



# 166MHZ CLOCK FOR SIS CHIPSET

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## 1. GENERAL DESCRIPTION

The W83194BR-730 is a Clock Synthesizer which provides all clocks required for high-speed RISC or CISC microprocessor such as AMD K7. W83194BR-730 provides 64 CPU/PCI frequencies which are selectable with smooth transitions by hardware or software. W83194BR-730 also provides 13 SDRAM clocks.

The W83194BR-730 provides step-less frequency programming by controlling the VCO freq. and the programmable PCI clock output divisor ratio. A watch dog timer is quipped and when time out, the RESET# pin will output 4ms pulse signal.

The W83194BR-730 accepts a 14.318 MHz reference crystal as its input. Spread spectrum built in at 0~-0.5% or  $\pm 0.25\%$  to reduce EMI. Programmable stopping individual clock outputs and frequency selection through I<sup>2</sup>C interface. The device meets the Pentium power-up stabilization, which requires CPU and PCI clocks be stable within 2 ms after power-up. Using dual function pin for the slots(ISA, PCI, CPU, DIMM) is not recommend.

## 2. PRODUCT FEATURES

- Supports AMD CPU with I<sup>2</sup>C.
- 3 CPU clocks (one free-running CPU clock)
- 13 SDRAM clocks for 3 DIMMs
- 6 PCI synchronous clocks
- 2 AGP clocks
- 2 REF clocks as 14.318MHz outputs
- < 250ps skew among CPU and SDRAM clocks
- < 250ps skew among PCI clocks
- Skew from CPU(earlier) to PCI clock 1 to 4ns, center 2.6ns.
- Smooth frequency switch with selections from 66 MHz to 200 MHz CPU
- Stepless frequency programming by controlling the VCO freq. and the clock output divisor ratio
- Programmable skew for CPU to SDRAM and CPU to AGP clock outputs
- I<sup>2</sup>C 2-Wire serial interface and I<sup>2</sup>C read back
- $\pm 0.25\%$  or 0~-0.5% spread spectrum function to reduce EMI
- Programmable registers to enable/stop each output and select modes
- MODE pin for power Management and RESET# out when system hang
- One 48 MHz for USB & one 24\_48 MHz for super I/O
- 48-pin SSOP package

## 3. PIN CONFIGURATION

|                    |    |   |    |                     |
|--------------------|----|---|----|---------------------|
| VddR               | 1  | ● | 48 | VddLCPU             |
| REF1^/ &AGPSEL     | 2  |   | 47 | CPUC0\$             |
| REF0^/ &FS3        | 3  |   | 46 | CPU0\$              |
| Vss                | 4  |   | 45 | CPUCS_C1\$          |
| Xin                | 5  |   | 44 | Vss                 |
| Xout               | 6  |   | 43 | VddSD               |
| VddP               | 7  |   | 42 | SDRAM 0             |
| PCICLK0^/ &FS1     | 8  |   | 41 | SDRAM 1             |
| PCICLK1^/ &FS2     | 9  |   | 40 | SDRAM 2             |
| PCICLK2^           | 10 |   | 39 | Vss                 |
| PCICLK3^           | 11 |   | 38 | SDRAM 3             |
| PCICLK4^           | 12 |   | 37 | SDRAM 4             |
| PCICLK5/RESET\$    | 13 |   | 36 | SDRAM 5             |
| Vss                | 14 |   | 35 | VddSD               |
| VddAGP             | 15 |   | 34 | SDRAM 6             |
| AGPCLK0/SEL24#_48* | 16 |   | 33 | SDRAM 7             |
| AGPCLK1/Mode1*     | 17 |   | 32 | Vss                 |
| Vss                | 18 |   | 31 | SDRAM 8/PD#         |
| Vss                | 19 |   | 30 | SDRAM 9/SDRAM_STOP# |
| 48MHz/&FS0         | 20 |   | 29 | VssSD               |
| 24_48MHz/&Mode     | 21 |   | 28 | SDRAM 10/PCI_STOP#  |
| Vdd48              | 22 |   | 27 | SDRAM11/CPU_STOP#   |
| SDATA*             | 23 |   | 26 | SDRAM12             |
| SDCLK*             | 24 |   | 25 | VddSD               |

\* : 120K pull-up  
 &: 120K pull-down  
 ^ : 2X driving strength  
 \$ : Open-drain  
 #: Active LOW

## 4. PIN DESCRIPTION

IN - Input

OUT - Output

I/O - Bi-directional Pin

# - Active Low

\* - Internal 250kΩ pull-up

### 4.1 Crystal I/O

| SYMBOL | PIN | I/O | FUNCTION                                                               |
|--------|-----|-----|------------------------------------------------------------------------|
| Xin    | 5   | IN  | Crystal input with internal loading capacitors and feedback resistors. |
| Xout   | 6   | OUT | Crystal output at 14.318MHz nominally.                                 |

