

DIGI-KEY CORPORATION

Issue No. : 151RAA00007022

Date of Issue : June 27,2007

Classification : New Changed

PRODUCT SPECIFICATION FOR APPROVAL

Product Description : Metal Film Chip Resistors, High Reliability Type(RoHS)
Product Part Number : ERA2A□□ * * * X
ERA2A□□ * * * * X
Country of Origin : JAPAN
Applications : Standard electronic equipment

*If you approve this specification, please fill in and sign the below and return 1 copy to us.

Approval No	:	
Approval Date	:	
Executed by	:	

		(signature)
Title	:	
Dept.	:	

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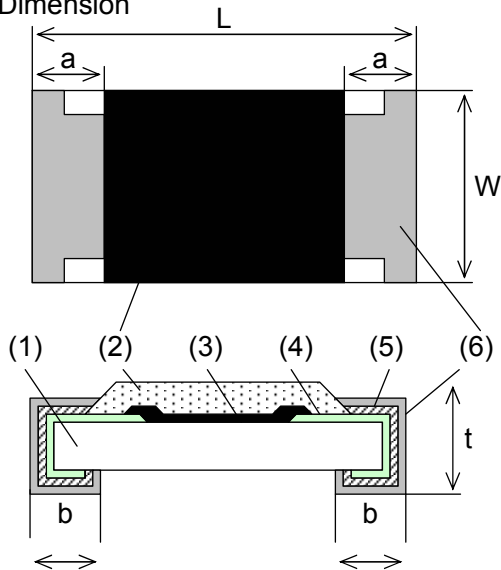
Title

Manager of Engineering

Panasonic

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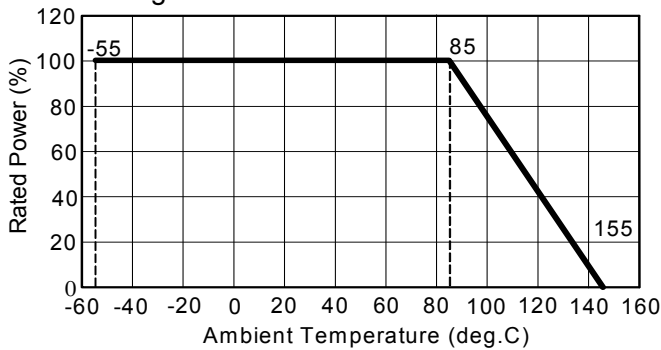
1. Dimension



- (1) Substrate: Alumina
- (2) Protective Coating: Epoxy Resin
- (3) Resistive Element: High reliability metal Alloy
- (4) Inner Termination: Special Termination
- (5) Middle Termination : Ni Plating
- (6) Outer Termination: Sn Plating

	L	W	a	b	t
Dimension (mm)	1.00±0.10	0.50 ^{+0.10} / _{-0.05}	0.15±0.10	0.25±0.10	0.35±0.05

2. Power Derating Curve



Category temperature range:
-55 °C to +155 °C

Figure 1

3. Ratings

Item	Rated value (Explanation)		
Power rating	0.063 W } When used at ambient temperature above 70 °C, power rating shall be determined in accordance with Figure 1.		
Rated voltage & Rated continuous working voltage (RCWV)	The rated voltage of each resistor should be calculated from the equation below, and when the rated voltage exceeds the limiting element voltage, the limiting element voltage should be the rated voltage. Rated voltage(V) = $\sqrt{\text{Power rating(W)} \times \text{Resistance value}(\Omega)}$ Max. RCWV ;25V		
Maximum overload voltage	Voltage should be 2.5 times the rated voltage. When the voltage exceeds the maximum overload voltage, the value shown below should be the maximum overload voltage. Max. overload voltage : 50V		
Resistance tolerance	± 0.1% (B), ± 0.5% (D)		
Resistance range	Resistance tolerance	T.C.R.	Resistance range
	± 0.5%	± 100×10 ⁻⁶ /°C	10Ω~46.4Ω
	± 0.1%, ± 0.5%	± 25×10 ⁻⁶ /°C	47Ω~100kΩ

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4. Explanation of Part Number

E	R	A	2	A	E	B	1	0	2	X
(1)	(2)	(3)	(4)	(5)	(6)	(7)				

- (1) Product code : Metal Film Chip Resistor
(2) Size and power rating : 1.0 mm x 0.5 mm, 0.063W
(3) Series

Code	Series
A	E-24 series, E-96 series

- (4) Temperature Coefficient of Resistance (T.C.R.)

Code	Resistance tolerance
E	$\pm 25 \times 10^{-6}/^{\circ}\text{C}$
K	$\pm 100 \times 10^{-6}/^{\circ}\text{C}$

- (5) Resistance Tolerance

Code	Resistance tolerance
B	$\pm 0.1\%$
D	$\pm 0.5\%$

- (6) Resistance value

<E-24 series>

3-digits : The first two digits are the significant figures of resistance value, and the last figure shows the number of zero following in ohm.

ex) 123 $\rightarrow 12 \times 10^3 \rightarrow 12\text{k}\Omega$

<E-96 series>

4-digits : In case of resistance value is over 100 Ω

The first three digits are significant figures of resistance value, and the last figure show the number of zero following in ohm.

In case of resistance value is under 100 Ω

"R" shows a decimal point and the other three digits show significant figures.

ex) 1212 $\rightarrow 121 \times 10^2 \rightarrow 12.1\text{k}\Omega$

12R1 $\rightarrow 12.1\Omega$

- (7) Packaging configuration

Code	Packaging configuration
X	Punched carrier taping (10,000pcs/reel)

5. Appearance & Construction

Item	Explanation
Appearance & Construction	<ol style="list-style-type: none"> The resistive element should be covered with protective coating that does not fade easily. The surface of coating should avoid unevenness, flaw, pinhole and discoloration. The electrode should be printed uniformly, as shown in the dimensions. The plating should not fade easily, and should avoid unevenness, flaw, pinhole, projection and discoloration. The electrode should be connected electrically, mechanically to resistive element.

As far as there shall not designation especially, the following tests and measurement shall be operated under the following conditions.

Normal temperature: 5 $^{\circ}\text{C}$ to 35 $^{\circ}\text{C}$

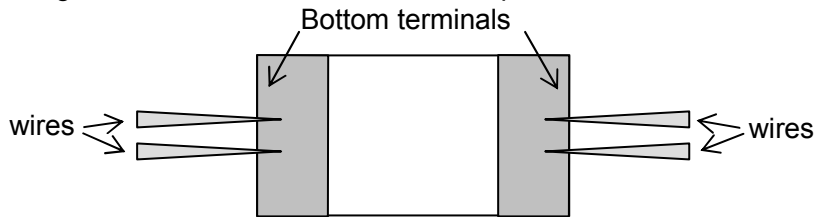
Normal humidity: 45 %RH to 85 %RH

Normal atmospheric pressure: 86 k Pa to 106 k Pa

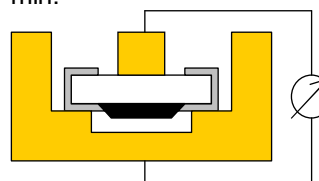
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<Measuring method>

In measuring resistance value, 4 wires must be put on the bottom terminals as below.

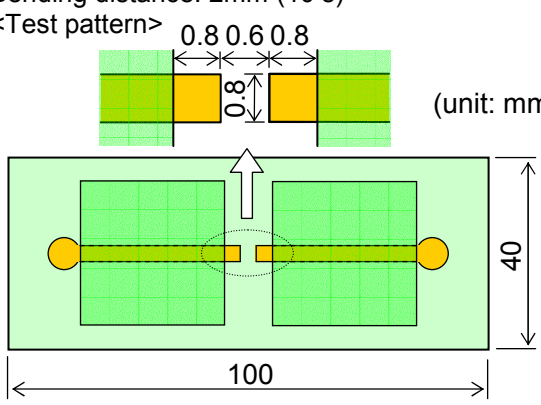


6. Performance Specification

Item	Specification	Test method (JIS-C5201-1)
DC resistance	DC resistance value shall be within the specified tolerance.	At 20 °C, 65%RH
Temperature coefficient of resistance (TCR)	Resistance range 10Ω~46.4Ω: ± 100x10 ⁻⁶ /°C Resistance range 47Ω~100kΩ: ± 25x10 ⁻⁶ /°C	Natural resistance change per temperature degree centigrade. TCR=(R ₂ -R ₁)x10 ⁶ /R ₁ (t ₂ -t ₁) (x10 ⁻⁶ /°C) R ₁ : Resistance value at reference temperature (t ₁) R ₂ : Resistance value at test temperature (t ₂) t ₁ : 25 °C , t ₂ : 125 °C
Short time overload	Resistance tolerance ± 0.5%: ΔR: ± (0.5% +0.05 Ω) Resistance tolerance ± 0.1%: ΔR: ± (0.1% +0.05 Ω)	Resistors shall be applied 2.5 times the rated voltage for 5 s. Max. overload voltage shall be 50V
Dielectric withstanding	No evidence of flashover, mechanical damage, arcing or insulation breakdown	AC 100V between substrate and termination for 1 min. 
Insulation resistance	Min. 1,000 MΩ	Resistors shall be facing down. After applying DC 100V to the resistor, insulation resistance shall be measured.

