ON Semiconductor®

LCD and Camera EMI Filter Array with ESD Protection

CM1631

Features

- Four, six and eight channels of EMI filtering with integrated ESD protection
- Pi-style EMI filters in a capacitor-resistor-capacitor (C-R-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 1 GHz
- uDFN package with 0.40mm lead pitch:
  - 4-ch. = 8-lead uDFN
  - 6-ch. = 12-lead uDFN
  - 8-ch. = 16-lead uDFN
- Tiny uDFN package size:
  - 8-lead: 1.70mm x 1.35mm x 0.50mm
  - 12-lead: 2.50mm x 1.35mm x 0.50mm
  - 16-lead: 3.30mm x 1.35mm x 0.50mm
- Increased robustness against vertical impacts during manufacturing process
- Lead-free finishing, RoHS compliant

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 CM1631 is a family of pi-style EMI filter arrays with ESD protection, which integrates four, six, or eight filters (C-R-C) in a small form factor, uDFN 0.40mm pitch package. The CM1631 has component values of 15pF-100W-15pF per channel with a cut-off frequency of 120MHz, and can be used in applications with data rates up to 48Mbps. The device includes ESD diodes on every pin, that provide a very high level of protection for sensitive electronic components against possible electrostatic discharge (ESD). The ESD protection diodes safely dissipate ESD strikes of ±15kV, which is well 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 greater than ±30kV.

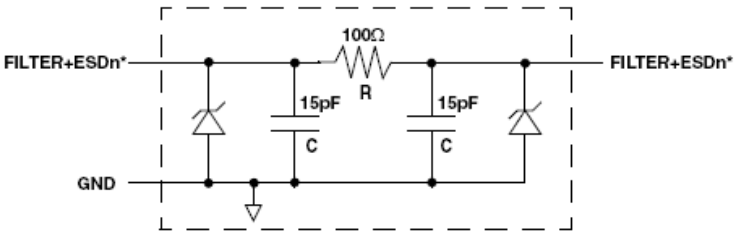
These devices are particularly well-suited for portable electronics (e.g. wireless handsets, PDAs, notebook computers) because of their small package and easy-to-use pin assignments. In particular, the CM1631 is ideal for EMI filtering and protecting data and control lines for the I/O data ports, LCD display and camera interface in mobile handsets.

The CM1631 is housed in space-saving, ultra-low-profile 8-, 12- and 16-lead uDFN packages with a 0.40mm pitch and is available with lead-free finishing. This smaller size uDFN package provides up to 42% board space saving vs. the 0.50mm pitch uDFN packages.

May 2010 – Rev. 0

Publication Order Number:
CM1631/D

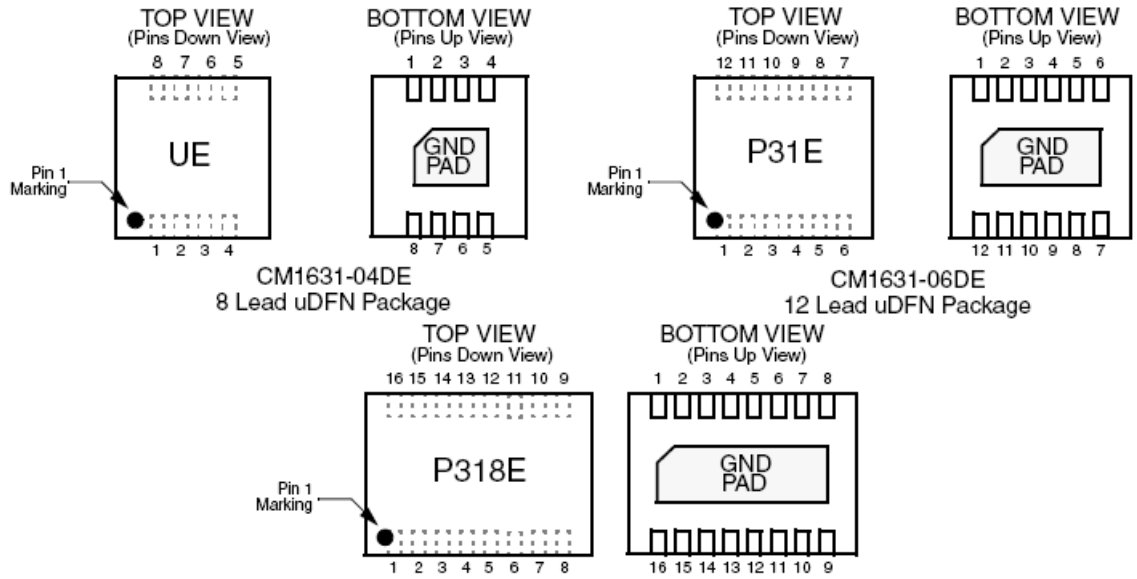
Electrical Schematic



* See Package/Pinout Diagram for expanded pin information.

1 of 4, 6 or 8 EMI/RFI + ESD Channels

PACKAGE / PINOUT DIAGRAMS



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	Lead-free Finish	
		Ordering Part Number[1]	Part Marking
8	uDFN-8	CM1631-04DE	UE
12	uDFN-12	CM1631-06DE	P31E
16	uDFN-16	CM1631-08DE	P318E

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 (SEE NOTE1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
R	Resistance		80	100	120	Ω
C_{TOTAL}	Total Channel Capacitance	At 2.5VDC Reverse Bias, 1MHz, 30mVAC	24	30	36	pF
C	Capacitance C	At 2.5VDC Reverse Bias, 1MHz, 30mVAC	12	15	18	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 -0.4	 6.8 -0.8		 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	Note 2	 ±30 ±15			 kV kV
R_{DYN}	Dynamic Resistance Positive Negative			 2.3 0.9		 Ω Ω
f_C	Cut-off Frequency Z_{SOURCE}=50Ω, Z_{LOAD}=50Ω	Channel R = 100Ω, Channel C = 15pF		110		MHz
A_{1GHz}	Absolute Attenuation @ 1GHz from 0dB Level	Z_{SOURCE} = 50Ω, Z_{LOAD} = 50Ω, DC Bias = 0V; Notes 1 and 3		35		dB
$A_{800MHz - 6GHz}$	Absolute Attenuation @ 800MHz to 6GHz from 0dB Level	Z_{SOURCE} = 50Ω, Z_{LOAD} = 50Ω, DC Bias = 0V; Notes 1 and 3		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: Attenuation / RF curves characterized by a network analyzer using microprobes.

