

# PECL TO CMOS CONVERTER

**ICS508**

## Description

The ICS508 is the most cost effective way to generate a high quality, high frequency CMOS clock output from a PECL clock input.

The ICS508 has separate VDD supplies for the PECL input buffer and the output buffer, allowing different voltages to be used. For example, the input clock could use a 3.3 V supply while the output operates from 2.5V.

The device has an Output Enable pin that tri-states the clock output when the OE pin is taken low.

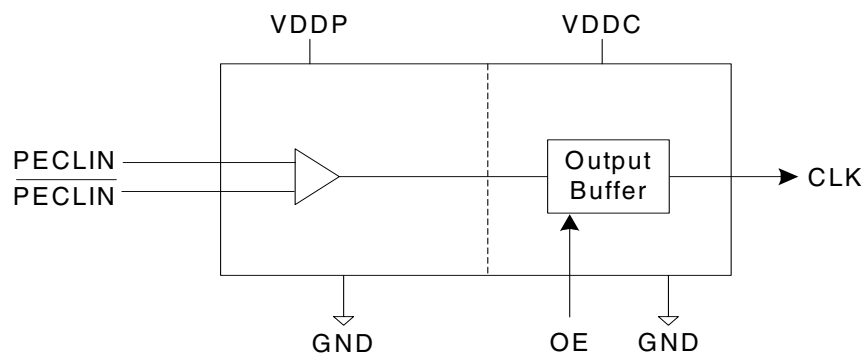
The ICS508 is a member of IDT's ClockBlocks™ family.

## Features

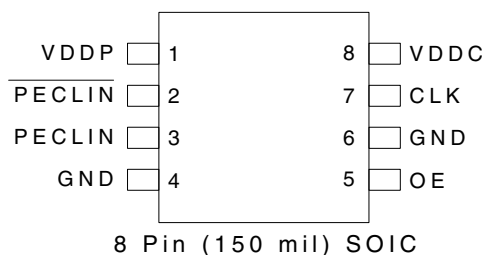
- Packaged in 8 pin SOIC or die
- Separate VDD supplies allow voltage translation
- Clock frequency of 0 - 250 MHz
- Duty cycle of 45/55
- Operating voltages of 2.375 to 5.5V
- Tri-state output for board level testing
- 24mA output drive capability
- Industrial temperature version available
- Advanced, low power, sub-micron CMOS process

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

## Block Diagram



## Pin Assignment



## Pin Descriptions

| Pin Number | Pin Name                   | Pin Type | Pin Description                                                          |
|------------|----------------------------|----------|--------------------------------------------------------------------------|
| 1          | VDDP                       | Output   | Connect to 3.3V or 5V. Supplies PECL input buffer.                       |
| 2          | $\overline{\text{PECLIN}}$ | Input    | Complementary PECL clock input.                                          |
| 3          | PECLIN                     | Input    | PECL clock input.                                                        |
| 4          | GND                        | Power    | Connect to ground.                                                       |
| 5          | OE                         | Input    | Output enable. Tri-states CLK output when low. Internal pull-up to VDDC. |
| 6          | GND                        | Power    | Connect to ground.                                                       |
| 7          | CLK                        | Output   | Clock output.                                                            |
| 8          | VDDC                       | Power    | Connect to 2.5 V, or 3.3 V, or 5 V. Supplies output buffer and OE pin.   |

## External Components

The ICS508 requires two 0.01 $\mu$ F decoupling capacitors to be connected between VDDP and GND and between VDDC and GND. They must be connected close to the ICS508 to minimize lead inductance. A 33 $\Omega$  series terminating resistor can be used next to the CLK pin.

## Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the ICS508. 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, VDDP and VDDC           | 7 V                  |
| PECL Inputs                             | -0.5 V to VDDP+0.5 V |
| Clock Output and OE Pin                 | -0.5 V to VDDC+0.5 V |
| Ambient Operating Temperature, ICS508   | 0 to +70° C          |
| Ambient Operating Temperature, ICS508MI | -40 to +85° C        |
| Storage Temperature                     | -65 to +150° C       |
| Soldering Temperature                   | 260° C               |

## Recommended Operation Conditions

| Parameter                                         | Min.            | Typ. | Max.  | Units |
|---------------------------------------------------|-----------------|------|-------|-------|
| Ambient Operating Temperature, ICS508M            | 0               |      | +70   | ° C   |
| Ambient Operating Temperature, ICS508MI           | -40             |      | +85   | ° C   |
| Power Supply Voltage (measured in respect to GND) | +3.15           |      | +3.45 | V     |
| Reference crystal parameters                      | Refer to page 3 |      |       |       |

## DC Electrical Characteristics

**VDDP = VDDC = 3.3V ±5%** , Ambient temperature 0 to +70° C, unless stated otherwise

| Parameter                  | Symbol          | Conditions             | Min.       | Typ. | Max.       | Units |
|----------------------------|-----------------|------------------------|------------|------|------------|-------|
| Operating Voltage          | VDD             | VDDP                   | 3          |      | 5.5        | V     |
|                            | VDD             | VDDC                   | 2.375      |      | 5.5        | V     |
| Peak to Peak Input Voltage |                 | PECLIN                 | 0.3        |      | 1          | V     |
| Common Mode Range          |                 | PECLIN<br>VDDP = 5 V   | VDDP - 3.7 |      | VDDP - 0.6 | V     |
|                            |                 | PECLIN<br>VDDP = 3.3 V | VDDP - 2.0 |      | VDDP - 0.6 | V     |
| Input High Voltage         | V <sub>IH</sub> | OE only                | 2          |      | VDDC       | V     |
| Input Low Voltage          | V <sub>IL</sub> | OE only                |            |      | 0.8        | V     |

| Parameter                | Symbol   | Conditions                   | Min.       | Typ. | Max. | Units      |
|--------------------------|----------|------------------------------|------------|------|------|------------|
| Output High Voltage      | $V_{OH}$ | VDDC = 5 V<br>IOH = -24 mA   | VDDC - 0.4 |      |      | V          |
|                          |          | VDDC = 3.3 V<br>IOH = -18 mA | VDDC - 0.4 |      |      | V          |
|                          |          | VDDC = 2.5 V<br>IOH = -8 mA  | VDDC - 0.4 |      |      | V          |
| Output Low Voltage       | $V_{OL}$ | VDDC = 5 V<br>IOL = 24 mA    |            |      | 0.4  | V          |
|                          |          | VDDC = 3.3 V<br>IOL = 18 mA  |            |      | 0.4  | V          |
|                          |          | VDDC = 2.5 V<br>IOL = 8 mA   |            |      | 0.4  | V          |
| On Chip Pull-up Resistor | $R_{PU}$ | OE                           |            | 250  |      | k $\Omega$ |
| Operating Supply Current | IDDP     | 100 MHz, no load             |            | 1.5  |      | mA         |
|                          | IDDC     | 100 MHz, no load             |            | 8    |      | mA         |

