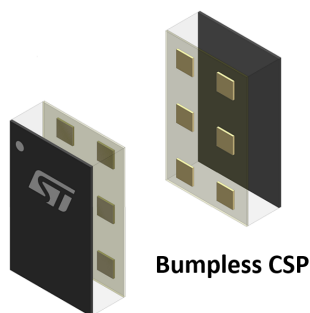
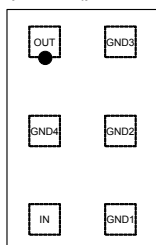


2.4 GHz low pass filter matched to STM32WB55Vx



Top view (pads down)



Features

- Integrated impedance matching to STM32WB55Vx
- LGA footprint compatible
- 50 Ω nominal impedance on antenna side
- Deep rejection harmonics filter
- Low insertion loss
- Small footprint
- Low thickness $\leq 450 \mu\text{m}$
- High RF performance
- RF BOM and area reduction
- [ECOPACK2](#) compliant component

Applications

- Bluetooth 5
- OpenThread
- Zigbee®
- IEEE 802.15.4
- Optimized for STM32WB55Vx

Description

The [MLPF-WB55-02E3](#) integrates an impedance matching network and harmonics filter. The matching impedance network has been tailored to maximize the RF performance of STM32WB55Vx. This device uses STMicroelectronics IPD technology on non-conductive glass substrate which optimizes RF performance.

Product status link

[MLPF-WB55-02E3](#)

1 Characteristics

Table 1. Absolute ratings ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter	Value	Unit
P_{IN}	Input power RF_{IN}	10	dBm
V_{ESD}	ESD ratings human body model (JESD22-A114-C), all I/O one at a time while others connected to GND	2000	V
	ESD ratings machine model, all I/O	200	
T_{OP}	Maximum operating temperature	-40 to +105	$^{\circ}\text{C}$

Table 2. Impedances($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z_{IN}	STM32WB55xx single-ended impedance	-	matched to STM32WB55Vx	-	Ω
Z_{OUT}	Antenna impedance	-	50	-	Ω

Table 3. Electrical characteristics and RF performance ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter		Value			Unit
			Min.	Typ.	Max.	
f	Frequency range		2400		2500	MHz
IL	Insertion loss $ S_{21} $			1.0	1.2	dB
RL_{IN}	Input return loss $ S_{11} $		13	17		dB
RL_{OUT}	Output return loss $ S_{22} $		15	18		dB
Att	Harmonic rejection levels $ S_{21} $	Attenuation at 2fo (4800-5825) MHz	43	45		dB
		Attenuation at 3fo (7200 – 7500) MHz	47	53		dB
		Attenuation at 4fo (9600 – 10000) MHz	41	56		dB
		Attenuation at 5fo (12000 – 12500) MHz	38	44		dB

1.1 RF measurement

Figure 1. Transmission (dB)

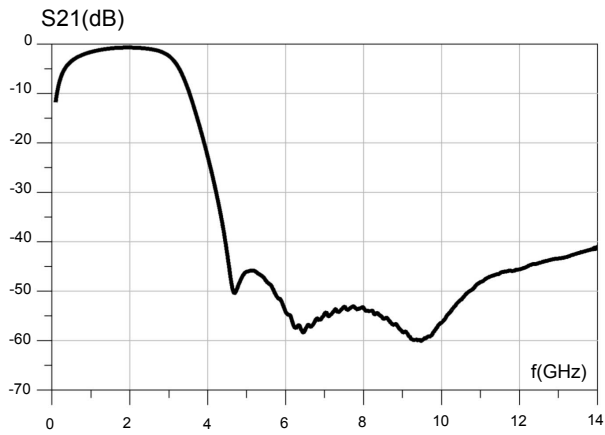


Figure 2. Insertion loss (dB)

