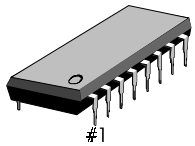
INTRODUCTION

The KS9802 is a CMOS integrated circuit for the infrared ray remote control transmitter function to be used with the KS9801 for receiver. It can be applied to TV, VCR, VDP, CDP and AV controller.
The KS9802 has 18 functions, and a total of 75 commands can be transmitted. These commands are generated by continuous keys with multiple keying and 12 commands by single shot keys.

16–DIP–300A



FEATURES

- Wide range of operating supply voltage :
  V_{DD} = 2.0V ~ 5V
- Low power consumption : I_{DS}<1 μA at standby mode
- Containing ceramic oscillation circuit
- Function of multiple keying
- Adaptable to various models using custom code bits

ORDERING INFORMATION

Device	Package	Operating Temperature
KS9802	16–DIP–300A	– 20°C ~ + 75°C

BLOCK DIAGRAM

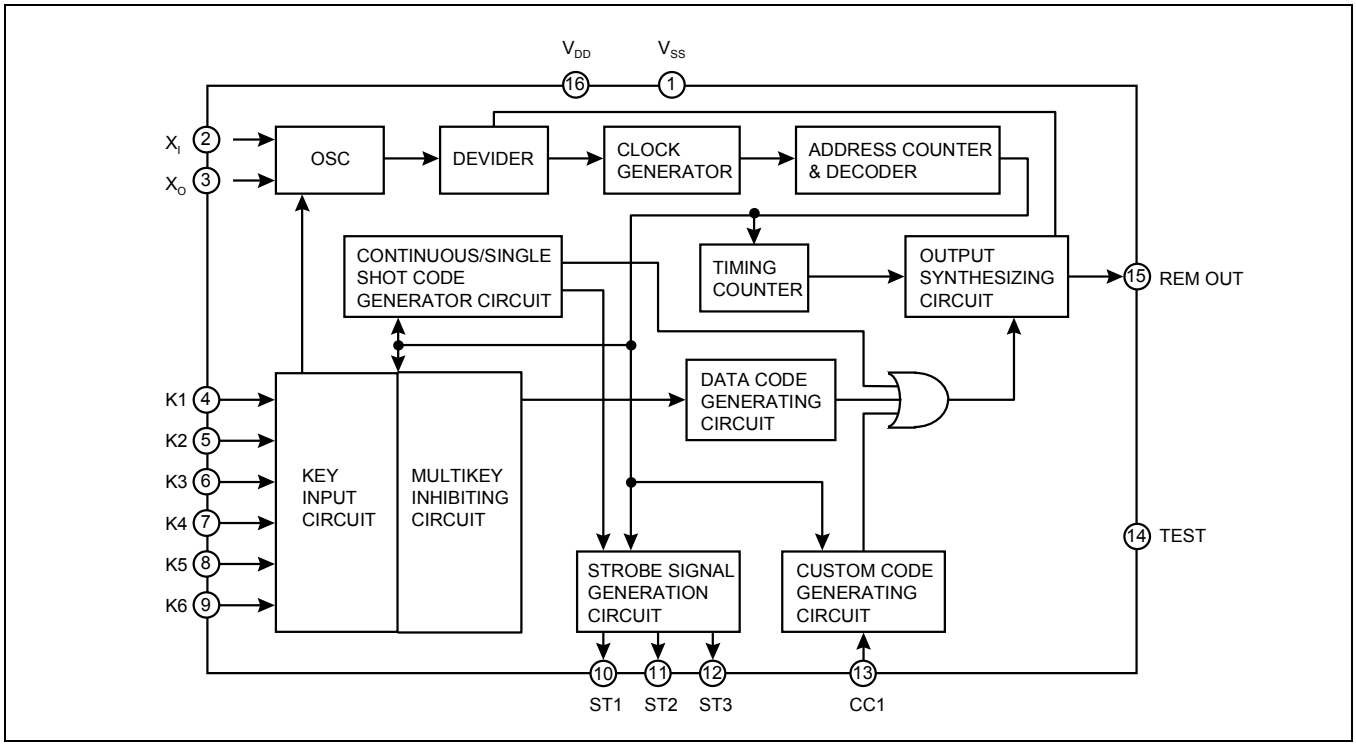


Figure 1.

