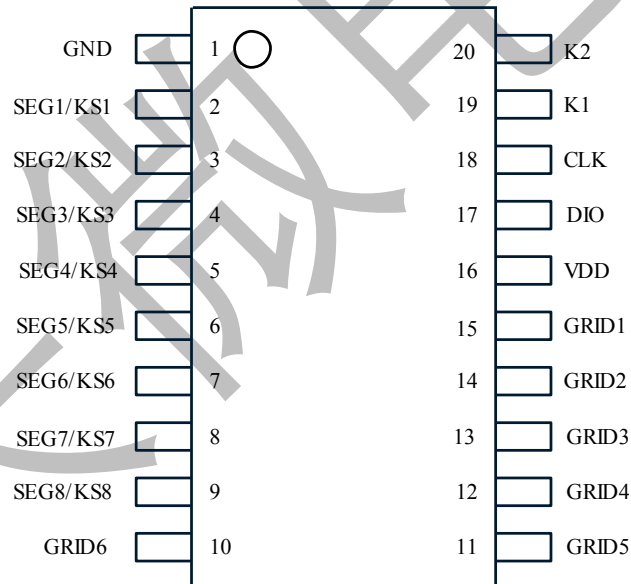


TM1637 is a kind of LED (light-emitting diode display) drive control special circuit with keyboard scan interface and it's internally integrated with MCU digital interface, data latch, LED high pressure drive and keyboard scan. This product is in DIP20/SOP20 package type with excellent performance and high quality, which is mainly applicable to the display drive of induction cooker, micro-wave oven and small household electrical appliance.

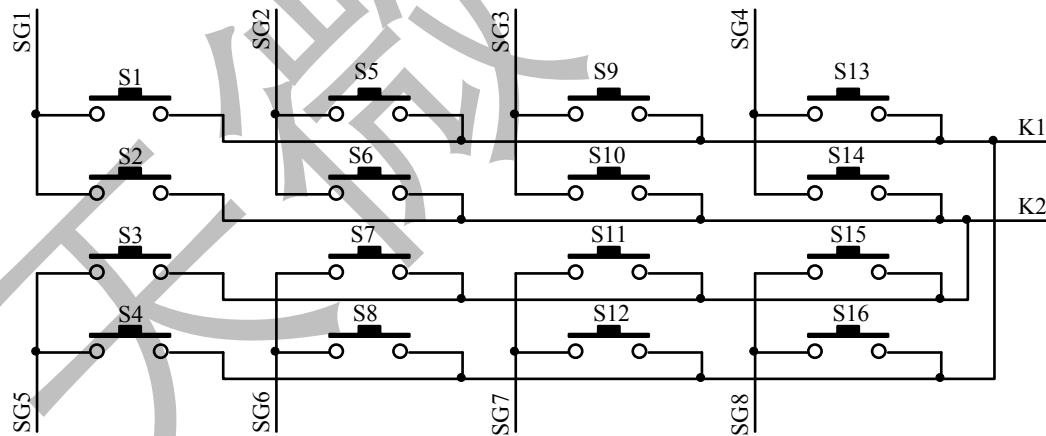
- Applied power CMOS technique
- The display mode (8 segments*6 bit) supports output by common anode LED.
- Keyboard scan (8×2bit), with enhanced identification circuit with anti-interference keys
- Luminance adjustment circuit (adjustable 8 duty ratio)
- Two-wire serial interface (CLK, DIO)
- Oscillating type: Built-in RC oscillator
- Built-in power-on reset circuit
- Built-in automatic blanking circuit
- Package type: DIP20/SOP20



DIO	Data input/output	17	It is used for serial data input and output. The input data has a low level fluctuation while high level transfer at SCLK. Once one bit is transferred, one ACK is generated at falling edge of the 8 th clock inside the chip.
CLK	Clock input	18	It is used for data input and output at rising edge.
K1~K2	Data input by keyboard scan	19-20	Inputting the pin data here and it will be latched when the display cycle is over.
SG1~SG8	Output (segment)	2-9	Segment Output (also keyboard scan) and N-channel open drain output
GRID6~GRID1	Output (bit)	10-15	Bit output and P-channel open drain output
VDD	Logic Supply	16	Anode power connection
GND	logic ground	1	Grounding connection



