

LCD Driver (19*4) with Key Scan (4*8)

. General Description:

此 IC 是針對 VCD/DVD LCD 面板而設計，CM2221整合 LCD driver 功能，並精簡 CM2221 的應用線路，達到成本降低的目標，希望讓客戶的產品更有競爭力。

. Features:

- ◇ 工作電壓 2.4V-5.5V
- ◇ RC 振盪器 (always on)，需要外掛一個固定電阻和電容，其頻率為 56.875KHZ 或是 455KHZ resonator振盪器
- ◇ 可以推動 32 FUNCTION KEY 和 3 個 DOUBLE KEY (64+6 Using D7 pin)
- ◇ 提供簡單串接介面給 LCD 介面使用
- ◇ 液晶驅動 19 SEG/4 COM，1/4 duty，1/3 bias
- ◇ 提供內部 RESET 線路

. Application:

- VCD 面板控制器
- DVD 面板控制器
- 音響面板控制器

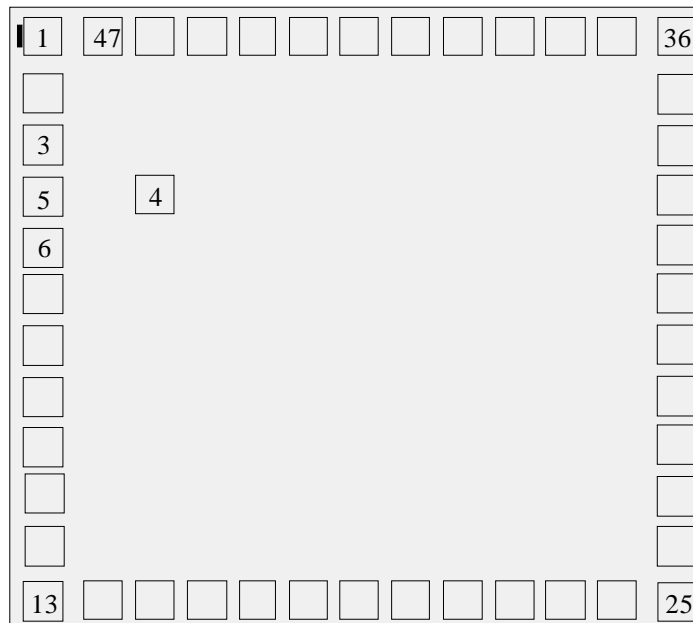
. Pin Description

Name	I/O	Description	pins
R2-R1	I	鍵盤輸入腳 (active high)	2
XI	I	Resonator 振盪線路腳	1
XO	O	Resonator 振盪線路腳	1
ROSC	I	RC oscilallator 振盪線路腳	1
SEG18-0	O	LCD segment output pin	19
COM3-COM0	O	LCD common output pin	4
SYNCB	I	串接輸入控制腳，low active，有 pull high 電阻 140Kohm@5V	1
CKWB	I	串接輸入控制腳，low active，有 pull high 電阻 140Kohm@5V	1
DI	I	串接輸入資料腳，有 pull high 電阻 140Kohm@5V	1
GND	P	Ground pin	1
DOUT	O	資料輸出腳	1
VDD	P	Power pin	1
VLCD	P	LCD power pin	1
D7	I	資料碼設定腳 (pull low 280Kohm@5V)	1
C8-C1	I/O	Column control for keyboard matrix	8
AIN	I	客戶碼設定腳	1
R4-R3	I	鍵盤輸入腳 (active high, pull low 200Kohm@5V)	2
Total Pin			47

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LCD Driver (19*4) with Key Scan (4*8)

. Pin Assignment



RLCD-C

NO.	NAME	X	Y	NO.	NAME	X	Y	NO.	NAME	X	Y
1	R2	-710	650	17	SEG7	-230	-650	33	DOUT	710	287.5
2	R1	-710	517.5	18	SEG6	-115	-650	34	VDD	710	402.5
3	XI	-710	402.5	19	SEG5	0	-650	35	VLCD	710	517.5
4	XO	-462.2	287.5	20	SEG4	115	-650	36	D7	710	650
5	ROSC	-710	287.5	21	SEG3	230	-650	37	C8	575	650
6	SEG18	-710	172.5	22	SEG2	345	-650	38	C7	460	650
7	SEG17	-710	57.5	23	SEG1	460	-650	39	C6	345	650
8	SEG16	-710	-57.5	24	SEG0	575	-650	40	C5	230	650
9	SEG15	-710	-172.5	25	COM3	710	-650	41	C4	115	650
10	SEG14	-710	-287.5	26	COM2	710	-517.5	42	C3	0	650
11	SEG13	-710	-402.5	27	COM1	710	-402.5	43	C2	-115	650
12	SEG12	-710	-517.5	28	COM0	710	-287.5	44	C1	-230	650
13	SEG11	-710	-650	29	SYNCB	710	-172.5	45	AIN	-345	650
14	SEG10	-575	-650	30	CKWB	710	-57.5	46	R4	-460	650
15	SEG9	-460	-650	31	DI	710	57.5	47	R3	-575	650
16	SEG8	-345	-650	32	VSS	710	172.5				

Chip size : 1540*1650um

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LCD Driver (19*4) with Key Scan (4*8)

. AC / DC Characteristics

1 Absolutely max. ratings

ITEM	SYMBOL	RATING	UNIT
Operating Temperature	Top	-20°C - +70°C	°C
Storage Temperature	Tsto	-50°C - +125°C	°C
Supply Voltage	VDD	5.5	V
Voltage to input terminal	Vin	Vss-0.3 to Vdd+0.3	V

2 D.C. Characteristics

Item	Symbol	Condition	min.	typ.	Max.	unit
Operating voltage	VDD		2.4	5	5.5	V
Power consumption current	I _{OPR}	System clock at 56.875Khz RC oscillator, LCD on, no load, @5V		400	800	uA
Input low voltage for input pin	V _{IL1}		0		0.3VDD	V
Input high voltage for input pin	V _{IH1}		0.7VDD		VDD	V
RC oscillator start-up voltage	V _{ST}		2.7			V
RC oscillator sustain voltage	V _{SU}		2.4			V
DOUT source current	I _{IROH}	VDD = 5V, V _{OH} = 4.5V	6	12		mA
DOUT sink current	I _{IROL}	VDD = 5V, V _{OL} = 0.5V	6	12		mA

