

Universal Programmable Clock Generator (UPCG)

Features

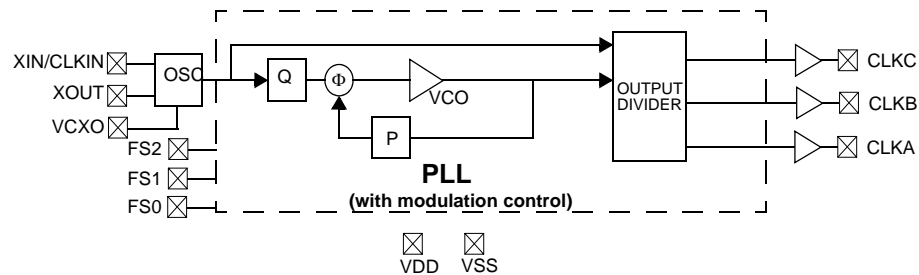
- Spread spectrum, VCXO, and frequency select
- Input frequency range:
 - Crystal: 8–30 MHz
 - CLKIN: 0.5–100 MHz
- Output frequency:
 - Commercial: 1–200 MHz
 - Industrial: 1–166 MHz
- Integrated phase-locked loop
- Low jitter, high accuracy outputs
- 3.3 V operation
- 8-pin SOIC package

Functional Description

The CY22800 is a multi-function clock generator that supports various applications in consumer and communications markets. The device uses the Cypress proprietary PLL along with spread spectrum and VCXO technology to make it one of the most versatile clock synthesizers in the marketplace. The CY22800 is a field-programmable synthesizer that can be programmed using an easy-to-use programmer dongle, CY36800, with one of many predefined configuration files for fast sample generation of prototype builds. The CY22800 is a reprogrammable device that can be programmed up to 100 times. The latest configurations available for this device are summarized in [CY22800 Configurations on page 5](#).

For a complete list of related documentation, click [here](#).

Logic Block Diagram

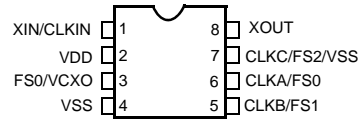


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Pin Configurations

Figure 1. CY22800 8-Pin SOIC (150 Mils) Pinout



Pin Definitions

| Name | Pin Number | Description |
|--------------|------------|---|
| XIN | 1 | Reference input; crystal or external clock |
| VDD | 2 | 3.3 V voltage supply |
| FS0/VCXO | 3 | Frequency select 0/VCXO analog control voltage ^[1] |
| VSS | 4 | Ground |
| CLKB/FS1 | 5 | Clock output B/frequency select 1 ^[1] |
| CLKA/FS0 | 6 | Clock output A/frequency select 0 ^[1] |
| CLKC/FS2/VSS | 7 | Clock output C/frequency select 2/VSS ^[1] |
| XOUT | 8 | Reference output (No Connect when the reference is a clock) |

Note

1. Pin definition changes for different configurations. Refer to the specific one-page data sheet for more details.

Spread Spectrum Clock Generation (SSCG)

The CY22800 can generate spread spectrum clocks (SSCG) to reduce EMI found in today's high-speed digital electronic systems.

The device uses proprietary spread spectrum clock (SSC) technology to synthesize and modulate the frequency of the input clock. By modulating the frequency of the clock, the measured EMI at the fundamental and harmonic frequencies is greatly reduced. This reduction in radiated energy can significantly reduce the cost of complying with regulatory agency (EMC) requirements and improve time to market without degrading system performance.

The CY22800 uses a preprogrammed configuration of memory arrays to synthesize output frequency and offers eight different spread percentages (refer to the [CY22800 Configurations on page 5](#) – Code numbers -015 to -022), and an additional option to turn the spread on and off.

For the above-mentioned configurations, the modulation frequency varies with the reference frequency as follows:

$$f_{\text{mod}} = \frac{f_{\text{ref}}}{1000}$$

VCXO

One of the key components of the CY22800 device is the VCXO. The VCXO is used to "pull" the reference crystal higher or lower in order to lock the system frequency to an external source. This

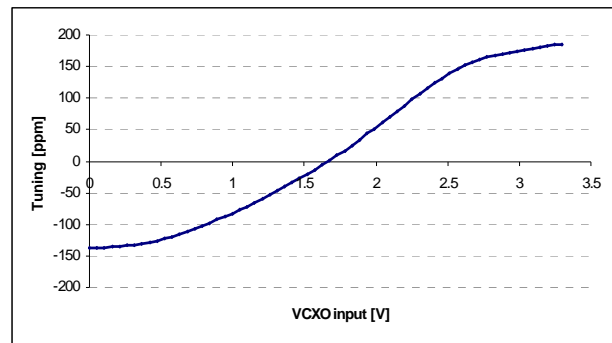
is ideal for applications where the output frequency needs to track along with an external reference frequency that is constantly shifting.

A special pullable crystal must be used in order to have adequate VCXO pull range. Pullable Crystal specifications are included in this data sheet.

VCXO Profile

Figure 2 shows an example of what a VCXO profile looks like. The analog voltage input is on the X-axis and the PPM range is on the Y-axis. An increase in the VCXO input voltage results in a corresponding increase in the output frequency. This has the effect of moving the PPM from a negative to positive offset.

