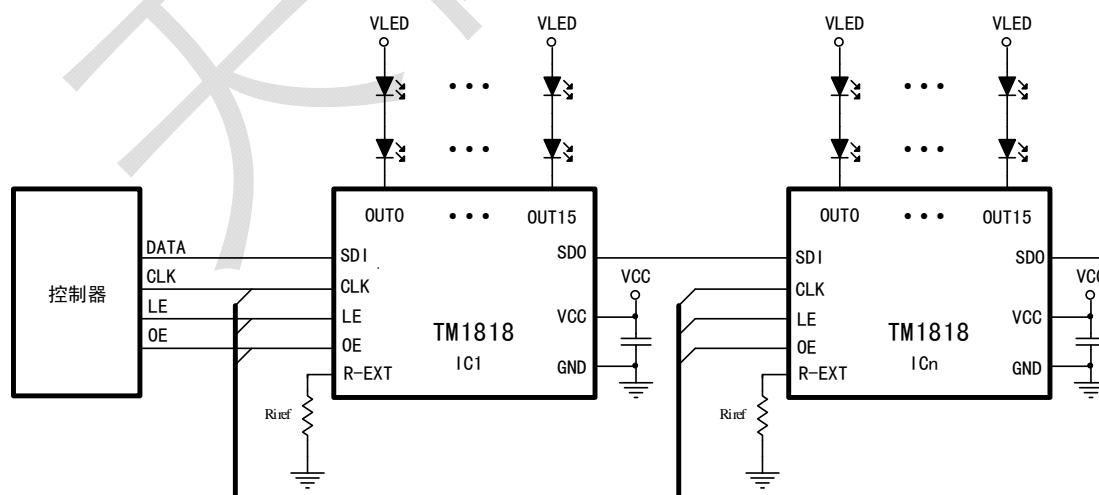## Product description

　　The TM1818 serial-interfaced sinks 16 LED clusters with constant current to keep the uniform intensity of LED displays. In applications, an external resistor is used to set the full-scale constant output current from 5mA up to 60mA.THE TM1818 guarantees each output can endure maximum 17V DC voltage stress. The built-in shift registers and data latches making the TM1818 effective solution in driving LED display. The output enable function gates all 16 outputs on and off. SINCE the serial data input rate can be reaches up to 25MHz, the TM1818 will satisfy system which needs high volume date transmission to control LED display.
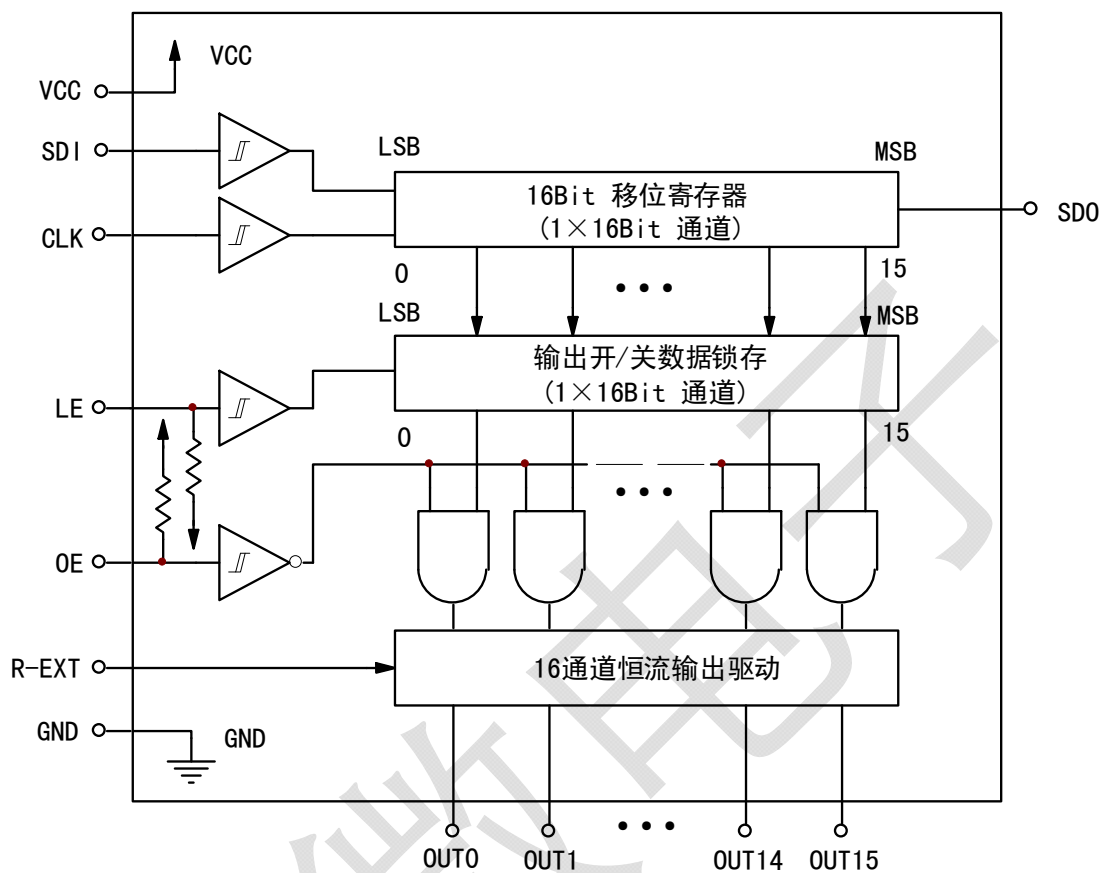
Feature

- 16 constant-current outputs rate at 17V
- Current output size is not due to changes in the output load voltage change.
- Constant out put current range :5mA-60mA
- Extremely accurate current output value
  $\leqslant \pm 1.5\%$ current matching between outputs.
  $\pm 2.0\%$ current matching between ICs.
- All output current are programmed together using a single external resistor.
- High serial date transfer rate: 25MHz.
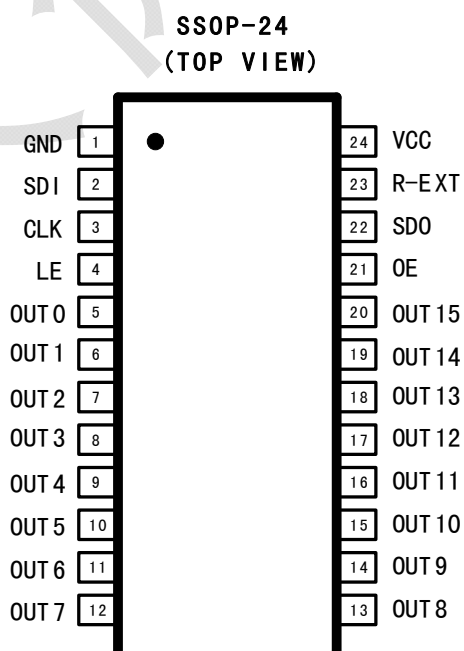- Operating supply voltage range of 3.5V-4.5V
- package：SOP24 SSOP24　QSOP24

Application: LED display, lighting variable message Signs.

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Ver1.1

Structure

16Bit 移位寄存器
（1×16Bit 通道）

输出开/关数据锁存
（1×16Bit 通道）

16通道恒流输出驱动

Pin Configurations

SSOP-24
(TOP VIEW)

GND	1	24	VCC
SDI	2	23	R-EXT
CLK	3	22	SDO
LE	4	21	OE
OUT0	5	20	OUT15
OUT1	6	19	OUT14
OUT2	7	18	OUT13
OUT3	8	17	OUT12
OUT4	9	16	OUT11
OUT5	10	15	OUT10
OUT6	11	14	OUT9
OUT7	12	13	OUT8

Ver1.1

Output and input equivalent ciruit :
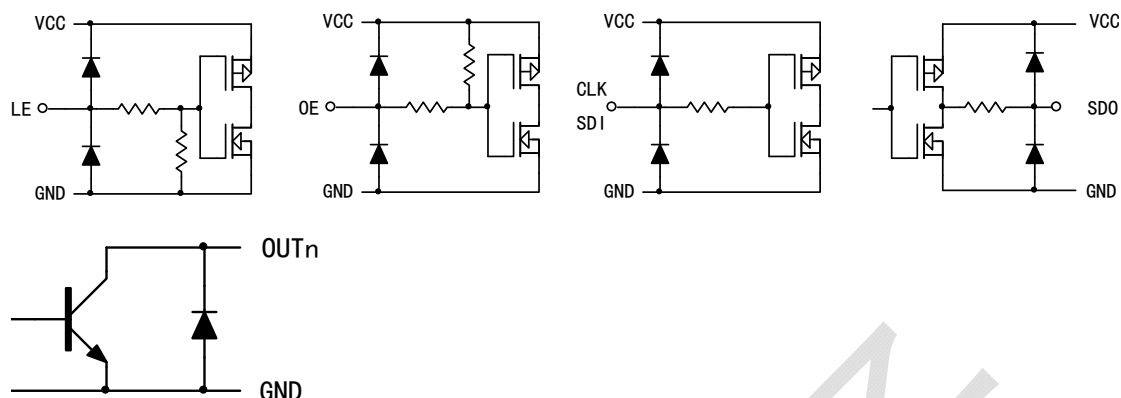
Pin functions

port		I/O	Functional Description
name	pin		
SDI	2	I	Serial data input, Schmidt buffer input
CLK	3	I	Serial data shift clock input of the Schmitt buffer input clock rise shift data
LE	4	I	Data latch control side, Schmidt buffer input When LE is high, the serial data will be passed to the input latch; When LE is low, data is latched
OE	21	I	Output enable control side, when OE is low, will start OUT0 ~ OUT15 Output; When OE is high, OUT0 ~ OUT15 output will be turned off, the pin internal pull-up resistor to VCC
R-EXT	23	I/O	The constant current value is set to end; set OUT0 ~ OUT15 output current, an external resistor to GND
SDO	22	O	The serial data output at the rising edge of CLK output can be connected to the SDI port of the next chip.
OUT0	5	O	The constant current source output. Each output can be shorted to improve the constant current.
OUT1	6	O	Constant current source output
OUT2	7	O	Constant current source output
OUT3	8	O	Constant current source output
OUT4	9	O	Constant current source output
OUT5	10	O	Constant current source output
OUT6	11	O	Constant current source output
OUT7	12	O	Constant current source output
OUT8	13	O	Constant current source output
OUT9	14	O	Constant current source output
OUT10	15	O	Constant current source output
OUT11	16	O	Constant current source output
OUT12	17	O	Constant current source output

OUT13	18	O	Constant current source output
OUT14	19	O	Constant current source output
OUT15	20	O	Constant current source output
VCC	24	-	Chip power
GND	1	-	Control logic and current-loop ground

In the dry season or dry environments prone to static electricity, electrostatic discharge may damage the IC days Microelectronics recommend preventive treatment measures to take all appropriate integrated circuits, improper operation and welding may cause ESD damage or performance, the chip does not work.

Timing diagram
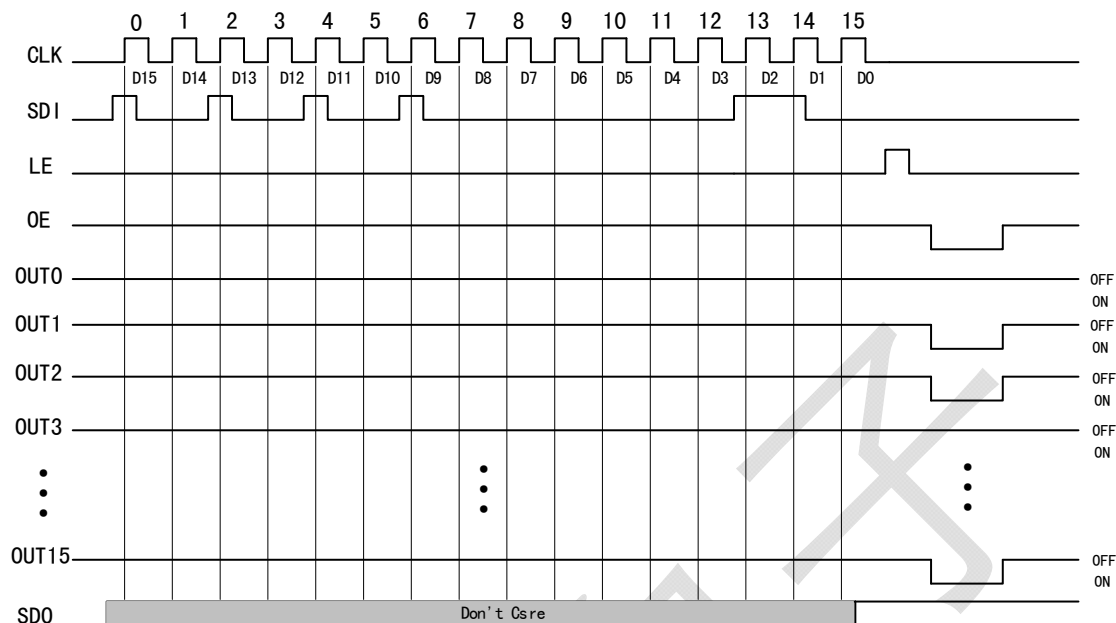
Absolute Maximum Ratings range (1) (2)

Parameter			range	unit
VCC	电源电压		-0.4～6.0	V
VIN	输入端电压范围	SDI,CLK,LE,OE	-0.4～VCC+0.4V	V
IOUT	输出端电流(D　C)	OUT0~OUT15	65	mA
VOUT	输出端电压范围	OUT0~OUT15,SDO	-0.4～+6.0	V
FCLK	时钟频率	CLK,SDI,LE,OE	25	MHZ
Topr	Operating　Temperature		-40～+85	℃
Tstg	Storage Temperature		-55～+150	℃
ESD	人体模式（HBM）		4000	V
	机器模式（MM）		300	V

（1）These levels in the above table, the chip under conditions of prolonged use may cause permanent damage to the device, which reduces the reliability of the device. Days Microelectronics is not recommended in any other condition, the chip more than the limit parameter.

（2）All voltage values are relative to the network to test

推荐工作条件范围

（在-40℃~+85℃下）除非另有说明

参数		测试条件	TM1818			单位
			最小值	典型值	最大值	
直流参数规格表：VCC=3V~5.5V						
VCC	电源电压		3	5.0	5.5	V
VO	输出端耐压范围	OUT0~OUT15			5.5	V
VIH	高电平输入电压		$0.7 \times VCC$		VCC	V
VIL	低电平输入电压		GND		$0.3 \times VCC$	V
IOH	高电平输出电流	VCC=5V,SDO=4.5V			-8	mA
IOL	低电平输出电流	VCC=5V,SDO=0.5V			16	mA
IOLC	恒定输出灌电流	OUT0~OUT15 $3V \leqslant VCC \leqslant 3.6V$	2		45	mA
		OUT0~OUT15 $3.6V \leqslant VCC \leqslant 5.5V$	2		60	mA
TA	工作温度范围		-40		+85	℃
TJ	工作结温范围		-40		+125	℃
交流参数规格表：VCC=3V~5.5V						
FCLK	数据移位时钟频率	CLK			25	MHZ
TWH0	脉冲持续时间	CLK	15			ns
TWH0		CLK	15			ns
TWH1		LE	25			ns
TWH2		OE	60			ns
TWL2		OE	30			ns
TSU0	时间建立	SDI – CLK↑	5			ns
TSU1		LE↓ – CLK↑	12			ns
TH0	时间保持	SDI – CLK↑	5			ns
TH1		LE↓ – CLK↑	12			ns

Electronic characteristics

（在 VCC=3V~5.5V 和-40℃~+85℃下，典型值 VCC=5V 和 TA=+25℃）除非另有说明

参数		测试条件	TM1818			单位
			最小值	典型值	最大值	
VOH	高电平输出电压	IOH=-6mA：SDO	VCC-0.4		VCC	V
VOL	低电平输出电压	IOL=10mA：SDO			0.4	V
IIN	输入电流	VIN=接 VCC 或者 GND SDI,CLK,LE,OE	-1		1	uA
ICC0	电源电流（VCC）	SDI/CLK/LE=0,OE=1 ,Riref=开路		11	12	mA
ICC1		SDI/CLK/LE=0,OE=1 ,Riref=1.2K		12	13	mA
ICC2		OUT0~OUT15 开,SDI,CLK,LE,OE=0, Riref=470Ω		15	16	mA
ICC3		OUT0~OUT15 开,SDI,CLK,LE,OE=0, Riref=1.2K		13	14	mA
IOLC	恒定输出电流	OUT0~OUT15 开,VOUTn=1V=VOUTfix=1V,Riref=470Ω,VCC=5V, TA=25℃	36.3	37	37.7	mA
IOLKG	输出漏电流	OUTn=OFF,VOUTn=VOUTfix=5.5V,OE=1,Riref=1.5K,			0.1	uA
ΔIOLC0	恒流误差（通道对通道）	OUT0~OUT15 开 ,VOUTn=1V=VOUTfix=1V,Riref=470Ω		±1	±1.5	%
ΔIOLC1	恒流误差（芯片对芯片）	OUT0~OUT15 开,VOUTn=1V=VOUTfix=1V,Riref=1.5K,VCC=3V~5V, TA=25℃		±1.5	±2	%
ΔIOLC2	线性调整	OUT0~OUT15 开,VOUTn=1V=VOUTfix=1V,Riref=470Ω,VCC=3V~5 V		±0.5	±1	%/V
ΔIOLC3	负载调整	OUT0~OUT15 开,VOUTn=1V~3V,VOUTfix=1V,Riref=470Ω		±1	±3	%/V
VIREF	基准电压输出	Riref=470Ω,TA=25℃	1.10	1.16	1.22	V
RPUP	上拉电阻	OE	32	40	48	kΩ
RPDWN	下拉电阻	LE	32	40	48	kΩ

Switch characteristics

（在 VCC=3V~5.5V 和-40℃~+85℃,，典型值 VCC=5V 和 TA=+25℃）除非另有说明

| 参数		测试条件	TM1818			单位
			最小值	典型值	最大值	
TR0	上升时间	SDO		50	100	nS
TR1		OUTn		80	160	nS
TF0	下降时间	SDO		50	100	nS
TF1		OUTn		80	160	nS
TD0	传输延迟时间	CLK↑至 SDO↑↓		60	120	nS
TD1		LE↑或 OE↑↓至 OUT0/OUT7/OUT8/OUT15 开/关		100	150	nS
TD2		LE↑或 OE↑↓至 OUT1/OUT6/OUT9/OUT14 开/关		120	170	nS
TD3		LE↑或 OE↑↓至 OUT2/OUT5/OUT10/OUT13 开/关		140	190	nS
TD4		LE↑或 OE↑↓至 OUT3/OUT4/OUT11/OUT12 开/关		160	210	nS
TON_ERR	输出误差时间		-50		50	nS

Time Waveform

输入时间

输出时间
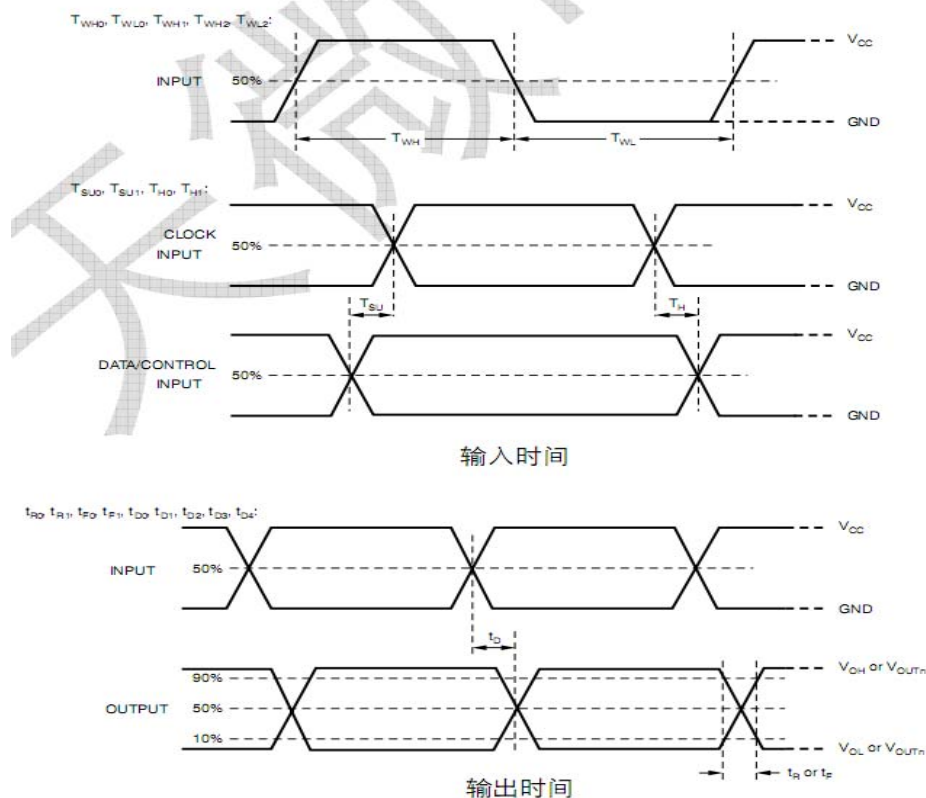
Application Message

As shown below, from an external resistor (Rext) to adjust the output current (IOUT), using the following formula can calculate the value of output current:

$$I_{out} = \frac{1.16V}{Riref} \times 15$$
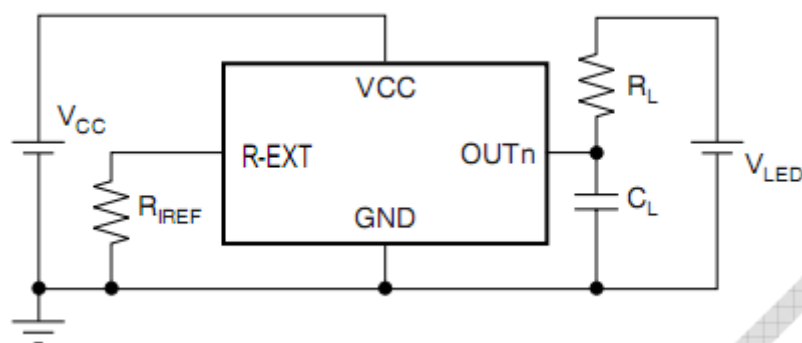
Formula of Riref refers to the R-EXT terminal of the voltage value. When the resistance value is 470Ω, by calculating available output current value 37mA; when the resistance is 1200Ω, the output current is 14.5mA.
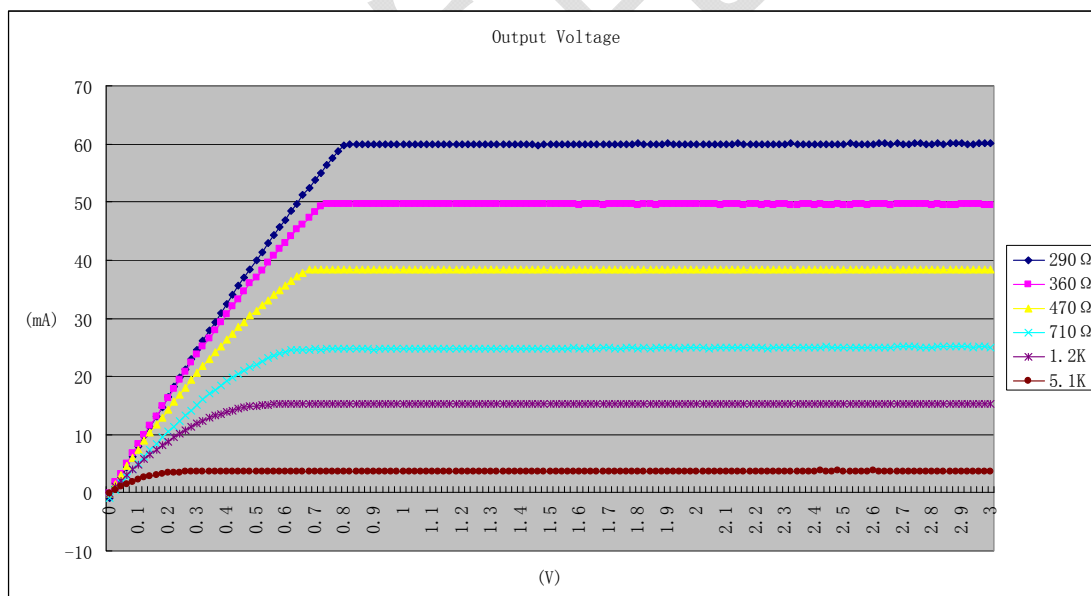
The R-EXT pin of GND with different resistance value can be output on the OUT pin end get different constant currents, but different under constant current constant voltage into a turning point is different, visible, in the 60mA under the constant current voltage point≈ 0.8V, whereas in 15mA constant current voltage point down to about 0.5V, in circuit design should be fully considered when OUTx end pressure drop, in order to avoid driving current can not reach the set value of pre.

In addition, OUTx end conduction time in a long time is not suitable to work in a high pressure drop, this will increase the chip power loss, which causes serious effect heating of the chip, system stability.

In practical application, probably because the signal wire or other factors produced by electromagnetic interference, in order to avoid such fault, suggested that the TM1818 and LED display module over a short distance.

Package Drawing

TM1818SS Outline Drawing

Unit : mm

Package Type : SSOP24-150-0.64
Weight : 0.11g
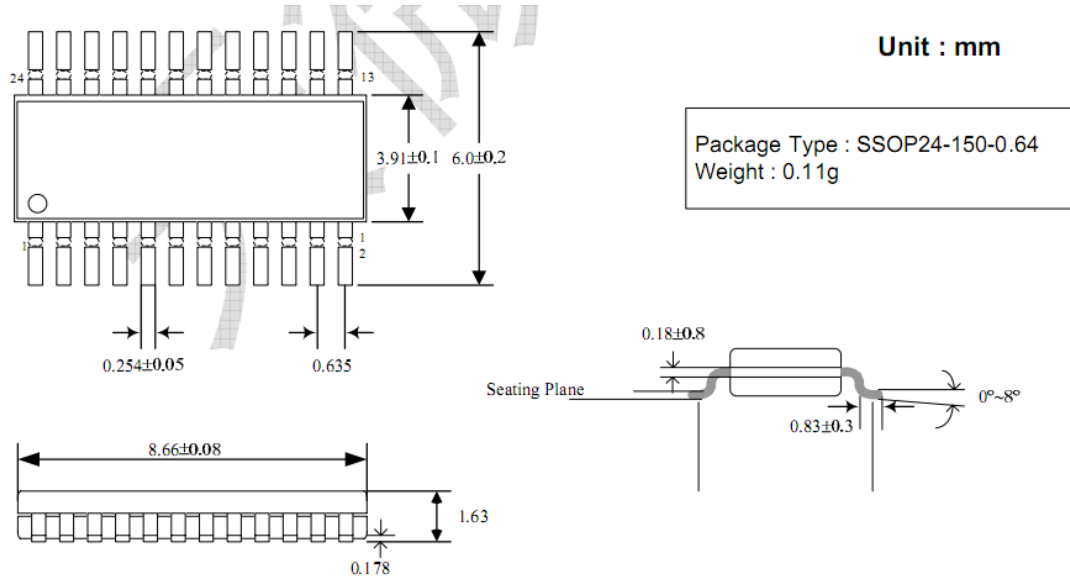
TM1818QS Outline Drawing

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.21	–	0.31
b1	0.20	0.25	0.27
c	0.20	–	0.25
c1	0.19	0.20	0.21
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	0.535	0.635	0.735
L	0.45	0.60	0.80
L1		1.05REF	
L2		0.25BSC	
R	0.08	–	–
R1	0.08	–	–
h	0.30	0.40	0.50
θ	0°	–	8°
θ1	6°	8°	10°
θ2	6°	8°	10°
θ3	5°	7°	9°
θ4	5°	7°	9°

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD MO−137 AE
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

Ver1.1