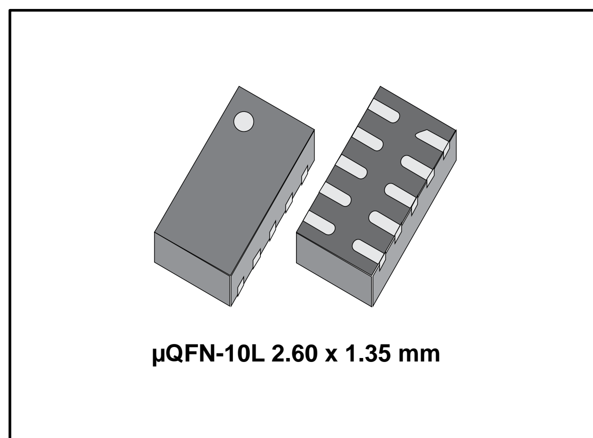
ECMF4-2450A17M10

Common mode filter with ESD protection for high speed serial interface

Datasheet - production data



µQFN-10L 2.60 x 1.35 mm

Features

- High differential mode attenuation on WLAN frequencies :
  - -23 dB at 2.4 GHz and -32 dB at 5.0 GHz
- Large bandwidth: 1.7 GHz
- Very low PCB space consumption.
- Thin package: 0.55 mm max.
- Lead-free package.
- High reduction of parasitic elements through integration.

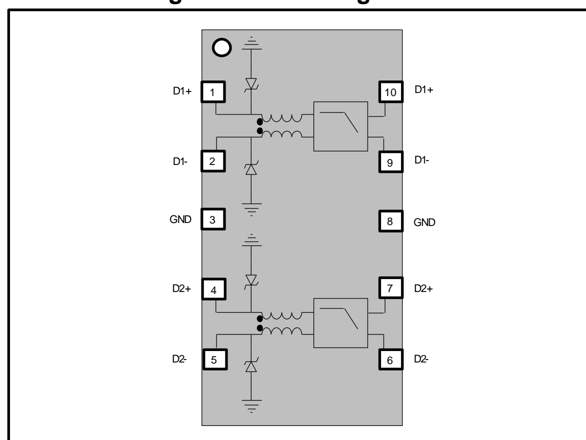
Applications

- Set top box
- Streaming box
- HDMI stick
- Game console
- Notebook, laptop
- Portable devices

Description

The ECMF4-2450A17M10 is a highly integrated common mode filter and low pass filter designed to suppress WiFi differential and common mode noise on high speed differential serial buses like HDMI. The device can protect and filter 2 differential lanes.

Figure 1: Pin configuration



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 (connector side) Air discharge (connector side)	 8 15	kV
I_{RMS}	Maximum RMS current		100	mA
T_{op}	Operating temperature		-40 to +85	°C
T_j	Maximum junction temperature		125	°C
T_{stg}	Storage temperature range		-55 to +150	°C

Figure 2: Electrical characteristics (definitions)

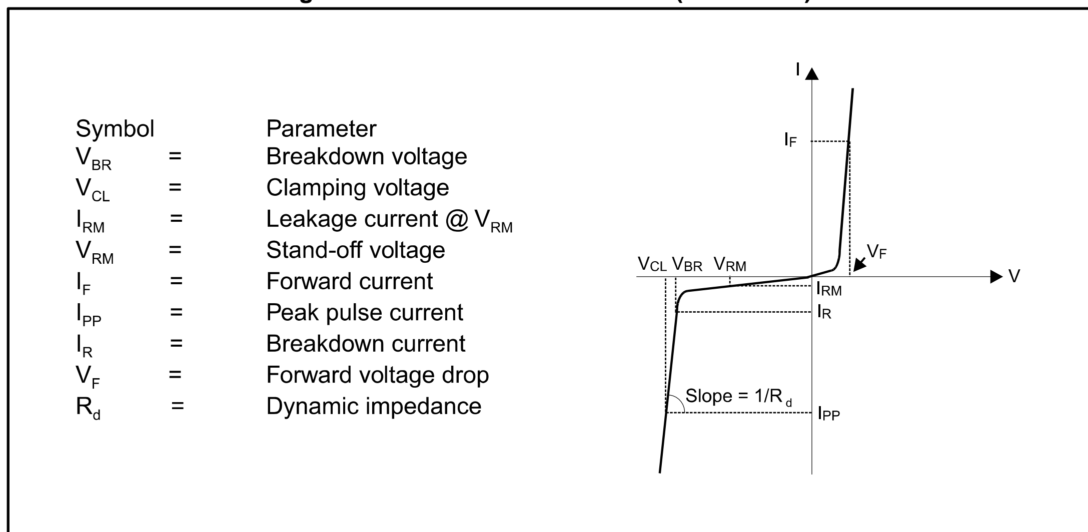


Table 2: Electrical characteristics (T_{amb} = 25 °C)

Symbol	Test condition		Min.	Typ.	Max.	Unit
V_{BR}	I_R = 1 mA		4.5	5.5		V
I_{RM}	V_{RM} = 3 V per line				100	nA
R_{DC}	DC serial resistance			5.5		Ω
F_c	-3 dB differential mode cut-off frequency			1.7		GHz
V_{CL}	I_{PP} = 1 A, 8/20 µs				10	V
V_{CL}	IEC 61000 4-2, +8 kV contact (I_{PP} = 16 A), measured at 30 ns			12.9		V
C_{diode} [D+ or D-]/ GND	$V_{D+/D-}$ = 0 V, F = 2.5 GHz to 6 GHz			0.35	0.45	pF
R_d	Dynamic resistance, t_P = 100 ns	D+ or D- to GND		0.48		Ω
R_d	Dynamic resistance, t_P = 100 ns	GND to D+ or D-		0.96		Ω

Table 3: Pin description

Pin number	Description	Pin number	Description
1	D1+ (to connector)	6	D2- (to IC)
2	D1- (to connector)	7	D2+ (to IC)
3	GND	8	GND
4	D2+(to connector)	9	D1- (to IC)
5	D2- (to connector)	10	D1+ (to IC)

1.1 Characteristics (curves)

Figure 3: Differential attenuation versus frequency ($Z_{0\ diff}$ = 100 Ω) – evaluation board with SMA connector

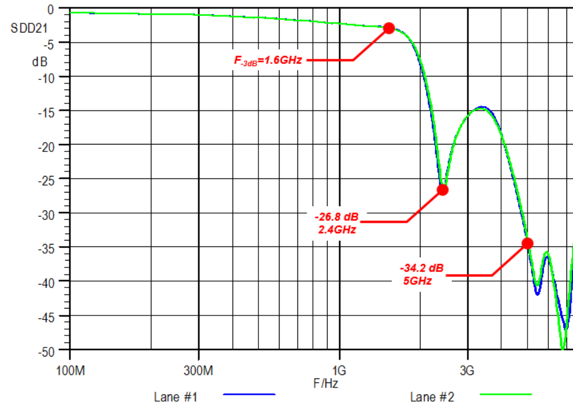


Figure 4: Common mode attenuation versus frequency ($Z_{0\ com}$ = 50 Ω)

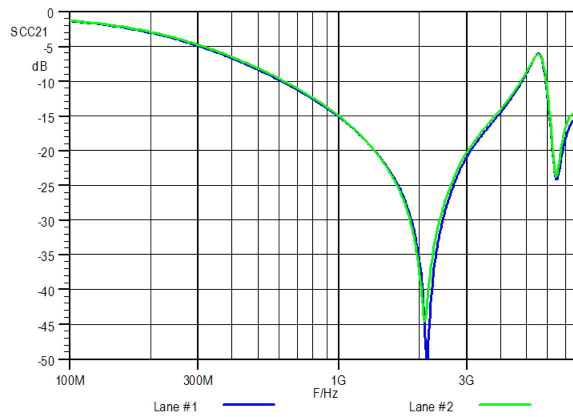
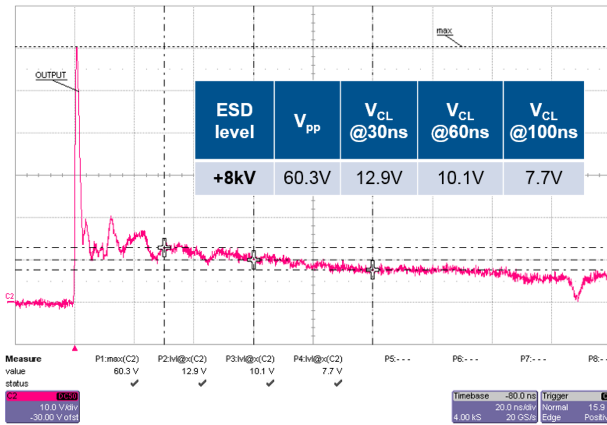
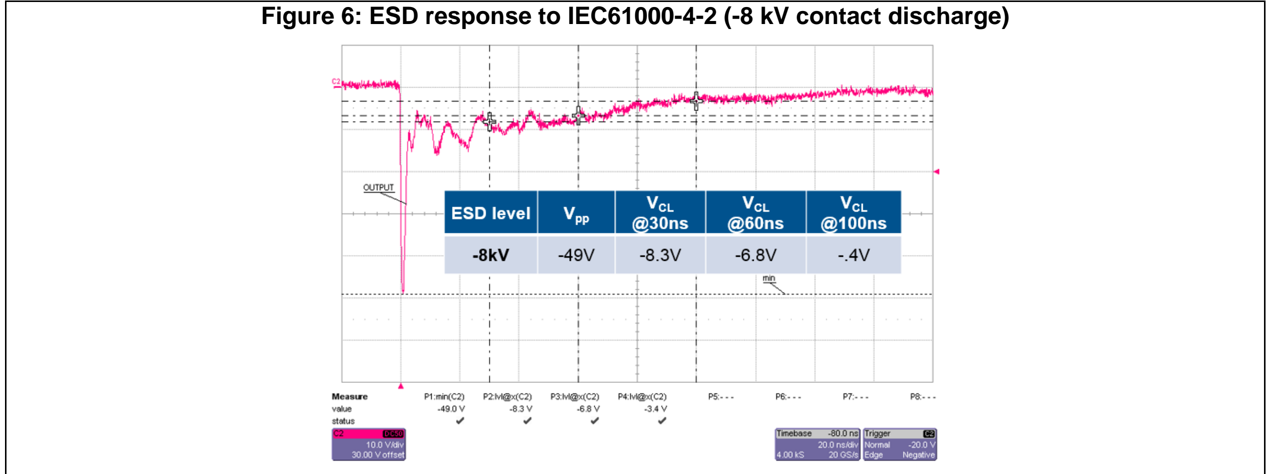


Figure 5: ESD response to IEC61000-4-2 (+8 kV contact discharge)



ESD level	V_{PP}	V_{CL} @30ns	V_{CL} @60ns	V_{CL} @100ns
+8kV	60.3V	12.9V	10.1V	7.7V

Figure 6: ESD response to IEC61000-4-2 (-8 kV contact discharge)



ESD level	V_{PP}	V_{CL} @30ns	V_{CL} @60ns	V_{CL} @100ns
-8kV	-49V	-8.3V	-6.8V	-.4V

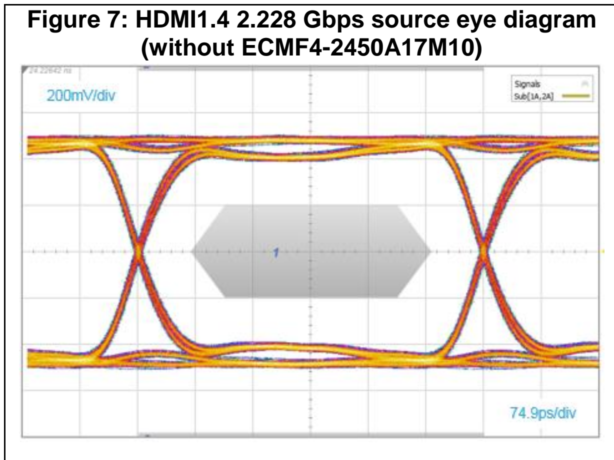


Figure 7: HDMI1.4 2.228 Gbps source eye diagram (without ECMF4-2450A17M10)

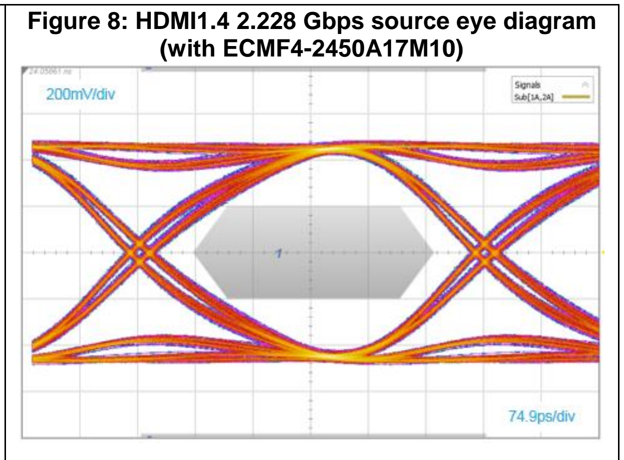


Figure 8: HDMI1.4 2.228 Gbps source eye diagram (with ECMF4-2450A17M10)

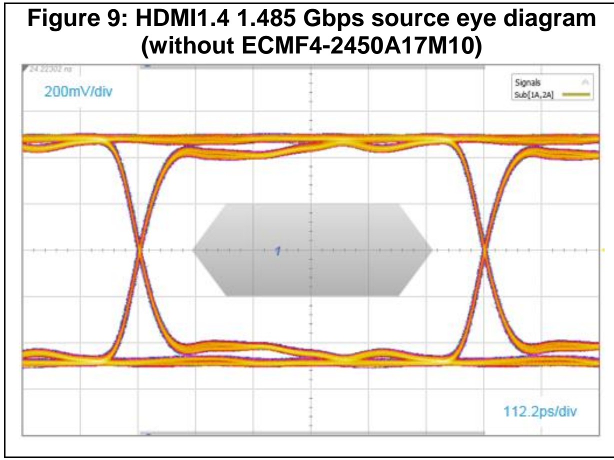


Figure 9: HDMI1.4 1.485 Gbps source eye diagram (without ECMF4-2450A17M10)

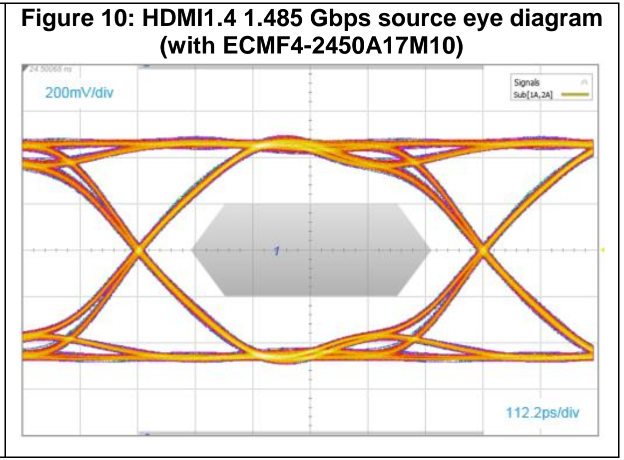
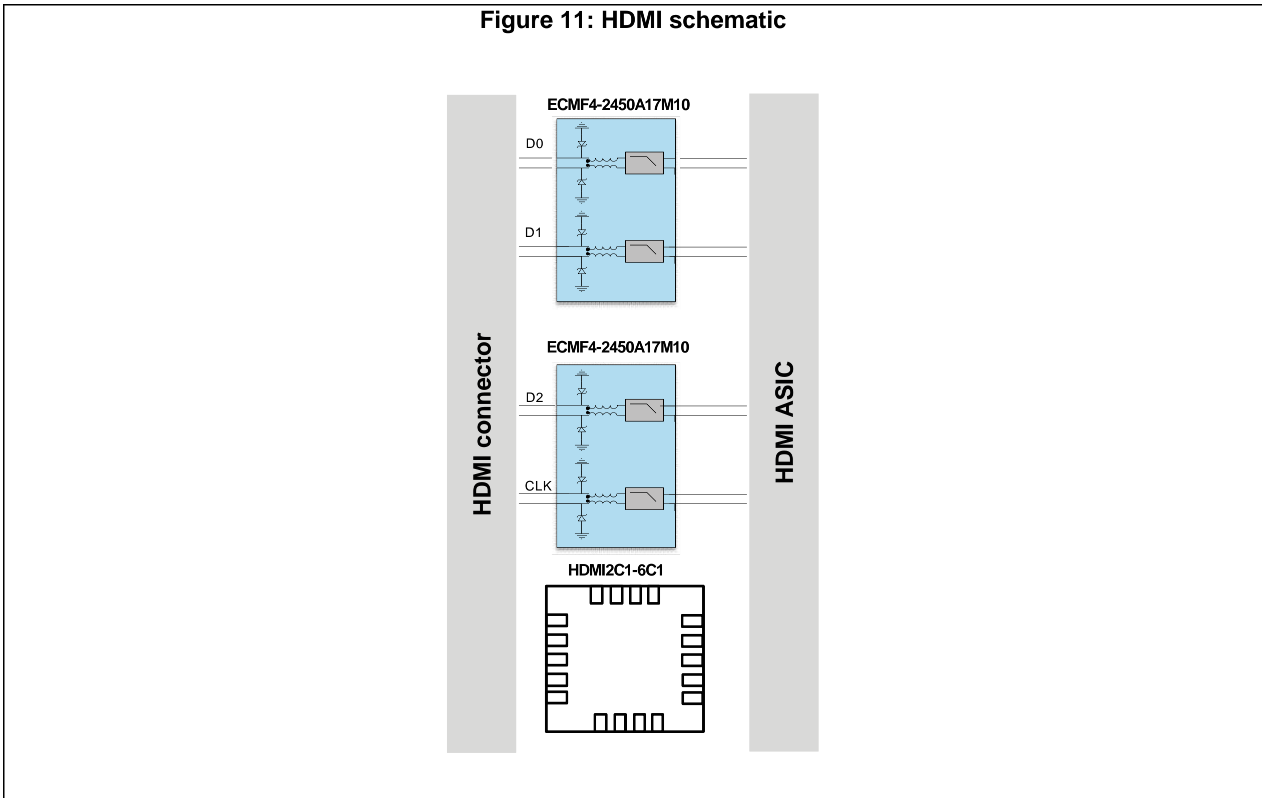


Figure 10: HDMI1.4 1.485 Gbps source eye diagram (with ECMF4-2450A17M10)

2 Application information

Figure 11: HDMI 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 µQFN10L package information

Figure 12: µQFN10L package outline

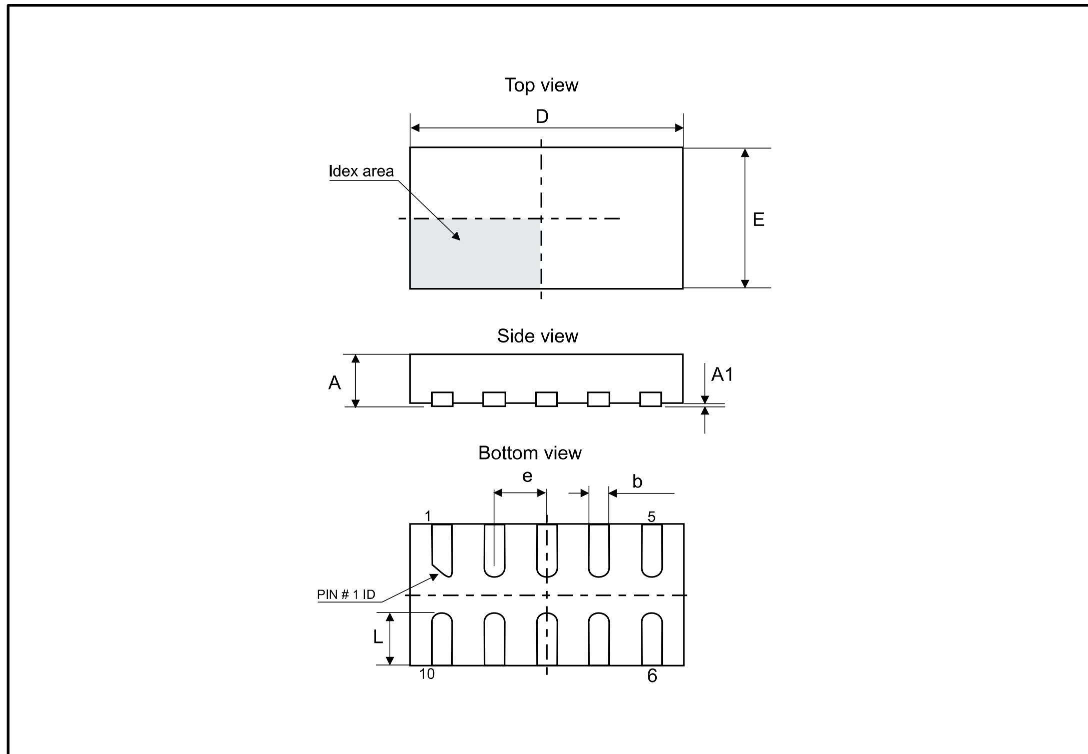


Table 4: µQFN10L package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.45	0.50	0.55	0.018	0.020	0.022
A1	0.00	0.02	0.05	0.00	0.0008	0.002
b	0.15	0.20	0.25	0.006	0.008	0.010
D	2.55	2.60	2.65	0.1	0.102	0.104
E	1.30	1.35	1.40	0.051	0.053	0.055
e		0.50			0.020	
L	0.40	0.50	0.60	0.016	0.020	0.024

Figure 13: Footprint recommendations, dimensions in mm (inches)

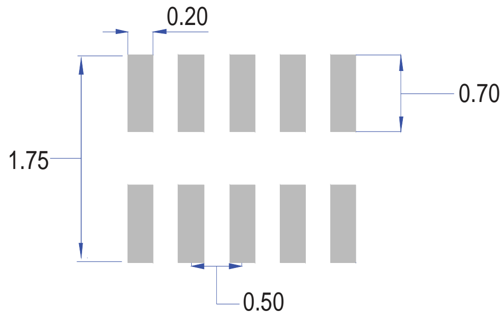
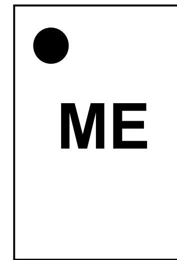
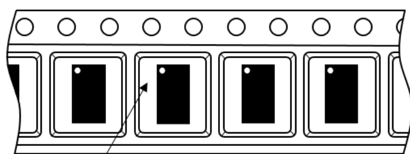


Figure 14: Marking layout



Product marking may be rotated by 90° for assembly plant differentiation. In no case should this product marking be used to orient the component for its placement on a PCB. Only pin 1 mark is to be used for this purpose.

Figure 15: Package orientation in reel



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

Figure 16: Tape and reel orientation

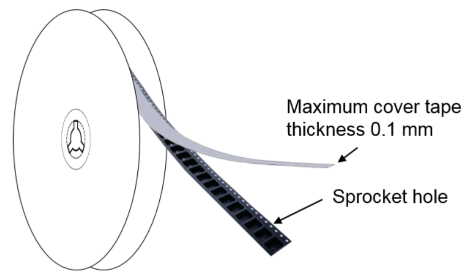


Figure 17: Reel dimensions in mm

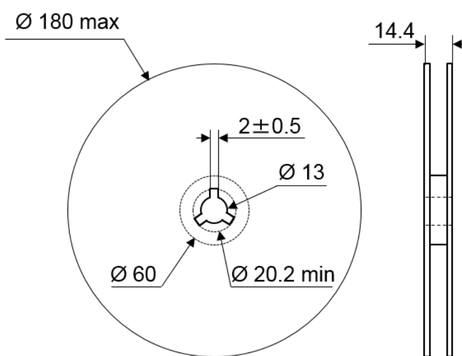


Figure 18: Inner box dimension definition in mm

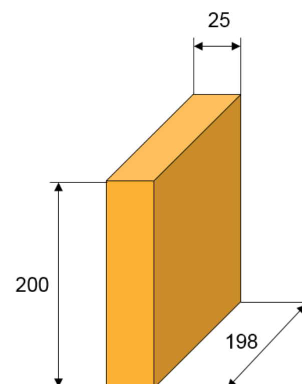


Figure 19: Tape dimension definitions

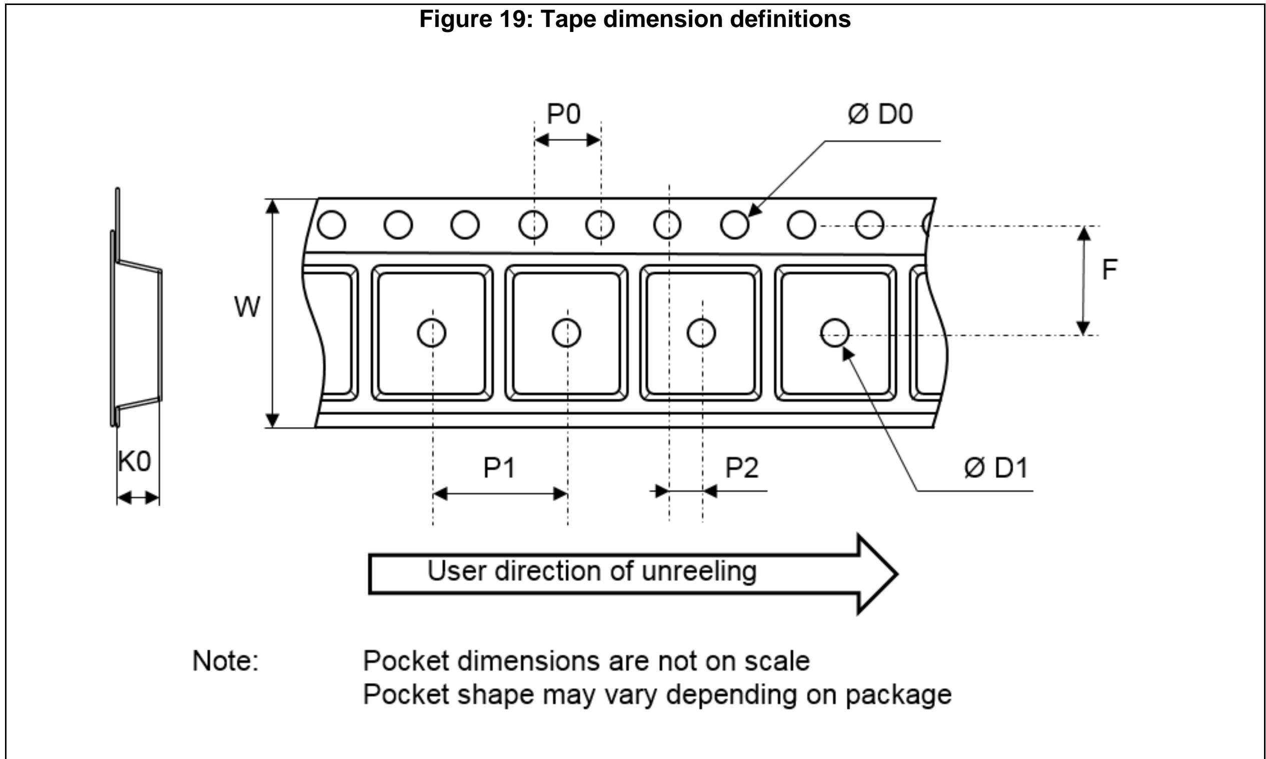


Table 5: Tape and reel mechanical data

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
P1	3.9	4.0	4.1
P0		4.0	
Ø D0	1.4	1.5	1.6
Ø D1	1		
F	3.45	3.5	3.55
K0	0.6	0.7	0.8
P2	1.95	2	2.05
W	7.9	8	8.3

4 Recommendation on PCB assembly

4.1 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. Solder paste with fine particles: powder particle size is 20-45 µm.

4.2 Placement

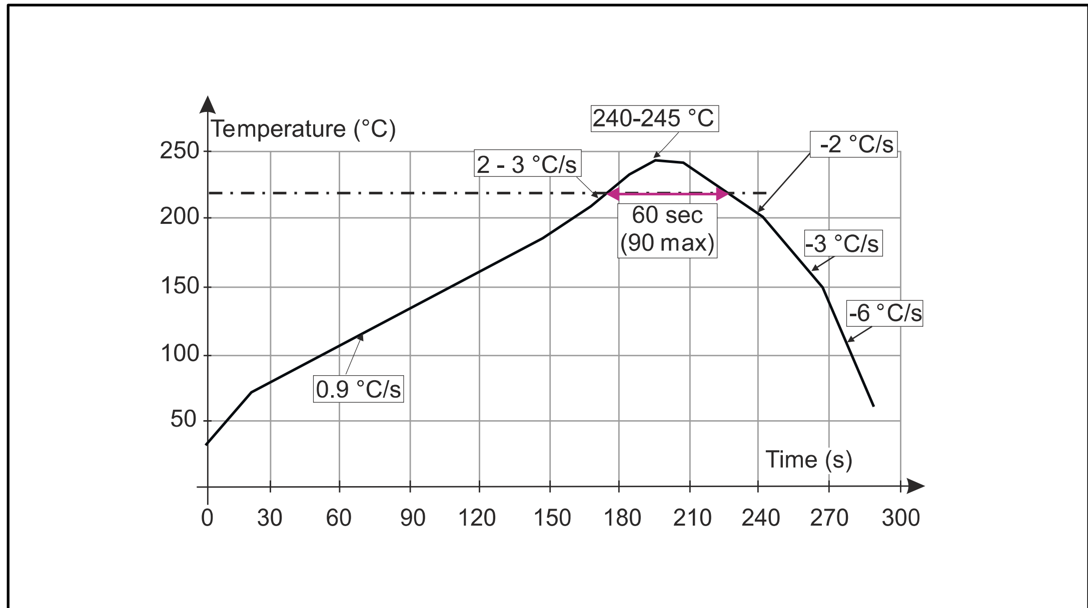
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering
3. Standard tolerance of ±0.05 mm is recommended.
4. 3.5 N placement force is recommended. Too much placement force can lead to squeezed out solder 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.

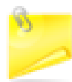
4.3 PCB design preference

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. The symmetrical layout is recommended, in case any tilt phenomena caused by asymmetrical solder paste amount due to the solder flow away.

4.4 Reflow profile

Figure 20: ST ECOPACK® recommended soldering reflow profile for PCB mounting





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

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

5 Ordering information

Figure 21: Ordering information scheme

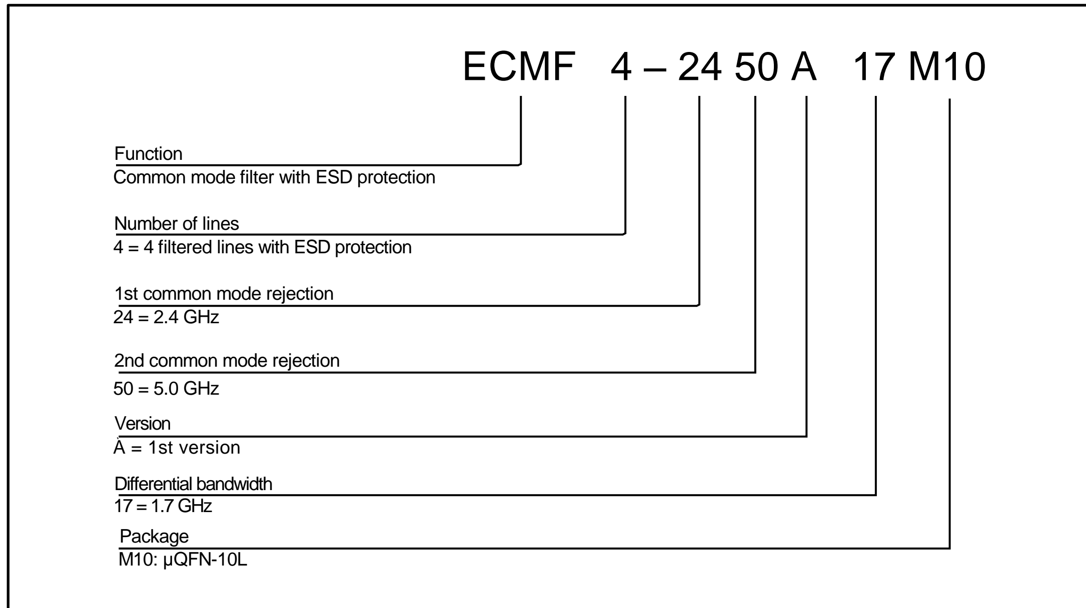


Table 6: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
ECMF4-2450A17M10	ME	µQFN-10L	5 mg	3000	Tape and reel

6 Revision history

Table 7: Document revision history

Date	Revision	Changes
08-Nov-2016	1	Initial release.

IMPORTANT NOTICE – PLEASE 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 acknowledgement.

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. 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.

© 2016 STMicroelectronics – All rights reserved