



# APPROVAL SHEET

Customer Name : \_\_\_\_\_  
Customer P/N : \_\_\_\_\_  
Frequency : 32.768000 KHz  
Aker Approved P/N : SMA-000032-2XL2T0  
Aker MPN : SMA-000032-2XL2T0  
Rev. : 1  
ISSUE DATE : Jan.25.2019

APPROVED	CHECKED	PREPARED
		
APPROVED BY CUSTOMER		

## AKER TECHNOLOGY CO., LTD.

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

**RoHS compliant**





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Aker Approved P/N	:	SMA-000032-2XL2T0
APPROVED	:	Xtal
PREPARED	:	Kiku
		SHEET : 2 of 10
		REV . : 1

## 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±5 °C

Relative humidity : 40%~70%

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

Ambient temperature : 25±3 °C

Relative humidity : 40%~70%

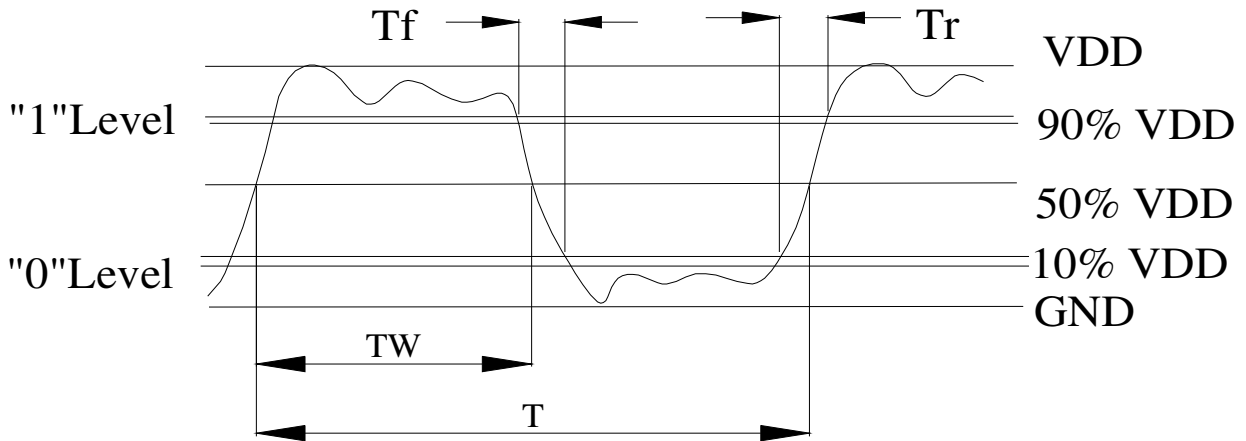
■ AKER Model : SMA-221

■ Cutting Model : AT CUT

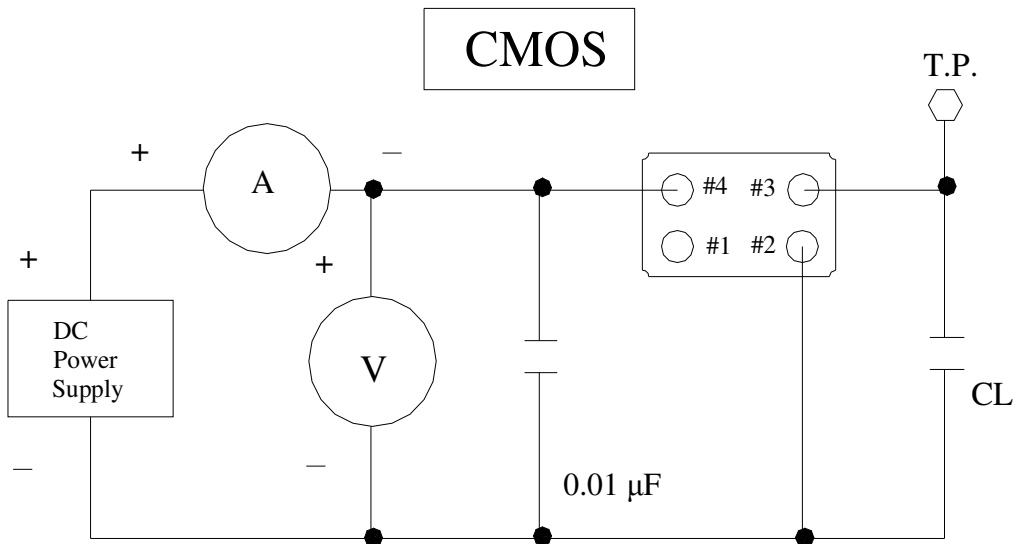
Parameters	Symbol	Electrical Spec				Notes
		Min.	Typ.	Max.	Units.	
Nominal Frequency		32.768000			KHz	
Frequency Stability		±30			ppm	
Supply Voltage	V <sub>DD</sub>	3.3±10%			V	
Output Load CMOS	CL	15			pF	
Aging		±3			ppm	First Year
Enable Control		Yes				Pad 1
Operating Temperature		-20	25	70	°C	
Storage Temperature Range		-55	~	125	°C	
Output Voltage High	VoH	2.97			V	
Output Voltage Low	VoL			0.33	V	
Input Current	I <sub>cc</sub>			5	mA	
Standby Current	I <sub>st</sub>			10	μA	
Rise Time	T <sub>r</sub>			100	ns	10%~90%V <sub>DD</sub> Level
Fall Time	T <sub>f</sub>			100	ns	10%~90%V <sub>DD</sub> Level
Symmetry (Duty ratio)	TH/T	45	~	55	%	
Start-up Time	T <sub>osc</sub>			35	ms	
Enable Voltage High	V <sub>hi</sub>	70%V <sub>DD</sub>			V	
Disable Voltage Low	V <sub>lo</sub>			30%V <sub>DD</sub>	V	
Output Enable Delay Time	T <sub>on</sub>			35	ms	
Output Disable Delay Time	T <sub>off</sub>			200	ns	

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

## 2. C - MOS LOAD OUTPUT WAVEFORM



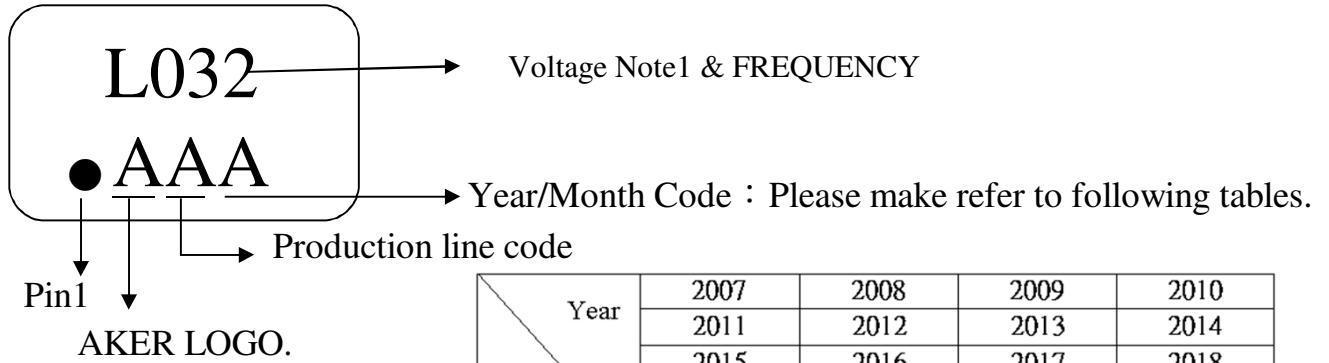
## 3. C - MOS LOAD TEST CIRCUIT



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

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#### 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

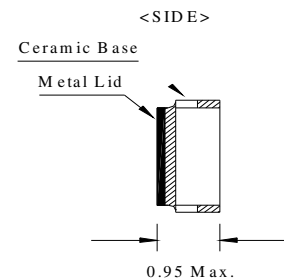
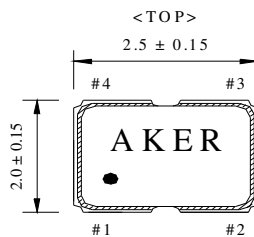
Year	2007	2008	2009	2010								
	2011	2012	2013	2014								
2015	2016	2017	2018									
2019	2020	2021	2022									
2023	2024	2025	2026									
Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	A	B	C	D	E	F	G	H	J	K	L	M
	N	P	Q	R	S	T	U	V	W	X	Y	Z
	a	b	c	d	e	f	g	h	j	k	l	m
	n	p	q	r	s	t	u	v	w	x	y	z