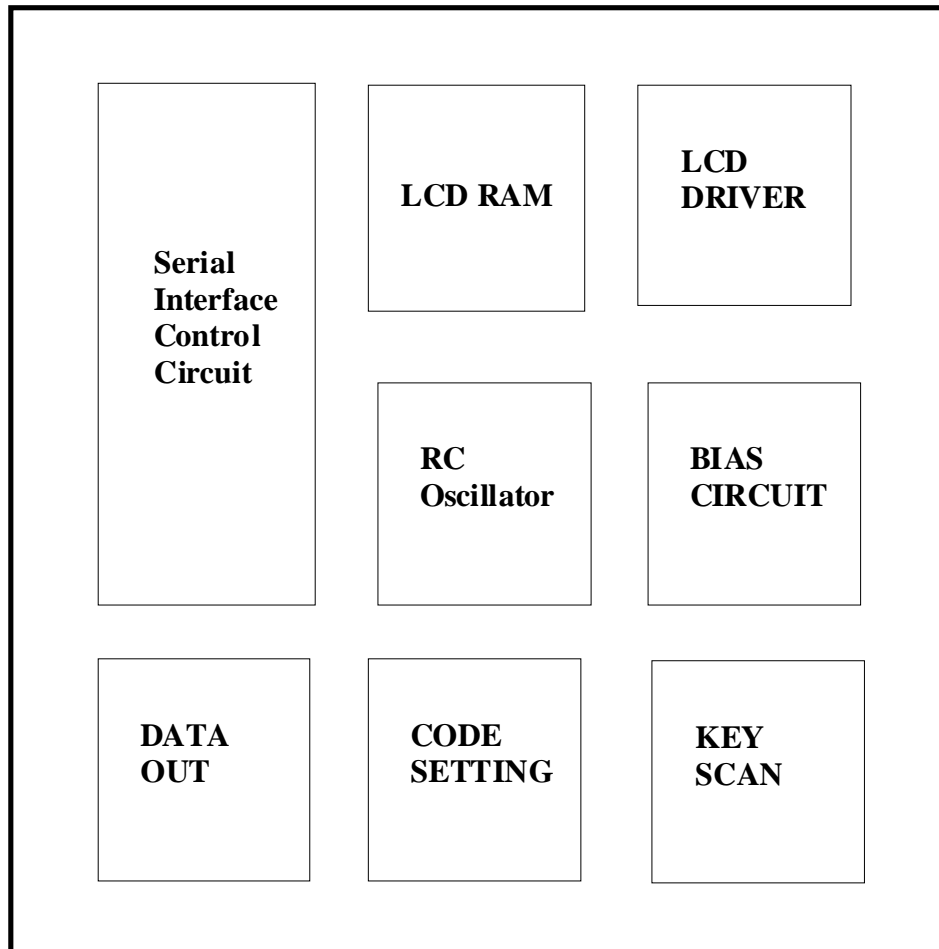
3 A.C. Characteristics

Item	Symbol	Condition	min.	typ.	Max.	unit
System clock	f _{SYS}	RC oscillator @5v		56.875		KHz
LCD frame frequency	F _{LCD}	1/4 duty		55.5		HZ
串行控制 CKWB	F _{CKWB}	@5V , Clock duty 50%			500	KHz
串行控制 SYNCB (Reset pulse width of high state)	t _{SYNCB}	@5V		100		ns

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LCD Driver (19*4) with Key Scan (4*8)

. Block Diagram



RLCD-2

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LCD Driver (19*4) with Key Scan (4*8)

. Function Description

1 LCD 控制格式表

功能	前置碼	Mode Code	控制碼	
			位址碼	資料碼
指令	1	00	0-C7C6C5C4--C3C2C1C0	
寫入	1	010	A4A3A2A1A0	B0B1B2B3

功能	控制碼 0-C7C6C5C4--C3C2C1C0	功能描述	Initial State
系統控制	0-0010—0001	RC 振盪器不給 LCD driver 用 & LCD 偏壓電路 OFF	V
	0-0010—0011	RC 振盪器提供給 LCD driver 用	x
液晶顯示控制	0-0010—0101	LCD 偏壓電路 OFF	V
	0-0010—0111	LCD 偏壓電路 ON	x

Note: 此 IC 的 Oscillator 是一直振盪的，以上『系統控制』碼只是控制內部 clock 要不要供給 LCD driver 的線路使用。

2 LCD RAM 位置

A4A3A2 A1A0	COM3 Bit3	COM2 Bit2	COM1 Bit1	COM0 Bit0	A4A3A2 A1A0	COM3 Bit3	COM2 Bit2	COM1 Bit1	COM0 Bit0
00 _H	SEG0				10 _H	SEG9			
01 _H					11 _H				
02 _H	SEG1				12 _H	SEG10			
03 _H					13 _H				
04 _H	SEG2				14 _H	SEG11			
05 _H					15 _H				
06 _H	SEG3				16 _H	SEG12			
07 _H					17 _H				
08 _H	SEG4.				18 _H	SEG13.			
09 _H					19 _H				
0A _H	SEG5				1A _H	SEG14			
0B _H					1B _H				
0C _H	SEG6				1C _H	SEG15			
0D _H					1D _H	SEG16			
0E _H	SEG7				1E _H	SEG17			
0F _H	SEG8				1F _H	SEG18			

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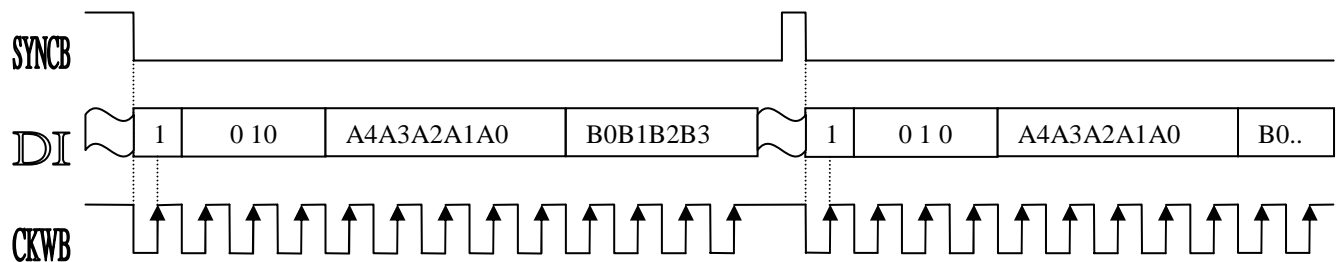
LCD Driver (19*4) with Key Scan (4*8)