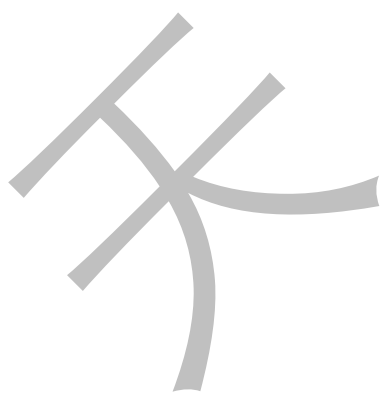
Electrostatic discharge led by much static at dry weather or environment could damage the integrated circuit. TITAN MICRO ELECTRONICS suggests you to take every measure to protect integrated circuit. ESD damage or decreased performance by inappropriate operation or welding could lead to chip failure.

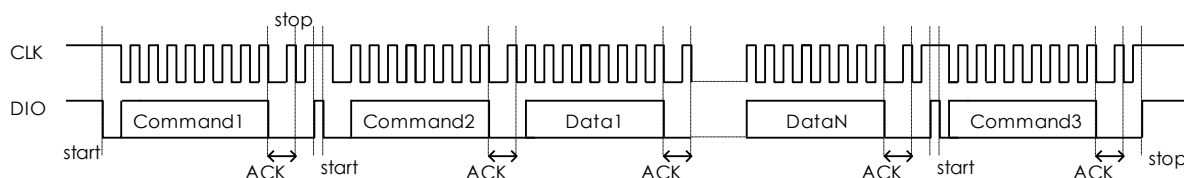


When a key is pressed, the key scan data is as follows: (Where low level is forward and high level is backward, 1110_1111 stands for 0xF7).

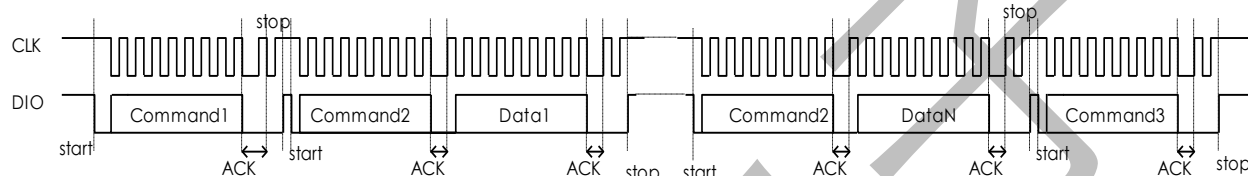
	1110_1111	0110_1111	1010_1111	0010_1111	1100_1111	0100_1111	1000_1111	0000_1111
	1111_0111	0111_0111	1011_0111	0011_0111	1101_0111	0101_0111	1001_0111	0001_0111

Note: Where there is no key pressed down, the key read data should be 1111_1111 with forward low level and backward high level. Since strong interference exists in the use of kitchen appliances, such as induction cooker, negative edge trigger mode was applied in TM1637 to avoid mistake trigger, which is also the called “key jumping”. TM 1637 doesn’t support combined key pressing.





Command1: Set data
Command2: Set address
Data1~N: Transfer display data
Command3: Control display



Command1: Set data
Command2: Set data
Data1~N: Transfer display data
Command3: Control display

Command is used to set the display mode and the LED driver status.

The first byte input from DIO at CLK falling edge acts as a command. The highest B7 and B6 bytes after decoding are used to distinguish different commands.

0	1	Data command setting
1	0	Display and control command setting
1	1	Address command setting

When STOP command is sent during command or data transfer, serial communication is initialized and command or data transferring becomes invalid (Command or data transferred before remain effective.).

