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## Product Reference Information

**Part Number:** CY22800FXI  
**Manufacturer:** Infineon Technologies  
**Package:** 8-SOIC (0.154" , 3.90mm Width)  
**Availability:** Please confirm with sales

### Product Page:

<https://antrexco.com/product/details/infineon-technologies/cy22800fxi.html>

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### Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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# Universal Programmable Clock Generator (UPCG)

## Features

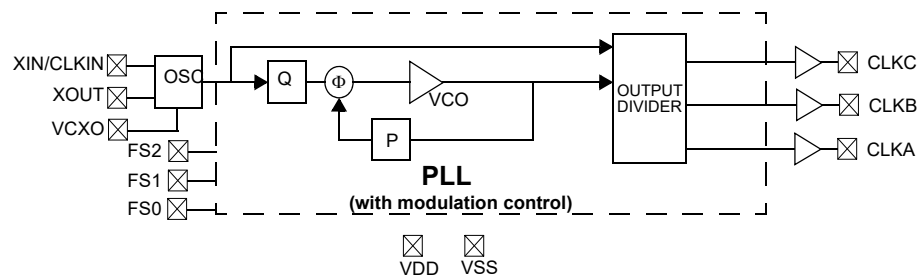
- Spread spectrum, VCXO, and frequency select
- Input frequency range:
  - Crystal: 8–30 MHz
  - CLKIN: 0.5–100 MHz
- Output frequency:
  - Commercial: 1–200 MHz
  - Industrial: 1–166 MHz
- Integrated phase-locked loop
- Low jitter, high accuracy outputs
- 3.3 V operation
- 8-pin SOIC package

## 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

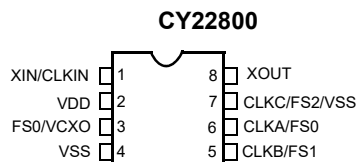


## Contents

|                                                      |           |                                                      |           |
|------------------------------------------------------|-----------|------------------------------------------------------|-----------|
| <b>Pin Configurations</b> .....                      | <b>3</b>  | <b>Timing Definitions</b> .....                      | <b>13</b> |
| <b>Pin Definitions</b> .....                         | <b>3</b>  | <b>Ordering Information</b> .....                    | <b>14</b> |
| <b>Spread Spectrum Clock Generation (SSCG)</b> ..... | <b>4</b>  | Ordering Code Definitions .....                      | 14        |
| <b>VCXO</b> .....                                    | <b>4</b>  | <b>Package Diagram</b> .....                         | <b>15</b> |
| VCXO Profile .....                                   | 4         | <b>Acronyms</b> .....                                | <b>16</b> |
| <b>CY22800 Configurations</b> .....                  | <b>5</b>  | <b>Document Conventions</b> .....                    | <b>16</b> |
| <b>Cypress Programmable Clocks</b> .....             | <b>10</b> | Units of Measure .....                               | 16        |
| <b>Absolute Maximum Conditions</b> .....             | <b>11</b> | <b>Document History Page</b> .....                   | <b>17</b> |
| <b>Recommended Operating Conditions</b> .....        | <b>11</b> | <b>Sales, Solutions, and Legal Information</b> ..... | <b>18</b> |
| <b>Pullable Crystal Specifications</b> .....         | <b>11</b> | Worldwide Sales and Design Support .....             | 18        |
| <b>Recommended Crystal Specifications</b> .....      | <b>12</b> | Products .....                                       | 18        |
| <b>DC Electrical Specifications</b> .....            | <b>12</b> | PSoC® Solutions .....                                | 18        |
| <b>Thermal Resistance</b> .....                      | <b>12</b> | Cypress Developer Community .....                    | 18        |
| <b>AC Electrical Characteristics</b> .....           | <b>13</b> | Technical Support .....                              | 18        |
| <b>Test Circuit</b> .....                            | <b>13</b> |                                                      |           |

## Pin Configurations

**Figure 1. 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 <sup>[1]</sup> |
| VSS          | 4          | Ground                                                        |
| CLKB/FS1     | 5          | Clock output B/frequency select 1 <sup>[1]</sup>              |
| CLKA/FS0     | 6          | Clock output A/frequency select 0 <sup>[1]</sup>              |
| CLKC/FS2/VSS | 7          | Clock output C/frequency select 2/VSS <sup>[1]</sup>          |
| 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

