ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

OZDISAN ELEKTRONIK A.S.

Description : Thick Film Chip Resistors (Terminal Lead Free)

Royalohm Part no.:

25121WF470LT4E (RMC 1W (2512) +/- 1% 0.47Ω T/R-4,000)

Approved by

Parts corresponding to RoHS Compliant: 2005-Apr.-1

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Approved	Checked	Prepared
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Issue Date: 2017/07/31

CHANGE NOTIFICATION HISTORY			
Version	**Date of Version**	**History**	**Remark**
1	2017/07/31	Resistance Value: 0.47Ω	

Customer: OZDISAN ELEKTRONIK A.S.	Part No.: 25121WF470LT4E

1. Scope:

This specification for approval relates to Thick Film Chip Resistors (Terminal Lead Free) manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form:

	Type	Power Rating	Resistance tolerance	Nominal Resistance
Ex.	RMC 2512	1W	F	0.47Ω

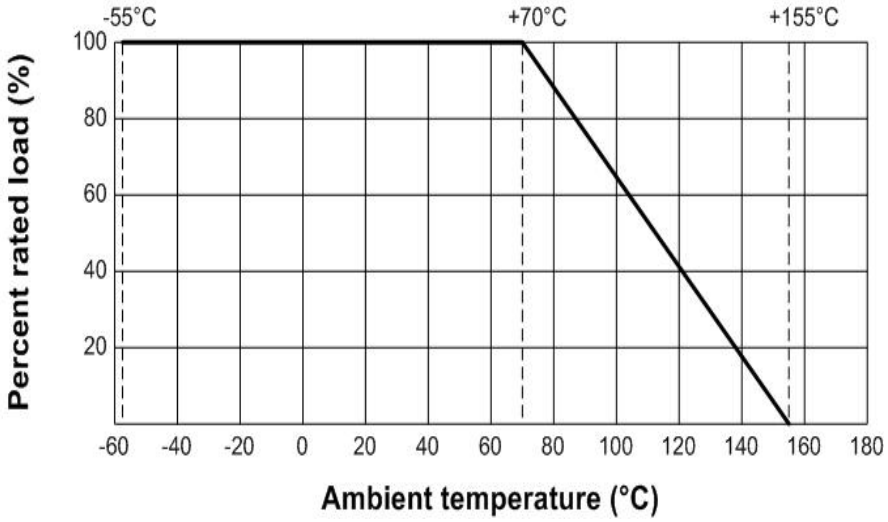
3. Ratings:

Type	RMC 2512
Power Rating	1W at 70℃
Max. Working Voltage	0.68 V
Max. Overload Voltage	1.71 V
Dielectric Withstanding Voltage	500 V
Temperature Range	-55℃～ +155℃
Ambient Temperature	70 ℃
Resistance Value	0.47Ω

3.1 Power rating:

Resistors shall have a power rating based on continuous load operation at an ambient temperature of 70 ℃ . For temperature in excess of 70 ℃ , The load shall be derate as shown in figure 1.