Figure 2. VCXO Profile



CY22800 Configurations

| Code # | Code name | Input Freq. (MHz) | Output Freq. (MHz) | SS | VCXO |
|-------------------------------------|--|--------------------------------|--|----|------|
| Commercial Temperature Range | | | | | |
| CY22800-001A | X2 Multiplier | CLKIN: 0.5–100 XTAL: 8–30 | CLKA: 1–200 or REFOUT | N | N |
| CY22800-002A | X3 Multiplier | CLKIN: 0.5–66.66 XTAL: 8–30 | CLKA: 1.5–200 or REFOUT | N | N |
| CY22800-003A | X4 Multiplier | CLKIN: 0.5–50 XTAL: 8–30 | CLKA: 2–200 or REFOUT | N | N |
| CY22800-004A | X5 Multiplier | CLKIN: 0.5–40 XTAL: 8–30 | CLKA: 2.5–200 or REFOUT | N | N |
| CY22800-005A | X6 Multiplier | CLKIN: 0.5–33.33 XTAL: 8–30 | CLKA: 3–200 CLKB: REFOUT | N | N |
| CY22800-006A | X8 Multiplier | CLKIN: 0.5–25 XTAL: 8–25 | CLKA: 4–200 CLKB: REFOUT | N | N |
| CY22800-007A | Clock multiplier for consumer & communication applications | 14.318 ^[2] | CLKA: 33.33, 66.66, 50, 75, 80, 100, 133.33 See D/S | N | N |
| CY22800-008A | Clock multiplier for consumer & communication applications | 14.318 ^[2] | CLKA: 12, 24, 48, 60, 62.5, 106.25, 125 See D/S | N | N |
| CY22800-009A | Clock multiplier for consumer & communication applications | 20 ^[2] | CLKA: 33.33, 66.66, 50, 75, 80, 100, 133.33 See D/S | N | N |
| CY22800-010A | Clock multiplier for consumer & communication applications | 20 ^[2] | CLKA: 12, 24, 48, 60, 62.5, 106.25, 125 See D/S | N | N |
| CY22800-011A | Clock multiplier for consumer & communication applications | 25 ^[2] | CLKA: 33.33, 66.66, 50, 75, 80, 100, 133.33 See D/S | N | N |
| CY22800-012A | Clock multiplier for consumer & communication applications | 25 ^[2] | CLKA: 12, 24, 48, 60, 62.5, 106.25, 125 See D/S | N | N |
| CY22800-013A | Clock multiplier for consumer & communication applications | 27 ^[2] | CLKA: 33.33, 66.66, 50, 75, 80, 100, 133.33 See D/S | N | N |
| CY22800-014A | Clock multiplier for consumer & communication applications | 27 ^[2] | CLKA: 12, 24, 48, 60, 62.5, 106.25, 125 See D/S | N | N |

Note

2. Fixed CLKIN/Xtal frequency. Refer to the one page data sheet corresponding to the Code # for detailed input and output ranges.

CY22800 Configurations *(continued)*

| Code # | Code name | Input Freq. (MHz) | Output Freq. (MHz) | SS | VCXO |
|--------------|---|--------------------------------------|---|----|------|
| CY22800-015A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 0.25\%$ or off) CLKB: REF or REF/2 (spread $\pm 0.25\%$ or off) | Y | N |
| CY22800-016A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.1 | CLKA: REF (spread $\pm 0.5\%$ or off) CLKB: REF or REF/2 (spread $\pm 0.5\%$ or off) | Y | N |
| CY22800-017A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 0.75\%$ or off) CLKB: REF or REF/2 (spread $\pm 0.75\%$ or off) | Y | N |
| CY22800-018A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.3 | CLKA: REF (spread $\pm 1.0\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.0\%$ or off) | Y | N |
| CY22800-019A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 1.25\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.25\%$ or off) | Y | N |
| CY22800-020A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 1.5\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.5\%$ or off) | Y | N |
| CY22800-021A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.1 | CLKA: REF (spread $\pm 1.75\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.75\%$ or off) | Y | N |
| CY22800-022A | Spread spectrum for consumer and communication applications | CLKIN: 25.0–100.0 XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 2.0\%$ or off) CLKB: REF or REF/2 (spread $\pm 2.0\%$ or off) | Y | N |
| CY22800-023A | MPEG-2 clock generator for DTV and STB w/ VCXO | XTAL: 13.5 | CLKA: 27 CLKB: 54 CLKC: 27 | N | Y |
| CY22800-024A | MPEG-2 clock generator for DTV and STB w/ VCXO | XTAL: 13.5 | CLKA: 13.5 CLKB: 54 CLKC: 27 | N | Y |
| CY22800-025A | MPEG-2 clock generator for DTV and STB w/ VCXO | XTAL: 13.5/27.0 (Selectable) | CLKB: 27, 27 | N | Y |
| CY22800-026A | MPEG-2 clock generator for DTV and STB w/ VCXO | XTAL: 13.5/27.0 (Selectable) | CLKB: 27, 27 CLKC: 27, 27 | N | Y |
| CY22800-027A | MPEG-2 clock generator for DTV and STB w/ VCXO | XTAL: 27 | CLKB: 27, 27 CLKC: 27, 27.027 (–1 ppm) | N | Y |
| CY22800-028A | MPEG-2 clock generator for DTV and STB w/ VCXO | XTAL: 27 | CLKB: 27, 27 CLKC: 27, 27.027 (0 ppm) | N | Y |
| CY22800-029A | HDTV, STB clock generator (USB/Ethernet/iLink clock) | XTAL/CLKIN: 27 | CLKA: 24.576, 25, 20, 48 CLKB: 27 | N | N |
| CY22800-030A | HDTV, STB clock generator (Ethernet/PCI/Microprocessor clock) | XTAL/CLKIN: 27 | CLKA: 25, 20 CLKB: 27 CLKC: 33.33, 66.66 | N | N |
| CY22800-031A | HDTV, STB clock generator (PCI/Microprocessor clock) | XTAL/CLKIN: 48 | CLKA: 33.33, 66.66, 100, 133.33 CLKB: 48 | N | N |
| CY22800-032A | HDTV, STB clock generator (pixel clocks) | XTAL/CLKIN: 27 | CLKA: 74.25, 74.175824, 148.5, 148.351648 CLKB: 27 | N | N |
| CY22800-033A | Audio clock generator for HDTV & STB (256fs) | XTAL/CLKIN: 27 | CLKA: (32K, 44.1K, 48K) \times 256 CLKB: 27 | N | N |

