

Issue No. : 151YP00005107

Date of Issue : August 01.2005

Classification : ☒ New ☐ Changed

PRODUCT SPECIFICATION FOR APPROVAL

Product Description : Thermal -Links / Thermal Cutoffs

Product Part Number : E Y P 2 M L 0 9 8 U

Country of Origin : JAPAN

Applications :

*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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Prepared by : Engineering Section

Contact Person :

Signature

Name(Print)

Title

K.Senda

Authorized by :

Signature

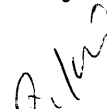
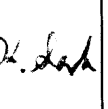

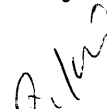
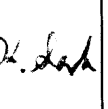

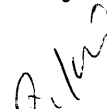
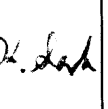

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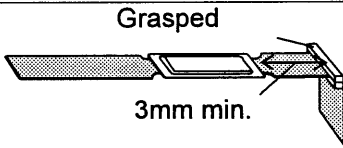
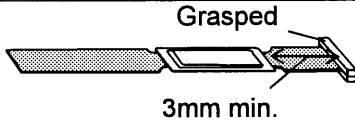
Title

A.Kono

Manager of Engineering

Panasonic

Classification	SPECIFICATION			Code No. YP-E-150						
Subject	THERMAL CUTOFFS / THERMAL LINKS (MS series, ML series, MT series, MU series, TP series)			1 of 7						
<p style="text-align: center;">PRECAUTIONS IN HANDLING (Application instructions)</p> <p>1. Precautions in design</p> <p>1) Use the TCO within their specified temperature and electrical ratings..</p> <p>① Use the TCO under an ambient temperature of not more than the maximum operating temperature specified in the individual specification. Using the TCO under a higher temperature than the maximum operating temperature may cause premature opening or opening delay.</p> <p style="padding-left: 20px;">* When TCO is continuously used at the temperature close to the functioning temperature, the TCO may operate while being used.</p> <p style="padding-left: 20px;">* When the TCO is continuously used at the temperature higher than the maximum operation temperature, the TCO may be degraded and may not operate normally at the specified temperature..</p> <p>② The holding temperature (Th) is defined as the highest temperature at which the TCO is activated continuously at the rated current for 168 hours. The TCO can not be used over 168 hours exceeding the holding temperature.</p> <p>③ Equipment shall be so designed that its overshoot does not exceed the maximum temperature limit(Tm) after the TCO operates.</p> <p>④ If the TCO is activated by voltage higher than the rated voltage or current higher than the rated current, the TCO produces excessive heat, resulting in premature opening. The arc generated at this condition of operation will result in an abnormality of appearance (crack on body and/or peeled insulating film) and insufficient insulation..</p> <p style="padding-left: 20px;">* When TCO is operated at abnormal status of mode while the rated voltage and/or the rated current being exceeded, it may not cut off the circuit.</p> <p>⑤ In case that transient overload might be applied, repeat the tests under the worst conditions assumed for decision before determining whether or not TCO is used.</p> <p>⑥ The TCO cannot be used as a current sensitive fuse</p> <p>2) To bring out fully the performances of TCO, a suitable TCO for equipment must be selected. Verification tests to select shall be made yourself every model.</p> <p>① Tests should be repeated for the finished equipment to confirm that the TCO does operate as expected.</p> <p>② To maximize the thermal response of TCO, bring both the body and the terminals as close to the heat source as possible and put into mounting location where the TCO is evenly heated. If there is large difference between the temperature transferred to the body and the temperature transferred to the terminals, TCO might operate faulty and cause in arcing and insulation deterioration.</p> <p>3) TCO body and terminals must be properly fixed when the TCO is mounted in the equipment. It may cause breaking of thermal element and/or terminals, or damages of the TCO body, or other failure when the body or terminals is not properly connected. Avoid a transport under the condition with a connection only a single side of terminal and the equipment as it might cause breaking of thermal element and/or terminals, or damages of the TCO body, or other failure due to the vibration or mechanical stress on the transportation.</p> <p>4) When TCO is mounted in the equipment, terminals must be aligned with the body. If TCO body and terminals are mutually mounted askew, it might cause breaking of thermal element and/or terminals. Also after assembling TCO in the equipment, avoid pulling, bending, pushing stress and twisting stress in the TCO body and terminals in order not to cause breaking of thermal element and/or terminals, or damages of the TCO body.</p> <p>5) Avoid vibration or other stress in the finished equipment. They may cause breaking of thermal element and/or terminals and damage of TCO body by the vibration or some stress even if the TCO in the equipment is kept at temperatures below its Maximum operating temperature.</p>										
Remarks / Revision										
Date enforced:	Panasonic Electronic Devices Co., Ltd..			<table border="1"> <tr> <td>Manager</td> <td>Checked</td> <td>Prepared</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	Manager	Checked	Prepared			
Manager	Checked	Prepared								
										