3 LCD 串列控制格式

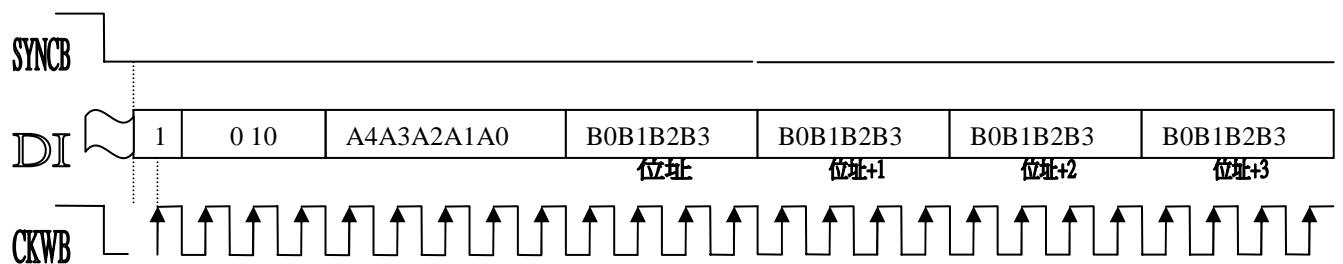
A. 寫入格式

功能	前置碼	Mode Code	位址碼	資料碼
寫入	1	010	A4A3A2A1A0	B0B1B2B3

分段寫入：



連續寫入：



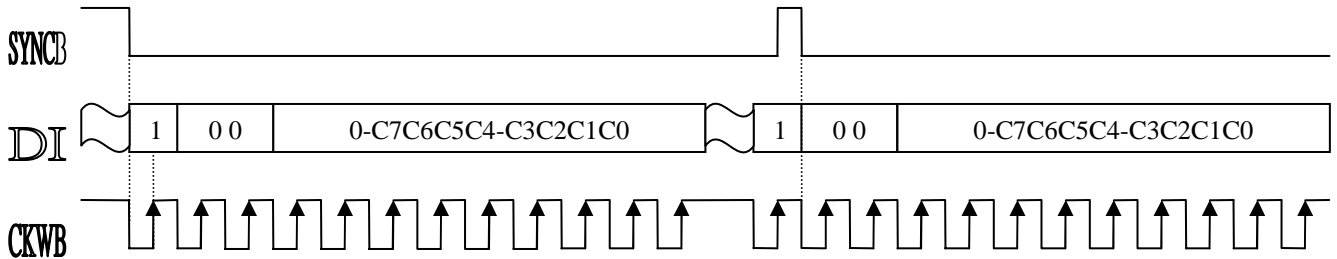
B. 控制格式

功能	前置碼	Mode Code	控制碼
指令	1	00	0-C7C6C5C4--C3C2C1C0

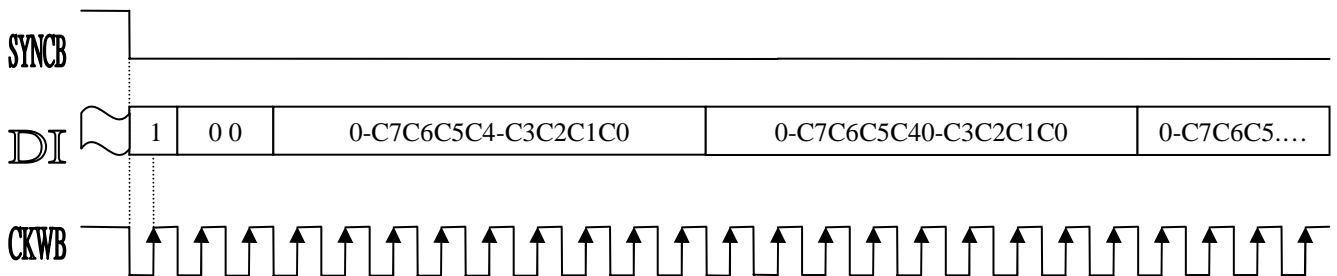
* All specs and applications shown above subject to change without prior notice.

LCD Driver (19*4) with Key Scan (4*8)

分段控制格式：



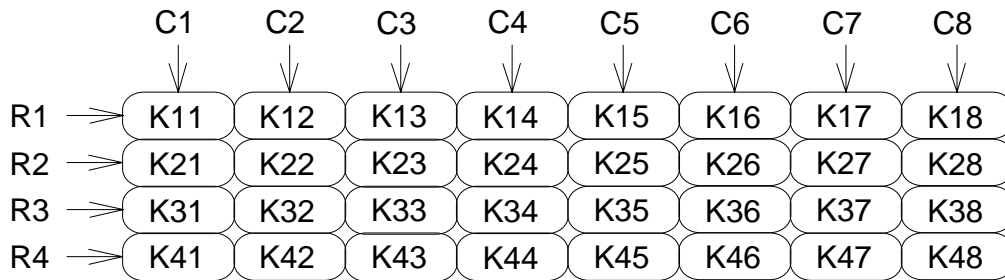
連續控制格式：



* All specs and applications shown above subject to change without prior notice.

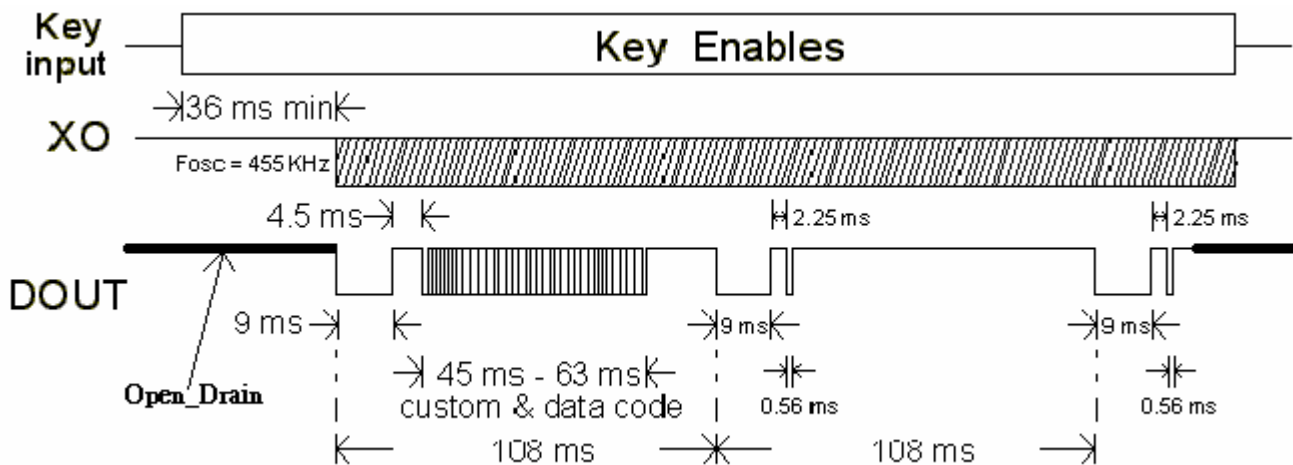
LCD Driver (19*4) with Key Scan (4*8)

