

# Double Oven Controlled Crystal Oscillator NI-10MHz-3000 Series

## NI-10M-3000 Series in 36.3x27.2mm DIP package

NI-10M-3000 Series oscillators are designed for applications where exceptional frequency stability and timing is required. The NI-10M-3000 units have both excellent temperature performance and short term stability. These characteristics make the NI-10M-3000 Series an excellent choice for timing applications requiring holdover of < 10  $\mu$ S for 24 hours. A choice of quartz resonators offers a variety of performance versus cost options to fit most applications.



RoHS Compliant Standard

### ELECTRICAL SPECIFICATIONS

#### 1. OUTPUT (PIN = "R.F. OUTPUT")

|      | Parameter        | Min.        | Typ. | Max. | Unit | Test Condition                                                                                                                              |
|------|------------------|-------------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1. | Frequency        | 10.000000   |      |      | MHz  |                                                                                                                                             |
| 1.2. | Initial Accuracy | -0.1        |      | +0.1 | ppm  | @ +25 $\pm$ 1°C<br>after turn on power 30 $\pm$ 5 minutes<br>$\leq$ 90 days following date code<br>VCO Input at Center Voltage $\pm$ 0.001V |
| 1.3. | Waveform         | Rectangular |      |      |      |                                                                                                                                             |
| 1.4. | Level            | HCMOS       |      |      |      |                                                                                                                                             |
|      | "1" level        | +2.4        |      |      | V    |                                                                                                                                             |
|      | "0" level        |             |      | +0.3 | V    |                                                                                                                                             |
| 1.5. | Load             |             | 15   |      | pF   |                                                                                                                                             |
| 1.6. | Duty cycle       | 45          | 50   | 55   | %    | @ +1.65V                                                                                                                                    |
| 1.7. | Spurious         |             |      | -60  | dBc  |                                                                                                                                             |

#### 2. FREQUENCY STABILITY

|      | Parameter  | Min.                 | Typ. | Max.  | Unit         | Test Condition                                       |
|------|------------|----------------------|------|-------|--------------|------------------------------------------------------|
| 2.1. | Ambient    | $\pm$ 0.2, $\pm$ 0.5 |      |       | ppb          | Refer to Table 1 : Ordering Information              |
|      |            | 0 ~ +70              |      |       | $^{\circ}$ C |                                                      |
|      |            | -30 ~ +70            |      |       |              |                                                      |
| 2.2. | Aging      |                      |      |       |              | Refer to Table 1 : Ordering Information              |
|      | Daily      | $\pm$ 0.1, $\pm$ 0.3 |      |       | ppb          |                                                      |
|      |            | $\pm$ 0.1, $\pm$ 0.3 |      |       | ppb          |                                                      |
|      | Yearly     | $\pm$ 20, $\pm$ 50   |      |       | ppb          |                                                      |
|      | 10 Years   | $\pm$ 0.1, $\pm$ 0.2 |      |       | ppm          |                                                      |
| 2.3. | Voltage    | -0.2                 |      | +0.2  | ppb          | $\pm$ 5% change                                      |
| 2.4. | Short term |                      |      | 0.007 | ppb/s        | root Allan variance                                  |
|      |            |                      |      | 0.01  | ppb/10s      |                                                      |
| 2.5. | Warm-up    | -20                  |      | +20   | ppb          | in 5 minutes @ +25 $\pm$ 1°C<br>referenced to 1 hour |

|      | Parameter   | Min. | Typ. | Max. | Unit   | Test Condition                                                                                                                                                                |
|------|-------------|------|------|------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.6. | Phase Noise |      |      | -90  | dBc/Hz | @ 1Hz                                                                                                                                                                         |
|      |             |      |      | -120 | dBc/Hz | @ 10Hz                                                                                                                                                                        |
|      |             |      |      | -138 | dBc/Hz | @ 100Hz                                                                                                                                                                       |
|      |             |      |      | -148 | dBc/Hz | @ 1KHz                                                                                                                                                                        |
|      |             |      |      | -155 | dBc/Hz | @ 10KHz                                                                                                                                                                       |
|      |             |      |      | -158 | dBc/Hz | @ 100KHz                                                                                                                                                                      |
| 2.7. | Retrace     | -5   |      | +5   | ppb    | After 60 minutes from turn on, following 24 hours minimum on time, and 24 hours maximum off time.<br>At constant temperature and voltage. Referenced to frequency at off time |

