



**THE DATASHEET OF
CY2077FZZ**



High-Accuracy One-Time Programmable Single-PLL Clock Generator

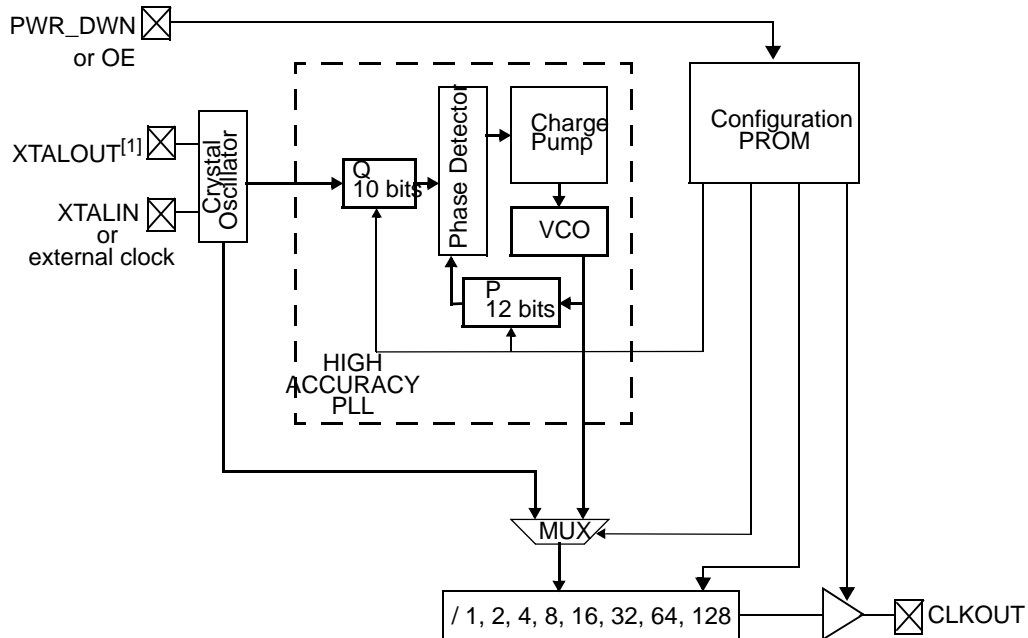
Features

- High-accuracy PLL with 12-bit multiplier and 10-bit divider
- One-time programmability
- 3.3 V or 5 V operation
- Operating frequency
 - 390 kHz–133 MHz at 5 V
 - 390 kHz–100 MHz at 3.3 V
- Reference input from either a 10 MHz–30 MHz fundamental toned crystal or a 1 MHz–75 MHz external clock
- PROM selectable TTL or CMOS duty cycle levels
- Sixteen selectable post-divide options, using either PLL or reference oscillator/external clock
- Programmable PWR_DWN or OE pin, with asynchronous or synchronous modes
- Low jitter outputs typically
 - 80 ps at 3.3 V/5 V
- Controlled rise and fall times and output slew rate
- Available in both commercial and industrial temperature ranges
- Factory programmable device options

Functional Description

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

Logic Block Diagram



Note

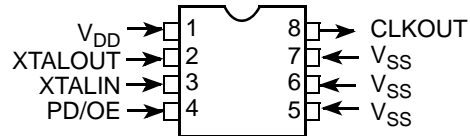
1. When using an external clock source, leave XTALOUT floating.

Contents

| | | | |
|---|-----------|--|-----------|
| Pinouts | 3 | Switching Waveforms | 12 |
| Pin Definitions | 3 | Typical Rise/Fall Time Trends | 13 |
| Functional Overview | 4 | Typical Duty Cycle Trends | 14 |
| PROM Configuration Block | 4 | Typical Jitter Trends | 15 |
| PLL Output Frequency | 4 | Programming Procedures | 16 |
| Power Management Features | 4 | Ordering Information | 16 |
| Absolute Maximum Ratings | 5 | Package Diagrams | 17 |
| Operating Conditions | 5 | Document History Page | 19 |
| Electrical Characteristics | 6 | Sales, Solutions, and Legal Information | 20 |
| Output Clock Switching Characteristics | | Worldwide Sales and Design Support | 20 |
| - Commercial | 7 | Products | 20 |
| Operating Conditions | 8 | PSoC® Solutions | 20 |
| Electrical Characteristics | 9 | Cypress Developer Community | 20 |
| Output Clock Switching Characteristics | | Technical Support | 20 |
| - Industrial | 10 | | |

Pinouts

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



Pin Definitions

8-pin SOIC

| Pin Name | Pin | Pin Description |
|--------------|---------|--|
| V_{DD} | 1 | Voltage supply |
| V_{SS} | 5, 6, 7 | Ground (all the pins must be grounded) |
| X_D | 2 | Crystal output (leave this pin floating when external reference is used) |
| X_G | 3 | Crystal input or external input reference |
| PWR_DWN / OE | 4 | One-time programmable power-down or output enable pin. PWR_DWN is active low. OE is active high. Weak pull-up. |
| CLKOUT | 8 | Clock output. Weak pull-down |

Functional Overview

CY2077 is an one-time programmable, high-accuracy, general-purpose, PLL-based design for use in applications such as modems, disk drives, CD-ROM drives, video CD players, DVD players, games, set-top boxes, and data/telecommunications.

CY2077 can generate a clock output up to 133 MHz at 5 V or 100 MHz at 3.3 V. It has been designed to give the customer a very accurate and stable clock frequency with little to zero PPM error. CY2077 contains a 12-bit feedback counter divider and 10-bit reference counter divider to obtain a very high resolution to meet the needs of stringent design specifications. Furthermore, there are eight output divide options of /1, /2, /4, /8, /16, /32, /64, and /128. The output divider can select between the PLL and crystal oscillator output/external clock, providing a total of 16 different options to add more flexibility in designs. TTL or CMOS duty cycles can be selected.

Power management with the CY2077 is also very flexible. The user can choose either a PWR_DWN, or an OE feature with which both have integrated pull up resistors. PWR_DWN and OE signals can be programmed to have asynchronous and synchronous timing with respect to the output signal. There is a weak pull down on the output that pulls CLKOUT LOW when either the PWR_DWN or OE signal is LOW. This weak pull down can easily be overridden by another clock signal in designs where multiple clock signals share a signal path.

Multiple options for output selection, better power distribution layout, and controlled rise and fall times enable the CY2077 to be used in applications that require low jitter and accurate reference frequencies.

PROM Configuration Block

Table 1. PROM Adjustable Features

| PROM Adjustable Features | |
|---|-----------------------------|
| Adjust Freq. | Feedback counter value (P) |
| | Reference counter value (Q) |
| | Output divider selection |
| Duty cycle levels (TTL or CMOS) | |
| Power management mode (OE or PWR_DWN) | |
| Power management timing (synchronous or asynchronous) | |

Table 2. Device Functionality: Output Frequencies

| Symbol | Description | Condition | Min | Max | Unit |
|--------|------------------|-------------------------------|------|-----|------|
| Fo | Output frequency | V _{DD} = 4.5 V–5.5 V | 0.39 | 133 | MHz |
| | | V _{DD} = 3.0 V–3.6 V | 0.39 | 100 | MHz |

Note

2. When using CyClocks, note that the PLL frequency range is from 50 MHz to 250 MHz for 5 V V_{DD} supply, and 50 MHz to 180 MHz for 3 V V_{DD} supply. The output frequency is determined by the selected output divider.

