

## Features

- Low-voltage operation
- $V_{DD}$  range from 2.5 V to 3.3 V
- 1:10 fanout
- Over voltage tolerant input hot swappable
- Drives either a 50-Ohm or 75-Ohm transmission line
- Low-input capacitance
- 250 ps typical output-to-output skew
- 19 ps typical DJ jitter
- Typical propagation delay < 3.5 ns
- High-speed operation > 500 MHz
- Industrial temperature range
- Available packages include: SSOP

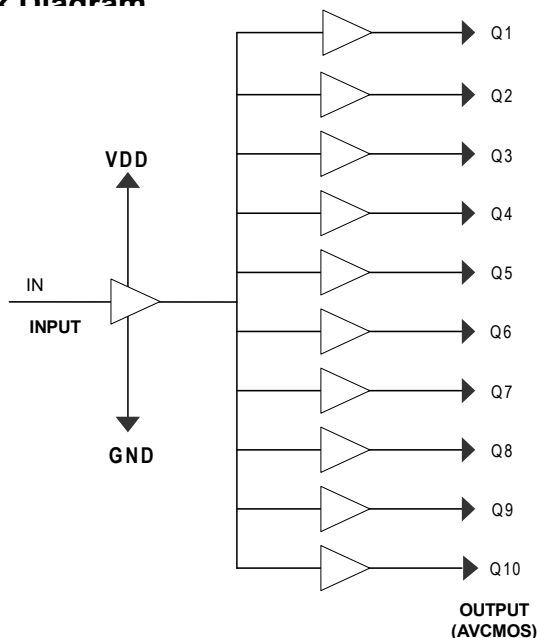
## Description

The Cypress series of network circuits are produced using advanced 0.35-micron CMOS technology, achieving the industry's fastest logic and buffers.

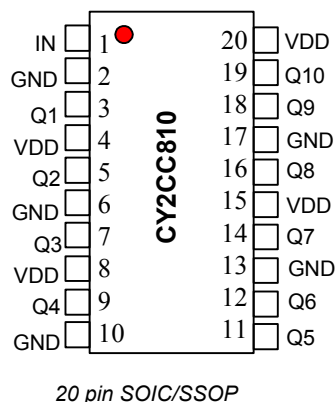
The Cypress CY2CC810 fanout buffer features one input and ten outputs. Designed for data communications clock management applications, the large fanout from a single input reduces loading on the input clock.

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

### Block Diagram



### Pin Configuration



## Contents

|                                                |          |                                                      |           |
|------------------------------------------------|----------|------------------------------------------------------|-----------|
| <b>Pin Description .....</b>                   | <b>3</b> | <b>Ordering Information.....</b>                     | <b>9</b>  |
| <b>Absolute Maximum Conditions .....</b>       | <b>3</b> | Ordering Code Definitions .....                      | 9         |
| <b>DC Electrical Characteristics .....</b>     | <b>3</b> | <b>Package Drawing and Dimensions .....</b>          | <b>10</b> |
| <b>DC Electrical Characteristics .....</b>     | <b>3</b> | <b>Document Conventions .....</b>                    | <b>11</b> |
| <b>Capacitance .....</b>                       | <b>4</b> | Units of Measure .....                               | 11        |
| <b>Power Supply Characteristics .....</b>      | <b>4</b> | <b>Document History Page .....</b>                   | <b>12</b> |
| <b>High-frequency Parametrics .....</b>        | <b>4</b> | <b>Sales, Solutions, and Legal Information .....</b> | <b>13</b> |
| <b>AC Switching Characteristics .....</b>      | <b>5</b> | Worldwide Sales and Design Support .....             | 13        |
| <b>AC Switching Characteristics .....</b>      | <b>5</b> | Products .....                                       | 13        |
| <b>Parameter Measurement Information .....</b> | <b>5</b> | PSoC Solutions .....                                 | 13        |
| <b>Parameter Measurement Information .....</b> | <b>7</b> |                                                      |           |

