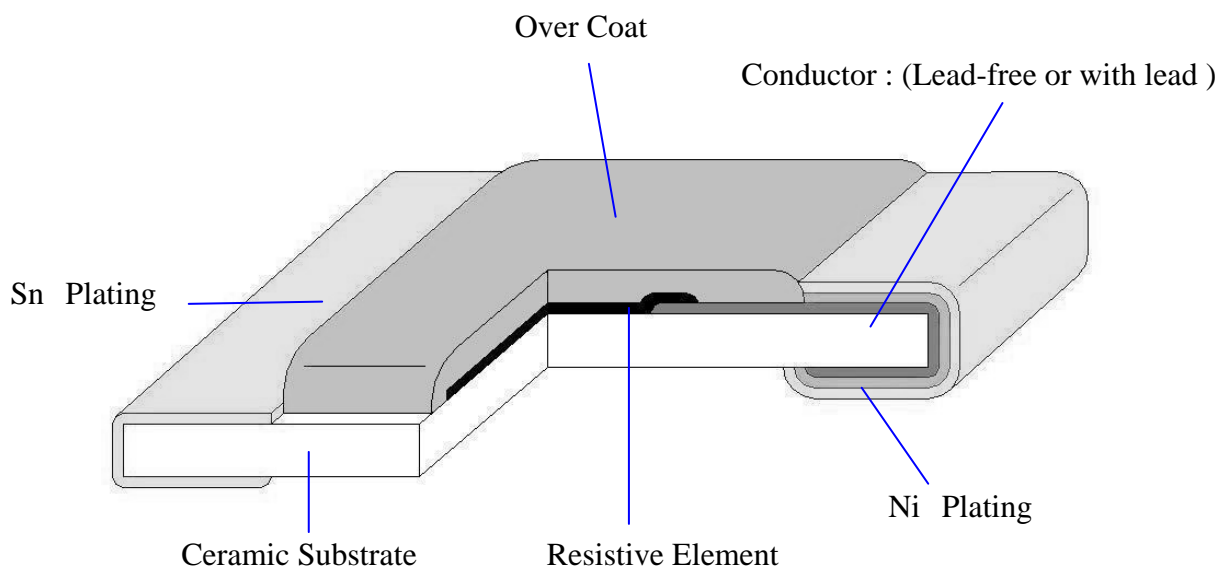


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1. Scope :

This specification applies for the RL series of thick film chip resistors made by MQEC.

2. Construction:



3. Type Designation:

RL

Product Code
RL : Chip Resistor

10

Size
Power Rating

F

Tolerance

TN

Packaging

R100

Nominal
Resistance

04-0402(1005) 1/16W
06-0603(1608) 1/8W
10-0805(2012) 1/4W
12-1206(3216) 1/2W
20-2010(5025) 3/4W
25-2512(6432) 1W

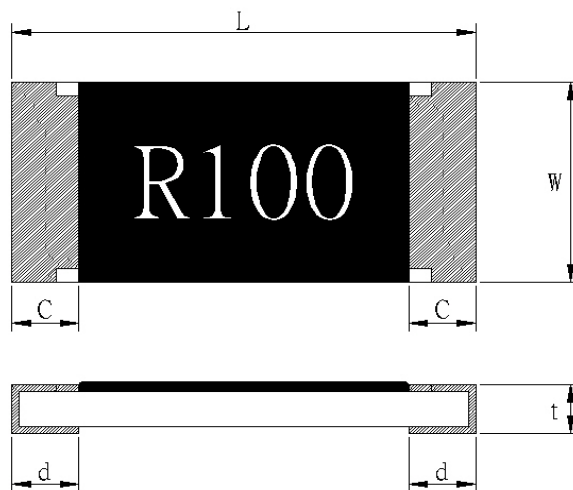
J- $\pm 5\%$
G- $\pm 2\%$
F- $\pm 1\%$

T-Paper Tape
E-Embossed Tape
N-Lead Free

3 Digits e.g.,5%
(E24) R10=0.1 Ω
4 Digits e.g.,1%
(E96) R100=0.1 Ω

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4. Dimensions:



UNIT: mm

Type	L	W	C	d	t
RL04	1.00 ^{+0.10} / _{-0.05}	0.50 ±0.05	0.20 ±0.10	0.25 ±0.10	0.35 ±0.05
RL06	1.60 ±0.10	0.80 ±0.10	0.30 ±0.20	0.35 ±0.20	0.45 ±0.10
RL10	2.00 ±0.10	1.25 ±0.10	0.40 ±0.20	0.35 ±0.20	0.50 ±0.10
RL12	3.10 ±0.20	1.55 ±0.10	0.50 ±0.30	0.40 ±0.20	0.55 ±0.10
RL20	5.00 ±0.20	2.50 ±0.20	0.60 ±0.30	0.50 ±0.25	0.55 ±0.10
RL25	6.30 ±0.20	3.20 ±0.20	0.60 ±0.30	0.50 ±0.25	0.55 ±0.10

5. Electrical characteristics :

Characteristics	Feature						Measurement Method
	RL04	RL06	RL10	RL12	RL20	RL25	
Power Ratings (W)	1/16W	1/8W	1/4W	1/2W	3/4W	1W	JIS Code 3A / JIS Code 3D
Resistance Value (mΩ)	200 ~ 910		100 ~ 910				Refer to JIS C 5202 5.1
T.C.R (ppm / °C)	200~500mΩ: ±300 501~910mΩ: ±200		±200				Refer to JIS C 5202 5.2
Operation Temperature Range(°C)	-55 ~ +125						
Resistance Tolerance (%)	± 1%, ± 2%, ± 5%						JIS C 5201 4.2.5
Insulation Resistance (MΩ)	Over 100						Refer to JIS C 5202 5.6 Mounting condition G
Maximum Working Voltage (V)	$(P * R)^{1/2}$						

Note : Except for the above standardized products, we also provide the customized products.

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5.1 Derating Curve :

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

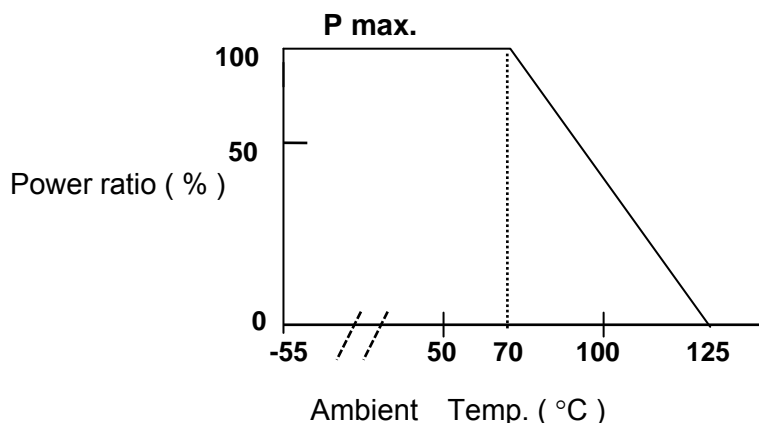


Figure 1

6. Reliability Test:(As specified in JIS C 5202)

Test Item	Reference standard	Condition of Test	Test Limits
Temperature Coefficient of Resistance	JIS-C5202-5.2	-55 ~ +125°C	Refer to paragraph 5
Short Time Overload	JIS-C5202-5.5	2.5 X rated voltage, 5s	1%:± (1%+0.005 Ω) 2%,5%:± (3%+0.005 Ω) Remark : 0402±(2%+0.005 Ω)
Load Life	JIS-C5202-7.10	1000 hours at rated power , 70°C, 1.5hours "ON ", 0.5hour "OFF"	1%:± (1%+0.001 Ω) 2%,5%:± (3%+0.001 Ω) Remark : 0402±(3%+0.005 Ω)
Load Life with Humidity	JIS-C5202-7.9	1000 hours at rated power , 40 ± 2°C, 90~95% RH 1.5hours "ON ", 0.5hour "OFF"	1%:± (1%+0.001 Ω) 2%,5%:± (3%+0.001 Ω) Remark : 0402±(3%+0.005 Ω)
Rapid Change of Temperature	JIS-C5202-7.4	-55°C (30 min.) / +125 °C(30 min.) 5 cycles	± 1%+0.005 Ω
Resistance to Soldering Heat	JIS-C5202-6.10	270 ± 5°C solder , 10 ± 1 sec dwell .	± 1%+0.005 Ω
Solderability	JIS-C5202-6.11	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.
Robustness of Termination (Bending Strength)	JIS-C5202-6.1	3mm deflection	± 1%+0.005Ω
Resistance to Dry Heat	JIS-C5202-7.2	125 ± 5°C for 96 ± 4hrs	1%: ± (1%+0.005 Ω) 2%,5%:± (2%+0.005 Ω)

Note* :RCWV : Rated continuous working voltage .

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7. Marking

7.1 Type: 0805,1206,2010,2512

7.1.1 E96: 1%

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

e.g., R100 = 100 m Ω

7.1.2 E24: 2%,5%

Resistance value is expressed by 3 digits, the first "R" means decimal point and the other digits represent for the normal resistance in Ω .

e.g., R10 = 100 m Ω

7.2 Type: 0603

7.2.1 E96: 1%

When the marking space is too small in such small-sized resistors as RL06, the marking can not made by 4 digits and may be made by two digits combined with one English capital.

Significant figures of nominal resistance

Symbol	E24	E96
01	10	100
02	11	110
03	12	
04	13	130
05	15	150
06	16	
07	18	
08	20	200
09	22	
10	24	
11	27	
12	30	
13	33	
14	36	
15	39	
16	43	
17	47	
18	51	
19	56	
20	62	
21	68	
22	75	750
23	82	
24	91	

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	10^6	10^7	10^{-1}	10^{-2}	10^{-3}

e.g., 01Z = 100 $\times 10^{-3}$ = 100 m Ω

Notes :

When the resistance value is not in the list of E96 , 3 digitals with underline in E-24 series is used as mark .

e.g., 0603 : 120m Ω , 1% Marking is 012

7.2.2 E24: 2%,5%

Resistance value is expressed by 3 digits, the first "0" means decimal point and the other digits represent for the normal resistance in Ω .

