

## 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:

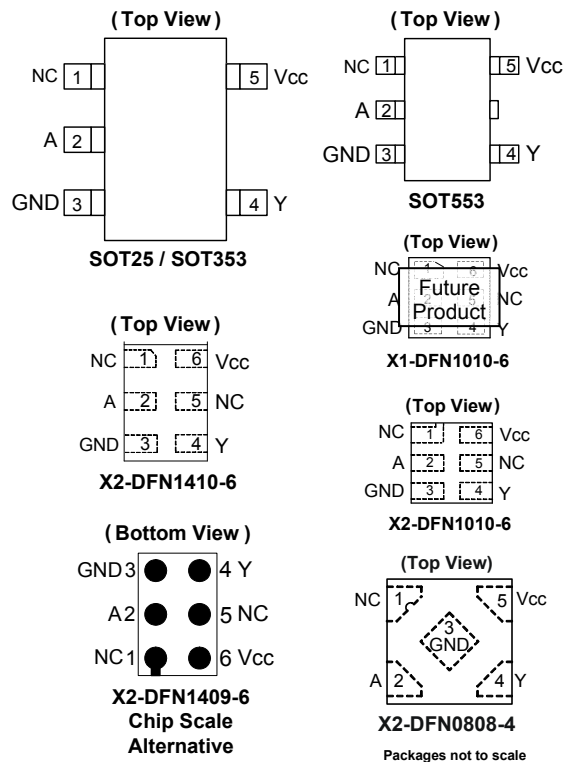
$$Y = \bar{A}$$

## Features

- Wide Supply Voltage Range from 1.65 to 5.5V
- $\pm 24\text{mA}$  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)**

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 < 1000 ppm antimony compounds.

## Pin Assignments

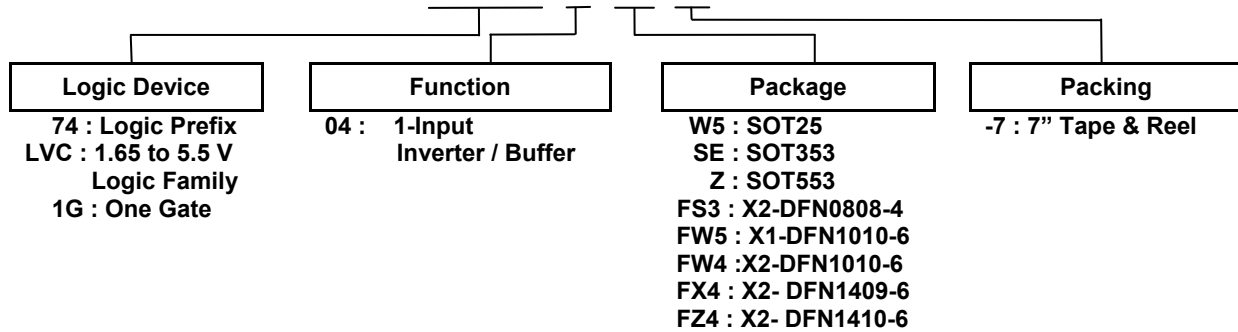


## Applications

- 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

## Ordering Information

74 LVC1G 04 XXX -7



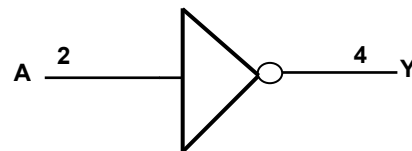
Device	Package Code	Package (Notes 4,5)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G04W5-7	W5	SOT25	3.0mm X 2.8mm X 1.2mm 0.95 mm lead pitch	3000/Tape & Reel	-7
74LVC1G04SE-7	SE	SOT353	2.0mm X 2.0mm X 1.1mm 0.65 mm lead pitch	3000/Tape & Reel	-7
74LVC1G04Z-7	Z	SOT553	1.6mm X 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 (Future Product)	FW5	X1-DFN1010-6 (Future Product)	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 <sub>CC</sub>	Supply Voltage

### Logic Diagram



### Function Table

Inputs	Output
A	Y
H	L
L	H

## Absolute Maximum Ratings (Notes 6, 7)

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	$\pm 50$	mA
$I_{CC}, I_{GN}$	Continuous Current Through $V_{CC}$ or GND	$\pm 100$	mA
$T_J$	Operating Junction Temperature	-40 to +150	$^{\circ}C$
$T_{STG}$	Storage Temperature	-65 to +150	$^{\circ}C$