Performance Information

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

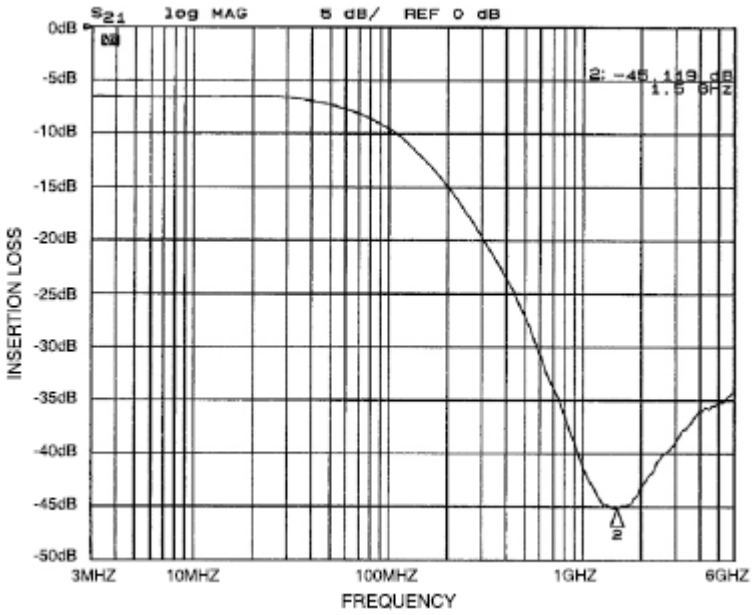


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1631-04DE)

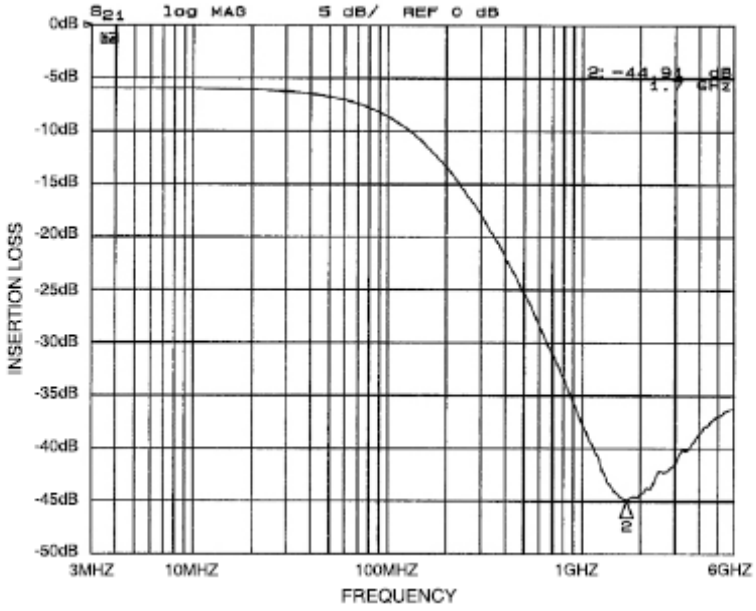


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1631-04DE)

Performance Information (cont'd)

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

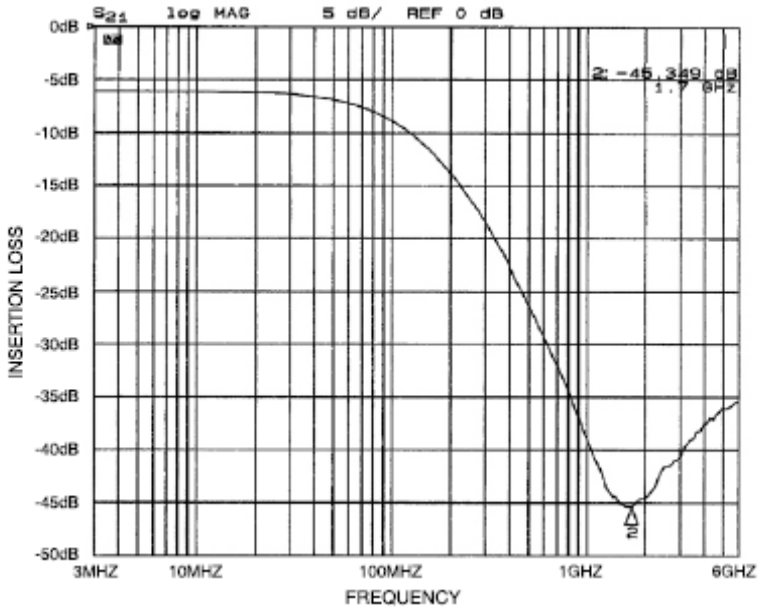


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1631-04DE)

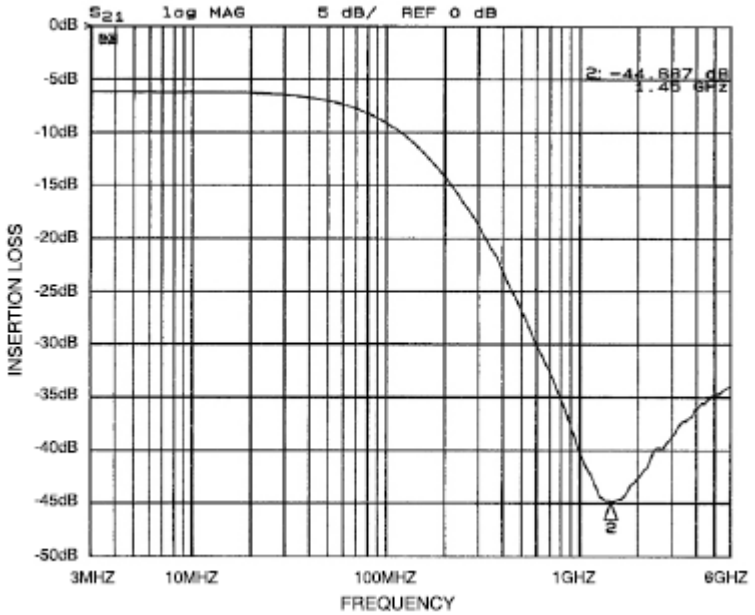


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1631-04DE)

