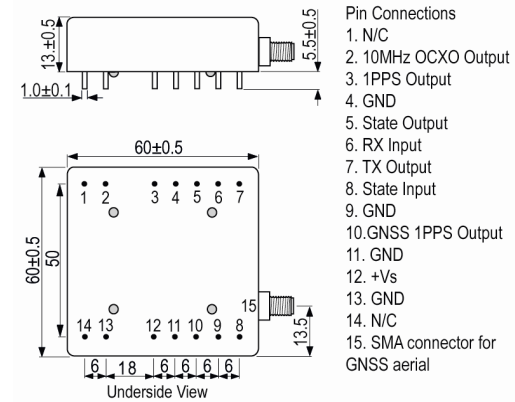## Description

- A disciplined OCXO incorporating a GNSS receiver unit to give 1PPS and 10MHz output. With 1.5µs holdover stability achieved by using an adaptive algorithm. Standard NMEA0183 data is available to the user via a serial port.
- Model   IQCM-112
- Model Issue number   1
- Working States (Workflow Diagram):
  Run1: Fast track. Adjust the OCXO 10MHz output frequency quickly to track the GNSS.
  Run2: Slow track. Adjust the OCXO 10MHz output frequency slowly when phase error is in the defined range.
  Holdover: No GNSS input present; an algorithm enables adaptive modelling of the frequency stability of an OCXO with reference to the GNSS timing signal.
  Free Run: Clock module powered up with no GNSS input.
- NMEA Data Words: GNSS data is available to the user via the interface on Pin 6 and Pin 7. These are broadcast every second in sync with the 1PPS output.
- Note 1: The IQCM-112 should be left powered and running for 7 days minimum before operation to allow for the OCXO's internal drift to stabilise.
  Note 2: The adaptive module algorithm can be built after 3 days operation with good GNSS signal, however this data will be lost at power down.
  Note 3: When State Input (Pin 8) is set low the IQCM-112 will operate in Holdover mode regardless of the 1PPS signal condition.
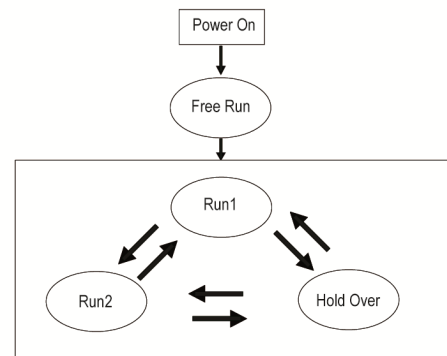
Frequency Parameters

- Frequency   10.0MHz
- Operating Temperature Range   -20.00 to 75.00°C
- 10MHz RF Output Details, Pin 2:
  HCMOS Compatible -
  VoH: 2.7V min
  VoL: 0.4V max
  Rise and Fall Time: 8ns max
  Duty Cycle: 45/55% max
  Accuracy (24-hour averaging when locked to 1PPS): ±1ppt
  Short Term Stability (tested after power for 1hr ref to 25°C, 1s, using PN9000 test equipment): 0.02ppb.
  Ageing (Vs and temperature constant, reference to T=25°C, Vs = 5.0V and after 30 days operation): ±0.2ppb per day, ±10ppb per year
- 1PPS Output from internal GNSS receiver, Pin 10, Phase Accuracy when locked to GNSS:
  Initial Lock Status (<30mins locked to GNSS): ±200ns max
  Full Lock (>30mins locked to GNSSS): ±80ns max
  Steady Lock State (>24hrs GNSS lock): 25ns RMS max

Outline (mm)

Pin Connections
1. N/C
2. 10MHz OCXO Output
3. 1PPS Output
4. GND
5. State Output
6. RX Input
7. TX Output
8. State Input
9. GND
10. GNSS 1PPS Output
11. GND
12. +Vs
13. GND
14. N/C
15. SMA connector for GNSS aerial

Workflow Diagram

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Electrical Parameters

- Supply Voltage   5.0V ±5%
- Note: Pins 3 to 11 and Pin 13 should not be subjected to a voltage greater 3.6V. If subjected to a higher voltage the processor will be damaged and the unit will not work correctly.
- 1PPS output from internal GNSS receiver, Pin 10:
  Waveform: HCMOS
  Test Condition: 15pF
  ViH: 2.7V min
  ViL: 0.4V max
  Pulse Width: 100ms min
- State Input, Pin 8 (<5mA load):
  Lock Enable: if left unconnected (internal pull-up cct) or logic high (2.7V min) is applied to pin 8 then the device will operate normally and lock when appropriate.
  Lock Disable: If logic low (0.4V max) is applied to pin 8 then the device cannot be locked.
- Power Supply Details, Pin 12:
  Supply Voltage: 5.0V ±5%
  Current Consumption: 2A during warm up, 1A steady state @ 25°C
  AC Ripple: 50mV pk-pk max, 10Hz to 1MHz
- GNSS Internal Receiver Specification:
  Type: GNSS Position Lock
  Number of Channels: 50
  Frequency Band: L1 (1575.42MHz)
  Tracking Code: C/A Code
  Tracking Capability: 12 Satellites
  Sensitivity: Tracking and Navigation -159dBm
              Reacquisition -144dBm
              Cold Start (autonomous) -148dBm
  Antenna Input SMA-KE (active antenna recommended)

Output Details

- Output Compatibility   HCMOS
- 1PPS Reference Output, Pin 3 (15pF test condition):
  Waveform: HCMOS
  VoH: 2.7V min
  VoL: 0.4V max
  Pulse Width: 100ms min
- Lock Status Indicator, Pin 5:
  Module Locked: 2.7V min
  Module Holdover: 0.4V max
  Module Locked means Working State is = Run2
  Current: 5mA max
- Serial Interface (Pin 6 and Pin 7):
  NMEA-0183
  VoL and ViL: 0.4V max
  VoH and ViH: 2.7V min
  Baud rate: 9600
  Bits: 8
  Parity: N
  Stop Bit: 1

Noise Parameters

- Phase Noise on 10MHz RF Output Signal (dBm/Hz):

Offset	Typical	Max
10Hz	-118	-113
100Hz	-138	-133
1kHz	-148	-143
10kHz	-150	-145
100kHz	-150	-145
1MHz	-150	-150

Environmental Parameters

- Storage Temperature: -55 to 105°C
  Humidity: 30 to 80%
- Shock: IEC 68-2-27 Test Ea, Severity 50A: 50G 11ms half sinewave, 3 times in three mutually perpendicular planes.
- Vibration: IEC 68-2-06, Test Fc: 10G, 0.75mm acceleration, 10Hz to 500Hz, 3 times in three mutually perpendicular planes.

Manufacturing Details

- ESD Levels: ANSI/ESDA/JEDEC JS-001-2010:
  Human Body Model, Class 2: 2000V to 4000V
  Machine Model, Class B: 200V to 400V

Compliance

- RoHS Status (2015/863/EU)   Compliant
- REACh Status   Compliant
- MSL Rating (JDEC-STD-033):   Not Applicable

Packaging Details

- Pack Style: Bulk   Loose in bulk pack
  Pack Size: 1
- *Alternative packing option available*

Technical Notes

- *Holdover stability 1.5µs in 24hrs ref ±5°C*

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