

## ROLLING CODE LEARNING DECODER

### GENERAL DESCRIPTION

The M520D rolling decoder is CMOS LSI for remote control system application. It decoder the encoded waveform generated by M520EB and drives data output pin(s) according to the code bits decoded from the received waveform. Up to 1,048,576 address codes that Interface with EEPROM (93LC46) can be stored 25 sets of customer codes at maximum.

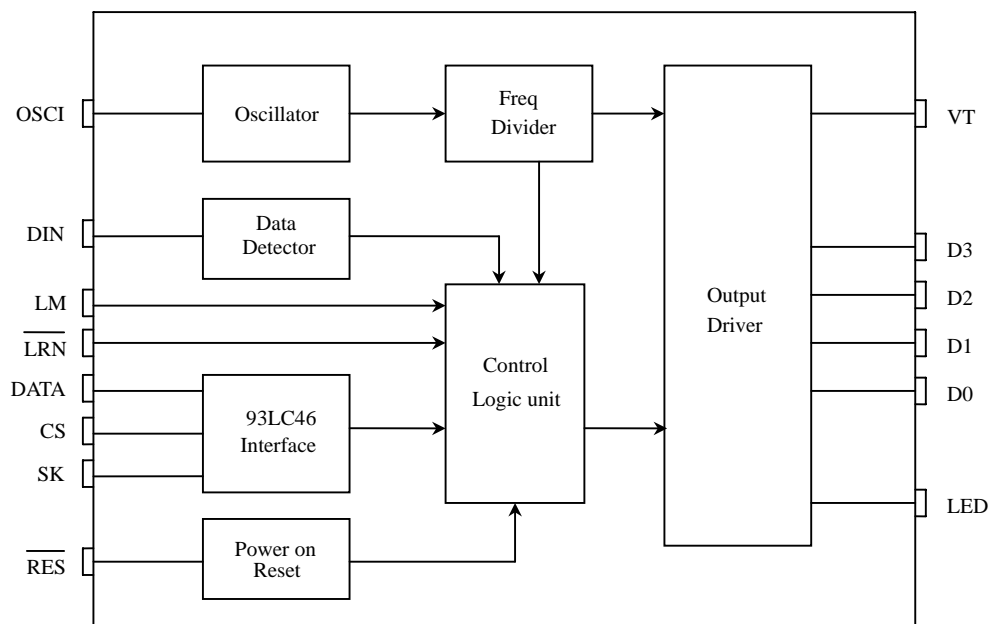
### FEATURES

- Operating voltage 2.4V~5.5V.
- Pairs with M520EB rolling encoders.
- Maximum 1,048,576 address and data code.
- 4 Data active : D0, D1, D2, D3.
- VT goes high during valid receiving 2 times.
- Selectable latch or momentary type of data output.
- An external oscillator resistor and capacitor.
- Interface with EEPROM (93LC46) can be stored 25sets of customer codes at maximum.
- Learning and rolling capability and the LED current for learning status and code error indication.

### APPLICATIONS

- Burglar alarm system, car door controllers, car alarm system, home/office security system...etc.

### BLOCK DIAGRAM





**ROLLING CODE LEARNING DECODER**

**ABSOLUTE MAXIMUM RATING**

(TA=25°C)

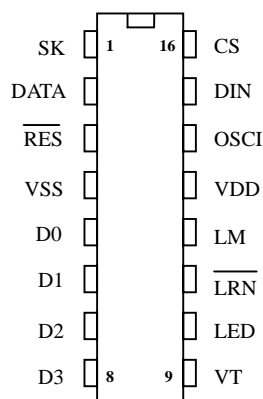
Parameter	Rating	Unit
Supply Voltage	-0.3 to 6.0	V
Input Voltage	-0.3~V <sub>DD</sub> +0.3	V
Operating Temperature	-20 to 75	°C
Storage Temperature	-40 to 125	°C

**ELECTRICAL CHARACTERISTICS**

Characteristics	Sym.	Min.	Typ.	Max.	Unit	Conditions
Operating Voltage	V <sub>DD</sub>	2.4	5	5.5	V	
Operating Current	I <sub>OP</sub>	—	1	2	mA	No load
Output Drive Current	I <sub>O</sub>	—	20	—	mA	@V <sub>DS</sub> =1.2V
Input Voltage	V <sub>IH</sub>	V <sub>DD</sub> -0.3	V <sub>DD</sub>	V <sub>DD</sub>	V	
	V <sub>IL</sub>	V <sub>SS</sub>	V <sub>SS</sub>	V <sub>SS</sub> +0.3		
Oscillator Frequency	F <sub>OSC</sub>	—	1	—	MHz	External±10%, R <sub>osc</sub> =18KΩ, C <sub>osc</sub> =30pF

