

## Praetorian™ L-C LCD and Camera EMI Filter Array with ESD Protection

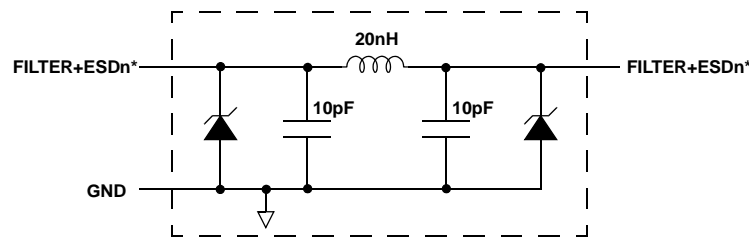
### Features

- Four 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 30dB attenuation (typical) at 1GHz
- 8-lead uDFN lead-free package with 0.5mm lead pitch
- Tiny 2.00mm x 2.00mm uDFN package size
- Increased robustness against vertical impacts during manufacturing process
- Lead-free RoHS compliant finishing

### Applications

- LCD and camera data lines 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.
- Wireless handsets
- Handheld PCs/PDAs
- LCD and camera modules

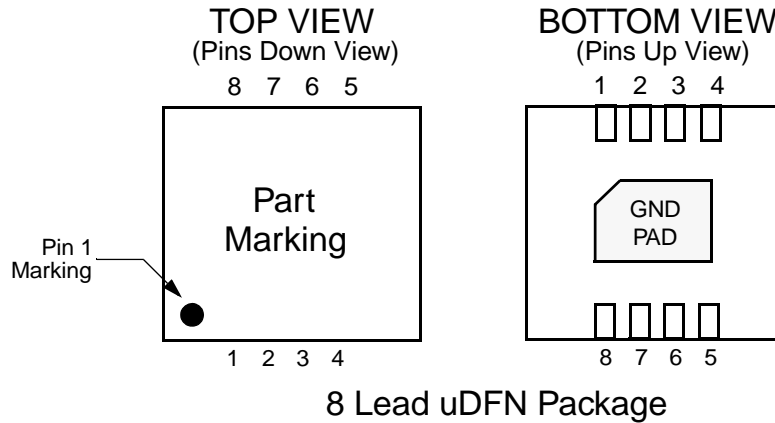
### Electrical Schematic



**1 of 4 EMI/RFI Filter Channels with Integrated  
ESD Protection**

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

**PACKAGE / PINOUT DIAGRAMS**



Notes:

1) These drawings are not to scale.

**PIN DESCRIPTIONS**

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	FILTER1	Filter + ESD Channel 1	8	FILTER1	Filter + ESD Channel 1
2	FILTER2	Filter + ESD Channel 2	7	FILTER2	Filter + ESD Channel 2
3	FILTER3	Filter + ESD Channel 3	6	FILTER3	Filter + ESD Channel 3
4	FILTER4	Filter + ESD Channel 4	5	FILTER4	Filter + ESD Channel 4
GND PAD	GND	Device Ground			

**Ordering Information**

**PART NUMBERING INFORMATION**

Pins	Package	Lead-free Finish	
		Ordering Part Number <sup>1</sup>	Part Marking
8	uDFN-8	CM1661-04DE	NE

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
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 NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
L	Channel Inductance			20		nH
C <sub>TOTAL</sub>	Total Channel Capacitance	At 2.5VDC Reverse Bias, 1MHz, 30mVAC	16	20	24	pF
C	Capacitance C1	At 2.5VDC Reverse Bias, 1MHz, 30mVAC		10		pF
V <sub>DIODE</sub>	Standoff Voltage	I <sub>DIODE</sub> =10μA		6.0		V
I <sub>LEAK</sub>	Diode Leakage Current (reverse bias)	V <sub>DIODE</sub> =+3.3V		0.1	1.0	μA
V <sub>SIG</sub>	Signal Clamp Voltage Positive Clamp Negative Clamp	I <sub>LOAD</sub> = 10mA I <sub>LOAD</sub> = -10mA	5.6 -1.5	6.8 -0.8	9 -0.4	V V
V <sub>ESD</sub>	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 <sub>DYN</sub>	Dynamic Resistance Positive Negative			2.3 0.9		Ω Ω
f <sub>R</sub>	Roll-off Frequency at -6dB Attenuation Z <sub>SOURCE</sub> =50Ω, Z <sub>LOAD</sub> =50Ω			400		MHz

Note 1: T<sub>A</sub>=25°C unless otherwise specified.

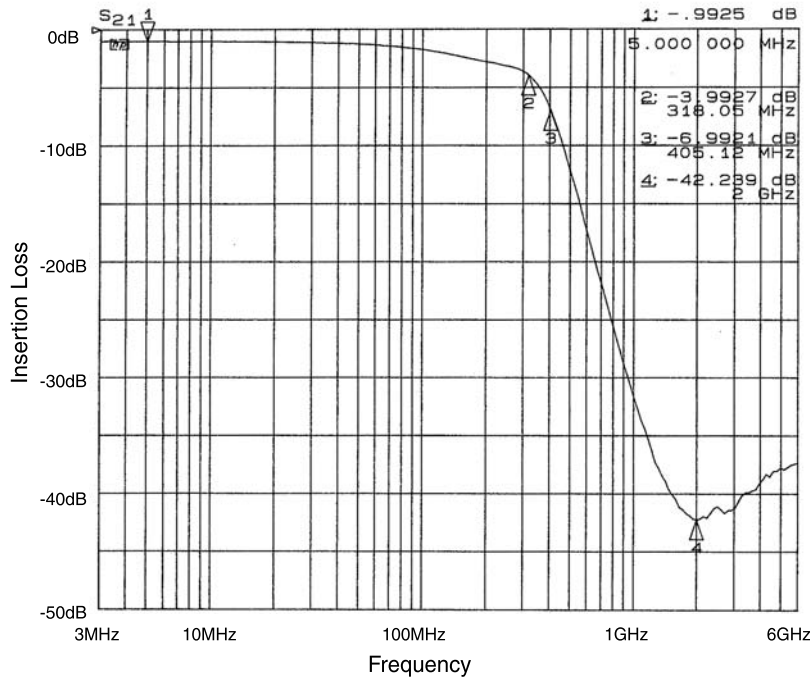
Note 2: ESD applied to input and output pins with respect to GND, one at a time.

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.

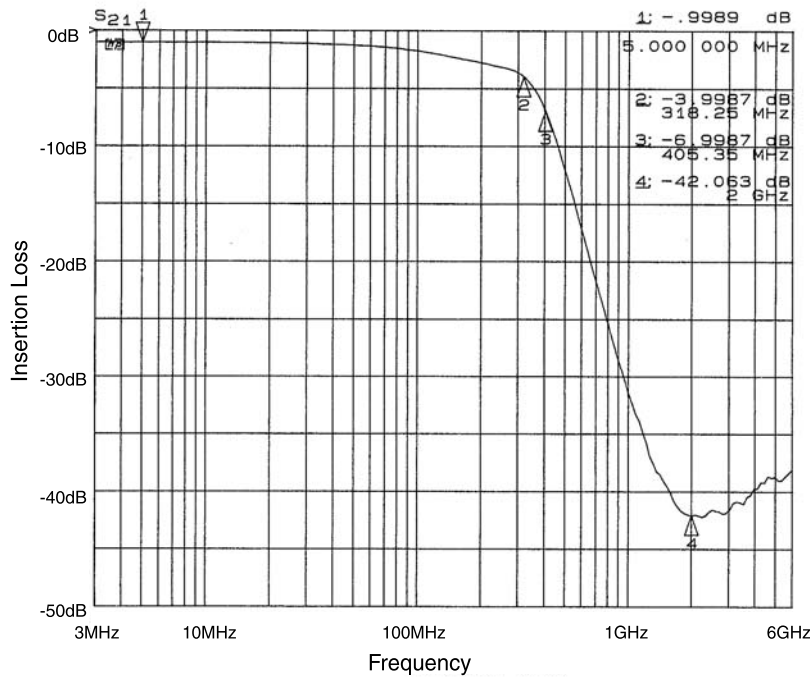
Note 4: These parameters are guaranteed by design and characterization.

**Performance Information**

Typical Filter Performance ( $T_A=25^\circ\text{C}$ , DC Bias=0V, 50 Ohm Environment)



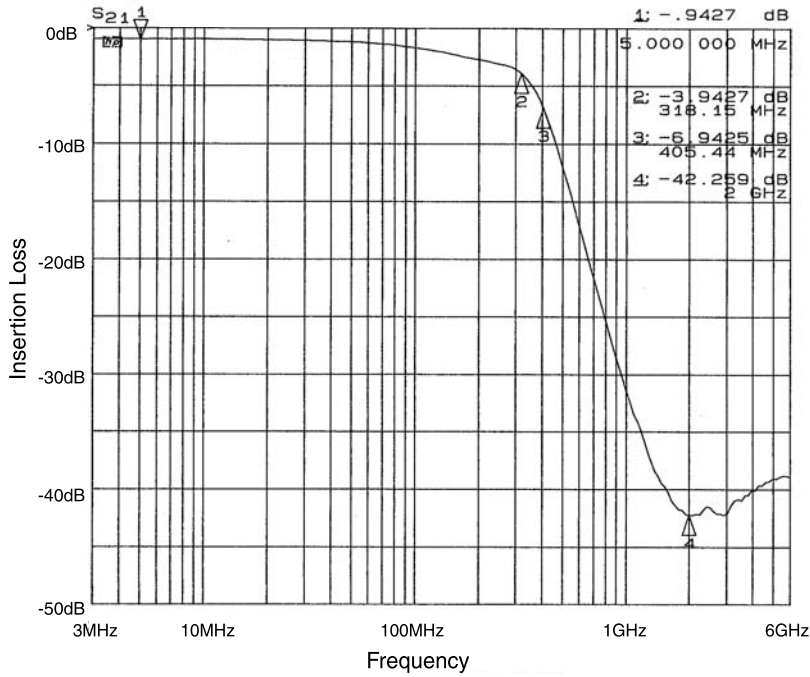
**Figure 1. Filter 1 Insertion Loss (CM1661-04DE)**



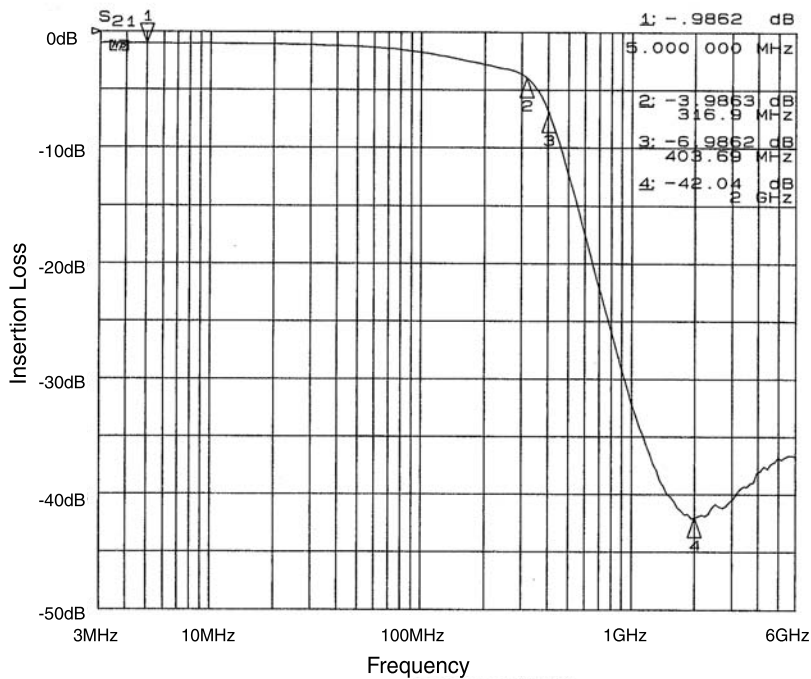
**Figure 2. Filter 2 Insertion Loss (CM1661-04DE)**

**Performance Information**

Typical Filter Performance ( $T_A=25^\circ\text{C}$ , DC Bias=0V, 50 Ohm Environment)

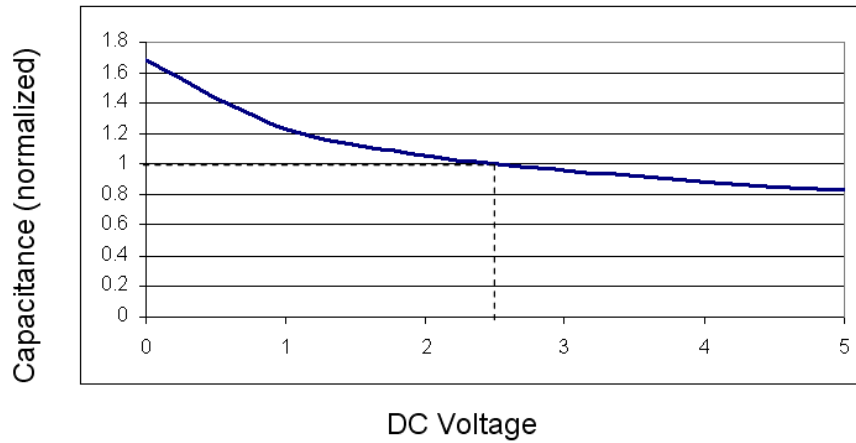


**Figure 3. Filter 3 Insertion Loss (CM1661-04DE)**



**Figure 4. Filter 4 Insertion Loss (CM1661-04DE)**

**Typical Diode Capacitance vs. Input Voltage**



**Figure 5. Filter Capacitance vs. Input Voltage  
(normalized to capacitance at 2.5VDC and 25°C)**

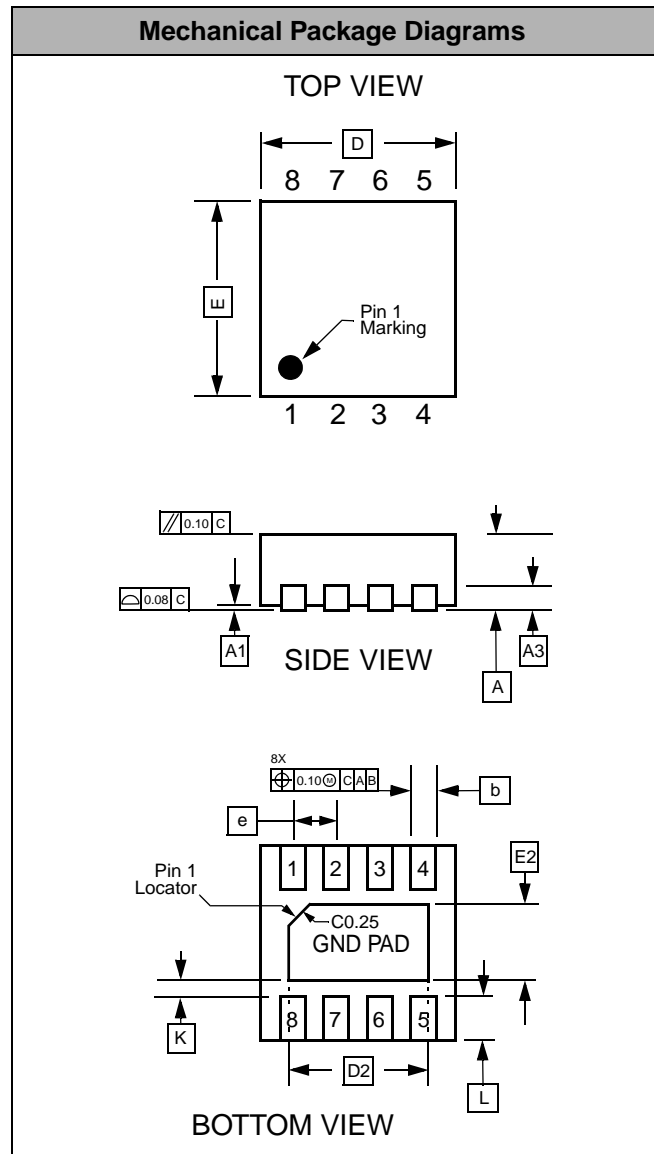
## Mechanical Details

### uUDFN-08 Mechanical Specifications, 0.5mm

Dimensions for the CM1661-04DE supplied in a 2mmx2mm, 8-lead, 0.5mm pitch uUDFN package are presented below.

PACKAGE DIMENSIONS						
Package	uUDFN					
JEDEC No.	MO-229C <sup>†</sup>					
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	0.20	0.25	0.30	0.008	0.010	0.012
D	1.90	2.00	2.10	0.075	0.079	0.083
D2	1.50	1.60	1.70	0.059	0.063	0.067
E	1.90	2.00	2.10	0.075	0.079	0.083
E2	0.80	0.90	1.00	0.031	0.035	0.039
e	0.50 BSC			0.020 BSC		
K	0.20			0.008		
L	0.20	0.30	0.40	0.008	0.012	0.016
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

<sup>†</sup>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 8-Lead, 0.5mm pitch uUDFN package