

EM MICROELECTRINCS MARIN SA

RECIPIENT

SPECIFICATIONS

Product No. : X1E000021014800

MODEL : TSX-3225

SPEC. No. : A15-806-1B

DATE: Aug. 5. 2015

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SPECIFICATIONS

1. Application

This document is applicable to the crystal unit that are delivered to EM MICROELECTRINCS MARIN SA from Seiko Epson Corp.

This product complies with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by Seiko Epson Corporation shall not be used for the development and manufacture of weapon of mass destruction or for other military purposes. Making available such products and technology to any third party who may use such products or technologies for the said purposes are also prohibited.

This product listed here is designed as components or parts for electronics equipment in general consumer use. We do not expect that any of these products would be incorporated or otherwise used as a component or part for the equipment, which requires an extra high reliability, such as satellite, rocket and other space systems, and medical equipment, the functional purpose of which is to keep life.

2. Product No. / Model

The product No. of this crystal unit is X1E000021014800.

The model is TSX-3225.

3. Packing

It is subject to the packing standard of Seiko Epson Corp.

4. Warranty

Defective parts which originate with us are replaced free of charge in the case of defects being found with 12 months after delivery.

5. Amendment and/or termination

Amendment and/or termination of this specification are subject to the agreement between the two parties.

6. Contents

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[1] Absolute maximum ratings

No.	Parameter	Symbol	Rating value	Note
1	Storage temperature range	T _{stg}	-40 °C to +125 °C	Frequency aging depends on the environmental characteristic specification.

[2] Operating range

No.	Parameter	Symbol	Value			unit	Note
			Min.	Typ.	Max.		
1	Operating temperature range	T _{use}	-40		+85	°C	
2	Level of drive	DL	-	10	200	μW	Recommended Level of drive (1 to 100 μW)

[3] Electrical characteristics

No.	Parameter	Symbol	Standard			unit	Conditions
			Min.	Typ.	Max.		
1	Nominal frequency	f	26			MHz	Fundamental
2	Frequency tolerance	f _{tol}	-10	-	+10	× 10 ⁻⁶	CL = 10 pF T _{use} = +25 °C ± 3 °C Level of drive : 10 μW. π circuit Not include aging.
3	Frequency versus temperature characteristics	f _{tem}	-20	-	+20	× 10 ⁻⁶	Ta = -40 °C to +85 °C (Ref. at + 25 °C ± 3 °C) Level of drive : 100 μW Series resonance.
4	Motional resistance(ESR)	R ₁	10	20	40	Ω	π circuit (IEC60444-2)
5	Motional Capacitance	C ₁	2.6	3.3	4	fF	
6	Shunt Capacitance	C ₀	1	1.3	1.6	pF	
7	Insulation resistance	IR	500	-	-	MΩ	DC 100 V ± 15 V 60 sec.
8	Frequency aging	f _{age}	±3 / 5 years			× 10 ⁻⁶	T _{use} = +25 °C ± 3 °C (no bias)

Total frequency deviation : $\pm 40 \times 10^{-6}$

(Frequency tolerance (+25°C) + Frequency versus temperature characteristics + Aging (5 years))

[4] Environmental and mechanical characteristics

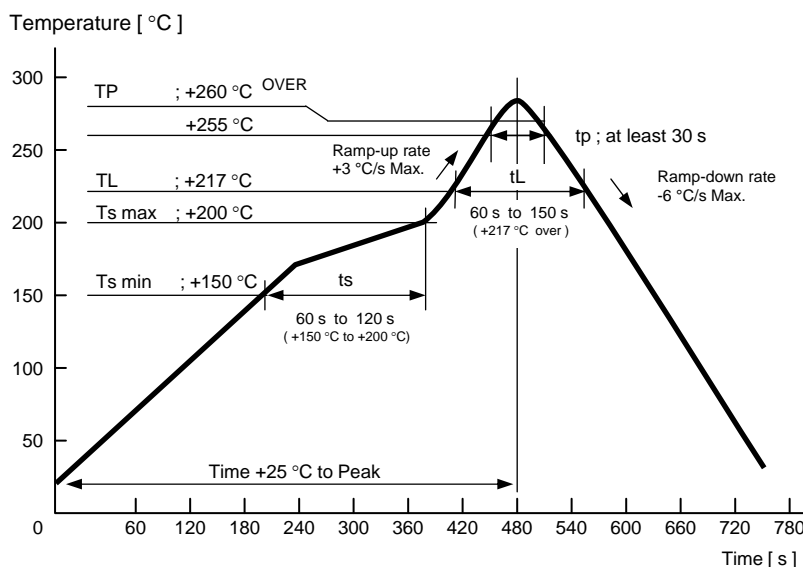
(The company evaluation condition : We evaluate it by the following examination item and examination condition.)