**PIN ASSIGNMENT**

**M520DP**





**ROLLING CODE LEARNING DECODER**

**PIN DESCRIPTION**

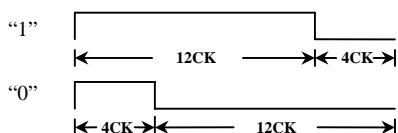
No.	Pin Name	I/O	Description
1	SK	O	Serial clock output for EEPROM (connected to SK pin of EEPROM)
2	DATA	I/O	Input data from EEPROM or output the received data to the EEPROM. (Connected to DO and DI) pin of EEPROM
3	$\overline{\text{RES}}$	I	Input for resetting the chip, active low.
4	VSS		Negative power supply (GND)
5~8	D0~D3	O	Output data pin , active high
9	VT	O	Valid receiving indication, active high
10	LED	O	The LED current for learning status indication.
11	$\overline{\text{LRN}}$	I	To set the chip into the learning mode, or to erase EEPROM data, active low.
12	LM	I	When the LH pin disconnected, the data output is of the latch type. When the LH pin connected to VSS, the data output is of the momentary type.
13	VDD		Positive power supply.
14	OSCI	I	Oscillator input pin , It connects to an external oscillator resistor and capacitor.
15	DIN	I	Serial information input pin from an RF or an IR receiver
16	CS	O	EEPROM chip selection signal output (connected to CS pin of EEPROM)

**FUNCTIONAL DESCRIPTION**

The M520D is a rolling decoder for remote control system application. It can interface with EEPROM(93LC46) , and store 25 sets of customer codes at maximum.M520D received waveform from its DIN pin and then decodes it. It contains 20 Address Bit, 4 data bit, 16 rolling bits followed by a Sync Bit.

**CODE WORD**

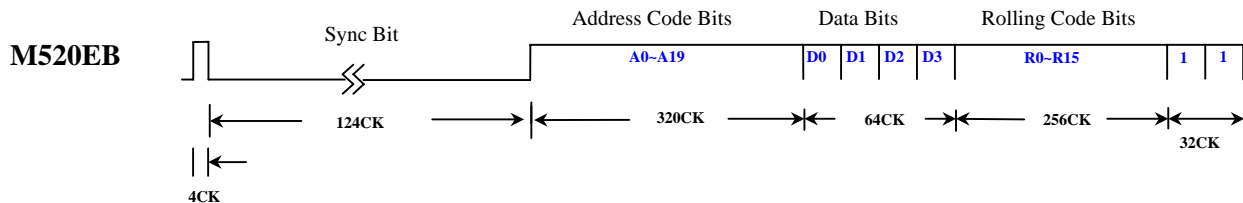
The transmission word of the M520EB that composes of 20 Address Bit, 4 Data Bit, 16 rolling bits, Sync Bit.



DEFINITE : 1CK= 16 OSC CLKS WIDTH



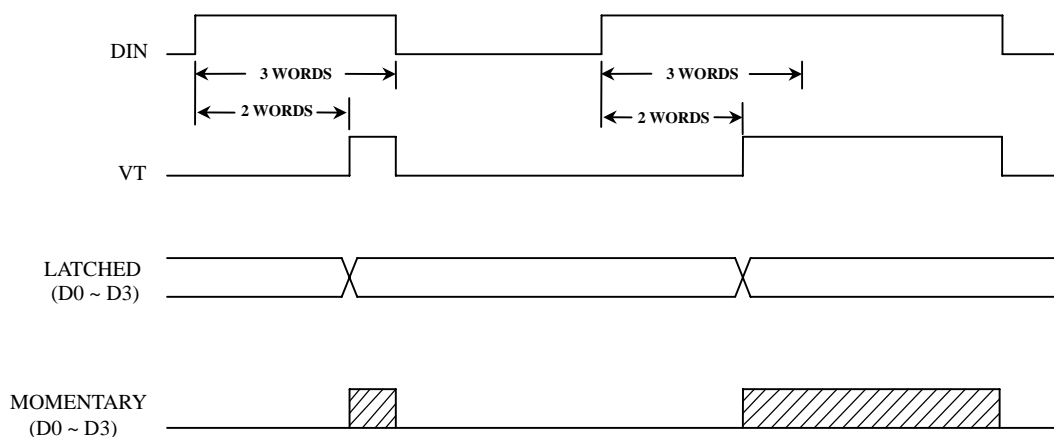
**ROLLING CODE LEARNING DECODER**



**VALID TRANSMISSION**

When M520D receives transmission code words, it first checks whether this is a valid transmission. A valid transmission must be a complete code word, and the address bits must match the address setting in the EEPROM. After two consecutive valid transmissions, M520D drives data pins (D0~D3) according to the data bits received, and raises VT to high voltage.

