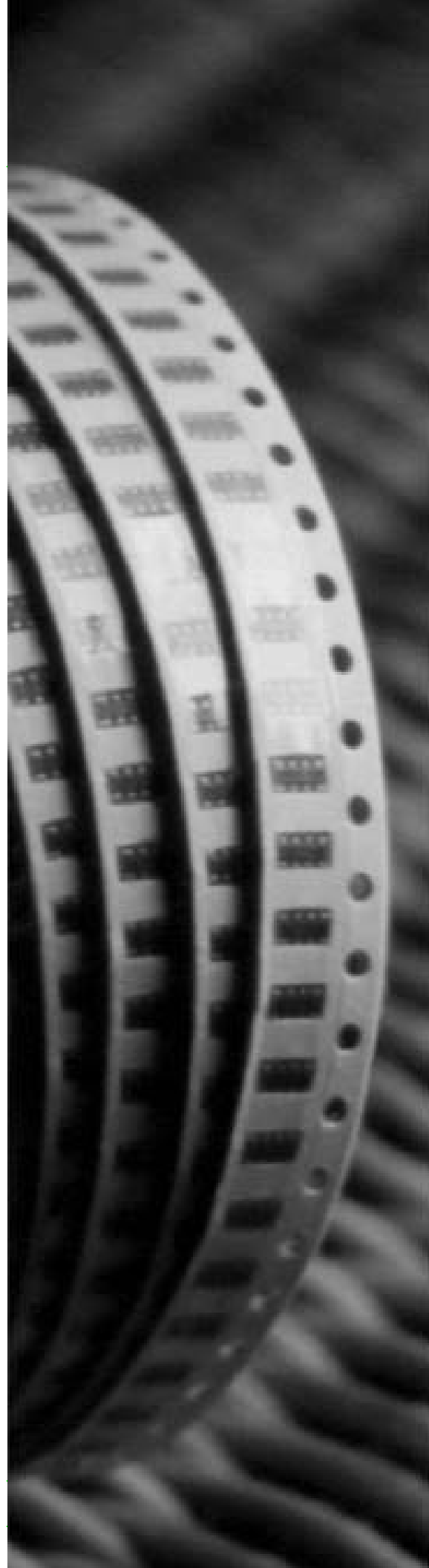


DATA SHEET

CHIP RESISTORS

RL Series

5%; 1%



SCOPE

This specification describes RL series chip resistors made by thick film process.

ORDERING INFORMATION

Part number is identified by the series, size, tolerance, packing style, temperature coefficient, special type and resistance value.

RL XXXX X X X XX XXXX
(1) (2) (3) (4) (5) (6)

(1) SIZE

0402=0.040×0.020

0603=0.063×0.033

0805=0.083×0.051

1206=0.122×0.063

1210=0.122×0.102

2010=0.197×0.098

2512=0.250×0.126

(2) TOLERANCE

F = ±1%

J = ±5%

(3) PACKAGING TYPE

R = Paper taping reel

K = Embossed Plastic Tape Reel

C = Bulk case

(4) TEMPERATURE CHARACTERISTIC OF RESISTANCE

– = Base on spec

(5) SPECIAL TYPE

07 = 7 inch dia. Reel

10 = 10 inch dia. Reel

13 = 13 inch dia. Reel

(6) RESISTANCE VALUE:

R056, R56

Remark: E24 (E48/96 on request)

MARKING

RL0805 / RL1206 / RL1210 / RL2010 / RL2512



Fig. 1 Value=20mΩ

Either tolerance in 5% or 1%: 4 digits
Uses MIL Standard resistance marking
“R” signifies decimal place

RL0603- R≥100mR IN E-24 SERIES



Fig. 2 Value=220mΩ

10mΩ, 20mΩ, 30mΩ, 40mΩ, 50mΩ, 60mΩ
3 digits
Uses MIL Standard resistance marking
“R” signifies decimal place

RL0402 / ALL STYLE NOT IN E-24 SERIES / R<100mR FOR RL0603



Fig. 3

No marking

CONSTRUCTION

The resistors are constructed out of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive paste. The composition of the paste is adjusted to give the approximate required resistance and laser cutting of this resistive layer that achieves tolerance trims the value. The resistive layer is covered with a protective coat and printed with the resistance value. Finally, the two external terminations are added. See fig. 4

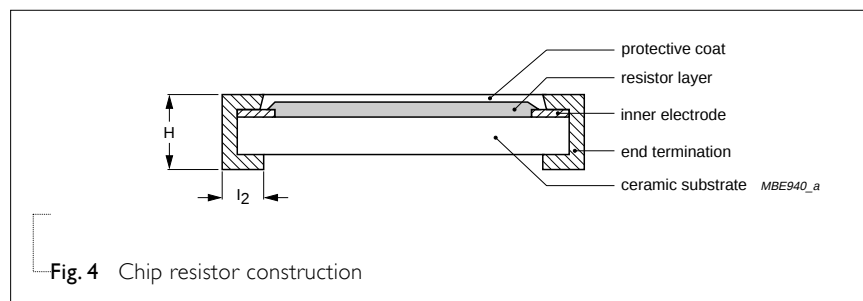
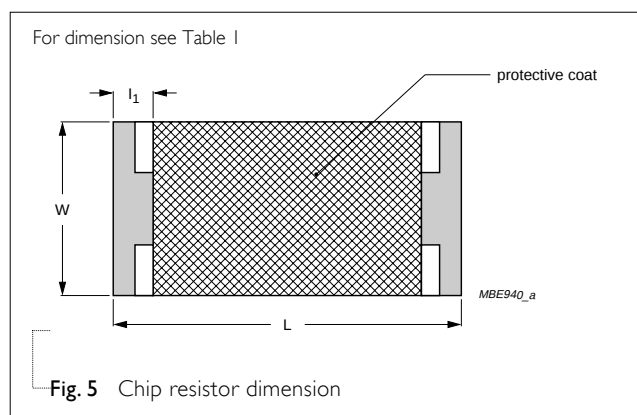


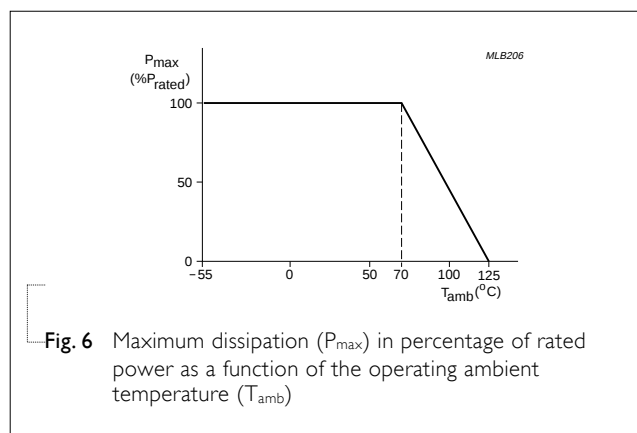
Fig. 4 Chip resistor construction

DIMENSION**Table I**

TYPE	L (mm)	W (mm)	H (mm)	I ₁ (mm)	I ₂ (mm)
RL0402	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
RL0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
RL0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
RL1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
RL1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.20	0.50±0.20
RL2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.20	0.50±0.20
RL2512	6.35±0.10	3.20±0.15	0.55±0.10	0.60±0.20	0.50±0.20

POWER RATING**RATED POWER AT 70°C:**

RL0402=1/16W, RL0603=1/10W, RL0805=1/8W, RL1206=1/4W, RL1210=1/2W, RL2010=3/4W, RL2512=1W

**RATED VOLTAGE:**

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{P \times R}$$

Where

V=Continuous rated DC

or AC (rms) working voltage (V)

P=Rated power (W)

R=Resistance value (Ω)

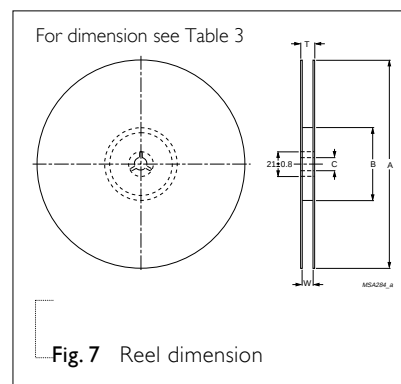
ELECTRICAL CHARACTERISTICS**Table 2**

CHARACTERISTICS	OPERATING TEMPERATURE RANGE	DERATED TO 0 LOAD AT	RESISTANCE RANGE	TEMPERATURE COEFFICIENT	
				10m Ω ≤Rn<100m Ω	100m Ω ≤Rn<1 Ω
RL0402	-55°C to +125°C	+125°C	100m Ω ≤Rn<1 Ω	---	±800ppm/°C
RL0603	-55°C to +125°C	+125°C	10m Ω ≤Rn<1 Ω	±1,500ppm/°C	±600ppm/°C
RL0805	-55°C to +125°C	+125°C	10m Ω ≤Rn<1 Ω	±1,500ppm/°C	±600ppm/°C
RL1206	-55°C to +125°C	+125°C	10m Ω ≤Rn<1 Ω	±1,500ppm/°C	±600ppm/°C
RL1210	-55°C to +125°C	+125°C	10m Ω ≤Rn<1 Ω	±1,500ppm/°C	±600ppm/°C
RL2010	-55°C to +125°C	+125°C	10m Ω ≤Rn<1 Ω	±1,500ppm/°C	±600ppm/°C
RL2512	-55°C to +125°C	+125°C	10m Ω ≤Rn<1 Ω	±1,500ppm/°C	±600ppm/°C

TAPING REEL

Table 3

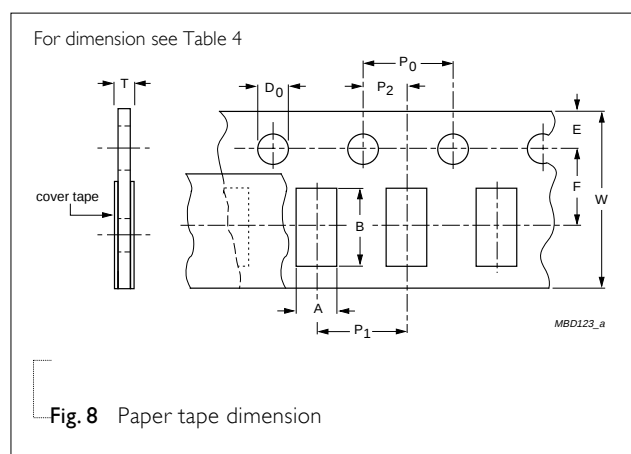
DIMENSION	RL0402	RL0603	RL0805	RL1206	RL1210	RL2010	RL2512
PACKAGING	Paper	Paper	Paper	Paper	Paper	Embossed	Embossed
TAPE	8mm	8mm	8mm	8mm	8mm	12mm	12mm
ØA (mm)	180+0/-3	180+0/-3	180+0/-3	180+0/-3	180+0/-3	180+0/-3	180+0/-3
ØB (mm)	60+1/-0	60+1/-0	60+1/-0	60+1/-0	60+1/-0	60+1/-0	60+1/-0
ØC (mm)	13.0±0.2	13.0±0.2	13.0±0.2	13.0±0.2	13.0±0.2	13.0±0.2	13.0±0.2
W (mm)	9.0±0.3	9.0±0.3	9.0±0.3	9.0±0.3	9.0±0.3	13.0±0.3	13.0±0.3
T (mm)	11.4±1	11.4±1	11.4±1	11.4±1	11.4±1	15.4±1	15.4±1



PAPER TAPE SPECIFICATION

Table 4

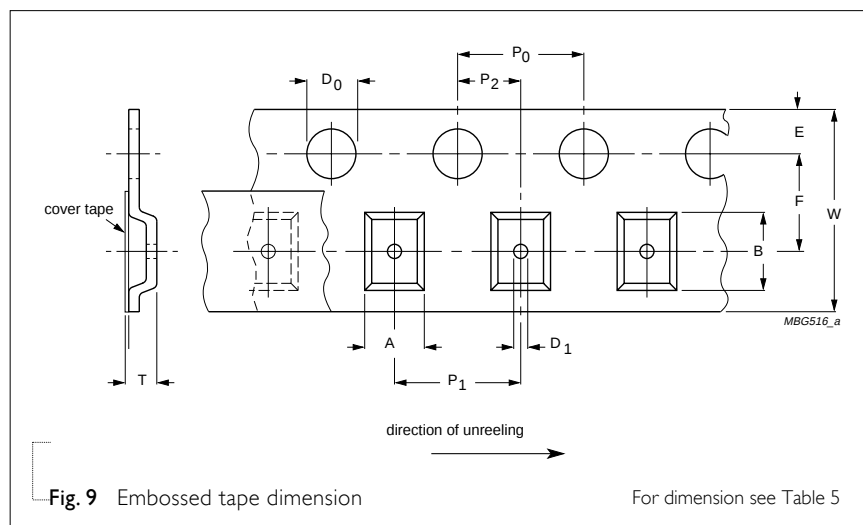
DIMENSION	RL0402	RL0603	RL0805	RL1206	RL1210
A (mm)	0.65±0.1	1.1±0.1	1.65±0.1	1.90±0.1	2.80±0.1
B (mm)	1.15±0.1	1.90±0.1	2.40±0.1	3.50±0.1	3.50±0.1
W (mm)	8.0±0.2	8.0±0.2	8.0±0.2	8.0±0.2	8.0±0.2
E (mm)	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1	1.75±0.1
F (mm)	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05	3.5±0.05
P ₀ (mm)	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1	4.0±0.1
P ₁ (mm)	2.0±0.05	4.0±0.05	4.0±0.05	4.0±0.05	4.0±0.05
P ₂ (mm)	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05
ØD ₀ (mm)	1.5+0.1/-0	1.5+0.1/-0	1.5+0.1/-0	1.5+0.1/-0	1.5+0.1/-0
T (mm)	0.53±0.10	0.70±0.10	0.85±0.10	0.85±0.10	0.85±0.10



