TEST REPORT

UL 1577

STANDARD FOR SAFETY Optical Isolators

Testing Laboratory	
Name..... :	shenzhen CTG testing co.,ltd
Address..... :	3/F, Yongxing Plastic Plant, No. 11 Waihuan Road,Shiyan street, Bao'an District, Shenzhen, China
Testing location..... :	shenzhen CTG testing co.,ltd
Date of issue	Dec, 11 2024
Applicant	
name..... :	SHENZHEN GOODWORK ELECTRONICS CO.，LTD
Address..... :	Unit 1006-1010, Block C, Digital Innovation Center, 328 Mintang Road, Minzhi Street, Longhua District, Shenzhen, Guangdong
Test specification:	
Standard..... :	UL 1577-2023
Test procedure ..... :	Type Test
Non-standard test method..... :	N/A
Test item	
Description..... :	photocoupler
Model and/or type reference..... :	PC817, EL354, EL357, EL1018, EL1019
Trademark ..... :	/
Manufacturer ..... :	Jiangsu Goodwork Microelectronics Technology Co., LTD
Address ..... :	Building 1, No. 3 Yancheng Economic and Technological Development Road, Yancheng City, Jiangsu Province
Test sample(s) received	Dec. 02, 2024
Test in period	Dec. 02, 2024 to Dec. 11, 2024
Test item particulars	
Classification of installation and use:	N/A
Supply Connection..... :	N/A
Possible test case verdicts	
- test case does not apply to the test object :	N(.A)
- test object does meet the requirement :	P(Pass)
- test object does not meet the requirement :	F(Fail)

Summary of testing:	
Tests performed (name of test and test clause): - UL 1577-2023 The submitted samples were found to comply with the requirements of above specification.	Testing location: 3/F, Yongxing Plastic Plant, No. 11 Waihuan Road,Shiyan street, Bao'an District, Shenzhen,China

Test item particulars:	
Temperature:	23°C±2°C
Relative humidity:	≤55％
Atmospheric pressure:	(9.0±0.2)kPa
Mass of the equipment (kg):	See instruction
Possible test case verdicts:	
- test case does not apply to the test object:	N/A
- test object does meet the requirement:	P (Pass)
- test object does not meet the requirement:	F (Fail)
Testing:	
Date of receipt of test item:	Dec. 02, 2024
Date (s) of performance of tests:	Dec. 02, 2024 to Dec. 11, 2024

Modified History

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	2024/12/11	/

General remarks:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

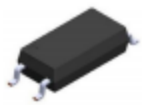
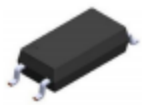
Throughout this report a ☒ comma / ☐ point is used as the decimal separator.

Clause numbers between brackets refer to clauses in UL 1577- 2023

Attachment No. 1: photo.

General product information:

The product is photocoupler.

PC817:	EL357	EL354	EL1018	EL1019
 				

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict
1	Scope		P
1.1	These requirements cover optical isolators, also called optical couplers or photocouplers: a) Intended to provide unidirectional signal transfer between dielectrically isolated circuits and, b) Intended for use in equipment with a supply voltage not exceeding 600 V ac rms or dc.		P
1.2	These requirements cover the electrical isolation properties of the insulation between the isolated circuits of the optical isolator.		P
1.3	These requirements also cover double protection optical isolators that are employed in circuits rated up to 250 V, 50 or 60 Hz, in radio, video, and television equipment, and similar equipment in applications in which breakdown of the optical isolator may result in a risk of fire, electric shock, or injury to persons.		P
1.4	These requirements do not cover the electrical properties of the separate circuits of the optical isolator.		P
1.5	These requirements apply to optical isolators for use as components in devices and appliances. Compliance of an optical isolator with these requirements does not indicate that the isolator is acceptable for use as a component of an end product without further investigation.		P
2	Units of Measurement		P
2.1	Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.		P
3	Undated References		P
3.1	Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.		P
4	Glossary		P
4.1	For the purpose of this standard the following definitions apply.		P

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict
4.2	DERATING CURVE – A graph of ambient temperature versus power or current, provided by the manufacturer, where the power and/or current is reduced as the operating ambient temperature is increased.		P
4.3	DIELECTRIC ISOLATION-VOLTAGE RATING – The maximum voltage-withstand potential between the input and output circuits of the optical isolator.		P
4.4	DOUBLE PROTECTION OPTICAL ISOLATORS– Optical isolators employed in some unique audio, video and similar applications bridging reinforced insulation.		P
4.5	HERMETICAL SEAL – Any material employed, such as a case or housing, that completely prevents air filtration, for example an encapsulant.		P
4.6	INSULATING MATERIALS – Any material providing isolation between the input and output of the optical isolator. Housing or Case material that provides isolation over the surface and through the material would be considered an insulating material.		P
4.7	MAXIMUM JUNCTION TEMPERATURE – The maximum allowable temperature of the optical isolator semiconductor junction as specified by the manufacturer.		P
4.8	MAXIMUM OPERATING AMBIENT TEMPERATURE – The maximum temperature of the air surrounding the optical isolator when power is applied, as specified by the manufacturer.		P
4.9	MAXIMUM STORAGE TEMPERATURE – The maximum temperature at which the optical isolator can be stored without any power applied, as specified by the manufacture.		P
4.10	PHOTO-EMITTER – A device internal to the optical isolator that generates electromagnetic radiation, such as a light-emitting diode (LED), used to transmit signals to the photo sensor.		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.11	PHOTO-SENSOR – A device internal to the optical isolator that generates an electrical current due to incident light, such as a photo diode or a photo-conductive transducer, used to receive signals from the photo-emitter.		P
	CONSTRUCTION		P
5	General		P
5.1	An optical isolator shall be constructed in compliance with Corrosion Protection, Section 6, Insulating Materials, Section 7, Live Parts, Section 8, and Spacings, Section 9.		P
6	Corrosion Protection		P
6.1	Iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means.	Metal Pin	P
7	Insulating Materials		P
7.1	Insulating materials employed as part of an optical isolator shall be subjected to the Dielectric Voltage-Withstand Test, Section 11, and the Overload Test, Section 12.		P
7.2	Additionally, insulating materials, other than the case or housing, that are not encapsulated or hermetically sealed, shall also be investigated in accordance with the applicable requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.	UL 746C, Enclosure	P
7.3	Insulating materials shall have a relative thermal index or generic thermal index equal to or greater than the maximum junction temperature or maximum storage temperature of the optical isolator. whichever is greater. Insulating materials where the relative thermal index or the generic thermal index of the material is exceeded shall be subjected to the Limited Thermal Aging Test, Section 13.		P

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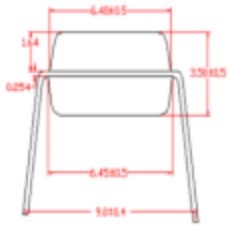
Clause	Requirement + Test	Result - Remark	Verdict
7.4	Materials used to encapsulate devices, such as a case or housing, shall operate within the generic temperature limitations as specified in the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B, or shall be tested as outlined in Limited Thermal Aging Test, Section 13.		P
8	Live Parts		P
8.1	Metal employed for current-carrying parts shall be of stainless steel, plated steel, copper, silver, gold, nickel, aluminum, an alloy of the same, or an equivalent material.	Input pin and output pin	P
9	Spacings		P
9.1	The optical isolator's external spacings between input and output circuits shall be based on the end product spacing requirements.	 Input and output: 6.45mm	P
	PERFORMANCE		P
10	General		P
10.1	Optical isolators shall be tested as described in the Dielectric Voltage-Withstand Test, Section 11 and the Limited Thermal Aging Test, Section 13.		P
11	Dielectric Voltage-Withstand Test	See The table	P
11.1	Immediately following each of the conditionings indicated in 11.5 – 11.8, each representative optical isolator shall be capable of withstanding without breakdown for 60 seconds a potential equal to the rated dielectric isolation voltage, as specified by the manufacturer, applied between the input and output terminals of the optical isolator. A dc test potential shall be applied to a device having a dc rated dielectric isolation voltage. The value of the potential applied to an ac rated device shall be in volts rms.		P