PIN CONFIGURATION

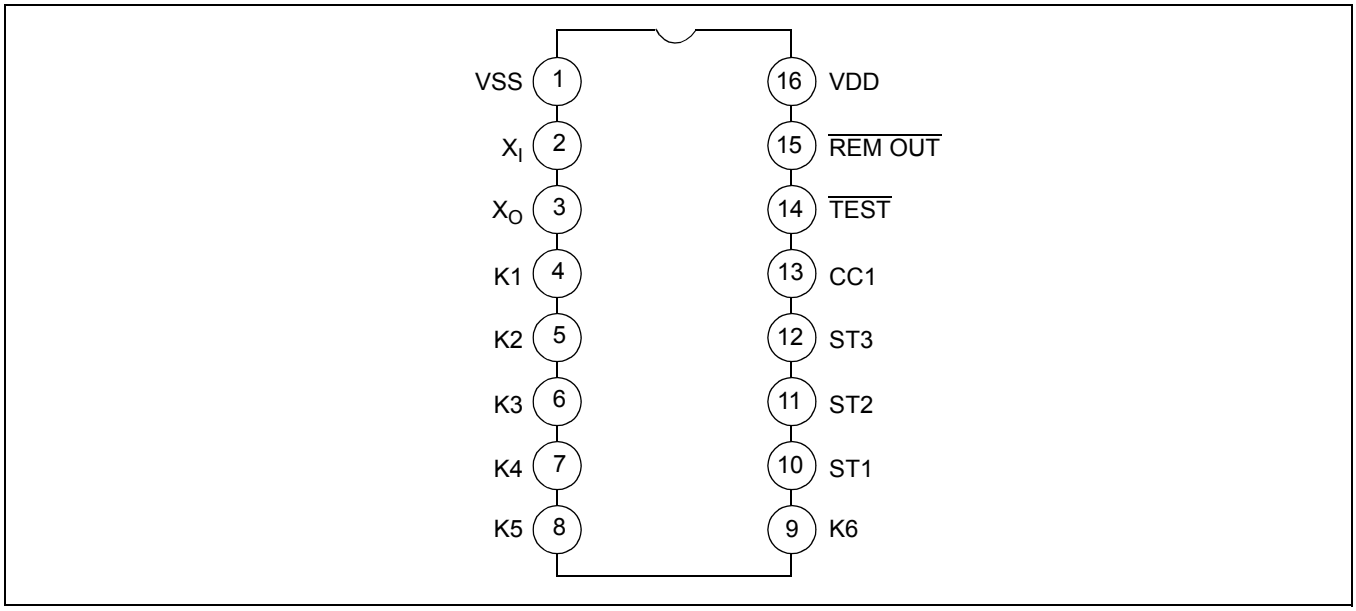


Figure 2.

PIN DISCRIPTION

Pin No.	Symbol	Input/Output	Description
1,16	V_{SS1}, V_{DD}	GND, Power	Ground, power supply terminals
2	X_I	OSC Input	Terminal for OSC, and used for connecting a 455kHz ceramic resonator
3	X_O	OSC output	
4~9	K1 ~ K6	Key Input	Key input terminal for key matrix (with a built-in pull down resistor)
10~12	ST1 ~ ST3	Strobe Output	Strobe output terminal for key matrix
13	CCI	Custom Code Input	Selected custom code
14	$\overline{TEST}$	Test Terminal	With a built-in pull up resistor
15	$\overline{REM\text{-}OUT}$	Remote Output	Remote signal output, modulation is made by 12 bits 1 cycle and 38kHz carrier wave

