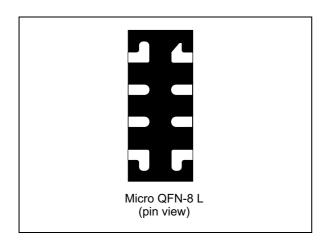
ECMF02-4CMX8



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 micro QFN-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 for 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

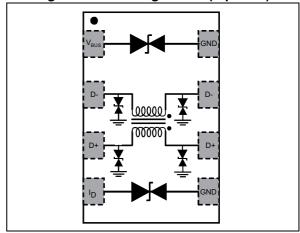
Where transient overvoltage protection in ESD sensitive equipment is required, such as:

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

Description

The 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.

Figure 1. Pin configuration (top view)



1 Characteristics

Table 1. Absolute maximum ratings (T_{amb} = 25 °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 _j	Maximum operating junction temperature		-40 to +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

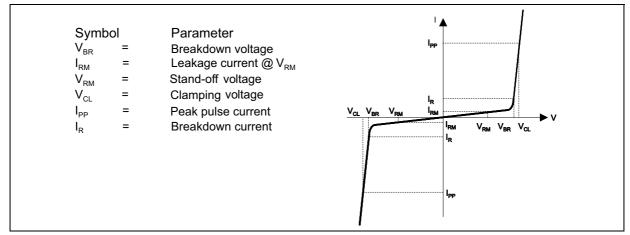


Table 2. Electrical characteristics (values, T_{amb} = 25 °C)

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 $_{\rm 0~diff}$ = 90 Ω) for data lines D+ and D-

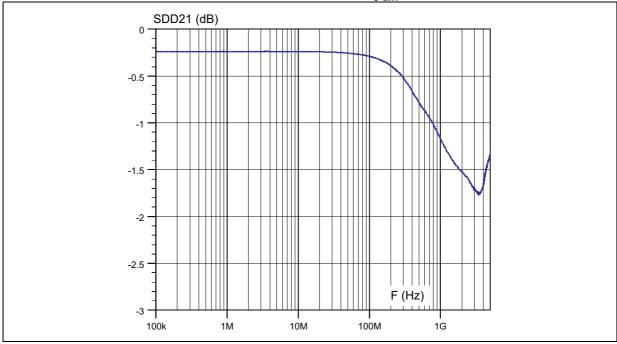


Figure 4. SCC21 common mode attenuation measurement (Z $_{\!0~com}$ = 45 Ω)

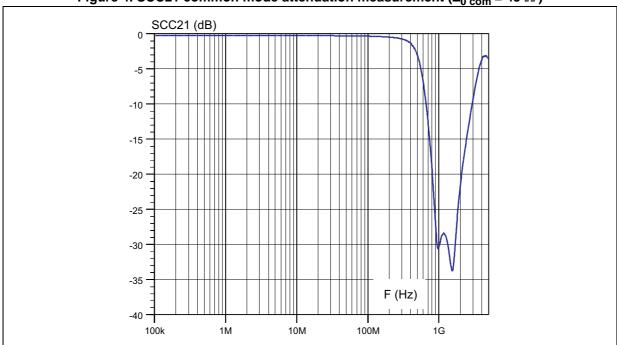


Figure 5. ID frequency response measurement (Z₀ = 75 Ω)

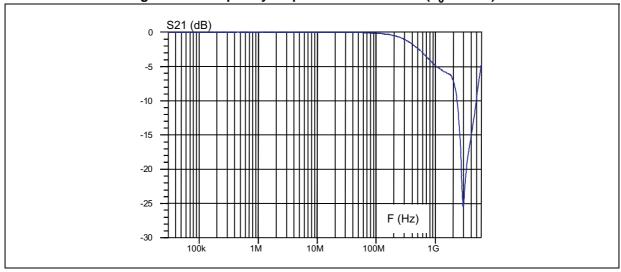
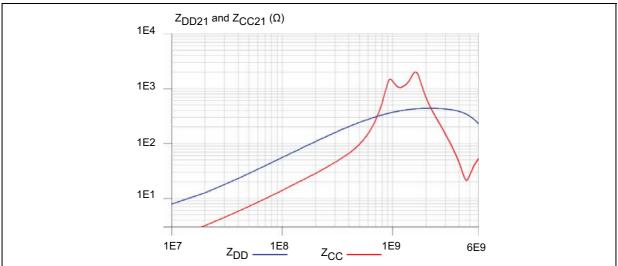


Figure 6. Differential (Z_{DD21}) and common mode (Z_{CC21}) impedance versus frequency

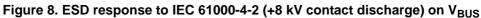


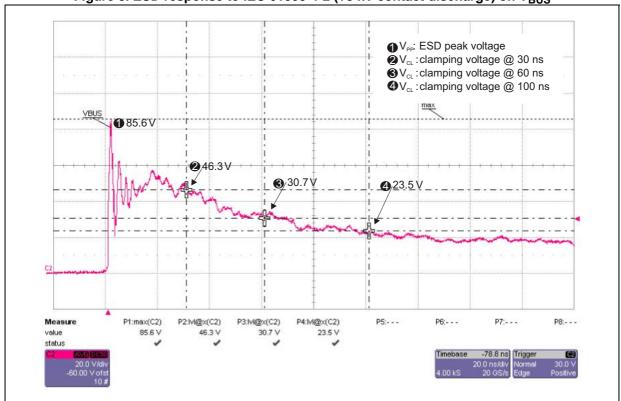
Attenuators

D
D
D
D
D
Oscilloscope

50 Ω

Figure 7. ESD test conditions





577

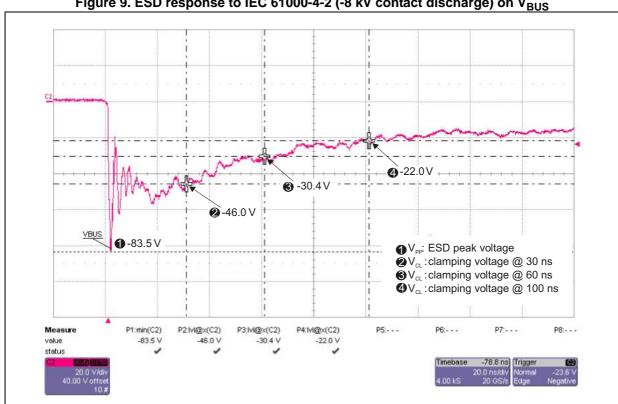
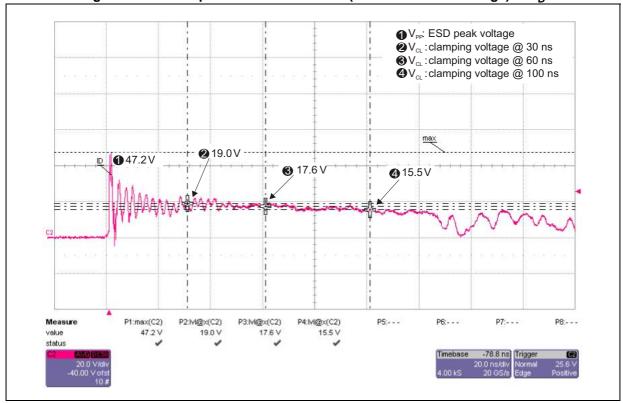


Figure 9. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on V_{BUS}





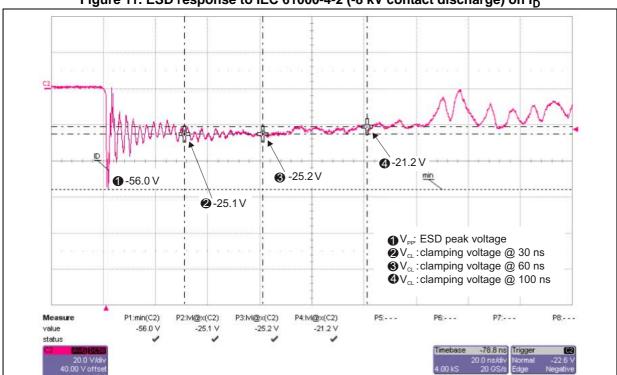
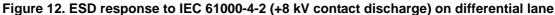
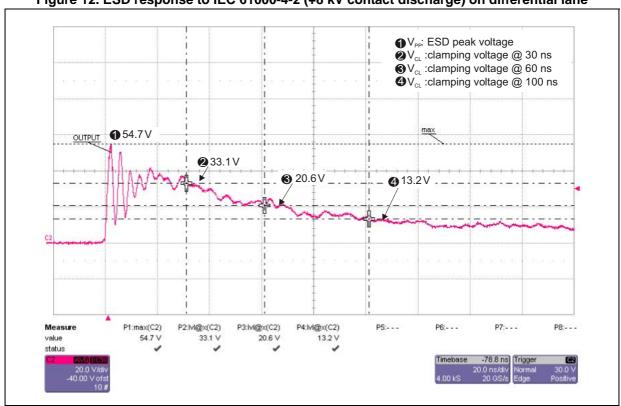


