

NEW UL LISTING FOR RIGID.FLEX:
MAXIMUM PERFORMANCE –
HIGHEST SAFETY

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

KNOW-HOW

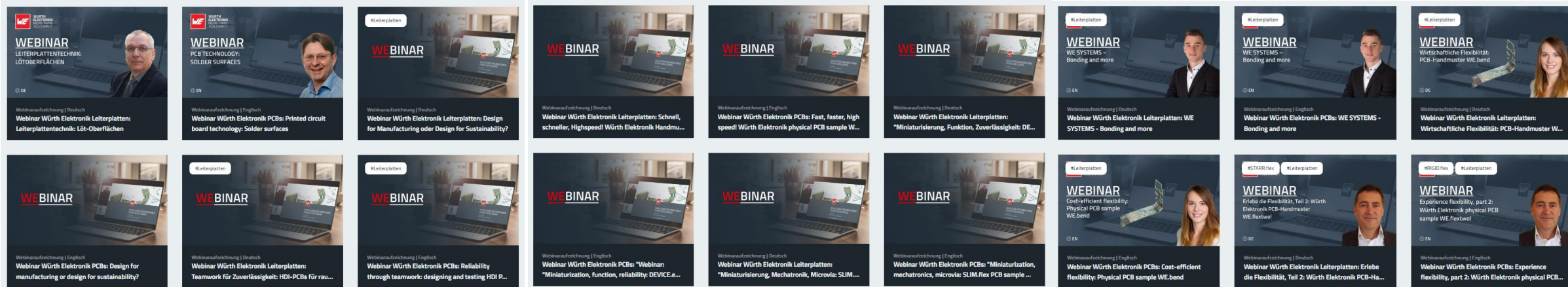
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WEBINAR

Cost-efficient flexibility:
Physical PCB sample
WE.bend



AGENDA

New UL listing for RIGID.flex

1. Introduction Underwriters Laboratories (UL)
 - Scope of a UL Listing
 - Parameters of a UL Listing
 - Correct specification of a UL-compliant PCB
2. UL special features of RIGID.flex
3. UL types RIGID.flex with WE CBT
4. New listing WE63 in detail
5. Support for our customers



Werner Öchslen
Technical Project Management



Andreas Schilpp
Technical Marketing



UNDERWRITERS LABORATORIES (UL) INTRODUCTION

History

Underwriters Laboratories (underwriter) Inc. was founded in Chicago in 1894 by William Henry Merrill. The electrical engineer had been sent there from Boston on behalf of the insurers to inspect the Palace of Electricity at the World's Fair with regard to electrical risks. The 25-year-old recognized the growing potential in the field of product safety and stayed in Chicago, where he founded Underwriters Laboratories with the support of the fire insurance companies and several manufacturers of electrical equipment. Merrill developed standards, launched tests, designed the necessary equipment and identified potential sources of danger.

Source: called 13.03.2025, 11:50

https://de.wikipedia.org/wiki/Underwriters_Laboratories

- UL: Government mandate to develop standards and test them at the same time (no “separation of powers”)
- In Germany: Standardization and testing are separate, e.g. DIN EN and TÜV/Dekra
- There are other certifiers for components, but UL is always responsible for final acceptance!
- This makes UL a very strong brand



UNDERWRITERS LABORATORIES (UL) INTRODUCTION

Drivers for UL Component Recognition

FIRE

- Fuel source
- Ignitability



ELECTRIC SHOCK

- Breakdown of insulation
- Mechanical strength



END-PRODUCT CERTIFICATION

- Many standards require UL Recognized PCBs to be used
- The requirements for the PCB will depend on the application within the End-Product
- Requirements are always Application dependent and should be verified before defining what PCB UL-type is required

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

Test and test sample

FIRE

- Flammability according to UL 94



Criteria conditions	V-0	V-1	V-2
Afterflame time for each individual specimen t_1 or t_2	$\leq 10s$	$\leq 30s$	$\leq 30s$
Total afterflame time for any condition set (t_1 plus t_2 for the 5 specimens)	$\leq 50s$	$\leq 250s$	$\leq 250s$
Afterflame plus afterglow time for each individual specimen after the second flame application ($t_2 + t_3$)	$\leq 30s$	$\leq 60s$	$\leq 60s$
Afterflame or afterglow of any specimen up to the holding clamp	No	No	No
Cotton indicator ignited by flaming particles or drops	No	No	Yes

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

What is the purpose and benefit of a UL listing?

- Characterisation of material and PCB properties
- Acts as a guide for designers to select a material / PCB that has suitable properties
- Assessed for use as a component in end products

- UL Recognition gives the user confidence that the PCB met certain requirements when it was assessed
- UL Recognition reduces the test program the OEM's product will need to go through during its safety certification assessment
- Follow-Up Service Inspections by a UL Field Representative at each manufacturing facility on a quarterly basis securing compliance with UL listing



- IF the UL Field Rep finds the PCB does not have the appropriate Recognition they will raise a Variation Notice which can include
 - **STOP-SHIPMENT**
 - **REMOVAL OF UL MARK FROM PRODUCT**

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

US & Canadian Recognition - ZPMV2 vs. ZPMV8

CCN - Category Control Number, a code used by UL to differentiate product categories

ZPMV - CCN for Rigid PCBs, can also include flex constructions

- The additional listing for Canada (obtained, an additional ZPMV8 listing) is applied for at UL by the LP manufacturer and, if necessary, issued by paperwork.
- UL compares the materials listed in ZPMV2 with the properties listed/required for Canada in the CSA, and if these match, the additional ZPMV8 listing is obtained, and the corresponding marking may then also be applied in future.
- As not all materials on the market have identical CSA approval, it is possible that a manufacturer's LP types may differ between ZPMV2 and ZPMV8. When selecting a type, both listings of an LP manufacturer must therefore always be checked.
- Würth Elektronik CBT also has Canadian approval with identical parameters for all materials and listed LP types. This enables labeling with the label



UNDERWRITERS LABORATORIES (UL) INTRODUCTION

Recognition Levels

A UL Recognized PCB will have one of two levels of Recognition:

- Flammability-Only Recognition
- Full Recognition

Need to understand the end-product requirements before specifying the Recognition level needed.

