

Description

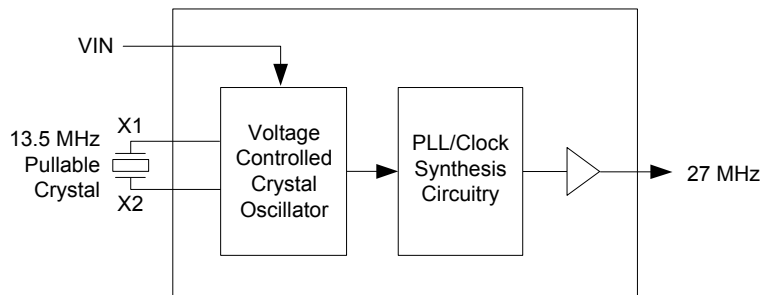
The MK2727 is IDT’s lowest cost, low-jitter, high-performance VCXO and PLL clock synthesizer designed to replace expensive 27MHz VCXOs. The on-chip Voltage Controlled Crystal Oscillator accepts a 0 to 3V input voltage to cause the output clocks to vary by ± 100 ppm. Using IDT’s patented VCXO and analog Phase-Locked Loop (PLL) techniques, the device uses an inexpensive external 13.5 MHz pullable crystal input to produce a 27 MHz output clock.

IDT manufactures the largest variety of Set-Top Box and multimedia clock synthesizers for all applications. If more clock outputs are needed, see the MK2731 or MK277x family of parts. Consult IDT to eliminate VCXOs, crystals and oscillators from your board.

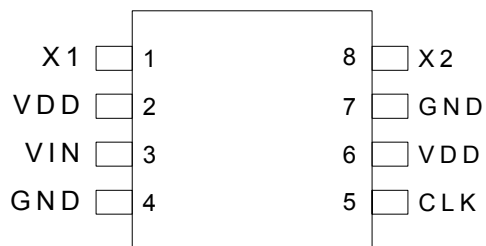
Features

- Packaged in 8-pin narrow SOIC
- Uses an inexpensive 13.500 MHz external crystal
- On-chip VCXO with pull range of 200 ppm (minimum)
- VCXO input tuning voltage 0 to 3.3 V
- 25 mA output drive capability at TTL levels
- Advanced, low-power, sub-micron CMOS process
- 5 V operating voltage

Block Diagram



Pin Assignment



8-Pin (150 mil) SOIC

Pin Descriptions

| Pin Number | Pin Name | Pin Type | Pin Description |
|------------|----------|----------|---|
| 1 | X1 | Input | Crystal connection. Connect to a pullable 13.5 MHz crystal. |
| 2 | VDD | Power | Connect to +5 V. |
| 3 | VIN | Input | Voltage input to VCXO. Zero to 3 V analog input which controls the frequency of the VCXO. |
| 4 | GND | Power | Connect to ground. |
| 5 | CLK | Output | 27 MHz clock output. |
| 6 | VDD | Power | Connect to +5 V. |
| 7 | GND | Power | Connect to ground. |
| 8 | X2 | Input | Crystal connection. Connect to a pullable 13.5 MHz crystal. |

External Component Selection

The MK2727 requires a minimum number of external components for proper operation.

Decoupling Capacitor

A decoupling capacitor of 0.01 μ F must be connected between VDD (pin 2) and GND (pin 4), as close to these pins as possible. For optimum device performance, the decoupling capacitor should be mounted on the component side of the PCB. Avoid the use of vias in the decoupling circuit.

Series Termination Resistor

When the PCB trace between the clock output (CLK, pin 5) and the load is over 1 inch, series termination should be used. To series terminate a 50 Ω trace (a commonly used trace impedance), place a 33 Ω resistor in series with the clock line, as close to the clock output pin as possible. The nominal impedance of the clock output is 20 Ω .

