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Date: 2019/10/28  
 Subscriber: 911747001  
 PartySite: 178499  
 File No: E492577  
 Project No: 4789214415  
 PD No: 19M31631  
 Type: R  
 PO Number:

Subject: **Procedure And/Or Report Material**

The following material resulting from the investigation under the above numbers is enclosed.

**Issue**

<u>Date</u>	<u>Vol</u>	<u>Sec</u>	<u>Pages</u>	<u>Revised Date</u>
2017/04/28	1	1	Revised Description Page(s) 9,10	2019/10/24
2017/04/28	1	1	New Test Record 3	2019/10/24
2017/04/29	1	2	Revised Description Page(s) 8,9,10	2019/10/24
2017/04/29	1	2	New Test Record 3	2019/10/24
2017/04/30	1	3	Revised Description Page(s) 8,9	2019/10/24
2017/04/30	1	3	New Test Record 3	2019/10/24

PO: 134804PN

Inspections at your plant will be conducted under the supervision of DANIEL DEATHERAGE, UL INSPECTION CENTER NORTHWEST AREA OFFICE, UL LLC, FIELD SERVICES DEPT,NORTH REGION, 2600 NW LAKE RD, CAMAS, WA, United States, 98607., PHONE: 360.597.8635, EMAIL: Dan.Deatherage@ul.com

Please file revised pages and illustrations in place of material of like identity. New material should be filed in its proper numerical order.

NOTE: Follow-Up Service Procedure revisions DO NOT include Cover Pages, Test Records and Conclusion Pages. Report revisions DO NOT include Authorization Pages, Indices, Section General Pages and Appendixes.

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SCL File

UL INSPECTION CENTER 969

BASE MATERIALS - continued

TABLE IIc - BASE MATERIALS (ADHESIVELESS - INTEGRAL FILM/COPPER)

Type	# Base Material								Mfg Process
	+ Mfr	Grade Designation	Film			\$ SS/DS	Copper Thickness		
			Generic Type	Min Thk (mic)	Max Thk (mic)		Min (mic)	Max (mic)	
F2	D	AP#@	PI	25	101	DS	%%	%%	1
<b>F2</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>PI</b>	<b>25</b>	<b>50</b>	<b>DS</b>	<b>%%</b>	<b>%%</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive/copper systems, unless otherwise indicated.
- + - Manufacturers Name (UL File #) - D: Dupont (**E124294**); T: **Thinflex (E219724)**
- \$ - SS: Single-Sided (Only); DS: Double-Sided or Single-Sided
- %% - Not established for Flammability Classification Only Types.

COVER LAYER

TABLE IIIa - COVER FILM (FILM WITH INTEGRAL ADHESIVE ON ONE SIDE)

Type	Cover Film #							To Be Used With		Mfg Process
	+ Mfr	Grade	Film			Adhesive		Base Material		
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)	+ Mfr	Grade	
F2	D	FR#	PI	12.5	25.4	12.5	51	D	FR#@	1
F2	D	FR#	PI	12.5	25.4	12.5	51	D	AP#@	1
<b>F2</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>12.5</b>	<b>25.4</b>	<b>12.5</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)
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BASE MATERIALS - continued

TABLE IIc - BASE MATERIALS (ADHESIVELESS - INTEGRAL FILM/COPPER)

Type	Base Material #								Mfg Process
	+ Mfr	Grade Designation	Film			\$ SS/DS	Copper Thickness		
			Generic Type	Min Thk (mic)	Max Thk (mic)		Min (mic)	Max (mic)	
F3	D	AP#0	PI	25	127	DS	%%	%%	1
<b>F3</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>PI</b>	<b>25</b>	<b>50</b>	<b>DS</b>	<b>%%</b>	<b>%%</b>	<b>1</b>

TABLE LEGEND:

- #- Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive/copper systems, unless otherwise indicated.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive or clad-conductor.
- + - Manufacturers Name (UL File #) - D: Dupont (**E124294**); T: **Thinflex (E219724)**
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- %% - Not established for Flammability Classification Only Types.

COVER LAYER

TABLE IIIa - COVER FILM (FILM WITH INTEGRAL ADHESIVE ON ONE SIDE)

Type	Cover Film #							To Be Used With Base Material		Mfg Process
	+ Mfr	Grade	Film			Adhesive		+ Mfr	Grade	
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)			
F3	D	FR#	PI	12.5	25.4	12.5	51	D	AP#@	1
F3	D	FR#	PI	12.5	25.4	12.5	51	D	FR#@	1
<b>F3</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>12.5</b>	<b>25.4</b>	<b>12.5</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>1</b>

TABLE LEGEND:

- #- Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)

BOND PLY

TABLE IVa - BOND PLY - (FILM WITH INTEGRAL ADHESIVE ON BOTH SIDES)

Type	Bond Ply #							To Be Used With Flexible Base Material		To Be Used With Cover Layer		Mfg Process
	+ Mfr	Grade	Film			Adhesive		+ Mfr	Grade	+ Mfr	Grade	
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)					
F3	D	FR#	PI	25	25	25	51	D	AP#@	-	-	1
F3	D	FR#	PI	25	25	25	51	D	FR#@	-	-	1
<b>F3</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	-	-	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)

BASE MATERIALS - continued

TABLE IIc - BASE MATERIALS (ADHESIVELESS - INTEGRAL FILM/COPPER)

Type	Base Material #								Mfg Process
	+ Mfr	Grade Designation	Film			\$ SS/DS	Copper Thickness		
			Generic Type	Min Thk (mic)	Max Thk (mic)		Min (mic)	Max (mic)	
F4	D	AP#@	PI	25	101	DS	%%	%%	1
<b>F4</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>PI</b>	<b>25</b>	<b>50</b>	<b>DS</b>	<b>%%</b>	<b>%%</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (**E124294**); T: **Thinflex (E219724)**
- %% - Not established for Flammability Classification Only Types.

## COVER LAYER

TABLE IIIa - COVER FILM (FILM WITH INTEGRAL ADHESIVE ON ONE SIDE)

Type	Cover Film #							To Be Used With Base Material		Mfg Process
	+ Mfr	Grade	Film			Adhesive		+	Grade	
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)			
F4	D	FR#	PI	12.5	25.4	12.5	51	D	AP#0	1
<b>F4</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>12.5</b>	<b>25.4</b>	<b>12.5</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>1</b>

## TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)



BASE MATERIALS - continued

TABLE IIc - BASE MATERIALS (ADHESIVELESS - INTEGRAL FILM/COPPER)

Type	# Base Material								Mfg Process
	+ Mfr	Grade Designation	Film			\$ SS/DS	Copper Thickness		
			Generic Type	Min Thk (mic)	Max Thk (mic)		Min (mic)	Max (mic)	
F2	D	AP#@	PI	25	101	DS	%%	%%	1
<b>F2</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>PI</b>	<b>25</b>	<b>50</b>	<b>DS</b>	<b>%%</b>	<b>%%</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive/copper systems, unless otherwise indicated.
- + - Manufacturers Name (UL File #) - D: Dupont (**E124294**); T: **Thinflex (E219724)**
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COVER LAYER

TABLE IIIa - COVER FILM (FILM WITH INTEGRAL ADHESIVE ON ONE SIDE)

Type	Cover Film #							To Be Used With		Mfg Process
	+ Mfr	Grade	Film			Adhesive		Base Material		
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)	+ Mfr	Grade	
F2	D	FR#	PI	12.5	25.4	12.5	51	D	FR#@	1
F2	D	FR#	PI	12.5	25.4	12.5	51	D	AP#@	1
<b>F2</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>12.5</b>	<b>25.4</b>	<b>12.5</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)
- \$ - SS: Single-Sided (Only); DS: Double-Sided or Single-Sided

TEST RECORD NO. 3

No testing was considered necessary for the addition of new Adhesiveless Base film Thinflex (E219724) Grade Thinflex-A2 at 25-50 mic thickness to Single Layer Flex Type F2

Previous flame testing on Dupont basefilm AP may represent testing of Thinflex basefilm Thinflex-A2 based on the polyimide ANSI like program.

TEST RECORD SUMMARY:

The results of this investigation indicate that the product(s) evaluated comply with the applicable requirements in

- UL 796F STANDARD FOR FLEXIBLE MATERIALS INTERCONNECT CONSTRUCTIONS- Edition 3 - Revision Date 2016/03/16

and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

Test Record by:

Bunra AV  
Engineer

Reviewed by:

Caroline Simonian-Owens  
Senior Project Engineer

MICHELLE COURIER ROSS  
Staff Engineer

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BASE MATERIALS - continued

TABLE IIc - BASE MATERIALS (ADHESIVELESS - INTEGRAL FILM/COPPER)

Type	Base Material #								Mfg Process
	+ Mfr	Grade Designation	Film			\$ SS/DS	Copper Thickness		
			Generic Type	Min Thk (mic)	Max Thk (mic)		Min (mic)	Max (mic)	
F3	D	AP#0	PI	25	127	DS	%%	%%	1
<b>F3</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>PI</b>	<b>25</b>	<b>50</b>	<b>DS</b>	<b>%%</b>	<b>%%</b>	<b>1</b>

TABLE LEGEND:

- #- Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive/copper systems, unless otherwise indicated.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive or clad-conductor.
- + - Manufacturers Name (UL File #) - D: Dupont (**E124294**); T: **Thinflex (E219724)**
- \$ - SS: Single-Sided (Only); DS: Double-Sided or Single-Sided
- %% - Not established for Flammability Classification Only Types.

COVER LAYER

TABLE IIIa - COVER FILM (FILM WITH INTEGRAL ADHESIVE ON ONE SIDE)

Type	Cover Film #							To Be Used With Base Material		Mfg Process
	+ Mfr	Grade	Film			Adhesive		+ Mfr	Grade	
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)			
F3	D	FR#	PI	12.5	25.4	12.5	51	D	AP#@	1
F3	D	FR#	PI	12.5	25.4	12.5	51	D	FR#@	1
<b>F3</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>12.5</b>	<b>25.4</b>	<b>12.5</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>1</b>

TABLE LEGEND:

- #- Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)

BOND PLY

TABLE IVa - BOND PLY - (FILM WITH INTEGRAL ADHESIVE ON BOTH SIDES)

Type	Bond Ply #							To Be Used With Flexible Base Material		To Be Used With Cover Layer		Mfg Process
	+ Mfr	Grade	Film			Adhesive		+ Mfr	Grade	+ Mfr	Grade	
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)					
F3	D	FR#	PI	25	25	25	51	D	AP#@	-	-	1
F3	D	FR#	PI	25	25	25	51	D	FR#@	-	-	1
<b>F3</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>-</b>	<b>-</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)

TEST RECORD NO. 3

No testing was considered necessary for the addition of new Adhesiveless basefilm Thinflex (E219724) Grade Thinflex-A2 at 25-50 mic thickness to Multilayer Flex Type F3.

Previous flame testing on Dupont basefilm AP may represent testing of Thinflex basefilm Thinflex-A2 based on the polyimide ANSI like program.

TEST RECORD SUMMARY:

The results of this investigation indicate that the product(s) evaluated comply with the applicable requirements in

- UL 796F STANDARD FOR FLEXIBLE MATERIALS INTERCONNECT CONSTRUCTIONS-  
Edition 3 - Revision Date 2016/03/16

and therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

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Engineer

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BASE MATERIALS - continued

TABLE IIc - BASE MATERIALS (ADHESIVELESS - INTEGRAL FILM/COPPER)

Type	Base Material #								Mfg Process
	+ Mfr	Grade Designation	Film			\$ SS/DS	Copper Thickness		
			Generic Type	Min Thk (mic)	Max Thk (mic)		Min (mic)	Max (mic)	
F4	D	AP#@	PI	25	101	DS	%%	%%	1
<b>F4</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>PI</b>	<b>25</b>	<b>50</b>	<b>DS</b>	<b>%%</b>	<b>%%</b>	<b>1</b>

TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (**E124294**); T: **Thinflex (E219724)**
- %% - Not established for Flammability Classification Only Types.



## COVER LAYER

TABLE IIIa - COVER FILM (FILM WITH INTEGRAL ADHESIVE ON ONE SIDE)

Type	Cover Film #							To Be Used With Base Material		Mfg Process
	+ Mfr	Grade	Film			Adhesive		+ Mfr	Grade	
			Generic Type	Min Thk (mic)	Max Thk (mic)	Min Thk (mic)	Max Thk (mic)			
F4	D	FR#	PI	12.5	25.4	12.5	51	D	AP#0	1
<b>F4</b>	<b>D</b>	<b>FR#</b>	<b>PI</b>	<b>12.5</b>	<b>25.4</b>	<b>12.5</b>	<b>51</b>	<b>T</b>	<b>Thinflex-A2</b>	<b>1</b>

## TABLE LEGEND:

- # - Recognized Component - Industrial Laminates (QMTS2); received as integral film/adhesive system.
- ## - Recognized Component - Plastic (QMFZ2); film received without integral adhesive.
- + - Manufacturers Name (UL File #) - D: Dupont (E124294)

TEST RECORD NO. 3

No testing was considered necessary for the addition of new Adhesiveless Base film Thinflex (E219724) Grade Thinflex-A2 at 25-50 mic thickness to Multilayer Flex Type F4.

Previous flame testing on Dupont basefilm AP may represent testing of Thinflex basefilm Thinflex-A2 based on the polyimide ANSI like program.

TEST RECORD SUMMARY:

The results of this investigation indicate that the product(s) evaluated comply with the applicable requirements in

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