SINGLE-BIT DUAL POWER SUPPLY TRANSLATING BUFFER WITH 3 STATE OUTPUTS

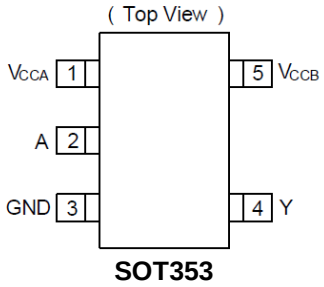
Description

The 74AUP1T34 is a single-bit, dual-supply, noninverting buffer translator suitable for transmitting a single logic bit across different voltage domains. It is a unidirectional translator from A to Y. The input pin A has input switching thresholds related to V_{CCA}, operating from 0.9V to 3.6V. The output pin Y has a HIGH level output voltage that tracks V_{CCB}, also operating from 0.9V to 3.6V. This arrangement allows for universal low-voltage translation between any voltages from 0.9V to 3.6V.

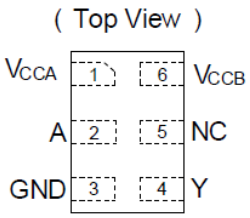
The three-state feature occurs when the V_{CCA} power-supply voltages are zero. This is also an I_{OFF} feature and allows the output to remain in a high-impedance state, preventing damaging backflow currents and providing power-down electrical isolation of up to 3.6V. If the V_{CCB} is at ground, the input circuits at pin A are disabled and no input current flows regardless of any applied voltage between 0V and 3.6V.

The 74AUP1T34 is available in the SOT353, X2-DFN1410-6, and X2-DFN1010-6 packages, and is specified for operation from -40°C to +125°C among all supply voltages. The wide temperature ranges and high ESD tolerance facilitate their use in harsh applications.

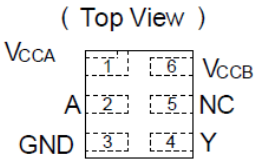
Pin Assignments



SOT353



X2-DFN1410-6



X2-DFN1010-6

Features

- Wide Supply Voltage Range:
  - V_{CC}(A): from 0.9V to 3.6V
  - V_{CC}(B): from 0.9V to 3.6V
- ±6mA Output Drive at 3V
- Low-Static Power Consumption; I_{CC} = 5μA (Maximum)
- High Noise Immunity (100mV Hysteresis Typical)
- I_{OFF} Supports Partial Power-Down Mode Operation
- I_{OFF} Controlled by V_{CCB} Being at 0V
- Input Isolation when V_{CCA} is Ground; No Input Current Even when Floating
- ESD Protection Exceeds JESD 22
  - Exceeds 5000V Human Body Model (A114)
  - Exceeds 1000V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, class II
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **An automotive-compliant part is available under separate datasheet (74AUP1T34Q)**

Applications

- Voltage level translation:
  - Well suited to join logic types operating at different voltages
- Power-down signal isolation:
  - When V_{CCA} = GND output is three-state
  - When V_{CCB} = GND input is disabled and may be left floating
- Wide array of products such as:
  - Cell phones, tablets, e-readers
  - PCs, notebooks, netbooks, ultrabooks
  - Networking, routers, gateways
  - Personal electronics
  - Telecommunications
  - Industrial devices

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ 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 Descriptions

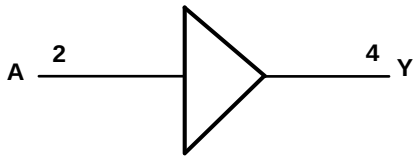
Pin Name	Pin SOT353	Pin X2-DFN1410-6	Pin X2-DFN1010-6	Function
V_{CCA}	1	1	1	Supply for pin A
A	2	2	2	Data Input (threshold based on V_{CCA})
GND	3	3	3	Ground
Y	4	4	4	Data Output (V_{OH} based on V_{CCB})
NC	—	5	5	NC (can be connected to any potential)
V_{CCB}	5	6	6	Supply for pin Y

Function Table

Supply Voltage		Input	Output
V_{CCA}	V_{CCB}	A	Y
0.9V to 3.6V	0.9V to 3.6V	L	L
0.9V to 3.6V	0.9V to 3.6V	H	H
0V	0.9V to 3.6V	X	Z
0V to 3.6V	0V	Isolated (Note 4)	Z

