Description

The 74LVC1G04 is a single inverter gate with a standard push-pull output. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. 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.

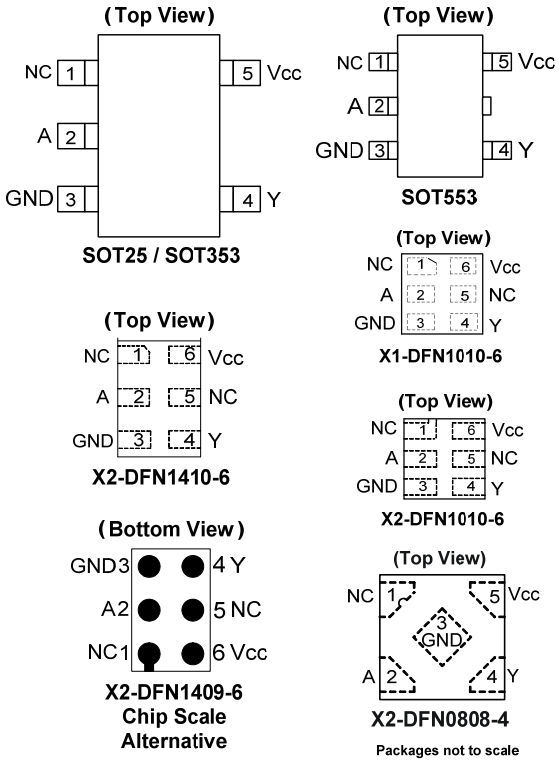
The gate performs the positive Boolean function:

$$Y = \overline{A}$$

Features

- Wide Supply Voltage Range from 1.65 to 5.5V
- ± 24mA Output Drive at 3.3V
- CMOS Low Power Consumption
- I_{OFF} Supports Partial-Power-Down Mode Operation
- Inputs Accept Up to 5.5V
- ESD Protection Tested per JESD 22
  - Exceeds 200-V Machine Model (A115)
  - Exceeds 2000-V Human Body Model (A114)
  - Exceeds 1000-V Charged Device Model (C101)
- Latch-Up Exceeds 100mA per JESD 78, Class I
- Range of Package Options
- Direct Interface with TTL Levels
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Pin Assignments



Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide Array of Products Such as.
  - PCs, Networking, Notebooks, Netbooks, PDAs
  - Tablet Computers, E-readers
  - Computer Peripherals, Hard Drives, CD/DVD ROM
  - TV, DVD, DVR, set top box
  - Cell Phones, Personal Navigation / GPS
  - MP3 players ,Cameras, Video Recorders

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

74 LVC1G 04 XXX -7

Logic Device
74 : Logic Prefix
LVC : 1.65 to 5.5 V Logic Family
1G : One Gate

Function
04 : 1-Input Inverter / Buffer

Package
W5 : SOT25
SE : SOT353
Z : SOT553
FS3 : X2-DFN0808-4
FW5 : X1-DFN1010-6
FW4 :X2-DFN1010-6
FX4 : X2- DFN1409-6
FZ4 : X2- DFN1410-6

Packing
-7 : 7" Tape & Reel

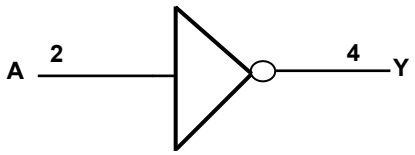
Part Number	Package Code	Package (Notes 4 & 5)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G04W5-7	W5	SOT25	3.0mm X 2.8mm X 1.2mm 0.95 mm lead pitch	3000/Tape & Reel	-7
74LVC1G04SE-7	SE	SOT353	2.0mm X 2.0mm X 1.1mm 0.65 mm lead pitch	3000/Tape & Reel	-7
74LVC1G04Z-7	Z	SOT553	1.6mm X 1.6 mm X 0.62mm 0.5 mm lead pitch	4000/Tape & Reel	-7
74LVC1G04FS3-7	FS3	X2-DFN0808-4	0.9mm X 0.9 mm X 0.35mm 0.5 mm pad pitch (diamond)	5000/Tape & Reel	-7
74LVC1G04FW5-7	FW5	X1-DFN1010-6	1.0mm X 1.0mm X 0.5mm 0.35 mm pad pitch	5000/Tape & Reel	-7
74LVC1G04FW4-7	FW4	X2-DFN1010-6	1.0mm X 1.0mm X 0.4mm 0.35 mm pad pitch	5000/Tape & Reel	-7
74LVC1G04FX4-7	FX4	X2-DFN1409-6 Chip scale alternative	1.4mm X 0.9mm X 0.4mm 0.5 mm pad pitch	5000/Tape & Reel	-7
74LVC1G04FZ4-7	FZ4	X2-DFN1410-6	1.4mm X 1.0mm X 0.4mm 0.5 mm pad pitch	5000/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	Description
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	H

