

CMOS Multiplexer for Keypad Switches

Features

- Voltage drop of less than 10mV under light loads
- 100kΩ pull-up resistors on outputs
- 16-lead QFN package - 3mm x 3mm, 0.5mm pitch
- Up to 60% space saving vs. discrete solution
- Flexibility in design with "separate" outputs
- Functionally equivalent to a five-diode pair network

Applications

- Keypad switches in mobile electronics
- Enables more keys from current keyboard controller without extra I/O from chipset
- Roller pad or joystick in mobile electronic products
- Wireless Handsets
- MP3 Players
- Digital Cameras

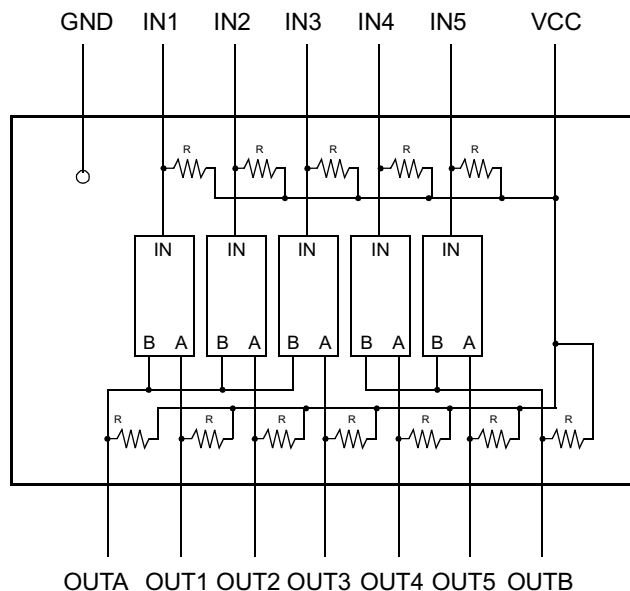
Product Description

The CM2500-05QF is a CMOS multiplexer for keypad switches available in a 16-lead QFN package. The device is functionally equivalent to a five-diode pair network. However, each channel in this network has virtually no voltage drop from input to output under light load. All inputs and outputs have an internal pull up to Vcc.

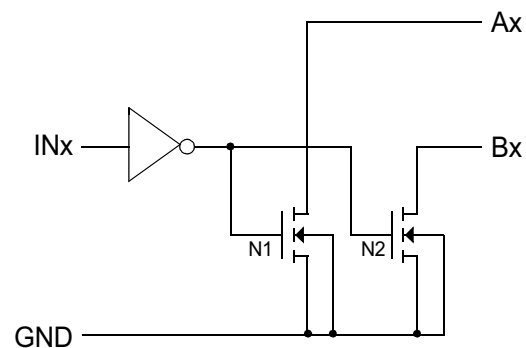
This device is particularly well suited for portable electronics (e.g. mobile handsets, PDAs, notebook computers) because of its small package format. This product is ideal for converting the logic of keypad switches where each switch pulls two sense lines low. The keypad multiplexer channels are set-up in series on the keypad sense lines such that it will interface directly to the CPU chipset.

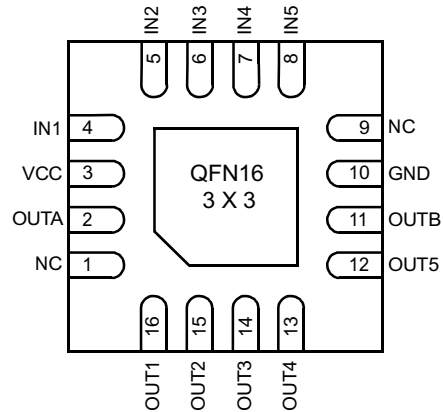
The CM2500-05QF is available in a space-saving, low-profile QFN package. This presents a 60% saving in space when compared with a discrete implementation.

Simplified Block Schematic



Simplified Module Schematic (One channel pair only)



PACKAGE / PINOUT DIAGRAM


**16-Lead QFN Package
Bottom View**

Note: This drawing is not to scale.

PIN DESCRIPTIONS

PINS	NAME	DESCRIPTION
1	NC	No internal connection.
2	OUTA	Combined "Functional OR" output of IN1, IN2 and IN3.
3	VCC	Positive supply voltage.
4	IN1	Input 1 from switch to be multiplexed.
5	IN2	Input 2 from switch to be multiplexed.
6	IN3	Input 3 from switch to be multiplexed.
7	IN4	Input 4 from switch to be multiplexed.
8	IN5	Input 5 from switch to be multiplexed.
9	NC	No internal connection.
10	GND	Negative supply voltage.
11	OUTB	Combined "Functional OR" output of IN4 and IN5.
12	OUT5	Output 5 to keypad interface lines.
13	OUT4	Output 4 to keypad interface lines.
14	OUT3	Output 3 to keypad interface lines.
15	OUT2	Output 2 to keypad interface lines.
16	OUT1	Output 1 to keypad interface lines.

Ordering Information

PART NUMBERING INFORMATION			
PADS	Package	Ordering Part Number ²	Part Marking
16	QFN16	CM2500-05QF	CM250005QF

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

Specifications

ABSOLUTE MAXIMUM RATINGS		
PARAMETER	RATING	UNITS
ESD Protection (HBM, All Pins, See Note 1)	±1600	V
V _{CC}	[GND - 0.5] to +6.0	V
V _I (Inputs and Outputs)	[GND - 0.5] to [V _{CC} + 0.5]	V
Storage Temperature Range	-65 to +150	°C
Operating Temperature Range - Junction	-40 to +150	°C
DC Package Power rating	0.5	W

Note 1: Equivalent to discharging a 100pF capacitor via a 1.5kΩ resistor (Human body model).

STANDARD (RECOMMENDED) OPERATING CONDITIONS					
SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS
V _{CC}	Supply Voltage	1.5		5.5	V
V _I	DC Input Voltage	0	-	V _{CC}	V
T _{AMB}	Ambient Operating Temperature Range	-40	-	85	°C

ELECTRICAL OPERATING CHARACTERISTICS (NOTE 1)						
Supply Pins (V _{BUS} = 4.1V to 5.5V; V _{CC} = 1.65V to 3.6V)						
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
I _{CC}	Supply quiescent current	All inputs/outputs floating		0.1	10.0	μA
R _{OUT}	OUTx Pull-up Resistance		75	100	125	kΩ
R _{IN2.7}	INx Pull-up Resistance	V _{CC} =2.7V, PIN at GND	50	100	150	kΩ
R _{IN1.8}	INx Pull-up Resistance	V _{CC} =1.8V, PIN at GND	120	240	360	kΩ
V _D	Voltage Drop (OUTx to GND)	V _{CC} =2.7V, INx = GND		10	100	mV
I _L	OUTx Leakage Current	INx floating			1.0	μA
C _P	OUTx / INx Pin Capacitance	At 2.5 Volt bias, 1 MHz			15	pF

Note 1: Operating Characteristics are over Standard Operating Conditions unless otherwise specified.

