

# 1:10 Clock Fanout Buffer

## Features

- Low voltage operation
- Full range support:
  - 3.3V
  - 2.5V
  - 1.8V
- 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 1.8V
  - 650 MHz at 2.5V and 3.3V
- Industrial versions available
- Available in SSOP package

## Description

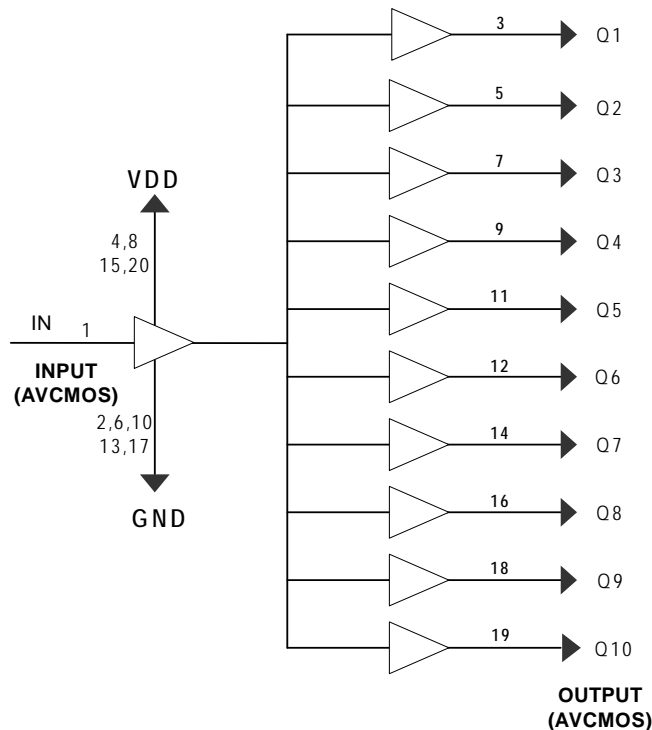
The Cypress series of network circuits are produced using advanced 0.35 micron CMOS technology, achieving the industry's fastest logic and buffers.

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

Designed for Data Communications clock management applications, the large fanout from a single input reduces loading on the input clock.

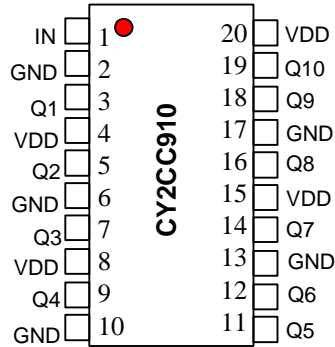
Cypress employs the unique AVCMOS type outputs VOI (Variable Output Impedance) that dynamically adjust for variable impedance matching, eliminate the need for series damping resistors, and reduce overall noise.

## Logic Block Diagram



## Pin Configuration

Figure 1. 20-Pin SOIP-SSOP



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<sup>[1]</sup>

Storage Temperature:..... -65°C to +150°C  
 Ambient Temperature: ..... -40°C to +85°C  
 Supply Voltage to Ground Potential  
 V<sub>CC</sub>.....-0.5V to 4.6V  
 Input.....-0.5V to 5.8V

