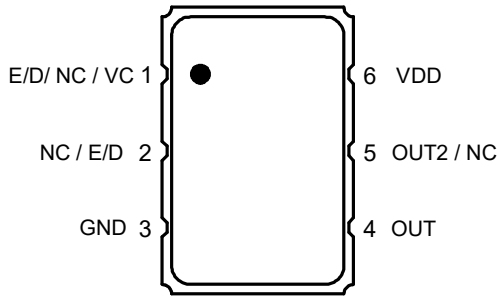## Description

The SWPQ201 devices are low phase noise quartz-based PLL oscillators supporting a large range of frequencies and output interface
types. These devices are designed to operate at three different power supplies and are available in multiple package sizes as well as temperature grades.

With a patented one-time program (OTP) allowing for infinite memory shelf life, the SWPQ201 devices can be programmed to generate an output frequency from 10MHz to 1500MHz with a resolution as low as 1Hz accuracy. The configuration capability of this family of devices allows for fast delivery times for both sample and large
production orders.

## Pin Assignments

**Note**: To minimize power supply line noise, a 0.01µF bypass capacitor should be placed between $V_{DD}$ (Pin 6) and GND (Pin 3).



**Table 1. Pin Description**

| Pin # | Name | Description |
|---|---|---|
| 1 | E/D<br>NC<br>VC | Enable/Disable [a][b]<br>No connect<br>VCXO |
| 2 | NC<br>E/D | No connect<br>Enable/Disable [a][b] |
| 3 | GND | Connect to ground |
| 4 | OUT | Output |
| 5 | OUT2<br>NC | Complementary output<br>No connect |
| 6 | $V_{DD}$ | Supply voltage |

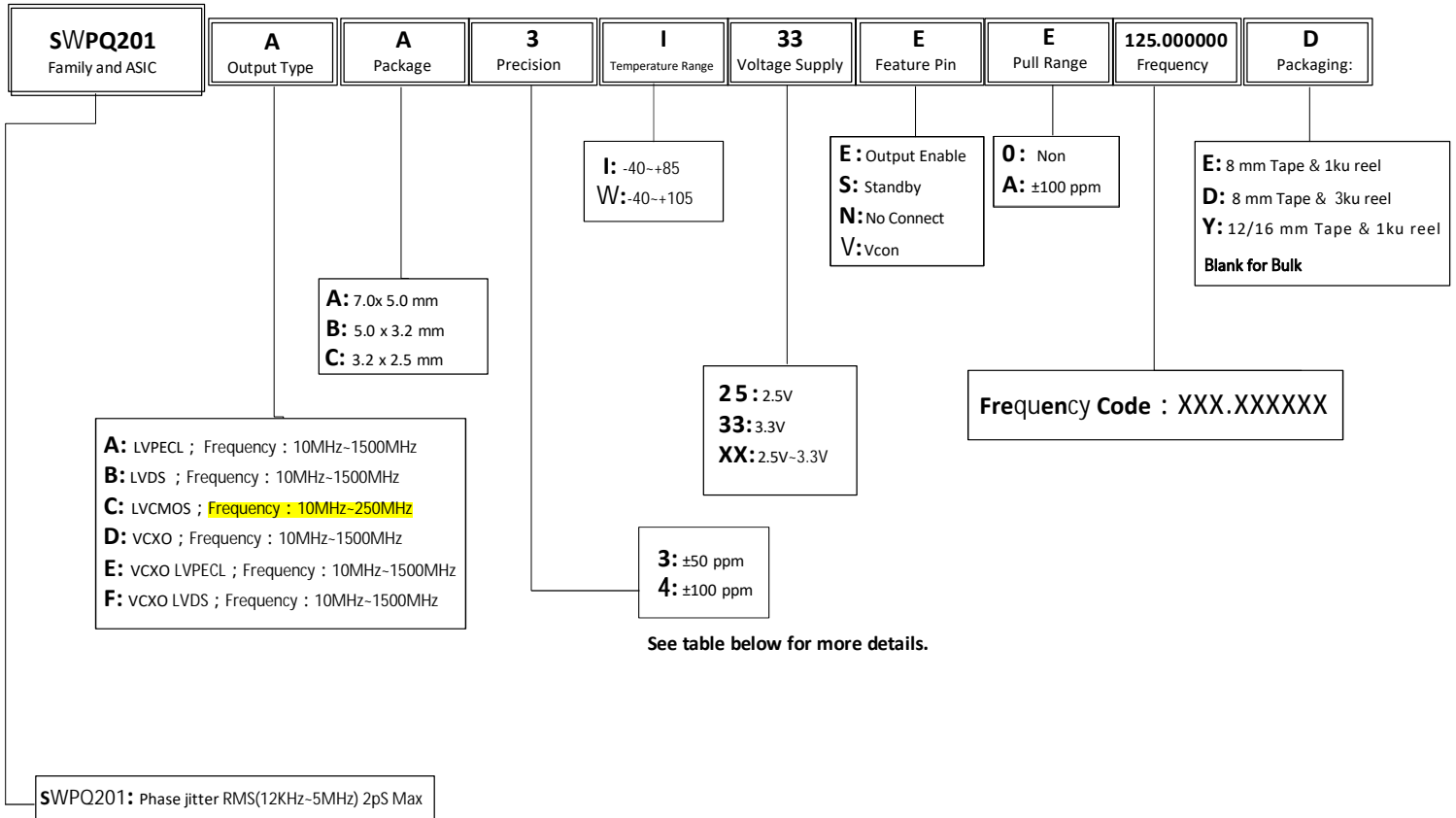[a] Pulled high internally = output enabled.

