

## Description

The 74LVC2G04 is a dual inverter gate with standard push-pull outputs. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using I<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

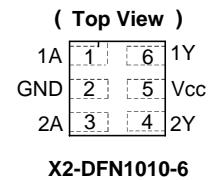
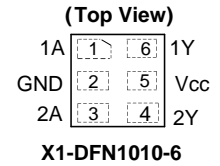
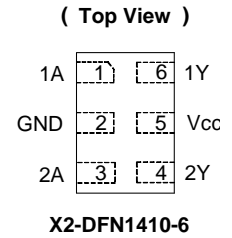
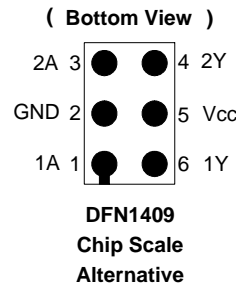
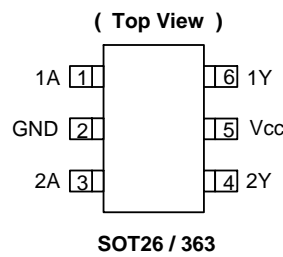
$$Y = \overline{A}$$

## Features

- Wide Supply Voltage Range from 1.65V to 5.5V
- ±24mA Output Drive at 3.0V
- CMOS Low Power Consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs Accept up to 5.5V
- ESD Protection Tested per JESD 22
  - Exceeds 200-V Machine Model (A115)
  - Exceeds 2000-V Human Body Model (A114)
  - Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- DFN1409 package designed as a direct replacement for chip scale packaging.
- Range of Package Options SOT26, SOT363, X1-DFN1010-6, X2-DFN1010-6, X2-DFN1409-6, and X2-DFN1410-6
- Leadless Packages Named per JESD30E
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

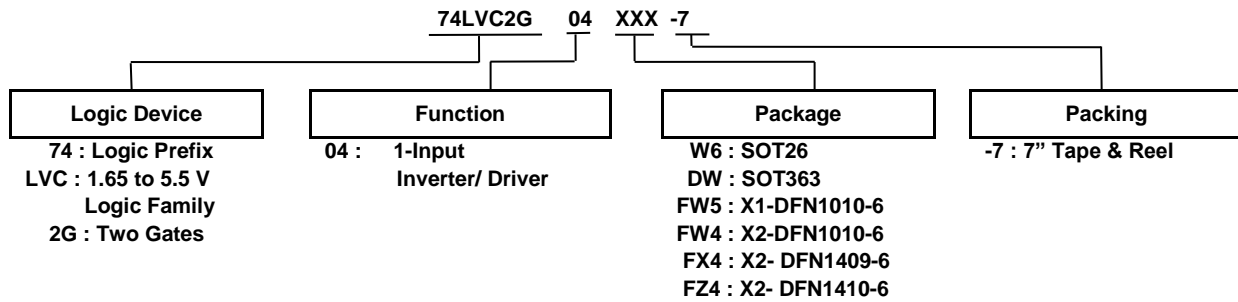
## Pin Assignment



## Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
  - PCs, Networking, Notebooks, Netbooks, Tablets
  - Computer Peripherals, Hard Drives, SSD, CD/DVD ROM
  - TV, DVD, DVR, Set-Top Box
  - Cell Phones, Personal Navigation / GPS
  - MP3 Players, Cameras, Video Recorders

## Ordering Information



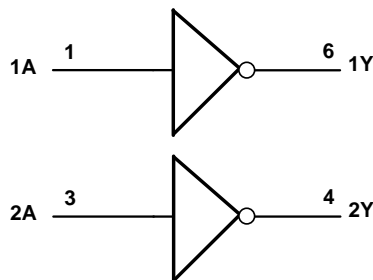
Device	Package Code	Package (Note 4)	Package Size	7" Tape and Reel (Note 5)	
				Quantity	Part Number Suffix
74LVC2G04W6-7	W6	SOT26	2.8mm X 2.2 mm X 1.1mm 0.95 mm lead pitch	3,000/Tape & Reel	-7
74LVC2G04DW-7	DW	SOT363	2.0mm X 2.0mm X 1.1mm 0.65 mm lead pitch	3,000/Tape & Reel	-7
74LVC2G04FW5-7	FW5	X1-DFN1010-6	1.0mm X 1.0mm X 0.5mm 0.35 mm pad pitch	5,000/Tape & Reel	-7
74LVC2G04FW4-7	FW4	X2-DFN1010-6	1.0mm X 1.0mm X 0.4mm 0.35 mm pad pitch	5,000/Tape & Reel	-7
74LVC2G04FX4-7	FX4	X2-DFN1409-6 Chip Scale Alternative	1.4mm X 0.9mm X 0.4mm 0.5 mm pad pitch	5,000/Tape & Reel	-7
74LVC2G04FZ4-7	FZ4	X2-DFN1410-6	1.4mm X 1.0mm X 0.4mm 0.5 mm pad pitch	5,000/Tape & Reel	-7

