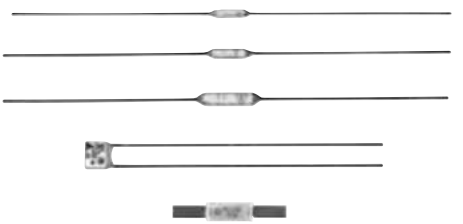
Thermal Cutoffs (TCO)/ Thermal-Links

EYP Series: **N**
Series: **F**
Series: **E**
Series: **H**
Series: **MT**



■ Features

- **Small and Insulation Type**
  TCO is compact and insulated, featuring quick temperature response, and mountable in a small space without insulation or protection.
- **High Reliability**
  TCO open reliably when the equipment become abnormal, and is not resettable.
- **Solid Structure**
  Unique formed lead provides reliable TCO connection and provides easy assembly handling. (Axial lead type only)
- **Non-Cadmium Alloy**
  TCO uses specially selected Non-Cadmium alloy.
- **Available on Special Request**
  Available for taping type, lead forming, insulated lead etc.
- **Thin Type**
  Thickness is less than 1 mm. Available for spot welding.

■ Approved Safety Standards

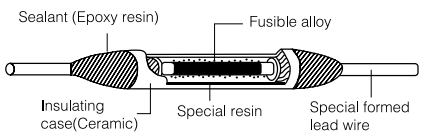
- ▽ (Japan) : No. 33-□□□
- UL (U.S.A.) : E60271
- CSA (Canada) : LR67163
- VDE (Germany) : 4811. 6-□□□□-□□□□
- BEAB (U.K.) : C□□□□
  See Ratings in details.

■ Recommended Applications

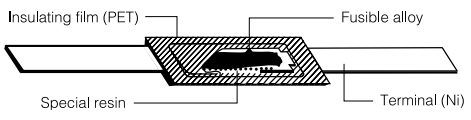
- Transformers, Solenoids, Ventilation fan, Electric fans, Small electric motors, Driers, Gas home appliances, Fluorescent lights, Electric shavers, Adaptors, Heating devices, ICs, battery, etc. The TCO can be used for overheating protection.

■ Construction

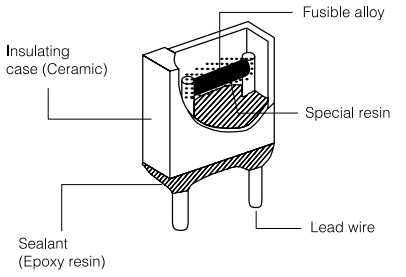
● Axial lead type (N, F and E series)



● Thin type (MT series)



● Radial lead type (H series)



