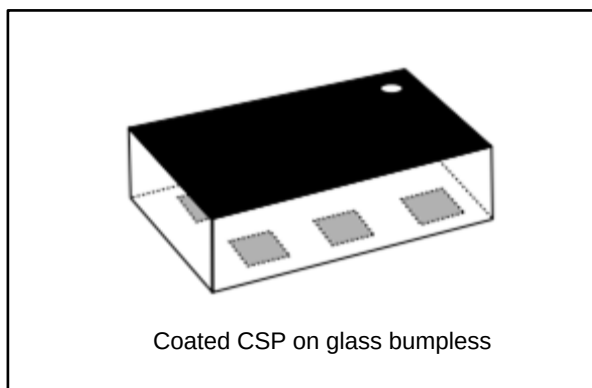


50 ohms / matched to ATSAMR21E18 balun transformer, with integrated harmonic filter

Datasheet - production data



Description

The BALF-ATM-01E3 from STMicroelectronics is an integrated balun, which also integrates a matching network in a monolithic glass substrate. Matching impedance has been customized for the ATMEL chip. The device uses STMicroelectronics' IPD technology on a non-conductive glass substrate to optimize RF performance.

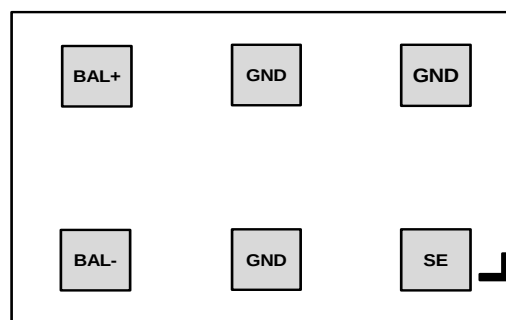
Features

- 2.4 – 2.5 GHz balun with integrated matching network
- Matching optimized for following chipsets: ATSAMR21E18
- Low insertion loss
- Low amplitude imbalance
- Low phase imbalance
- Coated CSP on glass bumpless
- Small footprint 2.5 mm²

Benefits

- Very low profile
- High RF performance
- PCB space saving versus discrete solution
- BOM count reduction
- Efficient manufacturability

Figure 1: Pin configuration (pad view)



PAD VIEW

1 Characteristics

Table 1: Absolute maximum ratings (limiting values)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
P _{IN}	Input power RF _{IN}		-	4	dBm
V _{ESD}	ESD ratings MIL STD883C (HBM: C = 100 pF, R = 1.5 Ω, air discharge)	2000	-		V
	ESD ratings machine model (MM: C = 200 pF, R = 25 Ω, L = 500 nH)	500	-		
T _{OP}	Operating temperature	-40	-	+105	°C

Table 2: Electrical characteristics (T_{amb} = 25 °C)

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
Z _{OUT}	Nominal differential output impedance	Conjugate match to ATSAMR21E18			Ω
Z _{IN}	Nominal input impedance		50		Ω
f	Frequency range (bandwidth)	2400		2500	MHz
I _L	Insertion loss at 2.45 GHz		0.91	1.3	dB
R _L	Single ended side at 2.45 GHz	15	26.3		dB
R _L	Differential side at 2.45 GHz	15	26.1		dB
φ _{imb}	Phase imbalance at 2.45 GHz	-9	0	9	°
A _{imb}	Amplitude imbalance at 2.45 GHz	-0.4	0	0.4	dB
H ₂	Harmonic 2 attenuation at 4.9 GHz	20	35		dB
H ₃	Harmonic 3 attenuation at 7.35 GHz	20	25		dB

1.1 RF measurement

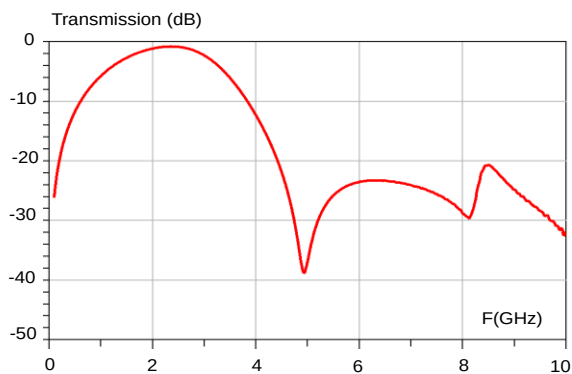
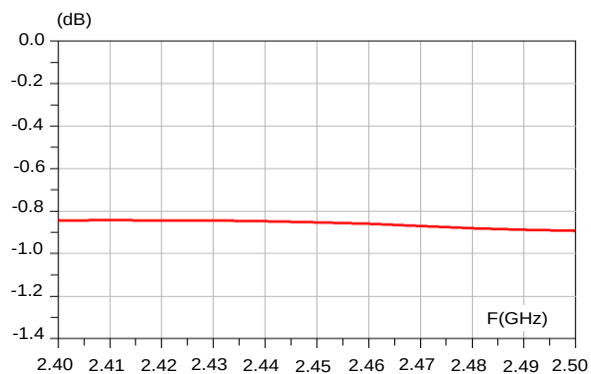
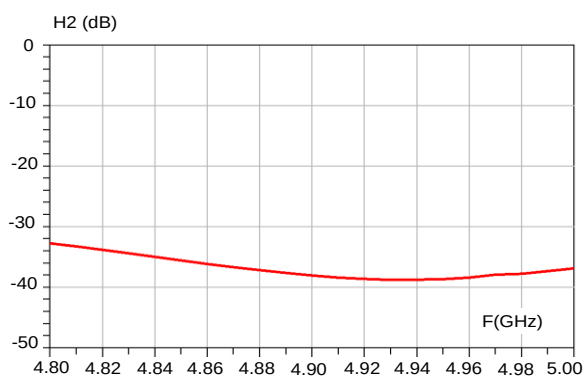
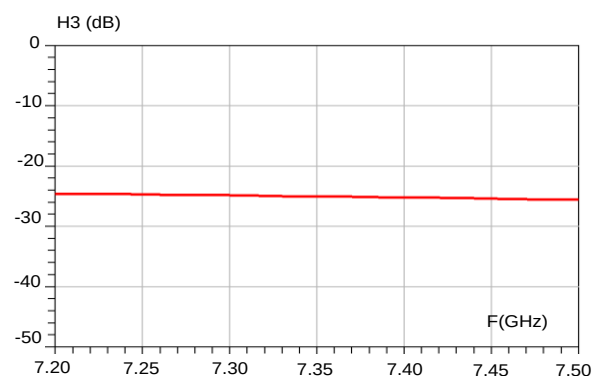
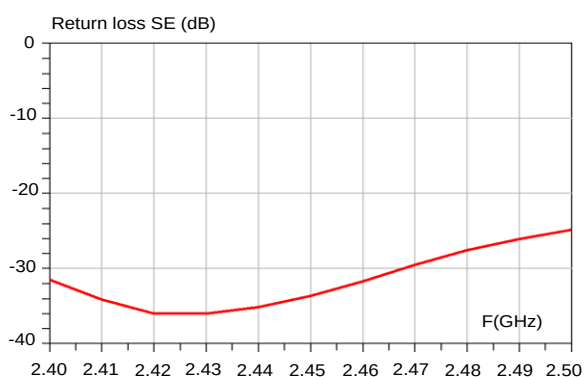
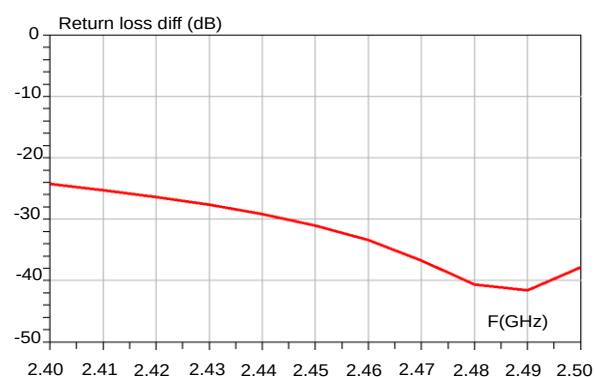
Figure 2: Transmission (dB)**Figure 3: Insertion loss (dB)****Figure 4: H2 attenuation (dB)****Figure 5: H3 attenuation (dB)****Figure 6: Return Loss SE (dB)****Figure 7: Return Loss diff (dB)**

Figure 8: Amplitude imbalance (dB)

