



MC14422

Advance Information

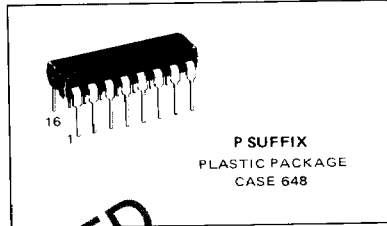
CMOS LSI
(LOW-POWER COMPLEMENTARY MOS)
REMOTE CONTROL TRANSMITTER

REMOTE CONTROL TRANSMITTER

The MC14422 is a remote control transmitter circuit designed for use in television receivers, security controls, toys, industrial remote controls, and remote control locks. The circuit is intended for use with the MC6525 or MC6526 NMOS remote control receiver.

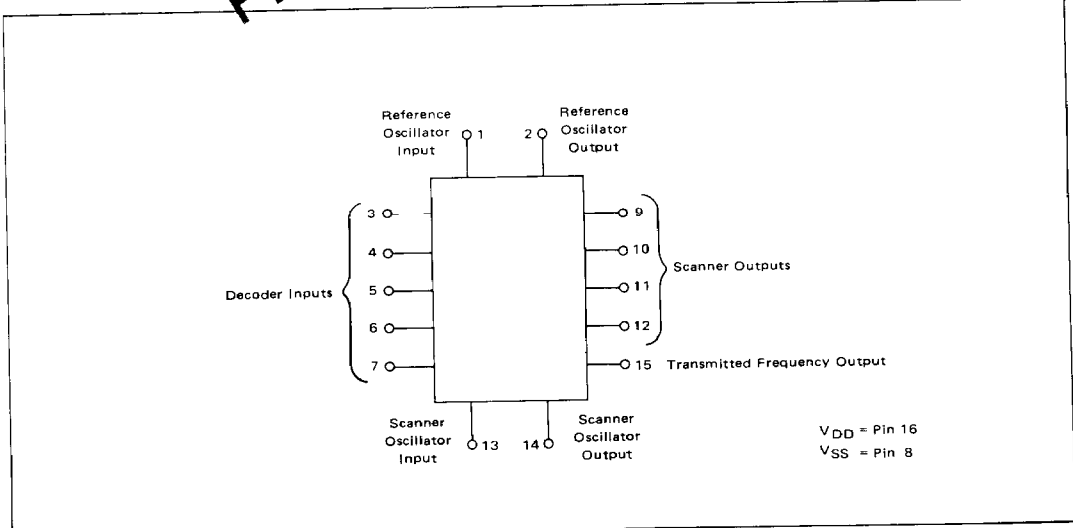
Using digital frequency multiplexing, the MC14422 generates five frequencies which are transmitted sequentially to form a code corresponding to a particular function in the receiver circuit. The wide channel spacing between these frequencies eliminates problems due to doppler effect. The frequency multiplex system inherently provides a good degree of noise immunity.

- 22 Channel Capacity
- Transmission of Information Is Achieved by Time Multiplexing Five Frequencies
- No Possibility of Doppler Effect Interference
- Extremely Low External Component Count
- Low Power Consumption
- Designed for Use with the MC6525 or MC6526 Remote Control Receiver



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit. For proper operation it is recommended that V_{in} and V_{out} be constrained to the range $V_{SS} \approx (V_{in} \text{ or } V_{out}) \leq V_{DD}$. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}).

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This is advance information and specifications are subject to change without notice.

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MAXIMUM RATINGS (Voltages referenced to V_{SS})

Rating	Symbol	Value	Unit
DC Supply Voltage	V_{DD}	-0.5 to +10	Vdc
Input Voltage, All Inputs	V_{in}	$V_{DD} + 0.5$	Vdc
DC Current Drain per Pin	I	10	mAdc
Operating Temperature Range	T_A	0 to +55	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

