

LCD and Camera EMI Filter Array with ESD Protection

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
- $\pm 15\text{kV}$ 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 35dB attenuation (typical) at 1 GHz
- TDFN package with 0.40mm lead pitch:
 - 4-ch. = 8-lead TDFN
 - 6-ch. = 12-lead TDFN
 - 8-ch. = 16-lead TDFN
- Tiny TDFN package size:
 - 8-lead: 1.7mm x 1.35mm
 - 12-lead: 2.5mm x 1.35mm
 - 16-lead: 3.3mm x 1.35mm
- Increased robustness against vertical impacts during manufacturing process
- Lead-free 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

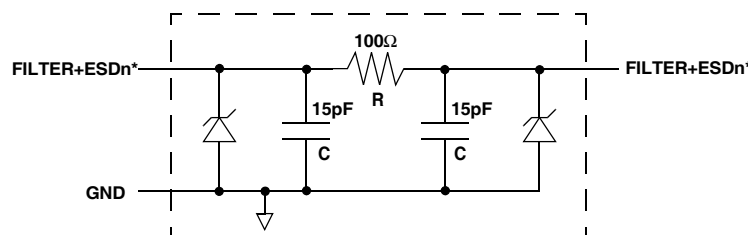
Product Description

The CM1431 is a family of pi-style EMI filter arrays with ESD protection, which integrates four, six and eight filters (C-R-C) in small form factor TDFN 0.40mm pitch packages. The CM1431 has component values of 15pF-100 Ω -15pF per channel. The CM1431 has a cut-off frequency of 120MHz and can be used in applications with data rates up to 48Mbps. 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 safely dissipate ESD strikes of $\pm 15\text{kV}$, 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 at greater than $\pm 30\text{kV}$.

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 CM1431 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.

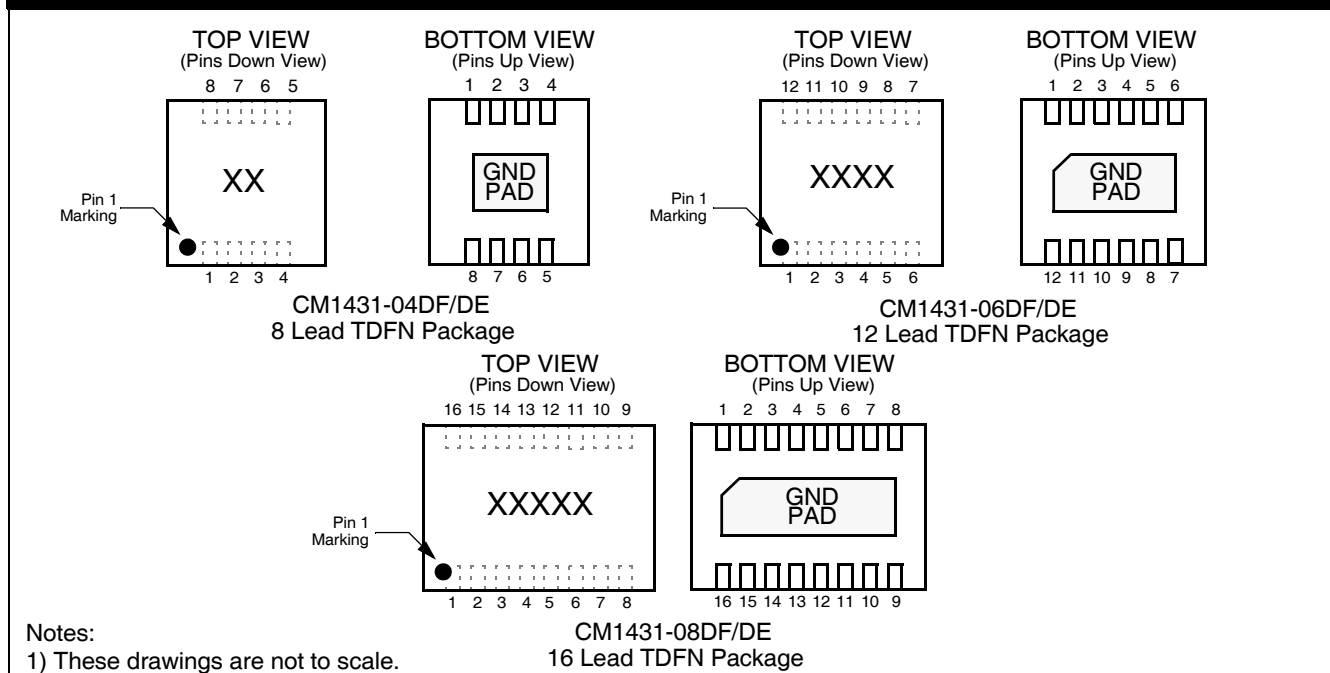
The CM1431 is housed in space-saving, low-profile 8-, 12- and 16-lead TDFN packages with a 0.40mm pitch and is available with lead-free finishing. This smaller size TDFN package provides up to 42% board space saving vs. the 0.50mm pitch TDFN packages.

