

**1:10 Clock Fanout Buffer**

**Features**

- Low voltage operation
- Full range support:
  - 3.3 V
  - 2.5 V
  - 1.8 V
- Over voltage tolerant input hot swappable
- 1:10 Fanout
- Drives either a 50-Ohm or 75-Ohm load
- Low input capacitance
- Low output skew
- Low propagation delay
- Typical ( $t_{pd}$  less than 4 ns)
- High speed operation:
  - 200 MHz at 1.8 V
  - 650 MHz at 2.5 V and 3.3 V

- Industrial temperature range
- Available in SSOP package

**Functional Description**

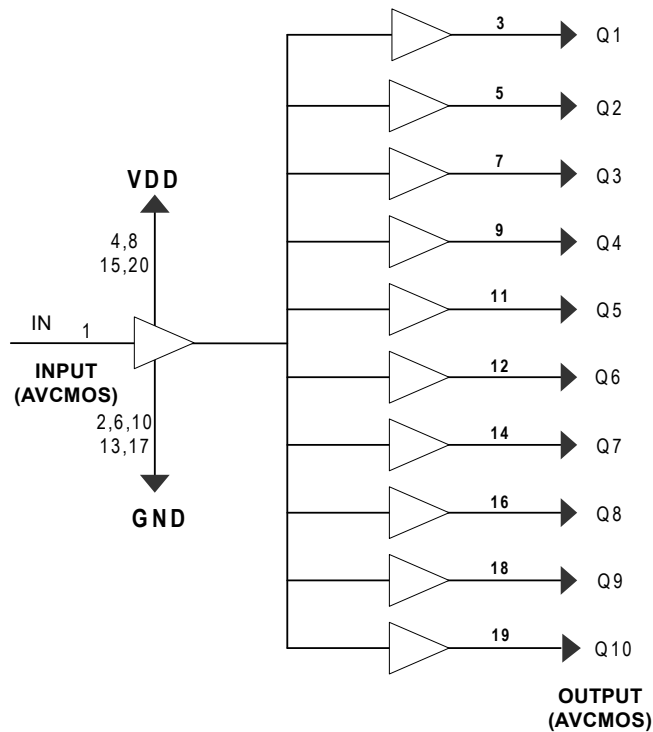
The Cypress series of network circuits are produced using advanced 0.35 micron CMOS technology, achieving the industry's fastest logic and buffers.

The Cypress CY2CC910 fanout buffer features one input and 10 outputs. It is ideal for conversion from and to 3.3 V, 2.5 V, and 1.8 V

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](#).

**Logic Block Diagram**

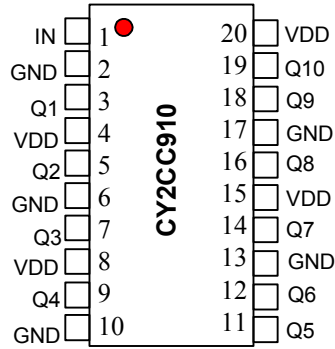


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## Pin Configuration

**Figure 1. 20-Pin SOIP/SSOP pinout**



20 pin SOIC/SSOP

## Pin Description

Pin Number	Pin Name	Description
1	IN	Input
2,6,10,13,17	GND	Ground
4,8,15,20	V <sub>DD</sub>	Power Supply
3,5,7,9,11,12,14,16,18,19	Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10	Output

### Maximum Ratings

Exceeding maximum ratings<sup>[1]</sup> may shorten the useful life of the device. User guidelines are not tested.

- Storage temperature: ..... -65° C to +150° C
- Ambient temperature: ..... -40° C to +85° C
- Supply voltage to ground potential

- V<sub>CC</sub> ..... -0.5 V to 4.6 V
- Input ..... -0.5 V to 5.8 V
- Supply voltage to ground potential (Outputs only) ..... -0.5 V to V<sub>DD</sub> + 1 V
- DC output voltage ..... -0.5 V to V<sub>DD</sub> + 1 V
- Power dissipation ..... 0.75 W

### DC Electrical Characteristics

At 3.3 V (See Figure 2)

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				80		mV

### DC Electrical Characteristics

At 2.5 V (See Figure 2)

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 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				80		mV

**Note**

1. 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.

