ON Semiconductor®

Praetorian ® C-L-C LCD and Camera EMI FilterArray with ESD Protection

CM1461

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 20dB attenuation (typical) at 1GHz
- TDFN lead-free package with 0.50mm lead pitch:
  - 4-ch. = 8-lead TDFN
  - 6-ch. = 12-lead TDFN
  - 8-ch. = 16-lead TDFN
- Tiny TDFN package size:
  - 8-lead: 2.00mm 2.00mm
  - 12-lead: 3.00mm x 1.35mm
  - 1 6-lead: 4.00mm x 1.60mm
- 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

Product Description

The CM1461 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 TDFN 0.50mm pitch packages. Each EMI filter channel of the CM1461 is implemented as a 3-pole L-C filter where the component values are 10pF-20nH-10pF. The CM1461's roll-off frequency at -6dB attenuation is 400MHz and can be used in applications where the data rates are as high as 140Mbps while providing greater than 30dB over the 800MHz to 2.7GHz 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.

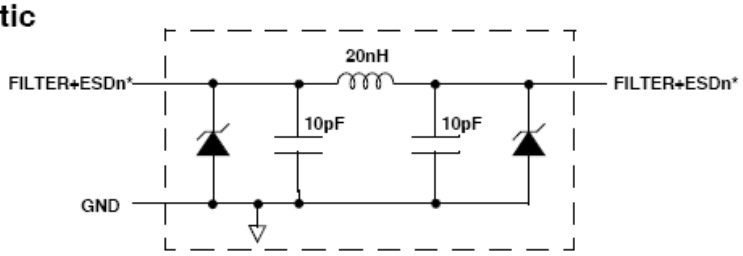
This device is particularly well suited for wireless handsets, mobile LCD modules and PDAs because of its small package format and easy-to-use pin assignments. In particular, the CM1461 is ideal for EMI filtering and protecting data and control lines for the LCD display and camera interface in mobile handsets.

The CM1461 is housed in space saving, low profile 8, 12 and 16-lead TDFN packages where the pitch is 0.50mm in a lead-free format.

February 2010 – Rev. 2

Publication Order Number:
CM1461/D

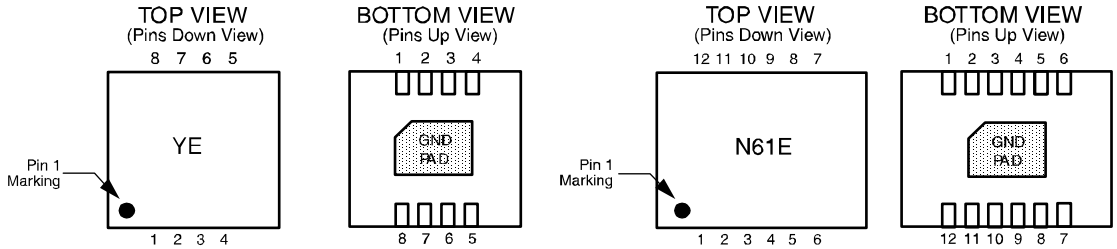
Electrical Schematic



* See Package/Pinout Diagram for expanded pin information.

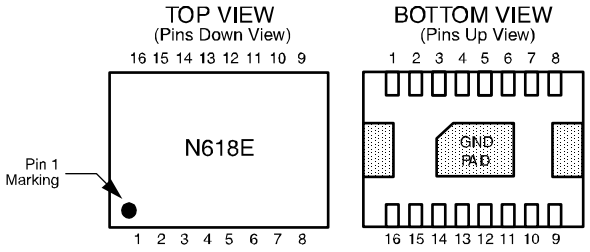
1 of 4, 6 or 8 EMI/RFI Filter Channels with Integrated ESD Protection

PACKAGE / PINOUT DIAGRAMS



CM1461-04DE
8 Lead TDFN Package

CM1461-06DE
12 Lead TDFN Package



CM1461-08DE
16 Lead TDFN Package (with Exposed End Pads)

Notes:
1) These drawings are not to scale.

PIN DESCRIPTIONS										
DEVICE PIN(s)			NAME	DESCRIPTION		DEVICE PIN(s)			NAME	DESCRIPTION
-04	-06	-08				-04	-06	-08		
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	Ordering Part Number[1]	Part Marking
8	TDFN-8	CM1461-04DE	YE
12	TDFN-12	CM1461-06DE	N61E
16	TDFN-16 EEP	CM1461-08DE	N618E

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	℃
Current per Inductor	30	mA
DC Package Power Rating	500	mW

STANDARD OPERATING CONDITIONS

PARAMETER	RATING	UNITS
Operating Temperature Range	–40 to +85	℃

ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
L	Channel Inductance			20		nH
C_{TOTAL}	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_{DIODE}	Standoff Voltage	I_{DIODE}=10μA		6.0		V
I_{LEAK}	Diode Leakage Current (reverse bias)	V_{DIODE}=+3.3V		0.1	1.0	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 -0.4	 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 and 3	 ±30 ±15			 kV kV
R_{DYN}	Dynamic Resistance Positive Negative			 2.3 0.9		 Ω Ω
f_R	Roll-off Frequency at -6dB Attenuation Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω			400		MHz

Note 1: T_A=25℃ 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.

