九齊科技股份有限公司

Nyquest Technology Co., Ltd.

DATA SHEET

NY1D Series

Low Power Constant Current LED Driver

Version 1.0

Sep. 29, 2012

Revision History

Version	Date	Description	Modified Page
1.0	2012/9/29	First release.	-

1. 概述

NY1D系列產品爲單晶片CMOS的LED驅動IC，目前只有1個母體 NY1D003A。NY1D系列是一個非常簡單的線性定電流元件，提供三通道的恆流輸出，有 20mA 或 30mA 的兩種電流輸出形態。具有絕佳的負載與電源調變率和極小輸出電流誤差，能使 LED 的電流非常穩定；而在大面積的光源上，即使電源及負載的變動範圍很大時，都能讓LED亮度保持均勻一致，並增長LED使用壽命。提供IC致能功能(CE)，可配合數位 PWM 控制線路，達到更精準的灰階電流控制。

2. 功能

(1). 寬廣的工作電壓： V_{DD} = 1.8V ~ 6.4V。

(2). 只有1個母體 NY1D003A，可支援3通道的20mA或30mA的恆流輸出。

(3). 低輸出壓降，V_{OUT} ≧ 0.2V 即可保持恆流。

(4). 小於 0.1μA 的靜態電流。

(5). +/- 1%/V 的電源及負載調變率。

(6). ZTC電流補償線路，可在-40 ~ +85ºC溫度範圍內保持電流恆定。

(7). 提供快速的 IC 致能控制 (CE)，電位上升/電位下降時間僅有2μs，可用來搭配高速的 PWM 調光；或是將 CE 腳短接到VDD，由VDD來做PWM 調光。

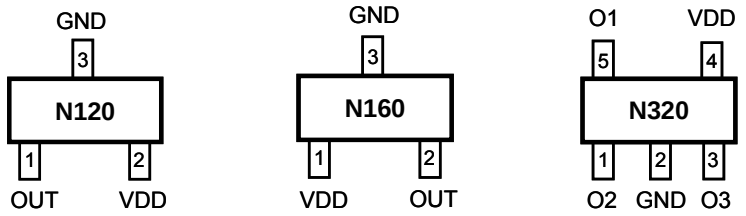
(8). 提供 VDD≦1.6V 的低電壓關閉保護功能 (Under Voltage Lock Out, UVLO)，可以在上電瞬間或電源不穩定時對IC或線路進行保護。

(9). 每通道都提供輸出短路/開路的線路保護。

(10). 高達 4KV 的人體靜電模式 (HBM) 的 ESD 保護。

(11). 提供多種出貨型態，以滿足客戶不同的應用需求。*(接受客製化輸出電流)*

編號	*LED 電流*	*通道數*	*封裝*
NY1D003A-N120	20mA	1	SOT23-3
NY1D003A-N160	60mA	1	SOT23-3
NY1D003A-N320	20mA	3	SOT23-5



1. GENERAL DESCRIPTION

The NY1D series are single-chip LED Drive CMOS IC. There is only one body of NY1D003A currently. NY1D003A is a very simple linear LED driver, which provides 3-channel constant current output with 20mA or 30mA. With excellent load/line regulation and minimized current skew, LED current can be kept very stable. In large range of LED light source, it makes the light intensity very uniform and extends LED lifetime even when power or load fluctuate in a wide range. A chip-enable (CE) function is also provided for digital PWM control to achieve more precise current adjusting of gray level.

2. FEATURES

(1). Wide operating voltage range: V_{DD} = 1.8V ~ 6.4V.

(2). There is one body, NY1D003A. It provides 3-channel constant current output with 20mA or 30mA.

(3). Very low dropout voltage for constant current. ($V_{OUT} \geqq$ 0.2V)

(4). Less than 0.1μA standby current.

(5). Less than 1%/V load or line regulation.

(6). ZTC current compensation for constant current in wide range temperature of -40 ~ +85ºC.

(7). Chip-Enable (CE) with short current-rising/falling time of 2μs can control LED dimming by high frequency PWM input. With a short circuit between CE and VDD, PWM dimming can be also controlled by VDD.

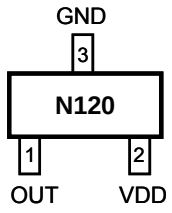
(8). When VDD is under 1.6V, the Under-Voltage-Lock-Out (UVLO) function will be enabled to prevent IC or circuit unstable while power up or is unstable.

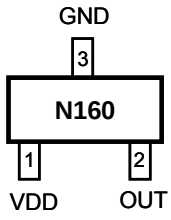
(9). Offer output short / open circuit protection for each channel.

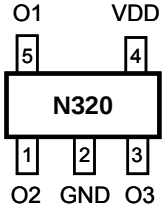
(10). High 4KV HBM ESD protection.

(11). Various shipping type for different application requirement. *(Accept customized output current)*

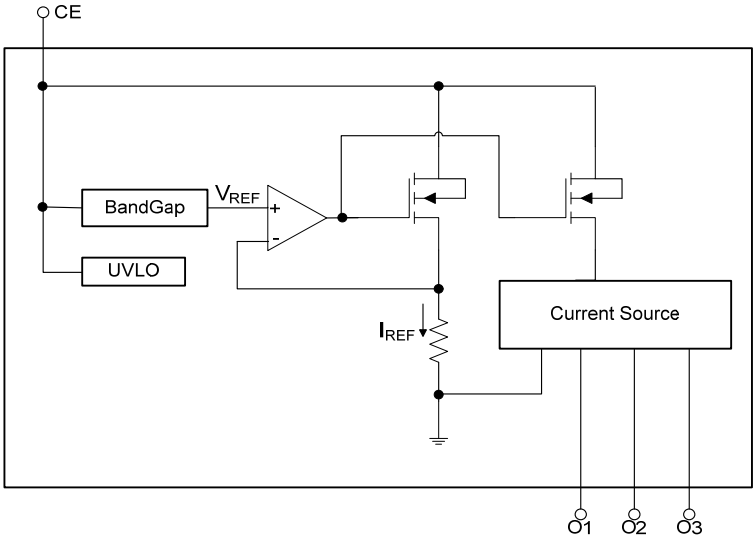
P/N	*LED Sink Current*	*Channel No.*	*Package*
NY1D003A-N120	20mA	1	SOT23-3
NY1D003A-N160	60mA	1	SOT23-3
NY1D003A-N320	20mA	3	SOT23-5





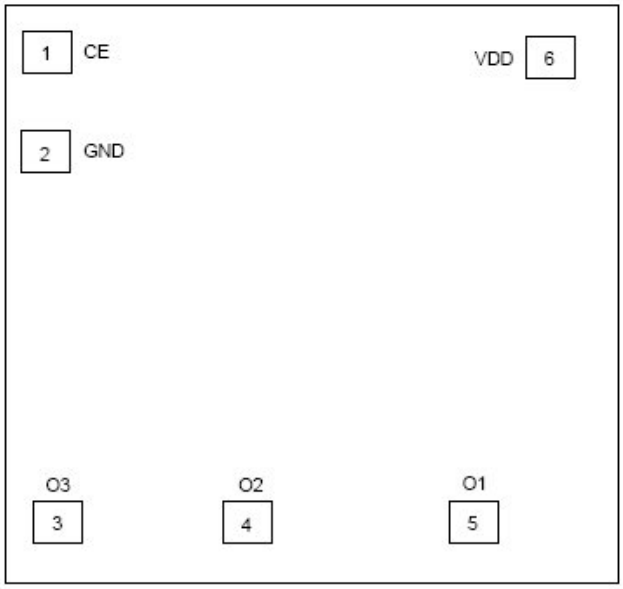


3. BLOCK DIAGRAM



4. PAD DESCRIPTION

Pad Name	Pad No.	ATTR.	Description
CE	1	I	Chip enable, active high.
GND	2	Power	Negative power.
O3	3	O	LED output channel-3, sink connection.
O2	4	O	LED output channel-2, sink connection.
O1	5	O	LED output channel-1, sink connection.
VDD	6	Power	Positive power.



