

QuickSyn Frequency Synthesizers



FSL mmW Series



This series offers models FSL-2740, FSL-5067, and FSL-7682, which extend QuickSyn Lite synthesizers into the millimeter-wave range. The three available models correspond to popular millimeter wave bands—27 GHz to 40 GHz, 50 GHz to 67 GHz, and 76 GHz to 82 GHz. The QuickSyn Lite mmW synthesizer modules are a cost-effective solution for applications requiring a stable and clean CW millimeter wave source.



FSL-2740, FSL-5067, FSL-7682 Specifications

Description	Specification		
Frequency	FSL-2740	FSL-5067	FSL-7682
Range	27 GHz to 40 GHz	50 GHz to 67 GHz	76 GHz to 82 GHz
Resolution	1 Hz		
Switching Time	1 ms 100 μ s with Option 3		
List Mode	32,000 points		

Description	Specification		
Output Power	FSL-2740	FSL-5067	FSL-7682
Power	+17 dBm min., +18 dBm typ., +24 dBm max.	+15 dBm min., +17 dBm typ., +22 dBm max.	+10 dBm min., +11 dBm typ., +14 dBm max.
Output Return Loss	10 dB nom.		

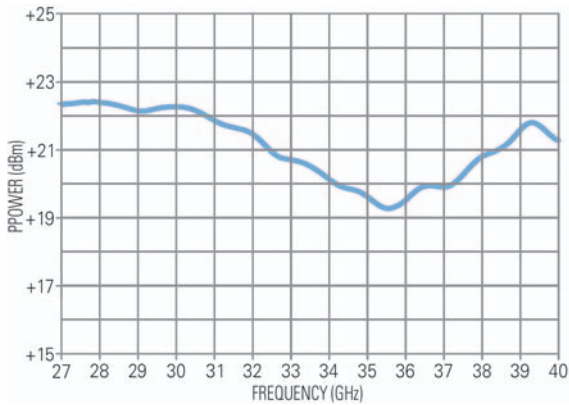


FIGURE 6: FSL-2740 Typical Power Output

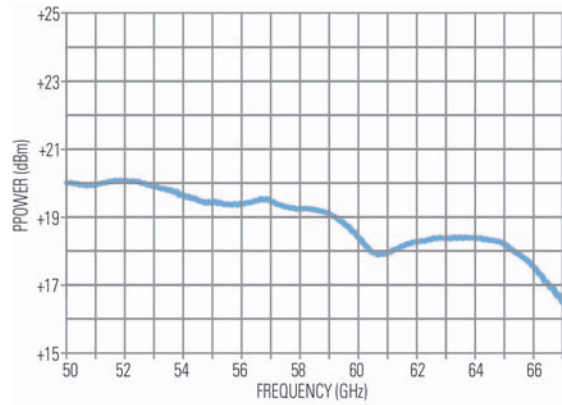


FIGURE 7: FSL-5067 Typical Power Output

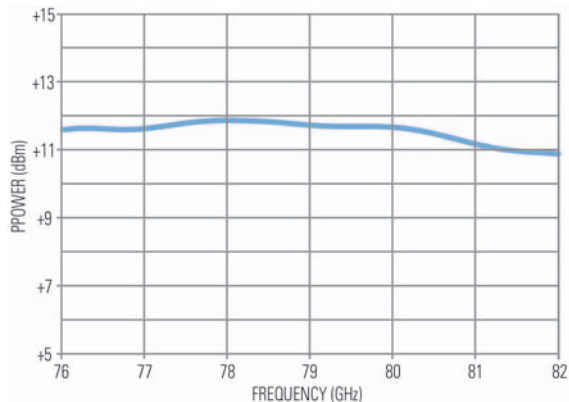


FIGURE 8: FSL-7682 Typical Power Output

Description		Specification		
Internal Reference		FSL-2740	FSL-5067	FSL-7682
Frequency Output			10 MHz typ.	
Power Output			+3 dBm min., +5 dBm typ., +7 dBm max.	
Mute			-60 dBm max.	
Frequency Temperature Stability			±1 ppm	
Aging ¹			±1 ppm / year	
Locking Range			±5 ppm	
Output Impedance			50 Ω nom.	
External Reference		FSL-2740	FSL-5067	FSL-7682
Frequency Input			10 MHz typ.	
Power Input			+10 dBm min., +5 dBm typ., +10 dBm max.	
Input level (absolute max.)			+15 dBm max.	

