

MOSFET - Power, Single N-Channel

60 V, 9 mΩ, 48 A

NVLJWS011N06CL

Features

- Small Footprint for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	60	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	48	A
		$T_C = 100^\circ\text{C}$	34	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	46	W
		$T_C = 100^\circ\text{C}$	23	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	12	A
		$T_A = 100^\circ\text{C}$	8.5	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^\circ\text{C}$	2.9	W
		$T_A = 100^\circ\text{C}$	1.4	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	233	A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	38	A	
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 2.3 \text{ A}$)	E_{AS}	103	mJ	
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.

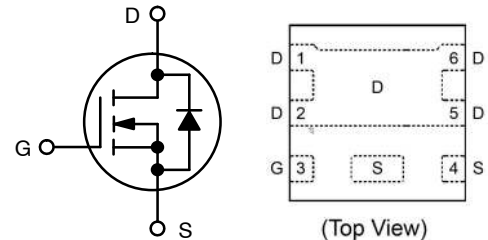
THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Junction-to-Case	$R_{\theta JC}$	3.3	$^\circ\text{C}/\text{W}$
Junction-to-Ambient	$R_{\theta JA}$	52	

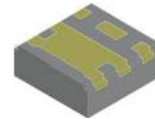
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
60 V	9 mΩ @ 10 V	48 A
	13 mΩ @ 4.5 V	

ELECTRICAL CONNECTION



N-CHANNEL MOSFET



WDFNW6 (2.05x2.05)
CASE 515AD

MARKING DIAGRAM



- XXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NVLJWS011N06CL

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			27.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		10	μA
			$T_J = 125^\circ\text{C}$		100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 4)

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		7.7	9	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		10.7	13	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 34\ \mu\text{A}$	1.2		2.0	V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(TH)}/T_J$			-5.6		mV/°C
Forward Transconductance	g_{FS}	$V_{DS} = 6\text{ V}, I_D = 10\text{ A}$		39		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		912		pF
Output Capacitance	C_{OSS}			460		
Reverse Transfer Capacitance	C_{RSS}			8		
Total Gate Charge	$Q_{G(TOT)}$	$V_{DS} = 48\text{ V}; I_D = 10\text{ A}, V_{GS} = 4.5\text{ V}$		6.3		nC
Total Gate Charge	$Q_{G(TOT)}$	$V_{DS} = 48\text{ V}; I_D = 10\text{ A}, V_{GS} = 10\text{ V}$		13.6		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4		
Gate-to-Source Charge	Q_{GS}			2.5		
Gate-to-Drain Charge	Q_{GD}			1.4		
Plateau Voltage	V_{GP}			2.7		V

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 10\text{ A}, R_G = 6\ \Omega$		8.1		ns
Turn-Off Delay Time	$t_{d(OFF)}$			23.3		
Rise Time	t_r			3.0		
Fall Time	t_f			3.6		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_{SD} = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.82	1.2	V
			$T_J = 125^\circ\text{C}$		0.69		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI/dt = 100\text{ A}/\mu\text{s}, I_{SD} = 10\text{ A}, V_{DS} = 48\text{ V}$		32		ns	
Charge Time	t_a			15.8			
Discharge Time	t_b			16			
Reverse Recovery Charge	Q_{RR}			20		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.

4. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

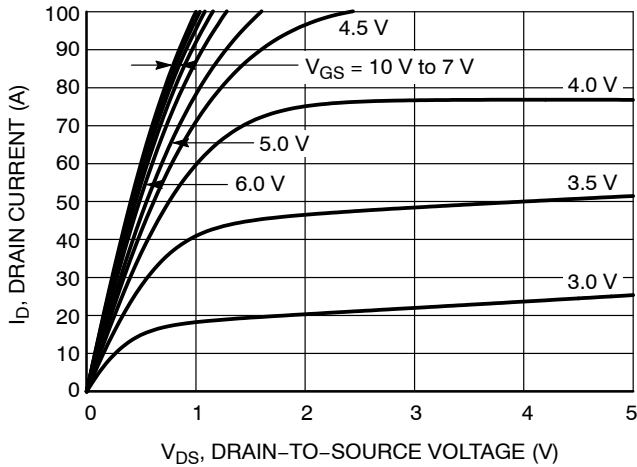


Figure 1. On-Region Characteristics

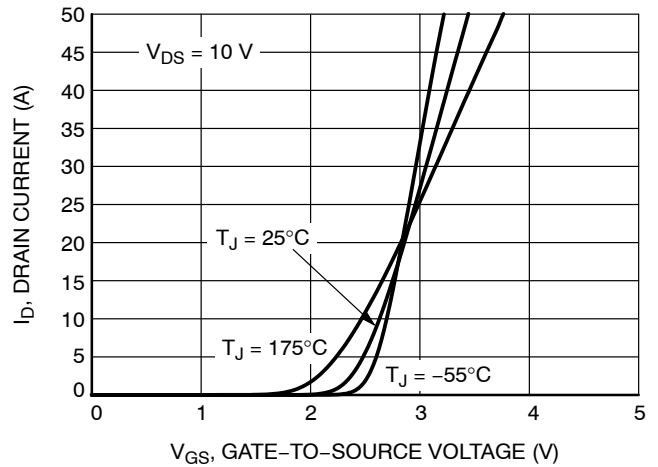


Figure 2. Transfer Characteristics

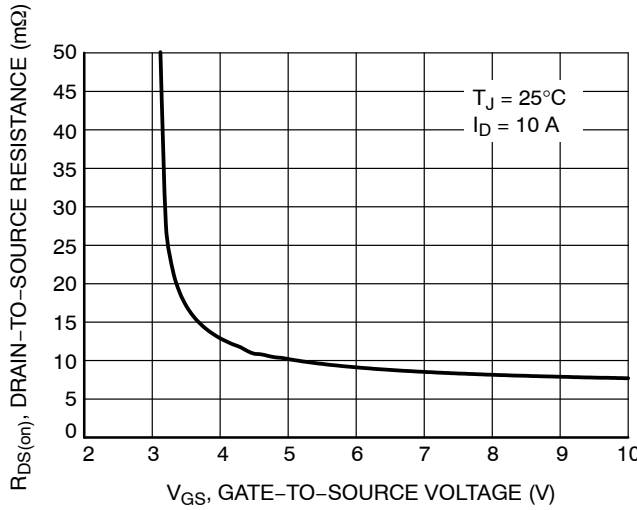


Figure 3. On-Resistance vs. Gate-to-Source Voltage

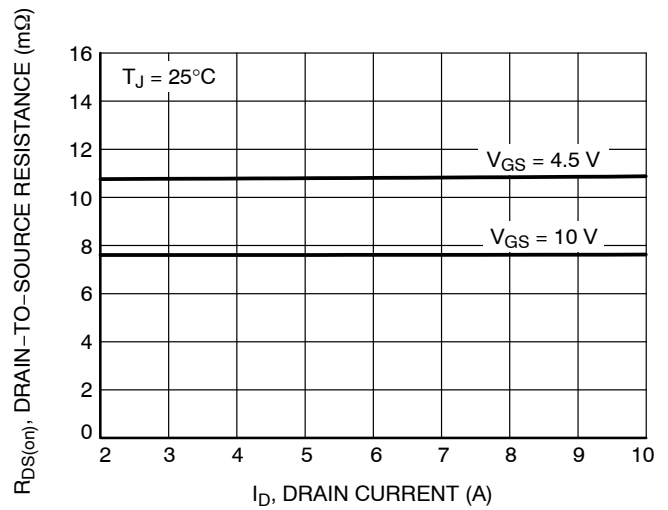


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

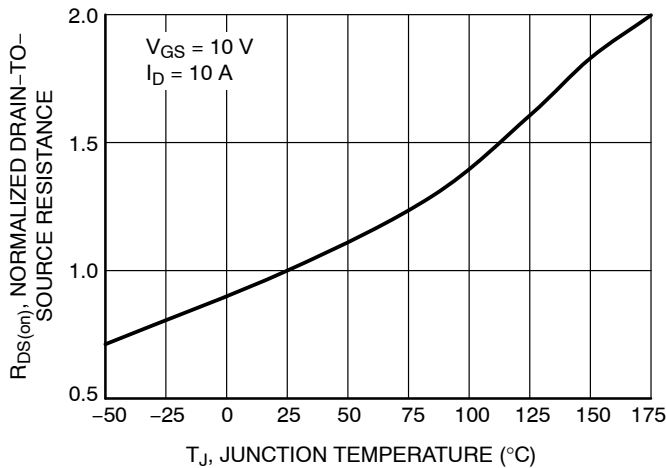


Figure 5. On-Resistance Variation with Temperature

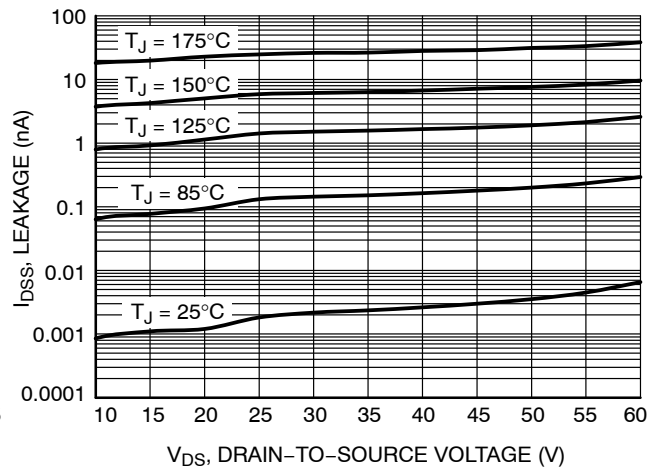


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

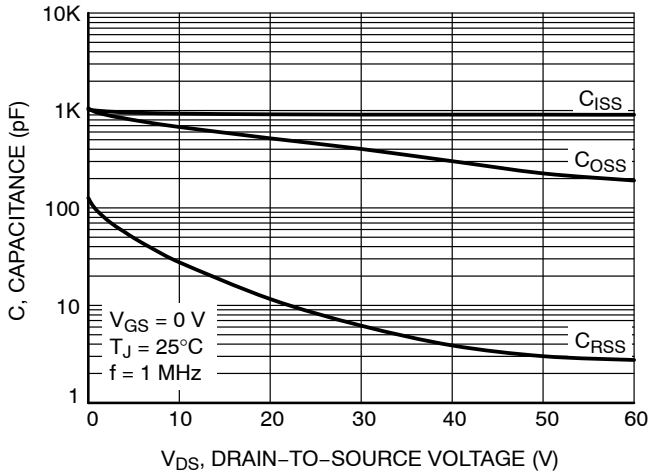