April 1, 2005										

Classification	SPECIFICATION	Code No. YP-E-150
Subject	THERMAL CUTOFFS / THERMAL LINKS (MS series, ML series, MT series, MU series, TP series)	2 of 7
<p>6) When sealing the TCO with resin, select the resin that does not corrode the body and/or terminals. When sealing the overall TCO with resin, test repeatedly on the finished equipment in order to confirm if TCO is damaged by the expansion and shrinkage of the resin itself, by the curing temperature, and if the sealed TCO operate normally. Especially when TCO is assembled by hot-melt casting and so on, keep the working condition so that the temperature of TCO body may not reach up to its Operating temperature minus 15 degrees Celsius and the working time at over its Holding temperature may not take longer than ten minutes.</p> <p>7) When immersing equipment on which the TCO is mounted in varnish or solvent and drying it, repeat the test to check whether or not the varnish or solvent used dissolves the coating of the TCO or causes damage, such as cracks, before performing the treatment</p> <p>8) TCO does not take the use under the following special environments into consideration. Do not use under the following environments.</p> <p>① In liquids such as water, oil, chemical and/or organic solvent.</p> <p>② Under direct sunlight, and/or outdoor and/or dusty atmospheres.</p> <p>③ In place where water condensation occurs.</p> <p>* Use in the following environments may affect the performance of the TCO; Verify performance and reliability etc. before production use.</p> <p>a. In places full of corrosive gases such as sea breeze, Cl₂, H₂S, NH₃, SO₂ and/or NO₂.</p> <p>b. In environment with high static electricity and/or strong electromagnetic waves.</p> <p>* Do not use TCO in aerospace equipment, atomic energy equipment, military weapon, life saving equipment, etc.</p> <p>2. Precautions in handling</p> <p>The body of TCO is composed of resinous film, and please do not be pressured TCO with instruments. Moreover, the terminals are thin and have the edges, and please carry out suitable handling not injured. (Using of a glove, tweezers, etc. is recommended)</p> <p>1) Forming and cutting</p> <p>① Terminals are to be bent or cut at least 3 mm away from the TCO body to avoid damaging the TCO body. shall not be grasped with any tools or holders. Terminals of thin type TCO are to be grasped before they are bent. (See Fig.1)</p> <p>② It is recommended that experimental assembly be made by production personnel to verify that manufacturing procedures does not exceed neither a pulling forces of 5N nor a pushing forces of 5N on the terminals (pulling forces of 10N and pushing forces of 5N in case of MU/MT series), and that manufacturing procedures does not induce excessive twisting between both terminals or between terminal and body.</p> <p>③ The terminals shall not be nicked, fractured or burned. The body must not be damaged, burned or overheated.</p>		
<div><div></div><div></div></div> <p>Fig.1</p>		
<p>2) Welding</p> <p>① The terminals are to be certainly clamped not to damage TCO at least 3mm away from the body. Improper connections may cause damage to the body 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.</p> <p>② It is recommended that the preliminary test to determine proper welding conditions is made in order not to make the heat of welding influence TCO, for example, function the TCO or narrow the fusible alloy, etc, and in order that the welding method, like a resistance welding, laser welding, ultrasonic welding and so on, does not damage to TCO.</p> <p>③ When re-welding, cool off TCO in the room conditions for at least 30 seconds.</p>		
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Subject	THERMAL CUTOFFS / THERMAL LINKS (MS series, ML series, MT series, MU series, TP series)	3 of 7
<p>④ When TCO is heated by welding, be careful not to pull, push or twist the TCO terminals.</p> <p>⑤ If water or solvent is used for cleaning, check and confirm reliability of the agent.</p> <p>3) Do not make soldering. If TCO is to be soldered, please inquire about soldering of our engineering department.</p> <p>4) 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.</p> <p>5) In case that TCO is fixed to other component or units by some material like taping, the force to the body and/or terminal should not exceeded 3N.</p> <p>6) Do not repair TCO. For replacement, install the same part number of TCO in the same way exactly.</p> <p>3. Matters to be attended to from the viewpoint of quality control</p> <p>1) Measurement of resistance between terminals and checking of the internal status with X-rays are effective means to confirm the status of TCO on delivery and at mounting in the equipment.</p> <p>2) It is necessary to confirm normal operation of TCO with the trial pieces and the equipment of the initial production lot set at normal condition and at abnormal condition.</p> <p>4. Storage method</p> <p>1) Store TCO in packing cases or in polyethylene bags within the temperature of -10°C to +40°C and relative humidity of 30% to 75%. Store them at the location where no rapid change of temperature or humidity, or no direct sunlight is applied. The location must also be free from vibration or shock or the like.</p> <p>2) Avoid the storage in places containing corrosive gases such as sea breeze, Cl₂, H₂S, NH₃, SO₂ and/or NO₂.</p> <p>3) The period of guarantee for performance such as weldability is for one year after our delivery; and this condition applies only in the case where the storage method specified in above has been followed.</p> <p>5. Law and Regulations</p> <p>1) No ozone-depleting substances subjected to regulations under the Montreal Protocol are used in our manufacturing processes, including in the manufacture of this product.</p> <p>2) All the materials used in this product exist in chemical substances recognized under “Lows on examination of chemical substances and regulations of manufacturing and others.”</p> <p>3) None of the materials used in this product contain the designated incombustible bromic substances, PBBOs or PBBs.</p> <p>4) Please contact us to obtain a notice as to whether this product has passed inspection under review criteria primarily based on Foreign Exchange and Foreign Trade Control Law and appended table in the Export Control Law.</p> <p>6. Notice</p> <p>1) Please return to us a sheet of the specifications after you accept them and sign on the cover page. Unless returned to us beyond three months from the date of issue, we should consider that you have accepted them.</p> <p>2) In time to modify this specification, when we receive your acceptance under mutual confirmation based on your review, we understand that you accept the revised specification and consider the former specifications to be not effective.</p>		
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Date enforced:	Panasonic Electronic Devices Co., Ltd.	
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1. General

