100.0 MHz-SC Mini-USO Space Crystal Oscillator

Title: 100.0 MHz-SC Mini-USO Space Crystal Oscillator

P/N: 501-27990
Rev: A
Date: 04-24-14

Tolerances:
- 0.XX Dec: ±0.030" (except as noted)
- 0.XXX Dec: ±0.010" (except as noted)

Dimensions are in inches.
GENERAL REQUIREMENTS

Material, Design and Construction: MIL-PRF-55310
Parts and Materials List: Supplied
Crystal: Premium Q, Z-swept, synthetic quartz, 1/10 output frequency
Outgassing: TML<1% and CVCM <0.1% per SP-R-002A
Traceability: Semiconductor and passive lot and date code tracking
De-rating: per EEE-INST-002, (JPL-D-8545, alternative)
Soldering: J-STD-001 class 3
Case: Nickel-plated aluminum housing
Finish: Electroless nickel per MIL-C-26074

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REV DATE REVISION RECORD DWN AUTH
- 04-02-14 Initial Release Liz
A 04-24-14 501- Liz

Wenzel Associates, Inc.
Austin, Texas

MODEL DEFINITIONS

PF (Proto-Flight Model)  Design and Construction similar in appearance and identical in form, fit, and function to FM. Developed using best commercial practice, including some commercial parts and materials. EM shall be subjected only to electrical tests, with some environmental testing performed.

FM (Flight Model)  Fabricated to meet all design, construction, and test requirements reference MIL-PRF-55310, Class 1, Product level S. FM shall be subjected to the entire compliment of electrical and environmental acceptance tests listed.

Flight Model Space Level, Parts EEE-INST-002, Level 1,2,3 MIL-PRF-3098 Level 2 Crystals, Tested to Table 2, Qual Table 3 by similarity
MIL-PRF-19500 / MIL-STD-750 Semiconductors, JANTX with PIN D, JANTX with PIN D and DPA (5 ea)

Qualification Model  EM unit, when specified, using EEE-INST-002, Level 1,2,3 parts where available. Testing for (1) unit.

501-27990-01  Proto-Flight Model
501-27990-02  Qualification Model
501-27990-03  FM Flight Model

ELECTRICAL PERFORMANCE

RF Output Frequency 100 MHz (fixed, please specify), sine wave
Frequency Accuracy (initial) ±1 x 10^-8 at +25°C
Frequency Stability <1x 10^-9 over 3°C, -20°C to +60°C, under vacuum
Aging Rate (after 90 days operating)
1 day ±2x 10^-10
1 year ±2 x 10^-8 after 60 days operating
RF Output Power +12 dBm ±2 dB into 50Ω
RF Output 2nd Harmonic -30 dBc
RF Output Sub-harmonics ≤-40 dBc
RF Output Spurious ≤-100 dBc, 100 KHz to 1 GHz
Phase Noise (Static)
100 MHz -116 dBc/Hz
10 Hz -124 dBc/Hz
100 Hz -134 dBc/Hz
1 kHz -141 dBc/Hz
10 kHz -142 dBc/Hz
100 kHz -142 dBc/Hz
Allen Deviation (10 to 10kHz)
1 second 3e-12
10 seconds 3e-12
100 seconds 3e-12
Supply voltage +15 VDC ±5%
Warm-up power ≤8 watts
Warm-up time ≤20 minutes at ambient pressure ≤5 x 10^-5 torr
Input power ≤5 watts steady state at ambient pressure ≤5 x 10^-5 torr

ENVIRONMENTAL CONDITIONS

Acceptance temperature -20°C to +60°C
Proto-flight temperature -20°C to +60°C
Storage temperature -40°C to +85°C
Ambient pressure Atmospheric (760 torr), Vacuum (≤5 x 10^-5 torr)

MECHANICAL SPECIFICATIONS

Size 4” x 3” x 1.5”
Weight ≤380 grams
Physical Pressure relief holes, vented
**QUALIFICATION TESTS** (Non-flight model, only)

Group I (1 samples) Visual, Electrical Tests*
Burn-in (operational) 240 hours minimum at +75°C
Group II (1 samples) 30 Days

Group III Subgroup 1 (1 sample)
Random Vibration 11.95 Grms, MIL-STD-202, method 214 I-D, 50 to 2000 Hz, 5 min per axis

Group III Subgroup 2 (1 sample)
Ambient Pressure MIL-STD-202, Method 105, at <5 x 10^-5 torr

Group III Subgroup 3 (1 sample)
Resistance to Soldering Heat MIL-STD-202, Method 210, Condition A

Group III Subgroup 4 (1 sample)
Terminal Strength MIL-STD-202, Method 211, Condition C, Not applicable for pins <0.25"
Solderability MIL-STD-202, Method 208
Resistance to Solvents MIL-STD-202, Method 215 Not applicable when marking is electro-etched

Electrical Tests* Radiographics MIL-STD-202, method 209

**ACCEPTANCE TESTS** (Flight Model)

Electrical Tests* Random Vibration (non-operational) 7.56 Grms overall, MIL-STD-202 Method 214 Test Cond I-B, 50 to 2000 Hz, 5 min per axis
Thermal Shock MIL-STD-202, Method 107, Condition A, 5 Cycles, -55°C to +85°C
Electrical Tests* Burn-In (operational) 240 hours minimum at +75°C
Aging Rate Project to 30 days operating
Electrical Tests* Radiographics MIL-STD-202, method 209

*ELECTRICAL TESTS

Tested at ambient pressure ≤5 x 10^-5 torr and at -20, +25, and 60°C unless otherwise noted

Warm-Up Power (-20°C only)
Warm-Up Time (-20°C only)
Input Power
Cold Start (-20°C)
Hot Start (+60°C)
RF Output Power
RF Output Harmonics
RF Output Spurious Frequency Accuracy (+25°C only)
Frequency Stability Phase Noise - Static (+25°C only, 760 torr)

**ANALYSES**

Thermal Analysis, Component Stress Analysis

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**Wenzel Associates, Inc.**

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