MOSFET – Power, N-Channel with Schottky Barrier Diode, Schottky Diode, μCool, WDFN 2X2 mm

30 V, 4.6 A, 2.0 A

NTLJF4156N

Features

- WDFN Package Provides Exposed Drain Pad for Excellent Thermal Conduction
- Co-Packaged MOSFET and Schottky For Easy Circuit Layout
- $R_{DS(on)}$ Rated at Low $V_{GS(on)}$ Levels, V_{GS} = 1.5 V
- Low Profile (<0.8 mm) for Easy Fit in Thin Environments
- Low V_F Schottky
- This is a Pb-Free Device

Applications

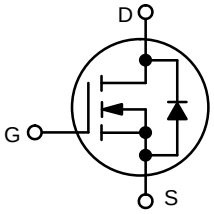
- DC-DC Converters
- Li-Ion Battery Applications in Cell Phones, PDA's, Media Players
- Color Display and Camera Flash Regulators

MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
30 V	70 mΩ @ 4.5 V	4.6 A
	90 mΩ @ 2.5 V	
	125 mΩ @ 1.8 V	
	250 mΩ @ 1.5 V	

SCHOTTKY DIODE

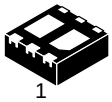
V_R MAX	V_F TYP	I_F MAX
30 V	0.47 V	2.0 A



N-CHANNEL MOSFET

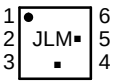


SCHOTTKY DIODE



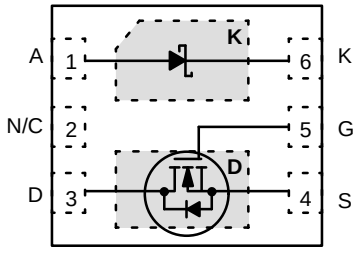
WDFN6
CASE 506AN

MARKING DIAGRAM



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

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

MAXIMUM RATINGS (T_J = 25 °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_J = 25 °C	I_D	3.7	A
		T_J = 85 °C		2.7	
	t ≤ 5 s	T_J = 25 °C		4.6	
Power Dissipation (Note 1)	Steady State	T_J = 25 °C	P_D	1.5	W
	t ≤ 5 s			2.3	
Continuous Drain Current (Note 2)	Steady State	T_J = 25 °C	I_D	2.5	A
		T_J = 85 °C		1.8	
Power Dissipation (Note 2)		T_J = 25 °C	P_D	0.71	
Pulsed Drain Current	t_p = 10 μs		I_{DM}	20	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°C
Source Current (Body Diode) (Note 2)			I_S	2.4	A
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 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface Mounted on FR4 Board using the minimum recommended pad size of 30 mm^2, 2 oz. Cu.

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SCHOTTKY DIODE MAXIMUM RATINGS (T_J = 25 °C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	V_{RRM}	30	V
DC Blocking Voltage	V_R	30	V
Average Rectified Forward Current	I_F	2.0	A

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient − Steady State (Note 3)	$R_{\theta JA}$	83	°C/W
Junction-to-Ambient − t ≤ 5 s (Note 3)	$R_{\theta JA}$	54	
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 of 30 mm^2, 2 oz. Cu.

MOSFET ELECTRICAL CHARACTERISTICS (T_J = 25 °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 V, I_D = 250 μA		30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 250 μA, Ref to 25°C			18.1		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 24 V, V_{GS} = 0 V	T_J = 25 °C			1.0	μA
			T_J = 85 °C			10	
Gate-to-Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±8.0 V				100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		0.4	0.7	1.0	V
Gate Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				2.8		mV/°C
Drain-to-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 4.5, I_D = 2.0 A			47	70	mΩ
		V_{GS} = 2.5, I_D = 2.0 A			56	90	
		V_{GS} = 1.8, I_D = 1.8 A			88	125	
		V_{GS} = 1.5, I_D = 1.5 A			133	250	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 2.0 A			4.5		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 15 V			427		pF
Output Capacitance	C_{OSS}				51		
Reverse Transfer Capacitance	C_{RSS}				32		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 2.0 A			5.4	6.5	nC
Threshold Gate Charge	$Q_{G(TH)}$				0.5		
Gate-to-Source Charge	Q_{GS}				0.8		
Gate-to-Drain Charge	Q_{GD}				1.24		
Gate Resistance	R_G				3.7		Ω

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.

