

File E231499  
Project 4790540443

June 29, 2023

REPORT

on

COMPONENT - Wiring, Printed

Recognized Company: REAL TIME FOCUS TECHNOLOGY CORP

TAOYUAN TAIWAN

Copyright © 2023 UL LLC

UL LLC authorizes the above named company to reproduce this Report only for purposes as described in the Conclusion. The Report should be reproduced in its entirety; however to protect confidential product information, the Construction Details Descriptive pages may be excluded.

## MARKING:

The company identification, factory identification (if the board is produced at more than one location), and board type designation appear in permanent ink or are etched on each board.

A ▲ (delta) symbol will be marked on those products within a given-type designation that comply with direct support of current-carrying parts performance level requirements of UL 796 (see Table II).

For CNR type designations, the company's identification, the type designation and the Recognized Component Mark for Canada appear in permanent ink or are etched in each board.



## TRADEMARK DESIGNATION:

The following trademark or trade name, if any, may be used to identify products described in this Procedure in lieu of the Listee and/or Recognized Company name. The company identification is the Recognized Company's name or trademark.

RTF

\*

NCAB  
\_T1\_

TABLE II - BASE MATERIALS

Type	Base Material &								Total Build-Up Thk. (mm)	Conductor Thk.# (mic)	PWB Mfg. Proc.	Meets UL 746E DSR	CTI V (PLC)
	Individual Laminate Matl.				Individual Bonding Sheet Matl.								
	UL/ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)	UL/ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)					
M-1	FR-4.0	NY	NP-140R [NY2]	70	FR-4.0	NY	NP-140B [NY2]	38	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	NY	NP-170R, NP-170TL, NP-170SR, NP-170STL	50	FR-4.0	NY	NP-170B, NP-170SB	50	0.63	E:17 I:35	A	Yes	<b>100 (4)</b>
	FR-4.0	S	SM-730R, SM-730M,	70	FR-4.0	S	SM-730B	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-420	70	FR-4.0	HT	HTE-42B	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	IT	IT-140TC	70	FR-4.0	IT	IT-140BS	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.1	IT	IT-140GTC, IT-150GTC	100	FR-4.1	IT	IT-140GBS, IT-150GBS	50	0.63	E:17 I:35	A	Yes	<b>100 (4)</b>
	FR-4.0	IT	IT-180TC	50	FR-4.0	IT	IT-180BS	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	UP	UP-001, UP-TL, UP-001TC	100	FR-4.0	UP	UP-P, UP-001P, UP-001-PTC	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	IS	IS400 [I1]	50	FR-4.0	IS	IS400++ [I1]	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	IS	IS410, IS410BC, Ultra Ec 25	50	FR-4.0	IS	IS410++	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	PE	N4103-13-** [PE2]	50	FR-4.0	PE	N4203-13-** [PE2]	40	0.63	E:17 I:35	A1	Yes	<b>175 (3)</b>
	FR-4.0	IT	IT-180ATC	50	FR-4.0	IT	IT-180ABS	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>

See following pages for foot note

TABLE II - BASE MATERIALS

Type	Base Material &								Total Build-Up Thk. (mm)	Conductor Thk.# (mic)	PWB Mfg. Proc.	Meets UL 746E DSR	CTI V (PLC)
	Individual Laminate Matl.				Individual Bonding Sheet Matl.								
	UL/ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)	UL/ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)					
M-1	FR-4.0	NY	NP-155R, NP-155TL, NP-175R, NP-175TL	50	FR-4.0	NY	NP-155B, NP-175B	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	TU	TU-752, TU-768 F, TU-768, TU-788	50	FR-4.0	TU	TU-75P, TU-768P F, TU-768P, TU-788P	50	0.63	E:17 I:35	A	Yes	<b>75 (3)</b>
	FR-4.0	VT	VT-41, VT-42, VT-45, VT-42S	70	FR-4.0	VT	VT-41PP, VT-42PP, VT-45PP, VT-42S PP	50	0.63	E:17 I:35	A	Yes	<b>100 (4)</b>
	FR-4.0	HT	HTE-570, HTE-760	50	FR-4.0	HT	HTE-57B, HTE-76B	50	0.63	E:17 I:35	A	Yes	<b>100 (4)</b>
	FR-4.0	HT	HTE-590-2, HTE-770	50	FR-4.0	HT	HTE-59B-2, HTE-77B	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	UP	UP-170TL, UP-170	100	FR-4.0	UP	UP-170B	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	E	EM-310, EM-320, EM-320 (5)	50	FR-4.0	E	EM-32B, EM-32B (5)	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	E	EM-827, EM-827 (E)	50	FR-4.0	E	EM-827B, EM-827B (E)	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.1	VT	VT-441, VT-441TC, VT-447, VT-447TC	50	FR-4.1	VT	VT-441PP, VT-447PP	50	0.63	E:17 I:35	A	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-500, HTE-800	50	FR-4.0	HT	HTE-50B, HTE-80B	50	0.63	E:17 I:35	A	Yes	175 (3)

