CHIP☀NE

集创北方

ICND2150S

(16-Channel PWM Constant Current LED Sink Driver)

Description

The ICND2150S is a 16-channel PWM constant current sink LED driver for 1:16 time multiplexing applications. The constant-current value of all 16 channels is set by a single external resistor.
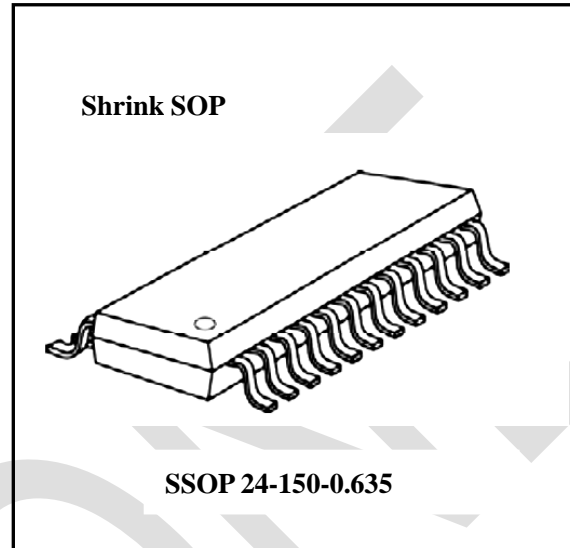
ICND2150S converts serial input date into the gray scale of each pixel by a 16-bit shift register. ICND2150S detects individual LED open errors without extra components. ICND2150S also integrated pre-charge circuit for ghosting reduction.

The ICND2150S exploits precise current regulation technology, with both channel-to-channel error and chip-to-chip error less than ±2.0%.

Features

✦ 16 constant-current output channels
✦ Support time-multiplexing for 1~16 scans
✦ Output current setting range：
  0.5~25mA×16@V_{DD}=5V   constant current output
  0.5~18mA×16@V_{DD}=4.2V constant current output
  0.5~10mA×16@V_{DD}=3.3V constant current output
✦ Current accuracy
   Between channel :< ±2.0 %(Max.)
   Between ICs :< ±2.0 % (Max.)
✦ 8 bit current gain：50%~200%
✦ Low knee voltage
   IOUT=18mA@VDS=0.25V, VDD=4V
✦ Fast response of output current:
   $\overline{OE}$ (min):20ns@V_{DD}=5V
✦ Data transfer frequency: f_{MAX}=25MHz(Max)
✦ Power supply voltage: V_{DD}=3.3～5V
✦ Operating Temperature: –40°C to +85°C
✦ Output current equation

$$Iout = \frac{9.23}{R_{EXT}}$$

✦ Pre-charge for ghosting reduction
✦ LED open detection
✦ Enhanced Circuit for Caterpillar Cancelling
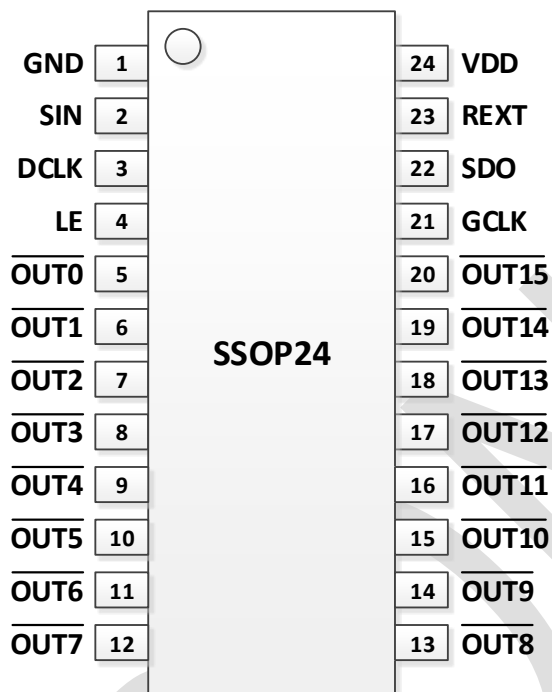✦ Low-gray scale enhancement
✦ Integrating LED protection circuit

