



**W83176R-400**

**W83176G-400**

Winbond Current Mode  
Differential Buffer  
for PCI Express and SATA

Date: May/16/2006      Revision: 0.6

# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### W83176R-400/W83176G-400 Datasheet Revision History

	PAGES	DATES	VERSION	WEB VERSION	MAIN CONTENTS
1	n.a.	05/11/04	0.5	n.a.	First publish
2	7	05/16/06	0.6	n.a.	Add lead free part
3					
4					
5					
6					
7					
8					
9					
10					

# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### **Table of Content-**

1.	GENERAL DESCRIPTION .....	1
2.	PRODUCT FEATURES .....	1
3.	PIN CONFIGURATION .....	1
4.	BLOCK DIAGRAM .....	2
5.	PIN DESCRIPTION.....	3
	5.1 Clock Outputs .....	3
	5.2 Power Pins.....	3
6.	I <sup>2</sup> C CONTROL AND STATUS REGISTERS .....	4
	6.1 Register 0: Control Register (Default: 07h) .....	4
	6.2 Register 1: Control Register (Default: FFh) .....	4
	6.3 Register 2: Control Register (Default: 00h) .....	4
	6.4 Register 3: Reserved Register (Default: 00h) .....	5
	6.5 Register 4: Winbond Chip ID – Project Code Register (Default: 11h).....	5
	6.6 Register 5: Test Register (Default: 00h) .....	5
7.	ACCESS INTERFACE .....	6
	7.1 Block Write protocol.....	6
	7.2 Block Read protocol .....	6
	7.3 Byte Write protocol .....	6
	7.4 Byte Read protocol.....	6
8.	ORDERING INFORMATION.....	7
9.	HOW TO READ THE TOP MARKING .....	7
10.	PACKAGE DRAWING AND DIMENSIONS.....	8

# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 1. GENERAL DESCRIPTION

The W83176R-400 supports four current mode differential Clock pair's buffer output companion devices to CK409 or CK410 clock generator.

The W83176R-400 provides I<sup>2</sup>C serial bus interface to program the registers to enable or disable each clock outputs. The W83176R-400 accepts a reference clock as its input current mode differential pair's clock.

### 2. PRODUCT FEATURES

- Four current mode differential clock pairs clock outputs
- Support zero delay buffer mode and normal buffer mode
- Supports two hardware output enable/disable pin
- Programmable PLL bandwidth
- Low Skew outputs (< 50ps)
- Low cycle to cycle jitter (<100ps)
- I<sup>2</sup>C 2-Wire serial interface and supports Byte or Block Data R/W
- 28-pin SSOP package

### 3. PIN CONFIGURATION

VDD	1	●	28	VDDA
SRCT_IN	2		27	GND
SRC_C_IN	3		26	IR EF
GND	4		25	GND
VDD	5		24	VDD
DIFT1	6		23	DFIT6
DIFC1	7		22	DIFC6
OE_1*	8		21	OE_6*
DIFT2	9		20	DIFT5
DIFC2	10		19	DIFC5
VDD	11		18	VDD
PLL/NORMAL#	12		17	HIGH_BW#
SCLK*	13		16	SRC_STOP#
SDATA*	14		15	PD#

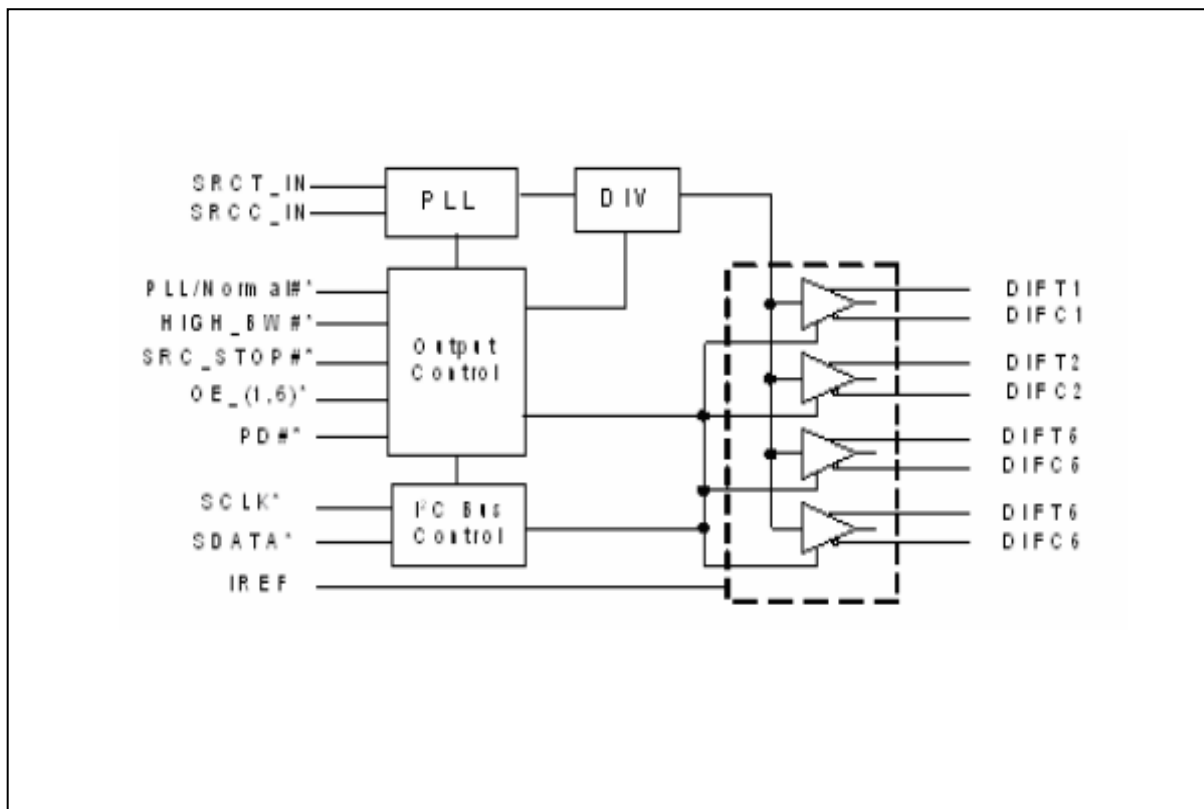
\*: Internal pull-up resistor  
120K to VDD

# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 4. BLOCK DIAGRAM



# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 5. PIN DESCRIPTION

BUFFER TYPE SYMBOL	DESCRIPTION
IN	Input
OUT	Output
IN <sub>tp120k</sub>	Latched input at power up, internal 120kΩ pull up.
*	Internal 120kΩ pull-up
#	Low Active

#### 5.1 Clock Outputs

PIN	PIN NAME	TYPE	DESCRIPTION
2,3	SRCT_IN SRCC_IN	IN	SRC Differential clock input
6,9,20,23,	DIFT (1,2,5,6)	OUT	True Clocks of differential pair outputs
7,10,19,22	DIFC (1,2,5,6)	OUT	Complement Clocks of differential pair outputs
8,21	OE (1,6)*	IN	DIFT/C (1, 6) output control, 0=Tri-state, 1=Enable output, This is internal 120K pull up.
13	SCLK *	IN	Serial clock of I <sup>2</sup> C 2-wire control interface Internal pull-up resistor 120K to VDD
14	SDATA *	I/O	Serial data of I <sup>2</sup> C 2-wire control interface Internal pull-up resistor 120K to VDD
15	PD#*	IN	Active low to power down the device into low power state is stopped VCO and all output buffers, This is internal 120K pull up.
16	SRC_STOP#*	IN	Active low to stop differential output buffers, This is internal 120K pull up.
17	HIGH_BW#*	IN <sub>tp120k</sub>	Latched input at power up to selecting PLL Band Width 0=HIGH, 1=LOW, This is internal 120K pull up.
26	IREF	OUT	Deciding the reference current for the Differential clock pairs. The pin was connected to the precision resistor tied to ground to decide the appropriate current; 475 ohm is the standard value for 0.7V differential clock output.

#### 5.2 Power Pins

PIN	PIN NAME	DESCRIPTION
4,25,27	GND	Ground
1,5,11,18,24	VDD	Power Supply 3.3V
28	VDDA	Analog power supply, 3.3V



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

6. I<sup>2</sup>C CONTROL AND STATUS REGISTERS

## 6.1 Register 0: Control Register (Default: 07h)

BIT	NAME	PWD	DESCRIPTION
7	PD_DM	0	PD# Drive mode, 0:driven, 1:Hi-Z
6	SRC_ST_DM	0	SRC_STOP Drive mode, 0:driven, 1:Hi-Z
5	SEL_SRCDIV	0	0:control by pin, 1:control by I2C
4	SEL_NORMAL	0	0:control by pin, 1:control by I2C
3	SEL_PLLBW	0	0:control by pin, 1:control by I2C
2	PLL_BW_ADJ	1	0:High BW, 1:Low BW
1	NORMAL#/PLL	1	0:Normal buffer, 1:PLL mode
0	SRC_DIV#	1	0:Divided by 2 mode, 1:Normal (output=input)

## 6.2 Register 1: Control Register (Default: FFh)

BIT	NAME	PWD	DESCRIPTION
7	Reserved	1	Reserved
6	DIF6_EN	1	0:Disabled (Hi-Z), 1:Enable
5	DIF5_EN	1	0:Disabled (Hi-Z), 1:Enable
4	Reserved	1	Reserved
3	Reserved	1	Reserved
2	DIF2_EN	1	0:Disabled (Hi-Z), 1:Enable
1	DIF1_EN	1	0:Disabled (Hi-Z), 1:Enable
0	Reserved	1	Reserved

## 6.3 Register 2: Control Register (Default: 00h)

BIT	NAME	PWD	DESCRIPTION
7	Reserved	0	Reserved
6	DIF6STOP_EN	0	0:Free-run, 1:Stoppable
5	DIF5STOP_EN	0	0:Free-run, 1:Stoppable
4	Reserved	0	Reserved
3	Reserved	0	Reserved
2	DIF2STOP_EN	0	0:Free-run, 1:Stoppable
1	DIF1STOP_EN	0	0:Free-run, 1:Stoppable
0	Reserved	0	Reserved

# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 6.4 Register 3: Reserved Register (Default: 00h)

BIT	NAME	PWD	DESCRIPTION
7	Reserved	0	Reserved
6	Reserved	0	Reserved
5	Reserved	0	Reserved
4	Reserved	0	Reserved
3	Reserved	0	Reserved
2	Reserved	0	Reserved
1	Reserved	0	Reserved
0	Reserved	0	Reserved

### 6.5 Register 4: Winbond Chip ID – Project Code Register (Default: 11h)

BIT	NAME	PWD	DESCRIPTION
7	CHPI_ID [7]	0	Winbond Chip ID. W83176R-400 (SA5911).
6	CHPI_ID [6]	0	Winbond Chip ID.
5	CHPI_ID [5]	0	Winbond Chip ID.
4	CHPI_ID [4]	1	Winbond Chip ID.
3	CHPI_ID [3]	0	Winbond Chip ID.
2	CHPI_ID [2]	0	Winbond Chip ID.
1	CHPI_ID [1]	0	Winbond Chip ID.
0	CHPI_ID [0]	1	Winbond Chip ID.

### 6.6 Register 5: Test Register (Default: 00h)

BIT	NAME	PWD	DESCRIPTION
7	TEST1	0	Reserved
6	TEST0	0	Reserved
5	Reserved	0	Reserved
4	Reserved	0	Reserved
3	Reserved	0	Reserved
2	Reserved	0	Reserved
1	Reserved	0	Reserved
0	Reserved	0	Reserved



# W83176R-400/W83176G-400

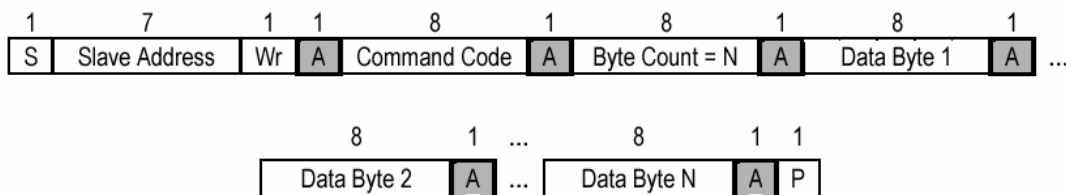


## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 7. ACCESS INTERFACE

The W83176R-400 provides I<sup>2</sup>C Serial Bus for microprocessor to read/write internal registers. In the W83176R-400 is provided Block Read/Block Write and Byte-Data Read/Write protocol. **The I<sup>2</sup>C write address is defined at 0xDC. The I<sup>2</sup>C read address is defined at 0xDD.**

#### 7.1 Block Write protocol

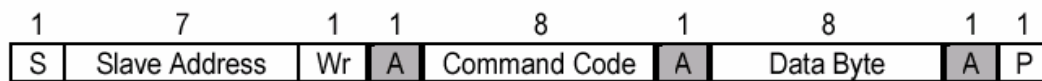


#### 7.2 Block Read protocol

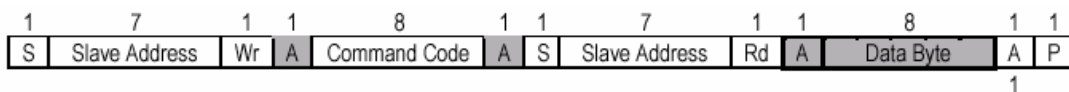


## In block mode, the command code must filled '00h'

#### 7.3 Byte Write protocol



#### 7.4 Byte Read protocol



## In Byte Mode, the index No= (Register No) + 1

# W83176R-400/W83176G-400

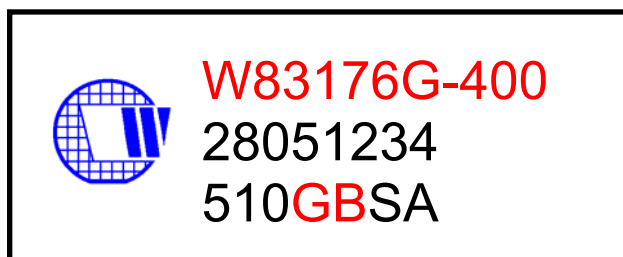
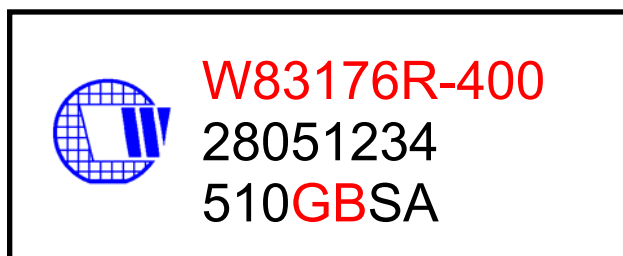


## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 8. ORDERING INFORMATION

PART NUMBER	PACKAGE TYPE	PRODUCTION FLOW
W83176R_400	28 PIN SSOP	Commercial, 0°C to +70°C
W83176G-400	28 PIN SSOP (Lead free package)	Commercial, 0°C to +70°C

### 9. HOW TO READ THE TOP MARKING



1st line: Winbond logo and the type number:

Normal part: W83176R-400, Lead free part: W83176G-400

2nd line: Tracking code 2 8051234

2: wafers manufactured in Winbond FAB 2

**8051234**: wafer production series lot number

3rd line: Tracking code 418 G B SA

510: packages made in '2005, week 10

G: assembly house ID; O means OSE, G means GR

B: IC revision

SA: Winbond Internal use

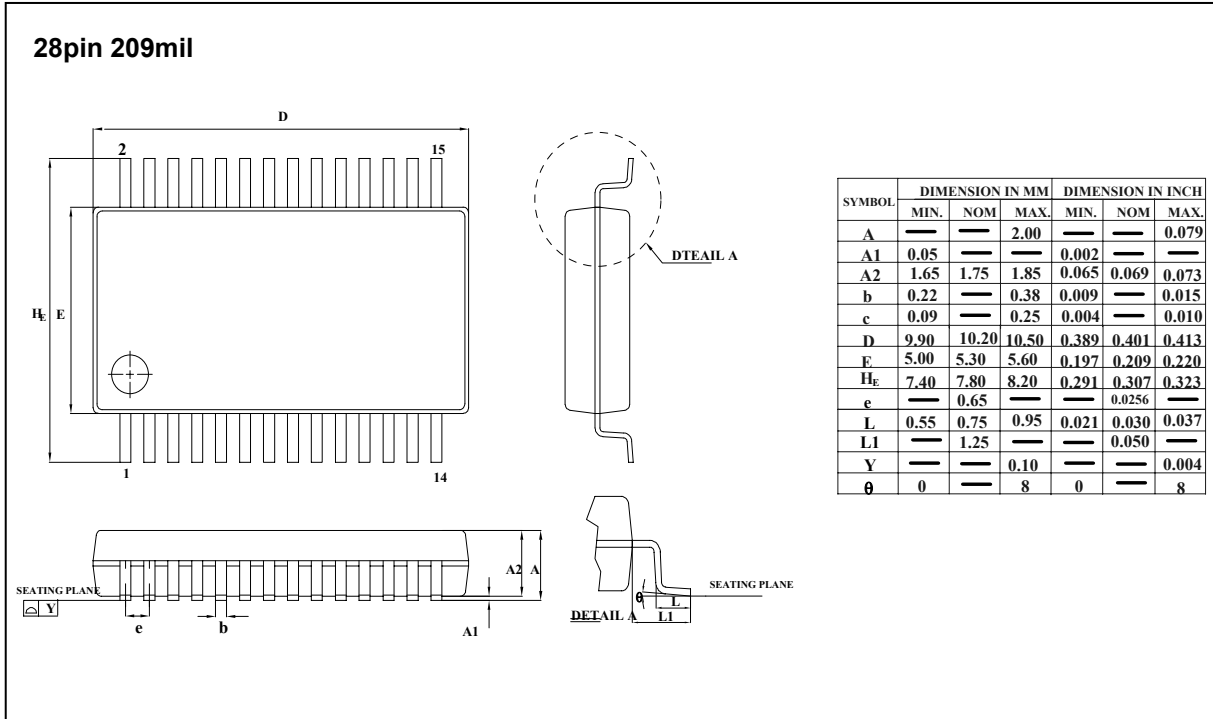
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.

# W83176R-400/W83176G-400



## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### 10. PACKAGE DRAWING AND DIMENSIONS



# W83176R-400/W83176G-400



---

## CURRENT MODE DIFFERENTIAL BUFFER FOR PCI EXPRESS AND SATA

### Important Notice

Winbond products are not designed, intended, authorized or warranted for use as components in systems or equipment intended for surgical implantation, atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, or for other applications intended to support or sustain life. Further more, Winbond products are not intended for applications wherein failure of Winbond products could result or lead to a situation wherein personal injury, death or severe property or environmental damage could occur.

Winbond customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Winbond for any damages resulting from such improper use or sales.



#### Headquarters

No. 4, Creation Rd. III,  
Science-Based Industrial Park,  
Hsinchu, Taiwan  
TEL: 886-3-5770066  
FAX: 886-3-5665577  
<http://www.winbond.com.tw/>

#### Taipei Office

9F, No.480, Rueiguang Rd.,  
Neihu District, Taipei, 114,  
Taiwan, R.O.C.  
TEL: 886-2-8177-7168  
FAX: 886-2-8751-3579

#### Winbond Electronics Corporation America

2727 North First Street, San Jose,  
CA 95134, U.S.A.  
TEL: 1-408-9436666  
FAX: 1-408-5441798

#### Winbond Electronics Corporation Japan

7F Daini-ueno BLDG, 3-7-18  
Shinyokohama Kohoku-ku,  
Yokohama, 222-0033  
TEL: 81-45-4781881  
FAX: 81-45-4781800

#### Winbond Electronics (Shanghai) Ltd.

27F, 2299 Yan An W. Rd. Shanghai,  
200336 China  
TEL: 86-21-62365999  
FAX: 86-21-62365998

#### Winbond Electronics (H.K.) Ltd.

Unit 9-15, 22F, Millennium City,  
No. 378 Kwun Tong Rd.,  
Kowloon, Hong Kong  
TEL: 852-27513100  
FAX: 852-27552064

---

*Please note that all data and specifications are subject to change without notice.  
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*