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### **125 Series FTS375** Disciplined Reference and Synchronous Clock Generator

# CONNOR WINFIELD

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> JATA SHEET

#### **General Description**

The FTS375 module is a GPS driven, mixed-signal phase lock loop, providing a 1 PPS CMOS output from a Connor-Winfield GPS timing receiver and generating a 10 MHz CMOS and a 10 MHz SINE output from an intrinsically low jitter voltage controlled crystal oscillator. The FTS375 can lock to a 10 MHz reference derived from the on-board GPS receiver or an external 10 MHz reference or to an external 1 PPS reference. Alarms are provided to indicate Lossof-Lock, Holdover, and Antenna Fault. The on-board GPS receiver requires an outdoor mounted GPS antenna for the best stability and consistent performance.



The mode control inputs are used to manually switch between references and/or holdover. The user application should monitor the alarm outputs and manually switch modes as needed.

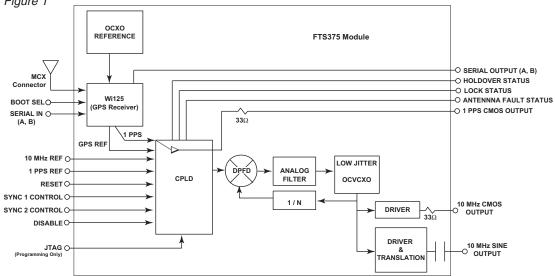
Serial I/O lines provide access to the NMEA messages from the GPS receiver (referenced in the Connor-Winfield's Wi125 User Manual. Contact Connor-Winfield Sales for a copy). The serial I/O lines can be used to access GPS timestamp information, or to verify that the receiver has recovered from an alarm condition. The reset is used to reset the GPS receiver (if needed).

#### **Features**

- Phase locked 10 MHz output
- 1 PPS output
- 3 selectable references: GPS, External 10 MHz or External 1 PPS
- Holdover
- Three alarm outputs. (Loss-of-Lock, Holdover and Antenna Fault)
- Serial input and output ports (GPS receiver)
- Master reset
- +3.3 Volt power supply
- Commercial Temp (0-70° C)
- Mechanical Dimensions: 3.937" x 1.969" x 0.708" (100mm x 50mm x 17.98mm)
- Package: 36-pin Through-Hole
- Fixed Position Unit

#### Figure 1

#### **Functional Block Diagram**



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#### **Pin Description**

Table 1			
Pin #	Pin Name	Description	Note
1	1 PPS Ref Input	Externally provided LVCMOS 1 PPS reference	
2	GND	Ground	
3	10 MHz Ref Input	Externally provided LVCMOS 10 MHz reference	
4	No Connect	Used for factory programming	
5	10 MHz CMOS Output	10 MHz low jitter CMOS output	
6	GND	Ground	
7	10 MHz Sine Output	10 MHz AC coupled low jitter SINE output	
8	No Connect	Used for factory programming	
9	No Connect	Used for factory programming	
10	No Connect	Used for factory programming	
11	*Reset	Pull low to reset GPS receiver	
12	ТХА	RS-232 transmit signal for UART0	
13	ТХВ	RS-232 transmit signal for UART1	
14	GND	Ground	
15	RXA	RS-232 receive signal for UART0	
16	RXB	RS-232 receive signal for UART1	
17	GND	Ground	
18	*Bootsel	Normally high. Pull low to reprogram the GPS receiver	
19	GND	Ground	
20	Antenna Supply Voltage	Antenna Supply voltage. Limit continuous current to 45mA	
21	Vcc1	3.3V supply voltage for the GPS circuitry	
22	GND	Ground	
23	Unused	Spare CPLD connection	
24	Unused	Spare CPLD connection	
27	Antenna Fault Status	High = A fault has been detected on pin 20 (Ant Supply Voltage)	
28	1 PPS Out	1 PPS CMOS output	
29	Lock Status	High = Unit is locked to the selected reference	
30	Holdover Status	High = Unit is in holdover	
31	SYNC2 Control	Lock mode control signal	
32	SYNC1 Control	Lock mode control signal	
33	Unused	Spare CPLD connection	
34	*Disable	Pull low to disable the 10 MHz CMOS and SINE outputs	
35	GND	Ground	
36	Vcc2	3.3V supply voltage for PLL and interfacing circuitry	

Note: Vcc1 and Vcc2 should not be connected; otherwise phase noise performance will degrade.