4 The keyboard form :



5 Transmission code

A. 同 CM2221，但是沒有 38Khz carrier 的 Data (Data only)

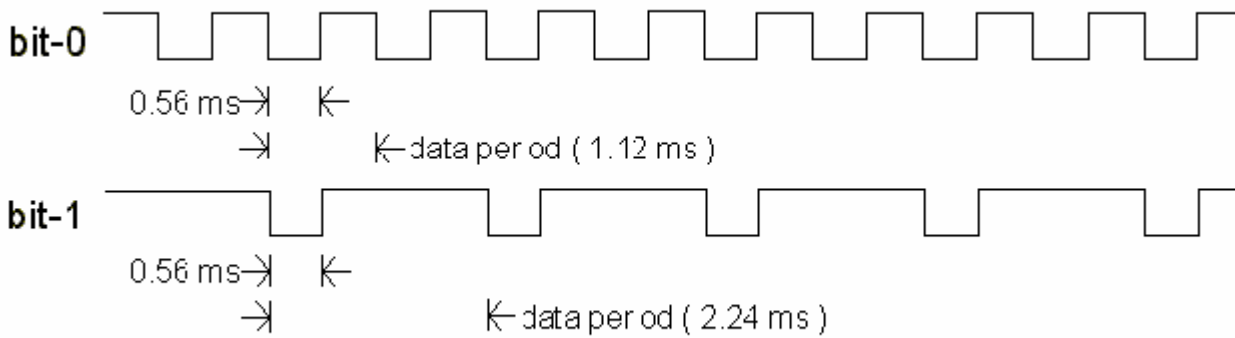


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LCD Driver (19*4) with Key Scan (4*8)

B. Pulse Position Modulation

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) :



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LCD Driver (19*4) with Key Scan (4*8)

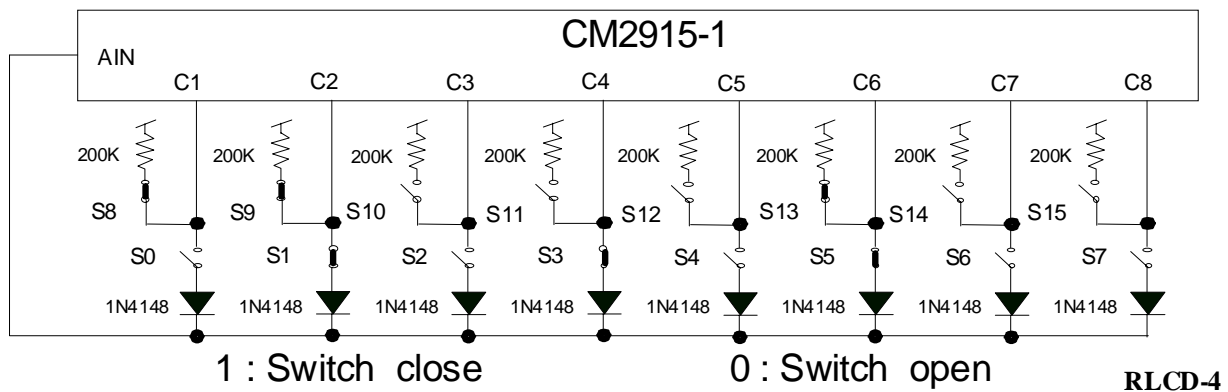
6 To set the custom codes (A0 - - - A15)

The algorithm rule of the custom codes (A0 - - - A15) can be selected by mask option , and the user can choose the CM2915-1 or CM2915-2 .

A. The CM2915-1 custom code

The value of ROM1 (8 bits) & ROM2 (8 bits) are both “ 00H “ , and it is decided by one mask layer . 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
---	---	---	---	---	---	---	---

Custom codes A0 - - - A15 : →

A0 - - A7								A8 - - A15							
0	1	0	1	0	1	0	0	0	1	1	0	1	1	1	1

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LCD Driver (19*4) with Key Scan (4*8)

B. The CM2915-2 custom code

In this case, the 28 bits on chip MASK ROM (ROM2 & ROM3-0, ROM3-1, ROM3-2 and ROM3-3) is available and it is decided by one mask layer. The value of ROM2 is "00H" and the value of ROM3 is show below "ROM3 option table". The A0 - - A2 are set by S0 - - S7 ("A0 - - A2 option table"). The A3 - - A7 are set by S14 & S15("ROM3 option table"). The A8 - - A15 equal some bits be inverted of A0 - - A7 and the inversion are decided by logical OR between the switches S8 - - S13 and ROM2.

A0 - - A2 option table	option table		
	A0	A1	A2
S0 = 1	0	0	0
S1 = 1	1	0	0
S2 = 1	0	1	0
S3 = 1	1	1	0
S4 = 1	0	0	1
S5 = 1	1	0	1
S6 = 1	0	1	1
S7 = 1	1	1	1

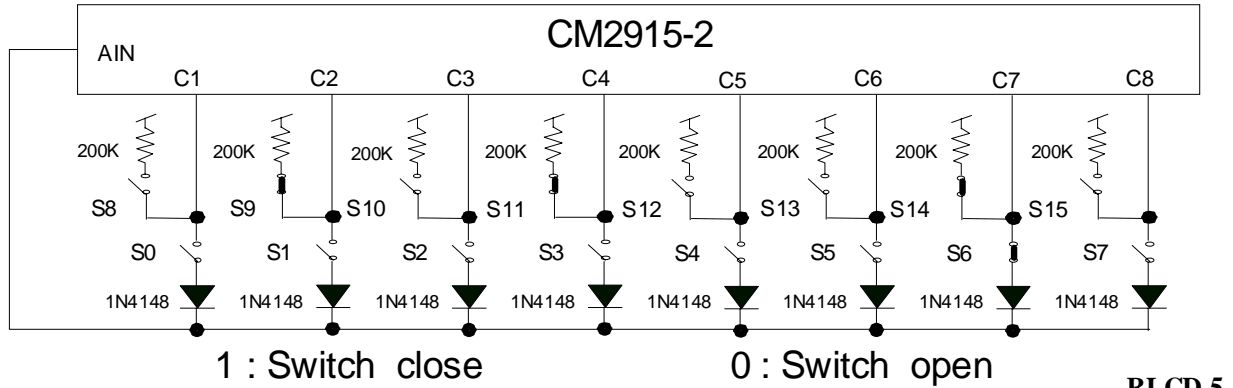
ROM3 option table							
S14	S15	A3	A4	A5	A6	A7	ROM3
0	0	0	0	0	0	0	ROM3-0
0	1	1	1	0	0	1	ROM3-1
1	0	0	0	0	0	1	ROM3-2
1	1	1	0	1	1	1	ROM3-3

S0 - - S7 are closed must only one.
 Note : priority S7 > - - - > S0 (A0 - - A2 option table)

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LCD Driver (19*4) with Key Scan (4*8)

For example :



External switch S0 --- S15 : →

S0 -- S7								S8 -- S15				
0	0	0	0	0	0	1	0	0	1	0	1	0

On chip ROM2 : →

ROM2							
0	0	0	0	0	0	0	0

A0 -- A2 , A3 -- A7 : →

S0 -- S7				S14 , S15			
0	1	1	0	0	0	0	1

A8' -- A15' : →

(S8 -- S13) OR ROM2							
0	1	0	1	0	0	x	x
↓	x	↓	x	↓	↓	↓	↓
-	A1	-	A3	-	-	-	-
A1B	-	A2B	-	A4B	A5B	A6B	A7B

A8 -- A15 : →

1	1	0	0	1	1	1	0
---	---	---	---	---	---	---	---

Custom codes A0 --- A15 : →

A0 -- A7								A8 -- A15							
0	1	1	0	0	0	0	1	1	1	0	0	1	1	1	0

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LCD Driver (19*4) with Key Scan (4*8)

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

The CM2915 contains 32 function keys ◦ Each key corresponds to one data code ◦ The CM2915 provide 3 double keys ◦

C. The CM2915 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 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.