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7. Mechanical Characteristics

Item	Specifications	Test method (JIS-C5201-1)
Bending strength	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$ and no mechanical damage.	Substrate: Glass epoxy (t=1.0 mm) Span: 90mm Bending distance: 2mm (10 s) <Test pattern>  <p>(unit: mm)</p>
Solderability	Termination should be covered uniformly with solder (Min. 95% coverage)	Resistors shall be dipped in the melted solder bath at $235 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ for $2 \text{ s} \pm 0.5 \text{ s}$. Flux shall be removed from the surface of termination with clean organic solvent.
Resistance to soldering heat	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$	Resistors shall be dipped in the melted solder bath at $270 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$ for $10 \text{ s} \pm 1 \text{ s}$.
Resistance to solvent	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$ and without distinct deformation in appearance	Solvent solution: Isopropyl alcohol (1) Dipping $10 \text{ h} \pm 1 \text{ h}$, dry in room condition for $30 \text{ min} \pm 10 \text{ min}$. (2) Ultrasonic wave washing $5 \text{ min} \pm 1 \text{ min}$ (0.3W/cm , 28kHz), dry in room condition for $30 \text{ min} \pm 10 \text{ min}$.

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8. Environmental Test

Item	Specification	Test method (JIS-C5201-1)															
High temperature exposure	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$	Resistors shall be exposed at $155 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$ with no load for 1000 h +48/-0 h.															
Temperature cycling	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$ and without distinct deformation in appearance	Resistors shall be tested for 5 cycles continuously in accordance with the following duty cycle. <table border="1" data-bbox="890 584 1401 757"> <thead> <tr> <th>Step</th> <th>Temperature ($^\circ\text{C}$)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55 ± 3</td> <td>30</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>Max. 3</td> </tr> <tr> <td>3</td> <td>$+125 \pm 3$</td> <td>30</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>Max.3</td> </tr> </tbody> </table>	Step	Temperature ($^\circ\text{C}$)	Time (min.)	1	-55 ± 3	30	2	Room temperature	Max. 3	3	$+125 \pm 3$	30	4	Room temperature	Max.3
Step	Temperature ($^\circ\text{C}$)	Time (min.)															
1	-55 ± 3	30															
2	Room temperature	Max. 3															
3	$+125 \pm 3$	30															
4	Room temperature	Max.3															
Humidity (Steady state)	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$	Resistors shall be exposed at $85 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ and 85% relative humidity in a humidity test chamber for 1000 h +48/-0 h.															
Load Life	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$	Resistors shall be operated at DC rated voltage (1.5 h "ON", 0.5 h "OFF") for 1000 h +48/-0 h in a test chamber controlled at $85 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$.															
Load life in Hhumidity	Resistance tolerance $\pm 0.5\%$: $\Delta R: \pm (0.5\% + 0.05 \Omega)$ Resistance tolerance $\pm 0.1\%$: $\Delta R: \pm (0.1\% + 0.05 \Omega)$	Resistors shall be operated at rated DC voltage (1.5 h "ON", 0.5 h "OFF") for 1000 h +48/-0 h in a test chamber controlled at $85 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ and at 85 % relative humidity.															

9. Resistance value marking No-marking

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10. Common Precautions in Handling Resistors