EMBOSSED TAPE SPECIFICATION

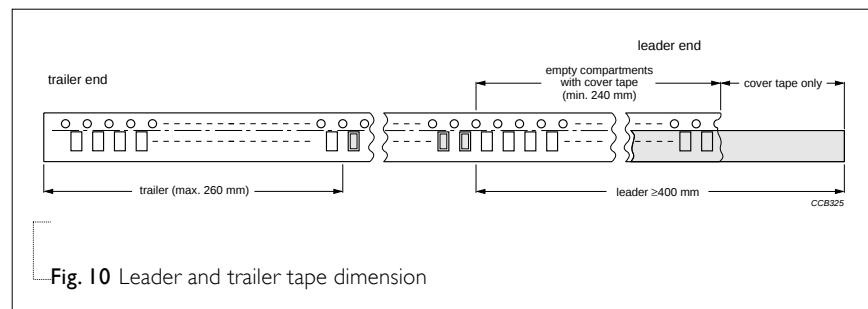
Table 5

DIMENSION	RL2010	RL2512
A (mm)	2.80±0.2	3.5±0.2
B (mm)	5.4±0.2	6.7±0.2
W (mm)	12.0±0.3	12±0.3
E (mm)	1.75±0.1	1.75±0.1
F (mm)	5.5±0.05	5.5±0.05
P ₀ (mm)	4.0±0.1	4.0±0.1
P ₁ (mm)	4.0±0.1	4.0±0.1
P ₂ (mm)	2.0±0.05	2.0±0.05
ØD ₀ (mm)	1.5+0.1/-0	1.5+0.1/-0
ØD ₁ (mm)	1.5+0.25/-0	1.5+0.25/-0
T (mm)	1.0±0.1	1.0±0.1



PACKING METHOD

LEADER/TRAILER TAPE SPECIFICATION



BULK CASSETTE

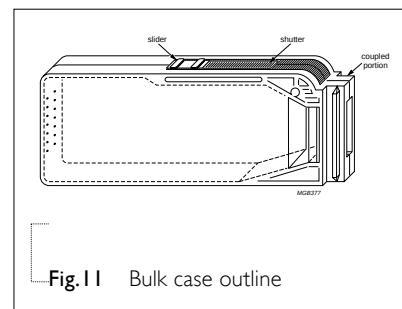


Table 6 Packing style and packaging quantity

PACKING STYLE	REEL DIMENSION	RL0402	RL0603	RL0805	RL1206	RL1210	RL2010	RL2512
Paper Taping Reel (R)	7" (178 mm)	10,000	5,000	5,000	5,000	5,000	---	---
	10" (254 mm)	20,000	10,000	10,000	10,000	10,000	---	---
	13" (330 mm)	50,000	20,000	20,000	20,000	20,000	---	---
Embossed Taping Reel (K)	7" (178 mm)	---	---	---	---	---	4,000	4,000
Bulk Cassette (C)		50,000	25,000	10,000	---	---	---	---