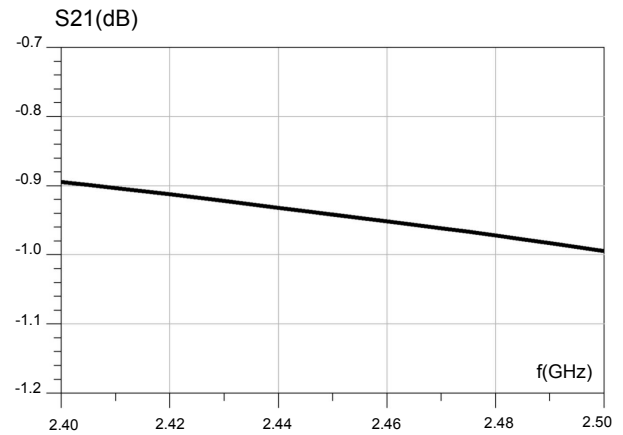


Figure 3. Input return loss (dB)

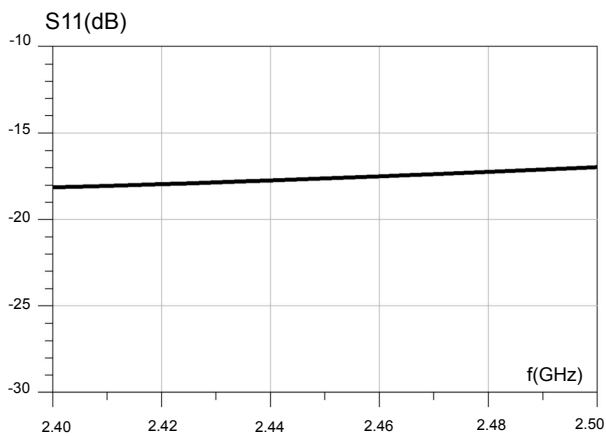


Figure 4. Output return loss (dB)

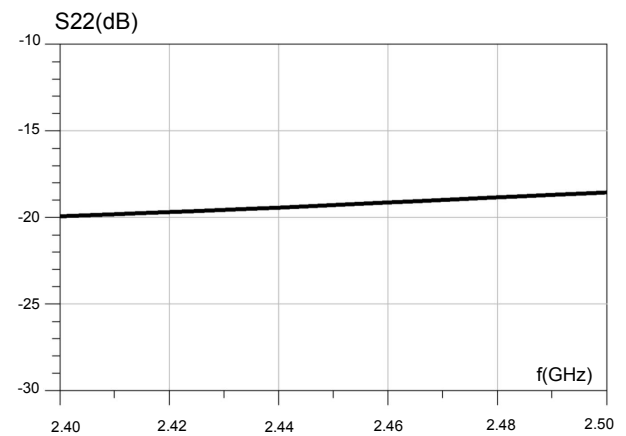


Figure 5. Attenuation 2f0 (dB)

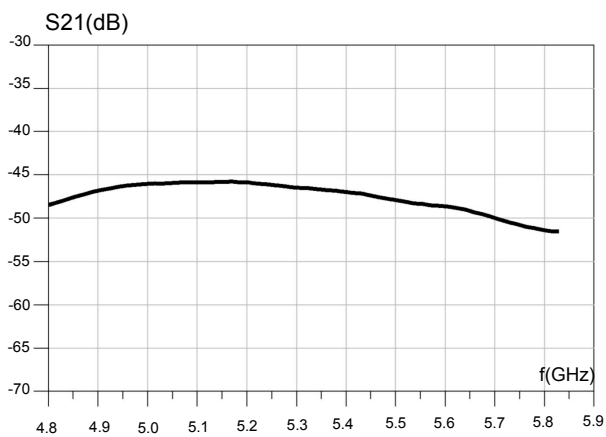


Figure 6. Attenuation 3f0 (dB)