See following pages for foot note

TABLE II - BASE MATERIALS (CONT'D)

Type	Base Material &								Total Build-Up Thk. (mm)	Conductor Thk.# (mic)	PWB Mfg. Proc.	Meets UL 746E DSR	CTI V (PLC)
	Individual Laminate Matl.				Individual Bonding Sheet Matl.								
	UL/ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)	UL/ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)					
M-3	FR-4.0	IT	IT-140TC	70	FR-4.0	IT	IT-140BS	50	1.00	E:103~206 I:206	A	Yes	<b>175 (3)</b>
*	FR-4.0	UP	UP-001, UP-TL, UP-001TC	200	FR-4.0	UP	UP-P, UP-001P, UP-001-PTC	50	1.00	E:103~206 I:206	A	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-420	200	FR-4.0	HT	HTE-420B	50	1.00	E:103~206 I:206	A	Yes	<b>175 (3)</b>
	FR-4.0	S	SM-730R, SM-730M	200	FR-4.0	S	SM-770B	50	1.00	E:103~206 I:206	A	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-590-2, HTE-770	50	FR-4.0	HT	HTE-59B-2, HTE-77B	50	1.00	E:103~206 I:206	A	Yes	<b>175 (3)</b>
	FR-4.0	NY	NP-140R [NY2]	50	FR-4.0	NY	NP-140B [NY2]	38	1.00	E:103~206 I:206	A	Yes	<b>175 (3)</b>
M-5	FR-4.0	UP	UP-001, UP-TL, UP-001TC	200	FR-4.0	UP	UP-P, UP-001P, UP-001-PTC	50	0.63	E:103 I:103	A	Yes	<b>175 (3)</b>
*M6	FR-4.0	NY	NP-140R [NY2]	50	FR-4.0	NY	NP-140B [NY2]	38	0.32	E:17 I:34	A	Yes	<b>175 (3)</b>

See following pages for foot note

TABLE II - BASE MATERIALS (CONT'D)

Type	Base Material &								Total Build- Up Thk. (mm)	Con- ductor Thk.# (mic)	PWB Mfg. Proc.	Meets UL 746E DSR	CTI V (PLC)
	Individual Laminate Matl.				Individual Bonding Sheet Matl.								
	UL/ ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)	UL/ ANSI Grade	Mfr. +	Grade	Min. Thk. (mic)					
M-11	FR-4.0	NY	NP-175FTL [NY1]	50	FR-4.0	NY	NP-175FB [NY1]	50	0.63	E: 17 I: 35	A	Yes	175 (3)
M-12	FR-4.0	VT	VT-41 [V1]	50	FR-4.0	VT	VT-41PP [V1]	50	0.63	E: 17 I: 35	A	Yes	100 (4)
	FR-4.0	VT	VT-42 [V2]	50	FR-4.0	VT	VT-42PP [V2]	50	0.63	E: 17 I: 35	A	Yes	175 (3)
M15	FR-4.0	ZH	H1170	75	FR-4.0	ZH	H1170P	75	0.38	E: 12 I: 35	A	Yes	175 (3)
	FR-4.0	ZH	H150 (LF) , H150 (LF) Q	50	FR-4.0	ZH	H150P (LF) , H150P (LF) Q	50	0.38	E: 12 I: 35	A	Yes	100 (4)
M-HF	FR-4.1	ZH	H140HF [ZH1]	50	FR-4.1	ZH	H140HFPP [ZH1]	50	0.63	E: 12 I: 35	A	Yes	600 (0)
	FR-4.1	TU	TU-862 HF [TU1]	50	FR-4.1	TU	TU-86P HF [TU1]	50	0.38	E: 12 I: 35	A	Yes	175 (3)
	FR-4.1	E	EM-370 [E1]	55	FR-4.1	E	EM-37B [E1]	50	0.15	E: 12 I: 35	A	Yes	175 (3)
	FR-4.1	E	EM-370 (D)	55	FR-4.1	E	EM-37B (D)	50	0.15	E: 12 I: 35	A	Yes	175 (3)
	FR-4.1	HT	HTE-650 [HT1]	50	FR-4.1	HT	HTE-65B [HT1]	50	0.15	E: 12 I: 35	A	Yes	250 (2)
RF1	-	TU	TU-883 [TU2]	50	-	TU	TU-883P [TU2]	50	0.38	E: 12 I: 70	A	Yes	175 (3)
RF2	-	R	RO4350B™ [R1]	100	-	R	RO4450B™ [R1]	90	0.50	E: 12 I: 34	A	Yes	600 (0)
RF3	-	TU	TU-933 [TU3]	50	-	TU	TU-933P [TU3]	50	0.38	E: 12 I: 70	A	Yes	175 (3)
RF4	FR-4.0	IS	FR408HR	50	FR-4.0	IS	FR408HR++	50	0.38	E: 12 I: 70	A	Yes	250 (2)

