



california micro devices

CM1436

4 and 8 Channel EMI Filter Arrays with ESD Protection

Features

- Four, six and eight channels of EMI filtering with ESD protection
- Greater than 30dB of attenuation from 800MHz to 3GHz
- $\pm 15\text{kV}$ ESD protection (IEC 61000-4-2, contact discharge)
- $\pm 30\text{kV}$ ESD protection (HBM)
- Fabricated with *Centurion*TM advanced low capacitance zener process technology
- Space saving, low-profile 8-, 12- and 16-lead 0.4mm pitch TDFN packages
- Lead-free version available

Applications

- I/O port protection for mobile handsets, notebook computers, PDAs etc.
- EMI filtering for data ports in cell phones, PDAs or notebook computers.
- EMI filtering for LCD, camera and chip-to-chip data lines

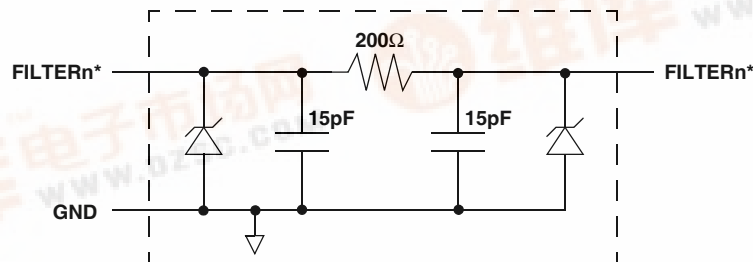
Product Description

California Micro Devices's CM1436 is an EMI filter array with ESD protection, which integrates either four, six or eight pi filters (C-R-C). Each CM1436 filter has component values of 15pF-200 Ω -15pF. These parts include ESD protection diodes on every pin, providing 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 $\pm 15\text{kV}$ contact discharge, twice the specification requirement of the IEC 61000-4-2, Level 4 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 $\pm 30\text{kV}$.

This device is particularly well-suited for portable electronics (e.g. mobile handsets, PDAs, notebook computers) because of its small package and easy-to-use pin assignments. In particular, the CM1436 is ideal for EMI filtering and protecting data lines from ESD in wireless handsets.

The CM1436 is available in space-saving, low-profile, 8-lead, 12-lead and 16-lead 0.4mm pitch TDFN packages. It is fabricated with California Micro Devices' *Centurion*TM process and available with optional lead-free finishing.

Electrical Schematic

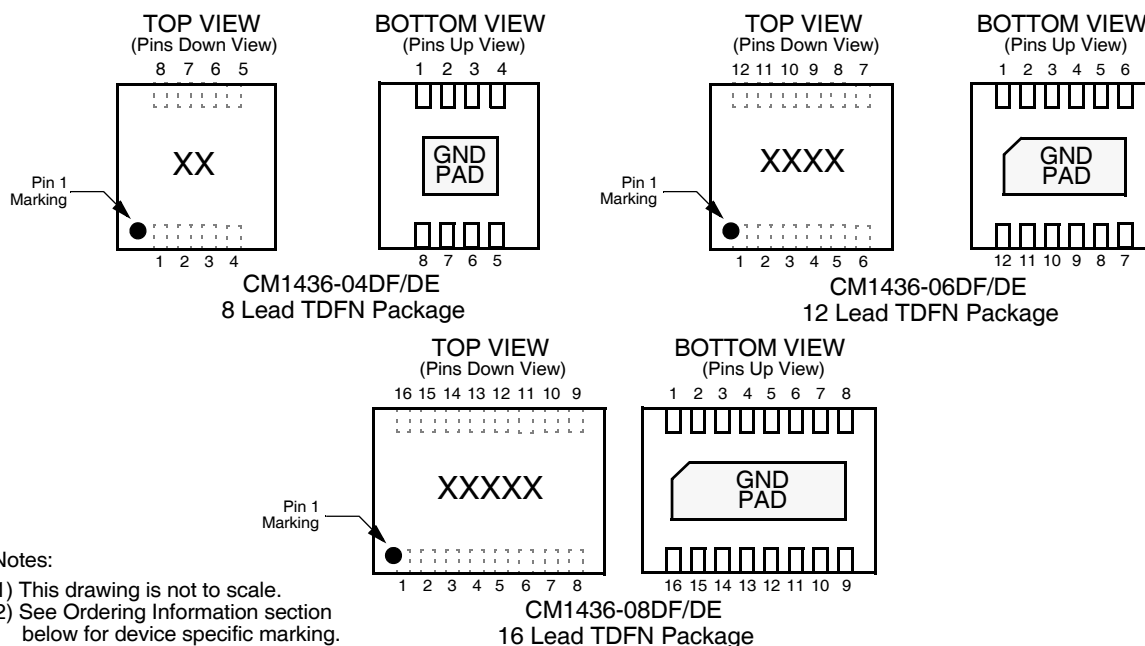


1 of 4/6/8 EMI Filtering + ESD Channels

* See Package/Pinout Diagram for expanded pin information.



