

Common mode filter with ESD protection for high speed serial interface

Datasheet - production data

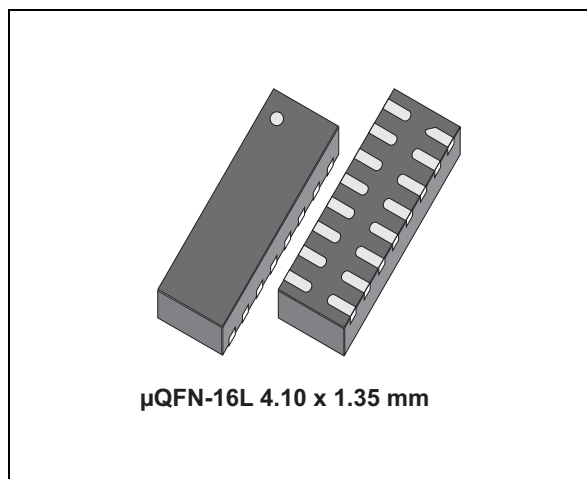
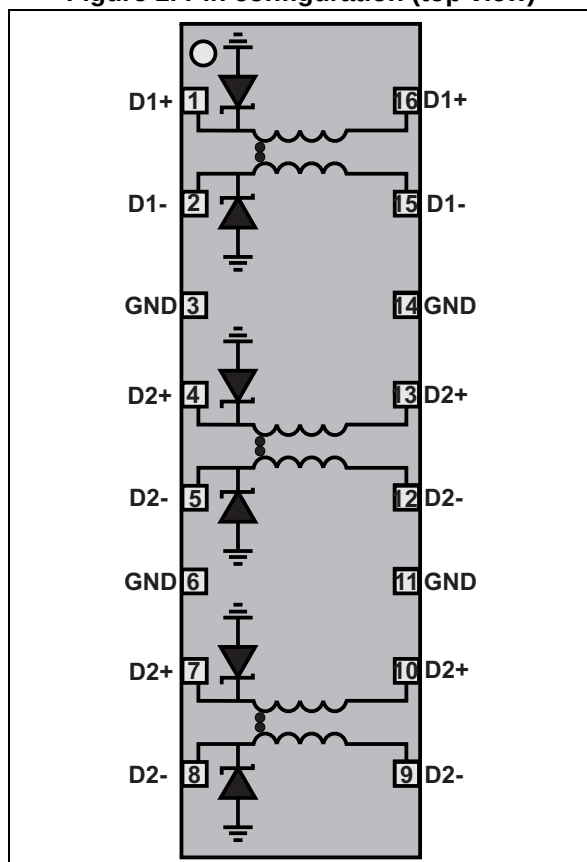


Figure 1. Pin configuration (top view)



Features

- Very large differential bandwidth to comply with HDMI Full HD, MIPI, USB2.0, USB3.0, Display Port and other high speed serial interfaces
- Provides -20 dB attenuation at 700 MHz in LTE bands
- High common mode attenuation: -25 dB between 800 MHz - 900 MHz
- Very low PCB space consumption
- Thin package: 0.55 mm max.
- Lead-free package
- High reduction of parasitic elements through integration.

Complies with the following standards:

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

Applications

- Mobile phones
- Notebook, laptop
- Portable devices
- PND

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 Full HD, MIPI, Display Port and other high speed serial interfaces. The device has a very large differential bandwidth to comply with these standards. The device can protect and filter 3 differential lanes.

1 Characteristics

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

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	IEC 61000-4-2 Contact discharge (connector side) Air discharge (connector side)	8 16	kV
I_{DC}	Maximum DC current		100	mA
T_{op}	Operating temperature range		-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)

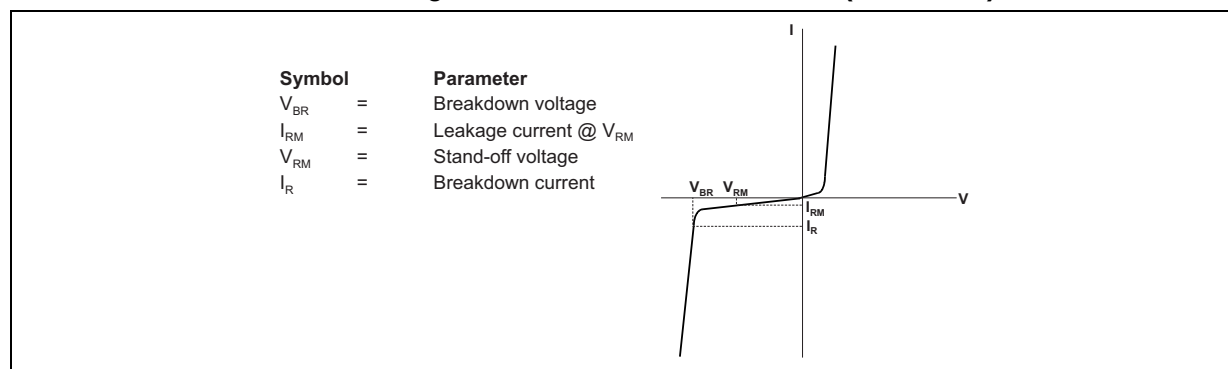


Table 2. Electrical characteristics ($T_{amb} = 25\text{ °C}$)

Symbol	Test conditions	Min.	Typ.	Max.	Unit
V_{BR}	$I_R = 1\text{ mA}$	6			V
I_{RM}	$V_{RM} = 3\text{ V per line}$			100	nA
R_{DC}	DC serial resistance		5		Ω

