LED Driver Datasheet

NU514L

4 channel constant current LED driver

Features

- 4 constant current sink outputs
- 12 ~ 200mA channel sink current
- 3V to 12V supply voltage
- Excellent current sink uniformity
  channel to channel: $< \pm 4\%$
  chip to chip: $< \pm 4\%$
- OE pulse width: 120ns
- Schmitt trigger input
- 160℃ thermal half power protect
- Maximum output voltage: 17V
- -40℃ ~ +85℃ operating temperature
- Green package

## Package Type

- SOP8

Product Description

NU514L is a 4 channels constant current sink driver used for LED lighting. NU514L can sink 4 channels constant current simultaneously by the control of a single OE pin. The sink current of output channels can be set easily by an external resistor Rext. Each output channel can be connected with each other to gain higher current driving capability. With this parallel-able output capability, one NU514L can drive constant current from 12mA to 800mA being used to most types of LEDs.

Applications

- General LED Lighting
- Decoration lighting for architecture
- LCD back lighting
- Street lamp
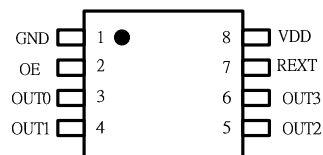
Terminal Description
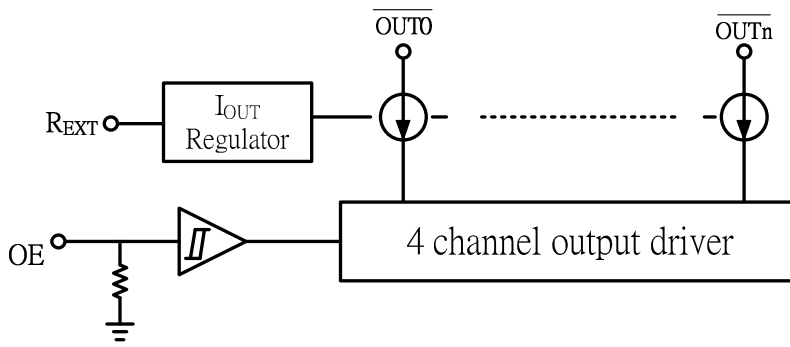
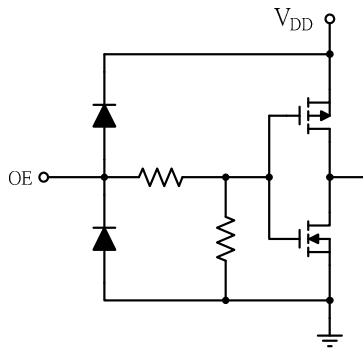| Pin name	Function
V_{DD}	3V~12V power supply
GND	Chip ground pin
R_{EXT}	Current setting resistor
OE	Output enable
OUT0 ~ OUT3	Constant current sink terminals

Protection Circuit

- 8KV output channel ESD protection

Block Diagram

Equivalent Circuits for OE Input

Maximum Ratings (T = 25°C)

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{DD}	0 ~ 16	V
Input pin voltage	V_{IN}	-0.2 ~ V_{DD}	V
Output current	I_{OUT}	240	mA/Channel
Output voltage	V_{OUT}	-0.2 ~ 24.0	V
Total GND terminals current	I_{GND}	1000	mA
Power Dissipation (On PCB)	PD	1	W
Thermal Resistance	$R_{TH(j-a)}$	100	°C /W
Junction temperature	T_j	135	°C
Operating temperature (Ambient)	T_{OPR}	-40~+85	°C
Storage temperature	T_{STG}	-55~+150	°C