Figure 1

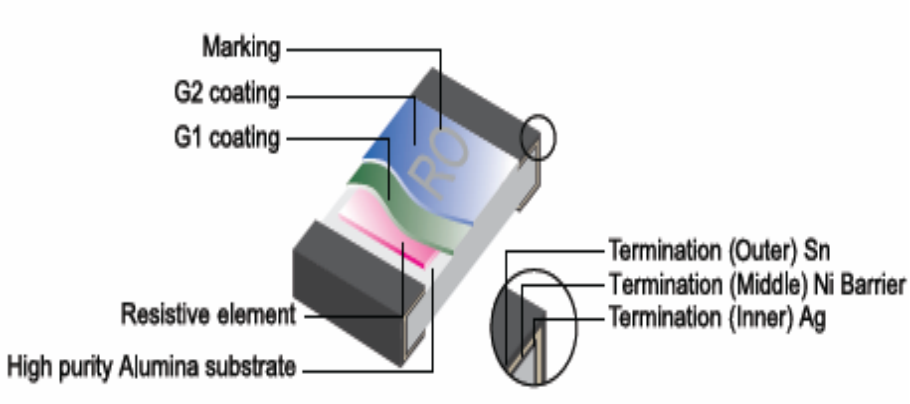


3.2 Nominal Resistance

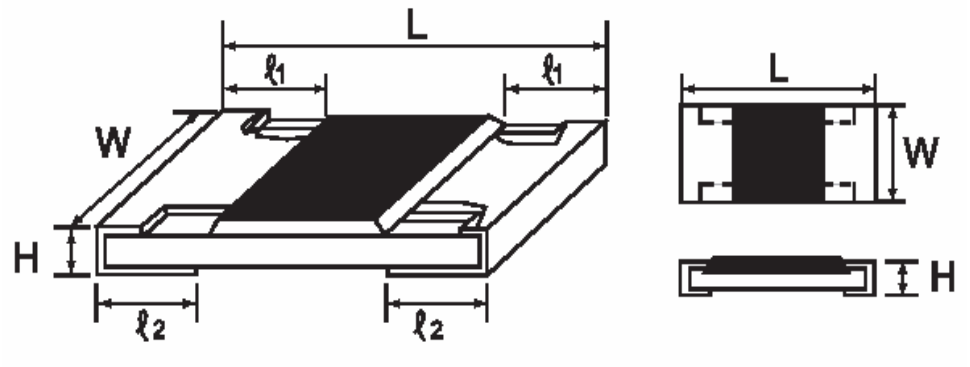
Effective figures of nominal resistance shall be in accordance with E-24 and E-96 series E-96 series for 1 % and E-24 series for 2 % and 5 %

Thick Film Chip Resistors (Terminal Lead Free)

4. Construction :



5. Power rating and dimensions



Dimension :

Type	Dimension (mm)				
	L ± 0.10	W ± 0.15	H ± 0.10	ℓ1± 0.25	ℓ2 ± 0.20
RMC 2512	6.35	3.20	0.55	0.60	0.50

Power Rating :

Type	Power Rating at 70 ℃	Tolerance %	Resistance Value	Standard Series
RMC 2512	1W	± 1	0.47Ω	E-96

Thick Film Chip Resistors (Terminal Lead Free)

6. Marking :

6.1 Resistors

A. Marking for E-96 series in 2512 size : 4 Digits

*The first 3 digits are singnificant figures of resistance and the 4th digit denoted number of zeros.

Ex. | | 2701 | | 2.7KΩ

*For ohmic values below 100 Ω, letter"R" is for decimal point.

Ex. | | R330 | | 0.33Ω

6.2 Labels

Label shall be marked with the following item :

A. Nominal Resistance and Resistance Tolerance

B. Power Rating and Size

C. Quantity

D. Part No.

E. P.O.No.

F. Lot No.

Ex.

ROYALOHM

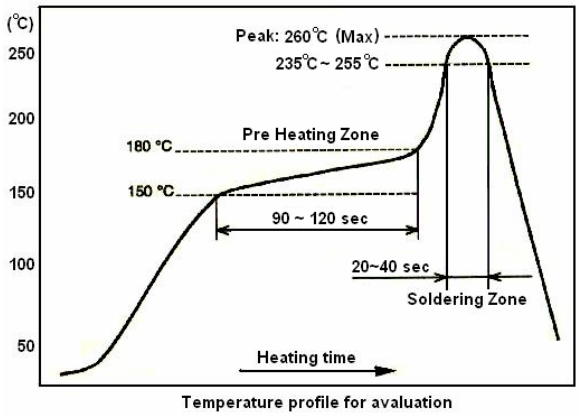
CHIP RESISTOR

RESISTANCE:	0.47	Ω	± 1 %
WATTAGE:	1W		SIZE: 2512
QUANTITY:	4,000	PCS	Pb-Free
PART NO.:			
P.O.NO.:			
LOT NO. :	6050008	25121WF470LT4E	

Remark : Label is 0R47, value is 0.47Ω, marking is R470

Thick Film Chip Resistors (Terminal Lead Free)

7. Performance specification :

Characteristics	Limits	Test Methods (JIS C 5201-1)
Insulation resistance	1,000 MΩ or more	Apply 500V DC between protective coating and termination for 1 min, then measure (Sub-clause 4.6)
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down	Apply 500V AC between protective coating and termination for 1 minute (Sub-clause 4.7)
Temperature coefficient	±800 PPM/℃	Natural resistance change per temp. degree centigrade. $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance value at room temperature (t1) R_2: Resistance value at room temp. plus 100 ℃ (t2) (Sub-clause 4.8)
Short time overload	Resistance change rate is ± (1.0% + 0.1Ω) Max.	Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds (Sub-clause 4.13)
Solderability	95 % coverage Min.	Test temperature of solder : 245 ± 3 ℃ Dwell time in solder : 2 ~ 3 seconds (Sub-clause 4.17)
Soldering temp. reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)	Wave soldering condition: (2 cycles Max.) Pre-heat : 100 ~ 120 ℃, 30 ± 5 sec. Suggestion solder temp.: 235 ~ 255 ℃, 10 sec. (Max.) Peak temp.: 260 ℃ Reflow soldering condition: (2 cycles Max.) Pre-heat : 150 ~ 180 ℃, 90 ~ 120 sec. Suggestion solder temp.: 235 ~ 255 ℃, 20 ~ 40 sec. Peak temp.: 260 ℃  Temperature profile for avaluation Hand soldering condition: The soldering iron tip temperature should be less than 300℃and maximum contract time should be 5 sec.