Note 1: VDDP must always be greater than or equal to VDDC

## AC Electrical Characteristics

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

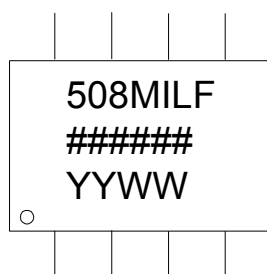
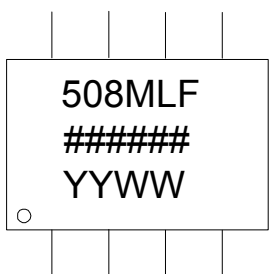
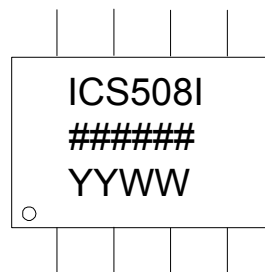
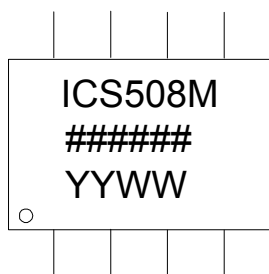
| Parameter                           | Symbol   | Conditions                       | Min. | Typ. | Max. | Units |
|-------------------------------------|----------|----------------------------------|------|------|------|-------|
| Input Frequency                     | $f_{IN}$ |                                  | 0    |      | 250  | MHz   |
| Output Clock Rise Time              | 100 MHz  | 0.8 V to 2.0 V, VDDP=VDDC = 5 V  |      | 0.4  |      | ns    |
|                                     | 100 MHz  | 0.8 V to 2.0 V, VDDP=VDDC=3.3 V  |      | 0.6  |      | ns    |
|                                     | 100 MHz  | 0.8 V to 2.0 V, VDDP=VDDC=2.5 V  |      | 1    |      | ns    |
| Output Clock Fall Time              | 100 MHz  | 2.0 V to 0.8 V, VDDP=VDDC = 5 V  |      | 0.4  |      | ns    |
|                                     | 100 MHz  | 2.0 V to 0.8 V, VDDP=VDDC=3.3 V  |      | 0.6  |      | ns    |
|                                     | 100 MHz  | 2.0 V to 0.8 V, VDDP=VDDC=2.5 V  |      | 1    |      | ns    |
| Output Enable Time                  | 100 MHz  | OE high to output on 0 - 100 MHz |      | 7    | 20   | ns    |
| Output Disable Time                 | 100 MHz  | OE low to tri-state 0 - 100 MHz  |      | 7    | 20   | ns    |
| Propagation Delay                   |          | VDDP = 5 V, VDDC = 5 V,          |      | 4    | 6    | ns    |
|                                     | 100 MHz  | VDDP = 5 V, VDDC = 3.3 V         |      | 4.5  | 7    | ns    |
|                                     | 100 MHz  | VDDP = 5 V, VDDC = 2.5 V         |      | 5.5  | 9    | ns    |
|                                     | 100 MHz  | VDDP = 3.3 V, VDDC = 3.3 V       |      | 4.5  | 7    | ns    |
|                                     |          | VDDP = 3.3 V, VDDC = 2.5 V       |      | 5.5  | 9    | ns    |
| Output Clock Duty Cycle 0 - 100 MHz |          | Any VDD combination              | 45   |      | 55   | %     |

| Parameter                                | Symbol | Conditions                 | Min. | Typ. | Max. | Units |
|------------------------------------------|--------|----------------------------|------|------|------|-------|
| Output Clock Duty Cycle<br>100 - 166 MHz |        | VDDP = 5 V, VDDC = 5 V     | 45   |      | 55   | %     |
|                                          |        | VDDP = 5 V, VDDC = 3.3 V   | 45   |      | 55   | %     |
|                                          |        | VDDP = 5 V, VDDC = 2.5 V   | 40   |      | 60   | %     |
|                                          |        | VDDP = 3.3 V, VDDC = 3.3 V | 40   |      | 60   | %     |
|                                          |        | VDDP = 3.3 V, VDDC = 2.5 V | 45   |      | 55   | %     |
| Output Clock Duty Cycle<br>166 - 250 MHz |        | VDDP = 5 V, VDDC = 5 V     | 40   |      | 60   | %     |
|                                          |        | VDDP = 5 V, VDDC = 3.3 V   | 40   |      | 60   | %     |
|                                          |        | VDDP = 5 V, VDDC = 2.5 V   | 35   |      | 65   | %     |
|                                          |        | VDDP = 3.3 V, VDDC = 3.3 V | 35   |      | 65   | %     |
|                                          |        | VDDP = 3.3 V, VDDC = 2.5 V | 40   |      | 60   | %     |

## Thermal Characteristics

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

## Marking Diagrams

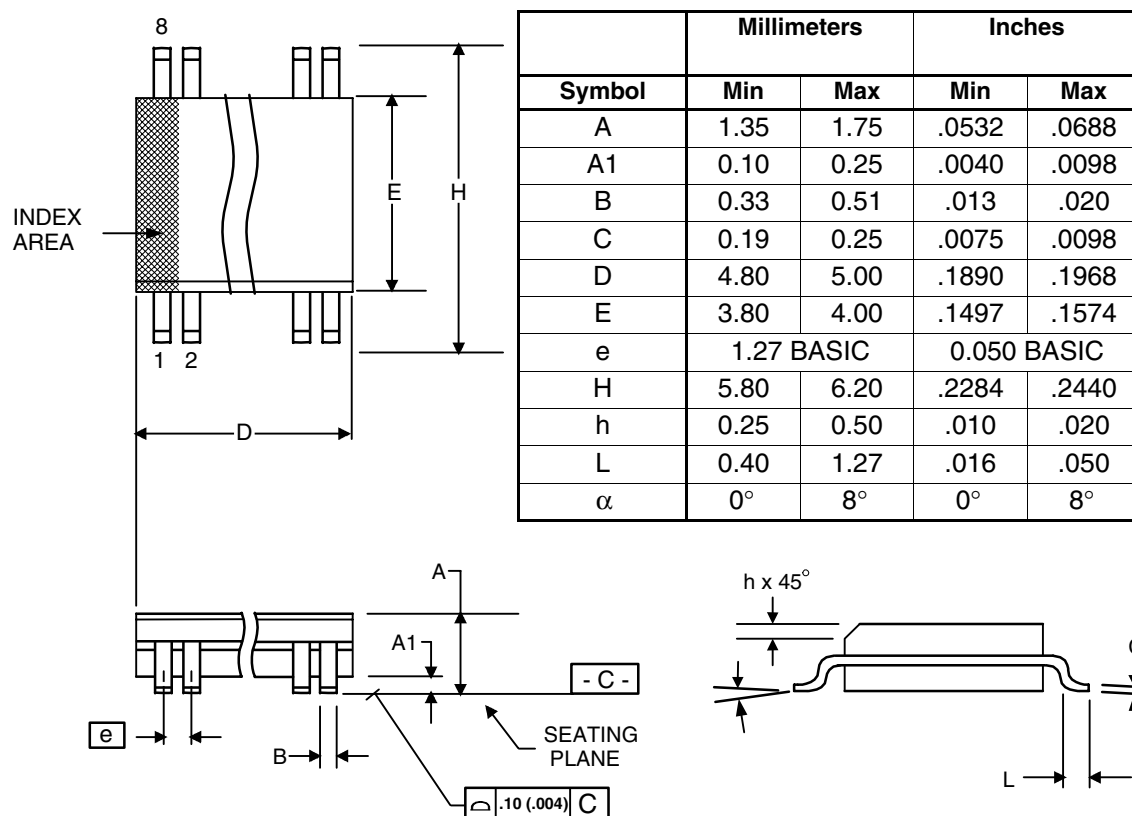


### Notes:

1. ##### is the lot number
2. YYWW is the last two digits of the year and the week number that the part was assembled.
3. "I" denotes industrial temperature range.
4. "LF" denotes Pb-free.
5. Bottom marking: country of origin if not USA.

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

Package dimensions are kept current with JEDEC Publication No. 95



### \*Ordering Information

| Part / Order Number | Marking    | Shipping Packaging          | Package    | Temperature   |
|---------------------|------------|-----------------------------|------------|---------------|
| 508M*               | see page 6 | Tubes                       | 8 pin SOIC | 0 to +70° C   |
| 508MT*              |            | Tape and Reel               | 8 pin SOIC | 0 to +70° C   |
| 508MI*              |            | Tubes                       | 8 pin SOIC | -40 to +85° C |
| 508MIT*             |            | Tape and Reel               | 8 pin SOIC | -40 to +85° C |
| 508MLF              |            | Tubes                       | 8 pin SOIC | 0 to +70° C   |
| 508MLFT             |            | Tape and Reel               | 8 pin SOIC | 0 to +70° C   |
| 508MILF             |            | Tubes                       | 8 pin SOIC | -40 to +85° C |
| 508MILFT            |            | Tape and Reel               | 8 pin SOIC | -40 to +85° C |
| 508-DWF             | -          | Die on uncut, probed wafers |            | 0 to +70° C   |
| 508-DPK             | -          | Tested die in waffle pack   |            | 0 to +70° C   |

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

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