7 Function Keys control

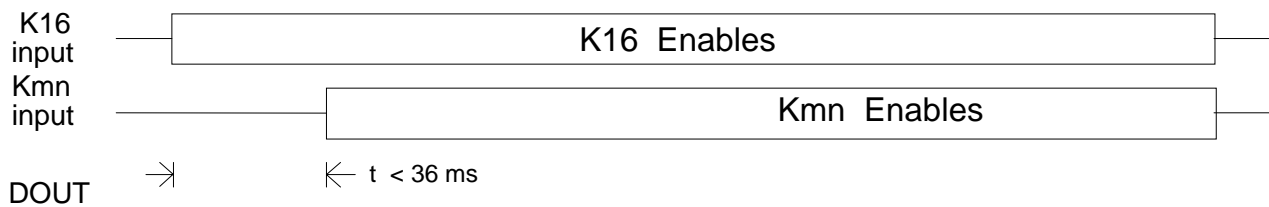
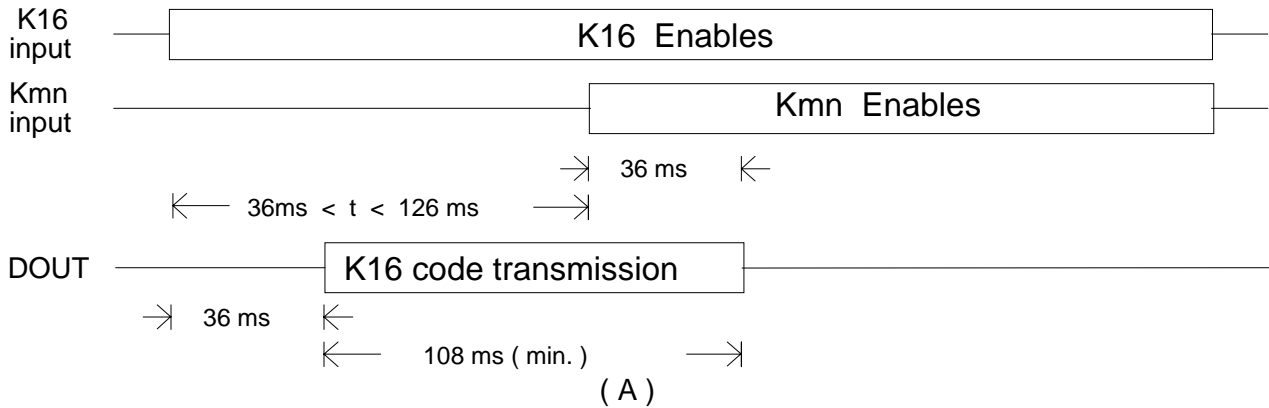
If two or more keys are depressed simultaneously (except K16+K26 & K16+K36 & K16+K46) , the transmission is disabled by the multi-depression prevention circuit ◦ As regards the key transmission priority in the case of two depressions , with simultaneous depressions (± 36 ms) transmission is disabled 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 IRO 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 ◦ 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 ◦

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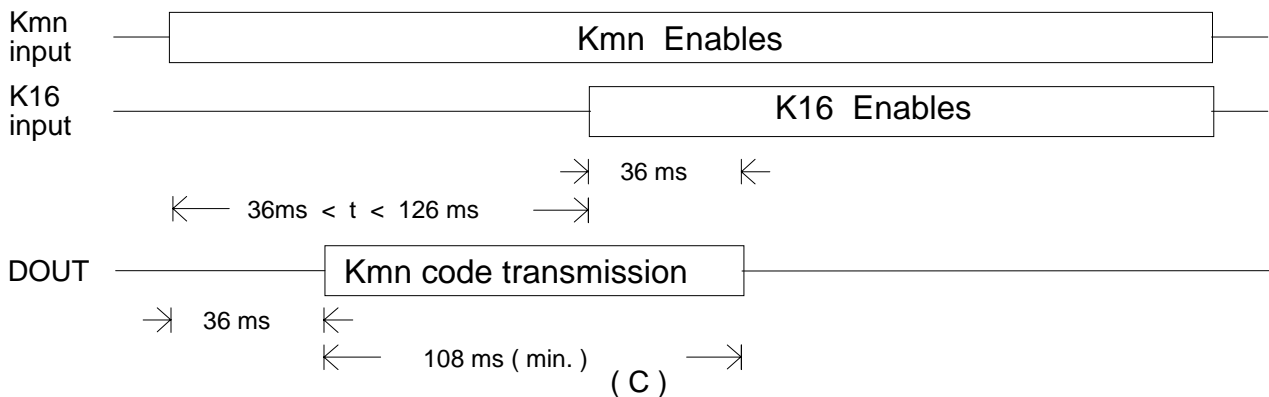
LCD Driver (19*4) with Key Scan (4*8)

A. Two or more keys are depressed (except K16+K26 & K16+K36 & K16+K46)

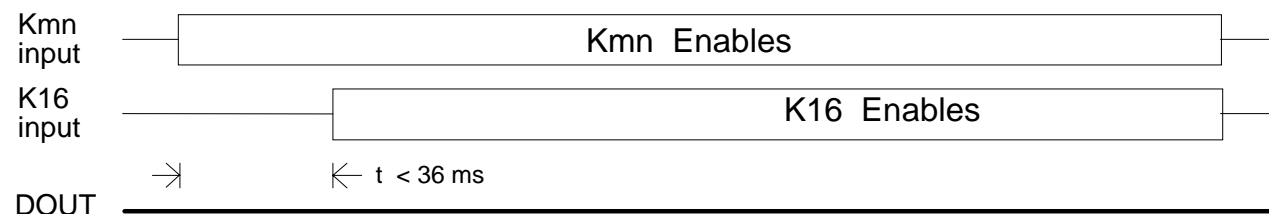


The transmission is disabled.