Note: 4. Floating input pin is allowed for this case

Logic Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.) (Note 5)

Symbol	Parameter	Rating	Unit
ESD HBM	Human Body Model ESD Protection	5	kV
ESD CDM	Charged Device Model ESD Protection	1	kV
V_{CCA}, V_{CCB}	Supply Voltage Range	-0.3 to +4.0	V
V_I	Input Voltage Range	-0.5 to +4.6	V
V_O	Voltage Applied to Output in High-Impedance or I_{OFF} State	-0.5 to +4.6	V
V_O	Voltage Applied to Output in High or Low State	-0.5 to +4.6	V
I_{IK}	Input Clamp Current V_I < 0	-50	mA
I_{OK}	Output Clamp Current	-50	mA
I_O	Continuous Output Current	±50	mA
—	Continuous Current Through V_{CCA} or GND	±100	mA
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C

Note: 5. Stresses beyond the absolute maximum can result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Condition (@T_A = +25°C, unless otherwise specified.) (Note 6)

Symbol	Parameter	V_{CCA}	V_{CCB}	Min	Max	Units
V_{CCA}	Operating Voltage	—	—	0.9	3.6	V
V_{CCB}	Operating Voltage	—	—	0.9	3.6	V
V_{IH}	High-Level Input Voltage	0.9V to 1.95V	0.9V to 3.6V	0.65 x V_{CCA}	—	V
		2.3V to 2.7V	0.9V to 3.6V	1.6	—	
		3V to 3.6V	0.9V to 3.6V	2	—	
V_{IL}	Low-Level Input Voltage	0.9V	0.9V to 3.6V	—	0.3 x V_{CCA}	V
		1V to 1.95V	0.9V to 3.6V	—	0.35 x V_{CCA}	
		0.35 x V_{CCA}	0.9V to 3.6V	—	0.7	
		3V to 3.6V	0.9V to 3.6V	—	0.8	
T_A	Operating Free-Air Temperature			-40	+125	°C

Note: 6. Test condition for each of the three package types: Device mounted on JEDEC standard PCB per JESD51, with minimum recommended pad layout.

Electrical Characteristics (@T_A = -40°C to +125°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions		V_{CCA}	V_{CCB}	T_A = -40°C to +125°C		Unit
						Min	Max	
V_{OH}	High-Level Output Voltage	I_{OH} = -100µA		0.9V to 3.6V	0.9V to 3.6V	V_{CCB} – 0.2	—	V
		I_{OH} = -0.25mA		0.9V to 1V	0.9V to 1V	0.75 x V_{CCB}	—	
		I_{OH} = -1.5mA		1.2V	1.2V	1	—	
		I_{OH} = -2mA		1.65V	1.65V	1.32	—	
		I_{OH} = -3mA		2.3V	2.3V	1.9	—	
		I_{OH} = -6mA		3V	3V	2.72	—	
V_{OL}	Low-Level Output Voltage	I_{OL} = 100µA		0.9V to 3.6V	0.9V to 3.6V	—	0.1	V
		I_{OL} = 0.25mA		0.9V to 1V	0.9V to 1V	—	0.1	
		I_{OL} = 1.5mA		1.2V	1.2V	—	0.3 x V_{CCB}	
		I_{OL} = 2mA		1.65V	1.65V	—	0.31	
		I_{OL} = 3mA		2.3V	2.3V	—	0.31	
		I_{OL} = 6mA		3V	3V	—	0.31	
I_I	Input Current	V_I = V_{CCA} or GND		0.9V to 3.6V	0.9V to 3.6V	—	±1	µA
I_{OFF}	Off-State Current	A pin	V_I or V_O = 0V to 3.6V	0V	0 to 3.6V	—	±5	µA
		Y pin		0 to 3.6V	0V	—	±5	
I_{CCA}	Supply Current	V_I = V_{CCA} or GND I_O = 0mA		0.9V to 3.6V	0.9V to 3.6V	—	5	µA
				0.9V to 3.6V	V_{CCA}	—	2	
				0V	0V to 3.6V	—	1	
				0.9V to 3.6V	0V	—	1	
I_{CCB}	Supply Current	V_I = V_{CCA} or GND I_O = 0mA		0.9V to 3.6V	0.9V to 3.6V	—	5	µA
				0.9V to 3.6V	V_{CCA}	—	2	
				0V	0V to 3.6V	—	1	
				0.9V to 3.6V	0V	—	1	
I_{CCA} + I_{CCB}	Supply Current	V_I = V_{CCA} or GND I_O = 0mA		1.2V to 3.6V	1.2V to 3.6V	—	20	µA
C_I	Input Capacitance	A pin	V_I = 3.3V or GND	3.3V	3.3V	—	4	pF
C_O	Output Capacitance	Y pin	V_O = 3.3V or GND	0V	3.3V	—	7	pF

