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ECMF02-4CMX8

Common mode filter with ESD protection for USB 2.0 Interface

Datasheet - production data

Features

- Integrated common mode filter
- Differential pair ESD protection
- 16 V V_{BUS} ESD and EOS protection
- ID pin ESD protection
- Low profile µQFN-8L package
- High bandwidth: >6 GHz
- Optimized for high speed USB 2.0
- High common mode attenuation at 900 MHz and 1.8 GHz
- Support of audio over USB 2.0 thanks to bidirectional ESD protection
- Ultra compact, low board space
- Low height: < 0.55 mm

Complies with the following standards:

- IEC 61000-4-2 level 4:
 - ±15 kV (air discharge)
 - ±8 kV (contact discharge)
- RoHS2 compliant

Applications

Where transient over-voltage protection in ESD sensitive equipment is required, such as:

- Computers
- Printers
- Communication systems
- Cellular phone handsets and accessories
- Video equipment

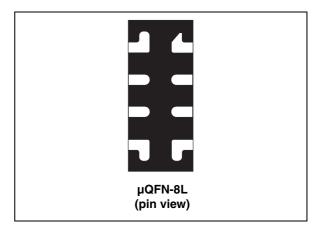
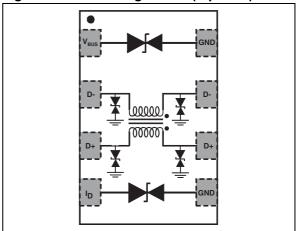


Figure 1. Pin configuration (top view)



Description

ECMF02-4CMX8 affords key component integration such as common mode filter D+ and D- lines and ESD protection on all lines. This device offers an optimized flow-through footprint for USB 2.0 applications.

1 Characteristics

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

Symbol		Value	Unit	
V _{PP}	Peak pulse voltage ⁽¹⁾	ESD discharge IEC 61000-4-2, level 4 Contact discharge on D+/D- pins Contact discharge on V _{BUS} and I _D pins Air discharge on all pins	10 20 30	kV
P _{PP}	Peak pulse power (8/20μs) on V _{BUS}		150	W
I _{PP}	Peak pulse current (8/20µs) on V _{BUS}		4.8	Α
T _{op}	Operating temperature		-30 to +85	°C
Tj	Maximum junction temperature		125	°C
T _{stg}	Storage temperature range		- 55 to +150	°C

^{1.} Measurements done on IEC 61000-4-2 test bench. For further details see Application note AN3353.

Figure 2. Electrical characteristics - definitions

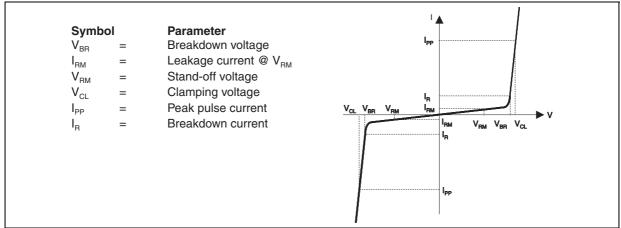


Table 2. Electrical characteristics (values, $T_{amb} = 25$ °C)

Symbol	Test conditions	Min.	Тур.	Max.	Unit		
	Data Lines						
V _{BR}	I _R = 1 mA 6				V		
I _{RM}	V _{RM} = 5.5 V per line			100	nA		
R _{DC}	DC serial resistance on data line		3	4	Ω		
V _{BUS}							
V _{BR}	I _R = 1 mA 15 16.5 18		V				
I _{RM}	V _{RM} = 12 V			50	nA		
V _{CL}	Clamping voltage. $I_{PP} = 1 \text{ A}, t_p = 8/20 \mu \text{s}$			20	V		
V _{CL}	Clamping voltage. $I_{PP} = 2.5 \text{ A}, t_p = 8/20 \mu\text{s}$			24	V		
I _D							
V _{BR}	I _R = 1 mA 6		V				
I _{RM}	V _{RM} = 1.5 V per line			100	nA		

Figure 3. SDD21 differential attenuation measurement (Z $_{0 \text{ diff}}$ = 90 Ω) for data lines D+ and D-