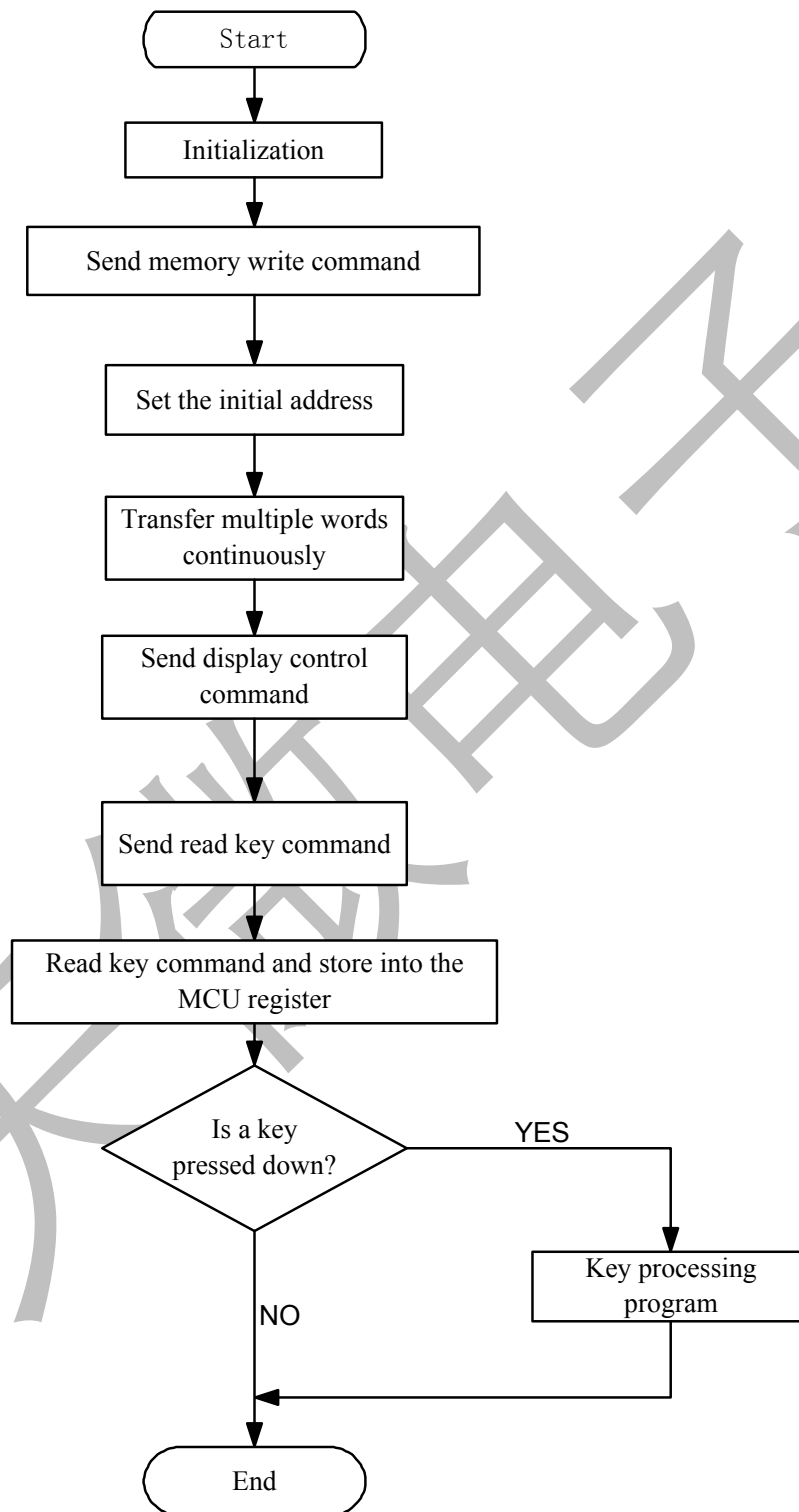
This command is to set data write and data read. 01 and 11 are not permitted to set for B1 and B0 bits.

