

# Single-PLL General Purpose EPROM Programmable Clock Generator

## Features

- Single phase locked loop (PLL) architecture
- EPROM programmability
- Factory programmable (CY2907) or field programmable (CY2907F) device options
- Up to two configurable outputs
- Low skew, low jitter, high accuracy outputs
- Power management (power-down, OE)
- Frequency select option
- Configurable 5 V or 3.3 V Operation
- 8-pin SOIC package

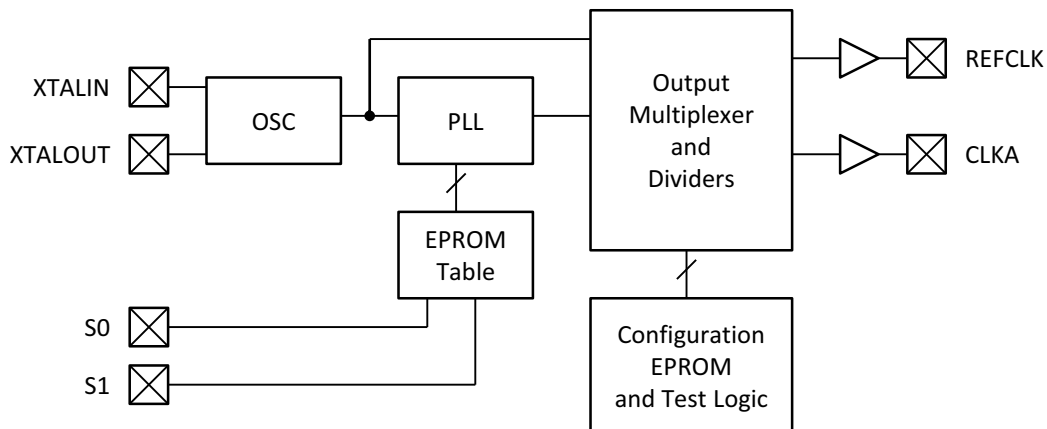
## Benefits

- Generates a custom frequency from an external source
- Easy customization and fast turnaround
- Programming support available for all opportunities
- Provides clocking requirements from a single device
- Meets critical industry standard timing requirements
- Supports low power applications
- Up to 16 user selectable frequencies
- Supports industry standard design platforms
- Industry standard packaging saves on board space

## Functional Description

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

## Logic Block Diagram

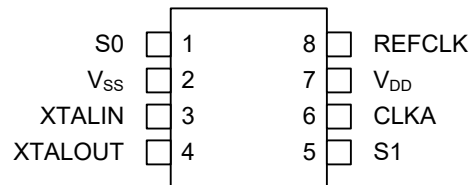


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## Pin Configurations

Figure 1. 8-pin SOIC pinout (Top View)



## Pin Description

| Name                      | Pin Number | Description   |
|---------------------------|------------|---|
|                           | 8-pin SOIC |   |
| S1                        | 5          | Frequency select (CLKA) (internal pull-up resistor to V <sub>DD</sub> ) |
| V <sub>SS</sub>           | 2          | Ground  |
| XTALIN <sup>[1]</sup>     | 3          | Reference crystal input   |
| XTALOUT <sup>[1, 2]</sup> | 4          | Reference crystal feedback  |
| CLKA                      | 6          | Clock output  |
| V <sub>DD</sub>           | 7          | Voltage supply  |
| REFCLK                    | 8          | Reference clock output (default, can be driven by PLL if desired)       |
| S0                        | 1          | Frequency select (CLKA) (internal pull-up resistor to V <sub>DD</sub> ) |

### Notes

1. For best accuracy, use a parallel resonant crystal, C<sub>LOAD</sub> ≈ 17 pF.
2. Float XTALOUT pin if XTALIN is driven by reference clock (as opposed to crystal).

## Functional Overview

The CY2907 is a general purpose clock generator designed for use in a wide variety of applications — from graphics to PC peripherals to disk drives. It generates selectable system clock frequencies from a single reference input (crystal or reference clock). The CY2907 is configured with an EPROM array, similar to the other devices in the Cypress EPROM Programmable Clock family, making it easy to customize for any application. Furthermore, the CY2907 is compatible with all industry standard 9107 and 9108 clock synthesizers.