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

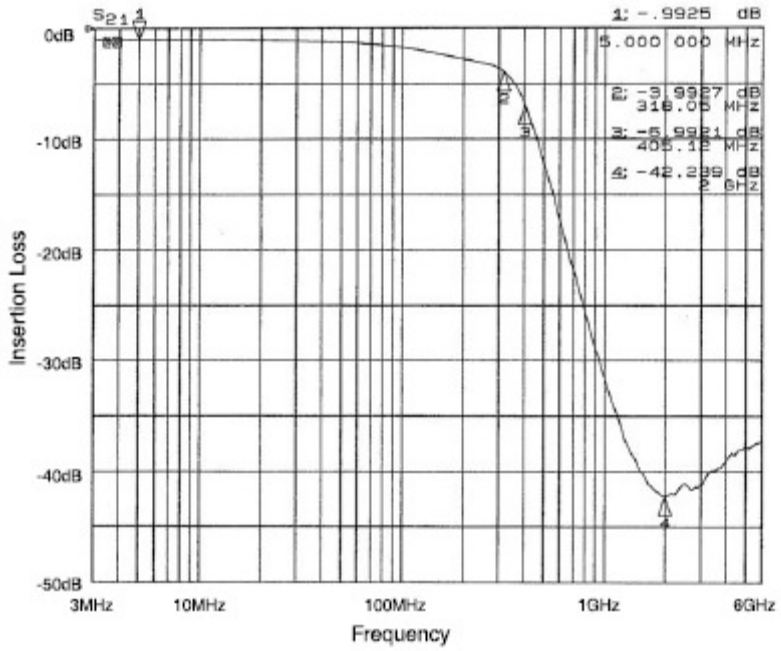


Figure 1. Filter 1 Insertion Loss (CM1461-04DE)

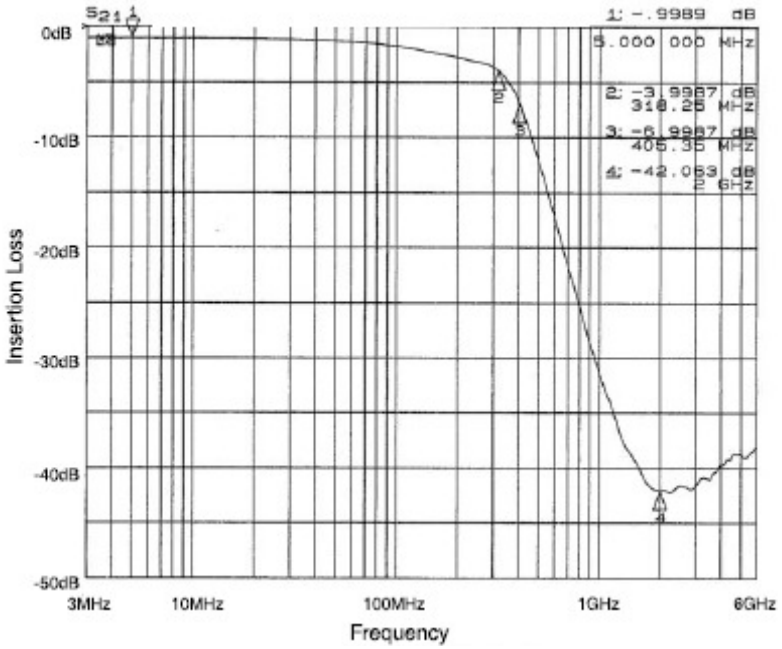


Figure 2. Filter 2 Insertion Loss (CM1461-04DE)

Performance Information (Cont'd)

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

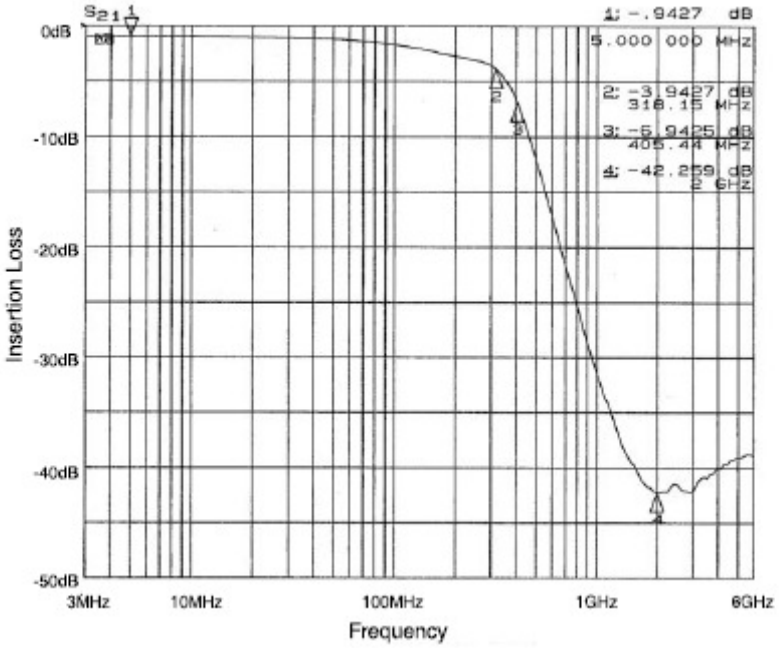


Figure 3. Filter 3 Insertion Loss (CM1461-04DE)

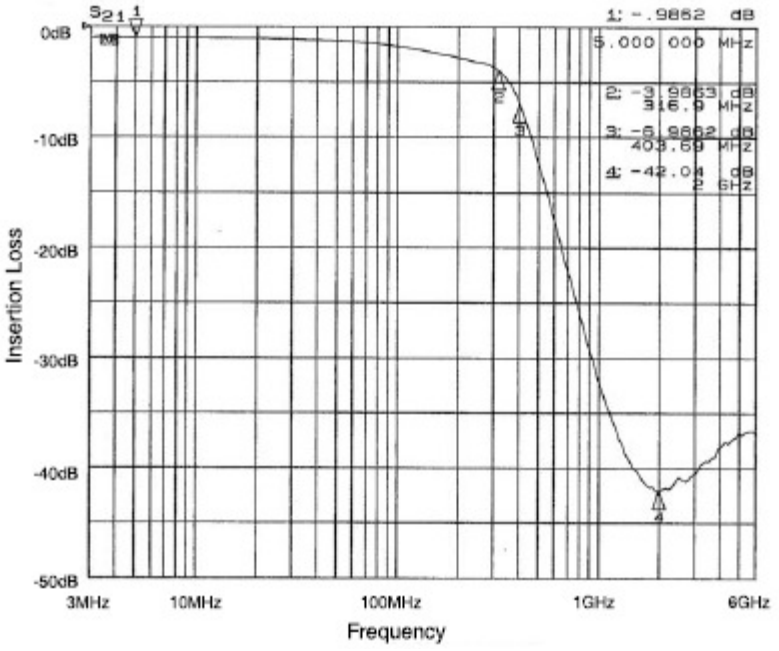


Figure 4. Filter 4 Insertion Loss (CM1461-04DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

