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1. Register Descriptions

The register descriptions section describes the behavior and function of the customer-programmable volatile-memory registers in the 5x1503 (5X1503/5L1503) clock generator. For information on product operation, see the *5X1503 Datasheet*.

2. MicroClock Clock Generator Register Set

The 5X1503/5L1503 contains volatile (RAM) 8-bit registers and non-volatile 8-bit registers (see Figure 1). The non-volatile registers are One-Time Programmable (OTP), and pre-programmed at the factory with a custom dash-code configuration.

The device operates according to settings in the RAM registers. The device contains two complete configurations. At power-up, a pre-programmed configuration is transferred from OTP to the RAM registers. The device behavior can then be modified by reprogramming the RAM registers through I2C.

The device can start up in "I2C mode" or in "Dynamic Frequency Control mode" (DFC), depending upon the status of the SEL_DFC pin 2 at power-up (see also the datasheet). I2C access is only possible when the device has started up in I2C mode. Pre-programming settings determine which of the four DFC configurations is loaded into the RAM registers at power-up in I2C mode. Using I2C commands, the configuration can be changed and there are also commands to reload a DFC configuration.

Table 1. 5X1503/5L1503 Family of Products

| Product | Description | Package |
|---------|--|---------|
| 5X1503 | 1.8V integrated with an internal 52MHz crystal (standard 5X1503). | 10-DFN |
| 5L1503 | 1.8V using an external crystal (standard 5L1503). | 10-DFN |
| 5X1503L | 1.8V integrated with an internal 52MHz crystal, low output swing at channel 1. | 10-DFN |
| 5L1503L | 1.8V using an external crystal, low output swing at channel 1. | 10-DFN |
| 5X1503S | 1.8V integrated with an internal 52MHz crystal. (support spread spectrum clock). | 10-DFN |
| 5L1503S | 1.8V using an external crystal. (support Spread spectrum clock). | 10-DFN |

3. Limit of VCO for Each MicroClock Device

- For standard 5X1503 / standard 5L1503:
FVCO: 50MHz – 130MHz
- For 5X1503L / 5L1503L:
FVCO: 50MHz – 130MHz
- For 5X1503S / 5L1503S:
FVCO: 500MHz – 1100MHz

4. User Configuration Table Selection on PLL

Dynamic Frequency Control (DFC) mode is to use either four different fractional feedback divider values, or two complete configurations with two different fractional feedback divider values which are used to control VCO frequency applying only to PLL.

At power-up, the voltage at SEL_DFC (pin 2) is latched and used to select the function on SEL_DFC/SDA/DFC0 (pin 2) and SCL/OE3/DFC1 (pin 1) pins on the device (see (Table 2 [Table 1:](#))).

When a pull-down resistor (0Ω - $10K\Omega$) is placed on SEL_DFC (pin 2), the SEL_DFC/SDA/DFC0 and SCL/OE3/DFC1 pins are configured to be hardware selection as DFC inputs, DFC0 and DFC1. Connecting DFC0 and DFC1 to VDD33 and/or GND selects one of four DFC configuration sets, DFC 0 through DFC 3, which is then loaded into the volatile configuration registers to configure the clock synthesizer frequencies. The DFC 0 through DFC 3 configurations are preprogrammed at the factory according to customer specifications and assigned a specific dash code as part number.

When a pull-up resistor ($1.8K\Omega$ - $10K\Omega$) is placed on SEL_DFC (pin 2), the pins SEL_DFC/SDA/DFC0 and SCL/OE3/DFC1 are configured as an I²C interface's SDA and SCL slave bus. DFC configuration 0 is loaded into the volatile configuration registers by default to configure the clock synthesizer. The host system can use the I²C bus to update the volatile RAM registers to change the configurations and to read status registers.

The pull-up resistor on SEL_DFC will become the pull-up resistor for the SDATA line of the I²C interface. $10K\Omega$ is commonly used when the 5x1503 is the only device on the bus, and smaller values may be needed when the I²C interface is shared with multiple devices.

