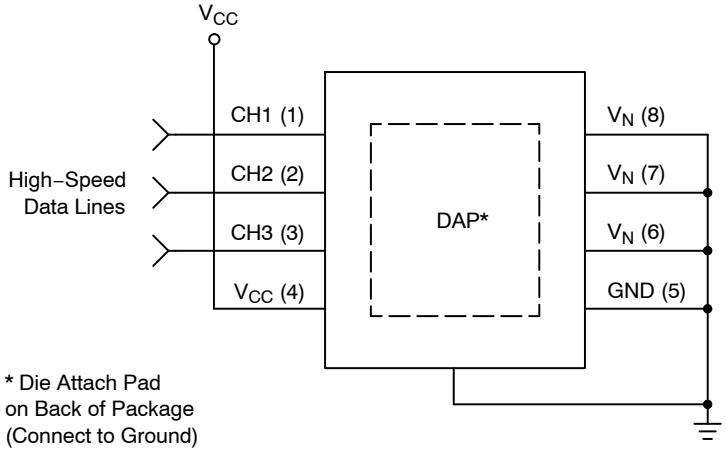
CM1641

4-Channel Low Capacitance Dual-Voltage ESD Protection Array

Features

- Three Channels of Low Voltage ESD Protection
- One Channel of High Voltage ESD Protection
- Provides ESD Protection to IEC61000−4−2 Level 4:
  - ♦ ±8 kV Contact Discharge (Pins 1−3)
  - ♦ ±15 kV 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*
- These Devices are Pb−Free and are RoHS Compliant

TYPICAL APPLICATION



* Die Attach Pad on Back of Package (Connect to Ground)

Note: All grounds must be connected.

ON Semiconductor®

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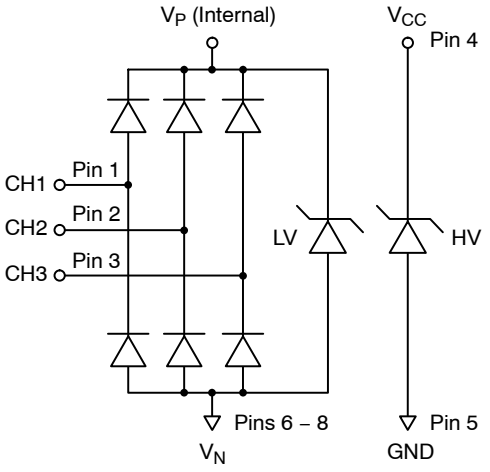
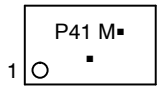
UDFN8
D4 SUFFIX
CASE 517BC

ELECTRICAL SCHEMATIC



Note: Pins 5 and 6 to 8 are connected to a common substrate.

MARKING DIAGRAM



P41 = CM1641−04D4
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
CM1641−04D4	UDFN−8 0.4 mm (Pb−Free)	3000/Tape & Reel

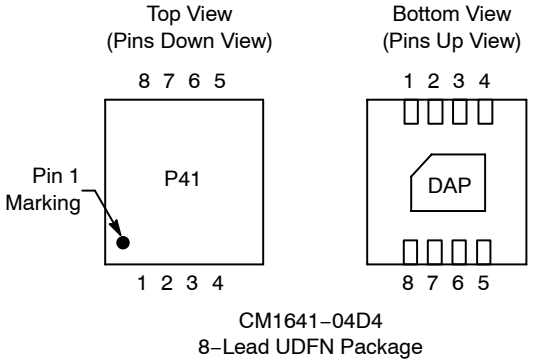
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

*Standard test condition is IEC61000−4−2 level 4 test circuit with each pin subjected to ±8 kV 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.

Table 1. PIN DESCRIPTIONS

4−Channel, 8−Lead, UDFN−8 Package			
Pin	**Name**	**Type**	**Description**
1	CH1	I/O	LV Low−capacitance ESD Channel
2	CH2	I/O	LV Low−capacitance ESD Channel
3	CH3	I/O	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)

PACKAGE / PINOUT DIAGRAMS



CM1641−04D4
8−Lead UDFN Package

SPECIFICATIONS

Table 2. 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
Storage Temperature Range	−65 to +150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 3. STANDARD OPERATING CONDITIONS

Parameter	Rating	Units
Operating Temperature Range	−40 to +85	°C

Table 4. ELECTRICAL OPERATING CHARACTERISTICS (Note 1)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_F	LV Diode Reverse Voltage (Positive Voltage)	I_F = 10 mA, T_A = 25°C	6.8	8.2	9.2	V
	LV Diode Forward Voltage (Negative Voltage)	I_F = 10 mA, T_A = 25°C	−1.05	−0.90	−0.60	
I_{LEAK}	LV Channel Leakage Current	T_A = −30°C to 65°C, V_{IN} = 3.3 V V_N = 0 V			100	nA
C_{IN}	LV Channel Input Capacitance	At 1 MHz, V_N = 0 V, V_{IN} = 1.65 V		1.2	1.5	pF
ΔC_{IN}	LV Channel Input Capacitance Matching	At 1 MHz, V_N = 0 V, V_{IN} = 1.65 V		0.02		pF
I_{LEAK_HV}	HV Channel Leakage Current	T_A = 25°C, V_{CC} = 11 V, V_N = 0 V		0.1	1.0	μA
C_{IN_HV}	HV Channel Input Capacitance	At 1 MHz, V_N = 0 V, V_{IN} = 2.5 V		53		pF
V_{F_HV}	HV Diode Breakdown Voltage Positive Voltage	I_F = 10 mA, 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

Table 4. ELECTRICAL OPERATING CHARACTERISTICS (Note 1)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{CL}	LV Channel Clamp Voltage (Pin 1−3) Positive Transients Negative Transients	 T_A = 25°C, I_{PP} = 1 A, t_P = 8/20 μS		 +9.64 −1.75		V
R_{DYN}	Dynamic Resistance LV Channel Positive Transients LV Channel Negative Transients HV Channel Positive Transients HV Channel Negative Transients	I_{PP} = 1 A, t_P = 8/20 μS Any I/O Pin to Ground		 0.72 0.59 1.20 0.36		Ω

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

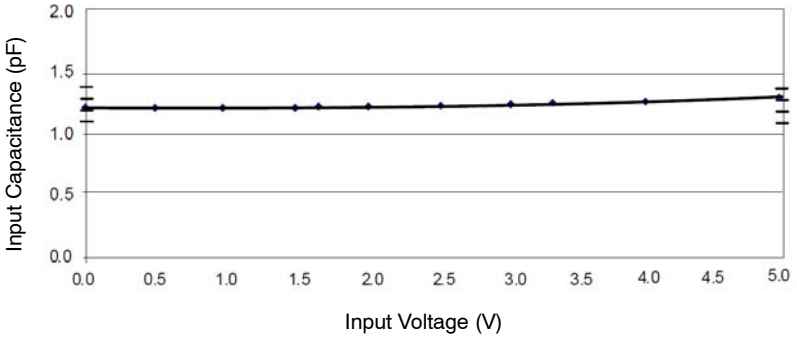


Figure 1. Typical Variation of C_{IN} vs. V_{IN} (Low Voltage Inputs, f = 1 MHz, V_N = 0 V)

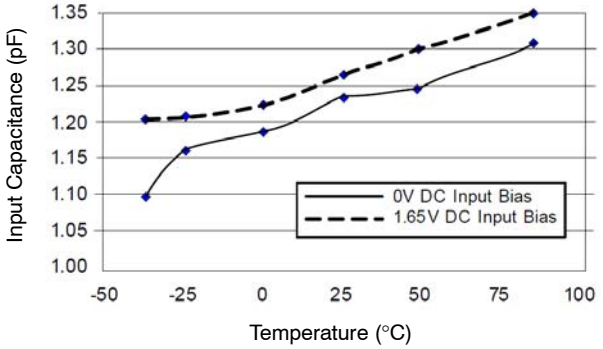


Figure 2. Typical Variation of C_{IN} vs. Temperature (Low Voltage Inputs, f = 1 MHz, V_N = 0 V)

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance for Low Voltage Pins

Nominal conditions unless specified otherwise, 50 Ω Environment.

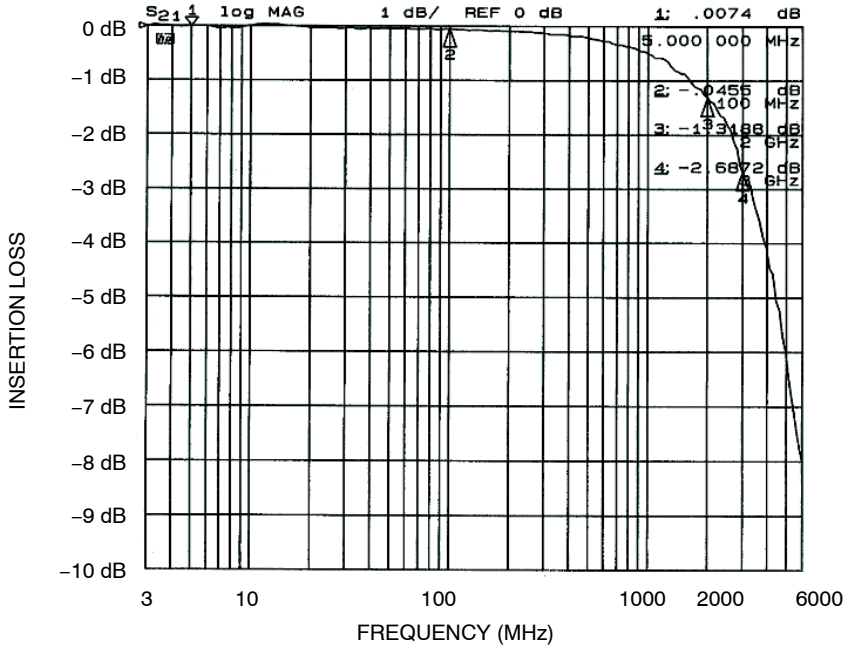


Figure 3. Channel 1 vs. All GND Pins (0 V DC Bias)

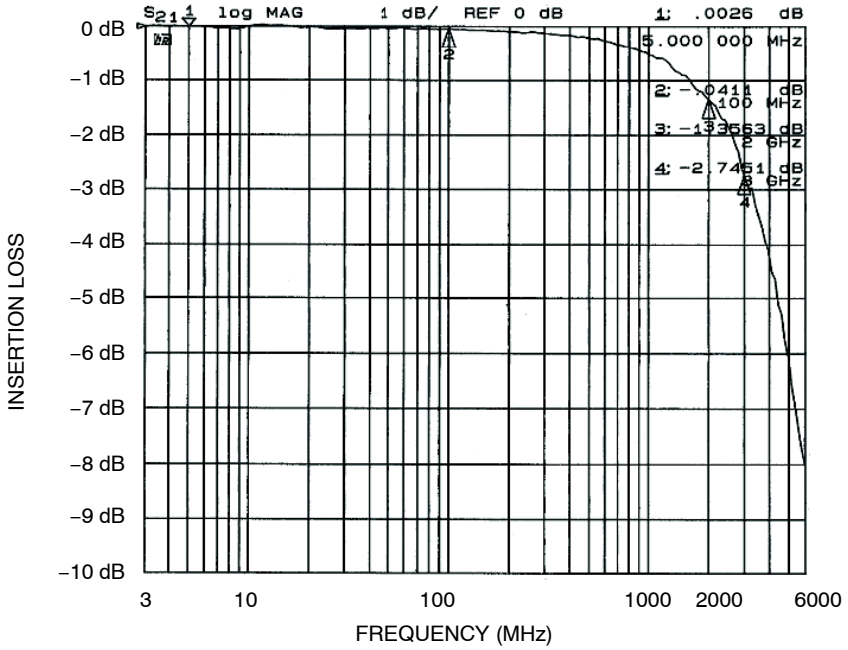


Figure 4. Channel 2 vs. All GND Pins (0 V DC Bias)

PERFORMANCE INFORMATION (Cont'd)

Typical Filter Performance for Low Voltage Pins

Nominal conditions unless specified otherwise, 50 Ω Environment.

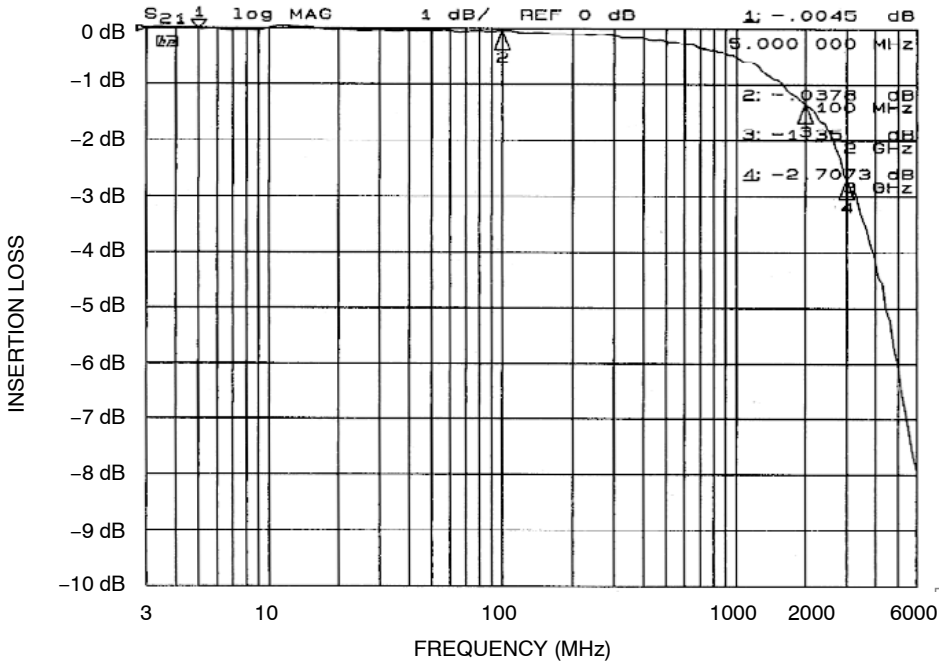
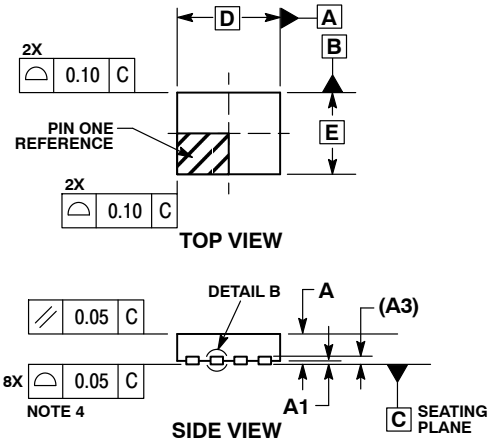
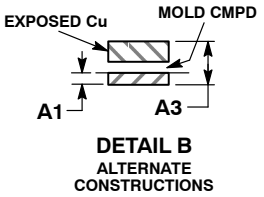


Figure 5. Channel 3 vs. All GND Pins (0 V DC Bias)

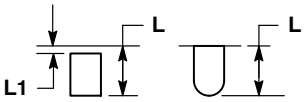
PACKAGE DIMENSIONS

UDFN8, 1.7x1.35, 0.4P
CASE 517BC−01
ISSUE O





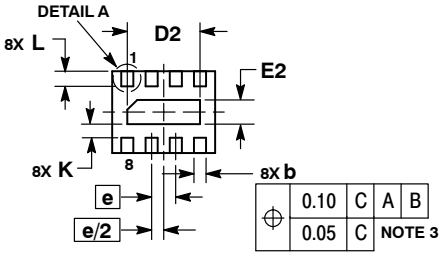
DETAIL B
ALTERNATE CONSTRUCTIONS



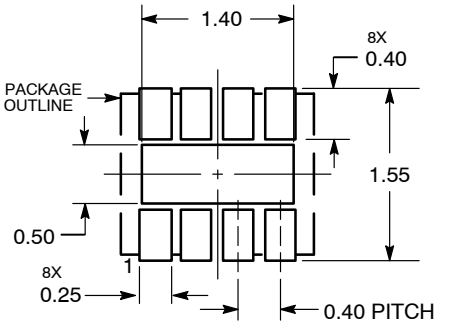
DETAIL A
ALTERNATE TERMINAL CONSTRUCTIONS

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 mm FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	1.70 BSC	
D2	1.10	1.30
E	1.35 BSC	
E2	0.30	0.50
e	0.40 BSC	
K	0.15	−−−
L	0.20	0.30
L1	−−−	0.05



RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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