固定抵抗器
FIXED RESISTORS

OPERATING TEMP.	−55～+155℃

フロー／WAVE　リフロー／REFLOW

特長　FEATURES

2A～4B:
・電流雑音が小さく、耐パルス性が高い
・マルチマウントに特に適している

2A～4B:
・Current noise level is low, yet highly resistant to pulses.
・Especially suitable for high speed automated mounting.

用途　APPLICATIONS

・一般の炭素皮膜、金属皮膜抵抗器はチューナ等のRFユニットに最適
・オーディオ／ビデオ／携帯電話／ノートパソコン／カムコーダ／ゲーム／VTRなど

・General carbon and metal-film resistors are optimal for use in RF unit tuners, etc.
・Audio/video, cellular phones, notebook PCs, camcorders, games, VCR, etc.

形名表記法　ORDERING CODE

1 形式

JC	クロスコンダクタ(0Ω)
RD	炭素皮膜固定抵抗器
RN	金属皮膜固定抵抗器

2 形状寸法　L×φD[mm]

2A	3.5×1.4（メルフ）
3A	2.0×1.25(メルフ)
4B	1.6×1.0（円筒）

3 定格電力 [W]

2A	0.1
2B	0.125

5 公称抵抗値（Ω）

例	
151	150

6 抵抗値許容差　[%]

J	±5

4 特性

Y	−10～+85℃

7 当社管理番号

R D 2 A 2 B Y 1 0 2 J ○ ○ ○

1 2 3 4 5 6 7

1 Type

JC	CROSS CONDUCTOR(0Ω)
RD	CARBON FILM
RN	METAL FILM

2 External dimensions LXφD [mm]

2A	3.5×1.4 (Melf)
3A	2.0×1.25(Melf)
4B	1.6×1.0 (Tubular)

3 Rated power [W]

2A	0.1
2B	0.125

5 Nominal Resistance(Ω)

example	
151	150

6 Resistance tolerance [%]

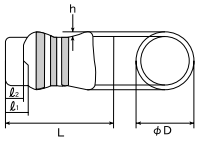
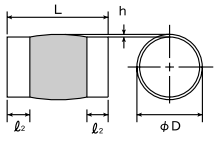
J	±5

4 Characteristics

Y	−10～+85℃

7 Internal code

外形寸法　EXTERNAL DIMENSIONS

Type	2A	3A	4B
Fig.			
L	3.5±0.2 (0.138±0.008)	2.0±0.1 (0.079±0.004)	$1.6^{+0.15}_{-0.05}$ $(0.063^{+0.006}_{-0.002})$
ℓ_1	1.0 max (0.039 max)	0.6 max (0.024 max)	———
ℓ_2	0.6 min (0.024 min)	0.3 min (0.012 min)	$0.2^{+0.25}_{0}$ $(0.008^{+0.010}_{0})$
ϕD(T)	$1.4^{+0.2}_{-0.1}$ $(0.055^{+0.008}_{-0.004})$	$1.25^{+0.10}_{-0.05}$ $(0.049^{+0.004}_{-0.002})$	$1.0^{+0.10}_{-0.05}$ $(0.039^{+0.004}_{-0.002})$
h	0.1 max (0.004 max)	0.07 max (0.003 max)	0.05 max (0.002 max)

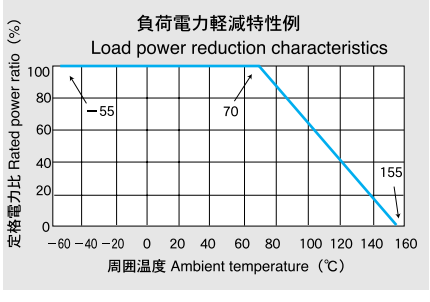
Unit : mm(Inch)

