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Metal film milli-ohm (10~300mΩ) chip resistors (CRM) are made in chip size from 0201 to 2512 for Calchip. These resistors apply as current detecting resistor for applications such as power supplies, computers, HDDs, Cellular telephones, etc.

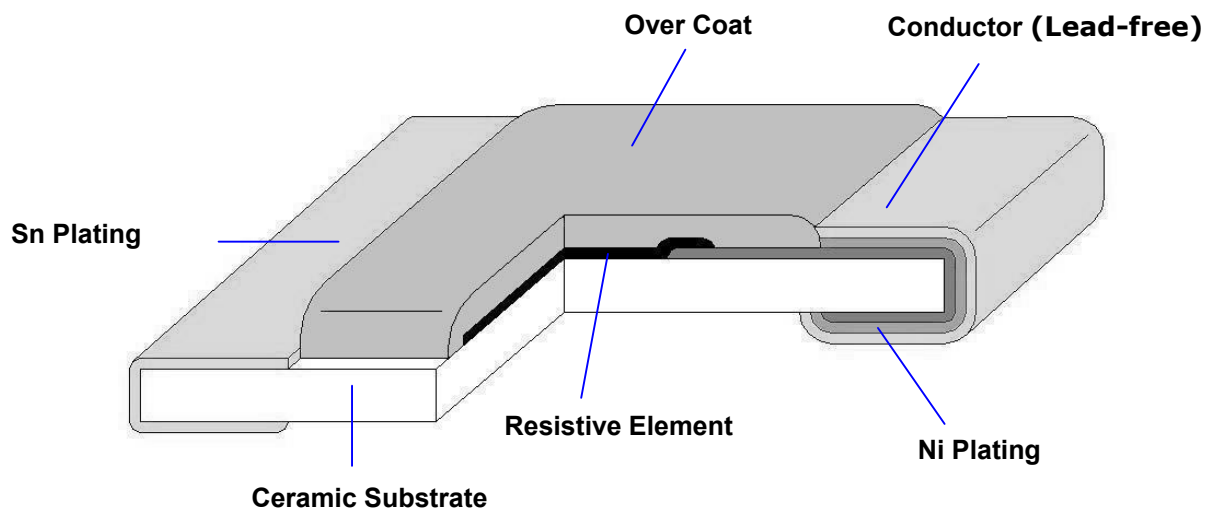
1. Features

- Low Resistance and High Accuracy Resistor for Current Detection
- Homogeneous Ni Alloy Films
- High Purity Alumina Substrate for High Power Dissipation
- Pb-free to Meet RoHS Requirements