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{DD}	6	V
Input Voltage	V_{IN}	V_{SS} −0.3 ~ V_{DD}+0.3	V
Power Dissipation	P_D	200	mW
Operating Temperature	T_{OPR}	−20 ~ 75	°C
Storage Temperature	T_{STG}	−55 ~ +125	°C
REM-OUT Output Current	I_{OUT}	−5	mA

ELECTRICAL CHARACTERISTICS

(Ta = 25°C , V_{DD} = 3V, unless otherwise specified)

Characteristic				Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Operating Voltage				V_{DD}	All function operation	2.0	–	50	V
Operating Current				I_{DD}	Key on, without LOAD	–	0.1	1.0	mA
Static Current				I_{DS}	OSC stop, all key off	–	–	10	μA
Input	K1 ~ K6 CCI	V_{IN}	H	V_{IH}	–	0.8 Vdd	–	Vdd	V
			L	V_{IL}	–	0	–	0.2 Vdd	V
	K1 ~ K6	I_{IN}	H	I_{IH}	V_{IH} = 3.0V	10	20	60	μA
			L	I_{IL}	V_{IL} = 0V	–1.0	–	1.0	μA
	CCI TEST	I_{IN}	H	I_{IH}	V_{OH} = 3.0V	–1.0	–	1.0	μA
			L	I_{IL}	V_{IL} = 0V	10	20	60	μA
Out put	ST1 ~ ST3	I_{OUT}	H	I_{OH}	V_{OH} = 2.0V	–0.5	–	–	mA
			L	I_{OL}	V_{OL} = 3.0V	50	–	–	μA
	REM-OUT	I_{OUT}	H	I_{OH}	V_{OH} = 2.0V	-0.1	–	–	mA
			L	I_{OL}	V_{OL} = 2.0V	1.0	–	–	mA
OSC Feedback Resistor				Rf	–	–	500	–	kΩ
Oscillatiion Frequency				f_{OSC}	–	400	455	500	kHz

FUNCTIONAL DESCRIPTION

1. OSCILLATION CIRCUIT

- The oscillation circuit is activated when any key is depressed. The ceramic resonator connected to X_I, X_O is normally operated at 455kHz oscillation frequency.

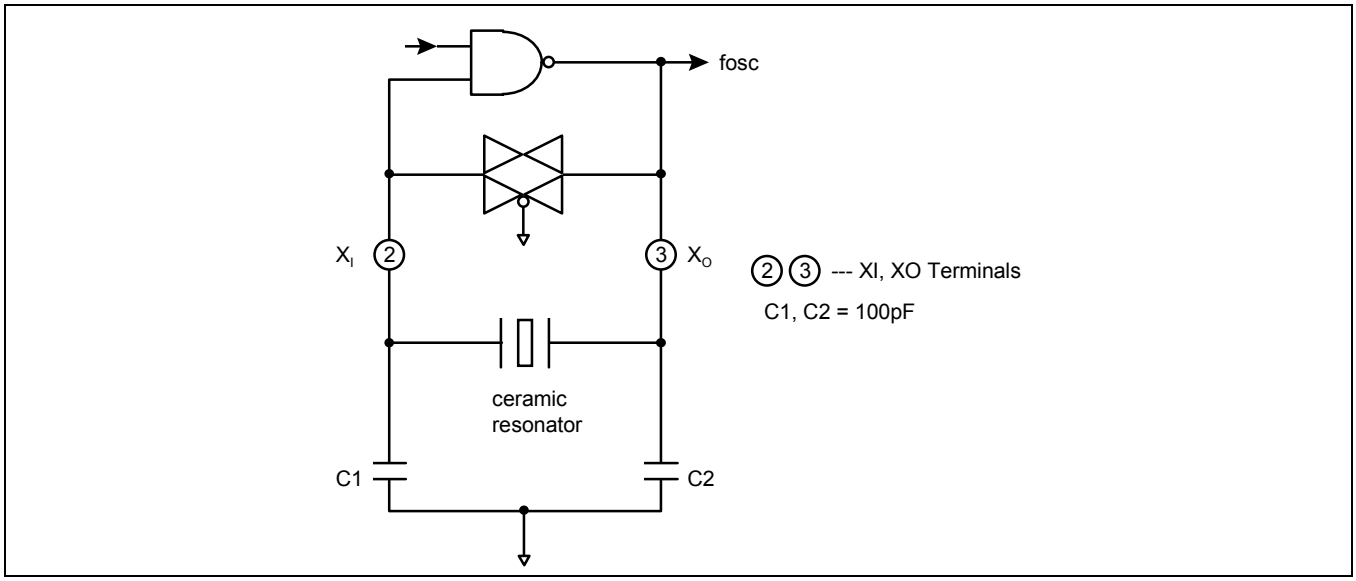


Figure 3.

2. KEY INPUT & STROBE OUTPUT

- All key input pins have a pull down resistor to VSS. 18 keys can be connected by key input K1 ~ K6 and 6x3 matrix by means of strobe signal ST1 ~ ST3.
- Multiple keying is possible for the keys connected to ST1 Line (key No. 1 ~ 6), and all depressed keys are output (Output becomes continuous pulses).
- Among the strobe signal lines, priority is set in the order, ST1>ST2>ST3.
  The keys connected to ST2 and ST3 lines have priority and when input is made through more than 2 keys, and single signal is preferentially output in order of K1 ~ K6.
- Finally, the keys connected to ST2 and ST3 lines are for single signals and no second signal is transmitted unless input is made again *after* the key is *released* once.

*** Key Matrix**

	ST1(CT)		ST2 (S1)		ST3C (S2)	
K1	••••••••••	1	••••••	7	••••••	C
K2	••••••••••	2	••••••	8	••••••	D
K3	••••••••••	3	••••••	9	••••••	E
K4	••••••••••	4	••••••	10	••••••	F
K5	••••••••••	5	••••••	A	••••••	G
K6	••••••••••	6	••••••	B	••••••	H

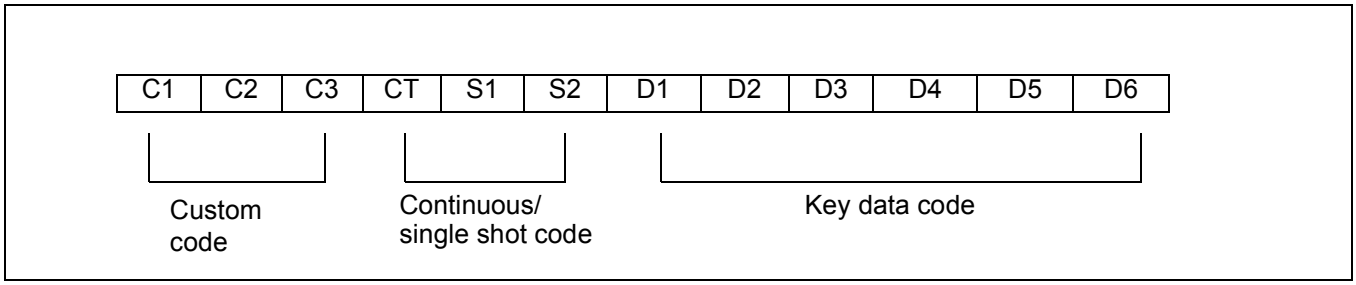
Key on. 1 ~ 6: continuous keys
Key on. 7 ~ H: single shot keys

*** Key Data Code**

key No.	Key Data Code									Output Type	Key No.	Key Data Code									Output Type
	CT	S1	S2	D1	D2	D3	D4	D5	D6			CT	S1	S2	D1	D2	D3	D4	D5	D6	
1	1	0	0	1	0	0	0	0	0	Cont	10	0	1	0	0	0	0	1	0	0	Sing
2	1	0	0	0	1	0	0	0	0	″	a	0	1	0	0	0	0	0	1	0	″
3	1	0	0	0	0	1	0	0	0	″	b	0	1	0	0	0	0	0	0	1	″
4	1	0	0	0	0	0	1	0	0	″	c	0	0	1	1	0	0	0	0	0	″
5	1	0	0	0	0	0	0	1	0	″	d	0	0	1	0	1	0	0	0	0	″
6	1	0	0	0	0	0	0	0	1	″	e	0	0	1	0	0	1	0	0	0	″
7	0	1	0	1	0	0	0	0	0	Sing	f	0	0	1	0	0	0	1	0	0	″
8	0	1	0	0	1	0	0	0	0	″	g	0	0	1	0	0	0	0	1	0	″
9	0	1	0	0	0	1	0	0	0	″	h	0	0	1	0	0	0	0	0	1	″

