

Semiconductor devices - Micro-electromechanical devices -- Part 11: Test method for coefficients of linear thermal expansion of free-standing materials for micro-electromechanical systems

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**Semiconductor devices -
Micro-electromechanical devices -
Part 11: Test method for coefficients of linear thermal expansion
of free-standing materials for micro-electromechanical systems
(IEC 62047-11:2013)**

Dispositifs à semiconducteurs -
Dispositifs microélectromécaniques -
Partie 11: Méthode d'essai pour les
coefficients de dilatation thermique
linéaire des matériaux autonomes pour
systèmes microélectromécaniques
(CEI 62047-11:2013)

Halbleiterbauelemente -
Bauelemente der Mikrosystemtechnik -
Teil 11: Prüfverfahren für lineare
thermische Ausdehnungskoeffizienten für
freistehende Werkstoffe der
Mikrosystemtechnik
(IEC 62047-11:2013)

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Foreword

The text of document 47F/154/FDIS, future edition 1 of IEC 62047-11, prepared by IEC/TC 47F "Microelectromechanical systems" of IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62047-11:2013.

The following dates are fixed:

- latest date by which the document has to be (dop) 2014-05-21
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publication of an identical national
standard or by endorsement
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Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62047-3	-	Semiconductor devices - Micro-electromechanical devices - Part 3: Thin film standard test piece for tensile-testing	EN 62047-3	-

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SEMICONDUCTOR DEVICES – MICRO-ELECTROMECHANICAL DEVICES –

Part 11: Test method for coefficients of linear thermal expansion of free-standing materials for micro-electromechanical systems

1 Scope

This part of IEC 62047 specifies the test method to measure the linear thermal expansion coefficients (CLTE) of thin free-standing solid (metallic, ceramic, polymeric etc.) micro-electro-mechanical system (MEMS) materials with length between 0,1 mm and 1 mm and width between 10 μm and 1 mm and thickness between 0,1 μm and 1 mm, which are main structural materials used for MEMS, micromachines and others. This test method is applicable for the CLTE measurement in the temperature range from room temperature to 30 % of a material's melting temperature.

2 Normative References

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

IEC 62047-3, *Semiconductor devices – Micro-electromechanical devices – Part 3: Thin film standard test piece for tensile-testing*

3 Symbols and designations

Symbols and corresponding designations are given in Table 1.

Table 1 – Symbols and designations

Symbol	Unit	Designation
g	μm	Gauge length
L_0	μm	Initial length of a test piece
L_T	μm	Length of a test piece at temperature T
T	$^{\circ}\text{C}$	Temperature
t	μm	Thickness of a test piece
w	μm	Width of a test piece
α_{av}	$1/^{\circ}\text{C}$	Average coefficient of thermal expansion of a test piece
α_S	$1/^{\circ}\text{C}$	Average coefficient of thermal expansion of a substrate
δ_T	μm	Thermal deformation
ε_T	1	Thermal strain