

## 1. Scope:

1.1 This specification is covered following series (此電流檢測電阻器規格書包含下列產品):

- CUM1206 series
- CUM2512 series
- CUM2725 series
- CUM2728 series
- CUM4527 series

## 2. Product Features (產品特性)::

2.1 Applications include current sensing, voltage division and pulse applications (應用範圍包括電流感應，分壓及脈衝應用)

2.2 Suitable for high precision current sensing circuit protection application (適用於高精度的電流感應器能應用於產品的保護).

2.3 The resistive material stable and ultra low TCR. Low and Stable TCR  $\leq \pm 50 \text{ppm}/^\circ\text{C}$  (穩定的合金板材料可提供穩定且低的溫度系數。穩定且低的溫度系數可控制於 $\leq \pm 50 \text{ppm}/^\circ\text{C}$ ).

2.4 Specially selected and stabilized materials allow for high temperature derating to  $+ 170^\circ\text{C}$  (精心挑選並穩定材料允許高溫降額至 $+170^\circ\text{C}$ )

2.5 Pure tin plating provides compatibility with lead (Pb) free and lead containing soldering processes (產品電極端使用純錫電鍍，適合於無鉛與含鉛的銲接製程).

2.6 Excellent stability ( $|\Delta R/R| \leq \pm 1.0\%$  for 1000 h at  $70^\circ\text{C}$ ) different environmental conditions (在不同的環境下有極佳的穩定度(誤差值 $\leq \pm 1.0\%$ ，當產品處於 $70^\circ\text{C}/1,000$ 小時下)).

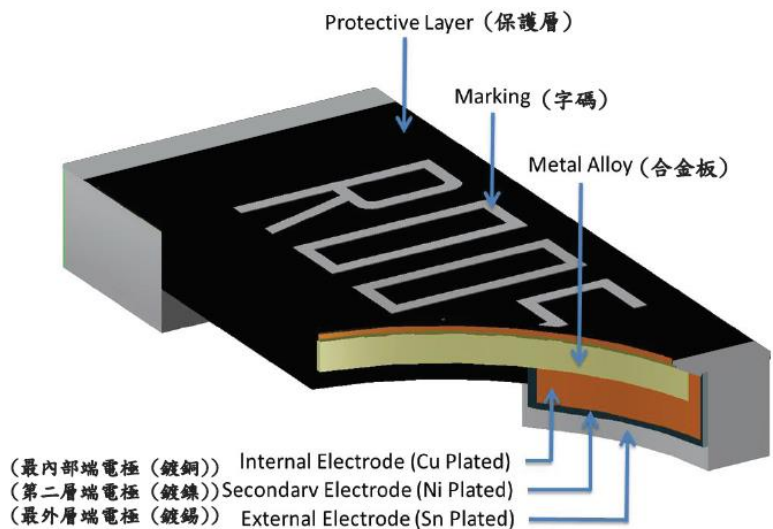
2.7 Compliant to RoHS directive 2011/65/EU and Halogen free (符合 RoHS 指令 2011/65/EU 指令與無鹵的要求).

2.8 Flame retardant type material is used to meet UL94 V-0 requirements (不燃型材料符合 UL94 V-0 的要求).

## 3. Product Constructional (產品結構):

3.1 The resistors are constructed in a high grade material, Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the metal alloy (本公司的電流檢測電阻器是以高規格的材料所建構。金屬端電極附著在合金板的末端並且保護層與合金板的上層連接).

3.2 The resistive layer is covered with a protective coat, and two external end terminations are added. Wrap-around terminations have an electroplated nickel barrier and pure Tin (lead free) or matte-tin finish, ensuring excellent 'leach' resistance properties and solderability (電阻層以保護層(漆)來包覆並加上兩個電極端。電極端以電鍍鎳為屏障並以純錫(無鉛)或表面無光澤的錫來包覆，來確保極佳銲錫性).