	Flammability-Only Recognition	Full Recognition
Flame Rating	✓	✓
Solder Limits	✓	✓
Maximum Operating Temperature (MOT)	-	✓
Direct Support (DSR)	-	✓
Comparative Tracking Index (CTI)	-	✓

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

MOT, DSR and CTI

MOT

Maximum Operating Temperature

- UL interpretation: The maximum continuous operating temperature to which the PCB can be exposed under normal operating conditions
- The MOT is used to determine the conditioning temperatures in the following test methods:
Adhesion; Delamination;
Delamination of different dielectric materials

DSR

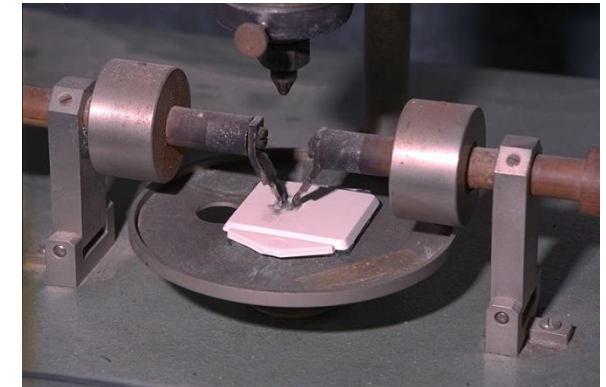
Direct Support Requirements

- Depending on the material and its thickness
 - Combination of properties is assessed
 - No specific test

CTI

Comparative Tracking Index

- Measuring arrangement for determining the tracking resistance



Source: Dr. Reiner Düren, Labor für Kunststoffprüfungen.RedPiranha in der Wikipedia auf Deutsch - Eigenes Werk (Originaltext: Eigene Aufnahme), CC BY-SA 3.0 de, <https://commons.wikimedia.org/w/index.php?curid=21238590>

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

Approved elements for a registered PCB

Material

- Base material
 - Cores
 - Prepreg
 - Flex materials
- Solder resist
- Plugging paste
- Ink for Legend print

Base material and resists / inks are already registered with UL by the manufacturer

Construction

- Stackups
 - Location of the flexes
 - Minimum laminate thicknesses
 - Min. and max. dielectric build-up thickness
 - Copper thickness inside, copper foil outside
- Bending type (use A / B)
- Via constructions
- Assembly on one or both sides

Parameter

- Flame Rating
- MOT
- Design limits
 - Minimum width ladder
 - Ditto at the edge
 - Max. unbroken copper area
- Soldering parameters

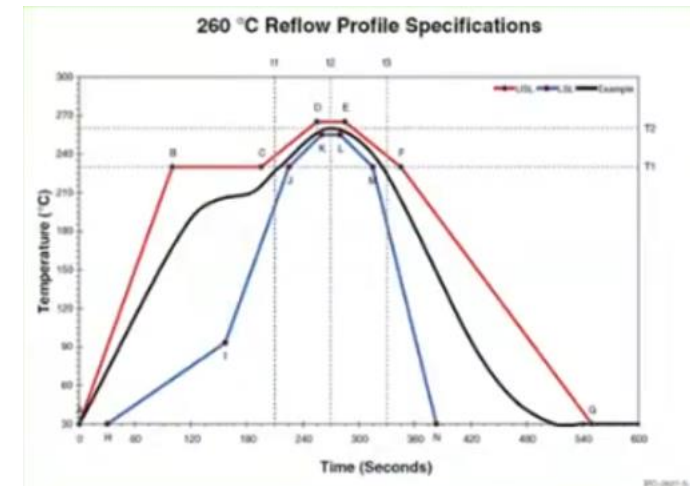
Production Process

- All processes >100°C
- All metallization processes
- All solder surfaces
- All coatings
- All external processes

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

New since 13.10.2020 - Soldering process according to IPC-TM-650

- The basis is the IPC-TM-650 2.6.27 - Thermal Stress, Convection Reflow Assembly Simulation
- Previous "Solder Limits" are replaced by "Assembly Solder Process IPC"
 - Peak temperature
 - Cycles
 - Standard: 6 cycles of the IPC T260 profile
- Old listings remain unchanged
- UL inspectors check the new parameters when assembling UL-labeled PCBs
- Soldering processes exceed the listed MOT parameters of the PCB and can lead to material degradation
- Preconditioning of the test samples is carried out using the listed temperature profile with the listed number of cycles, for example for
 - Flammability tests
 - Adhesion tests
 - Delamination tests



UNDERWRITERS LABORATORIES (UL) INTRODUCTION

Delivery specification for UL PCBs

Definition of the requirements from applicable UL standards, e.g.

- UL 489 / CSA 22.2 No. 5-02 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
- UL 508 / CSA 22.2 No.14, Industrial Control Equipment (alt)
- UL 508A (Industrial Control Panels)
- UL 60730 Automatic Electrical Controls for Household and Similar Use
 - UL 60730-2-10A, Particular Requirements for Motor Starting Relays
 - UL 60730-2-11A, Particular Requirements for Energy Regulators
- UL 60947, Low-Voltage Switchgear and Controlgear
 - Part 4-1: Electromechanical Contactors and Motor-Starters
- NFPA 79 (Machinery Panels),
- UL notes in the certification documentation (“Section General” or as a critical component in the “descriptor”)

Printed Wiring Boards - All printed wiring boards shall be R/C (ZPMV2) whose solder time and temperature are not exceeded and which can be confirmed in the Recognized Component Directory and whose maximum operating temperature is 105°C or higher.

Printed Wiring Boards - Not applicable for printed wiring boards entirely located within Class 2 circuitry - All printed wiring boards shall be R/C (ZPMV2 or ZP XK2) whose solder time and temperature are not exceeded and which can be confirmed in the Recognized Component Directory and whose maximum operating temperature is 105°C or higher, rated V-2 minimum, suitable for UL 796 DSR.

Printed Wiring Board - Any R/C (ZPMV2), rated V-0, 105°C, or better.

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

Correct specification of a UL-compliant PCB

NO overspecification / NO copy&paste

- **CCN** - Category Control Number, a code used by UL to differentiate product categories
- Find UL product category
- Category guidelines provide information about the requirements
 - Flammability only sufficient?
 - If yes: 94V-2 or 94V-1 sufficient?
 - MOT necessary?

NO overspecification / NO copy&paste

Examples for UL Category Control Numbers

- NKCR: Auxiliary Devices
- NRAQ: Programmable Controllers
- NRGF: Programmable Safety Controllers
- NIPJ: Active Opto-electronic Protective Devices Employing Vision-based Protective Devices
- QUXX: Process Control Equipment, Electrical
- NRKH: Proximity Switches
- NIPM: Active-Opto-electronic Protective Devices Responsive to Diffuse Reflection
- NIPF: Active-Opto-electronic Protective Devices

UNDERWRITERS LABORATORIES (UL) INTRODUCTION

What must and can be included in the labeling?

