



IPC-8401

Guidelines for In-Mold Electronics

Developed by the In-Mold Electronics Interconnection
Task Group (D-83A) of the 3D Plastronics Committee (D-80) of IPC

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Table of Contents

1.0	Scope	1
1.1	Purpose	1
1.2	Classification	1
1.3	Measurement Units	1
1.4	Definition of Requirements	1
1.5	Clause References	1
1.5.1	Appendices	1
1.6	Abbreviations and Acronyms	1
1.7	Terms and Definitions	2
1.7.1	Conductive Adhesive	2
1.7.2	Crossover	2
1.7.3	Curing	2
1.7.4	Curing, Light	2
1.7.5	Curing, Thermal	2
1.7.6	Decorative Film	2
1.7.7	Dielectric	2
1.7.8	Dielectric Ink	2
1.7.9	Dispensing	2
1.7.10	Electrically Conductive Ink	2
1.7.11	Elongation Ink or Film Elongation	2
1.7.12	Film	2
1.7.13	Flexible Printed Circuit (FPC)	2
1.7.14	Functional Film	2
1.7.15	Functional Ink	2
1.7.16	Graphic Ink	2
1.7.17	Injection Molding Resin	2
1.7.18	In-Mold Electronics (IME)	2
1.7.19	Injection Molding	2
1.7.20	Ink	2
1.7.21	Light Emitting Diode (LED)	3
1.7.22	Resistivity, Electrical	3
1.7.23	Screen Printing	3
1.7.24	Structural Adhesive	3
1.7.25	Substrate	3
1.7.26	Surface Mount Component	3
1.7.27	Surface Mounting, Surface Mount Technology, SMT	3
1.7.28	Thermoplastic Polymer	3
1.7.29	Thermoforming (high pressure)	3
1.7.30	Thermoforming (vacuum forming)	3

2.0	Applicable Documents	4
2.1	IPC	4
2.2	Joint Industry Standards	4
2.3	ASTM	4
3.0	Introduction to IME Technology	5
4.0	Manufacturing Process	6
4.1	Printing	7
4.2	Surface Mounting (SMT)	8
4.3	Thermoforming	9
4.4	Injection Molding	10
5.0	IME Part Structure	11
6.0	Candidate Materials	14
6.1	Substrates	15
6.2	Functional Inks	16
6.2.1	Functional Inks – Graphic Inks	16
6.2.2	Functional Inks – Electrically Conductive Inks	16
6.2.2.1	Electrically Conductive Inks – High Elongation Inks	17
6.2.2.2	Electrically Conductive Inks – General Purpose Inks	17
6.2.2.3	Electrically Conductive Inks – High Conductive Inks	17
6.2.3	Functional Inks – Dielectric Inks	18
6.2.3.1	Dielectric Inks – Crossover Dielectric Inks	18
6.2.3.2	Dielectric Inks – Protective Dielectric Inks	18
6.3	Surface Mounting Components	19
6.4	Surface Mounting Adhesives	21
6.5	Injection Molding Resin	23
7.0	IME Production Test Methods	24
7.1	Testing After Printing	25
7.2	Testing After SMT	25
7.3	Testing After Thermoforming	25
7.4	Testing After Injection Molding	25
	APPENDIX A – Abbreviations and Acronyms	26

Figures

Figure 4-1	IME Manufacturing Process.....	6
Figure 4-2	Printing: Two-dimensional Functional IME Film with Printed Decorative and Functional Ink Layers.....	7
Figure 4-3	SMT: Two-dimensional functional IME film with surface mounted component.....	8
Figure 4-4	Thermoforming: 3D Functional IME Film with Printed Inks, Components and FPC.....	9
Figure 4-5	Injection Molding: Two film IME Part with Encapsulated Electronics.....	10
Figure 5-1	One-film IME Structure.....	11
Figure 5-2	Two-film IME Structure.....	12
Figure 5-3	Multi-shot IME Structure.....	13
Figure 6-1	An Optimal LED Component Package for IME: Terminals on Opposite Sides of the Component.....	20
Figure 6-2	Component Surface Mounting in IME is made with Electrically Conductive and Structural Adhesives.	21

Tables

Table 6-1	Typical IME Substrate Materials and their General Properties.....	15
Table 6-2	Typical IME Injection Molding Materials and their General Properties.....	23
Table 7-1	Testing Focus at Different Manufacturing Processes.....	24
Table A-1	Abbreviation and Acronyms.....	26

1.0 Scope

In-Mold Electronics (hereafter referred to as IME) integrates printed electronics and electrical components, such as LEDs, into injection molded plastics creating a three-dimensional smart molded structure. IME technology uses mass production processes, materials and components. IME parts are structural electronics characterized by their lightweight, thinness, robustness and seamless integration.

The demand for advanced technologies that can enhance the functionality of surfaces across industries such as automotive, aerospace, and white goods is steadily increasing. These functional surfaces offer novel user inputs and changes in the environment with illumination in compact assembly spaces and with high reliability. This document gives a general description of IME – a mass production technology enabling smart surfaces.

1.1 Purpose The purpose of this document is to increase general understanding of IME technology. Information on manufacturing processes, structures, candidate materials and production test methods is included for designers, suppliers, manufacturers and end-users. This document is not intended to be a complete design guideline for IME.

1.2 Classification This standard recognizes that In-Mold Electronic assemblies are subject to classifications by intended end-item use. Three general end-product classes have been established to reflect differences in manufacturability, complexity, functional performance requirements, and verification (inspection/test) frequency.

CLASS 1 General Electronic Products

Includes products suitable for applications where the major requirement is function of the completed assembly.

CLASS 2 Dedicated Service Electronic Products

Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

CLASS 3 High Performance/Harsh Environment Electronic Products

Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment must function when required, such as life support or other critical systems.

1.3 Measurement Units This Standard uses International System of Units (SI) units per ASTM SI10, IEEE/ASTM SI 10, Section 3 [Imperial English equivalent units are in brackets for convenience]. The SI units used in this Standard are millimeters (mm) [in] for dimensions and dimensional tolerances, Celsius (°C) [°F] for temperature and temperature tolerances, grams (g) [oz] for weight and lumens (lm) [footcandles] for illuminance.

Note: This Standard uses other SI prefixes (ASTM SI10, Section 3.2) to eliminate leading zeroes (for example, 0.0012 mm becomes 1.2 µm) or as alternative to powers-of-ten (3.6 x 10³ mm becomes 3.6 m).

1.4 Definition of Requirements This document is intended to be used as a guide and there are no specific requirements or criteria unless separately and specifically called out in a contractual agreement or other documentation. The word “should” reflects recommendations and is used to reflect general industry practices and procedures for guidance only.

Line drawings and illustrations are depicted herein to assist in the interpretation of the written requirements of this Standard. Illustrations are not in scale. The text takes precedence over the figures.

1.5 Clause References When a clause in this document is referenced its subordinate clauses apply, unless the requirement references specific subordinate clauses.

1.5.1 Appendices Appendices to this standard are not binding requirements unless separately and specifically required by this standard, the applicable contracts, assembly drawing(s), documentation or purchase orders.

1.6 Abbreviations and Acronyms Periodic table elements are abbreviated in the standard. See Appendix A for full spellings of abbreviations (including elements) and acronyms used in this standard.