

# MN6014, MN6014S

## Remote-control Transmitter CMOS LSIs

### ■ Outline

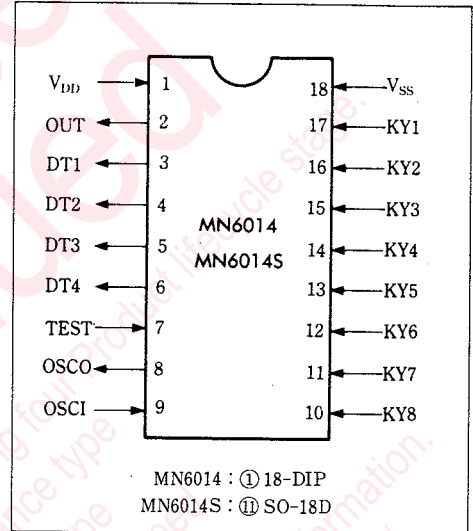
The MN6014/S is a remote-control transmitter CMOS LSI which can have up to 32 keys. A mask option allows the use of 2 kinds of codes; 11-bit and 12-bit ones.

It requires 3V power and provided in 18-pin DIL type and SO type packages.

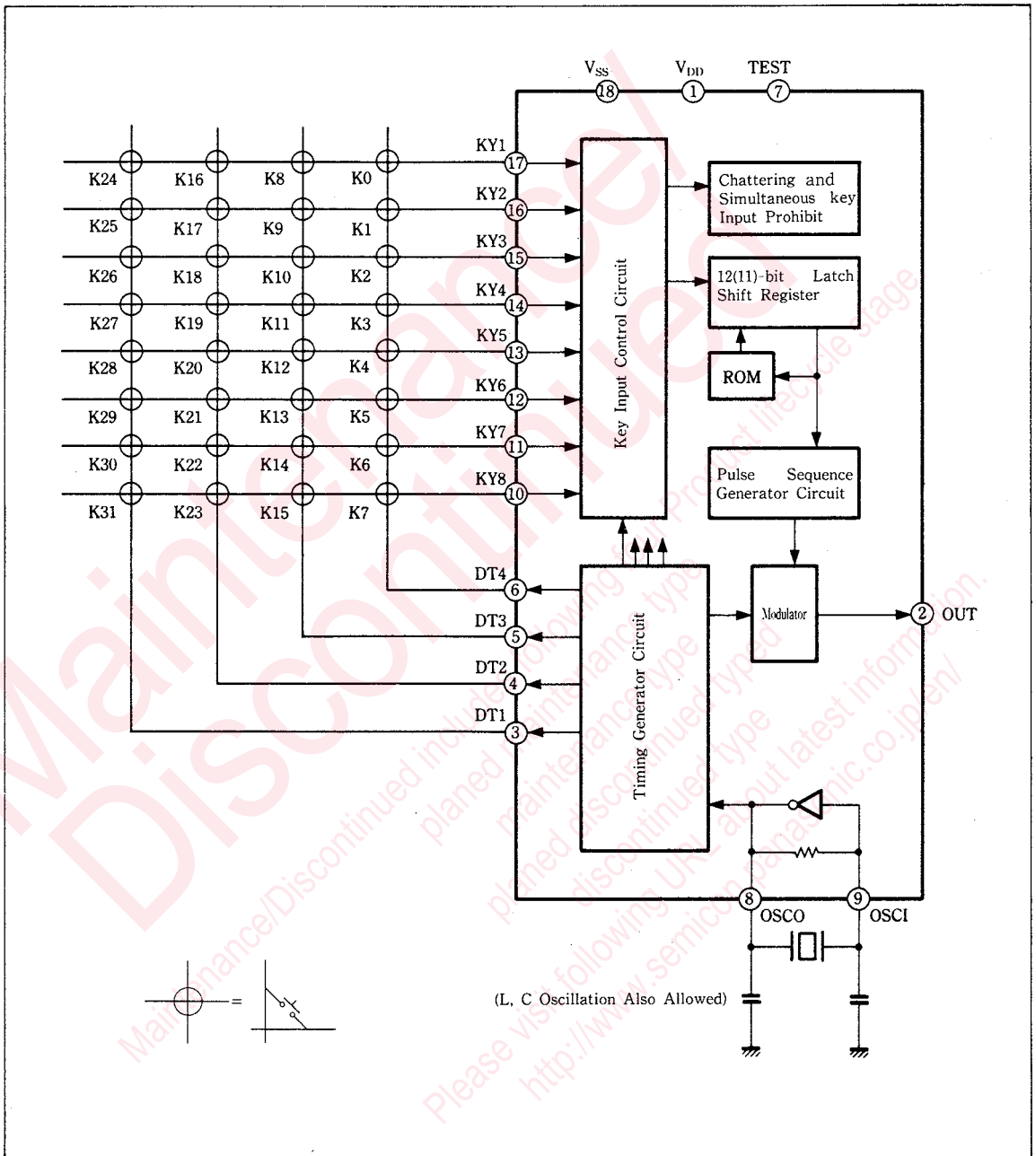
### ■ Features

- Capable of having up to 32 kinds of keys.
- Outputs a pulse sequence repeatedly to all the keys.
- 11-bit/12-bit code selectable(mask option).
- An output is as follows in pulse codes:
  - \* Bit code
  - Custom code(5-/6-bit)+Data code(6-bit)+Custom reverse code(5-/6-bit)+Data reverse code(6-bit)
- Built-in ROM(mask ROM) for the data code and custom code
- Built-in oscillator circuit for ceramic oscillator (about 500 kHz)
- Capable of selecting one eighth or one twelfth carrier of a ceramic oscillation frequency.(mask option)
- Oscillation starts after accepting a key input, and the internal circuit is actuated to output a signal. Oscillation halts upon completion of signal output. Power consumption is very low when there is no key input.
- An output is prohibited when multiple keys are pressed.

### ■ Pin Configuration



■ Block Diagram



### ■ Absolute Maximum Ratings ( $V_{SS}=GND$ , $T_a=25^\circ C$ )

Item	Symbol	Rating	Unit
Supply Voltage	$V_{DD}$	-0.3~+5.0	V
Input voltage	$V_i$	-0.3~ $V_{DD}+0.3$	V
Output voltage	$V_o$	-0.3~ $V_{DD}+0.3$	V
Operating ambient temperature	$T_{opr}$	-20~+70	$^\circ C$
Storage temperature	$T_{stg}$	-55~+100	$^\circ C$

### ■ Operating Condition ( $V_{SS}=0V$ , $T_a=25^\circ C$ )

Item	Symbol	Condition	min.	typ.	max.	Unit
Supply voltage	$V_{DD}$		2.2	3.0	3.5	V

### ■ Electrical Characteristics

#### ● DC Characteristics ( $V_{DD}=3V$ , $V_{SS}=0V$ , $T_a=25^\circ C$ )

Item	Symbol	Condition	min.	typ.	max.	Unit
