

### 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<sub>OFF</sub>. The I<sub>OFF</sub> circuitry disables the output preventing damaging current backflow when the device is powered down.

The gate performs the positive Boolean function:

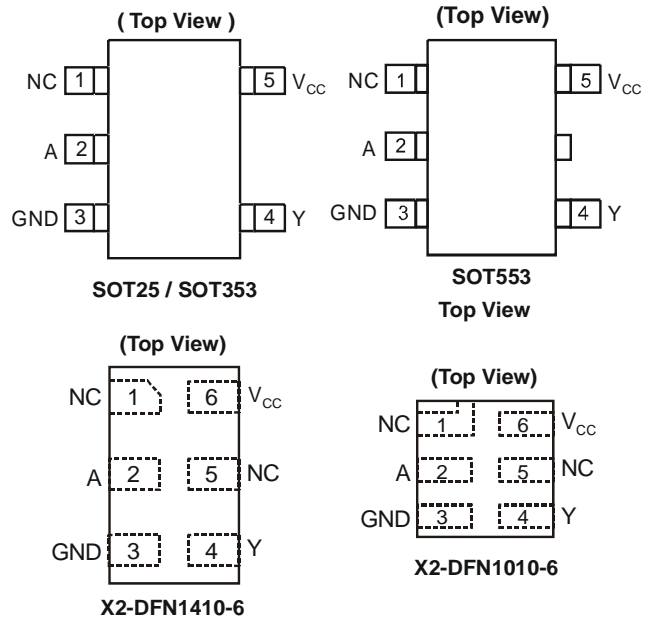
$$Y = \bar{A}$$

### Features

- Wide Supply Voltage Range from 1.65 to 5.5V
- ±24mA Output Drive at 3.3V
- CMOS low power consumption
- I<sub>OFF</sub> Supports Partial-Power-Down Mode Operation
- Inputs accept up to 5.5V
- ESD Protection Tested per JESD 22
  - Exceeds 200-V Machine Model (A115-A)
  - Exceeds 2000-V Human Body Model (A114-A)
  - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options
- Direct Interface with TTL Levels
- All packages Assembled with “Green” Molding Compound (no Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 1)

Notes: 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. No purposely added lead. Halogen and Antimony free. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html)

### Pin Assignments



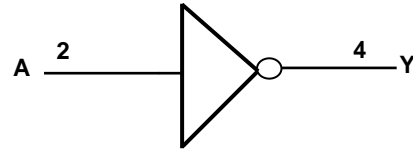
### Applications

- 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

### 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 (Note 2)

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 <sub>CC</sub>	Supply Voltage Range	-0.5 to 6.5	V
V <sub>I</sub>	Input Voltage Range	-0.5 to 6.5	V
V <sub>O</sub>	Voltage applied to output in high impedance or I <sub>OFF</sub> state	-0.5 to 6.5	V
V <sub>O</sub>	Voltage applied to output in high or low state.	-0.3 to V <sub>CC</sub> +0.5	V
I <sub>IK</sub>	Input Clamp Current V <sub>I</sub> <0	-50	mA
I <sub>OK</sub>	Output Clamp Current	-50	mA
I <sub>O</sub>	Continuous output current	±50	mA
I <sub>CC</sub> , I <sub>GN</sub>	Continuous current through V <sub>CC</sub> or GND	±100	mA
T <sub>J</sub>	Operating Junction Temperature	-40 to 150	°C
T <sub>STG</sub>	Storage Temperature	-65 to 150	°C

Notes: 2. 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 3)

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> = 3V		-16	
		V <sub>CC</sub> = 4.5V		-32	
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> = 3V		16	
		V <sub>CC</sub> = 4.5V		32	
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: 3. 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		
		$I_{OH} = -16mA$	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	
		$I_{OL} = 16mA$	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 4)		204		$^\circ C/W$
		SOT353			371		
		SOT553			231		
		X2-DFN1010-6			445		
		X2-DFN1410-6			460		
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT25	(Note 4)		52		$^\circ C/W$
		SOT353			143		
		SOT553			105		
		X2-DFN1010-6			250		
		X2-DFN1410-6			265		

Notes: 4. Test condition for SOT25, SOT353, SOT553, X2-DFN1410-6 and X2-DFN1010-6: 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.