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
ESD MM	Machine Model ESD Protection	200	V
V_{CC}	Supply Voltage Range	-0.5 to 6.5	V
V_I	Input Voltage Range	-0.5 to 6.5	V
V_O	Voltage Applied to Output in High Impedance or I_{OFF} State	-0.5 to 6.5	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	-50	mA
I_O	Continuous Output Current	±50	mA
I_{CC}, I_{GN}	Continuous Current Through V_{CC} or GND	±100	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	Operating	1.65	5.5	V
		Data retention only	1.5	—	V
V_{IH}	High-Level Input Voltage	V_{CC} = 1.65V to 1.95V	0.65 X V_{CC}	—	V
		V_{CC} = 2.3V to 2.7V	1.7	—	
		V_{CC} = 3V to 3.6V	2	—	
		V_{CC} = 4.5V to 5.5V	0.7 X V_{CC}	—	
V_{IL}	Low-Level Input voltage	V_{CC} = 1.65V to 1.95V	—	0.35 X V_{CC}	V
		V_{CC} = 2.3V to 2.7V	—	0.7	
		V_{CC} = 3V to 3.6V	—	0.8	
		V_{CC} = 4.5V to 5.5V	—	0.3 X V_{CC}	
V_I	Input Voltage		0	5.5	V
V_O	Output Voltage		0	V_{CC}	V
I_{OH}	High-Level Output Current	V_{CC} = 1.65V	—	-4	mA
		V_{CC} = 2.3V	—	-8	
		V_{CC} = 2.7V	—	-12	
		V_{CC} = 3V	—	-16	
			—	-24	
		V_{CC} = 4.5V	—	-32	
I_{OL}	Low-Level Output Current	V_{CC} = 1.65V	—	4	mA
		V_{CC} = 2.3V	—	8	
		V_{CC} = 2.7V	—	12	
		V_{CC} = 3V	—	16	
			—	24	
		V_{CC} = 4.5V	—	32	
Δt/ΔV	Input Transition Rise or Fall Rate	V_{CC} = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20	ns/V
		V_{CC} = 3.3V ± 0.3V	—	10	
		V_{CC} = 5V ± 0.5V	—	5	
T_A	Operating Free-Air Temperature	—	-40	+125	°C

Note: 8. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (All typical values are at V_{CC} = 3.3V, T_A = +25°C)