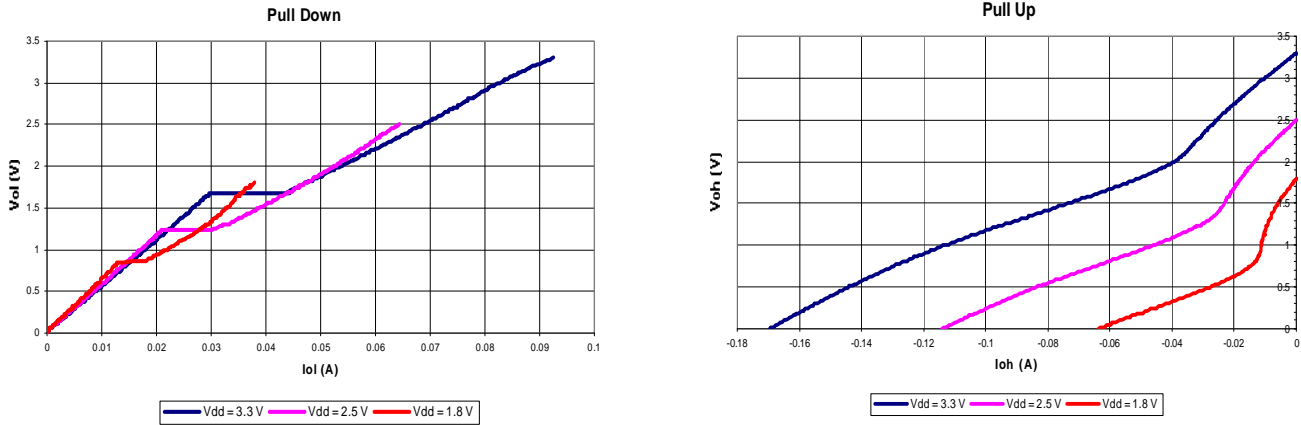
Supply Voltage to Ground Potential  
 (Outputs only) ..... -0.5V to V<sub>DD</sub> + 1V  
 DC Output Voltage..... -0.5V to V<sub>DD</sub> + 1V  
 Power Dissipation..... 0.75W

### 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.

## Variable Output Impedance Control (VOI)

Figure 2. Output Voltage versus Output Current ( $T_A = 25^\circ\text{C}$ )



## DC Electrical Characteristics

At 3.3V (See Figure 3)

Parameter	Description	Conditions	Min	Typ	Max	Unit
$V_{OH}$	Output High Voltage	$V_{DD} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -12 \text{ mA}$	2.3	3.3		V
$V_{OL}$	Output Low Voltage	$V_{DD} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 12 \text{ mA}$		0.2	0.5	V
$V_{IH}$	Input High Voltage	Guaranteed Logic High Level	2		5.8	V
$V_{IL}$	Input Low Voltage	Guaranteed Logic Low Level			0.8	V
$I_{IH}$	Input High Current	$V_{DD} = \text{Max.}$ $V_{IN} = 2.7\text{V}$			1	$\mu\text{A}$
$I_{IL}$	Input Low Current	$V_{DD} = \text{Max.}$ $V_{IN} = 0.5\text{V}$			-1	$\mu\text{A}$
$I_I$	Input High Current	$V_{DD} = \text{Max.}, V_{IN} = V_{DD}(\text{Max.})$			20	$\mu\text{A}$
$V_{IK}$	Clamp Diode Voltage	$V_{DD} = \text{Min.}, I_{IN} = -18 \text{ mA}$		-0.7	-1.2	V
$I_{OK}$	Continuous Clamp Current	$V_{DD} = \text{Max.}, V_{OUT} = \text{GND}$			-50	mA
$O_{OFF}$	Power-down Disable	$V_{DD} = \text{GND}, V_{OUT} = < 4.5\text{V}$			100	$\mu\text{A}$
$V_H$	Input Hysteresis			80		mV

**At 2.5V** (See [Figure 3](#))

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>			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.			1	μA
I <sub>IL</sub>	Input Low Current	V <sub>DD</sub> = Max.			-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> = < 4.5V			100	μA
V <sub>H</sub>	Input Hysteresis			80		mV

**At 1.8V** (See [Figure 7](#))

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		0.65V <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> = 0V	2.5		pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	6.5		pF

**Power Supply Characteristics** (See [Figure 3](#))

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> - 0.6V)			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

