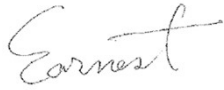



APPROVAL SHEET

Customer Name	:	
Customer P/N	:	
Frequency	:	32.768000 KHz
Aker Approved P/N	:	D31N-032768-B-D4-05
Aker MPN	:	D31N-032768-B-D4-05
REVISION	:	A0
ISSUED DATE	:	2023/2/9

APPROVED	CHECKED	PREPARED
		
APPROVED BY CUSTOMER		

AKER TECHNOLOGY CO., LTD.

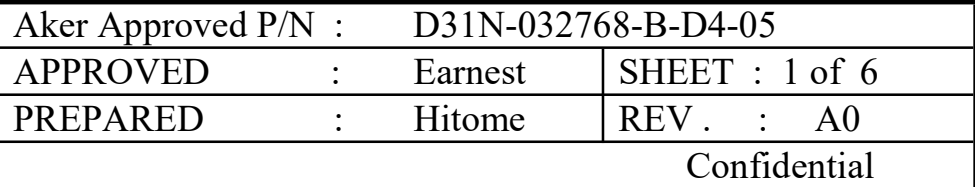
ADDRESS : NO 11-3, Jianguo Rd., Tanzi Dist., Taichung City 427, Taiwan.

TEL : 886-4-25335978

FAX : 886-4-25336011

Web: www.aker.com.tw

RoHS compliant



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

TUNING FORK CRYSTAL SPECIFICATION

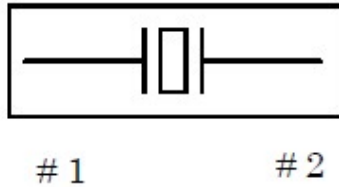
1. ELECTRICAL CHARACTERISTICS

Item	Symbol	Rating value			Unit	Note
		Min.	Typ.	Max.		
Storage temperature range	T _{stg}	- 55		+ 125	°C	Suppose to be within CI STD at + 25 °C ± 3 °C.
Maximum level of drive	GL		0.5		μW	

Operating temperature range	T _{use}	- 40		+ 125	°C	
Level of drive	DL	0.01	0.1	0.5	μW	
Vibration mode		Fundamental				

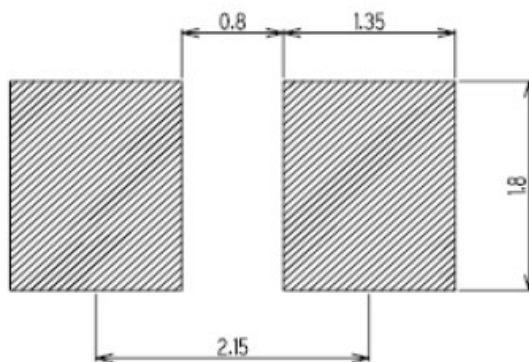
Item		Symbol	Value	Unit	Conditions
Nominal Frequency		f _{nom}	32.768	kHz	
Frequency tolerance		f _{tol}	± 20	× 10 ⁻⁶	CL = 12.5 pF Ta = + 25 ± 3 °C Level of drive : 0.1 μW Not include aging
Motional resistance		R1	70 Max.	kΩ	
Motional capacitance		C1	3.2 Typ.	fF	CI meter : HP4294A Level of drive : 0.5 μW
Shunt capacitance		C0	0.9 Typ.	pF	
Frequency temperature characteristics	Turnover temperature	Ti	+ 25 ± 5	°C	Values are calculated by The frequencies at + 10, + 25, + 40 °C with C-MOS circuit.
	Parabolic coefficient	B	- 0.04 Max.	× 10 ⁻⁶ / °C ²	
Isolation resistance		IR	500 Min.	MΩ	DC 100V ± 15, 60 seconds Between terminal # 1 and terminal # 2
Frequency Aging		f _{age}	± 3	× 10 ⁻⁶ / year	Ta = + 25 °C ± 3 °C Level of drive : 0.1 μW

2 . INTERNAL CONNECTION:

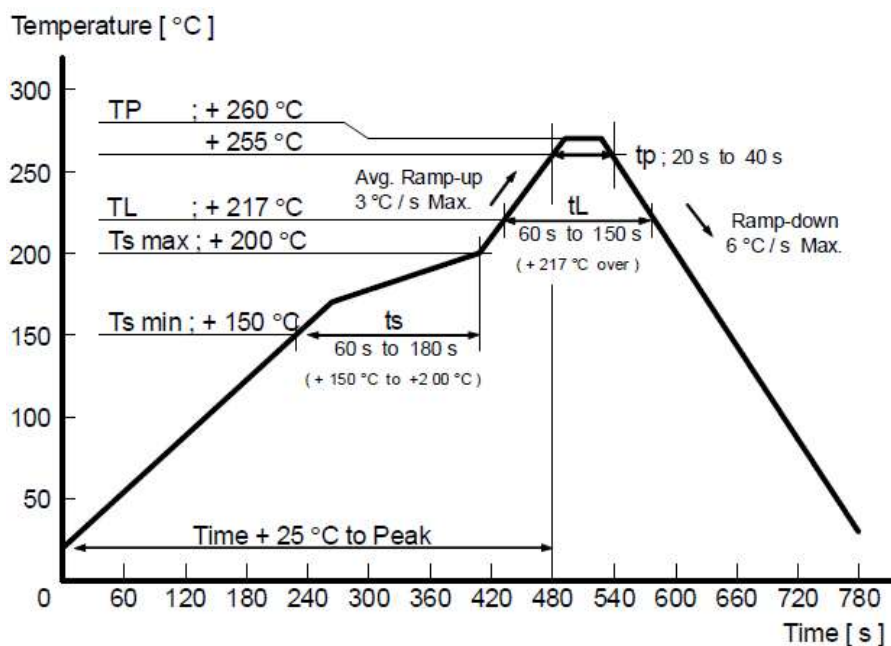


(**) Lid does not connect with # 1 and # 2

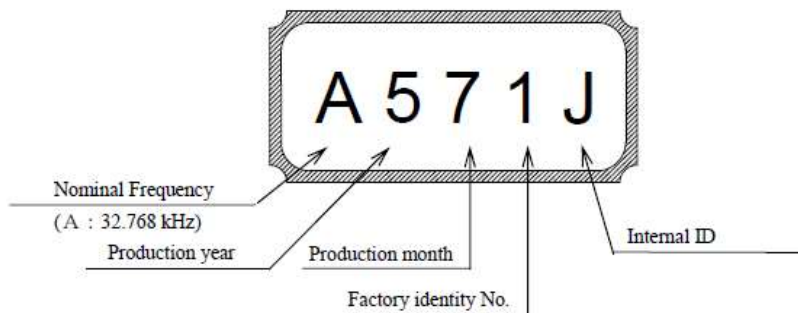
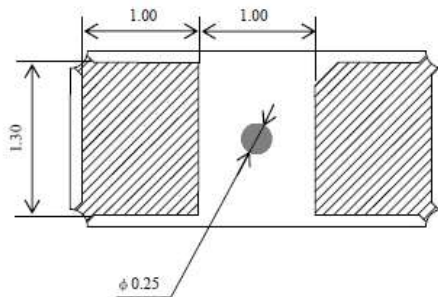
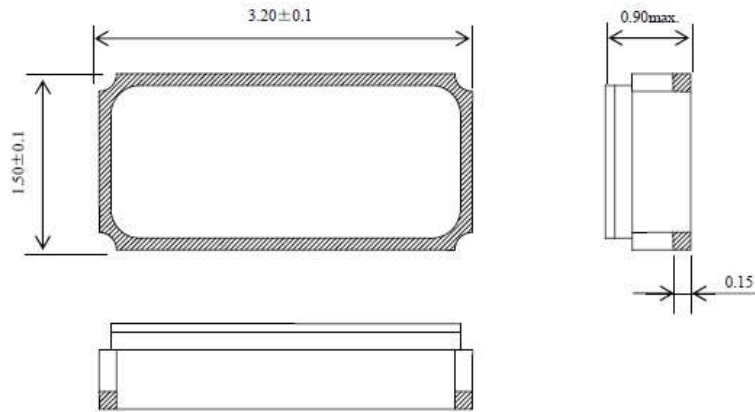
3 . RECOMMENDED SOLDERING PATTERN:(Unit : mm)



4. SOLDERING REFLOW PROFILE :



5 . DIMENSIONS : (Unit : mm)