[b] Low = output disabled.

See Ordering Information for more details.

## Features

- Frequency range: 10MHz to 1500MHz[1]
- Output types: LVDS, LVPECL, LVCMOS, VCXO
  VCXO LVPECL, VCXO LVDS
- Supply voltage options: 2.5V, or 3.3V
- Phase jitter (12kHz to 5MHz): 2pS Max
- Package options:
  - 3.2 × 2.5 × 1.2 mm
  - 5.0 × 3.2 × 1.2 mm
  - 7.0 × 5.0 × 1.3 mm
- Frequency stability options: ±50, or ±100 ppm
- Operating temperature: -40°C to +85°C
- Frequency stability options: ±100 ppm
- Operating temperature: -40°C to +105°C

[1] There is a dead zone between 1037.5MHz to 1500MHz. Contact support for frequencies above 1500MHz.

# Ordering Information

| SWPQ201 Family and ASIC | A Output Type | A Package | 3 Precision | I Temperature Range | 33 Voltage Supply | E Feature Pin | E Pull Range | 125.000000 Frequency | D Packaging: |
|---|---|---|---|---|---|---|---|---|---|

**I:** -40~+85
**W:** -40~+105

**E :** Output Enable
**S:** Standby
**N:** No Connect
**V:** Vcon

**0:** Non
**A:** ±100 ppm

**E:** 8 mm Tape & 1ku reel
**D:** 8 mm Tape & 3ku reel
**Y:** 12/16 mm Tape & 1ku reel
**Blank for Bulk**

**A:** 7.0x 5.0 mm
**B:** 5.0 x 3.2 mm
**C:** 3.2 x 2.5 mm

**25:** 2.5V
**33:** 3.3V
**XX:** 2.5V~3.3V

**Frequency Code   XXX.XXXXXX**

**A:** LVPECL    Frequency    10MHz~1500MHz
**B:** LVDS    Frequency    10MHz~1500MHz
**C:** LVCMOS    Frequency    10MHz~250MHz
**D:** VCXO    Frequency    10MHz~1500MHz
**E:** VCXO LVPECL    Frequency    10MHz~1500MHz
**F:** VCXO LVDS    Frequency    10MHz~1500MHz

**3:** ±50 ppm
**4:** ±100 ppm

See table below for more details.