## Device Programming

Two versions of the CY2907 are available - Field Programmable and Factory Programmable. Field programmable devices must be programmed before being installed in an application. They are one-time-programmable (OTP). Customers can program small quantities in-house using the Cypress CY3670 programmer. Production quantities are available through Cypress's value-added distribution partners, or by using third party programmers from BP Microsystems, Hi-Lo Systems, and others.

For high volume orders, devices can be factory programmed by Cypress. All requests must be submitted to the local Cypress Field Application Engineer (FAE) or sales representative. After the request is processed, you receive a new part number, samples, and a data sheet with the programmed values. This part number is used for additional sample requests and production orders.

## CyberClocks™ Software

CyberClocks is an easy-to-use software application that enables the user to configure any one of the EPROM Programmable Clocks offered by Cypress. You may specify the input frequency, PLL and output frequencies, and different functional options. Note the output frequency ranges in this data sheet when specifying them in CyberClocks to make sure that you stay within the limits. After a configuration is established, you can print the configuration and save programming files in ENT and JED formats.

CyberClocks runs on PCs running the Windows™ operating system, and is available for free download on the Cypress Semiconductor website at [www.cypress.com](http://www.cypress.com).

Within the CyberClocks application, the CY2907 is found in the CyClocks™ section. Note that the standalone CyberClocks software should not be confused with the CyberClocks Online software, which is a web-based application that is used to configure other programmable clock devices.

## Cypress CY3670 Programming Kit

Cypress's CY3670 is a portable programmer that connects to a PC serial port and enables users of CyClocks software to quickly and easily program any of the CY2291F, CY2292F, CY2071AF, and CY2907F devices. An adapter is also required and is ordered separately. The CY3097 is the adapter for the CY2907F8.

### Maximum Ratings

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

Supply voltage ..... -0.5 to +7.0 V  
 Input voltage ..... -0.5 V to  $V_{DD} + 0.5$  V

Storage temperature  
 (non-condensing) ..... -65 °C to +150 °C  
 Max soldering temperature (10 sec) ..... +260 °C  
 Junction temperature ..... +150 °C  
 Static discharge voltage  
 (per MIL-STD-883, method 3015) ..... > 2000 V

### Operating Conditions

| Parameter <sup>[3]</sup> | Description                                | Min  | Max  | Unit |
|--------------------------|--|------|------|------|
| V <sub>DD</sub>          | Supply voltage, 5 V operation              | 4.5  | 5.5  | V    |
|                          | Supply voltage, 3.3 V operation            | 3.0  | 3.6  | V    |
| T <sub>A</sub>           | Commercial operating temperature, Ambient  | 0    | 70   | °C   |
| C <sub>L</sub>           | Maximum capacitive load                    | –    | 15   | pF   |
| f <sub>REF</sub>         | External reference crystal                 | 10.0 | 25.0 | MHz  |
|                          | External reference clock <sup>[4, 5]</sup> | 1.0  | 30.0 | MHz  |

**Notes**

- 3. Electrical parameters are guaranteed with these operating conditions.
- 4. Guaranteed by design, not 100% tested in production.
- 5. Load = max typical configuration, f<sub>REF</sub> = 14.318 MHz. Specific configurations may vary. A close approximation of I<sub>DD</sub> can be derived by the following formula:  
 $I_{DD} \text{ (mA)} = V_{DD} \times (6.25 + (0.055 \times f_{REF}) + (0.0017 \times C_{LOAD} \times (F_{CLKA} + REFCLK)))$ . C<sub>LOAD</sub> is specified in pF and F is specified in MHz.

## Electrical Characteristics

At 5.0 V Commercial ( $V_{DD} = 4.5 \text{ V to } 5.5 \text{ V}$ ,  $T_A = 0 \text{ }^\circ\text{C to } +70 \text{ }^\circ\text{C}$ )