No.	Item	Value *1 *2		Test Conditions
			$\Delta f / f [1 \times 10^{-6}]$	
1	Shock	*3	± 2.0	100 g dummy Jig (SE Standard) drop from 1500 mm height on the concrete 3 directions 10 times
2	Vibration	*3	± 1.0	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	High temperature storage	*3	± 2.0	+85 °C × 1 000 h
4	Low temperature storage	*3	± 2.0	-40 °C × 1 000 h
5	Temperature humidity storage	*3	± 2.0	+85 °C × 85 %RH × 1 000 h
6	Temperature cycle	*3	± 2.0	-40 °C ↔ +85 °C 30 minutes at each temp. 1 000 cycle
7	Sealing	*3	1×10^{-9} Pa·m ³ /s Max.	For He leak detector
8	Shear	No peeling-off at a solder part		10 N press for 10 s ± 1 s Ref. IEC 60068-2-21
9	Pull – off	No peeling-off at a solder part		10 N press for 10 s ± 1 s Ref. IEC 60068-2-21
10	Solderability	Terminals must be 95% covered With fresh solder.		Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)
11	Resistance to soldering heat	± 1.0		For convention reflow soldering furnace (3 times) (For IPC/JEDEC J-STD-020D.1)

< Notes >

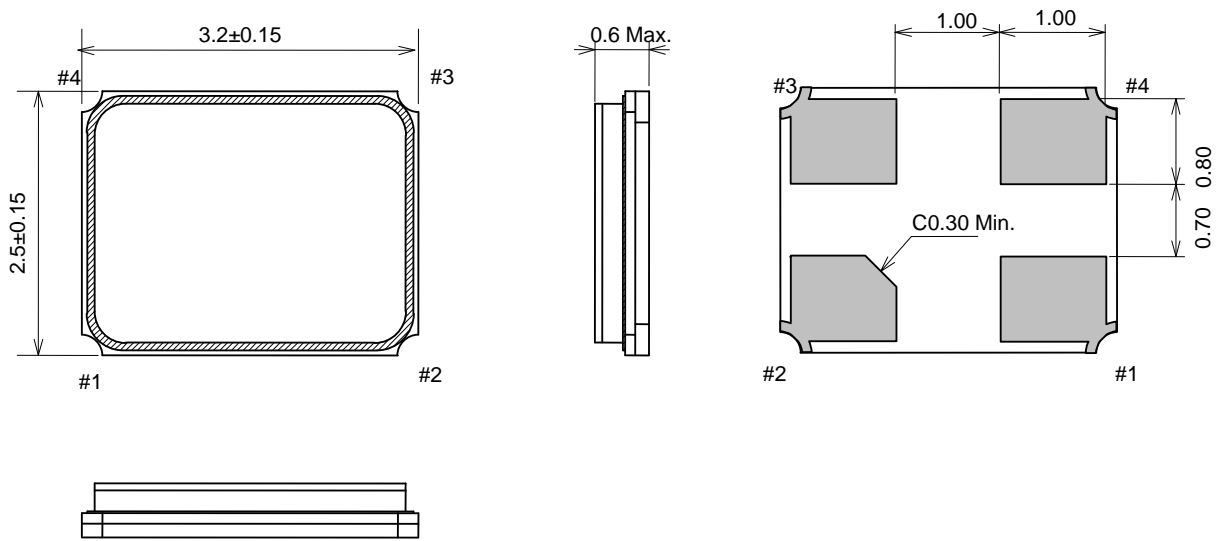
- *1 each test done independently.
- *2 measuring 24 h later leaving in room temperature after each test.
- *3 Item No.1 to No.7 shall be tested after following pre conditioning.
- Resistance at before above tests should be less than ± 20 % or less than ± 10 Ω .
- Pre conditioning : Test crystal must be leaving in room temperature for 24 h after reflow(3 times).

Convention reflow (follow to IPC / JEDEC J-STD-020D.1)



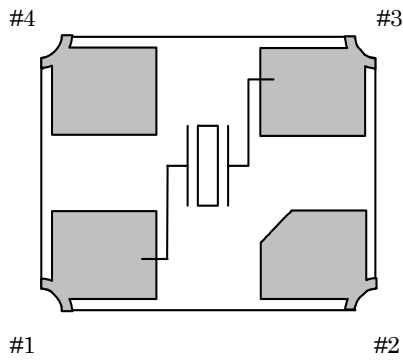
[5] Dimensions and Circuit

1) Outline drawing



2) Circuit

(Top View)