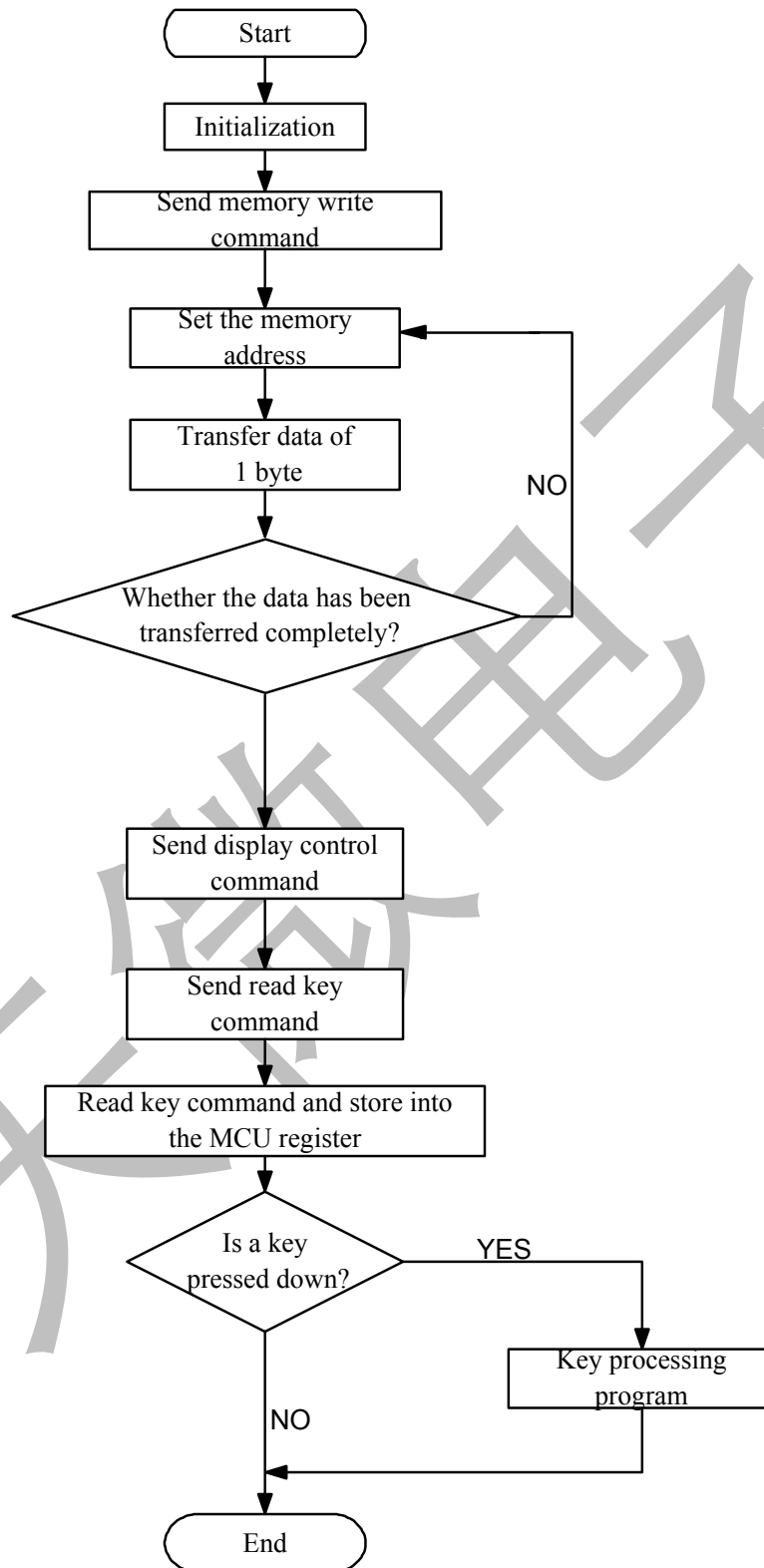
0	1	Zero should be inserted for irrelevant items.			0	0	Data write and read mode setting	Write data to display register
0	1				1	0		Read key scan data
0	1			0			Address adding mode setting	Automatic address adding
0	1			1				Fix address
0	1		0				Test mode setting (for internal)	Normal mode
0	1		1					Test mode