| Parameter      | Description               | Test Conditions   | Min | Max | Unit          |
|----------------|---------------------------|---|-----|-----|---------------|
| $V_{IH}$       | High-level input voltage  | Except crystal inputs   | 2.0 | –   | V             |
| $V_{IL}$       | Low-level input voltage   | Except crystal inputs   | –   | 0.8 | V             |
| $V_{OH}^{[6]}$ | High-level output voltage | $V_{DD} = V_{DD} \text{ Min.}$   $I_{OH} = -30 \text{ mA}$   CLKA | 2.4 | –   | V             |
| $V_{OL}^{[6]}$ | Low-level output voltage  | $V_{DD} = V_{DD} \text{ Min.}$   $I_{OL} = 10 \text{ mA}$   CLKA  | –   | 0.4 | V             |
| $I_{OH}^{[6]}$ | Output high current       | $V_{OH} = 2.0 \text{ V}$  | –   | –35 | mA            |
| $I_{OL}^{[6]}$ | Output low current        | $V_{OL} = 0.8 \text{ V}$  | 22  | –   | mA            |
| $I_{IH}$       | Input high current        | $V_{IH} = V_{DD}$   | –2  | 2   | $\mu\text{A}$ |
| $I_{IL}$       | Input low current         | $V_{IL} = 0 \text{ V}$  | –   | 20  | $\mu\text{A}$ |
| $I_{DD}^{[7]}$ | Power supply current      | $\overline{\text{PD}}$ HIGH, CLKA = 50 MHz                        | –   | 42  | mA            |
| $I_{DD}$       | Power supply current      | $\overline{\text{PD}}$ LOW, Logic inputs LOW                      | –   | 100 | $\mu\text{A}$ |
| $I_{DD}$       | Power supply current      | $\overline{\text{PD}}$ LOW, Logic inputs HIGH                     | –   | 40  | $\mu\text{A}$ |
| $R_{PU}^{[6]}$ | Pull-up resistor          | $V_{IN} = V_{DD} - 1.0 \text{ V}$                                 | –   | 700 | k $\Omega$    |

## Electrical Characteristics

At 3.3 V Commercial ( $V_{DD} = 3.0 \text{ V to } 3.6 \text{ V}$ ,  $T_A = 0 \text{ }^\circ\text{C to } +70 \text{ }^\circ\text{C}$ )

| Parameter      | Description               | Test Conditions                               | Min                  | Max                 | Unit          |
|----------------|---------------------------|---|----------------------|---------------------|---------------|
| $V_{IH}$       | High-level input voltage  | Except crystal inputs                         | $0.7 \times V_{DD}$  | –                   | V             |
| $V_{IL}$       | Low-level input voltage   | Except crystal inputs                         | –                    | $0.2 \times V_{DD}$ | V             |
| $V_{OH}^{[6]}$ | High-level output voltage | CLKA, $I_{OH} = -5 \text{ mA}$                | $0.85 \times V_{DD}$ | –                   | V             |
| $V_{OL}^{[6]}$ | Low-level output voltage  | CLKA, $I_{OL} = 6 \text{ mA}$                 | –                    | $0.1 \times V_{DD}$ | V             |
| $I_{OH}^{[6]}$ | Output high current       | $V_{OH} = 0.7 \times V_{DD}$                  | –                    | –10                 | mA            |
| $I_{OL}^{[6]}$ | Output low current        | $V_{OL} = 0.2 \times V_{DD}$                  | 15                   | –                   | mA            |
| $I_{IH}$       | Input high current        | $V_{IH} = V_{DD}$                             | –2                   | 2                   | $\mu\text{A}$ |
| $I_{IL}$       | Input low current         | $V_{IL} = 0 \text{ V}$                        | –                    | 10                  | $\mu\text{A}$ |
| $I_{DD}^{[7]}$ | Power supply current      | $\overline{\text{PD}}$ HIGH, CLKA = 50 MHz    | –                    | 40                  | mA            |
| $I_{DD}$       | Power supply current      | $\overline{\text{PD}}$ LOW, Logic inputs LOW  | –                    | 40                  | $\mu\text{A}$ |
| $I_{DD}$       | Power supply current      | $\overline{\text{PD}}$ LOW, Logic inputs HIGH | –                    | 12                  | $\mu\text{A}$ |
| $R_{PU}^{[6]}$ | Pull-up resistor          | $V_{IN} = V_{DD} - 0.5 \text{ V}$             | –                    | 900                 | k $\Omega$    |

### Notes

6. Guaranteed by design, not 100% tested in production.

7. Load = max. typical configuration,  $f_{REF} = 14.318 \text{ MHz}$ . Specific configurations may vary. A close approximation of  $I_{DD}$  can be derived by the following formula:  
 $I_{DD} \text{ (mA)} = V_{DD} \times (6.25 + (0.055 \times F_{REF}) + (0.0017 \times C_{LOAD} \times (F_{CLKA} + REFCLK)))$ .  $C_{LOAD}$  is specified in pF and F is specified in MHz.

