



No. ✕ 2120B

Infrared Remote Control Transmitter IC

Preliminary

Functions

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

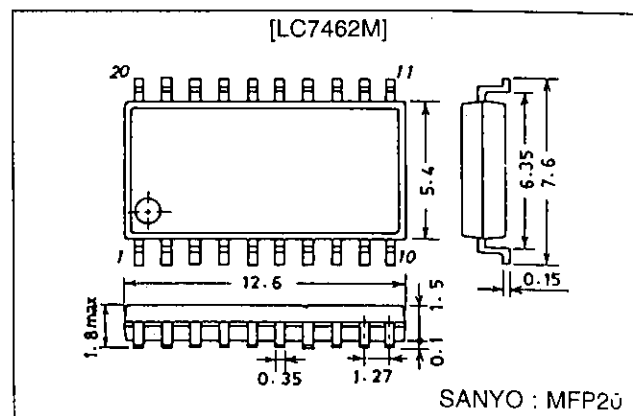
Features

- Two selections of custom code (8 bits)
(SEL pin-selectable ... option)
- Since the custom code is set internally, no external diode is required.
- Since double-press operation provides no priority, the number of external parts can be reduced.

Package Dimensions

unit : mm

3036B-MFP20



Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{DD} 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	Pd max	Ta ≤ 85°C	150	mW
Operating temperature	Topr		-40 to +85	°C
Storage temperature	Tstg		-50 to +125	°C

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

Parameter	Symbol	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}	$K_10 \text{ to } K_13, \text{ SEL}$	$0.7V_{DD}$		V_{DD}	V
Input low-level voltage	V_{IL}	$K_10 \text{ to } K_13, \text{ SEL}$	V_{SS}		$0.3V_{DD}$	V
Oscillation frequency	f_{osc}		400	455	500	kHz

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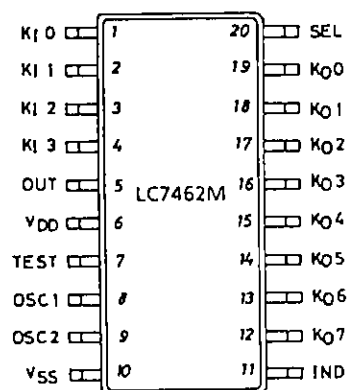
N3096HA(II)/52095MH/1118TS/1106YO No.2120-1/8

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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{DD} = 3.0\text{ V}$

