

MOSFET - Power, Single N-Channel

40 V, 5 mΩ, 68 A

NVLJWS6D0N04CL

Features

- Small Footprint for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- Wetable 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_{DS}	40	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	I_D 68 A
		$T_C = 100^\circ\text{C}$	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	P_D 46 W
		$T_C = 100^\circ\text{C}$	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	I_D 15 A
		$T_A = 100^\circ\text{C}$	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^\circ\text{C}$	P_D 2.5 W
		$T_A = 100^\circ\text{C}$	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM} 277	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 ($I_{L(pk)} = 4 \text{ A}$)	E_{AS}	113	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.

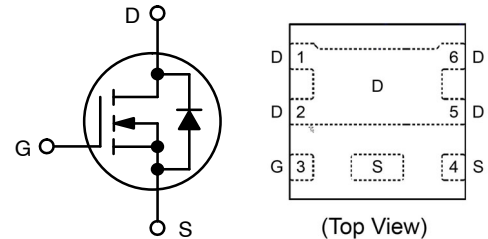
THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State	$R_{\theta JC}$	3.3	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	61	

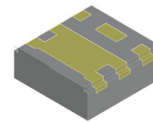
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent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

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	5 mΩ @ 10 V	68 A
	8 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.

NVLJWS6D0N04CL

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			21		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$	$T_J = 25^\circ\text{C}$		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)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 34\text{ }\mu\text{A}$	1.2		2.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-5.3		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		4	5	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		6	8	
Forward Transconductance	g_{FS}	$V_{DS} = 3\text{ V}, I_D = 10\text{ A}$		38		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 25\text{ V}$		1150		pF
Output Capacitance	C_{OSS}			475		
Reverse Transfer Capacitance	C_{RSS}			18		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 32\text{ V}, I_D = 10\text{ A}$		10		nC
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 10\text{ A}$		20		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.7		nC
Gate-to-Source Charge	Q_{GS}			3.1		
Gate-to-Drain Charge	Q_{GD}			3.0		
Plateau Voltage	V_{GP}			2.6		V

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 10\text{ A}, R_G = 6\text{ }\Omega$		9		ns
Rise Time	t_r			5		
Turn-Off Delay Time	$t_{d(OFF)}$			31		
Fall Time	t_f			7		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.79	1.2	V
			$T_J = 125^\circ\text{C}$		0.65		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 10\text{ A}$		33		ns	
Charge Time	t_a			15			
Discharge Time	t_b			18			
Reverse Recovery Charge	Q_{RR}			15		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 $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

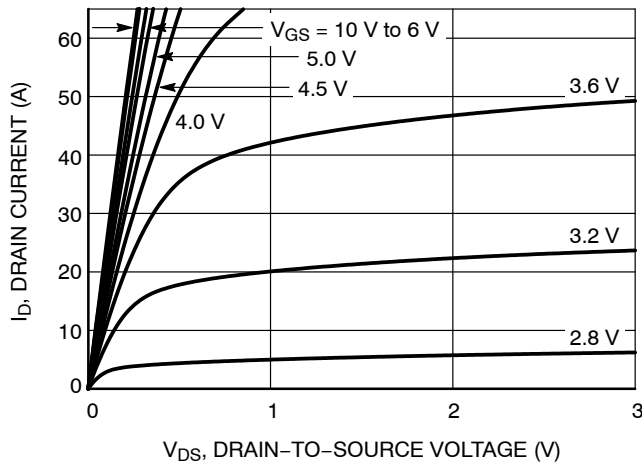


Figure 1. On-Region Characteristics

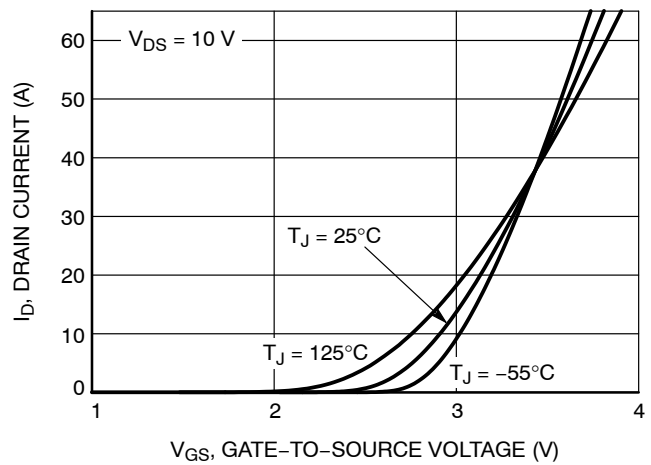


Figure 2. Transfer Characteristics

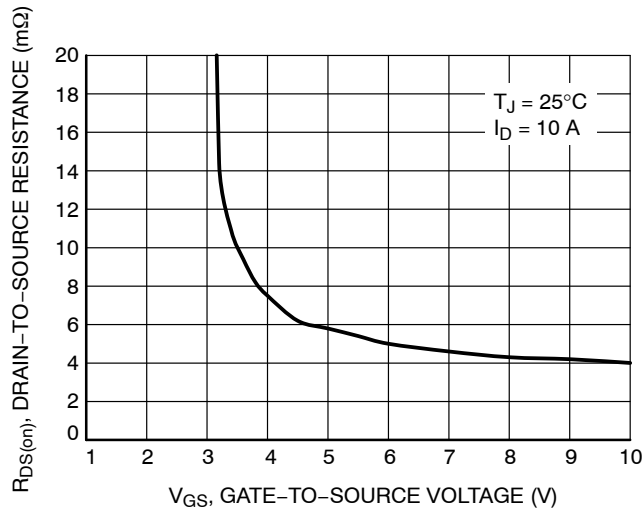


Figure 3. On-Resistance vs. Gate-to-Source Voltage

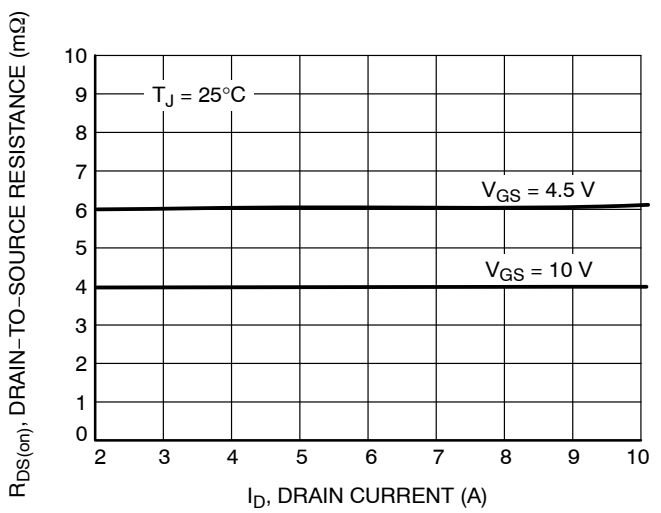


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

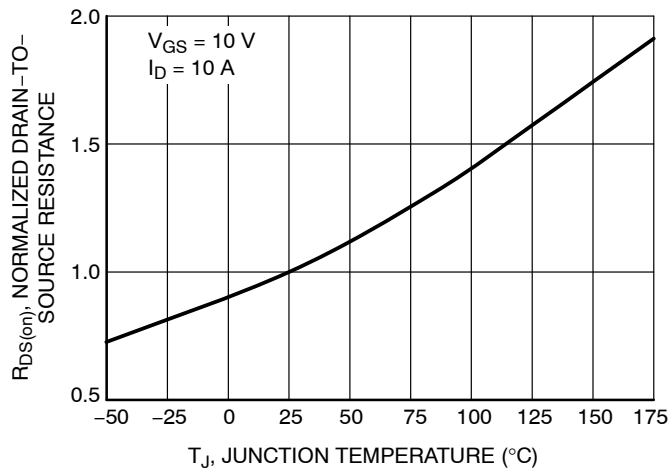