- 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)

Symbol	Parameter	Min	Max	Unit	
V <sub>CC</sub>	Operating Voltage	Operating	1.65	5.5	V
		Data retention only	1.5	—	V
V <sub>IH</sub>	High-Level Input Voltage	V <sub>CC</sub> = 1.65V to 1.95V	0.65 X V <sub>CC</sub>	—	V
		V <sub>CC</sub> = 2.3V to 2.7V	1.7	—	
		V <sub>CC</sub> = 3V to 3.6V	2	—	
		V <sub>CC</sub> = 4.5V to 5.5V	0.7 X V <sub>CC</sub>	—	
V <sub>IL</sub>	Low-Level input voltage	V <sub>CC</sub> = 1.65V to 1.95V	—	0.35 X V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3V to 2.7V	—	0.7	
		V <sub>CC</sub> = 3V to 3.6V	—	0.8	
		V <sub>CC</sub> = 4.5V to 5.5V	—	0.3 X V <sub>CC</sub>	
V <sub>I</sub>	Input Voltage	0	5.5	V	
V <sub>O</sub>	Output Voltage	0	V <sub>CC</sub>	V	
I <sub>OH</sub>	High-Level Output Current	V <sub>CC</sub> = 1.65V	—	-4	mA
		V <sub>CC</sub> = 2.3V	—	-8	
		V <sub>CC</sub> = 2.7V	—	-12	
		V <sub>CC</sub> = 3V	—	-16	
		V <sub>CC</sub> = 4.5V	—	-24	
I <sub>OL</sub>	Low-Level Output Current	V <sub>CC</sub> = 1.65V	—	4	mA
		V <sub>CC</sub> = 2.3V	—	8	
		V <sub>CC</sub> = 2.7V	—	12	
		V <sub>CC</sub> = 3V	—	16	
		V <sub>CC</sub> = 4.5V	—	24	
Δt/ΔV	Input Transition Rise or Fall Rate	V <sub>CC</sub> = 1.8V ± 0.15V, 2.5V ± 0.2V	—	20	ns/V
		V <sub>CC</sub> = 3.3V ± 0.3V	—	10	
		V <sub>CC</sub> = 5V ± 0.5V	—	5	
T <sub>A</sub>	Operating free-air temperature	—	-40	+125	°C

Notes: 8. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics** (All typical values are at  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ C$ )

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	$I_{OH} = -100\mu A$	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	$I_{OL} = 100\mu A$	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	$V_I = 5.5V$ or GND	0 to 5.5V	—	$\pm 0.1$	$\pm 5$	—	$\pm 100$	$\mu A$
$I_{OFF}$	Power Down Leakage Current	$V_I$ or $V_O = 5.5V$	0V	—	—	$\pm 10$	—	$\pm 200$	$\mu A$
$I_{CC}$	Supply Current	$V_I = 5.5V$ or GND $I_O = 0$	5.5V	—	0.1	10	—	200	$\mu A$
$\Delta I_{CC}$	Additional Supply Current	Input at $V_{CC} - 0.6V$	3V to 5.5V	—	—	500	—	5000	$\mu A$
$C_i$	Input Capacitance	$V_I = V_{CC} -$ or GND	3.3V	—	5	—	—	—	pF

**Package Characteristics** (All typical values are at  $V_{CC} = 3.3V$ ,  $T_A = +25^\circ C$ )

Symbol	Parameter	Test Conditions	$V_{CC}$	Min	Typ.	Max	Unit
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT25	(Note 9)	—	204	—	$^\circ C/W$
		SOT353		—	371	—	
		SOT553		—	231	—	
		X2-DFN0808-4		—	400	—	
		X1-DFN1010-6		—	435	—	
		X2-DFN1010-6		—	445	—	
		X2-DFN1409-6		—	470	—	
		X2-DFN1410-6		—	460	—	
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT25	(Note 9)	—	52	—	$^\circ C/W$
		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  $T_A = +25^\circ C$  and nominal voltages 1.8V, 2.5V, 2.7V, 3.3V, and 5.0V.

