



Features

- Four, six and eight channels of EMI filtering with integrated ESD protection
- Pi-style EMI filters in a capacitor-resistorcapacitor (C-R-C) network
- ±15kV ESD protection on each channel (IEC 61000-4-2 Level 4, contact discharge)
- \pm 30kV ESD protection on each channel (HBM)
- Greater than 30dB of attenuation from 800MHz to 3GHz
- 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: 1.7mm x 1.35mm x 0.50mm
 - 12-lead: 2.5mm x 1.35mm x 0.50mm
 - 16-lead: 3.3mm x 1.35mm x 0.50mm
- Increased robustness against vertical impacts during manufacturing process
- Lead-free finishing

Applications

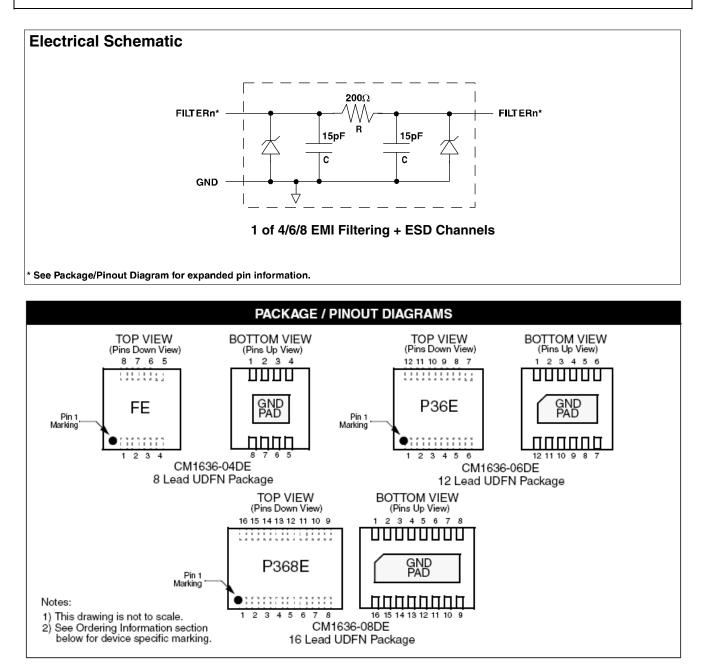
- I/O port protection for mobile handsets, notebook computers, PDAs etc.
- EMI filtering for data ports in cell phones, PDAs or notebook computers.
- EMI filtering for LCD, camera and chip-to-chip data lines

Product Description

The CM1636 is an EMI filter array with ESD protection, which integrates either four, six or eight pi filters (C-R-C). Each CM1636 filter has component values of 15pF-200W-15pF. These parts include ESD protection diodes on every pin, providing a very high level of protection for sensitive electronic components that may be subjected to electrostatic discharge (ESD). The ESD diodes connected to the filter ports safely dissipate ESD strikes of \pm 15kV contact discharge, twice the specification requirement of the IEC 61000-4-2, Level 4 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 30kV.

This device is particularly well-suited for portable electronics (e.g. mobile handsets, PDAs, notebook computers) because of its small package and easyto-use pin assignments. In particular, the CM1636 is ideal for EMI filtering and protecting data lines from ESD in wireless handsets.

The CM1636 is available in space-saving, ultra-lowprofile, 8-lead, 12-lead and 16-lead 0.4mm pitch UDFN packages. It is fabricated with California Micro Devices' *Centurion*TM process and available with leadfree finishing.



	PIN DESCRIPTIONS												
	Pins					Pins							
1636- 04Dx	1636- 06Dx	1636- 08Dx	NAME	DESCRIPTION	1636- 04Dx	1636- 06Dx	1636- 08Dx	NAME	DESCRIPTION				
1	1	1	FILTER1	Filter Channel 1	8	12	16	FILTER1	Filter Channel 1				
2	2	2	FILTER2	Filter Channel 2	7	11	15	FILTER2	Filter Channel 2				
3	3	3	FILTER3	Filter Channel 3	6	10	14	FILTER3	Filter Channel 3				
4	4	4	FILTER4	Filter Channel 4	5	9	13	FILTER4	Filter Channel 4				
	5	5	FILTER5	Filter Channel 5		8	12	FILTER5	Filter Channel 5				
	6	6	FILTER6	Filter Channel 6		7	11	FILTER6	Filter Channel 6				
		7	FILTER7	Filter Channel 7			10	FILTER7	Filter Channel 7				
		8	FILTER8	Filter Channel 8			9	FILTER8	Filter Channel 8				
	GND Pad		GND	Device Ground									