(B)



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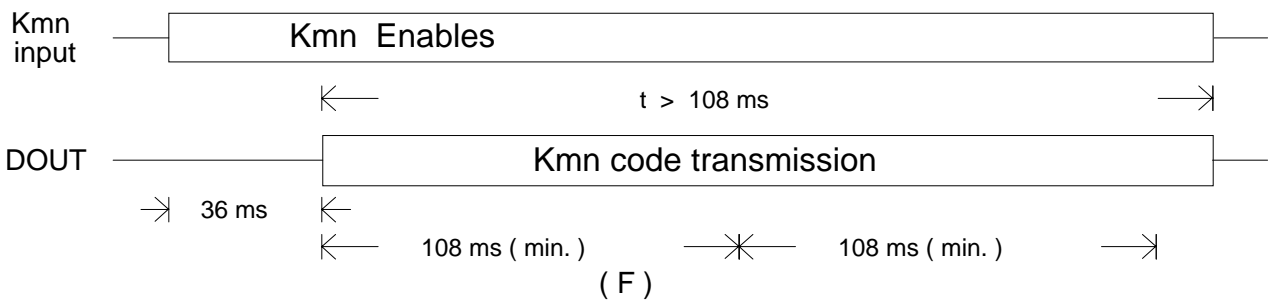
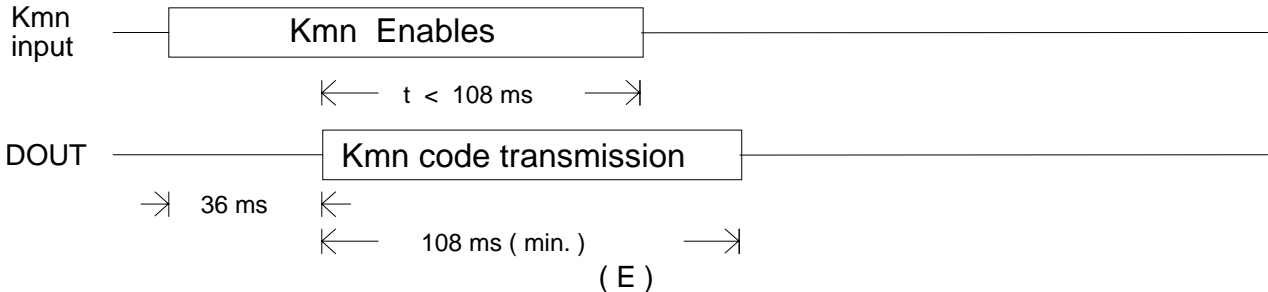


The transmission is disabled.

(D)

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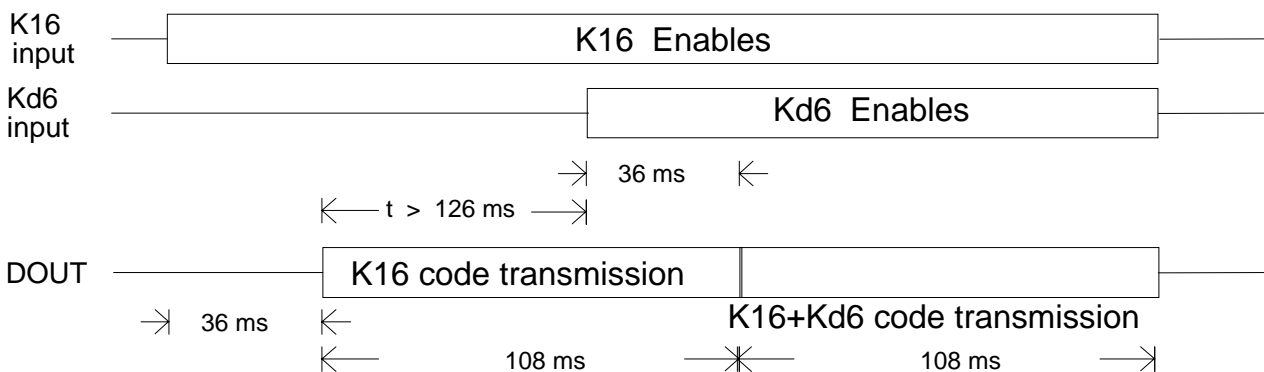
LCD Driver (19*4) with Key Scan (4*8)



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 CM2915 is facilitated with 36 ms starting time .

B. The 3 double keys are depressed (K16+K26 & K16+K36 & K16+K46)

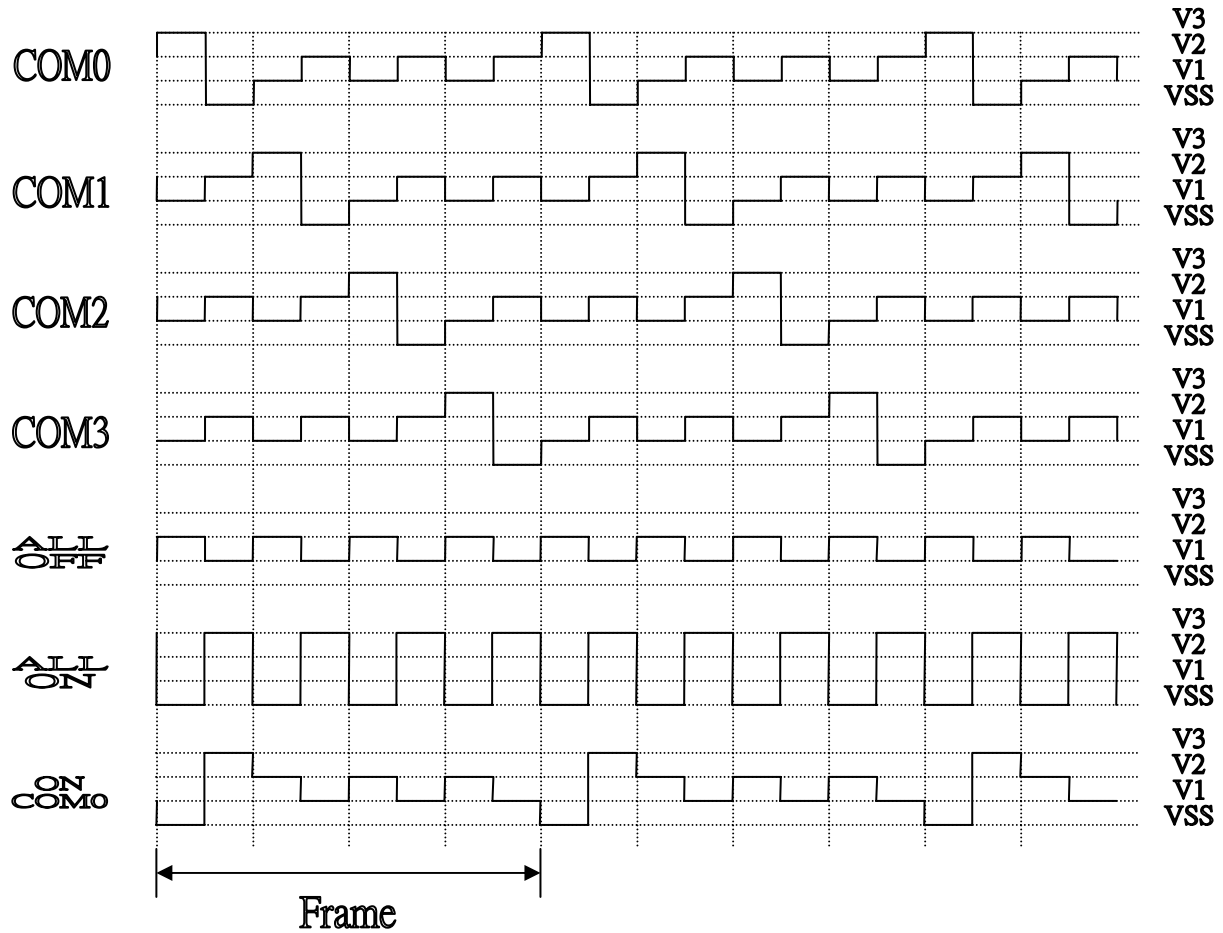
Kd6 : one of (K26 or K36 or K46)