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

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MOSFET ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise noted)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)							
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DD} = 15 V, I_D = 2.0 A, R_G = 2.0 Ω			4.8		ns
Rise Time	t_r				9.2		
Turn-Off Delay Time	$t_{d(OFF)}$				14.2		
Fall Time	t_f				1.7		
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Recovery Voltage	V_{SD}	V_{GS} = 0 V, IS = 2.0 A	T_J = 25 °C		0.78	1.2	V
			T_J = 125 °C		0.62		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, d_{ISD}/d_t = 100 A/μs, I_S = 2.0 A			10.5		ns
Charge Time	t_a				7.6		
Discharge Time	t_b				2.9		
Reverse Recovery Time	Q_{RR}				5.0		nC

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.

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.1 A		0.34	0.39	V
		I_F = 1.0 A		0.47	0.53	
Maximum Instantaneous Reverse Current	I_R	V_R = 30 V		17	20	μA
		V_R = 20 V		3.0	8.0	
		V_R = 10 A		2.0	4.5	

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 85 °C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.1 A		0.22	0.35	V
		I_F = 1.0 A		0.40	0.50	
Maximum Instantaneous Reverse Current	I_R	V_R = 30 V		0.22	2.5	mA
		V_R = 20 V		0.11	1.6	
		V_R = 10 V		0.06	1.2	

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 125 °C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage	V_F	I_F = 0.1 A		0.2	0.29	V
		I_F = 1.0 A		0.4	0.47	
Maximum Instantaneous Reverse Current	I_R	V_R = 30 V		2.0	20	mA
		V_R = 20 V		1.1	10.9	
		V_R = 10 V		0.63	8.4	

SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Capacitance	C	V_R = 5.0 V, f = 1.0 MHz		38		pF

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.

7. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
8. Surface-mounted on FR4 board using the minimum recommended pad size of 30 mm^2, 2 oz cu.
9. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
10. Switching characteristics are independent of operating junction temperatures.

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TYPICAL PERFORMANCE CURVES (T_J = 25 °C unless otherwise noted)

