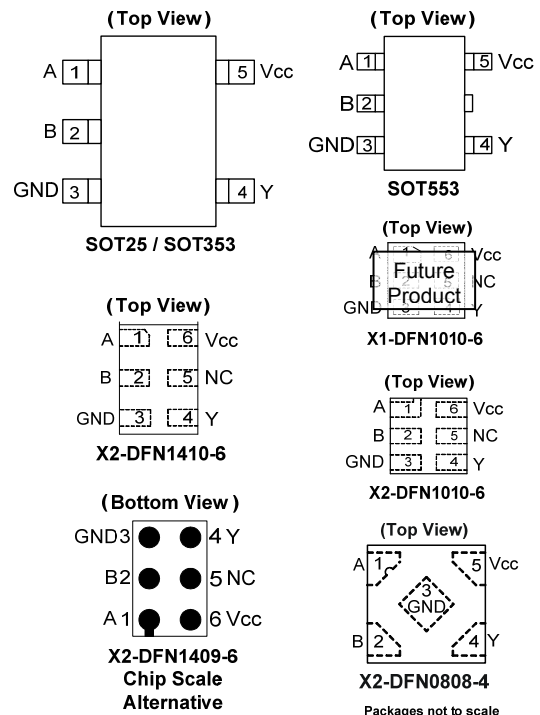


SINGLE 2 INPUT EXCLUSIVE OR GATE
Description

The 74LVC1G86 is a single 2-input EXCLUSIVE OR 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:

$$Y = A \oplus B \text{ or } Y = \overline{A}B + A\overline{B}$$

Pin Assignments

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)**

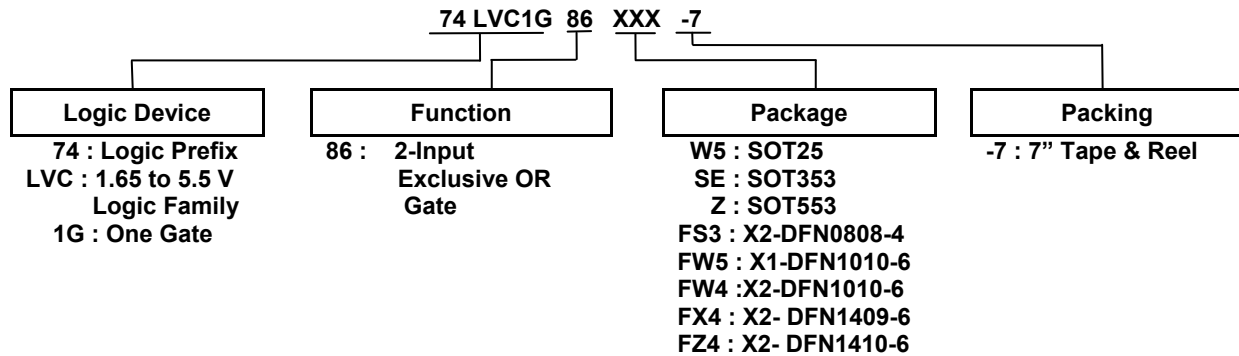
Applications

- Voltage Level Shifting
- Bus Driver / Repeater
- Parity Bit Generation
- Selectable signal Inverter
- Power Down Signal Isolation
- General Purpose Logic
- 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> 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



Device	Package Code	Package (Notes 4, 5)	Package Size	7" Tape and Reel	
				Quantity	Part Number Suffix
74LVC1G86W5-7	W5	SOT25	3.0mm X 2.8mm X 1.2mm 0.95mm lead pitch	3000/Tape & Reel	-7
74LVC1G86SE-7	SE	SOT353	2.0mm X 2.0mm X 1.1mm 0.65mm lead pitch	3000/Tape & Reel	-7
74LVC1G86Z-7	Z	SOT553	1.6mm X 1.6 mm X 0.62mm 0.5mm lead pitch	4000/Tape & Reel	-7
74LVC1G86FS3-7	FS3	X2-DFN0808-4	0.9mm X 0.9 mm X 0.35mm 0.5mm pad pitch (diamond)	5000/Tape & Reel	-7
74LVC1G86FW5-7 (Future Product)	FW5	X1-DFN1010-6 (Future Product)	1.0mm X 1.0mm X 0.5mm 0.35mm pad pitch	5000/Tape & Reel	-7
74LVC1G86FW4-7	FW4	X2-DFN1010-6	1.0mm X 1.0mm X 0.4mm 0.35mm pad pitch	5000/Tape & Reel	-7
74LVC1G86FX4-7	FX4	X2-DFN1409-6 (Chip scale alternative)	1.4mm X 0.9mm X 0.4mm 0.5mm pad pitch	5000/Tape & Reel	-7
74LVC1G86FZ4-7	FZ4	X2-DFN1410-6	1.4mm X 1.0mm X 0.4mm 0.5mm pad pitch	5000/Tape & Reel	-7

