

SANYO**LC7461M****Infrared Remote Control Transmitter IC****Functions**

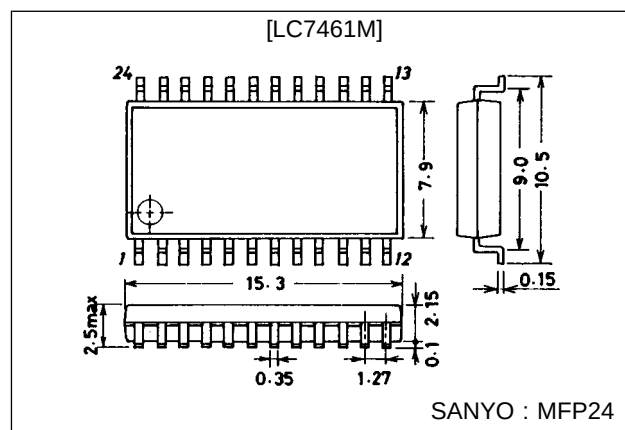
- 32 $\oplus$ 3 function keys
- 13-bit custom codes
- Operating supply voltage range $V_{DD} = 1.8$ to 3.6 V
- Supply current at the standby mode $I_{DD} = 1 \mu\text{A}$ or less
- Double-press operation keys (no priority given)
- On-chip oscillator (ceramic resonator : connected externally)

Features

- The custom code consists of 7 bits to be fixed by the on-chip ROM and 6 bits being pin-settable. Sixty-four custom codes may be selected externally (no diode required).
- Minimum number of external parts required

Package Dimensions

unit : mm

3045B-MFP24**Specifications****Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$**

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD \text{ max}}$	V_{DD}	$V_{SS}-0.3$ to $+5.5$	V
Input voltage	V_{IN}	Each input pin	$V_{SS}-0.3$ to $V_{DD}+0.3$	V
Output voltage	V_{OUT}	Each output pin	$V_{SS}-0.3$ to $V_{DD}+0.3$	V
Output current	I_{OUT}	OUT	-35	mA
Allowable power dissipation	$P_d \text{ max}$	$T_a \leq 85^\circ\text{C}$	150	mW
Operating temperature	T_{opr}		-40 to $+85$	$^\circ\text{C}$
Storage temperature	T_{stg}		-50 to $+125$	$^\circ\text{C}$

