Communication Techniques, Inc.

Frequency Synthesizers
Series BBS

Features

- Broad Band Coverage: Up to 0.01 to 5.12 GHz in a Single Unit
- Any Step Size 1 Hz to 10 MHz
- Low Phase Noise: -131 dBc/Hz Typ. at 100 kHz Offset (F = 1000 MHz)
- Compact Low Profile Housing
- Standard Models with 1 Hz Steps:
    - BBS-100: 750 - 1000 & 1500 - 2000 MHz
    - BBS-200: 9 - 2200 MHz
    - BBS-400: 9 - 4400 MHz
    - BBS-500: 10 - 5120 MHz
    - BBS-600: 4400 - 6000 MHz
- Low Spurious
- +13 to +17 dBm Output Power
- 3 Wire Serial Programming Standard
- DC Supplies: +5.1 V and +8 to +20 V
- Locks to External 10 MHz Reference

Options

(Consult Factory)

- Custom Bands
- Custom Step Sizes
- External 5 - 100 MHz Reference
- Internal Reference
- Parallel Control - Up 21 Bits
- Single DC Supply Operation
- Low Power Version with larger step
- Integrated Phase Noise Optimization
- VXI Interface

Description

The BBS series synthesizers offer broadband frequency coverage with very fine frequency resolution and low phase noise in a compact package. Several standard models are available with 1 Hz step size that provide high quality signals for a wide variety of applications. The basic BBS-200 covers 9 - 2200 MHz. The BBS-400 doubles the range to 4400 MHz, and the BBS-500 further extends the upper limit to 5120 MHz. The BBS-100 is optimized for wireless bands within 750-1000 and 1500 - 2000 MHz. For C-Band SatCom the BBS-600 spans 4400-6000 MHz. The standard BBS synthesizers feature low phase noise both at high and low offsets. For example a 1 GHz output signal typically has phase noise of -129 to -136 dBc/Hz at 100 kHz offset and - 87 to -91 dBc/Hz at 100 Hz offset assuming a low noise reference is used. At 10 MHz the 100 Hz noise is -127 to -131 dBc/Hz while at 100 kHz offset a noise floor limitation of typically -153 dBc/Hz is seen. At 4 GHz the phase noise is typically -117 to -120 dBc/Hz at 100 kHz offset and -76 to -80 dBc/Hz at 100 Hz offset.

These units are well suited for use as synthesized local oscillators in communication system applications from cellular radio to SatCom, especially where fine frequency resolution is needed. The broad frequency coverage, low phase noise and small size make the BBS an ideal synthesizer for instrumentation and automated test.

The standard BBS units lock to an external 10 MHz reference and are simply programmed with 33 serial bits using a 3 wire Enable/Clock/Data protocol which can be easily generated from the parallel printer port of a PC. The units operate from +5.1 V and +8 to +20 V dc supplies.

For applications with larger step sizes, a lower power custom "L" version of the BBS can be provided with some degradation in close-in phase noise. Minimum step size is 10 kHz over the fundamental range (1500-2000, 1088-2200, or 1280-2560 MHz). For the L version phase noise and spurious are better with higher step sizes. Also step sizes are scaled by the division or multiplication factor following the fundamental range. For example the BBS-100L provides 10 kHz steps 1500-2000 MHz and 5 kHz steps 750-1000 MHz.

CTI can customize the frequency band and frequency step coding for specific requirements. In addition the phase noise curve can be adjusted to optimize weighted integrated phase noise over a specified offset range. For example, higher data rate systems usually require the best noise at high offsets rather than close-in. The BBS can lock to customer specified external reference frequencies up to 100 MHz. Internal references are also available.

Performance Specifications

FREQUENCY RANGE	Standard Units • BBS-100: 750-1000 MHz and 1500-2000 MHz • BBS-200: 9 - 2200 MHz • BBS-400: 9 - 4400 MHz • BBS-500: 10 - 5120 MHz • BBS-600: 4400 - 6000 MHz Custom Units: 5 - 6000 MHz
BANDWIDTH of custom units	Any band within above ranges
STEP SIZE	Standard Units: 1 Hz. Customer specified: 1 Hz to 10 MHz L version: 10 kHz to 5 MHz (referenced to fundamental band)
PHASE NOISE	see table
POWER	+13 to +17 dBm

		offsets <30 kHz	other
SPURIOUS (excluding spurs from Ext. Ref.) BBS-100 typical			
	750-1000 MHz:	<-76 dBc	<-85 dBc
	1500-2000 MHz:	<-70 dBc	<-80 dBc
BBS-200 & -400 typical			
	<272 MHz:	<-85 dBc	<-85 dBc
	272-544 MHz:	<-82 dBc	<-85 dBc
	544-1088 MHz:	<-76 dBc	<-85 dBc
	1088-2200 MHz:	<-70 dBc	<-80 dBc
BBS-400 typical	2200-4400 MHz:	<-65 dBc	<-74 dBc (subharm <-65 dBc)
BBS-600 typical	4400-6000 MHz:	<-63 dBc	<--70 dBc (subharm <-65 dBc)
HARMONICS	<-15 dBc typ.		
EXTERNAL REFERENCE	10 MHz at +3 +/-3 dBm; 5-100 MHz optional		
FREQ. ACCURACY WITH EXT. REF.	Same as External Reference ±2x10^{-11}		
FREQUENCY CONTROL	Standard: 3 wire serial (Clk/Data/Enab) TTL 33 bits Parallel: 21 bits TTL (21 bits = 2 million frequencies max) Internal MCU has non-volatile RAM and can be custom programmed		
SWITCHING SPEED	<25 mS typ. on standard units		
DC SUPPLY VOLTAGE (measured at synth J1 pin)	Dual: +5.0 to 5.4 Vdc at 750 mA and +8 to +20 Vdc at 150 mA (L version = 300 mA on 5 - 5.4 Vdc)		
	Single: +8 Vdc to +20 Vdc at 900 mA; (L version = 450 mA)		
RIPPLE ON DC	5 mVpp max 50 Hz - 50 kHz; 50 mVpp 50 kHz - 10 MHz		
LOCK ALARM	TTL Hi = Locked		
OPERATING TEMPERATURE (baseplate)	0 to +60° C standard; optional range -20 to +75° C		
RF CONNECTORS	SMA female		
MULTIPIN CONNECTOR (DC, Freq,, Alarm)	Protected Header (3M 25XX): 10 pin for serial; 30/26 pin for parallel		
DIMENSIONS	3.6 x 5.8 x 0.98 inches excluding connectors		

Specifications subject to change without notice

Phase Noise - Typical

MODEL	FREQ (MHz)	*100 Hz	*1 kHz	*10 kHz	100 kHz	1 MHz
BBS-100	1000	-87	-88	-112	-136	-143
	2000	-81	-82	-106	-130	-150
BBS-200 & 400	10	-131	-134	-144	-153	-153
	100	-111	-114	-124	-150	-153
	1000	-91	-94	-104	-130	-143
	2000	-85	-88	-98	-124	-146
BBS-400	4000	-79	-82	-92	-118	-140
BBS-500	10	-129	-133	-144	-153	-153
	100	-109	-113	-124	-149	-153
	1000	-89	-93	-104	-129	-143
	2000	-83	-87	-98	-123	-143
	5000	-74	-78	-89	-114	-134
BBS-600	5500	-75	-80	-90	-114	-138
BBS-100L - 5 kHz steps	1000	-64	-76	-114	-136	-143
- 10 kHz steps	2000	-58	-70	-108	-130	-150

*Phase noise on the external reference must be raised by 20 x Log10 (F/Fref) dB and added to the listed synthesizer phase noise on a power basis for offsets up to 10 kHz.