

Preliminary W83193R-02/-04/-04A



83.3 MHZ 3-DIMM CLOCK

1.0 GENERAL DESCRIPTION

The W83193R-02/-04/-04A is a Main board Clock Synthesizer which provides all clocks required for high-speed RISC or CISC microprocessor such as Intel PentiumPro, PentiumII, AMD or Cyrix. Eight different frequency of CPU and PCI clocks are externally selectable with smooth transitions.

The W83193R-02/-04/-04A also provides I2C serial bus interface to program the registers to enable or disable each clock outputs and choose the 0.5% or 1.5% center type spread spectrum.

The W83193R-02/-04/-04A accepts a 14.318 MHz reference crystal as its input and runs on a 3.3V supply. High drive PCI and SDRAM CLOCK outputs typically provide greater than 1V /nS slew rate into 30 pF loads. CPU CLOCK outputs typically provide better than 1V /nS slew rate into 20 pF loads as maintaining 50 ±5% duty cycle. The fixed frequency outputs as REF, 24 MHz, and 48 MHz provide better than 0.5V /nS slew rate.

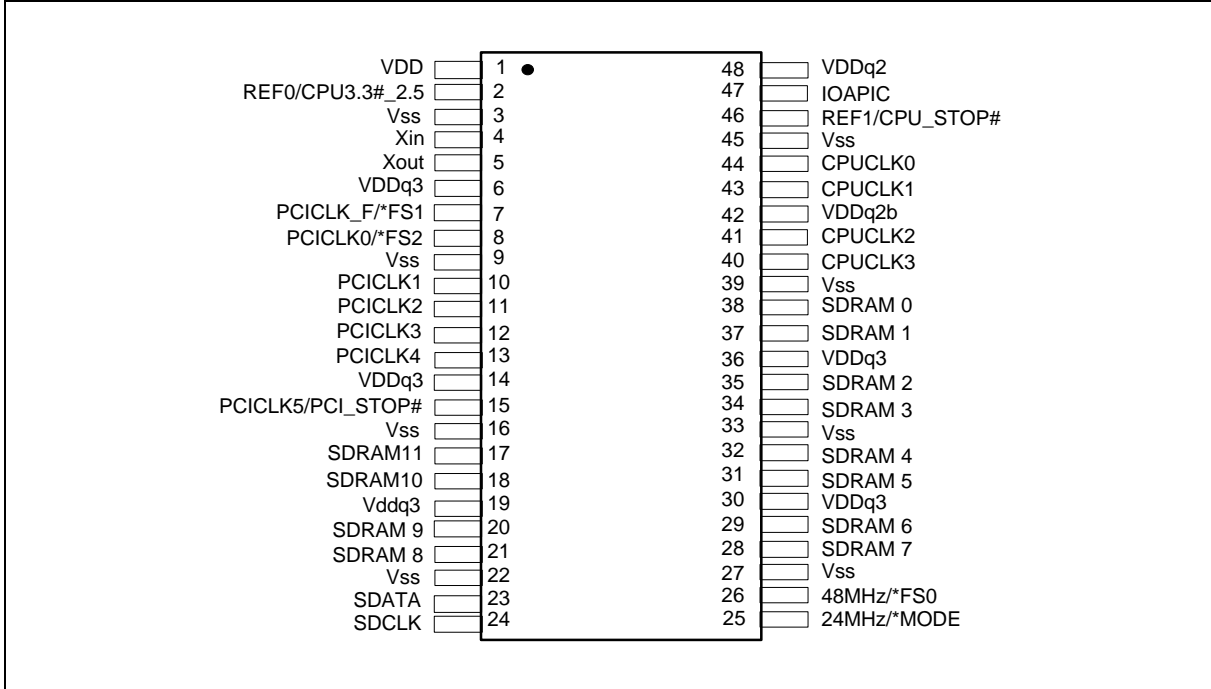
2.0 FEATURES

- Supports Pentium™, Pentium™ Pro, Pentium™ II, AMD and Cyrix CPUs with I²C.
- 4 CPU clocks
- 12 SDRAM clocks for 3 DIMs.
- 7 PCI synchronous clocks.
- One IOAPIC clock for multiprocessor support.
- Optional single or mixed supply:
(V_{DD} = V_{DDq3} = V_{DDq2} = V_{DDq2b} = 3.3V) or (V_{DD} = V_{DDq3} = 3.3V, V_{DDq2} = V_{DD2b} = 2.5V)
- < 250 pS skew among CPU and SDRAM clocks.
- < 250 pS skew among PCI clocks.
- Smooth frequency switch with selections from 50 MHz to 83.3 MHz CPU. (W83193R-04)
- Smooth frequency switch with selections from 50 MHz to 112 MHz CPU. (W83193R-04A)
- I²C 2-Wire serial interface and I²C read back.
- Spread spectrum function to reduce EMI.
- Programmable registers to enable/stop each output and select modes
(mode as Tri-state or Normal)
- MODE pin for power Management
- 48 MHz for USB
- 24 MHz for super I/O
- Packaged in 48-pin SSOP

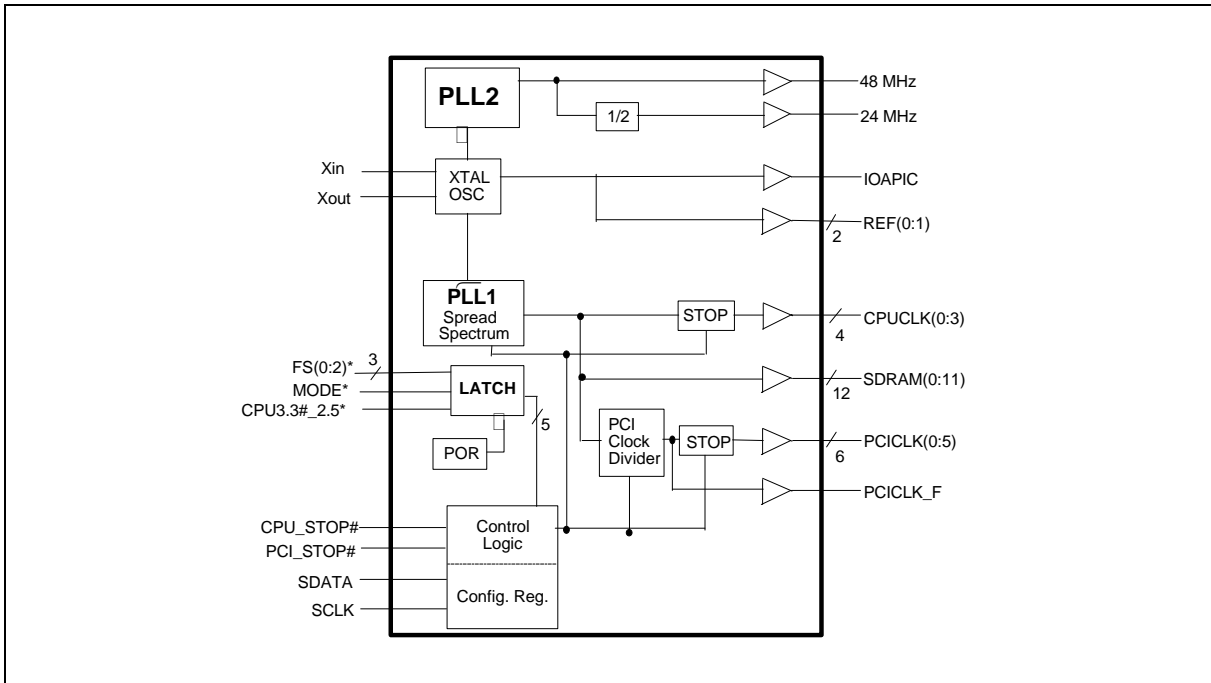
Preliminary W83193R-02/-04/-04A



4.0 PIN CONFIGURATION



3.0 BLOCK DIAGRAM



Preliminary W83193R-02/-04/-04A



5.0 PIN DESCRIPTION

IN - Input

OUT - Output

I/O - Bi-directional Pin

- Active Low

* - Internal 250kΩ pull-up

5.1 Crystal I/O

| SYMBOL | PIN | I/O | FUNCTION |
|--------|-----|-----|--|
| Xin | 4 | IN | Crystal input with internal loading capacitors and feedback resistors. |
| Xout | 5 | OUT | Crystal output at 14.318 MHz nominally. |

5.2 CPU, SDRAM, PCI Clock Outputs

| SYMBOL | PIN | I/O | FUNCTION |
|--------------------|--|-----|---|
| CPUCLK [0:3] | 40, 41, 43, 44 | OUT | Low skew (< 250 pS) clock outputs for host frequencies such as CPU, Chipset and Cache. VDDQ2 is the supply voltage for these outputs. |
| IOAPIC | 47 | OUT | High drive buffered output of the crystal, and is powered by VDDQ2. |
| SDRAM [0:11] | 17, 18, 20, 21, 28, 29, 31, 32, 34, 35, 37, 38 | O | SDRAM clock outputs which have the same frequency as CPU clocks. |
| PCICLK_F/ *FS1 | 7 | I/O | Latched input for FS1 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks. Free running PCI clock during normal operation. |
| PCICLK 0 / *FS2 | 8 | I/O | Latched input for FS2 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks. PCI clock during normal operation. |
| PCICLK [1:4] | 10, 11, 12, 13 | OUT | Low skew (< 250 pS) PCI clock outputs. |
| PCICLK5/ PCI_STOP# | 15 | I/O | Internal 250 KΩ pull-up. If MODE = 1 (default), then this pin is a PCI5 clock output. If MODE = 0 , then this pin is PCI_STOP # and used in power management mode for synchronously stopping the all PCI clocks. |

Preliminary W83193R-02/-04/-04A



5.3 I²C Control Interface

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

5.4 Fixed Frequency Outputs

| SYMBOL | PIN | I/O | FUNCTION |
|------------------|-----|-----|---|
| REF0/CPU3.3#_2.5 | 2 | I/O | Internal 250kΩ pull-up. Latched input for CPU3.3#_2.5 at initial power up. Reference clock during normal operation. Latched high - VDDq2 = VDDq2b = 2.5V Latched low - VDDq2 = VDDq2b = 3.3V |
| REF1/CPU_STOP# | 46 | I/O | Internal 250 KΩ pull-up. If MODE = 1 (default), then this pin is a REF1 buffered output of the crystal. If MODE = 0, then this pin is CPU_STOP# input used in power management mode for synchronously stopping the all CPU clocks. |
| 24MHz / *MODE | 25 | I/O | Internal 250 KΩ pull-up. Latched input for MODE at initial power up. 24 MHz output for super I/O during normal operation. |
| 48MHz / *FS0 | 26 | I/O | Internal 250 KΩ pull-up. Latched input for FS0 at initial power up for H/W selecting the output frequency of CPU, SDRAM and PCI clocks. 48 MHz output for USB during normal operation. |

5.5 Power Pins

| SYMBOL | PIN | FUNCTION |
|--------|------------------------------|---|
| VDD | 1 | Power supply for Ref [0:1] crystal and core logic. |
| VDDq2 | 42 | Power supply for CPUCLK[0:3], either 2.5V or 3.3V. |
| VDDq2b | 48 | Power supply for IOAPIC output, either 2.5V or 3.3V. |
| VDDq3 | 6, 14, 19, 30, 36 | Power supply for SDRAM, PCICLK and 48/24 MHz outputs. |
| VSS | 3, 9, 16, 22, 27, 33, 39, 45 | Circuit Ground. |

Preliminary W83193R-02/-04/-04A



6.0 FREQUENCY SELECTION

W83193R-02/-04 Frequency Table

| FS2 | FS1 | FS0 | CPU, SDRAM (MHz) | PCI (MHz) | REF, IOAPIC (MHz) |
|-----|-----|-----|------------------|-----------|-------------------|
| 0 | 0 | 0 | 50 | 25 | 14.318 |
| 0 | 0 | 1 | 75 | 32 | 14.318 |
| 0 | 1 | 0 | 83.3 | 41.65 | 14.318 |
| 0 | 1 | 1 | 68.5 | 34.25 | 14.318 |
| 1 | 0 | 0 | 83.3 | 33.3 | 14.318 |
| 1 | 0 | 1 | 75 | 37.5 | 14.318 |
| 1 | 1 | 0 | 60 | 30 | 14.318 |
| 1 | 1 | 1 | 66.8 | 33.4 | 14.318 |

