Praetorian™ L-C LCD and Camera EMI Filter Array with ESD Protection in Ultra-Thin uDFN Packages

Features

- Four, six and eight channels of EMI filtering with integrated ESD protection
- Pi-style EMI filters in a capacitor-inductor-capacitor (C-L-C) network
- ±15kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- ±30kV ESD protection on each channel (HBM)
- Greater than -35dB attenuation (typical) at 1GHz
- 0.5mm thick uDFN package with 0.40mm lead pitch:
  - 4-channel = 8-lead uDFN
  - 6-channel = 12-lead uDFN
  - 8-channel = 16-lead uDFN
- Tiny uDFN package size:
  - 8-lead: 1.70mm x 1.35mm
  - 12-lead: 2.50mm x 1.35mm
  - 16-lead: 3.30mm x 1.35mm
- Lead-free packaging

Applications

- LCD and camera data lines in mobile handsets
- Wireless handsets
- LCD and camera modules

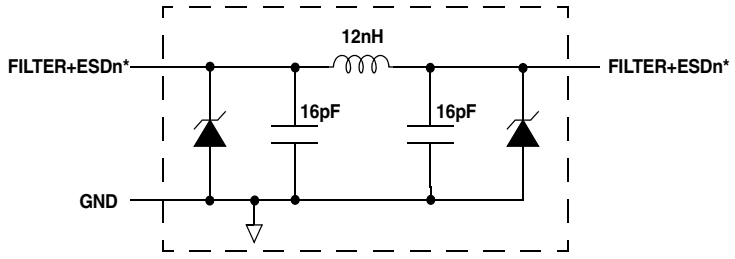
Product Description

California Micro Devices' CM1690 is a family of pi-style EMI filter arrays with ESD protection, which integrates four, six and eight filters (C-L-C) in small form factor uDFN 0.40mm pitch packages. Each EMI filter channel of the CM1690 is implemented as a 3-pole L-C filter where the component values are 16pF-12nH-16pF. The CM1690's roll-off frequency at –6dB attenuation is 330MHz and can be used in applications where the data rates are as high as 140Mbps while providing greater than –35dB attenuation over the 1.0GHz to 3.0GHz frequency range. The parts include 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 protection diodes connected to the filter ports are designed and characterized to safely dissipate ESD strikes of ±15kV, beyond the maximum requirement of the IEC61000-4-2 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 ±30kV.

This device is particularly well suited for wireless handsets, mobile LCD modules and PDAs because of its small package format and easy-to-use pin assignments. In particular, the CM1690 is ideal for EMI filtering and protecting data and control lines for the LCD display and camera interface in mobile handsets.

The CM1690 is available in space saving, ultra low profile 8-, 12-, and 16-lead 0.40mm uDFN packages with lead-free finishing.

Electrical Schematic

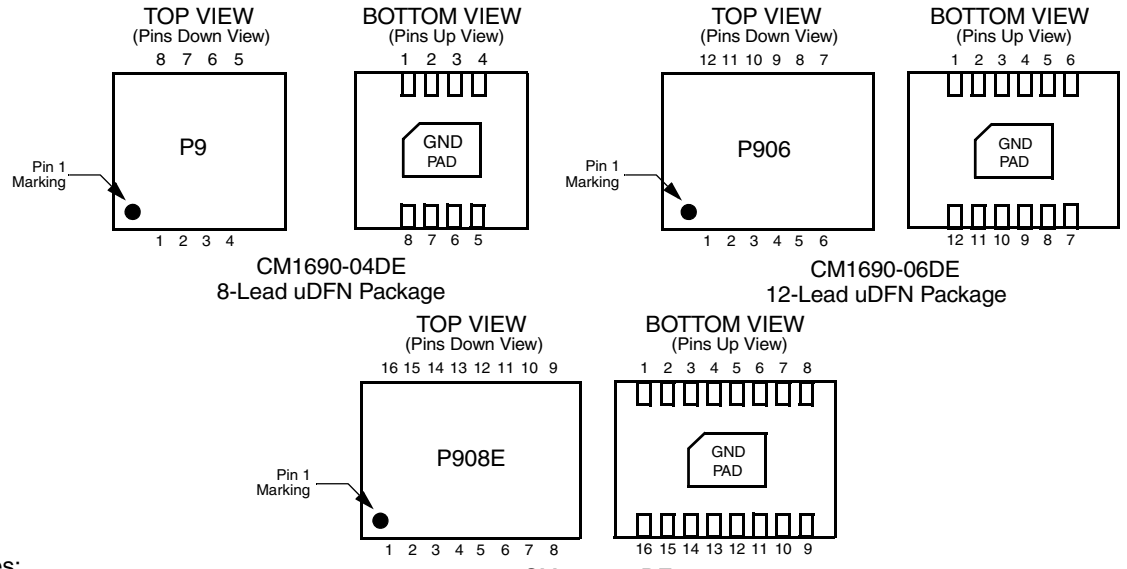


1 of 4, 6 or 8 EMI/RFI Filter Channels with Integrated ESD Protection

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

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PACKAGE / PINOUT DIAGRAMS



Notes:
1) These drawings are not to scale.

