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2416 Dot Matrix Display Information Board User's Guide

Product Name	:	2416 Dot Matrix Display Information Board
Product ID	:	DE-DP016
Product Version	:	Ver 1.1
Document Version	:	Ver 1.0

User's Guide

Contents

Chapter1 Overview and Main Feature

2416 Dot Matrix Display Information Boards is manufactured by Sure Electronics. It can be driven by SPI like interface. It an be easy interfaced to any Microcontrollers. It can be widely used in panel meter, big clocks and any other information display usage.

It's a memory mapping LED display board and driven by HT1632 LED display controller. The device supports 16-gradation LEDs for each outline using PWM control with software instructions. A serial interface is conveniently provided for the command mode and data mode. Only three or four signals are required for the interface between the host controller and the information board. The display can be extended by cascading the information board for wider applications.

1-1 Gallery

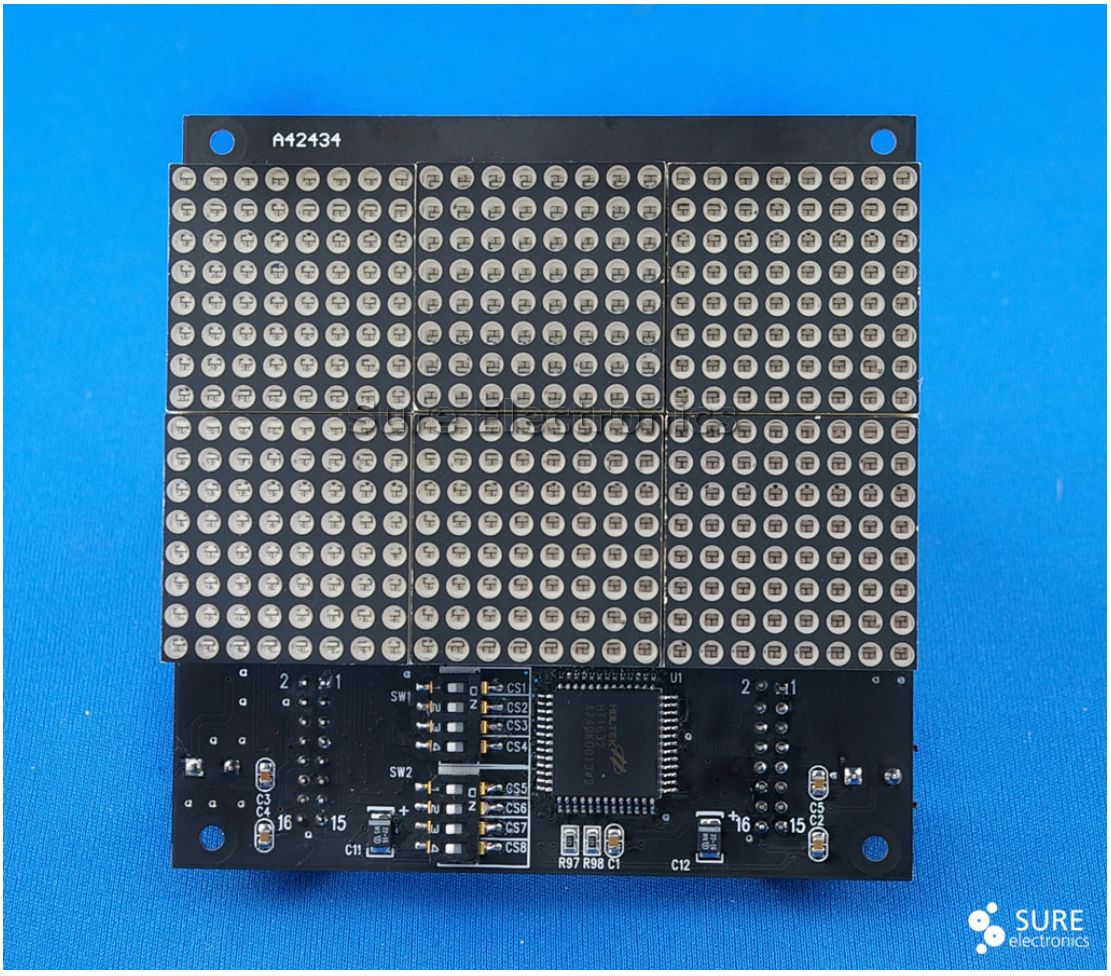


Figure 1

1-2 Main Feature

- Size: 4inch×2.5inch display area.
- 2416 dot matrix on each board.

- Operating voltage and current: 5V, 350mA (Max.), 200mA(Avg.)
- 16-level PWM brightness control.
- Each board contains 6 pieces of 8*8 LED dot matrix boards.
- Serial MCU interface----CS, RD*(optional), WR, DATA.
- Cascading function for extended applications (up to 4 boards possible).
- Power can be supplied and command data can be transmitted by IDC sockets from microcontrollers.
- Auxiliary power supply terminal blocks may be needed when connected to next LED matrix board.

