# VC-715

## LVPECL Voltage Controlled Crystal Oscillator


## Features

- Small Industry Standard Package, 5.0 x 7.5 x 2.0 mm
- 1.024 MHz to 77.76 MHz Output Frequency
- 3.3 V Operation
- Fundamental crystal for ultra low jitter
- Complementary PECL Outputs
- Low phase noise and custom options
- 0/70 or –40/85° C operating temperature
- Enable /Disable (PECL)

Product is compliant to RoHS directive and fully compatible with lead free assembly

## Applications

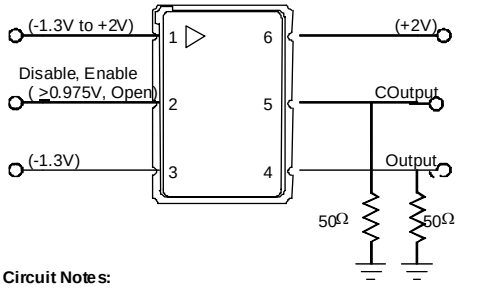
PLL circuits for Clock Smoothing and Frequency Translation

- Fiber Channel
- SONET
- SDH, ITU-T G.709
- SONET, GR-253-CORE Issue3

## Description

The VC-715 is a voltage controlled crystal oscillator that operates at the fundamental frequency of the internal crystal. The crystal is a high-Q quartz device that enables the circuit to achieve low phase jitter performance over a wide operating temperature range. The oscillator is housed in an industry standard hermetically sealed leadless surface mount package and is available on tape and reel.

| Electrical Performance | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Min** | **Typical** | **Maximum** | **Units** |
| Frequency | | $f_O$ | 1.024 | | 77.76 | MHz |
| Supply Voltage (+3.3 V) | | $V_{DD}$ | 3.135 | 3.30 | 3.465 | V |
| Supply Current | | $I_{DD}$ | | | <65 | mA |
| Output Logic Levels | | | | | | |
| Output Logic High | 0 / 70 ºC | $V_{OH}$ | $V_{DD}$ -1.025 | | $V_{DD}$ -0.880 | V |
| Output Logic Low | 0 / 70 ºC | $V_{OL}$ | $V_{DD}$ -1.810 | | $V_{DD}$ -1.620 | V |
| Output Logic High | -40 / 85 ºC | $V_{OH}$ | $V_{DD}$ -1.085 | | $V_{DD}$ -0.880 | V |
| Output Logic Low | -40 / 85 ºC | $V_{OL}$ | $V_{DD}$ -1.830 | | $V_{DD}$ -1.555 | V |
| Transition Times | | | | | | |
| Rise Time | | $t_R$ | | | 1 | ns |
| Fall Time | | $t_F$ | | | 1 | ns |
| Symmetry or Duty Cycle | | SYM | 45 | 50 | 55 | % |
| Operating temperature | | | 0/70 or –40/85 | | | °C |
| Test Conditions for APR | | $V_C$ | 0.3 | | 3.0 | V |
| Absolute Pull Range | | APR | ± 50 | | | ppm |
| Gain Transfer | | | Positive | | | ppm/V |
| Control Voltage Bandwidth (-3dB) | | BW | 10 | | | kHz |
| Input Leakage, Control Voltage Input | | | | | ±1 | uA |
| Package Size | | | 5.0 x 7.5 x 2.0 | | | mm |




**Test Circuit Notes:**
1) To Permit 50Ω Measurement of Outputs, all DC Inputs are Biased D
2) All Voltage Sources Contain Bypass Capacitors to Minimize Supply
3) 50Ω Terminations are Within Test Equipment.

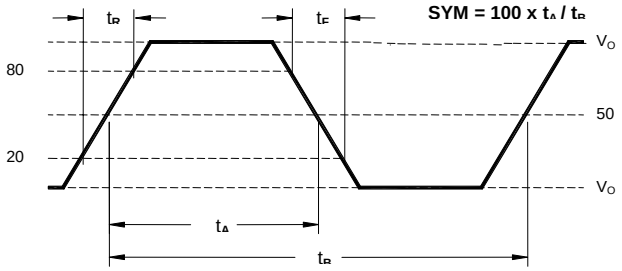
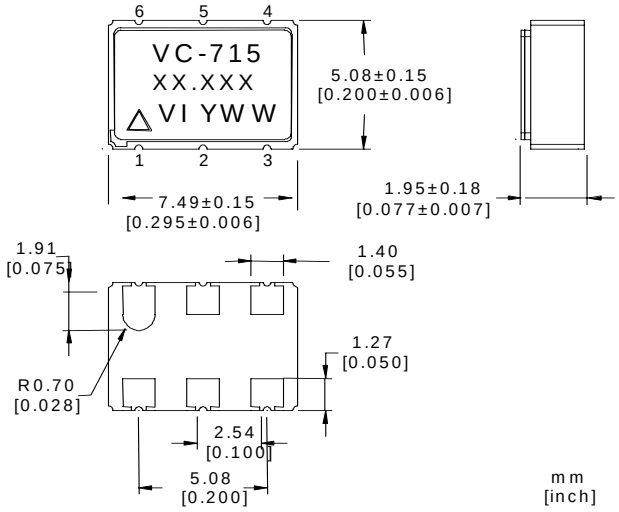


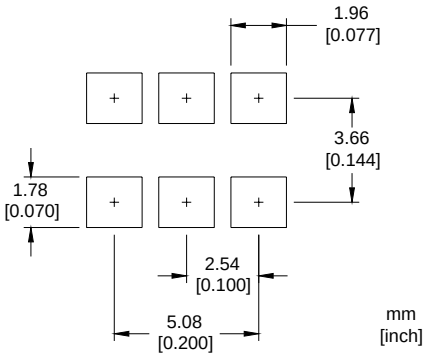

**Figure 2. PECL Waveform**

# VC-715 Voltage Controlled Crystal Oscillator

## Outline Diagram



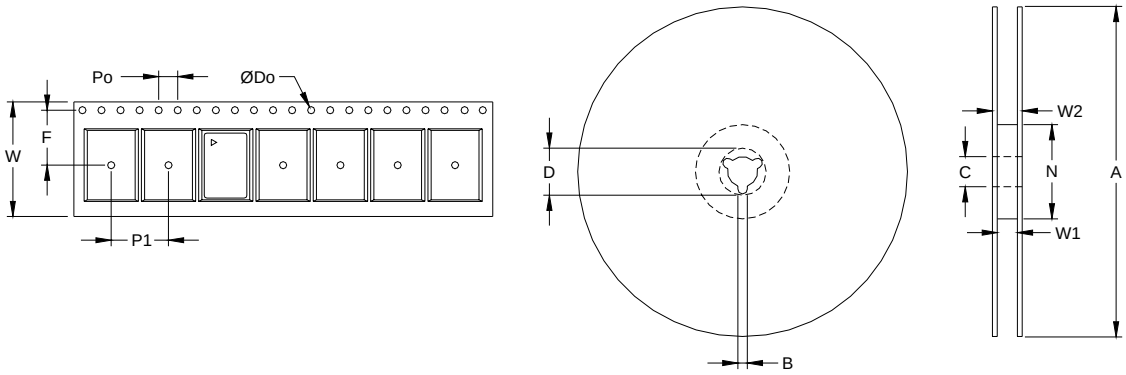

## Pad Layout




## Pin Out

| Pin | Symbol | Function |
|---|---|---|
| 1 | $V_C$ | VCXO Control Voltage |
| 2 | OE | Output Enable/Disable<br>Enabled = PECL Logic 1 (or Open)<br>Disabled = PECL Logic 0 |
| 3 | GND | Case and Electrical Ground |
| 4 | Output | Output |
| 5 | COutput | Complementary Output |
| 6 | $V_{cc}$ | Power Supply Voltage (3.3 V) |

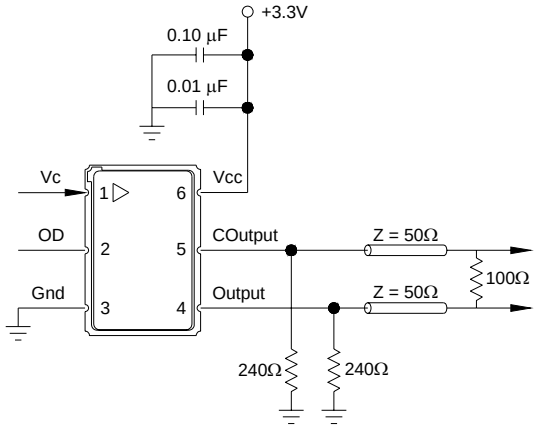
## Tape and Reel (EIA-481-2-A)



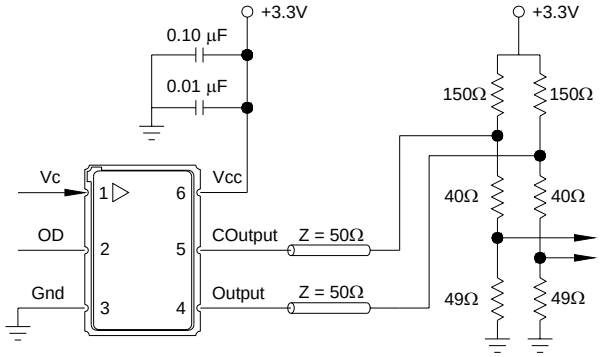

## Tape Dimensions (mm) / Reel Dimensions (mm)

| Dimension | W | F | Do | Po | P1 | A | B | C | D | N | W1 | W2 | # Per |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tolerance | Typ | Typ | Typ | Typ | Typ | Typ | Min | Typ | Min | Min | Typ | Max | Reel |
| VC-715 | 16 | 7.5 | 1.5 | 4 | 8 | 178 | 1.5 | 13 | 20.2 | 50 | 16.4 | 22.4 | 200 |