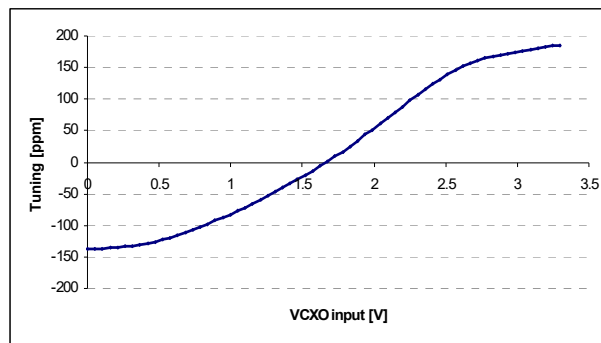
One of the key components of the CY22800 device is the VCXO. The VCXO is used to "pull" the reference crystal higher or lower in order to lock the system frequency to an external source. This is ideal for applications where the output frequency needs to track along with an external reference frequency 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 |
|-------------------------------------|------------------------------------------------------------|--------------------------------|--------------------------------------------------------|----|------|
| <b>Commercial Temperature Range</b> |                                                            |                                |                                                        |    |      |
| CY22800-001A                        | X2 Multiplier                                              | CLKIN: 0.5–100<br>XTAL: 8–30   | CLKA: 1–200 or REFOUT                                  | N  | N    |
| CY22800-002A                        | X3 Multiplier                                              | CLKIN: 0.5–66.66<br>XTAL: 8–30 | CLKA: 1.5–200 or REFOUT                                | N  | N    |
| CY22800-003A                        | X4 Multiplier                                              | CLKIN: 0.5–50<br>XTAL: 8–30    | CLKA: 2–200 or REFOUT                                  | N  | N    |
| CY22800-004A                        | X5 Multiplier                                              | CLKIN: 0.5–40<br>XTAL: 8–30    | CLKA: 2.5–200 or REFOUT                                | N  | N    |
| CY22800-005A                        | X6 Multiplier                                              | CLKIN: 0.5–33.33<br>XTAL: 8–30 | CLKA: 3–200<br>CLKB: REFOUT                            | N  | N    |
| CY22800-006A                        | X8 Multiplier                                              | CLKIN: 0.5–25<br>XTAL: 8–25    | CLKA: 4–200<br>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<br>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<br>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<br>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<br>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<br>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<br>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<br>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<br>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<br>XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 0.25\%$ or off)<br>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<br>XTAL: 25.0–30.1 | CLKA: REF (spread $\pm 0.5\%$ or off)<br>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<br>XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 0.75\%$ or off)<br>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<br>XTAL: 25.0–30.3 | CLKA: REF (spread $\pm 1.0\%$ or off)<br>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<br>XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 1.25\%$ or off)<br>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<br>XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 1.5\%$ or off)<br>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<br>XTAL: 25.0–30.1 | CLKA: REF (spread $\pm 1.75\%$ or off)<br>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<br>XTAL: 25.0–30.0 | CLKA: REF (spread $\pm 2.0\%$ or off)<br>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<br>CLKB: 54<br>CLKC: 27                                                          | N  | Y    |
| CY22800-024A | MPEG-2 clock generator for DTV and STB w/ VCXO                | XTAL: 13.5                           | CLKA: 13.5<br>CLKB: 54<br>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<br>CLKC: 27, 27                                                              | N  | Y    |
| CY22800-027A | MPEG-2 clock generator for DTV and STB w/ VCXO                | XTAL: 27                             | CLKB: 27, 27<br>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<br>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<br>CLKB: 27                                                      | N  | N    |
| CY22800-030A | HDTV, STB clock generator (Ethernet/PCI/Microprocessor clock) | XTAL/CLKIN: 27                       | CLKA: 25, 20<br>CLKB: 27<br>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<br>CLKB: 48                                               | N  | N    |
| CY22800-032A | HDTV, STB clock generator (pixel clocks)                      | XTAL/CLKIN: 27                       | CLKA: 74.25, 74.175824, 148.5, 148.351648<br>CLKB: 27                                     | N  | N    |
| CY22800-033A | Audio clock generator for HDTV & STB (256fs)                  | XTAL/CLKIN: 27                       | CLKA: (32K, 44.1K, 48K) $\times$ 256<br>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) × 384<br>CLKB: 27             | N  | N    |
| CY22800-035A | Audio clock generator for HDTV & STB (512fs)                   | XTAL/CLKIN: 27                    | CLKA: (32K, 44.1K, 48K) × 512<br>CLKB: 27             | N  | N    |
