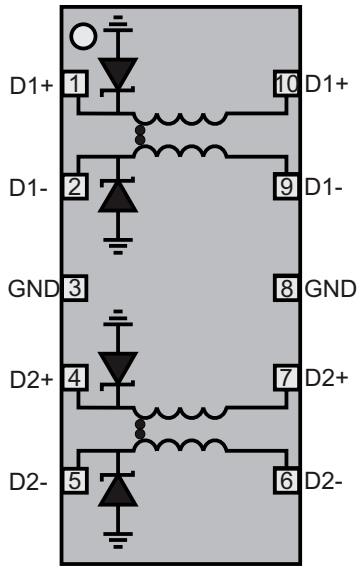
ECMF4-20A42N10

Common mode filter with ESD protection for high speed serial interface

Datasheet - production data

µQFN-10L
1.35 mm x 2.2 mm x 0.5 mm

Figure 1. Pin configuration (top view)



Features

- 5GHz differential bandwidth to comply with HDMI 2.0, HDMI 1.4, USB 3.1, MIPI, Display Port, etc.
- High common mode attenuation on LTE, GSM, GPS and WLAN frequencies:
  - -13 dB at 0.7 GHz
  - -23 dB at 1.5 GHz
  - -25 dB at 2.4 GHz
  - -23 dB at 2.7 GHz
  - -13 dB at 5.0 GHz
- Very low PCB space consumption
- Thin package: 0.5 mm max
- Lead free and RoHS package
- High reduction of parasitic elements through integration

Applications

- Notebook, laptop
- Streaming box
- Set top box
- Portable devices

Description

This device is a highly integrated common mode filter designed to suppress EMI/RFI common mode noise on high speed differential serial buses like HDMI 2.0, HDMI1.4, USB 3.1 Gen 1, Ethernet, MIPI, Display Port and other high speed serial interfaces. It has a very large differential bandwidth to comply with these standards and can also protect and filter 2 differential lanes.

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 IEC 61000-4-2 Air discharge	8 15	kV
I_{RMS}	Maximum RMS current		100	mA
T_{op}	Operating temperature range		-40 to +85	°C
T_{stg}	Storage temperature range		-55 to +150	°C
T_L	Maximum lead temperature for soldering during 10s		260	°C

Figure 2. Electrical characteristics (definitions)

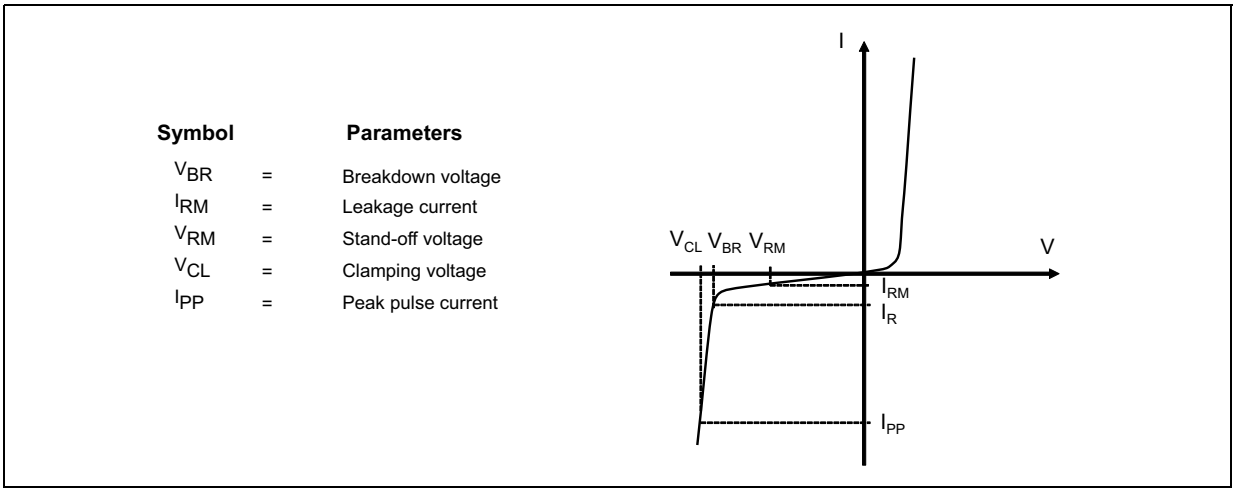


Table 2. Electrical characteristics (T_{amb} = 25 °C)

Symbol	Test conditions	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		Ω
F_c	Differential mode cut-off frequency at -3 dB		5.0		GHz
V_{CL}	I_{PP} = 1 A - 8/20 µs			10	V
V_{CL}	Measured at 30 ns, IEC 61000-4-2 +8 kV contact		11		V
$C_{diode\ (I/O-I/O)}$	$V_{I/O}$ = 0 V, f = 200 MHz to 3 GHz, V_{OSC} = 30 mV		0.2	0.3	pF
$C_{diode\ (I/O-GND)}$	$V_{I/O}$ = 0 V, f = 2.5 GHz to 6 GHz		0.35	0.45	pF

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

Figure 3. Differential attenuation versus frequency ($Z_{0\ diff}$ = 100 Ω)

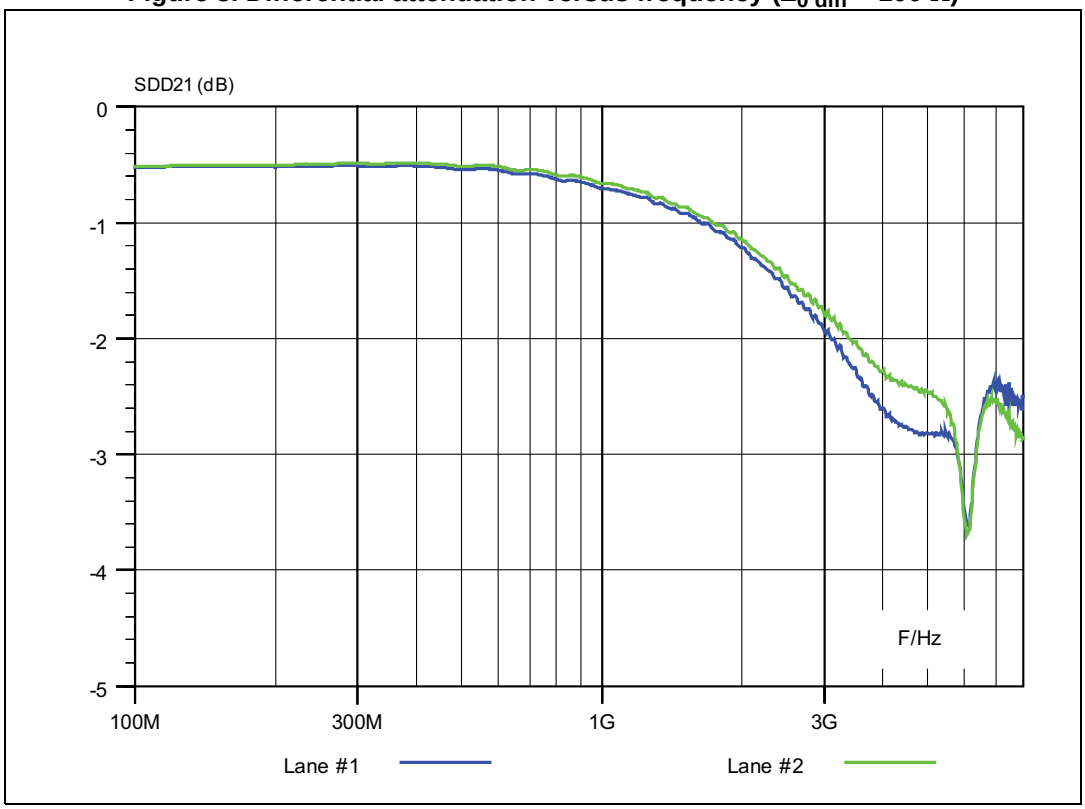


Figure 4. Common mode attenuation versus frequency ($Z_{0\ com}$ = 50 Ω)

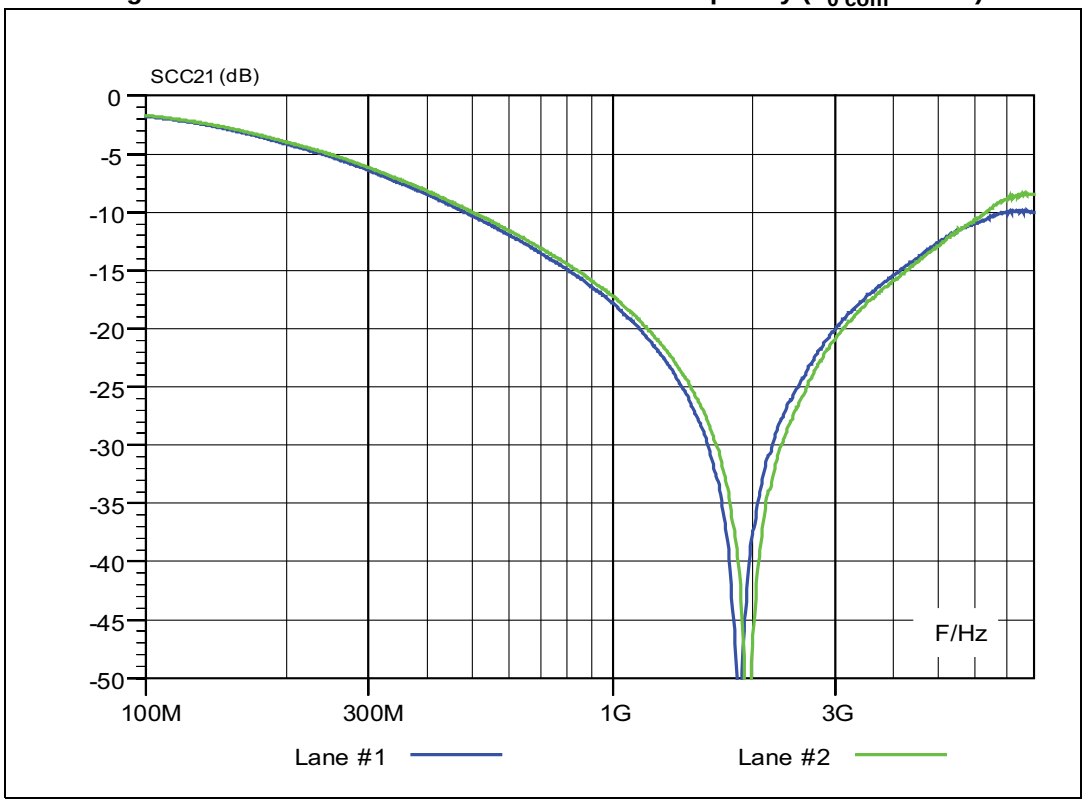


Figure 5. ESD response to IEC61000-4-2 (+8 kV contact discharge)

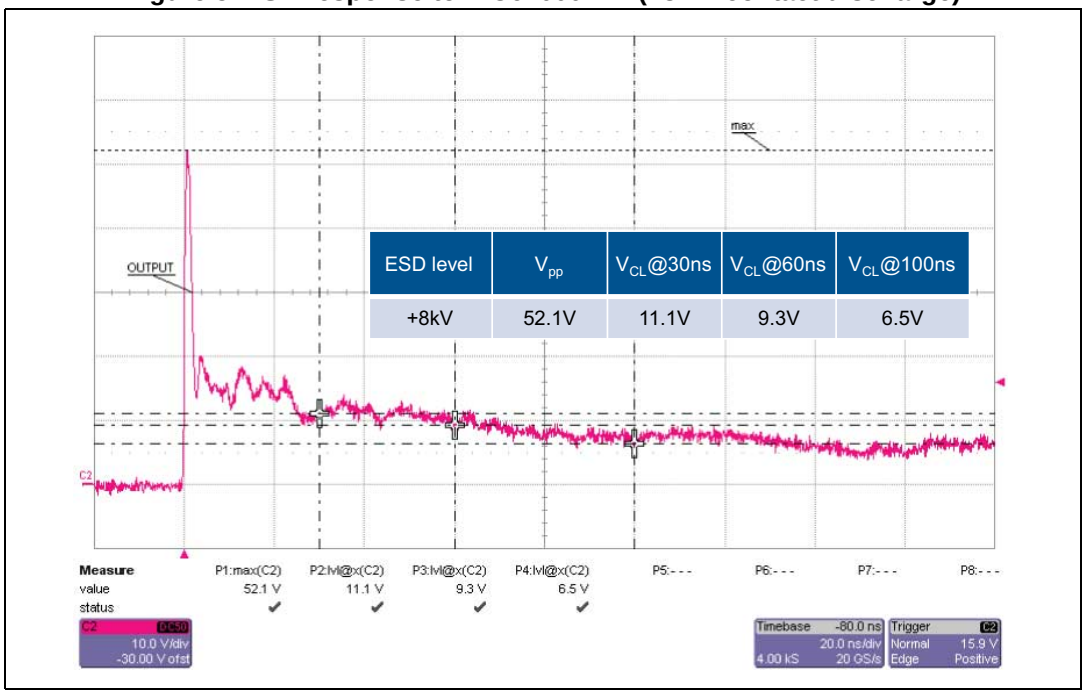


Figure 6. ESD response to IEC61000-4-2 (-8 kV contact discharge)

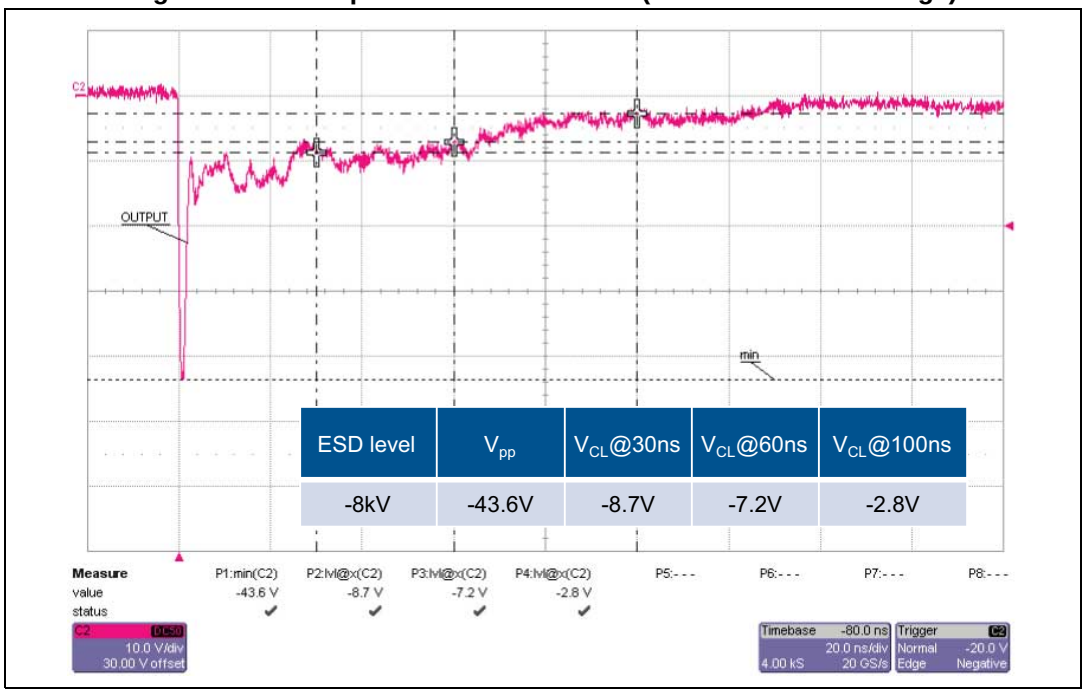


Figure 7. USB3.1 Gen 1 5.0 Gbps eye diagram without ECMF4-20A42N10 (without cable and EQ)

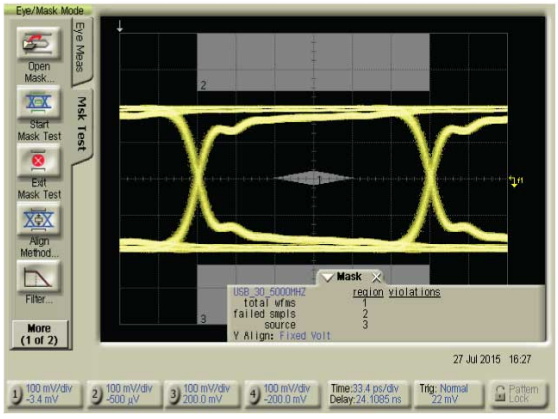


Figure 8. USB3.1 Gen 1 5.0 Gbps eye diagram with ECMF4-20A42N10 (without cable and EQ)

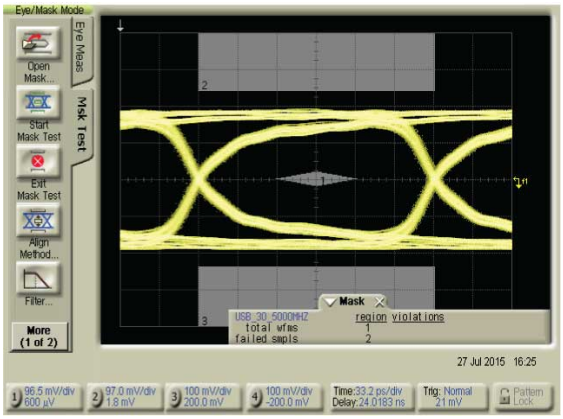


Figure 9. USB3.1 Gen 2 10.0 Gbps eye diagram without ECMF4-20A42N10 (without cable and EQ)

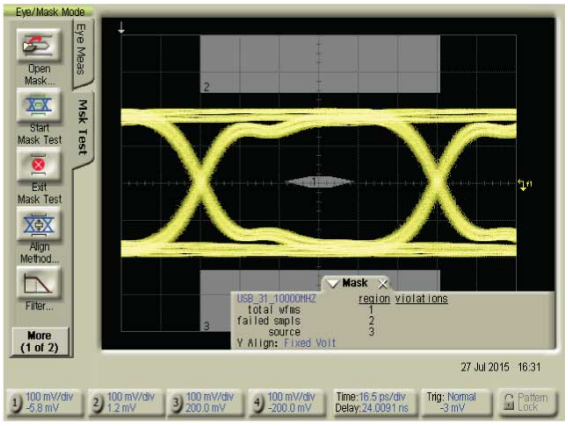


Figure 10. USB3.1 Gen 2 10.0 Gbps eye diagram with ECMF4-20A42N10 (without cable and EQ)

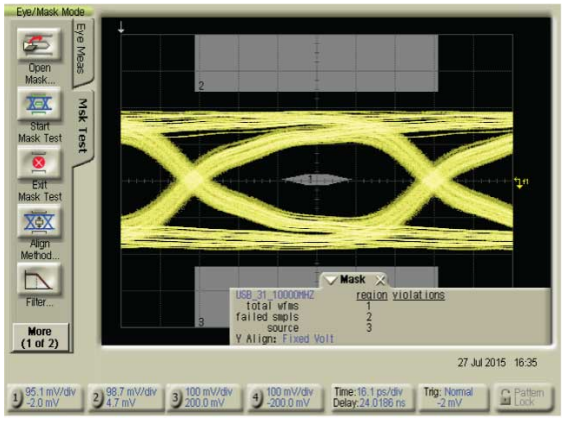


Figure 11. HDMI2.0 5.94 Gbps eye diagram without ECMF4-20A42N10 (without cable and EQ)

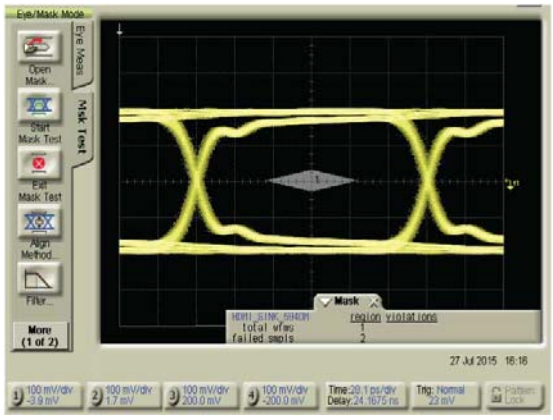


Figure 12. HDMI2.0 5.94 Gbps eye diagram with ECMF4-20A42N10 (without cable and EQ)

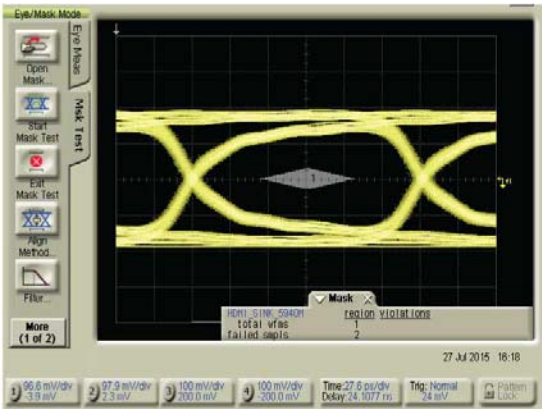


Figure 13. HDMI1.4 3.35 Gbps eye diagram without ECMF4-20A42N10

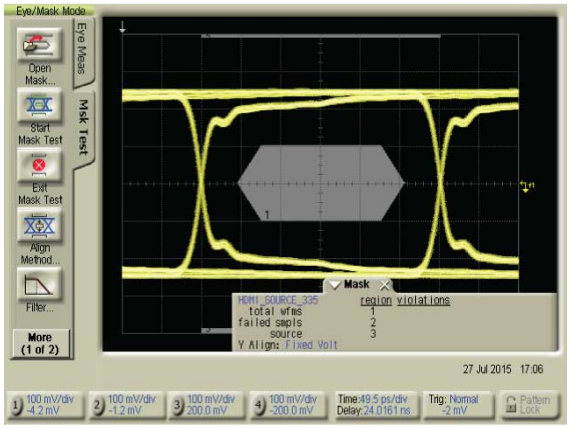


Figure 14. HDMI1.4 3.35 Gbps eye diagram with ECMF4-20A42N10

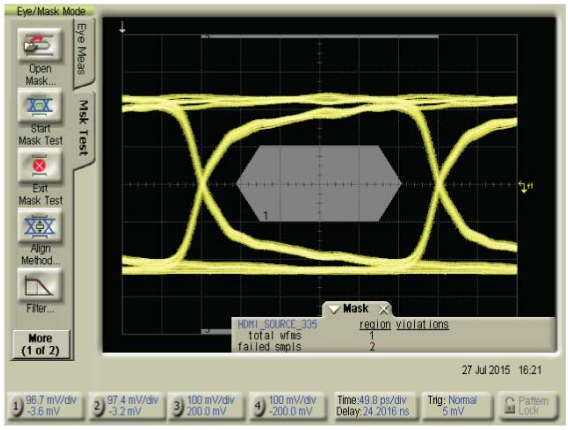
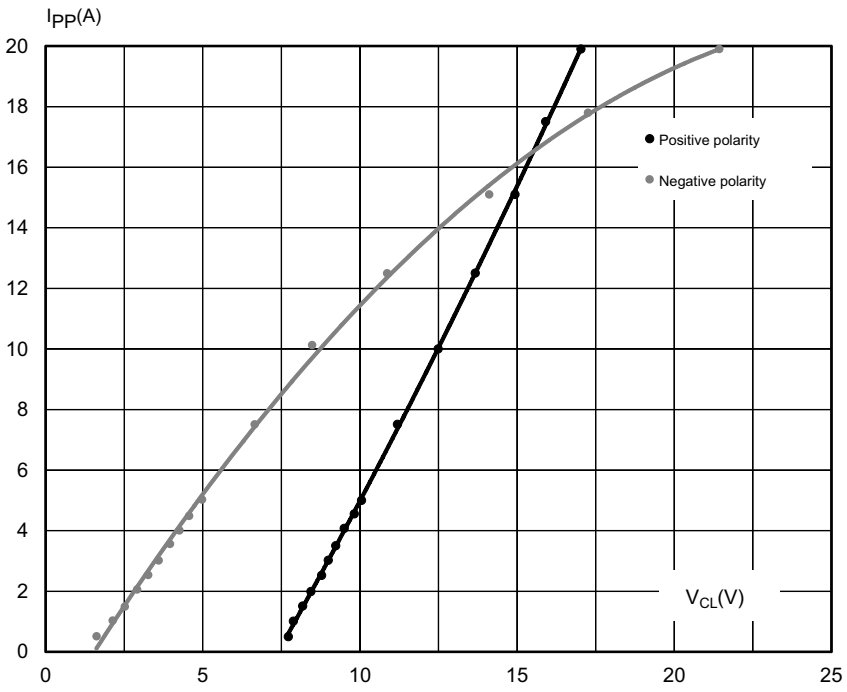


Figure 15. TLP characteristic



2 Package information

- Epoxy meets UL94, V0
- Lead-free package

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 µQFN-10L package information

Figure 16. µQFN-10L package outline

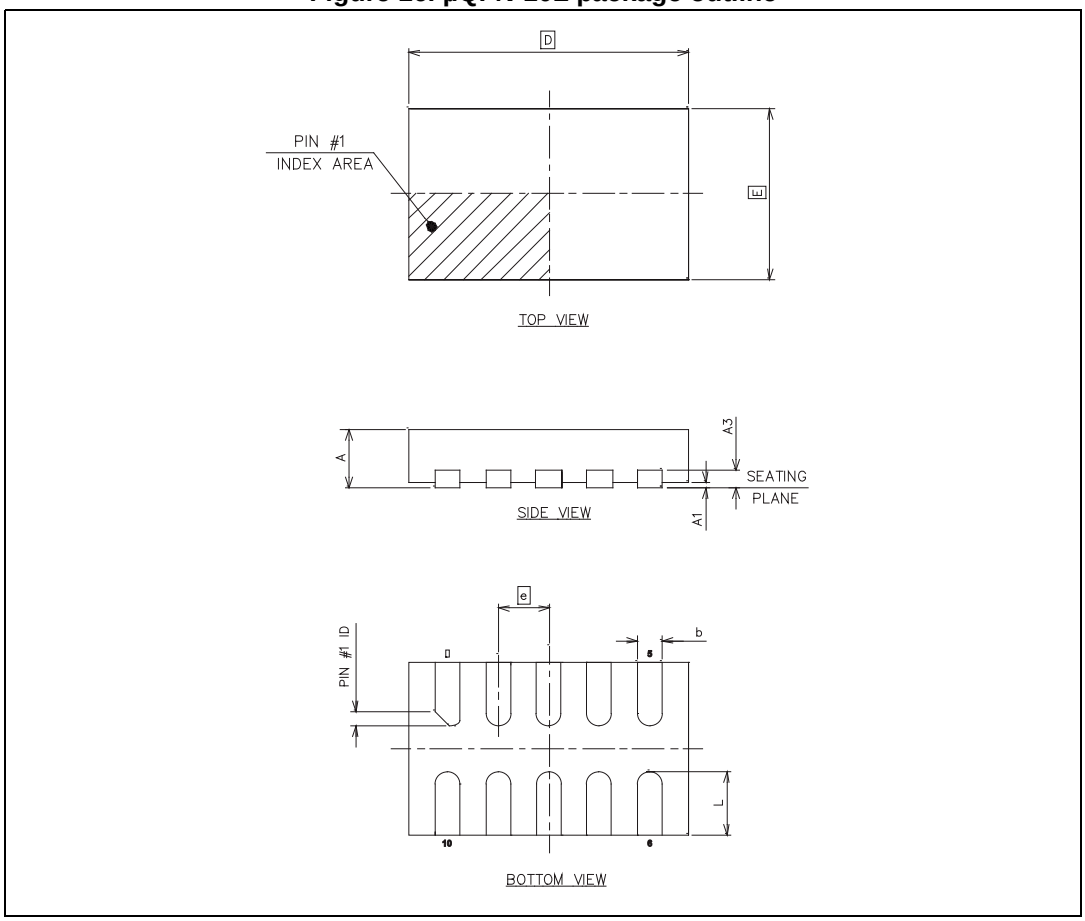


Table 4. µQFN-10L package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.41	0.45	0.50	0.183	0.201	0.223
A1		0.02	0.05		0.009	0.022
A3		0.127			0.057	
b	0.15	0.2	0.25	0.067	0.089	0.112
D	2.15	2.2	2.25	0.96	0.982	1.004
E	1.3	1.35	1.4	0.58	0.603	0.625
e		0.4			0.179	
L	0.4	0.5	0.6	0.179	0.223	0.268

Figure 17. Footprint

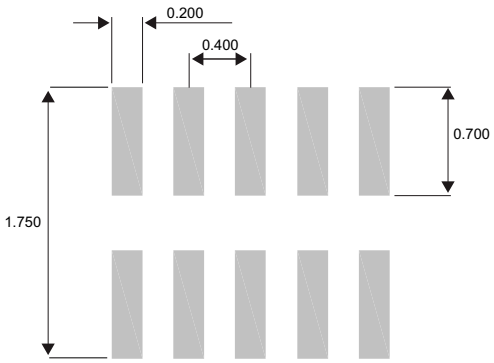
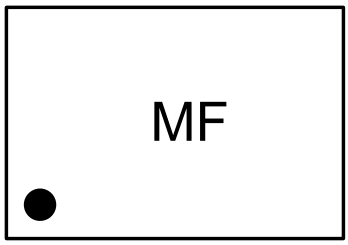
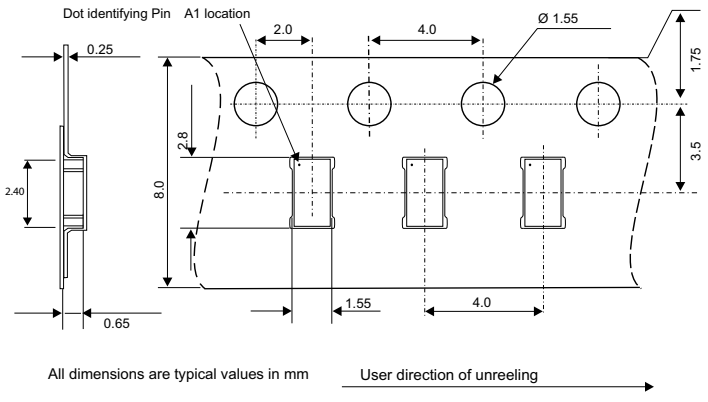


Figure 18. Marking



Note: Product marking may be rotated by 180° 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 19. Tape and reel specifications



3 Recommendation on PCB assembly

3.1 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.

3.2 Placement

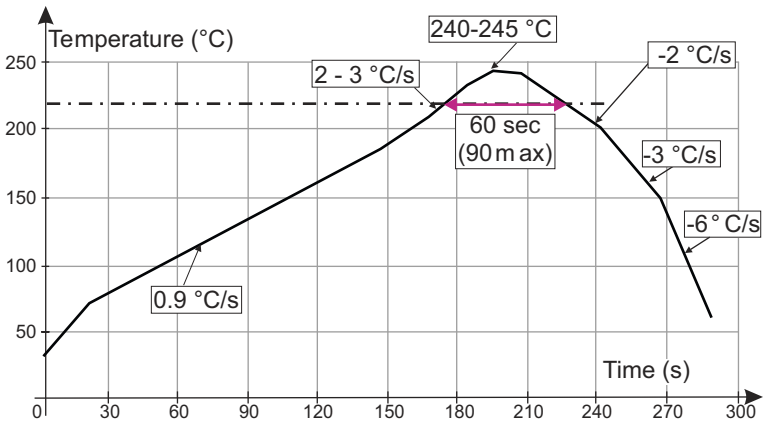
1. Manual positioning is not recommended.
2. It is recommended to use the lead recognition capabilities of the placement system, not the outline centering.
3. Standard tolerance of ±0.05 mm is recommended.
4. 3.5 N placement force is recommended. Too much placement force can lead to squeezed out solder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

3.3 PCB design

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.

3.4 Reflow profiles

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



Note: Minimize air convection currents in the reflow oven to avoid component movement.Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020

4 Ordering information

Figure 21. Ordering information scheme

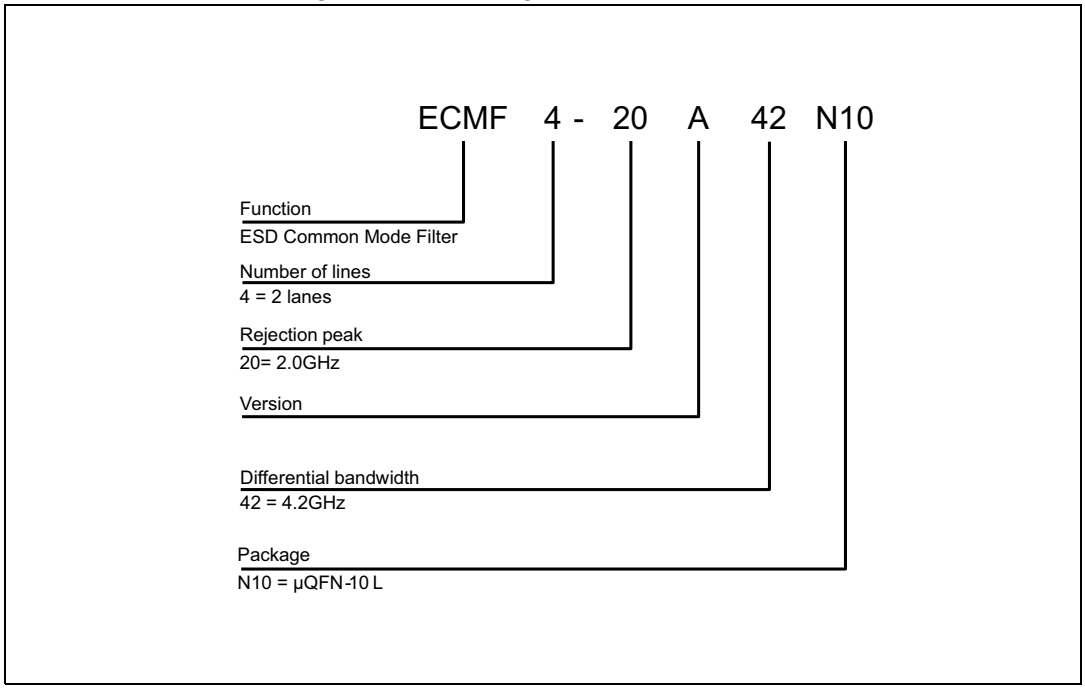


Table 5. Ordering information

Order code	Marking(1)	Package	Weight	Base qty.	Delivery mode
ECMF4-20A42N10	MF	µQFN-10L	5.00 mg	3000	Tape and reel

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

5 Revision history

Table 6. Document revision history

Date	Revision	Changes
16-May-2016	1	Initial release.