

## 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 ( $t_{pd} < 4$  ns)
- High-speed operation:
  - 200 MHz@1.8V
  - 650 MHz@2.5V/3.3V
- Industrial versions available
- Available packages include: SOIC, SSOP

### Description

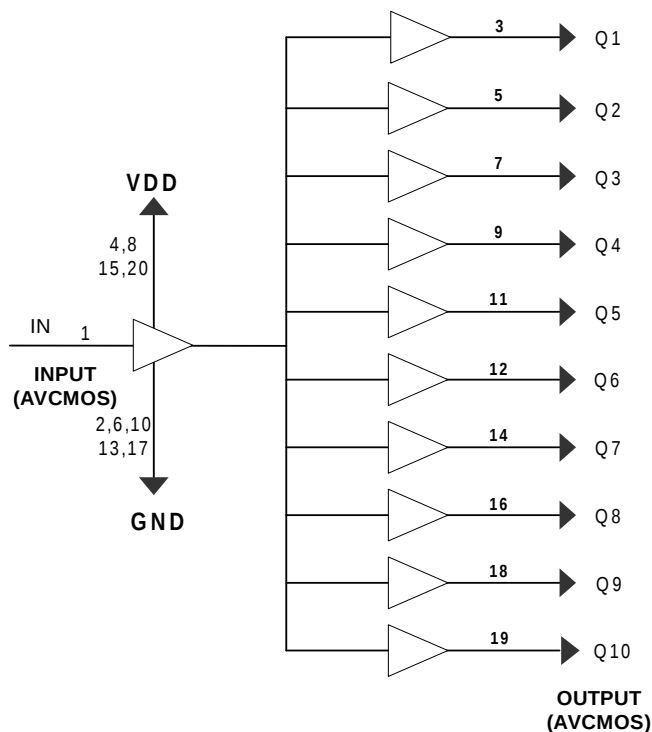
The Cypress series of network circuits are produced using advanced 0.35 micron CMOS technology, achieving the industries fastest logic and buffers.

The Cypress CY2CC910 fanout buffer features one input and ten outputs. Ideal for conversion from/to 3.3V/2.5V/1.8V

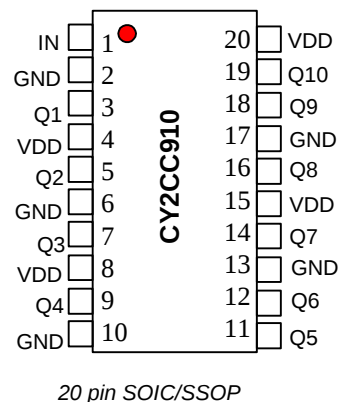
Designed for Data Communications clock management applications, the large fanout from a single input reduces loading on the input clock.

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

### Block Diagram



### Pin Configuration



## 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

## Variable Output Impedance Control (VOI™)

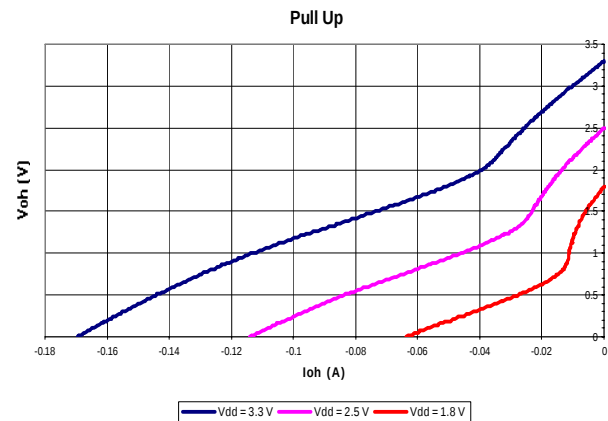


Figure 1. Output Voltage vs. Output Current (T<sub>A</sub> = 25°C)

## DC Electrical Characteristics @ 3.3V (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> = 2.7V   |      |      | 1    | μA   |
| I <sub>IL</sub>  | Input Low Current        | V <sub>DD</sub> = Max.                                                       | V <sub>IN</sub> = 0.5V   |      |      | -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   |

### 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 @ 2.5V (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> = 2.4V  |      |      | 1    | μA   |
| I <sub>IL</sub>  | Input Low Current        | V <sub>DD</sub> = Max.                                                       | V <sub>IN</sub> = 0.5V  |      |      | -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   |

**DC Electrical Characteristics @ 1.8V (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  |                               | 0.65V <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 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> - 0.6V) |      |     | 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/MHz |
| I <sub>C</sub>   | Total Power Supply Current                           | V <sub>DD</sub> = Max<br>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 |
|-------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------|------|------|------|
| $D_J$             | Jitter, Deterministic                | 50% duty cycle $t_W(50-50)$<br>The "point to point load circuit"<br>  Output Jitter – Input Jitter             | See Figure 4 |      | 20   | ps   |
| $F_{max}$<br>3.3V | Maximum frequency<br>$V_{DD} = 3.3V$ | 50% duty cycle $t_W(50-50)$<br>Standard Load Circuit.                                                          | See Figure 2 |      | 160  | MHz  |
|                   |                                      | 50% duty cycle $t_W(50-50)$<br>The "point to point load circuit"                                               | See Figure 4 |      | 650  |      |
| $F_{max}$<br>2.5V | Maximum frequency<br>$V_{DD} = 2.5V$ | The "point-to-point load circuit"<br>$V_{IN} = 2.4V/0.0V$ $V_{OUT} = 1.7V/0.7V$                                | See Figure 4 |      | 200  | MHz  |
| $F_{max}$<br>1.8V | Maximum frequency<br>$V_{DD} = 1.8V$ | The "6-pF load circuit"<br>$V_{IN} = 1.7V/0.0V$ $V_{OUT} = 1.2V/0.4V$                                          | See Figure 6 |      | 200  | MHz  |
| $F_{max(20)}$     | Maximum frequency<br>$V_{DD} = 3.3V$ | 20% duty cycle $t_W(20-80)$<br>The "point to point load circuit"<br>$V_{IN} = 3.0V/0.0V$ $V_{OUT} = 2.3V/0.4V$ | See Figure 5 |      | 250  | MHz  |
| $t_W$<br>3.3V     | Minimum pulse<br>$V_{DD} = 3.3V$     | The "point-to-point load circuit"<br>$V_{IN} = 3.0V/0.0V$ $F = 100$ MHz<br>$V_{OUT} = 2.0V/0.8V$               | See Figure 4 | 1    |      | ns   |
| $t_W$<br>2.5V     | Minimum pulse<br>$V_{DD} = 2.5V$     | The "point-to-point load circuit"<br>$V_{IN} = 2.4V/0.0V$ $F = 100$ MHz<br>$V_{OUT} = 1.7V/0.7V$               | See Figure 4 | 1    |      | ns   |
| $t_W$<br>1.8V     | Minimum pulse<br>$V_{DD} = 1.8V$     | The "6-pF load circuit"<br>$V_{IN} = 1.7V/0.0V$ $V_{OUT} = 1.2V/0.4V$                                          | See Figure 6 | 1    |      | ns   |

### AC Switching Characteristics @ 3.3V $V_{DD} = 3.3V \pm 5\%$ , 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                                                                                                         |               | 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   |

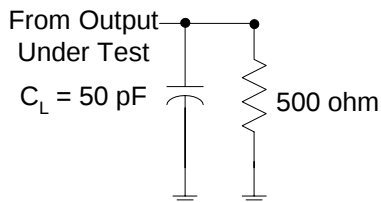
### AC Switching Characteristics @ 2.5V $V_{DD} = 2.5V \pm 5\%$ , Temperature = $-40^\circ C$ to $+85^\circ C$

| 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                                                                                                         |               | 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   |

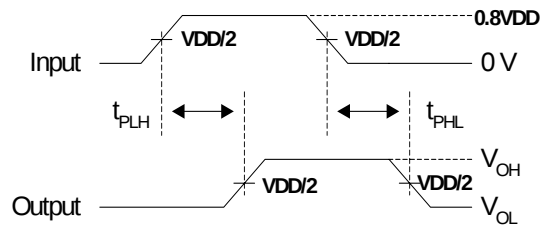
**AC Switching Characteristics @ 1.8V  $V_{DD} = 1.8V \pm 5\%$ , Temperature =  $-40^{\circ}C$  to  $+85^{\circ}C$**

| Parameter          | Description                                                                                                              |               | Min. | Typ. | Max. | Unit |
|--------------------|--------------------------------------------------------------------------------------------------------------------------|---------------|------|------|------|------|
| t <sub>PLH</sub>   | Propagation Delay – Low to High                                                                                          | See Figure 7  | 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 20 – 80%                                                                                                |               | 0.2  |      | 1.5  | ns   |
| t <sub>F</sub>     | Output Fall Time 20 – 80%                                                                                                |               | 0.2  |      | 1.5  | ns   |
| t <sub>SK(0)</sub> | Output Skew: Skew between outputs of the same package (in phase).                                                        | See Figure 10 |      |      | 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 9  |      |      | 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 11 |      |      | 0.4  | ns   |

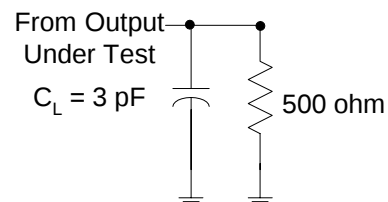
**Parameter Measurement Information:  $V_{DD}@3.3V-2.5V$**



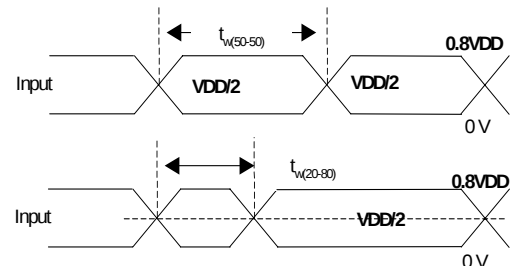
**Figure 2. Load Circuit** [3,4,5]



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

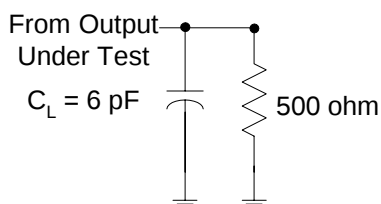


**Figure 4. Point to Point Load Circuit** [3,4,5]

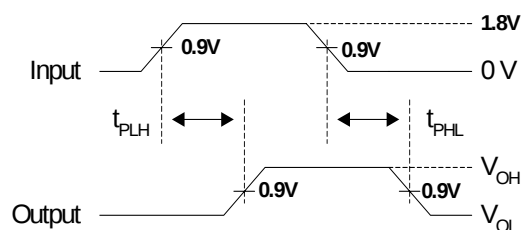


**Figure 5. Voltage Waveforms–Pulse Duration** [4]

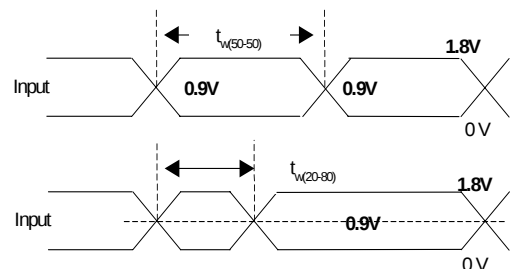
**Parameter Measurement Information:  $V_{DD}@1.8V$**



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



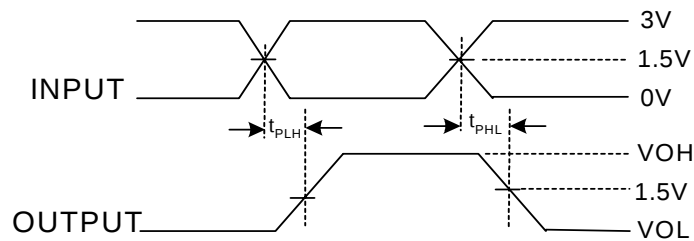
**Figure 7. Voltage Waveforms Propagation Delay Times** [6]



**Figure 8. Voltage Waveforms–Pulse Duration** [4]

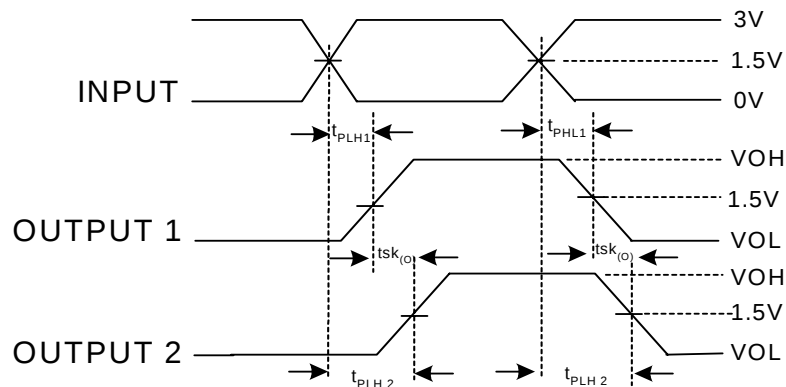
**Notes:**

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



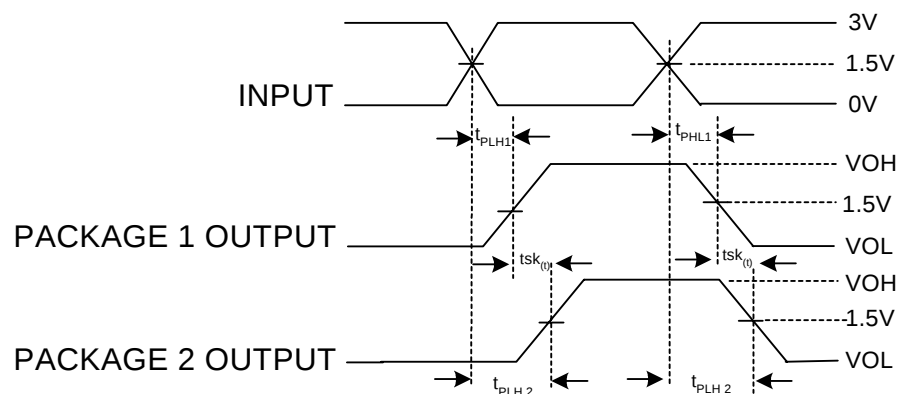
$$tsk_{(p)} = |t_{PHL} - t_{PLH}|$$

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



$$tsk_{(p)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

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



$$tsk_{(O)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

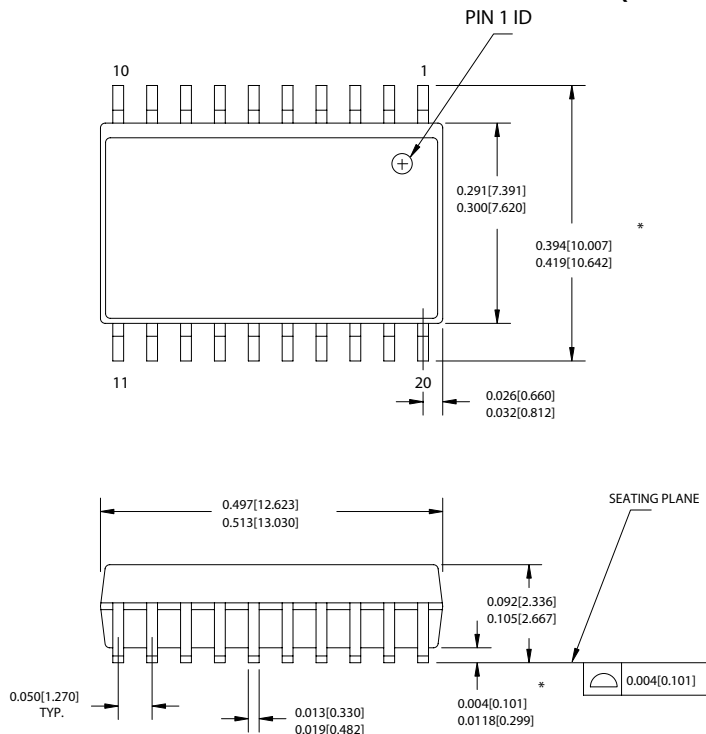
**Figure 11. Package Skew -  $tsk_{(O)}$**

**Ordering Information**

| Part Number      | Package Type              | Product Flow             |
|------------------|---------------------------|--------------------------|
| CY2CC910SI       | 20-pin SOIC               | Industrial, –40° to 85°C |
| CY2CC910SIT      | 20-pin SOIC–Tape and Reel | Industrial, –40° to 85°C |
| CY2CC910SC       | 20-pin SOIC               | Commercial, 0°C to 70°C  |
| CY2CC910SCT      | 20-pin SOIC–Tape and Reel | Commercial, 0°C to 70°C  |
| CY2CC910OI       | 20-pin SSOP               | Industrial, –40° to 85°C |
| CY2CC910OIT      | 20-pin SSOP–Tape and Reel | Industrial, –40° to 85°C |
| CY2CC910OC       | 20-pin SSOP               | Commercial, 0°C to 70°C  |
| CY2CC910OCT      | 20-pin SSOP–Tape and Reel | Commercial, 0°C to 70°C  |
| <b>Lead-free</b> |                           |                          |
| CY2CC910OXI      | 20-pin SSOP               | Industrial, –40° to 85°C |
| CY2CC910OXIT     | 20-pin SSOP–Tape and Reel | Industrial, –40° to 85°C |
| CY2CC910OXC      | 20-pin SSOP               | Commercial, 0°C to 70°C  |
| CY2CC910OXCT     | 20-pin SSOP–Tape and Reel | Commercial, 0°C to 70°C  |