Electrical Schematic



* See Package/Pinout Diagram for expanded pin information.

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

PACKAGE / PINOUT DIAGRAMS

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	Standard Finish		Lead-free Finish	
		Ordering Part Number ¹	Part Marking	Ordering Part Number ¹	Part Marking
8	TDFN-8	CM1431-04DF	WF	CM1431-04DE	WE
12	TDFN-12	CM1431-06DF	N31F	CM1431-06DE	N31E
16	TDFN-16	CM1431-08DF	N318F	CM1431-08DE	N318E

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 -1.5	6.8 -0.8	9.0 -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 _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, 4 and 5		35		dB
A _{800MHz - 6GHz}	Absolute Attenuation @ 800MHz to 6GHz from 0dB Level	Z _{SOURCE} = 50Ω, Z _{LOAD} = 50Ω, DC Bias = 0V; Notes 1, 4 and 5		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: 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)

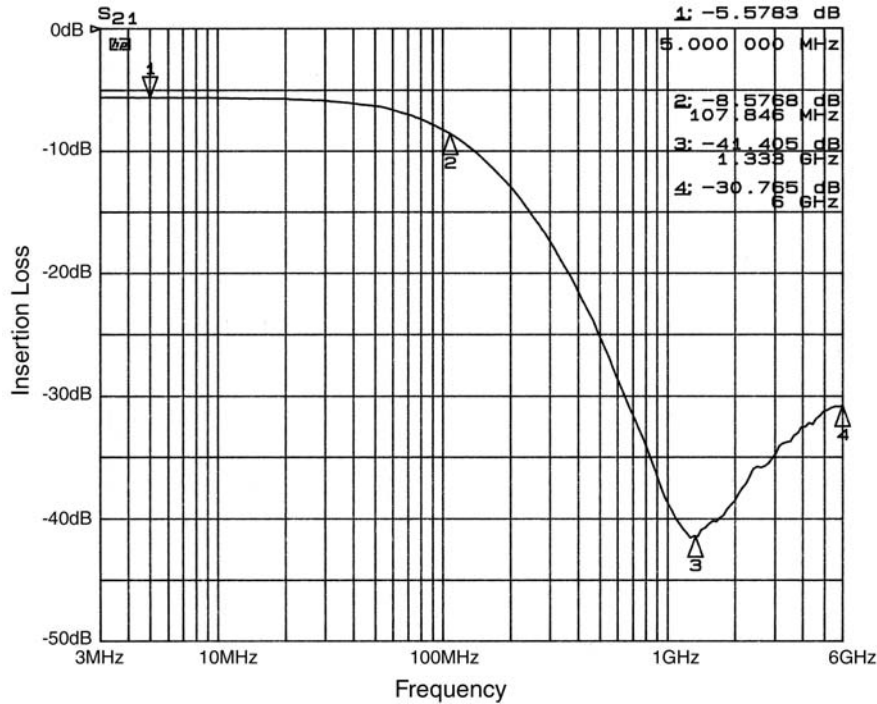


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND)