**SWPQ201:** Phase jitter RMS(12KHz~5MHz) 2pS Max

## Table 2.  Frequency Stability and Operating Temperature Decoder

| "Precision" and "Temperature Range" Codes | Operating Temperature | Frequency Stability | | |
|---|---|---|---|---|
| | | Minimum | Maximum | Units |
| "3" and "V" | -40°C to +85°C | -50 | +50 | ppm |
| "4" and "V" | -40°C to +85°C | -100 | +100 | ppm |
| "3" and "W" | -40° to +105°C | -50 | +50 | ppm |
| "4" and "W" | -40° to +105°C | -100 | +100 | ppm |

# Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the device. The ratings, which are standard values for Starwave 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.

**Table 3.  Absolute Maximum Ratings**

| Item | Rating | | | |
|---|---|---|---|---|
| $V_{DD}$ | -0.5 to +5.0V | | | |
| E/D | -0.5V to $V_{DD}$ + 0.5V | | | |
| OUT | -0.5V to $V_{DD}$ + 0.5V | | | |
| Storage Temperature | -55°C to 125°C | | | |
| Maximum Junction Temperature | 105°C | | | |
| Core Current | 30mA maximum  LVCMOS 10MHz~200MHz | | | |
| Theta $J_A$ | JU6 | 75.9 °C/W | JS6 | 89.6 °C/W |
| Theta $J_B$ | | 48.6 °C/W | | 54.3 °C/W |

# ESD Compliance

**Table 4.  ESD Compliance**

| Human Body Model (HBM) | 1000V |
|---|---|

# Mechanical Testing

**Table 5.  Mechanical Testing \***

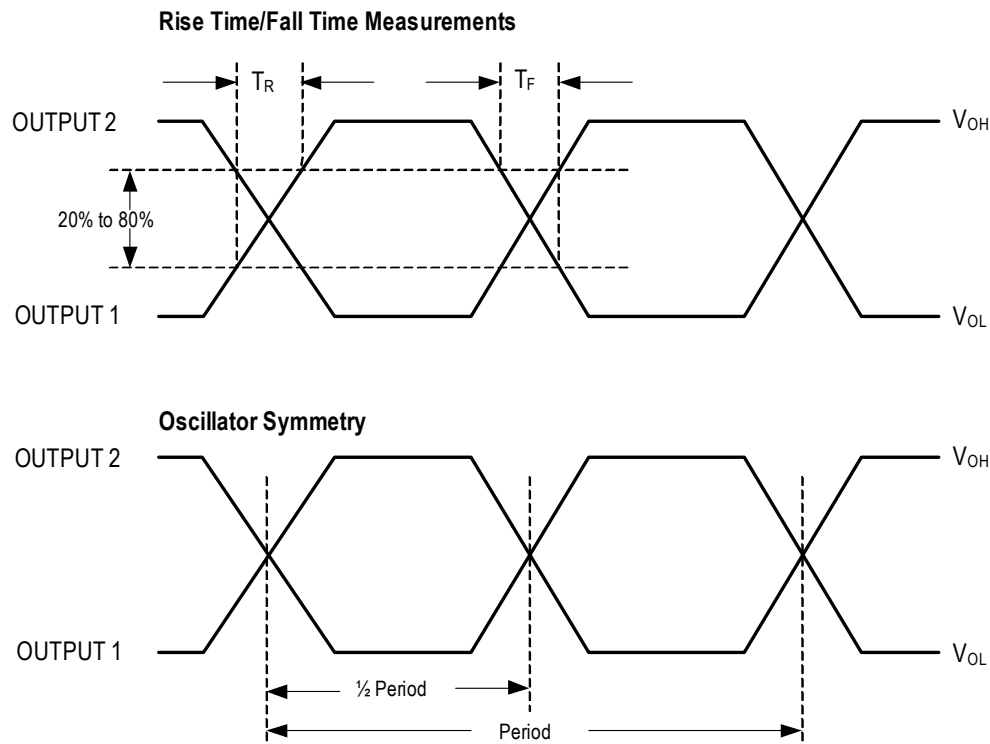| Parameter | Test Method |
|---|---|
| Mechanical Shock | Half-sine wave with 0.3ms 3000G. X, Y, Z each direction 1 time. |
| Mechanical Vibration | Frequency: 10 – 55MHz amplitude: 1.5mm.<br>Frequency: 55 – 2000Hz peak value: 20G.<br>Duration time: 4H for each X,Y,Z axis; total 12hours. |
| High Temp Operating Life (HTOL) | 2000 hours at 125°C (under power). |
| Hermetic Seal | Gross leak (air leak test). Fine leak (Helium leak test) He-pressure: 6kgf/cm² 2 hours. |