PLL Output Frequency

CY2077 contains a high-resolution PLL with 12-bit multiplier and 10-bit divider^[2]. The output frequency of the PLL is determined by the following formula:

$$F_{PLL} = \frac{2 \cdot (P + 5)}{(Q + 2)} \cdot F_{REF}$$

where P is the feedback counter value and Q is the reference counter value. P and Q are One-Time programmable values.

The calculation of P and Q values for a given PLL output frequency is handled by the CyberClocks™ software. Refer to [Programming Procedures on page 16](#) for details.

Power Management Features

PWR_DWN and OE options are configurable by PROM programming for the CY2077. In PWR_DWN mode, all active circuits are powered down when the control pin is set LOW. When the control pin is set back HIGH, both the PLL and oscillator circuit must reload. In the case of OE, the output is three-stated and weakly pulled down when the control pin is set LOW. The oscillator and PLL are still active in this state, which leads to a quick clock output return when the control pin is set back HIGH.

Additionally, PWR_DWN and OE can be configured to occur asynchronously or synchronously with respect to CLKOUT. In asynchronous mode, PWR_DWN or OE disables CLKOUT immediately (allowing for logic delays), without respect to the current state of CLKOUT. Synchronous mode prevents output glitches by waiting for the next falling edge of CLKOUT after PWR_DWN, or OE becomes asserted. In either asynchronous or synchronous setting, the output is always enabled synchronously by waiting for the next falling edge of CLKOUT.

Absolute 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) -55°C to +150°C

Junction temperature 150°C

Static discharge voltage
(per MIL-STD-883, method 3015) ≥ 2000 V

Operating Conditions

For Commercial Temperature Device

| Parameter | Description | Min | Max | Unit |
|------------|--|------|-----|------|
| V_{DD} | Supply voltage | 3.0 | 5.5 | V |
| T_A | Operating temperature, ambient | 0 | +70 | °C |
| C_{TTL} | Max. capacitive load on outputs for TTL levels $V_{DD} = 4.5$ V–5.5 V, output frequency = 1 MHz–40 MHz | – | 50 | pF |
| | $V_{DD} = 4.5$ V–5.5 V, output frequency = 40 MHz–125 MHz | – | 25 | pF |
| | $V_{DD} = 4.5$ V–5.5 V, output frequency = 125 MHz–133 MHz | – | 15 | pF |
| C_{CMOS} | Max. capacitive load on outputs for CMOS levels $V_{DD} = 4.5$ V–5.5 V, output frequency = 1 MHz–40 MHz | – | 50 | pF |
| | $V_{DD} = 4.5$ V–5.5 V, output frequency = 40 MHz–125 MHz | – | 25 | pF |
| | $V_{DD} = 4.5$ V–5.5 V, output frequency = 125 MHz–133 MHz | – | 15 | pF |
| | $V_{DD} = 3.0$ V–3.6 V, output frequency = 1 MHz–40 MHz | – | 30 | pF |
| | $V_{DD} = 3.0$ V–3.6 V, output frequency = 40 MHz–100 MHz | – | 15 | pF |
| X_{REF} | Reference frequency, input crystal with $C_{load} = 10$ pF | 10 | 30 | MHz |
| | Reference frequency, external clock source | 1 | 75 | MHz |
| t_{PU} | Power-up time for all V_{DD} 's to reach minimum specified voltage (power ramps must be monotonic) | 0.05 | 50 | ms |

Electrical Characteristics

 $T_A = 0\text{ }^{\circ}\text{C to }+70\text{ }^{\circ}\text{C}$

| Parameter | Description | Test Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------------|--|-----------------------|-----|-----------------------|------|
| V _{IL} | Low-level input voltage | V _{DD} = 4.5 V–5.5 V | – | – | 0.8 | V |
| | | V _{DD} = 3.0 V–3.6 V | – | – | 0.2 × V _{DD} | V |
| V _{IH} | High-level input voltage | V _{DD} = 4.5 V–5.5 V | 2.0 | – | – | V |
| | | V _{DD} = 3.0 V–3.6 V | 0.7 × V _{DD} | – | – | V |
| V _{OL} | Low-level output voltage | V _{DD} = 4.5 V–5.5 V, I _{OL} = 16 mA | – | – | 0.4 | V |
| | | V _{DD} = 3.0 V–3.6 V, I _{OL} = 8 mA | – | – | 0.4 | V |
| V _{OHC} MOS | High-level output voltage CMOS levels | V _{DD} = 4.5 V–5.5 V, I _{OH} = –16 mA | V _{DD} – 0.4 | – | – | V |
| | | V _{DD} = 3.0 V–3.6 V, I _{OH} = –8 mA | V _{DD} – 0.4 | – | – | V |
| V _{OHTTL} | High-level output voltage TTL levels | V _{DD} = 4.5 V–5.5 V, I _{OH} = –8 mA | 2.4 | – | – | V |
| I _{IL} | Input low current | V _{IN} = 0 V | – | – | 10 | μA |
| I _{IH} | Input high current | V _{IN} = V _{DD} | – | – | 5 | μA |
| I _{DD} | Power supply current Unloaded | V _{DD} = 4.5 V–5.5 V, output frequency ≤ 133 MHz | – | – | 45 | mA |
| | | V _{DD} = 3.0 V–3.6 V, output frequency ≤ 100 MHz | – | – | 25 | mA |
| I _{DD} ^[3] | Stand-by current (PD = 0) | V _{DD} = 4.5 V–5.5 V | – | 25 | 100 | μA |
| | | V _{DD} = 3.0 V–3.6 V | – | 10 | 50 | μA |
| R _{UP} | Input pull-up resistor | V _{DD} = 4.5 V–5.5 V, V _{IN} = 0 V | 1.1 | 3.0 | 8.0 | MΩ |
| | | V _{DD} = 4.5 V–5.5 V, V _{IN} = 0.7 × V _{DD} | 50 | 100 | 200 | kΩ |
| I _{OE_CLKOUT} | CLKOUT pull-down current | V _{DD} = 5.0 V | – | 20 | – | μA |

