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_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

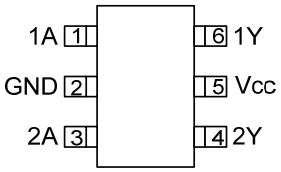
$$Y = \overline{A}$$

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, SOT353, DFN1010, DFN1409 and DFN1410
- Leadless packages per JESD30E
  - DFN1410 denoted as X2-DFN1410-6
  - DFN1409 denoted as X2-DFN1409-6
  - DFN1010 denoted as X2-DFN1010-6
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

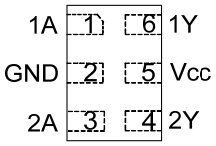
Pin Assignment

(Top View)



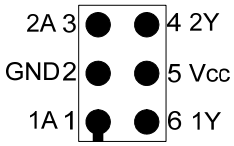
SOT26 / 363

(Top View)



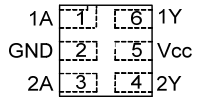
DFN1410

(Bottom View)



DFN1409
Chip Scale
Alternative

(Top View)



DFN1010

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, CD/DVD ROM
  - TV, DVD, DVR, set top box
  - Cell Phones, Personal Navigation / GPS
  - MP3 players ,Cameras, Video Recorders

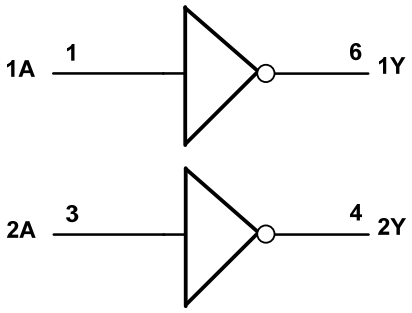
Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free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

Click here for ordering information, located at the end of datasheet

Pin Descriptions

Pin Name	Pin NO	Function
1A	1	Data Input
GND	2	Ground
2A	3	Data Input
2Y	4	Data Output
V_{CC}	5	Supply Voltage
1Y	6	Data Output

Logic Diagram



Function Table

Inputs	Output
A	**Y**
H	L
L	H

Absolute Maximum Ratings (Note 4) (@T_A = +25°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	±100	mA
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C

Note: 4. 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.

Recommended Operating Conditions (Note 5) (@T_A = +25°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} = 1.65V to 1.95V	0.65 X V_{CC}		V
		V_{CC} = 2.3V to 2.7V	1.7		
		V_{CC} = 3V to 3.6V	2		
		V_{CC} = 4.5V to 5.5 V	0.7 X V_{CC}		
V_{IL}	Low-Level Input Voltage	V_{CC} = 1.65V to 1.95V		0.35 X V_{CC}	V
		V_{CC} = 2.3V to 2.7V		0.7	
		V_{CC} = 3V to 3.6V		0.8	
		V_{CC} = 4.5V to 5.5V		0.3 X 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} = 1.65V		-4	mA
		V_{CC} = 2.3V		-8	
		V_{CC} = 3V		-16	
				-24	
		V_{CC} = 4.5V		-32	
I_{OL}	Low-Level Output Current	V_{CC} = 1.65V		4	mA
		V_{CC} = 2.3V		8	
		V_{CC} = 3V		16	
				24	
		V_{CC} = 4.5V		32	
Δt/ΔV	Input Transition Rise or Rall Rate	V_{CC} = 1.8V ± 0.15 V, 2.5V ± 0.2V		20	ns/V
		V_{CC} = 3.3V ± 0.3V		10	
		V_{CC} = 5V ± 0.5V		5	
T_A	Operating free-air temperature		-40	125	°C

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics

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

Package Characteristics (All typical values are at V_{CC} = 3.3V, T_A = 25°C.)

Symbol	Parameter	Package	Conditions	Min	Typ	Max	Unit
C_I	Input Capacitance	Typical of all packages	Vcc = 3.3V V_I = V_{CC} – or GND		3.5		pF
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT26	(Note 6)		204		°C/W
		SOT363			371		
		X2-DFN1410-6			430		
		X2-DFN1409-6			450		
		X2-DFN1010-6			510		
θ_{JC}	Thermal Resistance Junction-to-Case	SOT26	(Note 6)		52		°C/W
		SOT363			143		
		X2-DFN1410-6			190		
		X2-DFN1409-6			225		
		X2-DFN1010-6			250		

Note: 6. Test condition for SOT26, SOT363, X2-DFN1410-6, X2-DFN1409-6 and X2-DFN1010 -6: Device mounted on FR-4 substrate PC board, 2oz copper with minimum recommended pad layout.

