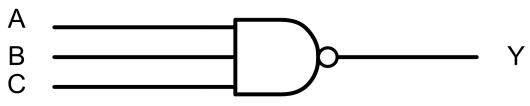
Dual 2-Input Positive-NAND Gate

1 Features	2 Application
- Supports 5V V_{CC} operation - Inputs accept voltages to 5.5 V - Provides down translation to V_{CC} - Low power consumption, 10-μA Max I_{CC} - ±24-mA output drive at 3.3 V - I_{off} supports live insertion, partial-power-down mode, and back drive protection	-AV receivers - DLP front projection system - Digital picture frames - Digital radio - Digital still cameras - Digital video cameras (DVC) - GPS: personal navigation devices - Handset: smartphones - Notebook PC and netbooks - Network-attached storage (NAS) - Power line communication modems - Server PSU - STB, DVR, and streaming media

3 Description	Circuit Diagram
This single 3-input positive-NAND gate is designed for 1.65-V to 5.5-V V_{CC} operation. The 74LVC1G10 performs the Boolean function $Y=\overline{A \cdot B \cdot C}$ or $Y=\overline{A}+\overline{B}+\overline{C}$ in positive logic. The 74LVC1G10 device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.	

4 Device Summary, Pin and Packages

Table. 4-1. Device Summary(1)

Serial Name	Part Name	Package	MSL(2)	Package Qty
74LVC1G10	74LVC1G10S6	SOT23-6	3	Tape and Reel,3000
	74LVC1G10C6	SC70-6	3	Tape and Reel,3000

(1) For all available packages, please contact product sales.

(2) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

4 Device Summary, Pin and Packages(continued)

Top View

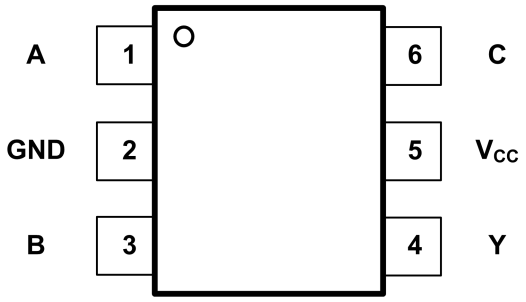


Fig.4-1. 74LVC1G10: S6(SOT23-6) Package
74LVC1G10: C6(SC70-6) Package

Table. 4-2. Pin Definition

PIN		Type	Description
Name	S6 C6		
A	1	I	Data Input
GND	2	-	Ground
B	3	I	Data Input
Y	4	O	Data Output
V_{CC}	5	-	Supply Voltage
C	6	I	Data Input

5 Voltage, Temperature, ESD and Thermal Ratings

5.1 Absolute Maximum Ratings(1)

Parameters			Min	Max	Unit
V_{CC}	Supply voltage range		-0.5	6.5	V
V_I	Input voltage range		-0.5	6.5	V
V_O	Voltage range applied to any output in the high-impedance or power-off state(2)		-0.5	6.5	V
V_O	Voltage range applied to any output in the high or low state(2)		-0.5	V_{CC}+0.5	V
I_{IK}	Input clamp current	V_I<0		-50	mA
I_{OK}	Output clamp current	V_O<0		-50	mA
I_O	Continuous output current			±50	mA
	Continuous current through V_{CC} or GND			±100	mA
T_J	Junction temperature under bias			150	°C
T_{stg}	Storage temperature range		-55	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may 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-rated conditions for extended periods may affect device reliability.
(2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic Discharge	Human-Body Model (HBM)(1)	8 K	V
		Charged-Device Model (CDM)(2)	2 K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5 Voltage, Temperature, ESD and Thermal Ratings(continued)

5.3 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage		1.65	5.5	V
V_{IH}	High-Level Input Voltage	VCC=1.65V to1.95V	0.65×VCC		V
		VCC=2.3V to 2.7V	1.7		
		VCC=3V to 3.6V	2		
		VCC=4.5V to 5.5V	0.7×VCC		
V_{IL}	Low-Level Input Voltage	VCC=1.65V to1.95V		0.35×VCC	V
		VCC=2.3V to 2.7V		0.7	
		VCC=3V to 3.6V		0.8	
		VCC=4.5V to 5.5V		0.3×VCC	
V_I	Input Voltage		0	5.5	V
V_O	Output Voltage		0	VCC	V
I_{OH}	High-Level Output Current	VCC=1.65V		-4	mA
		VCC=2.3V		-8	
		VCC=3V		-16	
				-24	
		VCC=4.5V		-32	
I_{OL}	Low-Level Output Current	VCC=1.65V		4	mA
		VCC=2.3V		8	
		VCC=3V		16	
				24	
		VCC=4.5V		32	
Δt/Δv	Input Transition Rise or Fall Rate	VCC=1.8V±0.15V,2.5V±0.2V		20	ns/V
		VCC=3.3V±0.3V		10	
		VCC=5V±0.5V		5	
TA	Operating Free-Air Temperature		-40	125	°C