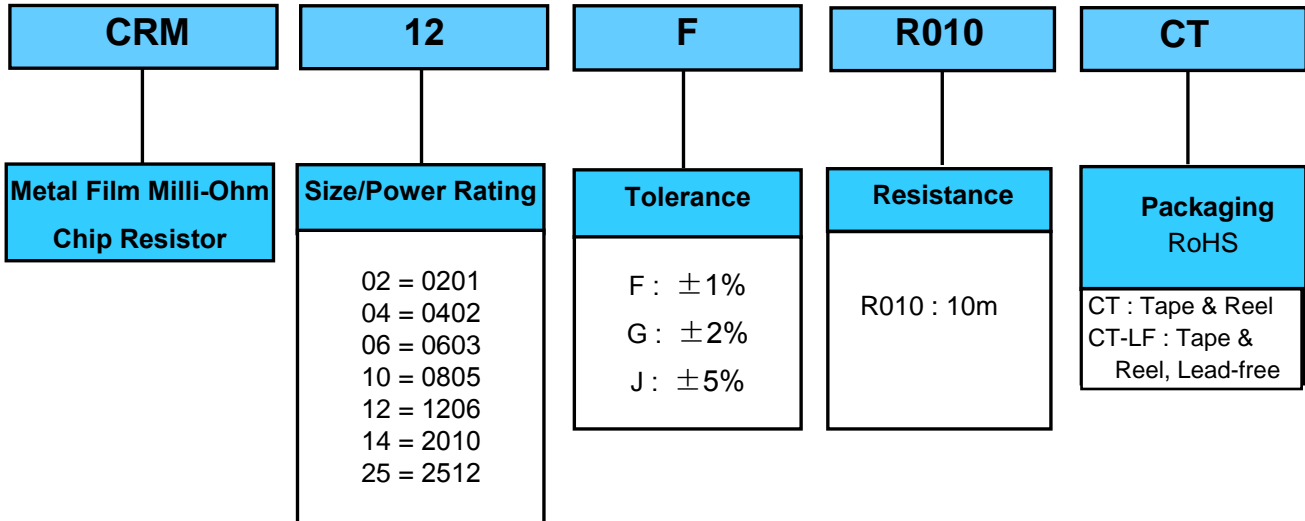
2. Applications

- Power Management Applications
- Switching Power Supply
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Portable Instruments (PDA and Cell Phone)
- Voltage Regulation Module (VRM)
- Computer

3. Construction:



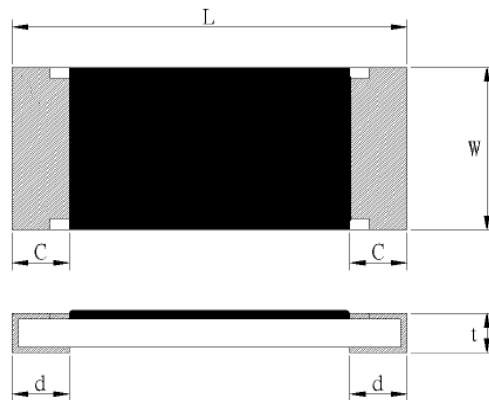
4. Type Designation:



5. Ratings, Characteristics, and Dimensions:

Chip Size	Power Rating	TCR (ppm/°C)	Resistance Range (mΩ)			Operating Temp. Range	Dimension (mm)				
			F:±1%	G:±2%	J:±5%		L	W	t	c	d
0201	0.1W	± 700	–	–	20~33	-55°C~+125°C	0.6±0.03	0.3±0.03	0.27±0.05	0.12±0.05	0.15±0.05
		± 500	36~100								
		± 300	101~300								
0402	0.125W	± 500	–	–	20~30		1.0±0.1	0.55±0.05	0.38±0.05	0.2±0.1	0.25±0.10
		± 300	33~43								
		± 200	47~300								
0603	0.2W	± 500	10~30				1.6±0.1	0.85±0.10	0.48±0.10	0.3±0.2	0.30±0.20
		± 350	33~43								
		± 150	47~300								
0805	0.25W	± 500	10~30			2.0±0.1	1.30±0.10	0.57±0.10	0.35±0.2	0.40±0.20	
		± 350	33~43								
		± 150	47~300								
1206	0.5W	± 400	10~30			3.1±0.2	1.60±0.10	0.62±0.10	1.0±0.3	0.40±0.20	
		± 250	33~43								
		± 150	47~91								
			100~300								

2010	0.75W	± 400	10~30			5.0±0.2	2.60±0.20	0.62±0.10	1.7±0.3	0.5±0.25
		± 250	33~43							
		± 150	47~91							
			100~300							
2512	1W	± 400	10~30			6.3±0.2	3.20±0.20	0.62±0.10	1.9±0.3	0.5±0.25
		± 250	33~43							
		± 150	47~91							
			100~300							



Derating Curve :

For resistors operated at ambient temperature over 70°C, power rating shall be derated in accordance with figure 1.

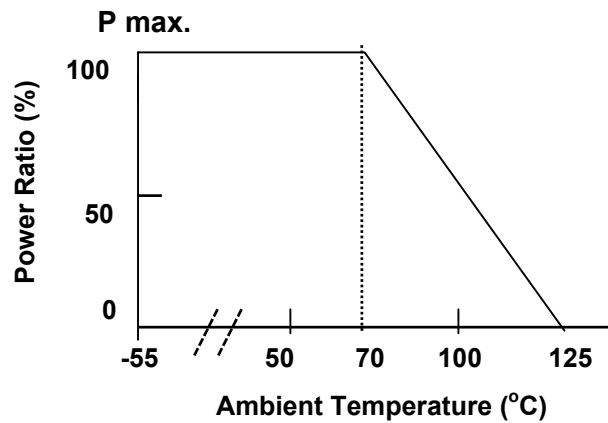


Figure 1

6. Marking:

From 0805 to 2512:

Resistance value is expressed by 4 digits, the first “R” means decimal point and the other digits represent for the normal resistance in Ω .

eg., $15m\Omega = R015$, $100m\Omega = R100$,

For 0603:

The marking of CRM06 can not represent by 4 digits but by 3 digits.

