

### Description

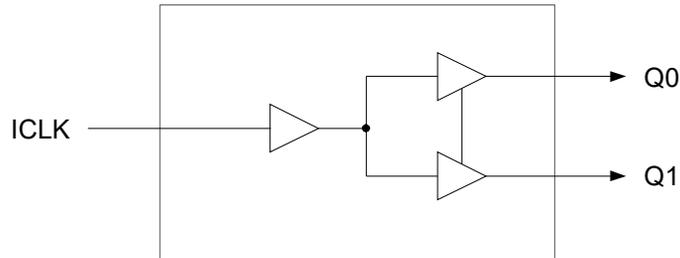
The 74FCT38072S is a low skew, single input to two output, clock buffer. The 74FCT38072S has best in class additive phase Jitter of sub 50 fsec.

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.

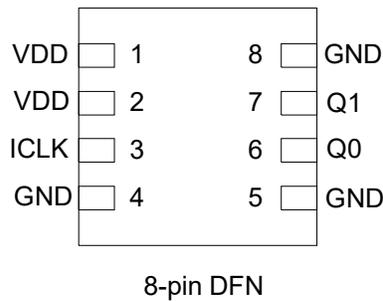
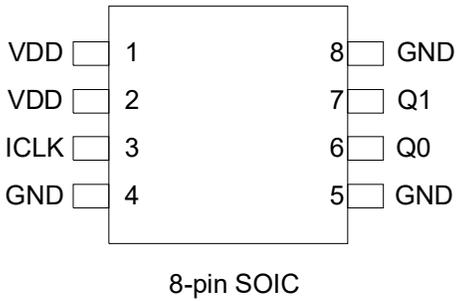
### Features

- Low additive phase jitter RMS: 50fs
- Extremely low skew outputs (50ps)
- Low cost clock buffer
- Packaged in 8-pin SOIC and 8-pin DFN, Pb-free
- Input/Output clock frequency up to 200 MHz
- Low power CMOS technology
- Operating voltages of 1.8V to 3.3V
- Extended temperature range (-40° to +105°C)

### Block Diagram



## Pin Assignments



## Pin Descriptions

Pin Number <sup>1</sup>	Pin Name	Pin Type	Pin Description
1	VDD	Power	Connect to +1.8V, +2.5 V, or +3.3 V.
2	VDD	Power	Connect to +1.8V, +2.5 V, or +3.3 V.
3	ICLK	Input	Clock input.
4	GND	Power	Connect to ground.
5	GND	Power	Connect to ground.
6	Q0	Output	Clock output 0.
7	Q1	Output	Clock output 1.
8	GND	Power	Connect to ground.

1. VDD on pin 1 and 2 is the same internal signal and must be connected to the same power rail on the PCB.

## External Components

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

To achieve the low output skew that the 74FCT38072S is capable of, careful attention must be paid to board layout. Essentially, both 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 30  $\Omega$  series termination on one output (with 33  $\Omega$  on the others) will cause at least 15 ps of skew.

## Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the 74FCT38072S. These ratings, which are standard values for IDT 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
Outputs	-0.5 V to VDD+0.5 V
ICLK	3.465V
Ambient Operating Temperature (extended)	-40 to +105°C
Storage Temperature	-65 to +150°C
Junction Temperature	125°C
Soldering Temperature	260°C

## Recommended Operation Conditions

Parameter	Min.	Typ.	Max.	Units
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, 2.5V, 3.3V)

**VDD=1.8V ±5%**, Ambient temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		1.71		1.89	V
Input High Voltage, ICLK	V <sub>IH</sub>	Note 1	0.7xVDD		VDD	V
Input Low Voltage, ICLK	V <sub>IL</sub>	Note 1			0.3xVDD	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -10 mA	1.3			V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 10mA			0.35	V
Operating Supply Current	IDD	No load, 135 MHz		15		mA
Nominal Output Impedance	Z <sub>O</sub>			17		Ω
Input Capacitance	C <sub>IN</sub>	ICLK		5		pF

Notes: 1. Nominal switching threshold is VDD/2

**VDD=2.5 V ±5%**, Ambient temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		2.375		2.625	V
Input High Voltage, ICLK	V <sub>IH</sub>	Note 1	0.7xVDD		VDD	V
Input Low Voltage, ICLK	V <sub>IL</sub>	Note 1			0.3xVDD	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -16 mA	1.8			V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 16 mA			0.5	V
Operating Supply Current	IDD	No load, 135 MHz		18		mA
Nominal Output Impedance	Z <sub>O</sub>			17		Ω
Input Capacitance	C <sub>IN</sub>	ICLK		5		pF

**VDD=3.3 V ±5%**, Ambient temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating Voltage	VDD		3.15		3.45	V
Input High Voltage, ICLK	V <sub>IH</sub>	Note 1	0.7xVDD		VDD	V
Input Low Voltage, ICLK	V <sub>IL</sub>	Note 1			0.3xVDD	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -25 mA	2.2			V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 25 mA			0.7	V
Operating Supply Current	IDD	No load, 135 MHz		22		mA
Nominal Output Impedance	Z <sub>O</sub>			17		Ω
Input Capacitance	C <sub>IN</sub>	ICLK		5		pF

## AC Electrical Characteristics

(VDD = 1.8V, 2.5V, 3.3V)

**VDD = 1.8V ±5%**, Ambient Temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t <sub>OR</sub>	0.36 to 1.44 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Output Fall Time	t <sub>OF</sub>	1.44 to 0.36 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Start-up Time	t <sub>START-UP</sub>	Part start-up time for valid outputs after VDD ramp-up			2	ms
Propagation Delay		Note 1	1.5	2.5	4	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12kHz-20MHz			0.05	ps
Output to Output Skew		Rising edges at VDD/2, Note 2		50	65	ps
Device to Device Skew		Rising edges at VDD/2			200	ps

**VDD = 2.5 V ±5%**, Ambient Temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t <sub>OR</sub>	0.5 to 2.0 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Output Fall Time	t <sub>OF</sub>	2.0 to 0.5 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Start-up Time	t <sub>START-UP</sub>	Part start-up time for valid outputs after VDD ramp-up			2	ms
Propagation Delay		Note 1	1.8	2.5	4.5	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12kHz-20MHz			0.05	ps
Output to Output Skew		Rising edges at VDD/2, Note 2		50	65	ps
Device to Device Skew		Rising edges at VDD/2			200	ps

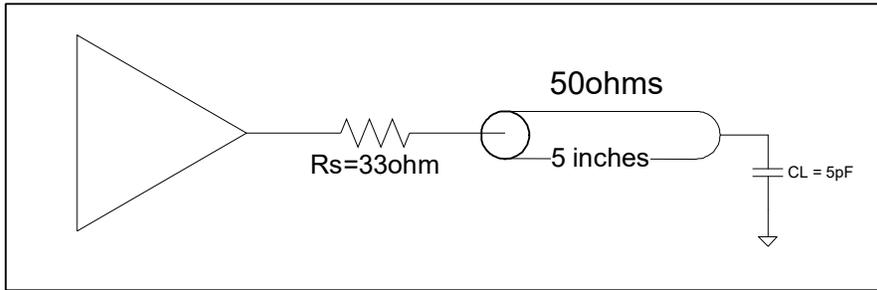
**VDD = 3.3 V ±5%**, Ambient Temperature -40° to +105°C, unless stated otherwise

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Frequency			0		200	MHz
Output Rise Time	t <sub>OR</sub>	0.66 to 2.64 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Output Fall Time	t <sub>OF</sub>	2.64 to 0.66 V, C <sub>L</sub> =5 pF		0.6	1.0	ns
Start-up Time	t <sub>START-UP</sub>	Part start-up time for valid outputs after VDD ramp-up			2	ms
Propagation Delay		Note 1	1.5	2.5	4	ns
Buffer Additive Phase Jitter, RMS		125MHz, Integration Range: 12kHz-20MHz			0.05	ps
Output to Output Skew		Rising edges at VDD/2, Note 2		50	65	ps
Device to Device Skew		Rising edges at VDD/2			200	ps

Notes:

1. With rail to rail input clock
2. Between any 2 outputs with equal loading.
3. Duty cycle on outputs will match incoming clock duty cycle. Consult Renesas for tight duty cycle clock generators.