## Pin Description

| Pin Number                         | Pin Name        | Description  |         |
|------------------------------------|-----------------|--------------|---------|
| 1                                  | IN              | Input        | LVC MOS |
| 2, 6, 10, 13, 17                   | GND             | Ground       | Power   |
| 4, 8, 15, 20                       | V <sub>DD</sub> | Power Supply | Power   |
| 3, 5, 7, 9, 11, 12, 14, 16, 18, 19 | Q1... Q10       | Output       | AVC MOS |

## Absolute Maximum Conditions<sup>[1, 2]</sup>

| Parameter        | Description                               | Min  | Max                 | Unit |
|------------------|-------------------------------------------|------|---------------------|------|
| V <sub>DD</sub>  | V <sub>DD</sub> ground supply voltage     | -0.5 | 4.6                 | V    |
| V <sub>IN</sub>  | Input supply voltage to ground potential  | -0.5 | 5.8                 | V    |
| V <sub>OUT</sub> | Output supply voltage to ground potential | -0.5 | V <sub>DD</sub> + 1 | V    |
| T <sub>S</sub>   | Temperature, storage                      | -65  | 150                 | °C   |
| T <sub>A</sub>   | Temperature, operating ambient            | -40  | 85                  | °C   |
|                  | Power dissipation                         | 0.75 |                     | W    |

## DC Electrical Characteristics @ 3.3 V (see Figure 5)

| Parameter        | Description              | Conditions                                                                                             | Min | Typ. | Max  | Unit |
|------------------|--------------------------|--------------------------------------------------------------------------------------------------------|-----|------|------|------|
| V <sub>OH</sub>  | Output high voltage      | V <sub>DD</sub> = Min, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OH</sub> = -12 mA | 2.3 | 3.3  |      | V    |
| V <sub>OL</sub>  | Output low voltage       | V <sub>DD</sub> = Min, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OL</sub> = 12 mA  | -   | 0.2  | 0.5  | V    |
| V <sub>IH</sub>  | Input high voltage       | Guaranteed Logic High Level                                                                            | 2   | -    | 5.8  | V    |
| V <sub>IL</sub>  | Input low voltage        | Guaranteed Logic Low Level                                                                             | -   | -    | 0.8  | V    |
| I <sub>IH</sub>  | Input high current       | V <sub>DD</sub> = Max, V <sub>IN</sub> = 2.7 V                                                         | -   | -    | 1    | μA   |
| I <sub>IL</sub>  | Input low current        | V <sub>DD</sub> = Max, V <sub>IN</sub> = 0.5 V                                                         | -   | -    | -1   | μA   |
| I <sub>I</sub>   | Input high current       | V <sub>DD</sub> = Max, V <sub>IN</sub> = V <sub>DD</sub> (Max)                                         | -   | -    | 20   | μA   |
| V <sub>IK</sub>  | Clamp diode voltage      | V <sub>DD</sub> = Min, I <sub>IN</sub> = -18 mA                                                        | -   | -0.7 | -1.2 | V    |
| I <sub>OK</sub>  | Continuous clamp current | V <sub>DD</sub> = Max, V <sub>OUT</sub> = GND                                                          | -   | -    | -50  | mA   |
| O <sub>OFF</sub> | Power down disable       | V <sub>DD</sub> = GND, V <sub>OUT</sub> = < 4.5 V                                                      | -   | -    | 100  | μA   |
| V <sub>H</sub>   | Input hysteresis         | V <sub>DD</sub> = Min, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                            | -   | 80   |      | mV   |