## 4. Product Specifications(產品規格):

MODEL	Rating Power at 70°C	T.C.R. (ppm/°C)	Max. Rating Current	Max. Overload Current	Resistance Range (mΩ)		Material	Operating Temperature Range (°C)
					0.5% (D)	1.0% (F) 2.0% (G) 5.0% (J)		
CUM1206	0.75W	≤±50	3.83	7.66	51~75	51~75	R051~R075 : FeCrAl	-55~+170°C
	1W		31.62	63.24	7~50	1~50	R001 : MnCuSn R002~R007 : MnCu R008~R050 : FeCrAl	
CUM2512	1W	≤±75	44.72	100.00	---	0.5~0.75	R0005~R00075 : MnCuSn	
	1W	≤±50	31.62	70.71	5~500	1~500	R001~R006 : MnCu R007~R500 : FeCrAl	
	2W	≤±75	63.24	141.42	---	0.5~0.75	R0005~R00075 : MnCuSn	
	2W	≤±50	44.72	100.00	5~450	1~450	R001~R006 : MnCu R007~R450 : FeCrAl	
	3W	≤±75	77.45	173.20	---	0.5~0.75	R0005~R00075 : MnCuSn	
	3W	≤±50	54.77	122.47	5~100	1~100	R001~R006 : MnCu R007~R100 : FeCrAl	
CUM2725	4W	≤±100	141.42	282.84	---	0.2	R0002~R0004 : MnCuSn	
		≤±50	126.49	252.98		0.25~3	R0005~R0025 : MnCu R003 : FeCrAl	
CUM2728	4W	≤±50	31.62	63.24	7~450	4~450	R004~R450 : FeCrAl	
CUM4527	2W	≤±75	63.24	141.42	---	0.5	R0005 : MnCuSn	
	2W	≤±50	44.72	100.00	7~100	1~100	R001~R005 : MnCu R006~R100 : FeCrAl	
	3W	≤±75	77.45	173.20	---	0.5	R0005 : MnCuSn	
	3W	≤±50	54.77	122.47	7~60	1~60	R001~R005 : MnCu R006~R060 : FeCrAl	
	5W	≤±75	100.00	173.20	---	0.5	R0005 : MnCuSn	
	5W	≤±50	70.71	122.47	7~500	1~500	R001~R005 : MnCu R006~R500 : FeCrAl	

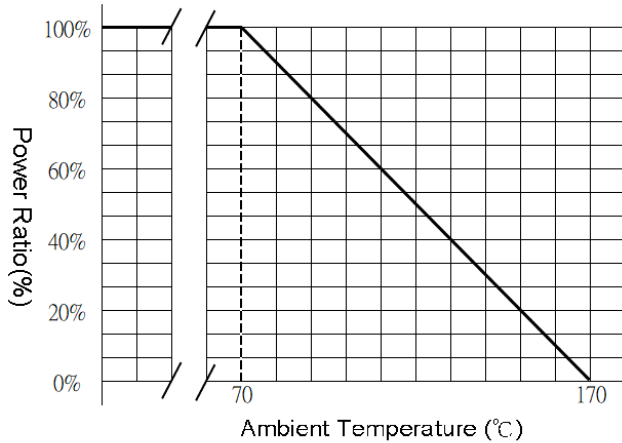
Remark 備註:

- a. "\*" Special tolerance and range of resistance are under requested. ("\*" 如需特殊的公差和阻值請與我們聯絡).

## 5. Power Derating Curve(功率減額曲線):

5.1 The Operating Temperature Range: -55°C ~+170°C.(溫度範圍: -55°C ~+170°C).

5.2 For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below(當電阻工作在溫度超過 70°C 時，額定功率必須減額，減額曲線依據下圖)：



## 6. Rating Current(額定電流):

6.1 The following equation may be used to determine the DC (Direct Current) or AC (Alternating Current) (RMS, root mean square value) of normal rated power. However, if the result value exceeds the highest current of regulated standards (paragraph 5), the highest normal rated power is to be used

(以下的公式也許被用於確定DC(直流電)或AC(交流電)電流(RMS, 均方根值)的正常額定功率。無論如何，如果結果超出被調控的最高標準電流(參考第五章節)時，最高的正常額定功率將被使用)。

Remark:

- a. I: Rating Current.
- b. P: Rating Power.
- c. R: Resistance.