Figure 11. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on I_D





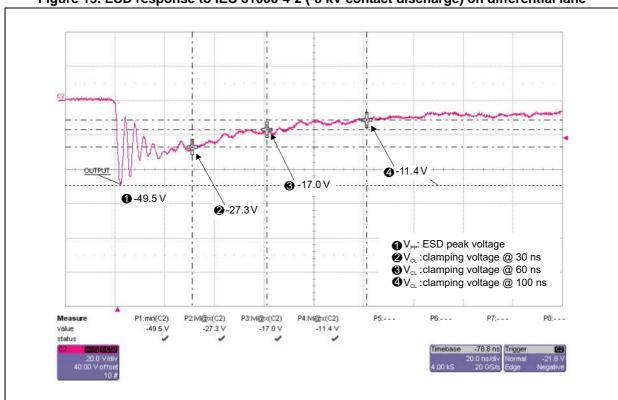
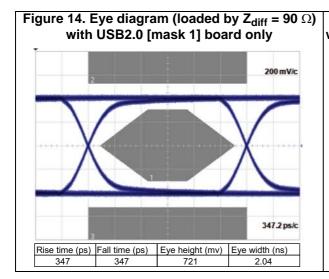
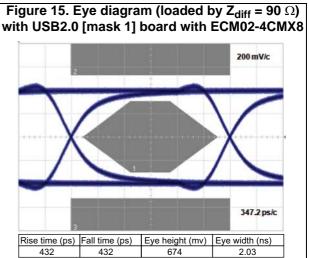


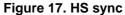
Figure 13. ESD response to IEC 61000-4-2 (-8 kV contact discharge) on differential lane

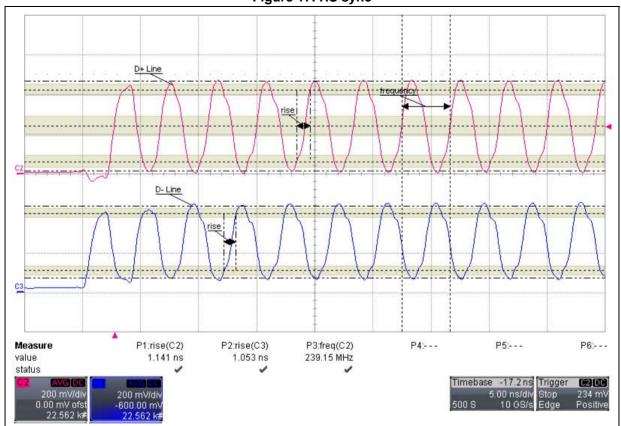




2diff (Ω)
98
96
94
92
90
88
0 1 2 3 4

Figure 16. TDR measurement (loaded by Z_{diff} = 90 Ω), rise time 400 ps

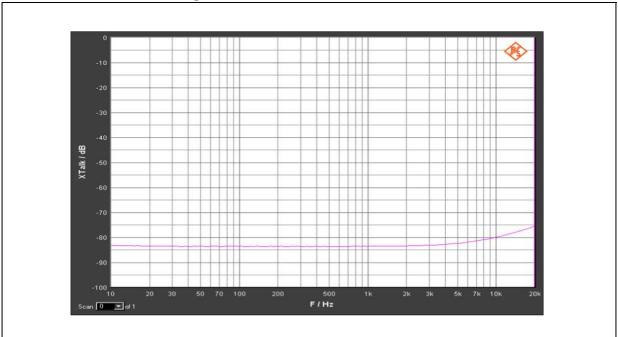




0.1 0.000 0.