Chapter 2 Hardware Detail

2-1 Schematic

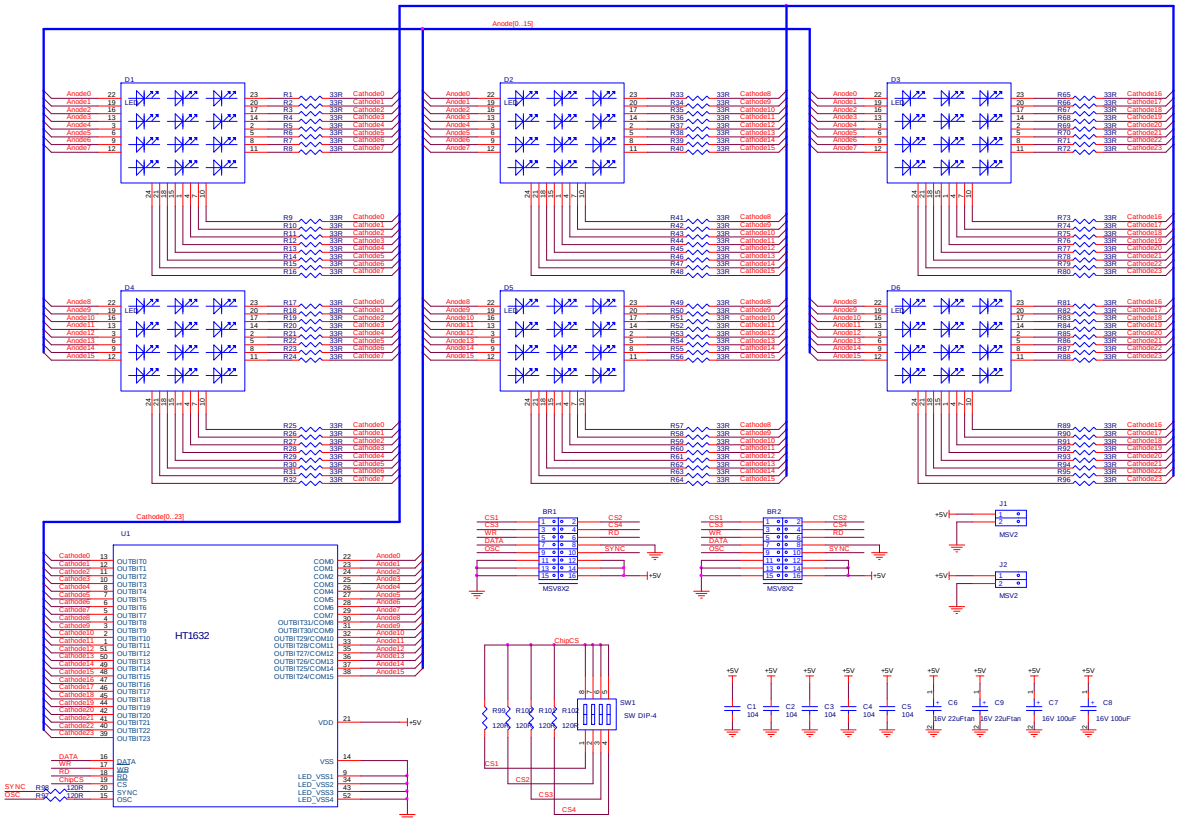
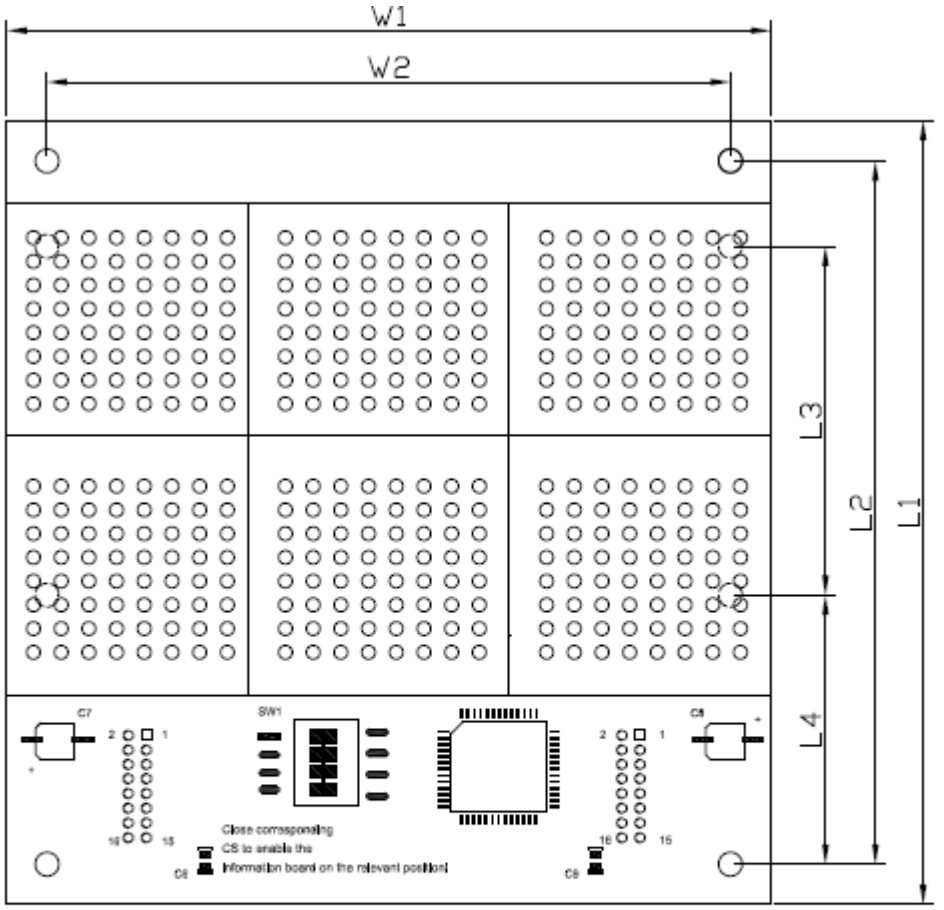


Figure 2

2-2 Physical Dimension



Symbol	W 1	W 2	L1	L 2	L3	L 4
Inch	3.80	3.42	3.90	3.60	1.75	1.30
mm	96.52	86.92	99.06	91.44	44.45	33.02

