IEC 60191-4

Edition 3.1   2018-03
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

**Mechanical standardization of semiconductor devices –
Part 4: Coding system and classification into forms of package outlines for semiconductor device packages**

**Normalisation mécanique des dispositifs à semiconducteurs –
Partie 4: Système de codification et classification en formes des structures des boîtiers pour dispositifs à semiconducteurs**

IEC 60191-4:2013-10+AMD1:2018-03 CSV(en-fr)

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MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 4: Coding system and classification into forms of package outlines for semiconductor device packages

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IEC 60191-4 edition 3.1 contains the third edition (2013-10) [documents 47D/837/FDIS and 47D/848/RVD] and its amendment 1 (2018-03) [documents 47D/897/CDV and 47D/904/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60191-4 has been prepared by subcommittee 47D: Semiconductor devices packaging, of IEC technical committee 47: Semiconductor devices.

This third edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Material code "S" is added to indicate a silicon based package.

b) Description of "WL" is added to be used for general use.

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

A list of all the parts in the IEC 60191 series, published under the general title *Mechanical standardization of semiconductor devices*, can be found on the IEC website.

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

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*   withdrawn,
*   replaced by a revised edition, or
*   amended.

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MECHANICAL STANDARDIZATION OF SEMICONDUCTOR DEVICES –

Part 4: Coding system and classification into forms of package outlines for semiconductor device packages

1   Scope

This part of IEC 60191 specifies a method for the designation of package outlines and for the classification of forms of package outlines for semiconductor devices and a systematic method for generating universal descriptive designators for semiconductor device packages.

The descriptive designator provides a useful communication tool but has no implied control for assuring package interchangeability.

2   Coding system of package outlines for semiconductor devices

The following coding system will be used in the publications concerning mechanical standardization:

–   first: a three-digit serial number (000 to 999);
–   second: a single reference letter indicating the form as shown in Table 1;
–   third: a two-digit serial number (00 to 99) to indicate a variant of an outline drawing. The use of prefix P to indicate a provisional drawing remains unchanged.

Examples

–   101A00
–   050G13
–   P 101F01

3   Classification into forms of package outlines for semiconductor devices

The package outline drawings for semiconductor devices are classified into forms according to the following scheme:

–   form A: single-ended
–   form B: heat-sink-mounted
–   form C: stud-mounted
–   form D: axial-leaded
–   form E: surface-mounted
–   form F: single-ended, heat-sink-mounted
–   form G: dual and quad in-line
–   form H: axial lead-less.

4   Coding system for semiconductor-device packages

4.1   General

The standard coding system is a method for identifying the physical features of an electronic device package family. The system is predicated upon a minimum two-character designator, which indicates the package outline style. This designator can be extended, through the use of optional, user-selected fields, to provide additional package information such as terminal position and count, terminal form, package shape, and predominant body material.

4.2   New descriptive codes

If a new package that does not conform to one of the designated field character codes is being proposed, a new code may be recommended for standardization.

4.3   Descriptive designators

4.3.1   General remarks

The package outline style code is the only compulsory field within this descriptive designation system. Additional information may be provided using optional prefixes and suffixes described by the system. In general, these fields are independent of one another. Unless otherwise indicated herein, the users of this system may pick and choose which of these fields they wish to implement for their specific application (see Figure 1). The descriptive designator may be extended with additional information, provided this information is separated from the descriptive designator by a slash (/) (see 4.3.7).

NOTE   Basic package codes and names are presented in Table B.1.

4.3.2   Minimum descriptive designator

The minimum descriptive designator is a two-letter code that classifies device packages into standard package outline styles. These styles identify general external physical features. Common two-letter descriptive codes or abbreviations are included, such as CC, FP, SO, GA.

Figure A.1 shows two-letter codes for various device package outline styles and depicts examples of each. Table 1 lists the two-letter package-outline-style codes described in Clause 5.

Optional	–	Optional	Optional unless material prefix designator	Minimum descriptive designator		–	Optional	Optional
P	–	S	Q	C	C	–	J	3 2
Material		Features	Position	Package			Form	Count

Terminal count
(4.3.6.1, 4.3.6.2)
A one-, two-, or
three-digit suffix

Lead form
(4.3.6.1, 4.3.6.2,
Table 5, Figure A.2)
A single-letter suffix

Package outline style
(4.3.2, Table 1, Figure A.1)
A double-letter designator

Terminal position
(4.3.3, Table 2)
A single-letter prefix

Package-specific features
(4.3.5, Table 4)
A single-letter or multi-
letter prefix