#### Absolute Maximum Rating

Symbol	Parameter	Minimum	Maximum	Units	Notes
V <sub>CC</sub>	Power Supply Voltage	-0.3	3.7	Volts	1
V <sub>IN</sub>	Input Voltage	-0.3	4.6	Volts	1
V <sub>PREAMP</sub>	Antenna Supply Voltage	2.7	13.2	Volts	1
T <sub>s</sub>	Storage Temperature	-30	80	°C	1

#### **Operating Specifications**

Symbol	Parameter	Minimum	Nominal	Maximum	Units	Notes	
V <sub>cc</sub> 1	Supply Voltage 1	3.135	3.3	3.465	V		
I <sub>cc</sub> 1	Supply Current 1		.480	1.2	А		
V <sub>cc</sub> 2	Supply Voltage 2	3.135	3.3	3.465	V	2	
I <sub>cc</sub> 2	Supply Current 2		.380	1.0	А		
I <sub>cc</sub> 2 T <sub>o</sub>	Temperature Range	0		70	°C		
t <sub>JTOL</sub>	Input Jitter Tolerance	30			ns		
t <sub>AQ GPS</sub>	GPS Input Acquisition Time		150		sec	3	
t <sub>AQ EXT</sub>	External Input Acquisition Time		120		sec	3	
_	Oscillator Performance						
F <sub>CAP</sub>	Capture/Pull-in Range	±45 ppb					
F <sub>BW</sub>	Jitter Filter Bandwidth	0.1 Hz Typ.					
DC	Duty Cycle	45/55%					
RMS	RMS Phase Noise						
	10 Hz - 2 MHz		1 ps Typ.				
	12 kHz - 2 MHz	0.6 ps Typ.					
		Holdover	/Wander Gene	ration Performance		4	
T <sub>STA</sub>	Temperature Stability		±20 ppb				
V <sub>STA</sub>	Vcc Stability	±5 ppb					
A <sub>DAILY</sub>	Daily Aging	2 ppb					
A <sub>YEARLY</sub>	Yearly Aging		80 ppb				
	Wander Generation Specification		ETSI-PRC				

NOTES:

Table 2

Table 3

1. Stresses beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the module. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "Operating Specifications" is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

2. Requires external regulation and supply decoupling.

3. Cold Power-up.

Table 4

4. Holdover will be re-calculated with each successful lock. Yearly aging represents 1 continuous year in Holdover.

#### Mode Control Table

SYNC 1	SYNC 2	Operating Mode
0	0	Force Holdover
0	1	Lock to External 10 MHz reference*
1	0	Lock to External 1 PPS reference
1	1	(Default) Lock to GPS Signal

\* Note: Holdover is not supported in this mode; loss of the 10 MHz reference will rail the PLL output until the reference returns or another mode is selected

FTS375 Data Sheet #: **SG174 P**age **3** of Rev: **02** Date: **01/03/12** 



#### Input And Output Characteristics

		LVCMOS Inputs and Outpu	its		
Symbol	Parameter	Minimum	Maximum	Units	Notes
V <sub>IH</sub>	High Level Input Voltage	1.7	4.0	V	
V <sub>IL</sub>	Low Level Input Voltage	-0.5	0.8	V	
V <sub>OH</sub>	High Level Output Voltage	2.4		V	
V <sub>OL</sub>	Low Level Output Voltage		0.4	V	
Co	Output Capacitance		10	pF	
		10MHz Sine Output			
Symbol	Parameter	Typical		Units	Notes
	Load	50		ohms	
	Output Power	9		dB <sub>m</sub>	
	Total Harmonic Distortion	2.2		%	

#### **GPS Receiver Specifications**

Parameter	Specifications	Notes	
Acquisition/Tracking Sensitivity	-155dBm/-156dBm		
Acquisition Time:			
Hot Start w/ Network Assist	Outdoor: <2 sec Indoor: (-148dBm) <5 sec		
Stand Alone	Cold: <45 sec Warm: <38 sec Hot: <5 sec Re-acquisition: <1sec (90% confidence)		
Supported Protocols	Network Assist, NMEA 0183		

#### Reset Generation (I/O pin 11 - RESET)

The power-on-reset for the FTS375 is generated on-board. If it is desired to extend the power-on-reset signal or provide a manual reset of the GPS receiver, pull this signal low.

#### Antenna Requirements

# ParameterNotesThe FTS375 antenna connector is an MCX (female)The antenna supply voltage provided to Pin 20 must be within the range of 2.7 to 13.2V (AMR);<br/>the antenna must be able to operate at this voltageThe antenna's continuous current draw must be <=45mA</td>The antenna must have a full sky view for optimal receiver performanceAn active antenna with a minimum 10dB gain (including cable loss) should be used

Standard 125 Series models are designed for fixed position operation only. Contact Connor-Winfield Sales for mobile application model offerings