Quartz Crystal

The MK2727 VCXO function consists of the external crystal and the integrated VCXO oscillator circuit. To assure the best system performance (frequency pull range) and reliability, a crystal device with the recommended parameters (shown below) must be used, and the layout guidelines discussed in the following section shown must be followed.

The frequency of oscillation of a quartz crystal is determined by its “cut” and by the load capacitors connected to it. The MK2727 incorporates on-chip variable load capacitors that “pull” (change) the frequency of the crystal. The crystal

specified for use with the MK2727 is designed to have zero frequency error when the total of on-chip + stray capacitance is 14 pF.

Recommended Crystal Parameters:

| | |
|------------------------------|-----------------|
| Initial Accuracy at 25° C | ±20 ppm |
| Temperature Stability | ±30 ppm |
| Aging | ±20 ppm |
| Load Capacitance | 14 pf |
| Shunt Capacitance, C0 | 7 pF Max |
| C0/C1 Ratio | 250 Max |
| Equivalent Series Resistance | 35 Ω Max |

The external crystal must be connected as close to the chip as possible and should be on the same side of the PCB as the MK2727. There should be no vias between the crystal pins and the X1 and X2 device pins. There should be no signal traces underneath or close to the crystal.

Crystal Tuning Load Capacitors

The crystal traces should include pads for small fixed capacitors, one between X1 and ground, and another between X2 and ground. The need for these capacitors is determined at system prototype evaluation, and is influenced by the particular crystal used (manufacture and frequency) and by PCB layout. The typical required capacitor value is 1 to 4 pF.

The procedure for determining the value of these capacitors can be found in application note MAN05.

Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the MK2727. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

| Item | Rating |
|-------------------------------|---------------------|
| Supply Voltage, VDD | 7 V |
| All Inputs and Outputs | -0.5 V to VDD+0.5 V |
| Ambient Operating Temperature | 0 to +70° C |
| Storage Temperature | -65 to +150° C |
| Soldering Temperature | 260° C |

Recommended Operation Conditions

| Parameter | Min. | Typ. | Max. | Units |
|---|-----------------|------|-------|-------|
| Ambient Operating Temperature | 0 | | +70 | ° C |
| Power Supply Voltage (measured in respect to GND) | +4.75 | 5.0 | +5.25 | V |
| Reference crystal parameters | Refer to page 3 | | | |

DC Electrical Characteristics

VDD=5 V \pm 5% , Ambient temperature 0 to +70° C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|-----------------|--------------------------|---------|-----------|------|-------|
| Operating Voltage | VDD | | 4.75 | | 5.25 | V |
| Output High Voltage | V _{OH} | I _{OH} = -25 mA | 2.4 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 25 mA | | | 0.4 | V |
| Output High Voltage (CMOS Level) | V _{OH} | I _{OH} = -8 mA | VDD-0.4 | | | V |
| Operating Supply Current | I _{DD} | No load | | 20 | | mA |
| Short Circuit Current | I _{OS} | | | \pm 100 | | mA |
| VIN, VCXO Control Voltage | V _{IA} | | 0 | | 3 | V |

AC Electrical Characteristics

VDD = 5 V \pm 5%, Ambient Temperature 0 to +70° C, unless stated otherwise

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|-------------------------------------|-----------------|----------------------------------|-----------|--------|----------|-------|
| Input Crystal Frequency | | | | 13.500 | | MHz |
| Input Crystal Accuracy | | | | | \pm 30 | ppm |
| Output Clock Rise Time | t _{OR} | 0.8 to 2.0 V | | | 1.5 | ns |
| Output Clock Fall Time | t _{OF} | 2.0 to 0.8 V | | | 1.5 | ns |
| Output Clock Duty Cycle | t _D | Measured at 1.4 V | 40 | 50 | 60 | % |
| Maximum Absolute Jitter, short term | t _J | | | 200 | | ps |
| 27 MHz Output Pullability | | 0V \leq VIN \leq 3 V, Note 1 | \pm 100 | | | ppm |

