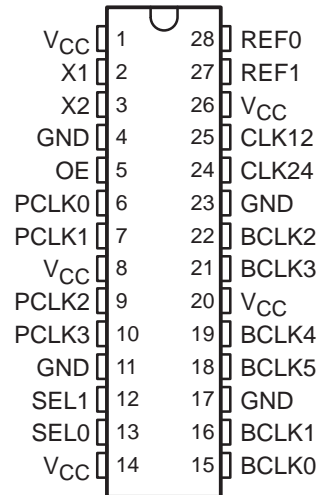


CDC9841 PC MOTHERBOARD CLOCK SYNTHESIZER/DRIVER WITH 3-STATE OUTPUTS

SCAS458D – DECEMBER 1994 – REVISED APRIL 1996

- Four CPU Clock Outputs With Programmable Frequency (50 MHz, 60 MHz, and 66 MHz)
- Six Clock Outputs at Half-CPU Frequency for PCI
- One 24-MHz Clock Output
- One 12-MHz Clock Output
- Two 14.318-MHz Reference Outputs
- All Output Clock Frequencies Derived From a Single 14.31818-MHz Crystal Input
- LVTTTL-Compatible Inputs and Outputs
- Internal Loop Filters for Phase-Lock Loops Eliminate the Need for External Components
- Operates at 3.3 V_{CC}
- Distributed V_{CC} and Ground Pins Reduce Switching Noise
- Packaged in Plastic Small-Outline Package

DW PACKAGE
(TOP VIEW)



description

The CDC9841 is a high-performance clock synthesizer/driver that generates all required clock signals necessary for a high-performance PC motherboard. The four central processing unit (CPU) clock outputs (PCLKn) are programmable to one of three frequencies (50 MHz, 60 MHz, or 66 MHz) via the SEL0 and SEL1 control inputs. The six peripheral-component-interconnect (PCI) clock outputs (BCLKn) are half the frequency of PCLKn and are delayed 1 ns to 4 ns from the rising edge of the CPU clock. In addition, the four fixed-frequency outputs provide a 24-MHz clock (CLK24), a 12-MHz clock (CLK12), and two buffered copies of the 14.318-MHz input reference (REF0, REF1).

The CDC9841 generates all output frequencies from a 14.31818-MHz crystal input. A reference clock can be provided at X1 instead of a crystal input.

Two phase-lock loops (PLLs) generate the CPU clock frequency and the 24-MHz clock frequency. On-chip loop filters and internal feedback eliminate the need for external components. The PCI and 12-MHz clock frequencies are derived from the base CPU and 24-MHz clock frequencies, respectively. The PLL circuit can be bypassed in the TEST mode (i.e., SEL0 = SEL1 = H) to distribute a test clock provided at the X1 input. Because the CDC9841 is based on PLL circuitry, it requires a stabilization time to achieve phase lock of the PLL. This stabilization time is required following power up and application of a fixed-frequency, fixed-phase signal at the X1 input, as well as following any changes to the SELn inputs.

PCLKn and BCLKn provide low-skew/low-jitter clock signals for reliable clock operation. All outputs are 3 state and are enabled via OE.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1996, Texas Instruments Incorporated

CDC9841

PC MOTHERBOARD CLOCK SYNTHESIZER/DRIVER

WITH 3-STATE OUTPUTS

SCAS458D – DECEMBER 1994 – REVISED APRIL 1996

FUNCTION TABLE

| OE | SEL0 | SEL1 | X1 | PCLKn | BCLKn | REFn | CLK24 | CLK12 |
|----|------|------|-------------------|--------|--------|------------|--------|--------|
| L | X | X | 14.31818 MHz | Hi-Z | Hi-Z | Hi-Z | Hi-Z | Hi-Z |
| H | L | L | 14.31818 MHz | 50 MHz | 25 MHz | 14.318 MHz | 24 MHz | 12 MHz |
| H | L | H | 14.31818 MHz | 60 MHz | 30 MHz | 14.318 MHz | 24 MHz | 12 MHz |
| H | H | L | 14.31818 MHz | 66 MHz | 33 MHz | 14.318 MHz | 24 MHz | 12 MHz |
| H | H | H | TCLK [†] | TCLK/2 | TCLK/4 | TCLK | TCLK/4 | TCLK/8 |

[†] TCLK is a test clock input at the X1 input during test mode.



