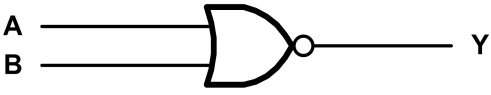


## GT74LVC1G02

### Single 2-Input Positive-NOR Gate

1 Features	2 Application
<ul style="list-style-type: none"> <li>- Operate from 1.65 V to 5.5 V</li> <li>- Supports 5-V VCC operation</li> <li>- Specified from -40°C to 125°C</li> <li>- Provides down translation to V<sub>CC</sub></li> <li>- Max t<sub>pd</sub> of 4 ns at 3.3 V</li> <li>- ±24-mA output drive at 3.3 V</li> </ul>	<ul style="list-style-type: none"> <li>- Personal digital assistant devices</li> <li>- AV receiver</li> <li>- MP3 player/recorder</li> <li>- Solid state drive (SSD): client and enterprise</li> <li>- Power: telecom/server AC/DC supply</li> <li>- TV: LCD/digital and high-definition (HDTV)</li> </ul>

3 Description	Circuit Diagram
<p>This single 2-input positive-NOR gate is designed for 1.65-V to 5.5-V V<sub>CC</sub> operation.</p> <p>The GT74LVC1G02 device performs the Boolean function <math>Y = \overline{A + B}</math> or <math>Y = \overline{A} \cdot \overline{B}</math> in positive logic. The CMOS device has high output drive while maintaining low static power dissipation over a broad V<sub>CC</sub> operating range.</p> <p>This device is fully specified for partial-power-down applications using I<sub>off</sub>. The I<sub>off</sub> circuitry prevents damaging current backflow through the device when the gate is powered down and its output is floating.</p>	

## 4 Revision History

Revision	Date	Note
Rev. A1. 0	2023. 09. 02	Original Version
Rev. A1. 1	2023. 12. 15	1.Updated Package Qty 2.Added Tape and Reel Information 3.Added Application Note
Rev. A1. 2	2023. 12. 26	1.Added Marking 2.Added MSL
Rev. A1. 3	2024. 01. 26	Updated Part Name

The latest datasheet version should be checked on the GTIC official website, as the company does not actively inform customers about updates to the datasheet.

## 5 Device Summary, Pin and Packages

**Table 5-1. Device Summary<sup>(1)</sup>**

Serial Name	Part Name	Package	Body Size (Nom)	Marking <sup>(2)(4)</sup>	MSL <sup>(3)</sup>	Package Qty
GT74LVC1G02	GT74LVC1G02S5	SOT23-5	2.90mm×1.60mm×1.10mm	1G02 XXXXX	3	Tape and Reel,3000
	GT74LVC1G02C5	SC70-5	2.10mm×1.25mm×1.00mm	1G02 XXXXX	3	Tape and Reel,3000

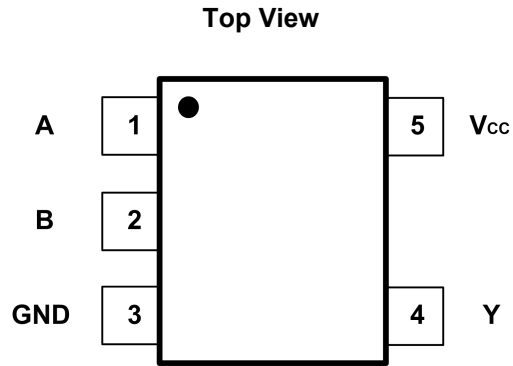
(1) For all available packages, please contact product sales.

(2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

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

(4) "XXXXX" in Marking will be appeared as the batch code.

