

# CS-300

## Clock Smoother



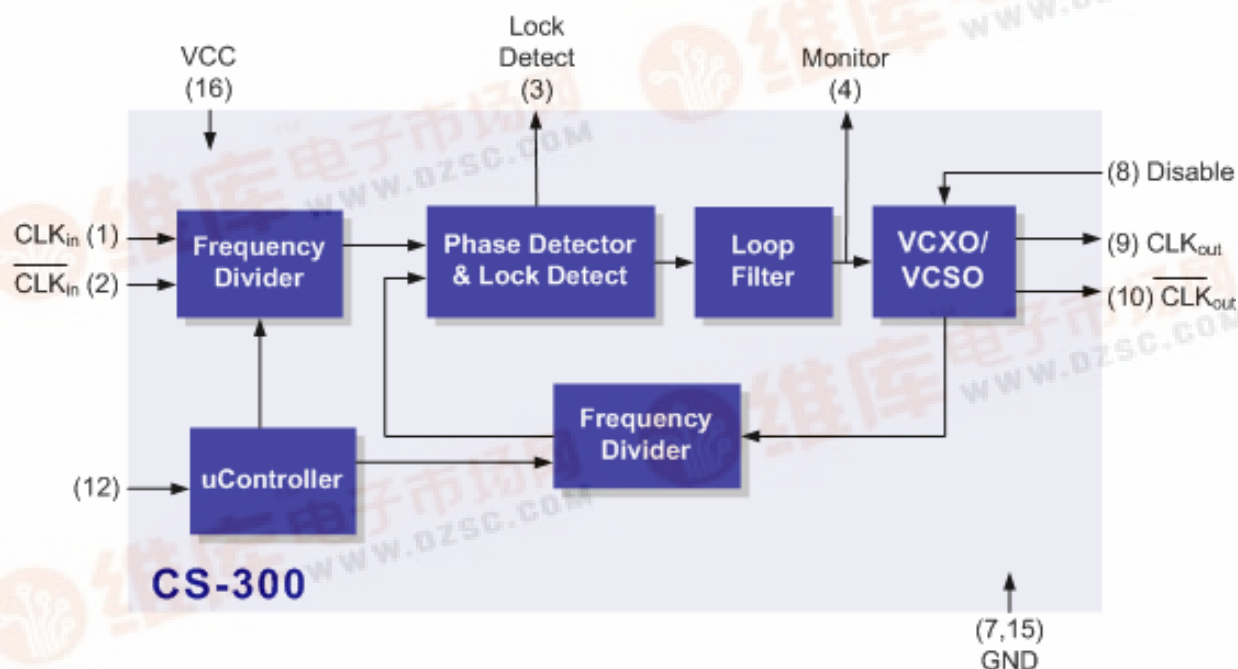
### Features

- Output frequencies to 850 MHz
- Ultra Low Jitter LVPECL, LVDS Outputs
- Locks to Input Frequency (i.e. 622.08 MHz)
- 3.3 Vdc or 5.0 Vdc supply
- Lock / Loss of Signal Alarm
- 1" x 0.8" x 0.25", Surface Mount (FR4 base)
- Product is compliant to RoHS directive



### Applications

- SONET / SDH / ATM
- DWDM / FDM
- DSL – PON Interconnects
- FEC (Forward Error Correction)



# CS-300 Clock Smoother

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## Description

Vectron's CS-300 is a SAW based Clock Smoother and Frequency Translator which is used to "clean up" noisy input frequencies. This series can accept any input frequency from 10 MHz to 700 MHz and then "cleans up" up the signal to provide an ultra low jitter output signal. The output jitter of this unit is well below the requirements of OC-192.

The CS-300 also has the ability to translate either one or two different input frequencies between 10 MHz and 700 MHz to one common output frequency, such as input frequencies of 622.08 MHz and 666.5143 MHz translated to an output frequency of 622.08 MHz. This unit is of particular interest to those working with FEC applications or needing to switch between 10G and OC-192.