Table 5

Table 6

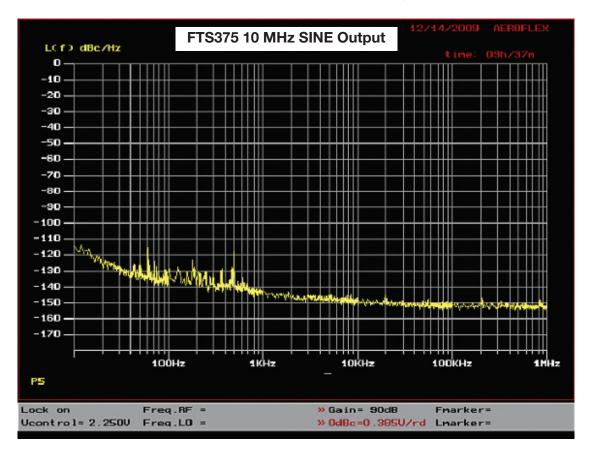
Table 7

#### Phase Noise Figure 2

#### Phase Noise:

Offset Frequency (Hz)	Typical (dBc / Hz)
10	-115
100	-135
1k	-143
10k	-148
100k	-152
1M	-153

#### FTS375 Lock to GPS, Sine Output



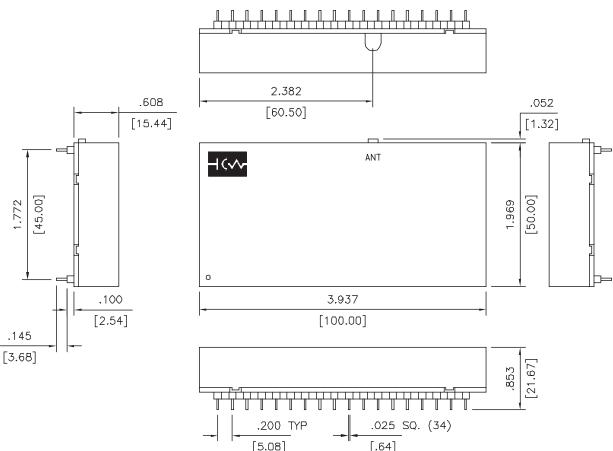


#### Soldering and Cleaning Recommendations

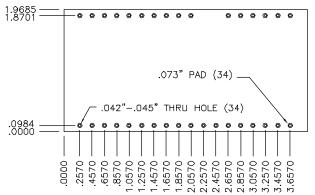
Hand solder, leaded wave solder, and lead-free wave solder processes are recommended for attaching the FTS375 after reflow processes are complete. Since the FTS375 does not have hermetic enclosure, hand cleaning the leads is recommended and the module should not be completely immersed.

#### Package Dimensions



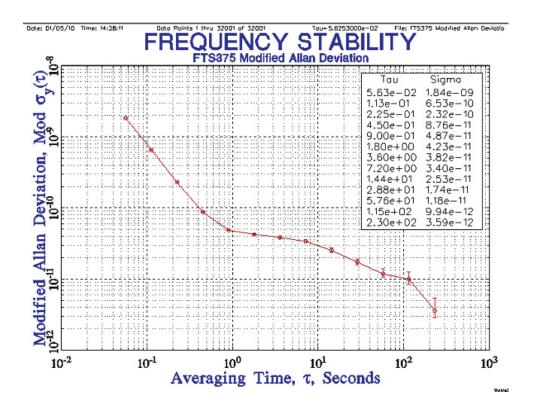


## Package Dimensions Top View and Keep out Area Figure 4

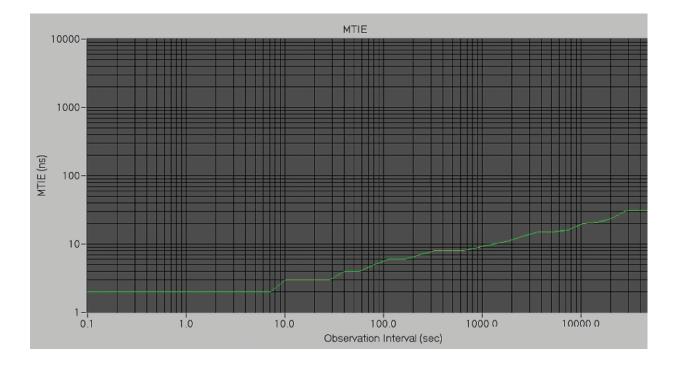




FTS375 Data Sheet #: SG174 Page 6 of 8 Rev: 02 Date: 01/03/12



FTS375 Wander Generation Plot Figure 6



FTS375 Data Sheet #: **SG174 P**age **7** of Rev: **02** Date: **01/03/12** 





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#### **Ordering Information**

FTS375	-010.0M	
	Output Frequency	

Revision	Date	Note
P00	1/06/10	Preliminary Release
00	06/16/10	125 Series Update and revise to release
01	05/27/11	Updated Block Diagram with Wi125 Receiver & Soldering Recommendation
02	01/03/12	Added Package Information to Features