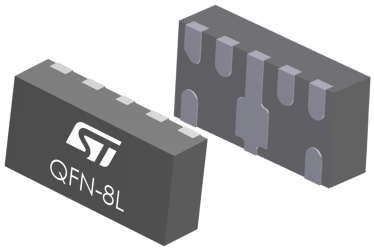
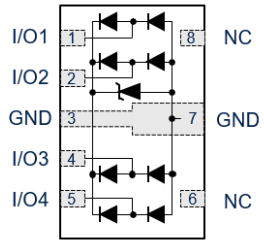
HSP061-4NY8

Datasheet

3 V 4-line high speed port protection in QFN-8L



QFN-8L 2 x 1 x 0.52 mm



NC = internally not connected

Product status link
HSP061-4NY8

Features

- Large bandwidth: 6 GHz
- Low capacitance: 0.5 pF
- Operating junction temperature range: -40 °C to 150 °C
- RoHS compliant and halogen free
- Complies with IEC 61000-4-2, exceeds level 4 :
  - ±8 kV (contact discharge)
  - ±20 kV (air discharge)

Applications

- USB 5Gbps
- USB 10Gbps
- HDMI 2.1
- FPD-Link III
- GMSL
- 1000BASE-T1
- APIX3

Description

The HSP061-4NY8 is a 4-line low capacitance TVS designed to protect high-speed interfaces with differential lines in industrial and consumer applications.

Electro-static discharge (ESD) capability is compliant with system level ESD standard IEC 61000-4-2, and then with the low energy ESD component level standards such as human body model (HBM), and charge device model (CDM).

The large bandwidth is compatible with USB 5Gbps, USB 10Gbps, HDMI 2.1 - 12Gbps, FPD-Link III 4 - 16Gbps, GMSL 3 - 12Gbps, 1000BASE-T1, APIX3 6Gbps.

The device is packaged in a 8-pin QFN of 2 mm x 1.0 mm with a nominal height of 0.52 mm.

1 Characteristics

Table 1. Absolute maximum ratings (T_{amb} = 25 °C)

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	IEC 61000-4-2 Contact discharge Air discharge	 ±8 ±20	kV
I_{PP}	Repetitive peak pulse current (8/20 µs)		3	A
T_{stg}	Storage temperature range		-65 to +150	°C
T_j	Operating junction temperature range		-40 to +150	
T_L	Maximum lead temperature for soldering during 10 s		260	

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

Symbol	Test conditions	Min.	Typ.	Max.	Unit
V_{BR}	Breakdown voltage at 1 mA	6			V
V_{RM}	Stand-off voltage			3	V
I_{RM}	V_{RM} = 3 V			100	nA
V_{CL}	I_{PP} = 1A, 8/20 µs			12	V
V_{CL}	IEC 61000-4-2, +8 kV contact, measured at 30 ns		18		V
$C_{I/O - I/O}$	Capacitance I/O to I/O, $V_{I/O}$ = 0 V, 200 MHz < f < 3000 MHz, V_{OSC} = 30 mV		0.25	0.3	pF
$C_{I/O - GND}$	Capacitance I/O to ground, $V_{I/O}$ = 0 V, 200 MHz < f < 3000 MHz V_{OSC} = 30 mV		0.5	0.6	pF
$\Delta C_{I/O - GND}$	Capacitance variation I/O, $V_{I/O}$ = 0 V, f = 1 MHz, V_{OSC} = 30 mV		0.03	0.05	pF
f_c	Cut-off frequency at - 3dB		6		GHz
Z_{Diff}	t_r = 200 ps (10 - 90%), Z0 Diff = 100 Ω (HDMI specification)	90	100	110	Ω

1.1 Characteristics (curves)

Figure 1. Leakage current versus junction temperature

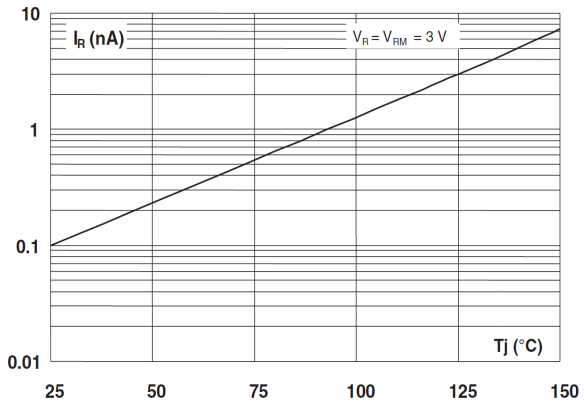


Figure 2. ESD response to IEC 61000-4-2 (+8 kV contact discharge)