## DC Electrical Characteristics

At 1.8 V (See Figure 6)

Parameter	Description	Test Condition <sup>[2]</sup>	Min	Max	Unit
V <sub>DD</sub>	Supply voltage		1.71	1.89	V
V <sub>IH</sub>	Input high voltage		0.65 V <sub>DD</sub> [1.1]	4.3	V
V <sub>IL</sub>	Input low voltage		-0.3	0.35 V <sub>DD</sub> [0.6]	V
V <sub>OH</sub>	Output high voltage	I <sub>OH</sub> = -2 mA	V <sub>DD</sub> - 0.45[1.2]		V
V <sub>OL</sub>	Output low voltage	I <sub>OH</sub> = 2 mA		0.45	V

## Capacitance

Parameter	Description	Test Conditions	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

## Thermal Resistance

Parameter <sup>[3]</sup>	Description	Test Conditions	20-pin SSOP	Unit
θ <sub>JA</sub>	Thermal resistance (junction to ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, in accordance with EIA/JESD51.	79	°C/W
θ <sub>JC</sub>	Thermal resistance (junction to case)		35	°C/W

## Power Supply Characteristics

(See Figure 2)

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(6 V))			50	μA
I <sub>CCD</sub>	Dynamic power supply current	V <sub>DD</sub> = Max Input toggling 50% Duty Cycle, Outputs Open			0.63	mA/ MHz
I <sub>C</sub>	Total power supply current	V <sub>DD</sub> = Max Input toggling 50% Duty Cycle, Outputs Open f <sub>L</sub> = 40 MHz			25	mA

### Notes

2. Test load conditions: 500-Ohm to ground with approximately 6-pF total loading and 200-MHz maximum frequency.
3. These parameters are guaranteed by design and are not tested.

## High Frequency Parametrics

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
$D_J$	Jitter, Deterministic	50% duty cycle $t_W(50-50)$ The "point to point load circuit"   Output Jitter – Input Jitter	See Figure 4		20	ps
$F_{max}$ 3.3 V	Maximum frequency $V_{DD} = 3.3 V$	50% duty cycle $t_W(50-50)$ Standard Load Circuit.	See Figure 2		160	MHz
		50% duty cycle $t_W(50-50)$ The "point to point load circuit"	See Figure 4		650	
$F_{max}$ 2.5 V	Maximum frequency $V_{DD} = 2.5 V$	The "point-to-point load circuit" $V_{IN} = 2.4 V/0.0 V$ $V_{OUT} = 1.7 V/0.7 V$	See Figure 4		200	MHz
$F_{max}$ 1.8 V	Maximum frequency $V_{DD} = 1.8 V$	The "6-pF load circuit" $V_{IN} = 1.7/0.0 V$ $V_{OUT} = 1.2 V/0.4 V$	See Figure 6		200	MHz
$F_{max(20)}$	Maximum frequency $V_{DD} = 3.3 V$	20% duty cycle $t_W(20-80)$ The "point to point load circuit" $V_{IN} = 3.0 V/0.0 V$ $V_{OUT} = 2.3 V/0.4 V$	See Figure 5		250	MHz
$t_W$ 3.3 V	Minimum pulse $V_{DD} = 3.3 V$	The "point-to-point load circuit" $V_{IN} = 3.0 V/0.0 V$ $F = 100 MHz$ $V_{OUT} = 2.0 V/0.8 V$	See Figure 4	1		ns
$t_W$ 2.5 V	Minimum pulse $V_{DD} = 2.5 V$	The "point-to-point load circuit" $V_{IN} = 2.4 V/0.0 V$ $F = 100 MHz$ $V_{OUT} = 1.7 V/0.7 V$	See Figure 4	1		ns
$t_W$ 1.8 V	Minimum pulse $V_{DD} = 1.8 V$	The "6-pF load circuit" $V_{IN} = 1.7 V/0.0 V$ $V_{OUT} = 1.2 V/0.4 V$	See Figure 6	1		ns