**Note**

2. Test load conditions: 500-Ohm to ground with approximately 6-pF total loading and 200-MHz maximum frequency.

## 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) The "point to point load circuit"   Output Jitter – Input Jitter			20	ps
F <sub>max</sub> 3.3V	Maximum frequency V <sub>DD</sub> = 3.3V	50% duty cycle t <sub>W</sub> (50-50) Standard Load Circuit.			160	MHz
		50% duty cycle t <sub>W</sub> (50-50) The "point to point load circuit"			650	
F <sub>max</sub> 2.5V	Maximum frequency V <sub>DD</sub> = 2.5V	The "point-to-point load circuit" V <sub>IN</sub> = 2.4V/0.0V V <sub>OUT</sub> = 1.7V/0.7V			200	MHz
F <sub>max</sub> 1.8V	Maximum frequency V <sub>DD</sub> = 1.8V	The "6-pF load circuit" V <sub>IN</sub> = 1.7/0.0V V <sub>OUT</sub> = 1.2V/0.4V			200	MHz
F <sub>max(20)</sub>	Maximum frequency V <sub>DD</sub> = 3.3V	20% duty cycle t <sub>W</sub> (20-80) The "point to point load circuit" V <sub>IN</sub> = 3.0V/0.0V V <sub>OUT</sub> = 2.3V/0.4V			250	MHz
t <sub>W</sub> 3.3V	Minimum pulse V <sub>DD</sub> = 3.3V	The "point-to-point load circuit" V <sub>IN</sub> = 3.0V/0.0V F = 100 MHz V <sub>OUT</sub> = 2.0V/0.8V	1			ns
t <sub>W</sub> 2.5V	Minimum pulse V <sub>DD</sub> = 2.5V	The "point-to-point load circuit" V <sub>IN</sub> = 2.4V/0.0V F = 100 MHz V <sub>OUT</sub> = 1.7V/0.7V	1			ns
t <sub>W</sub> 1.8V	Minimum pulse V <sub>DD</sub> = 1.8V	The "6-pF load circuit" V <sub>IN</sub> = 1.7V/0.0V V <sub>OUT</sub> = 1.2V/0.4V	1			ns

## AC Switching Characteristics

At 3.3V (V<sub>DD</sub> = 3.3V ± 5%, Temperature = -40°C to +85°C)

Parameter	Description	Min	Typ	Max	Unit	
t <sub>PLH</sub>	Propagation Delay – Low to High	See Figure 4	1.5	2.7	3.5	ns
t <sub>PHL</sub>	Propagation Delay – High to Low		1.5	2.7	3.5	ns
t <sub>R</sub>	Output Rise Time			0.8		V/ns
t <sub>F</sub>	Output Fall Time			0.8		V/ns
t <sub>SK(0)</sub>	Output Skew: Skew between outputs of the same package (in phase).	See Figure 11			0.2	ns
t <sub>SK(p)</sub>	Pulse Skew: Skew between opposite transitions of the same output (t <sub>PHL</sub> – t <sub>PLH</sub> ).	See Figure 10			0.2	ns
t <sub>SK(t)</sub>	Package Skew: Skew between outputs of different packages at the same power supply voltage, temperature and package type.	See Figure 12			0.4	ns

At 2.5V (V<sub>DD</sub> = 2.5V ± 5%, Temperature = -40°C to +85°C)

Parameter	Description	Min	Typ	Max	Unit	
t <sub>PLH</sub>	Propagation Delay – Low to High	See Figure 4	1.5	2.7	3.5	ns
t <sub>PHL</sub>	Propagation Delay – High to Low		1.5	2.7	3.5	ns
t <sub>R</sub>	Output Rise Time			0.8		V/ns
t <sub>F</sub>	Output Fall Time			0.8		V/ns
t <sub>SK(0)</sub>	Output Skew: Skew between outputs of the same package (in phase).	See Figure 11			0.2	ns
t <sub>SK(p)</sub>	Pulse Skew: Skew between opposite transitions of the same output (t <sub>PHL</sub> – t <sub>PLH</sub> ).	See Figure 10			0.2	ns
t <sub>SK(t)</sub>	Package Skew: Skew between outputs of different packages at the same power supply voltage, temperature and package type.	See Figure 12			0.4	ns