| CY22800-036A | Audio clock generator for HDTV & STB (768fs)                   | XTAL/CLKIN: 27                    | CLKA: (32K, 44.1K, 48K) × 768<br>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<br>(−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<br>(−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<br>(±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<br>(±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)<br>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)<br>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)<br>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)<br>CLKB: 27        | Y  | N    |
| CY22800-045A | Spread spectrum clock generator with Multiplier option         | CLKIN: 35–100                     | CLKA: ×1, ×2, ×4 or /2 (spread −0.5%)<br>CLKB: REFOUT | Y  | N    |
| CY22800-046A | Spread spectrum clock generator with Multiplier option         | CLKIN: 35–100                     | CLKA: ×1, ×2, ×4 or /2 (spread −1.0%)<br>CLKB: REFOUT | Y  | N    |
| CY22800-047A | Spread spectrum clock generator with Multiplier option         | CLKIN: 35–100                     | CLKA: ×1, ×2, ×4 or /2 (spread −1.5%)<br>CLKB: REFOUT | Y  | N    |
| CY22800-048A | Spread spectrum clock generator with Multiplier option         | CLKIN: 35–100                     | CLKA: ×1, ×2, ×4 or /2 (spread −2.0%)<br>CLKB: REFOUT | Y  | N    |
| CY22800-049A | Spread spectrum clock generator with Multiplier option         | CLKIN: 35–100                     | CLKA: ×1, ×2, ×4 or /2 (spread −2.5%)<br>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<br>(−1.5% or off)     | Y  | N    |
| CY22800-051A | ×10 Multiplier                                                 | CLKIN: 0.5–20<br>XTAL: 8–20       | CLKA: 5–200<br>CLKB: REFOUT                           | N  | N    |
| CY22800-052A | ×12 Multiplier                                                 | CLKIN: 0.5–16.66<br>XTAL: 8–16.66 | CLKA: 6–200.0<br>CLKB: REFOUT                         | N  | N    |
| CY22800-053A | ×15 Multiplier                                                 | CLKIN: 0.5–13.33<br>XTAL: 8–13.33 | CLKA: 7.5–200<br>CLKB: REFOUT                         | N  | N    |
| CY22800-054A | ×20 Multiplier                                                 | CLKIN: 0.5–10<br>XTAL: 8–10       | CLKA: 10–200<br>CLKB: REFOUT                          | N  | N    |
| CY22800-055A | ×25 Multiplier                                                 | CLKIN: 0.5–8<br>XTAL: 8           | CLKA: 12.5–200<br>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<br>XTAL: 8–30 | CLKA: 1.67–88.67<br>CLKB: REFOUT                     | N  | N    |
| CY22800-057A | 4/3 Multiplier                                                 | CLKIN: 2–100<br>XTAL: 8–30   | CLKA: 2.66–133.33<br>CLKB: REFOUT                    | N  | N    |
| CY22800-058A | 3/4 Multiplier                                                 | CLKIN: 3.5–133<br>XTAL: 8–30 | CLKA: 2.625–99.75<br>CLKB: REFOUT                    | N  | N    |
| CY22800-059A | 3/2 Multiplier                                                 | CLKIN: 1.5–133<br>XTAL: 8–30 | CLKA: 2.25–199.5<br>CLKB: REFOUT                     | N  | N    |
| CY22800-060A | 2/5 Multiplier                                                 | CLKIN: 5–133<br>XTAL: 8–30   | CLKA: 2–53.2<br>CLKB: REFOUT                         | N  | N    |
| CY22800-061A | 3/5 Multiplier                                                 | CLKIN: 3.5–133<br>XTAL: 8–30 | CLKA: 2.1–80<br>CLKB: REFOUT                         | N  | N    |
| CY22800-062A | 5/6 Multiplier                                                 | CLKIN: 3–80<br>XTAL: 8–30    | CLKA: 2.5–66.67<br>CLKB: REFOUT                      | N  | N    |
| CY22800-063A | 6/5 Multiplier                                                 | CLKIN: 2–66.67<br>XTAL: 8–30 | CLKA: 2.4–80<br>CLKB: REFOUT                         | N  | N    |
| CY22800-064A | 5/8 Multiplier                                                 | CLKIN: 2.5–80<br>XTAL: 8–30  | CLKA: 1.56–50<br>CLKB: REFOUT                        | N  | N    |
| CY22800-065A | 8/5 Multiplier                                                 | CLKIN: 2–50<br>XTAL: 8–30    | CLKA: 3.2–80<br>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)<br>CLKB: 27       | Y  | N    |
| CY22800-067A | 5/4 Multiplier                                                 | CLKIN: 5–133<br>XTAL: 8–30   | CLKA: 6–166<br>CLKB: REFOUT                          | N  | N    |
| CY22800-068A | 4/5 Multiplier                                                 | CLKIN: 5–33<br>XTAL: 8–30    | CLKA: 4–106<br>CLKB: REFOUT                          | N  | N    |
| CY22800-069A | 66/64 Multiplier                                               | CLKIN: 5–133<br>XTAL: 8–30   | CLKA: 5–137<br>CLKB: REFOUT                          | N  | N    |
| CY22800-070A | 64/66 Multiplier                                               | CLKIN: 5–133<br>XTAL: 8–30   | CLKA: 5–129<br>CLKB: REFOUT                          | N  | N    |