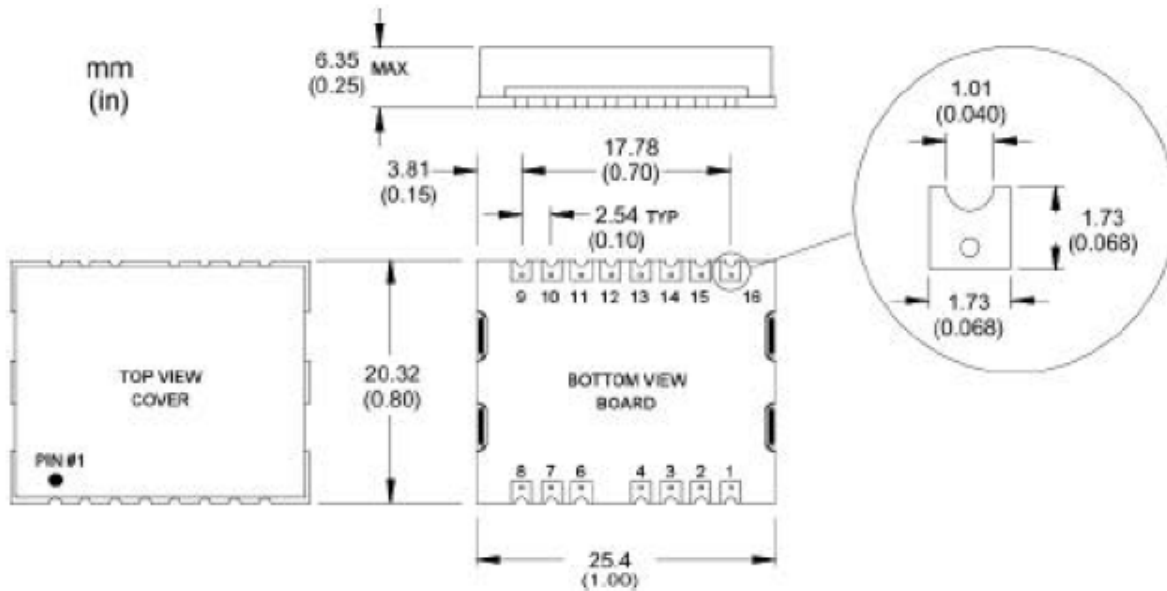
The "Input Frequency Tracking Capability" is the total amount of frequency deviation on the input signal that the CS-300 is guaranteed to track. As an example, a typical input clock would be 622.08 MHz  $\pm$  20 ppm. The CS-300 is guaranteed to track at least  $\pm$ 40 ppm of error over temperature/ aging/ power supply and is more than twice what most applications require.

| Performance Characteristics                                                                     |                          |                                                              |                       |              |                       |            |
|-------------------------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------|-----------------------|--------------|-----------------------|------------|
| Parameter                                                                                       |                          | Symbol                                                       | Minimum               | Typical      | Maximum               | Units      |
| Supply Voltage,                                                                                 | C = 5 Vdc<br>D = 3.3 Vdc | V <sub>CC</sub><br>V <sub>CC</sub>                           | 4.75<br>3.135         | 5.00<br>3.30 | 5.25<br>3.465         | Vdc<br>Vdc |
| Supply Current                                                                                  | 5 Vdc<br>3.3 Vdc         | I <sub>CC</sub><br>I <sub>CC</sub>                           |                       | 135<br>115   | 200<br>200            | mA<br>mA   |
| Input Signal,                                                                                   | F = Comp PECL            | CLKIN                                                        | 10 MHz                | PECL         | 700 MHz               | ---        |
| Output                                                                                          | F = Comp PECL            | ---                                                          | 155.52 MHz            | PECL         | 800 MHz               | ---        |
| V <sub>OL</sub> @ +25°C                                                                         |                          | V <sub>OL</sub>                                              | V <sub>CC</sub> -1.95 |              | V <sub>CC</sub> -1.63 | V          |
| V <sub>OH</sub> @ +25°C                                                                         |                          | V <sub>OH</sub>                                              | V <sub>CC</sub> -0.98 |              | V <sub>CC</sub> -0.75 | V          |
| Rise / Fall Time (20% to 80% @ 622.08 MHz)                                                      |                          | t <sub>R</sub> /t <sub>F</sub>                               |                       | 250          | 400                   | ps         |
| Output Symmetry                                                                                 |                          | Sym                                                          | 45                    | 49/51        | 55                    | %          |
| Jitter Generation, rms (12kHz to 20MHz)                                                         |                          |                                                              |                       | 0.23         | 1.0                   | ps         |
| Jitter Generation, rms(cycle to cycle method)                                                   |                          |                                                              |                       | 3            |                       | ps         |
| Jitter Transfer, GR-253-CORE section 5.6.2.1.2                                                  |                          |                                                              |                       |              | 0.1                   | dB         |
| Input Frequency Tracking Capability<br>(Can translate a Stratum 1,2,3,3E,4 or SONET Min source) |                          | APR                                                          | +/-40                 |              |                       | ppm        |
| Operating Temperature                                                                           |                          | Temp Range C = 0°C to +70°C<br>Temp Range F = -40°C to +85°C |                       |              |                       |            |
| Size                                                                                            |                          | See page 3 for outline Drawings and Dimensions               |                       |              |                       |            |