Ordering Information

PART NUMBERING INFORMATION									
		Lead-free Finish							
Leads/Pins	Package	Ordering Part Number ¹	Part Marking						
8	UDFN-08	CM1636-04DE	FE						
12	UDFN-12	CM1636-06DE	P36E						
16	UDFN-16	CM1636-08DE	P368E						

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							
Package DC Power Rating	300	mW							

STANDARD OPERATING CONDITIONS								
PARAMETER	RATING	UNITS						
Operating Temperature Range	-40 to +85	°C						

	ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)											
SYMBOL	PARAMETER	CONDITIONS	MIN	ТҮР	МАХ	UNITS						
R	Resistance		160	200	240	Ω						
C _{total}	Total Channel Capacitance	At 2.5VDC Reverse Bias, 1MHz, 30mVAC	24	30	36	pF						
С	Capacitance	At 2.5V DC, 1MHz, 30mV AC		15		pF						
V	Diode Standoff Voltage	$I_{\text{DIODE}} = 10 \mu A$		6.0		V						
I _{leak}	Diode Leakage Current (reverse bias)	$V_{\text{DIODE}} = 3.3 V$		0.1	1	μA						
V_{SIG}	Signal Voltage Positive Clamp Negative Clamp	$I_{LOAD} = 10mA$ $I_{LOAD} = -10mA$	5.6 -0.4	6.8 -0.8		>						
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	±30 ±15			kV kV						
f _c	Cut-off Frequency Z_{SOURCE} =50 Ω , Z_{LOAD} =50 Ω	R = 200Ω, C = 15pF; Note 3		100		MHz						
A _{1GHz}	Absolute Attenuation @ 1GHz from 0dB Level	$Z_{\text{SOURCE}} = 50\Omega$, $Z_{\text{LOAD}} = 50\Omega$, DC Bias = 0V; Notes 1 and 3		35		dB						
A _{800MHz} - 6GHz	Absolute Attenuation @ 800MHz to 6GHz from 0dB Level	$Z_{\text{SOURCE}} = 50\Omega$, $Z_{\text{LOAD}} = 50\Omega$, DC Bias = 0V; Notes 1 and 35		30		dB						

Note 1: $T_A = 25^{\circ}C$ 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

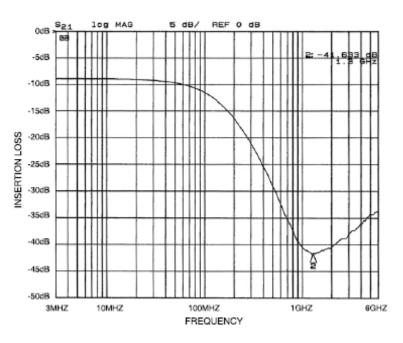


Figure 1. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1636-04DE)

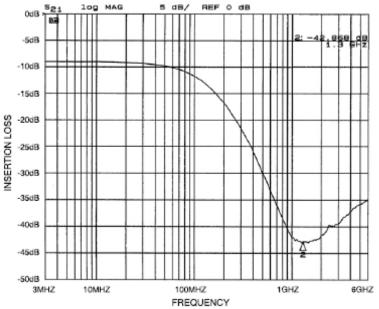


Figure 2. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1636-04DE)

Performance Information (cont'd)

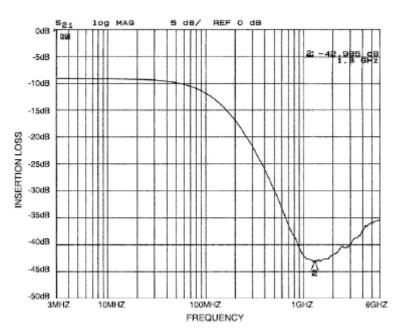


Figure 3. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1636-04DE)

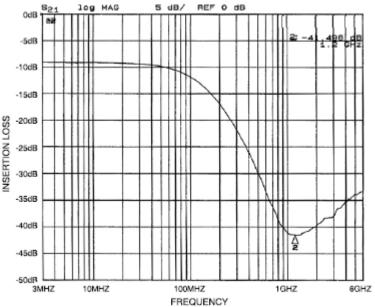


Figure 4. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1636-04DE)

Performance Information (cont'd)

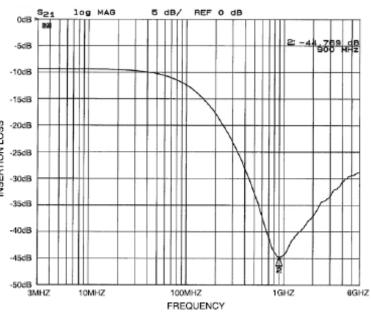
S₂₁ log MAG 5 dB/ REF 0 dB 0dB 2: -4 769 -5dB -10dB -15dB INSERTION LOSS -20dB -25dB -30dB -35dB -40dB -45dB 쑬 -50dB 3MHZ 10MHZ 100MHZ 1GHZ FREQUENCY

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

Figure 5. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1636-06DE)

5 dB/ REF 0 dB log MAG S21 0dB BX -5dB -10dB -15dB **NSERTION LOSS** -20dB -25dB -30dB -35dB -40dB -45dB -50dB 3MHZ Λł 10MHZ 100MHZ 1GHZ 6GHZ FREQUENCY

Figure 6. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1636-06DE)



Performance Information (cont'd)

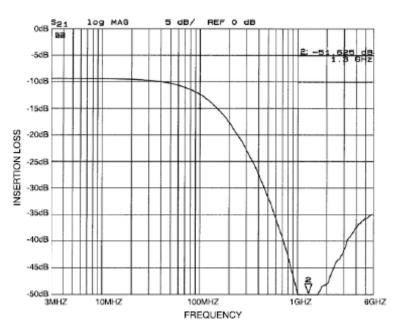


Figure 7. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1636-06DE)

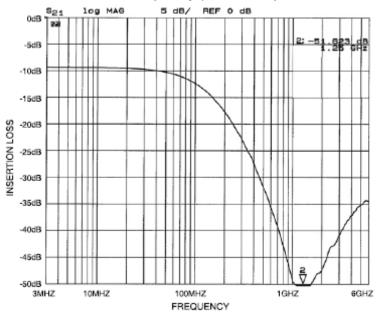


Figure 8. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1636-06DE)

Performance Information (cont'd)

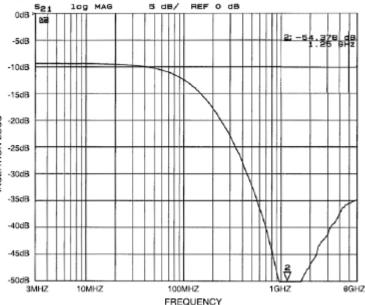
Typical Filter Performance (T_A=25°C, DC Bias=0V, 50 Ohm Environment)

109 MAG 5 dB/ REF 0 dB 521 0dB 376 -5dB -10dB -15dB -20dB INSERTION LOSS -25dB -30dB -35dB -40dB -45dB 5 -50dB 3MHZ 10MHZ 100MHZ 1GHZ FREQUENCY

Figure 9. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1636-06DE)

5 dB/ REF 0 dB 52 log MAG 0dB D¥ 2:-48,416 dB -5dB -10dB -15dB NSERTION LOSS -20dB -25dB -30dB -35dB -40dB -45dB -50dB 10MHZ 100MHZ 3MHZ 6GHZ 1GHZ FREQUENCY

Figure 10. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1636-06DE)



Performance Information (cont'd)