| CY22800-071A | 255/238 Multiplier                                             | CLKIN: 5–133<br>XTAL: 8–30   | CLKA: 5–142<br>CLKB: REFOUT                          | N  | N    |
| CY22800-072A | 238/255 Multiplier                                             | CLKIN: 5–133<br>XTAL: 8–30   | CLKA: 5–124<br>CLKB: REFOUT                          | N  | N    |
| CY22800-073A | 3-Output Fanout Buffer                                         | CLKIN: 1–133<br>XTAL: 8–30   | CLKA = CLKB = CLKC: REFOUT                           | N  | N    |
| CY22800-074A | X2 Multiplier with Fanout and REFOUT                           | CLKIN: 9–100<br>XTAL: 9–30   | CLKA = CLKC: 18–200<br>CLKB: REFOUT                  | N  | N    |
| CY22800-075A | X3 Multiplier with Fanout and REFOUT                           | CLKIN: 6–66<br>XTAL: 8–30    | CLKA = CLKC: 18–200<br>CLKB: REFOUT                  | N  | N    |
| CY22800-076A | X4 Multiplier with Fanout and REFOUT                           | CLKIN: 5–50<br>XTAL: 8–30    | CLKA = CLKC: 20–200<br>CLKB: REFOUT                  | N  | N    |
| CY22800-077A | /2 Clock Divider                                               | CLKIN: 0.5–133<br>XTAL: 8–30 | CLKA: 0.25–66.5<br>CLKB = CLKC: 0.25–66.5 or off     | N  | N    |
| CY22800-078A | /3 Clock Divider                                               | CLKIN: 0.5–133<br>XTAL: 8–30 | CLKA: 0.17–44.3<br>CLKB = CLKC: 0.17–44.3 or off     | N  | N    |
| CY22800-079A | /4 Clock Divider                                               | CLKIN: 0.5–133<br>XTAL: 8–30 | CLKA: 0.125–33.25<br>CLKB = CLKC: 0.125–33.25 or off | N  | N    |
| CY22800-080A | /5 Clock Divider                                               | CLKIN: 0.5–133<br>XTAL: 8–30 | CLKA: 0.1–26.6<br>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<br>XTAL: 8–30      | CLKA: 0.083–22.2<br>CLKB = CLKC: 0.083–22.2 or off                                        | N  | N    |
| CY22800-082A                        | /7 Clock Divider                                            | CLKIN: 0.5–133<br>XTAL: 8–30      | CLKA: 0.071–19<br>CLKB = CLKC: 0.071–19 or off                                            | N  | N    |
| CY22800-083A                        | /8 Clock Divider                                            | CLKIN: 0.5–133<br>XTAL: 8–30      | CLKA: 0.063–16.6<br>CLKB = CLKC: 0.063–v16.6 or off                                       | N  | N    |
| CY22800-084A                        | /9 Clock Divider                                            | CLKIN: 0.5–133<br>XTAL: 8–30      | CLKA: 0.056–14.8<br>CLKB = CLKC: 0.056–14.8 or off                                        | N  | N    |
| CY22800-085A                        | /10 Clock Divider                                           | CLKIN: 0.5–133<br>XTAL: 8–30      | CLKA: 0.05–13.3<br>CLKB = CLKC: 0.05–13.3 or off                                          | N  | N    |
| <b>Industrial Temperature Range</b> |                                                             |                                   |                                                                                           |    |      |
| CY22800-115A                        | Spread spectrum for consumer and communication applications | CLKIN: 25– 82.5<br>XTAL: 25–30    | CLKA: REF (spread $\pm 0.25\%$ or off)<br>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<br>XTAL: 25–30     | CLKA: REF (spread $\pm 0.5\%$ or off)<br>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<br>XTAL: 25 - 30   | CLKA: REF (spread $\pm 0.75\%$ or off)<br>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<br>XTAL: 25–30     | CLKA: REF (spread $\pm 1.0\%$ or off)<br>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<br>XTAL: 25–30     | CLKA: REF (spread $\pm 1.25\%$ or off)<br>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<br>XTAL: 25–30     | CLKA: REF (spread $\pm 1.5\%$ or off)<br>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<br>XTAL: 25–30     | CLKA: REF (spread $\pm 1.75\%$ or off)<br>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 $-0.5\%$ )<br>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 $-1.0\%$ )<br>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 $-1.5\%$ )<br>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 $-2.0\%$ )<br>CLKB: REFOUT       | Y  | N    |
| CY22800-151A                        | $\times 10$ Multiplier                                      | CLKIN: 0.5–16.5<br>XTAL: 8–16.5   | CLKA: 5–165<br>CLKB: REFOUT                                                               | N  | N    |
| CY22800-152A                        | $\times 12$ Multiplier                                      | CLKIN: 0.5–13.75<br>XTAL: 8–13.75 | CLKA: 6–165<br>CLKB: REFOUT                                                               | N  | N    |
| CY22800-153A                        | $\times 15$ Multiplier                                      | CLKIN: 0.5–11<br>XTAL: 8–11       | CLKA: 7.5–165<br>CLKB: REFOUT                                                             | N  | N    |

