SM5022
IR ENCODER

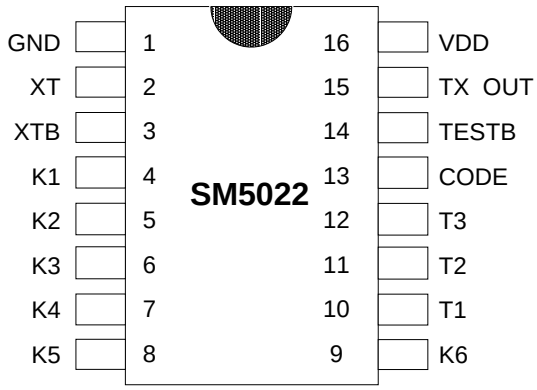
FEATURES

* Up to 18 keys transmission
* Single-key & multi-key transmission
* Wide range operating voltage : VDD= 2 ~ 5 V
* CMOS technology, low power consumption
* Few components for external circuit
* Built-in oscillating circuit

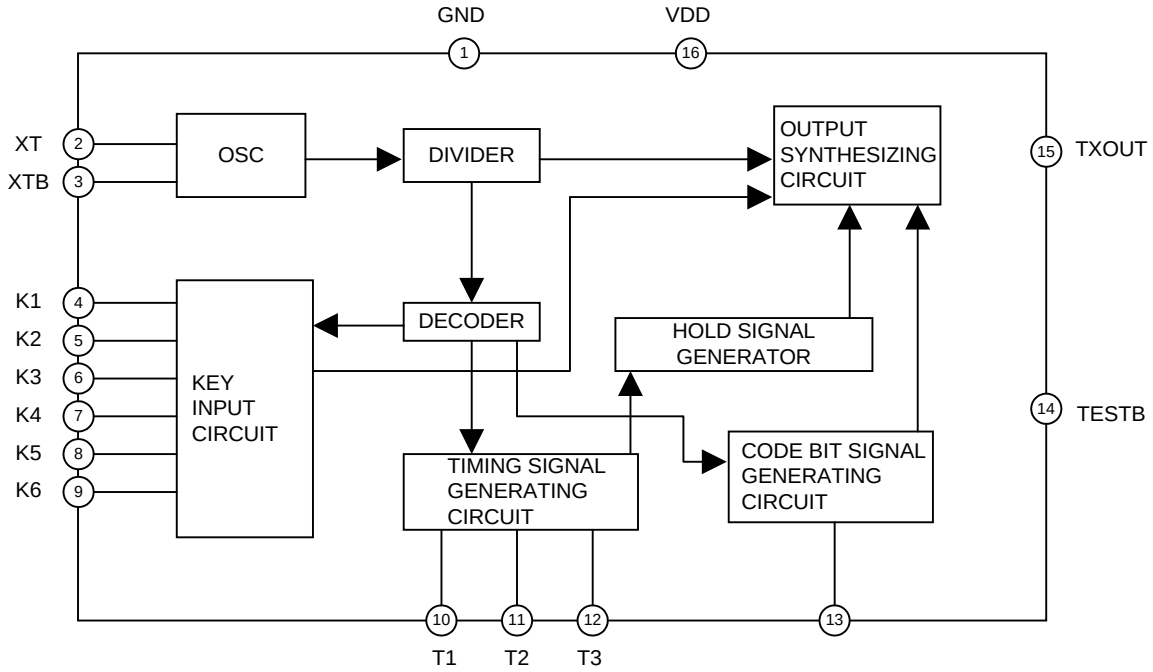
APPLICATIONS

IR Remote for TV, Hi-Fi, Video

PIN ASSIGNMENT



BLOCK DIAGRAM



PIN DESCRIPTION

Pin	I/O	Description
VDD		Positive power supply
XT,XTB	I,O	455KHz resonator input, built-in pull down resistor
K1 ~ K6	I	Key matrix input port, built-in pull down resistor
T1 ~ T3	O	Key matrix output port
CODE	I	Custom code setting
TESTB	I	No connection
TXOUT	O	IR data output
GND		Negative power supply (substrate).

FUNCTION DESCRIPTION

(1) Oscillation Circuit

Built-in oscillating circuit, only an external LC or ceramic resonator will determine the oscillation frequency. When oscillation frequency set at 455KHz, IR data output will be modulated by 38KHz carrier frequency. For power saving, oscillating circuit will be triggered only when key is pressed.