CY22800 Configurations *(continued)*

| Code # | Code name | Input Freq. (MHz) | Output Freq. (MHz) | SS | VCXO |
|--------------|--|-----------------------------------|---|----|------|
| CY22800-034A | Audio clock generator for HDTV & STB (384fs) | XTAL/CLKIN: 27 | CLKA: (32K, 44.1K, 48K) x 384 CLKB: 27 | N | N |
| CY22800-035A | Audio clock generator for HDTV & STB (512fs) | XTAL/CLKIN: 27 | CLKA: (32K, 44.1K, 48K) x 512 CLKB: 27 | N | N |
| CY22800-036A | Audio clock generator for HDTV & STB (768fs) | XTAL/CLKIN: 27 | CLKA: (32K, 44.1K, 48K) x 768 CLKB: 27 | N | N |
| CY22800-037A | Spread spectrum clock generator for PCI and ASIC | XTAL/CLKIN: 14.31818 | CLKA: 33.33, 66.66, 100, 133.33 (-0.5% or off) | Y | N |
| CY22800-038A | Spread spectrum clock generator for PCI and ASIC | XTAL/CLKIN: 14.31818 | CLKA: 33.33, 66.66, 100, 133.33 (-1.0% or off) | Y | N |
| CY22800-039A | Spread spectrum clock generator for PCI and ASIC | XTAL/CLKIN: 14.31818 | CLKA: 33.33, 66.66, 100, 133.33 (±0.25% or off) | Y | N |
| CY22800-040A | Spread spectrum clock generator for PCI and ASIC | XTAL/CLKIN: 14.31818 | CLKA: 33.33, 66.66, 100, 133.33 (±0.5% or off) | Y | N |
| CY22800-041A | Spread spectrum clock generator for Audio / Video Applications | XTAL/CLKIN: 27 | CLKA: 33, 66 (spread -0.5% or off) CLKB: 27 | Y | N |
| CY22800-042A | Spread spectrum clock generator for Audio / Video Applications | XTAL/CLKIN: 27 | CLKA: 33, 66 (spread -1.0% or off) CLKB: 27 | Y | N |
| CY22800-043A | Spread spectrum clock generator for Audio / Video Applications | XTAL/CLKIN: 27 | CLKA: 33, 66 (spread ±0.25% or off) CLKB: 27 | Y | N |
| CY22800-044A | Spread spectrum clock generator for Audio / Video Applications | XTAL/CLKIN: 27 | CLKA: 33, 66 (spread ±0.5% or off) CLKB: 27 | Y | N |
| CY22800-045A | Spread spectrum clock generator with Multiplier option | CLKIN: 35-100 | CLKA: x1, x2, x4 or /2 (spread -0.5%) CLKB: REFOUT | Y | N |
| CY22800-046A | Spread spectrum clock generator with Multiplier option | CLKIN: 35-100 | CLKA: x1, x2, x4 or /2 (spread -1.0%) CLKB: REFOUT | Y | N |
| CY22800-047A | Spread spectrum clock generator with Multiplier option | CLKIN: 35-100 | CLKA: x1, x2, x4 or /2 (spread -1.5%) CLKB: REFOUT | Y | N |
| CY22800-048A | Spread spectrum clock generator with Multiplier option | CLKIN: 35-100 | CLKA: x1, x2, x4 or /2 (spread -2.0%) CLKB: REFOUT | Y | N |
| CY22800-049A | Spread spectrum clock generator with Multiplier option | CLKIN: 35-100 | CLKA: x1, x2, x4 or /2 (spread -2.5%) CLKB: REFOUT | Y | N |
| CY22800-050A | Spread spectrum clock generator for PCI and ASIC | XTAL/CLKIN: 14.31818 | CLKA: 33.33, 66.66, 100, 133.33 (-1.5% or off) | Y | N |
| CY22800-051A | x10 Multiplier | CLKIN: 0.5-20 XTAL: 8-20 | CLKA: 5-200 CLKB: REFOUT | N | N |
| CY22800-052A | x12 Multiplier | CLKIN: 0.5-16.66 XTAL: 8-16.66 | CLKA: 6-200.0 CLKB: REFOUT | N | N |
| CY22800-053A | x15 Multiplier | CLKIN: 0.5-13.33 XTAL: 8-13.33 | CLKA: 7.5-200 CLKB: REFOUT | N | N |
| CY22800-054A | x20 Multiplier | CLKIN: 0.5-10 XTAL: 8-10 | CLKA: 10-200 CLKB: REFOUT | N | N |
| CY22800-055A | x25 Multiplier | CLKIN: 0.5-8 XTAL: 8 | CLKA: 12.5-200 CLKB: REFOUT | N | N |