## 4.2 CPU, SDRAM, PCI, AGP Clock Outputs

| SYMBOL                 | PIN                         | I/O | FUNCTION                                                                                                                                                |
|------------------------|-----------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPUC0\$<br>CPUT0\$     | 47,46                       | OD  | Open drain output clock for host frequencies CPU. Powered by VddLCPU. Stopped if CPU_STOP# is low.                                                      |
| CPUCS_C1\$             | 45                          | OD  | Open drain clock for chipset. Stopped if CPU_STOP# is low and Register1 bit7=0. The same phase as CPUC0\$.                                              |
| SDRAM [0:7],12         | 42,41,40,38,37,36,34,33, 26 | OUT | SDRAM clock outputs. The same phase as CPUC0\$                                                                                                          |
| SDRAM 8/PD#            | 31                          | OUT | Pin21 &Mode=0, SDRAM clock outputs.<br>Pin21 &Mode=1, PD# input                                                                                         |
| SDRAM9/<br>SDRAM_STOP# | 30                          | OUT | Pin21 &Mode=0, SDRAM clock outputs.<br>Pin21 &Mode=1, SDRAM_STOP# input                                                                                 |
| SDRAM 10/<br>PCI_STOP# | 28                          | OUT | Pin21 &Mode=0, SDRAM clock outputs.<br>Pin21 &Mode=1, PCI_STOP# input                                                                                   |
| SDRAM 11/<br>CPU_STOP# | 27                          | OUT | Pin21 &Mode=0, SDRAM clock outputs.<br>Pin21 &Mode=1, CPU_STOP# input                                                                                   |
| PCICLK0^/&FS1          | 8                           | I/O | Low skew (< 250ps) PCI clock outputs.<br>Latched input for FS1 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks. |
| PCICLK1^/&FS2          | 9                           | I/O | Low skew (< 250ps) PCI clock outputs.<br>Latched input for FS2 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks. |
| PCICLK [2:4]^          | 10,11,12                    | I/O | Low skew (< 250ps) PCI clock outputs.<br>Latched Input.                                                                                                 |
| PCICLK5/<br>RESET\$    | 13                          | I/O | PCI clock during normal operation. (pin 17 MODE1=1)<br>If pin17 MODE1=0, RESET# (open drain, 4ms low active pulse when Watch Dog time out)              |
| AGPCLK0/<br>SEL24#_48* | 16                          | I/O | Low skew (< 250ps) AGP clock output.<br>Latched Input. SEL24#_48*=1, Pin 21 is 24MHz;<br>SEL24_48*=0, Pin21 is 48MHz                                    |
| AGPCLK1/<br>Mode1*     | 17                          | OUT | AGP clock outputs<br>Latched Input. Mode1*=1, Pin 13 is PCICLK;<br>Mode1*=0, Pin13 is RESET#                                                            |



### 4.3 I<sup>2</sup>C Control Interface

| SYMBOL | PIN | I/O | FUNCTION                                                  |
|--------|-----|-----|-----------------------------------------------------------|
| SDATA* | 23  | I/O | Serial data of I <sup>2</sup> C 2-wire control interface  |
| SDCLK* | 24  | IN  | Serial clock of I <sup>2</sup> C 2-wire control interface |

### 4.4 Fixed Frequency Outputs

| SYMBOL           | PIN | I/O | FUNCTION                                                                                                                                                                 |
|------------------|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REF0 ^/ &AGPSEL  | 2   | I/O | 14.318MHz reference clock. This REF output is the atched input for &AGPSEL at initial power up for H/W selecting the output frequency of AGP clocks.                     |
| REF1 ^/ &FS3     | 3   | I/O | 14.318MHz reference clock.<br>Latched input for FS3 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks.                             |
| 24_48MHz / &Mode | 21  | I/O | 24_48MHz output clock, selected by pin16.<br>Latched Input. &Mode=0, Pin 27,28,30,31 are SDRAM clocks; &Mode=0, Pin27,28,29,31 are CPU_STOP#, SDRAM_STOP#, PCI_STOP#,PD# |
| 48MHz / &FS0     | 20  | I/O | 48MHz output for USB during normal operation.<br>Latched input for FS0 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks.          |

### 4.5 Power Pins

| SYMBOL  | PIN                    | FUNCTION                                                      |
|---------|------------------------|---------------------------------------------------------------|
| VddR    | 1                      | Power supply for Ref [0:1] crystal and core logic.            |
| VddAGP  | 15                     | Power supply for AGP output, 3.3V.                            |
| VddLCPU | 48                     | Power supply for CPUC0,T0,CS_C1, either 2.5V or 3.3V.         |
| VddP    | 7                      | Power supply for PCICLK[0:5], 3.3V.                           |
| VddSD   | 43,35,29,25            | Power supply for SDRAM[0:12], and CPU PLL core, nominal 3.3V. |
| Vdd48   | 19                     | Power for 24 & 48MHz output buffers and fixed PLL core.       |
| Vss     | 4,14,18,19,29,32,39,44 | Circuit Ground.                                               |