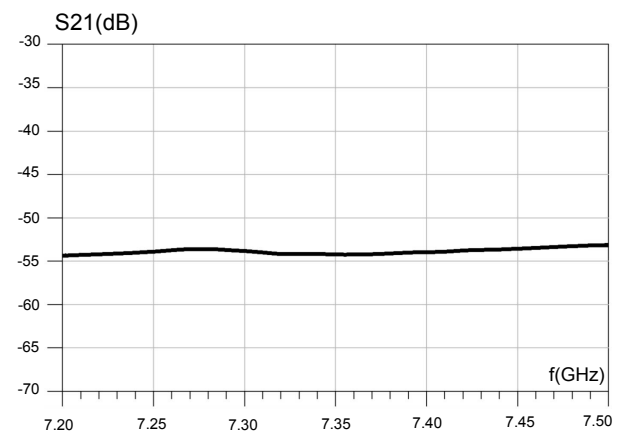
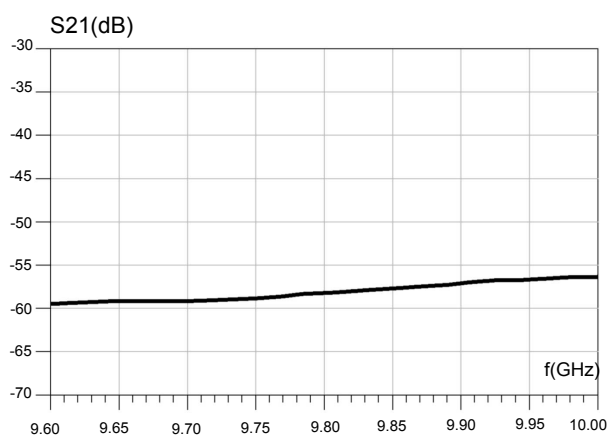
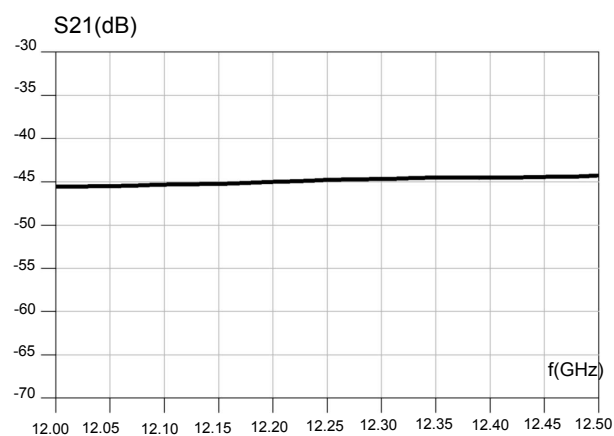


Figure 7. Attenuation 4f0 (dB)

Figure 8. Attenuation 5f0 (dB)


2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

2.1 Bumpless CSP package information

Figure 9. Bumpless CSP package outline

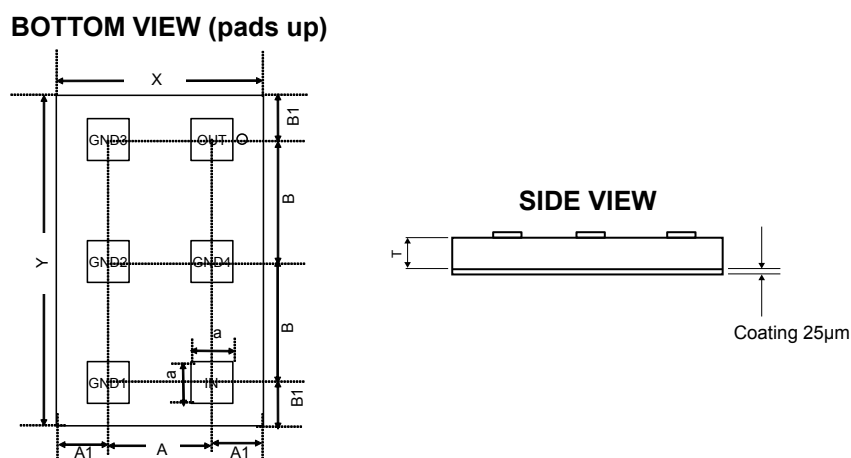


Table 4. Bumpless CSP package mechanical data

Parameter	Description	Min.	Typ.	Max.	Unit
X	X dimension of the die	975	1000	1025	µm
Y	Y dimension of the die	1575	1600	1625	µm
A	X pitch		500		µm
B	Y pitch		587		µm
A1	Distance from bump to edge of die on X axis		250		µm
B1	Distance from pad to edge of die on Y axis		213		µm
a	Pad dimension		200		µm
T	Substrate thickness	375	400	425	µm

Figure 10. Marking

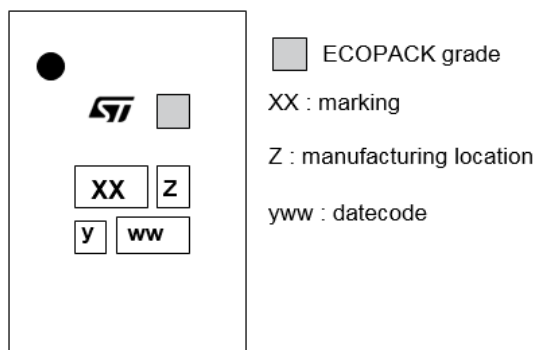
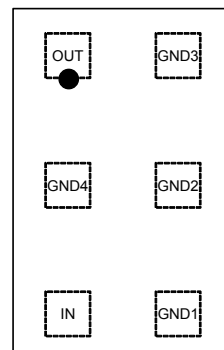


Figure 11. Top view

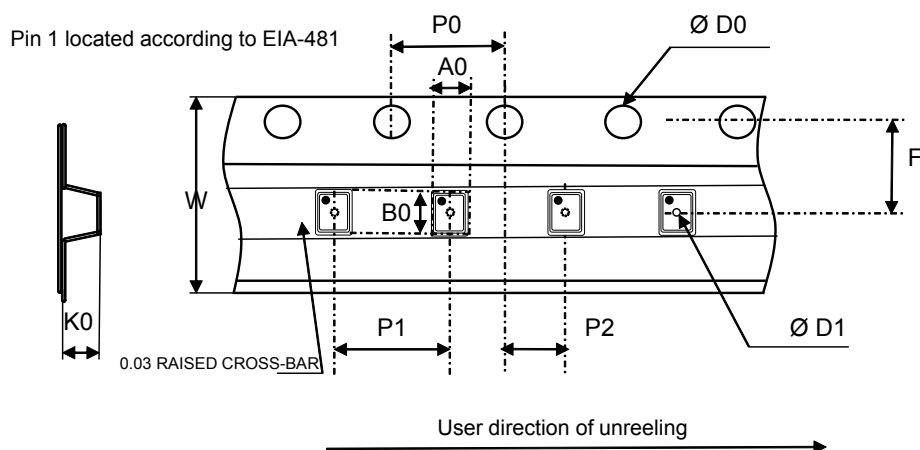
Top view (pads down)



More packing information is available in the application note:

- AN2348 Flip-Chip: "Package description and recommendations for use"

Figure 12. Tape and reel outline



Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

Table 5. Tape and reel mechanical data

Ref	Dimensions		
	Millimeters		
	Min	Typ	Max
A0	1.04	1.09	1.14
B0	1.64	1.69	1.74
K0	0.47	0.52	0.57
P1	3.9	4.0	4.1
P0	3.9	4.0	4.1
Ø D0	1.4	1.5	1.6
Ø D1	0.35	0.40	0.45
F	3.45	3.50	3.55
P2	1.95	2.00	2.05
W	7.9	8.0	8.3