Package

Shrink SOP

SSOP 24-150-0.635

ICND2150S

Pin Configuration

SSOP24-P-150-0.635

GND	1		24	VDD
SIN	2		23	REXT
DCLK	3		22	SDO
LE	4		21	GCLK
$\overline{OUT0}$	5	SSOP24	20	$\overline{OUT15}$
$\overline{OUT1}$	6		19	$\overline{OUT14}$
$\overline{OUT2}$	7		18	$\overline{OUT13}$
$\overline{OUT3}$	8		17	$\overline{OUT12}$
$\overline{OUT4}$	9		16	$\overline{OUT11}$
$\overline{OUT5}$	10		15	$\overline{OUT10}$
$\overline{OUT6}$	11		14	$\overline{OUT9}$
$\overline{OUT7}$	12		13	$\overline{OUT8}$

| ICND2150S(SSOP24)		
Pin No.	**Pin Name**	**Function**
1	GND	Power Ground
2	SIN	Serial data input
3	DCLK	Clock input terminal for data shift and command information
4	LE	Data transfer command input
5～20	$\overline{OUT0} \sim \overline{OUT15}$	Constant current output
21	GCLK	The reference clock input pin for PWM gray scale control
22	SDO	Serial data output
23	REXT	Constant-current value setting .Connection to an external resistor to GND
24	VDD	Power-supply voltage

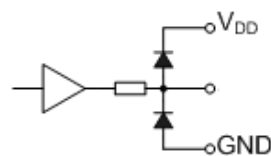## ICND2150S Block Diagram
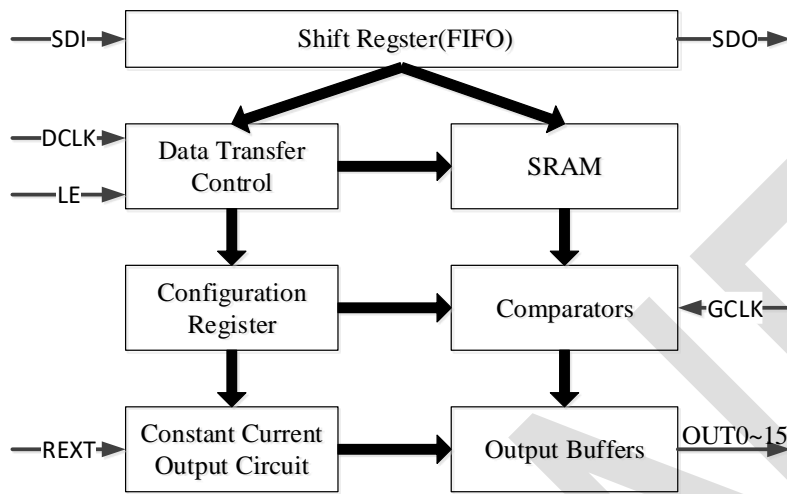
I/O Equivalent Circuits

1. GCLK, SDI, LE
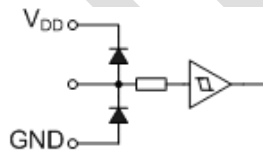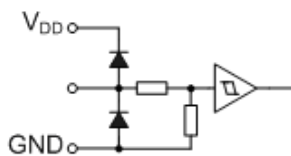
2. DCLK   **3. SDO**

Maximum Rating (Ta=25℃)

Characteristics	Symbol	Rating	Unit
Supply Voltage	V_{DD}	0~6.0	V
Output Current	I_O	25	mA
Input Voltage	V_{IN}	-0.4~V_{DD}+0.4	V
Output voltage	V_{OUT}	10V	
Clock Frequency	F_{CLK}	25	MHz
GND Terminal Current	I_{GND}	+500	mA
Operating Temperature	T_{opr}	-40 ~ 85	℃
Storage Temperature	T_{stg}	-55 ~ 150	℃