## 5. FREQUENCY SELECTION BY HARDWARE

| FS3      | FS2      | FS1      | FS0      | VCO<br>(MHZ) | CPU<br>(MHZ) | SDRAM<br>(MHZ) | PCI<br>(MHZ) | AGPSEL=0<br>(MHZ) | AGPSEL=1<br>(MHZ) |
|----------|----------|----------|----------|--------------|--------------|----------------|--------------|-------------------|-------------------|
| 0        | 0        | 0        | 0        | 400          | 100          | 100            | 33.3         | 66.6              | 50                |
| 0        | 0        | 0        | 1        | 400          | 100          | 133            | 33.3         | 66.6              | 50                |
| 0        | 0        | 1        | 0        | 300          | 100          | 150            | 30.0         | 60                | 50                |
| 0        | 0        | 1        | 1        | 400          | 100          | 66.6           | 33.3         | 66.6              | 50                |
| <b>0</b> | <b>1</b> | <b>0</b> | <b>0</b> | <b>336</b>   | <b>112</b>   | <b>112</b>     | <b>33.6</b>  | 67.2              | 56                |
| 0        | 1        | 0        | 1        | 500          | 125          | 100            | 31.3         | 62.5              | 50                |
| 0        | 1        | 1        | 0        | 372          | 124          | 124            | 31           | 62                | 46.5              |
| 0        | 1        | 1        | 1        | 400          | 133          | 100            | 33.3         | 66.6              | 50                |
| 1        | 0        | 0        | 0        | 400          | 133          | 133            | 33.3         | 66.6              | 50                |
| 1        | 0        | 0        | 1        | 300          | 150          | 150            | 30           | 60                | 50                |
| <b>1</b> | <b>0</b> | <b>1</b> | <b>0</b> | <b>333</b>   | <b>111</b>   | <b>166</b>     | <b>33.3</b>  | 66.6              | 55.6              |
| <b>1</b> | <b>0</b> | <b>1</b> | <b>1</b> | <b>330</b>   | <b>110</b>   | <b>165</b>     | <b>33.0</b>  | 66                | 55                |
| 1        | 1        | 0        | 0        | 332          | 166          | 166            | 33.3         | 66.6              | 55.6              |
| 1        | 1        | 0        | 1        | 360          | 90           | 90             | 30           | 60                | 45                |
| 1        | 1        | 1        | 0        | 192          | 48           | 48             | 32           | 64                | 48                |
| <b>1</b> | <b>1</b> | <b>1</b> | <b>1</b> | <b>192</b>   | <b>45</b>    | <b>60</b>      | <b>30</b>    | <b>60</b>         | <b>45</b>         |

## 6. SERIAL CONTROL REGISTERS

The Pin column lists the affected pin number and the @PowerUp column gives the default state at true power up. "Command Code" byte and "Byte Count" byte must be sent following the acknowledge of the Address Byte. Although the data (bits) in these two bytes are considered "don't care", they must be sent and will be acknowledge. After that, the sequence described below (Register 0, Register 1, Register 2, ....) will be valid and acknowledged.

Bytes sequence order for I<sup>2</sup>C controller :

|                               |     |                              |     |                            |     |                            |
|-------------------------------|-----|------------------------------|-----|----------------------------|-----|----------------------------|
| Clock Address<br>A(6:0) & R/W | Ack | 8 bits dummy<br>Command code | Ack | 8 bits dummy<br>Byte count | Ack | Byte0,1,2...<br>until Stop |
|-------------------------------|-----|------------------------------|-----|----------------------------|-----|----------------------------|

Set R/W to 1 when Read back", the data sequence is as follows :

|                               |     |        |     |        |     |                              |
|-------------------------------|-----|--------|-----|--------|-----|------------------------------|
| Clock Address<br>A(6:0) & R/W | Ack | Byte 0 | Ack | Byte 1 | Ack | Byte2, 3, 4...<br>until Stop |
|-------------------------------|-----|--------|-----|--------|-----|------------------------------|