### AC Switching Characteristics

At 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 3	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			0.2	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			0.4	ns

### AC Switching Characteristics

At 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 3	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			0.2	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			0.4	ns

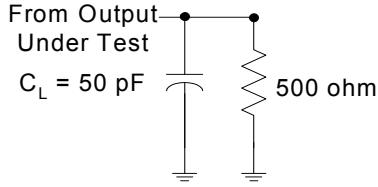
### AC Switching Characteristics

At 1.8 V ( $V_{DD} = 1.8\text{ V} \pm 5\%$ , Temperature =  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ )

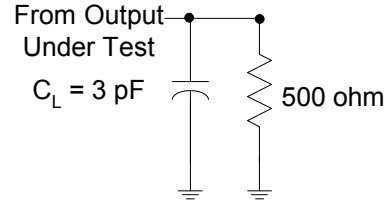
Parameter	Description		Min	Typ	Max	Unit
$t_{PLH}$	Propagation delay – Low to High	See Figure 7	1.5	2.7	3.5	ns
$t_{PHL}$	Propagation delay – High to Low		1.5	2.7	3.5	ns
$t_R$	Output rise time 20 – 80%		0.2		1.5	ns
$t_F$	Output fall time 20 – 80%		0.2		1.5	ns
$t_{SK(0)}$	Output Skew: Skew between outputs of the same package (in phase).	See Figure 10			0.2	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			0.4	ns

**Parameter Measurement Information:  $V_{DD}$  at 3.3 V to 2.5 V**

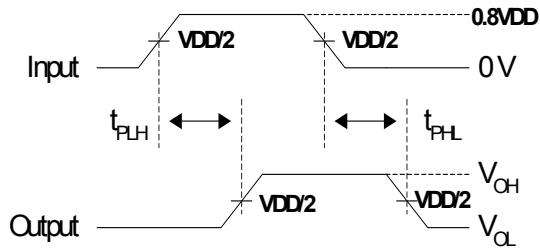
**Figure 2. Load Circuit** [3, 4, 5]



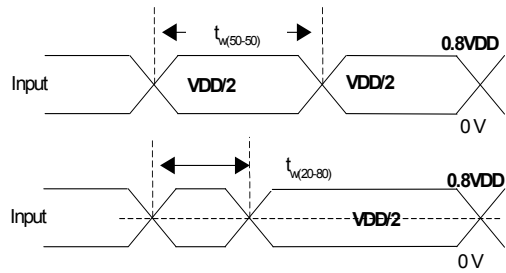
**Figure 4. Point to Point Load Circuit** [3, 4, 5]



**Figure 3. Voltage Waveforms Propagation Delay Times** [6]



**Figure 5. Voltage Waveforms – Pulse Duration** [4]





Parameter Measurement Information:  $V_{DD}$  at 8 V

Figure 6. Load Circuit [3, 4, 5]

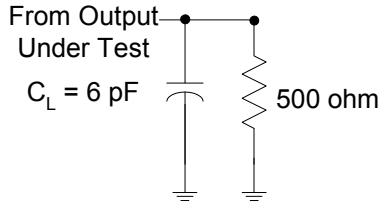


Figure 8. Voltage Waveforms – Pulse Duration [4]