W83193R-04A Frequency Table

| FS2 | FS1 | FS0 | CPU, SDRAM (MHz) | PCI (MHz) | REF, IOAPIC (MHz) |
|-----|-----|-----|------------------|-----------|-------------------|
| 0 | 0 | 0 | 50 | 25 | 14.318 |
| 0 | 0 | 1 | 100 | 50 | 14.318 |
| 0 | 1 | 0 | 83.3 | 41.65 | 14.318 |
| 0 | 1 | 1 | 68.5 | 34.25 | 14.318 |
| 1 | 0 | 0 | 90 | 45 | 14.318 |
| 1 | 0 | 1 | 75 | 37.5 | 14.318 |
| 1 | 1 | 0 | 112 | 56 | 14.318 |
| 1 | 1 | 1 | 66.8 | 33.4 | 14.318 |

7.0 CPU 3.3#_2.5 BUFFER SELECTION

| CPU 3.3#_2.5 (PIN 2) INPUT LEVEL | CPU & IOAPIC OPERATE AT |
|----------------------------------|-------------------------|
| 1 | V _{DD} = 2.5V |
| 0 | V _{DD} = 3.3V |

8.0 FUNCTIONAL DESCRIPTION

8.1 Power Management Functions

All clocks can be individually enabled or disabled via the 2-wire control interface. On power up, external circuitry should allow 3 ms for the VCO to stabilize prior to enabling clock outputs to assure correct pulse widths. When MODE = 0, pins 15 and 46 are inputs (PCI_STOP#), (CPU_STOP#), when MODE = 1, these functions are not available. A particular clock could be enabled as both the 2-wire serial control interface and one of these pins indicate that it should be enable.

Preliminary W83193R-02/-04/-04A



The W83193R-02/-04/-04A may be disabled in the low state according to the following table in order to reduce power consumption. All clocks are stopped in the low state, but maintain a valid high period on transitions from running to stop. The CPU and PCI clocks transform between running and stop by waiting for one positive edge on PCICLK_F followed by negative edge on the clock of interest, after which high levels of the output are either enabled or disabled.

| CPU_STOP# | PCI_STOP# | CPU | PCI | OTHER CLKs | XTAL & VCOs |
|-----------|-----------|---------|---------|------------|-------------|
| 0 | 0 | Low | Low | Running | Running |
| 0 | 1 | Low | Running | Running | Running |
| 1 | 0 | Running | Low | Running | Running |
| 1 | 1 | Running | Running | Running | Running |

8.2 2-Wire I²C Control Interface

The clock generator is a slave I²C component which can be read back the data stored in the latches for verification. All proceeding bytes must be sent to change one of the control bytes. The 2-wire control interface allows each clock output individually enabled or disabled. On power up, the W83193R-02/-04/-04A initializes with default register settings, and then it's optional to use the 2-wire control interface.

The SDATA signal only changes when the SDCLK signal is low, and is stable when SDCLK is high during normal data transfer. There are only two exceptions. One is a high-to-low transition on SDATA while SDCLK is high used to indicate the beginning of a data transfer cycle. The other is a low-to-high transition on SDATA while SDCLK is high used to indicate the end of a data transfer cycle. Data is always sent as complete 8-bit bytes followed by an acknowledge generated.

Byte writing starts with a start condition followed by 7-bit slave address and a write command bit [1101 0010], command code checking [0000 0000], and byte count checking. After successful reception of each byte, an acknowledge (low) on the SDATA wire will be generated by the clock chip. Controller can start to write to internal I²C registers after the string of data. The sequence order is as follows:

Bytes sequence order for I²C controller:

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

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

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

8.3 Serial Control Registers

The pin column lists the affected pin number and the @PowerUp column gives the state at true power up. Registers are set to the values shown only on 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 below described sequence (Register 0, Register 1, Register 2,) will be valid and acknowledged.

Preliminary W83193R-02/-04/-04A



8.3.1 Register 0: CPU Frequency Select Register (1 = Enable, 0 = Stopped)

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|--|
| 7 | 0 | - | 0 = $\pm 1.5\%$ Spread Spectrum Modulation 1 = $\pm 0.5\%$ Spread Spectrum Modulation |
| 6 | 0 | - | SSEL2 (Frequency table selection by software via I ² C) |
| 5 | 0 | - | SSEL1 (Frequency table selection by software via I ² C) |
| 4 | 0 | - | SSEL0 (Frequency table selection by software via I ² C) |
| 3 | 0 | - | 0 = Selection by hardware 1 = Selection by software I ² C - Bit 6:4 |
| 2 | 0 | - | 0 = Spread Spectrum center spread type 1 = Spread Spectrum down spread type |
| 1 | 0 | - | 0 = Normal 1 = Spread Spectrum enabled |
| 0 | 0 | - | 0 = Running 1 = Tristate all outputs |

Frequency table selection by software via I²C

| SSEL2 | SSEL1 | SSEL0 | CPU, SDRAM (MHz) | PCI (MHz) | REF, IOAPIC (MHz) |
|-------|-------|-------|------------------|-----------|-------------------|
| 0 | 0 | 0 | 50 | 25 | 14.318 |
| 0 | 0 | 1 | 75 | 32 | 14.318 |
| 0 | 1 | 0 | 83.3 | 41.65 | 14.318 |
| 0 | 1 | 1 | 68.5 | 34.25 | 14.318 |
| 1 | 0 | 0 | 83.3 | 33.3 | 14.318 |
| 1 | 0 | 1 | 75 | 37.5 | 14.318 |
| 1 | 1 | 0 | 60 | 30 | 14.318 |
| 1 | 1 | 1 | 66.8 | 33.4 | 14.318 |

FUNCTION TABLE

| FUNCTION DESCRIPTION | OUTPUTS | | | | |
|-------------------------|-----------|-----------|-------|--------|--------|
| | CPU | PCI | SDRAM | REF | IOAPIC |
| TRI-STATE | Hi-Z | Hi-Z | Hi-Z | Hi-Z | Hi-Z |
| NORMAL | See table | See table | CPU | 14.318 | 14.318 |

Preliminary W83193R-02/-04/-04A



8.3.2 Register 1: CPU, 48/24 MHz Clock Register (1 = Enable, 0 = Stopped)

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|----------------------------|
| 7 | 1 | - | Reserved |
| 6 | 1 | - | Reserved |
| 5 | 1 | - | Reserved |
| 4 | 1 | - | Reserved |
| 3 | 1 | 40 | CPUCLK3 (Active/ Inactive) |
| 2 | 1 | 41 | CPUCLK2 (Active/ Inactive) |
| 1 | 1 | 43 | CPUCLK1 (Active/ Inactive) |
| 0 | 1 | 44 | CPUCLK0 (Active/ Inactive) |

8.3.3 Register 2: PCI Clock Register (1 = Enable, 0 = Stopped)

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|-----------------------------|
| 7 | x | - | Reserved |
| 6 | 1 | 7 | PCICLK_F (Active/ Inactive) |
| 5 | 1 | 15 | PCICLK5 (Active/ Inactive) |
| 4 | 1 | 13 | PCICLK4 (Active/ Inactive) |
| 3 | 1 | 12 | PCICLK3 (Active/ Inactive) |
| 2 | 1 | 11 | PCICLK2 (Active/ Inactive) |
| 1 | 1 | 10 | PCICLK1 (Active/ Inactive) |
| 0 | 1 | 8 | PCICLK0 (Active/ Inactive) |

8.3.4 Register 3: SDRAM Clock Register (1 = Enable, 0 = Stopped)

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|---------------------------|
| 7 | 1 | 28 | SDRAM7 (Active/ Inactive) |
| 6 | 1 | 29 | SDRAM6 (Active/ Inactive) |
| 5 | 1 | 31 | SDRAM5 (Active/ Inactive) |
| 4 | 1 | 32 | SDRAM4 (Active/ Inactive) |
| 3 | 1 | 34 | SDRAM3 (Active/ Inactive) |
| 2 | 1 | 35 | SDRAM2 (Active/ Inactive) |
| 1 | 1 | 37 | SDRAM1 (Active/ Inactive) |
| 0 | 1 | 38 | SDRAM0 (Active/ Inactive) |

Preliminary W83193R-02/-04/-04A



8.3.5 Register 4: Additional SDRAM Clock Register (1 = Enable, 0 = Stopped)

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|----------------------------|
| 7 | x | - | Reserved |
| 6 | x | - | Reserved |
| 5 | x | - | Reserved |
| 4 | x | - | Reserved |
| 3 | 1 | 17 | SDRAM11 (Active/ Inactive) |
| 2 | 1 | 18 | SDRAM10 (Active/ Inactive) |
| 1 | 1 | 20 | SDRAM9 (Active/ Inactive) |
| 0 | 1 | 21 | SDRAM8 (Active/ Inactive) |

8.3.6 Register 5: Peripheral Control (1 = Enable, 0 = Stopped)

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|---------------------------|
| 7 | x | - | Reserved |
| 6 | x | - | Reserved |
| 5 | x | - | Reserved |
| 4 | 1 | 47 | IOAPIC (Active/ Inactive) |
| 3 | x | - | Reserved |
| 2 | x | - | Reserved |
| 1 | 1 | 46 | REF1 (Active/ Inactive) |
| 0 | 1 | 2 | REF0 (Active/ Inactive) |

8.3.7 Register 6: Reserved Register

| BIT | @POWERUP | PIN | DESCRIPTION |
|-----|----------|-----|-------------|
| 7 | x | - | Reserved |
| 6 | x | - | Reserved |
| 5 | x | - | Reserved |
| 4 | x | - | Reserved |
| 3 | x | - | Reserved |
| 2 | x | - | Reserved |
| 1 | x | - | Reserved |
| 0 | x | - | Reserved |

Preliminary W83193R-02/-04/-04A



9.0 SPECIFICATIONS

9.1 Absolute Maximum Ratings

Stresses greater than those listed in this table may cause permanent damage to the device. Precautions should be taken to avoid application of any voltage higher than the maximum rated voltages to this circuit. Maximum conditions for extended periods may affect reliability. Unused inputs must always be tied to an appropriate logic voltage level (Ground or VDD).

| PARAMETER | SYMBOL | RATING |
|--|-----------|-------------------|
| Voltage on any pin with respect to GND | VDD , VIN | -0.5V to +7.0V |
| Storage Temperature | TSTG | -65° C to +150° C |
| Ambient Temperature | TB | -55° C to +125° C |
| Operating Temperature | TA | 0° C to +70° C |

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

9.2 AC CHARACTERISTICS

VDD = VDDq3 = 3.3V ±5%, VDDq2 = VDDq2b = 2.375V~2.9V , TA = 0° C to +70° C

| PARAMETER | SYM. | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|---|--------------|------|------|------|-------|--|
| Output Duty Cycle | | 45 | 50 | 55 | % | Measured at 1.5V |
| CPU/SDRAM to PCI Offset | tOFF | 1 | | 4 | nS | 15 pF Load Measured at 1.5V |
| Skew (CPU-CPU), (PCI-PCI), (SDRAM-SDRAM) | tSKEW | | | 250 | pS | 15 pF Load Measured at 1.5V |
| CPU/SDRAM Cycle to Cycle Jitter | tCCJ | | | ±250 | pS | |
| CPU/SDRAM Absolute Jitter | tJA | | | 500 | pS | |
| Jitter Spectrum 20 dB Bandwidth from Center | BWJ | | | 500 | KHz | |
| Output Rise (0.4V–2.0V) & Fall (2.0V–0.4V) Time | tTLH tTHL | 0.4 | | 1.6 | nS | 15 pF Load on CPU and PCI outputs |
| Overshoot/Undershoot Beyond Power Rails | Vover | 0.7 | | 1.5 | V | 22 Ω at source of 8 inch PCB run to 15 pF load |
| Ring Back Exclusion | VRBE | 0.7 | | 2.1 | V | Ring Back must not enter this range. |

Preliminary W83193R-02/-04/-04A



9.3 DC Characteristics

V_{DD} = V_{DDq3} = 3.3V ±5%, V_{DDq2} = V_{DDq2b} = 2.375V~2.9V, T_A = 0° C to +70° C

| PARAMETER | SYM. | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|---|--------------------|------|------|------|-----------------|--|
| Input Low Voltage | V _{IL} | | | 0.8 | V _{dc} | |
| Input High Voltage | V _{IH} | 2.0 | | | V _{dc} | |
| Input Low Current | I _{IL} | | | -66 | μA | |
| Input High Current | I _{IH} | | | 5 | μA | |
| Output Low Voltage I _{OL} = 4 mA | V _{OL} | | | 0.4 | V _{dc} | All outputs |
| Output High Voltage I _{OH} = 4 mA | V _{OH} | 2.4 | | | V _{dc} | All outputs using 3.3V power |
| Tri-State Leakage Current | I _{OZ} | | | 10 | μA | |
| Dynamic Supply Current for V _{DD} + V _{DDq3} | I _{DD3} | | | | mA | CPU = 66.6 MHz PCI = 33.3 MHz with load |
| Dynamic Supply Current for V _{DDq2} + V _{DDq2b} | I _{DD2} | | | | mA | Same as above |
| CPU Stop Current for V _{DD} + V _{DDq3} | I _{CPUS3} | | | | mA | Same as above |
| CPU Stop Current for V _{DDq2} + V _{DDq2b} | I _{CPUS2} | | | | mA | Same as above |
| PCI Stop Current for V _{DD} + V _{DDq3} | I _{PD3} | | | | mA | |

9.4 Buffer Characteristics

9.4.1 Type 1 Buffer for CPU (0:3)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|--|------------------------|------|------|------|-------|-------------------------|
| Pull-up Current Min. | I _{OH} (min.) | -27 | | | mA | V _{out} = 1.0V |
| Pull-up Current Max. | I _{OH} (max.) | | | -27 | mA | V _{out} = 2.0V |
| Pull-down Current Min. | I _{OL} (min.) | TBD | | | mA | V _{out} = 1.2V |
| Pull-down Current Max. | I _{OL} (max.) | | | 27 | mA | V _{out} = 0.3V |
| Rise/Fall Time Min. Between 0.4V and 2.0V | T _{RF} (min.) | 0.4 | | | nS | 10 pF Load |
| Rise/Fall Time Max. Between 0.4V and 2.0V | T _{RF} (max.) | | | 1.6 | nS | 20 pF Load |

Preliminary W83193R-02/-04/-04A



9.4.2 Type 2 Buffer for IOAPIC

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|--|------------|------|------|------|-------|-----------------|
| Pull-up Current Min. | IOH (min.) | | | | mA | Vout = 1.4V |
| Pull-up Current Max. | IOH (max.) | | | -29 | mA | Vout = 2.7V |
| Pull-down Current Min. | IOL (min.) | | | | mA | Vout = 1.0V |
| Pull-down Current Max. | IOL (max.) | | | 28 | mA | Vout = 0.2V |
| Rise/Fall Time Min. Between 0.7V and 1.7V | TRF (min.) | 0.4 | | | nS | 10 pF Load |
| Rise/Fall Time Max. Between 0.7V and 1.7V | TRF (max.) | | | 1.8 | nS | 20 pF Load |

9.4.3 Type 3 Buffer for REF1, 24 MHz, 48 MHz

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|--|------------|------|------|------|-------|-----------------|
| Pull-up Current Min. | IOH (min.) | -29 | | | mA | Vout = 1.0V |
| Pull-up Current Max. | IOH (max.) | | | -23 | mA | Vout = 3.135V |
| Pull-down Current Min. | IOL (min.) | 29 | | | mA | Vout = 1.95V |
| Pull-down Current Max. | IOL (max.) | | | | mA | Vout = 0.4V |
| Rise/Fall Time Min. Between 0.8V and 2.0V | TRF (min.) | 1.0 | | | nS | 10 pF Load |
| Rise/Fall Time Max. Between 0.8V and 2.0V | TRF (max.) | | | 4.0 | nS | 20 pF Load |

9.4.4 Type 4 Buffer for REF0 and SDRAM (0:11)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|--|------------|------|------|------|-------|-----------------|
| Pull-up Current Min. | IOH (min.) | | | | mA | Vout = 1.65V |
| Pull-up Current Max. | IOH (max.) | | | -46 | mA | Vout = 3.135V |
| Pull-down Current Min. | IOL (min.) | | | | mA | Vout = 1.65V |
| Pull-down Current Max. | IOL (max.) | | | 53 | mA | Vout = 0.4V |
| Rise/Fall Time Min. Between 0.8V and 2.0V | TRF (min.) | 0.5 | | | nS | 20 pF Load |
| Rise/Fall Time Max. Between 0.8V and 2.0V | TRF (max.) | | | 1.3 | nS | 30 pF Load |

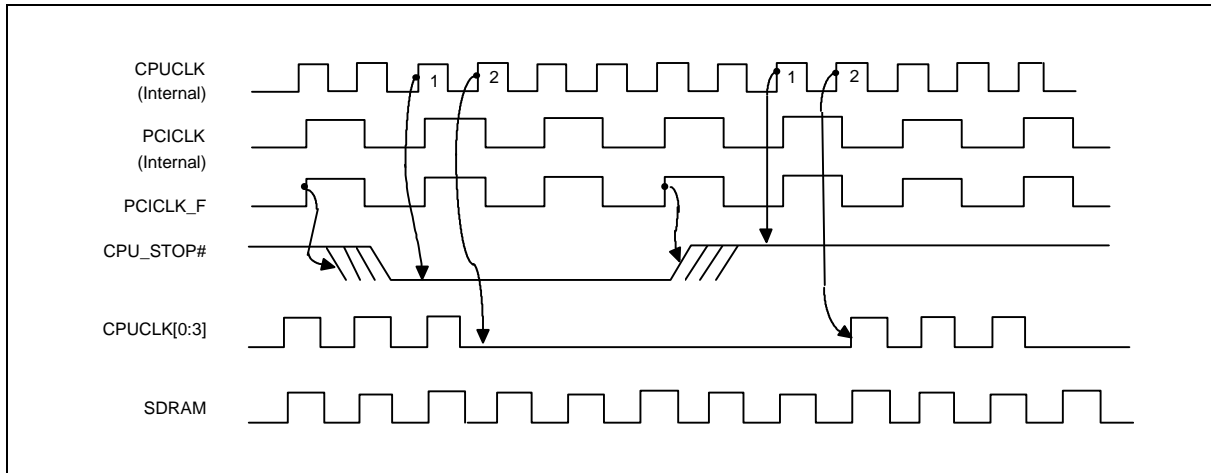


9.4.5 Type 5 Buffer for PCICLK (0:5, F)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
|--|------------------------|------|------|------|-------|---------------------------|
| Pull-up Current Min. | I _{OH} (min.) | -33 | | | mA | V _{out} = 1.0V |
| Pull-up Current Max. | I _{OH} (max.) | | | -33 | mA | V _{out} = 3.135V |
| Pull-down Current Min. | I _{OL} (min.) | 30 | | | mA | V _{out} = 1.95V |
| Pull-down Current Max. | I _{OL} (max.) | | | 38 | mA | V _{out} = 0.4V |
| Rise/Fall Time Min. Between 0.8V and 2.0V | T _{RF} (min.) | 0.5 | | | nS | 15 pF Load |
| Rise/Fall Time Max. Between 0.8V and 2.0V | T _{RF} (max.) | | | 2.0 | nS | 30 pF Load |

10.0 POWER MANAGEMENT TIMING

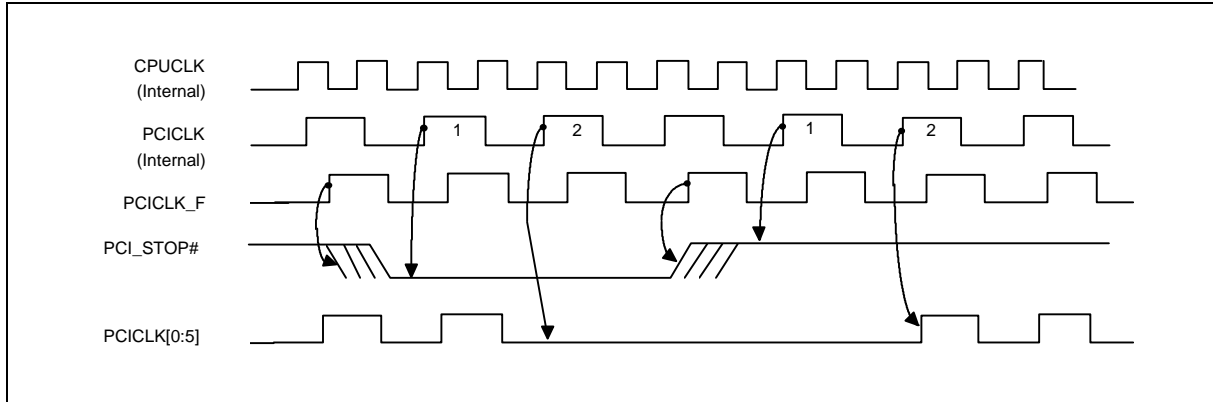
10.1 CPU_STOP# Timing Diagram (synchronous)



For synchronous Chipset, CPU_STOP# pin is a synchronous "active low" input pin used to stop the CPU clocks for low power operation. This pin is asserted synchronously by the external control logic at the rising edge of free running PCI clock(PCICLK_F). All other clocks will continue to run while the CPU clocks are stopped. The CPU clocks will always be stopped in a low state and resume output with full pulse width. In this case, CPU "clocks on latency" is less than 2 CPU clocks and "clocks off latency" is less than 2 CPU clocks.



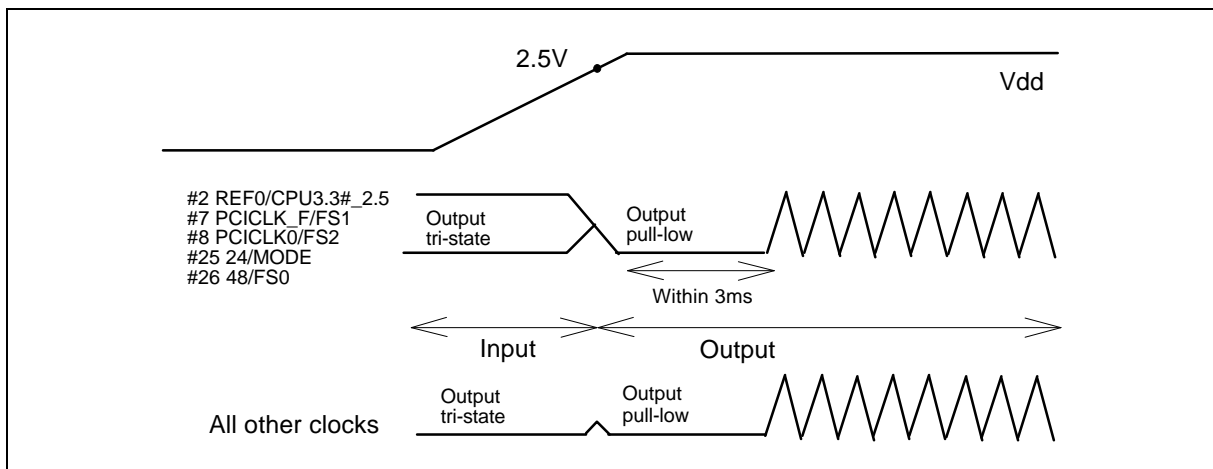
10.2 PCI_STOP# Timing Diagram (synchronous)



For synchronous Chipset, PCI_STOP# pin is a synchronous active low” input pin used to stop the PCICLK [0:5] for low power operation. This pin is asserted synchronously by the external control logic at the rising edge of free running PCI clock(PCICLK_F). All other clocks will continue to run while the PCI clocks are stopped. The PCI clocks will always be stopped in a low state and resume output with full pulse width. In this case, PCI clocks on latency“ is less than 1 PCI clocks and clocks off latency” is less then 1 PCI clocks.

11.0 OPERATION OF DUAL FUCTION PINS

Pins 2, 7, 8, 25, and 26 are dual function pins and are used for selecting different functions in this device (see Pin description). During power up, these pins are in input mode (see Figure 1), therefore, and are considered input select pins. When VDD reaches 2.5V, the logic level that is present on these pins are latched into their appropriate internal registers. Once the correct information are properly latched, these pins will change into output pins and will be pulled low by default. At the end of the power up timer (within 3 mS) outputs starts to toggle at the specified frequency.



