RS2G34 Dual Buffer Gate

1 FEATURES

- **Operating Voltage Range:1.65V to 5.5V**
- **Low Power Consumption:1µA (Max)**
- **Operating Temperature Range:**
  -40°C to +125°C
- **Inputs Accept Voltage to 5.5V**
- **High Output Drive: ±24mA at V_{CC}=3.0V**
- **I_{off} Supports Partial-Power-Down Mode Operation**
- **Micro SIZE PACKAGES: SOT23-6, SOT363(SC70-6)**

2 APPLICATIONS

- **AC Receiver**
- **Blu-ray Players and Home Theaters**
- **Desktops or Notebook PCs**
- **Digital Video Cameras (DVC)**
- **Mobile Phones**
- **Personal Navigation Device (GPS)**
- **Portable Media Player**
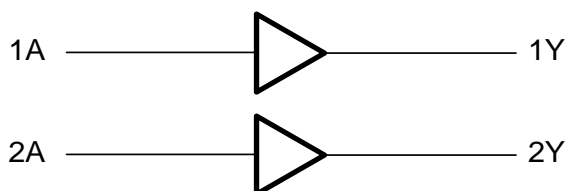
3 DESCRIPTIONS

The RS2G34 dual buffer gate is designed for 1.65V to 5.5V V_{CC} operation.

The RS2G34 device performs the Boolean function Y=A in positive logic.

The CMOS device has high output drive while maintaining low static power dissipation over a broad V_{CC} operating range.

The RS2G34 is available in Green SOT23-6 and SOT363(SC70-6) packages. It operates over an ambient temperature range of -40°C to +125°C.

Device Information [1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS2G34	SOT23-6(6)	1.60mm×2.92mm
	SOT363 (SC70-6)(6)	2.10mm×1.25mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

4 FUNCTION TABLE

INPUT	OUTPUT
A	**Y**
H	H
L	L

Y=A
H=High Voltage Level
L=Low Voltage Level

LOGIC SYMBOL

1A ————▷———— 1Y

2A ————▷———— 2Y

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5 Revision History

Note: Page numbers for previous revisions may different from page numbers in the current version.

| Version	Change Date	Change Item
A.1	2023/02/06	Initial version completed

6 PACKAGE/ORDERING INFORMATION [1]

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING [2]	PACKAGE OPTION
RS2G34	RS2G34XH6	-40°C ~+125°C	SOT23-6	2G34	Tape and Reel,3000
	RS2G34XC6	-40°C ~+125°C	SC70-6 (SOT363)	2G34	Tape and Reel,3000

NOTE:
(1) This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the right-hand navigation.
(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.

7 PIN CONFIGURATIONS

TOP VIEW

1A	1	6	1Y
GND	2	5	Vcc
2A	3	4	2Y

SOT23-6/SOT363(SC70-6)
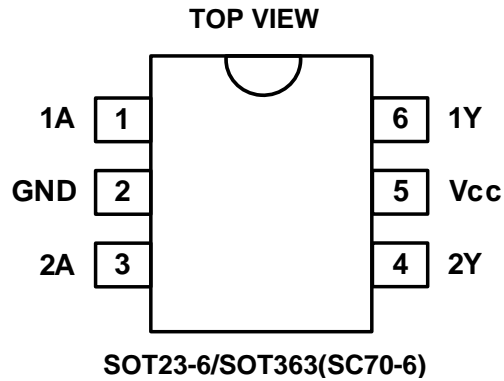
PIN DESCRIPTION

PIN SOT23-6/SOT363(SC70-6)	NAME	I/O TYPE [1]	FUNCTION
1	1A	I	Input 1
2	GND	P	Ground
3	2A	I	Input 2
4	2Y	O	Output 2
5	V_{CC}	P	Supply Power
6	1Y	O	Output 1

(1) I=input, O=output, P=power.

8 SPECIFICATIONS

8.1 Absolute Maximum Ratings [1]

over operating free-air temperature range (unless otherwise noted) [1] [2]

			MIN	MAX	UNIT
V_{CC}	Supply voltage range		-0.5	6.5	V
V_I	Input voltage range [2]		-0.5	6.5	V
Vo	Voltage range applied to any output in the high-impedance or power-off state [2]		-0.5	6.5	V
Vo	Voltage range applied to any output in the high or low state [2] [3]		-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
$θ_{JA}$	Package thermal impedance [4]	SOT23-6		230	°C/W
		SOT363(SC70-6)		265	
T_J	Junction temperature [5]		-65	150	°C
Tstg	Storage temperature		-65	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 value of V_{CC} is provided in the *Recommended Operating Conditions table.*

(4) The package thermal impedance is calculated in accordance with JESD-51.

(5) The maximum power dissipation is a function of $T_{J(MAX)}$, $R_{θJA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{θJA}$. All numbers apply for packages soldered directly onto a PCB.

8.2 ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

		VALUE	UNIT
$V_{(ESD)}$ Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1]	±4000	V
	Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002[2]	±1500	V
	Machine model (MM)	±200	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.

ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

9 ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (TYP values are at T_A = +25°C, Full=-40°C to 125°C, unless otherwise noted.) [1]

9.1 Recommended Operating Conditions

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
Supply voltage	V_{CC}	Operating	1.65	5.5	V
		Data retention only	1.5		
High-level input voltage	V_{IH}	V_{CC}=1.65V to 1.95V	0.65 x 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 x V_{CC}		
Low-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V		0.35 x V_{CC}	V
		V_{CC}=2.3V to 2.7V		0.7	
		V_{CC}=3V to 3.6V		0.8	
		V_{CC}=4.5V to 5.5V		0.3 x V_{CC}	
Input voltage	V_I		0	5.5	V
Output voltage	V_O		0	V_{CC}	V
Input transition rise or fall	$\Delta t/\Delta v$	V_{CC}=1.8V± 0.15V,2.5V ± 0.2V		20	ns/V
		V_{CC}=3.3V± 0.3V		10	
		V_{CC}=5V± 0.5V		5	
Operating temperature	T_A		-40	+125	°C

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

9.2 DC Characteristics

PARAMETER		TEST CONDITIONS	V$_{CC}$	TEMP	MIN[2]	TYP[3]	MAX[2]	UNIT
V$_{OH}$		I$_{OH}$ = -100µA	1.65V to 5.5V	Full	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$_{OL}$		I$_{OL}$ = 100µA	1.65V to 5.5V	Full			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$_I$	A inputs	V$_I$=5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	µA
				Full			±5	
I$_{off}$		V$_I$ or V$_O$=5.5V	0	+25°C		±0.1	±1	µA
				Full			±10	
I$_{CC}$		V$_I$=5.5V or GND, I$_O$=0	1.65V to 5.5V	+25°C		0.1	1	µA
				Full			10	
ΔI$_{CC}$		One input at V$_{CC}$-0.6V, Other inputs at V$_{CC}$ or GND	3V to 5.5V	Full			500	µA
C$_i$ (Input Capacitance)		V$_I$ = V$_{CC}$ or GND	3.3V	+25°C		4		pF

(1) All unused inputs of the device must be held at V$_{CC}$ or GND to ensure proper device operation.
(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

9.3 AC Characteristics

| PARAMETER	SYMBOL	TEST CONDITIONS		MIN[2]	TYP[3]	MAX[2]	UNIT
Propagation Delay	t$_{pd}$	V$_{CC}$=1.8V±0.15V	C$_L$=30pF, R$_L$=1kΩ		13.3		ns
		V$_{CC}$=2.5V±0.2V	C$_L$=30pF, R$_L$=500Ω		5.3		
		V$_{CC}$=3.3V±0.3V	C$_L$=50pF, R$_L$=500Ω		4.2		
		V$_{CC}$=5V±0.5 V	C$_L$=50pF, R$_L$=500Ω		3.4		
Power dissipation capacitance	C$_{pd}$	V$_{CC}$=1.8V	f=10MHz		16		pF
		V$_{CC}$=2.5V			18		
		V$_{CC}$=3.3V			18		
		V$_{CC}$=5V			20		