Thick Film Chip Resistors (Terminal Lead Free)

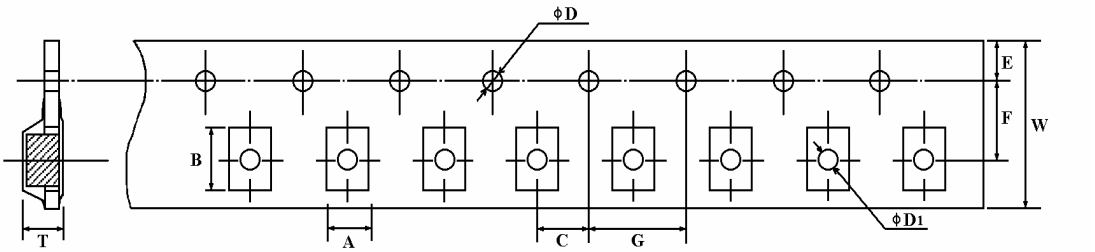
7. Performance specification :

<table>
<tr><th>Characteristics</th><th>Limits</th><th>Test Methods
(JIS C 5201-1)</th></tr>
<tr><td>Soldering
Heat</td><td>Resistance change rate is:
±(1%+0.05Ω) Max.</td><td>Dip the resistor into a solder bath having
a temperature of 260°C±3°C and hold it for 10±1
seconds.
(Sub-clause 4.18)</td></tr>
<tr><td>Temperature
cycling</td><td>Resistance change rate is
± (0.5% + 0.05Ω) Max.</td><td>Resistance change after continuous
5 cycles for duty cycle specified below :
<table>
<tr><th>Step</th><th>Temperature</th><th>Time</th></tr>
<tr><td>1</td><td>-55℃ ± 3℃</td><td>30 mins</td></tr>
<tr><td>2</td><td>Room temp.</td><td>10～15 mins</td></tr>
<tr><td>3</td><td>+155℃ ± 2℃</td><td>30 mins</td></tr>
<tr><td>4</td><td>Room temp.</td><td>10～15 mins</td></tr>
</table>
(Sub-clause 4.19)</td></tr>
<tr><td>Load life in
humidity</td><td>Resistance change rate is
± (1.0% + 0.1Ω) Max.</td><td>Resistance change after 1,000 hours
(1.5 hours "on", 0.5 hour "off") at RCWV
in a humidity chamber controlled at
40℃ ± 2℃ and 90 to 95 % relative humidity
(Sub-clause 4.24.2.1)</td></tr>
<tr><td>Load Life</td><td>Resistance change rate is
± (1.0% + 0.1Ω) Max.</td><td>Permanent resistance change after 1,000 hours
operating at RCWV, with duty cycle of
(1.5 hours"on", 0.5 hour"off") at 70℃ ± 2℃ ambient
(Sub-clause 4.25.1)</td></tr>
<tr><td>Terminal
bending</td><td>Resistance change rate is
± (1.0% + 0.05Ω) Max.</td><td>Twist of Test Board :
Y/X = 5/90 mm for 10 seconds
(Sub-clause 4.33)</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Thick Film Chip Resistors (Terminal Lead Free)

8. Packing specification :

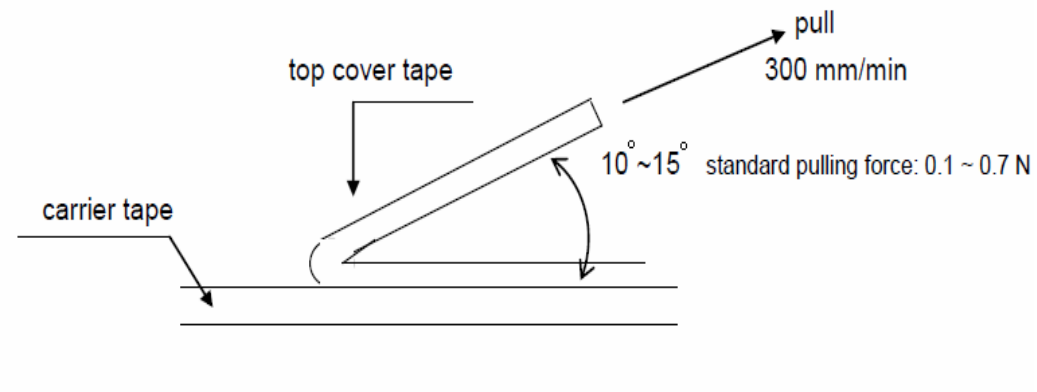
* Taping Dimension (mm)