Electrical Characteristics and Recommended Operating Conditions

Characteristic		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage		V_{DD}	Room Temp.	3	-	12	V
Output port sustaining voltage		V_{OUT}	$I_{OUT} = 0mA$	-	-	17	V
Output current		I_{OUT}	OUTn = 1V	12	-	200	mA
Output leakage		I_{LEAK}	$V_O = 7V$ and channel off	-	-	0.5	uA
Channel current skew (Output)		dI_{OUT1}	$I_{OUT} = 80mA, V_{OUT} = 1V$	-	-	±4	%
Center current skew (IC)		dI_{OUT2}	$I_{OUT} = 80mA, V_{OUT} = 1V$	-	-	±4	%
Line regulation		$\%/dV_{DD}$	$R_{EXT} = 900\Omega, V_{OUT} = 1V$	-	-	±1	%
Load regulation		$\%/dV_{OUT}$	$R_{EXT} = 900\Omega$	-	-	±1	%
Input voltage		V_{IH}		$0.7V_{DD}$	-	-	V
		V_{IL}		-	-	$0.3V_{DD}$	V
Thermal protect (Junction temperature)		T_{HalfP}	Half current output	-	160	-	°C
Pull down resistor (OE)		R_{PU}		400	500	700	KΩ
Supply current	All output "Off"	$I_{DD1(off)}$	R_{EXT} = Open, all output off	-	-	1	mA
		$I_{DD2(off)}$	$R_{EXT} = 900\Omega$, all output off	-	4	-	mA
		$I_{DD3(off)}$	$R_{EXT} = 600\Omega$, all output off	-	5	-	mA
	All output "On"	$I_{DD1(on)}$	$R_{EXT} = 900\Omega$, all output on	-	5	-	mA
		$I_{DD2(on)}$	$R_{EXT} = 600\Omega$, all output on	-	6	-	mA

Switching Characteristics

| Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time (OE from "L" to "H")	t_{pLH}	V_{DD}=4V, V_{OUT}=1V, I_{OUT}=80mA, OE= 0V → 4V	300	-	450	nS
Output current rising time (OE from "L" to "H")	t_{OERise}	V_{DD}=4V, V_{OUT}=1V, I_{OUT}=80mA, OE= 0V → 4V	100	-	250	nS
Propagation Delay Time (OE from "H" to "L")	t_{pHL}	V_{DD}=4V, V_{OUT}=1V, I_{OUT}=80mA, OE= 4V → 0V	300	-	450	nS
Output current falling time (OE from "H" to "L")	t_{OEFall}	V_{DD}=4V, V_{OUT}=1V, I_{OUT}=80mA, OE= 4V → 0V	100	-	250	nS