Table 2. Power-Up Setting of Hardware Select Pin vs. I2C Mode, and Default OTP Configuration Register

| SEL_DFC Strap at Power Up | DFC1/SCL pin | DFC0/SDA pin | Function |
|-------------------------------------|--------------|--------------|--|
| Pull-Down | 0 | 0 | DFC 0 used to initialize RAM configuration registers. |
| | 0 | 1 | DFC 1 used to initialize RAM configuration registers. |
| | 1 | 0 | DFC 2 used to initialize RAM configuration registers. |
| | 1 | 1 | DFC 3 used to initialize RAM configuration registers. |
| 1.8K Ω -10k Ω Pull-Up | SCL | SDA | I2C bus enabled to access registers. DFC 0 used to initialize RAM configuration registers. |

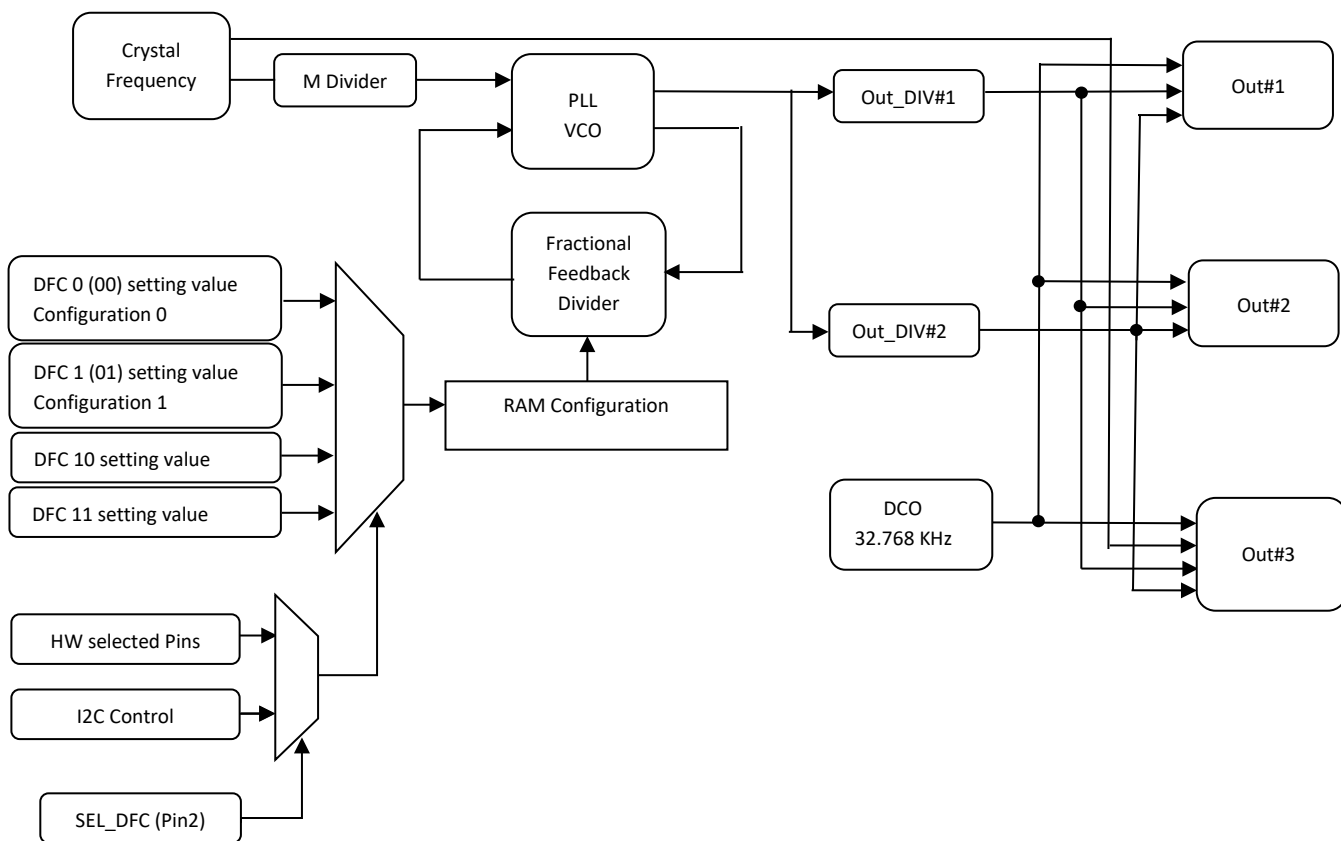


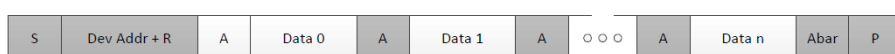
Figure 1. DFC Block Diagram on PLL

5. I2C Interface and Register Access

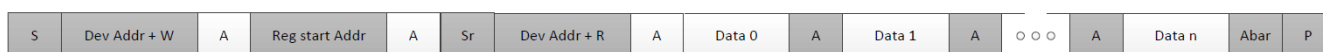
When powered up in I²C mode, the device allows access to internal RAM registers. The default device address is 0xD0 for 8 bits or 0x68 for 7 bits. The device can be pre-programmed for addresses in the range 0xD0-D2-D4-D6 for 8 bits, or 0x68-69-6A-6B for 7 bits. The device acts as a slave device on the I2C bus using one of the four I2C addresses to allow multiple devices to be used in the system. The interface accepts byte-oriented block write and block read operations. Two address bytes specify the register address of the byte position of the first register to write or read. Data bytes (registers) are accessed in sequential order from the lowest to the highest byte (most significant bit