



# Spread Aware™, Zero Delay Buffer

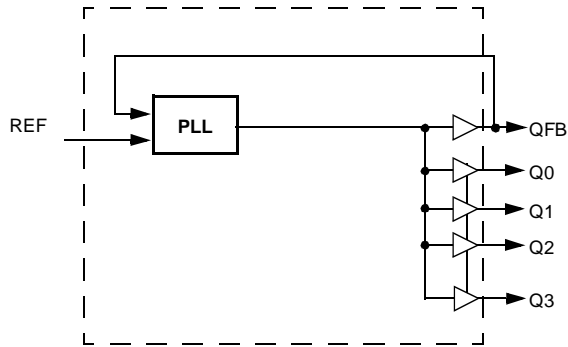
## Features

- Spread Aware™—designed to work with SSFTG reference signals
- Outputs may be three-stated
- Available in 8-pin SOIC package
- Extra strength output drive available (-15 version)
- Internal feedback maximized the number of outputs available in 8-pin package

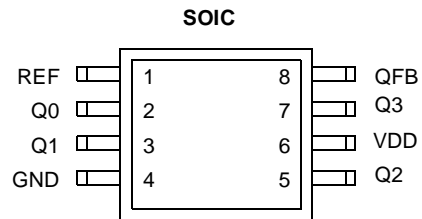
## Key Specifications

Operating Voltage: ..... 3.3V±10%  
 Operating Range: .....  $10 < f_{OUT} < 133$  MHz  
 Cycle-to-Cycle Jitter: ..... 200 ps  
 Output-to-Output Skew: ..... 250 ps  
 Device-to-Device Skew:..... 700 ps  
 Propagation Delay:..... 350 ps

### Block Diagram



### Pin Configuration



Spread Aware is a trademark of Cypress Semiconductor Corporation.

## Pin Definitions

Pin Name	Pin No.	Pin Type	Pin Description
REF	1	I	<b>Reference Input:</b> The output signals Q0:3 will be synchronized to this signal unless the device is programmed to bypass the PLL.
Q0:3	2, 3, 5, 7	O	<b>Outputs:</b> These signals will be synchronous and of equal frequency to the signal input at pin 1.
QFB	8	O	<b>Feedback Output:</b> This output signal does not vary from signals Q0:3 in function, but is noted as the signal used to establish the propagation delay of nearly 0.
VDD	6	P	<b>Power Connections:</b> Connect to 3.3V. Use ferrite beads to help reduce noise for optimal jitter performance.
GND	4	P	<b>Ground Connections:</b> Connect all grounds to the common system ground plane.

## Overview

The W163 products are five-output zero delay buffers. A Phase-Locked Loop (PLL) is used to take a time-varying signal and provide five copies of that same signal out. The internal feedback to the PLL provides outputs in phase with the reference inputs.

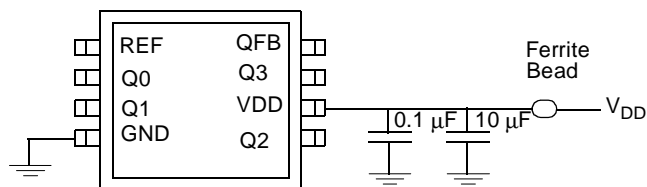
the result is a significant amount of tracking skew which may cause problems in systems requiring synchronization.

For more details on Spread Spectrum timing technology, please see the Cypress Application note titled, "EMI Suppression Techniques with Spread Spectrum Frequency Timing Generator (SSFTG) ICs."

## Spread Aware

Many systems being designed now utilize a technology called Spread Spectrum Frequency Timing Generation. Cypress has been one of the pioneers of SSFTG development, and we designed this product so as not to filter off the Spread Spectrum feature of the Reference input, assuming it exists. When a zero delay buffer is not designed to pass the SS feature through,

## Schematic



## Absolute Maximum Ratings

Stresses greater than those listed in this table may cause permanent damage to the device. These represent a stress rating only. Operation of the device at these or any other conditions

above those specified in the operating sections of this specification is not implied. Maximum conditions for extended periods may affect reliability.

Parameter	Description	Rating	Unit
$V_{DD}, V_{IN}$	Voltage on any pin with respect to GND	-0.5 to +7.0	V
$T_{STG}$	Storage Temperature	-65 to +150	°C
$T_A$	Operating Temperature	0 to +70	°C
$T_B$	Ambient Temperature under Bias	-55 to +125	°C
$P_D$	Power Dissipation	0.5	W

## DC Electrical Characteristics: $T_A = 0^\circ\text{C}$ to $70^\circ\text{C}$ , $V_{DD} = 3.3\text{V} \pm 10\%$

Parameter	Description	Test Condition	Min	Typ	Max	Unit
$I_{DD}$	Supply Current	Unloaded, 100 MHz			40	mA
$V_{IL}$	Input Low Voltage				0.8	V
$V_{IH}$	Input High Voltage		2.0			V
$V_{OL}$	Output Low Voltage	$I_{OL} = 12\text{ mA} (-15)$ $I_{OL} = 8\text{ mA} (-5)$			0.4	V
$V_{OH}$	Output High Voltage	$I_{OL} = 12\text{ mA} (-15)$ $I_{OL} = 8\text{ mA} (-5)$	2.4			V
$I_{IL}$	Input Low Current	$V_{IN} = 0\text{V}$			50	$\mu\text{A}$
$I_{IH}$	Input High Current	$V_{IN} = V_{DD}$			100	$\mu\text{A}$

## AC Electrical Characteristics: $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ , $V_{DD} = 3.3\text{V} \pm 10\%$