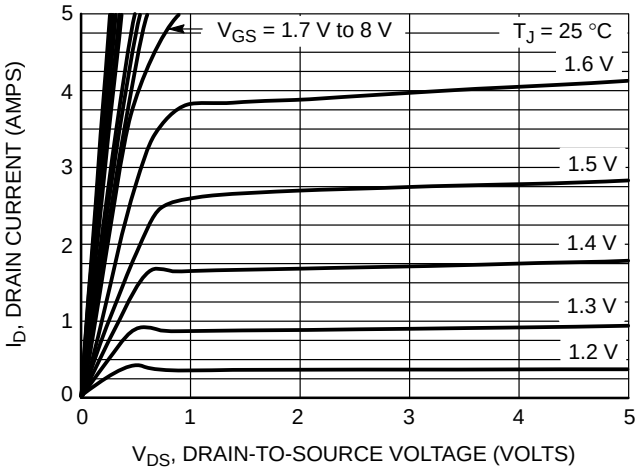


Figure 1. On-Region Characteristics

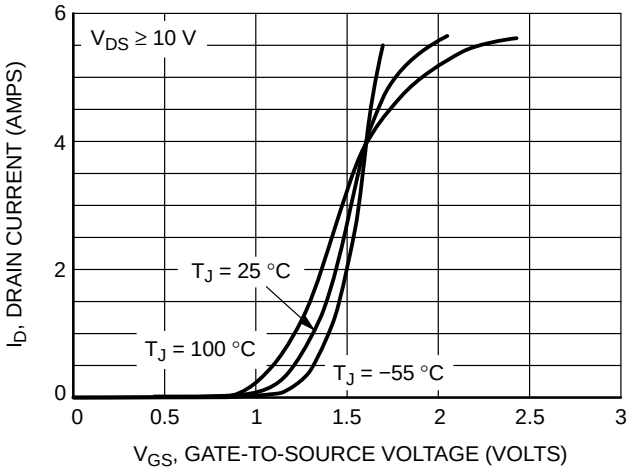


Figure 2. Transfer Characteristics

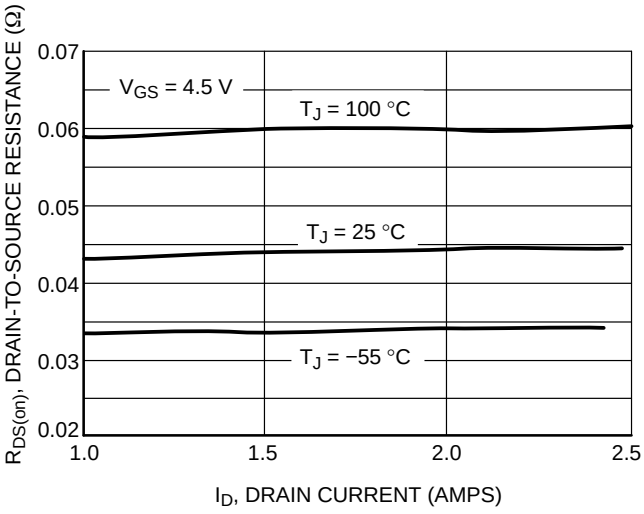


Figure 3. On-Resistance versus Drain Current

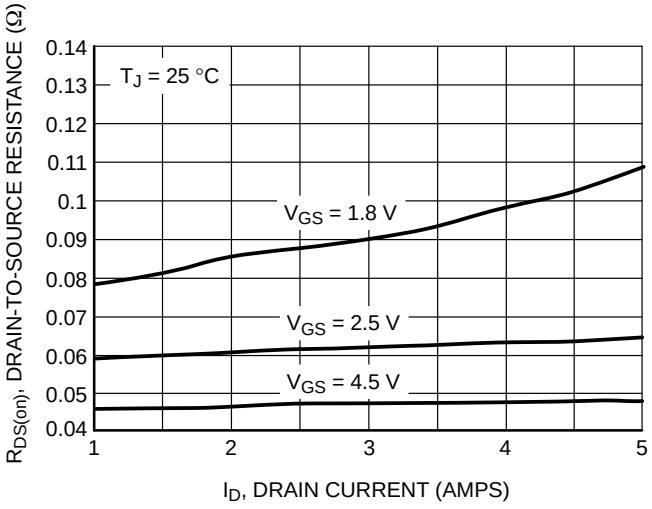


Figure 4. On-Resistance versus Drain Current and Gate Voltage

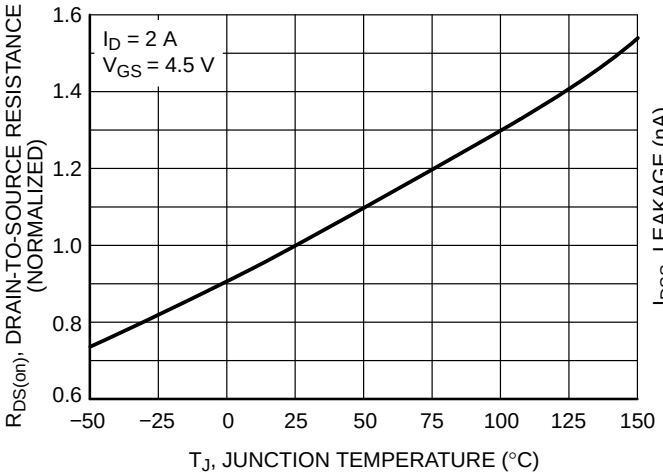


Figure 5. On-Resistance Variation with Temperature

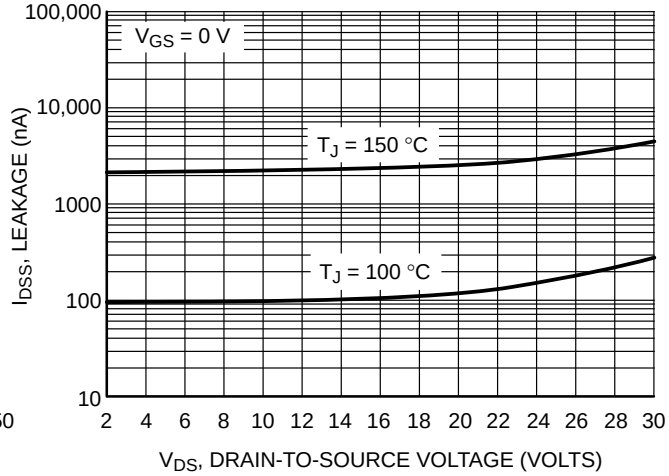


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL PERFORMANCE CURVES (T_J = 25 °C unless otherwise noted)