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## Outline Drawing

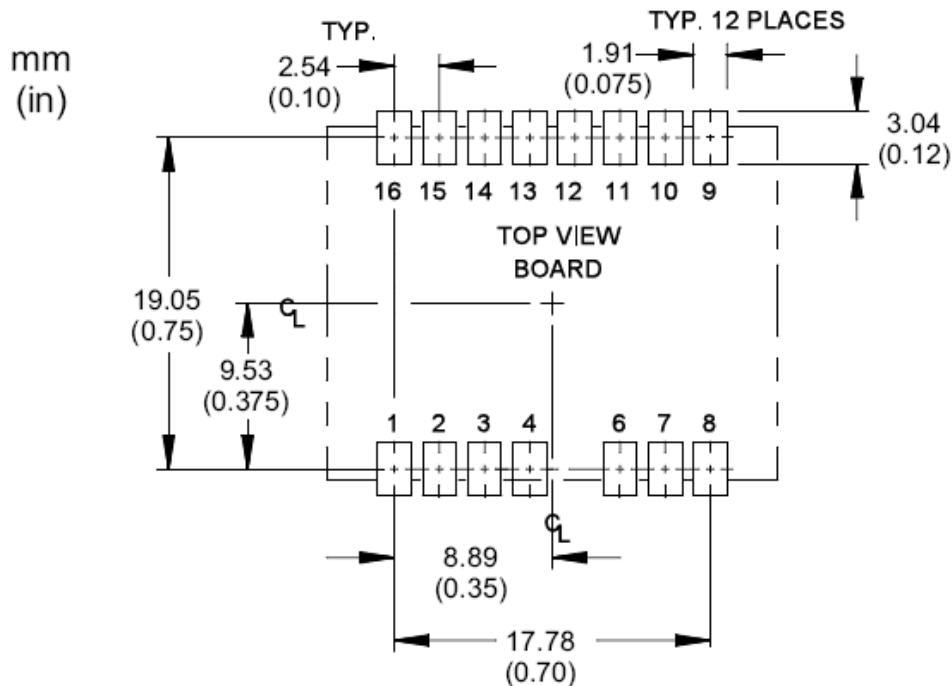


| Pin | Symbol              | Function                                                                                                                                                                                                               |
|-----|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | CLKIN Q             | Input Frequency (Q)                                                                                                                                                                                                    |
| 2   | CLKIN $\bar{Q}$     | Complementary Input Frequency ( $\bar{Q}$ )                                                                                                                                                                            |
| 3   | LD<br>(Output)      | Lock Detect<br>Logic "1" indicates a locked condition.<br>Logic "0" indicates an out of lock condition.                                                                                                                |
| 4   | Monitor<br>(Output) | PLL/ VCXO control voltage<br>Under locked conditions, should be >0.3V and <3.0V for the 3.3 volt option or >0.5V and <4.5V for the 5 volt option. Input frequency may be out of range if voltage exceeds these limits. |
| 5   | ---                 | Missing                                                                                                                                                                                                                |
| 6   | NC                  | No Connection                                                                                                                                                                                                          |
| 7   | GND                 | Ground                                                                                                                                                                                                                 |
| 8   | Disable<br>(Input)  | Floating = Output enabled<br>Logic "0" = Output disabled                                                                                                                                                               |
| 9   | OUT                 | Output (Q)                                                                                                                                                                                                             |
| 10  | COUT                | Complementary Output ( $\bar{Q}$ )                                                                                                                                                                                     |