Parameter	Description	Test Condition	Min	Typ	Max	Unit
$f_{IN}$	Input Frequency		10		133	MHz
$f_{OUT}$	Output Frequency	15-pF load <sup>[5]</sup>	10		133	MHz
$t_R$	Output Rise Time (-05) <sup>[1]</sup>	2.0 to 0.8V, 15-pF load			2.5	ns
	Output Rise Time (-15) <sup>[1]</sup>	2.0 to 0.8V, 20-pF load			1.5	ns
$t_F$	Output Fall Time (-05) <sup>[1]</sup>	2.0 to 0.8V, 15-pF load			2.5	ns
	Output Rise Time (-15) <sup>[1]</sup>	2.0 to 0.8V, 20-pF load			1.5	ns
$t_{CLKR}$	Input Clock Rise Time <sup>[1]</sup>				?	ns
$t_{CLKF}$	Input Clock Fall Time <sup>[1]</sup>				?	ns
$t_{PD}$	FBIN to REF Skew <sup>[2, 3]</sup>	Measured at $V_{DD}/2$	-350	0	350	ps
$t_{SK}$	Output to Output Skew	All outputs loaded equally	-250	0	250	ps
$t_{SKDD}$	Device to Device Skew	Measured at FBIN pins, $V_{DD}/2$	-700	0	700	ps
$t_D$	Duty Cycle	15-pF load <sup>[4]</sup>	45	50	55	%
$t_{LOCK}$	PLL Lock Time	Power supply stable and			1.0	ms
$t_{JC}$	Jitter, Cycle-to-Cycle				200	ps

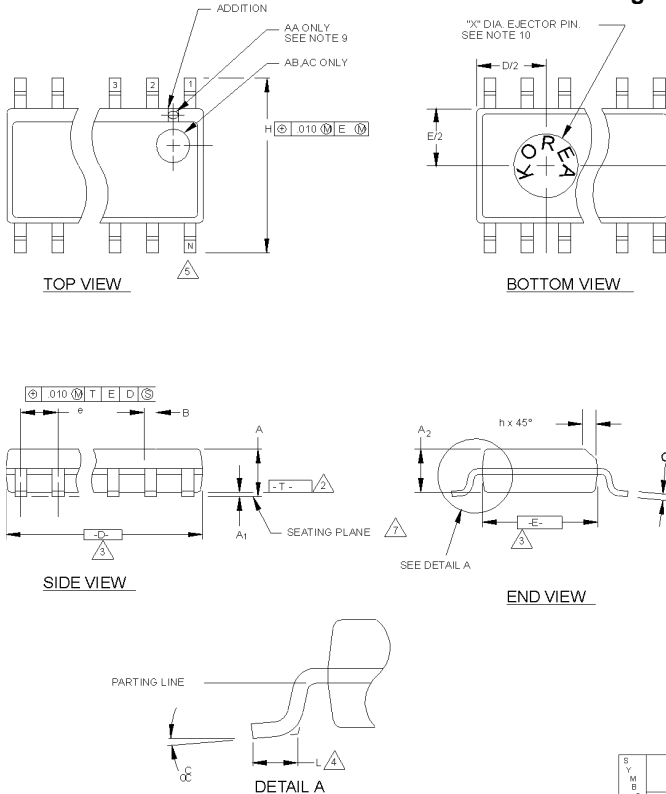
### Notes:

1. Longer input rise and fall time will degrade skew and jitter performance.
2. All AC specifications are measured with a  $50\Omega$  transmission line, load terminated with  $50\Omega$  to 1.4V.
3. Skew is measured at 1.4V on rising edges.
4. Duty cycle is measured at 1.4V.
5. For the higher drive -15, the load is 20 pF.

**Ordering Information**

Ordering Code	Option	Package Name	Package Type
W163	-05, -15	G	8-pin Plastic SOIC (150-mil)

Document #: 38-00787-\*A

**Package Diagram**
**8-Pin Small Outline Integrated Circuit (SOIC, 150-mil)**


THIS TABLE IN INCHES

SYMBOL	COMMON DIMENSIONS			NOTE VARIATIONS	3 D			5 N
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.	
A	.061	.064	.068	AA	.189	.194	.196	8
A <sub>1</sub>	.004	.006	.0098	AB	.337	.342	.344	14
A <sub>2</sub>	.055	.058	.061	AC	.386	.391	.393	16
B	.0138	.016	.0192					
C	.0075	.008	.0098					
D	SEE VARIATIONS			3				
E	.150	.155	.157					
e	.050 BSC							
H	.230	.236	.244					
h	.010	.013	.016					
L	.016	.025	.035					
N	SEE VARIATIONS			5				
α	0°	5°	8°					
X	.085	.093	.100					

THIS TABLE IN MILLIMETERS

SYMBOL	COMMON DIMENSIONS			NOTE VARIATIONS	3 D			5 N
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.	
A	1.55	1.63	1.73	AA	4.80	4.93	4.98	8
A <sub>1</sub>	0.127	0.15	0.25	AB	8.58	8.69	8.74	14
A <sub>2</sub>	1.40	1.47	1.55	AC	9.80	9.93	9.98	16
B	0.35	0.41	0.49					
C	0.19	0.20	0.25					
D	SEE VARIATIONS			3				
E	3.81	3.94	3.99					
e	1.27 BSC							
H	5.84	5.99	6.20					
h	0.25	0.33	0.41					
L	0.41	0.64	0.89					
N	SEE VARIATIONS			5				
α	0°	5°	8°					
X	2.16	2.36	2.54					