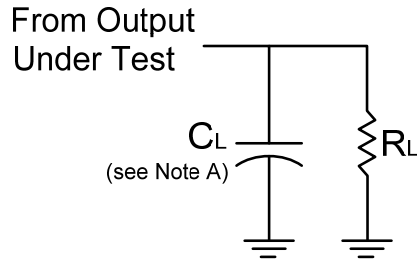
Parameter	From Input	To Output	$V_{CC}$	$T_A = -40^\circ C$ to $+85^\circ C$			$T_A = -40^\circ C$ to $+125^\circ C$		Unit
				Min	Typ	Max	Min	Max	
$t_{pd}$	A or B	Y	$1.8V \pm 0.15V$	1.0	3.0	7.5	1.0	9.5	ns
			$2.5V \pm 0.2V$	0.5	2.0	5.0	0.5	6.5	
			2.7V	0.5	2.3	5.2	0.5	7.0	
			$3.3V \pm 0.3V$	0.5	2.0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

**Operating Characteristics**

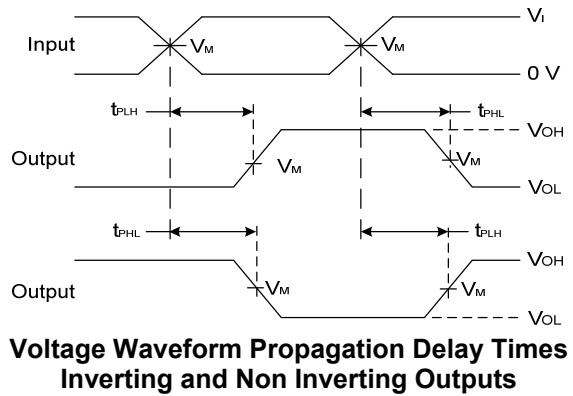
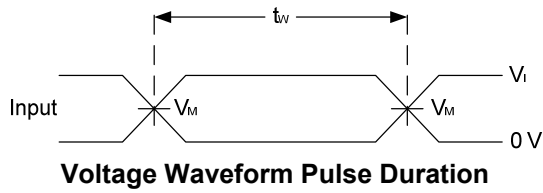
$T_A = +25^\circ C$

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 <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>	R <sub>L</sub>
	V <sub>I</sub>	t <sub>r</sub> /t <sub>f</sub>			
1.8V ± 0.15V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30pF	1kΩ
2.5V ± 0.2V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	30pF	500Ω
2.7V	V <sub>CC</sub>	≤2.5ns	1.5V	50pF	500Ω
3.3V ± 0.3V	3.0V	≤2.5ns	1.5V	50pF	500Ω
5.0V ± 0.5V	V <sub>CC</sub>	≤2.5ns	V <sub>CC</sub> /2	50pF	500Ω

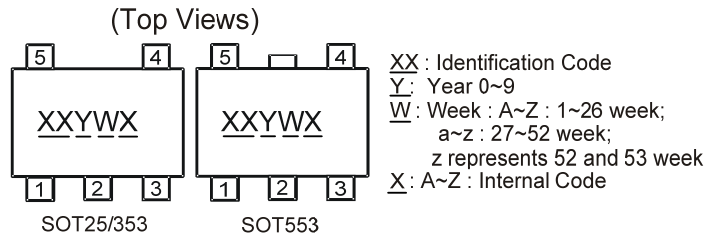


**Figure 1. Load Circuit and Voltage Waveforms**

- Notes:
- A. Includes test lead and test apparatus capacitance.
  - B. All pulses are supplied at pulse repetition rate ≤ 10MHz.
  - C. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>PD</sub>.

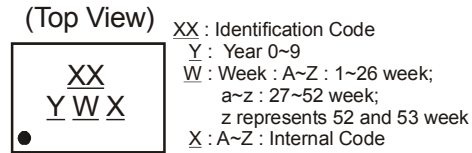
**Marking Information**

**(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**

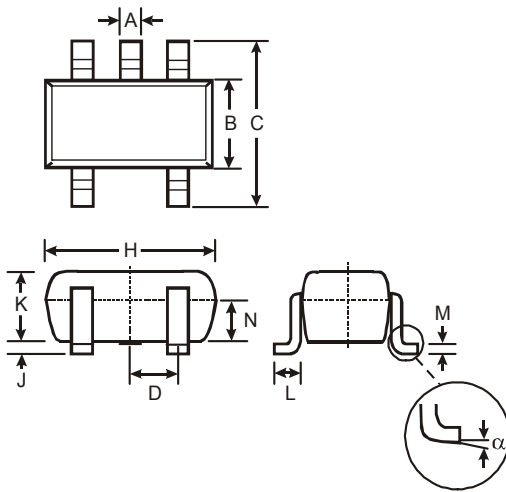


Part Number	Package	Identification Code
74LVC1G04FS3-7	X2-DFN0808-4	WU
74LVC1G04FW5-7	X1-DFN1010-6	V4
74LVC1G04FW4-7	X2-DFN1010-6	UU
74LVC1G04FX4-7	X2-DFN1409-6	MC
74LVC1G04FZ4-7	X2-DFN1410-6	UU