## Switching Characteristics

At 5.0 V Commercial

| Parameter <sup>[8]</sup> | Output <sup>[9]</sup> | Description                     | Test Conditions                      | Min  | Max   | Unit |
|--------------------------|-----------------------|---------------------------------|--------------------------------------|------|-------|------|
| t <sub>R</sub>           | CLKA                  | Output rise time 0.8 V to 2.0 V | 15 pF load                           | –    | 1.40  | ns   |
| t <sub>F</sub>           | CLKA                  | Output fall time 2.0 V to 0.8 V | 15 pF load                           | –    | 1.00  | ns   |
| t <sub>R</sub>           | CLKA                  | Output rise time 20% to 80%     | 15 pF load                           | –    | 3.5   | ns   |
| t <sub>F</sub>           | CLKA                  | Output fall time 80% to 20%     | 15 pF load                           | –    | 2.5   | ns   |
| t <sub>D</sub>           | CLKA                  | Duty cycle                      | 15 pF load at 1.4 V                  | 45.0 | 55.0  | %    |
| F <sub>I</sub>           | XTALIN                | Input frequency                 | Crystal oscillator                   | 10   | 25    | MHz  |
| F <sub>I</sub>           | XTALIN                | Input frequency                 | External input clock <sup>[10]</sup> | 1    | 30    | MHz  |
| F <sub>O</sub>           | CLKA                  | Output frequency                | CY2907, 15 pF load                   | 0.5  | 130.0 | MHz  |
|                          |                       |                                 | CY2907F, 15 pF load                  | 0.5  | 100.0 | MHz  |
| t <sub>JIS</sub>         | CLKA                  | Jitter (one sigma)              | 20 MHz to 130 MHz                    | –    | 150   | ps   |
| t <sub>JIS</sub>         | CLKA                  | Jitter (one sigma)              | 14 MHz to 20 MHz                     | –    | 200   | ps   |
| t <sub>JIS</sub>         | CLKA                  | Jitter (one sigma)              | Less than 14 MHz                     | –    | 1     | %    |
| t <sub>JAB</sub>         | CLKA                  | Jitter (absolute)               | 20 MHz to 130 MHz                    | –250 | + 250 | ps   |
| t <sub>JAB</sub>         | CLKA                  | Jitter (absolute)               | 14 MHz to 20 MHz                     | –500 | + 500 | ps   |
| t <sub>JAB</sub>         | CLKA                  | Jitter (absolute)               | Less than 14 MHz                     | –    | 3     | %    |
| t <sub>PU</sub>          |                       | Power-up time                   |                                      | –    | 18    | ms   |
| t <sub>FT</sub>          | CLKA                  | Transition time                 | 8 MHz to 66.6 MHz                    | –    | 13    | ms   |

### Notes

8. Guaranteed by design, not 100% tested in production.
9. REFCLK output can also be configured to be driven by the PLL. In that case these characteristics are also valid.
10. Refer to the application note *Crystal Oscillator Topics* when using an external reference clock as an input frequency source.

## Switching Characteristics

At 3.3 V Commercial

| Parameter <sup>[11]</sup> | Output <sup>[12]</sup> | Description                 | Test Conditions                      | Min  | Max   | Unit |
|---------------------------|------------------------|-----------------------------|--------------------------------------|------|-------|------|
| t <sub>R</sub>            | CLKA                   | Output rise time 20% to 80% | 15 pF Load                           | –    | 3.5   | ns   |
| t <sub>F</sub>            | CLKA                   | Output fall time 80% to 20% | 15 pF Load                           | –    | 2.5   | ns   |
| t <sub>D</sub>            | CLKA                   | Duty cycle                  | 15 pF Load at 1.4 V                  | 40.0 | 53.0  | %    |
| F <sub>I</sub>            | XTALIN                 | Input frequency             | Crystal Oscillator                   | 10   | 25    | MHz  |
| F <sub>I</sub>            | XTALIN                 | Input frequency             | External Input Clock <sup>[13]</sup> | 1    | 30    | MHz  |
| F <sub>O</sub>            | CLKA                   | Output frequency            | CY2907, 15 pF Load                   | 0.5  | 100.0 | MHz  |
|                           |                        |                             | CY2907F, 15 pF Load                  | 0.5  | 80.0  | MHz  |
| t <sub>JIS</sub>          | CLKA                   | Jitter (one sigma)          | 25 MHz to 100 MHz                    | –    | 150   | ps   |
| t <sub>JIS</sub>          | CLKA                   | Jitter (one sigma)          | 14 MHz to 25 MHz                     | –    | 200   | ps   |
| t <sub>JIS</sub>          | CLKA                   | Jitter (one sigma)          | Less than 14 MHz                     | –    | 1     | %    |
| t <sub>JAB</sub>          | CLKA                   | Jitter (absolute)           | 25 MHz to 120 MHz                    | –250 | +250  | ps   |
| t <sub>JAB</sub>          | CLKA                   | Jitter (absolute)           | 14 MHz to 25 MHz                     | –500 | +500  | ps   |
| t <sub>JAB</sub>          | CLKA                   | Jitter (absolute)           | Less than 14 MHz                     | –    | 3     | %    |
| t <sub>PU</sub>           |                        | Power-up time               |                                      | –    | 18    | ms   |
| t <sub>FT</sub>           | CLKA                   | Transition time             | 8 MHz to 66.6 MHz                    | –    | 13    | ms   |

