

## **TT6221-1 & TT6222-1 REMOTE CONTROL TRANSMITTER**

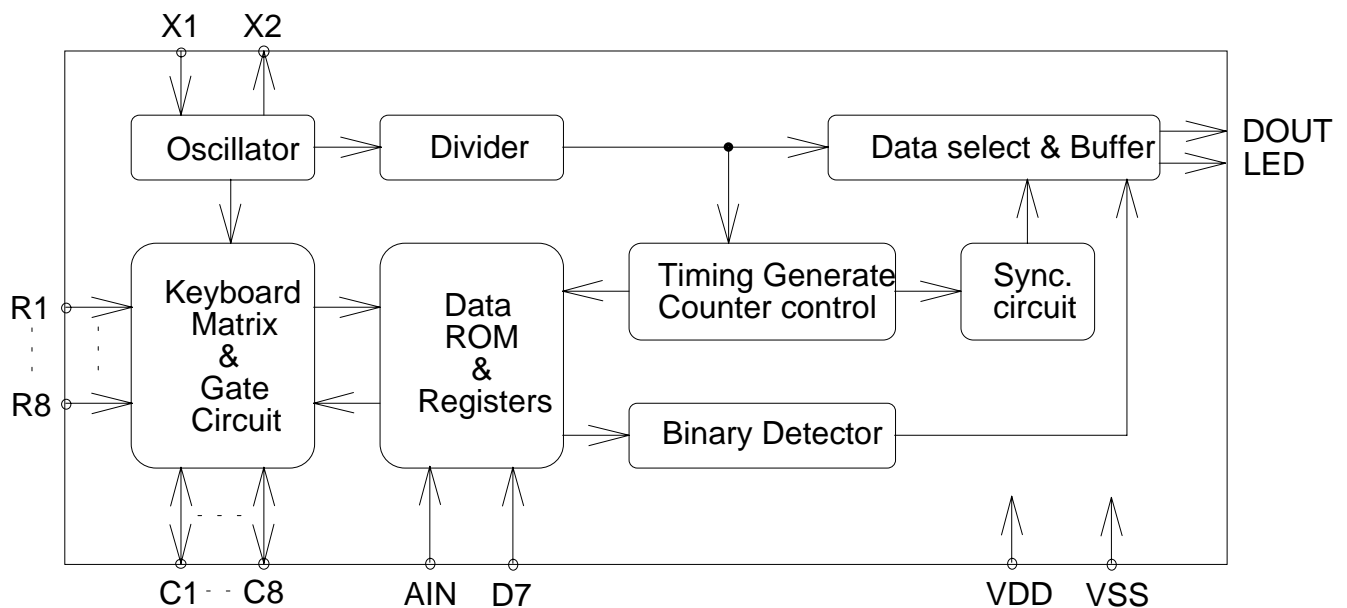
### **General Description**

TT6221-1 and TT6222-1 are high performance remote control transmitter COMS IC , it is specially designed for use on infrared remote control applications。 The custom codes (Max.) of TT6221-1 and TT6222-1 are available by setting external diodes and resistors。 The transmission code consists of “ leader pulse “、” 16 bits custom code “ and ” 16 bits data code “。

### **Feature Description**

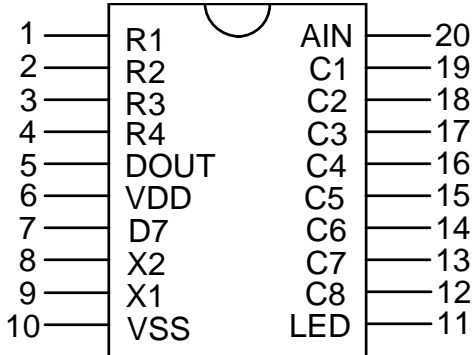
- ◆ High performance **CMOS** technology
- ◆ Low power consumption ( VDD = 2.0 3.3 V )
- ◆ TT6221-1 : **32** function keys and **3** double action keys and **64 + 6** function codes are available ( Using **D7** pin )
- ◆ TT6222-1 : **64** function keys and **3** double action keys and **128 + 6** function codes are available ( Using **D7** pin )
- ◆ PPM ( Pulse Position Modulation ) code method
- ◆ Ceramic resonator frequency **455 KHz**
- ◆ **DOUT** with a **38 KHz** carrier for IR medium
- ◆ Custom codes can be selected ( Using external diodes and resistors )

### **Block Diagram**

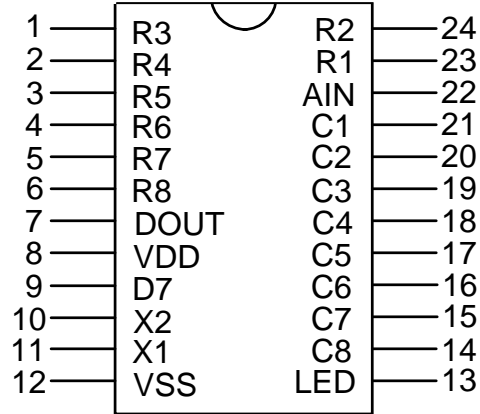


## Package configuration

TT6221-1



TT6222-1



## Pin Description

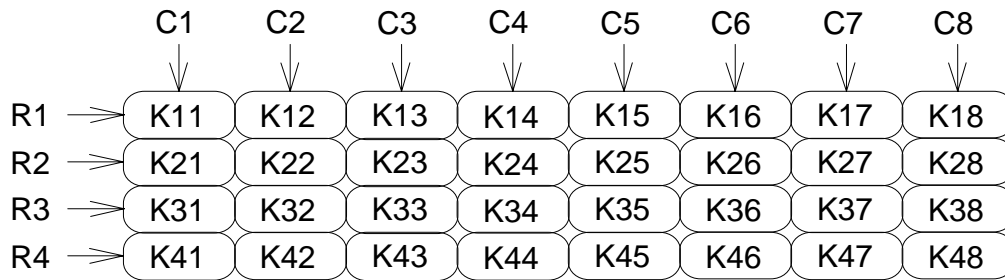
TT6221-1 PIN No.	TT6222-1 PIN No.	PIN Name	I/O	DESCRIPTION
3	1	R3	I	Row control for keyboard matrix ( active high )
4	2	R4	I	Row control for keyboard matrix ( active high )
-	3	R5	I	Row control for keyboard matrix ( active high )
-	4	R6	I	Row control for keyboard matrix ( active high )
-	5	R7	I	Row control for keyboard matrix ( active high )
-	6	R8	I	Row control for keyboard matrix ( active high )
5	7	DOUT	O	Serial data output with 38 KHZ carrier
6	8	VDD	P	Positive power supply
7	9	D7	I	Data code D7 setting
8	10	X2	O	455 KHZ resonator oscillator output
9	11	X1	I	455 KHZ resonator oscillator input
10	12	VSS	P	Negative power supply
11	13	LED	O	Indicator LED output
12	14	C8	I/O	Column control for keyboard matrix
13	15	C7	I/O	Column control for keyboard matrix
14	16	C6	I/O	Column control for keyboard matrix
15	17	C5	I/O	Column control for keyboard matrix
16	18	C4	I/O	Column control for keyboard matrix
17	19	C3	I/O	Column control for keyboard matrix
18	20	C2	I/O	Column control for keyboard matrix
19	21	C1	I/O	Column control for keyboard matrix
20	22	AIN	I	Low byte of custom codes ( 8 bits ) scan input
1	23	R1	I	Row control for keyboard matrix ( active high )
2	24	R2	I	Row control for keyboard matrix ( active high )

## Functional Description :

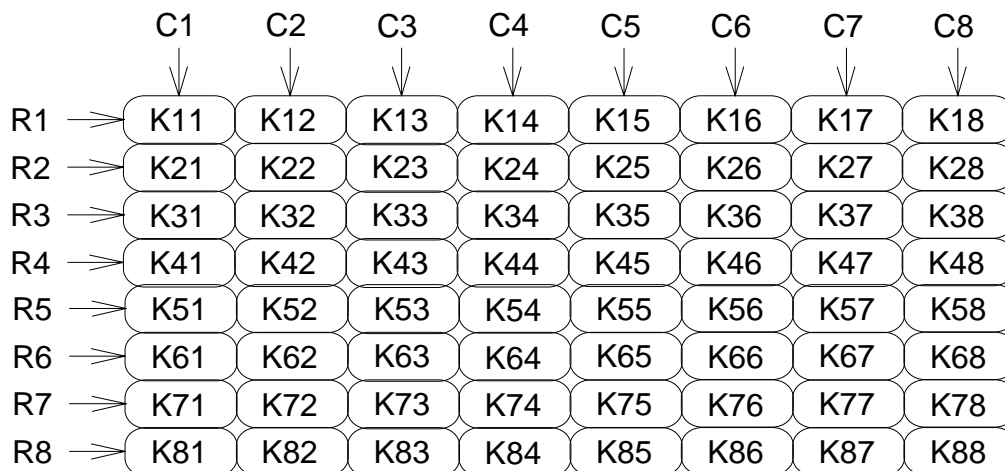
### Keyboard scan

TT6221-1 and TT6222-1 Stay in the stand-by state , the oscillator is OFF and the stand-by current < 1uA 。 The TT6221-1 consists of 32 function keys and TT6222-1 consists of 64 function keys. The keyboard form of the TT6221-1 & TT6222-1 are as shown.

◆ The TT6221-1 keyboard form :



◆ The TT6222-1 keyboard form :

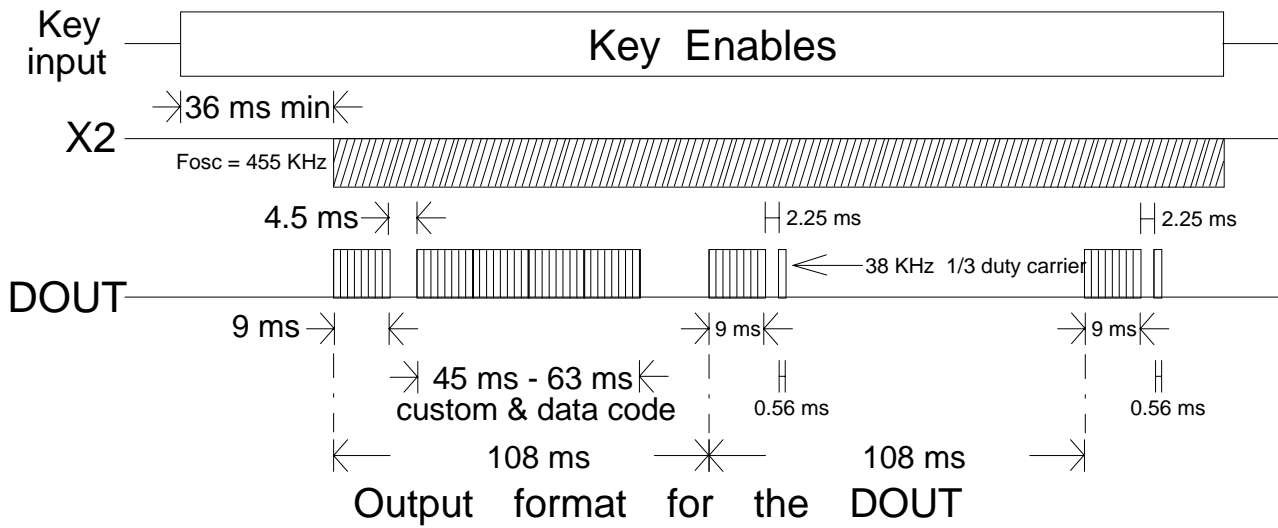


### Transmission codes

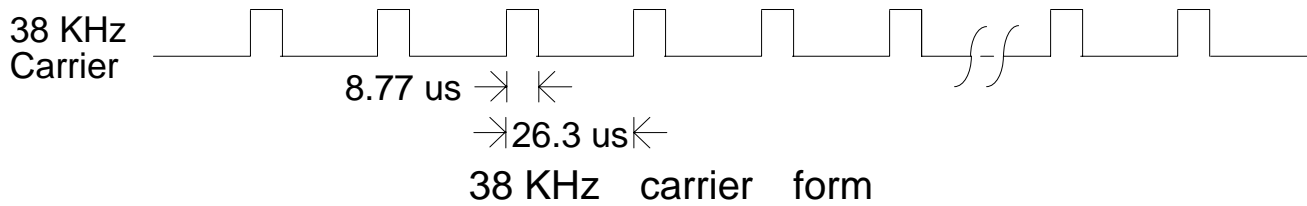
When one of the keys ( 32 keys or 64 keys ) is triggered over 36 ms , the oscillator is enable and the IC is activated. If the key is pressed and held for 108 ms or less , the 108 ms transmission codes of the TT6221-1 & TT6222-1 consist of a 9 ms header code,a 4.5 ms off code , 16-bits custom codes ( 18 ms 36 ms ) , 8-bits data codes ( 9 ms 18 ms ) and the inverse codes of the 8-bits data codes ( 18 ms 9 ms ) .

After the pressed key is held for 108 ms , if the key is still held down , the transmission codes turn out to be a composition of header code ( 9 ms ) and off code ( 2.5 ms ) only.

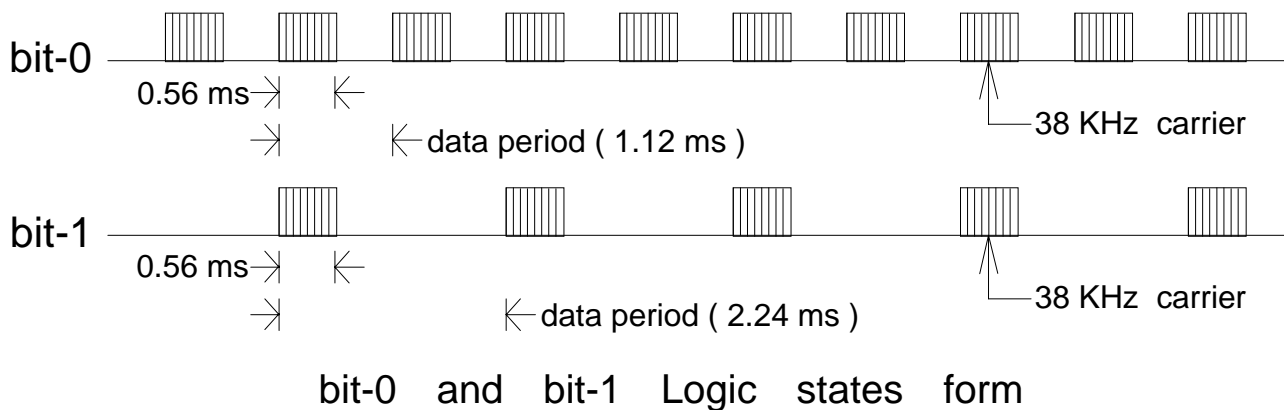
The following is an illustration of the transmission codes:



The output code carrier ( 38 KHz ) of the DOUT pin :



The transmission codes employ the PPM ( Pulse Position Modulation ) method to represent their two logic states by bit-0 ( 1.12 ms ) and bit-1 ( 2.24 ms ) :



**To set the custom codes ( A0 - - A15 )**

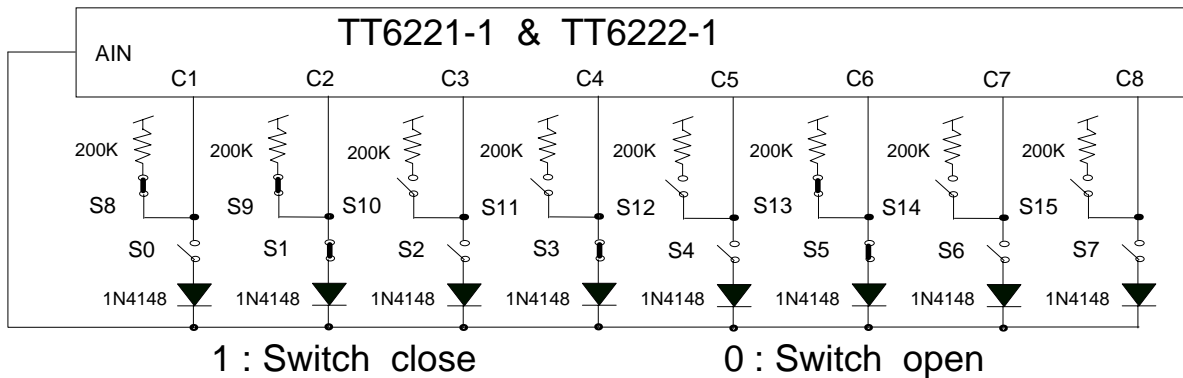
The algorithm rule of the custom codes ( A0 - - A15 ) can be selected by mask option , and the user can choose the TT6221-1 & TT6222-1.

◆ The TT6221-1 & TT6222-1 :

The value of ROM1 ( 8 bits ) & ROM2 ( 8 bits ) are both “ 00H “.

The A0 - - A7 are set by logical **OR** between the switches (S0 - - S7) and ROM1. The A8 - - A15 equal some bits be inverted of A0 - - A7 , the inversion are decided by logical **OR** between the switches (S8 - - S15) and ROM2.

For example :



External switch S0 - - S15 : →	S0 - - S7	S8 - - S15
	0 1 0 1 0 1 0 0	1 1 0 0 0 1 0 0

On chip ROM1 , ROM2 : →	ROM1	ROM2
	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0

A0 - - A7 : →	(S0 - - S7) OR ROM1
	0 1 0 1 0 1 0 0

A8' - - A15' : →	(S8 - - S15) OR ROM2
	1 1 0 0 0 1 0 0
	X X ↓ ↓ ↓ X ↓ ↓
	A0 A1 - - - A5 - -
	- - A2B A3B A4B - A6B A7B

1 : non-inversion  
0 : inversion

A8 - - A15 : →	0 1 1 0 1 1 1 1
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Custom codes A0 - - A15 : →	A0 - - A7	A8 - - A15
	0 1 0 1 0 1 0 0	0 1 1 0 1 1 1 1

**The vaules of the data codes ( D0 - - D7 )**

The TT6221-1 contains **32** function keys and the TT6222-1 contains **64** function keys. Each key corresponds to one data code. The TT6221-1 & TT6222-1 provide 3 double keys.

The TT6221-1 data codes :

KEY NAME	DATA CODES							D7	KEY NAME	DATA CODES							D7		
	D0	-----	D6								D0	-----	D6						
K11	0	0	0	0	0	0	0	0/1	K15	0	0	0	0	1	0	0	0/1		
K21	1	0	0	0	0	0	0	0/1	K25	1	0	0	0	1	0	0	0/1		
K31	0	1	0	0	0	0	0	0/1	K35	0	1	0	0	1	0	0	0/1		
K41	1	1	0	0	0	0	0	0/1	K45	1	1	0	0	1	0	0	0/1		
K12	0	0	1	0	0	0	0	0/1	K16	0	0	1	0	1	0	0	0/1		
K22	1	0	1	0	0	0	0	0/1	K26	1	0	1	0	1	0	0	0/1		
K32	0	1	1	0	0	0	0	0/1	K36	0	1	1	0	1	0	0	0/1		
K42	1	1	1	0	0	0	0	0/1	K46	1	1	1	0	1	0	0	0/1		
K13	0	0	0	1	0	0	0	0/1	K17	0	0	0	1	1	0	0	0/1		
K23	1	0	0	1	0	0	0	0/1	K27	1	0	0	1	1	0	0	0/1		
K33	0	1	0	1	0	0	0	0/1	K37	0	1	0	1	1	0	0	0/1		
K43	1	1	0	1	0	0	0	0/1	K47	1	1	0	1	1	0	0	0/1		
K14	0	0	1	1	0	0	0	0/1	K18	0	0	1	1	1	0	0	0/1		
K24	1	0	1	1	0	0	0	0/1	K28	1	0	1	1	1	0	0	0/1		
K34	0	1	1	1	0	0	0	0/1	K38	0	1	1	1	1	0	0	0/1		
K44	1	1	1	1	0	0	0	0/1	K48	1	1	1	1	1	0	0	0/1		
K16+K26	1	0	1	0	1	1	0	0/1	K16+K46	1	1	1	0	1	1	0	0/1		
K16+K36	0	1	1	0	1	1	0	0/1											

◆ The TT6222-1 data codes :

KEY NAME	DATA CODES							D7	KEY NAME	DATA CODES							D7		
	D0	-----	D6								D0	-----	D6						
K11	0	0	0	0	0	0	0	0/1	K15	0	0	0	0	1	0	0	0/1		
K21	1	0	0	0	0	0	0	0/1	K25	1	0	0	0	1	0	0	0/1		
K31	0	1	0	0	0	0	0	0/1	K35	0	1	0	0	1	0	0	0/1		
K41	1	1	0	0	0	0	0	0/1	K45	1	1	0	0	1	0	0	0/1		
K12	0	0	1	0	0	0	0	0/1	K16	0	0	1	0	1	0	0	0/1		
K22	1	0	1	0	0	0	0	0/1	K26	1	0	1	0	1	0	0	0/1		
K32	0	1	1	0	0	0	0	0/1	K36	0	1	1	0	1	0	0	0/1		
K42	1	1	1	0	0	0	0	0/1	K46	1	1	1	0	1	0	0	0/1		
K13	0	0	0	1	0	0	0	0/1	K17	0	0	0	1	1	0	0	0/1		
K23	1	0	0	1	0	0	0	0/1	K27	1	0	0	1	1	0	0	0/1		
K33	0	1	0	1	0	0	0	0/1	K37	0	1	0	1	1	0	0	0/1		
K43	1	1	0	1	0	0	0	0/1	K47	1	1	0	1	1	0	0	0/1		
K14	0	0	1	1	0	0	0	0/1	K18	0	0	1	1	1	0	0	0/1		
K24	1	0	1	1	0	0	0	0/1	K28	1	0	1	1	1	0	0	0/1		
K34	0	1	1	1	0	0	0	0/1	K38	0	1	1	1	1	0	0	0/1		
K44	1	1	1	1	0	0	0	0/1	K48	1	1	1	1	1	0	0	0/1		
K51	0	0	0	0	0	0	1	0/1	K55	0	0	0	0	1	0	1	0/1		
K61	1	0	0	0	0	0	1	0/1	K65	1	0	0	0	1	0	1	0/1		
K71	0	1	0	0	0	0	1	0/1	K75	0	1	0	0	1	0	1	0/1		
K81	1	1	0	0	0	0	1	0/1	K85	1	1	0	0	1	0	1	0/1		
K52	0	0	1	0	0	0	1	0/1	K56	0	0	1	0	1	0	1	0/1		
K62	1	0	1	0	0	0	1	0/1	K66	1	0	1	0	1	0	1	0/1		
K72	0	1	1	0	0	0	1	0/1	K76	0	1	1	0	1	0	1	0/1		
K82	1	1	1	0	0	0	1	0/1	K86	1	1	1	0	1	0	1	0/1		
K53	0	0	0	1	0	0	1	0/1	K57	0	0	0	1	1	0	1	0/1		
K63	1	0	0	1	0	0	1	0/1	K67	1	0	0	1	1	0	1	0/1		
K73	0	1	0	1	0	0	1	0/1	K77	0	1	0	1	1	0	1	0/1		
K83	1	1	0	1	0	0	1	0/1	K87	1	1	0	1	1	0	1	0/1		
K54	0	0	1	1	0	0	1	0/1	K58	0	0	1	1	1	0	1	0/1		
K64	1	0	1	1	0	0	1	0/1	K68	1	0	1	1	1	0	1	0/1		
K74	0	1	1	1	0	0	1	0/1	K78	0	1	1	1	1	0	1	0/1		
K84	1	1	1	1	0	0	1	0/1	K88	1	1	1	1	1	0	1	0/1		
K16+K26	1	0	1	0	1	1	0	0/1	K16+K46	1	1	1	0	1	1	0	0/1		
K16+K36	0	1	1	0	1	1	0	0/1											

The 8-bit data codes of will define the inverse codes of the other 8-bit data codes ( D8 - - D15 ) .D7 is defined by an external switch. Code D7=0 -> connect to vdd.

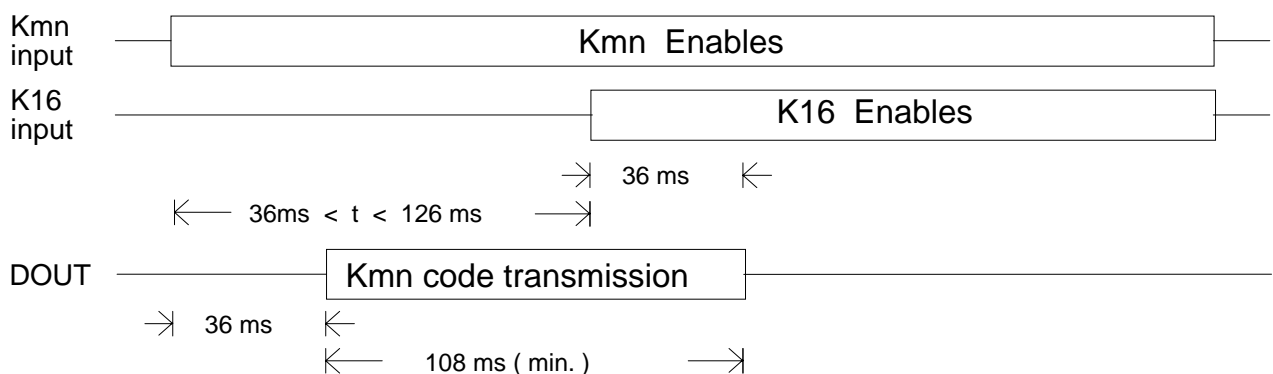
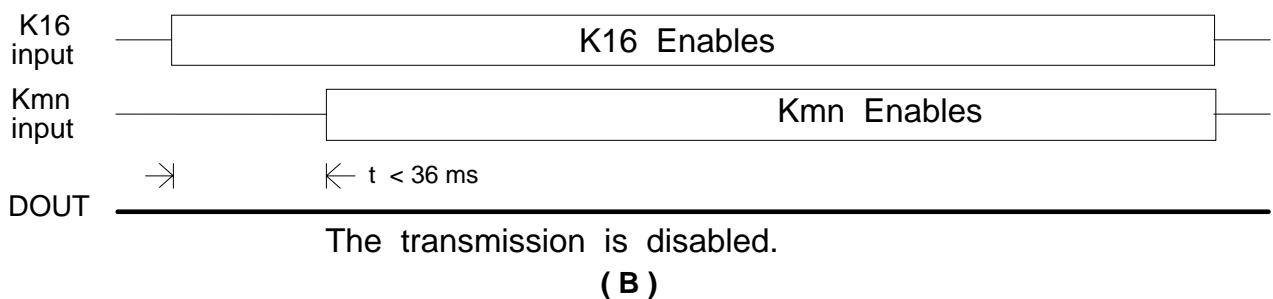
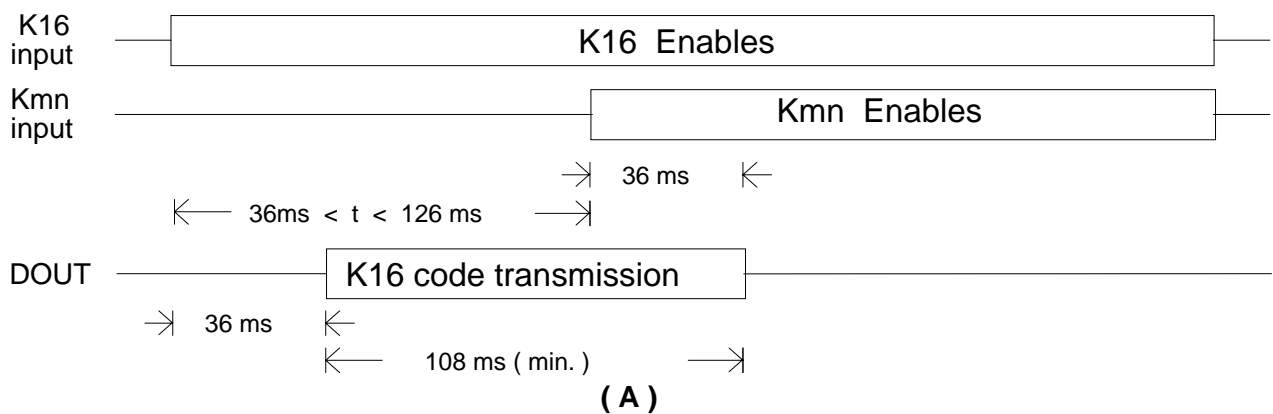
Code D7=1 -> connect to vss.

**Function Keys control**

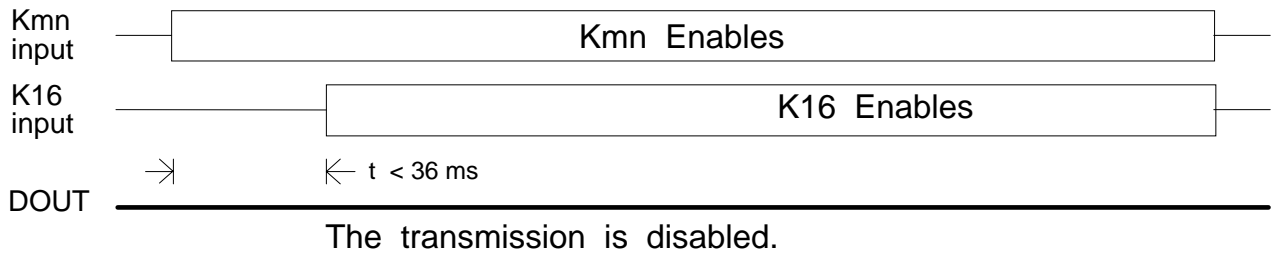
If two or more keys are depressed simultaneously ( except **K16+K26** & **K16+K36** & **K16+K46** ), the transmission is disabled by the multi-depression prevention circuit. As regards the key transmission priority in the case of two depressions , with simultaneous depressions (  $\pm 36$  ms ) transmission is disabled and first depressions , later remainder priority is used.

When a key is pressed , reading of the custom code and key data code is started , and DOUT output begins 36 ms later , so that if the key is begin depressed during this 36 ms interval one transmission is performed. If a key is held down for 108 ms or longer , consecutive transmissions of the leader code only are performed while the key is depressed depressed depressed. As a key interruption operation can handle an interval of up to 126 ms ( from ON to ON ) . It is possible to configure a system with an extremely fast response time.

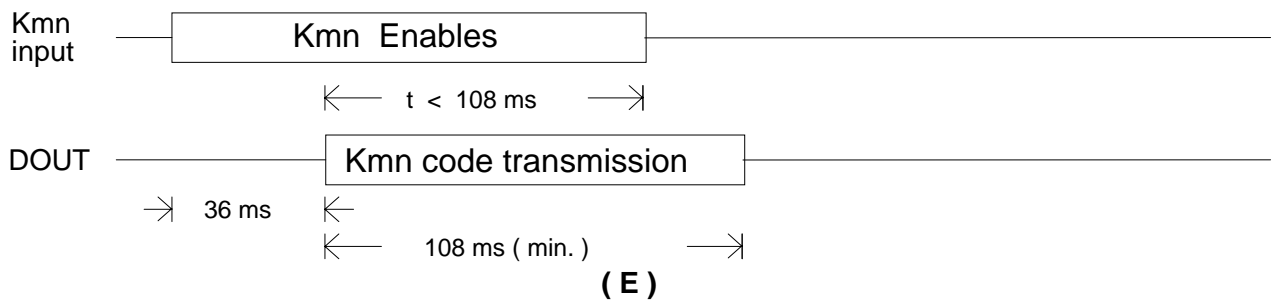
- ◆ Two or more keys are depressed ( except **K16+K26** & **K16+K36** & **K16+K46** ) :



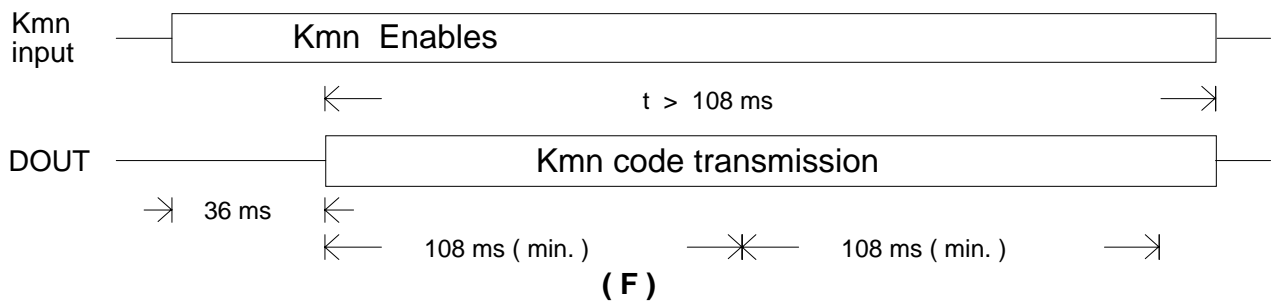
**( C )**



**( D )**



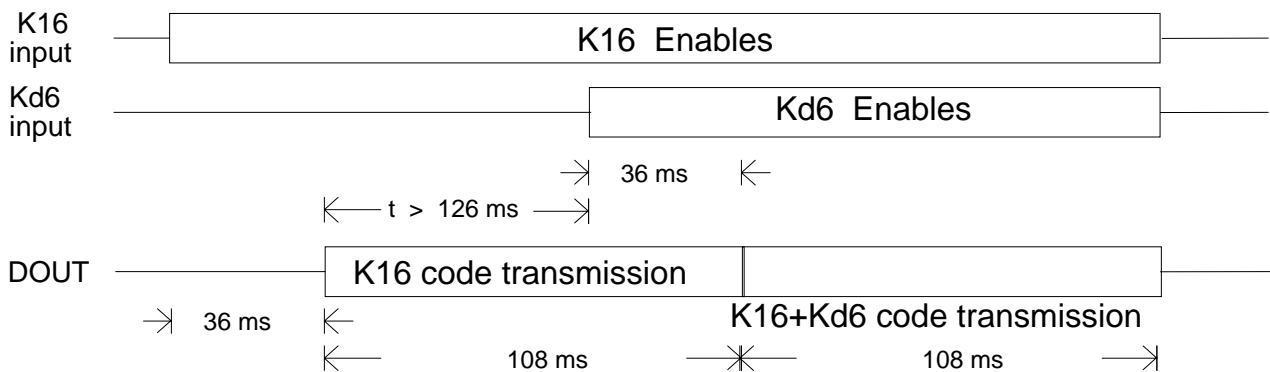
**( E )**



**( F )**

To avoid the mistakes made by keyboard scanning or simultaneous two-key input , excep 3 double key active function ( K16+K26 , K16+K36 , K16+K46 ) , the TT6221 & TT6222 are facilitated with 36 ms starting time.

- ◆ The 3 double keys are depressed ( **K16+K26** & **K16+K36** & **K16+K46** ) :  
**Kd6** : one of ( K26 or K36 or K46 )





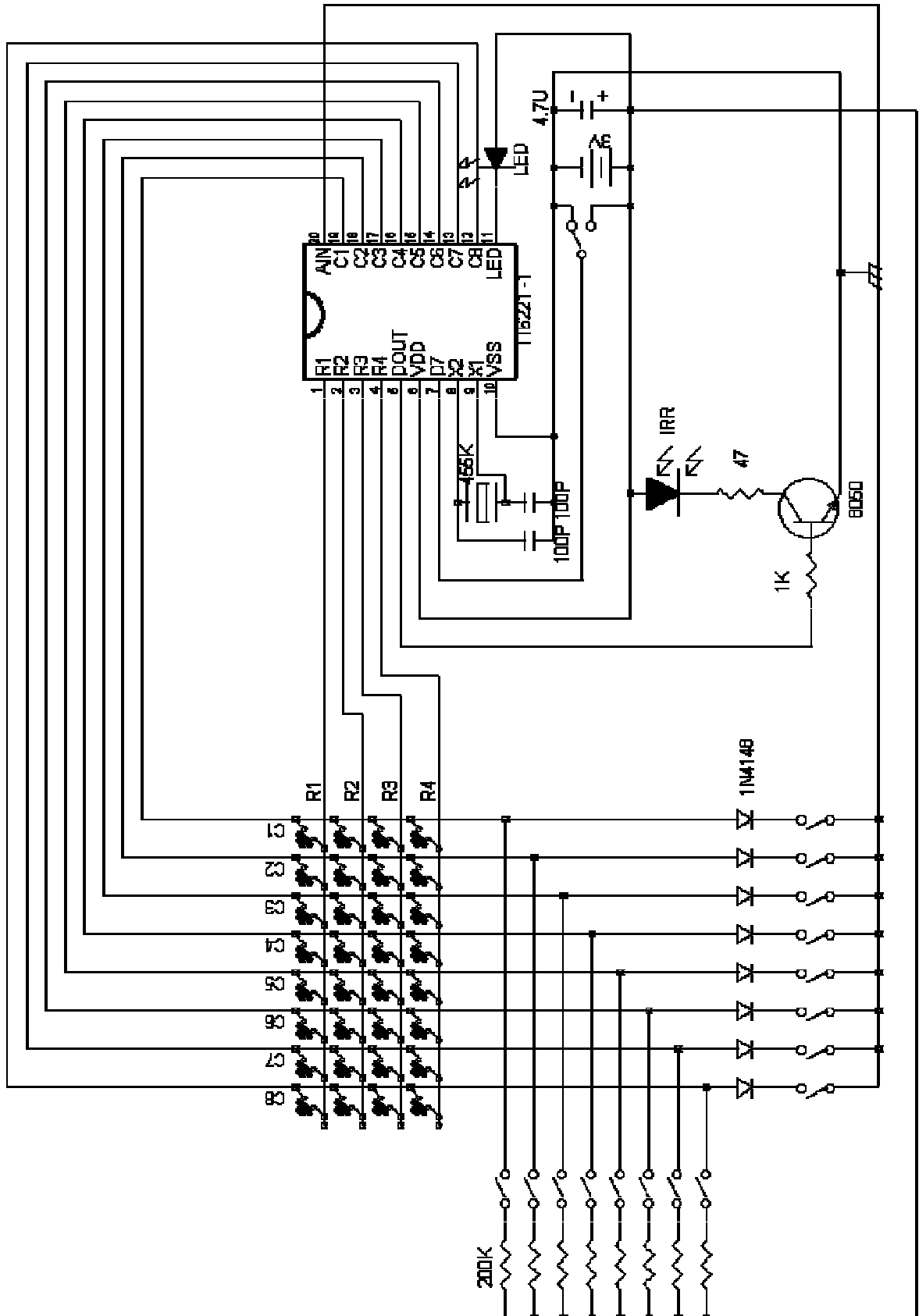
**Absolute maximum ratings :**

ITEM	DESCRIPTION	SYMBOL	RATINGS		UNIT
Supply voltage		VDD	2.0	3.3	V
Operating temperature		Topr	- 20	70	
Storage temperature		Tstg	- 50	125	

**Electronic characteristics :**

ITEM	SYMBOL	CONDITION	MIN.	TYPE	MAX.	UNIT
Supply voltage		VDD	2.0	3.0	3.3	V
Stand-by current ( Oscillator OFF )	ISB	VDD = 3.0 V	-	-	1.0	uA
Operating current ( Oscillator ON )	IOP	VDD = 3.0 V No lead	-	60	100	uA
Driving current ( DOUT )	IOH1	VDD = 3.0 V VO = 1.5 V	-	- 12.0	-	mA
Sinking current ( DOUT )	IOL1	VDD = 3.0 V VO = 0.3 V	-	1.0	-	mA
Driving current ( LED )	IOH2	VDD = 3.0 V VO = 2.7 V	-	- 400	-	uA
Sinking current ( LED )	IOL2	VDD = 3.0 V VO = 0.3 V	-	2.4	-	mA
Driving current ( C1 / C8 )	IOH3	VDD = 3.0 V VO = 2.7 V	- 1.0	- 2.0	-	mA
Sinking current ( C1 / C8 )	IOL3	VDD = 3.0 V VO = 0.3 V	20	25	-	uA
Input HIGH voltage( R1 – R8)	VIH1	VDD = 3.0 V	1.9	-	3.0	V
Input LOW voltage ( R1 – R8)	VIL1	VDD = 3.0 V	0	-	0.8	V
Input HIGH voltage( C1 –C8 )	VIH2	VDD = 3.0 V	1.0	-	3.0	V
Input LOW voltage ( C1 – C8)	VIL2	VDD = 3.0 V	0	-	0.5	V
Input HIGH voltage ( AIN)	VIH3	VDD = 3.0 V	1.25	-	3.0	V
Input LOW voltage ( AIN)	VIL3	VDD = 3.0 V	0	-	0.5	V
Pull LOW resistor ( AIN )	RPL1		-	240K	-	
Pull HIGH resistor ( AIN )	RPH		-	290K	-	
Pull LOW resistor ( R1 – R8 )	RPL2		-	400K	-	
Pull LOW resistor ( C1 / C8 )	RPL3		-	900K	-	
System frequency ( X2 )	Fosc	Resonator 455 KHz	-	455	-	KHz

TT6221-1 APPLICATION



TT6222-1 APPLICATION