Notes: 4. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.  
5. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Pin Descriptions

Pin Name	Pin.	Function
1A	1	Data Input
GND	2	Ground
2A	3	Data Input
2Y	4	Data Output
Vcc	5	Supply Voltage
1Y	6	Data Output

## Logic Diagram



## Function Table

Inputs	Output
A	Y
H	L
L	H

**Absolute Maximum Ratings** (Notes 6 & 7) (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
ESD MM	Machine Model ESD Protection	200	V
$V_{CC}$	Supply Voltage Range	-0.5 to +6.5	V
$V_I$	Input Voltage Range	-0.5 to +6.5	V
$V_O$	Voltage Applied to Output in High Impedance or $I_{OFF}$ State	-0.5 to +6.5	V
$V_O$	Voltage Applied to Output in High or Low State	-0.3 to $V_{CC} + 0.5$	V
$I_{IK}$	Input Clamp Current $V_I < 0$	-50	mA
$I_{OK}$	Output Clamp Current $V_O < 0$	-50	mA
$I_O$	Continuous Output Current	-50	mA
	Continuous Current Through $V_{DD}$ or GND	$\pm 100$	mA
$T_J$	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature	-65 to +150	$^\circ\text{C}$

- Note 6. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.
- Note 7. Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

**Recommended Operating Conditions** (Note 8) (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Min	Max	Unit	
$V_{CC}$	Operating Voltage	Operating	1.65	5.5	V
		Data Retention Only	1.5	—	V
$V_{IH}$	High-Level Input Voltage	$V_{CC} = 1.65\text{V to } 1.95\text{V}$	$0.65 \times V_{CC}$	—	V
		$V_{CC} = 2.3\text{V to } 2.7\text{V}$	1.7	—	
		$V_{CC} = 3\text{V to } 3.6\text{V}$	2	—	
		$V_{CC} = 4.5\text{V to } 5.5\text{V}$	$0.7 \times V_{CC}$	—	
$V_{IL}$	Low-Level Input Voltage	$V_{CC} = 1.65\text{V to } 1.95\text{V}$	—	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3\text{V to } 2.7\text{V}$	—	0.7	
		$V_{CC} = 3\text{V to } 3.6\text{V}$	—	0.8	
		$V_{CC} = 4.5\text{V to } 5.5\text{V}$	—	$0.3 \times V_{CC}$	
$V_I$	Input Voltage	0	5.5	V	
$V_O$	Output Voltage	0	$V_{CC}$	V	
$I_{OH}$	High-Level Output Current	$V_{CC} = 1.65\text{V}$	—	-4	mA
		$V_{CC} = 2.3\text{V}$	—	-8	
		$V_{CC} = 3\text{V}$	—	-16	
		$V_{CC} = 4.5\text{V}$	—	-24	
$I_{OL}$	Low-Level Output Current	$V_{CC} = 1.65\text{V}$	—	4	mA
		$V_{CC} = 2.3\text{V}$	—	8	
		$V_{CC} = 3\text{V}$	—	16	
		$V_{CC} = 4.5\text{V}$	—	24	
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CC} = 1.8\text{V} \pm 0.15\text{V}, 2.5\text{V} \pm 0.2\text{V}$	—	20	ns/V
		$V_{CC} = 3.3\text{V} \pm 0.3\text{V}$	—	10	
		$V_{CC} = 5\text{V} \pm 0.5\text{V}$	—	5	
$T_A$	Operating Free-Air Temperature	—	-40	125	$^\circ\text{C}$

Note: 8. Unused inputs should be held at  $V_{CC}$  or Ground.

