ON Semiconductor®

LCD and Camera EMI Filter Array with ESD Protection

CM1409

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
- ±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
- TDFN package with 0.50mm lead pitch:
  - 6-ch. = 12-lead TDFN
  - 8-ch. = 16-lead TDFN
- Tiny TDFN package size:
  - 12-lead: 3.0mm x 1.35mm
  - 16-lead: 4.0mm x 1.60mm
- Increased robustness against vertical impacts during manufacturing process
- RoHS-compliant, 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 CM1409 is a family of pi-style EMI filter arrays with ESD protection, which integrates either six or eight filters (C-R-C) in a small form factor, TDFN 0.50mm pitch package. The CM1409 has component values of 15pF-100Ω-15pF per channel. The CM1409 has a cut-off frequency of 110MHz and can be used in applications with data rates up to 44Mbps. The parts include ESD diodes on every pin, which provide a very high level of protection for sensitive electronic components against electrostatic discharge (ESD). The ESD protected diodes safely dissipate ESD strikes of ±15kV, which even exceeds 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.

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 CM1409 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 CM1409 is housed in space-saving, low-profile 12- and 16-lead TDFN packages with a 0.50mm pitch, RoHS-compliant, lead-free finishing.

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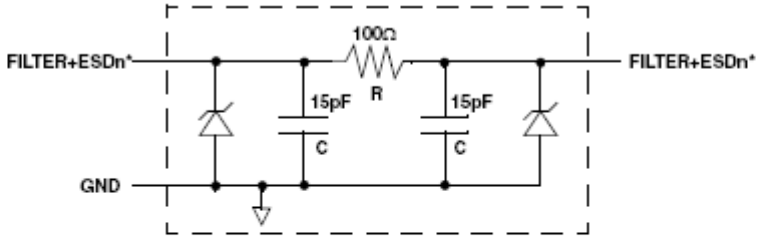
Publication Order Number:
CM1409/D

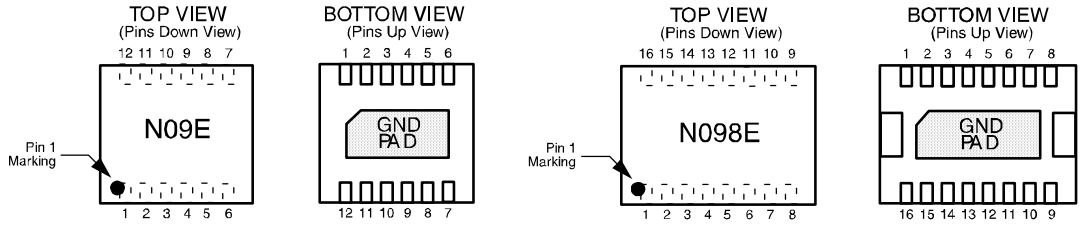
Block Diagram



1 of 6 or 8 EMI/RFI + ESD Channels

* See Package/Pinout Diagram for expanded pin information.

PACKAGE / PINOUT DIAGRAMS



CM1409-06DE
12-Lead TDFN Package

CM1409-08DE
16-Lead TDFN Package

Note:
1) These drawings are not to scale.

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[1]	Part Marking
12	TDFN-12	CM1409-06DE	N09E
16	TDFN-16	CM1409-08DE	N098E

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_1	At 2.5VDC Reverse Bias, 1MHz, 30mVAC		15		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	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)