Notes:

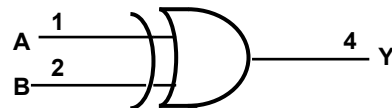
4. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.

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

Pin Description

Pin Name	Description
A	Data Input
B	Data Input
GND	Ground
Y	Data Output
Vcc	Supply Voltage
NC	No Connection

Logic Diagram



Function Table

Inputs		Output
A	B	Y
H	H	L
L	H	H
H	L	H
L	L	L

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	±50	mA
I _{CC} , I _{GND}	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:
- 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.
 - 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_{CC}	Operating Voltage	Operating	1.65	5.5
		Data Retention Only	1.5	—
V_{IH}	High-Level Input Voltage	$V_{CC} = 1.65V$ to $1.95V$	$0.65 \times V_{CC}$	V
		$V_{CC} = 2.3V$ to $2.7V$	1.7	
		$V_{CC} = 3V$ to $3.6V$	2	
		$V_{CC} = 4.5V$ to $5.5V$	$0.7 \times V_{CC}$	
V_{IL}	Low-level Input voltage	$V_{CC} = 1.65V$ to $1.95V$	—	V
		$V_{CC} = 2.3V$ to $2.7V$	—	
		$V_{CC} = 3V$ to $3.6V$	—	
		$V_{CC} = 4.5V$ to $5.5V$	—	
V_I	Input Voltage	0	5.5	V
V_O	Output Voltage	0	V_{CC}	V
I_{OH}	High-Level Output Current	$V_{CC} = 1.65V$	—	mA
		$V_{CC} = 2.3V$	—	
		$V_{CC} = 2.7V$	—	
		$V_{CC} = 3V$	—	
		$V_{CC} = 4.5V$	—	
I_{OL}	Low-Level Output Current	$V_{CC} = 1.65V$	—	mA
		$V_{CC} = 2.3V$	—	
		$V_{CC} = 2.7V$	—	
		$V_{CC} = 3V$	—	
		$V_{CC} = 4.5V$	—	
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	$V_{CC} = 1.8V \pm 0.15V, 2.5V \pm 0.2V$	—	ns/V
		$V_{CC} = 3.3V \pm 0.3V$	—	
		$V_{CC} = 5V \pm 0.5V$	—	
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 $V_{CC} = 3.3V$, $T_A = +25^{\circ}C$)

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	—	± 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	One input at $V_{CC} - 0.6V$ Other inputs at V_{CC} or GND	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 $V_{CC} = 3.3V$, $T_A = +25^\circ C$)

Symbol	Parameter	Test Conditions	V_{CC}	Min	Typ.	Max	Unit
θ_{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	—	
θ_{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	3.7	9.9	1.0	13.0	ns
			2.5V $\pm$ 0.2V	0.5	2.5	5.5	0.5	7.0	
			2.7V	0.5	2.8	5.8	0.5	7.5	
			3.3V $\pm$ 0.3V	0.5	2.3	5.0	0.5	6.5	
			5.0V $\pm$ 0.5V	0.5	1.9	4.0	0.5	5.5	