(a) Resistance value higher than or equals to $100m\Omega$ is represented by E96 series. However, for resistance value not in the list of E96, 3 digitals with underline in E24 series is used.

eg., $100m\Omega = 01Z$, $200m\Omega = 08Z$, $120m\Omega = \underline{012}$

Code	E24	E96
01	10	100
05	11	110
12	13	130
18	15	150
30	20	200

Symbol for multipliers

Symbol	A	B	C	D	E	F	G	H	X	Y	Z
multipliers	10^0	10^1	10^2	10^3	10^4	10^5	10^8	10^7	10^{-1}	10^{-2}	10^{-3}

(b) Resistance value lower than $100m\Omega$ is represented by 2 digits plus a symbol L.

eg., $10m\Omega = 10L$, $20m\Omega = 20L$, $47m\Omega = 47L$

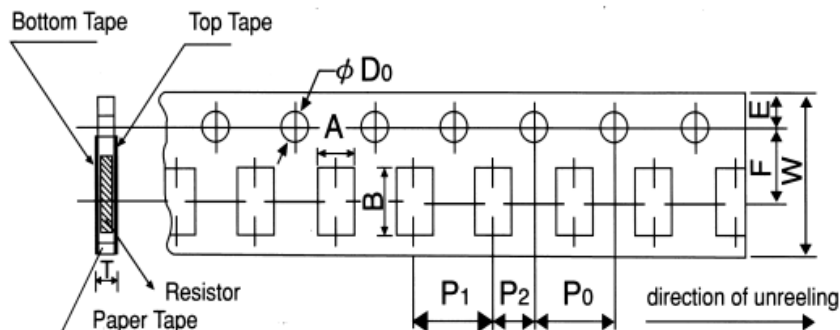
For 0402 and 0201: No Marking.

7. Reliability Tests: (As specified in JIS C 5202)

Test Items	Condition of Test	Test Limits	Reference standard
TCR (Temperature Coefficient of Resistance)	-55 ~ +125 °C	Refer to paragraph 5	JIS-C5202 - 5.2
Short Time Overload	2.5 X rated voltage, 5s	0201:± (2%+0.001 Ω) others: ± (1%+0.001 Ω)	JIS-C5202 - 5.5
Load Life	Apply rated power at 70°C for 1000 hours, 1.5hours "ON" and 0.5hour "OFF"	0201:± (3%+0.001 Ω) others: ± (2%+0.001 Ω)	JIS-C5202 - 7.10
Moisture Resistance	Storage at 40±2°C and 90~95% RH for 1000h	0201:± (3%+0.001 Ω) others: ± (2%+0.001 Ω)	JIS-C5202 - 7.9
Rapid Change of Temperature	-55 °C (30 min.) / +125 °C (30 min.) 100 cycles	± (1%+0.001 Ω)	JIS-C5202 - 7.4
Resistance to Soldering Heat	270±5 °C solder , 10±1 sec dwell	0201:± (2%+0.001 Ω) others: ± (1%+0.001 Ω)	JIS-C5202 - 6.10
Solderability	245±5 °C solder, 2±0.5 sec dwell. Solder : Sn96.5 / Ag3.0 / Cu0.5	At least 95% of surface area of electrode shall be covered with new solder.	JIS-C5202 - 6.11
Robustness of Termination (Bending Strength)	3mm deflection	0201:± (2%+0.001 Ω) others: ± (1%+0.001 Ω)	JIS-C5202 - 6.1
High Temperature Exposure	125 ±5 °C for 1000 hrs	± (1%+0.001 Ω)	JIS-C5202 - 7.2