| 11  | NC                  | No Connection                                                                                                                                                                                                          |
| 12  | Freq. Select        | "0" = Primary Frequency<br>"1" = Secondary Frequency (Do not Exceed Vdd)                                                                                                                                               |
| 13  | NC                  | No Connection                                                                                                                                                                                                          |
| 14  | NC                  | No Connection                                                                                                                                                                                                          |
| 15  | GND                 | Ground                                                                                                                                                                                                                 |
| 16  | V <sub>cc</sub>     | 5 Vdc or 3.3 Vdc                                                                                                                                                                                                       |

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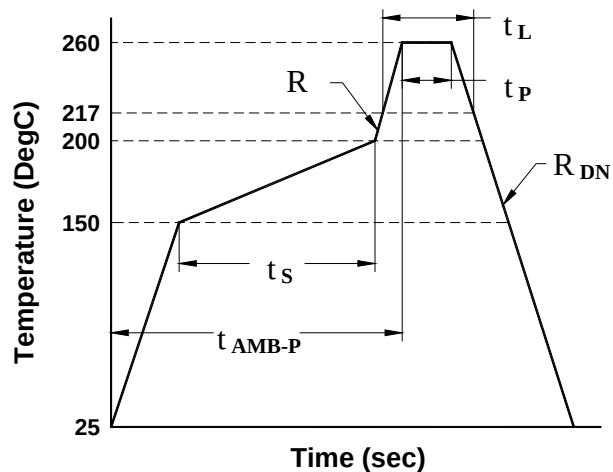
## Recommended Pad Layout



## Reflow Profile (IPC/JEDEC J-STD-020C)

| Parameter                | Symbol      | Value                   |
|--------------------------|-------------|-------------------------|
| PreHeat Time             | $t_s$       | 60 sec Min, 180 sec Max |
| Ramp Up                  | $R_{UP}$    | 3 °C/sec Max            |
| Time Above 217 °C        | $t_L$       | 60 sec Min, 150 sec Max |
| Time To Peak Temperature | $t_{AMB-P}$ | 480 sec Max             |
| Time At 260 °C           | $t_P$       | 20 sec Min, 40 sec Max  |
| Ramp Down                | $R_{DN}$    | 6 °C/sec Max            |

The CS-300 is being qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The temperatures refer to the topside of the package, measured on the package body surface. The CS-300 should not be subjected to a wash process that will immerse it in solvents. NO CLEAN is the recommended procedure. The CS-300 has been designed for pick and place reflow soldering. The CS-300 may be reflowed once and should not be reflowed in the inverted position.