See following pages for foot note

& - Recognized Component, (QMTS2)

+ - NY: Nan Ya (E98983); IT: Iteq (E178114); S: Shinemore (E199230); HT: Hong Tai (E188094); IS: Isola (E41625); UP: Uniplus (E166524); PE: Park Electrochemical (E36295); VT: Ventec (E214381); TU: Taiwan Union (E189572); E: ELITE (E150504); ZH: Zhejiang Huazheng (E136069); R: ROGERS (E102763).

# - I = Maximum internal thickness; E = Minimum external thickness.

- [I1] - Isola (E41625) IS400, PCL-FR-254, PCL-FR-370HR, Auto-HR, PCL-FR-370 Turbo, PCL-HP-850, PCL-FR-250HR, PCL-HP-870, 185HR/IS400++, PCL-FRP-254, PCL-FRP-370HR, PCL-FRP-370 Turbo, PCL-HPP-850, PCL-FRP-250HR, PCL-HPP-870, 185HR
- [NY1]- Nan Ya (E98983) NP-175FR, NP-175FTL, NP-155FR, NP-155FTL, NP-180FR, NP-180FTL, NP-175FMR, NP-175FMTL, NP-155FMR, NP-155FMTL/NP-175FB, NP-155FB, NP-180FB, NP-175FMB, NP-155FMB.
- [NY2]- Nan Ya (E98983) NP-140R, NP-140TL, NP-140MR, NP-140MTL/NP-140B, NP-140MB
- [PE2]- Park Electrochemical (E36295) N4103-13-\*\*, N4<sup>^^</sup>-13RF-\*\*, N4103-13EP\*\*/N4203-13-\*\*, N4203-13EP\*\*  
\*\* - May be followed by suffix "SI" denoting alternate glass type.
- [V1] - Ventec (E214381) VT-41, VT-41TC, VT-45, VT-45TC/VT-41PP, VT-45PP
- [V2] - Ventec (E214381) VT-42, VT-42TC, VT-42S/VT-42PP, VT-42S PP.
- [ZH1] - Zhejiang Huazheng (E136069) H140HF, H145HF, H150HF, H155HF, H160HF, H170HF, H175HF, H180HF, H185HF, H190HF, H200HF, H1600HF/ H140HFPP, H145HFPP, H150HFPP, H155HFPP, H160HFPP, H170HFPP, H175HF, H180HFPP, H185HFPP, H190HFPP, H200HFPP, H1600HFPP
- [TU1] - Taiwan Union (E189572) TU-862, TU-863, TU-862 HF, TU-862 LK, TU-862S, TU-742 HF, TU-742 MV, TU-747 HF, TU-747 LK, TU-747 HF (C), TU-865, TU-868, TU-815, TU-862T, TU-747T, TU-787 LK, TU-863+, TU-748, TU-788 LK/TU-86P, TU-863P, TU-86P HF, TU-86P LK, TU-862P S, TU-84P NF, TU-84P MF, TU-84P LF, TU-74P HF, TU-74P MV, TU-747P HF, TU-747P LK, TU-747P HF (C), TU-865P, TU-868P, TU-815P, TU-862P T, TU-747P T, TU-787P LK, TU-863P+, TU-748P, TU-788P LK
- [TU2] - Taiwan Union (E189572) TU-883, TU-883 Sp, TU-883A, TU-883A Sp, TU-883C, TU-883C Sp, TU-885, TU-901/TU-883P, TU-883P Sp, TU-883P A, TU-883P A Sp, TU-883P C, TU-883P C Sp, TU-885P, TU-901P
- [TU3] - Taiwan Union (E189572) TU-933, TU-933B, TU-933E, TU-933+, TU-933D, TU-933A, TU-943, TU-933V, TU-933 (P2), TU-943E, TU-943N, TU-943R, TU-933+ (R), TU-933+ (Z)/ TU-933P, TU-933P B, TU-933P E, TU-933P+, TU-933P D, TU-933P A, TU-943P, TU-933P V, TU-933P (P2), TU-943P E, TU-943P N, TU-943P R, TU-933P+ (R), TU-933P+ (Z)
- [E1] - ELITE (E150504) EM-370, EM-370 (Z), EM-370 (5)/ EM-37B, EM-37B (Z), EM-37B (L), EM-37B (5)
- [HT1] - Hong Tai (E188094) HTE-650, HTE-650-D, HTE-700/HTE-65B, HTE-65B-D, HTE-70B
- [R1] - ROGERS (E102763) RO4350B™, RO4350B2™, RO4350B3™, RO4350D™/RO4450B™, RO4450F™

