




MK2732-05 Low Phase Noise VCXO+Multiplier

Description

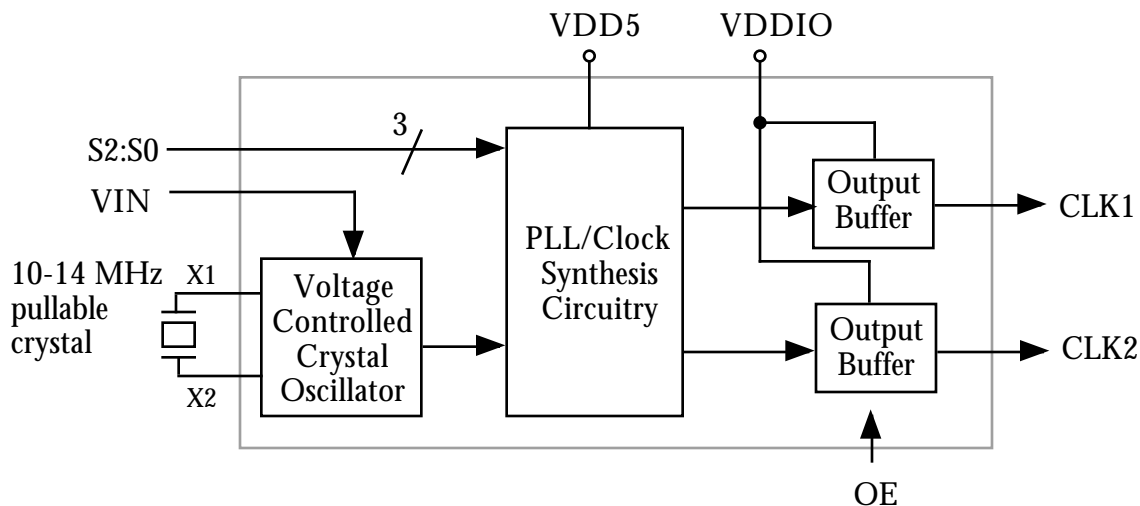
The MK2732-05 is a low cost, low jitter, high performance VCXO and PLL clock synthesizer designed to replace expensive discrete VCXOs and multipliers. The on-chip Voltage Controlled Crystal Oscillator (VCXO) accepts a 0 to 3 V input voltage to cause the output clocks to vary by ± 100 ppm. Using ICS/MicroClock's patented VCXO and analog Phase-Locked Loop (PLL) techniques, the device uses an inexpensive 10 MHz to 14.318 MHz pullable crystal input to produce one or two output clocks.

ICS manufactures the largest variety of Set-Top Box and multimedia clock synthesizers for all applications. Consult ICS to eliminate VCXOs, crystals and oscillators from your board.

Features

- Packaged in 16 pin narrow SOIC 
- Replaces a VCXO and multiplier
- Uses an inexpensive pullable crystal
- Output clocks up to 85 MHz
- On-chip patented VCXO with pull range of 200 ppm (± 100 ppm) minimum
- VCXO tuning voltage of 0 to 3 V
- Zero ppm synthesis error in both clocks
- 25 mA output drive capability at TTL levels
- Advanced, low power, sub-micron CMOS process
- 5 V operating voltage for core, ability to run output clocks at 3.3V or 5V

Block Diagram

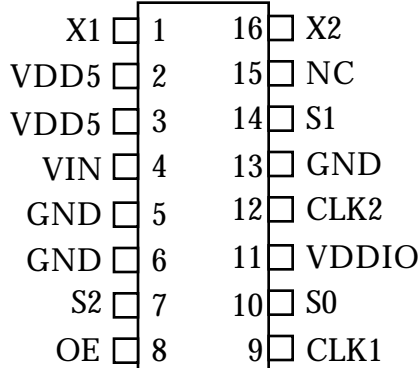




MK2732-05 Low Phase Noise VCXO+Multiplier

Pin Assignment

MK2732-05



16 pin narrow (150 mil) SOIC

Clock Select Table

| S2 | S1 | S0 | CLK1 | CLK2 |
|----|----|----|-------|---------|
| 0 | 0 | 0 | REF/4 | REF/2 |
| 0 | 0 | M | OFF | x0.666 |
| 0 | 0 | 1 | OFF | x2.6666 |
| 0 | 1 | 0 | OFF | x4 |
| 0 | 1 | M | OFF | x1.5 |
| 0 | 1 | 1 | OFF | x1.3333 |
| 1 | 0 | 0 | Test | Test |
| 1 | 0 | M | OFF | x4 |
| 1 | 0 | 1 | OFF | x2 |
| 1 | 1 | 0 | OFF | x3 |
| 1 | 1 | M | OFF | x5 |
| 1 | 1 | 1 | OFF | x6 |

0=connect directly to GND, 1=connect directly to VDDIO, OFF=output stopped low.

Pin Descriptions

| Number | Name | Type | Description |
|----------|-------|------|--|
| 1 | X1 | XI | Crystal connection. Connect to a pullable crystal of 10-14.318 MHz. |
| 2, 3 | VDD5 | P | Core VDD. Connect to +5V. |
| 4 | VIN | VI | Voltage Input to VCXO. Zero to 3V signal which controls the frequency of the VCXO. |
| 5, 6, 13 | GND | P | Connect to ground. |
| 7 | S2 | I | Select input #2. Selects outputs per table above. Do not exceed VDDIO. |
| 8 | OE | I | Output Enable. Tri-states outputs when low. Do not exceed VDDIO. |
| 9 | CLK1 | O | Clock Output #1 per table above. Amplitude = VDDIO. |
| 10 | S0 | TI | Select input #0. Selects outputs per table above. Do not exceed VDDIO. |
| 11 | VDDIO | P | Input and output VDD. Connect to +3.3V or +5V. Clock amplitude matches this voltage. |
| 12 | CLK2 | O | Clock Output #2 per table above. Amplitude = VDDIO. |
| 14 | S1 | I | Select input #1. Selects outputs per table above. Do not exceed VDDIO. |
| 15 | NC | - | Nothing is connected internally to this pin. |
| 16 | X2 | XO | Crystal connection. Connect to a pullable crystal of 10-14.318 MHz. |

Key: I = Input with internal pull-up resistor; TI = tri-level input; O = output; P = power supply connection; VI = analog voltage input; XI, XO = crystal pins.

External Components

The MK2732-05 requires a minimum number of external components for proper operation. Decoupling capacitors of 0.1µF should be connected between VDD5 and GND on pins 3 and 5, and VDDIO and GND on pins 11 and 13, as close to the MK2732-05 as possible. A series termination resistor of 33 Ω may be used for each clock output. The input crystal must be connected as close to the chip as possible. The input crystal should be a fundamental mode, parallel resonant, pullable, AT cut. A crystal with 14 pF load capacitance is recommended. Consult ICS/MicroClock for recommended suppliers. **IMPORTANT** - consult the application note MAN05 for layout guidelines.



MK2732-05

Low Phase Noise VCXO+Multiplier

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 (VDD5 = 5.0V unless noted) | | | | | |
| Core Operating Voltage, VDD5 | | 4.75 | 5.0 | 5.25 | V |
| I/O Operating Voltage, VDDIO | | 3.15 | 3.3 | VDD5 | 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, binary inputs | S2, S1, OE | 2 | | | V |
| Input Low Voltage, VIL, binary inputs | S2, S1, OE | | | 0.8 | V |
| Input High Voltage, VIH, trinary input | S0, pin 10 | VDDIO-0.5 | | | V |
| Input Low Voltage, VIL, trinary input | S0, pin 10 | | | 0.5 | 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 | VDDIO-0.4 | | | V |
| Operating Supply Current, IDD | No Load | | 19 | | mA |
| Short Circuit Current | Each output | | ±100 | | mA |
| Input Capacitance | S2:S0, OE | | 7 | | pF |
| Frequency synthesis error | Both clocks | | | 0 | ppm |
| VIN, VCXO control voltage | | 0 | | 3 | V |
| AC CHARACTERISTICS (VDD5 = 5.0V unless noted) | | | | | |
| Input Crystal Frequency | | 10 | | 14.31818 | MHz |
| Output Clock Frequency | | 2.5 | | 85.9 | MHz |
| Output Clock Rise Time | 0.8 to 2.0V | | | 1.5 | ns |
| Output Clock Fall Time | 2.0 to 0.8V | | | 1.5 | ns |
| Output Clock Duty Cycle | At VDDIO/2 | 40 | | 60 | % |
| Maximum Absolute Jitter | | | ±100 | | ps |
| Phase Noise, relative to carrier | 10 kHz offset | | -115 | | dBc/Hz |
| Output pullability, note 2 | 0V VIN 3V | ±100 | | | ppm |

- 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.
2. With an ICS/MicroClock approved pullable crystal.

Pullable Crystal Specifications:

| | |
|----------------------------------|------------|
| Correlation (load) Capacitance | 14 pF |
| CO/C1 | 240 max |
| ESR | 35 max |
| Operating Temperature | 0 to 70 °C |
| Initial Accuracy | ±20 ppm |
| Temperature plus Aging Stability | ±50 ppm |

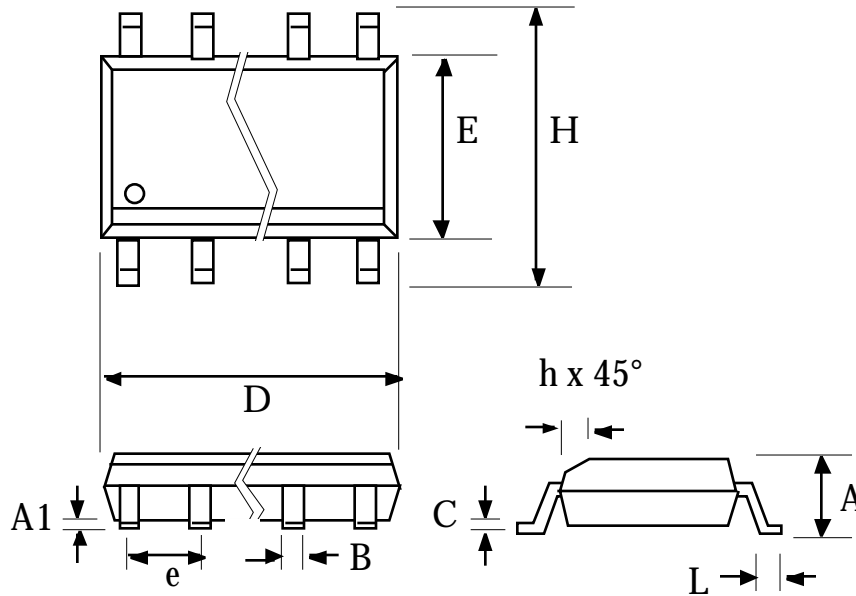


MK2732-05 Low Phase Noise VCXO+Multiplier

Package Outline and Package Dimensions

(For current dimensional specifications, see JEDEC Publication No. 95.)

16 pin SOIC narrow



| Symbol | Inches | | Millimeters | |
|--------|----------|--------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.0532 | 0.0688 | 1.35 | 1.75 |
| A1 | 0.0040 | 0.0098 | 0.10 | 0.24 |
| B | 0.0130 | 0.0200 | 0.33 | 0.51 |
| C | 0.075 | 0.098 | 1.91 | 2.40 |
| D | 0.3859 | 0.3937 | 9.80 | 10.00 |
| E | 0.1497 | 0.1574 | 3.80 | 4.00 |
| e | .050 BSC | | 1.27 BSC | |
| H | 0.2284 | 0.2440 | 5.80 | 6.20 |
| h | 0.0099 | 0.0195 | 0.25 | 0.50 |
| L | 0.0160 | 0.0500 | 0.41 | 1.27 |

Ordering Information

| Part/Order Number | Marking | Shipping packaging | Package | Temperature |
|-------------------|------------|--------------------|-------------|-------------|
| MK2732-05S | MK2732-05S | tubes | 16 pin SOIC | 0-70 °C |
| MK2732-05STR | MK2732-05S | tape and reel | 16 pin SOIC | 0-70 °C |

Revision history:

| Version | Revision | Comments |
|---------|----------|--|
| A | 10308 | Original |
| B | 12078 | CLK1 and CLK2 functions switched in 000 address, changed from x0.75 to x0.666 in 00M address, changed name of VDD3.3 to VDDIO. |
| C | 4289 | Added jitter spec, changed VDD on VIH and VOH to VDDIO, lowered IDD. Added L dimension, changed address. Eliminated "Preliminary". |
| D | 12279 | Changed to JEDEC dimensions. Changed VDD to ±5%. Added Pullable Crystal Specifications. |

While the information presented herein has been checked for both accuracy and reliability, Integrated Circuit Systems, Incorporated (ICS) assumes no responsibility for either its use or for the infringement of any patents or other rights of third parties, which would result from its use. No other circuits, patents, or licenses are implied. This product is intended for use in normal commercial applications. Any other applications such as those requiring extended temperature range, high reliability, or other extraordinary environmental requirements are not recommended without additional processing by ICS. ICS reserves the right to change any circuitry or specifications without notice. ICS does not authorize or warrant any ICS product for use in life support devices or critical medical instruments.