

750 to 1500 MHz Frequency Synthesizer

Low Phase Noise in a Lower Cost Package



Features

- **Low Phase Noise: -110 dBc/Hz (100 kHz offset)**
- **Internal Reference Oscillator (External Optional at No Additional Charge)**
- **No User Programming Required**
- **Integrated Microcontroller Look-up Table**
- **EAR99, RoHS Compliant**
- **DEMO Board available upon request**

API Technologies' Model LCFS1050 frequency synthesizer combines a monolithic integer-n microwave synthesizer, a reference oscillator and a microcontroller to provide an economical frequency source solution. Complex serial register programming is not required. A built-in lookup table in the microcontroller allows for simplified frequency programming with a dual 8-bit binary frequency selection word. Either parallel or serial programming can be accommodated. A Demo or Evaluation board can be ordered as an LCFS1050-DEMO. The LCFS1050 synthesizer is RoHS compliant, however there is a lead based solder used in the construction of the Demo Board (if the DEMO Board is requested).

Technical Specifications

Parameter	Typical	Min/Max
Frequency Range	750 to 1500 MHz	750 to 1500 MHz
Output Power	+13 dBm	-
Internal Input Reference Frequency	40 MHz	-
Step Size	2.5 MHz	-
SSB Phase Noise	-92 dBc/Hz @ 1 kHz -92 dBc/Hz @ 10 kHz -110 dBc/Hz @ 100 kHz -139 dBc/Hz @ 1 MHz -162 dBc/Hz @ 10 MHz	-
Digital Lock Indicator	3.3 volt logic	-
Locking Speed	200 μ sec	-
Spurious	-40 dBc	-
Harmonics	-20 dBc	-
Output VSWR	1.75:1	2.0:1
DC Supply Voltage	+3.3 volts	(+/- 2%) volts
DC Supply Current*	175 mA	---
Frequency Accuracy	\pm 2 PPM	---
Frequency Aging	\pm 1 PPM	---
Frequency vs. Temperature	\pm 2 PPM	---

Maximum (No Damage) Ratings

Storage Temperature	-40°C to +125°C
Operating Temperature	-55°C to +85°C
DC Voltage	+5 volts

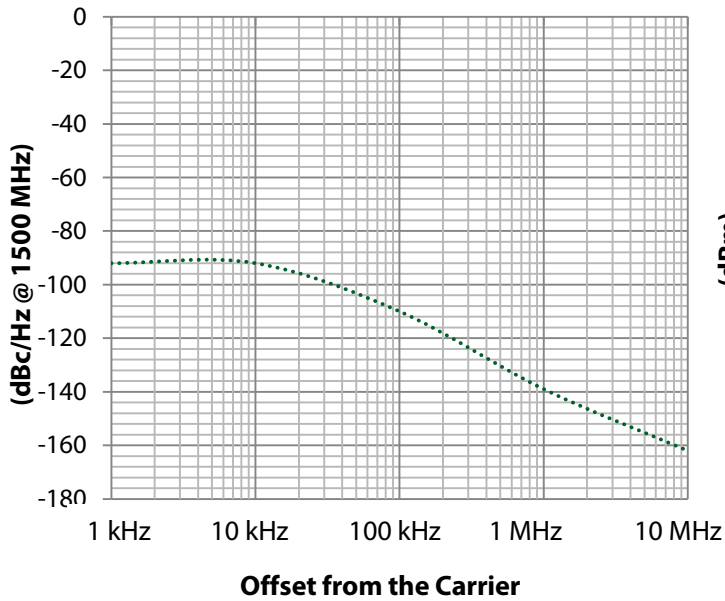
Notes: Typical values are measured at 25°C, but not guaranteed.

Mechanical & Electrical

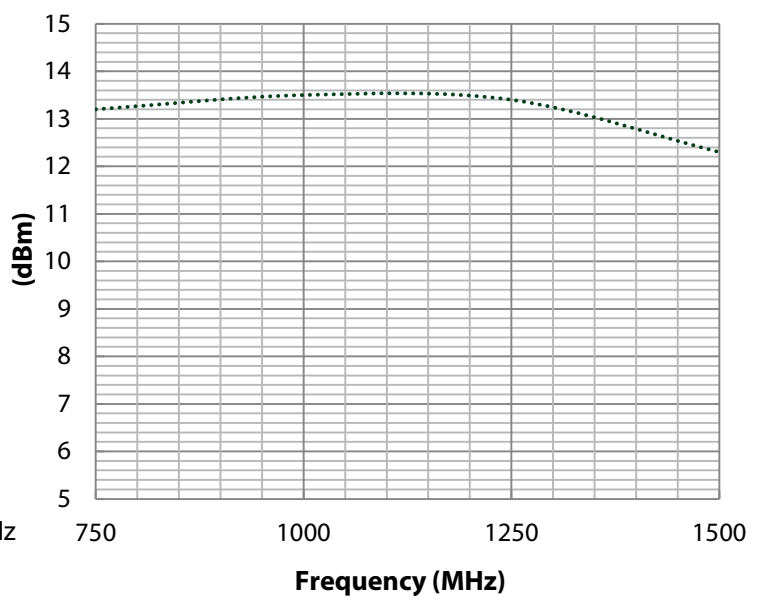
Parameter	Specification
Specification Temperatures (Min/Max)	-40°C to +85°C
Housing Size	0.800" L x 0.800" W x 0.130" H
Housing Drawing	LC800
Package Type	Surface Mount

