NIPPON PRECISION CIRCUITS INC.

SM8130 series

White LED Driver IC

OVERVIEW

The SM8130 series are a doubler charge pump DC/DC converter with built-in constant current circuit (independent 3ch). Stable output supply can be realized by an input series regulator and an output side charge pump. 1 to 3 lights of white LED connected in parallel can be lighted. Current variation among LED is reduced due to the independent 3ch constant circuit. Current value sent to white LED can be set by supply level of CONT pin. In addition, brightness can also be adjusted by controlling of CONT pin supply.

FEATURES

- 1 to 3 lights of white LED (connected in parallel) lighted
- Output current value can be set by CONT pin supply (0.25V: 10mA/pcs, 0.50V: 20mA/pcs)
- Brightness adjustable by controlling of CONT pin supply
- Current variation among LED decreased by high precision
- LED current regulation function for LED protection from excess current
  ($I_{LIMIT1\ to\ 3}$ = 30mA ± 10%)
- Input voltage range: 2.7 to 4.6V
- Output voltage: 5.0V (typ)
- Quiescent current: 3.5mA (typ)
- Standby current: 1.0µA (max)
- Switching frequency: 500kHz (typ)
- LED current accuracy: 20mA ± 3%
  (V_{CONT} = 0.50V)
- Package: 10-pin SON

APPLICATIONS

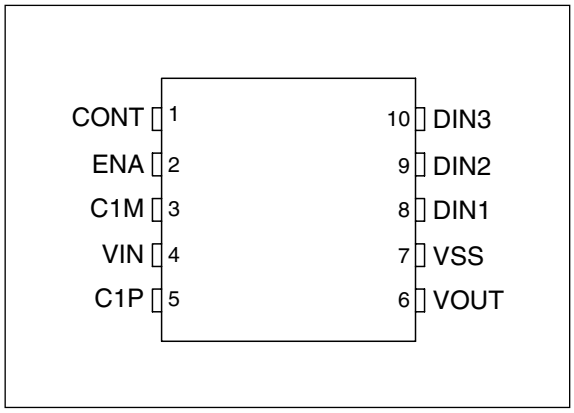
- Cellular phone
- Pager
- Digital still camera
- Handy terminal
- PDAs
- Portable games
- White LED driving
- Smart card reader
- USB port
- Li-ion battery backup supply
- PCMCIA local 5V supply
- Local 3V to 5V conversion

ORDERING INFORMATION

Device	Package
SM8130A50D	10-pin SON

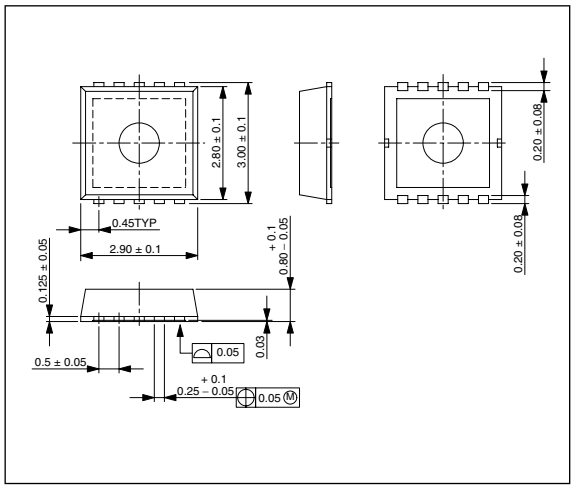
PINOUT

(Top view)

