CM1631

LCD and Camera EMI Filter Array with ESD Protection

ON Semiconductor®

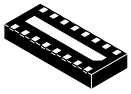
http://onsemi.com



UDFN8
DE SUFFIX
CASE 517BC



UDFN12
DE SUFFIX
CASE 517BD



UDFN16
DE SUFFIX
CASE 517BE

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 0.40 mm pitch package. The CM1631 has component values of 15 pF − 100 Ω − 15 pF per channel with a cut−off frequency of 120 MHz, and can be used in applications with data rates up to 48 Mbps. 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 ±15 kV, 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 ±30 kV.

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 0.40 mm pitch and is available with lead−free finishing. This smaller size UDFN package provides up to 42% board space saving vs. the 0.50 mm pitch UDFN packages.

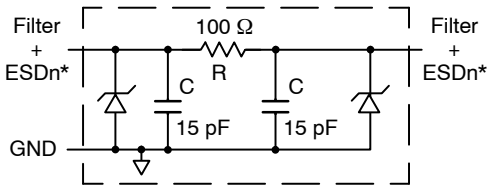
Features

- 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
- ±15 kV ESD Protection on Each Channel (IEC 61000−4−2 Level 4, Contact Discharge)
- ±30 kV ESD Protection on Each Channel (HBM)
- Greater than 35 dB Attenuation (Typical) at 1 GHz
- UDFN Package with 0.40 mm Lead Pitch:
  - 4−ch. = 8−lead UDFN
  - 6−ch. = 12−lead UDFN
  - 8−ch. = 16−lead UDFN
- Tiny UDFN Package Size:
  - 8−lead: 1.70 mm x 1.35 x 0.50 mm
  - 12−lead: 2.50 mm x 1.35 x 0.50 mm
  - 16−lead: 3.30 mm x 1.35 x 0.50 mm
- Increased Robustness against Vertical Impacts During Manufacturing Process
- These Devices are Pb−Free and are RoHS Compliant

Applications

- LCD and Camera Data Lines in Mobile Handsets
- EMI Filtering for Data Ports in Cell Phones, PDAs or Notebook Computers
- LCD and Camera Modules
- I/O Port Protection for Mobile Handsets, Notebook Computers, PDAs, etc.
- Handheld PCs/PDAs
- Wireless Handsets

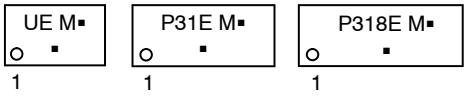
ELECTRICAL SCHEMATIC



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

* See Package/Pinout Diagrams for expanded pin information.

MARKING DIAGRAM



UE = CM1631−04DE
P31E = CM1631−06DE
P318E = CM1631−08DE
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
CM1631−04DE	UDFN−8 (Pb−Free)	3000/Tape & Reel
CM1631−06DE	UDFN−12 (Pb−Free)	3000/Tape & Reel
CM1631−08DE	UDFN−16 (Pb−Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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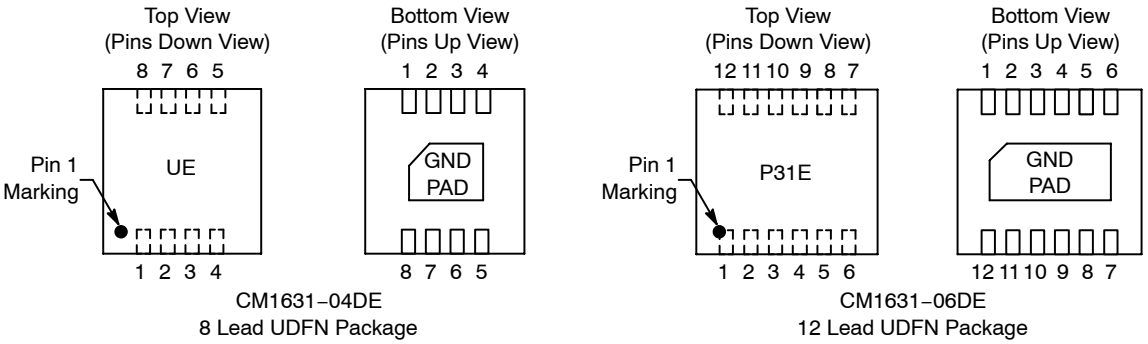
PACKAGE / PINOUT DIAGRAMS



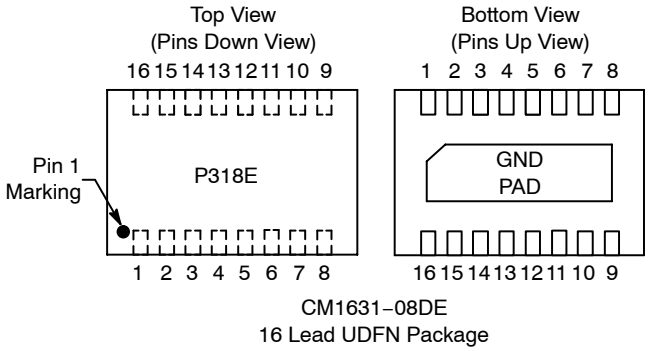


Table 1. PIN DESCRIPTIONS

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	–	–	–	–	

SPECIFICATIONS

Table 2. 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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 3. STANDARD OPERATING CONDITIONS

Parameter	Rating	Units
Operating Temperature Range	−40 to +85	°C

Table 4. ELECTRICAL OPERATING CHARACTERISTICS (Note 1)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
R	Resistance		80	100	120	Ω
C_{TOTAL}	Total Channel Capacitance	At 2.5 V DC Reverse Bias, 1 MHz, 30 mV AC	24	30	36	pF
C	Capacitance C	At 2.5 V DC Reverse Bias, 1 MHz, 30 mV AC	12	15	18	pF
V_{DIODE}	Stand−off Voltage	I_{DIODE} = 10 μA		6.0		V
I_{LEAK}	Diode Leakage Current (Reverse Bias)	V_{DIODE} = 3.3 V		0.1	1.0	μA
V_{SIG}	Signal Clamp Voltage Positive Clamp Negative Clamp	 I_{LOAD} = 10 mA I_{LOAD} = −10 mA	 5.6 −0.4	 6.8 −0.8		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
R_{DYN}	Dynamic Resistance Positive Negative			 2.3 0.9		Ω
f_C	Cut−off Frequency Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω	Channel R = 100 Ω, Channel C = 15 pF		 110		MHz
A_{1GHz}	Absolute Attenuation @ 1 GHz from 0 dB Level	Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω, DC Bias = 0 V (Notes 1 and 3)		35		dB
$A_{800MHz - 6GHz}$	Absolute Attenuation @ 800 MHz to 6 GHz from 0 dB Level	Z_{SOURCE} = 50 Ω, Z_{LOAD} = 50 Ω, DC Bias = 0 V (Notes 1 and 3)		30		dB

1. T_A = 25°C unless otherwise specified.
2. ESD applied to input and output pins with respect to GND, one at a time.
3. Attenuation / RF curves characterized by a network analyzer using microprobes.

PERFORMANCE INFORMATION

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

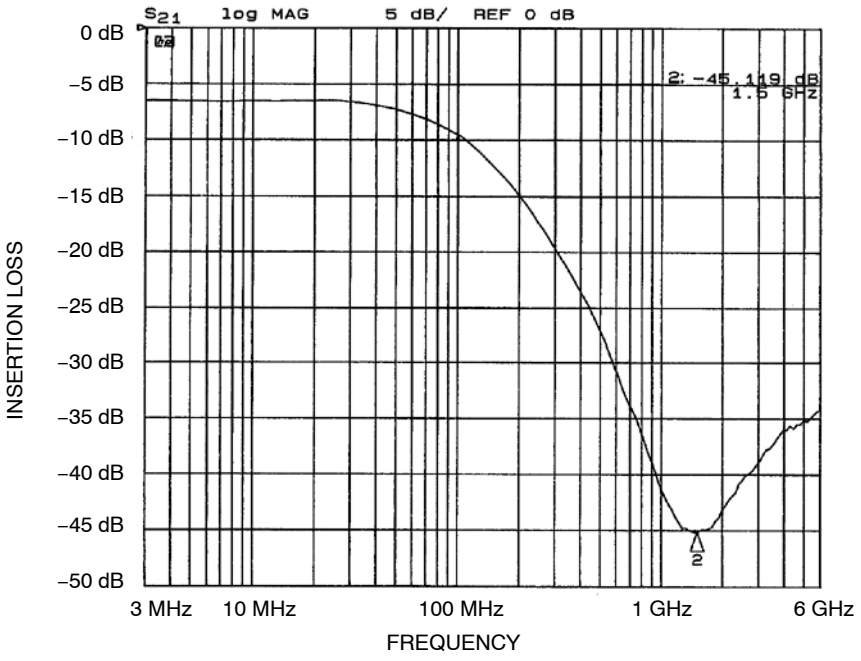


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1631−04DE)

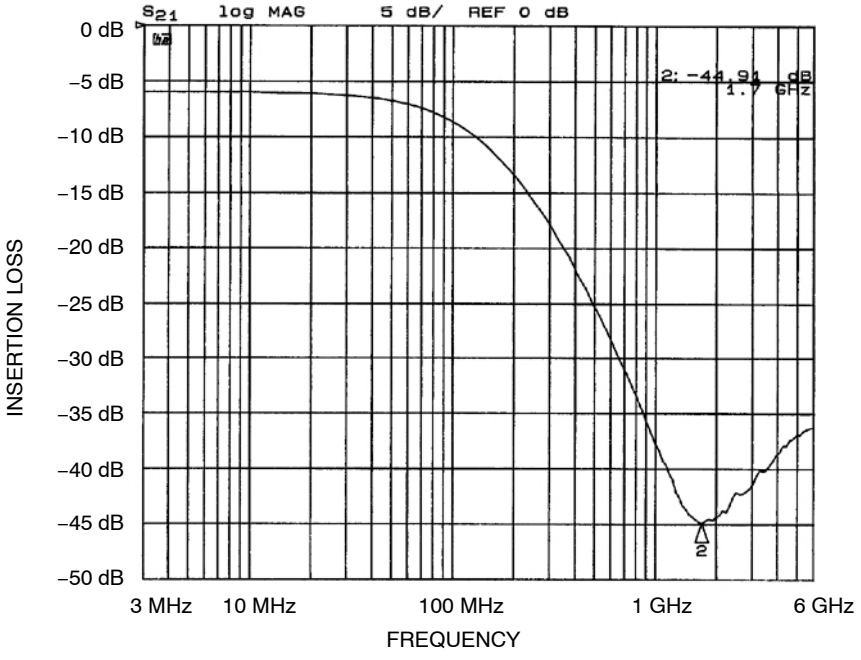


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1631−04DE)

PERFORMANCE INFORMATION (Cont'd)

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

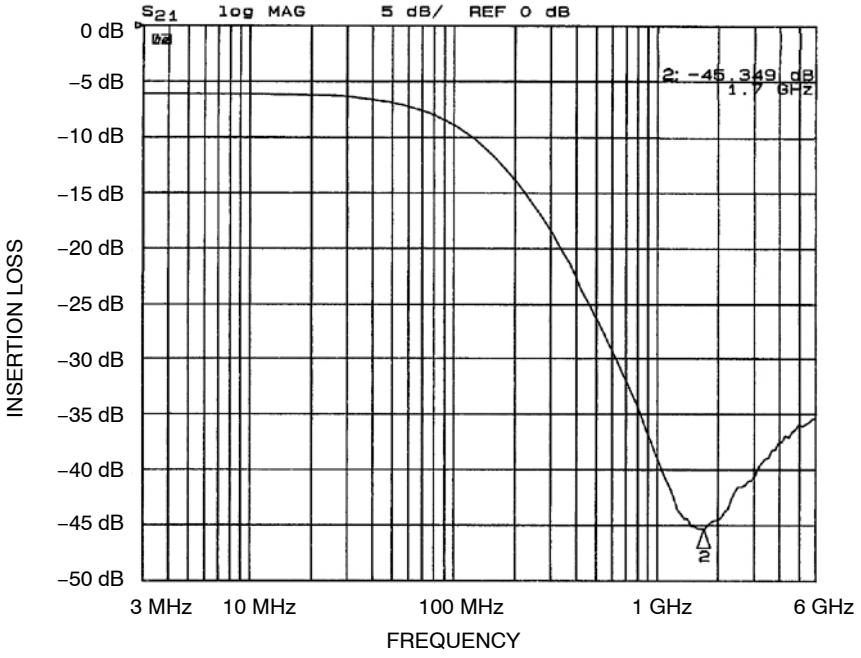


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1631−04DE)