* The IC substrate must be connected to GND or Floating.

5. ABSOLUTE MAXIMUM RATING

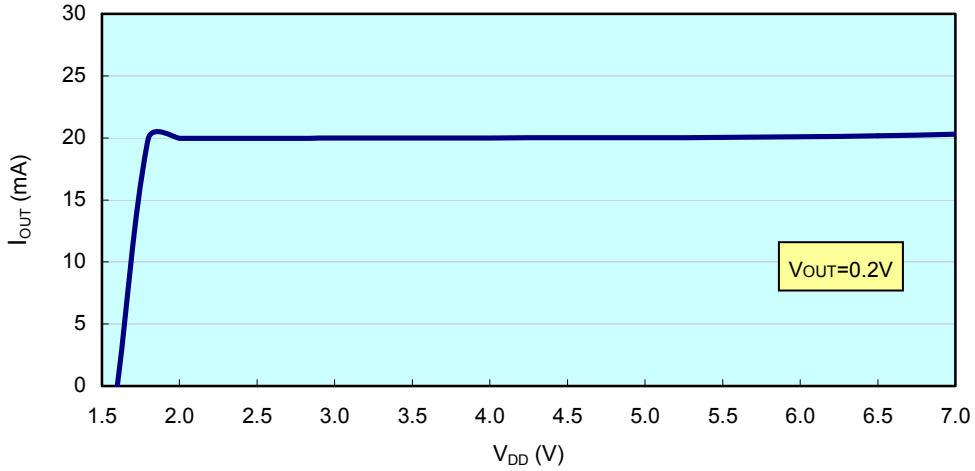
Symbol	Parameter	Rating	Unit
V_{DD} ~GND	Supply voltage	-0.5 ~ +7.0	V
V_{IN}	Input voltage	GND-0.3 < V_{IN} < V_{DD}+0.3	V
V_{OUT}	Output voltage	GND < V_{OUT} < V_{DD}	V
P_D	Power dissipation	350	mW
θ_{JA}	Thermal Resistance	220	ºC/W
T_A	Ambient temperature	-40 ~ +85	ºC
T_J	Junction temperature	150	ºC
T_{ST}	Storage temperature	-65 ~ +150	ºC