### AC Switching Characteristics

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

Parameter	Description	Min	Typ	Max	Unit
$t_{PLH}$	Propagation Delay – Low to High	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).			0.2	ns
$t_{SK(p)}$	Pulse Skew: Skew between opposite transitions of the same output ( $t_{PHL} - t_{PLH}$ ).			0.2	ns
$t_{SK(t)}$	Package Skew: Skew between outputs of different packages at the same power supply voltage, temperature and package type.			0.4	ns

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

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

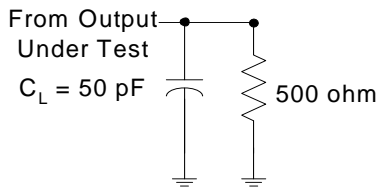


Figure 5. Point to Point Load Circuit [3,4,5]

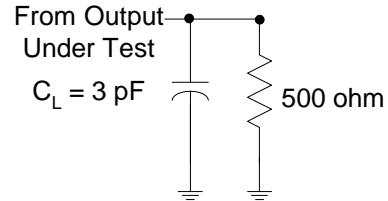


Figure 4. Voltage Waveforms Propagation Delay Times [6]

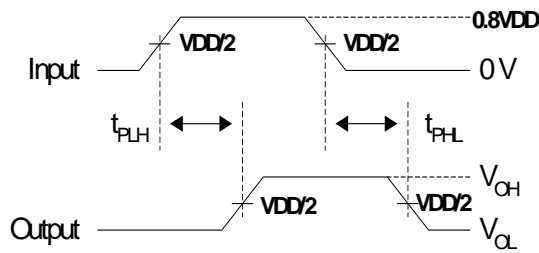
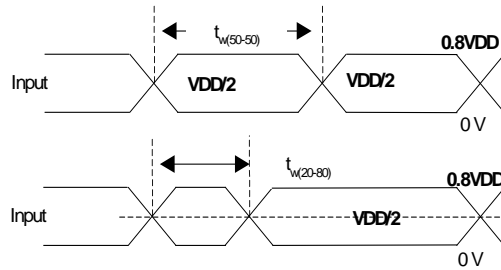


Figure 6. Voltage Waveforms – Pulse Duration [4]



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

Figure 7. Load Circuit [3,4,5]

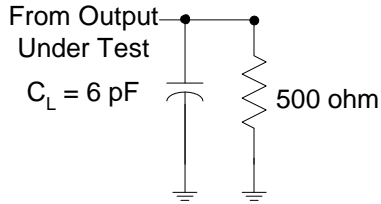


Figure 8. Voltage Waveforms Propagation

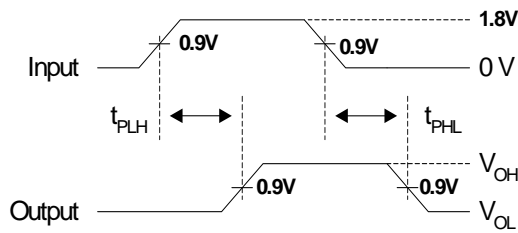


Figure 9. Voltage Waveforms – Pulse Duration [4]