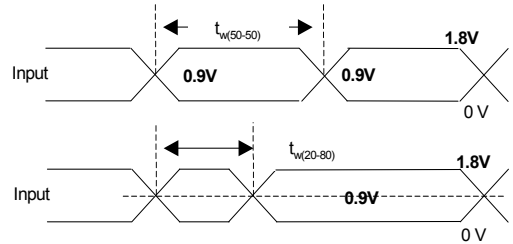


Figure 7. Voltage Waveforms Propagation

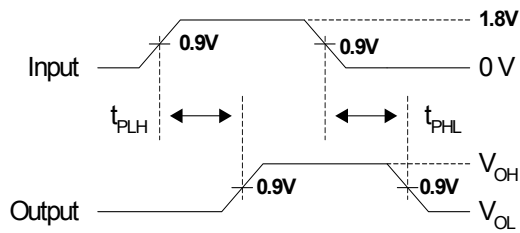


Figure 9. Pulse Skew -  $tsk_{(p)}$

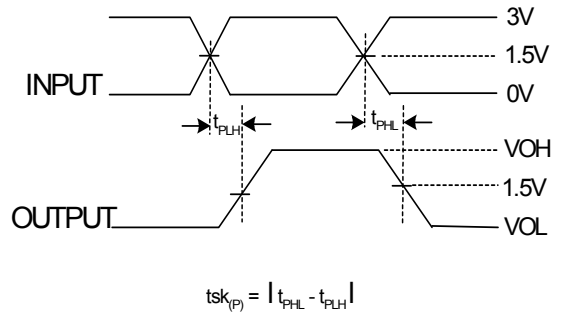
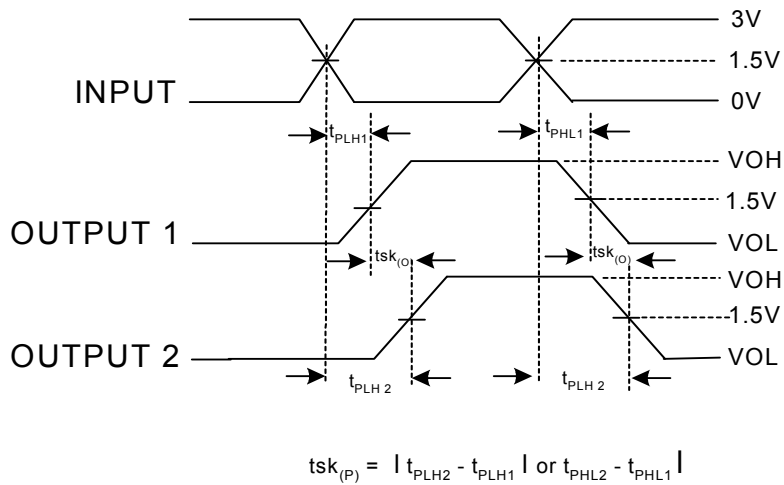