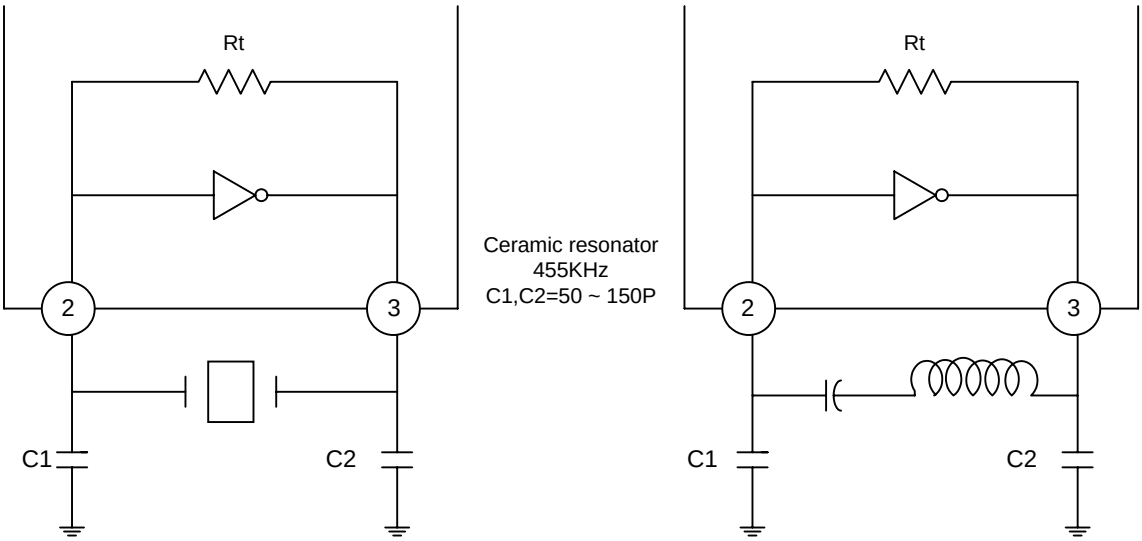


Figure 1

(2) Key Input

(a) Key matrix is constructed as Figure 2.

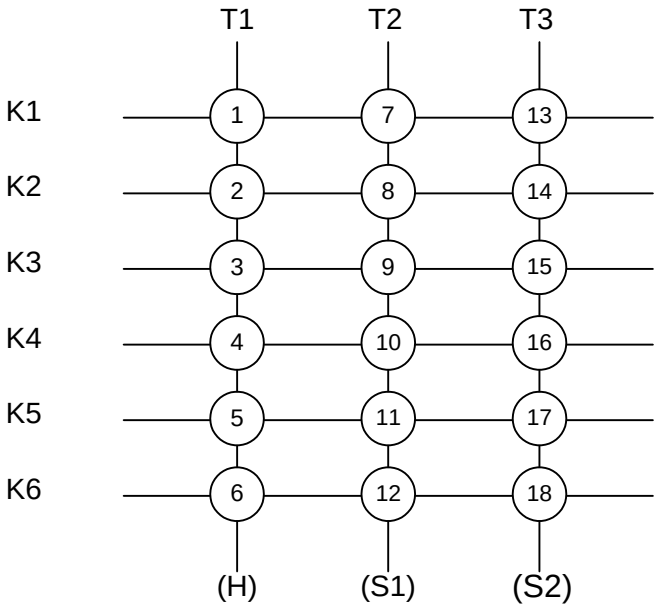


Figure 2

(b) Key 1~6

Continuous output, multi-key transmission is possible.

(C) Key 7~18

Single output only.

(3) Data Transmission

IR/RF data are composed of 12 bits frame as Figure3. C1~C3 are custom code. H, S1, S2, represent T1, T2, T3 indicating continuous output or single output. D1~D6 represent K1~K6 for data.