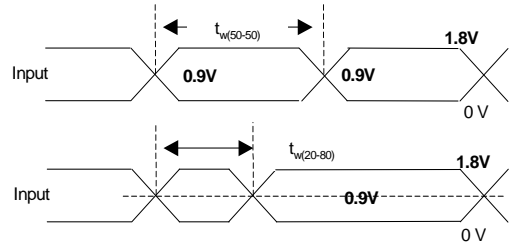


Figure 10. Pulse Skew -  $tsk_{(p)}$

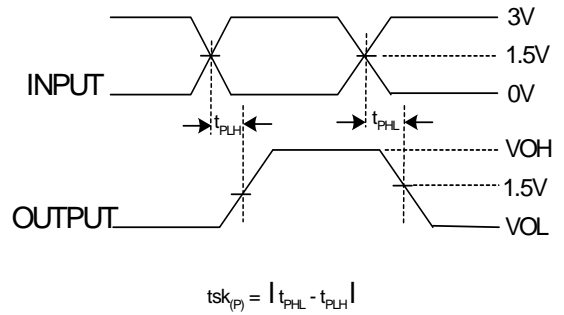
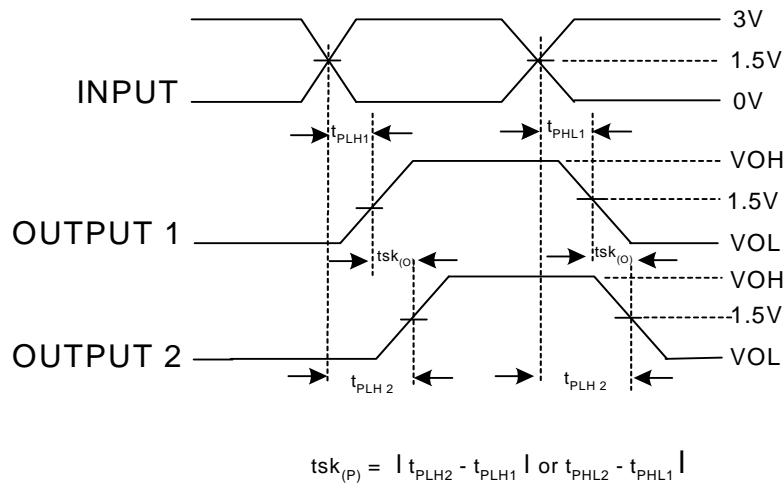


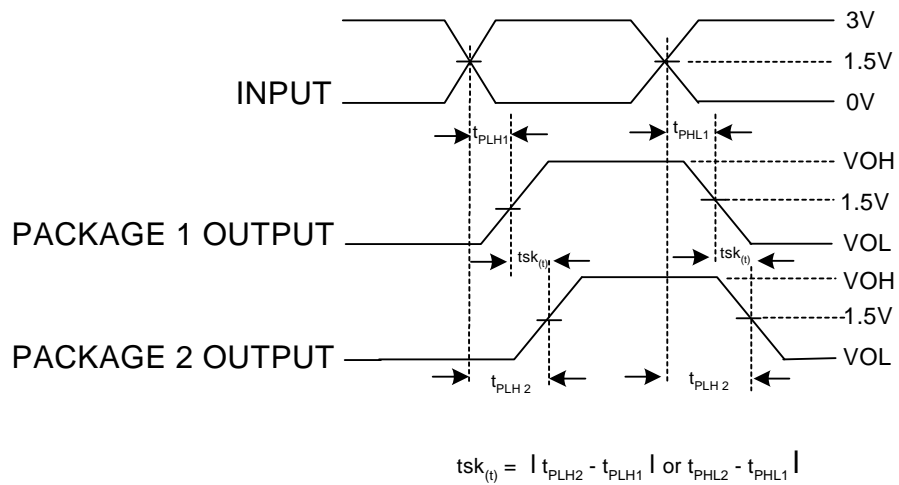
Figure 11. Output Skew -  $tsk_{(o)}$



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 12. Package Skew -  $tsk_{(t)}$



Ordering Information

Part Number <sup>[7]</sup>	Package Type	Product Flow	Status
<b>Pb-free</b>			
CY2CC9100XI	20-pin SSOP	Industrial, -40° to 85°C	Active
CY2CC9100XIT	20-pin SSOP–Tape and Reel	Industrial, -40° to 85°C	Active
CY2CC9100XC	20-pin SSOP	Commercial, 0°C to 70°C	Active
CY2CC9100XCT	20-pin SSOP–Tape and Reel	Commercial, 0°C to 70°C	Active
CY2CC9100XI-1	20-pin SSOP	Industrial, -40° to 85°C	Active
CY2CC9100XI-1T	20-pin SSOP–Tape and Reel	Industrial, -40° to 85°C	Active

