

# Specification

|              |                         |
|--------------|-------------------------|
| Drawing No.  | TNY1T-H1-DEX01-01 [1/7] |
| Issued Date. | 6-Jun-18                |

## TO: Mouser

Note: In case of specification change, KYOCERA Part Number also will be changed.

|                               |                        |
|-------------------------------|------------------------|
| Product Name                  | Crystal Oscillator     |
| Product Model                 | _____                  |
| Frequency                     | 48.0000 MHz            |
| Customer Part Number          | ---                    |
| Customer Specification Number | _____                  |
| KYOCERA Part Number           | KC2016Z48.0000C1GX00   |
| Remarks                       | RoHS Compliant / MSL 1 |

### Customer Acceptance

|                  |                  |  |
|------------------|------------------|--|
| Accept Signature | Accept Date      |  |
|                  | Department       |  |
|                  | Person in charge |  |

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|                                                    |                   |             |            |           |
|----------------------------------------------------|-------------------|-------------|------------|-----------|
| Design Department                                  | Quality Assurance | Approved by | Checked by | Issued by |
| KYOCERA Corporation<br>Crystal Components Division |                   |             |            |           |

## Revision History

[illegible]

**1. Scope**

This specification shall be defined of the Clock Oscillator for the integrated circuits (ICs).

**2. Customer Part Number**

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**3. KYOCERA Part Number****KC2016Z48.0000C1GX00****4. Electrical Characteristics****4-1. Absolute Maximum Rating**

| Item                 | Symbol    | Rated Value            | Units |
|----------------------|-----------|------------------------|-------|
| Power Supply Voltage | $V_{CC}$  | -0.3 to +4.5           | V     |
| Input Voltage        | $V_{IN}$  | -0.3 to $V_{CC} + 0.3$ | V     |
| Storage Temperature  | $T_{STG}$ | -55 to +150            | °C    |

Note:

If the part is used beyond absolute maximum ratings, it may cause internal destruction. The part should be used under the recommended operating conditions the reliability of this part may be damaged if those conditions are exceeded.

**4-2. Recommended Operating Conditions**

| Item                  | Symbol    | Min  | Typ | Max      | Units | Remarks |
|-----------------------|-----------|------|-----|----------|-------|---------|
| Power Supply Voltage  | $V_{CC}$  | 1.71 | 3.3 | 3.63     | V     |         |
| Input Voltage         | $V_{IN}$  | 0    | --- | $V_{CC}$ | V     |         |
| Operating Temperature | $T_{OPR}$ | -40  | 25  | +85      | °C    |         |

**4-3. Electrical Characteristics**

| Item                                                            | Symbol      | Min          | Typ     | Max          | Units | Remarks                               |
|-----------------------------------------------------------------|-------------|--------------|---------|--------------|-------|---------------------------------------|
| Output Frequency                                                | $F_O$       | --           | 48.0000 | --           | MHz   |                                       |
| Frequency Tolerance*                                            | $F_{tol}$   | -50          | --      | +50          | ppm   |                                       |
| Current Consumption<br>(NoLoad/ $1.71 \leq V_{CC} \leq 2.25V$ ) | $I_{CC}$    | --           | --      | (1.8)        | mA    |                                       |
| Current Consumption<br>(NoLoad/ $2.25 < V_{CC} \leq 2.8V$ )     |             | --           | --      | (2.2)        |       |                                       |
| Current Consumption<br>(NoLoad/ $2.8 < V_{CC} \leq 3.63V$ )     |             | --           | --      | (3.3)        |       |                                       |
| Standby Current                                                 | $I_{ST}$    | --           | --      | 5            | μA    |                                       |
| Symmetry (Duty Ratio)                                           | SYM         | 45           | 50      | 55           | %     | @50% $V_{CC}$                         |
| Rise Time/ Fall Time<br>(10% $V_{CC}$ to 90% $V_{CC}$ /Loaded)  | $T_r / T_f$ | --           | --      | (2.0)        | ns    | $1.71 \leq V_{CC} \leq 2.25V$         |
|                                                                 |             | --           | --      | (1.6)        |       | $2.25 < V_{CC} \leq 2.8V$             |
|                                                                 |             | --           | --      | (1.3)        |       | $2.8 < V_{CC} \leq 3.63V$             |
| Output Voltage-"L"                                              | $V_{OL}$    | ---          | ---     | 10% $V_{CC}$ | V     | $I_{OL}=4mA$                          |
| Output Voltage-"H"                                              | $V_{OH}$    | 90% $V_{CC}$ | ---     | ---          | V     | $I_{OH}=-4mA$                         |
| Output Load                                                     | CL          | ---          | ---     | 15           | pF    | CMOS                                  |
| Input Voltage-"L"                                               | $V_{IL}$    | ---          | ---     | 30% $V_{CC}$ | V     |                                       |
| Input Voltage-"H"                                               | $V_{IH}$    | 70% $V_{CC}$ | ---     | ---          | V     |                                       |
| Output Disable Time                                             | $t_{dis}$   | ---          | ---     | 200          | ns    |                                       |
| Output Enable Time                                              | $t_{ena}$   | ---          | ---     | 5            | ms    |                                       |
| Start-up Time                                                   | $t_{sta}$   | ---          | ---     | 5            | ms    | @Minimum operating voltage to be 0sec |
| 1 Sigma Jitter**                                                | $J_{Sigma}$ | ---          | ---     | 8            | ps    |                                       |
| Peak to Peak Jitter**                                           | $J_{PK-PK}$ | ---          | ---     | 60           | ps    |                                       |
| Phase Jitter                                                    | ---         | ---          | 40      | ---          | ps    | BW:12kHz to 20MHz                     |