5.4 Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT23-6	196	81	°C/W
SC70-6	178	98	°C/W

6 Electrical Specifications(1)

Over recommended operating free-air temperature range (unless otherwise noted)

Parameter	Test Conditions	V_{CC}	–40°C to 85°C			–40°C to 125°C			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{OH}	I_{OH}=–100 µA	1.65 V to 5.5 V	V_{CC}-0.1			V_{CC}-0.1			V
	I_{OH}=–4 mA	1.65 V	1.2			1.2			
	I_{OH}=–8 mA	2.3 V	1.9			1.9			
	I_{OH}=–16 mA	3 V	2.4			2.4			
	I_{OH}=–24 mA		2.3			2.3			
	I_{OH}=–32 mA	4.5 V	3.8			3.8			
V_{OL}	I_{OL}=100 µA	1.65 V to 5.5 V			0.1			0.1	V
	I_{OL}=4 mA	1.65 V			0.45			0.45	
	I_{OL}=8 mA	2.3 V			0.3			0.3	
	I_{OL}=16 mA	3 V			0.4			0.4	
	I_{OL}=24 mA				0.55			0.55	
	I_{OL}=32 mA	4.5 V			0.55			0.55	
I_I A or B or C Inputs	V_I=5.5 V or GND	0 to 5.5 V			±5			±5	µA
I_{off}	V_I or V_O=5.5 V	0			±10			±10	µA
I_{CC}	V_I=5.5 V or GND, I_O=0	1.65 V to 5.5 V			10			10	µA
ΔI_{CC}	One Input at V_{CC} – 0.6 V, Other Inputs at V_{CC} or GND	3 V to 5.5 V			500			500	µA
C_i	V_I=V_{CC} or GND	3.3 V		4			4		pF

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

6 Electrical Specifications (continued)

Switching Characteristics, CL=15 pF

Over recommended operating free-air temperature range (unless otherwise noted)

Parameter	From (Input)	To (Output)	–40°C to 85°C								Unit
			V_{CC}=1.8 V ± 0.15 V		V_{CC}=2.5 V ± 0.2 V		V_{CC}=3.3 V ± 0.3 V		V_{CC}=5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
tpd	A or B or C	Y	2.6	15.2	1.6	5.6	1.2	4.1	1	3.1	ns

Over recommended operating free-air temperature range, CL=30 pF or 50 pF (unless otherwise noted)

Parameter	From (Input)	To (Output)	–40°C to 85°C								Unit
			V_{CC}=1.8 V ± 0.15 V		V_{CC}=2.5 V ± 0.2 V		V_{CC}=3.3 V ± 0.3 V		V_{CC}=5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
tpd	A or B or C	Y	2.9	17.2	1.4	6.2	1.3	4.9	1	3.5	ns

Over recommended operating free-air temperature range, CL=30 pF or 50 pF (unless otherwise noted)

Parameter	From (Input)	To (Output)	–40°C to 125°C								Unit
			V_{CC}=1.8 V ± 0.15 V		V_{CC}=2.5 V ± 0.2 V		V_{CC}=3.3 V ± 0.3 V		V_{CC}=5 V ± 0.5 V		
			Min	Max	Min	Max	Min	Max	Min	Max	
tpd	A or B or C	Y	2.9	20	1.4	7.8	1.3	6.2	1	4.6	ns

Operating Characteristics

T_A=25°C

	Parameter	Test Conditions	V_{CC}=1.8 V	V_{CC}=2.5 V	V_{CC}=3.3 V	V_{CC}=5 V	Unit
			Typ	Typ	Typ	Typ	
Cpd	Power Dissipation Capacitance	f=10 MHz	18	19	20	23	pF

7 Typical Characteristics

Over recommended operating free-air temperature range, CL=30 pF or 50 pF (unless otherwise noted)