Note

3. If external reference is used, it is required to stop the reference (set reference to LOW) during power-down.

Output Clock Switching Characteristics - Commercial

Over the Operating Range ^[4]

| Parameter | Description | Test Conditions | Min | Typ | Max | Unit |
|-----------------|---|---|-----|-----|--------|------|
| t _{1w} | Output duty cycle at 1.4 V, V _{DD} = 4.5 V–5.5 V, t _{1w} = t _{1A} ÷ t _{1B} | 1 MHz–40 MHz, C _L ≤ 50 pF | 45 | – | 55 | % |
| | | 40 MHz–125 MHz, C _L ≤ 25 pF | 45 | – | 55 | % |
| | | 125 MHz–133 MHz, C _L ≤ 15 pF | 45 | – | 55 | % |
| t _{1x} | Output duty cycle at V _{DD} /2, V _{DD} = 4.5 V–5.5 V, t _{1x} = t _{1A} ÷ t _{1B} | 1 MHz–40 MHz, C _L ≤ 50 pF | 45 | – | 55 | % |
| | | 40 MHz–125 MHz, C _L ≤ 25 pF | 45 | – | 55 | % |
| | | 125 MHz–133 MHz, C _L ≤ 15 pF | 45 | – | 55 | % |
| t _{1y} | Output duty cycle at V _{DD} /2, V _{DD} = 3.0 V–3.6 V, t _{1y} = t _{1A} ÷ t _{1B} | 1 MHz–40 MHz, C _L ≤ 30 pF | 45 | – | 55 | % |
| | | 40 MHz–100 MHz, C _L ≤ 15 pF | 40 | – | 60 | % |
| t ₂ | Output clock rise time | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 50 pF | – | – | 1.8 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 25 pF | – | – | 1.2 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 15 pF | – | – | 0.9 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 4.5 V–5.5 V, C _L = 50 pF | – | – | 3.4 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 30 pF | – | – | 4.0 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 15 pF | – | – | 2.4 | ns |
| t ₃ | Output clock fall time | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 50 pF | – | – | 1.8 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 25 pF | – | – | 1.2 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 15 pF | – | – | 0.9 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 4.5 V–5.5 V, C _L = 50 pF | – | – | 3.4 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 30 pF | – | – | 4.0 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 15 pF | – | – | 2.4 | ns |
| t ₄ | Startup time out of power-down | PWR_DWN pin LOW to HIGH ^[5] | – | 1 | 2 | ms |
| t _{5a} | Power-down delay time (synchronous setting) | PWR_DWN pin LOW to output LOW (T = period of output CLK) | – | T/2 | T + 10 | ns |
| t _{5b} | Power-down delay time (asynchronous setting) | PWR_DWN pin LOW to output LOW | – | 10 | 15 | ns |
| t ₆ | Power-up time | From power-on ^[5] | – | 1 | 2 | ms |

Notes

- Not all parameters measured in production testing.
- Oscillator start time can not be guaranteed for all crystal types. This specification is for operation with AT cut crystals with ESR < 70 Ω.

Output Clock Switching Characteristics - Commercial (continued)

 Over the Operating Range ^[4]

| Parameter | Description | Test Conditions | Min | Typ | Max | Unit |
|-----------------|--|--|-----|------|----------------|---------------------|
| t _{7a} | Output disable time (synchronous setting) | OE pin LOW to output high-Z (T = period of output CLK) | – | T/2 | T + 10 | ns |
| t _{7b} | Output disable time (asynchronous setting) | OE pin LOW to output high-Z | – | 10 | 15 | ns |
| t ₈ | Output enable time (always synchronous enable) | OE pin LOW to HIGH (T = period of output CLK) | – | T | (1.5 × T) + 25 | ns |
| t ₉ | Peak-to-peak period jitter | V _{DD} = 3.0 V–3.6 V, 4.5 V–5.5 V, F _o > 33 MHz, V _{CO} > 100 MHz | – | 80 | 150 | ps |
| | | V _{DD} = 3.0 V–5.5 V, F _o < 33 MHz | – | 0.3% | 1% | % of F _O |

Operating Conditions

For Industrial Temperature Device

| Parameter | Description | Min | Max | Unit |
|-------------------|---|------|-----|------|
| V _{DD} | Supply voltage | 3.0 | 5.5 | V |
| T _A | Operating temperature, ambient | –40 | +85 | °C |
| C _{TTL} | Max. capacitive load on outputs for TTL levels V _{DD} = 4.5 V–5.5 V, output frequency = 1 MHz–40 MHz | – | 35 | pF |
| | V _{DD} = 4.5 V–5.5 V, output frequency = 40 MHz–125 MHz | – | 15 | pF |
| | V _{DD} = 4.5 V–5.5 V, output frequency = 125 MHz–133 MHz | – | 10 | pF |
| C _{CMOS} | Max. capacitive load on outputs for CMOS levels V _{DD} = 4.5 V–5.5 V, output frequency = 1 MHz–40 MHz | – | 35 | pF |
| | V _{DD} = 4.5 V–5.5 V, output frequency = 40 MHz–125 MHz | – | 15 | pF |
| | V _{DD} = 4.5 V–5.5 V, output frequency = 125 MHz–133 MHz | – | 10 | pF |
| | V _{DD} = 3.0 V–3.6 V, output frequency = 1 MHz–40 MHz | – | 20 | pF |
| | V _{DD} = 3.0 V–3.6 V, output frequency = 40 MHz–100 MHz | – | 10 | pF |
| X _{REF} | Reference frequency, input crystal with C _{load} = 10 pF | 10 | 30 | MHz |
| | Reference frequency, external clock source | 1 | 75 | MHz |
| t _{PU} | Power-up time for all VDD's to reach minimum specified voltage (power ramps must be monotonic) | 0.05 | 50 | ms |

Electrical Characteristics

 $T_A = -40\text{ }^{\circ}\text{C to }+85\text{ }^{\circ}\text{C}$

| Parameter | Description | Test Conditions | Min | Typ | Max | Unit |
|----------------------------------|--|--|-----------------------|-----|-----------------------|------|
| V _{IL} | Low-level input voltage | V _{DD} = 4.5 V–5.5 V | – | – | 0.8 | V |
| | | V _{DD} = 3.0 V–3.6 V | – | – | 0.2 × V _{DD} | V |
| V _{IH} | High-level input voltage | V _{DD} = 4.5 V–5.5 V | 2.0 | – | – | V |
| | | V _{DD} = 3.0 V–3.6 V | 0.7 × V _{DD} | – | – | V |
| V _{OL} | Low-level output voltage | V _{DD} = 4.5 V–5.5 V, I _{OL} = 16 mA | – | – | 0.4 | V |
| | | V _{DD} = 3.0 V–3.6 V, I _{OL} = 8 mA | – | – | 0.4 | V |
| V _{OHC} MOS | High-level output voltage, CMOS levels | V _{DD} = 4.5 V–5.5 V, I _{OH} = –16 mA | V _{DD} – 0.4 | – | – | V |
| | | V _{DD} = 3.0 V–3.6 V, I _{OH} = –8 mA | V _{DD} – 0.4 | – | – | V |
| V _{OHT} TTL | High-level output voltage, TTL levels | V _{DD} = 4.5 V–5.5 V, I _{OH} = –8 mA | 2.4 | – | – | V |
| I _{IL} | Input low current | V _{IN} = 0 V | – | – | 10 | μA |
| I _{IH} | Input high current | V _{IN} = V _{DD} | – | – | 5 | μA |
| I _{DD} | Power supply current, Unloaded | V _{DD} = 4.5 V–5.5 V, output frequency ≤ 133 MHz | – | – | 45 | mA |
| | | V _{DD} = 3.0 V–3.6 V, output frequency ≤ 100 MHz | – | – | 25 | mA |
| I _{DD} S ^[6] | Stand-by current (PD = 0) | V _{DD} = 4.5 V–5.5 V | – | 25 | 100 | μA |
| | | V _{DD} = 3.0 V–3.6 V | – | 10 | 50 | |
| R _{UP} | Input pull-up resistor | V _{DD} = 4.5 V–5.5 V, V _{IN} = 0 V | 1.1 | 3.0 | 8.0 | MΩ |
| | | V _{DD} = 4.5 V–5.5 V, V _{IN} = 0.7 × V _{DD} | 50 | 100 | 200 | kΩ |
| I _{OE_CLKOUT} | CLKOUT pull-down current | V _{DD} = 5.0 V | – | 20 | – | μA |