## Solder Resists

Types	Process	Solder Resists <sup>e</sup>
M-1	A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 28
	A1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22
M-3	A	2, 3, 4, 5, 6, 7, 8, 9, 12, 14, 17, 18, 19, 21, 22
M-5	A	20, 21, 22
M6	A	18, 19, 21, 22
M-11	A	8, 14, 22
M-12	A	23, 24, 25
M15	A	15, 18, 22
M-HF	A	14, 26, 27
RF1	A	14, 28
RF2	A	14, 28
RF3	A	14, 28
RF4	A	14, 28



@ - Solder Resist Grades (Recognized Component, QMJU2):

No.	Solder Resists		
	Manufacturer	Grade	File Number
1.	Chung-Yu	ZSR-150/ZSH-3 (ALL)	E112960
2.	Taiyo	S-502AA/HD-B (GN)	E69262
3.	Taiyo	S-502AB/HD-A (GN)	E69262
4.	Tamura	DSR-2200K/CA-2200K (GN, BL)	E67710
5.	Tamura	DSR-2200KG/CA-2200KG (GN)	E67710
6.	Tamura	DSR-2200NK/CA-2200NK (BL, RD, GN, YL)	E67710
7.	Tamura	DSR-2200NC/CA-2200NC (CL, BL, YL)	E67710
8.	Tamura	DSR-2200TL/CA-2200TL (GN, BK, BL, RD, YL WT)	E67710
9.	Tamura	DSR-2200TS01/CA-2200TS01 (GN, BL, RD)	E67710
10.	Tamura	DSR-2200TS11/CA-2200TS06 (GN)	E67710
11.	Tamura	DSR-2200TS13/CA-2200TS01 (BK)	E67710
12.	Tamura	DSR-2200TS25/CA-2200TS01 (GN)	E67710
13.	Tamura	DSR-2200TS05/CA-2200TS05 (AL, OR)	E67710
14.	Onstatic	R-500/HD-5 (ALL)	E208670
15.	Taiyo	PSR-2000AV/CA-25AV (GN)	E69262
16.	Taiyo	PSR-2000AN/CA-25AA (GN, RD, BL, YL)	E69262
17.	Taiyo	PSR-4000CE/CA-40CE (GN)	E69262
18.	Advance	PSR-550B/LS-55B (ALL)	E210858
19.	Advance	SR-6000/CA-60 (ALL)	E210858
20.	Taiyo	PSR-4000MP/CA-40MP (GN)	E69262
21.	Taiyo	PSR-4000DE/CA-40DE (GN, BK, BL)	E69262
22.	Taiyo	PSR-2000BK/CA-25BK (GN)	E69262
23.	Taiyo	PSR-4000JB/CA-40JB (WT)	E69262
24.	Taiyo	PSR-4000JN/CA-40JN (WT)	E69262
25.	Taiyo	PSR-4000JD/CA-40JD (WT)	E69262
26.	Taiyo	PSR-2000BA/CA-25AX (GN)	E69262
27.	Taiyo	PSR-2000BJ/CA-25BJ (GN)	E69262
28.	Nan Ya	LP-4G/HP-25D (ALL)	E123174