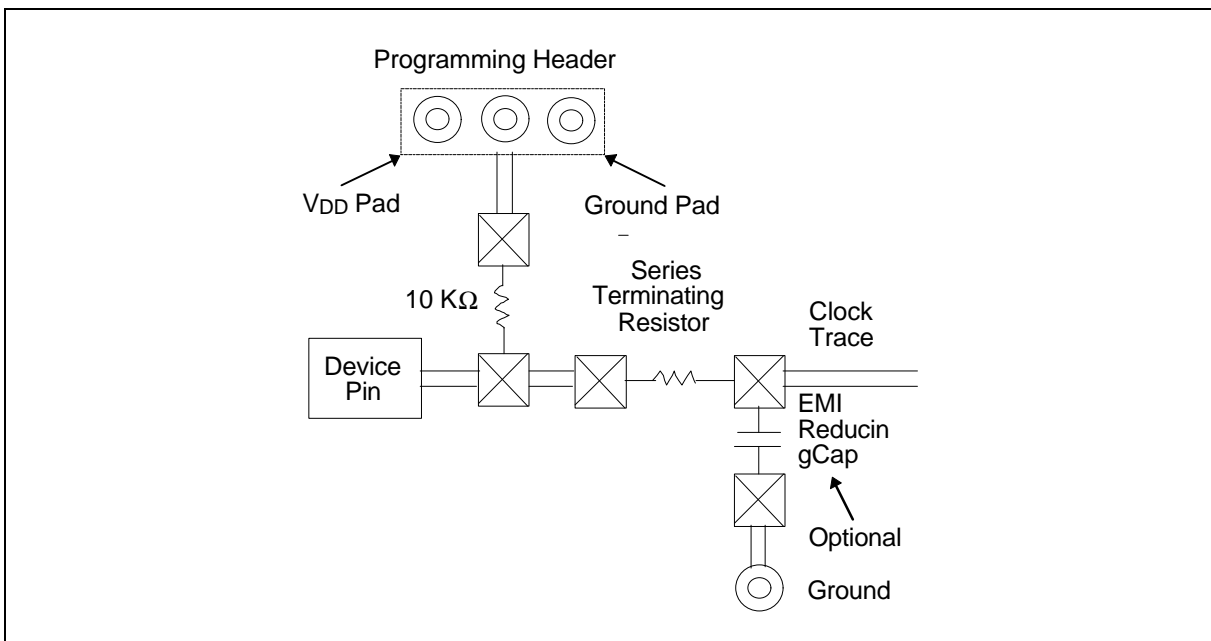
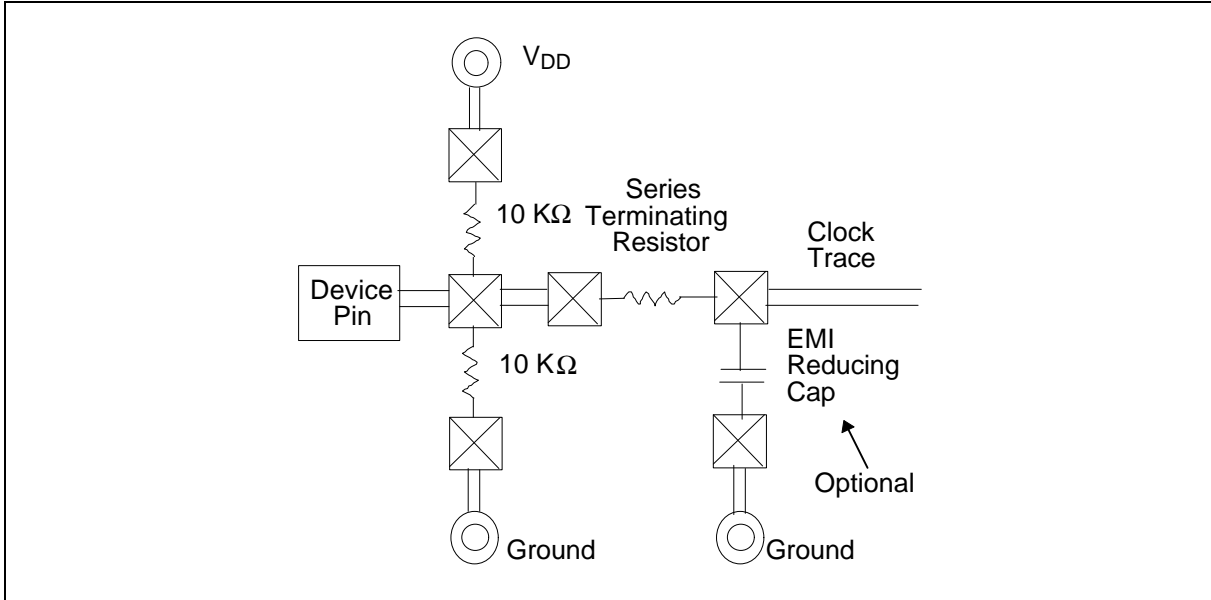
Each of these pins are a large pull-up resistor (250 KΩ @3.3V) inside. The default state will be logic 1, but the internal pull-up resistor may be too large when long traces or heavy load appear on these dual function pins. Under these conditions, an external 10 KΩ resistor is recommended to be

Preliminary W83193R-02/-04/-04A



connected to V_{DD} if logic 1 is expected. Otherwise, the direct connection to ground if a logic 0 is desired. The $10\text{ K}\Omega$ resistor should be placed before the series terminating resistor. Note that these logic will only be latched at initial power on.

If optional EMI reducing capacitor are needed, they should be placed as close to the series terminating resistor as possible and after the series terminating resistor. These capacitor has typical values ranging from 4.7 pF to 22 pF .

