



## Features

**2.400 GHz - 2.500 GHz**

**Standard 3 Wire Interface**

**Small layout 0.582" × 0.8"**



## Applications

**Digital Radio Equipment**  
**Fixed Wireless Access**  
**Satellite Communications Systems**  
**Base Stations**  
**Personal Communications Systems**  
**Portable Radios**  
**Test Instruments**  
**Wireless Infrastructure**



The CPLL58 is a complete PLL/Synthesizer needing only an external frequency reference and supply voltages for the internal PLL (phase lock loop) and VCO (voltage controlled oscillator). The Crystek CPLL58 is programmed using a standard three line interface (Data, Clock and Load Enable).

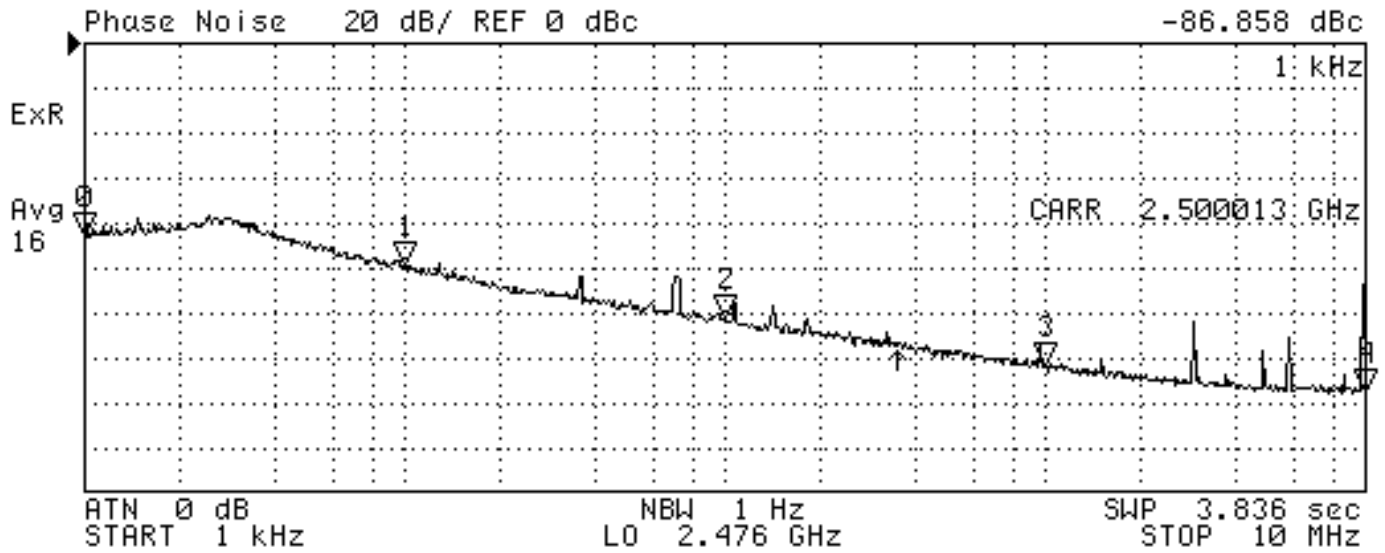
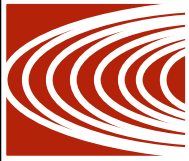
The CPLL58 family has been initially released to cover 1 GHz to 5 GHz in bands. It is housed in a compact 0.582-in. × 0.8-in. × 0.15-in. SMD package which saves board space. Typical phase noise at 4 GHz is -90 dBc/Hz at 10 kHz offset with 0 dBm minimum output power.





