SINGLE INVERTER WITH OPEN DRAIN OUTPUT

Description

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

The 74AUP1G06 is a single inverter with an open drain 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_{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:

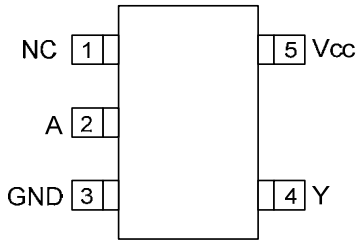
$Y = \overline{A}$

Features

- 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_{CC} < 0.9µA
- Low Dynamic Power Consumption
  - C_{PD} = 6 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 250 mV at Vcc = 3.0V
- I_{OFF} 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)**

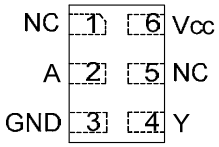
Pin Assignments

(Top View)



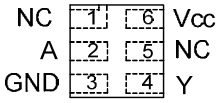
SOT353

(Top View)



DFN1410

(Top View)



DFN1010

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

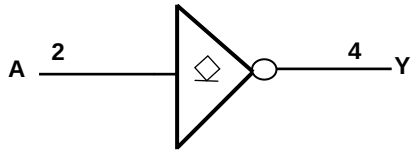
Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined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

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

Pin Descriptions

Pin Name	Function
NC	No Connection
A	Data Input
GND	Ground
Y	Data Output
V_{CC}	Supply Voltage

Logic Diagram



Function Table

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

Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	KV
ESD CDM	Charged Device Model ESD Protection	1	KV
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})	±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	°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		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} = 0.8V		20	uA
		V_{CC} = 1.1V		1.1	mA
		V_{CC} = 1.4V		1.7	
		V_{CC} = 1.65V		1.9	
		V_{CC} = 2.3V		3.1	
		V_{CC} = 3.0V		4	
Δt/ΔV	Input Transition Rise or Fall Rate	V_{CC} = 0.8V to 3.6V		200	ns/V
T_A	Operating Free-Air Temperature		-40	125	°C

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

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC}	T_A = +25°C		T_A = -40°C to +85°C		Unit
				Min	Max	Min	Max	
V_{IH}	High-Level Input Voltage		0.8V to 1.65V	0.80 X V_{CC}		0.80 X V_{CC}		V
			1.65V to 1.95V	0.65 X V_{CC}		0.65 X V_{CC}		
			2.3V to 2.7V	1.6		1.6		
			3.0V to 3.6V	2.0		2.0		
V_{IL}	Low-Level Input Voltage		0.8V to 1.65V		0.30 X V_{CC}		0.30 X V_{CC}	V
			1.65V to 1.95V		0.35 X V_{CC}		0.35 X V_{CC}	
			2.3V to 2.7V		0.7		0.7	
			3.0V to 3.6V		0.9		0.9	
V_{OL}	High-Level Input Voltage	I_{OL} = 20μA	0.8V to 3.6V		0.1		0.1	V
		I_{OL} = 1.1mA	1.1V		0.3 X V_{CC}		0.3 X V_{CC}	
		I_{OL} = 1.7mA	1.4V		0.31		0.37	
		I_{OL} = 1.9mA	1.65V		0.31		0.35	
		I_{OL} = 2.3mA	2.3V		0.31		0.33	
		I_{OL} = 3.1mA			0.44		0.45	
		I_{OL} = 2.7mA	3V		0.31		0.33	
		I_{OL} = 4mA			0.44		0.45	
I_I	Input Current	A or B Input V_I = GND to 3.6V	0V to 3.6V		± 0.1		± 0.5	μA
I_{OFF}	Power Down Leakage Current	V_I or V_O = 0V to 3.6V	0V		± 0.2		± 0.5	μA
I_{OZ}	Z State Leakage Current	V_O = 3.6V V_i = 3.6V	3.6V		± 0.2		± 0.5	μA
ΔI_{OFF}	Delta Power Down Leakage Current	V_I or V_O = 0V to 3.6V	0V to 0.2V		0.2		0.6	μA
I_{CC}	Supply Current	V_I = GND or V_{CC}, I_O = 0	0.8Vto 3.6V		0.5		0.9	μA
ΔI_{CC}	Additional Supply Current	Input at V_{CC} -0.6V	3.3V		40		50	μA

Electrical Characteristics (cont.) (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC}	T_A = -40°C to +125°C		Unit
				Min	Max	
V_{IH}	High-Level Input Voltage		0V to 1.65V	0.80 X V_{CC}		V
			1.65V to 1.95V	0.70 X V_{CC}		
			2.3V to 2.7 V	1.6		
			3.0 V to 3.6V	2.0		
V_{IL}	Low-Level Input Voltage		0.8V to 1.65V		0.25X V_{CC}	V
			1.65V to 1.95V		0.35 X V_{CC}	
			2.3V to 2.7V		0.7	
			3.0V to 3.6V		0.9	
V_{OL}	High-Level Input Voltage	I_{OL} = 20μA	0.8V to 3.6V		0.11	V
		I_{OL} = 1.1mA	1.1V		0.3 X V_{CC}	
		I_{OL} = 1.7mA	1.4V		0.41	
		I_{OL} = 1.9mA	1.65V		0.39	
		I_{OL} = 2.3mA	2.3V		0.36	
		I_{OL} = 3.1mA			0.50	
		I_{OL} = 2.7mA	3V		0.36	
		I_{OL} = 4mA			0.50	
I_I	Input Current	A or B Input V_I = GND to 3.6V	0V to 3.6V		± 0.75	μA
I_{OFF}	Power Down Leakage Current	V_I or V_O = 0V to 3.6V	0V		± 3.5	μA
I_{OZ}	Z State Leakage Current	V_O = 3.6V V_i = 3.6V	3.6V		± 1.5	μA
ΔI_{OFF}	Delta Power Down Leakage Current	V_I or V_O = 0V to 3.6V	0V to 0.2V		± 2.5	μA
I_{CC}	Supply Current	V_I = GND or V_{CC}, I_O = 0	0.8V to 3.6V		3.0	μA
ΔI_{CC}	Additional Supply Current	Input at V_{CC} -0.6V	3.3V		75	μA

Switching Characteristics

C_L = 5pF see Figure 1

Parameter	From Input	TO OUTPUT	V_{CC}	T_A = +25°C			T_A = -40°C to +85°C		T_A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.8V		12.8						ns
			1.2V ± 0.1V	2.0	4.3	9.9	2	10.9	2	12	
			1.5V ± 0.1V	1.5	3.1	6.1	1.5	7.1	1.5	7.8	
			1.8V ± 0.15V	1.2	2.8	4.7	1.2	5.7	1.2	6.3	
			2.5V ± 0.2V	1	2.2	3.2	1	3.9	1	4.3	
			3.3V ± 0.3V	0.8	2.2	3.3	0.8	3.6	0.8	4	

C_L = 10pF see Figure 1

Parameter	From Input	TO OUTPUT	V_{CC}	T_A = +25°C			T_A = -40°C to +85°C		T_A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.8V		15.8						ns
			1.2V ± 0.1V	2.5	5.4	11.2	2.5	13.2	2.5	15	
			1.5V ± 0.1V	2	3.9	7	2	8.5	2	9.4	
			1.8V ± 0.15V	1.7	3.6	5.4	1.7	6.7	1.7	7.4	
			2.5V ± 0.2V	1.4	2.9	3.8	1.4	4.5	1.4	5	
			3.3V ± 0.3V	1.2	3.2	4.6	1.2	4.9	1.2	5.4	

C_L = 15pF see Figure 1

Parameter	From Input	TO OUTPUT	V_{CC}	T_A = +25°C			T_A = -40°C to +85°C		T_A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.8V		18.8						ns
			1.2V ± 0.1V	2.9	6.4	12.2	2.9	15.2	2.9	17	
			1.5V ± 0.1V	2.3	4.6	7.7	2.3	9.4	2.3	10	
			1.8V ± 0.15V	2.1	4.5	6.6	2.1	7.3	2.1	8.1	
			2.5V ± 0.2V	1.7	3.5	4.6	1.7	5.1	1.7	5.7	
			3.3V ± 0.3V	1.5	4	6	1.5	6.5	1.5	7.2	

C_L = 30pF see Figure 1

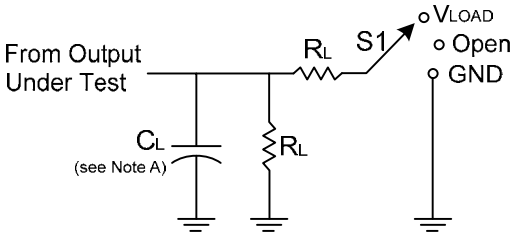
Parameter	From Input	TO OUTPUT	V_{CC}	T_A = +25°C			T_A = -40°C to +85°C		T_A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A	Y	0.8 V		27.8						ns
			1.2V ± 0.1V	3.9	9.3	16.5	3.9	19.3	3.9	21.3	
			1.5V ± 0.1V	3.2	6.8	10.1	3.2	12	3.2	13.2	
			1.8 V ± 0.15V	2.9	6.8	10.7	2.9	11	2.9	12.1	
			2.5V ± 0.2V	2.5	5.3	7.2	2.5	7.8	2.5	8.6	
			3.3V ± 0.3V	2.3	6.5	10.5	2.3	10.8	2.3	11.9	

Operating and Package Characteristics (@T_A = +25°C, unless otherwise specified.)

Parameter		Test Conditions		V_{CC}	Typ	Unit
C_{pd}	Power Dissipation Capacitance	f = 1MHz No Load		0.8V	2.6	pF
				1.2V ± 0.1V	2.8	
				1.5V ± 0.1V	2.9	
				1.8V ± 0.15V	3.1	
				2.5V ± 0.2V	3.6	
				3.3V ± 0.3V	4.2	
C_i	Input Capacitance	V_i = V_{CC} or GND		0V or 3.3V	1.5	pF
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT353	(Note 6)		371	°C/W
		X2-DFN1410-6			430	
		X2-DFN1010-6			445	
θ_{JC}	Thermal Resistance Junction-to-Case	SOT353	(Note 6		143	°C/W
		X2-DFN1410-6			190	
		X2-DFN1010-6			250	

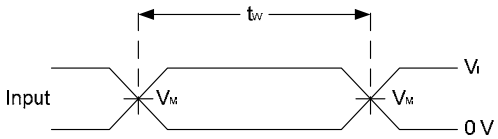
Notes: 6. Test condition for SOT353, X2-DFN1410-6, and X2-DFN1010-6 devices mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Parameter Measurement Information

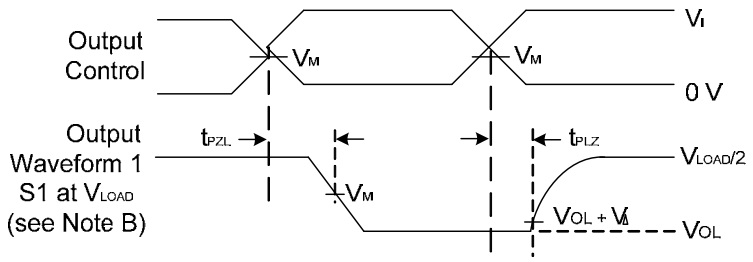


TEST	S1	R_L
t_{PLZ}/t_{PZL}	Vload	5KΩ

V_{CC}	Inputs		V_M	V_{LOAD}	C_L	$V\Delta$
	V_I	t_r/t_f				
0.8V	V_{CC}	≤3ns	$V_{CC}/2$	2 X V_{CC}	5, 10, 15, 30pF	0.1V
1.2V±0.1V	V_{CC}	≤3ns	$V_{CC}/2$	2 X V_{CC}	5, 10, 15, 30pF	0.1V
1.5V±0.1V	V_{CC}	≤3ns	$V_{CC}/2$	2 X V_{CC}	5, 10, 15, 30pF	0.1V
1.8V±0.15V	V_{CC}	≤3ns	$V_{CC}/2$	2 X V_{CC}	5, 10, 15, 30pF	0.15V
2.5V±0.2V	V_{CC}	≤3ns	$V_{CC}/2$	2 X V_{CC}	5, 10, 15, 30pF	0.15V
3.3V±0.3V	V_{CC}	≤3ns	$V_{CC}/2$	2 X V_{CC}	5, 10, 15, 30pF	0.3V



Voltage Waveform Pulse Duration

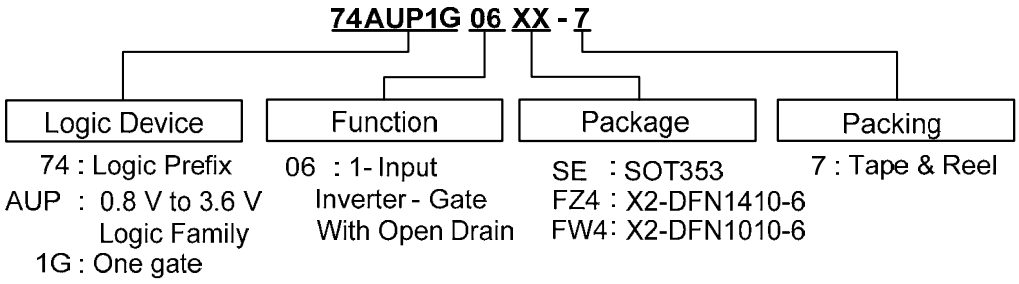


Voltage Waveform Enable and Disable Times
Low and High Level Enabling

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. For the open drain device the specified propagation delay t_{PD} is the same as t_{PLZ} and t_{PZL}.

Ordering Information

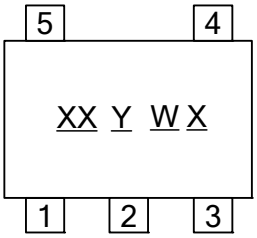


Part Number	Package Code	Packaging	7" Tape and Reel	
			Quantity	Part Number Suffix
74AUP1G06SE-7	SE	SOT353	3000/Tape & Reel	-7
74AUP1G06FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7
74AUP1G06FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7

Marking Information

(1) SOT353

(Top View)

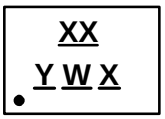


XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Internal code

Part Number	Package	Identification Code
74AUP1G06SE	SOT353	XM

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

(Top View)



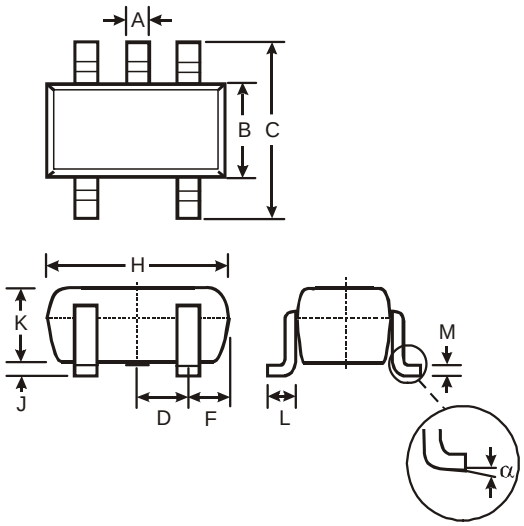
XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents 52 and 53 week
X : A~Z : Internal code

Part Number	Package	Identification Code
74AUP1G06FZ4	X2-DFN1410-6	XM
74AUP1G06FW4	X2-DFN1010-6	XM

Package Outline Dimensions (All dimensions in mm.)

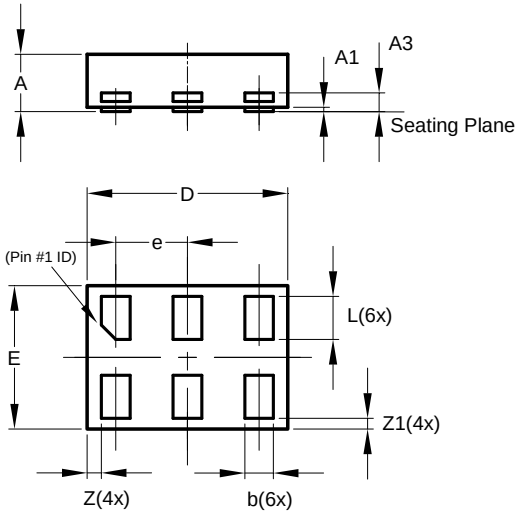
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(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

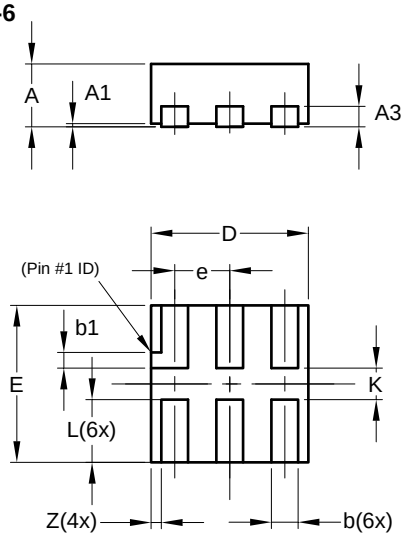


X2-DFN1410-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

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

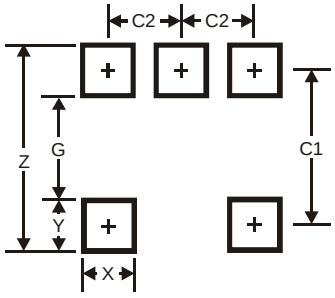


X2-DFN1010-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

Suggested Pad Layout

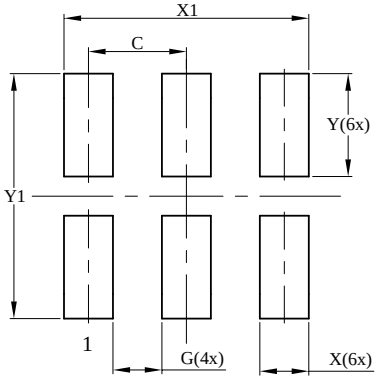
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version

(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

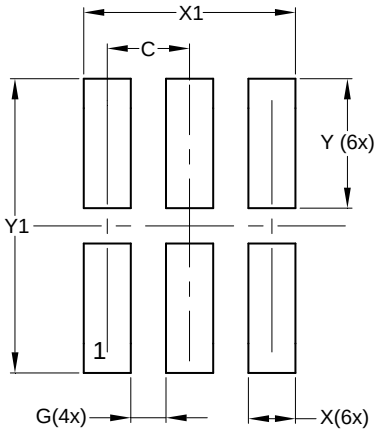


Dimensions	Value (in mm)
C	0.500
G	0.250
X	0.250
X1	1.250
Y	0.525
Y1	1.250

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)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250