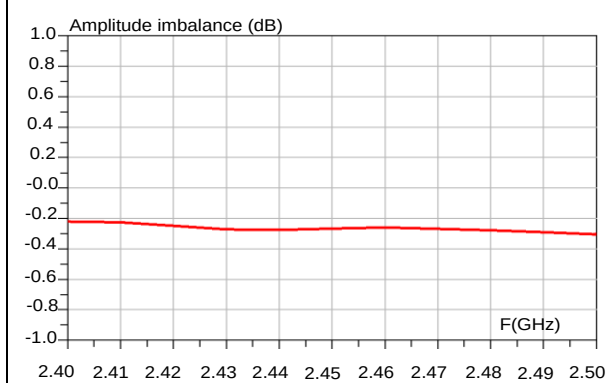
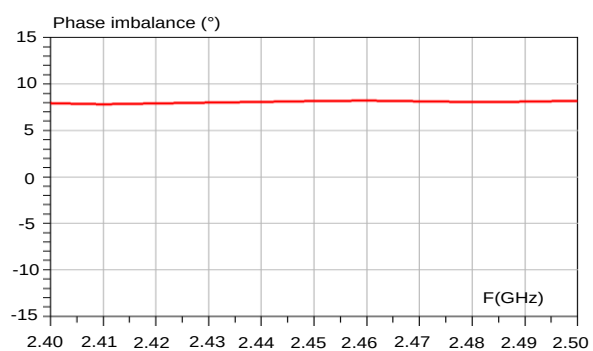
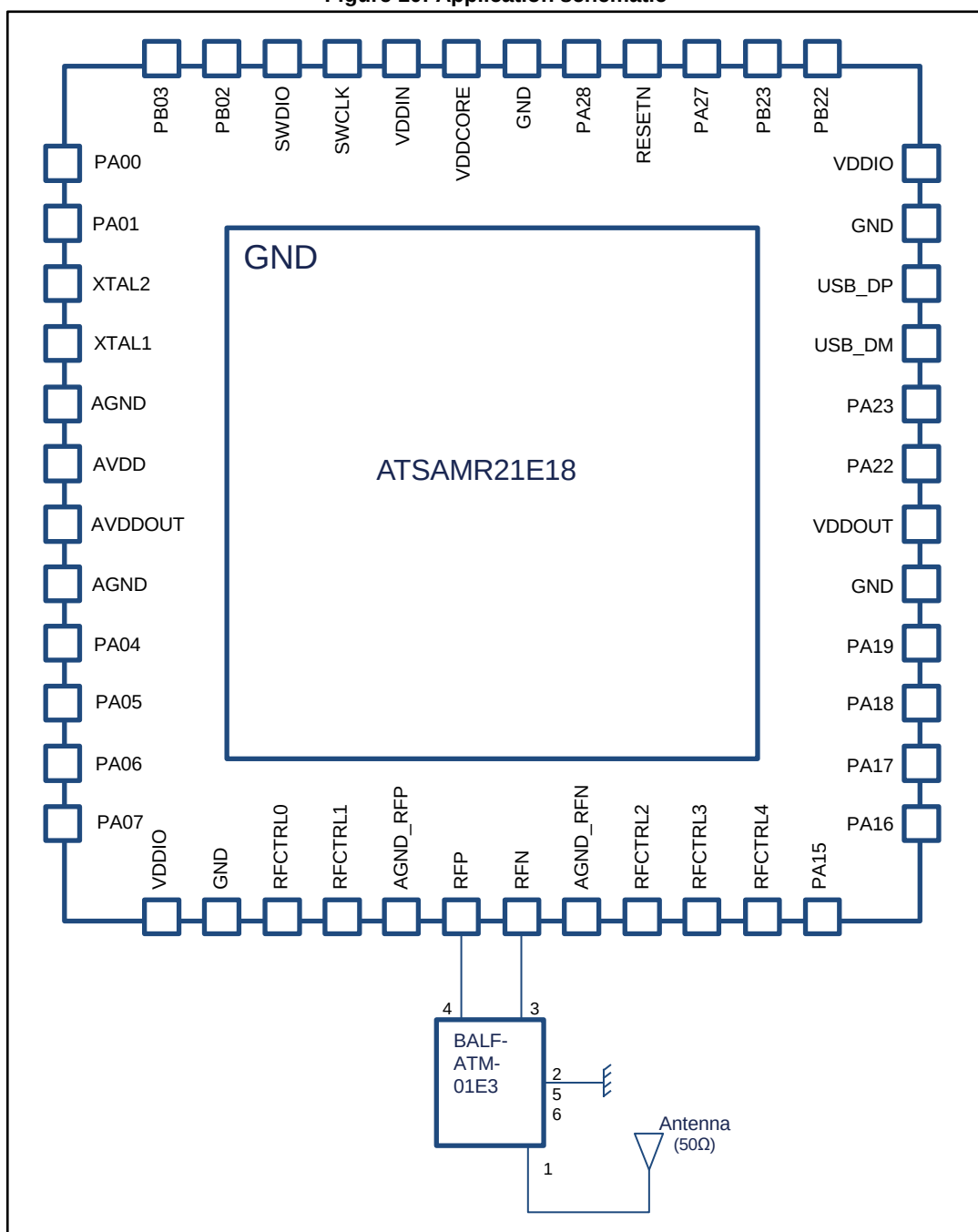