$$I = \sqrt{P/R}$$

## 7. Ordering Information(訂購訊息):

Model (種類)	Size (尺寸)	Power Rating (Watts) 額定功率(瓦特)	Packing* 包裝	Tolerance** 公差	Resistance*** 電阻值
CUM	1206 2512 2725 2728 4527	<ul style="list-style-type: none"> <li>• B: 0.5W</li> <li>• C: 0.75W,</li> <li>• 1: 1.0W,</li> <li>• D: 1.5W,</li> <li>• 2: 2.0W,</li> <li>• 3: 3.0W,</li> <li>• 4: 4.0W,</li> <li>• 5: 5.0W</li> </ul>	<ul style="list-style-type: none"> <li>• 1: 1,000pcs</li> <li>• 2: 2,000pcs</li> <li>• 4: 4,000pcs</li> <li>• 5: 5,000pcs</li> </ul>	<ul style="list-style-type: none"> <li>• D=±0.5%;</li> <li>• F=±1.0%;</li> <li>• G=±2.0%;</li> <li>• J=±5.0%</li> </ul>	R003: 3mΩ R100: 100mΩ

Remark 備註:

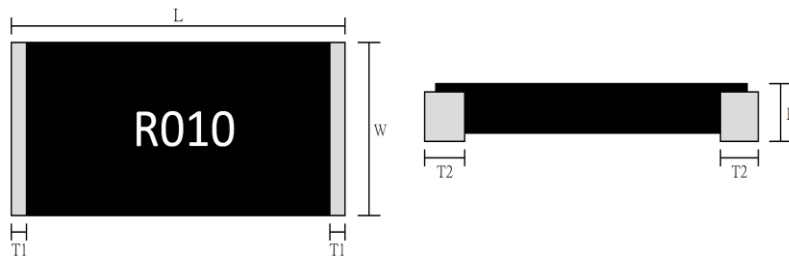
a. “\*\*” The packing quantity per reel are listed below (“\*\*”:每個膠盤可裝的產品數量):

Model (種類)	Tape Width (寬度)	Diameter (直徑)	Piece/reel (標準(每個膠盤))
CUM1206	8 mm/embossed plastic	178 mm/7"	5,000 pieces (5,000 顆)
CUM1206 R001			4,000 pieces (4,000 顆)
CUM2512	12 mm/embossed plastic		4,000 pieces (4,000 顆)
CUM2725			2,000 pieces (2,000 顆)
CUM2725(0.2~0.8)			1,000 pieces (1,000 顆)
CUM2728			2,000 pieces (2,000 顆)
CUM4527	24 mm/embossed plastic		1,000 pieces (1,000 顆)

b. “\*\*\*” Special tolerance and range of resistance are under requested (“\*\*\*” 如需特殊的公差和阻值請與我們聯絡).

c. “\*\*\*\*” Normal product order information has 3 digits, if includes one decimal point then the order information should be 4 digits (e.g. 0.5mΩ is R0005), if includes 2 decimal points, then it should be 5 digits (e.g. 0.25mΩ is R00025) (“\*\*\*\*” 正常的產品是三碼, 如有一位小數點則為四碼 (例如 0.5mΩ 是 R0005), 如有兩位小數點則為五碼 (例如 0.25mΩ 是 R00025)).

## 8. Dimensions : Unit mm



MODEL	Power Rating	Resistance Range	L	W	H	T1	T2	
1206	0.75W	51~75mΩ	3.200±0.254	1.650±0.254	0.400±0.254	0.508±0.254	0.508±0.254	
	1W	1mΩ			0.820±0.254			
		2mΩ			0.700±0.254			
		3mΩ			0.600±0.254			
		4~20mΩ			0.550±0.254			
21~50mΩ	0.470±0.254							
2512	1W	451~500mΩ	6.350±0.254	3.050±0.254	0.350±0.254	0.750±0.254	0.850±0.254	
2512	1W 2W	0.5mΩ			0.820±0.254	1.980±0.254	1.15±0.254	1.980±0.254
		0.75 mΩ			0.700±0.254	2.200±0.254		
		1mΩ			0.720±0.254	1.400±0.254		
		1.5mΩ				1.150±0.254		
		2~5mΩ				1.100±0.254		
		6mΩ			0.550±0.254	1.100±0.254		
		7~10mΩ			0.600±0.254			
		11~75mΩ			0.550±0.254			
		76~100mΩ			0.470±0.254			
		101~135mΩ			0.75±0.254	1.100±0.254		
		136~200mΩ					0.400±0.254	
201~450mΩ	0.400±0.254	0.75±0.254			0.850±0.254			