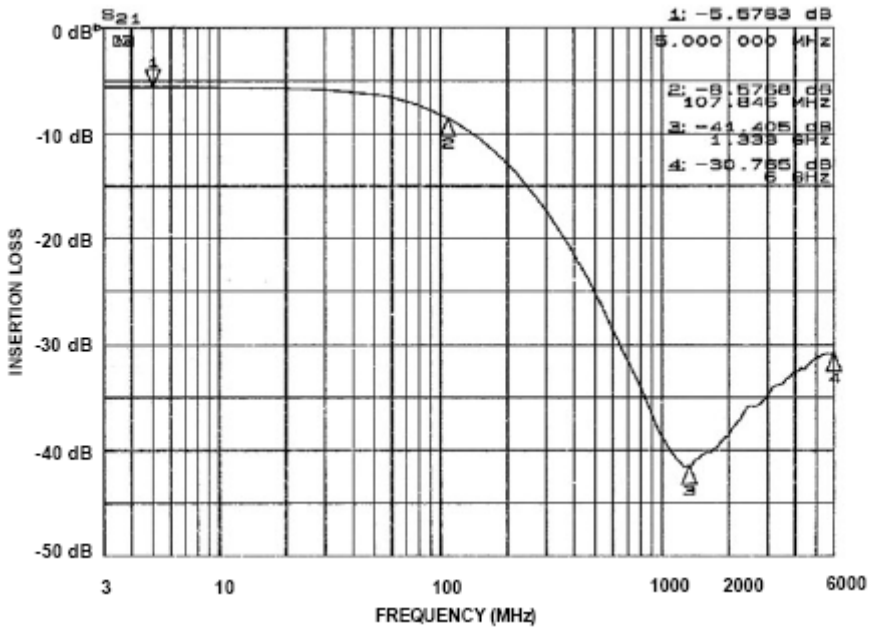


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND)

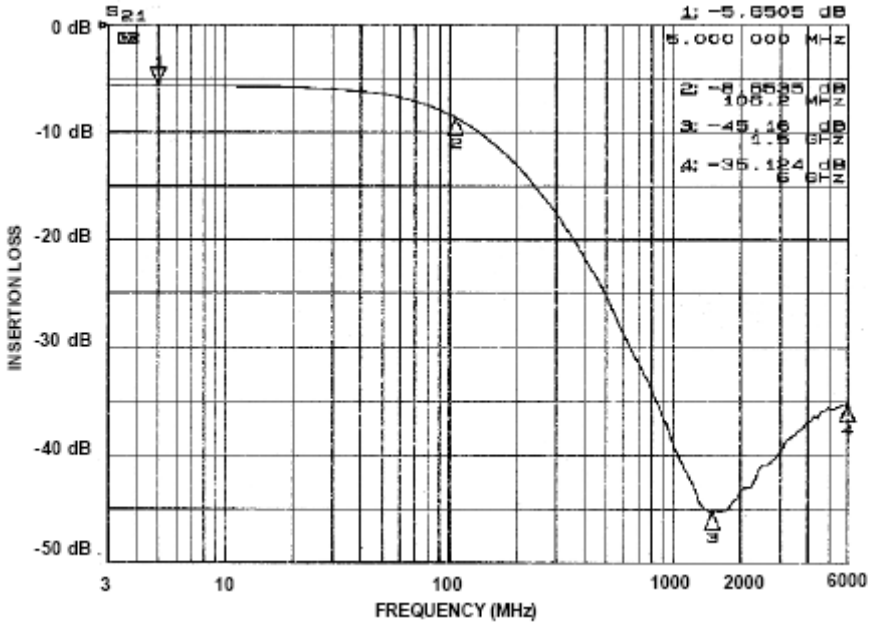


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND)

Performance Information (cont'd)

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

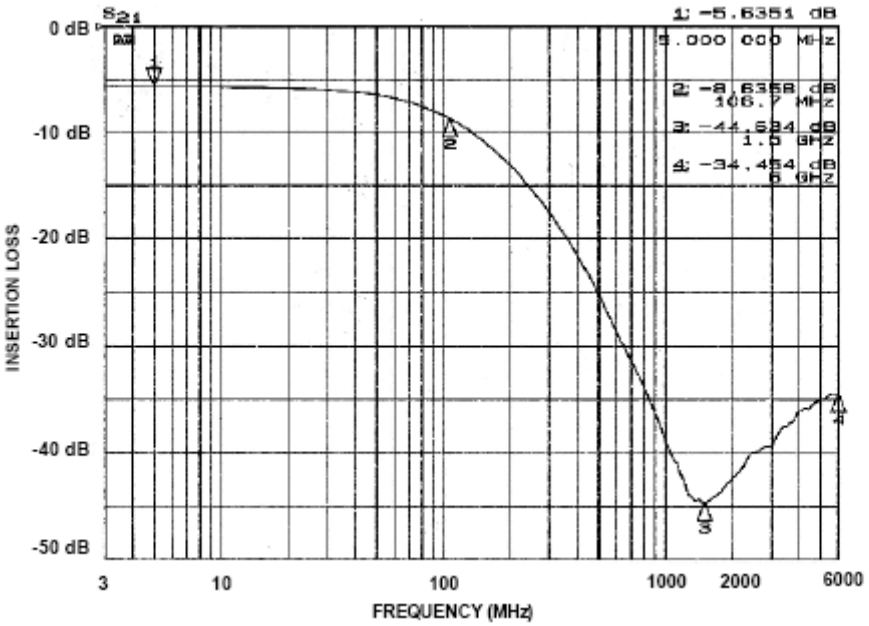


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND)

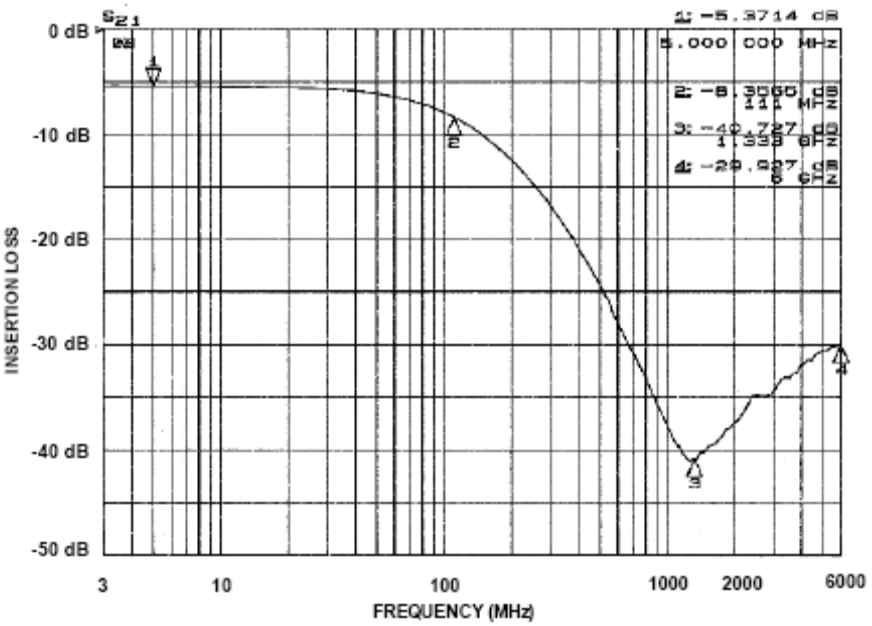


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND)

Performance Information (cont'd)

