

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):

- TCUM 1206 series
- TCUM 2010 series
- TCUM 2512 series
- TCUM 2725 series
- TCUM 2728 series
- TCUM 2817 series
- TCUM 4527 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係數。穩定且低的溫度係數可控制於 $\leq \pm 50 \text{ppm}/^\circ\text{C}$).

2.4 Specially selected and stabilized materials allow for high temperature derating to + 170 °C (精心挑選並穩定材料允許高溫降額至+170°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 °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度C/1,000小時下)).

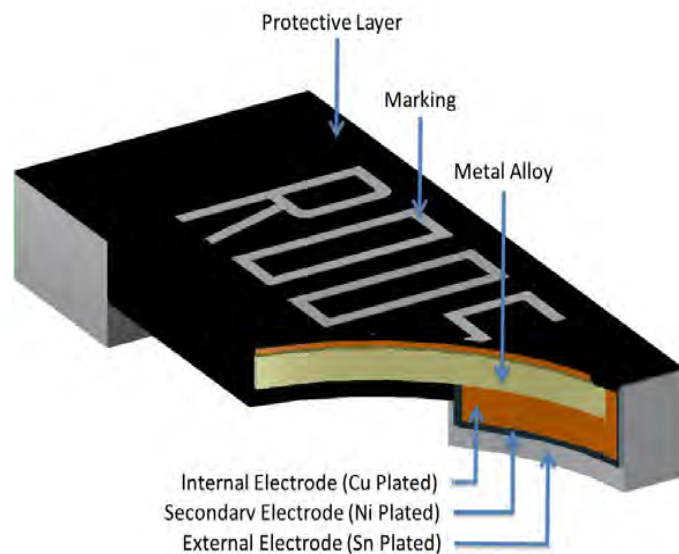
2.7 Compliant to RoHS directive 2011/65/EU and Halogen free (符合RoHS指令2011/65/EU指令與無鹵的要求).

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成。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):

Type 類別	# of Terminals 電極端數目	Max. Rating Power 最大額定功率(W)	Max. Rating Current 最大額定電流(A)	Max. Overload Current 最大過負載電流(A)	TCR (ppm/°C)溫度係數	Resistance Range (mΩ)* 電阻值範圍		Operating Temperature 操作溫度
						D (±0.5%)	F (±1%); G (±2%); J (±5%)	
TCUM 1206	2	0.50	3.13	6.26	≤±50	51.0~100.0	51.0~100.0	-55~+170°C
		0.75	5.98	11.95		21.0~50.0	21.0~50.0	
		1.0	31.62	63.25		7.0~100.0	1.0~100.0	
TCUM 2010		0.75	3.25	7.27		71.0~100.0	71.0~100.0	
		1.0	5.68	12.70		31.0~70.0	31.0~70.0	
		1.5	38.73	77.46		7.0~100.0	1.0~100.0	
TCUM 2512		1	44.72	100.00		7.0~680.0	0.5~680.0	
		2	63.25	141.42		7.0~450.0	0.5~450.0	
		3	77.46	134.16		7.0~100.0	0.5~100.0	
TCUM 2725		4	126.49	252.98		--	0.25~3.0	
TCUM 2728		4	31.62	54.77		7.0~600.0	4.0~600.0	
TCUM 2817		3	54.77	109.54		7.0~200.0	1.0~200.0	
TCUM 4527	3	2.45	4.24	501m~1.0R	501m~1.0R			
	5	70.71	122.47	7.0~500.0	1.0~500.0			

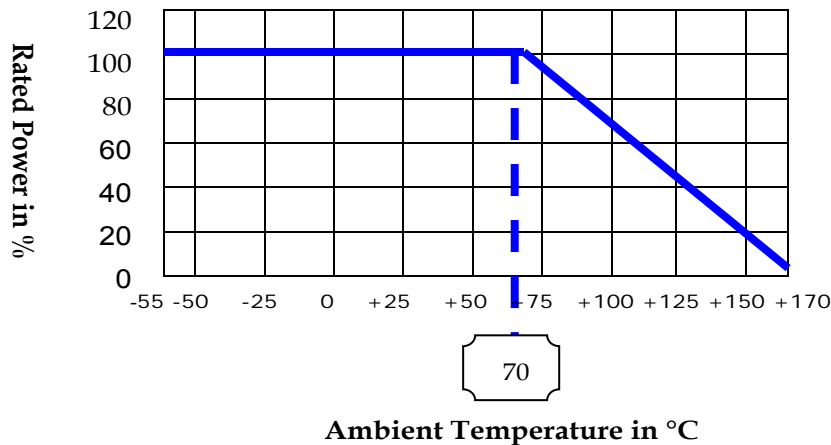
Remark 備註:

- 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
TCUM	1206 2010 2512 2725 2728 2817 4527	<ul style="list-style-type: none"> • B: 0.5W, • C: 0.75W, • 1: 1.0W, • D: 1.5W, • 2: 2.0W, • 3: 3.0W, • 4: 4.0W, • 5: 5.0W 	<ul style="list-style-type: none"> • A: 500pcs • 1: 1,000pcs • 2: 2,000pcs • 4: 4,000pcs • 5: 5,000pcs 	<ul style="list-style-type: none"> • D=±0.5%; • F=±1.0%; • G=±2.0%; • J=±5.0% 	e.g.: R003: 3mΩ R100: 100mΩ

Remark 備註:

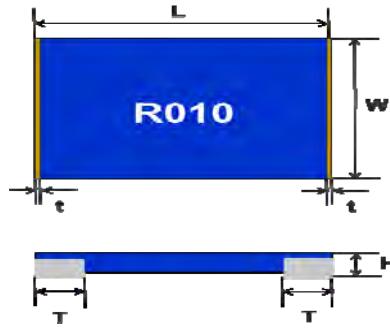
a. “*” The packing quantity per reel are listed below (“*”:每個膠盤可裝的產品數量):

Model (種類)	Tape Width (寬度)	Diameter (直徑)	Piece/reel (標準(每個膠盤))
TCUM 1206	8 mm/embossed plastic	178 mm/7"	5,000 pieces (5,000 顆)
TCUM 2010	12 mm/embossed plastic		4,000 pieces (4,000 顆)
TCUM 2512			4,000 pieces (4,000 顆)
TCUM 2725			2,000 pieces (2,000 顆)
TCUM 2728			2,000 pieces (2,000 顆)
TCUM 2817			1,000 pieces (1,000 顆)
TCUM 4527	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. Physical Dimensions(產品尺寸):



Type 型別	Maximum Power Rating (Watts) 最大額定功率 (瓦特)	Resistance Range (mΩ) (電阻值範圍)	Dimensions - in inches (millimeters) 尺寸-英寸(公釐)				
			L	W	H	T	t
TCUM1206	0.5	51.0 ~ 100.0	0.120±0.010 (3.200±0.254)	0.065±0.010 (1.650±0.254)	0.012±0.010 (0.300±0.254)	0.020±0.010 (0.508±0.254)	0~0.008 (0~0.200)
	0.75	21.0 ~ 50.0			0.015±0.010 (0.390±0.254)		
	1.0	1.0~2.0			0.026±0.010 (0.670±0.254)		
		3.0~100.0			0.019±0.010 (0.490±0.254)		
TCUM2010	0.75	71.0~100.0	0.200±0.010 (5.100±0.254)	0.095±0.010 (2.400±0.254)	0.012±0.010 (0.310±0.254)	0.033±0.010 (0.840±0.254)	0~0.008 (0~0.200)
	1	31.0~70.0			0.018±0.010 (0.460±0.254)		
	1.5	1.0~2.0			0.026±0.010 (0.670±0.254)		
		2.5~30.0			0.018±0.010 (0.460±0.254)		
		31.0~100.0			0.023±0.010 (0.590±0.254)		
TCUM2512	1	0.5~1.0	0.250±0.010 (6.350±0.254)	0.120±0.010 (3.050±0.254)	0.026±0.010 (0.670±0.254)	0.087±0.010 (2.200±0.254)	0~0.008 (0~0.200)
		1.5			0.022±0.010 (0.560±0.254)	0.078±0.010 (2.000±0.254)	0.008~0.039 (0.200~1.000)
		2.0~100.0			0.043±0.010 (1.100±0.254)		
		101.0~680.0			0.019±0.010 (0.490±0.254)	0.033±0.010 (0.850±0.254)	
	2	0.5~1.0			0.026±0.010 (0.670±0.254)	0.087±0.010 (2.200±0.254)	0~0.008 (0~0.200)
		1.5			0.022±0.010 (0.560±0.254)	0.078±0.010 (2.000±0.254)	0.008~0.039 (0.200~1.000)
		2.0~100.0			0.043±0.010 (1.100±0.254)		
		101.0~450.0			0.024±0.010 (0.610±0.254)	0.033±0.010 (0.850±0.254)	