## FREQUENCY BY SOFTWARE

| SSEL<br>5 | SSEL<br>4 | SSEL<br>3 | SSEL<br>2 | SSEL<br>1 | SSEL<br>0 | VCO<br>(MHz) | CPU<br>(MHz) | SDRAM<br>(MHz) | PCI<br>(MHz) | AGPSEL=0<br>(MHz) | AGPSEL=1<br>(MHz) |
|-----------|-----------|-----------|-----------|-----------|-----------|--------------|--------------|----------------|--------------|-------------------|-------------------|
| 0         | 0         | 0         | 0         | 0         | 0         | 400          | 100          | 100            | 33.3         | 66.6              | 50                |
| 0         | 0         | 0         | 0         | 0         | 1         | 400          | 100          | 133            | 33.3         | 66.6              | 50                |
| 0         | 0         | 0         | 0         | 1         | 0         | 300          | 100          | 150            | 30           | 60                | 50                |
| 0         | 0         | 0         | 0         | 1         | 1         | 400          | 100          | 66.6           | 33.3         | 66.6              | 50                |
| <b>0</b>  | <b>0</b>  | <b>0</b>  | <b>1</b>  | <b>0</b>  | <b>0</b>  | <b>336</b>   | <b>112</b>   | <b>112</b>     | <b>33.6</b>  | 67.2              | 56                |
| 0         | 0         | 0         | 1         | 0         | 1         | 500          | 125          | 100            | 31.3         | 62.5              | 50                |
| 0         | 0         | 0         | 1         | 1         | 0         | 372          | 124          | 124            | 31           | 62                | 46.5              |
| 0         | 0         | 0         | 1         | 1         | 1         | 400          | 133          | 100            | 33.3         | 66.6              | 50                |
| 0         | 0         | 1         | 0         | 0         | 0         | 400          | 133          | 133            | 33.3         | 66.6              | 50                |
| 0         | 0         | 1         | 0         | 0         | 1         | 300          | 150          | 150            | 30           | 60                | 50                |
| <b>0</b>  | <b>0</b>  | <b>1</b>  | <b>0</b>  | <b>1</b>  | <b>0</b>  | <b>333</b>   | <b>111</b>   | <b>166</b>     | <b>33.3</b>  | 66.6              | 55.6              |
| <b>0</b>  | <b>0</b>  | <b>1</b>  | <b>0</b>  | <b>1</b>  | <b>1</b>  | <b>330</b>   | <b>110</b>   | <b>165</b>     | <b>33</b>    | 66                | 55                |
| 0         | 0         | 1         | 1         | 0         | 0         | 332          | 166          | 166            | 33.3         | 66.6              | 55.6              |
| 0         | 0         | 1         | 1         | 0         | 1         | 360          | 90           | 90             | 30           | 60                | 45                |
| 0         | 0         | 1         | 1         | 1         | 0         | 192          | 48           | 48             | 32           | 64                | 48                |
| <b>0</b>  | <b>0</b>  | <b>1</b>  | <b>1</b>  | <b>1</b>  | <b>1</b>  | <b>192</b>   | <b>45</b>    | <b>60</b>      | <b>30</b>    | <b>60</b>         | <b>45</b>         |
| 0         | 1         | 0         | 0         | 0         | 0         | 368          | 92           | 92             | 30.67        | 61.33             | 46                |
| 0         | 1         | 0         | 0         | 0         | 1         | 380          | 95           | 95             | 31.67        | 63.33             | 47.5              |
| 0         | 1         | 0         | 0         | 1         | 0         | 384          | 96           | 96             | 32           | 64                | 48                |
| 0         | 1         | 0         | 0         | 1         | 1         | 392          | 98           | 98             | 32.67        | 65.33             | 49                |
| 0         | 1         | 0         | 1         | 0         | 0         | 368          | 92           | 122.67         | 30.67        | 61.33             | 46                |
| 0         | 1         | 0         | 1         | 0         | 1         | 380          | 95           | 126.67         | 31.67        | 63.33             | 47.5              |
| 0         | 1         | 0         | 1         | 1         | 0         | 384          | 96           | 128            | 32           | 64                | 48                |
| 0         | 1         | 0         | 1         | 1         | 1         | 392          | 98           | 130.67         | 32.67        | 65.33             | 49                |
| 0         | 1         | 1         | 0         | 0         | 0         | 354          | 118          | 88.5           | 29.5         | 59                | 44.25             |
| 0         | 1         | 1         | 0         | 0         | 1         | 360          | 120          | 90             | 30           | 60                | 45                |
| 0         | 1         | 1         | 0         | 1         | 0         | 366          | 122          | 91.5           | 30.5         | 61                | 45.75             |
| 0         | 1         | 1         | 0         | 1         | 1         | 378          | 126          | 94.5           | 31.5         | 63                | 47.25             |
| 0         | 1         | 1         | 1         | 0         | 0         | 378          | 126          | 126            | 31.5         | 63                | 47.25             |
| 0         | 1         | 1         | 1         | 0         | 1         | 384          | 128          | 128            | 32           | 64                | 48                |
| 0         | 1         | 1         | 1         | 1         | 0         | 390          | 130          | 130            | 32.5         | 65                | 48.75             |
| 0         | 1         | 1         | 1         | 1         | 1         | 408          | 136          | 136            | 34           | 68                | 51                |
| 1         | 0         | 0         | 0         | 0         | 0         | 408          | 102          | 102            | 34           | 68                | 51                |
| 1         | 0         | 0         | 0         | 0         | 1         | 412          | 103          | 103            | 34.33        | 68.67             | 51.5              |
| 1         | 0         | 0         | 0         | 1         | 0         | 416          | 104          | 104            | 34.67        | 69.33             | 52                |
| 1         | 0         | 0         | 0         | 1         | 1         | 420          | 105          | 105            | 35           | 70                | 52.5              |
| 1         | 0         | 0         | 1         | 0         | 0         | 408          | 102          | 136            | 34           | 68                | 51                |
| 1         | 0         | 0         | 1         | 0         | 1         | 412          | 103          | 137.33         | 34.33        | 68.67             | 51.5              |
| 1         | 0         | 0         | 1         | 1         | 0         | 416          | 104          | 138.67         | 34.67        | 69.33             | 52                |
| 1         | 0         | 0         | 1         | 1         | 1         | 424          | 106          | 141.33         | 35.33        | 70.67             | 53                |

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FREQUENCY BY SOFTWARE, continued

| SSEL<br>5 | SSEL<br>4 | SSEL<br>3 | SSEL<br>2 | SSEL<br>1 | SSEL<br>0 | VCO<br>(MHz) | CPU<br>(MHz) | SDRAM<br>(MHz) | PCI<br>(MHz) | AGPSEL=0<br>(MHz) | AGPSEL=1<br>(MHz) |
|-----------|-----------|-----------|-----------|-----------|-----------|--------------|--------------|----------------|--------------|-------------------|-------------------|
| 1         | 0         | 1         | 0         | 0         | 0         | 390          | 130          | 97.5           | 32.5         | 65                | 48.75             |
| 1         | 0         | 1         | 0         | 0         | 1         | 405          | 135          | 101.25         | 33.75        | 67.5              | 50.63             |
| 1         | 0         | 1         | 0         | 1         | 0         | 414          | 138          | 103.5          | 34.5         | 69                | 51.75             |
| 1         | 0         | 1         | 0         | 1         | 1         | 426          | 142          | 106.5          | 35.5         | 71                | 53.25             |
| 1         | 0         | 1         | 1         | 0         | 0         | 411          | 137          | 137            | 34.25        | 68.5              | 51.38             |
| 1         | 0         | 1         | 1         | 0         | 1         | 414          | 138          | 138            | 34.5         | 69                | 51.75             |
| 1         | 0         | 1         | 1         | 1         | 0         | 417          | 139          | 139            | 34.75        | 69.5              | 52.13             |
| 1         | 0         | 1         | 1         | 1         | 1         | 429          | 143          | 143            | 35.75        | 71.5              | 53.63             |
| 1         | 1         | 0         | 0         | 0         | 0         | 429          | 143          | 107.25         | 35.75        | 71.5              | 53.63             |
| 1         | 1         | 0         | 0         | 0         | 1         | 432          | 144          | 108            | 36           | 54                | 43.2              |
| 1         | 1         | 0         | 0         | 1         | 0         | 435          | 145          | 108.75         | 36.25        | 54.38             | 43.5              |
| 1         | 1         | 0         | 0         | 1         | 1         | 438          | 146          | 109.5          | 36.5         | 54.75             | 43.8              |
| 1         | 1         | 0         | 1         | 0         | 0         | 441          | 147          | 110.25         | 29.4         | 55.13             | 44.1              |
| 1         | 1         | 0         | 1         | 0         | 1         | 444          | 148          | 111            | 29.6         | 55.5              | 44.4              |
| 1         | 1         | 0         | 1         | 1         | 0         | 456          | 152          | 114            | 30.4         | 57                | 45.6              |
| 1         | 1         | 0         | 1         | 1         | 1         | 459          | 153          | 114.75         | 30.6         | 57.38             | 45.9              |
| 1         | 1         | 1         | 0         | 0         | 0         | 468          | 156          | 117            | 31.2         | 58.5              | 46.8              |
| 1         | 1         | 1         | 0         | 0         | 1         | 474          | 158          | 118.5          | 31.6         | 59.25             | 47.4              |
| 1         | 1         | 1         | 0         | 1         | 0         | 480          | 160          | 120            | 32           | 60                | 48                |
| 1         | 1         | 1         | 0         | 1         | 1         | 489          | 163          | 122.25         | 32.6         | 61.13             | 48.9              |
| 1         | 1         | 1         | 1         | 0         | 0         | 498          | 166          | 124.5          | 33.2         | 62.25             | 49.8              |
| 1         | 1         | 1         | 1         | 0         | 1         | 525          | 175          | 131.25         | 35           | 65.63             | 52.5              |
| 1         | 1         | 1         | 1         | 1         | 0         | 534          | 178          | 133.5          | 35.6         | 66.75             | 53.4              |
| 1         | 1         | 1         | 1         | 1         | 1         | 540          | 180          | 135            | 36           | 67.5              | 54                |

### 6.1 Register 0: Frequency Select Register

| BITS | @POWERUP | PIN | DESCRIPTION                                                                         |
|------|----------|-----|-------------------------------------------------------------------------------------|
| 7    | 0        | -   | SSEL5 ( Frequency table selection by software via I <sup>2</sup> C)                 |
| 6    | 0        | -   | SSEL4 ( Frequency table selection by software via I <sup>2</sup> C)                 |
| 5    | 0        | -   | SSEL3 ( Frequency table selection by software via I <sup>2</sup> C)                 |
| 4    | 0        | -   | SSEL2 ( Frequency table selection by software via I <sup>2</sup> C)                 |
| 3    | 0        | -   | SSEL1 ( Frequency table selection by software via I <sup>2</sup> C)                 |
| 2    | 0        | -   | SSEL0 (Frequency table selection by software via I <sup>2</sup> C )                 |
| 1    | 0        | -   | 0 = Selection by hardware<br>1 = Selection by software I <sup>2</sup> C - Bit (7:2) |
| 0    | 0        | -   | 0 = Running<br>1 = Tristate all outputs                                             |