## Package Drawing and Dimensions

### 20-Lead (300-Mil) SOIC S5

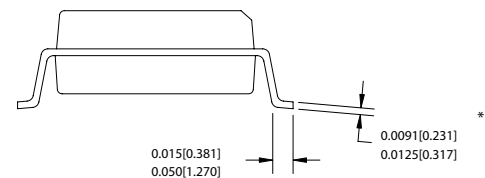


DIMENSIONS IN INCHES [MM] MIN.  
MAX.

REFERENCE JEDEC MO-119

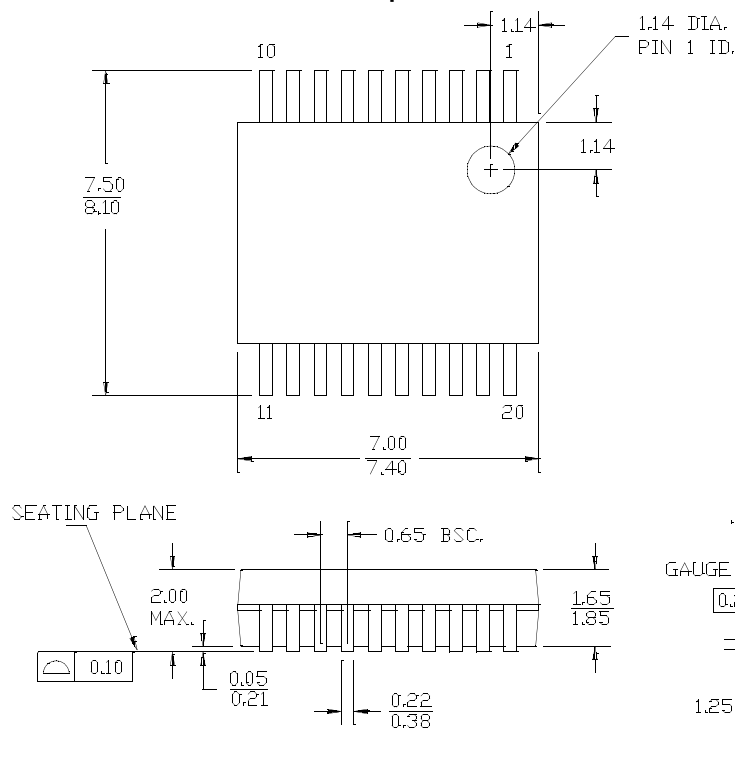
PACKAGE WEIGHT 0.55 gms

| PART # |                |
|--------|----------------|
| S20.3  | STANDARD PKG.  |
| SZ20.3 | LEAD FREE PKG. |

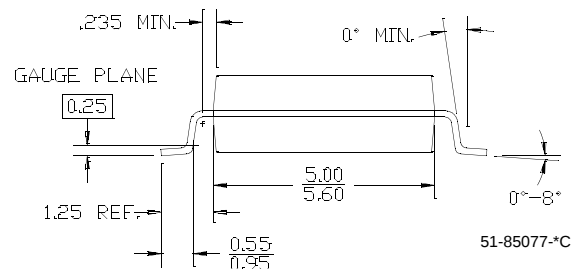


51-85024-\*B

### 20-pin Shrunk Small Outline Package O20



DIMENSIONS IN MILLIMETERS MIN.  
MAX.



51-85077-\*C

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## Document History Page

| Document Title: CY2CC910 COMLINK™ SERIES 1:10 Clock Fanout Buffer<br>Document #: 38-07348 |         |            |                 |                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------|---------|------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REV.                                                                                      | ECN NO. | Issue Date | Orig. of Change | Description of Change                                                                                                                                                                                                                                                                                                 |
| **                                                                                        | 114318  | 05/10/02   | TSM             | New Data Sheet                                                                                                                                                                                                                                                                                                        |
| *A                                                                                        | 119148  | 10/07/02   | RGL             | Added 5.8 as the Max. value for $V_{IH}$ in the DC Electrical Characteristics @3.3V table.<br>Changed the Max. value of $V_{IH}$ from 5.8 to 5.0 in the DC Electrical Characteristics @2.5V table.<br>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  | See ECN    | RGL             | Added Lead-free devices for SSOP                                                                                                                                                                                                                                                                                      |