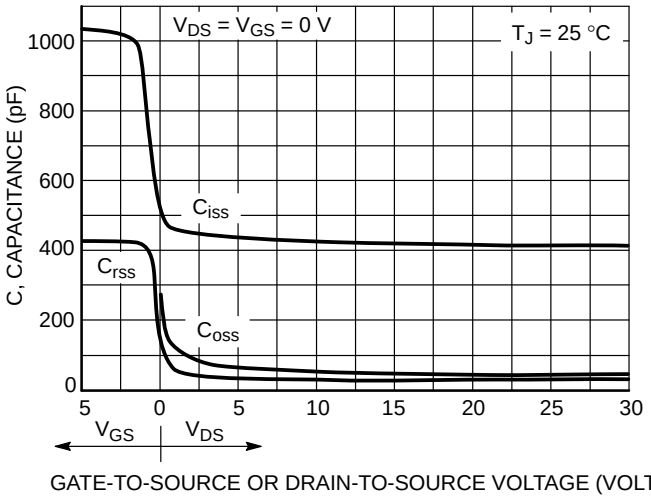


Figure 7. Capacitance Variation

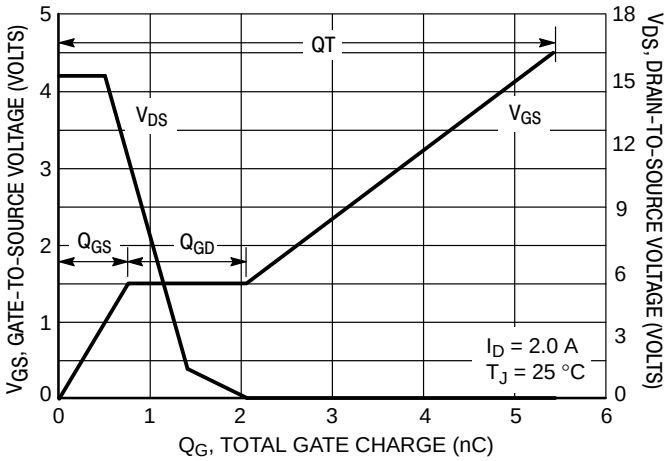


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

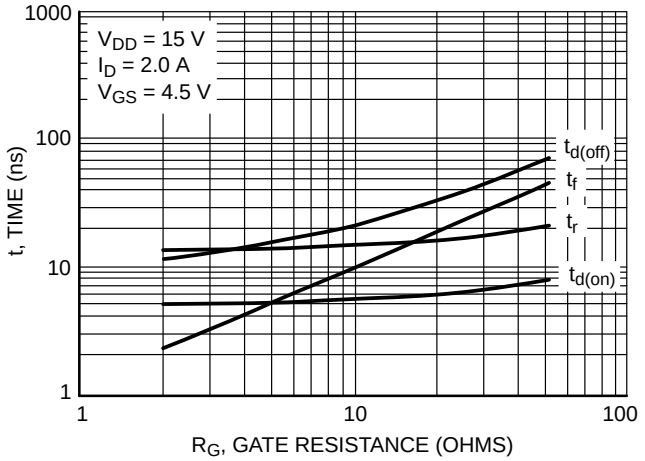


Figure 9. Resistive Switching Time Variation versus Gate Resistance

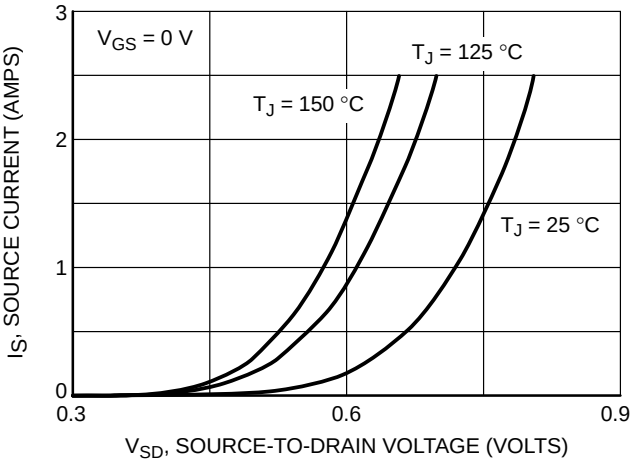


Figure 10. Diode Forward Voltage versus Current

