COS/MOS INTEGRATED CIRCUIT

M 1124

30-CHANNEL REMOTE CONTROL TRANSMITTER

- FEW EXTERNAL COMPONENTS
- INTERLOCK PREVENTS INCORRECT SELECTION
- QUASI-ZERO STAND-BY CURRENT
- WIDE SUPPLY VOLTAGE RANGE
- INPUTS FULLY PROTECTED

The M 1124 is a monolithic integrated circuit intended for remote controlled systems in which 30 different ultrasonic frequencies are used to transmit 30 commands.
The M 1124 comprises on oscillator circuit which does not require external components except the quartz. Further it comprises a fixed and a variable frequency divider, a decoder and a command error protection. All the command inputs are pulled-up to V_{DD} by integrated resistors, to reduce the number of external components. Due to the relative low input impedances, the M 1124 is not suited for touch contacts. The circuit is produced in COS/MOS technology. In conjunction with the ultrasonic receivers M 1025 or M 1130, a complete remote control system can be realized. The device is available in a 16-lead dual in-line plastic package.

ABSOLUTE MAXIMUM RATINGS*

V_{DD}**	Supply voltage	-0.5 to	12	V
V_I	Input voltage	-0.5 to V_{DD}	+0.5	V
$\|I_O\|$	Output current		10	mA
P_{tot}	Total power dissipation		200	mW
T_{stg}	Storage temperature	-65 to	150	°C
T_{op}	Operating temperature	0 to	70	°C

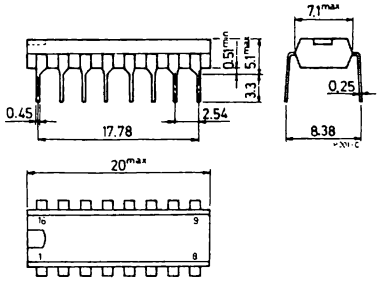
* Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicate in the "Recommended operating conditions" section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

** All voltages are with respect to V_{SS} (GND).

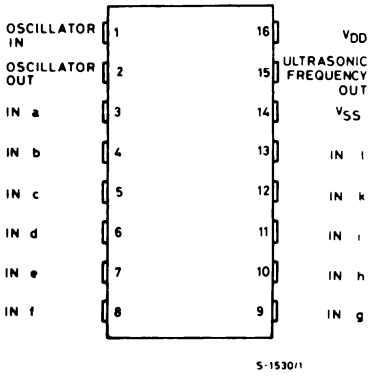
ORDERING NUMBER: M 1024 B1

MECHANICAL DATA

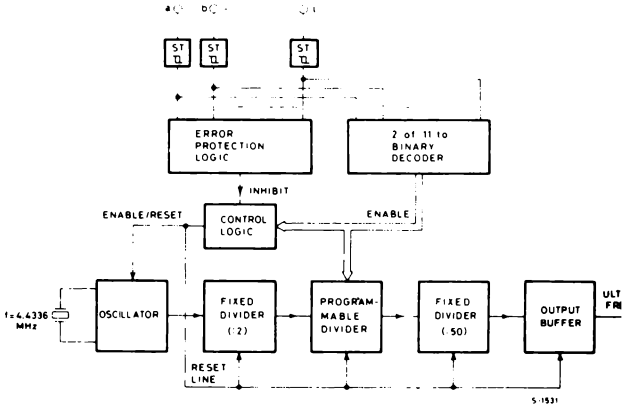
Dimensions in mm



PIN CONNECTIONS



BLOCK DIAGRAM



TRUTH TABLE (f_i = 4.4336 MHz)