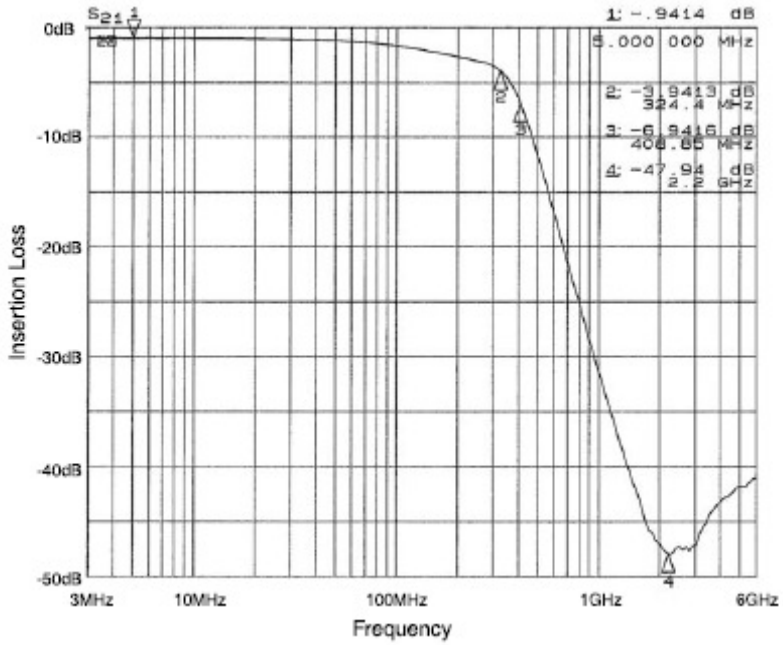


Figure 5. Filter 1 Insertion Loss (CM1461-06DE)

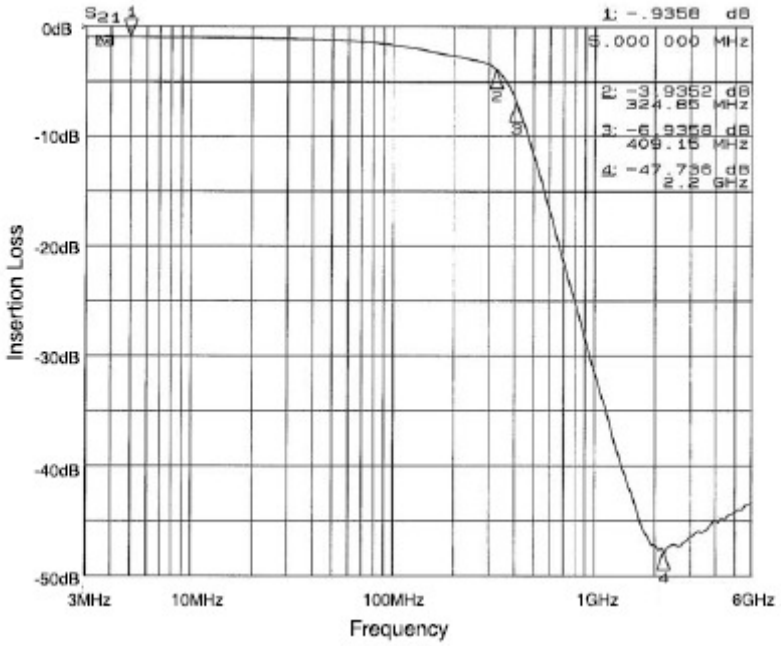


Figure 6. Filter 2 Insertion Loss (CM1461-06DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

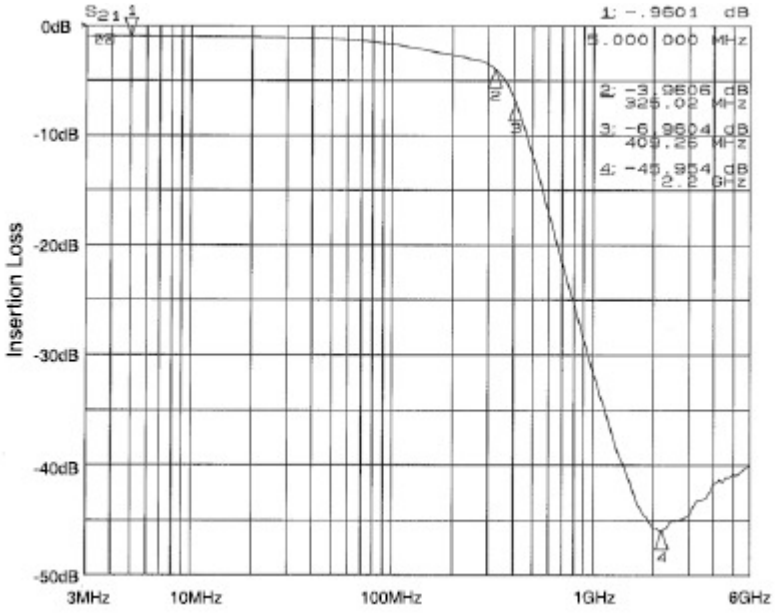


Figure 7. Filter 3 Insertion Loss (CM1461-06DE)