Package Characteristics

Symbol	Parameter	Package	Test Conditions	Min	Typ	Max	Unit
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT353	Note 7	—	318	—	°C/W
		X2-DFN1410-6		—	210	—	
		X2-DFN1010-6		—	180	—	
θ_{JC}	Thermal Resistance Junction-to-Case	SOT353	Note 7	—	156	—	°C/W
		X2-DFN1410-6		—	54	—	
		X2-DFN1010-6		—	34	—	

Note: 7. Test condition for each of the three package types: Device mounted on JEDEC standard PCB per JESD51, with minimum recommended pad layout.

Switching Characteristics

Parameter	Test Conditions	V_{CCA}	V_{CCB}	Min	Typ	Max	Units
t_{PLH}/t_{PHL} Propagation Delay Time Low-to-High Output / High-to-Low Output	C_L = 5pF	0.9V	0.9V	—	25	—	ns
			1.2V	—	18	—	
			1.65V	—	16.2	—	
			2.3V	—	16.3	—	
			3V	—	16.8	—	
	C_L = 5pF	1.2V	0.9V	—	—	42.5	
			1.2V	—	—	24.9	
			1.65V	—	—	23.2	
			2.3V	—	—	22.6	
			3V	—	—	22.5	
	C_L = 5pF	1.65V	0.9V	—	—	40	
			1.2V	—	—	10.7	
			1.65V	—	—	8.84	
			2.3V	—	—	8.08	
			3V	—	—	7.88	
	C_L = 5pF	2.3V	0.9V	—	—	41.3	
			1.2V	—	—	8.02	
			1.65V	—	—	5.73	
			2.3V	—	—	4.92	
			3V	—	—	4.2	
	C_L = 5pF	3V	0.9V	—	—	42.5	
			1.2V	—	—	7.61	
			1.65V	—	—	5.5	
			2.3V	—	—	4.65	
			3V	—	—	4.39	
t_{PLH}/t_{PHL} Propagation Delay Time Low-to-High Output / High-to-Low Output	C_L = 10pF	0.9V	0.9V	—	28.9	—	ns
			1.2V	—	19.8	—	
			1.65V	—	17.9	—	
			2.3V	—	18	—	
			3V	—	18.5	—	
	C_L = 10pF	1.2V	0.9V	—	—	43.22	
			1.2V	—	—	12.33	
			1.65V	—	—	9.57	
			2.3V	—	—	8.81	
			3V	—	—	8.61	
	C_L = 10pF	1.65V	0.9V	—	—	40.44	
			1.2V	—	—	9.21	
			1.65V	—	—	6.57	
			2.3V	—	—	5.5	
			3V	—	—	4.73	
	C_L = 10pF	2.3V	0.9V	—	—	41.56	
			1.2V	—	—	8.3	
			1.65V	—	—	5.54	
			2.3V	—	—	4.42	
			3V	—	—	4.01	
	C_L = 10pF	3V	0.9V	—	—	42.81	
			1.2V	—	—	7.87	
			1.65V	—	—	4.55	
			2.3V	—	—	3.8	
			3V	—	—	3.36	

Switching Characteristics (continued)

Parameter	Test Conditions	V_{CCA}	V_{CCB}	Min	Typ	Max	Units
t_{PLH}/t_{PHL} Propagation Delay Time Low-to-High Output / High-to-Low Output	C_L = 15pF	0.9V	0.9V	—	30.6	—	ns
			1.2V	—	21.6	—	
			1.65V	—	19.6	—	
			2.3V	—	19.7	—	
			3V	—	20.3	—	
	C_L = 15pF	1.2V	0.9V	—	—	43.87	
			1.2V	—	—	12.9	
			1.65V	—	—	10.3	
			2.3V	—	—	9.54	
			3V	—	—	9.34	
	C_L = 15pF	1.65V	0.9V	—	—	40.78	
			1.2V	—	—	9.59	
			1.65V	—	—	6.95	
			2.3V	—	—	5.87	
			3V	—	—	5.07	
	C_L = 15pF	2.3V	0.9V	—	—	41.79	
			1.2V	—	—	8.55	
			1.65V	—	—	5.8	
			2.3V	—	—	4.68	
			3V	—	—	4.27	
	C_L = 15pF	3V	0.9V	—	—	43.09	
			1.2V	—	—	8.16	
			1.65V	—	—	4.84	
			2.3V	—	—	4.09	
			3V	—	—	3.65	
t_{PLH}/t_{PHL} Propagation Delay Time Low-to-High Output / High-to-Low Output	C_L = 30pF	0.9V	0.9V	—	32.1	—	ns
			1.2V	—	21.3	—	
			1.65V	—	18.7	—	
			2.3V	—	18	—	
			3V	—	18.3	—	
	C_L = 30pF	1.2V	0.9V	—	—	45.65	
			1.2V	—	—	14.76	
			1.65V	—	—	12.37	
			2.3V	—	—	11.61	
			3V	—	—	11.41	
	C_L = 30pF	1.65V	0.9V	—	—	41.72	
			1.2V	—	—	10.65	
			1.65V	—	—	8.01	
			2.3V	—	—	6.94	
			3V	—	—	5.99	
	C_L = 30pF	2.3V	0.9V	—	—	42.44	
			1.2V	—	—	9.26	
			1.65V	—	—	6.51	
			2.3V	—	—	6.39	
			3V	—	—	5.97	
	C_L = 30pF	3V	0.9V	—	—	43.69	
			1.2V	—	—	8.8	
			1.65V	—	—	6.48	
			2.3V	—	—	5.72	
			3V	—	—	5.28	

Parameter Measurement Information (Notes B, C)

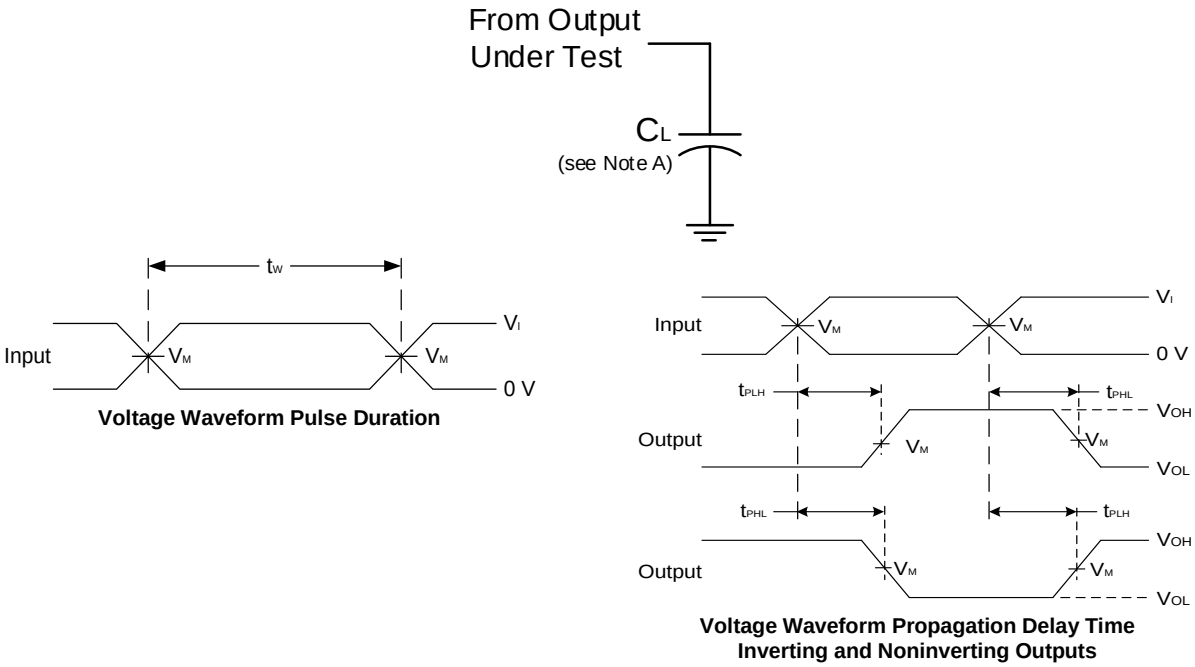
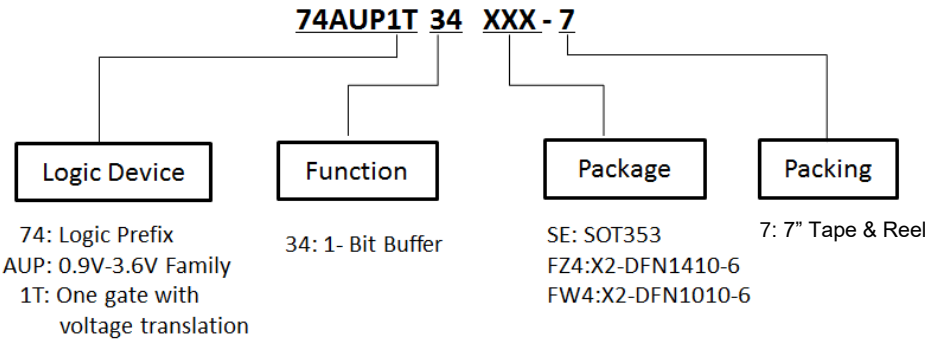