CY22800 Configurations *(continued)*

| Code # | Code name | Input Freq. (MHz) | Output Freq. (MHz) | SS | VCXO |
|--------------|--|------------------------------|--|----|------|
| CY22800-056A | 2/3 Multiplier | CLKIN: 2.5–133 XTAL: 8–30 | CLKA: 1.67–88.67 CLKB: REFOUT | N | N |
| CY22800-057A | 4/3 Multiplier | CLKIN: 2–100 XTAL: 8–30 | CLKA: 2.66–133.33 CLKB: REFOUT | N | N |
| CY22800-058A | 3/4 Multiplier | CLKIN: 3.5–133 XTAL: 8–30 | CLKA: 2.625–99.75 CLKB: REFOUT | N | N |
| CY22800-059A | 3/2 Multiplier | CLKIN: 1.5–133 XTAL: 8–30 | CLKA: 2.25–199.5 CLKB: REFOUT | N | N |
| CY22800-060A | 2/5 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 2–53.2 CLKB: REFOUT | N | N |
| CY22800-061A | 3/5 Multiplier | CLKIN: 3.5–133 XTAL: 8–30 | CLKA: 2.1–80 CLKB: REFOUT | N | N |
| CY22800-062A | 5/6 Multiplier | CLKIN: 3–80 XTAL: 8–30 | CLKA: 2.5–66.67 CLKB: REFOUT | N | N |
| CY22800-063A | 6/5 Multiplier | CLKIN: 2–66.67 XTAL: 8–30 | CLKA: 2.4–80 CLKB: REFOUT | N | N |
| CY22800-064A | 5/8 Multiplier | CLKIN: 2.5–80 XTAL: 8–30 | CLKA: 1.56–50 CLKB: REFOUT | N | N |
| CY22800-065A | 8/5 Multiplier | CLKIN: 2–50 XTAL: 8–30 | CLKA: 3.2–80 CLKB: REFOUT | N | N |
| CY22800-066A | Spread spectrum clock generator for Audio / Video Applications | XTAL/CLKIN: 27 | CLKA: 33, 66 (spread –1.5% or off) CLKB: 27 | Y | N |
| CY22800-067A | 5/4 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 6–166 CLKB: REFOUT | N | N |
| CY22800-068A | 4/5 Multiplier | CLKIN: 5–33 XTAL: 8–30 | CLKA: 4–106 CLKB: REFOUT | N | N |
| CY22800-069A | 66/64 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 5–137 CLKB: REFOUT | N | N |
| CY22800-070A | 64/66 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 5–129 CLKB: REFOUT | N | N |
| CY22800-071A | 255/238 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 5–142 CLKB: REFOUT | N | N |
| CY22800-072A | 238/255 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 5–124 CLKB: REFOUT | N | N |
| CY22800-073A | 3-Output Fanout Buffer | CLKIN: 1–133 XTAL: 8–30 | CLKA = CLKB = CLKC: REFOUT | N | N |
| CY22800-074A | X2 Multiplier with Fanout and REFOUT | CLKIN: 9–100 XTAL: 9–30 | CLKA = CLKC: 18–200 CLKB: REFOUT | N | N |
| CY22800-075A | X3 Multiplier with Fanout and REFOUT | CLKIN: 6–66 XTAL: 8–30 | CLKA = CLKC: 18–200 CLKB: REFOUT | N | N |
| CY22800-076A | X4 Multiplier with Fanout and REFOUT | CLKIN: 5–50 XTAL: 8–30 | CLKA = CLKC: 20–200 CLKB: REFOUT | N | N |
| CY22800-077A | /2 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.25–66.5 CLKB = CLKC: 0.25–66.5 or off | N | N |
| CY22800-078A | /3 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.17–44.3 CLKB = CLKC: 0.17–44.3 or off | N | N |
| CY22800-079A | /4 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.125–33.25 CLKB = CLKC: 0.125–33.25 or off | N | N |
| CY22800-080A | /5 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.1–26.6 CLKB = CLKC: 0.1–26.6 or off | N | N |

CY22800 Configurations *(continued)*

| Code # | Code name | Input Freq. (MHz) | Output Freq. (MHz) | SS | VCXO |
|-------------------------------------|---|-----------------------------------|---|----|------|
| CY22800-081A | /6 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.083–22.2 CLKB = CLKC: 0.083–22.2 or off | N | N |
| CY22800-082A | /7 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.071–19 CLKB = CLKC: 0.071–19 or off | N | N |
| CY22800-083A | /8 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.063–16.6 CLKB = CLKC: 0.063–v16.6 or off | N | N |
| CY22800-084A | /9 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.056–14.8 CLKB = CLKC: 0.056–14.8 or off | N | N |
| CY22800-085A | /10 Clock Divider | CLKIN: 0.5–133 XTAL: 8–30 | CLKA: 0.05–13.3 CLKB = CLKC: 0.05–13.3 or off | N | N |
| Industrial Temperature Range | | | | | |
| CY22800-115A | Spread spectrum for consumer and communication applications | CLKIN: 25– 82.5 XTAL: 25–30 | CLKA: REF (spread $\pm 0.25\%$ or off) CLKB: REF or REF/2 (spread $\pm 0.25\%$ or off) | Y | N |
| CY22800-116A | Spread spectrum for consumer and communication applications | CLKIN: 25–82.5 XTAL: 25–30 | CLKA: REF (spread $\pm 0.5\%$ or off) CLKB: REF or REF/2 (spread $\pm 0.5\%$ or off) | Y | N |
| CY22800-117A | Spread spectrum for consumer and communication applications | CLKIN: 25–82.5 XTAL: 25 - 30 | CLKA: REF (spread $\pm 0.75\%$ or off) CLKB: REF or REF/2 (spread $\pm 0.75\%$ or off) | Y | N |
| CY22800-118A | Spread spectrum for consumer and communication applications | CLKIN: 25–82.5 XTAL: 25–30 | CLKA: REF (spread $\pm 1.0\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.0\%$ or off) | Y | N |
| CY22800-119A | Spread spectrum for consumer and communication applications | CLKIN: 25–82.5 XTAL: 25–30 | CLKA: REF (spread $\pm 1.25\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.25\%$ or off) | Y | N |
| CY22800-120A | Spread spectrum for consumer and communication applications | CLKIN: 25–82.5 XTAL: 25–30 | CLKA: REF (spread $\pm 1.5\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.5\%$ or off) | Y | N |
| CY22800-121A | Spread spectrum for consumer and communication applications | CLKIN: 25–82.5 XTAL: 25–30 | CLKA: REF (spread $\pm 1.75\%$ or off) CLKB: REF or REF/2 (spread $\pm 1.75\%$ or off) | Y | N |
| CY22800-145A | Spread spectrum clock generator with Multiplier option | CLKIN: 35–82.5 | CLKA: $\times 1, \times 2, \times 4$ or /2 (spread -0.5%) CLKB: REFOUT | Y | N |
| CY22800-146A | Spread spectrum clock generator with Multiplier option | CLKIN: 35–82.5 | CLKA: $\times 1, \times 2, \times 4$ or /2 (spread -1.0%) CLKB: REFOUT | Y | N |
| CY22800-147A | Spread spectrum clock generator with Multiplier option | CLKIN: 35–82.5 | CLKA: $\times 1, \times 2, \times 4$ or /2 (spread -1.5%) CLKB: REFOUT | Y | N |
| CY22800-148A | Spread spectrum clock generator with Multiplier option | CLKIN: 35–82.5 | CLKA: $\times 1, \times 2, \times 4$ or /2 (spread -2.0%) CLKB: REFOUT | Y | N |
| CY22800-151A | $\times 10$ Multiplier | CLKIN: 0.5–16.5 XTAL: 8–16.5 | CLKA: 5–165 CLKB: REFOUT | N | N |
| CY22800-152A | $\times 12$ Multiplier | CLKIN: 0.5–13.75 XTAL: 8–13.75 | CLKA: 6–165 CLKB: REFOUT | N | N |
| CY22800-153A | $\times 15$ Multiplier | CLKIN: 0.5–11 XTAL: 8–11 | CLKA: 7.5–165 CLKB: REFOUT | N | N |

CY22800 Configurations *(continued)*

| Code # | Code name | Input Freq. (MHz) | Output Freq. (MHz) | SS | VCXO |
|--------------|----------------|---------------------------------|----------------------------------|----|------|
| CY22800-154A | x20 Multiplier | CLKIN: 0.5–8.25 XTAL: 8–8.25 | CLKA: 10–165 CLKB: REFOUT | N | N |
| CY22800-155A | x25 Multiplier | CLKIN: 0.5–6.6 XTAL: 8–6.6 | CLKA: 12.5–165 CLKB: REFOUT | N | N |
| CY22800-156A | 2/3 Multiplier | CLKIN: 2.5–82.5 XTAL: 8–30 | CLKA: 1.67–55 CLKB: REFOUT | N | N |
| CY22800-157A | 4/3 Multiplier | CLKIN: 1.5–82.5 XTAL: 8–27.5 | CLKA: 2–110 CLKB: REFOUT | N | N |
| CY22800-158A | 3/4 Multiplier | CLKIN: 3.5–110 XTAL: 8–30 | CLKA: 2.625–82.5 CLKB: REFOUT | N | N |
| CY22800-159A | 3/2 Multiplier | CLKIN: 1.5–110 XTAL: 8–27.5 | CLKA: 2.25–165 CLKB: REFOUT | N | N |
| CY22800-160A | 2/5 Multiplier | CLKIN: 5–133 XTAL: 8–30 | CLKA: 2–53.2 CLKB: REFOUT | N | N |
| CY22800-161A | 3/5 Multiplier | CLKIN: 3.5–110 XTAL: 8–30 | CLKA: 2.1–66 CLKB: REFOUT | N | N |
| CY22800-162A | 5/6 Multiplier | CLKIN: 3–66 XTAL: 8–30 | CLKA: 2.5–55 CLKB: REFOUT | N | N |
| CY22800-163A | 6/5 Multiplier | CLKIN: 2–55 XTAL: 8–30 | CLKA: 2.4–66 CLKB: REFOUT | N | N |
| CY22800-164A | 5/8 Multiplier | CLKIN: 2.5–80 XTAL: 8–30 | CLKA: 1.56–50 CLKB: REFOUT | N | N |
| CY22800-165A | 8/5 Multiplier | CLKIN: 2–41.25 XTAL: 8–30 | CLKA: 3.2–66 CLKB: REFOUT | N | N |

Cypress offers a wide range of programmable clock synthesizers that can be used to generate any other frequencies not covered by the CY22800. [Cypress Programmable Clocks](#) summarizes all Cypress programmable devices including CY22800.

Cypress Programmable Clocks

| Part # ^[3] | No. of PLL | Input Freq. | Output Freq. | Package | No. of Outputs | Spread Spectrum | VCXO | I ² C |
|-----------------------|------------|-------------|--------------|---|----------------|-----------------|------|------------------|
| CY22800 | 1 | 0.5–100 | up to 200 | 8-pin SOIC | up to 3 | Yes | Yes | No |
| CY22801 | 1 | 0.5–133 | up to 200 | 8-pin SOIC | up to 3 | No | No | No |
| CY22050 | 1 | 1–133 | 0.08–200 | 16-pin TSSOP | up to 6 | No | No | No |
| CY22150 | 1 | 1–133 | 0.08–200 | 16-pin TSSOP | up to 6 | No | No | Yes |
| CY25100 | 1 | 8–166 | 3–200 | 8-pin SOIC / 8-pin TSSOP | up to 2 | Yes | No | No |
| CY25200 | 1 | 3–166 | 3–200 | 16-pin TSSOP | up to 6 | Yes | No | No |
| CY241V08 | 1 | 27/13.5 | 27/13.5 | 8-pin SOIC | up to 2 | No | Yes | No |
| CY22392 | 3 | 1–166 | up to 200 | 16-pin TSSOP | up to 6 | No | No | No |
| CY22381 | 3 | 1–166 | up to 200 | 8-pin SOIC | up to 3 | No | No | No |
| CY22393 | 3 | 1–166 | up to 200 | 16-pin TSSOP | up to 6 | No | No | Yes |
| CY22394/5 | 3 | 1–166 | up to 200 | 16-pin TSSOP | up to 5 | No | No | No |
| CY22388/89/91 | 4 | 1–100 | 1–166 | 16-pin TSSOP / 20-pin TSSOP, 32-pin QFN | up to 8 | No | Yes | No |

Note

3. CY3672 can be used to program the clock devices listed in [Cypress Programmable Clocks](#).

Absolute Maximum Conditions

| Parameter | Description | Min | Max | Unit |
|-----------------|---|-----------------------|-----------------------|------|
| V _{DD} | Supply voltage | -0.5 | 4.6 | V |
| T _S | Storage temperature | -65 | 125 | °C |
| T _J | Junction temperature | - | 125 | °C |
| | Digital inputs | V _{SS} - 0.3 | V _{DD} + 0.3 | V |
| | Digital outputs referred to V _{DD} | V _{SS} - 0.3 | V _{DD} + 0.3 | V |
| | Electro-static discharge | 2 | - | kV |

Recommended Operating Conditions

| Parameter | Description | Min | Typ | Max | Unit |
|---------------------------------|---|------|-----|------|------|
| V _{DD} | Operating voltage | 3.14 | 3.3 | 3.47 | V |
| T _A | Ambient temperature, commercial grade | 0 | - | 70 | °C |
| | Ambient temperature, industrial grade | -40 | - | 85 | °C |
| C _{LOAD} | Max. load capacitance on the CLK output | - | - | 15 | pF |
| f _{REF} ^[4] | Reference frequency | 0.5 | - | 100 | MHz |
| t _{PU} | Power up time for all V _{DDs} to reach minimum specified voltage (power ramps must be monotonic) | 0.05 | - | 500 | ms |

Pullable Crystal Specifications for VCXO Application Only

| Parameter | Name | Min | Typ | Max | Unit |
|--------------------------------|--|------|-----|------|------|
| C _{LNOM} | Crystal load capacitance | - | 14 | - | pF |
| R ₁ | Equivalent series resistance | - | - | 25 | Ω |
| R ₃ /R ₁ | Ratio of third overtone mode ESR to Fundamental Mode ESR. Ratio used because typical R ₁ values are much less than the maximum spec | 3 | - | - | - |
| DL | Crystal drive level. No external series resistor assumed | - | 0.5 | 2 | mW |
| F _{3SEPHI} | Third overtone separation from 3 × F _{NOM} (High Side) | 300 | - | - | ppm |
| F _{3SEPLO} | Third overtone separation from 3 × F _{NOM} (Low Side) | - | - | -150 | ppm |
| C ₀ | Crystal shunt capacitance | - | - | 7 | pF |
| C ₀ /C ₁ | Ratio of Shunt to motional capacitance | 180 | - | 250 | |
| C ₁ | Crystal motional capacitance | 14.4 | 18 | 21.6 | fF |

Note

4. Configuration dependent, see the one-page documents.

Recommended Crystal Specifications for All other Applications

| Parameter | Name | Description | Min | Typ | Max | Unit |
|-------------------|------------------------------------|--|-----|-----|-----|------|
| F _{NOM} | Nominal crystal frequency | Parallel resonance, fundamental mode, and AT cut | 8 | – | 30 | MHz |
| C _{LNOM} | Nominal load capacitance | | – | 12 | – | pF |
| R ₁ | Equivalent series resistance (ESR) | Fundamental mode | – | 35 | 50 | Ω |
| DL | Crystal drive level | No external series resistor assumed | – | 0.5 | 2 | mW |

DC Electrical Specifications

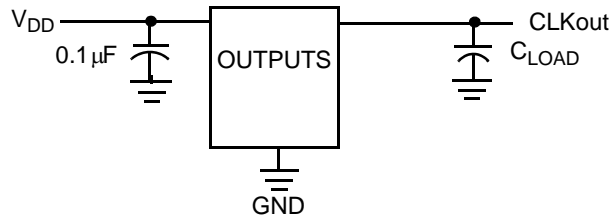
| Parameter | Name | Description | Min | Typ | Max | Unit |
|-------------------|------------------------|--|------|-----|-----------------|-----------------|
| I _{OH} | Output high current | V _{OH} = V _{DD} – 0.5 V, V _{DD} = 3.3 V (source) | 12 | 24 | – | mA |
| I _{OL} | Output low current | V _{OL} = 0.5 V, V _{DD} = 3.3 V (sink) | 12 | 24 | – | mA |
| C _{IN1} | Input capacitance | All input pins except XIN and XOUT | – | – | 7 | pF |
| C _{IN2} | Input capacitance | XIN and XOUT pins for non-VCXO applications | – | 24 | – | pF |
| I _{IH} | Input high current | V _{IH} = V _{DD} | – | 5 | 10 | μA |
| I _{IL} | Input low current | V _{IL} = 0 V | – | – | 50 | μA |
| f _{ΔXO} | VCXO pullability range | | ±150 | – | – | ppm |
| V _{VCXO} | VCXO input range | | 0 | – | V _{DD} | V |
| V _{IH} | Input high voltage | CMOS levels, 70% of V _{DD} | 0.7 | – | – | V _{DD} |
| V _{IL} | Input low voltage | CMOS levels, 30% of V _{DD} | – | – | 0.3 | V _{DD} |