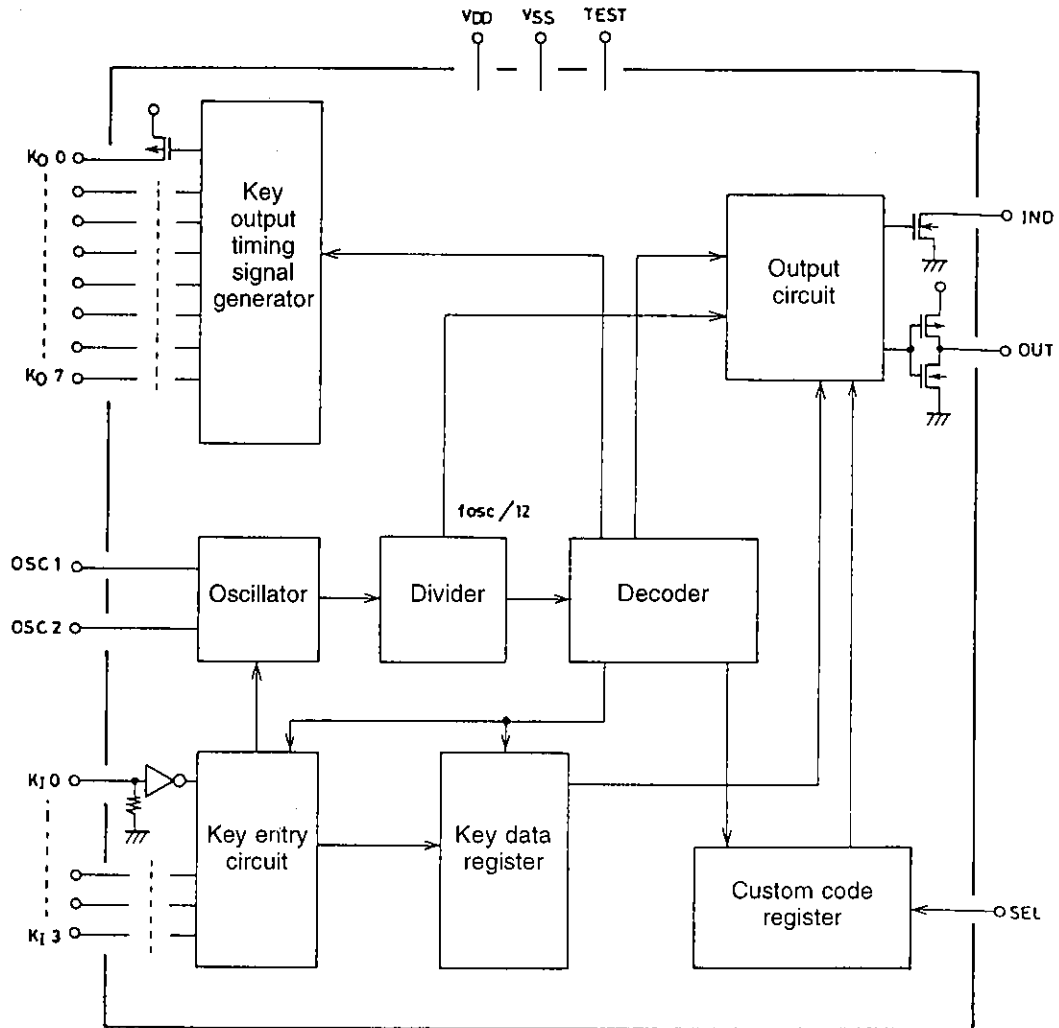
Parameter	Symbol	Conditions	min	typ	max	Unit
Operating supply current	I_{DD}	$V_{DD} = \text{Key ON, output: no load}$			1	mA
Quiescent supply current	I_{DS}	$V_{DD} = \text{All keys OFF, OSC stop}$			1	μA
Output high-level current	I_{OH1}	$\text{OUT} = V_{DD} = 1.8\text{ V}, V_{OH} = 1.0\text{ V}$		-8		mA
	I_{OH2}	$\text{OUT} = V_{DD} = 3.0\text{ V}, V_{OH} = 1.0\text{ V}$		-25		mA
Display output current	I_{OL1}	$\text{IND} = V_{DD} = 1.8\text{ V}, V_{OH} = 1.0\text{ V}$		2		mA
	I_{OL2}	$\text{IND} = V_{DD} = 3.0\text{ V}, V_{OH} = 1.0\text{ V}$		5		mA
Output high-level voltage	V_{OH}	$K_00 \text{ to } K_07 = I_{OH} = -0.1\text{ mA}$			0.3	V
Output low-level voltage	V_{OL}	$\text{OUT} = I_{OL} = 0.1\text{ mA}$			0.3	V
Output OFF-state leakage current	I_{OFF}	$K_00 \text{ to } K_07, \text{IND}$			1	μA
Input high-level current	I_{IH}	$\text{SEL} = V_{IN} = V_{DD}$			1	μA
Input low-level current	I_{IL}	$\text{SEL} = V_{IN} = V_{SS}$	-1			μA
Input floating voltage	V_{IF}	$K_00 \text{ to } K_03$			$0.1V_{DD}$	V
Input pull-down resistance	R_{IN}	$K_00 \text{ to } K_03$	75	100	125	$\text{k}\Omega$

Pin Assignment



Top view

Block Diagram



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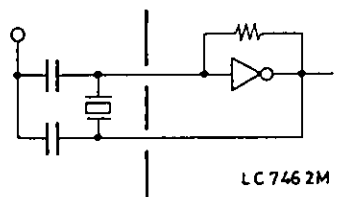
Pin Description

