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Standard Specification for Format, Physical Properties, and Test Methods for 19 and 35 mm Testable Tape Carrier for Perimeter Tape Carrier-Bonded Semiconductor Devices[1]

This standard is issued under the fixed designation F 637; 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 (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Editorial changes were made throughout in September 1994.

INTRODUCTION

It is the purpose of this specification to facilitate interchangeability of carrier tape produced by various manufacturers. Standardization is also intended to promote efficient utilization of equipment used to test devices on tape and assemble them to hybrid circuits. A complete description of a particular carrier tape requires specification of a considerable number of parameters not covered by this standard. This standard specification includes only elements of format design for which substantial consensus with respect to technically and economically sound commercial practice has been achieved.

1. Scope

1.1 This specification covers standard formats for testable semiconductor lead carrier tape suitable for hybrid applications.

1.2 This standard specifies tape width, configuration, and location of guide perforations ("sprocket holes"), location of lead pattern frames on tape, lead pattern window size, and placement of outer lead bond and electrical test pad areas in the lead pattern.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following hazard caveat pertains only to the test method portion, Section 7 of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions:*

2.1.1 *lead pattern window*—in tape carrier bonding, the area in each frame in which plastic backing of plastic/metal composite tape is totally or partially removed to expose appropriate areas of bare conducting leads for attachment to a microelectronic device on the inner end and a mounting substrate on the outer end.

2.1.2 *outer lead bond area*—in tape carrier bonding, that area on each lead which will be connected to a mounting substrate.

2.1.3 *tape format*—in tape carrier bonding, the layout design elements of carrier tape, including the topographical arrangement of lead pattern elements and test contacts in each frame, description of the placement of frames upon the tape, and the specification of tape width and the placement of mechanical handling aids, such as guide perforations.

2.1.4 *testable tape carrier*—in microelectronic fabrication, a continuous length of plastic/metal composite film, superficially resembling motion picture film, which carries at each frame position a repetitive pattern of electrically conducting leads and test contacts.

2.1.4.1 Discussion—The lead arrangement is designed so as to electrically interconnect points on a microelectronic device with contacts on the mounting substrate of the device. The test contacts permit static or dynamic evaluation, or both, of each microelectronic device prior to assembly to a mounting substrate.

2.1.5 *test pads*—in tape carrier bonding, conducting areas in each tape frame position that can be contacted electrically by probes in order to test devices attached to the tape.

3. Classification

3.1 A wide variety of formats are covered under this standard. Tape format style is classified according to the following code:

" Style A–B–C–D–E–F–G–H–I–J"

where:

[1] This specification is under the jurisdiction of ASTM Committee F-1 on Electronics and is the direct responsibility of Subcommittee F01.16 on Tape Automated Bonding.

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A = nominal tape width in millimeters (see Table 1),
B = pattern pitch expressed as an integral multiple of the standard sprocket pitch of 0.1870 inch (for example, 4 = 4 sprocket pitch = 0.7480 inch) (see Table 1),
C = side dimension of square lead pattern window in millimeters (see Table 1),
D = base film material: K = Polyimide M = Polyester,
E = base film thickness expressed in mils (for example, 5 = 0.005 in.),
F = copper type: ED = Electrodeposited AR = As-Rolled,
G = copper thickness expressed in ounces (for example, 1 = 1 oz = 0.0014 in.),
H = lead configuration: P = Planar B = Bumped,
I = lead finish: CU = Copper (no finish) SN = Tin AU = Gold
J = pattern style: S = all leads electrically connected to a common conductor for plating, static grounding, etc. O = all leads electrically isolated.

NOTE 1—Example of a tape format style classification, as follows:
"Style 35–4–7–K–5–ED–1–P–SN–O"
This tape format style identifies a 1.4-in. (35-mm) wide tape carrier with patterns on a 4-sprocket pitch, having a 0.28 by 0.28-in. 7 by 7-mm lead pattern window, fabricated on a polyimide film, 0.005 in.-thick (127-μm) with electrodeposited copper, 1-oz thick (0.0014 in.), (35.6μ m) having planar leads tin-plated with all leads electrically isolated.

4. Ordering Information

4.1 The purchase order or contract shall specify the tape format style classification (see 2.1).

4.2 Additional details of tape design and manufacture not covered by this specification shall be as agreed between the purchaser and the supplier as part of the purchase contract.

5. Dimensions

5.1 Figs. 1-3, and Table 1 specify standard tape widths, frame placement on tape, guide perforation, outer lead bond pad, lead pattern window size, and test pad format options.

6. Sampling

6.1 Unless otherwise agreed to between the purchaser and the supplier, conformance with Section 5 shall be determined by sampling and testing specimens from each lot.

6.1.1 A lot shall consist of all material processed in one essentially continuous production operation, and delivered in one shipment from one supplier against one order description.

6.1.2 *Sampling Plan*:

6.1.2.1 The sampling plan shall be agreed upon between the purchaser and the supplier.

6.1.2.2 Samples chosen shall be representative of the lot.

7. Test Methods

7.1 *Dimensional Tolerances*:

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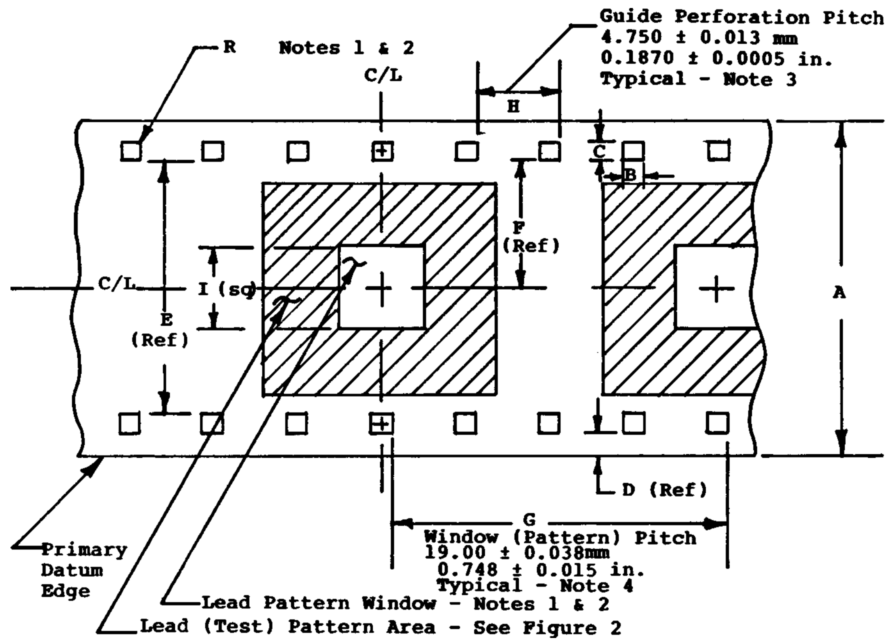
TABLE 1 Dimensions for 19 and 35-mm Tape Format (see Fig. 1 and Fig. 2)

NOTE 1—For smaller die or fewer leads, Dimension I may be reduced in increments of 1.000 mm (0.0394 in.). The selection of an appropriate I for any specific die requires consideration of parameters not covered by this Standard such as die size, number and location of leads, assembly equipment and processes, minimum spacing between windows for film strength, etc.

	Dimension	19mm Tape		35mm Tape	
		in.	mm	in.	mm
A	Tape width	0.748 ±0.003	19.00 ±0.075	1.377 ±0.003	34.975 ±0.075
B	Perforation length	0.0560 ±0.001	1.422 ±0.025	0.078 ±0.001	1.98 ±0.025
C	Perforation width	0.0560 ±0.001	1.422 ±0.025	0.1100 ±0.001	2.794 ±0.025
D	Tape edge to perforation edge from primary datum edge	0.034 ±0.002	0.86 ±0.05	0.079 ±0.002	2.01 ±0.05
E	Width between perforation edges	0.568 ±0.001	14.427 ±0.025	0.999 ±0.001	25.375 ±0.025
F	Perforation edge to window C/L	0.284 ±0.001	7.21 ±0.025	0.4995 ±0.001	12.69 ±0.025
G	Window pitch (typical)	0.748 ±0.015	19.000 ±0.038	0.748 ±0.015	19.000 ±0.038
H	Guide perforation pitch	0.1870 ±0.0005	4.750 ±0.013	0.1870 ±0.0005	4.750 ±0.013
	100 perforations	18.70 ±0.030	475.0 ±0.762	18.70 ±0.030	475.0 ±0.762
I	Lead pattern window maximum dimension (see Note)	0.394 ±0.002	10.0 ±0.05	0.472 ±0.002	12.0 ±0.05
R	Maximum radius	0.010	0.25	0.021	0.53
Po	Maximum test pad pattern outline (square)	0.498	12.65	0.890	22.50
Ts	Test pad spacing (noncumulative)	0.025	0.64	0.050	1.27
Tw	Test pad width	0.020 ±0.002	0.51 ±0.05	0.040 ±0.002	1.02 ±0.05
Td	Test pad depth (min)	0.018	0.46	0.038	0.97
Os	Outer lead bond C/L spacing (noncumulative)	0.020	0.51	0.020	0.51
Ow	Outer lead bond width (nominal)	0.010	0.25	0.010	0.025
OL	Minimum outer lead bond length:	0.015	0.38	0.015	0.58
	Flat leads	0.045	1.15	0.045	1.15
	Formed leads				
IL	Minimum straight extension of inner lead from edge of silicon die	0.005	0.13	0.005	0.13



NOTE 1—Mislocation of any portion of leads within lead pattern window to transverse C/L of specified guide perforations shall not exceed 0.005 in. true position.

NOTE 2—Mislocation of nominal polymer opening C/L for lead pattern window to C/L of specified guide perforations and tape shall not exceed 0.003 in. true position.

NOTE 3—Tolerance does not include cumulative errors or splices. Error across splices shall not exceed 0.003 in.

NOTE 4—Window (pattern) pitch shall be an integral multiple of the guide perforation pitch and will dictate maximum lead pattern window and maximum test pattern area. Typical frame pitch is 0.7480 ± 0.0015 in., or 19.0000 ± 0.038 mm.

NOTE 5—See Table 1 for dimensions.

FIG. 1 19 and 35-mm Tape Format

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7.1.1 Equipment used for these tests shall include an *Optical Comparator, Microscope*, or equivalent piece of apparatus capable of reading to 0.0001 in. (2.54 µm) with a repeatability of 0.0001 in.

7.1.2 Tape tolerances and dimensions shall be in conformance with Table 1.

7.2 *Peel Strength*:

7.2.1 *Apparatus*—Similar to Interconnection Packaging Circuitry IPC/TM-650, Method 2.4.9:

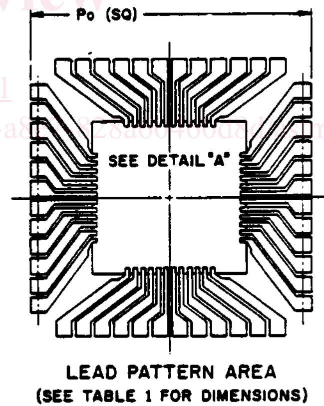
7.2.1.1 *Testing Machine*, power driven, crosshead autographic type, or an equivalent constant speed drive machine,

7.2.1.2 *Bath* suitable for etching copper foils,

7.2.1.3 *Free Wheeling Rotary Drum* (German wheel), 6-i n. (15.2-cm) diameter, and

7.2.1.4 *Solder Pot* capable of maintaining 288 ± 5°C.

7.2.2 *Procedure*—As received samples, prepare four samples 0.125 by 9 in. (3.18 by 229 mm) (0.0625 by 5 in. (1.59 by 127 mm) may be used only if there are space limitations that do not permit use of the 0.125 in. size) using standard commercial practices. Samples to be tested must be etched. Condition samples for 12 h at 23 ± 2°C and 50 % RH (±3 %). Attach specimen to the test fixture with double sided tape, cement, or mechanical clamps. Peel the *conductor from the film* at a crosshead speed of 2 in./min (8.5 mm/s). Peel load shall fall within 15 to 85 % of the range scale used on the test machine. Load shall be continuously recorded and the entire length of the peeled conductor bond value shall be averaged. A minimum of 3 in. (76 mm) or 50 % of the minimum length



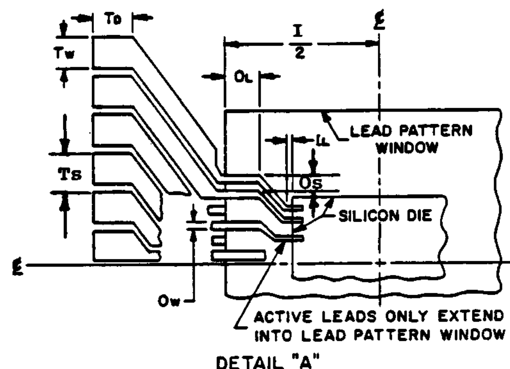


FIG. 2 19 and 35-mm Tape Format (Detail)