first). Read and write block transfers can be stopped after any complete byte transfer. During a write operation, data will not be moved into the registers until the STOP signal is received, at which point, all data received in the block write will be written simultaneously in the registers.

For full electrical I²C compliance, it is recommended to use external pull-up resistors for SDA (Serial Data) and SCL (Serial Clock). There are no internal pull-up or pull-down resistors.

Current Read



Sequential Read



Sequential Write



- from master to slave
- from slave to master

- S = start
- Sr = repeated start
- A = acknowledge
- Abar = none acknowledge
- P = stop

Table 3. DFC Register Map Summary ¹

| Register Address | Function Explanation |
|------------------|---|
| 0x00 | Configuration selection / I2C settings |
| 0x01 | Xtal divider / Dash Code ID |
| 0x02 | Crystal Oscillator / PPS mode settings |
| 0x03 | OPT protection / PPS mode settings |
| 0x04 | PLL and integer feedback divider settings |
| 0x05 | Integer feedback divider setting |
| 0x06 | Fractional feedback divider setting |
| 0x07 | |
| 0x08 | Spread-spectrum setting |
| 0x09 | |
| 0x0A | |
| 0x0B | Reference divider setting |
| 0x0C | PLL loop filter R setting |
| 0x0D | PLL charge pump control |
| 0x0E | Output Dividers 1 setting |
| 0x0F | Output Dividers 2 setting |
| 0x10 | OE#1 and OE#2 function selection |
| 0x11 | OUT#1, OUT#2, and OUT#3 clock selection |
| 0x12 | PLL and PPS timer control |
| 0x13 | Output control setting |
| 0x14 | OUT#1 and DIV4 control |