Electrical Characteristics (Unless otherwise specified, V_{DD} =3.3~5V，T_a =25℃)

Characteristics	Symbol	Test circuit	Test Conditions	Min	Typ	Max	Unit
High level logic output voltage	V_{OH}	1	I_{OH}=-1mA, SDO	V_{DD}-0.4	-	V_{DD}	V
Low level logic output voltage	V_{OL}	1	I_{OH}=+1mA, SDO	-	-	0.4	V
High level logic input voltage	V_{IH}		0.7*V_{DD}	-	V_{DD}	V	
Low level logic input voltage	V_{IL}	3	GND	-	0.3*V_{DD}	V	
High level logic input current	I_{IH}	2	V_{IN}=V_{DD}, SDI,CLK,LE,GCLK	-	-	1	µA
Low level logic input current	I_{IL}	1	V_{IN}=GND SDI,CLK,LE,GCLK	-1	-	-	µA
Power supply current	I_{DD1}	4	Rext=Open，Out off	-	4.3		mA
	I_{DD2}	4	Rext=10KΩ，Out off	-	4.8		mA
Constant current error	ΔI_O	5	0.5mA~25mA	-	±1.0	±2.0	%
Constant current power supply voltage regulation	%V_{DD}	5	R_{EXT}=3kΩ, $\overline{OUT0}$ ~ $\overline{OUT15}$	-	±0.1	-	%/V
Constant current output voltage regulation	%V_{OUT}	5	V_O=0.6~3.0V, R_{EXT}=3kΩ, $\overline{OUT0}$ ~ $\overline{OUT15}$	-	±0.1		%/V
Pull-down resistor	R_{DOWN}	2	DCLK	100	200	400	kΩ