- Since multiple keying is possible, key no. 1 ~ 6 are capable of outputting 63 commands through a combination of D1 ~ D6 data.
- Key No. 7 ~ h are the single shot keys for output 12 commands.

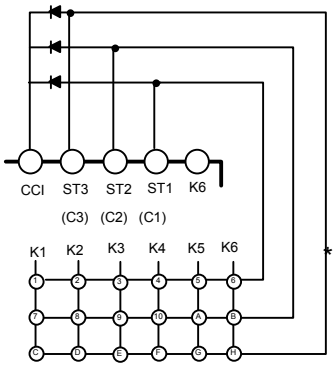
* Output Fomat: Transmission command consists of a 3-bit Custom code.
3-bit Continuous/Single shot code and 6-bit Data code.



3. CUSTOM CODE (C1, C2, C3)

- Custom code bit is made at one terminal with diodes connected through ST1 ~ ST3 strobe terminals

CCI = Custom Code Input



* Custom code bit consists of 3 bits (C1,C2,C3), and makes 8 custom codes.

Figure 4.

- Custom code bit becomes 1 when diodes are connected to the CCI terminal through strobe signal (ST1 ~ST3), but if diodes are not connected, custom code bit becomes “0”. (In the above diagram, C1. C2 and C3 are “1”, 1 and data.)

- Custom code bit of the KS9802 has 3 bits. However, the KS9801 (16-DIP) which is a receiver, and the KS9803 (24-DIP) are able to use only C2, C3, and C1, C2 custom code bits, respectively.

- For C1 and C3 custom code bit data not used on the KS9801 and KS9803, you must transmit “1”, and diodes must be connected as follows.

Custom code bit	
C1	C2
C3	C2
1	0
0	1
1	1

C1,C2 • • • • • • KS9803 (24-DIP)
C2,C3 • • • • • • KS9801 (16-DIP)
Note:
* Custom code bit “0” can not be used
* Custom code C1 can’t be used on the KS9801 and C3 can’t be used on the KS9803

4. REMOTE OUTPUT

a. Basic waveform (at fosc = 455kHz)

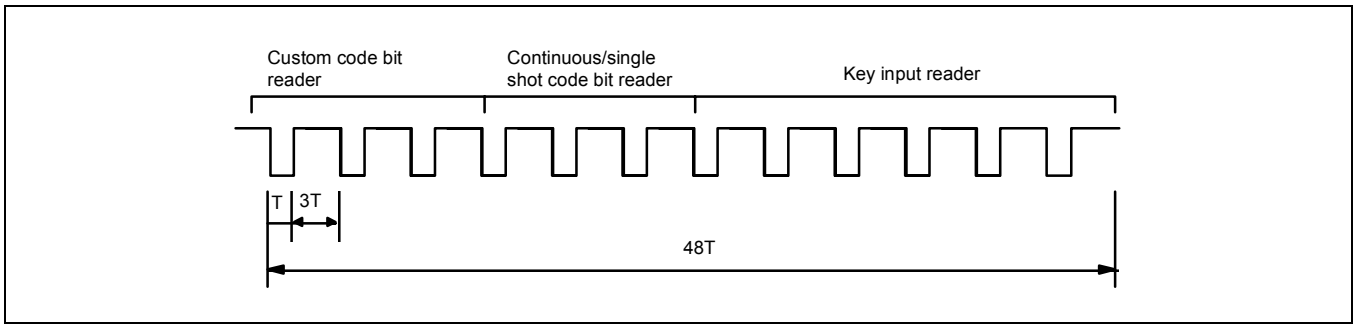


Figure 5.

- Basic remote waveform is 12-bit serial data in configuration as shown above.
- The time of each bit T is decided as shown below by the oscillation frequency fOSC, by means of 01 and 00.
- T = (1/fOSC) X 192[sec]

b. Distinction of bit "0" and "1"

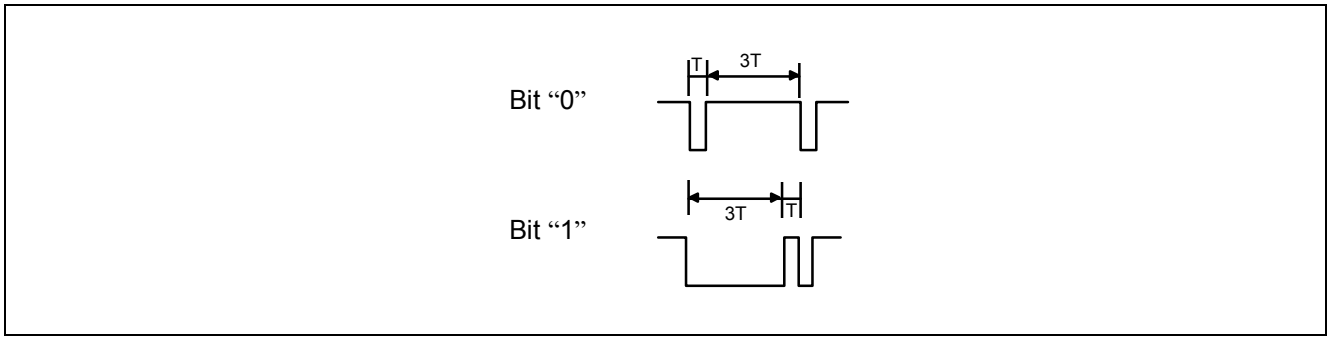


Figure 6.

C. Remote output of Single shot key

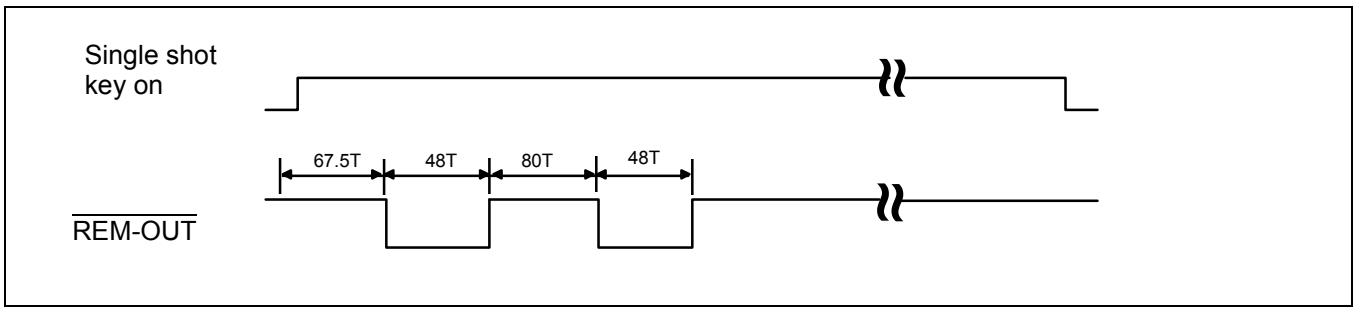


Figure 7.