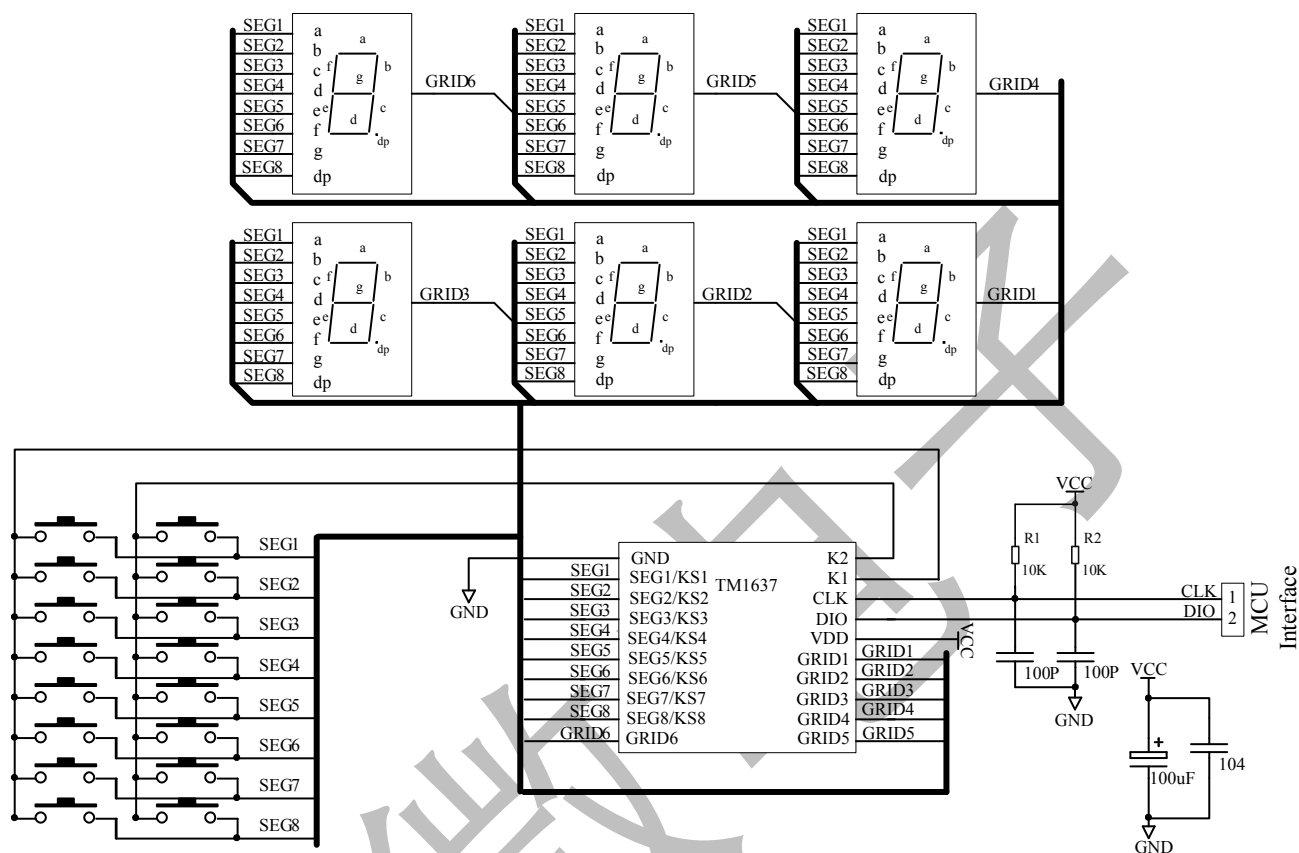
1	1	Zero should be inserted for irrelevant items.	0	0	0	0	C0H	
1	1		0	0	0	1	C1H	
1	1		0	0	1	0	C2H	
1	1		0	0	1	1	C3H	
1	1		0	1	0	0	C4H	
1	1		0	1	0	1	C5H	

The command is used to set the display register address. If the address is set as C6H or a higher one, the data will be ignored until effective address is set. Once electrified, the default address is C0H.

