

## Description

The Advanced Ultra Low Power (AUP) CMOS logic family is designed for low power and extended battery life in portable applications.

The 74AUP2G06 is composed of two inverters with open drain outputs designed for operation over a power supply range of 0.8V to 3.6V. 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 gates perform the positive Boolean function:

$$Y = \bar{A}$$

## Features

- Advanced Ultra Low Power (AUP) CMOS
- Supply Voltage Range from 0.8V to 3.6V
- 4mA Output Drive at 3.0V
- Low Static power consumption
- $I_C < 0.9\mu A$
- Low Dynamic Power Consumption
- $C_{PD} = 0.6\text{pF}$  Typical at 3.6V
- Schmitt Trigger Action at All Inputs Make the Circuit Tolerant for Slower Input Rise and Fall Time. The hysteresis is typically 250mV at  $V_{CC} = 3.0V$
- $I_{OFF}$  Supports Partial-Power-Down Mode Operation
- ESD Protection 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
- Leadless packages per JESD30E
  - DFN1410 denoted as X2-DFN1410-6
  - DFN1010 denoted as X2-DFN1010-6
  - DFN0910 denoted as X2-DFN0910-6
- 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 Assignments

### (Top View)

1A	1	6	1Y
GND	2	5	Vcc
2A	3	4	2Y

DFN1410

1A	1	6	1Y
GND	2	5	Vcc
2A	3	4	2Y

DFN1010

1A	1	6	1Y
GND	2	5	Vcc
2A	3	4	2Y

DFN0910

## Applications

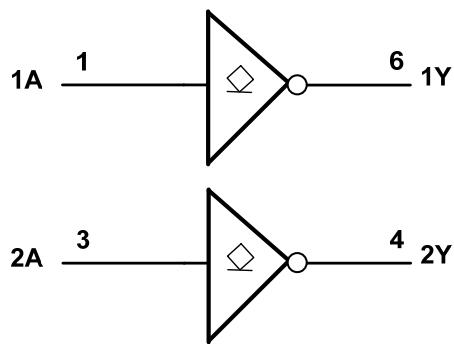
- Suited for battery and low power needs
- Wide array of products such as:
  - PCs, networking, notebooks, netbooks, PDAs
  - Tablet Computers, E-readers
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box
  - Cell Phones, Personal Navigation / GPS
  - MP3 players, Cameras, Video Recorders

[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
Vcc	5	Supply Voltage
1Y	6	Data Output

## Logic Diagram



## Function Table

Inputs	Output
nA	nY
H	L
L	Z

**Absolute Maximum Ratings** (Note 4) (@ $T_A = +25^\circ\text{C}$ , 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 +4.6	V
$V_I$	Input Voltage Range	-0.5 to +4.6	V
$V_O$	Voltage Applied to Output in High or Low State	-0.5 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 ( $V_O = 0$ to $V_{CC}$ )	$\pm 20$	mA
$I_{CC}$	Continuous Current through $V_{CC}$	50	mA
$I_{GND}$	Continuous Current through GND	-50	mA
$T_J$	Operating Junction Temperature	-40 to +150	$^\circ\text{C}$
TSTG	Storage Temperature	-65 to +150	$^\circ\text{C}$

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 recommended values.

**Recommended Operating Conditions** (Note 5) (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter		Min	Max	Unit
$V_{CC}$	Operating Voltage		0.8	3.6	V
$V_I$	Input Voltage		0	3.6	V
$V_O$	Output Voltage		0	$V_{CC}$	V
$I_{OL}$	Low-Level Output Current	$V_{CC} = 0.8\text{V}$	—	20	$\mu\text{A}$
		$V_{CC} = 1.1\text{V}$	—	1.1	mA
		$V_{CC} = 1.4\text{V}$	—	1.7	
		$V_{CC} = 1.65\text{V}$	—	1.9	
		$V_{CC} = 2.3\text{V}$	—	3.1	
		$V_{CC} = 3.0\text{V}$	—	4	
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CC} = 0.8\text{V}$ to $3.6\text{V}$	—	200	ns/V
$T_A$	Operating Free-Air Temperature		-40	+125	$^\circ\text{C}$

