

## U7250LF

### 1.0 Specification References

| Parameter            | Description                                    |
|----------------------|------------------------------------------------|
| a. Rakon part number | U7250LF                                        |
| b. Description       | ROM1490E<br>10.0MHz MERC+ 14x9H HOT RC2.5 3.3V |
| c. Version           | B (2017-09-11) - PRELIMINARY                   |
| d. Package           | L x W x H: 14.2 x 9.2 x 6.5 mm nom.            |



### 2.0 Absolute Maximum Ratings <sup>1</sup>

| Parameter               | Min. | Max. | Unit. |
|-------------------------|------|------|-------|
| a. Storage temperature  | -55  | 125  | °C    |
| b. Supply voltage (Vcc) | -0.5 | 6    | V     |
| c. Power dissipation    |      | 2    | W     |
| d. Load                 |      | 50   | pF    |

### 3.0 Frequency Characteristics <sup>2</sup>

| Parameter                                              | Min.                                                                                                                                                                                        | Typ. | Max.               | Unit       | Test Condition / Description                                                                         |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------|------------|------------------------------------------------------------------------------------------------------|
| a. Nominal frequency (Fn)                              |                                                                                                                                                                                             | 10.0 |                    | MHz        |                                                                                                      |
| b. Frequency calibration                               |                                                                                                                                                                                             |      | ±0.5               | ppm        | At 25°C ± 2°C, at time of shipment, reference to nominal frequency                                   |
| c. Reflow shift                                        |                                                                                                                                                                                             |      | ±0.5               | ppm        | After 1 hour recovery at 25°C                                                                        |
| d. Operating temperature range                         | -40                                                                                                                                                                                         |      | 85                 | °C         |                                                                                                      |
| e. Frequency stability over temperature (in still air) |                                                                                                                                                                                             |      | 10                 | ppb        | Peak-to-peak                                                                                         |
| f. Frequency slope $\Delta F/\Delta T$ in still air    |                                                                                                                                                                                             |      | ±0.5               | ppb/°C     | Temperature ramp $\leq 1^\circ\text{C}/\text{minute}$                                                |
| g. All causes stability                                |                                                                                                                                                                                             |      | ±4.6               | ppm        | Including calibration, temperature, supply voltage & load changes and 20 years life, reference to Fn |
| h. Supply voltage stability                            |                                                                                                                                                                                             | ±5   |                    | ppb        | ±2% variation, reference to frequency at 3.3V                                                        |
| i. Load sensitivity                                    |                                                                                                                                                                                             | ±5   |                    | ppb        | ±10% variation, reference to frequency at 15pF                                                       |
| j. Warm-up time <sup>3</sup>                           |                                                                                                                                                                                             | < 3  |                    | minutes    |                                                                                                      |
| k. Long term stability (aging)                         |                                                                                                                                                                                             |      | ±1<br>±0.3<br>±1.5 | ppb<br>ppm | Per day, after 60 days of continuous operation<br>First year<br>10 years                             |
| l. Wander generation <sup>4</sup>                      | TDEV compliant with GR-1244 fig 5-4 & G.812 types II & III fig 2<br>MTIE compliant with GR-1244 fig 5-5 & G.812 types II & III fig 1<br>TDEV & MTIE compliant with G.8262, G.8263, G.8273.2 |      |                    |            |                                                                                                      |

<sup>1</sup> Operating beyond this limit may result in change or permanent damage to the device.

<sup>2</sup> The characteristics of the component may be temporarily affected by the processes of assembly and soldering. The frequency specifications apply after 48 hours of continuous operation after assembly. Nominal conditions (T=25°C, Vcc=3.3V, C<sub>load</sub>=15pF) apply unless otherwise stated.

<sup>3</sup> Time needed for frequency to be within ±20 ppb reference to frequency after 1 hour, at 25°C. Parameter is frequency, assembly and operating history dependent.

<sup>4</sup> Oscillator stabilised 24 hours at constant temperature (±1°C, still air). Data subjected to relevant loop filter values (-3dB cut-off, 2<sup>nd</sup> order high pass).