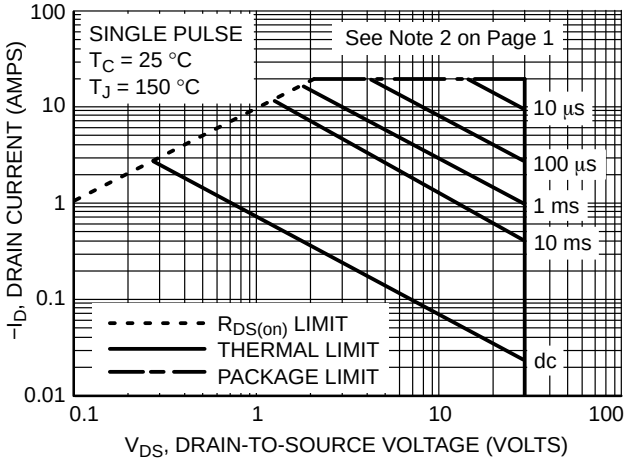


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL PERFORMANCE CURVES (T_J = 25 °C unless otherwise noted)

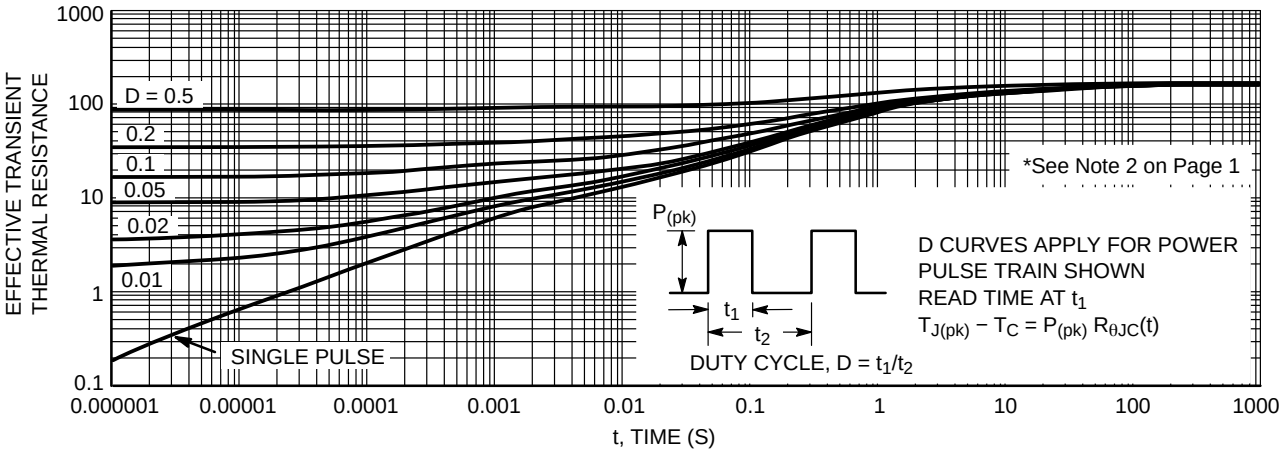


Figure 12. Thermal Response

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TYPICAL SCHOTTKY PERFORMANCE CURVES (T_J = 25 °C unless otherwise noted)