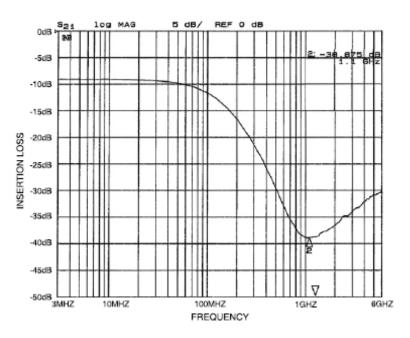


Figure 11. Insertion Loss vs. Frequency (FILTER1 Input to GND, CM1636-08DE)

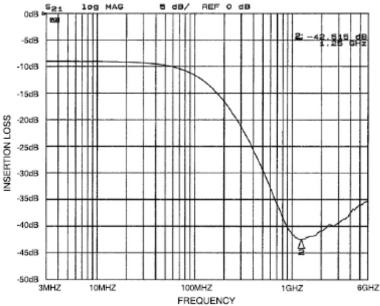


Figure 12. Insertion Loss vs. Frequency (FILTER2 Input to GND, CM1636-08DE)

Performance Information (cont'd)

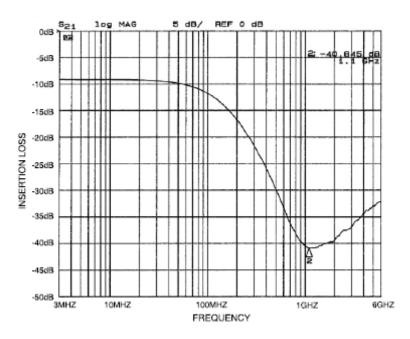


Figure 13. Insertion Loss vs. Frequency (FILTER3 Input to GND, CM1636-08DE)

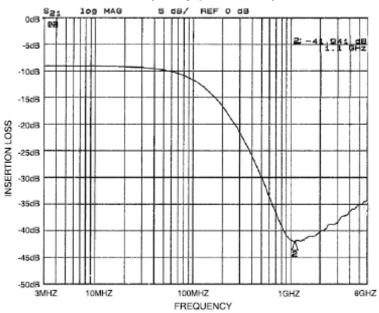


Figure 14. Insertion Loss vs. Frequency (FILTER4 Input to GND, CM1636-08DE)

Performance Information (cont'd)

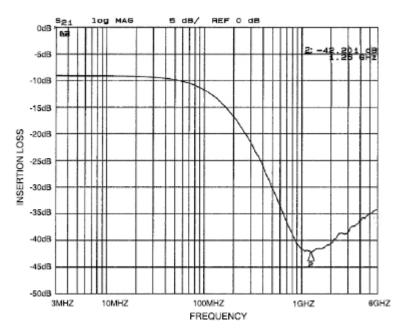


Figure 15. Insertion Loss vs. Frequency (FILTER5 Input to GND, CM1636-08DE)

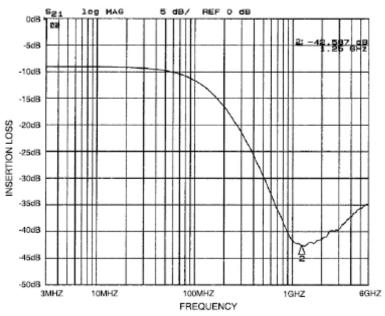
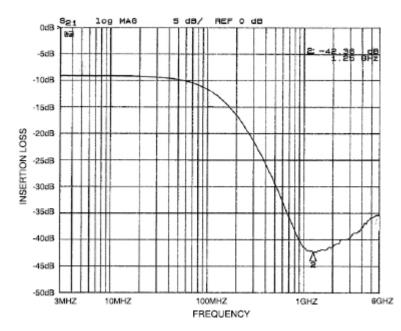


Figure 16. Insertion Loss vs. Frequency (FILTER6 Input to GND, CM1636-08DE)

Performance Information (cont'd)





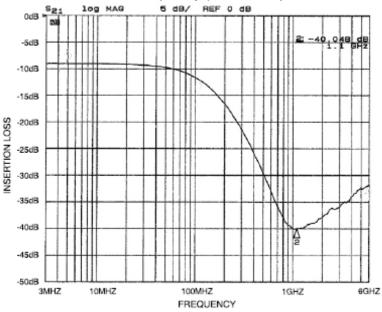


Figure 18. Insertion Loss vs. Frequency (FILTER8 Input to GND, CM1636-08DE)