## Electrical Characteristics

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	-40°C to +85°C		-40°C to +125°C		Unit
				Min	Max	Min	Max	
V <sub>OH</sub>	High-Level Output Voltage	I <sub>OH</sub> = -100μA	1.65V to 5.5V	V <sub>CC</sub> - 0.1	—	V <sub>CC</sub> - 0.1	—	V
		I <sub>OH</sub> = -4mA	1.65V	1.2	—	0.95	—	
		I <sub>OH</sub> = -8mA	2.3V	1.9	—	1.7	—	
		I <sub>OH</sub> = -16mA	3V	2.4	—	1.9	—	
		I <sub>OH</sub> = -24mA		2.3	—	2.0	—	
		I <sub>OH</sub> = -32mA	4.5V	3.8	—	3.4	—	
V <sub>OL</sub>	Low-Level Output Voltage	I <sub>OL</sub> = 100μA	1.65V to 5.5V	—	0.1	—	0.1	V
		I <sub>OL</sub> = 4mA	1.65V	—	0.45	—	0.70	
		I <sub>OL</sub> = 8mA	2.3V	—	0.3	—	0.45	
		I <sub>OL</sub> = 16mA	3V	—	0.4	—	0.60	
		I <sub>OL</sub> = 24mA		—	0.55	—	0.80	
		I <sub>OL</sub> = 32mA	4.5V	—	0.55	—	0.80	
I <sub>I</sub>	Input Current	V <sub>I</sub> = 5.5V or GND	0 to 5.5V	—	± 5	—	± 20	μA
I <sub>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 5.5V	0	—	± 10	—	± 20	μA
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = 5.5V or GND I <sub>O</sub> = 0	1.65V to 5.5V	—	10	—	40	μA
ΔI <sub>CC</sub>	Additional Supply Current	Input at V <sub>CC</sub> -0.6V	3V to 5.5V	—	500	—	5000	μA

## Package Characteristics (All typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = +25°C.)

Symbol	Parameter	Package	Conditions	Min	Typ	Max	Unit
C <sub>I</sub>	Input Capacitance	Typical of all packages	V <sub>CC</sub> = 3.3V V <sub>I</sub> = V <sub>CC</sub> or GND	—	3.5	—	pF
θ <sub>JA</sub>	Thermal Resistance Junction-to-Ambient	SOT26	(Note 9)	—	204	—	°C/W
		SOT363		—	371	—	
		X2-DFN1410-6		—	430	—	
		X2-DFN1409-6		—	450	—	
		X1-DFN1010-6		—	495	—	
		X2-DFN1010-6		—	510	—	
θ <sub>JC</sub>	Thermal Resistance Junction-to-Case	SOT26	(Note 9)	—	52	—	°C/W
		SOT363		—	143	—	
		X2-DFN1410-6		—	190	—	
		X2-DFN1409-6		—	225	—	
		X1-DFN1010-6		—	245	—	
		X2-DFN1010-6		—	250	—	

Note: 9. Test condition for all packages: Device mounted on FR-4 substrate PC board, 2oz copper with minimum recommended pad layout.

## Switching Characteristics

T<sub>A</sub> = -40°C to +85°C, C<sub>L</sub> = 30 or 50pF (See Figure 1)

Parameter	From (Input)	TO (OUTPUT)	V <sub>CC</sub> = 1.8V ± 0.15V		V <sub>CC</sub> = 2.5V ± 0.2V		V <sub>CC</sub> = 3.3V ± 0.3V		V <sub>CC</sub> = 5V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A	Y	0.5	8.0	1.0	4.4	0.5	4.1	0.5	3.2	ns

T<sub>A</sub> = -40°C to +125°C, C<sub>L</sub> = 30 or 50pF (See Figure 1)

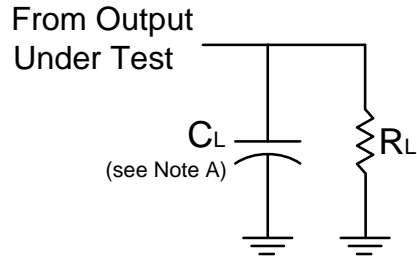
Parameter	From (Input)	TO (OUTPUT)	V <sub>CC</sub> = 1.8V ± 0.15V		V <sub>CC</sub> = 2.5V ± 0.2V		V <sub>CC</sub> = 3.3V ± 0.3V		V <sub>CC</sub> = 5V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A	Y	0.5	9.5	0.5	5.4	0.5	5.5	0.5	3.8	ns