1. See Table 4 for details at the bit level.

Table 4. RAM Register Map

| Register Address | | Register Bit | Default | Function explanation |
|------------------|------|---|---------|--|
| Decimal | Hex | | | |
| 00 | 0x00 | 7 | 0 | OTP in Device preprogrammed? 0 = Non-Programmed, 1 = Programmed. |
| | | 6 | 0 | Device TRIM bits preprogrammed? 0 = No, 1 = Yes |
| | | [5..4] | 00 | I ² C Device address: 00=0xD0 / 0x68, 01 = 0xD2 / 0x69, 10 = 0xD4 / 0x6A, 11 = 0xD6 / 0x6B ⁽¹⁾ |
| | | 3 | 0 | OTP protection: 0 = Read/Write enabled, 1 = Write Blocked ⁽²⁾ |
| | | 2 | 0 | OTP complete configuration selection: 0 = configuration 0 (Default), 1 = configuration 1 |
| | | [1..0] | 00 | DFC selection: 00 = DFC#0 (Default) 01 = DFC#1 10 = DFC#2 11 = DFC#3 |
| 01 | 0x01 | 7 | 0 | Crystal divider for DCO: 0 = Crystal value / 2, 1 = Bypass without using divider. |
| | | [6..0] | 00-hex | Dash Code or Device ID information |
| 02 | 0x02 | [7..4] | 0001 | Crystal Oscillator Output pin Capacitance: C _{XOUT} (pF) = 9.0 + Bits[3..0] × 1.0 |
| | | $CL_{XTAL} = C_{XIN} \times C_{XOUT} / (C_{XIN} + C_{XOUT})$ $C_{XIN} = C_{XOUT} \text{ recommended for optimum oscillator gain: } CL_{XTAL} = C_{XIN} / 2 = C_{XOUT} / 2$ General CL _{XTAL} resolution is 0.5pF. Resolution of 0.25pF possible by setting C _{XIN} 1 bit lower than C _{XOUT} . | | |
| | | [3..2] | 00 | PPS Hysteresis voltage threshold setting: 00 = 20mV (Default) 01 = 40mV 10 = 60mV 11 = 80mV |
| | | 1 | 0 | PPS Vbias programming Bit 1 |
| | | 0 | 0 | PPS Vbias programming Bit 0 |
| | | 03 | 0x03 | 7 |
| 03 | 0x03 | 6 | 0 | OTP configuration 2 protection bit: 0 = Disabled, 1 = Enabled |
| | | 5 | 0 | OTP configuration 1 protection bit: 0 = Disabled, 1 = Enabled |
| | | 4 | 0 | OTP configuration 0 protection bit: 0 = Disabled, 1 = Enabled |
| | | [3..2] | 00 | PPS OE2 amplitude programming: 00 = 400mV (Default) 01 = 500mV 10 = 600mV 11 = 700mV |
| | | [1..0] | 00 | PPS OE1 amplitude programming: 00 = 400mV (Default) 01 = 500mV 10 = 600mV 11 = 700mV |
| | | 04 (Apply to 5X1503S) | 0x04 | 7 |
| 6 | 0 | Differential CLKIN on X1/X2: 0 = Disabled, 1 = Enabled (For 5X1503 Only) 11=0xD6 / 0x6B ⁽¹⁾ | | |
| 5 | 0 | PLL Spread Hi-resolution Selection: 0 = Normal, 1 = Enabled, Shifted to 4-bits | | |
| 4 | 0 | PLL 3 rd pole loop filter enable bit: 0 = Disabled, 1 = Enabled | | |

5X1503 / 5L1503 Register Descriptions and Programming Guide

| Register Address | | Register Bit | Default | Function explanation |
|--|------|--------------|---------|---|
| Decimal | Hex | | | |
| | | 3 | 0 | Reserved. |
| | | [2:0] | 000 | PLL Feedback Integer Divider, Bits[10..8]. Supported values 16 ~ 2047. Default is 48 |
| 04 (Apply to 5X1503 /5X1503L) | 0x04 | 7 | 0 | Ultra power down bit: 0 = Disabled , 1 = Enabled |
| | | 6 | 0 | Differential CLKIN on X1/X2: 0 = Disabled , 1 = Enabled (For 5X1503 Only) 11 = 0xD6 / 0x6B ⁽¹⁾ |
| | | 5 | 0 | PLL Spread Hi-resolution Selection: 0 = Normal , 1 = Enabled, Shifted to 4-bits |
| | | 4 | 0 | PLL 3 rd pole loop filter enable bit: 0 = Disabled , 1 = Enabled |
| | | 3 | 0 | Selection of Divide by 4: 0 = Disabled , 1 = Enabled |
| | | [2:0] | 000 | PLL Feedback Integer Divider, Bits[10..8]. Supported values 16 ~ 2047. Default is 48 |
| 05 | 0x05 | [7..0] | 28-hex | PLL Feedback Divider, Bits[7..0] of 11 bits total. See 0x04 for Bits[2:0]. 5X1503S = 28-hex in default 5X1503 / 5X1503L = 30-hex in default |
| 06 | 0x06 | [15:8] | 00-hex | PLL Fractional Feedback Divider Bit[15:8] of 16 bits total, See 0x07 for Bit[7:0] Default is 00 |
| 07 | 0x07 | [7:0] | 00-hex | PLL Fractional Feedback Divider Bit[7:0] of 16 bits total, See 0x06 for Bit[15:8] Default is 00 |
| 08 | 0x08 | [15:8] | 00-hex | PLL Spread Spectrum Step Size Control Bit[15:8] of 16 bits total, See 0x09 for Bit[7:0], Default is 00 meaning no spread function. |
| 09 | 0x09 | [7:0] | 00-hex | PLL Spread Spectrum Step Size Control Bit[7:0] of 16 bits total, See 0x08 for Bit[15:8], Default is 00 meaning no spread function. |
| 10 | 0x0A | [7:0] | 00-hex | PLL Spread Period Control, Bit[7:0] of 8 bits total. Default is 00 meaning no spread function. |
| 11 | 0x0B | 7 | 1 | PLL Reference Divider, Divide-by-1: 0 = Disabled , 1 = Enabled 5X1503S = 1 (default) 5X1503 / 5X1503L = 0 (default) |
| | | 6 | 0 | PLL Reference Divider, Divide-by-2: 0 = Disabled , 1 = Enabled |
| | | [5..0] | 011010 | PLL Reference Divider, Divide by 1 ~ 63. Default is 26. |
| 12 | 0x0C | 7 | 0 | PLL Reference Divider Doubler: 0 = Disabled , 1 = Enabled |
| | | 6 | 0 | PLL Reference Current Selection, 0 = 1X, 1 = 2X 5X1503S = 1 (default) 5X1503 / 5X1503L = 0 (default) |
| | | 5 | 0 | PLL Spread Spectrum Control: 0 = Disabled, 1 = Enabled |
| | | [4..0] | 00001 | For 5X1503S PLL Loop Filter Resistor. Setting 00001 for 1KΩ only. $R_{LF2} (K\Omega) = 7K + (1K \times PLL_R1K) + (12.5K \times PLL_R12.5K) + (25K \times PLL_R25K) + (50K \times PLL_R50K) + (100K \times PLL_R100K)$ |
| | | [4..0] | 00011 | For 5X1503 / 5X1503L PLL Loop Filter Resistor. Setting 00011 for 44.5KΩ only. $R_{LF2} (K\Omega) = 7K + (12.5K \times PLL_R12.5K) + (25K \times PLL_R25K) + (50K \times PLL_R50K) + (75K \times PLL_R75K) + (100K \times PLL_R100K)$ |

5X1503 / 5L1503 Register Descriptions and Programming Guide

| Register Address | | Register Bit | Default | Function explanation |
|------------------|------|--------------|----------|--|
| Decimal | Hex | | | |
| 13 | 0x0D | [7..0] | 10111001 | For 5X1503S PLL Charge Pump Multiplier = Bits[4..0] + 1. Range is 1 ~ 63. $[10\mu\text{A} \times (1 + \text{SIREF})(1\text{XCP_1X} + 1\text{XCP_2X} + 1\text{XCP_4X} + 1\text{XCP_8X} + 1\text{XCP_16X} + 1\text{XCP_31X})] / 3\text{XCP_3} + 24\text{XCP_24}$ $I_{\text{CP2}} (\mu\text{A}) = 10 \times (1 + \text{B11Bit}[0]) \times (1 + \text{Bits}[7..3]) / (\text{Bit}[2] / 24) \text{ or } (\text{Bit}[1] / 3)$. Default is $11 \times (1+0) \times (1+4) / (24) = 1.667\mu\text{A}$ |
| | | | 00010110 | For 5X1503 / 5X1503L PLL Charge Pump Multiplier = Bits[4..0] + 1. Range is 1 ~ 63. $[10\mu\text{A} \times (1 + \text{SIREF})(1\text{XCP_1X} + 1\text{XCP_2X} + 1\text{XCP_4X} + 1\text{XCP_8X} + 1\text{XCP_16X} + 1\text{XCP_31X})] / 3\text{XCP_3} + 24\text{XCP_24}$ $I_{\text{CP2}} (\mu\text{A}) = 10 \times (1 + \text{B11Bit}[0]) \times (1 + \text{Bits}[7..3]) / (\text{Bit}[2] / 24) \text{ or } (\text{Bit}[1] / 3)$. Default is $11 \times (1+0) \times (1+4) / (24) = 1.667\mu\text{A}$ |
| 14 | 0x0E | [7:3] | 01010 | For 5X1503S Output Divider1 (DIV1) Value, Default is 10, Refer to Table 3 in datasheet on Page6 |
| | | [7:3] | 00001 | For 5X1503 / 5X1503L Output Divider1 (DIV1) Value, Default is 3, Refer to Table 3 in datasheet on Page6 |
| | | 2 | 0 | Divider2 (DIV2) source clock select: 0 = REF , 1 = PLL, See Bit0 for source clock. |
| | | 1 | 1 | Divider1 (DIV1) source clock select: 0 = REF , 1 = PLL |
| | | 0 | 0 | Divider2 (DIV2) source seed select: 0 = disable, 1 = from DIV1, See Bit2 for DIV2 clock selection. |
| 15 | 0x0F | [7:3] | 00001 | Output Divider1 (DIV1) Value, Default is 3, Refer to Table 3 in datasheet on Page6 |
| | | 2 | 0 | Out#3 Output state select control: 0 = Normal, 1 = Tristate |
| | | 1 | 0 | Out#2 Output state select control: 0 = Normal, 1 = Tristate |
| | | 0 | 0 | Out#1 Output state select control: 0 = Normal, 1 = Tristate |
| 16 | 0x10 | 7 | 1 | Out#1 Output enable control: 0 = Disable, 1 = Enable (Default) |
| | | [6:5] | 00 | OE1 pin function selection: 00 = OUT#1 output enable/disable control (Default) 01 = Power down # 10 = OUT#1 set as PPS mode 11 = DFC0 |
| | | 4 | 1 | Out#2 Output enable control: 0 = Disable, 1 = Enable (Default) |
| | | [3:2] | 00 | OE2 pin function selection: 00 = OUT#2 output enable/disable control (Default) 01 = Config_SEL 10 = OUT#2 set as PPS mode 11 = DFC1 |
| | | 1 | 1 | Out#2 Output Free-run control: 0 = Free-run, 1 = Normal (Default) |
| | | 0 | 0 | Out#1 Output Free-run control: 0 = Free-run (Default), 1 = Normal |

5X1503 / 5L1503 Register Descriptions and Programming Guide

| Register Address | | Register Bit | Default | Function explanation |
|------------------|------|--------------|---------|--|
| Decimal | Hex | | | |
| 17 | 0x11 | [7:6] | 00 | Out#1 output clock selection: 00 = 32.768Khz (Default) 01 = Clock from OUTDIV2 10 = N/A 11 = Clock from OUTDIV1 |
| | | [5:4] | 11 | Out#2 output clock selection: 00 = 32.768Khz 01 = Clock from OUTDIV2 10 = N/A 11 = Clock from OUTDIV1(Default) |
| | | [3:2] | 10 | Out#3 output clock selection: 00 = 32.768Khz 01 = Clock from OUTDIV2 10 = REF (Default) 11 = Clock from OUTDIV1 |
| | | 1 | 1 | Out#3 Output enable control: 0 = Disable, 1 = Enable (Default) |
| | | 0 | 0 | DFC function control: 0 = Disable (Default), 1 = Enable |
| 18 | 0x12 | 7 | 1 | PLL Power Down Control bit, 0 = Power Down PLL , 1 = PLL in operational mode, Default is PLL in Normal Operational Mode |
| | | 6 | 1 | PLL Lock Bypass enable selection, 0 = Bypass, 1 = Not Bypass (Lock mode), Default is PLL in Not Bypass Mode |
| | | 5 | 0 | SCLK pin (Pin1) in Hardware mode function select: 0 = OE3, 1 = DFC1 |
| | | 4 | 0 | PPS Power Down enable control: 0 = Disable (Default), 1 = Enable |
| | | [3:2] | 00 | OUT#2 / OE#2 PPS timer select: 00 = 100uS (Default) 01 = 200uS 10 = 400uS 11 = 800uS |
| | | [1:0] | 00 | OUT#1 / OE#1 PPS timer select: 00 = 100uS (Default) 01 = 200uS 10 = 400uS 11 = 800uS |
| 19 | 0x13 | 7 | 0 | OUT#1 CLK invert control: 0 = Non-Invert (Default), 1 = Invert |
| | | 6 | 0 | OUT#2 CLK invert control: 0 = Non-Invert (Default), 1 = Invert |
| | | 5 | 0 | OUT#3 CLK invert control: 0 = Non-Invert (Default), 1 = Invert |
| | | 4 | 1 | Out#3 Output Free-run control: 0 = Free-run, 1 = Normal (Default) |
| | | [3:2] | 00 | OUT#2 Amplitude Select Control: 00 = 1.8V (Default) 01 = 1.0V 10 = 1.1V 11 = 1.2V |
| | | [1:0] | 00 | OUT#3 Amplitude Select Control: 00 = 1.8V (Default) 01 = 1.0V 10 = 1.1V 11 = 1.2V |

| Register Address | | Register Bit | Default | Function explanation |
|------------------|------|--------------|---------|---|
| Decimal | Hex | | | |
| 20 | 0x14 | 7 | 1 | I2C part power down control bit: 0 = I2C function in power down (Default), 1 = I2C function in operational mode (Default) |
| | | 6 | 0 | Reference clock output (OUT#2 / OUT#3): 0 = stop (Default), 1 = Free-run |
| | | 5 | 0 | Output clocks free run control: 0 = OUT#2 Free-run (Default), 1 = OUT#2 / OUT#3 Free-run |
| | | 4 | 0 | Power down polarity control: 0 = Non-Invert (Default), 1 = Invert |
| | | 3 | 0 | Bypass AC cap in X1 for 5X1503 only: 0 = Normal (Default), 1 = Bypass |
| | | 2 | 0 | For 5X1503 / 5X1503S Reserved Bit |
| | | 1 | 1 | For 5X1503 / 5X1503S Reserved Bit |
| | | 0 | 1 | For 5X1503 / 5X1503S Reserved Bit |
| | | [2:0] | 011 | 5X1503L CLK 32K Low drive amplitude select: 000 = 1.8V 001 = 0.8V 010 = 0.9V 011 = 1.0V (Default) 100 = 1.1V 101 = 1.2V |

Note 1: To be able to read this information, you already need to know the device address.

Note 2: These two bits show the configuration number 0~3 that will be loaded from OTP into registers at power-up. When changing these bits through I²C you instruct the chip to load another configuration from OTP. This is useful for switching between OTP configurations when in I²C mode. This method is also used to step through each configuration for reading back OTP contents.