Typical Diode Capacitance vs. Input Voltage

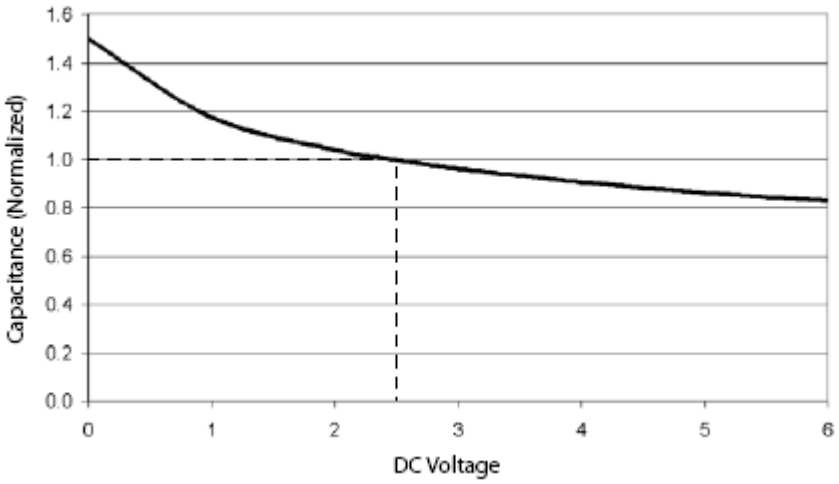


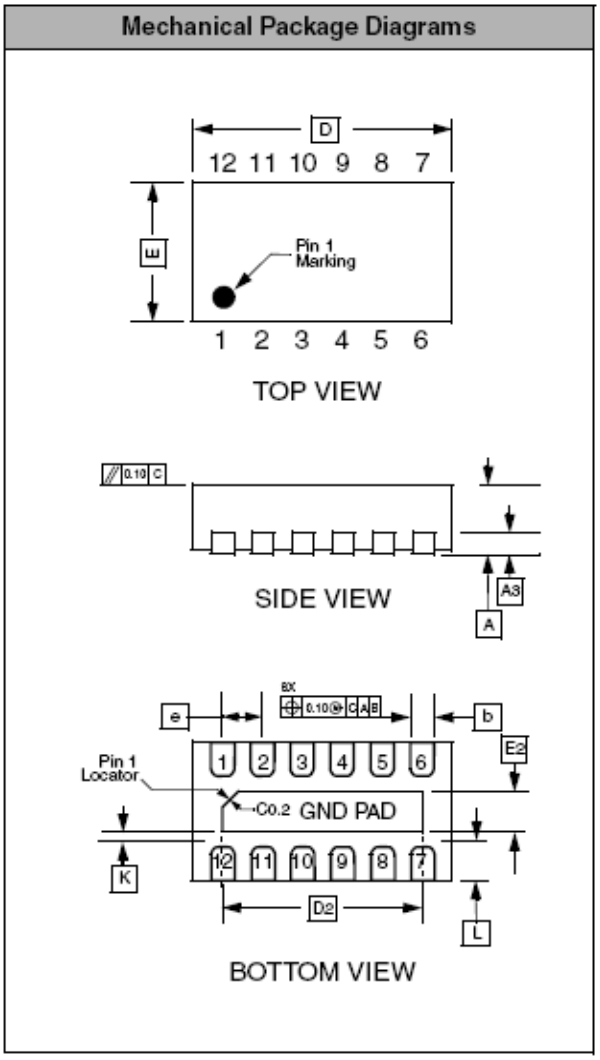
Figure 5. Filter Capacitance vs. Input Voltage (normalized to capacitance at 2.5VDC and 25°C)

Mechanical Details

TDFN-12 Mechanical Specifications

The CM1409-06DE is supplied in a 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
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	0.35	0.40	0.45	0.014	0.016	0.018
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						

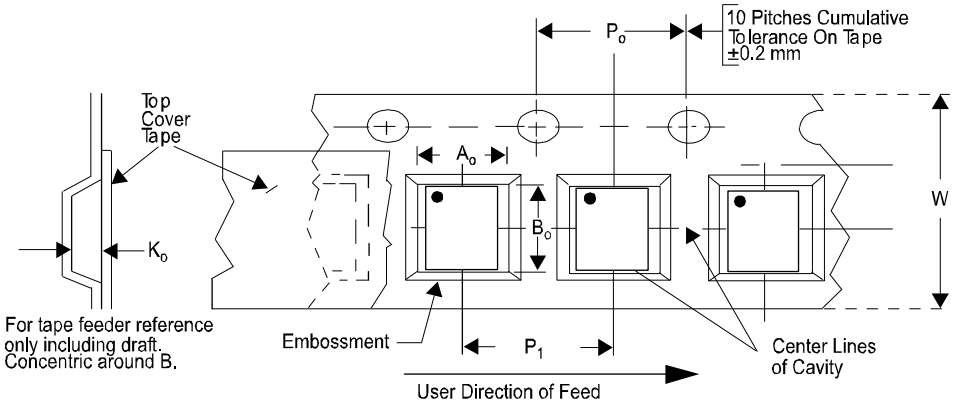


Dimensions for 12-Lead, 0.5mm pitch TDFN package

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
CM1409-06DE	3.00 X 1.35 X 0.75	3.30 X 1.65 X 1.05	8mm	178mm (7")	3000	4mm	4mm