**5 Device Summary, Pin and Packages(Continued)**



**Fig.5-1. GT74LVC1G02: S5 (SOT23-5) Package**

**GT74LVC1G02: C5 (SC70-5) Package**

**Table 5-2 Pin definition**

Name	Pin		I/O	Description
	S5	C5		
A	1		I	Data Input
B	2		I	Data Input
GND	3		-	Ground
Y		4	O	Data Output
VCC		5	-	Supply Voltage

## 6 Voltage, Temperature, ESD and Thermal Ratings

### 6.1 Absolute Maximum Ratings<sup>(1)</sup>

Parameters		Min.	Max.	Unit
V <sub>CC</sub>	Supply voltage range	-0.5	6.5	V
V <sub>I</sub>	Input voltage range <sup>(2)</sup>	-0.5	6.5	V
V <sub>O</sub>	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	-0.5	6.5	V
V <sub>O</sub>	Voltage range applied to any output in the high or low State <sup>(2)(3)</sup>	-0.5	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	V <sub>O</sub> < 0	-50	mA
I <sub>O</sub>	Continuous output current		±50	mA
	Continuous current through V <sub>CC</sub> or GND		±100	mA
T <sub>J</sub>	Junction temperature	-55	150	°C
T <sub>stg</sub>	Storage temperature	-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 and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The output positive-voltage rating may be exceeded up to 6.5 V maximum if the output current rating is observed.

### 6.2 ESD Ratings

ESD		Value	Unit
V(ESD)	Electrostatic discharge	Human-body model (HBM) <sup>(1)</sup>	8 K
		Charged device model (CDM) <sup>(2)</sup>	1.5 K

(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.

## 6 Voltage, Temperature, ESD and Thermal Ratings(Continued)

### 6.3 Recommended Operating Conditions<sup>(1)</sup>

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

Symbol	Parameter		Min	Max	Units
V <sub>CC</sub>	Supply Voltage	Operating	1.65	5.5	V
V <sub>IH</sub>	High-Level Input Voltage	V <sub>CC</sub> =1.65V to 1.95V	0.65×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×V <sub>CC</sub>		
V <sub>IL</sub>	Low-Level Input Voltage	V <sub>CC</sub> =1.65V to 1.95V		0.35×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×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	
				-24	
		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	
				24	
		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	
TA	Operating Free-air Temperature	All Other Packages	-40	125	°C

(1) All unused digital inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation.

### 6.4 Thermal Information

Package Type	θ <sub>JA</sub>	θ <sub>JC</sub>	Unit
SOT23-5	250	81	°C/W
SC70-5	400	150	°C/W

## 7 Electrical Specifications

### 7.1 Electrical Characteristics

$V_{CC}=1.65V$  to  $5.5V$ , FULL= $-40^{\circ}C$  to  $+125^{\circ}C$ . Typical values are at  $T_A=+25^{\circ}C$  (unless otherwise noted)<sup>(1)</sup>

Parameter	Symbol	Test Conditions	$V_{CC}$	$T_A$	Min	Typ	Max	Units
Output								
Output High Voltage	$V_{OH}$	$I_{OH}=-100\mu A$	1.65V to 5.5V	FULL	$V_{CC}-0.1$			V
		$I_{OH}=-4mA$	1.65V	FULL	1.2			V
		$I_{OH}=-8mA$	2.3V	FULL	1.9			V
		$I_{OH}=-16mA$	3V	FULL	2.4			V
		$I_{OH}=-24mA$		FULL	2.3			V
		$I_{OH}=-32mA$	4.5V	FULL	3.8			V
Output Low Voltage	$V_{OL}$	$I_{OL}=100\mu A$	1.65V to 5.5V	FULL			0.1	V
		$I_{OL}=4mA$	1.65V	FULL			0.45	V
		$I_{OL}=8mA$	2.3V	FULL			0.3	V
		$I_{OL}=16mA$	3V	FULL			0.4	V
		$I_{OL}=24mA$		FULL			0.55	V
		$I_{OL}=32mA$	4.5V	FULL			0.55	V
Off-State Current	$I_{off}$	$V_I$ or $V_O=5.5V$	0V	FULL			$\pm 10$	$\mu A$
Input								
Input Leakage Current	$I_I$	$V_I=5.5V$ or GND	0V to 5.5V	FULL			$\pm 5$	$\mu A$
Input Capacitance	$C_i$	$V_I=V_{CC}$ or GND	3.3V	FULL		4		pF
Power Supply								
Power Supply Range	$V_{CC}$		1.65V to 5.5V	FULL	1.65		5.5	V
Power Supply Current	$I_{CC}$	$V_I=V_{CC}$ or GND, $I_O=0$	5.5V	FULL			10	$\mu A$
Delta Power Current	$\Delta I_{CC}$	One Input at $V_{CC}-0.6V$ , Other Inputs at $V_{CC}$ or GND	3V to 5.5V	FULL			500	$\mu A$

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

### 7.2 Switching Characteristics

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

Parameter	From(Input)	To(Output)	$-40^{\circ}C$ to $+125^{\circ}C$								Units
			$V_{CC}=1.8V\pm 0.15V$		$V_{CC}=2.5V\pm 0.2V$		$V_{CC}=3.3V\pm 0.3V$		$V_{CC}=5V\pm 0.5V$		
			Min	Max	Min	Max	Min	Max	Min	Max	
$t_{pd}$	A or B	Y	1	9	1	3.8	1	4	1	3.3	ns

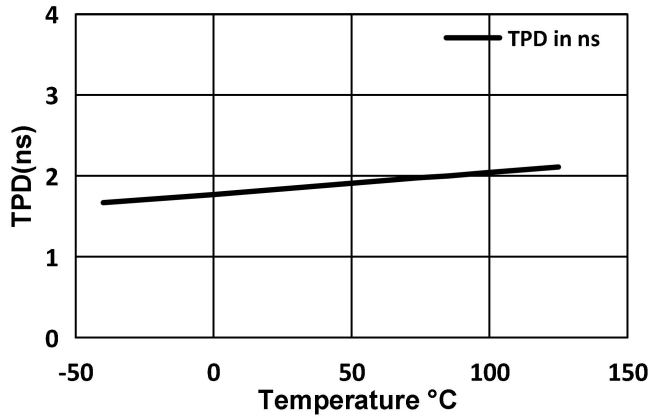
### 7.3 Operating Characteristics

$T_A=-40^{\circ}C$  to  $+125^{\circ}C$

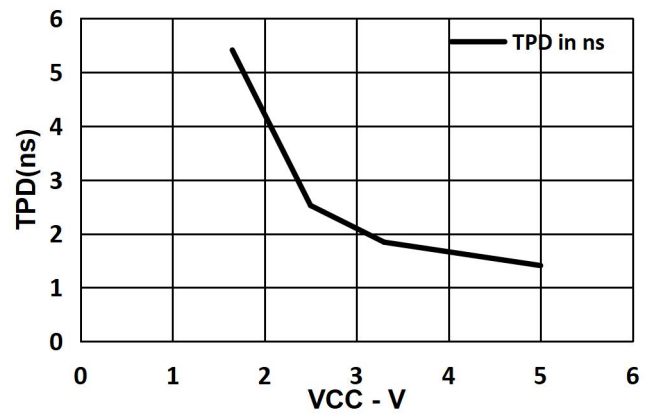
Parameter		Test Conditions	$V_{CC}=1.8V$	$V_{CC}=2.5V$	$V_{CC}=3.3V$	$V_{CC}=5V$	Units
			Typ	Typ	Typ	Typ	
$C_{pd}$	Power Dissipation Capacitance	$f=10MHz$	23	23	23	31	pF

### 8 Typical Characteristics

$V_{CC}=1.65V$  or  $5.5V$ , FULL= $-40^{\circ}C$  to  $+125^{\circ}C$ . Typical values are at  $T_A=+25^{\circ}C$  (unless otherwise noted)



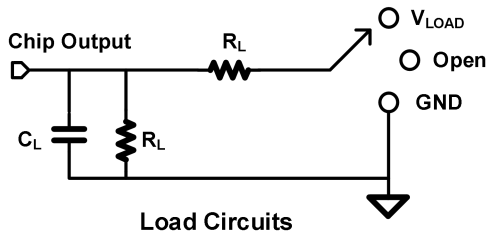
**Fig.8-1. TPD Across Temperature at 3.3V V<sub>CC</sub>**



**Fig.8-2. TPD Across V<sub>CC</sub> at 25°C**

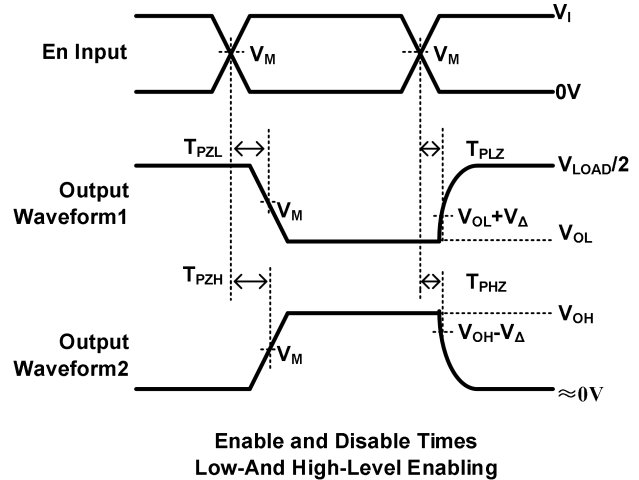
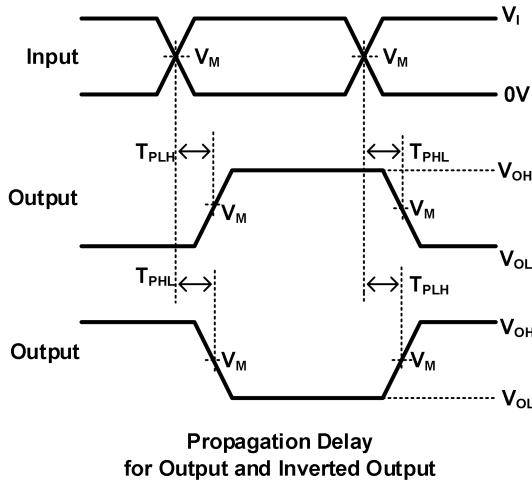
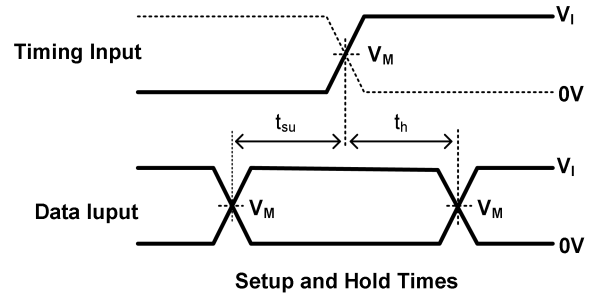
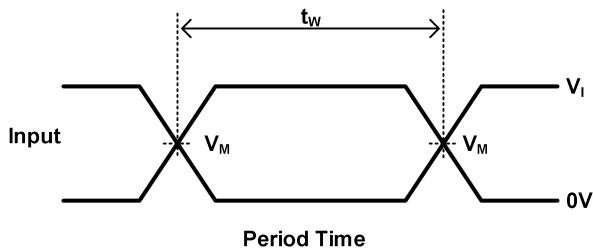


## 9 Measurement Information



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

$V_{CC}$	Inputs		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_i$	$T_r/T_f$					
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k $\Omega$	0.15V
$2.5V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 $\Omega$	0.15V
$3.3V \pm 0.15V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$5V \pm 0.15V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 $\Omega$	0.3V



Notes: A.  $C_L$  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 devices.

## 10 Detailed Description

### 10.1 Overview

The GT74LVC1G02 device contains one 2-input positive-NOR gate and performs the Boolean function  $Y = \overline{A + B}$  or  $Y = \overline{A} \cdot \overline{B}$  in positive logic.

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. The  $I_{off}$  feature allows voltages on the inputs and outputs, when  $V_{CC}$  is 0 V.

### 10.2 Functional Block Diagram

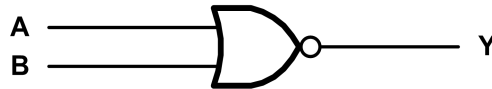


Fig.10-1.Functional Block Diagram

### 10.3 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.

### 10.4 Device Functional Modes

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

## 11 Application Note

The GT74LVC1G02 is a high drive CMOS device that can be used for implement NOR logic with a high output drive, such as an LED application. It can produce 24-mA of drive current at 3.3V making it Ideal for driving multiple outputs and good for high speed applications up to 100Mhz. The inputs are 5.5-V tolerant allowing translation down to  $V_{CC}$ .