8. Taping & Reel

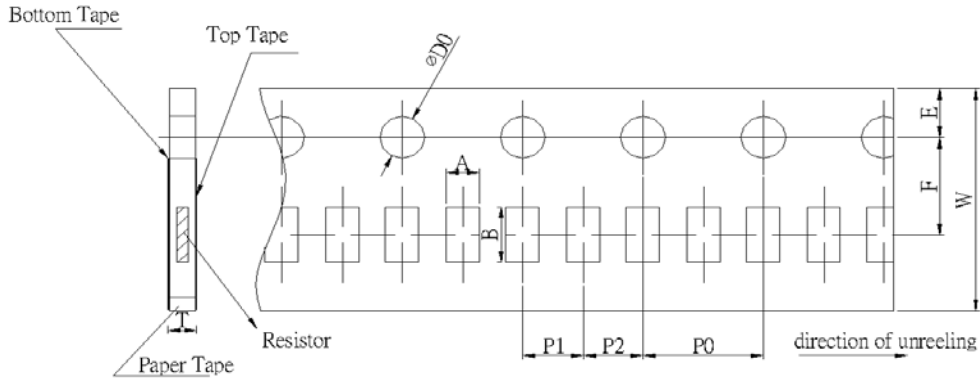
8.1 Taping Dimensions: 4 mm pitch paper



UNIT: mm

Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Paper Tape	CRM06	1.1 ± 0.10	1.9 ± 0.1	8.0 ± 0.2	3.5 ± 0.05	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	φ1.5	0.64 ± 0.1
	CRM10	1.6 ± 0.15	2.4 ± 0.2								0.84 ± 0.1
	CRM12	2.0 ± 0.15	3.6 ± 0.2								0.84 ± 0.1

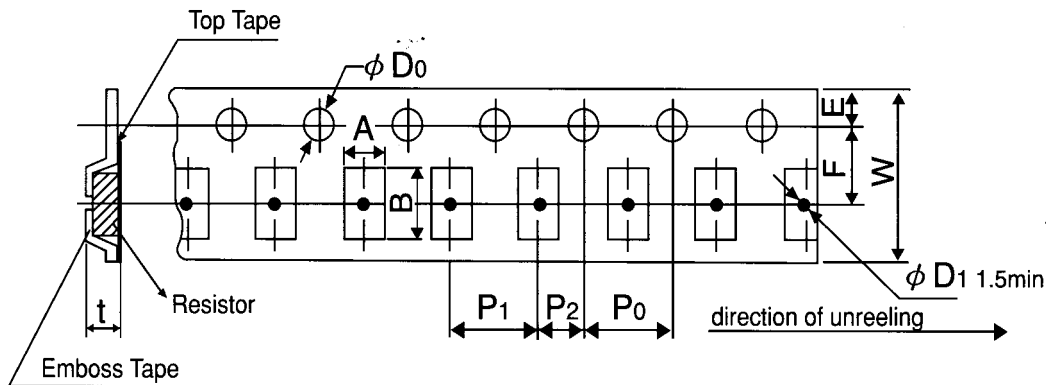
8.2 Taping Dimensions: 2 mm pitch paper



UNIT:mm

Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Paper Tape	CRM02	0.37±0.05	0.67±0.1	8.0±0.2	3.5±0.05	1.75±0.1	2.0±0.1	2.0±0.05	4.0±0.1	+0.1 1.5 -0	0.37±0.1
	CRM04	0.7±0.05	1.2±0.05	8.0±0.2	3.5±0.05	1.75±0.1	2.0±0.1	2.0±0.1	4.0±0.1	+0.1 1.5 -0	0.45±0.1

