DUAL INVERTERS with OPEN DRAIN OUTPUTS

Description

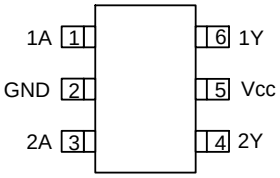
The 74LVC2G06 is a dual inverter gate with open drain outputs. The device is designed for operation with a power supply range of 1.65V to 5.5V. The input is tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down. The open-drain output can be connected to other open drain outputs to implement active-low wired-OR or active-high wired-AND functions. The maximum sink current is 32mA.

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)**

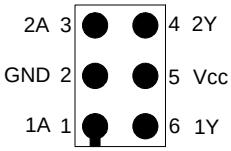
Pin Assignments

(Top View)



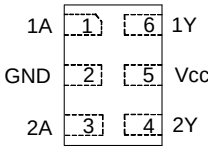
SOT26 / 363

(Bottom View)



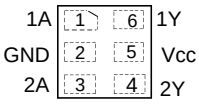
DFN1409
Chip Scale
Alternative

(Top View)



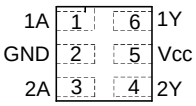
X2-DFN1410-6

(Top View)



X1-DFN1010-6

(Top View)



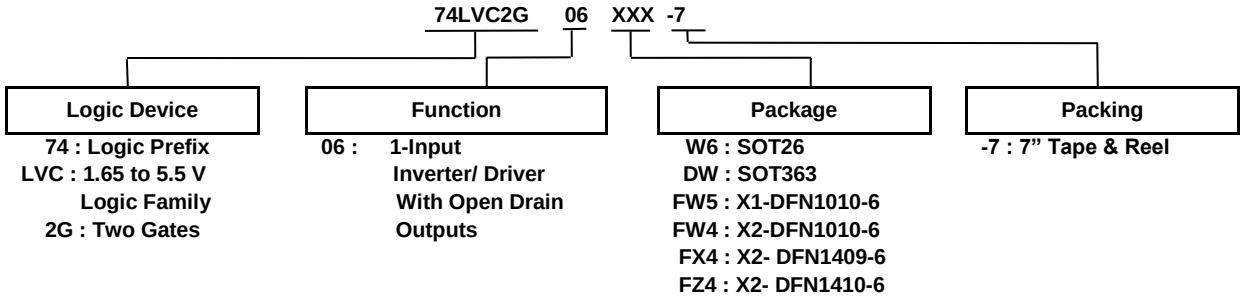
X2-DFN1010-6

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

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.

Ordering Information



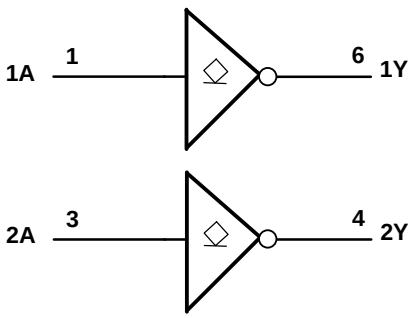
Device	Package Code	Package (Note 4)	Package Size	7" Tape and Reel (Note 5)	
				Quantity	Part Number Suffix
74LVC2G06W6-7	W6	SOT26	2.8mm X 2.2 mm X 1.1mm 0.95 mm lead pitch	3,000/Tape & Reel	-7
74LVC2G06DW-7	DW	SOT363	2.0mm X 2.0mm X 1.1mm 0.65 mm lead pitch	3,000/Tape & Reel	-7
74LVC2G06FW5-7	FW5	X1-DFN1010-6	1.0mm X 1.0mm X 0.5mm 0.35 mm pad pitch	5,000/Tape & Reel	-7
74LVC2G06FW4-7	FW4	X2-DFN1010-6	1.0mm X 1.0mm X 0.4mm 0.35 mm pad pitch	5,000/Tape & Reel	-7
74LVC2G06FX4-7	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
74LVC2G06FZ4-7	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 Open Drain
V_{CC}	5	Supply Voltage
1Y	6	Data Output Open Drain

Logic Diagram



Function Table

Inputs	Output
A	Y
H	L
L	Z

Absolute Maximum Ratings (Notes 6 & 7) (@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 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.
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°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 5.5V	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_{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 Fall Rate	V_{CC} = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20	ns/V
		V_{CC} = 3.3V ± 0.3V	—	10	
		V_{CC} = 5V ± 0.5V	—	10	
T_A	Operating Free-Air Temperature		-40	+125	°C

Note: 8. 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_{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_{OZ}	Z State Leakage Current	V_O = 0 to 5.5V	3.6V	—	± 10	—	± 10	µA
I_{OFF}	Power Down Leakage Current	V_I or V_O = 5.5V	0V	—	± 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 9)	—	204	—	°C/W
		SOT363		—	371	—	
		X2-DFN1410-6		—	430	—	
		X2-DFN1409-6		—	450	—	
		X1-DFN1010-6		—	495	—	
		X2-DFN1010-6		—	510	—	
θ_{JC}	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_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	6.5	0.5	3.9	0.5	3.4	0.5	2.9	ns

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

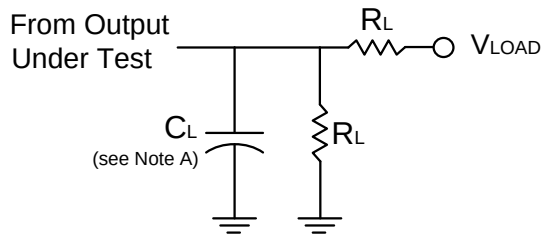
Parameter	From (Input)	TO (OUTPUT)	V_{CC} = 1.8V ± 0.15V		V_{CC} = 2.5V ± 0.2V		V_{CC} = 3.3V ± 0.3V		V_{CC} = 5V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.5	8.2	0.5	4.9	0.5	4.3	0.5	3.7	ns

Operating Characteristics

T_A = +25°C

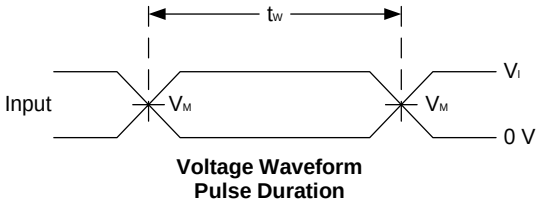
Parameter		Test Conditions	V_{CC} = 1.8V	V_{CC} = 2.5V	V_{CC} = 3.3V	V_{CC}= 5V	Unit
			Typ	Typ	Typ	Typ	
C_{pd}	Power Dissipation Capacitance	f = 10 MHz	3	3	4	6	pF

Parameter Measurement Information

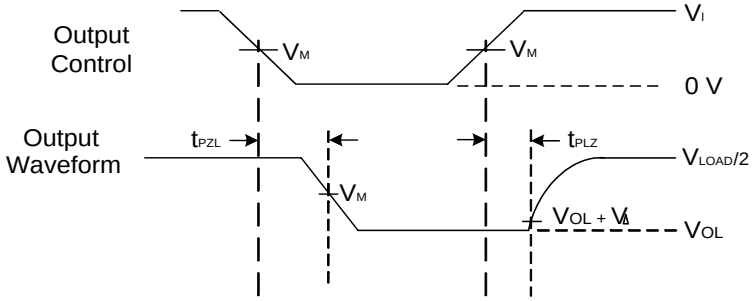


TEST	Condition
t_{PLZ} (See Notes D and E)	Vload
t_{PZL} (See Notes D and F)	Vload

V_{CC}	Inputs		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 X V_{CC}	30pF	1kΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 X V_{CC}	30pF	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5 V	6 V	50pF	500Ω	0.3V
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	2 X V_{CC}	50pF	500Ω	0.3V



Voltage Waveform Pulse Duration



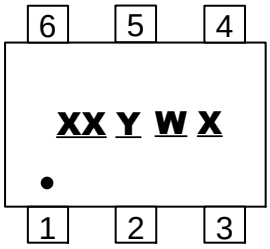
Voltage Waveform Propagation Delay Times

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. The inputs are measured one at a time with one transition per measurement.
D. For the open drain device t_{PLZ} and t_{PZL} are the same as t_{PD}.
E. t_{PZL} is measured at V_M.
F. t_{PLZ} is measured at V_{OL} +V_Δ.

Marking Information

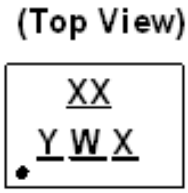
(1) SOT26, SOT363



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
74LVC2G06W6-7	SOT26	Z3
74LVC2G06DW-7	SOT363	Z3

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

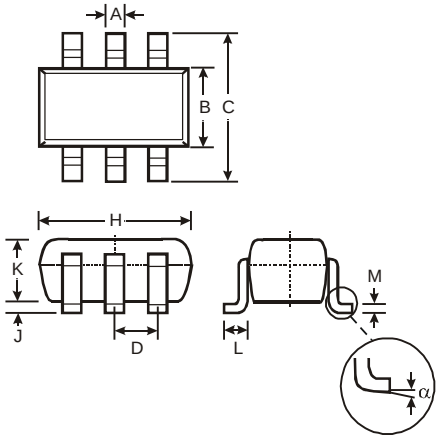


XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Internal code

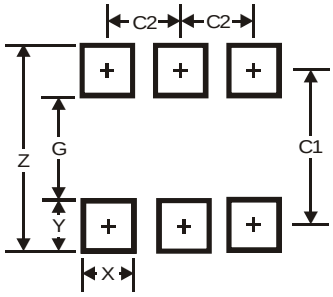
Part Number	Package	Identification Code
74LVC2G06FW4-7	X2-DFN1010-6	Z3
74LVC2G06FW5-7	X1-DFN1010-6	W3
74LVC2G06FX4-7	X2-DFN1409-6	X3
74LVC2G06FZ4-7	X2-DFN1410-6	Z3

SOT26 Package Outline Dimensions and Suggested Pad Layout

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



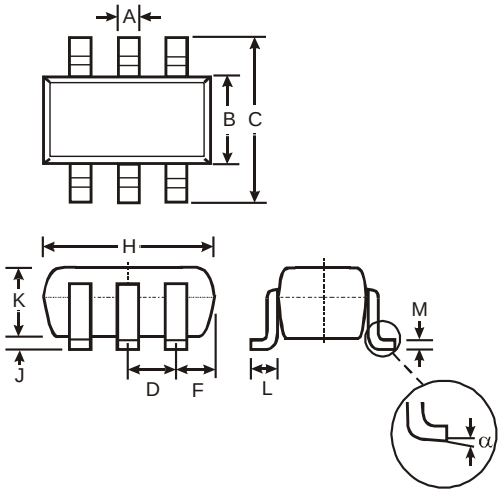
SOT26			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
α	0°	8°	—
All Dimensions in mm			



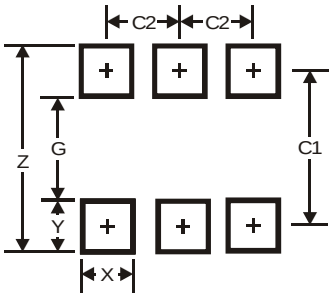
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

SOT363 Package Outline Dimensions and Suggested Pad Layout

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



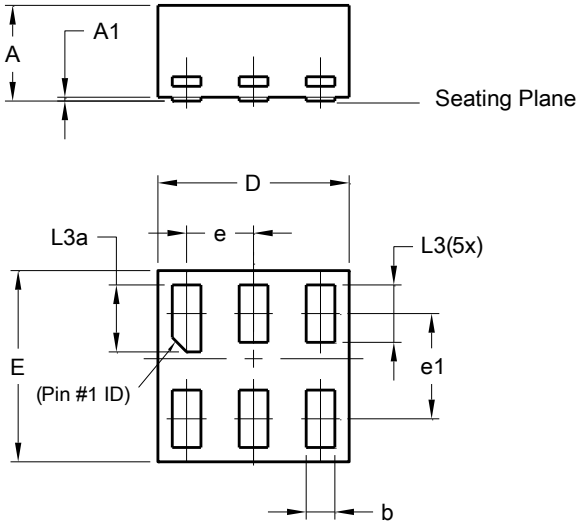
SOT363			
Dim	**Min**	**Max**	**Typ**
A	0.10	0.30	0.25
B	1.15	1.35	1.30
C	2.00	2.20	2.10
D	0.65 Typ		
F	0.40	0.45	0.425
H	1.80	2.20	2.15
J	0	0.10	0.05
K	0.90	1.00	1.00
L	0.25	0.40	0.30
M	0.10	0.22	0.11
α	0°	8°	-
All Dimensions in mm			



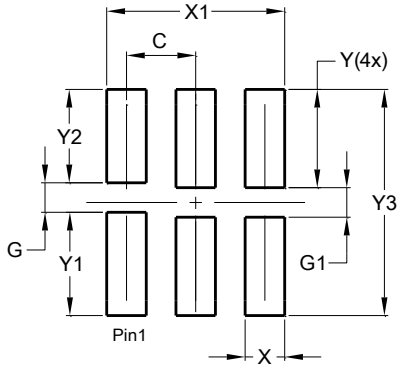
Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

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.



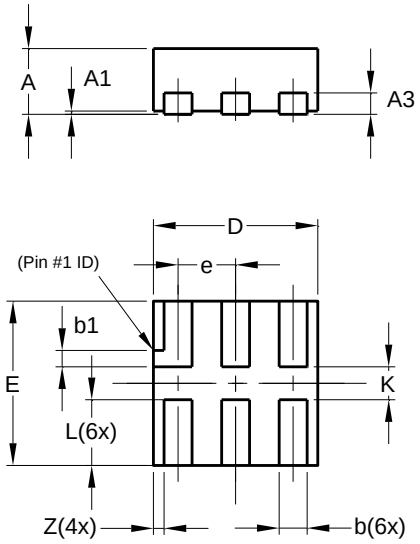
X1-DFN1010-6 (Type B)			
Dim	**Min**	**Max**	**Typ**
A	-	0.50	0.39
A1	-	0.04	-
b	0.12	0.20	0.15
D	0.95	1.050	1.00
E	0.95	1.050	1.00
e	0.35 BSC		
e1	0.55 BSC		
L3	0.27	0.30	0.30
L3a	0.32	0.40	0.35
All Dimensions in mm			



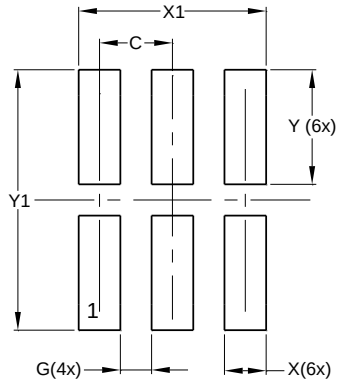
Dimensions	Value (in mm)
C	0.350
G	0.150
G1	0.150
X	0.200
X1	0.900
Y	0.500
Y1	0.525
Y2	0.475
Y3	1.150

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

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



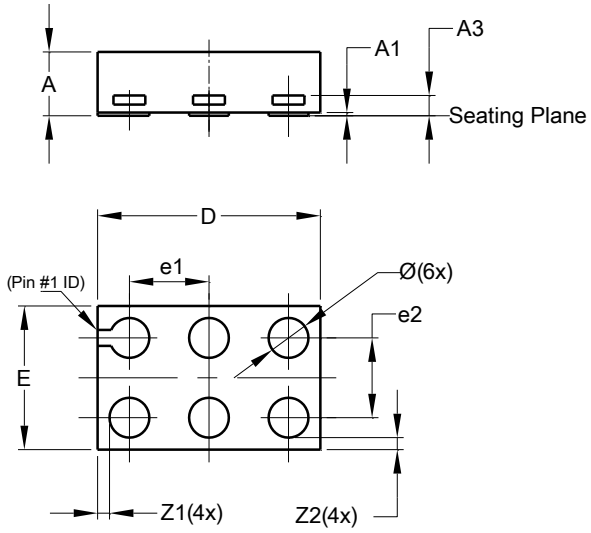
X2-DFN1010-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			



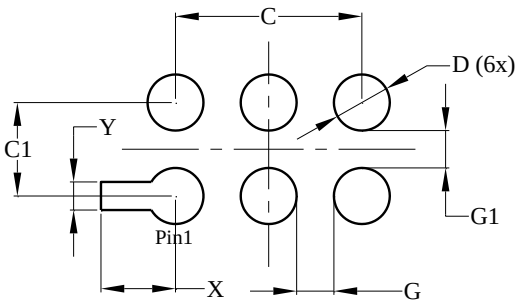
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

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.



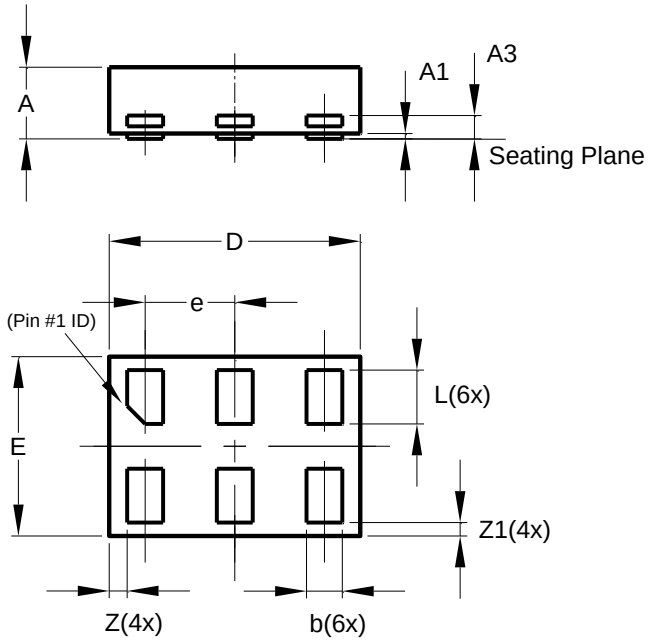
X2-DFN1409-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0	0.05	0.02
A3	—	—	0.13
Ø	0.20	0.30	0.25
D	1.35	1.45	1.40
E	0.85	0.95	0.90
e1	—	—	0.50
e2	—	—	0.50
Z1	—	—	0.075
Z2	—	—	0.075
All Dimensions in mm			



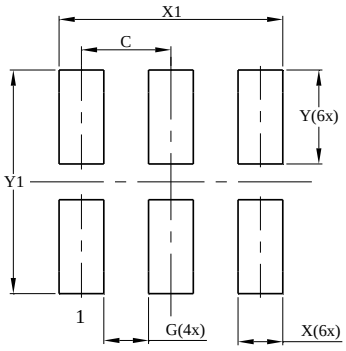
Dimensions	Value (in mm)
C	1.000
C1	0.500
D	0.300
G	0.200
G1	0.200
X	0.400
Y	0.150

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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