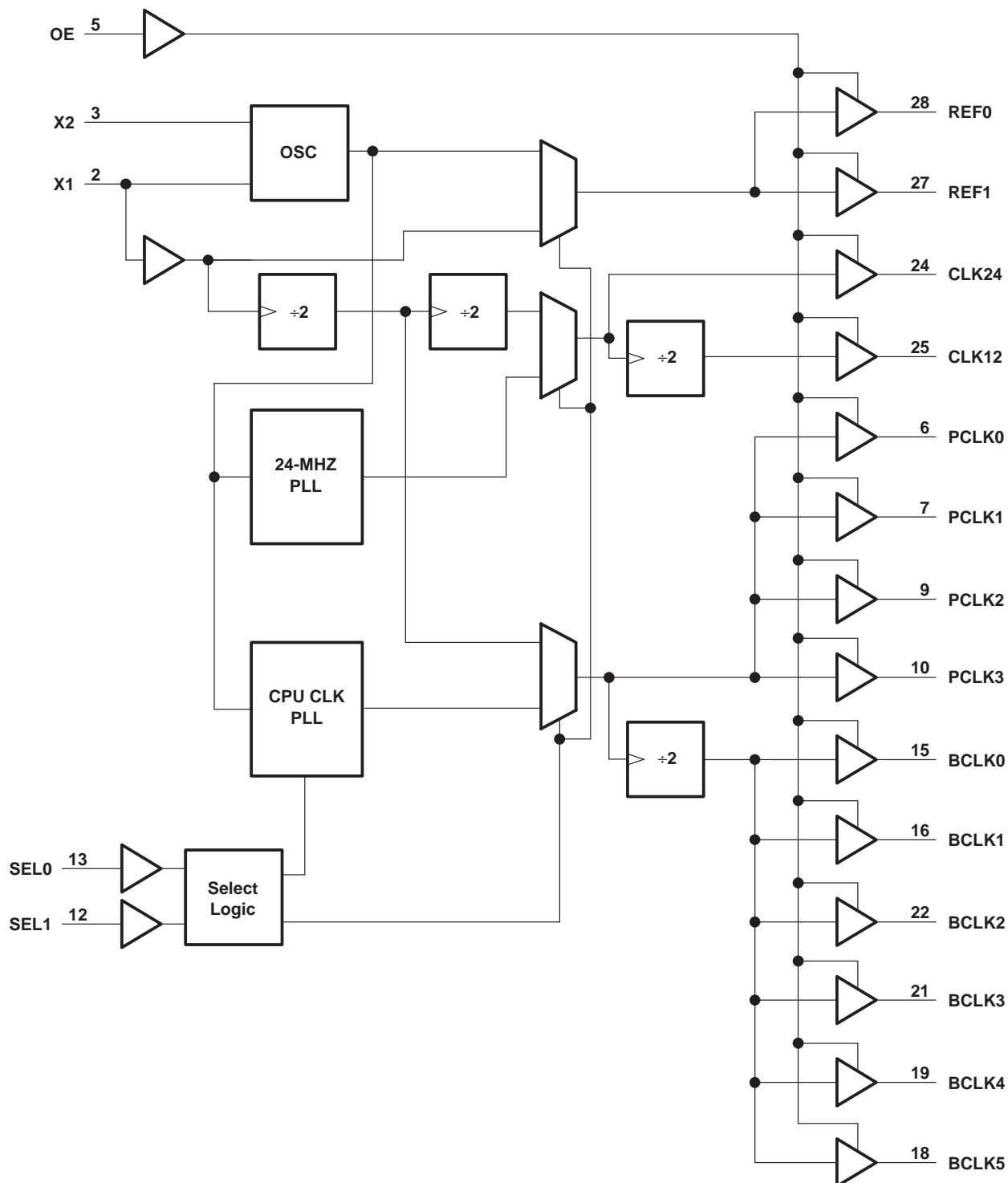
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