6. Block Diagrams

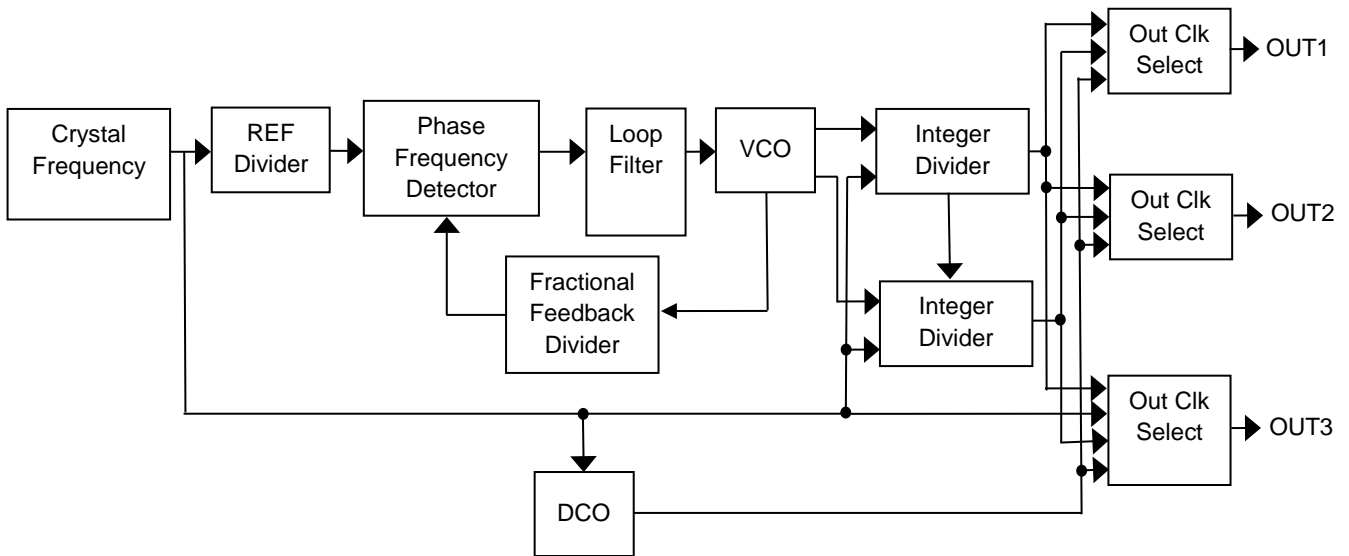


Figure 2. 5X1503 / 5X1503L

Equations:

$$F_{VCO} = F_{CRYSTAL} / \text{Ref Divider} \times (\text{Total Feedback Divider}) \quad (\text{see registers } 0x04 \sim 0x07)$$

$$F_{OUT1} = F_{OUT2} = F_{OUT3} = F_{VCO} / \text{Integer Divider} \quad (\text{see registers } 0x14 [7:3] \text{ and } 0x15 [7:3])$$

The total feedback divider value is the fractional and Integer counter settings.

Limit of VCO on each MicroClock Device:

For 5X1503S / 5L1503S

$F_{CRYSTAL}$: 10MHz ~ 52MHz

F_{VCO} : 500MHz ~ 1100MHz

Integer Output Divider: 1 ~ 88 (Refer to Table 3 in Datasheet)

For 5X1503 / 5X1503L / 5L1503 / 5L1503L

$F_{CRYSTAL}$: 10MHz ~ 52MHz

F_{VCO} : 50MHz ~ 130MHz

Integer Output Divider: 1 ~ 88 (Refer to Table 3 in Datasheet)

Appendix: PLL Configuration Regarding to Fractional Feedback Divider

The Fractional Feedback Divider (FFD) is composed of an 11-bit integer portion (addresses 0x04 and 0x05) and a 16-bit fractional portion (addresses 0x06 and 0x07).

$$\text{FFD value } P = \text{INT}(P) + \text{FRAC}(P) = F_{\text{VCO}} / F_{\text{PFD}} \quad (1)$$

$$\text{FFD Integer [10..0]} = \text{DEC2HEX}(\text{INT}(P)) \quad (2)$$

The FFD divides the VCO frequency F_{VCO} down to the phase-frequency detector frequency F_{PFD} .

$$F_{\text{PFD}} = F_{\text{VCO}} / (P).$$

Convert $\text{FRAC}(P)$ to hex with Eq.2 where ROUND2INT means to round to the nearest integer. The round-off error of P in ppm is the output frequency error in ppm.

$$\text{FFD Fraction [15..0]} = \text{DEC2HEX}(\text{ROUND2INT}(2^{16} \times \text{FRAC}(P))) \quad (3)$$

Example: Assume a 25MHz crystal is used. If a desired frequency is 100.25MHz output clocks with a post-divider value to be 5, the VCO frequency then is 501.25MHz.

The Phase Frequency Detector frequency $F_{\text{PFD}} = 25\text{MHz}$ and the FFD value is $501.25 / 25 = 20.05$.

The integer portion is 20 so address 0x05 as <7:0> is 14-hex and address 0x04 as <10:8> is 00-hex

The fractional portion is 0.05.

$$\begin{aligned} \text{FFD Fraction [15..0]} &= \text{DEC2HEX}(\text{ROUND2INT}(2^{16} \times 0.05)) = \text{DEC2HEX}(\text{ROUND2INT}(3276.8)) \\ &= \text{DEC2HEX}(3277) = 0C \text{ CD} \end{aligned}$$

Address 0x06 as <15:8> = 0C-hex and address 0x07 as <7:0> = CD-hex.

There is a small error from the rounding. The actual FFD value is $20 + 3277 / 2^{16} = 20.050003052$.

The rounding error is $20.050003052 / 20.05 - 1 = 0.152\text{ppm}$.

Revision History

| Revision | Date | Description |
|----------|----------|------------------|
| 1.0 | Jun.4.20 | Initial release. |

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