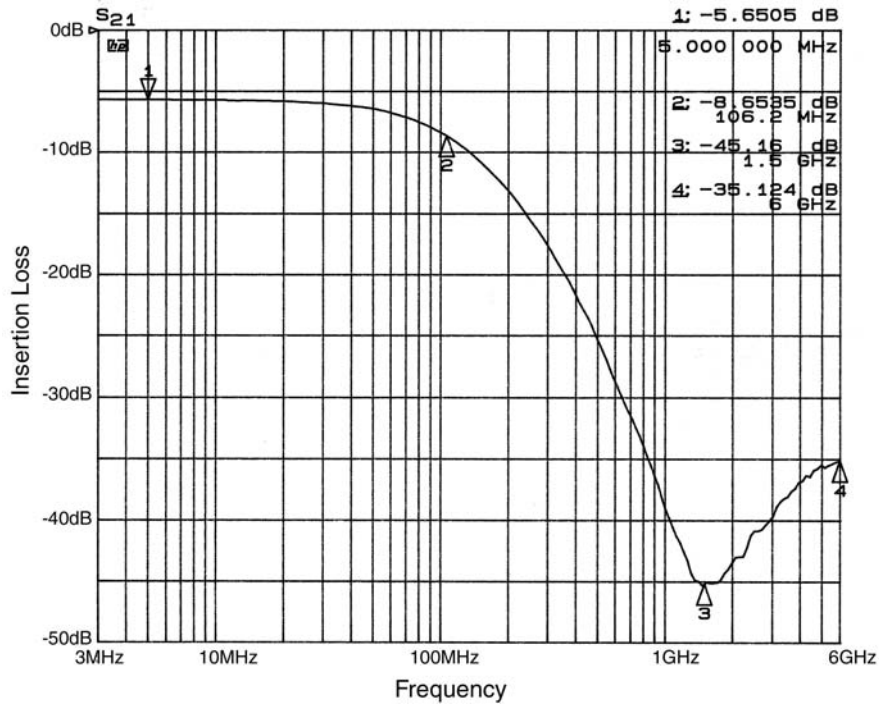


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND)

Performance Information (cont'd)

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

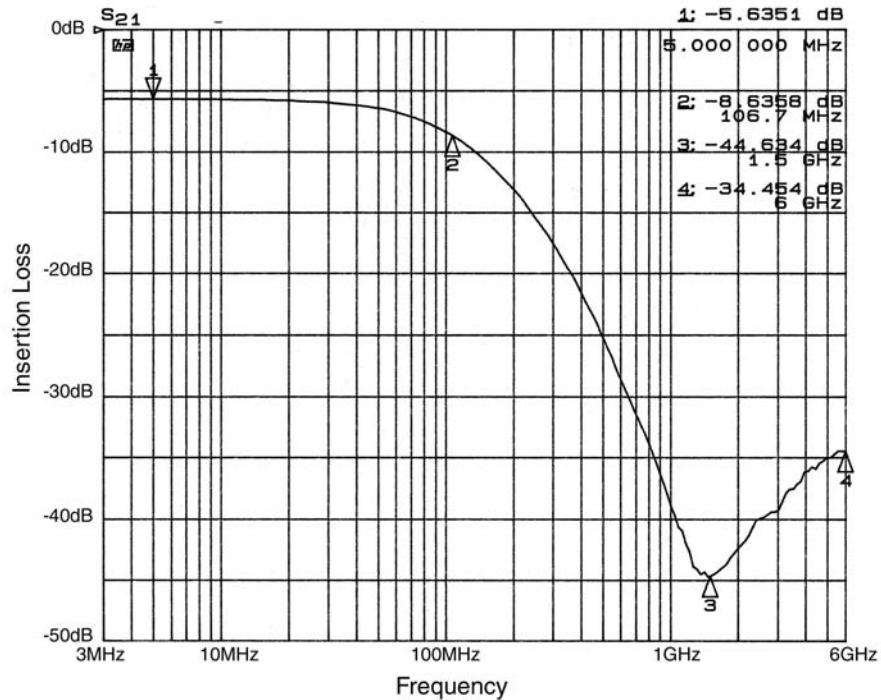


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND)

