

# APPROVAL SHEET

Customer Name : \_\_\_\_\_  
Customer P/N : \_\_\_\_\_  
Frequency : 20.000000 MHz  
Aker Approved P/N : SMAF-020000-2-D2-00  
Aker MPN : SMAF-020000-2-D2-00  
Rev. : 1  
ISSUE DATE : Feb.9.2023

| APPROVED                                                                            | CHECKED | PREPARED                                                                              |
|-------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------|
|  |         |  |
| APPROVED BY CUSTOMER                                                                |         |                                                                                       |
|                                                                                     |         |                                                                                       |

**AKER TECHNOLOGY CO., LTD.**

ADDRESS : NO 11-3, Jianguo Rd., Tanzi Dist., Taichung City 427, Taiwan.

TEL : 886-4-25335978 FAX : 886-4-25336011

Web: [www.aker.com.tw](http://www.aker.com.tw)

**MSL:Level 1**

**RoHS Compliant**

**IATF 16949 Certified**

**AEC-Q200 Qualified**



Confidential

[illegible]

## SMD CRYSTAL OSCILLATOR

### 1. ELECTRICAL CHARACTERISTICS

#### ■ Standard atmospheric conditions

Unless otherwise specified , the standard range of atmospheric conditions for making measurement and tests are as follow :

Ambient temperature :  $25 \pm 5^{\circ}\text{C}$

Relative humidity : 40%~70%

If there is any doubt about the results , measurement shall be made within the following limits :

