

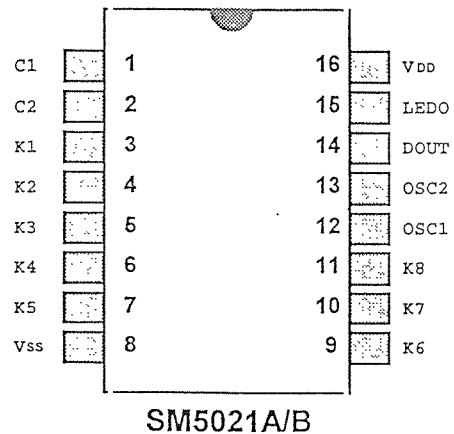
# SM5021

## ENCODER

### GENERAL DESCRIPTION

The SM5021A/B is a high performance infrared remote control encoder utilizing CMOS technology. Mode A is a single-key control and mode B is a multi-key control during data transmission, supports eight data key inputs and a LED output to indicate the status during transmission. Auto power off function when key is not pressed to save power, custom codes to distinguish different products. SM5021 encoder is paired with SM5031/SM5032 decoder for more data control applications.

### PIN DIAGRAM



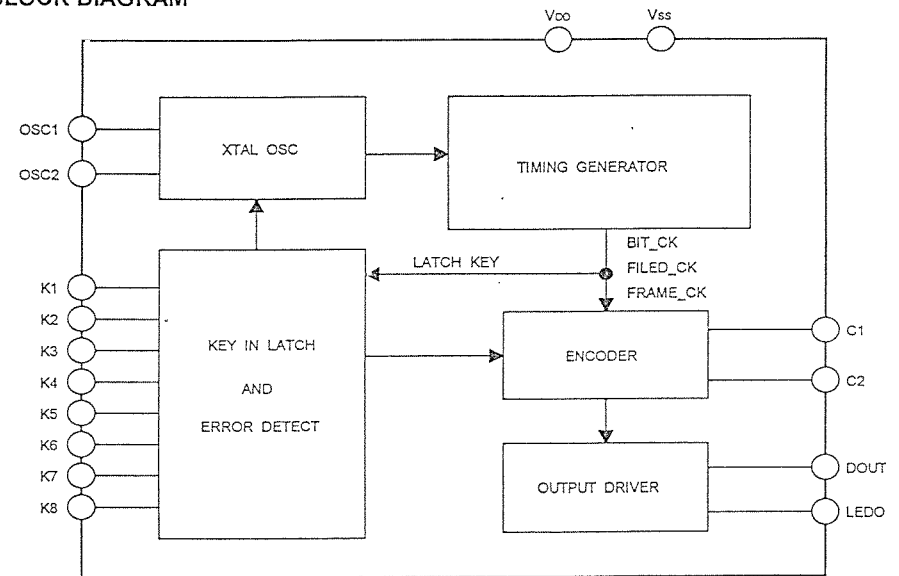
### FEATURES

- \* Wide operation voltage range, 2.5V to 6V
- \* Eight data key control
- \* Option of single-key or multi-key control
- \* Two custom codes to separate products
- \* Auto power off for saving power
- \* LED output to indicate transmission status
- \* Direct infrared LED 38KHz modulation output
- \* Low power consumption
- \* Paired with SM5031/SM5032 decoder
- \* 16 pin DIP or SO package

### APPLICATIONS

- \* SM3011/SM3012 Fan Remote Control
- \* Audio Remote Control
- \* Toy Remote Control
- \* Consumer Products Remote Control

### BLOCK DIAGRAM



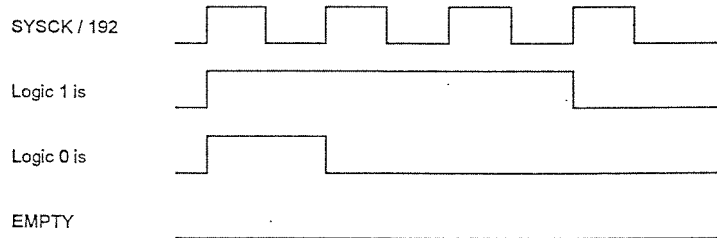
### PIN DESCRIPTION

PIN NAME	I/O	FUNCTION
C1,C2	I	CUSTOM CODE
K1 ~ K8	I	REMOTE CONTROL KEY INPUTS ( BUILT-IN PULL-LOW RESISTOR )
VSS	POWER	NEGATIVE POWER SUPPLY
OSC1	I	455K Hz XTAL OSC PIN
OSC2	O	455K Hz XTAL OSC PIN
DOUT	I/O	SIGNAL OUTPUT
LEDO	I/O	TRANSMISSION INDICATOR
VDD	POWER	POSITIVE POWER SUPPLY

## FUNCTION DESCRIPTION

### A. Encoder Signal Output Format

#### Bit Format



#### Frame Format

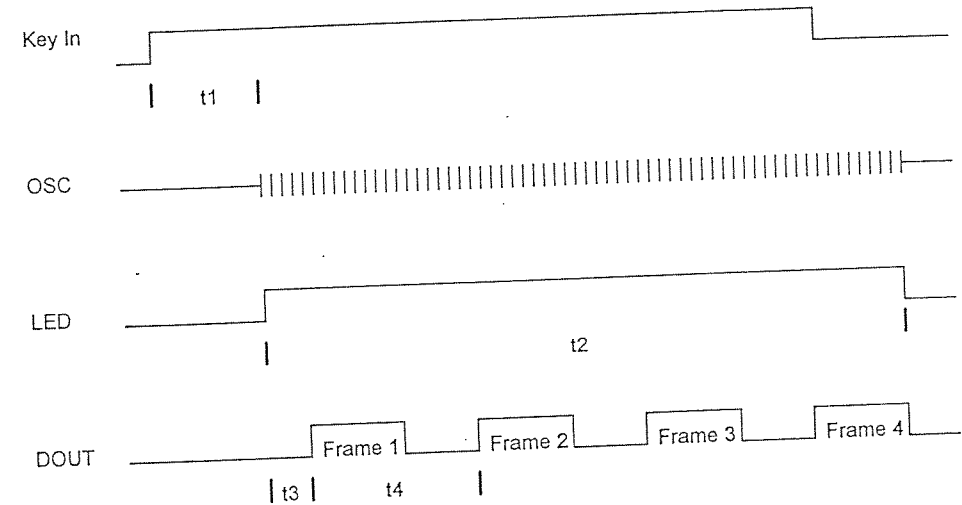
There are four frames, encoder generates during sending. Each frame contains four field:

- a) Frame Head / Three-Bits      1 1 0 (Metal Option)
- b) Custom Code / Two-Bits      C1 C2
- c) Control Word / Seven-Bits    0000001 ~ 1000110
- d) Synch Filed / Four-Bits of Empty

### B. Transmission Code Table

START WORD	CUSTOM CODE	B1	B2	B3	B4	B5	B6	B7	TRANSMIT
1 1 0	C1 C2	0	0	0	0	0	0	1	K1
1 1 0	C1 C2	0	0	0	0	0	1	0	K2
1 1 0	C1 C2	0	0	0	0	1	0	0	K3
1 1 0	C1 C2	0	0	0	1	0	0	0	K4
1 1 0	C1 C2	0	0	1	0	0	0	0	K5
1 1 0	C1 C2	0	1	0	0	0	0	0	K6
1 1 0	C1 C2	1	0	0	0	0	1	1	K7
1 1 0	C1 C2	1	0	0	0	1	1	0	K8

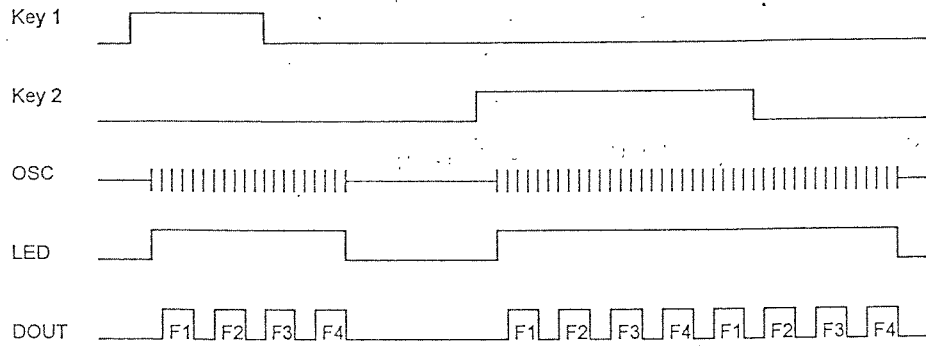
### C. Transmission Timing



- \* t1: Key pressing > 32ms
- \* t2: Transmission time  $t3 + 108ms$  ( Four Frame )  
If t1 is over  $t3 + 108ms$ , DOUT will be transmitted again.  
 $[( \text{Pressing Time} ) \text{MOD} ( t3+108ms ) + 1] * 108ms + t3$
- \* t3: Oscillator stable time.     $\text{OSC} / 384 = 0.8ms$
- \* t4: 3-Bits ( Head ) + 7-Bits ( Data ) + 6-Bits ( Empty ) = 16-Bits ( 27ms )
- \* OSC: 455KHz XTAL

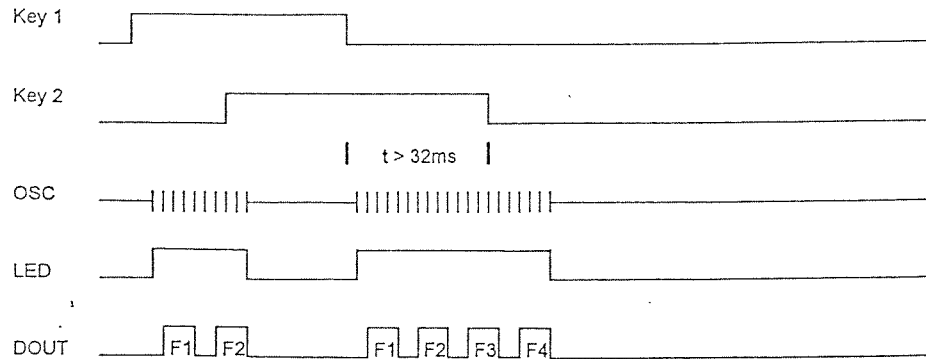
### D. SM5021A Transmission Waveform

#### Normal Condition



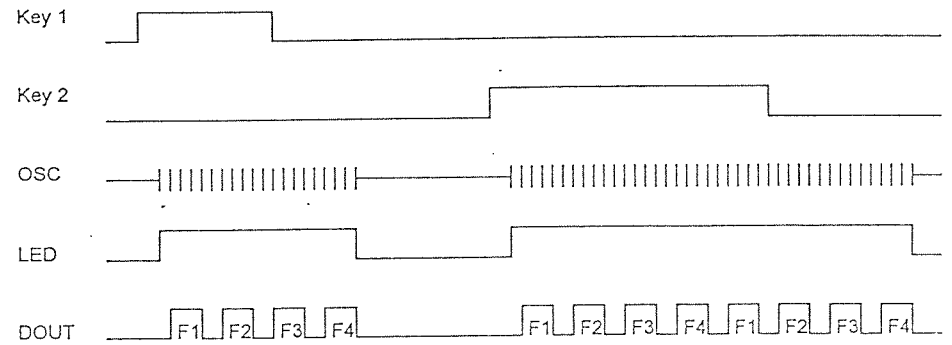
#### Overlap Condition

If more than one key is pressed, transmission stops.



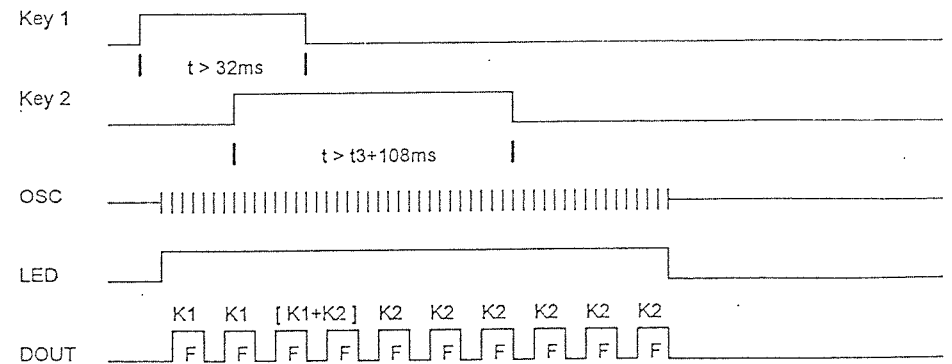
### E. SM5021B Transmission Waveform

#### Normal Condition



#### Overlap Condition

If more than one key is pressed, multi-key data transmission.



## APPLICATION CIRCUIT

### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	$V_{DD} - V_{SS}$		-0.3~6	V
Input Voltage	$V_I$		$V_{SS}-0.3 \sim V_{DD}+0.3$	V
Output Voltage	$V_O$		$V_{SS}-0.3 \sim V_{DD}+0.3$	V
Maximum Power Consumption	$P_a$	$V_{DD} - V_{SS} = 5V$	500	mW
Operating Temperature	$T_{opr}$		-10~70	°C
Storage Temperature	$T_{stg}$		-40~125	°C

### DC ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Supply Voltage	$V_{DD}$		2.2	3	6	V
Stand-by Current	$I_{SS}$	$V_{DD} - V_{SS} = 3V$ OSC stop all output pins open		1		uA
Input High Level	$V_{IH}$		1.5	2.1	3.5	V
Input Low Level	$V_{IL}$		0.7	1	1.5	V
DOUT Source Current	$I_{OH}$	$V_{OH} = +2.4V$			5	mA
LEDO Source Current	$I_{OH}$	$V_{OH} = +2.4V$			10	mA
DOUT Sink Current	$I_{OL}$	$V_{OL} = +0.4V$			5	mA