- When any one of the single shot keys is depressed, the above single shot signal is transmitted in 2 cycles, and the remote output ends.

d. Remote output of continuous key

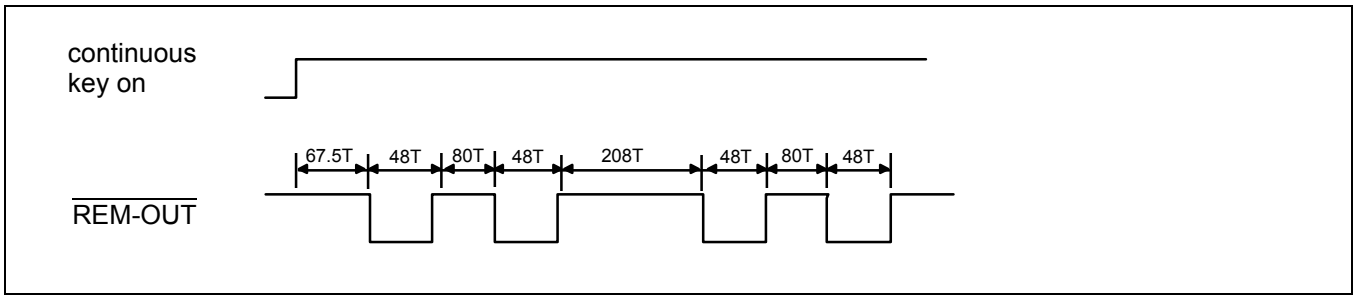
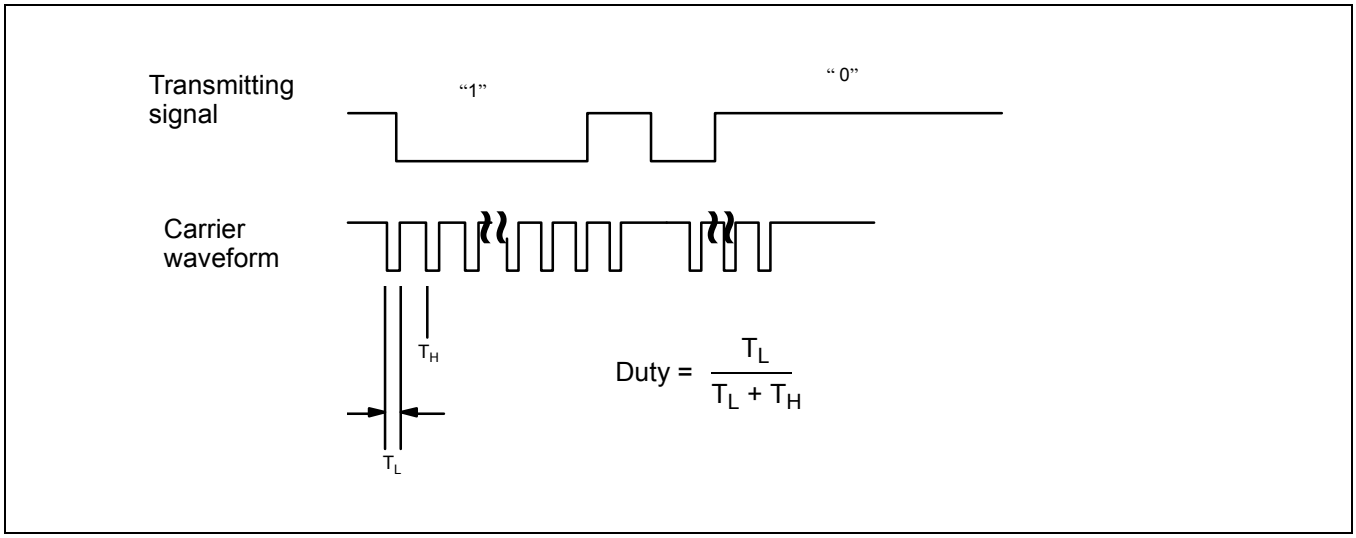


Figure 8.

- When any one of the signal shot keys is depressed, the above continuous signal is 2 cycles output, repeatedly output 208T pause and 2 cycles output is 2 pause of 208T.

e. Carrier waveform



- When single shot or continous signal is transmitting, each code bit is switched by a carrier of duty 1/3 output after the pulse modulated.
- In 455kHz oscillation the signal is modulated by 1/3 duty 38MHz, and carrier (fC) is decided by oscillation frequency fOSC by means of X_I and X_O.