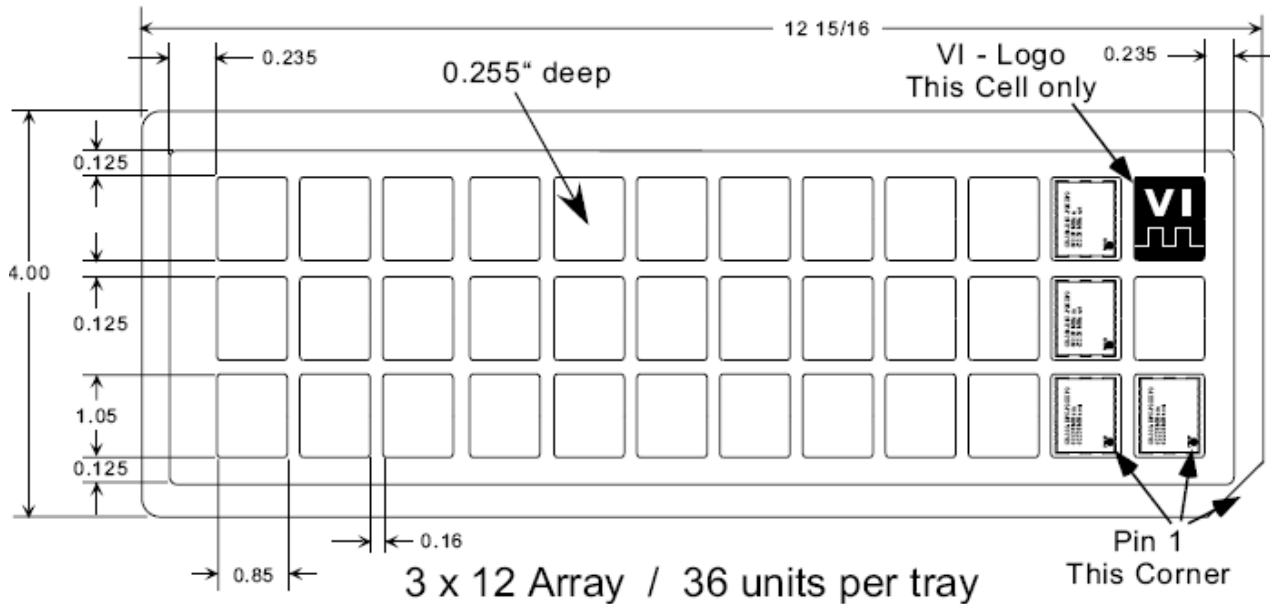


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## Standard Shipping Method

The Standard ship method for volume production of the CS-300 series is in a matrix tray. These trays are 100% recyclable. The trays also offer the added feature that they can be continuously feed into a pick-n-place machine eliminating the down time required with tape-n-reel.



## Handling Precautions

Although protection circuitry has been designed into this device, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. VI employs a human-body model (HBM) and a charged-device model (CDM) for ESD-susceptibility testing and protection design evaluation. ESD voltage thresholds are dependent on the circuit parameters used to define the mode.

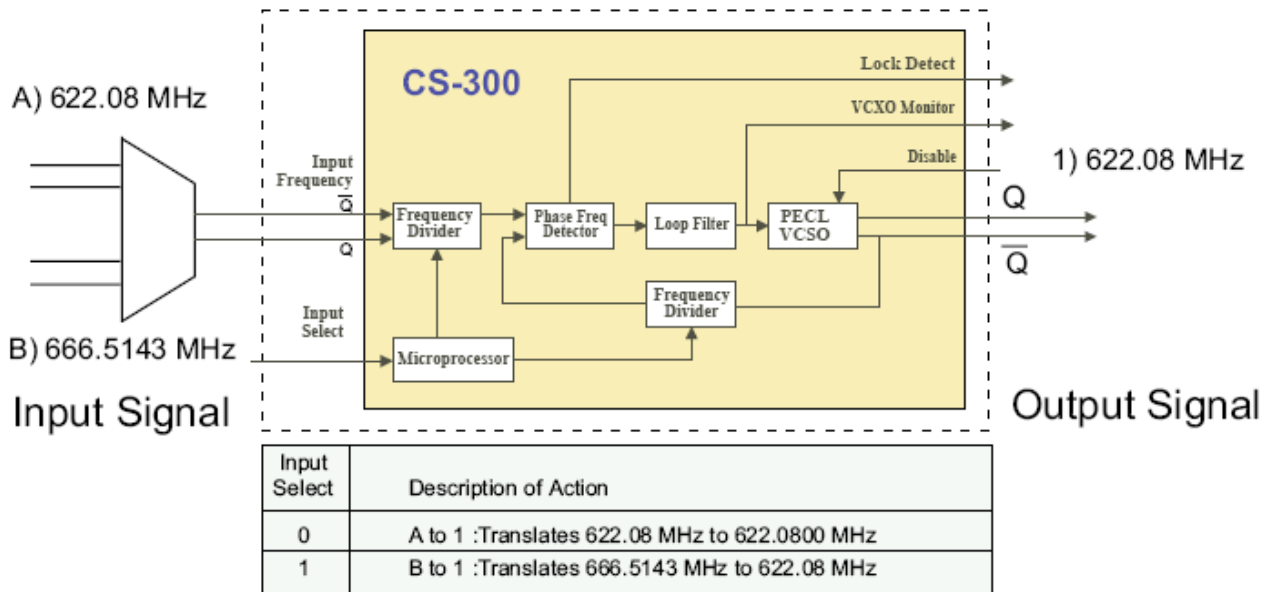
Although no industry-wide standard has been adopted for the CDM, a standard HBM (resistance = 1500 ohms, capacitance = 100pf) is widely used and therefore can be used for comparison purposes. The HBM ESD threshold presented here was obtained by using these circuit parameters.

