

# RS4G86 Quadruple 2-Input Exclusive-OR Gate

## 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<sub>CC</sub>=3.0V
- PACKAGES: SOIC-14(SOP14) and TSSOP-14

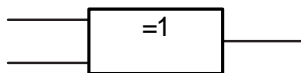
## APPLICATIONS

- AV Receiver
- Blu-ray Player and Home Theater
- Digital Picture Frame (DPF)
- High-Speed Data Acquisition and Generation
- Personal Navigation Device (GPS)
- Portable Media Player

### LOGIC SYMBOL



### IEE/IEC LOGIC SYMBOL



## DESCRIPTION

The RS4G86 Quadruple 2-input exclusive-OR gate is designed for 1.65V to 5.5V V<sub>CC</sub> operation.

The RS4G86 device performs the Boolean function  $Y = \bar{A}B + A\bar{B}$  in positive logic. The device is fully specified for partial-power-down applications using I<sub>off</sub>. The I<sub>off</sub> circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The RS4G86 is available in Green SOIC-14(SOP14) and TSSOP-14 packages. It operates over an ambient temperature range of -40°C to +125°C.

### Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
RS4G86	SOIC-14(SOP14)	8.65mm×3.90mm
	TSSOP-14	5.00mm×4.40mm

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

### FUNCTION TABLE

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

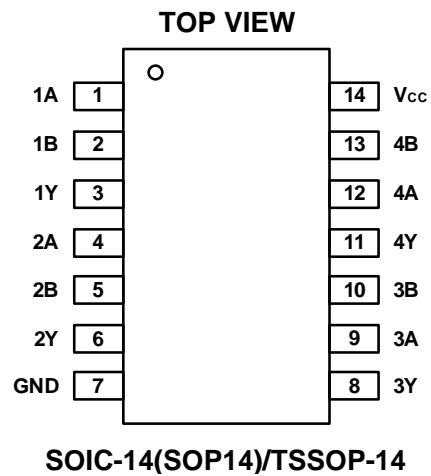
H=High Voltage Level  
L=Low Voltage Level

## Revision History

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

Version	Change Date	Change Item
A.1	2021/01/21	Initial version completed
A.2	2021/12/22	Added the TAPE AND REEL INFORMATION

## PIN CONFIGURATIONS



## PIN DESCRIPTION

PIN	NAME	I/O TYPE	FUNCTION
<b>SOIC-14(SOP14)/TSSOP-14</b>			
1	1A	I	Channel 1 logic input
2	1B	I	Channel 1 logic input
3	1Y	O	Logic level output1
4	2A	I	Channel 2 logic input
5	2B	I	Channel 2 logic input
6	2Y	O	Logic level output2
7	GND	-	Ground
8	3Y	O	Logic level output3
9	3A	I	Channel 3 logic input
10	3B	I	Channel 3 logic input
11	4Y	O	Logic level output4
12	4A	I	Channel 4 logic input
13	4B	I	Channel 4 logic input
14	V <sub>cc</sub>	-	Power Supply

## Specifications

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

over operating free-air temperature range (unless otherwise noted) <sup>(1)</sup> <sup>(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>	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)</sup> <sup>(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	-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 value of V<sub>CC</sub> is provided in the *Recommended Operating Conditions table*.

### ESD Ratings

		VALUE	UNIT	
V <sub>(ESD)</sub>	Electrostatic discharge	Human-body model (HBM)	±8000	V
		Machine model (MM)	±500	V

### Thermal Information:

THERMAL METRIC		RS4G86		UNIT
		14PINS		
		SOIC-14(SOP14)	TSSOP-14	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	122.2	141.2	°C/W
R <sub>θJC(top)</sub>	Junction-to-case(top) thermal resistance	80.9	78.8	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	80.6	85.8	°C/W
Ψ <sub>JT</sub>	Junction-to-top characterization parameter	40.4	27.7	°C/W
Ψ <sub>JB</sub>	Junction-to-board characterization parameter	80.3	85.5	°C/W
R <sub>θJC(bot)</sub>	Junction-to-case(bottom) thermal resistance	N/A	N/A	°C/W

**PACKAGE/ORDERING INFORMATION**

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING <sup>(1)</sup>	PACKAGE OPTION
RS4G86	RS4G86XP	-40°C ~+125°C	SOIC-14(SOP14)	RS4G86	Tape and Reel,4000
	RS4G86XQ	-40°C ~+125°C	TSSOP-14	RS4G86	Tape and Reel,4000

NOTE:

- (1) 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.

## ELECTRICAL CHARACTERISTICS

over recommended operating free-air temperature range (TYP values are at  $T_A = +25^\circ\text{C}$ , unless otherwise noted.) <sup>(1)</sup>

### 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		
		$V_{CC}=3\text{V to }3.6\text{V}$	2.2		
		$V_{CC}=4.5\text{V to }5.5\text{V}$	$0.7 \times V_{CC}$		
Low-level input voltage	$V_{IL}$	$V_{CC}=1.65\text{V to }1.95\text{V}$		$0.20 \times V_{CC}$	V
		$V_{CC}=2.3\text{V to }2.7\text{V}$		0.3	
		$V_{CC}=3\text{V to }3.6\text{V}$		0.4	
		$V_{CC}=4.5\text{V to }5.5\text{V}$		$0.15 \times V_{CC}$	
Input voltage	$V_I$		0	5.5	V
Output voltage	$V_O$		0	$V_{CC}$	V
Input transition rise or fall	$t_r, t_f$	$V_{CC}=1.8\text{V} \pm 0.15\text{V}, 2.5\text{V} \pm 0.2\text{V}$		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	$^\circ\text{C}$

### DC Characteristics

PARAMETER	TEST CONDITIONS	$V_{CC}$	TEMP	MIN	TYP	MAX	UNIT
$V_{OH}$	$I_{OH} = -100\mu\text{A}$	1.65V to 5.5V	Full	$V_{CC}-0.1$			V
	$I_{OH} = -4\text{mA}$	1.65V		1.2			
	$I_{OH} = -8\text{mA}$	2.3V		1.9			
	$I_{OH} = -16\text{mA}$	3V		2.4			
	$I_{OH} = -24\text{mA}$			2.3			
	$I_{OH} = -32\text{mA}$	4.5V		3.8			
$V_{OL}$	$I_{OL} = 100\mu\text{A}$	1.65V to 5.5V	Full			0.1	V
	$I_{OL} = 4\text{mA}$	1.65V				0.45	
	$I_{OL} = 8\text{mA}$	2.3V				0.3	
	$I_{OL} = 16\text{mA}$	3V				0.4	
	$I_{OL} = 24\text{mA}$					0.55	
	$I_{OL} = 32\text{mA}$	4.5V				0.55	
$I_i$	A or B inputs	$V_I=5.5\text{V or GND}$	0V to 5.5V	+25 $^\circ\text{C}$	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
				Full		$\pm 5$	
$I_{off}$		$V_I \text{ or } V_O=5.5\text{V}$	0V	+25 $^\circ\text{C}$	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
				Full		$\pm 10$	
$I_{CC}$		$V_I=5.5\text{V or GND}, I_o=0$	1.65V to 5.5V	+25 $^\circ\text{C}$	0.1	1	$\mu\text{A}$
				Full		10	
$\Delta I_{CC}$		One input at $V_{CC}-0.6\text{V}$ , Other inputs at $V_{CC}$ or GND	3V to 5.5V	Full		500	$\mu\text{A}$

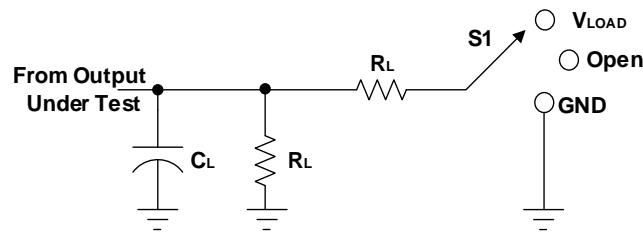
**AC Characteristics**

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Propagation Delay	$t_{pd}$	$V_{CC}=1.8V\pm 0.15V$	$C_L=30pF, R_L=1k\Omega$		14.2		ns
		$V_{CC}=2.5V\pm 0.2V$	$C_L=30pF, R_L=500\Omega$		11.1		
		$V_{CC}=3.3V\pm 0.3V$	$C_L=50pF, R_L=500\Omega$		6.7		
		$V_{CC}=5V\pm 0.5V$	$C_L=50pF, R_L=500\Omega$		5.3		
Input Capacitance	$C_i$	$V_{CC}=3.3V$	$V_I=V_{CC}$ or GND		4		pF
Power dissipation capacitance	$C_{pd}$	$V_{CC}=1.8V$	$f=10MHz$		20		pF
		$V_{CC}=2.5V$			21		
		$V_{CC}=3.3V$			22		
		$V_{CC}=5V$			25		

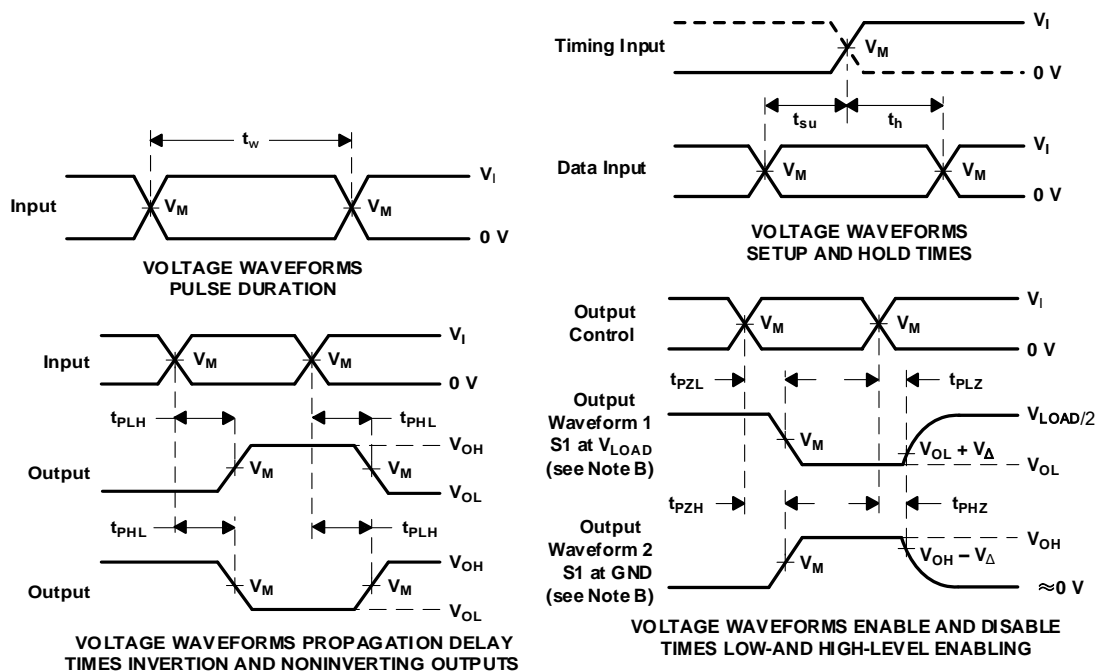
(1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

## Parameter Measurement Information



TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M $\Omega$	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	15pF	1M $\Omega$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M $\Omega$	0.3V



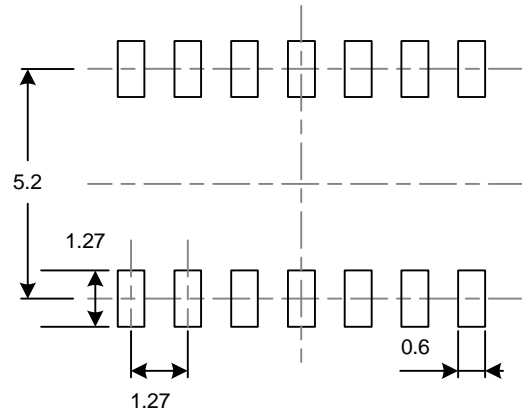
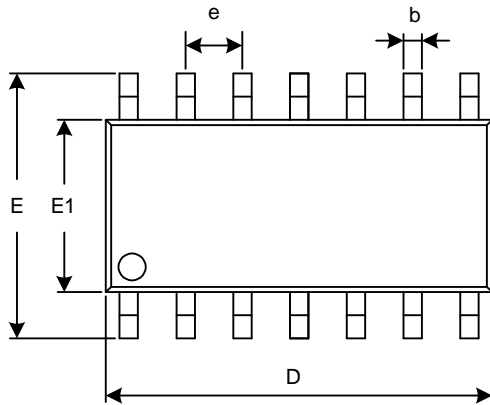
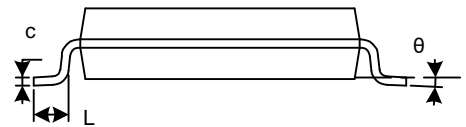
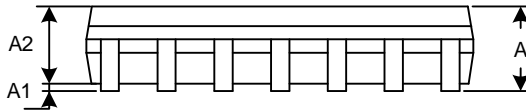
- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the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

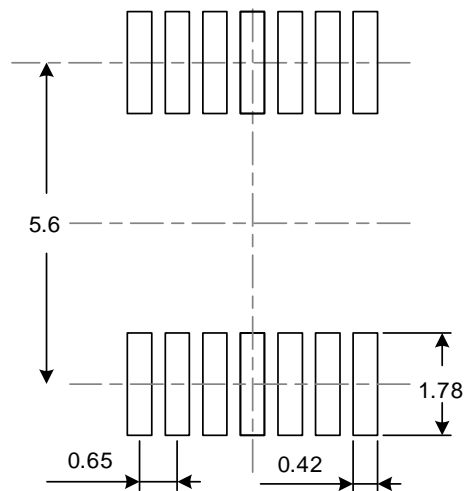
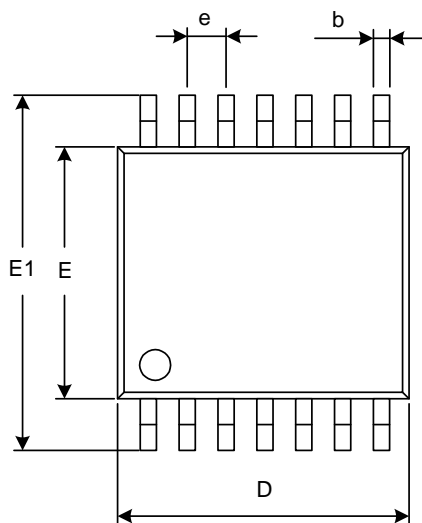
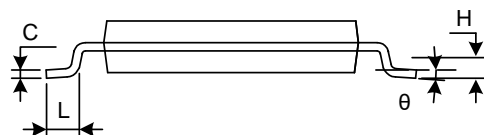
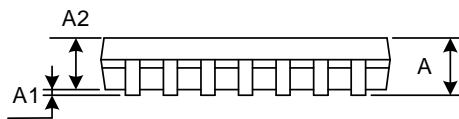


# PACKAGE OUTLINE DIMENSIONS

## SOIC-14(SOP14)


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


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
$\theta$	0°	8°	0°	8°

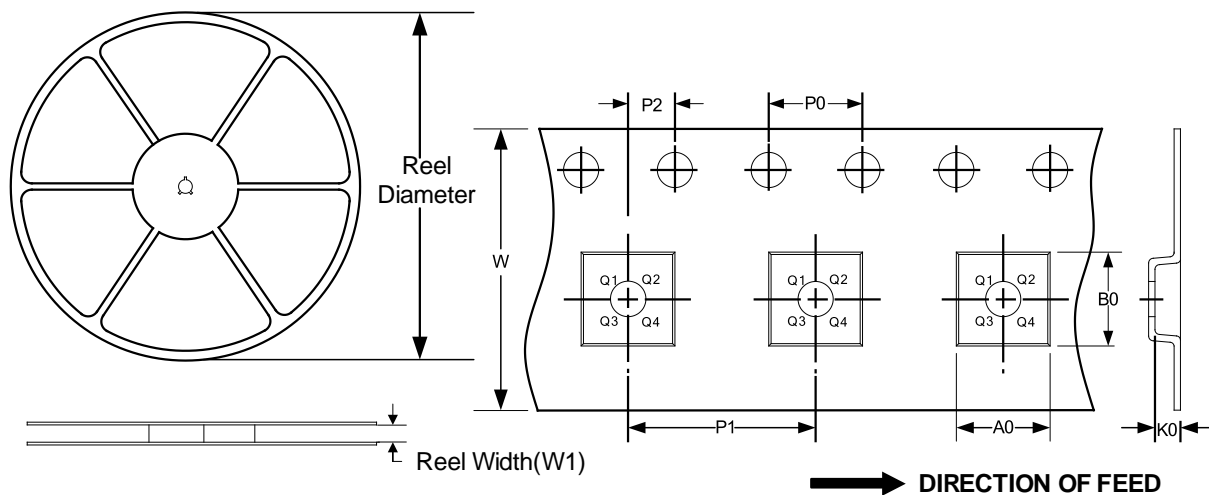
**TSSOP-14**

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


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
H	0.25(TYP)		0.01(TYP)	
$\theta$	1°	7°	1°	7°

## 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
SOIC-14(SOP14)	13"	16.4	6.60	9.30	2.10	4.0	8.0	2.0	16.0	Q1
TSSOP-14	13"	12.4	6.95	5.60	1.20	4.0	8.0	2.0	12.0	Q1