Channel Number	Inputs											Output Frequency
	a	b	c	d	e	f	g	h	i	k	l	
1	H	H	H	H	L	H	H	L	H	H	H	33 945 Hz
2	H	H	H	H	L	H	H	H	H	H	L	34 291 Hz
3	H	H	H	H	L	H	L	H	H	H	H	34 638 Hz
4	H	H	H	H	L	H	H	H	H	L	H	34 984 Hz
5	H	H	H	H	L	L	H	H	H	H	H	35 330 Hz
6	H	H	H	H	L	H	H	H	L	H	H	35 677 Hz
7	L	H	H	H	H	L	H	H	H	H	H	36 023 Hz
8	L	H	H	H	H	H	H	H	L	H	H	36 370 Hz
9	H	L	H	H	H	L	H	H	H	H	H	36 716 Hz
10	H	L	H	H	H	H	H	H	L	H	H	37 062 Hz
11	H	H	L	H	H	L	H	H	H	H	H	37 409 Hz
12	H	H	L	H	H	H	H	H	L	H	H	37 755 Hz
13	H	H	H	L	H	L	H	H	H	H	H	38 101 Hz
14	H	H	H	L	H	H	H	H	L	H	H	38 448 Hz
15	L	H	H	H	H	H	L	H	H	H	H	38 794 Hz
16	L	H	H	H	H	H	H	H	H	L	H	39 141 Hz
17	H	L	H	H	H	H	L	H	H	H	H	39 487 Hz
18	H	L	H	H	H	H	H	H	H	L	H	39 833 Hz
19	H	H	L	H	H	H	L	H	H	H	H	40 180 Hz
20	H	H	L	H	H	H	H	H	H	L	H	40 526 Hz
21	H	H	H	L	H	H	L	H	H	H	H	40 872 Hz
22	H	H	H	L	H	H	H	H	H	L	H	41 219 Hz
23	L	H	H	H	H	H	H	L	H	H	H	41 565 Hz
24	L	H	H	H	H	H	H	H	H	H	L	41 912 Hz
25	H	L	H	H	H	H	H	L	H	H	H	42 258 Hz
26	H	L	H	H	H	H	H	H	H	H	L	42 604 Hz
27	H	H	L	H	H	H	H	L	H	H	H	42 951 Hz
28	H	H	L	H	H	H	H	H	H	H	L	43 297 Hz
29	H	H	H	L	H	H	H	L	H	H	H	43 643 Hz
30	H	H	H	L	H	H	H	H	H	H	L	43 990 Hz

DESCRIPTION

The truth table shows the 30 ultrasonic transmission frequencies used in the wireless transmission of remote control commands to the receiver. These frequencies are derived from the frequency of a quartz controlled oscillator with the aid of a variable frequency divider operating on the blanking principle. This is accomplished by blanking out between 1 to 30 out of every 128 pulses of the oscillator frequency (4.4336 MHz) divided by 2.

The variable divider is followed by a fixed divider which divides by 50. It reduces the jitter, which is unavoidable when using the blanking principle, to negligible values. The expression for the ultrasonic output frequency is

$$f_o = \frac{f_i\,(97 + N)}{12\,800}$$

wherein N is the channel number and f_i = 4.4336 MHz (sub-carrier frequency). The space between two adjacent ultrasonic frequencies is 346.4 Hz.

The inputs accept a 2 of 11 code: by connecting simultaneously to V_{SS} one of a to e and one of f to l input, a 5 bit word is generated internally and applied to the variable divider. The relative frequency is thus available at the output.

An error protection circuit prevents incorrect operation. Under these conditions the oscillator will not start to operate, and the frequency divider is held in a defined position.

Since consumption under standby conditions is very low, the ultrasonic transmitter need never be switched off. The selected frequency appears at the output when the threshold voltage is exceeded at the two control inputs.

RECOMMENDED OPERATING CONDITIONS

V_{DD}	Supply voltage	6 to 9	V
V_I	Input voltage	0 to V_{DD}	V
f_p	Parallel resonance frequency of the quartz at C_L = 10 pF	4.433	MHz
r_S	Series resistance of the quartz at CL= 10 pF	< 200	Ω
T_{op}	Operating temperature	0 to 70	°C

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Typical values are at T_{amb} = 25°C, unless otherwise specified.

Parameter		Test conditions	Values			Unit
			Min.	Typ.	Max.	
I_{DDL}	Quiescent supply current	All inputs at V_{DD}		2	10	µA
I_{DD}	Supply current	V_{DD} = 9 V - oscillator running - ultrasonic freq. output open		1.5	3	mA
I_I	Input current	V_I = 0		-20		µA
r_{on}	High level output resistance (on state)	I_{OH} = -1 mA		0.5	1	kΩ
r_{on}	Low level output resistance (on state)	I_{OL} = 0.2 mA		1.5	3	kΩ
V_{TH}	Threshold voltage of the control inputs			4.1		V

TYPICAL APPLICATION