

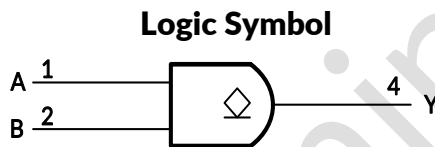
# RS1G09-Q1 Single 2-Input AND Gate with Open-Drain Output

## 1 FEATURES

- **RS1G09-Q1 AEC-Q100 Qualification is Ongoing**
- **Operating Voltage Range: 1.65V to 5.5V**
- **Low Power Consumption: 1 $\mu$ A (Max)**
- **Operating Temperature Range: -40°C to +125°C**
- **Inputs Accept Voltage to 5.5V**
- **High Output Drive:  $\pm$ 24mA at  $V_{CC}$ =3.0V**
- **Micro Size Packages: SC70-5**

## 2 APPLICATIONS

- **Active Noise Elimination**
- **Bar Code Scanner**
- **Blood Pressure Monitor**
- **CPAP Machine**
- **Fingerprint Identification**
- **Network Attached Storage (NAS)**



## 3 DESCRIPTIONS

The RS1G09-Q1 is a single 2-input AND gate with open-drain output. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

The RS1G09-Q1 is available in Green SC70-5 packages. It operates over an ambient temperature range of -40°C to +125°C.

**Device Information <sup>(1)</sup>**

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS1G09-Q1	SC70-5	2.10mm $\times$ 1.25mm

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

## 4 FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
H	H	Z
L	H	L
H	L	L
L	L	L

H=High Voltage Level  
 L=Low Voltage Level  
 Z=high-impedance OFF-state

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## 5 REVISION HISTORY

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

Version	Change Date	Change Item
A.0	2026/05/29	Preliminary version completed

Preliminary version

**6 PACKAGE/ORDERING INFORMATION <sup>(1)</sup>**

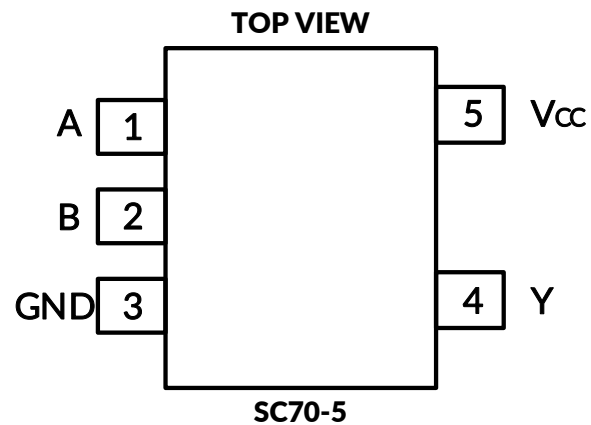
PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	Lead finish/Ball material <sup>(2)</sup>	MSL Peak Temp <sup>(3)</sup>	PACKAGE MARKING <sup>(4)</sup>	PACKAGE OPTION
RS1G09-Q1	RS1G09XC5-Q1	-40°C ~+125°C	SC70-5 <sup>(5)</sup>	TBD	MSL1-260°-Unlimited	1G09	Tape and Reel, 3000

**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) Lead finish/Ball material. Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
- (3) Runic classify the MSL level with using the common preconditioning setting in our assembly factory conforming to the JEDEC industrial standard J-STD-20F. Please align with Runic if your end application is quite critical to the preconditioning setting or if you have special requirement.
- (4) 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.
- (5) Equivalent to SOT353.