#### 5. DIMENSION :

( UNIT : mm )

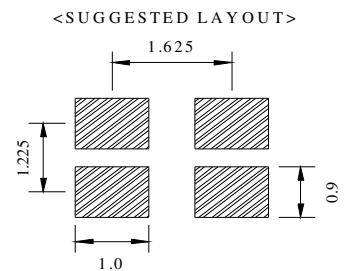
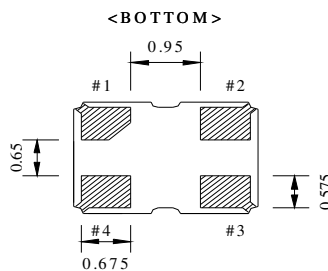
##### Enable / Disable Function

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

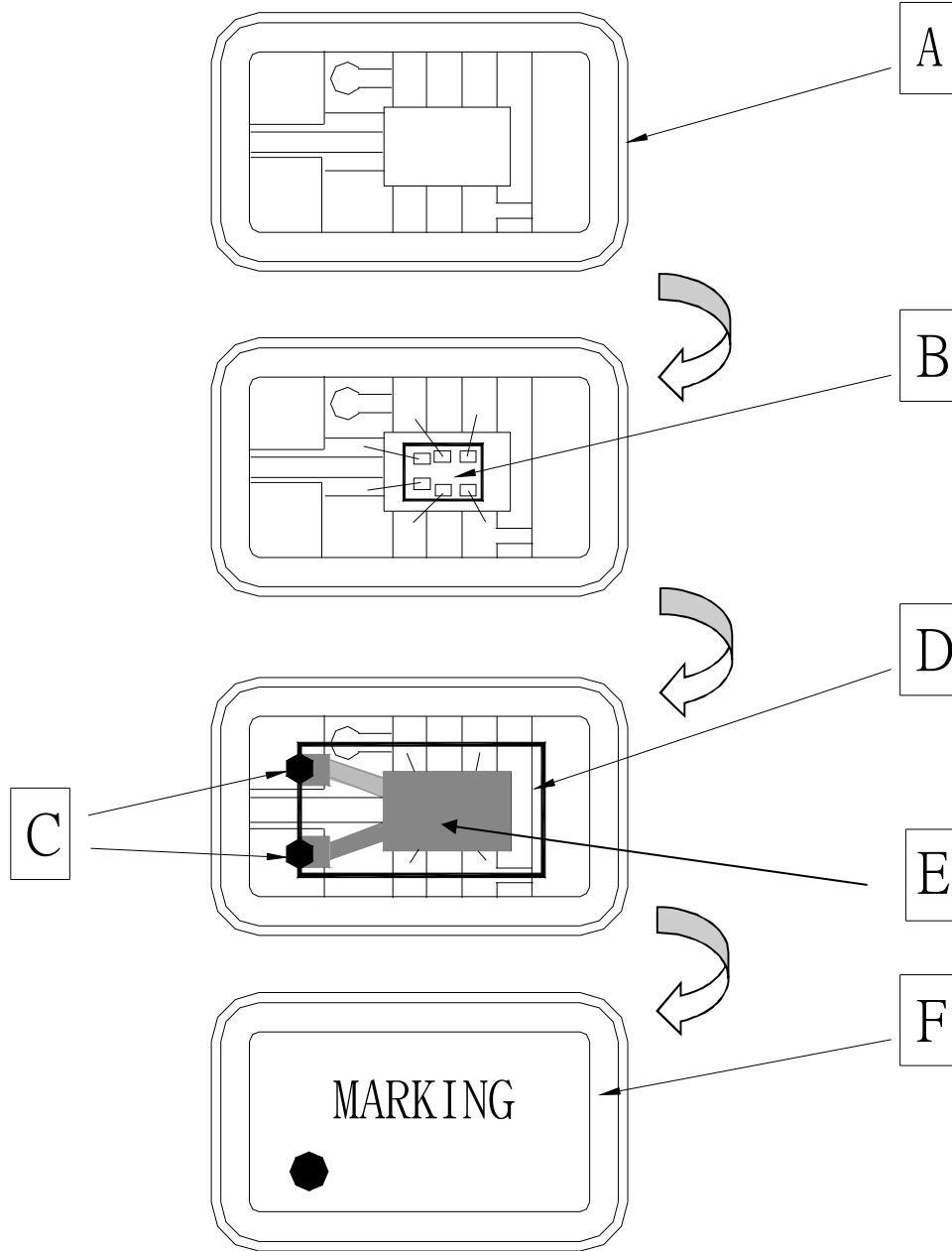


##### PIN FUNCTION

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



## 6 . STRUCTURE ILLUSTRATION



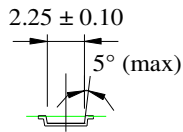