Ambient temperature :  $25 \pm 3^{\circ}\text{C}$

Relative humidity : 40%~70%

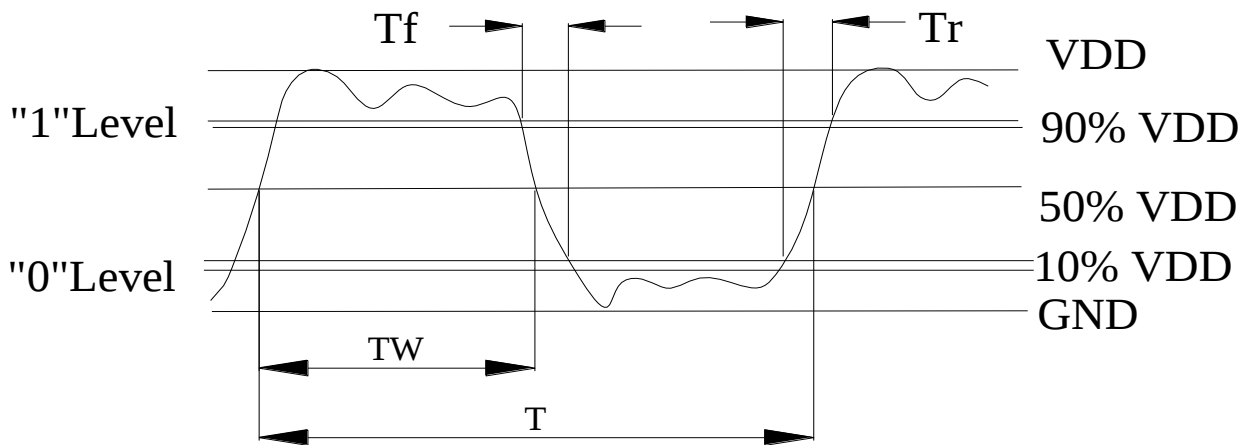
#### ■ AKER Model : SMAF-221

#### ■ Cutting Mode : AT CUT

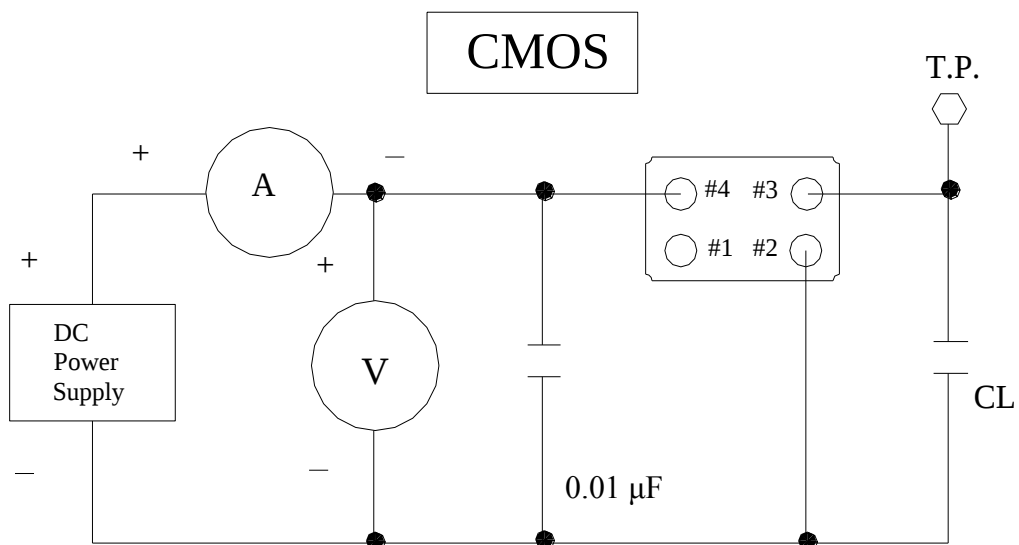
| Parameters                | Symbol   | Electrical Spec |      |              |                    | Notes                        |
|---------------------------|----------|-----------------|------|--------------|--------------------|------------------------------|
|                           |          | Min.            | Typ. | Max.         | Units.             |                              |
| Nominal Frequency         |          | 20.000000       |      |              | MHz                |                              |
| Frequency Stability       |          | $\pm 50$        |      |              | ppm                |                              |
| Supply Voltage            | $V_{CC}$ | 1.62            | ~    | 3.63         | V                  |                              |
| Output Load CMOS          | CL       |                 |      | 15           | pF                 |                              |
| Aging                     |          | $\pm 3$         |      |              | ppm                | First Year                   |
| Enable Control            |          | Yes             |      |              |                    | Pad 1                        |
| Operating Temperature     |          | -40             | 25   | 85           | $^{\circ}\text{C}$ |                              |
| Storage Temperature Range |          | -55             | ~    | 150          | $^{\circ}\text{C}$ |                              |
| Output Voltage High       | VoH      | $90\%V_{DD}$    |      |              | V                  |                              |
| Output Voltage Low        | VoL      |                 |      | $10\%V_{DD}$ | V                  |                              |
| Input Current             | Icc      |                 |      | 12           | mA                 |                              |
| Standby Current           | Ist      |                 |      | 10           | $\mu\text{A}$      |                              |
| Rise Time                 | Tr       |                 |      | 6            | ns                 | $10\% \sim 90\%V_{DD}$ Level |
| Fall Time                 | Tf       |                 |      | 6            | ns                 | $90\% \sim 10\%V_{DD}$ Level |
| Symmetry (Duty ratio)     | TH/T     | 45              | ~    | 55           | %                  |                              |
| Start-up Time             | Tosc     |                 |      | 10           | ms                 |                              |
| Enable Voltage High       | Vhi      | $70\%V_{DD}$    |      |              | V                  |                              |
| Disable Voltage Low       | Vlo      |                 |      | $30\%V_{DD}$ | V                  |                              |
| Output Enable Delay Time  | T on     |                 |      | 10           | ms                 |                              |
| Output Disable Delay Time | T off    |                 |      | 200          | ns                 |                              |
| Phase Jitter RMS          |          |                 |      | 1            | ps                 | 12KHz~5MHz                   |

\*Please kindly be noted that AKER DO NOT guarantee parts quality which involves human security application.\*