Typical Performance

Phase Noise (dBc/Hz)



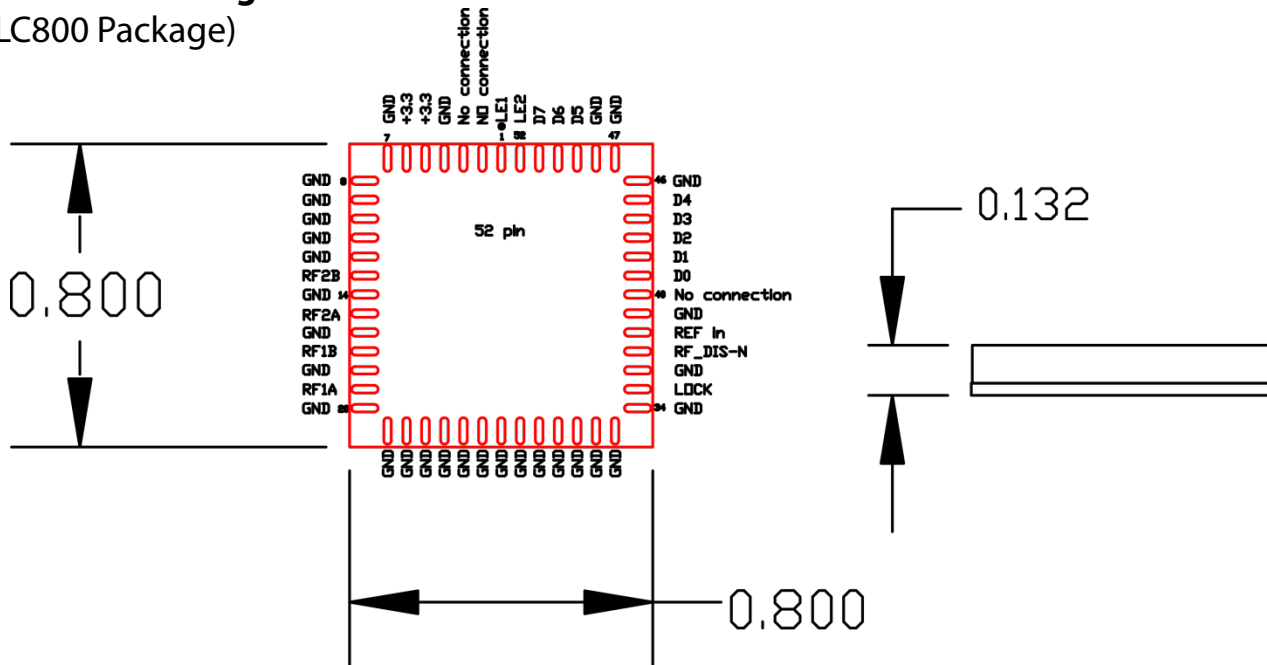
Output Power (dBm)



