



### Features

- Bidirectional EMI/RFI filtering and line termination with integrated ESD protection
- Provides ESD protection to IEC61000-4-2:
  - ±15kV contact discharge
- TVS working voltage: 5V
- Termination resistors: 40Ω
- Pull-up resistors: 25kΩ
- Typical capacitance per line: 12pF ( $V_{IN} = 2.5V$ )
- Protection and termination for six lines + Vcc
- Solid-state technology

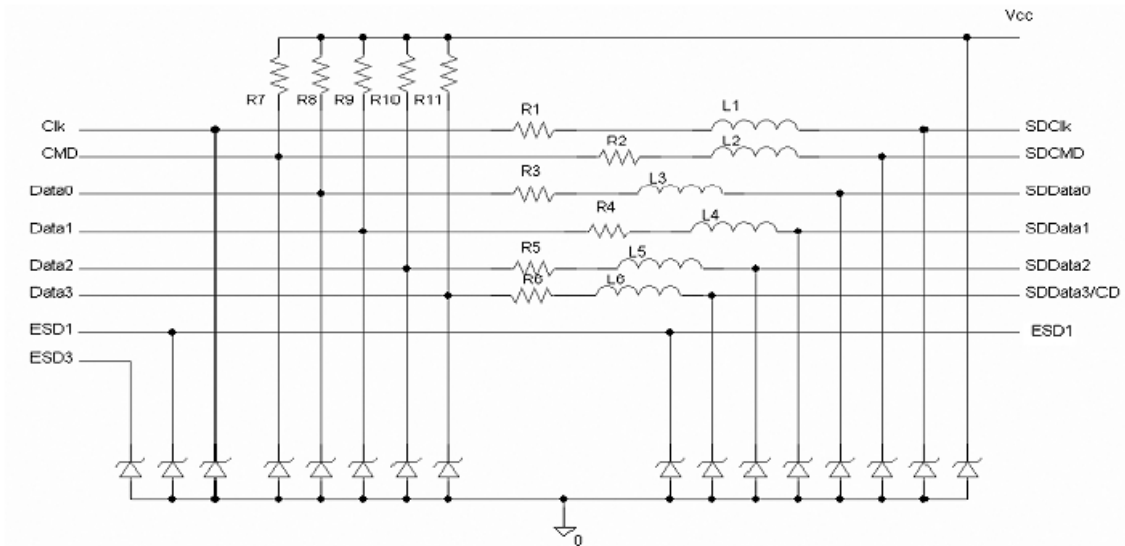
### Applications

- T-Flash / MicroSD interfaces
- MMC interfaces
- CDMA, GSM, 3G cell phones

### Mechanical Characteristics

- 0.40mm, uDFN 16-pin package
- RoHS/WEEE compliance, lead-free finish
- Nominal dimensions: 3.30 x 1.35 x 0.50mm
- Pitch: 0.4mm
- Pin-lead finish: NiPd

### Electrical Schematic



## Description

The CM1624 is a combination EMI filter and line termination device with integrated TVS diodes for use on Multimedia Card interfaces. This state-of-the-art device utilizes solid-state, silicon-avalanche technology for superior clamping performance and DC electrical characteristics. The CM1624 has been optimized for protection of T-Flash/MicroSD interfaces in cellular phones and other portable electronics.

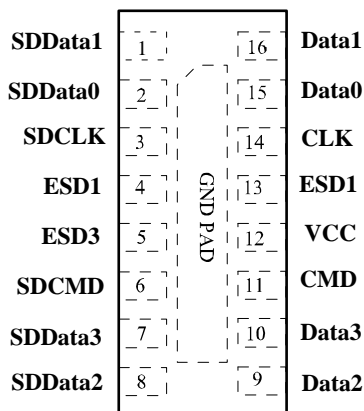
The CM1624 consists of six circuits that includes series impedance matching resistors and pull-up resistors as required by the SD specification. TVS diodes are included on each line for ESD protection. An additional TVS diode connection is included for protection of the voltage (Vcc) bus. Termination resistor value of 40Ω is provided on the SDData0, SDData1, SDData2, SDData3, CMD, and CLK lines.