■ Ratings

● N series

Part No.	Type No. of Approved Standards	Rated Functioning Temp.*1 (°C)	Functioning Temp.*2 (°C)	Maximum Operating Temp.*3 (°C)	Holding Temp.*4 (°C)	Maximum Temp. Limit (°C)*5		Electrical Rating			Approved Safety Standards					Approved Safety Standards File No.
						UL,VDE, BEAB	CSA	AC/ DC	Amp. (A)	Volt. (V)	⛛	UL	CSA	VDE	BEAB	
EYP2BN082	N082	86	82±2	52	56	200	150	AC	3	125		○	○	○	—	UL : E60271 CSA : LR67163 VDE : 4811.6-1171-0001 BEAB : C0736
				60	60			AC	2	250	33-627	○	○	○	○	
				45	50			DC	4	50		○	○	○	—	
EYP2BN088	N088	92	88±2	56	60	200		AC	3	125		○	—	—	—	
				62	65			AC	2	250	33-627	○	—	—	—	
				47	52			DC	4	50		○	—	—	—	
EYP2BN098	N098	102	98±2	65	70	200	150	AC	3	125		○	○	○	—	
				75	76			AC	2	250	33-632	○	○	○	○	
				55	60			DC	4	50		○	○	○	—	
EYP2BN109	N109	114	110±3	76	86	200	150	AC	3	125		○	○	○	—	
				80	90			AC	2	250	33-634	○	○	○	○	
				65	74			DC	5	50		○	○	○	—	
EYP2BN110	N110	115	110^{+3}_{-2}	76	86	200		AC	3	125		○	○	○	—	
				80	90			AC	2	250	33-634	○	○	○	—	
				65	74			DC	5	50		○	○	○	—	
EYP2BN124	N124	130	126±2	90	105	200	180	AC	3	125		○	○	○	—	
				94	105			AC	2	250	33-619	○	○	○	○	
				80	94			DC	5	50		○	○	○	—	
EYP2BN126	N126	133	128±2	92	108	200	180	AC	3	125		○	○	○	—	
				96	108			AC	2	250	33-619	○	○	○	○	
				82	96			DC	5	50		○	○	○	—	
EYP2BN135	N135	140	136±3	99	115	200	180	AC	3	125		○	○	○	—	
				103	115			AC	2	250	33-619	○	○	○	○	
				80	90			DC	6	50		○	○	○	—	
EYP2BN143	N143	145	141±2	105	115	200	180	AC	3	125		○	○	○	—	
				110	120			AC	2	250	33-621	○	○	○	○	
				80	90			DC	6	50		○	○	○	—	
EYP2BN163	N163	168	163^{+4}_{-2}	120	130	200		AC	3	125		○	○	○	—	
				120	135			AC	2	250	33-623	○	○	○	○	
				90	100			DC	6	50		○	○	○	—	
EYP2BN183	N183	188	183^{+3}_{-2}	120	140	200		AC	3	125		○	○	○	—	
				120	140			AC	2	250	33-625	○	○	○	○	
				120	130			DC	6	50		○	○	○	—	

Note: Part number of long lead types are added letter "L" at the end of the number.

● F series

Part No.	Type No. of Approved Standards	Rated Functioning Temp.*1 (°C)	Functioning Temp.*2 (°C)	Maximum Operating Temp.*3 (°C)	Holding Temp.*4 (°C)	Maximum Temp. Limit (°C)*5		Electrical Rating			Approved Safety Standards					Approved Safety Standards File No.
						UL,VDE, BEAB	CSA	AC/ DC	Amp. (A)	Volt. (V)	⛛	UL	CSA	VDE	BEAB	
EYP1BF102	F102	102	98±2	70	74	200	150	AC	2	125		○	○	○	—	UL : E60271 CSA : LR67163 VDE : 4811.6-4510-1026 BEAB : C0738
				75	76			AC	1	250	33-632	○	○	○	○	
				55	60			DC	3.5	50		○	○	○	—	
EYP1BF115	F115	115	110^{+3}_{-2}	76	90	200	150	AC	2	125		○	○	○	—	
				80	90			AC	1	250	33-634	○	○	○	○	
				70	80			DC	4	50		○	○	○	—	
EYP1BF130	F130	130	126±2	90	105	200	180	AC	2	125		○	○	○	—	
				94	105			AC	1	250	33-619	○	○	○	○	
				74	90			DC	4.5	50		○	○	○	—	
EYP1BF133	F133	133	128±2	92	108	200	180	AC	2	125		○	○	○	—	
				96	108			AC	1	250	33-619	○	○	○	○	
				76	92			DC	4.5	50		○	○	○	—	
EYP1BF139	F139	139	135±3	99	115	200	180	AC	2	125		○	○	○	—	
				103	115			AC	1	250	33-619	○	○	○	○	
				80	95			DC	5	50		○	○	○	—	
EYP1BF168	F168	168	163^{+3}_{-2}	120	135	200		AC	2	125		○	○	○	—	
				120	142			AC	1	250	33-623	○	○	○	—	
				95	110			DC	5	50		○	○	○	—	

Note: Part number of long lead types are added letter "L" at the end of the number.

● E series

Part No.	Type No. of Approved Standards	Rated Functioning Temp.*1 (°C)	Functioning Temp.*2 (°C)	Maximum Operating Temp.*3 (°C)	Holding Temp.*4 (°C)	Maximum Temp. Limit (°C)*5		Electrical Rating			Approved Safety Standards					Approved Safety Standards File No.
						UL,VDE, BEAB	CSA	AC/ DC	Amp. (A)	Volt. (V)	▽	UL	CSA	VDE	BEAB	
EYP05BE102	E102	102	98±2	70	78	200	150	AC	1.5	125		○	○	○	—	UL : E60271 CSA : LR67163 VDE : 4811.6-4510-1030 BEAB : C0739
				75	80			AC	0.5	250	33-632	○	○	○	○	
				65	70			DC	3	50		○	○	○	—	
EYP05BE115	E115	115	110±2	76	93	200	150	AC	1.5	125		○	○	○	—	
				80	95			AC	0.5	250	33-634	○	○	○	○	
				70	84			DC	3	50		○	○	○	—	
EY05BE130	E130	130	126±2	90	112	200	180	AC	1.5	125		○	○	○	—	
				94	112			AC	0.5	250	33-619	○	○	○	○	
				83	102			DC	3	50		○	○	○	—	
				70	81			DC	5	50		○	—	—	—	
EYP05BE133	E133	133	128±2	92	115	200	180	AC	1.5	125		○	○	○	—	
				96	115			AC	0.5	250	33-619	○	○	○	○	
				85	105			DC	3	50		○	○	○	—	
EYP05BE139	E139	139	135±2	99	120	200	180	AC	1.5	125		○	○	○	—	
				103	120			AC	0.5	250	33-619	○	○	○	○	
				92	110			DC	3	50		○	○	○	—	
				80	90			DC	5	50		○	—	—	—	

Note: E130 and E139 are additionaly approved for UL, on DC50V 5A
Part number of long lead types are added letter "L" at the end of the number.

● H series

Part No.	Type No. of Approved Standards	Rated Functioning Temp.*1 (°C)	Functioning Temp.*2 (°C)	Maximum Operating Temp.*3 (°C)	Holding Temp.*4 (°C)	Maximum Temp. Limit (°C)*5		Electrical Rating			Approved Safety Standards					Approved Safety Standards File No.
						UL,VDE, BEAB	CSA	AC/ DC	Amp. (A)	Volt. (V)	▽	UL	CSA	VDE	BEAB	
EYP2BH102	H102	102	98±2	70	74	200	200	AC	3	125		○	○	○	—	UL : E60271 CSA : LR67163 VDE : 4811.6-4510-1029 BEAB : C0737
				75	76			AC	2	250	33-632	○	○	○	○	
				65	70			DC	3.5	50		○	○	○	—	
EYP2BH115	H115	115	110±2	76	86	200	200	AC	3	125		○	○	○	—	
				80	90			AC	2	250	33-634	○	○	○	○	
				74	84			DC	3.5	50		○	○	○	—	
EYP2BH130	H130	130	126±2	90	105	200	200	AC	3	125		○	○	○	—	
				94	105			AC	2	250	33-619	○	○	○	○	
				86	100			DC	3.5	50		○	○	○	—	
EYP2BH133	H133	133	128±2	92	108	200	200	AC	3	125		○	○	○	—	
				96	108			AC	2	250	33-619	○	○	○	○	
				88	102			DC	3.5	50		○	○	○	—	
EYP2BH139	H139	139	135±2	99	115	200	200	AC	3	125		○	○	○	—	
				103	115			AC	2	250	33-619	○	○	○	○	
				95	107			DC	3.5	50		○	○	○	—	
EYP2BH168	H168	168	163^{+3}_{-2}	120	135	200	200	AC	3	125		○	○	○	—	
				120	142			AC	2	250	33-623	—	○	○	—	
				120	135			DC	3.5	50		○	○	○	—	

● MT series

Part No.	Type No. of Approved Standards	Rated Functioning Temp.*1 (°C)	Functioning Temp.*2 (°C)	Maximum Operating Temp.*3 (°C)	Holding Temp.*4 (°C)	Maximum Temp. Limit (°C)*5	Electrical Rating			Approved Safety Standards	Approved Safety Standards File No.
							AC/ DC	Amp. (A)	Volt. (V)	UL	
EYP2MT092	MT092	92	89±2	55	60	150	DC	2	50	○	UL : E60271
EYP2MT092A	MT092A										
EYP2MT092B	MT092B										
EYP2MT098	MT098	98	94±2	60	65	150	DC	2	50	○	
EYP2MT098A	MT098A										
EYP2MT098B	MT098B										
EYP2MT102	MT102	102	98±2	65	70	150	DC	2	50	○	
EYP2MT102A	MT102A										
EYP2MT102B	MT102B										

*1 Rated Functioning Temperature (UL: TF, CSA,VDE, BEAB: Tf)
The temperature at which a TCO changes its state of conductivity to open circuit with loading detection current only.
Tolerance; ▽ ; ±7 °C
UL,CSA,VDE, BEAB; $^{0}_{-10}$°C

*2 Functioning Temperature (Fusing-off temperature)
The functioning temperature at which a TCO changes its state of conductivity to open circuit in the ambient air oven which increases temperature by 1 °C per minute and with loading the detective current 0.1 A or less.

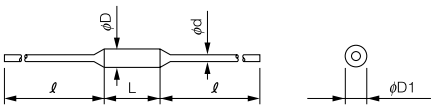
*3 Maximum Operating Temperature.
The maximum temperature at which a TCO can be maintained while conducting rated current for 3000 h.
For details please refer to delivery specification.

*4 Holding Temperature (UL: TH, CSA: Th, VDE, BEAB: Tc)
The maximum temperature at which a TCO can be maintained while conducting rated current for 168 h which will not cause a change in state of conductivity to open circuit.

*5 Maximum Temperature Limit (UL: TM, CSA,VDE, BEAB: Tm)
The maximum temperature at which a TCO can maintains its mechanical and electrical properties without closing again for 10 minutes after a TCO has changed its state of conductivity.

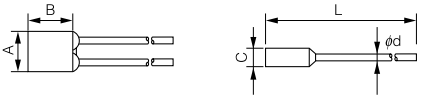
■ Dimensions in mm (not to scale)

● Axial lead type



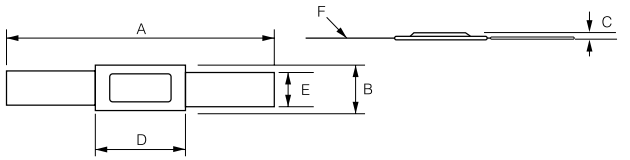
	Dimensions (mm)				
	L	φD	φD1	ℓ	φd
N Series	9.0±1.0	2.5±0.2	3 max.	38±3 (✻78±3)	0.60±0.05
F Series	6.0±1.0	$1.85^{+0.20}_{-0.15}$	2.2 max.	38±3 (✻68±3)	0.53±0.02
E Series	5.0±0.5	1.5±0.1	1.8 max.	38±3 (✻68±3)	0.53±0.02

● Radial lead type



	Dimensions (mm)				
	A	B	C	L	φd
H Series	5.0±0.5	4.0±0.5	2.2±0.3	55±3	0.53±0.02

(✻) Long lead type



		Dimensions (mm)					
		A	B	C	D	E	F
NEW	MT Series	26.5±0.5	4.5±0.4	0.75±0.20	$11.0^{+0.6}_{-0.4}$	3.0±0.2	0.15±0.02

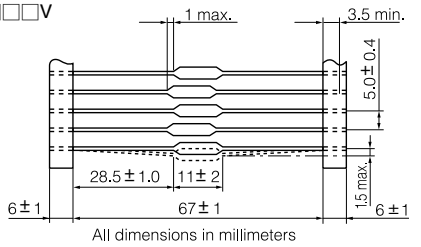
■ Marking

Following items shall be indicated on TCO at least.

- N, F, E, H Series : Type No., Date Code, M Mark(Ⓜ), ▽, Rated Functioning Temperature, Rated Current
- MT Series : Type No., Date Code, M Mark(Ⓜ)

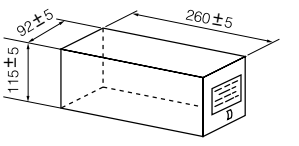
■ Standard Taping Specifications

EYP2B□□□□V



All dimensions in millimeters

BOX



Standard Quantity 4000 pcs.

■ Packing Methods

Part No.	Standard Quantity	Style	Weight/pcs. (mg)
EYP2BN□□□	100 pcs./Bag	Bulk	340
EYP2BN□□□L			510
EYP1BF□□□			220
EYP1BF□□□L			330
EYP05BE□□□			210
EYP05BE□□□L			320
EYP2BH□□□			350
EYP2BN□□□V	4000 pcs./Box	Flat Box	340
EYP2MT□□□□	200 pcs./Bag	Bulk	130

⚠Safety Precautions

● Design Applications

1. Temperature rating and electrical rating are specified for TCO. Use TCO within the ratings.
   1) Use a TCO under the ambient temperature not more than the maximum operating temperature specified in the individual specification.
      Using a TCO under higher temperature than the maximum operating temperature may cause premature opening or opening delay.
   - When a TCO is continuously used at the temperature close to the functioning temperature, the TCO may operate while being used.
   - When a TCO is continuously used at the temperature higher than the maximum operation temperature, the TCO may be deteriorated and may not operate at a specified temperature in abnormality.

   2) The holding temperature is defined as the highest temperature at which a TCO activated continuously with the rated current for 168 hours, does not operate. The TCO can not be used over 168 hours exceeding the holding temperature.
   3) An equipment shall be so designed that its over shoot does not exceed the maximum temperature limit after the TCO operates.
   4) If a TCO is activated by voltage higher than the rated voltage or current higher than the rated current, the TCO itself produces excessive heat, resulting in premature opening and arc generated at operation that will cause abnormality of appearance(crack on body) and insufficient insulation.
   - When a TCO is operated at abnormal status of equipment while the rated voltage and/or the rated current being exceeded, it may not cut off the circuit.

   5) Where transient overload is expected to be applied, repeat the tests under the worst condition assumed for decision.
   6) A TCO cannot be used as a current sensitive fuse.
2. To fully use the function of a TCO, suitable TCO to each equipment must be selected. For selection, test by yourself for each equipment.
   1) Tests shall be so repeated for the finished equipment that TCO does not operate under normal condition and does operate under abnormal condition only.
   2) To improve thermal response of a TCO, put the main body of the TCO and the lead wires(terminals) as close to the heat source as possible and the place where the TCO is evenly heated.
      If the temperatures transferred to the main body and to the lead wires(terminals) are largely different from each other, improper operation is expected causing arc and deterioration of insulation.
3. Avoid application of excessive vibration and mechanical stress to the TCO fitted. Otherwise, cutting off failure of fusible alloy or lead wires, or damage to the main body may be caused.
4. When sealing a TCO with resin, select the resin that does not corrode the seals or the lead wires(terminals). When sealing the overall TCO with resin, test repeatedly to confirm normal operation of the TCO on the finished equipment.
5. TCO does not take the use under the following special environments into consideration. Do not use under the following environments.
   1) Use in liquids such as water, oil, chemical and organic solvent
   2) Use under direct sunlight and in outdoor and dusty atmospheres
   3) Use in such a place where a TCO is wetted due to dew condensation.

   ✻ The use in the following environments may affect the performance of the TCO; prior to use verify the performance, reliability, etc. thoroughly.
      (1) Use in places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2 and NO_2
      (2) Use in environment with large static electricity and strong electromagnetic waves.

   ✻ Do not use the TCO in aerospace equipment, atomic energy equipment, military weapon, life saving equipment, etc.

