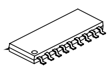
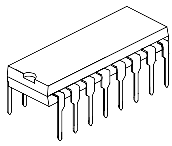
FOR INFRARED REMOTE CONTROL TRANSMITTER


SOP-16


DIP-16

DESCRIPTION

The SC9148B is CMOS LSI developed for use on the infrared remote control transmitter. This LSI has 18 functions, and total 75 commands can be transimitted : 63 commands by the continuous keys of multiple keyings is possible and 12 commands by the single shot keys.

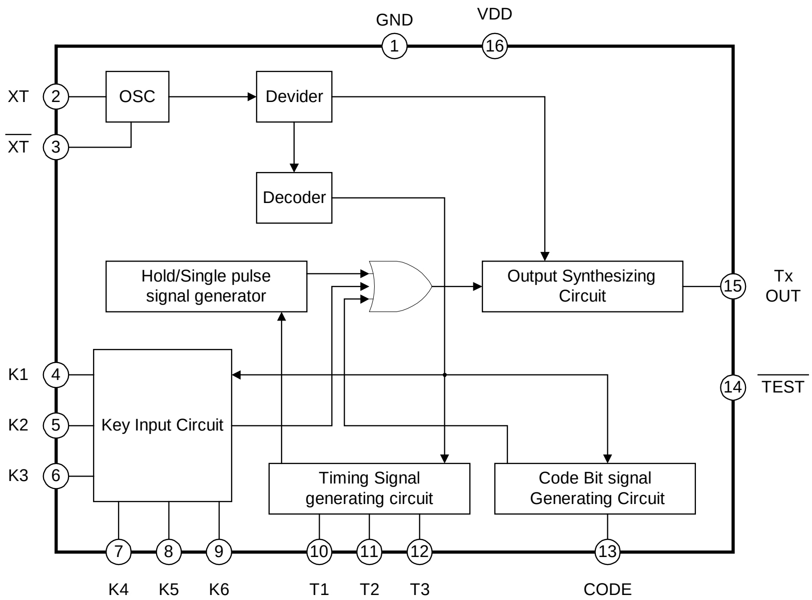
FEATURES

* Wide operating voltage range(V_{DD}=2.2V ~ 5.0V)
* CMOS structure assures extremely low power dissipation
* Mulitiple keying is possible
* Less external parts
* Adaptable to other Models as Code Bits are available
* An oscillator can be constructed only by connecting an LC or Ceramic Resonater as the oscillation circuit is housed.

ODERING INFORMATION

SC9148B	Advanced version. All functions same as SC9148. DIP-16 package.
SC9148S	Advanced version. SOP-16 package.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage(Pin 16)	V_{DD}	6.0	V
Input/Output Voltage	V_{IN},V_{OUT}	Vss-0.3V ~ V_{DD}+0.3V	V
Power Dissipation	P_D	200	mW
Operating Temperature	Tamb	-20 ~ +75	°C
Storage Temperature	Tstg	-55~+125	°C

ELECTRICAL CHARACTERISTICS(Tamb=25°C, V_{DD}=3.0V,Unless otherwise specified)

Parameter				Symbol	Test conditions	Min	Typ	Max	Unit
Operating Supply Voltage				V_{DD}	All function operation	2.2		5.0	V
Operating supply current				I_{DD}	Key ON, without load			1.0	mA
Quiescent Current comsuption				I_{DS}	All key OFF stop of OSC			1.0	μA
Input Termianl	K1~K6 CODE	Input Voltage	"H" Level	V_{IH}		2.0		3.0	V
			"L" Level	V_{IL}		0		0.5	V
	K1~K6	Input Current	"H" Level	I_{IH}	V_{IH}=3.0V	20	30	60	μA
			"L" Level	I_{IL}	V_{IL}=0V	-1.0		1.0	μA
	CODE TEST	Input Current	"H" Level	I_{IH}	V_{IH}=3.0V	-1.0		1.0	μA
			"L" Level	I_{IL}	V_{IL}=0V	20	30	60	μA
Output Terminal	T1~T3	Output Current	"H" Level	I_{OH}	V_{OH}=2.0V	-500			μA
			"L" Level	I_{OL}	V_{OL}=3.0V	50			μA
	Tx	Output Current	"H" Level	I_{OH}	V_{OH}=2.0V	-0.1			mA
			"L" Level	I_{OL}	V_{OL}=3.0V	1.0			mA
OSC Feedback resistor				Rf			500		kΩ
Oscillation frequency				f_{OSC}		400	455	600	kHz