Table 3. Pin description

Pin number	Description	Pin number	Description	Pin number	Description	Pin number	Description
1	D1+ to connector	5	D2- to connector	9	D3- to IC	13	D2+ to IC
2	D1- to connector	6	GND	10	D3+ to IC	14	GND
3	GND	7	D3+ to connector	11	GND	15	D1- to IC
4	D2+ to connector	8	D3- to connector	12	D2- to IC	16	D1+ to IC

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

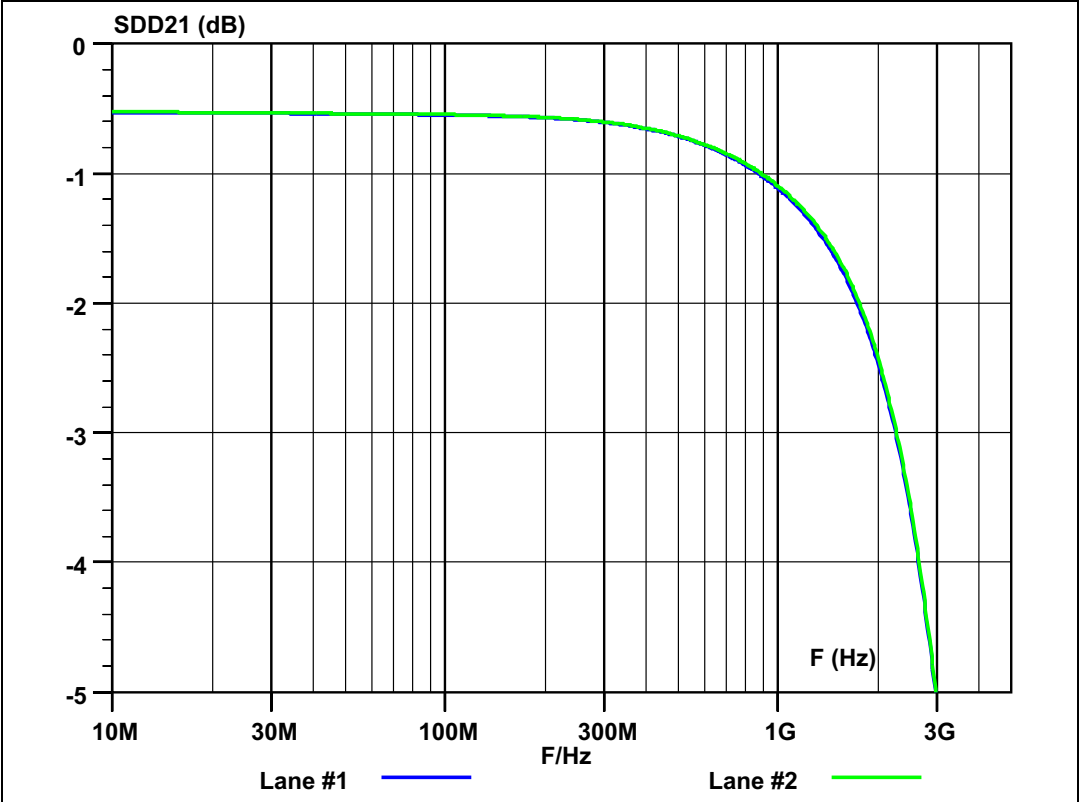


Figure 4. Common mode attenuation versus frequency ($Z_{0\text{ com}} = 50\ \Omega$)

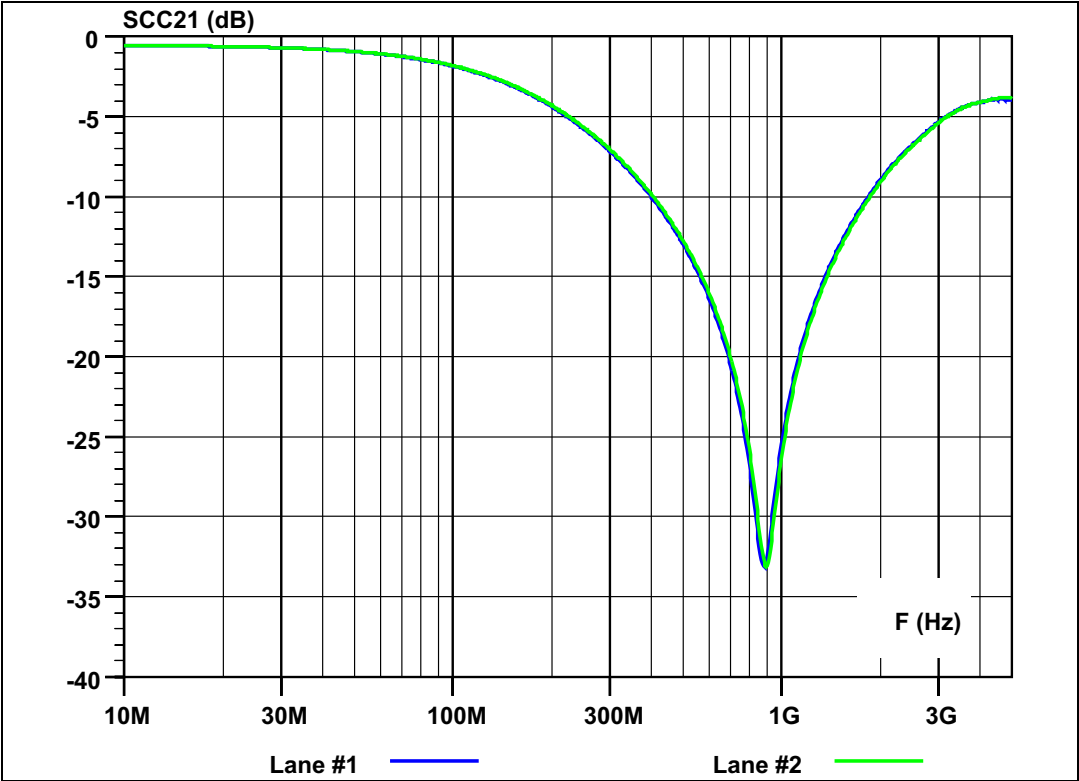


Figure 5. Differential (Z_{DD21}) and common mode (Z_{CC21}) impedance versus frequency