¹A self-calibration feature can be launched through USB command for in-field units.

Description		Specification		
Spectral Purity		FSL-2740	FSL-5067	FSL-7682
Harmonics		-20 dBc typ., -15 dBc max.	-30 dBc typ., -25 dBc max.	-30 dBc typ.
Out-of-Band Sub-Harmonics (F/2 & 3F/2)		-40 dBc typ., -15 dBc max.	-60 dBc typ., -50 dBc max.	-60 dBc typ.
In-Band Sub-Harmonics (3F/4 & 5F/4)		-40 dBc typ., -35 dBc max.	-60 dBc typ., -50 dBc max.	-60 dBc typ., -50 dBc max.
Spurious		-60 dBc typ., -55 dBc max.	-60 dBc typ., -50 dBc max.	-60 dBc typ., -50 dBc max.
Phase Noise		FSL-2740	FSL-5067	FSL-7682
		40 GHz (typ.) (max.)	67 GHz (typ.) (max.)	82 GHz (typ.) (max.)
dBc/Hz				
100 Hz		-55 -61	-59 -53	-57 -51
1 kHz		-90 -84	-89 -83	-87 -81
10 kHz		-100 -94	-100 -94	-99 -92
100 kHz		-103 -97	-101 -95	-101 -93
1 MHz		-105 -99	-103 -97	-100 -95
10 MHz		-116 -110	-117 -111	-115 -109
Floor		-145 -145	-141 -135	-141 -135

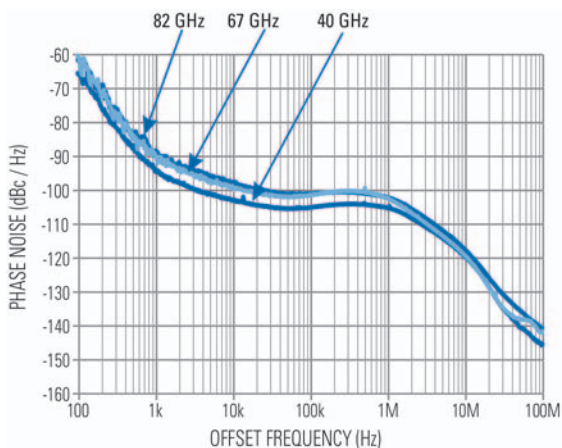


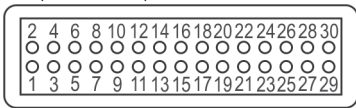
FIGURE 9: Phase Noise

Description		Specification		
Electrical		FSL-2740	FSL-5067	FSL-7682
Supply Voltage			+11.4 V min., +12 V typ., +12.6 V max.	
Absolute Maximum Supply Voltage			+15 max.	
Supply Current		1350 mA typ., 1500 mA max.	1350 mA typ., 1500 mA max.	1450 mA typ., 1600 mA max.

Description	Specification		
Temperature¹	FSL-2740	FSL-5067	FSL-7682
Operating		0° C to +40° C	
Storage		-40° C to +70° C	

¹Adequate heat sinking must be provided in order to prevent permanent damage.

Description	Specification		
Physical	FSL-2740	FSL-5067	FSL-7682
Size (W x L x H)		4 in. x 4 in. x 1.8 in.	
Weight		1.6 lb. (0.73 kg)	

Description	Specification		
Connectors	FSL-2740	FSL-5067	FSL-7682
RF OUT	K Type	V Type	WR12
REF IN		SMA-F	
REF OUT		SMA-F	
SPI ¹	30 pin, 0.05 in. spaced double-row header 		
USB		Mini-AB receptacle (USB 2.0)	