TABLE II - Base Materials

Type	Base Material &								Total Build - Up Thk (mm)	Conductor Thickness		PWB Mfg Proc	Meets UL 746E DSR	CTI V (PLC)
	Individual Laminate Matl.				Individual Bonding Sheet Matl.					Min (mic)	Max (mic)			
	UL/ANSI Grade	Mfr +	Grade	Min Thk (mic)	UL/ANSI Grade	Mfr +	Grade	Min Thk (mic)						
M-33	FR-4.0	ZW	H1170 [ZW1]	75	FR-4.0	ZW	H1170P [ZW1]	75	1.00	E: 34 I: 206	A	Yes	175 (3)	
	FR-4.0	ZW	H150 (LF) [ZW2]	50	FR-4.0	ZW	H150P (LF) [ZW2]	50	1.00	E: 34 I: 206	A	Yes	175 (3)	
M-11	FR-4.0	NY	NP-175FTL [NY1]	50	FR-4.0	NY	NP-175FB [NY1]	50	0.63	E: 17 I: 35	A	Yes	175 (3)	
	FR-4.0	TUC	TU-662 [TU1]	50	FR-4.0	TUC	TU-662P [TU1]	50	0.63	E: 17 I: 35	A	Yes	175 (3)	

& -	Recognized Component, (QMTS2)
+ -	ZW: Zhejiang Wazam New Materials (E136069); NY: Nan Ya (E98983); TUC: Taiwan Union (E189572).
# -	I = Maximum internal thickness; E = Minimum external thickness
Acceptable Alternatives/Family:	
[ZW1]	Zhejiang Wazam New Materials (E136069) H1170/H1170P alternatives: H1170, H1170Q, H1170Z, H1170QA/H1170P, H1170PQ, H1170PZ, H1170PQA
[ZW2]	Zhejiang Wazam New Materials (E136069) H150 (LF)/H150P (LF) alternatives: H150 (LF), H150 (LF)Q, H150 (LF)Z/H150P (LF), H150P (LF)Q, H150P (LF)Z
[NY1]	NAN YA (E98983) NP-175FTL/NP-175FB alternatives: NP-175FR, NP-175FTL, NP-155FR, NP-155FTL, NP-180FR, NP-180FTL, NP-175FMR, NP-175FMTL, NP-155FMR, NP-155FMTL, NP-175FBH, NP-155FBH/NP-175FB, NP-155FB, NP-180FB, NP-175FMB, NP-155FMB, NP-175FBHB, NP-155FBHB
[TU1]	TAIWAN UNION (E189572) TU-662/TU-662P alternatives: TU-662, TU-662F, TU-668, TU-688/TU-66P, TU-66P F, TU-668P, TU-688P

SOLDER RESISTS

Types	Process	Solder Resists <sup>®</sup>
M-33	A	1, 2
M-11	A	1, 3, 4

@ - Solder Resist Grades (Recognized Component, QMJU2):

No.	Solder Resists		
	Manufacturer	Grade	File Number
1.	Onstatic	R-500/HD-5 (ALL)	E208670
2.	Taiyo	PSR-2000AV/CA-25AV (GN)	E69262
3.	<b>Taiyo</b>	<b>PSR-2000BK/CA-25BK (GN)</b>	<b>E69262</b>
4.	<b>Nan Ya</b>	<b>LP-4G/HP-25D (ALL)</b>	<b>E123174</b>
5.			
6.			
7.			
8.			
9.			
10.			

TABLE II - BASE MATERIALS

Type	Base Material &			Min. Thk. (mm)	Min. Copper Thk. (mics)	SS/ DS <sup>®</sup>	PWB Mfg. Process	Meets UL 746E DSR	CTI <b>V</b> (PLC)
	UL/ ANSI Grade	Mfr +	Grade						
D-1	CEM-1	NY	CEM-1-87, UV Block CEM-1-87	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	NY	FR-4-86, UV Block FR-4-86	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	JL	LS-4Y	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	UP	UP-L, UP-LTC	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	NY	NP-170R, NP-170TL, NP-170SR, NP-170STL	0.63	17	DS	B	Yes	<b>100 (4)</b>
	FR-4	S	SM-730R, SM-730M	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	IT	IT-140GTC, IT-150GTC	0.63	17	DS	B	Yes	<b>175 (3)</b>
	CEM-1	CC	CCP-508	0.63	17	DS	B	Yes	<b>600 (0)</b>
	FR-4	IS	IS400 [I1]	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	IS	IS410, IS410BC, Ultra Ec 25	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	PE	N4103-13-** [PE1]	0.63	17	DS	B1	Yes	<b>175 (3)</b>
	FR-4	IT	IT-180ATC	0.63	17	DS	B	Yes	<b>175 (3)</b>
	CEM-3	NY	UV Block CEM-3-92, CEM-3-92	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	NY	NP-155R, NP-155TL, NP-175R, NP-175TL	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4	TU	TU-752, TU-768 F, TU-768, TU-788	0.63	17	DS	B	Yes	<b>175 (3)</b>

See page 5B for footnotes.