Applications Information

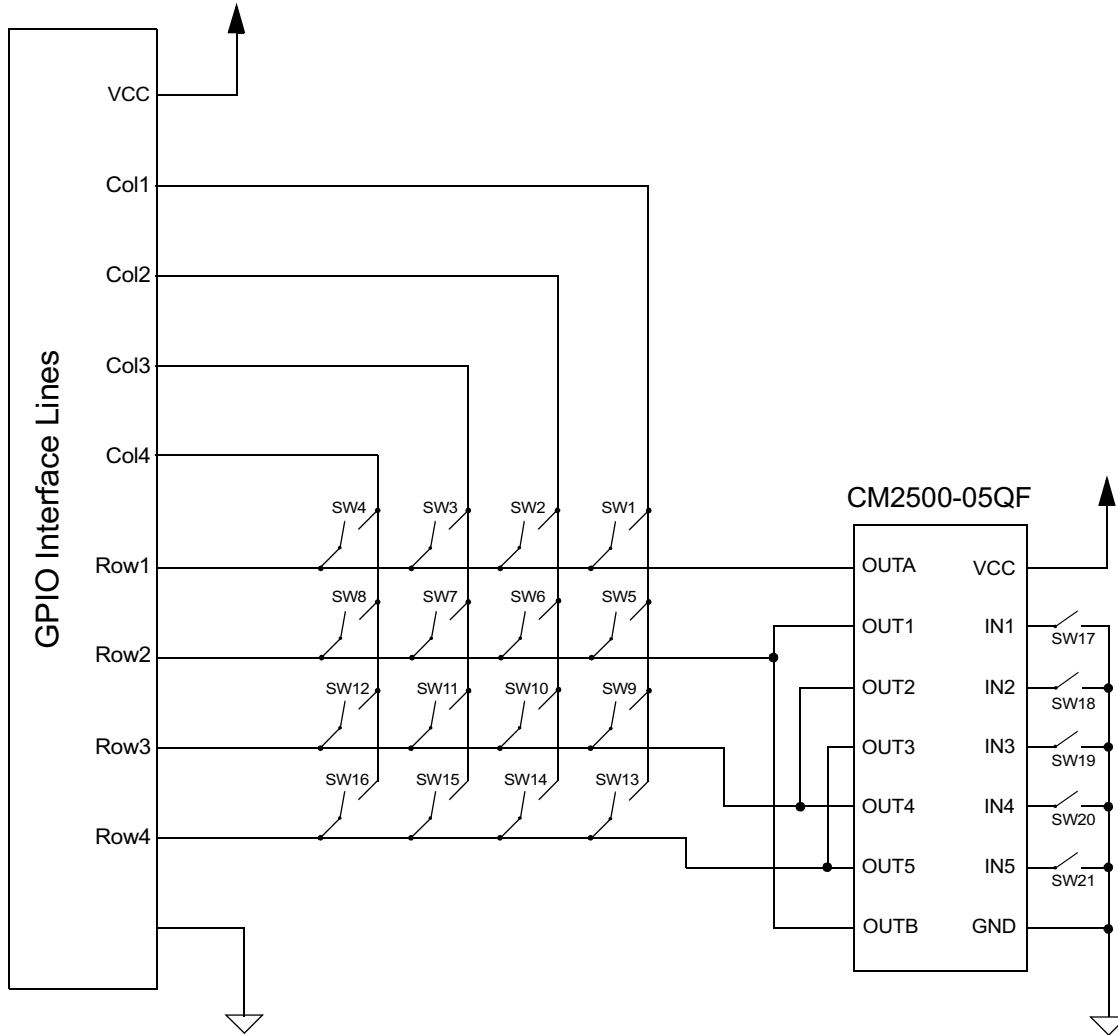


Figure 1. Typical Application for Extended 4X4 Keyboard

The CM2500-05QF can be used with just about any keypad configuration. The diagram below gives an example of an interface for a 4 column x 4 row implementation. The outputs of the CM2500-05QF have been designed to interface with nearly any type of keyboard setup provided the same methodology is used.

Basically if any one of the switches 17 to 21 are closed, it will pull down 2 row lines rather than 1. All outputs on the CM2500-05QF are open drain.

It follows in the above implementation that:

- If SW17 is closed, row 1 and 2 are pulled low.
- If SW18 is closed, row 1 and 3 are pulled low.
- If SW19 is closed, row 1 and 4 are pulled low.
- If SW20 is closed, row 2 and 3 are pulled low.
- If SW21 is closed, row 2 and 4 are pulled low.
- If SW17-SW21 are not closed, the standard scan routine is in effect (i.e., one row is pulled low)

In larger keypad implementations, multiple CM2500-05QF can be used to yield more switches.

Mechanical Details

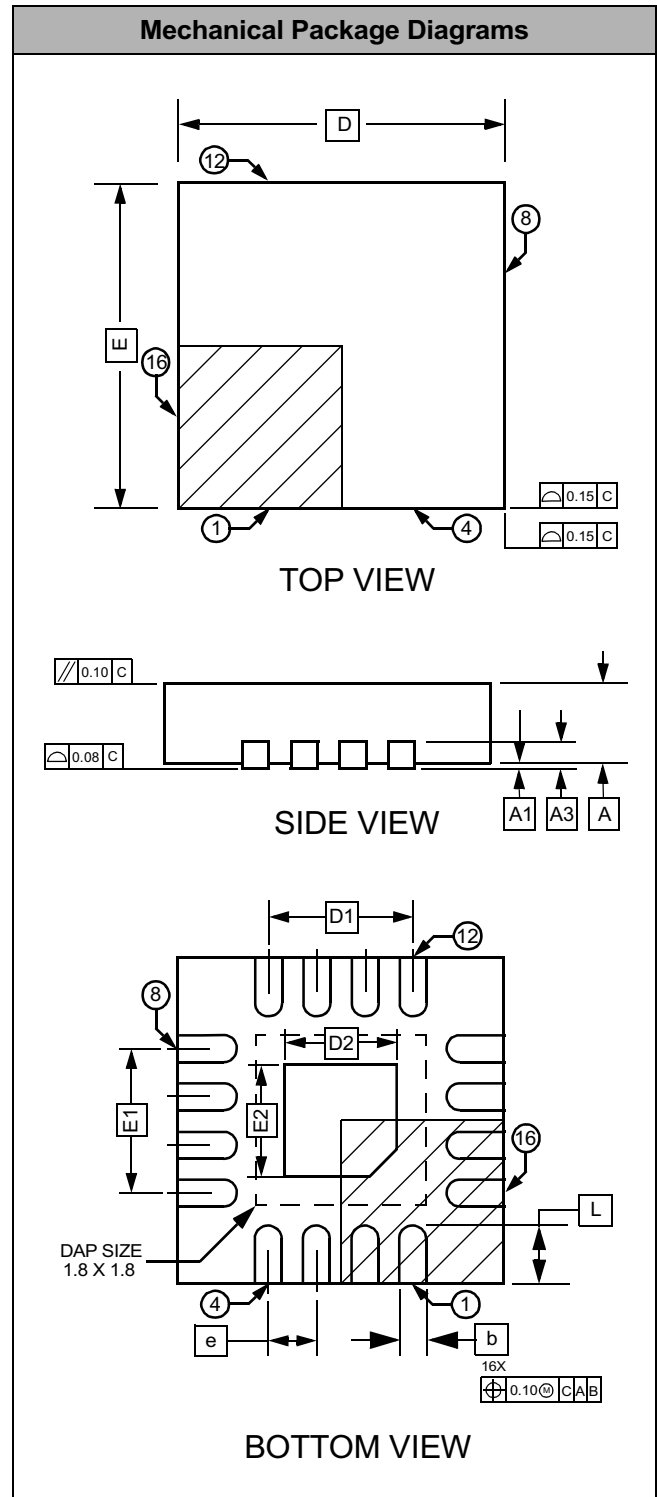
PLCC Mechanical Specifications

Dimensions for CM2500-05QF devices packaged in 16-lead QFN packages are presented below.

For complete information on the QFN16 package, see the California Micro Devices QFN Package Information document.

PACKAGE DIMENSIONS						
Package	QFN					
Leads	16					
Dim.	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.70	0.75	0.80	.028	.030	.031
A1	0.00	0.02	0.05	0.00	.001	.002
A3	0.20 REF			.008		
b	0.20	0.25	0.30	.008	.010	.012
D	2.9	3.0	3.1	.114	.118	.122
D1	1.50 REF			.059 REF		
D2	1.00	1.10	1.20	.039	.043	.047
E	2.9	3.0	3.1	.114	.118	.122
E1	1.50 REF			.059 REF		
E2	1.00	1.10	1.20	.039	.043	.047
e	0.50 TYP.			.020 TYP.		
L	0.30	0.40	0.50	.012	.016	.020
# per tape and reel	2500 pieces					
Controlling dimension: millimeters						

* This is an approximate number which may vary.



Package Dimensions for 16-Lead QFN