Performance Information (cont'd)

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

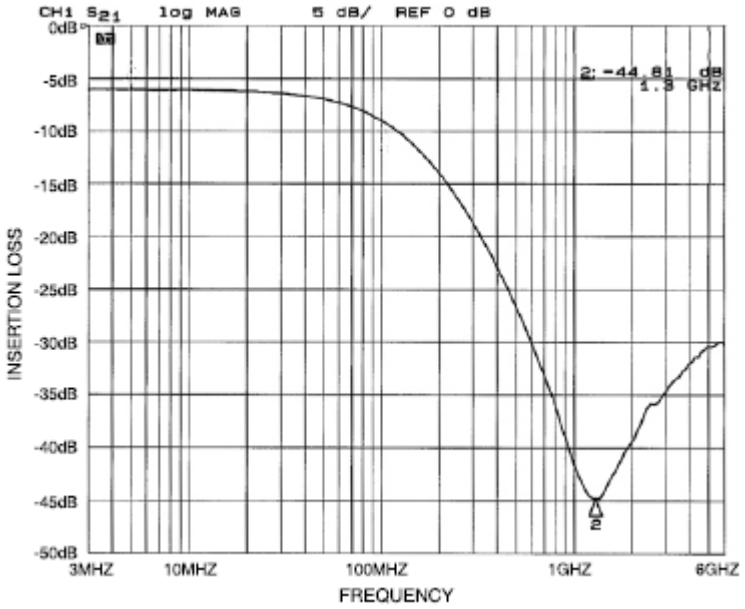


Figure 5. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1631-06DE)

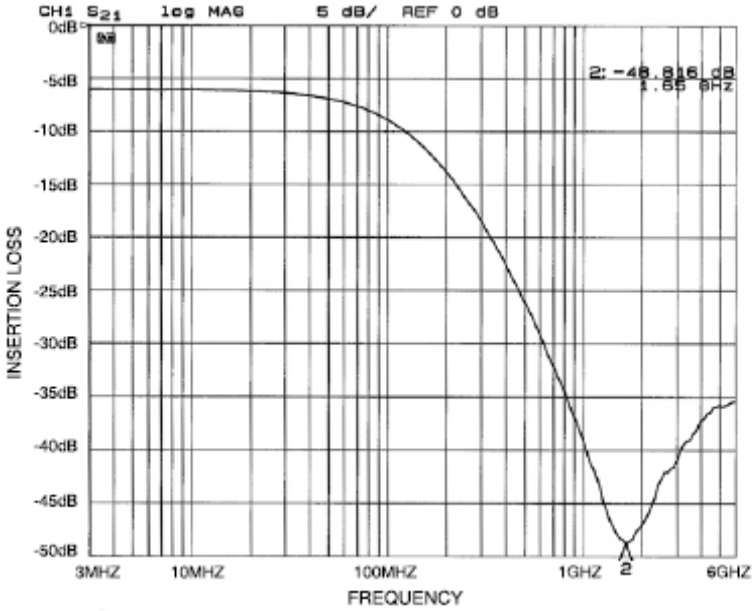


Figure 6. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1631-06DE)

Performance Information (cont'd)

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

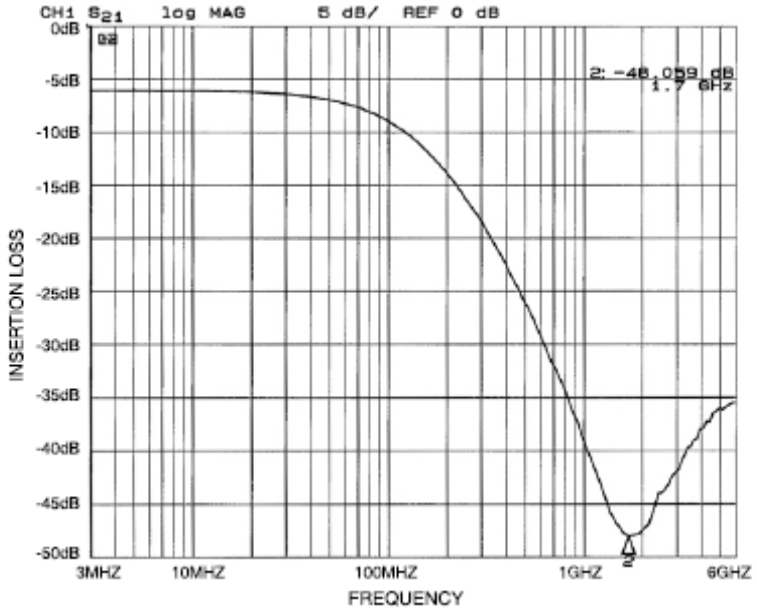


Figure 7. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1631-06DE)

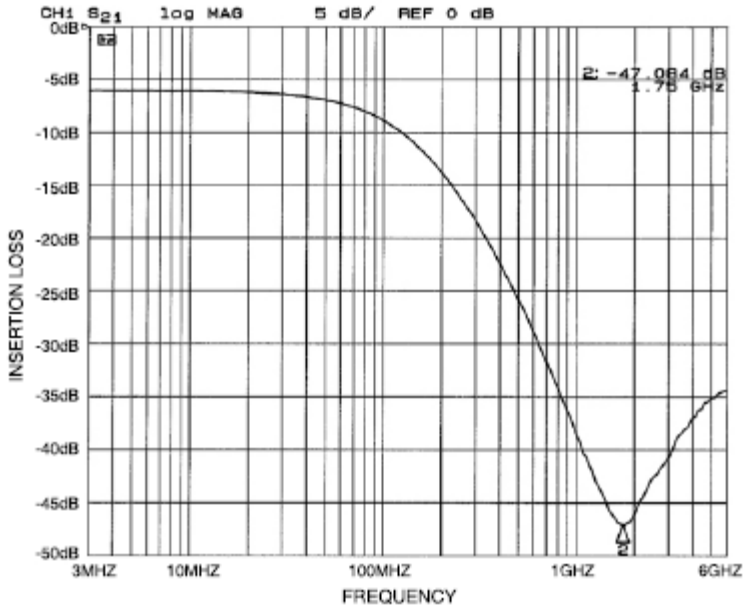


Figure 8. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1631-06DE)