TABLE II - BASE MATERIALS (CONT'D)

Type	Base Material &			Min. Thk. (mm)	Min. Copper Thk. (mics)	SS/ DS <sup>e</sup>	PWB Mfg. Process	Meets UL 746E DSR	CTI <b>V</b> (PLC)
	UL/ ANSI Grade	Mfr +	Grade						
D-1	FR-4.0	VT	VT-45, VT-42S, VT-41, VT-42, VT-41RD, VT-42RD, VT-45RD	0.63	17	DS	B	Yes	<b>100 (4)</b>
	FR-4.0	ZH	H140A	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-570, HTE-760	0.63	17	DS	B	Yes	<b>100 (4)</b>
	FR-4.0	HT	HTE-590-2, HTE-770	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	UP	UP-170TL, UP-170	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	E	EM-310, EM-320, EM-320 (5)	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	E	EM-827, EM-827 (E)	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	IT	IT-180TC	0.63	17	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-500, HTE-800	0.63	17	DS	B	Yes	<b>175 (3)</b>
D-3	FR-4.0	IT	IT-140TC	1.00	103~206	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	UP	UP-L, UP-LTC	1.00	103~206	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-420	1.00	103~206	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	S	SM-730R, SM-730M	1.00	103~206	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	HT	HTE-590-2, HTE-770	1.00	103~206	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	ZH	H140A	1.00	103~206	DS	B	Yes	<b>175 (3)</b>
	FR-4.0	NY	NP-140R [NY2]	1.00	103~206	DS	B	Yes	<b>175 (3)</b>

\*

See page 5B for footnotes.

TABLE II - BASE MATERIALS (CONT'D)

Type	Base Material &			Min. Thk. (mm)	Min. Copper Thk. (mics)	SS/ DS <sup>e</sup>	PWB Mfg. Process	Meets UL 746E DSR	CTI V (PLC)
	UL/ ANSI Grade	Mfr +	Grade						
D6	FR-4.0	NY	NP-140R [NY2]	0.08	E:17	DS	B	-	175 (3)
D-11	FR-4.0	NY	NP-175FTL [NY1]	0.63	E:17	DS	B	Yes	175 (3)
D-12	FR-4.0	VT	VT-41 [V1]	0.63	E:17	DS	B	Yes	100 (4)
	FR-4.0	VT	VT-42 [V2]	0.63	E:17	DS	B	Yes	175 (3)
D15	FR-4.0	ZH	H1170	0.38	12	DS	B	Yes	175 (3)
	FR-4.0	ZH	H150 (LF) , H150 (LF) Q	0.38	12	DS	B	Yes	100 (4)
D-HF	FR-4.1	ZH	H140HF [ZH1]	0.63	12	DS	B	Yes	600 (0)
	FR-4.1	TU	TU-862 HF [TU1]	0.38	12	DS	B	Yes	175 (3)
	FR-4.1	E	EM-370 [E1]	0.15	12	DS	B	Yes	175 (3)
	FR-4.1	E	EM-370 (D)	0.15	12	DS	B	Yes	175 (3)
	FR-4.1	HT	HTE-650 [HT1]	0.15	12	DS	B	Yes	250 (2)

See page 5B for footnotes.

& - Recognized Component, (QMTS2)  
 @ - SS - Single Sided; DS - Double Sided or Single Sided  
 + - NY: Nan Ya (E98983); JL: Jiangsu Lianxin (E176891);  
 CC: Chang Chun (E108591); UP: Uniplus (E166524); IT: Iteq (E178114);  
 S: Shinemore (E199230); PE: Park Electrochemical (E36295); TU: Taiwan  
 Union (E189572); VT: Ventec (E214381); ZH: Zhejiang Huazheng New Material  
 CO LTD (E136069); HT: Hong Tai (E188094); E: ELITE (E150504); IS: Isola  
 (E41625); ZH: Zhejiang Huazheng (E136069).  
 # - E: Minimum external thickness

