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INTERNATIONAL STANDARD

AMENDMENT 1

Semiconductor devices –
Part 16-5: Microwave integrated circuits – Oscillators

IEC 60747-16-5:2013-06/AMD1:2020-07(en)

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FOREWORD

This amendment has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

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

CDV	Report on voting
47E/673/CDV	47E/705/RVC

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

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

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- withdrawn,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

The contents of the corrigendum of September 2020 have been included in this copy.

2 Normative references

Replace the existing references IEC 60747-4 and IEC 60747-16-3 by the following new references:

IEC 60747-4:2007, *Semiconductor devices – Discrete devices – Part 4: Microwave diodes and transistors*
IEC 60747-4:2007/AMD 1:2017

IEC 60747-16-3:2002, *Semiconductor devices – Part 16-3: Microwave integrated circuits – Frequency converters*
IEC 60747-16-3:2002/AMD 1:2009
IEC 60747-16-3:2002/AMD 2:2017

Replace the existing terminological entry 3.3 with the following:

3.3
phase noise
$\mathscr{L}(f)$
frequency-domain measure of the short-term frequency stability of an oscillator

Note 1 to entry: This phase noise is normally expressed as the power spectral density of the phase fluctuations, $S_\phi(f)$, where the phase fluctuation function is $\phi(t)=2\pi Ft-2\pi F_0 t$. The spectral density of phase fluctuation can be directly related to the spectral density of frequency fluctuation by the following formula:

$$S_\phi(f)=\left(\frac{F_0}{f}\right)S_y(f) \text{ rad}^2/\text{Hz}$$

where

F is the oscillator frequency;

F_0 is the average oscillator frequency;

f is the Fourier frequency.

Note 2 to entry: $\mathscr{L}(f)$ is pronounced "script-ell of f".

[SOURCE: IEC 60050-561:2014, 561-03-22, modified – A symbol and Note 2 to entry have been added.]

Replace the existing terminological entry 3.14 with the following:

3.14
load mismatch tolerance
ψ_L
maximum load VSWR in the range where the device oscillates with no unexpected spurious intensity and/or no discontinuity of frequency tuning characteristics (in case of VCO) at all phase angles

Note 1 to entry: "VSWR" is an abbreviation of "voltage standing wave ratio".

Note 2 to entry: "VCO" is an abbreviation of "voltage controlled oscillator".

5.4.2.2.2 Principle of measurement

Replace the text:

"L_2 is the conversion gain from point A to point C."

by the following:

L_2 is the circuit loss from point A to point C.

5.4.2.2.4 Precautions to be observed

Replace the last sentence as follows:

The value of the output power $P_{o.osc}$ defined at the point A shall be measured beforehand (see 5.3).

5.4.2.3.4 Precautions to be observed

Replace the last sentence as follows:

The value of the output power $P_{o.osc}$ defined at the point A shall be measured beforehand (see 5.3).

5.4.2.4.2 Principle of measurement

Replace the text

"L_2 is the power at the point B in dBm, less the power at the point A in dBm."

by the following:

L_2 is the circuit loss from point A to point B.

5.4.2.4.4 Precautions to be observed

Replace the last sentence as follows:

The value of the output power $P_{o.osc}$ defined at the point A shall be measured beforehand (see 5.3).

5.8.3 Principle of measurement

Replace the existing subclause as follows:

The n-th order harmonic distortion ratio P_{nth}/P_1 is derived from the following equations:

$$P_{nth}/P_1 = P_{nth} - P_1 \quad (9)$$

$$P_1 = P(f_1) + L(f_1)$$

$$P_{nth} = P(f_{nth}) + L(f_{nth})$$

where

P_1 is the output power of the fundamental (or desired) frequency;
P_{nth} is the power of the n-th order harmonic frequency;
$P(f_1)$ is the value indicated by the spectrum analyser at the output frequency f_1;
$P(f_{nth})$ is the value indicated by the spectrum analyser at the n-th order harmonic frequency f_{nth};
$L(f_1)$ is the circuit loss from point A to point B at the output frequency f_1;
$L(f_{nth})$ is the circuit loss from point A to point B at the n-th order harmonic frequency f_{nth};
P_1, P_{nth}, $P(f_1)$ and $P(f_{nth})$ are expressed in dBm, P_{nth}/P_1, $L(f_1)$ and $L(f_{nth})$ are expressed in dB.

NOTE For example, in case of doubling oscillator the harmonics include n-th/2 subharmonics.

5.13.3 Principle of measurement

Replace the existing subclause as follows:

The spurious distortion ratio P_s/P_1 is derived from the following equations:

$$P_s/P_1 = P_s - P_1 \quad (16)$$

$$P_1 = P(f_1) + L(f_1)$$

$$P_s = P(f_s) + L(f_s)$$

where

P_1 is the output power of the fundamental (or desired) frequency;
P_s is the maximum power of the spurious output, except harmonic components;
$P(f_1)$ is the value indicated by the spectrum analyser at the output frequency f_1;
$P(f_s)$ is the value indicated by the spectrum analyser at the spurious frequency f_s;
$L(f_1)$ is the circuit loss from point A to point B at the output frequency f_1;
$L(f_s)$ is the circuit loss from point A to point B at the spurious frequency f_s;
P_1, P_s, $P(f_1)$ and $P(f_s)$ are expressed in dBm, P_s/P_1, $L(f_1)$ and $L(f_s)$ are expressed in dB.