

1.0 PURPOSE:

The purpose of this document is to define the requirements for procurement of thickfilm substrates printed by an outside source and used for hybrid device fabrication at M.S. Kennedy Corporation.

2.0 APPLICATION:

This procedure shall apply to all thickfilm substrates as follows:

2.1 Condition A - Elements to be used in "fully" compliant hybrid products as defined in MIL-PRF-38534 (Class H, G, D, E). Purchase order shall not delete any of the requirements of this specification. Thickfilm substrate evaluation shall be performed by the substrate manufacturer prior to shipment of the lot.

2.2 Condition B - Elements intended to be used in full compliance with MIL-PRF-38534 (Class H, G, D, E or K) but element evaluation will be the responsibility of M.S. Kennedy.

2.3 Condition C - Elements to be used on customer source control drawings or MSK standard product which do not impose MIL-PRF-38534.

2.4 Condition D - Elements to be used in "fully" compliant hybrid products as defined in MIL-PRF-38534 Class K. Purchase order shall not delete any of the requirements of this specification. Thickfilm substrate evaluation shall be performed by the substrate manufacturer prior to shipment of the lot.

2.5 Conflicting Requirements:

In the event of conflict between requirements of this specification and other requirements, the following shall apply in order of precedence:

- a. Purchase order
- b. Detail specification control drawing
- c. This specification
- d. Other documents referenced

3.0 REFERENCE DOCUMENTS:

3.1 MIL-PRF-38534

3.2 Applicable MSK thickfilm substrate drawing.

3.3 MSK purchase order.

4.0 DEFINITIONS:

4.1 Element - A constituent of the hybrid microcircuit that contributes directly to its operation.

4.2 Substrate Inspection Lot - Substrate inspection lot will consist of homogeneous substrates having the same number of layers, manufactured using the same facilities, processes, materials and vacuum deposited, plated or printed as one lot.

4.3 Element Evaluation - As applicable to this specification and shall consist of substrate evaluation per MIL-PRF-38534 for Class H or K (as applicable).

DO NOT SCALE DRAWING	APPROVALS		FSCM NO.	MSK	M.S. KENNEDY CORPORATION LIVERPOOL, NEW YORK 13088	DOCUMENT CONTROL STAMP	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLE ± - ± - ± - ± -	DRAFTER	DATE	5 1 6 5 1	TITLE PROCUREMENT SPECIFICATION FOR THICKFILM SUBSTRATES			
	DRAFTING CHECK	DATE					
	ENGINEERING CHECK	DATE					
	QUALITY ASSURANCE	DATE					
MATERIAL N/A				MSK DWG. NO. 1026-8309	REV. B	SHEET 2 OF 6	DEPARTMENT / COPY NO.
FINISH N/A							

4.4 Environmentally controlled area:

- 4.4.1 Class E per ISO 14644-1, -2 (Class 100,000 per MIL-STD-209) or equivalent.
- 4.4.2 Temperature -25°c +3, -5°c
- 4.4.3 Pressure - A minimum true pressure of 0.03 in. of water between the controlled area and any area not controlled with all entryways closed.
- 4.4.4 Humidity - RH 30 to 65%.

5.0 REQUIREMENTS:

5.1 General:

- 5.1.1 The vendor must have a quality system that meets or exceeds the requirements of MIL-I-45208, ISO9001 or AS9100 (or equivalent) and a calibration system that meets MIL-STD 45662/ANSI/NCSL Z540-1, ISO10012-1/ISO10012-2 or equivalent.
- 5.1.2 The vendor shall notify M.S. Kennedy in writing of any Class I (major) change of product or process as defined in MIL-STD-480 and/or MIL-PRF-38534 configuration control. All changes must be approved by MS Kennedy in writing prior to implementation.
- 5.1.3 All material and processes used by vendor will be suitable for polymeric adhesive, soldering or eutectic die mounting where specified. As applicable to the substrate design, pad metallization shall be suitable for thermosonic, ultrasonic and/or thermo compression bonding of gold or aluminum wire and shall be capable of withstanding a pull test as specified per MIL-STD-883 Method 2011.
- 5.1.4 All material and processes used by vendor will be suitable for thickfilm substrate fabrication. Materials shall be specified by MS Kennedy. The basic thickfilm substrate fabrication process shall be in accordance with substrate fabrication flow chart drawing 2422-1563 latest revision. Any deviation to this process shall be documented and approved by MS Kennedy in writing prior to beginning the substrate fabrication.
- 5.1.5 All electrical test and visual inspection shall be done at the element level with rejects identified and removed from the lot.
- 5.1.6 Certificate of Compliance shall be signed by a responsible vendor official and shall be enclosed with each shipment with the following minimum information.
 - a. Device type
 - b. Supplier's name and address
 - c. Manufacturer's name (if applicable)
 - d. Device quantity
 - e. Purchase order number
 - f. Applicable MSK drawing number and revision level
 - g. Lot Number
- 5.1.7 M.S. Kennedy, MSK's customer or Regulatory Agency reserves the right to review any vendor program, process and data to assure conformance to the requirements of this specification, the purchase order and the applicable MSK Thickfilm Substrate Drawing.

DO NOT SCALE DRAWING	APPROVALS		FSCM NO.	MSK	M.S. KENNEDY CORPORATION LIVERPOOL, NEW YORK 13088		DOCUMENT CONTROL STAMP
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLE ± - ± - ± -	DRAFTER	DATE	5		TITLE		
	DRAFTING CHECK	DATE	1	PROCUREMENT SPECIFICATION			
	ENGINEERING CHECK	DATE	6	FOR			
MATERIAL N/A			5	THICKFILM SUBSTRATES			
FINISH N/A	QUALITY ASSURANCE	DATE	1	MSK DWG. NO. 1026-8309	REV. B	SHEET 3 OF 6	DEPARTMENT / COPY NO.

5.1.8 The manufacturer shall have evidence of a working operator training and certification program. This program shall also include a written description of each process available to the operator.

5.1.9 The manufacturer shall flow down any applicable requirements to the sub-tier supplier.

6.0 PROCEDURE:

6.1 Condition A:

6.1.1 The vendor shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032.

6.1.2 The vendor must perform 100% visual to an in-house control document in an environmentally controlled area and ensure compliance to all visual, electrical and mechanical specifications. The vendor shall perform 100% electrical testing (resistor measurement as applicable) at 25°C to ensure compliance to the manufacturer's electrical characteristics and/or MSK Thickfilm Substrate Drawing.

6.1.3 Element evaluation shall be performed by the vendor for each substrate inspection lot 100% in accordance with MIL-PRF-38534 for Class H devices to ensure compliance with the electrical characteristics and/or applicable MSK Thickfilm Substrate Drawing.

Documentation and test samples will be provided with each lot.

6.1.4 Delivery Conditions:

6.1.4.1 The vendor is responsible for ensuring that elements are packaged properly so as to avoid damage during shipment. Thickfilm substrates shall have protection between each substrate top side surface.

6.1.4.2 The type of element, name of manufacturer, quantity and lot number are to be clearly marked on each container.

6.1.4.3 A certificate of compliance, as defined herein shall be signed by the responsible vendor official, shall be enclosed with each shipment.

6.1.4.4 Required Documentation - Evidence of the vendor's inspection performance shall be maintained at the vendor's facility. The evidence maintained should include the following:

- a. Name of operation, specification number and revision of each process or test.
- b. Part number and manufacturer internal lot identification number (s).
- c. Date(s) of test and operator identification.
- d. Calibration control number and calibration due date of all major equipment components used for test.
- e. Quantity tested and rejected for each process or test and actual quantity tested if sampled.
- f. Specific major conditions of test that are verifiable by operator including times, temperatures and inspection magnification.
- g. For electrical test, test program number and revision levels (as applicable).

DO NOT SCALE DRAWING	APPROVALS		FSCM NO.	MSK	M.S. KENNEDY CORPORATION LIVERPOOL, NEW YORK 13088	DOCUMENT CONTROL STAMP	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLE ± - ± - ± -	DRAFTER	DATE	5	TITLE PROCUREMENT SPECIFICATION FOR THICKFILM SUBSTRATES			
	DRAFTING CHECK	DATE					
MATERIAL N/A	ENGINEERING CHECK	DATE	6	MSK DWG. NO. 1026-8309			DEPARTMENT / COPY NO.
FINISH N/A	QUALITY ASSURANCE	DATE	5				
			1				

6.2 Condition B:

- 6.2.1 The vendor shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032.
- 6.2.2 The vendor shall perform visual inspection to an in-house sample plan in an environmentally controlled area and ensure compliance to all visual and mechanical specifications.
- 6.2.3 The vendor shall perform electrical test at 25°C to an in-house sample plan to ensure compliance to the manufacturer's electrical characteristics and/or MSK Thickfilm Substrate Drawing.
- 6.2.4 Substrates shall be capable of passing substrate evaluation in accordance with MIL-PRF-38534.
- 6.2.5 Delivery conditions shall be in accordance with paragraph 6.1.4.

6.3 Condition C:

- 6.3.1 The vendor shall guarantee performance of the elements to conform to the electrical, mechanical and visual specifications in the applicable MSK Thickfilm Substrate Drawing.
- 6.3.2 Delivery conditions shall be in accordance with paragraph 6.1.4.

6.4 Condition D:

- 6.4.1 The vendor shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032.
- 6.4.2 For MIL-PRF-38534, the vendor must perform 100% visual to an in-house control document in an environmentally controlled area and ensure compliance to all visual, electrical and mechanical specifications. The vendor shall perform 100% electrical testing (resistor measurement as applicable) at 25°C to ensure compliance to the manufacturer's electrical characteristics and/or MSK Thickfilm Substrate Drawing.
- 6.4.3 Element evaluation shall be performed by the vendor for each substrate inspection lot 100% in accordance with MIL-PRF-38534 for Class K devices to ensure compliance with the manufacturer's electrical characteristics and/or applicable MSK Thickfilm Substrate Drawing.

Documentation and test samples will be provided with each lot.


6.4.4 Delivery Conditions:

- 6.4.4.1 Delivery conditions shall be in accordance with paragraph 6.1.4.

7.0 QUALITY ASSURANCE PROVISIONS:

- 7.1 M.S. Kennedy reserves the right to perform testing in accordance with paragraph 2.0 and any failure of the material to meet the requirements of this document shall be cause for rejection of the shipment.
- 7.2 M.S. Kennedy reserves the right to review any vendor program, process and data to assure conformance to the requirements of this specification, the purchase order and the applicable MSK Thickfilm Substrate Drawing.

NOTE: WHERE PROPRIETARY YIELD DATA WOULD BE REVEALED DURING 100 PERCENT INSPECTIONS, THE USE OF ONLY A "QUANTITY ACCEPTED" COLUMN OF THE TRAVELER SHALL BE ACCEPTABLE.

DO NOT SCALE DRAWING	APPROVALS		FSCM NO.		M.S. KENNEDY CORPORATION LIVERPOOL, NEW YORK 13088	DOCUMENT CONTROL STAMP	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLE ± - ± - ± - ± -	DRAFTER	DATE	5 1 6 5 1	TITLE PROCUREMENT SPECIFICATION FOR THICKFILM SUBSTRATES			
	DRAFTING CHECK	DATE					
	ENGINEERING CHECK	DATE					
	QUALITY ASSURANCE	DATE					
MATERIAL N/A				MSK DWG. NO. 1026-8309	REV. B	SHEET 5 OF 6	DEPARTMENT / COPY NO.
FINISH N/A							

8.0 ACCEPT/REJECT CRITERIA:

- 8.1 Accept all lots which pass the applicable paragraphs of this procedure and the MSK thickfilm substrate drawing.
- 8.2 Reject any device(s) and separate it from the lot which fails an electrical parameter or visual/mechanical criteria.
- 8.3 Reject any lot which does not pass element evaluation.

9.0 REFERENCE DOCUMENTS:

- 9.1 MIL-STD-883 Test Methods 2032
- 9.2 Applicable MSK thickfilm substrate drawing.
- 9.3 M.S. Kennedy purchase order
- 9.4 DOD-STD-480 military standard, configuration control engineering changes, deviations and waivers
- 9.5 MIL-I-45208, ISO 9001 OR AS9100
- 9.6 MIL-PRF-38534
- 9.7 MSK Substrate Fabrication Flow Chart, Dwg. 2422-1563 latest revision.
- 9.8 MIL-STD-45662, ANSI/NCSL Z540-1 or ISO10012-1/ISO10012-2 or equivalent calibration system.
- 9.9 ISO 14644-1, -2 or equivalent

DO NOT SCALE DRAWING	APPROVALS		FSCM NO.	MSK	M.S. KENNEDY CORPORATION LIVERPOOL, NEW YORK 13088	DOCUMENT CONTROL STAMP	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLE ± - ± - ± -	DRAFTER	DATE	5 1 6 5 1	TITLE PROCUREMENT SPECIFICATION FOR THICKFILM SUBSTRATES			
	DRAFTING CHECK	DATE					
MATERIAL N/A	ENGINEERING CHECK	DATE					
FINISH N/A	QUALITY ASSURANCE	DATE					
				MSK DWG. NO. 1026-8309	REV. B	SHEET 6 OF 6	DEPARTMENT / COPY NO.