- Mandatory (traceability): Manufacturer, Datecode: **WE, 0725**
- Should (traceability): Lot number: -
- **UL marking**
 - Mandatory: Manufacturer identification or E number: **WE**
 - Mandatory: UL type according to listing: **63A**
 - Optional: Factory marking
 - Optional: UR mark



- Optional: Flammability classification: **94V-0**



Marking: Company name or tradename "WE" or file number and type designation. May be followed by a suffix to denote factory identification or burning test classification.

AGENDA

New UL listing for RIGID.flex

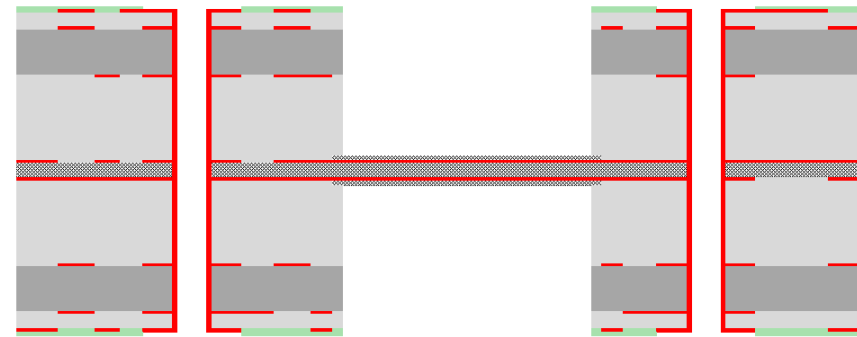
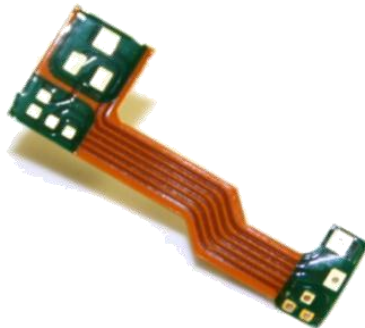
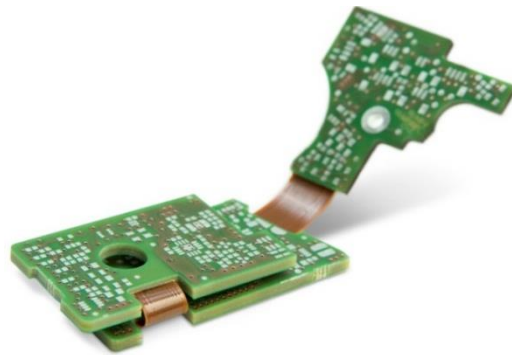
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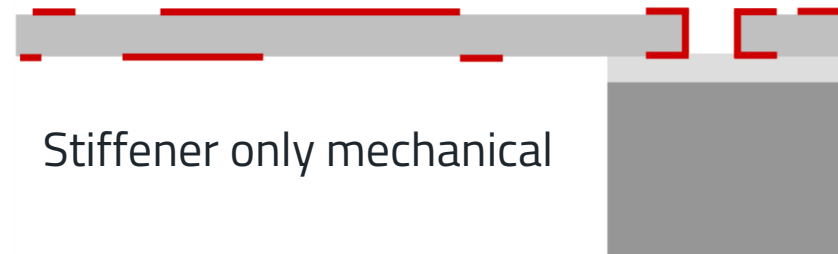
UL SPECIAL FEATURES OF RIGID.FLEX

Differences between FPC and RFPC

Flexible (FPC) and rigidflex (RFPC) PCB's



- Lötstopmmaske und Kupfer
- Prepreg
- FR4-Kern mit Kupfer
- Prepreg
- Deckfolie
- Polyimidkern mit Kupfer
- Deckfolie
- Prepreg
- FR4-Kern mit Kupfer
- Prepreg
- Lötstopmmaske und Kupfer



Stiffener only mechanical

- Deckfolie oder Flexlack
- Polyimidkern mit Kupfer
- Deckfolie
- Prepreg, Kleber, Kaltkleber
- FR4-Kern ohne Kupfer

UL SPECIAL FEATURES OF RIGID.FLEX

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- Via constructions
- Assembly on one or both sides

Parameter

- Flame Rating
- MOT
- Design limits
 - Minimum width ladder
 - Ditto at the edge
 - Max. unbroken copper area
- Soldering parameters

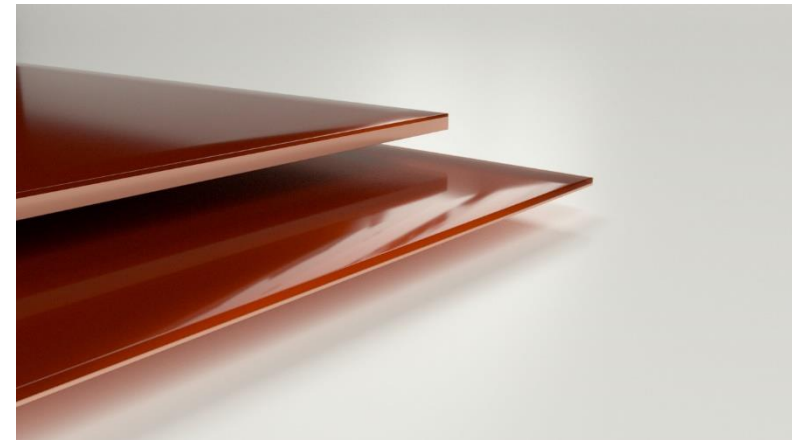
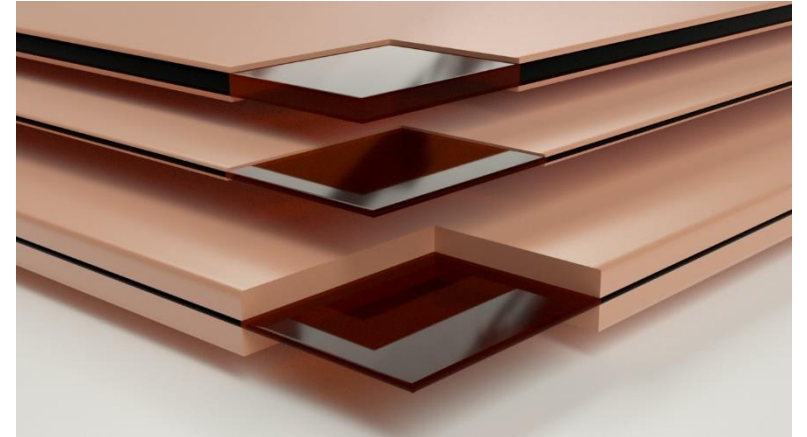
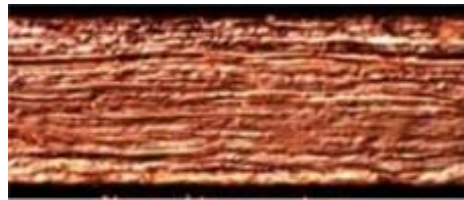
Production Process