8.3 Taping Dimensions: 4 mm Emboss

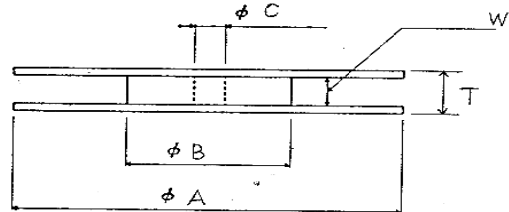
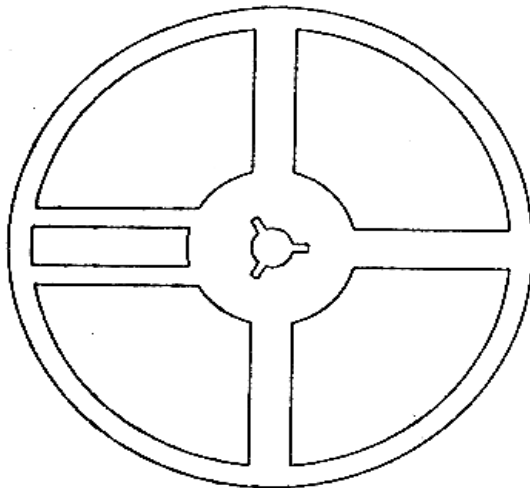


UNIT:mm

Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Emboss	CRM20	2.8±0.2	5.3±0.2	12.0±0.2	5.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.05	+0.1 1.5 -0	0.85±0.15
	CRM25	3.6±0.2	6.9±0.2								

Type Size		Paper Tape		Emboss Plastic Tape 4 mm pitch
		4 mm pitch	2 mm pitch	
		178mm/R	178mm/R	
CRM	02		10000	
	04		10000	
	06	5000		
	10	5000		
	12	5000		
	20			4000
	25			4000

8.4 Reel Specifications



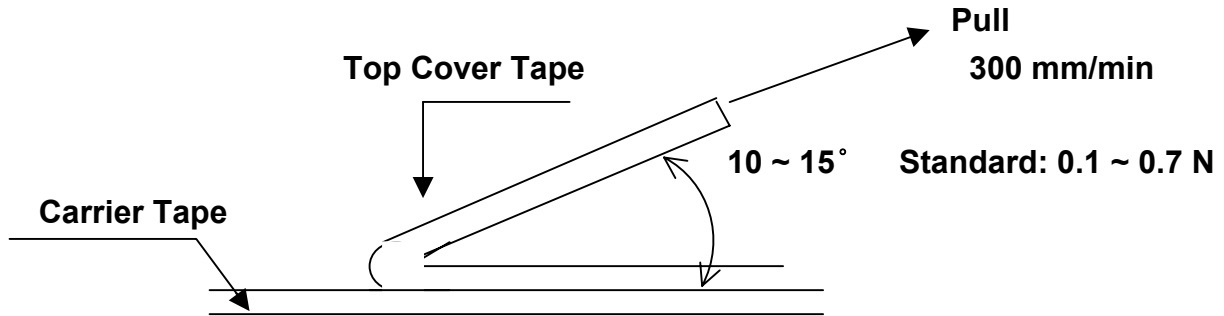
Series	ϕA	ϕB	ϕC	W	T
CRM02/04/06/10/12	178 ± 2.0	60.0 ± 1.0	13.0 ± 1.0	9.0 ± 1.0	11.5 ± 1.0
CRM 20/25				13.0 ± 1.0	15.5 ± 1.0

(Unit : mm)

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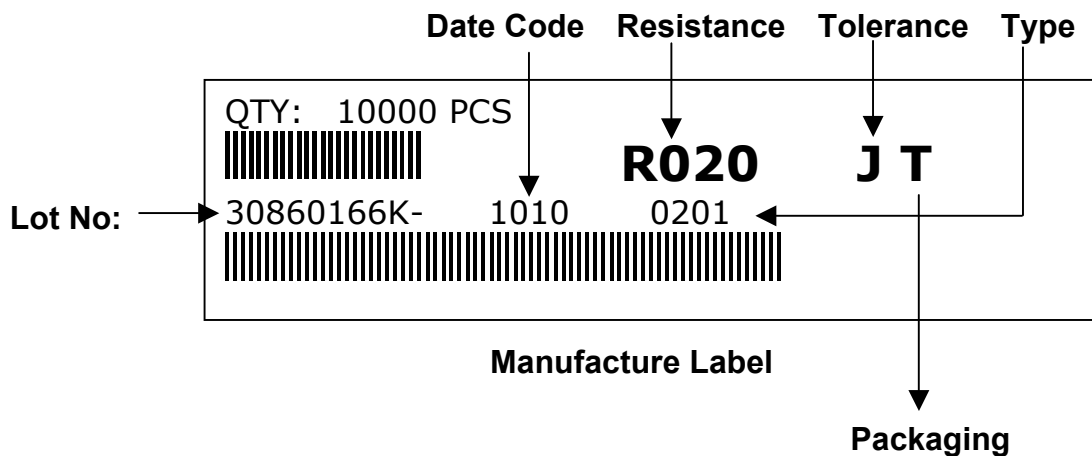
8.5 Peel-off force :

