

# LVHSTL TO CMOS CLOCK DIVIDER

## ICS558A-02

### Description

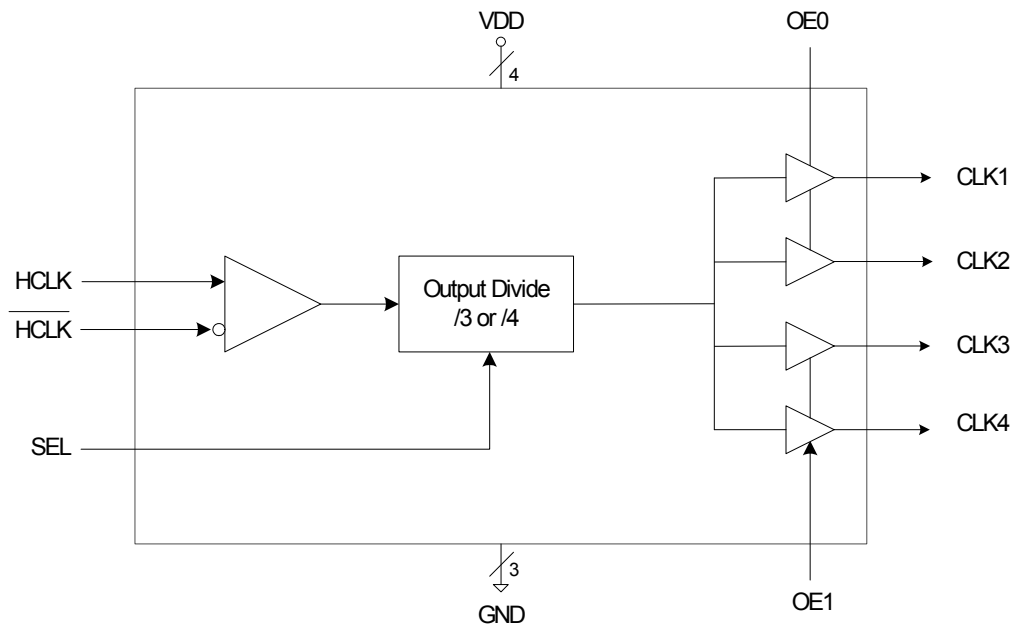
The ICS558A-02 accepts a high-speed LVHSTL input and provides four CMOS low skew outputs from a selectable internal divider (divide by 3, divide by 4). The four outputs are split into two banks of two outputs. Each bank has a separate output enable to tri-state the output buffers.

The ICS558A-02 is a member of the IDT Clock Blocks™ family of clock generation, synchronization, and distribution devices.

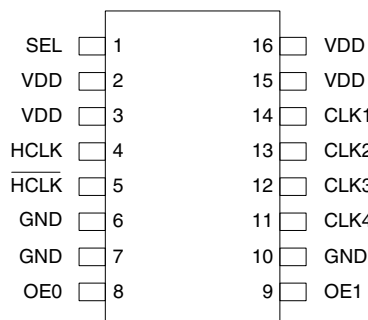
### Features

- 16-pin TSSOP package
- LVHSTL inputs
- Accepts up to 250 MHz input frequency
- Four low skew (<250 ps) outputs
- Selectable internal divider of 3 or 4
- Operating voltage of 3.3 V
- Lead-free, RoHS compliant package

### Block Diagram



## Pin Assignment



16 Pin 173 Mil (0.65mm) TSSOP

## Tri-State Table

| OE1 | OE0 | CLK 1, CLK 2 | CLK 3, CLK 4 |
|-----|-----|--------------|--------------|
| 0   | 0   | Tri-state    | Tri-state    |
| 0   | 1   | Clock ON     | Tri-state    |
| 1   | 0   | Tri-state    | Clock ON     |
| 1   | 1   | Clock ON     | Clock ON     |

## Output Divide Selection

| SEL | Output Divide |
|-----|---------------|
| 0   | /3            |
| 1   | /4            |