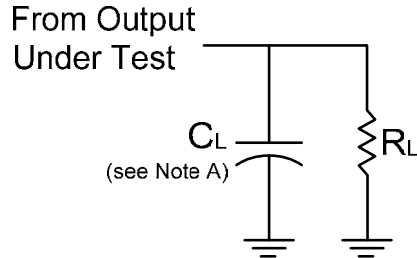
Parameter	From Input	To Output	$V_{CC}$	$T_A = -40^\circ C$ to $85^\circ C$			$T_A = -40^\circ C$ to $125^\circ C$		Unit
				Min	Typ	Max	Min	Max	
$t_{pd}$	A or B	Y	$1.8V \pm 0.15V$	1.0	3.0	7.5	1.0	9.5	ns
			$2.5V \pm 0.2V$	0.5	2.0	5.0	0.5	6.5	
			2.7V	0.5	2.3	5.2	0.5	7.0	
			$3.3V \pm 0.3V$	0.5	2.0	4.2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

### Operating Characteristics

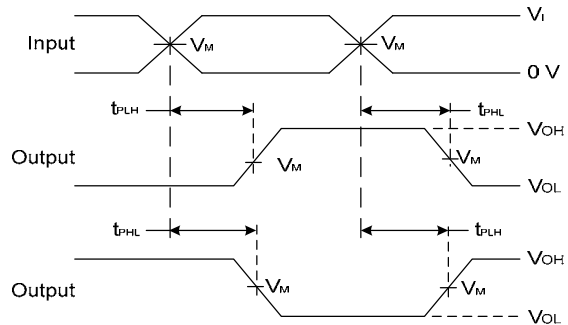
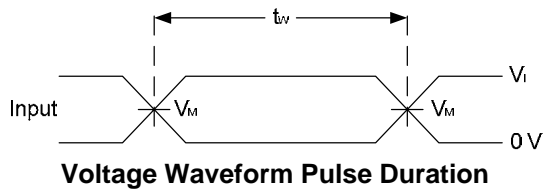
$T_A = 25^\circ C$

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	$f = 10$ MHz	16	16	16	16	pF

**Parameter Measurement Information**



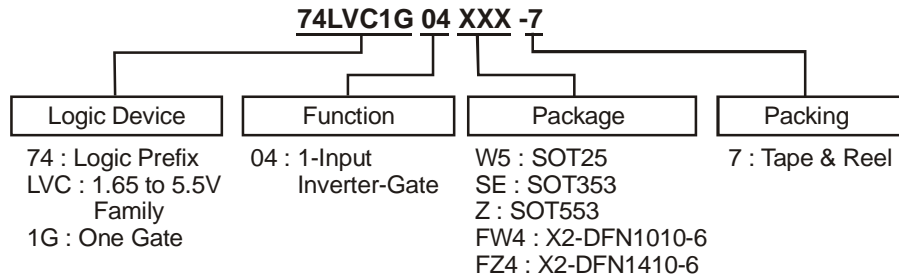
$V_{CC}$	Inputs		$V_M$	$C_L$	$R_L$
	$V_I$	$t_r/t_f$			
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	30 pF	1 K $\Omega$
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	30 pF	500 $\Omega$
2.7V	$V_{CC}$	$\leq 2.5ns$	1.5V	50 pF	500 $\Omega$
$3.3V \pm 0.3V$	3.0 V	$\leq 2.5ns$	1.5V	50 pF	500 $\Omega$
$5.0V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	50 pF	500 $\Omega$



**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  $\leq 10$  MHz.
  - C.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{PD}$ .

### Ordering Information

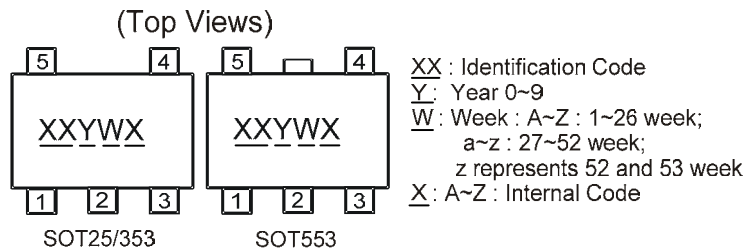


Device	Package Code	Packaging (Note 6)	7" Tape and Reel	
			Quantity	Part Number Suffix
74LVC1G04W5-7	W5	SOT25	3000/Tape & Reel	-7
74LVC1G04SE-7	SE	SOT353	3000/Tape & Reel	-7
74LVC1G04Z-7	Z	SOT553	4000/Tape & Reel	-7
74LVC1G04FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7
74LVC1G04 FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7

Notes: 5. 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>.  
6. The taping orientation is located on our website at <http://www.diodes.com/datasheets/ap02007.pdf>

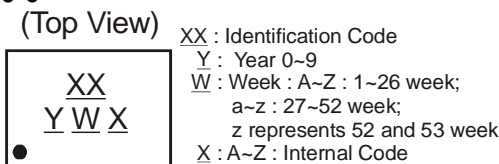
### Marking Information

#### (1) SOT25, SOT353 and SOT553



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

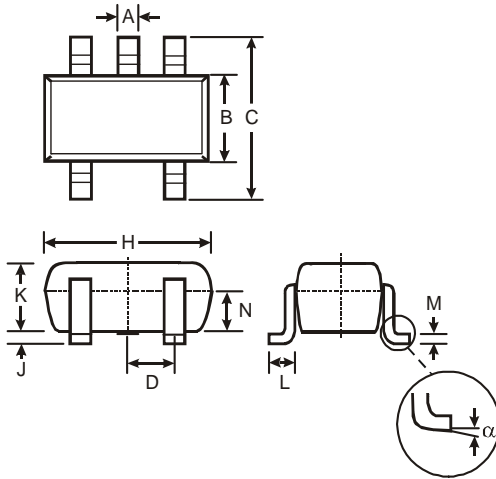
#### (2) X2-DFN1010-6 and X2-DFN1410-6



Part Number	Package	Identification Code
74LVC1G04FW4	X2-DFN1010-6	UU
74LVC1G04FZ4	X2-DFN1410-6	UU

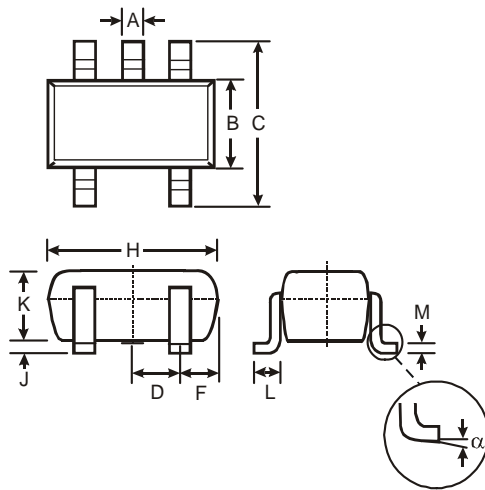
**Package Outline Dimensions (All Dimensions in mm)**

**(1) Package Type: SOT25**



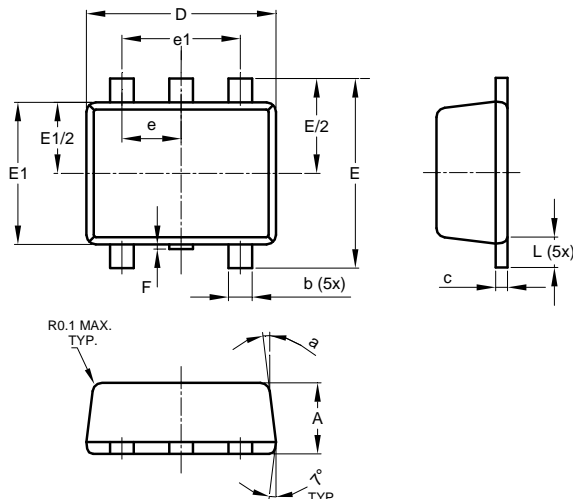
SOT25			
Dim	Min	Max	Typ
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	—	—	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
$\alpha$	0°	8°	—
All Dimensions in mm			

**(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
$\alpha$	0°	8°
All Dimensions in mm		

**(3) Package Type: SOT553**

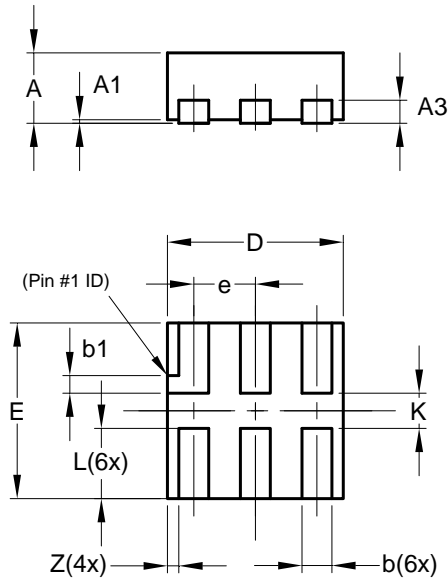


SOT553			
Dim	Min	Max	Typ
A	0.55	0.62	0.60
b	0.15	0.30	0.20
c	0.10	0.18	0.15
D	1.50	1.70	1.60
E	1.55	1.70	1.60
E1	1.10	1.25	1.20
e	0.50 BSC		
e1	1.00 BSC		
F	0.00	0.10	—
L	0.10	0.30	0.20
$\alpha$	6°	8°	7°
All Dimensions in mm			



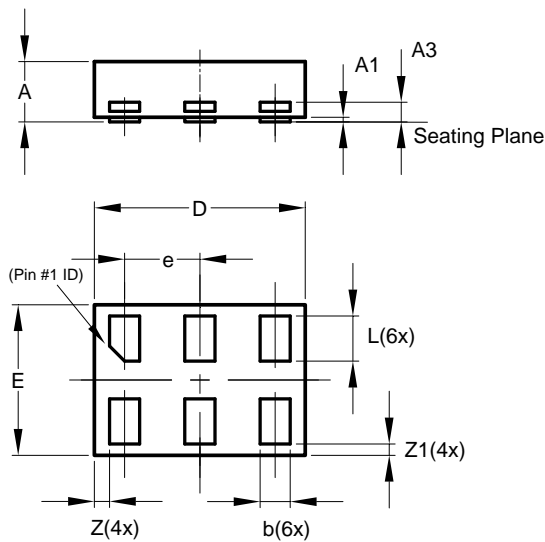
**Package Outline Dimensions (cont.)**

**(4) 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			

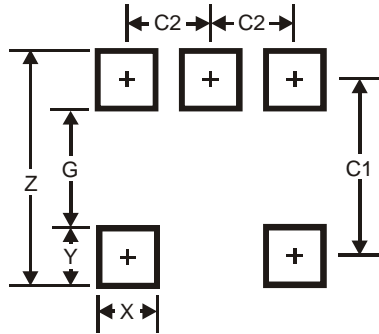
**(5) Package Type: X2-DFN1410-6**



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			

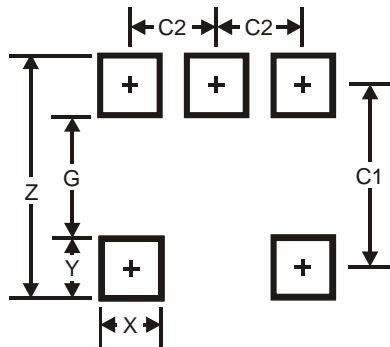
**Suggested Pad Layout**

**(1) Package Type: SOT25**



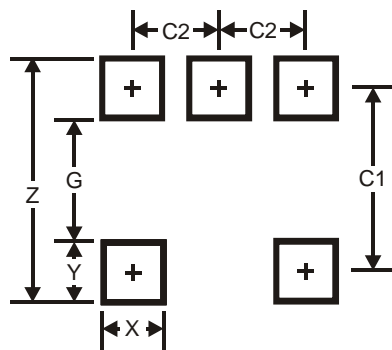
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

**(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

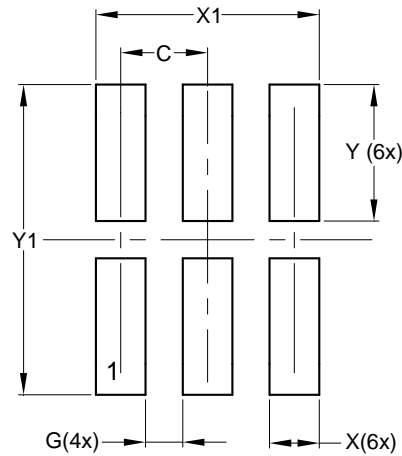
**(3) Package Type: SOT553**



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

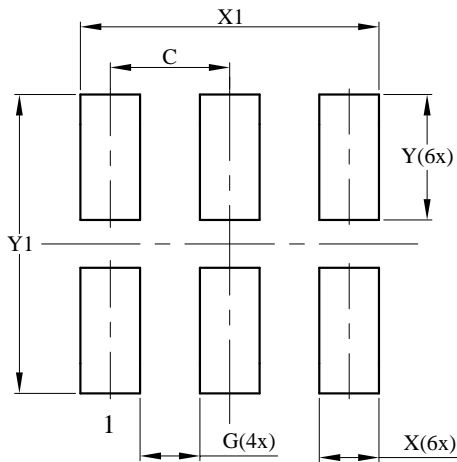
**Suggested Pad Layout (cont.)**

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



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

**(5) 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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