PIN DESCRIPTION

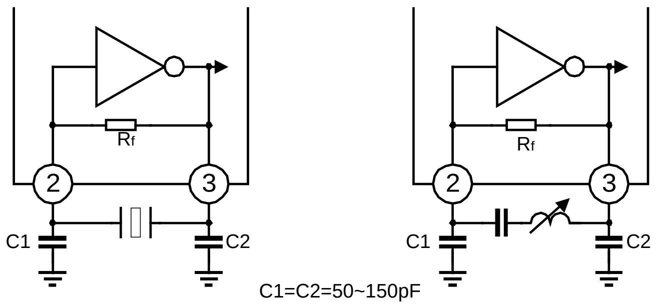
Pin No.	Symbol	Terminal	Function/operation
1,16	GND,V_{DD}		Supply Voltage Terminal
2,3	XT, non-XT	Termial for OSC	Terminal for OSC, and used for connecting a 455kHz ceramic resonater etc. (with a built-in feedback resistor)
4~9	K1~K6	Key Input terminal	Key input Terminal for key matrix. 18 keys can be connected at T1~T3 x K1~K6 (with a built-in pull-down resistor)
10~12	T1~T3	Timing Signal Output Terminal	Digit timing output terminal for key matrix.
13	CODE	Code bit input Terminal	Terminal for matching code between transmitting and receiving
14	Non-TEST	Test terminal	Keep this terminal open
15	Tx Out	Transmitting output terminal	Transmitting signal output. Modulation is made by 12 bits 1 cycle and 38kHz carrier wave.

FUNCTIONAL DESCRIPTION

1. OSCILLATION CIRCUIT

As the self-bias type amplifier by means of CMOS inverter has been housed, the oscillation circuit can be constructed when LC or ceramic resonater is connected.

When oscillation frequency is set at 455kHz, carrier wave of transmitting signal is set at 38kHz, oscillation of the oscillation circuit is kept stopped unless the keys are operated, thus reducing power consumption.



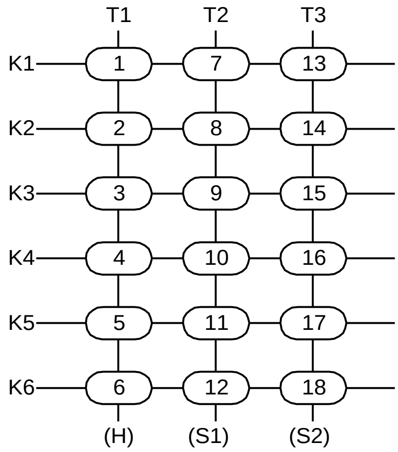
C1=C2=50~150pF

2. KEY INPUT

18 keys can be connected by key input K1~K6 and 6 ×3 matrix by means of timing signal T1~T3 .
Multiple keying is possible for the keys connected to T1 line up to sextet , and all key inputs are output . (Output becomes continuous pulses .)

Between the timing signal lines , priority has been decided in order of T1, T2 , T3 . The keys connected to T2 and T3 lines have priority and input is made through more than 2 keys , single signal is preferentially output in order of K1~K6 .

Further , the keys connected to T2 and T3 lines are for single and not second signal is transmitted unless input is made again after the key is released once.



KEY MATRIX

Key No.1~6

Continuous key output with it pressed, and multiple keying is possible.

Key No.7~18

These keys are the single-shot keys and when input is made, signal is output only one time.

3. TRANSMISSION COMMAND

Transmission command is in one word 12-bits configuration. C1~C3 are code bits adaptable to many models, H,S1 and S2 continous signal and single-shot signal codes ,and D1~D6 are Key input data codes in 6-bits.

C1	C2	C3	H	S1	S2	D1	D2	D3	D4	D5	D6

4. DATA CODE

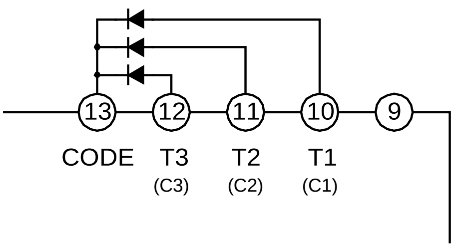
Key No.	DATA									Output Form	Key No.	DATA									Output Form
	H	S1	S2	D1	D2	D3	D4	D5	D6			H	S1	S2	D1	D2	D3	D4	D5	D6	
1	1	0	0	1	0	0	0	0	0	Continuous	10	0	1	0	0	0	0	1	0	0	Single-shot
2	1	0	0	0	1	0	0	0	0	Continuous	11	0	1	0	0	0	0	0	1	0	Single-shot
3	1	0	0	0	0	1	0	0	0	Continuous	12	0	1	0	0	0	0	0	0	1	Single-shot
4	1	0	0	0	0	0	1	0	0	Continuous	13	0	0	1	1	0	0	0	0	0	Single-shot
5	1	0	0	0	0	0	0	1	0	Continuous	14	0	0	1	0	1	0	0	0	0	Single-shot
6	1	0	0	0	0	0	0	0	1	Continuous	15	0	0	1	0	0	1	0	0	0	Single-shot
7	0	1	0	1	0	0	0	0	0	Single-shot	16	0	0	1	0	0	0	1	0	0	Single-shot
8	0	1	0	0	1	0	0	0	0	Single-shot	17	0	0	1	0	0	0	0	1	0	Single-shot
9	0	1	0	0	0	1	0	0	0	Single-shot	18	0	0	1	0	0	0	0	0	1	Single-shot