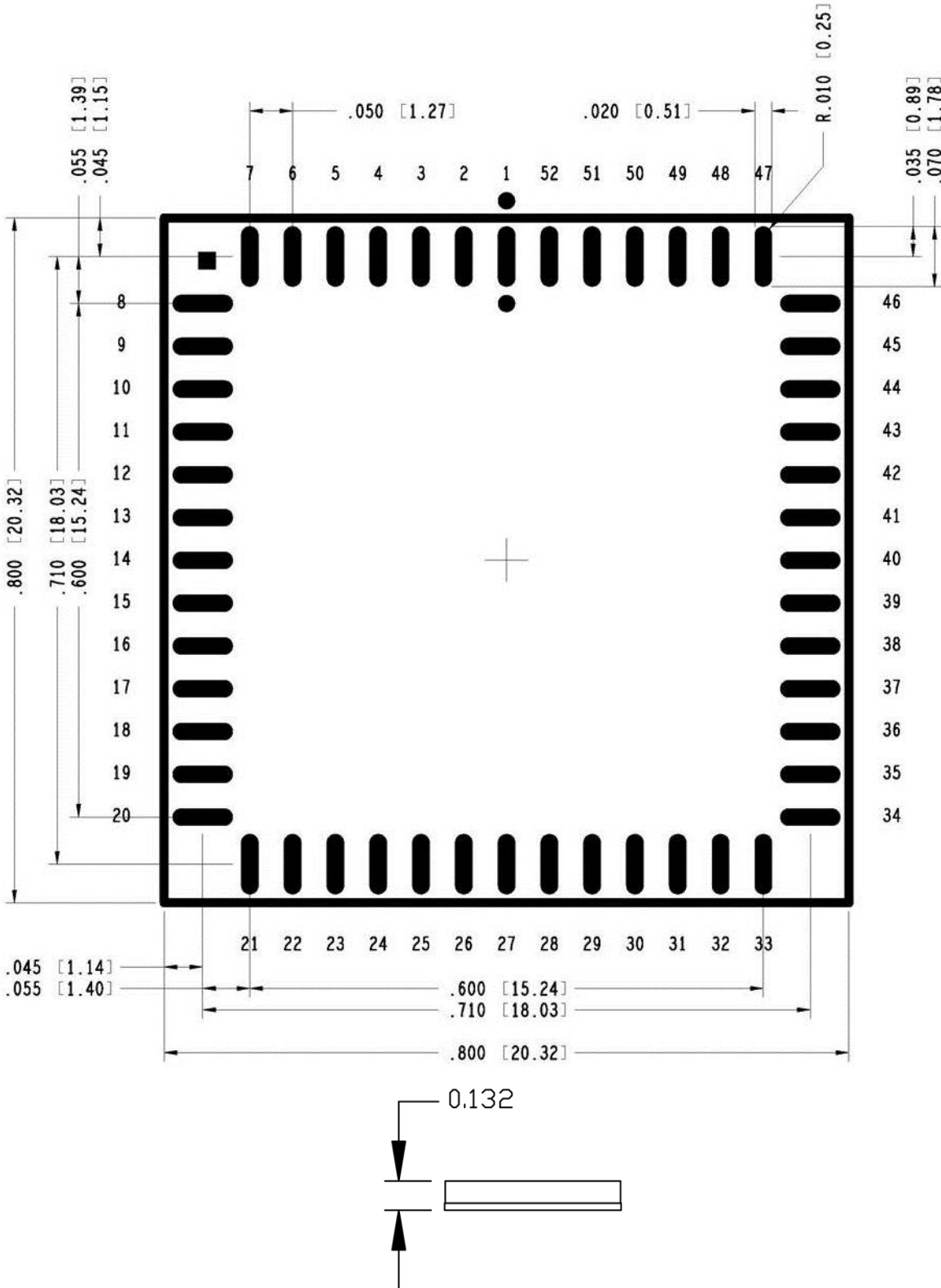
Notes

1. Specifications labeled "min." or "max." are guaranteed in a 50 Ohm system over the specified temperature range.
2. Output frequency and step size must be specified.
3. Other input voltages are available.

Outline Drawing (LC800 Package)



Outline Drawing
(LC800 Package)





Application Notes

The Demo Board will be supplied with a similar spreadsheet along with some “Visual Basic Code” that transfers the frequency entered in the yellow cell to the USB and parallel converter located on the Demo Board.

Pinout Description

Pin 1 and 52	Latch 1 and Latch 2 Normally tied together. A rising edge on these pins latches the low control byte. A falling edge latches the High control byte.
Pins 2,3 and 40	No connection. Leave these pins open. (used for factory programming)
Pin 4	DC Ground
Pins 5 and 6	+3.3 V dc power input
Pin 8-11	DC Ground
Pin 12	RF Ground
Pin 13	Ground
Pin 14	RF Ground
Pin 15	RF Output
Pin 16	RF Ground
Pin 17	Ground
Pin 18	RF ground
Pin 19	Ground
Pin 20	RF Ground
Pins 21-34	DC Ground
Pin 35	Lock detect output (High when locked/ Low unlocked), internal 240 ohm series resistor can directly drive a lock LED to ground (5 mA source current).
Pin 36	DC Ground
Pin 37	RF disable normally open. Ground this pin to blank the RF output.
Pin 38	Reference oscillator in/out (one or the other depending on model option) output 1k impedance. Input 50 ohms (1 dBm nominal)
Pin 39	Signal Ground for Reference
Pin 40	No connection. Leave this pins open. (used for factory programming)
Pin 41	Data 0 LSB of the upper or lower 8 bit control word
Pin 42	Data 1
Pin 43	Data 2
Pin 44	Data 3
Pin 45	Data 4
Pin 46-48	Data Ground
Pin 49	Data 5
Pin 50	Data 6
Pin 51	Data 7 MSB of the upper or lower 8 bit control word

Note: Ground unused RF outputs.