Figure 1. Load Circuit and Voltage Waveforms

Notes: A. Includes test lead and test apparatus capacitance.
B. All pulses are supplied at pulse repetition rate ⩽ 10MHz.
C. t_{PLH} and t_{PHL} are the same as t_{PD}.

Ordering Information (Note 8)



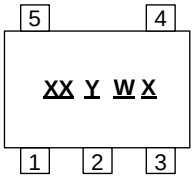
Part Number	Package Code	Package	Packing		Part Number Suffix
			Qty.	Carrier	
74AUP1T34SE-7	SE	SOT353	3000	7" Tape & Reel	-7
74AUP1T34FZ4-7	FZ4	X2-DFN1410-6	5000	7" Tape & Reel	-7
74AUP1T34FW4-7	FW4	X2-DFN1010-6	5000	7" Tape & Reel	-7

Note: 8. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

(1) SOT353

(Top View)

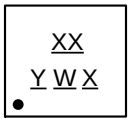


XX : Identification Code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
a to z : 27 to 52 week; z represents
52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
74AUP1T34SE-7	SOT353	4S

(2) DFN Packages

(Top View)



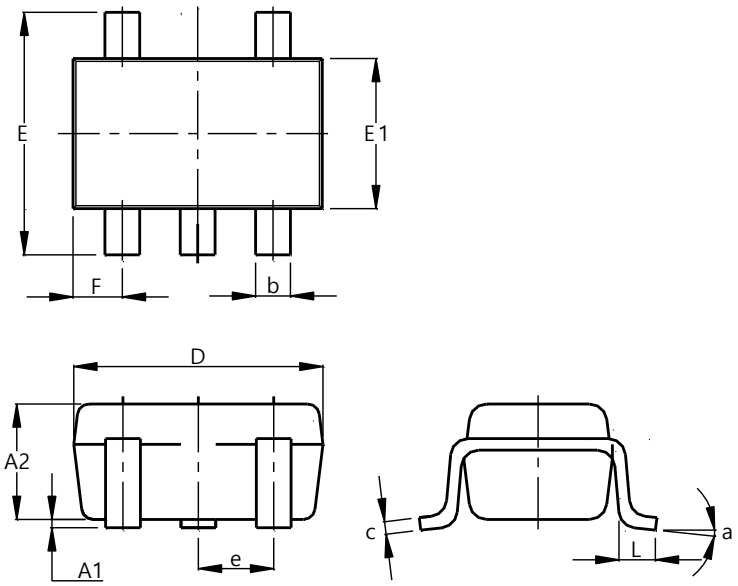
XX : Identification Code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
a~z : 27~52 week; z represents
52 and 53 week
X : Internal Code

Part Number	Package	Identification Code
74AUP1T34FZ4-7	X2-DFN1410-6	4S
74AUP1T34FW4-7	X2-DFN1010-6	4U