Switching Characteristics

T_A = -40°C to +85°C, C_L = 30 or 50pF (see Figure 1)

Parameter	From (Input)	TO (OUTPUT)	V_{CC} = 1.8V ± 0.15V		V_{CC} = 2.5V ± 0.2V		V_{CC} = 3.3V ± 0.3V		V_{CC} = 5V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.5	8.0	1.0	4.4	0.5	4.1	0.5	3.2	ns

T_A=-40°C to +125°C, C_L = 30 or 50pF (see Figure 1)

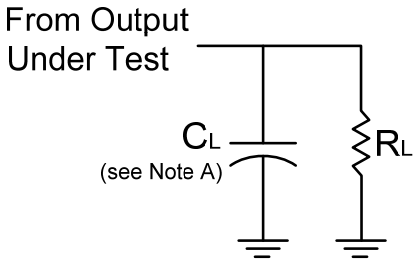
Parameter	From (Input)	TO (OUTPUT)	V_{CC} = 1.8V ± 0.15V		V_{CC} = 2.5V ± 0.2V		V_{CC} = 3.3V ± 0.3V		V_{CC} = 5V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.5	9.5	0.5	5.4	0.5	5.5	0.5	3.8	ns

Operating Characteristics

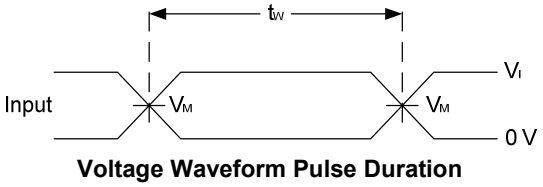
T_A = +25°C

Parameter		Test Conditions	V_{CC} = 1.8V	V_{CC} = 2.5V	V_{CC} = 3.3V	V_{CC}= 5V	Unit
			Typ	Typ	Typ	Typ	
C_{pd}	Power dissipation capacitance	f = 10MHz	17	19	20	21	pF

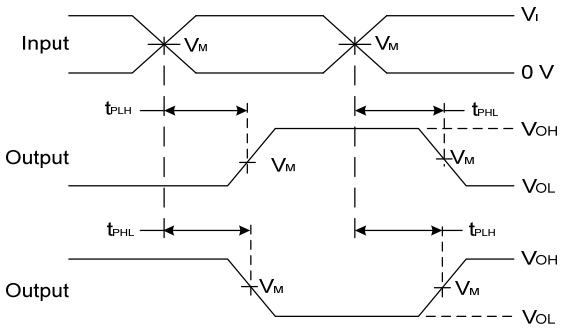
Parameter Measurement Information



V_{CC}	Inputs		V_M	C_L	R_L
	V_I	t_r/t_f			
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	30 pF	1 kΩ
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	30 pF	500 Ω
3.3V±0.3V	3V	≤2.5ns	1.5 V	50 pF	500 Ω
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	50 pF	500 Ω



Voltage Waveform Pulse Duration

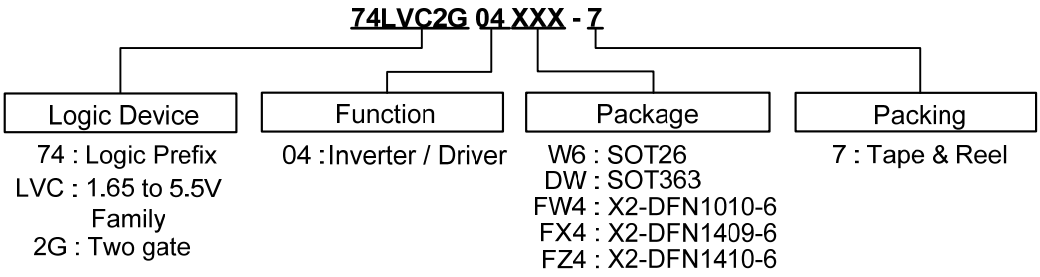


Voltage Waveform Propagation Delay Times
Inverting and Non Inverting Outputs

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_{PLH} and t_{PHL} are the same as t_{PD}.

