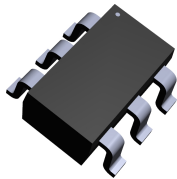
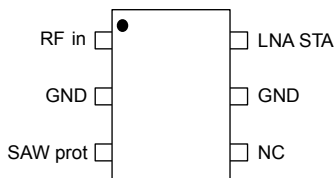


## STA8089 / STA8090 LNA impedance matching with ESD protection in SOT23



SOT23-6L



NC: pin internally not connected and not to be connected on PCB

Product status link

[BPF8089-01SC6](#)

### Features

- Companion chip of STA8089 and STA8090 (GNSS receiver)
- Compatible with GPS / Galileo / GLONASS / BeiDou / QZSS
- Designed to match STA8089 and STA8090 LNA to 50  $\Omega$
- Protection of LNA input against ESD on antenna connector
- Lead finishing: NiPdAu

### Complies with the following standards

- RoHS device
- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002
- IPC7531 footprint and JEDEC registered package
- MIL STD 883C, C = 100 pF – R = 1.5 k $\Omega$ :
  - 2 kV
- IEC 61000-4-2, C = 150 pF, R = 330  $\Omega$ , level 4:
  - 8 kV (contact discharge)
  - 15 kV (air discharge)

### Applications

- Portable systems such as GPS / Galileo / GLONASS / BeiDou / QZSS receivers.

### Description

To be used in GNSS receiver, the **BPF8089-01SC6** is an integrated RF front-end with input impedance matching circuit to be located between STA8089 and STA8090 low noise amplifier input and the antenna. It embeds a matching network associated with an ESD protection to protect STA8089 and STA8090 LNA input according to EOS and ESD standards.

Part of the ASIP product range, this device is packaged in a SOT23-6L and compatible with automatic optical inspection.

# 1 Characteristics

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

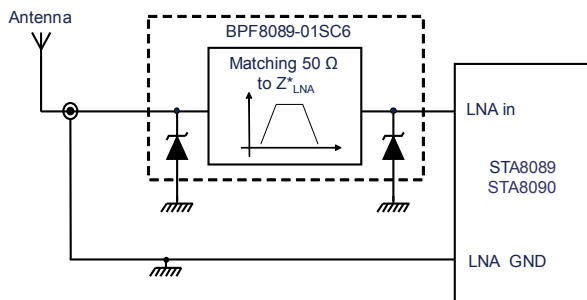
Symbol	Parameter		Value	Unit
$P_{IN}$	RF input power		0	dBm
$V_{PP}$	Peak pulse voltage	IEC 61000-4-2 (C = 150 pF, R = 330 $\Omega$ )		kV
		Contact discharge	8	
		Air discharge	15	
		MIL STD 883C (C = 100pF, R = 1.5k $\Omega$ )	2	
$V_{DC}$	DC input voltage		0 to +3.3	V
$T_j$	Operating junction temperature range		-55 to +125	$^{\circ}\text{C}$
$T_L$	Maximum lead temperature for soldering during 10 s		260	$^{\circ}\text{C}$

**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , refer to recommended land pattern)**

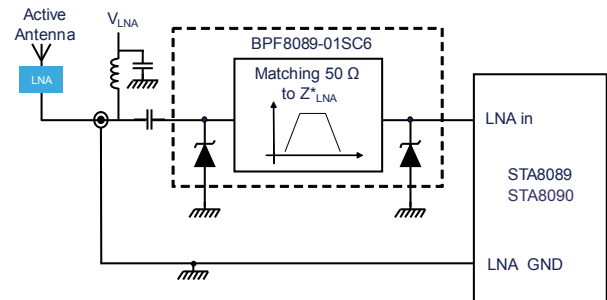
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$Z_{OUT}$	Output impedance on LNA STA side		Conjugate match to STA8089 and STA8090 LNA $I_N$			$\Omega$
$Z_{IN}$	Input impedance on antenna side			50		$\Omega$
F	Frequency range (bandwidth)	Antenna pin loaded with $Z_{IN}$ and LNA STA pin loaded with $Z_{OUT}$	1559		1610	MHz
$I_L$	Insertion loss in bandwidth			2.4	5	dB
$R_{L\ OUT}$	Output return loss in bandwidth		13			dB
$R_{L\ IN}$	Input return loss in bandwidth		13			dB

## 1.1 Characteristics (curves)

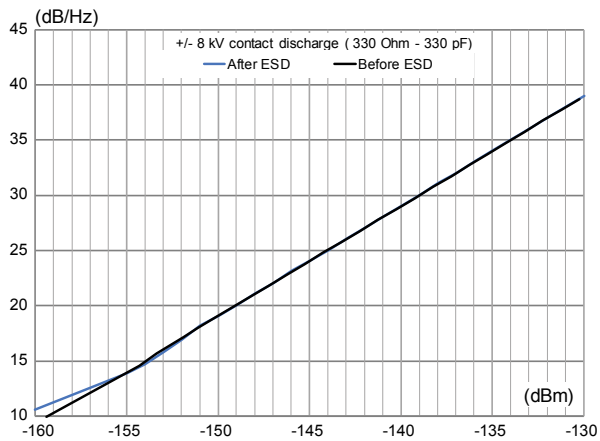
**Figure 1. Solution for passive antenna**



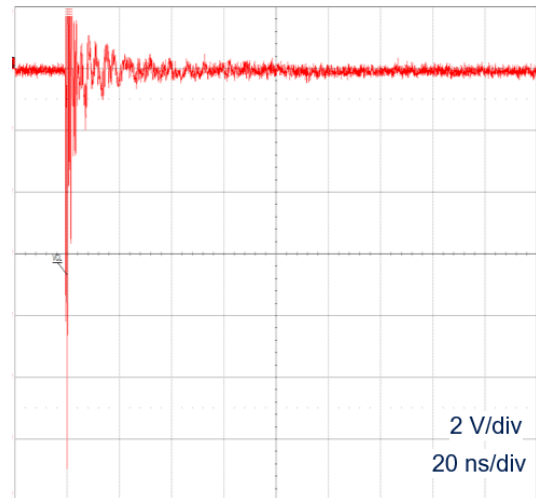
**Figure 2. Solution for active antenna**



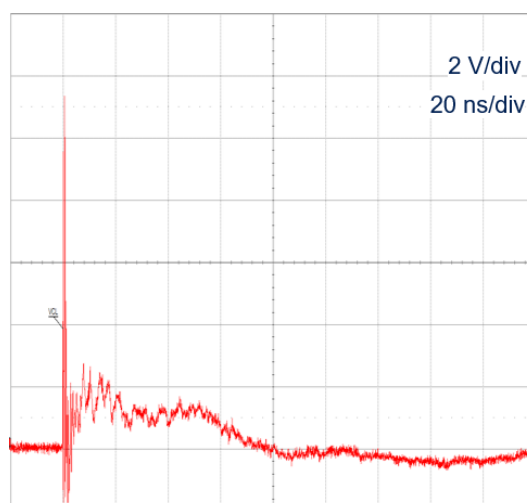
**Figure 3. C/N0 before and after ESD test**



**Figure 4. Response to IEC 61000-4-2 (C = 150 pF, R = 330 Ω, -8 kV contact discharge)**

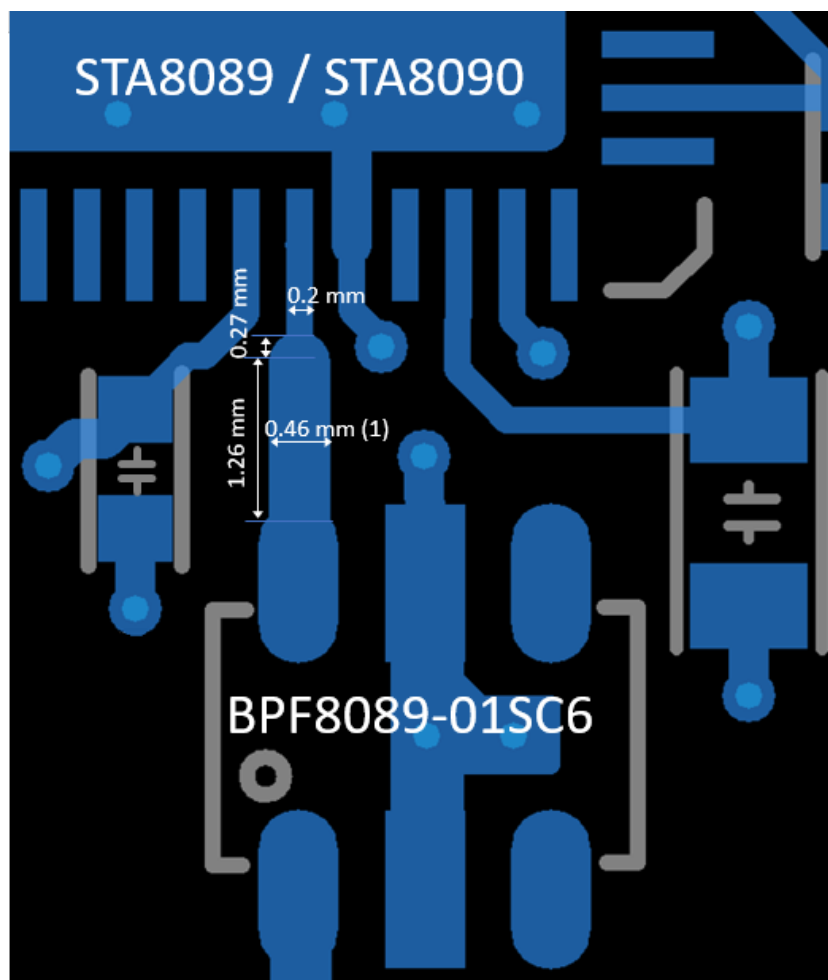


**Figure 5.** Response to IEC 61000-4-2 (C = 150 pF, R = 330  $\Omega$ , +8 kV contact discharge)



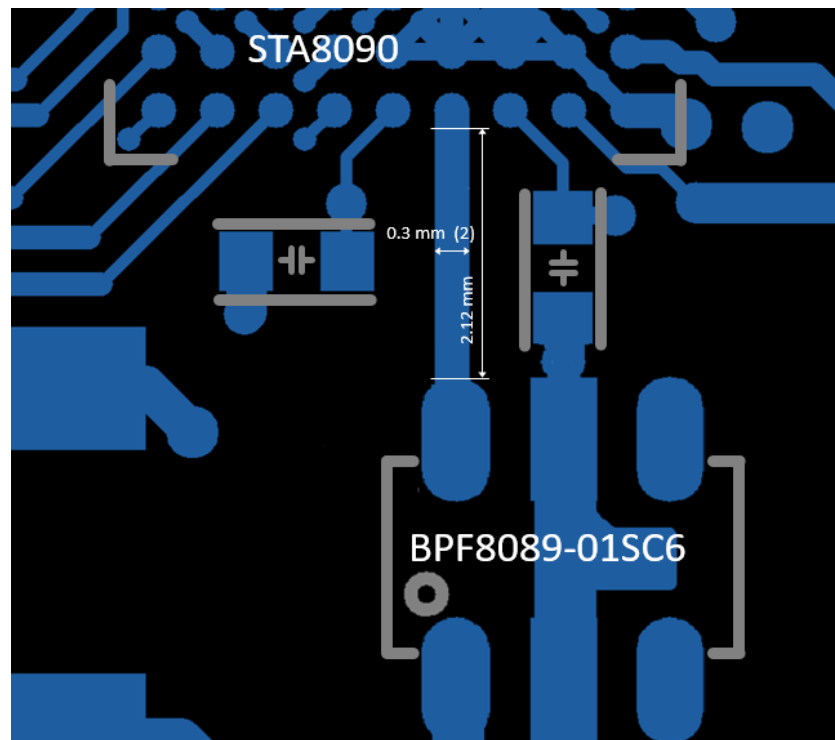
## 2 Recommendation on PCB assembly

**Figure 6.** Recommended layout for STA8089FG, STA8089FGA, STA8089G, STA8089GA, STA8089GAT, STA8090GA and STA8090GAT



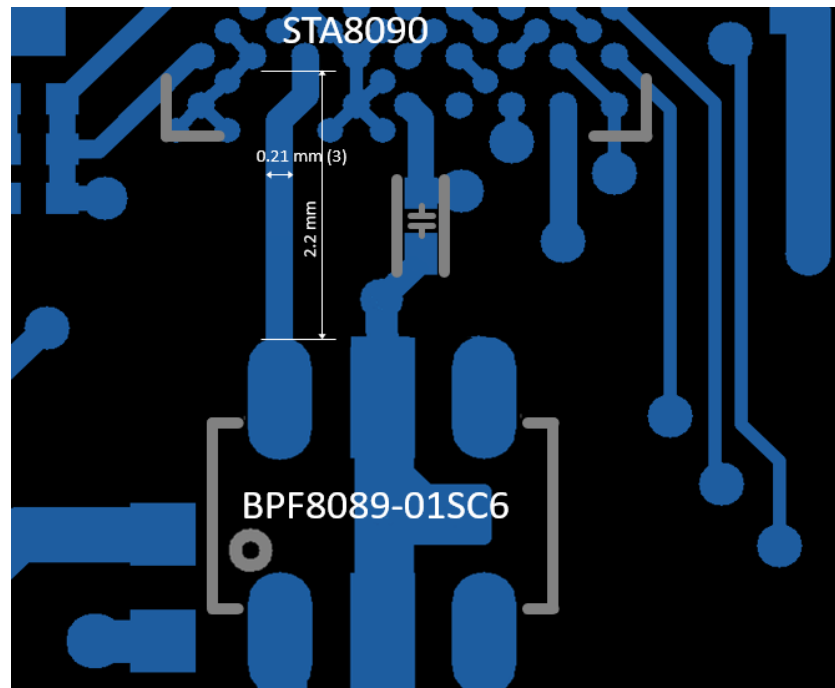
**Note:** See note (1) dimension of 0.46 mm is valid for the stack-up given in Figure 9. For different stack-up, recalculation of the track width must be done to get  $Z_0 = 50 \text{ Ohm}$

**Figure 7. Recommended layout for STA8090FG, STA8090EXG and STA8090EXGA**



**Note:** See note (2) dimension of 0.3 mm is valid for the stack-up given in Figure 9. For different stack-up, recalculation of the track width must be done to get  $Z_0 = 100 \text{ Ohm}$

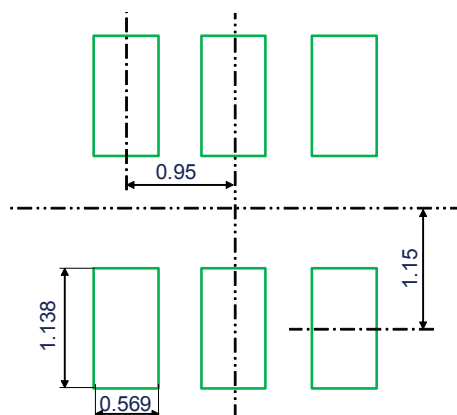