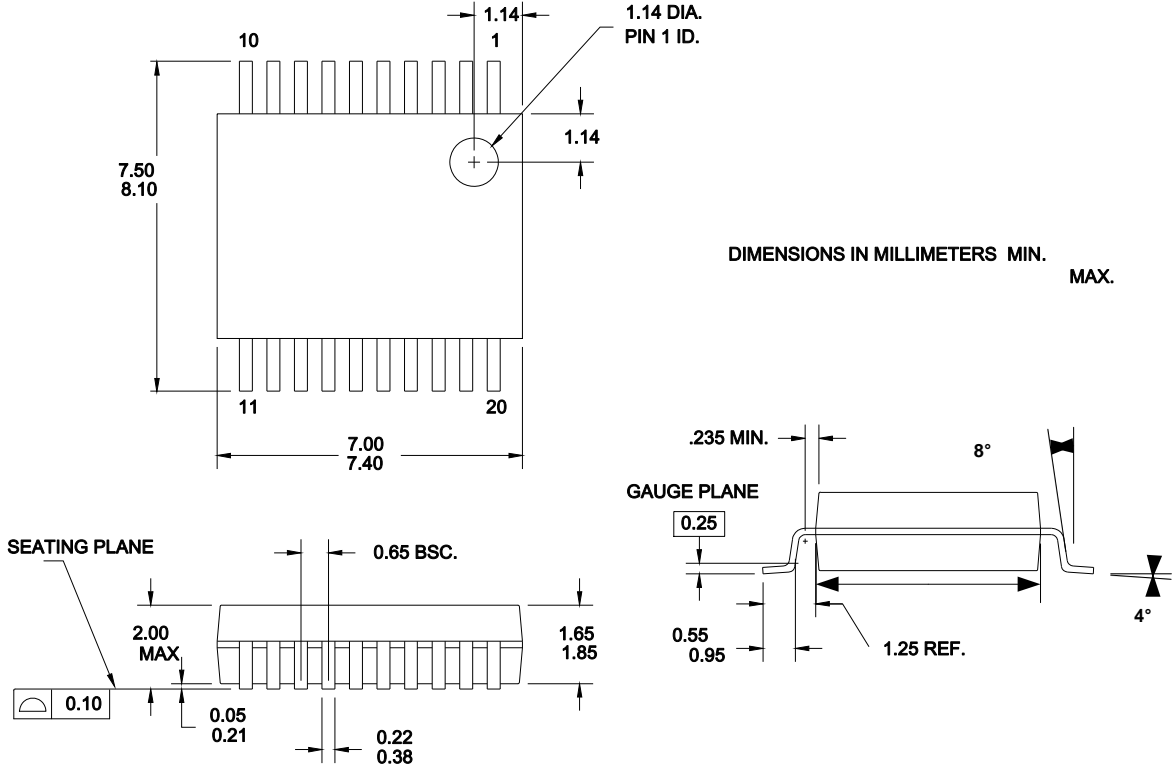
Note

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



Package Drawing

Figure 13. 20-Pin Shrunk Small Outline Package O20



51-85077 \*D

## 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 @3.3V table. Changed the Max. value of $V_{IH}$ from 5.8 to 5.0 in the DC Electrical Characteristics @2.5V table. Changed the value of $V_{IH}$ from $V_{DD}+0.3$ [2.25] to 4.3 in the DC Electrical Characteristics @1.8V 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 template
*D	2896073	CXQ	03/19/10	Updated package diagram Removed obsolete parts from ordering information table and added CY2CC910OXI-1, CY2CC910OXI-1T Removed reference to SOIC packages

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