As the multiple keying is possible , key No .1~6 are capable of output 63 commands through a combination of D1~D6 data .

Key No . 7~18 are the single-shot keys for output 12 commands , and 75 commands can be output through a combination of continuous key (multiple keying is possible) and single-shot key .

5. CODE BITS(C1,C2,C3)

Code bit can be made at one terminal with diodes connected through T1 ~ T3 timing terminals .



CODE BIT		
C1	C2	C1,C2 IS FOR SC9150A
C3	C2	C2,C3 IS FOR SC9149A
1	0	CODE BIT "0","0" CAN NOT BE USED
0	1	
1	1	

Data of C1 , C2 and C3 code bit become “1” when diodes are connected to CODE Terminal through Timing Signal Terminals T1 ~T3, and ‘0’ when not connected . (In the above diagram , C1 , C2 and C3 are “1” , “1” and “1” data .)

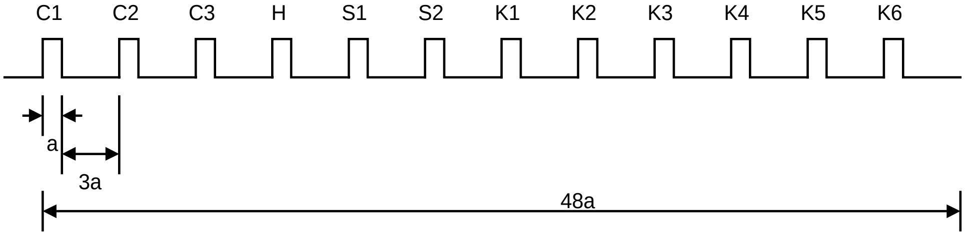
The SC9148P has 3 code bits . However , the SC9149P that is a receiving IC (DIP 16 PIN) and the SC9150P (DIP 24 PIN) are able to use only C2 and C3 , and C1 and C2 2 code bits , respectively .

Therefore , diodes must be connected so that code bit data of the SC9148P agreement with the receiving IC .
Note : For C3 and C1 code bit data not used on the SC9150P and SC9149P , it is necessary to transmit ‘1’ and diodes must be so connected .

6. TRANSMITTING WAVEFORM

6.1 BASIC TRANSMITTING WAVEFORM (at fosc=455kHz)

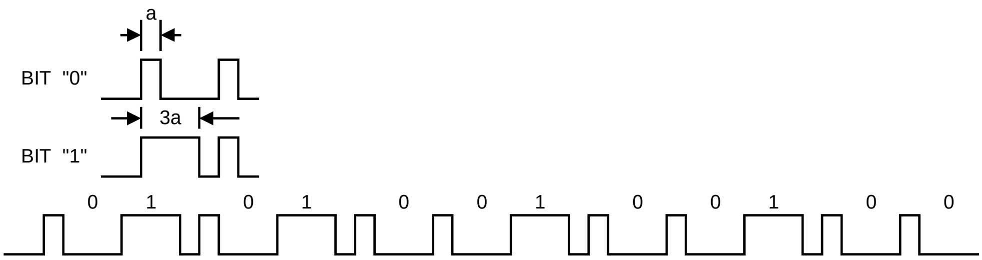
C1~C3: CODE BIT READER
H,S1,S2: HOLD/SINGLE PULSE READER
K1~K6: KEY INPUT READER



Basic transmitting waveform is 12-bits serial data in configuration as shown above.
The time of each bit “ a” is decided as shown below by oscillation frequency fosc by means of XT and non-XT.

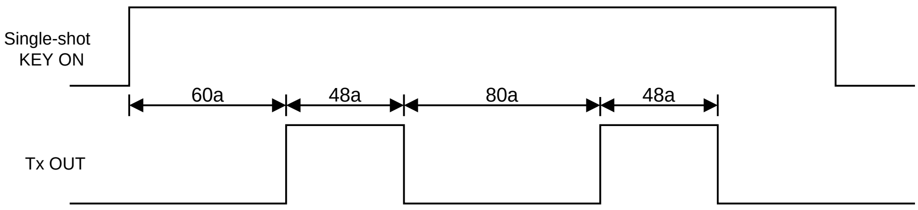
$a=(1/fosc)\times192(sec)$

6.2 DISTINCTION OF BIT “0” AND “1”



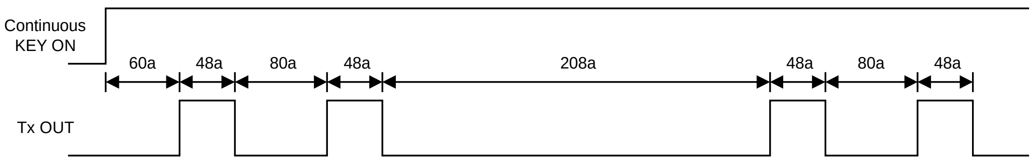
One word of the above transmission command is in the configuration of (010100100100).

6.3 SINGLE-SHOT SIGNAL



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

6.4 CONTINUOUS SIGNAL

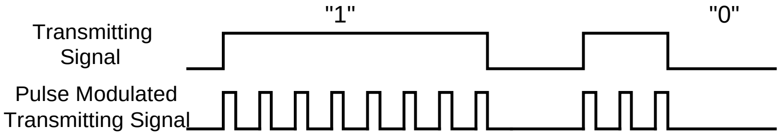


When any one of the continuous keys is depressed, the above continuous signal is 2 cycles output, repeatedly output 208a pause and 2 cycles is 2 pause of 208a.