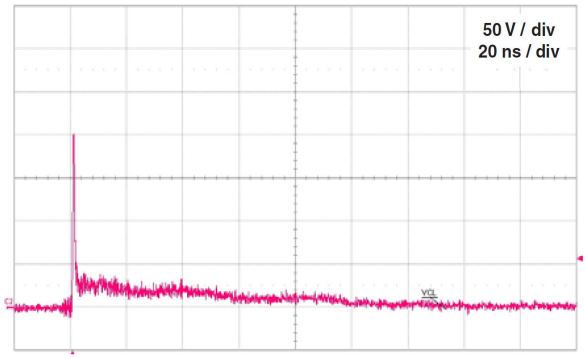


Figure 3. ESD response to IEC 61000-4-2 (-8 kV contact discharge)

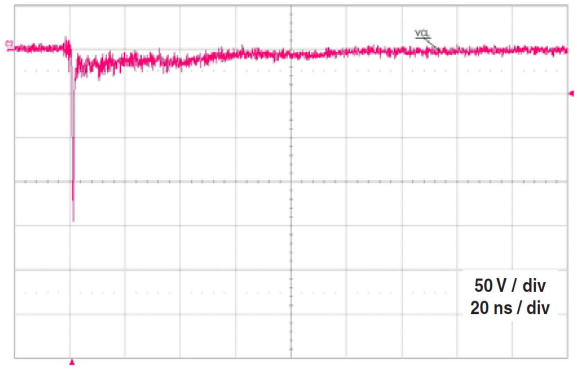


Figure 4. S_{21} attenuation

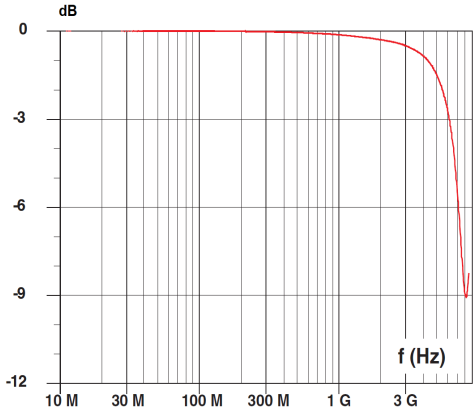


Figure 5. HDMI2.1 - 12 Gbps per channel without device (with worst cable model), 8dB CTLE and 25 mV DFE

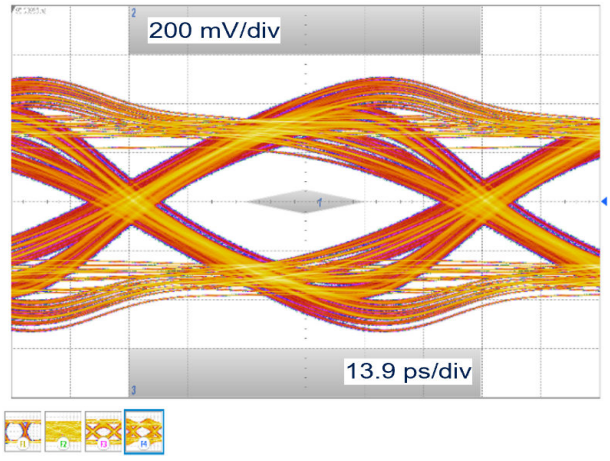


Figure 6. HDMI2.1 - 12 Gbps per channel with device (with worst cable model), 8dB CTLE and 25 mV DFE