PIN DESCRIPTIONS

DEVICE PIN(s)						DEVICE PIN(s)				
-04	-06	-08	NAME	DESCRIPTION		-04	-06	-08	NAME	DESCRIPTION
1	1	1	FILTER1	Filter + ESD Channel 1		8	12	16	FILTER1	Filter + ESD Channel 1
2	2	2	FILTER2	Filter + ESD Channel 2		7	11	15	FILTER2	Filter + ESD Channel 2
3	3	3	FILTER3	Filter + ESD Channel 3		6	10	14	FILTER3	Filter + ESD Channel 3
4	4	4	FILTER4	Filter + ESD Channel 4		5	9	13	FILTER4	Filter + ESD Channel 4
	5	5	FILTER5	Filter + ESD Channel 5			8	12	FILTER5	Filter + ESD Channel 5
	6	6	FILTER6	Filter + ESD Channel 6			7	11	FILTER6	Filter + ESD Channel 6
		7	FILTER7	Filter + ESD Channel 7				10	FILTER7	Filter + ESD Channel 7
		8	FILTER8	Filter + ESD Channel 8				9	FILTER8	Filter + ESD Channel 8
GND PAD			GND	Device Ground						

Ordering Information

PART NUMBERING INFORMATION

Pins	Package	Lead-free Finish	
		Ordering Part Number[1]	Part Marking
8	uDFN-8	CM1690-04DE	P9
12	uDFN-12	CM1690-06DE	P906
16	uDFN-16	CM1690-08DE	P908E

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

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Specifications

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	**RATING**	**UNITS**
Storage Temperature Range	–65 to +150	°C
Current per Inductor	30	mA
DC Package Power Rating	500	mW

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

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
L	Channel Inductance			12		nH
C_{TOTAL}	Total Channel Capacitance	At 2.5VDC Reverse Bias, 1MHz, 30mVAC	25	33	40	pF
C	Capacitance C1	At 2.5VDC Reverse Bias, 1MHz, 30mVAC		16.5		pF
V_{DIODE}	Standoff Voltage	I_{DIODE} = 10µA		6.0		V
I_{LEAK}	Diode Leakage Current (reverse bias)	V_{DIODE} = +3.3V		0.1	0.3	µA
V_{SIG}	Signal Clamp 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 Level 4	Notes 2, 3 and 4	 ±30 ±15			 kV kV
R_{DYN}	Dynamic Resistance Positive Negative			 2.3 0.9		 Ω Ω
f_C	Roll-off Frequency at -6dB Attenuation Z_{SOURCE} = 50Ω, Z_{LOAD} = 50Ω			330		MHz
$R_{INSULATION}$	Insulation Resistance	V_{DIODE}=3.3V, Note 4	10			MΩ
$R_{CHANNEL}$	Channel Resistance			8		Ω

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 (i.e. if ESD is applied to pin A1 then clamping voltage is measured at pin C1). Unused pins are left open.

Note 4: These parameters are guaranteed by design and characterization.

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Performance Information

Typical Diode Capacitance vs. Input Voltage

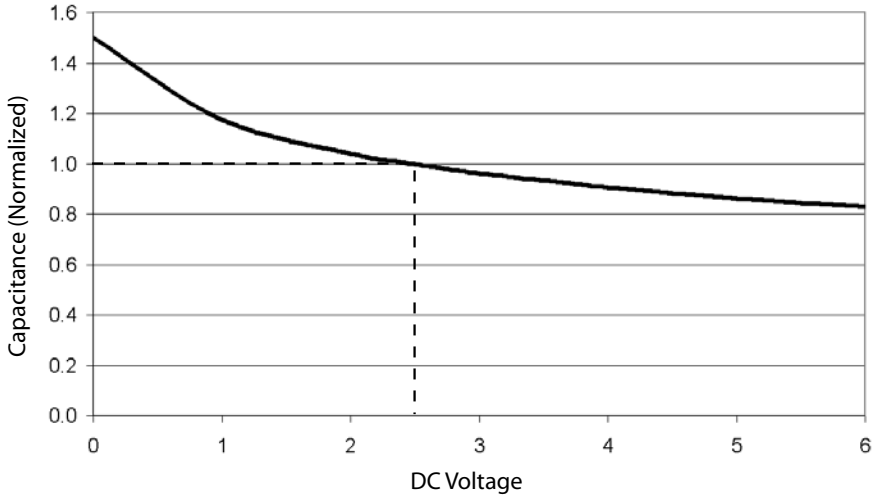


Figure 1. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5VDC and 25°C)

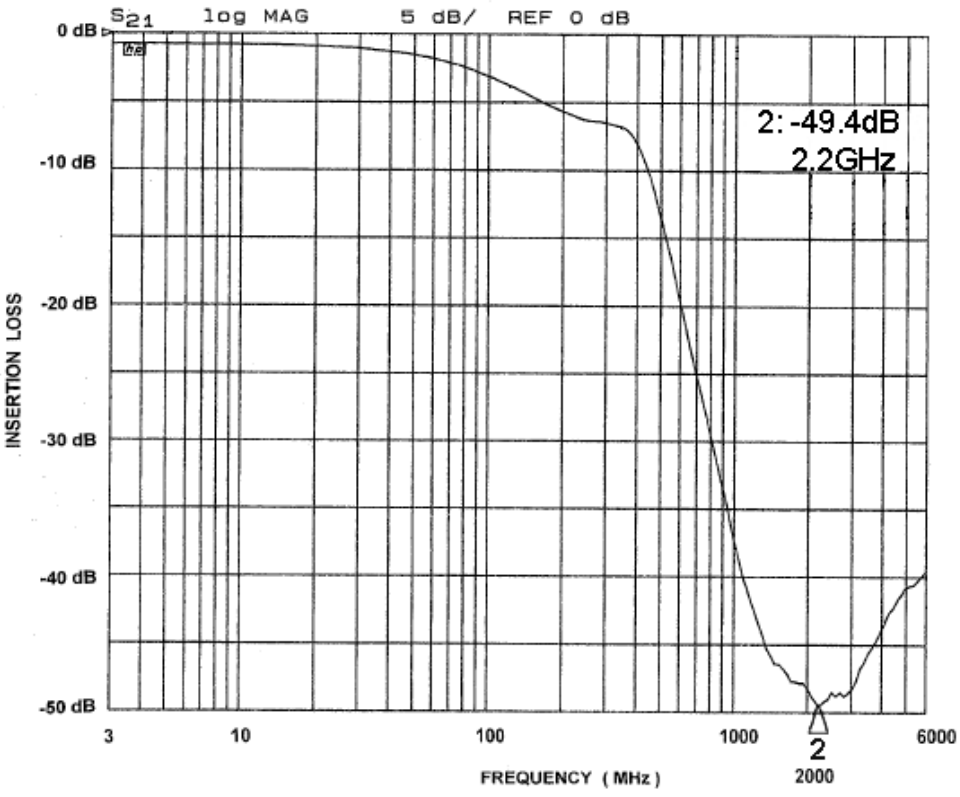


Figure 2. Typical Performance Curve

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Mechanical Details

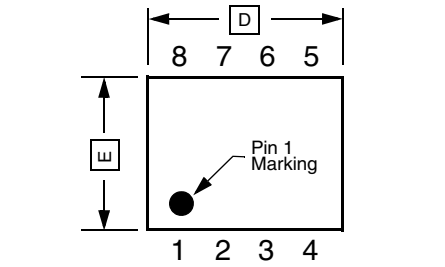
uDFN-08 Mechanical Specifications

Dimensions for the CM1690 supplied in an 8-lead, 0.4mm pitch uDFN package are presented below.

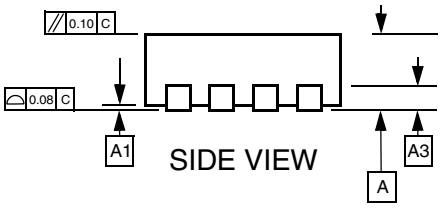
PACKAGE DIMENSIONS						
Package	uDFN					
JEDEC No.	MO-229C*					
Leads	8					
Dim.	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A	0.45	0.50	0.55	0.018	0.020	0.022
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.127 REF			0.005 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	1.60	1.70	1.80	0.063	0.067	0.071
D2	1.10	1.20	1.30	0.043	0.047	0.051
E	1.25	1.35	1.45	0.049	0.053	0.057
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					
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.

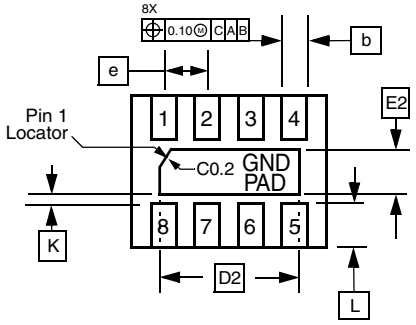
Mechanical Package Diagrams



TOP VIEW



SIDE VIEW



BOTTOM VIEW

Dimensions for 8-Lead, 0.4mm pitch uDFN package

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Mechanical Details (cont'd)

