

## LCD and Camera EMI Filter Array with ESD Protection

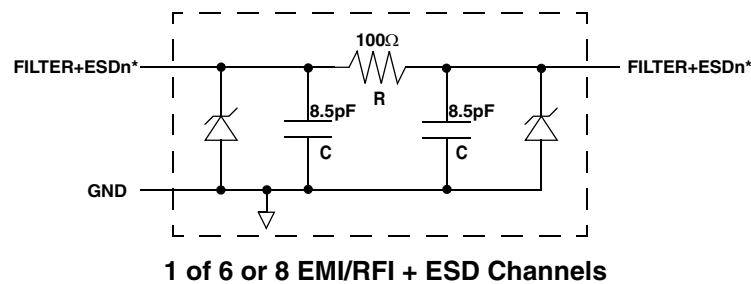
### Features

- Six or eight channels of EMI filtering with integrated ESD protection
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-C) network
- $\pm 15\text{kV}$  ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- $\pm 30\text{kV}$  ESD protection on each channel (HBM)
- Greater than  $-25\text{dB}$  attenuation (typical) at  $1\text{GHz}$
- NuDFN package with  $0.40\text{mm}$  lead pitch:
  - 12-lead:  $2.5\text{mm} \times 1.20\text{mm} \times 0.50\text{mm}$
  - 16-lead:  $3.5\text{mm} \times 1.20\text{mm} \times 0.50\text{mm}$
- Lead-free finishing

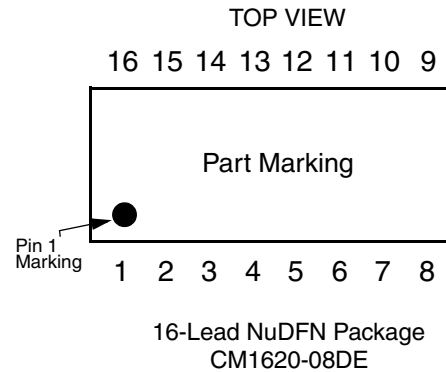
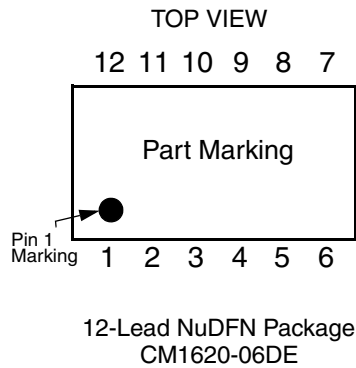
### Applications

- 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

### Electrical Schematic



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

**PACKAGE / PINOUT DIAGRAMS**


Note: These drawings are not to scale.

**16-PIN DESCRIPTIONS**

DEVICE PIN(s)		NAME	DESCRIPTION	DEVICE PIN(s)		NAME	DESCRIPTION
-06	-08			-06	-08		
1	1	FILTER1	Filter + ESD Channel 1	12	16	FILTER1	Filter + ESD Channel 1
2	2	FILTER2	Filter + ESD Channel 2	11	15	FILTER2	Filter + ESD Channel 2
3	3	FILTER3	Filter + ESD Channel 3	10	14	FILTER3	Filter + ESD Channel 3
4	4	FILTER4	Filter + ESD Channel 4	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 <sup>1</sup>	Part Marking
12	NuDFN-12	CM1620-06DE	P20
16	NuDFN-16	CM1620-08DE	P208

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
DC Package Power Rating	500	mW

### STANDARD OPERATING CONDITIONS

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

### ELECTRICAL OPERATING CHARACTERISTICS (NOTE1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
R	Resistance		80	100	120	Ω
C <sub>TOTAL</sub>	Total Channel Capacitance	At 2.5VDC Reverse Bias, 1MHz, 30mVAC	14	17	22	pF
C	Capacitance C	At 2.5VDC Reverse Bias, 1MHz, 30mVAC		8.5		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	I <sub>LOAD</sub> = 10mA	5.6	6.8	9.0	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	See notes 2 and 3.	±30			kV
R <sub>DYN</sub>	Dynamic Resistance Positive Negative			2.3 0.9		Ω Ω
f <sub>C</sub>	Cut-off Frequency Z <sub>SOURCE</sub> = 50Ω, Z <sub>LOAD</sub> = 50Ω	Channel R = 100Ω, Channel C = 17pF		200		MHz
A <sub>1GHz</sub>	Absolute Attenuation @ 1GHz from 0dB Level	Z <sub>SOURCE</sub> = 50Ω, Z <sub>LOAD</sub> = 50Ω, DC Bias = 0V; See notes 1, 4, 5.		-30		dB
A <sub>800MHz - 6GHz</sub>	Absolute Attenuation @ 800MHz to 6GHz from 0dB Level	Z <sub>SOURCE</sub> = 50Ω, Z <sub>LOAD</sub> = 50Ω, DC Bias = 0V; See notes 1, 4, 5.		-25		dB

