PFDS400®

PREFORM BASED DIFFUSION SOLDERING

FOR HIGH TEMPERATURE ELECTRONIC APPLICATIONS

PFARR

WIR BRINGEN LOTE IN FORM

GETTING SOLDER INTO SHAPE

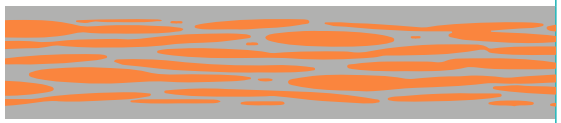
WHAT IS PFDS400®
AND HOW DOES IT WORK ?

- a metallic composite, consisting of a lead-free solder and a metallic carrier
- the solder supports the wettability of the components
- the metallic carrier is the source of the diffusion process
- after soldering the joint consists of intermetallic phases exhibiting high-temperature stability, desoldering temperature >> 400 °C
  (for the Cu-Sn-System)

WHAT CAN I EXPECT?

- A very temperature-stable, high-strength, non-ductile joint
- With the right soldering technology, low voiding in the joint – we know how to achieve this
- No requirement for secondary heat treatment
- Increase in thermal conductivity, compared to monolithic solder joints
- Increased reliability of the joint
- A team of engineers to support your specific application and adjust PFDS400® as far as possible to meet your demands

TYPES OF PFDS400®

"Mono-layer" (PFDS400® M) type	"ARB" (PFDS400® ARB) type
Schematic layout in cross section	
	
metallic core double-coated with lead-free Sn- or In- based solder layers	metallic particles distributed in a lead-free Sn-based solder matrix

The combination of metals defines the diffusion solder system {e.g. Cu-Sn} and the resulting IMCs (for Cu-Sn: Cu6Sn5 and Cu3Sn)

ADVANTAGES OF PFDS400®

Both PFDS400® types

+ **preform-based** (perfect volume and easy placement, no further cleaning steps needed)
+ **suitable for common reflow-soldering processes**
  (peak temperature depends on the chosen solder constituent, e. g. 260°C for SnAg3.5
+ **temperature-stable joint (desoldering temp. > 400 °C)**,
  therefore an additional soldering step is no problem for PFDS400®
+ **feasible fitting of PFDS400® to customer-specific requirements**
+ **PFDS400® provides the ability to replace expensive materials and processes**
  e.g. AuSn20 and silver sintering

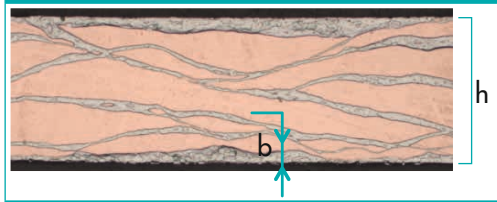
"Mono-layer" (PFDS400® M) type

+ less effort in production than *ARB* type
– "rigid" core layer → limited compensation of baseplate warpage → suitable for even surfaces e.g. die attach

"ARB" (PFDS400® ARB) type

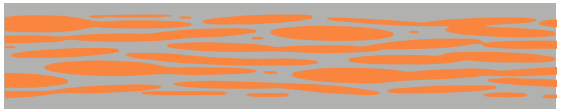
+ flexible particles → good compensation of baseplate warpage → suitable for more uneven surfaces e.g. Baseplate attach
– more effort in production than M type

AVAILABLE PREFORM DIMENSIONS AS OF OCTOBER 2021

	"Mono-layer" (PFDS400® M) type	"ARB" (PFDS400® ARB) type
		
unit	**dimensions**	**dimensions**
height h, **mm**	• 0.050 – 0.200 • (others possible on request)	• 0.100 – 0.200 • (others possible on request)
common coating thickness b, **mm**	• 0.008 – 0.012 • (others possible on request e.g. 0,015)	• coating thickness is not homogeneous
width of preforms, **mm**	• up to 20.0	• up to 40.0
length of preforms, **mm**	• up to 20.0	• up to 40.0

MATERIAL COMBINATIONS AS OF OCTOBER 2021

"Mono-layer" (PFDS400® M) type	
	
materials	
solder layers	• Sn-based • In-based (under development)
metallic core	• Cu-HCP/C10300 • Ag • Ni (under development)

"ARB" (PFDS400® ARB) type	
	
materials	
solder	• Sn-based
metallic particles	• Cu-HCP/C10300 • Ag • Ni (under development)

MOST SUITABLE CONDITIONS FOR PFDS400® M

Power modules	
Die attach (Si, **SiC, GaN**)	
feasible **reverse-side metallisation**	• Ni/Au, Ni/Ag, Cu, Ni, Ag, Au
feasible **substrates**	• **DCB/DBC, AMB** • **Substrates with CTE-mismatch compensating layers**
feasible **metallisation** of **substrate**	• **Ni, Ag, Cu (bare)**
soldering technique	• **vacuum reflow solder furnace, with reducing/ activating atmospheres (preferably HCOOH)** • **application** of **moderate pressure** • preferably fluxless to address voiding

SUITABLE CONDITIONS FOR PFDS400® M

Other stacks	
Sensors, thermoelectrical modules, sealing, ...	
feasible **metallisation** of components	• Ni/Au, Ni/Ag, Cu, Ni, Ag, Au
components with matching CTEs	• **joints consisting of IMCs show non-ductile behaviour under thermo-mechanical stress**
soldering technique	• **vacuum reflow solder furnace, with activating / reducing atmospheres (HCOOH)** • application of **moderate** pressure • wafer bonder • sinter press • preferably fluxless to address voiding

SUITABLE CONDITIONS FOR PFDS400® ARB

(IN DEVELOPMENT)

Power modules	
Baseplate attach (Al, AlSiC, Cu) (in development)	
feasible **metallisation of baseplate**	• Cu, Ni galvanised • thickness **min. 4µm**
feasible **substrates**	• **DCB/DBC, AMB**
feasible **metallisation** of **substrate**	• **Ni, Ag, Cu (bare)**
soldering technique	• **vacuum reflow solder furnace, with reducing/ activating atmospheres (preferably HCOOH)** • application of **moderate pressure**

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