**CY22800 Configurations** *(continued)*

| Code #       | Code name      | Input Freq. (MHz)               | Output Freq. (MHz)               | SS | VCXO |
|--------------|----------------|---------------------------------|----------------------------------|----|------|
| CY22800-154A | ×20 Multiplier | CLKIN: 0.5–8.25<br>XTAL: 8–8.25 | CLKA: 10–165<br>CLKB: REFOUT     | N  | N    |
| CY22800-155A | ×25 Multiplier | CLKIN: 0.5–6.6<br>XTAL: 8–6.6   | CLKA: 12.5–165<br>CLKB: REFOUT   | N  | N    |
| CY22800-156A | 2/3 Multiplier | CLKIN: 2.5–82.5<br>XTAL: 8–30   | CLKA: 1.67–55<br>CLKB: REFOUT    | N  | N    |
| CY22800-157A | 4/3 Multiplier | CLKIN: 1.5–82.5<br>XTAL: 8–27.5 | CLKA: 2–110<br>CLKB: REFOUT      | N  | N    |
| CY22800-158A | 3/4 Multiplier | CLKIN: 3.5–110<br>XTAL: 8–30    | CLKA: 2.625–82.5<br>CLKB: REFOUT | N  | N    |
| CY22800-159A | 3/2 Multiplier | CLKIN: 1.5–110<br>XTAL: 8–27.5  | CLKA: 2.25–165<br>CLKB: REFOUT   | N  | N    |
| CY22800-160A | 2/5 Multiplier | CLKIN: 5–133<br>XTAL: 8–30      | CLKA: 2–53.2<br>CLKB: REFOUT     | N  | N    |
| CY22800-161A | 3/5 Multiplier | CLKIN: 3.5–110<br>XTAL: 8–30    | CLKA: 2.1–66<br>CLKB: REFOUT     | N  | N    |
| CY22800-162A | 5/6 Multiplier | CLKIN: 3–66<br>XTAL: 8–30       | CLKA: 2.5–55<br>CLKB: REFOUT     | N  | N    |
| CY22800-163A | 6/5 Multiplier | CLKIN: 2–55<br>XTAL: 8–30       | CLKA: 2.4–66<br>CLKB: REFOUT     | N  | N    |
| CY22800-164A | 5/8 Multiplier | CLKIN: 2.5–80<br>XTAL: 8–30     | CLKA: 1.56–50<br>CLKB: REFOUT    | N  | N    |
| CY22800-165A | 8/5 Multiplier | CLKIN: 2–41.25<br>XTAL: 8–30    | CLKA: 3.2–66<br>CLKB: REFOUT     | N  | N    |