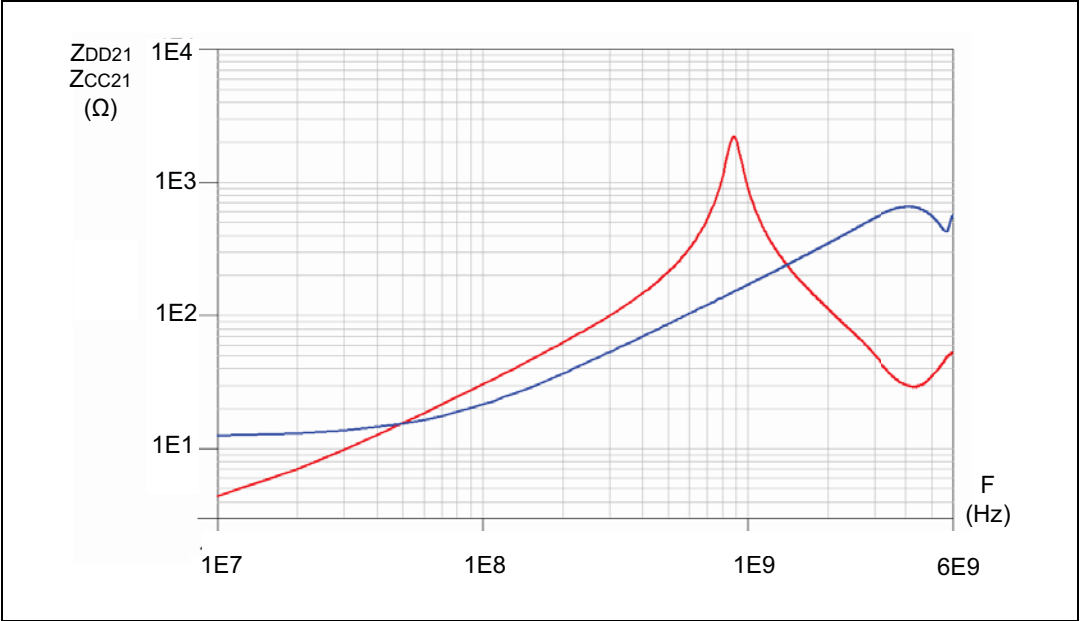


Figure 6. ESD response to IEC61000-4-2 (+8 kV contact discharge)

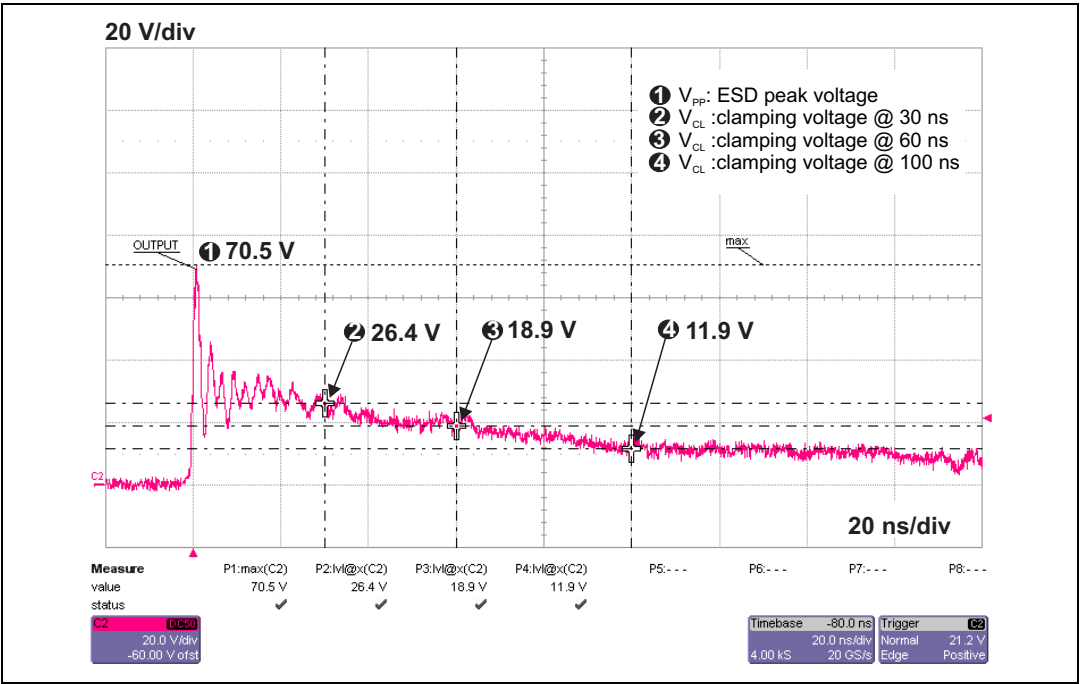


Figure 7. ESD response to IEC61000-4-2 (-8 kV contact discharge)

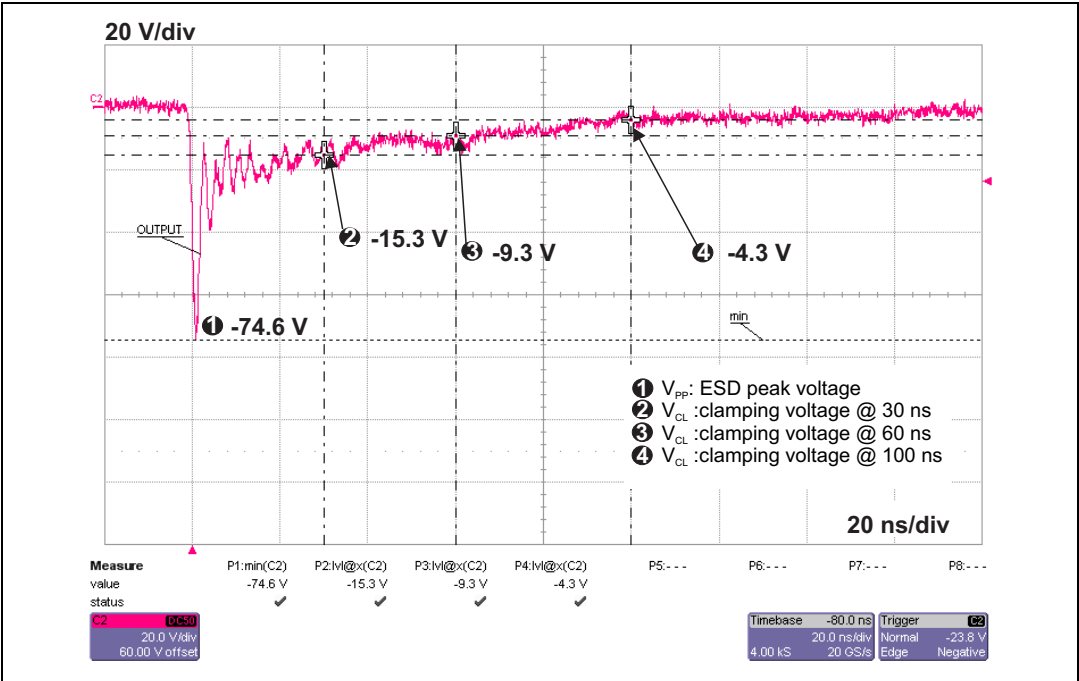


Figure 8. USB2.0 480 Mbps eye diagram without device

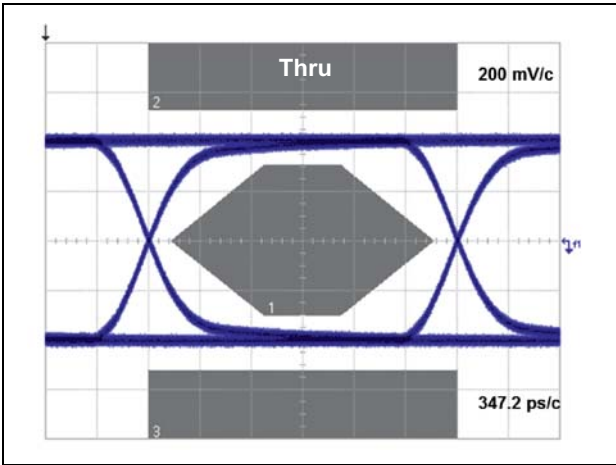


Figure 9. USB2.0 480 Mbps eye diagram with device

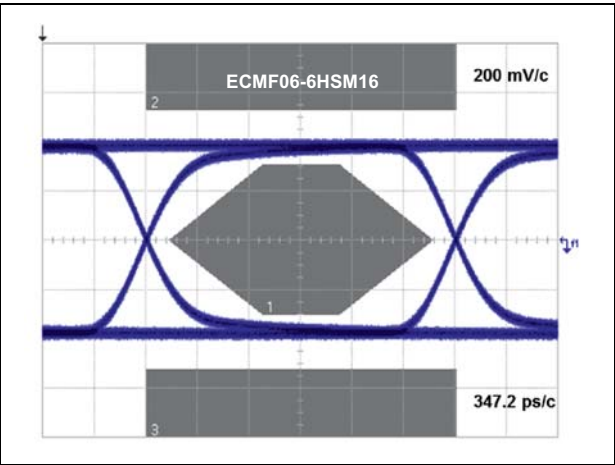


Figure 10. USB3.0 5 Gbps eye diagram without device

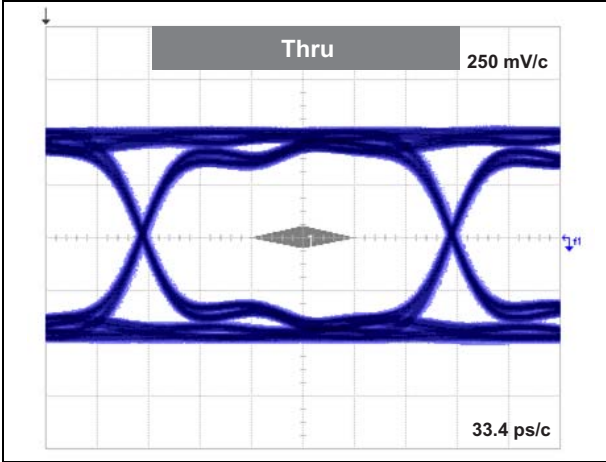