CDC9841

PC MOTHERBOARD CLOCK SYNTHESIZER/DRIVER WITH 3-STATE OUTPUTS

SCAS458D – DECEMBER 1994 – REVISED APRIL 1996

functional block diagram



CDC9841

PC MOTHERBOARD CLOCK SYNTHESIZER/DRIVER

WITH 3-STATE OUTPUTS

SCAS458D – DECEMBER 1994 – REVISED APRIL 1996

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

| | |
|---|----------------------------|
| Supply voltage range, V_{CC} | –0.5 V to 4.6 V |
| Input voltage range, V_I (see Note 1) | –0.5 V to 4.6 V |
| Voltage range applied to any output in the high state or power-off state, V_O (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Current into any output in the low state, I_O | $2 \times I_{OHmax}$ |
| Input clamp current, I_{IK} ($V_I < 0$) | –18 mA |
| Output clamp current, I_{OK} ($V_O < 0$) | –50 mA |
| Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2) | 1.2 W |
| Storage temperature range, T_{stg} | –65°C to 150°C |

[†] Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note in the 1994 *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002B.

recommended operating conditions (see Note 3)

| | | MIN | MAX | UNIT |
|----------|--------------------------------|--------------|----------|------|
| V_{CC} | Supply voltage | 3.135 | 3.6 | V |
| V_{IH} | High-level input voltage | 2 | | V |
| V_{IL} | Low-level input voltage | | 0.8 | V |
| V_I | Input voltage | 0 | V_{CC} | V |
| I_{OH} | High-level output current | REF0 | –12 | mA |
| | | REF1 | –8 | |
| | | PCLKn | –6 | |
| | | BCLKn | –12 | |
| | | CLK24, CLK12 | –4 | |
| I_{OL} | Low-level output current | REF0 | 12 | mA |
| | | REF1 | 8 | |
| | | PCLKn | 6 | |
| | | BCLKn | 12 | |
| | | CLK24, CLK12 | 4 | |
| T_A | Operating free-air temperature | 0 | 70 | °C |

NOTE 3: Unused inputs must be held high or low to prevent them from floating.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

CDC9841
PC MOTHERBOARD CLOCK SYNTHESIZER/DRIVER
WITH 3-STATE OUTPUTS

SCAS458D – DECEMBER 1994 – REVISED APRIL 1996

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | | MIN | MAX | UNIT |
|-----------|--|--------------------------|------------------|-----|----------|---------------|
| V_{IK} | $V_{CC} = 3.135\text{ V}$, | $I_I = -18\text{ mA}$ | | | -1.2 | V |
| V_{OH} | $V_{CC} = 3.135\text{ V}$ | $I_{OH} = -12\text{ mA}$ | REF0 | 2.5 | | V |
| | | $I_{OH} = -8\text{ mA}$ | REF1 | 2.5 | | |
| | | $I_{OH} = -6\text{ mA}$ | PCLKn | 2.5 | | |
| | | $I_{OH} = -12\text{ mA}$ | BCLKn | 2.5 | | |
| | | $I_{OH} = -4\text{ mA}$ | CLK24, CLK12 | 2.5 | | |
| V_{OL} | $V_{CC} = 3.135\text{ V}$ | $I_{OL} = 12\text{ mA}$ | REF0 | | 0.4 | V |
| | | $I_{OL} = 8\text{ mA}$ | REF1 | | 0.4 | |
| | | $I_{OL} = 6\text{ mA}$ | PCLKn | | 0.4 | |
| | | $I_{OL} = 12\text{ mA}$ | BCLKn | | 0.4 | |
| | | $I_{OL} = 4\text{ mA}$ | CLK24, CLK12 | | 0.4 | |
| I_I | $V_{CC} = 3.6\text{ V}$, | $V_I = V_{CC}$ or GND | | | ± 1 | μA |
| I_{OZ} | $V_{CC} = 3.6\text{ V}$, | $V_O = V_{CC}$ or GND | | | ± 10 | μA |
| I_{CC} | $V_{CC} = 3.6\text{ V}$, $V_I = V_{CC}$ or GND | $I_O = 0$, | Outputs enabled† | | 50 | mA |
| | | | Outputs disabled | | 1 | |
| C_i | $V_I = V_{CC}$ or GND | | | | | pF |
| C_o | $V_O = V_{CC}$ or GND | | | | | pF |
| C_{pd} | $V_I = 3\text{ V}$ or 0 | | | | | pF |

