

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



ESL measuring method – **STANDARD PREVIEW**  
Part 2: Surface mount capacitors for use in electronic equipment  
(standards.iteh.ai)

Méthode de mesure de l'ESL – **IEC 62490-2:2010**  
Partie 2: Condensateurs pour montage en surface utilisés dans les équipements  
électroniques  
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## ESL MEASURING METHOD –

**Part 2: Surface mount capacitors  
for use in electronic equipment**

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The text of this standard is based on the following documents:

FDIS	Report on voting
40/2045/FDIS	40/2057/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 62490 series, under the general title *ESL measuring method*, can be found on the IEC web site.

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## ESL MEASURING METHOD –

### Part 2: Surface mount capacitors for use in electronic equipment

#### 1 Scope

This part of IEC 62490 provides the ESL measuring method for the surface mount capacitors for use in electronic equipment.

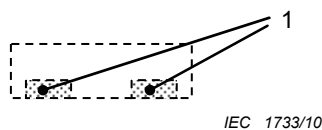


Figure 1a – Lead frame electrode terminal      Figure 1b – Thin coating electrode terminal  
**Figure 1 – Lead frame and thin coating types of surface mount capacitors  
 and the specification of the dimensions ( $L$ ,  $W$ , and  $H$ )**

The ESL measurement method can be applicable to the surface mount capacitors with the following properties, but not limited to these:

- a) capacitance range: 10  $\mu\text{F}$  to 1 000  $\mu\text{F}$ ;
- b) size:  $L \times W = 3,2 \text{ mm} \times 1,6 \text{ mm}$  to  $7,3 \text{ mm} \times 4,3 \text{ mm}$ ,  $H = 4,0 \text{ mm}$ ;
- c) ESL range: 5 nH or less.

NOTE The surface mount capacitors in this document are limited to capacitors with lead frame or with thin coated terminals, see Figure 1. The scope of this document does not include capacitors with face down terminals, see Figure 2.



#### Key

- 1 terminals (shaded section)

**Figure 2 – Surface mount capacitors with face down terminal**

#### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60384-1:2008, *Fixed capacitors for use in electronic equipment – Part 1: Generic specification*

### 3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60384-1 and the following apply.

#### 3.1 equivalent series inductance L ESL

inductive part of the impedance of capacitors

NOTE The unit of ESL is Henry (H).