Supply current	$I_{DD}$	No key input			5	$\mu A$
Power consumption	$P_D$	No key input			15	$\mu W$
Input pins 1: KY1-KY8 (With Pull-down Resistors)						
Voltage high level	$V_{IH1}$		1.5			V
Voltage low level	$V_{IL1}$				0.6	V
Input current	$I_{IN1}$	$V_{IN}=3V$	5	15	30	$\mu A$
Input leakage current	$I_{LK1}$	$V_{IN}=0V$			-10	$\mu A$
Input Pin 2: TEST (With Pull-down Resistors) (Normally, Used at Open)						
Voltage low level	$V_{IL2}$				0.6	V
Input current	$I_{IN2}$	$V_{IN}=3V$	2		30	$\mu A$
Input Pin 3: OSC1						
Voltage high level	$V_{IH3}$		2.4			V
Voltage low level	$V_{IL3}$				0.6	V
Input current	$I_{LK3}$	$V=0$ to 3 V at key input time			$\pm 15$	$\mu A$
Output Pin 1: OUT						
Current high level	$I_{OH1}$	$V_{OUT}=1.5V$		-6.0		mA
Current low level	$I_{OL1}$	$V_{OUT}=0.6V$	50			$\mu A$
Output Pin 2: OSC0						
Current high level	$I_{OH2}$	$V_{OUT}=2.4V$		-60		$\mu A$
Current low level	$I_{OL2}$	$V_{OUT}=0.6V$		+60		$\mu A$
Output Pins 3: DT1-DT4						
Current high level	$I_{OH3}$	$V_{OUT}=2.6V$		-200		$\mu A$
Current low level	$I_{OL3}$	$V_{OUT}=3.0V$	5	15	30	$\mu A$

### ■ Pin Descriptions

Pin No	Symbol	Pin Name	Description
10~17	KY1~KY8	Key input	Key matrix input pin. Pull-down resistor built in.
3~6	DT1~DT4	Scan signal output	Configures a matrix between this and KY1-KY8 to generate a key input signal.
2	OUT	Signal output	Outputs a pulse sequence modulated by a carrier.
8	OSCO	Oscillator circuit output	Output pin for the oscillating inverter. Connect one end of a ceramic oscillator to this.(feedback resistor built in) (spurious oscillation preventive resistor built in)
9	OSCI	Oscillator circuit input	Input pin for the oscillating inverter
7	TEST	Test	LST test pin. Normally open. Pull-down resistor built in.
1	V <sub>DD</sub>	Power supply	Connects to V <sub>DD</sub> (3 V).
18	V <sub>SS</sub>	GND	Connects to V <sub>SS</sub> (0 V).

