



A Product Line of  
Diodes Incorporated



# SPECIFICATION FOR APPROVAL

|                   |  |
|-------------------|--|
| CUSTOMER          | _____  |
| NOMINAL FREQUENCY | 24.000000 MHz  |
| PRODUCT TYPE      | TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR |
| SPEC. NO. ( P/N ) | MK2400001  |
| CUSTOMER P/N      | _____  |
| ISSUE DATE        | July 16, 2018  |
| VERSION           | A  |

| APPROVED      | PREPARED     | QA               |
|---------------|--------------|------------------|
| <i>Brenda</i> | <i>Kelby</i> | <i>Song Yang</i> |

## Diodes Incorporated

No.2, Ziqiang 5th Rd., Zhongli Industrial Park,  
 Zhongli Dist., Taoyuan City 32063, Taiwan (R.O.C.)  
 TEL: 886-3-451-8888  
 FAX: 886-3-461-3865  
<https://www.diodes.com>

- \*Pb-free
- \*RoHS Compliant
- \*HF-Halogen Free
- \*REACH Compliant

**TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR**

***MK2400001***

VER. A 16-Jul-18

**VERSION HISTORY**

| Version No. | Version Date | Description                 | Notes |
|-------------|--------------|-----------------------------|-------|
| 01          | Feb.21,2013  | Initial Release             |       |
| A           | Jul.16,2018  | Updated logo & Test Circuit |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |
|             |              |                             |       |



# TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR

## MK2400001

VER. A 16-Jul-18

### ELECTRICAL SPECIFICATIONS

**SRe Part Number : MK2400001**

| Item                            | Symbol                         | Specifications      | Units | Notes                                 |
|---------------------------------|--------------------------------|---------------------|-------|---------------------------------------|
| Nominal Frequency               | F <sub>0</sub>                 | 24.000000           | MHz   |                                       |
| Frequency Stability             | FT                             | ± 25                | ppm   | **See note                            |
| Operating Temperature Range     | TR                             | -40 to +85          | °C    |                                       |
| Supply Voltage                  | V <sub>DD</sub>                | +3.3 ± 10%          | V     |                                       |
| Logic Type                      | LT                             | LVC MOS             |       |                                       |
| Supply Current, Output Enabled  | I <sub>DD/OE</sub>             | 10                  | mA    | Max.                                  |
| Supply Current, Output Disabled | I <sub>DD/OD</sub>             | 10                  | µA    | Max.                                  |
| Duty Cycle (Symmetry)           | DC/SY                          | 45 / 55             | %     | Measured 50% of Waveform              |
| Rise / Fall Time                | T <sub>R</sub> /T <sub>F</sub> | 3                   | ns    | Max. Measured at 10 / 90% of Waveform |
| Output Voltage "0" Level        | V <sub>OL</sub>                | 10% V <sub>DD</sub> | V     | Max.                                  |
| Output Voltage "1" Level        | V <sub>OH</sub>                | 90% V <sub>DD</sub> | V     | Min.                                  |
| Output Load                     | CL                             | 15                  | pF    | Max                                   |
| Central Spread                  |                                | ±1.00               | %     |                                       |
| EMI Reduction                   |                                | -7                  | dBc   | Min (-12dBc typ)                      |
| Storage Temperature Range       |                                | -55°C to +125°C     | °C    |                                       |

※ This product doesn't include harmful substance that stipulated by SONY SS-00259 Level 1 and S-AT2-001 Level 1 standard. RoHS Compliant (Pb - Free).

**\*\*Stability includes all combinations of Operating Temperature, Load changes, rated Input (Supply) Voltage changes, Initial Calibration Tolerance (25°C), Aging (1 year at 25°C Average Effective Ambient Temperature), Shock and Vibration.**

#### Output Enable / Disable Function

| Parameter  | Min.               | Typ. | Max.               | Units | Notes          |
|--|--------------------|------|--------------------|-------|----------------|
| Input Voltage (Pin1), Output Enable                      | 0.7V <sub>DD</sub> |      |                    | V     | Or Open        |
| Input Voltage (Pin1), Output Disable (low power standby) |                    |      | 0.3V <sub>DD</sub> | V     | Output is Hi-Z |