Please visit

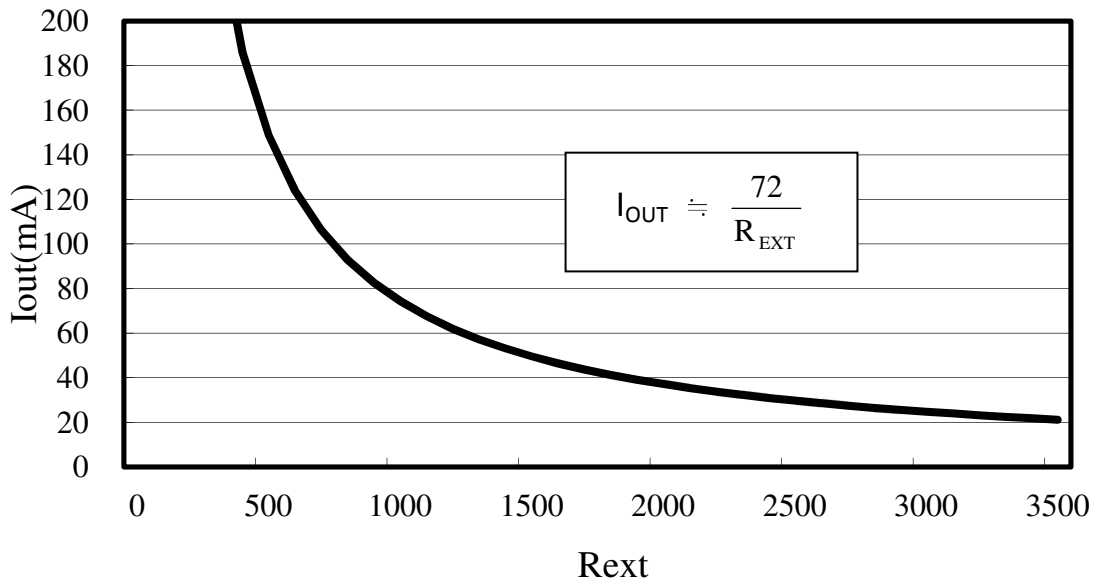## Test Circuit for Switching Characteristics
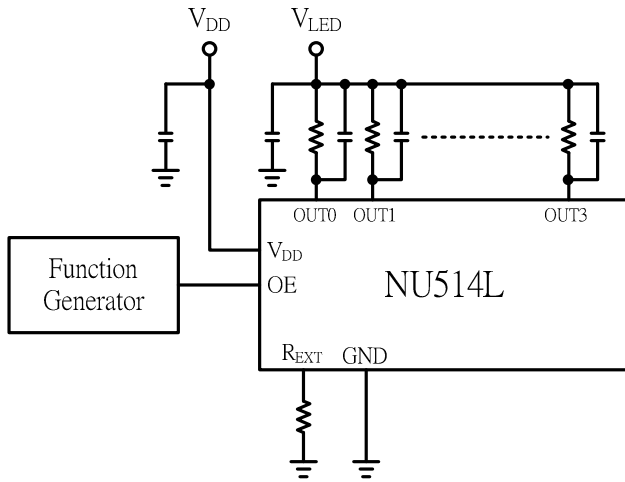
Timing Waveforms
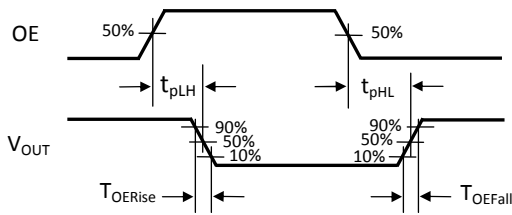
I/V curve
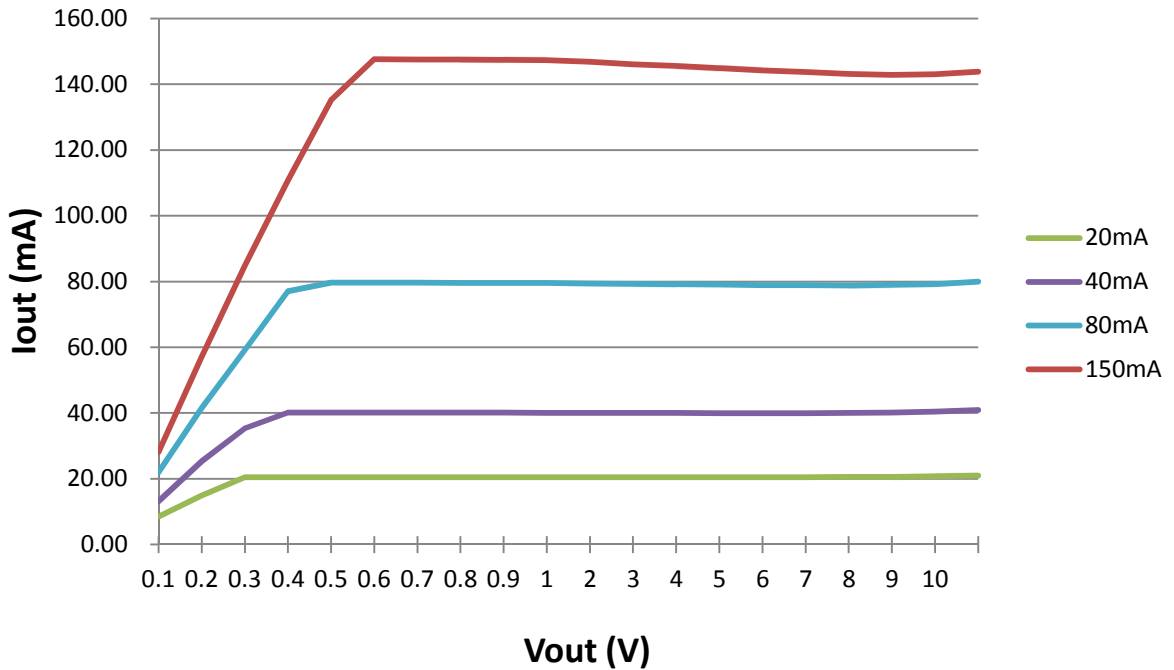
Output Current Setting