MSB				LSB					
1	0	Zero should be inserted for irrelevant items.		0	0	0	Setting of extinction number	1/16 Pulse width is set as 1/16.	
1	0			0	0	1		2/16 Pulse width is set as 2/16	
1	0			0	1	0		4/16 Pulse width is set as 4/16	
1	0			0	1	1		10/16 Pulse width is set as 10/16	
1	0			1	0	0		11/16 Pulse width is set as 11/16	
1	0			1	0	1		12/16 Pulse width is set as 12/16	
1	0			1	1	0		13/16 Pulse width is set as 13/16	
1	0			1	1	1		14/16 Pulse width is set as 14/16	
1	0		0				Display switch setting	Display OFF	
1	0		1					Display ON	







1. filtering capacitor between VDD and GND should be arranged on PCB plate as close to TM1637 chip as possible to strengthen filtering effect.
2. 100pF capacitor connected to the DIO, CLK communication port pull-up and pull-down can reduce interference to radio communications port.
3. Since blue-ray nixie tube break over step-down voltage is 3V, TM1637 power supply should be 5V.

℃

Logic power supply voltage	VDD	-0.5 ~ +7.0	V
Logic input voltage	VI1	-0.5 ~ VDD + 0.5	V
LED and SEG drive sink current	IO1	50	mA
LED and GRID drive source current	IO2	200	mA
Power loss	PD	400	mW
Work temperature	Topt	-40 ~ +85	℃
Storage temperature	Tstg	-65 ~ +150	℃

~ ℃

Logic power supply voltage	VDD	5	V	-		
High-level input voltage	VIH	0.7 VDD	-	VDD	V	-
Low-level input voltage	VIL	0	-	0.3 VDD	V	-

℃

GRID drive source current	Ioh1	80	120	180	mA	GRID1~GRID6, Vo = vdd-2V
	Ioh2	80	140	200	mA	GRID1~GRID6, Vo = vdd-3V
SEG drive sink current	IOL1	20	30	50	mA	SEG1~SEG8 Vo=0.3V
DOUT pin output low current	Idout	4	-	-	mA	Vo = 0.4V, dout
High-level output current tolerance	Itolsg	-	-	5	%	Vo = VDD - 3V, GRID1~GRID6
Output pull down resistor	RL		10		KΩ	K1~K2