## 2 . C - MOS LOAD OUTPUT WAVEFORM

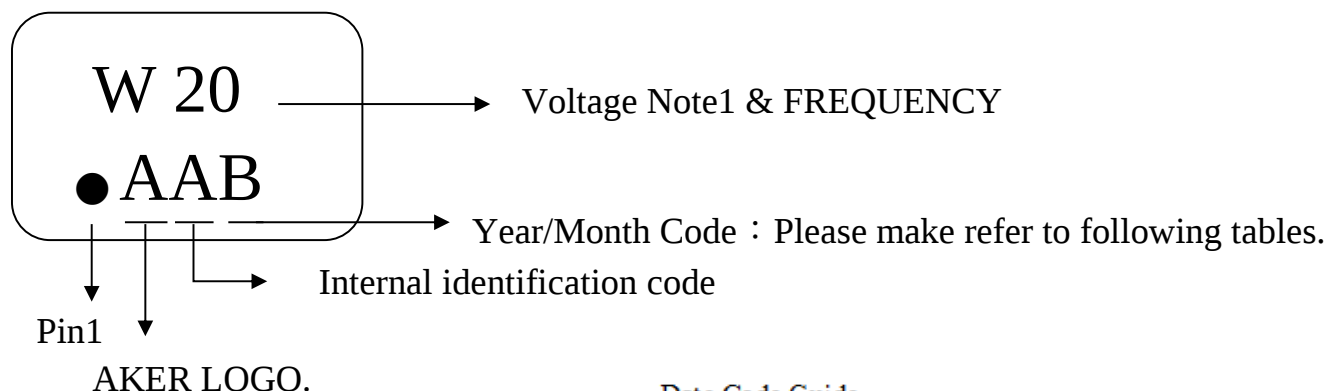


## 3 . C - MOS LOAD TEST CIRCUIT



\*\*\*Because SMA series has no by pass capacitor.  
So,we recommend our customer to use capacitor 0.01  $\mu F$   
in join Vcc and GND.

## 4 . MARKING :



NOTE1:

|   |                     |
|---|---------------------|
| T | 5.0V TTL            |
| C | 4.5~5.0V CMOS       |
| L | 2.97~3.63V TTL&CMOS |
| R | 2.8~3.0V CMOS       |
| S | 2.25~2.75V CMOS     |
| Y | 1.5~2.0V CMOS       |
| Z | 0.8~1.4V CMOS       |
| W | Voltage Range CMOS  |

Date Code Guide

| Year  | 2021   | 2022   | 2023   | 2024   |
|-------|--------|--------|--------|--------|
|       | 2025   | 2026   | 2027   | 2028   |
| Month | (4N+1) | (4N+2) | (4N+3) | (4N+0) |
| JAN   | a      | n      | A      | N      |
| FEB   | b      | p      | B      | P      |
| Mar   | c      | q      | C      | Q      |
| Apr   | d      | r      | D      | R      |
| May   | e      | s      | E      | S      |
| Jun   | f      | t      | F      | T      |
| Jul   | g      | u      | G      | U      |
| Aug   | h      | v      | H      | V      |
| Sep   | j      | w      | J      | W      |
| Oct   | k      | x      | K      | X      |
| Nov   | l      | y      | L      | Y      |
| Dec   | m      | z      | M      | Z      |

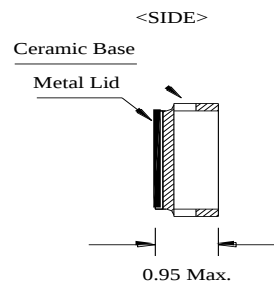
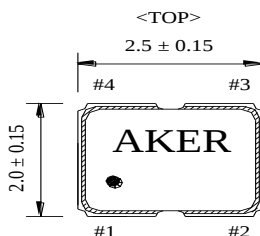
A cycle every four years

## 5 . DIMENSION :

( UNIT : mm )

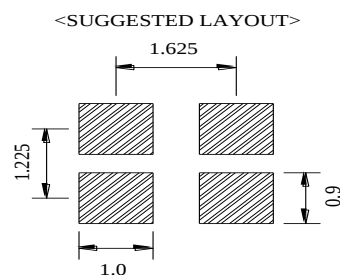
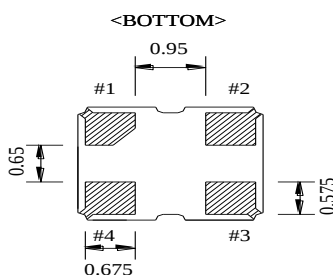
### Enable / Disable Function

|             |                |
|-------------|----------------|
| E/D (#1)    | OUTPUT (#3)    |
| HIGH (Open) | Operating      |
| LOW         | High impedance |