| ESD Threshold Voltage |           |       |
|-----------------------|-----------|-------|
| Model                 | Threshold | Unit  |
| Human-Body (HBM)      | 500       | V min |
| Charged-Device        | 500       | V min |

# CS-300 Clock Smoother

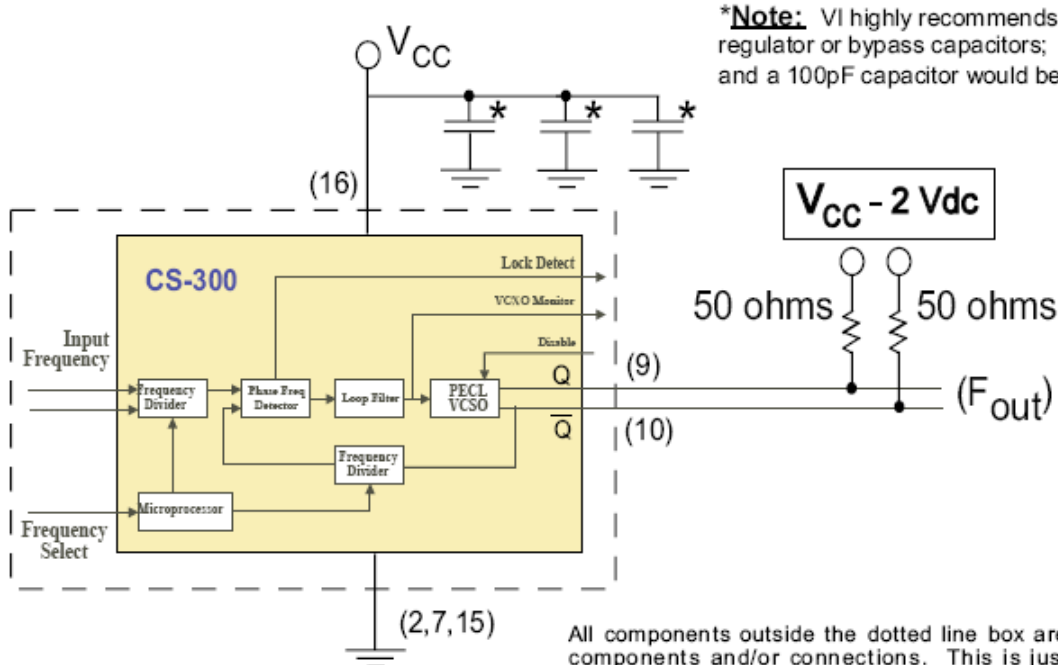
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## Typical Application



All components outside the dotted line box are user supplied components and/or connections. This is just one possible configuration of the CS-300. For additional information about your specific needs please contact our Factory.

