



## LEARNING DECODER

### GENERAL DESCRIPTION

The M320D learning decoder is CMOS LSI for remote control system application. It decodes the encoded waveform generated by M320EA/M320EB 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 32 sets of customer codes at maximum.

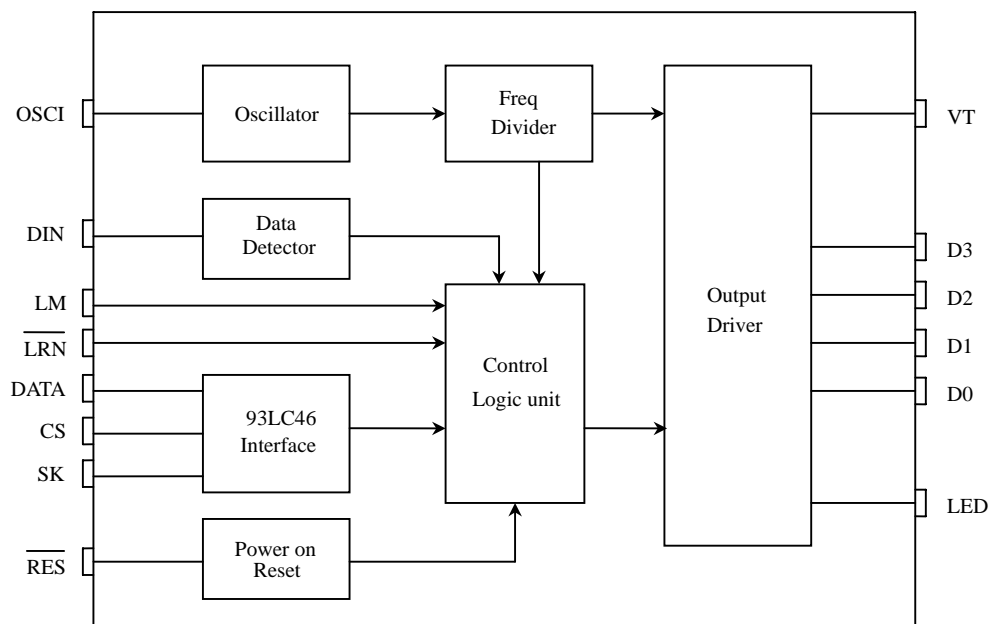
### FEATURES

- Operating voltage 2.4V~5.5V.
- Pairs with M320EA/M320EB OTP encoders.
- Maximum 1,048,576 address and data code.
- 4 Data active: D0, D1, D2, D3.
- VT goes high during valid receiving.
- Selectable latch or momentary type of data output.
- An external oscillator resistor and capacitor.
- Interface with EEPROM (93LC46) can be stored 32 sets of customer codes at maximum.
- Learning capability and the LED current for learning status indication.

### APPLICATIONS

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

### BLOCK DIAGRAM





## 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   |

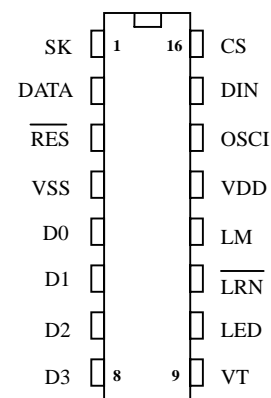
### ELECTRICAL CHARACTERISTICS

| Characteristics      | Sym.             | Min.                 | Typ.            | Max.                 | Unit | Conditions   |
|----------------------|------------------|----------------------|-----------------|----------------------|------|--|
| Operating Voltage    | V <sub>DD</sub>  | 2.4                  | 4.5             | 5.5                  | V    |  |
| Operating Current    | I <sub>OP</sub>  | —                    | 0.46            | 1                    | mA   | No load  |
| Output Drive Current | I <sub>O</sub>   | —                    | 23.5            | —                    | 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> | —                    | 1.1             | —                    | MHz  | External±10%,R <sub>osc</sub> =22KΩ,C <sub>osc</sub> =20PF |

### 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.<br>(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.<br>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,<br>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)  |

