GREELED
格瑞电子

SM18512PS
DMX IC Datasheet

Specification

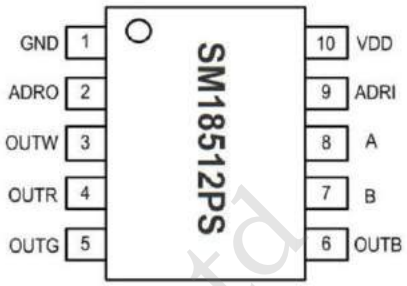
Model No.: SM18512PS

Product: SOP10,DMX,4CH output

Document No.: SPC-TOP-C/2305001

Issue Date :01-05-2023

Version: A-23



Greeled Approval		Customer Approval	
Aduit	Confirmation	Aprroval	Audit
Mr Chiang	Ms Lee		
Date:		□ Qualified	□ Disqualified
Reason:			

1.Feature:

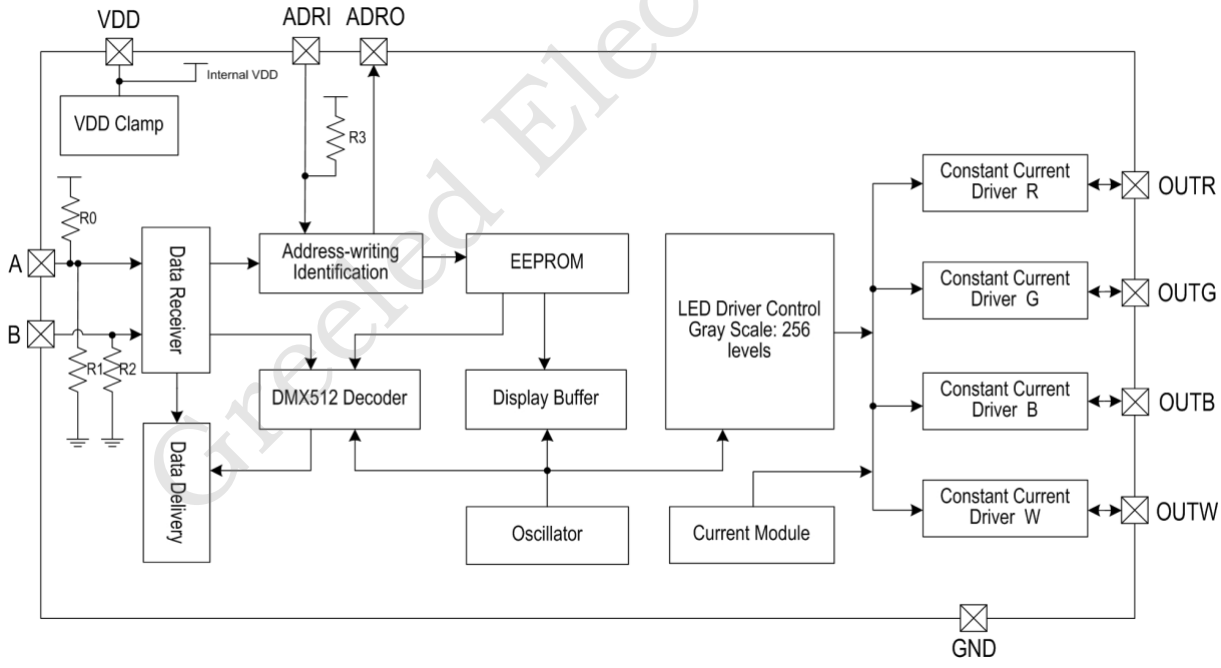
- ■ SOP10 package,Four channel constant current output,default current 18mA/CH
- ■ Compatible with DMX512 (1990) Protocol
- ■ Differential signal data rate 200-750kbps
- ■ The PWM scanning frequency 4KHz
- ■ Max 4096 channel are addressable
- ■ First chip output red color and other chips output green color once writing address successfully.
- ■ First chip output red color and other chips output setting color once writing parameter successfully.
- ■ First chip output red color and other chips output yellow color once writing current gain successfully.
- ■ First chip output red color and other chips output purple color auto addressable successfully.
- ■ Chip address wire self inspection when it is open.
- ■ No signal input over 2 second, Display last frame effect or default effect.
- ■ Built-in channel 1/2/3/4 selection function
- ■ The R/G/B/W output ports withstand value max 40V
- ■ Out R/G/B/W, 5bit current gain adjustable.

2.Application:

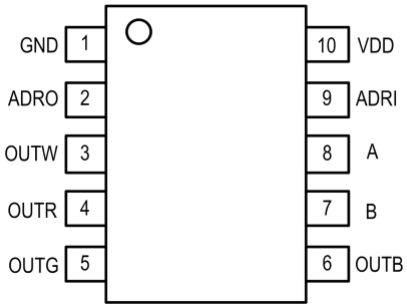
Device, Huge event,TV studio

Indoor&outdoor decoration

3.Block diagram:



4.Pin diagram and define:



No.	Symbol	Function description
1	GND	Ground
2	ADRO	Address enable signal output
3-6	OUTW/R/G/B	R/G/B/W Constant current output
7	B	Differential signal”-” input
8	A	Differential signal”+” input
9	ADRI	Address enable signal input
10	VDD	Power supply

4.Absolute max parameter (unless otherwise specified, Ta=25℃):

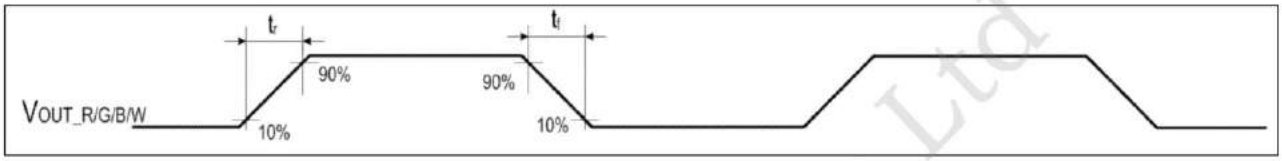
Parameter	Symbol	Value	Unit
Working Voltage	VDD	-0.4～5.5	V
Logic input voltage	VI	-0.4～VDD+0.4	V
Output port withstand Voltage	BVout	+45	V
Output port max current	Iout	22	mA
VDD max damp current	Idamp	20	mA
Working temperature	Topt	-40～+120	℃
Storage temperature	Tstg	-50～+120	℃
ESD pressure（body mode）	VESD	2000	V

5.Electronics Parameter(if no special instructions,V Ta=-25℃):

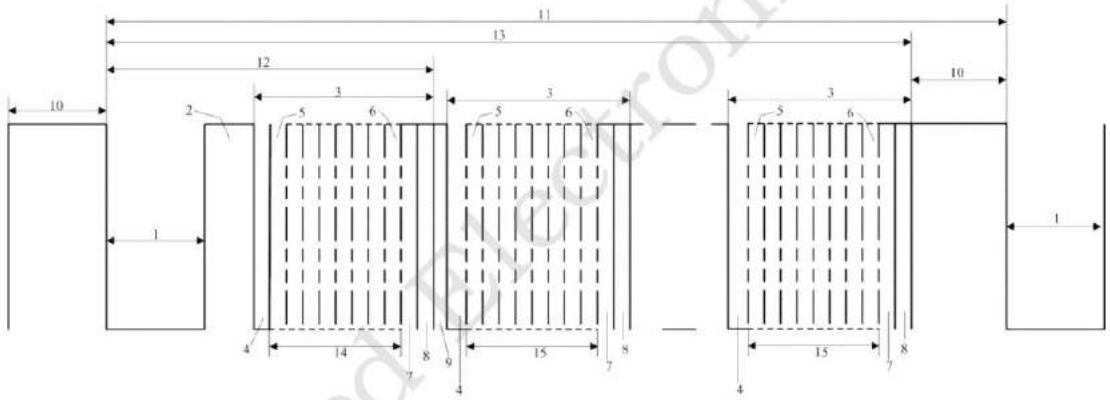
Symbol	Parameter	Test conditions	Min	Typical	Max	Unit
V_{DD}	Internal clamp voltage	External supply VCC = 12V, current limit between VCC and VDD Resistance RD = 1 KΩ	4.8	5.2	5.4	V
I_{DD}	Static current (power saving mode)	V_{DD} = 5V， I_{OUT} "OFF"	-	3.8	-	mA
	Static current (operating mode)	V_{DD} = 5V， I_{OUT} "ON"	-	5.1	-	mA
I_{OH}	DAO port driver	DAO Output High level, Current to GND	-	-37	-	mA
I_{OL}		DAO Output Low level, Current to VDD	-	36	-	mA
I_{OUT_RGBW}	OUT R/G/B/W Output current	Current gain bits D5: D4: D3: D2: D1 = 11111.	-	18	-	mA
dI_{OUT_RGBW}	OUT R/G/B/W Output current accuracy	I_{OUT}=18mA	-	±3	-	%
R_{down_AB}	A/B port resistance to ground	VDD=4.5V	-	200	-	KΩ
R_{UP_A}	A port pull-up resistor	VDD=4.5V	-	250	-	KΩ
V_{CM}	Differential Input Common-Mode Voltage	-	-	-	12	V
I_{AB}	Differential Input Current	-	-	-	28	uA
V_{TH}	Differential input threshold voltage	VDD = 5V, B = 2.5V, A input high, low level	-200	-	200	mV
$\triangle V_{TH}$	Differential input hysteresis voltage	VDD = 5V, B = 2.5V, A input high, low level	-	80	-	mV
V_{DS_S}	IOUT constant current knee voltage	I_{OUT} = 18mA	-	0.3	-	V
% VS V_{DS}	OUT R/G/B/W Output current variation	I_{OUT} =18mA, V_{DS}=1~3V	-	1	-	%
%VS V_{DD}		I_{OUT} =18mA, V_{DS}=4.5~5.5V	-	1	-	
%VS T_A		I_{OUT} =18mA, T_A =-40~+85℃	-	4	-	
R_{UP_ADRI}	ADRI pull-up resistor	-	-	23	-	KΩ
T_{OTP}	Over-temperature protection starting junction temperature	-	-	135	-	℃
I_{leak}	OUT R/G/B/W Port leakage current	I_{OUT}"OFF", V_{DS} = 40V	-	-	1	uA

6.Switch Parameter(if no special instructions, Ta=-25℃):

Symbol	Parameter	Test conditions	Min	Typical	Max	Unit
f_{PWM}	OUT R/G/B/W Output PWM frequency	I_{OUT}=18mA, OUT R/G/B/W in series with 200 Ω resistor to VDD	-	4K	-	Hz
t_r	OUT R/G/B/W Port Voltage conversion time (Note 6)	IOUT = 16 mA, OUT R/G/B/W port in series with 100 Ω resistor to VDD, 15pF load capacitance to ground	-	100	-	ns
t_f			-	170	-	ns



7.Data communication protocol description (DMX Protocol):



1- "SPACE" for BREAK
2- "MARK" After BREAK (MAB)
3- Slot Time
4- START Bit
5- LEAST SIGNIFICANT Data BIT
6- MOST SIGNIFICANT Data BIT
7- STOP Bit
8- STOP Bit
9- "MARK" Time Between slots
10- "MARK" Before BREAK (MBB)
11- BREAK to BREAK Time
12- RESET Sequence (BREAK,MAB,START Code)
13- DMX512 Packet
14- START CODE (Slot 0 Data)
15- SLOT 1 DATA
16- SLOT nnn DATA(Maximun 512)

Designation	Description	Min	Typical	Max	Unit
-	Bit Rate	245	250	255	kbit/s
-	Bit Time	3.92	4	4.08	us
-	Minimum Update Time for 513 slots	-	22.7	-	ms
-	Maximum Update Rate for 513 slots	-	44	-	/s
1	"SPACE" for BREAK	88	-	-	us
2	"MARK" After BREAK (MAB)	8	-	-	us
9	"MARK" Time Between slots	0	-	<1.00	s
10	"MARK" Before BREAK (MBB)	0	-	<1.00	s
11	BREAK to BREAK Time	1196	-	-	us
13	DMX512 Packet	1196	-	-	us

Note:

(1) The above data format is fully compatible with DMX512 (1990);

(2) This product needs to receive at least two frames of data before refreshing the port output. The port output corresponding to the current received data needs to be refreshed after identifying the next frame data MAB.

8. Constant current characteristic

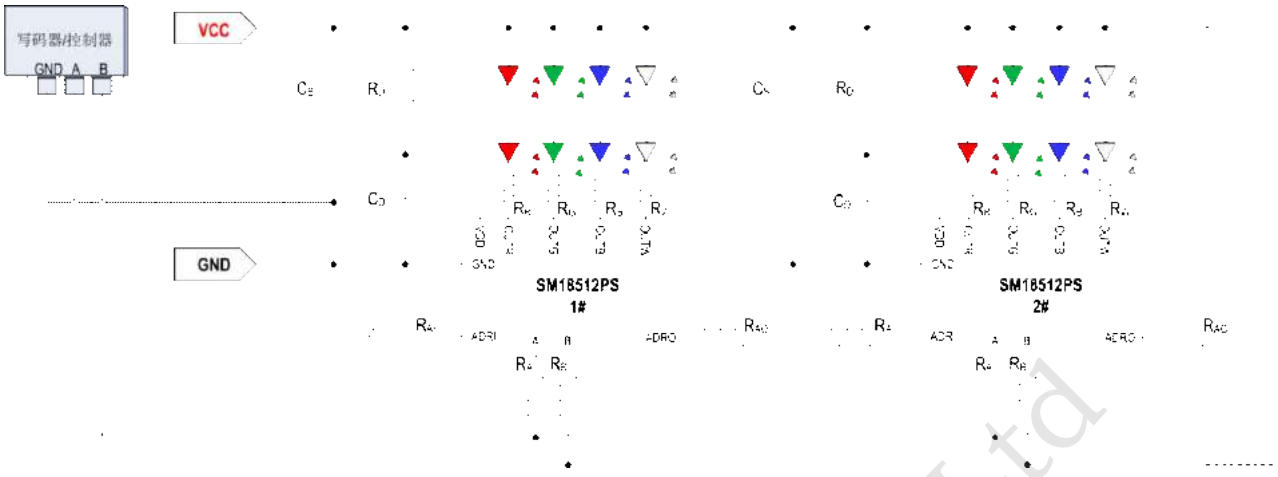
The SM18512PS OUT port voltage reaches the set constant current inflection point voltage, the output current IOUT no longer changes with the rise of the OUT port voltage VDS. The relationship curve between IOUT and VDS is shown in the above figure

9. Current gain setting as following table

Current gain	D5	D4	D3	D2	D1	Corresponding current value (mA)
0	0	0	0	0	0	1.1
1	0	0	0	0	1	1.7
2	0	0	0	1	0	2.2
3	0	0	0	1	1	2.7
4	0	0	1	0	0	3.3
5	0	0	1	0	1	3.9
6	0	0	1	1	0	4.4
7	0	0	1	1	1	4.9
8	0	1	0	0	0	5.5
9	0	1	0	0	1	6.1
10	0	1	0	1	0	6.6
11	0	1	0	1	1	7.1
12	0	1	1	0	0	7.7
13	0	1	1	0	1	8.2
14	0	1	1	1	0	8.8
15	0	1	1	1	1	9.3
16	1	0	0	0	0	9.9
17	1	0	0	0	1	10.4
18	1	0	0	1	0	10.9
19	1	0	0	1	1	11.5
20	1	0	1	0	0	12.0
21	1	0	1	0	1	12.6
22	1	0	1	1	0	13.1
23	1	0	1	1	1	13.6
24	1	1	0	0	0	14.2
25	1	1	0	0	1	14.8
26	1	1	0	1	0	15.3
27	1	1	0	1	1	15.8
28	1	1	1	0	0	16.4
29	1	1	1	0	1	16.9
30	1	1	1	1	0	17.5
31	1	1	1	1	1	18.0

Note:D5 ~ D1 are arranged from high to low.

10.Typical application circuit



SM18512PS typical application circuit parameters include power input voltage VCC, current-limiting resistor RD, system power filter capacitor CS and R/G/B/W LED divider resistors RR, RG, RB, RW, address signal input protection resistor RAI and address signal output protection resistor RAO. The A/B bus signal is connected to the resistors RA and RB in series.

（1） VCC is the input power supply voltage, RD is the voltage-stabilizing and current-limiting resistor, which is used to limit the working current of the internal voltage-stabilizing module when the voltage-stabilizing function of the chip is started;

Chip supply voltage VDD: VDD = VCC- (IDD + IIN) * RD;

Where, IIN is the operating current of the internal voltage regulator module of the chip, IDD is the quiescent current of the chip (excluding the current of voltage regulator module), and the RD resistance must ensure VDD > 3 V. The larger the RD resistance is, the lower the system power consumption is, but the system anti-interference ability is weak; the smaller the RD resistance is, the higher the system power consumption is, and the higher the working temperature is.

For different input supply voltages VCC, the design reference values of the current-limiting resistor RD are shown in the following table:

VCC（V）	5V	6V	9V	12V	15V	18V	24V	36V
R_D（Ω）	33	68	300	1.0K	1.5K	2.0K	3.0K	2.4K+2.4K

（2） CS is the capacitance of the system power supply to the ground, which is used to reduce the fluctuation of the power supply. The capacitance of 0.1 uF-10uF can be selected according to the actual load of the system;

（3） CD is the filter capacitor of the chip, which is used to stabilize the VDD voltage of the chip and ensure the normal operation of the chip. The recommended value of CD is 100 nF;

（4） RA and RB are protective resistors for A/B signal input ports to prevent abnormal bus signals caused by damage to A and B ports of the chip;

（5） RAI is the protective resistor of the address signal input port to prevent the signal input port from being damaged due to electric hot plug, reverse connection between the positive and negative poles of the power supply and the signal line, etc.;

RAO is the protection resistor of the address signal output port to prevent the signal output port from being damaged due to electric hot plug, reverse connection between the positive and negative poles of the power supply and the signal line, etc.

(6) RR, RG, RB and RW are respectively the divider resistors of the OUTR/G/B/W ports, which are used to reduce the voltage of the OUTR/G/B/W ports and reduce the power consumption of the chip, and the calculation formula is RR/RG/RB/RW = (VCC − N * VLED − VDS)/ILED, where VCC is the input voltage. VLED is the voltage drop of the LED lamp, ILED is the port output current, and VDS is the OUTR/G/B/W port voltage. The OUTR/G/B/W current can be output constantly when it reaches 1V. Considering the attenuation of voltage in practical application, the voltage of OUTR, G, B and W port should be considered as appropriate in design. In order to ensure the constant current output of the port, it is recommended that the port voltage VDS of OUTR/G/B/W be designed to be about 3.0 V, subject to the actual application; The reference values of voltage drop VLED of different color lamp beads are as follows: voltage drop of red lamp is about 2.2 V, voltage drop of green lamp is about 3.2 V, voltage drop of blue lamp is about 3.2 V, and voltage drops of white lamp are about 3.2 V. The details are subject to the actual specifications of lamp beads

(7) RR, RG, RB and RW are respectively the divider resistors of the OUTR/G/B/W ports, which are used to reduce the voltage of the OUTR/G/B/W ports and reduce the power consumption of the chip, and the calculation formula is RR/RG/RB/RW = (VCC − N * VLED − VDS)/ILED, where VCC is the input voltage. VLED is the voltage drop of the LED lamp, ILED is the port output current, and VDS is the OUTR/G/B/W port voltage. The OUTR/G/B/W current can be output constantly when it reaches 1V. Considering the attenuation of voltage in practical application, the voltage of OUTR, G, B and W port should be considered as appropriate in design. In order to ensure the constant current output of the port, it is recommended that the port voltage VDS of OUTR/G/B/W be designed to be about 3.0 V, subject to the actual application; The reference values of voltage drop VLED of different color lamp beads are as follows: voltage drop of red lamp is about 2.2 V, voltage drop of green lamp is about 3.2 V, voltage drop of blue lamp is about 3.2 V, and voltage drops of white lamp are about 3.2 V. The details are subject to the actual specifications of lamp beads

In the default application, according to different input voltages and different numbers of leds in series, the recommended values of the corresponding parameters are as follows:

VCC	OUTR/G/B/W port Number of LEDs in series (PCs)	R_D(Ω)	C_D（nF）	R_A(Ω)	R_B(Ω)	R_{AI}(Ω)	R_{AO}(Ω)	R_R(Ω)	R_G(Ω)	R_B(Ω)	R_W(Ω)
12V	3	1K	100	10K	10K	510	510	150	No	No	No
24V	6	3K	100	10K	10K	510	510	510	150	150	150

Model No.	Description	Qty/Reel	Reel/Ctn
SM18512PS	SOP10,DMX,4CH output	4000pcs	5Reel

GREELED ELECTRONIC LTD

Add: 2F,1st Building logistic park,shiyan town,shenzhen city

E-mail:sales@gree-leds.com Skype:greeledelectronic

Automatic function selection

Description of automatic addressing function

1） Turn on the automatic addressing function: first set the automatic addressing step of the chip through the write parameter function; Then the automatic addressing function is enabled by the controller. After the write command is successful, the first light is red and the rest are purple.

2） When the system with the automatic addressing function is enabled, the automatic addressing operation will be performed every time the system is powered on again (the controller needs to send a normal gray scale data signal). The first chip at the signal input end (that is, the ADRI floating chip) is judged to be the first address 1. The chips are automatically addressed in turn according to the set number of steps, and the new address data will be automatically saved.

3） After the automatic addressing is successful, the first chip turns on the red light, and the other chips turn on the green light for 2 seconds. Description of automatic addressing function

1） Turn on the automatic addressing function: first set the stepping by writing parameters, and then use the controller to enable the automatic addressing function. After the write command is successful, the first light is red, and the rest are purple.

2） After the lamp is powered on and the automatic addressing is successful, the green light of the chip is on for 2 seconds; At the same time, the chip automatically exits the automatic addressing mode. Description of adaptive function

1） Turn on the adaptive function: use the controller to enable the adaptive function. After the command is written successfully, the first light is red and the rest are purple.

2） After the lamp is powered on and the self-adaptation is successful, the green light of the chip is on for 2 seconds; At the same time, the chip automatically exits the adaptive mode. Description of precautions for automatic function

1） When the automatic function is selected through the controller, only one of the automatic addressing/automatic addressing/adaptive functions can be selected; After the selection is successful, the first light is red, and the rest are purple.

2） Automatic addressing/self-adaption can be used for lamp repair. The address can be automatically identified when the lamp with the automatic addressing function is turned on for maintenance; The address, parameters and current gain can be automatically identified when the lamp with adaptive function is turned on for maintenance;

3） The first lamp does not support the automatic addressing/adaptive function;

4） After the controller writes the address, all automatic functions will be turned off automatically;

5） After the engineering commissioning is completed, it is recommended to turn off the automatic addressing function.

Address line open circuit self-check function

The SM18512PS built-in address open circuit self-test function is as follows:

1） Enable the self-test function: enable the self-test function through the write parameter function;

2） After the self-check function is turned on, the chip will automatically detect whether it is normally connected to the address line of the preceding lamp every time it is powered on. If the line is open or the lamp is the first lamp, the red light will be on, and the normally connected lamp will not be on.

Note: If the chip with automatic function is turned on, the self-test function will not work.

Out port open width compensation function

The SM18512PS open width compensation functions are as follows:

1） Turn on the BIT function: turn on the width compensation function through the write parameter function;

2） The compensation of the opening width of the out port is 0 to 6 levels, and the opening time of the out port is increased by about 260 ns for each level, and level 0 represents no compensation;