Figure 18. Total harmonic distortion on differential lanes





2 Application schematic

ECMF02-4CMX8

BECMF02-4CMX8

Micro USB receptacle

Figure 20. Application schematic

Package information 3

- 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.

3.1 Micro QFN-8L package information

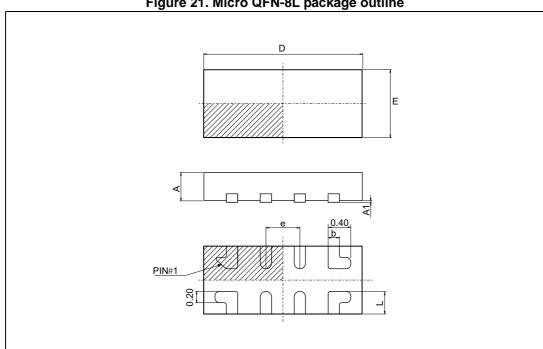


Figure 21. Micro QFN-8L package outline

Table 3. Micro QFN-8L package mechanical data

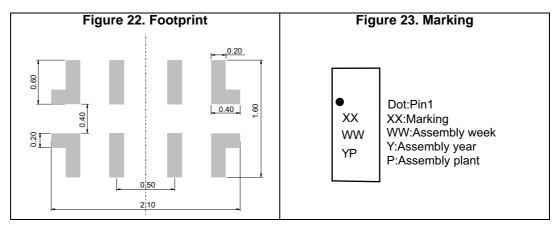
	Dimensions					
Ref.		Millimeters		Inches ⁽¹⁾		
	Тур.	Min.	Max.	Тур.	Min.	Max.
Α	0.50	0.45	0.55	0.020	0.018	0.022
A1	0.02	0.00	0.05	0.0008	0.00	0.002
b	0.20	0.15	0.25	0.008	0.006	0.010
D	2.50	2.45	2.55	0.098	0.096	0.100
E	1.20	1.15	1.25	0.047	0.045	0.049

Package information ECMF02-4CMX8

· · · · · · · · · · · · · · · · · · ·							
	Dimensions						
Ref.		Millimeters			Inches ⁽¹⁾		
	Тур.	Min.	Max.	Тур.	Min.	Max.	
е	0.50	0.45	0.55	0.020	0.018	0.022	
L	0.40	0.30	0.50	0.016	0.012	0.020	

Table 3. Micro QFN-8L package mechanical data (continued)

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



Dot identifying Pin A1 location 4.0 ± 0.1 0.30 ± 0.02 3.5 ± 0.05 Ø 0.80 4.0 ± 0.1 1.45 ± 0.05 0.70 ± 0.05 All dimensions are typical values in mm User direction of unreeling

Figure 24. Tape and reel specifications

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

DocID022286 Rev 3 14/16

ECMF02-4CMX8 Ordering information

4 Ordering information

Figure 25. Ordering information scheme

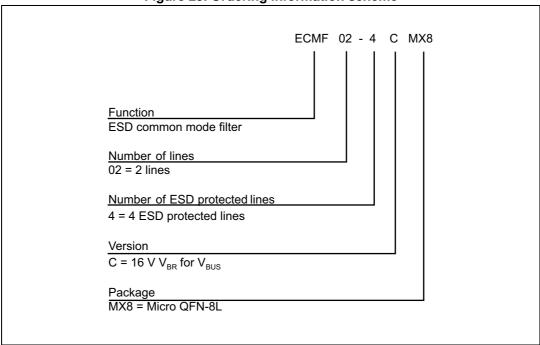


Table 4. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ECMF02-4CMX8	KG	Micro QFN-8L	3.7 mg	3000	Tape and reel

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

5 Revision history

Table 5. Document revision history

Date	Revision	Changes
19-Sep-2012	1	Initial release.
27-May-2014	2	Updated Figure 24, Figure 25 and reformatted the document.
05-May-2015	3	Added Figure 6. Updated Table 1. Format updated to current standard.

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