



Preliminary

GENERAL DESCRIPTION

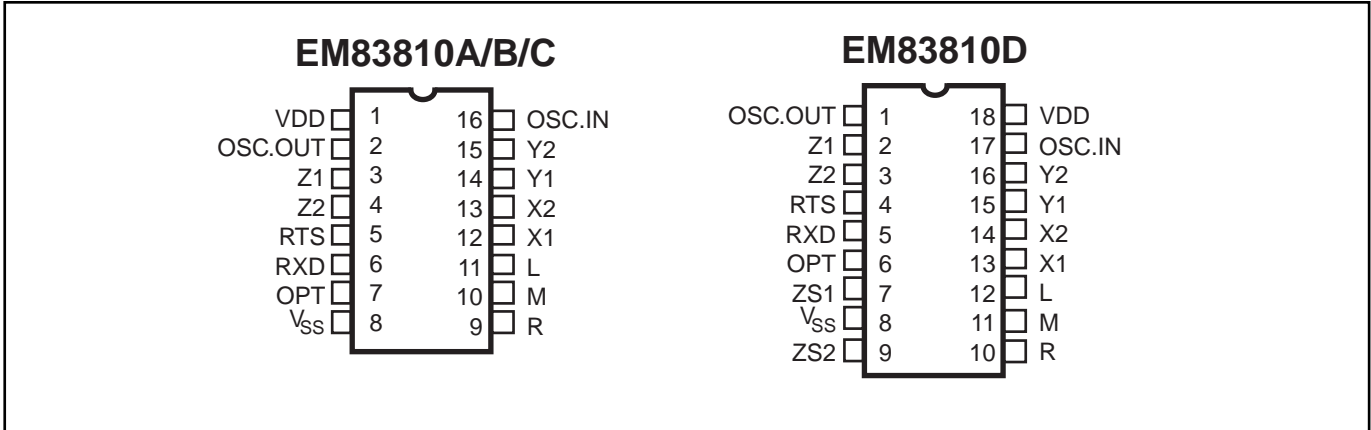
The EM83810 PnP Serial Mouse Controller is specially designed to control mouse device for WINDOWS 95 system. This single chip can interface three key-switches , four X,Y photo signals and two Z direction signals to RS-232C.