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

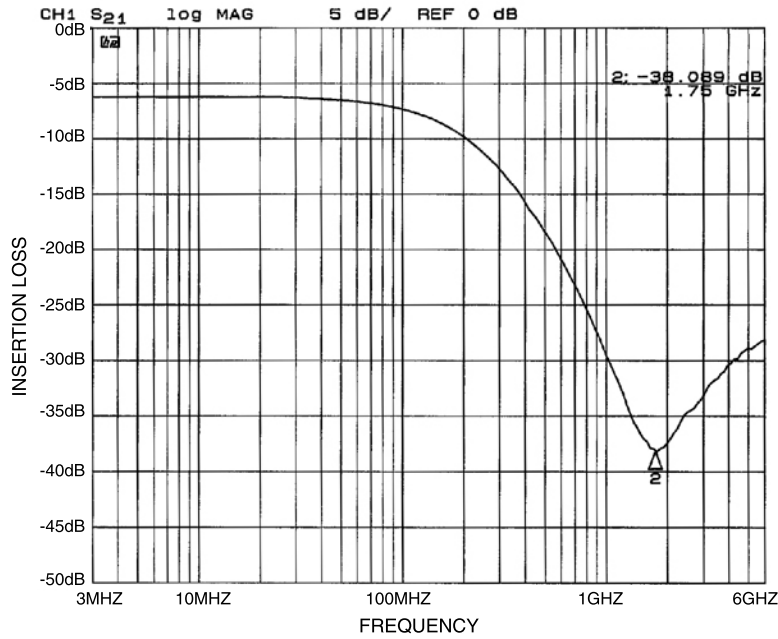


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1620-06DE)

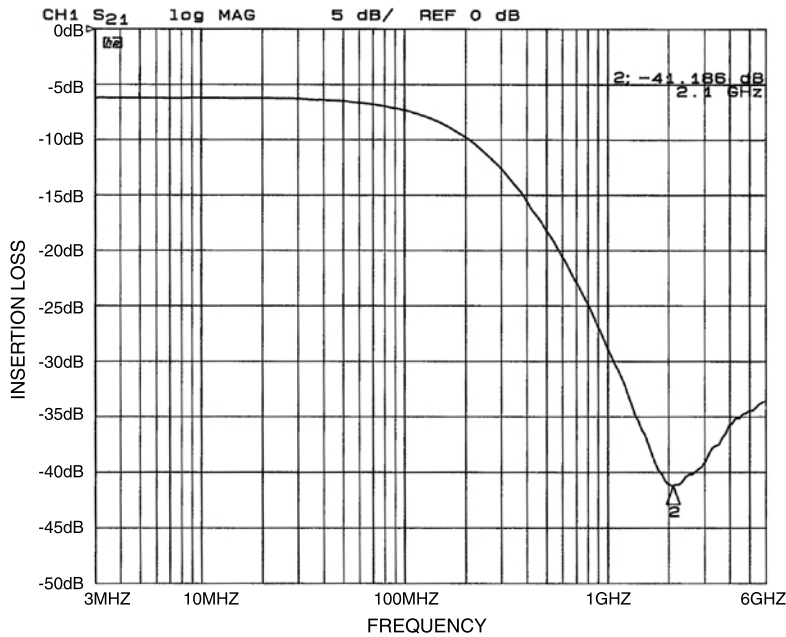


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1620-06DE)

Performance Information (cont'd)

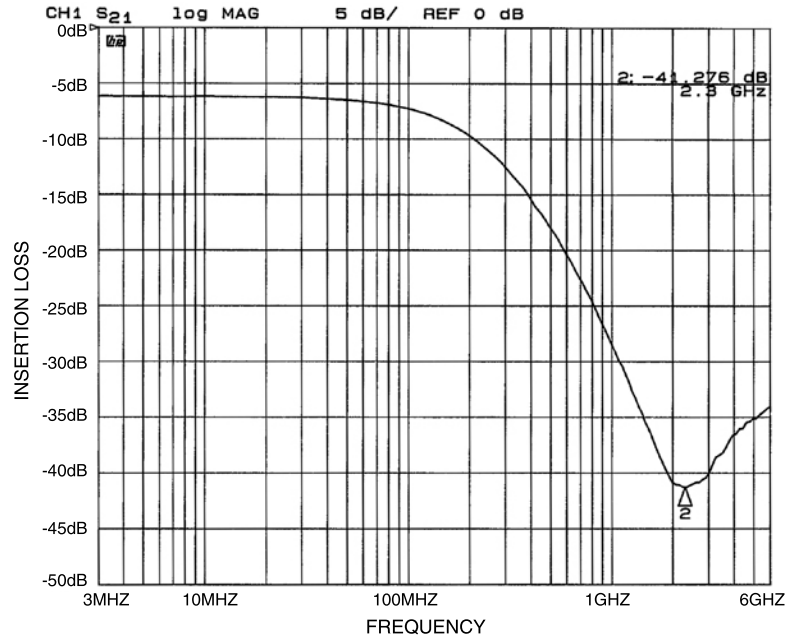


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1620-06DE)

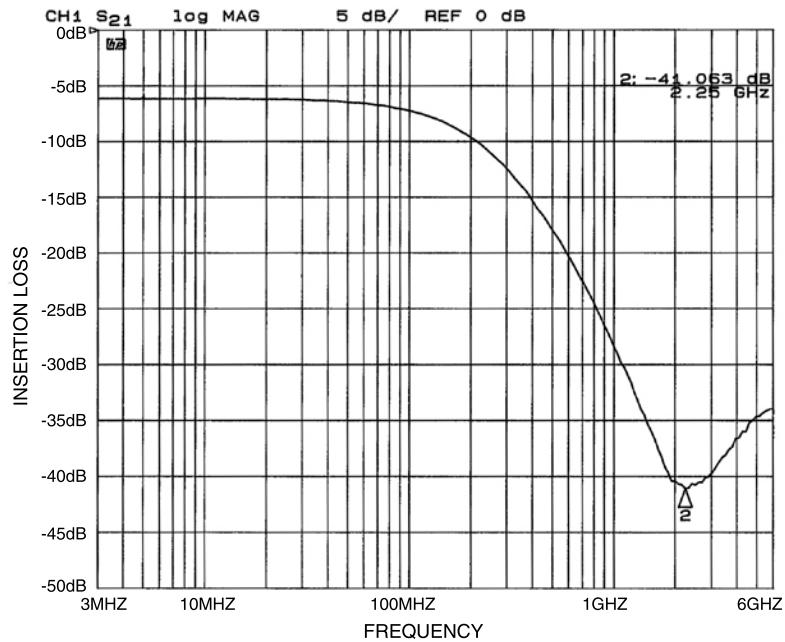
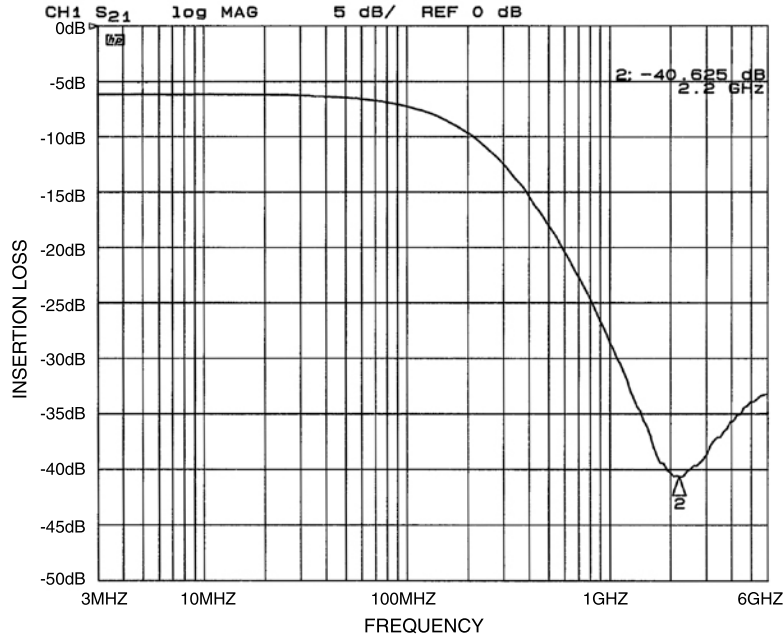
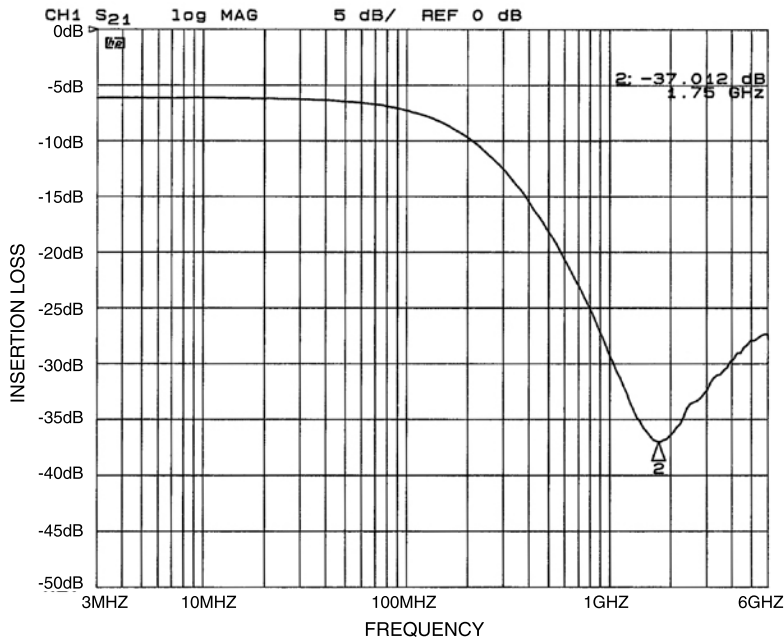


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1620-06DE)

**Performance Information (cont'd)**



**Figure 5. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1620-06DE)**



**Figure 6. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1620-06DE)**

Performance Information (cont'd)

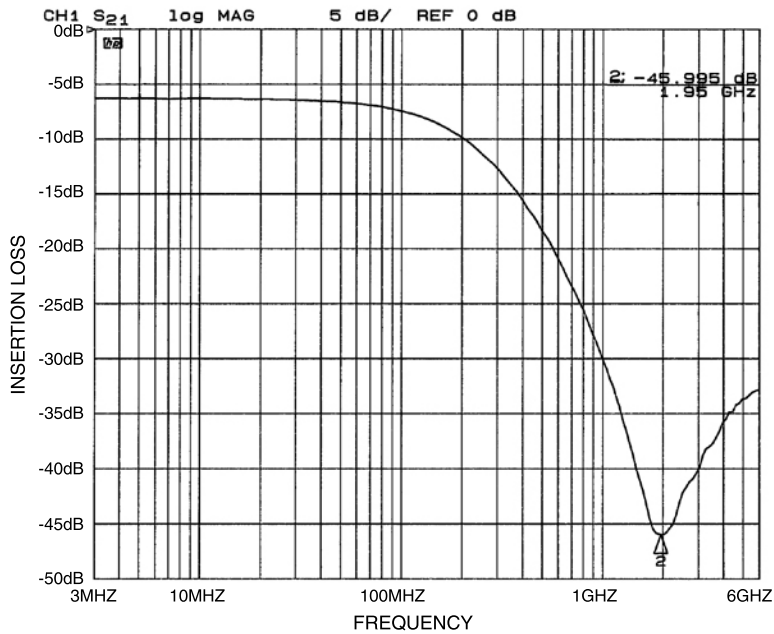


Figure 7. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1620-08DE)

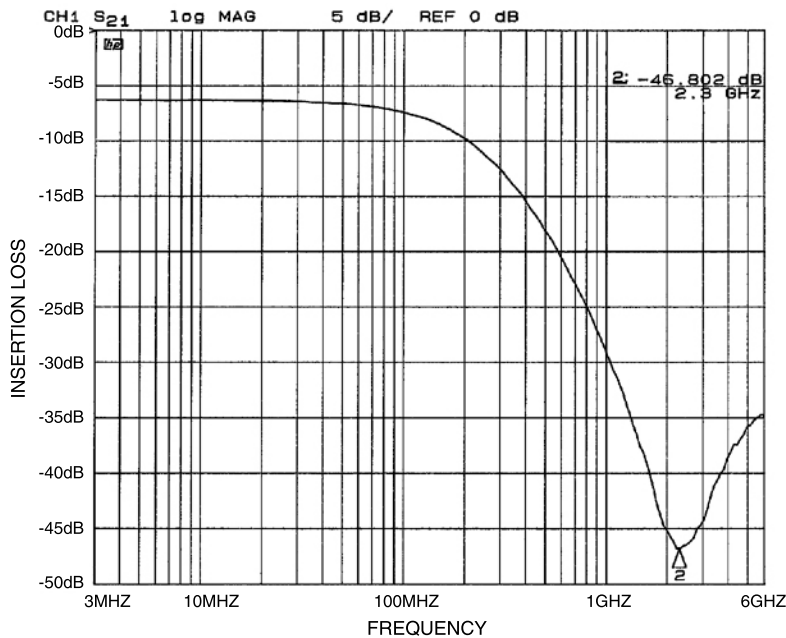
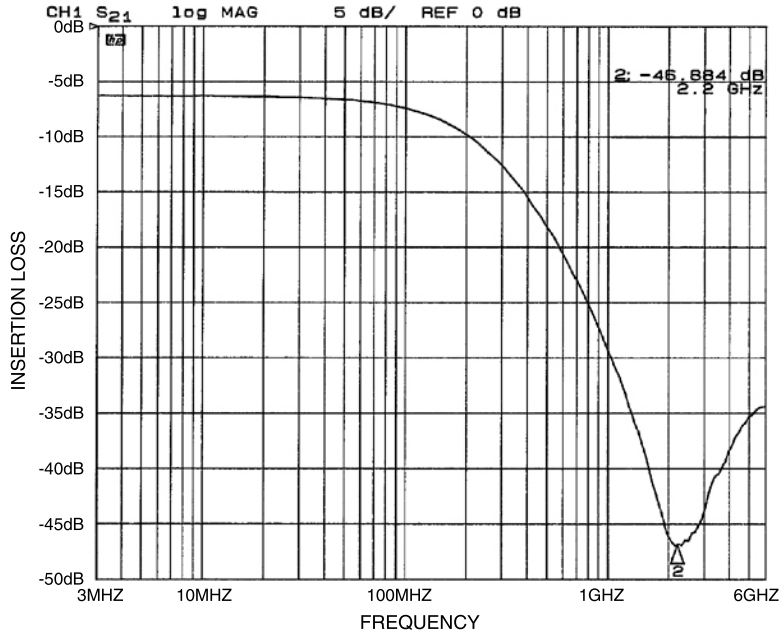
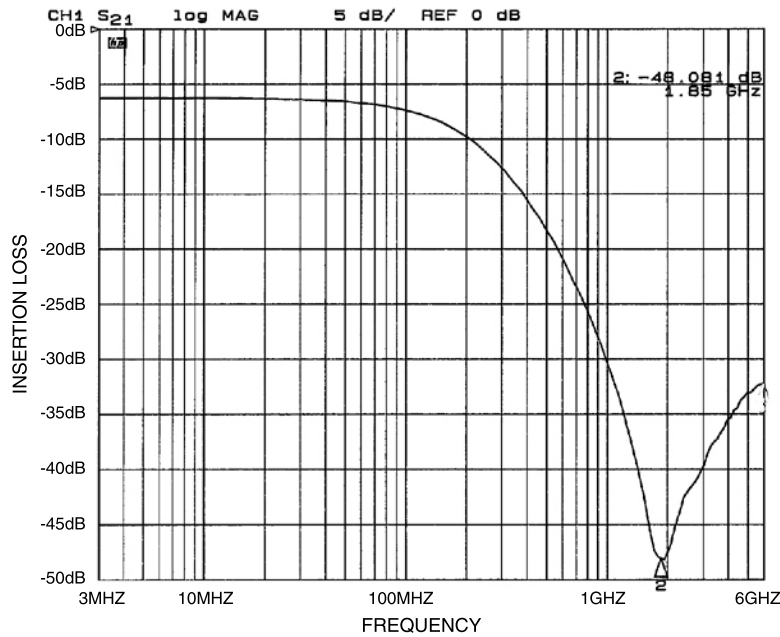


Figure 8. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1620-08DE)

**Performance Information (cont'd)**



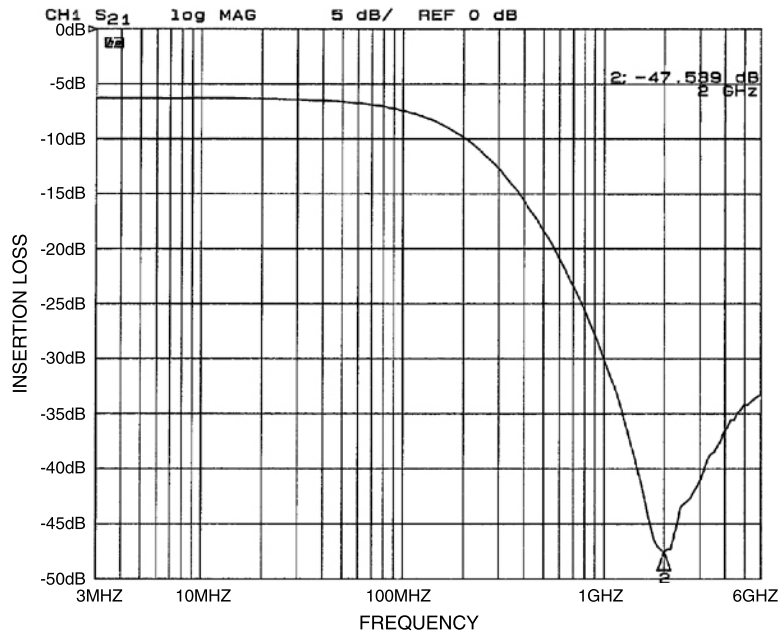
**Figure 9. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1620-08DE)**



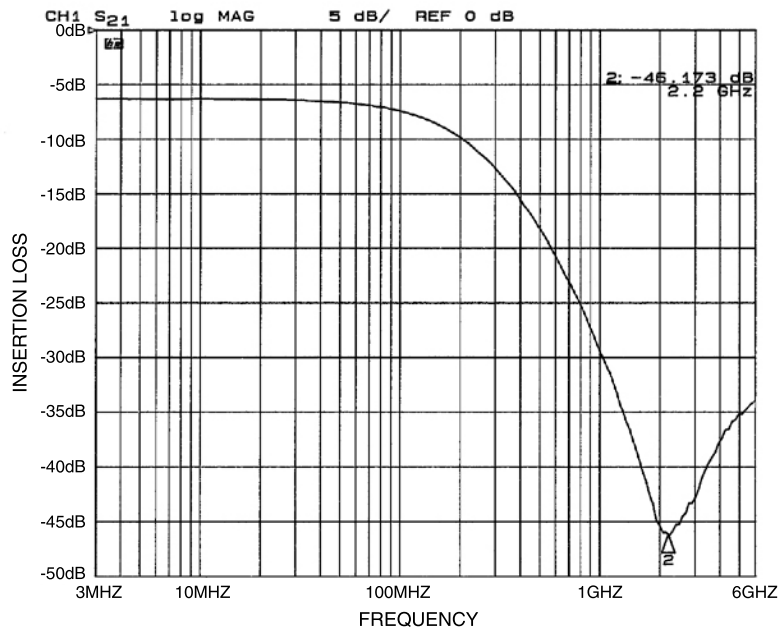
**Figure 10. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1620-08DE)**



**Performance Information (cont'd)**



**Figure 11. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1620-08DE)**



**Figure 12. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1620-08DE)**

Performance Information (cont'd)

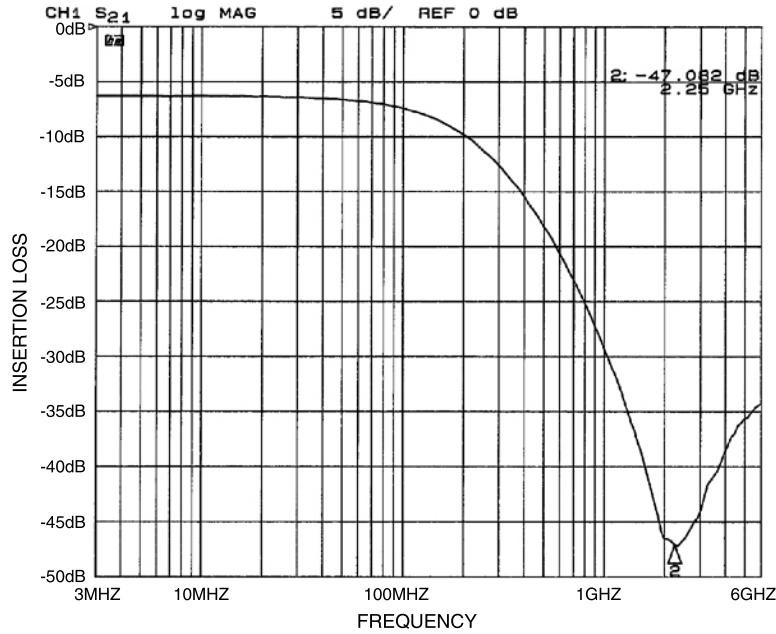


Figure 13. Insertion Loss vs. Frequency (FILTER7 Input to GND, CM1620-08DE)

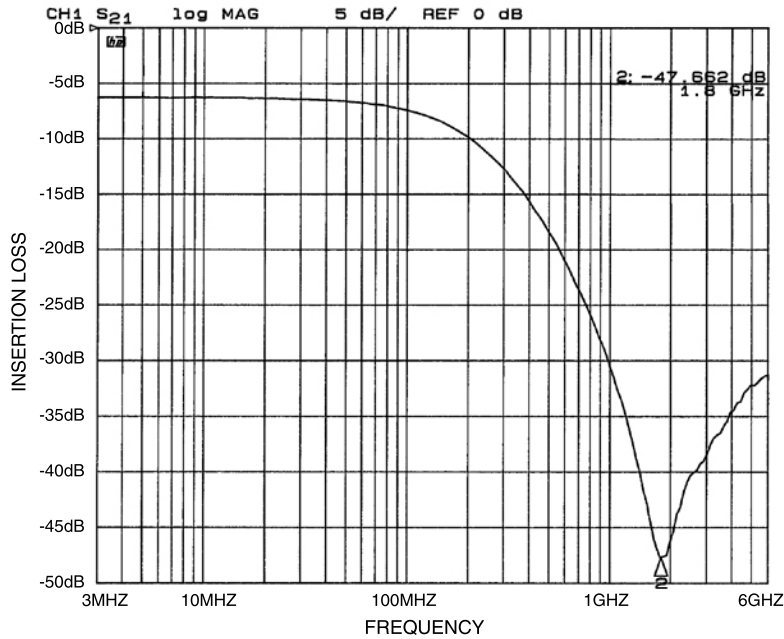
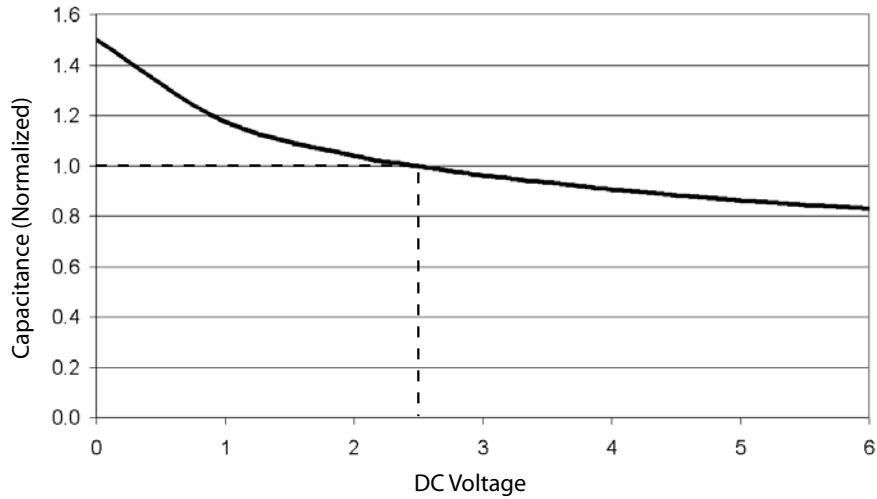


Figure 14. Insertion Loss vs. Frequency (FILTER8 Input to GND, CM1620-08DE)

## Performance Information (cont'd)

### Typical Diode Capacitance vs. Input Voltage



**Figure 15. Filter Capacitance vs. Input Voltage  
(Normalized to Capacitance at 2.5VDC and 25°C)**

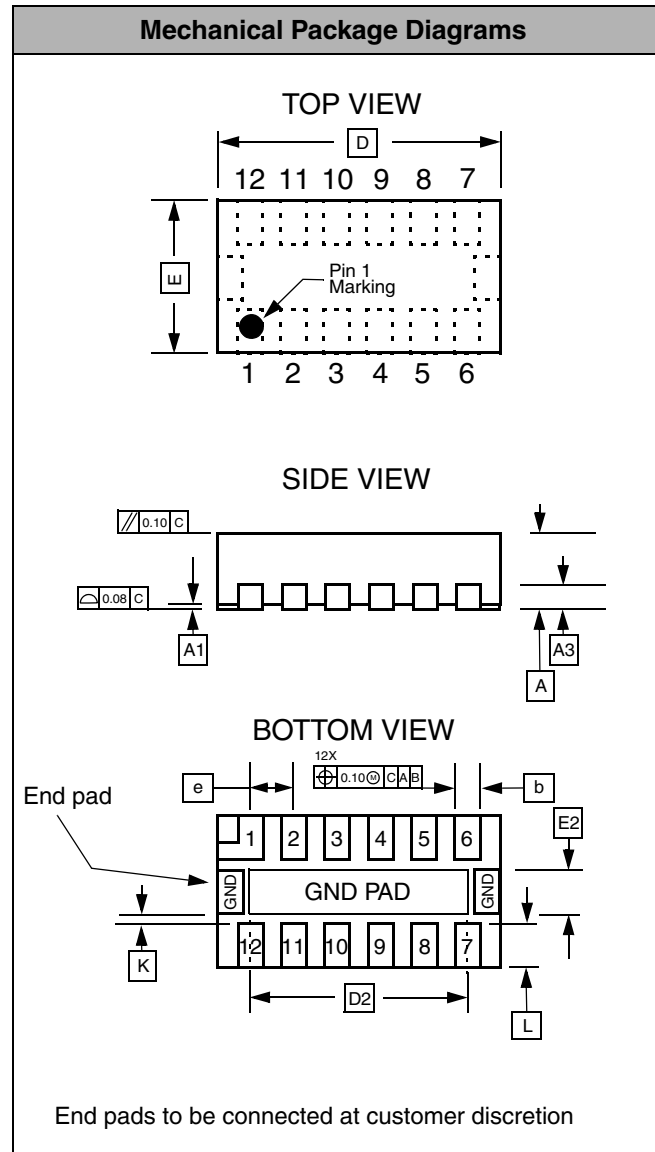
## Mechanical Details

### NuDFN-12 Mechanical Specifications

Dimensions for the 12-lead, 0.4mm pitch NuDFN package are presented below.

PACKAGE DIMENSIONS						
Package	NuDFN					
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	1.70	1.80	1.90	0.067	0.071	0.075
E	1.10	1.20	1.30	0.043	0.047	0.051
E2	0.20	0.30	0.40	0.008	0.012	0.016
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.20	0.25	0.30	0.008	0.010	0.012
# 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 12-Lead, 0.4mm pitch NuDFN package**

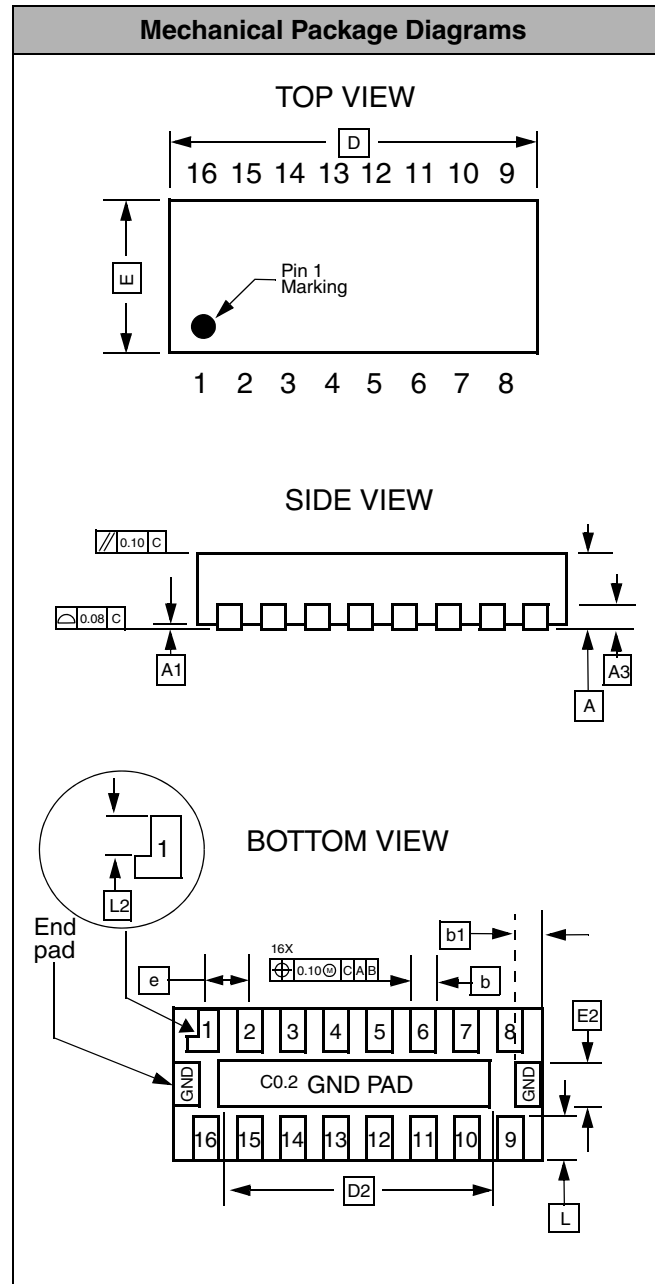
## Mechanical Details

### NuDFN-16 Mechanical Specifications, 0.4mm

Dimensions for the 16-lead, 0.4mm pitch NuDFN package are presented below.

PACKAGE DIMENSIONS						
Package	NuDFN					
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
b1	.20 BSC			0.008 BSC		
D	3.40	3.50	3.60	0.134	0.138	0.142
D2	2.70	2.80	2.90	0.106	0.110	0.114
E	1.10	1.20	1.30	0.043	0.047	0.051
E2	0.20	0.30	0.40	0.008	0.012	0.016
e	0.400 BSC			0.016 BSC		
L	0.20	0.25	0.30	0.008	0.010	0.012
L2	0.15 REF			0.006 REF		
# 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, and L dimensions as called out in the table above.



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