## 4.0 Root Allan Variance (at 25°C)

| Parameter              | Min. | Typ.                                                                                                            | Max. | Unit | Test Condition / Description                                       |
|------------------------|------|-----------------------------------------------------------------------------------------------------------------|------|------|--------------------------------------------------------------------|
| a. Root Allan Variance |      | $5 \times 10^{-11}$<br>$8 \times 10^{-11}$<br>$6 \times 10^{-11}$<br>$6 \times 10^{-11}$<br>$5 \times 10^{-11}$ |      |      | tau = 0.1s<br>tau = 1.0s<br>tau = 10s<br>tau = 100s<br>tau = 1000s |

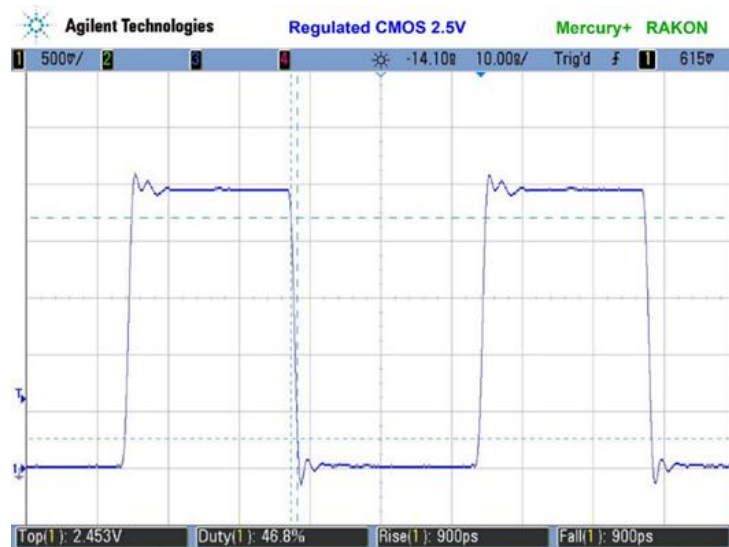
## 5.0 Power Supply

| Parameter                                          | Min. | Typ. | Max. | Unit | Test Condition / Description |
|----------------------------------------------------|------|------|------|------|------------------------------|
| a. Supply voltage (Vcc)                            |      | 3.3  |      | V    | ±5%                          |
| b. Input power (Warm up)                           |      | 1600 | 1750 | mW   | At Vcc = 3.3V                |
| c. Input power (Steady state in still air at 25°C) |      | 400  | 440  | mW   | At Vcc = 3.3V                |

## 6.0 Oscillator Output – Regulated CMOS 2.5V

| Parameter                                       | Min. | Typ. | Max. | Unit | Test Condition / Description |
|-------------------------------------------------|------|------|------|------|------------------------------|
| a. Output voltage level low (V <sub>OL</sub> )  | 0    |      | 0.2  | V    |                              |
| b. Output voltage level high (V <sub>OH</sub> ) | 2.3  |      | 2.7  | V    |                              |
| c. Rise and fall time                           |      | 1    | 2    | ns   | 10% to 90% level             |
| d. Duty cycle                                   | 45   |      | 55   | %    | At 50% level                 |
| e. Load                                         |      | 15   |      | pF   | Nominal                      |

f. Waveform screenshot (example at 20MHz)



## 7.0 SSB Phase Noise (at 25°C)

| Parameter        | Typ. | Unit.  | Test Condition / Description |
|------------------|------|--------|------------------------------|
| a. 1Hz offset    | -75  | dBc/Hz |                              |
| b. 10Hz offset   | -100 | dBc/Hz |                              |
| c. 100Hz offset  | -130 | dBc/Hz |                              |
| d. 1kHz offset   | -153 | dBc/Hz |                              |
| e. 10kHz offset  | -158 | dBc/Hz |                              |
| f. 100kHz offset | -158 | dBc/Hz |                              |
| g. 1MHz offset   | -160 | dBc/Hz |                              |

## 8.0 Marking

| Parameter | Description                                                                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a. Type   | Laser marked                                                                                                                                                          |
| b. Line 1 | <b>[ R FFFF YM ]</b><br>Rakon identifier R, Frequency FFFF (M=MHz, e.g. 10M0=10.0MHz), Year Y (A=2010, B=2011, ...), Month M (1=Jan, 2=Feb, ..., A=Oct, B=Nov, C=Dec) |
| c. Line 2 | <b>[ • XXX LLL ]</b><br>Pin 1 •, Internal code XXX, Lot code LLL                                                                                                      |