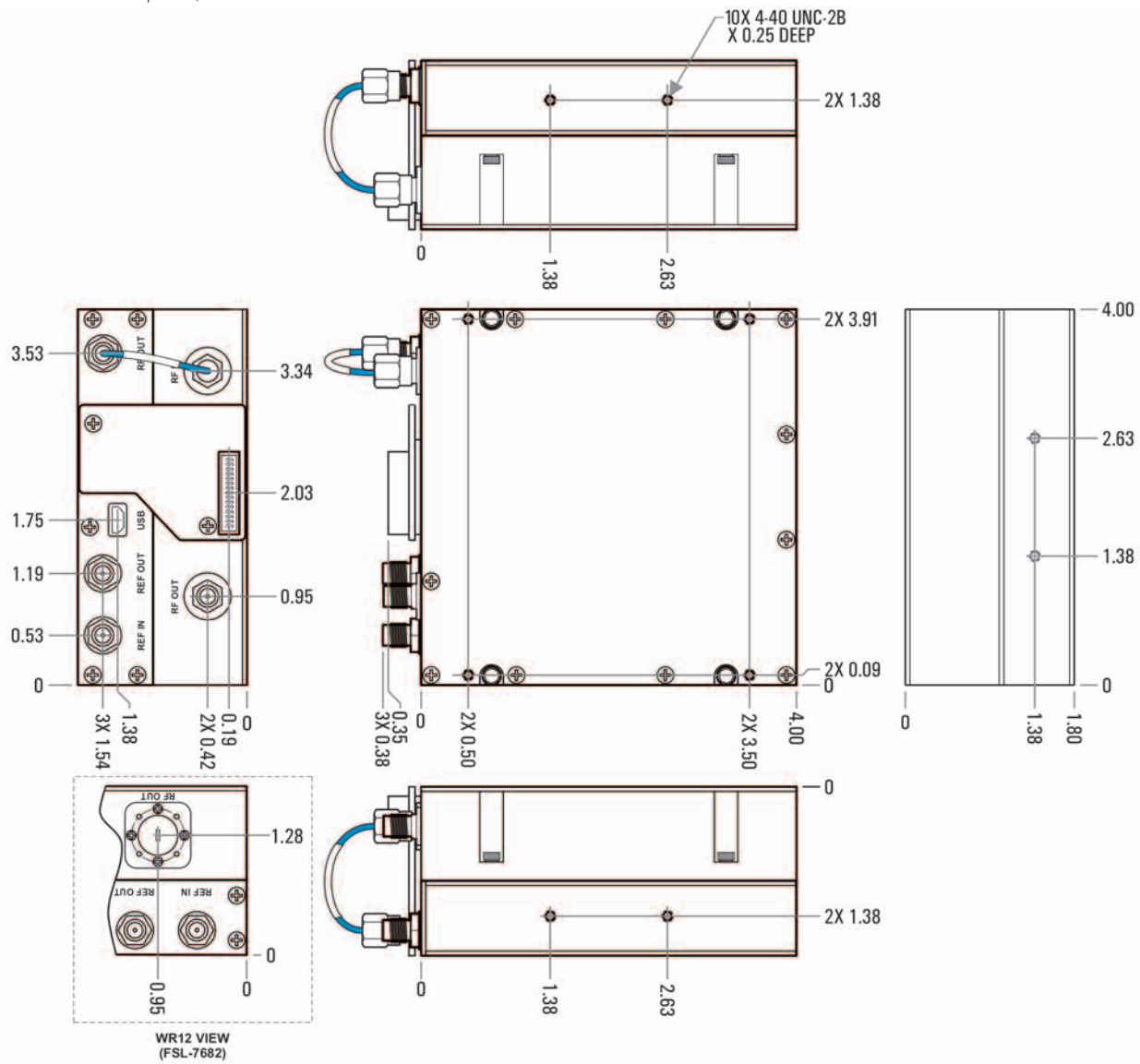
¹National Instruments recommends Hirose manufactured socket SFSD-15-28-H-06.00-SL