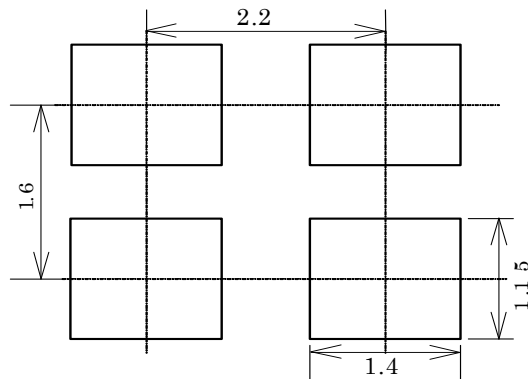


Pin
 # 1, # 3 : X'tal
 # 2, # 4 : GND

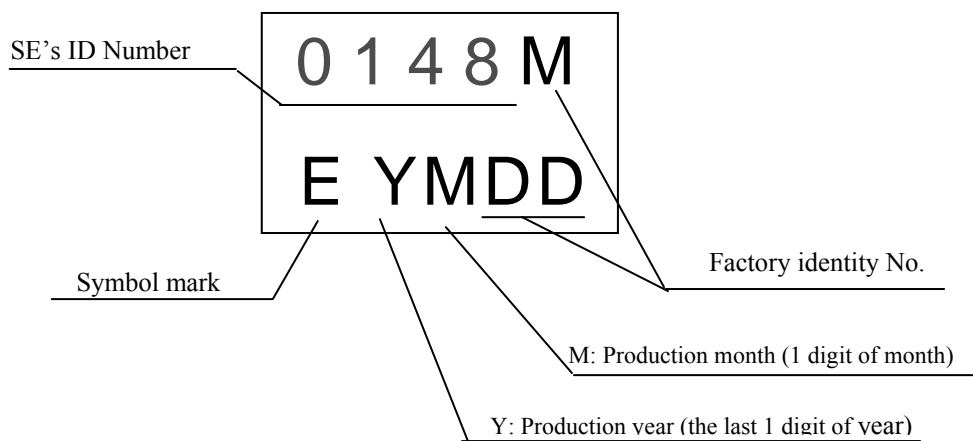
Type	TSX-3225	Terminal treatment	W+Ni+Au plated	Unit	1 = 1mm
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[6] Recommended soldering pattern and Marking layout

1) Recommended soldering pattern



2) Marking layout



Production month

Month	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.

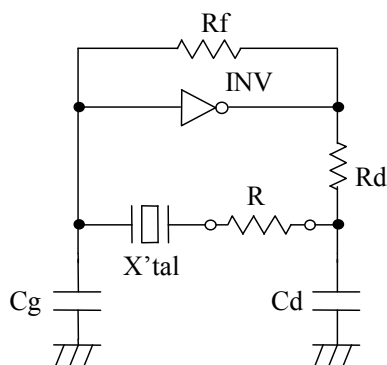
Type : TSX-3225

Unit : 1 = 1mm

[7] Notes

1. Max three (3) times reflow is allowed.
I hope the gauntlet ahead in 5s or less from +350 °C or less in case of the adjustment with the soldering iron.
2. 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.
3. The shortest line patterning on board is recommendable.
Too long line on board may cause of abnormal oscillation.
4. Please normal temperature (+15 °C to +35 °C) and normal humidity (25 to 85 %RH) as much as possible for the frequency accuracy securing.
Storing the crystal products under higher or lower temperature or high humidity for long period may affect frequency stability or solderability. Check conditions prior to use.
5. This product may be affected to ultrasonic cleaning. Check conditions prior to use.
6. When do the be dewy of the oscillation circuit board, the frequency change or the oscillation stop is generated. Please use it under the condition without the be dewy.
7. Applying excessive excitation force to the crystal unit may cause deterioration damage.
8. Few data or readings taken at user side may be different from our company's data.
Confirmation of the different value is necessary before application.
9. To avoid malfunction, no pattern under or near the crystal is allowed.
10. Unless adequate negative resistance is allocated in the oscillation circuit, start up time of oscillation may be increased, or no oscillation may occur. In order to avoid this, please provide enough negative resistance in the circuit design.

<How to check the negative resistance>



1) Connect the resistor(R) to the circuit in series with the crystal unit.

2) Adjust R so that oscillation can start (or stop).

Negative resistance of circuit (-R) =
R+ Series resistance of crystal (R1)

3) Measure R when oscillation just start (or stop) in above(2)

R > R1 Max. 5 to 10 times.

TAPING SPECIFICATION

テープ梱包基準書

1. APPLICATION 適用範囲

This document is applicable to TSX-3225.

