

Description

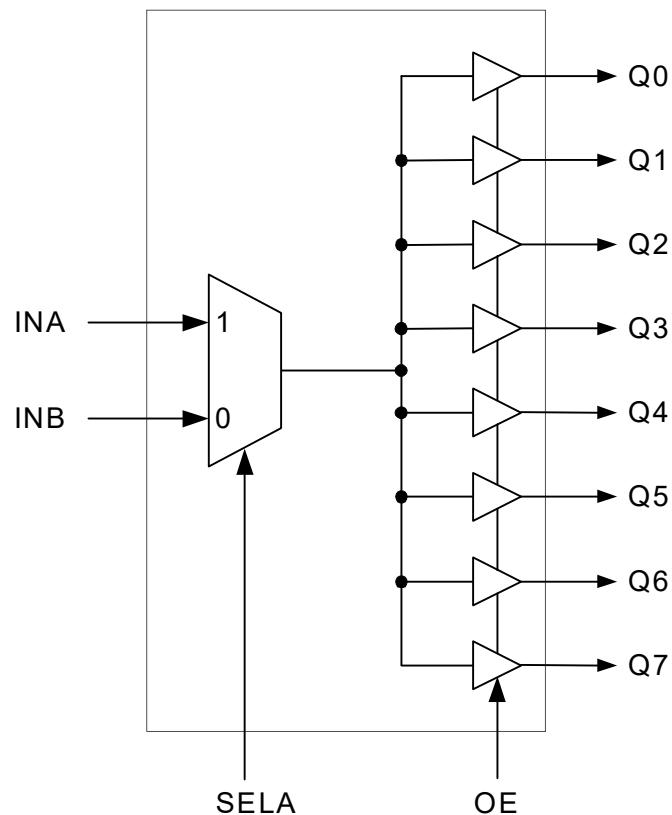
The 552-02S is a low skew, single-input to eight- output clock buffer. The device offers a dual input with pin select for switching between two clock sources. It has best in class Additive Phase Jitter of sub 50fsec

Renesas makes many non-PLL and PLL based low skew output devices as well as Zero Delay Buffers to synchronize clocks. Contact us for all of your clocking needs.

Features

- Low RMS Additive Phase Jitter: 50fs
- Low output skew: 50ps
- Operating Voltages of 1.8V to 3.3V
- Packaged in 16-pin TSSOP and 16-pin VFQFPN, Pb-free
- Input clock multiplexer simplifies clock selection
- Output Enable pin tri-states outputs
- Input/Output clock frequency up to 200MHz
- Low power CMOS technology
- 3.3V tolerant inputs
- Extended temperature (-40°C to +105°C)

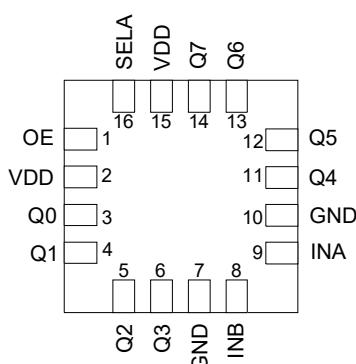
Block Diagram



Pin Assignments

OE	1	16	SEL A
VDD	2	15	VDD
Q0	3	14	Q7
Q1	4	13	Q6
Q2	5	12	Q5
Q3	6	11	Q4
GND	7	10	GND
INB	8	9	INA

16 Pin TSSOP



16-pin VFQFN

Input Source Select

SEL A	Input
0	INB
1	INA

Pin Descriptions

Pin Number	Pin Name	Pin Type	Pin Description
1	OE	Input	Output Enable. Tri-states outputs when low. Internal pull-up resistor.
2	VDD	Power	Connect to +1.8V, +2.5V or +3.3V. Must be the same as pin 15.
3	Q0	Output	Clock Output 0.
4	Q1	Output	Clock Output 1.
5	Q2	Output	Clock Output 2.
6	Q3	Output	Clock Output 3.
7	GND	Power	Connect to ground.
8	INB	Input	Clock Input B. 3.3V tolerant.
9	INA	Input	Clock Input A. 3.3V tolerant.
10	GND	Power	Connect to ground.
11	Q4	Output	Clock Output 4.
12	Q5	Output	Clock Output 5.
13	Q6	Output	Clock Output 6.
14	Q7	Output	Clock Output 7.
15	VDD	Power	Connect to +1.8V, +2.5V or +3.3V. Must be the same as pin 2.
16	SEL A	Input	Selects either INA or INB. Internal pull-up resistor.

External Components

A minimum number of external components are required for proper operation. Decoupling capacitors of $0.01\mu\text{F}$ should be connected between VDD on pin 2 and GND on pin 7, and between VDD on pin 15 and GND on pin 10, as close to the device as possible. A 33Ω series terminating resistor should be used on each clock output if the trace is longer than 1 inch.

To achieve the low output skews that the 552-02S is capable of, careful attention must be paid to board layout. Essentially, all 8 outputs must have identical terminations, identical loads, and identical trace geometries. If they do not, the output skew will be degraded. For example, using a 30Ω series termination on one output (with 33Ω on the others) will cause at least 15ps of skew.

Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the 552-02S. These ratings, which are standard values for Renesas commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

Item	Rating
Supply Voltage, VDD	3.465V
All Inputs and Outputs	-0.5V to 3.465V
Ambient Operating Temperature, Extended	-40 to +105°C
Storage Temperature	-65 to +150°C
Junction Temperature	175°C
Soldering Temperature	260°C

Recommended Operation Conditions

Parameter	Minimum	Typical	Maximum	Unit
Ambient Operating Temperature, Extended	-40	-	+105	°C
Power Supply Voltage (measured in respect to GND)	+1.71	-	+3.465	V

DC Electrical Characteristics

VDD = 1.8V $\pm 5\%$, Ambient temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Operating Voltage	VDD		1.71	-	1.89	V
Input High Voltage, INA, INB	V _{IH}	Note 1	0.7xVDD	-	1.89	V
Input Low Voltage, INA, INB	V _{IL}	Note 1	-	-	0.3xVDD	V
Input High Voltage, OE, SELA	V _{IH}		0.7xVDD	-	VDD	V
Input Low Voltage, OE, SELA	V _{IL}		-	-	0.3xVDD	V
Output High Voltage	V _{OH}	I _{OH} = -10mA	1.3	-	-	V
Output Low Voltage	V _{OL}	I _{OL} = 10mA	-	-	0.35	V
Operating Supply Current	IDD	No load, 135MHz	-	32	-	mA

VDD = 2.5V $\pm 5\%$, Ambient temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Operating Voltage	VDD		2.375	-	2.625	V
Input High Voltage, INA, INB	V _{IH}	Note 1	0.7xVDD	-	2.625	V
Input Low Voltage, INA, INB	V _{IL}	Note 1	-	-	0.3xVDD	V
Input High Voltage, OE, SELA	V _{IH}		0.7xVDD	-	VDD	V
Input Low Voltage, OE, SELA	V _{IL}		-	-	0.3xVDD	V
Output High Voltage	V _{OH}	I _{OH} = -16mA	1.8	-	-	V
Output Low Voltage	V _{OL}	I _{OL} = 16mA	-	-	0.5	V
Operating Supply Current	IDD	No load, 135MHz	-	43	-	mA

VDD = 3.3V $\pm 5\%$, Ambient temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Operating Voltage	VDD		3.135	-	3.465	V
Input High Voltage, INA, INB	V _{IH}	Note 1	0.7xVDD	-	3.465	V
Input Low Voltage, INA, INB	V _{IL}	Note 1	-	-	0.3xVDD	V
Input High Voltage, OE, SELA	V _{IH}		0.7xVDD	-	VDD	V
Input Low Voltage, OE, SELA	V _{IL}		-	-	0.3xVDD	V
Output High Voltage	V _{OH}	I _{OH} = -25mA	2.2	-	-	V
Output Low Voltage	V _{OL}	I _{OH} = 25mA	-	-	0.7	V
Operating Supply Current	IDD	No load, 135MHz	-	55	-	mA

AC Electrical Characteristics

VDD = 1.8V $\pm 5\%$, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Input Frequency			0	-	200	MHz
Output Rise Time	t_{OR}	0.36 to 1.44 V, $C_L = 5\text{pF}$	-	1	1.5	ns
Output Fall Time	t_{OF}	1.44 to 0.36 V, $C_L = 5\text{pF}$	-	1	1.5	ns
Start-up Time	$t_{START-UP}$	Part start-up time for valid outputs after VDD ramp-up	-	-	2	ms
Propagation Delay	Note 1	135MHz	2	2.5	3	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12kHz–20MHz	-	50	65	ps
Output to output skew	Note 2	Rising edges at VDD/2	-	0	65	ps
Input A to Input B skew	Note 3		-	0	50	ps

VDD = 2.5V $\pm 5\%$, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Input Frequency			0	-	200	MHz
Output Rise Time	t_{OR}	0.5 to 2.0 V, $C_L = 5\text{pF}$	-	0.6	1.0	ns
Output Fall Time	t_{OF}	2.0 to 0.5 V, $C_L = 5\text{pF}$	-	0.6	1.0	ns
Start-up Time	$t_{START-UP}$	Part start-up time for valid outputs after VDD ramp-up	-	-	2	ms
Propagation Delay	Note 1	135MHz	2	2.7	3.5	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12kHz–20MHz	-	50	65	ps
Output to output skew	Note 2	Rising edges at VDD/2	-	0	65	ps
Input A to Input B skew	Note 3		-	0	50	ps

VDD = 3.3V $\pm 5\%$, Ambient Temperature -40°C to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Unit
Input Frequency			0	-	200	MHz
Output Rise Time	t_{OR}	0.66 to 2.64 V, $C_L = 5\text{pF}$	-	0.6	1.0	ns
Output Fall Time	t_{OF}	2.64 to 0.66 V, $C_L = 5\text{pF}$	-	0.6	1.0	ns
Start-up Time	$t_{START-UP}$	Part start-up time for valid outputs after VDD ramp-up	-	-	2	ms
Propagation Delay	Note 1	135MHz	2	2.5	3	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12kHz–20MHz	-	50	65	ps
Output to output skew	Note 2	Rising edges at VDD/2	-	0	65	ps
Input A to Input B skew	Note 3		-	0	50	ps

Notes:

1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.
3. Propagation delay matching through the part.
4. Duty cycle on outputs will match incoming clock duty cycle. Consult Renesas for tight duty cycle clock generators.

Package Outline Drawings

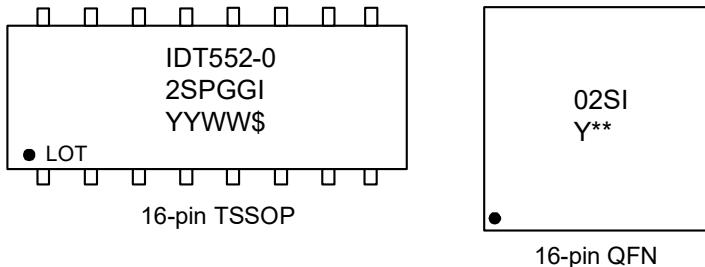
The package outline drawings are located at the end of this document and are accessible from the Renesas website (see [Ordering Information](#) for POD links). The package information is the most current data available and is subject to change without revision of this document

Ordering Information

Part Number	Carrier Type	Package	Temperature Range
552-02SPGGI	Tubes	4.4mm body 16-TSSOP	-40°C to +105°C
552-02SPGGI8	Tape & Reel	4.4mm body 16-TSSOP	-40°C to +105°C
552-02SCMGI	Cut Tape	2.5 × 2.5 mm 16-VFQFPN	-40°C to +105°C
552-02SCMGI8	Tape & Reel	2.5 × 2.5 mm 16-VFQFPN	-40°C to +105°C

“G” after the two-letter package code denotes Pb-Free configuration, RoHS compliant.

Marking Diagrams



Notes:

1. “**” is the lot sequence.
2. “YYWW” or “Y” is the last digit(s) of the year and week that the part was assembled.
3. “\$” denotes the mark code.
4. “LOT” denotes lot number.
5. “G” after the two-letter package code denotes RoHS compliant package.
6. “I” denotes extended temperature range device.
7. Bottom marking: country of origin (TSSOP only).

Revision History

Date	Description of Change
Apr 9, 2024	<ul style="list-style-type: none"> • Changed Carrier Type in Ordering Information for CMG packages to Cut Tape from Tubes. • Removed package outline drawings from document and replaced them with dynamic links in Ordering Information. • Updated Package Outline Drawings section.
Apr 18, 2017	<ul style="list-style-type: none"> • Replaced package outline drawings with latest CMG16 and PGG16 versions. • Updated legal disclaimer.
Jul 11, 2016	Release to final.

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