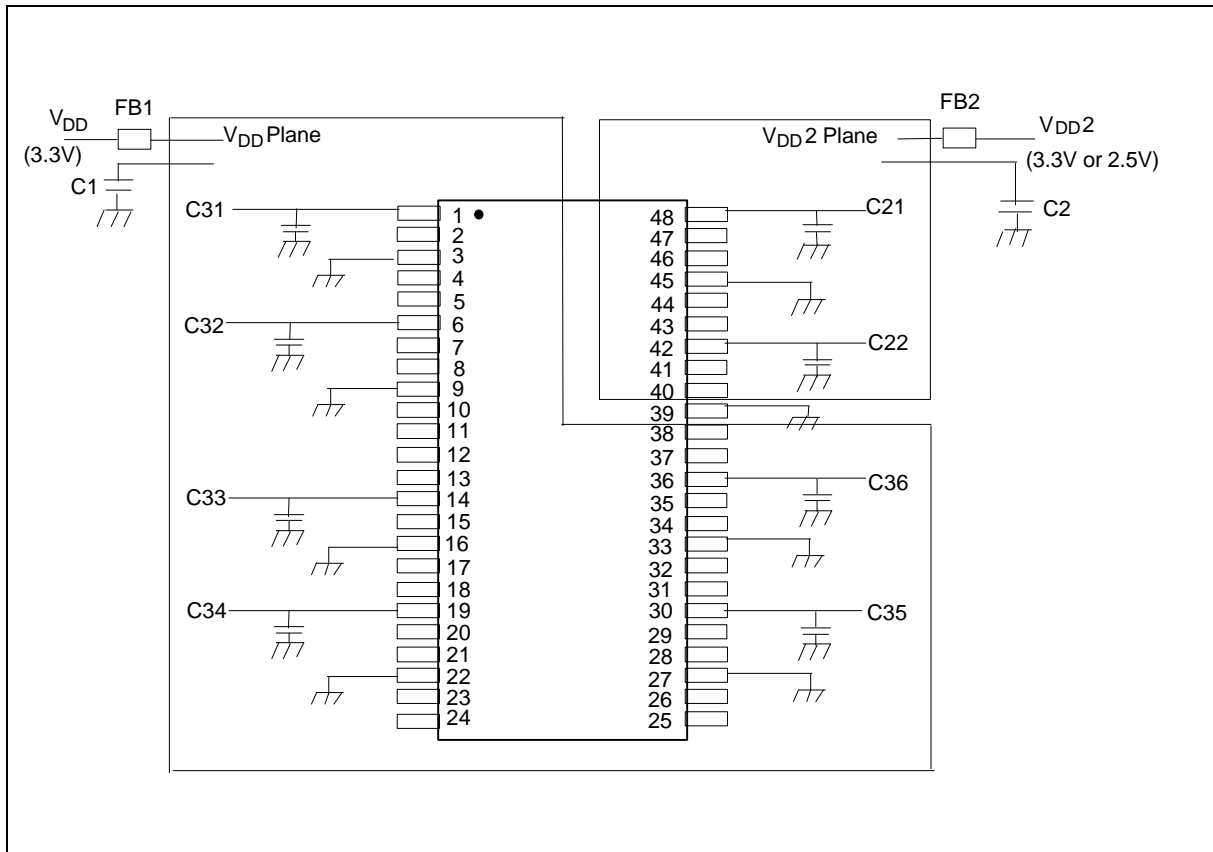


Preliminary W83193R-02/-04/-04A



12.0 POWER SUPPLY SUGGESTION

1. A solid ground plane should be placed around the clock device. Ground connections should be tied to this main ground plane as short as possible. No cuts should be made in the ground plane around the device.
2. C21,C22,C31,C36 are decoupling capacitors (0.1 μ F surface mount, low ESR, ceramic capacitors.) They should be placed as possible as the VDD pin and the ground via.
3. C1 and C2 are supply filtering capacitors for low frequency power supply noise. A 22 μ F (or 10 μ F) tantalum capacitor is recommended.
4. Use of Ferrite Bead (FB) are recommended to further reduce the power supply noise.
5. The power supply trace to the VDD pins must be thick enough so that voltage drops across the trace resistance is negligible.



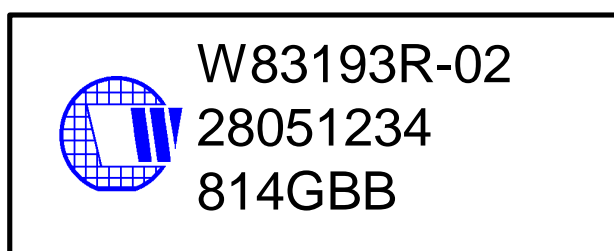
Preliminary W83193R-02/-04/-04A



13.0 ORDERING INFORMATION

| PART NUMBER | PACKAGE TYPE | PRODUCTION FLOW |
|----------------|--------------|----------------------------|
| W83193R-02/-04 | 48-pin SSOP | Commercial, 0° C to +70° C |

14.0 HOW TO READ THE TOP MARKING



1st line: Winbond logo and the type number: W83193R-02/-04

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

814: packages made in '98, week 14

G: assembly house ID; A means ASE, S means SPIL, G means GR

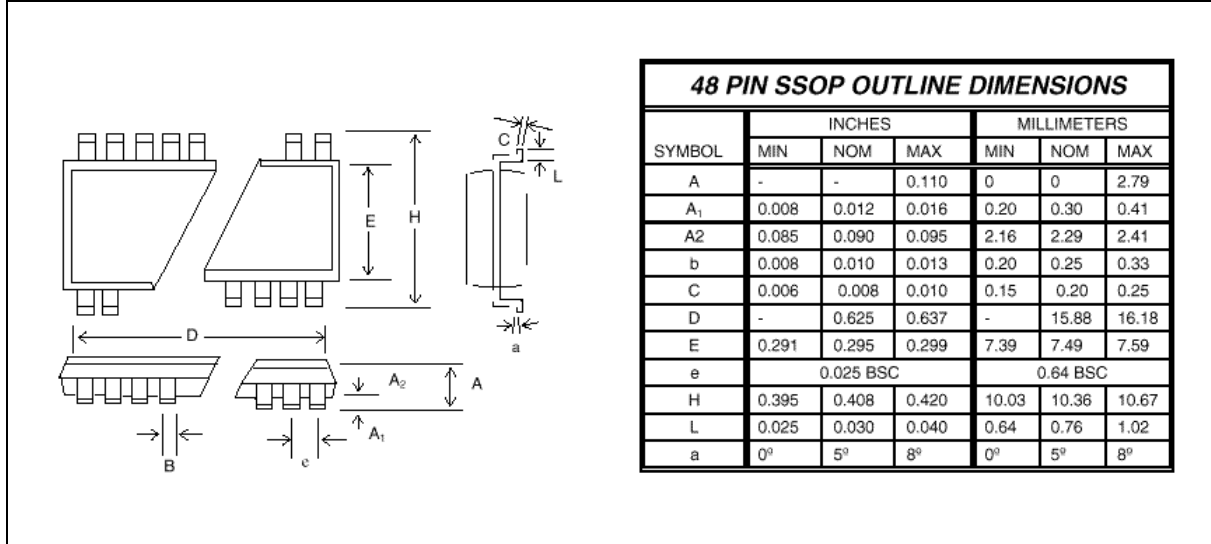
BB: IC revision

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15.0 PACKAGE DIMENSIONS



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