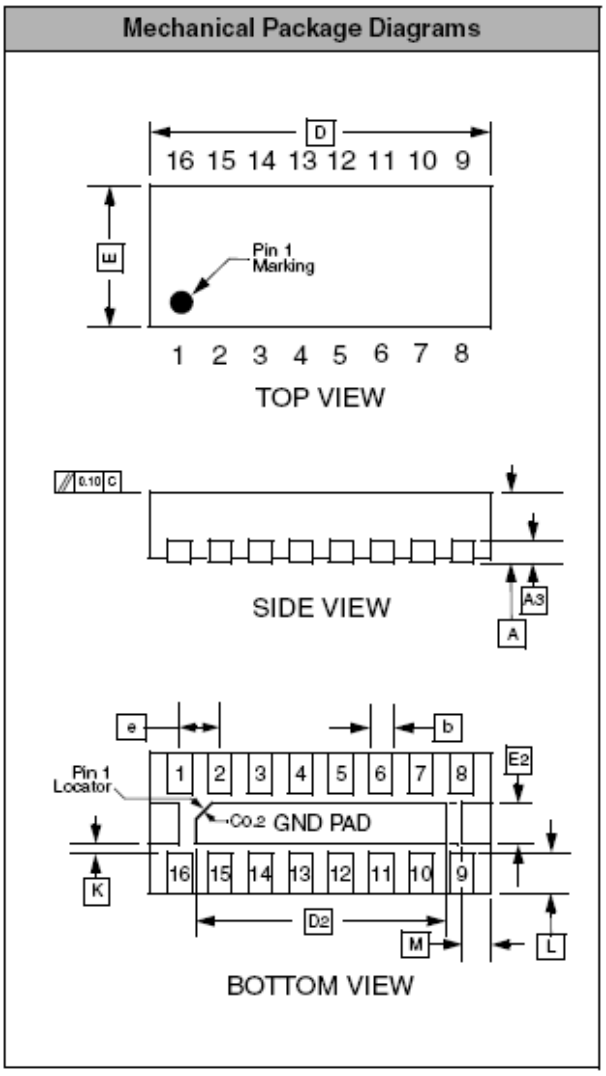


Mechanical Details (cont'd)

TDFN-16 Mechanical Specifications

The CM1409-08DE is supplied in a 16-lead, 0.5mm pitch TDFN package. Dimensions 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
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						

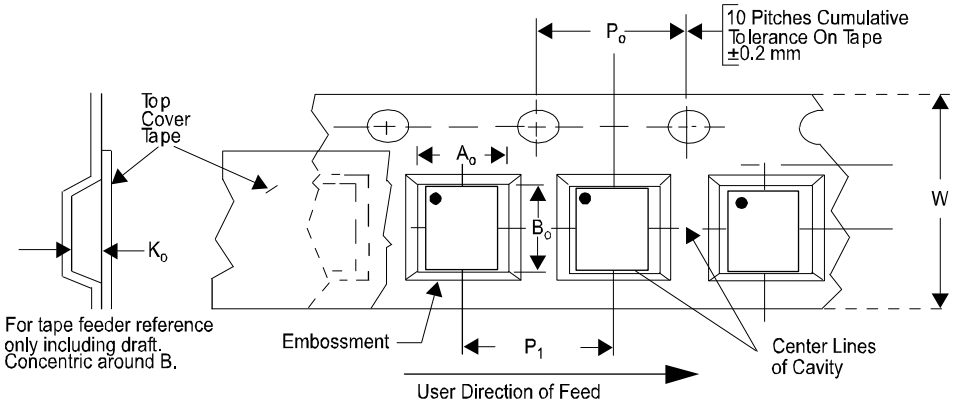


Dimensions for 16-Lead, 0.5mm pitch TDFN package

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
CM1409-08DE	4.00 X 1.60 X 0.75	4.30 X 1.90 X 1.20	12mm	178mm (7")	3000	4mm	4mm



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