



IPAD™

EMIF02-USB01

2 LINES EMI FILTER INCLUDING ESD PROTECTION

MAIN APPLICATION

- ESD protection and EMI filtering for USB port.

DESCRIPTION

The EMIF02-USB01 is a highly integrated array designed to suppress EMI / RFI noise for USB port filtering.

The EMIF02-USB01 flip-chip packaging means the package size is equal to the die size. That's why EMIF02-USB01 is a very small device.

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

BENEFITS

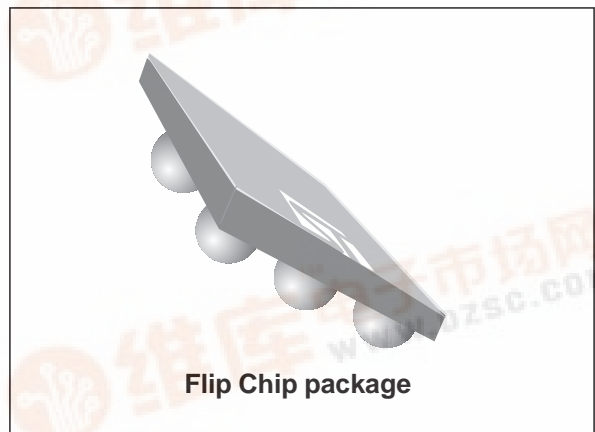
- 2 lines low-pass-filter + 2 lines ESD protection
- High efficiency in EMI filtering
- Very low PCB space consuming: 2.5 mm²
- Very thin package: 0.65 mm
- High efficiency in ESD suppression (IEC61000-4-2 level 4)
- High reliability offered by monolithic integration
- High reducing of parasitic elements through integration & wafer level packaging.

COMPLIES WITH THE FOLLOWING STANDARDS :

IEC61000-4-2 level 4

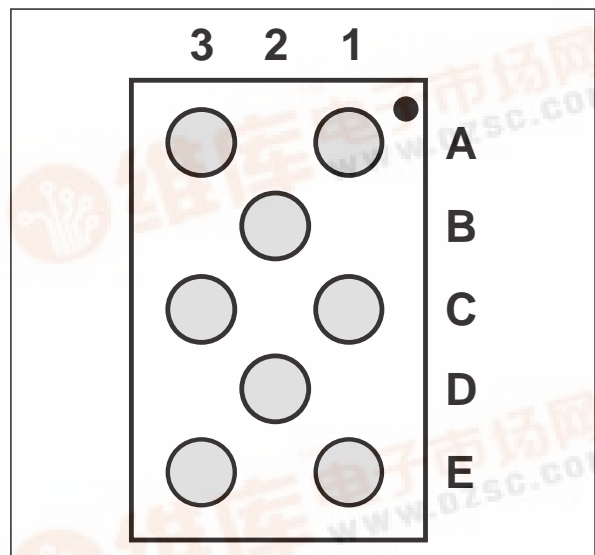
15kV (air discharge)
8 kV (contact discharge)

on input & output pins.



Flip Chip package

PIN CONFIGURATION



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SCHEMATIC

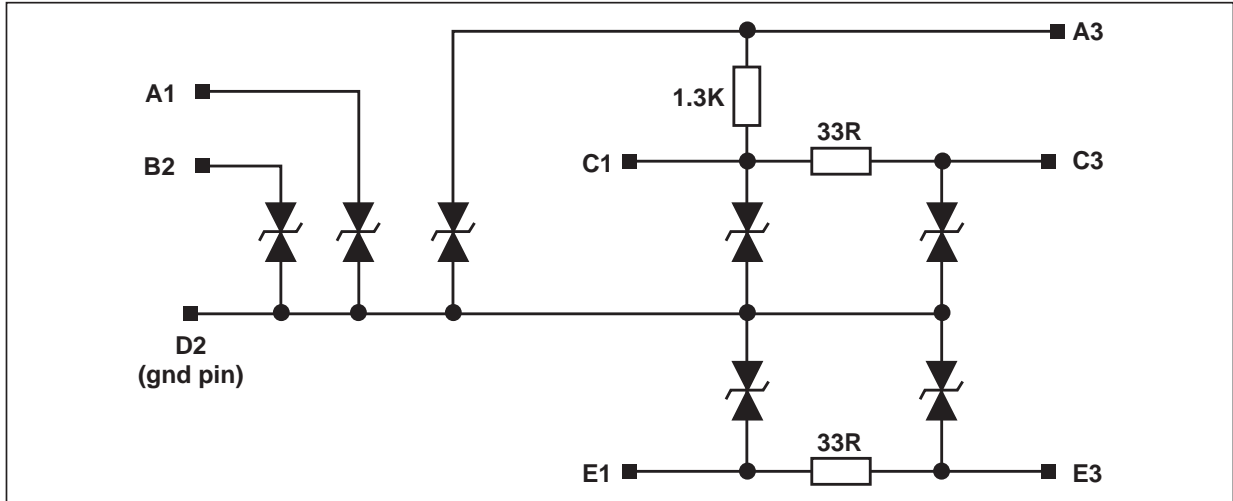


Fig. 1: Filtering behavior

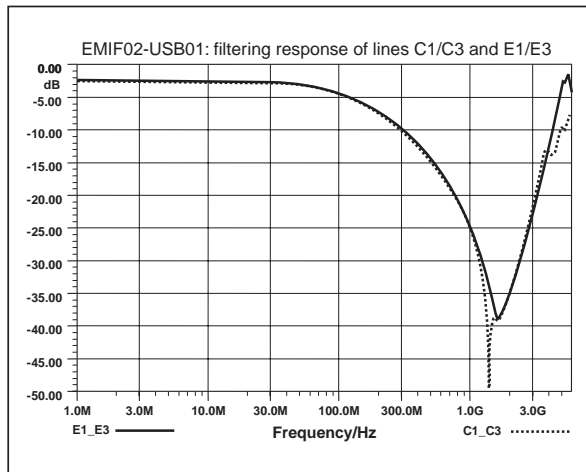


Fig. 3: Capacitance versus reverse applied voltage

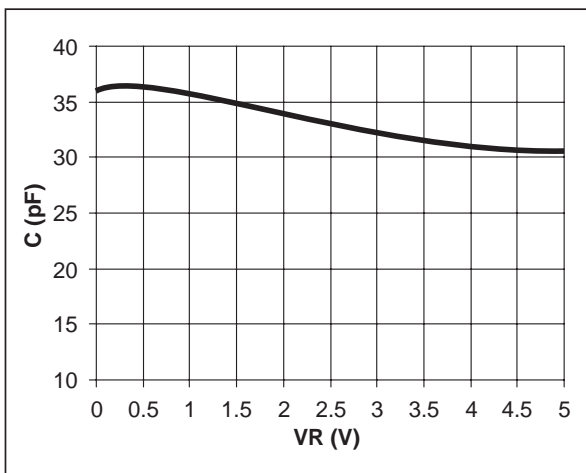


Fig. 2: ESD response to IEC61000-4-2 Level 4

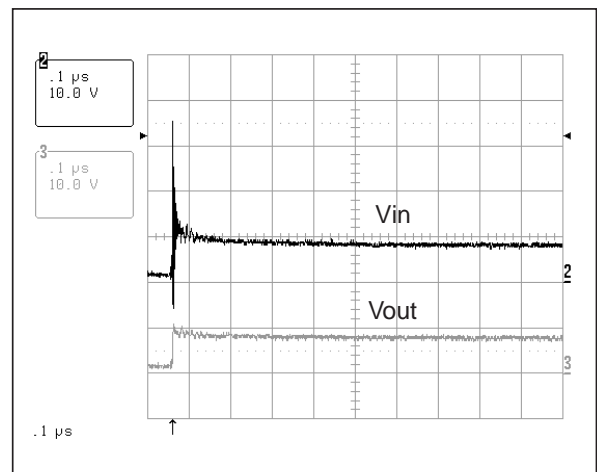
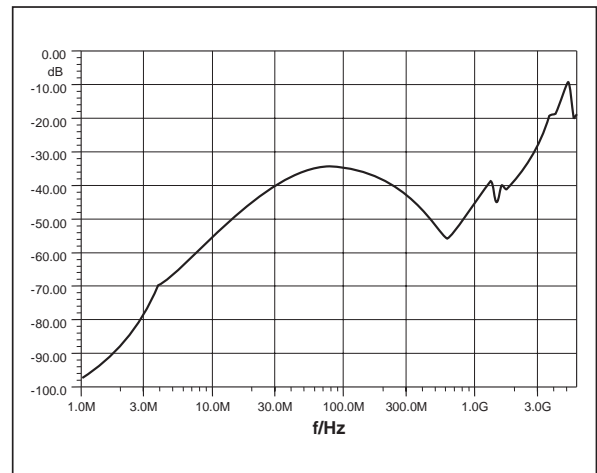


Fig. 4: Digital crosstalk

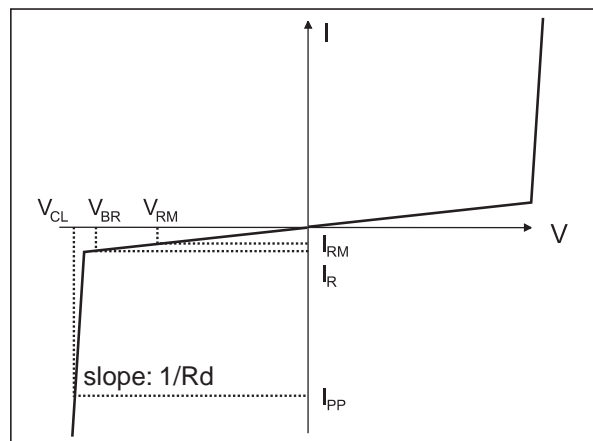


ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter and test conditions	Value	Unit
V_{PP}	ESD discharge IEC61000-4-2, air discharge ESD discharge IEC61000-4-2, contact discharge	15 8	kV
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	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter
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



Symbol	Test conditions	Min.	Typ.	Max.	Unit
V_{BR}	$I_R = 1\text{ mA}$	6			V
I_{RM}	$V_{RM} = 3\text{ V}$		0.1	0.5	μA
C_{line}	@ 0V		40	45	pF
R_1, R_2	Tolerance $\pm 5\%$		33.0		Ω
R_3	Tolerance $\pm 5\%$		1.30		k Ω

APLAC MODELS

Fig. 5: Aplac model of resistors

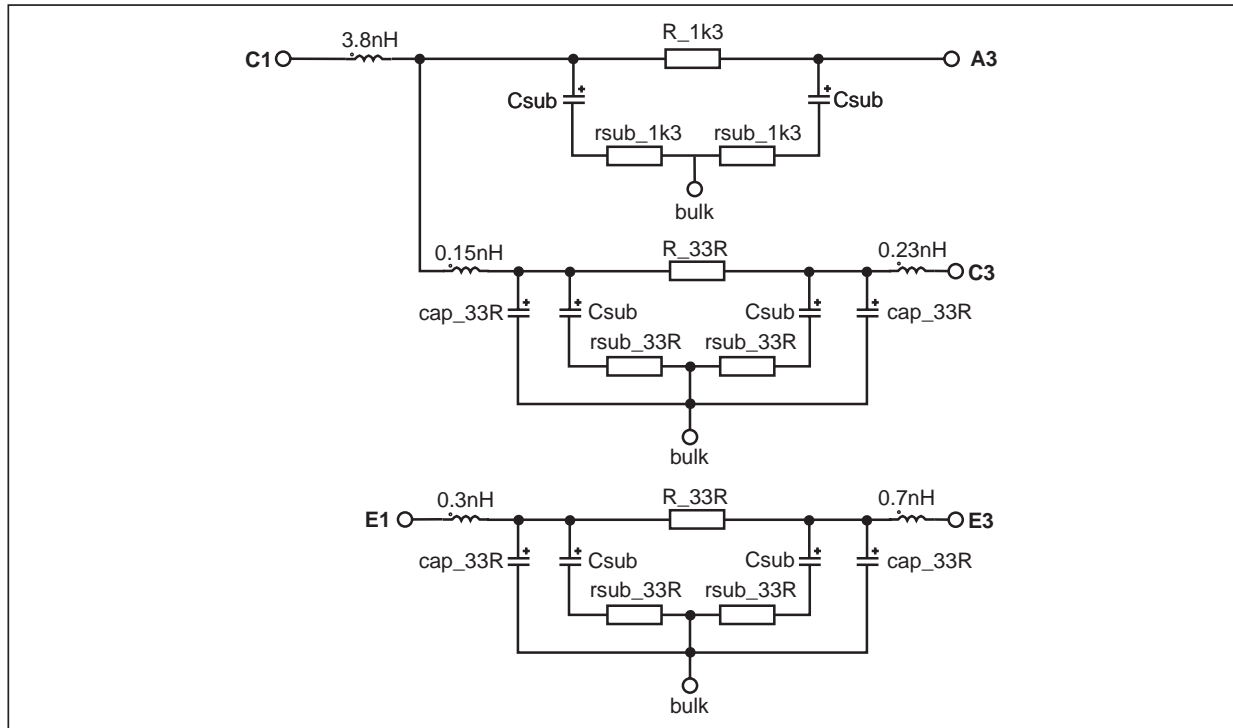


Fig. 6: Aplac model of the diodes

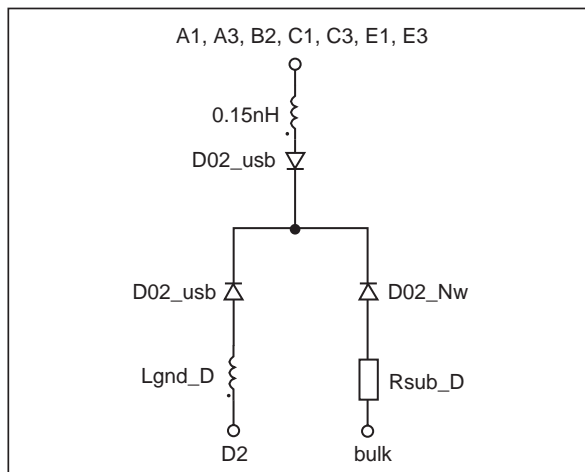
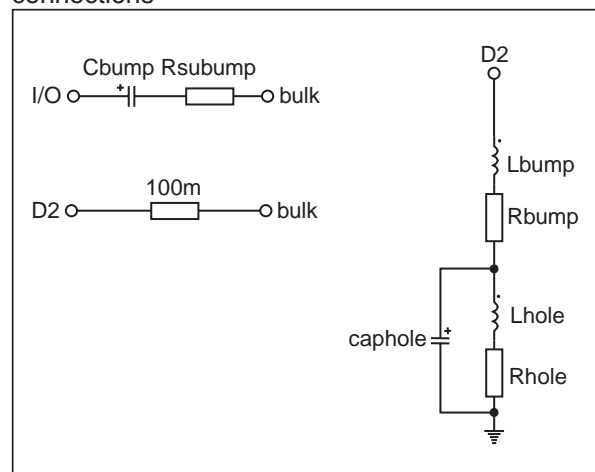


Fig. 7: Aplac model of bumps & ground connections

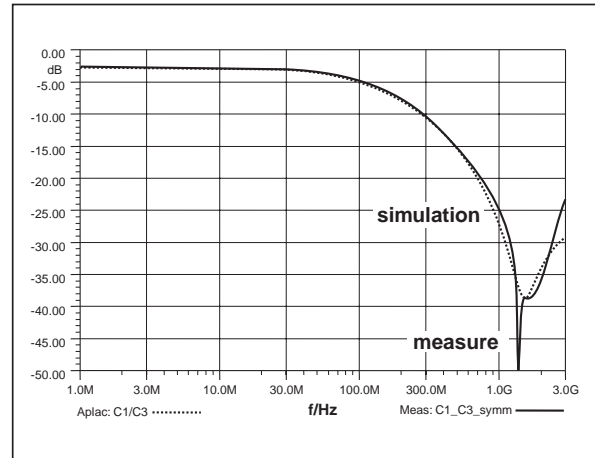


EMIF02-USB01

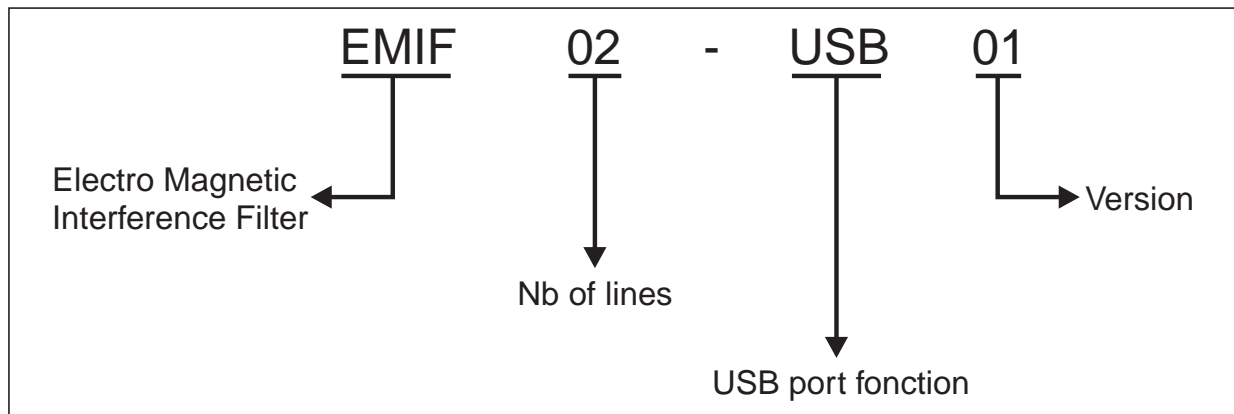
Fig. 8: Aplac model parameters

aplacvar R_33R 33.9	Model D02_Nw	Model D02_usb
aplacvar cap_33R 1.2pF	BV=100	BV=16
	IBV=1m	IBV=1m
aplacvar R_1k3 1.3k	CJO=6.8p	CJO=Cz
	M=0.3333	M=0.3333
aplacvar Cz29pF	RS=2	RS=2
aplacvar Rsub_D 100	VJ=0.6	VJ=0.6
	TT=100n	TT=100n
aplacvar Csub0.3pF		
aplacvar Rsub_33R 15		
aplacvar Rsub_1k3 50		
aplacvar lhole 10pH		
aplacvar Rhole400m		
aplacvar Caphole0.4pF		
aplacvar Lgnd_D 150pH		
aplacvar Lbump 50pH		
aplacvar Rbump 50m		
aplacvar Cbump 1.5pF		
aplacvar Rsubump 150		

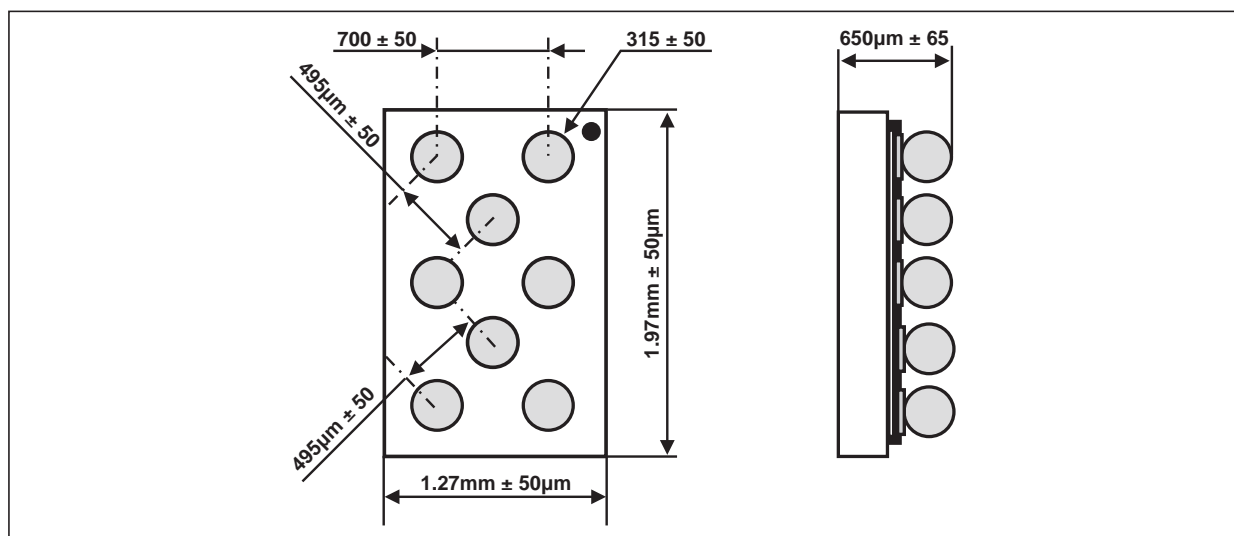
Fig. 9: Comparison between Aplac simulations and measured frequency response.



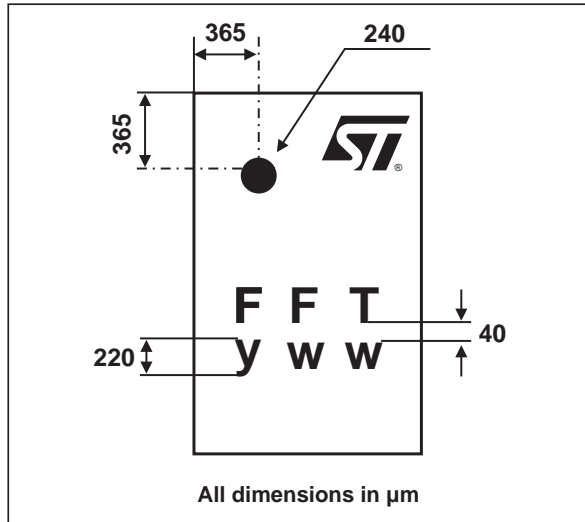
ORDER CODE



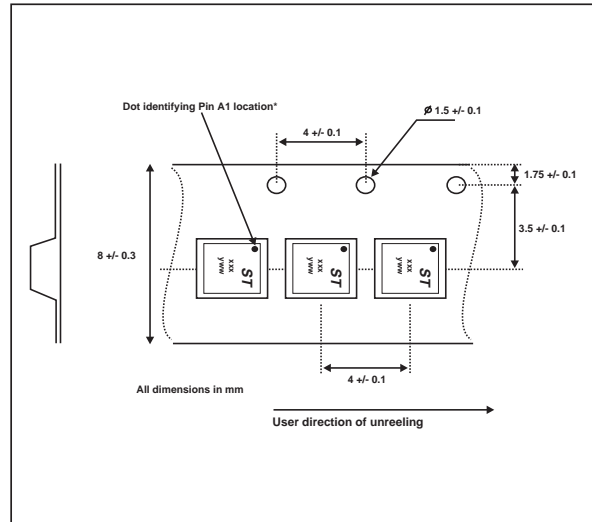
PACKAGE MECHANICAL DATA



MARKING



PACKING



OTHER INFORMATION

Ordering code	Marking	Package	Weight	Base qty	Delivery mode
EMIF02-USB01	FFT	Flip Chip	3.35 mg	5000	Tape & reel (7")

Note: More packing informations are available in the application note AN1235: "Flip-Chip CSP: Package description and recommendations for use"

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