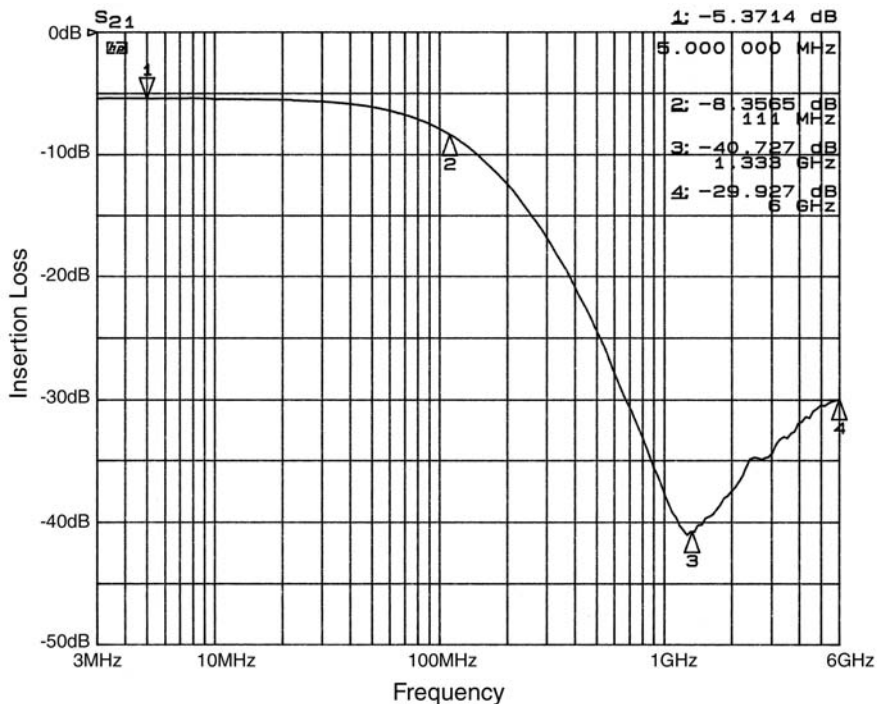
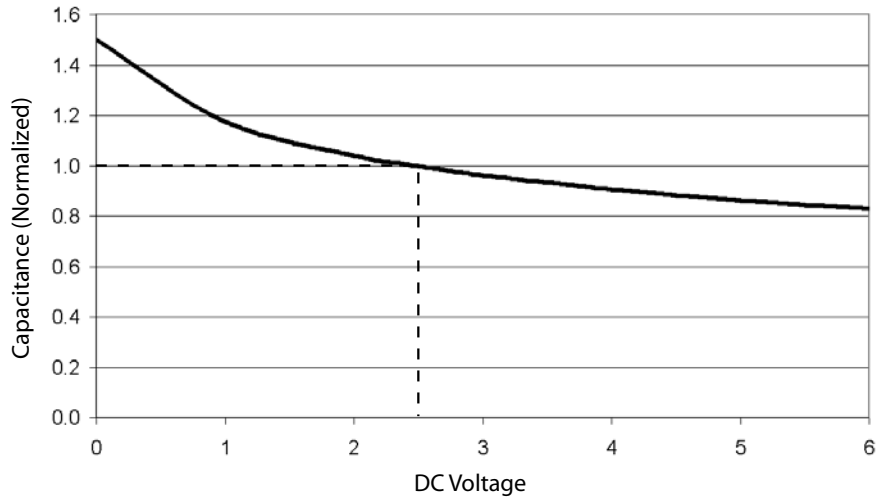


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND)

Performance Information (cont'd)

Typical Diode Capacitance vs. Input Voltage



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

Mechanical Details

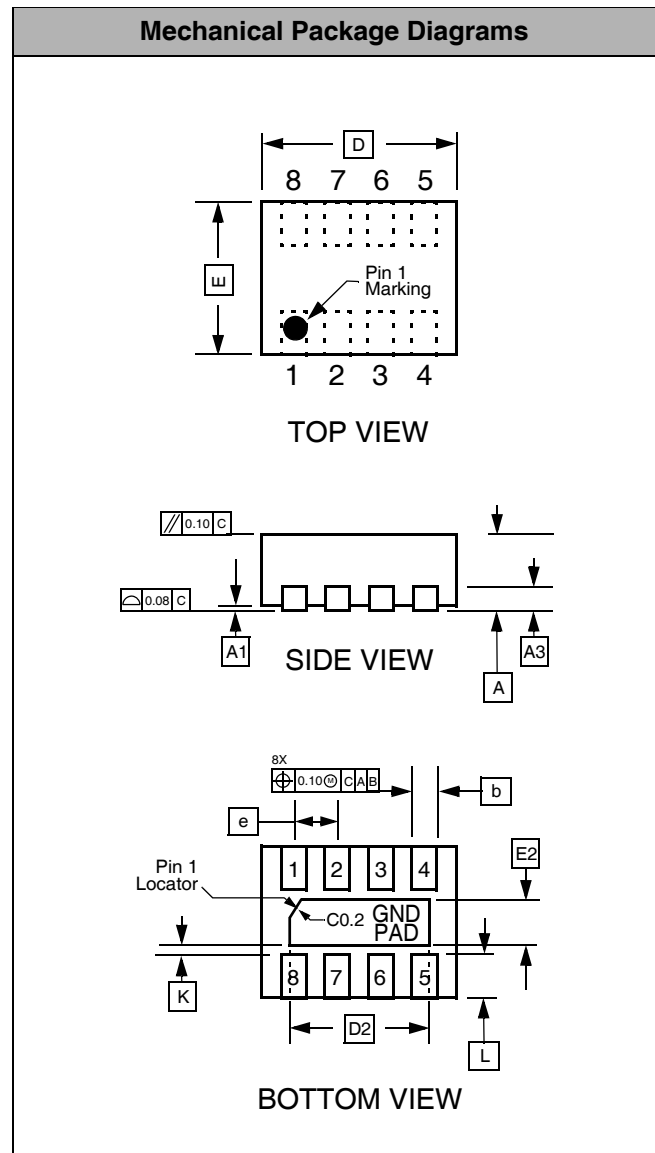
CM1431-04DF/DE Mechanical Specifications

Dimensions for the CM1431-04DF/DE supplied in a 8-lead, 0.4mm pitch TDFN package are presented below.

For complete information on the TDFN-8, see the California Micro Devices TDFN Package Information document.

PACKAGE DIMENSIONS						
Package	TDFN					
JEDEC No.	MO-229C [†]					
Leads	8					
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	0.15	0.20	0.25	0.006	0.008	0.010
D	1.65	1.70	1.75	0.065	0.067	0.069
D2	1.10	1.20	1.30	0.043	0.047	0.051
E	1.30	1.35	1.40	0.051	0.053	0.055
E2	0.30	0.40	0.50	0.012	0.016	0.020
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.15	0.25	0.35	0.006	0.010	0.014
# 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 8-Lead, 0.4mm pitch TDFN package

Mechanical Details (cont'd)

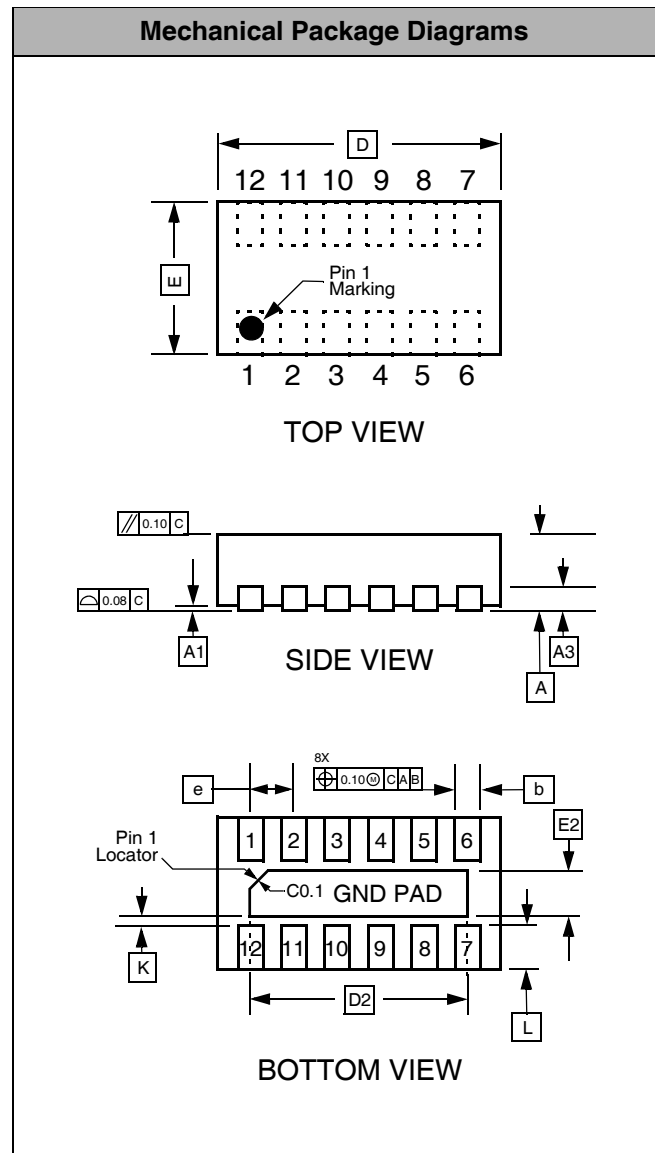
CM1431-06DF/DE Mechanical Specifications

Dimensions for the CM1431-06DF/DE supplied in a 12-lead, 0.4mm pitch TDFN package are presented below.