## Output Load Configuration



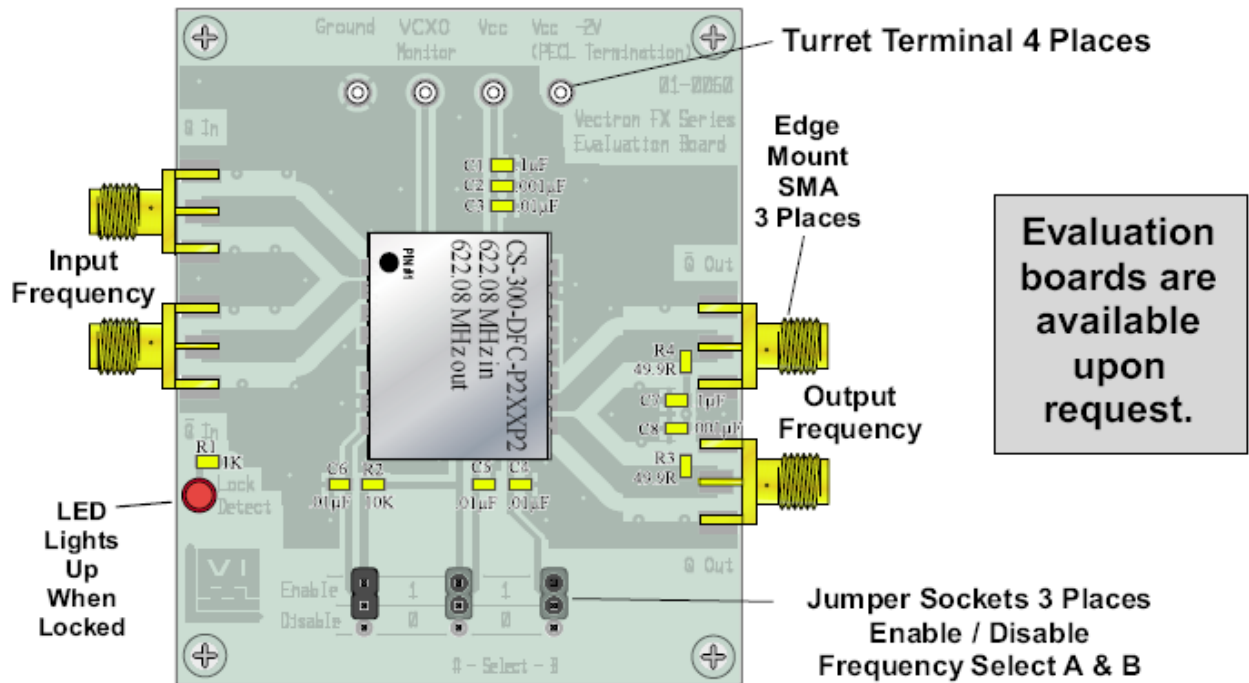
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## Evaluation Board



## FAQ's

Q1: What are the different input frequencies available?

A: The CS-300 is able to handle any input frequency between 10 MHz and 700 MHz.  
(A list of standard frequencies is available on page 8.)

Q2: How many different input frequencies can a specific CS-300 accept?

A: Each CS-300 can be programmed to accept up to 2 different input frequencies.

Q3: If there is only one set of input pins, how can your unit accept 2 different frequencies?

A: The customer is required to supply a multiplexer which would switch between the different input frequencies. The multiplexers' select pin would need to be sync'd to the select pin of the CS-300.

Q4: What is the lock time for the CS-300?

A: The exact lock time will depend on the specific input frequency. It should be noted that in all cases the lock time will be significantly less than 1 second.

Q5: What type of noise on the supply line can the CS-300 suppress?

A: The CS-300 is designed to clean up noise on the Input Clock Signal, it is not designed to clean up noisy power supplies. If excessive noise is present on the supply line it may degrade the output jitter performance. Additional external filtering may be required. Please consult with your power supply vendor on the best way to filter noise of your supply line.