**Figure 8. Recommended layout for STA8090WG and STA8090WGR**



**Note:** See note (3) dimension of 0.21 mm is valid for the stack-up given in Figure 9. For different stack-up, recalculation of the track width must be done to get  $Z_0 = 87 \text{ Ohm}$

**Figure 9. Recommended PCB stack-up**

Top layer	Cu = 35 $\mu\text{m}$	1070 $\mu\text{m}$
FR4 = 254 $\mu\text{m}$	(Er 4.5)	
GND layer	Cu = 17 $\mu\text{m}$	
FR4 = 458 $\mu\text{m}$	(Er 4.5)	
	Cu = 17 $\mu\text{m}$	
FR4 = 254 $\mu\text{m}$	(Er 4.5)	
Bottom layer	Cu = 35 $\mu\text{m}$	

**Figure 10. Recommended stencil opening (mm)**


## 2.1 Solder paste

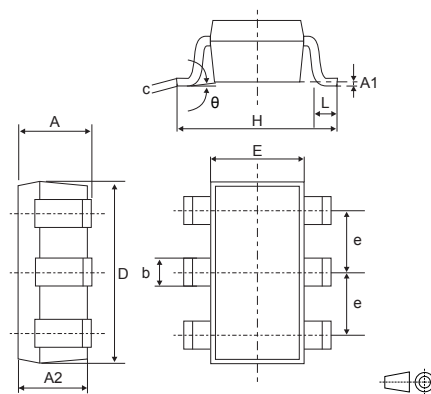
1. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
2. "No clean" solder paste is recommended.
3. Offers a high tack force to resist component movement during high speed.
4. Use solder paste with fine particles: powder particle size is 20-38  $\mu\text{m}$ .

### 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](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 SOT23-6L package information

**Figure 11. SOT23-6L package outline**



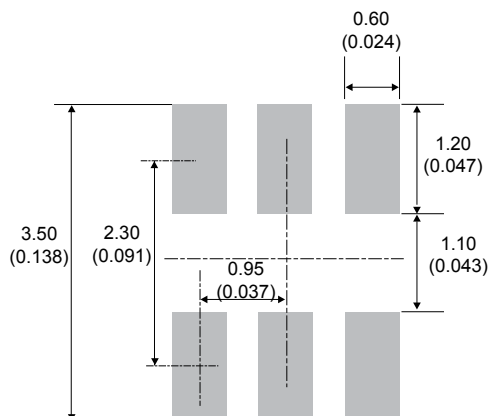
**Table 3. SOT23-6L package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.9		1.45	0.0354		0.0571
A1	0		0.15	0		0.0059
A2	0.9		1.3	0.0354		0.0512
b	0.30		0.5	0.0118		0.0197
c	0.09		0.2	0.0035		0.0079
D	2.8		3.05	0.1102		0.1201
E	1.5		1.75	0.0591		0.0689
e		0.95			0.0374	
H	2.6		3	0.1024		0.1181
L	0.3		0.6	0.0118		0.0236
θ	0		10	0		0.3937

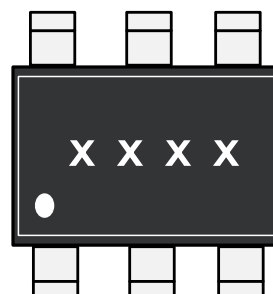
1. Value in inches are converted from mm and rounded to 4 decimal digits



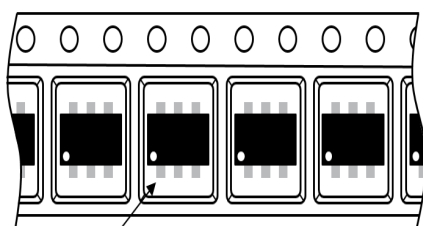
**Figure 12. Footprint recommendations, dimensions in mm (inches)**



**Figure 13. Marking layout (refer to ordering information table for marking)**



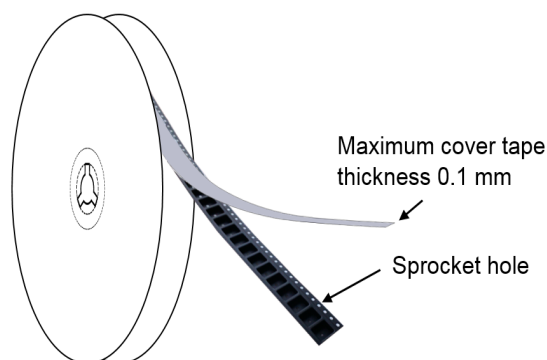
**Figure 14. Package orientation in reel**



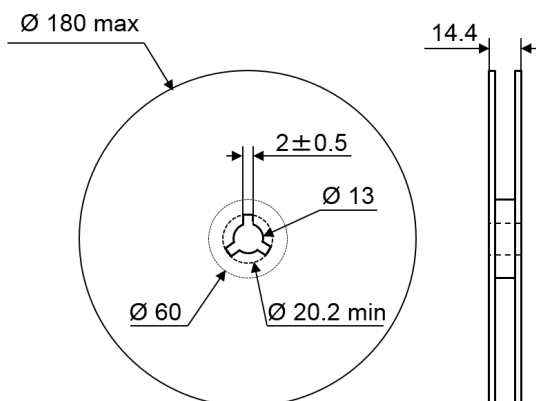
Pin 1 located according to EIA-481

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

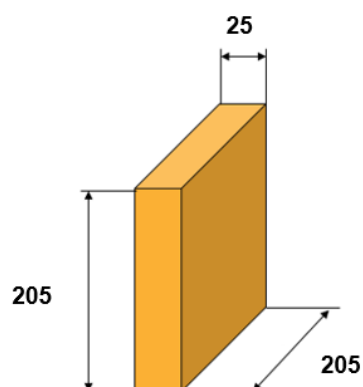
**Figure 15. Tape and reel orientation**



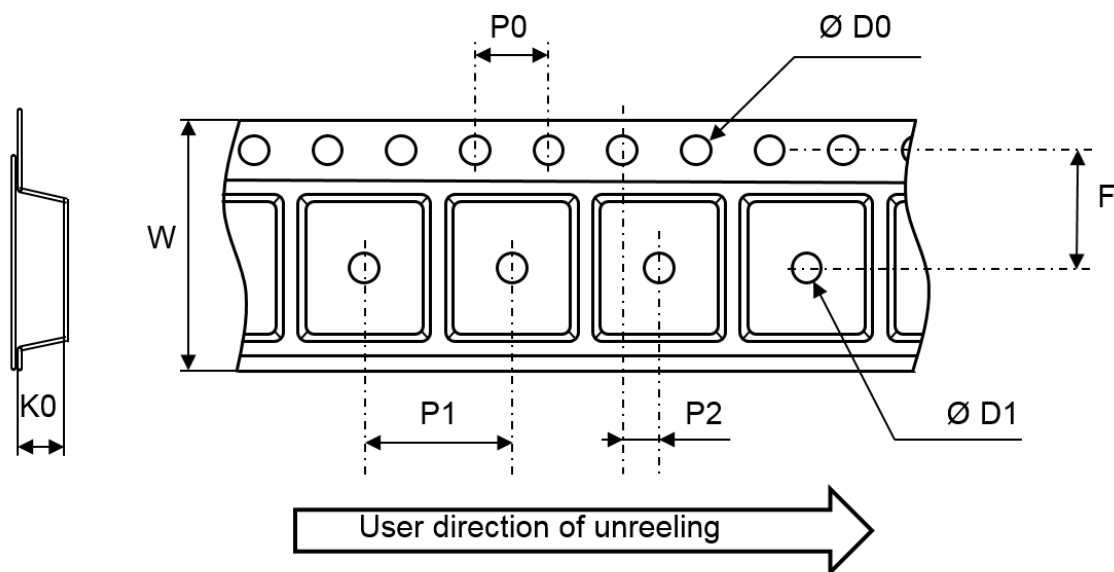
**Figure 16. Reel dimensions (mm)**



**Figure 17. Inner box dimensions (mm)**



**Figure 18. Tape and reel outline**



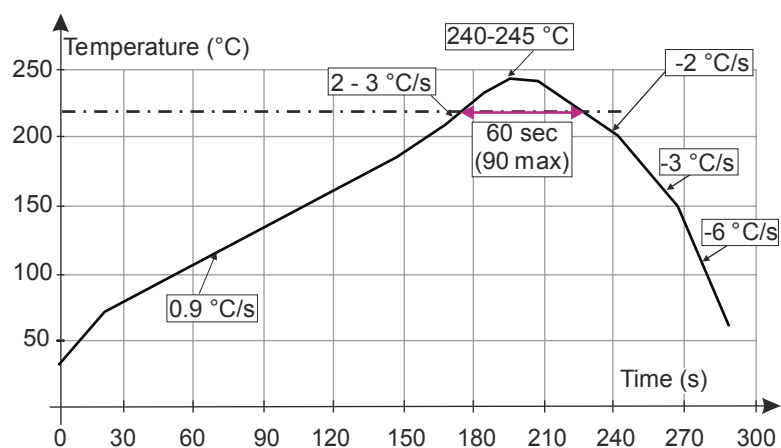
Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package

**Table 4. Tape and reel mechanical data**

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
P1	3.9	4	4.1
P0	3.9	4	4.1
D0	1.45	1.5	1.6
D1	1		
F	3.45	3.5	3.55
K0	1.3	1.4	1.6
P2	1.95	2	2.05
W	7.9	8	8.3

## 3.2 Reflow profile

Figure 19. ST ECOPACK® recommended soldering reflow profile for PCB mounting



*Note:* Minimize air convection currents in the reflow oven to avoid component movement.

*Note:* Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

## 4 Ordering information

**Table 5. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BPF8089-01SC6	B89 <sup>(1)</sup>	SOT23-6L	17.5 mg	3000	Tape and reel

1. The marking can be rotated by 90° to differentiate assembly location

## Revision history

**Table 6. Document revision history**

Date	Version	Changes
24-Sep-2020	1	Initial release.
15-Jul-2021	2	Updated <a href="#">Figure 6</a> , <a href="#">Figure 7</a> and <a href="#">Figure 8</a> .

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