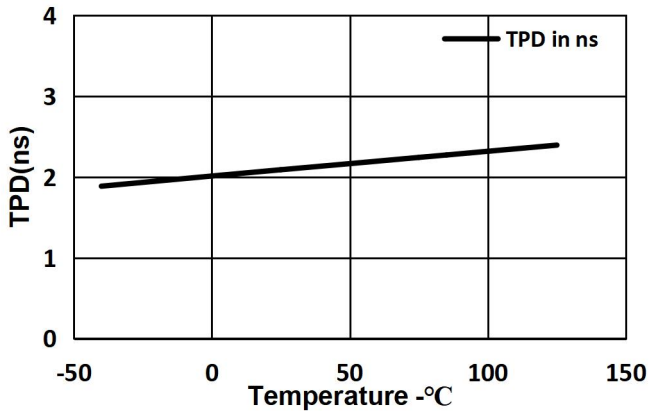


Fig.7-1. T_{PD} Across Temperature at 3.3 V V_{CC}

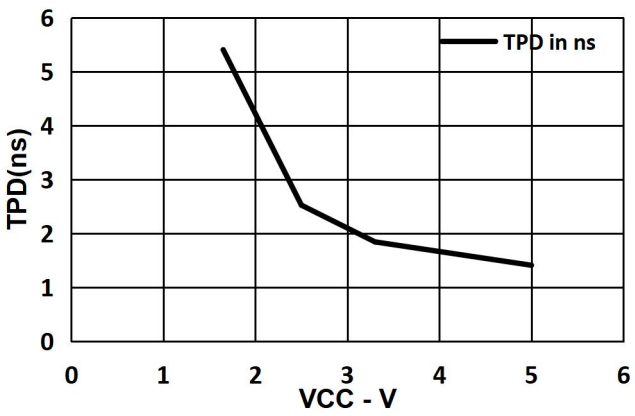
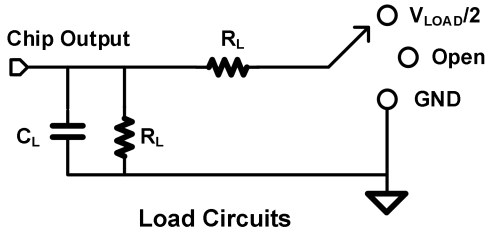


Fig.7-2. T_{PD} Across V_{CC} at 25℃

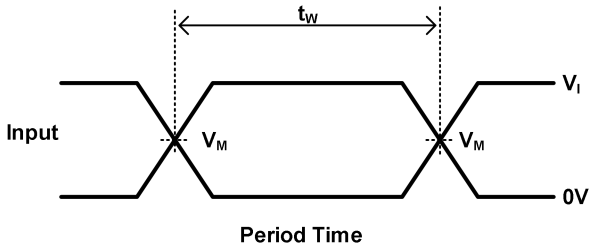
8 Parameter Measurement Information



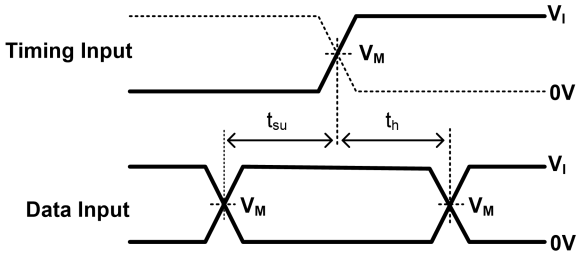
Load Circuits

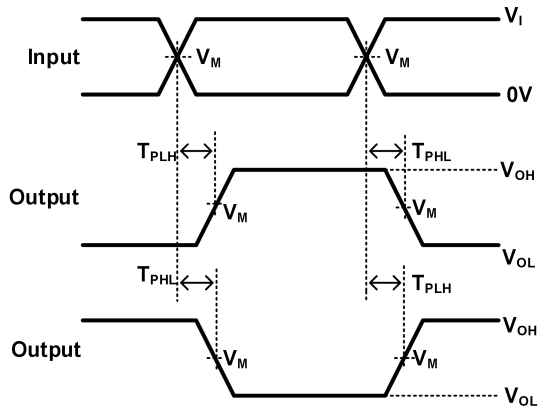
TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	T_r/T_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2\times V_{CC}$	15pF	1MΩ	0.15V
2.5V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2\times V_{CC}$	15pF	1MΩ	0.15V
3.3V±0.15V	3V	≤2.5ns	1.5V	6V	15pF	1MΩ	0.3V
5V±0.15V	V_{CC}	≤2.5ns	$V_{CC}/2$	$2\times V_{CC}$	15pF	1MΩ	0.3V