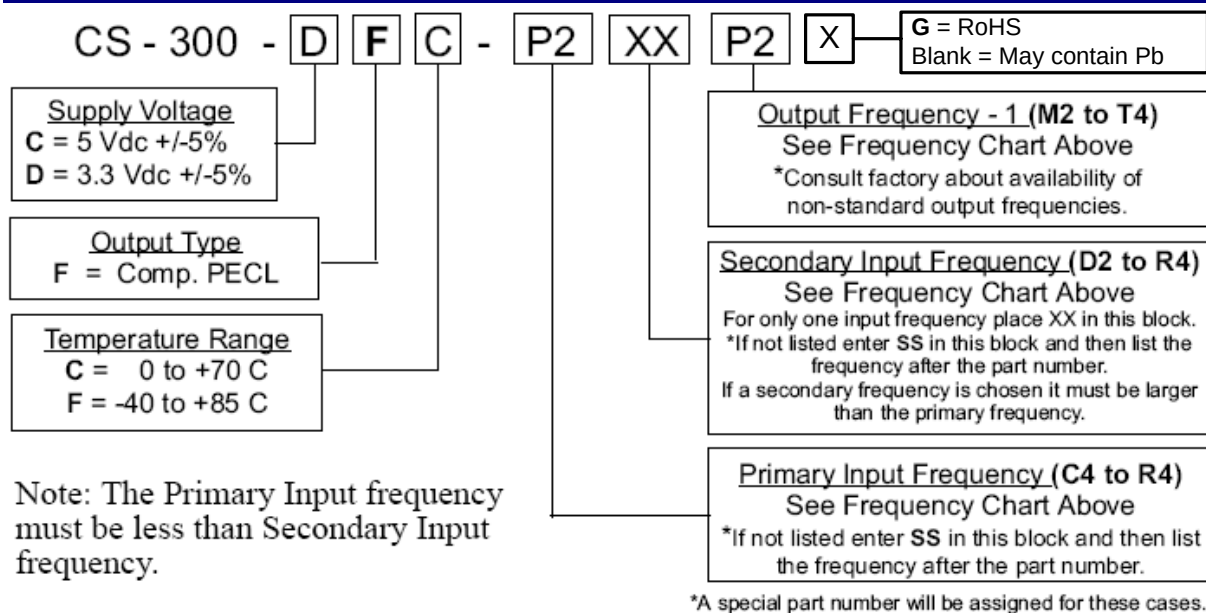
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## Standard Frequencies

|             |    |             |    |              |    |                        |    |
|-------------|----|-------------|----|--------------|----|------------------------|----|
| 10.000 MHz  | C4 | 38.8800 MHz | H5 | 139.264 MHz  | L5 | 669.1281 MHz           | R2 |
| 12.800 MHz  | D2 | 44.4343 MHz | J2 | 155.520 MHz  | M2 | 669.3266 MHz           | R3 |
| 13.000 MHz  | D3 | 44.7360 MHz | J3 | 156.250 MHz  | M3 | 669.6428 MHz           | R1 |
| 15.000 MHz  | D4 | 51.8400 MHz | J4 | 161.1328 MHz | M4 | 672.1627 MHz           | R5 |
| 16.384 MHz  | D5 | 61.4400 MHz | J5 | 166.6286 MHz | M5 | 690.5692 MHz           | R4 |
| 19.440 MHz  | D6 | 65.5360 MHz | J6 | 167.3316 MHz | N2 | 693.4830 MHz           | R6 |
| 20.0000 MHz | E2 | 74.1250 MHz | K1 | 168.0407 MHz | N3 | 710.9486 MHz           | T2 |
| 20.1416 MHz | E3 | 74.2500 MHz | K7 | 311.0400 MHz | P1 | 719.7344 MHz           | T3 |
| 20.4800 MHz | E4 | 77.7600 MHz | K2 | 622.0800 MHz | P2 | 777.6000 MHz           | T4 |
| 22.2171 MHz | E5 | 78.1250 MHz | K3 | 624.7048 MHz | P6 |                        |    |
| 26.0000 MHz | F3 | 78.6432 MHz | K5 | 625.0000 MHz | P3 |                        |    |
| 27.0000 MHz | F4 | 82.9440 MHz | K6 | 627.3296 MHz | P7 |                        |    |
| 29.4912 MHz | F5 | 112.000 MHz | L2 | 644.5313 MHz | P4 | No Second Input Freq   | XX |
| 32.7680 MHz | H3 | 114.000 MHz | L3 | 666.5143 MHz | P5 | Input Freq not listed  | SS |
| 37.0560 MHz | H4 | 125.000 MHz | L4 |              |    | Output Freq not listed | SS |

## How to Order



## For Additional Information, Please Contact:



USA: ..... Tel: 1-88-VECTRON-1 Fax: 1-888-FAX-VECTRON  
EUROPE: ..... Tel: +49 (0) 7268 8010 Fax: +49 (0) 7268 8012 81  
ASIA: ..... Tel: +86-21-5048-0777 Fax: +86-21-5048-1881

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