### 6.2 Register 1 : CPU Clock Register (1 = Active, 0 = Inactive)

| BITS | @POWERUP | PIN | DESCRIPTION                                                                                              |
|------|----------|-----|----------------------------------------------------------------------------------------------------------|
| 7    | 1        | -   | CPUCS_C1\$ free running control 1: stopped by CPU_STOP#<br>0: Free running pin                           |
| 6    | 1        | 27  | SDRAM11 (Active / Inactive)                                                                              |
| 5    | 0        | -   | 0 = Normal<br>1 = Spread spectrum enable                                                                 |
| 4    | 0        | -   | 0 = ±0.25% Center type Spread Spectrum Modulation<br>1= 0 ~ (-0.5%) Down type Spread Spectrum Modulation |
| 3    | 1        | 26  | SDRAM12 (Active / Inactive)                                                                              |
| 2    | 1        | 45  | CPUCS_C1\$(Active / Inactive)                                                                            |
| 1    | 1        | 46  | CPUC0\$ (Active / Inactive)                                                                              |
| 0    | 1        | 47  | CPUT0\$ (Active / Inactive)                                                                              |

### 6.3 Register 2: PCI, AGP Clock Register (1 = Active, 0 = Inactive)

| BITS | @POWERUP | PIN | DESCRIPTION                 |
|------|----------|-----|-----------------------------|
| 7    | 1        | 17  | AGPCLK1(Active / Inactive)  |
| 6    | 1        | 16  | AGPCLK0(Active / Inactive)  |
| 5    | 1        | 13  | PCICLK5 (Active / Inactive) |
| 4    | 1        | 12  | PCICLK4 (Active / Inactive) |
| 3    | 1        | 11  | PCICLK3 (Active / Inactive) |
| 2    | 1        | 10  | PCICLK2 (Active / Inactive) |
| 1    | 1        | 9   | PCICLK1 (Active / Inactive) |
| 0    | 1        | 8   | PCICLK0 (Active / Inactive) |

#### 6.4 Register 3: SDRAM Clock Additional Register (1 = Active, 0 = Inactive)

| BIT | @POWERUP | PIN | DESCRIPTION                |
|-----|----------|-----|----------------------------|
| 7   | 1        | 33  | SDRAM7 (Active / Inactive) |
| 6   | 1        | 34  | SDRAM6 (Active / Inactive) |
| 5   | 1        | 36  | SDRAM5 (Active / Inactive) |
| 4   | 1        | 37  | SDRAM4 (Active / Inactive) |
| 3   | 1        | 38  | SDRAM3 (Active / Inactive) |
| 2   | 1        | 40  | SDRAM2 (Active / Inactive) |
| 1   | 1        | 41  | SDRAM1 (Active / Inactive) |
| 0   | 1        | 42  | SDRAM0 (Active / Inactive) |

#### 6.5 Register 4: SDRAM Clock Additional Register (1 = Active, 0 = Inactive)

| BIT | @POWERUP | PIN | DESCRIPTION                 |
|-----|----------|-----|-----------------------------|
| 7   | X        | -   | AGPSEL#                     |
| 6   | X        | -   | FS3#                        |
| 5   | X        | -   | FS2#                        |
| 4   | X        | -   | FS1#                        |
| 3   | X        | -   | FS0#                        |
| 2   | 1        | 28  | SDRAM10 (Active / Inactive) |
| 1   | 1        | 30  | SDRAM9 (Active / Inactive)  |
| 0   | 1        | 31  | SDRAM8 (Active / Inactive)  |

#### 6.6 Register 5: Skew Register

| BIT | @POWERUP | PIN | DESCRIPTION                            |
|-----|----------|-----|----------------------------------------|
| 7   | 1        | -   | CSkew2 (SDRAM to CPU skew program bit) |
| 6   | 0        | -   | CSkew1 (SDRAM to CPU skew program bit) |
| 5   | 0        | -   | CSkew0 (SDRAM to CPU skew program bit) |
| 4   | 1        | -   | CAkew2 (AGP to CPU skew program bit)   |
| 3   | 0        | -   | CAkew1 (AGP to CPU skew program bit)   |
| 2   | 0        | -   | CAkew0 (AGP to CPU skew program bit)   |
| 1   | 1        | 21  | 24_48MHz(Active / Inactive)            |
| 0   | 1        | 20  | 48MHz(Active / Inactive)               |



### 6.7 Register 6: Watchdog Timer Register

| BITS | @POWERUP | PIN | DESCRIPTION                                    |
|------|----------|-----|------------------------------------------------|
| 7    | 0        | -   | Enable Count 1 = start timer<br>0 = stop timer |
| 6    | X        | -   | Second timeout status (READ ONLY)              |
| 5    | 0        | -   | Second count 5                                 |
| 4    | 0        | -   | Second count 4                                 |
| 3    | 0        | -   | Second count 3                                 |
| 2    | 0        | -   | Second count 2                                 |
| 1    | 0        | -   | Second count 1                                 |
| 0    | 0        | -   | Second count 0                                 |