The timing is show in the following diagram.



**LATCH & MOMENTARY**

The D0~D3 and VT pins are all at low level when power is turned on.

Data output type selection

- (1) LATCH Type (LM=OPEN) : The data outputs follow the encoder during valid receiving, and are then latched in this state until the next valid receiving occurs.
- (2) MOMENTARY Type (LM=VSS) : The data follow the encoder only during valid receiving.

**LEARNING MODE**

The M520D can save a maximum of 25 sets of customer codes in the EEPROM , After the EEPROM has stored 25 sets of customer codes in it, the decoder still receiving more (26<sup>th</sup> sets) will overriding 1st set of customer codes in the EEPROM, If any customer code exist, the learning more ignored.



## ROLLING CODE LEARNING DECODER

### • Operation :

1. To used learning mode , must let pin3 ( $\overline{\text{RES}}$  ) active low than release to high.
2.  $\overline{\text{LRN}}$  pin is active low over 0.5 seconds, the LED pin output a high level (LED on), the M520D enters the learning mode.
3. Let M520EB power on , send any key to learning code.
4. If the DI pin has received proper formatted data no mistakes, the received customer code is stored in the EEPROM and LED flashing 2 times. After the LED off and quits learning mode and goes to the remote control mode.
5. In learning mode decoder received exist code , the decoder just output data and goes to the remote control mode.
6. In the remote control mode received unauthorized code , the LED will flash to warning code error exist.

### • EEPROM erase function :

1. When  $\overline{\text{LRN}}$  pin is active low over 0.5 seconds , the LED pin is active high (LED ON), enters the learning mode.
2. Continues pressing  $\overline{\text{LRN}}$  pin active low 4 times. Enters the clear mode after LED flashing 4 times, indicate the data in the EEPROM are all erased completely.
3. The LED off and quits clear mode, it goes to the remote control mode.

### • Learning Mode and LED indication function table

Action	Operation	LED indication
Enters Learning Mode	1. $\overline{\text{RES}}$ key to low and release 2. Learning Key > 0.5sec	LED on
Learning success		LED flashing 2 times
The data in the EEPROM are all erased.	Enters Learning mode. Pressing the $\overline{\text{LRN}}$ key 4 times, after the data in the EEPROM are all erased.	LED flashing 4 times
End Learning Mode		LED off
Code Error		LED flashing



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**RECOMMEND OSCILLATOR PARAMETERS**

M520D oscillator is constructed by external Rosc and Cosc , Suggested Rosc=18KΩ , Cosc=30pF.

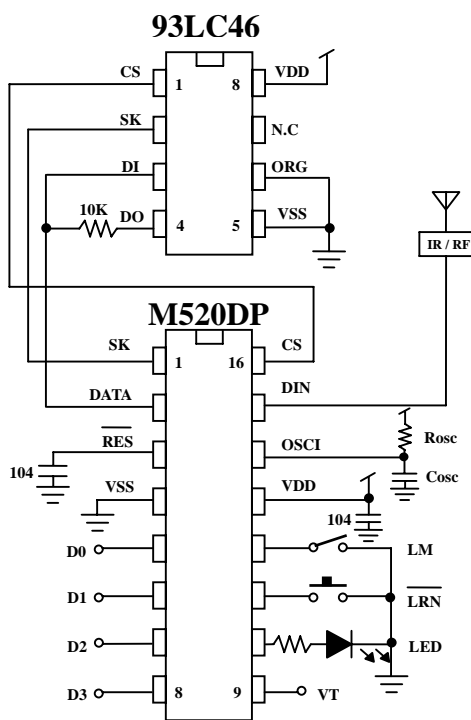
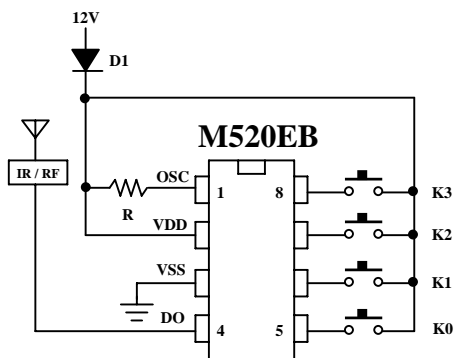
Suggested oscillator resistor of M520EB/M520D :

**M520EB** Fosc @80KHz <==> **M520D** 18KΩ/ 30PF (1MHz) ; Received range 500KHz ~ 1.0MHz ~1.5MHz

**DATA OUTPUT**

M520EB (D0-D3)	M520D (D0-D3)
0 (VSS)	0 (VSS)
1 (VDD)	1 (VDD)
POWER ON	0 (VSS)

**APPLICATION DIAGRAM**



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

( 以上電路及規格僅供參考,本公司得逕行修正 )