ON Semiconductor®

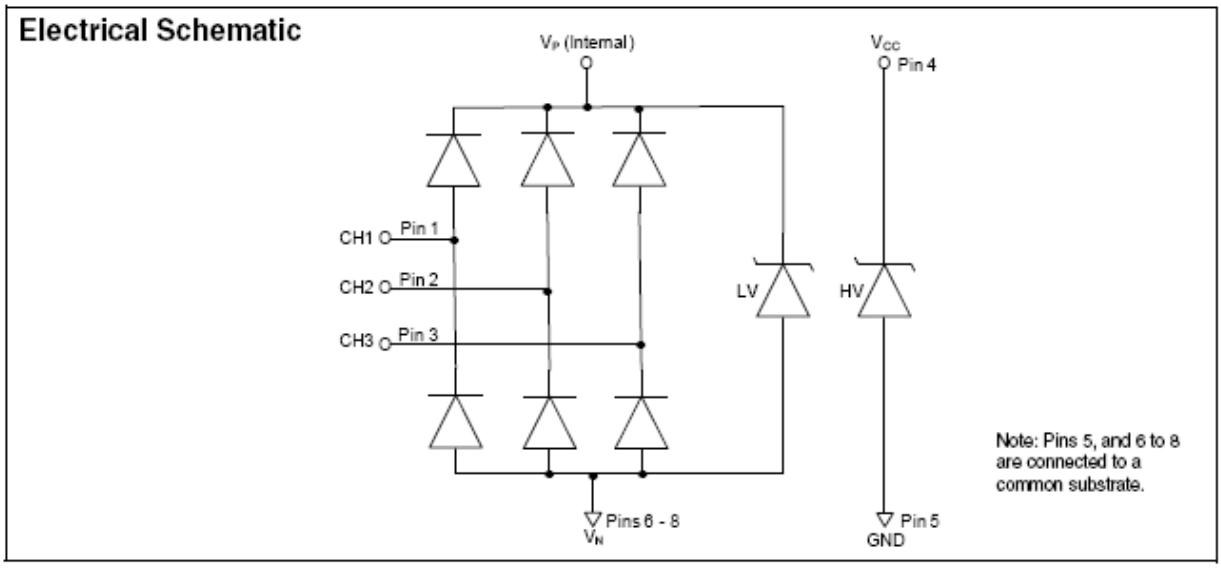
4-Channel Low Capacitance Dual-Voltage ESD Protection Array

CM1641

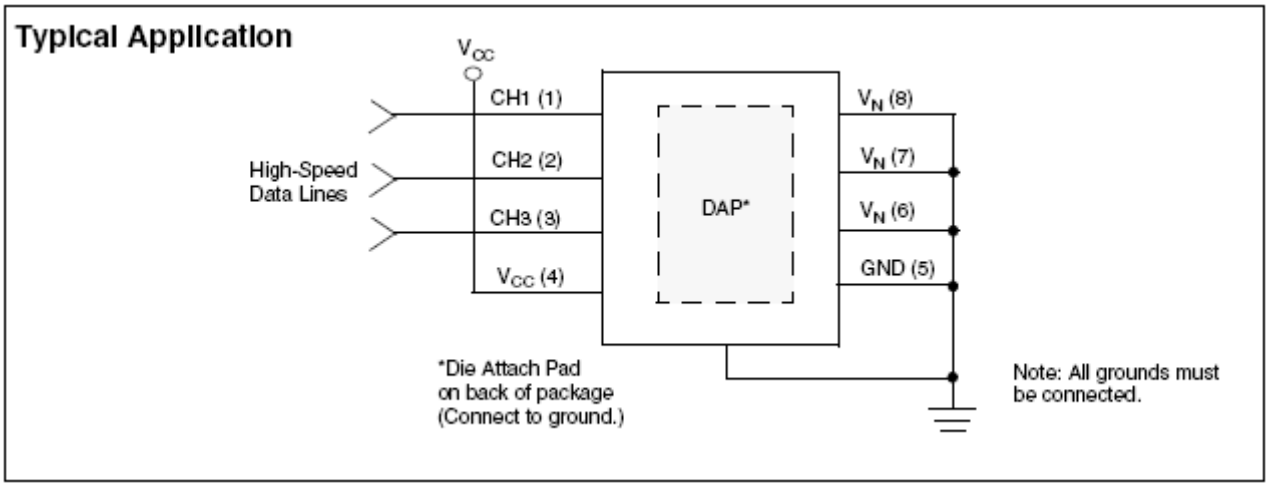
Features

- Three channels of low voltage ESD protection
- One channel of high voltage ESD protection
- Provides ESD protection to IEC61000-4-2 Level 4:
  ±8kV contact discharge (Pins 1-3)
  ±15kV contact discharge (Pin 4)
- Low channel input capacitance
- Minimal capacitance change with temperature and voltage
- High voltage zener diode protects supply rail
- No need for external bypass capacitors
- Each I/O pin can withstand over 1000 ESD strikes*
- RoHS compliant, lead-free finish

Electrical Schematic



Typical Application



*Standard test condition is IEC61000-4-2 level 4 test circuit with each pin subjected to ±8kV contact discharge for 1000 pulses. Discharges are timed at 1 second intervals and all 1000 strikes are completed in one continuous test run. The part is then subjected to standard production test to verify that all of the tested parameters are within spec after the 1000 strikes.

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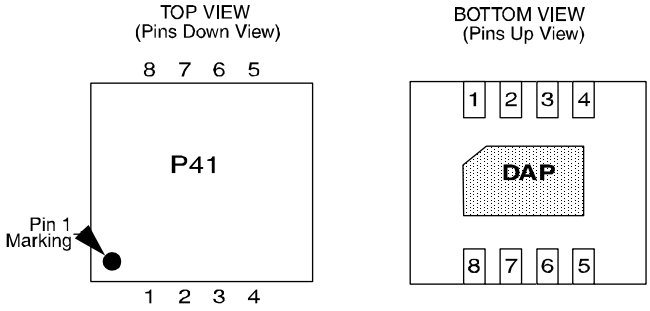
Publication Order Number:
CM1641/D

PACKAGE / PINOUT DIAGRAMS



8-Lead uDFN

Note: These drawings are not to scale.

Pin Descriptions

4-CHANNEL, 8-LEAD, UDFN-8 PACKAGE

Pin	Name	Type	Description
1	CH1	I/0	LV Low-capacitance ESD Channel
2	CH2	I/0	LV Low-capacitance ESD Channel
3	CH3	I/0	LV Low-capacitance ESD Channel
4	V_{CC}	HV V_{DD}	HV ESD Channel
5	GND		Ground
6	V_N		Negative Voltage Supply Rail
7	V_N		Negative Voltage Supply Rail
8	V_N		Negative Voltage Supply Rail
DAP	GND		Die Attach Pad (Ground)

Ordering Information

PART NUMBERING INFORMATION				
# of Channels	Leads	Package	Lead-free Finish	
			Ordering Part Number[1]	Part Marking
4	8	UDFN-8, 0.4mm	CM1641-04D4	P41

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

Specifications

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	RATING	UNITS
DC Voltage on Low-voltage Pins	6.0	V
DC Voltage on High-voltage Pins (V_{CC} pin)	14.5	V
Operating Temperature Range	–40 to +85	℃
Storage Temperature Range	–65 to +150	℃

STANDARD OPERATING CONDITIONS		
PARAMETER	RATING	UNITS
Operating Temperature Range	–40 to +85	℃

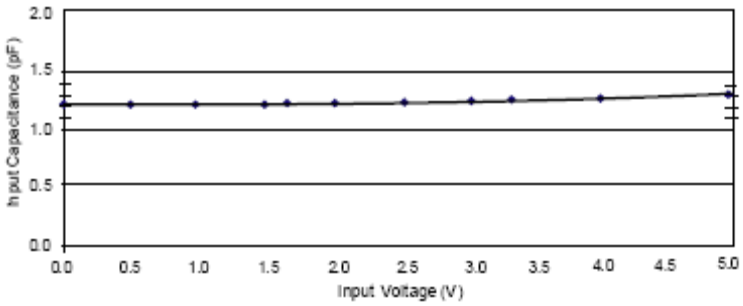
ELECTRICAL OPERATING CHARACTERISTICS (SEE NOTE 1)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_F	LV Diode Reverse Voltage (Positive Voltage)	I_F = 10mA; T_A = 25°C	6.8	8.2	9.2	V
	LV Diode Forward Voltage (Negative Voltage)	I_F = 10mA; T_A = 25°C	–1.05	–0.9	–0.6	V
I_{LEAK}	LV Channel Leakage Current	T_A = -30°C to 65°C; VIN= 3.3V, V_N=0V			100	nA
C_{IN}	LV Channel Input Capacitance	At 1 MHz, V_N=0V, VIN=1.65V		1.2	1.5	pF
ΔC_{IN}	LV Channel Input Capacitance Matching	At 1 MHz, V_N=0V, VIN=1.65V		0.02		pF
I_{LEAK_HV}	HV Channel Leakage Current	T_A=25°C; V_{CC}=11V, V_N=0V		0.1	1.0	μA
C_{IN_HV}	HV Channel Input Capacitance	At 1 MHz, V_N=0V, VIN=2.5V		53		pF
V_{F_HV}	HV Diode Breakdown Voltage Positive Voltage	I_F = 10mA; T_A=25°C	14.6		17.7	V
V_{ESD}	ESD Protection Peak Discharge Voltage at any channel input, in system Contact discharge per IEC 61000-4-2 standard	T_A=25°C	 ±8 (Pin 1-3) ±15 (Pin 4)			 kV kV
V_{CL}	LV Channel Clamp Voltage (Pin 1-3) Positive Transients Negative Transients	T_A=25°C, I_{PP} = 1A, t_P = 8/20μS		 +9.64 –1.75		 V V
R_{DYN}	Dynamic Resistance LV Channel Positive Transients LV Channel Negative Transients HV Channel Positive Transients HV Channel Negative Transients	I_{PP} = 1A, t_P = 8/20μS Any I/O pin to Ground;		 0.72 0.59 1.20 0.36		 Ω Ω Ω Ω

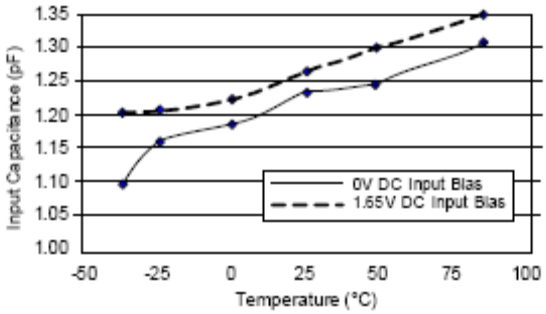
Note 1: All parameters specified at T_A = –40°C to +85°C unless otherwise noted.

Performance Information

Input channel capacitance performance curves for low voltage pins



Typical Variation of C_{IN} vs. VIN
(Low voltage inputs, f=1MHz, V_N = 0V)



Typical Variation of C_{IN} vs. Temp
(Low voltage inputs, f=1MHz, V_N = 0V)

Performance Information (cont'd)

Typical filter performance for low voltage pins

Nominal conditions unless specified otherwise, 50 ohm environment.

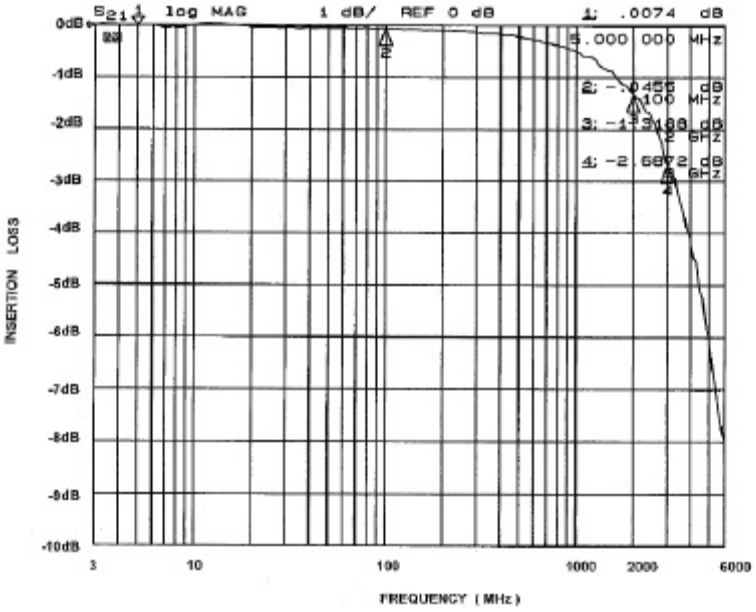


Figure 1. Channel 1 Vs. All GND Pins (0V DC Bias)

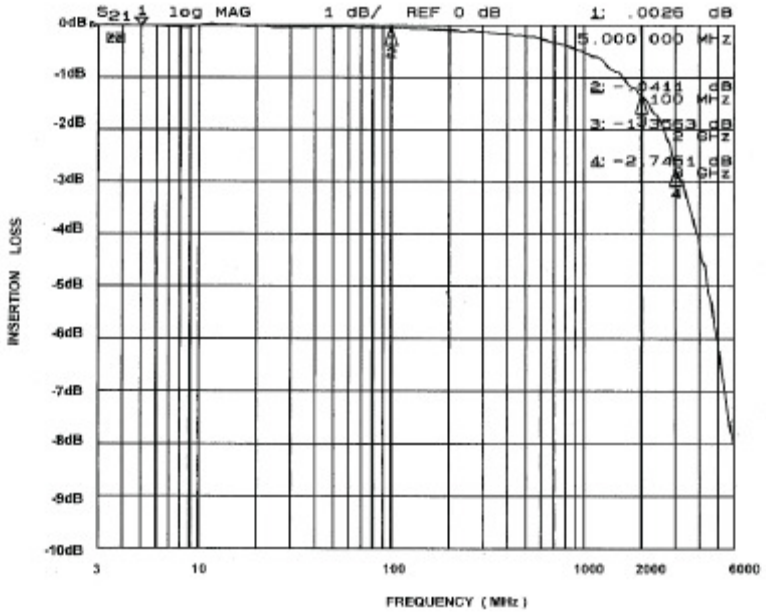


Figure 2. Channel 2 Vs. All GND Pins (0V DC Bias)

Performance Information (cont'd)

Typical filter performance for low voltage pins

Nominal conditions unless specified otherwise, 50 ohm environment.

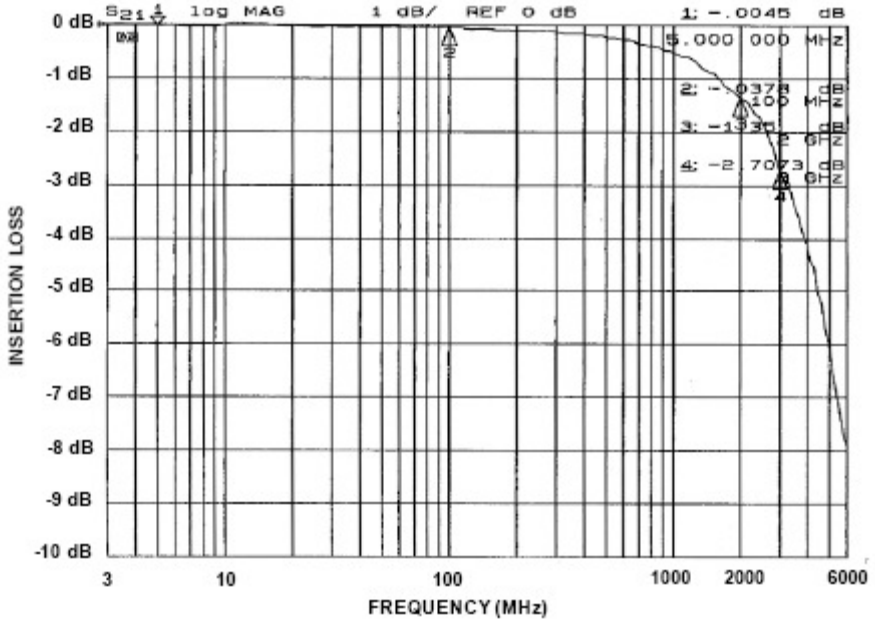


Figure 3. Channel 3 Vs. All GND Pins (0V DC Bias)

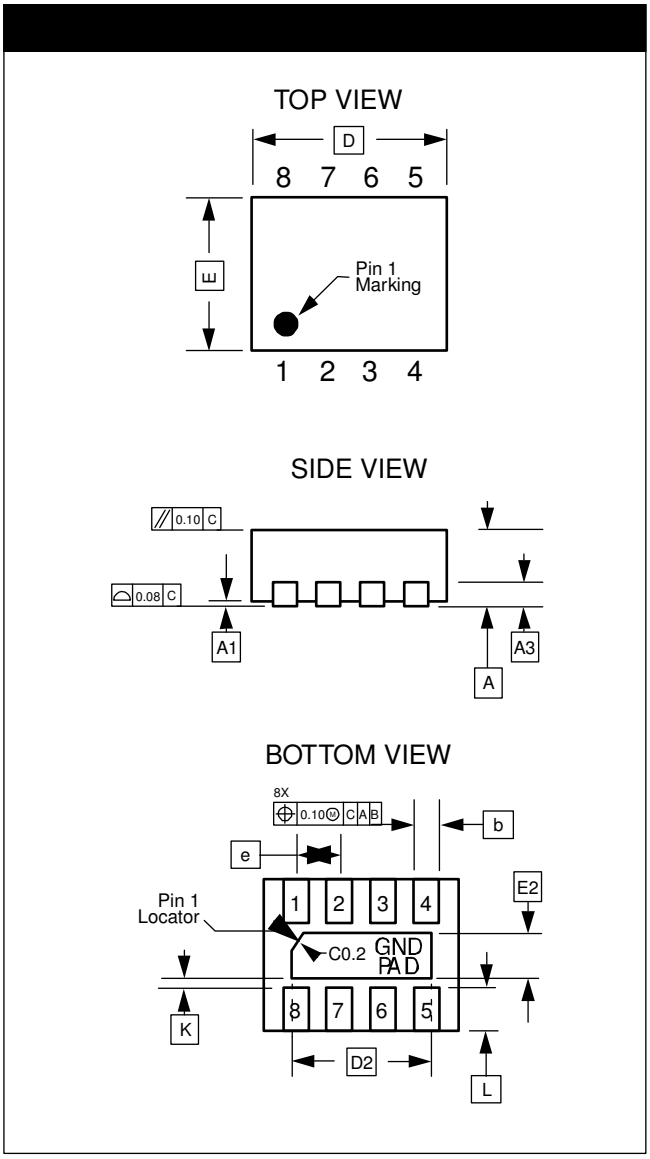
Mechanical Details

uDFN-08 Mechanical Specifications, 0.4mm

The 8-lead, 0.4mm pitch uDFN package dimensions are presented below.

PACKAGE DIMENSIONS						
Package	uDFN					
JEDEC No.	MO-229C*					
Leads	8					
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	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
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						

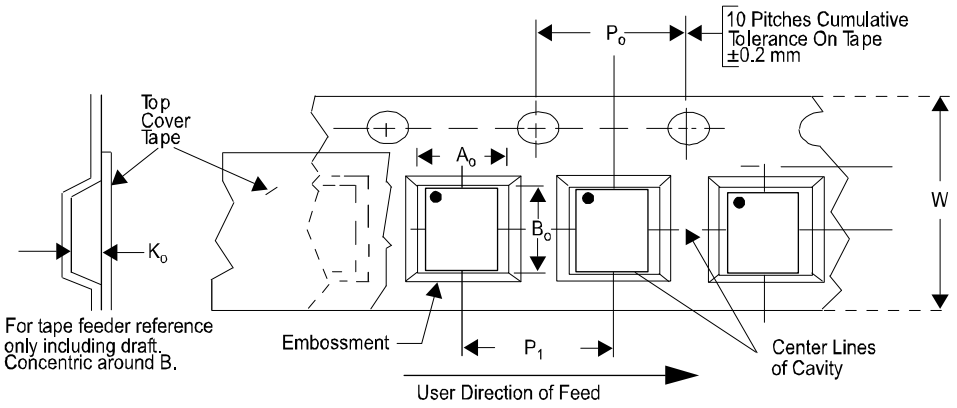
*This package is compliant with JEDEC standard MO-229C with the exception of the D, D2, E, E2, K and L dimensions as called out in the table above.



Dimensions for 8-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	P_0	P_1
CM1641	1.70 X 1.35 X 0.50	1.95 X 1.60 X 0.60	8mm	178mm (7")	3000	4mm	4mm



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