Characteristic	Symbol	Min	Typ	Max	Unit	
Supply Voltage	V_{DD}	5.0	—	8.0	Vdc	
Supply Current ($V_{DD} = 8.0$ Vdc)	Idle	—	0.4	100	μAdc	
	Operating	—	—	10	mAdc	
Output Drive Current ($V_{OH} = 4.0$ Vdc, $V_{DD} = 5.0$ Vdc Scanner Output Transmitted Frequency Output Scanner Oscillator Output Reference Oscillator Output ($V_{OL} = 1.0$ Vdc, $V_{DD} = 5.0$ Vdc) Scanner Output Transmitted Frequency Output Scanner Oscillator Output Reference Oscillator Output	Source	I_{OH}			μAdc mAdc mAdc mAdc	
	Sink	I_{OL}			μAdc mAdc mAdc mAdc	
			50	—	—	μAdc
			0.2	—	—	mAdc
			0.1	—	—	mAdc
			0.3	—	—	mAdc
	Input Current ($V_{IH} = 8.0$ Vdc, $V_{DD} = 8.0$ Vdc) Scanner Oscillator Input Reference Oscillator Input ($V_{IH} = 7.0$ Vdc, $V_{DD} = 8.0$ Vdc) Decoder Input ($V_{IL} = 0$ Vdc, $V_{DD} = 8.0$ Vdc) Scanner Oscillator Input Reference Oscillator Input ($V_{IL} = 1.0$ Vdc, $V_{DD} = 5.0$ Vdc) Decoder Input	Sink	I_{IH}			μAdc
				—	—	1.0
Source			4.0	—	400	
			-1.0	—	—	
		I_{IL}			μAdc	
		—	—	1.0		
		-4.0	—	-400		
		—	—	-25		
Reference Oscillator Frequency ($V_{DD} = 5.0$ Vdc)	f_{ref}	—	—	1.0	MHz	



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CIRCUIT OPERATION

As shown in Figure 1, until a matrix switch is depressed, the decoder inputs (pins 3 through 7) are high, all scanner outputs (pins 9 through 12) are low, and both the scanner and reference oscillators, as well as the output gate control circuit, are switched off. This is referred to as the "idle" mode. In this mode, with a significant part of the circuit switched off, current consumption is reduced to a minimum. The decoder section, however, remains in continuous operation so that a switch matrix command can be recognized. When a switch is depressed, the decoder will set the five latches in accordance with the correct code (see Figure 2). At the same time, a latch is triggered which activates the idle line and turns on the reference

oscillator, the scanner oscillator, the row enable, and the output gate control.

When the switch is operated just prior to time period t1, the following happens:

1. The scanner outputs become active and take up their respective code corresponding to t1 when the next negative going edge of the scanner oscillator occurs.
2. The reference oscillator is switched on.
3. The output gate control idle input is enabled.

Note: No output can occur at the transmitted frequency output (pin 15) until the negative going edge of the pin 12 scanner output signal has occurred at the end of time t4.

The timing example of Figure 1 uses the matrix connection of pin 4 connected to pin 11. Table 1 shows that the code for this connection is f_a transmitted in time period t2 and f_b transmitted in time period t3. After the negative going edge of the pin 12 scanner pulse has enabled the output gate control, an output cycle can begin. Therefore, in this case no output occurs in the time period t1, f_a and f_b are transmitted in time periods t2 and t3 respectively, and no output occurs during time t4.

The code is repeated continuously at pin 15 until the matrix switch is released. At this point the circuit completes the scan cycle and the trailing edge of the pin 12 scanner signal returns the circuit to its "idle" position.

The transmitted frequencies are generated by dividing a reference oscillator frequency by a variable divider circuit which is controlled by the decoder outputs.

TABLE 1 - TRANSMITTED FREQUENCY CODE

Channel Number	Matrix Connections Pin to Pin	Transmitted Frequencies			
		t1	t2	t3	t4
1	7 12	f _e			
2	7 9	f _e	f _a		
3	7 10	f _e		f _b	
4	7 11	f _e	f _a	f _b	
5	6 12	f _e			f _c
6	6 9	f _e	f _a		f _c
7	6 10	f _e		f _b	f _c
8	6 11	f _e	f _a	f _b	f _c
9	5 12	f _e			f _d
10	5 9	f _e	f _a		f _d
11	5 10	f _e		f _b	f _d
12	5 11	f _e	f _a	f _b	f _d
13	4 12			f _b	
14	4 11		f _a	f _b	
15	3 9				f _c
16	3 10		f _a		f _c
17	4 9			f _b	f _c
18	4 10		f _a	f _b	f _c
19	3 12				f _d
20	3 11		f _a		f _d
21	3,4 12			f _b	f _d
22	3,4 11		f _a	f _b	f _d

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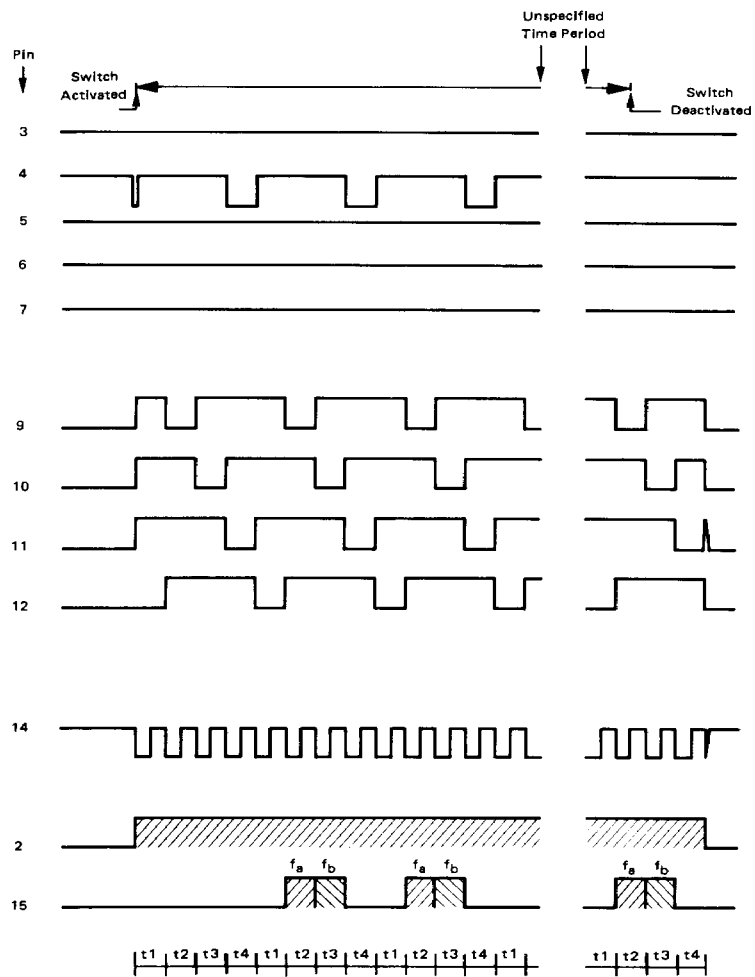
TABLE 2 - OUTPUT FREQUENCIES

Frequencies	Output Frequency	Division Ratio
f _a	34.688 kHz	f2/26.5
f _b	36.048 kHz	f2/25.5
f _c	37.519 kHz	f2/24.5
f _d	39.116 kHz	f2/23.5
f _e	42.755 kHz	f2/21.5

f2 = 919.222 kHz reference frequency

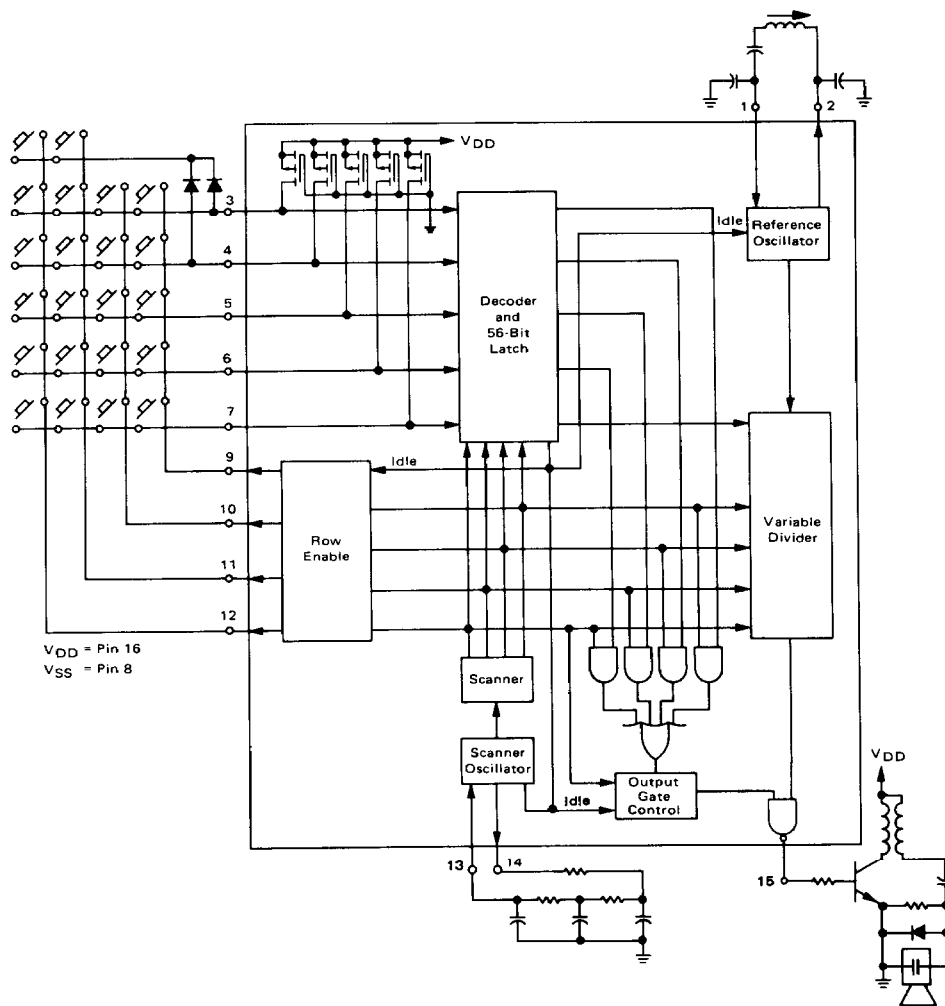
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FIGURE 1 – TIMING DIAGRAM
(Pin 4 Connected to Pin 11)



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FIGURE 2 – TYPICAL APPLICATION



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FIGURE 3 - REFERENCE OSCILLATOR EXTERNAL COMPONENTS

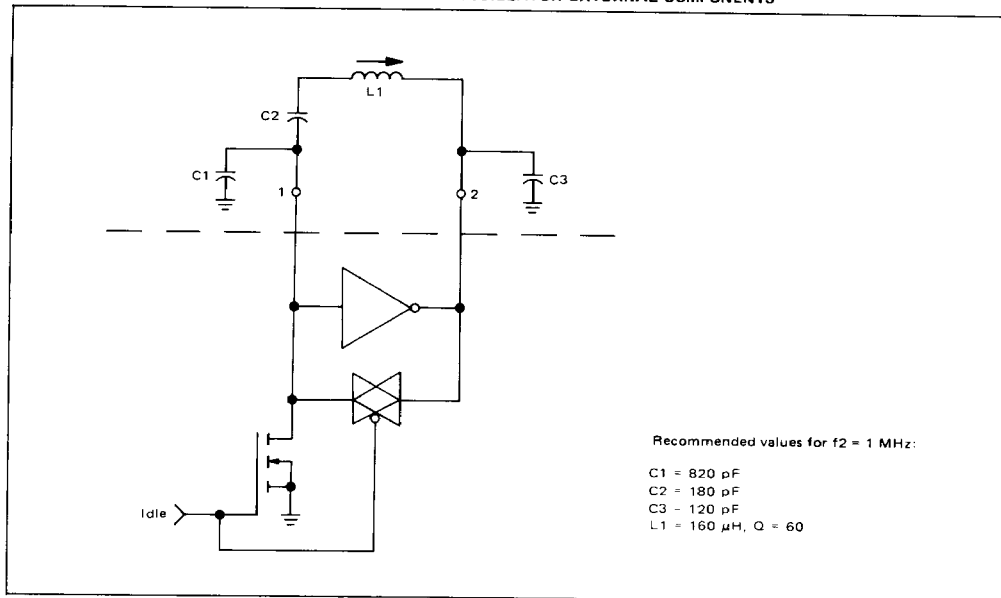
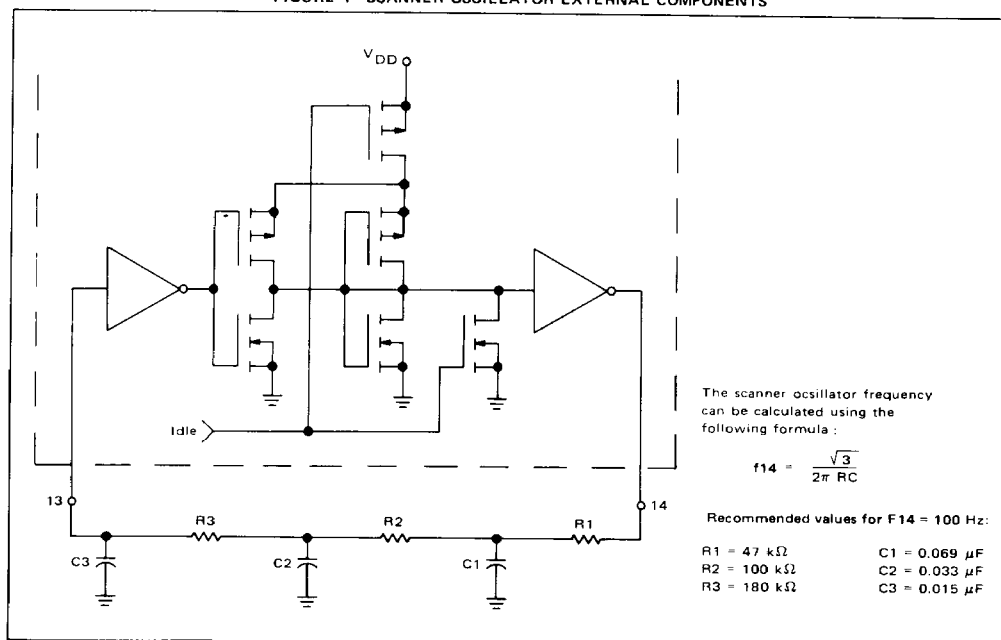


FIGURE 4 - SCANNER OSCILLATOR EXTERNAL COMPONENTS



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