Type 型別	Maximum Power Rating (Watts) 最大額定功率 (瓦特)	Resistance Range (mΩ) (電阻值範圍)	Dimensions - in inches (millimeters) 尺寸-英寸(公釐)				
			L	W	H	T	t
TCUM2512	3	0.5~1.0	0.250±0.010 (6.350±0.254)	0.120±0.010 (3.050±0.254)	0.026±0.010 (0.670±0.254)	0.087±0.010 (2.200±0.254)	0~0.008 (0~0.200)
		1.5				0.078±0.010 (2.000±0.254)	0.008~0.039 (0.200~1.000)
		2.0~50.0				0.043±0.010 (1.100±0.254)	
		50.0~100.0				0.029±0.010 (0.740±0.254)	
TCUM2725	4	0.25	0.268±0.010 (6.800±0.254)	0.250±0.010 (6.350±0.254)	0.032±0.010 (0.820±0.254)	0.091±0.010 (2.300±0.254)	0.008~0.039 (0.200~1.000)
		0.5			0.027±0.010 (0.690±0.254)		
		1			0.027±0.010 (0.690±0.254)	0.071±0.010 (1.800±0.254)	
		1.5~3.0			0.024±0.010 (0.610±0.254)		
TCUM2728	4	4.0~50.0	0.260±0.010 (6.600±0.254)	0.264±0.010 (6.700±0.254)	0.028±0.010 (0.720±0.254)	0.047±0.010 (1.200±0.254)	0.008~0.039 (0.200~1.000)
		51.0~450.0			0.033±0.010 (0.840±0.254)		
		451.0~600.0			0.030±0.010 (0.770±0.254)		
TCUM2817	3	1.0	0.280±0.010 (7.100±0.254)	0.165±0.010 (4.200±0.254)	0.027±0.010 (0.690±0.254)	0.071±0.010 (1.800±0.254)	0.008~0.039 (0.200~1.000)
		2.0~30.0			0.024±0.010 (0.610±0.254)	0.059±0.010 (1.500±0.254)	
		31.0~100.0			0.028±0.010 (0.720±0.254)		
		101.0~130.0			0.030±0.010 (0.770±0.254)		
		131.0~200.0			0.027±0.010 (0.690±0.254)		
TCUM4527	3	501.0~680.0	0.445±0.020 (11.300±0.500)	0.260±0.020 (6.600±0.500)	0.030±0.010 (0.770±0.254)	0.079±0.010 (2.000±0.254)	0.008~0.039 (0.200~1.000)
		681.0m~1.0 R			0.027±0.010 (0.690±0.254)		
	5	1.0			0.031±0.010 (0.790±0.254)	0.118±0.010 (3.000±0.254)	
		1.5			0.033±0.010 (0.840±0.254)		
		2.0~500.0			0.033±0.010 (0.840±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).

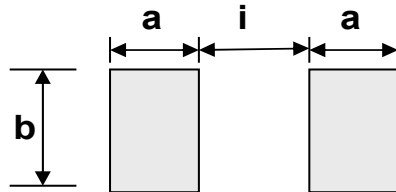
9.2 "R" designates the decimal location in ohms,, e.g. 1mΩ the product marking is R001, 25mΩ the product marking is R025 and 100mΩ the product marking is R100.

(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").

10. Recommended Land Pattern (建議印刷電路板上鐳墊的尺寸):



Type 型別	Maximum Power Rating (Watts) 最大額定功率(瓦特)	Resistance Range (mΩ) (電阻值範圍)	Dimensions - in inches (millimeters) 尺寸-英寸(公釐)		
			a	b	i
TCUM1206	0.5 & 0.75 & 1.0	1.0 ~ 100.0	0.063 (1.60)	0.086 (2.18)	0.026 (0.66)
TCUM2010	0.75 & 1.0 & 1.5	1.0 ~ 3.0	0.114 (2.89)	0.115 (2.92)	0.048 (1.22)
		3.1 ~ 100.0	0.090 (2.29)	0.115 (2.92)	0.095 (2.41)
TCUM2512	1.0 & 2.0 & 3.0	0.5 ~ 1.5	0.120 (3.05)	0.145 (3.68)	0.050 (1.27)
		2.0 ~ 3.5	0.083 (2.11)	0.145 (3.68)	0.125 (3.18)
		3.6 ~ 680.0	0.075 (1.90)	0.145 (3.68)	0.138 (3.50)
TCUM2725	4.0	0.25 ~ 0.5	0.125 (3.18)	0.270 (6.86)	0.052 (1.32)
		1.0 ~ 3.0	0.092 (2.34)	0.270 (6.86)	0.118 (3.00)
TCUM2728	4.0	4.0 ~ 600.0	0.108 (2.75)	0.308 (7.82)	0.138 (3.51)
TCUM2817	3.0	1.0 ~ 3.0	0.108 (2.75)	0.308 (7.82)	0.138 (3.51)
		3.5 ~ 200.0	0.096 (2.45)	0.308 (7.82)	0.122 (3.11)
TCUM4527	3.0 & 5.0	1.0 ~ 3.0	0.177 (4.50)	0.344 (8.74)	0.177 (4.50)
		3.5 ~ 100.0	0.134 (3.40)	0.344 (8.74)	0.292 (6.43)
		101.0m ~ 1R	0.115 (2.93)	0.344 (8.74)	0.300 (7.63)

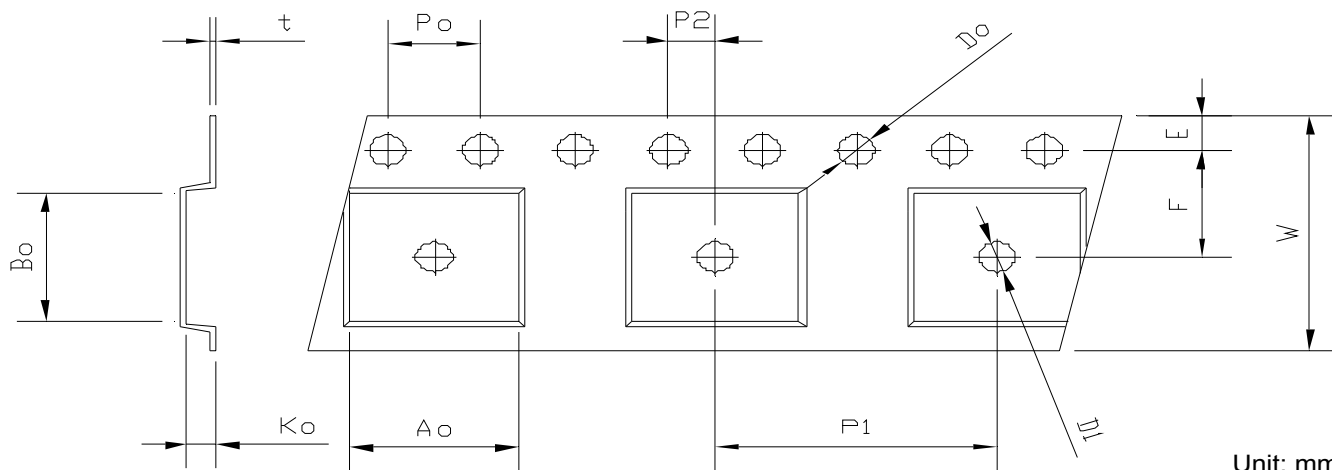
11. Product Reliability Performance(產品可靠度特性):