Note

6. If external reference is used, it is required to stop the reference (set reference to LOW) during power-down.

Output Clock Switching Characteristics - Industrial

Over the Operating Range ^[7]

| Parameter | Description | Test Conditions | Min | Typ | Max | Unit |
|-----------------|---|---|-----|-----|--------|------|
| t _{1w} | Output duty cycle at 1.4 V, V _{DD} = 4.5 V–5.5 V, t _{1w} = t _{1A} ÷ t _{1B} | 1 MHz–40 MHz, C _L ≤ 35 pF | 45 | – | 55 | % |
| | | 40 MHz–125 MHz, C _L ≤ 15 pF | 45 | – | 55 | % |
| | | 125 MHz–133 MHz, C _L ≤ 10 pF | 45 | – | 55 | % |
| t _{1x} | Output duty cycle at V _{DD} /2, V _{DD} = 4.5 V–5.5 V, t _{1x} = t _{1A} ÷ t _{1B} | 1 MHz–40 MHz, C _L ≤ 35 pF | 45 | – | 55 | % |
| | | 40 MHz–125 MHz, C _L ≤ 15 pF | 45 | – | 55 | % |
| | | 125 MHz–133 MHz, C _L ≤ 10 pF | 45 | – | 55 | % |
| t _{1y} | Output duty cycle at V _{DD} /2, V _{DD} = 3.0 V–3.6 V, t _{1y} = t _{1A} ÷ t _{1B} | 1 MHz–40 MHz, C _L ≤ 20 pF | 45 | – | 55 | % |
| | | 40 MHz–100 MHz, C _L ≤ 10 pF | 40 | – | 60 | % |
| t ₂ | Output clock rise time | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 35 pF | – | – | 1.8 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 15 pF | – | – | 1.2 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 10 pF | – | – | 0.9 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 4.5 V–5.5 V, C _L = 35 pF | – | – | 3.4 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 20 pF | – | – | 4.0 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 10 pF | – | – | 2.4 | ns |
| t ₃ | Output clock fall time | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 35 pF | – | – | 1.8 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 15 pF | – | – | 1.2 | ns |
| | | Between 0.8 V–2.0 V, V _{DD} = 4.5 V–5.5 V, C _L = 10 pF | – | – | 0.9 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 4.5 V–5.5 V, C _L = 35 pF | – | – | 3.4 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 20 pF | – | – | 4.0 | ns |
| | | Between 0.2 × V _{DD} to 0.8 × V _{DD} , V _{DD} = 3.0 V–3.6 V, C _L = 10 pF | – | – | 2.4 | ns |
| t ₄ | Startup time out of Power-down | PWR_DWN pin LOW to HIGH ^[8] | – | 1 | 2 | ms |
| t _{5a} | Power-down delay time (synchronous setting) | PWR_DWN pin LOW to output LOW (T = period of output clk) | – | T/2 | T + 10 | ns |
| t _{5b} | Power-down delay time (asynchronous setting) | PWR_DWN pin LOW to output LOW | – | 10 | 15 | ns |
| t ₆ | Power-up time | From power on ^[8] | – | 1 | 2 | ms |

Notes

7. Not all parameters measured in production testing.

8. Oscillator start time can not be guaranteed for all crystal types. This specification is for operation with AT cut crystals with ESR < 70Ω.

Output Clock Switching Characteristics - Industrial (continued)

 Over the Operating Range ^[7]

| Parameter | Description | Test Conditions | Min | Typ | Max | Unit |
|-----------------|--|--|-----|------|----------------|---------------------|
| t _{7a} | Output Disable time (synchronous setting) | OE pin LOW to output high-Z (T = period of output clk) | – | T/2 | T + 10 | ns |
| t _{7b} | Output Disable time (asynchronous setting) | OE pin LOW to output high-Z | – | 10 | 15 | ns |
| t ₈ | Output Enable time (always synchronous enable) | OE pin LOW to HIGH (T = period of output clk) | – | T | (1.5 × T) + 25 | ns |
| t ₉ | Peak-to-peak period jitter | V _{DD} = 3.0 V–3.6 V, 4.5 V–5.5 V, Fo > 33 MHz, V _{CO} > 100 MHz | – | 80 | 150 | ps |
| | | V _{DD} = 3.0 V – 5.5 V, Fo < 33 MHz | – | 0.3% | 1% | % of F _O |

Switching Waveforms

Figure 2. Duty Cycle Timing (t_{1w} , t_{1x} , t_{1y})

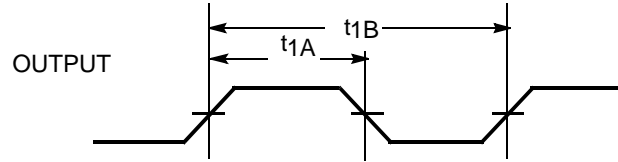


Figure 3. Output Rise/Fall Time

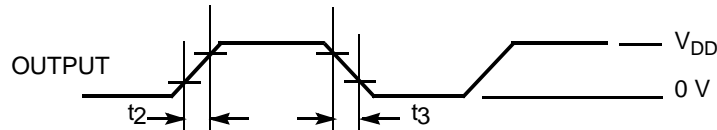


Figure 4. Power-down Timing (synchronous and asynchronous modes)