Performance Information (cont'd)

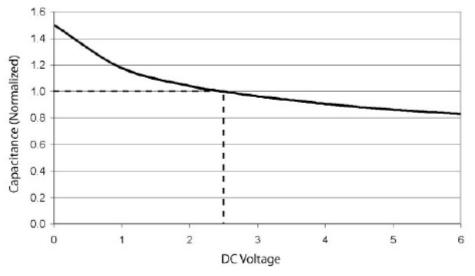


Figure 19. Filter Capacitance vs. Input Voltage over Temperature (normalized to capacitance at 2.5VDC and 25°C)

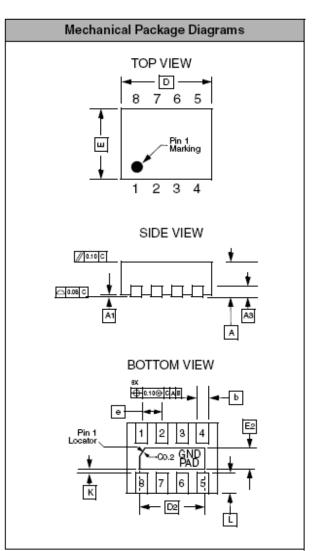
Mechanical Details

UDFN-08 Mechanical Specifications

Dimensions for the CM1636 supplied in a 8-lead, 0.4mm pitch UDFN package are presented below.

	PAC	KAGE	DIME	NSIO	NS				
Package		uDFN							
JEDEC No.			MO-	229C [*]					
Leads				8					
Dim.	N	lillimete	rs		Inches				
Dini.	Min	Nom	Max	Min	Nom	Max			
Α	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	С).127 RE	F	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			
е	(0.40 BS	0	C	0.016 BS	C			
к	l	0.22 RE	F	C	.009 RE	F			
L	0.15	0.25	0.35	0.006	0.010	0.014			
# per tape and reel			3000	pieces					
	Contro	olling din	nension:	millime	ters				

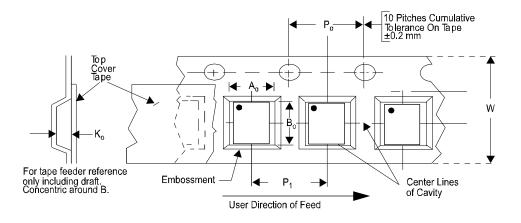
^{*}This package is compliant with JEDEC standard MO-229C with the exception of the D, D2, E, E2, K and L dimensions as called out in the table above.



Dimensions for 8-Lead, 0.4mm pitch uDFN package

Tape and Reel Specifications

PART NUMBER	PACKAGE SIZE (mm)	POCKET SIZE (mm) B _o X A _o X K _o	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P₀	P₁
CM1636-04DE	1.70 X 1.35 X 0.50	1.95 X 1.60 X 0.60	8mm	178mm (7")	3000	4mm	4mm



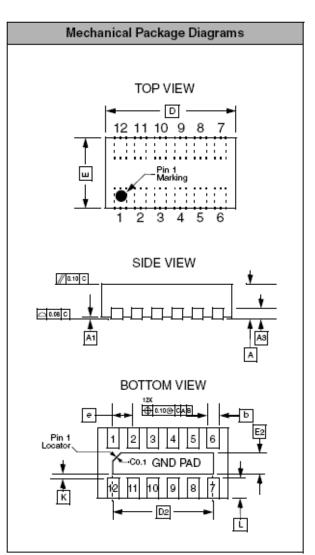
Mechanical Details (cont'd)

UDFN-12 Mechanical Specifications

Dimensions for the CM1636 suplied in a 12-lead, 0.4mm pitch UDFN package are presented below.

	PAC	KAGE	DIME	NSIO	NS		
Package			uĽ	DFN			
JEDEC No.			MO-2	229C [*]			
Leads			1	12			
Dim.	N	lillimete	rs		Inches		
Dini.	Min	Nom	Max	Min	Nom	Max	
А	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	C).127 RE	F	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	
е	(0.40 BS	C	C	0.016 BS	С	
к		0.22 RE	F	C	.009 RE	F	
L	0.15	0.25	0.35	0.006	0.010	0.014	
# per tape and reel		3000 pieces					
	Contro	olling din	nension:	millime	ters		

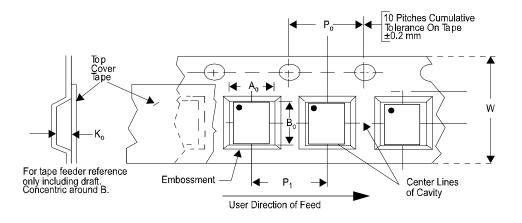
^{*}This package is compliant with JEDEC standard MO-229C with the exception of the D, D2, E, E2, K and L dimensions as called out in the table above.



Dimensions for 12-Lead, 0.4mm pitch uDFN package

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	P₀	P₁
CM1636-06DE	2.50 X 1.35 X 0.50	2.75 X 1.60 X 0.60	8mm	178mm (7")	3000	4mm	4mm



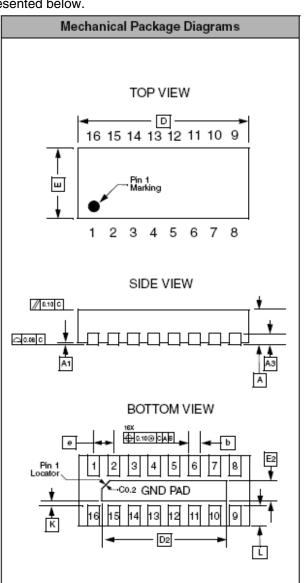
Mechanical Details (cont'd)

UDFN-16 Mechanical Specifications

Dimensions for the CM1636 suplied in a 16-lead, 0.4mm pitch UDFN package are presented below. The 16-lead, 0.4mm pitch uDFN package dimensions are presented below.

	PAC	KAGE	DIME	NSIO	NS				
Package		uDFN							
JEDEC No.			MO-2	229C [*]					
Leads			1	16					
Dim.	N	lillimete	rs		Inches				
Dini.	Min	Nom	Max	Min	Nom	Max			
А	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	С).127 RE	F	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			
е	(0.40 BS	С	C	0.016 BS	С			
к	(0.22 RE	F	C	.009 RE	F			
L	0.15	0.25	0.35	0.006	0.010	0.014			
# per tape and reel		3000 pieces							
	Contro	olling dim	nension:	millime	ters				

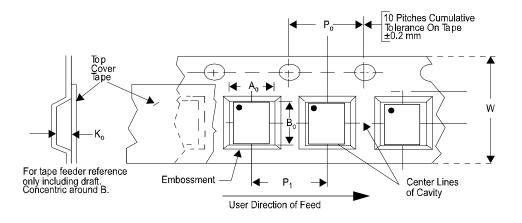
^{*}This package is compliant with JEDEC standard MO-229C with the exception of the D, D2, E, E2, K and L dimensions as called out in the table above.



Dimensions for 16-Lead, 0.4mm pitch uDFN package

Tape and Reel Specifications

PART NUMBER	PACKAGE SIZE (mm)	POCKET SIZE (mm) B _o X A _o X K _o	TAPE WIDTH W	REEL DIAMETER	QTY PER REEL	P₀	P ₁
CM1636-08DE	3.30 X 1.35 X 0.50	3.50 X 1.55 X 0.70	12mm	178mm (7")	3000	4mm	4mm



ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typical" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other application in which the failure of the SCILLC product create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resele in any manner.

PUBLICATION ORDERING INFORMATION

LI TERATURE FULFI LLMENT:

Literature Distribution Center for ON Semiconductor P.O. Box 5163, Denver, Colorado 80217 USA Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada Email I: orderlit@onsemi.com N. American Technical Support: 800-282-9855 Toll Free USA/Canada Europe, Middle East and Africa Technical Support: Phone: 421 33 790 2910 Japan Customer Focus Center Phone: 81-3-5773-3850

ON Semi conductor Websi te: www.onsemi.com

Order Li terature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative