NLAS7213

High-Speed USB 2.0 (480 Mbps) DPST Switch

The NLAS7213 is a DPST switch optimized for high−speed USB 2.0 applications within portable systems. It features ultra−low off capacitance, C_{OFF} = 3.0 pF (typ), and a bandwidth above 1118 MHz. It is optimized for applications that use a single USB interface connector to route multiple signal types. The C_{ON} and R_{ON} of both switches are suitably low to allow the NLAS7213 to pass any speed USB data or audio signals going to a moderately resistive terminal such as an external headset.

The NLAS7213 is protected on all pins with 8 kV Human Body Model ESD protection. It is offered in a 1.5 x 1.5 mm UQFN8 package.

Features

- R_{ON}: 10 Ω Max @ V_{CC} = 3.3 V
- C_{OFF}: 3.0 pF Typ @ V_{CC} = 3.3 V
- V_{CC} Operating Range: 1.65 V to 4.5 V
- > 1118 MHz Bandwidth
- OVT up to 5.25 V on D+/D− Pins
- 1.5 x 1.5 x 0.55 mm UQFN8
- 8 kV ESD Protection on All Pins
- This is a Pb−Free Device

Typical Applications

- High Speed USB 2.0 Data
- Mobile Phones
- Portable Devices

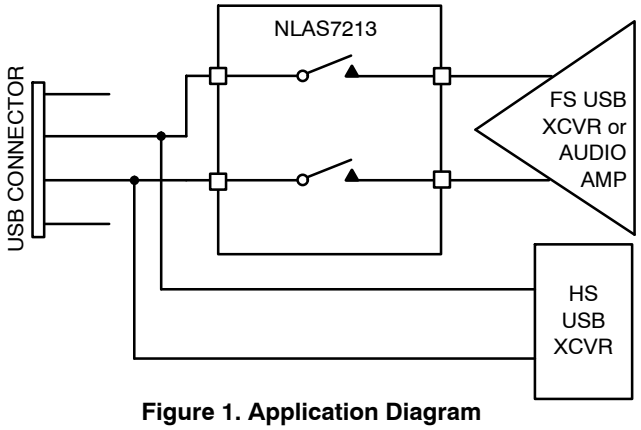


Figure 1. Application Diagram

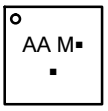
ON Semiconductor®

http://onsemi.com

MARKING DIAGRAM



UQFN8
(1.5 x 1.5 mm)
CASE 523AH



AA = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

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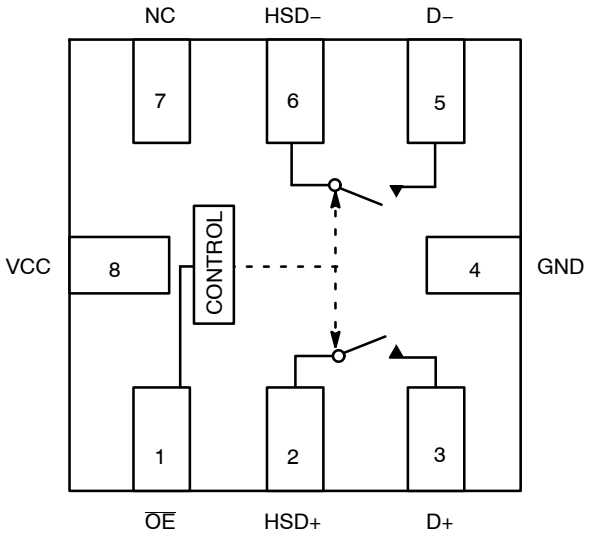


Figure 2. Pin Connections and Logic Diagram
(Top View)

Table 1. PIN DESCRIPTION

Pin	Function
$\overline{OE}$	Control Input Select Line
HSD+, HSD−, D+, D−	Data Ports

Table 2. TRUTH TABLE

$\overline{OE}$	Both Switches
1	OPEN
0	CLOSED

MAXIMUM RATINGS

Symbol	Pins	Parameter	Value	Unit
V_{CC}	V_{CC}	Positive DC Supply Voltage	−0.5 to +4.6	V
V_{IS}	HSD+, HSD−	Analog Signal Voltage	−0.5 to V_{CC} + 0.3	V
	D+, D−		−0.5 to +5.25	
V_{IN}	$\overline{OE}$	Control Input Voltage	−0.5 to +4.6	V
I_{CC}	V_{CC}	Positive DC Supply Current	50	mA
T_S		Storage Temperature	−65 to +150	°C
I_{IS_CON}	HSD+, HSD−, D+, D−	Analog Signal Continuous Current−Closed Switch	±300	mA
I_{IS_PK}	HSD+, HSD−, D+, D−	Analog Signal Continuous Current 10% Duty Cycle	±500	mA
I_{IN}	$\overline{OE}$	Control Input Current	±20	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Symbol	Pins	Parameter	Min	Max	Unit
V_{CC}		Positive DC Supply Voltage	1.65	4.5	V
V_{IS}	HSD+, HSD−	Analog Signal Voltage	GND	V_{CC}	V
	D+, D−		GND	4.5	
V_{IN}	$\overline{OE}$	Digital Select Input Voltage	GND	V_{CC}	V
T_A		Operating Temperature Range	−40	+85	°C

Minimum and maximum values are guaranteed through test or design across the Recommended Operating Conditions, where applicable. Typical values are listed for guidance only and are based on the particular conditions listed for section, where applicable. These conditions are valid for all values found in the characteristics tables unless otherwise specified in the test conditions.

ESD PROTECTION

Symbol	Parameter	Value	Unit
ESD	Human Body Model − All Pins	8.0	kV

DC ELECTRICAL CHARACTERISTICS

CONTROL INPUT (Typical: T = 25°C, V_{CC} = 3.3 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
V_{IH}	$\overline{OE}$	Control Input HIGH Voltage		2.7 3.3 4.2	1.3 1.3 1.4	–	–	V
V_{IL}	$\overline{OE}$	Control Input LOW Voltage		2.7 3.3 4.2	–	–	0.4 0.4 0.4	V
I_{IN}	$\overline{OE}$	Control Input Leakage Current	V_{IS} = GND	1.65 – 4.5	–	–	±1.0	μA

SUPPLY CURRENT AND LEAKAGE (Typical: T = 25°C, V_{CC} = 3.3 V, V_{IN} = V_{CC} or GND)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
I_{CC}	V_{CC}	Quiescent Supply Current	V_{IS} = V_{CC} or GND; I_D = 0 A	1.65 – 4.5	–	–	1.0	μA
$I_{NC(OFF)}$	HSD+, HSD–	OFF State Leakage Current	V_{COM} = 3.6 V, V_{NC} = 1.0 V	1.65 – 4.5	–	–	±1.0	μA
I_{OFF}		Power OFF Leakage Current	V_{IS} = GND	0	–	–	±1.0	μA

ON RESISTANCE (Typical: T = 25°C, V_{CC} = 3.3 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	–40°C to +85°C			Unit
					Min	Typ	Max	
R_{ON}		On–Resistance	I_{ON} = –8 mA V_{IS} = 0 to 0.4 V	2.7 3.3 4.2	–	9.0 8.0 7.2	9.5 8.5 7.5	Ω
R_{FLAT}		On–Resistance Flatness	I_{ON} = –8 mA V_{IS} = 0 to 0.4 V	2.7 3.3 4.2	–	0.8 0.5 0.3	–	Ω
ΔR_{ON}		On–Resistance Matching	I_{ON} = –8 mA V_{IS} = 0 to 0.4 V	2.7 3.3 4.2	–	0.07 0.07 0.04	–	Ω

AC ELECTRICAL CHARACTERISTICS

TIMING/FREQUENCY (Typical: T = 25°C, V_{CC} = 3.3 V, R_L = 50 Ω, C_L = 35 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	−40°C to +85°C			Unit
					Min	Typ	Max	
t_{ON}		Turn−ON Time (Figures 6, 7)		1.65 – 4.5	–	13.0	30.0	ns
t_{OFF}		Turn−OFF Time (Figures 6, 7)		1.65 – 4.5	–	12.0	25.0	ns
t_{PD}		Propagation Delay		1.65 – 4.5	–	0.25	–	ns
BW		−3 dB Bandwidth	C_L = 5 pF	1.65 – 4.5	–	1118	–	MHz

ISOLATION (Typical: T = 25°C, V_{CC} = 3.3 V, R_L = 50 Ω, C_L = 5 pF)

Symbol	Pins	Parameter	Test Conditions	−40°C to +85°C			Unit
				Min	Typ	Max	
O_{IRR}	Open	OFF−Isolation	f = 240 MHz	–	−20	–	dB
X_{TALK}	HSD+, HSD−	Non−Adjacent Channel Crosstalk	f = 240 MHz	–	−30	–	dB

CAPACITANCE (Typical: T = 25°C, V_{CC} = 3.3 V, R_L = 50 Ω, C_L = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	−40°C to +85°C			Unit
				Min	Typ	Max	
C_{IN}	$\overline{OE}$	Control Pin Input Capacitance	V_{CC} = 0 V	–	2.0	–	pF
C_{ON}	HSD+, to D+	ON Capacitance	$\overline{OE}$ = 0 V	–	3.0	–	pF
C_{OFF}	HSD+, HSD−	OFF Capacitance	V_{IS} = 3.3 V; $\overline{OE}$ = 3.3 V	–	3.0	–	pF

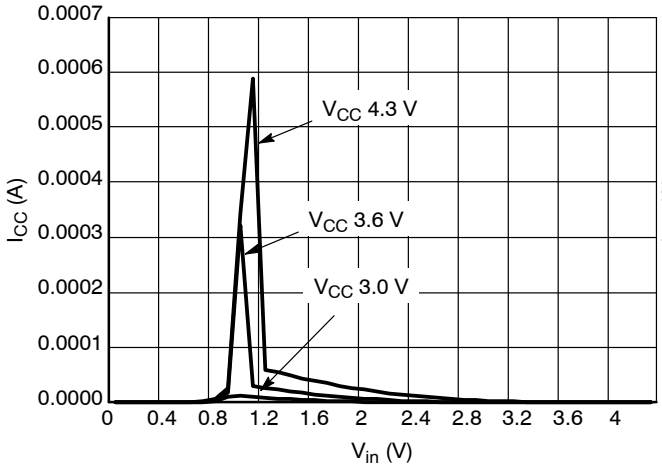


Figure 3. I_{CC} vs. V_{in}

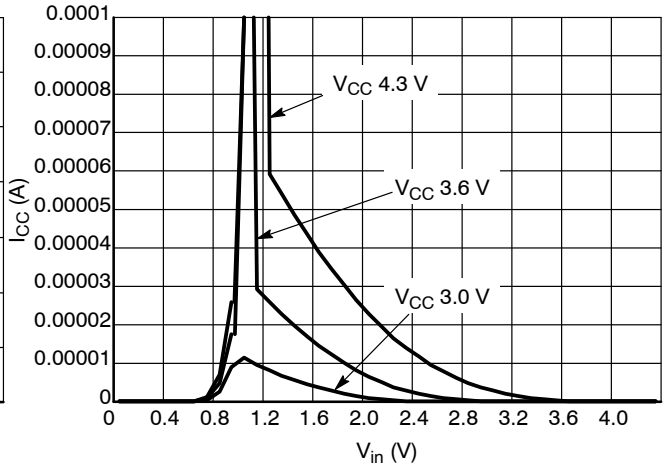
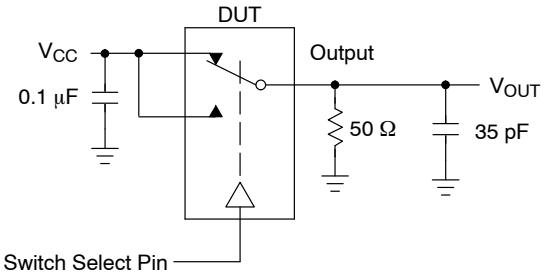


Figure 4. I_{CC} vs. V_{in}



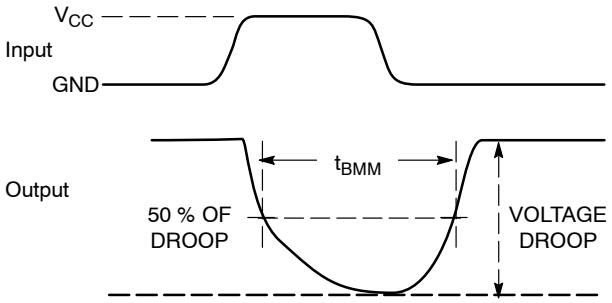
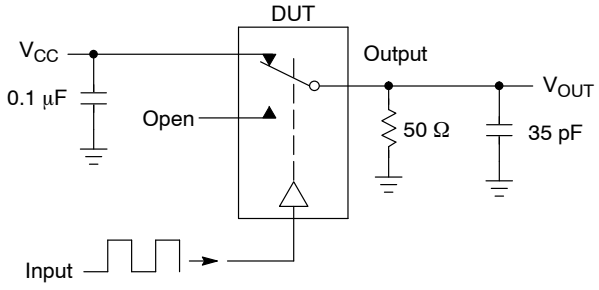


Figure 5. t_{BBM} (Time Break−Before−Make)



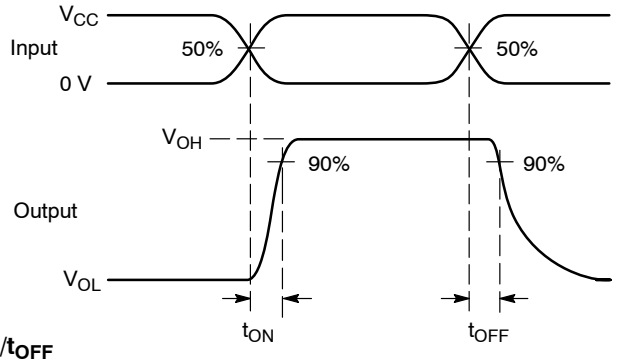
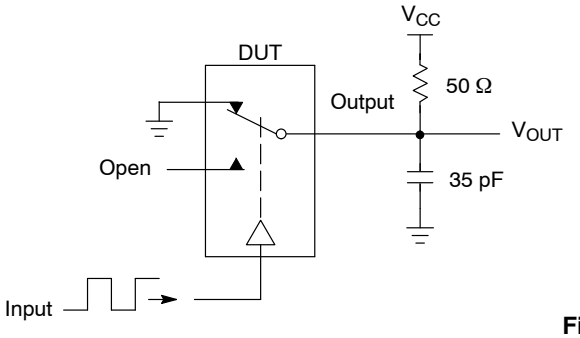


Figure 6. t_{ON}/t_{OFF}



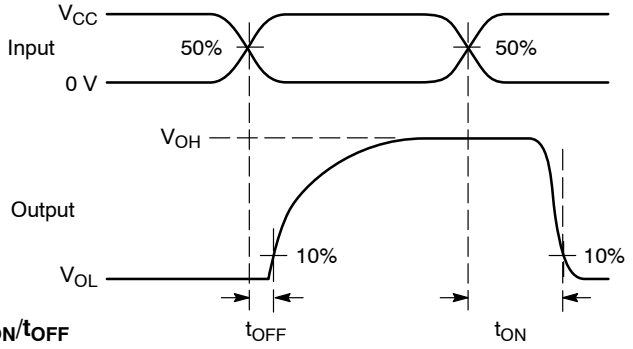
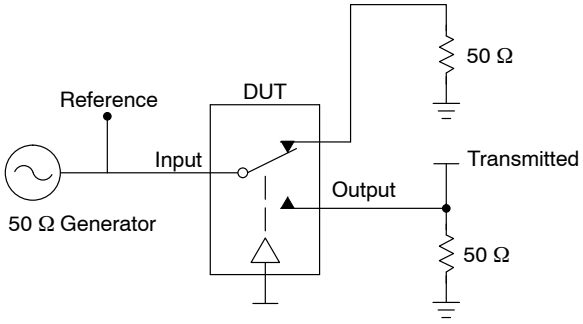


Figure 7. t_{ON}/t_{OFF}



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO}, Bandwidth and V_{ONL} are independent of the input signal direction.

V_{ISO} = Off Channel Isolation = 20 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz

V_{ONL} = On Channel Loss = 20 Log $\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz to 50 MHz

Bandwidth (BW) = the frequency 3 dB below V_{ONL}
V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50 Ω

Figure 8. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

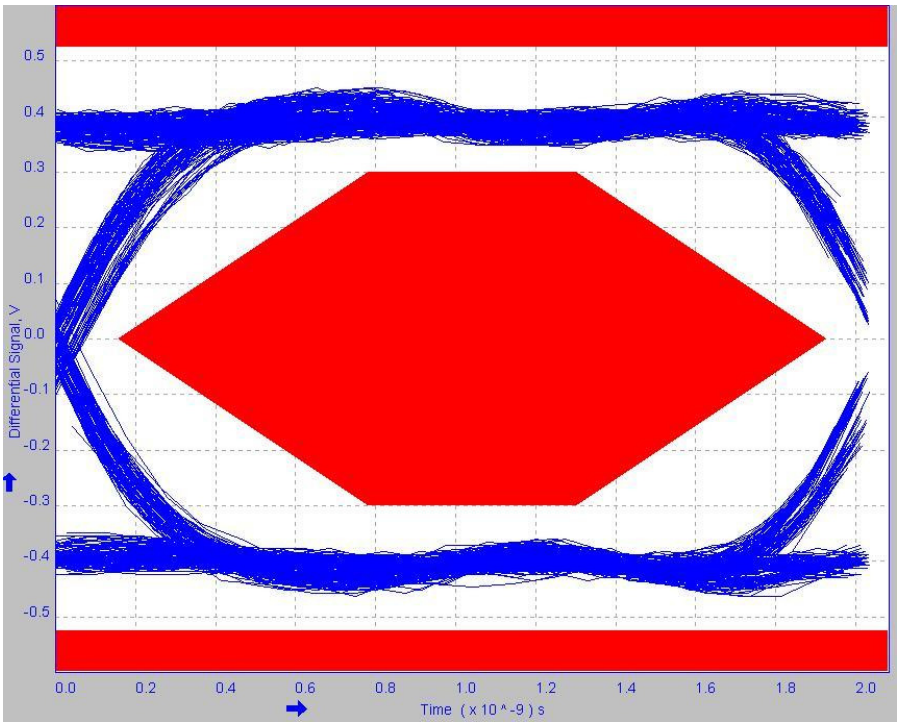


Figure 9. Signal Quality

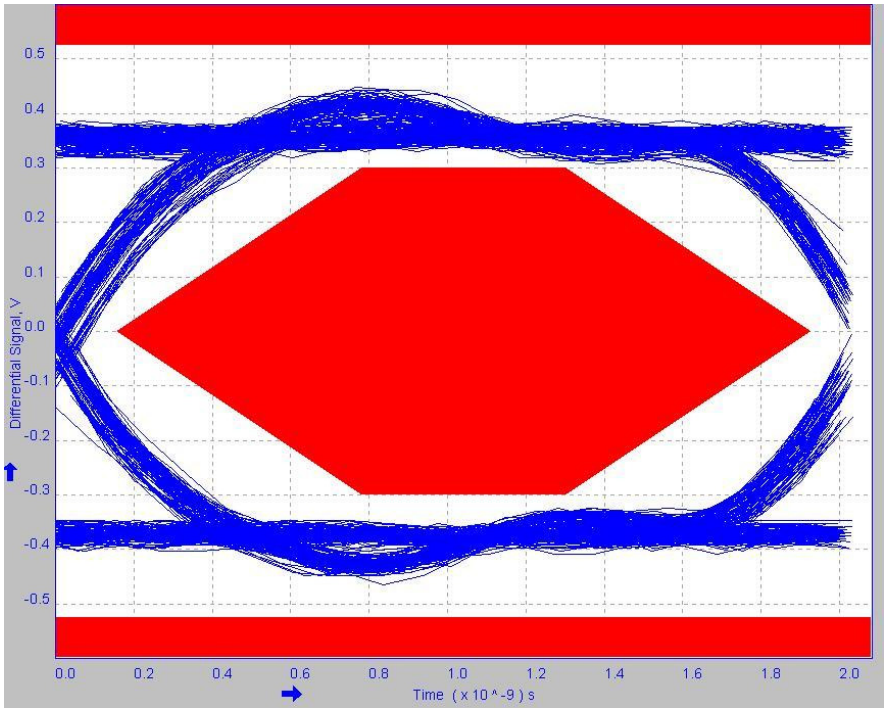


Figure 10. Near End Eye Diagram

Near End Test Data					Min	Max
Std.	Consecutive Jitter Range	−44.80	76.30	ps	−200 ps	+200 ps
	Paired JK Jitter Range	−63.59	56.33	ps		
	Paired KJ Jitter Range	−44.15	45.68	ps		
NO	Consecutive Jitter Range	−58.40	90.58	ps	−200 ps	+200 ps
	Paired JK Jitter Range	−65.90	70.64	ps		