### 4 Test fixture and compensation chip

#### 4.1 Test fixture

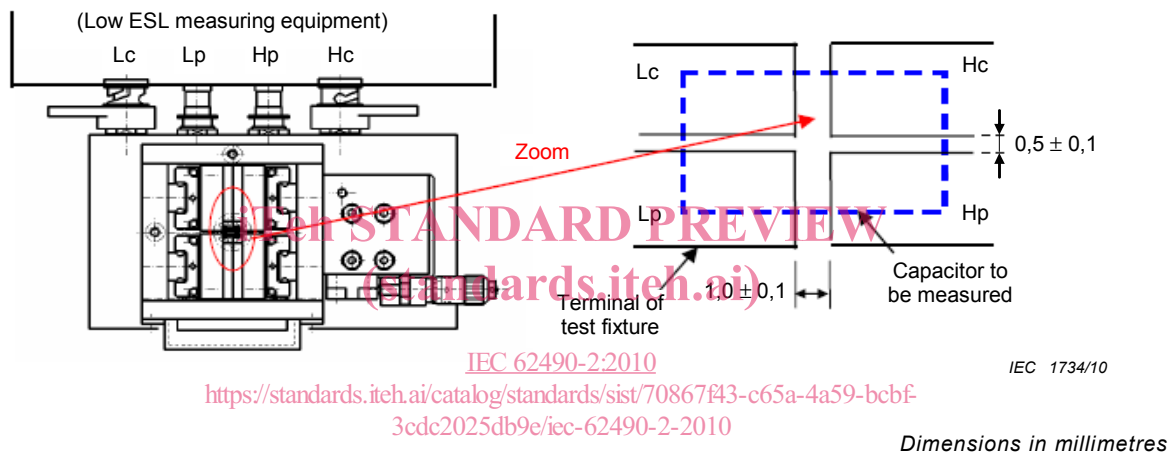


Figure 3a – Top view of test fixture

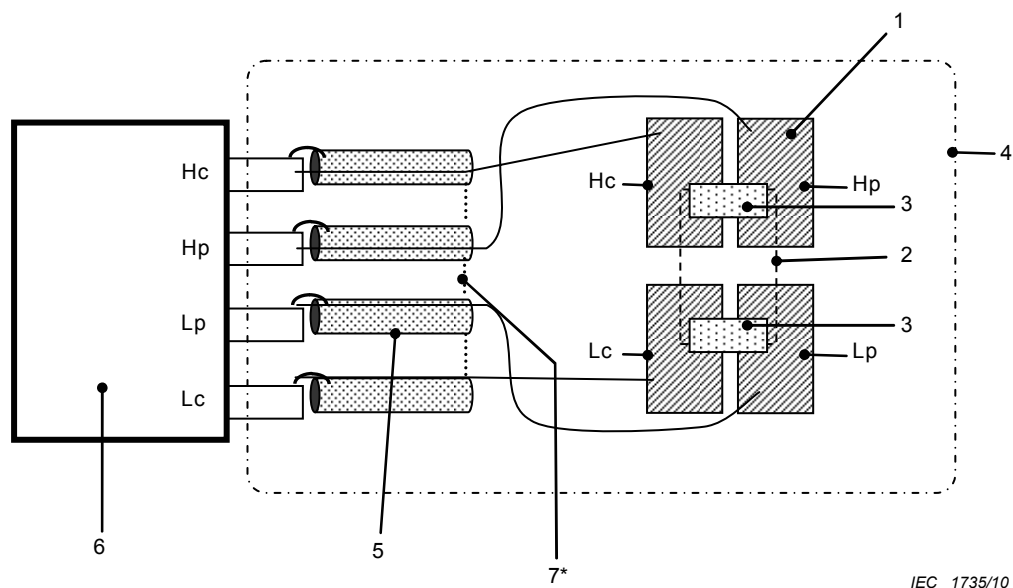
Figure 3b – Enlarge view of the terminals of test fixture

Figure 3 – Test fixture and terminals of test fixture

The test fixture shall have the following features.

- a) The test fixture has a 4-terminal structure. The capacitors can be mounted on the test fixture as shown in Figure 3. The terminals of the test fixture shall be connected to the low current terminal (Lc), the low voltage terminal (Lp), the high current terminal (Hc), and the high voltage terminal (Hp).





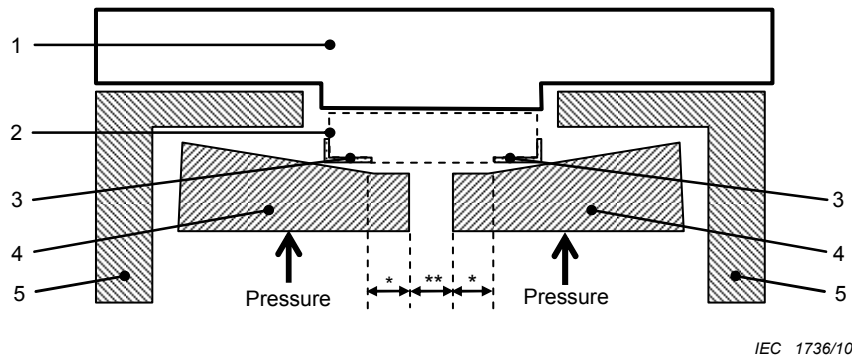
IEC 1735/10

**Key**

- |   |   |   |                                      |
|---|---|---|--------------------------------------|
| 1 | one of fixture terminals (shaded section) | 5 | coaxial cables (dotted section)      |
| 2 | capacitor (dashed line)                   | 6 | ESL measuring equipment (thick line) |
| 3 | capacitor terminal (dotted section)       | 7 | connect shielding wire (dotted line) |
| 4 | fixture (within dashed-dotted line)       |   |                                      |
- \* Connect sheaths of 4 coaxial cables to each other within very short distance of fixture terminals

**Figure 4 – Connection diagram**

- b) Anchoring the capacitor with pressure terminals which make stable contact provides high repeatability and reproducibility (see Figure 5).