### M320DP





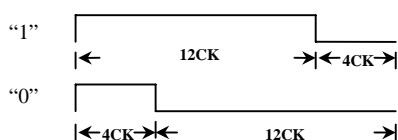
## LEARNING DECODER

### FUNCTIONAL DESCRIPTION

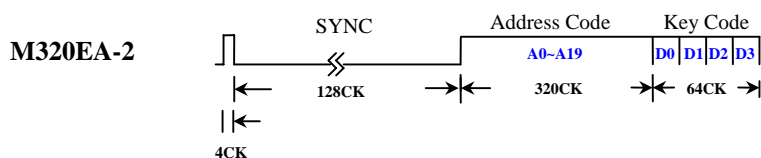
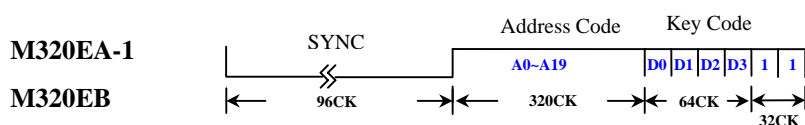
The M320D is a learning decoder for remote control system application. It can interface with EEPROM(93LC46) , and store 32 sets of customer codes at maximum.M320D received waveform from its DIN pin and then decodes it. It contains 20 Address Bit, 4 Data Bit, followed by a Sync Bit.

### CODE WORD

The transmission word of the M320EA/M320EB that composes of 20 Address Bit, 4 Data Bit, Sync Bit.



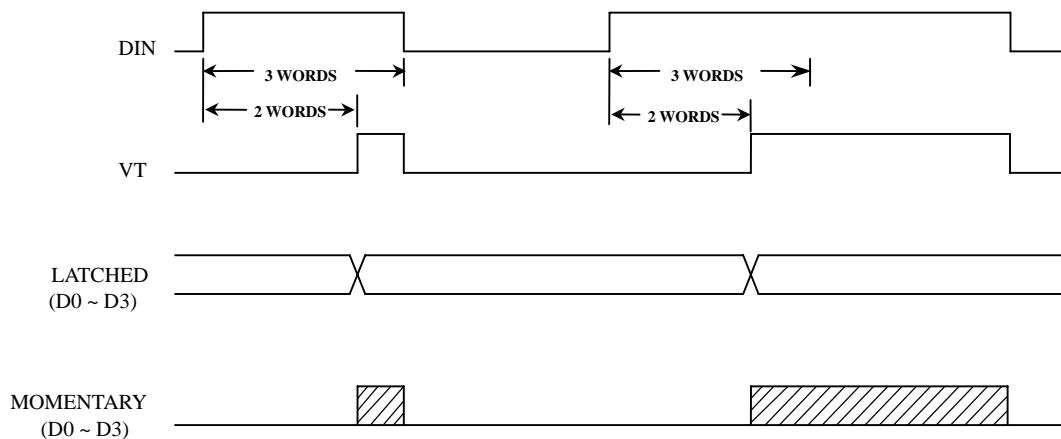
DEFINITE : 1CK= 8 OSC CLKS WIDTH



### VALID TRANSMISSION

When M320D 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, M320D 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.





## LEARNING DECODER

### 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 M320D can save a maximum of 32 sets of customer codes in the EEPROM, after the EEPROM has stored 32 sets of customer codes in it , the decoder still receiving more (33<sup>th</sup> sets) will overriding 1st set of customer codes in the EEPROM, If any customer code exist, the learning more ignored.

#### • Operation :

1.  $\overline{\text{LRN}}$  pin is active low over 0.5 seconds, the LED pin output a high level (LED on); the M320D enters the learning mode.
2. During the 8 seconds, 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.
3. If none of the customer code received within 8 seconds, After the LED off and quits learning mode, it goes to the remote control mode.