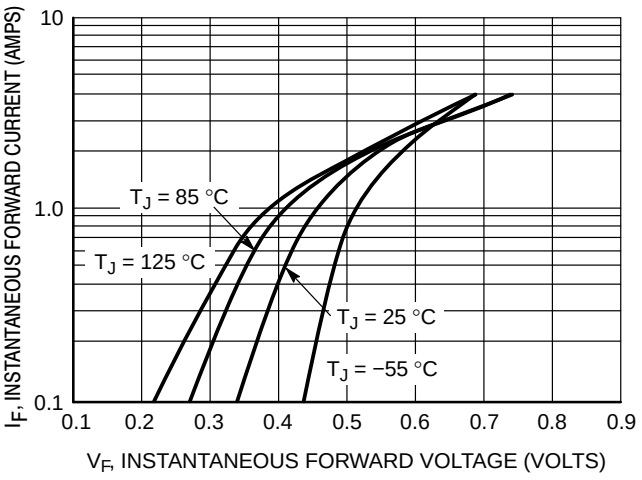


Figure 13. Typical Forward Voltage

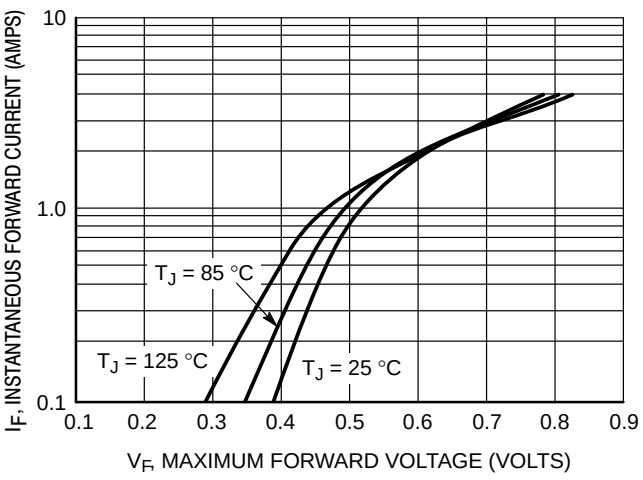


Figure 14. Maximum Forward Voltage

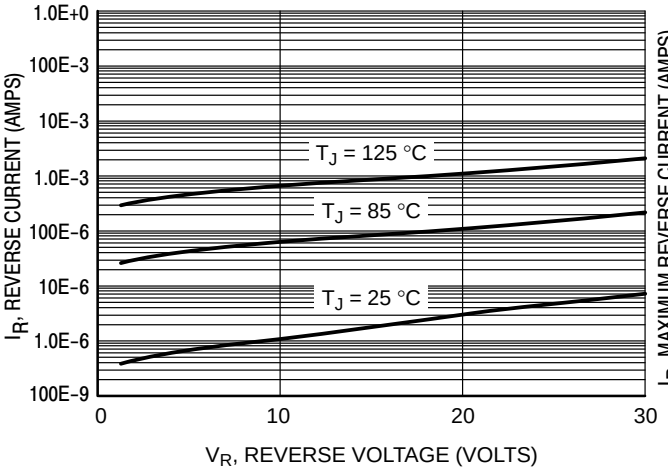


Figure 15. Typical Reverse Current

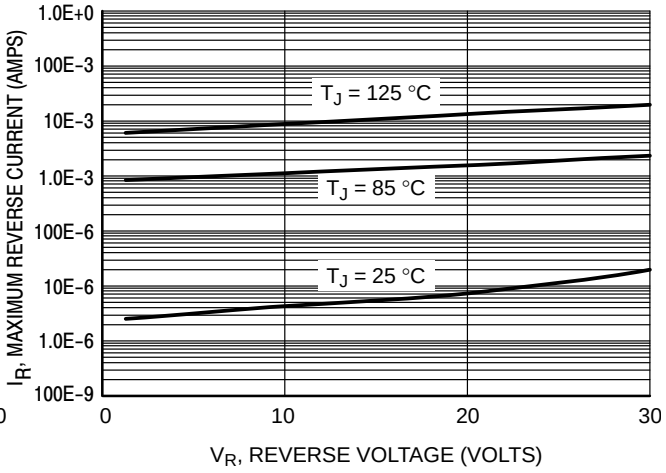


Figure 16. Maximum Reverse Current

ORDERING INFORMATION

Device	Package	Shipping†
NTLJF4156NT1G	WDFN6 (Pb-Free)	3000 / Tape & Reel
NTLJF4156NTAG	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 Specifications Brochure, BRD8011/D.

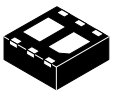
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REVISION HISTORY

Revision	Description of Changes	Date
5	Rebranded the document to **onsemi** format.	2/6/20026

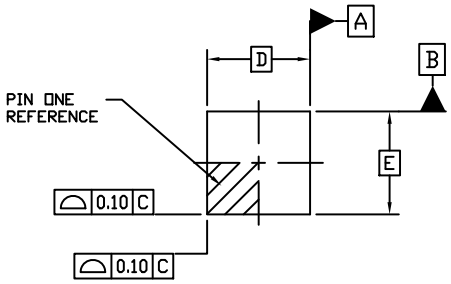
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

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WDFN6 2x2, 0.65P
CASE 506AN
ISSUE H

