PRELIMINARY SPECIFICATION

NEC
ELECTRON DEVICE

MOS DIGITAL INTEGRATED CIRCUIT
μPD6122G

MULTI-PURPOSE REMOTE CONTROL TRANSMITTER IC
CMOS LSI

DESCRIPTION

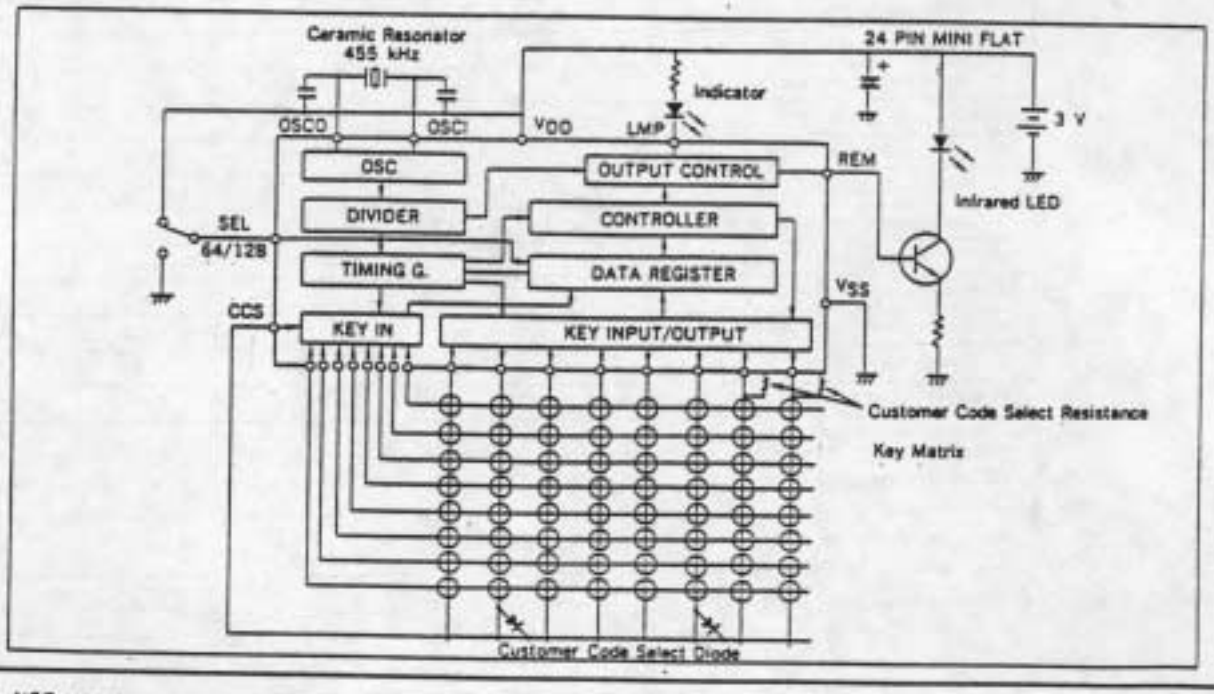
The μPD6122G is an infrared remote control transmitter LSI for TV, VCR, stereo components, cassette decks, air conditioners, and other appliances. The 65 536 number customer codes (MAX.) are available by setting external diodes, resistors, and internal MASK ROM.

The transmission code consists of "leader pulse", "16 bit customer code", and "16 bit data code". Using microprocessors for decoder, varlious applications can be realized.

