



GPS1300-10-1000

- Sub-miniature smd GPS disciplined 10.000MHz frequency standard; Sine wave and 1PPS LVCMOS outputs
- MTIE Stratum 1 compliance; theoretically approaching the 1×10^{-12} long term accuracy of the GPS caesium standard
- Excellent holdover from integrated precision ovened oscillator with very low phase noise
- Military, industrial and commercial applications in synchronization and timing



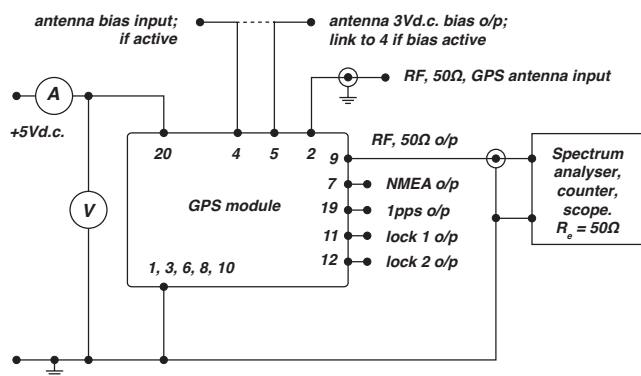
The GPS1300 sets a new benchmark for miniature smd frequency standards. The combination of regulation through the acquisition of GPS data, the storage of control levels, miniature size and integrated OCXO provides a component level module for incorporation into OEM equipment.

Disciplined from satellite data the module exhibits near Caesium standard accuracy and excellent holdover accuracy, during periods of GPS unavailability, from its integral low phase noise OCXO.

Available as a 10.000MHz precision reference standard the module may also be supplied to custom frequencies and specifications together with a range of internal oscillator performance variations and supply options.

Applications will include instrument calibration, system synchronisation, portable reference units, telecommunication base stations and extreme timing accuracy.

Test circuit:



Lock detect status levels: LVCMOS:

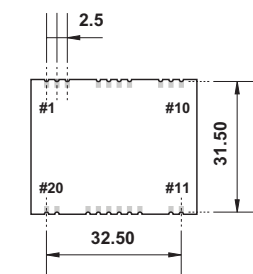
Levels will alternate at 8Hz for the first 4 seconds after turn on or when GPS receiver is not operational

lock 1	lock 2	
Low	Low	No signal being received
High	Low	GPS detect
Low	High	GPS lock
High	High	Reference Lock

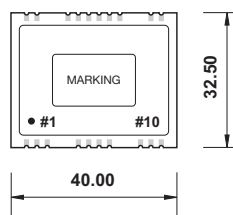
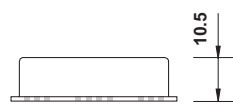
1 pps output level LVCMOS

Development conducted with active GPS antenna, gain (+25 ±2)dBm including cable

Dimensions(mm):



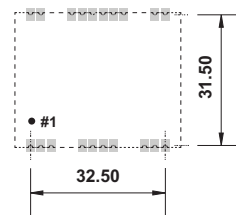
pads viewed from bottom
pad size (2.0 x 1.5)mm
pads are electroless gold



connections

- # 1 ground
- # 2 antenna
- # 3 ground
- # 4 antenna bias (if active)
- # 5 antenna bias supply output; 3Vd.c., if active link to # 4
- # 6 ground
- # 7 NMEA (3V CMOS RS232)
- # 8 ground
- # 9 r.f. output 10MHz 50Ω
- # 10 ground
- # 11 lock 1
- # 12 lock 2
- # 13 N/C factory use only
- # 14 N/C factory use only
- # 15 N/C factory use only
- # 16 N/C factory use only
- # 17 N/C factory use only
- # 18 N/C factory use only
- # 19 1 pps (LVCMOS)
- # 20 V_{cc}

suggested land pattern
land pad size (3.0 x 2.0)mm



hand soldering recommended



OCXO performance - GPS disciplined

During periods of lock the GPS1300 module provides r.f. output accuracy approaching the satellite on-board Caesium standards. Initial lock can be achieved within 15 minutes maximum dependent upon satellite availability. The lock condition is indicated by the status of the lock 1 and lock 2 outputs.

Performance during periods of GPS lock:

r.f. output	10.000MHz, sine wave
long term stability	theoretically approaching the 1×10^{-12} long term accuracy of the GPS caesium standard ($\Delta t = 24$ hours)
short term stability	1×10^{-11} ($\Delta t = 1$ sec)
phase noise*:	
single sideband	130dBc/Hz, $f_o + 10$ Hz
1Hz bandwidth	150dBc/Hz, $f_o + 100$ Hz
	160dBc/Hz, $f_o + 1$ kHz
	170dBc/Hz, $f_o + 10$ kHz

**phase noise is identical to that of the internal precision OCXO except during periods of frequency correction which cause a phase shift and therefore degradation of phase noise performance.*

1PPS accuracy ± 50 ns

Generic specification:

power supplies:	
supply voltage	+5Vd.c., custom options available
start up current	450mA max. -40°C
quiescent current	250mA max. +25°C

output level Sine wave; +10dBm ± 3 dBm, 50 Ω , CMOS o/p as custom option

harmonics <-25dBc
spurious <-90dBc

PPS output	1 PPS LVCMOS
lock 1 levels	LVCMOS
lock 2 levels	LVCMOS
NMEA	LVCMOS RS232 data stream

OCXO warm up time	5 minutes max. to within ± 0.1 ppm of nominal
insulation resistance	500Meg Ω min., 100Vd.c.
operating temperature	(-40 +70)°C, custom options available
storage temperature	(-40 +125)°C
marking	part number, frequency, date code, serial number

OCXO performance - holdover

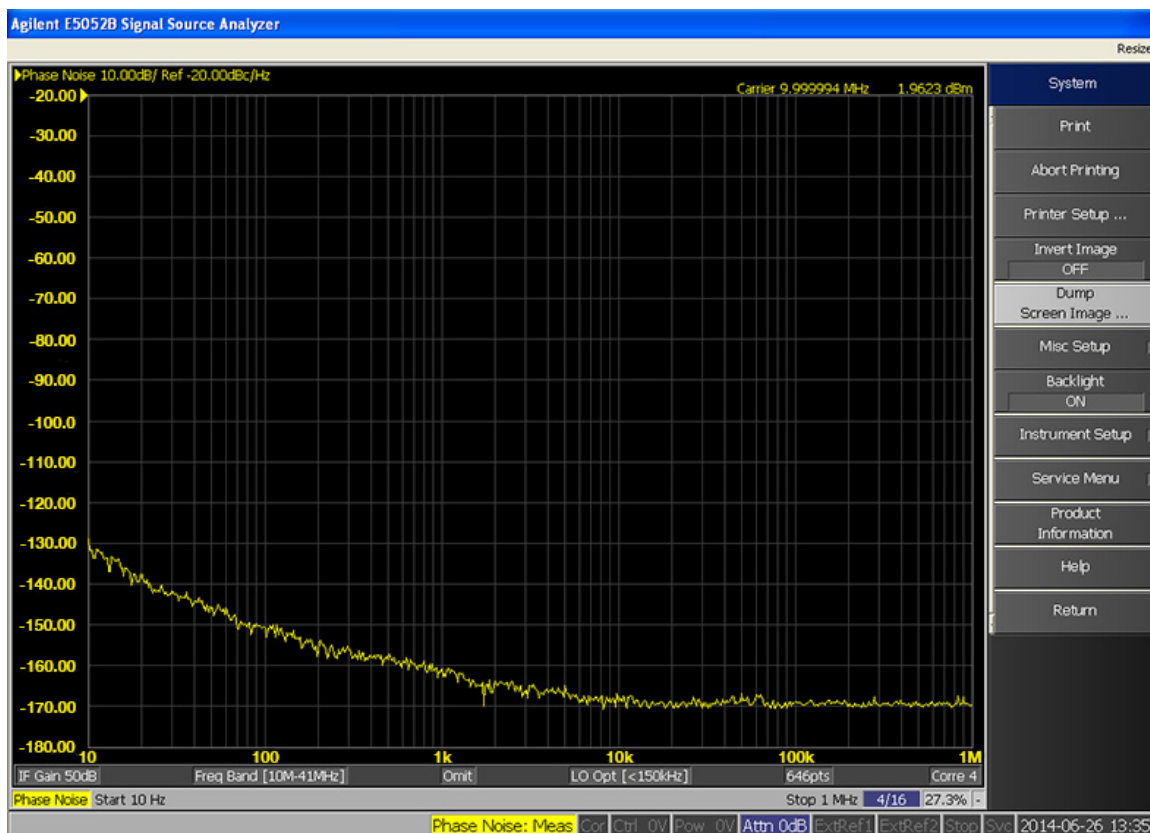
After initial warm up and GPS lock, and if lock is subsequently lost, the GPS1300 module provides r.f. output accuracy from the previously disciplined internal precision OCXO. The retention and application of the discipline data allows the OCXO set accuracy to be maintained and r.f. output is then a function of the OCXO performance. A fast return to disciplined performance is assured when satellite data is again available.

Performance during holdover:

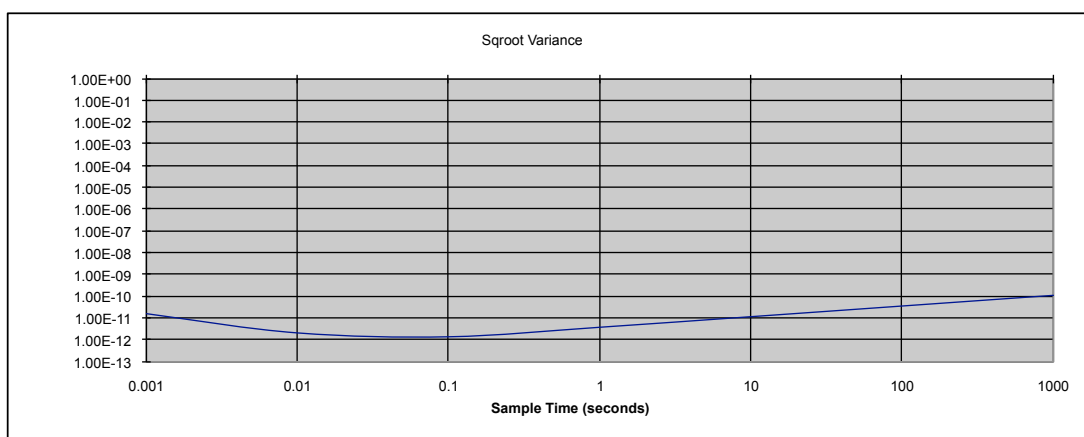
r.f. output	10.000MHz, sine wave
holdover stability	± 0.02 ppm max. (-40+70)°C, after 30 days continuous operation
short term ageing	$\pm 2 \times 10^{-10}$ max. per day after 30 days continuous operation
long term ageing	± 0.05 ppm max. per year after 30 days continuous operation
against V_{cc} change	± 0.002 ppm max. for $V_{cc} \pm 5\%$
phase noise:	
single sideband	130dBc/Hz, $f_o + 10$ Hz
1Hz bandwidth	150dBc/Hz, $f_o + 100$ Hz
	160dBc/Hz, $f_o + 1$ kHz
	170dBc/Hz, $f_o + 10$ kHz



Typical 10.000MHz internal OCXO phase noise performance



Allan Variance calculation from typical internal OCXO phase noise



Ref: David W. Allen, "Time and Frequency (Time-Domain) Characterization, Estimation, and Prediction of Precision Clocks and Oscillators"