PACKAGE / PINOUT DIAGRAMS



PIN DESCRIPTIONS

Pins			NAME	DESCRIPTION	Pins			NAME	DESCRIPTION
1436-04Dx	1436-06Dx	1436-08Dx			1436-04Dx	1436-06Dx	1436-08Dx		
1	1	1	FILTER1	Filter Channel 1	8	12	16	FILTER1	Filter Channel 1
2	2	2	FILTER2	Filter Channel 2	7	11	15	FILTER2	Filter Channel 2
3	3	3	FILTER3	Filter Channel 3	6	10	14	FILTER3	Filter Channel 3
4	4	4	FILTER4	Filter Channel 4	5	9	13	FILTER4	Filter Channel 4
	5	5	FILTER5	Filter Channel 5		8	12	FILTER5	Filter Channel 5
	6	6	FILTER6	Filter Channel 6		7	11	FILTER6	Filter Channel 6
		7	FILTER7	Filter Channel 7			10	FILTER7	Filter Channel 7
		8	FILTER8	Filter Channel 8			9	FILTER8	Filter Channel 8
GND Pad			GND	Device Ground					

Ordering Information

PART NUMBERING INFORMATION

Leads/Pins	Package	Standard Finish		Lead-free Finish	
		Ordering Part Number ¹	Part Marking	Ordering Part Number ¹	Part Marking
8	TDFN-08	CM1436-04DF	6F	CM1436-04DE	6E
12	TDFN-12	CM1436-06DF	N36F	CM1436-06DE	N36E
16	TDFN-16	CM1436-08DF	N368F	CM1436-08DE	N368E

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

Specifications

ABSOLUTE MAXIMUM RATINGS

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

STANDARD OPERATING CONDITIONS

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

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
R	Resistance		160	200	240	Ω
C	Capacitance	At 2.5V DC, 1MHz, 30mV AC	12	15	18	pF
V _{DIODE}	Diode Standoff Voltage	I _{DIODE} = 10μA		6.0		V
I _{LEAK}	Diode Leakage Current (reverse bias)	V _{DIODE} = 3.3V		0.1	1	μA
V _{SIG}	Signal Voltage Positive Clamp Negative Clamp	I _{LOAD} = 10mA I _{LOAD} = -10mA	5.6 -0.4	6.8 -0.8	9.0 -1.5	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 Level 4	Notes 2 and 3	±30 ±15			kV kV
f _C	Cut-off Frequency Z _{SOURCE} =50Ω, Z _{LOAD} =50Ω	R = 200Ω, C = 15pF; Note 3		100		MHz
A _{1GHz}	Absolute Attenuation @ 1GHz from 0dB Level	Z _{SOURCE} = 50Ω, Z _{LOAD} = 50Ω, DC Bias = 0V; Notes 1, 4 and 5		35		dB
A _{800MHz - 6GHz}	Absolute Attenuation @ 800MHz to 6GHz from 0dB Level	Z _{SOURCE} = 50Ω, Z _{LOAD} = 50Ω, DC Bias = 0V; Notes 1, 4 and 5		30		dB

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: These parameters are guaranteed by design and characterization.

Note 4: Attenuation / RF curves characterized by a network analyzer using microprobes.

Note 5: These parameters are NOT guaranteed by design, characterization and production.

Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise, 0V DC Bias, 50 Ohm Environment)

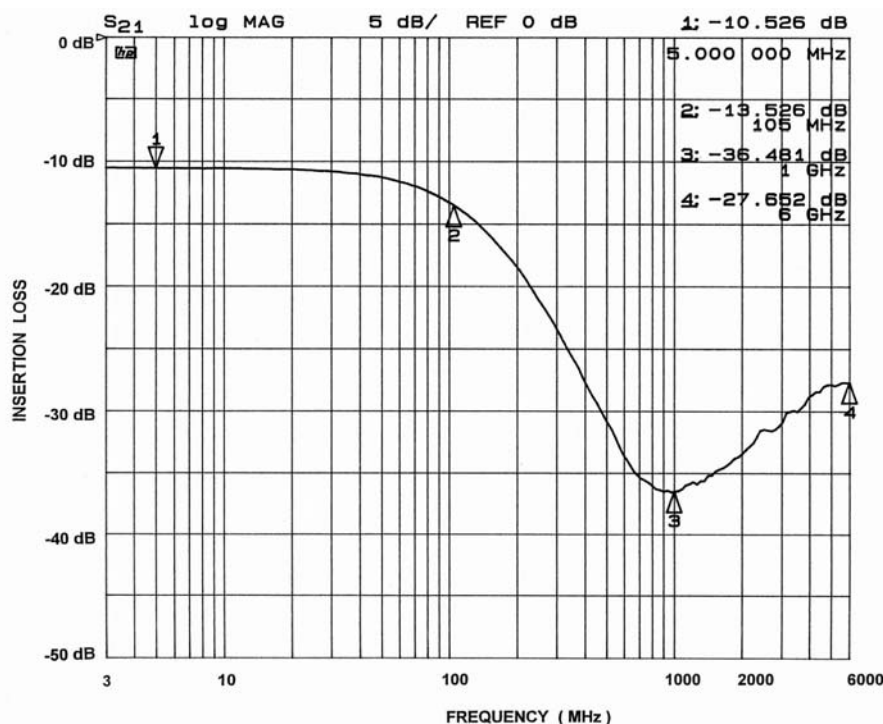


Figure 1. Channel 1 EMI Filter Performance (CM1436-04 only)

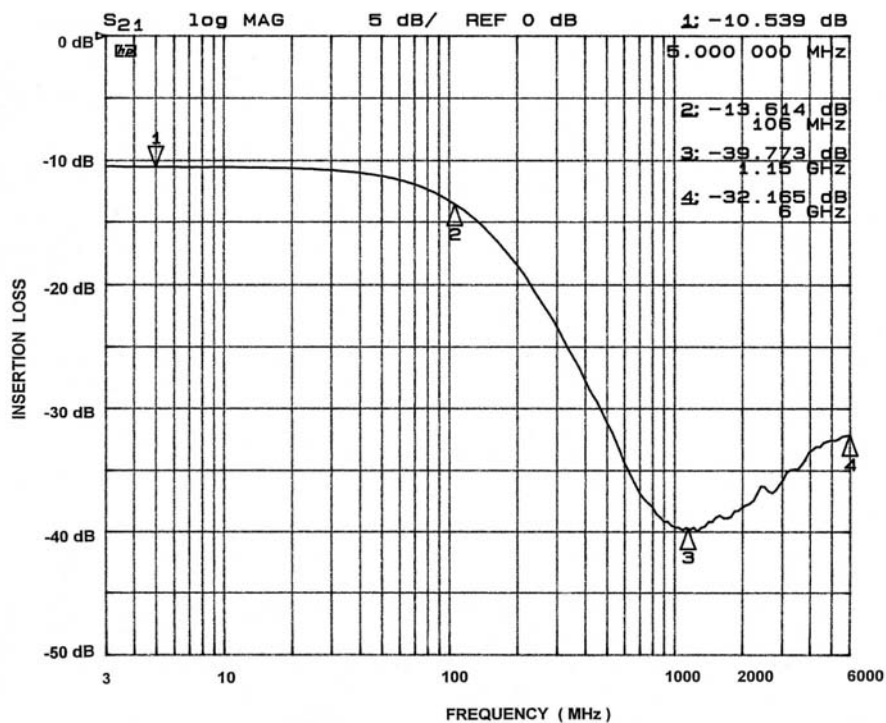


Figure 2. Channel 2 EMI Filter Performance (CM1436-04 only)

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 0V DC Bias, 50 Ohm Environment)

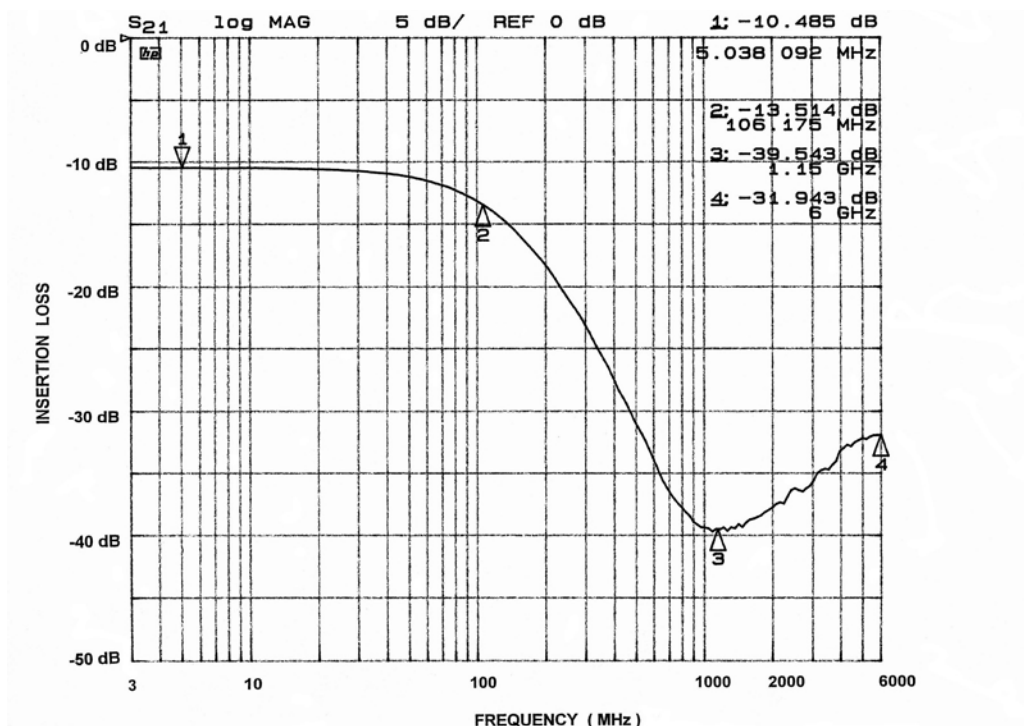


Figure 3. Channel 3 EMI Filter Performance (CM1436-04 only)

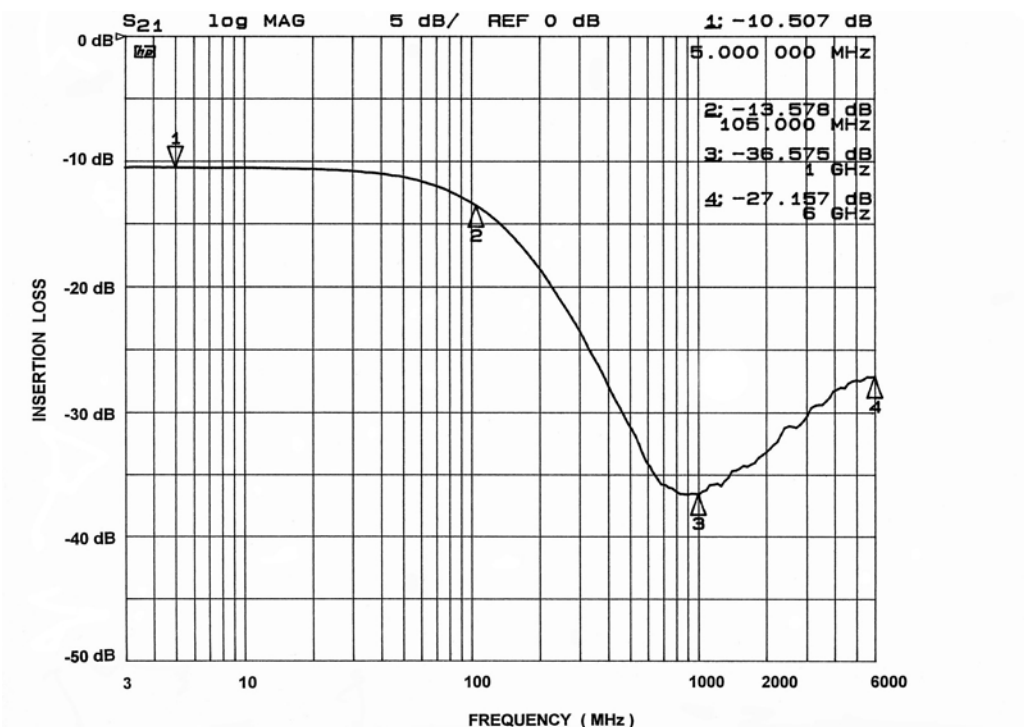


Figure 4. Channel 4 EMI Filter Performance (CM1436-04 only)

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 0V DC Bias, 50 Ohm Environment)

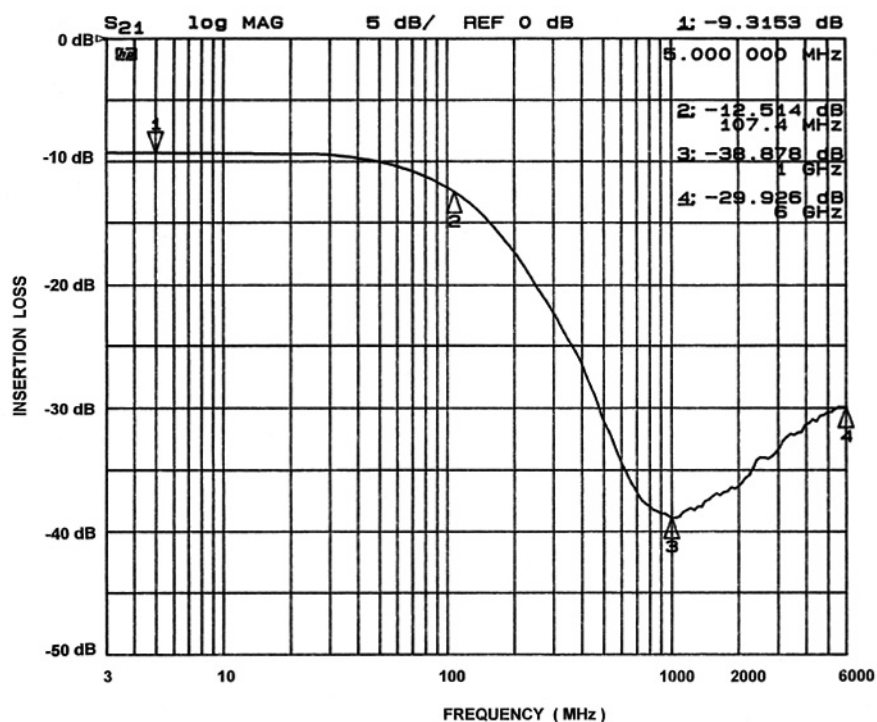


Figure 5. Channel 1 EMI Filter Performance (CM1436-06/08 only)

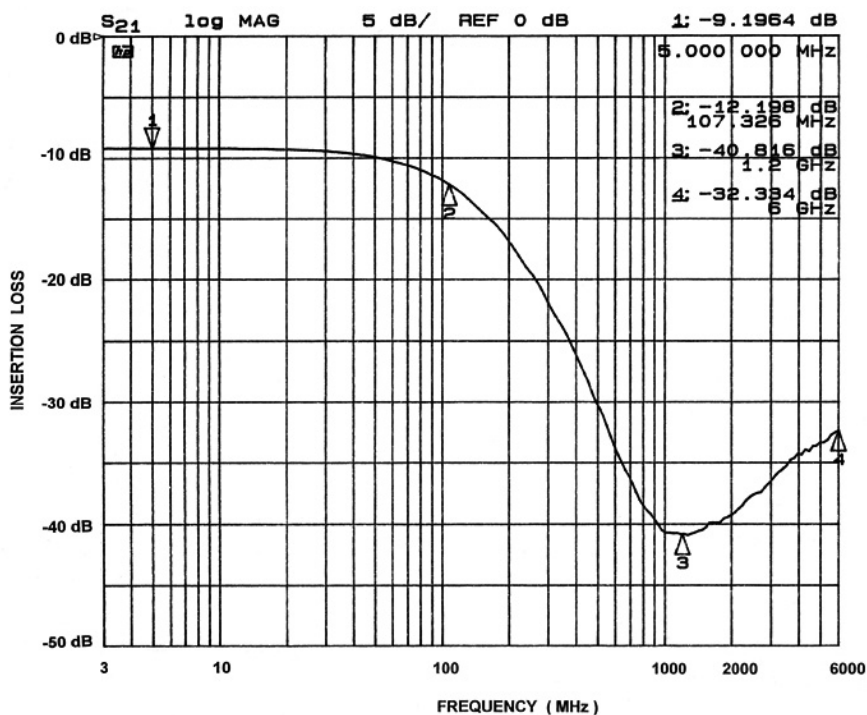


Figure 6. Channel 2 EMI Filter Performance (CM1436-06/08 only)

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 0V DC Bias, 50 Ohm Environment)

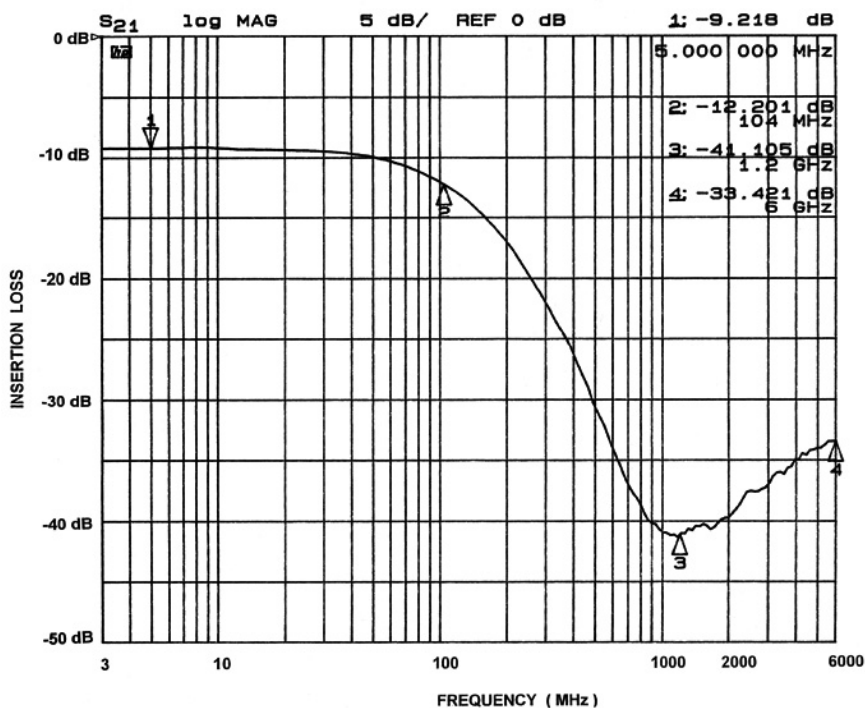


Figure 7. Channel 3 EMI Filter Performance (CM1436-06/08 only)

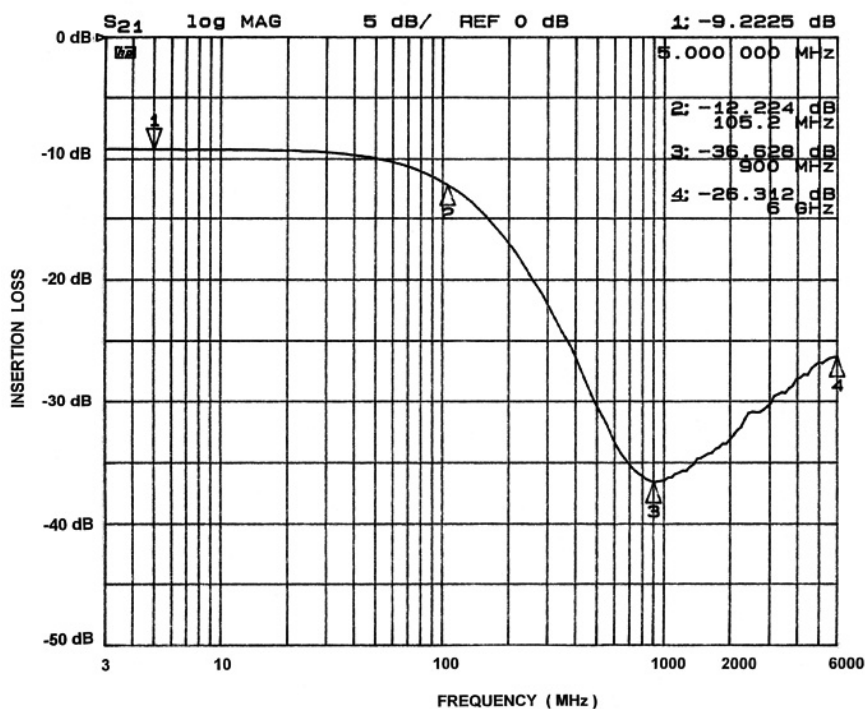


Figure 8. Channel 4 EMI Filter Performance (CM1436-06/08 only)

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 0V DC Bias, 50 Ohm Environment)

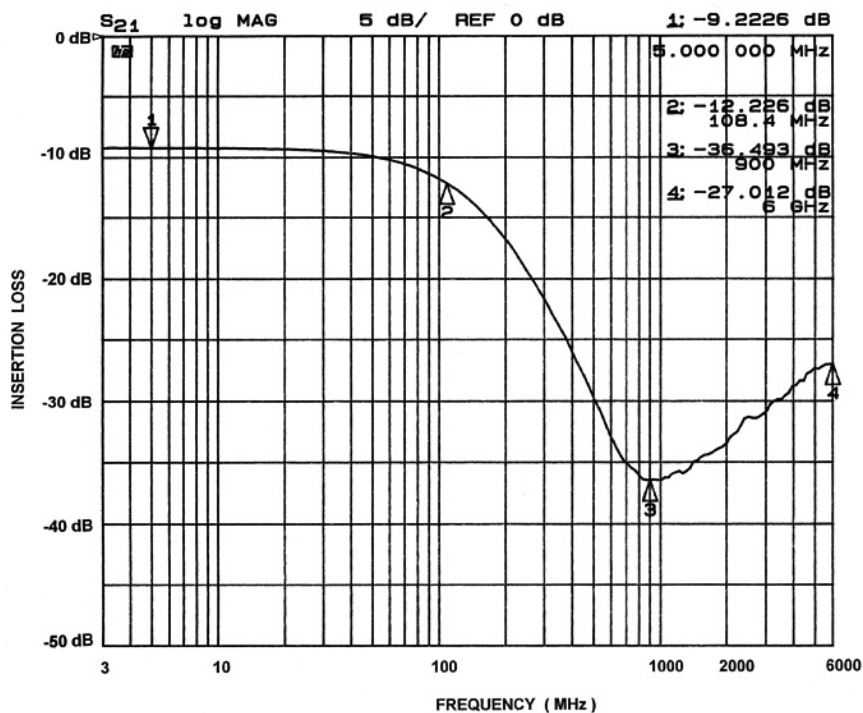


Figure 9. Channel 5 EMI Filter Performance (CM1436-06/08 only)

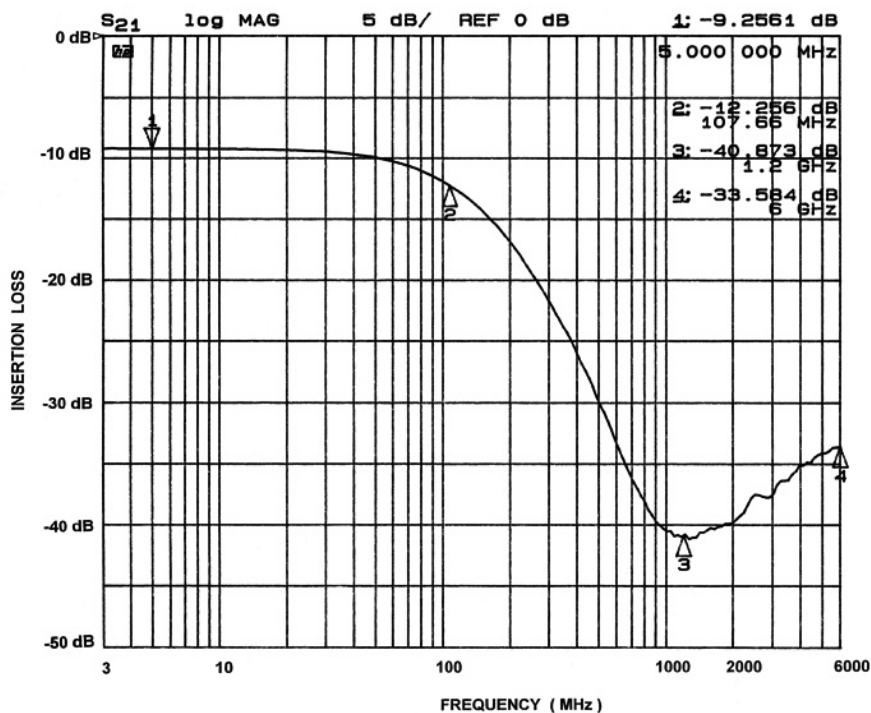


Figure 10. Channel 6 EMI Filter Performance (CM1436-06/08 only)

Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 0V DC Bias, 50 Ohm Environment)

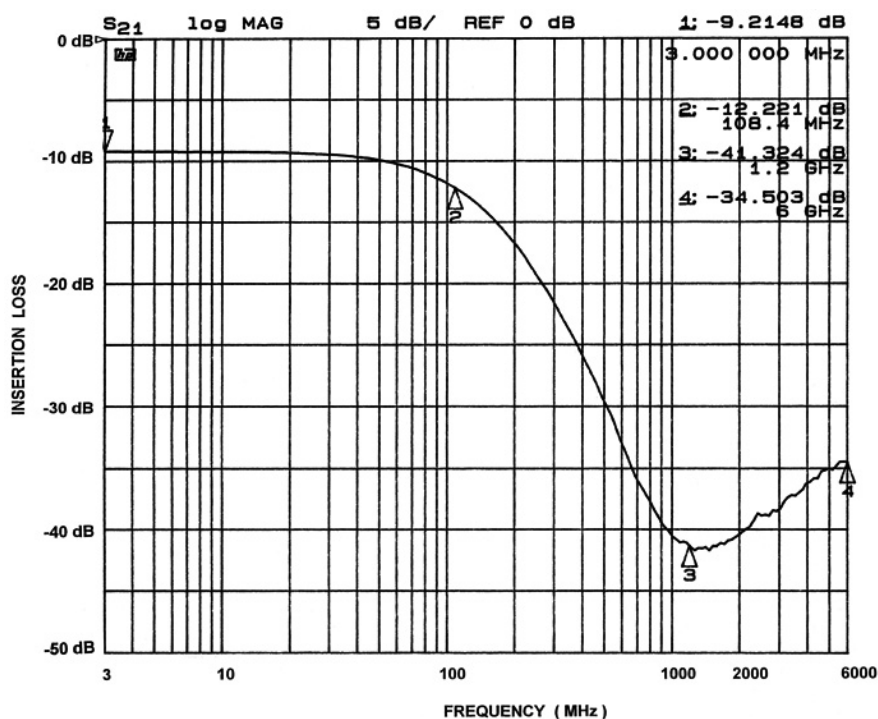


Figure 11. Channel 7 EMI Filter Performance (CM1436-08 only)

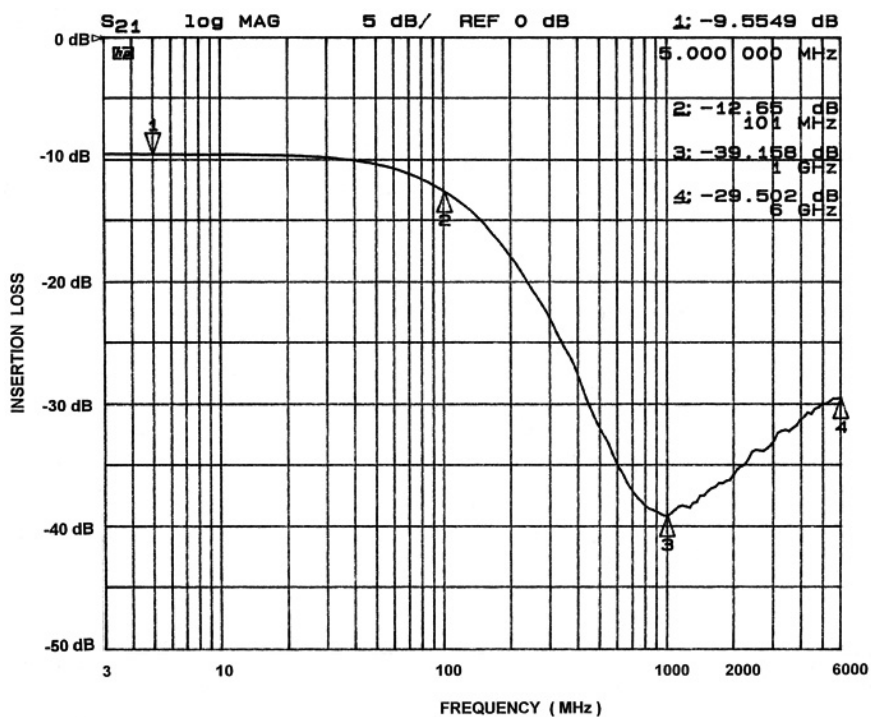
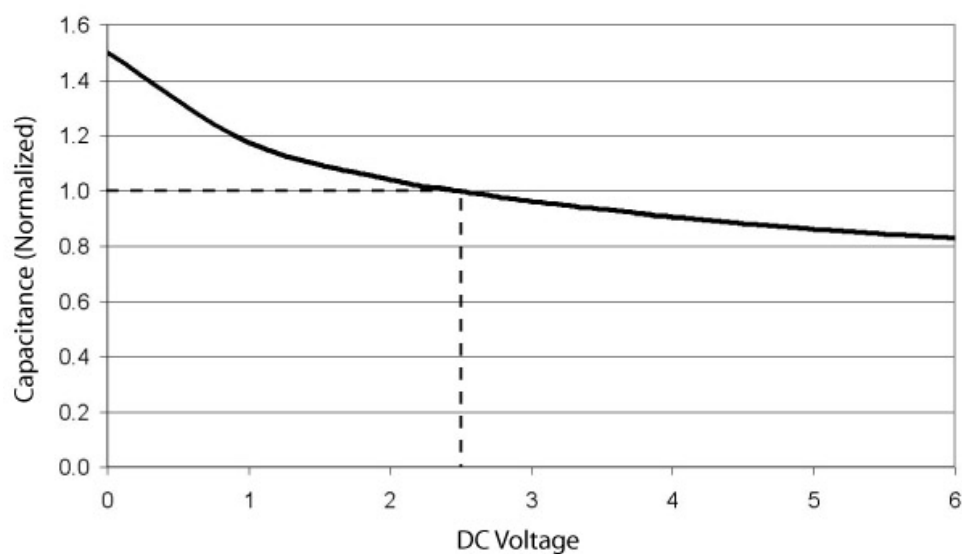


Figure 12. Channel 8 EMI Filter Performance (CM1436-08 only)

Performance Information (cont'd)



**Figure 13. Filter Capacitance vs. Input Voltage over Temperature
(normalized to capacitance at 2.5VDC and 25°C)**

Mechanical Details

CM1436-04DF/DE Mechanical Specifications

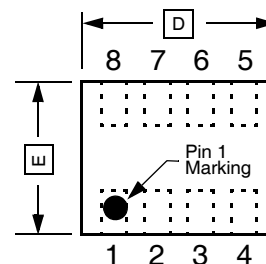
Dimensions for the CM1436-04DF/DE supplied in a 8-lead, 0.4mm pitch TDFN package are presented below.

For complete information on the TDFN-8, see the California Micro Devices TDFN Package Information document.

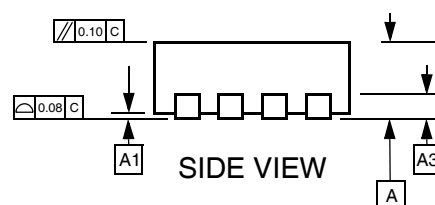
PACKAGE DIMENSIONS						
Package	TDFN					
JEDEC No.	MO-229C [†]					
Leads	8					
Dim.	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.20 REF			0.008 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.65	1.70	1.75	0.065	0.067	0.069
D2	1.10	1.20	1.30	0.043	0.047	0.051
E	1.30	1.35	1.40	0.051	0.053	0.055
E2	0.30	0.40	0.50	0.012	0.016	0.020
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.15	0.25	0.35	0.006	0.010	0.014
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

[†]This package is compliant with JEDEC standard MO-229C with the exception of the "D", "D2", "E", "E2", "K" and "L" dimensions as called out in the table above.

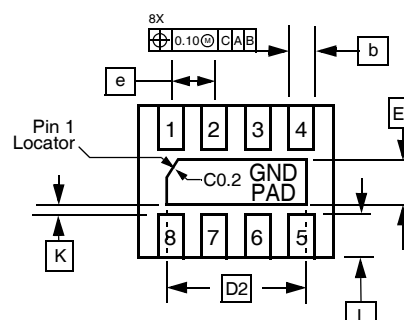
Mechanical Package Diagrams



TOP VIEW



SIDE VIEW



BOTTOM VIEW

Dimensions for 8-Lead, 0.4mm pitch TDFN package

Mechanical Details (cont'd)

CM1436-06DF/DE Mechanical Specifications

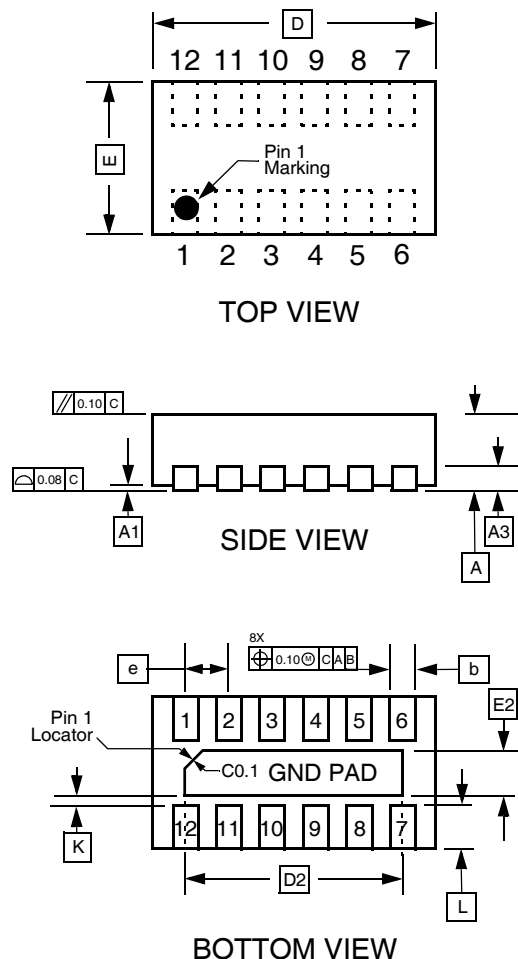
Dimensions for the CM1436-06DF/DE supplied in a 12-lead, 0.4mm pitch TDFN package are presented below.

For complete information on the TDFN-12, see the California Micro Devices TDFN Package Information document.

PACKAGE DIMENSIONS						
Package	TDFN					
JEDEC No.	MO-229C [†]					
Leads	12					
Dim.	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.20 REF			0.008 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	2.45	2.50	2.55	0.096	0.098	0.100
D2	1.90	2.00	2.10	0.075	0.079	0.083
E	1.30	1.35	1.40	0.051	0.053	0.055
E2	0.25	0.35	0.45	0.010	0.014	0.018
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.15	0.25	0.35	0.006	0.010	0.014
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

[†]This package is compliant with JEDEC standard MO-229C with the exception of the "D", "D2", "E", "E2", "K" and "L" dimensions as called out in the table above.

Mechanical Package Diagrams



Dimensions for 12-Lead, 0.4mm pitch TDFN package

Mechanical Details (cont'd)

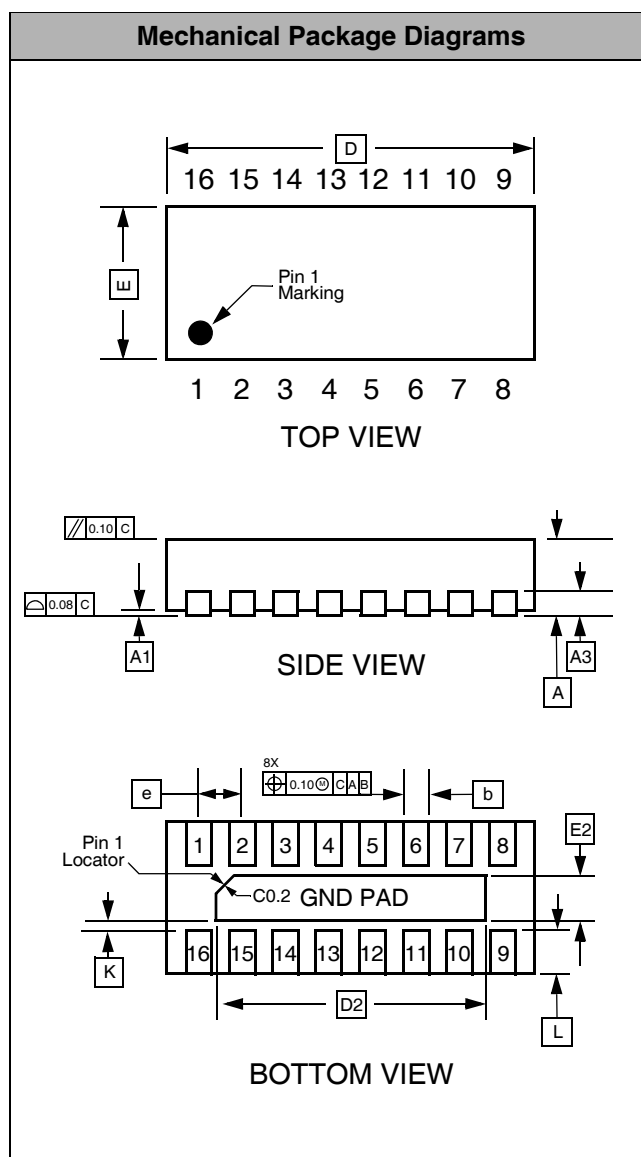
CM1436-08DF/DE Mechanical Specifications

The CM1436-08DF/DE is supplied in a 16-lead, 0.4mm pitch TDFN package. Dimensions are presented below.

For complete information on the TDFN-16, see the California Micro Devices TDFN Package Information document.

PACKAGE DIMENSIONS						
Package	TDFN					
JEDEC No.	MO-229C [†]					
Leads	16					
Dim.	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.40	0.55	0.70	0.016	0.022	0.028
b	0.20 REF			0.008 REF		
D	3.25	3.30	3.35	0.128	0.130	0.132
D2	2.80	2.90	3.00	0.110	0.114	0.118
E	1.30	1.35	1.40	0.051	0.053	0.055
E2	0.35	0.40	0.45	0.014	0.016	0.018
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.15	0.25	0.35	0.006	0.010	0.014
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

[†]This package is compliant with JEDEC standard MO-229C with the exception of the "D", "D2", "E", "E2", "K" and "L" dimensions as called out in the table above.



**Dimensions for 16-Lead, 0.4mm pitch
TDFN package**