Note: All electrical characteristics have defined on the maximum loaded and recommended operating conditions.

\*Over All Conditions:

Include initial tolerance, operating temperature range, rated power supply voltage change, load change, aging (1year @+25°C), shock and vibration

\*\*Based on Time Interval Analyzer "Wavecrest SIA-3000".

**Table 1**

#### 4-4. Measurement Condition

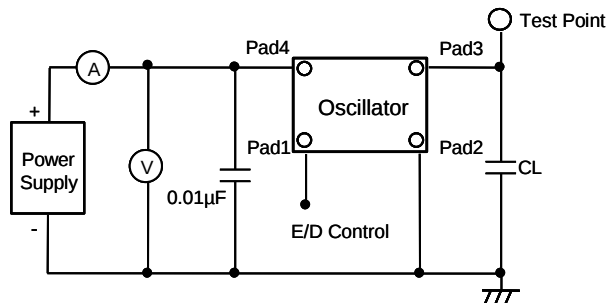
The reference temperature shall be  $+25 \pm 2^\circ\text{C}$ . The measurement shall be performed at the temperature range of  $+5^\circ\text{C}$  to  $+35^\circ\text{C}$  unless otherwise the result is doubtful.

#### 4-5. Measurement Circuit

The electrical characteristics shall be measured by test circuit "Fig. 1". Also jitter shall be measured by test circuit "Fig. 3".

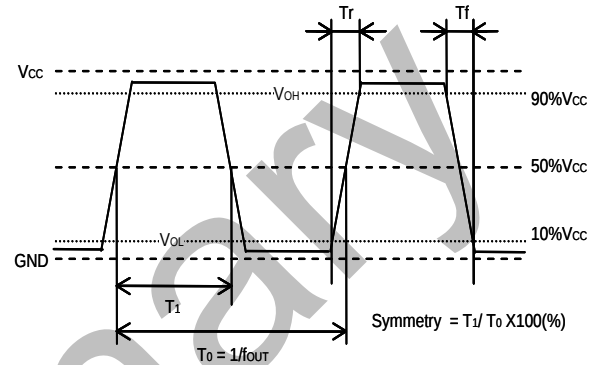
#### 4-6. Clock Timing Chart

The clock timing chart is "Fig. 2".