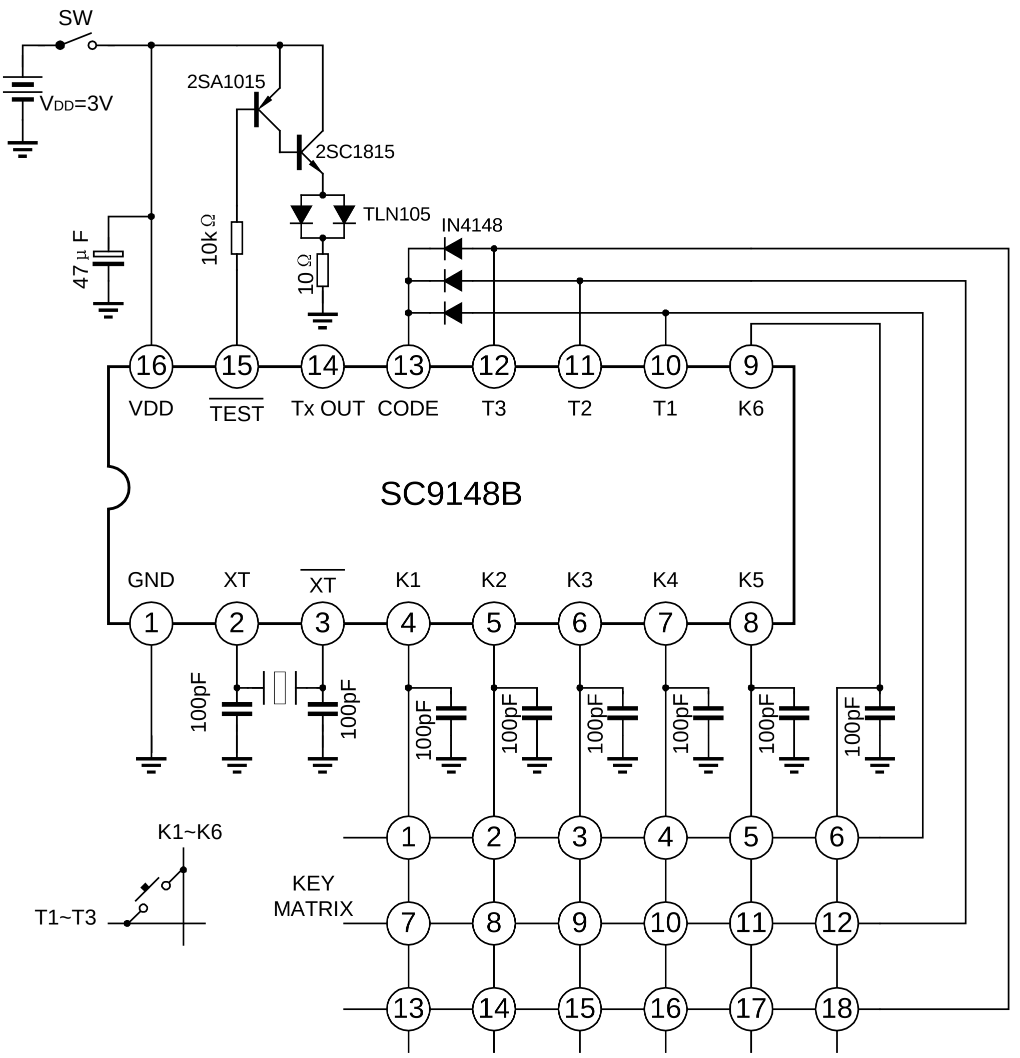
6.5 CARRIER WAVE

About 50~100mA current is normally applied through an infrared LED in order to extend an infrared ray reaching distance. Therefore, if a time, when LED is ON, is shortened as could as possible , it leads to reduction in power consumption. On this IC, when single-shot or continuous signal is transmitting, each bit is switching by a carrier of duty 1/3, output after the pulse modulated.
Carrier(fc) is decided by oscillation frequency fosc by means of XT and non-XT,

fc=fosc/12(Hz), fc=38kHz at fosc=455kHz.

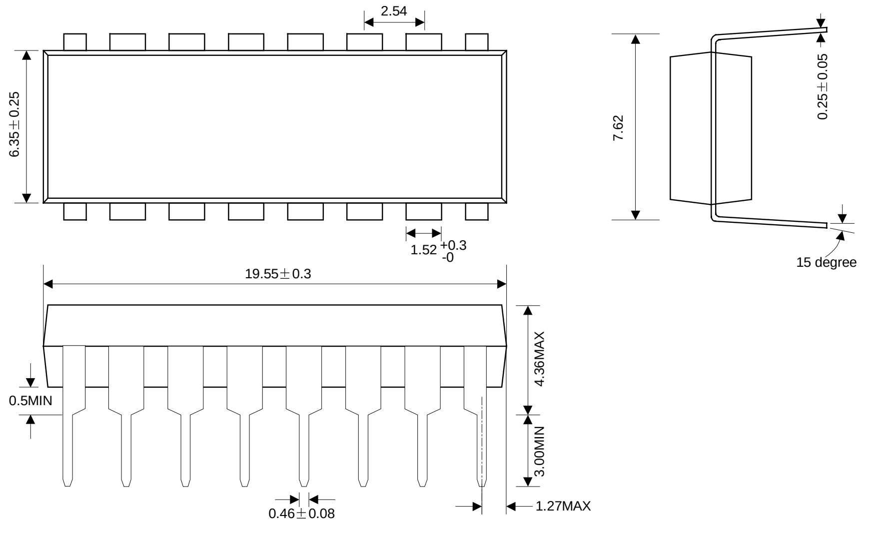


APPLICATION CIRCUIT

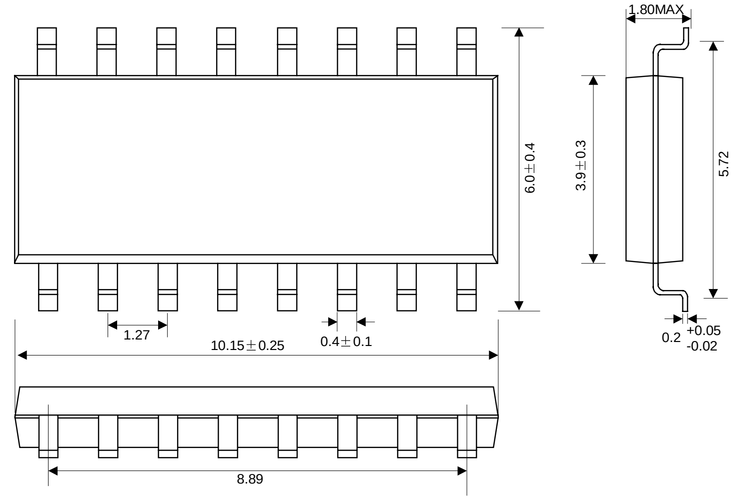


PACKAGE OUTLINE

DIP-16-300-2.54 UNIT:mm



SOP-16-225-1.27 UNIT:mm



Attach

Revision History

Data	REV	Description	Page
2000.12.31	1.0	Original	
2002.05.27	2.0	Modify the "SC9148A" to "SC9148B" Modify the "PACKAGE OUTLINE"	8
2002.09.10	2.1	Modify the "APPLICATION CIRCUIT"	7