



Dear Supplier,

The following appendices come from the latest version of 782-01013,  
Process for RoHS Compliant PCBA Design/Documentation procedure.

Thank you,

KMC Systems, Inc.

## Engineering – 782-01013: Process for RoHS Compliant PCBA Design/ Documentation, Rev H

### APPENDIX A STANDARD PCB FAB NOTES

#### Notes to Guidelines

The purpose of the following guidelines is to document and communicate the KMC standard notes for Printed Circuit Board (PCB) Fabs. It is applicable to KMC Designed Printed Circuit Boards and contains the standard notes.

It is the responsibility of the designer to call out the standard notes for Printed Circuit Board Fabs on the Fabrication Drawing, i.e. to reference this document (Appendix A). In the event the designer has an exception to one or multiple notes in Appendix A, the exception(s) shall be added to the Fabrication Drawing, noting the respective item, (Requirements and Acceptance, Marking, First Article Inspection Report, etc.) to which the exception pertains.

1. GENERAL:

- A. ALL TERMS AND DEFINITIONS SHALL BE IN ACCORDANCE WITH IPC-T-50 AND IPC-6011 (SERIES)
- B. THE LATEST REVISION OF ALL CITED STANDARDS, FORMS AND SPECIFICATIONS SHALL BE USED
- C. EXCEPTIONS TO STANDARD NOTES SHALL BE AS NOTED ON PRINT OR AS LISTED HEREIN BY KMC
- D. PRIMARY CONTACT FOR KMC – ELBIT SYSTEMS OF AMERICA IS THE BUYER / PLANNER

2. ITEMS ENCLOSED WITH OBLONG SYMBOL DENOTE CRITICAL PARAMETERS:

3. REQUIREMENTS AND ACCEPTANCE (PCB FABRICATION AND WORKMANSHIP):

- A. FABRICATE FROM KMC SUPPLIED ELECTRONIC FILES, SUPPLIED BY BUYER / PLANNER
- B. PRINT SHOWS PCB AS VIEWED FROM COMPONENT (TOP, LAYER 1) SIDE
- C. FABRICATE PCB IN ACCORDANCE WITH IPC-6012 CLASS 2; AS PER IPC -6011
- D. EXCEPTIONS TO IPC-6012 SHALL BE AS NOTED ON PRINT OR LISTED HEREIN
- E. PRIOR TO PCB FABRICATION, COMPARE GERBER DATA TO THE SUPPLIED IPC-D-356 NETLIST. REPORT ALL DISCREPANCIES TO KMC BUYER / PLANNER FOR CORRECTION BEFORE FABRICATION
- F. **THE PCB FABRICATED BARE BOARD PART NUMBER AND REVISION ARE IN ETCH ON THE BOTTOM SIDE OF THE BOARD. SUPPLIER SHALL CONFIRM THAT THE REVISION OF THE PCB BARE BOARD MATCHES THE REVISION OF THE FABRICATION DRAWING AND SHALL NOTIFY KMC BUYER / PLANNER IN WRITING FOR CORRECTION BEFORE PROCEEDING WITH THE FABRICATION IF THE REVISION DOESN'T MATCH**
- G. INSPECTION OF PRINTED CIRCUIT BOARD WORKMANSHIP TO COMPLY WITH
  - 1. ACCEPTABILITY OF PRINTED CIRCUIT BOARDS, IPC-A-600 CLASS 2

4. ITEM SUBSTITUTIONS OR PROCESS CHANGES:

- A. ALL ITEM OR PROCESS CHANGES SHALL BE **REQUESTED** VIA KMC "SUPPLIER MATERIAL REVIEW REQUEST" (SMRR), FORM 990-185, PRIOR TO IMPLEMENTATION

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### 5. MARKINGS:

- A. MANUFACTURER'S IDENTIFICATION, UL FLAMMABILITY RATING (SEE ITEM 10) AND DATE CODE SHALL BE RENDERED IN ETCH ON THE FAB IN AN AREA THAT IS FREE OF COMPONENTS AND MARKINGS
- B. ESD SYMBOL FOR SENSITIVITY/SUSCEPTIBILITY SHALL BE SILKSCREENED ON TOP SIDE OF PCB

### 6. ENVIRONMENTAL COMPLIANCE:

- A. ALL MATERIALS, FINISHES, AND PROCESSES MUST MEET CURRENT RESTRICTIONS ON HAZARDOUS SUBSTANCES IN COMPLIANCE WITH KMC FORM 990-200 "KMC SUPPLIER ENVIRONMENTAL COMPLIANCE REQUIREMENTS"

### 7. FIRST ARTICLE INSPECTION REPORT:

- A. SUPPLIER SHALL PROVIDE FIRST ARTICLE INSPECTION REPORT WITH THE FIRST LOT, AND FOR SUBSEQUENT REVISIONS A FIRST ARTICLE INSPECTION REPORT IS REQUIRED ON FEATURES THAT HAVE CHANGED

### 8. TESTING CRITERIA:

- A. ALL BOARDS SHALL BE 100% ELECTRICALLY NET LIST TESTED USING SUPPLIED IPC-D-356 NETLIST. THE SUPPLIER SHALL PROVIDE A TEST REPORT AND EACH BOARD SHALL BE STAMPED TO IDENTIFY THAT THE BOARD HAS PASSED TESTING
- B. CROSS-SECTION SAMPLES AND AN EVALUATION REPORT REQUIRED FOR EACH DATE CODE, SMALLEST HOLE SIZE SHALL BE INCLUDED IN THE COUPON FOR CROSS-SECTION
- C. IONIC CONTAMINATION TEST RESULTS TO BE PROVIDED FOR EACH DATE CODE(S) INDICATING LEVEL OF CONTAMINATION IN  $\mu\text{G}/\text{SQ. INCH}$  SHALL BE PROVIDED WITH SHIPMENT
- D. A SOLDERABILITY TEST SHALL BE CONDUCTED ON A SAMPLE PER ANSI/J-STD-003, TEST METHOD C, AND PROVIDED PER DATE CODE. ACCEPT/ REJECT CRITERIA FOR SOLDERABILITY TEST SHALL BE PER ANSI/J-STD-003 CLASS II, IPC A-600. A CERTIFICATE OF COMPLIANCE SHALL BE PROVIDED WITH SHIPMENT

### 9. PACKAGING FOR SHIPMENT:

- A. VACUUM SEALED IS REQUIRED
- B. STANDARD OR "SILVER SAVER" SLIP SHEET PAPER IS REQUIRED TO SEPARATE INDIVIDUAL PCBs
- C. MOISTURE INDICATOR/HUMIDITY INDICATOR CARD AND DESICCANT PACKS ARE REQUIRED. RH SHALL BE LESS THAN 30% ON DELIVERY
- D. INDIVIDUAL PCB OR BULK PACKAGING IS ACCEPTABLE

### 10. MATERIAL:

- A. PCB CONSTRUCTION SHALL MEET A FLAMMABILITY RATING OF UL 94V-0 PER UL796 AND SHALL BE MARKED AS 94V-0 (SEE ITEM 5)
- B. FINAL PCB THICKNESS SHALL BE AS SHOWN IN LAYER DETAIL. ALL LAYER THICKNESSES AND COPPER WEIGHTS SHALL BE PER THE STACK UP
- C. LAMINATE AND PRE-PREG MATERIAL SHALL BE IN ACCORDANCE WITH IPC-4101 /97, /98, /99, /101, /126 AND SHALL CONFORM TO THE FOLLOWING:
  - 1. VENTEC VT-47 OR EQUIVALENT

