

Description

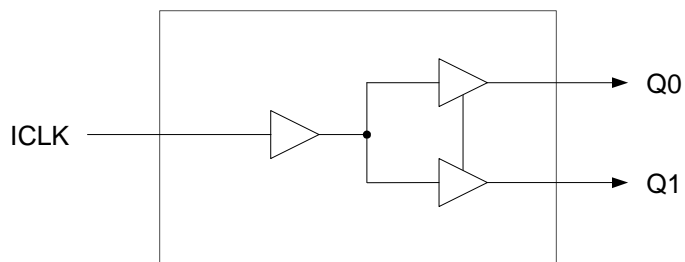
The 74FCT38072S is a low skew, single input to two output, clock buffer. The 74FCT38072S has best in class additive phase Jitter of sub 50 fsec.

IDT 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.

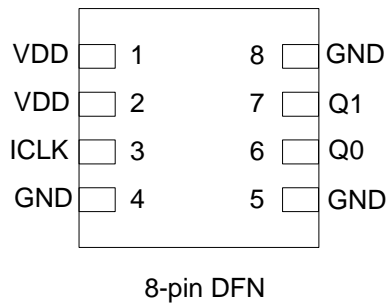
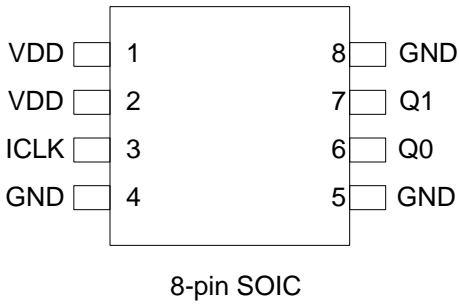
Features

- 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 | 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. |

External Components

A minimum number of external components are required for proper operation. A decoupling capacitor of 0.01 μF should be connected between VDD pin and GND pin, as close to the device as possible. A 33 Ω 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 Ω series termination on one output (with 33 Ω 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 _{IH} | Note 1 | 0.7xVDD | | VDD | V |
| Input Low Voltage, ICLK | V _{IL} | Note 1 | | | 0.3xVDD | V |
| Output High Voltage | V _{OH} | I _{OH} = -10 mA | 1.3 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 10mA | | | 0.35 | V |
| Operating Supply Current | IDD | No load, 135 MHz | | 15 | | mA |
| Nominal Output Impedance | Z _O | | | 17 | | Ω |
| Input Capacitance | C _{IN} | 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 _{IH} | Note 1 | 0.7xVDD | | VDD | V |
| Input Low Voltage, ICLK | V _{IL} | Note 1 | | | 0.3xVDD | V |
| Output High Voltage | V _{OH} | I _{OH} = -16 mA | 1.8 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 16 mA | | | 0.5 | V |
| Operating Supply Current | IDD | No load, 135 MHz | | 18 | | mA |
| Nominal Output Impedance | Z _O | | | 17 | | Ω |
| Input Capacitance | C _{IN} | 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 _{IH} | Note 1 | 0.7xVDD | | VDD | V |
| Input Low Voltage, ICLK | V _{IL} | Note 1 | | | 0.3xVDD | V |
| Output High Voltage | V _{OH} | I _{OH} = -25 mA | 2.2 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 25 mA | | | 0.7 | V |
| Operating Supply Current | IDD | No load, 135 MHz | | 22 | | mA |
| Nominal Output Impedance | Z _O | | | 17 | | Ω |
| Input Capacitance | C _{IN} | 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 _{OR} | 0.36 to 1.44 V, C _L =5 pF | | 0.6 | 1.0 | ns |
| Output Fall Time | t _{OF} | 1.44 to 0.36 V, C _L =5 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 | 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 _{OR} | 0.5 to 2.0 V, C _L =5 pF | | 0.6 | 1.0 | ns |
| Output Fall Time | t _{OF} | 2.0 to 0.5 V, C _L =5 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 | 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 _{OR} | 0.66 to 2.64 V, C _L =5 pF | | 0.6 | 1.0 | ns |
| Output Fall Time | t _{OF} | 2.64 to 0.66 V, C _L =5 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 | 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 IDT for tight duty cycle clock generators.

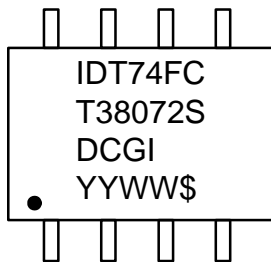
Test Load and Circuit



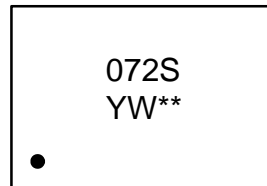
Thermal Characteristics (8SOIC)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|--|---------------|----------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | θ_{JA} | Still air | | 150 | | °C/W |
| | θ_{JA} | 1 m/s air flow | | 140 | | °C/W |
| | θ_{JA} | 3 m/s air flow | | 120 | | °C/W |
| Thermal Resistance Junction to Case | θ_{JC} | | | 40 | | °C/W |