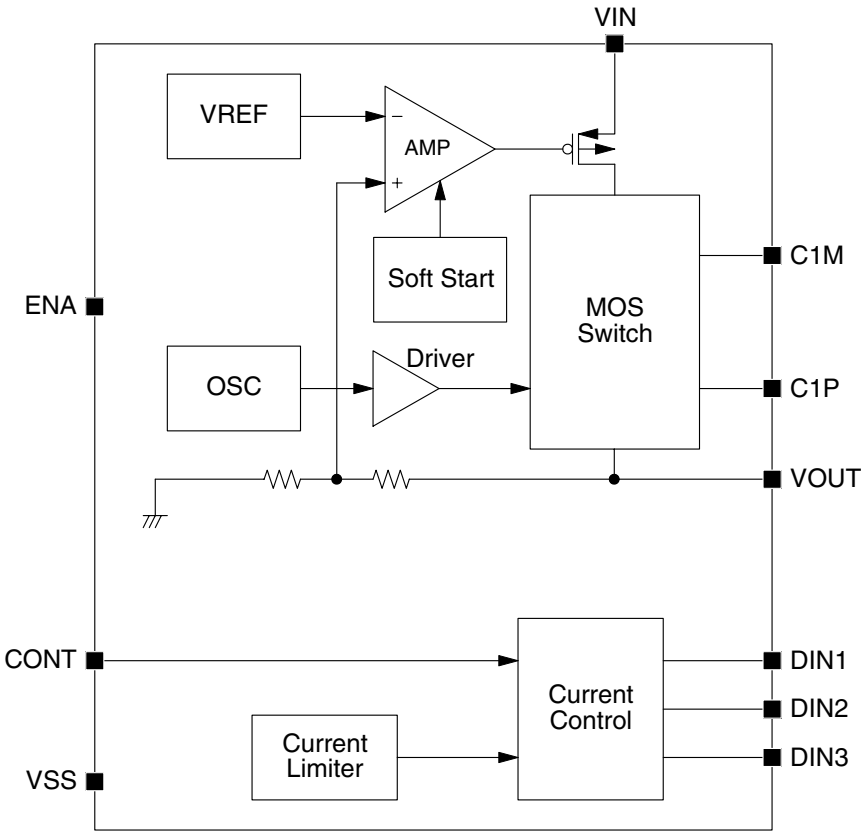


PACKAGE DIMENSIONS

(Unit: mm)



BLOCK DIAGRAM



PIN DESCRIPTION

Number	Name	I/O	Description
1	CONT	I	LED driving current control voltage input pin
2	ENA	Ip*1	Chip enable (High active)
3	C1M	–	Charge pump capacitor connection pin 1M
4	VIN	–	Power supply
5	C1P	–	Charge pump capacitor connection pin 1P
6	VOUT	O	LED driving voltage output pin
7	VSS	–	GND
8	DIN1	O	LED driving current control output pin 1
9	DIN2	O	LED driving current control output pin 2
10	DIN3	O	LED driving current control output pin 3

*1. Input with built-in pull-down resistor

SPECIFICATIONS

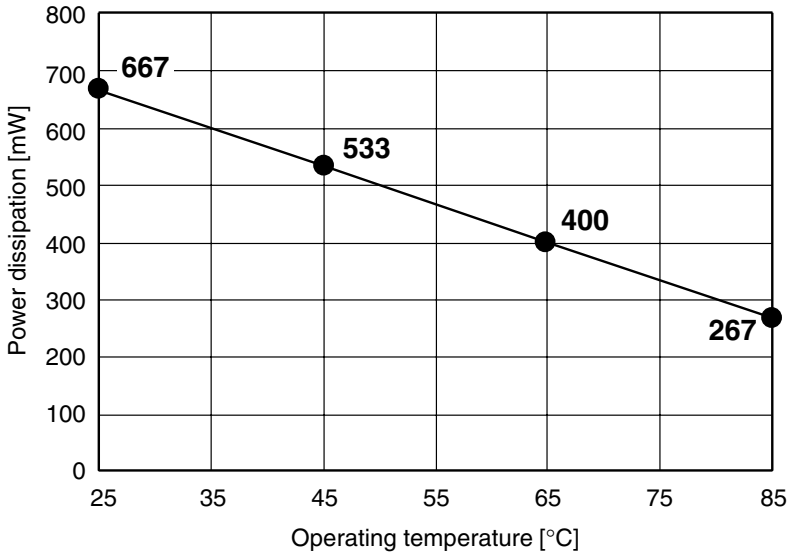
Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage range	V_{IN}	–0.3 to 6.5	V
Input voltage range	V_{ENA}, V_{CONT}	V_{SS} – 0.3 to V_{IN} + 0.3	V
Output voltage range	$V_{DIN1\ to\ 3}$	V_{SS} – 0.3 to V_{IN} + 0.3	V
	V_{OUT}	6.5	V
Power dissipation	P_D	667 (Ta = 25°C)*1	mW
Operating temperature range	T_{opr}	–30 to 85	°C
Storage temperature range	T_{stg}	–55 to 125	°C