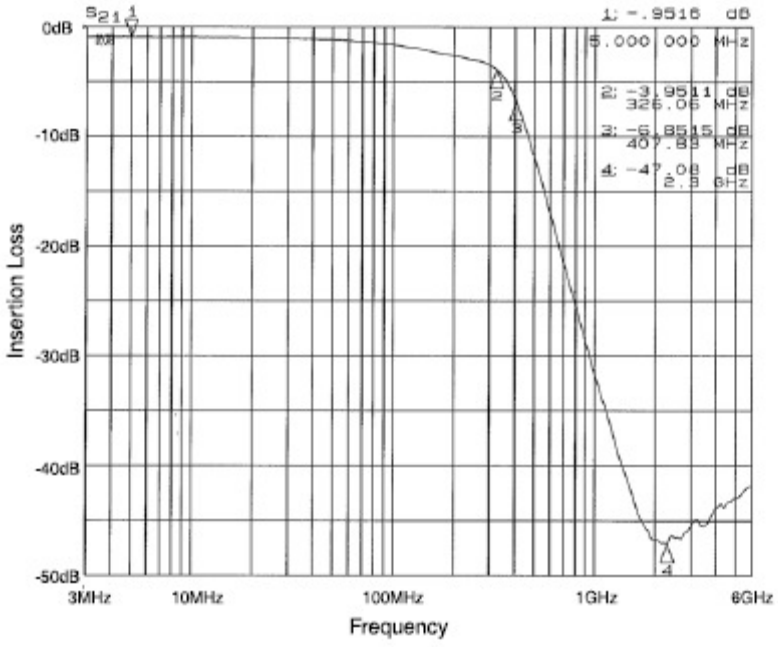


Figure 8. Filter 4 Insertion Loss (CM1461-06DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

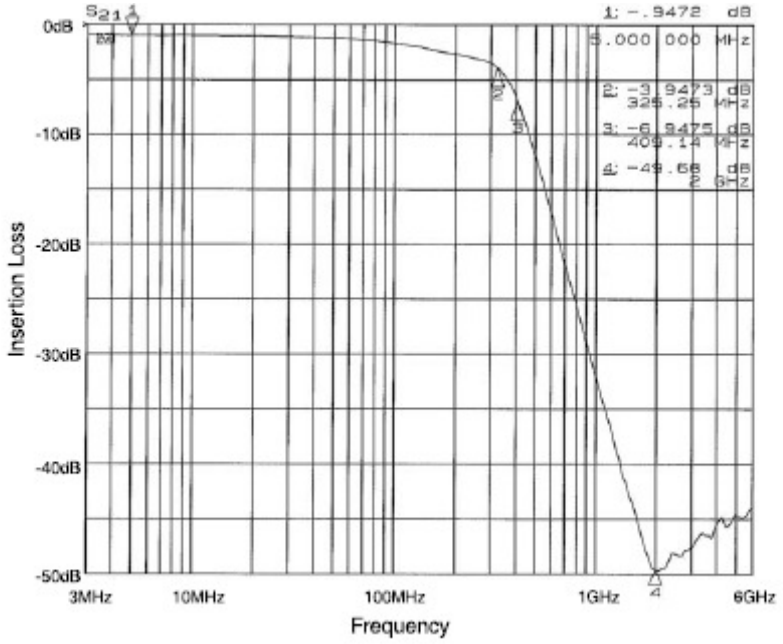


Figure 9. Filter 5 Insertion Loss (CM1461-06DE)

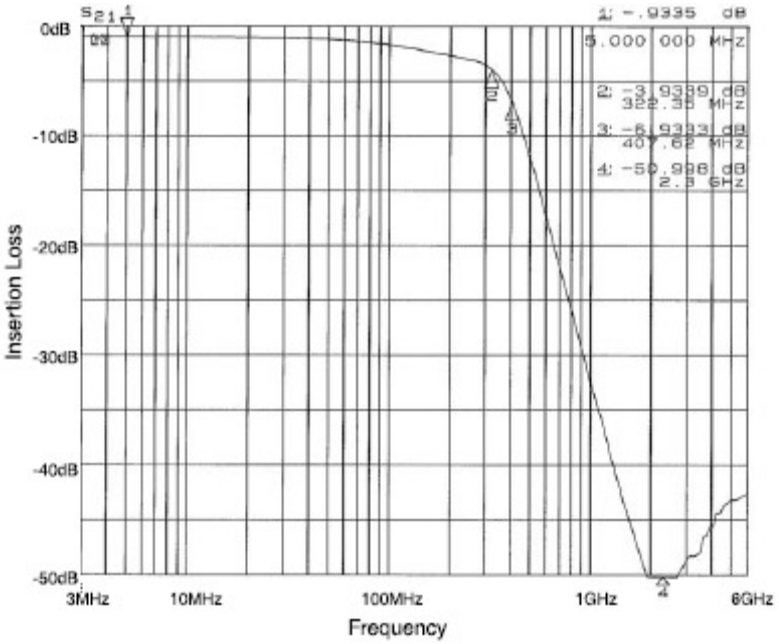


Figure 10. Filter 6 Insertion Loss (CM1461-06DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

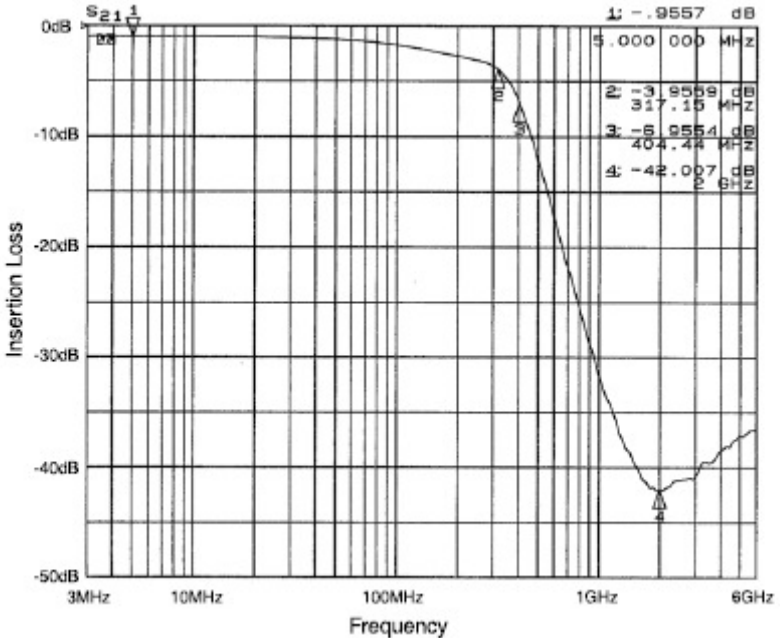


Figure 11. Filter 1 Insertion Loss (CM1461-08DE)