Figure 3 Physical Dimension

2-3 Electric Characteristics

D.C. Characteristics

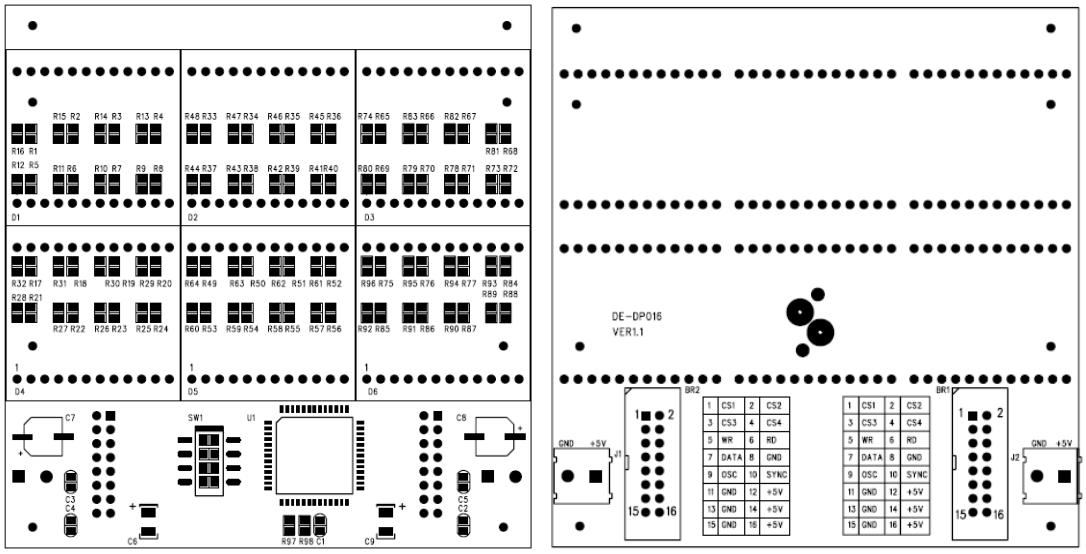
Parameter	Symbol	Absolute Maximum Rating	Units
Working Voltage	Vin	5	V
Operating Temperature	Topr	-20~+80	℃
Storage Temperature	Tstg	-25~+85	℃
LED work current	Iw	30mA on each LED, 1/8 duty	

A.C. Characteristics

Dot Scan: More than 1024Hz

Row Scan, Column Scan: More than 128Hz

2-4 Port Definition



Top Bottom

Figure 4 PCB Layout

Port Definition

Part	Pin	Name	Function
BR1, BR2	1	CS1	Chip Select. Close CS1 on Switch, SW1, to Enable the First Information Board in the serial.
	2	CS2	Chip Select. Close CS2 on Switch, SW1, to Enable the Second Information Board in the serial.
	3	CS3	Chip Select. Close CS3 on Switch, SW1, to Enable the Third Information Board in the serial.
	4	CS4	Chip Select. Close CS4 on Switch, SW1, to Enable the fourth Information Board in the serial.
	5	WR	Write Clock Input from Microcontroller (on BR1) or output to Next board (on BR2).
	6	RD	Read Clock Input from Microcontroller (on BR1) or output to Next board (on BR2). Optional.
	7	DATA	Serial Data Input from Microcontroller (on BR1) or output to Next board (on BR2).

	8,11,13,15	GND	Ground reference.
	9	OSC	If the System Clock is Sourced from an External Clock Source, the External Clock Source should be Connected to this Pad. If the On-Chip RC Oscillator is Selected, this Pad can be connected to a High or Low level. If the Cascade Mode is Selected, this Pad is the Driver of Clock Signal.
	10	SYNC	Cascade Synchronization Input and Output.
	12,14,16	+5v	Positive Power Supply, +5V only.
J1	---	---	Auxiliary Power Supply, +5V only.
J2	---	---	Auxiliary Power Supply, +5V only.