Notice for use

- (1) This specification shows the quality and performance of a unit component. Before adoption, be sure to evaluate and verify the product mounting it in your product.
- (2) We take no responsibility for troubles caused by the product usage that is not specified in this catalog. Be sure to exchange the delivery specification with us.
- (3) Use fail-safe design and ensure safety by carrying out the following items in cases where it is forecast that the failure of the product gives serious damage to something important like human life, for instant in traffic transportation equipment (trains, cars, traffic signal equipment, etc.), medical equipment, aerospace equipment, electric heating appliances, combustion and gas equipment, rotating equipment, disaster and crime preventive equipment.
 - * Ensure safety as the system by setting protective circuits and protective equipment.
 - * Ensure safety as the system by setting such redundant circuits as do not cause danger by a single failure.
- (4) When a dogma shall be occurred about safety for this product, be sure to inform us rapidly, operate your technical examination.
- (5) The product is designed to use in general standard applications of general electric equipment (AV products, household electric appliances, office equipment, information and communication equipment, etc.); hence, it do not take the use under the following special environments into consideration. Accordingly, the use in the following special environments, and such environmental conditions may affect the performance of the product; prior to use, verify the performance, reliability, etc. thoroughly.
 - 1) Use in liquids such as water, oil, chemical, and organic solvent.
 - 2) Use under direct sunlight, in outdoor or in dusty atmospheres.
 - 3) Use in places full of corrosive gases such as sea breeze, Cl₂, H₂S, NH₃, SO₂, and NO_x.
 - 4) Use in environment with large static electricity or strong electromagnetic waves.
 - 5) Where the product is close to a heating component, and where an inflammable such as a polyvinyl chloride wire is arranged close to the product.
 - 6) Where the resistor is sealed or coated with resin, etc.
 - 7) Where water or a water-soluble detergent is used in cleaning free soldering and in flux cleaning af ter soldering (Pay particular attention to soluble flux.)
 - 8) Use in such a place where the product is wetted due to dwe condensation.
- (6) If transient load (heavy load in a short time) like pulse is expected to be applied, carry out evaluation and confirmation test with resistors actually mounted on your own board. When the load of more than rated power is applied under the load condition at steady state, it may impair performance and/or reliability of resistor. Never exceed the rated power. When the product shall be used under special condition, be sure to ask us in advance.
- (7) Halogen type (Chlorine type, Bromine type, etc.) or other high-activity flux is not recommended as the residue may affect performance or reliability of resistors.
- (8) When soldering with soldering iron, never touch the body of the chip resistor with a tip of the soldering iron. When using a soldering iron with a tip at high temperature, solder for a time as short as possible. (3 s or less up to 350 °C)
- (9) Avoid physical shock to the resistor and nipping of the resistor with hard tool (a pair of pliers or tweezers) as it may damage protective film or the body of resistor and may affect resistor's performance.
- (10) Avoid immersion of chip resistor in solvent for long time. Use solvent after the effect of immersion is confirmed.

11. Storage Method

If the product is stored in the following environments and conditions, the performance and solderability may be badly affected, avoid the storage in the following environments.

- (1) Storage in places full of corrosive gases such as sea breeze, Cl₂, H₂S, NH₃, SO₂, and NO_x.
- (2) Storage in places exposed to direct sunlight.
- (3) Storage in places outside the temperature range of 5 °C to 35 °C and humidity range of 45 %RH to 85 %RH.
- (4) The period of guarantee for performance such as solderability is 1 year after our delivery; and this condition applies only to the case where the storage method specified in item 3) has been followed.

12. Laws and Regulations

- (1) This product has not been manufactured with any ozone-depleting chemical controlled under the Montreal Protocol.
- (2) This product complies with the RoHS Directive (Restriction of the use of certain Hazardous substances in electrical and electronic equipment (DIRECTIVE 2002/95/EC)).
- (3) All materials used in this part are registered material under the Law Concerning the Examination and Regulation of Manufacturs, etc. of Chemical substances.
- (4) All the materials used in this part contain no brominated materials of PBBO_s or PBB_s as the flame-retardant.
- (5) If you need the notice by letter of "A preliminary judgement on the laws of Japan foreign exchange and foreign trade control", be sure to let us know.

13. Production Site

Country: Japan, Plant: Panasonic Electronic Devices Fukui Co., Ltd.

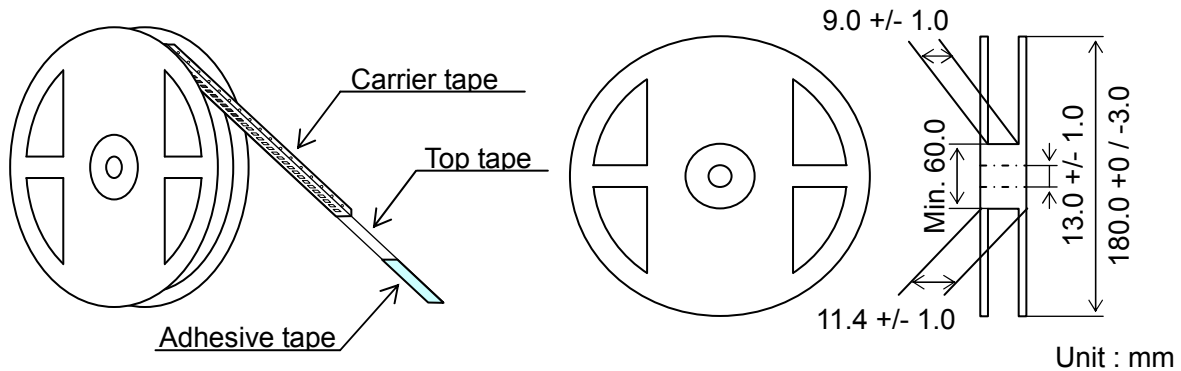
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14. Taped and Reel Package