Symbol	Parameter	Test Conditions	V_{CC}	-40°C to +85°C			-40°C to +125°C		Unit
				Min	Typ.	Max	Min	Max	
V_{OH}	High-Level Output Voltage	I_{OH} = -100µA	1.65V to 5.5V	V_{CC} – 0.1	—	—	V_{CC} – 0.1	—	V
		I_{OH} = -4mA	1.65V	1.2	—	—	0.95	—	
		I_{OH} = -8mA	2.3V	1.9	—	—	1.7	—	
		I_{OH} = -12mA	2.7V	2.2	—	—	1.9	—	
		I_{OH} = -16mA	3V	2.4	—	—	2.2	—	
		I_{OH} = -24mA		2.3	—	—	2.0	—	
		I_{OH} = -32mA	4.5V	3.8	—	—	3.4	—	
V_{OL}	Low-Level Output Voltage	I_{OL} = 100µA	1.65V to 5.5V	—	—	0.1	—	0.1	V
		I_{OL} = 4mA	1.65V	—	—	0.45	—	0.7	
		I_{OL} = 8mA	2.3V	—	—	0.3	—	0.45	
		I_{OL} = 12mA	2.7V	—	—	0.4	—	0.6	
		I_{OL} = 16mA	3V	—	—	0.4	—	0.6	
		I_{OL} = 24mA		—	—	0.55	—	0.8	
		I_{OL} = 32mA	4.5V	—	—	0.55	—	.8	
I_I	Input Current	V_I = 5.5 V or GND	0 to 5.5V	—	± 0.1	±5	—	± 100	µA
I_{OFF}	Power Down Leakage Current	V_I or V_O = 5.5V	0V	—	—	±10	—	±200	µA
I_{CC}	Supply Current	V_I = 5.5V or GND I_O=0	5.5V	—	0.1	10	—	200	µA
ΔI_{CC}	Additional Supply Current	Input at V_{CC} –0.6V	3V to 5.5V	—	—	500	—	5000	µA
C_i	Input Capacitance	V_i = V_{CC} – or GND	3.3V	—	5	—	—	—	pF

Package Characteristics (All typical values are at V_{CC} = 3.3V, T_A = +25°C)

Symbol	Parameter	Test Conditions	V_{CC}	Min	Typ	Max	Unit
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT25	(Note 9)	—	204	—	°C/W
		SOT353		—	371	—	
		SOT553		—	231	—	
		X2-DFN0808-4		—	400	—	
		X1-DFN1010-6		—	435	—	
		X2-DFN1010-6		—	445	—	
		X2-DFN1409-6		—	470	—	
		X2-DFN1410-6		—	460	—	
θ_{JC}	Thermal Resistance Junction-to-Case	SOT25	(Note 9)	—	52	—	°C/W
		SOT353		—	143	—	
		SOT553		—	105	—	
		X2-DFN0808-4		—	225	—	
		X1-DFN1010-6		—	250	—	
		X2-DFN1010-6		—	250	—	
		X2-DFN1409-6		—	275	—	
		X2-DFN1410-6		—	265	—	

Note: 9. Test condition for each of the 8 package types: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Switching Characteristics

Figure 1 Typical Values at T_A = +25°C and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

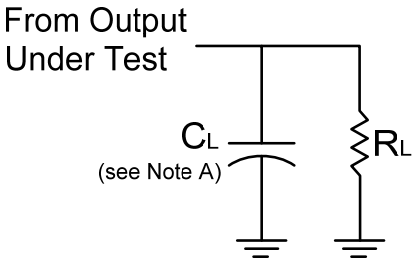
Parameter	From Input	To Output	V_{CC}	T_A = -40°C to +85°C			T_A = -40°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t_{pd}	A or B	Y	1.8V ± 0.15V	1.0	3.0	7.5	1.0	9.5	ns
			2.5V ± 0.2V	0.5	2.0	5.0	0.5	6.5	
			2.7V	0.5	2.3	5.2	0.5	7.0	
			3.3V ± 0.3V	0.5	2.0	4.2	0.5	5.5	
			5.0V ± 0.5V	0.5	1.6	3.7	0.5	5.0	

Operating Characteristics

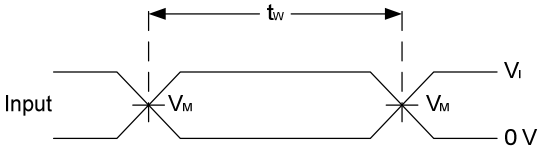
T_A = +25°C

Parameter		Test Conditions	V_{CC} = 1.8V	V_{CC} = 2.5V	V_{CC} = 3.3V	V_{CC} = 5V	Unit
			Typ	Typ	Typ	Typ	
C_{pd}	Power Dissipation Capacitance	f = 10MHz	16	16	16	16	pF