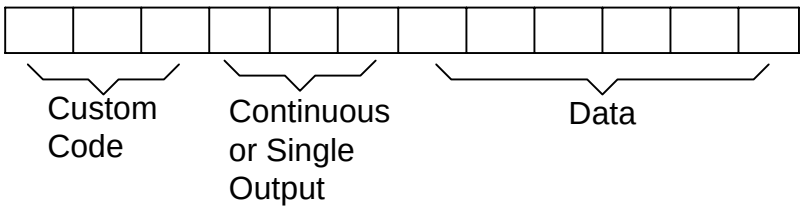


Figure 3

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Key No.	Data									Output Form
	T1	T2	T3	D1	D2	D3	D4	D5	D6	
1										CONTINUOUS
2										CONTINUOUS
3	1	0	0	0	0	1	0	0	0	CONTINUOUS
4	1	0	0	0	0	0	1	0	0	CONTINUOUS
5	1	0	0	0	0	0	0	1	0	CONTINUOUS
6	1	0	0	0	0	0	0	0	1	CONTINUOUS
7	0	1	0	1	0	0	0	0	0	SINGLE-SHOT
8	0	1	0	0	1	0	0	0	0	SINGLE-SHOT
9	0	1	0	0	0	1	0	0	0	SINGLE-SHOT
10	0	1	0	0	0	0	1	0	0	SINGLE-SHOT
11	0	1	0	0	0	0	0	1	0	SINGLE-SHOT
12	0	1	0	0	0	0	0	0	1	SINGLE-SHOT
13	0	0	1	1	0	0	0	0	0	SINGLE-SHOT
14	0	0	1	0	1	0	0	0	0	SINGLE-SHOT
15	0	0	1	0	0	1	0	0	0	SINGLE-SHOT
16	0	0	1	0	0	0	1	0	0	SINGLE-SHOT
17	0	0	1	0	0	0	0	1	0	SINGLE-SHOT
18	0	0	1	0	0	0	0	0	1	SINGLE-SHOT

Table 1

(b) Custom Code (C1 , C2 , C3)

Custom code is set by connecting diode from T1, T2, T3 to code pin.
Diode Connected = 1
Diode disconnected = 0

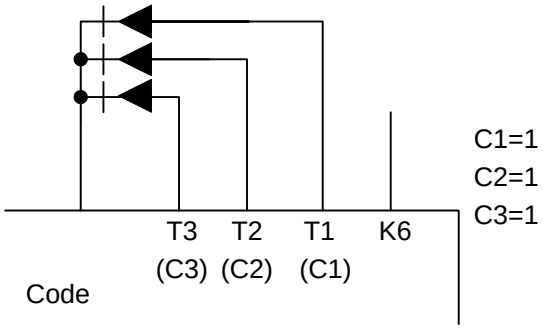


Figure 4

When SM5022 is paired with SM5033A for 10-Key control, or paired with SM5033AL for 10-Key control, custom code is set as follows:

SM5022			SM5033A/AL	
C1	**C2**	**C3**	**C2**	**C3**
1	0	1	0	1
1	1	0	1	0
1	1	1	1	1
1	0	0	0	0

(4) Waveform

(a) Basic transmitting waveform

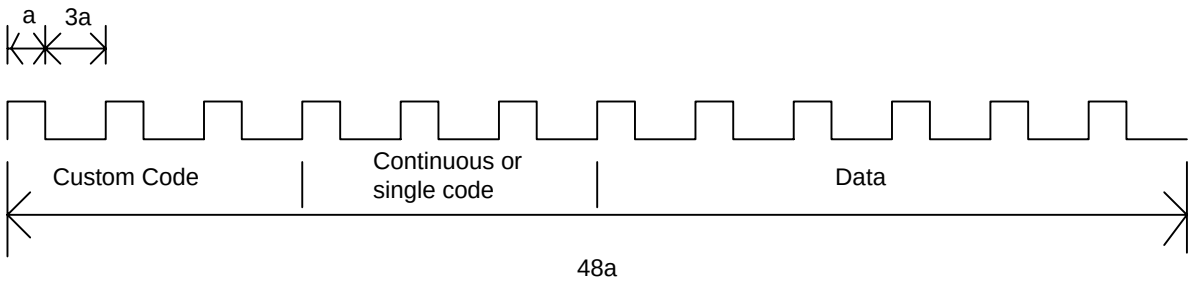
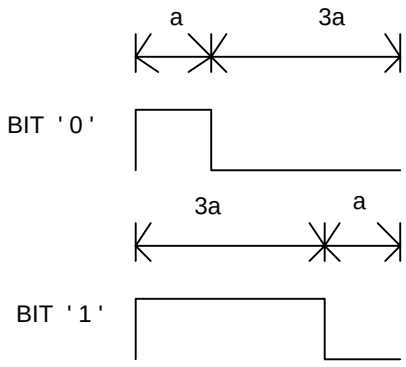


Figure 5

' a ' is determined by oscillating frequency fosc connecting to XT and XTB.

a = (1 / fosc) * 192 (second)

(b) Bit ' 1 ' and ' 0 '



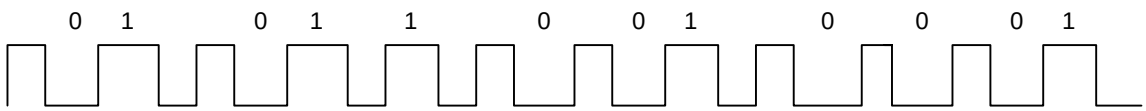


Figure 6

Figure 6 shows that code ' 0 1 0 1 1 0 0 1 0 0 0 1 ' is transmitted.