● Instruction

6. Forming and Cutting
   1) Lead wires(terminals) are to be bent or cut not to damage a TCO at least 3 mm away from the TCO seals. (axial / radial type) or body (thin type). The TCO seals (axial / radial type) shall not be grasped with any tools or holders. Terminals of thin type TCO are to be grasped when they are bent or out. (See Fig.1)
   2) The lead wires and terminals shall not be nicked, fractured or bumed.
      The body and/or seals must not be damaged, burned or overheated.
   3) It is recommended that experimental assembly trials should be made by production personnel so that they can verify that manufacturing procedures will not exceed the maximum tested “pull” and “push” forces of 20 N (thin type :10 N) and 5 N respectively on the lead wires, or induce excessive twisting, or the like.

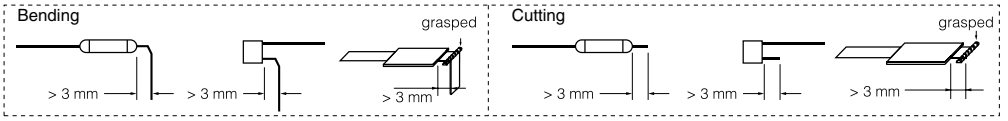


Fig-1

7. Solderling, Welding, Calking
   1) Lead wires are to be soldered with the standard conditions shown in Table 1.
      Excessive soldering heat and soldering time may cause damage to a TCO.
      If higher temperature, longer time or shorter lead length than the conditions of Table 1 are applied, it is recommended to run tests for finding the soldering conditions not to damage the TCO. Also using of tools such as plieris recommended to dissipate the soldering heat by grasping lead wires between TCO body and soldering point.
   2) Avoid preheating and gradual cooling as far as possible. If preheating and gradual cooling is made anyway, set the process conditions after confirming that the TCO is not affected by these procedures.
   3) Do not make reflow soldering.
   4) Thin type (MT series) is not to be soldered.
   5) If water or solvent is used for cleaning flux after soldering, check and confirm reliability of the agent.
   6) Lead wires are to be clamped at least 3 mm away from the seals.
      Improper connections may cause damage to the seals or other parts and may result in nuisance tripping of the devices due to the generation of excessive heat at a faulty high resistance junction.
   7) Set the conditions for welding and calking only after checking contact resistance and connection strength.
   8) When resoldering or rewelding, cool of the TCO in the room conditions.
   9) When a TCO is heated by soldering or welding, be careful not to pull, push or twist the TCO lead wires.

Table-1 Soldering Conditions

Temperature of Soldering: 300 °C Time: 3 s					Soldering point
Lead Length (ℓ)	Type No.				
25 mm	N082, N088	F102	E102, E115	H102, H115	
20 mm	N098, N109 N110	F115, F130 F133, F139	E130, E133 E139	H130, H133 H139	
15 mm	N124, N126 N135, N143	F168		H168	
10 mm	N163, N183				

8. The use of sufficiently flexible, appropriate free length and proper size wire shall be used for splice connection. Connection including connectors used for splicing shall be of the low resistance type, and they shall be made mechanically secure.
9. Where the lead wires of the TCO is tied with strings, put them at least 10 mm apart from the seals of the main body of the TCO.
10. Matters to be attended to from the viewpoint of quality control
    1) Measurement of resistance between lead wires (terminals) and checking of the internal status with X-rays are effective means to investigate the status of a TCO on delivery and at mounting in the equipment.
    2) It is necessary to cofirm normal operation of a TCO with the trial pieces and the equipments of the initial production lot set at normal condition and at abnormal condition.
11. Storage method
    1) Store the TCO in packing cases or in polyethylene bags under temperature –10 °C to +40 °C and relative humidity 30 % to 75 %. Store them at a location where no rapid changes of temperature or humidity or no direct sunlight is applied. The location must also be free from vibration and shock or the like.
    2) Avoid the storage in places full of corrosive gases such as sea breeze, Cl_2, H_2S, NH_3, SO_2 and NO_2.
    3) 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 above has been followed.
12. Do not repair TCO. For replacement, install the same part No. of TCO in the same way exactly.

Note: This catalog shows the quality and performance of a unit component. For quality assurance, please confirm your specific requirements with us. Before design-in be sure to evaluate and verify the product by mounting it in your product.