Figure 9: Phase imbalance (°)



2 Application schematic

Figure 10: Application schematic



3 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.

3.1 Coated CSP on glass bumpless package information

Figure 11: Coated CSP on glass bumpless package outline

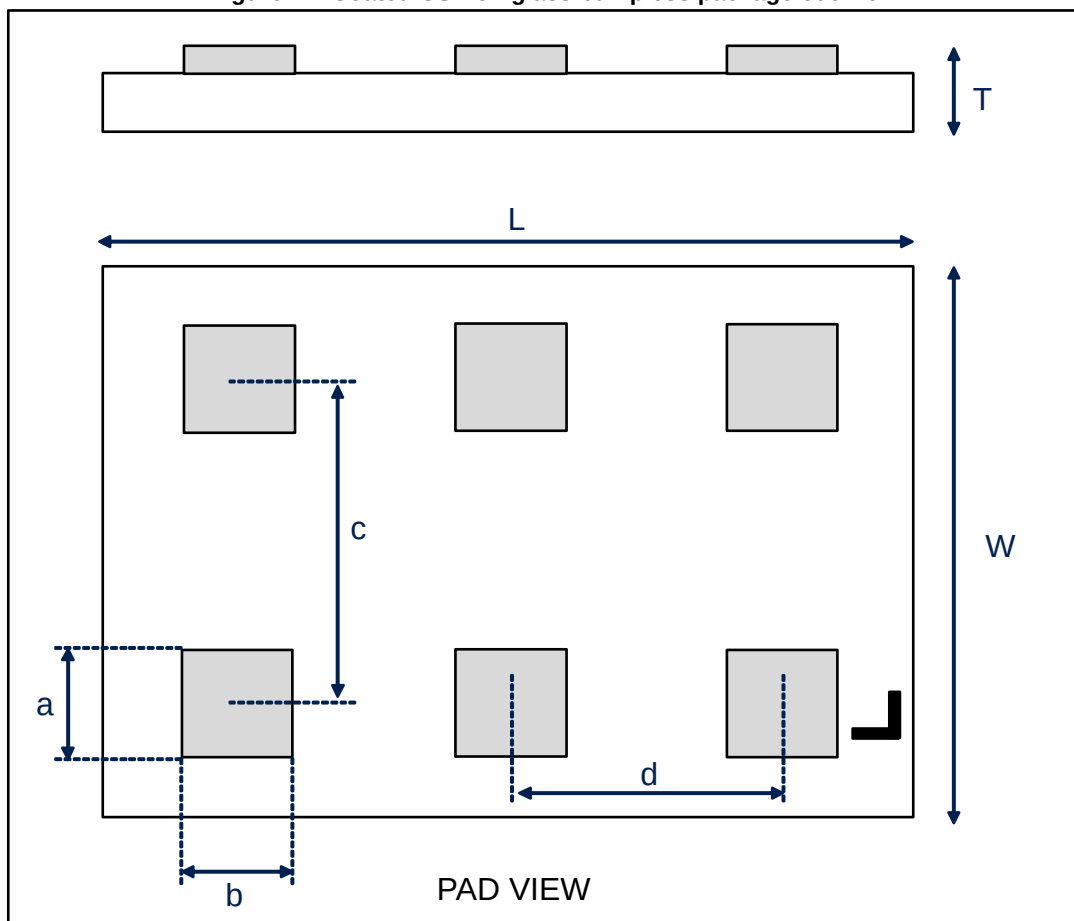


Table 3: Coated CSP on glass bumpless dimensions

Parameter	Dimensions (in mm)		
	Min.	Typ.	Max.
L	1.900	2.000	2.100
W	1.150	1.250	1.350
T	0.395	0.425	0.455
a		0.200	
b		0.200	
c		0.884	
d		0.650	

Figure 12: Recommended balun land pattern

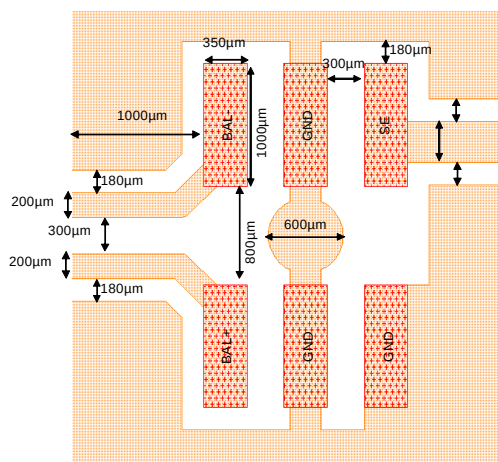


Figure 13: PCB stackup

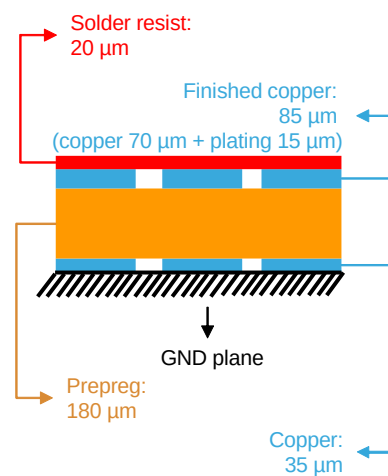


Figure 14: Marking

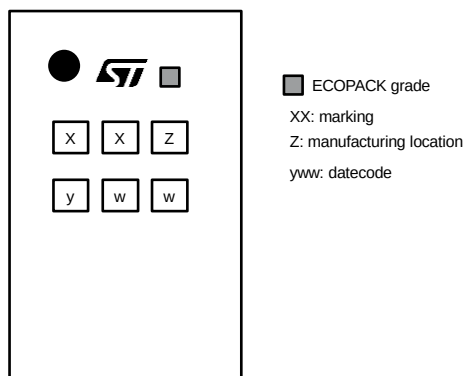


Figure 15: Pad bottom view

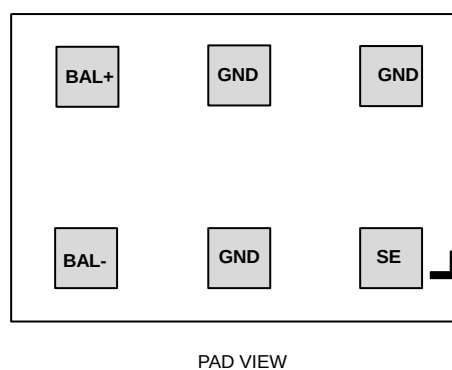


Table 4: Pin description

Pad#	Name	Description
1	SE	Single ended antenna connection
2, 5, 6	GND	Ground connection
3	BAL-	Balun differential negative pin
4	BAL+	Balun differential positive pin

3.2 Coated CSP on glass bumpless packing information

Figure 16: Tape mechanical data

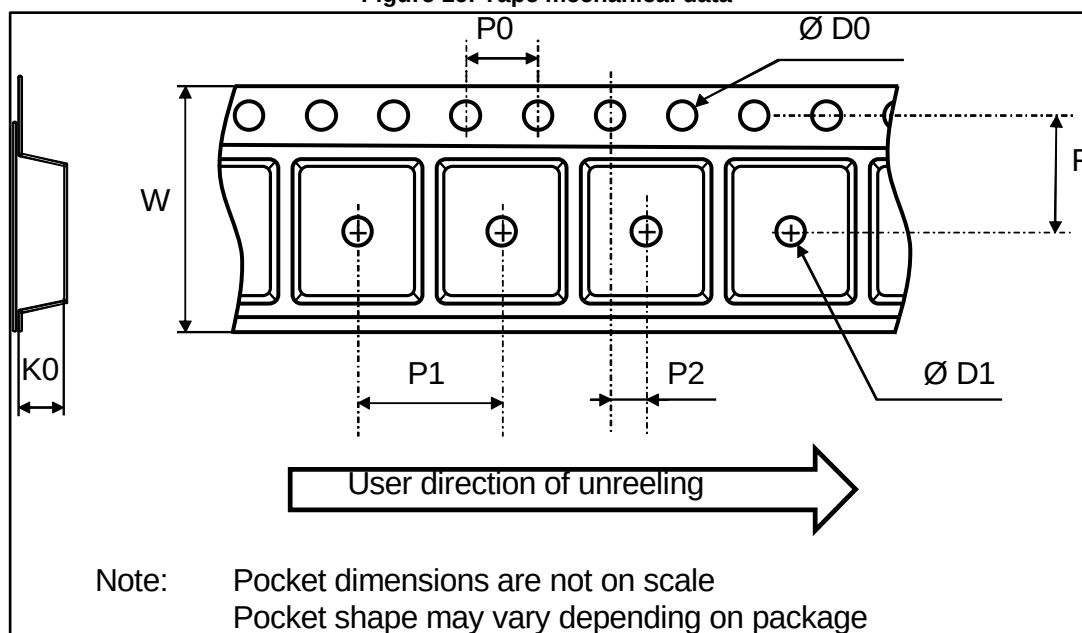
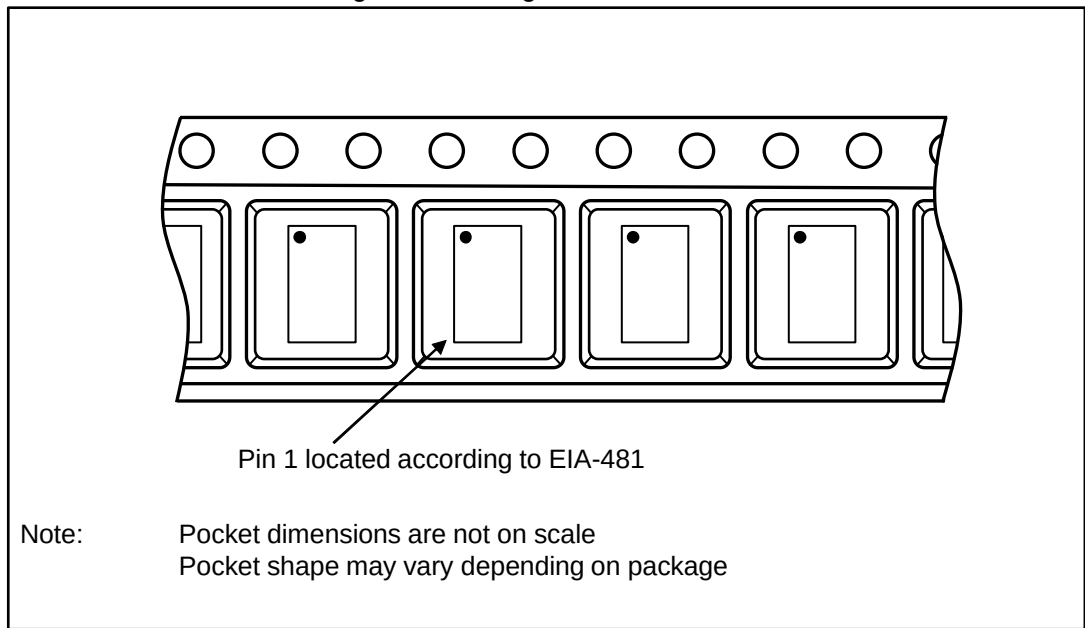


Table 5: Tape dimension definitions

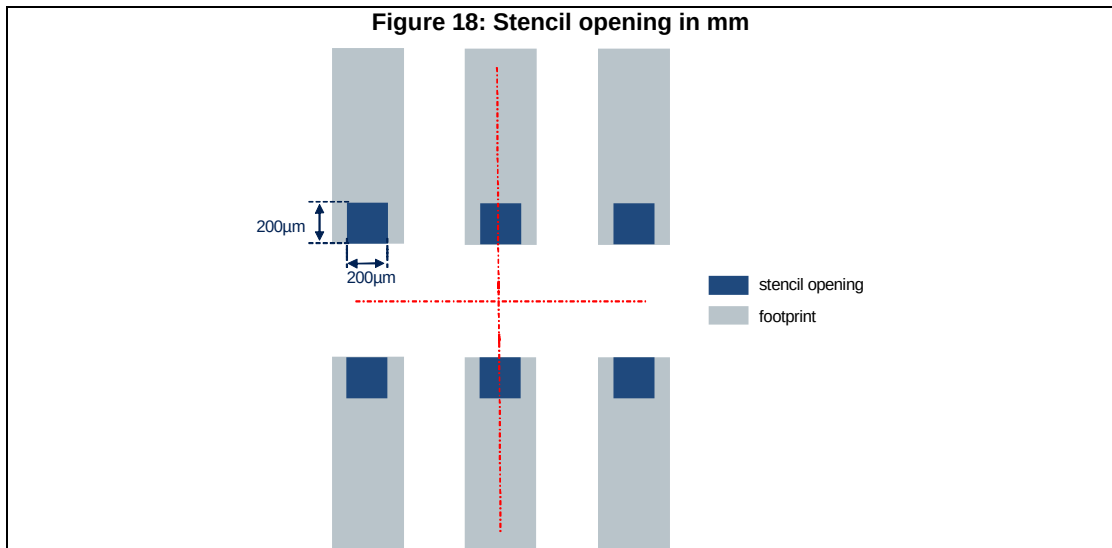
Ref.	Dimensions (in mm)		
	Min.	Typ.	Max.
P1	3.90	4.00	4.10
P0	3.90	4.00	4.10
D0	1.40	1.50	1.60
D1	0.35	0.40	0.45
F	3.45	3.50	3.55
K0	0.47	0.52	0.57
P2	1.95	2.00	2.05
W	7.90	8.00	8.30

Figure 17: Package orientation in reel



3.3 Stencil opening design

Figure 18: Stencil opening in mm



3.4 Solder paste

1. 100 μm Solder stencil thickness is recommended
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 high speed.
5. Solder paste with fine particles: powder particle size is 20-45 μm.

3.5 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. 3.5 N placement force is recommended. Too much placement force can lead to squeeze 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.

4 Ordering information

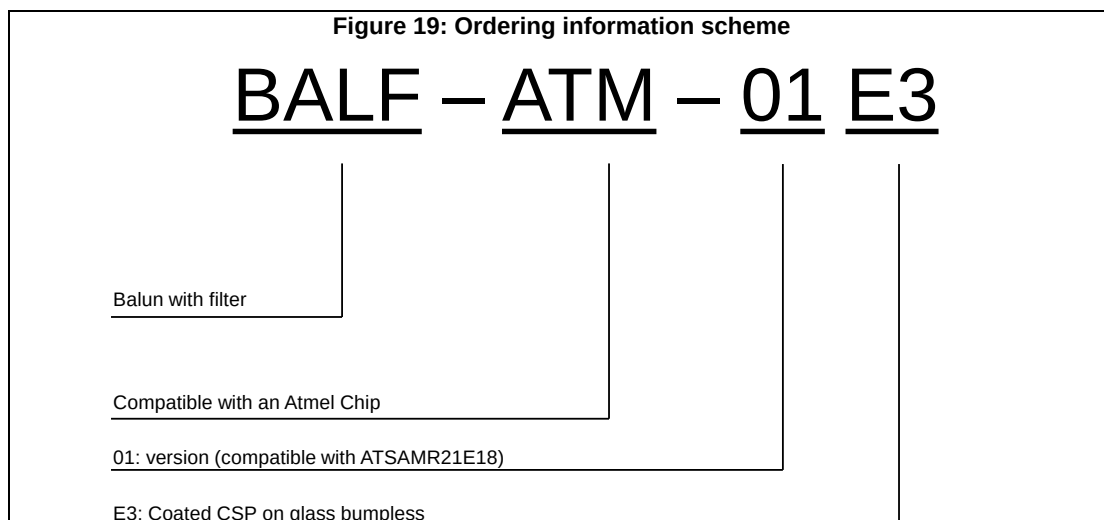


Table 6: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BALF-ATM-01E3	TJ	Coated CSP on glass bumpless	2.28 mg	5000	Tape and reel (7")

5 Revision history

Table 7: Document revision history

Date	Revision	Changes
07-Jun-2017	1	Initial release.

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