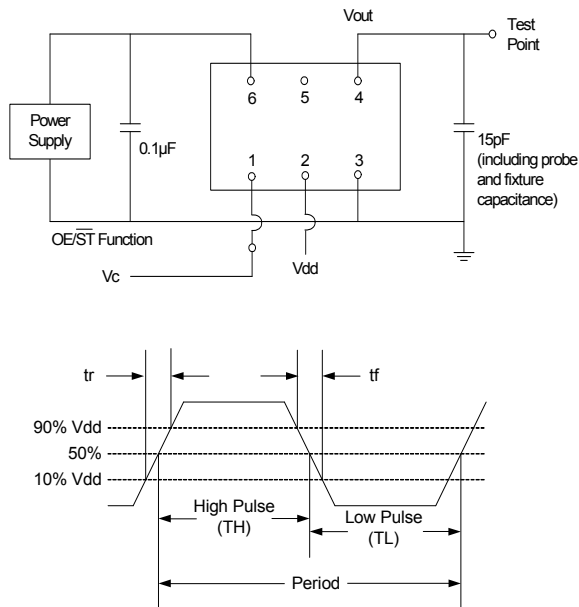\* MSL level does not apply.

# Solder Reflow Profile
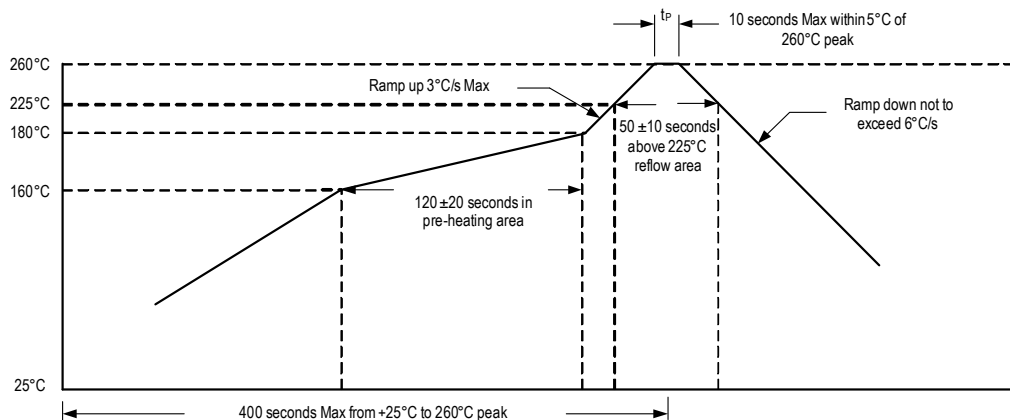
# Output Waveforms

## Figure 1.  LVDS Output Waveforms

**Output Levels/Rise Time/Fall Time Measurements**
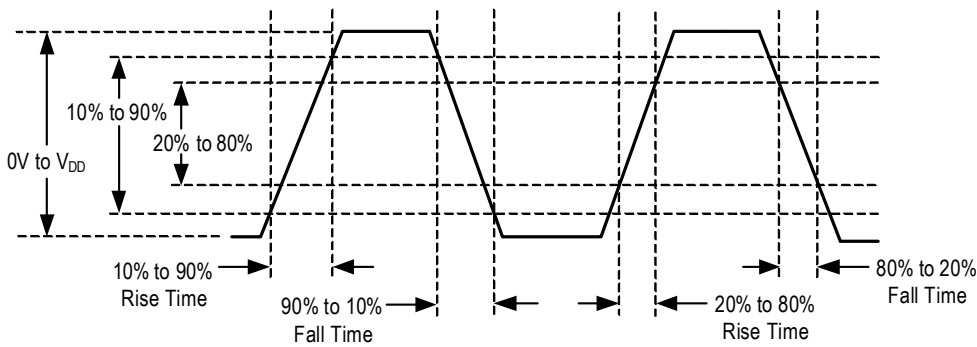


