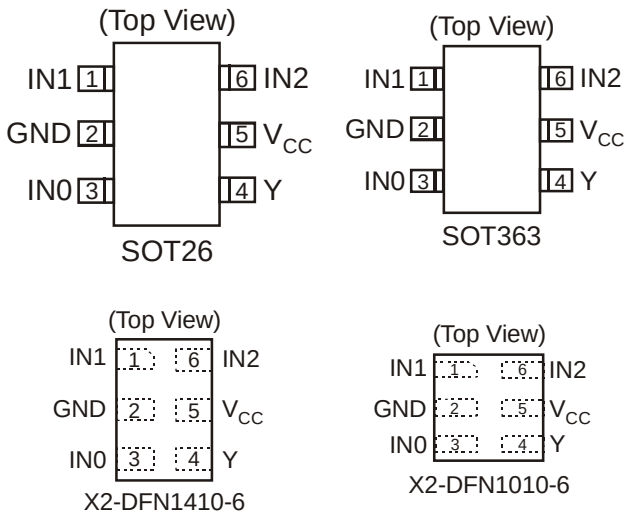
CONFIGURABLE MULTIPLE-FUNCTION GATE

Description

The 74LVC1G97 is a single three-input positive configurable multiple-function gate with a standard push-pull output. The output state is determined by eight patterns of three-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 to prevent 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.

Pin Assignments



Features

- Wide Supply Voltage Range from 1.65V to 5.5V
- ±24mA 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
  - 200V Machine Model (A115-A)
  - 2000V Human Body Model (A114-A)
- Latchup Exceeds 100mA per JESD 78, Class II
- Range of Package Options
- SOT26, SOT363, X2-DFN1410-6, and X2-DFN1010-6: 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)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

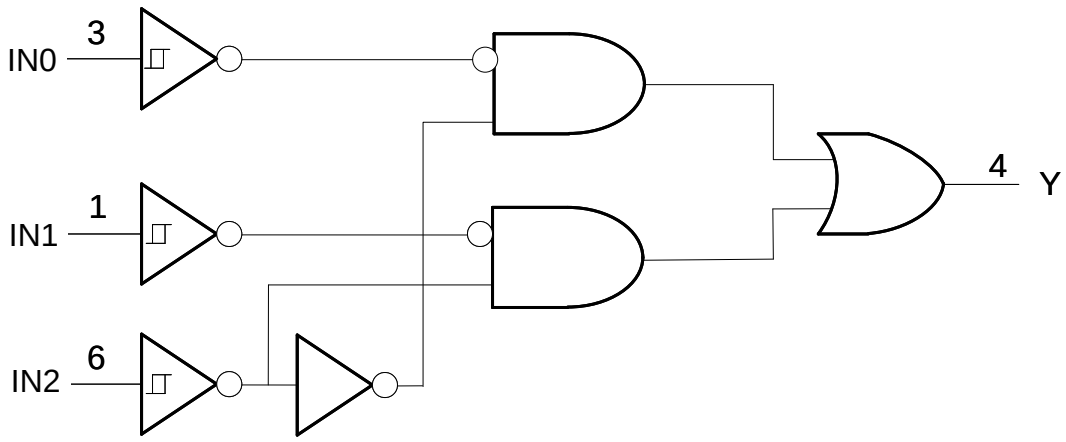
- Voltage level shifting
- General-purpose logics
- Power-down signal isolation
- Wide array of products such as:
  - PCs, networking, notebooks, netbooks, PDAs
  - Computer peripherals, hard drives, CD/DVD ROM
  - TVs, DVDs, DVRs, set-top boxes
  - Cell phones, personal navigation/GPS
  - MP3 players, cameras, video recorders

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 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 Number	Pin Name	Description
1	IN1	Data Input
2	GND	Ground
3	IN0	Data Input
4	Y	Data Output
5	V_{CC}	Supply Voltage
6	IN2	Data Input