#### • 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. During the 4 seconds, if 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                   | Learning Key > 0.5sec   | LED on               |
| Learning success                       |   | LED flashing 2 times |
| The data in the EEPROM are all erased. | Enters Learning mode. During the 4 seconds 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              |



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### RECOMMEND OSCILLATOR PARAMETERS

M320D oscillator is constructed by external  $R_{osc}$  和  $C_{osc}$

| $R_{osc}$ (K $\Omega$ ) | $C_{osc}$ (PF) | M320D     |
|-------------------------|----------------|-----------|
| 15                      | 20             | 1.55 MHz  |
| 20                      | 20             | 1.24 MHz  |
| 22                      | 20             | 1.11 MHz  |
| 27                      | 20             | 924.8 KHz |
| 36                      | 20             | 708.4 KHz |
| 43                      | 20             | 595.2 KHz |

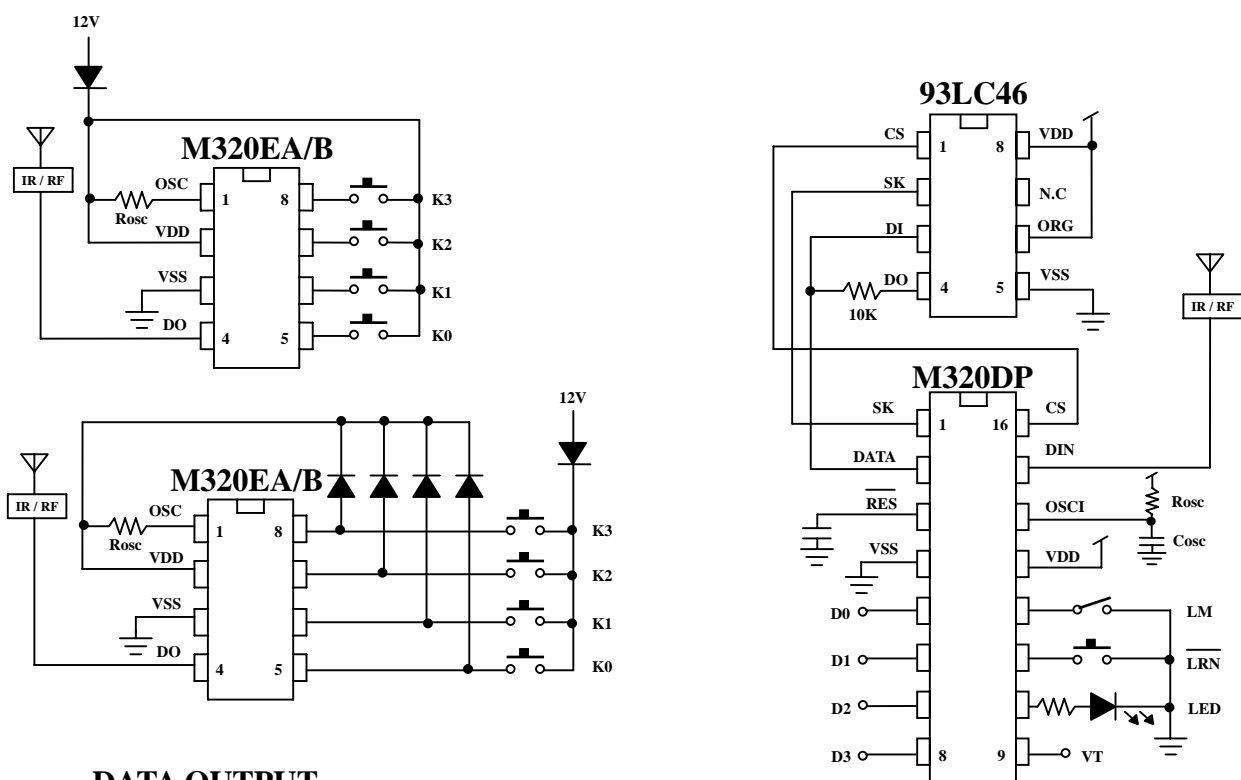
Suggested oscillator resistor of M320EA/M320D :

M320EA 390K $\Omega$  (~50KHz) < == > M320D 22K $\Omega$  / 20PF (~1.0MHz)

Suggested oscillator resistor of M320EB/M320D :

M320EB 300K $\Omega$  (~80KHz) < == > M320D 22K $\Omega$  / 20PF (~1.0MHz)

### APPLICATION DIAGRAM



### DATA OUTPUT

| M320EA/B<br>(D0~D3) | M320D<br>(D0~D3) |
|---------------------|------------------|
| 0 (VSS)             | 0 (VSS)          |
| 1 (VDD)             | 1 (VDD)          |
| POWER ON            | 0 (VSS)          |

\*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 )