(1) All unused inputs of the device must be held at V$_{CC}$ or GND to ensure proper device operation.
(2) This parameter is ensured by design and/or characterization and is not tested in production.
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.
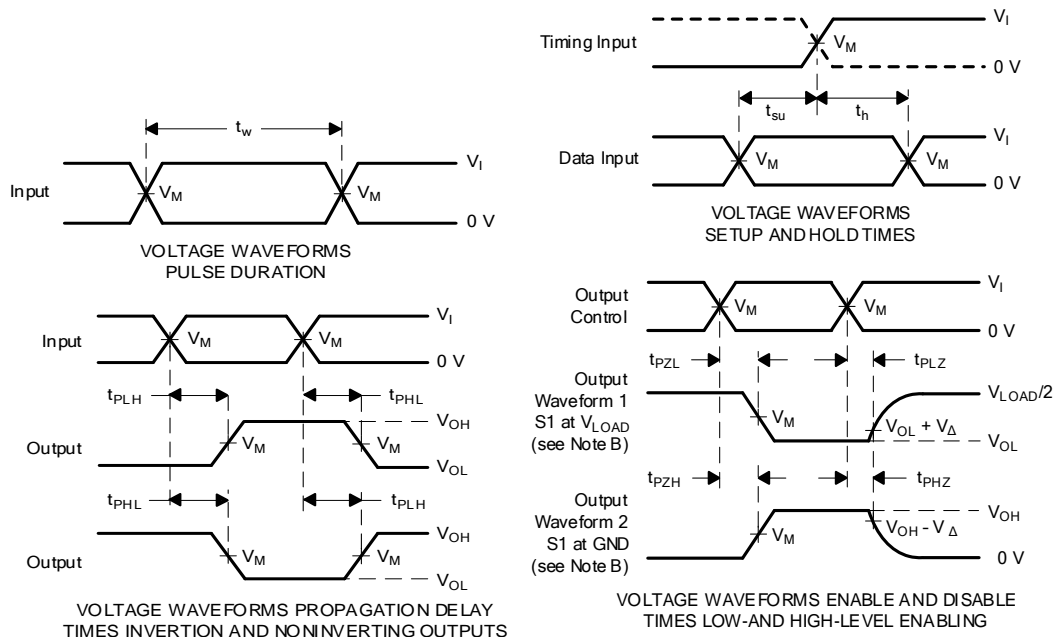
10 Parameter Measurement Information
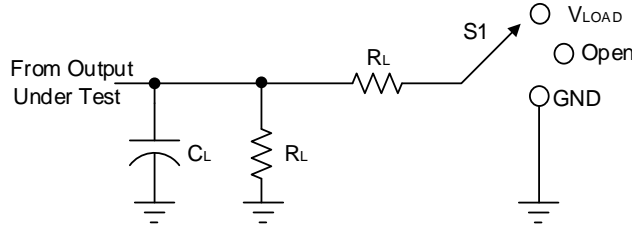
TEST	S1
t$_{PLH}$/t$_{PHL}$	Open
t$_{PLZ}$/t$_{PZL}$	V$_{LOAD}$
t$_{PHZ}$/t$_{PZH}$	GND

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 x V$_{CC}$	15pF	30pF	1MΩ	1kΩ	0.15V
2.5V±0.2V	V$_{CC}$	≤2ns	V$_{CC}$/2	2 x V$_{CC}$	15pF	30pF	1MΩ	500Ω	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	15pF	50pF	1MΩ	500Ω	0.3V
5V±0.5V	V$_{CC}$	≤2.5ns	V$_{CC}$/2	2 x V$_{CC}$	15pF	50pF	1MΩ	500Ω	0.3V

VOLTAGE WAVEFORMS
PULSE DURATION

VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES

VOLTAGE WAVEFORMS PROPAGATION DELAY
TIMES INVERTION AND NONINVERTING OUTPUTS

VOLTAGE WAVEFORMS ENABLE AND DISABLE
TIMES LOW- AND HIGH-LEVEL ENABLING

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$_O$ = 50 Ω.
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.

Figure 1. Load Circuit and Voltage Waveforms

11 Detailed Description

11.1 Overview
The RS2G34 device contains one buffer gate device and performs the Boolean function $Y = A$. 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.

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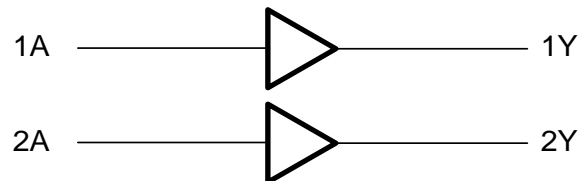
11.3 Feature Description
- Wide operating voltage range.
  - Operates from 1.65 V to 5.5 V.
- Allows down voltage translation.
- Inputs accept voltages to 5.5 V.
- I_{off} feature allows voltages on the inputs and outputs when V_{CC} is 0 V.

12 Application and Implementation

Information in the following applications sections is not part of the RUNIC component specification, and RUNIC does not warrant its accuracy or completeness. RUNIC's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

12.1 Application Information

The RS2G34 is a high drive CMOS device that can be used as a buffer with a high output drive, such as an LED application. It can produce 24 mA of drive current at 3.0 V making it ideal for driving multiple outputs and good for high speed applications up to 100MHz. The inputs are 5.5 V tolerant allowing it to translate down to V_{CC}.

12.2 Design Requirements

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.

13 Power Supply Recommendations

The power supply pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1uF capacitor is recommended and if there are multiple V_{CC} terminals then 0.01uF or 0.022uF capacitors are recommended for each power terminal. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1µF and 1µF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible.

14 Layout

14.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever float. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Specified below are the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally, they will be tied to GND or V_{CC} whichever make more sense or is more convenient.
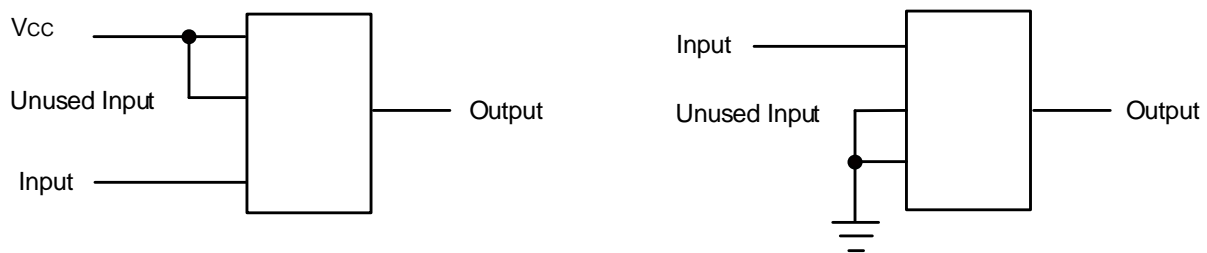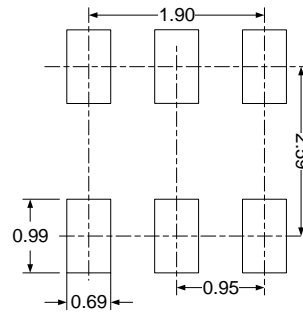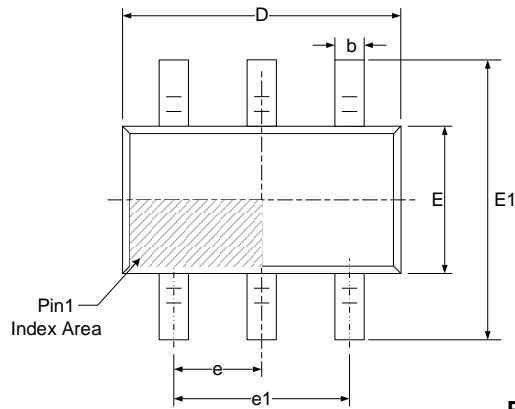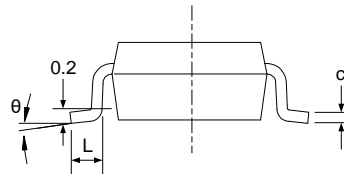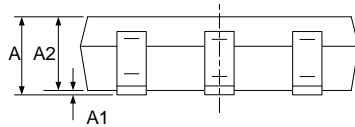
14.2 Layout Example