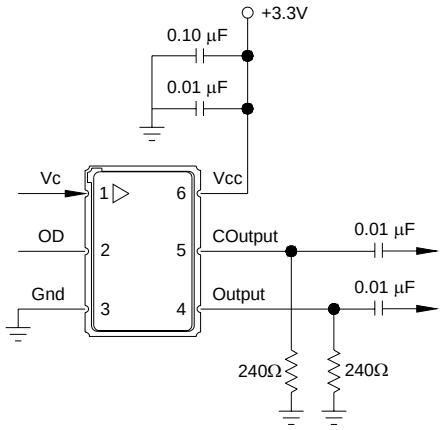
## Suggested Output Load Configurations



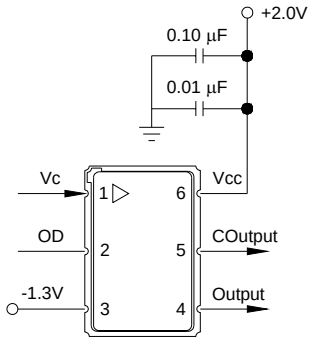

**LV-PECL to LV-PECL:** For short transmission lengths, the power consumption could be reduced by removing the 100Ω resistor and doubling the value of the pull down resistors.




**LV-PECL to LVDS:** Restricted for short transmission lengths. Configuration may require modification depending on LVDS receiver.




**Functional Test:** Allows standard power supply configuration. Since AC coupled, the LV-PECL levels cannot be measured.




**Production Test:** Allows direct DC coupling into 50Ω measurement equipment. Must bias the power supplys as shown. Similar to Figure 1.

## Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| Power Supply | $V_{CC}$ | 0 to 6 | V |
| Output Current | Iout | 25 | mA |
| Voltage Control Range | $V_C$ | 0 to $V_{CC}$ | V |
| Storage Temperature | TS | -55 to 125 | °C |
| Soldering Temp/Time[2] | $T_{LS}$ | 240/10 | °C/sec |

1) Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability.
2) Contact pads are gold over nickel, the maximum solder temp can be lower, e.g. 220C.

## Reliability

The VC-715 family is capable of meeting the following qualification tests:

## Environmental Compliance

| Parameter | Conditions |
|---|---|
| Mechanical Shock | MIL-STD-883, Method 2002 |
| Mechanical Vibration | MIL-STD-883, Method 2007 |
| Solderability | MIL-STD-883, Method 2003 |
| Gross and Fine Leak | MIL-STD-883, Method 1014 |
| Resistance to Solvents | MIL-STD-883, Method 2015 |

## Handling Precautions

Although ESD protection circuitry has been designed into the VC-715 proper precautions should be taken when handling and mounting. VI employs a human body model and a charged-device model (CDM) for ESD susceptibility testing and design protection evaluation.

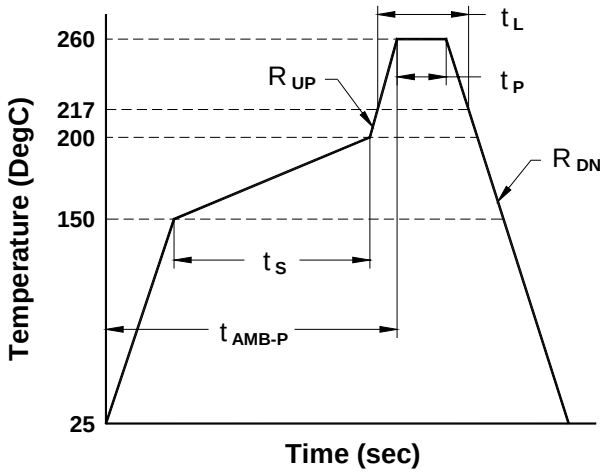
## ESD Ratings

| Model | Minimum | Conditions |
|---|---|---|
| Human Body Model | 500 | MIL-STD 883, Method 3015 |
| Charged Device Model | 500 | JESD 22-C101 |

VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VC-715's are hermetically sealed so an aqueous wash is not an issue. Contact pads are gold over nickel.

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

| 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 |




## Ordering Information

**VC - 715 - D F F - G F L – 19.440**

**Product Family**
VC: VCXO

**Package**
715: 5.0 x 7.5 x 2.8 mm
Low Frequency PECL

**Input**
D: 3.3 Vdc ±5%

**Output**
F: Complementary PECL

**Operating Temperature**
F: -40 to 85 °C
C: 0 to 70 °C

**Absolute Pull Range**
G: ± 50 ppm

**Enable - Disable)**
F: Pin 2

**Linearity, Stability**
L: ± 10 linearity, A: N/A

**Frequency**
Part Specific

## For Additional Information, Please Contact:

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