## Pin Descriptions

| Pin Number | Pin Name | Pin Type | Pin Description                                                            |
|------------|----------|----------|----------------------------------------------------------------------------|
| 1          | SEL      | Input    | Select pin for output divider. See table above. Internal pull-up to VDD.   |
| 2          | VDD      | Power    | Connect to +3.3 V.                                                         |
| 3          | VDD      | Power    | Connect to +3.3 V.                                                         |
| 4          | HCLK     | Input    | Differential LVHSTL input (true input).                                    |
| 5          | HCLK     | Input    | Differential LVHSTL input (complimentary input).                           |
| 6          | GND      | Power    | Connect to ground.                                                         |
| 7          | GND      | Power    | Connect to ground.                                                         |
| 8          | OE0      | Input    | Output enable for CLK1 and CLK2. See table above. Internal pull-up to VDD. |
| 9          | OE1      | Input    | Output enable for CLK3 and CLK4. See table above. Internal pull-up to VDD. |
| 10         | GND      | Power    | Connect to ground.                                                         |
| 11         | CLK4     | Output   | Low skew clock output.                                                     |
| 12         | CLK3     | Output   | Low skew clock output.                                                     |
| 13         | CLK2     | Output   | Low skew clock output.                                                     |
| 14         | CLK1     | Output   | Low skew clock output.                                                     |
| 15         | VDD      | Power    | Connect to +3.3 V.                                                         |
| 16         | VDD      | Power    | Connect to +3.3 V.                                                         |

## Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the ICS558A-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                | 4.6 V               |
| All Inputs and Outputs        | -0.5 V to VDD+0.5 V |
| Ambient Operating Temperature | 0 to +70 °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                     | 0     |      | +70  | °C    |
| Power Supply Voltage (measured in respect to GND) | +3.15 | +3.3 | +3.5 | V     |

## DC Electrical Characteristics

VDD=3.3 V  $\pm$ 5%, Ambient temperature 0 to +70°C, unless stated otherwise stated.

| Parameter                  | Symbol          | Conditions                 | Min.                 | Typ. | Max.                 | Units |
|----------------------------|-----------------|----------------------------|----------------------|------|----------------------|-------|
| Operating Voltage          | VDD             |                            | 3.135                | 3.3  | 3.465                | V     |
| Operating Supply Current   | IDD             | No load, 100 MHz           |                      | 60   |                      | mA    |
| Input High Voltage         | V <sub>IH</sub> | OE pins                    | VDD-0.5              |      | VDD                  | V     |
| Input Low Voltage          | V <sub>IL</sub> | OE pins                    |                      |      | 0.5                  | V     |
| Input High Voltage         | V <sub>IH</sub> | HCLK                       | V <sub>x</sub> + 0.1 |      | 1.2                  | V     |
| Input Low Voltage          | V <sub>IL</sub> | HCLK                       | -0.3                 |      | V <sub>x</sub> - 0.1 | V     |
| Peak to Peak Input Voltage |                 | HCLK                       | 0.3                  |      | 1.0                  | V     |
| HCLK Input Leakage Current | I <sub>IL</sub> |                            | -20                  |      | 20                   | μA    |
| Input Common Mode Voltage  | V <sub>x</sub>  | Input Common Mode          | 0.68                 |      | 0.90                 | V     |
| Output High Voltage        | V <sub>OH</sub> | I <sub>OH</sub> = -14.5 mA | 2.4                  |      |                      | V     |
| Output Low Voltage         | V <sub>OL</sub> | I <sub>OL</sub> = 9.4 mA   |                      |      | 0.4                  | V     |
| Nominal Output Impedance   | Z <sub>O</sub>  |                            |                      | 20   |                      | Ω     |
| Internal Pull-up Resistor  | R <sub>PU</sub> |                            |                      | 250  |                      | kΩ    |
| Input Capacitance          | C <sub>IN</sub> |                            |                      | 7    |                      | pF    |

## AC Electrical Characteristics

VDD = 3.3 V  $\pm$ 5%, Ambient Temperature 0 to +70°C, unless stated otherwise stated.