Figure 11. USB3.0 5 Gbps eye diagram with device

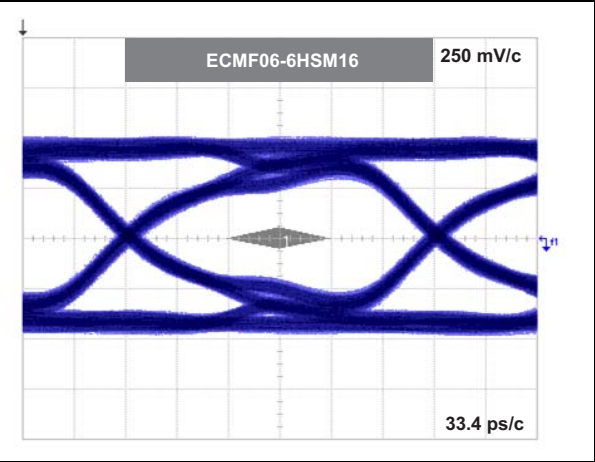


Figure 12. HDMI 3.35 Gbps eye diagram without device

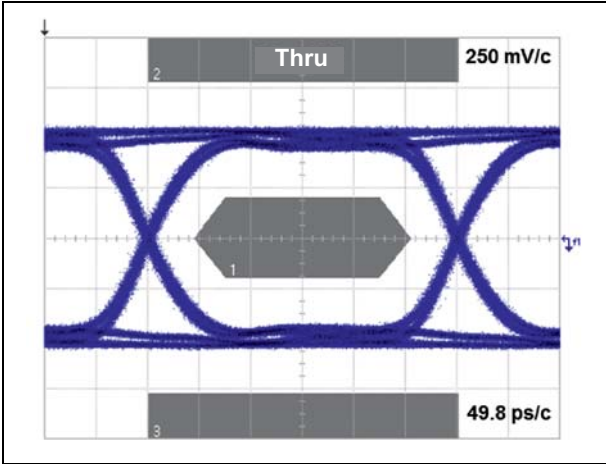


Figure 13. HDMI 3.35 Gbps eye diagram with device

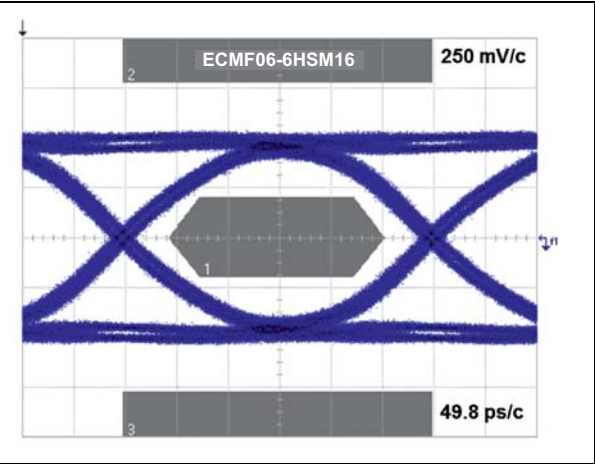
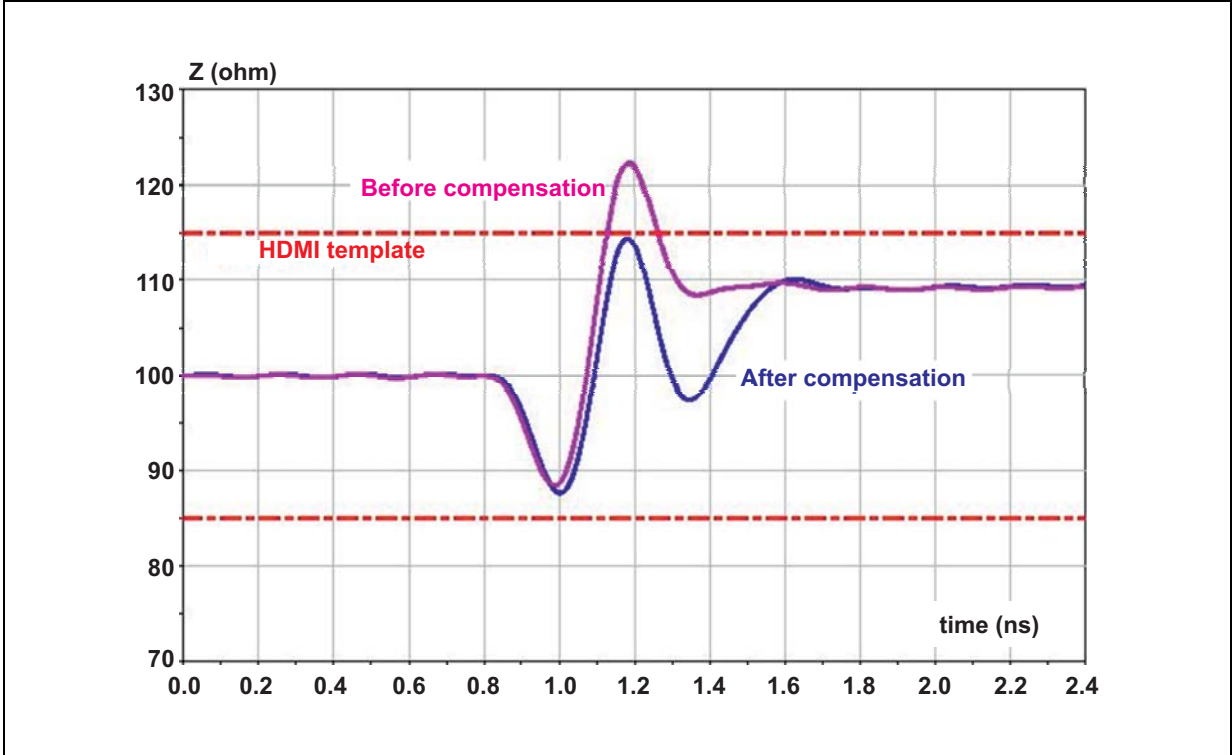
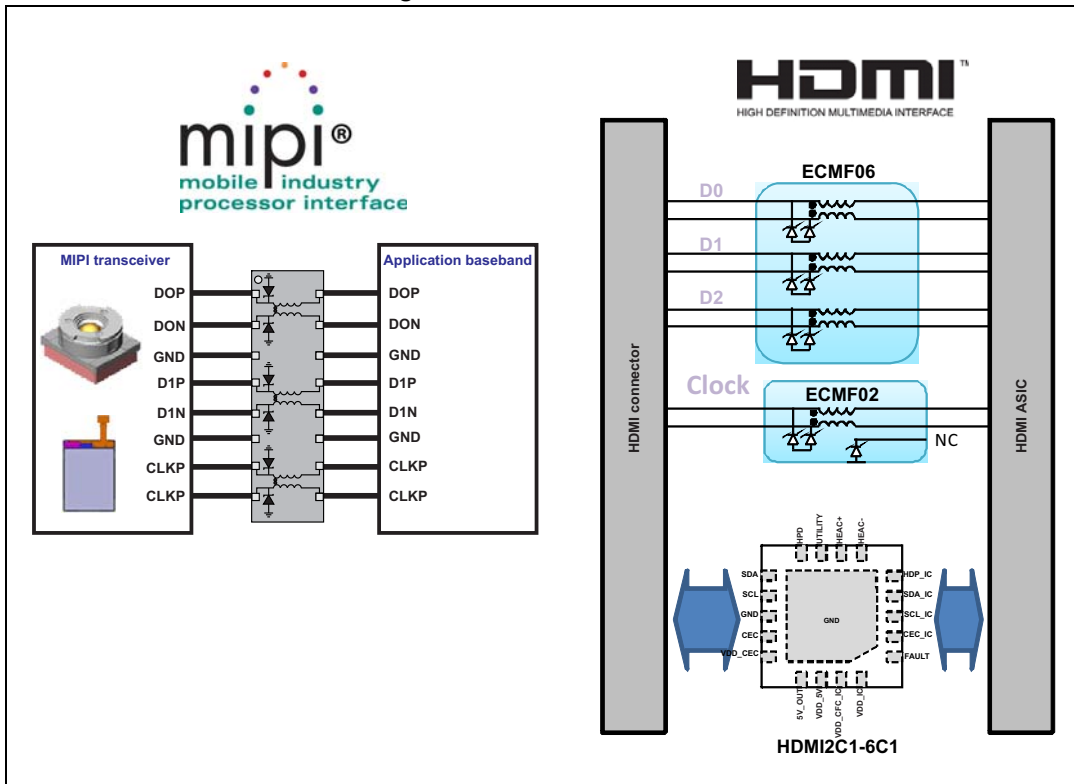


Figure 14. TDR



2 Application information

Figure 15. HDMI schematic



More application information available in following AN:

- Application Note AN4356: "Antenna desense on handheld equipment"
- Application Note AN4511: "Common Mode filters"
- Application Note AN4540: "MHL link filtering and protection"

3 PCB layout recommendations

Figure 16. PCB layout recommendations

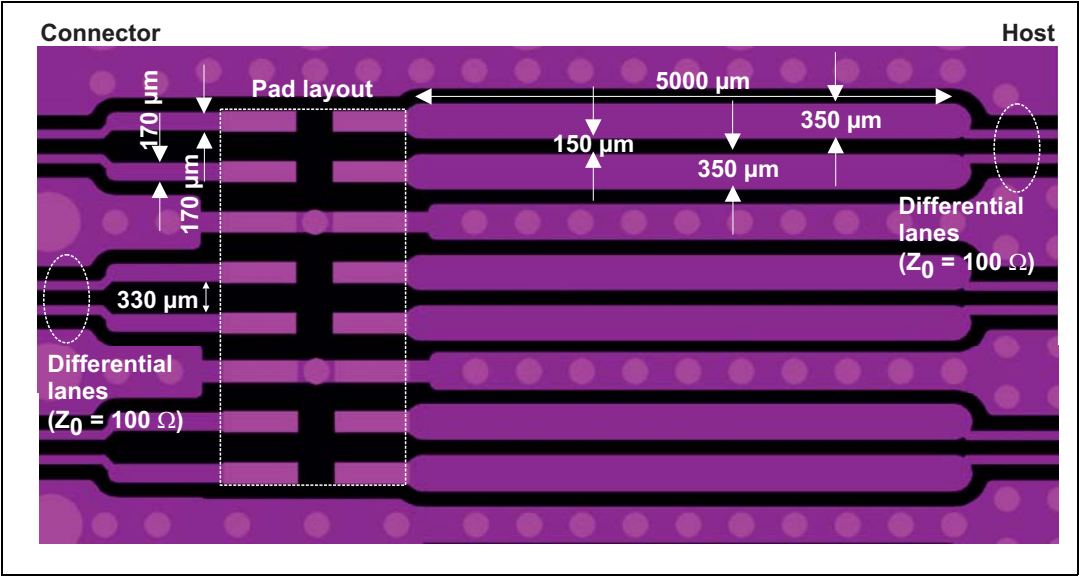
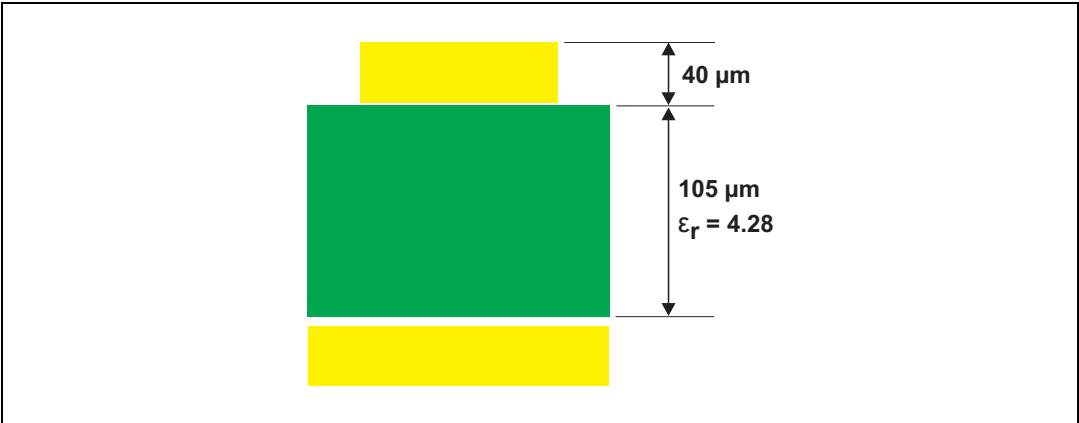


Figure 17. PCB stack dimensions



4 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.

Figure 18. μ QFN-16L dimension definitions

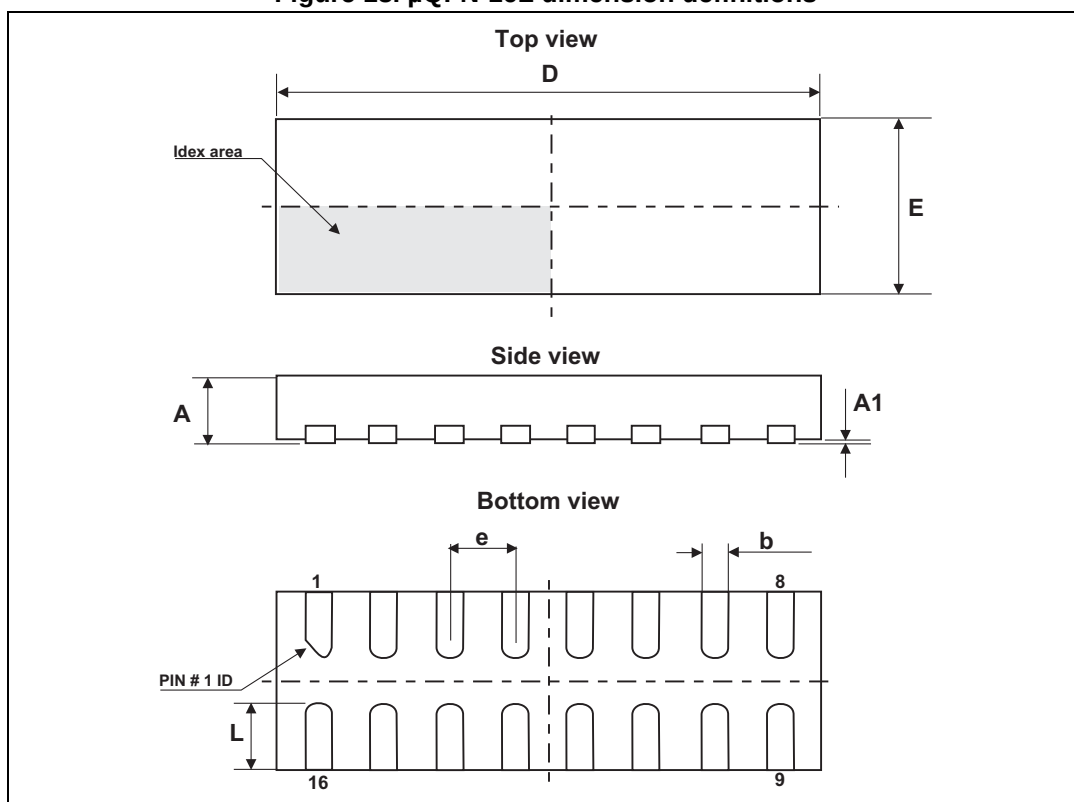


Table 4. μ QFN-16L dimension values

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		4.10			0.161	
E		1.35			0.053	
e		0.50			0.020	
L	0.40	0.50	0.60	0.016	0.020	0.024

Figure 19. Footprint

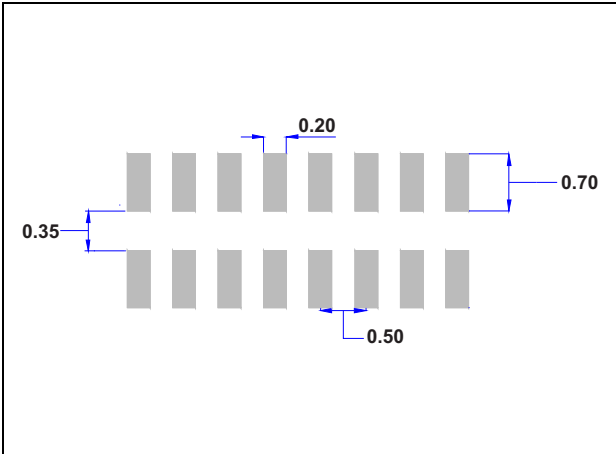


Figure 20. Marking

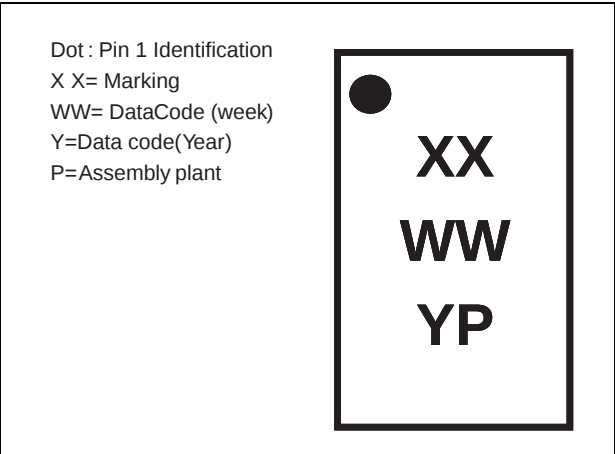
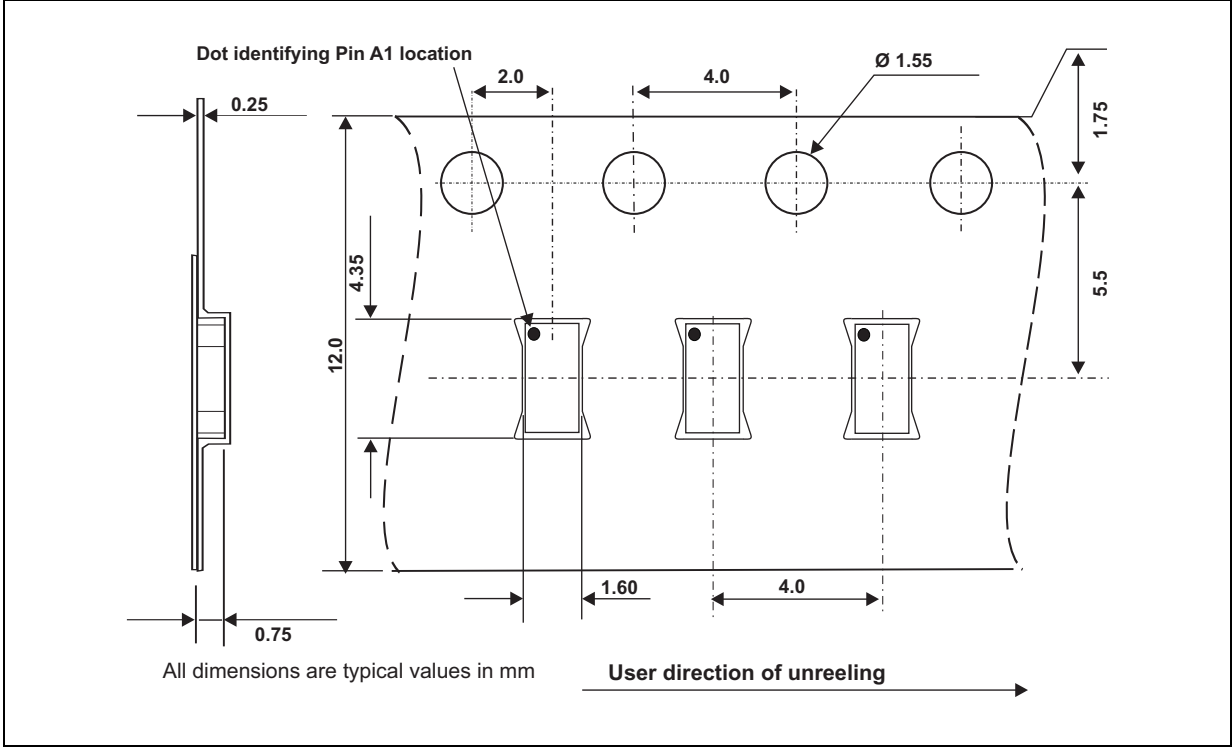


Figure 21. Tape and reel specifications



5 Ordering information

Figure 22. Ordering information scheme

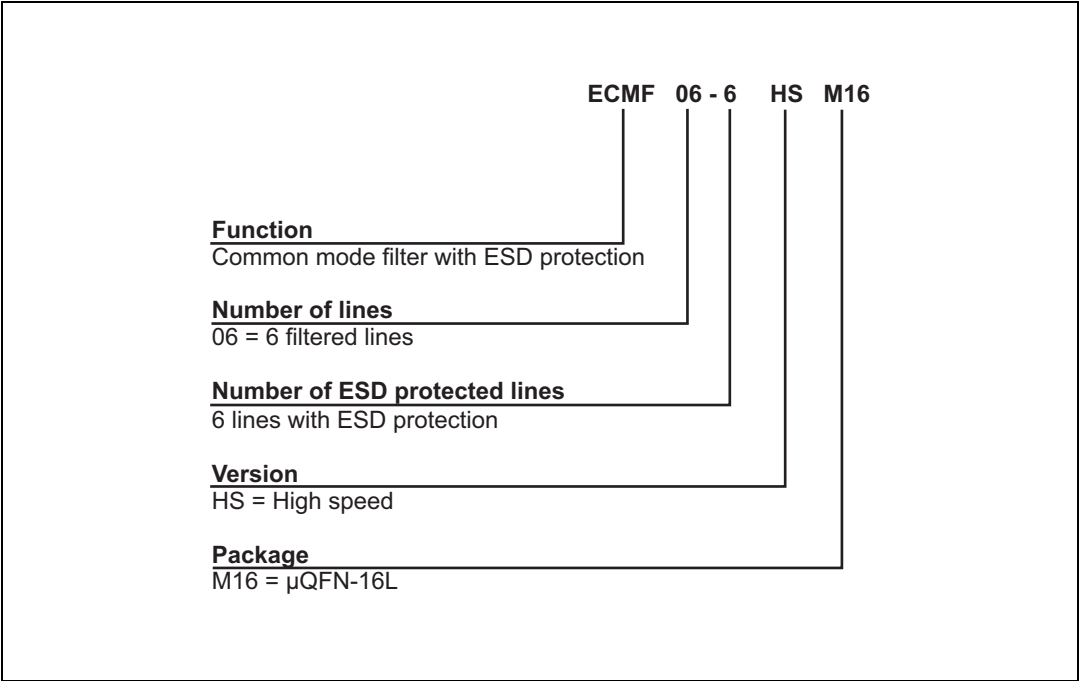


Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ECMF06-6HSM16	KL	μ QFN-16L	7.76 mg	3000	Tape and reel

6 Revision history

Table 6. Document revision history

Date	Revision	Changes
03-Oct-2013	1	Initial release.
25-Aug-2014	2	Added Figure 5: Differential (ZDD21) and common mode (ZCC21) impedance versus frequency .

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