



## Designation: **F375–89 (Reapproved 2015) F375 – 20**

# Standard Specification for Integrated Circuit Lead Frame Material<sup>1</sup>

This standard is issued under the fixed designation F375; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers the special requirements for metal strip to be used to fabricate integrated-circuit lead frames by stamping or photochemical milling.

1.2 The metals that are applicable to these parts include copper and copper alloys, ferrous alloys usually containing nickel or cobalt or chromium, nickel and nickel alloys, and other metallic materials.

1.3 The general chemical, physical, and mechanical property requirements of these materials are covered by other ASTM specifications (specifically Specifications **B103/B103M**, **B122/B122M**, **B152/B152M**, **B162**, **B465**, **F15**, **F30**, **F31**, **F49** and **F68**), and these should be consulted for properties and tempers that are different for the different metals. For metals for which no ASTM specification is available, other specifications should be adopted by agreement of the parties concerned.

1.4 The values stated in ~~inch-pound~~SI units are to be regarded as standard. The values given in parentheses ~~are mathematical conversions to~~ after SI units that are provided for information only and are not considered standard.

*1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

**B103/B103M** Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar

**B122/B122M** Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar

**B152/B152M** Specification for Copper Sheet, Strip, Plate, and Rolled Bar

**B162** Specification for Nickel Plate, Sheet, and Strip

**B465** Specification for Copper-Iron Alloy Plate, Sheet, Strip, and Rolled Bar

**E112** Test Methods for Determining Average Grain Size

**F15** Specification for Iron-Nickel-Cobalt Sealing Alloy

**F30** Specification for Iron-Nickel Sealing Alloys

**F31** Specification for Nickel-Chromium-Iron Sealing Alloys

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **F01** on Electronics and is the direct responsibility of Subcommittee **F01.03** on Metallic Materials, Wire Bonding, and Flip Chip.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

**F49 Specification for Molybdenum Strip for Electron Tubes—(Withdrawn 1978) (Withdrawn 1977)<sup>3</sup>**  
**F68 Specification for Oxygen-Free Copper in Wrought Forms for Electron Devices**

### 3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Quantity of each size,

3.1.2 Material and specification number appropriate to the material (see 2.1),

3.1.3 Temper or mechanical properties (see 4.1),

3.1.4 Dimensions: thickness, width, length if applicable (see 6.2 – 6.4),

3.1.5 How furnished: coils and coil size or lengths (see 10.1),

3.1.6 ASTM designation, referencing this specification number, and the fabricating process to be used,

3.1.7 Certification or test report requirements (see 11.1), and

3.1.8 Packing and marking requirements (see 12.1 and 12.2).

### 4. Materials and Manufacture

4.1 The materials covered by this specification shall conform to the chemical, physical, and mechanical property requirements prescribed in the material specification covering the metal or alloy and the temper (see 2.1).

4.2 The material shall conform to the requirements for lead frames as prescribed in this specification and shall be characteristically suitable for fabrication into lead frames by the fabricating process to be specified. Any special requirements relating to the material properties or the fabricating process, to be specified by the user, shall be agreed upon between the supplier and purchaser.

### 5. Chemical Composition

5.1 The material shall conform to the requirements as to chemical composition specified for flat products in the ASTM specification for the metal or alloy specified, unless otherwise agreed upon between supplier and purchaser.

### 6. Dimensions and Tolerances

6.1 *General*—For the purposes of determining conformance with the dimensional requirements prescribed in this specification, any measured value outside the specified limiting values for any dimension shall be cause for rejection.

6.2 *Thickness*—The thickness tolerances shall be those shown in **Table 1**.

6.3 *Width*—The width of material for thicknesses ranging from 0.100 to 0.765 mm (0.004 to 0.030 in.) shall conform to tolerances shown in **Table 2**.

6.4 *Length*—The length tolerances shall be those shown in the appropriate table for flat products in the ASTM specification covering the metal or alloy.

6.5 *Straightness*—The maximum edgewise curvature (camber) in any 96 in. (2.44 m)–2.5 m (98.4 in.) length shall be that shown in **Table 3**.

