

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°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)).

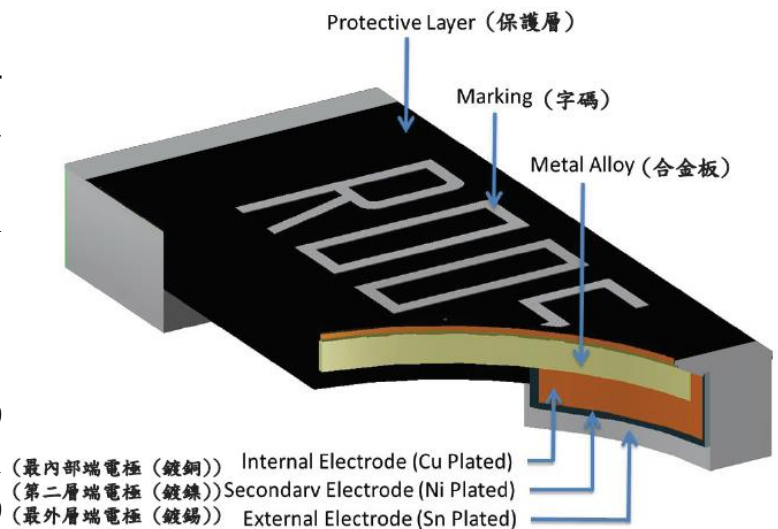
2.7 Compliant to RoHS directive 2011/65/EU and Halogen free (符合 RoHS 指令 2011/65/EU 指令與無鹵的要求).

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 | |

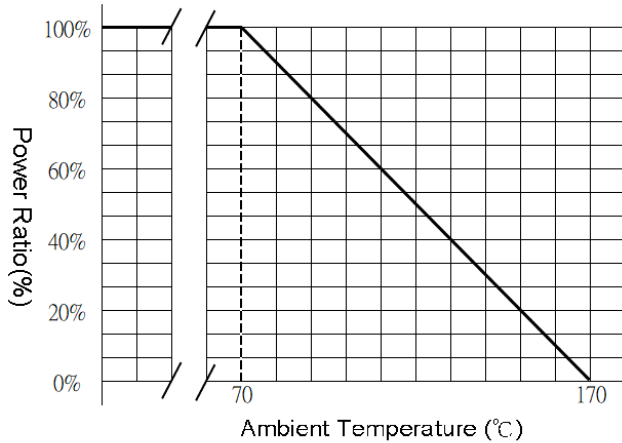
Remark 備註:

- 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"> • 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"> • 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% | R003: 3mΩ R100: 100mΩ |

Remark 備註:

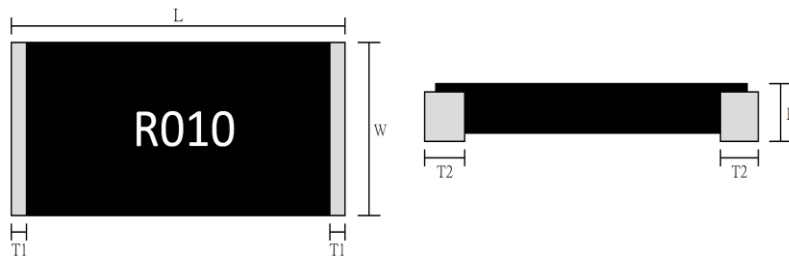
a. “*” The packing quantity per reel are listed below (“*”:每個膠盤可裝的產品數量):