Type	Power Rating	Resistance Range	L	W	H	T1	T2	
2512	3W	0.50mΩ	6.350±0.254	3.050±0.254	0.820±0.254	1.980±0.254	2.000±0.254	
		0.75mΩ			0.700±0.254	1.15±0.254	1.980±0.254	
		1mΩ			0.720±0.254		2.200±0.254	
		1.5mΩ					1.400±0.254	
		2~5mΩ			0.550±0.254	1.15±0.254	1.100±0.254	
		6mΩ				0.600±0.254		1.150±0.254
		7~10 mΩ						0.550±0.254
		11~75mΩ			0.650±0.254	1.15±0.254	1.500±0.254	
		76~100mΩ						0.550±0.254
2725	4W	0.2mΩ	6.900±0.254	6.350±0.254	1.100±0.254	1.20±0.254	2.150±0.254	
		0.25mΩ			0.950±0.254		2.287±0.254	
		0.3mΩ					1.975±0.254	
		0.35mΩ					1.710±0.254	
		0.4mΩ					1.440±0.254	
		0.5mΩ					2.080±0.254	
		0.6mΩ					1.780±0.254	
		0.8mΩ	1.300±0.254					
		1mΩ	6.800±0.254		0.650±0.254	1.15±0.254	1.800±0.254	
		1.5~1.6mΩ			0.550±0.254		1.500±0.254	
		2~3mΩ			0.580±0.254		0.40±0.254	1.050±0.254
4~450mΩ								
2728	4W	4~450mΩ	6.600±0.254	6.700±0.254	0.580±0.254	0.40±0.254	1.050±0.254	
4527	2W	0.5mΩ	11.300±0.500	6.600±0.500	0.770±0.254	0.90±0.254	3.000±0.254	
		1mΩ			0.650±0.254		2.000±0.254	
		1.5~5mΩ			0.550±0.254		0.90±0.254	
		6~100mΩ						
	3W	0.5mΩ			0.770±0.254	0.90±0.254	3.000±0.254	
		1mΩ			0.650±0.254		2.000±0.254	
		1.5~5mΩ			0.550±0.254		0.90±0.254	
		6~60mΩ						
	5W	0.5mΩ			0.800±0.254	0.65±0.254	3.000±0.254	
		1mΩ			0.680±0.254		2.000±0.254	
		1.5~5mΩ						
		6~500mΩ			0.580±0.254			

## 9. Marking Format(蓋印型式):

9.1 All the other products marking are 4 digits.

(所有的產品字碼均為 4 碼).

9.2 "R" designates the decimal location in ohms,, e.g. 1mΩ the product marking is R001, 25mΩ the product marking is R025 and 100mΩ the product marking is R100.

(當阻值小於 1 歐姆時以 "R" 來表示之; 例如 1mΩ 其蓋印字碼為 "R001"; 10mΩ 其蓋印字碼為 "R010"; 25mΩ 其蓋

印字碼為“R025”；100mΩ 其蓋印字碼為“R100”).

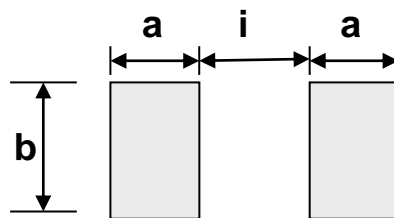
9.3 “m” designates the decimal location in milli-ohms, e.g. 0.25mΩ the product marking is 0m25, 0.5mΩ the product marking is 0m50, 5.5mΩ the product marking is 5m50 and 25.5mΩ the product marking is 25m5.

(當阻值有毫歐姆時以“m”來表示之；例如 0.25mΩ 其蓋印字碼為“0m25”；0.5mΩ 其蓋印字碼為“0m50”；25.5mΩ 其蓋印字碼為“25m5”).

9.4 The criteria to distinguishing the mark on the surface of products are that characters can be identified.

(產品表面字碼以可識別為主)

## 10. Recommended Land Pattern (建議印刷電路板上鉚墊的尺寸):



### Dimension

Unit: mm

TYPE	Resistance Range	a	b	i
1206 - 0.75W,1W	1mΩ~75mΩ	1.46	2.15	1.68
2512 -1W,2W,3W	0.5mΩ~1mΩ	3.24	3.68	1.27
	1.5 mΩ	3.20	3.68	1.35
	2 ~5mΩ	2.60	3.68	2.55
	6mΩ~200mΩ	2.30	3.68	3.15
	201mΩ~500mΩ	2.05	3.68	3.65
2725 - 4W	0.2~0.35mΩ	2.90	6.70	1.28
	0.4~0.8mΩ	3.25	6.85	1.70
	1~3mΩ	2.75	6.85	2.70
2728 - 4W	4mΩ~450mΩ	2.05	7.20	3.90
4527 - 2W,3W,5W	0.5mΩ~1.5mΩ	4.50	8.74	4.50
	2.0mΩ~100mΩ	3.50	8.74	6.50
	101mΩ~500mΩ	3.50	8.74	6.50

## 11. Product Reliability Performance(產品可靠度特性):

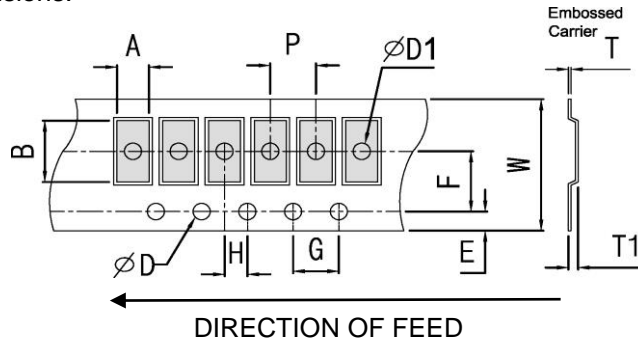
Test Item	Test Method	Procedure	Requirements
Temperature Coefficient of Resistance (T.C.R)	JIS-C-5201-1 4.8 IEC-60115-1 4.8	At 25°C /+150°C, 25°C is the reference temperature	As Spec
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	The number of rated power are as follows: <ul style="list-style-type: none"> <li>1206-0.75W: 5 times of rated power</li> <li>1206-1W: 5 times of rated power</li> <li>2512-1W: 5 times of rated power</li> <li>2512-2W: 5 times of rated power</li> <li>2512-3W: 5 times of rated power<sup>*(Note)*</sup></li> <li>2725-4W: 4 times of rated power</li> <li>2728-4W: 4 times of rated power</li> <li>4527-2W: 5 times of rated power</li> <li>4527-3W: 5 times of rated power</li> <li>4527-5W: 3 times of rated power for 5 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>4527: <math>\Delta R/R1 \leq \pm 2.0\%</math></li> <li>The others: <math>\Delta R/R1 \leq \pm 0.5\%</math></li> </ul>
High Temperature Exposure	JIS-C5201-1 4.25 IEC 60068-2-2	At 170°C for 1000 hours.	<ul style="list-style-type: none"> <li>4527: <math>\Delta R/R1 \leq \pm 2.0\%</math></li> <li>The others: <math>\Delta R/R1 \leq \pm 1.0\%</math></li> </ul>
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds.	$\Delta R/R1 \leq \pm 0.5\%$
Temperature Cycling	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme.	$\Delta R/R1 \leq \pm 0.5\%$
Biased Humidity	MIL-STD-202 Method 103	1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.	$\Delta R/R1 \leq \pm 0.5\%$
Load Life (Endurance)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1	70±2°C, RCWV or Max. working voltage whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF" .	<ul style="list-style-type: none"> <li>4527: <math>\Delta R/R1 \leq \pm 2.0\%</math></li> <li>The others: <math>\Delta R/R1 \leq \pm 1.0\%</math></li> </ul>
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds.	>95% coverage
Dielectric Withstanding Voltage	JIS-C5201-1 4.7	Applied 500VAC for 1 minute.	No short or burned on the appearance.
Core Body Strength	JIS-C5201-1 4.15	Central part pressurizing force : 5N , 10 seconds	No broken
Terminal Strength (SMD)	AEC Q200-006	Pressurizing force 17.7N for 60 seconds	No broken
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once 2mm for 10 seconds	$\Delta R/R1 \leq \pm 0.5\%$ No broken
Moisture Resistance	MIL-STD 202 Method 106	T=24 hours / Cycle ,10Cycles . Steps 7a& 7b not required. Unpowered . (Figure 1)	$\Delta R/R1 \leq \pm 0.5\%$

\*Note: This test is a destructive experiment. The top protective layer is prone to damage and peculiar smell during, in the 50mR~100mR resistance test. The resistance change rate can meets the specifications.



## 12. Packaging:

### 12.1 Embossed Dimensions:

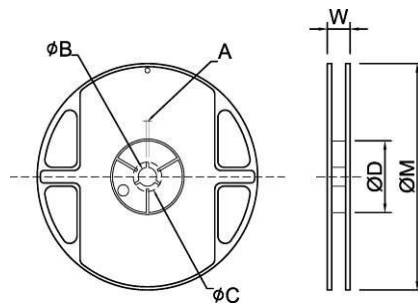


■ Dimension

Unit : mm

Item	Resistance Range (mΩ)	W	P	E	F	φD	φD1	G	H	A	B	T1	T
1206	1mΩ	8.0±0.30	4.0±0.10	1.75±0.10	3.5±0.10	1.50 <sup>+0.1</sup> <sub>0</sub>	1.0±0.10	4.0±0.10	2.0±0.10	2.03±0.10	3.55±0.10	1.10±0.10	0.20±0.05
1206	2~75mΩ	8.0±0.30	4.0±0.10	1.75±0.10	3.5±0.10		1.0±0.10	4.0±0.10	2.0±0.10	2.03±0.10	3.55±0.10	0.85±0.10	0.20±0.05
2512	0.5~1mΩ	12.0±0.30	4.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	3.50±0.10	6.75±0.10	1.10±0.10	0.20±0.05
2512	2~500mΩ	12.0±0.30	4.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	3.50±0.10	6.75±0.10	0.90±0.10	0.20±0.05
2725	0.2~0.8mΩ	12.0±0.30	8.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	6.81±0.10	7.16±0.10	1.30±0.10	0.25±0.05
2725	1~3mΩ	12.0±0.30	8.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	6.81±0.10	7.16±0.10	1.05±0.10	0.25±0.05
2728	4~450mΩ	12.0±0.30	8.0±0.10	1.75±0.10	5.5±0.10		1.55±0.10	4.0±0.10	2.0±0.10	7.10±0.10	7.05±0.10	0.95±0.10	0.20±0.05
4527	0.5~500mΩ	24.0±0.30	12.0±0.10	1.75±0.10	11.5±0.10		1.50±0.10	4.0±0.10	2.0±0.10	7.38±0.10	12.0±0.10	1.05±0.10	0.30±0.10

### 12.2 Reel Dimensions:



Reel Type / Tape	A	φB	φC	φD	W	φM
7" reel for 8 mm embossed	2.0±0.5	13.2±0.5	17.7±0.5	60.0±0.5	12.0±0.5	178±1.0
7" reel for 12 mm embossed	2.5±0.5	13.5±0.5	17.7±0.5	60.0±0.5	16.2±0.5	178±1.0
7" reel for 24 mm embossed	2.0±0.5	13.2±0.5	17.7±0.5	60.0±0.5	24.4±2.0	178±1.0

## ■ Storage Temperature

Temperature : 25±5°C, Humidity : 60±20%



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