Figure 7. Capacitance Variation

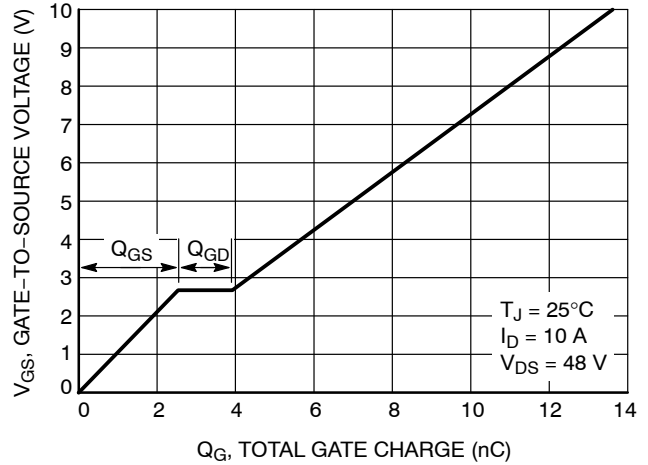


Figure 8. Gate-to-Source Voltage vs. Total Charge

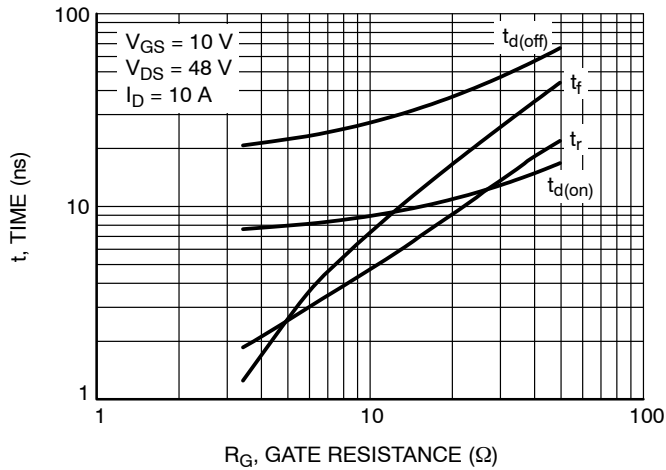


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

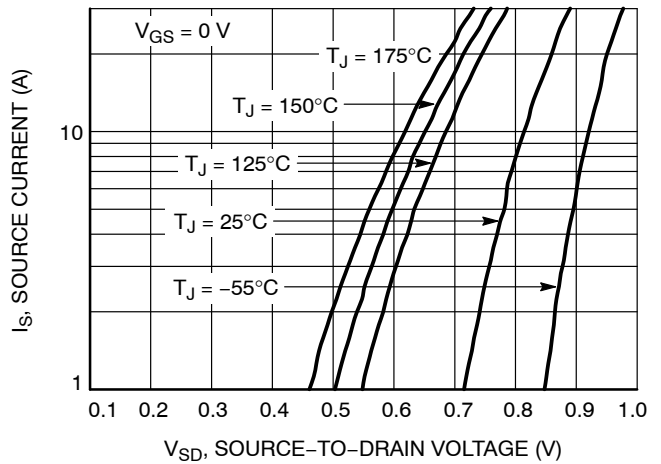


Figure 10. Diode Forward Voltage vs. Current

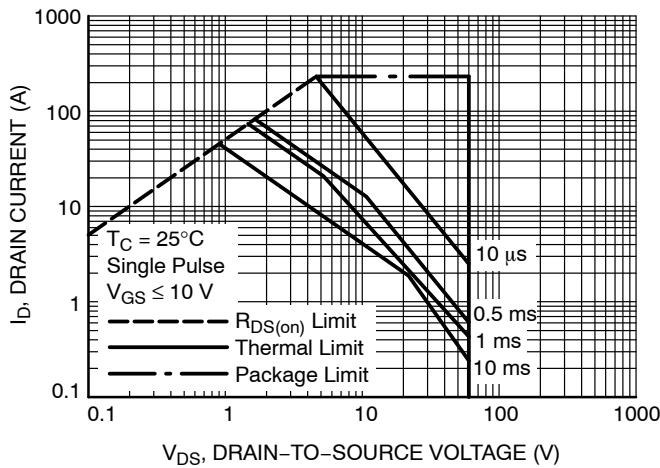


Figure 11. Maximum Rated Forward Biased Safe Operating Area

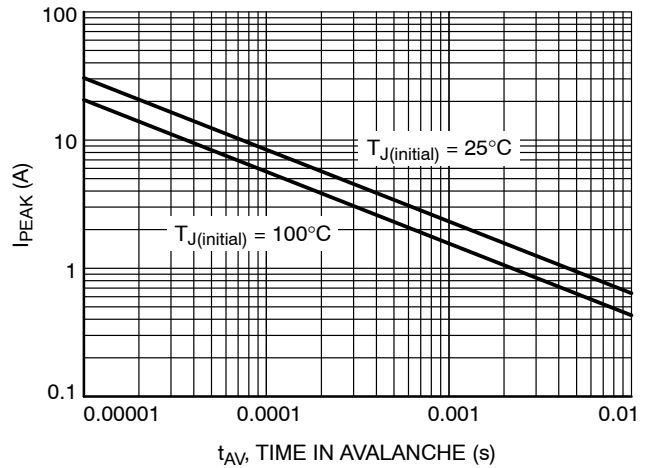


Figure 12. Maximum Drain Current vs. Time in Avalanche

NVLJWS011N06CL

TYPICAL CHARACTERISTICS

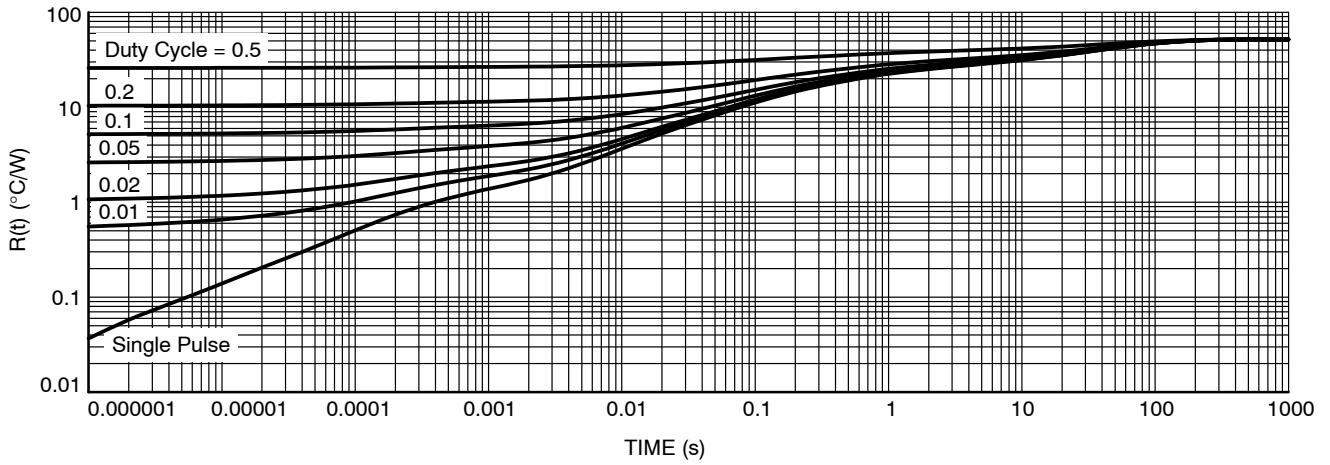


Figure 13. Transient Thermal Impedance

DEVICE ORDERING INFORMATION