**Oscillator Symmetry**
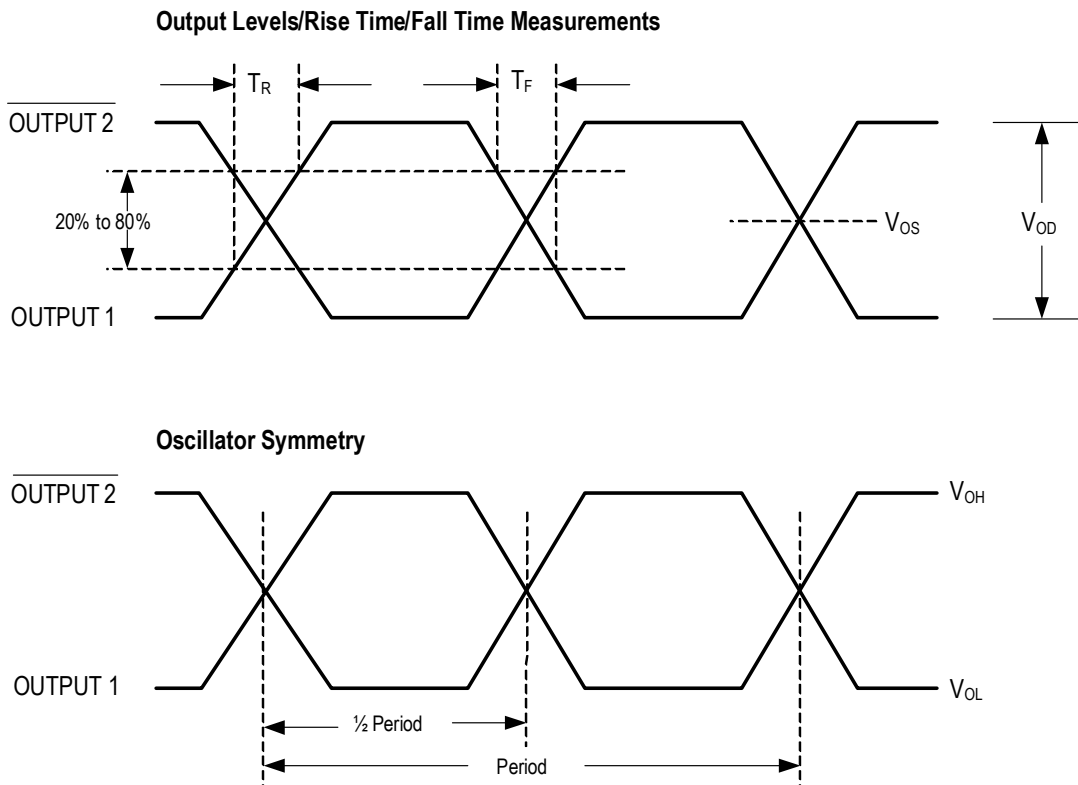


## Figure 2.  LVPECL Output Waveforms

**Rise Time/Fall Time Measurements**



**Oscillator Symmetry**

# STARWAVE

## Figure 3.  VCXO Output Waveforms

Vout

Test Point

Power Supply

0.1µF

6 5 4

1 2 3

15pF (including probe and fixture capacitance)

