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
- ±15kV ESD protection (IEC 61000-4-2, contact discharge)
- ±30kV ESD protection (HBM)
- Fabricated with *Centurion*™ 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

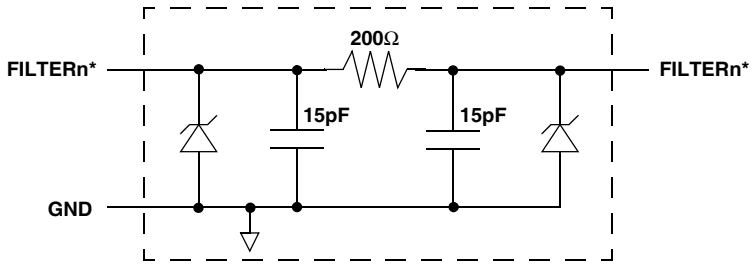
Product Description

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-200Ω-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 ±15kV 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 ±30kV.

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*™ process and available with optional lead-free finishing.

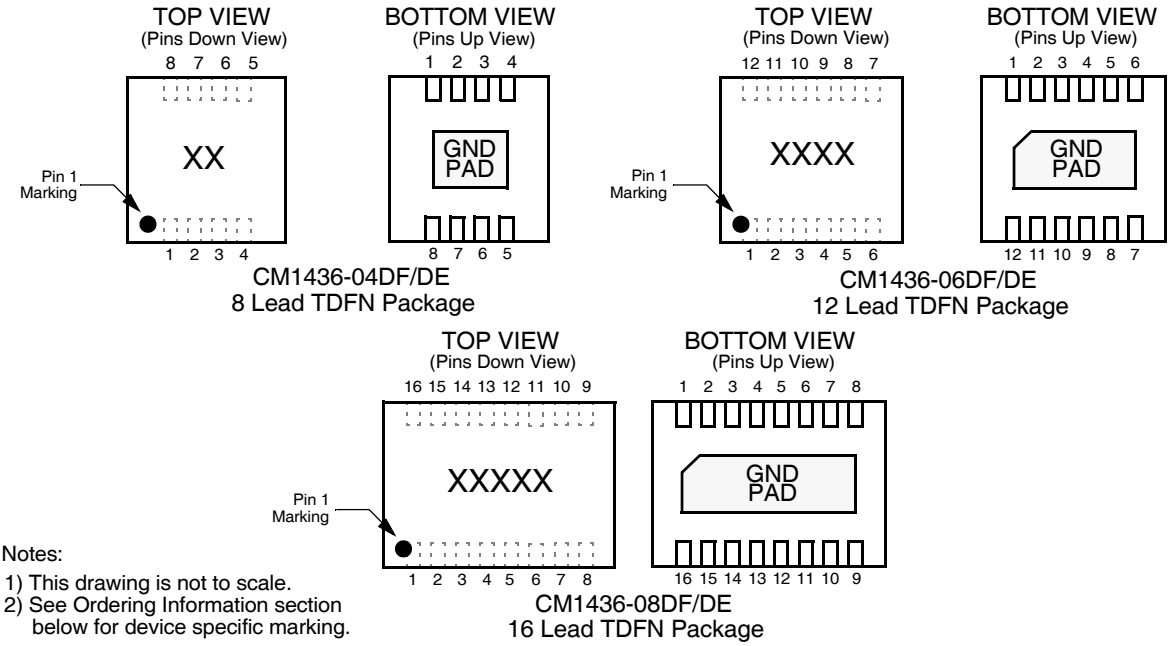
Electrical Schematic



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

*** See Package/Pinout Diagram for expanded pin information.**

PACKAGE / PINOUT DIAGRAMS



Notes:
1) This drawing is not to scale.
2) See Ordering Information section below for device specific marking.

PIN DESCRIPTIONS

Pins					Pins				
1436-04Dx	1436-06Dx	1436-08Dx	NAME	DESCRIPTION	1436-04Dx	1436-06Dx	1436-08Dx	NAME	DESCRIPTION
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

		Standard Finish		Lead-free Finish	
Leads/Pins	Package	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)