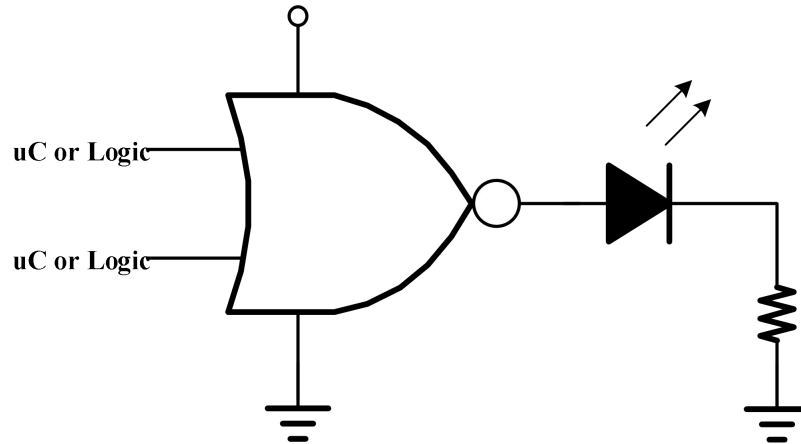
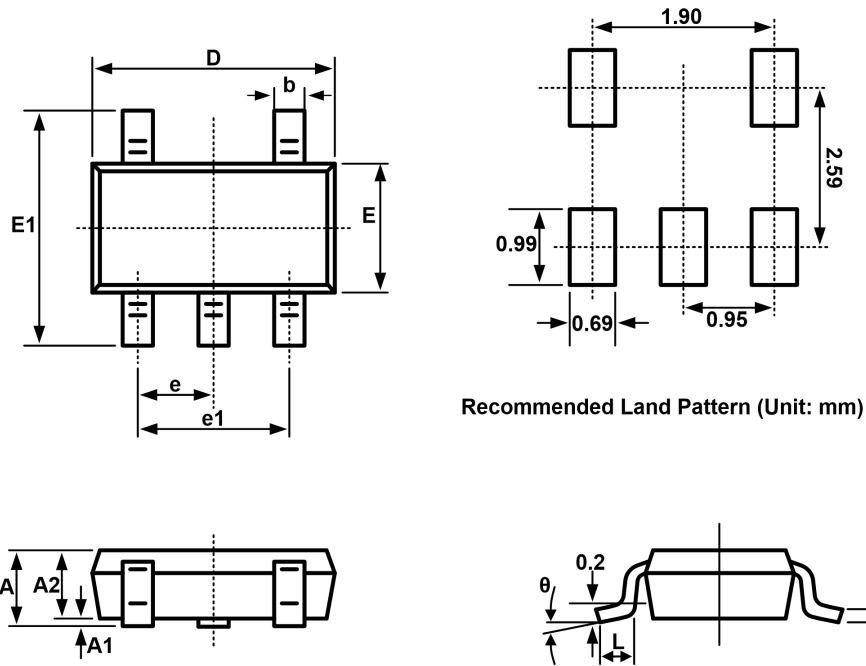


Fig.11-1. Basic LED Driver

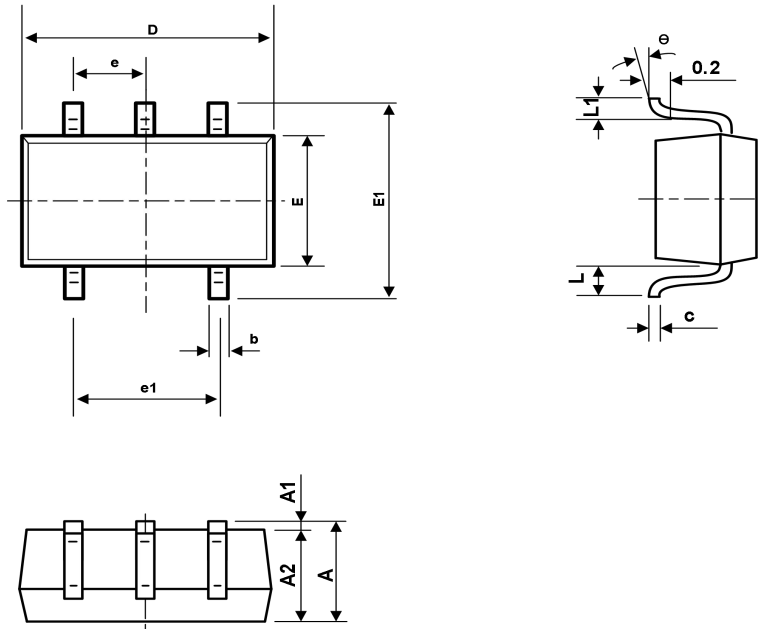
This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

Each VCC pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1- $\mu$ F capacitor is recommended. If there are multiple VCC pins, then a 0.01- $\mu$ F or 0.022- $\mu$ F capacitor is recommended for each power pin. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. A 0.1- $\mu$ F and 1- $\mu$ F capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

## 12 Package Outline Dimension

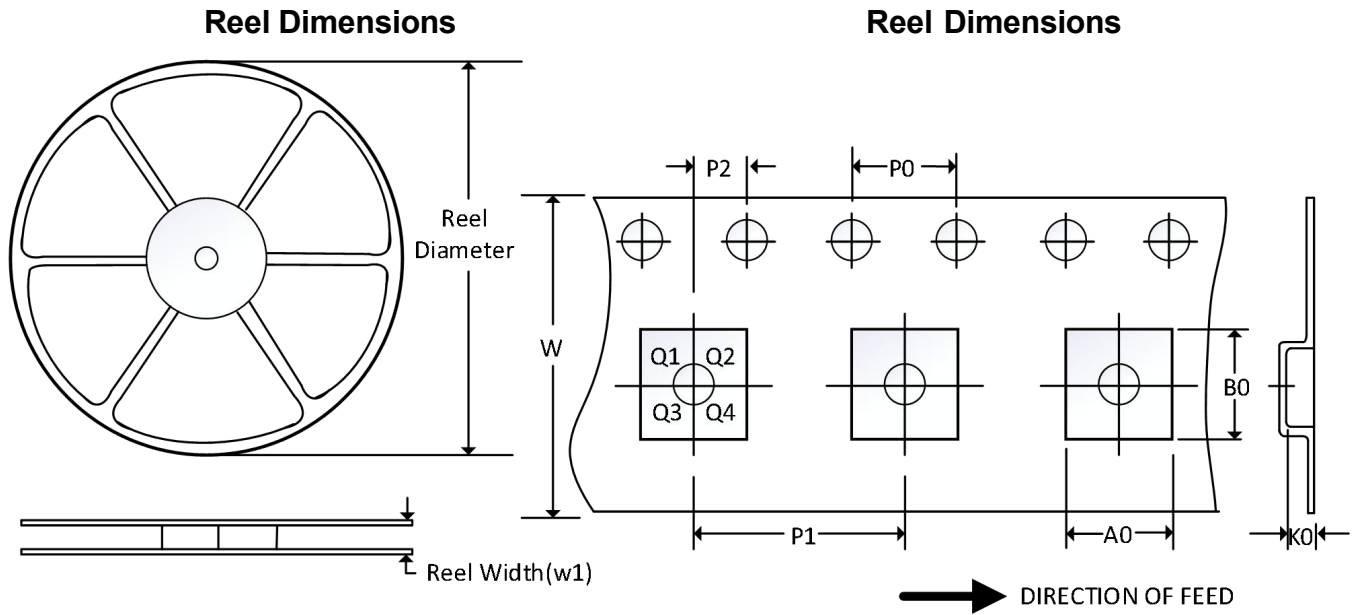
**SOT23-5**


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
L1	0.600REF		0.024REF	
θ	0°	8°	0°	8°

**12 Package Outline Dimension(Continued)**
**SC70-5**


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	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
e	0°	8°	0°	8°

### 13 Tape and Reel Information



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
SOT23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SC70-5	7"	9.5	2.25	2.55	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.