OE/ST Function

Vc

Vdd

tr

tf

90% Vdd

50%

10% Vdd

High Pulse (TH)

Low Pulse (TL)

Period

**Note:** Duty Cycle is computed as Duty Cycle = TH/Period.

## Figure 4.  LVCMOS Output Waveforms

### Rise Time/Fall Time Measurements

10% to 90%

20% to 80%

0V to $V_{DD}$

10% to 90% Rise Time

90% to 10% Fall Time

20% to 80% Rise Time

80% to 20% Fall Time

### Oscillator Symmetry

On Time ½ Period

Off Time ½ Period

50% $V_{DD}$
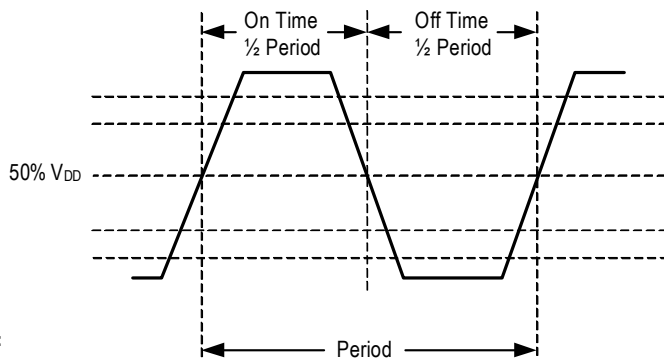