**Absolute Maximum Conditions**

| Parameter       | Description                                 | Min                   | Max                   | Unit |
|-----------------|---------------------------------------------|-----------------------|-----------------------|------|
| V <sub>DD</sub> | Supply voltage                              | –0.5                  | 4.6                   | V    |
| T <sub>S</sub>  | Storage temperature                         | –65                   | 125                   | °C   |
| T <sub>J</sub>  | Junction temperature                        | –                     | 125                   | °C   |
|                 | Digital inputs                              | V <sub>SS</sub> – 0.3 | V <sub>DD</sub> + 0.3 | V    |
|                 | Digital outputs referred to V <sub>DD</sub> | V <sub>SS</sub> – 0.3 | V <sub>DD</sub> + 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   |
| $f_{REF}^{[3]}$ | Reference frequency                                                                                 | 0.5  | –   | 100  | MHz  |
| $t_{PU}$        | Power up time for all $V_{DD}$ s 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   | $\Omega$ |
| $R_3/R_1$    | 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 $3 \times F_{NOM}$ (High Side)                                                                         | 300  | –   | –    | ppm      |
| $F_{3SEPLO}$ | Third overtone separation from $3 \times F_{NOM}$ (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       |

## 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  | $\Omega$ |
| DL         | Crystal drive level                | No external series resistor assumed              | –   | 0.5 | 2   | mW       |

### Note

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

## DC Electrical Specifications

| Parameter       | Name                   | Description                                                            | Min       | Typ | Max      | Unit          |
|-----------------|------------------------|------------------------------------------------------------------------|-----------|-----|----------|---------------|
| $I_{OH}$        | Output high current    | $V_{OH} = V_{DD} - 0.5\text{ V}$ ,<br>$V_{DD} = 3.3\text{ V}$ (source) | 12        | 24  | –        | mA            |
| $I_{OL}$        | Output low current     | $V_{OL} = 0.5\text{ V}$ , $V_{DD} = 3.3\text{ V}$ (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       | $\mu\text{A}$ |
| $I_{IL}$        | Input low current      | $V_{IL} = 0\text{ V}$                                                  | –         | –   | 50       | $\mu\text{A}$ |
| $f_{\Delta XO}$ | VCXO pullability range |                                                                        | $\pm 150$ | –   |          | 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      | $V_{DD}$      |

## Thermal Resistance

| Parameter <sup>[4]</sup> | Description                              | Test Conditions                                                                                                             | 8-pin SOIC | Unit                 |
|--------------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------|----------------------|
| $\theta_{JA}$            | Thermal resistance (junction to ambient) | Test conditions follow standard test methods and procedures for measuring thermal impedance, in accordance with EIA/JESD51. | 131        | $^{\circ}\text{C/W}$ |
| $\theta_{JC}$            | Thermal resistance (junction to case)    |                                                                                                                             | 41         | $^{\circ}\text{C/W}$ |