Performance Information (cont'd)

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

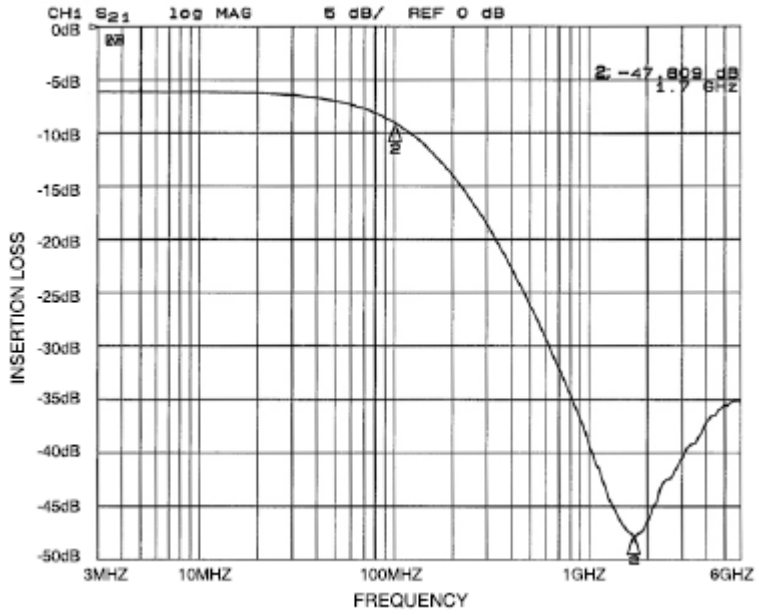


Figure 9. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1631-06DE)

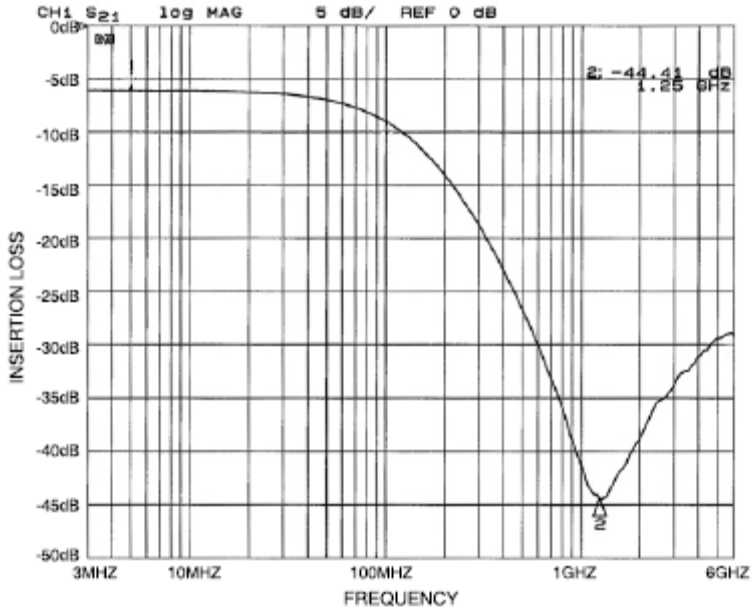


Figure 10. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1631-06DE)

Performance Information (cont'd)

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

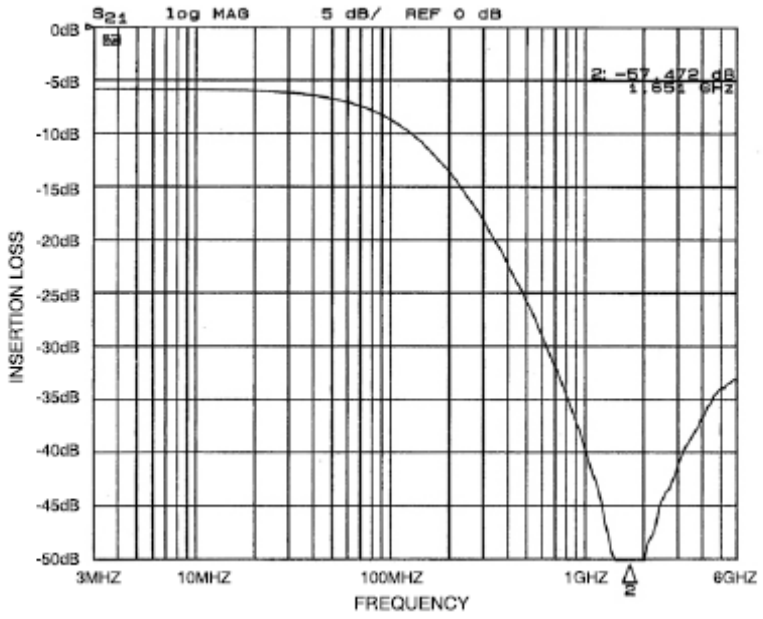


Figure 11. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1631-08DE)

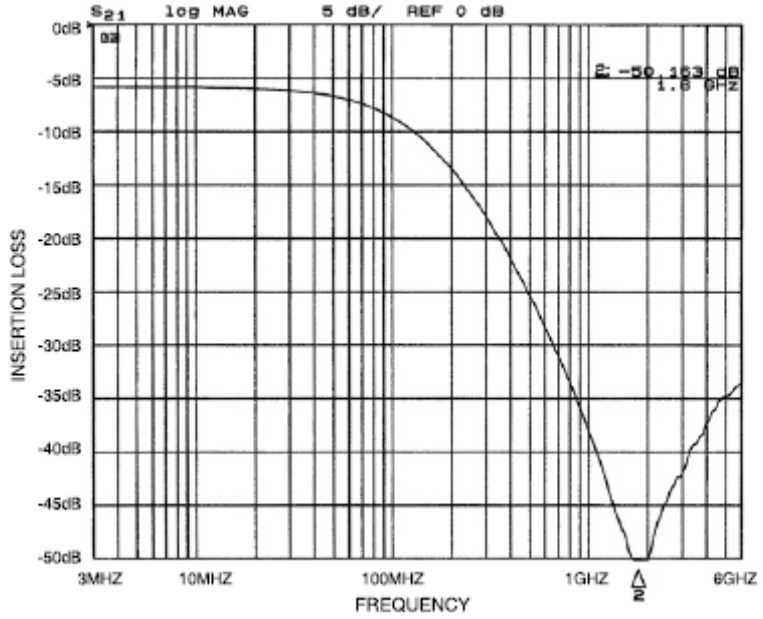


Figure 12. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1631-08DE)

Performance Information (cont'd)

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

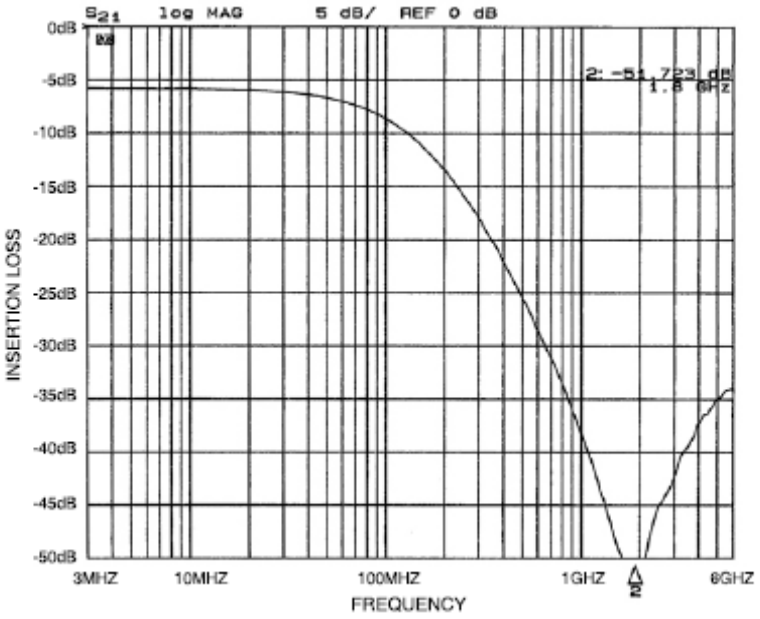


Figure 13. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1631-08DE)

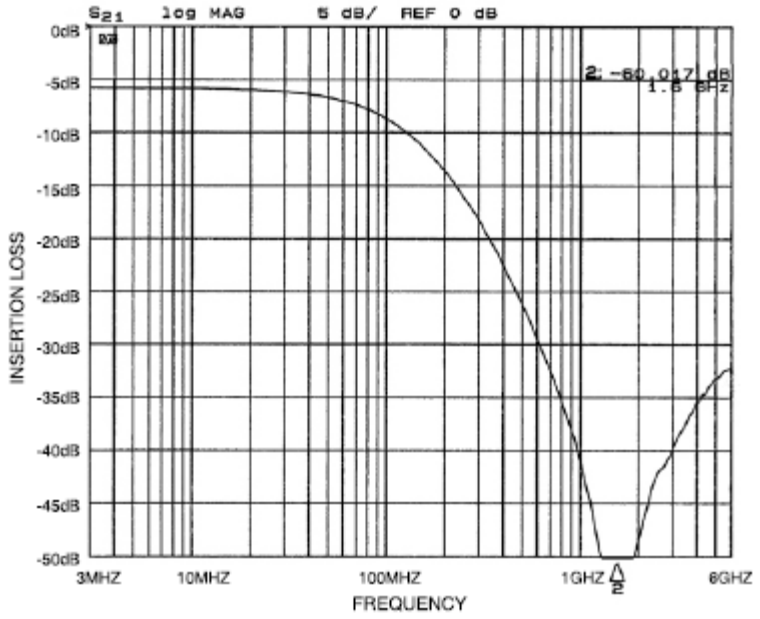


Figure 14. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1631-08DE)

Performance Information (cont'd)

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

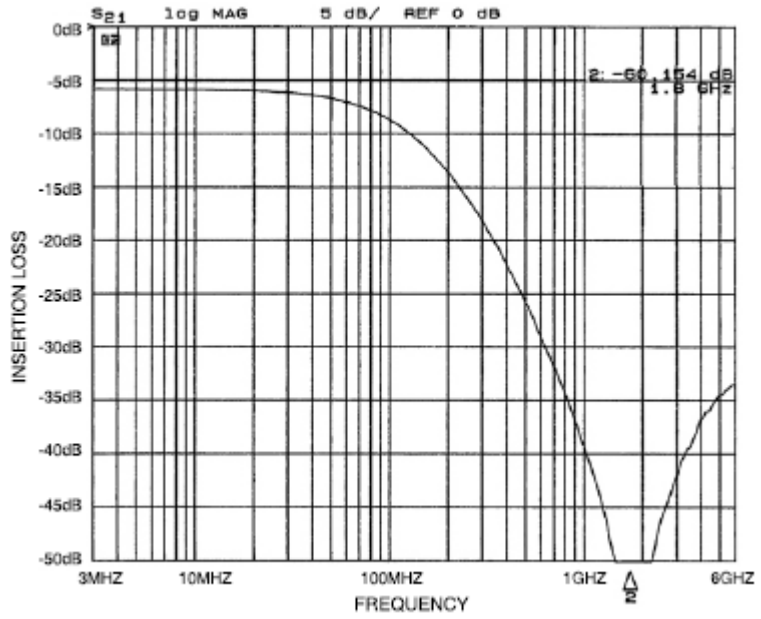


Figure 15. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1631-08DE)

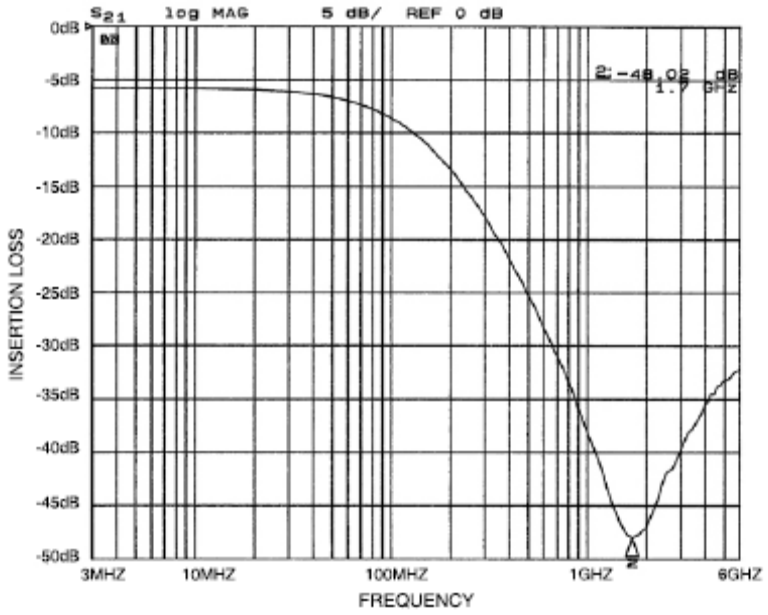


Figure 16. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1631-08DE)

Performance Information (cont'd)

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

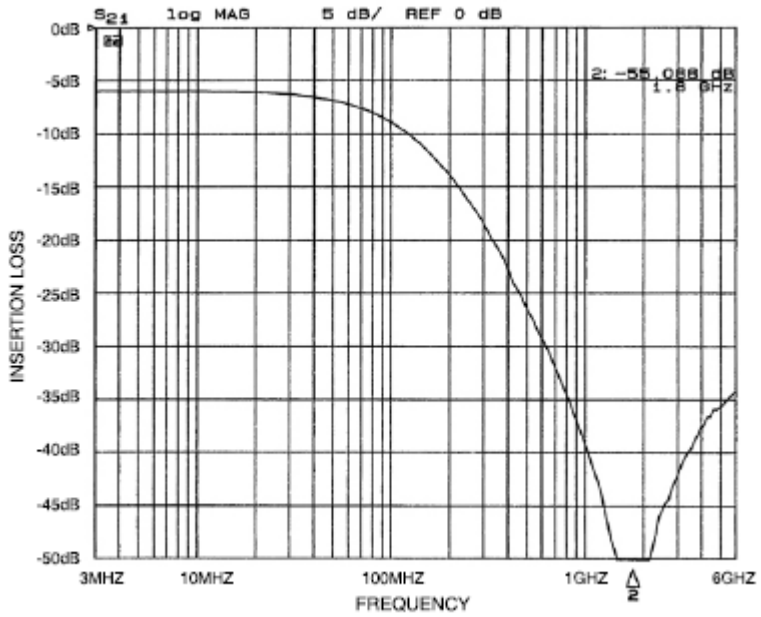


Figure 17. Insertion Loss vs. Frequency (FILTER7 Input to GND, CM1631-08DE)

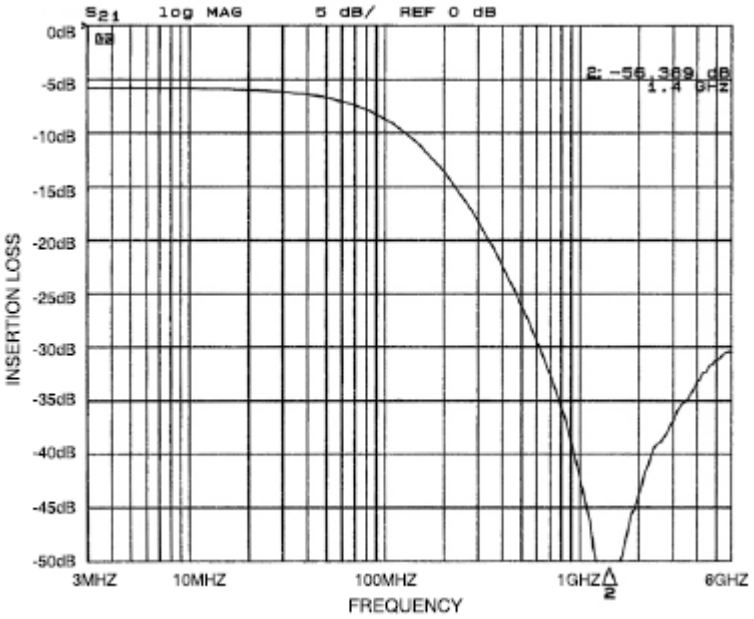


Figure 18. Insertion Loss vs. Frequency (FILTER8 Input to GND, CM1631-08DE)

Performance Information (cont'd)

Typical Diode Capacitance vs. Input Voltage

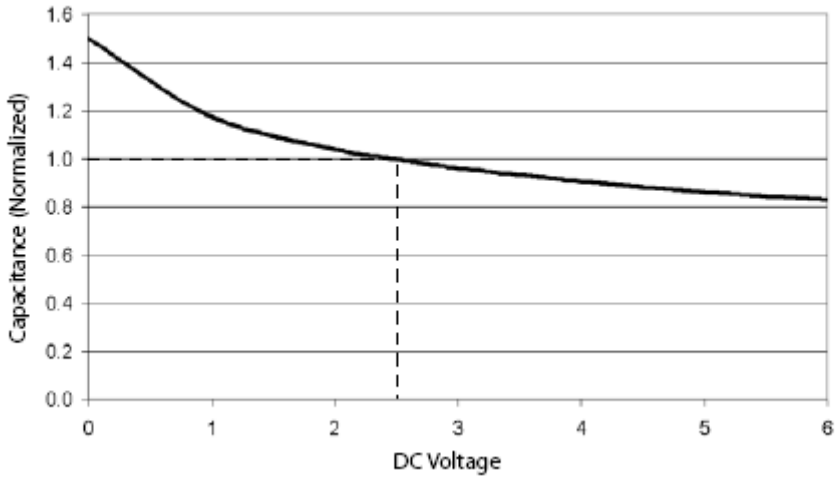


Figure 19. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5VDC and 25°C)