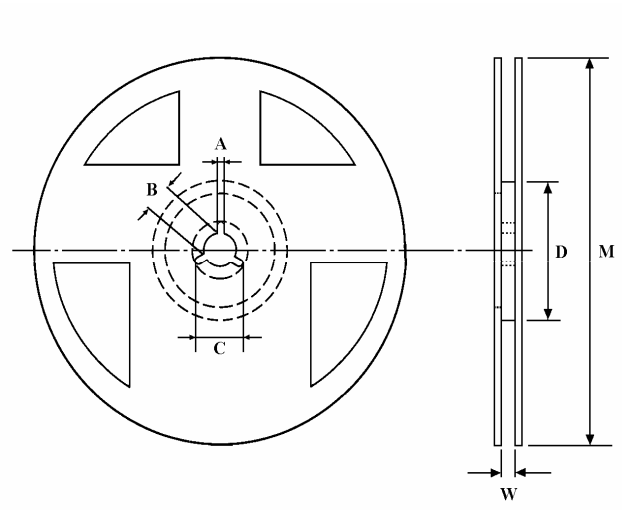
Type	A ±0.2	B ±0.2	C ±0.05	ϕ D+0.1 -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	ϕ D1+0.1 -0	T ± 0.1
RMC 2512	3.5	6.7	2.0	1.5	1.75	5.5	4.0	12	1.5	1.0

* Peeling Strength of Top Cover Tape

Test Condition: 0.1 to 0.7 N at a peel-off speed of 300 mm / min.



* Reel Dimension (mm)



Type	Quantity Per Reel	A ± 0.5	B ± 0.5	C ± 0.5	D ± 1	M ± 2	W ± 1
RMC 2512	4000 Pcs.	2	13	21	60	178	13.8

Part Number System

Explanation of Part Number System

Thick Film Chip Resistors (Terminal Lead Free)

1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	5	1	2	1	W	F	4	7	0	L	T	4	E

Product Type:
- 0201
- 0402
- 0603
- 0805
- 1206
- 1210
- 2010
- 2512

Wattage:

Normal size:
- WH = 1/32W
- WM = 1/20W
- WG = 1/16W
- WA = 1/10W
- W8 = 1/8W
- W4 = 1/4W
- W2 = 1/2W
- 1W = 1W

Small size:
- SA = 1/10W-S
- S8 = 1/8W-S
- S4 = 1/4W-S
- S3 = 1/3W-S
- 07 = 3/4W-S

Extra small size:
- U2 = 1/2W-SS (1210)

Tolerance:
- 0 ~ Jumper
- D ~ ± 0.5%
- F ~ ± 1%
- G ~ ± 2%
- J ~ ± 5%

Resistance Value:

E-24 series: the 1st digit is "0", the 2nd & 3rd digits are for the significant figures of the resistance and the 4th indicate the number of zeros following;

E-96 series: the 1st to 3rd digits are for the significant figures of the resistance and the 4th digit indicate the number of zeros following.

Decimal point is expressed :

"J"~ 0.1,**"K"**~0.01,**"L"**~0.001

Ex: 2Ω26 ~226K, 226Ω ~2260

Packing Type:
- T = T/R Packing

Packing Quantity:
- 1 = 1,000pcs
- 2 = 2,000pcs
- 3 = 3,000pcs
- 4 = 4,000pcs
- 5 = 5,000pcs
- A = 500pcs
- B = 2,500pcs
- C = 10,000pcs
- D = 20,000pcs
- E = 15,000pcs

Special Feature:
- E = Lead (Pb) Free Plating Type/ RoHS compliant

Sample : RMC 1W (2512) +/- 1% 0.47Ω T/R-4,000 → 25121WF470LT4E

Thick Film Chip Resistors (Terminal Lead Free)

Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.
This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

Storage Condition

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of 25°C ± 10°C and a relative humidity of 60%RH ± 10%RH, chemical and dust free atmosphere

Even within the above guarantee periods, do not store these products in the following conditions. Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight