



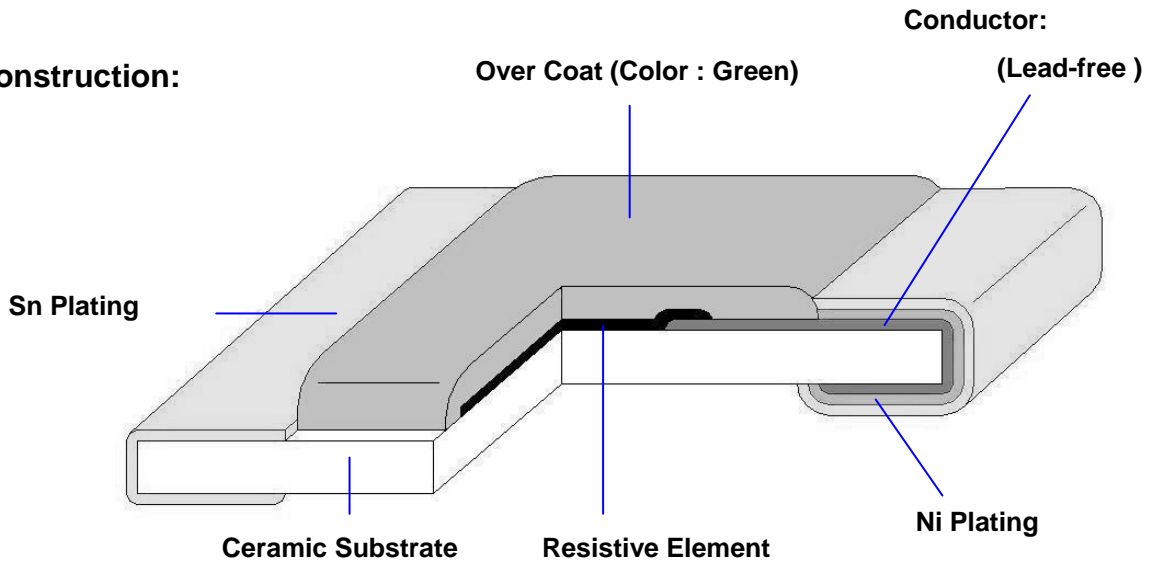
# Thick Film High Voltage Lead-Free Chip Resistors (Standard ) Halogen-Free

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## 1. Scope :

This specification applies for thick film high voltage Lead-Free chip resistors made by TA-I.

## 2. Construction:



## 3. Type Designation:

<b><u>RH</u></b>	<b><u>12</u></b>	<b><u>F</u></b>	<b><u>TN</u></b>	<b><u>4993</u></b>
Product Code	Size	Tolerance	Packaging	Nominal Resistance
RH : High voltage	Power Rating			

10-0805(2012)	1/8W
12-1206(3216)	1/4W

J- ±5%
G- ±2%
F- ±1%

T- Paper Tape
N- Lead Free

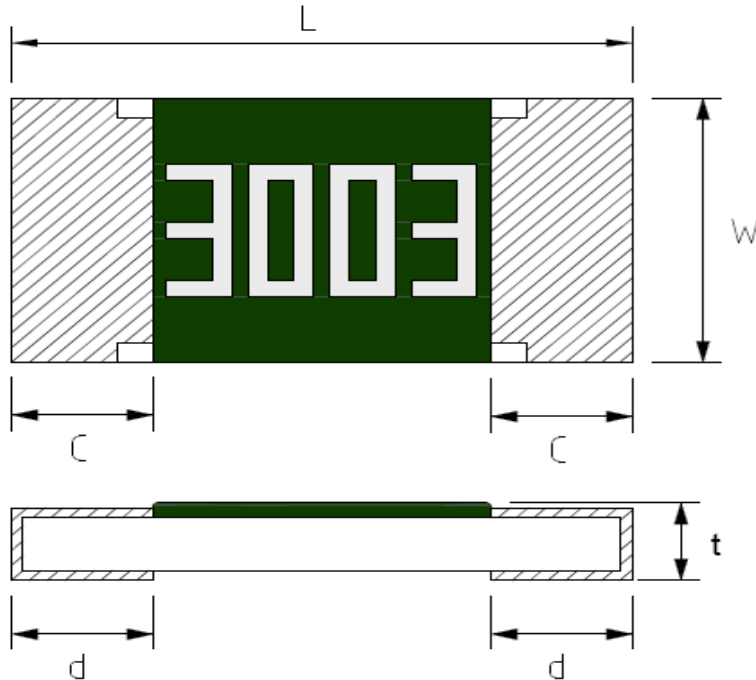
3 digits, e.g.:	(E-24) 104 = 100kΩ
4 digits, e.g.,:	(E-96) 4993 = 499kΩ



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**4. Dimensions:**



UNIT: mm

Type	L	W	C	d	t
RH10	2.00 ±0.10	1.25 ±0.10	0.35 ±0.20	0.40 ±0.20	0.50 ±0.10
RH12	3.10 ±0.20	1.55 ±0.10	0.40 ±0.25	0.40 ±0.20	0.55 ±0.10

**5. Ratings & Characteristics :**

Characteristics	Rating voltage	Feature		Measurement Method
		RH10	RH12	
Power Ratings (W)	Refer 5.2	1/8W	1/4W	JIS Code 3A / JIS Code 3D
Resistance Value (Ω)		10KΩ~10MΩ	47Ω ~ 27MΩ	Refer to JIS C 5201-1-4.5
T.C.R (ppm/°C)		±200		Refer to JIS C 5201-1-4.8
Operation Temperature Range (°C)		-55 ~ +155		
Resistance Tolerance (%)		±1, ±2, ±5		JIS C 5201-1-4.2.5
Maximum Working Voltage (V)		400	500	
Maximum Overload Voltage (V)		800	1000	

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.

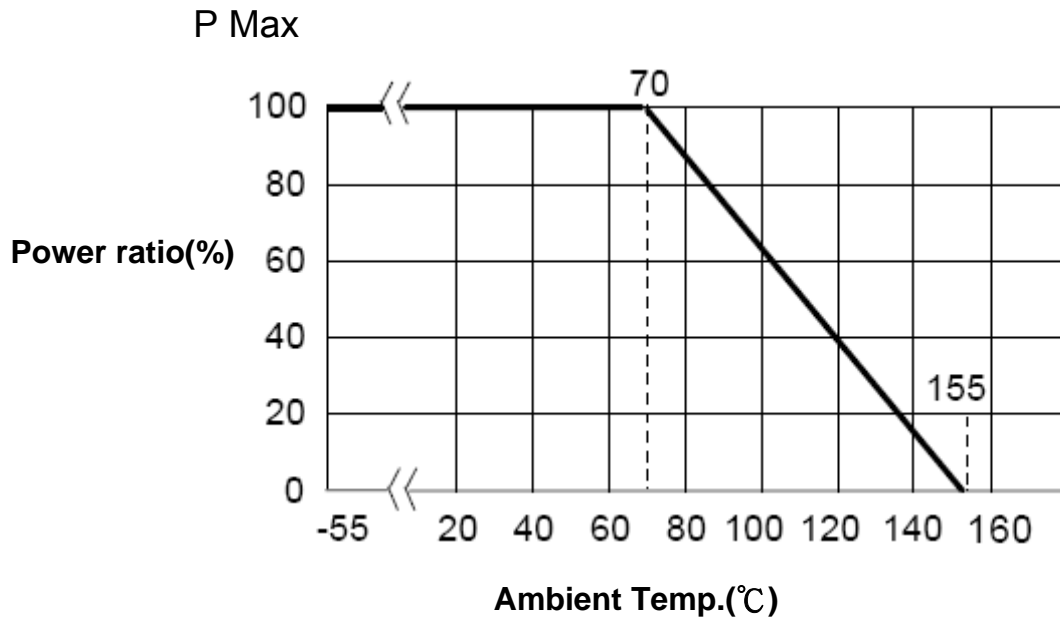


Figure 1

**5.2 Rated Voltage:**

The rated voltage is calculated by the following formula:

$$E = \sqrt{P * R}$$

E=Rated Voltage(V)

P=Rated Power(W)

R=Resistance Value(Ω)

E.G. : What is RH12FTN3003 the rated voltage ?