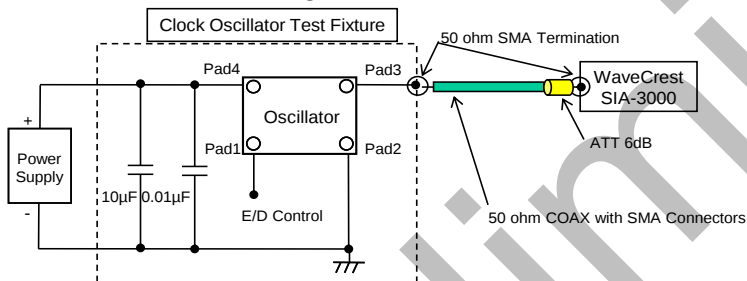


Note: CL includes probe and test fixture capacitance

**Fig.1 Test Circuits**



**Fig.2 Clock Timing Chart (C-MOS Output)**

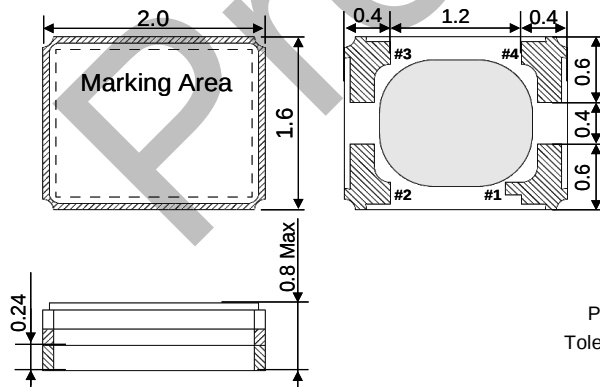


**Fig.3 Jitter Test Circuits**

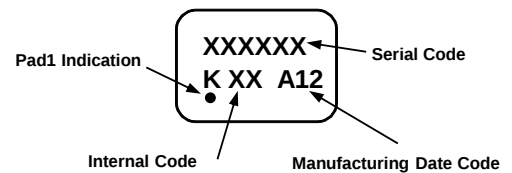
#### <Measurement Conditions>

- Time Interval Analyzer
  - WaveCrest SIA-3000
- DTS timer calibration
  - Over 30 minutes warm-up
  - Extend 30 minutes calibration
- Jitter histogram conditions (Tail-fit)
  - More than 50,000cyc Hits
  - Bit Error Ratio (BER) -12 (14sigma)

## 5. Dimensions and Marking



Plating Ni+Au  
Tolerance:  $\pm 0.2$   
Unit: (mm)



#### Manufacturing Date Code

- 1) Year Code (2000: "Z", 2001: "A", 2002: "B" ....)
- 2) Weekly Code

| Pad arrangement |                |
|-----------------|----------------|
| 1               | Enable/Disable |
| 2               | Case GND       |
| 3               | Output         |
| 4               | $V_{CC}$       |

| Enable/Disable Function |                         |
|-------------------------|-------------------------|
| Pad1                    | Pad3 (Output)           |
| OPEN                    | Active                  |
| "H" Level               | Active                  |
| "L" Level               | High Z (No-Oscillation) |

## 6. Parts Numbering Guide

**KC2016Z 48.0000 C 1 G X 00**

**A B C D E F G**

A. Series (SMD Oscillator)

B. Output Frequency

C. Output

C: C-MOS

D. Supply Voltage

1: 1.8V/ 2.5V/ 3.3V Compatible

E. Frequency Tolerance\*

G:  $\pm 50\text{ppm}$ 

F: Symmetry (Duty Ratio) and Enable/Disable Function

X: Symmetry: 45% to 55% with Stand-by Function

G. Suffix for Individual Requirements

(STD Specification is "00")

Packing (Tape &amp; Reel 2,000pcs/Reel)

\*Over All Conditions:

Include initial tolerance, operating temperature range, rated power supply voltage change, load change, aging (1year @+25°C), shock and vibration

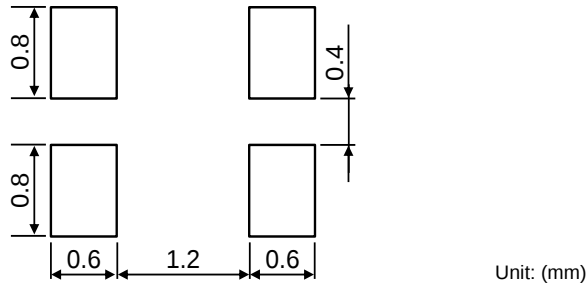
## 7. Environmental Characteristics

| Items                              | Conditions                                                                                                                                                  | Criteria of Acceptance                        |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 7-1. Solderability                 | Soaking:<br>+245 $\pm$ 5°C, 5.0 $\pm$ 0.5sec                                                                                                                | Dipped portion:<br>Minimum 95% coverage       |
| 7-2. Soldering Heat Resistance     | Reflow soldering:<br>Peak +260°C max, 10sec, Twice max                                                                                                      | Without looseness or crack etc                |
| 7-3. Temperature Cycle             | 10cycles:<br>-55°C to +125°C (30minuts each/ cycle)                                                                                                         | Clause 7-10 shall be satisfied.               |
| 7-4. Mechanical Shock (Pulse)      | 5 times<br>14,750m/sec <sup>2</sup> (1,500G), Duration of pulse 0.5msec<br>(MIL-STD-883D-2002.3 Condition B)                                                |                                               |
| 7-5. Vibration                     | 4 times each axis X, Y, Z:<br>20 to 2,000Hz and 2,000Hz to 20Hz/cycle<br>Peak acceleration 196m/sec <sup>2</sup> (20G)<br>(MIL-STD-883D-2007.2 Condition A) |                                               |
| 7-6. High Temperature              | 1000 hours:<br>Temperature: +85 $\pm$ 5/-3°C                                                                                                                |                                               |
| 7-7. Low Temperature               | 1000 hours:<br>Temperature: -40 $\pm$ 5/-3°C                                                                                                                |                                               |
| 7-8. Humidity Cycle                | 10 cycles:<br>Based on 1004 specifications<br>(MIL-STD-883D-1004.7)                                                                                         | Clause 7-1 shall be satisfied.                |
| 7-9. Hermeticity 1<br>(Gross leak) | Soaking:<br>+125°C, 5minutes                                                                                                                                | No bubbles appeared                           |
| 7-10. Hermeticity 2<br>(Fine leak) | Measured by Helium Detector Equipment<br>(MIL-STD-883D-1014.10 Condition A1)                                                                                | 5 $\times 10^{-9}$ Pa m <sup>3</sup> /sec max |

After each testing, the parts shall be subjected to standard atmospheric conditions more than 2 hours. After that, the electrical characteristics shall be measured. The result of the test shall be satisfied **Table 1**.

**Table 3**

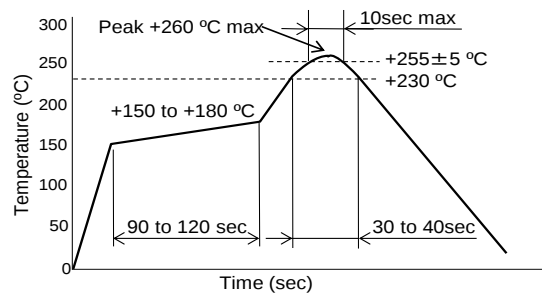
## 8. Recommended Land pattern and Soldering Guide



Note:

Since the part doesn't have Bypass Capacitor between  $V_{cc}$  and GND, Please mount high frequency type capacitor 0.01 $\mu$ F to the nearest position of oscillator.

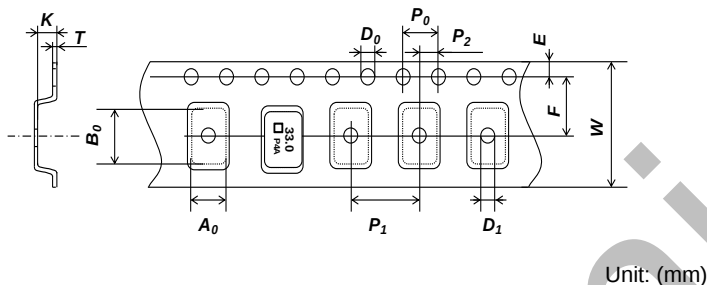
**Fig.4 Land pattern**



Available Reflow times: Maximum twice

**Fig.5 Reflow profile (Lead Free Available)**

## 9. Taping Specifications



| Symbol     | $A_0$   | $B_0$    | $W$     | $F$        | $E$      |
|------------|---------|----------|---------|------------|----------|
| Dimensions | 1.8±0.1 | 2.25±0.1 | 8.0±0.2 | 3.5±0.05   | 1.75±0.1 |
| Symbol     | $P_1$   | $P_2$    | $P_0$   | $D_0$      | $T$      |
| Dimensions | 4.0±0.1 | 2.0±0.05 | 4.0±0.1 | 1.5±0.1/-0 | 0.2±0.05 |
| Symbol     | $K$     | $D_1$    |         |            |          |
| Dimensions | 0.9±0.1 | 1.1±0.1  |         |            |          |

**Fig.6 Emboss Carrier Tape**

Std.

