



Frequency Generator & Integrated Buffers for PENTIUM/Pro™

General Description

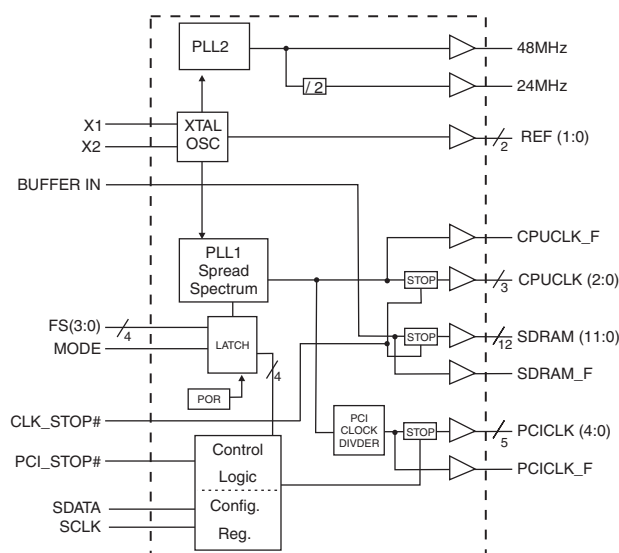
The ICS9248-127 is the single chip clock solution for Desktop designs using the VIA MVP4 and Aladdin 7 style chipset. It provides all necessary clock signals for such a system.

Spread spectrum may be enabled through I²C programming. Spread spectrum typically reduces system EMI by 8dB to 10dB. This simplifies EMI qualification without resorting to board design iterations or costly shielding. The ICS9248-127 employs a proprietary closed loop design, which tightly controls the percentage of spreading over process and temperature variations.

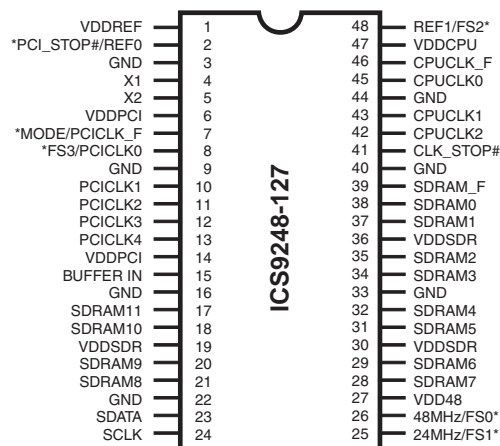
Features

- Up to 124MHz frequency support.
- Spread Spectrum for EMI control 0 to -0.5% down spread and $\pm 0.25\%$ center spread
- Serial I²C interface for Power Management, Frequency Select, Spread Spectrum.
- Provides the following system clocks
 - 4-CPU's @ 3.3V, up to 124MHz.
 - 13-SDRAMs @ 3.3V, up to 124MHz (including SDRAM_F)
 - 6-PCI (including 1 free running, PCICLK_F) @ 3.3V, CPU/2 or CPU/3.
 - 1-24MHz @ 3.3V fixed.
 - 1-48MHz @ 3.3V fixed.
 - 2-REF @ 3.3V, 14.318MHz.
- Efficient Power management scheme through PCI and STOP CLOCKS.

Block Diagram



Pin Configuration



48-Pin SSOP

* Internal Pull-up Resistor of 240K to VDD

Power Groups

VDDCPU, GNDCPU = CPUCLKS, CPUCLK_F
VDDSDR, GNDS DR = SDRAMCLKS, SDRAM_F
VDDPCI, GNDCPU = PCICLKs, PCICLK_F
VDD48 = 48MHz, 24MHz
VDDREF, GNDREF = REF, X1, X2