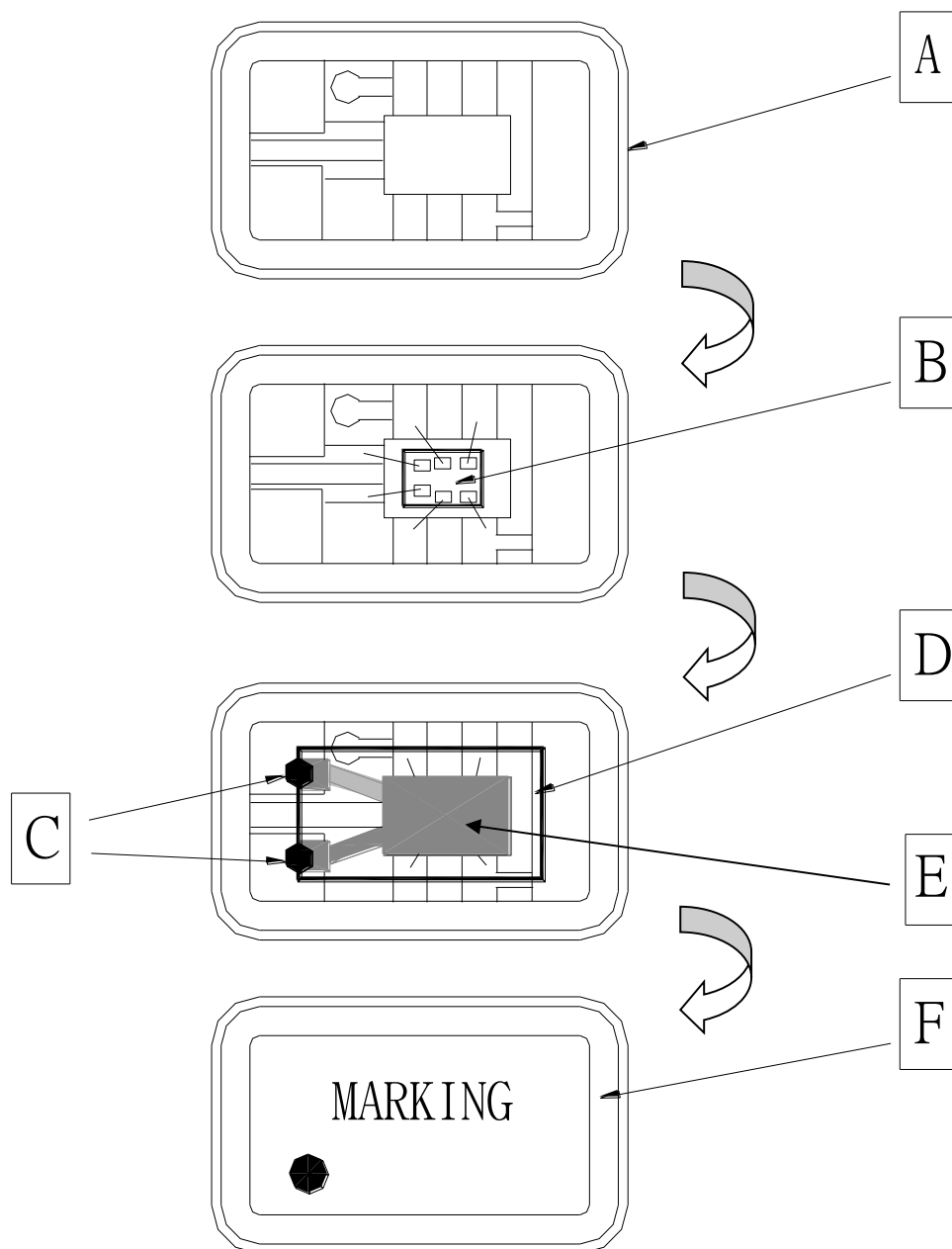


### PIN FUNCTION

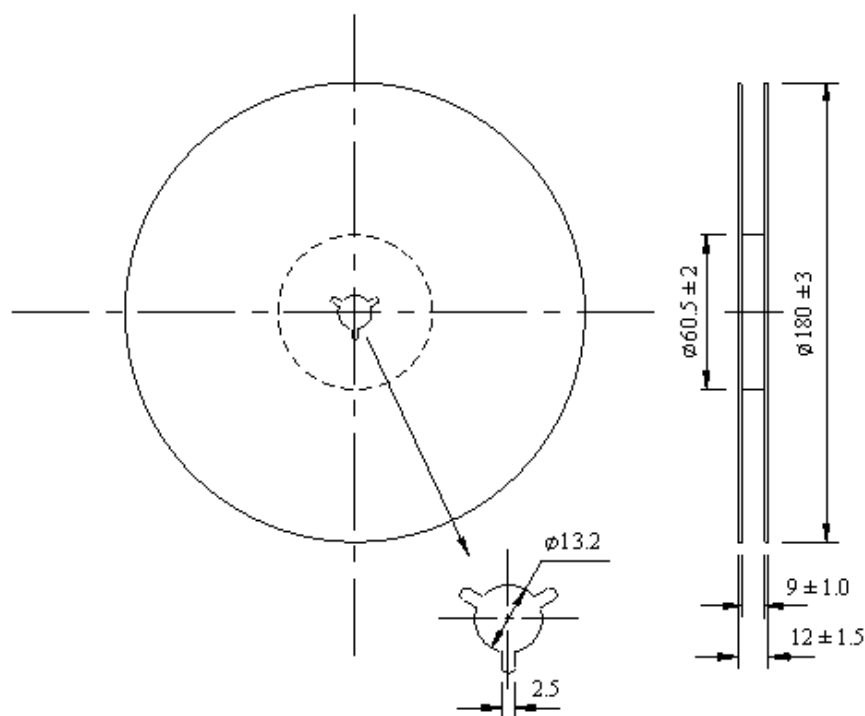
- #1 : Enable / Disable Control
- #2 : GND
- #3 : OUTPUT
- #4 : VDD



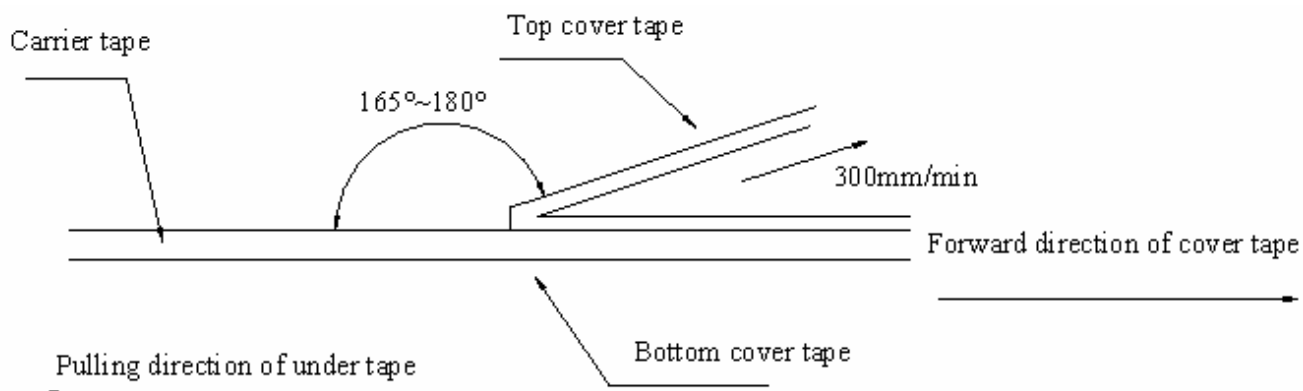
## 6 . STRUCTURE ILLUSTRATION



| COMPONENTS |                     | MATERIALS                                                  | COMPONENTS |               | MATERIALS        |
|------------|---------------------|------------------------------------------------------------|------------|---------------|------------------|
| A          | Base (Package)      | Ceramic (Al <sub>2</sub> O <sub>3</sub> )+Kovar (Fe/Co/Ni) | D          | Crystal blank | SiO <sub>2</sub> |
| B          | IC chip             | .                                                          | E          | Electrode     | Cr / Ag          |
| C          | Conductive adhesive | Ag / Silicon resin                                         | F          | Lid           | Fe/Co/Ni         |



## 8. COVER TAPE ADHESION STRENGTH :

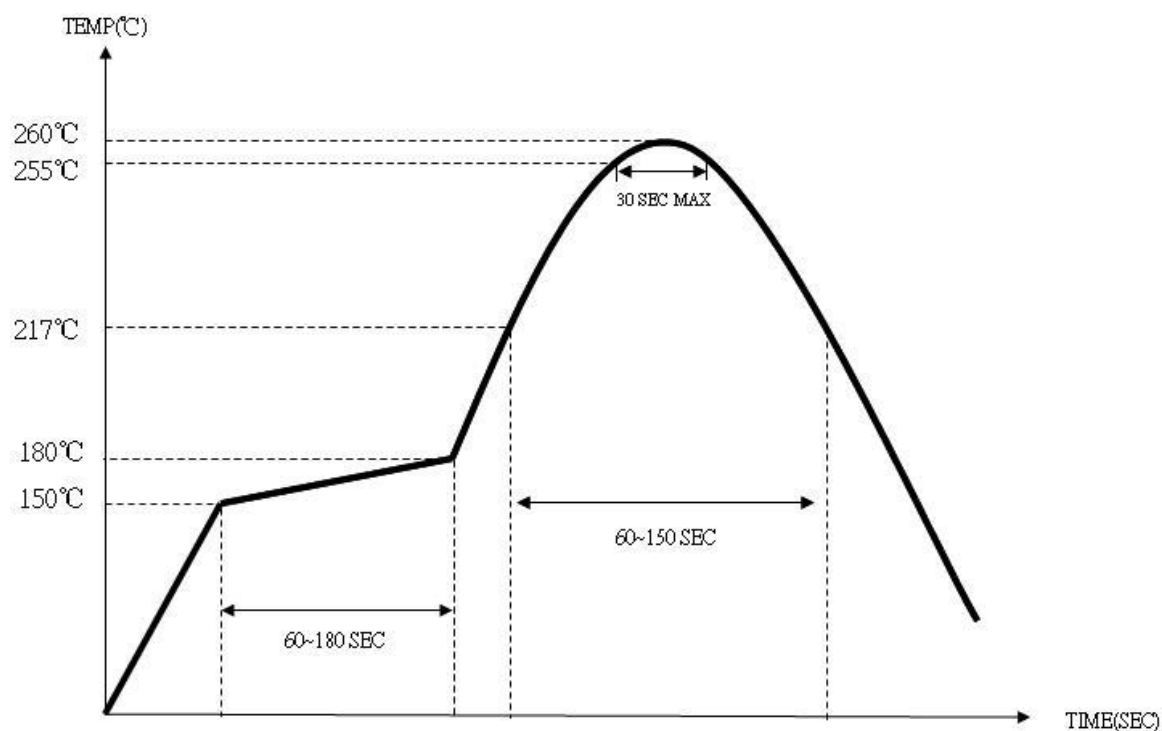


\*\*\* In the case, the cover tape is pulled off under the above conditions, the cover tape adhesion strength should be 10.2g~71.4g

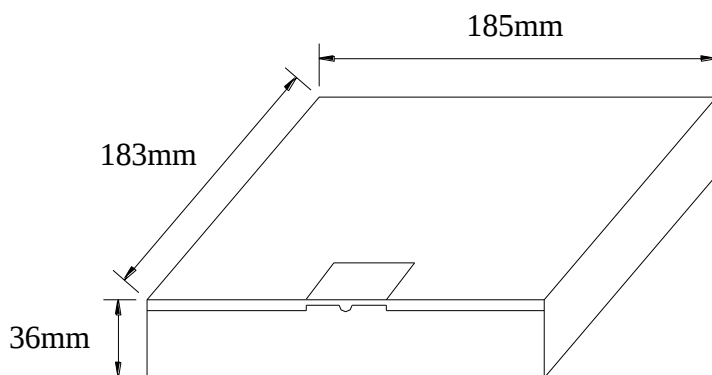
Plastic tape: 10.2g~71.4g

(Cover tape adhesion strength)