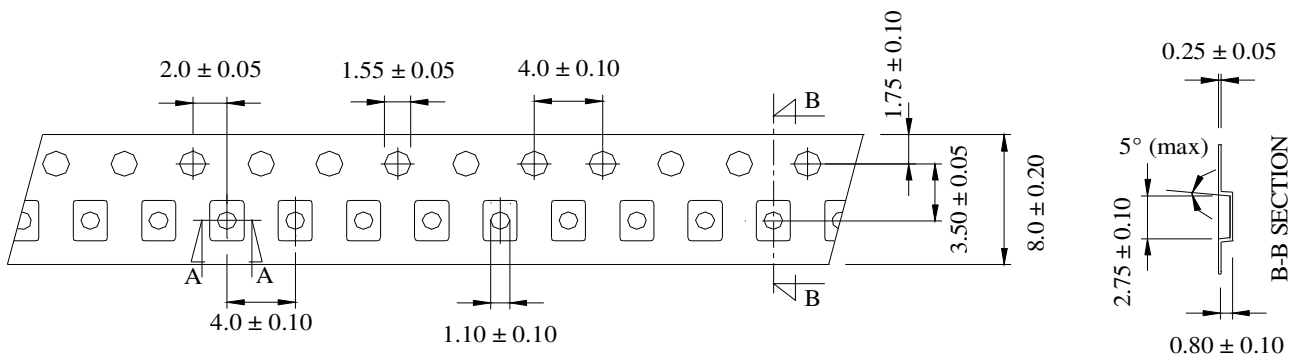
COMPONENTS		MATERIALS	COMPONENTS		MATERIALS
A	Base (Package)	Ceramic (Al <sub>2</sub> O <sub>3</sub> )+Kovar (Fe/Co/Ni)	D	Crystal blank	SiO <sub>2</sub>
B	IC chip	-	E	Electrode	Cr / Ag
C	Conductive adhesive	Ag / Silicon resin	F	Lid	Fe/Co/Ni

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## 7. PACKING :

### TAPE SPECIFICATION

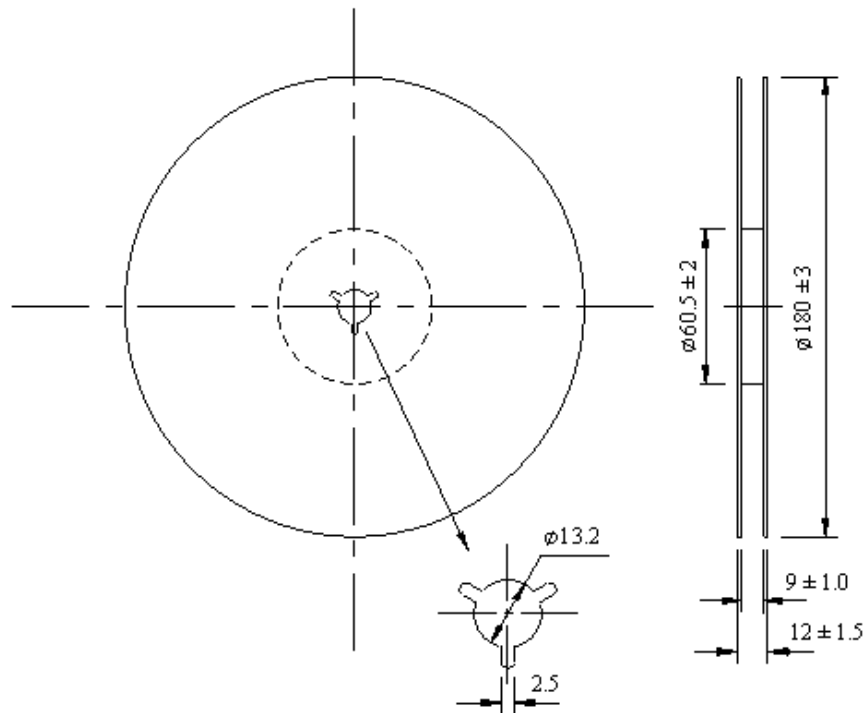
( Unit : mm )



A-A SECTION

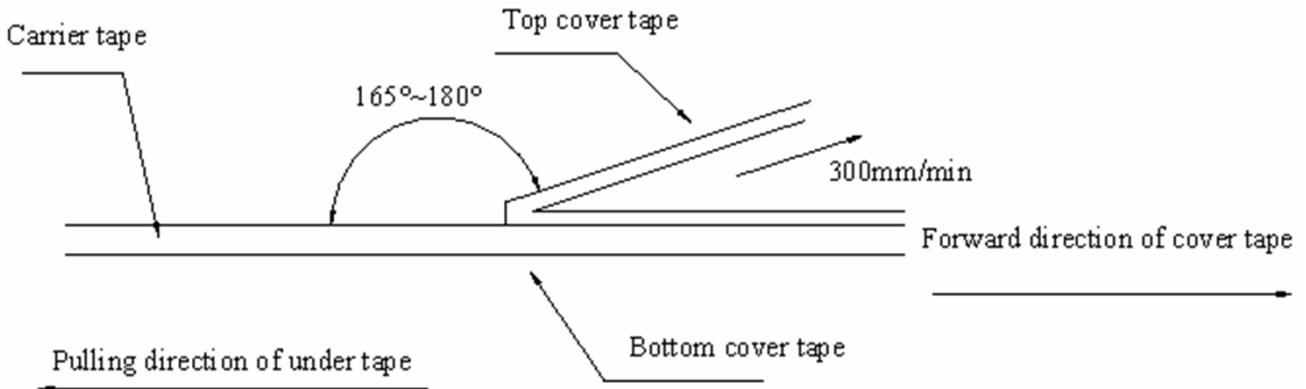
### OUTLINE DIMENSION

( Unit : mm )



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## 8. COVER TAPE ADHESION STRENGTH :

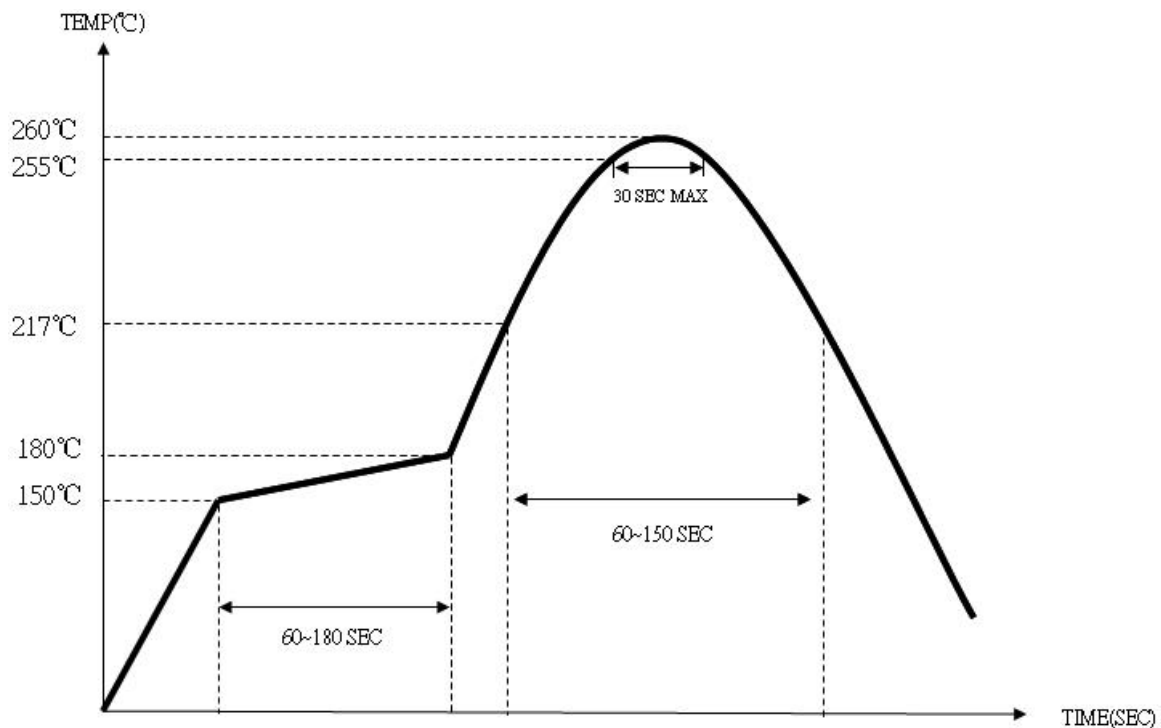


\*\*\* In the case, the cover tape is pulled off under the above conditions, the cover tape adhesion strength should be 10.2g~71.4g

Plastic tape: 10.2g~71.4g

(Cover tape adhesion strength)

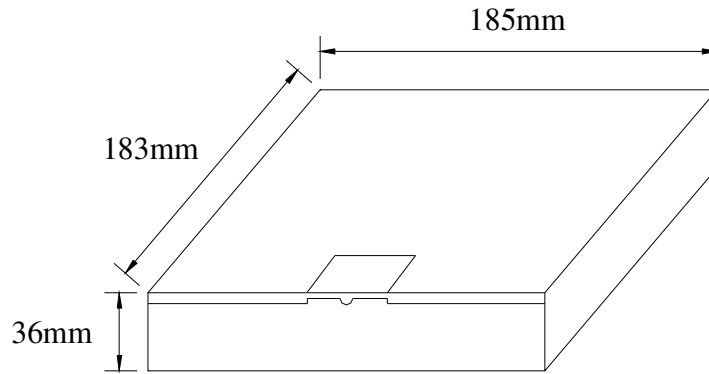
## 9. SOLDERING REFLOW PROFILE



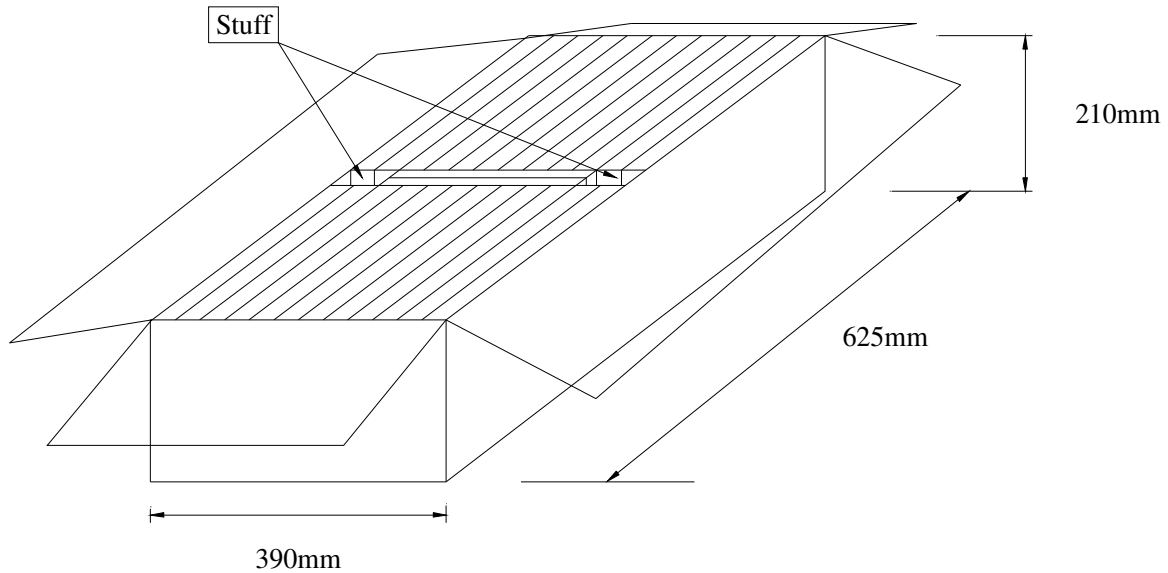


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## 10. PACKING :



BOX = 3000 PCS / REEL(MAX)



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



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## 11 . MECHANICAL PERFORMANCE

TEST ITEMS	TEST METHODS AND TEST CONDITION	PERFORMANCE
11.1 Drop Test	The specimen is measured for its frequency before the test. It is then dropped from a height of 100 cm or more as a free fall object onto a hard wooden plate of 30mm or more in thickness. ( in accordance with JIS-C0044 )	To satisfy the electrical performance .
11.2 Vibration Test	The specimen is measured for its frequency before the test. Most them into X,Y and Z axes, respectively, for the vibration test. Vibration condition: Frequency range ; 20 ~ 2000HZ Peak to peak amplitude : 1.52 mm Peak acceleration : 20G Sweep time : 20 minute / axis Ppendicular total test time : 4 hours ( in accordance with MIL-STD-883F : 2007.3 )	
11.3 Resistance to Soldering Test	The specimen is measured for its frequency before the test. Place the specimen on the belt of the conveyance and let it pass through the reflow with the presetted temperature condition. After passing twice the reflow place,the specimen under the referee condition for ~2 hours and then measure its electrical performance. Temperature Condition of IR Simulation: The temperature range of the preheated section is setted at 150 ~ 180°C for 60~120 sec. For the next section the temperature range is setted at 217~260°C for 45~90 sec. and within this time range the specimen should be able to sustain at the peak temperature, 260+/-3°C , for 10 sec long. ( in accordance with JESD22-B106-B )	
11.4 Fine Leak Test	Place the specimen in a pressurized container and pressurize it with the detection gas ( mixed gas consisting of 95% or more helium ) for at least 2 hours. Complete the measurement of the concentration of helium within 30 min after taking it out from the pressurized container. ( in accordance with MIL-STD-883F : 1014.11 )	
The referee condition . Temperature 25 ± 2 °C Humidity 44 ~ 55 % Pressure 86 ~ 106 kPa ( in accordance with MIL-STD-883E : 1014.9 )		



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## 12 . CLIMATIC RESISTANCE

TEST ITEMS	TEST METHODS AND TEST CONDITION	PERFORMANCE
12.1 Low Temp Exposure Test	<p>The specimen is measured for its frequency before the test .</p> <p>Place the specimen in the chamber and kept it at the temperature of <math>-40 \pm 3^{\circ}\text{C}</math> for <math>168 \pm 6</math> hours .</p> <p>Take the specimen out of the chamber and measure itselectrical performance after leaving 1 ~ 2 hours under the referee condition.</p> <p>( in accordance with JIS-C0020 )</p>	To satisfy the electrical performance .
12.2 Aging Test	<p>The specimen is measured for its frequency before the test .</p> <p>Place the specimen in the testing chamber and keep it at the temperature of <math>+125 \pm 3^{\circ}\text{C}</math> for <math>720 \pm 48</math> hours.</p> <p>And then take the specimen out of the chamber and measure its electrical performance after leaving for 1 ~ 2 hours under the referee condition .</p> <p>( in accordance with JIS-C0021 )</p>	
12.3 High Temperature & High Humidity	<p>The specimen is measured for its frequency before the test .</p> <p>Place the specimen in the testing chamber and kept it at the temperature of <math>+85 \pm 5^{\circ}\text{C}</math> and humidity of <math>85 \pm 5\%</math> for <math>168 \pm 6</math> hours.and then take the specimen out and measure its electrical performance after leaving for 1 ~ 2 hours under the referee condition.</p> <p>( in accordance with MIL-STD-883F : 1004.7 )</p>	
12.4 Temperature Cycle Test	<p>The specimen is measured for its frequency before the test .</p> <p>Subject the specimen to the 100 cycles of temperature ranges stated below .</p> <p style="text-align: center;">High temp . <math>+125 \pm 3^{\circ}\text{C}</math> (<math>15 \pm 3</math> min).</p> <div style="text-align: center;"> <p>2~3 min                      2~3 min.</p> <p style="text-align: center;">Low temp . <math>-55 \pm 3^{\circ}\text{C}</math> (<math>15 \pm 3</math> min).</p> </div> <p>Measure its electrical performance after leaving it for 1 ~ 2 hours under the referee condition .</p> <p>( in accordance with MIL-STD-883F : 1010.8 )</p>	