

SIM Card EMI Filter Array with ESD Protection

Features

- Three channels of EMI filtering, each with ESD
- Two additional channels of ESD-only protection
- ±10kV ESD protection (IEC 61000-4-2, contact discharge)
- ±25kV ESD protection (HBM)
- Greater than 30dB of attenuation at 1GHz
- 10-bump, 1.960mm x 1.330mm footprint Chip Scale Package (CSP)
- Lead-free version available

Applications

- SIM Card slot in mobile handsets
- I/O port protection for mobile handsets, notebook computers. PDAs. etc.
- EMI filtering for data ports in cell phones, PDAs or notebook computers

Product Description

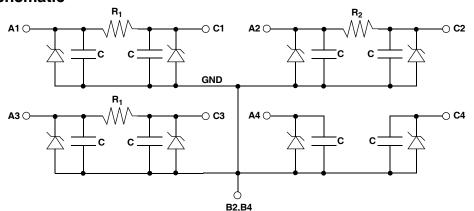
CAMD's CSPEMI400 is an EMI filter array with ESD protection, which integrates three pi filters (C-R-C) and two additional channels of ESD protection. CSPEMI400 has component values of 20pF-47Ω-20pF, and 20pF-100 Ω -20pF. The parts include avalanche-type ESD diodes on every pin, which provide a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The ESD diodes connected to the filter ports safely dissipate ESD strikes of ±10kV, exceeding the maximum requirement of the IEC 61000-4-2 international standard. Using the MIL-STD-883 (Method 3015) specification for Human Body Model (HBM) ESD, the pins are protected for contact discharges at greater than ±25kV.

The ESD diodes on pins A4 and C4 ports are designed and characterized to safely dissipate ESD strikes of ±10kV, well beyond the maximum requirement of the IEC 61000-4-2 international standard.

This device is particularly well suited for portable electronics (e.g. mobile handsets, PDAs, notebook computers) because of its small package format and easyto-use pin assignments. In particular, the CSPEMI400 is ideal for EMI filtering and protecting data lines from ESD for the SIM card slot in mobile handsets.

The CSPEMI400 is available in a space-saving, lowprofile Chip Scale Package with optional lead-free finishing.

Electrical Schematic



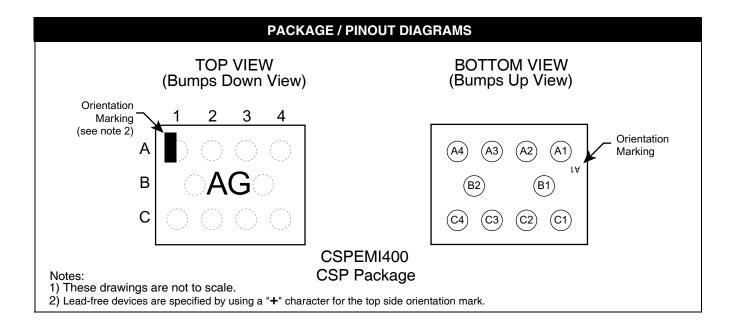
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R₁=100Ω $R_2=47\Omega$

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PIN DESCRIPTIONS						
TYPE	PIN	DESCRIPTION				
EMI	A1	EMI Filter with ESD Protection for RST Signal				
Filter	C1	EMI Filter with ESD Protection for RST Signal				
EMI	A2	EMI Filter with ESD Protection for CLK Signal				
Filter	C2	EMI Filter with ESD Protection for CLK Signal				
Device	B1	Device Ground				
Ground	B2	Device Ground				
EMI	A3	DAT EMI Filter with ESD Protection				
Filter	C3	DAT EMI Filter with ESD Protection				
ESD Channel	A4	ESD Proection Channel - V _{CC} Supply				
ESD Channel	C4	ESD Proection Channel				

Ordering Information

	PART NUMBERING INFORMATION							
		Standa	rd Finish	Lead-free Finish ²				
Bumps	Package	Ordering Part Number ¹	Part Marking	Ordering Part Number ¹	Part Marking			
10	CSP	CSPEMI400	AG	CSPEMI400G	AG			

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

Note 2: Lead-free devices are specified by using a "+" character for the top side orientation mark.



Specifications

ABSOLUTE MAXIMUM RATINGS					
PARAMETER RATING U					
Storage Temperature Range	-65 to +150	°C			
DC Power per Resistor	100	mW			
DC Package Power Rating	300	mW			

STANDARD OPERATING CONDITIONS					
PARAMETER	RATING	UNITS			
Operating Temperature Range	-40 to +85	°C			

	ELECTRICAL OPERATING CHARACTERISTICS ¹							
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS		
R ₁	Resistance of R ₁		80	100	120	Ω		
R ₂	Resistance of R ₂		38	47	56	Ω		
С	Capacitance	V _{IN} = 2.5VDC, 1MHz, 30mV ac	16	20	24	pF		
V _{STANDOFF}	Stand-off Voltage	Ι = 10μΑ		6.0		V		
I _{LEAK}	Diode Leakage Current	V _{BIAS} = 3.3V			300	nA		
V _{SIG}	Signal Voltage Positive Clamp Negative Clamp	I _{LOAD} = 10mA I _{LOAD} = -10mA	5.6 -1.5	6.8 -0.8	9.0 -0.4	V V		
V _{ESD}	In-system ESD Withstand Voltage a) Human Body Model, MIL-STD-883, Method 3015 b) Contact Discharge per IEC 61000-4-2	Notes 2,4 and 5	±25 ±10			kV kV		
V _{CL}	Clamping Voltage during ESD Discharge MIL-STD-883 (Method 3015), 8kV Positive Transients Negative Transients	Notes 2,3,4 and 5			+12 -7	V V		
f _{C1}	Cut-off frequency $Z_{SOURCE} = 50\Omega$, $Z_{LOAD} = 50\Omega$	R = 100Ω, C = 20pF		77		MHz		
f _{C2}	Cut-off frequency $Z_{SOURCE} = 50\Omega$, $Z_{LOAD} = 50\Omega$	$R = 47\Omega$, $C = 20pF$		85		MHz		

Note 1: $T_A=25$ °C unless otherwise specified.

Note 2: ESD applied to input and output pins with respect to GND, one at a time.

Note 3: Clamping voltage is measured at the opposite side of the EMI filter to the ESD pin. For example, if ESD is applied to Pin A1, then clamping voltage is measured at Pin C1.

Note 4: Unused pins are left open

Note 5: The parameters are guaranteed by design.



Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

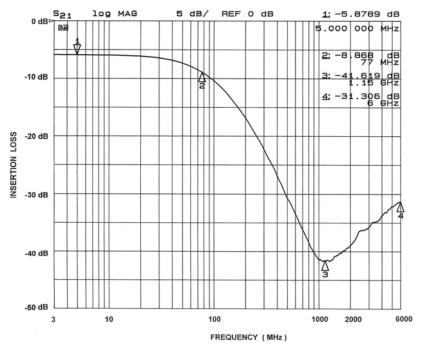


Figure 1. A1-C1 EMI Filter Performance

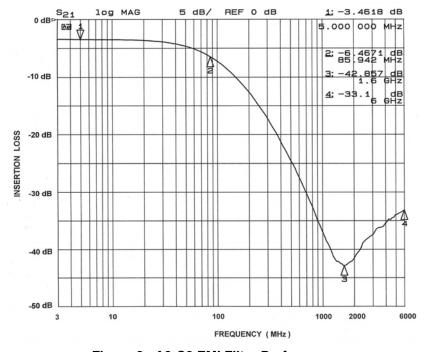


Figure 2. A2-C2 EMI Filter Performance



Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50 Ohm Environment)

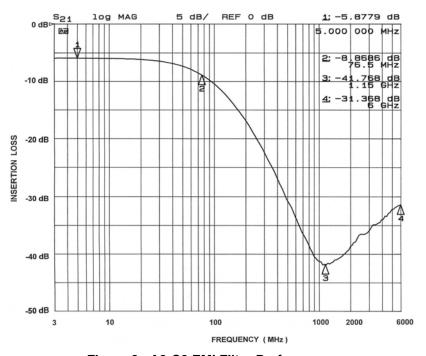


Figure 3. A3-C3 EMI Filter Performance

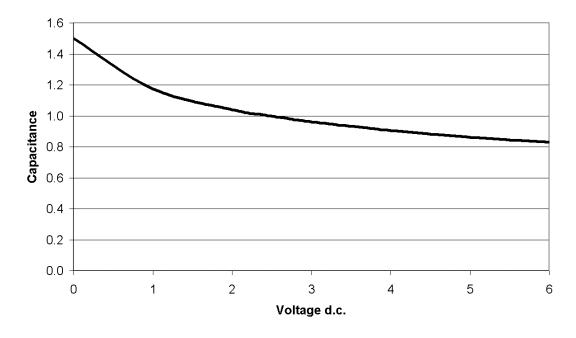
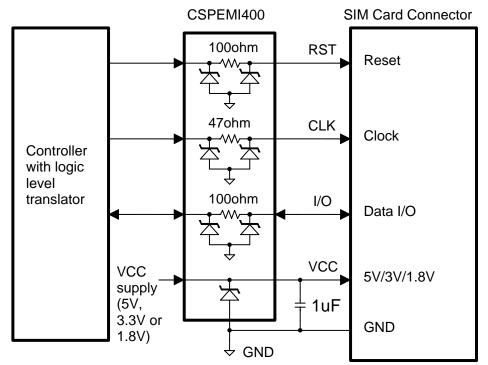


Figure 4. Typical Diode Capacitance vs. Input Voltage (normalized to 2.5VDC)



Application Information

The CSPEMI400 provides a bidirectional filter and protector for all the signals and the power line on the SIM (subscriber identity module) card connector. SIM cards are found in all GSM cellular phones and in some other handheld devices or card readers. The ESD diodes protect the controller against possible ESD strikes that may occur when the connector pins are exposed during direct contact, or during insertion of the SIM card into the card slot. The EMI filter suppresses all high-frequency noise, preventing the unwanted EMI signals from both entering and exiting the main board. The signals that interface with the SIM card are the Reset, the Clock and the bidirectional data I/O, as shown in Figure 5.



Note: One channel of the CSPEMI400 with a zener diode is not shown on the diagram.

Figure 5. Typical Application Diagram for the SIM Card Interface

For best filter and ESD performance, both GND bumps (B1, B2) of the CSPEMI400 should be directly connected to the Ground plane. A small capacitor of about $1\mu F$ is required next to the V_{CC} pin of the SIM connector in order to improve stability of the SIM card supply rail.

For information on the assembly of the CSPEMI400 to the PCB (printed circuit board), please refer to the Chip Scale Package (CSP) Application Note AP217, or contact factory at 800-325-4966 for technical support.



Application Information (cont'd)

Refer to Application Note AP-217, "The Chip Scale Package", for a detailed description of Chip Scale Packages offered by California Micro Devices.

PRINTED CIRCUIT BOARD RECOMMENDATIONS							
PARAMETER VALUE							
Pad Size on PCB	0.275mm Round						
Pad Definition	Non-Solder Mask defined pads						
Solder Mask Opening	0.325mm Round						
Solder Stencil Thickness	0.125 - 0.150mm						
Solder Stencil Aperture Opening (laser cut, 5% tapered walls)	0.330mm Round						
Solder Flux Ratio	50/50 by volume						
Solder Paste Type	No Clean						
Pad Protective Finish	OSP (Entek Cu Plus 106A)						
Tolerance — Edge To Corner Ball	<u>+</u> 50μm						
Solder Ball Side Coplanarity	<u>+</u> 20μm						
Maximum Dwell Time Above Liquidous	60 seconds						
Maximum Soldering Temperature for Eutectic Devices using Eutectic Solder Paste	240°C						
Maximum Soldering Temperature for Lead-free Devices using Lead-free Solder Paste	260°C						

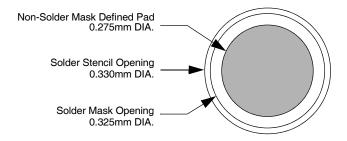


Figure 6. Recommended Non-Solder Mask Defined Pad Illustration

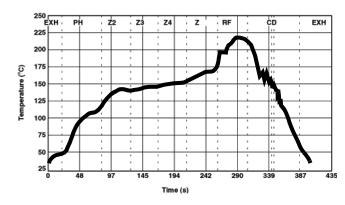


Figure 7. Eutectic (SnPb) Solder Ball Reflow Profile

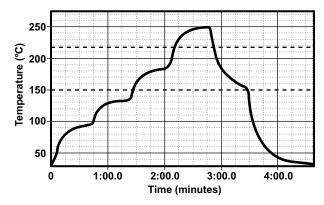


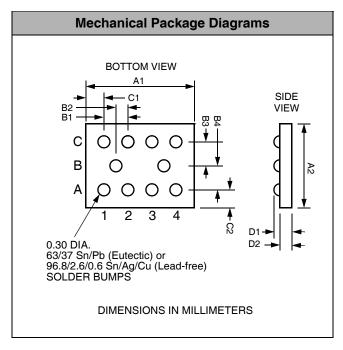
Figure 8. Lead-free (SnAgCu) Solder Ball Reflow Profile



CSP Mechanical Specifications

The CSPEMI400 is supplied in a custom Chip Scale Package (CSP). Dimensions are presented below. For complete information on CSP, see the California Micro Devices CSP Package Information document.

PACKAGE DIMENSIONS								
Pack	age	Custom CSP						
Bum	ıps		10					
Dim	M	Millimeters Inches						
Dilli	Min	Nom	Max	Min	Nom	Max		
A1	1.915	1.960	2.005	0.0754	0.0772	0.0789		
A2	1.285	1.285 1.330 1.375		0.0506	0.0524	0.0541		
B1	0.495	0.500	0.505	0.0195	0.0197	0.0199		
B2	0.245	0.250	0.255	0.0096	0.0098	0.0100		
В3	0.430	0.435	0.440	0.0169	0.0171	0.0173		
B4	0.430	0.435	0.440	0.0169	0.0171	0.0173		
C1	0.180	0.230	0.280	0.0071 0.0091 0.0071 0.091		0.0110		
C2	0.180	0.230	0.280			0.0110		
D1	0.562 0.60		0.650	0.0221	0.0239	0.0256		
D2	0.356	0.381	0.406	0.0140	0.0150	0.0160		
# per tape and reel		3500 pieces						
	Controlling dimension: millimeters							



Package Dimensions for CSPEMI400 **Chip Scale Package**

CSP Tape and Reel Specifications

PART NUMBER	CHIP SIZE (mm)	POCKET SIZE (mm) B ₀ X A ₀ X K ₀	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P_0	P ₁
CSPEMI400	1.96 X 1.33 X 0.606	2.08 X 1.45 X 0.71	8mm	178mm (7")	3500	4mm	4mm

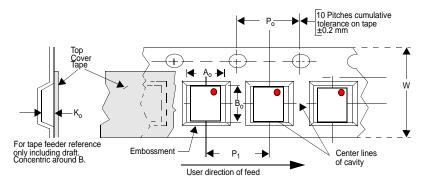


Figure 9. Tape and Reel Mechanical Data