本基準書は、TSX-3225 のテーピング梱包について規定する。

2. CONTENTS 目次

Item No.	Item	Page
[1]	Taping specification テーピング仕様	1 to 2
[2]	Inner Sleeve スリーブへの収納	3
[3]	Shipping carton 外装箱への収納	
[4]	Marking 表示	4
[5]	Quantity 収納数量	
[6]	Storage environment 保管環境	
[7]	Handling リール取扱い	

[1] Taping specification テーピング仕様

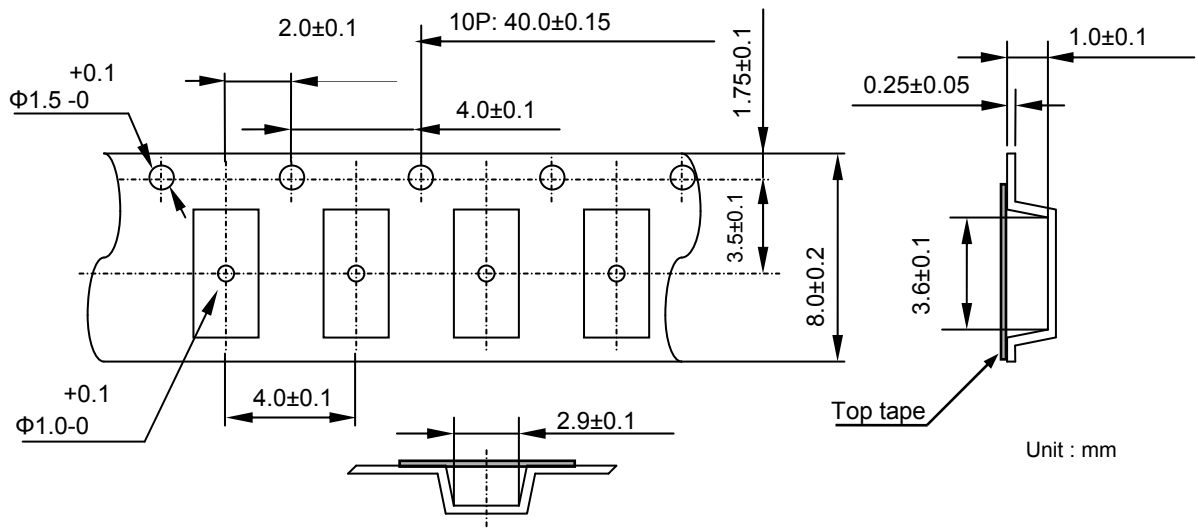
Subject to EIA-481, IEC 60286.

「EIA-481」「IEC 60286」に準拠する。

(1) Tape dimensions TE0804L

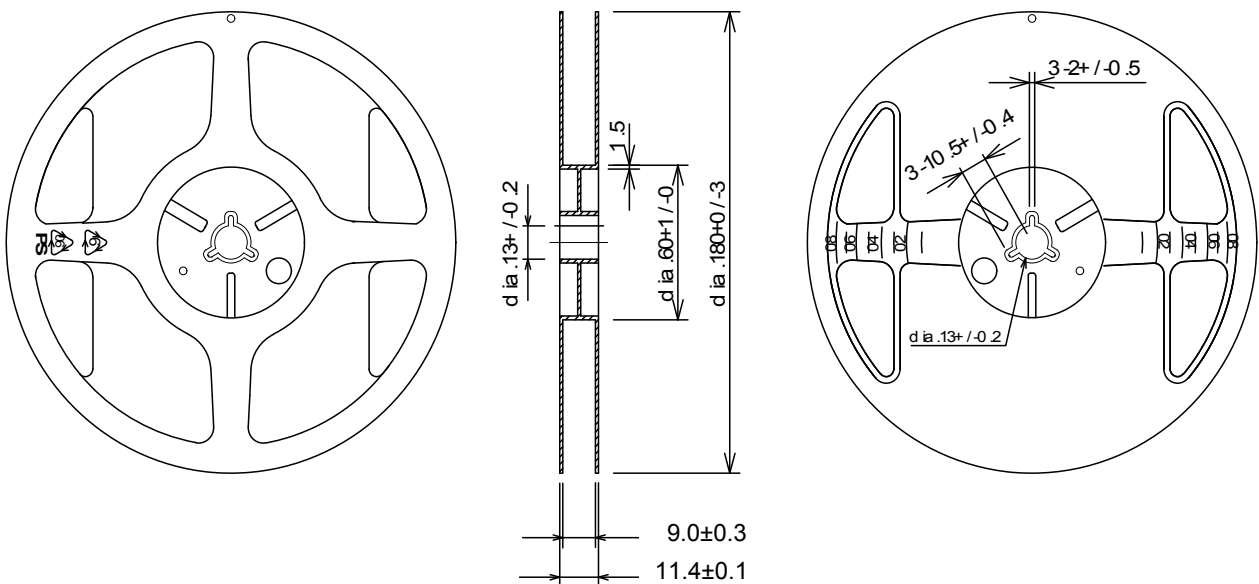
Material of the Carrier Tape キャリアテープ材質: PS

Material of the Top Tape トップテープ材質 : PET+PE



(2) Reel dimensions (EIAJ RRM08Bc60)