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

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40 to +85°C		Unit
				Min	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		0.8V to 1.65V	0.80 X V <sub>CC</sub>		0.80 X V <sub>CC</sub>		V
			1.65V to 1.95V	0.65 X V <sub>CC</sub>		0.65 X V <sub>CC</sub>		
			2.3V to 2.7V	1.6		1.6		
			3.0V to 3.6V	2.0		2.0		
V <sub>IL</sub>	Low-Level Input voltage		0.8V to 1.65V		0.30 X V <sub>CC</sub>		0.30 X V <sub>CC</sub>	V
			1.65V to 1.95V		0.35 X V <sub>CC</sub>		0.35 X V <sub>CC</sub>	
			2.3V to 2.7V		0.7		0.7	
			3.0V to 3.6V		0.9		0.9	
V <sub>OL</sub>	Low-Level Output Voltage	I <sub>OL</sub> = 20µA	0.8V to 3.6V		0.1		0.1	V
		I <sub>OL</sub> = 1.1mA	1.1V		0.3 X V <sub>CC</sub>		0.3 X V <sub>CC</sub>	
		I <sub>OL</sub> = 1.7mA	1.4V		0.31		0.37	
		I <sub>OL</sub> = 1.9mA	1.65V		0.31		0.35	
		I <sub>OL</sub> = 2.3mA	2.3V		0.31		0.33	
		I <sub>OL</sub> = 3.1mA			0.44		0.45	
		I <sub>OL</sub> = 2.7mA	3V		0.31		0.33	
		I <sub>OL</sub> = 4mA			0.44		0.45	
I <sub>I</sub>	Input Current	A or B Input, V <sub>I</sub> = GND to 3.6V	0V to 3.6V		±0.1		±0.5	µA
I <sub>OZ</sub>	Z State Leakage Current	V <sub>O</sub> = 3.6V, V <sub>I</sub> = 3.6V	3.6V		±0.1		±0.5	µA
I <sub>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0V		±0.2		±0.6	µA
ΔI <sub>OFF</sub>	Delta Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0V to 0.2V		±0.2		±0.6	µA
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0	0.8V to 3.6V		0.5		0.9	µA
ΔI <sub>CC</sub>	Additional Supply Current	One input at V <sub>CC</sub> -0.6V Other inputs at V <sub>CC</sub> or GND	3.3V		40		50	µA
Symbol	Parameter	Test Conditions	V <sub>CC</sub>	T <sub>A</sub> = -40°C to +125°C		Unit		
				Min	Max			
V <sub>IH</sub>	High-Level Input Voltage		0.8V to 1.65V	0.80 X V <sub>CC</sub>		V		
			1.65V to 1.95V	0.70 X V <sub>CC</sub>				
			2.3V to 2.7V	1.6				
			3.0V to 3.6V	2.0				
V <sub>IL</sub>	Low-Level Input voltage		0.8V to 1.65V		0.25 X V <sub>CC</sub>	V		
			1.65V to 1.95V		0.30 X V <sub>CC</sub>			
			2.3V to 2.7V		0.7			
			3.0V to 3.6V		0.9			
V <sub>OL</sub>	Low-Level Output Voltage	I <sub>OL</sub> = 20µA	0.8V to 3.6V		0.11	V		
		I <sub>OL</sub> = 1.1mA	1.1V		0.33 X V <sub>CC</sub>			
		I <sub>OL</sub> = 1.7mA	1.4V		0.41			
		I <sub>OL</sub> = 1.9mA	1.65V		0.39			
		I <sub>OL</sub> = 2.3mA	2.3V		0.36			
		I <sub>OL</sub> = 3.1mA			0.50			
		I <sub>OL</sub> = 2.7mA	3V		0.36			
		I <sub>OL</sub> = 4mA			0.50			
I <sub>I</sub>	Input Current	A or B Input, V <sub>I</sub> = GND to 3.6V	0V to 3.6V		± 0.75	µA		
I <sub>OZ</sub>	Z State Leakage Current	V <sub>O</sub> = 3.6V, V <sub>I</sub> = 3.6V	3.6V		± 0.75	µA		
I <sub>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0V		± 0.75	µA		
ΔI <sub>OFF</sub>	Delta Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0V to 0.2V		± 2.5	µA		
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = GND or V <sub>CC</sub> , I <sub>O</sub> = 0	0.8V to 3.6V		1.4	µA		
ΔI <sub>CC</sub>	Additional Supply Current	Input at V <sub>CC</sub> -0.6V Other inputs at V <sub>CC</sub> or GND	3.3V		75	µA		

## Switching Characteristics

$C_L = 5\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>cc</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A	Y	0.8V		12.8						ns
			1.2V ± 0.1V	2.6	5.8	11.3	2.3	12.5	2.3	15.9	
			1.5V ± 0.1V	1.8	3.6	6.4	1.6	7.4	1.6	8.2	
			1.8V ± 0.15V	1.5	2.9	5	1.4	5.9	1.4	6.5	
			2.5V ± 0.2V	1.2	2.4	3.9	1.1	4.5	1.1	5	
			3.3V ± 0.3V	0.9	3	3.5	0.8	3.9	0.8	4.3	

$C_L = 10\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>cc</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A	Y	0.8V		14.5						ns
			1.2V ± 0.1V	3.1	7	13.4	2.9	15.1	2.9	19.2	
			1.5V ± 0.1V	2.3	4.8	7.5	2.1	8.7	2.1	10.5	
			1.8V ± 0.15V	2	3.8	4.8	1.8	7	1.8	7.7	
			2.5V ± 0.2V	1.6	3.1	4.6	1.5	5.4	1.5	6	
			3.3V ± 0.3V	1.2	4.3	4.9	1.1	5.4	1.1	5.9	

$C_L = 15\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>cc</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A	Y	0.8V		16.2						ns
			1.2V ± 0.1V	3.5	8.2	14.3	3.3	17.4	3.3	22.5	
			1.5V ± 0.1V	2.6	6.2	8.6	2.4	10.5	2.4	13.7	
			1.8V ± 0.15V	2.3	5	6.7	2.1	8	2.1	9.8	
			2.5V ± 0.2V	2.1	3.9	5.1	1.8	6.1	1.8	6.8	
			3.3V ± 0.3V	1.6	5.6	6.4	1.4	7.1	1.4	7.8	

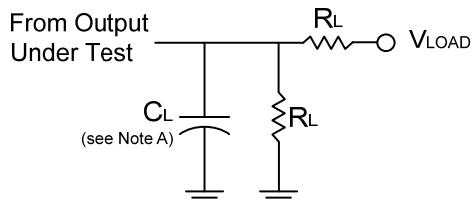
$C_L = 30\text{pF}$  see Figure 1

Parameter	From Input	TO OUTPUT	V <sub>cc</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t <sub>pd</sub>	A	Y	0.8V		19.8						ns
			1.2V ± 0.1V	4.8	9.8	18.4	4.4	18.4	4.4	25.8	
			1.5V ± 0.1V	3.6	8.2	13.9	3.2	13.9	3.2	18	
			1.8V ± 0.15V	3.2	7.8	12.2	2.9	12.2	2.9	15.2	
			2.5V ± 0.2V	2.4	7.5	9.9	2.6	9.9	2.6	11.4	
			3.3V ± 0.3V	1.8	9.2	10.6	2.1	11.6	2.1	12.8	

## Operating Characteristics (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Parameter		Test Conditions	V <sub>CC</sub>	Typ	Unit
C <sub>pd</sub>	Power Dissipation Capacitance No Load	f = 1MHz No Load	0.8V	0.3	pF
			1.2V $\pm$ 0.1V	0.4	
			1.5V $\pm$ 0.1V	0.5	
			1.8V $\pm$ 0.15V	0.5	
			2.5V $\pm$ 0.2V	0.5	
			3.3V $\pm$ 0.3V	0.6	
C <sub>I</sub>	Input Capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND	0V or 3.3V	2.0	pF
C <sub>O</sub>	Output Capacitance	V <sub>O</sub> = V <sub>CC</sub> or GND	0V	2.0	pF

## Parameter Measurement Information



TEST	Condition
t <sub>PLZ</sub> (see Notes D and E)	V <sub>load</sub>
t <sub>PZL</sub> (see Notes D and F)	V <sub>load</sub>

V <sub>CC</sub>	Inputs		V <sub>M</sub>	V <sub>LOAD</sub>	C <sub>L</sub>	R <sub>L</sub>	V <sub>Δ</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>					
0.8V	V <sub>CC</sub>	$\leq 3$ ns	V <sub>CC</sub> /2	2 X V <sub>CC</sub>	5, 10, 15, 30pF	5k $\Omega$	0.1V
1.2V $\pm$ 0.1V	V <sub>CC</sub>	$\leq 3$ ns	V <sub>CC</sub> /2	2 X V <sub>CC</sub>	5, 10, 15, 30pF	5k $\Omega$	0.1V
1.5V $\pm$ 0.1V	V <sub>CC</sub>	$\leq 3$ ns	V <sub>CC</sub> /2	2 X V <sub>CC</sub>	5, 10, 15, 30pF	5k $\Omega$	0.15V
1.8V $\pm$ 0.15V	V <sub>CC</sub>	$\leq 3$ ns	V <sub>CC</sub> /2	2 X V <sub>CC</sub>	5, 10, 15, 30pF	5k $\Omega$	0.15V
2.5V $\pm$ 0.2V	V <sub>CC</sub>	$\leq 3$ ns	V <sub>CC</sub> /2	2 X V <sub>CC</sub>	5, 10, 15, 30pF	5k $\Omega$	0.15V
3.3V $\pm$ 0.3V	V <sub>CC</sub>	$\leq 3$ ns	V <sub>CC</sub> /2	2 X V <sub>CC</sub>	5, 10, 15, 30pF	5k $\Omega$	0.3V

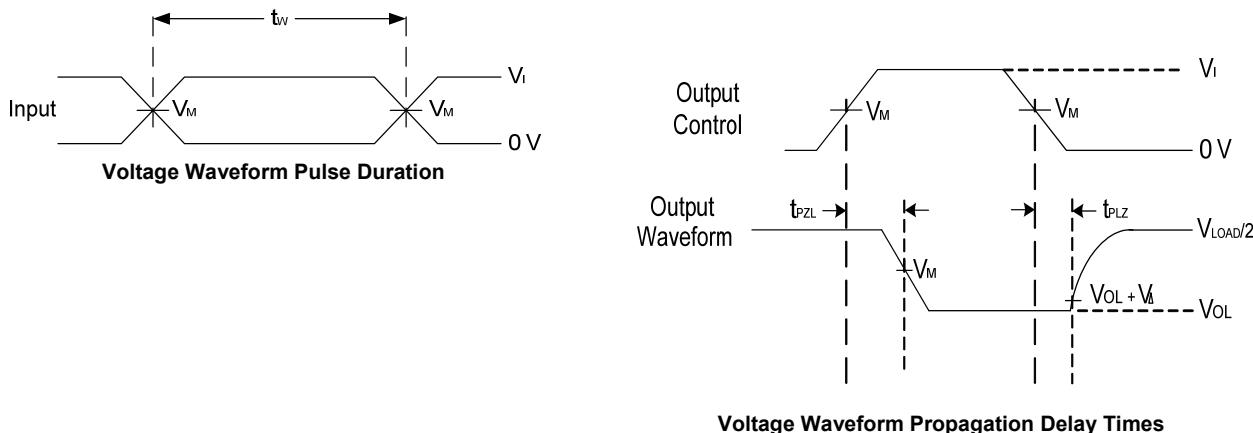
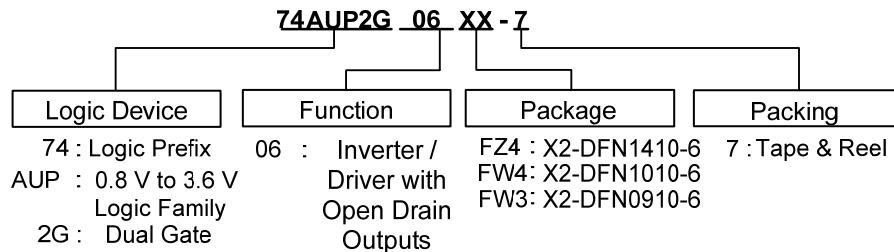


Figure 1. Load Circuit and Voltage Waveforms

Notes:

- A. Includes test lead and test apparatus capacitance.
- B. All pulses are supplied at pulse repetition rate  $\leq 10\text{MHz}$ .
- C. The inputs are measured one at a time with one transition per measurement.
- D. For the open drain device t<sub>PLZ</sub> and t<sub>PZL</sub> are the same as t<sub>PD</sub>
- E. t<sub>PZL</sub> is measured at V<sub>M</sub>.
- D. t<sub>PLZ</sub> is measured at V<sub>OL</sub> + V<sub>Δ</sub>.

## Ordering Information



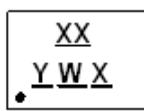
Device	Package Code	Packaging	7" Tape and Reel (Note 6)	
			Quantity	Part Number Suffix
74AUP2G06FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7
74AUP2G06FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7
74AUP2G06FW3-7	FW3	X2-DFN0910-6	5000/Tape & Reel	-7

Note: 6. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>

## Marking Information

(1) X2-DFN1410-6, X2-DFN1010-6, X2-DFN0910-6

**(Top View)**



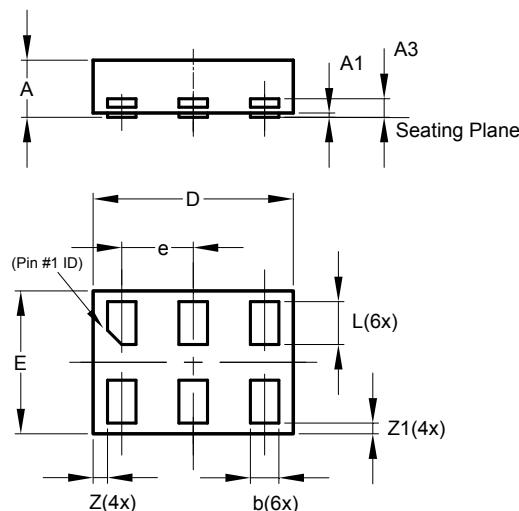
XX : Identification Code  
 Y : Year : 0~9  
 W : Week : A~Z : 1~26 week;  
       a~z : 27~52 week; z represents  
       52 and 53 week  
 X : A~Z : Internal code

Part Number	Package	Identification Code
74AUP2G06FZ4	X2-DFN1410-6	RN
74AUP2G06FW4	X2-DFN1010-6	SN
74AUP2G06FW3	X2-DFN0910-6	MN

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

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

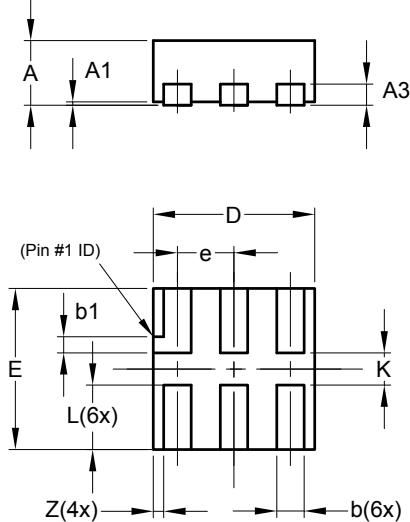
**(1) Package Type X2-DFN1410-6**



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

**(2) Package Type: X2-DFN1010-6**



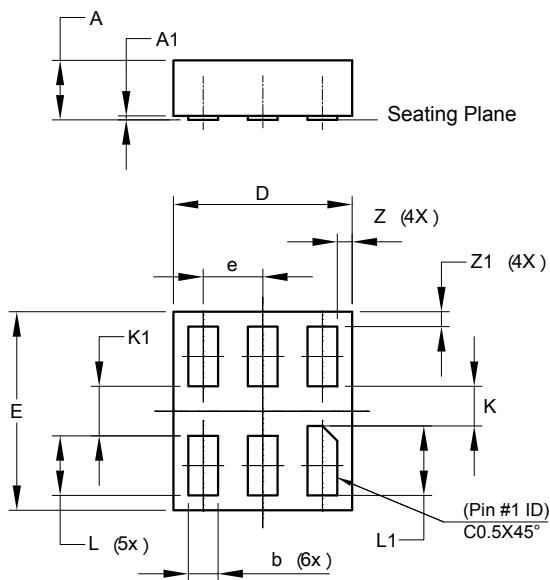
X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065

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.

### (3) Package Type: X2-DFN0910-6



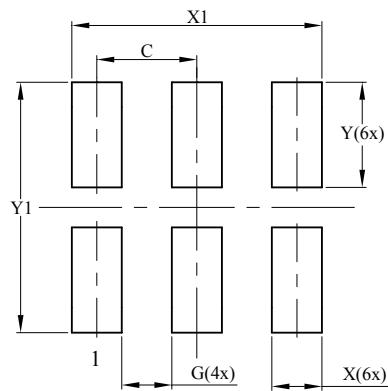
X2-DFN0910-6			
Dim	Min	Max	Typ
<b>A</b>	-	0.35	0.30
<b>A1</b>	0	0.03	0.02
<b>b</b>	0.10	0.20	0.15
<b>D</b>	0.85	0.95	0.90
<b>E</b>	0.95	1.05	1.00
<b>e</b>	-	-	0.30
<b>K</b>	0.20	-	-
<b>K1</b>	0.25	-	-
<b>L</b>	0.25	0.35	0.30
<b>L1</b>	0.30	0.40	0.35
<b>Z</b>	-	-	0.075
<b>Z1</b>	-	-	0.075

All Dimensions in mm

## Suggested Pad Layout

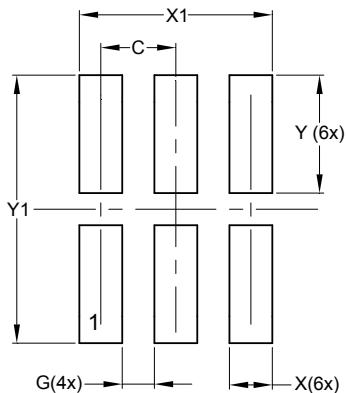
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### (1) Package Type X2-DFN1410-6



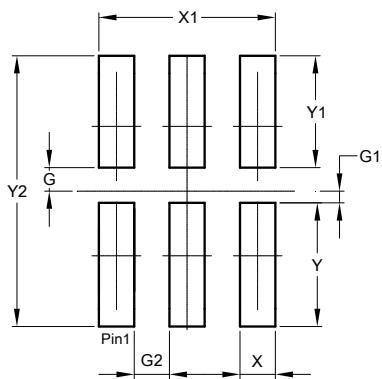
Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

### (2) 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

### (3) Package Type: X2-DFN0910-6



Dimensions	Value (in mm)
G	0.100
G1	0.050
G2	0.150
X	0.150
X1	0.750
Y	0.525
Y1	0.475
Y2	1.150

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