TYPE	TEST METHOD	ACCEPTANCE STANDARD
Temperature Coefficient of Resistance (T.C.R.)	Measure resistance at +25°C or specified room temperature as R₁, then measure at -55°C or +125°C respectively as R₂. Determine the temperature coefficient of resistance from the following formula: Formula $T.C.R. = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ Where t₁ = +25°C or specified room temperature t₂ = -55°C or +125°C test temperature R₁ = resistance at reference temperature in ohms R₂ = resistance at test temperature in ohms	Refer to table 2
Thermal Shock	At -55±3°C for 2 minutes and at +125±2°C for 2 minutes as one cycle. After 5 cycles, the specimen shall be stabilized at room temperature. Measure the resistance to determine ΔR/R(%) after one more hour.	±1.0%
Low Temperature Operation	Place the specimen in a test chamber maintained at -65 (+0/-5)°C. After one hour stabilization at this temperature, full rated working voltage shall be applied for 45 (+5/-0) minutes. Have 15 (+5/-0) minutes after remove the voltage, the specimen shall be removed from the chamber and stabilized at room temperature for 24 hrs. Measure the resistance to determine ΔR/R(%).	±1.0% No mechanical damage
Short Time Overload	Apply 2.5 times of rated voltage but not exceeding the maximum overload voltage for 5 seconds. Have the specimen stabilized at room temperature for 30 minutes minimum. Measure the resistance to determine ΔR/R(%).	±1.0% for 1% tolerance ±2.0% for 5% tolerance No evidence of mechanical damage
Insulation Resistance	Place the specimen in the jig and apply a rated continues overload voltage (R.C.O.V) for one minute. Measure the insulation resistance.	≥10,000MΩ
Dielectric Withstand Voltage	Place the specimen in the jig and apply a specified value continuous overload voltage for one minute.	Breakdown voltage > specification and without open/short
Resistance To Soldering Heat	Immerse the specimen in the solder pot at 260±5°C. for 10±1 seconds. Have the specimen stabilized at room temperature for 30 minutes minimum. Measure the resistance to determine ΔR/R(%).	±1.0% No visible damage

TYPE	TEST METHOD	ACCEPTANCE STANDARD
Moisture Resistance	Place the specimen in the test chamber and subject to 42 damp heat cycles. Each one of which consists of the steps 1 to 7 as figure 13. The total length of test is 1,000 hours. Have the specimen stabilized at room temperature for 24 hours after testing. Measure the resistance to determine $\Delta R/R(\%)$.	$\pm 2.0\%$ No visible damage
Life	Place the specimen in the oven at $70 \pm 2^\circ\text{C}$. Apply the rated voltage to the specimen at the 1.5 hours on and 0.5 hour off cycle. The total length of test is 1,000 hours. Have the specimen stabilized at room temperature for one hour minimum after testing. Measure the $\Delta R/R(\%)$.	$\pm 2.0\%$ for 1% tolerance $\pm 3.0\%$ for 5% tolerance
Solderability	Immerse the specimen in the solder pot at $235 \pm 5^\circ\text{C}$ for 5 sec.	At least 95% solder coverage on the termination

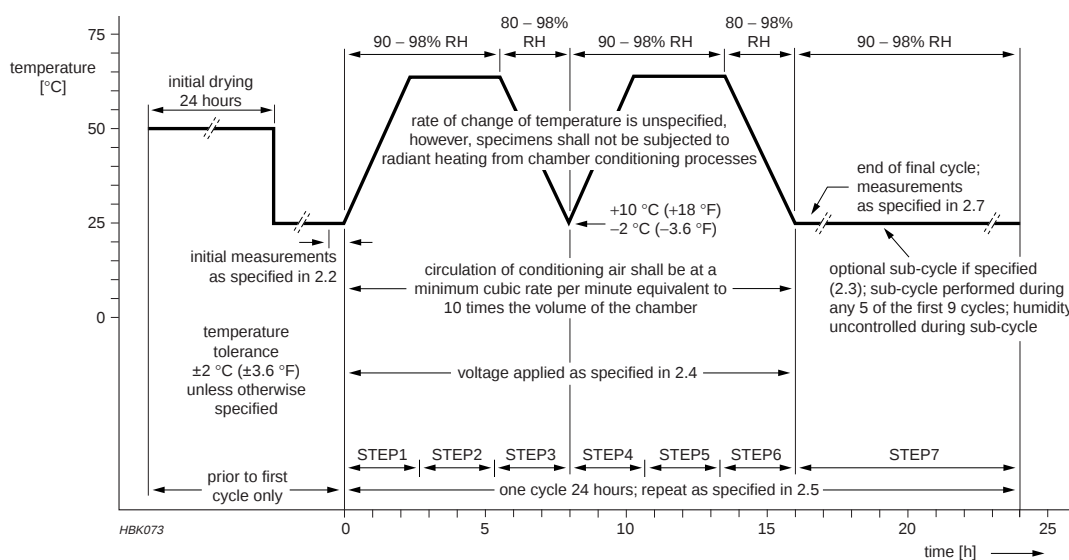


Fig. 13 Conditions by change of temperature