For complete information on the TDFN-12, see the California Micro Devices TDFN Package Information document.

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	0.15	0.20	0.25	0.006	0.008	0.010
D	2.45	2.50	2.55	0.096	0.098	0.100
D2	1.90	2.00	2.10	0.075	0.079	0.083
E	1.30	1.35	1.40	0.051	0.053	0.055
E2	0.25	0.35	0.45	0.010	0.014	0.018
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.15	0.25	0.35	0.006	0.010	0.014
# 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 TDFN package

Mechanical Details (cont'd)

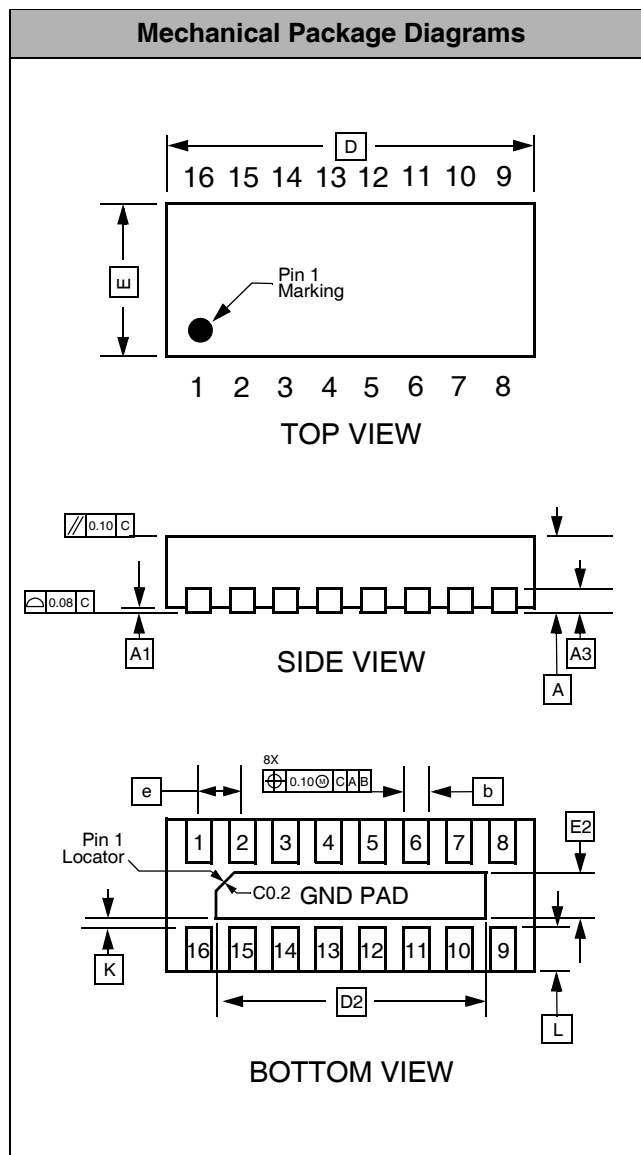
CM1431-08DF/DE Mechanical Specifications

Dimensions for the CM1431-08DF/DE supplied in a 16-lead, 0.4mm pitch TDFN package are presented below.

For complete information on the TDFN-16, see the California Micro Devices TDFN Package Information document.

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	0.40	0.55	0.70	0.016	0.022	0.028
b	0.20 REF			0.008 REF		
D	3.25	3.30	3.35	0.128	0.130	0.132
D2	2.80	2.90	3.00	0.110	0.114	0.118
E	1.30	1.35	1.40	0.051	0.053	0.055
E2	0.35	0.40	0.45	0.014	0.016	0.018
e	0.40 BSC			0.016 BSC		
K	0.20			0.008		
L	0.15	0.25	0.35	0.006	0.010	0.014
# 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 16-Lead, 0.4mm pitch TDFN package