Figure 5. On-Resistance Variation with Temperature

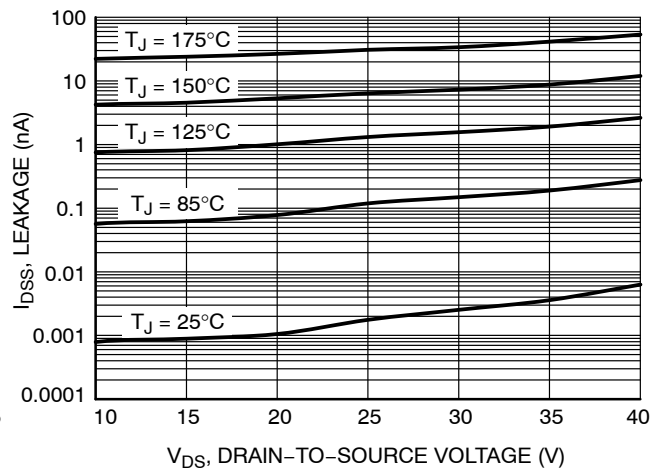


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

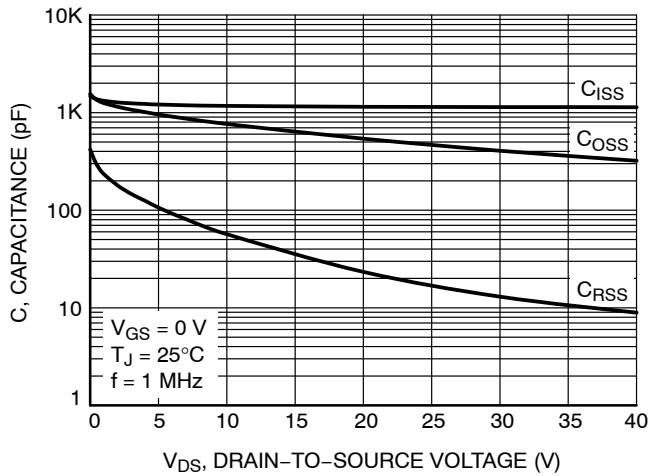


Figure 7. Capacitance Variation

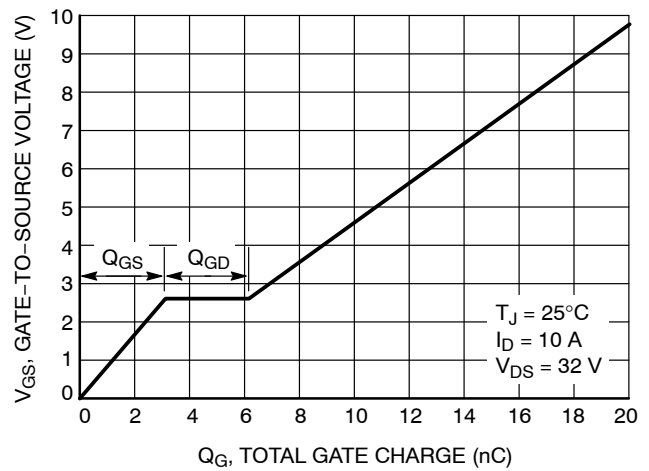


Figure 8. Gate-to-Source Voltage vs. Total Charge

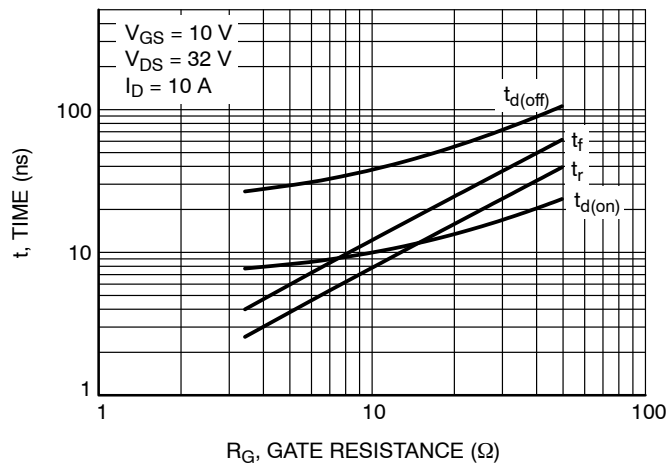