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2. LAMINATE MINIMUM REQUIREMENTS: TG  $\geq$  170°C TD  $\geq$  340°C
  3. COEFFICIENT OF THERMAL EXPANSION (CTE) SHALL BE 3.5 TOTAL MAXIMUM. PER IPC-TM-650 2.4.24
  - D. PLATE THROUGH-HOLES PER IPC-6012, AND AS SPECIFIED IN HOLE CHART/LEGEND
  - E. MINIMUM ANNULAR RING PER IPC-6012 AND AS SPECIFIED
11. FINISH:
    - A. ALL EXPOSED CONDUCTIVE PATTERN AREAS SHALL BE PLATED WITH ELECTROLESS NICKEL IMMERSION GOLD (ENIG) PER IPC-4552
    - B. APPLY LIQUID PHOTO IMAGEABLE SOLDER MASK (COLOR GREEN) PER IPC-SM-840, CLASS H, SEMI-GLOSS FINISH, OVER BARE COPPER TO BOTH EXTERNAL LAYERS OF BOARD
    - C. SILKSCREEN SHALL BE WHITE, PERMANENT, ORGANIC, NON-CONDUCTIVE INK PER IPC-4781. THERE SHALL BE NO SILKSCREEN ON ANY COMPONENT LANDS
  12. THIEVING OF OUTER LAYERS IS ACCEPTABLE AS LONG AS THE COPPER IS KEPT A MINIMUM OF 0.200 INCHES (5.08 MM) FROM ANY DESIGN FEATURE
  13. SUPPLIER MAY REMOVE ALL NON-FUNCTIONAL PADS FROM INTERNAL SIGNAL LAYERS. SUPPLIER MAY ADD TEARDROP TO INTERNAL SIGNAL LAYER AT FUNCTIONAL PAD JUNCTION. **IT IS THE RESPONSIBILITY OF THE SUPPLIER TO MAINTAIN ACCURACY OF ANY AND ALL CHANGES**
  14. PANALIZATION DRAWING SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO FABRICATION, UNLESS OTHERWISE SPECIFIED
  15. QUALITY ASSURANCE DOCUMENTATION
    - A. ALL PRODUCT SHIPMENTS SHALL REQUIRE A FULL Q.A. DOCUMENTATION PACKAGE FOR EACH SHIPMENT. THE Q.A. DOCUMENTATION PACKAGE SHALL INCLUDE:
      1. CERTIFICATE OF CONFORMANCE REFERENCING THE P.O. NUMBER, PART NUMBER, REVISION, DATE CODE AND QUANTITIES COMPRISING THE SHIPMENT
      2. ELECTRICAL TEST REPORT CERTIFICATION: CERTIFICATION SHALL INCLUDE THE TYPE OF TESTING CONDUCTED, AND RESULTS
      3. FIRST ARTICLE INSPECTION DATA PER NOTE 7
      4. A CERTIFICATE OF COMPLIANCE, KMC FORM 990-200 (KMC SUPPLIER ENVIRONMENTAL COMPLIANCE REQUIREMENTS) PER NOTE 6
      5. A CROSS SECTION REPORT WITH MEASUREMENTS FOR EACH LAYER RECORDED IN ONE TEN THOUSANDTHS OF AN INCH (.XXXX), SURFACE CONDUCTOR AND PLATED THRU HOLE COPPER THICKNESS, EXTERNAL AND INTERNAL ANNULAR RING THICKNESS, SOLDER THICKNESS, AND SOLDER MASK THICKNESS
      6. A CROSS SECTION PLUG AND THE BOARD OR COUPON THAT IT WAS TAKEN FROM
      7. IONIC CONTAMINATION TEST RESULTS INDICATING THE LEVEL OF CONTAMINATION IN  $\mu\text{G}/\text{SQ. INCH}$
      8. THE DOCUMENTATION SHALL BE CONTAINED IN AN ENVELOPE AND SHIPPED WITH THE PRODUCT. THE ENVELOPE SHALL BE LABELED OR MARKED “**QUALITY ASSURANCE DOCUMENTATION ENCLOSED**” OR EQUIVALENT

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### APPENDIX B STANDARD PCB ASSEMBLY NOTES

#### Notes to Guidelines

The purpose of the following guidelines is to document and communicate the KMC standard notes for Printed Circuit Board Assemblies (PCBA). It is applicable to KMC Designed Printed Circuit Board Assemblies and contains the standard assembly notes.