**Operating Characteristics**

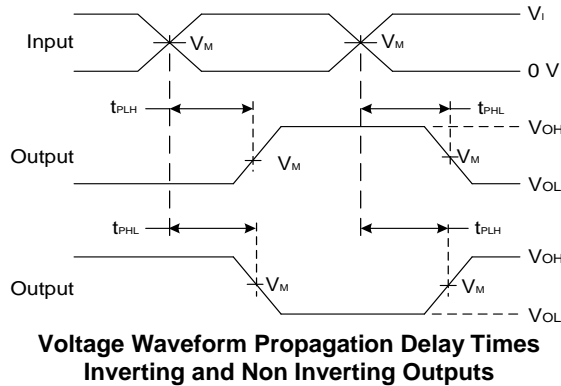
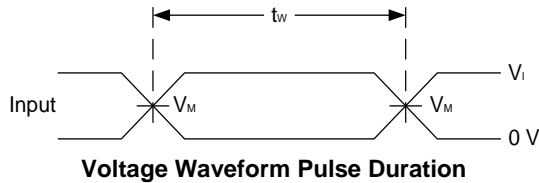
T<sub>A</sub> = +25°C

Parameter		Test Conditions	V <sub>CC</sub> = 1.8V	V <sub>CC</sub> = 2.5V	V <sub>CC</sub> = 3.3V	V <sub>CC</sub> = 5V	Unit
			Typ	Typ	Typ	Typ	
C <sub>pd</sub>	Power Dissipation Capacitance	f = 10MHz	17	19	20	21	pF

**Parameter Measurement Information**



V <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>	R <sub>L</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>			
1.8V±0.15V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30 pF	1 kΩ
2.5V±0.2V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30 pF	500 Ω
3.3V±0.3V	3V	≤2.5ns	1.5 V	50 pF	500 Ω
5V±0.5V	V <sub>CC</sub>	≤2.5ns	V <sub>CC</sub> /2	50 pF	500 Ω

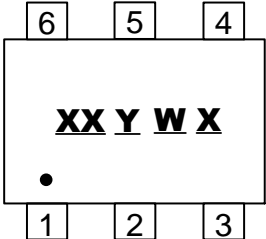


**Figure 1 Load Circuit and Voltage Waveforms**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
  - C. Inputs are measured separately one transition per measurement.
  - D. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>PD</sub>.

**Marking Information**

(1) SOT26, SOT363

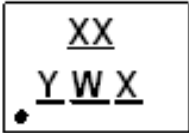


XX : Identification code  
Y : Year 0~9  
W : Week : A~Z : 1~26 week;  
 a~z : 27~52 week; z represents 52 and 53 week  
X : A~Z : Internal Code

Part Number	Package	Identification Code
74LVC2G04W6-7	SOT26	Z2
74LVC2G04DW-7	SOT363	Z2

(2) X1-DFN1010-6, X2-DFN1010-6, X2-DFN1409-6, X2-DFN1410-6

(Top View)

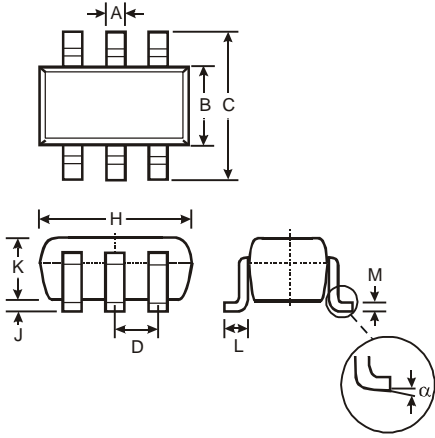


XX : Identification Code  
Y : Year : 0~9  
W : Week : A~Z : 1~26 week;  
 a~z : 27~52 week; z represents 52 and 53 week  
X : A~Z : Internal code

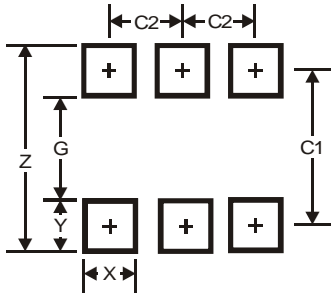
Part Number	Package	Identification Code
74LVC2G04FW4-7	X2-DFN1010-6	Z2
74LVC2G04FW5-7	X1-DFN1010-6	W2
74LVC2G04FX4-7	X2-DFN1409-6	X2
74LVC2G04FZ4-7	X2-DFN1410-6	Z2