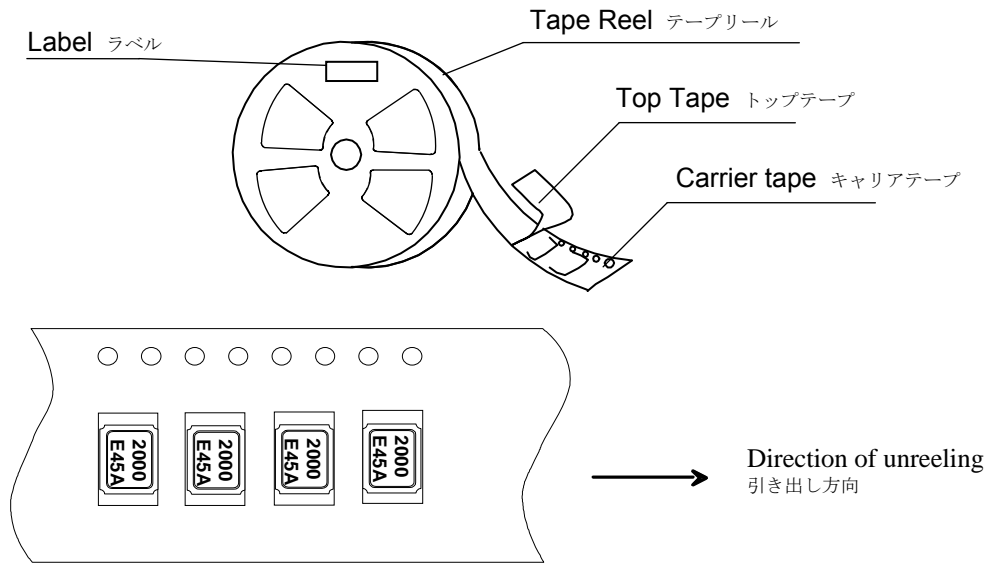
Material of the Reel リール材質: PS



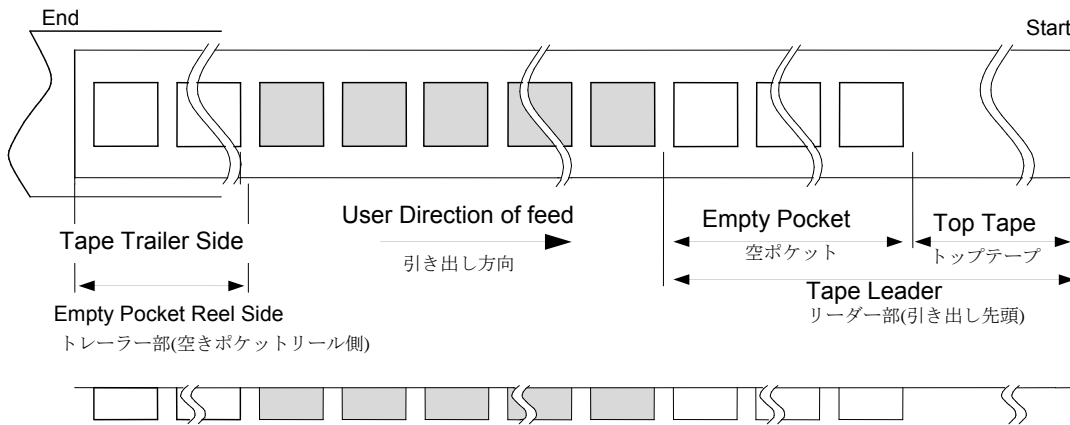
Form and Size of reel window shows are one of the example

リールの窓の形状は代表例を掲載。

(3) Packing 収納形態
 (a) Tape & Reel デバイス収納方法



(b) Start & End Point 引き出し先頭側及びリール側の処理



Item 項目		Empty Space 空きスペース	Note 備考
Tape Leader (引き出し先頭側)	Top Tape	Min. 250 mm	Feeding in the Top tape, the tip is fixed with tape. トップテープ単独で繰り出し、先端はテープにより固定。 Winding method is a diagram of the above リールへの巻き取り方法は、上図の通り。
	Carrier Tape	Min. 150 mm	
Tape Trailer (リール側)	Top Tape	Min. 0 mm	Tip is fixed to the reel. 先端はリールに固定。
	Carrier Tape	Min. 160 mm	

(4) Peel force of the cover tape トップテープの剥離強度

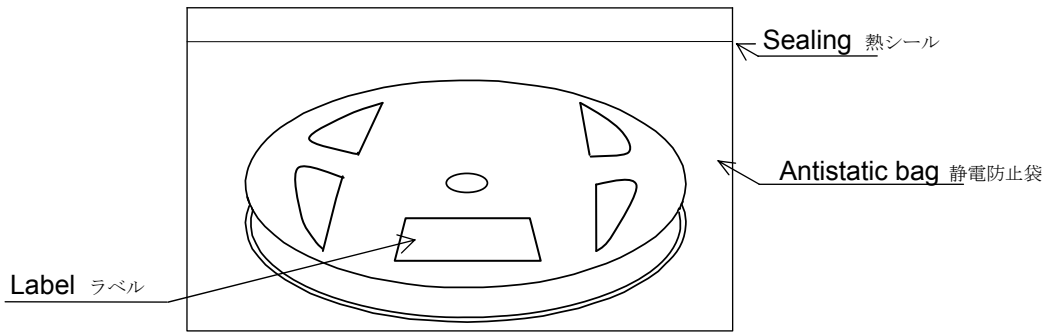
(a) angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.
 剥離角度: テープの接着面に対し 165~180 度とする。

(b) peel speed : 300 mm/min
 剥離速度: 300 mm/min とする。

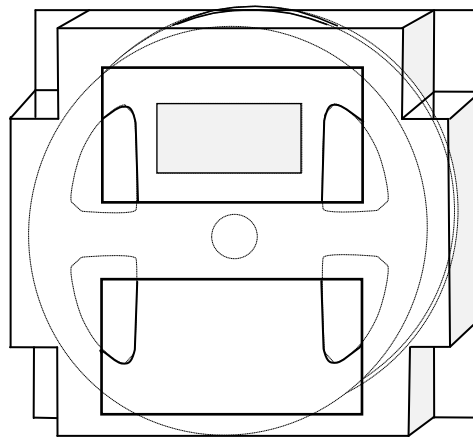
(c) peel strength : 0.1~1.0 N
 剥離強度: 0.1~1.0 N

[2] Inner sleeve

a) Packing to antistatic bag 袋への収納



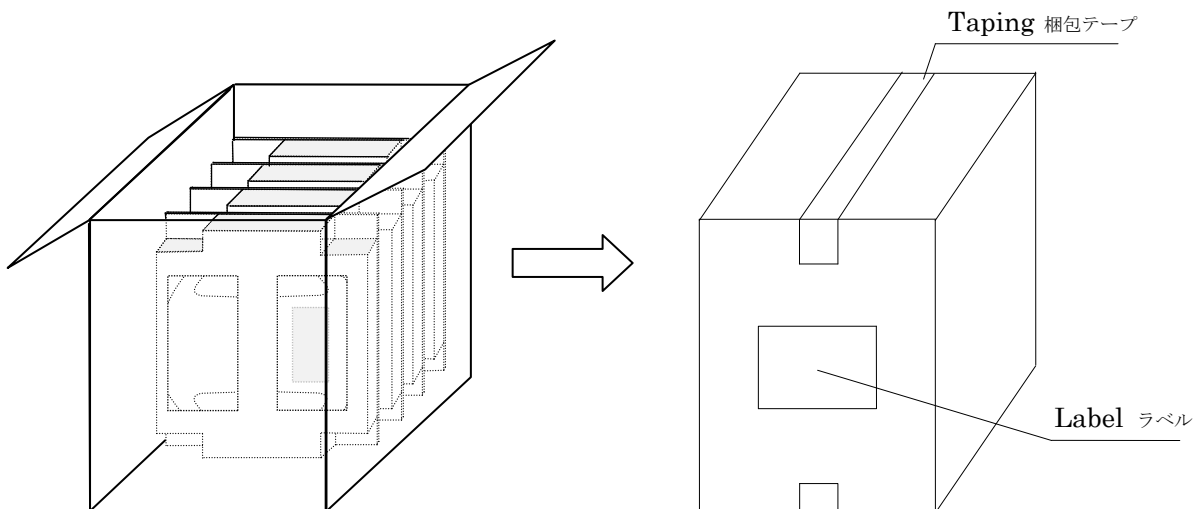
b) Packing to inner sleeve スリーブへの収納



* There is also a case to put the two reel.
2本リールを収納する場合があります。

[3] Shipping Carton 外装箱への収納

- Put inner sleeve into an outer box.
外装箱の中へ、スリーブを収納する。
- If there are room in the outer box, material is put in a shock absorbing together.
空間ができた時は、クッション材を入れる。



[4] Marking 表示**(1) Reel marking** リールへの表示

• Reel marking shall consist of

下記内容をリール表面に表示できるラベルを貼る。:

- 1) Parts name 製品名称
- 2) Quantity 製品数量
- 3) Manufacturing Date or symbol 製品の製造年月又はこれを示す記号
- 4) Manufacturer's Date or symbol 製品の製造業者又はその略号
- 5) Others (if necessary) その他必要事項

(2) Shipping carton marking 外装箱への表示

• Shipping carton marking shall consist of :

下記内容を外装箱表面に表示できるラベルを貼る。:

- 1) Parts name 製品名称
- 2) Quantity 製品数量

[5] Quantity 収納数量

• 2 000 pcs./reel (Standard)

However it is not the limit, in case that the order quantity does not fill with 2000 pieces.

Packing quantity is defined by 14th and 15th digit of product number.