## DC Electrical Characteristics @ 2.5 V (see Figure 1)

| Parameter        | Description              | Conditions                                                                                            | Min | Typ. | Max  | Unit |
|------------------|--------------------------|-------------------------------------------------------------------------------------------------------|-----|------|------|------|
| V <sub>OH</sub>  | Output high voltage      | V <sub>DD</sub> = Min, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OH</sub> = -7 mA | 1.8 | -    | -    | V    |
|                  |                          | I <sub>OH</sub> = 12 mA                                                                               | 1.6 | -    | -    | V    |
| V <sub>OL</sub>  | Output low voltage       | V <sub>DD</sub> = Min, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OL</sub> = 12 mA |     | -    | 0.65 | V    |
| V <sub>IH</sub>  | Input high voltage       | Guaranteed Logic High Level                                                                           | 1.6 | -    | 5.0  | V    |
| V <sub>IL</sub>  | Input low voltage        | Guaranteed Logic Low Level                                                                            | -   | -    | 0.8  | V    |
| I <sub>IH</sub>  | Input high current       | V <sub>DD</sub> = Max, V <sub>IN</sub> = 2.4 bV                                                       | -   | -    | 1    | μA   |
| I <sub>IL</sub>  | Input low current        | V <sub>DD</sub> = Max, V <sub>IN</sub> = 0.5 V                                                        | -   | -    | -1   | μA   |
| I <sub>I</sub>   | Input high current       | V <sub>DD</sub> = Max, V <sub>IN</sub> = V <sub>DD</sub> (Max)                                        | -   | -    | 20   | μA   |
| V <sub>IK</sub>  | Clamp diode voltage      | V <sub>DD</sub> = Min, I <sub>IN</sub> = -18 mA                                                       | -   | -0.7 | -1.2 | V    |
| I <sub>OK</sub>  | Continuous clamp current | V <sub>DD</sub> = Max, V <sub>OUT</sub> = GND                                                         | -   | -    | -50  | mA   |
| O <sub>OFF</sub> | Power-down disable       | V <sub>DD</sub> = GND, V <sub>OUT</sub> = < 4.5 V                                                     | -   | -    | 100  | μA   |
| V <sub>H</sub>   | Input hysteresis         | -                                                                                                     | -   | 80   | -    | mV   |

## Capacitance

| Parameter        | Description        | Test Conditions        | Min | Typ. | Max | Unit |
|------------------|--------------------|------------------------|-----|------|-----|------|
| C <sub>in</sub>  | Input capacitance  | V <sub>IN</sub> = 0 V  | –   | 2.5  | –   | pF   |
| C <sub>out</sub> | Output capacitance | V <sub>OUT</sub> = 0 V | –   | 6.5  | –   | pF   |

## Power Supply Characteristics (see Figure 5)

| Parameter        | Description                                          | Test Conditions                                                                                                                                                            | Min  | Typ. | Max  | Unit       |
|------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------------|
| ΔI <sub>CC</sub> | Delta I <sub>CC</sub> quiescent power supply current | (I <sub>DD</sub> @ V <sub>DD</sub> = Max and V <sub>IN</sub> = V <sub>DD</sub> ) – (I <sub>DD</sub> @ V <sub>DD</sub> = Max and V <sub>IN</sub> = V <sub>DD</sub> – 0.6 V) | –    | –    | 50   | μA         |
| I <sub>CCD</sub> | Dynamic power supply current                         | V <sub>DD</sub> = Max<br>Input toggling 50% Duty Cycle, Outputs Open                                                                                                       | –    | –    | 0.63 | mA/<br>MHz |
| I <sub>C</sub>   | Total power supply current                           | V <sub>DD</sub> = Max<br>Input toggling 50% Duty Cycle, Outputs Open<br>f <sub>L</sub> = 40 MHz                                                                            | –    | –    | 25   | mA         |
| t <sub>PU</sub>  | Power-up time for all V <sub>DD</sub> S              | Power-up to reach minimum specified voltage<br>(power ramp must be monotonic)                                                                                              | 0.05 | –    | 500  | ms         |

