

RS2G04 Dual Inverter Gate

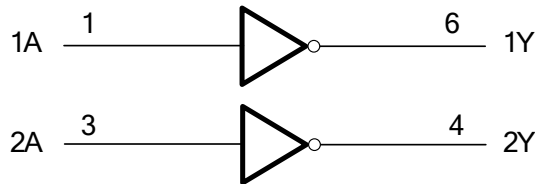
1 FEATURES

- **Operating Voltage Range:**1.65V to 5.5V
- **Low Power Consumption:**1μA (Max)
- **Operating Temperature Range:**
-40°C to +125°C
- **Input 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

Functional Block Diagram



3 DESCRIPTIONS

The RS2G04 Dual inverter gate is designed for 1.65V to 5.5V V_{CC} operation.

The RS2G04 device performs the Boolean function $Y = \bar{A}$.

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

The RS2G04 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) |
|-------------|--------------------|-----------------|
| RS2G04 | 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 | L |
| L | H |

$Y = \bar{A}$

H=High Voltage Level

L=Low Voltage Level

Table of Contents

| | |
|------------------------------------------------------------|----|
| 1 FEATURES | 1 |
| 2 APPLICATIONS | 1 |
| 3 DESCRIPTION | 1 |
| 4 FUNCTION TABLE | 1 |
| 5 Revision History | 3 |
| 6 PACKAGE/ORDERING INFORMATION ⁽¹⁾ | 4 |
| 7 PIN CONFIGURATIONS | 5 |
| 8 SPECIFICATIONS | 6 |
| 8.1 Absolute Maximum Ratings ⁽¹⁾ | 6 |
| 8.2 ESD Ratings | 6 |
| 9 ELECTRICAL CHARACTERISTICS | 7 |
| 9.1 Recommended Operating Conditions | 7 |
| 9.2 DC Characteristics | 8 |
| 9.3 AC Characteristics | 8 |
| 10 Parameter Measurement Information | 9 |
| 11 PACKAGE OUTLINE DIMENSIONS | 10 |
| 12 TAPE AND REEL INFORMATION | 12 |

5 Revision History

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

| Version | Change Date | Change Item |
|---------|-------------|----------------------------------------------------|
| A.1 | 2022/05/11 | Initial version completed |
| A.2 | 2022/07/13 | Change ORDERING NUMBER on Page 4@RevA.1 |
| A.3 | 2022/10/25 | Update ELECTRICAL CHARACTERISTICS on Page 7@RevA.2 |

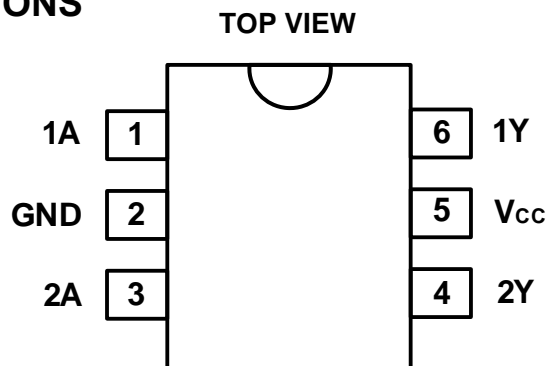
6 PACKAGE/ORDERING INFORMATION ⁽¹⁾

| PRODUCT | ORDERING NUMBER | TEMPERATURE RANGE | PACKAGE LEAD | PACKAGE MARKING ⁽²⁾ | PACKAGE OPTION |
|---------|-----------------|-------------------|----------------|--------------------------------|--------------------|
| RS2G04 | RS2G04XC6 | -40°C ~+125°C | SC70-6(SOT363) | 2G04 | Tape and Reel,3000 |
| | RS2G04XH6 | -40°C ~+125°C | SOT23-6 | 2G04 | 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



SOT23-6/SOT363(SC70-6)

PIN DESCRIPTION

| PIN | NAME | I/O TYPE ⁽¹⁾ | FUNCTION |
|-------------------------------|-----------------|-------------------------|-----------|
| SOT23-6/SOT363(SC70-6) | | | |
| 1 | 1A | I | Input 1 |
| 2 | GND | P | Ground |
| 3 | 2A | I | Input 2 |
| 4 | 2Y | O | Output 2 |
| 5 | V _{cc} | P | Power Pin |
| 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 |
| 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⁾ ⁽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 |
| T _{stg} | 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 (Full = -40°C to +125°C, typical values are at $T_A = +25^\circ\text{C}$, 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} | $V_{CC}=1.65\text{V to }1.95\text{V}$ | $0.65 \times V_{CC}$ | | V |
| | | $V_{CC}=2.3\text{V to }2.7\text{V}$ | 1.7 | | |
| | | $V_{CC}=3\text{V to }3.6\text{V}$ | 2 | | |
| | | $V_{CC}=4.5\text{V to }5.5\text{V}$ | $0.7 \times V_{CC}$ | | |
| Low-level input voltage | V_{IL} | $V_{CC}=1.65\text{V to }1.95\text{V}$ | | $0.35 \times V_{CC}$ | V |
| | | $V_{CC}=2.3\text{V to }2.7\text{V}$ | | 0.7 | |
| | | $V_{CC}=3\text{V to }3.6\text{V}$ | | 0.8 | |
| | | $V_{CC}=4.5\text{V to }5.5\text{V}$ | | $0.3 \times V_{CC}$ | |
| Input voltage | V_I | | 0 | 5.5 | V |
| Output voltage | V_O | | 0 | 5.5 | V |
| Input transition rise or fall | $\Delta t/\Delta v$ | $V_{CC}=1.8\text{V} \pm 0.15\text{V}, 2.5\text{V} \pm 0.2\text{V}$ | | 20 | ns/V |
| | | $V_{CC}=3.3\text{V} \pm 0.3\text{V}$ | | 10 | |
| | | $V_{CC}=5\text{V} \pm 0.5\text{V}$ | | 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 input | 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 |
| Input Capacitance (C _i) | | 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.

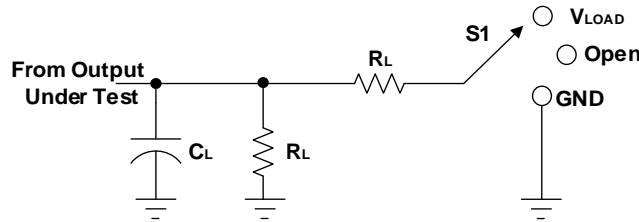
9.3 AC Characteristics

| 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 | | 13.0 | | ns |
| | | V _{CC} =2.5V±0.2V | C _L =30pF, R _L =500Ω | | 5.1 | | |
| | | V _{CC} =3.3V±0.3V | C _L =50pF, R _L =500Ω | | 4.2 | | |
| | | V _{CC} =5V±0.5V | C _L =50pF, R _L =500Ω | | 3.3 | | |
| 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.

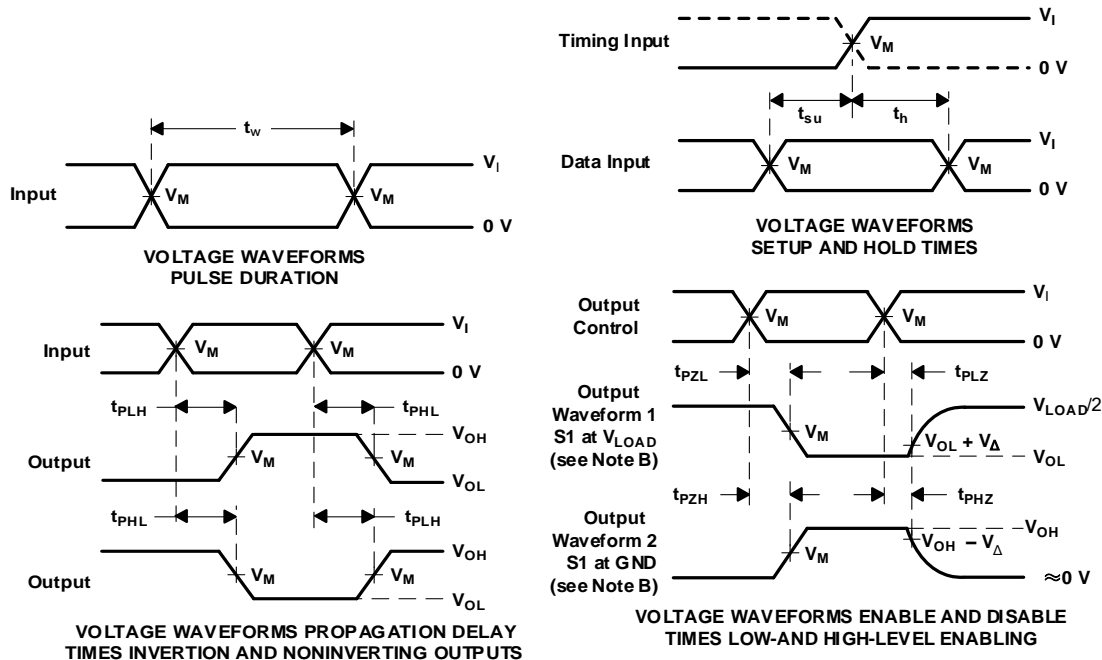
10 Parameter Measurement Information

Open-Drain



| TEST | S1 |
|-------------------|------------|
| t_{PLH}/t_{PHL} | Open |
| t_{PIZ}/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 |

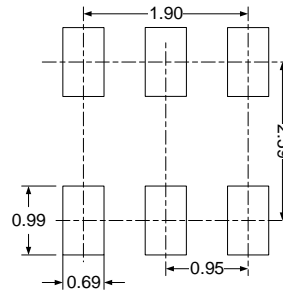
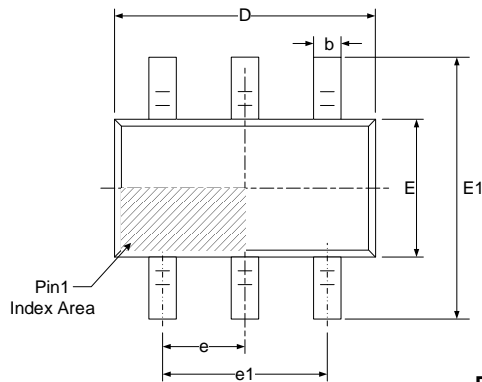
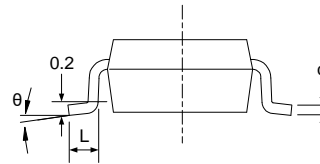
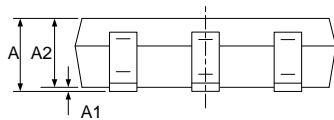


- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_o = 50 \Omega$.
 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.

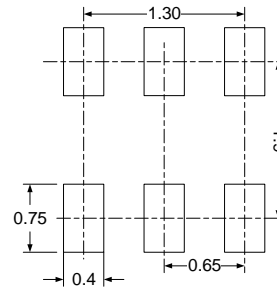
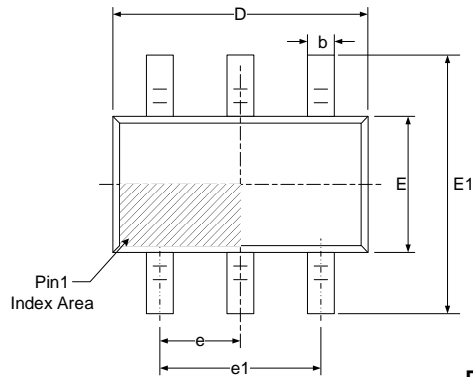
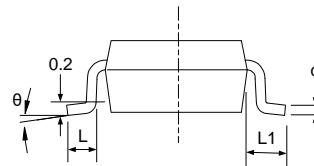
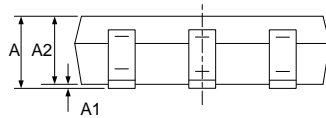
Figure 1. Load Circuit and Voltage Waveforms

11 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° |

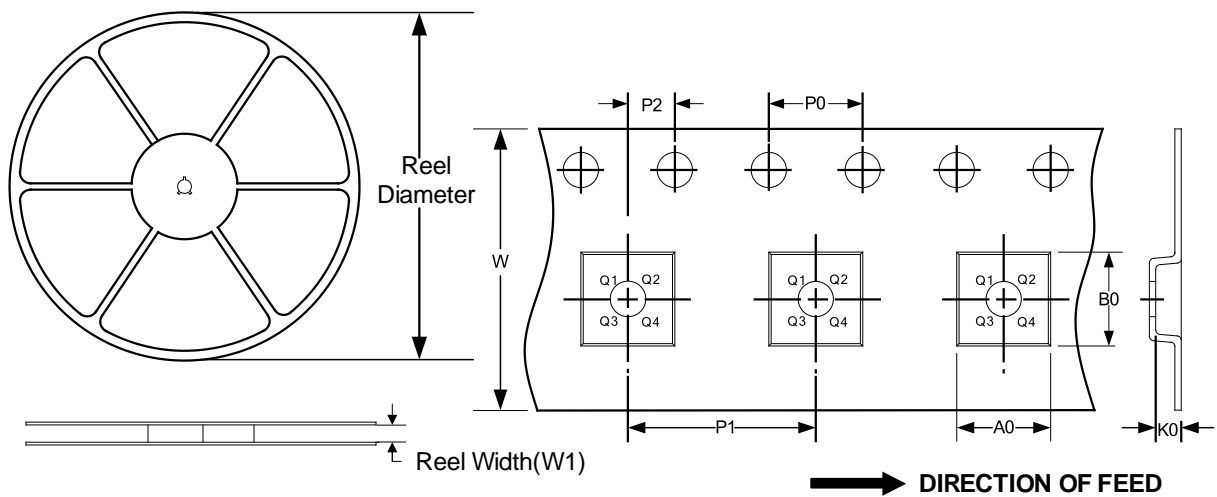
NOTE:

- 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.

12 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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