Test Items	Conditions of Test	Test Limits
Temperature Coefficient Ratio (T.C.R.)	$\text{T.C.R. (ppm/}^\circ\text{C)} = \frac{(R2-R1)}{R1 (T2-T1)} \times 10^6$ <ul style="list-style-type: none"> R1: resistance at room temperature (T1) R2: resistance at 150°C (T2) 	≤±50 ppm/°C
Temperature Cycling	-55°C to +150°C, 1,000cycles, 15min at each extreme	$\Delta R/R1 \leq \pm 0.5\%$
Short Time Overload	The number of rated power are as follows: <ul style="list-style-type: none"> TCUM1206-0.5W: 4 times of rated power TCUM1206-0.75W: 4 times of rated power TCUM1206-1.0W: 4 times of rated power TCUM2010-0.75W: 5 times of rated power TCUM2010-1.0W: 5 times of rated power TCUM2010-1.5W: 4 times of rated power TCUM2512-1.0W: 5 times of rated power TCUM2512-2.0W: 5 times of rated power TCUM2512-3.0W: 3 times of rated power TCUM2725-4.0W: 4 times of rated power TCUM2728-4.0W: 3 times of rated power TCUM2817-3.0W: 4 times of rated power TCUM4527-3.0W: 3 times of rated power TCUM4527-5.0W: 3 times of rated power Rating power duration: 5secs	<ul style="list-style-type: none"> TCUM4527$\Delta R/R1 \leq \pm 2.0\%$ The others: $\Delta R/R1 \leq \pm 0.5\%$
Resistance to Solder Heat	260±5°C Solder, 10±1secs dwell	$\Delta R/R1 \leq \pm 0.5\%$
High Temperature Exposure	1,000hrs at + 170 °C	<ul style="list-style-type: none"> TCUM4527$\Delta R/R1 \leq \pm 2.0\%$ The others: $\Delta R/R1 \leq \pm 1.0\%$
Load at Rated Power	1,000hrs@70 °C, 1.5hrs "ON", 0.5hrs "OFF"	<ul style="list-style-type: none"> TCUM4527$\Delta R/R1 \leq \pm 2.0\%$ The others: $\Delta R/R1 \leq \pm 1.0\%$
Bias Humidity	1,000hrs@+85°C/85%RH, Bias 1.5hrs "ON", 0.5hrs "OFF"	$\Delta R/R1 \leq \pm 0.5\%$
Solderability	245±5°C for 2±0.5secs	>95% coverage

 Remark: ΔR = (resistance after stress - resistance before stress); R1 means resistance before stress.

12. Packaging:

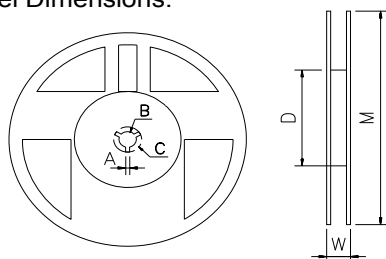
12.1 Embossed Dimensions:



Unit: mm

Item	W	P1	E	F	Do	D1	P0	Po*10	P2	Ao	Bo	Ko	t
TCUM1206	8.00	4.00	1.75	3.50	1.55	1.00	4.00	40.00	2.00	2.03	3.55	0.70	0.20
TCUM2010	12.00	4.00	1.75	5.50	1.55	1.55	4.00	40.00	2.00	2.85	5.55	0.82	0.25
TCUM2512	12.00	8.00	1.75	5.50	1.55	1.55	4.00	40.00	2.00	3.50	6.75	0.90	0.20
TCUM2725	12.00	8.00	1.75	5.50	1.55	1.55	4.00	40.00	2.00	6.81	7.16	1.05	0.25
TCUM2728	12.00	8.00	1.75	5.50	1.55	1.55	4.00	40.00	2.00	7.10	7.05	0.95	0.20
TCUM2817	12.00	8.00	1.75	5.50	1.55	1.55	4.00	40.00	2.00	4.60	7.50	1.20	0.25
TCUM4527	24.00	12.0	1.75	11.50	1.55	1.50	4.0	40.00	2.0	7.38	12.0	1.05	0.30
Tolerance	±0.30	±0.10	±0.10	±0.10	±0.05	±0.10	±0.10	±0.20	±0.10	±0.10	±0.10	±0.10	±0.05

12.2 Reel Dimensions:



Unit: mm

Reel Type / Tape	W	M	A	B	C	D
7" reel for 8 mm embossed (TCUM1206 series only)	12.00± 0.5	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 12 mm embossed	16.2 ± 0.5	178 ± 1.0	2.5 ± 0.5	13.5 ± 0.5	17.7 ± 0.5	60.0 ± 0.5
7" reel for 24 mm embossed (TCUM4527 series only)	24.4 +2/-0	178 ± 1.0	2.0 ± 0.5	13.2 ± 0.5	17.7 ± 0.5	60.0 ± 0.5