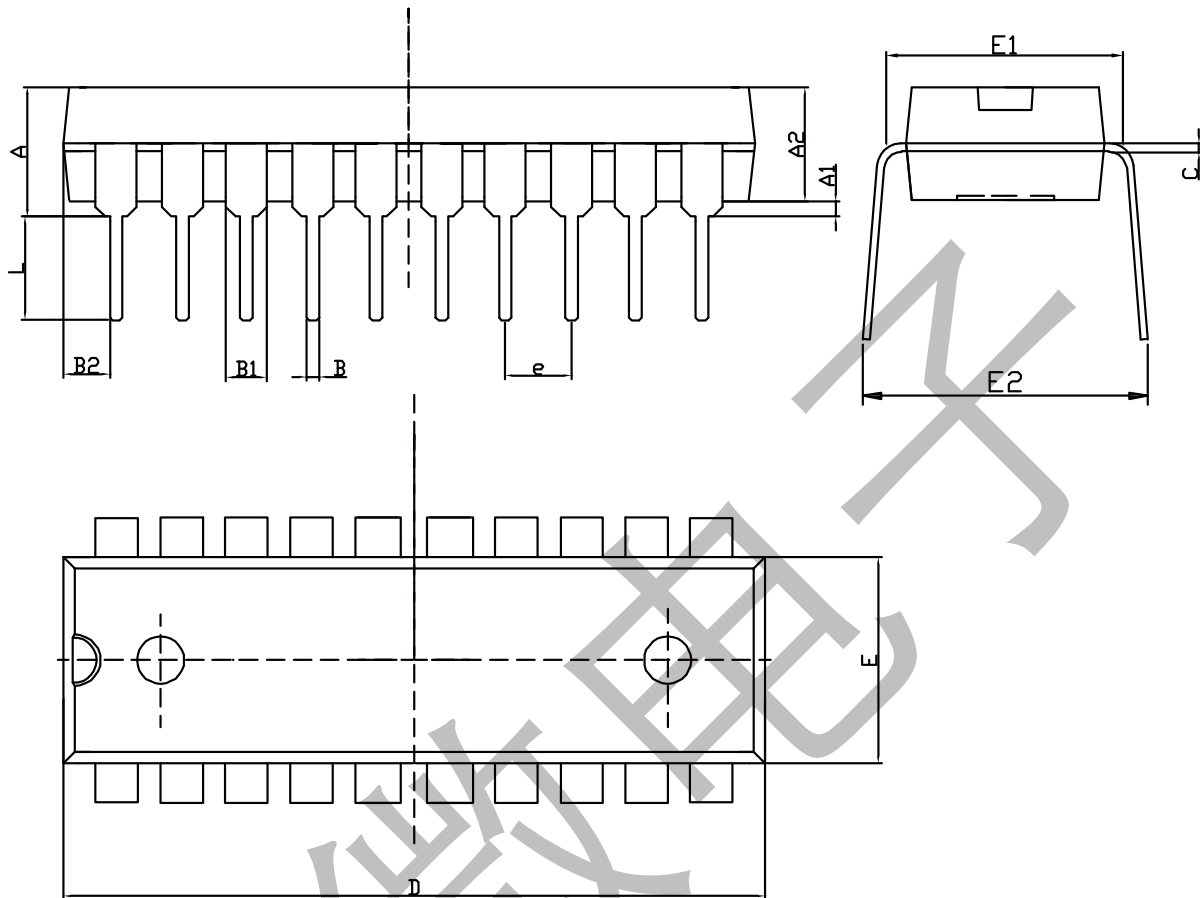
Input current	II	-	-	±1	μA	VI = VDD / VSS
High-level input voltage	VIH	0.7 VDD	-		V	CLK, DIN
Low-level input voltage	VIL	-	-	0.3 VDD	V	CLK, DIN
Lagging voltage	VH	-	0.35	-	V	CLK, DIN
dynamic current loss	IDDdyn	-	-	5	mA	Non-loaded, display OFF