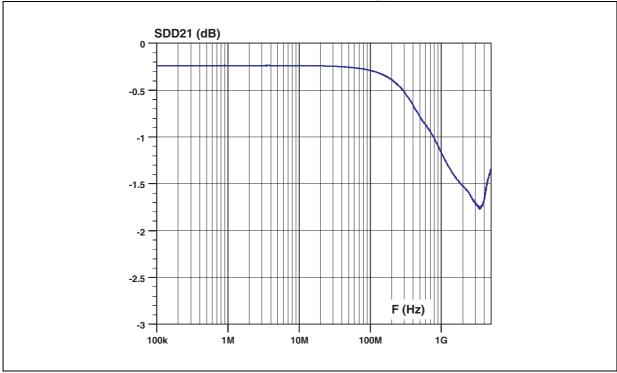


Figure 4. SCC21 common mode attenuation measurement ($Z_{0 \text{ com}} = 45 \Omega$)

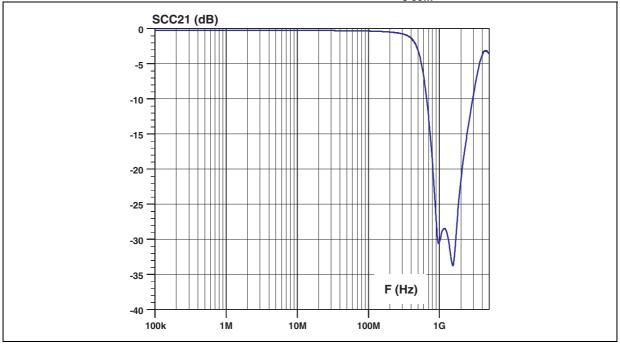


Figure 5. ID frequency response measurement ($Z_0 = 75 \Omega$)

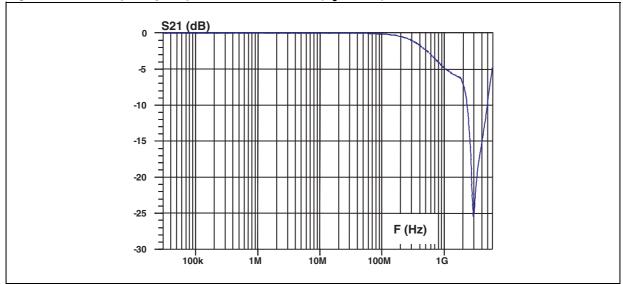


Figure 6. ESD test conditions

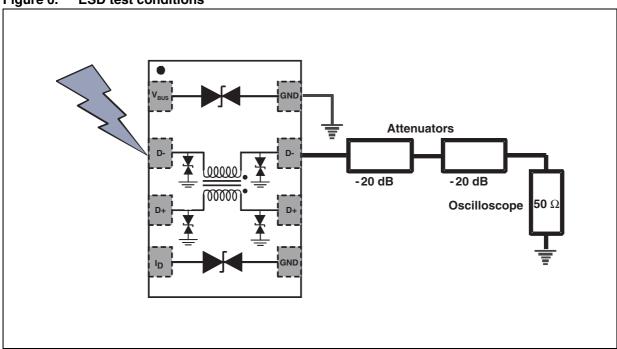
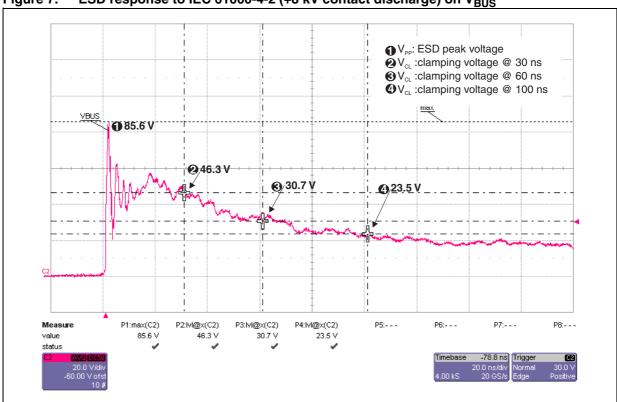
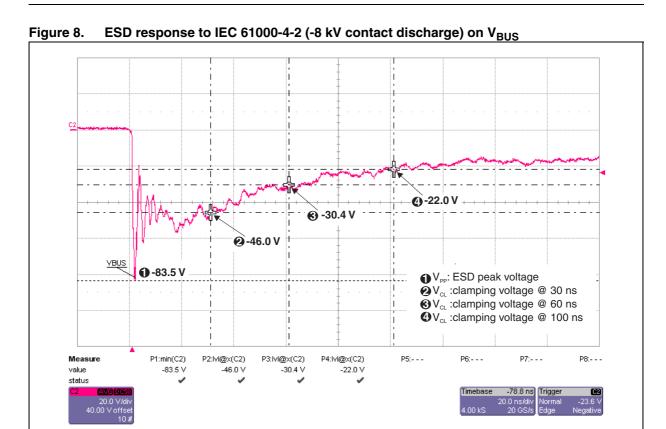
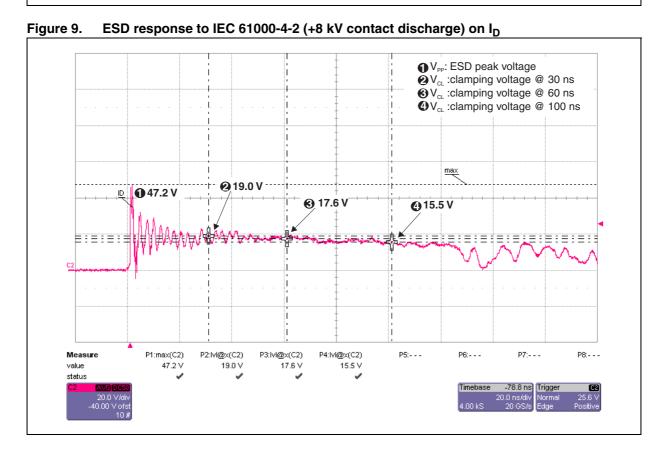


Figure 7. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on V_{BUS}









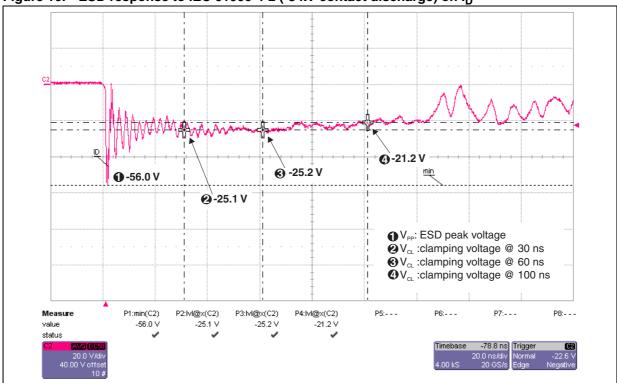
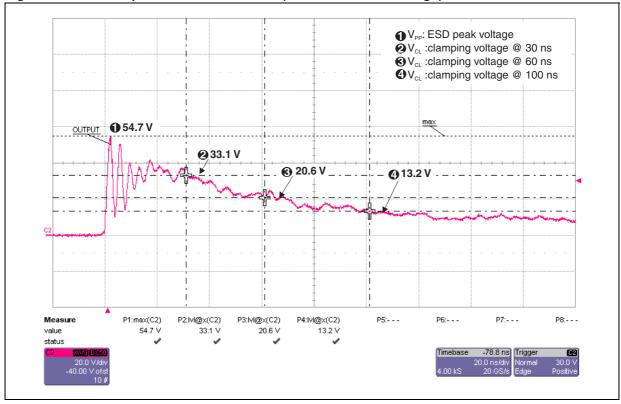


Figure 11. ESD response to IEC 61000-4-2 (+8 kV contact discharge) on differential lane



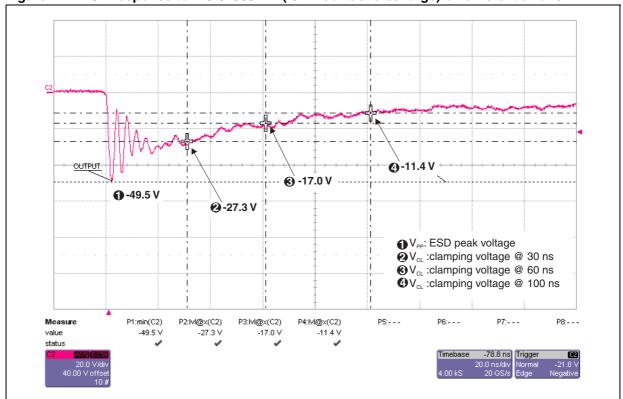
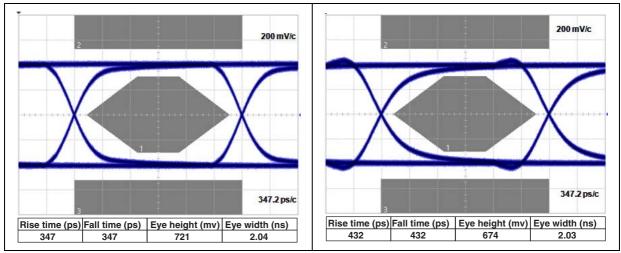


Figure 12. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on differential lane

Figure 13. Eye diagram (loaded by Z_{diff} = 90 Ω) Figure 14. Eye diagram (toaded by Z_{diff} = 90 Ω) Figure 14. Eye diagram with USB2.0 [mask 1] board only







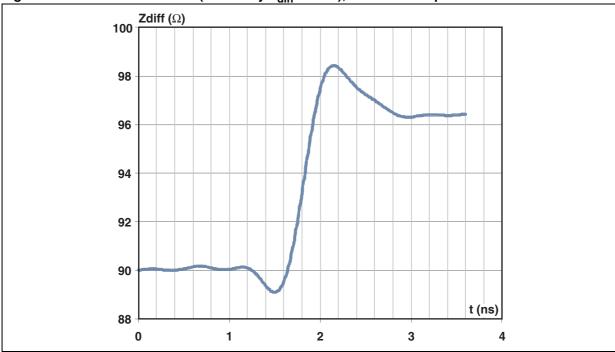


Figure 16. HS sync

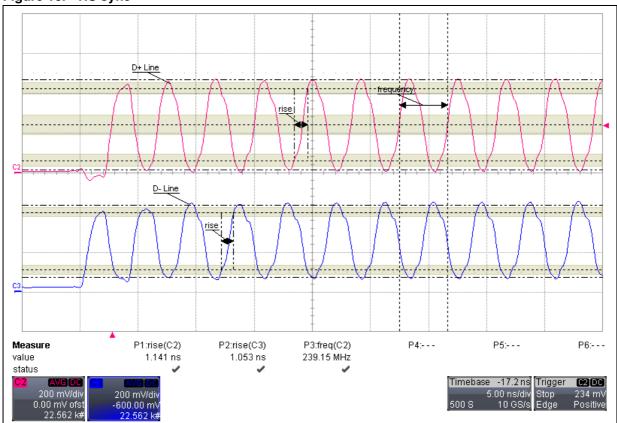


Figure 17. Total harmonic distortion on differential lanes

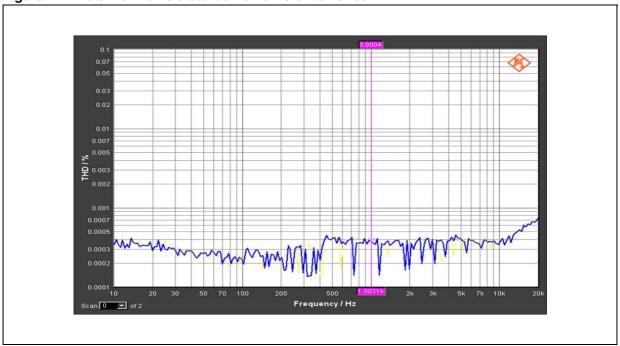
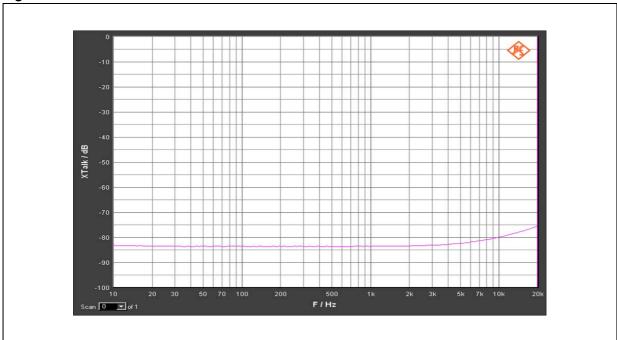