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

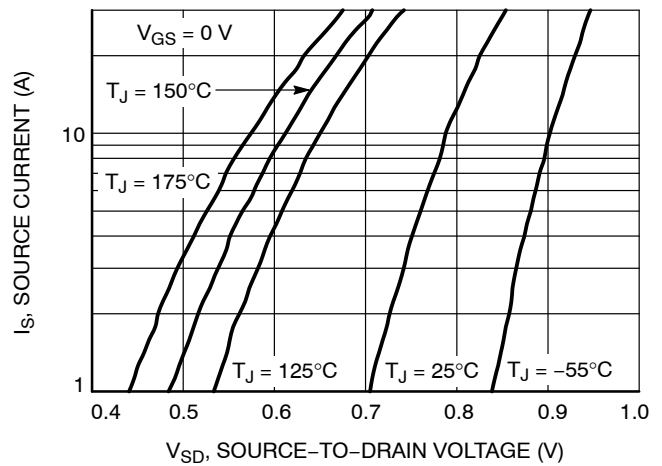


Figure 10. Diode Forward Voltage vs. Current

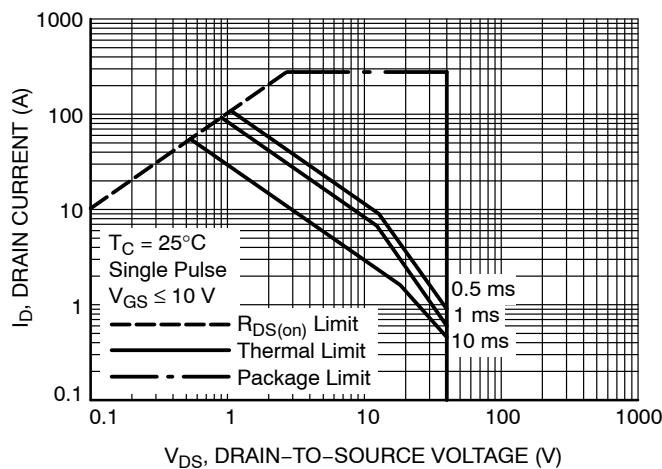


Figure 11. Maximum Rated Forward Biased Safe Operating Area

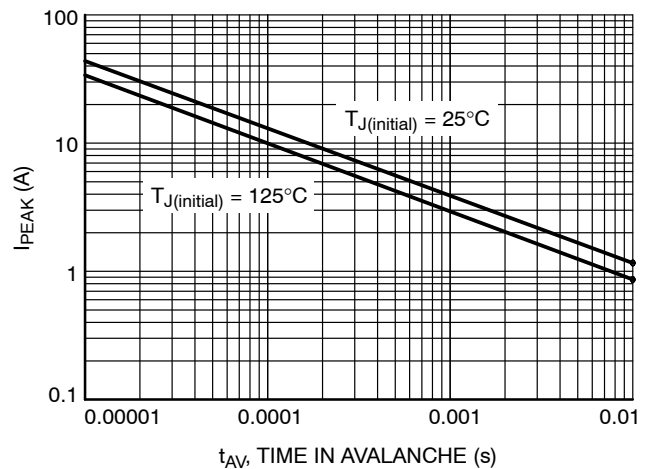


Figure 12. Maximum Drain Current vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

