




Description

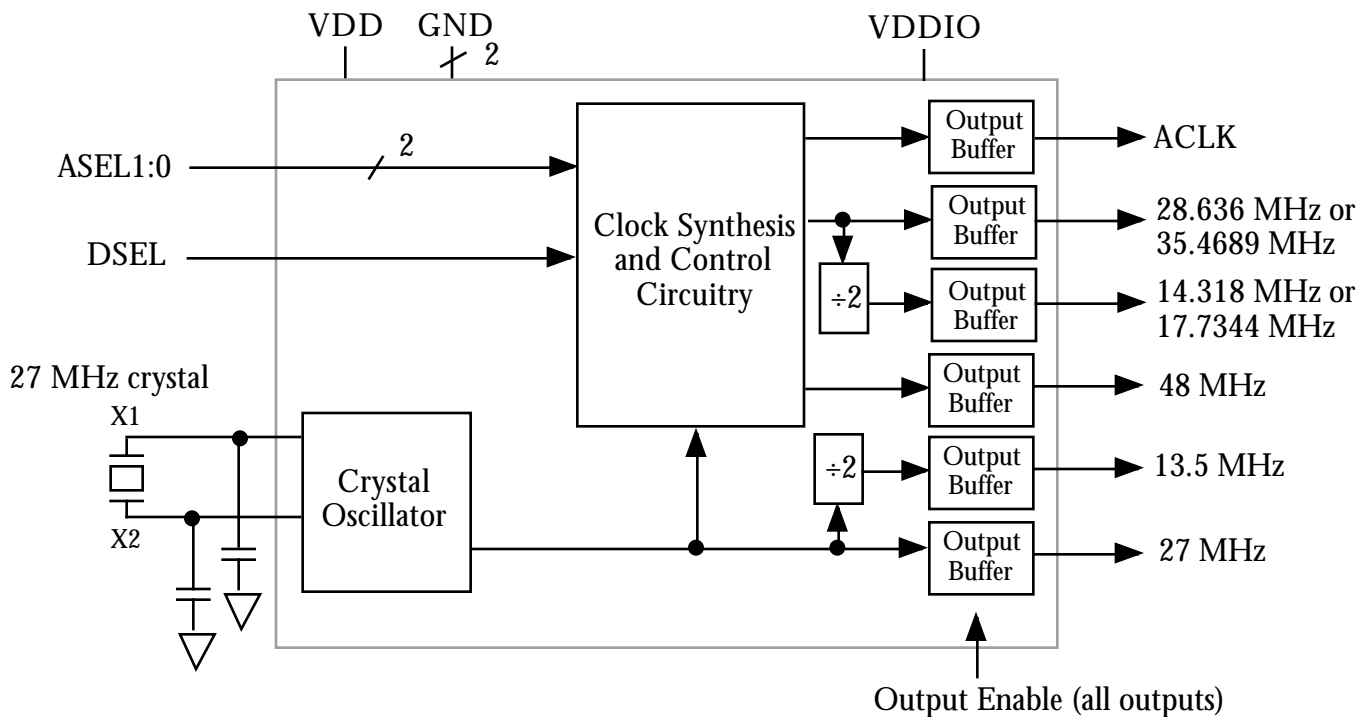
The ICS614-01 is a low cost, low jitter, high performance clock synthesizer for Intel's i752 graphics systems. It includes frequencies for video encoders and decoders. Using analog Phase-Locked Loop (PLL) techniques, the device accepts a 27 MHz fundamental mode crystal or clock input to produce multiple output clocks. The chip provides highly accurate video encoder and decoder clocks, as well as the 48 MHz necessary for the Intel graphics processor, and can produce a 24.576 MHz audio clock.

See the ICS604 or ICS513 for 8 pin devices that supply 48 MHz from a 14.31818 MHz input.

Features

- Packaged in 16 pin SOIC 
- Uses fundamental 27 MHz input crystal
- Supports Intel i752 graphics chip, popular video encoders and decoders, and audio
- Low jitter - 50 ps one sigma
- Output Enable function tri-states outputs
- 25mA output drive capability at TTL levels
- Advanced, low power, sub-micron CMOS process
- 5V±10% core voltage. Inputs and outputs can run 3.3V (or 5V) for easy system interface

Block Diagram





16 pin Intel Graphics Clock Source

Pin Assignment

| | | | |
|---------|---|----|-------|
| OE | 1 | 16 | ASEL1 |
| X2 | 2 | 15 | ASEL0 |
| X1/ICLK | 3 | 14 | 13.5M |
| VDD | 4 | 13 | VDDIO |
| GND | 5 | 12 | GND |
| DSEL | 6 | 11 | ACLK |
| 27M | 7 | 10 | DCLK |
| DCLK/2 | 8 | 9 | 48MHz |