[I1] Isola (E41625) IS400, PCL-FR-254, PCL-FR-370HR, Auto-HR, PCL-FR-370  
 Turbo, PCL-HP-850, PCL-FR-250HR, PCL-HP-870, 185HR.  
 [PE1] Park Electrochemical (E36295) N4103-13-\*\*, N4^^-13RF-\*\*, N4103-13EP\*\*  
 \*\* - May be followed by suffix "SI" denoting alternate glass type.  
 [NY1] Nan Ya (E98983) NP-175FR, NP-175FTL, NP-155FR, NP-155FTL, NP-180FR,  
 NP-180FTL, NP-175FMR, NP-175FMTL, NP-155FMR, NP-155FMTL  
 [NY2] Nan Ya (E98983) NP-140R, NP-140TL, NP-140MR, NP-140MTL  
 [V1] Ventec (E214381) VT-41, VT-41TC, VT-45, VT-45TC  
 [V2] Ventec (E214381) VT-42, VT-42TC, VT-42S  
 [ZH1] Zhejiang Huazheng (E136069) H140HF, H145HF, H150HF, H155HF, H160HF,  
 - H170HF, H175HF, H180HF, H185HF, H190HF, H200HF, H1600HF  
 [TU1] Taiwan Union (E189572) TU-862, TU-863, TU-862 HF, TU-862 LK, TU-862S,  
 - TU-742 HF, TU-742 MV, TU-747 HF, TU-747 LK, TU-747 HF (C), TU-865, TU-  
 868, TU-815, TU-862T, TU-747T, TU-787 LK, TU-863+, TU-748, TU-788 LK  
 [E1] - ELITE (E150504) EM-370, EM-370(Z), EM-370(5)  
 [HT1] Hong Tai (E188094) HTE-650, HTE-650-D, HTE-700  
 -

## SOLDER RESISTS

Types	Process	Solder Resists <sup>®</sup>
D-1	B	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 27
	B1	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21
D-3	B	1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 14, 17, 18, 19, 20, 21
D6	B	18, 19
D-11	B	8, 14, 21
D-12	B	22, 23, 24
D15	B	15, 18, 21
D-HF	B	14, 25, 26



@ - Solder Resist Grades (Recognized Component, QMJU2):

No.	Solder Resists		
	Manufacturer	Grade	File Number
1.	Chung-Yu	ZSR-150/ZSH-3 (ALL)	E112960
2.	Taiyo	S-502AA/HD-B (GN)	E69262
3.	Taiyo	S-502AB/HD-A (GN)	E69262
4.	Tamura	DSR-2200K/CA-2200K (GN, BL)	E67710
5.	Tamura	DSR-2200KG/CA-2200KG (GN)	E67710
6.	Tamura	DSR-2200NK/CA-2200NK (BL, RD, GN, YL)	E67710
7.	Tamura	DSR-2200NC/CA-2200NC (CL, BL, YL)	E67710
8.	Tamura	DSR-2200TL/CA-2200TL (GN, BK, BL, RD, YL, WT)	E67710
9.	Tamura	DSR-2200TS01/CA-2200TS01 (GN, BL, RD)	E67710
10.	Tamura	DSR-2200TS11/CA-2200TS06 (GN)	E67710
11.	Tamura	DSR-2200TS13/CA-2200TS01 (BK)	E67710
12.	Tamura	DSR-2200TS25/CA-2200TS01 (GN)	E67710
13.	Tamura	DSR-2200TS05/CA-2200TS05 (AL, OR)	E67710
14.	Onstatic	R-500/HD-5 (ALL)	E208670
15.	Taiyo	PSR-2000AV/CA-25AV (GN)	E69262
16.	Taiyo	PSR-2000AN/CA-25AA (GN, RD, BL, YL)	E69262
17.	Taiyo	PSR-4000CE/CA-40CE (GN)	E69262
18.	Advance	PSR-550B/LS-55B (ALL)	E210858
19.	Advance	SR-6000/CA-60 (ALL)	E210858
20.	Taiyo	PSR-4000DE/CA-40DE (GN, BK, BL)	E69262
21.	Taiyo	PSR-2000BK/CA-25BK (GN)	E69262
22.	Taiyo	PSR-4000JB/CA-40JB (WT)	E69262
23.	Taiyo	PSR-4000JN/CA-40JN (WT)	E69262
24.	Taiyo	PSR-4000JD/CA-40JD (WT)	E69262
25.	Taiyo	PSR-2000BA/CA-25AX (GN)	E69262
26.	Taiyo	PSR-2000BJ/CA-25BJ (GN)	E69262
27.	Nan Ya	LP-4G/HP-25D (ALL)	E123174