e.g., 010 =100 m Ω

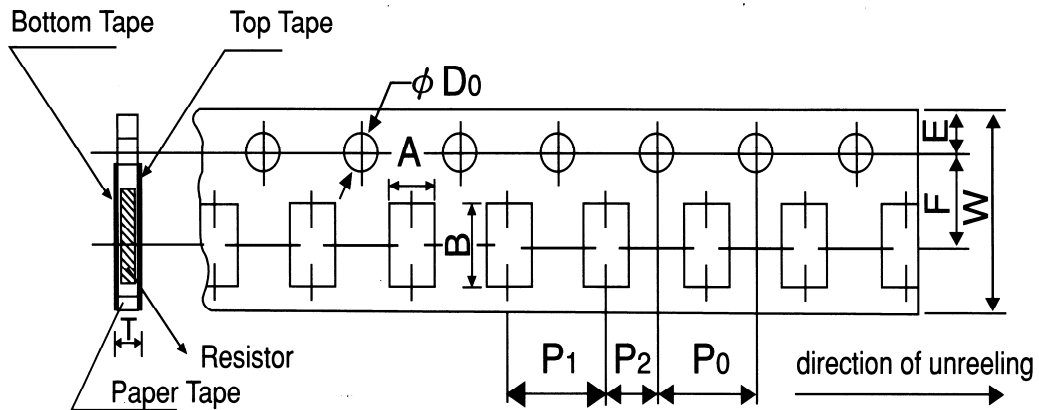
7.2 Type: 0402

RL04 : No Marking

8. Taping & Reel

8.1 Taping Dimensions

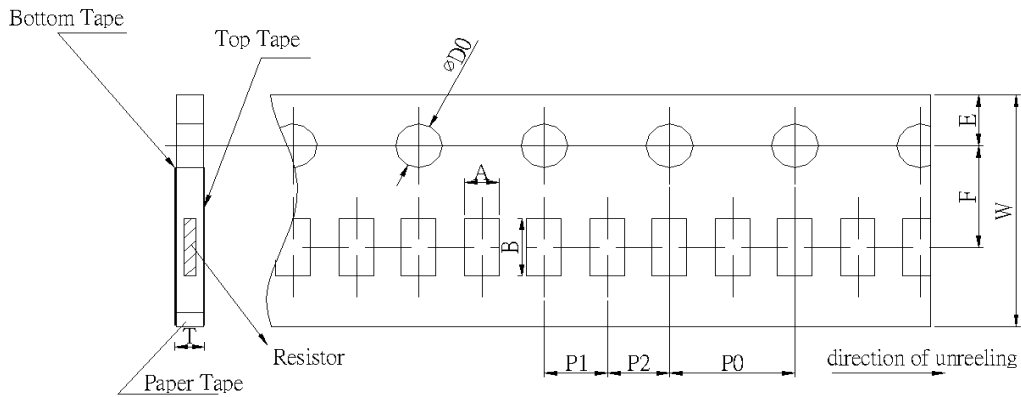
8.1.1 4 mm pitch paper



UNIT: mm

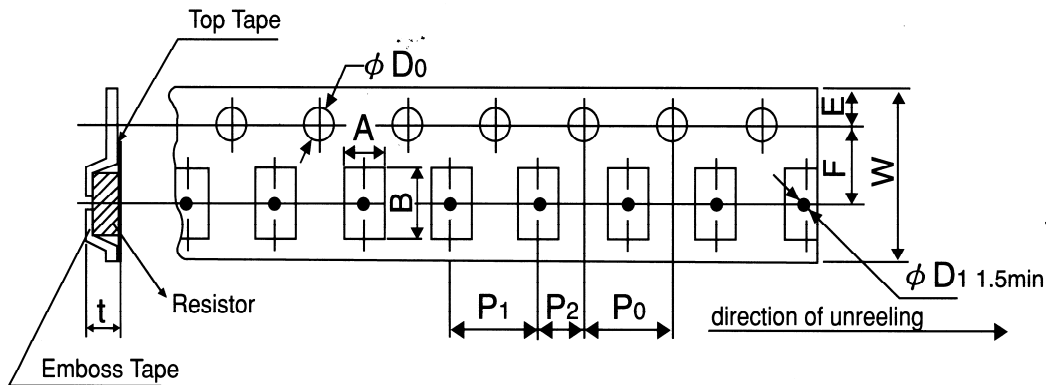
Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Paper Tape	RL06	1.1 ±0.1	1.9 ±0.1	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	ψ 1.5	0.64 ±0.1
	RL10	1.6 ±0.15	2.4 ±0.2								+0.1
	RL12	2.0 ±0.15	3.6 ±0.2								-0

8.1.2 2 mm pitch paper



Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Paper Tape	RL04	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	φ 1.5 +0.1 -0	0.45 ±0.1
	RL06	1.1 ±0.1	1.9 ±0.1	8.0 ±0.2	3.5±0.05	1.75±0.1	4.0 ±0.1	2.0 ±0.1	4.0 ±0.1	φ 1.5 +0.1 -0	0.64 ±0.1

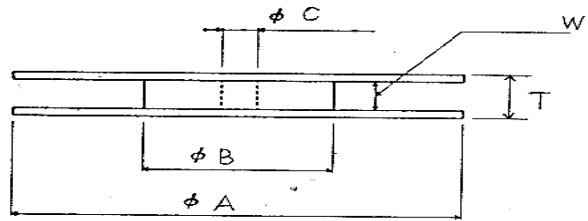
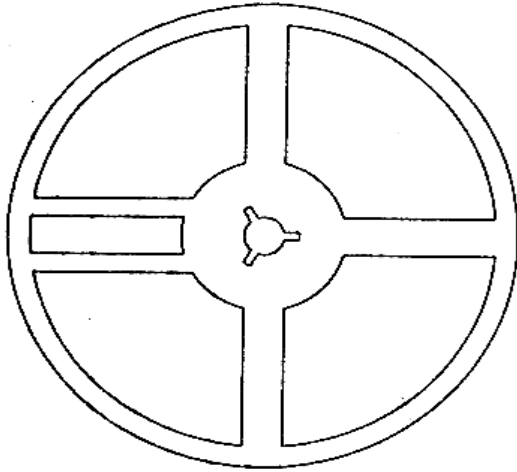
8.1.3 4 mm pitch Emboss



Packing	Type	A	B	W	F	E	P ₁	P ₂	P ₀	D ₀	T
Emboss	RL20	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	φ 1.5 +0.1 -0	0.85 ±0.15
	RL25	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	
RL	04		10000	
RL	06	5000	10000	
RL	10	5000		
RL	12	5000		
RL	20			4000
RL	25			4000

8.2 Reel Specifications

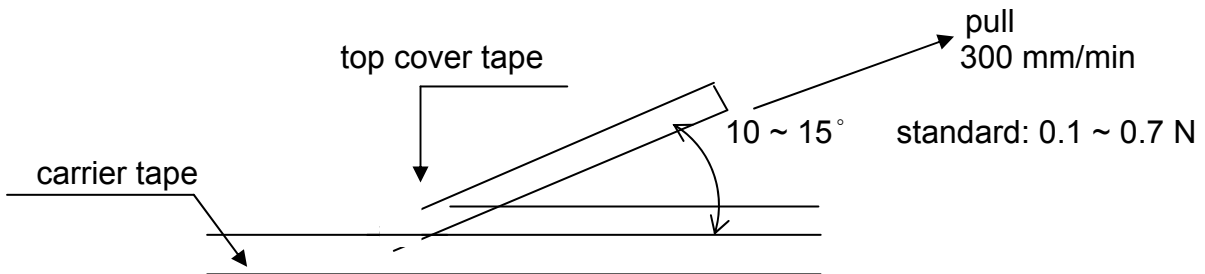


UNIT: mm

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

8.3 Peel – off force :

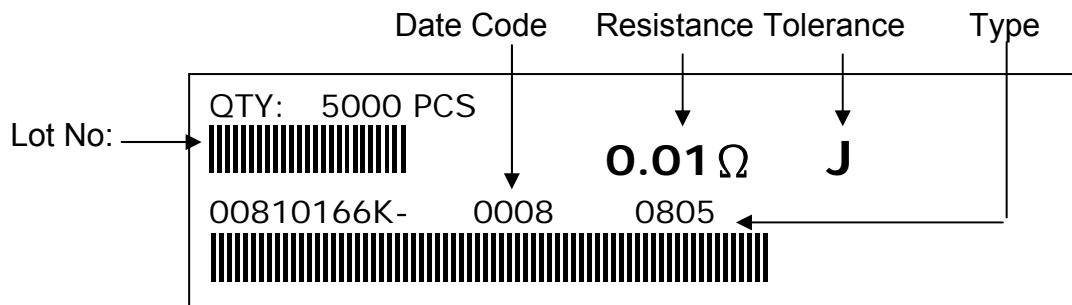
Peel – off force of paper and blister tape is in accordance with “JIS ” that is , 0.1 to 0.7 N at a peel-off speed of 300 mm / minute.



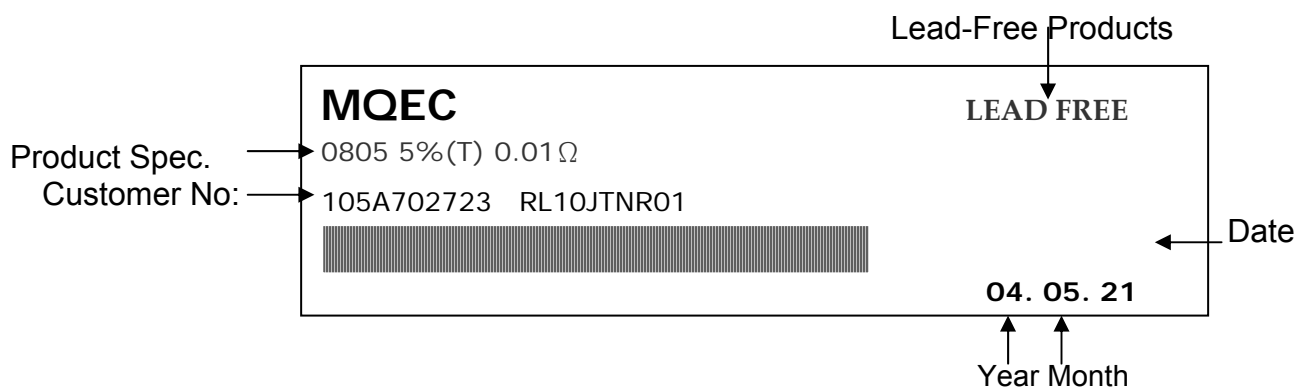
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9. Label

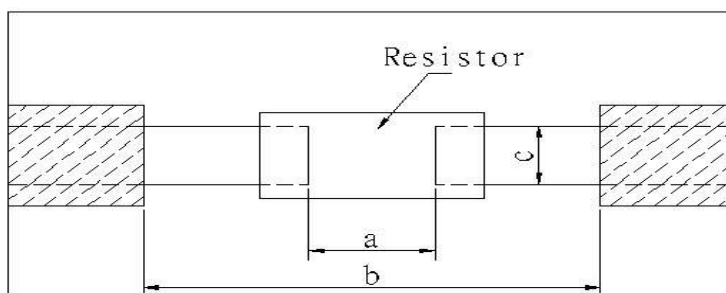
9.1 Manufacture Label :



9.2 Customer Label: (By customer request)

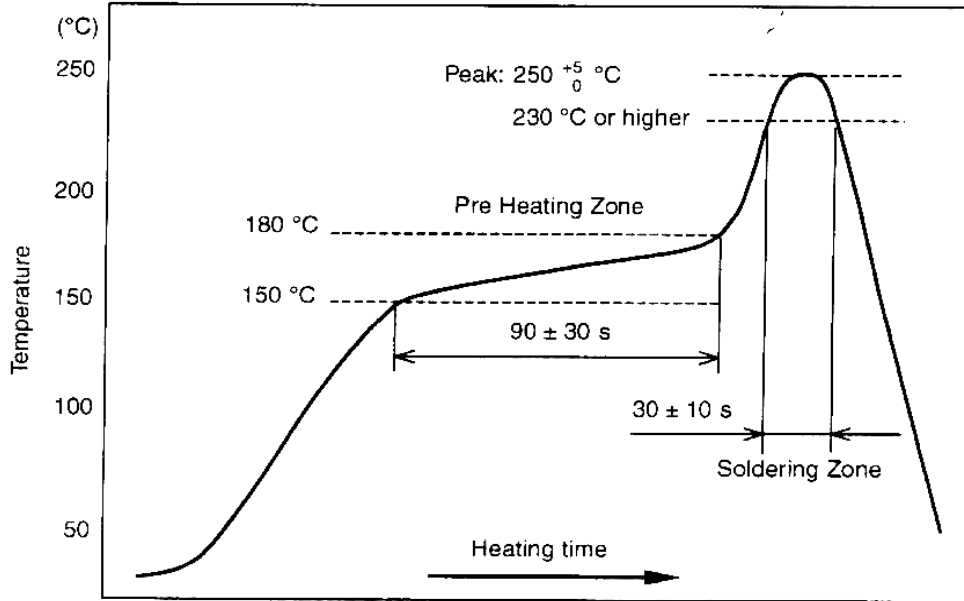


10. Recommended land patterns



Type	Land pattern Size	Dimension (mm)		
		a	b	c
RL	04(1005)	0.5~0.6	1.4~1.6	0.4~0.6
RL	06 (0603)	0.7~0.9	2.0~2.2	0.8~1.0
RL	10 (0805)	1.0~1.4	3.2~3.8	0.9~1.4
RL	12 (1206)	2.0~2.4	4.4~5.0	1.2~1.8
RL	20 (2010)	3.3~3.7	5.7~6.5	2.3~3.5
RL	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 / Cu0.5)



Peak : 250 ⁺⁵ / ₋₀ °C , 5 sec

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

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

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.