



SPECIFICATION

CUSTOMER : ZHIHE

PRODUCT NAME : IF-2LS

PRODUCT SPEC : IF-2LS2518T01

| | |
|-----------------|--------------------------------------|
| Customer: ZHIHE | Supplier: ITEQ(GUANGZHOU)CORPORATION |
| Customer: | Auditor: Jim Huang |
| Date: | Writer: QUNTINGZHU |
| | Date: 2021.06.08 |

Addition: If your company has no objections to this specification, please sign back this specification in five days after receiving it. If it exceeds the predetermined time and has not sign back yet, it will be regard as you have agreed with us on this specification. In the following trade the two sides should abide the request in the specification strictly. If your company have any changes in quality request in the future, please inform us in time to avoid any unnecessary problems.



Revise Record

| Version | Revised Date | Contents | Reasons |
|---------|--------------|------------------|---------|
| 1 | 2021/06/08 | New | --- |
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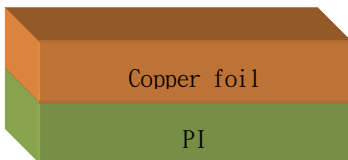
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1 Scope

This specification shall be applied to FCCL (IF-2LS) which is roll material and supplied by ITEQ(GUANGZHOU)CORPORATION to ZHIHE Group.

2 Composition of Product

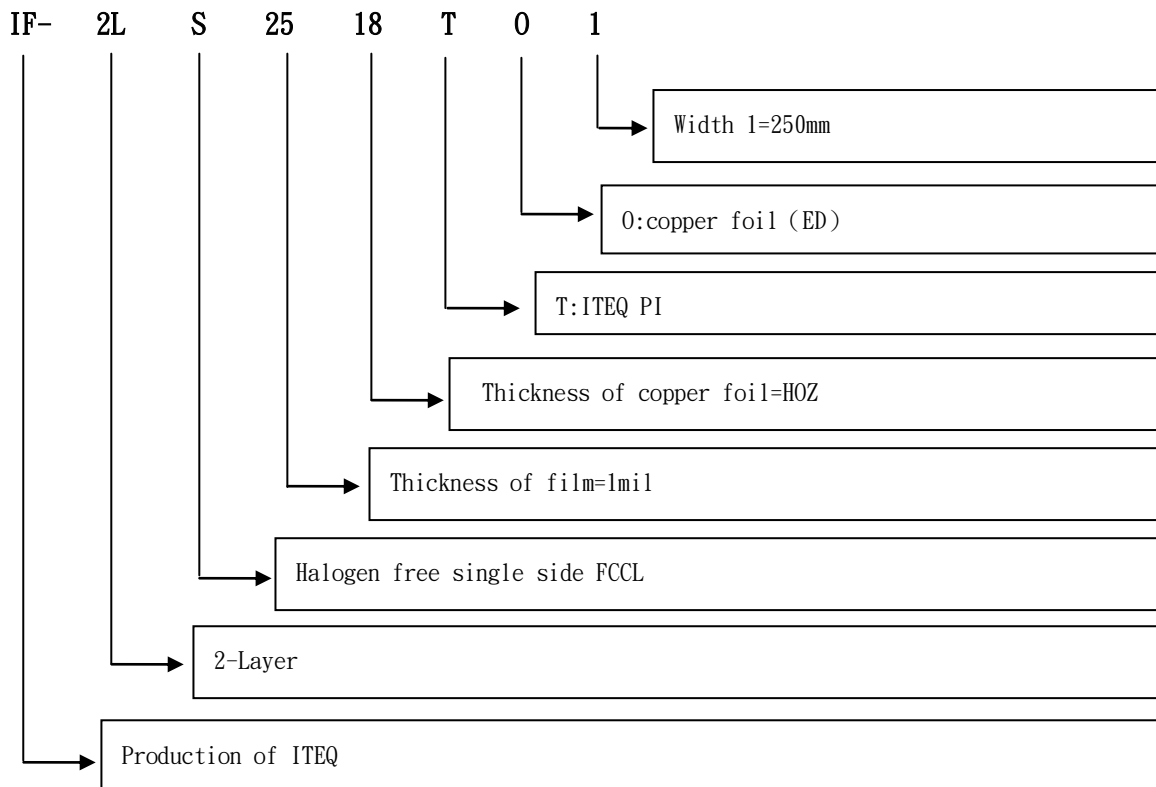
2.1 Construction



2.2 Composition

| Material | Type | CAS. Number |
|-------------|------------------|-------------|
| PI | ITEQ | ----- |
| Copper foil | copper foil (ED) | 7440-50-8 |

2.3 Definition of Product Spec



3 Specification

3.1 Appearance

| No | Defect | | Roll Material |
|----|------------------------------------|-----------------------------------|--|
| 1 | Copper foil side | dents | There shall be no dents with the longest dimension greater than 0.50mm and the total point count shall be no more than five per clad side per 0.1 m ² |
| 2 | | scratches | Scratches are not permitted where the depth is >20% of the nominal foil thickness |
| 3 | | wrinkle | Have no influence when use |
| 4 | | holes | No |
| 5 | | creases | Have no influence when use |
| 6 | | copper foil oxidation | shall be easily removed using diluted hydrochloric acid of 1 mol/dm, or other appropriate solvent. |
| 7 | | copper foil colour non-uniformity | can not be found by eye with no any equipment |
| 8 | | foreign substance on surface | shall be easily removed using diluted hydrochloric acid of 1 mol/dm, or other appropriate solvent. |
| 9 | Adhesive side(copper foil removed) | voids | The size of the voids shall not be >0.075mm in any direction |
| 10 | | colour non-uniformity | can not be found by eye with no any equipment |
| 11 | | striped pattern | can not be found by eye with no any equipment |
| 12 | In PI and Adhesive | inclusions | Non-conducting, the size of the inclusions shall not be >0.5mm in any direction, In the area of 25cm*25 cm, the number of 0.05-0.5mm inclusions shall be ≤6 |
| 13 | Product | material joint | No |
| 14 | | crack/tears | No |
| 15 | | No adhesive | No |
| 16 | | delamination | No |

Remark :

1 Foreign substances on surface:Dust, copper particles, PI particles ,adhesive, dirt, finger prints etc. on the material surface can be easily wiped off with a cloth.

2 Inclusions: Foreign particles, metallic or nonmetallic, that are entrapped (cannot be wiped off with a cloth) in the material and were not intended as part of the material formulation. The substance that can be intended as a part of the material formulation is not intended as an inclusion.

| Longest Dimension of Dent · I | Dent Point Value |
|--|------------------|
| $0.10 \text{ mm} \leq I < 0.25 \text{ mm}$ | 1 |
| $0.25 \text{ mm} \leq I < 0.50 \text{ mm}$ | 2 |
| $0.50 \text{ mm} \leq I < 0.75 \text{ mm}$ | 4 |

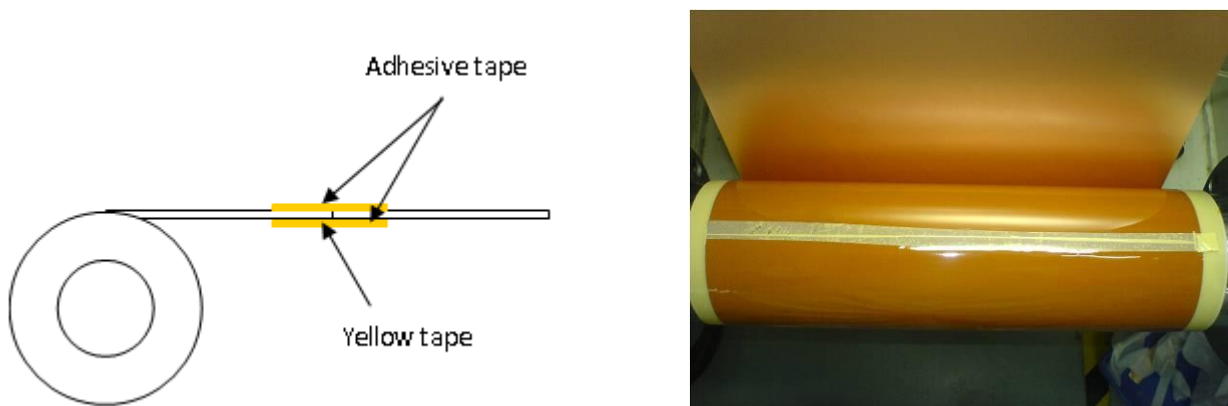
3.2 joints

3.2.1 Permissible number of joints

| Length per roll(m) | Permissible number of joints |
|--------------------|------------------------------|
| 100 | ≤ 3 |

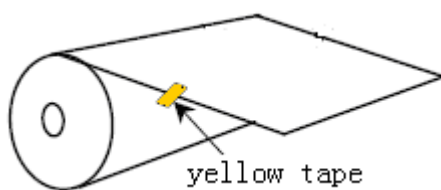
3.2.2 Splicing method

Two part FCCL shall be taped with PI adhesive tape on both PI and copper side, and more about 10mm PI adhesive tape shall be as joint mark. (As below Figure)



3.2.3 Defect marking

The defective area shall be indicated by a yellow tape at the edge of the FCCL. (As below Figure)



3.2.4 Extra length

0.5m of extra length shall be added for each defected part or splicing part.

3.3 Dimension

| Item | Thickness (μm) | Width(mm) | Length(m) |
|---------------|-----------------------------|---------------|---------------|
| IF-2LS2518T01 | $43 \pm 10\%$ | 250 ± 0.5 | $100 -0 +1.0$ |

3.4 properties

| Item | unit | Test conditions | Quality standards | Test method | |
|---------------------------------|--------------|-----------------|----------------------------|-------------|-----|
| Peel strength | kgf/cm(180°) | Normal State | ≥0.6 | 5.1 | |
| Dimension Stability | % | Method B | TD | 0±0.08 | 5.2 |
| | | | MD | 0±0.08 | |
| Soldering Resistance | --- | 300°C/30sec | No blister, delamination | 5.3 | |
| Chemical Resistance (fall rate) | % | NaOH | Peel strength fall rate≤20 | 5.4 | |
| | % | HCL | | | |
| | % | IPA | | | |
| Volume resistance | Ω·cm | C-96/23/65 | ≥10 ¹³ | 5.5 | |
| Surface resistance | Ω | C-96/23/65 | ≥10 ¹² | | |
| Dielectric constant (2GHz) | --- | C-24/23/50 | ≤4.0 | 5.6 | |
| Loss tangent (2GHz) | --- | C-24/23/50 | ≤0.04 | | |
| Absorbing water rate | % | D-24/23 | ≤2.0 | 5.7 | |

Our adhesive free single-sided base material is not suitable for metallization process, so it is recommended that customers use gold plating process

4 Test Method

4.1 Peel strength

Prepare the test specimen by etching; Conductors are 3.175mm wide * ≥150mm long.

Attach the specimen to the square test fixture.

Peel the conductor ,with a peel angle of 180° ,

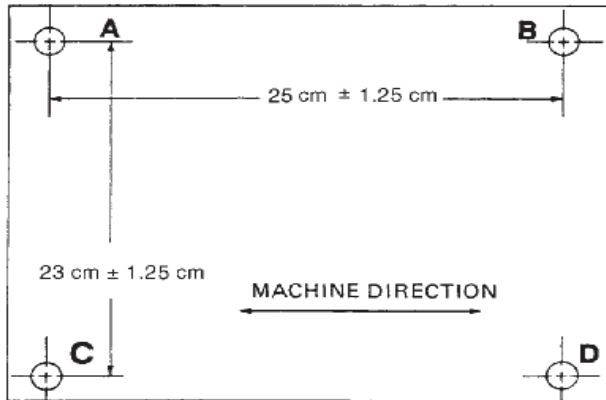
test speed of 50mm/min and at least distance 70mm.

Peel strength (Kgf/cm) = reading (Kgf) / conductor width(cm)

4.2 Dimension Stability

Specimen: 28 cm × 25 cm,

Specimen shall be stamped as shown in below Figure .



Measure the distance between hole centers A-B and C-D, also A-C and B-D. (I)

Method B: Then etch the specimen, wash the specimen with water completely, dry . At $23 \pm 2 \text{ }^\circ\text{C}$ and $55 \pm 5\% \text{ RH}$, Let stand for 1H and test in this environment. A-B and C-D, also A-C and B-D. (F1) Calculate the dimensional changes as formula 1.

$$\text{M.D.} = \frac{\frac{(A-B)_{F1} - (A-B)_I}{(A-B)_I} + \frac{(C-D)_{F1} - (C-D)_I}{(C-D)_I}}{2} \times 100$$

$$\text{T.D.} = \frac{\frac{(A-C)_{F1} - (A-C)_I}{(A-C)_I} + \frac{(B-D)_{F1} - (B-D)_I}{(B-D)_I}}{2} \times 100$$

Formulal

Where:

M. D. = % change in machine dimension

T. D. = % change in transverse dimension

I = Initial Reading

F1 = Final Reading

4.3 Soldering Resistance :

Firstly, the sample should be baked in the oven with 1 hour at 120°C .

The sample cutting into $5 \times 5 \text{ cm}$ size,

Take the specimen in molten solder at $300 \pm 5^\circ\text{C}$ for 30sec. And then check the surface of the specimen.

4.4 Chemical Resistance (fall rate)

Test three specimens in accordance with section 5.1

Immerse other three specimens for $10 \pm 0.5 \text{ min}$ in each chemical, then rinse these specimens in water for 1 min, dry. Test these specimens in accordance with section 5.1

Peel strength calculation rate:

Drop rate = $(\text{normal peel strength} - \text{immersed peel strength}) / \text{normal peel strength} \times 100\%$

4.5 Volume resistance and Surface resistance

Specimen: 10cm × 10 cm, Prepare the specimen by etching the cooper foil completely , then clean by water, then dry in oven at 105°C for 10 minutes, then stabilize the specimen at 23°C and 65%RH for 96hours.

Then test the specimen by High Resistance Meter , at the condition: 1KV DC, depressing time 60 seconds.

4.6 Dielectric constant and Loss tangent

Specimen: 7cm ×14cm,

Prepare the specimen by etching the cooper foil completely, then stabilize the specimen at 23°C and 50%RH for 24hours. Then test the specimen by High frequency Impedance Analyzer at 2GHz.

4.7 Absorbing water rate

A sample of copper foil completely etching away.

After washing dry, cutting 5 x5cm samples, in 105 °C oven drying within 1 h.

Take out specimens in dryer, cooling 10 min.

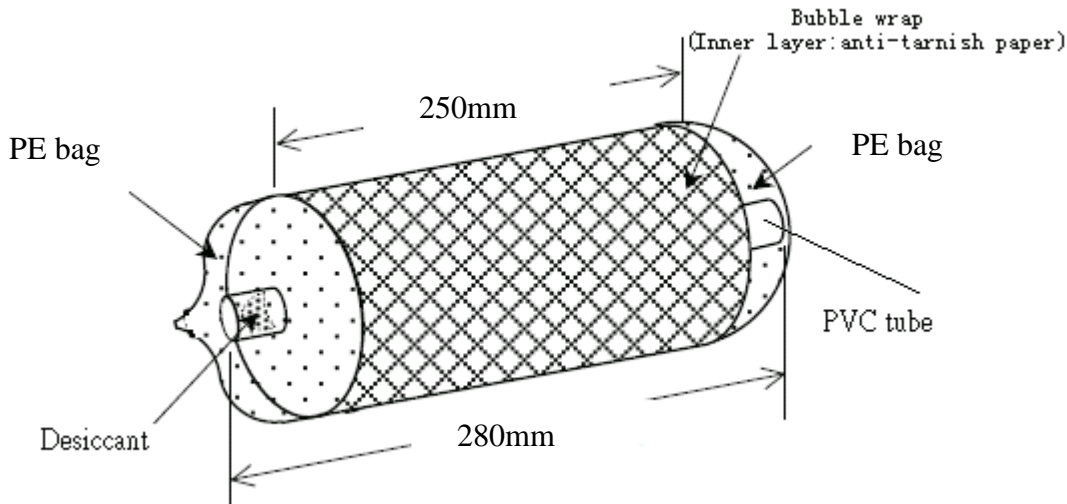
Try piece of weighing W1, need to be accurate to 0.1 mg.

Will weigh the sample, 23°C in all the distilled water or pure water for 24 +/-0.5 h.

With blotting paper wiping clean, immediately weighing W2, accurate to 0.1 mg.

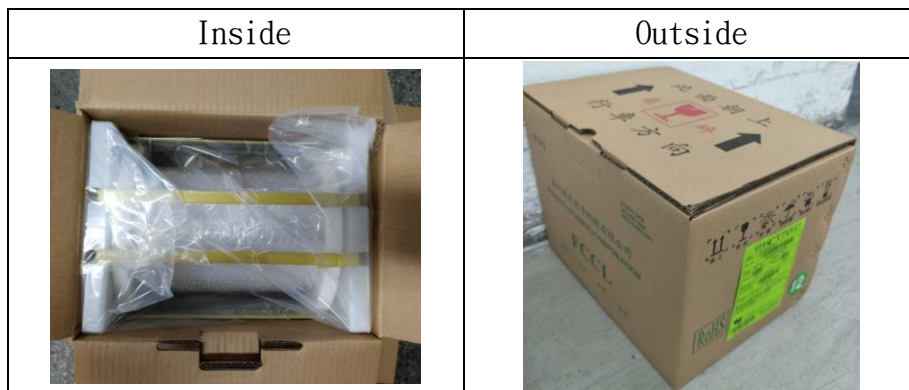
Calculation bibulous rate = $(W2-W1) / W1 \times 100\%$

5 Packing and Label



5.1 Packing

PVC tube Spec: Inner diameter:3", Thickness :3.5mm, Length: 280mm



5.2 Label on Box

The label shall contain the following information.

| Item | Example |
|--------------------------|----------------------------|
| (1) Manufacturer's name | ITEQ(GUANGZHOU)CORPORATION |
| (2) Product Spec | SPEC: IF-2LS2518T01 |
| (3) Roll No | Roll No: G17C05CB06B1 |
| (4) Length | Length : 100m |
| (5) Width | Width : 250mm |
| (6) Splice | Splice: 0 |
| (7) Stamp of approval | QC PASS |
| (8) MFG Date | MFG Date : 2017/12/05 |
| (9) Expire Date | Expire Date : 2018/12/04 |
| (10) RoHS2.0/HSF/HF Logo | RoHS2.0/HSF/HF |

Outer packing container labeled examples are as follows:



5.3 Label on Inside of PVC Tube

The label shall contain the following information.

| Item | Example |
|-------------------------|-----------------------|
| (1) Product Spec | SPEC: IF-2LS2518T01 |
| (2) Width | Width : 250mm |
| (3) Length | Length : 100m |
| (4) Splice | Splice: 0 |
| (5) Roll No | Roll No: G17C05CB06B1 |
| (6) RoHS2.0/HSF/HF Logo | RoHS2.0 HSF HF |

Label Example:



5.4 Label on Outside of PVC Tube

The label shall indicate Roll No.

Label Example:



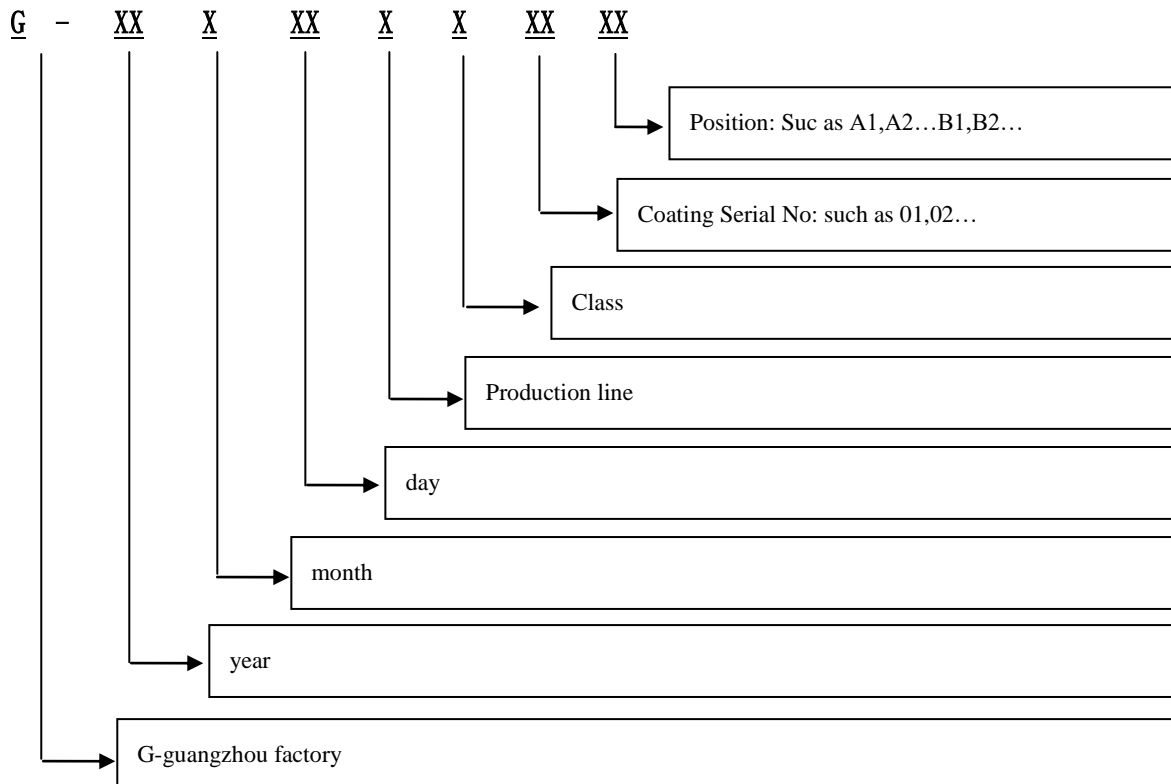
6 Guarantee Period and Storage Condition

The guarantee period of FCCL is 12 months from the MFG Date under the following condition.

Vacuum Packaging: max 30°C ;

Normal Packaging : max30°C 70%RH

7 Defination of Lot No



8 Test Report

Attachment: Test Report Form

品質檢驗報告

| | | | | | | | |
|--|---------------------------------|-----|------------------------------------|----|-----------------------|---------------------------------------|---|
| 客戶 Customer | | | | | 交貨日期 Delivery Date | | |
| 產品品名 Product Name | | | | | 產品規格 Product Spec | | |
| 基膜標稱厚度 Unit:mil Base Film Nominal Thickness | | | 粘劑標稱厚度 Unit:μm Adhesive Nominal | | | 銅箔標稱厚度 Unit:OZ Copper Foil Nominal | |
| 檢驗項目 Test Item | 剝離強度 Peel Strength | | 尺寸安定性 Dimension Stability | | 厚度 thickness | 幅寬 width | 焊錫耐熱性 solder float resistance 300°C/30sec |
| | A 面 | B 面 | Method B | | | | |
| 品質標準 Quality Spec | | | MD | TD | | | 判定 Judgment |
| | | | | | | | |
| 檢驗方法 Test Method | IPC-TM-650 2.4.9 Unit:kgf/cm | | IPC-TM-650 2.2.4 | | 聯茂規範 Unit:μm | 聯茂規範 Unit:mm | IPC-TM-650 2.4.13 |
| 批號 Lot No. | | | | | | | |
| | | | | | | | |

審核(Approved by):

製作(Editor):

注：(1)保存條件：<30°C,<70%RH 保存一年 (Deadline of reserve is 1 year in less than 30°C,70%RH condition).

(2)以上測試項目僅供參考(Above test for reference only).

(3)本產品符合 RoHS 要求。This product is in compliance with RoHS.

(4)本產品為無鹵產品。This product is a halogen free product.

W-GQA-F022-05A