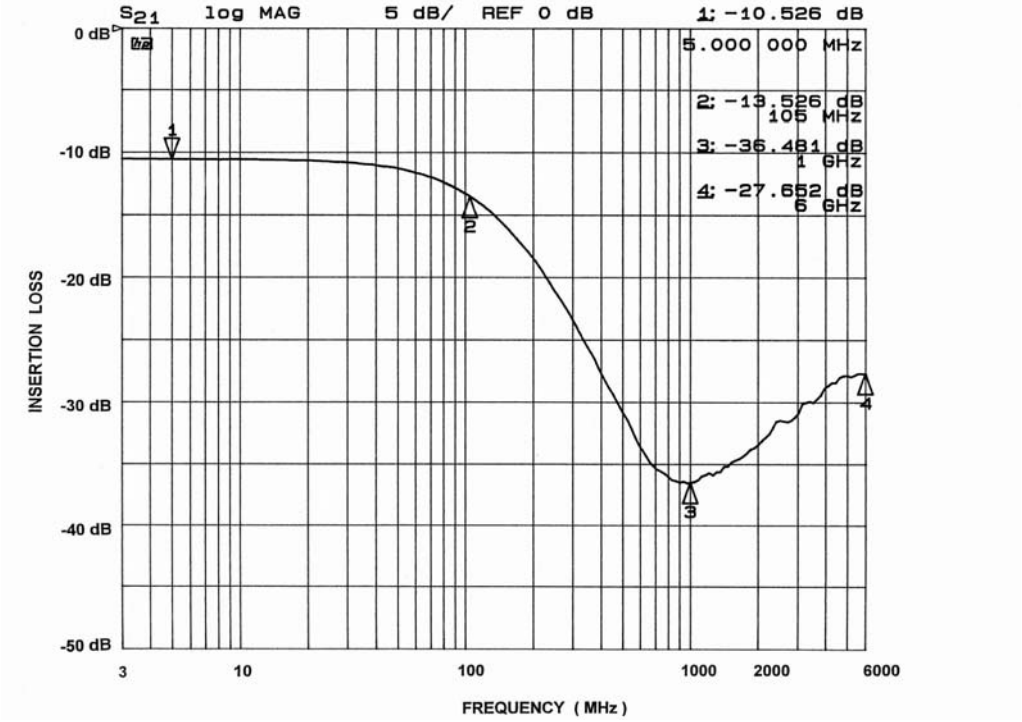


Figure 1. Channel 1 EMI Filter Performance (CM1436-04 only)

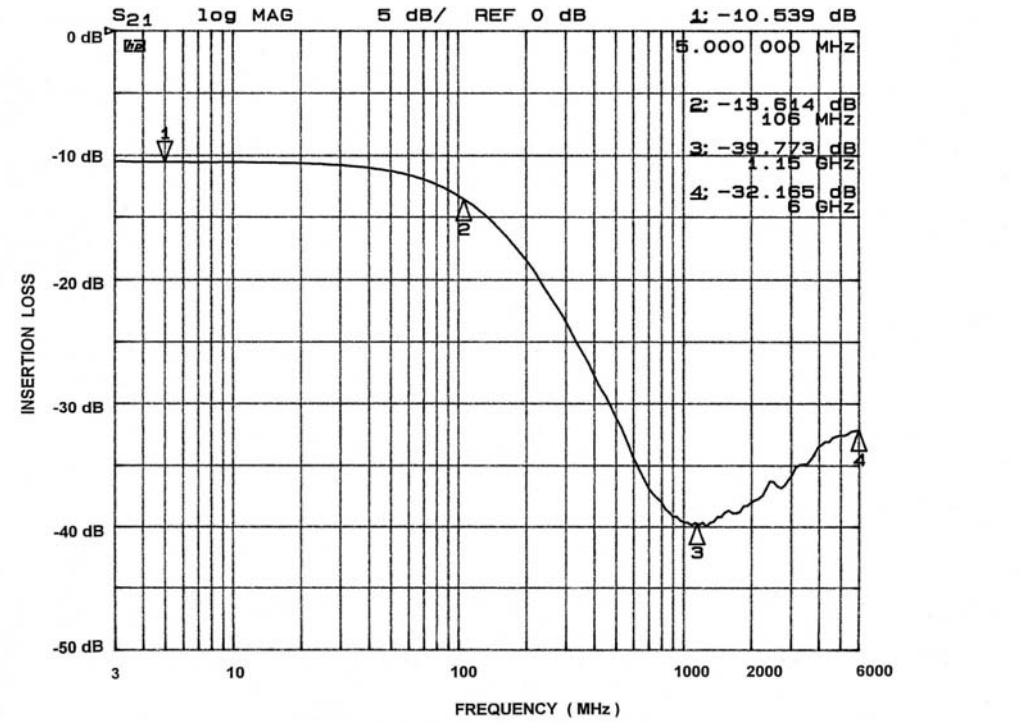


Figure 2. Channel 2 EMI Filter Performance (CM1436-04 only)

Performance Information (cont'd)