*1. When mounted on a 23 × 32 × 1.6mm glass-epoxy substrate, the relation of power dissipation and operating temperature see below.

- Power dissipation: P_D [mW]
- Maximum junction temperature: T_{MAX} = 125°C
- Operating temperature: Ta [°C]
- Thermal resistance: θ_J = 150°C/W

$$P_D = \frac{(T_{MAX} - Ta)}{\theta_J}$$



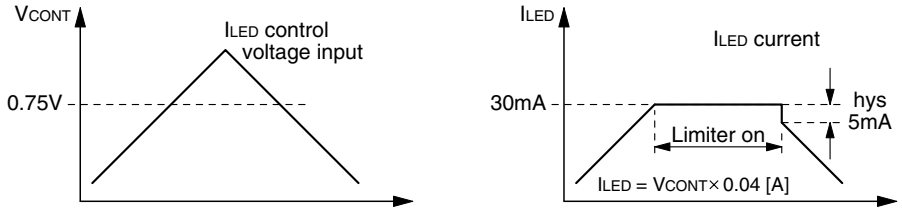
Electrical Characteristics

V_{IN} = 3.6V, V_{SS} = 0V, Ta = 25°C unless otherwise noted

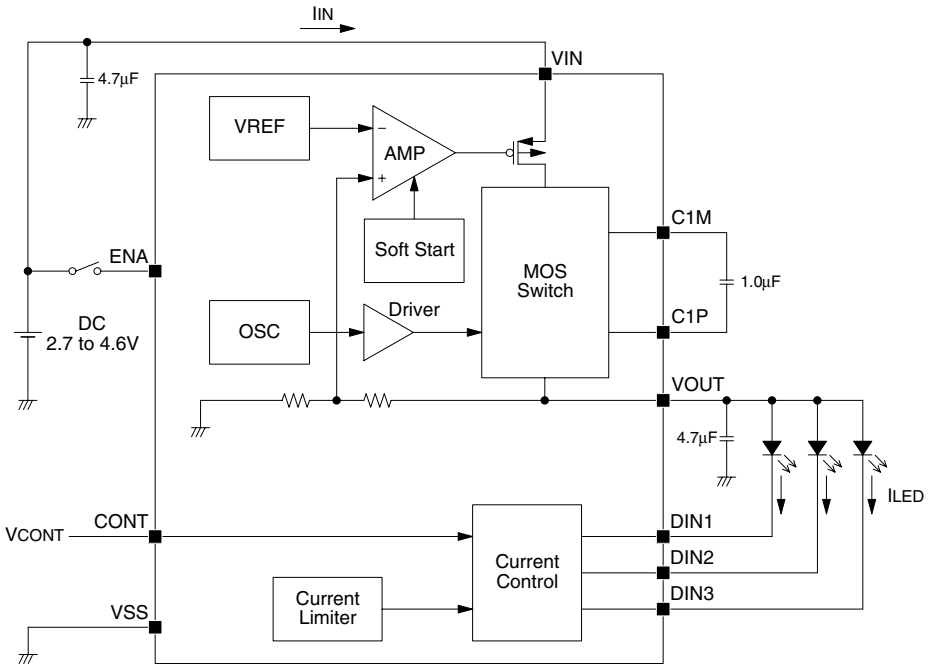
Parameter	Pin	Symbol	Condition	Rating			Unit
				min	typ	max	
Supply voltage	VIN	V_{IN}		2.7	3.6	4.6	V
Standby current	VIN	I_{STB}	V_{ENA} = 0V	–	0.01	1.0	µA
Quiescent current	VIN	I_{DD}	I_{LOAD} = 0mA	–	3.5	5.0	mA
Output voltage	VOUT	V_{OUT}	I_{OUT} = 60mA	4.8	5.0	5.2	V
Maximum output current	VOUT	I_{OUT}	V_{OUT} = 5.0V	–	–	100	mA
Switching frequency	C1M, C1P	f_{OSC}		450	500	550	kHz
Soft start time	DIN1 to 3	T_{SS}		–	1.0	2.0	ms
Offset current	DIN1 to 3	$I_{OFFSET1\ to\ 3}$	V_{CONT} = 0V	–	0.3	1.5	mA
LED current	DIN1 to 3	$I_{LED1\ to\ 3}$	V_{CONT} = 0.5V	19.4	20.0	20.6	mA
Limit current	DIN1 to 3	$I_{LIMIT1\ to\ 3}$	V_{CONT} = 1.0V	27.0	30.0	33.0	mA
Leak current	DIN1 to 3	I_{LEAK}	V_{ENA} = 0V, $V_{DIN1\ to\ 3}$ = 5.0V	–	–	1.0	µA
Input voltage	ENA	V_{IH}		1.8	–	–	V
		V_{IL}		–	–	0.6	V
Input current	ENA	I_{IH}	V_{ENA} = 3.6V	–	10.0	20.0	µA
	CONT	I_{CONTL}	V_{CONT} = 0V	–	–	1.0	µA
		I_{CONTH}	V_{CONT} = V_{IN}	–	–	1.0	µA