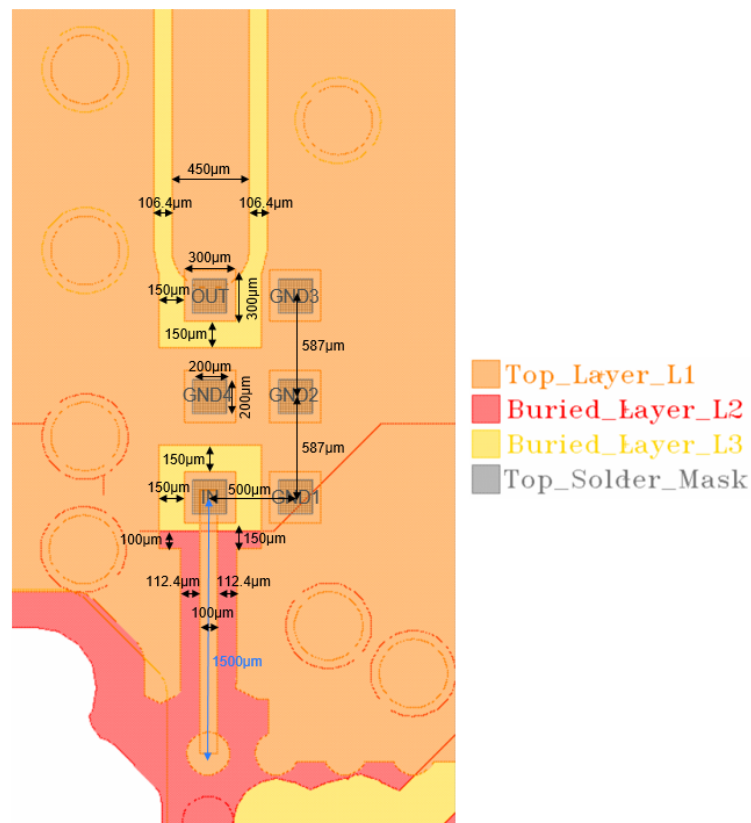
Table 6. Pad description top view (pads down)

Pad ref	Pad name	Description
A1	OUT	Antenna
A2	GND4	Ground
A3	IN	STM32WB55 RF out
B1	GND3	Ground
B2	GND2	Ground
B3	GND1	Ground

3 Recommendation on PCB assembly

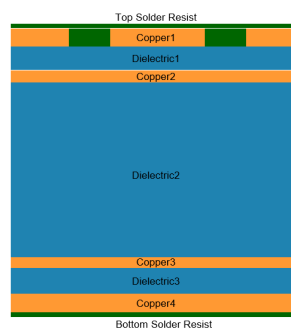
3.1 Land pattern

Figure 13. PCB land pattern recommendations



Transmission line between MLPF and antenna is dimensioned to 50 ohms characteristic impedance.
Transmission line between STM32 and MLPF is dimensioned to 56 ohms characteristic impedance.
Theses transmission line characteristics impedances have to be followed as close as possible.
Moreover, lines physical dimensions will have to be tuned according to specific PCB stack up if different from the one presented in datasheet to keep expected characteristic impedance values.