**SOT26 Package Outline Dimensions and Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



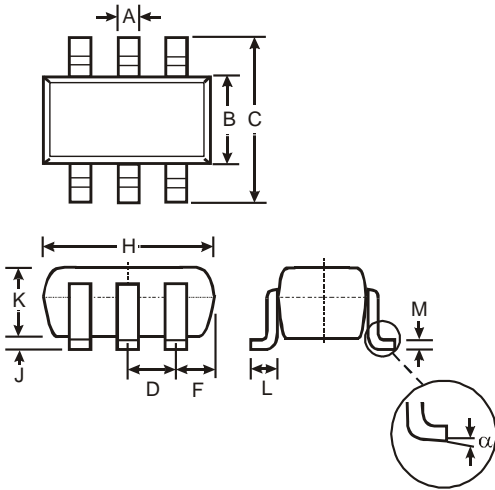
SOT26			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			



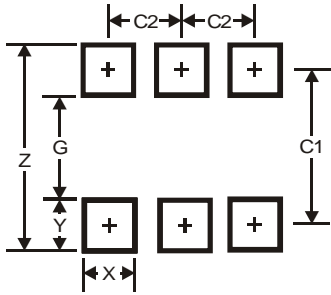
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

**SOT363 Package Outline Dimensions and Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



SOT363			
Dim	Min	Max	Typ
A	0.10	0.30	0.25
B	1.15	1.35	1.30
C	2.00	2.20	2.10
D	0.65 Typ		
F	0.40	0.45	0.425
H	1.80	2.20	2.15
J	0	0.10	0.05
K	0.90	1.00	1.00
L	0.25	0.40	0.30
M	0.10	0.22	0.11
α	0°	8°	-
All Dimensions in mm			

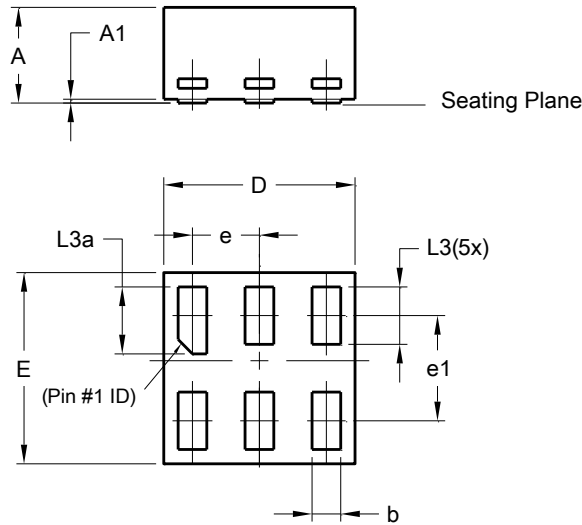


Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

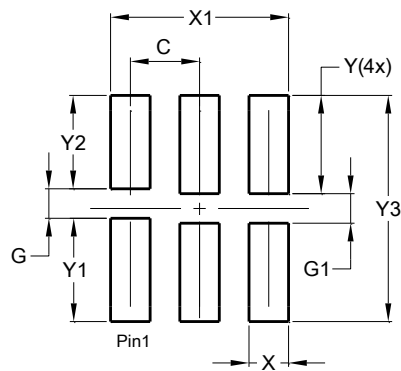


**X1-DFN1010-6 (Type B) Package Outline Dimensions and Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



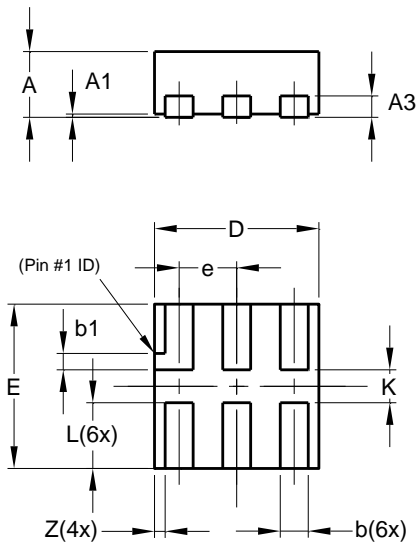
X1-DFN1010-6 (Type B)			
Dim	Min	Max	Typ
A	-	0.50	0.39
A1	-	0.04	-
b	0.12	0.20	0.15
D	0.95	1.050	1.00
E	0.95	1.050	1.00
e	0.35 BSC		
e1	0.55 BSC		
L3	0.27	0.30	0.30
L3a	0.32	0.40	0.35
All Dimensions in mm			



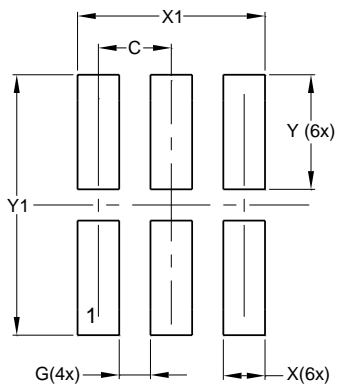
Dimensions	Value (in mm)
C	0.350
G	0.150
G1	0.150
X	0.200
X1	0.900
Y	0.500
Y1	0.525
Y2	0.475
Y3	1.150

**X2-DFN1010-6 Package Outline Dimensions and Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



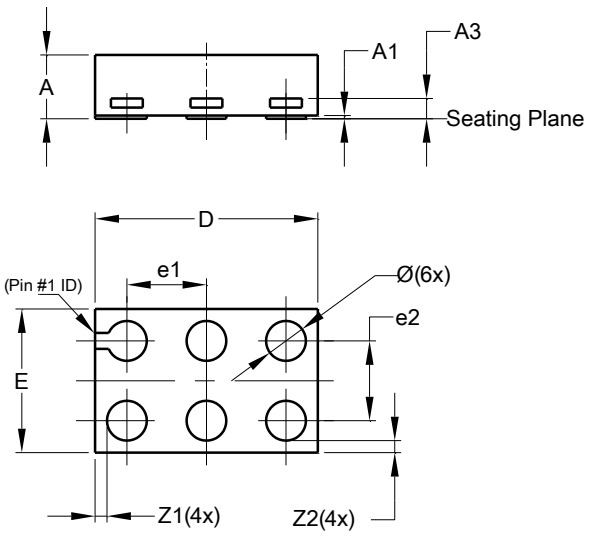
X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			



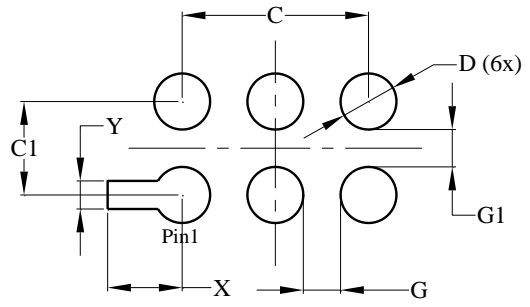
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

**X2-DFN1409-6 Package Outline Dimensions and Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



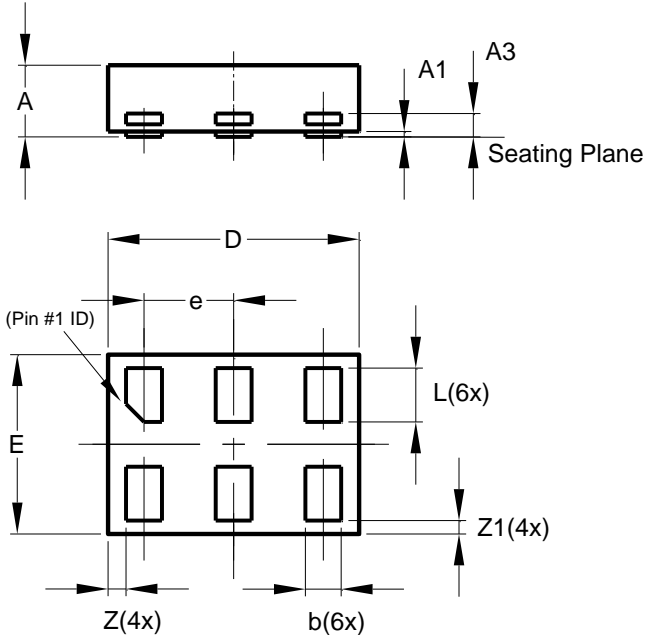
X2-DFN1409-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0	0.05	0.02
A3	—	—	0.13
$\varnothing$	0.20	0.30	0.25
D	1.35	1.45	1.40
E	0.85	0.95	0.90
e1	—	—	0.50
e2	—	—	0.50
Z1	—	—	0.075
Z2	—	—	0.075
<b>All Dimensions in mm</b>			



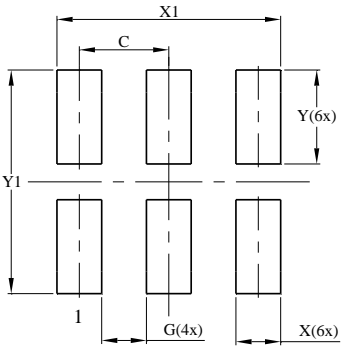
Dimensions	Value (in mm)
C	1.000
C1	0.500
D	0.300
G	0.200
G1	0.200
X	0.400
Y	0.150

**X2-DFN1410-6 Package Outline Dimensions and Suggested Pad Layout**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



X2-DFN1410-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			



Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

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