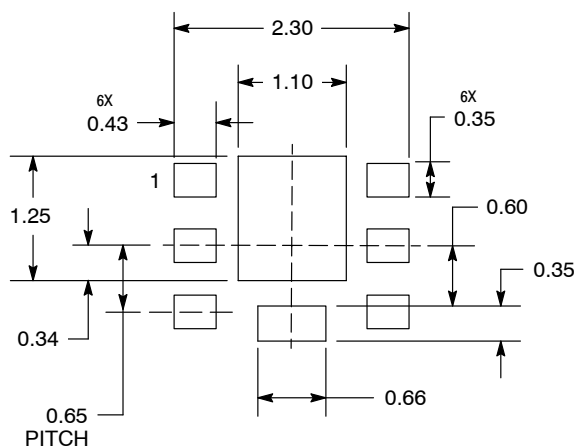
GENERIC MARKING DIAGRAM*



XX = 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.

SOLDERMASK DEFINED MOUNTING FOOTPRINT



DIMENSIONS: MILLIMETERS

STYLE 1:
PIN 1: DRAIN
2: DRAIN
3: GATE
4: SOURCE
5: DRAIN
6: DRAIN

STYLE 2:
PIN 1: COLLECTOR
2: COLLECTOR
3: BASE
4: EMITTER
5: COLLECTOR
6: COLLECTOR

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DESCRIPTION:	6 PIN WDFN 2X2, 0.65P	PAGE 1 OF 1

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