

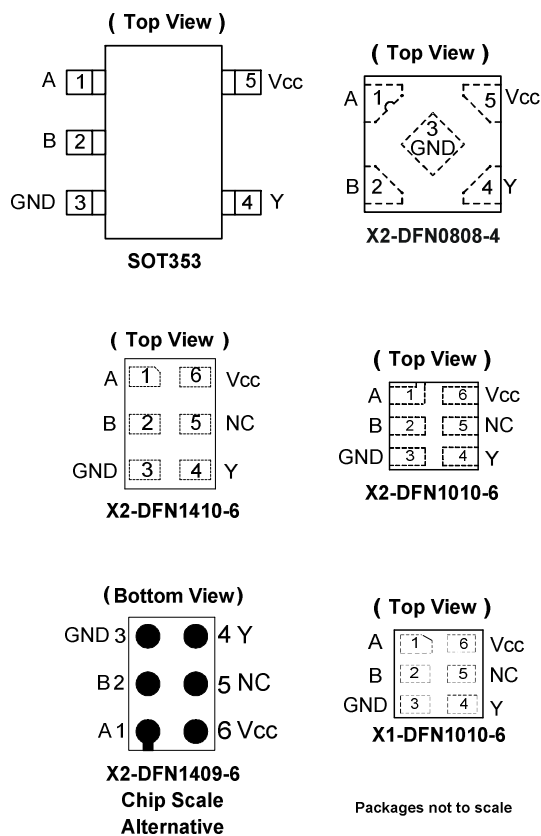
Description

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

The 74AUP1G00 is a single two-input positive NAND 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_{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:

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

Pin Assignments



Features

- Advanced Ultra Low Power (AUP) CMOS
- Supply Voltage Range from 0.8V to 3.6V
- ± 4 mA Output Drive at 3.0V
- Low Static Power Consumption
 $I_{CC} < 0.9\mu A$
- Low Dynamic Power Consumption
 $C_{PD} = 6pF$ (Typical at 3.6V)
- Schmitt Trigger Action at all inputs makes 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 Exceeds JESD 22
2000-V Human Body Model (A114)
Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- Leadless Packages Named per JESD30E
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

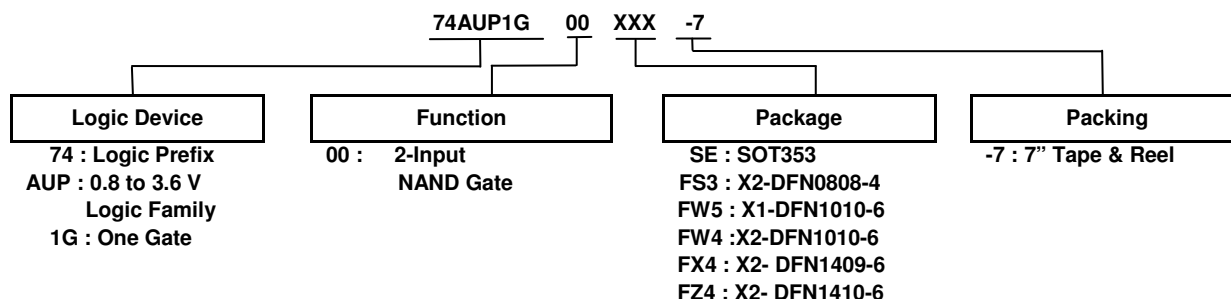
Applications

- 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, SSDs, CD/DVD ROMs
 - TVs, DVDs, DVRs, Set-Top Boxes

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 (Notes 4 & 5)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74AUP1G00SE-7	SE	SOT353	2.0mm x 2.0mm x 1.1mm 0.65 mm lead pitch	3,000/Tape & Reel	-7
74AUP1G00FS3-7	FS3	X2-DFN0808-4	0.8mm x 0.8mm x 0.35mm 0.5 mm pad pitch (diamond)	5,000/Tape & Reel	-7
74AUP1G00FW5-7	FW5	X1-DFN1010-6	1.0mm x 1.0mm x 0.5mm 0.35 mm pad pitch	5,000/Tape & Reel	-7
74AUP1G00FW4-7	FW4	X2-DFN1010-6	1.0mm x 1.0mm x 0.4mm 0.35 mm pad pitch	5,000/Tape & Reel	-7
74AUP1G00FX4-7	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
74AUP1G00FZ4-7	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	Function
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
V _{CC}	Supply Voltage

Logic Diagram



Function Table

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

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
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

Notes: 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		0.8	3.6	V
V _I	Input Voltage		0	3.6	V
V _O	Output Voltage		0	V _{CC}	V
I _{OH}	High-Level Output Current	V _{CC} = 0.8V	—	-20	μA
		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	
I _{OL}	Low-Level Output Current	V _{CC} = 0.8V	—	20	μA
		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: 8. 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 _{OH}	High-Level Output Voltage	I _{OH} = -20μA	0.8V to 3.6V	V _{CC} - 0.1	—	V _{CC} - 0.1	—	V
		I _{OH} = -1.1mA	1.1V	0.75 x V _{CC}	—	0.7 x V _{CC}	—	
		I _{OH} = -1.7mA	1.4V	1.11	—	1.03	—	
		I _{OH} = -1.9mA	1.65V	1.32	—	1.3	—	
		I _{OH} = -2.3mA	2.3V	2.05	—	1.97	—	
		I _{OH} = -3.1mA		1.9	—	1.85	—	
		I _{OH} = -2.7mA	3V	2.72	—	2.67	—	
		I _{OH} = -4mA		2.6	—	2.55	—	
V _{OL}	Low-Level Output 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	0 to 3.6V	—	± 0.1	—	± 0.5	μA
I _{OFF}	Power Down Leakage Current	V _I or V _O = 0V to 3.6V	0	—	0.2	—	0.6	μA
ΔI _{OFF}	Delta Power Down Leakage Current	V _I or V _O = 0V to 3.6V	0 V to 0.2V	—	0.2	—	0.6	μA
I _{CC}	Supply Current	V _I = GND or V _{CC} , I _O = 0	0.8 V to 3.6V	—	0.5	—	0.9	μA
ΔI _{CC}	Additional Supply Current	One Input at V _{CC} -0.6V Other Inputs at V _{CC} or GND	3.3V	—	40	—	50	μA

Electrical Characteristics (continued) (@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	—	0.8V to 1.65V	0.80 x V _{CC}	—	V
		—	1.65V to 1.95V	0.70 x V _{CC}	—	
		—	2.3V to 2.7V	1.6	—	
		—	3.0V to 3.6V	2.0	—	
V _{IL}	Low-Level Input Voltage	—	0.8V to 1.65V	—	0.25 x V _{CC}	V
		—	1.65V to 1.95V	—	0.30 x V _{CC}	
		—	2.3V to 2.7V	—	0.7	
		—	3.0V to 3.6V	—	0.9	
V _{OH}	High-Level Output Voltage	I _{OH} = -20μA	0.8V to 3.6V	V _{CC} - 0.11	—	V
		I _{OH} = -1.1mA	1.1V	0.6 x V _{CC}	—	
		I _{OH} = -1.7mA	1.4V	0.93	—	
		I _{OH} = -1.9mA	1.65V	1.17	—	
		I _{OH} = -2.3mA	2.3V	1.77	—	
		I _{OH} = -3.1mA		1.67	—	
		I _{OH} = -2.7mA	3V	2.40	—	
		I _{OH} = -4mA		2.30	—	
V _{OL}	Low-Level Output Voltage	I _{OL} = 20μA	0.8V to 3.6V	—	0.11	V
		I _{OL} = 1.1mA	1.1V	—	0.33 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	0 to 3.6V	—	± 0.75	μA
I _{OFF}	Power Down Leakage Current	V _I or V _O = 0V to 3.6V	0	—	± 3.5	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 Other Inputs at V _{CC} or GND	3.3V	—	75	μA

Switching Characteristics

 $C_L = 5\text{pF}$, See Figure 1

Parameter	From Input	TO OUTPUT	V_{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V	—	17.5	—	—	—	—	—	ns
			$1.2\text{V} \pm 0.1\text{V}$	2.5	5.3	11.0	2.1	12.2	2.1	13.5	
			$1.5\text{V} \pm 0.1\text{V}$	2.0	3.8	6.8	1.8	7.8	1.8	8.6	
			$1.8\text{V} \pm 0.15\text{V}$	1.6	3.1	5.3	1.4	6.2	1.4	6.9	
			$2.5\text{V} \pm 0.2\text{V}$	1.3	2.5	4.0	1.1	4.7	1.1	5.2	
			$3.3\text{V} \pm 0.3\text{V}$	1.0	2.2	3.6	1.0	4.2	1.0	4.7	

 $C_L = 10\text{pF}$, See Figure 1

Parameter	From Input	TO OUTPUT	V_{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V	—	21.0	—	—	—	—	—	ns
			$1.2\text{V} \pm 0.1\text{V}$	2.4	6.1	13.0	2.2	14.4	2.2	15.9	
			$1.5\text{V} \pm 0.1\text{V}$	2.4	4.4	7.9	2.2	9.2	2.2	10.2	
			$1.8\text{V} \pm 0.15\text{V}$	2.0	3.7	6.2	1.9	7.3	1.9	8.1	
			$2.5\text{V} \pm 0.2\text{V}$	1.4	3.0	4.7	1.3	5.6	1.3	6.2	
			$3.3\text{V} \pm 0.3\text{V}$	1.3	2.8	4.3	1.2	4.9	1.2	5.4	

 $C_L = 15\text{pF}$, See Figure 1

Parameter	From Input	TO OUTPUT	V_{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V	—	24.5	—	—	—	—	—	ns
			$1.2\text{V} \pm 0.1\text{V}$	3.4	6.9	14.8	3.1	16.5	3.1	18.2	
			$1.5\text{V} \pm 0.1\text{V}$	2.8	5.0	8.9	2.5	10.5	2.5	11.6	
			$1.8\text{V} \pm 0.15\text{V}$	2.0	4.1	7.0	2.0	8.3	2.0	9.2	
			$2.5\text{V} \pm 0.2\text{V}$	1.7	3.5	5.3	1.5	6.4	1.5	7.1	
			$3.3\text{V} \pm 0.3\text{V}$	1.6	3.2	4.9	1.4	5.7	1.4	6.3	

 $C_L = 30\text{pF}$, See Figure 1

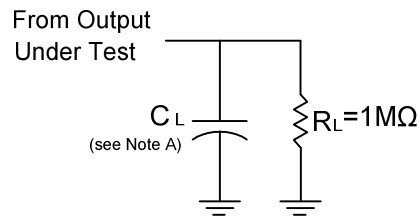
Parameter	From Input	TO OUTPUT	V_{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V	—	34.8	—	—	—	—	—	ns
			$1.2\text{V} \pm 0.1\text{V}$	4.6	17.5	22.0	4.1	22.6	4.1	24.9	
			$1.5\text{V} \pm 0.1\text{V}$	3.0	6.5	11.8	2.9	14.0	2.9	15.4	
			$1.8\text{V} \pm 0.15\text{V}$	2.6	5.4	9.3	2.3	11.1	2.3	12.3	
			$2.5\text{V} \pm 0.2\text{V}$	2.4	4.6	7.1	2.1	8.5	2.1	9.4	
			$3.3\text{V} \pm 0.3\text{V}$	2.3	2.6	6.5	2.1	7.6	2.1	8.4	

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	6.5	pF
				1.2V ± 0.1V	6.3	
				1.5V ± 0.1V	6.3	
				1.8V ± 0.15V	6.2	
				2.5V ± 0.2V	6.2	
				3.3V ± 0.3V	6.1	
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 9)	—	371	°C/W
		X2-DFN0808-4		—	430	
		X1-DFN1010-6		—	435	
		X2-DFN1010-6		—	445	
		X2-DFN1409-6		—	470	
		X2-DFN1410-6		—	460	
θ _{JC}	Thermal Resistance Junction-to-Case	SOT353	(Note 9)	—	143	°C/W
		X2-DFN0808-4		—	240	
		X1-DFN1010-6		—	250	
		X2-DFN1010-6		—	250	
		X2-DFN1409-6		—	275	
		X2-DFN1410-6		—	265	

Note: 9. Test condition for each of the six package types: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Parameter Measurement Information



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

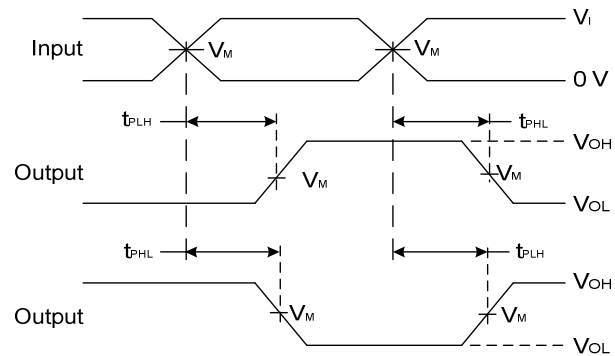
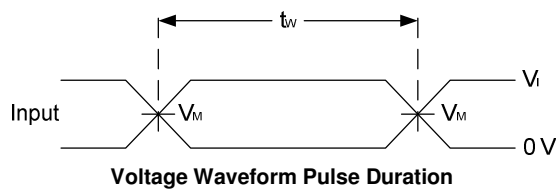
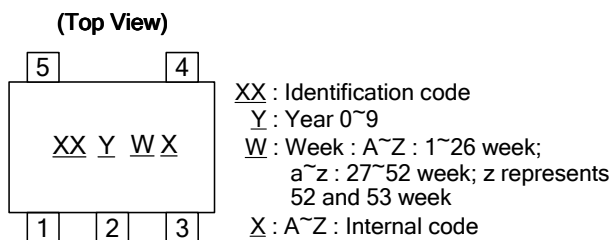


Figure 1 Load Circuit and Voltage Waveforms

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate $\leq 10MHz$.
 - C. Inputs are measured separately one transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{PD} .

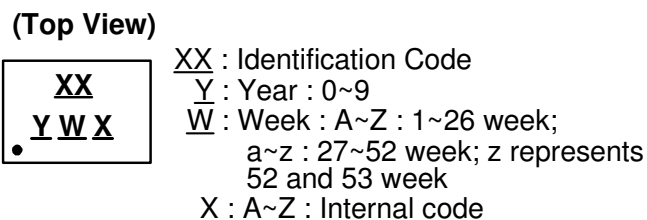
Marking Information

(1) SOT353



Part Number	Package	Identification Code
74AUP1G00SE-7	SOT353	XH

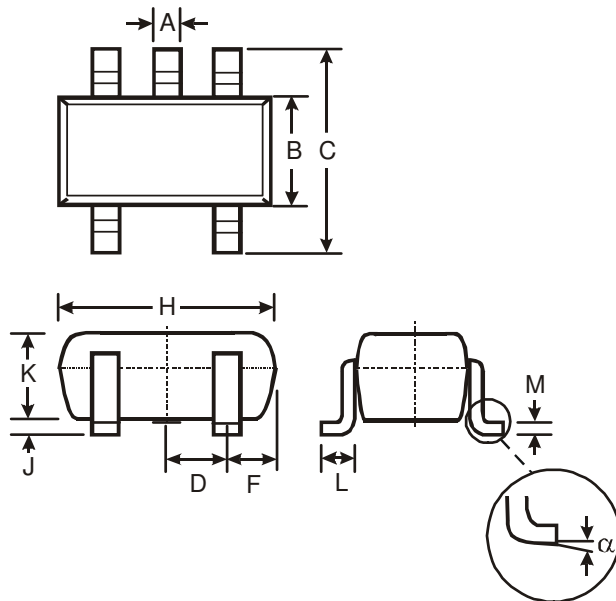
(2) X2-DFN0808-4, X1-DFN1010-6, X2-DFN1010-6, X2-DFN1409-6 and X2-DFN1410-6



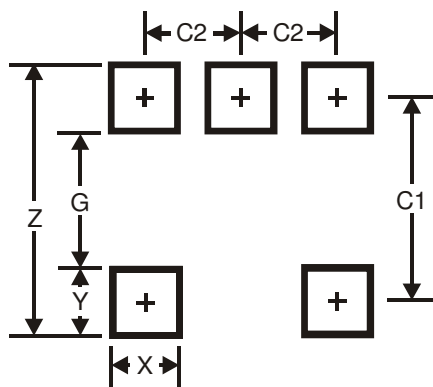
Part Number	Package	Identification Code
74AUP1G00FS3-7	X2-DFN0808-4	YJ
74AUP1G00FW5-7	X1-DFN1010-6	Q1
74AUP1G00FW4-7	X2-DFN1010-6	XH
74AUP1G00FX4-7	X2-DFN1409-6	HA
74AUP1G00FZ4-7	X2-DFN1410-6	XH

SOT353 Package Outline Dimensions and Suggested Pad Layout

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



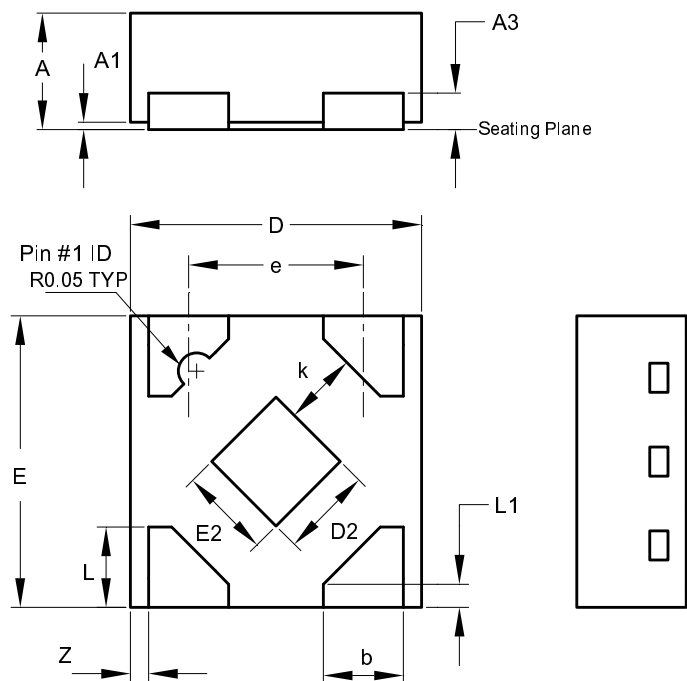
SOT353			
Dim	Min	Max	Typ
A	0.10	0.30	0.25
B	1.15	1.35	1.30
C	2.00	2.20	2.10
D	0.65 Typ		
F	0.40	0.45	0.425
H	1.80	2.20	2.15
J	0	0.10	0.05
K	0.90	1.00	1.00
L	0.25	0.40	0.30
M	0.10	0.22	0.11
α	0°	8°	-
All Dimensions in mm			



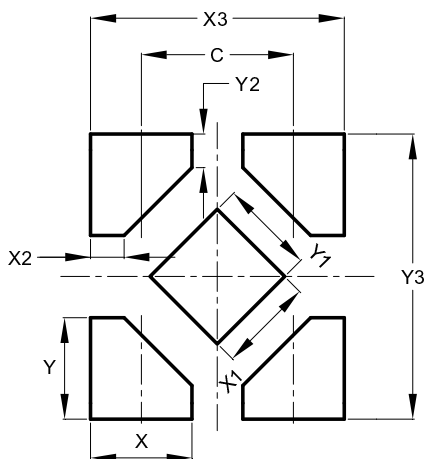
Dimensions	Value (in mm)
Z	2.5
G	1.3
X	0.42
Y	0.6
C1	1.9
C2	0.65

X2-DFN0808-4 Package Outline Dimensions and Suggested Pad Layout

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

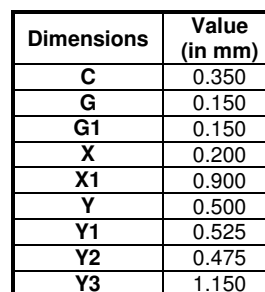
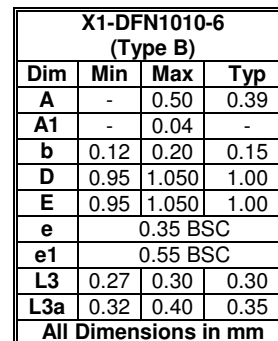


X2-DFN0808-4			
Dim	Min	Max	Typ
A	0.25	0.35	0.30
A1	0	0.04	0.02
A3	-	-	0.13
b	0.17	0.27	0.22
D	0.75	0.85	0.80
D2	0.15	0.35	0.25
E	0.75	0.85	0.80
E2	0.15	0.35	0.25
e	-	-	0.48
k	0.20	-	-
L	0.17	0.27	0.22
L1	0.02	0.12	0.07
z	-	-	0.05
All Dimensions in mm			



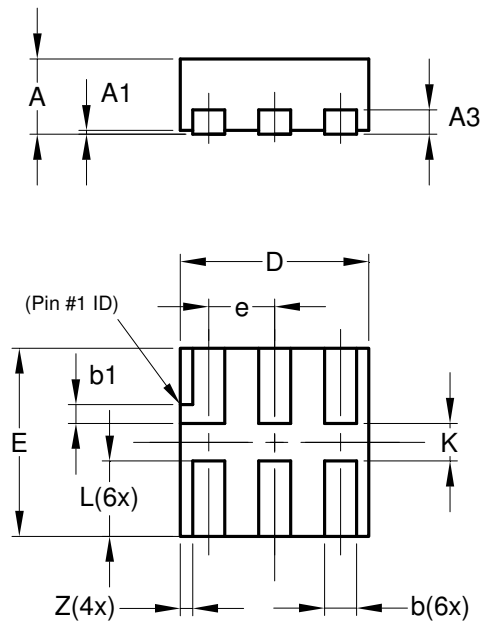
Dimensions	Value
C	0.480
X	0.320
X1	0.300
X2	0.106
X3	0.800
Y	0.320
Y1	0.300
Y2	0.106
Y3	0.900

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

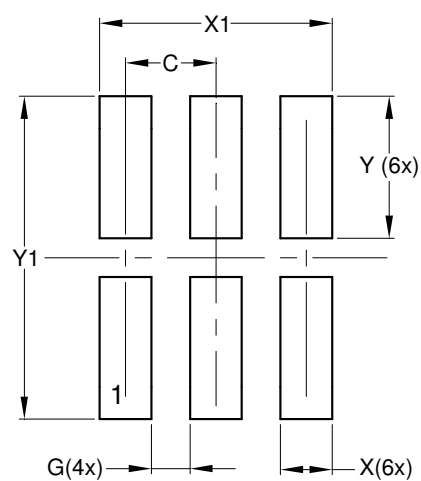


X2-DFN1010-6 Package Outline Dimensions and Suggested Pad Layout

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



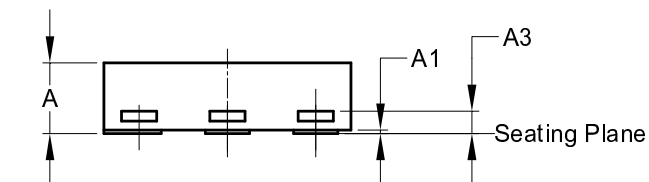
X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			



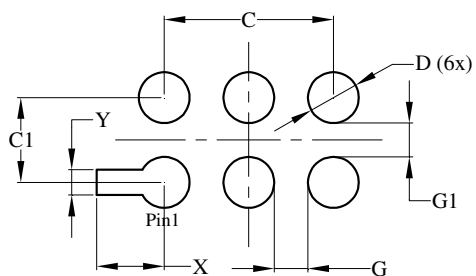
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

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.



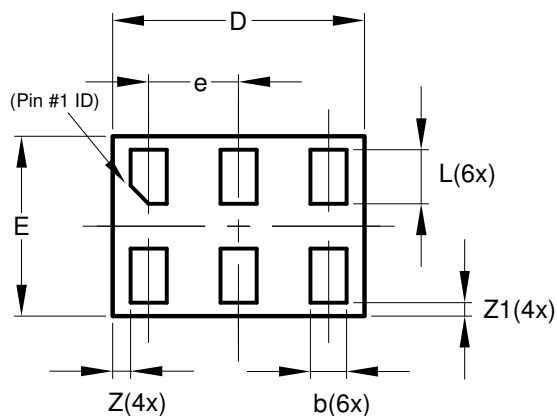
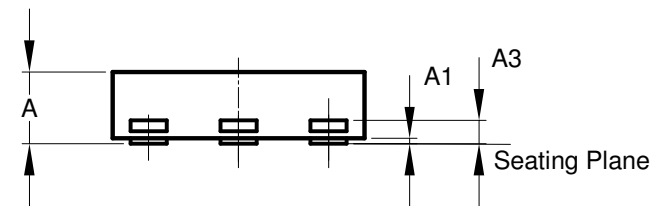
X2-DFN1409-6			
Dim	Min	Max	Typ
A	-	0.40	0.39
A1	0	0.05	0.02
A3	-	-	0.13
Ø	0.20	0.30	0.25
D	1.35	1.45	1.40
E	0.85	0.95	0.90
e1	-	-	0.50
e2	-	-	0.50
Z1	-	-	0.075
Z2	-	-	0.075
All Dimensions in mm			



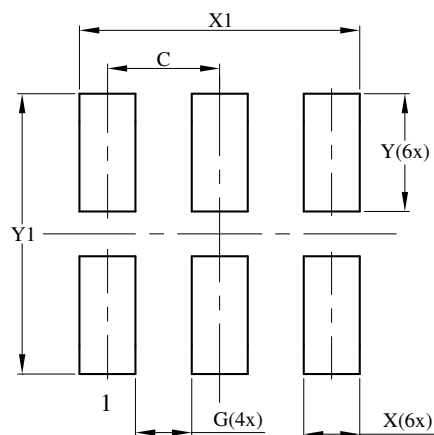
Dimensions	Value (in mm)
C	1.000
C1	0.500
D	0.300
G	0.200
G1	0.200
X	0.400
Y	0.150

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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