

Specification

| | |
|--------------|-------------------------|
| Drawing No. | TNY1T-H1-MEE01-03 [1/8] |
| Issued Date. | 15-Jun-25 |

TO:

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

| | |
|-------------------------------|---|
| Product Name | Crystal Oscillator |
| Product Model | _____ |
| Frequency | 10 MHz |
| Customer Part Number | --- |
| Customer Specification Number | _____ |
| KYOCERA Part Number | MC2520K10.0000C1XESH |
| Remarks | RoHS Compliant / MSL 1 / AEC-Q200 Certified |

Customer Acceptance

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

Seller
 KYOCERA Corporation
 Corporate Electronic Components Group
 Electronic Components Sales Division
 6 Takeda Tobadono-cho, Fushimi-ku, Kyoto
 612-8501 Japan
 TEL. No. 075-604-3500
 FAX. No. 075-604-3501

Manufacturer
 KYOCERA Corporation
 Corporate Electronic Components Group
 RF Devices Division
 Yamagata higashine Plant
 5850, Higashine-koh, Higashine-shi, Yamagata 999-3701
 Japan
 TEL. No. 0237-43-5611
 FAX. No. 0237-43-5615

| | | | | |
|---|-------------------|-------------|------------|-----------|
| Design Department | Quality Assurance | Approved by | Checked by | Issued by |
| Crystal Components Application Engineering Section2 RF Devices Engineering Department 1 RF Devices Division | | | | |

1. Scope

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

2. Customer Part Number

3. KYOCERA Part Number**MC2520K10.0000C1XESH****4. Electrical Characteristics**

4-1. Absolute Maximum Rating

| Item | Symbol | Rated Value | Units |
|----------------------|-----------|------------------------|-------|
| Power Supply Voltage | V_{CC} | -0.3 to +4.0 | V |
| Input Voltage | V_{IN} | -0.3 to $V_{CC} + 0.3$ | V |
| Storage Temperature | T_{STG} | -55 to +125 | °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} | 1.6 | 3.3 | 3.63 | V | |
| Input Voltage | V_{IN} | 0 | --- | V_{CC} | V | |
| Operating Temperature | T_{OPR} | -40 | 25 | +125 | °C | |

4-3. Electrical Characteristics

| Item | Symbol | Min | Typ | Max | Units | Remarks |
|--|-------------|--------------|-----|--------------|-------|---------------------------------------|
| Output Frequency | F_O | -- | 10 | -- | MHz | |
| Frequency Tolerance* | F_{tol} | -100 | -- | +100 | ppm | |
| Current Consumption (Loaded/ $1.6 \leq V_{CC} \leq 2.25V$) | I_{CC} | -- | -- | 2.5 | mA | |
| Current Consumption (Loaded/ $2.25 < V_{CC} \leq 2.8V$) | | -- | -- | 3 | | |
| Current Consumption (Loaded/ $2.8 < V_{CC} \leq 3.63V$) | | -- | -- | 3.5 | | |
| Standby Current | I_{ST} | -- | -- | 5 | μA | |
| Symmetry (Duty Ratio) | SYM | 45 | 50 | 55 | % | @50% V_{CC} |
| Rise Time/ Fall Time (10% V_{CC} to 90% V_{CC}) | Tr/ Tf | -- | -- | 6 | ns | $1.6 \leq V_{CC} \leq 2.25V$ |
| | | -- | -- | 5 | | $2.25 < V_{CC} \leq 2.8V$ |
| | | -- | -- | 4.5 | | $2.8 < V_{CC} \leq 3.63V$ |
| 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} | --- | --- | 2 | ms | |
| Start-up Time | t_{sta} | --- | --- | 2 | ms | @Minimum operating voltage to be 0sec |
| 1 Sigma Jitter** | J_{Sigma} | --- | --- | 5 | ps | |
| Peak to Peak Jitter** | J_{PK-PK} | --- | --- | 50 | ps | |
| Phase Jitter | --- | --- | --- | 1 | ps | BW:12kHz to 20MHz |

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

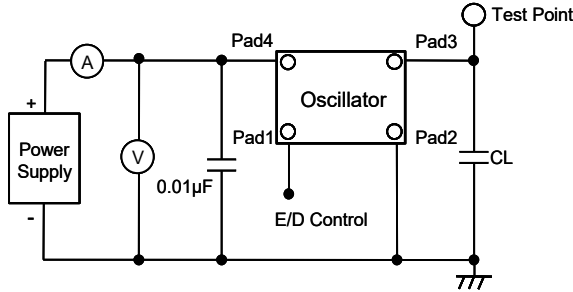
The reference temperature shall be $+25 \pm 2^\circ\text{C}$. The measurement shall be performed at the temperature range of $+5^\circ\text{C}$ to $+35^\circ\text{C}$ unless otherwise the result is doubtful.

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

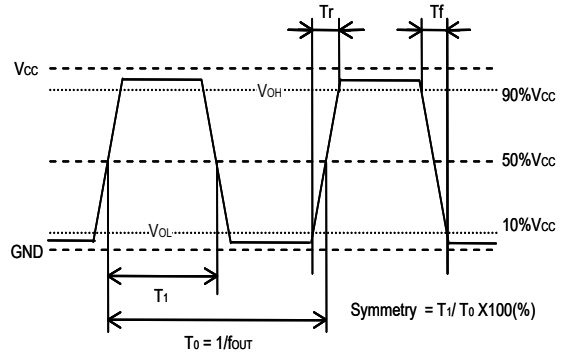


Fig.2 Clock Timing Chart (C-MOS Output)

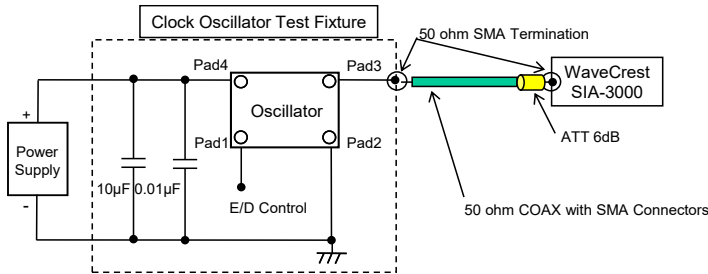
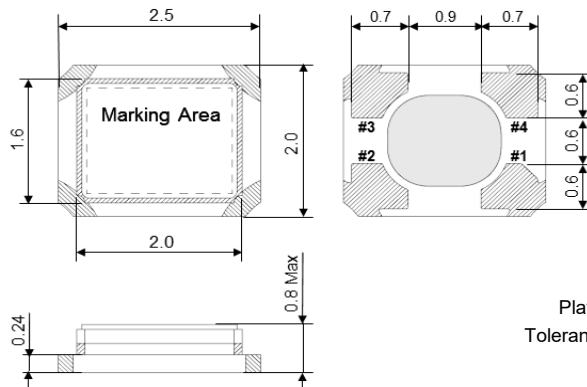


Fig.3 Jitter Test Circuits

<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



Output Frequency

The output frequency is three-digit without a decimal point. The frequency greater than the number of digits have rounded down.

(E.g. 14.31818MHz → "14.3")

Manufacturing Date Code

| Year | Code | Year | Code | Month | Code | Day | Code | Day | Code |
|------|------|------|------|-------|------|-----|------|-----|------|
| 2020 | W | 2031 | L | 1 | 1 | 1 | 1 | 11 | B |
| 2021 | A | 2032 | M | 2 | 2 | 2 | 2 | 12 | C |
| 2022 | B | 2033 | N | 3 | 3 | 3 | 3 | 13 | D |
| 2023 | C | 2034 | P | 4 | 4 | 4 | 4 | 14 | E |
| 2024 | D | 2035 | Q | 5 | 5 | 5 | 5 | 15 | F |
| 2025 | E | 2036 | R | 6 | 6 | 6 | 6 | 16 | G |
| 2026 | F | 2037 | S | 7 | 7 | 7 | 7 | 17 | H |
| 2027 | G | 2038 | T | 8 | 8 | 8 | 8 | 18 | J |
| 2028 | H | 2039 | V | 9 | 9 | 9 | 9 | 19 | K |
| 2029 | J | 2040 | W | 10 | A | 10 | A | 20 | L |
| 2030 | K | 2041 | A | 11 | B | 11 | B | | |
| | | | | 12 | C | 12 | C | 31 | Y |

e.g. : "P4A" means "Apr-10-2034"

Table 2

| Pad arrangement | |
|-----------------|-------------------|
| 1 | Stand-by Function |
| 2 | Case GND |
| 3 | Output |
| 4 | Vcc |

| Stand-by Function | |
|-------------------|-------------------------|
| Pad1 | Pad3 (Output) |
| OPEN | Active |
| "H" Level | Active |
| "L" Level | High Z (No-Oscillation) |

6. Parts Numbering Guide

MC2520K 10.0000 C 1 X E SH
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*

X: ±100ppm

F: Symmetry (Duty Ratio) and Stand-by Function

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

G. Suffix for Individual Requirements

SH : for Automotive

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

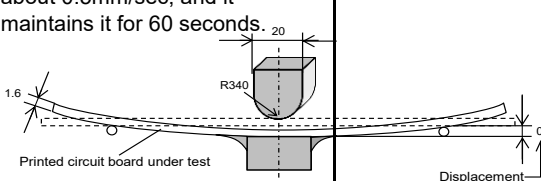
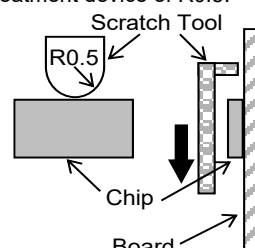
*Over All Conditions:

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

7. Environmental Characteristics (Based on AEC-Q200 Rev. D)

| AEC-Q200 No | Items | Conditions | Reference | Criteria of Acceptance | Sample Size [PCS] |
|-------------|-------------------------------------|--|-------------------------|--|-------------------|
| 3 | High Temperature Exposure (Storage) | +125°C 1000 hrs. Unpowered. | MIL-STD-202 Method 108 | Satisfy Electrical Characteristics. | 77 |
| 4 | Temperature Cycling | 1000cycles (-55 to +125°C) | JESD22 Method JA-104 | Satisfy Electrical Characteristics. | 77 |
| 6 | Moisture Resistance | +25°C, +65°C 90%RH 10cycles 24 hrs/1cycle. Unpowered. Steps 7a & 7b not required. | MIL-STD-202 Method 106 | Satisfy Electrical Characteristics. Clause 13 shall be also satisfied. | 77 |
| 7 | Biased Humidity | +85°C, 85%RH, 1000 hrs. VCC=3.63V, CL=15pF | MIL-STD-202 Method 103 | Satisfy Electrical Characteristics. | 77 |
| 8 | Operational Life | +125°C, 1000 hrs. VCC=3.63V, CL=15pF | MIL-STD-202 Method 108 | Satisfy Electrical Characteristics. | 77 |
| 9 | External Visual | Magnification 10x | MIL-STD-883 Method 2009 | Thing that abnormality is not found in externals. (Inspect device construction, marking and workmanship. Electrical Test not required.) | 30 |
| 10 | Physical Dimension | - | JESD22 Method JB-100 | Satisfy Approval Sheet | 30 |
| 12 | Resistance to Solvents | Magnification 10x | MIL-STD-202 Method 215 | Thing that abnormality is not found in externals. | 5 |
| 13 | Mechanical Shock | 100G/6ms/Half-sine Velocity change 12.3 (Vi)ft/sec | MIL-STD-202 Method 213 | Satisfy Electrical Characteristics. | 30 |
| 14 | Vibration | 10 to 2000Hz. 5g's for 20 minutes 12 cycles each of 3 orientations. | MIL-STD-202 Method 204 | Satisfy Electrical Characteristics. | 30 |
| 15 | Resistance to Soldering Heat | Soaking:+260±5°C, 10±1sec | MIL-STD-202 Method 210 | Satisfy Electrical Characteristics. | 30 |
| 16 | Thermal Shock | -55°C/+125°C. 300Cycles, Max. transfer time 20 sec. Dwell time 5 min. Air-Air. | MIL-STD-202 Method 107 | Satisfy Electrical Characteristics. | 30 |

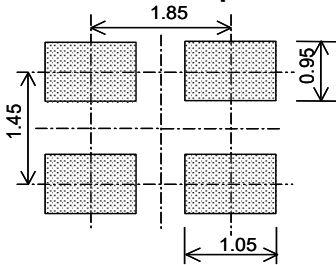
KYOCERA Corporation

| AEC-Q200 No | Items | Conditions | Reference | Criteria of Acceptance | Sample Size [PCS] |
|-------------|-----------------------------|--|----------------|--|-------------------|
| 17 | ESD | Human Body Model: 100pF/1500ohm/500~2000V 5 pulses | AEC-Q200-002 | Satisfy Electrical Characteristics. | 15 |
| 18 | Solderability | 8 hrs. steam age +215°C solder temperature 5 second dwell | J-STD-002 | Dipped potion: Minimum 95% coverage | 15 |
| 19 | Electrical Characterization | - | Approval Sheet | Satisfy Approval Sheet | 30 x 3Lot |
| 21 | Board Flex | It pressurizes in the direction of the arrow, it pressurizes at the speed of 2mm in bend width about 0.5mm/sec, and it maintains it for 60 seconds.  | AEC-Q200-005 | Satisfy Electrical Characteristics. Without looseness or crack etc. | 30 |
| 22 | Terminal Strength (SMD) | The static load of 1.8Kg is added in the direction of the arrow and it maintains it in the prime fields of parts for 60 sec with a scratch treatment device of R0.5.  | AEC-Q200-006 | Satisfy Electrical Characteristics. Without looseness or crack etc. | 30 |

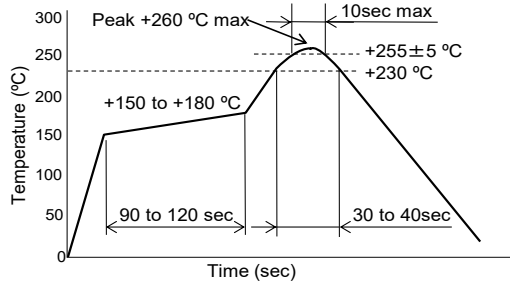
After each testing, the parts shall be subjected to standard atmospheric conditions more than 2 hours.

Table 3

8. Recommended Land pattern and Soldering Guide



Unit: (mm)



Available Reflow times: Maximum twice

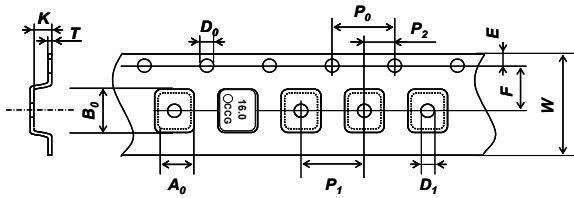
Note:

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

Fig.4 Land pattern

Fig.5 Reflow profile (Lead Free Available)

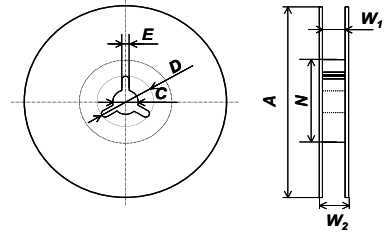
9. Taping Specifications



Unit: (mm)

| | | | | | |
|------------|----------------------|----------------------|----------------------|----------------------|----------|
| Symbol | A₀ | B₀ | W | F | E |
| Dimensions | 2.2±0.1 | 2.7±0.1 | 8.0±0.2 | 3.5±0.05 | 0-Jan-00 |
| Symbol | P₁ | P₂ | P₀ | D₀ | T |
| Dimensions | 4.0±0.1 | 2.0±0.05 | 4.0±0.1 | 1.5±0.1/-0 | 0-Jan-00 |
| Symbol | K | D₁ | | | |
| Dimensions | 1.0±0.1 | 1.1±0.1 | | | |

Fig.6 Emboss Carrier Tape



Unit: (mm)

| | | | |
|------------|----------------------|----------|----------------------|
| Symbol | A | N | W₁ |
| Dimensions | 0-Jan-00 | 1.75±0.1 | 0-Jan-00 |
| Symbol | W₂ | C | D |
| Dimensions | 0-Jan-00 | 0.2±0.05 | 0-Jan-00 |
| Symbol | E | | |
| Dimensions | 0-Jan-00 | | |

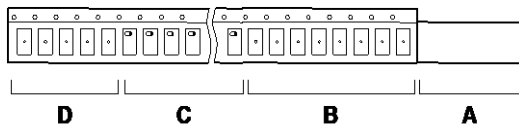
Fig.7 Reel

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 1.0N(100gf) 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

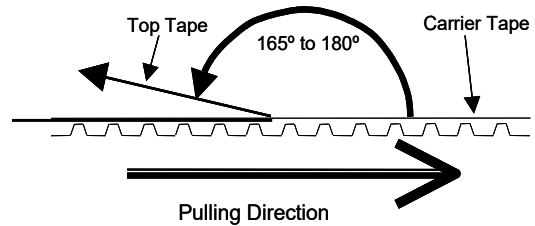


Fig.9 Peeling Strength

9-3. Reel Label

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

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

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

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. Quality guarantee

In case when Kyocera Corporation rooted failure occurred within 1year after its delivery, substitute product will be arranged based on discussion. Quality guarantee of product after 1year of its delivery is waived.

12. 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.

- G) This product can be used for general electronic equipment (information equipment, communication equipment, audiovisual equipment, measuring equipment, home appliances, etc.) Intended to be used. Equipment and systems (traffic equipment, safety equipment, aviation / space control, nuclear power control, life support equipment) that require special quality and reliability and whose failure or malfunction may endanger human life or harm the human body. (Including medical devices, etc.), basic driving functions (running, turning, stopping) and collision safety in traffic equipment, applications related directly or indirectly to collision safety, and applications that are expected to have a significant impact on property, etc. It is not intended to be used. In the unlikely event that this product is used for any of these purposes, we will not be liable for any damages resulting from such use.

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