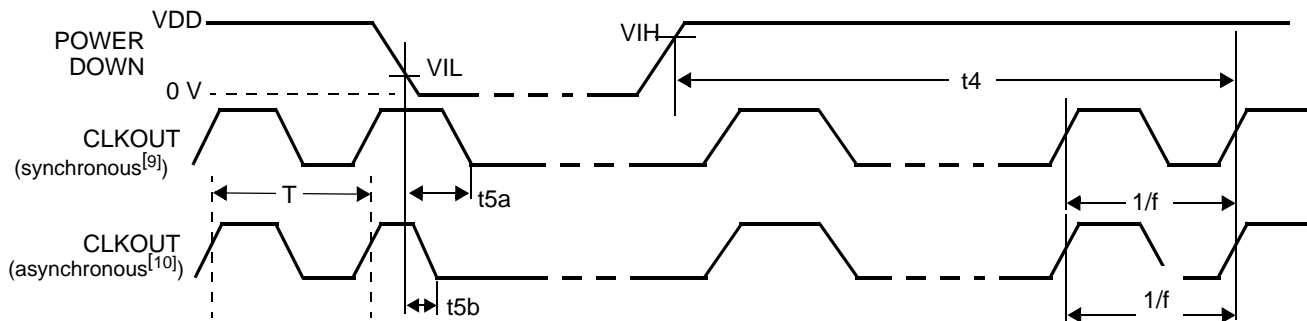


Figure 5. Power-up Timing

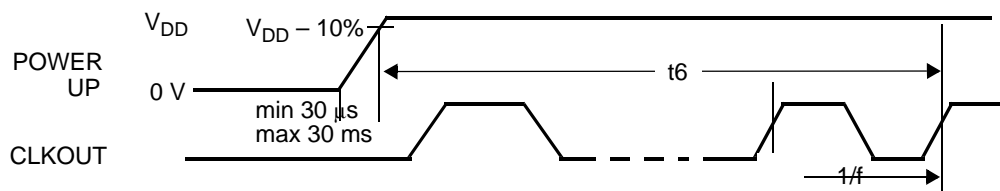
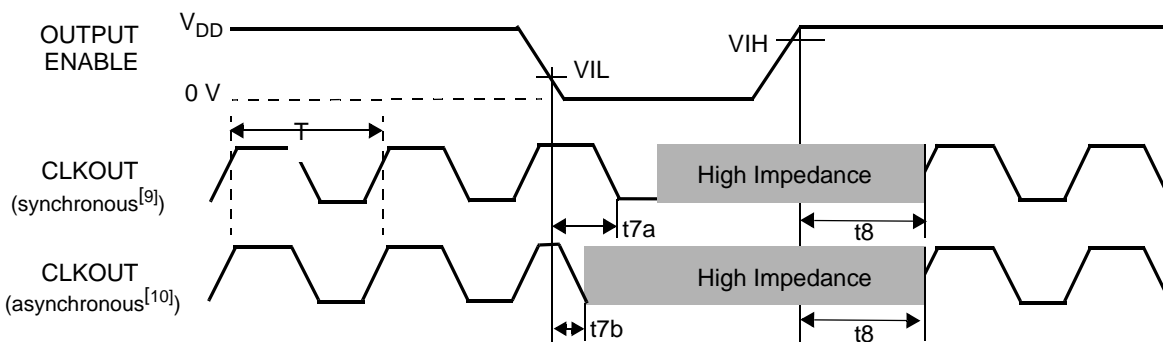


Figure 6. Output Enable Timing (synchronous and asynchronous modes)



Notes

- 9. In synchronous mode, the power-down or output three-state is not initiated until the next falling edge of the output clock.
- 10. In asynchronous mode, the power-down or output three-state occurs within 25 ns regardless of position in the output clock cycle.

Typical Rise/Fall Time Trends

For CY2077 [11]

Figure 7. Rise/Fall Time vs. VDD over Temperatures

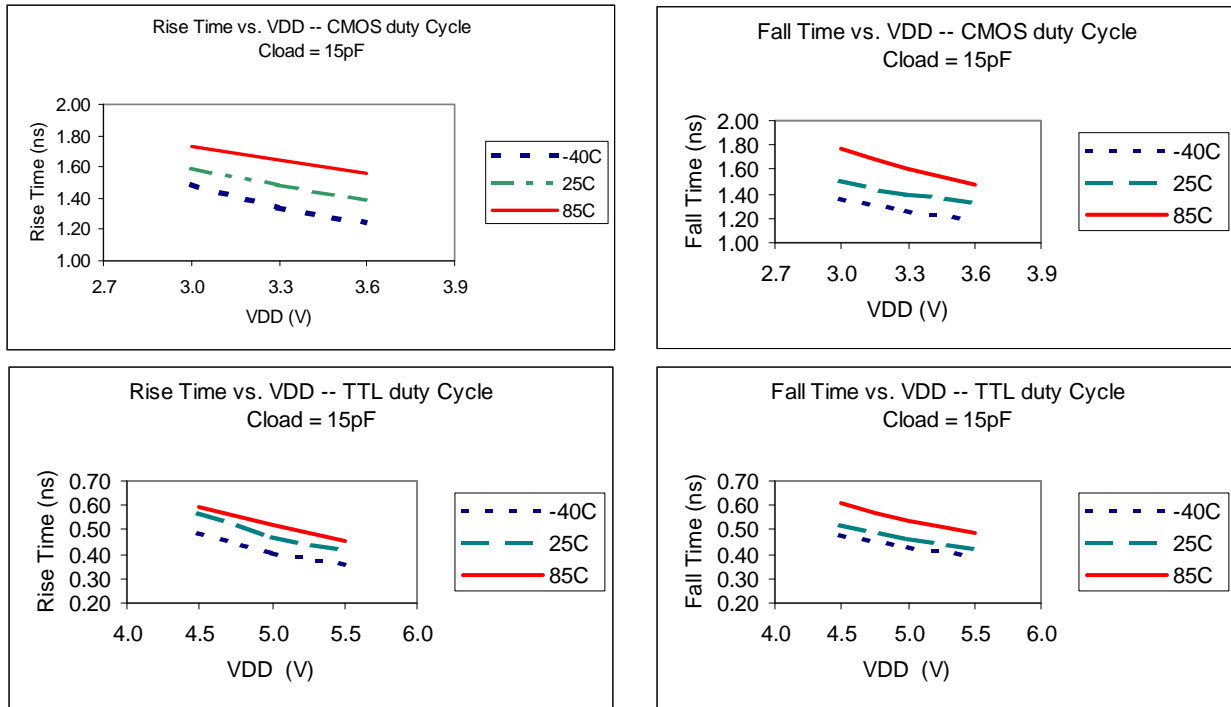
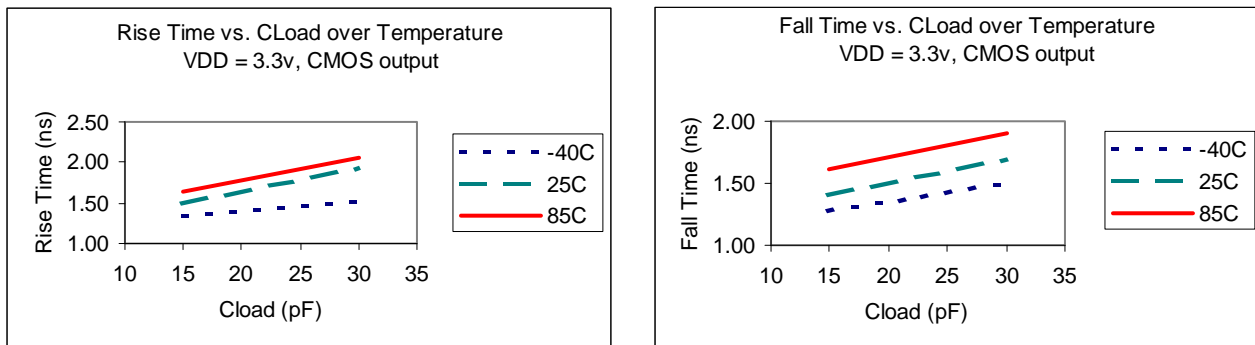


Figure 8. Rise/Fall Time vs. Output Loads over Temperatures



Note

11. Rise/Fall time for CMOS output is measured between $1.2 V_{DD}$ and $0.8 \times V_{DD}$. Rise/Fall time for TTL output is measured between 0.8 V and 2.0 V.