但し、注文数量が 2 000 pcs に満たない場合は、その限りではない。

収納数量は、製品型番の 14 桁、15 桁による。

14th and 15th digit of product number. 製品型番の 14 桁、15 桁	Quantity
00	2 000 pcs
01	Vinyl Bag(Bulk)
11	Any Quantity
12	250 pcs
14	1 000 pcs
16	3 000 pcs

[6] Storage environment 保管環境**(1) Before open the packing, we recommend to keep less than +30 °C and 85 %RH of Humidity, and to use it less than 6 months after delivery.**

開梱前の製品は、温度 +30 °C、湿度 85 %RH 以下での保管をして下さい。

貴社納入後、袋未開封で 6 ヶ月以内の実装を推奨します。

(2) We recommend to open Package in immediately before use. After open Package, We recommend to keeps less than 6 month. No need dry air before soldering work if it is less than temperature +30 °C, 85 humidity %RH.

使用直前まで開梱せず、袋開封後は 6 ヶ月以内の実装を推奨します。

温度 +30 °C、湿度 85 %RH 以下では、はんだ付け作業前に乾燥不要です。

(3) Not to storage with some erosive chemicals.

化学薬品類との同居を避ける。

(4) Nothing is allowed to put on the reel or carton to prevent mechanical damage

内・外装箱がゆがまないようまた、外圧がかからないように保管して下さい。

[7] Handling リール取扱い

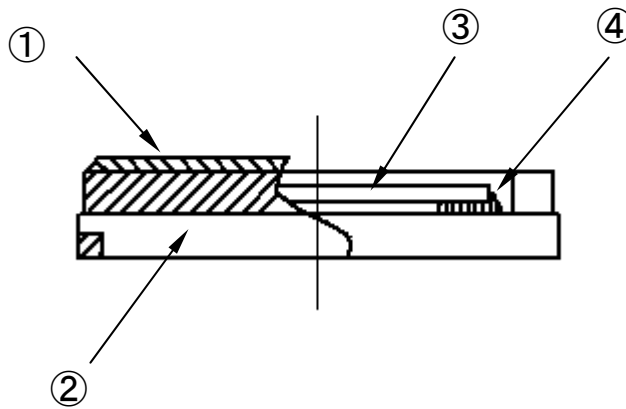
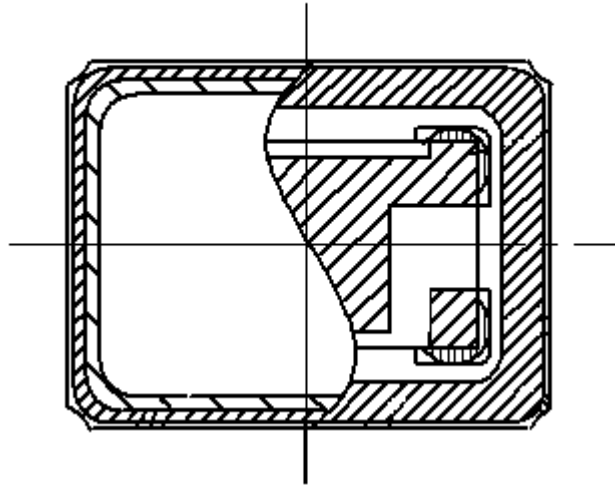
To handle with care to prevent the damage of tape, reel and products.

リールの取扱いについては、中のテープ・製品を変形させないようにして下さい。

Structure Diagram 構造図

Rev.3

Model 型式	TSX-3225	
Document No. 管理No.	A-0602-A-1	TSX-3225_D_0001



④	Crystal Adhesive 水晶接着	
③	Crystal chip 水晶片	
②	Package パッケージ	
①	Lid リッド	
No.	Name of Part 部品名	

RELIABILITY TEST DATA

Product Name : TSX-3225 ($16\text{MHz} \leq f_0 < 40\text{MHz}$)

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition .

No. A-06021-01-004E

No.	ITEM	TEST CONDITIONS	VALUE *1 *2	TEST	FAIL
			$\Delta f / f$ [1×10^{-6}]	Qty [n]	Qty [n]
1	Shock	100g dummy Jig(ETC Standard) drop from 1500mm high on Concrete 3 directions 10 time	(2) ± 2	22	0
2	Vibration	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 h \times 3 directions)	(2) ± 1	22	0
3	High temperature storage	+85°C \times 1 000 h	(1) ± 2	22	0
4	Low temperature storage	-40 °C \times 1 000 h	(1) ± 2	22	0
5	Temperature humidity storage	+85 °C \times 85 %RH \times 1 000 h	(1) ± 2	22	0
6	Temperature cycle	-40 °C <=> +85 °C 30 min at each temp. 1000 cycles	(1) ± 2	22	0
7	Sealing	For He leak detector	$1 \times 10^{-9} \text{ Pa} \cdot \text{m}^3 / \text{s}$ Max	22	0
8	Shear	10 N press for 10 s \pm 1 s Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
9	Pull - off	10 N press for 10 s \pm 1 s Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
10	Solderability	Dip termination into solder bath at +235 °C \pm 5 °C for 5 s (Using Rosin Flux)	Termination must be 95% covered with fresh solder	11	0
11	Resistance to soldering heat	For invention reflow soldering furnace (3 time)	± 1	22	0