Figure 2. Layout Diagram
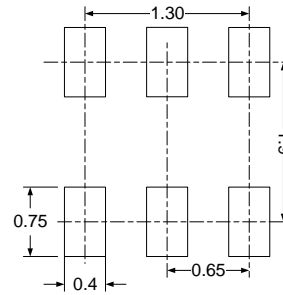
15 PACKAGE OUTLINE DIMENSIONS
## SOT23-6

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	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT363(SC70-6)
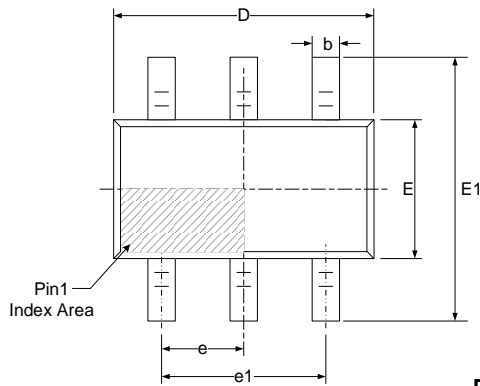
RECOMMENDED LAND PATTERN (Unit: mm)
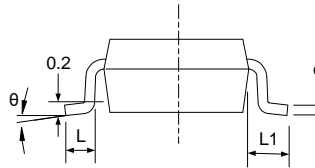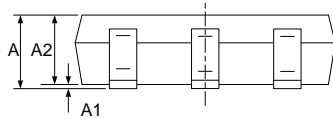
| Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

NOTE:
    A. All linear dimension is in millimeters.
    B. This drawing is subject to change without notice.
    C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
    D. BSC: Basic Dimension. Theoretically exact value shown without tolerances.

16 TAPE AND REEL INFORMATION

REEL DIMENSIONS   TAPE DIMENSION
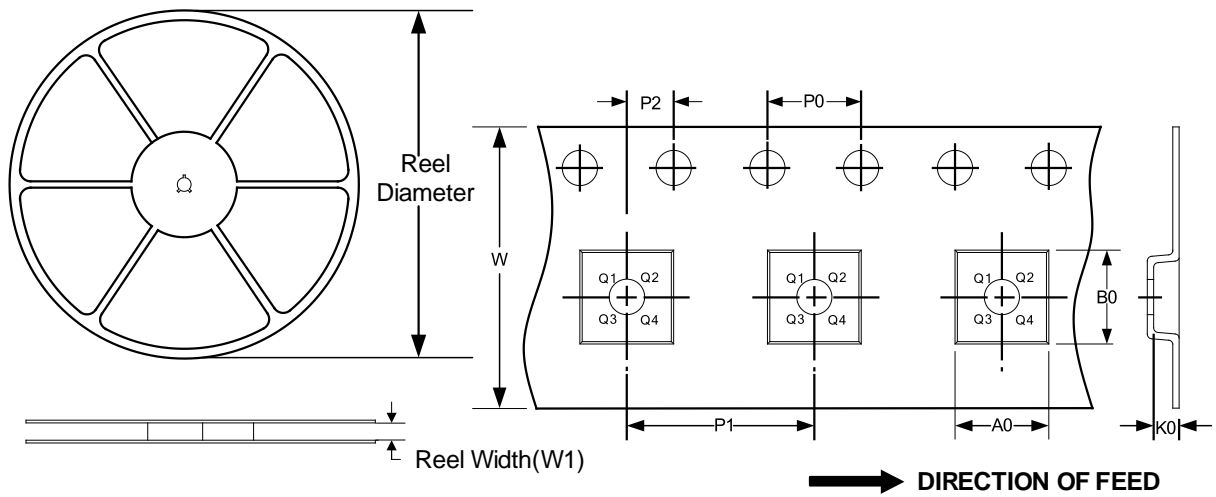
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOT363(SC70-6)	7''	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3
SOT23-6	7''	9.5	3.17	3.23	1.37	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.

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