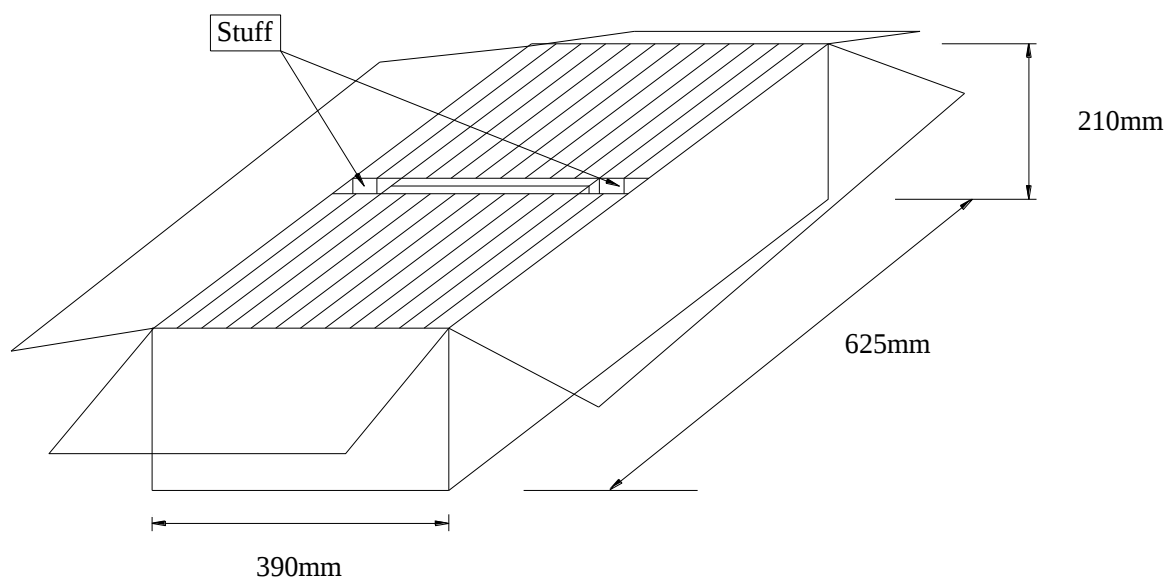
## 9. SOLDERING REFLOW PROFILE



## 10. PACKING :



BOX = 3000 PCS / REEL(MAX)



SMD product packs 32 BOX=The outside box packs (3000 PCS \* 32 BOX = 96000 PCS)(MAX)

## 11 . MECHANICAL PERFORMANCE

| TEST ITEMS                             | TEST METHODS AND TEST CONDITION                                                                                                                                    | PERFORMANCE                             |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 11.1 Temperature Cycling               | -55±3℃/30min maximum~+125±3℃/30min maximum , 1000cycles                                                                                                            | To satisfy the electrical performance . |
| 11.2 Operational Life                  | 125℃±3℃ , 1000hrs±12hrs Rated VDD applied.                                                                                                                         |                                         |
| 11.3 Biased Humidity                   | 85℃±5℃&85%±5%R.H. , 1000±12hrs Rated VDD applied.                                                                                                                  |                                         |
| 11.4 Resistance To Soldering Heat Test | Reflow test 2 times.                                                                                                                                               |                                         |
| 11.5 High Temperature Exposure         | 150℃±3℃ , 1000hrs±12hrs                                                                                                                                            |                                         |
| 11.6 Vibration Test                    | Freq.range: 10~2000Hz , Peak to peak amplitude:1.52mm<br>Peak acceleration:5G (49m/s <sup>2</sup> ) , 3 direction(X, Y,Z) , 20min 12cycles each of 3 orientations. |                                         |
| 11.7 Mechanical Shock                  | 100G , 6mS , 3 times for each direction(X, Y, Z ) , 3 cycles                                                                                                       |                                         |
| 11.8 Physical Dimension                | Verify physical dimensions to the applicable device detail specification.                                                                                          |                                         |
| 11.9 Solderability                     | 260℃ , Coated > 95%                                                                                                                                                |                                         |
| 11.10 Board Flex                       | PCB=100*40(mm) , Bending=2 mm (min) , Duration=60+5/-0 sec                                                                                                         |                                         |
| 11.11 External Visual                  | Inspect device construction and marking.                                                                                                                           |                                         |
| 11.12 Terminal Strength                | A force of 17.7N for 60 seconds.                                                                                                                                   |                                         |