## High-frequency Parametrics

| Parameter               | Description                                  | Test Conditions                                                                                                                             | Min          | Typ. | Max | Unit    |
|-------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|-----|---------|
| D <sub>J</sub>          | Jitter, Deterministic                        | 50% duty cycle t <sub>W</sub> (50–50)<br>The “point to point load circuit”<br>Output Jitter – Input Jitter                                  | 2.5 V        | –    | 23  | 35 ps   |
|                         |                                              |                                                                                                                                             | 3.3 V        | –    | 19  | 30 ps   |
| F <sub>max(3.3 V)</sub> | Maximum frequency<br>V <sub>DD</sub> = 3.3 V | 50% duty cycle t <sub>W</sub> (50–50)<br>Standard Load Circuit.                                                                             | See Figure 5 | –    | –   | 160 MHz |
|                         |                                              | 50% duty cycle t <sub>W</sub> (50–50)<br>The “point to point load circuit”                                                                  | See Figure 7 | –    | –   | 650 MHz |
| F <sub>max(2.5 V)</sub> | Maximum frequency<br>V <sub>DD</sub> = 2.5 V | The “point to point load circuit”<br>V <sub>IN</sub> = 2.4 bV/0.0 V V <sub>OUT</sub> = 1.7 V/0.7 V                                          | See Figure 7 | –    | –   | 200 MHz |
| F <sub>max(20)</sub>    | Maximum frequency<br>V <sub>DD</sub> = 3.3 V | 20% duty cycle t <sub>W</sub> (20–80)<br>The “point to point load circuit”<br>V <sub>IN</sub> = 3.0 V/0.0 V V <sub>OUT</sub> = 2.3 V/0.4 bV | See Figure 7 | –    | –   | 250 MHz |
|                         | Maximum frequency<br>V <sub>DD</sub> = 2.5 V | The “point to point load circuit”<br>V <sub>IN</sub> = 2.4 bV/0.0 V V <sub>OUT</sub> = 1.7 V/0.7 V                                          | See Figure 3 | –    | –   | 200 MHz |
| t <sub>W</sub>          | Minimum pulse<br>V <sub>DD</sub> = 3.3 V     | The “point to point load circuit”<br>V <sub>IN</sub> = 3.0 V/0.0 V F = 100 MHz<br>V <sub>OUT</sub> = 2.0 V/0.8 V                            | See Figure 7 | 1    | –   | – ns    |
|                         | Minimum pulse<br>V <sub>DD</sub> = 2.5 V     | The “point to point load circuit”<br>V <sub>IN</sub> = 2.4 bV/0.0 V F = 100 MHz<br>V <sub>OUT</sub> = 1.7 V/0.7 V                           | See Figure 3 | 1    | –   | – ns    |

### Note

- Stresses greater than those listed under absolute maximum ratings may cause permanent damage to the device. This is intended to be a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- Multiple Supplies: The voltage on any input or I/O pin cannot exceed the power pin during power-up. Power supply sequencing is NOT required.

**AC Switching Characteristics @ 3.3 V,  $V_{DD} = 3.3 \text{ V} \pm 5\%$ , Temperature =  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$** 

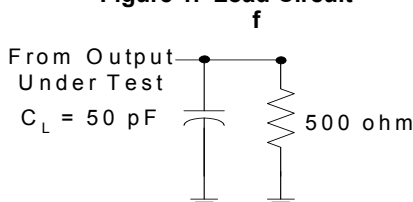
| Parameter   | Description                                                                                                              |               | Min | Typ. | Max  | Unit |
|-------------|--------------------------------------------------------------------------------------------------------------------------|---------------|-----|------|------|------|
| $t_{PLH}$   | Propagation delay – Low to High                                                                                          | See Figure 4  | 1.5 | 2.7  | 3.5  | ns   |
| $t_{PHL}$   | Propagation delay – High to Low                                                                                          |               | 1.5 | 2.7  | 3.5  | ns   |
| $t_R$       | Output rise time                                                                                                         | –             | –   | 0.8  |      | V/ns |
| $t_F$       | Output fall time                                                                                                         | –             | –   | 0.8  |      | V/ns |
| $t_{SK(0)}$ | Output Skew: Skew between outputs of the same package (in phase)                                                         | See Figure 10 | –   | 0.25 | 0.38 | ns   |
| $t_{SK(p)}$ | Pulse Skew: Skew between opposite transitions of the same output ( $t_{PHL} - t_{PLH}$ ).                                | See Figure 9  | –   | –    | 0.2  | ns   |
| $t_{SK(t)}$ | Package Skew: Skew between outputs of different packages at the same power supply voltage, temperature and package type. | See Figure 11 | –   | –    | 0.42 | ns   |