| 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 |

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 | 0.5mΩ | | | 0.820±0.254 | 1.980±0.254 | 1.15±0.254 | 2.000±0.254 |
| | | 0.75 mΩ | | | 0.700±0.254 | 1.980±0.254 | | |
| | | 1mΩ | | | 0.720±0.254 | 2.200±0.254 | | |
| | | 1.5mΩ | | | | 1.400±0.254 | | |
| | | 2~5mΩ | | | | 1.150±0.254 | | |
| | | 6mΩ | | | 0.550±0.254 | 1.100±0.254 | | |
| | 7~10mΩ | 0.600±0.254 | | | | | | |
| | 11~75mΩ | 0.550±0.254 | | | 1.05±0.254 | | | |
| | 76~100mΩ | | | | 0.75±0.254 | | | |
| | 101~135mΩ | 0.470±0.254 | | | | | | |
| | 136~200mΩ | 0.400±0.254 | | | | | | |
| | 201~450mΩ | | | | 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 | | | | 0.75±0.254 | |
| | | 7~10 mΩ | | | | | |
| | | 11~75mΩ | | | 0.550±0.254 | 0.75±0.254 | |
| | | 76~100mΩ | | | | | |
| 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 | | | | | |
| | | | | | | | |
| 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 | | |
| | | 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 | | |
| | | 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”).

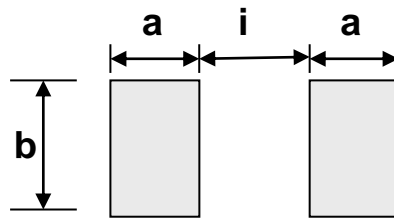
9.3 “m” designates the decimal location in milli-ohms, e.g. 0.25mΩ the product marking is 0m25, 0.5mΩ the product marking is 0m50, 5.5mΩ the product marking is 5m50 and 25.5mΩ the product marking is 25m5.

(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 |

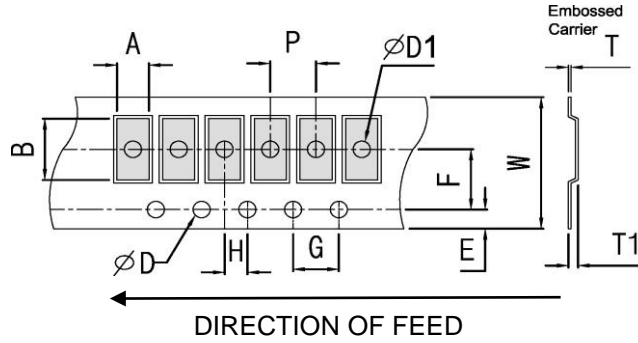
11. Product Reliability Performance(產品可靠度特性):

| 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"> 1206-0.75W: 5 times of rated power 1206-1W: 5 times of rated power 2512-1W: 5 times of rated power 2512-2W: 5 times of rated power 2512-3W: 5 times of rated power^{*(Note)*} 2725-4W: 4 times of rated power 2728-4W: 4 times of rated power 4527-2W: 5 times of rated power 4527-3W: 5 times of rated power 4527-5W: 3 times of rated power for 5 seconds. | <ul style="list-style-type: none"> 4527: $\Delta R/R1 \leq \pm 2.0\%$ The others: $\Delta R/R1 \leq \pm 0.5\%$ |
| High Temperature Exposure | JIS-C5201-1 4.25 IEC 60068-2-2 | At 170°C for 1000 hours. | <ul style="list-style-type: none"> 4527: $\Delta R/R1 \leq \pm 2.0\%$ The others: $\Delta R/R1 \leq \pm 1.0\%$ |
| 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"> 4527: $\Delta R/R1 \leq \pm 2.0\%$ The others: $\Delta R/R1 \leq \pm 1.0\%$ |
| 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:

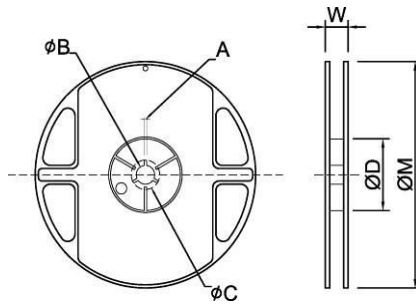


■ Dimension

Unit : mm

| Item | Resistance Range (mΩ) | W | P | E | F | ϕD | $\phi D1$ | 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 ^{+0.1} ₀ | 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%