Package-body material
(4.3.4, Table 3)
A single-letter prefix

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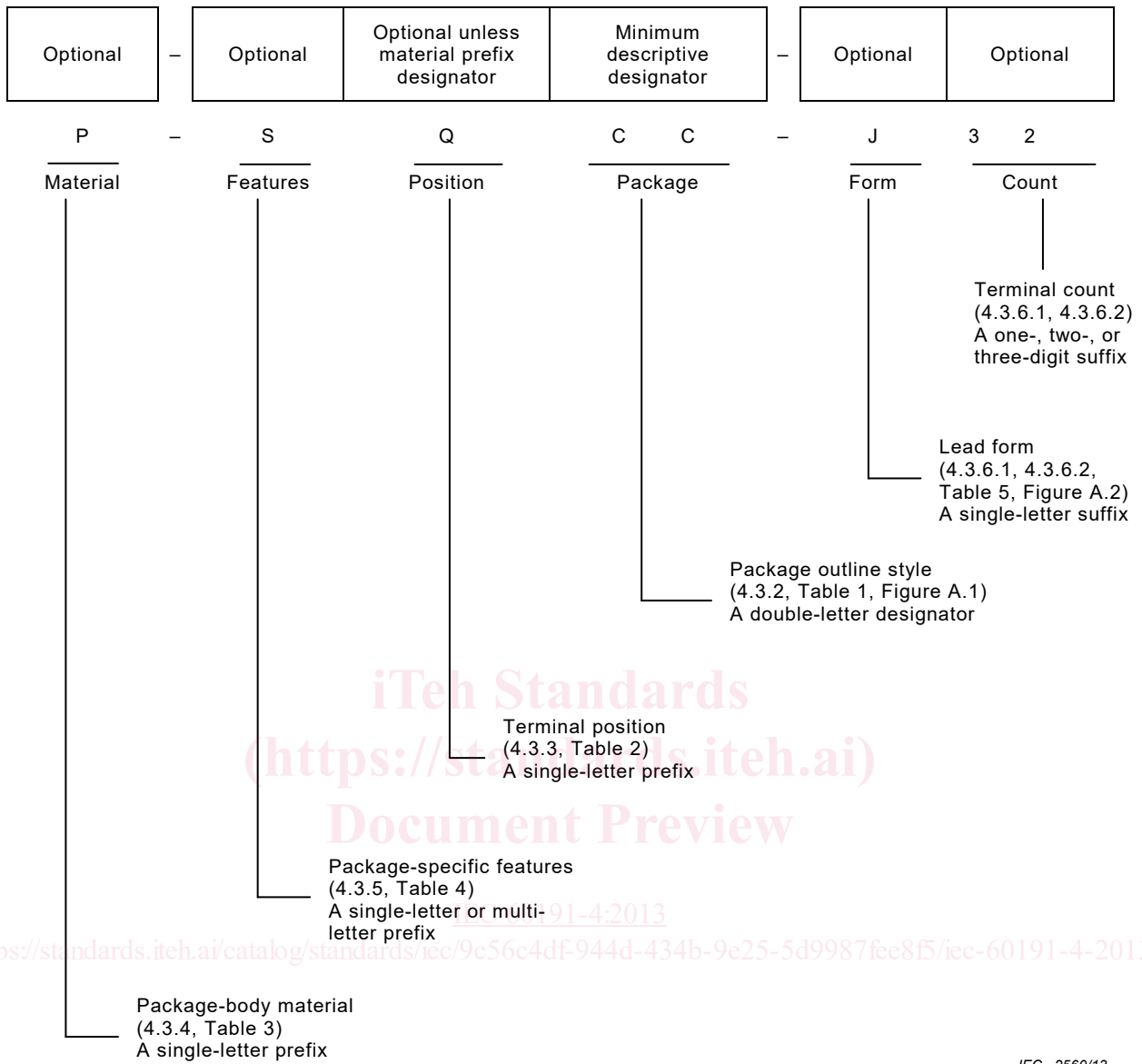**Figure 1 – Descriptive coding for semiconductor device packages**

Table 1 – Package-outline-style codes

Form	Code	Outline style
E	CC	Chip-carrier package
B	CP	Clamped package (press-pack)
A	CY	Cylinder or can package
D/E	DB	Disk-button package
F	FM	Flange-mount package
A	FO	Fibre optic device package
E	FP	Flatpack package
G	GA	Grid-array package
G	IL	In-line package. **The preferred designator is IP.**
G	IP	In-line package or inserted package. **Restrict to DIP/SIP/ZIP.**
D/H	LF	Long-form horizontal package
	MA	Microelectronic assembly
B	MP	Power module package
	MW	Microwave package
B	PF	Press-fit package
C	PM	Post-(stud-) mount package
E	SO*	Small-outline package
A	SS	Special-shape package
	UC	Uncased chip
	VP	Vertical surface-mount package
	XA-XZ	Non-defined family; vendor or user option

* Industry practice sometimes uses "P" for "package" in the location normally occupied by this field (except that there is no preceding hyphen), for example SOP.

4.3.3 Terminal-position prefix

The two-letter, package-outline-style code may be supplemented with a single-letter prefix that identifies the physical terminal positions or, if applicable, the interconnect land pattern. Examples of three-letter designators include common acronyms or abbreviations, such as DIP, LCC (QCC preferred), PGA, QFP, SIP, ZIP.

NOTE 1   A terminal is defined as an externally available point of connection.

NOTE 2   The proper terminal-position prefix is determined by the interconnect land structure. For example, the code for a single row of terminals formed into a staggered configuration would be "Z".

Table 2 gives a list of one-letter, terminal-position prefix codes.

4.3.4 Package-body-material prefix

The three-letter descriptive designator (see 4.3.2) may be further supplemented by a single-letter prefix that identifies the predominant package-body material. This prefix shall not be used unless the terminal-position prefix described in 4.3.2 is also used. Examples of such four-letter descriptive designators include common acronyms or abbreviations, such as CDIP, PDIP, PLCC (PQCC preferred), MELF, PQFP.

Table 3 gives a list of one-letter package-body-material prefix codes.

If the package-body material is other than one of those defined in Table 3, the letter "X" shall be used within the descriptive designator to signify a special or new material and shall later be replaced with an IEC-approved code.

4.3.5 Package-specific feature prefix

Package-specific features may be described through the use of a multiletter prefix. The package-specific feature prefix shall be set off from the following portion of the descriptive designator by a dash (–).

Table 4 gives a list of package-specific feature prefix codes. Figure 2 shows the relationship of codes to profile and pitch.

4.3.6 Lead-form and terminal-count suffixes

4.3.6.1 General lead-form and number of terminals

The general lead form (or terminal shape) and/or the number of terminals on a package may be described through the use of two fields, the lead-form suffix and the terminal-count suffix. These two fields shall be set off from the preceding portion of the descriptive designator by a dash (–).

Users of this system may choose to use the lead-form suffix, or the terminal-count suffix, or both. If the lead-form suffix is used in conjunction with the terminal-count suffix, it shall precede the terminal-count suffix.

Table 2 – Terminal-position prefixes

Code	Name	Position [a] [b]
A	Axial	Terminals extend from both ends in the direction of the major axis of a cylindrical or elliptical package
B	Bottom	Terminals extend from the bottom of the package
D	Double	Terminals are on opposite sides of a square or rectangular package or located in two parallel rows
E	End	Terminals are package endcaps having a circular or elliptical cross-section
L	Lateral	Terminals are on the four sides of a square or rectangular package **The preferred name is "quad", code Q**
P	Perpendicular	Terminals are perpendicular to the seating plane on a square or rectangular package. **Restrict to PGA family**
Q	Quad	Terminals are on four sides of a square or rectangular package or located in four parallel rows
R	Radial	Terminals extended radially from the periphery of a cylindrical or spherical package
S	Single	Terminals are on one surface of a square or rectangular package in a single row
T	Triple	Terminals are on three sides of a square or rectangular package
U	Upper	Terminals are perpendicular to and opposite the seating plane, and are on one surface of a package
X	Other	Terminal positions are other than those described
Z	Zig-zag	Terminals are on one surface of a square or rectangular package arranged in a staggered configuration

[a] These descriptions assume the seating plane in the bottom of the package.

[b] Reference to package shape does not take into account flanges, notches or other irregularities.

Table 3 – Prefixes for predominant package-body material

Code	Material
C	Ceramic, metal-sealed co-fired
G	Ceramic, glass-sealed
L	Glass
M	Metal
P	Plastic (including epoxy)
S	Silicon
T	Tape
X	Other

Table 4 – Prefixes for package-specific features

Order	Functional classification	Code	Package-specific feature
1	Outline addition	H	Integral heat slug
		D	Transparent window
		P	Piggyback or Terminal for stack
2	Seating height	None	Standard profile (1,70 mm < none)
		L	Low profile (1,20 mm < L ≤ 1,70 mm)
		T	Thin profile (1,00 mm < T ≤ 1,20 mm)
		V	Very thin profile (0,80 mm < V ≤ 1,00 mm)
		W	Very, very thin profile (0,65 mm < W ≤ 0,80 mm)
		U	Ultra thin profile (0,50 mm < U ≤ 0,65 mm)
		X	Extremely thin profile (X ≤ 0,50 mm)
3	Terminal pitch and position	S	Shrink pitch (< basic pitch) (restricted to DIP, SIP, SOP families)
			SDIP (1,778 mm pitch)
			SZIP (1,778 mm and 1,27 mm pitch)
			SSOP (1,0 mm, 0,8 mm, 0,65 mm, 0,5 mm and 0,4 mm pitch)
		F	Fine pitch (QFP at ≤ 0,50 mm pitch and ≤ 0,80 mm pitch for BGA and LGA)
		I	Interstitial pitch (staggered leads)

$$\boxed{X} \leq 0,50 \text{ mm} < \boxed{U} \leq 0,65 \text{ mm} < \boxed{W} \leq 0,80 \text{ mm} < \boxed{V} \leq 1,00 \text{ mm}$$

$$< \boxed{T} \leq 1,20 \text{ mm} < \boxed{L} \leq 1,70 \text{ mm} < \boxed{\text{No code}}$$

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Figure 2 – Relationship of codes to profile

4.3.6.2   Lead-form suffix

The lead-form suffix is a one-letter suffix that identifies the standard form or shape of the lead. Table 5 gives a list of one-letter, lead-form suffix codes.

If more than one type of terminal is present, the terminals carrying the principal current determine the lead-form code. If one of these terminals is a mounting stud or flange, its shape