Peel-off force of paper and blister tape is in accordance with "JIS", that is 0.1 to 0.7 N at a peel-off speed of 300 mm/minute.



9. Label

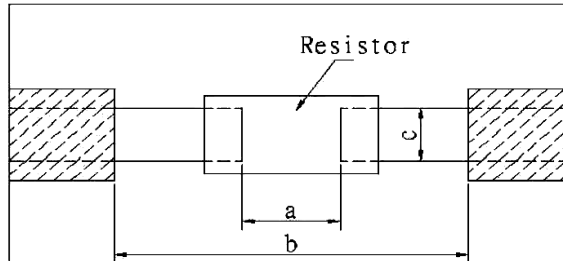
9.1 Manufacture Label :



9.2 Customer Label (By customer request):

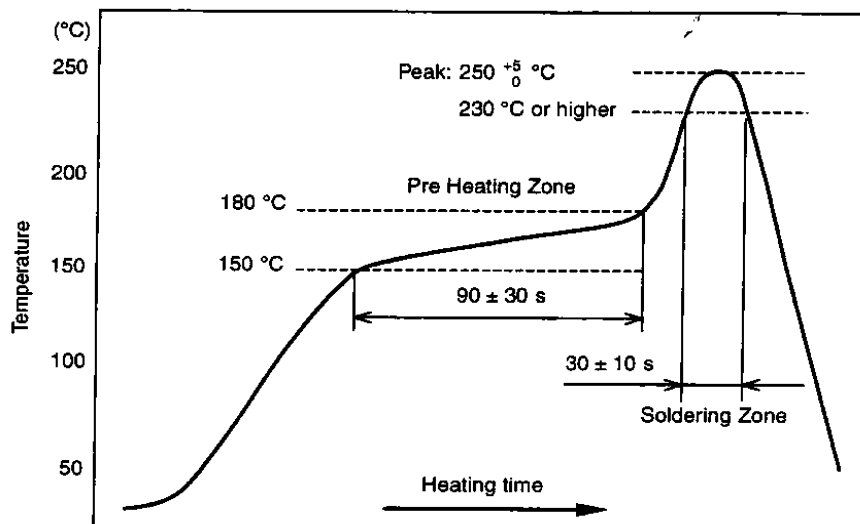


10. Recommended land patterns



Type	Land pattern Size	Dimension (mm)		
		a	b	c
CRM	02 (0201)	0.25~0.3	0.7~0.9	0.3~0.4
	04 (0402)	0.5~0.6	1.4~1.6	0.4~0.6
	06 (0603)	0.7~0.9	2.0~2.2	0.8~1.0
	10 (0805)	1.0~1.4	3.2~3.8	0.9~1.4
	12 (1206)	2.0~2.4	4.4~5.0	1.2~1.8
	20 (2010)	3.3~3.7	5.7~6.5	2.3~3.5
	25 (2512)	3.6~4.0	7.6~8.6	2.3~3.5

11. Recommend IR – Reflow profile : (Lead-Free solder : Sn96.5 / Ag3.0 / Cu0.5)



Peak : 250 $\begin{matrix} +5 \\ -0 \end{matrix}$ °C , 5 sec

Pre-heat Zone : 150 to 180°C, 90±30 sec

Soldering Zone : 230°C or higher , 30±10 sec



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12. Storage Conditions:

Temperature: 5°C~35°C, Humidity: 40%~75%

13. Shelf Life:

2 years from manufacturing date

14. ECN

Engineering Change Notice: The customer will be informed with ECN if there is significant modification on the characteristics and materials described in Approval Sheet.