

# 1:10 Clock Fanout Buffer

## Features

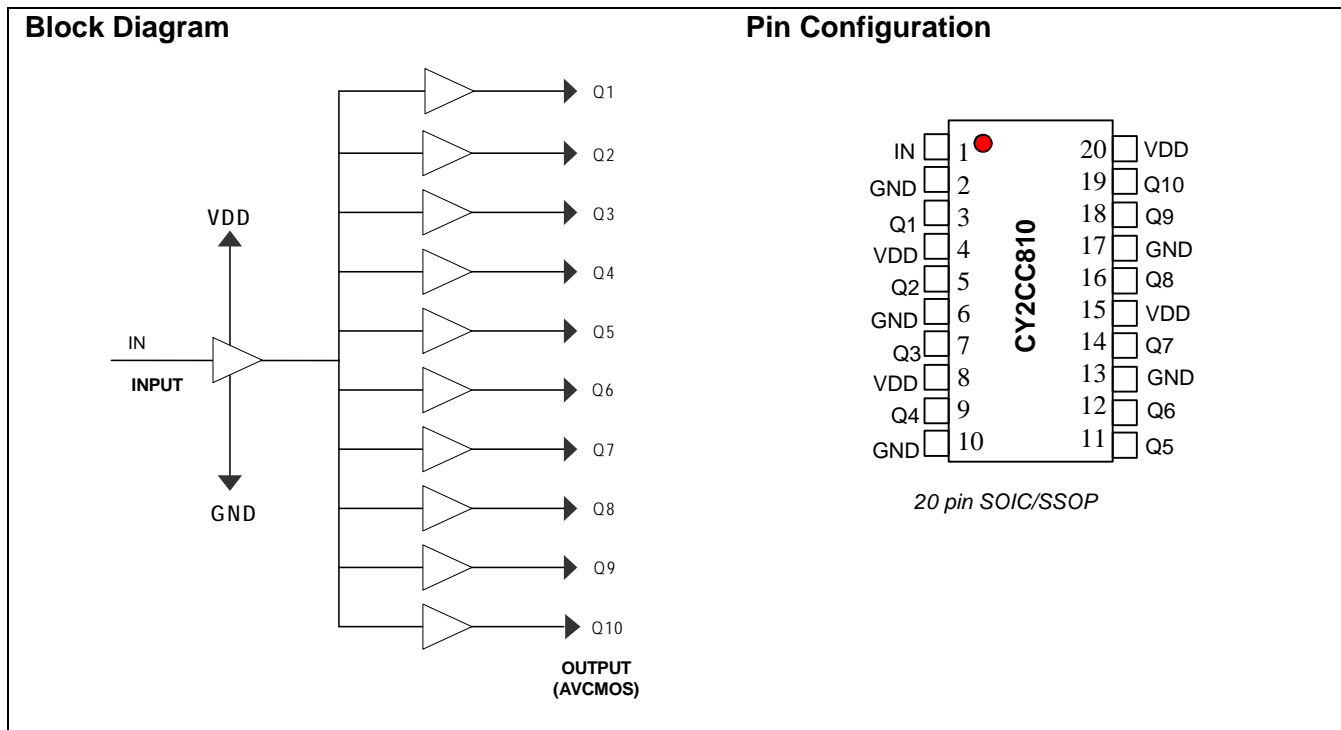
- Low-voltage operation
- $V_{DD}$  range from 2.5V to 3.3V
- 1:10 fanout
- Over voltage tolerant input hot swappable
- Drives either a 50-Ohm or 75-Ohm transmission line
- Low-input capacitance
- 250 ps typical output-to-output skew
- 19 ps typical DJ jitter
- Typical propagation delay < 3.5 ns
- High-speed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

AVCMOS-type outputs dynamically adjust for variable impedance matching and reduce noise overall.



## Pin Description

Pin Number	Pin Name	Description	
1	IN	Input	LVC MOS
2, 6, 10, 13, 17	GND	Ground	Power
4, 8, 15, 20	$V_{DD}$	Power Supply	Power
3, 5, 7, 9, 11, 12, 14, 16, 18, 19	Q1... Q10	Output	AVCMOS

**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 @ 3.3V (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> = 2.7V			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	V <sub>DD</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>		80		mV

**DC Electrical Characteristics @ 2.5V (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> = 2.4V			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

**Capacitance**

Parameter	Description	Test Conditions	Min.	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