6. DC CHARACTERISTICS *(V_{DD}=5.0V, V_{OUT}=2.0V, T_A=25ºC, unless otherwise specified)*

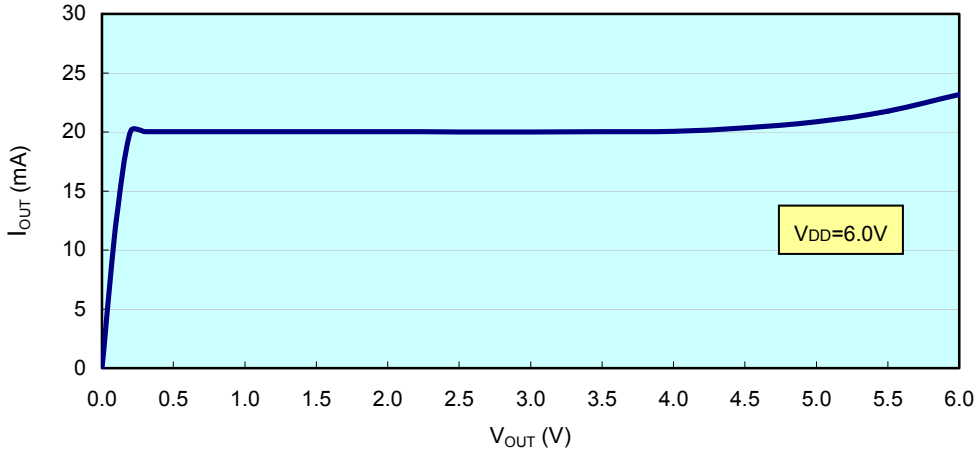
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
V_{DD}	Operating voltage	1.8		6.4	V	
I_{OP}	Operating current		200		µA	V_{DD}=3V, no loading
			230		µA	V_{DD}=5V, no loading
I_{SB}	Standby current		0.01	0.1	µA	V_{DD} < 7.0V, CE disable
$I_{LEAKAGE}$	Output leakage current		0.01	0.1	µA	V_{OUT} < 7.0V, CE disable
V_{IH}	Input voltage “High” of CE	0.8			V	CE enable
V_{IL}	Input voltage “Low” of CE			0.7	V	CE disable
I_{IH}	Input current “High” of CE		0.01	0.1	µA	CE enable
I_{IL}	Input current “Low” of CE		0.01	0.1	µA	CE disable
T_R & T_F	Rising/Falling time of CE/V_{DD}		2		µs	
V_{UVLO}	Under Voltage Lock Out		1.6		V	
V_{OUT}	Output low voltage	0.2			V	I_{OUT} = 20mA
		0.3			V	I_{OUT} = 30mA
I_{OUT}	Chip current deviation (20mA)	19	20	21	mA	V_{OUT} ≧ 0.2V
	Chip current deviation (30mA)	28.5	30	31.5	mA	V_{OUT} ≧ 0.3V
$\triangle I_{CH}$	Channel current deviation	-1		1	%	$\frac{I_{max} - I_{average}}{I_{average}}$ $\frac{I_{average} - I_{min}}{I_{average}}$
$\triangle I_T$	Temperature current deviation	-1.5		1.0	%	-40 ~ +85ºC

7. OPERATING CHARACTERISTICS

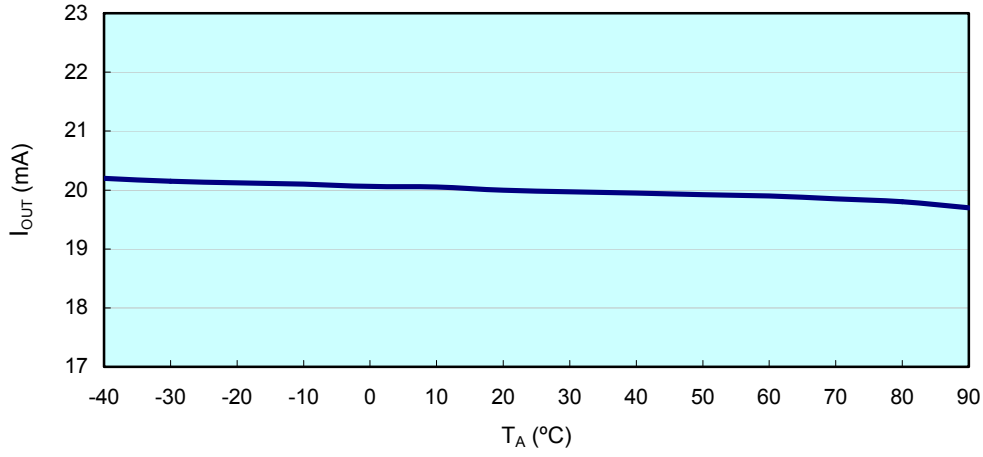
LED Current vs. Input Voltage (Line Regulation)



LED Current vs. Output Voltage (Load Regulation)

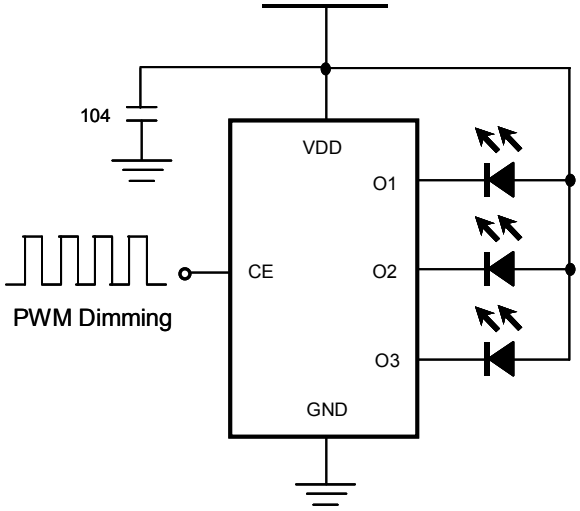


LED Current vs. Temperature

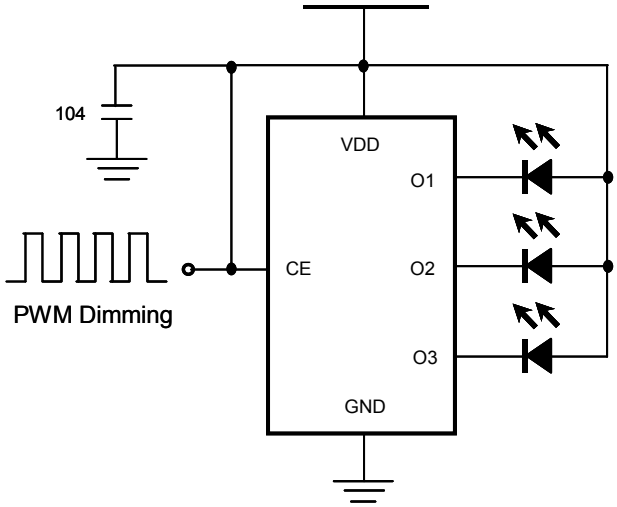


8. APPLICATION

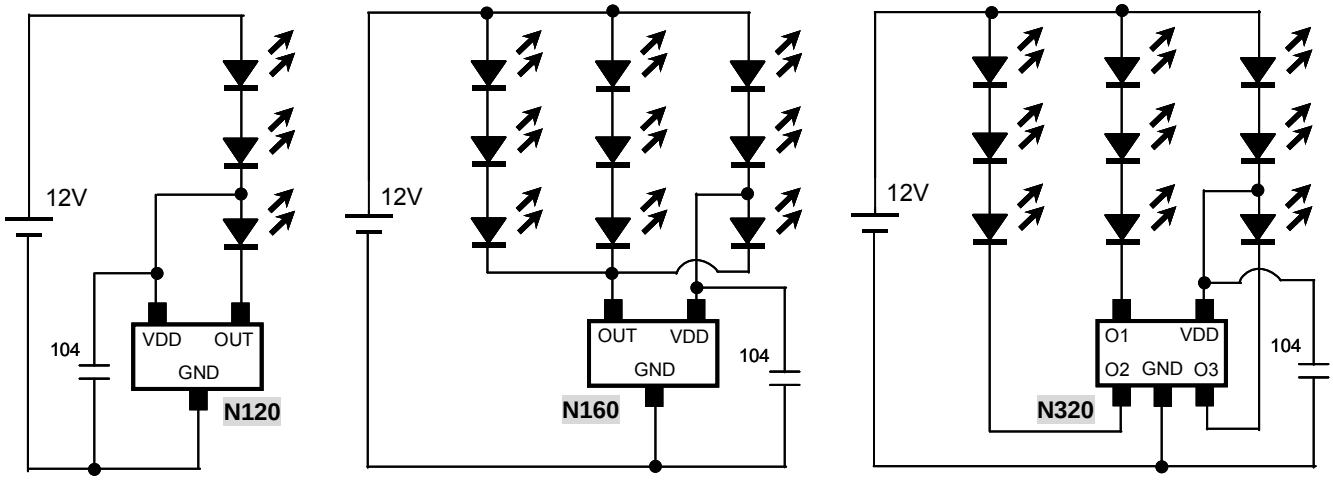
(1) 3 LEDs with CE PWM Dimming Control



(2) 3 LEDs with VDD PWM Dimming Control



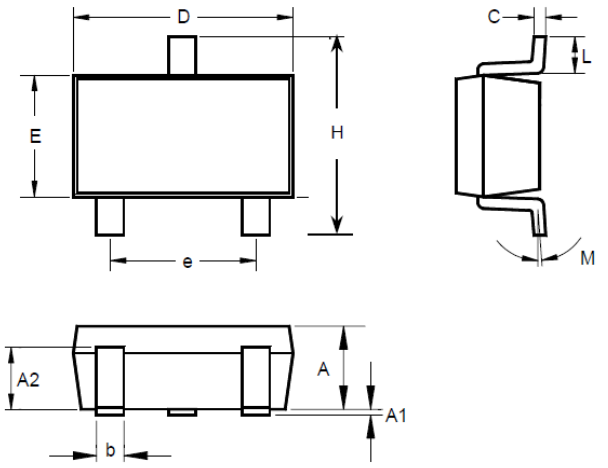
(3) N120, N160 and N320 for 12V Light Bar



** Please contact Nyquest or her agents for more application such as LED Lighting, LED Light Bar, LCD Backlight or RGB Lighting.*

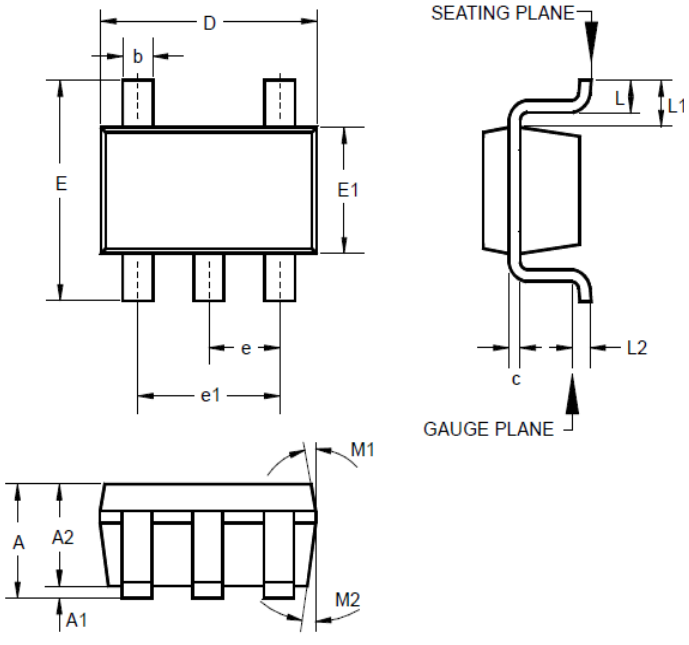
9. PACKAGE DIAGRAM

SOT23-3 Dimension



SYMBOL	MILLIMETERS		
	MIN	TYP	MAX
A	1.00	1.10	1.30
A1	0.00	0.05	0.10
A2	0.70	0.80	0.90
b	0.32	0.35	0.38
C	0.08	0.15	0.25
D	2.70	2.90	3.10
E	1.57	1.60	1.63
e	1.90 TYP.		
H	2.75	2.80	2.85
L	0.20	0.40	0.50
M	0°	5°	9°

SOT23-5 Dimension



SYMBOL	MILLIMETERS		
	MIN	TYP	MAX
A	1.09	1.15	1.21
A1	0.02	0.05	0.08
A2	1.07	1.10	1.13
b	0.32	0.35	0.38
c	0.10	0.15	0.20
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95 BSC		
e1	1.90 BSC		
L	0.37	0.40	0.60
L1	0.60 REF		
L2	0.25 BSC		
M1	7° REF		
M2	7° REF		

10. ORDERING INFORMATION

P/N	Shipping Type	Remarks
NY1D003A-020	Die	3 channels LED Driver each with 20mA.
NY1D003A-030	Die	3 channels LED Driver each with 30mA.
NY1D003A-0xx	Die	3 channels LED Driver each with customized current.
NY1D003A-N120	SOT23-3	1 channel LED Driver with 20mA.
NY1D003A-N160	SOT23-3	1 channel LED Driver with 60mA.
NY1D003A-N320	SOT23-5	3 channels LED Driver each with 20mA.