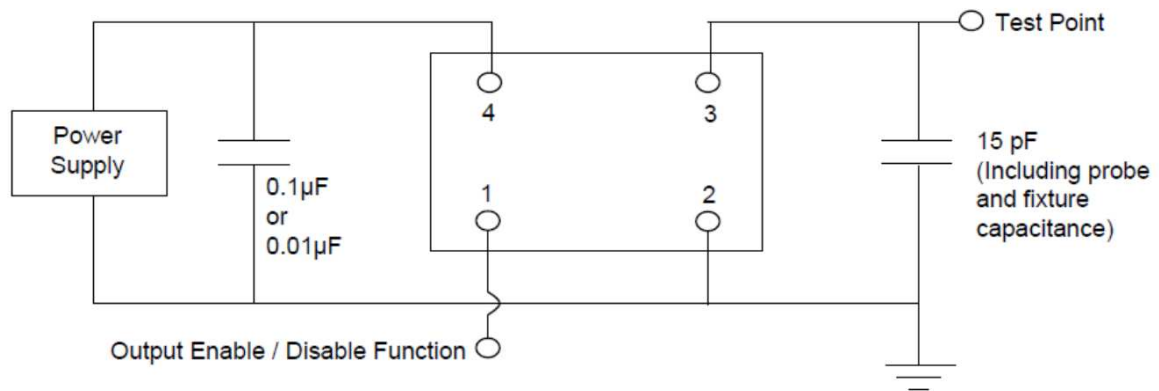


# TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR

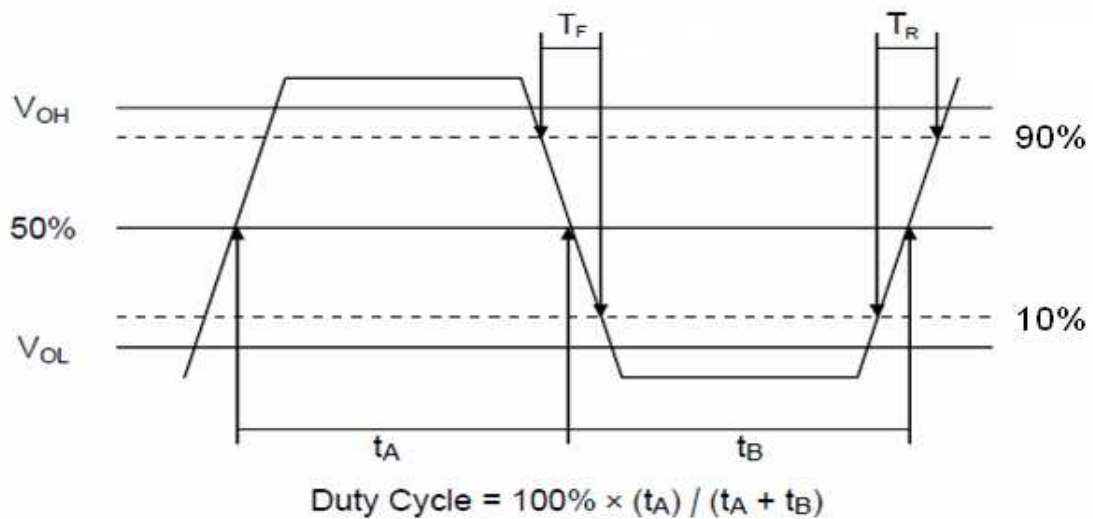
**MK2400001**

VER. A 16-Jul-18

## TEST CIRCUIT



## OUTPUT WAVEFORM



# TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR

**MK2400001**

VER. A 16-Jul-18

## RELIABILITY SPECIFICATIONS

### ENVIRONMENTAL:

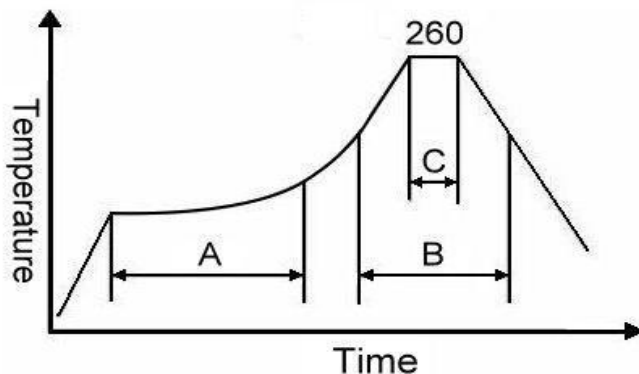
- a) THERMAL SHOCK: MIL-STD-883, Method 1011, Condition A
- b) MOISTURE RESISTANCE: MIL-STD-883, Method 1004
- c) VIBRATION: MIL-STD-883, Method 2007, Condition A
- d) RESISTANCE TO SOLDERING HEAT: J-STD-020D Table 5-2 Pb-free devices (except 2 cycles max)
- e) HAZARDOUS SUBSTANCE: Pb - free and RoHS Compliant.