Chapter 3 Application Notes

3-1 Display Memory

The static display memory, RAM, is organized into 96×4 bits and stores the displayed data. The contents of the RAM are directly mapped to the contents of LED driver. Data in the RAM can be accessed by the READ, WRITE, and READ-MODIFY-WRITE commands. The following table shows the mapping from the RAM to the LED pattern:

	Com15	Com14	Com13	Com12	Addr.	…..	Com3	Com2	Com1	Com0	Addr.
Out0					03H						00H
Out1					07H						04H
Out2					0BH						08H
Out3					0FH						0CH
Out4					13H						10H
Out5					17H						14H
Out6					1BH						18H
Out7					1FH						1CH
Out8					23H						20H
Out9					27H						24H
Out10					2BH						28H
Out11					2FH	…..					2CH
Out12					33H						30H
Out13					37H						34H
Out14					3BH						38H
Out15					3FH						3CH
Out16					43H						40H
Out17					47H						44H
Out18					4BH						48H
Out19					4FH						4CH
Out20					53H						50H
Out21					57H						54H
Out22					5BH	…..					58H
Out23					5FH						5CH
	D3	D2	D1	D0	Data		D3	D2	D1	D0	Data

The corresponding relation of dot on LED dot matrix board between LED RAM is as follow:

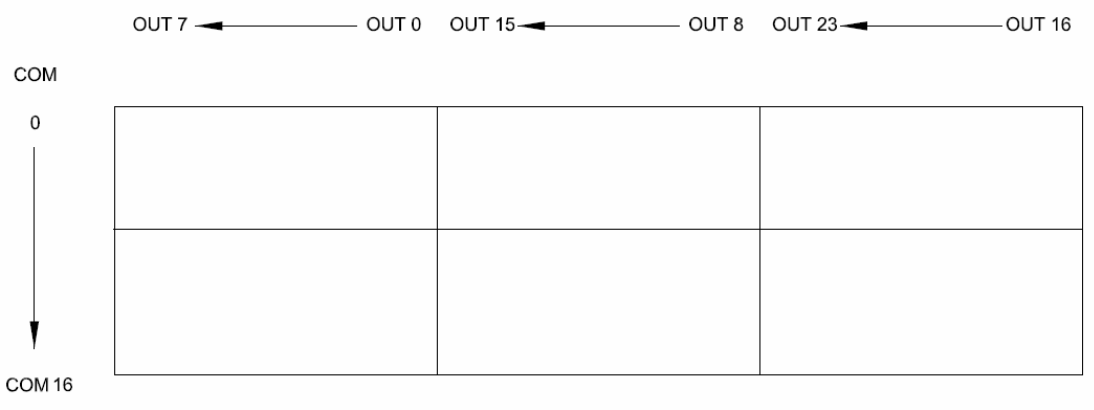


Figure 5

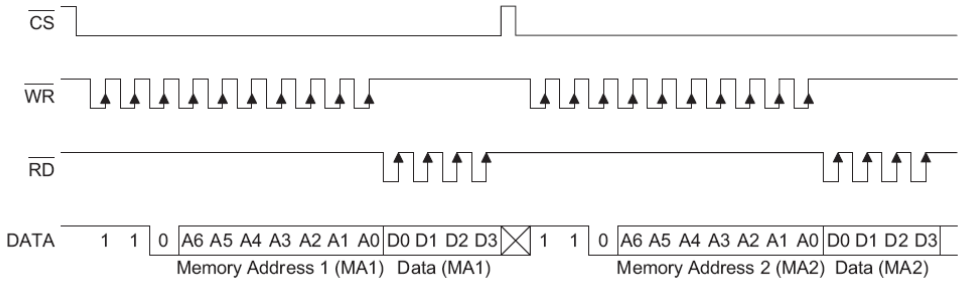
3-2 Command Format

The command mode consists of a system configuration command, a system frequency selection command, a LED configuration command, and an operating command. The data mode, on the other hand, includes READ, WRITE, and READ-MODIFY-WRITE operations.

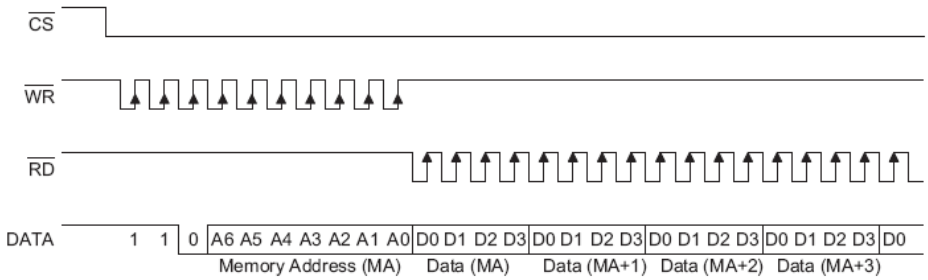
The mode of command should be issued before the data or command is transferred. If successive commands have been issued, the command mode ID, namely 1 0 0, can be omitted. While the system is operating in the non-successive command or the non-successive address data mode, the CS pin should be set to “1” and the previous operation mode will be reset also. Once the CS pin returns to “0”, a new operation mode ID should be issued first.

Timing Diagrams

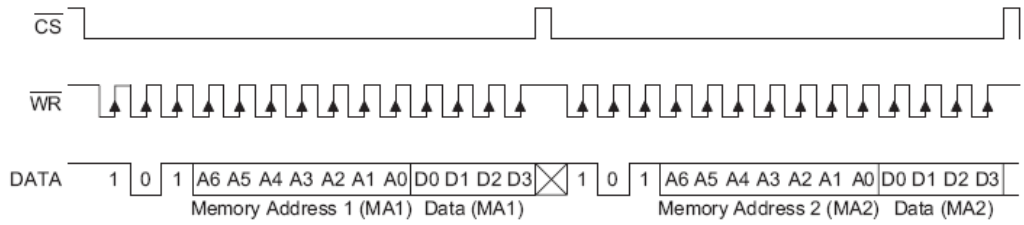
READ Mode---Command Code=1 1 0



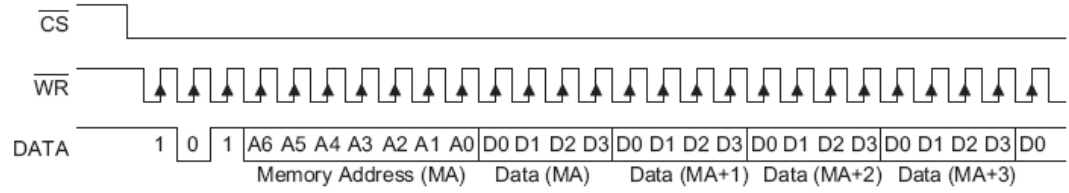
READ Mode --- Successive Address Reading