**AC Switching Characteristics @ 2.5 V,  $V_{DD} = 2.5 \text{ V} \pm 5\%$ , Temperature =  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$** 

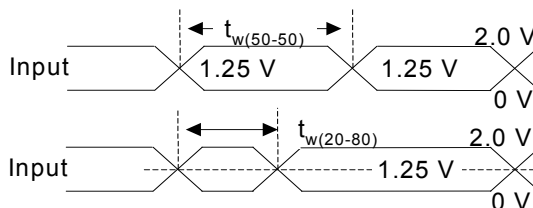
| Parameter   | Description                                                                                                              |               | Min | Typ. | Max  | Unit |
|-------------|--------------------------------------------------------------------------------------------------------------------------|---------------|-----|------|------|------|
| $t_{PLH}$   | Propagation delay – Low to High                                                                                          | See Figure 4  | 1.5 | 2.0  | 3.5  | ns   |
| $t_{PHL}$   | Propagation delay – High to Low                                                                                          |               | 1.5 | 2.0  | 3.5  | ns   |
| $t_R$       | Output rise time                                                                                                         | –             | –   | 0.8  |      | V/ns |
| $t_F$       | Output fall time                                                                                                         | –             | –   | 0.8  |      | V/ns |
| $t_{SK(0)}$ | Output Skew: Skew between outputs of the same package (in phase)                                                         | See Figure 10 | –   | 0.25 | 0.38 | ns   |
| $t_{SK(p)}$ | Pulse Skew: Skew between opposite transitions of the same output ( $t_{PHL} - t_{PLH}$ ).                                | See Figure 9  | –   | –    | 0.4  | ns   |
| $t_{SK(t)}$ | Package Skew: Skew between outputs of different packages at the same power supply voltage, temperature and package type. | See Figure 11 | –   |      | 0.65 | ns   |

**Parameter Measurement Information:  $V_{DD}$  @ 2.5 V**

**Figure 1. Load Circuit** <sup>[3,4,5]</sup>

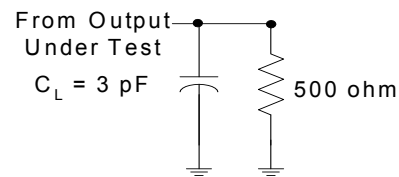


**Figure 2. Voltage Waveforms Pulse Duration** <sup>[6]</sup>

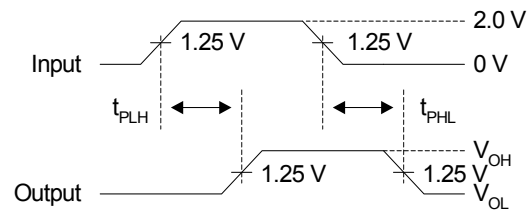

**Notes**

- $C_L$  includes probe and jig capacitance.
- All input pulses are supplied by generators having the following characteristics: PRR < 100 MHz,  $Z_0 = 50\Omega$ ,  $t_R < 2.5 \text{ ns}$ ,  $t_F < 2.5 \text{ ns}$ .
- The outputs are measured one at a time with one transition per measurement.
- $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