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

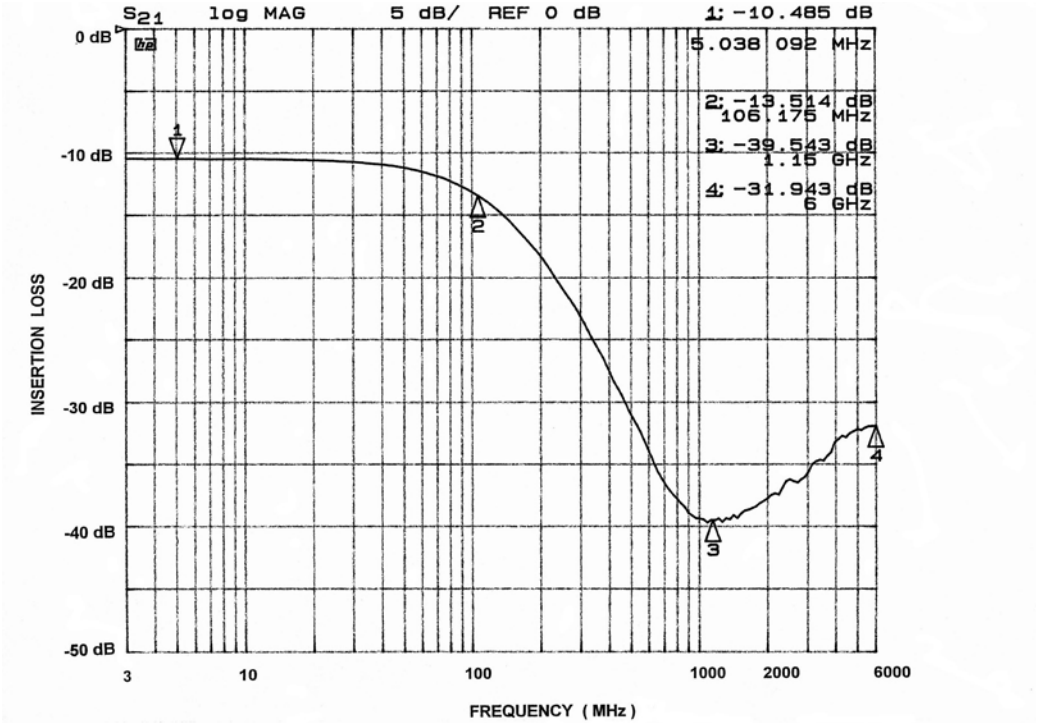


Figure 3. Channel 3 EMI Filter Performance (CM1436-04 only)

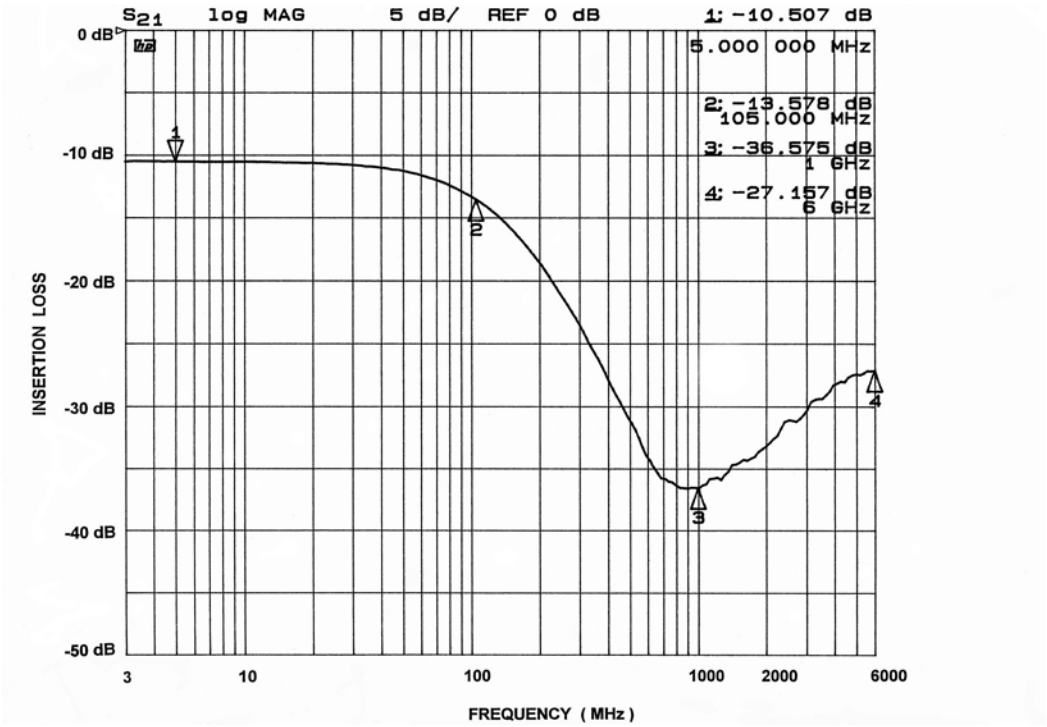


Figure 4. Channel 4 EMI Filter Performance (CM1436-04 only)

Performance Information (cont'd)