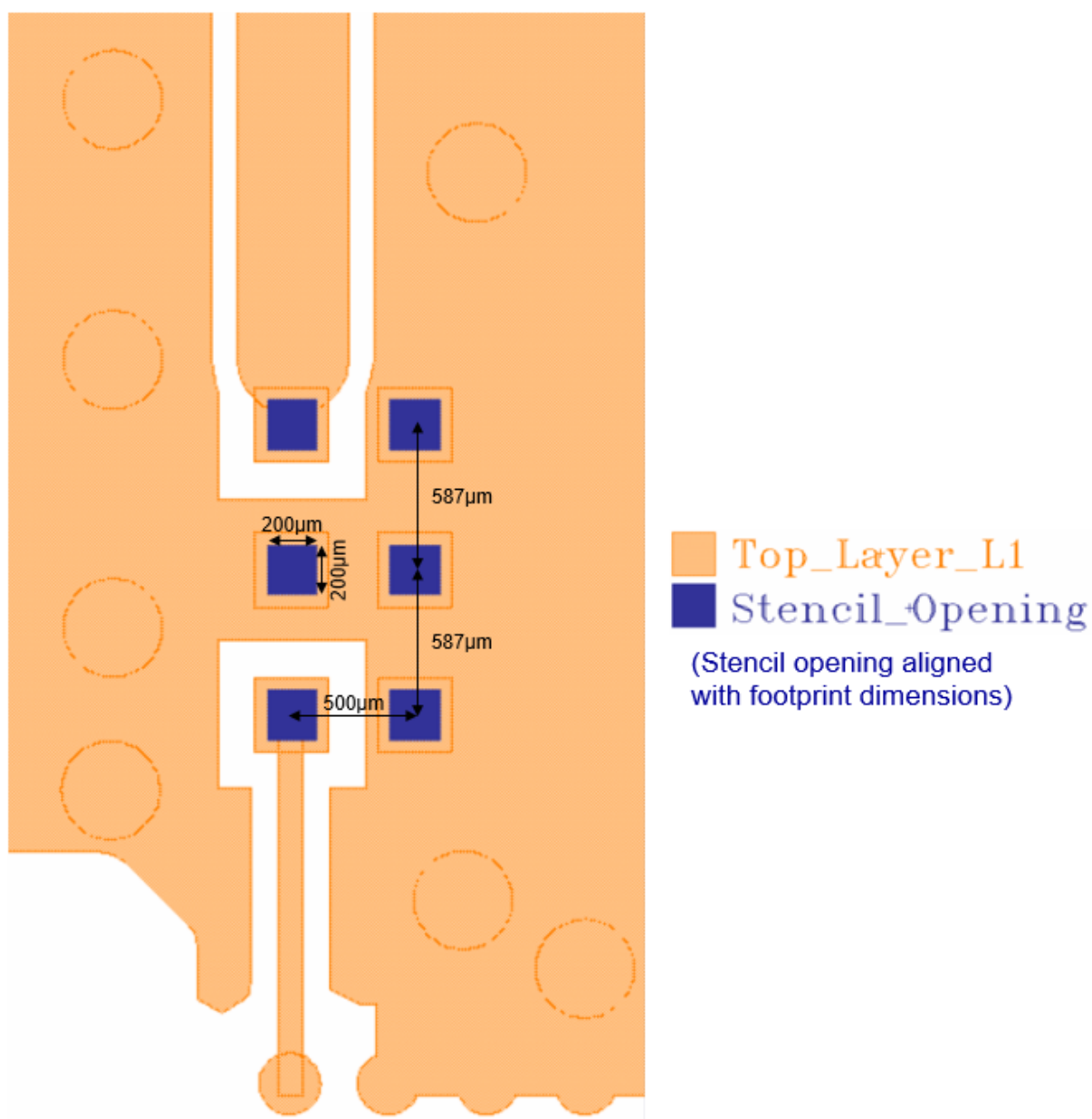
Figure 14. PCB stack-up recommendations



Material	Thickness	Dielectric constant
Copper1	62 μm	
Dielectric1	82 μm	3.69
Copper2	41 μm	
Dielectric2	1180 μm	3.69
Copper3	42 μm	
Dielectric3	87 μm	3.69
Copper4	66 μm	

3.2 Stencil opening design

Figure 15. Stencil opening recommendations



3.3 Solder paste

1. 100 µm solder stencil thickness is recommended to be drunk
2. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
3. “No clean” solder paste is recommended.
4. Offers a high tack force to resist component movement during PCB movement.
5. Solder paste with fine particles: powder particle size is 20-45 µm.

3.4 Placement

1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering
3. Standard tolerance of ± 0.05 mm is recommended.
4. 1.0 N placement force is recommended. Too much placement force can lead to squeezed out solder paste and cause solder joints to short. Too low placement force can lead to insufficient contact between package and solder paste that could cause open solder joints or badly centered packages.
5. To improve the package placement accuracy, a bottom side optical control should be performed with a high resolution tool.
6. For assembly, a perfect supporting of the PCB (all the more on flexible PCB) is recommended during solder paste printing, pick and place and reflow soldering by using optimized tools.

3.5 PCB design preference

1. To control the solder paste amount, the closed via is recommended instead of open vias.
2. The position of tracks and open vias in the solder area should be well balanced. A symmetrical layout is recommended, to avoid any tilt phenomena caused by asymmetrical solder paste due to solder flow away.

4 Ordering information

Figure 16. Ordering information scheme



Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
MLPF-WB55-02E3	TT	CSP Bumpless	1.546 mg	5000	Tape and reel (7")

Revision history

Table 8. Document revision history

Date	Revision	Changes
28-Nov-2019	1	Initial release.
14-Jan-2020	2	Updated Section Cover image .
25-Nov-2022	3	Updated Section 3.1 Land pattern .

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2022 STMicroelectronics – All rights reserved