**Figure 3. Point to Point Load Circuit<sup>[3,4,5]</sup>**

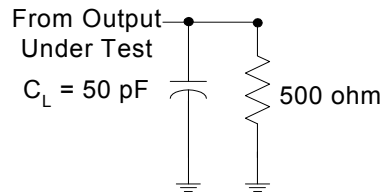


**Figure 4. Voltage Waveforms Propagation Delay Times<sup>[4]</sup>**

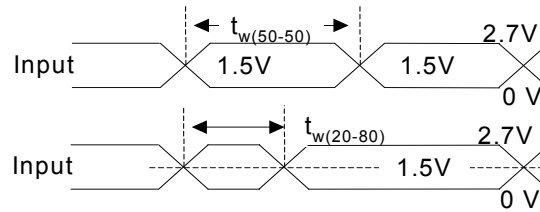


**Parameter Measurement Information:  $V_{DD}$  @ 3.3 V**

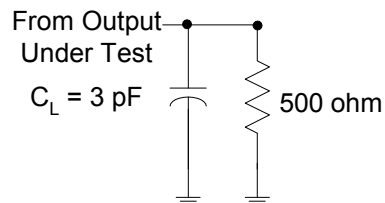
**Figure 5. Load Circuit** [3,4,5]



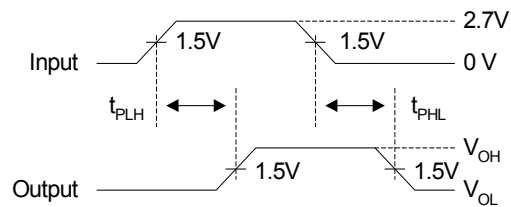
**Figure 6. Voltage Waveforms—Pulse Duration** [6]



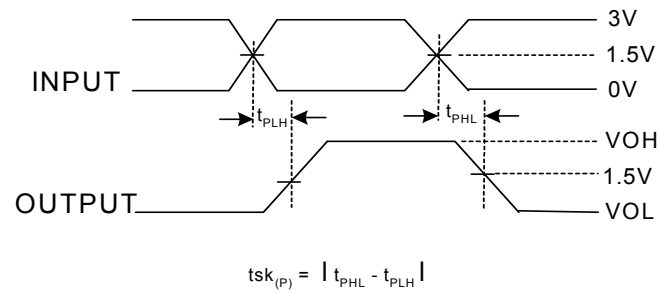
**Figure 7. Point to Point Load Circuit** [3,4,5]



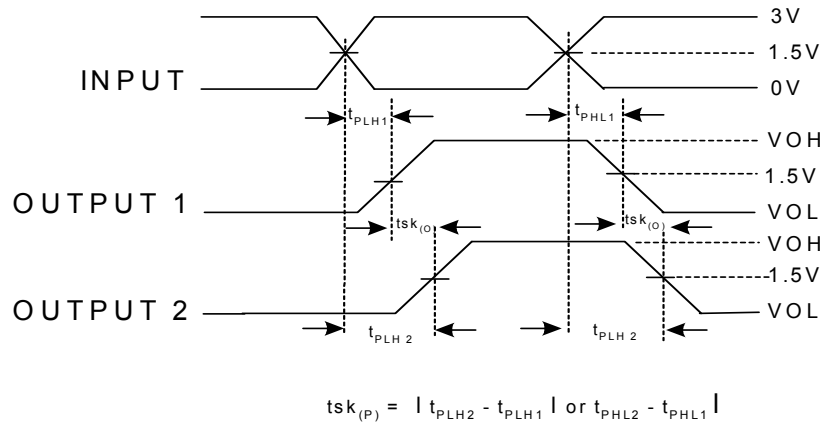
**Figure 8. Voltage Waveforms Propagation Delay Times** [4]