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Pin Descriptions

| PIN NUMBER | PIN NAME | TYPE | DESCRIPTION |
|--|------------------------|------|--|
| 1, 6, 14, 19, 27, 30, 36, 47 | VDD | PWR | 3.3V power supply |
| 2 | REF0 | OUT | 14.318 Mhz reference clock. This REF output is the STRONGER buffer for ISA BUS loads |
| | PCI_STOP# ¹ | IN | Halts PCICLK clocks at logic 0 level, when input low (In mobile mode, MODE=0) |
| 3,9,16,22, 33,40,44 | GND | PWR | Ground |
| 4 | X1 | IN | Crystal input, has internal load cap (36pF) and feedback resistor from X2 |
| 5 | X2 | OUT | Crystal output, nominally 14.318MHz. |
| 7 | PCICLK_F | OUT | Free running PCI clock not affected by PCI_STOP# for power management. |
| | MODE ^{1, 2} | IN | pin 2 function select pin, 1=Desktop Mode, 0=Mobile Mode. Latched Input. |
| 8 | FS3 ¹ | IN | Frequency select pin. Latched Input. |
| | PCICLK0 | OUT | PCI clock outputs. Synchronous to CPU clocks with 1-4ns skew (CPU early) |
| 13, 12, 11, 10 | PCICLK (4:1) | OUT | PCI clock outputs. Synchronous to CPU clocks with 1-4ns skew (CPU early) |
| 15 | BUFFER IN | IN | Input to Fanout Buffers for SDRAM outputs. |
| 17, 18, 20, 21, 28, 29, 31, 32, 34, 35, 37, 38 | SDRAM (11:0) | OUT | SDRAM clock outputs, Fanout Buffer outputs from BUFFER IN pin (controlled by chipset). |
| 23 | SDATA | I/O | Data pin for I ² C circuitry 5V tolerant |
| 24 | SCLK | IN | Clock pin of I ² C circuitry 5V tolerant |
| 25 | 24MHz | OUT | 24MHz output clock |
| | FS1 ^{1, 2} | IN | Frequency select pin. Latched Input. |
| 26 | 48MHz | OUT | 48MHz output clock |
| | FS0 ^{1, 2} | IN | Frequency select pin. Latched Input |
| 39 | SDRAM_F | OUT | Free running SDRAM clock output. Not affected by CPU_STOP# |
| 41 | CLK_STOP# | IN | This asynchronous input halts CPUCLK & SDRAM at logic "0" level when driven low. |
| 42, 43, 45 | CPUCLK (2:0) | OUT | CPU clock outputs, powered by VDDCPU |
| 46 | CPUCLK_F | OUT | Free running CPU clock. Not affected by the CPU_STOP# |
| 48 | REF1 | OUT | 14.318 MHz reference clock. |
| | FS2 ^{1, 2} | IN | Frequency select pin. Latched Input |

Notes:

- 1: Internal Pull-up Resistor of 240K to 3.3V on indicated inputs
- 2: Bidirectional input/output pins, input logic levels are latched at internal power-on-reset. Use 10Kohm resistor to program logic Hi to VDD or GND for logic low.



Mode Pin - Power Management Input Control

| MODE (Latched Input) | Pin 2 |
|-------------------------|----------------------|
| 0 | PCI_STOP# (Input) |
| 1 | REF0 (Output) |

Functionality

$V_{DD1,2,3} = 3.3V \pm 5\%$, $T_A = 0$ to $70^\circ C$

Crystal (X1, X2) = 14.31818MHz

| FS3 | FS2 | FS1 | FS0 | CPU (MHz) | PCI (MHz) |
|-----|-----|-----|-----|--------------|--------------|
| 0 | 0 | 0 | 0 | 124.00 | 41.33 |
| 0 | 0 | 0 | 1 | 120.00 | 40.00 |
| 0 | 0 | 1 | 0 | 114.99 | 38.33 |
| 0 | 0 | 1 | 1 | 109.99 | 36.66 |
| 0 | 1 | 0 | 0 | 105.00 | 35.00 |
| 0 | 1 | 0 | 1 | 83.31 | 41.65 |
| 0 | 1 | 1 | 0 | 80.00 | 40.00 |
| 0 | 1 | 1 | 1 | 75.00 | 37.50 |
| 1 | 0 | 0 | 0 | 100.00 | 33.33 |
| 1 | 0 | 0 | 1 | 95.19 | 31.73 |
| 1 | 0 | 1 | 0 | 83.31 | 27.77 |
| 1 | 0 | 1 | 1 | 97.00 | 32.33 |
| 1 | 1 | 0 | 0 | 90.00 | 30.00 |
| 1 | 1 | 0 | 1 | 70.00 | 35.00 |
| 1 | 1 | 1 | 0 | 66.82 | 33.41 |
| 1 | 1 | 1 | 1 | 60.00 | 30.00 |



Serial Configuration Command Bitmap

Byte0: Functionality and Frequency Select Register (default = 0)

| Bit | Description | | | PWD |
|--------------|---|--------------|--------------|----------------|
| Bit 7 | 0 - $\pm 0.25\%$ Center Spread Spectrum Modulation 1 - 0 to -0.5% Down Spread Spectrum Modulation | | | 1 |
| Bit [2, 6:4] | Bit [2, 6:4] | CPUCLK (MHz) | PCICLK (MHz) | Note1 0,010 |
| | 0000 | 124.00 | 41.33 | |
| | 0001 | 120.00 | 40.00 | |
| | 0010 | 114.99 | 38.33 | |
| | 0011 | 109.99 | 36.66 | |
| | 0100 | 105.00 | 35.00 | |
| | 0101 | 83.31 | 41.65 | |
| | 0110 | 80.00 | 40.00 | |
| | 0111 | 75.00 | 37.50 | |
| | 1000 | 100.00 | 33.33 | |
| | 1001 | 95.19 | 31.73 | |
| | 1010 | 83.31 | 27.77 | |
| | 1011 | 97.00 | 32.33 | |
| | 1100 | 90.00 | 30.00 | |
| | 1101 | 70.00 | 35.00 | |
| | 1110 | 66.82 | 33.41 | |
| | 1111 | 60.00 | 30.00 | |
| Bit 3 | 0 - Frequency is selected by hardware select, latched inputs 1 - Frequency is selected by Bit [2, 6:4] | | | 0 |
| Bit 1 | 0 - Normal 1 - Spread Spectrum Enabled | | | Note 2 1 |
| Bit 0 | 0 - Running 1- Tristate all outputs | | | 0 |

Note 1. Default at Power-up will be for latched logic inputs to define frequency.