AC Electrical Characteristics (V_{DD} = 3.3 V)

| Parameter | Name | Description | Min | Typ | Max | Unit |
|-----------------|------------------------|--|-----|-----|-----|------|
| DC | Output duty cycle | Duty cycle is defined in Figure 4 , 50% of V _{DD} | 45 | 50 | 55 | % |
| t ₃ | Rising edge slew rate | Output clock rise time, 20%–80% of V _{DD} | 0.8 | 1.4 | – | V/ns |
| t ₄ | Falling edge slew rate | Output clock fall time, 80%–20% of V _{DD} | 0.8 | 1.4 | – | V/ns |
| t ₁₀ | PLL Lock Time | | – | – | 3 | ms |

Test Circuit

Figure 3. Test Circuit Diagram



Timing Definitions

Figure 4. Duty Cycle Definition; $DC = t2/t1$

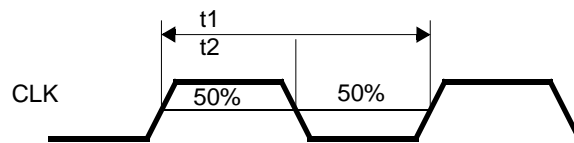
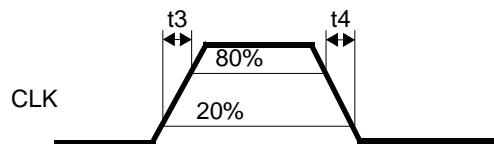


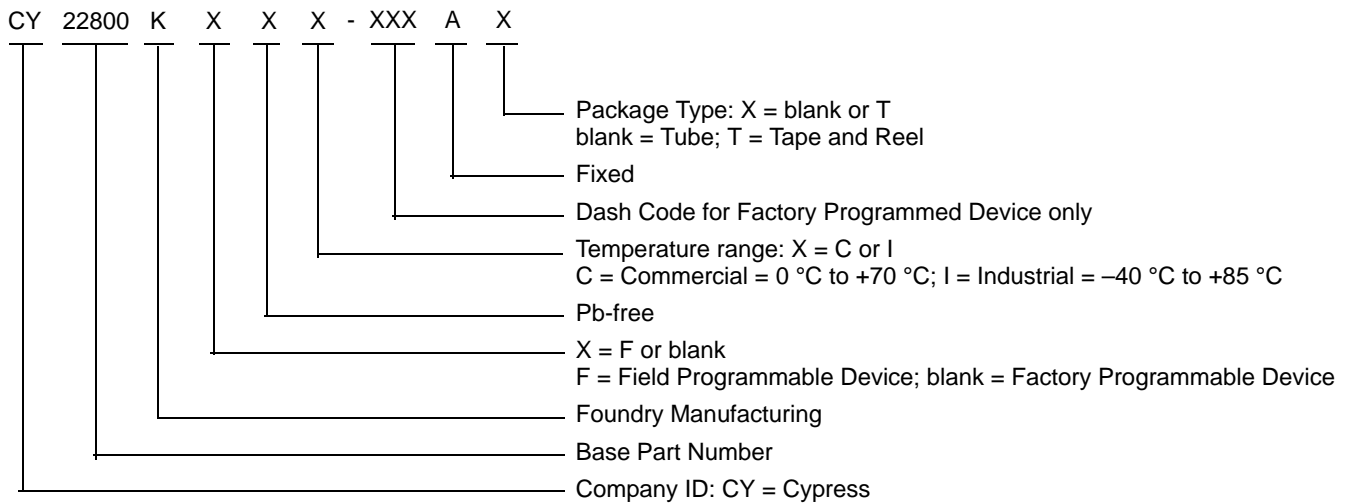
Figure 5. Rise and Fall Time Definitions



Ordering Information

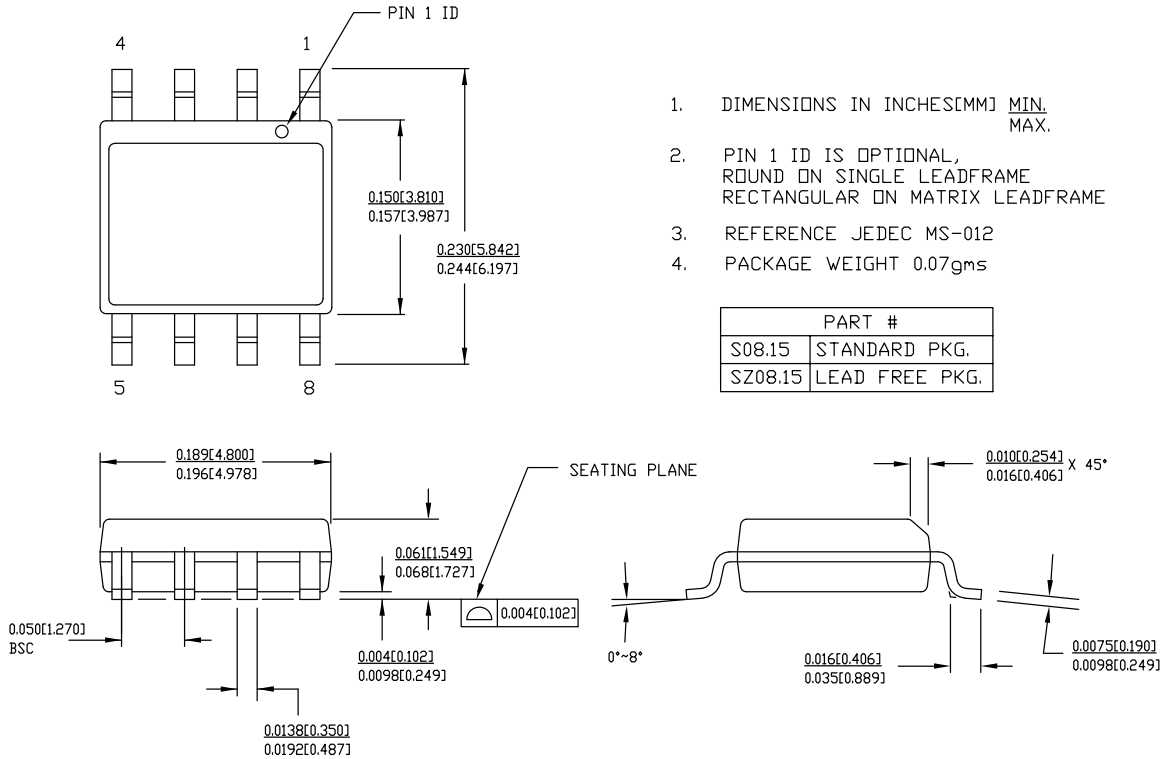
| Ordering Code | Package Type | Operating Range | Operating Voltage |
|---------------|----------------------------|-----------------|-------------------|
| CY22800KFXC | 8-pin SOIC | Commercial | 3.3 V |
| CY22800KFXCT | 8-pin SOIC – Tape and Reel | Commercial | 3.3 V |
| CY22800KFXI | 8-pin SOIC | Industrial | 3.3 V |
| CY22800KFXIT | 8-pin SOIC – Tape and Reel | Industrial | 3.3 V |

Ordering Code Definitions



Package Diagram

Figure 6. 8-pin SOIC (150 Mils) S08.15/SZ08.15 Package Outline, 51-85066



51-85066 *F

Acronyms

Table 1. Acronyms used in this Document

| Acronym | Description |
|---------|---|
| ASIC | application-specific integrated circuit |
| CMOS | complementary metal oxide semiconductor |
| DTV | digital television |
| EMC | electromagnetic compatibility |
| EMI | electromagnetic interference |
| ESR | equivalent series resistance |
| HDTV | high-definition television |
| PCI | peripheral component interface |
| PLL | phase-locked loop |
| QFN | quad flat no-lead |
| SOIC | small outline integrated circuit |
| SSC | supervisory system call |
| SSCG | spread spectrum clock generator |
| STB | set-top box |
| TSSOP | thin-shrink small outline package |
| UPCG | universal programmable clock generator |
| VCXO | voltage controlled crystal oscillator |

Document Conventions

Units of Measure

Table 2. Units of Measure

| Symbol | Unit of Measure |
|--------|-------------------|
| °C | degree Celsius |
| fF | femtofarad |
| kV | kilovolt |
| MHz | megahertz |
| μA | microampere |
| μF | microfarad |
| mA | milliampere |
| ms | millisecond |
| mW | milliwatt |
| ns | nanosecond |
| Ω | ohm |
| ppm | parts per million |
| % | percent |
| pF | picofarad |
| V | volt |

Document History Page

| Document Title: CY22800, Universal Programmable Clock Generator (UPCG) Document Number: 001-07704 | | | | |
|--|---------|-----------------|-----------------|--|
| Rev. | ECN No. | Orig. of Change | Submission Date | Description of Change |
| ** | 478688 | KKVTMP | 07/10/2006 | New data sheet |
| *A | 1063800 | KKVTMP | 05/20/2007 | Updated Features (Added Industrial Temperature information). Updated Functional Description (Updated the sentence to read as “The CY22800 is a reprogrammable device that can be programmed up to 100 times.”). Updated CY22800 Configurations (Added Industrial Temperature information and also some more codes and their respective details). Updated Cypress Programmable Clocks (Added CY22801 and its details). Updated Recommended Operating Conditions (Added Industrial Temperature information). Updated Pullable Crystal Specifications for VCXO Application ONLY (Changed unit for C ₁ parameter from pF to fF). Updated Ordering Information (Added Industrial Temperature information). |
| *B | 2440628 | AESA | 05/25/2008 | Updated Note 3. Added part numbers CY22800FXCT, CY22800FXIT, CY22800KFXC, CY22800KFXCT, CY22800KFXI, and CY22800KFXIT in Ordering Information . Added Note “Not recommended for new designs.” below Ordering Information . Updated template. |
| *C | 2897294 | KVM | 03/22/2010 | Removed part numbers CY22800FXC, CY22800FXCT, CY22800FXI and CY22800FXIT from the Ordering Information . Removed Note “Not recommended for new designs.” below Ordering Information . Updated Package Diagram . Updated copyright section. |
| *D | 3349379 | PURU | 08/26/2011 | Removed Benefits section on page 1. Updated Package Diagram . Added Ordering Code Definitions . Added Acronyms and Units of Measure . |
| *E | 3471796 | PURU | 12/21/2011 | Replaced all instances of CYTRA-102004-00 with CY22800 across the document. |
| *F | 4491759 | XHT | 9/8/2014 | Sunset review, updated package revision |
| *G | 4576237 | XHT | 11/21/2014 | Added related documentation hyperlink in page 1. Updated the Output Frequency for the following parts in Cypress Programmable Clocks table: CY22800, CY22801, CY22392, CY22381, CY22393, CY22394/5, and CY22388/89/91. |

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