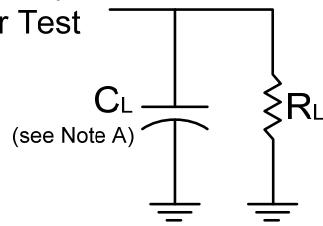
Operating Characteristics

$T_A = +25^\circ C$

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	14	14	14	14	pF

Parameter Measurement Information

From Output
Under Test



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

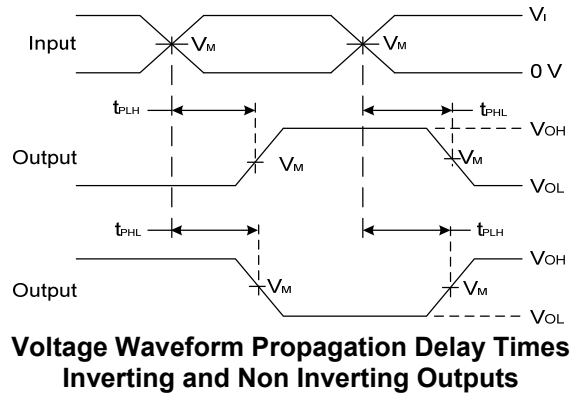
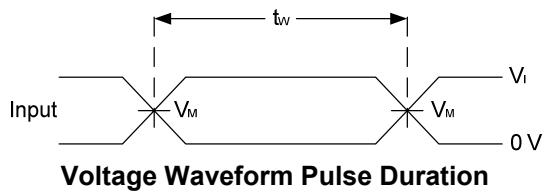
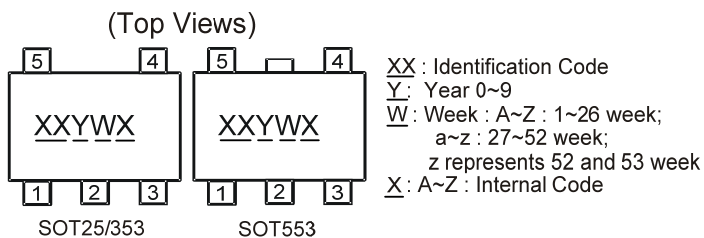


Figure 1. Load Circuit and Voltage Waveforms

- 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}.

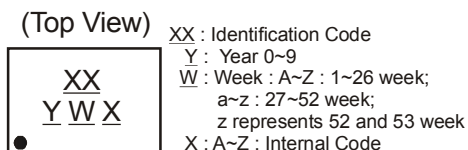
Marking Information

(1) SOT25, SOT353 and SOT553

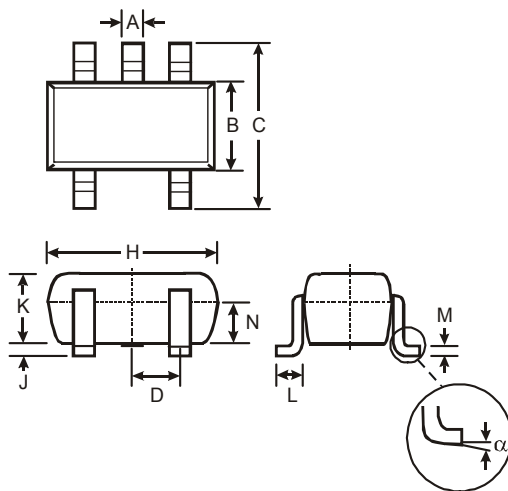


Part Number	Package	Identification Code
74LVC1G86W5-7	SOT25	UX
74LVC1G86SE-7	SOT353	UX
74LVC1G86Z-7	SOT553	UX

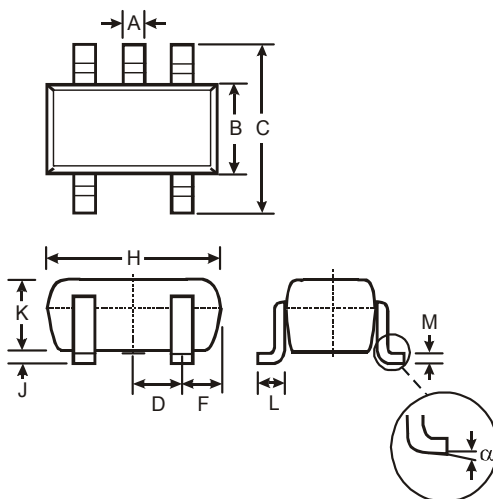
(2) DFN packages



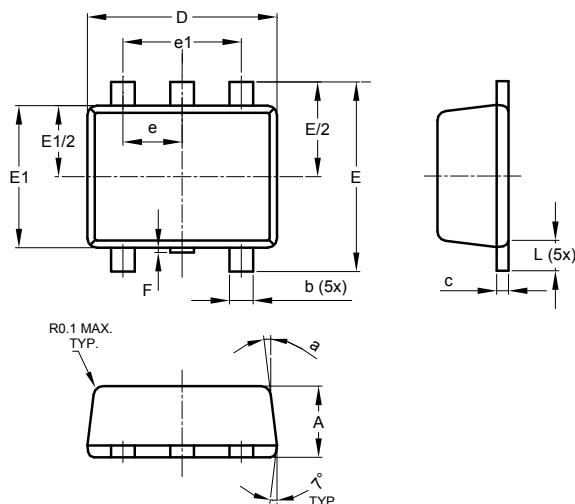
Part Number	Package	Identification Code
74LVC1G86FS3-7	X2-DFN0808-4	WX
74LVC1G86FW5-7	X1-DFN1010-6	VX
74LVC1G86FW4-7	X2-DFN1010-6	UX
74LVC1G86FX4-7	X2-DFN1409-6	MV
74LVC1G86FZ4-7	X2-DFN1410-6	UX

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


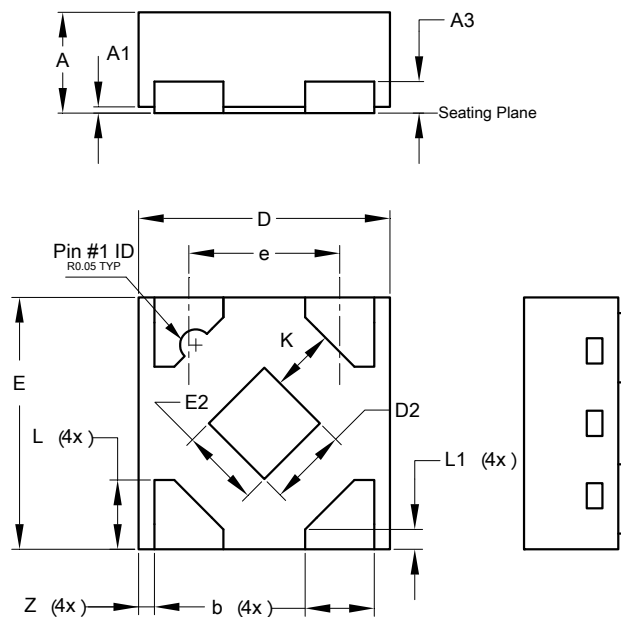
SOT353		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 Typ	
F	0.40	0.45
H	1.80	2.20
J	0	0.10
K	0.90	1.00
L	0.25	0.40
M	0.10	0.22
α	0°	8°
All Dimensions in mm		

(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			

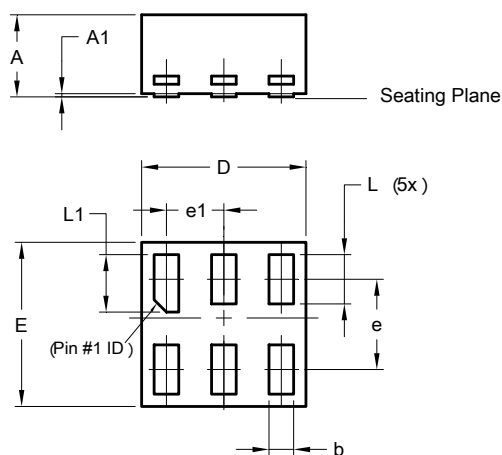
Package Outline Dimensions (cont.)

(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			

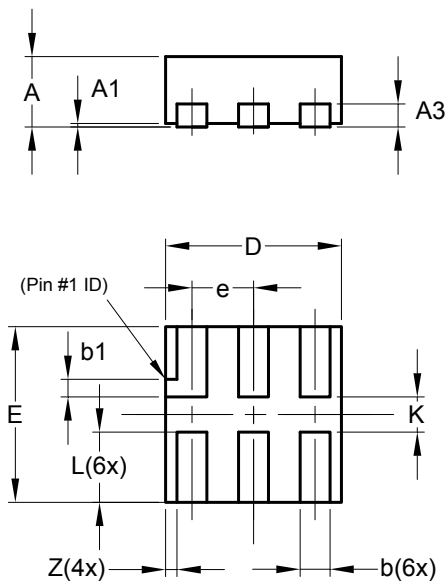
(5) Package Type: X1-DFN1010-6



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			

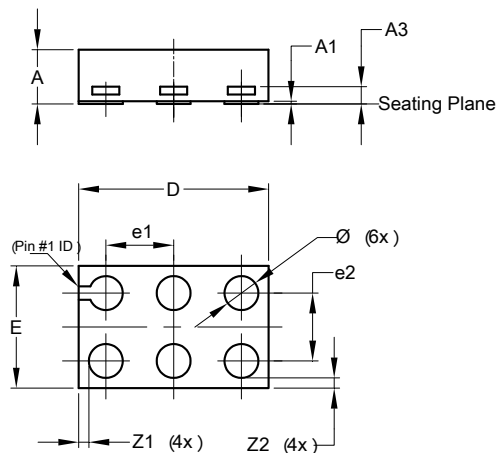
Package Outline Dimensions (cont.)

(6) Package Type X2-DFN1010-6



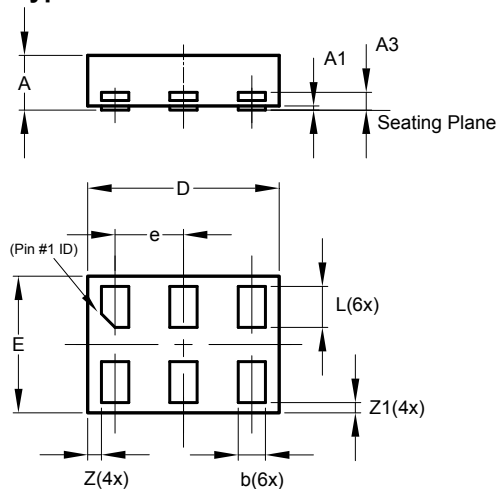
X2-DFN1010-6			
Dim	Min	Max	Typ
A	—	0.40	0.39
A1	0.00	0.05	0.02
A3	—	—	0.13
b	0.14	0.20	0.17
b1	0.05	0.15	0.10
D	0.95	1.05	1.00
E	0.95	1.05	1.00
e	—	—	0.35
L	0.35	0.45	0.40
K	0.15	—	—
Z	—	—	0.065
All Dimensions in mm			

(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			

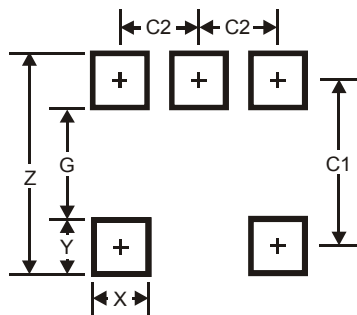
(8) Package Type: X2-DFN1410-6



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			

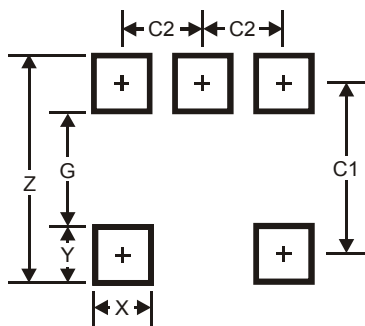
Suggested Pad Layout

(1) Package Type: SOT25



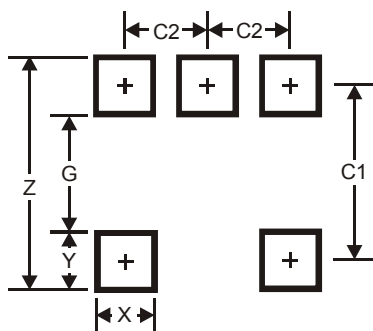
Dimensions	Value (in mm)
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

(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

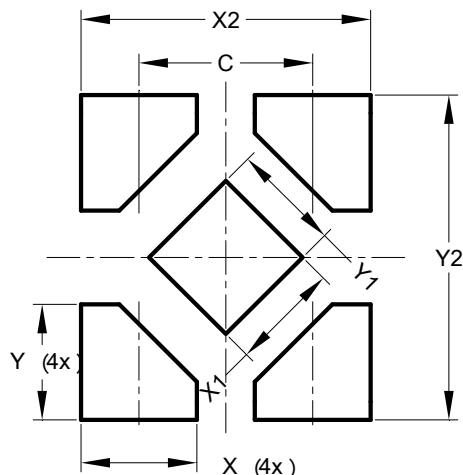
(3) Package Type: SOT553



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

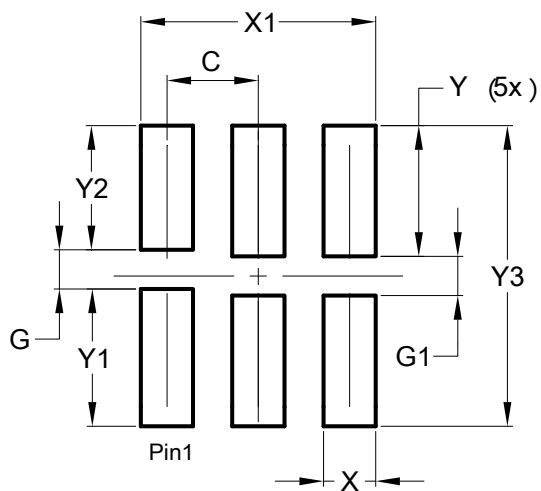
Suggested Pad Layout (cont.)

(4) Package Type X2-DFN0808-4

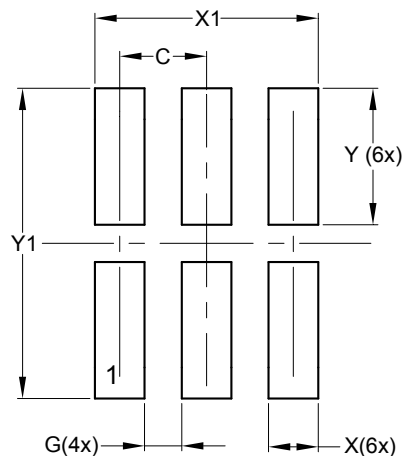


Dimensions	Value (in mm)
C	0.480
X	0.320
X1	0.300
X2	0.800
Y	0.320
Y1	0.300
Y2	0.900

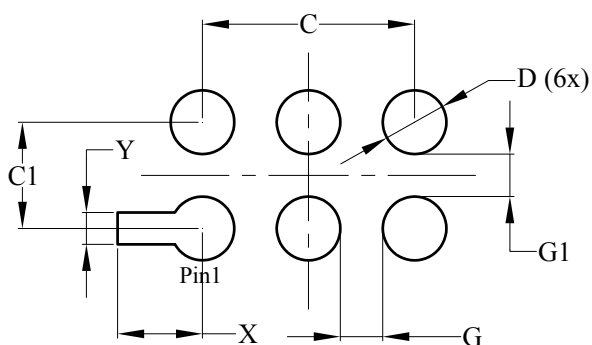
(5)(Package Type X1-DFN1010-6



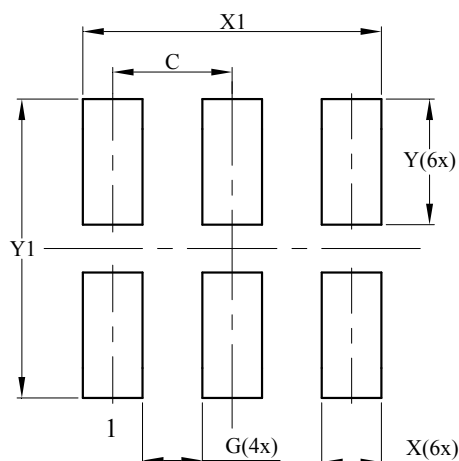
Dimensions	Value (in mm)
C	0.350
G	0.150
G1	0.150
X	0.200
X1	0.900
Y	0.500
Y1	0.525
Y2	0.475
Y3	1.150

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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