ICS614-01

ACLK Select Table for Audio and Square Pixel

| ASEL1 | ASEL0 | ACLK |
|-------|-------|-------------|
| 0 | 0 | Off |
| 0 | 1 | 29.4923 MHz |
| 1 | 0 | 24.5454 MHz |
| 1 | 1 | 24.576 MHz |

DCLK Select Table for NTSC/PAL

| DSEL | DCLK | DCLK/2 |
|------|----------|----------|
| 0 | 35.4689 | 17.73445 |
| 1 | 28.63636 | 14.31818 |

All Clock frequencies are in MHz.

0=connect directly to ground

1=connect directly to VDDIO

Pin Descriptions

| Number | Name | Type | Description |
|--------|---------|------|--|
| 1 | OE | I | Output Enable. Tri-states all output clocks when low. All running when high (VDDIO). |
| 2 | X2 | XO | Crystal connection. Connect to a 27 MHz fundamental parallel mode crystal. |
| 3 | X1/ICLK | XI | Crystal connection. Connect to a 27 MHz fundamental parallel mode crystal, or clock |
| 4 | VDD | P | Connect to +5V. |
| 5 | GND | P | Connect to ground. |
| 6 | DSEL | I | Input select. Determines DCLK and DCLK/2 per table above. Must be VDDIO. |
| 7 | 27M | O | Buffered crystal oscillator 27 MHz clock output. Amplitude = VDDIO. |
| 8 | DCLK/2 | O | NTSC or PAL 4X subcarrier frequency per table above. Amplitude = VDDIO. |
| 9 | 48M | O | 48.00 MHz clock output for Intel graphics processor. Amplitude = VDDIO. |
| 10 | DCLK | O | NTSC or PAL 8X subcarrier frequency per table above. Amplitude = VDDIO. |
| 11 | ACLK | O | Audio clock, or Square Pixel clock, per table above. Amplitude = VDDIO. |
| 12 | GND | P | Connect to ground. |
| 13 | VDDIO | P | Connect to +5V or +3.3V. Amplitude of output clocks will match this voltage. |
| 14 | 13.5M | O | Buffered crystal oscillator divided by two 13.5 MHz clock output. Amplitude = VDDIO. |
| 15 | ASEL0 | I | Input select 0 for ACLK. Determines ACLK frequency per table above. Must be VDDIO. |
| 16 | ASEL1 | I | Input select 1 for ACLK. Determines ACLK frequency per table above. Must be VDDIO. |

Key: I = Input; O = output; P = power supply connection; XI, XO = crystal connections.

**Electrical Specifications**

| Parameter | Conditions | Minimum | Typical | Maximum | Units |
|---|----------------------|---------|-----------|---------|-------|
| ABSOLUTE MAXIMUM RATINGS (note 1) | | | | | |
| Supply voltage, VDD | Referenced to GND | | | 7 | V |
| Inputs and Clock Outputs | Referenced to GND | -0.5 | | VDD+0.5 | V |
| Ambient Operating Temperature | | 0 | | 70 | C |
| Soldering Temperature | Max of 10 seconds | | | 260 | C |
| Storage temperature | | -65 | | 150 | C |
| DC CHARACTERISTICS (VDD = 5.0V unless noted) | | | | | |
| Operating Voltage, VDD | | 4.50 | | 5.50 | V |
| Operating Voltage, VDDIO | | 3.13 | | VDD | V |
| Input High Voltage, VIH, X1 pin only | | 3.5 | 2.5 | | V |
| Input Low Voltage, VIL, X1 pin only | | | 2.5 | 1.5 | V |
| Input High Voltage, VIH | | 2 | | | V |
| Input Low Voltage, VIL | | | | 0.8 | V |
| Output High Voltage, VOH | IOH=-25mA | 2.4 | | | V |
| Output Low Voltage, VOL | IOL=25mA | | | 0.4 | V |
| Output High Voltage, VOH, CMOS level | IOH=-8mA | VDD-0.4 | | | V |
| Operating Supply Current, IDD | No Load | | 35 | | mA |
| Short Circuit Current | Each output | | ±100 | | mA |
| Input Capacitance | OE, select pins | | 5 | | pF |
| VIN, VCXO control voltage | | 0 | | 3 | V |
| AC CHARACTERISTICS (VDD = 5.0V unless noted) | | | | | |
| Input Frequency | | | 27.000000 | | MHz |
| Input Crystal Accuracy | | | | 30 | ppm |
| Output Clock Accuracy (all but PAL square pixel) | Given exact input | | 0 | 1 | ppm |
| Output Clock Rise Time | 0.8 to 2.0V, no load | | | 1.5 | ns |
| Output Clock Fall Time | 0.8 to 2.0V, no load | | | 1.5 | ns |
| Output Clock Duty Cycle | At VDD/2 | 40 | | 60 | % |
| Maximum Absolute Jitter, short term | | | ±150 | | ps |
| Maximum Jitter, one sigma | | | 50 | | ps |

Notes: 1. Stresses beyond those listed under Absolute Maximum Ratings could cause permanent damage to the device. Prolonged exposure to levels above the operating limits but below the Absolute Maximums may affect device reliability.

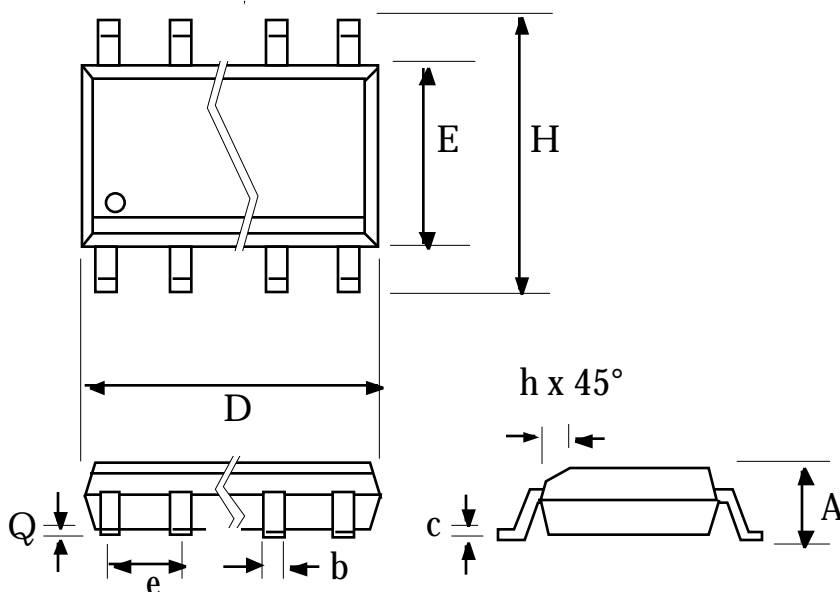


External Components/Crystal Selection

The ICS614-01 requires a minimum number of external components for proper operation. Decoupling capacitors of 0.01 μ F should be connected between VDD and GND, one between pins 4 and 5, and one between pins 13 and 12, as close to the part as possible. A series termination resistor of 33 Ω may be used for each clock output. The 27.000 MHz crystal must be connected as close to the chip as possible. The crystal should be a fundamental mode, parallel resonant, 30 ppm or better. Do not use third overtone. Crystal capacitors should be connected from pins X1 to ground and X2 to ground. In general, the value of these capacitors is given by the following equation, where C_L is the crystal load capacitance: Crystal caps (pF) = $(C_L - 6) \times 2$. So for a crystal with 16 pF load capacitance, two 20 pF caps can be used. For any given board layout, ICS can measure the board capacitance and recommend the exact capacitance value to use.

Package Outline and Package Dimensions

16 pin SOIC narrow



| | Inches | | Millimeters | |
|--------|----------|-------|-------------|--------|
| Symbol | Min | Max | Min | Max |
| A | 0.055 | 0.070 | 1.397 | 1.778 |
| b | 0.013 | 0.019 | 0.330 | 0.483 |
| c | 0.007 | 0.010 | 0.191 | 0.254 |
| D | 0.385 | 0.400 | 9.779 | 10.160 |
| E | 0.150 | 0.160 | 3.810 | 4.064 |
| H | 0.225 | 0.245 | 5.715 | 6.223 |
| e | .050 BSC | | 1.27 BSC | |
| h | | 0.016 | | 0.406 |
| Q | 0.004 | 0.01 | 0.102 | 0.254 |

Ordering Information

| Part/Order Number | Marking | Shipping packaging | Package | Temperature |
|-------------------|------------|--------------------|--------------------|-------------|
| ICS614M-01 | ICS614M-01 | tubes | 16 pin narrow SOIC | 0 to 70 C |
| ICS614M-01T | ICS614M-01 | tape and reel | 16 pin narrow SOIC | 0 to 70 C |

Rev. 12308, version A . First publication, Preliminary.

Rev. 2019, version B. Added jitter, IDD specifications, showed VDDIO on pin 13, added i752 designation.

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