

2-line IPAD™, EMI filter including ESD protection

Features

- 2-line low-pass filter + ESD protection
- High efficiency in EMI filtering
- Lead-free package
- Very low PCB space occupation: < 2.5 mm²
- Very thin package: 0.65 mm
- High efficiency in ESD suppression (IEC61000-4-2 level 4)
- High reliability offered by monolithic integration
- High reduction of parasitic elements through integration and wafer level packaging

Complies with the following standards

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

Application

ESD protection and EMI filtering for:

- USB port

Description

The EMIF02-USB01F2 is a highly integrated array designed to suppress EMI / RFI noise for USB port filtering. The EMIF02-USB01F2 Flip Chip packaging means the package size is equal to the die size.

Additionally, this filter includes ESD protection circuitry which prevents damage to the protected device when subjected to ESD surges up to 15 kV.

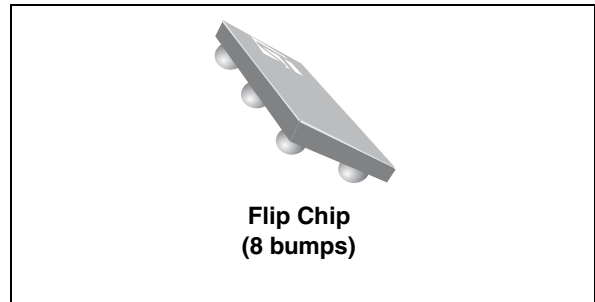


Figure 1. Pin configuration (bump side view)

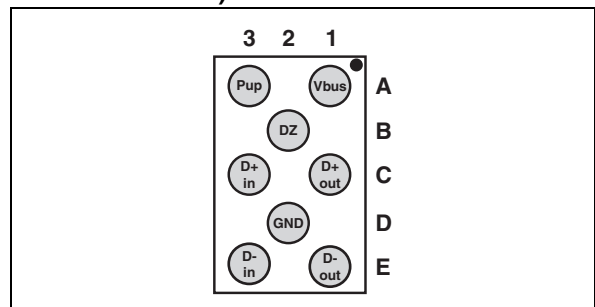
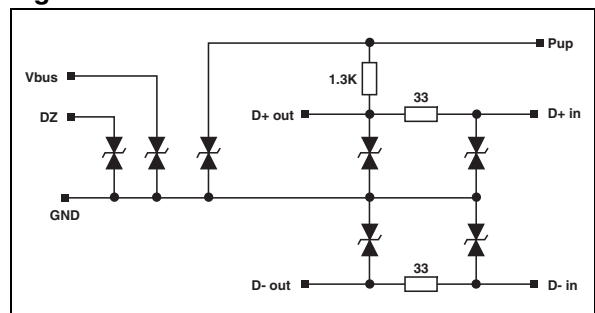


Figure 2. Schematic



TM: IPAD is a trademark of STMicroelectronics.

1 Electrical characteristics

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

Symbol	Parameter	Value	Unit
T_j	junction temperature	125	$^{\circ}\text{C}$
T_{op}	Operating temperature range	-40 to +85	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$

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

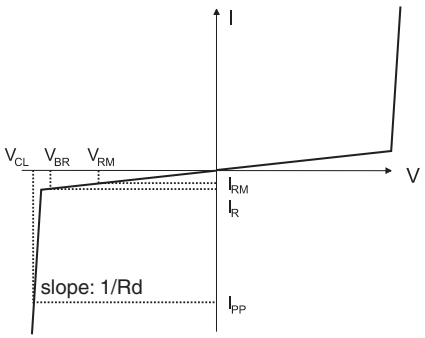
Symbol	Parameters				
V_{BR}	Breakdown voltage				
I_{RM}	Leakage current @ V_{RM}				
V_{RM}	Stand-off voltage				
V_{CL}	Clamping voltage				
R_d	Dynamic impedance				
I_{PP}	Peak pulse current				
$R_{I/O}$	Series resistance between input and output				
C_{line}	Input capacitance per line				
Symbol	Test conditions	Min	Typ	Max	Unit
V_{BR}	$I_R = 1\text{ mA}$	6			V
I_{RM}	$V_{RM} = 3\text{ V}$			0.5	μA
C_{line}	@ 0 V		40	45	pF
R_1, R_2	Tolerance $\pm 5\%$		33		Ω
R_3	Tolerance $\pm 5\%$		1.30		k Ω

Figure 3. S21 (dB) attenuation measurement Figure 4. Analog crosstalk measurements

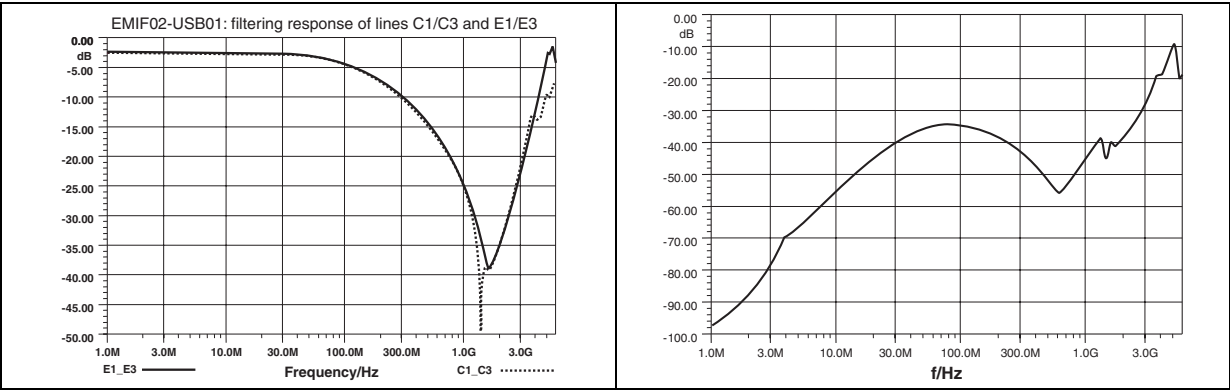


Figure 5. ESD response to IEC61000-4-2 (+15 kV air discharge) on one input V(in) and on one output (Vout) Figure 6. ESD response to IEC61000-4-2 (-15 kV air discharge) on one input V(in) and on one output (Vout)

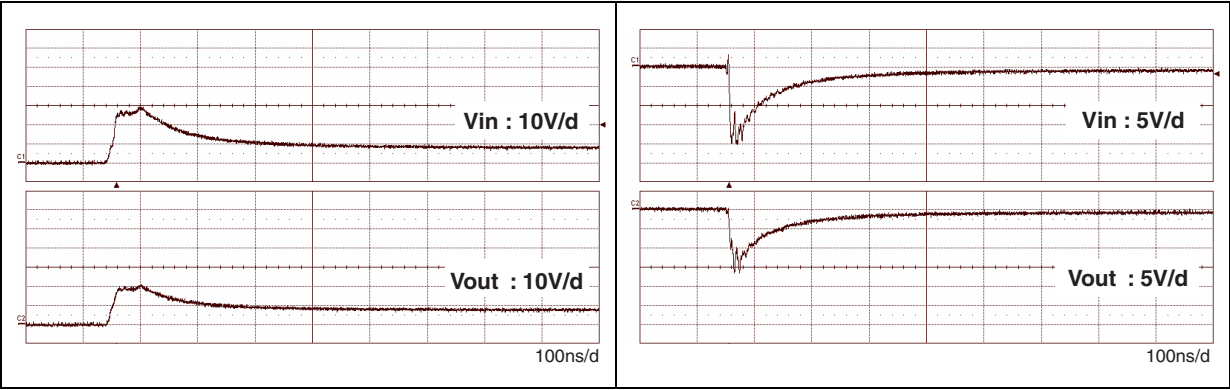
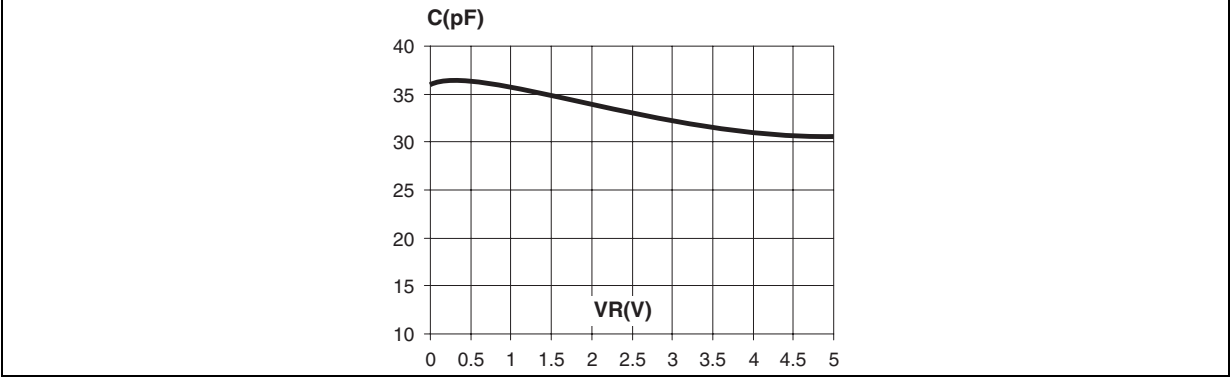


Figure 7. Capacitance versus reverse applied voltage (typical)



2 Application information

Figure 8. Aplac model (resistors, diodes and bumps and ground connections)

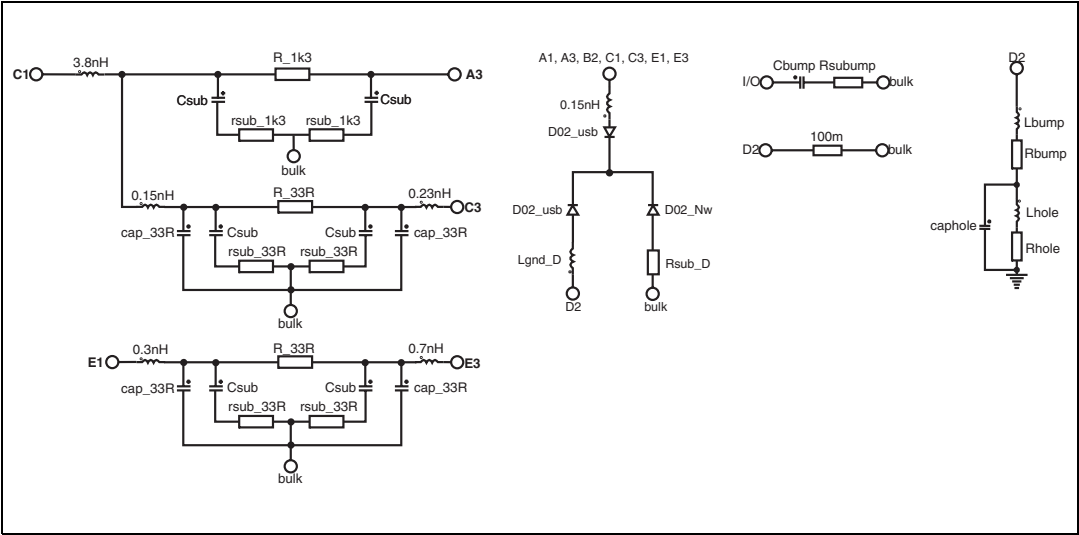
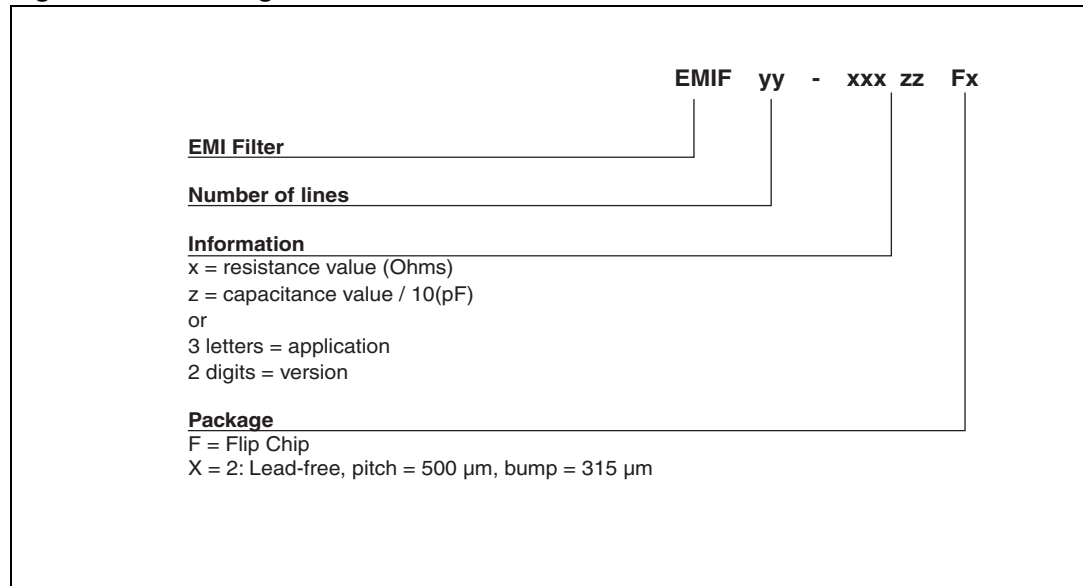


Figure 9. Aplac model parameters

R_33R 33.9	Model D02_Nw	Model D02_usb
cap_33R 1.2pF	BV=100	BV=16
	IBV=1m	IBV=1m
R_1k3 1.3k	CJO=6.8p	CJO=Cz
	M=0.3333	M=0.3333
Cz29pF	RS=2	RS=2
Rsub_D 100	VJ=0.6	VJ=0.6
	TT=100n	TT=100n
Csub0.3pF		
Rsub_33R 15		
Rsub_1k3 50		
lhole10pH		
Rhole400m		
Caphole0.4pF		
Lgnd_D 150pH		
Lbump50pH		
Rbump50m		
Cbump1.5pF		
Rsubump150		

3 Ordering information scheme

Figure 10. Ordering information scheme



4 Package information

In order to meet environmental requirements, ST offers these devices in ECOPACK[®] packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at www.st.com.

Figure 11. Package dimensions

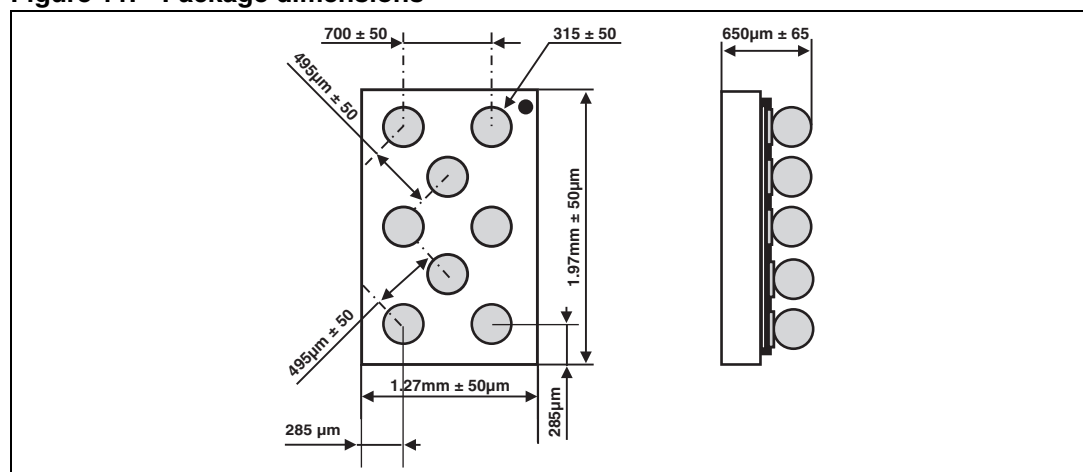


Figure 12. Footprint

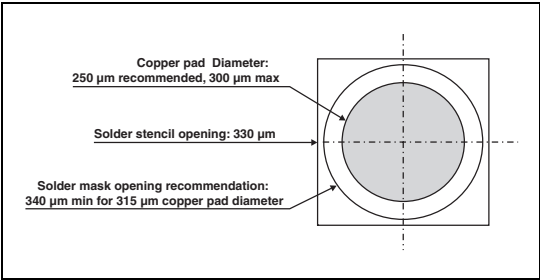


Figure 13. Marking

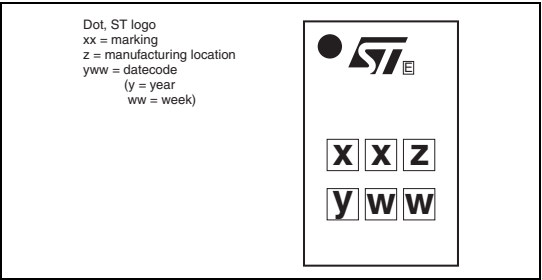
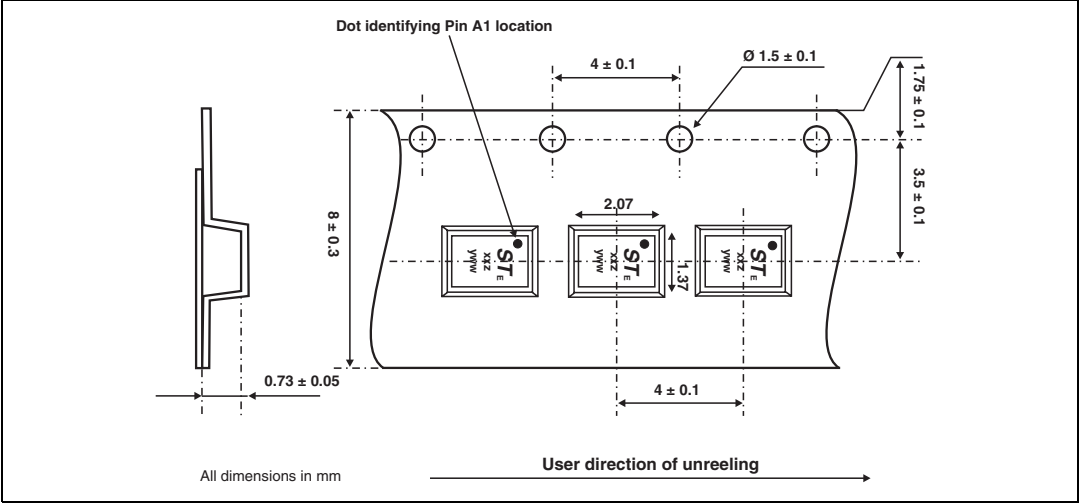


Figure 14. Flip Chip tape and reel specification



5 Ordering information

Table 3. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
EMIF02-USB01F2	FF	Flip Chip	3.35 mg	5000	Tape and reel 7"

Note: More information is available in the application notes:
AN1235: "Flip Chip: Package description and recommendations for use"
AN1751: "EMI filters: Recommendations and measurements"

6 Revision history

Table 4. Document revision history

Date	Revision	Changes
26-Oct-2004	1	Initial release.
16-Apr-2007	2	Updated ECOPACK statement. Updated Figure 10 , Figure 11 and Figure 14 . Reformatted to current standards.
29-Apr-2008	3	Typographical errors corrected.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED REPRESENTATIVE OF ST, ST PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS, WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2008 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com