Test Circuit

Test Circuit1: High level logic input voltage/Low level logic input voltage

$V_{IH} = V_{DD}$
$V_{IL} = 0\ V$
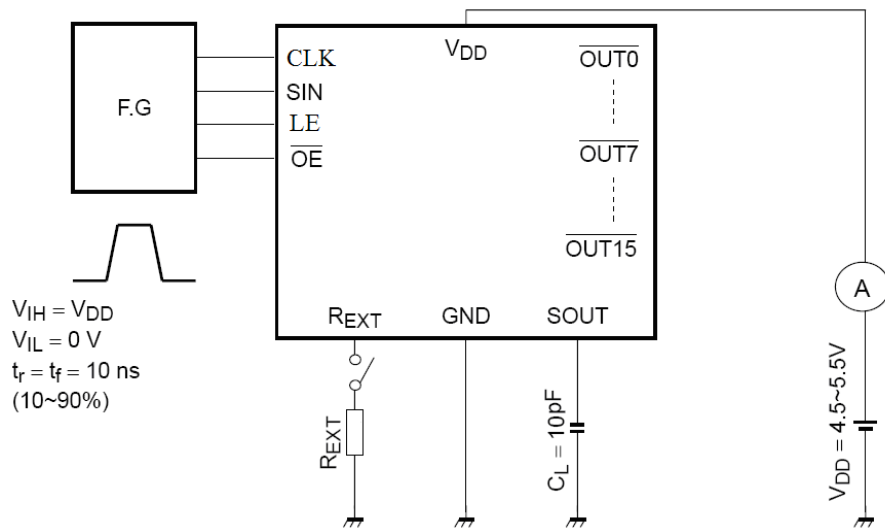$t_r = t_f = 10\ ns$
$(10\sim90\%)$
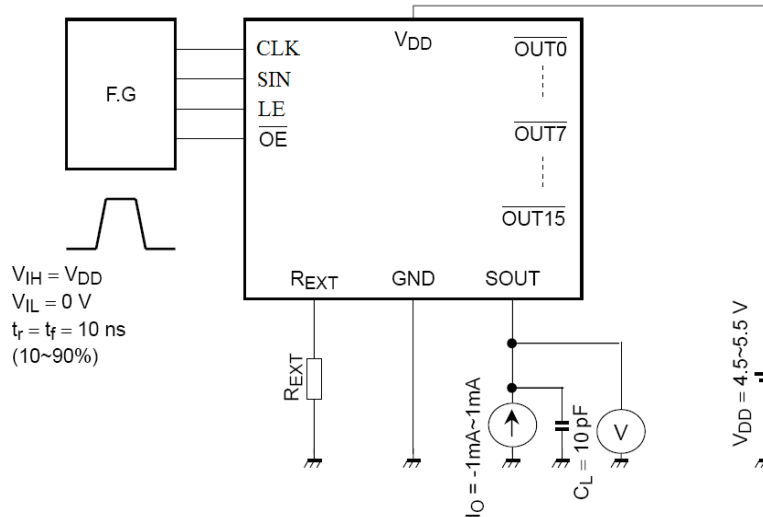
Test Circuit2: High level logic input current/Pull-down resistor
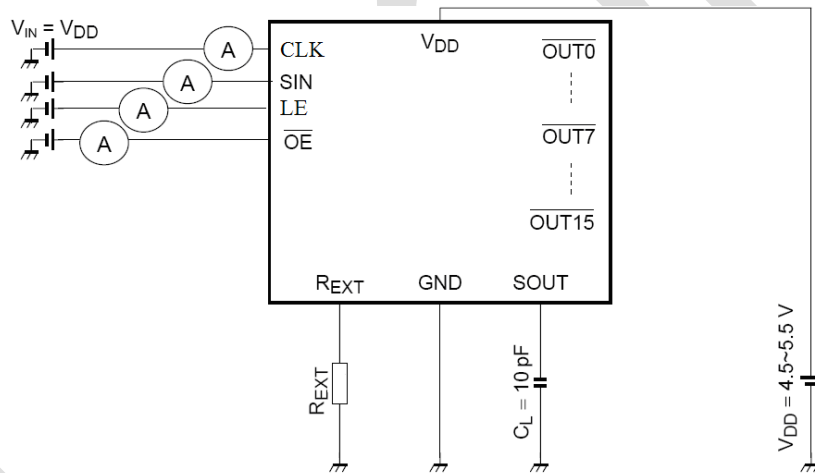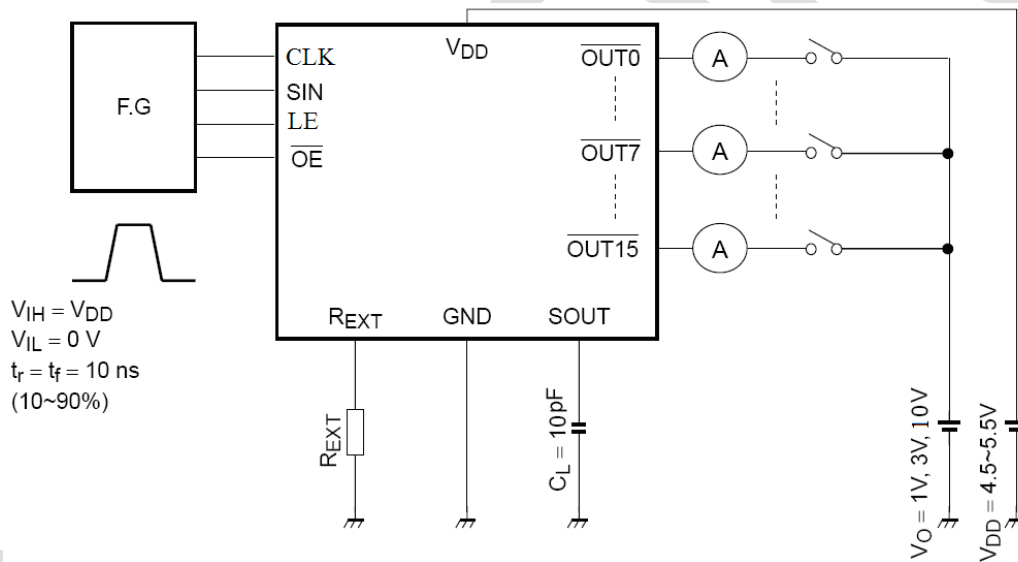

Test Circuit3：Low level logic input current/Pull-up resistor
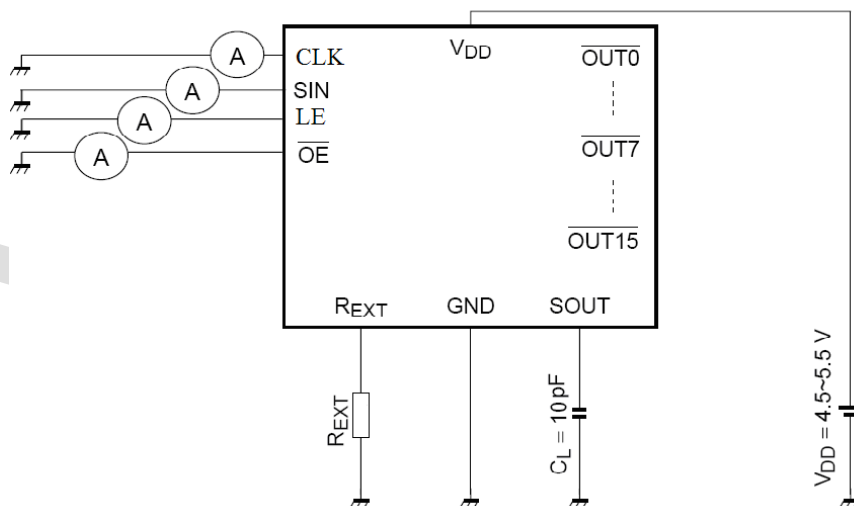
**Test Circuit4: Power supply current**

Test Circuit5: Constant current output/Output OFF leak current/Constant current error
Constant current power supply voltage regulation/Constant current output voltage regulation

Application Information

ICND2150S exploits precise current regulation technology, providing small channel-to-channel and IC-to-IC current variations.

1) The maximum current variation between channels is less than ±2.0%，and that between ICs<±2.0%.

2) The current characteristic of output stage is flat. The output current can be kept constant regardless of the variations of LED forward voltage.
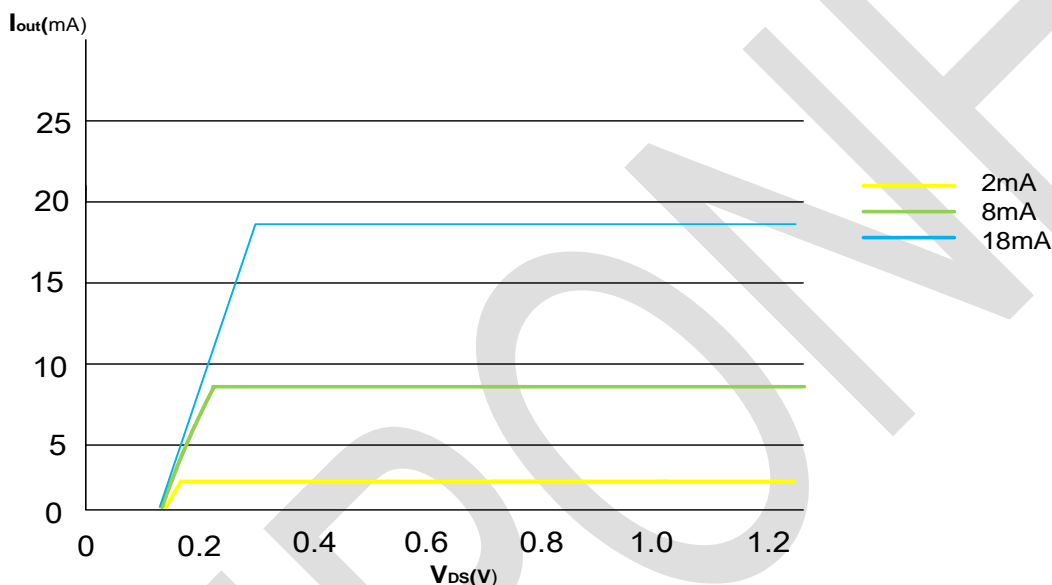
Setting Output Current

The output current (I_{out}) of ICND2150S is set by an external resistor, R_{ext}. The relationship between I_{out} and R_{ext} is：

$$Iout = \frac{9.23}{R_{EXT}}$$ **Igain=100%**

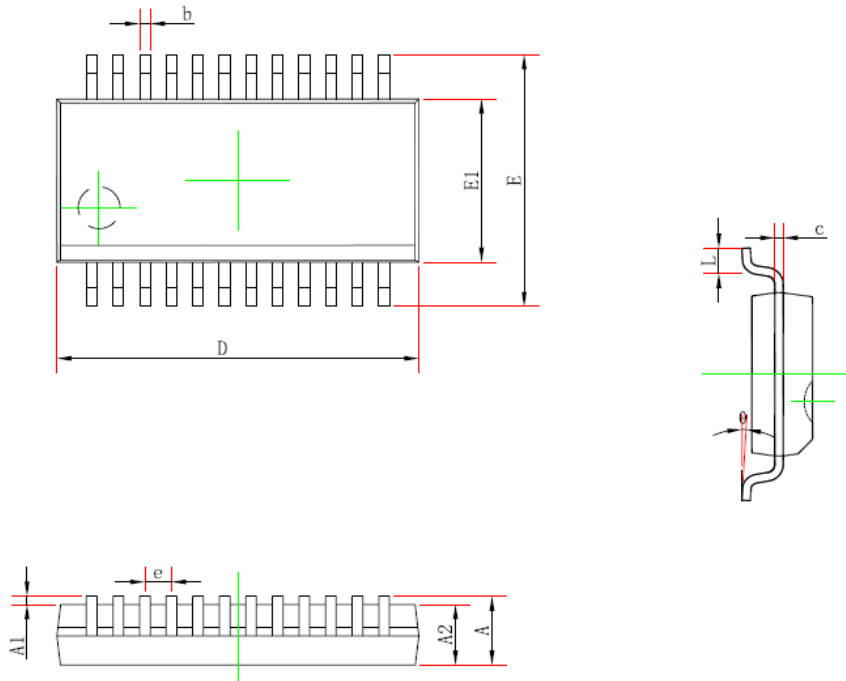Current gain minimum regulation step 0.78%, 192 adjustable

Iout=Igain x 0.78%+50% **192≥Igain**

NOTE:Igain is from 50%-200%.

Package Outline

SSOP24-P-150-0.635

SSOP24（150mil）PACKAGE OUTLINE DIMENSIONS

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	——	1.750	——	0.069
A1	0.100	0.250	0.004	0.010
A2	1.250	——	0.049	——
b	0.203	0.305	0.008	0.012
c	0.102	0.254	0.004	0.010
D	8.450	8.850	0.333	0.348
E1	3.800	4.000	0.150	0.157
E	5.800	6.200	0.228	0.244
e	0.635（BSC）		0.025（BSC）	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Product Ordering Information

Product number	Package （Pb-Free）	Weight （mg）
ICND2150S	SSOP24-0.635	130

Revision History

Rev	Date	Description
1.0	2020/02	Initial Release

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