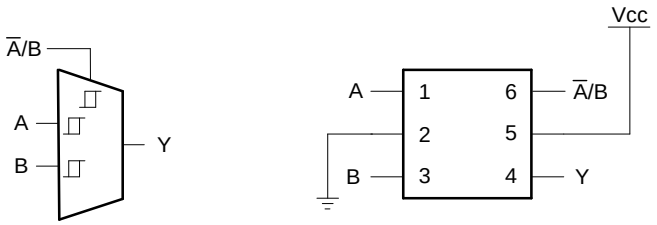
Logic Diagram



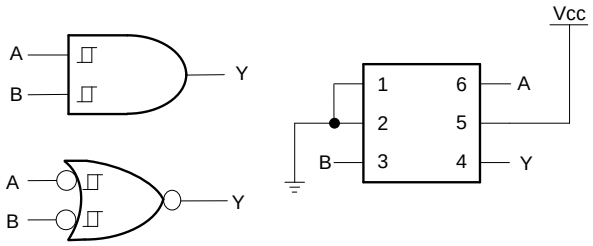
Function Table

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

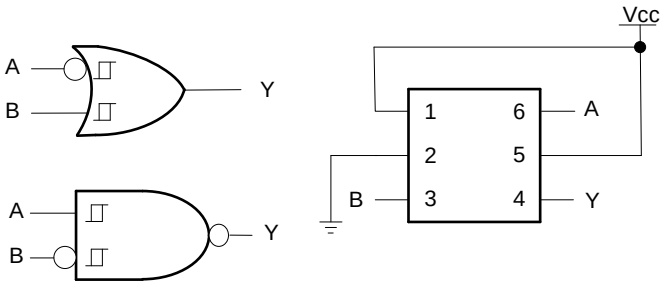
Logic Configurations



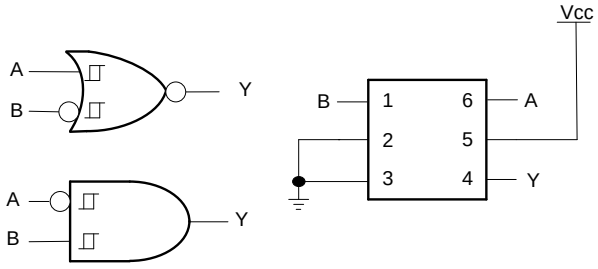
Configuration 1
2 to 1 Data Selector



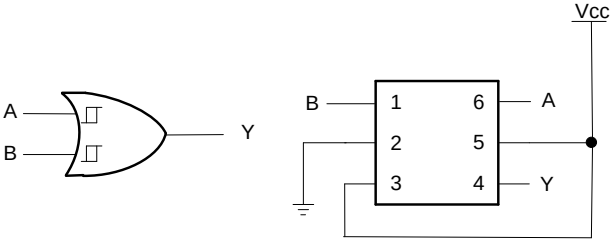
Configuration 2
2-Input AND Gate
2-Input NOR Gate with Both Inputs Inverted



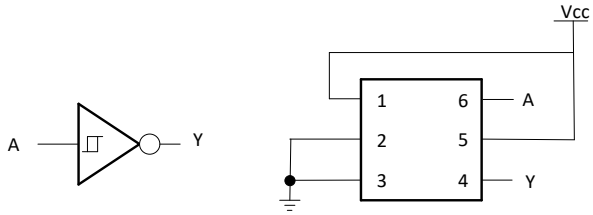
Configuration 3
2-Input NAND Gate with B Input Inverted
2-Input OR Gate with A Input Inverted



Configuration 4
2-Input NOR Gate with One Input Inverted
2-Input AND Gate with One Input Inverted



Configuration 5
2-Input OR Gate



Configuration 6
Inverter

Function Selection Table	
Logic Function	**Configuration**
2-to-1 Data Selector	1
2-Input AND GATE	2
2-Input AND with Inverted Input	3, 4
2-Input NOR with Inverted Input	3, 4
2-Input OR	5
2-Input NOR with Both Inputs Inverted	2
1-Input Inverter	6

Absolute Maximum Ratings (Notes 4, 5)

Symbol	Description	Rating	Unit
ESD HBM	Human Body Model ESD Protection	2	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	-0.3 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
—	Continuous Current Through Vdd or GND	±100	mA
T_J	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-65 to +150	°C

Notes: 4. Stresses greater than those listed under *Absolute Maximum Ratings* can cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to *Absolute Maximum Ratings* for extended periods can affect device reliability.
5. The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