バリエーション　AVAILABLE RANGE

Type		一般用　General Use								
		炭素皮膜　Carbon Film							金属皮膜　Metal Film	
		RD2A2B				RD3A2B			RN4B2A	
定格電力 Rated Wattage		0.125(1/8)W				0.125(1/8)W			0.10 (1/10) W	
最高使用電圧 Maximum Operating Voltage		150V				150V			50V	
最高過負荷電圧 Maximum Withstanding Voltage		300V				200V			100V	
抵抗温度係数 Temperature Characteristics [ppm/℃]		±350	+0 −600	−150 −1000	−150 −1500	±350	+0 −600	−150 −1000	±450	±350
抵抗値範囲［Ω］ (標準E-24シリーズ) Resistance Range (E-24 STEP)		1 1k	1.1k 47k	51k 510k	560k 1M	1 1k	1.1k 47k	51k 1M	2 100	110 1M
抵抗値許容差 Resistance Tolerance		J(±5%)								
電流雑音 Current Noise ［μV/V］	0.6max	100kΩmax				———			———	
	1.0max	110kΩ to 1MΩ				91kΩmax			10kΩmax	
	2.0max	———				100kΩ to 1MΩ			———	
	3.0max	———				———			11kΩ to 1MΩ	

クロスコンダクタ　Cross Conductors

形　式　Type	JC2A	JC3A	JC4B
定格電流［A］ Rated Current	2	2	2
抵抗値 Resistance［mΩ］	10 max	10 max	10 max

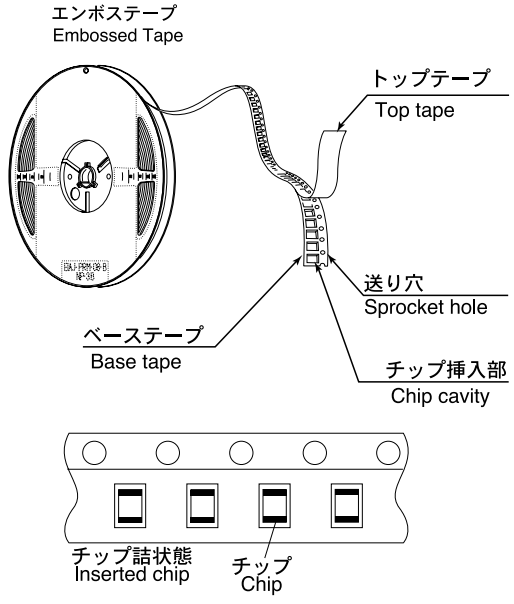


セレクション　ガイド Selection Guide P.12
アイテム一覧 Part Numbers P.461
特性図 Electrical Characteristics P.461
梱包 Packaging P.462
信頼性 Reliability Data P.464
使用上の注意 Precautions P.470
etc

①標準数量　Standard Quantity

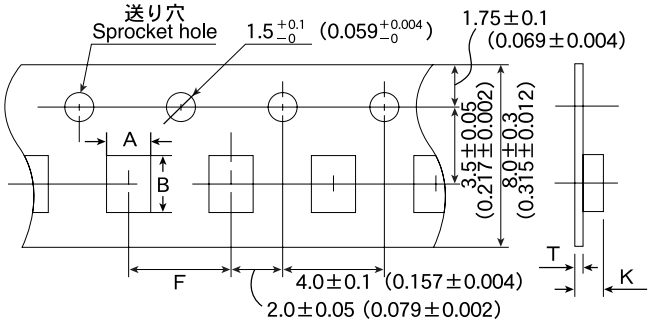
形　式 Type	標準数量　Standard Quantity [pcs]		
	袋づめ Packaging	バルクカセット Bulk cassette	テーピング Taping
RD2A, JC2A	5000	——	2500
RD3A, JC3A	5000	6000	3000
RN4B, JC4B	10000	10000	3000

②テーピング材質　Tape Material



③テーピング寸法　Taping dimensions

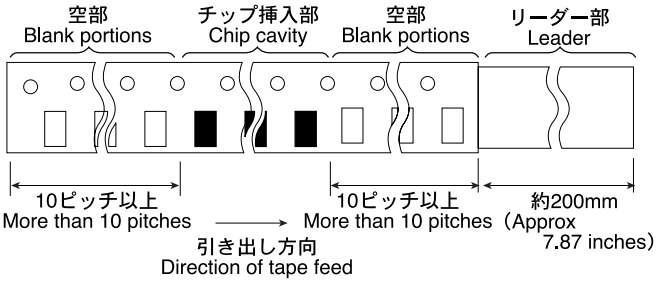
エンボステープ（8mm幅）　Embossed tape (0.315 inches wide)



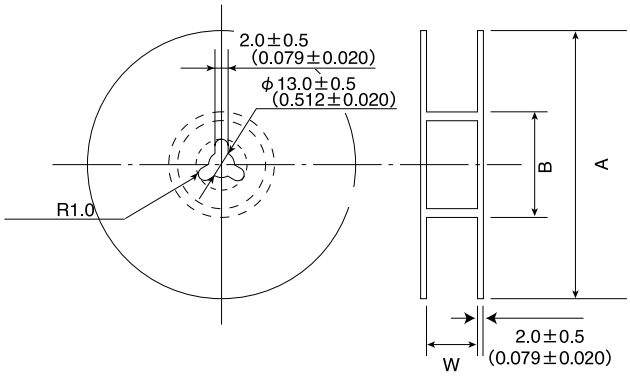
形　式 Type	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープの厚み Tape Thickness	
	A	B	F	K	T
RD2A, JC2A	2.1±0.2 (0.083±0.008)	3.8±0.2 (0.150±0.008)	4.0±0.1 (0.157±0.004)	1.8±0.2 (0.071±0.008)	0.3±0.05 (0.012±0.002)
RD3A, JC3A	2.1±0.1 (0.083±0.004)	2.5±0.2 (0.098±0.008)	4.0±0.1 (0.157±0.004)	1.4±0.2 (0.055±0.008)	0.3±0.05 (0.012±0.002)
RN4B, JC4B	1.45±0.15 (0.057±0.006)	2.0±0.2 (0.079±0.008)	4.0±0.1 (0.157±0.004)	1.2±0.2 (0.047±0.008)	0.25±0.05 (0.010±0.002)

Unit：mm (inch)

④リーダ部／空部　Leader and Blank Portion



⑤リール寸法　Reel Size



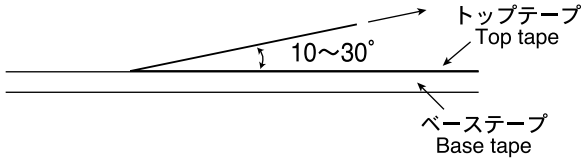
Unit：mm(inch)

形　式 Type	A	B	W
RD2A JC2A RD3A	180±0.5	60～61	9.1～9.3
JC3A RN4B JC4B	(7.089±0.020)	(2.36～2.399)	(0.393～0.51)

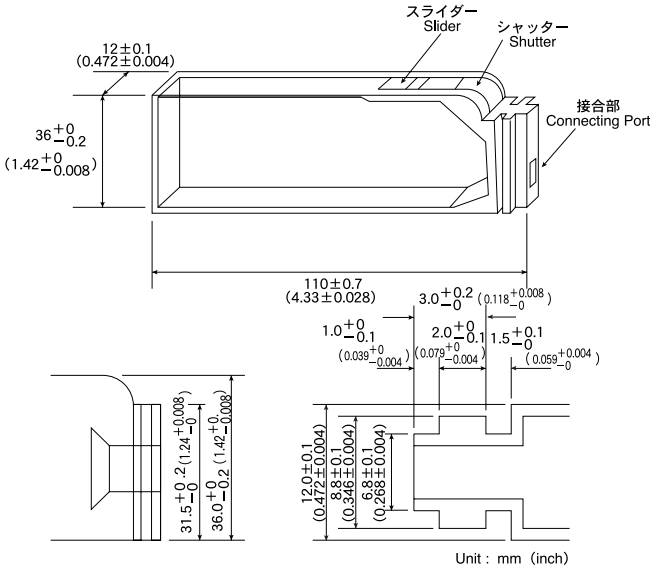
⑥トップテープ強度　Top Tape Strength

トップテープの剥離力は、下図矢印の方向にて0.19～0.59Nです。

The top tape requires a peel-off force of 0.19 to 0.59N in the direction of the arrow as illustrated below.



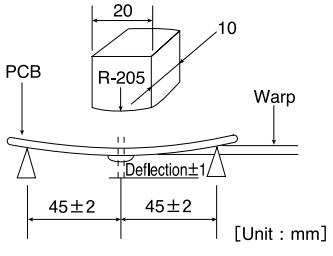
⑦バルクカセット　Bulk cassette dimensions



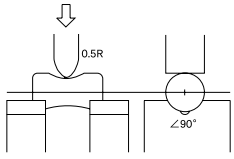
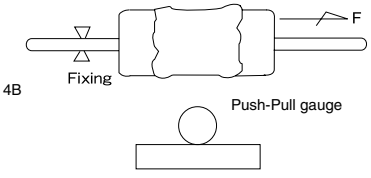
Fixed Resistors

Item	Specified Value		Test Methods and Remarks
	Carbon/Metal Film Resistor	Cross Conductor	
1. Operating Temperature Range	−55 to +155℃		
2. Storage Temperature Range	−55 to +155℃		
3. Rated Power	2A:1/8 W 3A:1/8 W 4B:1/10W	————	
4. Rated Current	————	2A, 3A, 4B : 2A	
5. Maximum Operating Voltage	2A : 150V 3A : 150V 4B : 50V	————	
6. Resistance	Within ±5% of Norminal Resistance (see the attached table)	10mΩ max.	According to JIS C 5202 clause 5.1. Nominal resistance (Ω) / Maximum applied voltage (V) Under 100 — 0.3 100 to under 1 k — 1 1 k to under 10 k — 3 10 k to under 100 k — 10 100 k to under 1M — 30 1M or over — 50
7. Temperature Characteristic of Resistance	Temperature coefficient shall be within the following range. 2A Under 1kΩ : ±350 1.1kΩ to 47kΩ : 0 to −600 51.0kΩ to 510kΩ :−150 to−1000 560kΩ or over : −150 to−1500 (ppm /℃) 3A Under 1kΩ : ±350 1.1kΩ to 47kΩ : 0 to −600 51.0kΩ to 1MΩ : −150 to −1000 (ppm/℃) 4B 2.0Ω to 100Ω : ±450 110Ω to 1 MΩ : ±350 (ppm/℃)	————	According to JIS C 5202 clause 5.2. Test temperature : Room temperature or room temperature+100℃ The T-C of resistance shall be expressed in accordance with JIS C 5202 clause 5.2.2 (2)(a).
8. Short TermOverload	Resistance change : Within±(1%+0.05Ω)	————	According to JIS C 5202 clause 5. 5. Test methods : Condition A Type / Maximum overload voltage 2A — 300V 3A — 200V 4B — 100V

Fixed Resistors

Item	Specified Value		Test Methods and Remarks
	Carbon/Metal Film Resistor	Cross Conductor	
9. Insulation Resistance	10000MΩ min.		According to JIS C 5202 clause 5.6. Mounting methods : Condition A Measuring voltage : 100VDC Conditions : Cross Conductor shall be mounted on a V block.
10. Withstanding Voltage	No abnormality such as flashover, burning, or breakdown.		According to JIS C 5202 clause 5.7. Wrap the metal foil around the insulated part with clearance to prevent creepage discharge between the foil and the terminal by the application of test voltage. Type / Test voltage / Duration 2A / 250V / 1 min. 3A / 150V 4B / 100V
11. Intermittent Overload	Resistance change : Within±(1%+0.05Ω)	———	According to JIS C 5202 clause 5.8. Number of applications : 10000±20 times Type / Maximum intermittent voltage 2A / 500V 3A / 300V 4B / 200V
12. Current Noise	2A 100kΩ or under : 0.6μV/V max. 110kΩ to 1.0MΩ :1.0μV/V max. 3A 91kΩ or under : 1.0μV/V max. 100kΩ to 1.0MΩ : 2.0μV/V max. 4B 10kΩ or under : 1.0μV/V max. 11kΩ to 1.0MΩ : 3.0μV/V max.	———	According to JIS C 5202 clause 5.9. Measuring equipment : Q.T.L (USA) 315 B type
13.Resistance to Flexure Substrate	Resistance change : Within±(1%+0.05Ω)	2A~4B : 10mΩ max.	Warp : 3 mm Test substrate : Glass-epoxy resin Speed : 0.5mm/s 

Fixed Resistors

Item	Specified Value		Test Methods and Remarks
	Carbon/Metal Film Resistor	Cross Conductor	
14. Body Strengh	No abnormality in appearance such as fissure, crack, or bend.	————	Applied force : 2A : 24.5N 3A : 19.6N 4B : 9.8N Duration : 10 sec. Speed : Shall attain to specified force in 2 sec. 
15. Terminal Fitness	2A : 9.8N min. 3A : 7.84N min. 4B : 4.9N min.	————	2A・3A Speed : 5mm/s 
16. Resistance to Soldering Heat	Resistance change : Within±(1%+0.05Ω)	2A~4B : 10mΩ max.	Solder temperature : 260±5℃ Duration : 5 $\pm^{1}_{0}$ sec. Flux immersion : 5±0.5 sec. Recovery : 1 hr or recovery under the standard condition after the test.
17. Solderability	At least 95% of terminal electrode is covered by new solder. The solderability is to be guaranteed for 6 months from the time of delivery.		Solder temperature : 230±5℃ Duration : 3±0.5 sec. Flux immersion : 5±0.5 sec.
18. Solvent Resistance/ Color Coding	No significant abnormality in appearance and legible marking.		According to JIS C 5202 clause 6. 9. Solvent type : Isoprophyl alcohol
19. Change of Temperature	Resistance change : Within ±(1%+0.05Ω)	2A~4B : 10mΩ max.	According to JIS C 5202 clause 7. 4. Conditions for 1 cycle Step 1 :Room temperature 3 min. Step 2 :−55±3℃ 30 min. Step 3 :Room temperature 3 min. Step 4 :125±3℃ 30 min. Number of cycles : 5
20. Endurance (Humidity Loading Test)	Resistance change : Within ±(5%+0.05Ω)	————	According to JIS C 5202 clause 7.9. Temperature : 60±2℃ Humidity : 90~95%RH Duration : 1000$\pm^{48}_{0}$ hrs
21. Endurance (Rated Current Loading Test)	Resistance change : Within ±(3%+0.05Ω)	————	According to JIS C 5202 clause 7.10. Temperature : 70±3℃ Duration : 1000$^{+48}_{-0}$ hrs

Precautions on the use of Fixed resistors

Stages	Precautions
1. Thermal design considerations	◆A guide for Mounting 1. Special attention is required when mounting resistors designed for less tolerance or low resistance values. 2. Keep the distance as far as possible between one resistor and the other so as to avoid the influences of heat stresses on each other. 3. For series resistor connection design, it is necessary to ensure that one resistor's heat does not rapidly transfer to another resistor. 4. Carefully select the base materials where resistors are mounted; these materials should be free from scorching and expansion. 5. Before applying a resin coating around resistors, it is recommended to always contact material manufacturer before beginning since any resin material is of a chemical composition.
2. Mechanical Stresses	◆Stresses to Chip Resistors 1. Heat deflection of the PC board directly affects the components. Therefore, careful consideration of the following items is required. (1) When designing layout of resistors onto the board, make sure that the electrodes are arranged the direction of the fiber weave. (called vertical direction.) (2) Lands with wide width can reduce the board resistance to warp. Always select appropriate land width. (3) When designing the layout of resistors always consider possible stresses coming from any post soldering operations, such as PC board splitting. (4) If the size of the right and left lands are different, the amount of solder may differ between lands, leading to stresses born on only one side of the land during the solder cooling process. Therefore, make sure that both lands have the same size. (5) Careful attention is required when different sizes of parts are closely mounted. 2. During the mounting operation or after, do not put any stresses on the protection film covering the body of the resistor. 3. When using a small tipped soldering iron, careful attention is required so as not to touch the electrodes. 4. If cracks are found, there is a possibility that the adjustment of the mounter is out of adjustment. Confirm the mounting machine conditions before starting operation. 5. Do not use any resistors that were dropped onto the floor or any second hand parts taken from other PC boards.
3. Coating Materials	◆Coating Resin 1. If there is a need to mold resistors into resin after mounting, the following cautions should be taken into account: If a resistor is molded into resin, repetitive heat shock during the hardening process may lead to breakage, resistance value change, or reduced performance of the resistor, depending on resistor protection film materials. These problems are due to heat inflation/deflation during the hardening process. To prevent these problems, better and flexible resin materials having higher resistance to heat and humidity, should be used. Do not use a resin containing ionic foreign matter, or materials that are dissociated to ion by absorbing humidity. They may reduce resistance to humidity, resulting in a malfunction of the resistor.
4. Storage, Transporting and Operating Environment	◆Conditions for Storage, Transportation and Operation 1. Special precautions must be taken to ensure resistors are not placed in an environment filled with any decomposition gases, dirt, high humidity, and sea air. Resistors used under these conditions may experience a reduction of insulation, corrosion, and short circuiting. 2. Again sea air, high humidity, dirt, and decomposition gasses can easily cause a resistor to short circuit, therefore, careful attention is required to the environment in which it will be used. When the resistor is exposed to these conditions in an application, the equipment must be designed in for special conditions such as being humidity proof. 3. When selecting wrapping/packaging materials, resistance to heat and direct sunlight should be carefully taken in to account. When transporting taped/bulk-packed resistors, package deformation or chip sticking may take place, causing troubles in mounting. Direct sunlight will deteriorate resistor solderability, reduce the strength of the tape materials, and make it difficult to maintain taping strength. 4. The resistors should not be exposed to high humidity and temperature. 5. When taped products are exposed to vibration for a long time, or mounting is conducted under excessively dry conditions, static electricity in the packaged tape can cause sticking of the top cover tape that leads to poor mounting, breakage of the resistors, or reduction in resistor performance. 6. Storage conditions vary depending on resistor types or manufacturers. Therefore, it is imperative to make a confirmation beforehand concerning storage conditions (temperature, humidity, storage period.)
5.Precautions	◆Usage precautions 1. The following conditions should be considered in resistor usage: Do not touch the resistors while in operation because the surface temperature is very high. Touching operating resistors may lead to serious burns or electrical shock.
6. Chemical Resistance	1. A resistor's painted area is designed to withstand a few minutes of solvent dipping. However, the solvent may cause the markings to come off very easily. This happens with flux spraying operations so it is recommend that the resistors not be touched. Also be careful of the above points when cleaning resistors in a ultrasonicwave chamber. 2. Combustibility characteristics of resistors may not be guaranteed if immersed in a solvent, so please contact the manufacturer concerning combustibility.

Precautions on the use of Fixed resistors

Stages	Precautions
7. Part Mounting and Soldering Conditions	◆Part Mounting and Soldering Conditions. 1. Any external force of any kind should not be applied to the resistors until they are cooled after heat treatment. ◆Parts Mounting of chip type resistors 1. Always refer to the recommended land patterns and part mounting process. 2. To achieve good chip resistor mounting onto a PC board the following points should be checked; the size of land pattern, the location and the type of adhesives (in case of wave-soldering.) Pattern design also differs with the type of mounter machine, soldering machines and PCB materials. 3. When using common pattern for several different sized components is used, the land pattern of the smaller items should be reduced with solder resist to prevent excessive amounts of solder that would cause electrode stress. 4. If some flux remains after cleaning, it may cause deterioration of moisture proofing through corrosion or hygroscopic conductivity. 5. Apply the conditions recommended by Taiyo Yuden when reflow soldering is conducted. 6. Soldering temperature in wave-soldering should be below 270 ℃, and do not exceed the time recommended in the solder profile. 7. If the resistors are soldered under a high temperature for longer than recommended in the solder profile it may cause solder-leaching. 8. A flux which has less corrosion and better flow characteristics than the solder should be applied. The melting point of the flux applied should be lower than the melting point of the solder. There are several types of fluxes available. Select suitable flux that matches soldering conditions, soldering machines, and the PCB materials. 9. The following precautions should be adhered to if soldering irons are used;. (1) Do not touch soldering irons to the resistor's protective coating. (2) When a high temperature is required at the tip of the iron, soldering time should be as short as possible(below 350 C and less than 3 minutes.) 10. Select an appropriate adhesive having higher insulation resistance and moisture proofing. The adhesive should also not deteriorate under the specified operating temperature and hot spot temperature. Also, a suitable amount of the adhesive should be applied. 11. To keep to external terminations of the resistors from separating from the body, compatible termination materials should be used. For example, if silver palladium (Ag-Pd) is used for the external terminations, Ag (2-2.5%) eutectic solder should be used. Please also carefully select the amount of solder used.
8. Hints for Higher Reliability of the Products	◆Failure modes Failure modes with resistors are considered as follows; 1. Disconnection 2. Short circuit 3. Unstable resistance value 4. Reaching too high of a resistance value 5. Lowering withstand voltage, change of resistance value by cracking of the outer coating Failure modes are all different, depending on the type of resistor. ◆Hints for Better Reliability The reliability of the resistors can be upgraded through adherence to the following points: 1. In order to prevent resistor deterioration at high temperatures, one should consider derating the load power and the voltage for resistors. 2. Careful handling of resistors should be taken into account to avoid possible breakage during assembly work. 3. If resistors are stored for very long time, or resistors are known to be past the time limit for storage, contact Taiyo Yuden before use.