Preliminary version

## 7 PIN CONFIGURATIONS



### PIN DESCRIPTION

PIN	NAME	I/O <sup>(1)</sup>	FUNCTION
SC70-5			
1	A	I	Input
2	B	I	Input
3	GND	P	Ground
4	Y	O	Output
5	V <sub>cc</sub>	P	Power pin

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

## 8 SPECIFICATIONS

### 8.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) <sup>(1)(2)</sup>

		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>	Output voltage range <sup>(2)</sup>	-0.5	6.5	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
θ <sub>JA</sub>	Package thermal impedance <sup>(3)</sup>	SC70-5	380	°C/W
T <sub>J</sub>	Junction temperature <sup>(4)</sup>	-65	150	°C
T <sub>stg</sub>	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 package thermal impedance is calculated in accordance with JESD-51.
- (4) The maximum power dissipation is a function of T<sub>J(MAX)</sub>, R<sub>θJA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any ambient temperature is P<sub>D</sub> = (T<sub>J(MAX)</sub> - T<sub>A</sub>) / R<sub>θJA</sub>. 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 <sub>(ESD)</sub>	Electrostatic discharge	Human-Body Model (HBM), per AEC Q100-002 <sup>(1)</sup>	TBD
		Charged-Device Model (CDM), per AEC Q100-011	TBD
		Latch-Up (LU), per AEC Q100-004	TBD
			mA

- (1) AEC Q100-002 indicates that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.



#### 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  $T_A = +25^\circ\text{C}$ , Full= $-40^\circ\text{C}$  to  $125^\circ\text{C}$ , unless otherwise noted.)<sup>(1)</sup>

### 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	$V_{CC}$	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	$^\circ\text{C}$

(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 <sub>CC</sub>	TEMP	MIN <sup>(2)</sup>	TYP <sup>(3)</sup>	MAX <sup>(2)</sup>	UNIT
V <sub>OL</sub>		I <sub>OL</sub> = 100 μA	1.65V to 5.5V	Full			0.1	V
		I <sub>OL</sub> = 4 mA	1.65V				0.45	
		I <sub>OL</sub> = 8 mA	2.3V				0.3	
		I <sub>OL</sub> = 16 mA	3V				0.4	
		I <sub>OL</sub> = 24 mA					0.55	
		I <sub>OL</sub> = 32 mA	4.5V				0.55	
I <sub>I</sub>	A or B inputs	V <sub>I</sub> =5.5 V or GND	0V to 5.5V	+25°C		±0.1	±1	μA
				Full			±5	
	I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> =5.5 V	0	+25°C		±0.1	±1	μA
				Full			±10	
	I <sub>CC</sub>	V <sub>I</sub> =5.5 V or GND, I <sub>O</sub> =0	1.65V to 5.5V	+25°C		0.1	1	μA
				Full			10	
	ΔI <sub>CC</sub>	One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND	3V to 5.5V	Full			500	μA
	C <sub>i</sub> (Input Capacitance)	V <sub>I</sub> =V <sub>CC</sub> or GND	3.3V	+25°C		4		pF

(1) All unused inputs of the device must be held at V<sub>CC</sub> 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

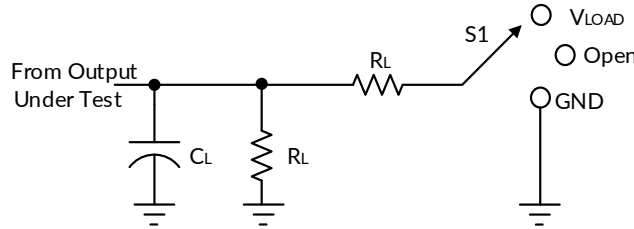
PARAMETER	SYMBOL	TEST CONDITIONS		MIN <sup>(2)</sup>	TYP <sup>(3)</sup>	MAX <sup>(2)</sup>	UNIT
Propagation Delay	t <sub>pd</sub>	V <sub>CC</sub> =1.8V±0.15V	C <sub>L</sub> =30pF, R <sub>L</sub> =1KΩ		6.4		ns
		V <sub>CC</sub> =2.5V±0.2V	C <sub>L</sub> =30pF, R <sub>L</sub> =500Ω		4.5		
		V <sub>CC</sub> =3.3V±0.3V	C <sub>L</sub> =50pF, R <sub>L</sub> =500Ω		4.2		
		V <sub>CC</sub> =5V±0.5V	C <sub>L</sub> =50pF, R <sub>L</sub> =500Ω		3.7		
Power Dissipation Capacitance	C <sub>pd</sub>	V <sub>CC</sub> =1.8V	f=10MHz		3		pF
		V <sub>CC</sub> =2.5V			3		
		V <sub>CC</sub> =3.3V			4		
		V <sub>CC</sub> =5V			6		

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

(2) This parameter is ensured by design and/or characterization and is not tested in production.

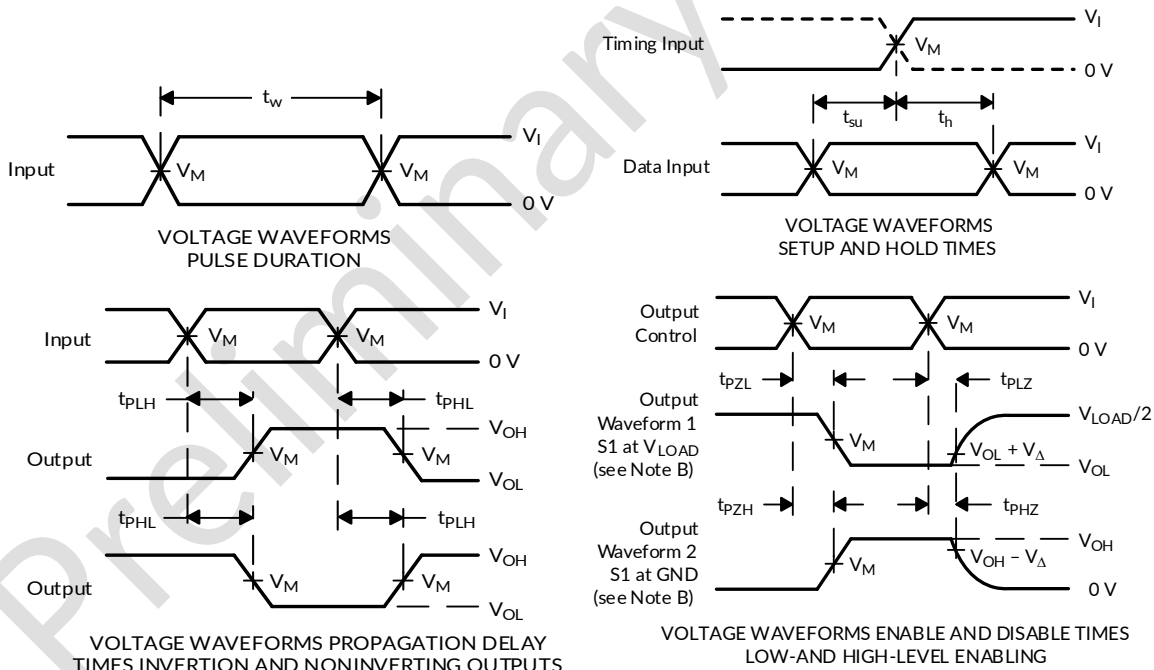
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

## 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		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 $\Omega$	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	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:  $PRR \leq 10$  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  $t_{dis}$ .

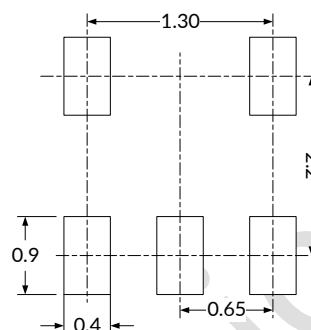
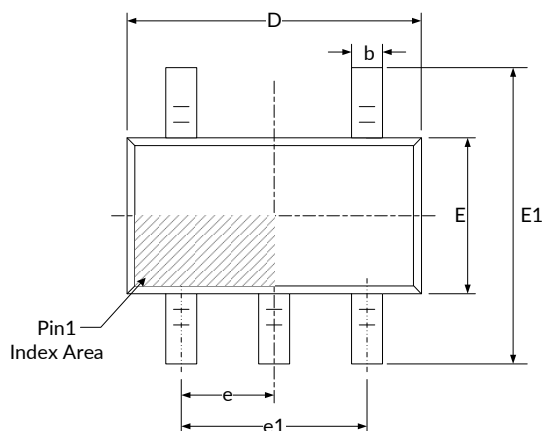
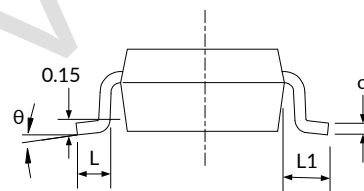
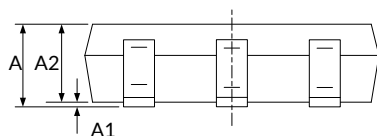
F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

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

**SC70-5 (4)**

**RECOMMENDED LAND PATTERN (Unit: mm)**


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A <sup>(1)</sup>	0.850	1.050	0.033	0.041
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D <sup>(1)</sup>	2.020	2.120	0.079	0.084
E <sup>(1)</sup>	1.250	1.350	0.049	0.053
E1	2.200	2.400	0.087	0.094
e	0.650(BSC) <sup>(2)</sup>		0.026(BSC) <sup>(2)</sup>	
e1	1.300(BSC) <sup>(2)</sup>		0.051(BSC) <sup>(2)</sup>	
L	0.280	0.380	0.011	0.015
L1	0.500(REF) <sup>(3)</sup>		0.020(REF) <sup>(3)</sup>	
θ	0°	8°	0°	8°

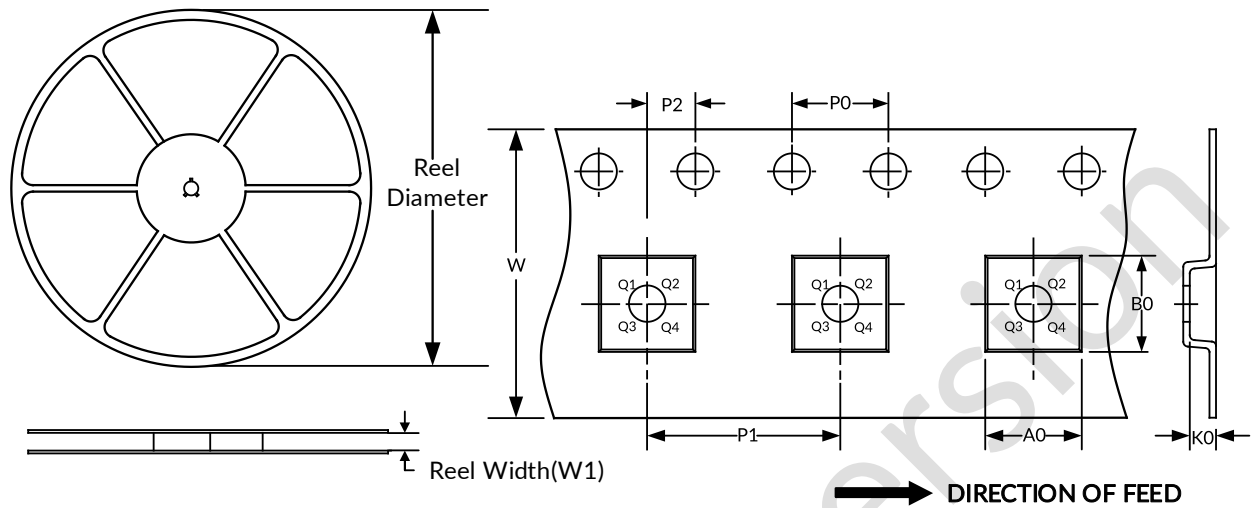
**NOTE:**

1. Plastic or metal protrusions of 0.15mm maximum per side are not included.
2. BSC (Basic Spacing between Centers), "Basic" spacing is nominal.
3. REF is the abbreviation for Reference.
4. This drawing is subject to change without notice.

## 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
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.

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