Max 2,000pcs/Reel

| Symbol     | $A$         | $N$      | $W_1$      |
|------------|-------------|----------|------------|
| Dimensions | 180 +0/-1.5 | 60+1/-0  | 9.0+0.3/-0 |
| Symbol     | $W_2$       | $C$      | $D$        |
| Dimensions | 11.4±1.0    | 13.0±0.2 | 21.0±0.8   |
| Symbol     | $E$         |          |            |
| Dimensions | 2.0±0.5     |          |            |

Option

Max 15,000pcs/Reel

| Symbol     | $A$       | $N$      | $W_1$      |
|------------|-----------|----------|------------|
| Dimensions | 330 +0/-2 | 100+1/-1 | 9.4+1/-0.5 |
| Symbol     | $W_2$     | $C$      | $D$        |
| Dimensions | -         | 13.0±0.2 | 21.0±0.8   |
| Symbol     | $E$       |          |            |
| Dimensions | 2.0±0.5   |          |            |

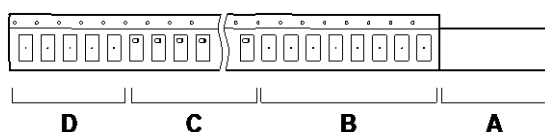
**Fig.7 Reel**

### 9-1. Taping Quantities

- The taping of per reel shall be packed 2,000 pcs.
- The parts shall be contained continuously in the pocket.

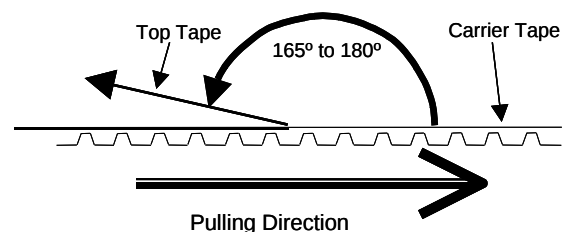
### 9-2. Leader and Blank Pockets

- The package shall be consisted of leader, blank pockets and loaded pocket as follows "Fig. 8".
- The power of peeling strength between top tape and carrier tape shall be 0.1N(10gf) to 0.7N(70gf) as follows "Fig. 9".



- A) Leader
- B) Blank Pocket (40mm to 320mm)  
A+B: 400mm to 560mm
- C) Load Pocket
- D) Blank Pocket (160mm minimum)

**Fig.8 Packing Method**



**Fig.9 Peeling Strength**

**9-3. Reel Label**

The reel label shall be consisted as below. (Based on EIAJ C-3 format)

- |                         |                  |
|-------------------------|------------------|
| A) Customer Part Number | D) Shipping Date |
| B) Lot No.              | E) Vender Name   |
| C) Quantities           |                  |

**9-4. Exterior Package Label**

The oscillator shall be packed properly to avoid defect in transportation. The exterior package label shall be consisted as below.

- |                         |                  |
|-------------------------|------------------|
| A) Name of Customer     | E) Quantities    |
| B) P/O No.              | F) Shipping Date |
| C) Customer Part Number | G) Vender Name   |
| D) Lot No.              |                  |

**10. The agreement of this specifications**

In case there is any obscure point or doubt concerning the contents of the specification, it shall be settled through consultation of both parties.

**11. Remarks on Usages****A) Storage Conditions**

The parts shall be stored in temperature range of -5 to +40°C, humidity 40 to 60% RH, and avoid direct sunlight. Then the parts shall be used within 6 months.

**B) Handling Conditions**

Although the part has protection circuit against static electricity, when excess static electricity is applied, the inside IC may get damaged.

Before mounting on the PCB, please make sure the direction of the part is correct. Otherwise the part of temperature will increase. And also the part will have some damages.

Please do not use the parts under the unfavorable condition such as beyond specified range in this specification.

Please do not use the parts under the condition, in the water or in the salt water also environment of dew or harmful gas.

Please make sure the condition of pick and place following pick up nozzle guideline.

Picking Method: Case of Head Unit 1.6 x 1.2mm (Inside Diameter)

The proper condition of pick and place will be different each equipment. Therefore, please check before testing.

**C) Rework Condition**

Please do not pick up Head Unit. We can't guaranty electrical performance and reliability.

**D) Soldering Conditions**

This product can respond to the general Pb-free reflow profile. The wave soldering cannot be supported.

**E) Soldering in Mounting**

In case of Solder paste and conductive glue contact product lid or product side face exception for product terminal it's possible to influence product characteristics.

Please be careful above contents.

**F) Washing Conditions**

Ultra sonic cleaning is available. However there is a possibility that Crystal in the part may cause damaged under certain condition. Therefore please test before using.

After washing, please dry the parts completely. Otherwise water drops between the parts and PCB may cause migration.

In case of using this part without above precaution, Kyocera is unable to guarantee the specific characteristics.



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