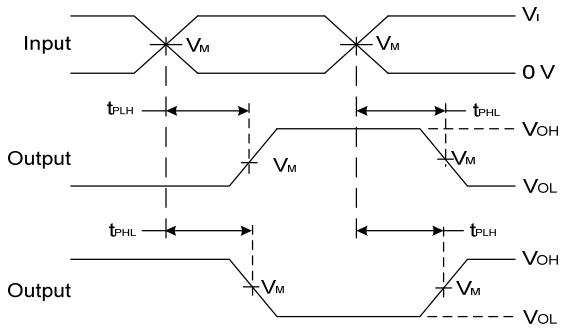
Parameter Measurement Information



V_{CC}	Inputs		V_M	C_L	R_L
	V_I	t_r/t_f			
1.8V ± 0.15V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	1kΩ
2.5V ± 0.2V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	500Ω
2.7V	V_{CC}	≤2.5ns	1.5V	50pF	500Ω
3.3V ± 0.3V	3.0V	≤2.5ns	1.5V	50pF	500Ω
5.0V ± 0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	50pF	500Ω



Voltage Waveform Pulse Duration



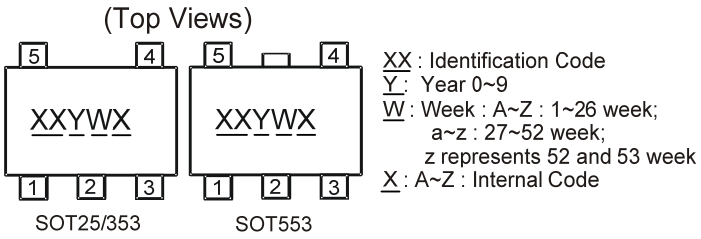
Voltage Waveform Propagation Delay Times Inverting and Non Inverting Outputs

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 ≤ 10MHz.
C. t_{PLH} and t_{PHL} are the same as t_{PD}.

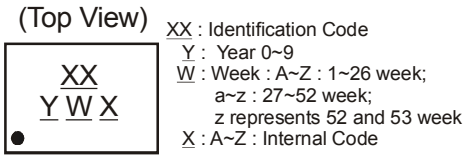
Marking Information

(1) SOT25, SOT353 and SOT553



Part Number	Package	Identification Code
74LVC1G04W5-7	SOT25	UU
74LVC1G04SE-7	SOT353	UU
74LVC1G04Z-7	SOT553	UU

(2) DFN Packages

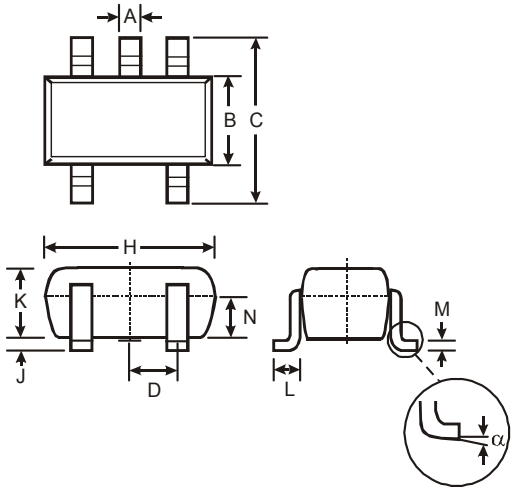


Part Number	Package	Identification Code
74LVC1G04FS3-7	X2-DFN0808-4	WU
74LVC1G04FW5-7	X1-DFN1010-6	V4
74LVC1G04FW4-7	X2-DFN1010-6	UU
74LVC1G04FX4-7	X2-DFN1409-6	MC
74LVC1G04FZ4-7	X2-DFN1410-6	UU

Package Outline Dimensions (All dimensions in mm.)

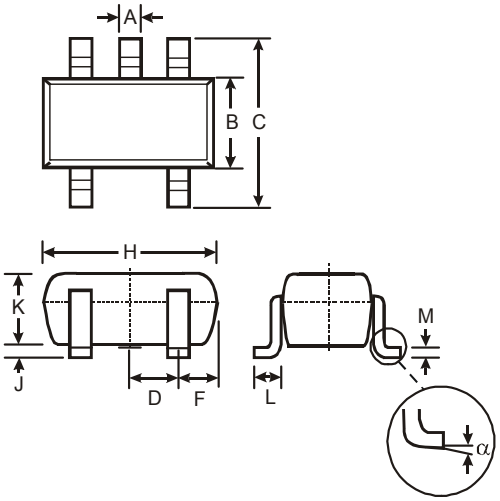
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(1) SOT25



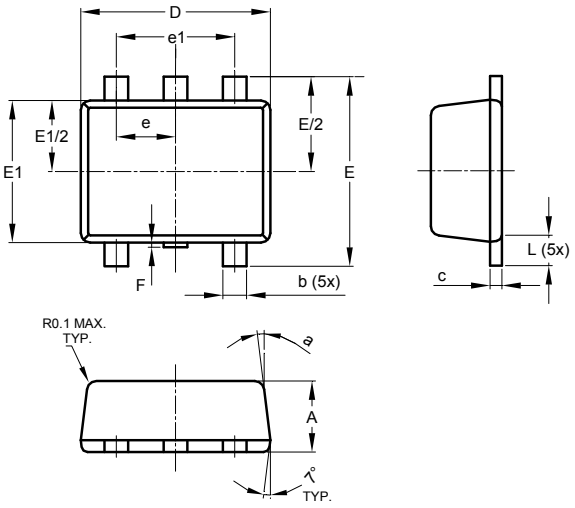
SOT25			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	—
All Dimensions in mm			

(2) SOT353



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

(3) SOT553

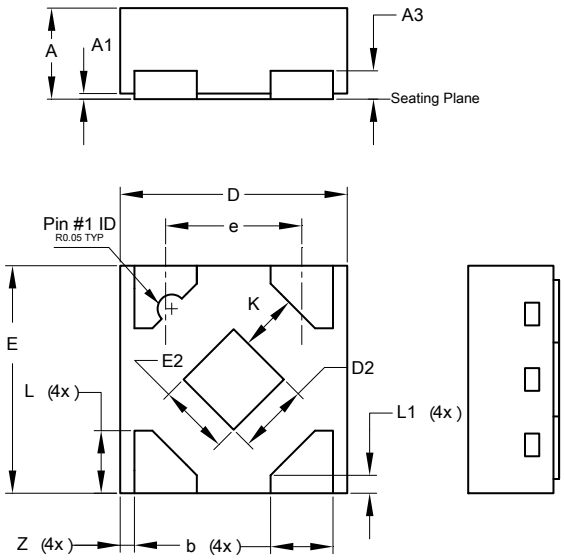


SOT553			
Dim	Min	Max	Typ
A	0.55	0.62	0.60
b	0.15	0.30	0.20
c	0.10	0.18	0.15
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	0.50 BSC		
e1	1.00 BSC		
F	0.00	0.10	—
L	0.10	0.30	0.20
a	6°	8°	7°
All Dimensions in mm			

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

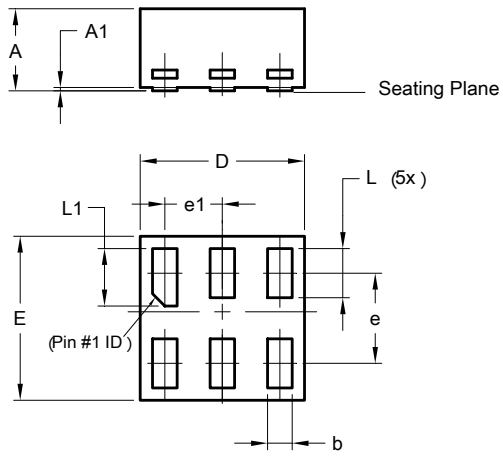
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(4) 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			

(5) X1-DFN1010-6

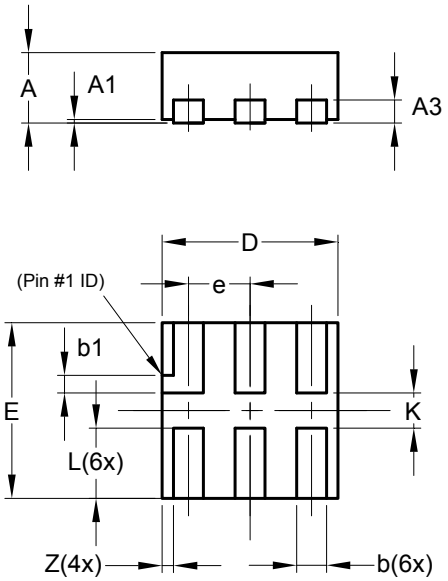


X1-DFN1010-6			
Dim	**Min**	**Max**	**Typ**
A	-	0.50	0.39
A1	-	0.04	-
b	0.12	0.20	0.15
D	0.95	1.050	1.00
E	0.95	1.050	1.00
e	0.55 BSC		
e1	0.35 BSC		
L	0.27	0.35	0.30
L1	0.32	0.40	0.35
All Dimensions in mm			

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

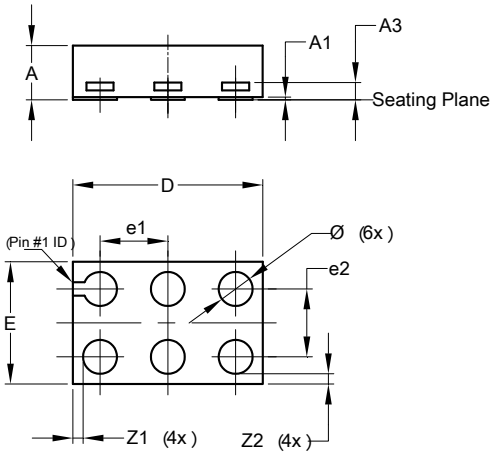
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

(6) X2-DFN1010-6



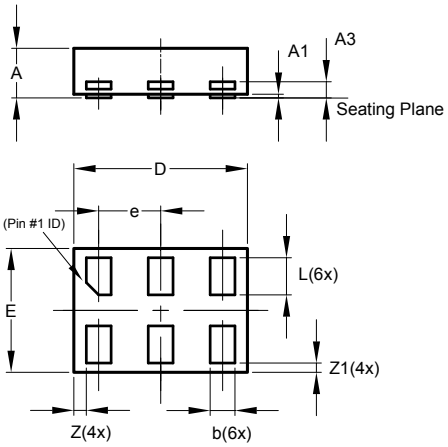
X2-DFN1010-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

(7) X2-DFN1409-6 CHIP SCALE ALTERNATIVE



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			

(8) X2-DFN1410-6

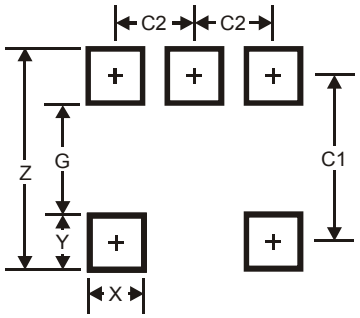


X2-DFN1410-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

Suggested Pad Layout

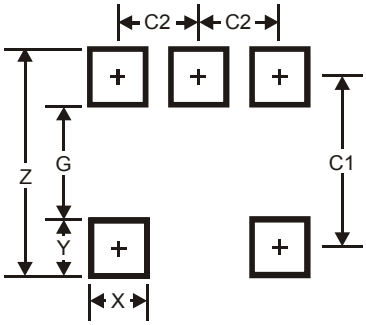
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(1) SOT25



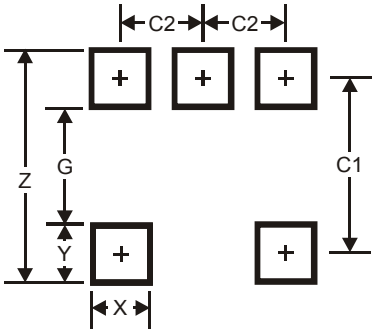
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(2) SOT353