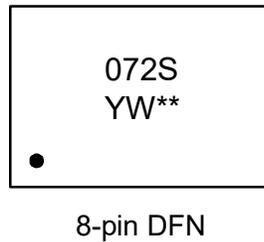
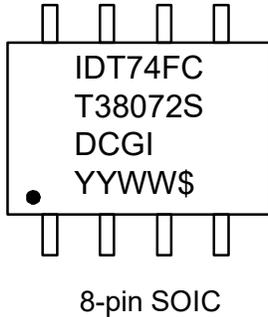
## Test Load and Circuit



## Thermal Characteristics (8SOIC)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Thermal Resistance Junction to Ambient	$\theta_{JA}$	Still air		150		$^{\circ}\text{C/W}$
	$\theta_{JA}$	1 m/s air flow		140		$^{\circ}\text{C/W}$
	$\theta_{JA}$	3 m/s air flow		120		$^{\circ}\text{C/W}$
Thermal Resistance Junction to Case	$\theta_{JC}$			40		$^{\circ}\text{C/W}$

## Marking Diagrams



### Notes:

1. “\*\*” is the lot number.
2. “YYWW” or “YW” are the last digits of the year and week that the part was assembled.
3. “G” denotes RoHS compliant package.
4. “\$” denotes the mark code.
5. “I” denotes extended temperature range device.

## Package Outline Drawings

The package outline drawings are appended at the end of this document and are accessible from the link below. The package information is the most current data available.

[www.idt.com/us/en/document/psc/8-soic-package-outline-drawing-0150-body-width-0050-pitch-dcg8d1](http://www.idt.com/us/en/document/psc/8-soic-package-outline-drawing-0150-body-width-0050-pitch-dcg8d1)

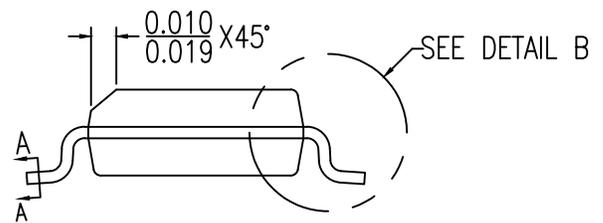
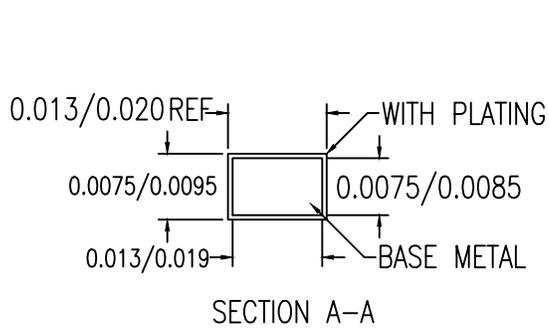
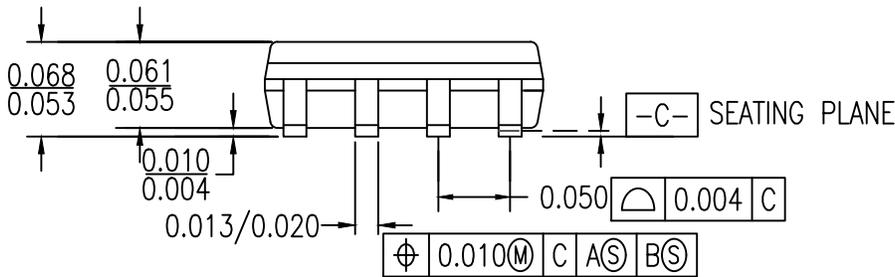
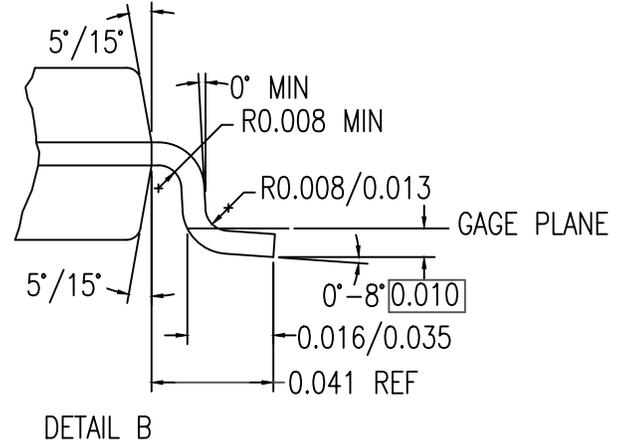
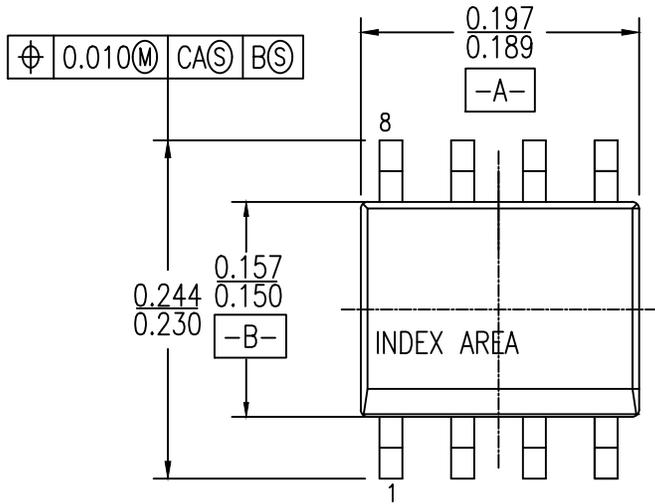
## Ordering Information

Part / Order Number	Marking	Shipping Packaging	Package	Temperature
74FCT38072SDCGI	see page 6	Tubes	8-pin SOIC	-40 to +105 °C
74FCT38072SDCGI8		Tape and Reel	8-pin SOIC	-40 to +105 °C
74FCT38072SCMGI		Cut Tape	8-pin DFN	-40 to +105 °C
74FCT38072SCMGI8		Tape and Reel	8-pin DFN	-40 to +105 °C

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

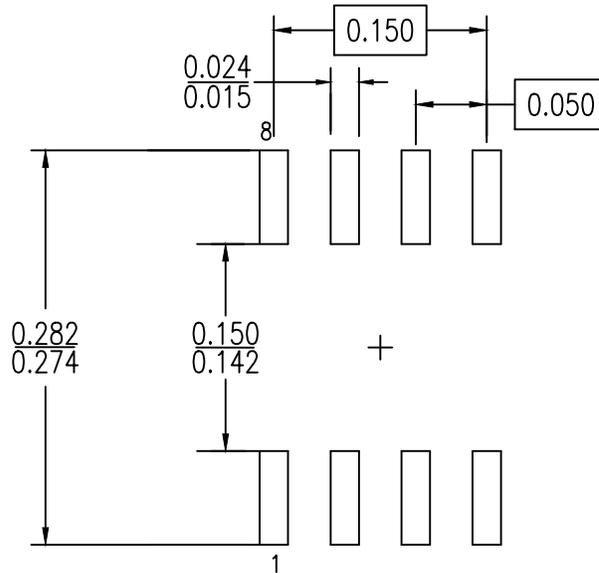
## Revision History

Revision Date	Description of Change
May 4, 2020	<ul style="list-style-type: none"> <li>Added a footnote to <a href="#">Pin Descriptions</a></li> <li>Updated the <a href="#">Package Outline Drawings</a>; however, no technical changes were made</li> </ul>
March 18, 2015	Initial release.



NOTES:

1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
2. ALL DIMENSIONS ARE IN INCHES



RECOMMENDED LAND PATTERN DIMENSION

NOTES:

1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
2. ALL DIMENSIONS ARE IN INCHES

Package Revision History		
Date Created	Rev No.	Description
July 27, 2018	Rev 01	Dedicate to Package DCG8 Only
Feb 24, 2016	Rev 00	Initial Release

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Rev.1.0 Mar 2020)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:  
[www.renesas.com/contact/](http://www.renesas.com/contact/)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.