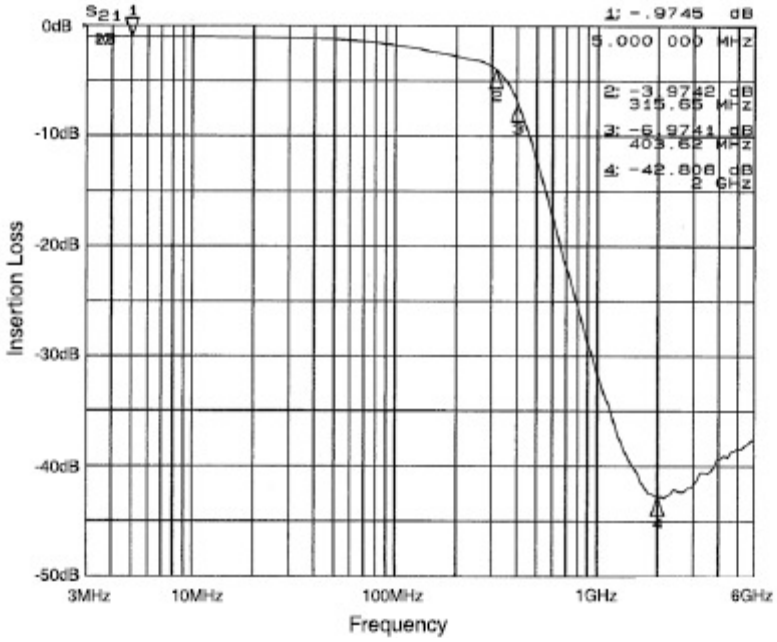


Figure 12. Filter 2 Insertion Loss (CM1461-08DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

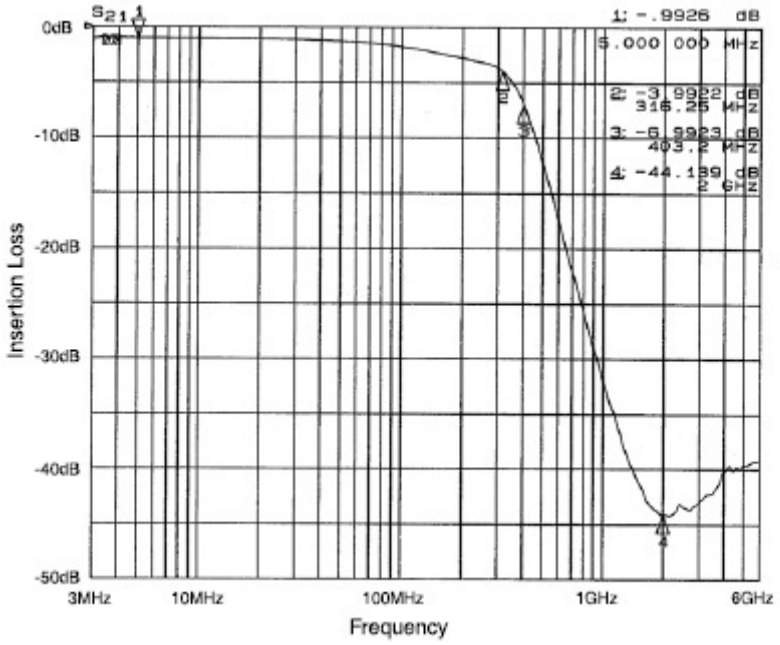


Figure 13. Filter 3 Insertion Loss (CM1461-08DE)

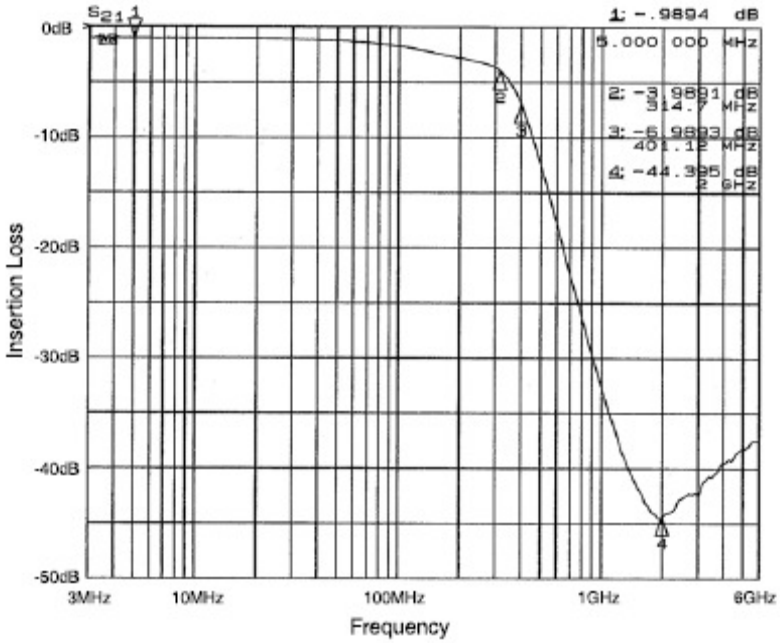


Figure 14. Filter 4 Insertion Loss (CM1461-08DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

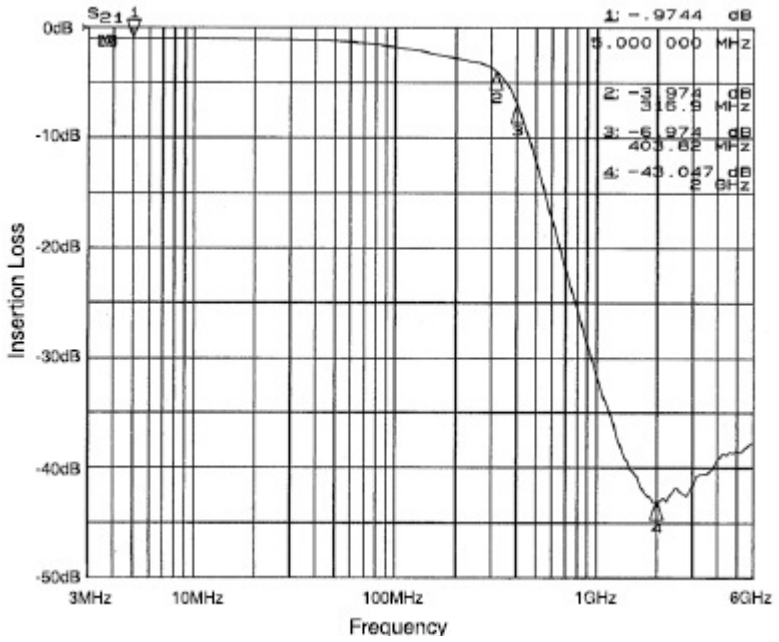


Figure 15. Filter 5 Insertion Loss (CM1461-08DE)

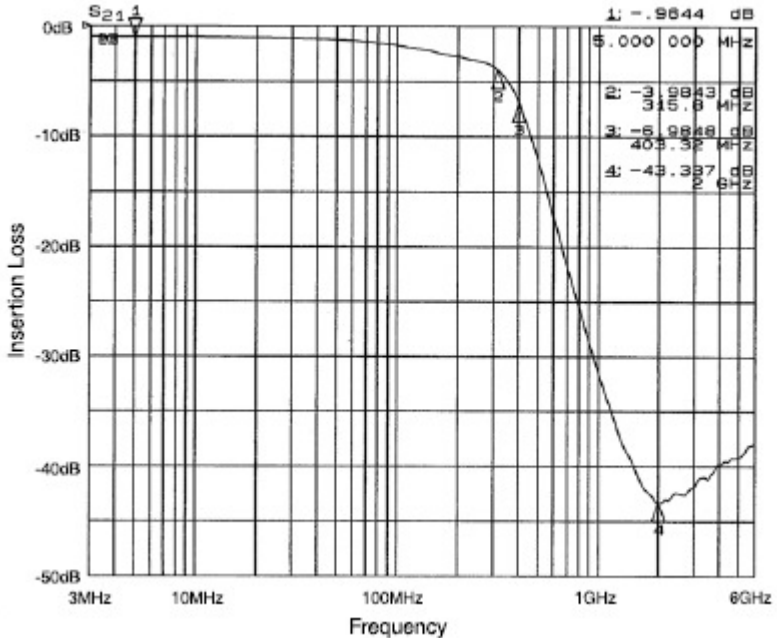


Figure 16. Filter 6 Insertion Loss (CM1461-08DE)

Performance Information

Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

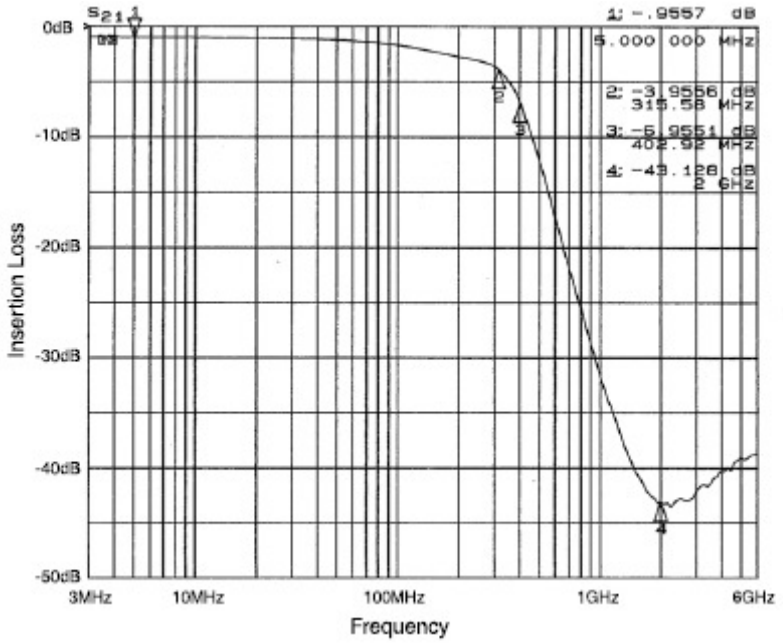


Figure 17. Filter 7 Insertion Loss (CM1461-08DE)

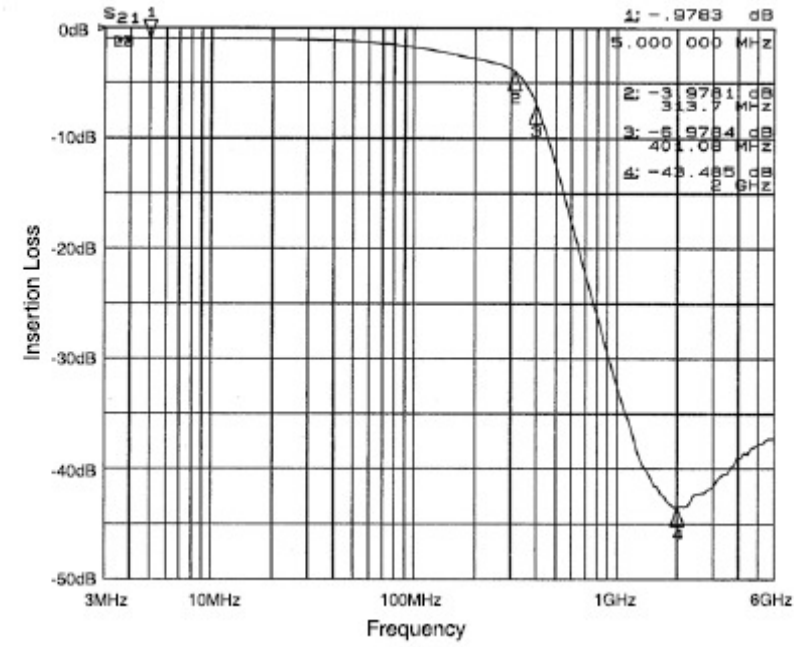


Figure 18. Filter 8 Insertion Loss (CM1461-08DE)

Typical Diode Capacitance vs. Input Voltage

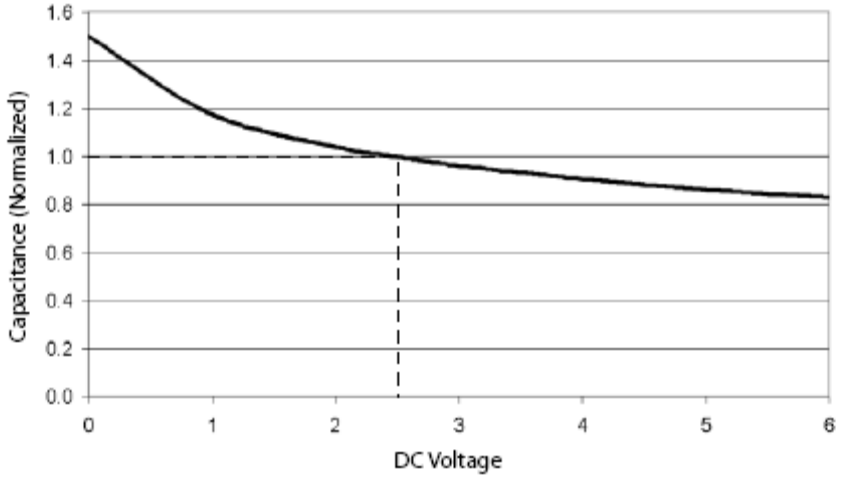


Figure 19. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5VDC and 25°C)

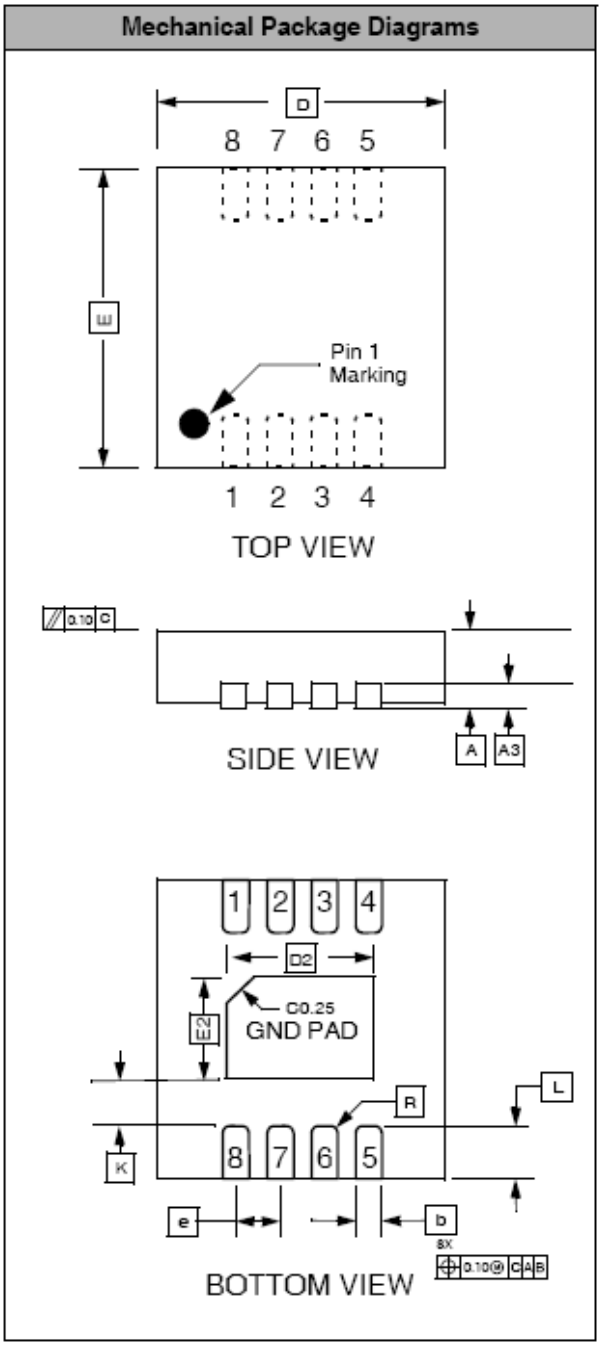
Mechanical Details

TDFN-08 Mechanical Specifications, 0.5mm

The CM1461-04DE is supplied in an 8-lead 0.5mm TDFN package. Dimensions are presented below.

PACKAGE DIMENSIONS						
Package	TDFN					
JEDEC No.	MO-229 (Var. VCCD-3)*					
Leads	8					
Dim.	**Millimeters**			**Inches**		
	Min	**Nom**	**Max**	**Min**	**Nom**	**Max**
A	0.70	0.75	0.80	0.028	0.030	0.031
A3	0.20 REF			0.008 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						

*This package is compliant with JEDEC standard MO-229, variation VCCD-3 with exception of the D2 and E2 dimensions as called out in the table above and the r1 dimension which is not specified in the MO-229 standard.



