

File E479892
Project 4787091314

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REPORT

on

COMPONENT - WIRING, PRINTED

Shenzhen Jia Li Chuang Technology Development Co LTD
Shenzhen, China

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DESCRIPTION

PRODUCT COVERED:

USR - Single layer printed wiring boards. See Table IA for Type Designations.

CNR - Multilayer printed wiring boards. See Table IA for Type JLC-2 Designations.

TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

USR - United States Recognized.

CNR - Canadian Standards Recognized.

Use - The boards are for use only in electrical equipment where the acceptability of the combination has been determined by UL LLC.

Acceptability Conditions- The following are among the considerations to be made in judging the suitability of the boards in the end product.

1. Solder Limits - The temperature and dwell time specified in Table IA shall not be exceeded when the boards are subjected to a wave, flow, dip or an equivalent soldering operation for assembling the components. The maximum dwell time is the cumulative time for all soldering operations when the soldering is done in different steps. These temperature and dwell time limits do not apply to hand soldering.
2. Maximum Operating Temperature - The maximum operating temperature on the board in the end product shall not exceed the value specified in Table IA. The maximum operating temperature is not evaluated for Flame Only boards and shall be considered during the end product evaluation.
3. Voltage Rating - No voltage rating is assigned. The suitability of the base material as insulation between live-metal parts and dead-metal parts shall be determined in the end product. See Table IB for silver voltage limitations and Table II for base material identification.
4. Pattern Limits - Conductor pattern limits are specified in Table IA and IB. The edge conductor width and conductor width specified in Table IA are the minimum acceptable widths. The maximum area diameter is the maximum allowable area of the circle that will cover the largest unpierced section of the conductors. The minimum separation between silver conductors of different potential is specified in Table IB. Flame Only boards are not evaluated to determine the minimum acceptable conductor widths, maximum area conductor diameter, and/or the silver conductor limitations.

5. Direct Support of Current-Carrying Parts - Printed wiring boards evaluated to determine if the base material meets the UL 746E minimum levels for direct-support of current carrying parts are identified in Table II to enable the OEM to select appropriate printed wiring boards for use in products. Flame Only boards are not evaluated to determine direct support.
6. Comparative Tracking Index (CTI) - The CTI is expressed as that voltage, which causes tracking on a printed wiring board base material after 50 drops of 0.1 percent ammonium chloride solution has fallen. Results of testing the nominal 3 mm (1/8 in.) thickness are considered representative of the material's performance in any thickness. Boards shall be assigned a performance level category (PLC) for CTI based on the PLC assigned to the base material. Flame Only boards are not evaluated to determine CTI.

CTI Range Tracking Index (TI in Volts)	Assigned PLC
600 and greater	0
400 and up to 600	1
250 and up to 400	2
175 and up to 250	3
100 and up to 175	4
Less than 100	5

For CNR, the actual CTI values are indicated in Table II.

7. Mechanical Strength - The adequacy of the board for the support and replacement of components shall be evaluated in the end product.
8. Flammability - The flammability classification for the board is indicated in Table IA for **USR and CNR**. The classification is based on samples tested with and without nonmetallic permanent coatings (such as solder resist) to be applied by this manufacturer using the UL 94 **and CAN/CSA-C22.2 No. 0.17** test methods. Coatings shall not be employed unless so indicated in the specified process. If the board assembler or end product manufacturer applies any coating, the effect of the coating on the flammability of the board is to be determined in the end product. Marking ink and flux are not considered a permanent coating.

9. Silver Conductors - The minimum spacing between any two silver conductors of different potential must not be less than that indicated in Table IB. The silver conductors have been found suitable only for circuits that do not require a dielectric strength potential greater than that indicated between adjacent parts. The maximum voltage applied between any two silver conductors must not exceed that listed in Table IB. Reference to silver conductors infers silver conductors and silver plated conductors, for purposes of this report, unless otherwise indicated. Flame Only boards are not evaluated to determine if silver conductors are present on the board, and the effect of silver conductors on the board shall be considered during the end product evaluation.
10. Other Considerations - The following items shall be considered for insertion into the end-product report:
 - A. Minimum required spacing between conductors of different potential and between these conductors and dead-metal parts. Cupping, twisting, bowing and/or warping of the board has not been evaluated.
 - B. Minimum required dielectric/insulation thickness (distance through) between conductor layers has not been evaluated regarding dielectric strength requirements in the end product design.
 - C. Pattern Limits. The narrowest conductor width shall not be less than the indicated minimum width mid-board or edge conductor depending upon operating temperature and/or ampacity conditions, as indicated in the end product report. Flame Only boards, the minimum width conductors have not been established.
 - D. Thickness or weight of conductors.
 - E. Solder limits.
 - F. The overall board dimensions.
 - G. Identification marking.
 - H. For flammability classification, identification of coatings applied by the assembler, end product, or user.

GENERAL CHARACTERISTICS:

The printed wiring boards must meet the marking, pattern limits, and solder limits given by Engineering Considerations and Table IA and IB.

The overall thickness of the finished board must be equal to or greater than the size indicated in the "Minimum Thickness" column in Table II excluding surface conductors.

The printed wiring boards are fabricated from the base materials shown in Table II, having a solid copper sheet in the minimum thickness shown bonded to one or both sides of the external laminate, unless otherwise indicated. The maximum external board conductor thickness of 102 microns (4 mils) may be used unless otherwise indicated.

DIMENSIONS SHOWN IN TABLE II ARE MINIMUM ACCEPTABLE VALUES.

NOTE - There shall be no changes, additions or substitutions made by the manufacturer in his production, to the information shown in Table II, without prior written clearance from UL LLC.

Marking - See Section General.

TABLE IA - Parameter Profile Indices

Type	Pattern Limits			Solder Limits		Maximum Operating Temp. (°C)	UL 94 Flame Class
	Min. Width (mm)	Max. Area Diameter (mm)	Min. Edge Width (mm)	Max. Temp. (°C)	Max. Time (sec.)		
JLC-2	0.1	25.4	0.3	288	30	130	V-0

TABLE IB - Silver Conductor Limitations

Type	Silver Conductor Materials Present (YES) or (No)	Min. Spacing Between Adjacent Silver Conductors of Different Potential (mm)	Maximum Voltage Withstood Between Silver Conductors (V dc)
JLC-2	NO	Not Determined	Not Determined

Note: Reference to silver conductors infers silver conductors and silver plated conductors, for purposes of this report, unless otherwise indicated.

TABLE II - Base Materials

Type	Base Material &			Min. Thk. (mm)	Min. Copper Thk. (mic)	SS/ DS@	PWB Mfg. Proc ess	Meets UL 746E DSR	CTI (PLC/ V)
	UL/ ANSI Grade	Mfr +	Grade						
JLC-2	FR-4.0	KB	KB-6160A	0.38	17	DS	A	YES	3/175
	FR-4.0	NY	NPN-150FR, NPN-150FTL, NPN-170FR, NPN-170FTL, NP-140F	0.38	17	DS	A	YES	3/175
	FR-4.0	NY	NP-175FR, NP-175FTL, NP-155FR, NP-155FTL, NP-180FR, NP-180FTL, NP-175FMR, NP-175FMTL, NP-155FMR, NP-155FMTL, NP-175FBH, NP-155FBH	0.38	17	DS	A	YES	3/175

& - Recognized Component, (QMTS2)

@ - SS - Single Sided; DS - Double Sided or Single Sided

+ - KB: Kingboard(E123995); NY: Nan Ya(E98983)

MANUFACTURING PROCESS:

1. Machining, cleaning, rinsing, air-drying and similar operations may be performed by the manufacturer, but are not listed in the following process description(s).
2. If not listed below, temperatures exceeding 100°C (212°F) or the maximum operating temperature of the type, whichever is greater, shall not be used in the following process description(s).
3. Any of the steps in the following process description may be omitted from the manufacturing process at the manufacturer's option, unless the process step is noted as a MUST step.
4. There shall be no changes, additions or substitutions by the manufacturer to the manufacturing process, as listed in the following process description(s), without prior written clearance from UL LLC.
5. Critical steps (including, but not limited to, process steps with temperatures over 100°C or MOT, whichever is greater) can be performed by an outside facility indicated in the Section General, if footnoted in the following process descriptions(s). Documentation is to be provided by the original manufacturing location to the subcontractor (see Appendix D for the service/work (traveler) instructions). This documentation is to be returned with the finished boards only to the original manufacturer.
6. Non-critical steps (including, but not limited to, process steps with temperatures below 100°C or MOT) may be performed by any outside facility. Documentation is to be provided by the original manufacturing location to the subcontractor (see Appendix D for the service/work (traveler) instructions). This documentation is to be returned with the finished boards only to the original manufacturer.
7. For any process steps in the following process description(s) performed at an alternate manufacturing location (as described in the Authorization Page or Supplement), documentation is to be provided by the original manufacturing location to the alternate manufacturer (see Appendix D for the service/work (traveler) instructions). This documentation is to be returned to the original manufacturer.

PROCESS:

See next page.

PROCESS A

Step	Description
1.	May cut, apply etch resist, may dry at 170°C maximum for 240 minutes maximum.
2.	May drill and debur boards.
3.	May scrub boards.
4.	May electroless plate copper over through holes or entire board.
5.	May electroplate copper
6.	May print pattern by silk screening or laminate dry film at 120°C maximum for 1 minute maximum.
7.	May etch using any etchant except chromic/sulfuric.
8.	May strip plating resist.
9.	Nonflame and HB rated types may be coated with any solder resists. V rated types may be coated with the resists indicated in the following pages. Boards may then be dried at 170°C maximum for 240 minutes maximum.
10.	May apply marking ink, and cure at 180°C maximum for 6 minutes maximum.
11.	May apply solder using hot air solder level at 280°C maximum for 10 seconds maximum.
12.	May electroplate nickel and then gold on contact fingers or entire pattern.
13.	May perform punching or routing.
14.	May wash boards and dry at 100°C maximum for 3 minutes maximum.
15.	No other plating operations performed and no other temperatures over 100°C or the maximum operating temperature of the board, whichever is greater, are encountered.

Solder Resists

Types	Process	Solder Resists@
JLC-2	A	1

@ - Solder Resist (Recognized Component, QMJU2):

No.	Solder Resist		
	Manufacturer	Grade (Color)	File Number
1.	Guangzhou Kuangchun	KSM-S6189/KSM-19 (ALL)	E189612