The algorithm rule of the custom codes (A0 - - - A15) can be selected by mask option , and the user can choose the CM2915-1 or CM2915-2 .

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8 LCD pattern

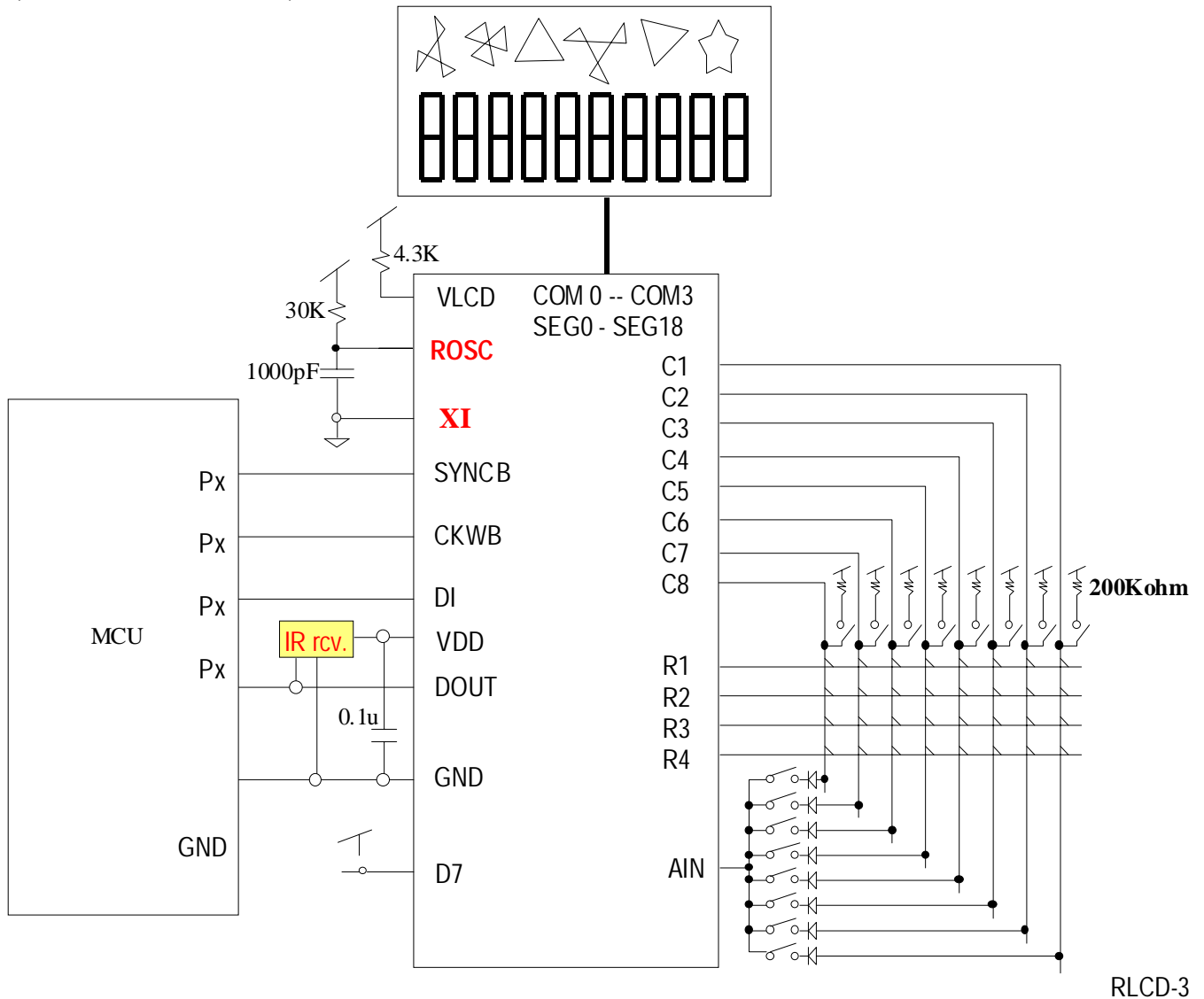


要調整 ROSC 的頻率時，請量測 Frame 要為 55.5Hz，至於其生產可容許的誤差範圍，要以接收器（FLASH ROM）所能辨認的最大頻率範圍來生產。

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LCD Driver (19*4) with Key Scan (4*8)

9 Application circuit (For RC oscillator use)

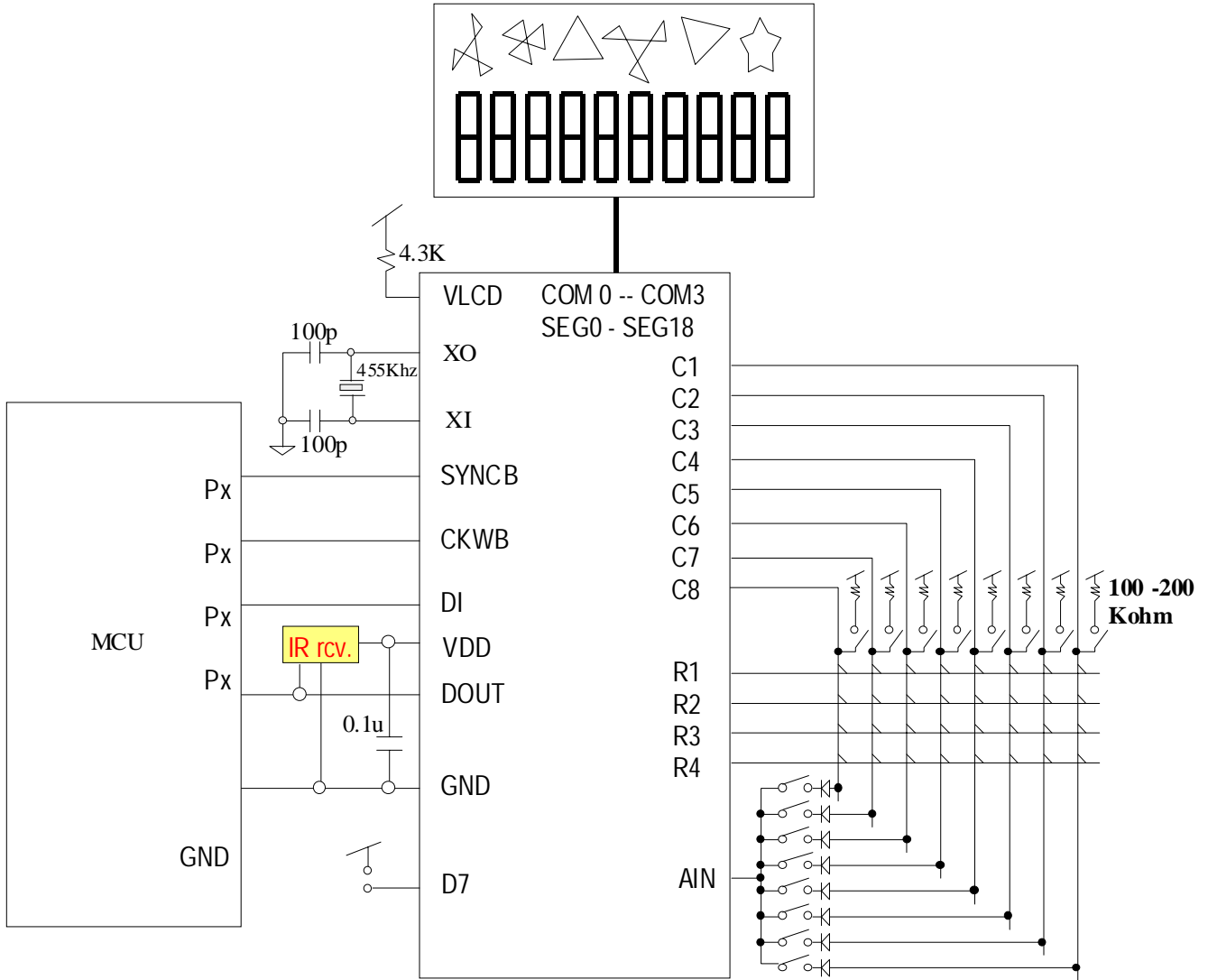


RLCD-3

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LCD Driver (19*4) with Key Scan (4*8)

(For Resonator oscillator use)

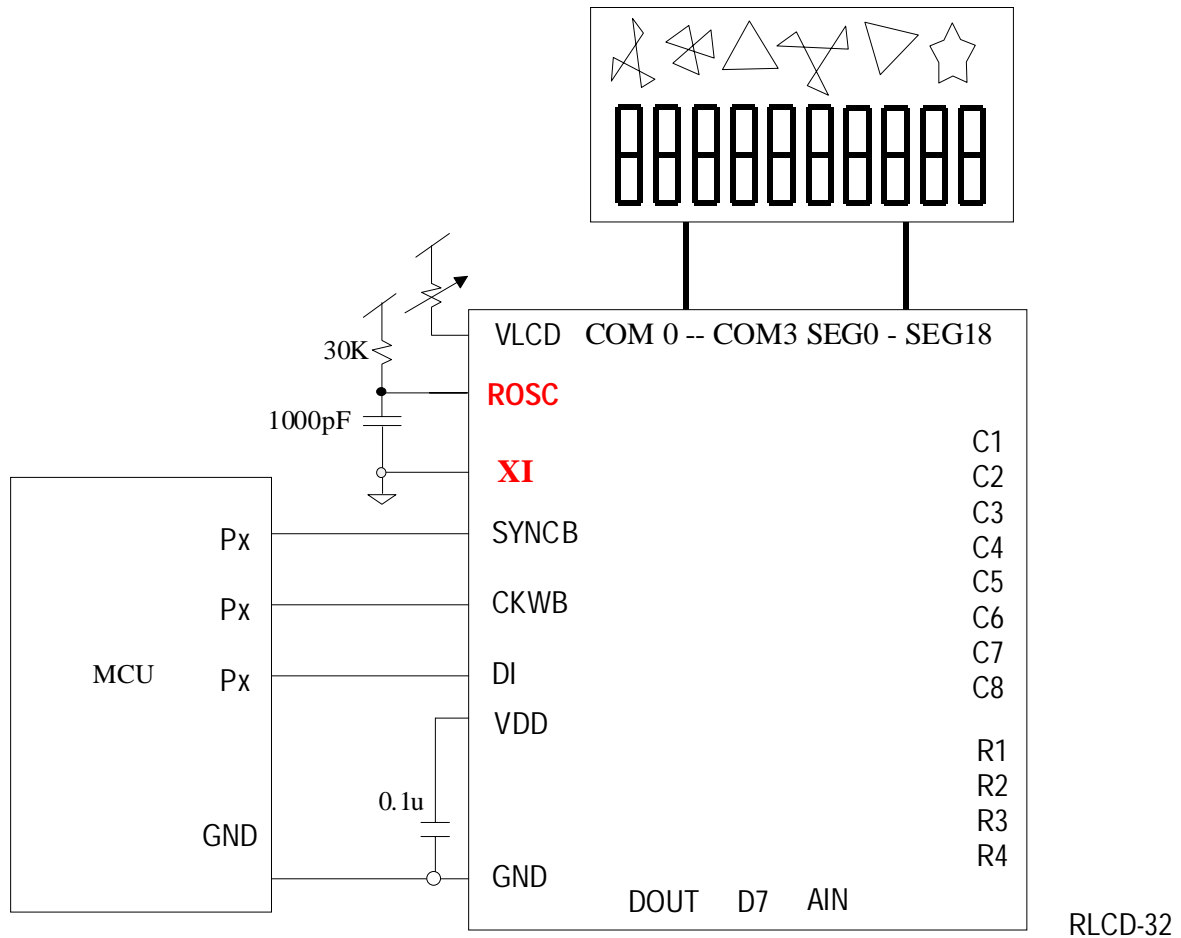


RLCD-31

* All specs and applications shown above subject to change without prior notice.

LCD Driver (19*4) with Key Scan (4*8)

(For LCD driver use)



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