**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.

**Power Supply Characteristics** (see Figure 5)

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Unit
$\Delta I_{CC}$	Delta $I_{CC}$ Quiescent Power Supply Current	$(I_{DD} @ V_{DD} = \text{Max. and } V_{IN} = V_{DD}) - (I_{DD} @ V_{DD} = \text{Max. and } V_{IN} = V_{DD} - 0.6V)$			50	$\mu\text{A}$
$I_{CCD}$	Dynamic Power Supply Current	$V_{DD} = \text{Max.}$ Input toggling 50% Duty Cycle, Outputs Open			0.63	mA/MHz
$I_C$	Total Power Supply Current	$V_{DD} = \text{Max.}$ Input toggling 50% Duty Cycle, Outputs Open $f_L = 40 \text{ MHz}$			25	mA
$t_{PU}$	Power-up time for all $V_{DDs}$	Power-up to reach minimum specified voltage (power ramp must be monotonic)	0.05		500	ms

**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	2.5V		23	35	ps
			3.3V		19	30	ps
$F_{\text{max}(3.3V)}$	Maximum frequency $V_{DD} = 3.3V$	50% duty cycle $t_W(50-50)$ Standard Load Circuit.	See Figure 5			160	MHz
		50% duty cycle $t_W(50-50)$ The "point to point load circuit"	See Figure 7			650	
$F_{\text{max}(2.5V)}$	Maximum frequency $V_{DD} = 2.5V$	The "point to point load circuit" $V_{IN} = 2.4V/0.0V$ $V_{OUT} = 1.7V/0.7V$	See Figure 7			200	MHz
$F_{\text{max}(20)}$	Maximum frequency $V_{DD} = 3.3V$	20% duty cycle $t_W(20-80)$ The "point to point load circuit" $V_{IN} = 3.0V/0.0V$ $V_{OUT} = 2.3V/0.4V$	See Figure 7			250	MHz
	Maximum frequency $V_{DD} = 2.5V$	The "point to point load circuit" $V_{IN} = 2.4V/0.0V$ $V_{OUT} = 1.7V/0.7V$	See Figure 3			200	MHz
$t_W$	Minimum pulse $V_{DD} = 3.3V$	The "point to point load circuit" $V_{IN} = 3.0V/0.0V$ $F = 100 \text{ MHz}$ $V_{OUT} = 2.0V/0.8V$	See Figure 7	1			ns
	Minimum pulse $V_{DD} = 2.5V$	The "point to point load circuit" $V_{IN} = 2.4V/0.0V$ $F = 100 \text{ MHz}$ $V_{OUT} = 1.7V/0.7V$	See Figure 3	1			

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

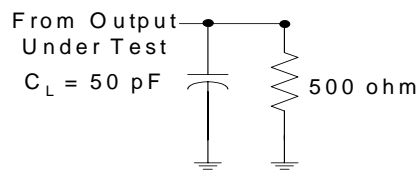
Parameter	Description	Min.	Typ.	Max.	Unit
$t_{PLH}$	Propagation Delay – Low to High	1.5	2.7	3.5	ns
$t_{PHL}$	Propagation Delay – High to Low				
$t_R$	Output Rise Time		0.8		V/ns
$t_F$	Output Fall Time		0.8		V/ns
$t_{SK(0)}$	Output Skew: Skew between outputs of the same package (in phase)	See Figure 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 @ 2.5V,  $V_{DD} = 2.5V \pm 5\%$ , Temperature =  $-40^{\circ}C$  to  $+85^{\circ}C$**

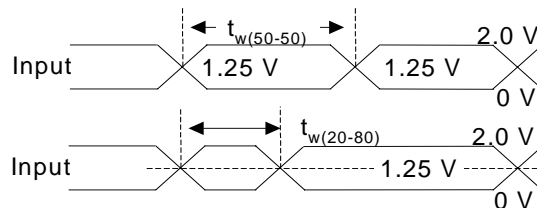
Parameter	Description	Min.	Typ.	Max.	Unit	
$t_{PLH}$	Propagation Delay – Low to High	See Figure 4	1.5	2.0	3.5	ns
$t_{PHL}$	Propagation Delay – High to Low		1.5	2.0	3.5	ns
$t_R$	Output Rise Time		0.8		V/ns	
$t_F$	Output Fall Time		0.8		V/ns	
$t_{SK(0)}$	Output Skew: Skew between outputs of the same package (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:  $V_{DD}$  @ 2.5V**

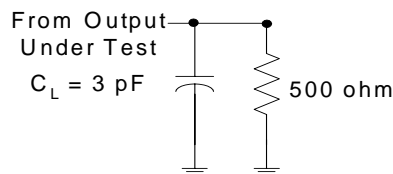
**Figure 1. Load Circuit [3,4,5]**



**Figure 2. Voltage Waveforms Pulse Duration [6]**



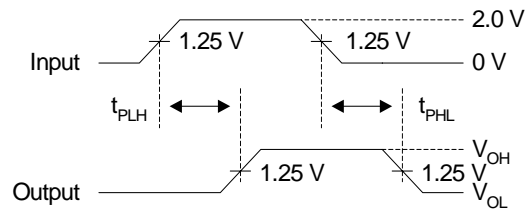
**Figure 3. Point to Point Load Circuit [3,4,5]**



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



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

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

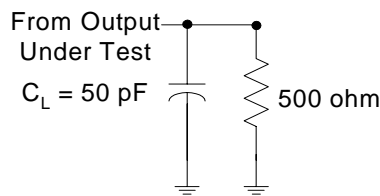


Figure 6. Voltage Waveforms—Pulse Duration<sup>[6]</sup>

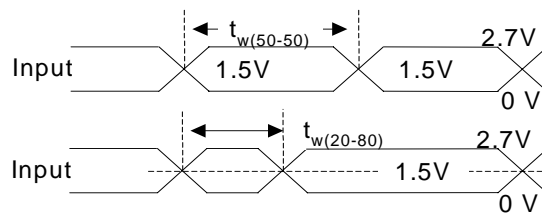


Figure 7. Point to Point Load Circuit<sup>[3,4,5]</sup>

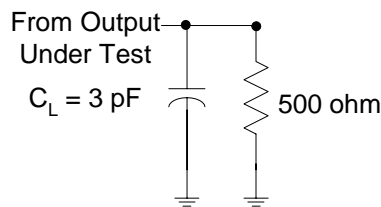


Figure 8. Voltage Waveforms Propagation Delay Times<sup>[4]</sup>

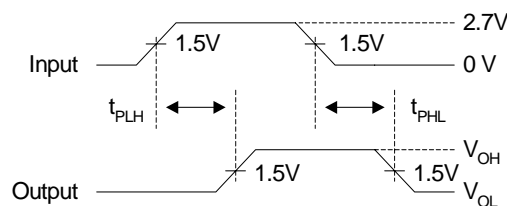


Figure 9. Pulse Skew— $tsk_{(p)}$

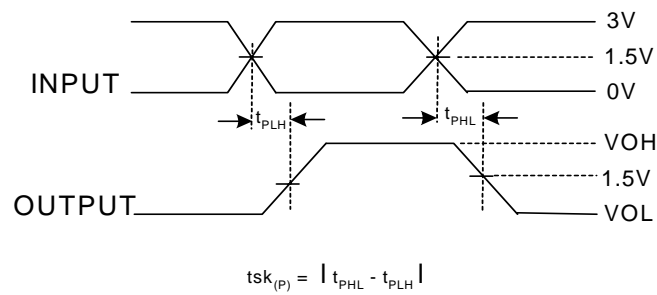


Figure 10. Output Skew— $tsk_{(o)}$

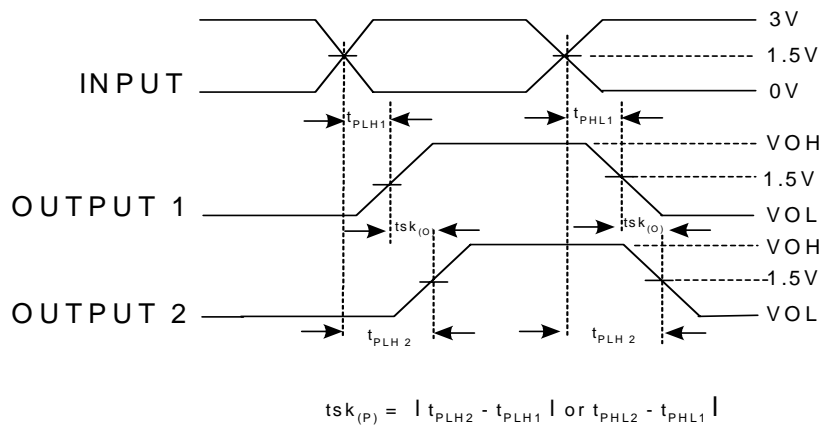
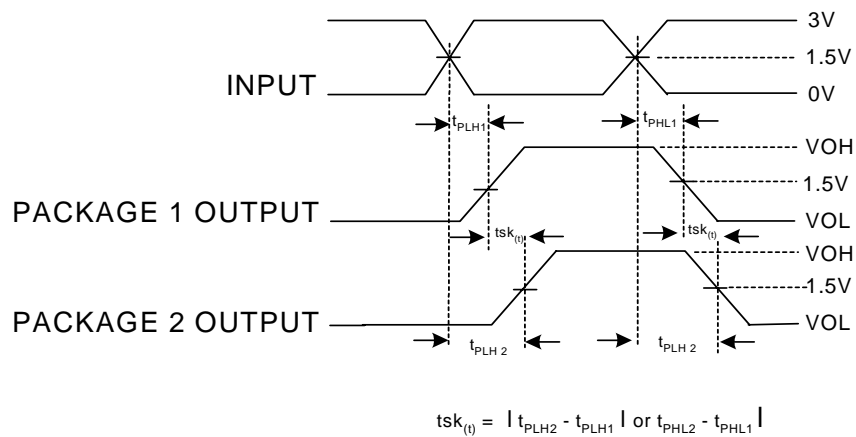


Figure 11. Package Skew— $tsk_{(t)}$



Ordering Information

Part Number	Package Type	Product Flow
CY2CC810OI	20-pin SSOP	Industrial, -40°C to 85°C
CY2CC810OIT	20-pin SSOP-Tape and Reel	Industrial, -40°C to 85°C
CY2CC810OC	20-pin SSOP	Commercial, 0°C to 70°C
CY2CC810OCT	20-pin SSOP-Tape and Reel	Commercial, 0°C to 70°C
<b>Lead-free</b>		
CY2CC810OXC	20-pin SSOP	Commercial, 0°C to 70°C
CY2CC810OXT	20-pin SSOP-Tape and Reel	Commercial, 0°C to 70°C
CY2CC810OXI	20-pin SSOP	Industrial, -40°C to 85°C
CY2CC810OXIT	20-pin SSOP-Tape and Reel	Industrial, -40°C to 85°C

Package Drawing and Dimensions

Figure 12. 20-Lead (300-Mil) SOIC S20.3/SZ20.3

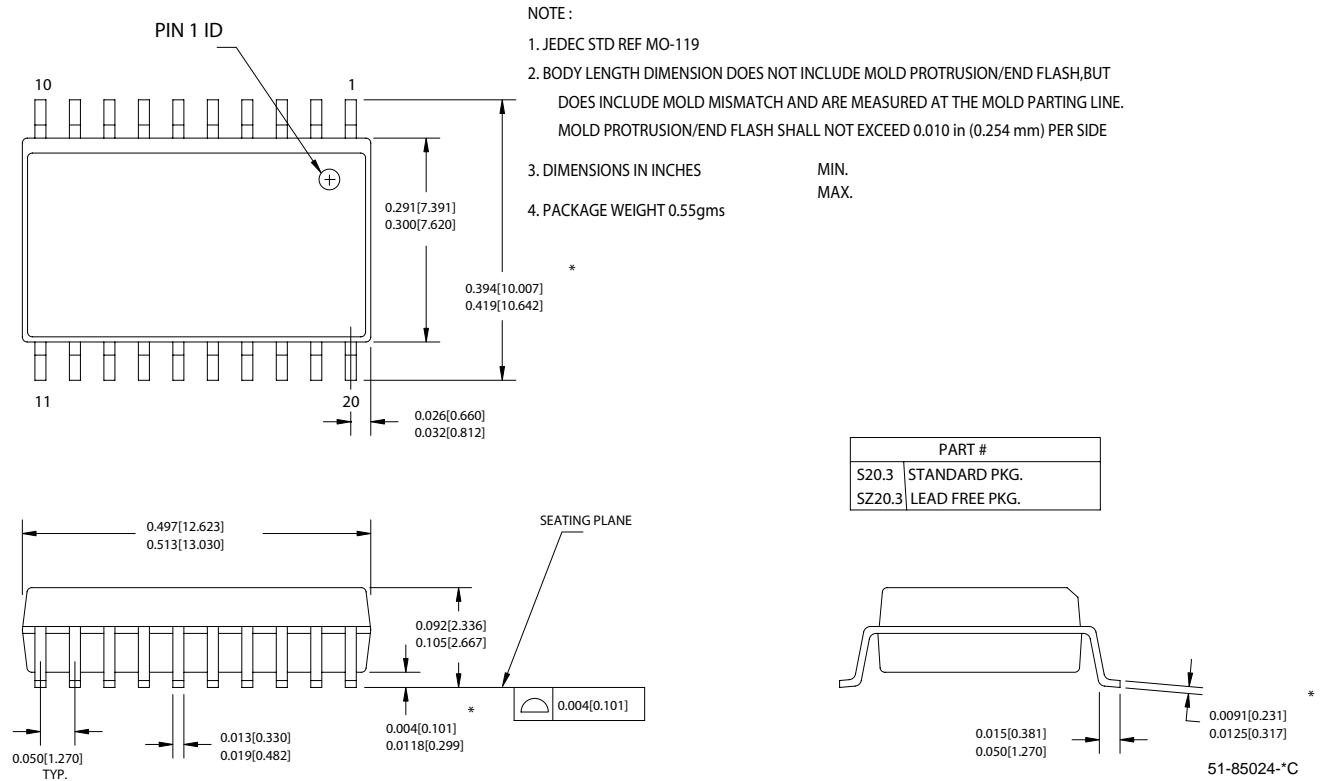
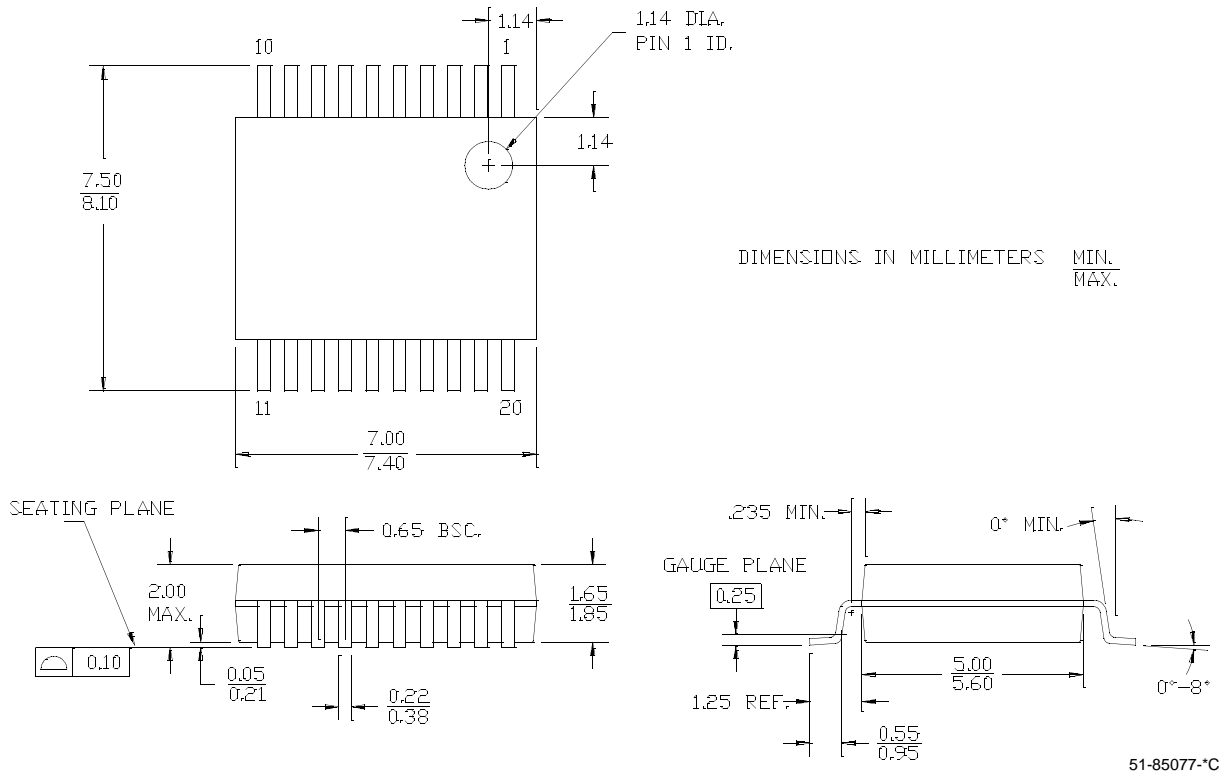


Figure 13. 20-lead (5.3-mm) Shrunk Small Outline Package O20



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**Document History Page**

Document Title: CY2CC810 1:10 Clock Fanout Buffer Document #: 38-07056				
REV.	ECN NO.	Issue 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 @3.3V table. Changed the Max. value of $V_{IH}$ from 1.8 to 5.0 in the DC Electrical Characteristics @2.5V table.
*C	122743	12/14/02	RBI	Added power up requirements to maximum ratings information.
*D	387761	See ECN	RGL	Added typical values Updated jitter and skew specs. Removed devices with SOIC package Added Lead-free SSOP package
*E	499991	See ECN	RGL	Added tpu parameter in the Power Supply Characteristics table