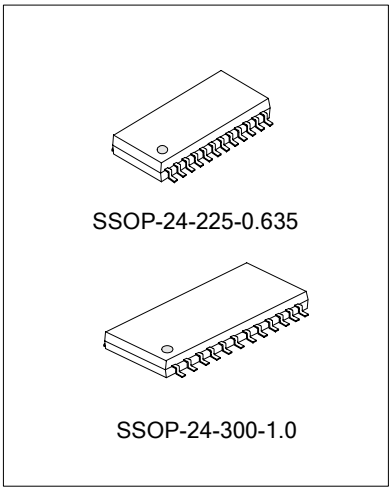
16-BIT CONSTANT CURRENT LED DRIVER

DESCRIPTION

SD16729 is a constant current LED driver with advanced Bi-CMOS technology, the constant current is determined by external resistor. It includes a 16-bit shift register, latches, the constant current driver and etc. In the output stage, there are 16 current sources which provide a 1-45mA constant current drive for LED through bipolar device.



FEATURES

* Output current adjustable through external resistor
* Data serial-in/serial-out
* 16-channel constant current output
* Output current: 1~45mA
* 30MHz clock frequency
* Fast output current response, $\overline{\text{ENABLE}}$ min. width:30ns
* Current Precision (all output are ON)

Precision		Test Condition
Between bits	Between ICs	
<±2%	<±3%	Output current:1~15mA

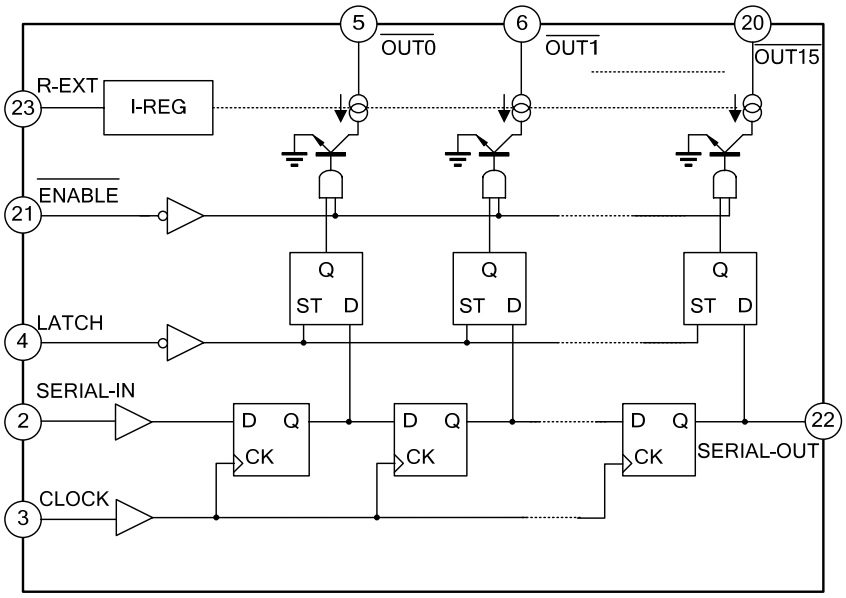
APPLICATIONS

* LED screen

ORDERING INFORMATION

Device	Package	Marking
SD16729P	SSOP-24-300-1.0	SD16729P
SD16729S	SSOP-24-225-0.635	SD16729S

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING (Tamb=25°C)

Characteristics		Symbol	Ratings	Unit
Supply Voltage		V_{DD}	6	V
Input Voltage		V_{IN}	-0.2~V_{DD}+0.2	V
Output Current		I_{OUT}	50	mA/ch
Output Voltage		V_{OUT}	-0.2~ 17	V
Power Dissipation	SD16729S	P_{D1}	1.04	W
Power Dissipation	SD16729P	P_{D2}	1.32	W
Thermal Resistance	SD16729S	$R_{th(j-a)1}$	120	°C/W
Thermal Resistance	SD16729P	$R_{th(j-a)2}$	94	°C/W
Storage Temperature		T_{stg}	-55~+150	°C
Operating Temperature		T_{opr}	-40 ~ 85	°C

OPERATING CONDITION RECOMMENDED

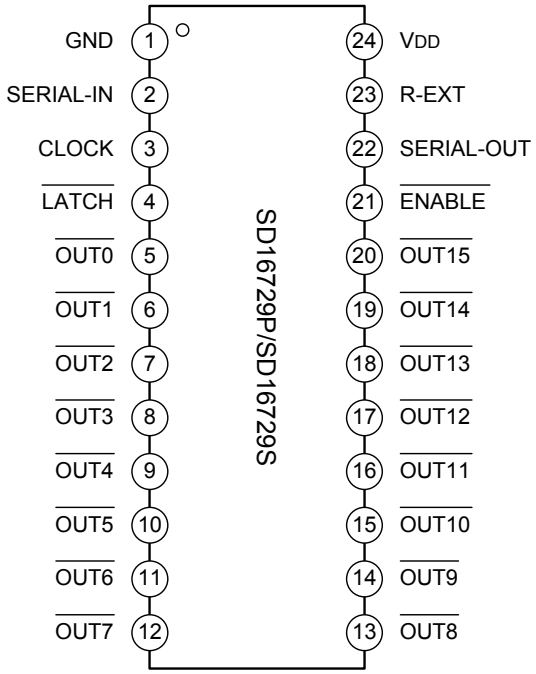
Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	-	3.0	-	5.5	V
Output Voltage	V_{OUT}	-	0.5	1	17	V
Output Current	I_{OUT}	-	1	-	45	mA/ch
	I_{OH}	SERIAL-OUT	-	-	1	mA
	I_{OL}	SERIAL-OUT	-	-	-1	mA
Input Voltage	V_{IH}	-	0.76V_{DD}	-	V_{DD}+ 0.15	V
Input Voltage	V_{IL}	-	-0.15	-	0.26V_{DD}	V
CLOCK Frequency	F_{clk}	Cascaded	-	-	30	MHz
LATCH Setup Time	$t_{SU(L)}$	-	5	-	-	nS
LATCH Hold Time	$t_{h(L)}$		30	-	-	nS
CLOCK Pulse Width	t_{CLK}		20	-	-	nS
$\overline{\text{ENABLE}}$ Pulse Width	t_{ENA}	I_{OUT} = 20 mA, conntected to LED for test	30	-	-	nS
CLOCK Setup Time	$t_{su(C)}$	-	10	-	-	nS
CLOCK Hold Time	$t_{h(C)}$	-	10	-	-	nS

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, T_{amb}=25°C, V_{DD}=3.0V-5.5V)

Characteristics	Symbol	Test conditions		Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	-		3.0	-	5.5	V
Output Current	I_{OUT1}	V_{DD}=3.3V V_{OUT}=1V	R_{EXT}=470Ω	38.53	39.55	40.61	mA
	I_{OUT2}	V_{DD}=5.0V V_{OUT}=1V		38.53	39.55	40.61	mA
	I_{OUT3}	V_{DD}=3.3V V_{OUT}=1V	R_{EXT}=1.2kΩ	14.81	15.25	15.69	mA
	I_{OUT4}	V_{DD}=5.0V V_{OUT}=1V		14.81	15.25	15.69	mA
	I_{OUT5}	V_{DD}=3.3V V_{OUT}=1V	R_{EXT} = 12kΩ	1.5	1.55	1.6	mA
	I_{OUT6}	V_{DD}=5.0V V_{OUT}=1V		1.5	1.55	1.6	mA
Output Leakage Current	I_{ok}	V_{OUT}=15.0V		-	-	1	uA
Output Current Precision (Bit To Bit)	△ I_{OUT1}	V_{OUT}>0.7V	R_{EXT}=1.2kΩ	-	±1	±2	%
	△ I_{OUT2}	V_{OUT}>0.7V	R_{EXT}=12kΩ				

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Output Voltage (SOUT)	V_{OH}	I_{OH}=-1.0 mA, V_{DD}=3.3 V	3	-	-	V
		I_{OH}=-1.0 mA, V_{DD}=5.0 V	4.7	-	-	V
Output Voltage (SOUT)	V_{OL}	I_{OL}=1.0 mA, V_{DD}=3.3 V	-	-	0.3	V
		I_{OL}=1.0 mA, V_{DD}=5.0 V	-	-	0.3	V
Output Current Regulation	%/V_{DD}	V_{DD}: 3.0V—5.0V	-	1	2	%
Pull-Down Resistance	$R_{IN(down)}$	-	115	250	460	kΩ
Pull-Up Resistance	$R_{IN(up)}$	-	115	250	460	kΩ
Supply Current OFF	I_{OFF}	V_{OUT}=15.0V, R_{EXT} =470Ω	11.5	13.14	15	mA
		V_{OUT}=15.0V, R_{EXT} =1.2kΩ	4.5	5.2	6	mA
		V_{OUT}=15.0V, R_{EXT}=12kΩ	0.57	0.72	0.86	mA
Supply Current ON	I_{ON}	V_{OUT}=1V, R_{EXT}=470Ω	18	20	23	mA
		V_{OUT}=1V, R_{EXT}=1.2kΩ	6.5	7.95	9.5	mA
		V_{OUT}=1V, R_{EXT}=12kΩ	0.83	1.04	1.24	mA
	I_{ON}	V_{OUT}=1V, T_{amb}=-40°C, R_{EXT}=470Ω	-	-	30	mA
		V_{OUT}=1V, T_{amb}= -40°C, R_{EXT}=1.2kΩ	-	-	13	mA
		V_{OUT}=1V, T_{amb}= -40°C, R_{EXT}=12kΩ	-	-	1.5	mA
Propagation Delay (“L” To “H”)	t_{pLH1}	CLK-$\overline{OUTn}$, $\overline{LATCH}$ = “H” $\overline{ENABLE}$ =“L”	-	50	70	ns
	t_{pLH2}	$\overline{LATCH}$ - $\overline{OUTn}$, $\overline{ENABLE}$ =“L”	-	50	70	ns
	t_{pLH3}	$\overline{ENABLE}$ - $\overline{OUTn}$, $\overline{LATCH}$ =“H”	-	50	70	ns
	t_{pLH4}	CLK—SERIAL OUT	3	10	15	ns
Propagation Delay (“H” To “L”)	t_{pHL1}	CLK-$\overline{OUTn}$, $\overline{LATCH}$ = “H” $\overline{ENABLE}$ =“L”	-	20	50	ns
	t_{pHL2}	$\overline{LATCH}$ - $\overline{OUTn}$, $\overline{ENABLE}$ =“L”	-	20	50	ns
	t_{pHL3}	$\overline{ENABLE}$ - $\overline{OUTn}$, $\overline{LATCH}$ =“H”	-	20	50	ns
	t_{pHL4}	CLK—SERIAL OUT	4	10	15	ns
Max. CLOCK Rise Time	tr	-	-	-	500	ns
Max. CLOCK Fall Time	tf	-	-	-	500	ns

PIN CONFIGURATION



PIN DESCRIPTION

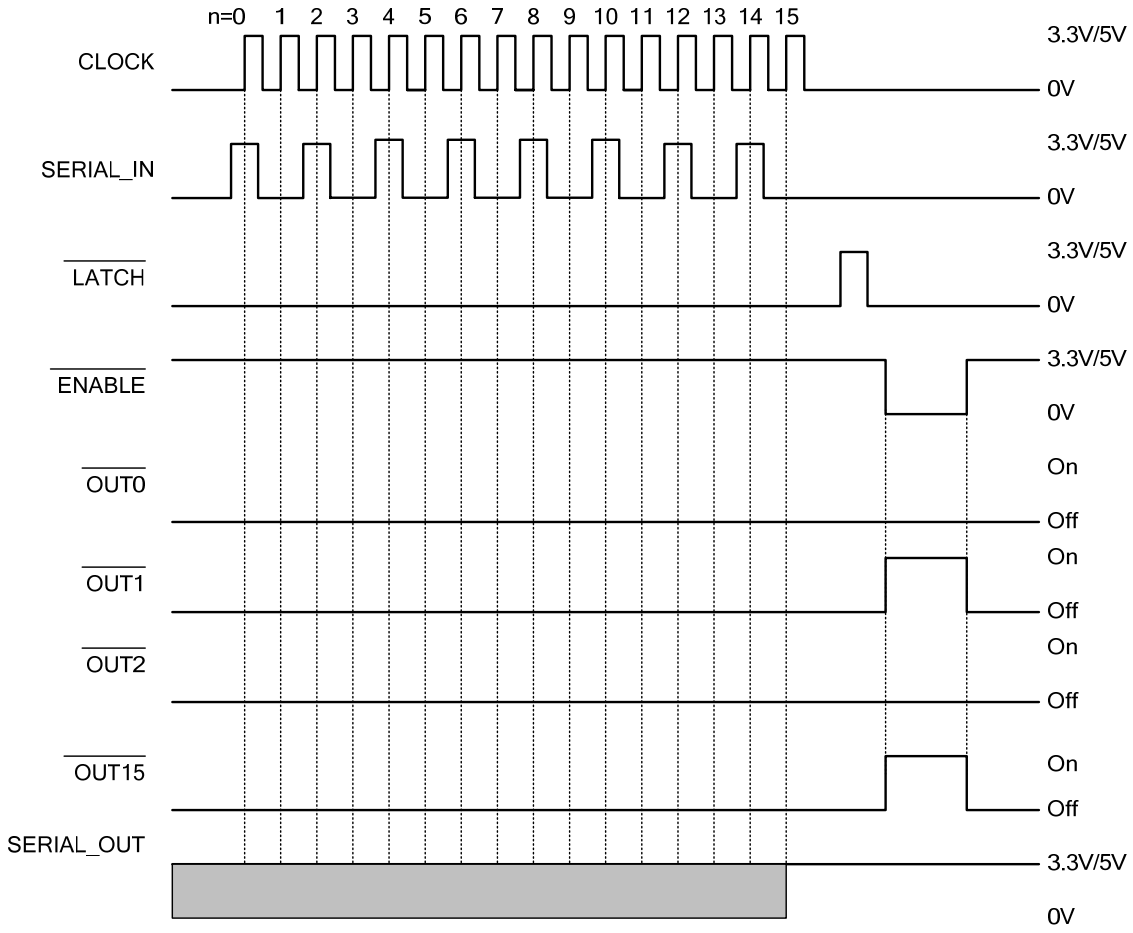
Pin No.	Pin Name	I/O	Pin Function
1	GND	--	Ground
2	SERIAL-IN	I	Shift register input pin
3	CLOCK	I	Clock input pin for shift register
4	$\overline{\text{LATCH}}$	I	Data strobe pin for the latch
5 ~ 20	$\overline{\text{OUT0}}$ ~ $\overline{\text{OUT15}}$	I/O	Output pins
21	$\overline{\text{ENABLE}}$	I	Output enable pin (active low)
22	SERIAL-OUT	O	Shift register output pin
23	R-EXT	I/O	External resistor connecting pin
24	VDD	--	Power supply

FUNCTION DESCROPTION

In the LED display applications, SD16729 can maintain almost no change in different channels or between the different chips. In the different channels, the current changes less than ±2%, while between the different chips, the current changes less than ± 3%.

There is only one pin connected to ground which is shared as analog ground, digital ground and power ground. It is recommended to route with min. inductance against switching noise and output current noise-induced IC faults.
In order to obtain a good current output, the chip needs an appropriate output voltage. According to the electrical characteristics table, users can get minimum output voltage and other related information. Even in the same output current conditions, the minimum output voltage of every part is different. .
In order to avoid noise interference, the resistance should be placed close to the pin R-EXT.

TIME SEQUENCE



NOTE: When $\overline{\text{LATCH}}$ is low, latch the data;

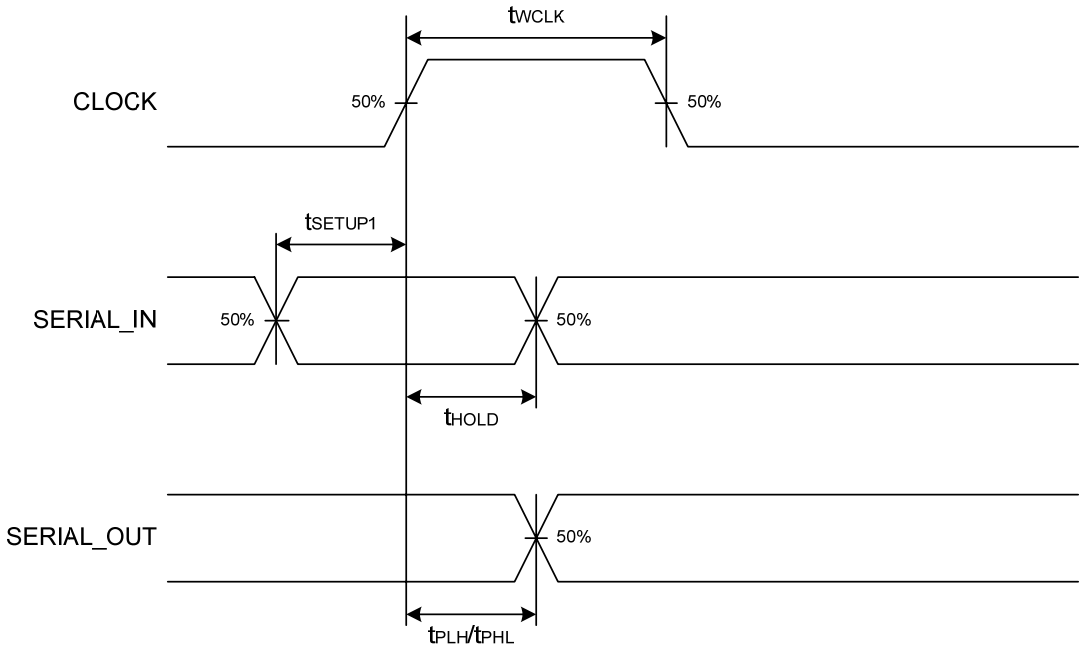
When $\overline{\text{LATCH}}$ high, data is is transmitted from input to output of register;

When $\overline{\text{ENABLE}}$ is low, normal response output;

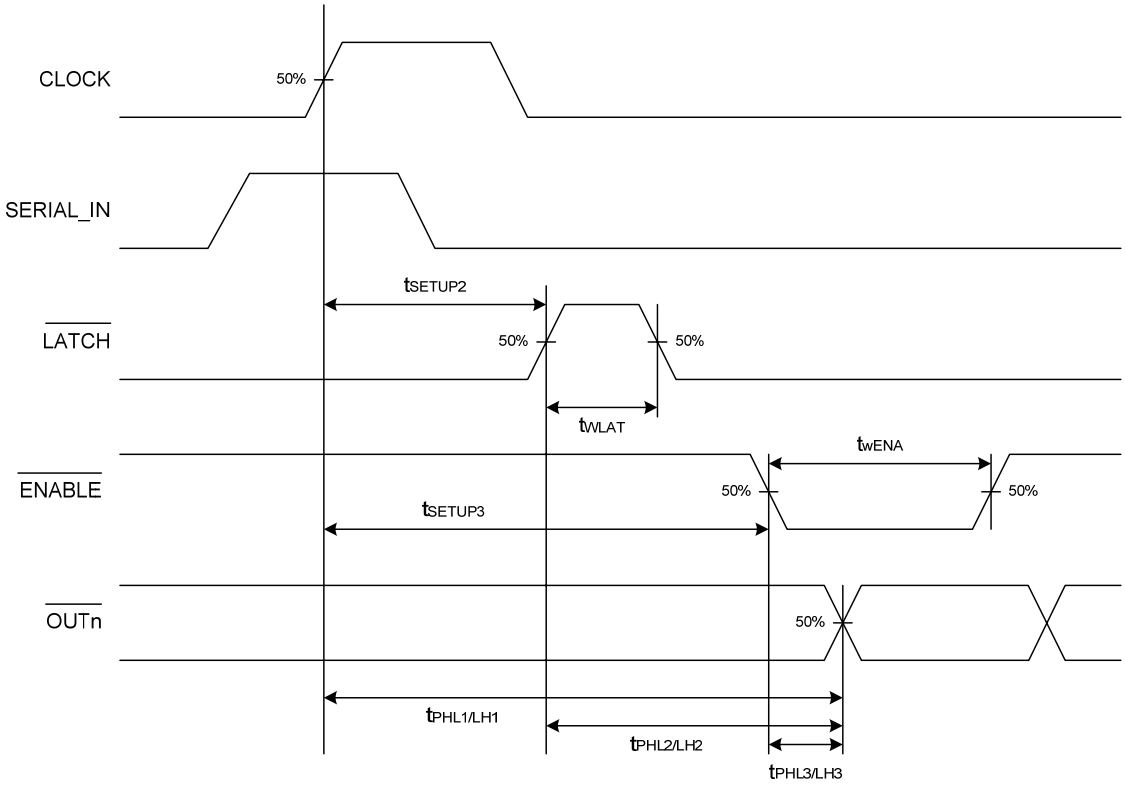
When $\overline{\text{ENABLE}}$ is high, output is not available.

SEQUENCE WAVEFORM

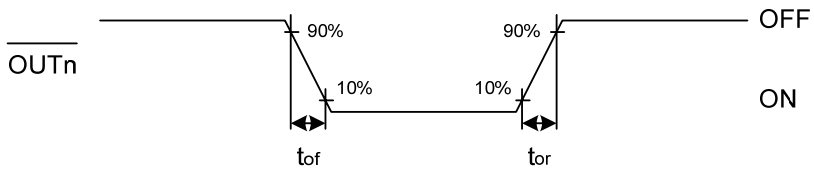
1. Clock, serial-in, serial-out



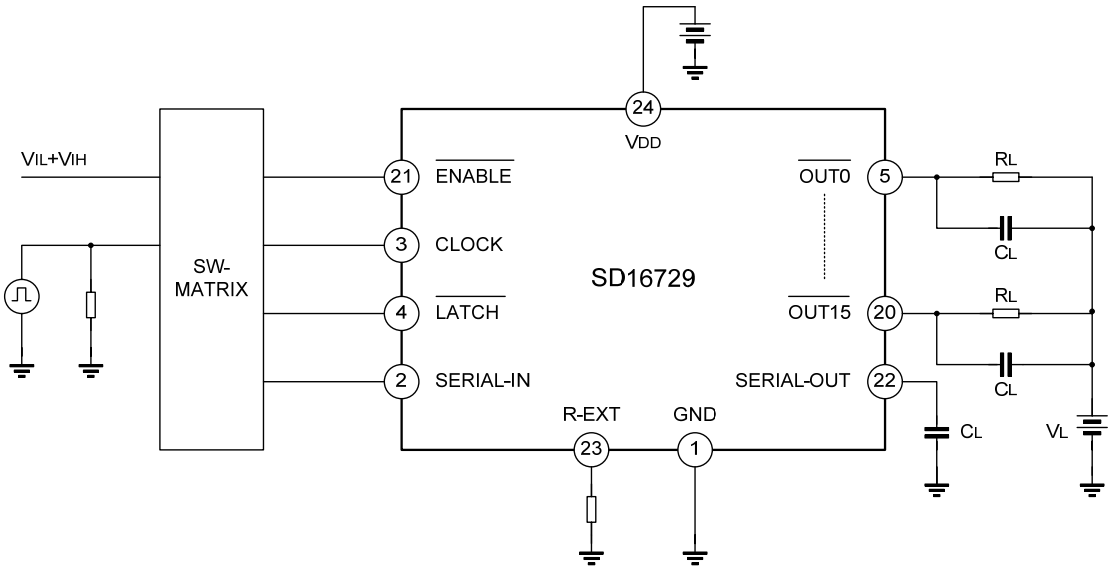
2. Clock, serial-in, $\overline{\text{LATCH}}$, $\overline{\text{ENABLE}}$, $\overline{\text{OUTn}}$



3. $\overline{\text{OUTn}}$

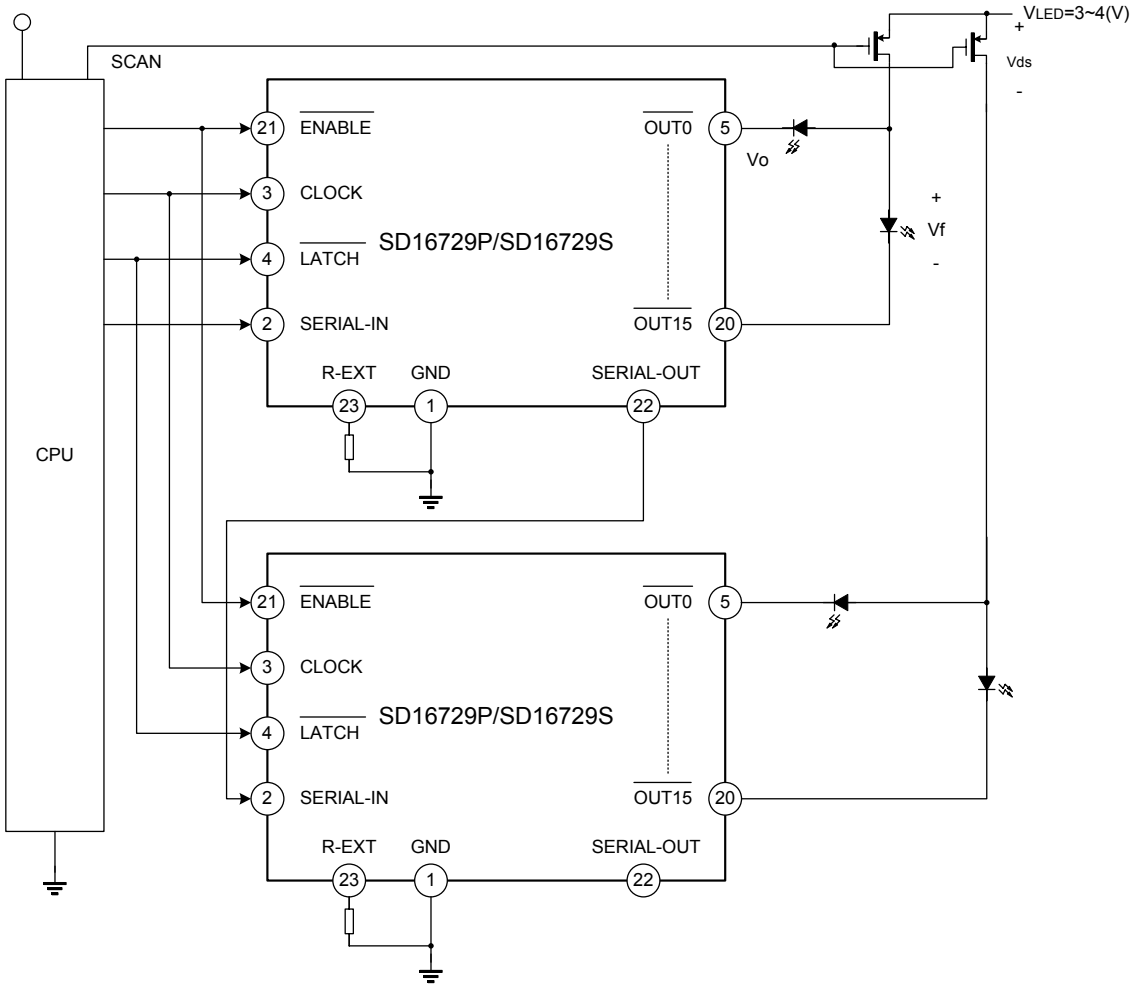


TEST CIRCUIT



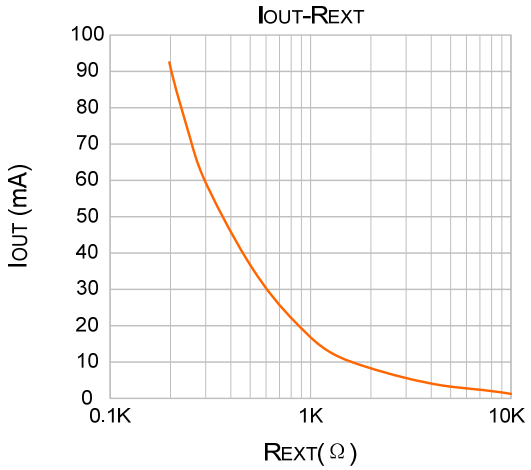
For this test circuit, T_{opr}=25°C, V_{DD}=V_{IH}=3.3V/5V, V_{OUT}=0.7V, V_{IL}=0V, R_{EXT}=490Ω, V_L=3.0V, R_L=60Ω, C_L=10.5pF.

TYPICAL APPLICATION CIRCUIT



Note: this circuit and corresponding parameters are just for reference, please set the parameter according to practical circuit.

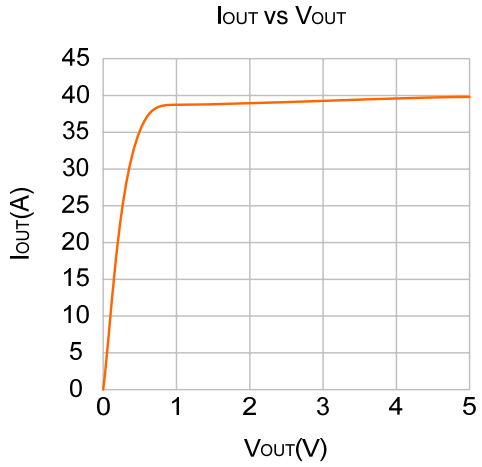
ELECTRICAL CHARACTERISTIC CURVE

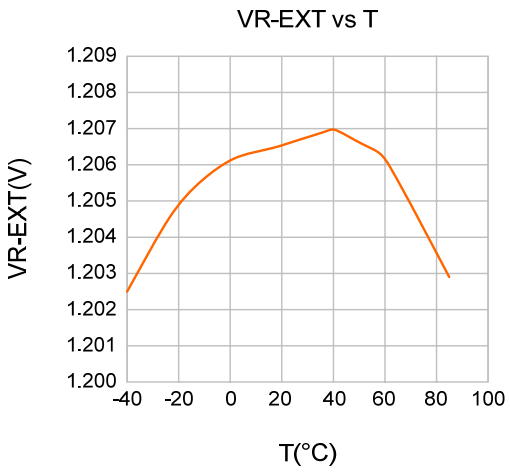


IOUT is given by:

IOUT= (VR-EXT /REXT)×15.2; VR-EXT=1.202V

Where, VR-EXT is voltage of R-EXT, and REXT is the resistance of resistor connected to R-EXT.



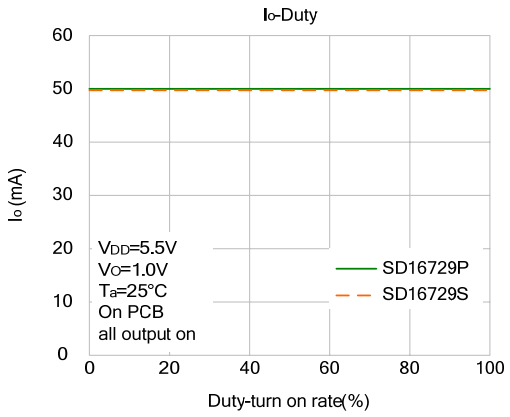


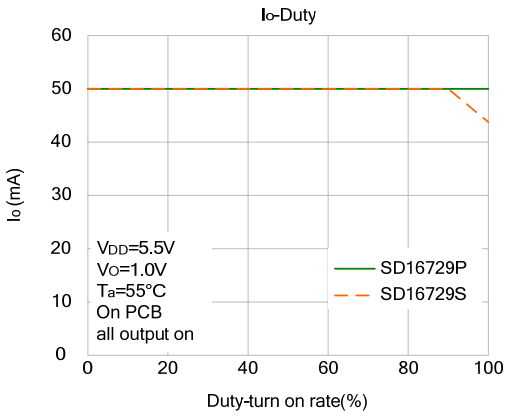
Power dissipation (PD)

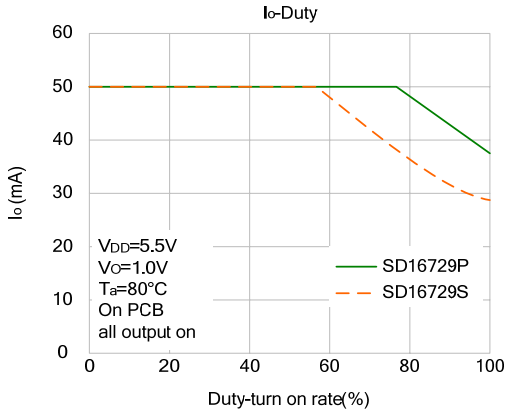
Max. power dissipation is given by: $P_{D(max)}=(T_j-T_a)/R_{th(j-a)}$ and actual power dissipation when 16 channel are all ON is expressed as: $P_{D(act)}=(I_{DD} \times V_{DD})+(I_{OUT} \times Duty \times V_{CE} \times 16)$.

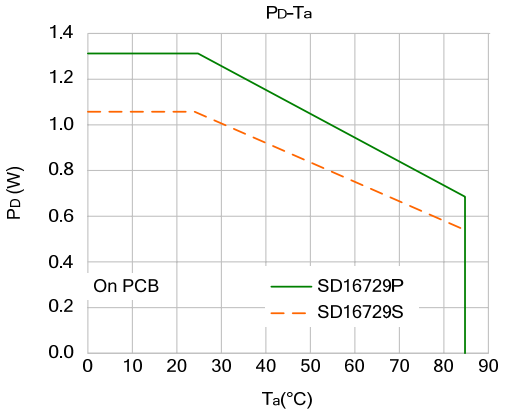
Hence, to make $P_{D(act)} \leq P_{D(max)}$, output current and duty cycle should be:

$I_{OUT}=\{[(T_j-T_a)/ R_{th(j-a)}]-(I_{DD} \times V_{DD})\}/V_{CE}/Duty/16$, where $T_j=150°C$.





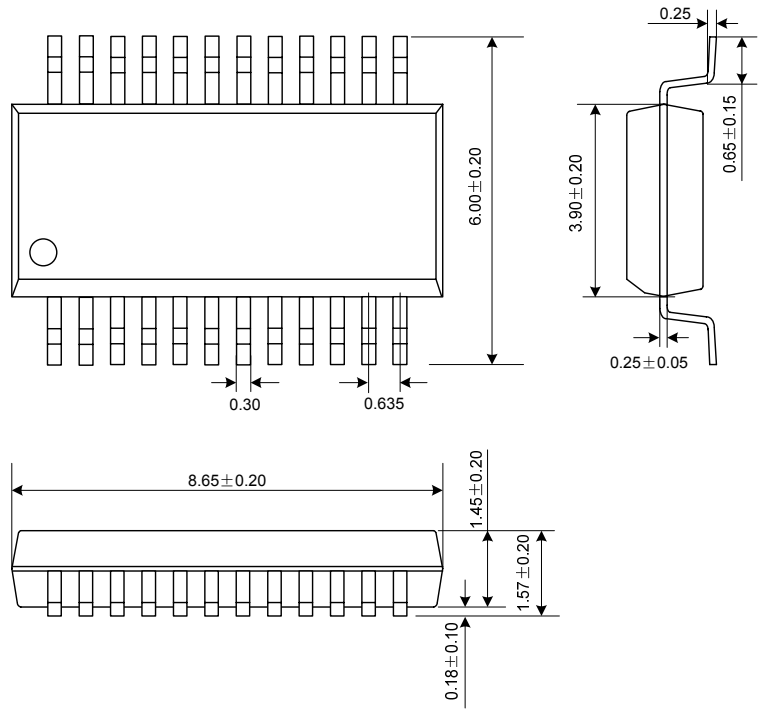




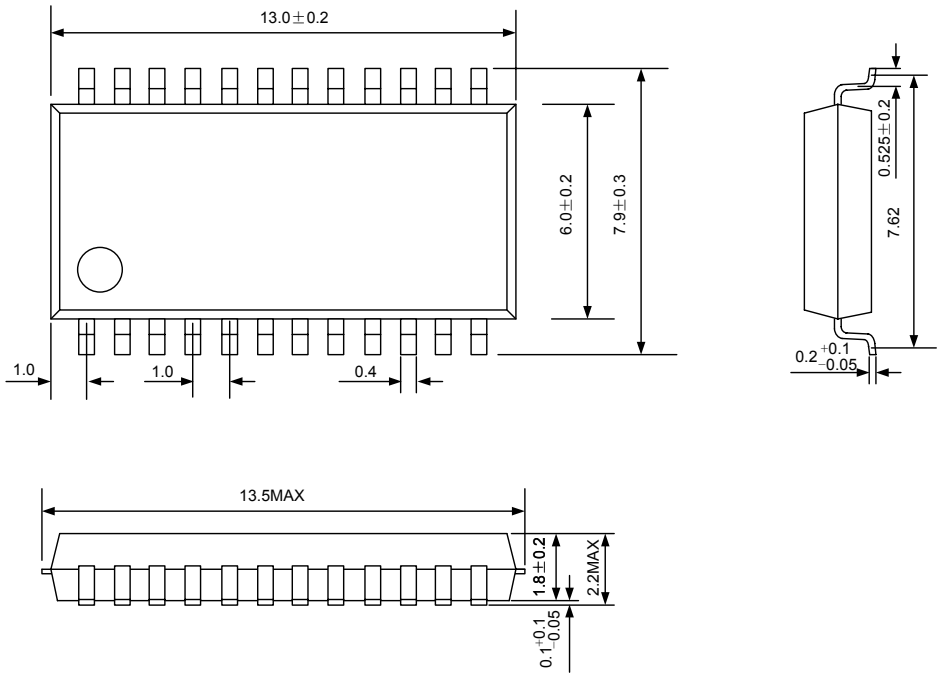
All the parameters are just for reference, please test for your design.

PACKAGE OUTLINE

SSOP-24-225-0.635 UNIT: mm



SSOP-24-300-1.0 UNIT: mm





MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

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- Silan reserves the right to make changes to the information herein for the improvement of the design and performance without further notice!
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