Ordering Information

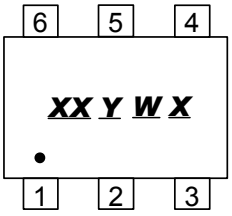


Device	Package Code	Packaging (Note 7)	7" Tape and Reel	
			Quantity	Part Number Suffix
74LVC2G04W6-7	W6	SOT26	3000/Tape & Reel	-7
74LVC2G04DW-7	DW	SOT363	3000/Tape & Reel	-7
74LVC2G04FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7
74LVC2G04FX4-7	FX4	X2-DFN1409-6	5000/Tape & Reel	-7
74LVC2G04FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7

Note: 7. The taping orientation is located on our website at http://www.diodes.com/datasheets/ap02007.pdf

Marking Information

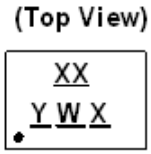
(1) SOT26, SOT363



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	SOT26	Z2
74LVC2G04DW	SOT363	Z2

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



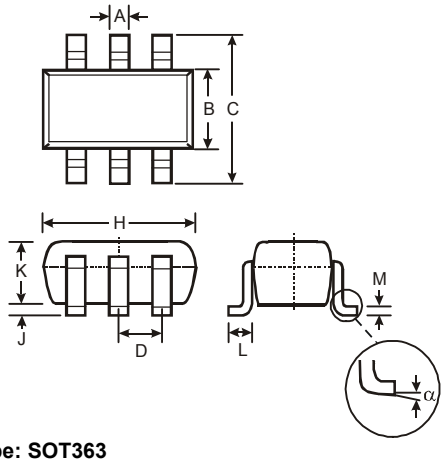
XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Internal code

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

Package Outline Dimensions (All dimensions in mm.)

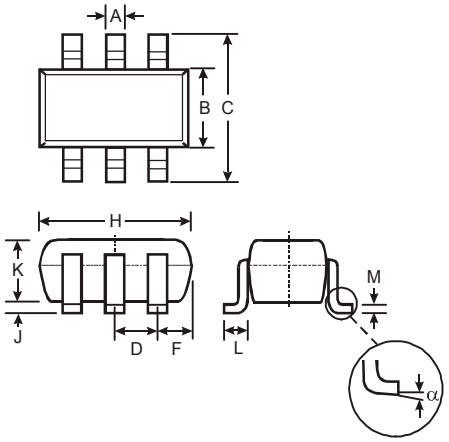
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(1) Package Type: SOT26



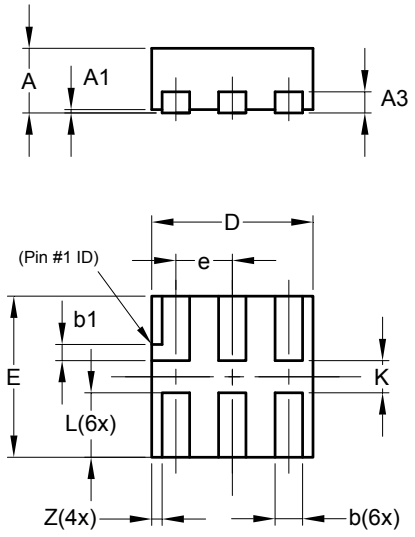
SOT26			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			

(2) Package Type: SOT363



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			

(3) Package Type: X2-DFN1010-6

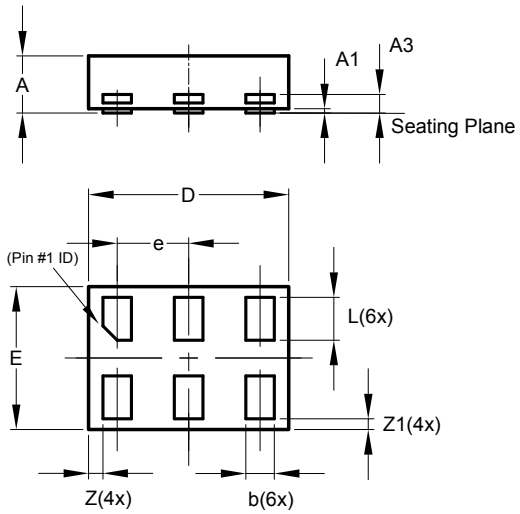


X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

Package Outline Dimensions (cont.) (All dimensions in mm.)

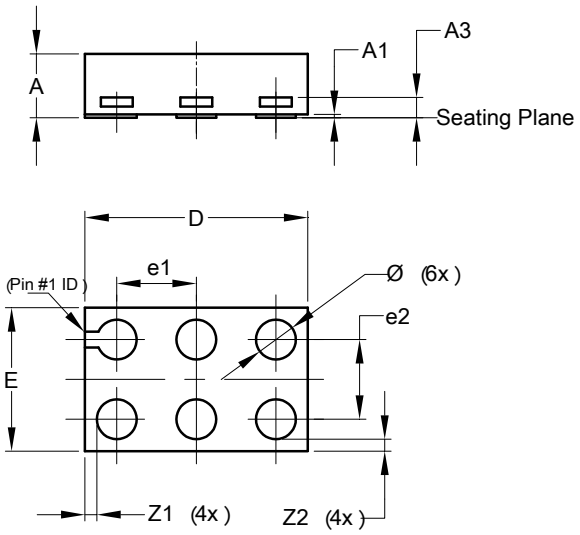
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(4) Package Type X2-DFN1410-6



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			

(5) Package Type: X2-DFN1409-6 Chip Scale Replacement

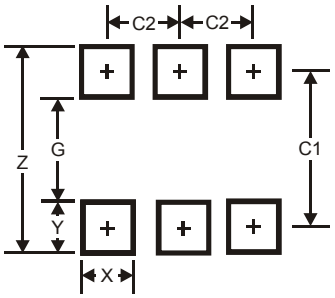


X2-DFN1409-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0	0.05	0.02
A3	—	—	0.13
Ø	0.20	0.30	0.25
D	1.35	1.45	1.40
E	0.85	0.95	0.90
e1	—	—	0.50
e2	—	—	0.50
Z1	—	—	0.075
Z2	—	—	0.075
All Dimensions in mm			

Suggested Pad Layout

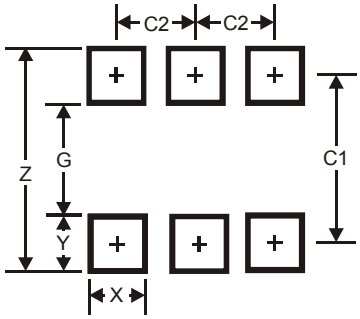
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(1) Package Type: SOT26



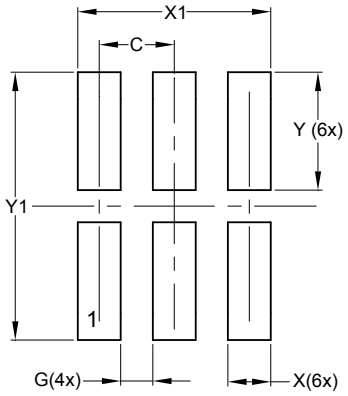
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(2) Package Type: SOT363



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

(3) Package Type: X2-DFN1010-6

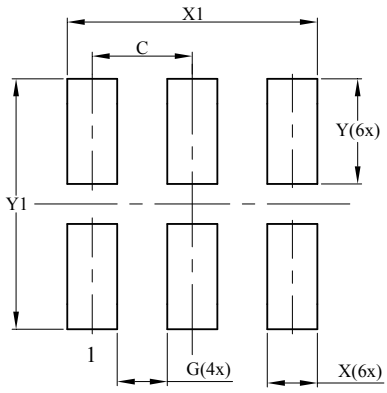


Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

Suggested Pad Layout (cont.)

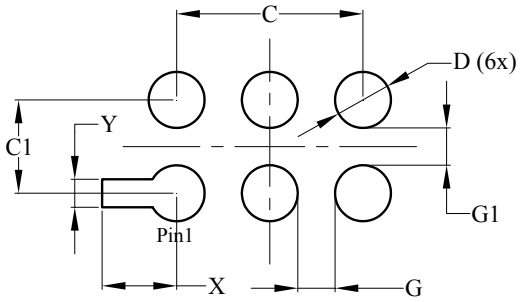
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(4) Package Type X2-DFN1410-6



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

(5) Package Type: X2-DFN1409-6 Chip Scale Replacement



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

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