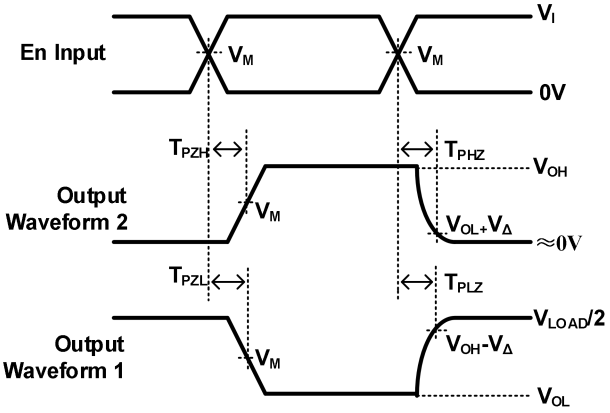


Period Time





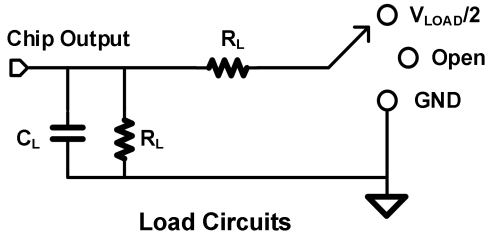
Propagation Delay
for Output and Inverted Output



Enable and Disable Times
Low-And High-Level Enabling

Notes: A. C includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, Z=50.
D. The outputs are measured one at a time, with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. t_{PLH} and t_{PHL} are the same as t_{pd}.
H. All parameters and waveforms are not applicable to all device.

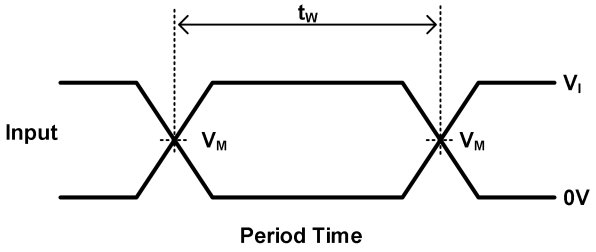
8 Parameter Measurement Information (Continued)



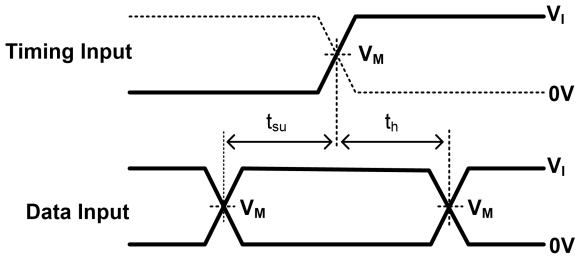
Load Circuits

TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

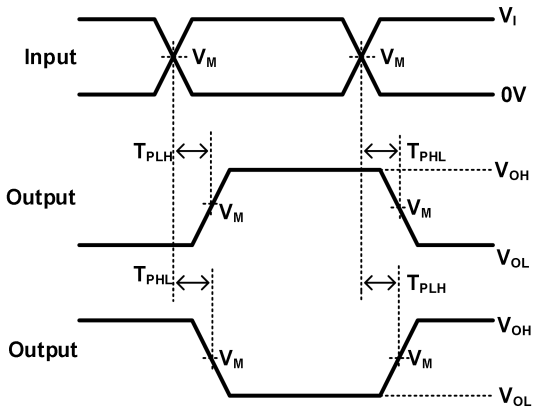
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	T_r/T_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2\times V_{CC}$	30pF	1kΩ	0.15V
2.5V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2\times V_{CC}$	30pF	500Ω	0.15V
3.3V±0.15V	3V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.15V	V_{CC}	≤2.5ns	$V_{CC}/2$	$2\times V_{CC}$	50pF	500Ω	0.3V



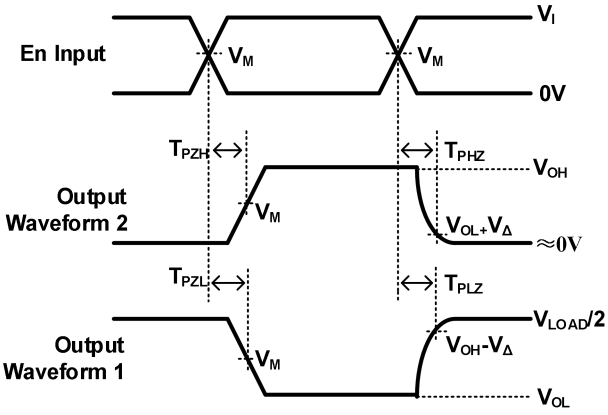
Period Time



Setup and Hold Times



Propagation Delay
for Output and Inverted Output



Enable and Disable Times
Low-And High-Level Enabling

Notes: A. C includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, Z=50.
D. The outputs are measured one at a time, with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. t_{PLH} and t_{PHL} are the same as t_{pd}.
H. All parameters and waveforms are not applicable to all device.

9 Detailed Description

9.1 Overview

This 3-input NAND gate is designed for 1.65-V to 5.5-V V_{CC} operation. The 74LVC1G10 device features a three-input NAND gate. The output state is determined by eight patterns of 3-bit input. All inputs can be connected to V_{CC} or GND. This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

9.2 Functional Block Diagram

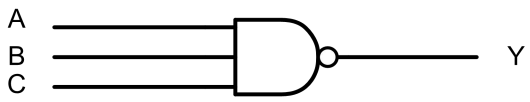


Fig. 9-1.Functional Block Diagram

9.3 Feature Description

- Wide operating voltage range.
- Operates from 1.65 V to 5.5 V.
- Allows down voltage translation.
- Inputs accept voltages to 5.5 V.
- I_{off} feature allows voltages on the inputs and outputs, when V_{CC} is 0 V.

9.4 Device Functional Modes

Input A			Output
A	**B**	**C**	**Y**
H	H	H	L
L	X	X	H
X	L	X	H
X	X	L	H

10 Application note

10.1 Application Information

The 74LVC1G10 device offers logical NAND configuration for many design applications. This example describes basic power sequencing using the NAND gate configuration. Power sequencing is often used in applications that require a processor or other delicate device with specific voltage timing requirements in order to protect the device from malfunctioning. In the application below, the power-good signals from the supplies tell the MCU to continue an operation.

10.2 Typical Application

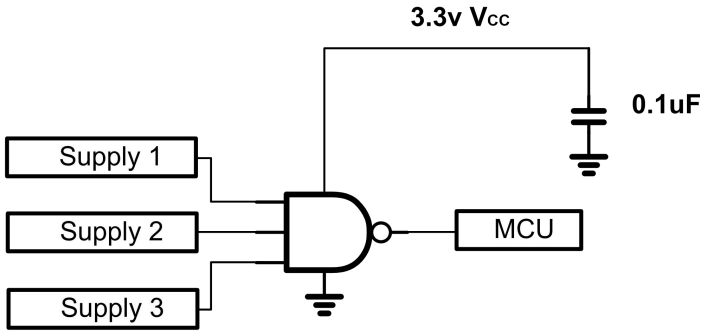
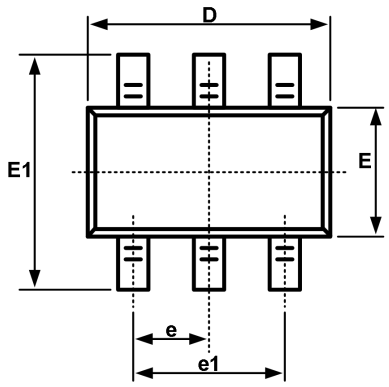
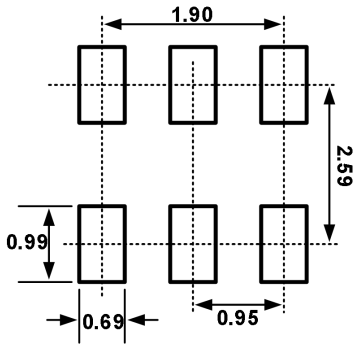


Fig.10-1.Typical Application Diagram

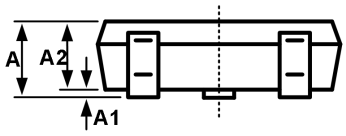
11 Package Outline Dimension

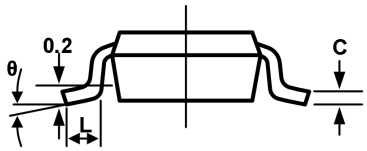
SOT23-6





Recommended Land Pattern (Unit: mm)

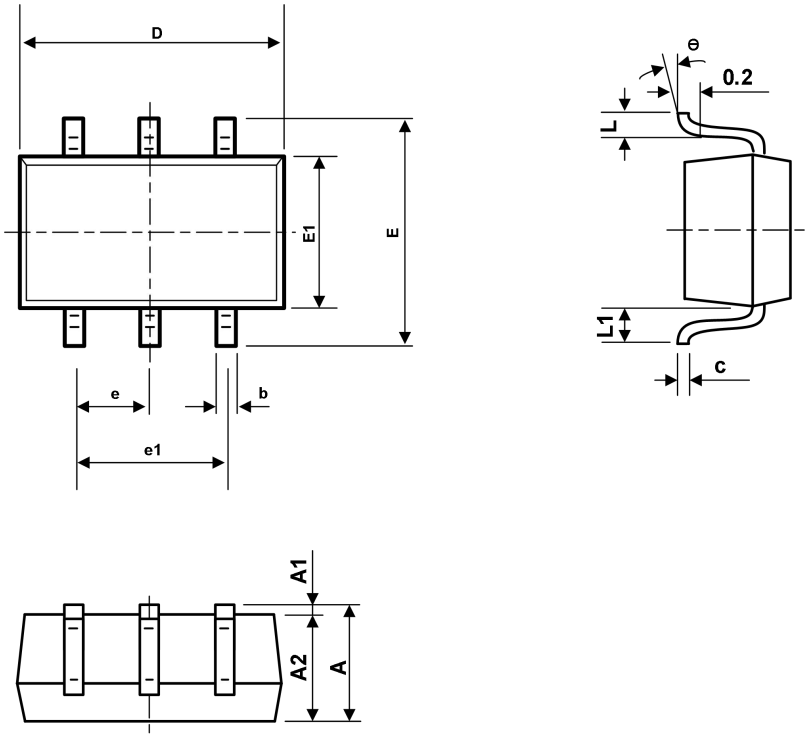




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950BSC		0.037BSC	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

11 Package Outline Dimension(continued)

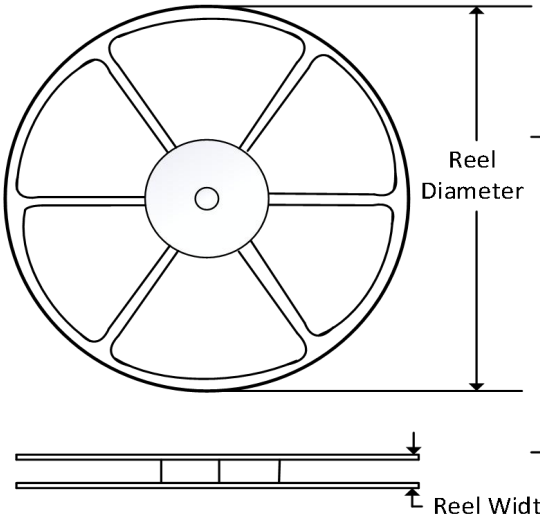
SC70-6



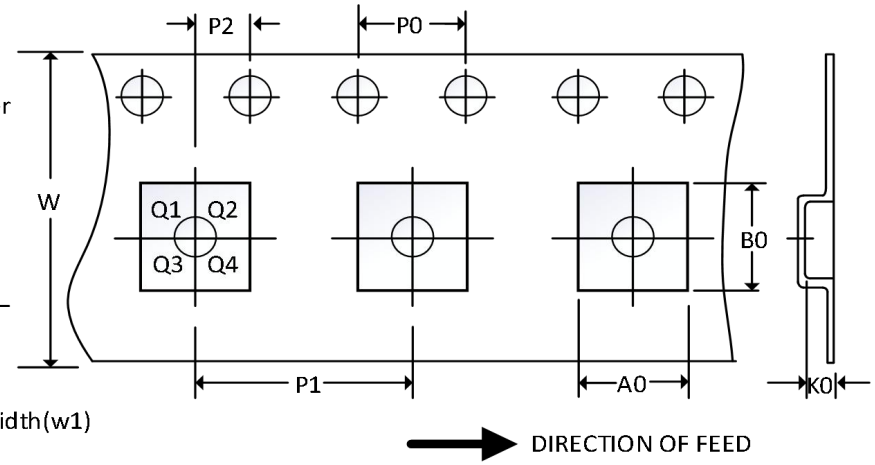
Symbol	Dimension In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.260	0.460	0.010	0.018
L1	0.525REF		0.021REF	
θ	0°	8°	0°	8°

12 Tape and Reel Information

Reel Dimensions



Reel Dimensions



NOTE: The picture is only for reference. Please make the object as the standard.

Key Parameter List of Tape and Reel

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-6	7''	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3
SC70-6	7''	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3

NOTE:
1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.