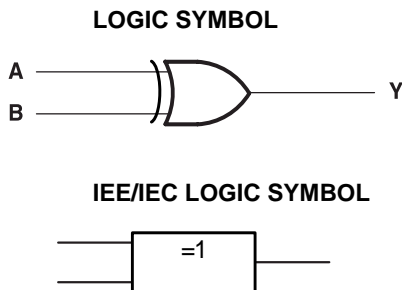# RS4G86 Quadruple 2-Input Exclusive-OR Gate

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$_{CC}$=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**

DESCRIPTION

The RS4G86 Quadruple 2-input exclusive-OR gate is designed for 1.65V to 5.5V V$_{CC}$ operation.

The RS4G86 device performs the Boolean function $Y=\overline{A}B+ A\overline{B}$ in positive logic. The 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 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.

LOGIC SYMBOL

IEE/IEC LOGIC SYMBOL

FUNCTION TABLE

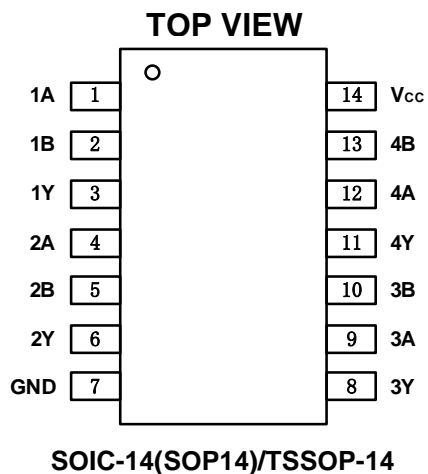| INPUTS		OUTPUT
A	B	Y
H	H	L
L	H	H
H	L	H
L	L	L

H=High Voltage Level
L=Low Voltage Level

Revision History

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

Version	Change Date	Change Item
A.1	2021/1/21	initial version completed

PIN CONFIGURATIONS

TOP VIEW

1A	1	14 Vcc
1B	2	13 4B
1Y	3	12 4A
2A	4	11 4Y
2B	5	10 3B
2Y	6	9 3A
GND	7	8 3Y

SOIC-14(SOP14)/TSSOP-14

PIN DESCRIPTION

PIN SOIC-14(SOP14)/TSSOP-14	NAME	I/O TYPE	FUNCTION
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	Vcc	-	Power Supply

Specifications

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
T_J	Junction temperature			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*.

ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM)	±8000	V
		Machine model (MM)	±500	V

Thermal Information:

THERMAL METRIC [1]		RS4G86		UNIT
		14PINS		
		SOIC-14(SOP14)	TSSOP-14	
$R_{\Theta JA}$	Junction-to-ambient thermal resistance	122.2	141.2	°C/W
$R_{\Theta JC(top)}$	Junction-to-case(top) thermal resistance	80.9	78.8	°C/W
$R_{\Theta JB}$	Junction-to-board thermal resistance	80.6	85.8	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	40.4	27.7	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	80.3	85.5	°C/W
$R_{\Theta JC(bot)}$	Junction-to-case(bottom) thermal resistance	N/A	N/A	°C/W

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING [1]	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°C, unless otherwise noted.) [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	0.65xV_{CC}		V
		V_{CC}=2.3V to 2.7V	1.7		
		V_{CC}=3V to 3.6V	2.2		
		V_{CC}=4.5V to 5.5V	0.7xV_{CC}		
Low-level input voltage	V_{IL}	V_{CC}=1.65V to 1.95V		0.20xV_{CC}	V
		V_{CC}=2.3V to 2.7V		0.3	
		V_{CC}=3V to 3.6V		0.4	
		V_{CC}=4.5V to 5.5V		0.15xV_{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}=1.8V± 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

DC Characteristics

PARAMETER		TEST CONDITIONS	V_{CC}	TEMP	MIN	TYP	MAX	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 or B 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	0V	+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

AC Characteristics

(T$_A$ =-40°C to +125°C, typical values are at T$_A$ = +25°C, unless otherwise noted.) [1]