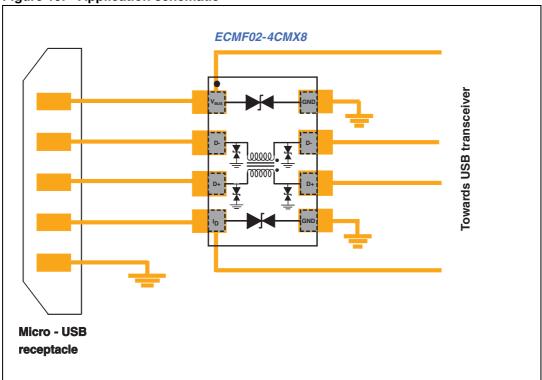
Figure 18. Crosstalk on differential lanes



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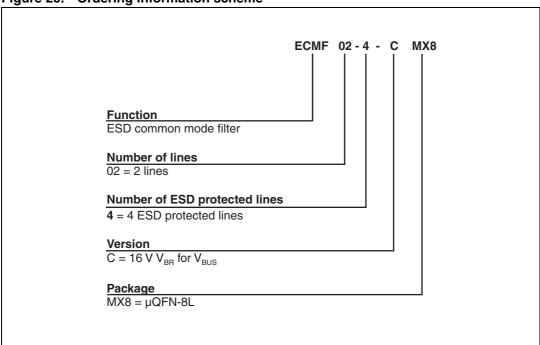
2 Application schematic

Figure 19. Application schematic



3 Ordering information scheme

Figure 20. Ordering information scheme



4 Package information

- Epoxy meets UL94, V0
- Lead-free packages

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.

Figure 21. µQFN-8L dimension definitions

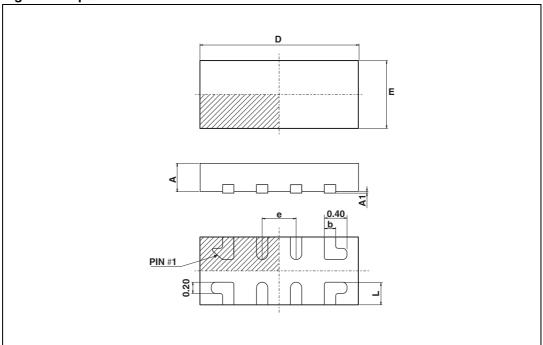


Table 3. µQFN-8L dimension values

	Dimensions						
Ref.	Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	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	2.45	2.50	2.55	0.096	0.098	0.100	
Е	1.15	1.20	1.25	0.045	0.047	0.049	
е	0.45	0.50	0.55	0.018	0.020	0.022	
L	0.30	0.40	0.50	0.012	0.016	0.020	

Package information ECMF02-4CMX8

Figure 22. Footprint

Figure 23. Marking

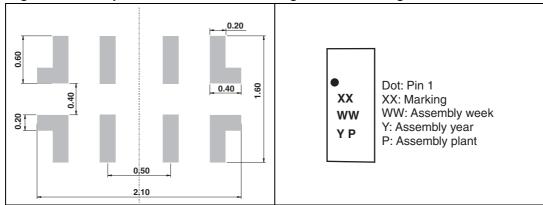
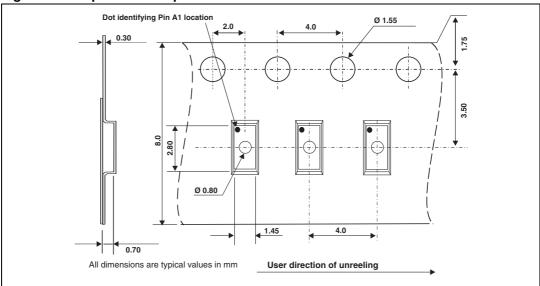


Figure 24. Tape and reel specifications



Note: More packing information is available in the application notes: AN1751: "EMI Filters: Recommendations and measurements"

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5 Ordering information

Table 4. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ECMF02-4CMX8	KG	μQFN-8L	3,7 mg	3000	Tape and reel

For the latest information on available order codes see the product pages on: www.st.com.

6 Revision history

Table 5. Document revision history

Date	Revision	Changes
19-Sep-2012	1	Initial release.

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