### Note

4. These parameters are guaranteed by design and are not tested.

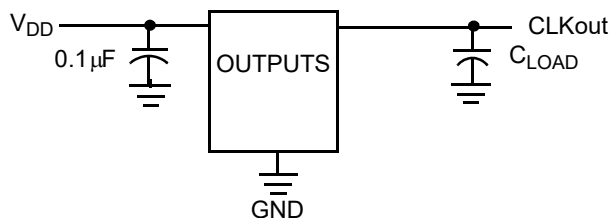
## AC Electrical Characteristics

( $V_{DD} = 3.3\text{ V}$ )

| 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;  $DC = t_2/t_1$

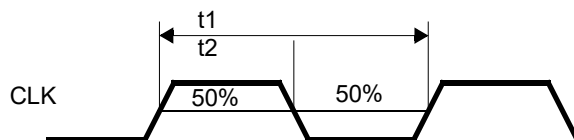
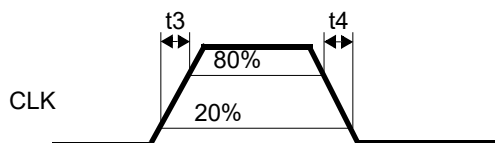


Figure 5. Rise and Fall Time Definitions



| Ordering Code | Package Type               | Operating Range | Operating Voltage |
|---------------|----------------------------|-----------------|-------------------|
| CY22800KFXC   | 8-pin SOIC                 | Commercial      | 3.3 V             |
| CY22800KFXT   | 8-pin SOIC – Tape and Reel | Commercial      | 3.3 V             |
| CY22800KFXI   | 8-pin SOIC                 | Industrial      | 3.3 V             |
| CY22800KFXT   | 8-pin SOIC – Tape and Reel | Industrial      | 3.3 V             |

The diagram illustrates the breakdown of the part number **CY22800KX-X-X-XXXA-X** into its constituent fields and their meanings:

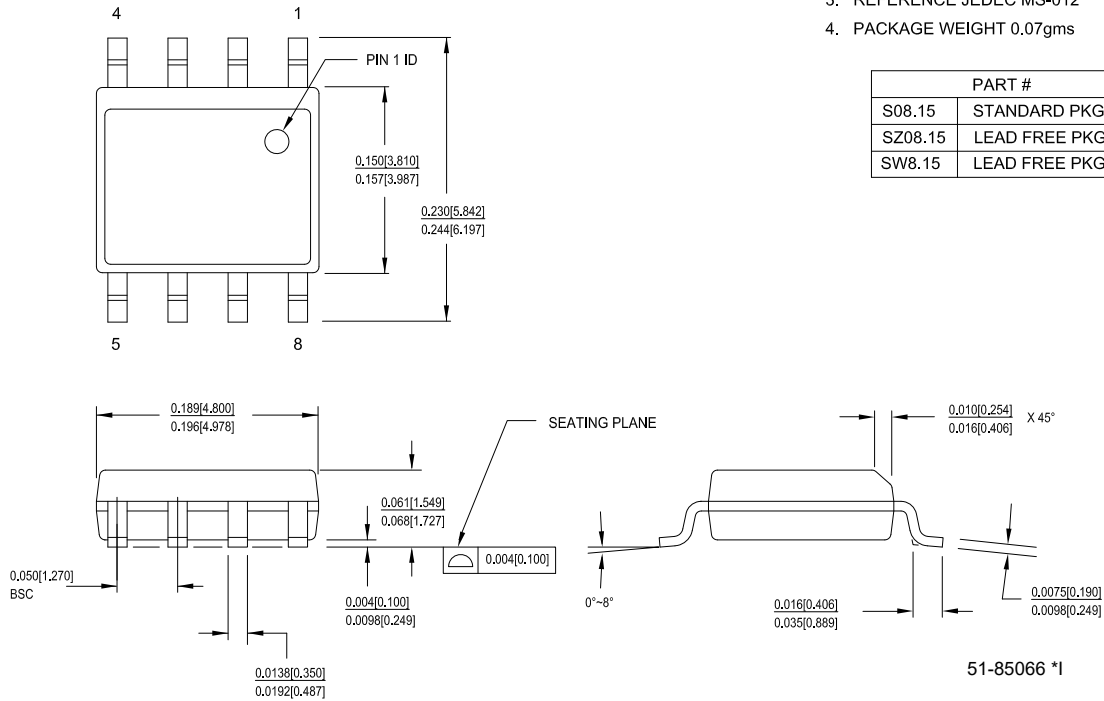
- CY**: Company ID: CY = Cypress
- 22800**: Base Part Number
- K**: Foundry Manufacturing
- X**: X = F or blank; F = Field Programmable Device; blank = Factory Programmable Device
- X**: Pb-free
- X**: Temperature range: X = C or I; C = Commercial = 0 °C to +70 °C; I = Industrial = -40 °C to +85 °C
- : Dash Code for Factory Programmed Device only
- XXX**: Fixed
- A**: Package Type: X = blank or T; blank = Tube; T = Tape and Reel
- X**: Package Type: X = blank or T; blank = Tube; T = Tape and Reel