RH12FTN3003 P=1/4W ; R:3003=300KΩ=300,000Ω

$$E = \sqrt{1/4(W) * 300000 (\Omega)} = 273.86 V$$

**Remark : However , it shall not exceed the maximum rated voltage .**



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**6. Reliability Tests:**

Test Items	Reference standard	Condition of Test	Test Limits
Visual examination		Checked by visual examination .	The marking shall be legible , as checked by visual examination
Temperature Coefficient of Resistance	IEC60115-1-4.8 JIS-C5201-1-4.8	-55 ~ +125 °C	Refer to paragraph 5
Dielectric Withstanding Voltage ( Voltage Proof )	IEC60115-1-4.7 JIS-C5201-1-4.7	500Va. c., voltage , 1 min .	No abnormalities such as flashover , burning dielectric breakdown shall appear .
Insulation Resistance	IEC60115-1-4.6 JIS-C5201-1-4.6	100V voltage , 1 min .	≥ 1GΩ
Solderability	IEC60115-1-4.17 JIS-C5201-1-4.17	245 ±5°C solder, 2 ±0.5 sec dwell. Solder : Sn96.5/Ag3/Cu0.5	At least 95% of surface area of electrode shall be covered with new solder.
Short Time Overload	IEC60115-1-4.13 JIS-C5201-1-4.13	2.5 × rated voltage, 5s	±(1.0%+0.05Ω) Remark : (RH10) 1% : ±(1.0%+0.05Ω) 5% : ±(2.0%+0.05Ω)
Resistance to Soldering Heat	IEC60115-1-4.18 JIS-C5201-1-4.18	270 ±5°C solder , 10 ±1 sec dwell .	±(1.0%+0.05Ω)
Rapid Change of Temperature	IEC60115-1-4.19 JIS-C5201-1-4.19	-55°C (30 min. ) / +155 °C (30 min. ) 5 cycles	±(1.0%+0.05Ω)
Load Life	IEC60115-1-4.25.1 JIS-C5201-1-4.25.1	1000 hours at rated power , 70°C , 1.5hours "ON " , 0.5hour "OFF"	±(5.0%+0.1Ω) Remark : (RH10) 1%: ±(1.0%+0.1Ω) 5%: ±(3.0%+0.1Ω)
Load Life with Humidity	IEC60115-1-4.24 JIS-C5201-1-4.24	1000 hours at rated voltage , 40±2°C, 90~95% RH 1.5hours "ON " , 0.5hour "OFF"	±(5.0%+0.1Ω) Remark : (RH10) 1%: ±(1.0%+0.1Ω) 5%: ±(3.0%+0.1Ω)
Robustness of Termination (Bending)	IEC60115-1-4.33 JIS-C5201-1-4.33	3mm deflection	±(1.0%+0.05Ω) Remark : (RH10) 1%: ±(0.5%+0.05Ω) 5%: ±(1.0%+0.05Ω)



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## 7. Marking

### 7.1 ±2% , ±5% (E24) :

Resistance value is expressed by 3 digits, the first two digits represent the significant figures of nominal resistance value in  $\Omega$ , and the third digit represents exponent for base of 10.

Ex. 106 =  $10 \times 10^6 = 10000000 \Omega = 10M\Omega$

### 7.2 ±1% (E96) :

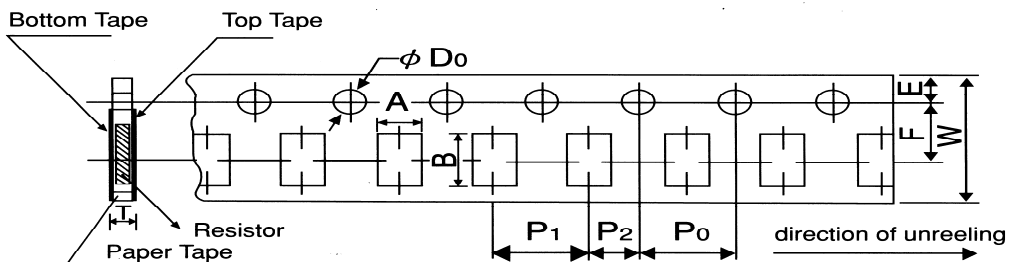
Resistance value is expressed by 4 digits, the first three digits represent the significant figures of nominal resistance value in  $\Omega$ , and the fourth digit represents exponent for base of 10.

Ex. 4993 =  $499 \times 10^3 = 499000 \Omega = 499K\Omega$

## 8. Taping & Reel

### 8.1 Taping Dimensions

#### 8.1.1 4 mm pitch paper



UNIT: mm

Packing	Type	A	B	W	F	E	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>	T
Paper Tape	RH10	1.6±0.15	2.4±0.2	8.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	$\phi$ 1.5	0.84±0.1
	RH12	2.0±0.15	3.6±0.2								

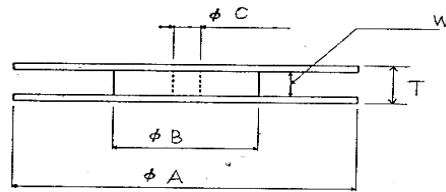
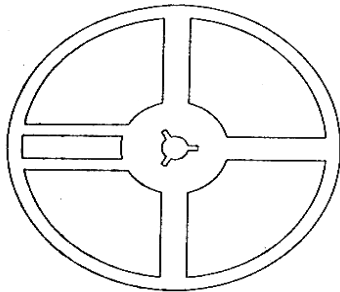


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Type series		Paper Tape
		4 mm pitch
		178mm/R
RH	10	5000
RH	12	5000

**8.2 Reel Specifications**

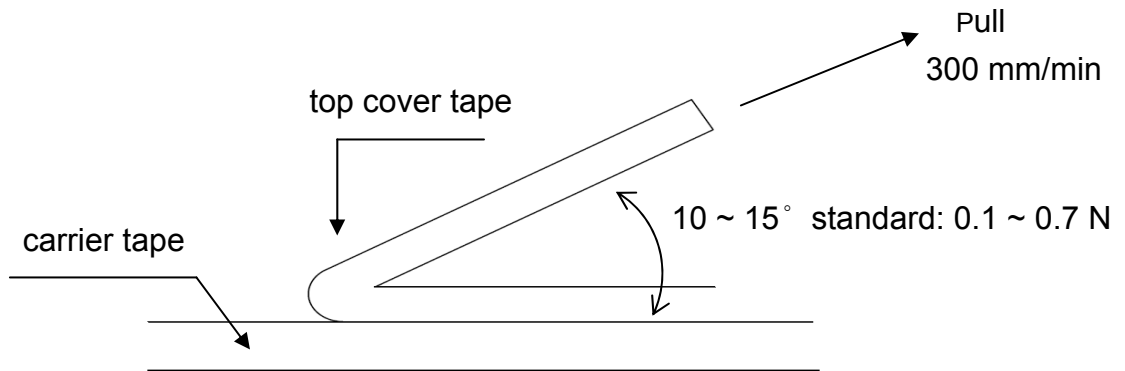


UNIT: mm

Type	$\phi A$	$\phi B$	$\phi C$	W	T
RH10 / 12	178 ±2.0	60.0±1.0	13.0 ±1.0	9.0 ±1.0	11.5 ±1.0

**8.3 Peel –off force :**

Peel –off force of paper and blister tape is in accordance with “JIS-C5202” that is , 0.1 to 0.7 N at a peel-off speed of 300 mm / minute.



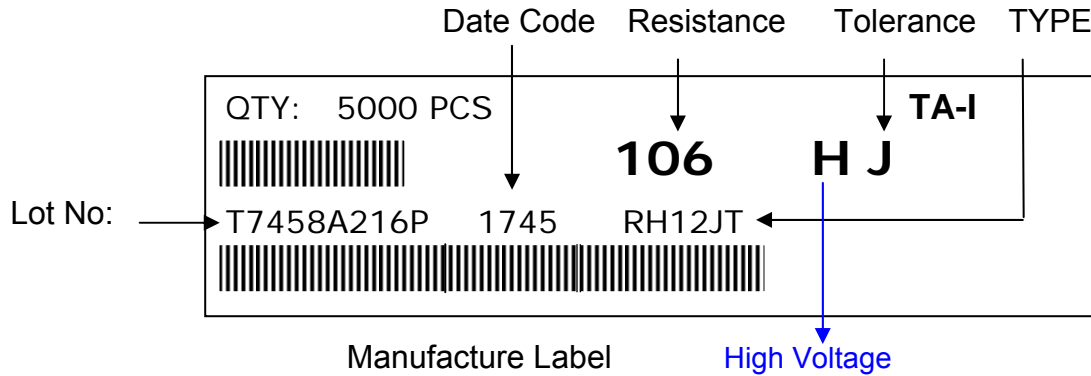


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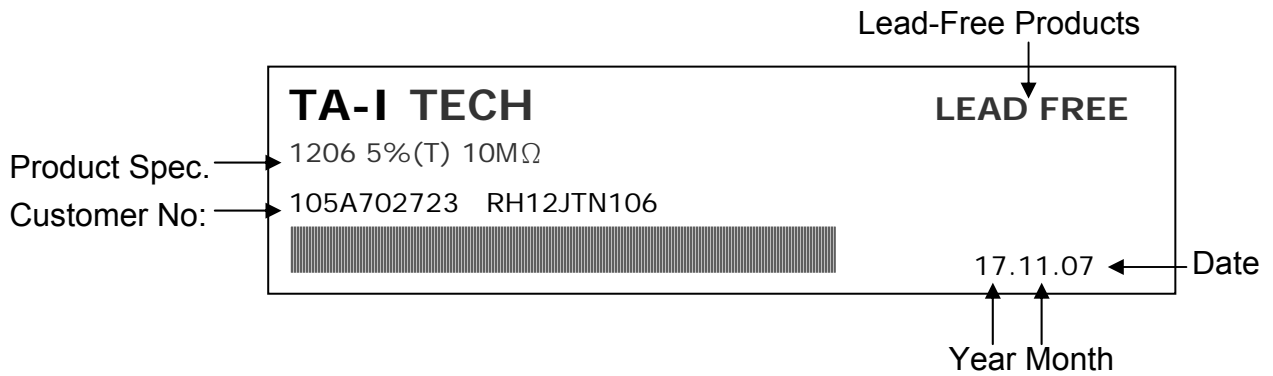
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9. Label

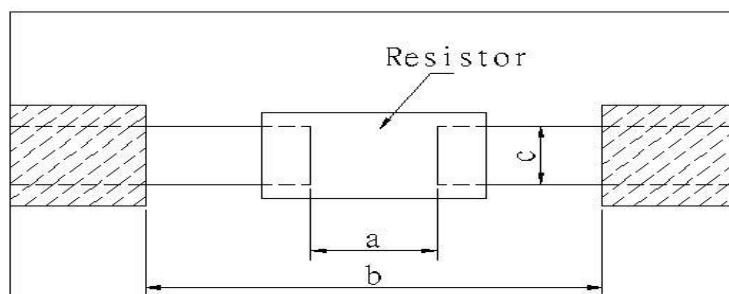
9.1 Manufacture Label :