Package Outline Dimensions

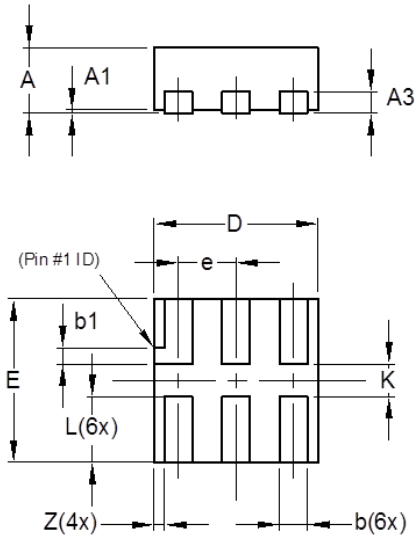
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT353



SOT353			
Dim	**Min**	**Max**	**Typ**
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

(2) Package Type: X2-DFN1010-6

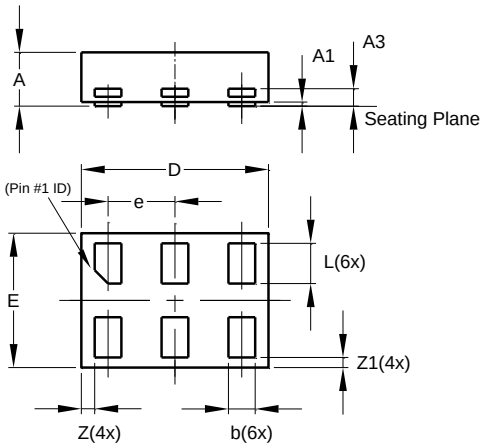


X2-DFN1010-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

Package Outline Dimensions (continued)

Please see http://www.diodes.com/package-outlines.html for the latest version.

(3) Package Type: X2-DFN1410-6

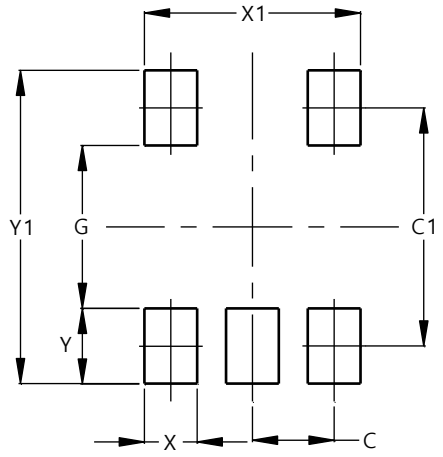


X2-DFN1410-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

Suggested Pad Layout

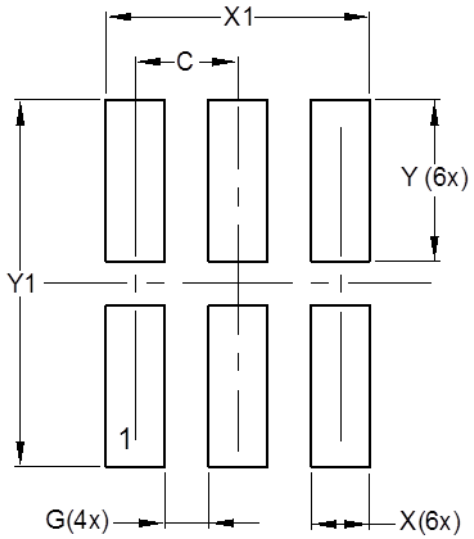
Please see http://www.diodes.com/package-outlines.html for the latest version.

(1) Package Type: SOT353



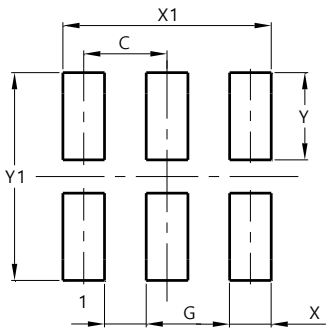
Dimensions	Value (in mm)
C	0.650
C1	1.900
G	1.300
X	0.420
X1	1.720
Y	0.600
Y1	2.500

(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-DFN1410-6



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

Mechanical Data

SOT353

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Mate Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.006 grams (Approximate)

X2-DFN1010-6

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - NiPdAu Nickel Palladium Gold, Solderable per MIL-STD-202, Method 208 e4
- Weight 0.0012 grams (Approximate)

X2-DFN1410-6

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - NiPdAu Nickel Palladium Gold, Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.002 grams (Approximate)

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