Pin Name	Pin No.	Input/Output	Equivalent Circuit	Pin Function
V_{DD} , V_{SS}	6, 10			Power supply pins: V_{SS} = GND
K_i0 to K_i3	1 to 4	Input		Key return signal entry pins
OUT	5	Output		Output pin for transmit LED drive
TEST	7	Input		LSI test pin Normally set to high-level or brought to open state
OSC1 OSC2	8 9	Input/output		Input/output pins for ceramic resonator-used oscillation Oscillator configuration
IND	11	Output		Output pin for transmit indicator LED drive
K_{O0} to K_{O7}	12 to 19	Output		Key scan timing signal output pins
SEL	20	Input		Either of the two shown below may be selected by option. (1) SW position 1 ON Two selections of custom code by SEL "H" or "L" (2) SW position 2 ON SEL pin: NC (No Connection)

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.

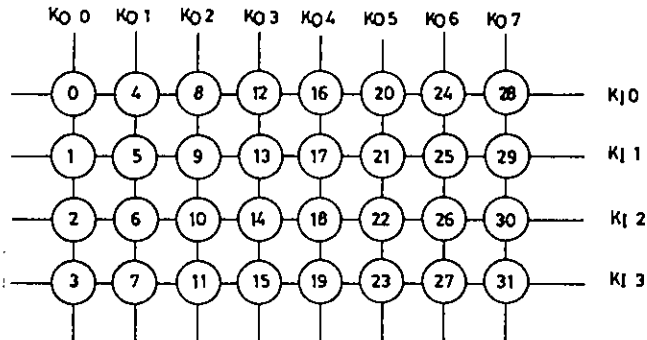


To minimize power dissipation, the oscillator stops oscillating except when key operation is performed.

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2. Key entry

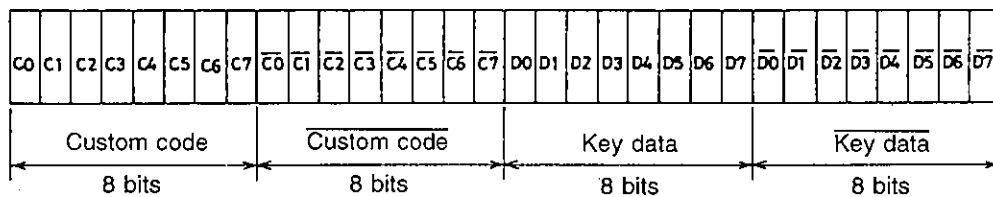
Key entry pins K_{I0} to K_{I3} and timing signal output pins K_{O0} to K_{O7} provide a key matrix of $4 \times 8 = 32$.



Multi-press of key No. 20 and one of key Nos. 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.

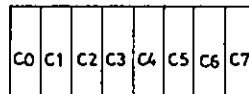
3. Data organization

Data consists of 32 bits in all: 8 bits of custom code, 8 bits of key data, and their inverted codes.



(a) Custom code

The custom code, which consists of 8 bits (C_0 to C_7) in all, is used to distinguish between receiving sets.



C_0 to C_7 are fixed by the internal mask ROM (impossible to fix externally). Two selections of custom code may be made externally by option (SEL pin-selectable).

Custom code option

	Option 1	Option 2
Custom code to be set internally	2 kinds	1 kind
Function of SEL pin	Two selections of custom code by SEL "H" or "L"	NC (No Connection)

(b) Key data

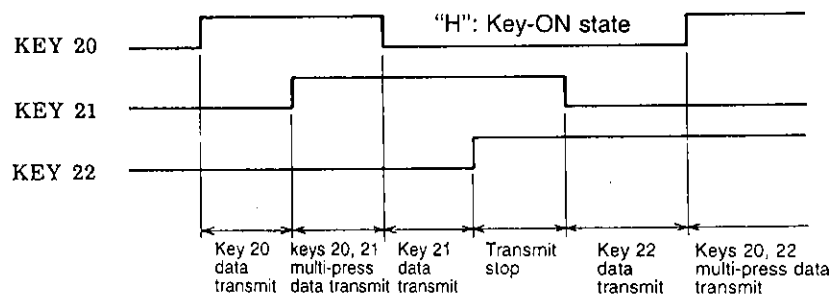
KEY No.	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0
3	1	1	0	0	0	0	0	0
4	0	0	1	0	0	0	0	0
5	1	0	1	0	0	0	0	0
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
28	0	0	1	1	1	0	0	0
29	1	0	1	1	1	0	0	0
30	0	1	1	1	1	0	0	0
31	1	1	1	1	1	0	0	0

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

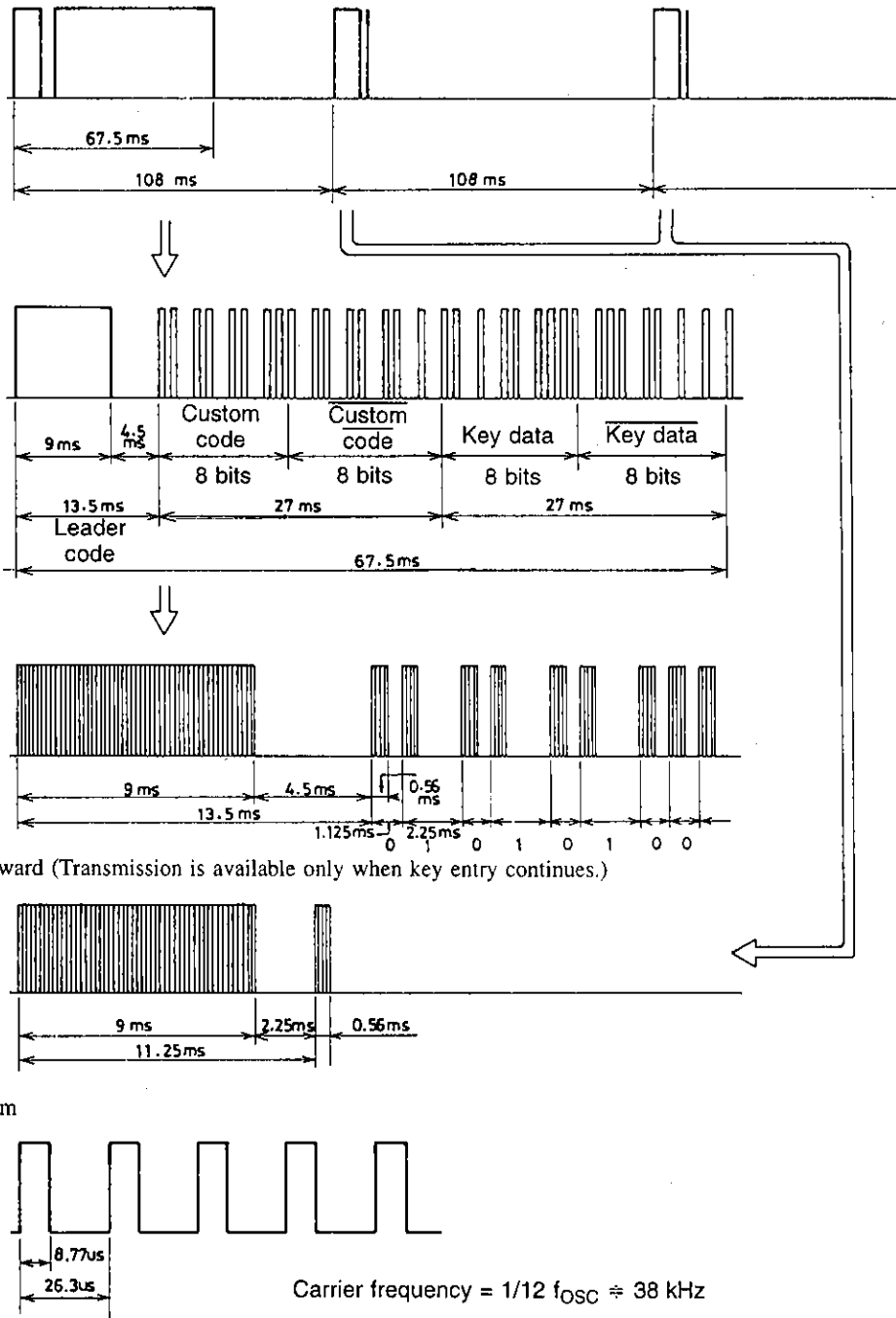
- D₆, D₇ may be preset to "0", "1" beforehand (mask option).

When multi-press of key No. 20 and one of key Nos. 21, 22, 23 is done, multi-bit D₅ will be set to "1", with no priority given in key entry.

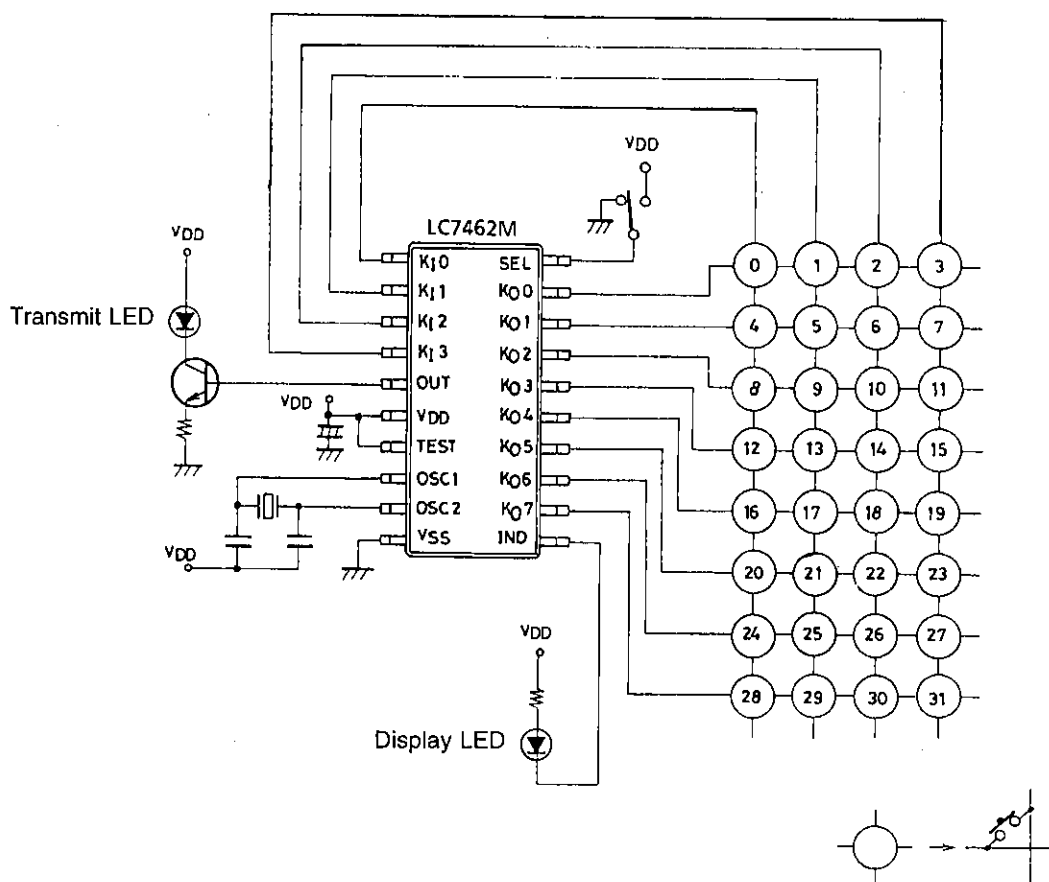


4. Transmit waveforms

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



Sample Application Circuit



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