† Device in normal operating mode with no load on outputs

timing requirements over recommended ranges of supply voltage and operating free-air temperature

| | | MIN | MAX | UNIT |
|---------------------|------------------|-----|-----|------|
| Stabilization time‡ | After SEL1, SEL0 | | 5 | ms |
| | After OE↑ | | 5 | |
| | After power up | | 5 | |

‡ Time required for the integrated PLL circuit to obtain phase lock of its feedback signal to its reference signal. In order for phase lock to be obtained, a fixed-frequency, fixed-phase reference signal must be present at X1. Until phase lock is obtained, the specifications for propagation delay and skew parameters given in the switching characteristics table are not applicable.

CDC9841

PC MOTHERBOARD CLOCK SYNTHESIZER/DRIVER

WITH 3-STATE OUTPUTS

SCAS458D – DECEMBER 1994 – REVISED APRIL 1996

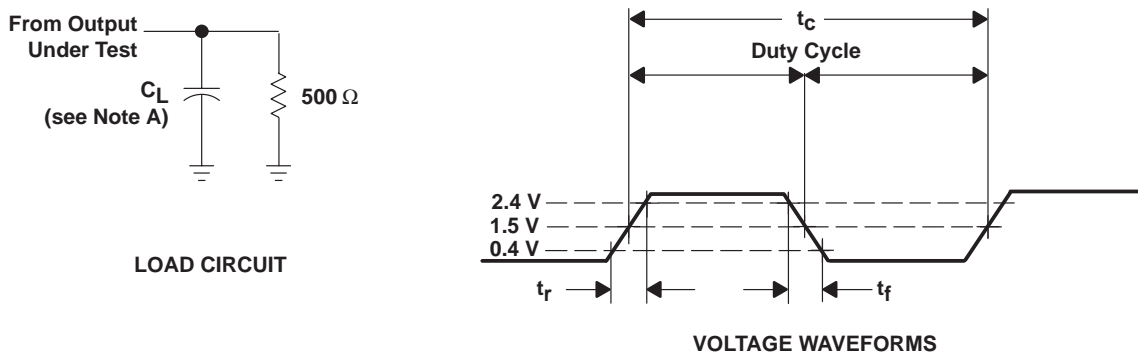
switching characteristics (see Figures 1 and 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 3.135 V to 3.6 V, T _A = 0°C to 70°C | | UNIT |
|--------------------------------|--------------------------------|--|--|------|------|
| | | | MIN | MAX | |
| t _{skew} [†] | | PCLKn (C _L = 20 pF) | | 200 | ps |
| | | BCLKn (C _L = 30 pF) | | 400 | |
| Offset [†] | PCLKn (C _L = 20 pF) | BCLKn (C _L = 30 pF) | 1 | 4 | ns |
| Jitter [†] | | PCLKn (C _L = 20 pF) | | ±250 | ps |
| | | BCLKn (C _L = 30 pF) | | ±350 | |
| Duty cycle [†] | | Any output | 45% | 55% | |
| t _c | | PCLKn (C _L = 20 pF) | SEL0 = L, SEL1 = L | 20 | ns |
| | | | SEL0 = L, SEL1 = H | 16.7 | |
| | | | SEL0 = H, SEL1 = L | 15 | |
| | | BCLKn (C _L = 30 pF) | SEL0 = L, SEL1 = L | 40 | |
| | | | SEL0 = L, SEL1 = H | 33.3 | |
| | | | SEL0 = H, SEL1 = L | 30 | |
| t _r ^{†‡} | | PCLKn (C _L = 20 pF), BCLKn (C _L = 30 pF) | | 2 | ns |
| t _f ^{†‡} | | PCLKn (C _L = 20 pF), BCLKn (C _L = 30 pF) | | 2 | ns |