The LCFS synthesizer is controlled by a 16 bit binary ($2^{16}=65536$) frequency control word. Interface logic is LV (3.3 V cmos). The control word addresses a custom lookup table in the built-in microcontroller for the desired output frequency. As an example a control word of all zeroes would address the first (lowest) frequency. The next location would address the next higher frequency (lowest frequency + 1 frequency step). The frequency control word is split into (2) 8 bit words along with a latch signal that differentiates between the low 8 bits and the high 8 bits. This control structure allows the synthesizer to be controlled by an 8 bit parallel port plus an additional latch control line (9 bits).

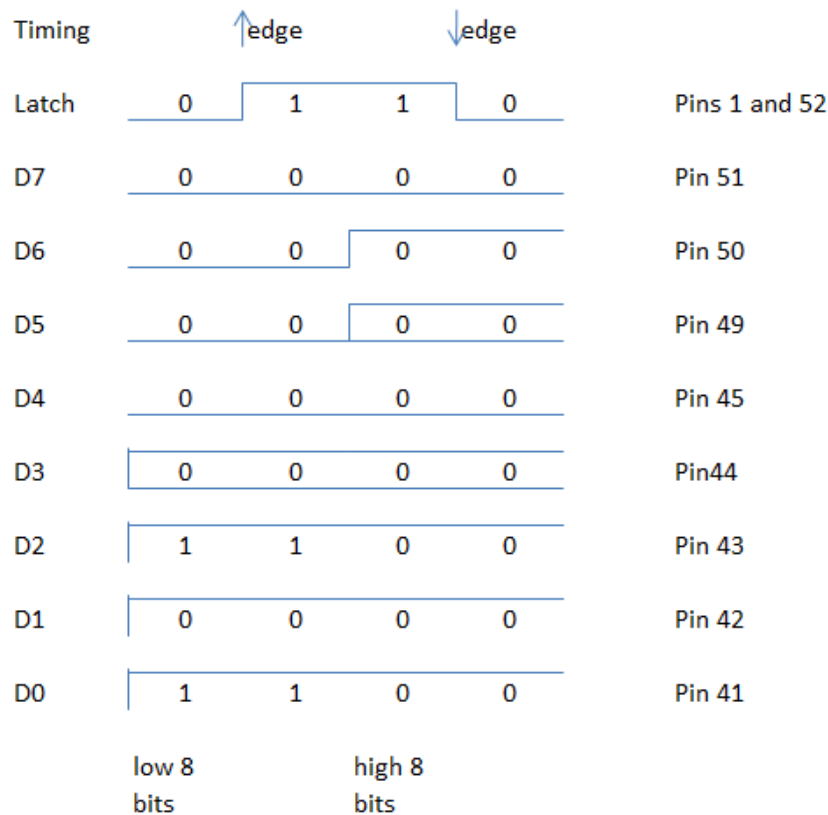
Programming example:

This spreadsheet calculates the control word and Low and High 8 bits from the desired output frequency. 275 to 550 MHz with a 5 MHz step size.

F_{out}	Control word= $(F_{out}-275)/5$	Leading zeroes suppressed
Desired frequency: 300 MHz	Control word= 5 (Base10)	Binary
Low 8 bits = the remainder of control word /256	Low 8 Bits= 5 (Base 10)	101
High 8 bits =int(control word/256)	High 8 Bits = 0 (Base 10)	0

If the synthesizer is programmed with a control word that is beyond the highest step, the highest frequency will be the output. The additional bit is the latching signal. The rising edge latches the Low 8 Bits and the falling edge latches the High 8 Bits.

Programming sequence:	(Base 10)
1 Program 5	Low 8 bits Output the Low 8 bits
2 Program 5	Latch signal goes High
3 Program 0	Latch signal still is High
4 Program 0	Latch signal goes Low Causes the latch signal to fall, storing the High 8 bits. The output of the synthesizer will now change to the new frequency.



LCFS Demo Board Driver Installation

- 1) Plug the USB cable to the Windows based (7 or newer) computer. The demo board and synthesizer will be powered by the USB port. Allow Windows time to find the driver through an automatic search. A good driver installation is indicated by a flashing yellow light.
- 2) Go to the Windows Control Panel, find the icon “hardware and sound, devices and printers”. There should be an icon for a USB serial port. Double click on the icon, and select the “Hardware” tab of the properties window.
- 3) Click on the properties button. On the “General” tab click on the change settings button. Click on the “Port Settings A” tab, and then click on the advanced button.
- 4) In the “Advanced Settings” window, click on the “com port” button and select a high numbered “com port” that is not in use such as 11 or 12.
- 5) Click on the OK button 3X to close all the windows.
- 6) You should now have a USB com port in your hardware window with the new com number. You will use this com number in the control spreadsheet to address a particular demo board. If you install multiple demo boards be sure to give them different com numbers.