FEATURES

- Low voltage operation .... V_{DD} = 2.0 to 3.3 V
- Low power consumption .... I_{DD} < 1 μA at standby mode
- 32 function keys and 3 double action keys
- 64 + 6 function codes are available. (Using SEL terminal)
- 65 536 customer codes can be selected. (Using external R, Di or internal MASK ROM)
- The transmission format is compatible with μPD1913C, 1943G, 6102G, 6120C, 6121G.
- Pin compatible with the μPD6102G.
- NEC standard μPD6122G-001 (μPD6102G compatible), μPD6122G-002 (Built-in customer code ROM).
- Package .... 24 pin MINI FLAT (SOP)

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Supply Voltage	V_{DD}	6.0	V
Input Voltage	V_{IN}	−0.3 to V_{DD}	V
Power Dissipation	P_d	250	mW
Operating Temperature	T_{opt}	−20 to +75	°C
Storage Temperature	T_{stg}	−40 to +125	°C

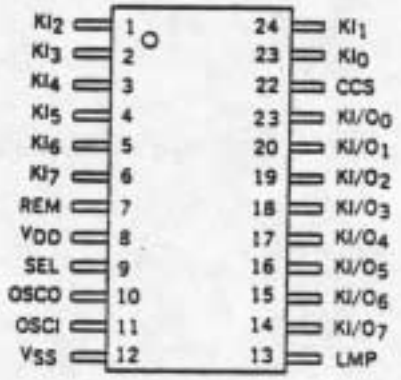
RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{DD}	2.0	3.0	3.3	V
Oscillation Frequency	f_{osc}	400	455	500	kHz
Input Voltage	V_{IN}	0		V_{DD}	V
Custom code select Pull up Resistance	R_{up}	160	200	240	kΩ

ELECTRICAL CHARACTERISTICS (T_a = 25 °C, V_{DD} = 3.0 V)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
Supply Voltage	V_{DD}	2.0	3.0	3.3	V	
Current Consumption 1	I_{DD1}		0.1	1.0	mA	f_{osc} = 455 kHz
Current Consumption 2	I_{DD2}			1.0	μA	f_{osc} = STOP
REM High Level Output Current	I_{OH1}	−5.0	−8.0		mA	V_o = 1.5 V
REM Low Level Output Current	I_{OL1}	15	30		μA	V_o = 0.3 V
LMP High Level Output Current	I_{OH2}	−15	−30		μA	V_o = 2.7 V
LMP Low Level Output Current	I_{OL2}	1	1.5		mA	V_o = 0.3 V
KI High Level Input Current	I_{IH1}	10		30	μA	V_{IN} = 3.0 V
KI Low Level Input Current	I_{IL1}			−0.2	μA	V_{IN} = 0 V
KI High Level Input Voltage	V_{IH1}	0.7 V_{DD}		V_{DD}	V	
KI Low Level Input Voltage	V_{IL1}	0		0.3 V_{DD}	V	
KI/O High Level Input Voltage	V_{IH2}	1.3		V_{DD}	V	
KI/O Low Level Input Voltage	V_{IL2}	0		0.4	V	
KI/O High Level Input Current	I_{IH2}	2		7	μA	V_{IN} = 3.0 V
KI/O Low Level Input Current	I_{IL2}			−0.2	μA	V_{IN} = 0 V
KI/O High Level Output Current	I_{OH3}	1.0		2.5	mA	V_o = 2.5 V
KI/O Low Level Output Current	I_{OL3}	35		100	μA	V_o = 1.7 V
CCS High Level Input Voltage	V_{IH3}	1.1			V	
CCS High Level Input Current	I_{IH3}			0.2	μA	Pull up V_{IN} = 3.0 V
CCS Low Level Input Current	I_{IL3}	−3		−8	μA	Pull up V_{IN} = 0 V
CCS High Level Input Current	I_{IH4}	10		30	μA	Pull down V_{IN} = 3.0 V
CCS Low Level Input Current	I_{IL4}			−0.2	μA	Pull down V_{IN} = 0 V

Connection Diagram (Top View)



Terminal		
1	KI_2	Key Input 2
2	KI_3	Key Input 3
3	KI_4	Key Input 4
4	KI_5	Key Input 5
5	KI_6	Key Input 6
6	KI_7	Key Input 7
7	REM	Remote Output
8	V_{DD}	3 V
9	SEL	64/128 Data Select
10	OSCO	Oscillator Output
11	OSCI	Oscillator Input
12	V_{SS}	
13	LMP	Lamp Output
14	KI/O_7	Key I/O 7
15	KI/O_6	Key I/O 6
16	KI/O_5	Key I/O 5
17	KI/O_4	Key I/O 4
18	KI/O_3	Key I/O 3
19	KI/O_2	Key I/O 2
20	KI/O_1	Key I/O 1
21	KI/O_0	Key I/O 0
22	CCS	Custom Code Select Input
23	KI_0	Key Input 0
24	KI_1	Key Input 1