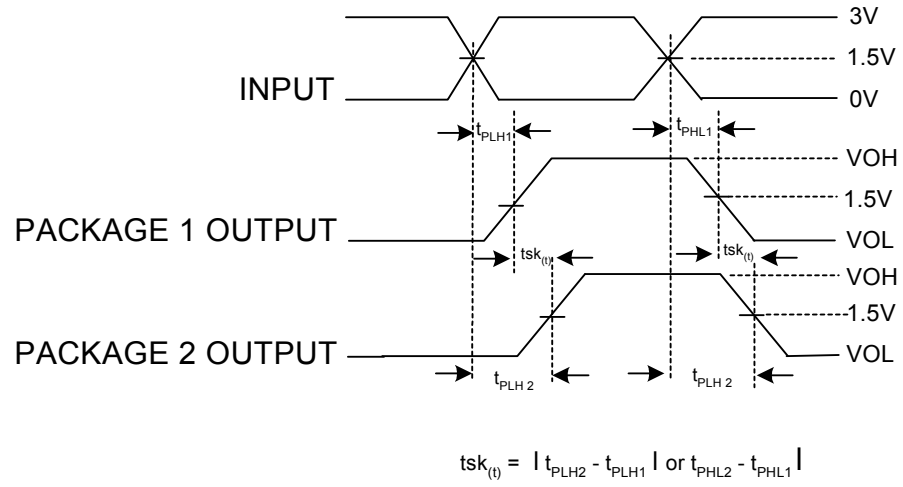
Figure 10. Output Skew -  $tsk_{(o)}$



Notes

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

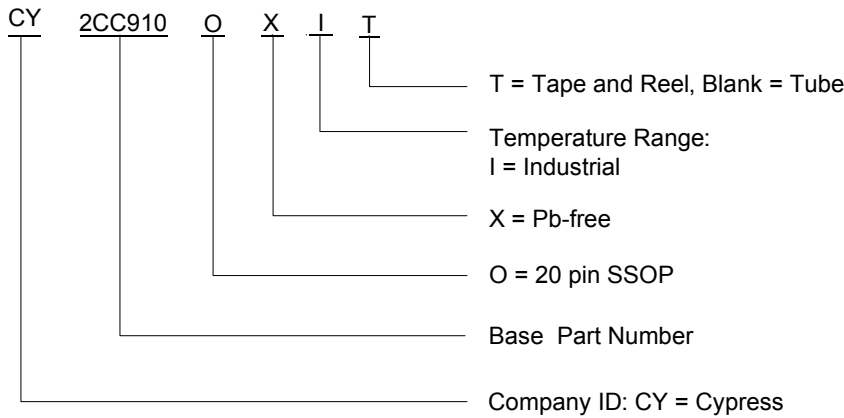
**Figure 11. Package Skew -  $tsk_{(t)}$**



**Ordering Information**

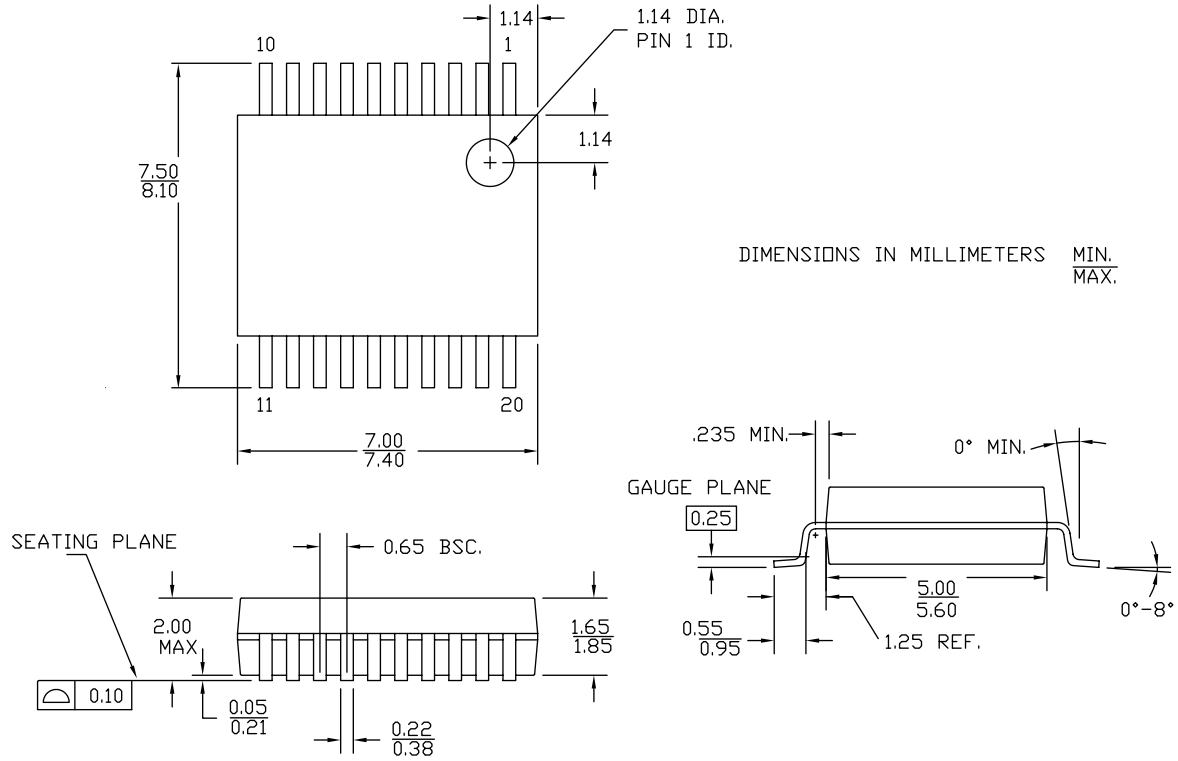
Part Number	Package Type	Product Flow
<b>Pb-free</b>		
CY2CC910OXI	20-pin SSOP	Industrial, -40° C to 85° C
CY2CC910OXIT	20-pin SSOP–Tape and Reel	Industrial, -40° C to 85° C

**Ordering Code Definitions**



Package Diagram

Figure 12. 20-pin SSOP (210 Mils) O20.21 Package Outline, 51-85077



51-85077 \*F

## Acronyms

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: CY2CC910, 1:10 Clock Fanout Buffer Document No: 38-07348				
Rev.	ECN No.	Orig. of Change	Submission Date	Description of Change
**	114318	TSM	05/10/02	New data sheet
*A	119148	RGL	10/07/02	Added 5.8 as the Max value for $V_{IH}$ in the DC Electrical Characteristics @3.3 V table. Changed the Max value of $V_{IH}$ from 5.8 to 5.0 in the DC Electrical Characteristics @2.5 V table. Changed the value of $V_{IH}$ from $V_{DD}+0.3$ [2.25] to 4.3 in the DC Electrical Characteristics @1.8 V table.
*B	404287	RGL	See ECN	Added Lead-free devices for SSOP
*C	2595534	CXQ / PYRS	10/23/08	Added "Status" column to Ordering Information table Updated Package Diagram 51-85024 Updated to new template.
*D	2896073	CXQ	03/19/10	Removed SOIC packages related information in all instances across the document. Updated <a href="#">Ordering Information</a> : Removed obsolete parts from ordering information table and added CY2CC910OXI-1, CY2CC910OXI-1T. Updated <a href="#">Package Diagram</a> .
*E	3056154	CXQ	10/08/2010	Updated <a href="#">Ordering Information</a> : Removed CY2CC910OXI-1, CY2CC910OXI-1T, CY2CC910OXC, and CY2CC910OXCT parts. Removed the Note "Devices with part numbers ending with -1 are identical to devices without the -1 suffix. There are no differences in specification." and its reference.
*F	3411742	PURU	10/18/2011	Added <a href="#">Contents</a> . Updated <a href="#">Functional Description</a> : Removed "Cypress employs the unique AVCMOS type outputs VOI (Variable Output Impedance) that dynamically adjust for variable impedance matching, eliminate the need for series damping resistors, and reduce overall noise." Removed "Variable Output Impedance Control (VOI)". Updated <a href="#">Ordering Information</a> Updated <a href="#">Package Diagram</a> . Added <a href="#">Acronyms</a> and <a href="#">Units of Measure</a> .
*G	4575136	TAVA	11/20/2014	Updated <a href="#">Functional Description</a> : Added "For a complete list of related resources, <a href="#">click here</a> ." at the end. Updated to new template. Completing Sunset Review.
*H	4586288	TAVA	12/03/2014	Updated <a href="#">Functional Description</a> : Replaced "resources" with "documentation".
*I	5272946	PSR	05/16/2016	Added <a href="#">Thermal Resistance</a> . Updated <a href="#">Package Diagram</a> : spec 51-85077 – Changed revision from *E to *F. Updated to new template.

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