DATE 25 JAN 2022



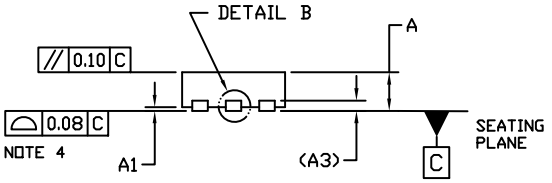
TOP VIEW



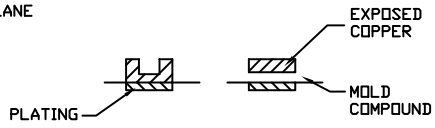
DETAIL A
OPTIONAL CONSTRUCTIONS

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 0.30 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.

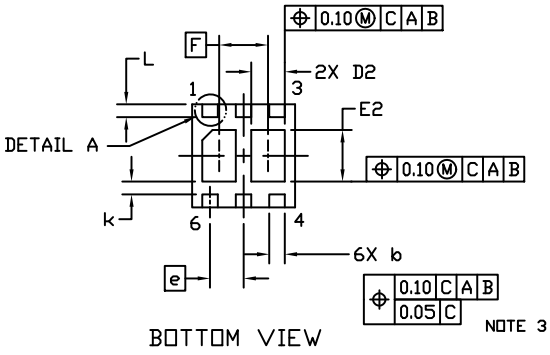


SIDE VIEW

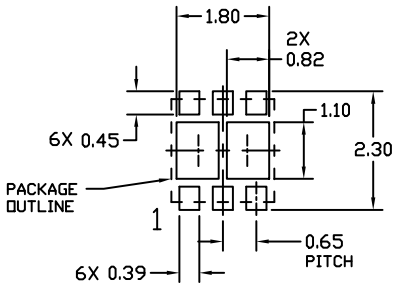


DETAIL B
OPTIONAL CONSTRUCTIONS

DIM	MILLIMETERS	
	MIN.	MAX.
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.57	0.77
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
F	0.95 BSC	
k	0.25 REF	
L	0.20	0.30
L1	---	0.10



BOTTOM VIEW



RECOMMENDED
MOUNTING FOOTPRINT
SOLDERMASK DEFINED

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. Some products may not follow the Generic Marking.

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DESCRIPTION:	**WDFN6 2x2, 0.65P**	**PAGE 1 OF 1**

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