FUNCTIONAL DESCRIPTION

LED driving current is able to control by regulating CONT pin input voltage. The relation between V_{CONT} and I_{LED} is I_{LED} [A] = 0.04 × V_{CONT} [V]. If CONT pin input voltage is over the limit value, the LED current limiter turns on to keep ILED at a constant limit current. By the CONT input hysteresis, V_{CONT} − I_{LED} relation has a discontinuity area at limiter turning off.



TYPICAL APPLICATIONS



V_{CONT}	I_{LED}/pcs	I_{IN}
0.125V	5mA/pcs	35mA
0.250V	10mA/pcs	65mA
0.375V	15mA/pcs	95mA
0.500V	20mA/pcs	125mA

Please pay your attention to the following points at time of using the products shown in this document.

The products shown in this document (hereinafter "Products") are not intended to be used for the apparatus that exerts harmful influence on human lives due to the defects, failure or malfunction of the Products. Customers are requested to obtain prior written agreement for such use from NIPPON PRECISION CIRCUITS INC. (hereinafter "NPC"). Customers shall be solely responsible for, and indemnify and hold NPC free and harmless from, any and all claims, damages, losses, expenses or lawsuits, due to such use without such agreement. NPC reserves the right to change the specifications of the Products in order to improve the characteristic or reliability thereof. NPC makes no claim or warranty that the contents described in this document dose not infringe any intellectual property right or other similar right owned by third parties. Therefore, NPC shall not be responsible for such problems, even if the use is in accordance with the descriptions provided in this document. Any descriptions including applications, circuits, and the parameters of the Products in this document are for reference to use the Products, and shall not be guaranteed free from defect, inapplicability to the design for the mass-production products without further testing or modification. Customers are requested not to export or re-export, directly or indirectly, the Products to any country or any entity not in compliance with or in violation of the national export administration laws, treaties, orders and regulations. Customers are requested appropriately take steps to obtain required permissions or approvals from appropriate government agencies.

NPC
NIPPON PRECISION CIRCUITS INC.

NIPPON PRECISION CIRCUITS INC.

4-3, Fukuzumi 2-chome, Koto-ku,
Tokyo 135-8430, Japan
Telephone: +81-3-3642-6661
Facsimile: +81-3-3642-6698
http://www.npc.co.jp/
Email: sales@npc.co.jp

NC0209AE 2003.09