### ■ Mask ROM

- For the custom code, one register code can be specified out of 64 kinds of "00" through "3F".
- For the data code, any one can be specified for each of the keys K0-K31 respectively out of 64 kinds of "00" through "3F".

### ■ Description of Operations

#### ● Key Input and Scan Signals

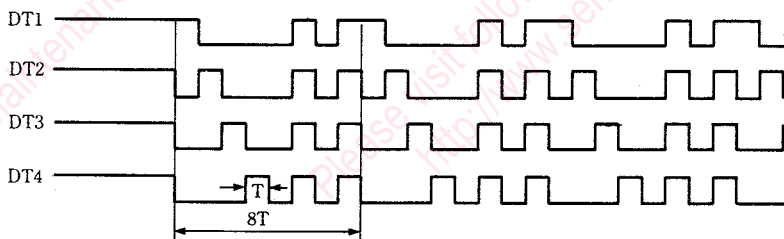
An 8×4-key matrix allows 32 kinds of key switches to be provided.(K0-K31)

Simultaneous key input prohibit: An output is prohibited when 2 or more keys are pressed simultaneously.

Key ON time: An output pulse is issued if a key switch is turned on for 21.8 ms.(chattering time excluded, oscillation source at 455 kHz)

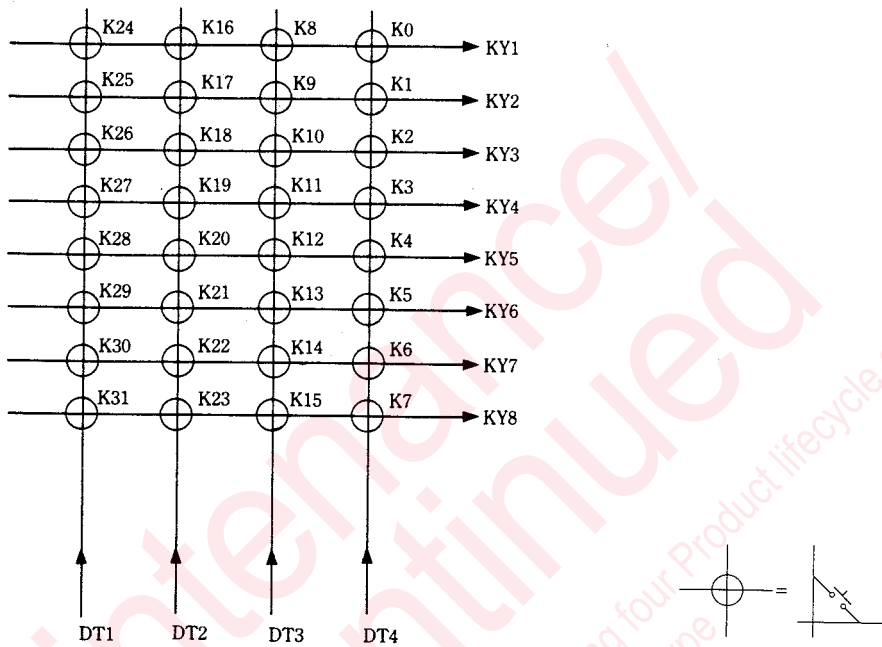
No output pulse is issued if the key switch is turned off before the time above is up.

Key matrix scan signals: Output at key ON



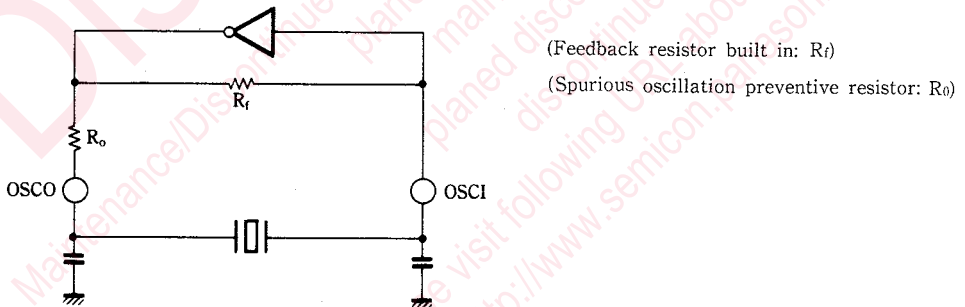
T: Basic Cycle( $T=1/f_{clk}$ )

## ● Key Matrix



## ● Oscillator Circuit and Timing

An inverter for the oscillator circuit configured with a ceramic oscillator is built in.