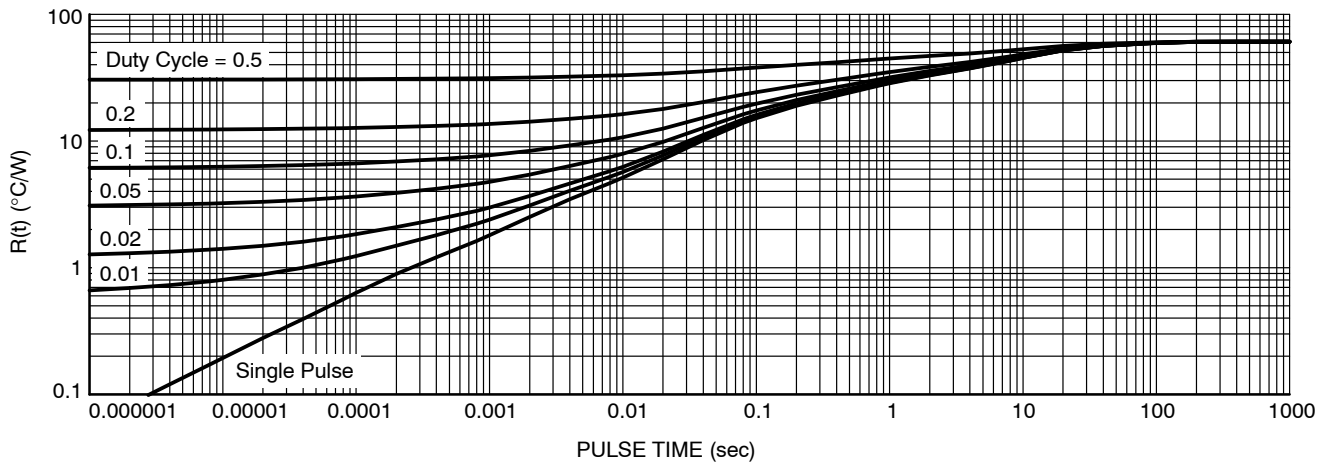


Figure 13. Transient Thermal Impedance

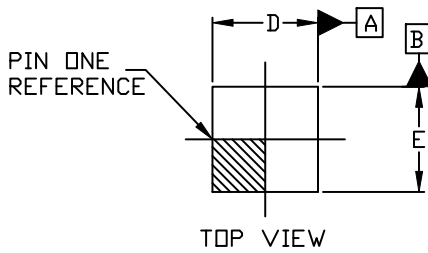
DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVLJWS6D0N04CLTAG	6D0N	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.

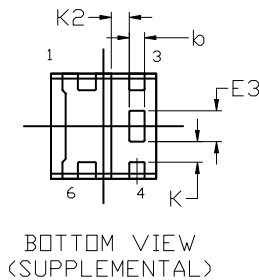
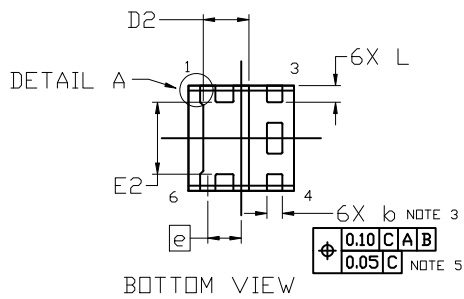
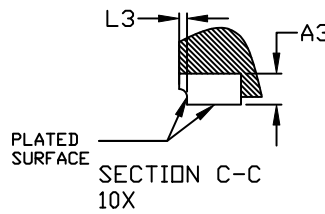
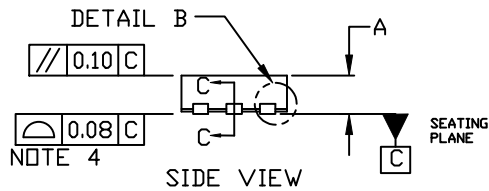
PACKAGE DIMENSIONS

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

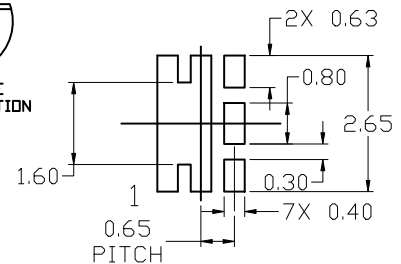
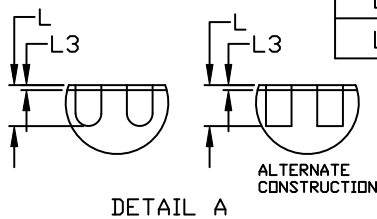
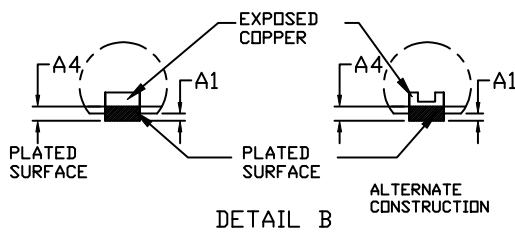


NOTES:

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.	NOM.	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, SOLDERRM/D.

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