FEATURES

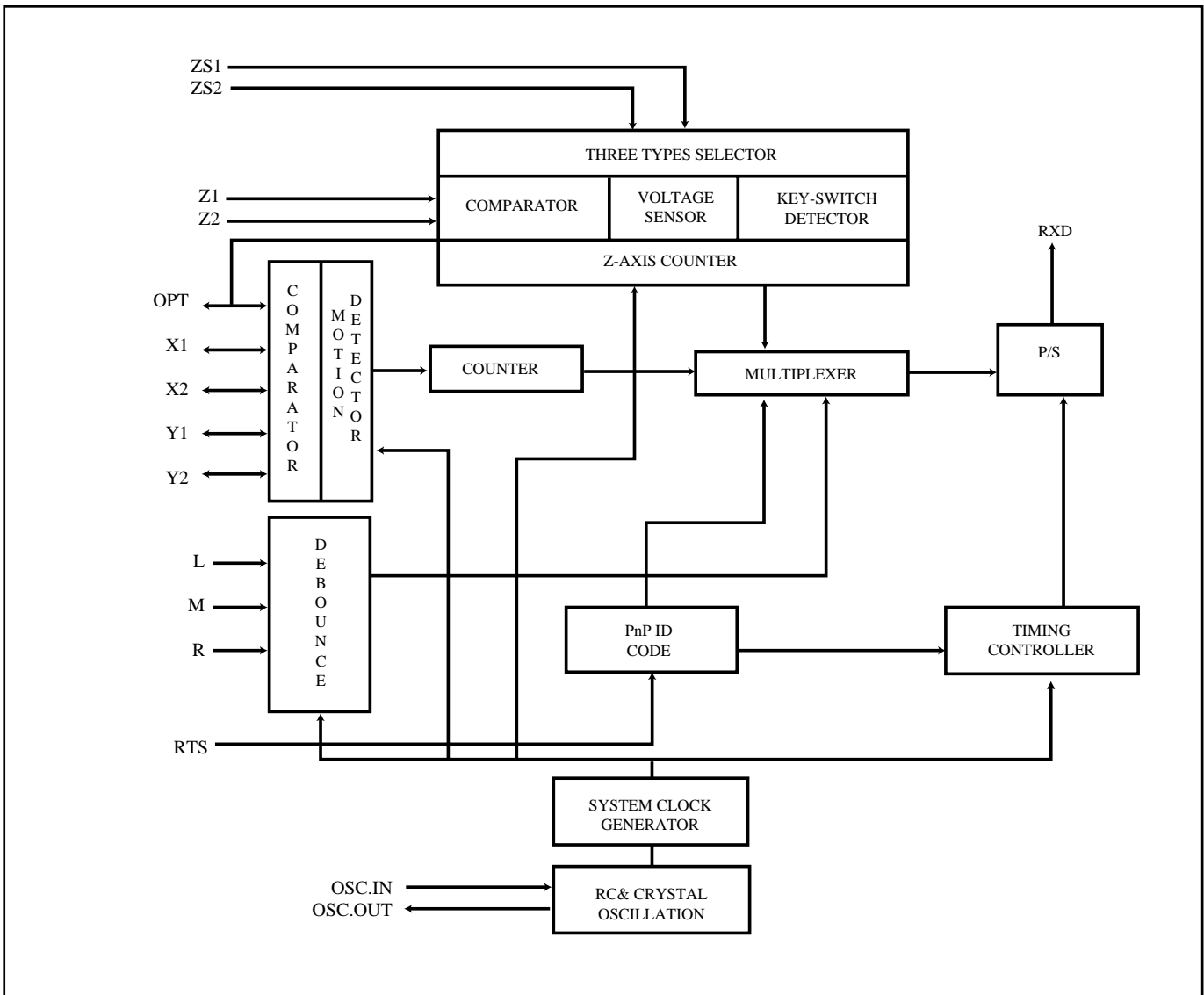
- Use 32.768 kHz crystal.
- Microsoft compatible four bytes format output in 1200 baud rate.
- 100 bytes PnP ID code could be filled by code layer.
- Three key-switches, four X,Y photo-couples inputs.
- Three type Z direction input:
 1. Photo couples input.
 2. Key-switches input.
 3. Voltage-sensing input.
- Both key-in and key-realse debounce interval 13 ms.
- The sampling rate of motion detector is about 65kHz.
- Photo-couple detector using noise immunity.
- RTS debouncing circuits.
- Three step dynamic input impedance.
- Using voltage comparator to detect photo-couple input.
- Photo couples test mode included.
- Built-in two zener diodes between Vdd to Vss,and RTS to Vdd.
- CMOS push-pull output.
- Package type:
 - a. EM83810A : 16 DIP, Z-axis—photo input.
 - b. EM83810B : 16 DIP, Z-axis—key input.
 - c. EM83810C : 16 DIP, Z-axis—voltage input.
 - d. EM83810D : 18 DIP, Z-axis—three type option.

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PIN ASSIGNMENTS



FUNCTION BLOCK DIAGRAM



* This specification are subject to be changed without notice.



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PIN DESCRIPTIONS

Symbol	I/O	Function
ZS1 ZS2	I	Both pins input pull high with 200kohm resistor. ZS1=1, and ZS2= 1: Z-axis selected to photo input. ZS1=0, and ZS2= 1: Z-axis selected to key input. ZS1=1, and ZS2= 0: Z-axis selected to voltage input.
OPT	I / O	INPUT: 200kohm pull high to VDD. When OPT is connected to VSS, EM83810 will enter test mode. In test mode, L will be the output of X1, while M will be the output of X2. Toggling R key can change these output to be Y1, Y2 respectively. OUTPUT: 2kHz Z-axis LED driving source. “ 1”= VRTS, “0”= floating . High duty is about 30us.
OSC.OUT OSC.IN	O I	32.768kHz crystal.
RTS	I	±12V signal with 10mA driving. Used as EM83810 ID code output trigger signal from low (-12V) to high (+12V). While under normal operating, RTS will keep on +12V driving. EM83810 clamp it by 6V zener diode to VDD and use it as RXD positive voltage. The RTS sensing debounce time is about 15us to 30us.
RXD	O	One report contains 4 data bytes, 7 data bits without parity in the data byte. The data byte is shifted out from LSB through MSB, started by start bit and ended by stop bit. The RXD signal swing between +6V and -6V
R M L	I	Three key-switches inputs. 200kohm resistor pull low.
X1 X2 Y1 Y2	I	Three step dynamic input impedance. Use voltage comparator to measure photo-couples "ON" ,or "OFF".
Z1 Z2	I	Z-axis inputs. Photo mode: Three step dynamic input impedance. Voltage comparator. Key mode: 200kohm resistor pull low. Voltage mode: 200kohm resistor pull low. 8 level voltage comparator.
VSS		Negative power. Connect to TXD (-12V) signal.
VDD		Power line. Connect to GND.