℃

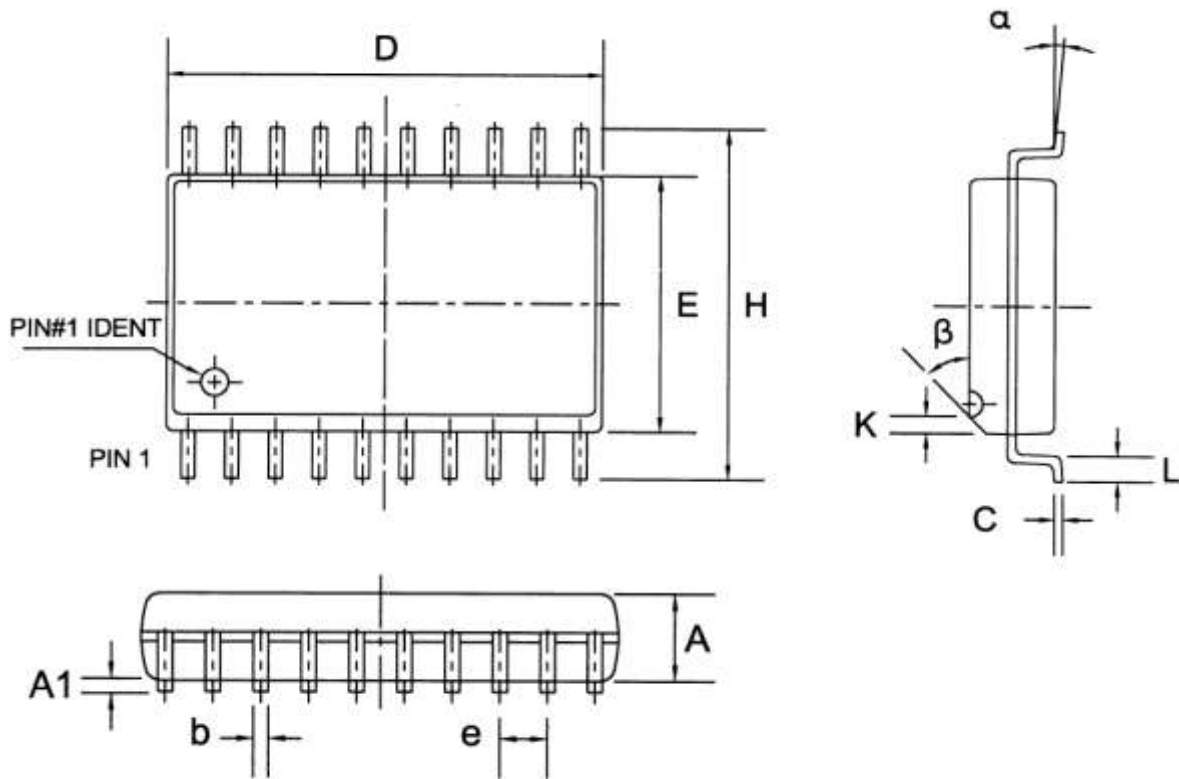
oscillation frequency	fosc	-	450	-	KHz	
Transmission delay time	tPLZ	-	-	300	ns	CLK → DIO
	tPZL	-	-	100	ns	CL = 15pF, RL = 10K Ω
Rise time	TTZH 1	-	-	2	μs	CL = 300p F GRID1 ~ GRID6 SEG1 ~ SEG8
	TTZH 2	-	-	0.5	μs	
Fall time	TTHZ	-	-	120	μs	CL = 300pF, Segn, Gridn
Maximum clock frequency	Fmax	-	-	500	KHz	占空比50% 50% duty ratio
Input capacitance	CI	-	-	15	pF	-

℃

Clock pulse width	PWCLK	400	-	-	ns	-
Data setup time	tSETUP	100	-	-	ns	-
Data hold time	tHOLD	100	-	-	ns	-
Waiting time	tWAIT	1	-	-	μs	CLK↑→CLK↓



A	3.71	4.00	4.31
A1	0.50	0.60	0.80
A2	3.20	3.40	3.60
B	0.33	0.45	0.53
B1	1.525(TYP)		
C	0.20	0.28	0.36
D	25.70	26.00	26.54
E	6.20	6.40	6.75
E1	7.32	7.78	8.25
e	2.54(TYP)		
L	3.00	3.30	3.60
E2	8.20	8.70	9.10
B2	0.87	1.02	1.17



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.15	2.35	2.55	0.085	0.093	0.100
A1	0.05	0.15	0.25	0.002	0.006	0.010
b	—	0.40	—	—	0.016	—
C	—	0.25	—	—	0.010	—
D	12.40	12.70	13.00	0.488	0.500	0.512
E	7.40	7.65	7.90	0.291	0.301	0.311
e	—	1.27	—	—	0.050	—
H	10.15	10.45	10.75	0.400	0.411	0.423
K	—	0.50	—	—	0.020	—
L	0.60	0.80	1.00	0.024	0.031	0.039
α	0°	—	8°	0°	—	8°
β	—	45°	—	—	45°	—

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