



PFDS400®

PREFORM BASED DIFFUSION SOLDERING

FOR HIGH TEMPERATURE
ELECTRONIC APPLICATIONS



PFARR

WIR BRINGEN LÖTE 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 $\gg 400\text{ °C}$ (for the Cu-Sn-System)

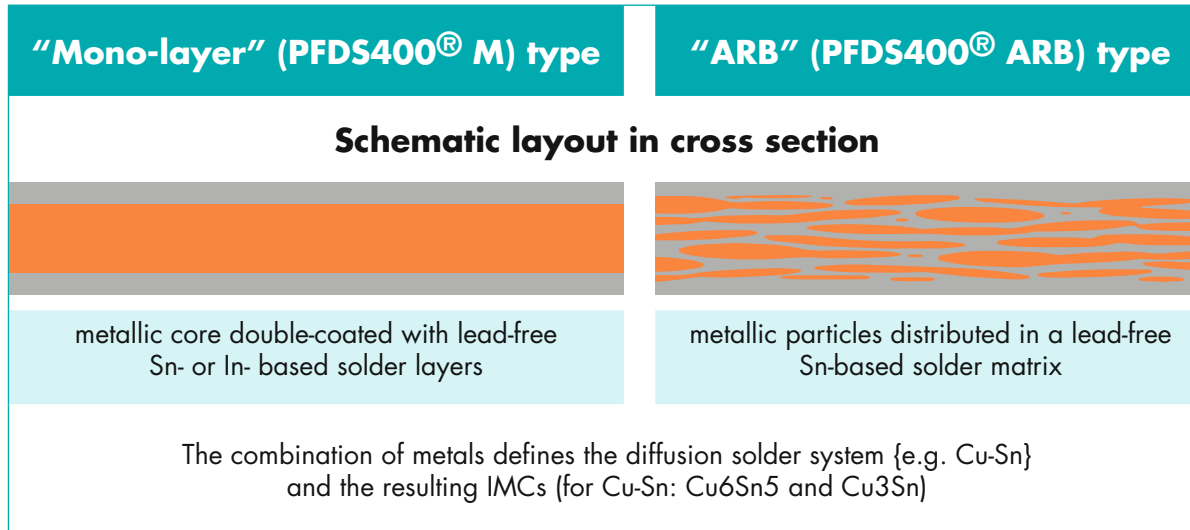
» WHAT CAN I EXPECT?

- 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®



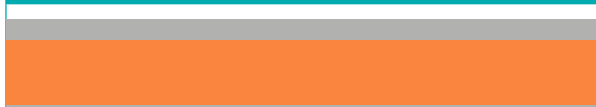


» ADVANTAGES OF PFDS400®

Both PFDS400® types

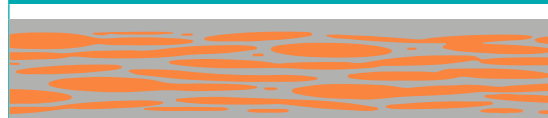
- + **preform-based** (perfect volume and easy placement, no further cleaning steps needed)
- + **suitable for common reflow-soldering processes**
(peak temperature depends on the chosen solder constituent, e. g. 260°C for SnAg3.5)
- + **temperature-stable joint (desoldering temp. > 400 °C),**
therefore 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



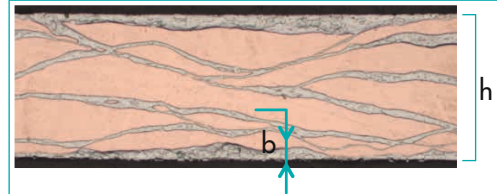
» AVAILABLE PREFORM DIMENSIONS AS OF OCTOBER 2021

“Mono-layer” (PFDS400® M) type



unit	dimensions
height h , mm	<ul style="list-style-type: none">• 0.050 – 0.200• (others possible on request)
common coating thickness b , mm	<ul style="list-style-type: none">• 0.008 – 0.012• (others possible on request e.g. 0,015)
width of preforms, mm	<ul style="list-style-type: none">• up to 20.0
length of preforms, mm	<ul style="list-style-type: none">• up to 20.0



“ARB” (PFDS400® ARB) type



dimensions
<ul style="list-style-type: none">• 0.100 – 0.200• (others possible on request)
<ul style="list-style-type: none">• coating thickness is not homogeneous
<ul style="list-style-type: none">• up to 40.0
<ul style="list-style-type: none">• up to 40.0



» MATERIAL COMBINATIONS AS OF OCTOBER 2021

"Mono-layer" (PFDS400® M) type	"ARB" (PFDS400® ARB) type
	
materials	materials
<p>solder layers</p> <ul style="list-style-type: none">• Sn-based• In-based (under development)	<p>solder</p> <ul style="list-style-type: none">• Sn-based
<p>metallic core</p> <ul style="list-style-type: none">• Cu-HCP/C10300• Ag• Ni (under development)	<p>metallic particles</p> <ul style="list-style-type: none">• Cu-HCP/C10300• Ag• Ni (under development)





» MOST SUITABLE CONDITIONS FOR PFDS400® M

Power modules	
Die attach (Si, SiC, GaN)	
feasible reverse-side metallisation	<ul style="list-style-type: none">• Ni/Au, Ni/Ag, Cu, Ni, Ag, Au
feasible substrates	<ul style="list-style-type: none">• DCB/DBC, AMB• Substrates with CTE-mismatch compensating layers
feasible metallisation of substrate	<ul style="list-style-type: none">• Ni, Ag, Cu (bare)
soldering technique	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Ni/Au, Ni/Ag, Cu, Ni, Ag, Au
components with matching CTEs	<ul style="list-style-type: none">• joints consisting of IMCs show non-ductile behaviour under thermo-mechanical stress
soldering technique	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Cu, Ni galvanised• thickness min. 4µm
feasible substrates	<ul style="list-style-type: none">• DCB/DBC, AMB
feasible metallisation of substrate	<ul style="list-style-type: none">• Ni, Ag, Cu (bare)
soldering technique	<ul style="list-style-type: none">• vacuum reflow solder furnace, with reducing/activating atmospheres (preferably HCOOH)• application of moderate pressure



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