Allowable Operating Conditions at $T_a = 25^\circ\text{C}$

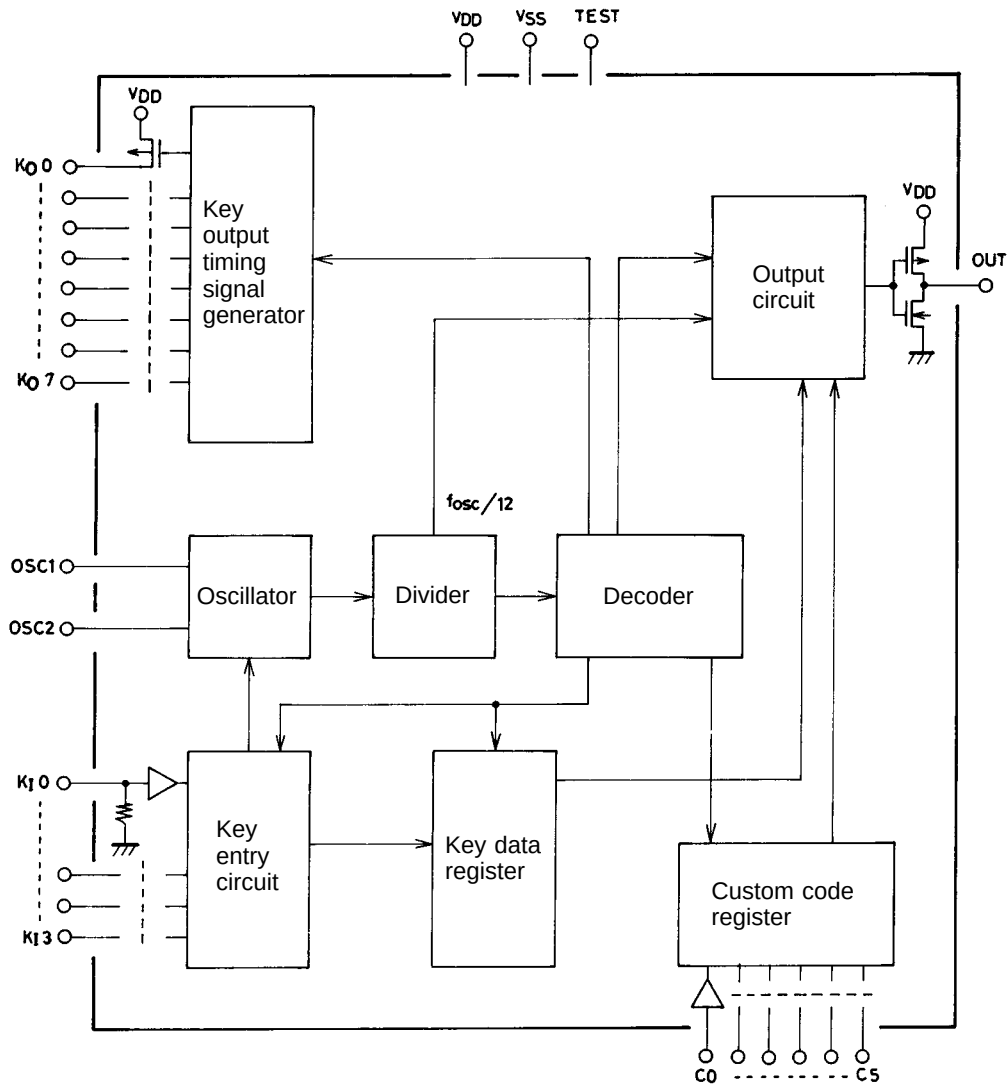
Parameter	Symbol	Pin Name	Conditions	min	typ	max	Unit
Supply voltage	V_{DD}	V_{DD}	$f_{OSC} = 455 \text{ kHz}$	1.8	3.0	3.6	V
Input high-level voltage	V_{IH}	K_10 to K_13 , C_0 to C_5		$0.7 V_{DD}$		V_{DD}	V
Input low-level voltage	V_{IL}	K_10 to K_13 , C_0 to C_5		V_{SS}		$0.3V_{DD}$	V
Oscillation frequency	f_{OSC}			400	455	500	kHz

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Electrical Characteristics at Ta = 25°C, V_{DD} = 3.0 V

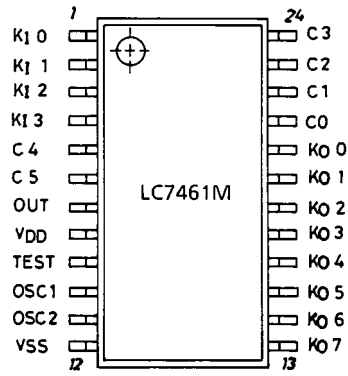
Parameter	Symbol	Pin Name	Conditions	min	typ	max	Unit
Operating supply current	I _{DD}	V _{DD}	Key ON, output: no load			1	mA
Quiescent supply current	I _{DS}	V _{DD}	All keys OFF, OSC stop			1	μA
Output high-level current	I _{OH1}	OUT	V _{DD} = 1.8 V, V _{OH} = 1.0 V		-8		mA
	I _{OH2}	OUT	V _{DD} = 3.0 V, V _{OH} = 1.0 V		-25		mA
Output high-level voltage	V _{OH}	K _O 0 to K _O 7	I _{OH} = -0.1 mA			0.3	V
Output low-level voltage	V _{OL}	OUT	I _{OL} = 0.1 mA			0.3	V
Output OFF-state leakage current	I _{OFF}	K _O 0 to K _O 7				1	μA
Input high-level current	I _{IH}	C ₀ to C ₅	V _{IN} = V _{DD}			1	μA
Input low-level current	I _{IL}	C ₀ to C ₅	V _{IN} = V _{SS}	-1			μA
Input floating voltage	V _{IF}	K _I 0 to K _I 3				0.1 V _{DD}	V
Input pull down resistance	R _{IN}	K _I 0 to K _I 3		75	100	125	kΩ

Internal Block Diagram



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Pin Assignment



Top view

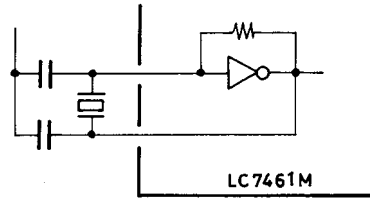
Pin Description

Pin Name	Pin No.	Input/Output	Internal Equivalent Circuit	Pin Function
V _{DD} , V _{SS}	8, 12			Power supply pins V _{SS} = GND
K _O 0 to K _O 7	13 to 20	Output		Key scan timing signal output pins
K _I 0 to K _I 3	1 to 4	Input		Keys return signal entry pins
OSC1 OSC2	10 11	Input/output		Input/output pins for ceramic resonator-used oscillation
C ₀ to C ₅	21 to 24, 5, 6	Input		Input pins for custom code setting Capable of externally setting 6 bits of 13 bits in all that provide a custom code
OUT	7	Output		Output pin for transmit LED drive
TEST	9	Input		LSI test pin Normally set to high-level or brought to open state

General Description of Function

1. Oscillator

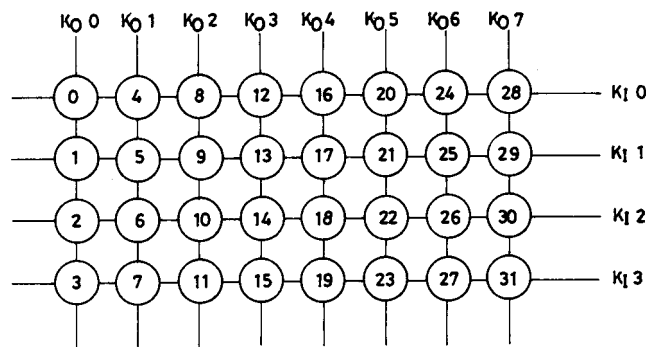
Since a self-bias type amplifier of CMOS inverter is contained, an oscillator can be formed by connecting a ceramic resonator.



To minimize power dissipation, the oscillator stops oscillating except when key operation is performed.

2. Key entry

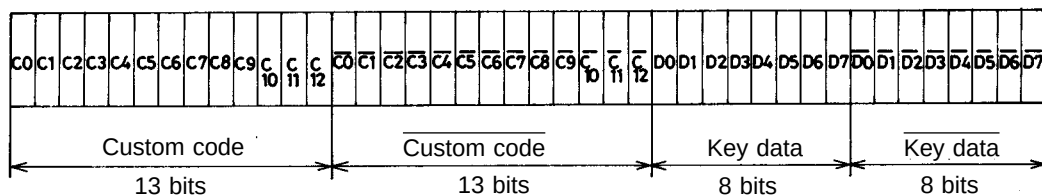
Key entry pins K_I0 to K_I3 and timing signal output pins K_O0 to K_O7 provide a key matrix of $4 \times 8 = 32$.



Multi-press of key No. 20 and one of key No. 21, 22, 23 may be done, with no priority given in key entry. When the two keys are kept pressed, a series of pulses will be output according to each key entry. If multi-press of keys which are not allowed multi-press is done, no output will be delivered.

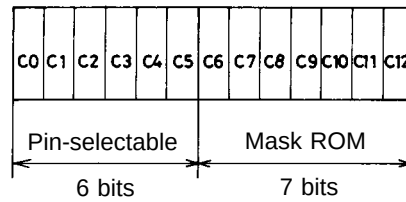
3. Data organization

Data consists of 42 bits in all: 13 bits of custom code, 8 bits of key data, and their inverted codes.

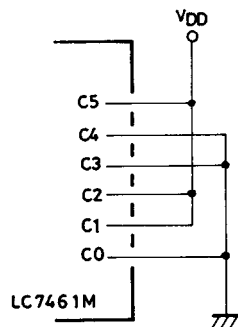


(a) Custom code

The custom code, which consists of 13 bits (C_0 to C_{12}) in all, is used to distinguish between receiving sets.



C_6 to C_{12} are fixed by the mask ROM and C_0 to C_5 are pin-settable.



In this example C_0 to C_5 are set as follows:

C_0	C_1	C_2	C_3	C_4	C_5
0	1	1	0	0	1

The custom codes are controlled by Sanyo to avoid duplication.

(b) Key data

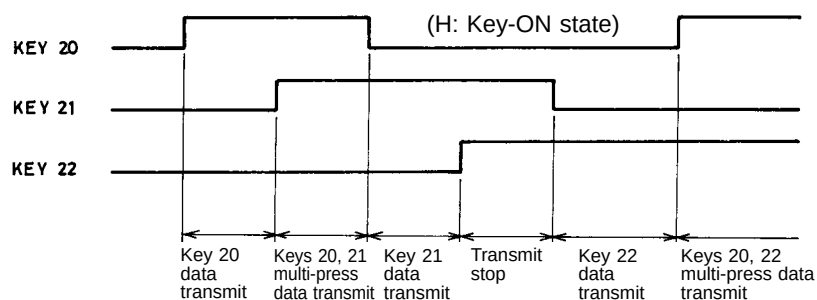
KEY No.	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
28	0	0	1	1	1	0	0	0
29	1	0	1	1	1	0	0	0
30	0	1	1	1	1	0	0	0
31	1	1	1	1	1	0	0	0

Multi-press

KEY No.	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇
20, 21	1	0	1	0	1	1	0	0
20, 22	0	1	1	0	1	1	0	0
20, 23	1	1	1	0	1	1	0	0

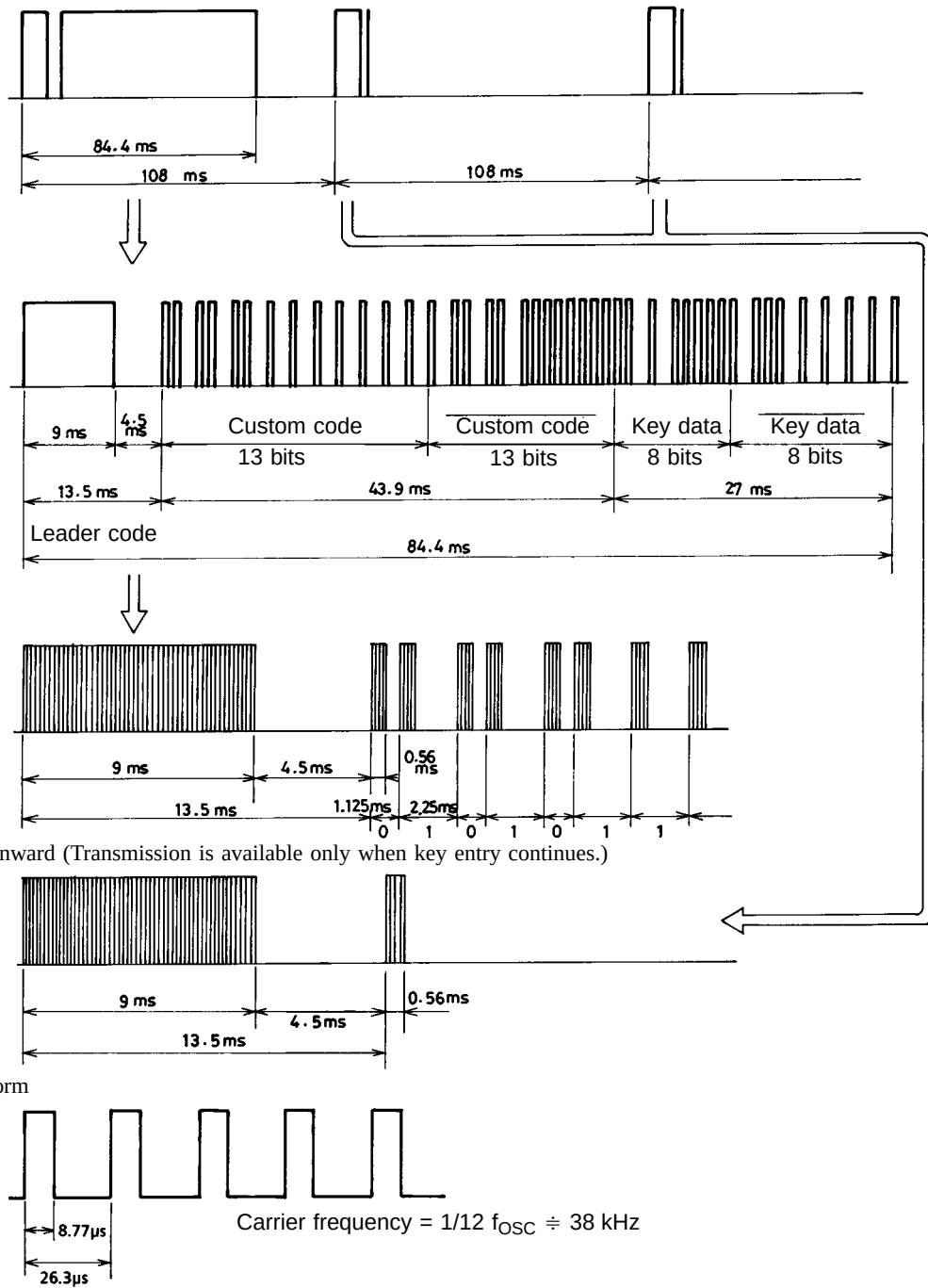
- D_6, D_7 may be preset to "0", "1" beforehand (mask option).

When multi-press of key No.20 and one of key No.21, 22, 23 is done, multi-bit D_5 will be set to "1", with no priority given in key entry.

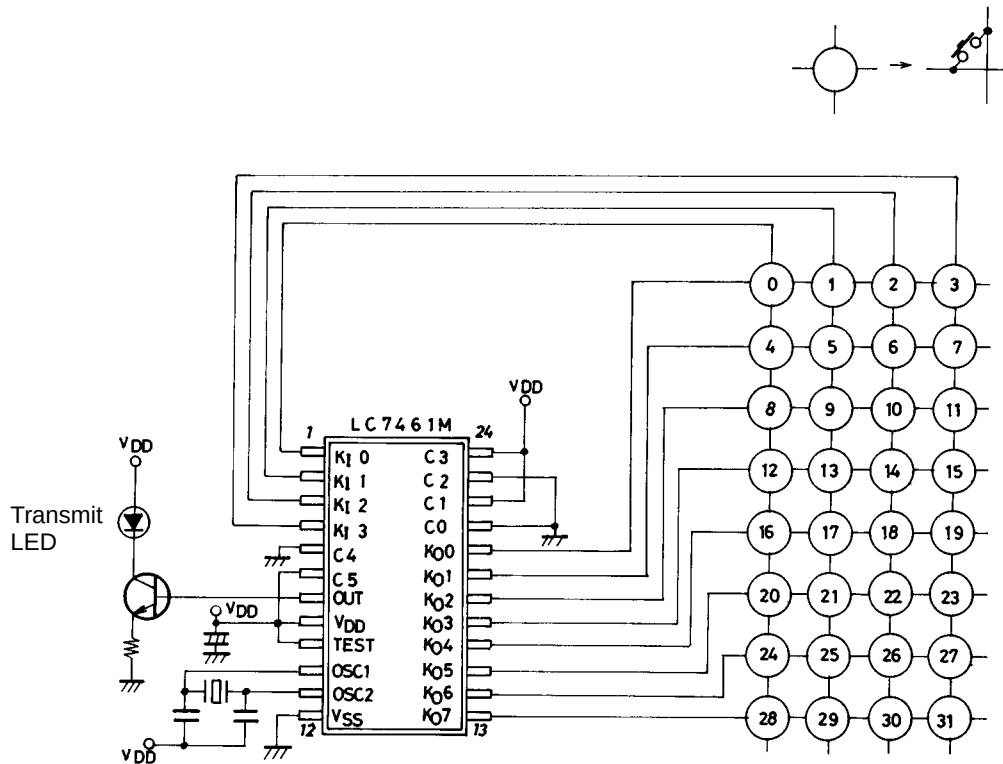


4. Transmit waveforms

The period of time shown below is for $f_{OSC} = 455 \text{ kHz}$.



Sample Application Circuit



In this example custom code C_0 to C_5 is $C_0 \cdots C_5$.
 0 1 0 1 0 1

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