### 3. ELECTRICAL FREQUENCY ADJUSTMENT (PIN = "VCO INPUT")

|      | Parameter       | Min.     | Typ. | Max.  | Unit | Test Condition                                                   |
|------|-----------------|----------|------|-------|------|------------------------------------------------------------------|
| 3.1. | Tuning Range    | -0.8     |      | -0.35 | ppm  | VCO @ Min. Voltage                                               |
|      |                 | +0.35    |      | +0.8  | ppm  | VCO @ Max. Voltage                                               |
| 3.2. | Control Voltage | 0        |      | +2.8  | V    | Referenced to frequency at nominal Center Voltage                |
| 3.3. | Slope           | Positive |      |       |      |                                                                  |
| 3.4. | Center Voltage  |          | +1.4 |       | V    | When not connected, VCO INPUT is internally held at this voltage |
| 3.5. | Linearity       | -10      |      | +10   | %    |                                                                  |
| 3.6. | Input Impedance | 50       |      |       | kΩ   |                                                                  |

### 4. INPUT POWER (PIN = "+VDC")

|      | Parameter    | Min.   | Typ. | Max.   | Unit | Test Condition |
|------|--------------|--------|------|--------|------|----------------|
| 4.1. | Voltage      | +3.135 | +3.3 | +3.465 | V    |                |
| 4.2. | Current      |        |      | 2.5    | A    | @ turn on      |
| 4.3. | Steady State |        |      | 2.5    | W    | @ +25°C        |

### 5. REFERENCE VOLTAGE (PIN = "REFERENCE VOLTAGE")

|      | Parameter             | Min.    | Typ. | Max.    | Units | Test Condition                |
|------|-----------------------|---------|------|---------|-------|-------------------------------|
| 5.1. | Voltage               | +2.66   | +2.8 | +2.94   | V     | Over temperature range in 2.1 |
| 5.2. | Load                  | 9       |      |         | kΩ    |                               |
| 5.3. | Temperature stability | -0.0005 |      | +0.0005 | V     |                               |

### 6. ENVIRONMENTAL

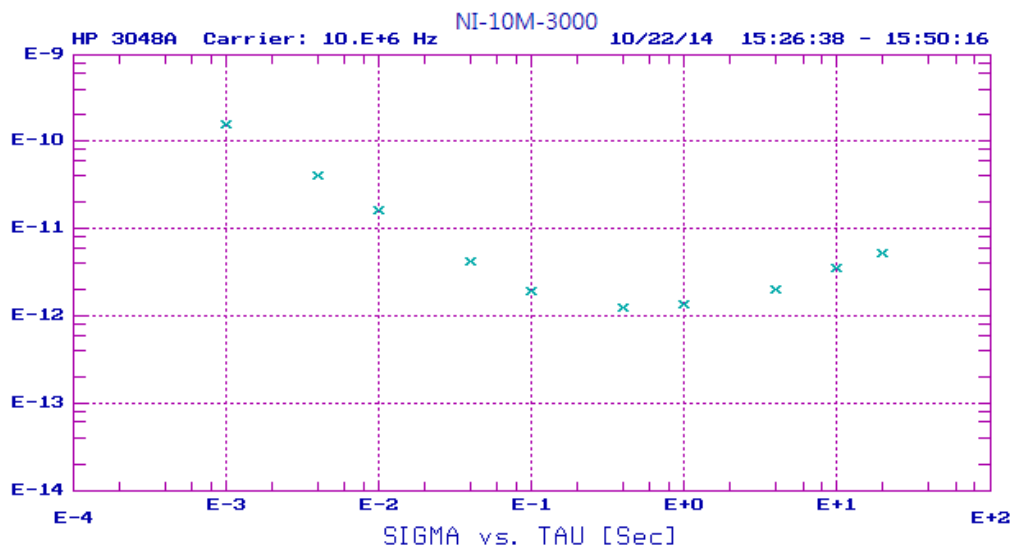
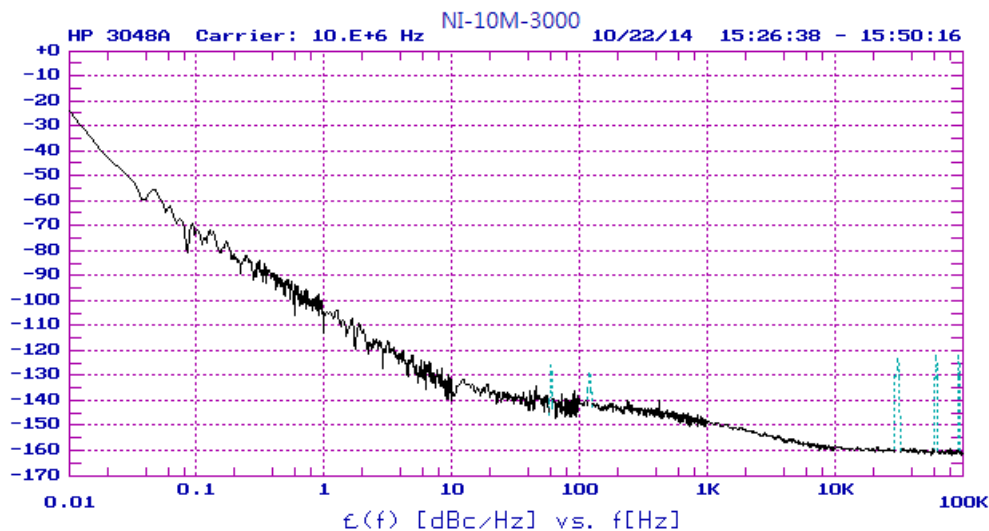
|      | Parameter                 | Reference Std.                            | Test Condition               |
|------|---------------------------|-------------------------------------------|------------------------------|
| 6.1. | Storage Temperature       | -40°C to +85°C                            |                              |
| 6.2. | Vibration (non-operating) | MIL-STD-202, Method 201                   | 0.06" Total p-p, 10 to 55 Hz |
| 6.3. | Shock (non-operating)     | MIL-STD-202, Method 213, Test Condition J | 30g, 11ms, half-sine         |

**Table 1 : ORDERING INFORMATION**

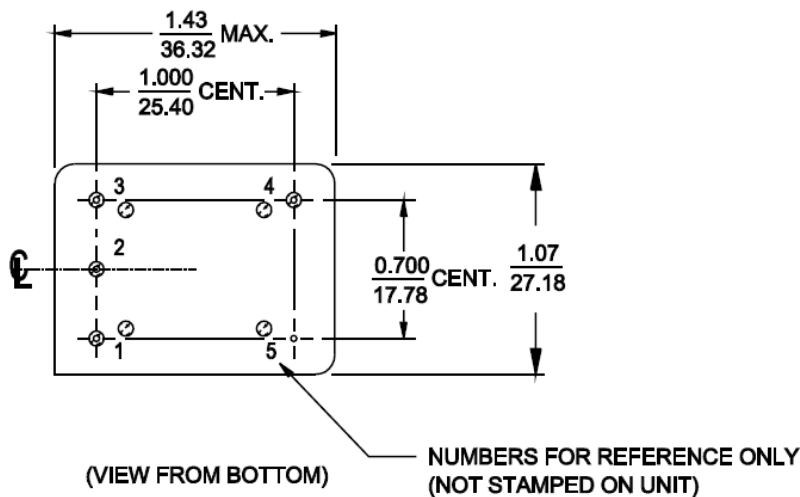
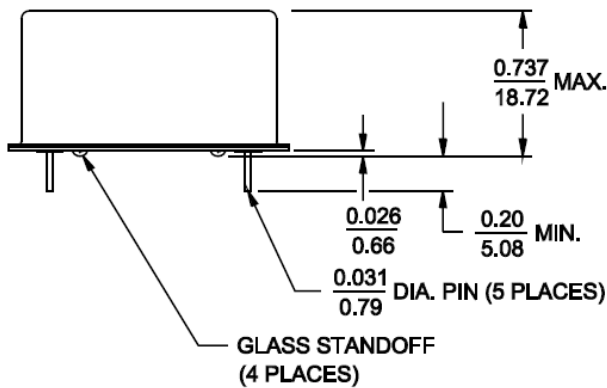
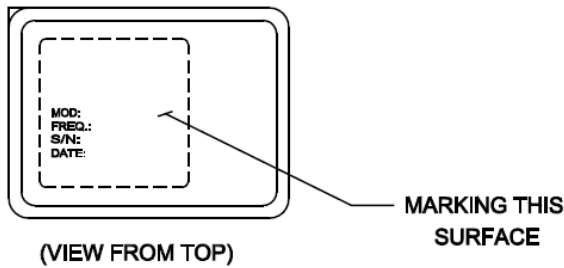
| Aging         |               | Aging Performance                                                |                                                                  |
|---------------|---------------|------------------------------------------------------------------|------------------------------------------------------------------|
|               |               | $\pm 0.1$ ppb/Day<br>$\pm 20$ ppb/Year<br>$\pm 0.1$ ppm/10 Years | $\pm 0.3$ ppb/Day<br>$\pm 50$ ppb/Year<br>$\pm 0.2$ ppm/10 Years |
| Temp. (°C)    | Ambient       |                                                                  |                                                                  |
| -30°C ~ +70°C | $\pm 0.5$ ppb | NI-10M-3000                                                      | NI-10M-3001                                                      |
|               | $\pm 0.2$ ppb | NI-10M-3010                                                      | NI-10M-3011                                                      |
| 0°C ~ +70°C   | $\pm 0.5$ ppb | NI-10M-3040                                                      | NI-10M-3041                                                      |
|               | $\pm 0.2$ ppb | NI-10M-3050                                                      | NI-10M-3051                                                      |

Other specifications may be available upon request.

### Phase Noise & Short Term Stability Test Data



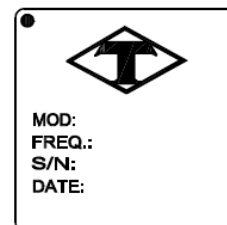
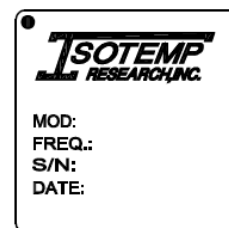
## OUTLINE DRAWING



| PIN CONNECTIONS   |                                                                |
|-------------------|----------------------------------------------------------------|
| PIN               | FUNCTION                                                       |
| 1<br>(See Note 1) | VCO INPUT<br>or<br>NOT CONNECTED                               |
| 2<br>(See Note 1) | REFERENCE VOLTAGE<br>or<br>OVEN MONITOR<br>or<br>NOT CONNECTED |
| 3                 | +VDC                                                           |
| 4                 | R. F. OUTPUT                                                   |
| 5                 | 0 VOLTS & CASE                                                 |

Note 1. If the specification does not specify parameters for either PIN1 or PIN2 then that respective PIN is NOT internally CONNECTED.

## MARKING



$\frac{\text{INCH}}{\text{mm}}$  (REFERENCE ONLY)