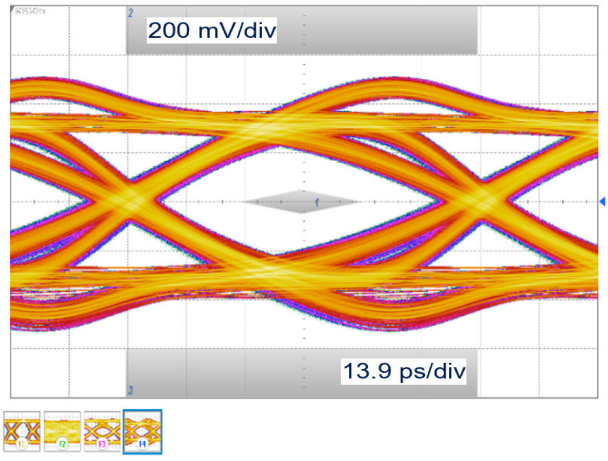


Figure 7. **USB 10 Gbps per channel without device, 0dB CTLE and DFE**

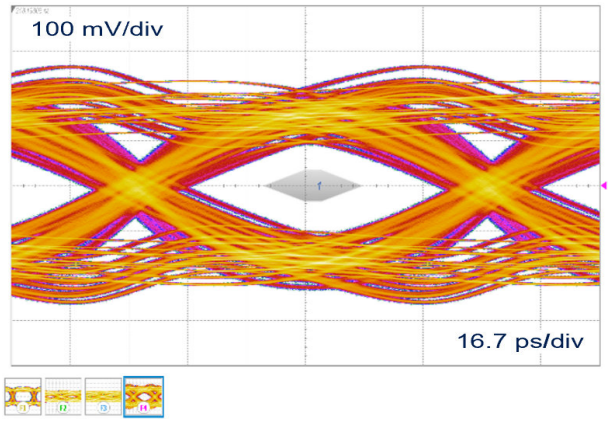


Figure 8. **USB 10 Gbps per channel with device, 0dB CTLE and DFE**

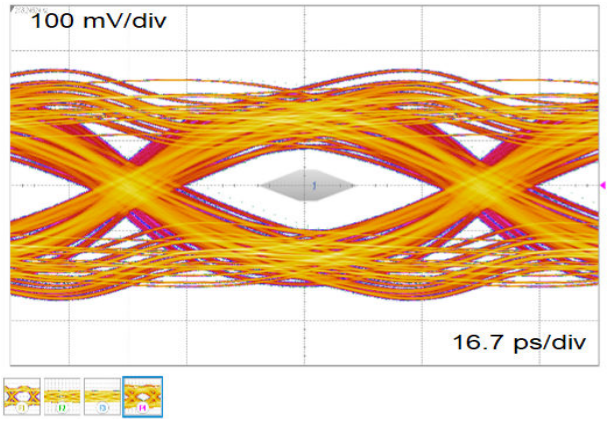
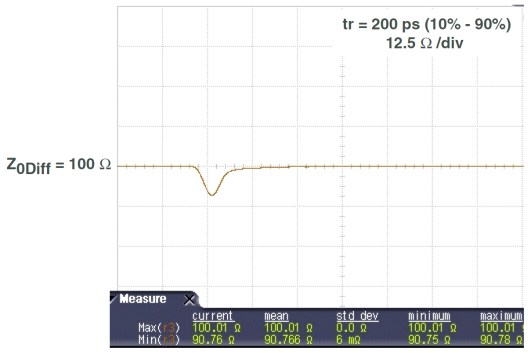


Figure 9. **Differential impedance (Zdiff)**



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 QFN-8L package information

Figure 10. **QFN-8L package outline**

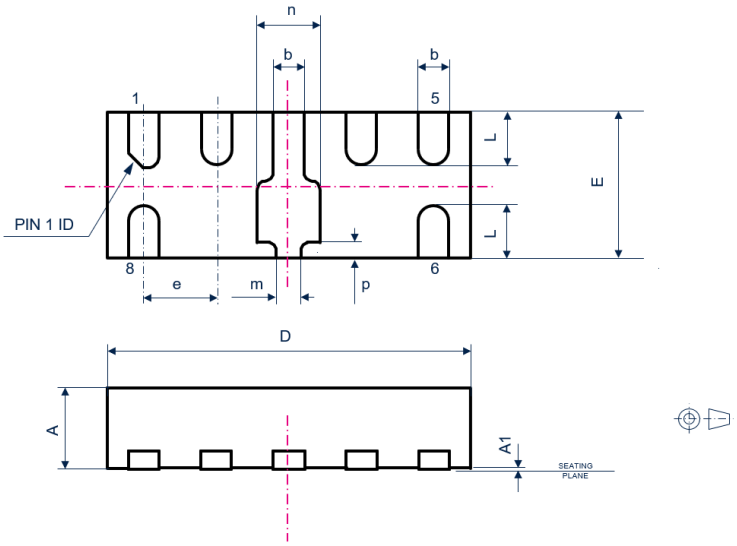


Table 3. **QFN-8L package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches(1)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.45	0.50	0.55	0.0177	0.0197	0.0217
A1	0.00	0.02	0.05	0.0000	0.0008	0.0020
b	0.15	0.20	0.25	0.0059	0.0079	0.0099
D	1.95	2.00	2.05	0.0767	0.0787	0.0808
E	0.95	1.00	1.05	0.0374	0.0394	0.0414
e	0.35	0.40	0.45	0.0137	0.0157	0.0178
L	0.25	0.35	0.45	0.0098	0.0138	0.0178
m		0.15			0.0059	
n		0.40			0.0157	
p		0.11			0.0043	

1. *Values in inches are converted from mm.*

2.2 Packing and marking information

Figure 11. Marking layout (refer to ordering information table for marking)

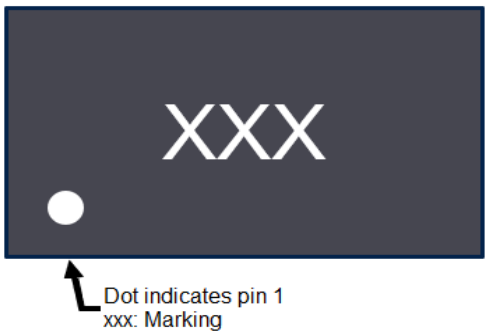
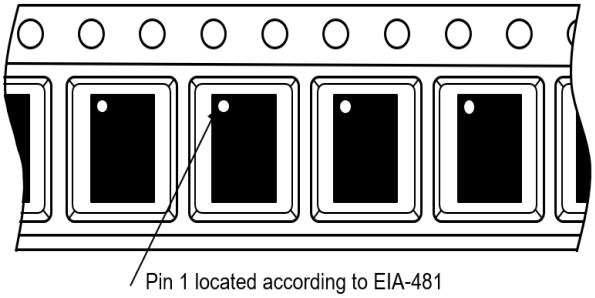


Figure 12. Package orientation in reel



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

Figure 13. Tape leader and trailer dimensions

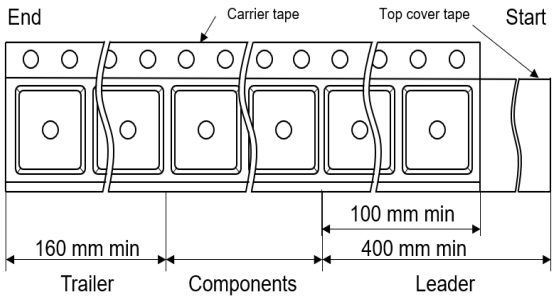


Figure 14. Tape and reel orientation

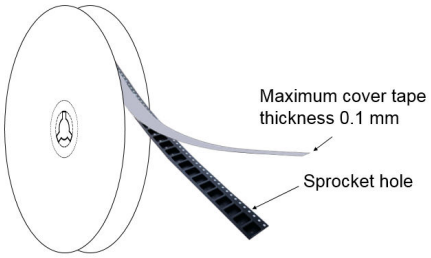


Figure 15. Reel dimensions (mm)

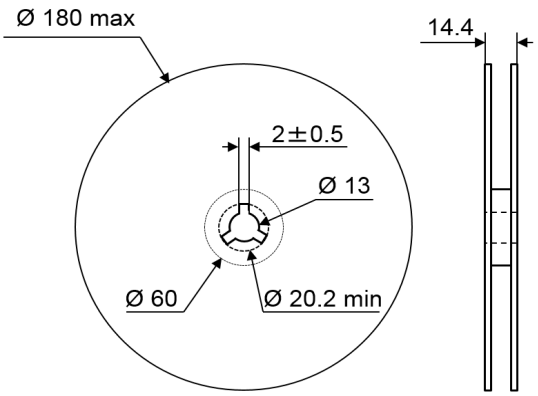


Figure 16. Inner box dimensions (mm)

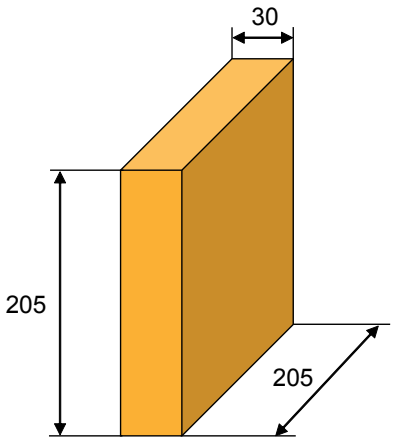
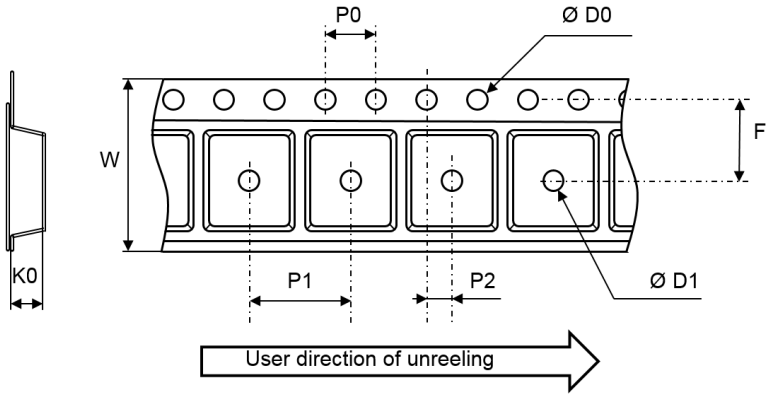


Figure 17. **Tape outline**



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.
∅D0	1.50	1.55	1.60
∅D1	0.8		
F	3.45	3.50	3.55
K0	0.58	0.63	0.68
P0	3.90	4.00	4.10
P1	3.90	4.00	4.10
P2	1.95	2.00	2.05
W	7.70	8.00	8.30

