



INTERNATIONAL STANDARD



**Printed electronics –
Part 202-7: Materials – Printed film – Measurement of peel strength for printed
layer on flexible substrate by the 90° peel method**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.035.01; 31.180

ISBN 978-2-8322-9466-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Standard atmospheric conditions	7
5 Test sample.....	7
5.1 General.....	7
5.2 Size of test sample	7
5.3 Applicability of the method	7
6 Testing method and test apparatus.....	8
6.1 General.....	8
6.2 Test apparatus.....	8
6.3 Test procedure.....	9
7 Data analysis.....	10
7.1 Peel strength calculation	10
7.2 Report of the results	10
Bibliography.....	12
Figure 1 – Schematic of peel test of the printed layer on a flexible substrate	8
Figure 2 – Apparatus for peel test of the printed layer on a flexible substrate.....	9
Figure 3 – Typical peeling curve measured during the peel test	10

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRINTED ELECTRONICS –

Part 202-7: Materials – Printed film – Measurement of peel strength for printed layer on flexible substrate by the 90° peel method

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62899-202-7 has been prepared by IEC technical committee 119: Printed Electronics. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
119/342/FDIS	119/345/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 62899 series, published under the general title *Printed electronics*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

A printed layer on a flexible substrate is widely employed as an electrode or interconnection for flexible devices. An integral component of this conductive body of the devices is conductive composite material and is commercialized as conductive ink.

A simple tape test method has been widely used for qualitative adhesion measurement, but it cannot be used to measure strong adhesion between the printed layer and the flexible substrate.

A conventional peel test method is widely used in the printed circuits industry to evaluate the adhesion between a thin printed layer with dense microstructure and the flexible substrate.

Peel strength value can be measured after an additional metal electroplating process on a thin printed layer to increase the printed layer thickness to provide a stable grip in an adhesion testing machine. However, it is not suitable for testing a printed layer which has a porous structure susceptible to contamination of the interface between the printed layer and flexible substrate during the electroplating process.

Therefore, a quantitative and reliable adhesion test method is used to measure and understand interfacial adhesion of the printed layer to the flexible substrate and its long-term reliability.

In this document, a new standard test method to measure the peel strength of a printed layer on a flexible substrate is proposed. This method calls for peeling the flexible substrate instead of an additional metal electroplating on the printed layer. It is useful to monitor and compare the thickness dependence of the peel strength of a layer on the same flexible substrate.

PRINTED ELECTRONICS –

Part 202-7: Materials – Printed film – Measurement of peel strength for printed layer on flexible substrate by the 90° peel method

1 Scope

This part of IEC 62899 provides a test method to measure the peel strength of a printed layer on a flexible substrate. This method calls for peeling the flexible substrate instead of an additional metal electroplating on the printed layer. The method described in this document can be used to compare the peel strengths of the printed layers on the same flexible substrate and thickness conditions. It can be used when the adhesion between the printed layer and flexible substrate is weaker than any other interface between the printed layer and the adhesive, the adhesive and the panel.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62899-202:2016, *Printed electronics – Part 202: Materials – Conductive ink*