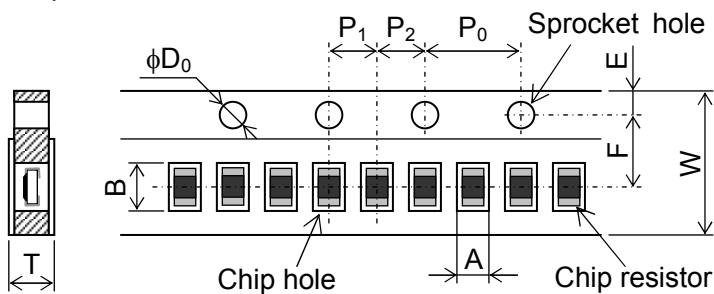
14-1. Physical Dimensions

14-1-1 Structure and dimensions of reel shall be as shown in the figure below.

In accordance with EIAJ ET-7200.



14-1-2 Carrier Tape Dimension



	A	B	W	F	E
Dimension (mm)	0.67+/-0.05	1.17+/-0.05	8.00+/-0.20	3.50+/-0.05	1.75+/-0.10

	P ₁	P ₂	P ₀	φD ₀	T
Dimension (mm)	2.00+/-0.10	2.00+/-0.05	4.00+/-0.10	1.50 ^{+0.10} ₋₀	0.52+/-0.05

14-2 Specifications

14-2-1 Taping

(1) Minimum Bending Radius

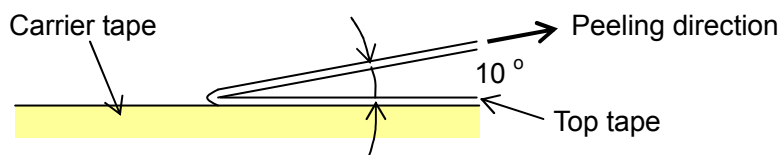
When carrier tape shall be bent by minimum bending radius (15mm), no deflection of chip and no break of carrier tape. However minimum bending radius shall be tested for 1 time.

(2) Resistance to climate of top tape

When it shall be exposed at 60 °C, 90 %RH to 95 %RH for 120 h, no exfoliation of top tape.

(3) When the test shall be operated with the below conditions, peel strength should be 0.049 N to 0.49 N, should not have flash and tear after peeling.

(Test Method)



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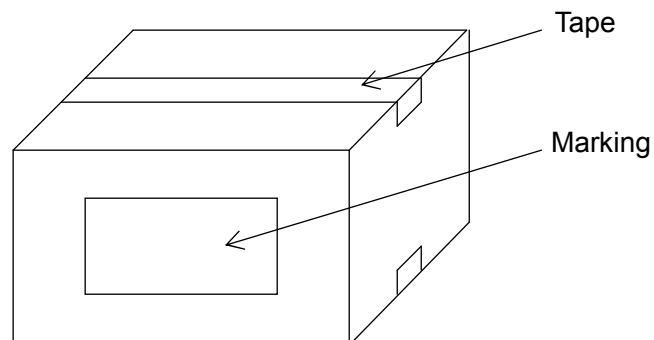
14-2-2 Quantity in Taping: 10,000 pcs./reel

14-2-3 Tape packaging

- (1) Resistance side shall be facing upward.
- (2) Chip resistor shall not be sticking to top tape and bottom tape.
- (3) Chip resistor shall be easy to take out from carrier tape and chip hole or sprocket hole shall not have flash and break.

14-3 Outer Packaging

Quantity: 20 reels (Max. 200,000 pcs.)



* When taping shall not reach Max. or quantity, the remaining empty space shall be buried with buffer material.

* When the quantity shall be few, alternative packaging methods may be used. No problem must occur during the exportation of the product.

14-4 Marking

At least production country is displayed in English.

(1) Side of reel (Marking shall be on one side)

1)Part name, 2)Part number, 3)Quantity, 4)Lot number, 5)Maker name, 6) Production country

(2)Packaging box

1)Customer name, 2)Part name, 3)Part number, 4)Customer part number, 5)Quantity.

6)Maker name, 7)Production country