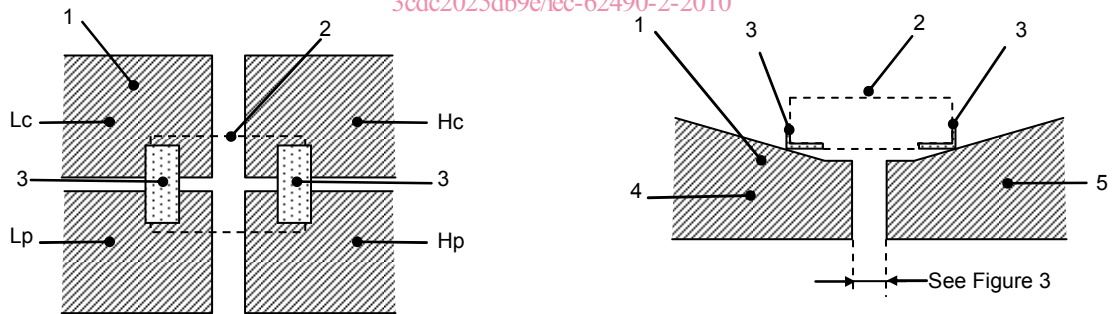
**Key**

- 1 lid of test fixture for fixing capacitor (thick line)
  - 2 capacitor (dashed line)
  - 3 capacitor terminal (dotted section)
  - 4 terminals of test fixture (shaded section)
  - 5 guides for capacitor (shaded section)
- \* 0,5 mm ± 0,1 mm  
 \*\* See Figure 3.

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**Figure 5 – Sectional view of the test fixture with an inserted surface mount capacitor pressured to the terminals of the test fixture**

c) Figure 6 is an example of surface mount capacitor mounted on terminals of test fixture.



**Key for Figure 6a**

- 1 one of fixture terminals (shaded section)
- 2 capacitor (dashed line)
- 3 capacitor terminal (dotted section)

**Key for Figure 6b**

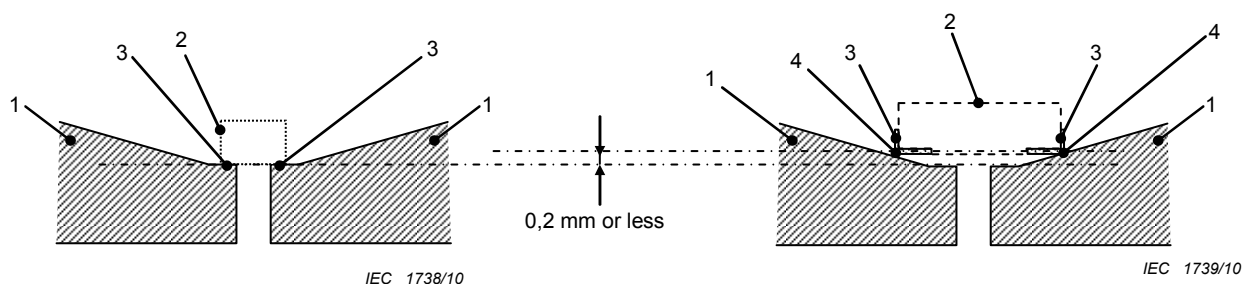
- 1 fixture terminal (shaded section)
- 2 capacitor (dashed line)
- 3 capacitor terminal (dotted section)
- 4 low side terminals (shaded section)
- 5 high side terminals (shaded section)

**Figure 6a – Top view of the fixture terminals**

**Figure 6b – Front view of the fixture terminals**

**Figure 6 – Example of surface mount capacitor mounted on terminals of test fixture**

d) The test fixture-terminals should be plain and be sloped to ensure the contact with the measuring point of short compensation chip (Figure 7a) and a capacitor to be measured (Figure 7b). However, the gap in the measuring points between short compensation chip and capacitor to be measured shall be 0,2 mm or less as shown in Figure 7.

**Key for Figure 7a**

- 1 fixture terminals (shaded section)
- 2 short compensation jig (dotted line)
- 3 position of contact points (dashed-dotted line)

Figure 7a – Short compensation chip

**Key for Figure 7b**

- 1 fixture terminals (shaded section)
- 2 capacitor (dashed line)
- 3 capacitor terminals (dotted section)
- 4 position of contact points (dashed-dotted line)

Figure 7b – Measured capacitor

**Figure 7 – Front view of mounting position of objects on test fixture****4.2 The open, short, and load compensation chip****4.2.1 The open compensation chip**

The shape and size of electrode terminals of the open compensation chip shall be the same as that of the capacitors to be measured. The open compensation chip shall connect each terminal as follows:

- a) connect between "High voltage terminal (Hp)" and "High current terminal (Hc)";
- b) connect between "Low voltage terminal (Lp)" and "Low current terminal (Lc)";
- c) insulate terminals of "High side" and "Low side" from each other.

**4.2.2 The load compensation chip**

The standard load-compensation chip shall be a thick film resistor whose resistance is  $49,9 \Omega$  (tolerance 1 %), and whose size is  $3,2 \text{ mm (L)} \times 1,6 \text{ mm (W)}$  with terminals exposed to the right-and-left side and the bottom part. The load compensation chip shall connect each terminal as follows:

- a) connect between "High voltage terminal (Hp)" and "High current terminal (Hc)";
- b) connect between "Low voltage terminal (Lp)" and "Low current terminal (Lc)".

**4.2.3 The short compensation chip**

The short compensation chip shall be a rectangular solid conductor which shall have a feature to make all four terminals of test fixture be short-circuited between each other.

Its base metal is made of copper, and plated with gold whose thickness is  $1 \mu\text{m}$  to  $2 \mu\text{m}$ .

To maintain measurement accuracy, the inductance value of the short compensation chip shall be  $1/5$  or less of that of the capacitors to be measured. The size shall be  $2,0 \text{ mm} \pm 0,05 \text{ mm (L)} \times 3,0 \text{ mm} \pm 0,05 \text{ mm (W)} \times 0,5 \text{ mm} \pm 0,05 \text{ mm (H)}$ .

## 5 Measuring method

### 5.1 Measuring equipment

The impedance analyser (balance bridge method) with the following specification or equivalent shall be used:

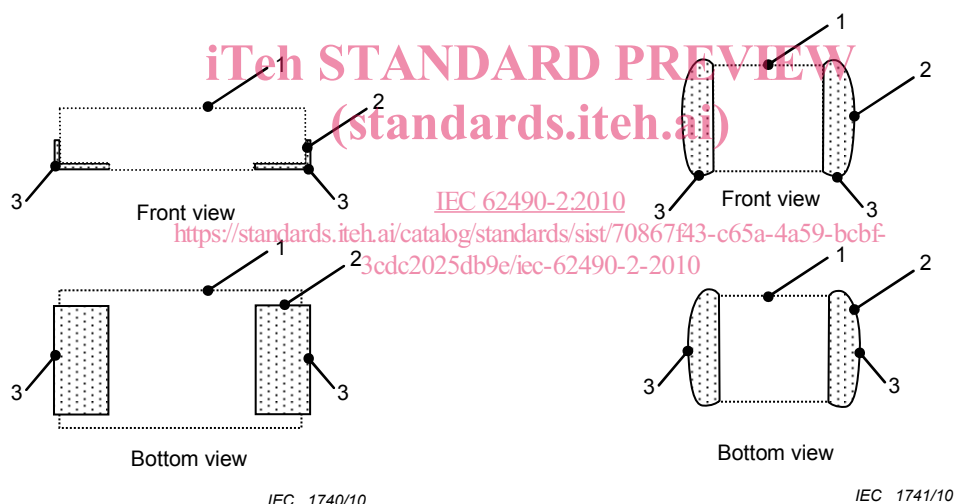
- a) inductance value (ESL) can be measured at a frequency of 40 MHz or higher;
- b) basic impedance accuracy shall be  $\pm 0,08\%$  or better;
- c) impedance value of  $3\text{ m}\Omega$  or less can be measured.

### 5.2 Measurement conditions

Measurements shall be made under the standard atmospheric conditions for testing, as specified in IEC 60384-1:2008, 4.2.1. In addition, if there is any doubt as to the validity of measurements, the recovery conditions, as specified in IEC 60384-1:2008, 4.2.2, shall be implemented.

### 5.3 Measurement points

ESL is measured along the points or lines which contact with the bearing points at the bottom of the terminal electrode of the capacitor as shown in Figure 8.



#### Key for figure 8a

- 1 capacitor (dotted line)
- 2 capacitor terminal (dotted section)
- 3 measurement points (line of contacting points between fixture terminals and capacitor terminals)

Figure 8a – Lead frame electrode terminal

#### Key for Figure 8b

- 1 capacitor (dotted line)
- 2 capacitor terminal (dotted section)
- 3 measurement points (line of contacting points between fixture terminals and capacitor terminals)

Figure 8b – Thin coating electrode terminal

Figure 8 – Measurement points

### 5.4 Frequency and signal level

Unless otherwise specified in the product specification, the frequency and signal shall be as follows:

- a) the measurement frequency shall be 40 MHz;
- b) the signal level of an oscillation of a measuring equipment shall be 0,5 V to 1,0 V in r.m.s..