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

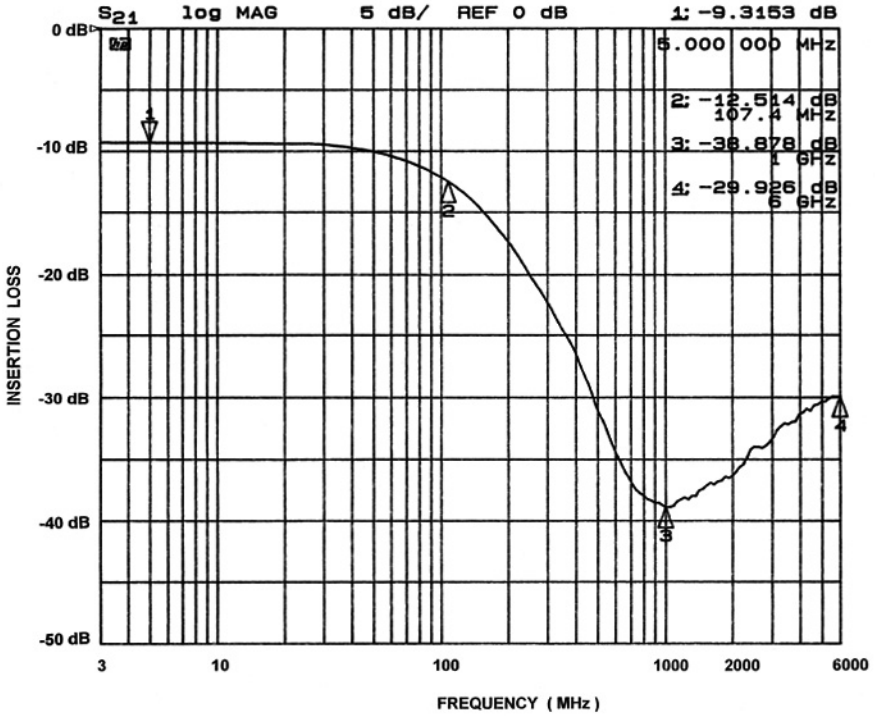


Figure 5. Channel 1 EMI Filter Performance (CM1436-06/08 only)

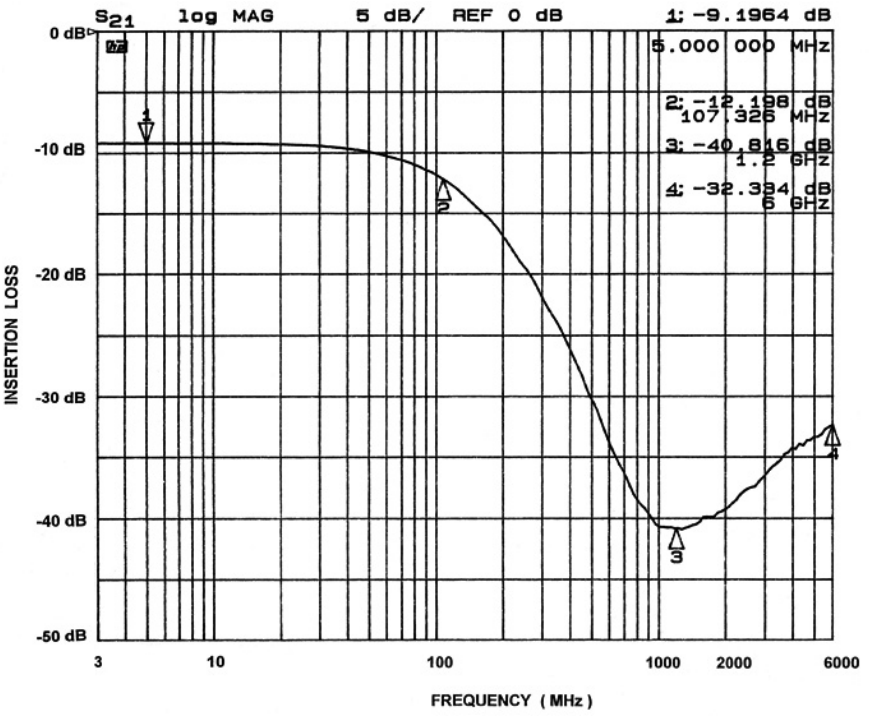


Figure 6. Channel 2 EMI Filter Performance (CM1436-06/08 only)

Performance Information (cont'd)

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

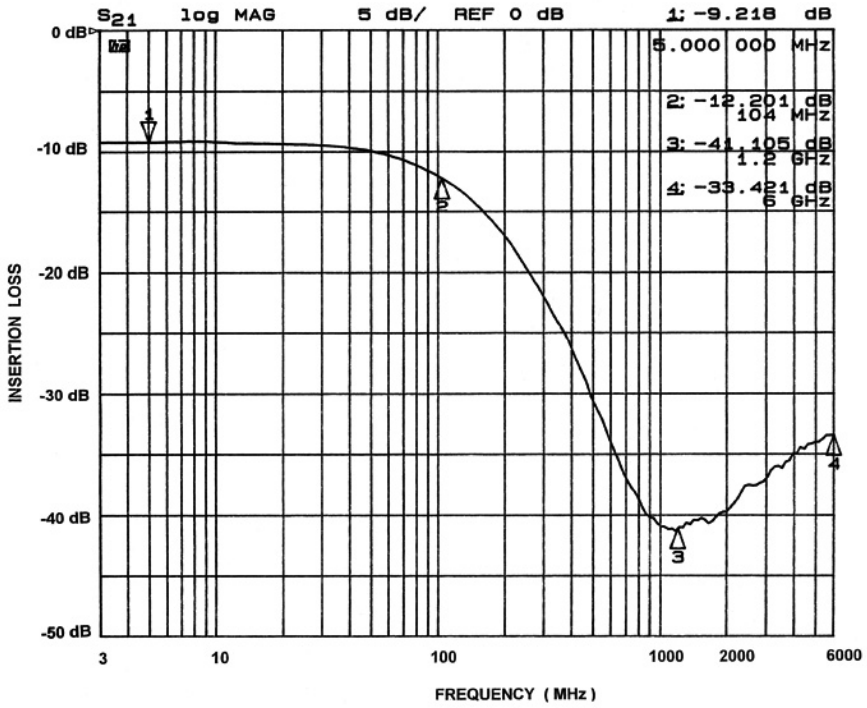


Figure 7. Channel 3 EMI Filter Performance (CM1436-06/08 only)

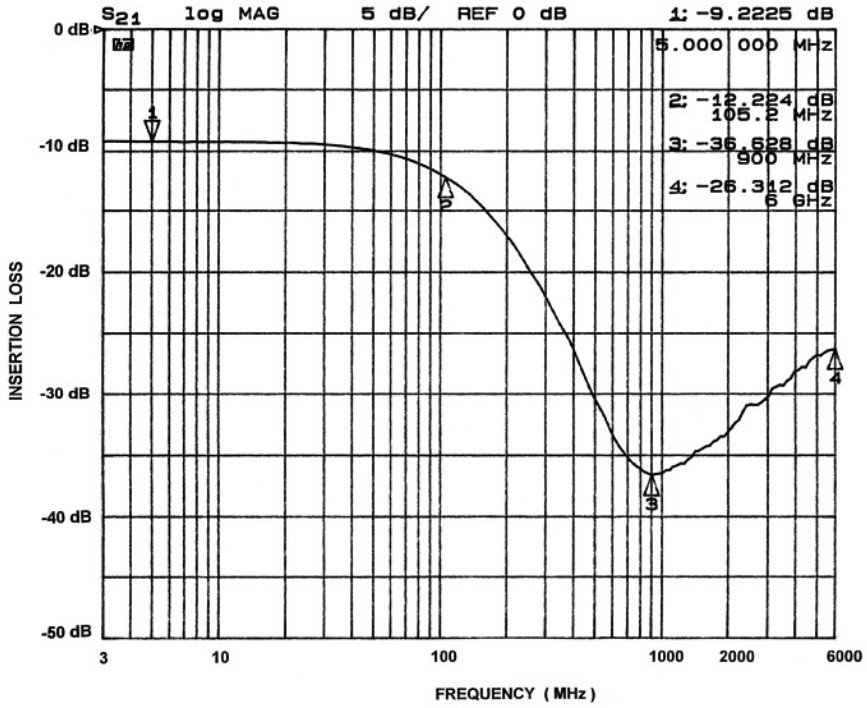


Figure 8. Channel 4 EMI Filter Performance (CM1436-06/08 only)

Performance Information (cont'd)

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

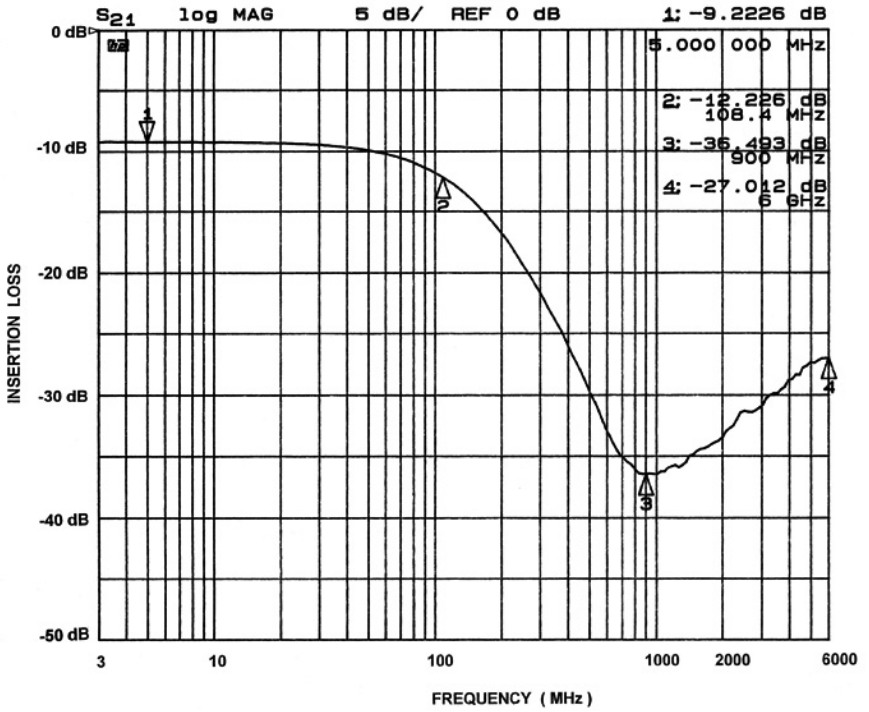


Figure 9. Channel 5 EMI Filter Performance (CM1436-06/08 only)

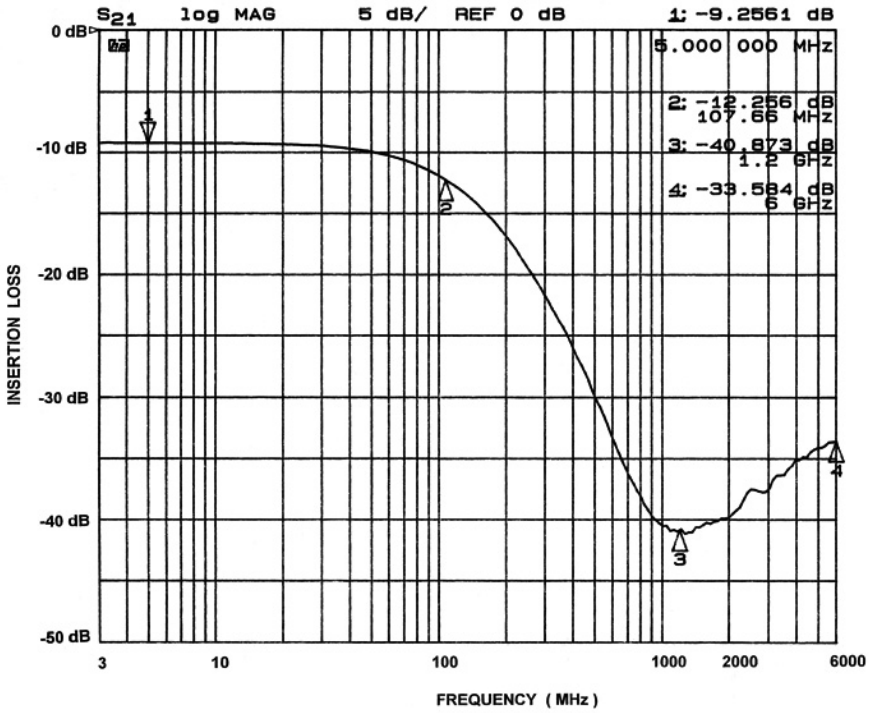


Figure 10. Channel 6 EMI Filter Performance (CM1436-06/08 only)

Performance Information (cont'd)

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

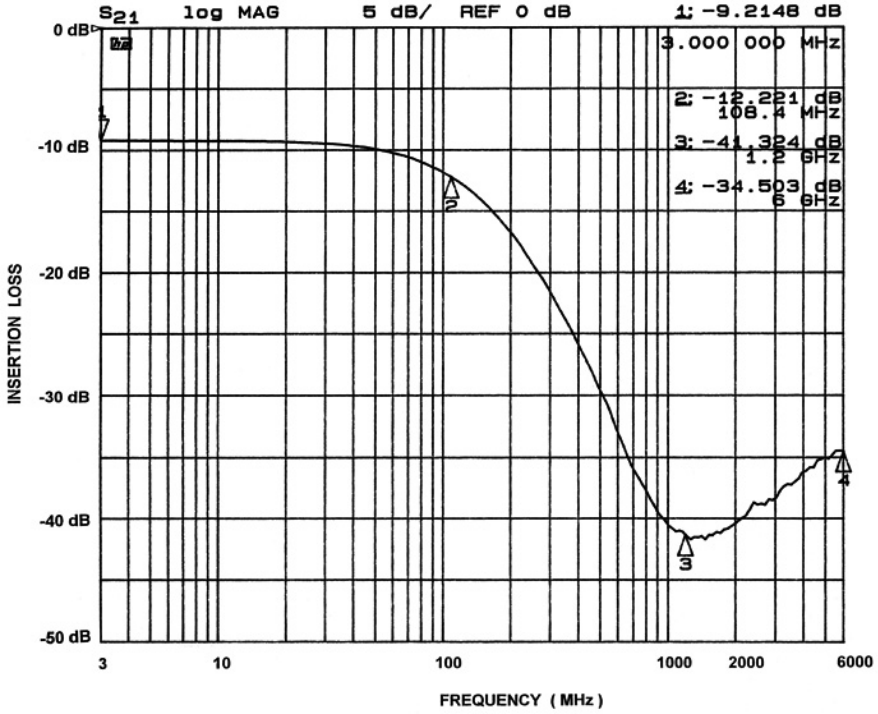


Figure 11. Channel 7 EMI Filter Performance (CM1436-08 only)

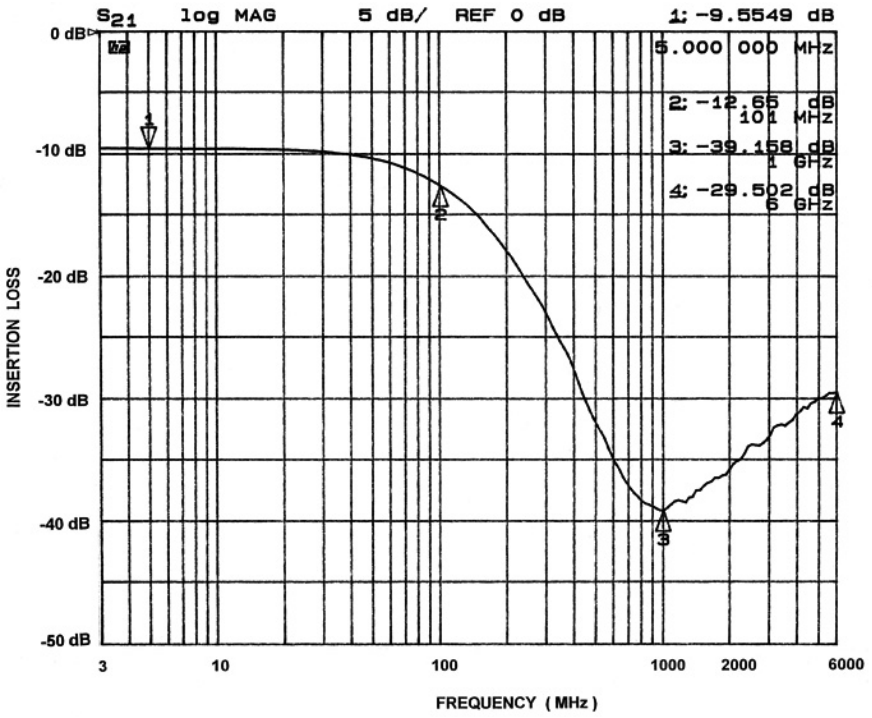


Figure 12. Channel 8 EMI Filter Performance (CM1436-08 only)

Performance Information (cont'd)

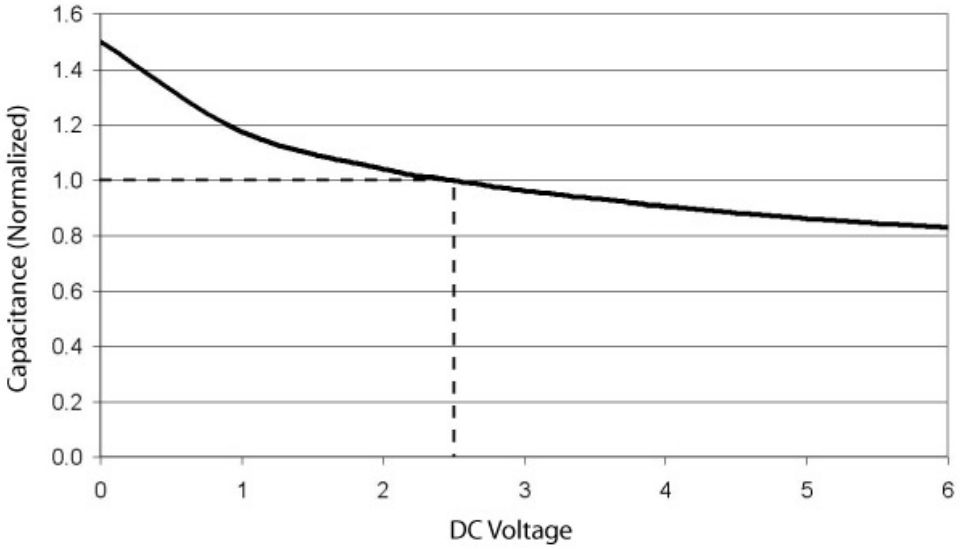


Figure 13. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5VDC and 25°C)

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.

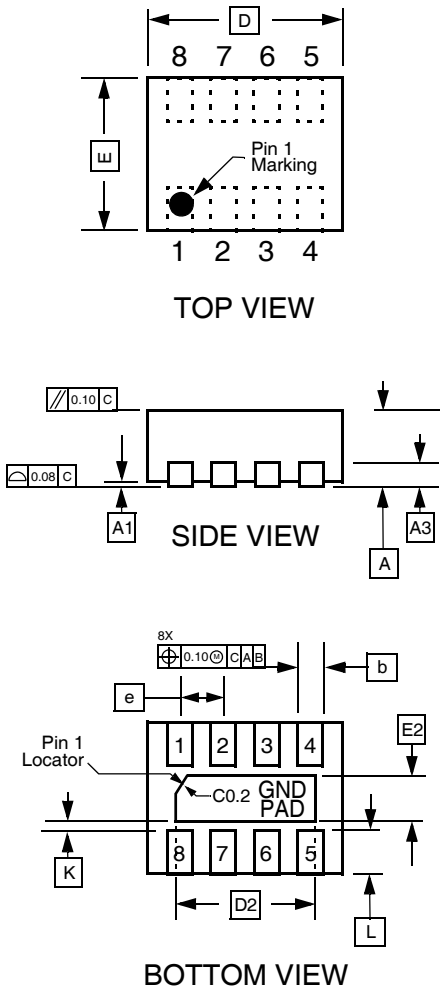
For complete information on the TDFN-8, see the California Micro Devices TDFN Package Information document.

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



Dimensions for 8-Lead, 0.4mm pitch TDFN package

Mechanical Details (cont'd)

CM1436-06DF/DE Mechanical Specifications

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

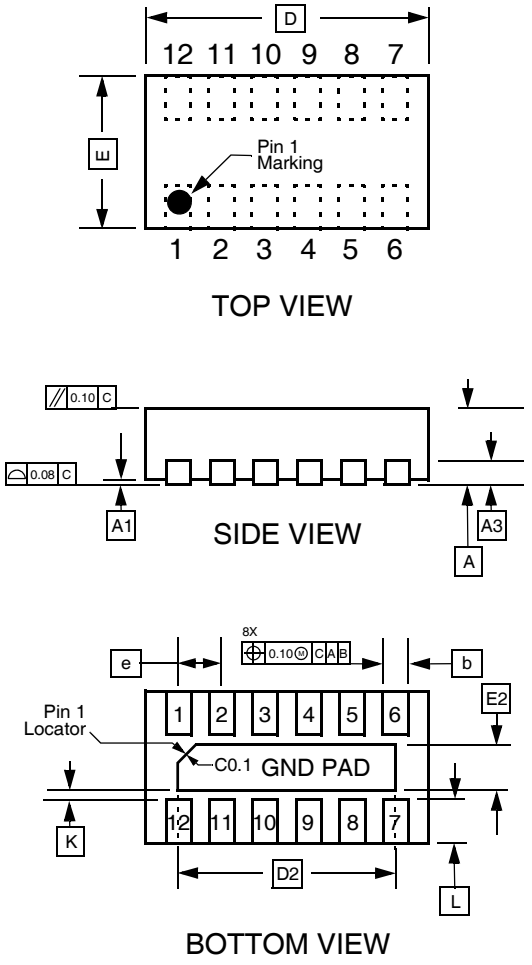
For complete information on the TDFN-12, see the California Micro Devices TDFN Package Information document.

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.

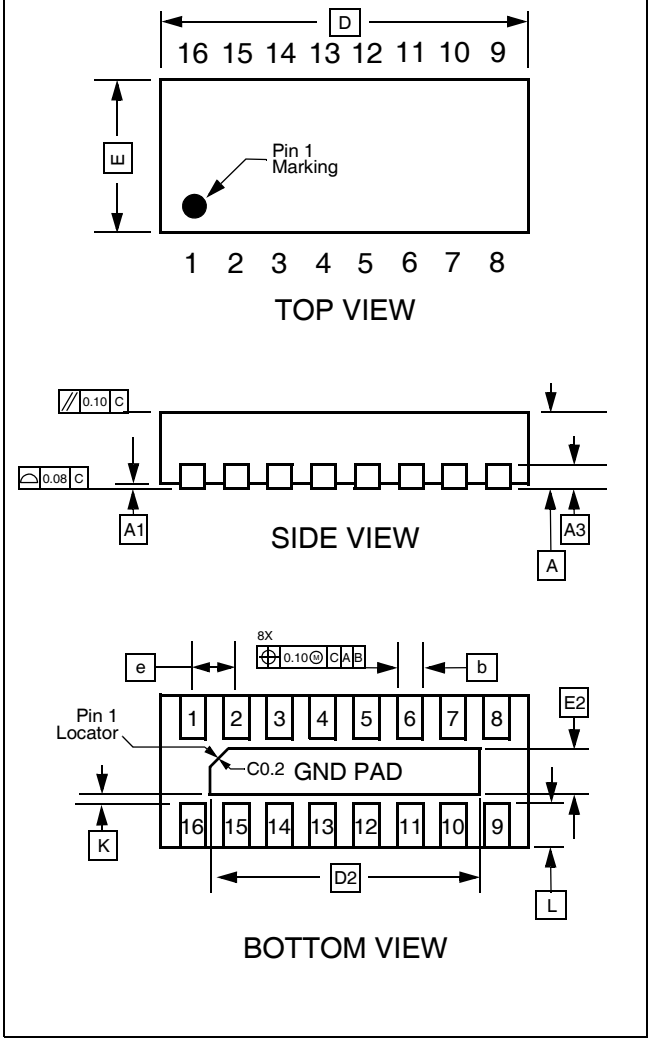
For complete information on the TDFN-16, see the California Micro Devices TDFN Package Information document.

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.

Mechanical Package Diagrams



Dimensions for 16-Lead, 0.4mm pitch TDFN package