Typical Duty Cycle Trends

For CY2077 [12]

Figure 9. Duty Cycle vs. V_{DD} over Temperatures

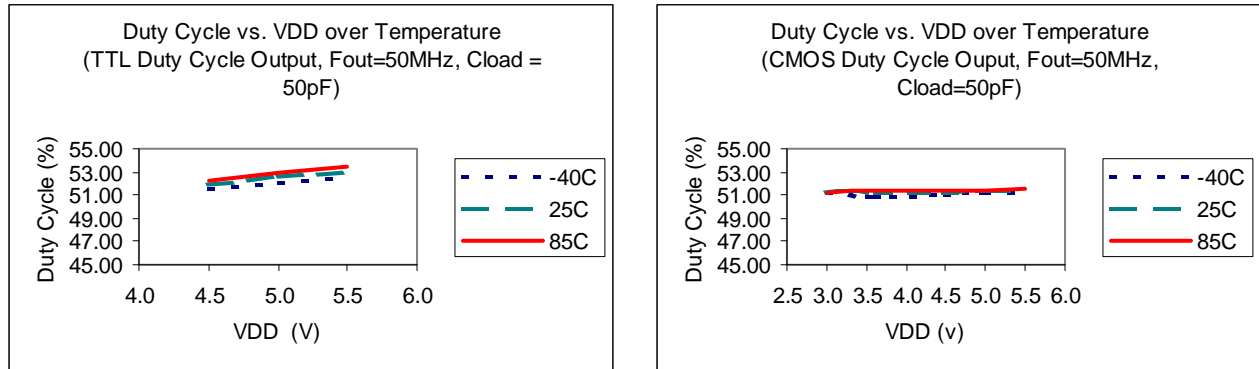


Figure 10. Duty Cycle vs. Output Load

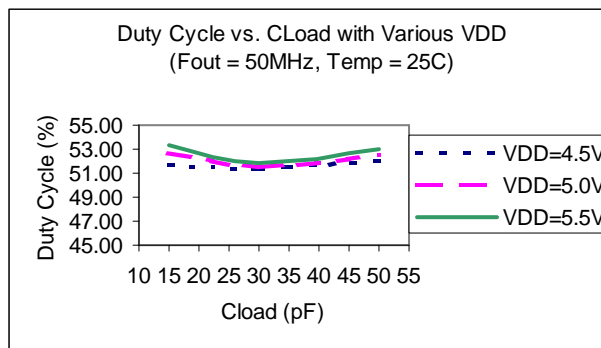
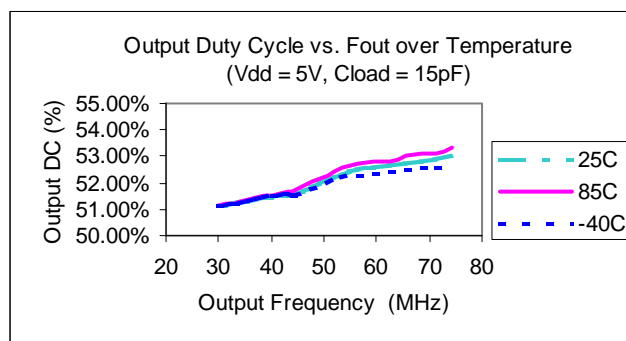


Figure 11. Duty Cycle vs. Output Frequency over Temperatures



Note

12. Duty cycle is measured at 1.4 V for TTL output and $0.5 \times V_{DD}$ for CMOS output.

Typical Jitter Trends

For CY2077

Figure 12. Period Jitter (pk-pk) vs. V_{DD} over Temperatures

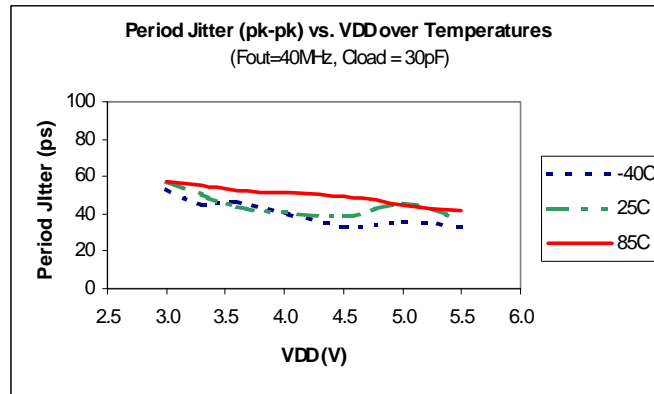
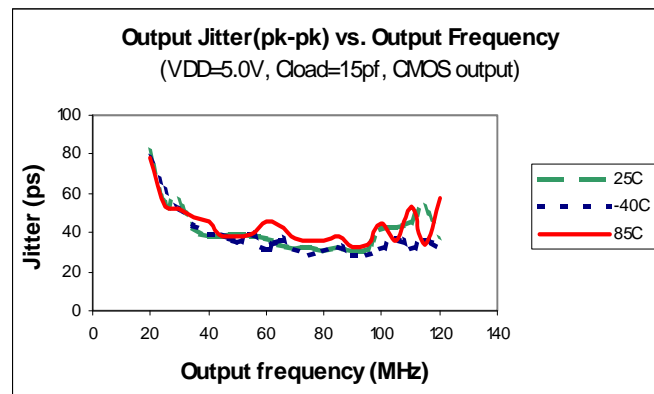
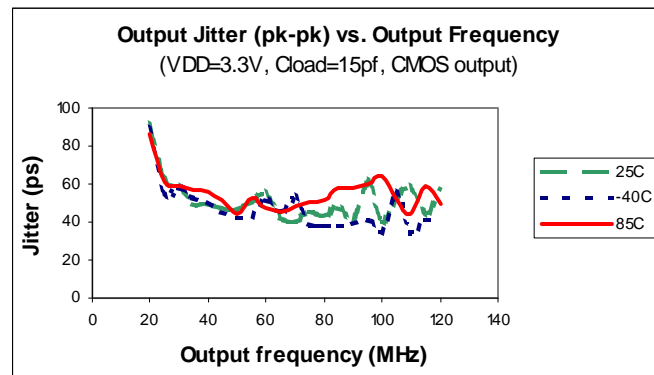


Figure 13. Period Jitter (pk-pk) vs. Output Frequency over Temperatures



Programming Procedures

Currently the CY2077 is available only as a field-programmable device, as indicated by an “F” in the ordering code.

Devices may be programmed using the [CY3672-USB](#) programmer, or through programmers available from third party programmer manufacturers such as Hi-Lo Systems and BP Micro. Programming services are also available from third parties, including some Cypress distribution partners.

To generate a JEDEC format programming file, customers must use CyClocks software. This software automatically calculates

the output frequencies that can be generated by CY2077 devices. The CyClocks software is a subset of the larger software tool CyberClocks, which is available free of charge from the Cypress web site (<http://www.cypress.com>). CyberClocks is installed on a PC and must not be confused with the web-based application CyberClocks Online.

For high volume designs, factory programming of customer-specific configurations is available on other 8-pin devices such as the CY22180, CY22801 and CY22381. Factory programming is no longer offered for new designs using the CY2077.

Ordering Information

| Ordering Code ^[14] | Package Name | Package Type | Operating Temperature Range | Operating Voltage |
|-------------------------------|--|----------------------------|----------------------------------|-------------------|
| Pb-Free | | | | |
| CY2077FSXC | S8 | 8-pin SOIC | Commercial (T = 0 °C to 70 °C) | 3.3 V or 5 V |
| CY2077FSXCT | S8 | 8-pin SOIC –Tape and Reel | Commercial (T = 0 °C to 70 °C) | 3.3 V or 5 V |
| CY2077FZZ | Z8 | 8-pin TSSOP | Commercial (T = 0 °C to 70 °C) | 3.3 V or 5 V |
| CY2077FZXI | Z8 | 8-pin TSSOP | Industrial (T = –40 °C to 85 °C) | 3.3 V or 5 V |
| CY2077FZXIT | Z8 | 8-pin TSSOP –Tape and Reel | Industrial (T = –40 °C to 85 °C) | 3.3 V or 5 V |
| Programmer | | | | |
| CY3672-USB | Programming Kit | | | |
| CY3696 | Socket adapter board, for programming CY2077FS (SOIC Package) | | | |
| CY3697 | Socket adapter board, for programming CY2077FZ (TSSOP Package) | | | |

Table 3. Obsolete or Not For New Designs

| Original Device | | Replacement Device | |
|-----------------------------------|---|--------------------|---------------------------|
| Ordering Code ^[13, 14] | Description | Ordering Code | Description |
| CY2077SC-xxx | | none | |
| CY2077SC-xxxT | | none | |
| CY2077SI-xxx | | none | |
| CY2077SI-xxxT | | none | |
| CY2077SXC-xxx | | none | |
| CY2077SXC-xxxT | | none | |
| CY2077ZC-xxx | | none | |
| CY2077ZC-xxxT | | none | |
| CY2077ZI-xxx | | none | |
| CY2077ZI-xxxT | | none | |
| CY2077ZXC-xxx | | none | |
| CY2077ZXC-xxxT | | none | |
| CY2077FSI | SOIC, Industrial (T = –40 °C to 85 °C) | CY2077FSXC | Pb-free SOIC, Commercial |
| CY2077FZ | TSSOP, Commercial (T = 0 °C to 70 °C) | CY2077FZZ | Pb-free TSSOP, Commercial |
| CY2077FZI | TSSOP, Industrial (T = –40 °C to 85 °C) | CY2077FZXI | Pb-free TSSOP, Industrial |

Notes

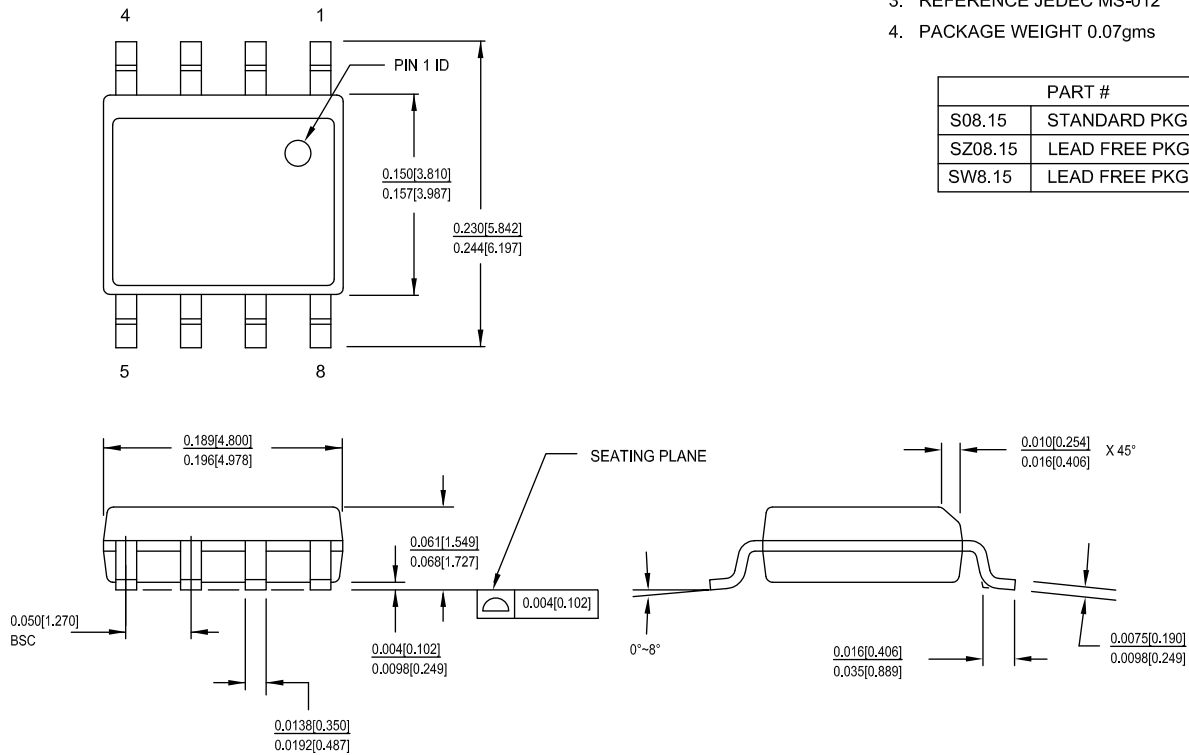
13. The CY2077SC-xxx(T), CY2077SI-xxx(T), CY2077SXC-xxx(T), CY2077ZC-xxx(T), CY2077ZI-xxx(T) and CY2077ZXC-xxx(T), are factory programmed configurations. Factory programming is available for high-volume design opportunities. For more details, contact your local Cypress FAE or Cypress Sales Representative.
14. The CY2077F are field programmable. For more details, contact your local Cypress FAE or Cypress Sales Representative.

