

### Description

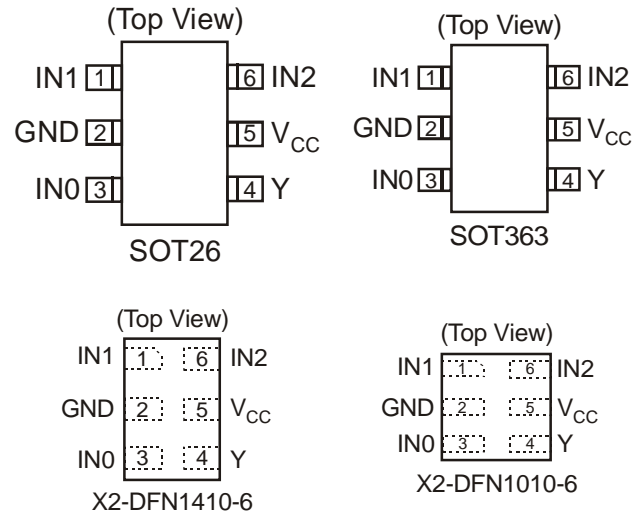
The 74LVC1G98 is a single 3-input positive configurable multiple function gate with a standard push-pull output. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions MUX, AND, OR, NAND, NOR, inverter or non-inverting buffer. All inputs can be connected to ground or  $V_{CC}$  as required. 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 IOFF. The IOFF circuitry disables the output preventing damaging current backflow when the device is powered down. The user is reminded that the device can simulate several types of logic gates but may respond differently due to the Schmitt action at the inputs.

### Features

- Wide Supply Voltage Range from 1.65V to 5.5V
- $\pm 24\text{mA}$  Output Drive at 3.3V
- CMOS low power consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs accept up to 5.5V
- ESD Protection Exceeds JESD 22
  - 200-V Machine Model (A115-A)
  - 2000-V Human Body Model (A114-A)
- Latch-Up Exceeds 100mA per JESD 78, Class II
- Range of Package Options
- SOT26, SOT363, DFN1410, and DFN1010: Available in "Green" Molding Compound (no Br, Sb)
  - **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 <1000ppm antimony compounds.

### Pin Assignments



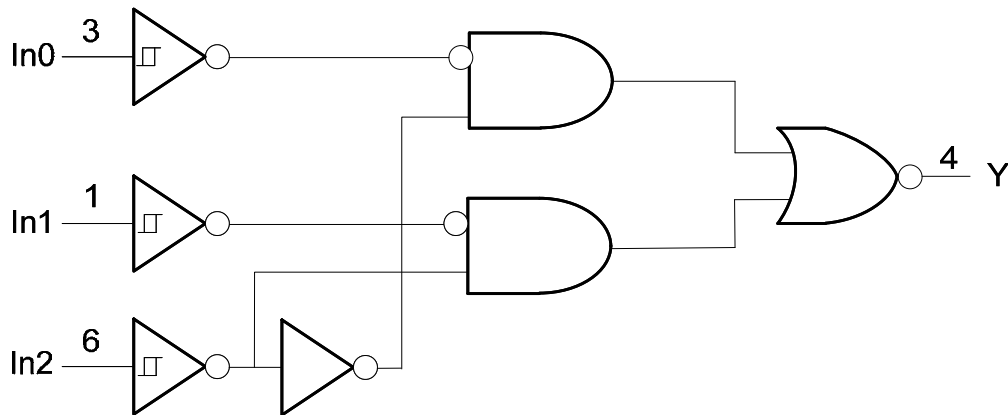
### Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
  - PCs, networking, notebooks, netbooks, PDAs
  - 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	Function
IN1	Data Input
GND	Ground
IN0	Data Input
Y	Data Output
V <sub>CC</sub>	Supply Voltage
IN2	Data Input