I²C readback of the power up default indicate the revision ID code in bit 2, 6:4 as shown.

Note 2. To ensure normal operation, Bit 7 needs to be "0" when in non - spread spectrum mode (Bit 1 = 0).

Note: PWD = Power-Up Default.



Byte 1: CPU, Active/Inactive Register (1 = enable, 0 = disable)

| Bit | Pin # | PWD | Description |
|-------|-------|-----|----------------------|
| Bit 7 | - | X | Latched FS2# |
| Bit 6 | 46 | 1 | CPUCLK_F (Act/Inact) |
| Bit 5 | - | 1 | (Reserved) |
| Bit 4 | - | 1 | (Reserved) |
| Bit 3 | 39 | 1 | SDRAM_F (Act/Inact) |
| Bit 2 | 42 | 1 | CPUCLK2 (Act/Inact) |
| Bit 1 | 43 | 1 | CPUCLK1 (Act/Inact) |
| Bit 0 | 45 | 1 | CPUCLK0 (Act/Inact) |

Byte 2: PCI Active/Inactive Register (1 = enable, 0 = disable)

| Bit | Pin # | PWD | Description |
|-------|-------|-----|----------------------|
| Bit 7 | - | X | Latched FS0# |
| Bit 6 | 7 | 1 | PCICLK_F (Act/Inact) |
| Bit 5 | - | 1 | (Reserved) |
| Bit 4 | 13 | 1 | PCICLK4 (Act/Inact) |
| Bit 3 | 12 | 1 | PCICLK3 (Act/Inact) |
| Bit 2 | 11 | 1 | PCICLK2 (Act/Inact) |
| Bit 1 | 10 | 1 | PCICLK1 (Act/Inact) |
| Bit 0 | 8 | 1 | PCICLK0 (Act/Inact) |

Byte 3: SDRAM Active/Inactive Register (1 = enable, 0 = disable)

| Bit | Pin # | PWD | Description |
|-------|-------|-----|---------------------------|
| Bit 7 | 17 | 1 | SDRAM11 (Active/Inactive) |
| Bit 6 | 18 | 1 | SDRAM10 (Active/Inactive) |
| Bit 5 | 20 | 1 | SDRAM9 (Active/Inactive) |
| Bit 4 | 21 | 1 | SDRAM8 (Active/Inactive) |
| Bit 3 | 28 | 1 | SDRAM7 (Active/Inactive) |
| Bit 2 | 29 | 1 | SDRAM6 (Active/Inactive) |
| Bit 1 | 31 | 1 | SDRAM5 (Active/Inactive) |
| Bit 0 | 32 | 1 | SDRAM4 (Active/Inactive) |

Notes:

1. Inactive means outputs are held LOW and are disabled from switching.
2. Latched Frequency Selects (FS#) will be inverted logic load of the input frequency select pin conditions.

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Byte 4: Reserved Active/Inactive Register (1 = enable, 0 = disable)

| Bit | Pin # | PWD | Description |
|-------|-------|-----|--------------|
| Bit 7 | - | 1 | (Reserved) |
| Bit 6 | - | 1 | (Reserved) |
| Bit 5 | - | 1 | (Reserved) |
| Bit 4 | - | 1 | (Reserved) |
| Bit 3 | - | X | Latched FS1# |
| Bit 2 | - | 1 | (Reserved) |
| Bit 1 | - | X | Latched FS3# |
| Bit 0 | - | 1 | (Reserved) |

Byte 5: Peripheral Active/Inactive Register (1 = enable, 0 = disable)

| Bit | Pin # | PWD | Description |
|-------|-------|-----|--------------------|
| Bit 7 | 34 | 1 | SDRAM3 (Act/Inact) |
| Bit 6 | 35 | 1 | SDRAM2 (Act/Inact) |
| Bit 5 | 37 | 1 | SDRAM1 (Act/Inact) |
| Bit 4 | 38 | 1 | SDRAM0 (Act/Inact) |
| Bit 3 | 26 | 1 | 48MHz (Act/Inact) |
| Bit 2 | 25 | 1 | 24MHz (Act/Inact) |
| Bit 1 | 48 | 1 | REF1 (Act/Inact) |
| Bit 0 | 2 | 1 | REF0 (Act/Inact) |

Notes:

1. Inactive means outputs are held LOW and are disabled from switching.
2. Latched Frequency Selects (FS#) will be inverted logic load of the input frequency select pin conditions.