9.2 Customer Label ( By customer request ) :



10. Recommended land patterns



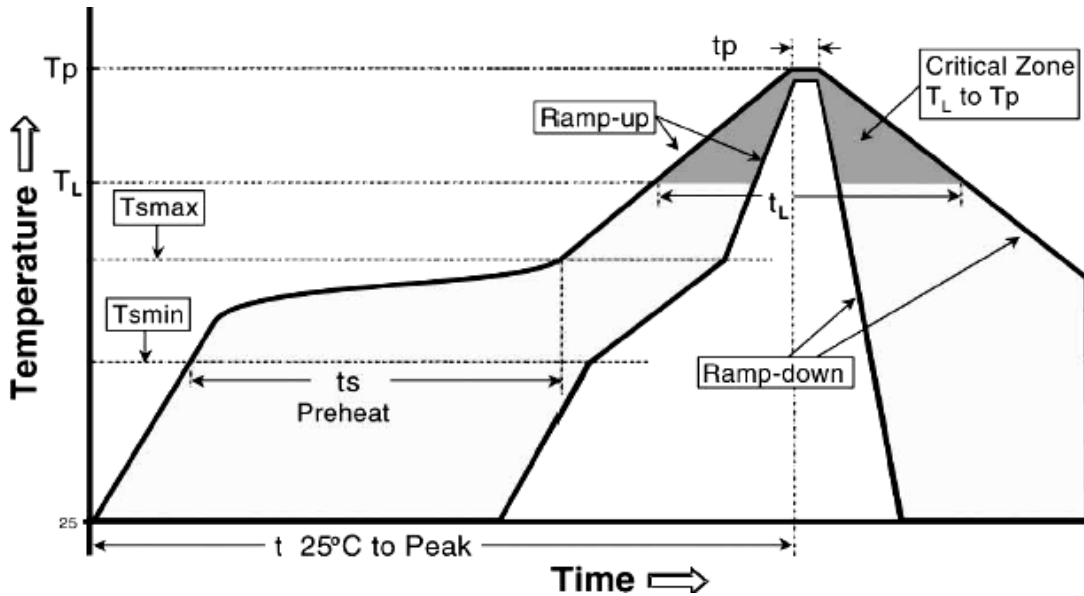
Land pattern		Dimension ( mm )		
Type	Size	a	b	c
RH	10 ( 0805 )	1.0~1.4	3.2~3.8	0.9~1.4
RH	12 ( 1206 )	2.0~2.4	4.4~5.0	1.2~1.8



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



Profile Feature	Lead (Pb )-Free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C / second max.
Preheat - Temperature Min (T <sub>smin</sub> ) - Temperature Max (T <sub>smax</sub> ) - Time (T <sub>smin</sub> to T <sub>smax</sub> ) (t <sub>s</sub> )	150°C 200°C 60 -150 seconds
Time maintained above : - Temperature (T <sub>L</sub> ) - Time (T <sub>L</sub> )	217°C 60-120 seconds
Peak Temperature (T <sub>p</sub> )	260°C
Time within $\begin{matrix} +0 \\ -5 \end{matrix}$ °C of actual Peak Temperature (t <sub>p</sub> ) <sup>2</sup>	10 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8minutes max.

Allowed Re-flow times : 3 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes,  
please use N2 Re-flow furnace .





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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.

**15. Manufacturing Country & City :**

TA-I TECHNOLOGY CO., LTD. ( Taiwan- Tao Yuan )

Tel: 886-3-3246169 Fax : 886-3-3246167

**Associated companies :**

(1) FORTUNE TASK RESISTOR FACTORY ( China – Dongguan )

Tel : 86-769-8339-4790~3 Fax : 86-769-8339-4794

(2) TA-I TECHNOLOGY (DONGGUAN ) CO., LTD. ( China –Dongguan )

Tel : 86-769-8339-4790~3 Fax : 86-769-8339-4794

(3) TA-I TECHNOLOGY ( SU ZHOU ) CO., LTD. ( China – Su Zhou)

Tel : 86- 512-63457879 Fax : 86-512-63457869

(4) TAI OHM ELECTRONICS ( M ) SDN. BHD. ( Malaysia – Penang )

Tel : 604- 3900480 Fax : 604-3901481

(5) P.T.TAI ELECTRONICS Indonesia ( Indonesia – Jakarta )

Tel : 62-21-89830123 Fax : 62-21-89830703