Dimensions for 8-Lead, 0.5mm pitch TDFN Package

Mechanical Details

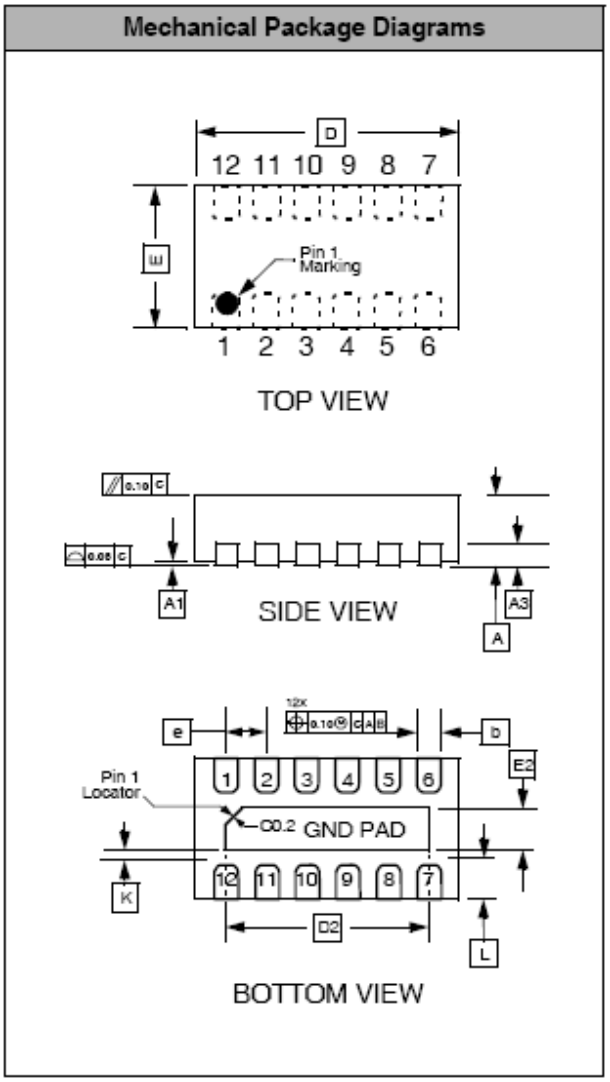
TDFN-12 Mechanical Specifications, 0.5mm

The CM1461-06DE is supplied in an 12-lead, 0.5mm pitch TDFN package. Dimensions are presented below.

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	0.20	0.25	0.30	0.008	0.010	0.012
D	2.90	3.00	3.10	0.114	0.118	0.122
D2	2.40	2.50	2.60	0.095	0.098	0.102
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	0.50 BSC			0.020 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.

Mechanical Package Diagrams



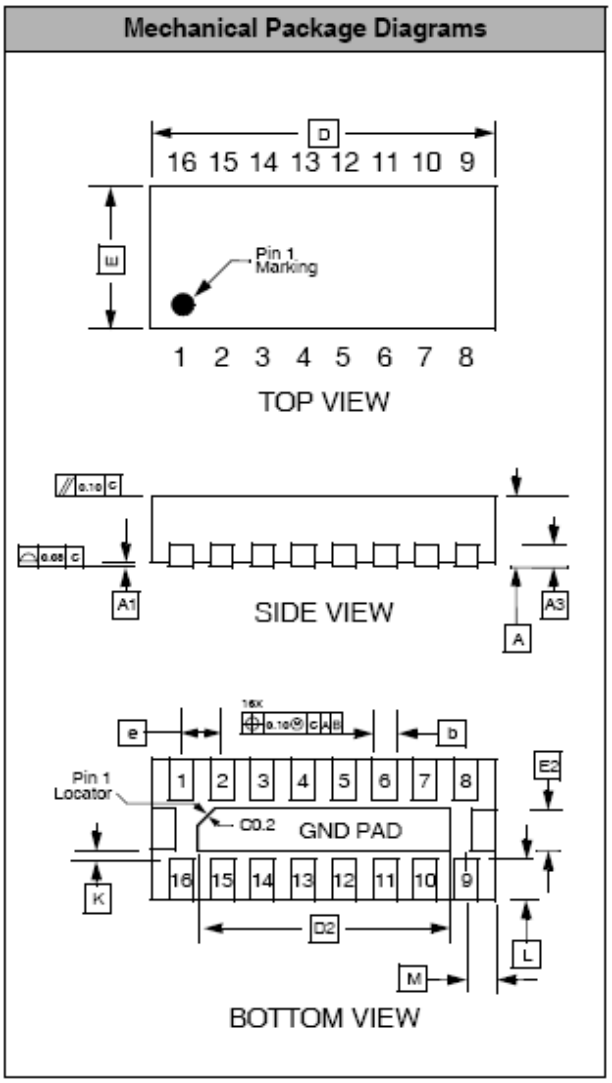
Dimensions for 12-Lead, 0.5mm pitch TDFN Package

Mechanical Details (Cont'd)

TDFN-16EEP Mechanical Specifications, 0.5mm

The CM1461-08DE is supplied in a 16-lead, 0.5mm pitch TDFN package with Exposed End Pads (EEP). Dimension are presented below.

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	0.20 REF			0.008 REF		
b	0.20	0.25	0.30	0.008	0.010	0.012
D	3.90	4.00	4.10	0.153	0.157	0.161
D2	3.10	3.20	3.30	0.122	0.126	0.130
E	1.50	1.60	1.70	0.059	0.063	0.067
E2	0.30	0.40	0.50	0.012	0.016	0.020
e	0.50 BSC			0.020 BSC		
K	0.20			0.008		
L	0.20	0.30	0.40	0.008	0.010	0.012
M	0.25 REF			0.010 REF		
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						



Dimensions for 16-Lead, 0.5mm pitch TDFN package with Exposed End Pads (EEP)

* 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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