	Paired KJ Jitter Range	−52.43	55.14	ps		

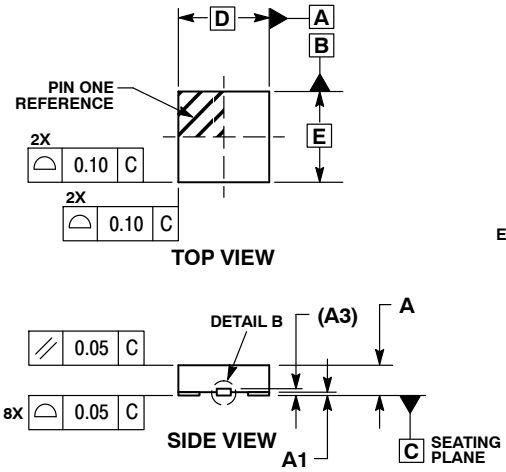
ORDERING INFORMATION

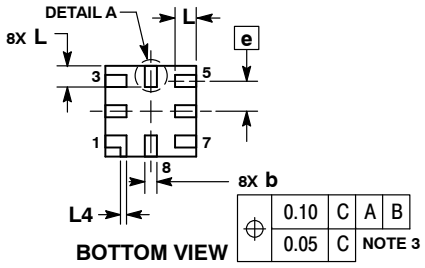
Device	Package	Shipping†
NLAS7213MUTBG	UQFN8 (Pb−Free)	3000 / Tape & Reel

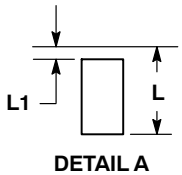
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

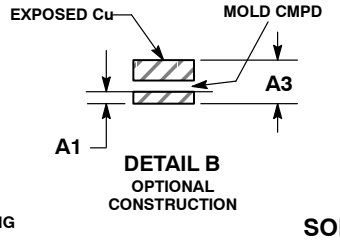
PACKAGE DIMENSIONS

UQFN8, 1.5x1.5, 0.5P
CASE 523AH−01
ISSUE O





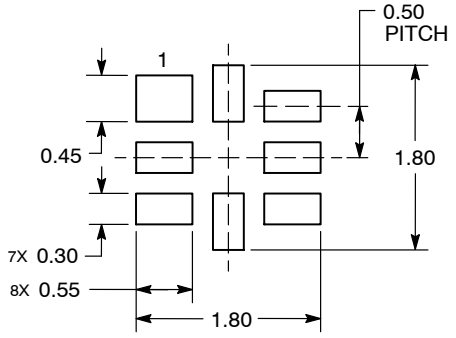




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	1.50 BSC	
E	1.50 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	0.00	0.03
L4	0.10 REF	

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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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