### 6.8 Register 7: M/N Program Register and Divisor

| BITS | @POWERUP | PIN | DESCRIPTION                       |
|------|----------|-----|-----------------------------------|
| 7    | 0        | -   | N value bit 8                     |
| 6    | 1        | -   | <b>Test 1 (Internal test use)</b> |
| 5    | 0        | -   | Test 0 (Internal test use)        |
| 4    | 0        | -   | M value bit 4                     |
| 3    | 0        | -   | M value bit 3                     |
| 2    | 0        | -   | M value bit 2                     |
| 1    | 0        | -   | M value bit 1                     |
| 0    | 0        | -   | M value bit 0                     |

### 6.9 Register 8: M/N Program Register

| BITS | @POWERUP | PIN | DESCRIPTION   |
|------|----------|-----|---------------|
| 7    | 0        | -   | N value bit 7 |
| 6    | 0        | -   | N value bit 6 |
| 5    | 0        | -   | N value bit 5 |
| 4    | 0        | -   | N value bit 4 |
| 3    | 0        | -   | N value bit 3 |
| 2    | 0        | -   | N value bit 2 |
| 1    | 0        | -   | N value bit 1 |
| 0    | 0        | -   | N value bit 0 |



### 6.10 Register 9: Spread Spectrum Register

| BITS | @POWERUP | PIN | DESCRIPTION                  |
|------|----------|-----|------------------------------|
| 7    | 0        | -   | Spread spectrum up count 3   |
| 6    | 0        | -   | Spread spectrum up count 2   |
| 5    | 0        | -   | Spread spectrum up count 1   |
| 4    | 0        | -   | Spread spectrum up count 0   |
| 3    | 0        | -   | Spread spectrum down count 3 |
| 2    | 0        | -   | Spread spectrum down count 2 |
| 1    | 0        | -   | Spread spectrum down count 1 |
| 0    | 0        | -   | Spread spectrum down count 0 |

### 6.11 Register 10: Divisor Register

| BITS | @POWERUP | PIN | DESCRIPTION                                                                                                                                  |
|------|----------|-----|----------------------------------------------------------------------------------------------------------------------------------------------|
| 7    | 0        | -   | 0: use frequency table<br>1: use M/N register to program frequency<br>The equation is <b><math>VCO\ freq. = 14.318MHz * (N+4) / M</math></b> |
| 6    | X        | -   | Ratio SEL3 (See ratio selection table)                                                                                                       |
| 5    | X        | -   | Ratio SEL2 (See ratio selection table)                                                                                                       |
| 4    | X        | -   | Ratio SEL1 (See ratio selection table)                                                                                                       |
| 3    | X        | -   | Ratio SEL0 (See ratio selection table)                                                                                                       |
| 2    | X        | -   | AGP Ratio SEL2 (See ratio selection table1)                                                                                                  |
| 1    | X        | -   | AGP Ratio SEL1 (See ratio selection table1)                                                                                                  |
| 0    | X        | -   | AGP Ratio SEL0 (See ratio selection table1)                                                                                                  |

### 6.12 Register 11: Winbond Chip ID Register (Read Only)

| BITS | @POWERUP | PIN | DESCRIPTION     |
|------|----------|-----|-----------------|
| 7    | 0        | -   | Winbond Chip ID |
| 6    | 0        | -   | Winbond Chip ID |
| 5    | 0        | -   | Winbond Chip ID |
| 4    | 0        | -   | Winbond Chip ID |
| 3    | 0        | -   | Winbond Chip ID |
| 2    | 1        | -   | Winbond Chip ID |
| 1    | 0        | -   | Winbond Chip ID |
| 0    | 1        | -   | Winbond Chip ID |



### 6.13 Register 12: Winbond Chip ID Register (Read Only)

| BIT | @POWERUP | PIN | DESCRIPTION     |
|-----|----------|-----|-----------------|
| 7   | 0        | -   | Winbond Chip ID |
| 6   | 0        | -   | Winbond Chip ID |
| 5   | 1        | -   | Winbond Chip ID |
| 4   | 1        | -   | Winbond Chip ID |
| 3   | 0        | -   | Version ID      |
| 2   | 0        | -   | Version ID      |
| 1   | 0        | -   | Version ID      |
| 0   | 1        | -   | Version ID      |

Ratio Selection Table

| REG 10<br>BIT6 | REG 10<br>BIT5 | REG 10<br>BIT4 | REG 10<br>BIT3 | VCO/<br>CPU | VCO/<br>SDRAM | VCO/<br>PCI |
|----------------|----------------|----------------|----------------|-------------|---------------|-------------|
| SSEL 3         | SSEL 2         | SSEL 1         | SSEL 0         | RATIO       | RATIO         | RATIO       |
| 0              | 0              | 0              | 0              | 2           | 2             | 10          |
| 0              | 0              | 0              | 1              | 2           | 3             | 10          |
| 0              | 0              | 1              | 0              | 3           | 2             | 10          |
| 0              | 0              | 1              | 1              | 3           | 3             | 10          |
| 0              | 1              | 0              | 0              | 3           | 3             | 12          |
| 0              | 1              | 0              | 1              | 3           | 3             | 16          |
| 0              | 1              | 1              | 0              | 3           | 4             | 12          |
| 0              | 1              | 1              | 1              | 3           | 4             | 16          |
| 1              | 0              | 0              | 0              | 4           | 3             | 10          |
| 1              | 0              | 0              | 1              | 4           | 3             | 12          |
| 1              | 0              | 1              | 0              | 4           | 3             | 16          |
| 1              | 0              | 1              | 1              | 4           | 4             | 12          |
| 1              | 1              | 0              | 0              | 4           | 6             | 12          |
| 1              | 1              | 0              | 1              | 6           | 3             | 12          |
| 1              | 1              | 1              | 0              | 6           | 4             | 12          |
| 1              | 1              | 1              | 1              | 6           | 6             | 12          |