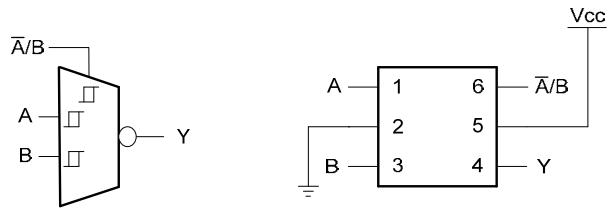
**Logic Diagram**



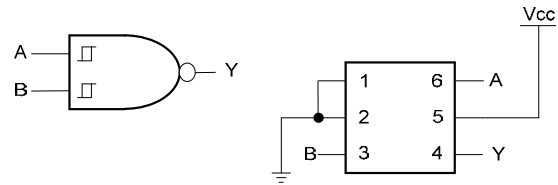
**Function Table**

Inputs			Output
IN2	IN1	IN0	Y
L	L	L	H
L	L	H	H
L	H	L	L
L	H	H	L
H	L	L	H
H	L	H	L
H	H	L	H
H	H	H	L

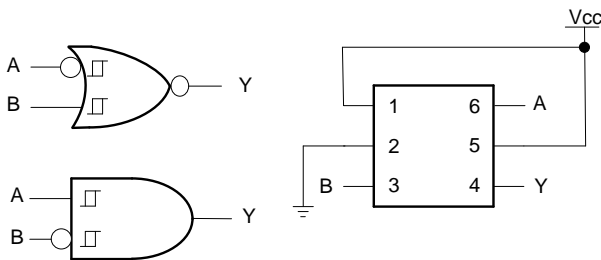
**Logic Configurations**



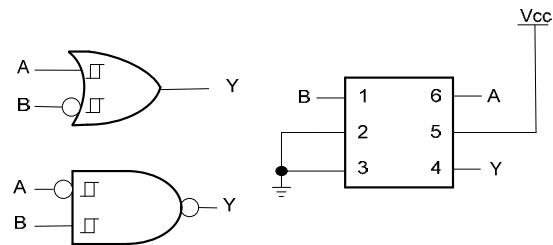
Configuration 1  
2 to 1 Data Selector with Inverted Output



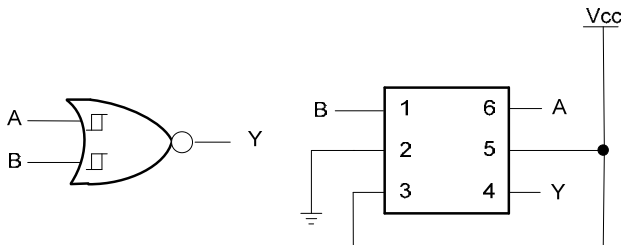
Configuration 2  
2-Input OR Gate with Both Inputs Inverted



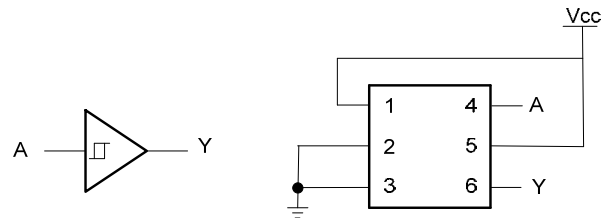
Configuration 3  
2-Input NAND Gate with B Input Inverted  
2-Input OR Gate with A Input Inverted



Configuration 4  
2-Input OR Gate with One Input Inverted  
2-Input NAND Gate with One Input Inverted



Configuration 5  
2-Input NOR Gate



Configuration 6  
Buffer

Function Selection Table	
Logic Function	Configuration
2-to-1 Data Selector with inverted output	1
2-input NAND gate	2
2-input AND with inverted input	3
2-input NOR with inverted input	3
2-input NAND with one inverted input	4
2-input OR with one inverted input	4
2-input NOR	5
1-input Buffer	6

### Absolute Maximum Ratings (Note 4)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	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
	Continuous current through V <sub>DD</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: 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)

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>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		-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> = 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> = 5 V ± 0.5V		5	
T <sub>A</sub>	Operating free-air temperature	-40	+125	°C	

Notes: 5. Unused inputs should be held at V<sub>CC</sub> or Ground.

**Electrical Characteristics  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$  (All typical values are at  $V_{CC} = 3.3\text{V}$ ,  $T_A = +25^\circ\text{C}$ )**

Symbol	Parameter	Test Conditions	V <sub>CC</sub>	Min	Typ.	Max	Unit
V <sub>T+</sub>	Positive-going input threshold voltage		1.65V	0.70		1.20	
			2.3V	1.11		1.60	
			3V	1.50		2.00	
			4.5V	2.16		2.74	
			5.5V	2.61		3.33	
V <sub>T-</sub>	Negative-going input threshold voltage		1.65V	0.30		0.72	
			2.3V	0.58		1.00	
			3V	0.80		1.30	
			4.5V	1.21		1.95	
			5.5V	1.45		2.35	
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )		1.65V	0.30		0.62	
			2.3V	0.40		0.80	
			3V	0.35		1.00	
			4.5V	0.55		1.10	
			5.5V	0.60		1.20	
V <sub>OH</sub>	High Level Output Voltage	I <sub>OH</sub> = -100μA	1.65V to 5.5V	V <sub>CC</sub> - 0.1			V
		I <sub>OH</sub> = -4mA	1.65V	1.2			
		I <sub>OH</sub> = -8mA	2.3V	1.9			
		I <sub>OH</sub> = -16mA	3V	2.4			
		I <sub>OH</sub> = -24mA		2.3			
		I <sub>OH</sub> = -32mA	4.5V	3.8			
V <sub>OL</sub>	High-level Input Voltage	I <sub>OL</sub> = 100μA	1.65V to 5.5V			0.1	V
		I <sub>OL</sub> = 4mA	1.65V			0.45	
		I <sub>OL</sub> = 8mA	2.3V			0.3	
		I <sub>OL</sub> = 16mA	3V			0.4	
		I <sub>OL</sub> = 24mA				0.55	
		I <sub>OL</sub> = 32mA	4.5V			0.55	
I <sub>I</sub>	Input Current	V <sub>I</sub> = 5.5V or GND	0 to 5.5V			± 5	μA
I <sub>OFF</sub>	Power Down Leakage Current	V <sub>I</sub> or V <sub>O</sub> = 5.5V	0			± 10	μA
I <sub>CC</sub>	Supply Current	V <sub>I</sub> = 5.5V of GND I <sub>O</sub> = 0	1.65V to 5.5V			10	μA
ΔI <sub>CC</sub>	Additional Supply Current	One input at V <sub>CC</sub> - 0.6V Other inputs at V <sub>CC</sub> or GND	3V to 5.5V			500	μA

**Electrical Characteristics**  $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$  (All typical values are at  $V_{CC} = 3.3\text{V}$ ,  $T_A = +25^\circ\text{C}$ )

Symbol	Parameter	Test Conditions	$V_{CC}$	Min	Typ	Max	Unit
$V_{T+}$	Positive-going input threshold voltage		1.65V	0.70		1.20	
			2.3V	1.11		1.60	
			3V	1.50		2.00	
			4.5V	2.16		2.74	
			5.5V	2.61		3.33	
$V_{T-}$	Negative-going input threshold voltage		1.65V	0.30		0.75	
			2.3V	0.58		1.03	
			3V	0.80		1.33	
			4.5V	1.21		1.95	
			5.5V	1.45		2.35	
$\Delta V_T$	Hysteresis ( $V_{T+} - V_{T-}$ )		1.65V	0.30		0.62	
			2.3V	0.37		0.80	
			3V	0.32		1.00	
			4.5V	0.50		1.20	
			5.5V	0.55		1.40	
$V_{OH}$	High Level Output Voltage	$I_{OH} = -100\mu\text{A}$	1.65V to 5.5V	$V_{CC} - 0.1$			V
		$I_{OH} = -4\text{mA}$	1.65V	0.95			
		$I_{OH} = -8\text{mA}$	2.3V	1.7			
		$I_{OH} = -16\text{mA}$	3V	1.9			
		$I_{OH} = -24\text{mA}$		2.0			
		$I_{OH} = -32\text{mA}$	4.5V	3.4			
$V_{OL}$	High-level Input Voltage	$I_{OL} = 100\mu\text{A}$	1.65V to 5.5V			0.1	V
		$I_{OL} = 4\text{mA}$	1.65V			0.7	
		$I_{OL} = 8\text{mA}$	2.3V			0.45	
		$I_{OL} = 16\text{mA}$	3V			0.6	
		$I_{OL} = 24\text{mA}$				0.8	
		$I_{OL} = 32\text{mA}$	4.5V			0.8	
$I_I$	Input Current	$V_I = 5.5\text{V}$ or GND	0 to 5.5V			$\pm 100$	$\mu\text{A}$
$I_{OFF}$	Power Down Leakage Current	$V_I$ or $V_O = 5.5\text{V}$	0			$\pm 200$	$\mu\text{A}$
$I_{CC}$	Supply Current	$V_I = 5.5\text{V}$ of GND $I_O = 0$	1.65V to 5.5V			200	$\mu\text{A}$
$\Delta I_{CC}$	Additional Supply Current	One input at $V_{CC} - 0.6\text{V}$ Other inputs at $V_{CC}$ or GND	3V to 5.5V			5000	$\mu\text{A}$

### Electrical 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
$C_I$	Input Capacitance	$V_I = V_{CC} - \text{ or } GND$	3.3		3.5		pF
$\theta_{JA}$	Thermal Resistance Junction-to-Ambient	SOT26	(Note 6)		204		$^\circ C/W$
		SOT363			371		
		X2-DFN1410-6			430		
		X2-DFN1010-6			510		
$\theta_{JC}$	Thermal Resistance Junction-to-Case	SOT26	(Note 6)		52		$^\circ C/W$
		SOT363			143		
		X2-DFN1410-6			190		
		X2-DFN1010-6			250		

Notes: 6. Test condition for SOT26, SOT363, X2-DFN1410-6 and X2-DFN1010-6: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

### Switching Characteristics

$T_A = -40^\circ C$  to  $+85^\circ C$ ,  $C_L = 30$  or  $50pF$  as noted (see Figure 1)

Parameter	From (Input)	TO (OUTPUT)	$V_{CC} = 1.8V \pm 0.15V$		$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 5V \pm 0.5V$		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pd}$	Any	Y	1.0	14.4	0.7	8.3	0.7	6.3	0.7	5.1	ns

$T_A = -40^\circ C$  to  $+125^\circ C$ ,  $C_L = 30$  or  $50pF$  as noted (see Figure 1)

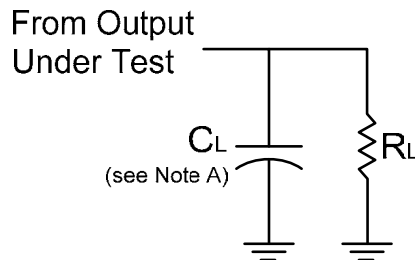
Parameter	From (Input)	TO (OUTPUT)	$V_{CC} = 1.8V \pm 0.15V$		$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 5V \pm 0.5V$		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pd}$	Any	Y	1.0	18.0	0.7	10.4	0.7	7.9	0.7	6.4	ns

### Operating Characteristics

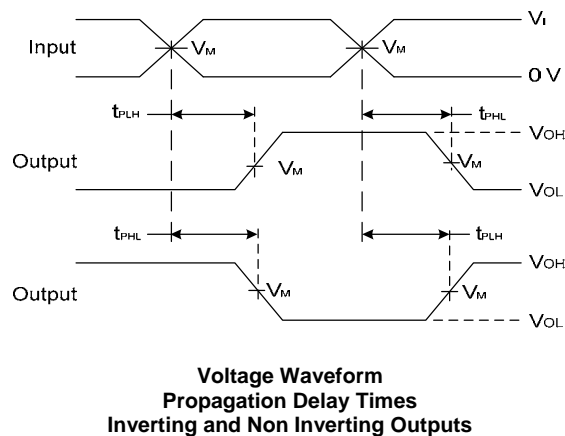
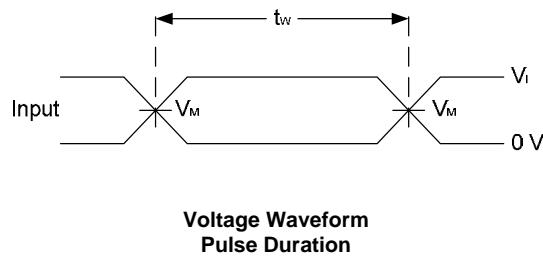
$T_A = +25^\circ C$

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	22	22	23	24	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
3.3V±0.3V	3V	≤2.5ns	1.5V	50pF	500Ω
5V±0.5V	V <sub>CC</sub>	≤2.5ns	V <sub>CC</sub> /2	50pF	500Ω

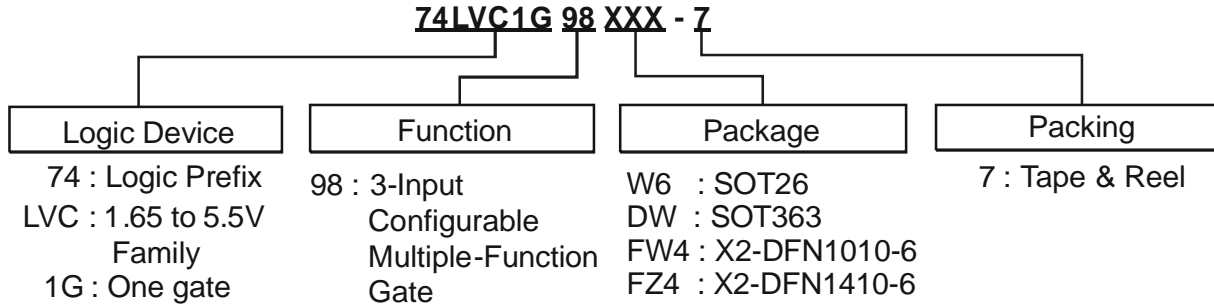


**Figure 1. Load Circuit and Voltage Waveforms**

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



**Ordering Information**



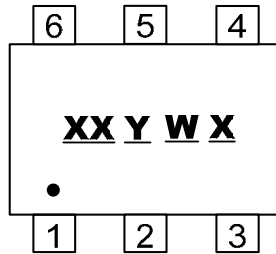
Device	Package Code	Packaging (Note 7)	7" Tape and Reel	
			Quantity	Part Number Suffix
74LVC1G98W6-7	W6	SOT26	3000/Tape & Reel	-7
74LVC1G98DW-7	DW	SOT363	3000/Tape & Reel	-7
74LVC1G98FW4-7	FW4	X2-DFN1010-6	5000/Tape & Reel	-7
74LVC1G98FZ4-7	FZ4	X2-DFN1410-6	5000/Tape & Reel	-7



Notes: 7. 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>.

**Marking Information**

(1) SOT26, SOT363

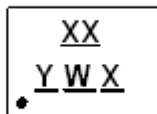


XX : Identification code  
Y : Year 0~9  
W : Week : A~Z : 1~26 week;  
a~z : 27~52 week; z represents  
52 and 53 week  
X : A~Z : Internal Code

Part Number	Package	Identification Code
74LVC1G98W6	SOT26	TZ
74LVC1G98DW	SOT363	TZ

(2) X2-DFN1010-6, X2-DFN1410-6

(Top View)

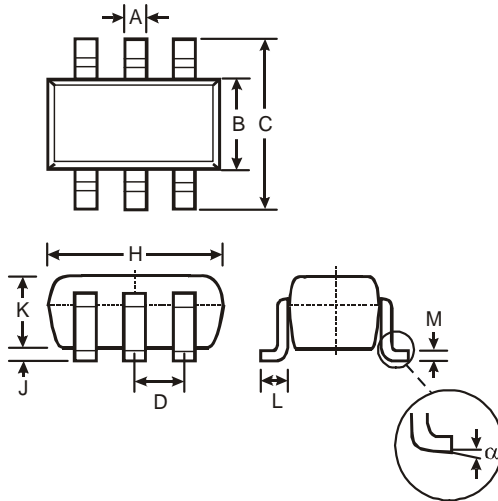


XX : Identification Code  
Y : Year : 0~9  
W : Week : A~Z : 1~26 week;  
a~z : 27~52 week; z represents  
52 and 53 week  
X : A~Z : Internal code

Part Number	Package	Identification Code
74LVC1G98FW4	X2-DFN1010-6	TZ
74LVC1G98Z4	X2-DFN1410-6	TZ

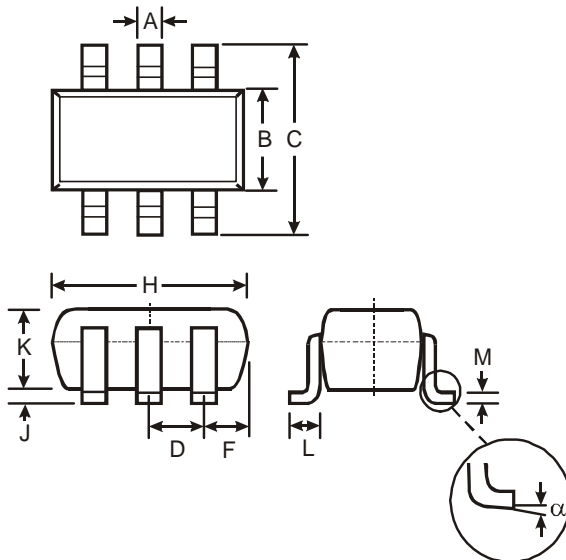
**Package Outline Dimensions (All Dimensions in mm)**