1.1 Scope
 This specification is applicable to TCO which are shipped for your company. Details or exceptions which should be applicable to the particular items are specified in the Individual Specifications. If there are any differences between this specification and the Individual Specifications, the Individual Specifications should have the priority.

1.2 Scope of Quality Assurance
 TCO is designed for safety by sensing overheating of electric and electronic equipment and cutting off circuits to prevent fires or smokes. So, check and confirm the "PRECAUTIONS IN HANDLING" (see page 1 to 3) before use. The Scope of Quality Assurance is restricted to the TCO unit itself, as specified in this specification. We have not responsibility to failures such as abnormality of the equipment like, generated from using, installing or handling beyond this Scope of Quality Assurance.

2. Explanation of part number
 Part number of TCO is indicated as follows.

EYP
(1)

2
(2)

ML
(3)

098
(4)

UP
(5)

(1) "Product code" is indicated by code.

(2) "Rated current" is indicated by code. (See Table.1)

(3) "Series" is indicated by code. (See Table. 2)

(4) "Rated functioning temperature" is indicated by code.
 (See attached Individual Specifications.)

(5) "DC resistance", "Processing of terminals" and
 "Pb free" is indicated by code.
 (See attached Individual Specifications. in details)

Table.1: Rated current

Code	Rated current
2	2A
4	4A

Table2.Series, Rated voltage

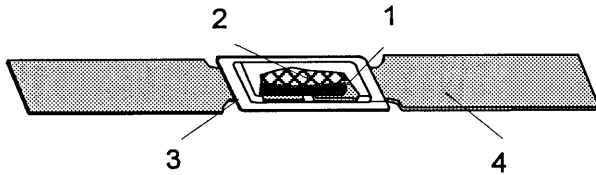
Code	Series	Rated voltage
MS	MS series	50V
ML	ML series	50V
MT	MT series	50V
MU	MU series	50V
TP	TP series	32V

3. Rating
 Ratings are specified in the Individual Specifications.

4. Approved Safety Standard
 Please confirm the Individual Specifications in details.

5. Constructions and marking

5.1 Constructions



1. Fusible alloy

2. Special resin (Flux)

3. Insulating part

4. Terminal (Ni)

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<div>5.2 Dimensions</div> <div>Dimensions are specified in the Individual Specifications.</div> <div>5.3 Marking</div> <div>All the markings shall be legible at regular handling.</div> <div>5.4 Appearance</div> <div>There shall be no visible damage such as destruction of the insulating part, remarkable scratch, or sharp bending of the terminals, etc.</div> <div>6. Performance tests</div> <div>Unless otherwise specified, all the performance tests shall be made under the following conditions.<div>Temperature: 25°C±10°C</div><div>Relative humidity: 45% to 75%</div><div>Air pressure: 86kPa to 106kPa</div></div> <div>6.1 Calibration verification test (Functioning temperature test)</div> <div>TCO shall be placed in an air oven and exposed at a temperature approximately 20°C below the rated functioning temperature for 15minutes to 30 minutes. The temperature shall then be increased with a rate of rise between 0.5°C/min to 1°C/min until the TCO functions (A detecting current shall be 10mA or less). The TCO shall function within the range specified in the Individual Specifications. If the result is doubtful, the TCO shall be tested in an oil bath as same method as above.</div> <div>6.2 DC resistance</div> <div>DC resistance shall be measured between both terminals including the body at the points of 20mm or the distance specified in the Individual Specifications (if total length of TCO is less than 20mm) at the current specified in the Individual Specifications (See Fig.1). DC resistance shall be within the range specified in the Individual Specifications.</div> <div>6.3 Surface temperature increment (MS series only)</div> <div>TCO shall be applied at rated current in the windless ambient temperature of 25°C±5°C. After stabilizing, the surface temperature of the central position of TCO shall be measured by thermocouple (See Fig.2).</div> <div><div>[Surface temperature increment] = [Surface temperature on TCO] - [ambient temperature]</div><div>Fig.1</div><div>Fig.2</div></div> <div>6.4 Insulation resistance</div> <div>(1) After the test in clause 6.1, insulation resistance is to be measured between the terminals at DC100V. Insulation resistance shall be within the range specified in the Individual Specifications.</div> <div>(2) Insulation resistance is to be measured between the metal foil coiled round the body and terminals at DC100V. Insulation resistance shall be within the range specified in the Individual Specifications.</div>		
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Subject	THERMAL CUTOFFS / THERMAL LINKS (MS series, ML series, MT series, MU series, TP series)		6 of 7
<p>6.5 Dielectric voltage withstand</p> <p>(1) After the test in clause 6.4(1), the TCO shall be capable of withstanding without breakdown while it shall be subjected to an AC voltage application specified in the Individual Specifications between the both terminals for 1 minute (increased voltage: 100V/s, detecting current: 1mA).</p> <p>(2) TCO shall be capable of withstanding without breakdown while it shall be subjected to an AC voltage application specified in the Individual Specifications between the metal foil coiled round the body and terminals for 1 minute (increased voltage ratio: 100V/s, detecting current: 1mA).</p> <p>6.6 Terminal pull strength</p> <p>One terminal is to be supported and the pulling force specified in the Individual Specifications is applied to other terminal for 10 seconds. There shall be no break of fusible alloy and/or terminals. The TCO is then followed by the test in clause 6.1.</p> <p>6.7 Terminal bend strength</p> <p>The body and a part of terminal are held so that a terminal is turned in the vertical plane through an angle of 90 degrees for 2 seconds to 3 seconds at 3mm apart from the edge of body and then returned to the original position at the same speed. Next the body of TCO is turned in opposite direction through an angle of 90 degrees and then returned to the original. There shall be no break of lead. The TCO is then followed by the test in clause 6.1.</p> <p>6.8 Crush</p> <p>A fixed board is to be put on the TCO, and the force specified in the Individual Specifications shall be applied to the TCO for 10 seconds. TCO shall be free from damage. The TCO is then followed by the test in clause 6.1. The functioning temperature shall be within the range specified in the Individual Specifications.</p> <p>6.9 Humidity</p> <p>TCO shall be placed in the test chamber maintained at a temperature 40°C±3°C and a relative humidity 90% to 95% for 500 hours. The TCO is then followed by the test in clause 6.1. The functioning temperature shall be within the range specified in the Individual Specifications.</p> <p>6.10 High temperature exposure</p> <p>TCO shall be placed in an air oven maintained at [maximum operating temperature] (+0°C, -3°C) for 1000h. The TCO shall not function throughout the test. The TCO is then followed by the test in clause 6.1. The functioning temperature shall be within the range specified in the Individual Specifications.</p> <p>6.11 Load life</p> <p>TCO shall be placed in an air oven maintained at [maximum operating temperature] (+0°C, -3°C)°C and then subjected to a rated current specified in the Individual Specifications for 1000 hours. The TCO shall not function throughout the test. The TCO is then followed by the test in clause 6.1. The functioning temperature shall be within the range specified in the Individual Specifications.</p> <p>6.12 Temperature cycling</p> <p>TCO is subjected to continuous 100cycles for 30 minutes at each temperature specified in the Individual Specifications. The TCO shall not function throughout the test. There shall be no remarkable abnormality. The TCO is then followed by the test in clause 6.1. The functioning temperature shall be within the range specified in the Individual Specifications.</p>			
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<p>7. Packing</p> <p>7.1 Inner packing</p> <p>Standard packing is 200 pieces of TCO to be packed in a polyethylene bag.</p> <p>7.2 Outer packing</p> <p>Standard quantities in the box are described as follows. If the quantities are less than the standard quantities or it may be afraid of some vibrations under conveyance, shock absorbers are to be packed together in a space of the box.</p> <p><Standard quantities in the inner box></p> <table> <tr> <td>EYP2MS□□□□</td> <td>1000 pcs.</td> </tr> <tr> <td>EYP2ML□□□□</td> <td>2000 pcs.</td> </tr> <tr> <td>EYP2ML□□□□, EYP2TP□□□□</td> <td>2000 pcs.</td> </tr> <tr> <td>EYP2ML□□□□□□, EYP2TP□□□□□□</td> <td>2000 pcs.</td> </tr> <tr> <td>EYP2MT□□□□</td> <td>1000 pcs.</td> </tr> <tr> <td>EYP4MU□□□□</td> <td>1000 pcs.</td> </tr> </table> <p>Above quantities may be changed without notice because of modifying the box or some other forming type designed.</p> <p>7.3 Marking</p> <p>The inner and outer packing shall be marked as follows;</p> <p>Part name, part number, rated current, rated voltage, rated functioning temperature, trade mark, date code, lot number, quantities, symbols of approved safety standards and so forth.</p> <p>Note1: "date code" is defined by three-digits.</p> <p>< Example ></p> <p><u>03</u> <u>D</u></p> <p>(1) (2)</p> <p>(1) "A production year " is indicated by the last two digits of year.</p> <p>(2) "A production month" is indicated by code.</p> <p>From January to September in numeral, October: "O", November: "N", December: "D"</p> <p>Note2: Lot number is defined as follows.</p> <p><Example> 0 3 0 0 2 0 1 0 1</p> <table> <tr> <td>0</td> <td>3</td> <td>0</td> <td>0</td> <td>2</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td></td> </tr> <tr> <td colspan="4"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">Production Number</td> </tr> <tr> <td colspan="4"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">Production day</td> </tr> <tr> <td colspan="4"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">Production month</td> </tr> <tr> <td colspan="4"></td> <td colspan="2"></td> <td colspan="2"></td> <td colspan="2">Production year</td> </tr> </table> <p>8. Inspection data sheet</p> <p>Appearance, dimension, DC resistance, insulation resistance and so forth are subjected to inspection every shipment lot and the delivery assurance sheet shall be packed together every shipment lot.</p> <p>9. Country and Manufacturer</p> <p>Country: Japan</p> <p>Manufacturer: Panasonic Communications Miyazaki Co., Ltd.</p> <tr> <td colspan="4">Remarks / Revision</td> </tr> <tr> <td>Date enforced:</td> <td colspan="2">Panasonic Electronic Devices Co., Ltd.</td> <td></td> </tr> <tr> <td>April 1, 2005</td> <td colspan="2"></td> <td></td> </tr>				EYP2MS□□□□	1000 pcs.	EYP2ML□□□□	2000 pcs.	EYP2ML□□□□, EYP2TP□□□□	2000 pcs.	EYP2ML□□□□□□, EYP2TP□□□□□□	2000 pcs.	EYP2MT□□□□	1000 pcs.	EYP4MU□□□□	1000 pcs.	0	3	0	0	2	0	1	0	1										Production Number										Production day										Production month										Production year		Remarks / Revision				Date enforced:	Panasonic Electronic Devices Co., Ltd.			April 1, 2005			
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CLASSIFICATION		INDIVIDUAL SPECIFICATION		Code No. YP-E-735R2	
Subject THERMAL-LINKS / THERMAL CUTOFFS EYP2ML098U (Approved type No. of safety standards is ML098)				1 of 1	

Dimensions and Marking

Dimensions

Marking

Trademark → ML **098**
M **05D** ← Type No.
← Date Code

A	B	C	D
25.0±0.5	3.2±0.2	0.65±0.15	4.5±0.5

E	G	(H)	J
3.0±0.2	10.25±0.5	(10.25±0.5)	0.1±0.02

*(K): The length between the ends of the burrs on the body is 5.5 mm max.
*The height of the burrs on the terminals is 0.05 mm max.

Ratings

Item	Rating
Electrical rating	DC 50V/2A
Rated functioning temperature	98°C
Maximum operating temperature	60°C
Holding temperature	65°C
Maximum temperature limit	135°C
Operating temperature	94(+3,-2.5)°C

Rated functioning temperature (Tf)
The temperature at which a TCO changes its state of conductivity to open circuit with detection current as the only load.
The temperature in the oven is then to be increased at a rated of 0.25°C to 0.5°C per minute until all TCO open.
Functioning temperature of each TCO shall not differ by more than plus 0°C and minus 10°C from the Tf.

Holding temperature (Th)
The maximum temperature at which a TCO can be maintained while conducting rated current for 168 hours which will not cause a change in state of conductivity to open circuit.

Maximum temperature Limit (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.

Performance specifications

Test item	No.	Method and condition	Specification
Calibration verification test (Functioning temperature test)	6.1	Increased temperature rate: 1°C/min	94(+3,-2.5)°C
DC resistance	6.2	Less than 1A within 20mm	9 ± 2mΩ
Insulation resistance	6.4	(1)Between the both terminals at DC100V (2)Between the body and terminals at DC100V	100MΩ or more than 100MΩ
Dielectric voltage-withstand	6.5	(1)Between the terminals at AC100V for 1min (2)Between the body and terminals at AC1100V for 1min	Withstanding at the normal conditions
Terminal pull strength	6.6	5N, 10s	94(+3,-2.5)°C
Terminal bend strength	6.7	90°, 1time	94(+3,-2.5)°C
Crush	6.8	20N, 10s	94(+3,-2.5)°C
Humidity	6.9	500h at 40°C and 90% to 95%	94(+3,-2.5)°C
High temperature exposure	6.10	1000h at 55°C (no load)	94(+3,-2.5)°C
Load life	6.11	1000h, 2A at 55°C	94(+3,-2.5)°C
Temperature cycling	6.12	100cycles at -20°C and 60°C	94(+3,-2.5)°C

Approved Standards (Type, File No.)	UL	VDE	CCC
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Date enforced April 1, 2005	Panasonic Electronic Devices Co., Ltd..	Manager	Checked	Prepared