- All processes >100°C
- All metallization processes
- All solder surfaces
- All coatings
- All external processes

UL SPECIAL FEATURES OF RIGID.FLEX – MATERIALS

Flexible base materials with copper cladding

- **Base material Polyimide**
 - Core thicknesses 25 μm , 50 μm , 75 μm , 100 μm , 125 μm and 150 μm
- **Copper thicknesses**
 - 18 μm , 35 μm and 70 μm
 - ED- und RA-quality



UL SPECIAL FEATURES OF RIGID.FLEX – MATERIALS

Flexible composite and protective materials

- **Coverlay**
 - Polyimide foil with single-sided adhesive (Acrylic or Epoxy)
 - Polyimide thicknesses 12,5 μm , 25 μm , 50 μm and 75 μm
 - Adhesive thicknesses 25 μm , 35 μm and 50 μm

- **BondPly**
 - Polyimide foil with double-sided adhesive (Acrylic)
 - Polyimide foil thicknesses 25 μm , 50 μm
 - Adhesive thicknesses 25 μm und 50 μm



UL SPECIAL FEATURES OF RIGID.FLEX – MATERIALS

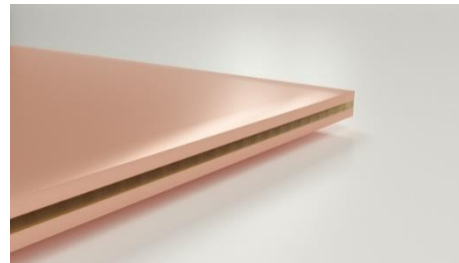
Rigid composite and base materials (FR4 and Prepreg)

- **Prepreg (Standard)**

- Adhesive between the layers
- Glassfibers pre-impregnated with a resin and hardener
- Common thicknesses: 106, 1080, 2116, 7628

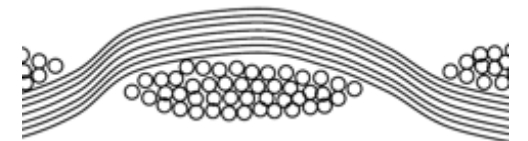
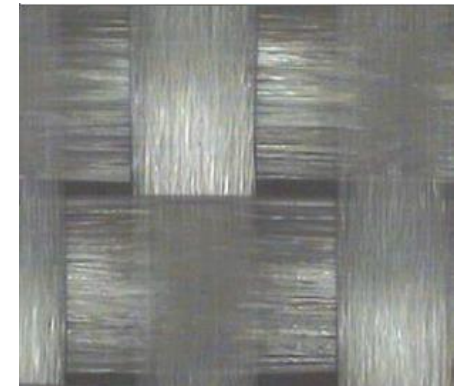
- **Prepreg Low Flow**

- The difference to 'normal' prepreg lies in the recipe of the resin and hardener
- Flow of the resin is restricted
- Common thicknesses: 106 und 1080



- **Kerne**

- Composite of individual prepregs
- Cladded with copper on both sides
- Core thicknesses in 60 µm, 100 µm und 125 µm, 150 µm, 200 µm, 250 µm, 300 µm, 360 µm, 410 µm....., 1,20 mm, 1,55 mm, ...



UL SPECIAL FEATURES OF RIGID.FLEX - COMBINATION OF THE MATERIALS

WE Standards RIGID.flex

Standard 1F-xRi

Material description	Flex area Structure	Viatypes		Standard values	1F-1Ri	1F-2Ri	1F-3Ri	1F-4Ri	1F-5Ri no plating	Modifications
		Standard	Modifications							
soldermask										flexible soldermask (F50210)
copper incl. plating	TopLayer			45µm	L1	L1	L1	L1	L1	
Polymide				50µm						
LowFlow Prepreg				50µm						
copper				19µm	L2	L2	L2			35µm
core 1										≥ 250µm
copper				19µm	L3	L3	L3			35µm
prepreg				2 x 1080						≥ 2 x 1080
copper				19µm	L4					35µm
core 2										≥ 100µm
copper				19µm	L5					35µm
prepreg				2 x 1080						≥ 2 x 1080
copper				19µm	L6	L6				35µm
core 3										≥ 250µm (= thickness core 1)
copper				19µm	L7	L7				35µm
prepreg				2 x 106						
copper incl. plating	BottomLayer			45µm	L8	L8	L8	L8		
soldermask										

Standard xRi-2F-xRi

Material description	Flex area Structure	Viatypes		Standard values	3Ri-2F-3Ri	2Ri-2F-2Ri	1Ri-2F-1Ri	Modification allowed
		Standard	Modification					
Soldermask								
copper incl. plating	TopLayer			45µm	L1	L1	L1	
prepreg				1 x 1080				≥ 1 x 1080
Core 1				18µm	L2	L2		≥ 100µm
prepreg				18µm	L3			35µm
Coverlay				3 x 1080				
Polymide				18µm	L4	L3	L2	35µm
Coverlay				50µm				75µm/100µm
prepreg				18µm	L6	L4	L3	35µm
Core 2				18µm	L4			35µm
prepreg				3 x 1080				
Core 2				18µm	L6			35µm
prepreg				18µm	L7	L6		35µm
copper incl. plating	BottomLayer			45µm	L8	L6	L4	≥ 1 x 1080
Soldermask								

Standard 2F-xRi

Material description	Flex area Structure	Viatypes		Standard values	2F-1Ri	2F-2Ri	2F-3Ri	2F-4Ri	Modifications
		Standard	Modifications						
soldermask									flexible soldermask (F50210)
copper incl. plating	TopLayer			45µm	L1	L1	L1	L1	
Polymide				50µm					
copper				18µm	L2	L2	L2	L2	
LowFlow Prepreg				50µm					≥ 106
core 1									≥ 250µm
copper				18µm	L3	L3	L3		35µm
prepreg				2 x 1080					≥ 2 x 1080
copper				19µm	L4				35µm
core 2									≥ 100µm
copper				18µm	L4				35µm
prepreg				2 x 1080					≥ 2 x 1080
copper				18µm	L4	L4			35µm
core 3									≥ 250µm (= thickness core 1)
copper				18µm	L7	L6			35µm
prepreg				1 x 1080					
copper incl. plating	BottomLayer			45µm	L8	L8	L4	L3	
soldermask									

Standard xRi-4F-xRi

Material description	Flex area Structure	Viatypes		Standard values	3Ri-4F-3Ri	2Ri-4F-2Ri	1Ri-4F-1Ri	Modification allowed
		Standard	Modification					
Soldermask								
copper incl. plating	TopLayer			45µm	L1	L1	L1	
prepreg				1 x 1080				≥ 1 x 1080
Core 1				18µm	L2	L2		≥ 100µm
prepreg				18µm	L3			35µm
Coverlay				3 x 1080				
Polymide				18µm	L4	L3	L2	35µm
Bondoly / PP				50µm				75µm/100µm
Coverlay				18µm	L6	L4	L3	35µm
Polymide				111 / 1080				121 / 2116
Coverlay				18µm	L6	L6	L4	35µm
prepreg				50µm				75µm/100µm
Coverlay				18µm	L7	L6	L6	35µm
prepreg				3 x 1080				
Core 2				18µm	L8			35µm
prepreg				18µm	L9	L7		≥ 100µm
prepreg				1 x 1080				35µm
copper incl. plating	BottomLayer			45µm	L10	L8	L6	≥ 1 x 1080
Soldermask								

UL SPECIAL FEATURES OF RIGID.FLEX – PRODUCTION PROCESS

Multiple Pressing

HDI stackup 4Ri-2F+4Ri + HDI 3-4b-3

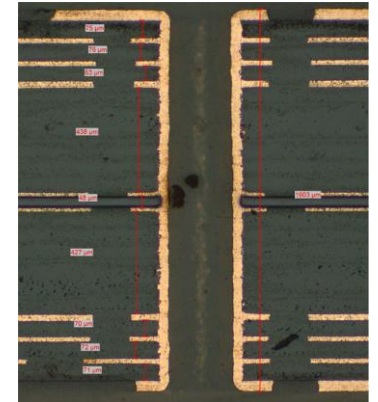
- Staggered Micro Vias
 - High reliability
- Buried Vias between L4 and L7
- Final product: Communication System



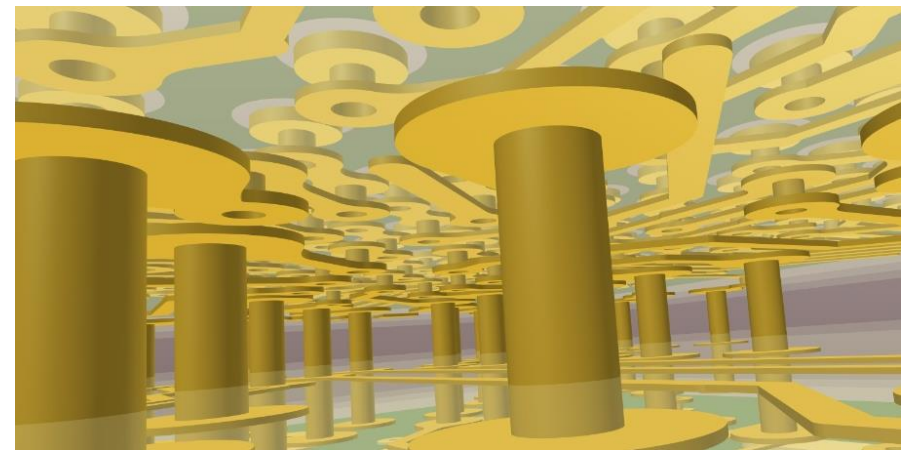
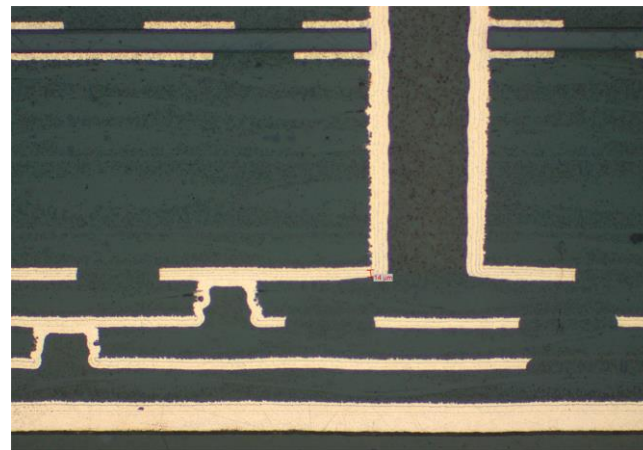
Rigidflex 4Ri-2F-4Ri + HDI 3-4b-3

PCB Thickness: 1.85 mm +/- 10% Flex Thickness: 0.16 mm +/- 0.05mm

Right area Structure	Flex area Thickness	Right area Thickness	Material description	Flex area Structure	Via types
Substrate		15			
L1	40	40	"Hard plating 1 x 1000		
L2	20	20	"Hard plating 1 x 1000		
L3	20	20	"Hard plating 1 x 1000		
L4	50	50	"Hard plating 1 x 1000		
		430	FR4 HTG 150°		
	40	40	Conformal		
L5	17	17			
	20	20	Polyimide		
L6	17	17			
	40	40	Conformal		
		430	FR4 HTG 150°		
L7	20	20	"Hard plating 1 x 1000		
L8	20	20	"Hard plating 1 x 1000		
L9	20	20	"Hard plating 1 x 1000		
L10	50	50	"Hard plating 1 x 1000		
L11	40	40	"Hard plating 1 x 1000		
Substrate		15			

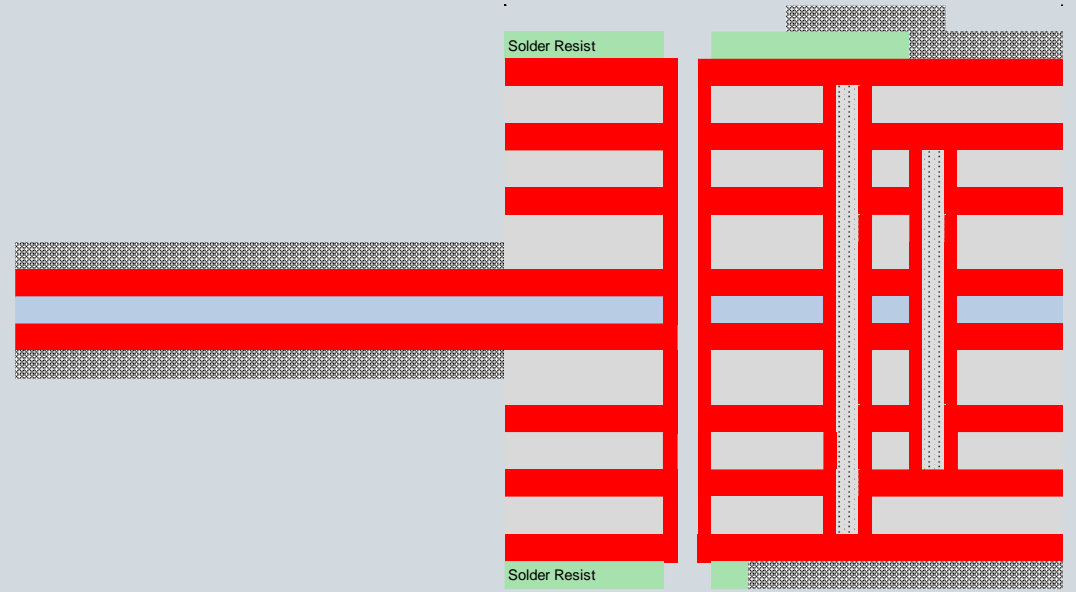
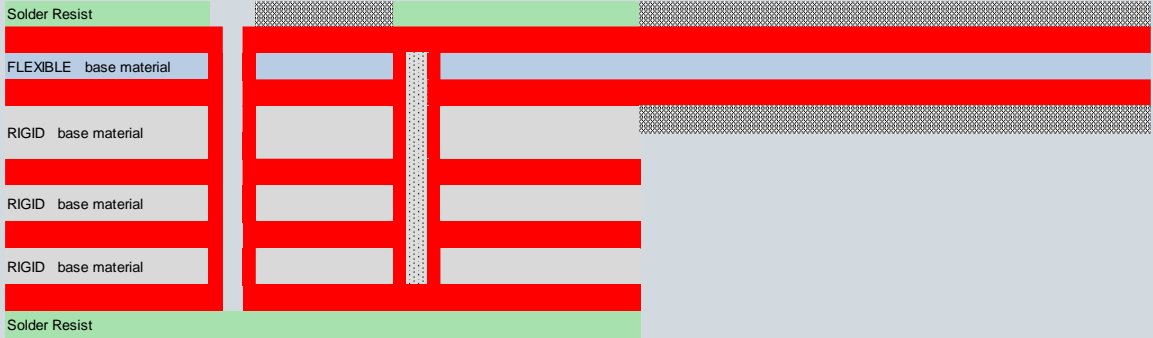
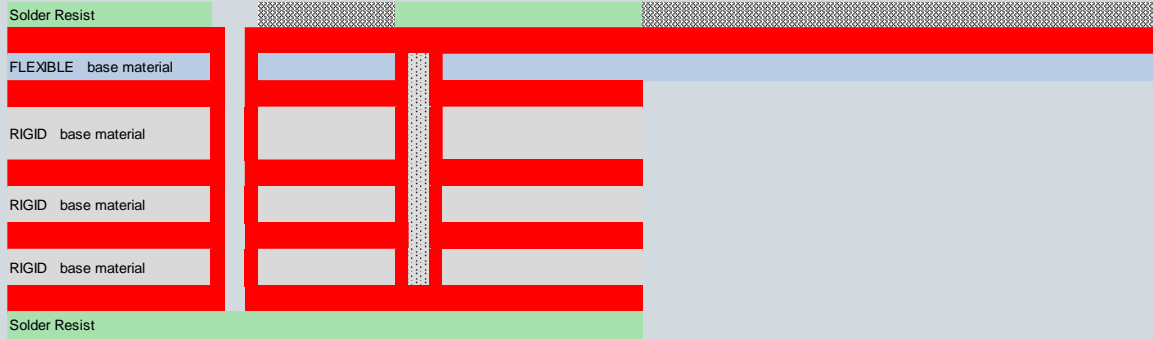


Source: Ceotronics



NEW UL-LISTING FOR RIGID.FLEX

WE63A / WE 63B - Materials + stackup

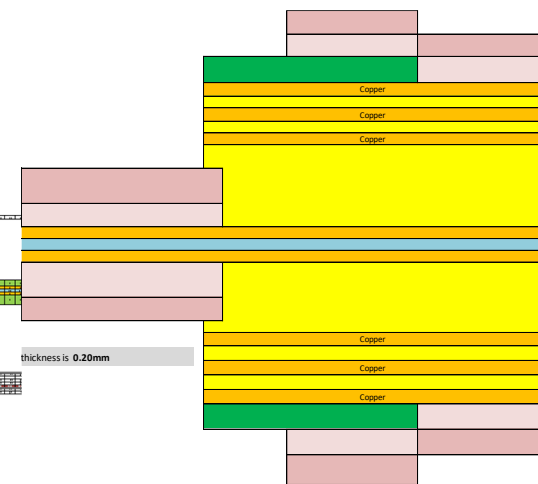


NEW UL-LISTING FOR RIGID.FLEX

WE63A / WE 63B - Process + Sample Requirement List

Process F3:

1	May etch with any etchant except chromic/trifluoric.
2A	May laminate Bare film with 8 mil film at pressure of 110 PSI and temperature of 175°C maximum for 120 minutes maximum.
2	May laminate Bare film on Bare film at pressure of 160 PSI and temperature of 210°C maximum for 120 minutes maximum.
2A	May apply copper on Bare film at pressure of 125°C maximum for 120 minutes maximum.
3	May laminate Flexible Interconnect Construction with rigid material. Must be rigid and flexible.
4	May make holes for plating through.
5	May form or halve.
6	May also etch plate through.
7	May also etch plate through.
8	May apply hole plating material in rigid interconnect construction only. Must be rigid and flexible.
9	May apply plating resist.
10	May also etch plate through.
11	MUST remove plating resist.
12	May etch with any etchant except chromic/trifluoric.
12A	Step 2-12 may be repeated three times.
13	May strip contact fingers to copper.
14	May also etch plate contact fingers with Ni/Au.
15	Non-flame rated and fire rated boards may be coated with overlayer resin. Coated Trace may be coated with the solder resist and solder Bare film Flexible Interconnect Construction as indicated in Table III. May apply solder resist on Bare film at the same time. Board may then be drilled at 175°C maximum for 120 minutes maximum.
16A	May apply solder mask (as directed in Table III) on rigid portion ONLY.
16	May apply solder mask (as directed in Table III) on flexible portion ONLY.
16B	May apply solder mask on 125°C maximum for 120 minutes maximum.
17	In Rigid Flexible Interconnect Construction only, May laminate Overlay (refer to Table III) over Solder resist/Solder Bare film Flexible Interconnect Construction (refer to Table III) and laminate Overlay construction in rigid portion at pressure of 160 PSI and temperature of 210°C maximum for 120 minutes maximum.
18	Overlay may be in the shape of HOI over on Cover coat of Flexible Interconnect Construction.
19	May immersion Ni/Au, Ni/P-Au, Sn, Silver surface (process temperature under 100°C).
20	Weather plating operations performed and no weather temperature over 100°C (212°F) encountered.

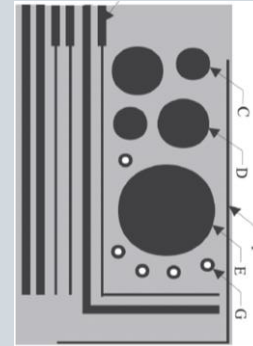


NEW UL-LISTING FOR RIGID.FLEX

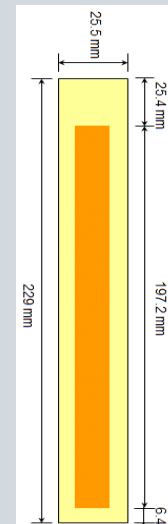
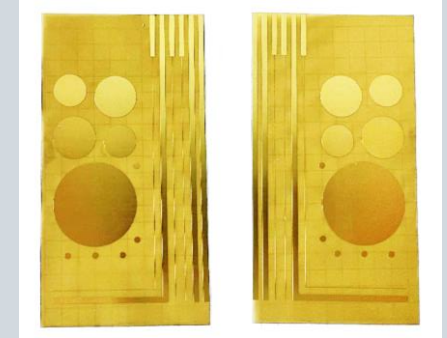
WE63A / WE 63B - Sample production

Sample Name	Description
CL	Coverlay Lamination
AB	Ambient Bend
CB	Cold Bend
RF	Repeated Flexing
BD	Bond/Delamination
DO	Delamination Only
V	Vertical Burning

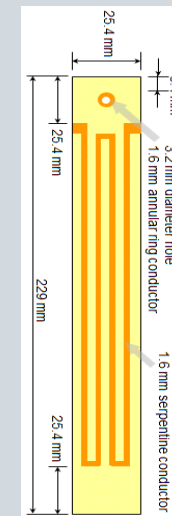
- 74 different stack- and layoutsamples produced
- Each sample order has an individual, non-series-compliant process flow
- Per Type ~ 20 samples tested



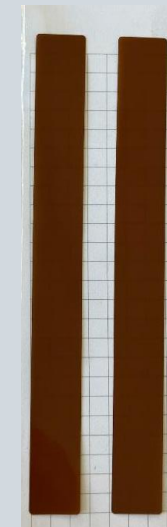
BD, DO & CL Samples



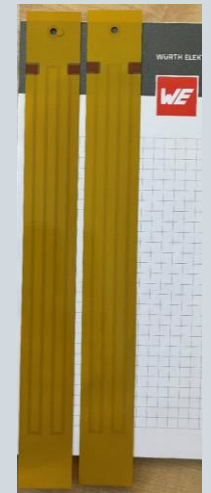
AB & CB Samples



RF Samples



V Samples



NEW UL-LISTING FOR RIGID.FLEX

UL-File E76251 – RIGID.flex UL-Listings

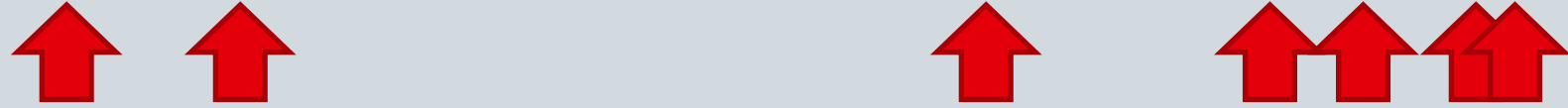
Type	Cond Width		Cond Thk	SS/ DS/ DSO	Area Diam	Max Report date After	Surface Mount Technology	Assembly Solder		Solder Limits		Oper Temp		Meets C UL796 T
	Min mm	Edge mm						Process °C	Process Cycles	°C	sec	°C	Class	
66 @	0.075	0.20	18 Int:70	DS	25.4	No	-	-	-	288	20	120	V-1	All 4
65	-	-	-	DS	-	No	-	-	-	288	17	-	V-0	- -
65A	-	-	-	DS	-	No	-	-	-	288	17	-	V-1	- -
63A (ASP 1) (Note 5)	0.05	0.05	5 Int:70	DS	25.4	Yes	Yes	260	6	-	-	130	V-0	All 4
63B (ASP 1) (Note 6)	0.05	0.05	5 Int:70	DS	25.4	Yes	Yes	260	6	-	-	130	V-0	All 4



NEW UL-LISTING FOR RIGID.FLEX

UL-File E76251 - WE63A / WE 63B in Detail

Type	Cond Width		Cond Thk	SS/ DS/ DSO	Max Area Diam	Report date After	Surface Mount Technology	Assembly Process Temp °C	Solder Process Cycles	Solder Limits		Max Oper Temp °C	Flame Class	Meets UL796	C T
	Min	Edge								°C	sec				
	mm	mm								mic	mic				
Multilayer rigid flex composite, flexible materials interconnect constructions															
63A (ASP 1) (Note 5)	0.05	0.05	5 Int:70	DS	25.4	Yes	Yes	260	6	-	-	130	V-0	All	4
63B (ASP 1) (Note 6)	0.05	0.05	5 Int:70	DS	25.4	Yes	Yes	260	6	-	-	130	V-0	All	4



- Minimum PCB thickness
 - 1F-xRi + 2F-xRi with ~0,50 mm thickness possible
 - xRi-2F-xRi with ~0,70 mm thickness possible
- Min. Line width 50 µm
- Up to 70 µm copper thickness
- 6 Reflow processes
- MOT 130°C
- Flammability V-0
- DSR All
- CTI 4 (100-175 V)

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Wiring, Printed - Component
Guide Information

WUERTH ELEKTRONIK GMBH & CO KG
SALZSTR 21, NIEDERNHALL 74676 DE

Type dsg: 63A (ASP 1) (Note 5)
Multilayer rigid flex composite, flexible materials interconnect constructions

Cond Width	Cond Width	Cond Thk	Cond Thk	Cond Thk	SS/ DS/ DSO	Max Area Diam	Report Date After	Surface Mount Technology	Assembly Process Temp °C	Assembly Solder Process Cycles	Assembly Solder Limits °C sec	Assembly Max Oper Temp °C	Assembly Flame Class	Assembly Meets UL796	Assembly C T	
0.05	0.05	5	70	102	DS	25.4	2022-01-01	Yes	260	6	-	-	130	V-0	All	4

(ASP 1) - Assembly solder process evaluated to IPC-TM-650, 2.6.27 Thermal Stress Assembly Simulation
(Note 5) - Minimum and Maximum External Copper Thickness on Basefilm = 5 to 70mic, Minimum and Maximum External Copper Thickness on flex and 8mic on rigid construction is achieved by etching of 12mic base copper foil. The as received construction is 12mic minimum only

Report Date: 2023-01-31
Last Revised: 2025-02-27

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Wiring, Printed - Component
Guide Information

WUERTH ELEKTRONIK GMBH & CO KG
SALZSTR 21, NIEDERNHALL 74676 DE

Type dsg: 63B (ASP 1) (Note 6)
Multilayer rigid flex composite, flexible materials interconnect constructions

Cond Width	Cond Width	Cond Thk	Cond Thk	Cond Thk	SS/ DS/ DSO	Max Area Diam	Report Date After	Surface Mount Technology	Assembly Process Temp °C	Assembly Solder Process Cycles	Assembly Solder Limits °C sec	Assembly Max Oper Temp °C	Assembly Flame Class	Assembly Meets UL796	Assembly C T	
0.05	0.05	5	70	102	DS	25.4	2022-01-01	Yes	260	6	-	-	130	V-0	All	4

(ASP 1) - Assembly solder process evaluated to IPC-TM-650, 2.6.27 Thermal Stress Assembly Simulation
(Note 6) - Minimum and Maximum External Copper Thickness on Basefilm = 5 to 70mic, Minimum and Maximum External Copper Thickness on flex and 8mic on rigid construction is achieved by etching of 12mic base copper foil. The as received construction is 12mic minimum only

Report Date: 2023-01-31
Last Revised: 2025-02-27

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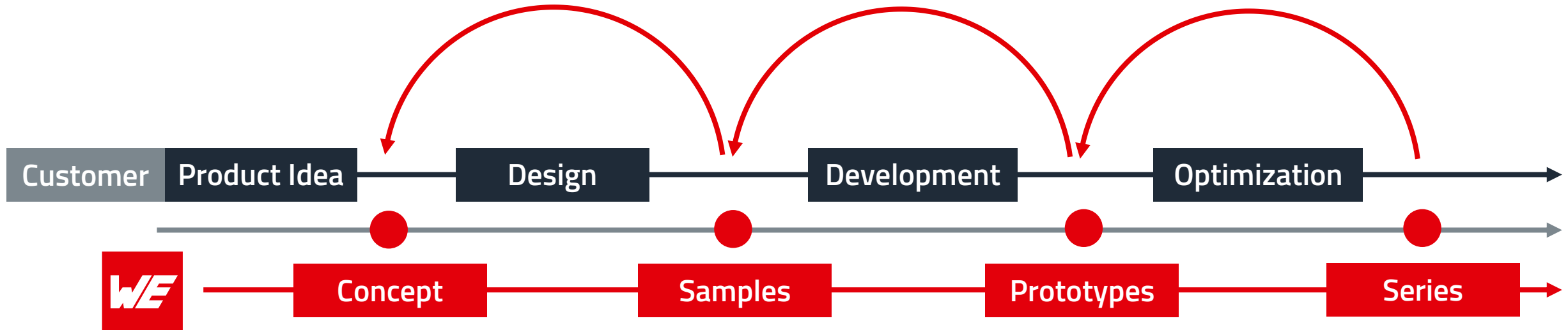


NEW UL-LISTING FOR RIGID.FLEX

Concept Phase

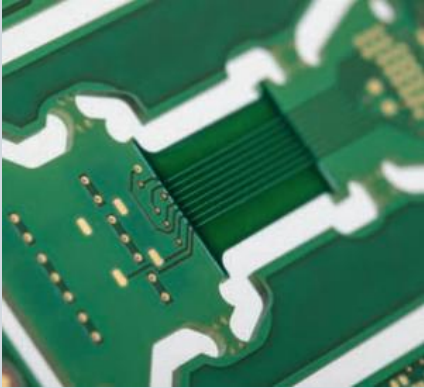
Already in the concept phase

- Check UL Guidelines for the application: check minimum requirement for the PCB
- Contact your pcb supplier
 - Check the UL requirement against the material, stack and production process of the pcb.



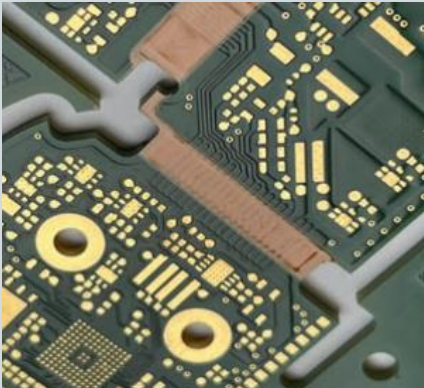
NEW UL-LISTING FOR RIGID.FLEX

Flexmask vs Coverlay



Flexmask

- Flammability-Only Recognition WE65 / WE 65A
 - flammability V-1
- Cheaper in comparison to Coverlay

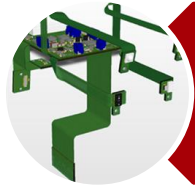


Coverlay

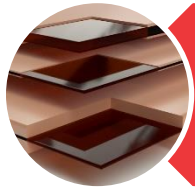
- Full Recognition WE63A / WE 63B
 - flammability V-0
 - MOT 130°
 - DSR ALL

NEW UL-LISTING FOR RIGID.FLEX

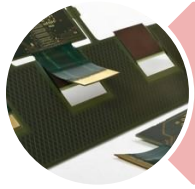
summary



Check requirements carefully - avoid overspecification



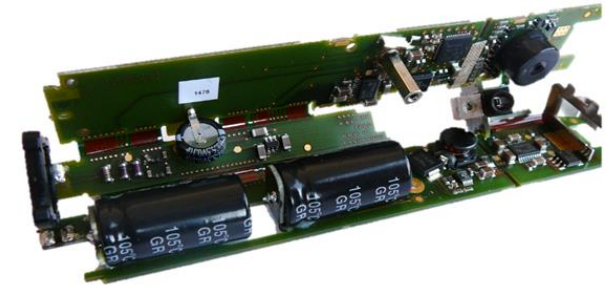
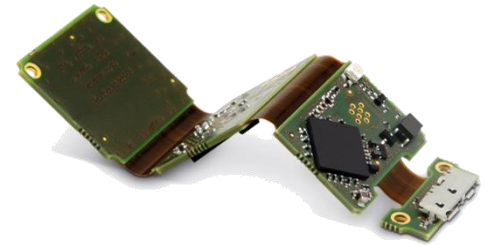
Use standards - special features in consultation



WE offers different UL listings for rigid-flex printed circuit board



We are happy to support you 😊





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What kind of
application

do you have?

HOW can  support you?

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