Notes

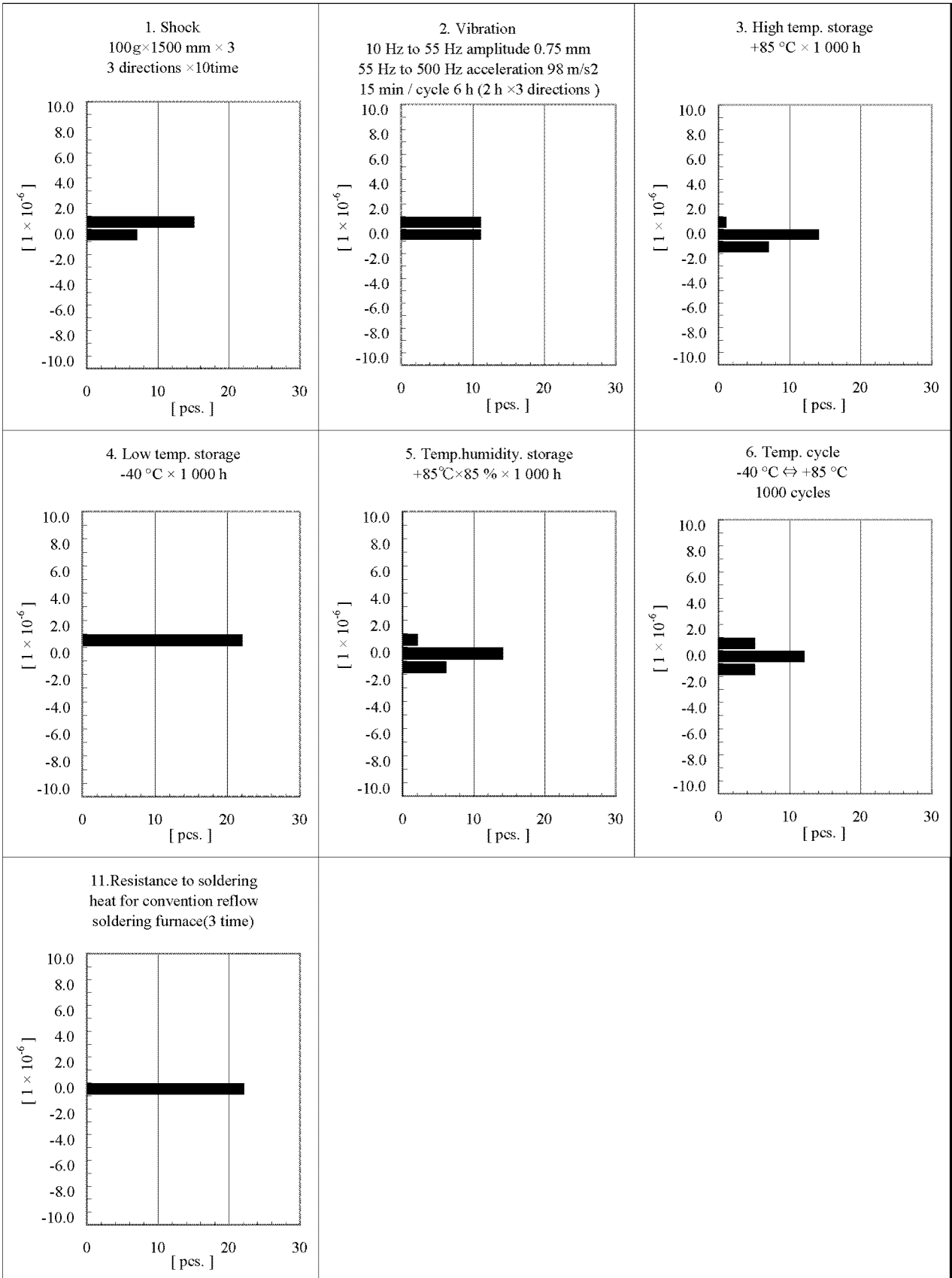
- Item No.1 to No.10 resistance at before above tests should be less than $\pm 20\%$ or less then $\pm 10 \Omega$.
- *1 Each test done independently.
- *2 Measuring 2h to 24h later leaving in room temperature after each test.
 - Measuring 24h later leaving in room temperature after each test.
 - Measuring 2h later leaving in room temperature after each test.

Qualification Data

Product Name : TSX-3225 (16MHz ≤ f0 < 40MHz)

Δf / f

No. A-06021-01-005E



Product Name : TSX-3225 (16MHz \leq f0 < 40MHz)

Δ CI

No. A-06021-01-006E