Absolute Maximum Ratings

| | |
|-------------------------------------|--------------------------------|
| Supply Voltage | 5.5 V |
| Logic Inputs | GND –0.5 V to $V_{DD} + 0.5$ V |
| Ambient Operating Temperature | 0°C to +70°C |
| Case Temperature | 115°C |
| Storage Temperature | –65°C to +150°C |

Stresses above those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These ratings are stress specifications only and functional operation of the device at these or any other conditions above those listed in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Electrical Characteristics - Input/Supply/Common Output Parameters

$T_A = 0 - 70^\circ\text{C}$; Supply Voltage $V_{DD} = 3.3$ V $\pm 5\%$ (unless otherwise stated)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------------------|---------------|--|----------------|--------|----------------|-------|
| Input High Voltage | V_{IH} | | 2 | | $V_{DD} + 0.3$ | V |
| Input Low Voltage | V_{IL} | | $V_{SS} - 0.3$ | | 0.8 | V |
| Supply Current | $I_{DD3.3}$ | $C_L = 0$ pF; Select @ 66M | | 77 | 180 | mA |
| Input frequency | F_i | $V_{DD} = 3.3$ V; | | 14.318 | | MHz |
| Input Capacitance ¹ | C_{IN} | Logic Inputs | | | 5 | pF |
| | C_{INX} | X1 & X2 pins | 27 | 36 | 45 | pF |
| Transition Time ¹ | T_{trans} | To 1st crossing of target Freq. | | 1.5 | 3 | ms |
| Settling Time ¹ | T_s | From 1st crossing to 1% target Freq. | | | | ms |
| Clk Stabilization ¹ | T_{STAB} | From $V_{DD} = 3.3$ V to 1% target Freq. | | | 3 | ms |
| Skew ¹ | $T_{CPU-BUS}$ | $V_T = 1.5$ V; | 1.0 | 2.2 | 4.0 | ns |

¹Guaranteed by design, not 100% tested in production.



Electrical Characteristics - CPU

$T_A = 0 - 70^\circ\text{C}$; $V_{DD}=3.3\text{V} \pm 5\%$; $C_L = 20\text{ pF}$ (unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------------------------|-----------------|---|------|------|------|----------|
| Output Impedance | R_{DSP2B}^1 | $V_O = V_{DD} * (0.5)$ | 10 | | 20 | Ω |
| Output Impedance | R_{DSN2B}^1 | $V_O = V_{DD} * (0.5)$ | 10 | | 20 | Ω |
| Output High Voltage | V_{OH2B} | $I_{OH} = -12\text{ mA}$ | 2.0 | 2.3 | | V |
| Output Low Voltage | V_{OL2B} | $I_{OL} = 12\text{ mA}$ | | 0.2 | 0.4 | V |
| Output High Current | I_{OH2B} | $V_{OH} = 1.7\text{ V}$ | | -41 | -19 | mA |
| Output Low Current | I_{OL2B} | $V_{OL} = 0.7\text{ V}$ | 19.0 | 37.0 | | mA |
| Rise Time ¹ | t_{r2B} | $V_{OL} = 0.4\text{ V}$, $V_{OH} = 2.4\text{ V}$ | 0.4 | 1.28 | 2.0 | ns |
| Fall Time ¹ | t_{f2B} | $V_{OH} = 2.4\text{ V}$, $V_{OL} = 0.4\text{ V}$ | 0.4 | 1.49 | 2.0 | ns |
| Duty Cycle ¹ | d_{t2B} | $V_T = 1.5\text{ V}$ | 48.0 | 54.8 | 58.0 | % |
| Skew window ¹ | t_{sk2B} | $V_T = 1.5\text{ V}$ | | 222 | 250 | ps |
| Jitter, Cycle-to-cycle ¹ | $t_{jcc-cyc2B}$ | $V_T = 1.5\text{ V}$ | | 152 | 250 | ps |

¹Guaranteed by design, not 100% tested in production.

Electrical Characteristics - 24MHz, 48MHz, REF

$T_A = 0 - 70^\circ\text{C}$; $V_{DD}=3.3\text{V} \pm 5\%$; $C_L = 20\text{ pF}$ (unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------------|--------------|---|-----|------|-----|----------|
| Output Impedance | R_{DSP5}^1 | $V_O = V_{DD} * (0.5)$ | 20 | | 60 | Ω |
| Output Impedance | R_{DSN5}^1 | $V_O = V_{DD} * (0.5)$ | 20 | | 60 | Ω |
| Output High Voltage | V_{OH5} | $I_{OH} = -14\text{ mA}$ | 2.4 | 2.9 | | V |
| Output Low Voltage | V_{OL5} | $I_{OL} = 6.0\text{ mA}$ | | 0.25 | 0.4 | V |
| Output High Current | I_{OH5} | $V_{OH} = 2.0\text{ V}$ | | -42 | -20 | mA |
| Output Low Current | I_{OL5} | $V_{OL} = 0.8\text{ V}$ | 10 | 18 | | mA |
| Rise Time ¹ | t_{r5} | $V_{OL} = 0.4\text{ V}$, $V_{OH} = 2.4\text{ V}$ | | 1.74 | 4.0 | ns |
| Fall Time ¹ | t_{f5} | $V_{OH} = 2.4\text{ V}$, $V_{OL} = 0.4\text{ V}$ | | 2.05 | 4.0 | ns |
| Duty Cycle ¹ | d_{t5} | $V_T = 1.5\text{ V}$, | 45 | 53.2 | 55 | % |
| Jitter ¹ | t_{jabs5} | $V_T = 1.5\text{ V}$ | | 307 | 800 | ps |

¹Guaranteed by design, not 100% tested in production.



Electrical Characteristics - PCI

$T_A = 0 - 70^\circ\text{C}$; $V_{DD}=3.3\text{V} \pm 5\%$; $C_L = 30\text{ pF}$ (unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--------------------------|---------------|---|-----|------|-----|----------|
| Output Impedance | R_{DSP1}^1 | $V_O = V_{DD} * (0.5)$ | 12 | 23 | 55 | Ω |
| Output Impedance | R_{DSN1}^1 | $V_O = V_{DD} * (0.5)$ | 12 | 20 | 55 | Ω |
| Output High Voltage | V_{OH1} | $I_{OH} = -18\text{ mA}$ | 2.4 | 2.9 | | V |
| Output Low Voltage | V_{OL1} | $I_{OL} = 9.4\text{ mA}$ | | 0.2 | 0.4 | V |
| Output High Current | I_{OH1} | $V_{OH} = 2.0\text{ V}$ | | -58 | -22 | mA |
| Output Low Current | I_{OL1} | $V_{OL} = 0.8\text{ V}$ | 25 | 52 | | mA |
| Rise Time ¹ | t_{r1} | $V_{OL} = 0.4\text{ V}$, $V_{OH} = 2.4\text{ V}$ | | 1.38 | 2.0 | ns |
| Fall Time ¹ | t_{f1} | $V_{OH} = 2.4\text{ V}$, $V_{OL} = 0.4\text{ V}$ | | 1.65 | 2.0 | ns |
| Duty Cycle ¹ | d_{t1} | $V_T = 1.5\text{ V}$ | 45 | 51.1 | 55 | % |
| Skew window ¹ | t_{sk1} | $V_T = 1.5\text{ V}$ | | 236 | 500 | ps |
| Jitter | t_{jabs1}^1 | $V_T = 1.5\text{ V}$ | | 214 | 500 | ps |

¹Guaranteed by design, not 100% tested in production.

Electrical Characteristics - SDRAM

$T_A = 0 - 70^\circ\text{C}$; $V_{DD}=3.3\text{V} \pm 5\%$; $C_L = 30\text{ pF}$ (unless otherwise specified)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|---------------|---|-----|------|-----|----------|
| Output Impedance | R_{DSP2A}^1 | $V_O = V_{DD} * (0.5)$ | 10 | | 20 | Ω |
| Output Impedance | R_{DSN2A}^1 | $V_O = V_{DD} * (0.5)$ | 10 | | 20 | Ω |
| Output High Voltage | V_{OH2A} | $I_{OH} = -28\text{ mA}$ | 2.4 | 2.8 | | V |
| Output Low Voltage | V_{OL2A} | $I_{OL} = 19\text{ mA}$ | | 0.3 | 0.4 | V |
| Output High Current | I_{OH2A} | $V_{OH} = 2.0\text{ V}$ | | -72 | -42 | mA |
| Output Low Current | I_{OL2A} | $V_{OL} = 0.8\text{ V}$ | 33 | 50 | | mA |
| Rise Time ¹ | t_{r2A} | $V_{OL} = 0.4\text{ V}$, $V_{OH} = 2.4\text{ V}$ | 0.5 | 0.97 | 1.6 | ns |
| Fall Time ¹ | t_{f2A} | $V_{OH} = 2.4\text{ V}$, $V_{OL} = 0.4\text{ V}$ | 0.5 | 1.07 | 1.6 | ns |
| Duty Cycle ¹ | d_{t2A} | $V_T = 1.5\text{ V}$ | 45 | 49.1 | 55 | % |
| Skew Window ¹ | t_{sk2A} | $V_T = 1.5\text{ V}$ | | 145 | 250 | ps |
| Skew (Buffer-In to SDRAM) ¹ | t_{sk2A} | $V_T = 1.5\text{ V}$ | | 3.5 | 5 | ps |

¹Guaranteed by design, not 100% tested in production.



General I²C serial interface information

The information in this section assumes familiarity with I²C programming.
For more information, contact ICS for an I²C programming application note.

How to Write:

- Controller (host) sends a start bit.
- Controller (host) sends the write address D2_(H)
- ICS clock will **acknowledge**
- Controller (host) sends a dummy command code
- ICS clock will **acknowledge**
- Controller (host) sends a dummy byte count
- ICS clock will **acknowledge**
- Controller (host) starts sending first byte (Byte 0) through byte 5
- ICS clock will **acknowledge** each byte *one at a time*.
- Controller (host) sends a Stop bit

| How to Write: | |
|---------------------------|----------------------|
| Controller (Host) | ICS (Slave/Receiver) |
| Start Bit | |
| Address D2 _(H) | |
| | ACK |
| Dummy Command Code | |
| | ACK |
| Dummy Byte Count | |
| | ACK |
| Byte 0 | |
| | ACK |
| Byte 1 | |
| | ACK |
| Byte 2 | |
| | ACK |
| Byte 3 | |
| | ACK |
| Byte 4 | |
| | ACK |
| Byte 5 | |
| | ACK |
| Stop Bit | |

How to Read:

- Controller (host) will send start bit.
- Controller (host) sends the read address D3_(H)
- ICS clock will **acknowledge**
- ICS clock will send the **byte count**
- Controller (host) acknowledges
- ICS clock sends first byte (**Byte 0**) through **byte 5**
- Controller (host) will need to acknowledge each byte
- Controller (host) will send a stop bit

| How to Read: | |
|---------------------------|----------------------|
| Controller (Host) | ICS (Slave/Receiver) |
| Start Bit | |
| Address D3 _(H) | |
| | ACK |
| | Byte Count |
| ACK | |
| | Byte 0 |
| ACK | |
| | Byte 1 |
| ACK | |
| | Byte 2 |
| ACK | |
| | Byte 3 |
| ACK | |
| | Byte 4 |
| ACK | |
| | Byte 5 |
| ACK | |
| Stop Bit | |

Notes:

1. The ICS clock generator is a slave/receiver, I²C component. It can read back the data stored in the latches for verification. **Read-Back will support Intel PIIX4 "Block-Read" protocol.**
2. The data transfer rate supported by this clock generator is 100K bits/sec or less (standard mode)
3. The input is operating at 3.3V logic levels.
4. The data byte format is 8 bit bytes.
5. To simplify the clock generator I²C interface, the protocol is set to use only "**Block-Writes**" from the controller. The bytes must be accessed in sequential order from lowest to highest byte with the ability to stop after any complete byte has been transferred. The Command code and Byte count shown above must be sent, but the data is ignored for those two bytes. The data is loaded until a Stop sequence is issued.
6. At power-on, all registers are set to a default condition, as shown.



Shared Pin Operation - Input/Output Pins

The I/O pins designated by (input/output) on the ICS9248-127 serve as dual signal functions to the device. During initial power-up, they act as input pins. The logic level (voltage) that is present on these pins at this time is read and stored into a 5-bit internal data latch. At the end of Power-On reset, (see AC characteristics for timing values), the device changes the mode of operations for these pins to an output function. In this mode the pins produce the specified buffered clocks to external loads.

To program (load) the internal configuration register for these pins, a resistor is connected to either the VDD (logic 1) power supply or the GND (logic 0) voltage potential. A 10 Kilohm (10K) resistor is used to provide both the solid CMOS programming voltage needed during the power-up programming period and to provide an insignificant load on the output clock during the subsequent operating period.

Figure 1 shows a means of implementing this function when a switch or 2 pin header is used. With no jumper is installed the pin will be pulled high. With the jumper in place the pin will be pulled low. If programmability is not necessary, than only a single resistor is necessary. The programming resistors should be located close to the series termination resistor to minimize the current loop area. It is more important to locate the series termination resistor close to the driver than the programming resistor.

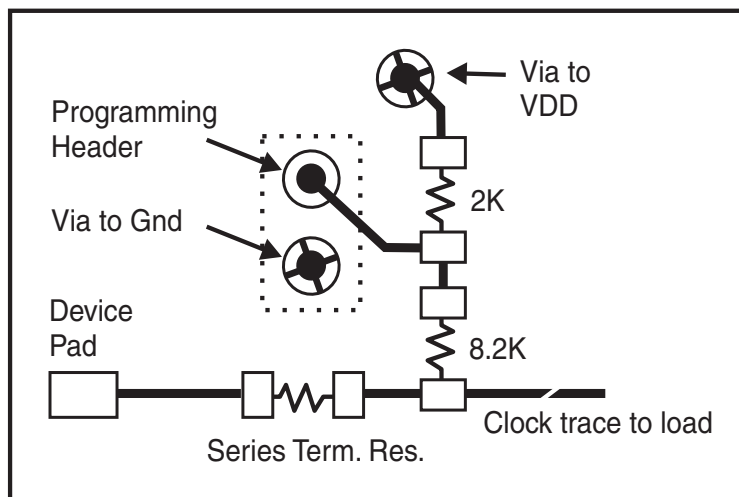
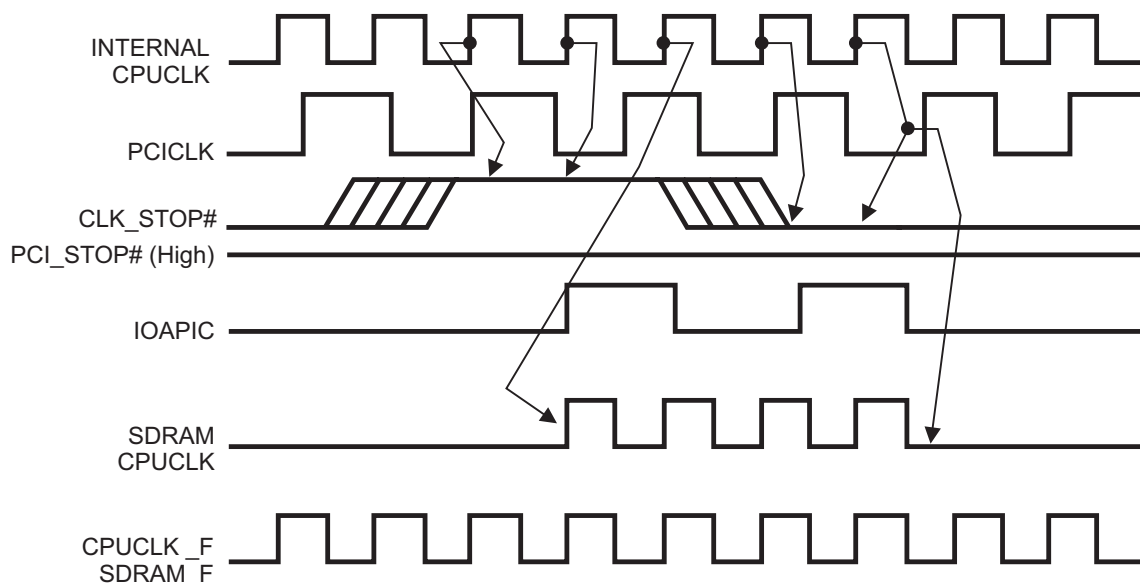


Fig. 1



CLK_STOP# Timing Diagram

CLK_STOP# is an asynchronous input to the clock synthesizer. It is used to turn off the CPU clocks for low power operation. CLK_STOP# is synchronized by the **ICS9248-127**. The minimum that the CPU clock is enabled (CPU_STOP# high pulse) is 100 CPU clocks. All other clocks will continue to run while the CPU clocks are disabled. The CPU clocks will always be stopped in a low state and start in such a manner that guarantees the high pulse width is a full pulse. CPU clock on latency is less than 4 CPU clocks and CPU clock off latency is less than 4 CPU clocks.



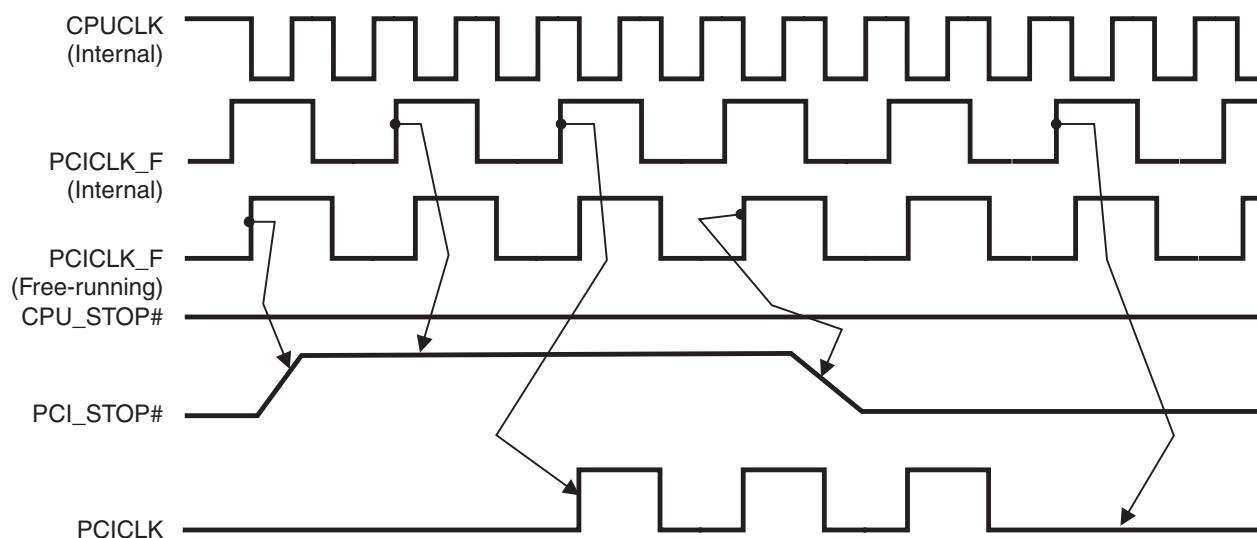
Notes:

1. All timing is referenced to the internal CPU clock.
2. CLK_STOP# is an asynchronous input and metastable conditions may exist. This signal is synchronized to the CPU clocks inside the **ICS9248-127**.
3. IOAPIC output is Stopped Glitch Free by CPUSTOP# going low.
4. SDRAM-F output is controlled by Buffer in signal, not affected by the **ICS9248-127** CLK_STOP# signal. SDRAM (0:11) are controlled as shown.
5. All other clocks continue to run undisturbed.



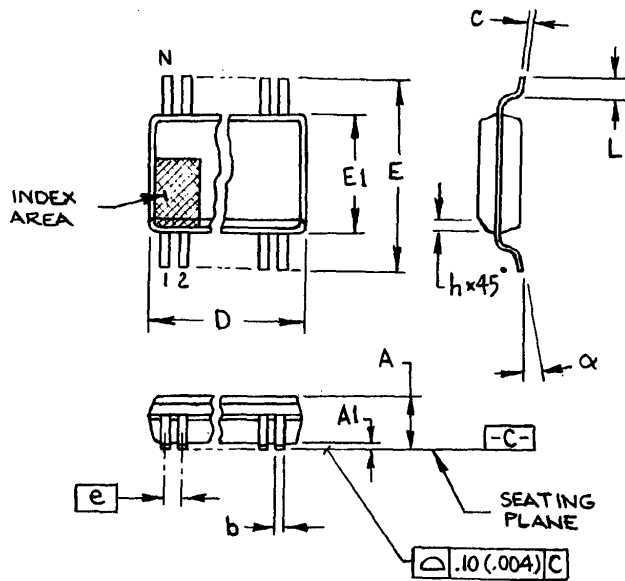
PCI_STOP# Timing Diagram

PCI_STOP# is an asynchronous input to the **ICS9248-127**. It is used to turn off the PCICLK [4:0] clocks for low power operation. PCI_STOP# is synchronized by the **ICS9248-127** internally. The minimum that the PCICLK [4:0] clocks are enabled (PCI_STOP# high pulse) is at least 10 PCICLK [4:0] clocks. PCICLK [4:0] clocks are stopped in a low state and started with a full high pulse width guaranteed. PCICLK [4:0] clock on latency cycles are only one rising PCICLK clock off latency is one PCICLK clock.



Notes:

1. All timing is referenced to the Internal CPUCLK (defined as inside the ICS9248 device.)
2. PCI_STOP# is an asynchronous input, and metastable conditions may exist. This signal is required to be synchronized inside the ICS9248.
3. All other clocks continue to run undisturbed.
4. CPU_STOP# is shown in a high (true) state.



300 mil SSOP

| SYMBOL | In Millimeters COMMON DIMENSIONS | | In Inches COMMON DIMENSIONS | |
|--------|-------------------------------------|--------|--------------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 2.413 | 2.794 | .095 | .110 |
| A1 | 0.203 | 0.406 | .008 | .016 |
| b | 0.203 | 0.343 | .008 | .0135 |
| c | 0.127 | 0.254 | .005 | .010 |
| D | SEE VARIATIONS | | SEE VARIATIONS | |
| E | 10.033 | 10.668 | .395 | .420 |
| E1 | 7.391 | 7.595 | .291 | .299 |
| e | 0.635 BASIC | | 0.025 BASIC | |
| h | 0.381 | 0.635 | .015 | .025 |
| L | 0.508 | 1.016 | .020 | .040 |
| N | SEE VARIATIONS | | SEE VARIATIONS | |
| α | 0° | 8° | 0° | 8° |

VARIATIONS

| N | D mm. | | D (inch) | |
|----|--------|--------|----------|------|
| | MIN | MAX | MIN | MAX |
| 28 | 9.398 | 9.652 | .370 | .380 |
| 34 | 11.303 | 11.557 | .445 | .455 |
| 48 | 15.748 | 16.002 | .620 | .630 |
| 56 | 18.288 | 18.542 | .720 | .730 |
| 64 | 20.828 | 21.082 | .820 | .830 |

Ordering Information

ICS9248yF-127-T

Example:

ICS XXXX y F - PPP - T

Designation for tape and reel packaging

Pattern Number (2 or 3 digit number for parts with ROM code patterns)

Package Type
F=SSOP

Revision Designator (will not correlate with datasheet revision)

Device Type (consists of 3 or 4 digit numbers)

Prefix

ICS, AV = Standard Device