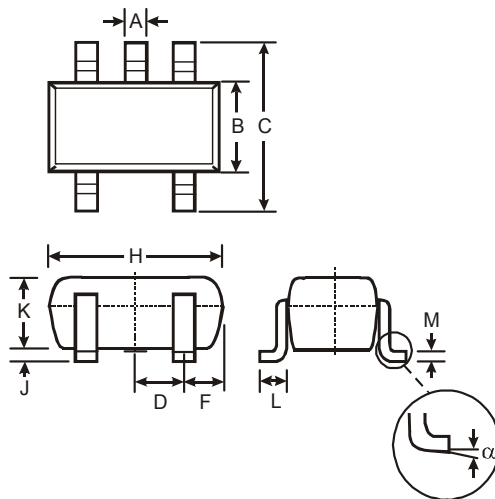
**Package Outline Dimensions** (All Dimensions in mm)

**(1) Package Type: SOT25**



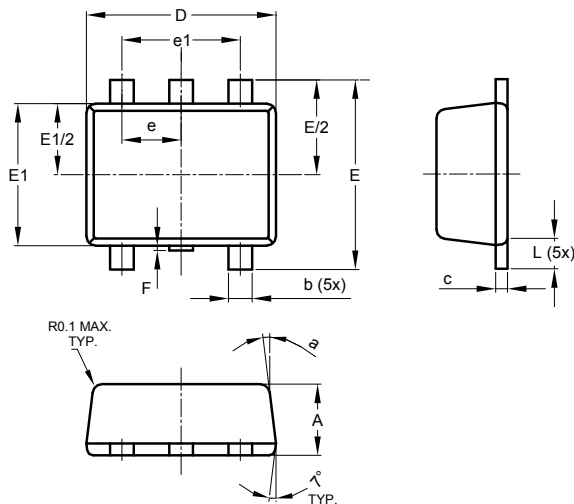
SOT25			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	—
All Dimensions in mm			

**(2) Package Type: 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		

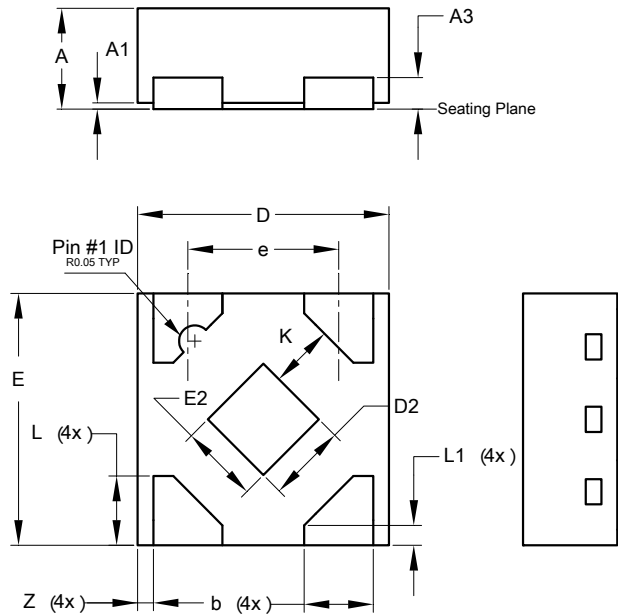
**(3) Package Type: SOT553**



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			

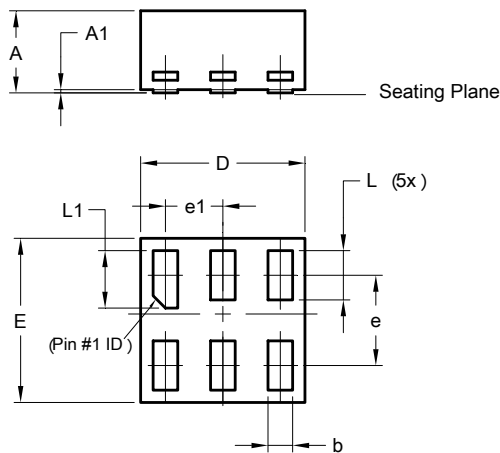
**Package Outline Dimensions (cont.)**

**(4) Package Type 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			

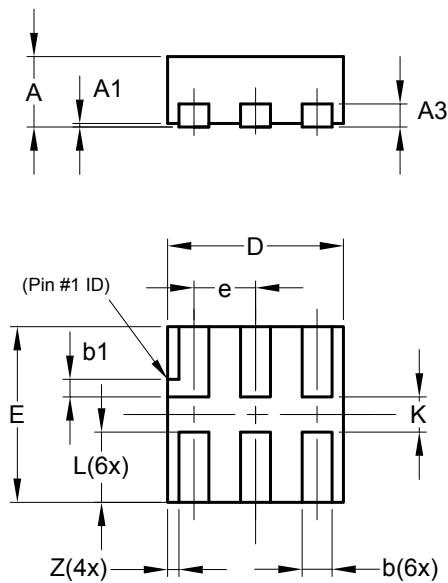
**(5) Package Type: X1-DFN1010-6**



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			

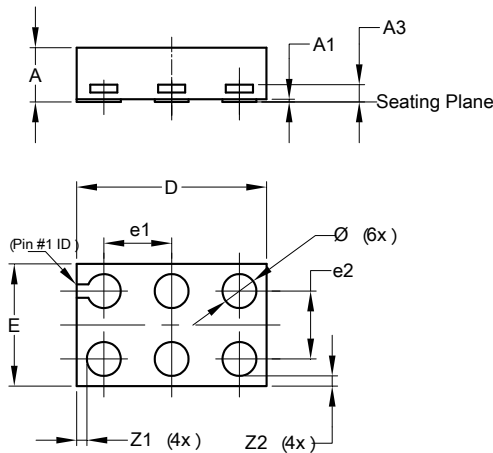
**Package Outline Dimensions (cont.)**

**(6) Package Type X2-DFN1010-6**



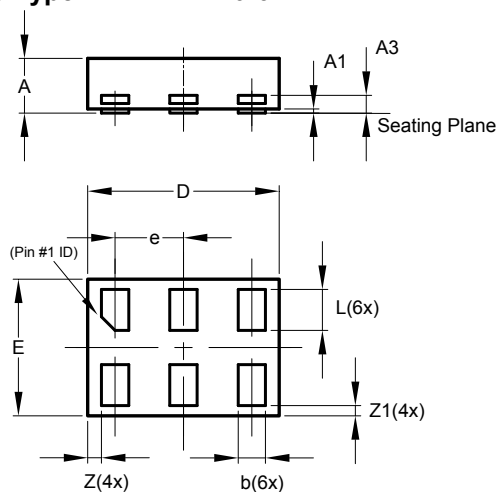
X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

**(7) Package Type: X2-DFN1409-6 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			

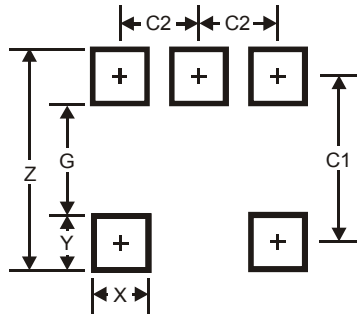
**(8) Package Type: X2-DFN1410-6**



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			

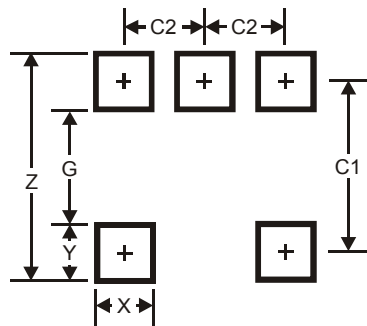
**Suggested Pad Layout**

**(1) Package Type: SOT25**



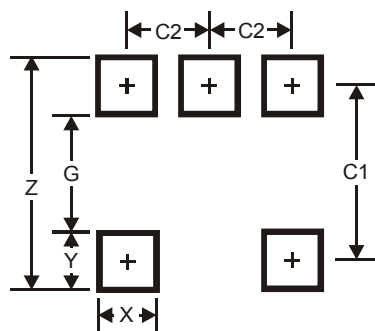
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

**(2) Package Type: SOT353**



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

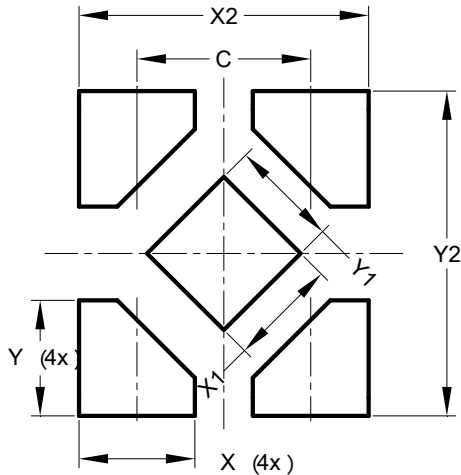
**(3) Package Type: SOT553**



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

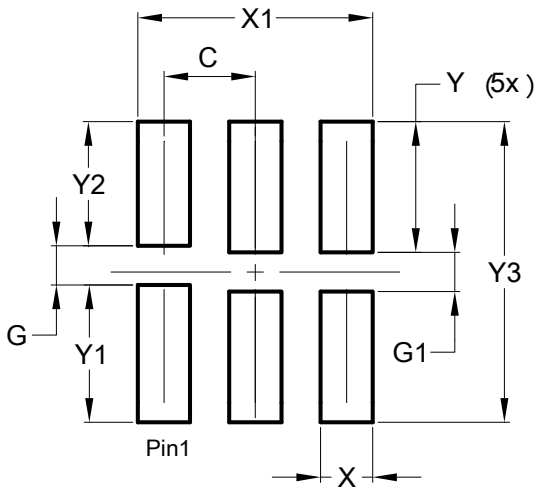
**Suggested Pad Layout (cont.)**

**(4) Package Type 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

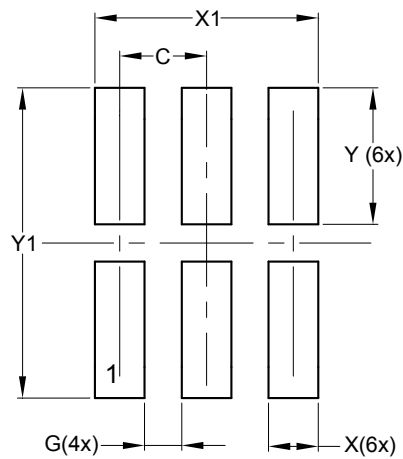
**(5)(Package Type X1-DFN1010-6**



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

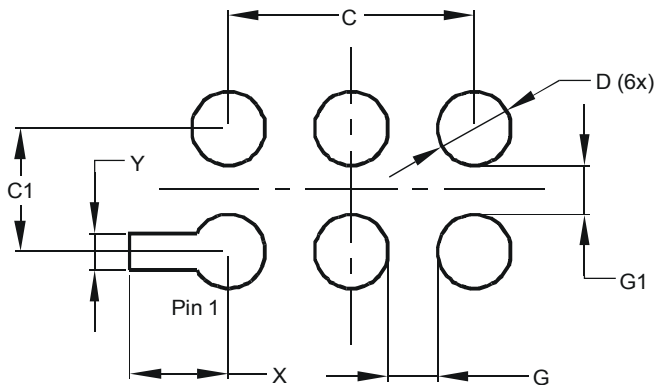
**Suggested Pad Layout (cont.)**

**(6) (Package Type X2-DFN1010-6)**



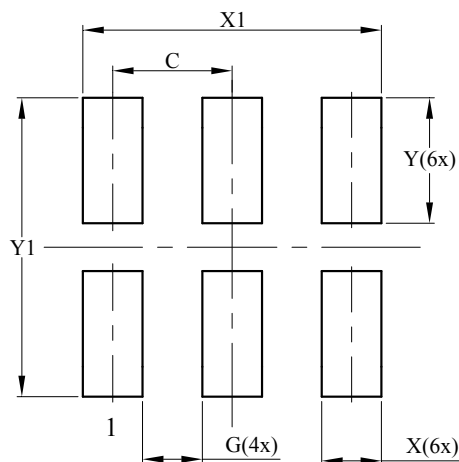
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

**(7) Package Type: 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) 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

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