TABLE II - BASE MATERIALS

Type	Base Material &							Min. Copper Thk. (mic)	SS / DS <sub>e</sub>	PWB Mfg. Process	Meets UL 746E DSR	CTI (PLC)
	UL/ANSI Grade	Mfr +	Grade	Metal Base Dielectric Thk		Metal Substrate						
				Min (mic)	Max (mic)	Type	Min Thk (mic)					
D8	-	E	EM-MP	50	250	Aluminum	300	17	SS	C	-	0
D88	-	ZW	HA80, HA81, HA82, HA83, HA84, HA85	75	150	Aluminum	700	17	SS	C	Yes	0
D9	-	E	EM-M1, EM-M1 (20)	75	250	Aluminum	500	30	SS	C	Yes	0
D-96	-	V	VT-4A2H	75	75	Aluminum	500	35	SS	C	Yes	2
D-98	-	V	VT-4B*, VT-4B3S	50	200	Aluminum	500	17	SS	C	-	0
D-99	-	C	CS89P, CS89C, CS-AL-89, CS88P, CS88C, CS-AL-88	80	100	Aluminum	600	34	DS <sub>g</sub>	D	-	-

& - Recognized Component, (QMTS2)

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

+ - E: Elite (E150504); C: Chin-Shi (E206580); V: Ventec (E214381).

% - See file E231499, report dated: 2016-08-03 for unlisted double sided construction.

## Solder Resists

Types	Process	Solder Resists@
D8	C	1, 2
D88	C	3, 4
D9	C	1, 2
D-96	C	3, 4
D-98	C	3, 4

@ - Solder Resist and Hole Plugging Grades (Recognized Component, QMJU2):

No.	Solder Resist		
	Manufacturer	Grade	File Number
1.	Advance	PSR-550B/LS-55B (ALL)	E210858
2.	Advance	SR-6000/CA-60 (ALL)	E210858
3.	Taiyo	PSR-4000JN/CA-40JN (WT)	E69262
4.	Taiyo	PSR-4000JB/CA-40JB (WT)	E69262

## Solder Resists

Types	Process	Solder Resists@
D-99	D	1, 2

## HOLE PLUGGING/SOLDER RESIST COMBINATIONS

Types	Process	Hole Plugging Material/ Solder Resist@
D-99	D	A/1, A/2

@ - Solder Resist and Hole Plugging Grades (Recognized Component, QMJU2):

No.	Hole Plugging		
	Manufacturer	Grade	File Number
A.	San-Ei	PHP-900 IR-6P, PHP-900 IR-6PW, PHP-900 IR-6PS or PHP-900 IR-6PSL (WT)	E70678

No.	Solder Resist		
	Manufacturer	Grade	File Number
1.	Taiyo	PSR-4000JN/CA-40JN (WT)	E69262
2.	Taiyo	PSR-4000JB/CA-40JB (WT)	E69262

TABLE II - Base Materials

Type	Base Material &			Min. Thk. (mm)	Copper Thickness		SS/DS@	PWB Mfg Proc	Meets UL 746E DSR	CTI V (PLC)
	UL/ANSI Grade	Mfr +	(mic) Grade		Min (mic)	Max (mic)				
<b>D-33</b>	<b>FR-4.0</b>	<b>ZW</b>	<b>H1170 [ZW1]</b>	<b>1.00</b>	<b>34</b>	<b>206</b>	<b>DS</b>	<b>B</b>	<b>Yes</b>	<b>175 (3)</b>
	<b>FR-4.0</b>	<b>ZW</b>	<b>H150 (LF) [ZW2]</b>	<b>1.00</b>	<b>34</b>	<b>206</b>	<b>DS</b>	<b>B</b>	<b>Yes</b>	<b>175 (3)</b>

& -	Recognized Component, (QMTS2)
+ -	ZW: Zhejiang Wazam New Materials (E136069).
@ -	SS - Single Sided; DS - Double Sided or Single Sided
Acceptable Alternatives/Family:	
[ZW1]	Zhejiang Wazam New Materials (E136069) H1170 alternatives:
-	H1170, H1170Q, H1170Z, H1170QA
[ZW2]	Zhejiang Wazam New Materials (E136069) H150(LF) alternatives:
-	H150(LF), H150(LF)Q, H150(LF)Z

SOLDER RESISTS

Types	Process	Solder Resists@
D-33	B	1, 2

@ - Solder Resist Grades (Recognized Component, QMJU2):

No.	Solder Resists		
	Manufacturer	Grade	File Number
1.	<b>Onstatic</b>	<b>R-500/HD-5 (ALL)</b>	<b>E208670</b>
2.	<b>Taiyo</b>	<b>PSR-2000AV/CA-25AV (GN)</b>	<b>E69262</b>