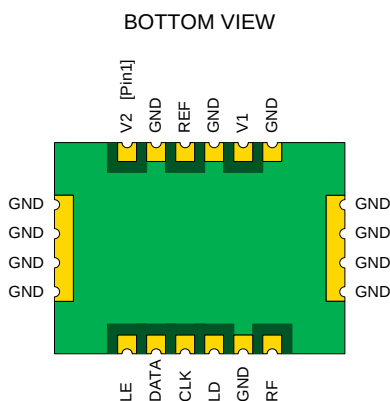
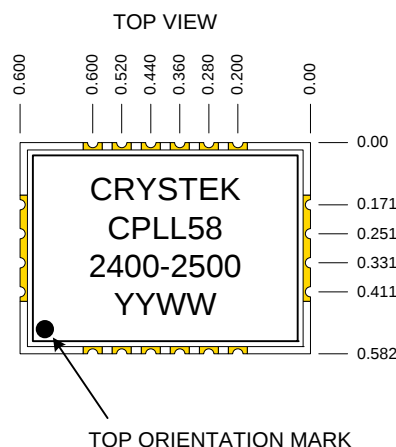
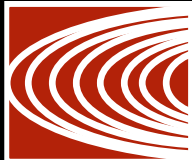
| PERFORMANCE SPECIFICATION                                                      | MIN   | TYP  | MAX   | UNITS  |
|--------------------------------------------------------------------------------|-------|------|-------|--------|
| <b>Frequency Range:</b>                                                        | 2.400 |      | 2.500 | GHz    |
| <b>Step Size:</b>                                                              |       | 1000 |       | kHz    |
| <b>Settling Time, to within <math>\pm 1</math>kHz (Freq. step &lt; 25MHz):</b> |       | 1    |       | msec   |
| <b>Output Power:</b>                                                           | 0     | +3.0 | +6.0  | dBm    |
| <b>Output Phase Noise: (See Plot Below)</b>                                    |       |      |       |        |
| @1kHz offset                                                                   |       | -85  | -80   | dBc/Hz |
| @10kHz offset                                                                  |       | -98  | -93   | dBc/Hz |
| @100kHz offset                                                                 |       | -122 | -117  | dBc/Hz |
| @1MHz offset                                                                   |       | -142 | -137  | dBc/Hz |
| <b>Power Supply:</b>                                                           |       |      |       |        |
| V1=VCO Supply                                                                  | 4.75  | 5.0  | 5.25  | Volts  |
| V2=PLL Supply                                                                  | 2.7   | 3.0  | 3.3   | Volts  |
| <b>Supply Current:</b>                                                         |       |      |       |        |
| I1=VCO Input Current                                                           |       | 50   |       | mA     |
| I2=PLL Input Current                                                           |       | 25   |       | mA     |
| Spurious Suppression                                                           |       |      |       | dBc    |
| PFDSpur                                                                        |       | -70  | -60   | dBc    |
| Reference Feedthru                                                             |       | -80  | -70   | dBc    |
| <b>Harmonic Suppression (2<sup>nd</sup> Harmonic):</b>                         |       |      |       |        |
| 2 <sup>nd</sup>                                                                |       | -15  | -10   | dBc    |
| Reference Frequency                                                            |       | 10   |       | MHz    |
| Input Reference Level                                                          | 0.8   |      | V2    | Vp-p   |
| RF Output Level                                                                | -5    | 0    | +5    | dBm    |
| Input Impedance                                                                |       | 100k |       | Ohm    |
| RF Output Impedance                                                            |       | 50   |       | Ohm    |
| <b>Operating Temperature Range:</b>                                            | -40   |      | +85   | °C     |
| <b>Logic Inputs (Clock, Data, and LE):</b>                                     |       |      |       |        |
| Input "High" Voltage                                                           | 1.4   |      |       |        |
| Input "Low" Voltage                                                            |       |      | 0.6   | Volts  |
| <b>Locked Detector (LD):</b>                                                   |       |      |       |        |
| Locked                                                                         | 1.4   |      |       | Volts  |
| Un-Locked                                                                      |       |      | 0.4   | Volts  |



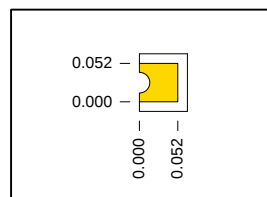


| N | SWP PARAM | VAL         |
|---|-----------|-------------|
| 0 | 1 kHz     | -86.858 dBc |
| 1 | 10 kHz    | -99.387 dBc |
| 2 | 100 kHz   | -123.44 dBc |
| 3 | 1 MHz     | -143.85 dBc |
| 4 | 10 MHz    | -155.95 dBc |



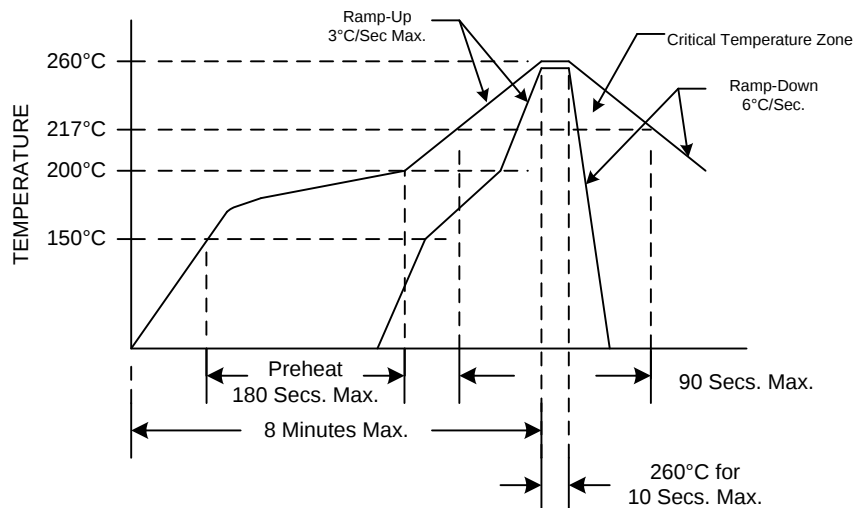


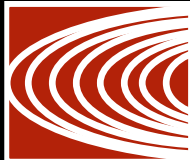
LE = Load Enable, CMOS Input  
DATA = Serial Data Input  
CLK = Clock  
LD = Lock Detect  
REF = Reference Input  
V1 = Analog Supply Input (VCO)  
V2 = Digital Supply Input (PLL)  
RF = RF Output