(c) Single-output signal

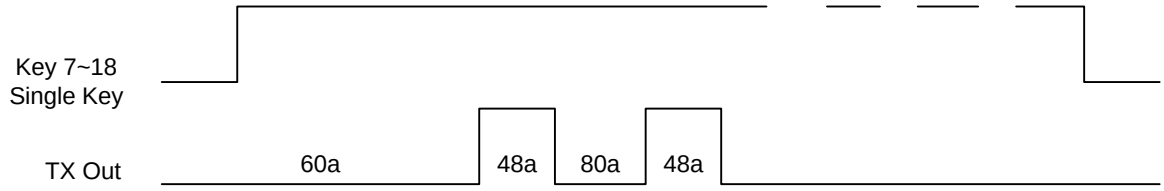


Figure 7

When any one of key 7~18 is pressed, data are transmitted twice as shown in Figure 7.

(d) Continuous-output signal

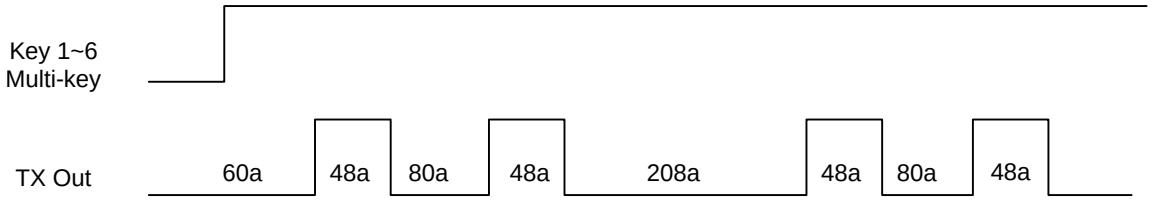


Figure 8

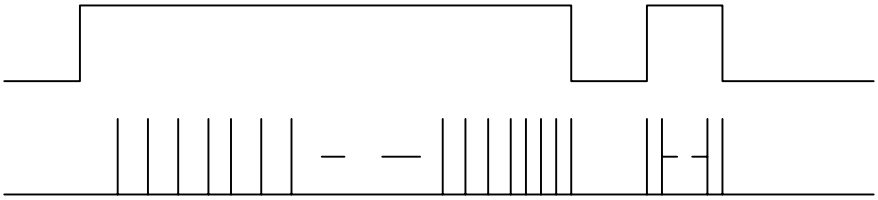
When any one of key 1~6 is pressed, data are transmitted twice and then repeat after 208a.

(e) Carrier

Carrier frequency fc is determined by fosc by:

fc = fosc / 12 (KHz)

when fosc=455KHz, fc=38KHz.



ABSOLUTE MAXIMUM RATING (Ta=25 ℃) :

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	VDD - Vss		-0.3 ~ 6	V
Input Voltage	V I		Vss - 0.3 ~ VDD + 0.3	V
Output Voltage	VO	VDD - Vss = 5V	Vss - 0.3 ~ VDD + 0.3	V
Maximum Power Consumption	Pa		500	mW
Operating Temperature	Topr		-10 ~ 70	℃
Storage Temperature	Tstg		-40 ~ 125	℃

DC CHARACTERISTIC (VDD=3V, Ta=25 ℃ unless specified)

Parameter				Symbol	Condition	Min.	Type	Max.	Unit
Supply Voltage				VDD	All function operation	2	-	5.0	V
Supply Current				ISB1	Key on without load	-	-	1.0	mA
Stand-by Current				ISB2	All key off stop of OSC	-	-	5.0	μA
Input	K1 ~ K6 CODE	input voltage	"H" level	VIH	-	2.0	-	3.0	V
			"L" level	VIL	-	0	-	0.5	V
Output	T1 ~ T3	output current	"H" level	IOH	VOH=2.0V	-500	-	-	μA
			"L" level	IOL	VOL=3.0V	50	-	-	μA
	TX	output current	"H" level	IOH	VOH=2.0V	-0.1	-	-	mA
			"L" level	IOL	VOL=2.0V	1.0	-	-	mA
OSC feedback resistance				Rf	-	-	500	-	Kohm
OSC frequency				fosc	-	400	455	600	KHz

APPLICATION CIRCUIT