### Notes

11. Guaranteed by design, not 100% tested in production.

12. REFCLK output can also be configured to be driven by the PLL. In that case these characteristics are also valid.

13. Refer to the application note *Crystal Oscillator Topics* when using an external reference clock as an input frequency source.



## Switching Waveforms

Figure 2. Frequency Select Change (Transition Time)

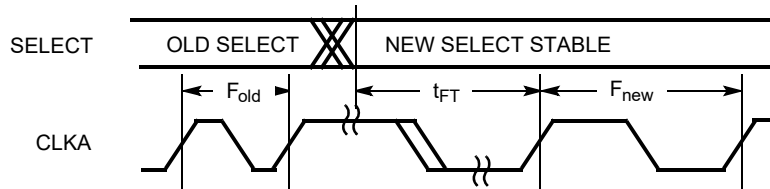


Figure 3. Duty Cycle Timing

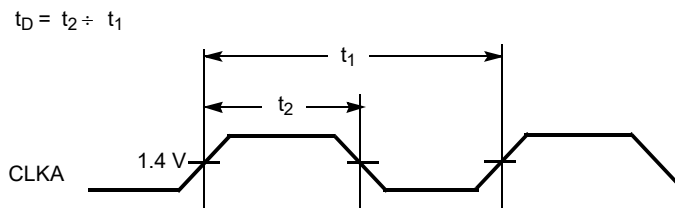
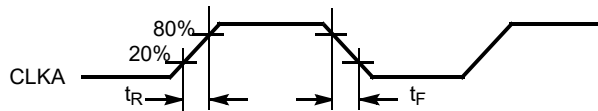
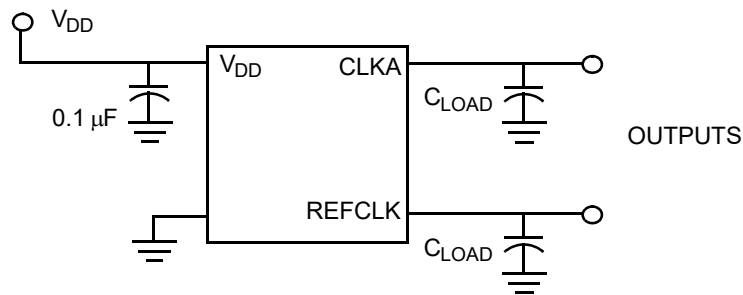


Figure 4. All Outputs Rise/Fall Time



## Test Circuit

Figure 5. Test Circuit

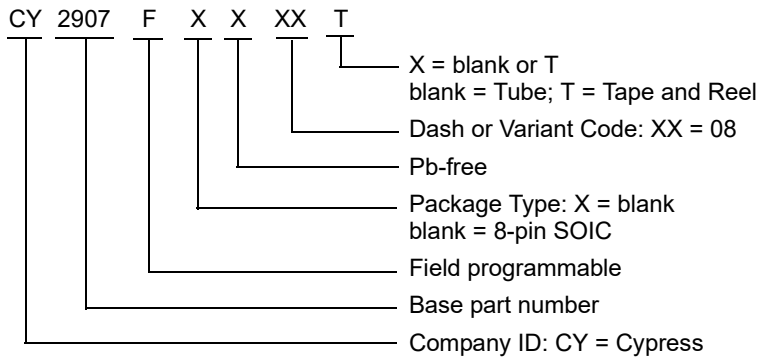


**Note:** All capacitors should be placed as close to each pin as possible.

### Ordering Information

| Ordering Code              | Package Type               | Operating Range                             |
|----------------------------|----------------------------|---|
| <b>Pb-free</b>             |                            |   |
| CY2907FX8 <sup>[14]</sup>  | 8-pin SOIC                 | 5.0 V/3.3 V, Commercial, Field programmable |
| CY2907FX8T <sup>[14]</sup> | 8-pin SOIC - Tape and Reel | 5.0 V/3.3 V, Commercial, Field programmable |

### Ordering Code Definitions



### Package Characteristics

| Package    | $\theta_{JA}$ (C/W) | $\theta_{JC}$ (C/W) | Transistor Count |
|------------|---------------------|---------------------|------------------|
| 8-pin SOIC | 170                 | 35                  | 5436             |

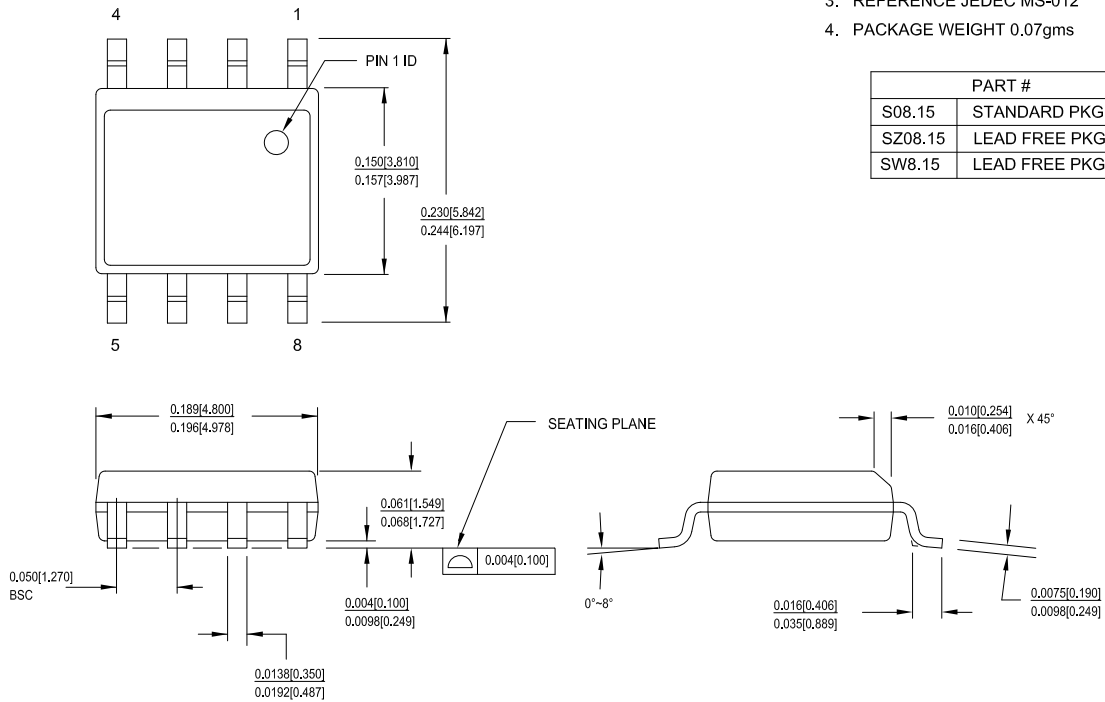
**Note**

14. Not for new designs. New designs should use a device other than the CY2907.

## Package Diagrams

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 |

51-85066 \*I

## Acronyms

| Acronym | Description                            |
|---------|--|
| EPROM   | Erasable Programmable Read Only Memory |
| OE      | Output Enable                          |
| PLL     | Phase-Locked Loop                      |
| SOIC    | Small-Outline Integrated Circuit       |
| TSSOP   | Thin-Shrink Small Outline Package      |

## Document Conventions

### Units of Measure

| Symbol | Unit of Measure   |
|--------|-------------------|
| °C     | degree Celsius    |
| kΩ     | kilohm            |
| MHz    | megahertz         |
| μA     | microampere       |
| mA     | milliampere       |
| ms     | millisecond       |
| mW     | milliwatt         |
| ns     | nanosecond        |
| ppm    | parts per million |
| %      | percent           |
| pF     | picofarad         |
| ps     | picosecond        |
| V      | volt              |

**Document History Page**

| Document Title: CY2907, Single-PLL General Purpose EPROM Programmable Clock Generator<br>Document Number: 38-07137 |         |                 |                 |   |
|--|---------|-----------------|-----------------|---|
| Revision   | ECN     | Orig. of Change | Submission Date | Description of Change   |
| **   | 110246  | SZV             | 12/18/2001      | Changed from Spec number: 38-00505 to 38-07137.   |
| *A   | 1088524 | KVM /<br>KKVTMP | 05/21/2007      | Added <a href="#">Device Programming</a> .<br>Updated <a href="#">Ordering Information</a> :<br>Updated part numbers.<br>Updated to new template.   |
| *B   | 2715646 | KVM /<br>AESA   | 06/10/2009      | Removed Industrial Temperature Range related information in all instances across the document.<br>Removed Selector Guide.<br>Updated <a href="#">Ordering Information</a> :<br>Updated part numbers.<br>Added Note 14 and referred the same note in all MPNs except CY3670.<br>Completing Sunset Review.  |
| *C   | 2948496 | KVM             | 06/09/2010      | Updated <a href="#">Ordering Information</a> :<br>Updated part numbers.<br>Updated <a href="#">Package Diagrams</a> :<br>spec 51-85066 – Changed revision from *C to *D.<br>spec 51-85067 – Changed revision from *B to *C.<br>Completing Sunset Review.  |
| *D   | 3051170 | BASH            | 10/07/2010      | Updated <a href="#">Ordering Information</a> :<br>Updated part numbers.<br>Added <a href="#">Ordering Code Definitions</a> .<br>Added <a href="#">Acronyms and Units of Measure</a> .<br>Minor edits.   |
| *E   | 3155189 | BASH            | 01/27/2011      | Minor Change:<br>Post to external web.  |
| *F   | 3402027 | BASH            | 10/11/2011      | Updated <a href="#">Ordering Information</a> :<br>Updated part numbers.<br>Updated <a href="#">Package Diagrams</a> :<br>spec 51-85066 – Changed revision from *D to *E.<br>spec 51-85067 – Changed revision from *C to *D.   |
| *G   | 4047640 | CINM            | 07/02/2013      | Updated <a href="#">Package Diagrams</a> :<br>spec 51-85066 – Changed revision from *E to *F.<br>Completing Sunset Review.  |
| *H   | 4399810 | AJU             | 06/05/2014      | Added watermark “Not Recommended for New Designs”.<br>Updated to new template.  |
| *I   | 4587350 | AJU             | 12/05/2014      | Removed watermark “Not Recommended for New Designs”.<br>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 <a href="#">Ordering Information</a> :<br>Updated part numbers.   |
| *J   | 5366091 | TAVA            | 07/22/2016      | Removed 14-pin SOIC package related information in all instances across the document.<br>Updated <a href="#">Logic Block Diagram</a> .<br>Updated <a href="#">Cypress CY3670 Programming Kit</a> :<br>Updated description.<br>Updated <a href="#">Package Diagrams</a> :<br>spec 51-85066 – Changed revision from *F to *H.<br>Removed spec 51-85067 *D.<br>Updated to new template.<br>Completing Sunset Review. |

**Document History Page** (continued)

| Document Title: CY2907, Single-PLL General Purpose EPROM Programmable Clock Generator<br>Document Number: 38-07137 |         |                 |                 |   |
|--|---------|-----------------|-----------------|---|
| Revision   | ECN     | Orig. of Change | Submission Date | Description of Change   |
| *K   | 6074874 | PAWK            | 02/19/2018      | Updated <a href="#">Package Diagrams</a> :<br>spec 51-85066 – Changed revision from *H to *I.<br>Updated to new template. |

## Sales, Solutions, and Legal Information

### Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

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|                               |  |
|-------------------------------|--|
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| Automotive                    | <a href="http://cypress.com/automotive">cypress.com/automotive</a> |
| Clocks & Buffers              | <a href="http://cypress.com/clocks">cypress.com/clocks</a>         |
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