

LOW SKEW 2 INPUT MUX AND 1 TO 8 CLOCK BUFFER

ICS552-02

Description

The ICS552-02 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 is part of IDT's ClockBlocks™ family. See the ICS553 for a 1 to 4 low skew buffer. For more than 8 outputs see the MK74CBxxx Buffalo™ series of clock drivers.

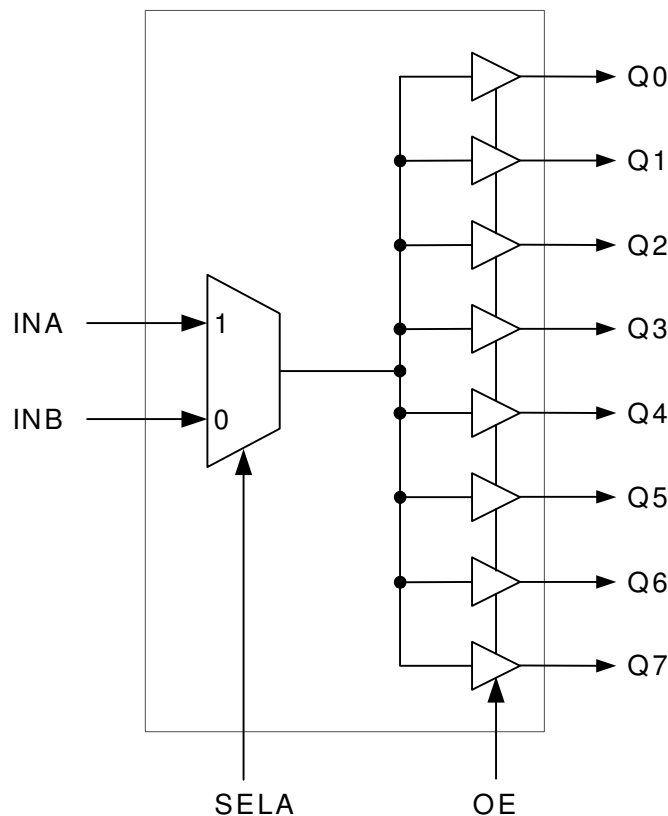
IDT makes many non-PLL and PLL based low skew output devices as well as Zero Delay Buffers to synchronize clocks. Contact us for all of your clocking needs.

Features

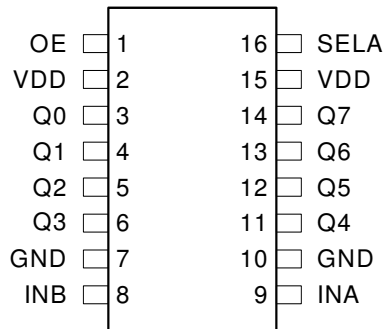
- Extremely low skew outputs (50ps maximum)
- Packaged in 16 pin TSSOP
- Available in Pb (lead) free package
- Low power CMOS technology
- Operating Voltages of 2.5 V to 5 V
- Output Enable pin tri-states outputs
- 5 V tolerant input clocks
- Input/Output clock frequency up to 200 MHz
- Input clock multiplexer simplifies clock selection
- Industrial temperature

NOTE: EOL for non-green parts to occur on 5/13/10 per PDN U-09-01

Block Diagram



Pin Assignment



16 Pin TSSOP

Input Source Select

| SELA | 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 +2.5V, +3.3V or +5.0V. 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. 5V tolerant input. |
| 9 | INA | Input | Clock Input A. 5V tolerant input. |
| 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 +2.5V, +3.3V or +5.0V. Must be the same as pin 2. |
| 16 | SELA | 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 μ 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 33 Ω 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 ICS552-02 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 30 Ω series termination on one output (with 33 Ω 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 ICS552-02. 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 | 7 V |
| SELA, OE, and all Outputs | -0.5 V to VDD+0.5 V |
| INA and INB | -0.5V to 5.5V |
| Ambient Operating Temperature | -40 to +85 °C |
| Storage Temperature | -65 to +150 °C |
| Junction Temperature | 175 °C |
| Soldering Temperature | 260 °C |

Recommended Operation Conditions

| Parameter | Min. | Typ. | Max. | Units |
|---|--------|------|-------|-------|
| Ambient Operating Temperature | -40 | – | +85 | °C |
| Power Supply Voltage (measured in respect to GND) | +2.375 | | +5.25 | V |

DC Electrical Characteristics

VDD=2.5 V ±5%, Ambient temperature -40 to +85 °C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|------------------------------|-----------------|--------------------------|-----------|------|-----------|-------|
| Operating Voltage | VDD | | 2.375 | | 2.625 | V |
| Input High Voltage, INA, INB | V _{IH} | Note 1 | VDD/2+0.5 | | 5.5 | V |
| Input Low Voltage, INA, INB | V _{IL} | Note 1 | | | VDD/2-0.5 | V |
| Input High Voltage, OE, SELA | V _{IH} | | 1.8 | | VDD | V |
| Input Low Voltage, OE, SELA | V _{IL} | | | | 0.7 | V |
| Output High Voltage | V _{OH} | I _{OH} = -16 mA | 2 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 16 mA | | | 0.4 | V |
| Operating Supply Current | IDD | No load, 135 MHz | | 35 | | mA |
| Short Circuit Current | I _{OS} | Each output | | 60 | | mA |

DC Electrical Characteristics (continued)

VDD=3.3 V ±5%, Ambient temperature -40 to +85 °C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|-----------------|--------------------------|-----------|------|-----------|-------|
| Operating Voltage | VDD | | 3.135 | | 3.465 | V |
| Input High Voltage, INA, INB | V _{IH} | Note 1 | VDD/2+0.7 | | 5.5 | V |
| Input Low Voltage, INA, INB | V _{IL} | Note 1 | | | VDD/2-0.7 | V |
| Input High Voltage, OE, SELA | V _{IH} | | 2 | | VDD | V |
| Input Low Voltage, OE, SELA | V _{IL} | | | | 0.8 | V |
| Output High Voltage | V _{OH} | I _{OH} = -25 mA | 2.4 | | | V |
| Output Low Voltage | V _{OL} | I _{OH} = 25 mA | | | 0.4 | V |
| Output High Voltage (CMOS Level) | V _{OH} | I _{OH} = -12 mA | VDD-0.4 | | | V |
| Operating Supply Current | IDD | No load, 135 MHz | | 50 | | mA |
| Short Circuit Current | I _{OS} | Each output | | 80 | | mA |

VDD=5 V ±5%, Ambient temperature -40 to +85 °C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|-----------------|--------------------------|---------|------|---------|-------|
| Operating Voltage | VDD | | 4.75 | | 5.25 | V |
| Input High Voltage, INA, INB | V _{IH} | Note 1 | VDD/2+1 | | 5.5 | V |
| Input Low Voltage, INA, INB | V _{IL} | Note 1 | | | VDD/2-1 | V |
| Input High Voltage, OE, SELA | V _{IH} | | 2 | | VDD | V |
| Input Low Voltage, OE, SELA | V _{IL} | | | | 0.8 | V |
| Output High Voltage | V _{OH} | I _{OH} = -35 mA | 2.4 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 35 mA | | | 0.4 | V |
| Output High Voltage (CMOS Level) | V _{OH} | I _{OH} = -12 mA | VDD-0.4 | | | V |
| Operating Supply Current | IDD | No load, 135 MHz | | 85 | | mA |
| Short Circuit Current | I _{OS} | Each output | | 100 | | mA |

Note: 1. Nominal switching threshold is VDD/2

AC Electrical Characteristics

VDD = 2.5V ±5%, Ambient Temperature -40 to +85 °C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|-----------------|-------------------------------------|------|------|------|-------|
| Input Frequency | | | 0 | | 200 | MHz |
| Output Rise Time | t _{OR} | 0.8 to 2.0 V, C _L =15 pF | | 1.0 | 1.5 | ns |
| Output Fall Time | t _{OF} | 2.0 to 0.8 V, C _L =15 pF | | 1.0 | 1.5 | ns |
| Propagation Delay | Note 1 | | | 3.5 | | ns |
| Output to output skew | Note 2 | Rising edges at VDD/2 | | 0 | 50 | ps |
| Input A to Input B skew | Note 3 | | | 0 | 50 | ps |

VDD = 3.3V ±5%, Ambient Temperature -40 to +85 °C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|-----------------|-------------------------------------|------|------|------|-------|
| Input Frequency | | | 0 | | 200 | MHz |
| Output Rise Time | t _{OR} | 0.8 to 2.0 V, C _L =15 pF | | 0.6 | 1.0 | ns |
| Output Fall Time | t _{OF} | 2.0 to 0.8 V, C _L =15 pF | | 0.6 | 1.0 | ns |
| Propagation Delay | Note 1 | | 2.0 | 3.0 | 5.5 | ns |
| Output to output skew | Note 2 | Rising edges at VDD/2 | | 0 | 50 | ps |
| Input A to Input B skew | Note 3 | | | 0 | 50 | ps |
| Part to Part Skew | | | | | 3.5 | ns |

VDD = 5.0V ±5%, Ambient Temperature -40 to +85 °C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|-----------------|-------------------------------------|------|------|------|-------|
| Input Frequency | | | 0 | | 200 | MHz |
| Output Rise Time | t _{OR} | 0.8 to 2.0 V, C _L =15 pF | | 0.3 | 0.7 | ns |
| Output Fall Time | t _{OF} | 2.0 to 0.8 V, C _L =15 pF | | 0.3 | 0.7 | ns |
| Propagation Delay | Note 1 | | | 2.8 | | ns |
| Output to output skew | Note 2 | Rising edges at VDD/2 | | 0 | 50 | ps |
| Input A to Input B skew | Note 3 | | | 0 | 50 | ps |

Notes: 1. With rail-to-rail input clock.

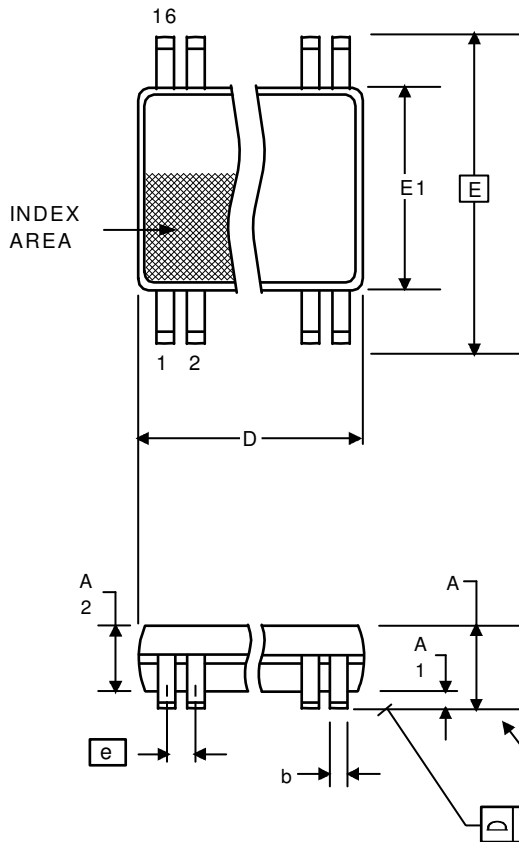
2. Between any two outputs with equal loading.

3. Propagation delay matching through the part.

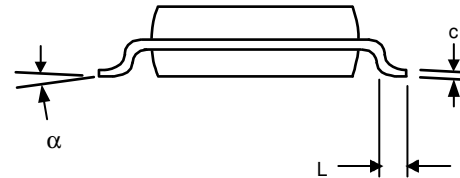
4. Duty cycle on outputs will match incoming clock duty cycle. Consult IDT for tight duty cycle clock generators.

Package Outline and Package Dimensions (16 pin TSSOP, 4.40 mm Body, 0.65 mm Pitch)

Package dimensions are kept current with JEDEC Publication No. 95, MO-153



| Symbol | Millimeters | | Inches | |
|----------|-------------|------|--------------|-------|
| | Min | Max | Min | Max |
| A | -- | 1.20 | -- | 0.047 |
| A1 | 0.05 | 0.15 | 0.002 | 0.006 |
| A2 | 0.80 | 1.05 | 0.032 | 0.041 |
| b | 0.19 | 0.30 | 0.007 | 0.012 |
| C | 0.09 | 0.20 | 0.0035 | 0.008 |
| D | 4.90 | 5.1 | 0.193 | 0.201 |
| E | 6.40 BASIC | | 0.252 BASIC | |
| E1 | 4.30 | 4.50 | 0.169 | 0.177 |
| e | 0.65 Basic | | 0.0256 Basic | |
| L | 0.45 | 0.75 | 0.018 | 0.030 |
| α | 0° | 8° | 0° | 8° |
| aaa | -- | 0.10 | -- | 0.004 |



Ordering Information

| Part / Order Number | Marking | Shipping Packaging | Package | Temperature |
|---------------------|----------|--------------------|--------------|---------------|
| 552G-02I* | 552G-02I | Tubes | 16-pin TSSOP | -40 to +85 °C |
| 552G-02IT* | 552G-02I | Tape and Reel | 16-pin TSSOP | -40 to +85 °C |
| 552G-02ILN | 552G02IN | Tubes | 16-pin TSSOP | -40 to +85 °C |
| 552G-02ILNT | 552G02IN | Tape and Reel | 16-pin TSSOP | -40 to +85 °C |

***NOTE: EOL for non-green parts to occur on 5/13/10 per PDN U-09-01**

Parts that are ordered with an "LN" suffix to the part number are the Pb-Free configuration and are RoHS compliant.

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