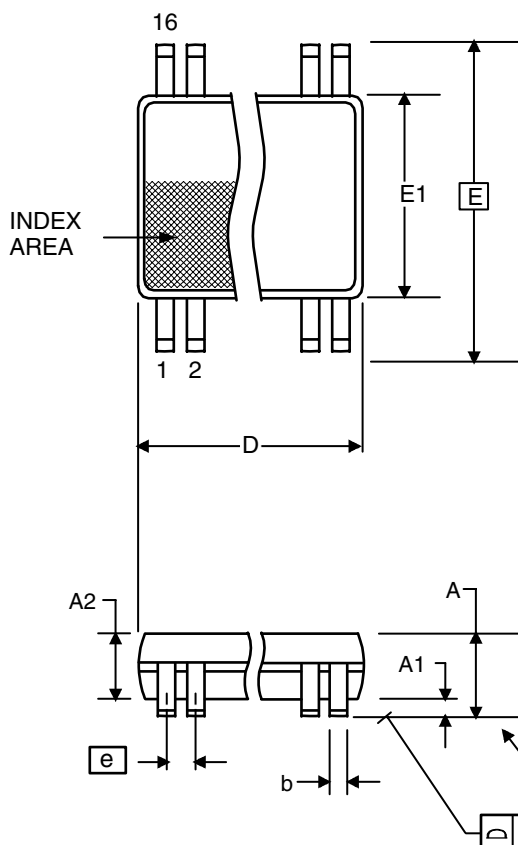
| Parameter                            | Symbol   | Conditions                | Min. | Typ. | Max. | Units |
|--------------------------------------|----------|---------------------------|------|------|------|-------|
| Input Frequency                      |          |                           | 0    |      | 250  | MHz   |
| Output Rise Time                     | $t_{OR}$ | 0.4 to 2.4 V, $C_L=30$ pF | 0.5  | 1.1  | 2.0  | ns    |
| Output Fall Time                     | $t_{OF}$ | 2.4 to 0.4 V, $C_L=30$ pF | 0.5  | 1.0  | 2.0  | ns    |
| Skew (between any two output clocks) |          | 30 pF load                |      | 0    | 250  | ps    |
| Propagation Delay                    |          |                           |      | 9    | 12   | ns    |
| Output Clock Duty Cycle              |          | at VDD/2, $C_L=30$ pF     | 45   | 50   | 55   | %     |

## Thermal Characteristics

| Parameter                              | Symbol        | Conditions     | Min. | Typ. | Max. | Units |
|----------------------------------------|---------------|----------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | $\theta_{JA}$ | Still air      |      | 78   |      | °C/W  |
|                                        | $\theta_{JA}$ | 1 m/s air flow |      | 70   |      | °C/W  |
|                                        | $\theta_{JA}$ | 3 m/s air flow |      | 68   |      | °C/W  |
| Thermal Resistance Junction to Case    | $\theta_{JC}$ |                |      | 37   |      | °C/W  |

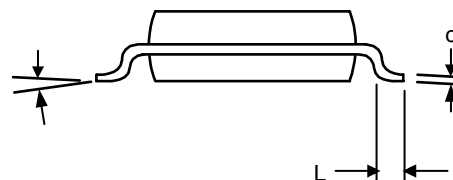
## Package Outline and Package Dimensions (16-pin TSSOP, 4.40 mm Body, 0.65 mm Pitch)

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 |
| $\alpha$ | 0°          | 8°   | 0°           | 8°    |
| aaa      | --          | 0.10 | --           | 0.004 |

\*For reference only. Controlling dimension in mm.



## Ordering Information

| Part / Order Number | Marking   | Shipping Packaging | Package      | Temperature |
|---------------------|-----------|--------------------|--------------|-------------|
| 558AG-02LN          | 558AG02LN | Tubes              | 16-pin TSSOP | 0 to 70° C  |
| 558AG-02LNT         | 558AG02LT | Tape and Reel      | 16-pin TSSOP | 0 to 70° C  |

\*LN denotes a lead-free, RoHS compliant package.

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