## 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 x $10^{-12}$ 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***

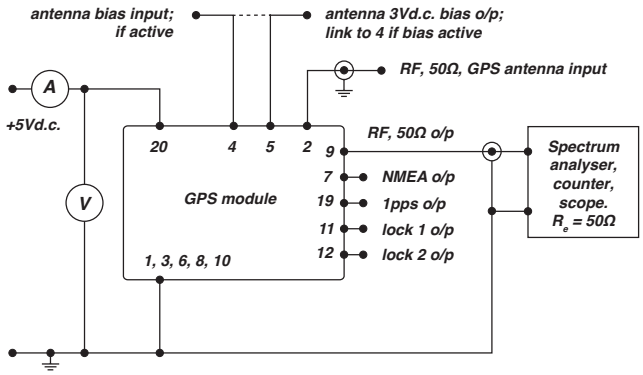

*The GPS1300 sets a new benchmark for miniature smd frequency standards. The combination of regulation through the aquisition of GPS data, the storage of control levels, miniature size and integrated OCXO provides a component level module for incorporation into OEM equipment.*

*Disciplined from satellite data the module exibits 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, telecommuncation base stations and extreme timing accuracy.*

### Test circuit:




***Lock detect status levels; LVCMOS:***

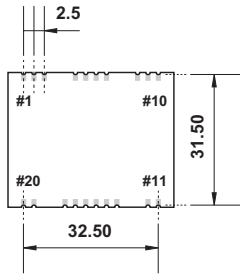
***Levels will alternate at 8Hz for the first 4 seconds after turn on or when GPS receiver is not operational***

| ***lock 1*** | ***lock2*** | |
|---|---|---|
| *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***

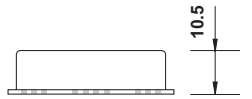
### Dimensions(mm):



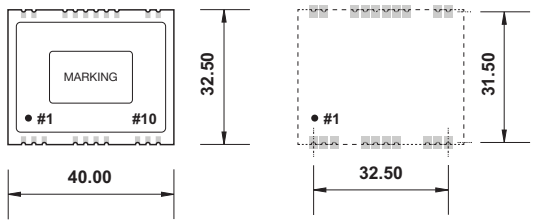

**pads viewed from bottom**
**pad size (2.0 x 1.5)mm**
**pads are electroless gold**

**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**

*September 7th 2012*



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## 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 x $10^{-12}$ long term accuracy of the GPS caesium standard ($\Delta t$ = 24 hours)* |
| ***short term stability*** | *1 x $10^{-11}$ ($\Delta t$ = 1 sec)* |
| ***phase noise*:*** | |
| *single sideband* | *120dBc/Hz, $f_o$ +10Hz* |
| *1Hz bandwidth* | *140dBc/Hz, $f_o$ +100Hz* |
| | *145dBc/Hz, $f_o$ +1kHz* |
| | *155dBc/Hz, $f_o$+10kHz* |

****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*** | *±50ns* |

## 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*** | *±0.02ppm max.(-40+70)°C, after 30 days continuous operation* |
| ***short term ageing*** | *±2 x $10^{-10}$ max. per day after 30 days continuous operation* |
| ***long term ageing*** | *±0.05ppm max. per year after 30 days continuous operation* |
| ***against $V_{cc}$ change*** | *±0.002ppm max. for $V_{cc}$ ±5%* |
| ***phase noise:*** | |
| *single sideband* | *120dBc/Hz, $f_o$ +10Hz* |
| *1Hz bandwidth* | *140dBc/Hz, $f_o$ +100Hz* |
| | *145dBc/Hz, $f_o$ +1kHz* |
| | *155dBc/Hz, $f_o$+10kHz* |

## 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 ±3dBm, 50Ω, 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 ±0.1ppm of nominal* |
| ***insulation resistance*** | *500MegΩ min., 100Vd.c.* |
| ***operating temperature*** | *(-40 +70)°C, custom options available* |
| ***storage temperature*** | *(-40 +125)°C* |
| ***marking*** | *part number, frequency, date code, serial number* |

*September 7th 2012*



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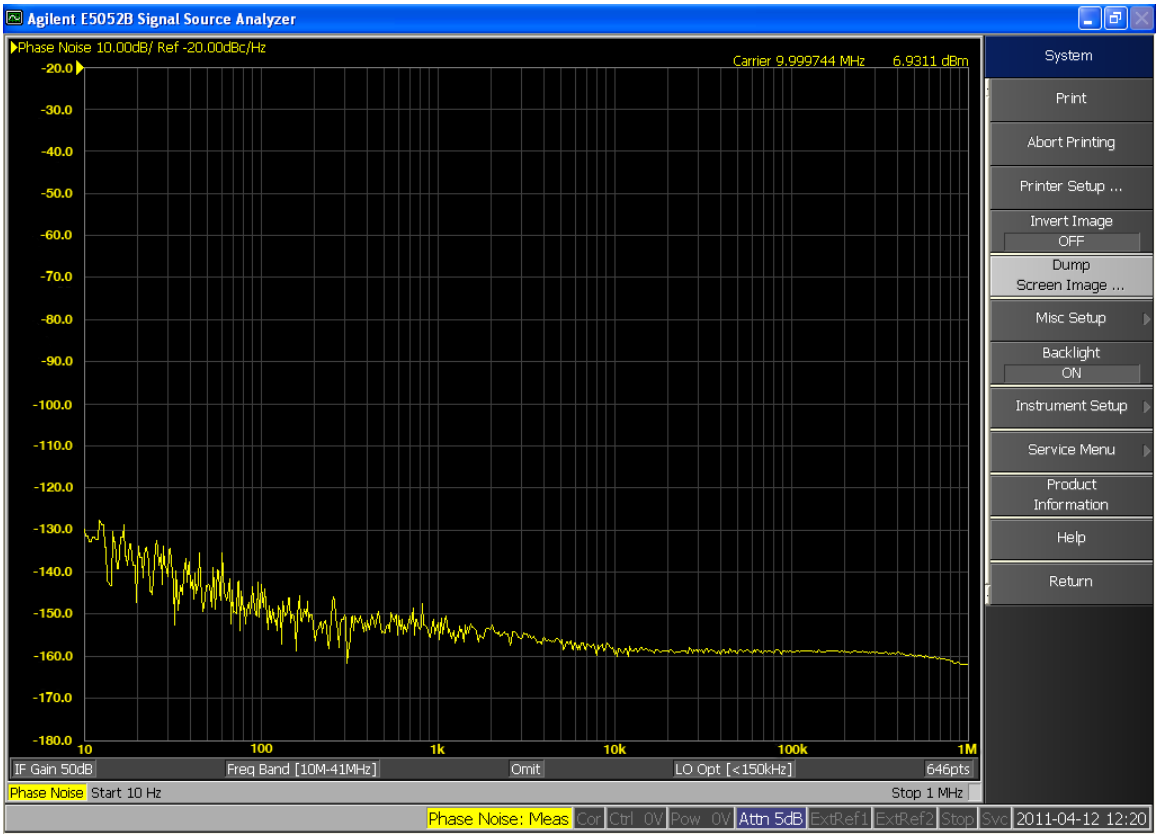
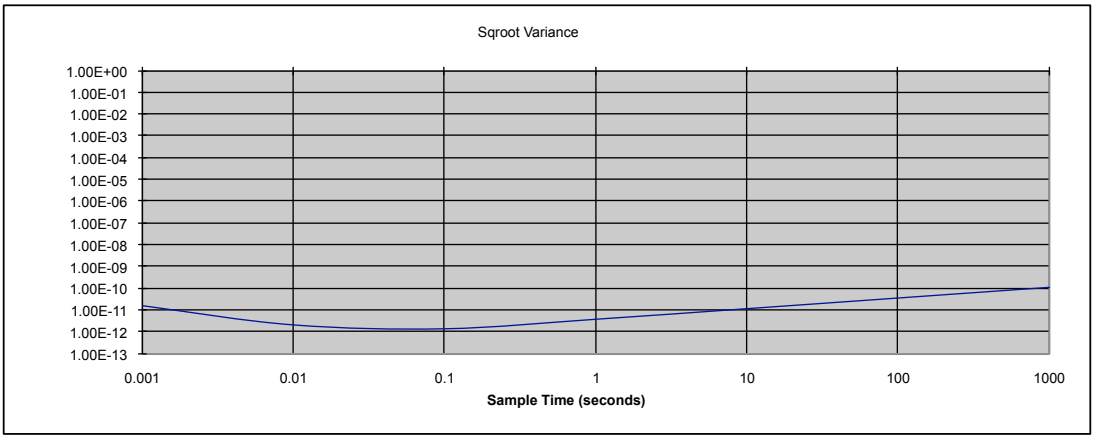
## Typical 10.000MHz internal OCXO phase noise performance




## 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"*

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