Period

**Note:**
11. Duty Cycle is computed as Duty Cycle = TH/Period.

**Figure 5.  VCXO LVPECL Output Waveforms**
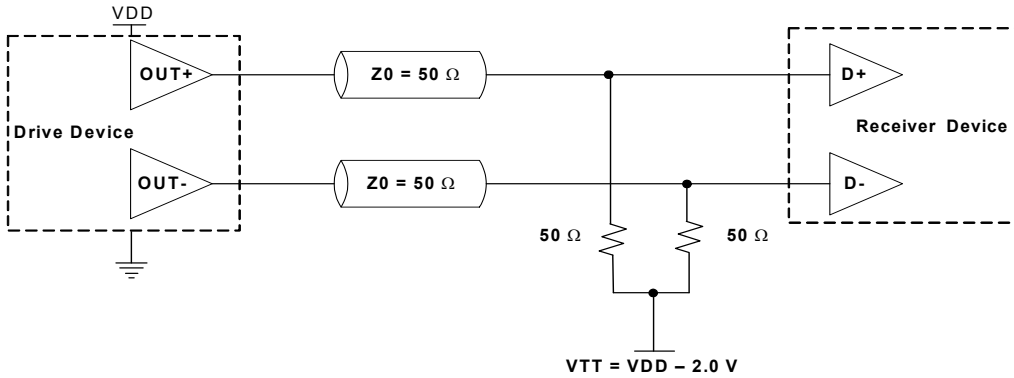


**Figure 1. LVPECL Typical Termination**
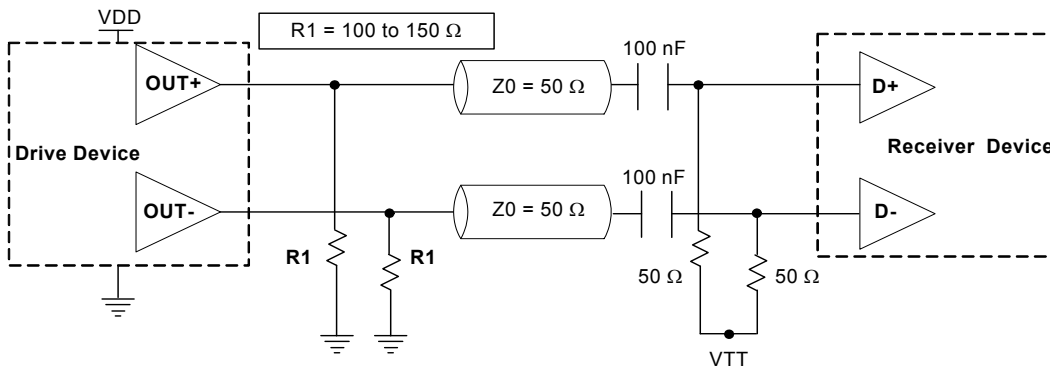


**Figure 2. LVPECL AC Coupled Termination**
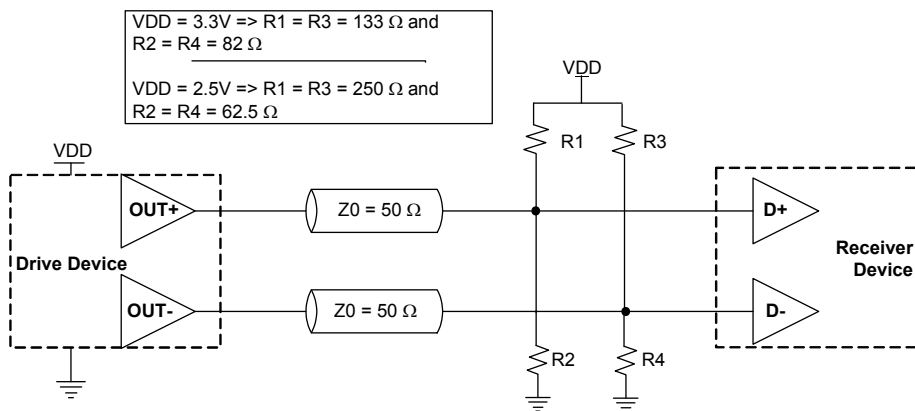


**Figure 3. LVPECL with Thevenin Typical Termination**
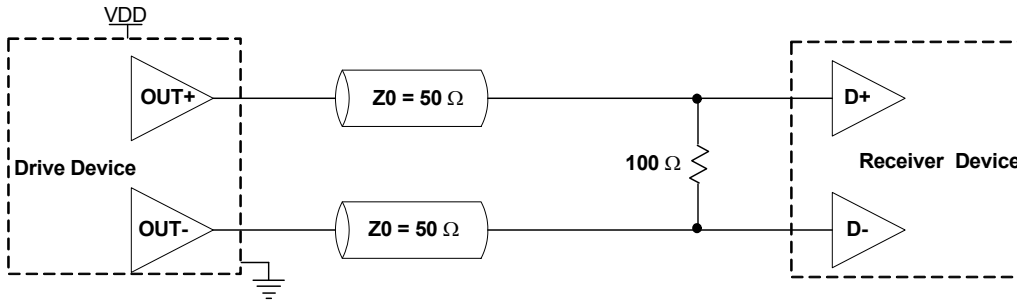
**Figure 6.  VCXO LVDS Output Waveforms**