It is the responsibility of the designer to call out the standard notes for Printed Circuit Board Assemblies on the PCB Assembly Drawing, i.e. to reference this document (Appendix B). In the event the designer has an exception to one or multiple notes in Appendix B, the exception(s) shall be added to the Assembly Drawing noting the respective item, (Requirements and Acceptance, Labeling, First Article Inspection Report, etc.) to which the exception pertains.

1. GENERAL:
  - A. ALL TERMS AND DEFINITIONS SHALL BE IN ACCORDANCE WITH IPC-T-50 AND IPC-A-610
  - B. THE LATEST REVISION OF ALL CITED STANDARDS, FORMS AND SPECIFICATIONS SHALL BE USED
  - C. EXCEPTIONS TO STANDARD NOTES SHALL BE AS NOTED ON PRINT OR AS LISTED HEREIN
  - D. PRIMARY CONTACT FOR KMC – ELBIT SYSTEMS OF AMERICA IS THE BUYER / PLANNER
2. ITEMS ENCLOSED WITH OBLONG SYMBOL DENOTE CRITICAL PARAMETERS:
3. **REQUIREMENTS AND ACCEPTANCE:**
  - A. ALL PCBA'S SHALL BE INSPECTED 100% AS A COMPLETE ASSEMBLY
  - B. INSPECTION OF PRINTED CIRCUIT BOARD ASSEMBLIES TO COMPLY WITH
    1. ACCEPTABILITY OF PRINTED CIRCUIT BOARD ASSEMBLIES, IPC-A-610 CLASS 2
  - C. AT THE SUCCESSFUL COMPLETION OF THE INSPECTION PROCESS THE SUPPLIER SHALL MARK OR STAMP THE PCBA'S WITH AN INSPECTION MARK. IF THE ASSEMBLY IS DOUBLE SIDED AN INSPECTION MARK SHALL BE MADE ON BOTH SIDES OF THE PCBA
4. ITEM SUBSTITUTIONS OR PROCESS CHANGES:
  - A. ALL ITEM OR PROCESS CHANGES SHALL BE **REQUESTED** VIA KMC "SUPPLIER MATERIAL REVIEW REQUEST" (SMRR), FORM 990-185, PRIOR TO IMPLEMENTATION

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### 5. LABELING:

#### A. THE SUPPLIER SHALL LABEL EACH PCBA WITH SEPARATE LABELS FOR:

1. PART NUMBER AND REVISION
2. SERIAL NUMBER
3. COUNTRY OF ORIGIN

#### B. CONTENT OF LABEL SHALL BE AS FOLLOWS

- |   |  |  |
|---|--|--|
| <ol style="list-style-type: none"> <li>1. Label, Serial Number <ol style="list-style-type: none"> <li>a) 2D Data Matrix Barcode with human readable font</li> <li>b) ZZZ = Manufacture Identification</li> <li>c) YY = Last two digits of year</li> <li>d) WW = Week of year</li> <li>e) XXXX= Sequential serial number (resets 9999)</li> <li>f) ZZYYWWXXXX</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>2. Label, Part Number / Revision <ol style="list-style-type: none"> <li>a) 2D Data Matrix Barcode with human readable font</li> <li>b) Part number and revision per assembly drawing</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>3. Label, Country of Origin <ol style="list-style-type: none"> <li>a) 2D Data Matrix Barcode with human readable font per ISO 3166 Country Codes</li> </ol> </li> </ol> |
|---|--|--|

Part Number  
Revision:

Country of Origin:  
XX



#### C. MATERIALS: POLYIMIDE (S-454) OR EQUIVALENT

### 6. ENVIRONMENTAL COMPLIANCE:

- #### A. ALL MATERIALS, FINISHES, AND PROCESSES MUST MEET CURRENT RESTRICTIONS ON HAZARDOUS SUBSTANCES IN COMPLIANCE WITH KMC FORM 990-200 (KMC SUPPLIER ENVIRONMENTAL COMPLIANCE REQUIREMENTS)

### 7. SOLDER AND SOLDER QUALITY:

- #### A. SOLDER AND SOLDER QUALITY REQUIREMENTS **SHALL BE** IN ACCORDANCE WITH "REQUIREMENTS FOR SOLDERED ELECTRICAL AND ELECTRONIC ASSEMBLIES", IPC J-STD-001 CLASS 2

### 8. FIRST ARTICLE INSPECTION REPORT:

- #### A. SUPPLIER SHALL PROVIDE FIRST ARTICLE INSPECTION REPORT WITH THE FIRST LOT, AND FOR SUBSEQUENT REVISIONS A FIRST ARTICLE INSPECTION REPORT IS REQUIRED ON FEATURES THAT HAVE CHANGED

### 9. ESD HANDLING:

- #### A. EOS / ESD: HANDLING AND MANUFACTURING PROCESSES SHALL BE IN COMPLIANCE WITH ANSI/ESD S20.20

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### 10. TESTING MARKING:

- A. ALL PCBA'S THAT ARE AUTOMATED TEST EQUIPMENT (ATE) TESTED AND PASS SHALL BE INDIVIDUALLY MARKED OR STAMPED
- B. ALL PCBA'S THAT ARE FUNCTIONALLY TESTED AND PASS SHALL BE INDIVIDUALLY MARKED OR STAMPED

### 11. PACKAGING FOR SHIPMENT:

- A. PCB ASSEMBLY SHALL BE INDIVIDUALLY PACKAGED IN A STATIC PROTECTIVE PACKAGING FOR SHIPMENT COMPLIANT TO ANSI/ESD S541

### 12. REWORK, MODIFICATION AND REPAIR

- A. ALL REWORK, MODIFICATION AND REPAIR OF THE PRINTED CIRCUIT ASSEMBLIES SHALL BE PERFORMED IN ACCORDANCE WITH IPC-7711/7721 "REWORK, MODIFICATION AND REPAIR OF ELECTRONIC ASSEMBLIES"

### 13. QUALITY ASSURANCE DOCUMENTATION

- A. ALL PRODUCT SHIPMENTS SHALL REQUIRE A FULL Q.A. DOCUMENTATION PACKAGE FOR EACH SHIPMENT. THE Q.A. DOCUMENTATION PACKAGE SHALL INCLUDE:
  - 1. CERTIFICATE OF CONFORMANCE REFERENCING THE P.O. NUMBER, PART NUMBER, REVISION, DATE CODE, AND QUANTITIES COMPRISING THE SHIPMENT
  - 2. ELECTRICAL TEST REPORT CERTIFICATION: CERTIFICATION SHALL INCLUDE THE TYPE OF TESTING CONDUCTED, AND RESULTS
  - 3. FIRST ARTICLE INSPECTION DATA PER NOTE 8
  - 4. A CERTIFICATE OF COMPLIANCE, KMC FORM 990-200 (KMC SUPPLIER ENVIRONMENTAL COMPLIANCE REQUIREMENTS) PER NOTE 6
  - 5. THE DOCUMENTATION SHALL BE CONTAINED IN AN ENVELOPE AND SHIPPED WITH THE PRODUCT. THE ENVELOPE SHALL BE LABELED OR MARKED "**QUALITY ASSURANCE DOCUMENTATION ENCLOSED**" OR EQUIVALENT

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