$f_C = f_{OSC}/12[Hz]$ f_C = 38kHz at f_{OSC} = 455kHz

APPLICATION CIRCUIT

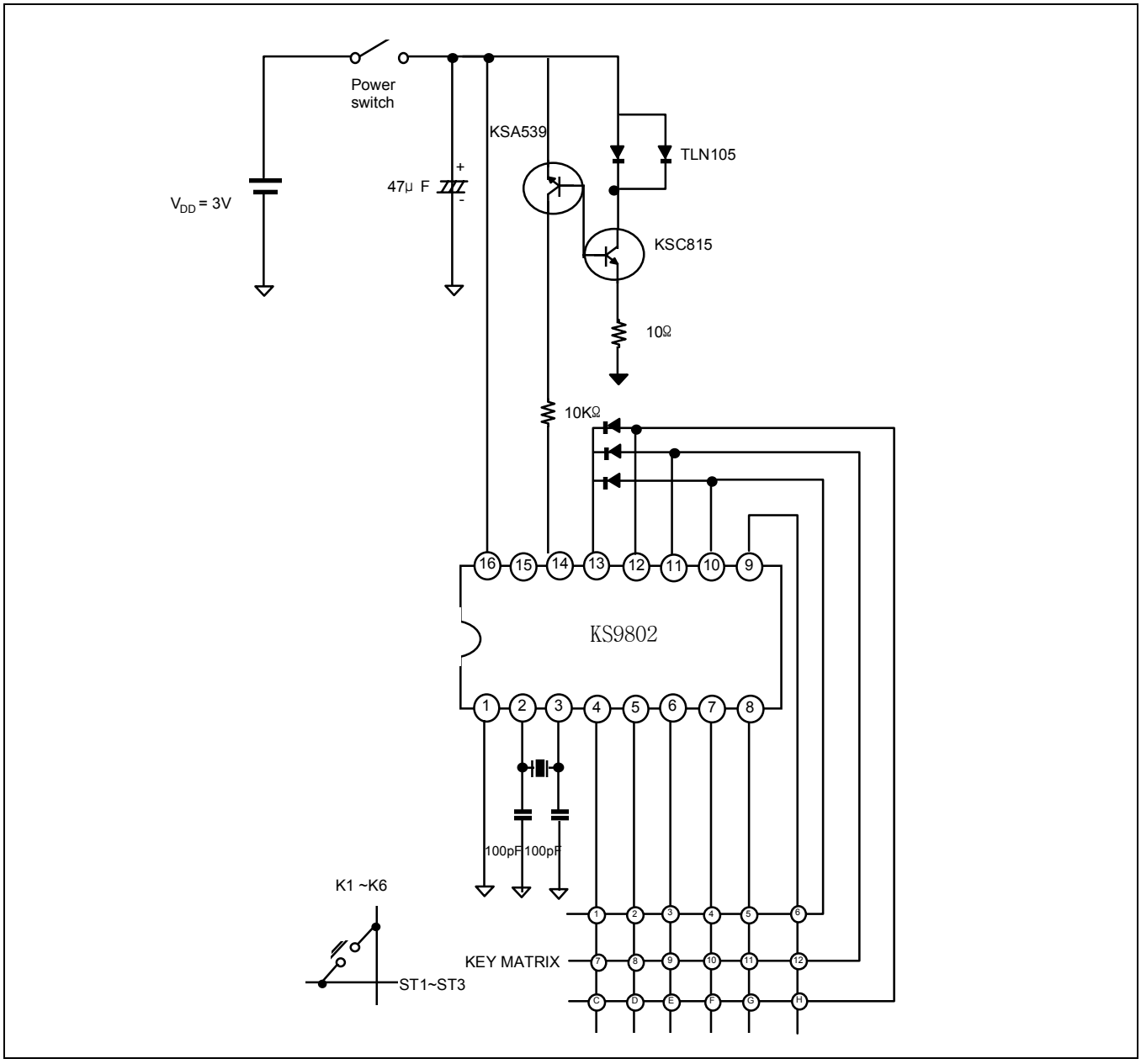


Figure 9.