Symbol of Manufacturing month

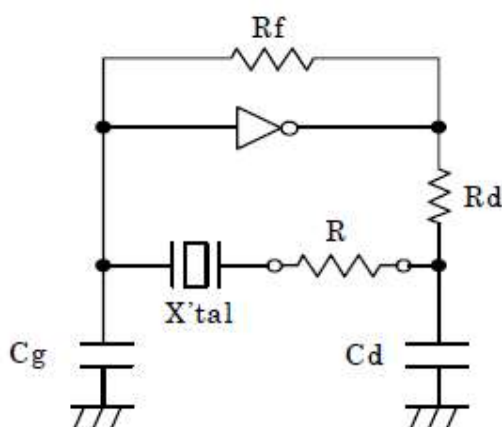
Month digit	1	2	3	4	5	6	7	8	9	10	11	12
Marking	1	2	3	4	5	6	7	8	9	X	Y	Z

* The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

6. NOTES :

1. Max three (3) times reflow is allowed. Once miss soldering is happened, hand work soldering by soldering iron is recommended. (+ 350 °C × within 5 s)
2. Patterning should be followed by our recommended one.
3. Applying excessive excitation force to the crystal resonator may cause deterioration damage.
4. Unless adequate negative resistance is allocated in the oscillation circuit, start up time of oscillation may be increased, or no oscillation may occur.

How to check the negative resistance.



- (1) Connect the resistance (R) to the circuit in series with the crystal resonator.
- (2) Adjust R so that oscillation can start (or stop).
- (3) Measure R when oscillation just start (or stop) in above (2).
- (4) Get the negative resistance
 $-R = R + CI$ value.
- (5) Recommended -R
 $|-R| > CI \times (5 \sim 10)$

5. The shortest patterning line on board is recommendable.
Too long line on board may cause of abnormal oscillation.
6. This device must be stored at the normal temperature and humidity conditions before mounting on a board.
7. Too much exciting shock or vibration may cause deterioration on damage.
Depending on the condition such as a shock in assembly machinery, the products may be damaged.
Please check your condition in advance to maintain shock level to be smallest.
8. Depending on the conditions, ultrasonic cleaning may cause resonant damage of the internal crystal resonator. Since we are unable to determine the conditions (type of cleaning unit, power, time, conditions inside the bath, etc.) to be used in your company, we cannot guarantee the safety of this unit when it is cleaned in an ultrasonic cleaner.
9. Please refer to packing specification regarding how to storage the products in the pack.

7. RELIABILITY SPECIFICATION

ITEM	TEST CONDITIONS	VALUE *1 *2	TEST Qty [n]	FAIL Qty [n]
		$\Delta f / f$ [1×10^{-6}]		
Shock resistance	Free drop from 1 000 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)	*3 ± 10	22	0
Vibration resistance	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s ² 10 Hz → 500 Hz → 10 Hz 15 min./cycle 6 h (2 hours . 3 directions)	*3 ± 5	22	0
Soldering heat resistance	IPC/JEDEC J-STD-020C Reflow (3 times)	± 5	22	0
High temperature storage	+125°C × 1 000 h	*3 ± 20	22	0
Low temperature storage	-55 °C × 1 000 h	*3 ± 15	22	0
Temperature humidity storage	+85 °C × 85 %RH × 1 000 h	*3 ± 10	22	0
High temperature bias	+125°C × 1 000 h (Bias , Drive level ; 0.5 μW)	*3 ± 20	22	0
Low temperature bias	-40 °C × 1 000 h (Bias , Drive level ; 0.5 μW)	*3 ± 15	22	0
Temperature humidity storage bias	+ 85°C × 85 %RH × 1 000 h (Bias , Drive level ; 0.5 μW)	*3 ± 15	22	0
Temperature cycle	-40 °C ↔ +125 °C 30 min at each temp. 1 000 cycles	*3 ± 15	22	0
Sealing	For He leak detector	*3 1×10^{-8} hPa·l / s Max.	11	0
Shear	20 N press for 10 s ± 1 Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
Pull - off	20 N press for 10 s ± 1 Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
Substrate bending	Bend width reaches 4 mm and hold for 20 s ± 1 s × 1 time Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
Solderability	Dip termination into solder bath at +235 °C ± 10 °C for 3 s (Using Rosin Flux)	Termination must be 95 % covered with fresh solder	11	0

Notes

*1 Each test shall be done independently.

*2 Measuring 2 h to 24 h later leaving in room temperature after each test. Drive level : 0.5 μW

*3 Pre conditionings

1. +125 °C × 24 h to +85 °C × 85 % × 168 h ± 1 h → reflow 3 times

2. Initial value shall be after 24 h at room temperature.

Shift of series resistance at before and after the test should be less than ±30 kΩ.

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