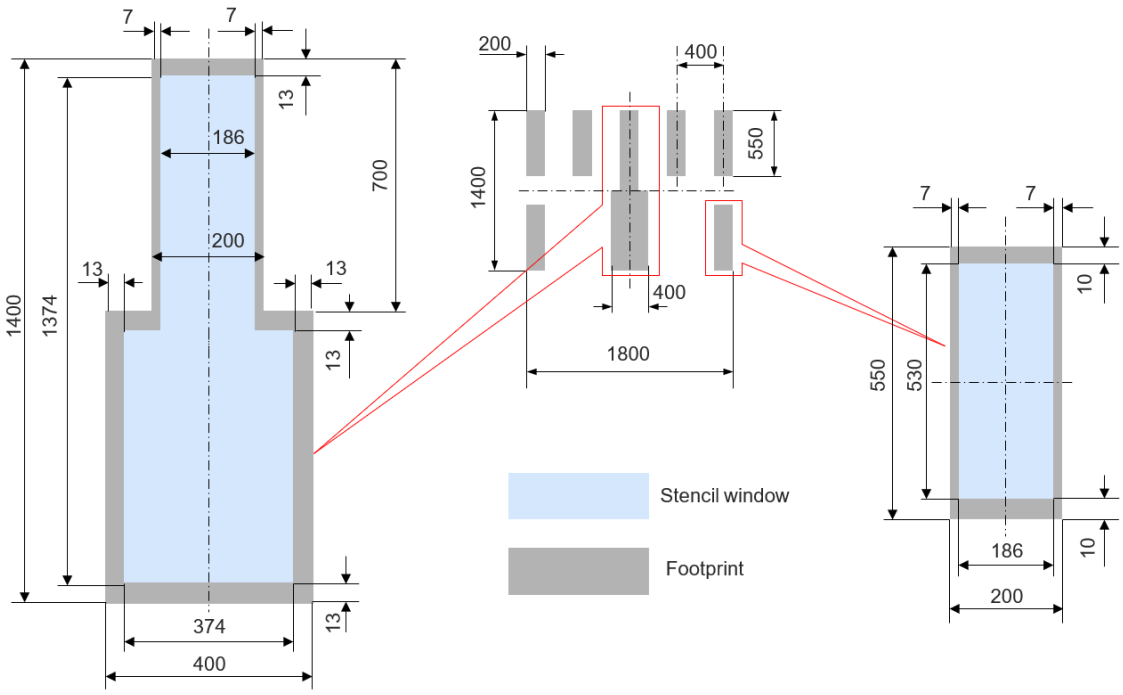
3 Recommendation on PCB assembly

3.1 Recommended footprint and stencil opening

Stencil opening thickness: 100 µm

Stencil opening ratio : 90 %

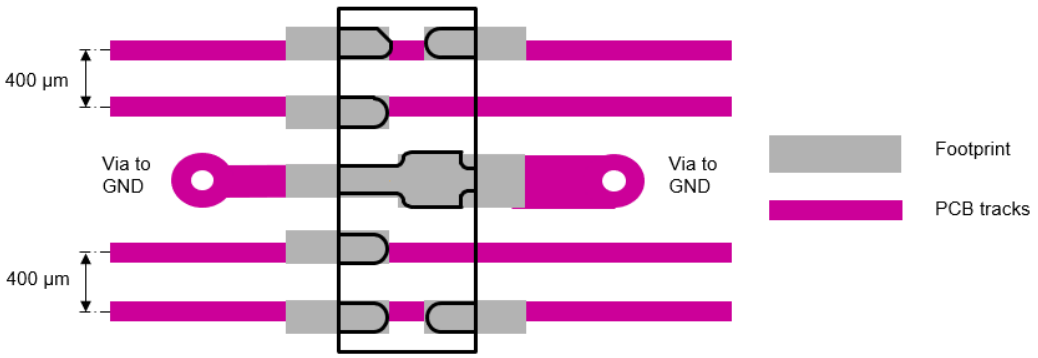
Figure 18. Recommended footprint and stencil opening (µm)



3.2 PCB design

1. To control the solder paste amount, closed vias are recommended instead of open vias.
2. A symmetrical layout is recommended.

Figure 19. Recommended printed circuit board layout



3.3 Solder paste

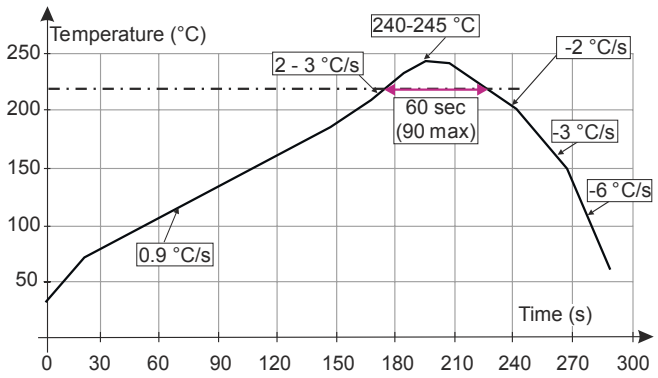
1. Halide-free flux qualification ROL0 according to ANSI/J-STD-004.
2. “No clean” solder paste is recommended.
3. Offers a high tack force to resist component movement during high speed.
4. Solder paste with fine particles: powder particle size is 20-38 µm.

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 Reflow profile

Figure 20. 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 [1]	Package	Weight	Base qty.	Delivery mode
HSP061-4NY8	H4N	QFN-8L	2.77 mg	6000	Tape and reel

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

Revision history

Table 6. **Document revision history**

Date	Revision	Changes
20-Apr-2010	1	Initial release.
15-Oct-2010	2	Updated values for ΔCI/O - GND in *Table 2*. Updated *Figure 13*. Updated package name.
29-Mar-2012	3	Updated *Table 2*. Updated weight value in *Table 4*.
19-Oct-2012	4	Added IEC 61000-4-2 air discharge parameter in *Table 1*. Added grid to *Figure 14* for easier reading of values.
27-Mar-2013	5	Added notes on marking rotation.
14-Feb-2024	6	Document reworked to improve readability. Updated USB and HDMI eyes diagrams.