(1) SOT26



SOT26			
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
α	0°	8°	—
All Dimensions in mm			

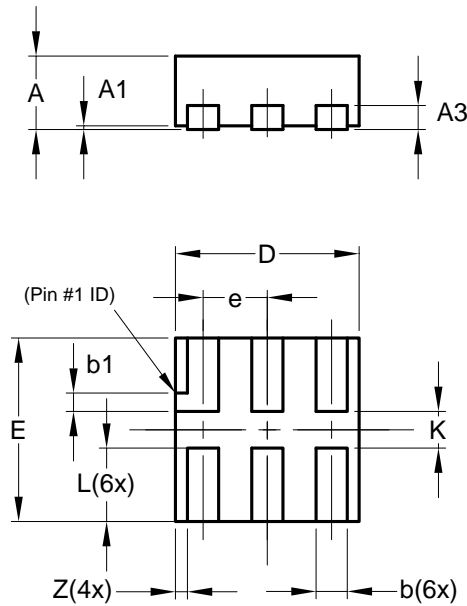
(2) SOT363



SOT363		
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		

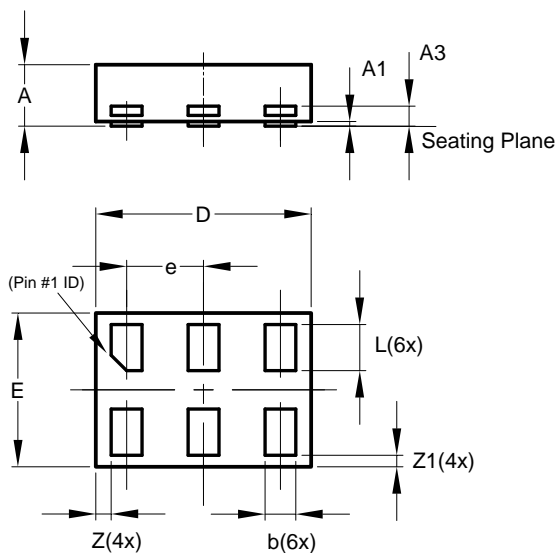
**Package Outline Dimensions (All Dimensions in mm)**

**(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			

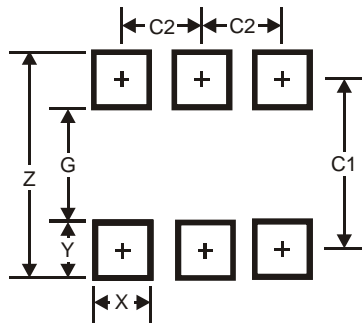
**(4) X2-DFN1410-6**



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			

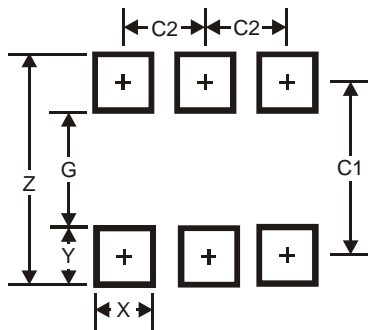
**Suggest Pad Layout**

(1) SOT26



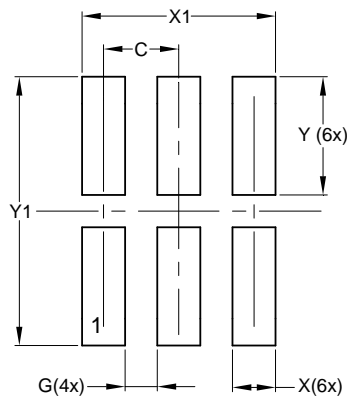
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(2) SOT363



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

(3) X2-DFN1010-6



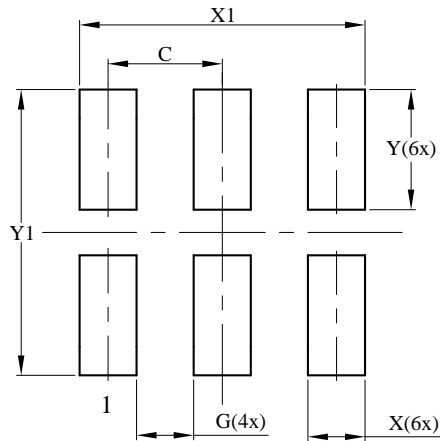
Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

---

**Suggest Pad Layout**

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(4) X2-DFN1410-6



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

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