## 9.0 Manufacturing Information

| Parameter                | Description                                                                                                          |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|
| a. Reflow soldering      | IPJ/JEDEC J-STD-020, see Pb-free solder reflow profile attached                                                      |
| b. Packaging description | Tape & Reel (see drawing attached)                                                                                   |
| c. Application Note      | For optimum performance follow the instructions in <a href="#">Guidelines for use of Mercury™ /Mercury+™ IC-OCXO</a> |

## 10.0 Environmental Specification

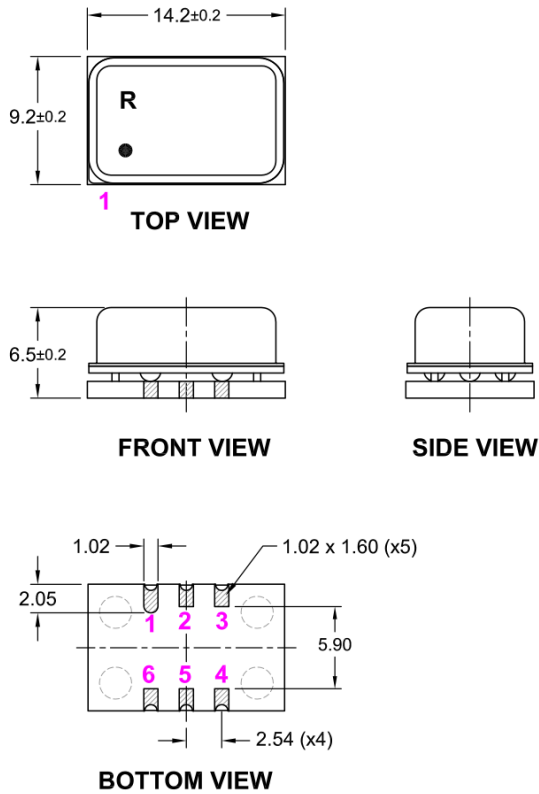
| Parameter                    | Description                                                                                                                                                                                                                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a. RoHS                      | Parts are fully compliant with the European Union directives 2002/95/EC and 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Note the RoHS compliant parts are suitable for assembly using both Lead-free solders and Tin / Lead solders |
| b. Acceleration steady state | IEC 60068-2-7 test Ga, 5000g, 10s (at peak acceleration), Y-axis only                                                                                                                                                                                                                                    |
| c. Moisture sensitivity      | IPC/JEDEC J-STD-020, Class 1                                                                                                                                                                                                                                                                             |
| d. Temperature cycle         | IEC 60068-2-14 test Na, 400 cycles, -40°C to +125°C                                                                                                                                                                                                                                                      |
| e. Solderability             | JESD 22-B102, Method 2, precondition 150°C, 16 hours                                                                                                                                                                                                                                                     |
| f. Humidity                  | EIA/JEDEC 22-A101, 85°C/85%R.H., 1000 hours                                                                                                                                                                                                                                                              |
| g. Shock                     | IEC 60068-2-27, test Ea; 1500g, 0.5ms, 18 shocks total                                                                                                                                                                                                                                                   |
| h. Vibration                 | IEC 60068-2-6, test Fc: 20g, 60 to 2000Hz 12 hours total                                                                                                                                                                                                                                                 |

## 11.0 Disclaimer

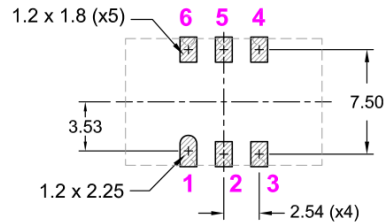
| Parameter     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a. Disclaimer | "Samples supplied according to this specification are supplied from our development or pre-production programme and as such are not qualification approved products. No condition, warranty or representation regarding quality, suitability, performance, life or continuation of supply is given or implied and Guarantee in clause 6.1 of our standard Conditions of Sale is not applicable. The right is reserved to change the design or specification or cease supply without notice." RAKON Limited |