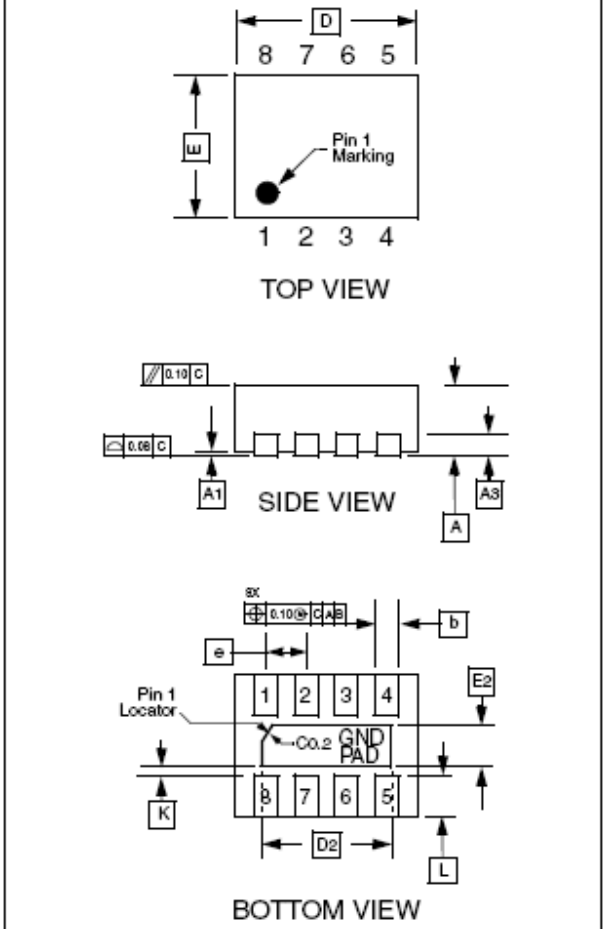
Mechanical Details

uDFN-08 Mechanical Specifications

Dimensions for the CM1631-04DE supplied in a 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	0.22 REF			0.009 REF		
L	0.15	0.25	0.35	0.006	0.010	0.014
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

Mechanical Package Diagrams

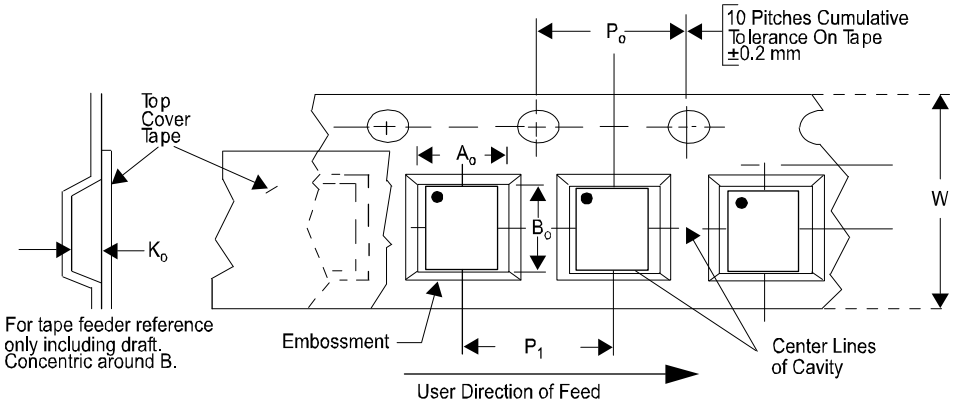


Dimensions for 8-Lead, 0.4mm pitch uDFN package

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.

Tape and Reel Specifications

PART NUMBER	PACKAGE SIZE (mm)	POCKET SIZE (mm) B_0 X A_0 X K_0	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P_0	P_1
CM1631-04DE	1.70 X 1.35 X 0.50	1.95 X 1.60 X 0.60	8mm	178mm (7")	3000	4mm	4mm

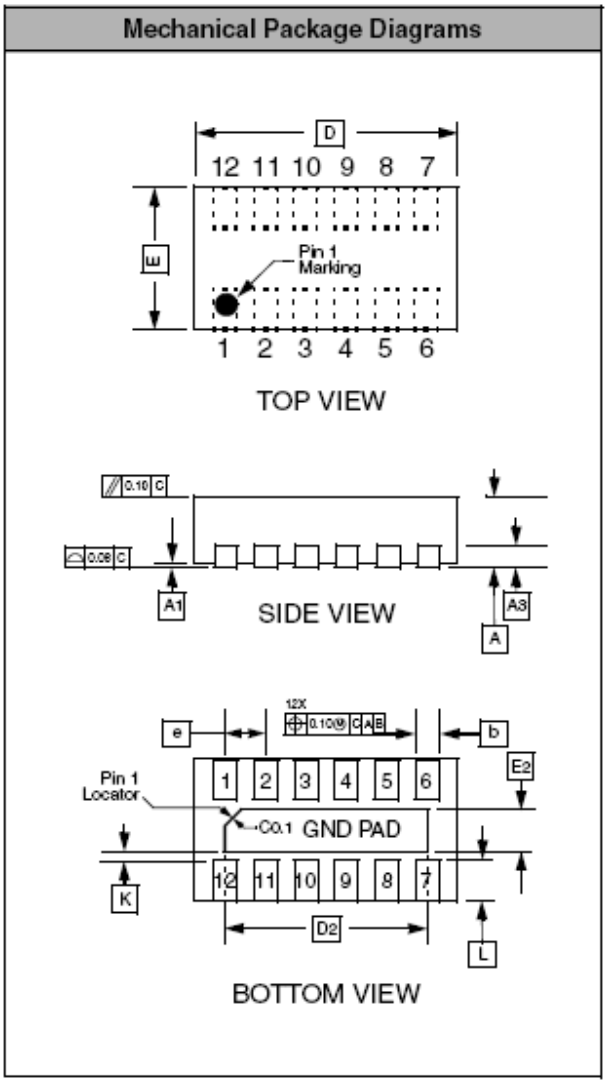


Mechanical Details (cont'd)

uDFN-12 Mechanical Specifications

Dimensions for the CM1631-06DE 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	0.22 REF			0.009 REF		
L	0.15	0.25	0.35	0.006	0.010	0.014
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