Package Diagrams

Figure 14. 8-pin SOIC (150 Mils) 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

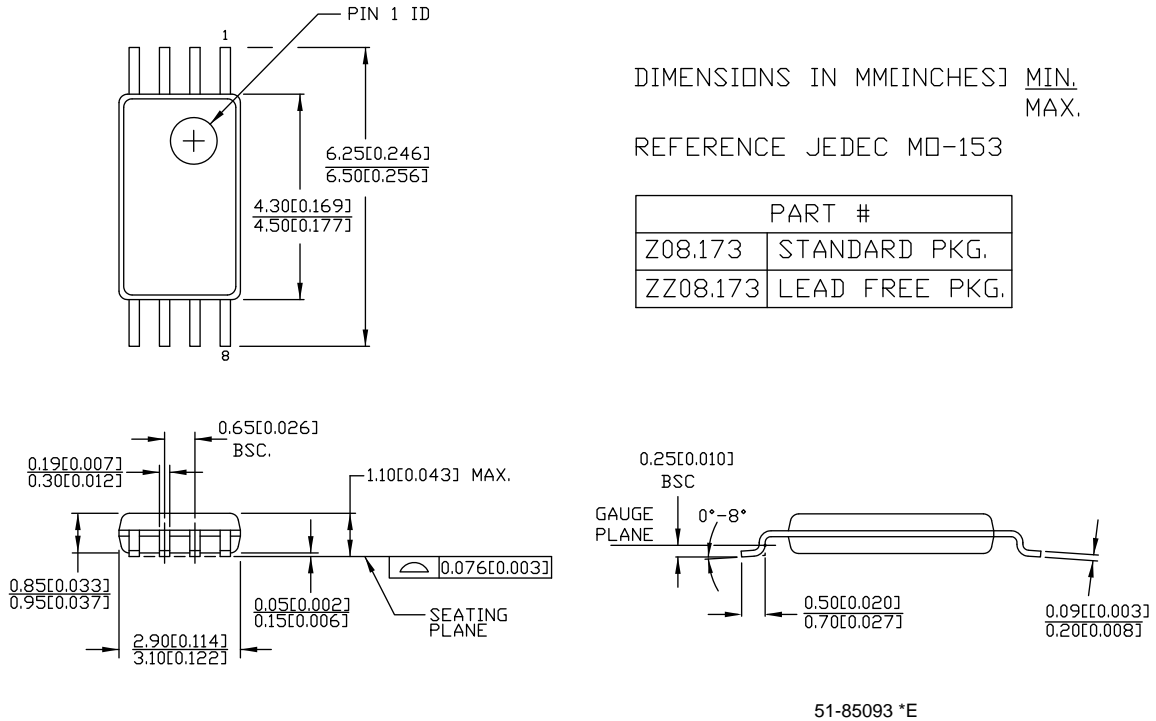
| PART # | |
|---------|---------------|
| S08.15 | STANDARD PKG |
| SZ08.15 | LEAD FREE PKG |
| SW8.15 | LEAD FREE PKG |



51-85066 *H

Package Diagrams (continued)

Figure 15. 8-pin TSSOP (4.40 mm Body) Package Outline, 51-85093



Document History Page

| Document Title: CY2077, High-Accuracy One-Time Programmable Single-PLL Clock Generator Document Number: 38-07210 | | | | |
|---|---------|------------------|-----------------|---|
| Revision | ECN | Orig. of Change | Submission Date | Description of Change |
| ** | 111727 | DSG | 02/07/02 | Convert from Spec number: 38-01009 to 38-07210 |
| *A | 114938 | CKN | 07/24/02 | Added table and notes to page 11 |
| *B | 121843 | RBI | 12/14/02 | Power up requirements added to Operating Conditions Information |
| *C | 2104546 | PYG / KVM / AESA | See ECN | Updated Ordering Information table Replaced the "Custom Configuration Request Procedure" section with "Programming Procedures" Updated package diagrams |
| *D | 2631183 | KVM / AESA | 01/06/09 | CY2077FS removed from the active part number table. Added CY2077FZXI and CY2077FZXIT to the Ordering Information table. Corrected wording on p. 2 about when the weak output pull-down is active. Added to Table 1 to indicate that PWR_DWN is active low and OE is active high. Updated to new template. |
| *E | 2905892 | CXQ | 04/07/10 | Updated Ordering Information : Updated Table 3 : Removed inactive part CY2077FS. Updated Package Diagrams : spec 51-85066 – Changed revision from *C to *D. spec 51-85093 – Changed revision from *A to *B. |
| *F | 3388539 | MNSB / PURU | 09/29/11 | Updated Programming Procedures : Replaced "CY3670" with "CY3672-USB". Updated Ordering Information : Updated part numbers. Updated Package Diagrams : spec 51-85066 – Changed revision from *D to *E. spec 51-85093 – Changed revision from *B to *C. |
| *G | 3514611 | PURU | 02/01/2012 | Removed Benefits. Updated Package Diagrams : spec 51-85093 – Changed revision from *C to *D. |
| *H | 4575273 | PURU | 11/20/2014 | Updated Functional Description : Added "For a complete list of related documentation, click here ." at the end. Updated Package Diagrams : spec 51-85066 – Changed revision from *E to *F. spec 51-85093 – Changed revision from *D to *E. |
| *I | 4694396 | TAVA | 03/20/2015 | Updated Package Diagrams : spec 51-85066 – Changed revision from *F to *G. Updated to new template. |
| *J | 5766130 | PSR | 06/07/2017 | Updated Document Title to read as "CY2077, High-Accuracy One-Time Programmable Single-PLL Clock Generator". Replaced "EPROM Programmable" with "One-time Programmable" in all instances across the document. Replaced "EPROM" with "PROM" in all instances across the document. Updated Logic Block Diagram . Updated Package Diagrams : spec 51-85066 – Changed revision from *G to *H. 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](#).

Products

| | |
|-------------------------------|--|
| ARM® Cortex® Microcontrollers | cypress.com/arm |
| Automotive | cypress.com/automotive |
| Clocks & Buffers | cypress.com/clocks |
| Interface | cypress.com/interface |
| Internet of Things | cypress.com/iot |
| Memory | cypress.com/memory |
| Microcontrollers | cypress.com/mcu |
| PSoC | cypress.com/psoc |
| Power Management ICs | cypress.com/pmic |
| Touch Sensing | cypress.com/touch |
| USB Controllers | cypress.com/usb |
| Wireless Connectivity | cypress.com/wireless |

PSoC® Solutions

[PSoC 1](#) | [PSoC 3](#) | [PSoC 4](#) | [PSoC 5LP](#)

Cypress Developer Community

[Forums](#) | [WICED IOT Forums](#) | [Projects](#) | [Video](#) | [Blogs](#) | [Training](#) | [Components](#)

Technical Support

cypress.com/support



© Cypress Semiconductor Corporation, 2002–2017. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC ("Cypress"). This document, including any software or firmware included or referenced in this document ("Software"), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress's patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage ("Unintended Uses"). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit cypress.com. Other names and brands may be claimed as property of their respective owners.

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View CY2077FZZ on WIN SOURCE](#)
-  [Cypress Semiconductor Corp](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management