[†] Specifications are applicable only after the PLL stabilization time has elapsed.

[‡] Rise and fall times are characterized using the load circuits shown in Figure 1.

PARAMETER MEASUREMENT INFORMATION CLOCK DRIVER CIRCUITS



- NOTES: A. C_L includes probe and jig capacitance.
B. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

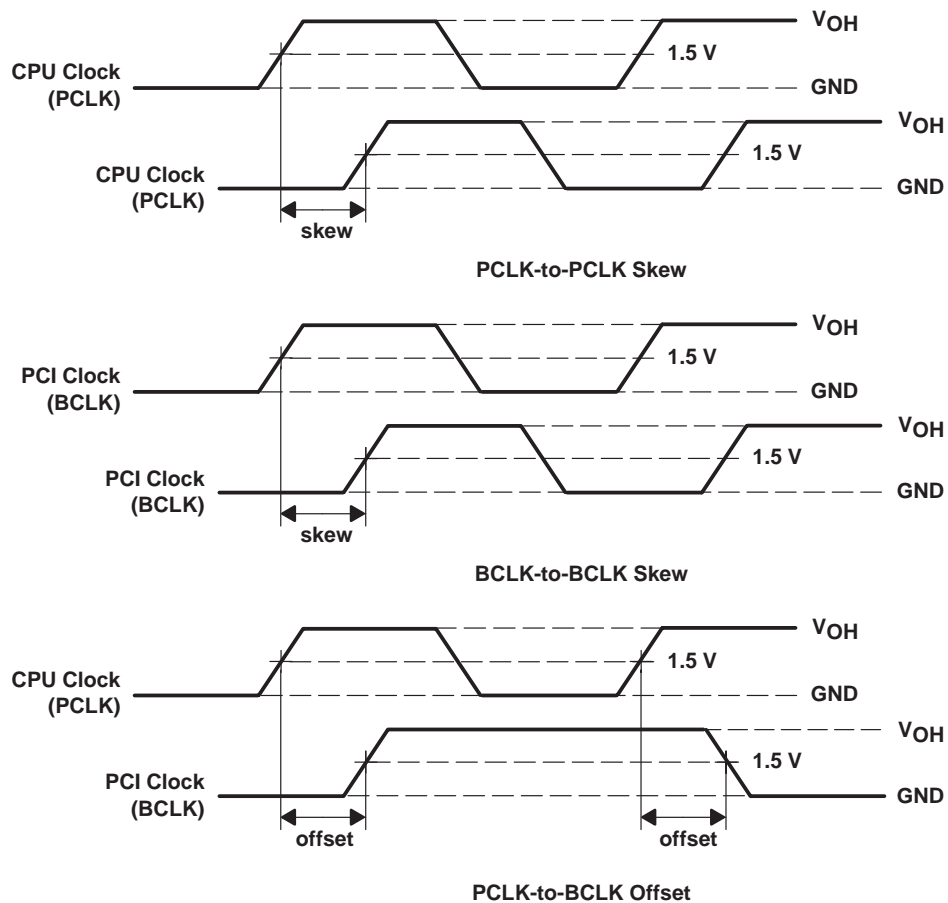


Figure 2. Waveforms for Calculation of t_{skew} and Offset

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.