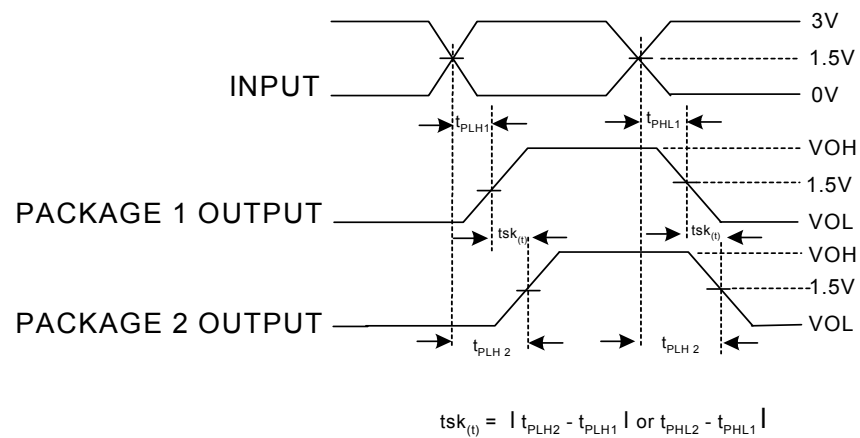
**Figure 9. Pulse Skew- $tsk_{(p)}$**



**Figure 10. Output Skew- $tsk_{(o)}$**



**Figure 11. Package Skew- $tsk_{(t)}$**

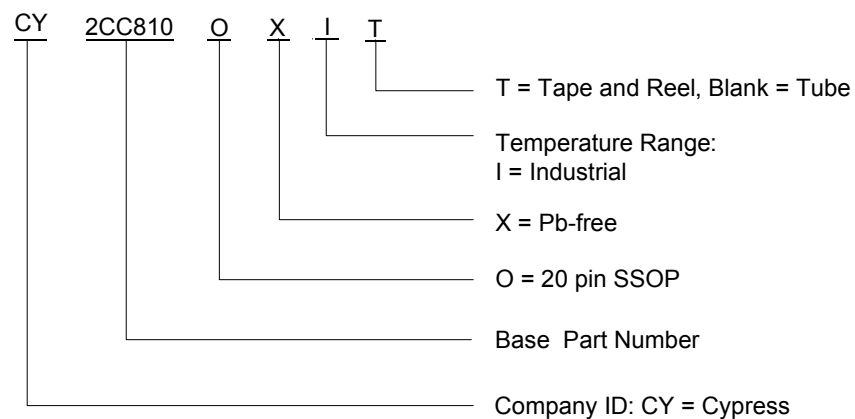




## Ordering Information

| Part Number <sup>[7]</sup> | Package Type              | Product Flow                |
|----------------------------|---------------------------|-----------------------------|
| <b>Pb-free</b>             |                           |                             |
| CY2CC810OXI                | 20-pin SSOP               | Industrial, -40 °C to 85 °C |
| CY2CC810OXIT               | 20-pin SSOP–Tape and Reel | Industrial, -40 °C to 85 °C |
| CY2CC810OXI-1              | 20-pin SSOP               | Industrial, -40 °C to 85 °C |
| CY2CC810OXI-1T             | 20-pin SSOP–Tape and Reel | Industrial, -40 °C to 85 °C |

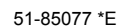
## Ordering Code Definitions



### Note

7. Devices with part numbers ending with -1 are identical to devices without the -1 suffix. There are no differences in specification.

**Figure 12. 20-Pin (5.3-mm) Shrunk Small Outline Package O20**



## Acronym

| Acronym | Description                             |
|---------|-----------------------------------------|
| CMOS    | complementary metal oxide semiconductor |
| DJ      | Deterministic Jitter                    |
| SSOP    | shrunk small outline package            |

## Document Conventions

### Units of Measure

| Symbol | Unit of Measure |
|--------|-----------------|
| °C     | degree Celsius  |
| MHZ    | megahertz       |
| uA     | microamperes    |
| mA     | milliamperes    |
| ms     | milliseconds    |
| ns     | nanoseconds     |
| %      | percent         |
| pF     | picofarads      |
| ps     | picoseconds     |
| V      | volt            |

## Document History Page

| Document Title: CY2CC810 1:10 Clock Fanout Buffer<br>Document #: 38-07056 |         |                 |                 |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------|---------|-----------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rev.                                                                      | ECN No. | Submission Date | Orig. of Change | Description of Change                                                                                                                                                                                                                                                                                                                                                                                               |
| **                                                                        | 107081  | 06/07/01        | IKA             | Convert from IMI to Cypress                                                                                                                                                                                                                                                                                                                                                                                         |
| *A                                                                        | 114315  | 05/09/02        | TSM             | $\Delta I_{DD}$ Validation                                                                                                                                                                                                                                                                                                                                                                                          |
| *B                                                                        | 119117  | 10/07/02        | RGL             | Added 5.8 as the Max value of $V_{IH}$ in the DC Electrical Characteristics @3.3 V table. Changed the Max value of $V_{IH}$ from 1.8 to 5.0 in the DC Electrical Characteristics @2.5 V table.                                                                                                                                                                                                                      |
| *C                                                                        | 122743  | 12/14/02        | RBI             | Added power up requirements to maximum ratings information.                                                                                                                                                                                                                                                                                                                                                         |
| *D                                                                        | 387761  | See ECN         | RGL             | Added typical values<br>Updated jitter and skew specs.<br>Removed devices with SOIC package<br>Added Lead-free SSOP package                                                                                                                                                                                                                                                                                         |
| *E                                                                        | 499991  | See ECN         | RGL             | Added tpu parameter in the Power Supply Characteristics table                                                                                                                                                                                                                                                                                                                                                       |
| *F                                                                        | 2896073 | 03/19/10        | CXQ             | Updated package diagram<br>Removed obsolete parts from ordering information table and added CY2CC810OXI-1, CY2CC810OXI-1T<br>Removed reference to SOIC packages                                                                                                                                                                                                                                                     |
| *G                                                                        | 3056154 | 10/08/2010      | CXQ             | Removed CY2CC810OXC and CY2CC810OXCT parts from <a href="#">Ordering Information</a> .                                                                                                                                                                                                                                                                                                                              |
| *H                                                                        | 3396159 | 10/10/2011      | PURU            | Added <a href="#">Contents</a><br>Updated <a href="#">Description</a><br>Updated <a href="#">Package Drawing and Dimensions</a><br>Added <a href="#">Ordering Code Definitions</a> , <a href="#">Acronym</a> , and <a href="#">Units of Measure</a> .<br>The statement related to Variable impedance "AVCMOS-type outputs dynamically adjust for variable impedance matching and reduce noise overall" was removed. |
| *I                                                                        | 4559526 | 11/07/2014      | PURU            | Added documentation related hyperlink in page 1                                                                                                                                                                                                                                                                                                                                                                     |

## Sales, Solutions, and Legal Information

### Worldwide Sales and Design Support

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| Clocks & Buffers         | <a href="http://cypress.com/go/clocks">cypress.com/go/clocks</a>                                                                     |
| Interface                | <a href="http://cypress.com/go/interface">cypress.com/go/interface</a>                                                               |
| Lighting & Power Control | <a href="http://cypress.com/go/powerpsoc">cypress.com/go/powerpsoc</a><br><a href="http://cypress.com/go/plc">cypress.com/go/plc</a> |
| Memory                   | <a href="http://cypress.com/go/memory">cypress.com/go/memory</a>                                                                     |
| Optical & Image Sensing  | <a href="http://cypress.com/go/image">cypress.com/go/image</a>                                                                       |
| PSoC                     | <a href="http://cypress.com/go/psoc">cypress.com/go/psoc</a>                                                                         |
| Touch Sensing            | <a href="http://cypress.com/go/touch">cypress.com/go/touch</a>                                                                       |
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