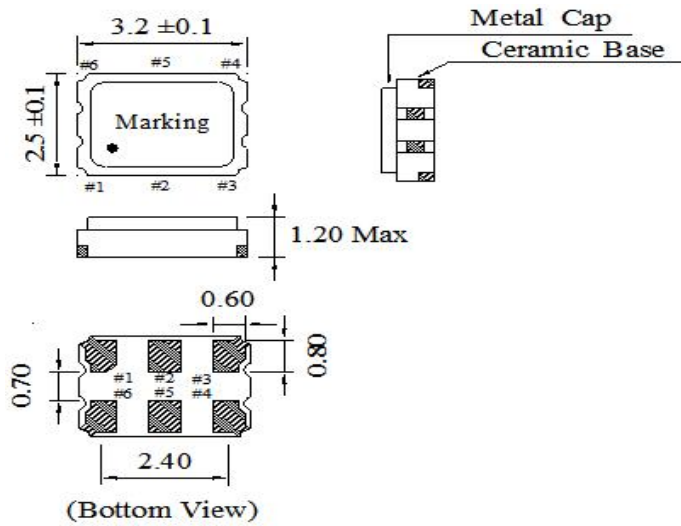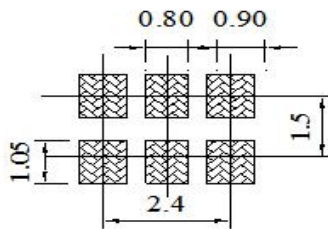**Figure 4. LVDS Single Termination (Load Terminated)**
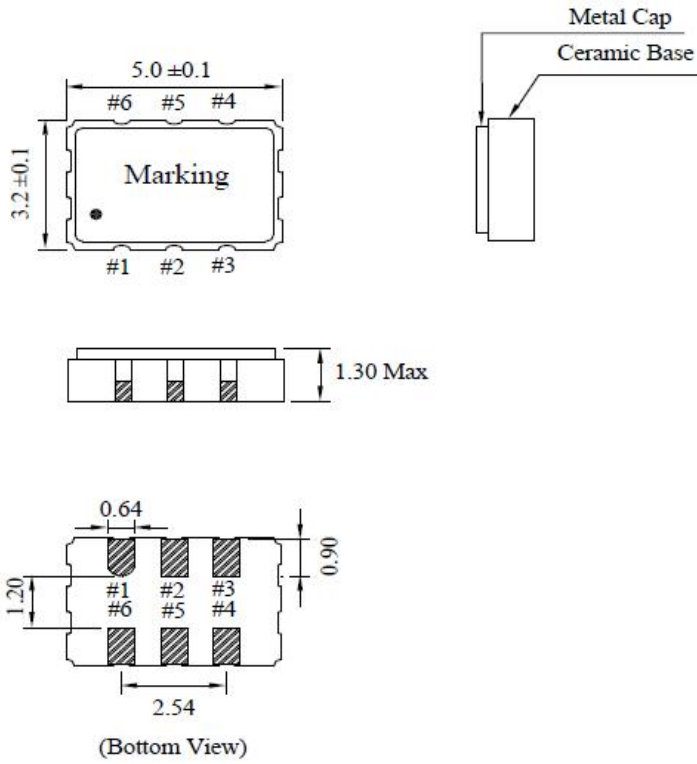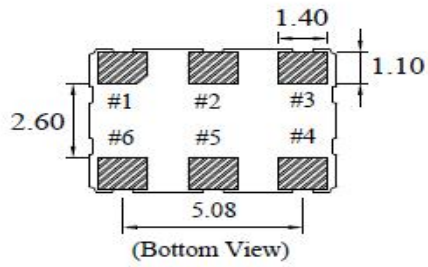
# Dimensions



(Bottom View)

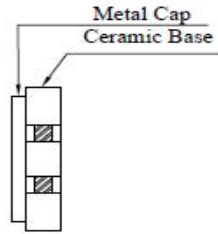**Recommended Soldering Pattern**



NOTES:

1. ALL DIMENSIONS IN MM.

# Dimensions

5.0 ±0.1
#6  #5  #4
3.2 ±0.1
Marking
#1  #2  #3

Metal Cap
Ceramic Base

1.30 Max

0.64
0.90
1.20
#1  #2  #3
#6  #5  #4
2.54

(Bottom View)

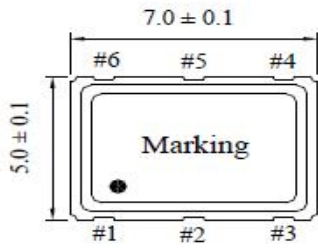**Recommended Soldering Pattern**
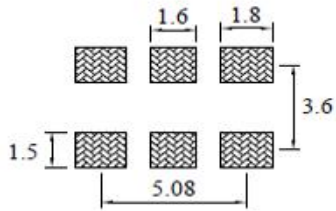
0.80
2.10
1.10
2.54

NOTES:

1. ALL DIMENSIONS IN MM.

## Dimensions



### Recommended Soldering Pattern



NOTES:

1. ALL DIMENSIONS IN MM.

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