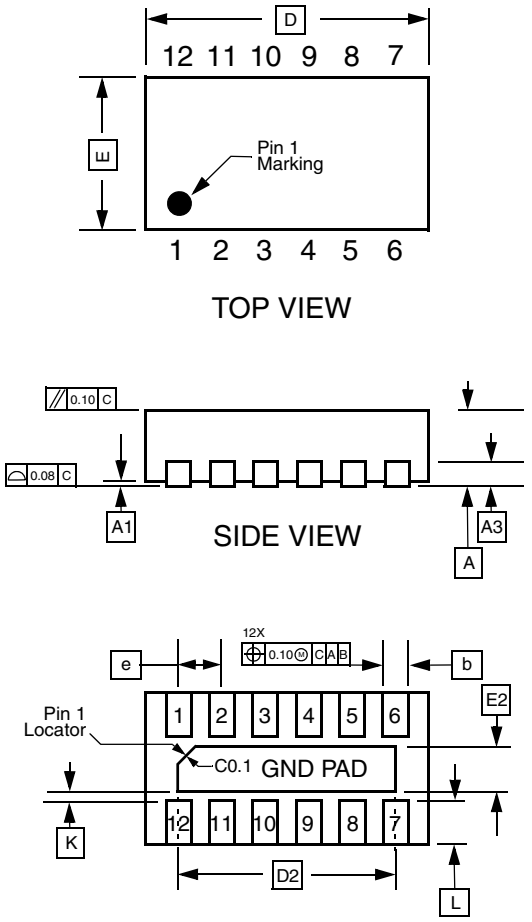
uDFN-12 Mechanical Specifications

Dimensions for the CM1690 supplied in a 12-lead, 0.4mm pitch uDFN package are presented below.

PACKAGE DIMENSIONS						
Package	uDFN					
JEDEC No.	MO-229C*					
Leads	12					
Dim.	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A	0.45	0.50	0.55	0.018	0.020	0.022
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.127 REF			0.005 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	2.40	2.50	2.60	0.094	0.098	0.102
D2	1.90	2.00	2.10	0.075	0.079	0.083
E	1.25	1.35	1.45	0.049	0.053	0.057
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					
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 uDFN package

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Mechanical Details (cont'd)

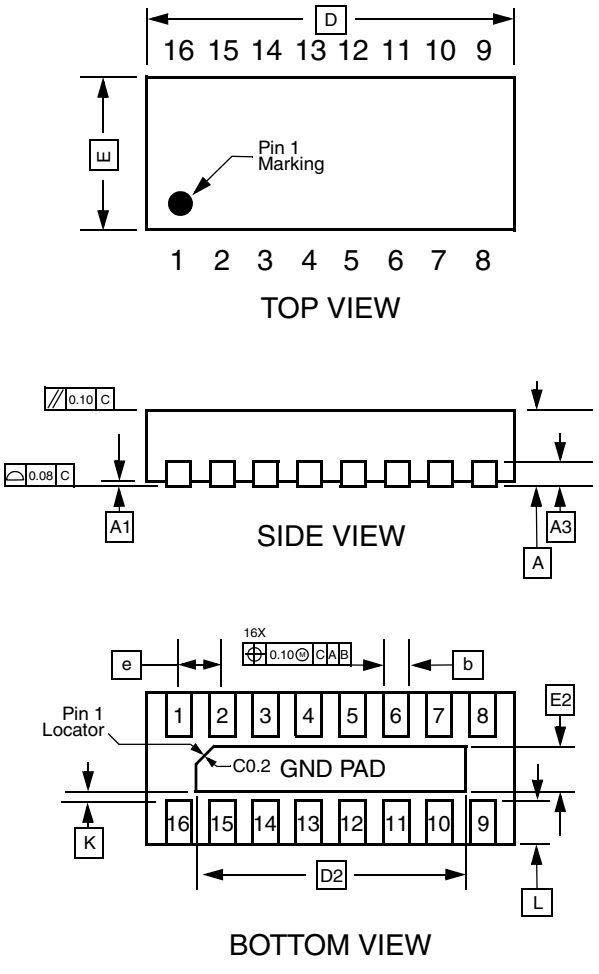
uDFN-16 Mechanical Specifications

Dimensions for the CM1690 supplied in a 16-lead, 0.4mm pitch uDFN package are presented below.

PACKAGE DIMENSIONS						
Package	uDFN					
JEDEC No.	MO-229C*					
Leads	16					
Dim.	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A	0.45	0.50	0.55	0.018	0.020	0.022
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.127 REF			0.005 REF		
b	0.15	0.20	0.25	0.006	0.008	0.010
D	3.20	3.30	3.40	0.126	0.130	0.134
D2	2.70	2.80	2.90	0.106	0.110	0.114
E	1.25	1.35	1.45	0.049	0.053	0.057
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					
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 uDFN package

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