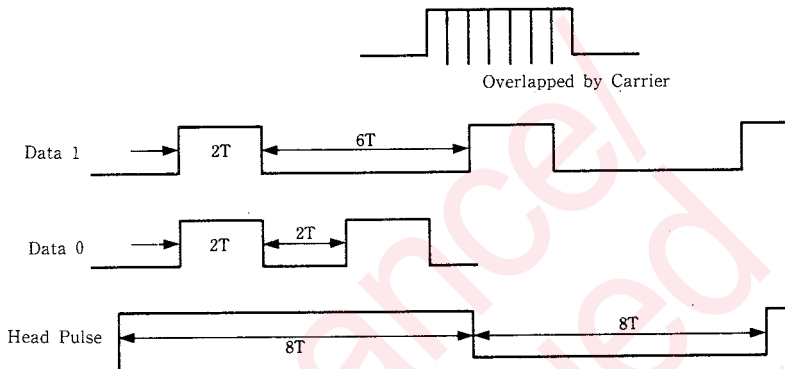


Oscillation Frequency and Timing (Ex.)

Source Oscillation	$f_{osc}$	455 kHz
Carrier	$f_{car1} = f_{osc} / 12$	37.9 kHz
	$f_{car2} = f_{osc} / 8$	56.9 kHz
Basic Clock	$f_{c1k} = f_{osc} / 192$	2.37 kHz
Basic Cycle	$T = 1 / f_{c1k}$	0.42ms

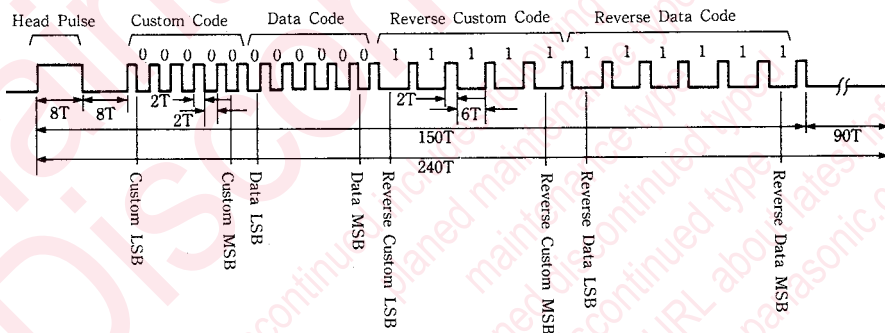
## ■ Output Format

### ● Data Format



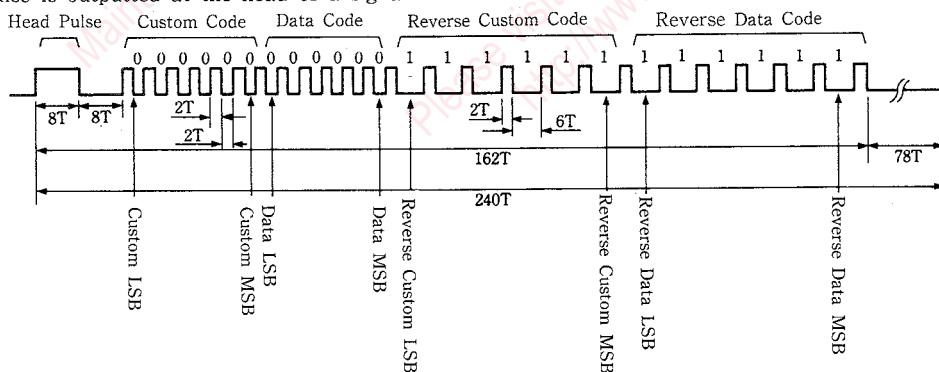
### ● Pulse Sequence Output 11-bit Mode

An output consists of 22 bits in total; 6 bits for an output corresponding to the key, 5 bits for the custom code, plus respective reverse bits. A head pulse is outputted at the head of a signal.



### ● Pulse Sequence Output 12-bit Mode

An output consists of 24 bits in total; 6 bits for an output corresponding to the key, 6 bits for the custom code, plus respective reverse bits. A head pulse is outputted at the head of a signal.



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