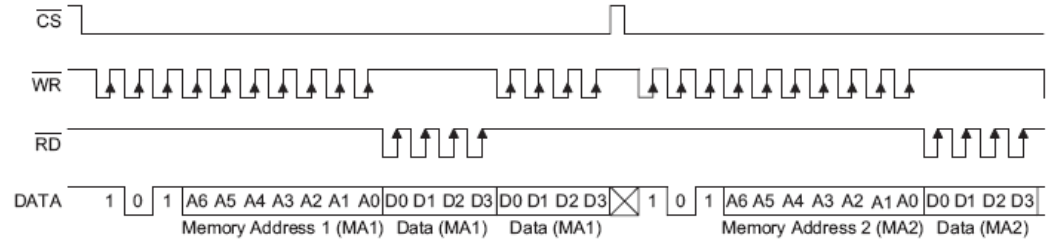
WRITE Mode --- Command Code= 1 0 1



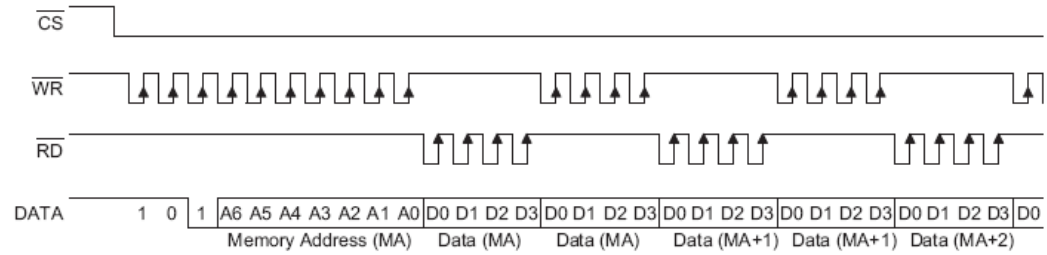
WRITE Mode --- Successive Address Reading



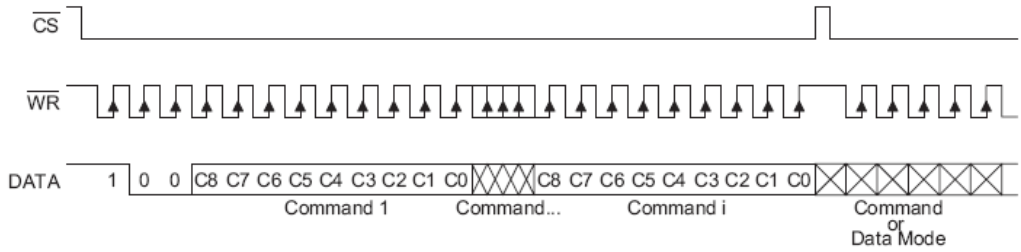
READ-MODIFY-WRITE Mode --- Command Code=1 0 1



READ-MODIFY-WRITE Mode --- Successive Address Accessing



Command Mode --- Command Code= 1 0 0



3-3 Command Summary

Name	ID	Command Code	D/C	Function
READ	110	A6A5A4A3A2A1A0D0D1D2D3	D	Read data from the RAM
WRITE	101	A6A5A4A3A2A1A0D0D1D2D3	D	Write data to the RAM
READ-MODIFY-WRITE	101	A6A5A4A3A2A1A0D0D1D2D3	D	Read and Write data to RAM
SYS DIS	100	0000-0000-X	C	Turn off both system oscillator and LED duty cycle generator
SYS EN	100	0000-0001-X	C	Turn off system oscillator
LED OFF	100	0000-0010-X	C	Turn off LED duty cycle generator
LED ON	100	0000-0011-X	C	Turn on LED duty cycle generator
BLINK OFF	100	0000-1000-X	C	Turn off blinking function
BLINK ON	100	0000-1001-X	C	Turn on blinking function
SLAVE MODE	100	0001-00XX-X	C	Set slave mode and clock source from external clock
MASTER MODE	100	0001-01XX-X	C	Set master mode and clock source on-chip RC oscillator
RC	100	0001-10XX-X	C	System clock
EXT CLK	100	0001-11XX-X	C	System clock source, external clock source
COMMONS OPTION	100	0010-11XX-X	C	P-MOS open drain output and 16 common option
PWM Duty	100	101X-0000-X	C	PWM 1/16 duty
		101X-0001-X	C	PWM 2/16 duty
		101X-0010-X	C	PWM 3/16 duty
		101X-0011-X	C	PWM 4/16 duty

		101X-0100-X	C	PWM 5/16 duty
		101X-0101-X	C	PWM 6/16 duty
		101X-0110-X	C	PWM 7/16 duty
		101X-0111-X	C	PWM 8/16 duty
		101X-1000-X	C	PWM 9/16 duty
		101X-1001-X	C	PWM 10/16 duty
		101X-1010-X	C	PWM 11/16 duty
		101X-1011-X	C	PWM 12/16 duty
		101X-1100-X	C	PWM 13/16 duty
		101X-1101-X	C	PWM 14/16 duty
		101X-1110-X	C	PWM 15/16 duty
		101X-1111-X	C	PWM 16/16 duty

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