FUNCTION DESCRIPTIONS

Operating Mode

(A) Data format

In microsoft mode, the transmission cycle consists of four bytes in one report. Each byte contains one start bit, 7 data bits and two stop bits. The first byte contains “L”, “R” key status and four bits of the two most

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significant bits in horizontal counter and vertical counter. The second byte represents the value accumulated by horizontal counter, the third byte is the data of the vertical counter. The last byte contains “M” key status and Z-axis value. The vertical data is transmitted in 2’s complement.

Output byte arrange

bit	no.	6	5	4	3	2	1	0
1st	byte.....	1	L	R	V7'	V6'	H7	H6
2nd	byte.....	0	H5	H4	H3	H2	H1	H0
3rd	byte.....	0	V5'	V4'	V3'	V2'	V1'	V0'
4th	byte.....	0	0	M	Z3	Z2	Z1	Z0

(B) Plug & Play ID code

When RTS input from low to high, EM83810 will send a string ID code. Customer can specify the contains of the code area and the length by change the code layer.

Field Name	Length	Field Data	Description
Other ID	<17	4D,5A,40,00,00,00	ID for legacy
Begin PnP	1	08	Begin PnP ID
PnP Revision	2	01,24	Version 1.00
EISA ID	3	25,2D,23	EMC
Product ID	4	10,10,10,11	0001
Serial Number	9	3C	None provided
Class ID	<34	3C,2D,2F,35,33,25	MOUSE Class
Driver ID	<42	3C,30,2E,30,10,26 10,21	PnP0F0A
User Name	<42	3C,25,2D,23,00,33 23,32,2F,2C,2C,29 2E,27,00,33,25,32 29,21,2C,00,2D,2F 35,33,25	EMC SCROLLING SERIAL MOUSE
Checksum	2	21,15	2 byte checksum
End PnP	1	09	End PnP ID

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ABSOLUTE MAXIMUM RATINGS

Parameter		Min.	Max.	Unit
Supply voltage	$V_{DD} - V_{SS}$	-0.3	7	V
	$RTS - V_{SS}$	-0.3	14	V
Temperature under bias		0	70	°C
Storage temperature		-65	150	°C
Power dissipation		-	500	mW

DC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ to 70°C)

Parameter	Sym.	Min.	Typ.	Max.	Unit.
Operating voltage	VDD	-	6	6.5	V
	VRTS	-	12	13	V
Operating current (Vdd=5.4V, RTS=Vdd)	Iop	-	-	0.8	mA
Operating current (Vdd=6.2V, RTS=Vdd)	Iop	3	-	-	mA
RTS operating current (Vdd=5.6V, RTS=11V)	Irts	-	-	1.8	mA
RTS operating current (Vdd=5.6V, RTS=12V)	Irts	4	-	-	mA
OPT high output voltage (Vrh=Vrts-0.4V)	Iop	16	-	24	mA
RXD high output voltage (Vrh=Vrts-2.6V)	Irh	2	-	-	mA
RXD low output voltage (Vrl=Vss+2.6V)	Irl	-	-	-2	mA
X1,X2,Y1,Y2 referance voltage Z1,Z2 (Photo mode)	Vpl	0.7	-	1.2	V
X1,X2,Y1,Y2 input current (80uA) Z1,Z2 (Photo mode)	Vpi	0.8	-	1.3	V
X1,X2,Y1,Y2 input current (500uA) Z1,Z2 (Photo mode)	Vpi	1.5	-	2.1	V
RTS high input voltage	Vt+	9.6	-	-	V
RTS low input voltage	Vt-	-	-	6.8	V
L,M,R,ZS1,ZS2,OPT input low voltage Z1,Z2 (Key mode)	Vil	-	-	1.5	V
L,M,R,ZS1,ZS2,OPT input high voltage Z1,Z2 (Key mode)	Vih	3.5	-	-	V
Z1,Z2 (Voltage mode) sensitivity	Vs	-3	-	+3	V
L,M,R input current Z1,Z2 (Key & voltage mode) (Vds=5.6V)	Imi	18	-	56	μA
ZS1,ZS2,OTP input current (Vds=0V)	Iri	-18	-	-56	μA
L,M,R,ZS1,ZS2,OPT,OSC.IN leakage current Z1,Z2 (Key mode) (Vds=0V)	Iil	-	-	1	μA
OSC.IN leakage current (Vds=5.6V)	Iih	-1	-	-	μA

* All voltages in above table are compared with VSS.

* All parameter in above table are tested under 5.6V except operating current.

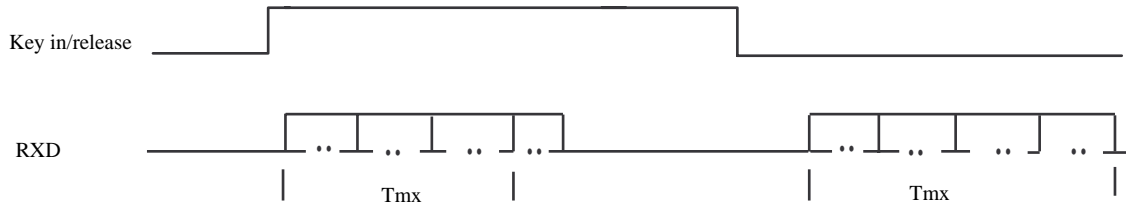
*Preliminary*AC ELECTRICAL CHARACTERISTICS ($T_A=0^{\circ}\text{C}$ to 70°C)

Parameters	Sym.	Min.	Typ.	Max.	Unit
Oscillating frequency	Fosc	-3.3%	32.40	+3.3%	kHz
Key debounce	Tkd	-	13	-	ms
Transmission time	Tmx	-	33.33	-	ms
Start bit time	Ts	-	833.3	-	us
Data bit time	Td	-	833.3	-	us
Stop bit time	Tp	-	833.3	-	us
Mode code delay time	Trd	11	-	14	ms
Photo couple input sampling time	Tph	-	15	-	us
Opt high duty	Topt	-	30	-	us
Opt frequency	Fopt	-	2	-	Khz

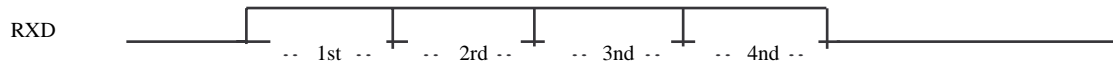
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TIMING DIAGRAM

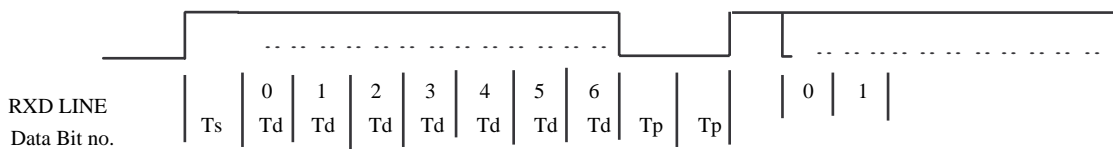
(A) P/S output :



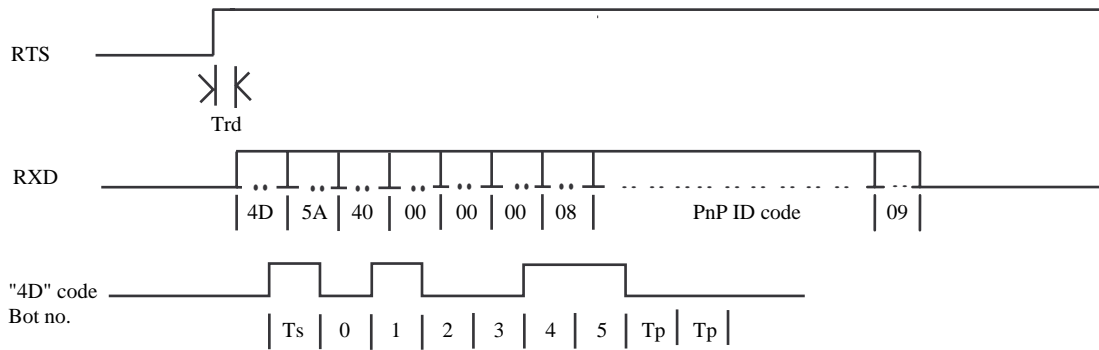
(B) Bytes structure :



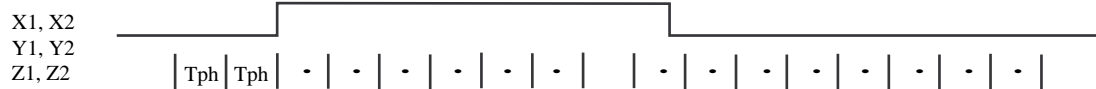
(C) Bits structure :



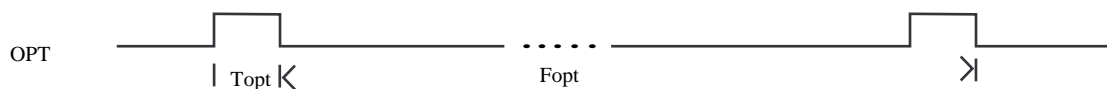
(D) PnP ID code echo timing :



(E) Photo-couples sampling clocks

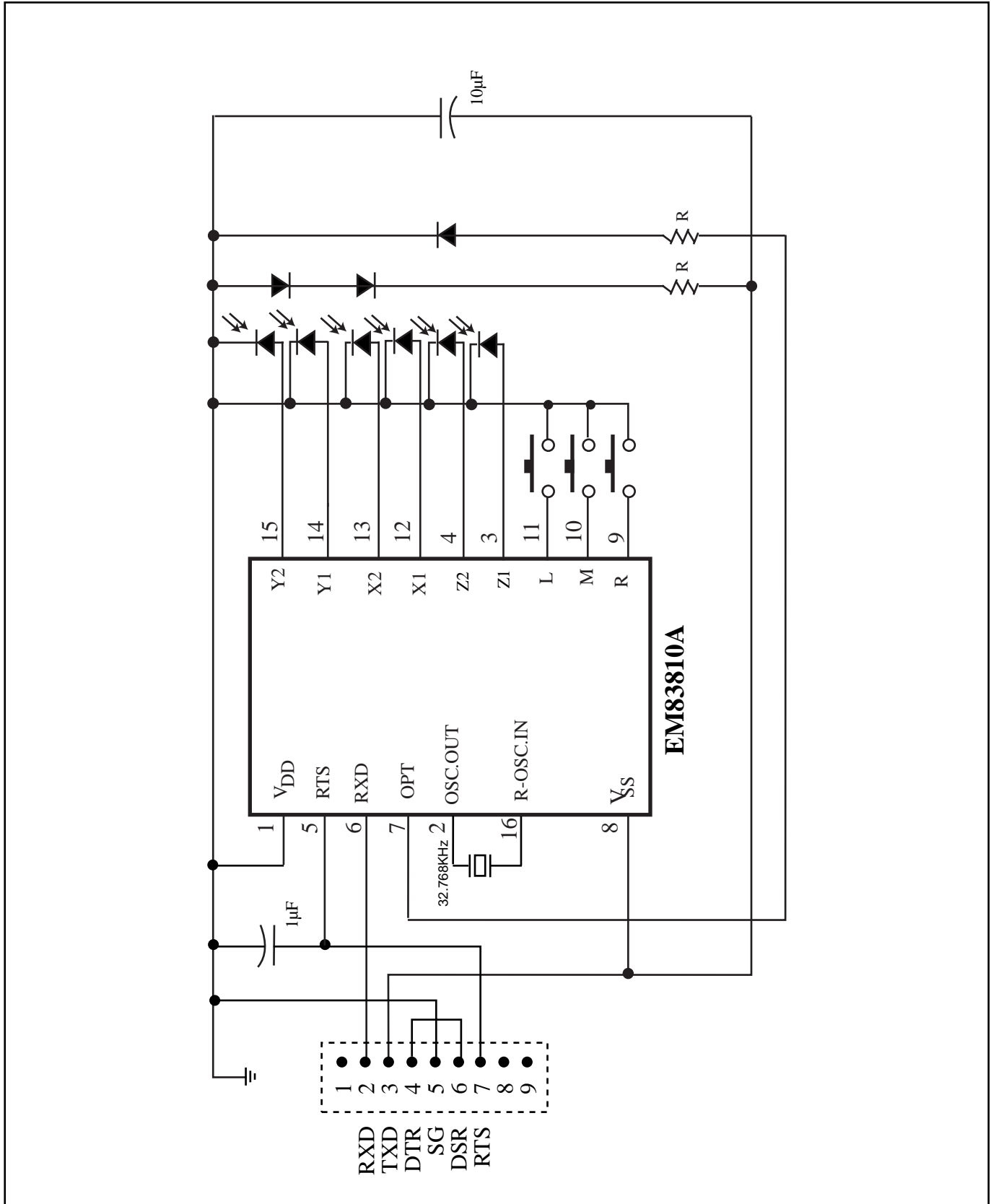


(F) OPT LED driving output

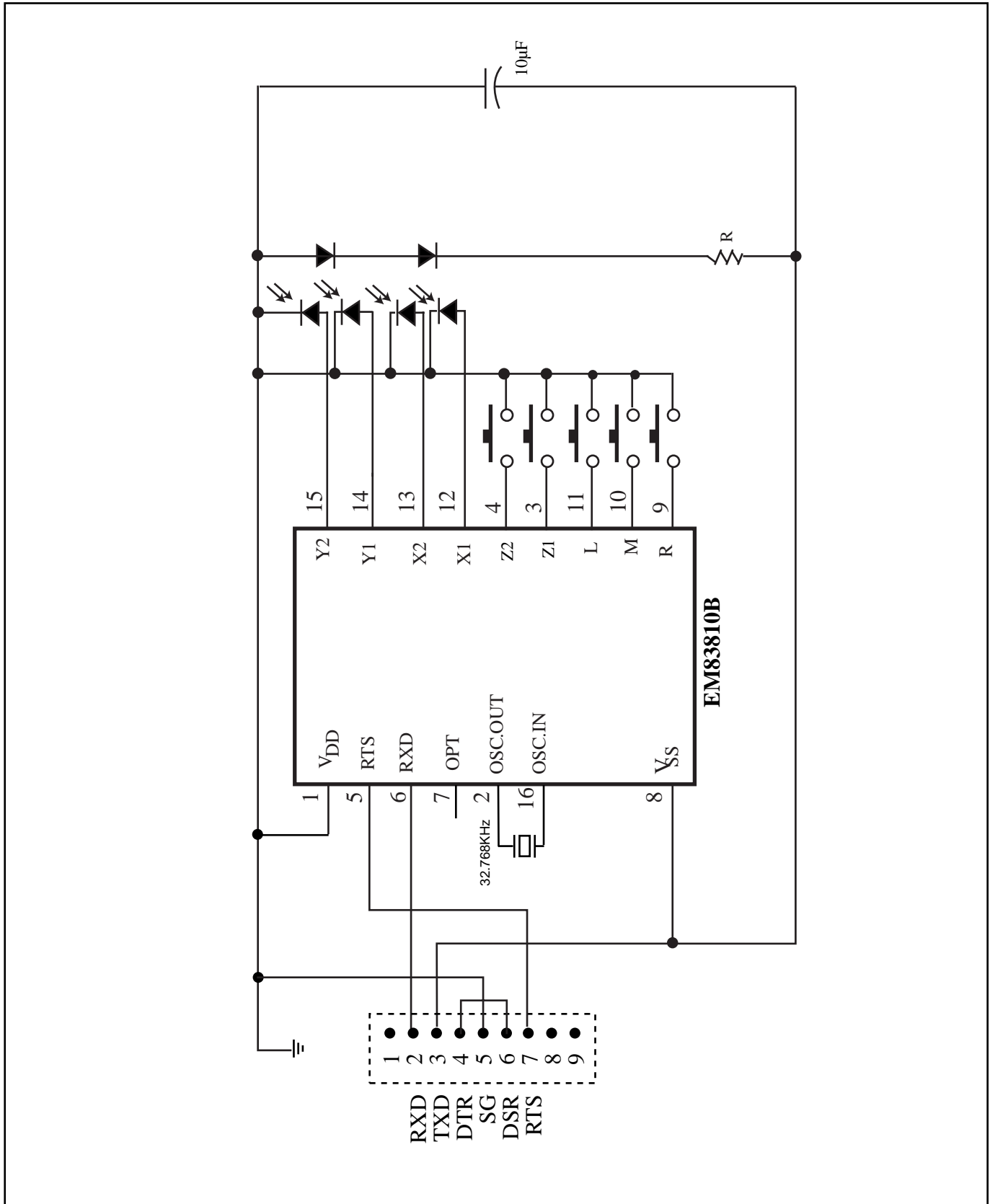


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APPLICATION CIRCUIT



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