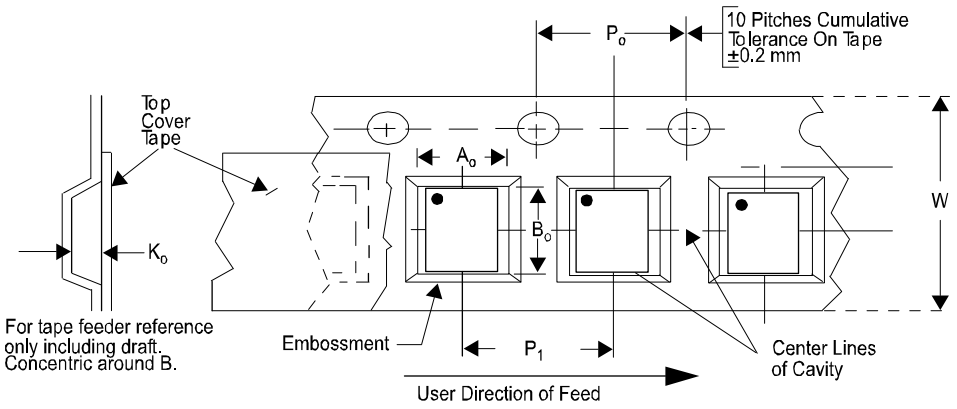


Dimensions for 12-Lead, 0.4mm pitch uDFN Package

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.

Tape and Reel Specifications

PART NUMBER	PACKAGE SIZE (mm)	POCKET SIZE (mm) B_0 X A_0 X K_0	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P_0	P_1
CM1631-06DE	2.50 X 1.35 X 0.50	2.75 X 1.60 X 0.70	8mm	178mm (7")	3000	4mm	4mm

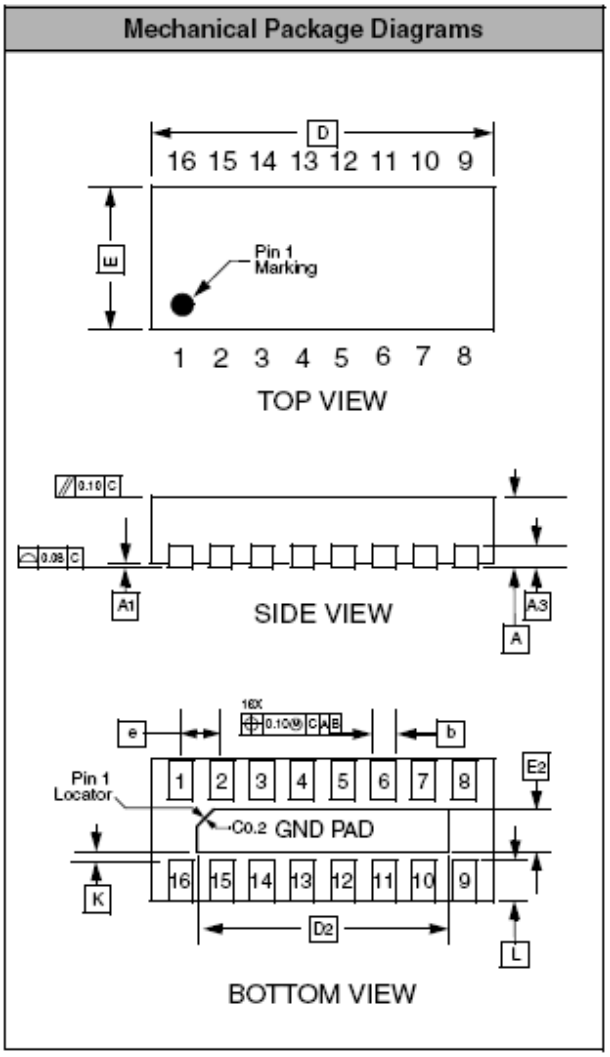


Mechanical Details (cont'd)

uDFN-16 Mechanical Specifications

Dimensions for the CM1631 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	0.22 REF			0.009 REF		
L	0.15	0.25	0.35	0.006	0.010	0.014
# per tape and reel	3000 pieces					
Controlling dimension: millimeters						

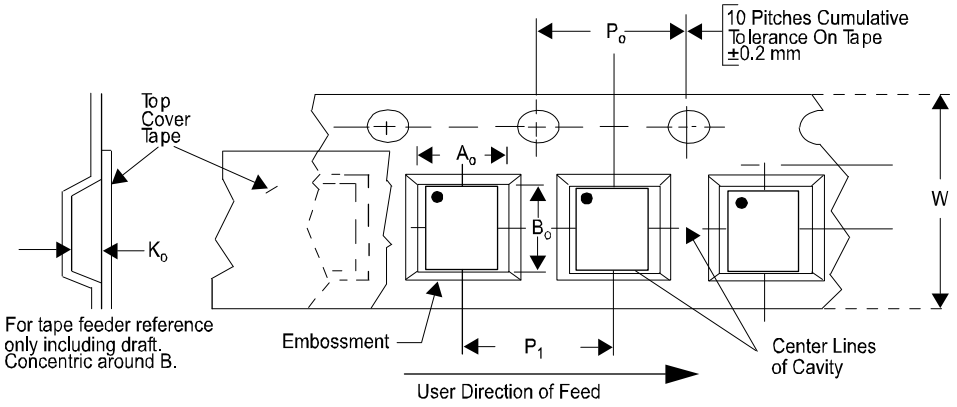


Dimensions for 16-Lead, 0.4mm pitch uDFN package

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.

Tape and Reel Specifications

PART NUMBER	PACKAGE SIZE (mm)	POCKET SIZE (mm) B_0 X A_0 X K_0	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P_0	P_1
CM1631-08DE	3.30 X 1.35 X 0.50	3.50 X 1.55X 0.70	8mm	178mm (7")	3000	4mm	4mm



PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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