Pad Detail

### RECOMMENDED REFLOW SOLDERING PROFILE





## ENVIRONMENTAL COMPLIANCE

| Parameter              | Conditions               |
|------------------------|--------------------------|
| Mechanical Shock       | MIL-STD-883, Method 2002 |
| Mechanical Vibration   | MIL-STD-883, Method 2007 |
| Solderability          | MIL-STD-883, Method 1014 |
| Resistance to Solvents | MIL-STD-883, Method 2016 |

## Programming Guide for CPLL58-XXXX

### Introduction

The CPLL58 uses a simple 3 wire interface to program four internal registers. See Figure 1.

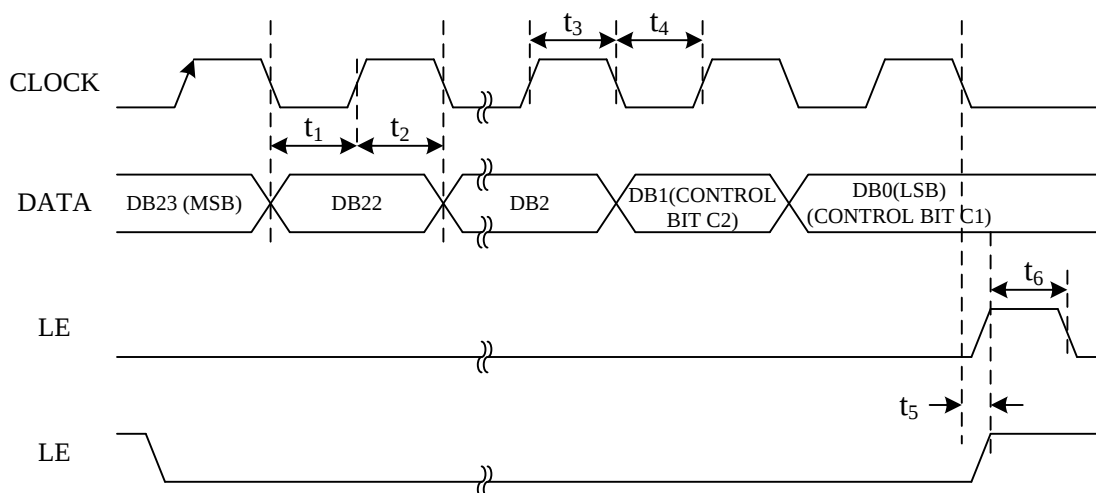


Figure 1. Timing Diagram

There are four 24 bit registers that need to be programmed. Which register is written into is simply controlled by Control Bits C1 and C2. Table I summarizes the Truth Table for Control Bits C1 and C2.

| Control Bits |    | Data Latch                           |
|--------------|----|--------------------------------------|
| C2           | C1 |                                      |
| 0            | 0  | R Counter                            |
| 0            | 1  | N Counter (A and B)                  |
| 1            | 0  | Function Latch (Including Prescaler) |
| 1            | 1  | Initialization Latch                 |

Table I. C2, C1 Truth Table



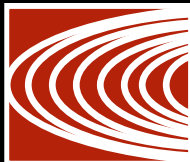


Table II shows the details of the four 24 bit registers.

| REFERENCE COUNTER LATCH |      |      |                          |                   |      |      |                            |                          |      |      |      |      |      |     |     |     |     |     |     |     |     |                 |       |
|-------------------------|------|------|--------------------------|-------------------|------|------|----------------------------|--------------------------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----------------|-------|
| RESERVED                |      |      | LOCK DETECT<br>PRECISION | TEST MODE<br>BITS |      |      | ANTI-<br>BACKLASH<br>WIDTH | 14-BIT REFERENCE COUNTER |      |      |      |      |      |     |     |     |     |     |     |     |     | CONTROL<br>BITS |       |
| DB23                    | DB22 | DB21 | DB20                     | DB19              | DB18 | DB17 | DB16                       | DB15                     | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1             | DB0   |
| X                       | 0    | 0    | LDP                      | T2                | T1   | ABP2 | ABP1                       | R14                      | R13  | R12  | R11  | R10  | R9   | R8  | R7  | R6  | R5  | R4  | R3  | R2  | R1  | C2(0)           | C1(0) |

| N COUNTER LATCH |      |         |                |      |      |      |      |      |      |      |      |      |      |     |     |               |     |     |     |     |     |              |       |
|-----------------|------|---------|----------------|------|------|------|------|------|------|------|------|------|------|-----|-----|---------------|-----|-----|-----|-----|-----|--------------|-------|
| RESERVED        |      | CP GAIN | 13-BIT COUNTER |      |      |      |      |      |      |      |      |      |      |     |     | 6-BIT COUNTER |     |     |     |     |     | CONTROL BITS |       |
| DB23            | DB22 | DB21    | DB20           | DB19 | DB18 | DB17 | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7           | DB6 | DB5 | DB4 | DB3 | DB2 | DB1          | DB0   |
|                 |      | G1      | B13            | B12  | B11  | B10  | B9   | B8   | B7   | B6   | B5   | B4   | B3   | B2  | B1  | A6            | A5  | A4  | A3  | A2  | A1  | C2(0)        | C1(1) |

| FUNCTION LATCH     |      |                 |                  |      |      |                   |      |      |                       |      |      |      |                  |                    |                    |             |                |     |     |                 |                  |                 |       |
|--------------------|------|-----------------|------------------|------|------|-------------------|------|------|-----------------------|------|------|------|------------------|--------------------|--------------------|-------------|----------------|-----|-----|-----------------|------------------|-----------------|-------|
| PRESCALER<br>VALUE |      | POWER-DOWN<br>2 | CURRENT SETTING2 |      |      | CURRENT SETTING 1 |      |      | TIMER COUNTER CONTROL |      |      |      | FASTLOCK<br>MODE | FASTLOCK<br>ENABLE | CP THREE-<br>STATE | PD POLARITY | MUXOUT CONTROL |     |     | POWER-DOWN<br>1 | COUNTER<br>RESET | CONTROL<br>BITS |       |
| DB23               | DB22 | DB21            | DB20             | DB19 | DB18 | DB17              | DB16 | DB15 | DB14                  | DB13 | DB12 | DB11 | DB10             | DB9                | DB8                | DB7         | DB6            | DB5 | DB4 | DB3             | DB2              | DB1             | DB0   |
| P2                 | P1   | PD2             | CP16             | CP15 | CP14 | CP13              | CP12 | CP11 | TC4                   | TC3  | TC2  | TC1  | F5               | F4                 | F3                 | F2          | M3             | M2  | M1  | PD1             | F1               | C2(1)           | C1(0) |
|                    |      |                 |                  |      |      |                   |      |      |                       |      |      |      |                  |                    |                    |             |                |     |     |                 |                  |                 |       |

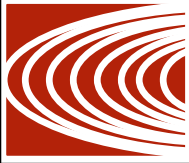
| INITIALIZATION LATCH |      |                         |                  |      |      |                   |      |      |                       |      |      |      |               |                 |                |             |                |     |     |                         |               |              |       |
|----------------------|------|-------------------------|------------------|------|------|-------------------|------|------|-----------------------|------|------|------|---------------|-----------------|----------------|-------------|----------------|-----|-----|-------------------------|---------------|--------------|-------|
| PRESCALER VALUE      |      | POWER-DOWN <sub>2</sub> | CURRENT SETTING2 |      |      | CURRENT SETTING 1 |      |      | TIMER COUNTER CONTROL |      |      |      | FASTLOCK MODE | FASTLOCK ENABLE | CP THREE-STATE | PD POLARITY | MUXOUT CONTROL |     |     | POWER-DOWN <sub>1</sub> | COUNTER RESET | CONTROL BITS |       |
| DB23                 | DB22 | DB21                    | DB20             | DB19 | DB18 | DB17              | DB16 | DB15 | DB14                  | DB13 | DB12 | DB11 | DB10          | DB9             | DB8            | DB7         | DB6            | DB5 | DB4 | DB3                     | DB2           | DB1          | DB0   |
| P2                   | P1   | PD2                     | CP16             | CP15 | CP14 | CP13              | CP12 | CP11 | TC4                   | TC3  | TC2  | TC1  | F5            | F4              | F3             | F2          | M3             | M2  | M1  | PD1                     | F1            | C2(1)        | C1(1) |

Table II. Latch Summary

When using the CPLL58 family in a synthesizer application, all four 24 bit registers need to be written into after power-up. After writing all four latches the first time, subsequent frequency step changes can be accomplished by changing the N Counter Latch only.

Specifications subject to change without notice.





***Programming Crystek p/n: CPLL58-2400-2500***

The following is specific programming for CPLL58-2400-2500 (2.400 GHz ~ 2.500 GHz with 1000 kHz Step Size and 10 MHz input reference frequency).

Program all three registers with the following:

R Counter Latch: 000028 H  
N Counter Latch: 004B01 H  
Function Latch: 9F8083 H

The above values will set the CPLL58-2400-2500 to 2.400 GHz



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