## 12.0 Model Outline:

### MODEL OUTLINE



### RECOMMENDED PAD LAYOUT (TOP VIEW)

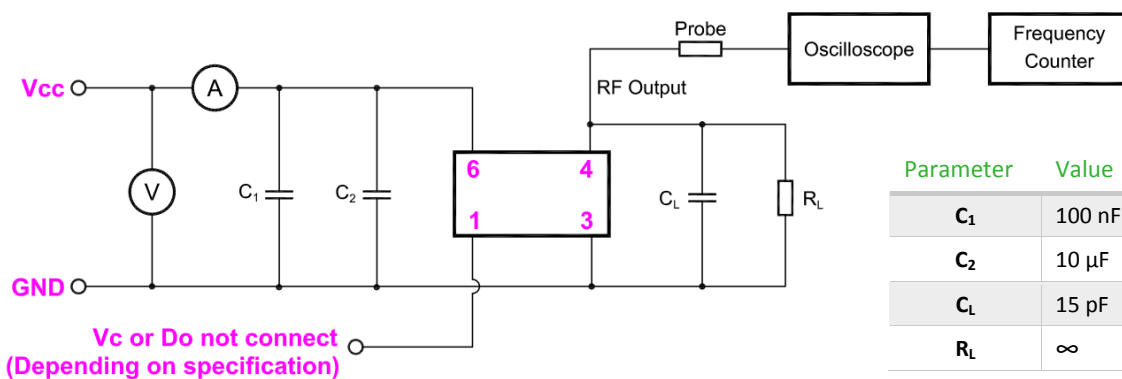


#1pinはオープンとして下さい。  
(または GNDに接続しても可)

| Pin | Connections                                                                                                           |
|-----|-----------------------------------------------------------------------------------------------------------------------|
| 1   | Do not connect (can be connected to GND)                                                                              |
| 2   | NC                                                                                                                    |
| 3   | GND                                                                                                                   |
| 4   | Output                                                                                                                |
| 5   | NC                                                                                                                    |
| 6   | Supply Voltage (Vcc), for correct operation decouple the supply voltage with a 10μF capacitor close to the oscillator |

動作を安定させるため 10 μF のデカップリングコンデンサを Vdd ~ GND 間の一番近いところに接続して下さい。

### TEST CIRCUIT



| Parameter      | Value  |
|----------------|--------|
| C <sub>1</sub> | 100 nF |
| C <sub>2</sub> | 10 μF  |
| C <sub>L</sub> | 15 pF  |
| R <sub>L</sub> | ∞      |

TITLE: ROM1490 Mercury+™ IC OCXO (Hermetic, H = 6.5mm)

RELATED DRAWINGS:

FILENAME: CAT950

REVISION: F

DATE: 15-Aug-17

SCALE: 2 : 1

Millimetres

TOLERANCES:

XX =

X.X = ±0.2

X.XX = ±0.10

X.XXX = ±0.05

X° =

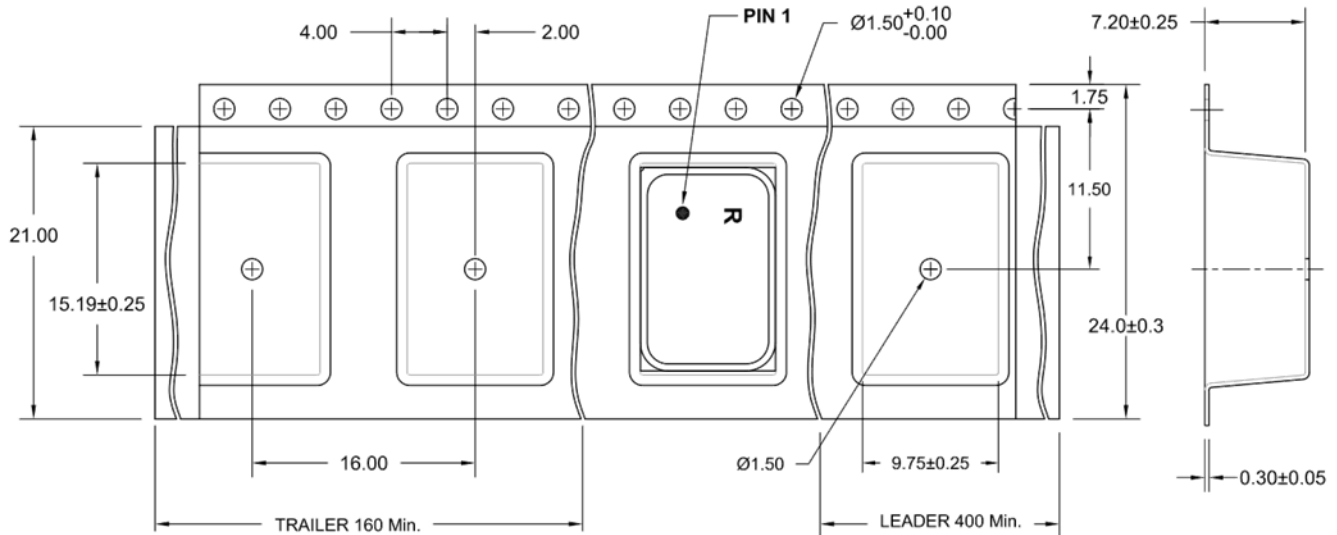
Hole =

# rakon

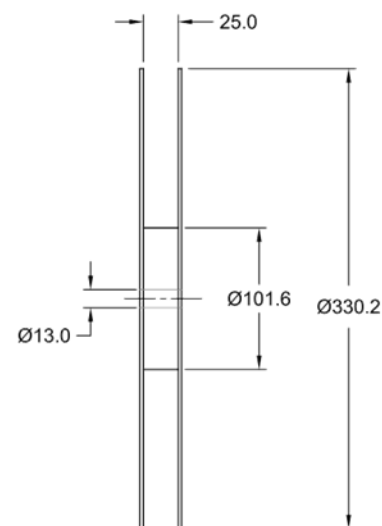
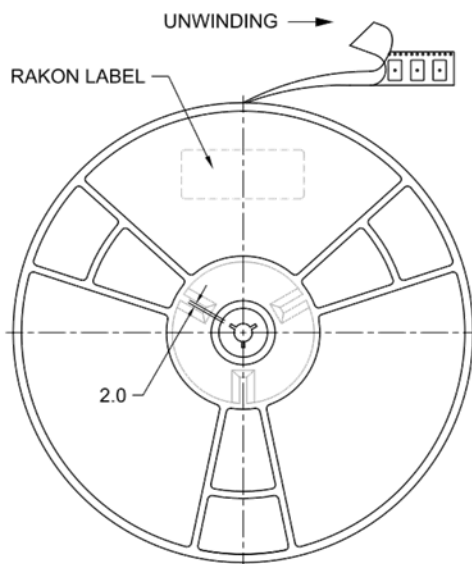
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## 13.0 Tape and Reel:

**TAPE DETAIL (SCALE 2 : 1)**



**REEL DETAIL (SCALE 1 : 5)**



TITLE: 1490 Series Tape & Reel (H:7.20 mm)

RELATED DRAWINGS:

FILENAME: CAT976

REVISION: B

DATE: 07-Dec-2015

SCALE:

---

Millimetres

TOLERANCES:

XX =

$$X.X = \pm 0.2$$
$$X.XX = \pm 0.10$$
$$\chi_{\text{XXX}} = \pm 0.05$$

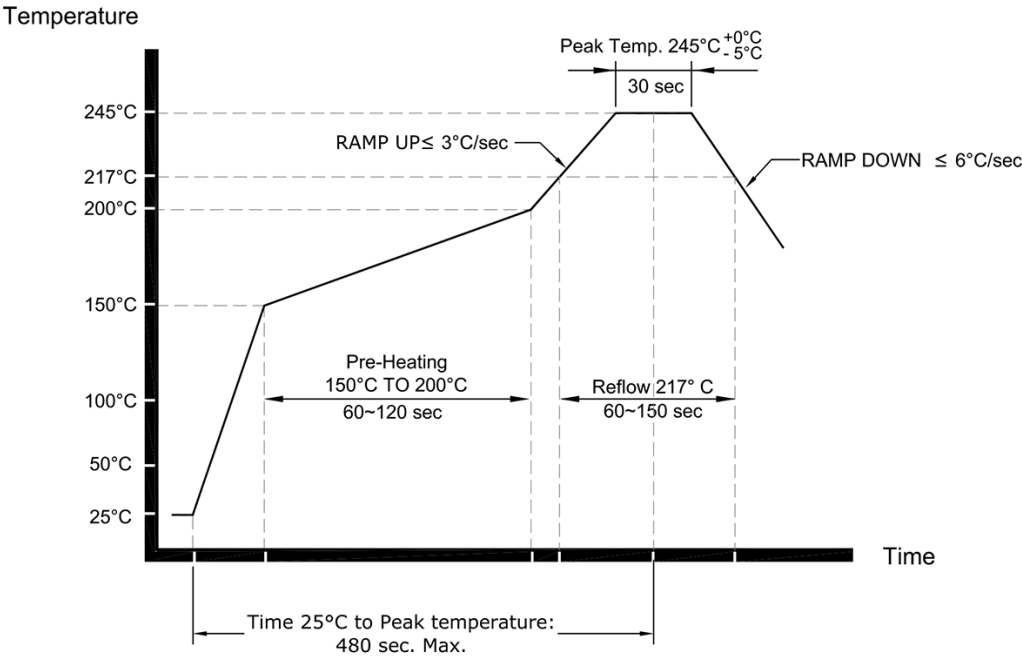
Hol

Hole =  $\pm 0.10$

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**14.0 Reflow:**



**NOTE:**

This profile was used during the qualification testing of the product and therefore represents worst case conditions. It is not recommended for use by the customer in the actual assembly of these parts.

TITLE: Mercury 1490 Series OXCO Reflow

FILENAME: CAT647

RELATED DRAWINGS:

REVISION: B

DATE: 27-Jun-13

SCALE: NTS

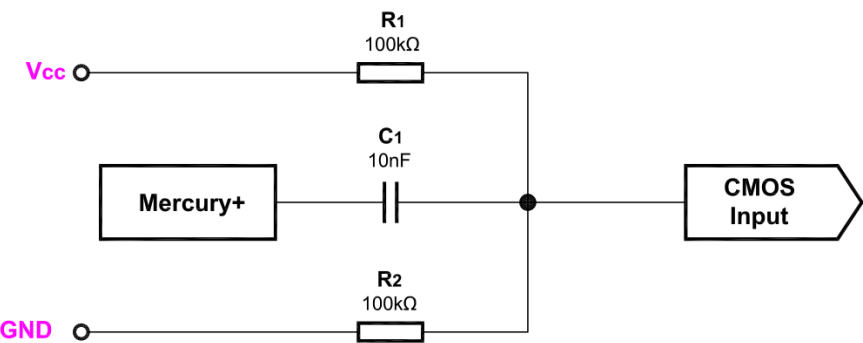
Millimetres

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15.0 Optional Bias Network to convert Mercury+ Output to Standard CMOS

| Parameter    | Vcc = 3.135V |         | Vcc = 3.3V |         | Vcc = 3.465V |         |
|--------------|--------------|---------|------------|---------|--------------|---------|
| Bias network | Without      | With    | Without    | With    | Without      | With    |
| VOH          | ≥ 2.3V       | ≥ 2.76V | ≥ 2.3V     | ≥ 2.85V | ≥ 2.3V       | ≥ 2.93V |
| VOH [%Vcc]   | ≥ 73%        | ≥ 88%   | ≥ 70%      | ≥ 86%   | ≥ 66%        | ≥ 73%   |
| VOL          | ≤ 0.2V       | ≤ 0.36V | ≤ 0.2V     | ≤ 0.45V | ≤ 0.2V       | ≤ 0.53V |
| VOL [%Vcc]   | ≤ 6.4%       | ≤ 12%   | ≤ 6.1%     | ≤ 14%   | ≤ 5.8%       | ≤ 15%   |



TITLE: Mercury+™ IC OCXO Optional Bias Network Output to Standard

RELATED DRAWINGS:

FILENAME: CAT977

REVISION: A

DATE: 07-Apr-2015

SCALE: NTS

Millimetres



## 16.0 Specification History

| Version | User | Changes                                                                                       | Approver | Date       |
|---------|------|-----------------------------------------------------------------------------------------------|----------|------------|
| A       | JO   | Initial issue                                                                                 | PD       | 2016-06-10 |
| B       | JO   | Specification brought up-to-date as per latest product model template (incl. outline drawing) | BR       | 2017-09-11 |

<2020-03-18> Warm up時の消費電流値を訂正（記：多摩デバイス 営業技術部）。