

## Description

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

The 74AUP1G32 is a single 2-input positive OR gate with a standard push-pull output 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<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:

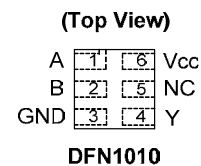
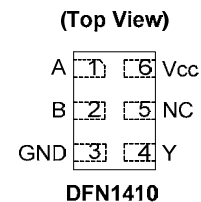
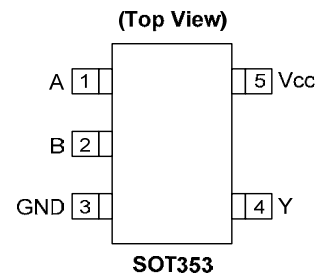
$$Y = \overline{\overline{A + B}} \text{ or } Y = \overline{\overline{A} \bullet \overline{B}}$$

## 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<sub>cc</sub> < 0.9µA
- Low Dynamic Power Consumption
  - C<sub>PD</sub> = 6.3pF (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 250 mV at V<sub>CC</sub> = 3.0V
- I<sub>OFF</sub> Supports Partial-Power-Down Mode Operation
- ESD Protection Exceeds JESD 22
  - 2000-V Human Body Model (A114-A)
  - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options SOT353, DFN1410, and DFN1010
- Leadless packages per JESD30E
  - DFN1010 denoted as X2-DFN1010-6
  - DFN1014 denoted as X2-DFN1014-6
- **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> 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



## Applications

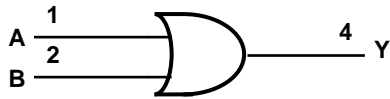
- Suited for battery and low power needs
- Wide array of products such as:
  - Tablets, E-readers
  - Cell Phones, Personal Navigation / GPS
  - MP3 players, Cameras, Video Recorders
  - PCs ultrabooks, notebooks, netbooks,
  - Computer peripherals, hard drives, CD/DVD ROM
  - TV, DVD, DVR, set top box

[Click here for ordering information, located at the end of datasheet](#)

## Pin Descriptions

Pin Name	Function
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
V <sub>CC</sub>	Supply Voltage

## Logic Diagram



## Function Table

Inputs		Output
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	H

### Absolute Maximum Ratings (Note 4) (@T<sub>A</sub> = +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
V <sub>CC</sub>	Supply Voltage Range	-0.5 to +4.6	V
V <sub>I</sub>	Input Voltage Range	-0.5 to +4.6	V
V <sub>O</sub>	Voltage applied to output in high or low state	-0.5 to V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> < 0	50	mA
I <sub>OK</sub>	Output Clamp Current (V <sub>O</sub> < 0)	50	mA
I <sub>O</sub>	Continuous output current (V <sub>O</sub> = 0 to V <sub>CC</sub> )	±20	mA
I <sub>CC</sub>	Continuous Current Through V <sub>CC</sub>	50	mA
I <sub>GND</sub>	Continuous Current Through GND	-50	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to +150	°C
T <sub>STG</sub>	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<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Operating Voltage		0.8	3.6	V
V <sub>I</sub>	Input Voltage		0	3.6	V
V <sub>O</sub>	Output Voltage		0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-Level Output Current	V <sub>CC</sub> = 0.8V		-20	μA
		V <sub>CC</sub> = 1.1V		-1.1	mA
		V <sub>CC</sub> = 1.4V		-1.7	
		V <sub>CC</sub> = 1.65V		-1.9	
		V <sub>CC</sub> = 2.3V		-3.1	
		V <sub>CC</sub> = 3.0V		-4	
I <sub>OL</sub>	Low-Level Output Current	V <sub>CC</sub> = 0.8V		20	μA
		V <sub>CC</sub> = 1.1V		1.1	mA
		V <sub>CC</sub> = 1.4V		1.7	
		V <sub>CC</sub> = 1.65V		1.9	
		V <sub>CC</sub> = 2.3V		3.1	
		V <sub>CC</sub> = 3.0V		4	
Δt/ΔV	Input Transition Rise or Fall Rate	V <sub>CC</sub> = 0.8V to 3.6V		200	ns/V
T <sub>A</sub>	Operating Free-Air Temperature		-40	+125	°C

Note: 5. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C 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>OH</sub>	High-Level Output Voltage	I <sub>OH</sub> = -20μA	0.8V to 3.6V	V <sub>CC</sub> - 0.1		V <sub>CC</sub> - 0.1		V
		I <sub>OH</sub> = -1.1mA	1.1V	0.75 X V <sub>CC</sub>		0.7 X V <sub>CC</sub>		
		I <sub>OH</sub> = -1.7mA	1.4V	1.11		1.03		
		I <sub>OH</sub> = -1.9mA	1.65V	1.32		1.3		
		I <sub>OH</sub> = -2.3mA	2.3V	2.05		1.97		
		I <sub>OH</sub> = -3.1mA		1.9		1.85		
		I <sub>OH</sub> = -2.7mA	3V	2.72		2.67		
		I <sub>OH</sub> = -4mA		2.6		2.55		
V <sub>OL</sub>	High-Level Input 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>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0		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

**Electrical Characteristics** (cont.) (@T<sub>A</sub> = +25°C, unless otherwise specified.)

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>OH</sub>	High-Level Output Voltage	I <sub>OH</sub> = -20μA	0.8V to 3.6V	V <sub>CC</sub> - 0.11		V
		I <sub>OH</sub> = -1.1mA	1.1V	0.6 X V <sub>CC</sub>		
		I <sub>OH</sub> = -1.7mA	1.4V	0.93		
		I <sub>OH</sub> = -1.9mA	1.65V	1.17		
		I <sub>OH</sub> = -2.3mA	2.3V	1.77		
		I <sub>OH</sub> = -3.1mA		1.67		
		I <sub>OH</sub> = -2.7mA	3V	2.40		
		I <sub>OH</sub> = -4mA		2.30		
V <sub>OL</sub>	High-Level Input 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>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0		±3.5	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		3.0	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 or B	Y	0.8V		16.8						ns
			1.2V ± 0.1V	2.2	5.1	10.9	2.1	11.9	2.1	13.2	
			1.5V ± 0.1V	1.6	3.6	6.6	1.4	7.5	1.4	8.3	
			1.8V ± 0.15V	1.4	3.0	5.2	1.2	6.0	1.2	6.6	
			2.5V ± 0.2V	1.1	2.4	3.9	1.0	4.6	1.0	5.1	
			3.3V ± 0.3V	1.0	2.1	3.5	0.9	4.1	0.9	4.6	

 $C_L=10\text{pF}$  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 or B	Y	0.8V		20.3						ns
			1.2V ± 0.1V	2.3	5.9	12.7	2.1	13.8	2.1	15.2	
			1.5V ± 0.1V	1.9	4.2	7.7	1.7	8.7	1.7	9.6	
			1.8V ± 0.15V	1.7	3.5	6.0	1.5	6.9	1.5	7.7	
			2.5V ± 0.2V	1.4	2.9	4.6	1.3	5.5	1.3	6.1	
			3.3V ± 0.3V	1.3	2.7	4.3	1.2	5.0	1.2	5.5	

 $C_L=15\text{pF}$  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 or B	Y	0.8V		23.8						ns
			1.2V ± 0.1V	3.3	6.7	16.3	3.0	19.9	3.0	19.9	
			1.5V ± 0.1V	2.3	4.8	8.6	2.0	9.8	2.0	10.8	
			1.8V ± 0.15V	2.0	4.0	6.7	1.8	7.9	1.8	8.7	
			2.5V ± 0.2V	1.7	3.3	5.3	1.6	6.3	1.6	6.9	
			3.3V ± 0.3V	1.5	3.1	4.9	1.5	5.8	1.5	6.4	

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

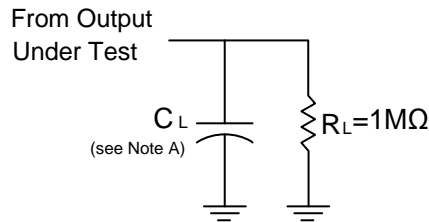
Parameter	From Input	TO OUTPUT	V <sub>CC</sub>	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		T <sub>A</sub> = -40°C to +125°C		Unit
				Min	Typ	Min	Min	Max	Min	Max	
t <sub>pd</sub>	A or B	Y	0.8V		34.1						ns
			1.2V ± 0.1V	4.5	15.0	19.1	4.0	23.5	4.0	23.7	
			1.5V ± 0.1V	3.4	6.3	11.3	2.9	13.3	2.9	14.7	
			1.8V ± 0.15V	2.6	5.3	8.9	2.4	10.7	2.4	11.8	
			2.5V ± 0.2V	2.3	4.4	7.0	2.2	8.4	2.2	9.3	
			3.3V ± 0.3V	2.0	3.2	6.4	2.0	7.7	2.0	8.5	

**Operating and Package Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

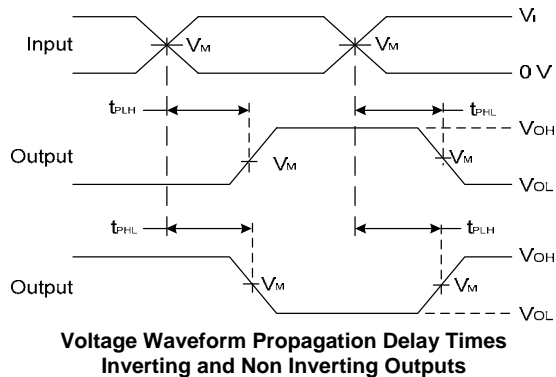
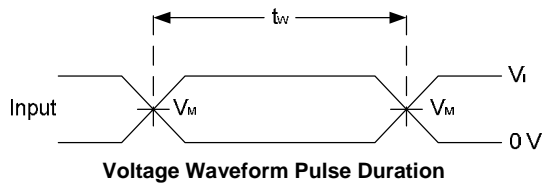
Parameter		Test Conditions		V <sub>CC</sub>	Typ	Unit
C <sub>pd</sub>	Power Dissipation Capacitance	f = 1MHz No Load		0.8V	6.9	pF
				1.2V ± 0.1V	6.8	
				1.5V ± 0.1V	6.7	
				1.8V ± 0.15V	6.6	
				2.5V ± 0.2V	6.4	
				3.3V ± 0.3V	6.3	
C <sub>i</sub>	Input Capacitance	V <sub>i</sub> = V <sub>CC</sub> or GND		0V or 3.3V	1.5	pF
θ <sub>JA</sub>	Thermal Resistance Junction-to-Ambient	SOT353	(Note 6)		371	°C/W
		X2-DFN1410-6		430		
		X2-DFN1010-6		445		
θ <sub>JC</sub>	Thermal Resistance Junction-to-Case	SOT353	(Note 6)		143	°C/W
		X2-DFN1410-6		190		
		X2-DFN1010-6		250		

Note: 6. Test condition for SOT353, X2-DFN1410-6, and X2-DFN1010-6 devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

**Parameter Measurement Information**



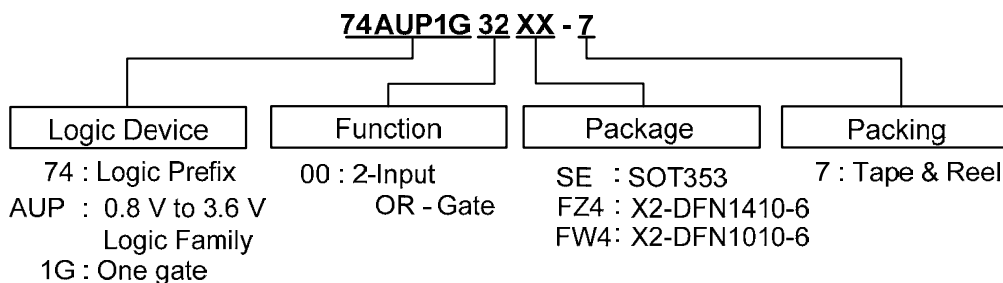
V <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>		
0.8V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
1.2V ± 0.1V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
1.5V ± 0.1V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
1.8V ± 0.15V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
2.5V ± 0.2V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF
3.3V ± 0.3V	V <sub>CC</sub>	≤3ns	V <sub>CC</sub> /2	5, 10, 15, 30pF



**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>.

## Ordering Information

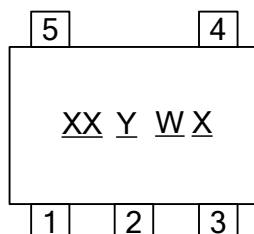


Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74AUP1G32SE-7	SE	SOT353	3000/Tape & Reel	-7
74AUP1G32FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7
74AUP1G32FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7

## Marking Information

### (1) SOT353

(Top View)

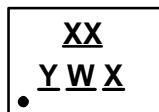


XX : Identification code  
Y : Year 0~9  
W : Week : A~Z : 1~26 week;  
a~z : 27~52 week; z represents  
52 and 53 week  
X : A~Z : Internal code

Part Number	Package	Identification Code
74AUP1G32SE	SOT353	XU

### (2) X2-DFN1410-6 and X2-DFN1010-6

(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

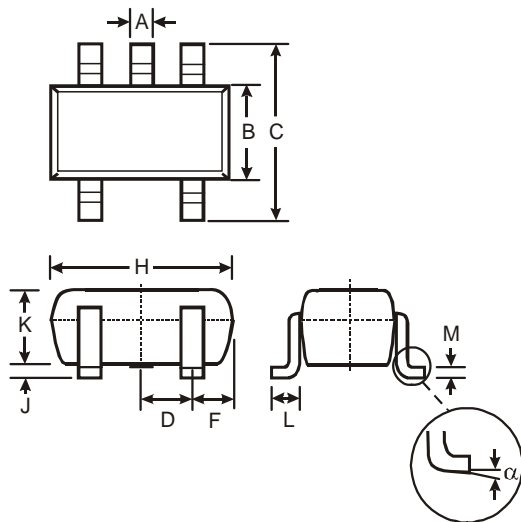
Part Number	Package	Identification Code
74AUP1G32FZ4	X2-DFN1410-6	XU
74AUP1G32FW4	X2-DFN1010-6	XU



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

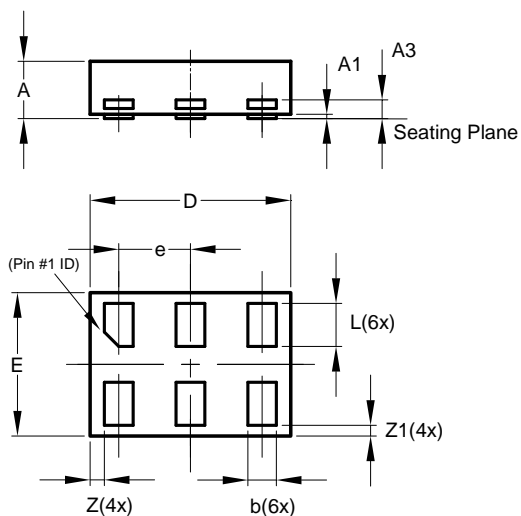
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

(1) SOT353



SOT353			
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			

(2) X2-DFN1410-6

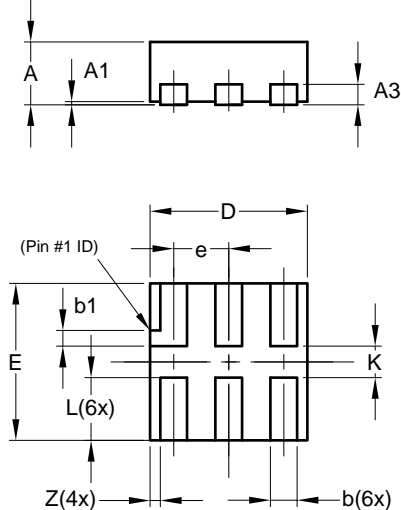


X2-DFN1410-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

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

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

(3) X2-DFN1010-6

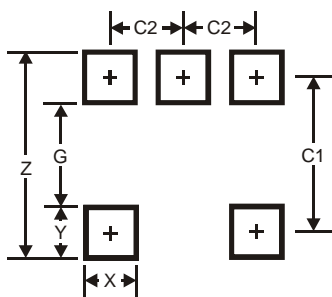


X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

**Suggested Pad Layout**

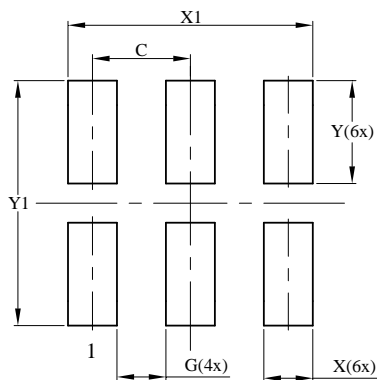
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version

(1) SOT353



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

(2) X2-DFN1410-6

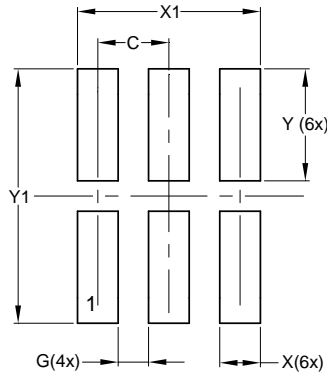


Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

## Suggested Pad Layout (cont.)

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

### (3) X2-DFN1010-6



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

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