### MECHANICAL:

- a) SHOCK: MIL-STD-883, Method 2002, Condition B
- b) SOLDERABILITY: JESD22-B102-D Method 2 (Preconditioning E)
- c) TERMINAL STRENGTH: MIL-STD-883, Method 2004, Test Condition D
- d) GROSS LEAK: MIL-STD-883, Method 1014, Condition C
- e) FINE LEAK: MIL-STD-883, Method 1014, Condition A2,  $R1=2 \times 10^{-8}$  atm cc/s
- f) SOLVENT RESISTANCE: MIL-STD-202, Method 215

## SUGGESTED IR REFLOW PROFILE

\*As per IPC-JEDEC J-STD-020D



Note:

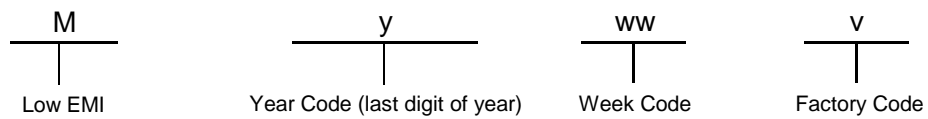
|   | Stage        | Temperature | Time       |
|---|--------------|-------------|------------|
| A | Preheat      | 150~200°C   | 60~120 Sec |
| B | Primary Heat | 217°C       | 60~150 Sec |
| C | Peak         | 260°C       | 10 Sec     |

# TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR

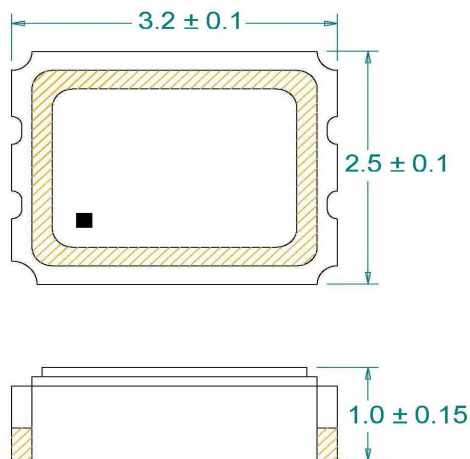
**MK2400001**

VER. A 16-Jul-18

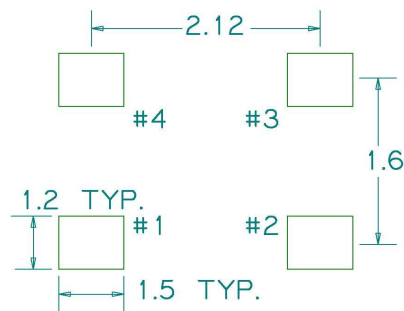
## MARKING



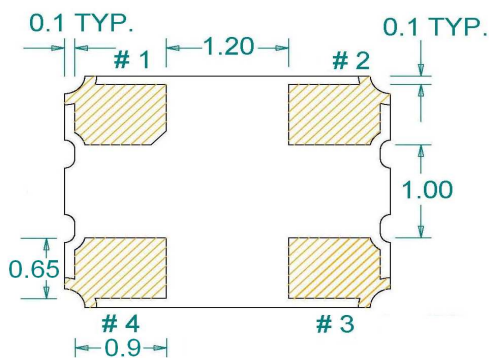
## MECHANICAL DRAWINGS ( Scale: None. Dimensions are in mm.)



### Recommended Land Pattern\*



\*External high-frequency power decoupling is recommended. (see test circuit for minimum recommendation). To ensure optimal performance, do not route traces beneath the package.