6.5.1 *Test Method*—Cut a length greater than 96 in. (2.44 m)–2.5 m (98.4 in.), representative of the material, and lay it on a flat

<sup>3</sup> The last approved version of this historical standard is referenced [in on www.astm.org](http://www.astm.org).

**TABLE 1 Thickness Tolerances**

Thickness, in.-(mm)	Thickness tolerance, ±, in.-(mm) for widths up to 24 in.-(610 mm); incl
0.0040 (0.102) to 0.0060 (0.152), incl	0.0003 (0.007)
Over 0.0060 (0.152) to 0.0090 (0.229), incl	0.0004 (0.010)
Over 0.0090 (0.229) to 0.0130 (0.330), incl	0.0006 (0.015)
Over 0.0130 (0.330) to 0.0170 (0.432), incl	0.0008 (0.020)
Over 0.0170 (0.432) to 0.0210 (0.533), incl	0.0009 (0.022)
Over 0.0210 (0.533) to 0.0300 (0.762), incl	0.0010 (0.025)

**TABLE 1 Thickness Tolerances**

Thickness, mm (in.)	Thickness tolerance, ±, mm (in.) for widths up to 610 mm (24 in.); incl
0.100 (0.004) to 0.150 (0.006), incl	0.007 (0.0003)
0.150 (0.006) to 0.230 (0.009), incl	0.010 (0.0004)
0.230 (0.009) to 0.330 (0.013), incl	0.015 (0.0006)
0.330 (0.013) to 0.430 (0.017), incl	0.020 (0.0008)
0.430 (0.017) to 0.530 (0.021), incl	0.022 (0.0009)
0.530 (0.021) to 0.765 (0.030), incl	0.025 (0.001)

**TABLE 2 Width Tolerances**

Width, in.-(mm)	Width tolerances, ±, in.-(mm) for thickness in the range 0.004 in.-(0.10 mm) to 0.030 in.-(0.76 mm); incl
2.000 (50.80) and under	0.003 (0.07)
Over 2.000 (50.80) to 6.000 (152.40), incl	0.005 (0.12)
Over 6.000 (152.40) to 12.000 (304.80), incl	0.010 (0.25)
Over 12.000 (304.80) to 24.000 (609.60), incl	0.016 (0.40)

**TABLE 2 Width Tolerances**

Width, mm (in.)	Width tolerance, ±, mm (in.)
50 (2.0) and under	0.07 (0.003)
Over 50 (2.0) to 150 (5.9), incl	0.12 (0.005)
Over 150 (5.9) to 300 (11.8), incl	0.25 (0.010)
Over 300 (11.8) to 610 (24.0), incl	0.40 (0.016)

**TABLE 3 Straightness (Camber) Tolerances**

Specified Width, in.-(mm)	Tolerance Per Unit Length of Any 96 in.-(2.44 m) Length, in.-(mm)
Up to 1½ (38.1), incl	1/8 (12.7)
Over 1½ (38.1)	1/4 (6.3)

**TABLE 3 Straightness (Camber) Tolerances**

Specified Width, mm (in.)	Maximum camber mm (in.) in 2.5 m (98.4 in.)
Up to 38 (1.5), incl	12.0 (0.472)
Over 38 (1.5)	6.0 (0.236)

surface. Place an 8-ft-a 2.5 m (98.4 in.) long straightedge against the concave edge of the strip. Measure the maximum distance of the straightedge from the edge of the material (curvature—the curvature is usually uniform and the point of maximum departure will usually be equidistant from the ends of the straightedge).

6.6 *Flatness*—Depending upon the method of manufacture of lead frames, flatness may be a major determinant of suitability for the intended fabricating process.

6.6.1 For flatness for photochemically milled lead frames, strip shall be free of waves, buckles, undulations, and ripples to the extent that special flattening operations may be required, and agreement of flatness requirements should be negotiated between purchaser and supplier, but in any case the maximum percent out-of-flatness shall be not over 5 % as defined in paragraph 6.1.1.3 of the Dimensions and Tolerances Section of Specification F49.