Ratio Selection Table 1

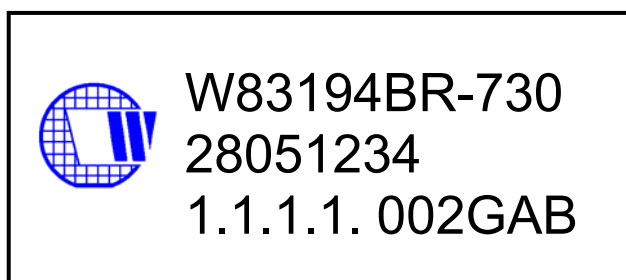
| REG10<br>BIT2 | REG10<br>BIT1 | REG10<br>BIT0 | VCO/<br>AGP |
|---------------|---------------|---------------|-------------|
| AGP2          | AGP1          | AGP0          | ratio       |
| 0             | 0             | 0             | 3           |
| 0             | 0             | 1             | 5           |
| 0             | 1             | 0             | 6           |
| 0             | 1             | 1             | 8           |
| 1             | 0             | 0             | 4           |
| 1             | 0             | 1             | -           |
| 1             | 1             | 0             | -           |
| 1             | 1             | 1             | 10          |



## 7. ORDERING INFORMATION

| PART NUMBER  | PACKAGE TYPE | PRODUCTION FLOW          |
|--------------|--------------|--------------------------|
| W83194BR-730 | 48 PIN SSOP  | Commercial, 0°C to +70°C |

## 8. HOW TO READ THE TOP MARKING



1st line: Winbond logo and the type number: W83194BR-730

2nd line: Tracking code 2 8051234

2: wafers manufactured in Winbond FAB 2

8051234: wafer production series lot number

3rd line: Tracking code 814 G B B

002: packages made in '00, week 02

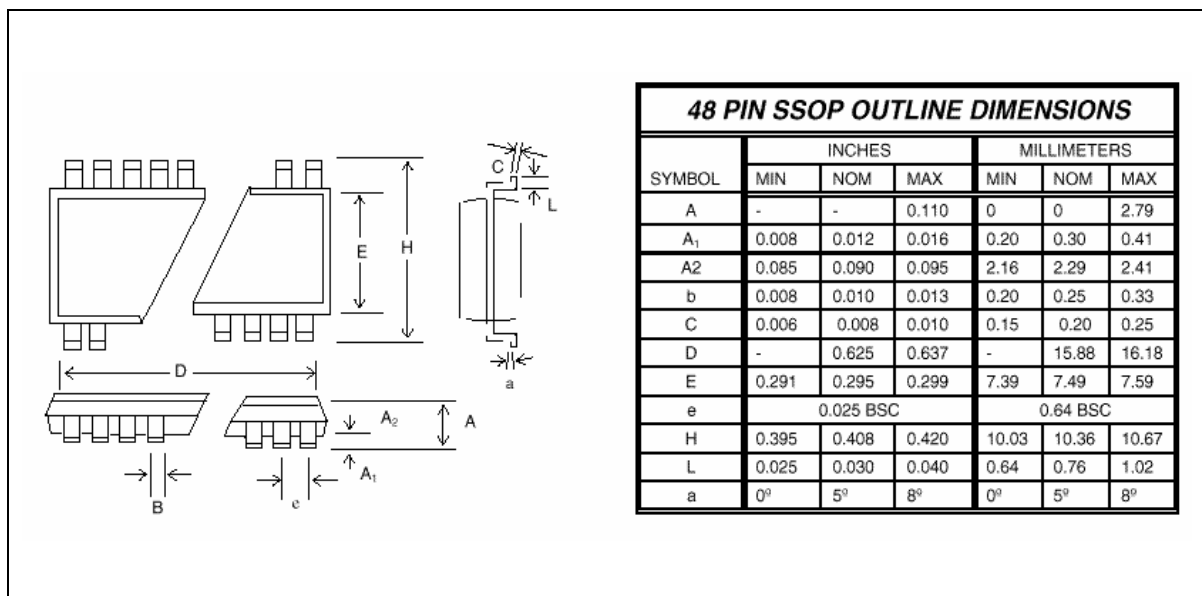
G: assembly house ID; O means OSE, G means GR

A: Internal use code

B: IC revision

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## 9. PACKAGE DRAWING AND DIMENSIONS



**10. REVISION HISTORY**

| VERSION | DATE         | PAGE | DESCRIPTION          |
|---------|--------------|------|----------------------|
| 1.0     | May 18, 2005 | 16   | ADD Important Notice |
|         |              |      |                      |

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