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

(3) SOT553

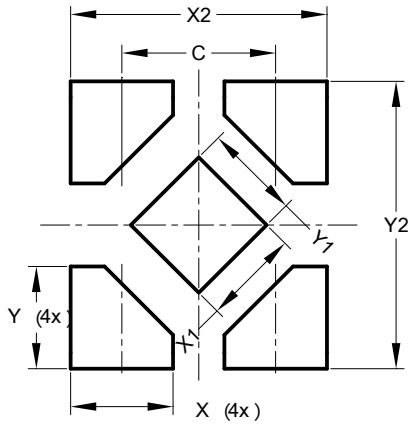


Dimensions	Value (in mm)
Z	2.2
G	1.2
X	0.375
Y	0.5
C1	1.7
C2	0.5

Suggested Pad Layout (cont.)

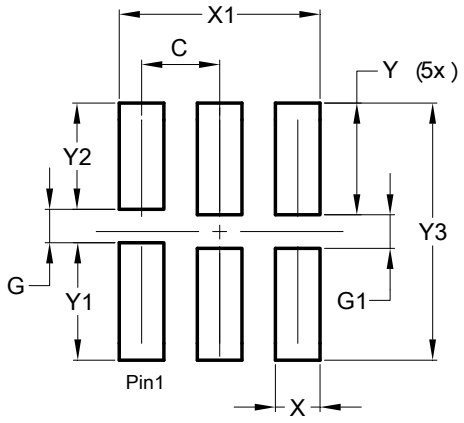
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(4) 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

(5) X1-DFN1010-6

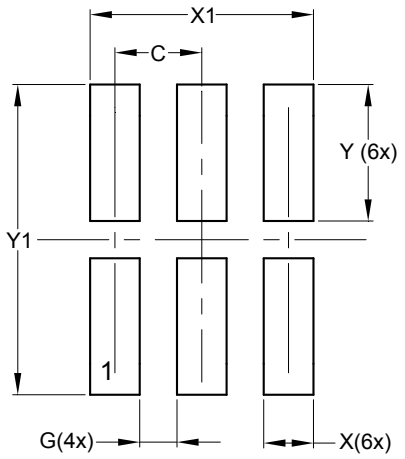


Dimensions	Value (in mm)
C	0.350
G	0.150
G1	0.150
X	0.200
X1	0.900
Y	0.500
Y1	0.525
Y2	0.475
Y3	1.150

Suggested Pad Layout (cont.)

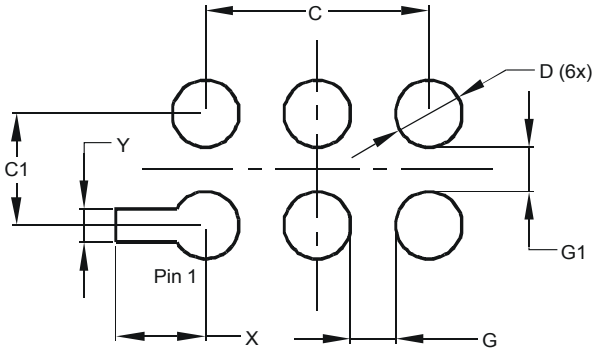
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

(6) X2-DFN1010-6



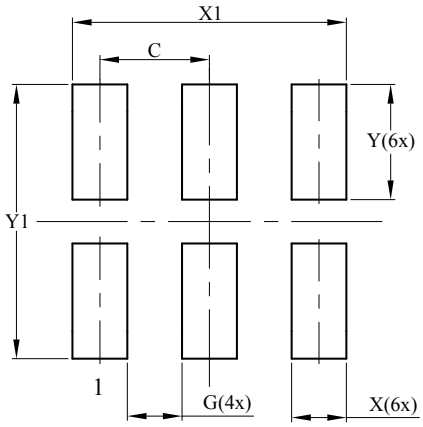
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

(7) 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

(8) 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

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.
Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

www.diodes.com