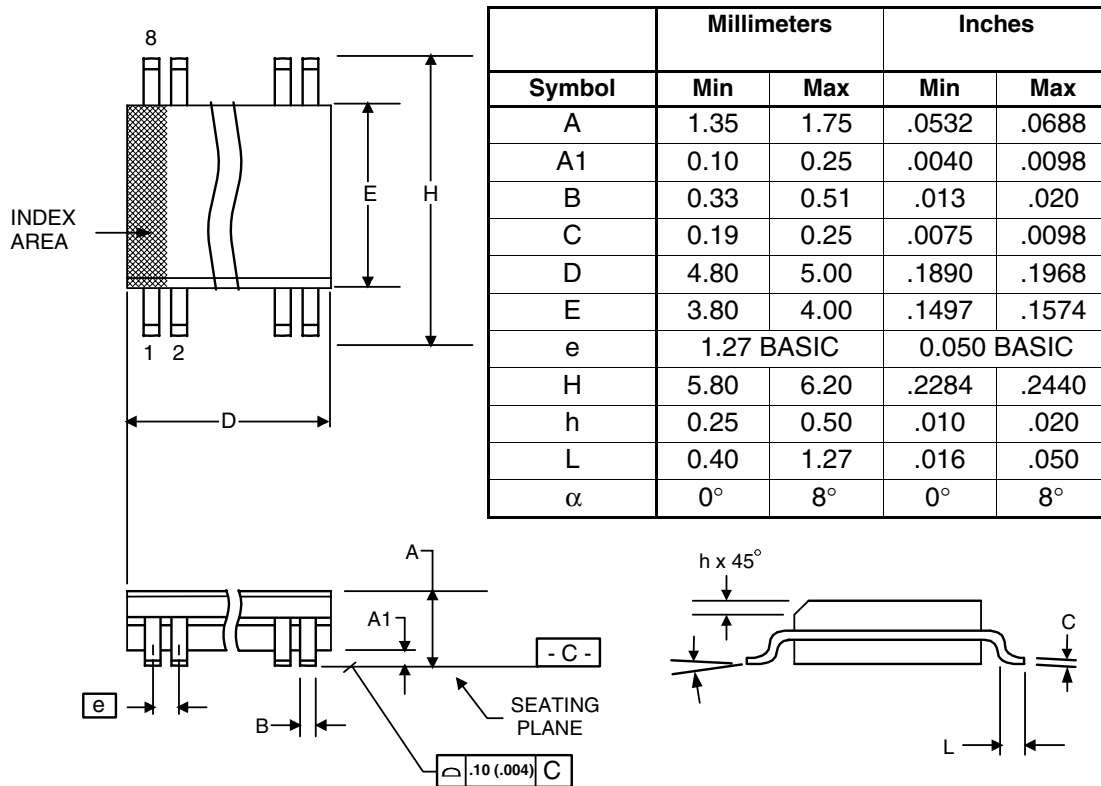
Note 1: External crystal device must conform with Pullable Crystal Specifications listed on page 3.

Thermal Characteristics

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|--|---------------|----------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | θ_{JA} | Still air | | 150 | | °C/W |
| | θ_{JA} | 1 m/s air flow | | 140 | | °C/W |
| | θ_{JA} | 3 m/s air flow | | 120 | | °C/W |
| Thermal Resistance Junction to Case | θ_{JC} | | | 40 | | °C/W |

Package Outline and Package Dimensions (8-pin SOIC, 150 Mil. Narrow Body)

Package dimensions are kept current with JEDEC Publication No. 95



Ordering Information

| Part / Order Number | Marking | Shipping Packaging | Package | Temperature |
|---------------------|---------|--------------------|------------|-------------|
| MK2727SLF | 2727SL | Tubes | 8-pin SOIC | 0 to +70° C |
| MK2727SLFTR | 2727SL | Tape and Reel | 8-pin SOIC | 0 to +70° C |

“LF” denotes Pb (lead) free package.

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