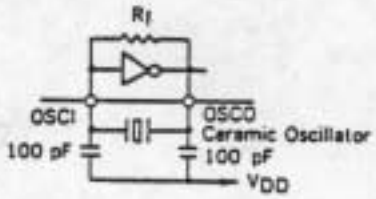
1. Key In & Output Pins KI_0 to KI_3, KI/O_0 to KI/O_7

Pull down resistors are connected between key input pins and V_{SS}. Simultaneous pressing of several keys activates the multiple input inhibiting circuit, thus making no transmission. Two key inputs with the interval of less than 36 ms is regarded as simultaneous. Priority of two inputs separating more than 36 ms is given on the first-pressed-first-served or longer-pressed-first-served basis.

Reading of the customer and key data codes starts at the press of a key, and 35 ms later REM output starts. One transmission is given if the key is kept pressed during this 36 ms. If the key is pressed for more than 180 ms, the leader code is only transmitted continuously. A very fast response is assured as the minimum ON-to-ON interval of 126 ms is discernible.

2. Oscillation Terminals OSCI, OSCO

The oscillation circuit is only activated by a key input. Adjustment works can be saved if a 400 to 500 kHz ceramic resonator is used.

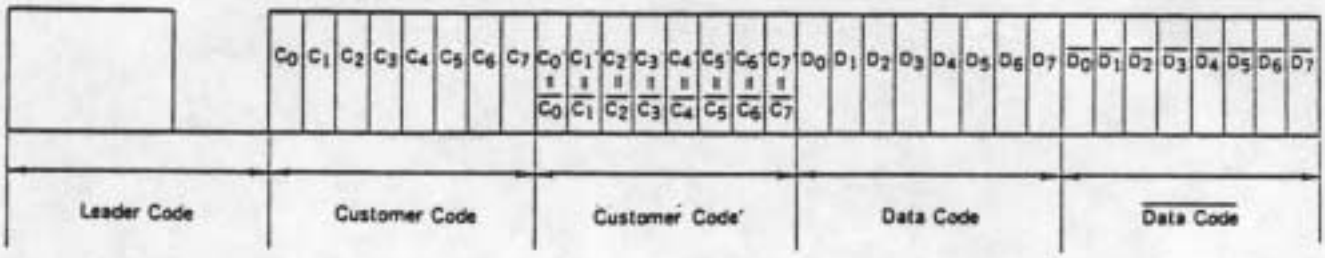


3. Power Supply Pins V_{DD}, V_{SS}

The standard voltage is 3 V or two dry cells. The workable range is 2.0 to 3.3 V. The stand-by current drain is only 1 μA as oscillation is only activated by the press of a key.

4. Remote Output REM

The transmission output consists of the leader code, 16 bit customer code, another 8 bit data code and the complementary codes of customer and data totalling 32 bits as shown below.



The leader code consists of 9 ms carrier and 4.5 ms OFF wave forms and works as the leader of the succeeding codes. This enables effective usage of time relations between reception detection and other processings when the receiver is micro-computerized. The succeeding codes are pulse position modulated (P.P.M.) and the 1 or 0 state depends on the time between pulses. Each code consists of eight bits and their complementary codes are simultaneously transmitted. The assures very low failure rate operation.

The data code has eight bits and D_0 to D_6 except D_5 can be selected by the key matrix K1 to K64. On double key pressing D_5 is given 1.

When the same key remains pressed the leader code is only transmitted repeatedly for saving of the infrared LED power drain. In this case the leader code transmission duty is predominant and the average power drain of the LED is about 3 % of I (peak). In case of 455 kHz oscillation the signal is modulated by 1/3 duty 38 kHz.