Recommended Operating Conditions (Note 6)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Operating Voltage	Operating	1.65	5.5	V
		Data retention only	1.5	—	V
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} = 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} = 3V	—	16	
			—	24	
		V_{CC} = 4.5V	—	32	
T_A	Operating Free-Air Temperature	—	-40	+125	°C

Note: 6. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = -40°C to +85°C. All typical values are at V_{CC} = 3.3V, T_A = +25°C)

Symbol	Parameter	Test Conditions	Vcc	Min	Typ	Max	Unit
V_{T+}	Positive-Going Input Threshold Voltage	—	1.65V	0.70	—	1.20	V
		—	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	—	0.72	V
		—	2.3V	0.58	—	1.00	
		—	3V	0.80	—	1.30	
		—	4.5V	1.21	—	1.95	
		—	5.5V	1.45	—	2.35	
ΔV_T	Hysteresis (V_{T+} - V_{T-})	—	1.65V	0.30	—	0.62	V
		—	2.3V	0.40	—	0.80	
		—	3V	0.35	—	1.00	
		—	4.5V	0.55	—	1.10	
		—	5.5V	0.60	—	1.20	
V_{OH}	High-Level Output Voltage	I_{OH} = -100µA	1.65V to 5.5V	V_{CC} – 0.1	—	—	V
		I_{OH} = -4mA	1.65V	1.2	—	—	
		I_{OH} = -8mA	2.3V	1.9	—	—	
		I_{OH} = -16mA	3V	2.4	—	—	
		I_{OH} = -24mA		2.3	—	—	
		I_{OH} = -32mA	4.5V	3.8	—	—	
V_{OL}	High-Level Input Voltage	I_{OL} = 100µA	1.65V to 5.5V	—	—	0.1	V
		I_{OL} = 4mA	1.65V	—	—	0.45	
		I_{OL} = 8mA	2.3V	—	—	0.3	
		I_{OL} = 16mA	3V	—	—	0.4	
		I_{OL} = 24mA		—	—	0.55	
		I_{OL} = 32mA	4.5V	—	—	0.55	
I_I	Input Current	V_I = 5.5V or GND	0 to 5.5V	—	—	±1	µA
I_{OFF}	Power-Down Leakage Current	V_I or V_O = 5.5V	0	—	—	±2	µA
I_{CC}	Supply Current	V_I = 5.5V of GND I_O = 0	1.65V to 5.5V	—	—	4	µA
ΔI_{CC}	Additional Supply Current	One input at V_{CC} – 0.6V Other inputs at V_{CC} or GND	3V to 5.5V	—	—	500	µA

Electrical Characteristics (@T_A = -40°C to +125°C. All typical values are at V_{CC} = 3.3V, T_A = +25°C)

Symbol	Parameter	Test Conditions	Vcc	Min	Typ	Max	Unit
V_{T+}	Positive-Going Input Threshold Voltage	—	1.65V	0.70	—	1.20	V
		—	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	V
		—	2.3V	0.58	—	1.03	
		—	3V	0.80	—	1.33	
		—	4.5V	1.21	—	1.95	
		—	5.5V	1.45	—	2.35	
ΔV_T	Hysteresis (V_{T+} - V_{T-})	—	1.65V	0.30	—	0.62	V
		—	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} = -100µA	1.65V to 5.5V	V_{CC} -0.1	—	—	V
		I_{OH} = -4mA	1.65V	0.95	—	—	
		I_{OH} = -8mA	2.3V	1.7	—	—	
		I_{OH} = -16mA	3V	1.9	—	—	
		I_{OH} = -24mA		2.0	—	—	
		I_{OH} = -32mA	4.5V	3.4	—	—	
V_{OL}	High-Level Input Voltage	I_{OL} = 100µA	1.65V to 5.5V	—	—	0.1	V
		I_{OL} = 4mA	1.65V	—	—	0.7	
		I_{OL} = 8mA	2.3V	—	—	0.45	
		I_{OL} = 16mA	3V	—	—	0.6	
		I_{OL} = 24mA		—	—	0.8	
		I_{OL} = 32mA	4.5V	—	—	0.8	
I_I	Input Current	V_I = 5.5V or GND	0 to 5.5V	—	—	±1	µA
I_{OFF}	Power-Down Leakage Current	V_I or V_O = 5.5V	0	—	—	±2	µA
I_{CC}	Supply Current	V_I = 5.5V of GND I_O = 0	1.65V to 5.5V	—	—	4	µA
ΔI_{CC}	Additional Supply Current	One input at V_{CC} - 0.6V Other inputs at V_{CC} or GND	3V to 5.5V	—	—	500	µA

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

Symbol	Parameter	Test Conditions	Vcc	Min	Typ	Max	Unit
C_I	Input Capacitance	V_I = V_{CC} – or GND	3.3	—	3.5	—	pF
θ_{JA}	Thermal Resistance Junction-to-Ambient	SOT26	(Note 7)	—	204	—	°C/W
		SOT363		—	371	—	
		X2-DFN1410-6		—	430	—	
		X2-DFN1010-6		—	510	—	
θ_{JC}	Thermal Resistance Junction-to-Case	SOT26	(Note 7)	—	52	—	°C/W
		SOT363		—	143	—	
		X2-DFN1410-6		—	190	—	
		X2-DFN1010-6		—	250	—	

Note: 7. 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°C to +85°C, C_L = 30 or 50pF as noted (See Figure 1)

Parameter	From (Input)	To (Output)	Vcc = 1.8V ± 0.15V		Vcc = 2.5V ± 0.2V		Vcc = 3.3V ± 0.3V		Vcc = 5V ± 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°C to +125°C, C_L = 30 or 50pF as noted (See Figure 1)

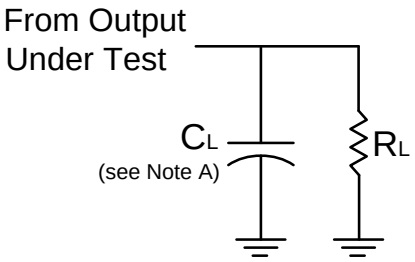
Parameter	From (Input)	To (Output)	Vcc = 1.8V ± 0.15V		Vcc = 2.5V ± 0.2V		Vcc = 3.3V ± 0.3V		Vcc = 5V ± 0.5V		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	Any	Y	1.0	18.0	0.7	10.4	0.7	7.9	0.7	6.4	ns

Operating Characteristics

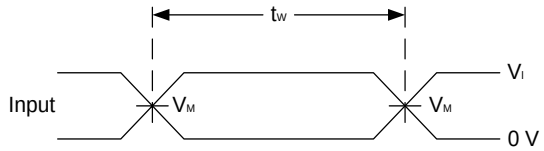
T_A = +25°C

Parameter		Test Conditions	Vcc = 1.8V	Vcc = 2.5V	Vcc = 3.3V	Vcc = 5V	Unit
			Typ	Typ	Typ	Typ	
C_{pd}	Power Dissipation Capacitance	f = 10MHz	22	22	23	24	pF

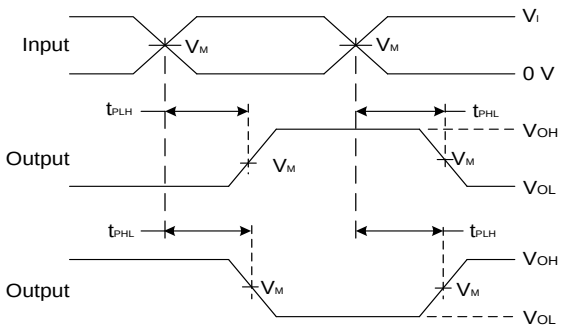
Parameter Measurement Information



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
3.3V ± 0.3V	3V	≤ 2.5ns	1.5V	50pF	500Ω
5V ± 0.5V	V_{CC}	≤ 2.5ns	V_{CC} / 2	50pF	500Ω



Voltage Waveform
Pulse Duration

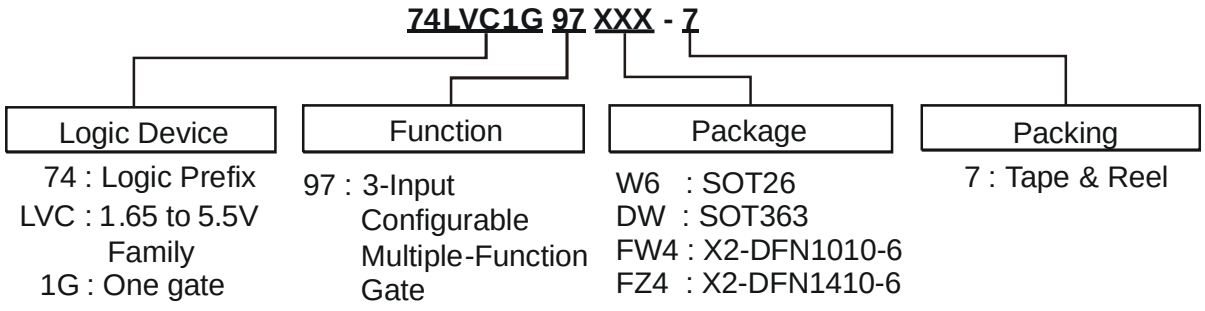


Voltage Waveform
Propagation Delay Times
Inverting and Non-Inverting Outputs

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. Inputs are measured separately one transition per measurement.
D. t_{PLH} and t_{PHL} are the same as t_{PD}.

Ordering Information (Note 8)

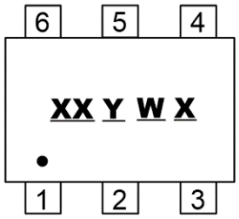


Part Number	Part Number Suffix	Package Code	Package	Packing	
				Qty.	Carrier
74LVC1G97W6-7	-7	W6	SOT26	3,000	7" Tape and Reel
74LVC1G97DW-7	-7	DW	SOT363	3,000	7" Tape and Reel
74LVC1G97FW4-7	-7	FW4	X2-DFN1010-6	5,000	7" Tape and Reel
74LVC1G97FZ4-7	-7	FZ4	X2-DFN1410-6	5,000	7" Tape and Reel

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

Marking Information

(1) SOT26, SOT363

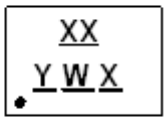


XX: Identification Code
Y: Year 0 to 9 (ex: 4 = 2024)
W: Week: A to Z: Week 1 to 26
a to z: Week 27 to 52; z Represents Week 52 and 53
X: A to Z: Internal Code

Part Number	Package	Identification Code
74LVC1G97W6-7	SOT26	TY
74LVC1G97DW-7	SOT363	TY

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

(Top View)



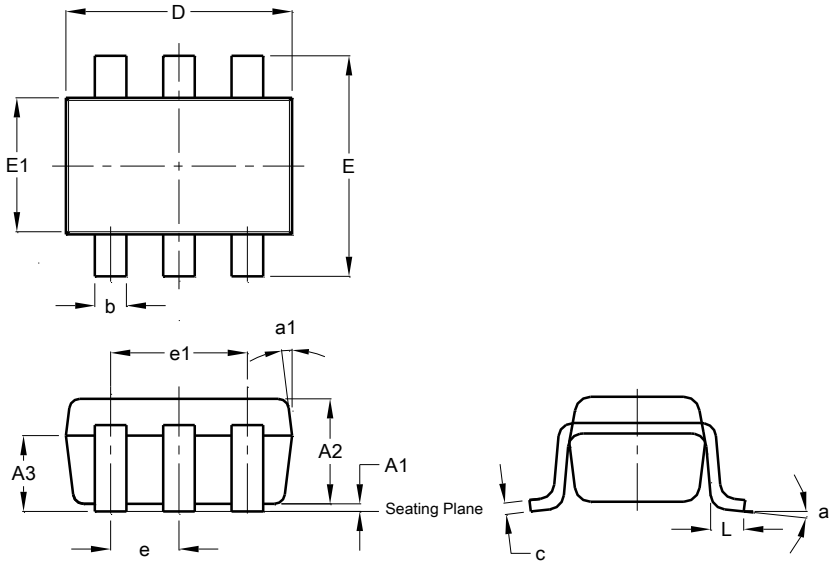
XX: Identification Code
Y: Year 0 to 9 (ex: 4 = 2024)
W: Week: A to Z: Week 1 to 26
a to z: Week 27 to 52; z Represents Week 52 and 53
X: A to Z: Internal Code

Part Number	Package	Identification Code
74LVC1G97FW4-7	X2-DFN1010-6	TY
74LVC1G97FZ4-7	X2-DFN1410-6	TY

Package Outline Dimensions

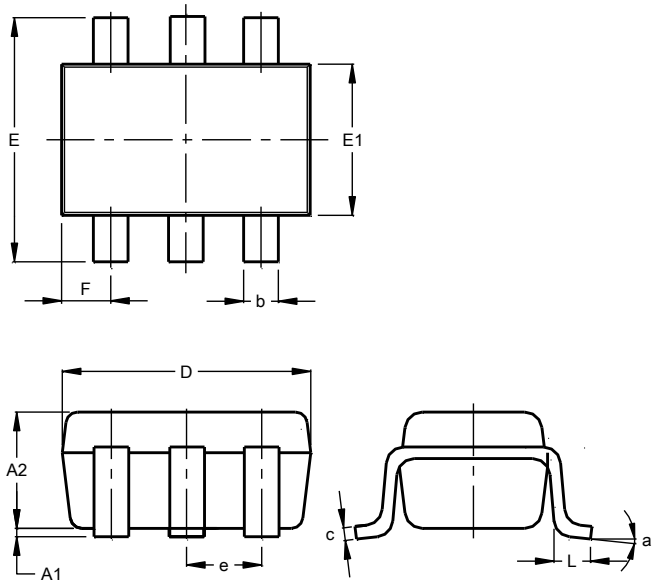
Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT26



SOT26			
Dim	**Min**	**Max**	**Typ**
A1	0.013	0.10	0.05
A2	1.00	1.30	1.10
A3	0.70	0.80	0.75
b	0.35	0.50	0.38
c	0.10	0.20	0.15
D	2.90	3.10	3.00
e	-	-	0.95
e1	-	-	1.90
E	2.70	3.00	2.80
E1	1.50	1.70	1.60
L	0.35	0.55	0.40
a	-	-	8°
a1	-	-	7°
All Dimensions in mm			

SOT363

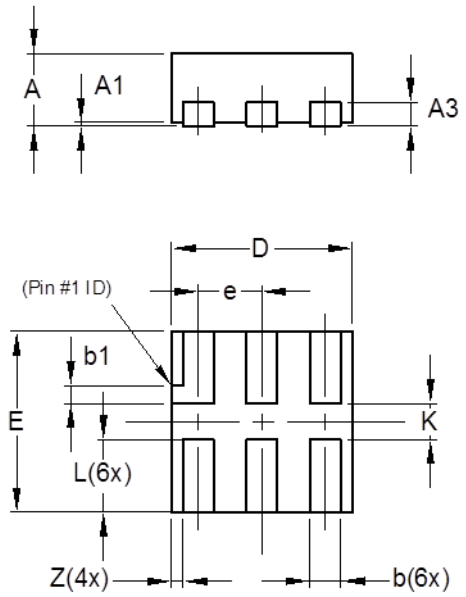


SOT363			
Dim	**Min**	**Max**	**Typ**
A1	0.00	0.10	0.05
A2	0.90	1.00	0.95
b	0.10	0.30	0.25
c	0.10	0.22	0.11
D	1.80	2.20	2.15
E	2.00	2.20	2.10
E1	1.15	1.35	1.30
e	0.650 BSC		
F	0.40	0.45	0.425
L	0.25	0.40	0.30
a	0°	8°	--
All Dimensions in mm			

Package Outline Dimensions (continued)

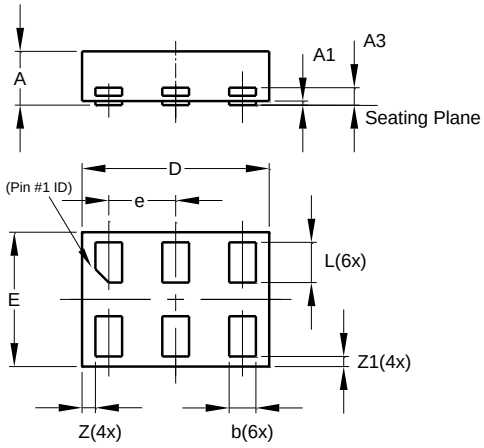
Please see http://www.diodes.com/package-outlines.html for the latest version.

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			

X2-DFN1410-6

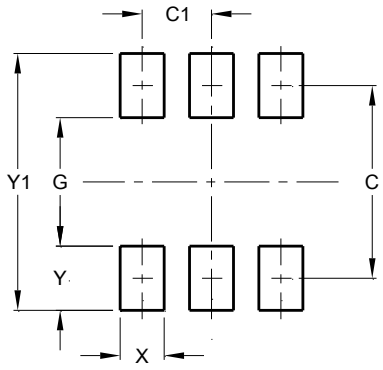


X2-DFN1410-6			
Dim	**Min**	**Max**	**Typ**
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.15	0.25	0.20
D	1.35	1.45	1.40
E	0.95	1.05	1.00
e	—	—	0.50
L	0.25	0.35	0.30
Z	—	—	0.10
Z1	0.045	0.105	0.075
All Dimensions in mm			

Suggested Pad Layout (Note 9)

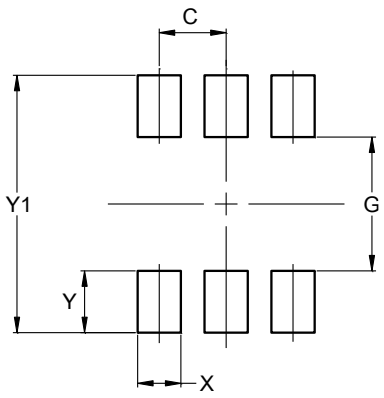
Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT26



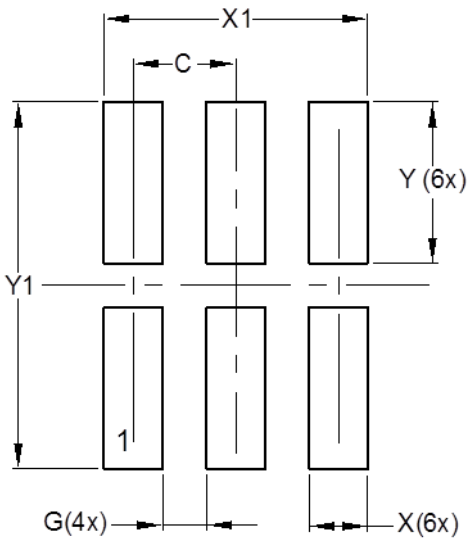
Dimensions	Value (in mm)
C	2.40
C1	0.95
G	1.60
X	0.55
Y	0.80
Y1	3.20

SOT363



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

X2-DFN1010-6

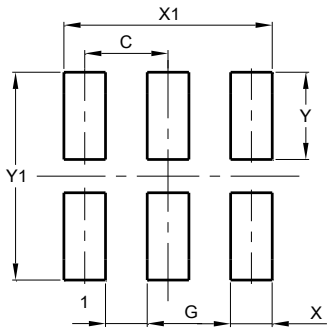


Dimensions	Value (in mm)
C	0.350
G	0.150
X	0.200
X1	0.900
Y	0.550
Y1	1.250

Suggested Pad Layout (Note 9) (continued)

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

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

Note: 9. The suggested land pattern dimensions have been provided for reference only, as actual pad layouts may vary depending on application. These dimensions may be modified based on user equipment capability or fabrication criteria. A more robust pattern may be desired for wave soldering and is calculated by adding 0.2 mm to the 'Z' dimension. For further information, please reference document IPC-7351A, Naming Convention for Standard SMT Land Patterns, and for International grid details, please see document IEC, Publication 97.

Mechanical Data

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (e3)
- Weight:
  - SOT26: 0.016 grams (Approximate)
  - SOT363: 0.006 grams (Approximate)
  - X2-DFN1010-6: 0.00118 grams (Approximate)
  - X2-DFN1410-6: 0.002 grams (Approximate)

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