Marking Diagrams



8-pin SOIC

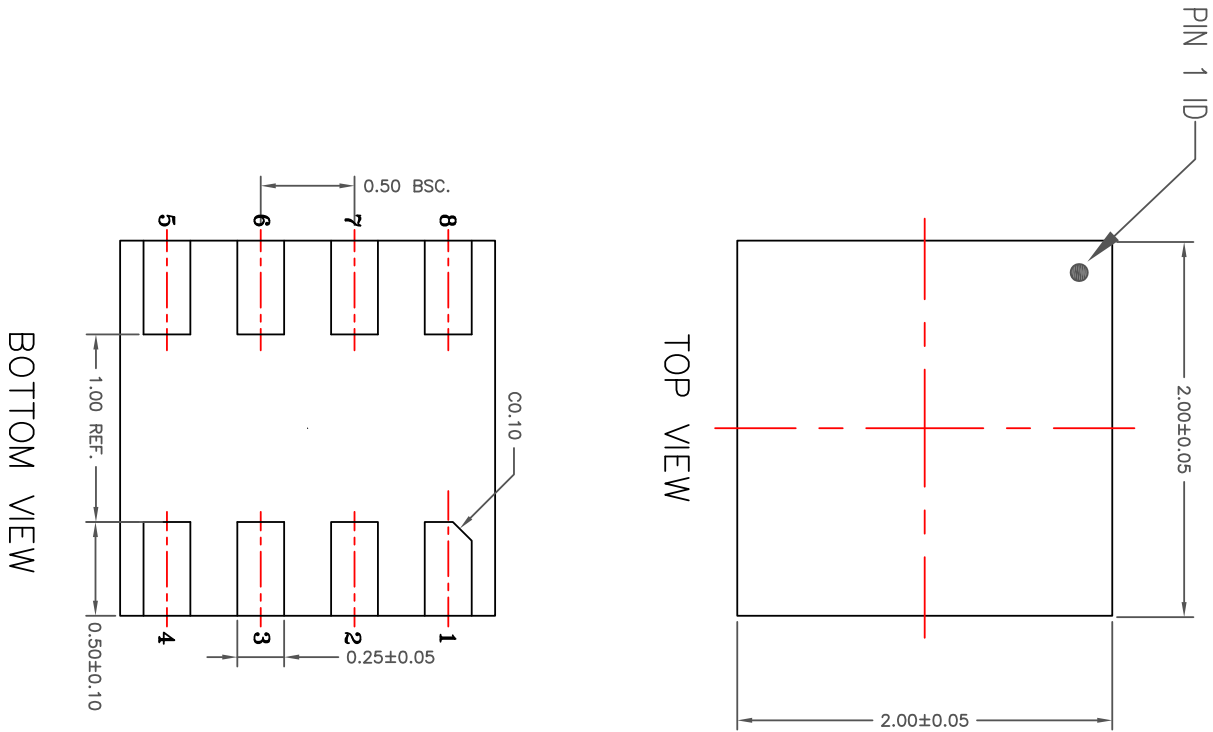


8-pin DFN

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 and Package Dimensions (8-pin DFN, 2mm x 2mm Body, 0.5mm pitch)

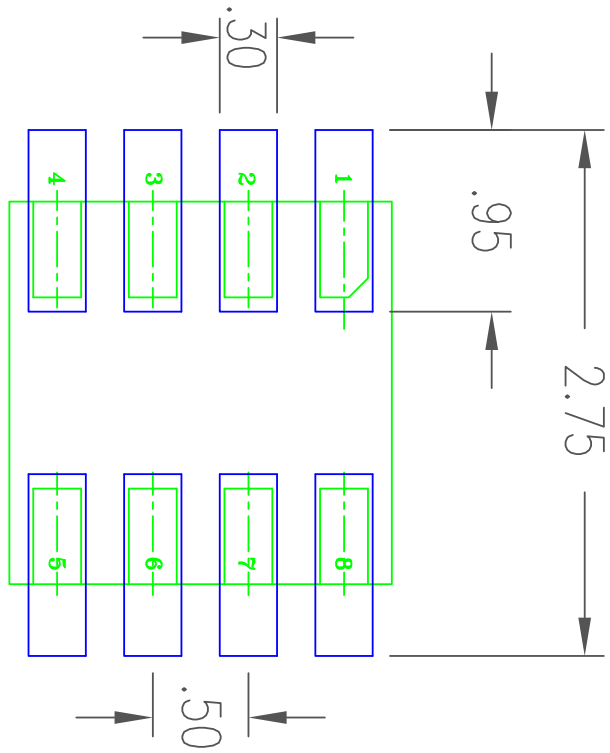


- NOTES:
1. ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
 2. ALL DIMENSIONS ARE IN MILLIMETERS

| REVISIONS | | | |
|-----------|-----------------|----------|----------|
| REV | DESCRIPTION | DATE | APPROVED |
| 00 | INITIAL RELEASE | 09/18/14 | JHUA |
| | | | |
| | | | |

| | | |
|------------------------------|-------------|---|
| TOLERANCES UNLESS SPECIFIED | | <p>6024 SILVER CREEK VALLEY ROAD San Jose, CA 95138 PHONE: (408) 284-8200 FAX: (408) 492-8674</p> |
| DECIMAL | ANGULAR | |
| XXX | ± | |
| XXXX | | |
| APPROVALS | DATE | TITLE |
| DRAWN: <i>gag</i> 09/10/14 | | CMG8 PACKAGE OUTLINE |
| CHECKED: <i>36a</i> 09/10/14 | | 2.0 X 2.0 mm BODY 0.5mm PITCH VFOFN |
| SIZE | DRAWING NO. | REV |
| C | PSC-4490 | 00 |
| DO NOT SCALE DRAWING | | SHEET 1 OF 2 |

Package Outline and Package Dimensions, cont. (8-pin DFN, 2mm x 2mm Body, 0.5mm pitch)



RECOMMENDED LAND PATTERN DIMENSION

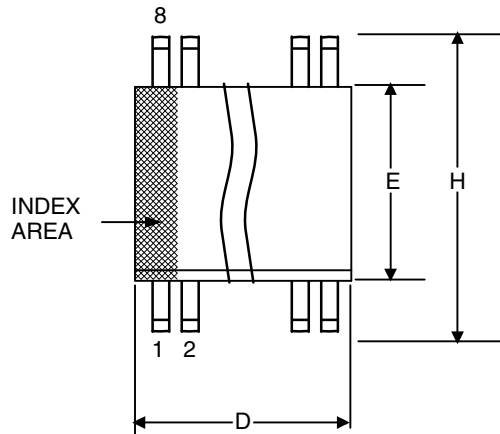
NOTES:

1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
2. TOP DOWN VIEW. AS VIEWED.
3. COMPONENT OUTLINE SHOW FOR REFERENCE IN GREEN.
4. LAND PATTERN IN BLUE. NSMD PATTERN ASSUMED.
5. LAND PATTERN RECOMMENDATION PER IPC-7351B GENERIC REQUIREMENT FOR MOUNT DESIGN AND LAND PATTERN.

| REVISIONS | | | |
|-----------|-----------------|----------|------|
| REV | DESCRIPTION | DATE | APPR |
| 00 | INITIAL RELEASE | 09/18/14 | JJH |
| | | | |
| | | | |

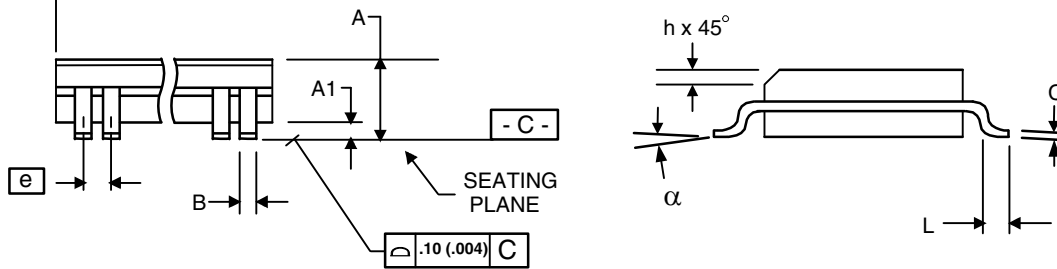
| | | | |
|-----------------------------|---------|------------------------------|-------------|
| TOLERANCES UNLESS SPECIFIED | | IDT 8024 SILVER CREEK VALLEY | |
| DECIMAL | ANGULAR | www.idt.com | |
| XXX± | ± | San Jose, CA 95138 | |
| XXXX± | | PHONE: (408) 284-8200 | |
| | | FAX: (408) 492-8674 | |
| APPROVALS | DATE | TITLE | |
| DRAWN 04C/09/10/14 | | CM38 PACKAGE OUTLINE | |
| CHECKED | | 2.0 X 2.0 mm BODY | |
| | | 0.5 mm PITCH VFOFN | |
| | | SIZE | DRAWING No. |
| | | C | PSC-4490 |
| | | DO NOT SCALE DRAWING | |
| | | | SHEET 2 |

Package Outline and Package Dimensions (8-pin SOIC, 150 Mil. Narrow Body)



| Symbol | Millimeters | | Inches* | |
|--------|-------------|------|-------------|-------|
| | Min | Max | Min | Max |
| A | 1.35 | 1.75 | .0532 | .0688 |
| A1 | 0.10 | 0.25 | .0040 | .0098 |
| B | 0.33 | 0.51 | .013 | .020 |
| C | 0.19 | 0.25 | .0075 | .0098 |
| D | 4.80 | 5.00 | .1890 | .1968 |
| E | 3.80 | 4.00 | .1497 | .1574 |
| e | 1.27 BASIC | | 0.050 BASIC | |
| H | 5.80 | 6.20 | .2284 | .2440 |
| h | 0.25 | 0.50 | .010 | .020 |
| L | 0.40 | 1.27 | .016 | .050 |
| a | 0° | 8° | 0° | 8° |

*For reference only. Controlling dimensions in mm.



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

| Rev. | Date | Originator | Description of Change |
|------|----------|--------------|-----------------------|
| A | 03/18/15 | B. Chandhoke | Initial release. |



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