## Package Diagram

Figure 6. 8-pin SOIC (150 Mils) S0815/SZ815/SW815 Package Outline, 51-85066

1. DIMENSIONS IN INCHES[MM] MIN.  
MAX.
2. PIN 1 ID IS OPTIONAL,  
ROUND ON SINGLE LEADFRAME  
RECTANGULAR ON MATRIX LEADFRAME
3. REFERENCE JEDEC MS-012
4. PACKAGE WEIGHT 0.07gms

| PART #  |               |
|---------|---------------|
| S08.15  | STANDARD PKG  |
| SZ08.15 | LEAD FREE PKG |
| SW8.15  | LEAD FREE PKG |



## 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)<br>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 <a href="#">Features</a> (Added Industrial Temperature information).<br>Updated <a href="#">Functional Description</a> (Updated the sentence to read as "The CY22800 is a reprogrammable device that can be programmed up to 100 times."<br>Updated <a href="#">CY22800 Configurations</a> (Added Industrial Temperature information and also some more codes and their respective details).<br>Updated Cypress Programmable Clocks (Added CY22801 and its details).<br>Updated <a href="#">Recommended Operating Conditions</a> (Added Industrial Temperature information).<br>Updated <a href="#">Pullable Crystal Specifications</a> (Changed unit for C <sub>1</sub> parameter from pF to fF).<br>Updated <a href="#">Ordering Information</a> (Added Industrial Temperature information). |
| *B                                                                                                   | 2440628 | AESA            | 05/25/2008      | Updated Cypress Programmable Clocks:<br>Updated Note 3.<br>Updated <a href="#">Ordering Information</a> :<br>Added part numbers CY22800FXCT, CY22800FXIT, CY22800KFXC, CY22800KFXCT, CY22800KFXI, and CY22800KFXIT.<br>Added Note "Not recommended for new designs." below.<br>Updated to new template.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| *C                                                                                                   | 2897294 | KVM             | 03/22/2010      | Updated <a href="#">Ordering Information</a> :<br>Removed part numbers CY22800FXC, CY22800FXCT, CY22800FXI and CY22800FXIT.<br>Removed Note "Not recommended for new designs." below the table.<br>Updated <a href="#">Package Diagram</a> .<br>Updated copyright section.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| *D                                                                                                   | 3349379 | PURU            | 08/26/2011      | Removed Benefits.<br>Updated <a href="#">Package Diagram</a> .<br>Added <a href="#">Ordering Code Definitions</a> .<br>Added <a href="#">Acronyms and Units of Measure</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| *E                                                                                                   | 3471796 | PURU            | 12/21/2011      | Replaced CYTRA-102004-00 with CY22800 in all instances across the document.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| *F                                                                                                   | 4491759 | XHT             | 9/8/2014        | Updated <a href="#">Package Diagram</a> .<br>Completing Sunset Review.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| *G                                                                                                   | 4576237 | XHT             | 11/21/2014      | Updated <a href="#">Functional Description</a> :<br>Added "For a complete list of related documentation, click <a href="#">here</a> ." at the end.<br>Updated Cypress Programmable Clocks:<br>Updated details in "Output Freq." column corresponding to the parts CY22800, CY22801, CY22392, CY22381, CY22393, CY22394/5, and CY22388/89/91.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| *H                                                                                                   | 5281166 | PSR             | 05/23/2016      | Added <a href="#">Thermal Resistance</a> .<br>Updated <a href="#">Package Diagram</a> :<br>spec 51-85066 – Changed revision from *F to *H.<br>Updated to new template.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| *I                                                                                                   | 5911987 | XHT             | 10/10/2017      | Removed "Cypress Programmable Clocks".<br>Updated <a href="#">Figure 6</a> (spec 51-85066 *H to *I) in <a href="#">Package Diagram</a> .<br>Updated Sales and Copyright information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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