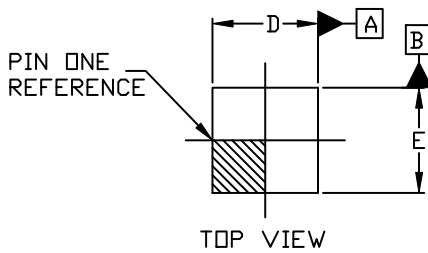
Device	Marking	Package	Shipping [†]
NVLJWS011N06CLTAG	011N	WDFNW6 (Pb-Free, Wettable Flanks)	3000 / Tape & Reel

[†]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.

NVLJWS011N06CL

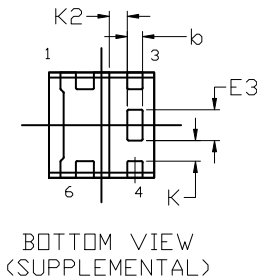
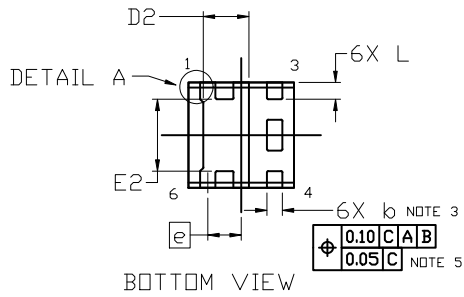
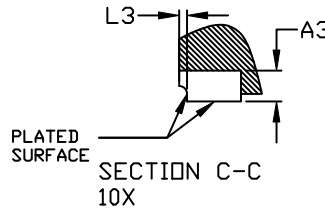
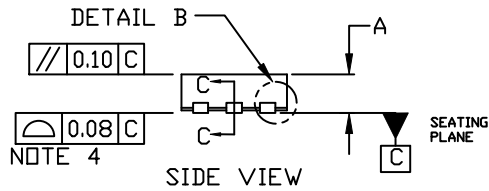
PACKAGE DIMENSIONS

WDFNW6 2.05x2.05, 0.65P
CASE 515AD
ISSUE O

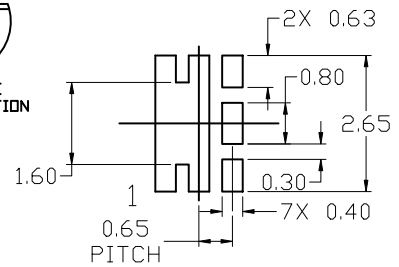
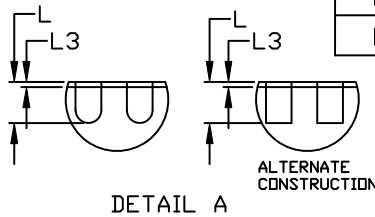
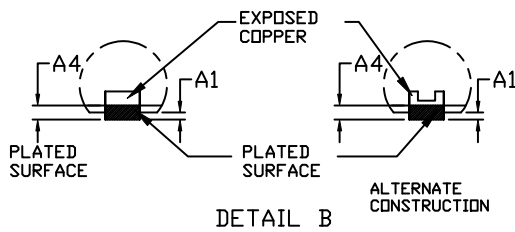


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION *b* APPLIES TO PLATED TERMINALS AND IS MEASURED BETWEEN 0.15 AND 0.30MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. POSITIONAL TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.



DIM	MILLIMETERS		
	MIN.	NDM.	MAX.
A	0.70	0.75	0.80
A1	0.00	---	0.05
A3	0.20 REF		
A4	0.10	---	---
b	0.25	0.30	0.35
D	1.95	2.05	2.15
D2	0.84	0.89	0.94
E	1.95	2.05	2.15
E2	1.35	1.40	1.45
E3	0.55	0.60	0.65
e	0.65 BSC		
K	0.40 REF		
K2	0.35 REF		
L	0.275	0.325	0.375
L3	---	---	0.09



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, SOLDERM/D.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:
Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative