

Description

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

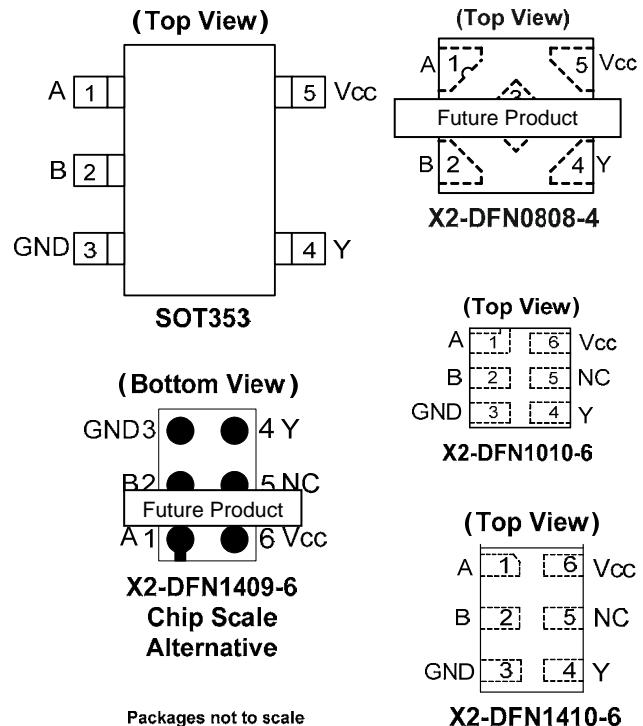
The 74AUP1G02 is a single 2-input positive NOR gate with a standard push-pull output designed for operation over a power supply range of 0.8V to 3.6V. The device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output preventing damaging current backflow when the device is powered down. The gate performs the positive Boolean function:

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

Features

- Advanced Ultra Low Power (AUP) CMOS
- Supply Voltage Range from 0.8V to 3.6V
- $\pm 4\text{mA}$ Output Drive at 3.0V
- Low Static power consumption
 - $I_{CC} < 0.9\mu\text{A}$
- Low Dynamic Power Consumption
 - $C_{PD} = 6.4\text{pF}$ (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 250 mV at $V_{CC} = 3.0\text{V}$
- 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
- Leadless packages named per JESD30E
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Pin Assignments



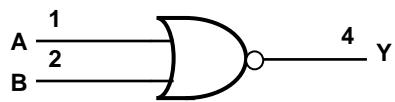
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products 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
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	L
H	L	L
H	H	L

Absolute Maximum Ratings (Note 4) (@ $T_A = +25^\circ\text{C}$, 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	$^\circ\text{C}$
T_{STG}	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 recommend 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_{OH}	High-Level Output Current	$V_{CC} = 0.8\text{V}$	-20	μA
		$V_{CC} = 1.1\text{V}$	-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	
I_{OL}	Low-Level Output Current	$V_{CC} = 0.8\text{V}$	20	μA
		$V_{CC} = 1.1\text{V}$	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 3.6V	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 _{CC}	$T_A = +25^\circ\text{C}$		$T_A = -40^\circ\text{C} \text{ to } +85^\circ\text{C}$		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		
			3.0 V 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} = 4 mA			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	0V to 0.2V		0.2		0.6	µA
I _{CC}	Supply Current	V _I = GND or V _{CC} , I _O = 0	0.8V 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 (cont.) (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC}	$T_A = -40^\circ\text{C} \text{ to } +125^\circ\text{C}$		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	$I_{OH} = -20 \mu\text{A}$	0.8V to 3.6V	$V_{CC} - 0.11$		V
		$I_{OH} = -1.1 \text{ mA}$	1.1V	0.6 X V_{CC}		
		$I_{OH} = -1.7 \text{ mA}$	1.4V	0.93		
		$I_{OH} = -1.9 \text{ mA}$	1.65V	1.17		
		$I_{OH} = -2.3 \text{ mA}$	2.3V	1.77		
		$I_{OH} = -3.1 \text{ mA}$		1.67		
		$I_{OH} = -2.7 \text{ mA}$	3V	2.40		
		$I_{OH} = -4 \text{ mA}$		2.30		
V_{OL}	Low-Level Output Voltage	$I_{OL} = 20 \mu\text{A}$	0.8V to 3.6V		0.11	V
		$I_{OL} = 1.1 \text{ mA}$	1.1V		0.33 X V_{CC}	
		$I_{OL} = 1.7 \text{ mA}$	1.4V		0.41	
		$I_{OL} = 1.9 \text{ mA}$	1.65V		0.39	
		$I_{OL} = 2.3 \text{ mA}$	2.3V		0.36	
		$I_{OL} = 3.1 \text{ mA}$			0.50	
		$I_{OL} = 2.7 \text{ mA}$	3V		0.36	
		$I_{OL} = 4 \text{ mA}$			0.50	
I_I	Input Current	A or B Input $V_I = \text{GND to } 3.6\text{V}$	0 to 3.6V		± 0.75	μA
I_{OFF}	Power Down Leakage Current	V_I or $V_O = 0\text{V to } 3.6\text{V}$	0		± 3.5	μA
ΔI_{OFF}	Delta Power Down Leakage Current	V_I or $V_O = 0\text{V to } 3.6\text{V}$	0V to 0.2V		± 2.5	μA
I_{CC}	Supply Current	$V_I = \text{GND or } V_{CC}, I_O = 0$	0.8V to 3.6V		3.0	μA
ΔI_{CC}	Additional Supply Current	Input at $V_{CC} - 0.6\text{V}$ 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}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C} \text{ to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C} \text{ to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V		17.0						ns
			$1.2V \pm 0.1V$	2.5	5.1	10.8	2.1	12.1	2.1	13.4	
			$1.5V \pm 0.1V$	1.6	3.7	6.7	1.4	7.8	1.4	8.6	
			$1.8V \pm 0.15V$	1.3	3.0	5.3	1.1	6.2	1.1	6.9	
			$2.5V \pm 0.2V$	1.0	2.4	3.9	0.9	4.6	0.9	5.1	
			$3.3V \pm 0.3V$	1.0	2.2	3.4	0.8	4.0	0.8	4.4	

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

Parameter	From Input	TO OUTPUT	V _{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C} \text{ to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C} \text{ to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V		20.4						ns
			$1.2V \pm 0.1V$	2.4	6.0	12.8	2.2	14.3	2.2	15.8	
			$1.5V \pm 0.1V$	1.9	4.3	7.9	1.7	9.2	1.7	10.2	
			$1.8V \pm 0.15V$	1.6	3.6	6.2	1.5	7.3	1.5	8.1	
			$2.5V \pm 0.2V$	1.4	3.0	4.7	1.2	5.6	1.2	6.2	
			$3.3V \pm 0.3V$	1.3	2.7	4.2	1.2	5.0	1.2	5.5	

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

Parameter	From Input	TO OUTPUT	V _{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C} \text{ to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C} \text{ to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V		23.9						ns
			$1.2V \pm 0.1V$	3.4	6.8	14.6	3.1	16.4	3.1	18.1	
			$1.5V \pm 0.1V$	2.3	4.8	8.9	2.0	10.4	2.0	11.5	
			$1.8V \pm 0.15V$	1.9	4.0	7.0	1.7	8.3	1.7	9.2	
			$2.5V \pm 0.2V$	1.7	3.4	5.4	1.5	6.3	1.5	7.0	
			$3.3V \pm 0.3V$	1.6	3.2	4.8	1.4	5.7	1.4	6.3	

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

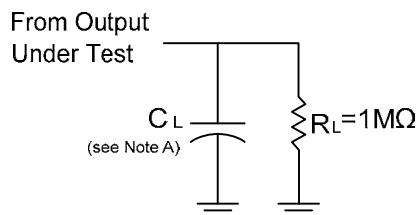
Parameter	From Input	TO OUTPUT	V _{CC}	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C} \text{ to } +85^\circ\text{C}$		$T_A = -40^\circ\text{C} \text{ to } +125^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t_{pd}	A or B	Y	0.8V		34.2						ns
			$1.2V \pm 0.1V$	4.6	19.0	22.0	4.1	22.4	4.1	24.7	
			$1.5V \pm 0.1V$	3.4	6.4	11.8	2.9	13.9	2.9	15.3	
			$1.8V \pm 0.15V$	2.6	5.3	9.3	2.3	11.1	2.3	12.3	
			$2.5V \pm 0.2V$	2.4	4.5	7.1	2.1	8.5	2.1	9.4	
			$3.3V \pm 0.3V$	2.0	2.9	6.4	2.1	7.7	2.1	8.5	

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

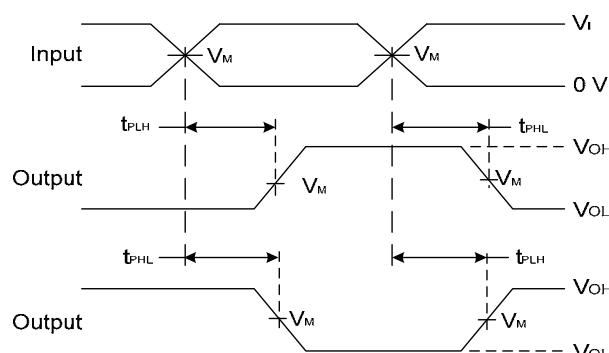
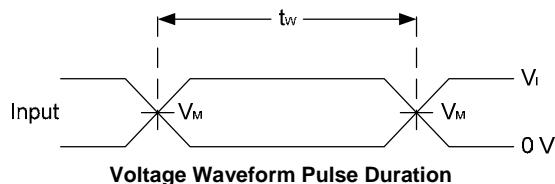
Parameter		Test Conditions		V _{CC}	Typ	Unit
C_{pd}	Power Dissipation Capacitance	$f = 1\text{MHz}$ No Load		0.8V	6.8	pF
				1.2V $\pm 0.1\text{V}$	6.7	
				1.5V $\pm 0.1\text{V}$	6.6	
				1.8V $\pm 0.15\text{V}$	6.2	
				2.5V $\pm 0.2\text{V}$	6.5	
				3.3V $\pm 0.3\text{V}$	6.4	
C_i	Input Capacitance	$V_i = V_{CC}$ or GND		0V or 3.3V	1.5	pF
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT353	(Note 6)		371	°C/W
		X2-DFN0808-4			430	
		X2-DFN1010-6			445	
		X2-DFN1409-6			470	
		X2-DFN1410-6			460	
θ_{JC}	Thermal Resistance Junction-to-Case	SOT353	(Note 6)		143	°C/W
		X2-DFN0808-4			240	
		X2-DFN1010-6			250	
		X2-DFN1409-6			275	
		X2-DFN1410-6			265	

Note: 6. Test condition for , SOT353, X2-DFN0808-4:, X2-DFN1010-6 X2-DFN1409-6 and X2-DFN1410-6: 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}	≤3ns	V _{CC} /2	5, 10, 15, 30pF
1.2V±0.1V	V _{CC}	≤3ns	V _{CC} /2	5, 10, 15, 30pF
1.5V±0.1V	V _{CC}	≤3ns	V _{CC} /2	5, 10, 15, 30pF
1.8V ±0.15V	V _{CC}	≤3ns	V _{CC} /2	5, 10, 15, 30pF
2.5V±0.2V	V _{CC}	≤3ns	V _{CC} /2	5, 10, 15, 30pF
3.3V±0.3V	V _{CC}	≤3ns	V _{CC} /2	5, 10, 15, 30pF

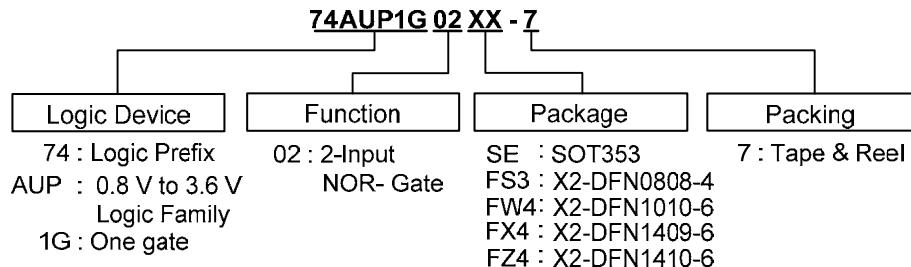


**Voltage Waveform Propagation Delay Times
Inverting and Non Inverting Outputs**

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. Inputs are measured separately one transition per measurement.
 - D. t_{P_{LH}} and t_{P_{HL}} are the same as t_{PD}.

Ordering Information



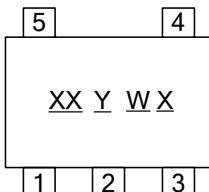
Device	Package Code	Packaging	7" Tape and Reel (Note 7)	
			Quantity	Part Number Suffix
74AUP1G02SE-7	SE	SOT353	3000/Tape & Reel	-7
74AUP1G02FS3-7**	FS3	X2-DFN0808-4	5000/Tape & Reel	-7
74AUP1G02FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7
74AUP1G02FX4-7**	FX4	X2-DFN1409-6	5000/Tape & Reel	-7
74AUP1G02FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7

Note: 7. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>
 ** Future Products – Contact your Diodes sales representative for availability.

Marking Information

(1) SOT353

(Top View)

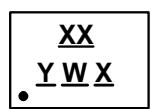


XX : Identification code
 Y : Year 0~9
 W : Week : A~Z : 1~26 week;
 a~z : 27~52 week; z represents
 52 and 53 week
 X : A~Z : Internal code

Part Number	Package	Identification Code
74AUP1G02SE	SOT353	XJ

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

(Top View)



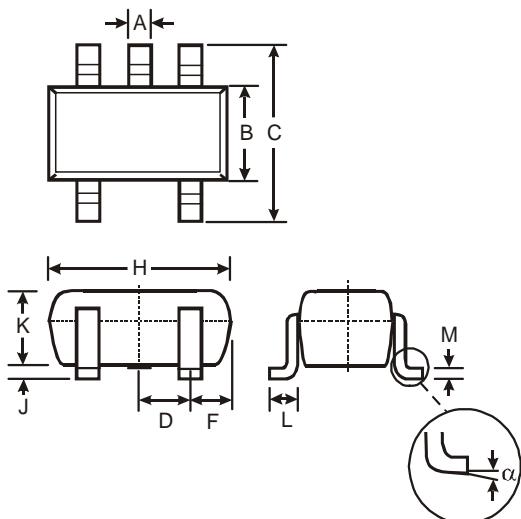
XX : Identification Code
 Y : Year : 0~9
 W : Week : A-Z : 1~26 week;
 a~z : 27~52 week; z represents
 52 and 53 week
 X : A~Z : Internal code

Part Number	Package	Identification Code
74AUP1G02FS3	X2-DFN0808-4	YP
74AUP1G02FW4	X2-DFN1010-6	XJ
74AUP1G02FX4	X2-DFN1409-6	HB
74AUP1G02FZ4	X2-DFN1410-6	XJ

Package Outline Dimensions (All dimensions in mm.)

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

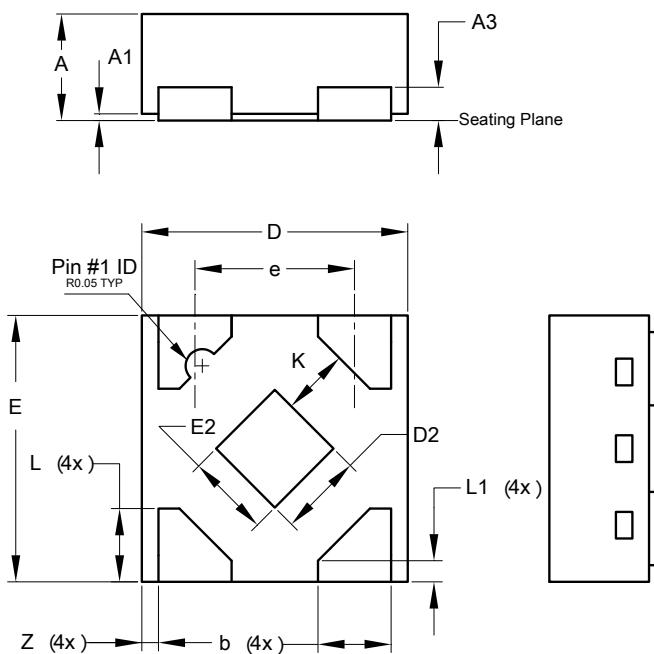
(1) SOT353



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-DFN0808-4



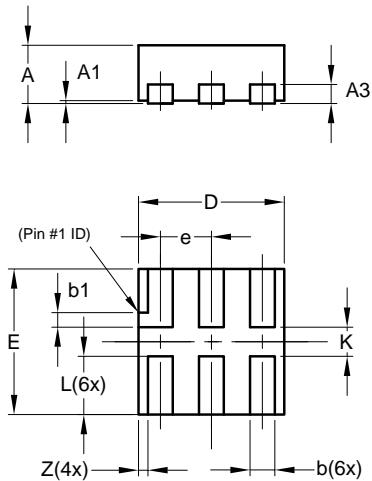
X2-DFN0808-4			
Dim	Min	Max	Typ
A	0.25	0.35	0.30
A1	0	0.04	0.02
A3	-	-	0.13
b	0.17	0.27	0.22
D	0.75	0.85	0.80
D2	0.15	0.35	0.25
E	0.75	0.85	0.80
E2	0.15	0.35	0.25
e	-	-	0.48
K	0.20	-	-
L	0.17	0.27	0.22
L1	0.02	0.12	0.07
Z	-	-	0.05

All Dimensions in mm

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

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

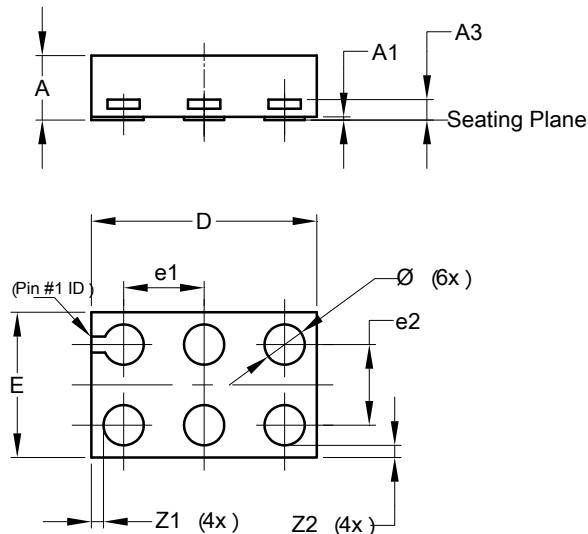
(3) X2-DFN1010-6



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

(4) X2-DFN1409-6



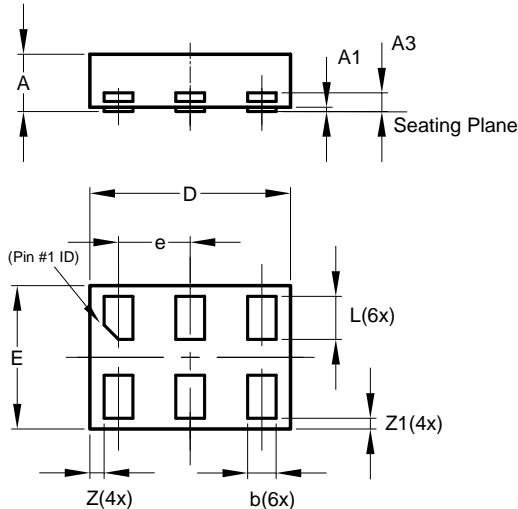
X2-DFN1409-6			
Dim	Min	Max	Typ
A	-	0.40	0.39
A1	0	0.05	0.02
A3	-	-	0.13
Ø	0.20	0.30	0.25
D	1.35	1.45	1.40
E	0.85	0.95	0.90
e1	-	-	0.50
e2	-	-	0.50
Z1	-	-	0.075
Z2	-	-	0.075

All Dimensions in mm

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

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

(5) X2-DFN1410-6



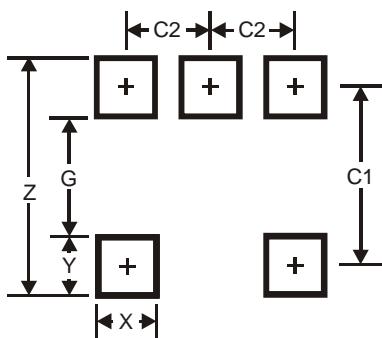
X2-DFN1410-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075

All Dimensions in mm

Suggested Pad Layout

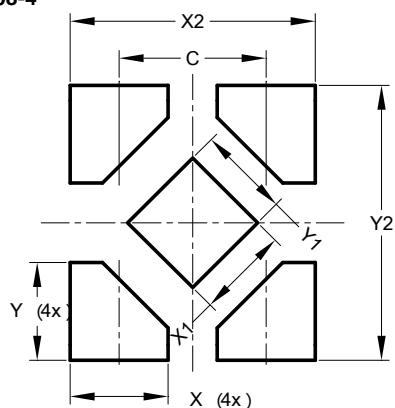
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version

(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-DFN0808-4

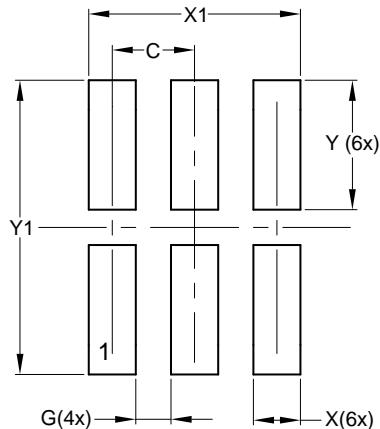


Dimensions	Value (in mm)
C	0.480
X	0.320
X1	0.300
X2	0.800
Y	0.320
Y1	0.300
Y2	0.900

Suggested Pad Layout

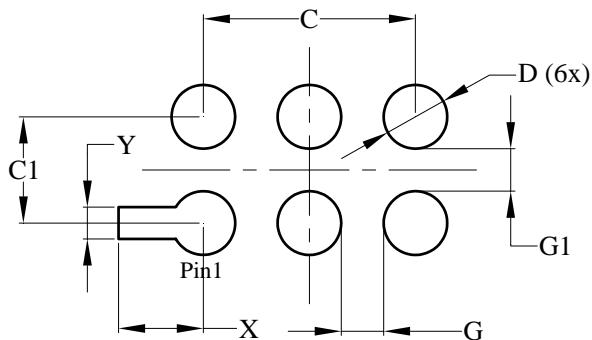
Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version

(3) X2-DFN1010-6



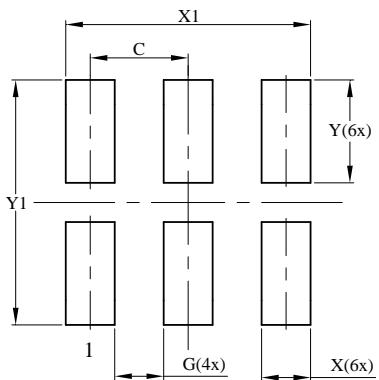
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	0.350

(4) X2-DFN1409-6



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

(5) 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

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