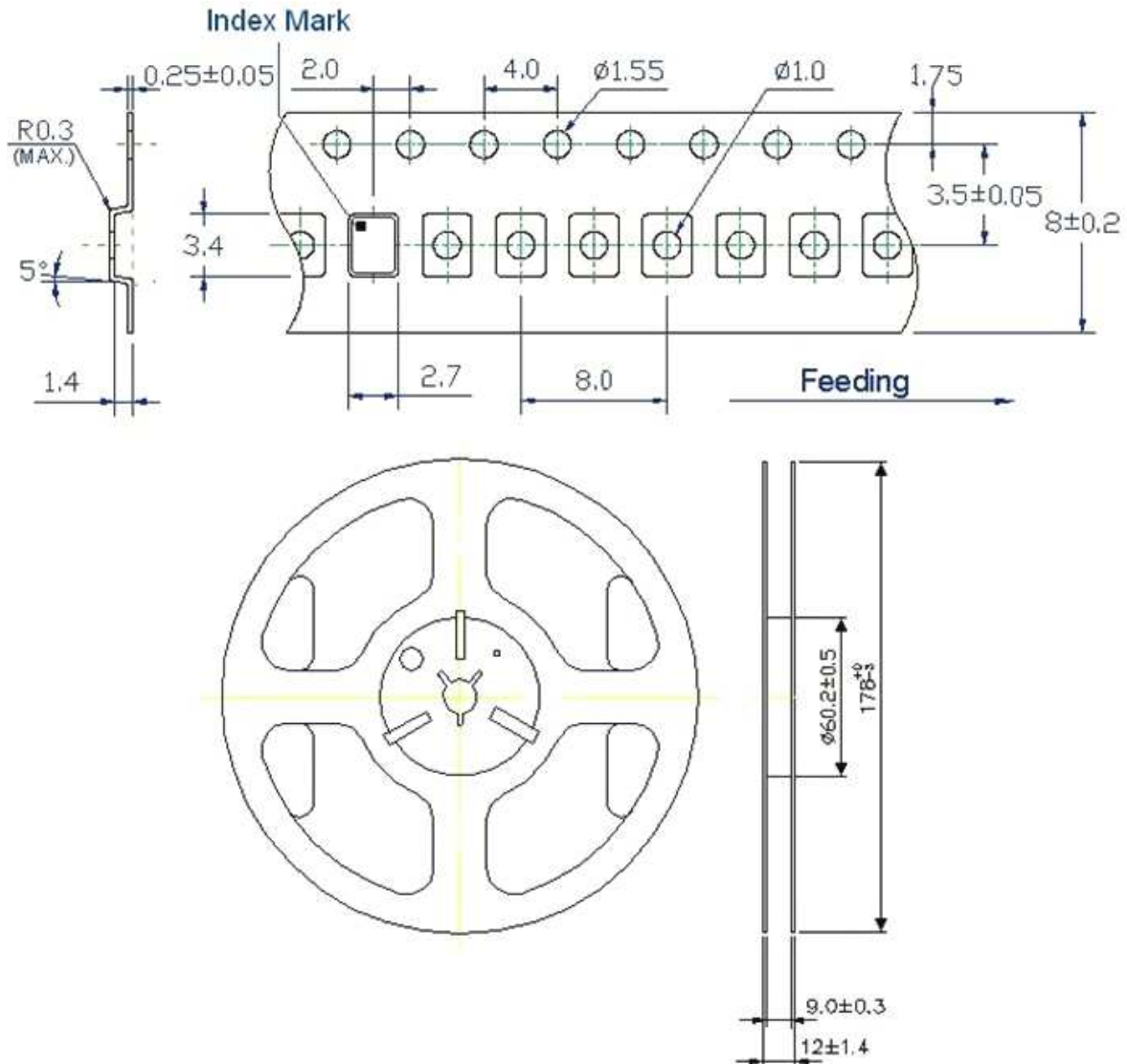
| Pin | Function     |
|-----|--------------|
| 1   | OE           |
| 2   | Ground       |
| 3   | Clock Output |
| 4   | $V_{DD}$     |

# TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR

**MK2400001**

VER. A 16-Jul-18

## TAPE & REEL



1. 230mm minimum leader which consist of carrier and/or tape followed by a minimum of 160mm of empty carrier tape sealed with cover tape.
2. 160mm minimum trailer of empty carrier tape sealed with cover tape.

# TYPE MK 3.2x2.5 SEAM SEALED CRYSTAL CLOCK OSCILLATOR

**MK2400001**

VER. A 16-Jul-18

## PACKING