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Clause	Requirement + Test	Result - Remark	Verdict
11.2	To determine whether a representative optical isolator complies with the requirements in 11.1, the test potential is to be applied as described in 11.4 by means of test equipment having the characteristics outlined in 11.3.		P
11.3	The test equipment for conducting the Dielectric Voltage-Withstand Test is to have the following features and characteristics: a) A means of indicating the test potential. b) For an ac rated device, a 40 – 70 Hz test potential that has a sinusoidal waveform.		P
11.4	The test potential is to be obtained from any convenient source either: a) Having a capacity of at least 500 VA, or b) If of a lower capacity with the voltmeter connected in the output circuit.		P
	The voltage is to be steadily increased until the required test level is reached and is to be held at that value for one minute. The increase in the applied potential is to be at a uniform rate and as rapid as is consistent with its value being correctly indicated by a voltmeter.		P
11.5	Six representative optical isolators are to be tested in the as-received condition.		P
11.6	Six representative optical isolators are to be exposed to the maximum rated junction temperature for 7 hours, before testing.		P
11.7	Six representative optical isolators are to be exposed to 85 percent relative humidity at 32.0 ±2.0°C (89.6 ±3.6°F) for 24 hours, before testing.	32°C, 85% R.H. 24hours	P
11.8	Six representative optical isolators are to be exposed to 0.0 ±2.0°C (32.0 ±3.6°F) for 7 hours, before testing.	0°C, 7hours	P
11.9	Separate sets of representative optical isolators are to be used for each of the various conditions in 11.5 – 11.8.		P
12	Overload Test		P

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict
12.1	Three representative optical isolators shall be connected to the rated electrical supply such that the photo-sensor (output) is caused to operate at 150 percent of maximum rated power while the photoemitter (input) is operated at rated power until temperatures stabilize.	Samples 1#: Enclosure: 61.7℃ Samples 2#: Enclosure: 68.2℃ Samples 3#: Enclosure: 64.9℃	P
12.2	Immediately after the overload conditioning, as described in 12.1, each of the three representative optical isolators shall withstand the rated isolation voltage as described in 11.1 and 11.4.		P
13	Limited Thermal Aging Test		P
13.1	An insulating or encapsulating material, as described in the Insulating Materials Section 7, shall not crack or warp in any of three representative optical isolators when the optical isolators are aged in a fulldraft oven at a temperature and time chosen from the graph in Figure 13.1 using the index line that corresponds to the greater of the maximum junction temperature or the maximum storage temperature of the device. All samples shall be conditioned for 1000 hours unless otherwise agreed by all concerned. Optical isolators shall not be subjected to conditioning less than 300 hours. Immediately after this oven conditioning, all three representative optical isolators shall withstand the rated isolation voltage as described in 11.1 and 11.4.	105℃ 300hours	P
13.2	The air oven is to be essentially as indicated in the Standard Test Methods for Forced-Convection Laboratory Ovens for Evaluation ofElectrical Insulation, ASTM D5374. A portion of the air may be recirculated, but a substantial amount of air is to be admitted continuously to maintain an essentially normal air content surrounding the representative optical isolators. The oven is to be adjusted to achieve 100 – 200 complete fresh-air changes per hour.		P

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	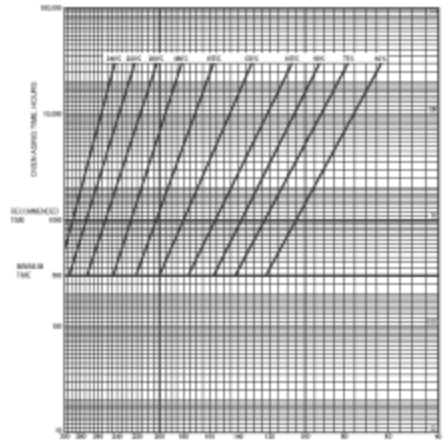		P
	DOUBLE-PROTECTION OPTICAL ISOLATORS		P
14	General		P
14.1	At least 20 representative double-protection optical isolators are required for the tests described in the Discharge Test, Section 15 and the Optical Isolator Life Test, Section 16.		P
15	Discharge Test		P
15.1	Ten representative optical isolators are to be tested as described in 15.2 and 15.3. As a result of this test: a) There shall be no visible evidence of damage to the optical isolator. Discoloration of the optical isolator is not considered to be evidence of damage. b) The optical isolator shall comply with the dielectric voltage-withstand tests described in 15.4.		P
15.2	To determine whether an optical isolator complies with the requirements in 15.1, it is to be subjected to 50 discharges from a 0.0005 microfarad capacitor that has been charged to a potential of 20 kV between the short-circuited input and short circuited output terminals. The interval between successive discharges is to be 5 seconds. The optical isolator may be submerged in an oil bath if arcing occurs over the surface or through air during the test.		P
15.3	The circuit to be used in performing the discharge test is illustrated in Figure 15.1.		P

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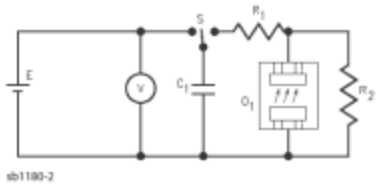
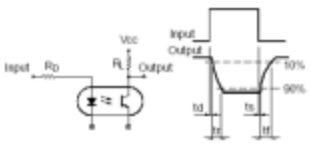
Clause	Requirement + Test	Result - Remark	Verdict
15.4	To determine whether an optical isolator complies with 15.1(b), the optical isolator shall withstand without breakdown for not less than 1 minute a potential at the greater of the rated isolation voltage or 3500 V rms having a frequency of 60 Hz, applied between: a) The input and output terminals of the optical isolator, and b) The input and output terminals of the optical isolator connected together and metal foil wrapped closely around the body of the optical isolator. The foil is to be kept at least 1/16 inch (1.6 mm) from the terminals.	Input and output: 3500V, 60Hz, 1min No break down.	P
			P
16	Optical Isolator Life Test		P
16.1	Ten representative optical isolators are to be conditioned as described in 16.2. After the conditioning, the optical isolators shall comply with the following: a) The isolation resistance between the input and output terminals of the optical isolator measured at 500 V dc, with a 2-minute electrification time, shall not be less than 500 megohms; and b) The optical isolator shall withstand without breakdown the dielectric voltage-withstand test described in 15.4(b).		P

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict
16.2	The optical isolators are to be conditioned in an air-circulating oven for 1008 hours. The air in the oven is to be maintained at a temperature of 85.0 ±3.0°C (185.0 ±5.4°F) and a relative humidity of 50 percent or less. Throughout the conditioning, each optical isolator is to be subjected to a 60 Hz potential of 440 V, except that once each hour the potential is to be doubled for 1/10 second. The potential is to be applied between the short circuited input and short circuited output terminals. A 1-A fuse or other device of acceptable sensitivity is to be connected in the supply circuit to each optical isolator to indicate if breakdown occurs. Clearing of a fuse indicates breakdown of an optical isolator. The optical isolators are to be allowed to cool to room temperature before proceeding with further tests.		P
	MANUFACTURING AND PRODUCTION-LINE TESTS		P
17	Dielectric Voltage-Withstand Test		N/A
17.1	Each optical isolator shall withstand, as a routine production-line test, the application of a potential between the input and output terminals. For an optical isolator having an ac isolation voltage rating, the frequency of the applied potential shall be 40 – 70 Hz. A dc test potential shall be applied for an optical isolator having a dc rated dielectric insulation voltage.		N/A
17.2	The production-line test potential shall be no less than either the rated dielectric isolation voltage for 60 seconds or 120 percent of the rated dielectric isolation voltage for one second.		N/A
17.4	The product may be in a heated or unheated condition for the test.		N/A

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict
17.5	The test equipment for conducting the dielectric voltage-withstand test is to have the following features and characteristics: a) A means of indicating the test potential, in volts rms, b) A 40 – 70 Hz test potential that has: 1) A sinusoidal waveform, and 2) A peak value of the waveform that is not to be less than 1.3 and not more than 1.5 times the root-mean-square value. c) An automatic reject feature that rejects any unacceptable unit or an audible or visual indicator of electrical breakdown. If the indicator of breakdown is audible or visual, the indicator is to remain active until the test equipment is reset manually.		N/A
17.6	If the output of the test-equipment is less than 500 VA, the equipment is to include a voltmeter in the output circuit to indicate the test potential directly.		N/A
17.7	If the output of the test-equipment is 500 VA or larger, the test potential may be indicated: a) By a voltmeter in the primary circuit or in a tertiary-winding circuit, b) By a selector switch marked to indicate the test potential, or c) In the case of test equipment that has a single output potential, by a marking in a readily visible location to indicate the test potential. When marking is used without an indicating voltmeter, the equipment is to include a positive means, such as an indicator lamp, to indicate that the manual reset switch actually resets following a dielectric breakdown.		N/A
17.8	Test equipment other than that described in 17.4 – 17.6 may be used if found acceptable to accomplish the intended factory control.		N/A
	RATINGS		P
18	General		P
18.1	An optical isolator shall be provided with a maximum power, a current, and a voltage rating for both the photo-emitter (input) and the photo-sensor (output) circuits.		P

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict
18.2	A dielectric isolation-voltage rating between the input and output terminals shall be specified in volts rms or dc, as applicable.		P
18.3	The maximum operating ambient temperature, maximum junction temperature, and maximum storage temperature shall be specified.		P
18.4	Derating specifications related to ambient temperatures shall also be provided.		P
18.5	Ratings may be expressed in tabular or graphic format.		P
	MARKINGS		P
19	General		P
19.1	Each device shall be marked with the manufacturer's name or trademark and model number. This marking shall appear on the device itself or on the smallest shipping carton in which the device was shipped.		P
19.2	The rating information specified in RATINGS, General, Section 18, shall appear in the manufacturer's specifications for the product.		P

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict

Dielectric Voltage-Withstand Test (11)
Method:
The test is made while the EUT is still in well-heated condition
Make sure the power switch ofthe EUT is in ON position.
Thin material can be tested in room temperature.
The test voltage is a.c. of 50 or 60 Hz or d.c. voltage equal to peak value of the a.c. voltage.
Test voltage is applied gradually raised from zero to the specified voltage and held at that value for 60s.
Insulation breakdown is: Current flows through the insulation rapidly increases in an uncontrolled manner; that is the insulation does not restrict the flow of the current.
Corona discharge or a single momentary flashover is not regarded as insulation breakdown.
A test incorporating reinforced insulation and lower grades insulation (BI, SI), care is taken not to overstress BI or SI.
Where capacitors (X or Y capacitors) are across the insulation, d.c. voltage is recommended for the test.
Discharge resistors shall be disconnected before testing.

Result:

11	Electric strength test		Pass
Test voltage applied between:		Test voltage (V)	Breakdown
Input and output		500VA 60Hz	No

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict

Discharge Test (15)
Method:
The test is made while the EUT is still in well-heated condition
Make sure the power switch of the EUT is in ON position.
Thin material can be tested in room temperature.
The test voltage is a.c. of 50 or 60 Hz or d.c. voltage equal to peak value of the a.c. voltage.
Test voltage is applied gradually raised from zero to the specified voltage and held at that value for 60s.
Insulation breakdown is: Current flows through the insulation rapidly increases in an uncontrolled manner; that is the insulation does not restrict the flow of the current.
Corona discharge or a single momentary flashover is not regarded as insulation breakdown.
A test incorporating reinforced insulation and lower grades insulation (BI, SI), care is taken not to overstress BI or SI.
Where capacitors (X or Y capacitors) are across the insulation, d.c. voltage is recommended for the test.
Discharge resistors shall be disconnected before testing.

Result:

15	Electric strength test		Pass
Test voltage applied between:		Test voltage (V)	Breakdown
Input and output		3500V 60Hz	No

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict

Optical Isolator Life Test (16)

Method:

The test is made while the EUT is still in well-heated condition

Make sure the power switch ofthe EUT is in ON position.

Thin material can be tested in room temperature.

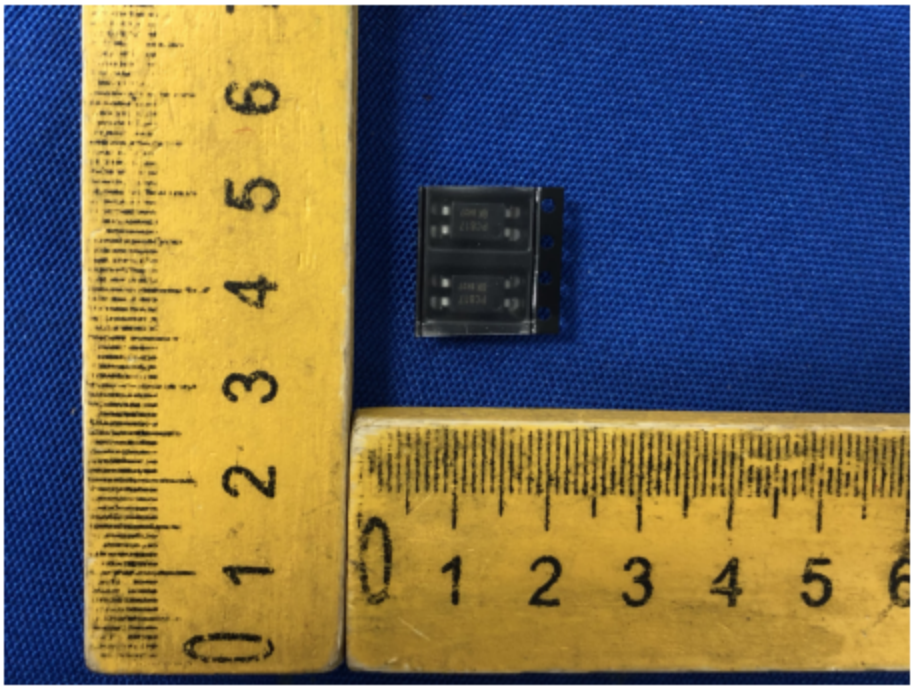
The test voltage is d.c. 500 voltage

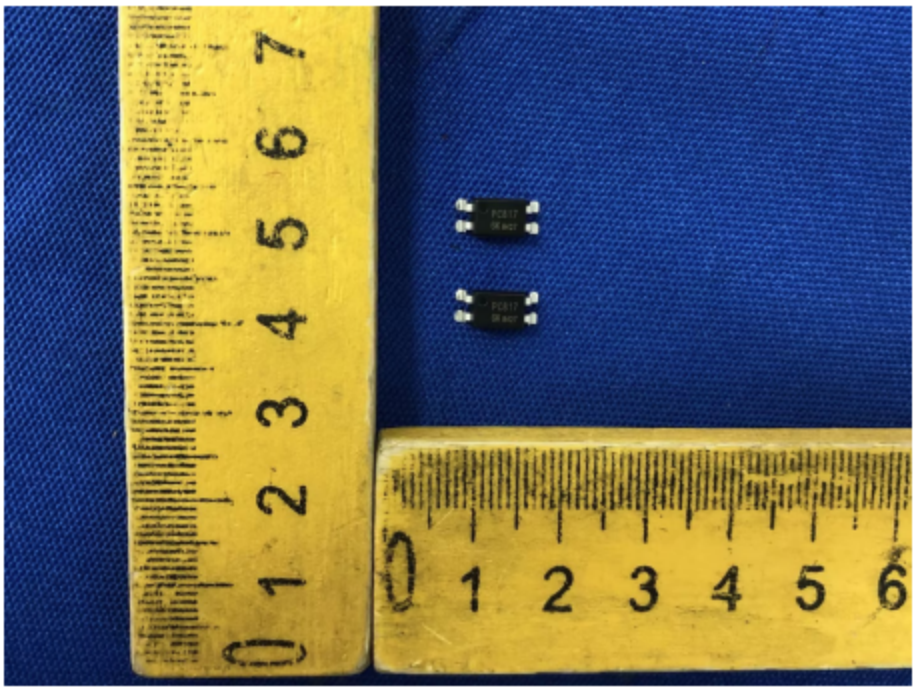
Test voltage is applied gradually raised from zero to the specified voltage and held at that value for 60s.

16	TABLE: Insulation resistance measurements		Pass
Insulation resistance R between:		R (MΩ)	Required R (Ω)
Input and Output		>100 MΩ	50000Ω

UL 1577			
Clause	Requirement + Test	Result - Remark	Verdict

Photos





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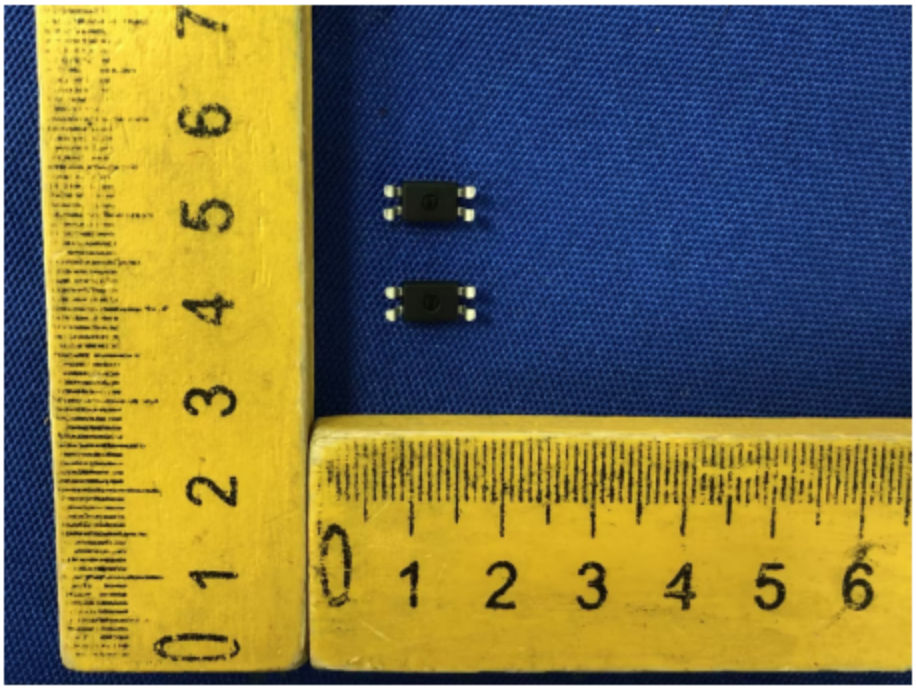

*******End of the Report*******

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