Description		Specification
SPI Interface Programming¹		
Signal	Pin	Description
SPI_CLK	20	SPI clock. Supplied by the controlling computer (not the synthesizer). The controlling computer is the SPI master; the synthesizer is the SPI slave.
SPI_SS	18	SPI Slave Select. This signal is an active low input to the synthesizer. It frames command communications. For each command, SPI_SS goes low before the first bit is sent and goes high after the last bit is sent.
SPI_MISO	24	Master In/Slave Out. Status and other returned information from the synthesizer to the controlling computer.
SPI_MOSI	22	Master Out/Slave In. Command data from the controlling computer to the synthesizer.
TRIGGER	14	Rising edge active input. When enabled, the trigger signal of +3.3 V can initiate freq. change or step through lists or sweeps.
LOCK	16	Output indicates the synthesizer is locked on its current setting (+3.3 V locked, 0 V unlocked).
REF_LOCK	13	Output indicates the synthesizer has detected an external reference signal and locked on that signal (+3.3 V locked, 0 V unlocked).
RESET	1	Internally pulled up to +3.3 V with 100 kΩ resistor. Active "low" signal, which has a minimum width of 1 ms, will reset the synthesizer to a default state.
PWER_+12V	26,28,30	External +12V DC supply.
GND	2,15,25,27,29	Ground.
N/C	3,4,5,6,7,8,9,10 11,12,17,19,21,23	Do not use. Reserved for factory use.

¹A QuickSyn communications specification is available on the ni-microwavecomponents.com website.

Mechanical Dimensions

Unless otherwise specified, dimensions are in inches ± 0.01 .



Description

Specification

Ordering Information

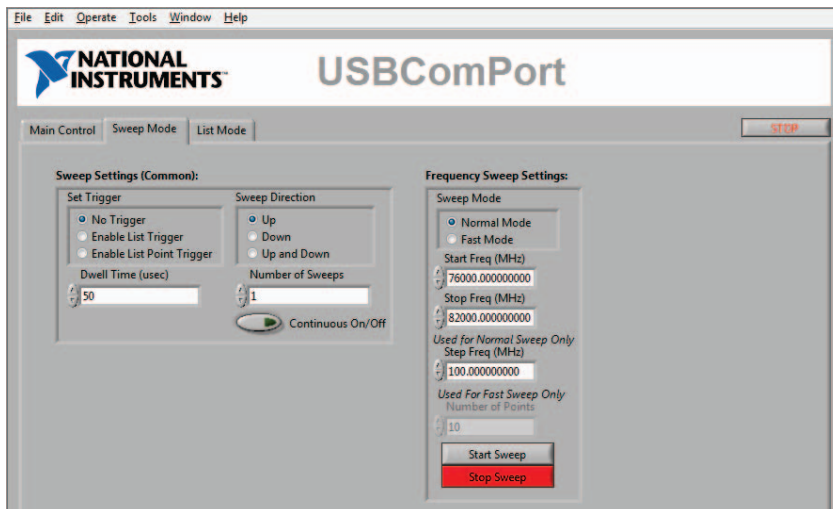
Models	FSL-2740	FSL-5067	FSL-7682
Option 3		Fast Switching	
Option 8		Two-year warranty extension (three years total)	
Accessory 4		Test report	
Accessory 6	Kit, Quickstart (includes Quickstart guide, USB cable, DC bias cable, and power supply)		
Accessory 10		Kit, heatsink	
Accessory 11		Certificate of calibration	

Soft Front Panel

You can control QuickSyn product functionality through the soft front panel, which is a graphical user interface available from the ni-microwavecomponents.com website. The soft front panel consists of three separate sections—the main-control panel, the sweep-mode panel, and the list-mode panel. From these panels, numerous sophisticated functions (e.g., precise frequency and power control, RF output and reference mute, blanking, independent frequency and power sweeps, list mode, modulation, and more) can be utilized, depending on which QuickSyn model you are using.



The soft front panel for the QuickSyn FSW Series frequency synthesizers is shown here. Reference, frequency, power, and modulation controls are presented on the main-control panel along with corresponding indicators and internal temperature.

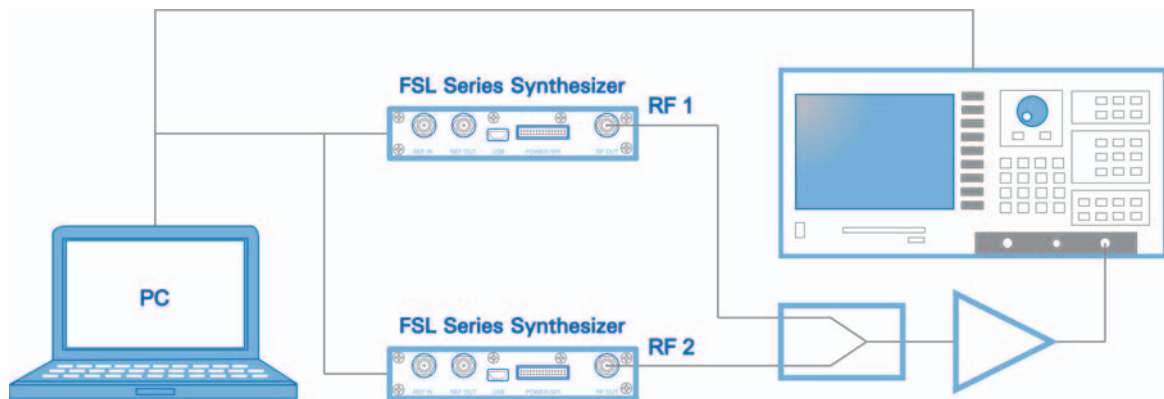


Sweep mode for the FSL Series is accessible through the sweep-mode panel shown here. You can set triggering, sweep direction, frequency range, and step size.

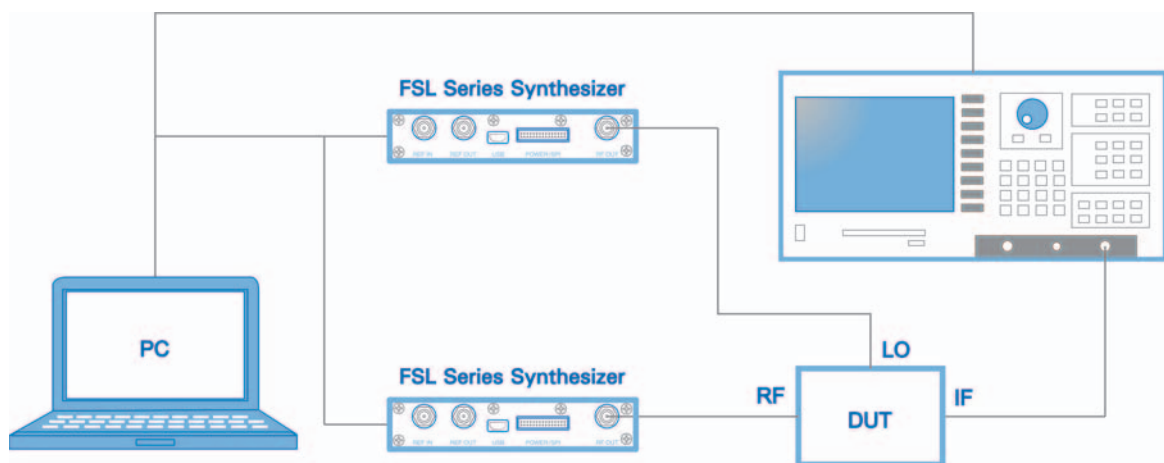
Application Examples

Two-tone tests are a standard benchmarking linearity of many RF products. Our FSL Series synthesizers allow for low-cost testing of third-order intercept points of amplifiers and mixers. Additionally, the low spurious performance of QuickSyn products makes them ideal for measuring conversion loss and conducting MxN spurious tests. In these applications, measurement speed is enhanced by our synthesizer's excellent frequency switching speed, sweep, list, and list trigger modes. Each list mode is capable of 32,000 step points.

Two-Tone Third-Order Intercept Test Setup



Mixer Conversion Loss Isolation and MxN Spurious Test Setup



With extended frequency coverage into millimeter wave, our FSLmmW Series synthesizers are ideal for many crucial tasks in the emerging 5G and automotive-radar markets and other applications that require compact size, low cost, fast testing, and instrument-grade phase-noise performance. Error vector magnitude (EVM) measurements are especially sensitive to phase-noise performance. The application here shows the QuickSyn FSLmmW series synthesizers used as low phase noise LOs that enable high-quality EVM measurements. The QuickSyn synthesizers can be used as direct input stimulus as well as to test the analog response of the DUT. The ability to seamlessly program numerous list and sweep points also aids in simplifying test systems.

Low Cost 5G EVM Test