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Propagation Delay	t$_{pd}$	V$_{CC}$=1.8V±0.15V	C$_L$=30pF, R$_L$=1kΩ		14.2		ns
		V$_{CC}$=2.5V±0.2V	C$_L$=30pF, R$_L$=500Ω		11.1		
		V$_{CC}$=3.3V±0.3V	C$_L$=50pF, R$_L$=500Ω		6.7		
		V$_{CC}$=5V±0.5 V	C$_L$=50pF, R$_L$=500Ω		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
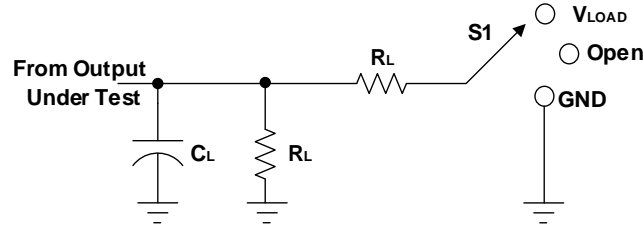
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_Δ
	V_I	t_r/t_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	15pF	1MΩ	0.15V
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	15pF	1MΩ	0.15V
3.3V±0.3V	3V	≤2.5ns	1.5V	6V	15pF	1MΩ	0.3V
5V±0.5V	V_{CC}	≤2.5ns	$V_{CC}/2$	2 x V_{CC}	15pF	1MΩ	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**
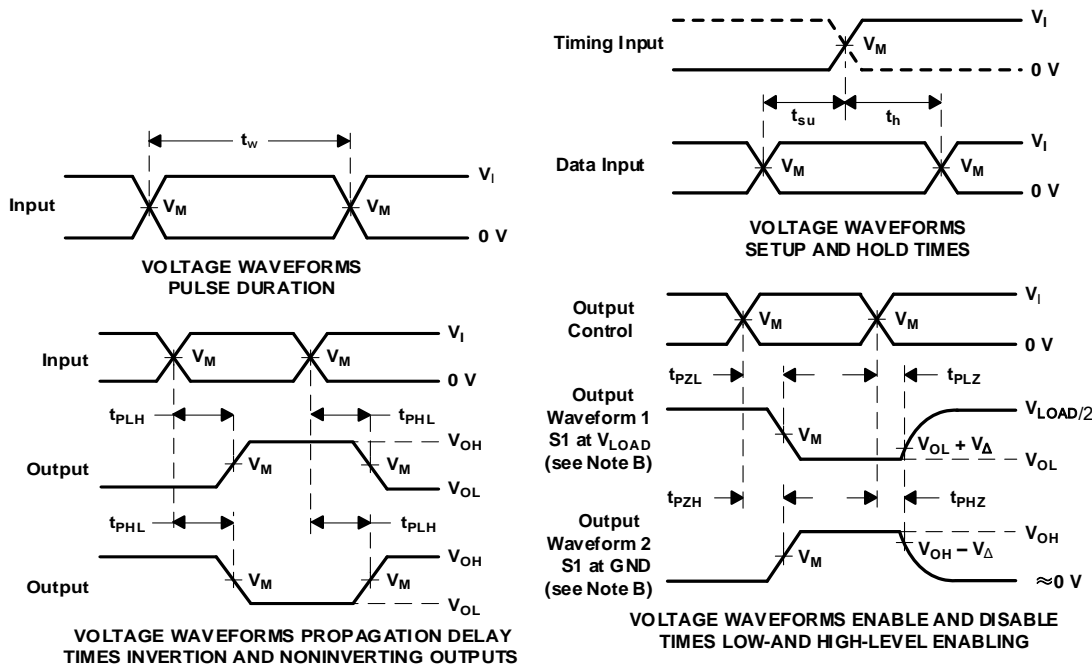
NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
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.
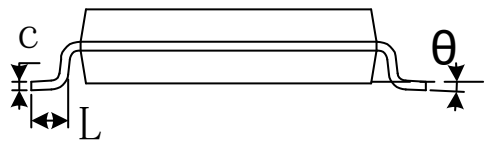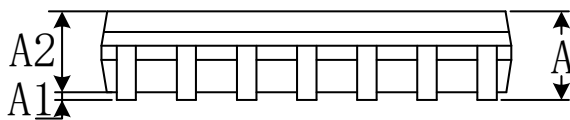
Figure 1. Load Circuit and Voltage Waveforms
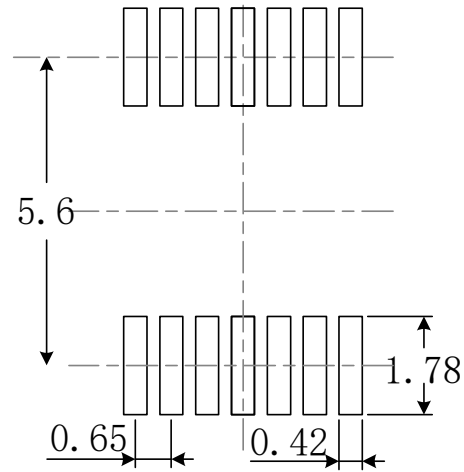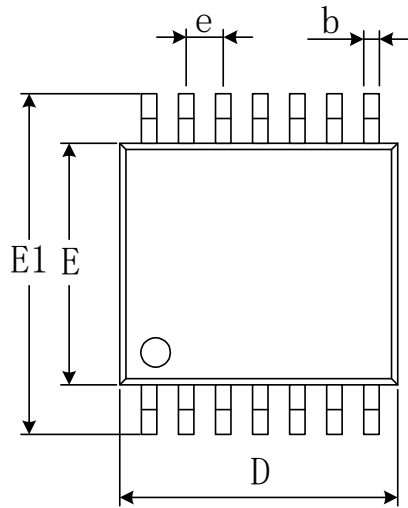
PACKAGE OUTLINE DIMENSIONS
SOIC-14(SOP14)
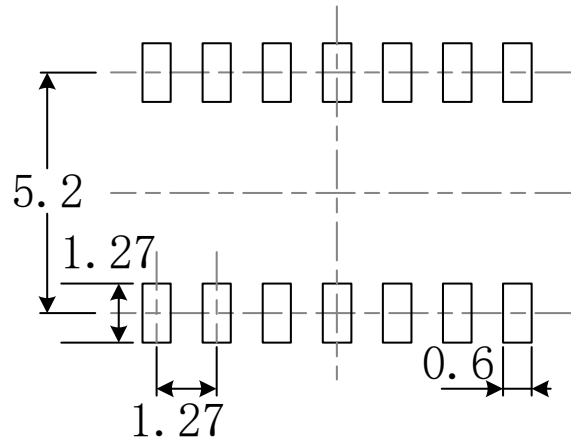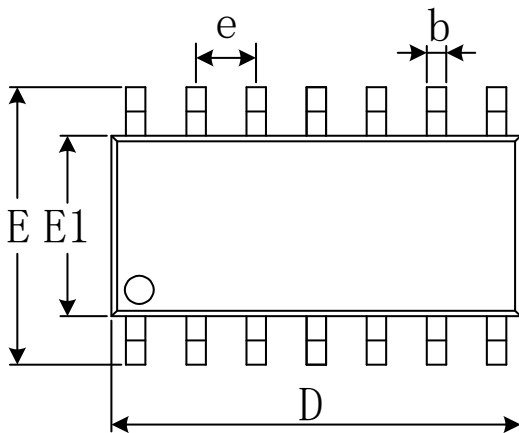
RECOMMENDED LAND PATTERN (Unit: mm)

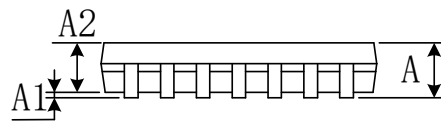| Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
e	1.270(BSC)		0.050(BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150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

TSSOP-14

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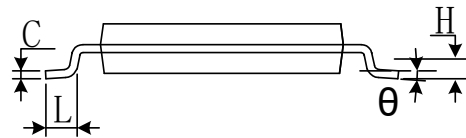
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.250	6.550	0.246	0.258
e	0.650(BSC)		0.026(BSC)	
L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