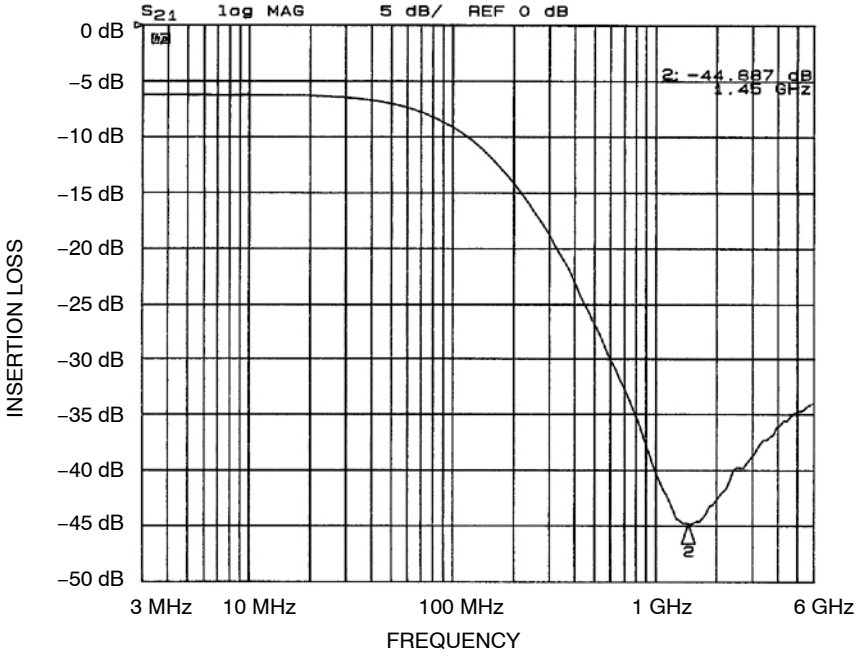


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1631−04DE)

PERFORMANCE INFORMATION (Cont'd)

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

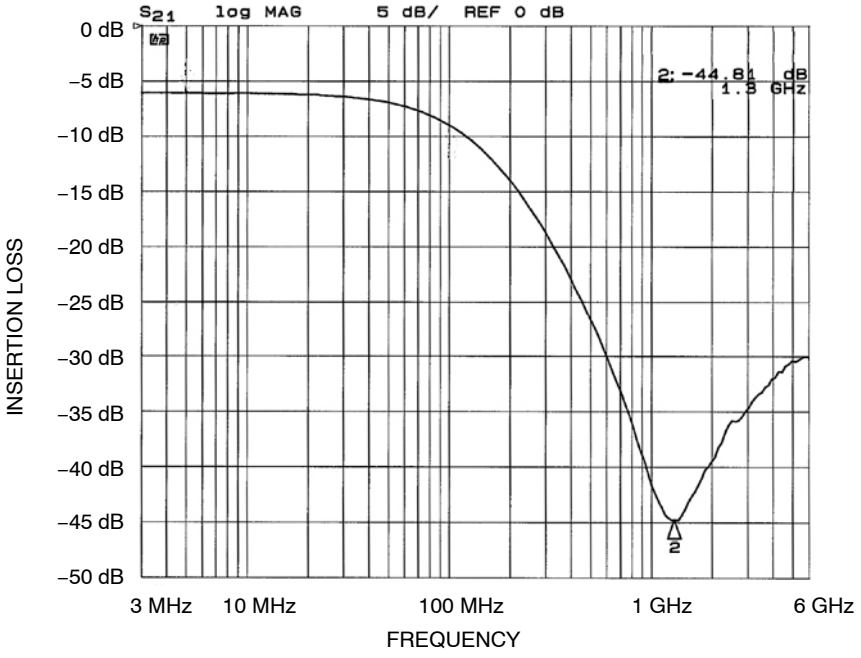


Figure 5. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1631−06DE)

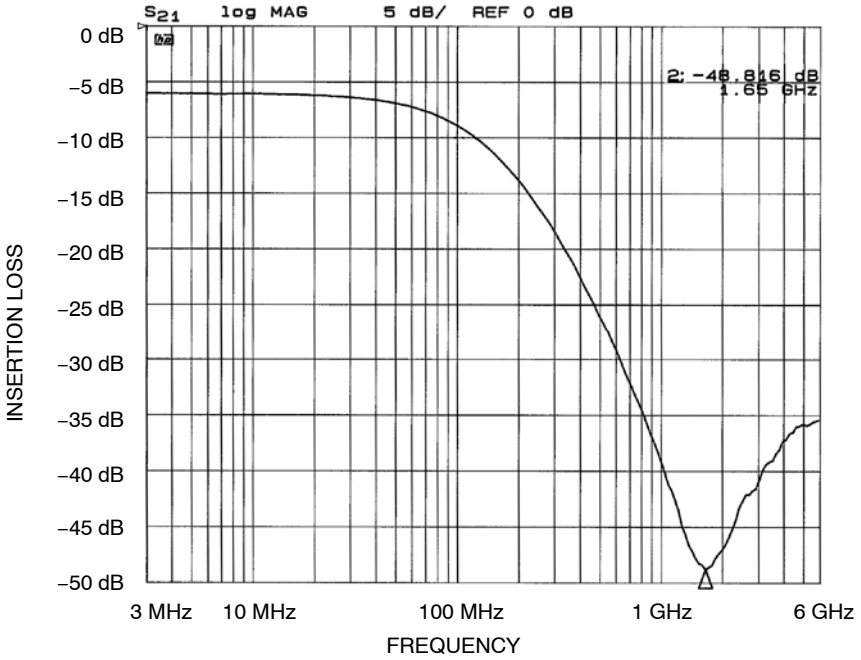


Figure 6. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1631−06DE)

PERFORMANCE INFORMATION (Cont'd)

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

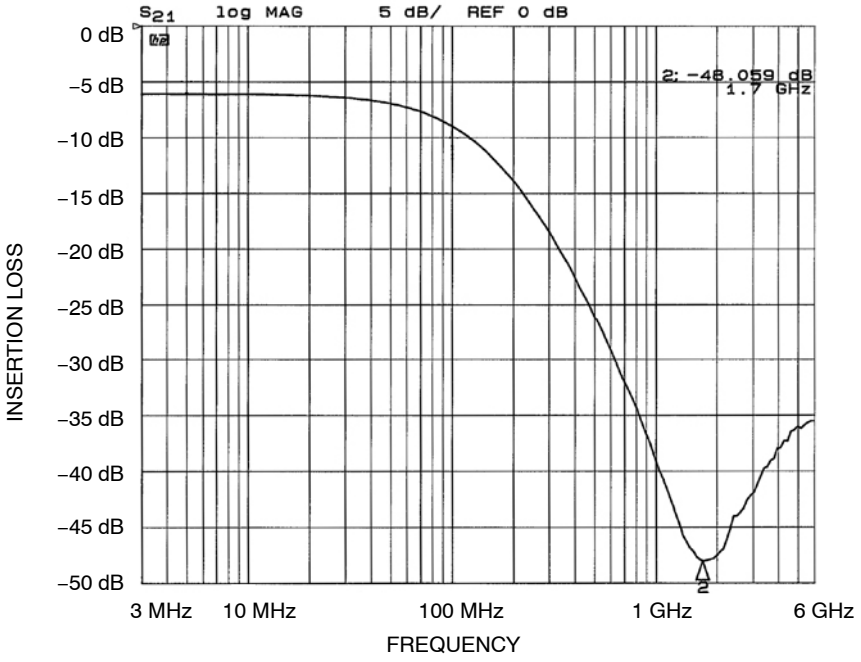


Figure 7. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1631−06DE)

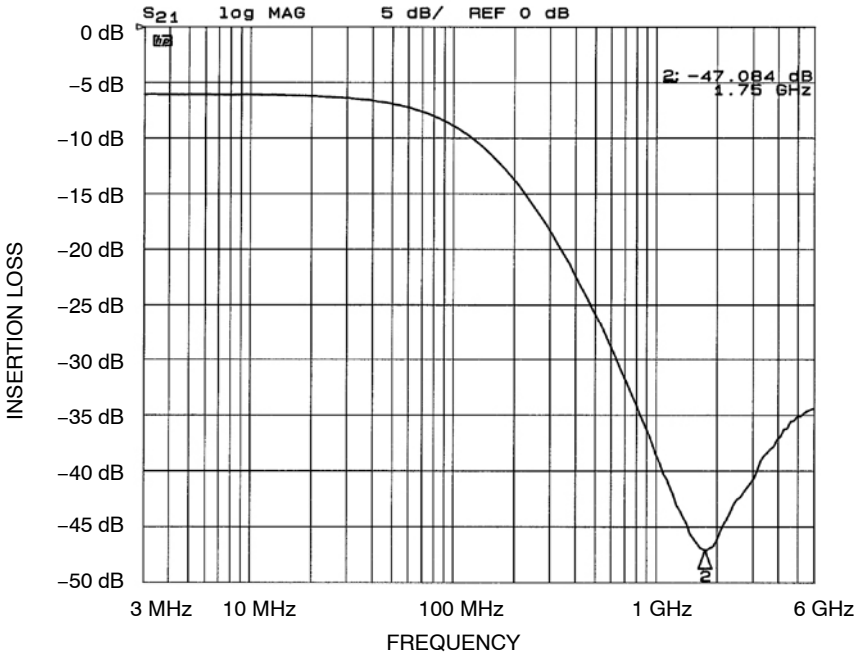


Figure 8. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1631−06DE)

PERFORMANCE INFORMATION (Cont'd)

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

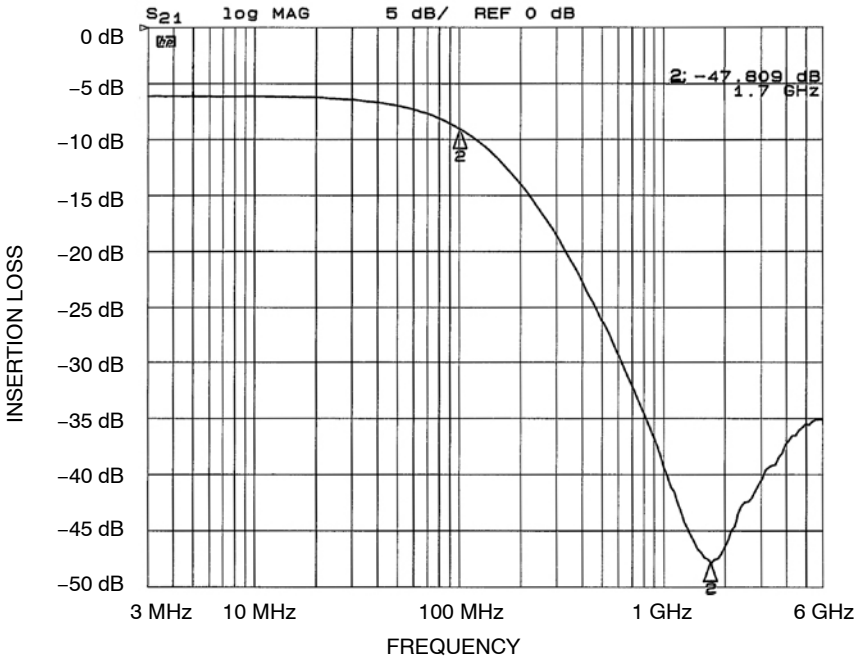


Figure 9. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1631−06DE)

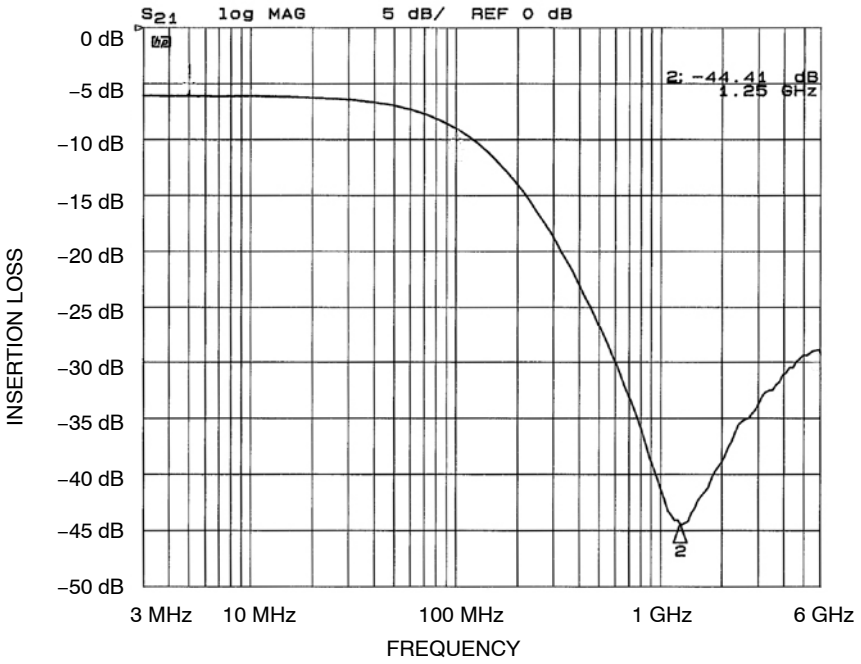


Figure 10. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1631−06DE)

PERFORMANCE INFORMATION (Cont'd)

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

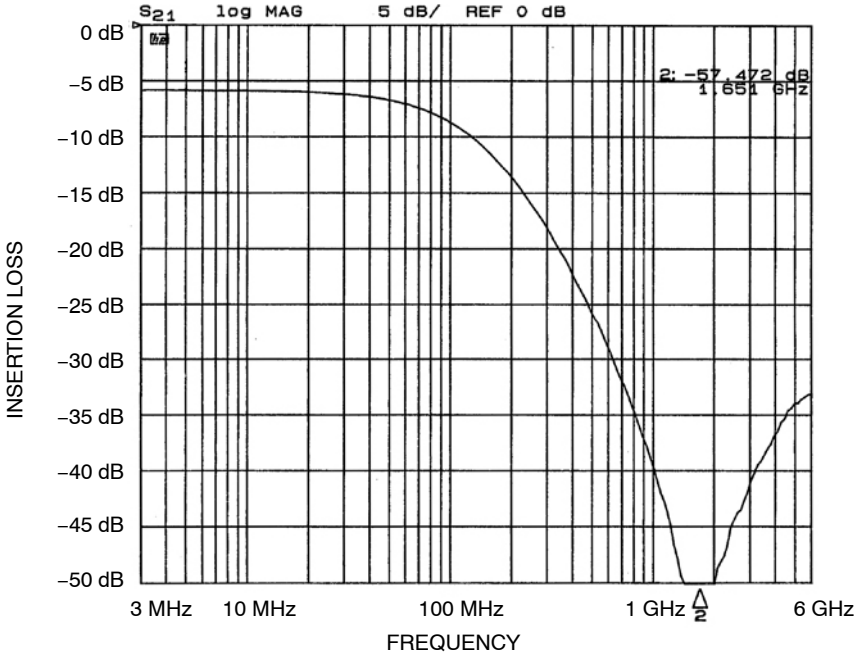


Figure 11. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1631−08DE)

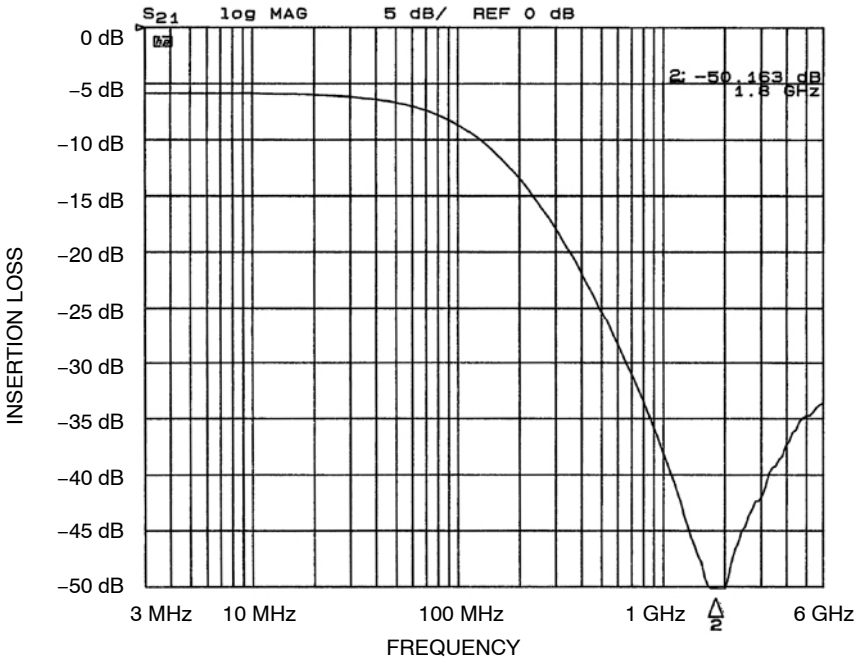


Figure 12. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1631−08DE)

PERFORMANCE INFORMATION (Cont'd)

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

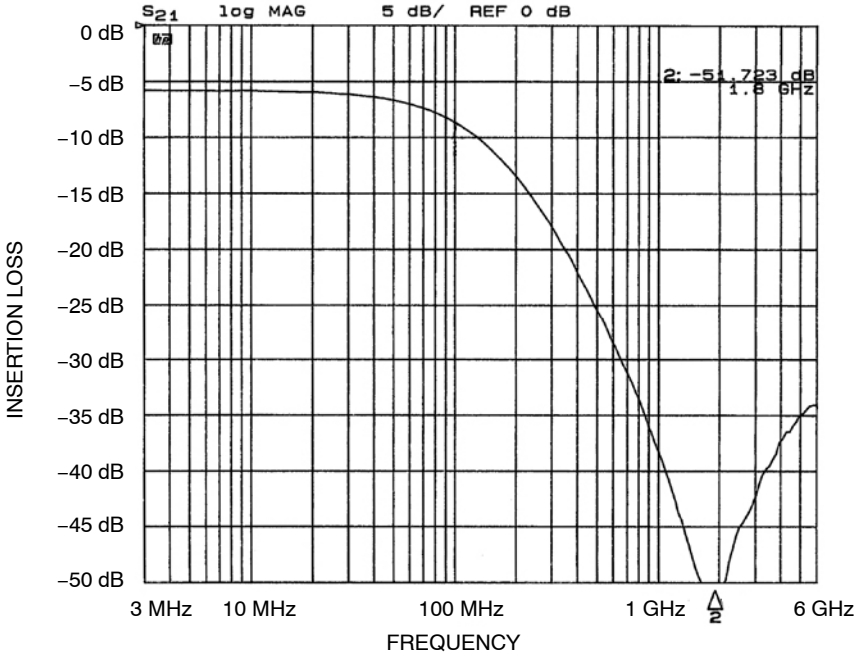


Figure 13. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1631−08DE)

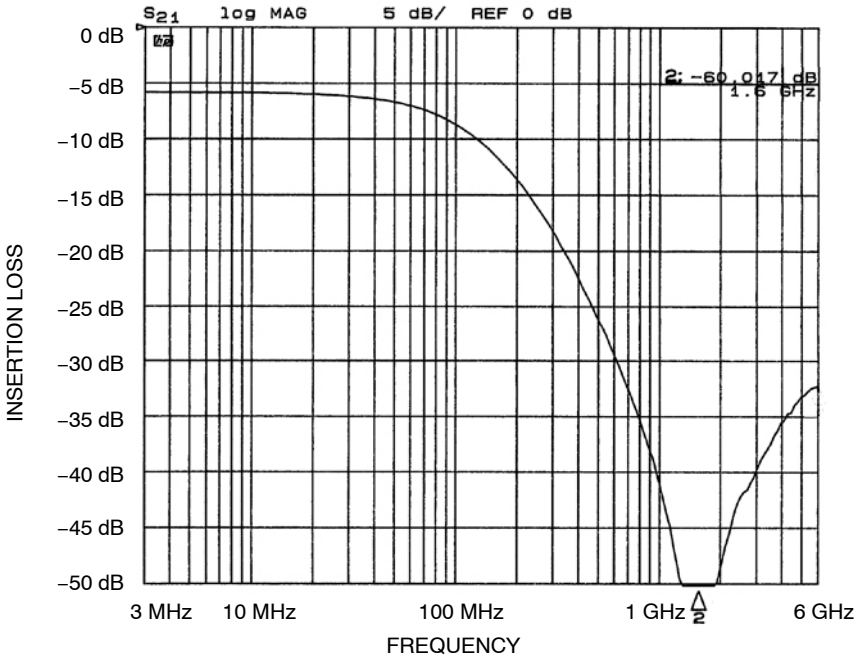


Figure 14. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1631−08DE)

PERFORMANCE INFORMATION (Cont'd)

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

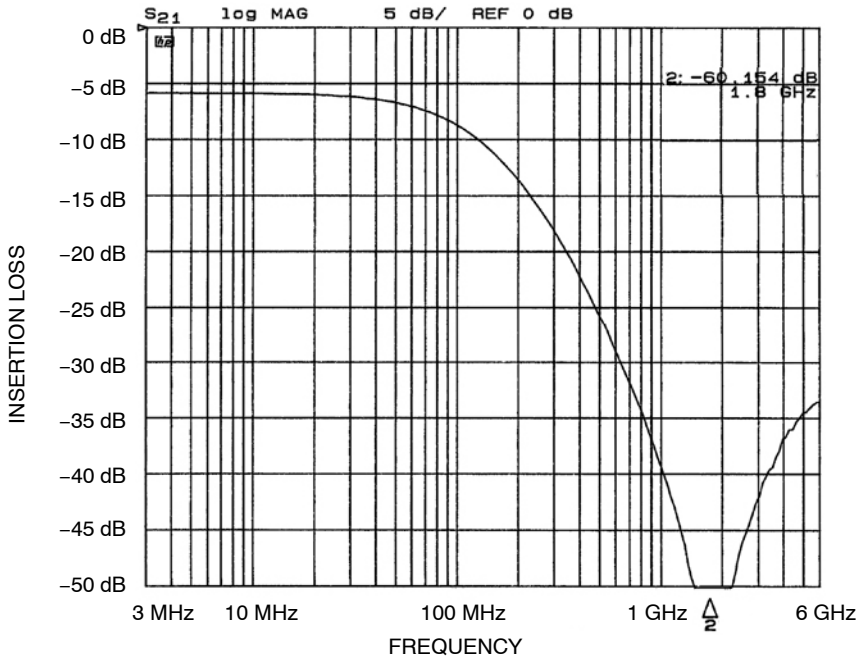


Figure 15. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1631−08DE)

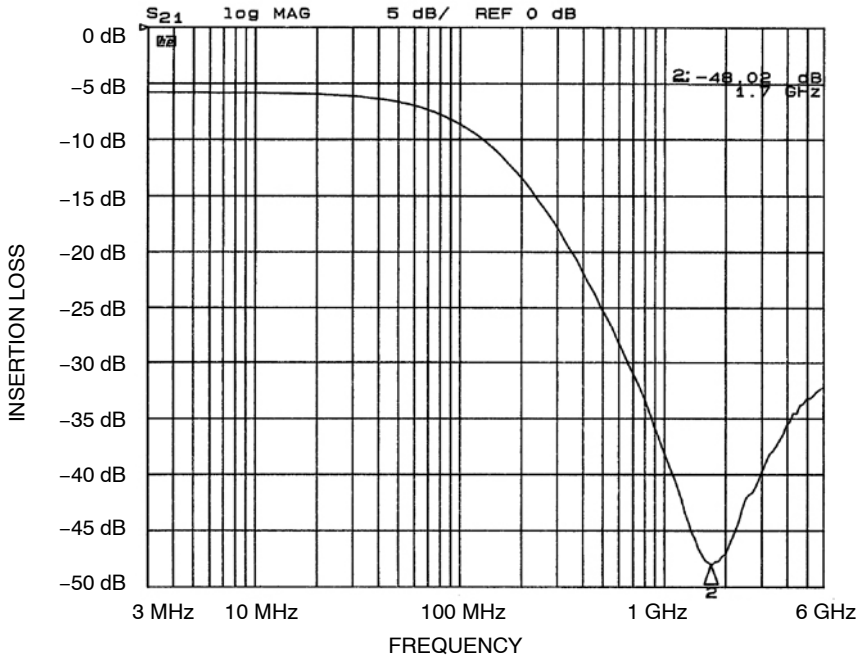


Figure 16. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1631−08DE)

PERFORMANCE INFORMATION (Cont'd)

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

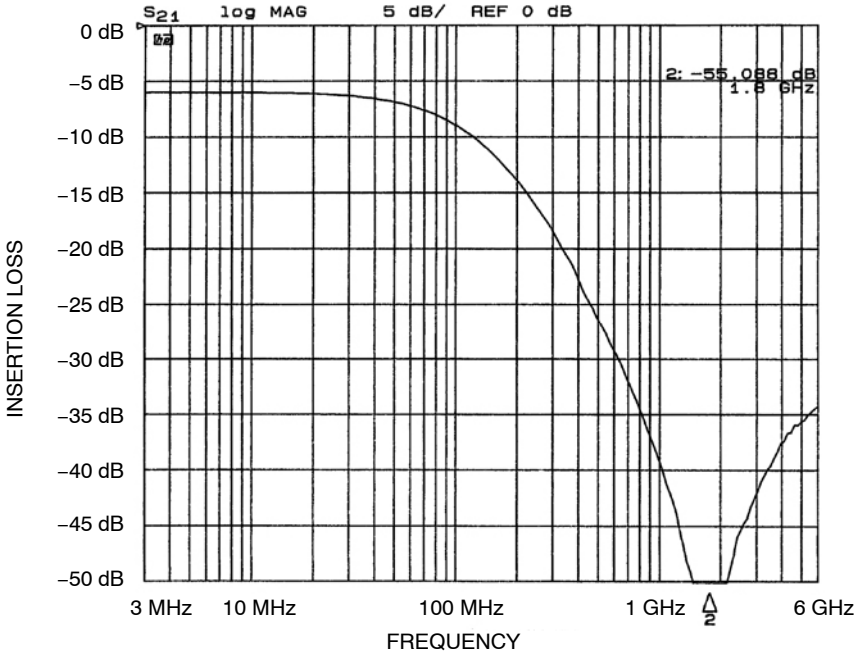


Figure 17. Insertion Loss vs. Frequency (FILTER7 Input to GND, CM1631−08DE)

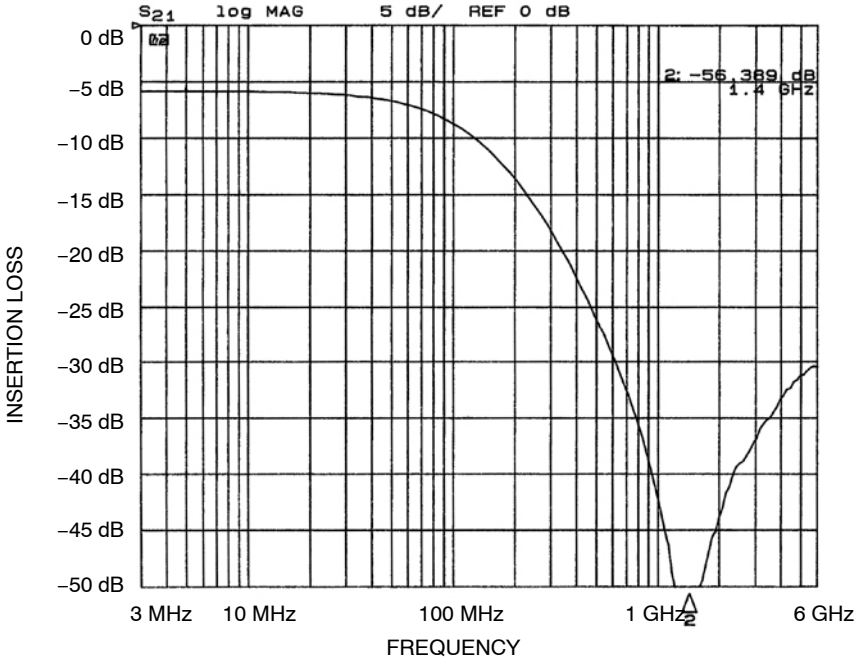


Figure 18. Insertion Loss vs. Frequency (FILTER8 Input to GND, CM1631−08DE)

PERFORMANCE INFORMATION (Cont'd)

Typical Diode Capacitance vs. Input Voltage

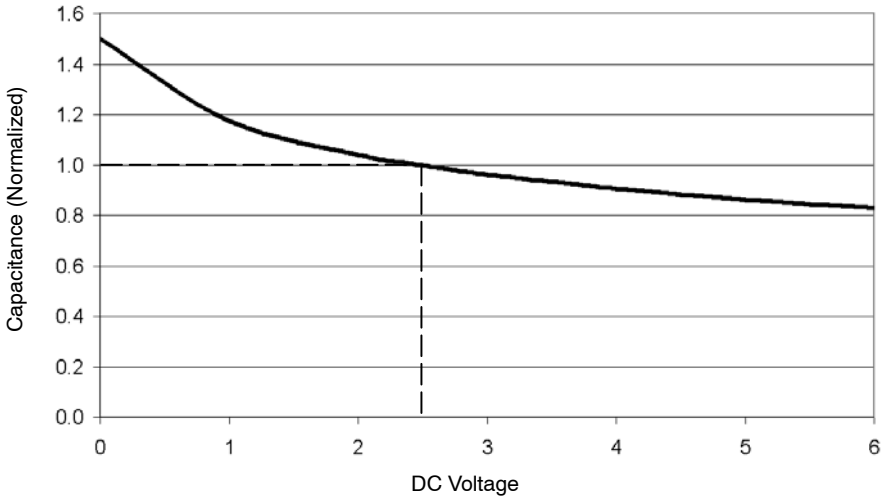
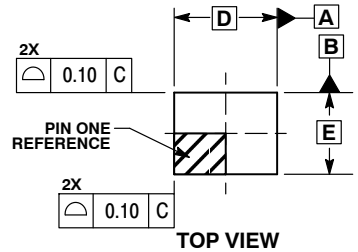


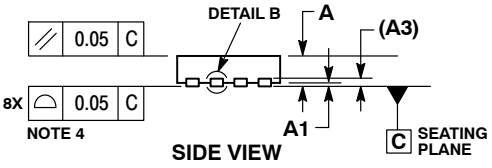
Figure 19. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5 V DC and 25°C)

PACKAGE DIMENSIONS

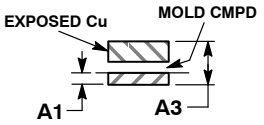
UDFN8, 1.7x1.35, 0.4P
CASE 517BC−01
ISSUE O



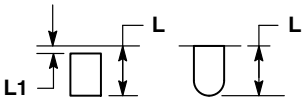
TOP VIEW



SIDE VIEW



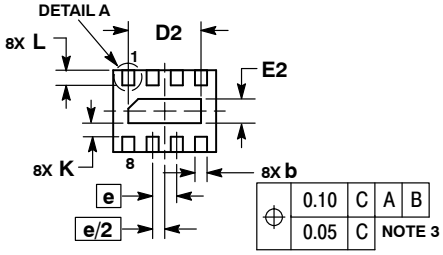
DETAIL B
ALTERNATE CONSTRUCTIONS



DETAIL A
ALTERNATE TERMINAL CONSTRUCTIONS

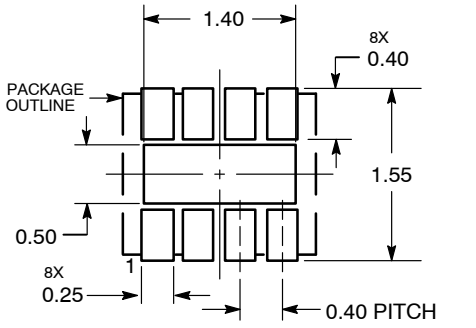
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	1.70 BSC	
D2	1.10	1.30
E	1.35 BSC	
E2	0.30	0.50
e	0.40 BSC	
K	0.15	−−−
L	0.20	0.30
L1	−−−	0.05



BOTTOM VIEW

RECOMMENDED SOLDERING FOOTPRINT*

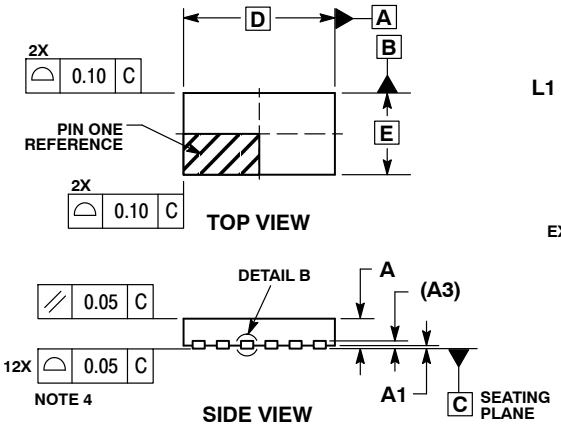


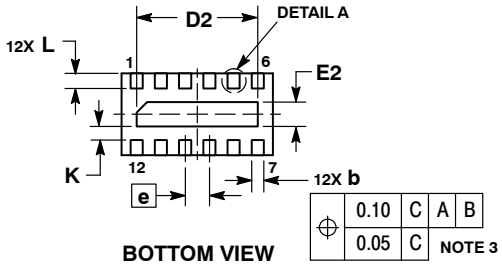
DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

UDFN12, 2.5x1.35, 0.4P
CASE 517BD−01
ISSUE O

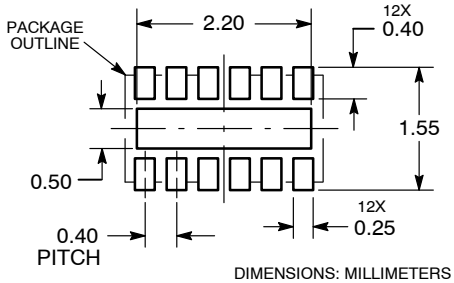




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	2.50 BSC	
D2	1.90	2.10
E	1.35 BSC	
E2	0.30	0.50
e	0.40 BSC	
K	0.15	−−−
L	0.20	0.30
L1	−−−	0.05

RECOMMENDED SOLDERING FOOTPRINT*

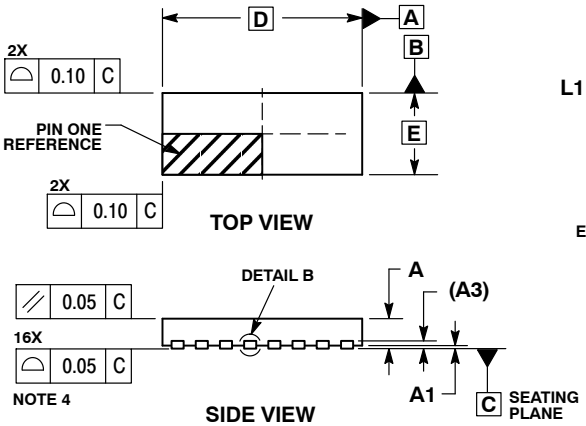


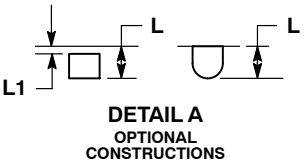
DIMENSIONS: MILLIMETERS

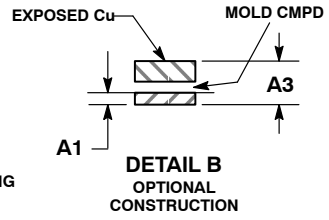
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

UDFN16, 3.3x1.35, 0.4P
CASE 517BE−01
ISSUE O

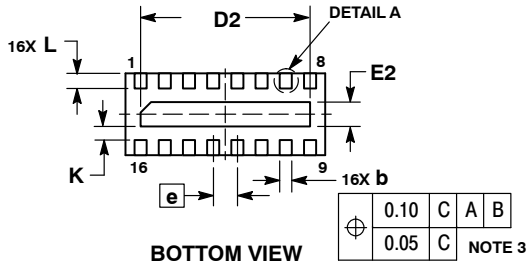




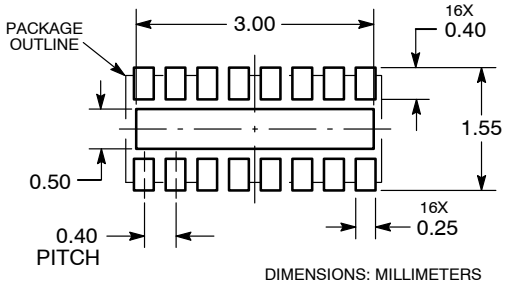


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	3.30 BSC	
D2	2.70	2.90
E	1.35 BSC	
E2	0.30	0.50
e	0.40 BSC	
K	0.15	−−−
L	0.20	0.30
L1	−−−	0.05



RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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