The output current of each channel of NU514L is set by an external resistor (R_{EXT}). The relationship between output current and external resistor is shown in the figure or calculated from the equation following.


$$I_{OUT} \fallingdotseq \frac{72}{R_{EXT}}$$

Application Notes

- In order to maximize the heat dissipation capability and keep the NU514L function normally, the thermal pad under   SOP package should be soldered to the PCB and connect to the ground net of system. More the ground area, more the heat dissipation capability that NU514L relies on.

- The V_{OUT} should be as low as possible near the knee point of the output I/V curve to minimize the heat generation from NU514L. An external resistors or zener diodes can be used to minimize V_{OUT} in the output current path. The suggestion V_{OUT} voltage is between 0.4v to 1v.
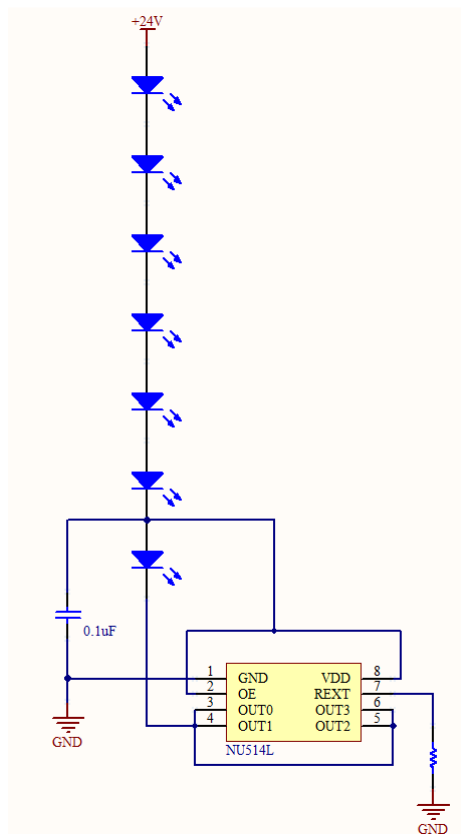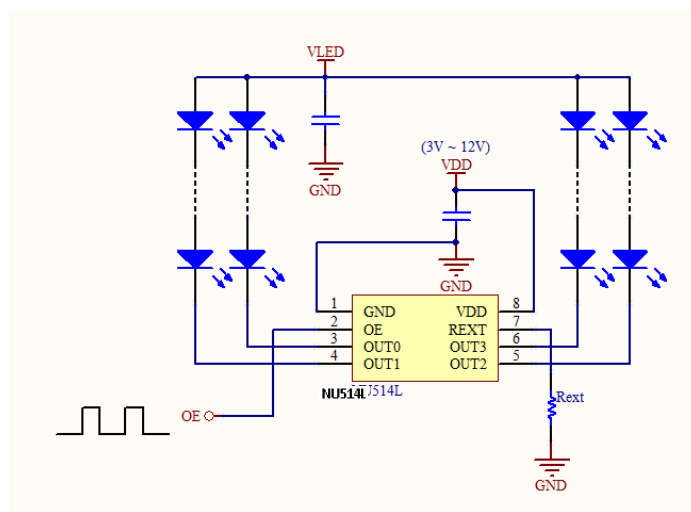
Ex: $V_{OUT} = V_{LED} - (V_{DROP} + V_F)$
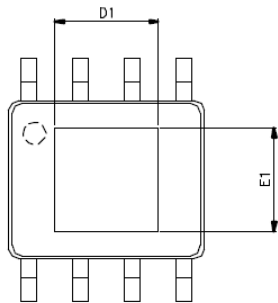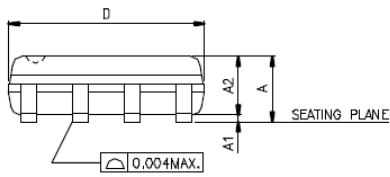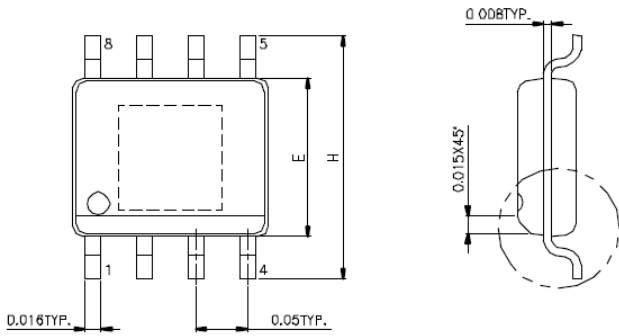
Please visit
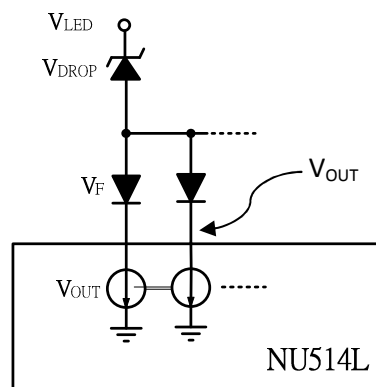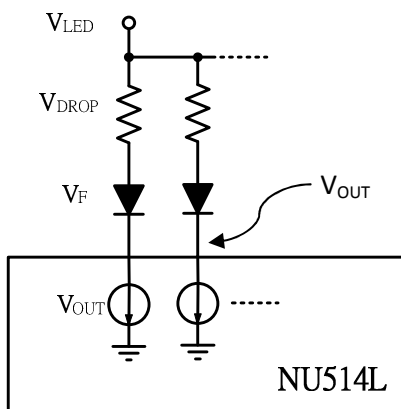
● The R$_{EXT}$ ground path should be as short and wide as possible to minimize the chip current skew.
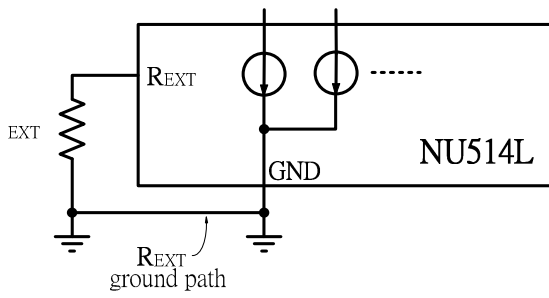
Typical Application Circuit

Please visit

Package Dimensions

E.P. VERSION ONLY
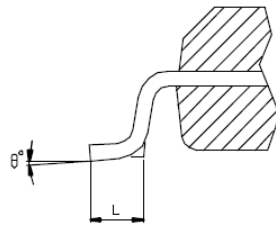
SYMBOLS	MIN.	MAX.
A	0.053	0.069
A1	0.002	0.006
A2	–	0.059
D	0.189	0.196
E	0.150	0.157
H	0.228	0.244
L	0.016	0.050
θ°	0	8

UNIT : INCH

THERMALLY ENHANCED DIMENSIONS

PAD SIZE	E1	D1
90X90E	0.081 REF	0.081 REF
95X130E	0.086 REF	0.117 REF

UNIT : INCH

Please visit