Pull-up resistors of 25kΩ are included on the SDData0, SDData1, SDData2, SDData3 and CMD lines, as well. These may be configured for devices operating in SD or SPI mode. The TVS diodes provide effective suppression of ESD voltages in excess of ±15kV (contact discharge) per IEC 61000-4-2, level 4. The CM1624 is in a 16-pin, RoHS/WEEE compliant, UDFN 16-pin package. It measures 3.30 x 1.35 x 0.50mm. The leads are spaced at a pitch of 0.4mm and are finished with lead-free NiPd.

## Package/Pin Information

### PACKAGE / PINOUT DIAGRAMS

Top View



Note:

1) This drawing is not to scale.

# CM1624

## PIN DESCRIPTIONS

| Pin     | Name    | Description                                     |
|---------|---------|---|
| 1       | SDData1 | Data line #1 input/output with pull-up resistor |
| 2       | SDData0 | Data line #0 input/output with pull-up resistor |
| 3       | SDCLK   | Clock line Input/Output                         |
| 4       | ESD1    | Single ESD                                      |
| 5       | ESD3    | Single ESD                                      |
| 6       | SDCMD   | Command Line Input/Output                       |
| 7       | SDData3 | Data line #3 input/output with pull-up resistor |
| 8       | SDData2 | Data line #2 input/output with pull-up resistor |
| 9       | Data2   | Data line #2 input/output with pull-up resistor |
| 10      | Data3   | Data line #3 input/output with pull-up resistor |
| 11      | CMD     | Command Line Input/Output                       |
| 12      | VCC     | Power Supply ESD Protection                     |
| 13      | ESD1    | Single ESD                                      |
| 14      | CLK     | Clock line Input/Output                         |
| 15      | Data0   | Data line #0 input/output with pull-up resistor |
| 16      | Data1   | Data line #1 input/output with pull-up resistor |
| GND PAD | GND     | Ground return to shield                         |

## Ordering Information

### PART NUMBERING INFORMATION (Note 1)

| PIN | PACKAGE          | LEAD-FREE FINISH | Part Marking     |
|-----|------------------|------------------|------------------|
| 16  | uDFN-16 (0.40mm) | CM1624 -08DE     | 1624(x) (Note 2) |

Note 1: Parts are shipped in Tape and Reel form unless otherwise specified.

Note 2: (x) = single character date code.

## Specifications

### ABSOLUTE MAXIMUM RATINGS\*

| PARAMETER                   | RATING      | UNITS |
|-----------------------------|-------------|-------|
| Operating Temperature Range | -40 to +85  | °C    |
| Storage Temperature Range   | -55 to +150 | °C    |

\*Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)

| SYMBOL     | PARAMETER   | CONDITIONS                              | MIN      | TYP  | MAX  | UNITS      |
|------------|---|---|----------|------|------|------------|
| $R_{CH}$   | Channel Resistance (R1 to R6)   |   | 34       | 40   | 46   | $\Omega$   |
| $L_{CH}$   | Channel Inductance  |   |          | 20   |      | nH         |
| C          | Capacitance per Channel   | $V_{IN} = 0V; 1MHz; 30mV_{RMS}$         | 16       | 20   | 24   | pF         |
|            |   | $V_{IN} = 2.5V; 1MHz; 30mV_{RMS};$      |          | 12   |      | pF         |
| $R_{UP}$   | Pull-up Resistance (R7 to R11)  |   | 21       | 25   | 29   | k $\Omega$ |
| $I_{LEAK}$ | Diode Leakage Current per Channel   | $V_{IN} = 3V$                           |          | 0.1  | 0.5  | $\mu A$    |
| $V_{SIG}$  | Signal Clamp Voltage<br>Positive Clamp<br>Negative Clamp  | $I_{LOAD} = 10mA$<br>$I_{LOAD} = -10mA$ | 5.6      | 6.8  | 9.0  | V          |
|            |   |   | -1.5     | -0.8 | -0.4 | V          |
| $V_{ESD}$  | ESD Protection - Peak Discharge Voltage at any channel input, in system:<br>a) Contact discharge per IEC 61000-4-2 Standard<br>and<br>b) Air discharge per IEC 61000-4-2 Standard |   | $\pm 15$ |      |      | kV         |
|            |   |   | $\pm 15$ |      |      | kV         |
| $f_C$      | Cut-off frequency<br>$Z_{SOURCE} = 50\Omega, Z_{LOAD} = 50\Omega$   |   |          | 300  |      | MHz        |

Note 1: All parameters specified at  $T_A = 25^\circ C$  unless otherwise noted.

## Performance Information

Typical Filter Performance (nominal conditions unless specified otherwise, 50Ω Environment)

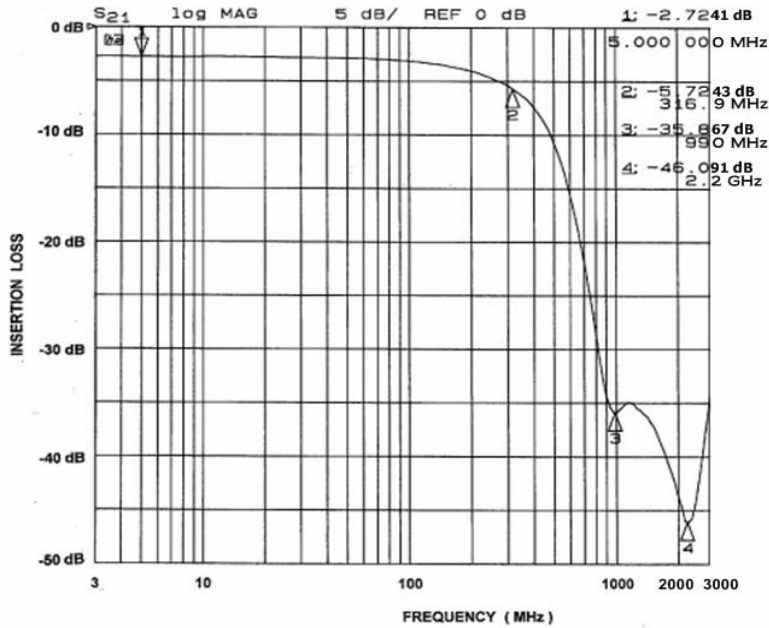


Figure 1. Insertion Loss VS. Frequency (Pins 1 and 16)

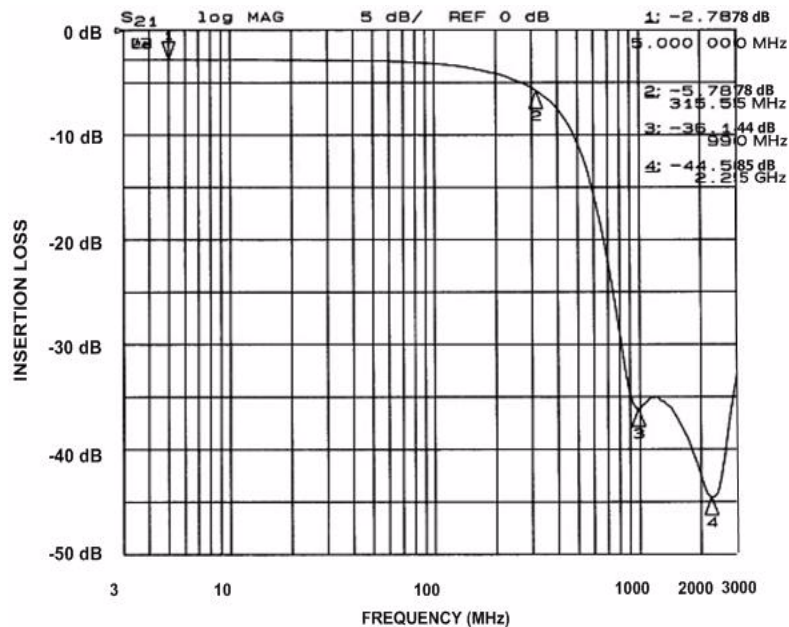


Figure 2. Insertion Loss VS. Frequency (Pins 2 and 15)

## Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50Ω Environment)

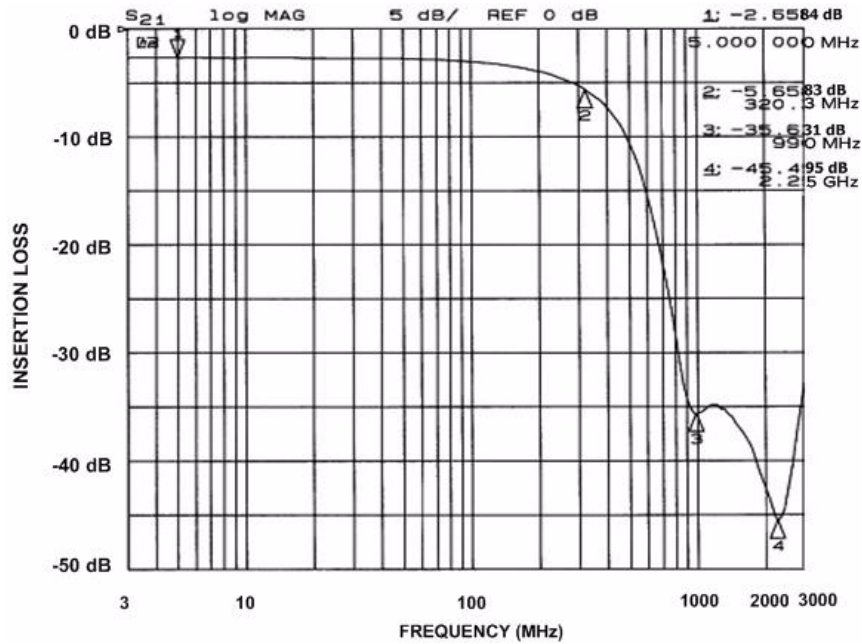


Figure 3. Insertion Loss VS. Frequency (Pins 3 and 14)

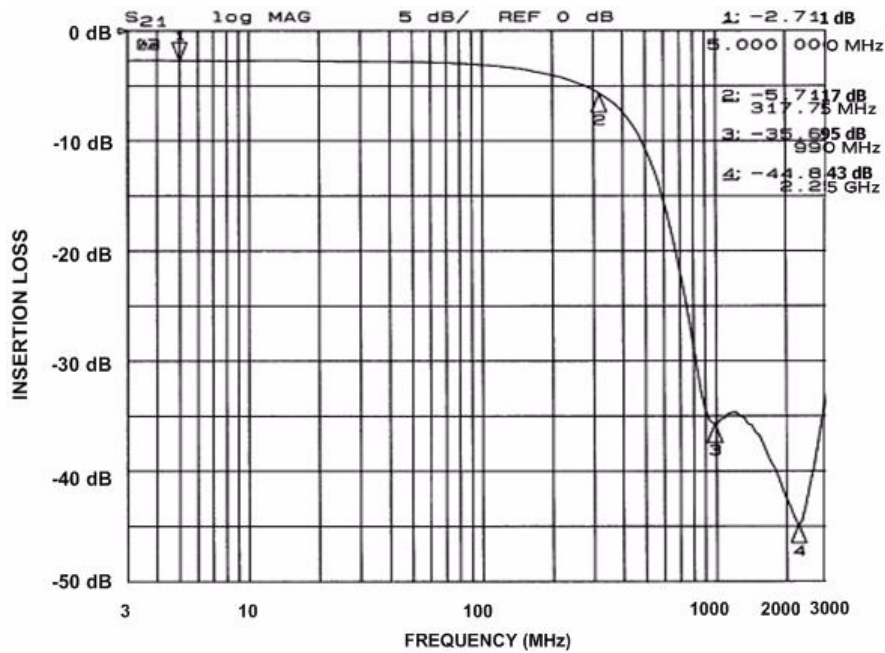


Figure 4. Insertion Loss VS. Frequency (Pins 6 and 11)

## Performance Information (cont'd)

Typical Filter Performance (nominal conditions unless specified otherwise, 50Ω Environment)

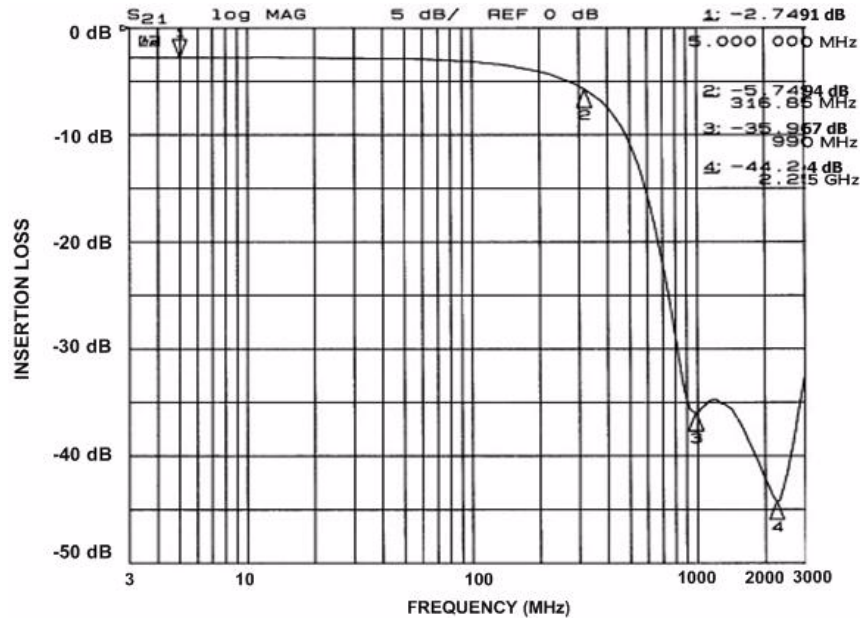


Figure 5. Insertion Loss VS. Frequency (Pins 7 and 10)

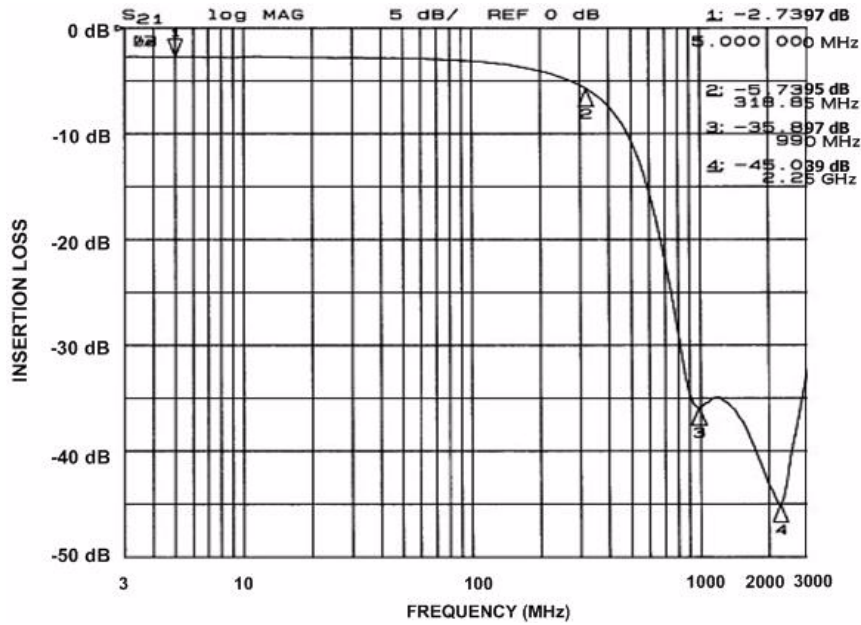


Figure 6. Insertion Loss VS. Frequency (Pins 8 and 9)

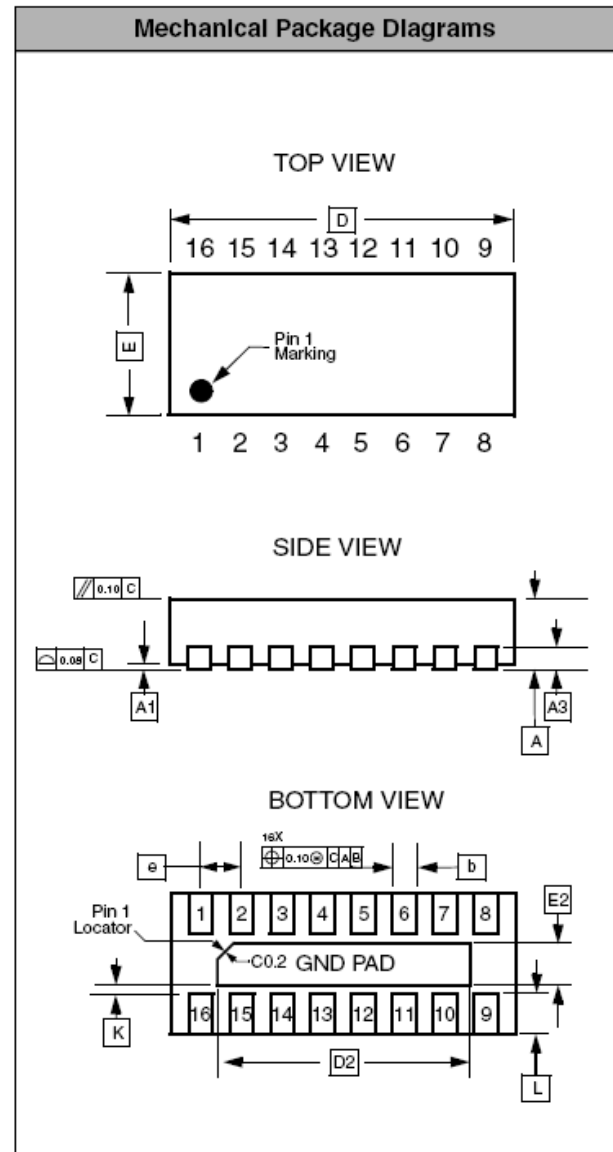
## Mechanical Details

### µDFN-16 Mechanical Specifications, 0.4mm

The 16-lead, 0.4mm pitch µDFN package dimensions are presented below.

| PACKAGE DIMENSIONS                 |             |      |      |           |       |       |
|------------------------------------|-------------|------|------|-----------|-------|-------|
| Package                            | µDFN        |      |      |           |       |       |
| 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 |             |      |      |           |       |       |

\*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.



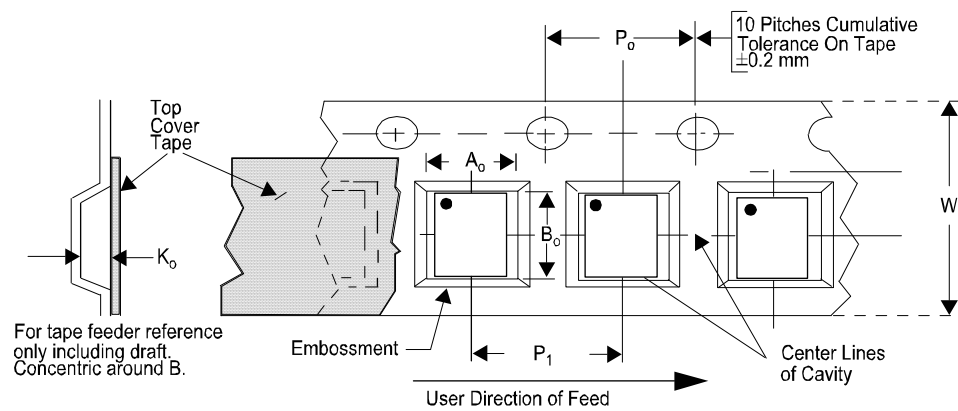
Dimensions for 16-Lead, 0.4mm pitch µDFN package




# CM1624

## Tape and Reel Specifications

| PART NUMBER  | PACKAGE SIZE (mm)  | POCKET SIZE (mm)<br>$B_o \times A_o \times K_o$ | TAPE WIDTH<br>W | REEL DIAMETER | QTY PER REEL | $P_o$ | $P_1$ |
|--------------|--------------------|---|-----------------|---------------|--------------|-------|-------|
| CM1624 -08DE | 3.30 X 1.35 X 0.50 | 3.50 X 1.55 X 0.70                              | 12mm            | 178mm (7")    | 3000         | 4mm   | 4mm   |



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Телефон: 8 (812) 309-75-97 (многоканальный)

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