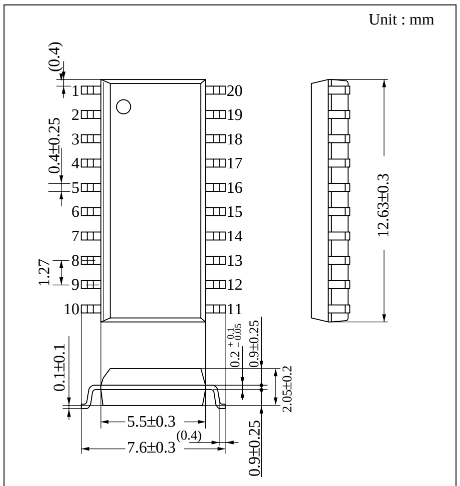
DN8667NS

8-Bit Shift Register Latch Constant Current Driver IC

■ Overview

The DN8667NS is a semiconductor integrated circuit which incorporates a 8-bit shift register, a latch driver and a constant current driver to satisfy the demand for equalization of LED panel brightness. It also incorporates the serial-in and serial-out/parallel-out functions. It employs the Bi-CMOS process : The 8-step shift register block and latch block consist of CMOS while the 8-step parallel driver block is bipolar.



20-pin SOP Package (SOP020-P-0300A)

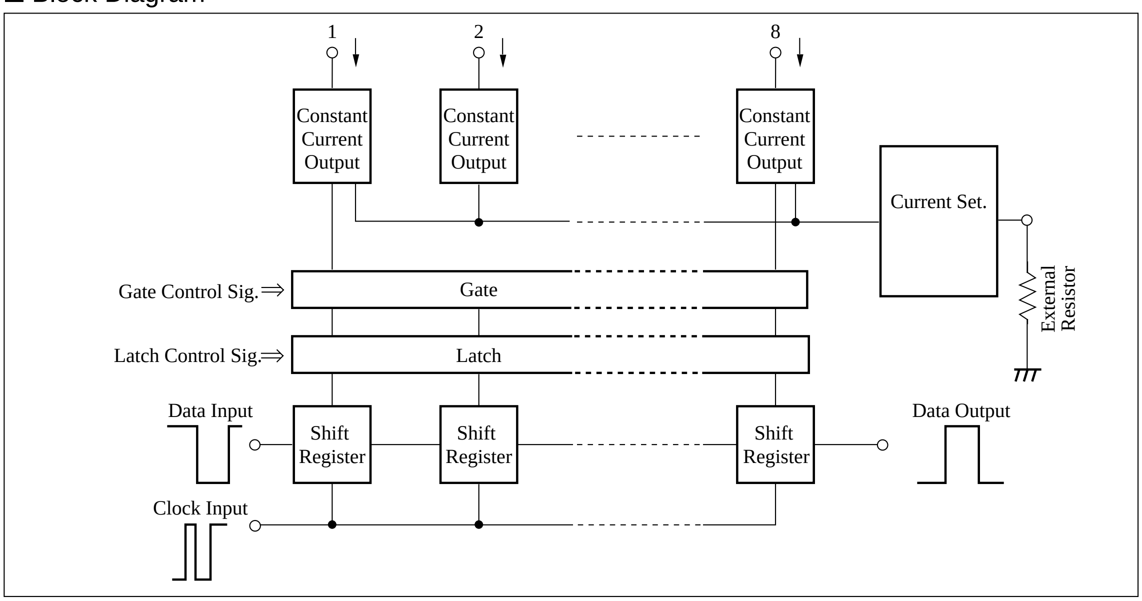
■ Features

- Serial-in, serial-out/parallel-out
- Cascade connection possible
- Constant current output (0 to 100 mA able to be set by one external resistor)
- Output-forced ON/OFF terminal attached (EN)
- Input/Output CMOS compatible

■ Application

- LED panel drive

■ Block Diagram



■ Absolute Maximum Rating (Ta = 25˚C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	0 to + 7.0	V
Output voltage	V_O	0 to + 14	V
Output current	I_O	150	mA
Power dissipation*	P_D	1.28	W
Operating ambient temperature	T_{opr}	–20 to + 85	˚C
Storage temperature	T_{stg}	–55 to + 150	˚C

* For printed board SM, it decreases with rate of 10.24 mW/˚C from Ta = 25 ˚C.

■ Recommended Operation Range (Ta=25 ˚C)

Parameter	Symbol	Range
Operating supply voltage	V_{CC}	4.5V to 5.5V

■ Electrical Characteristics (V_{CC}=5V,Ta=25 ± 2˚C)

Parameter		Symbol	Condition		min	typ	max	Unit
Input voltage	Positive direction	V_{T+}	V_{SOUT} = 0.1, V_{CC} – 0.1V $\lvert I_{SOUT}\rvert$ = 20µA		0.35V_{CC}	—	0.7V_{CC}	V
	Negative direction	V_{T-}	I_O ($\overline{Qn}$) = –10µA, 90mA V_O ($\overline{Qn}$) = 0.6V I_{ref} = –2.5mA		0.2V_{CC}	—	0.55V_{CC}	V
Input current		I_{IH}	V_{1H} = 5.0V		—	—	25	µA
		I_{IL}	V_{1L} = 0V		– 25	—	—	µA
Output voltage (SOUT)		V_{OH}	I_{OH} = – 0.4mA		4.0	—	—	V
		V_{OL}	I_{OL} = 1.6mA		—	—	0.5	V
Output current 1 ($\overline{Qn}$)		I_{OI}	V_O ($\overline{Qn}$) = 0.5V		—	—	100	mA
Output current 2 ($\overline{Qn}$)		I_{OI}	V_{CC} = 5.0V, I_{ref} = –12mA V_O ($\overline{Qn}$) = 1.0V		83	—	117	mA
Output current error between bits		DI_O			—	—	±6	%
Output leak current		I_{OLK}	V_O= 14V (Output OFF)		—	—	25	µA
Supply current		I_{CC1}	Total Driver Output OFF, V_{CC}=5.5V	I_{ref} = 0mA	—	—	2	mA
		I_{CC2}	Total Driver Output OFF, V_{CC}=5.5V	I_{ref} = –2.5mA	—	—	20	mA
		I_{CC3}	Total Driver Output ON, V_{CC}=5.5V	I_{ref} = –2.5mA	—	—	30	mA
Clock frequency		f_{CLK}	CLK	Input Duty 40 to 60%	—	—	20	MH_Z
Input pulse width		t_w	CLK	V_{CC}=5.0V R_L=50Ω C_L=15pF	20	—	—	ns
			STB		20	—	—	ns
Setting-up time		t_{su}	SIN		20	—	—	ns
			STB		15	—	—	ns
Holding time		t_h	SIN		20	—	—	ns
			STB		10	—	—	ns
Clock pulse rise time		t_r			—	—	500	ns
Clock pulse fall time		t_f			—	—	500	ns

Note) V_{CC}= 5V unless otherwise specified.

■ Pin Descriptions

Pin No.	Symbol	Pin name	Description
1	DGND	Digital ground	Digital ground
2	SIN	Serial data input	It is the serial data input terminal for shift register.
3	CLK	Clock input	The value of shift register shifts at the rising edge of clock input.
4	STB	Strobe input	Setting the STB input to "H" forwards the data of shift register to the latch. When the STB input is set to "L" , even if the value of shift register changes, the value of latch is not changed.
5 7,8 10,11 13,14 16	$\overline{Qn}$	Driver output	It outputs signals by using the polarity opposite to that of data taken into the latch. For example, when the value of serial input is "H" , the output becomes "L" level and the output is turned on. The output takes open collector form of NPN transistor.
6 9,12 15	PGND	Output ground	Output ground
17	EN	Enabling input	When the EN input is set to "H" , all the outputs are turned off, independent of condition of shift register or latch driver.
18	SOUT	Serial data output	It is the terminal which performs the serial-output of data inputted from the SIN.
19	RC	Constant current setting input	It connects the external resistor between RC and GND and sets the current of output block. * Output current calculation : $\underset{(A)}{I_O(\overline{Qn})} \approx \frac{20 \times V_{CC}\,(V)}{R_{RC}\,(\Omega) + 90}$ or $\underset{(\Omega)}{R_{RC}} \approx \frac{1}{2}\left(\frac{V_{CC}\,(V)}{I_{RC}\,(A)} - 180\right)$ ** RC terminal setting calculation : $\underset{(A)}{I_{RC}} \approx \frac{V_{CC}\,(V)}{2 \times R_{RC}\,(\Omega) + 180}$
20	V_{CC}	V_{CC}	Supply terminal

* Calculation example
$V_{CC} = 5V$
$R_{RC} = 910\Omega$

$I_O(\overline{Qn}) \approx \frac{20 \times 5}{910 + 90}$

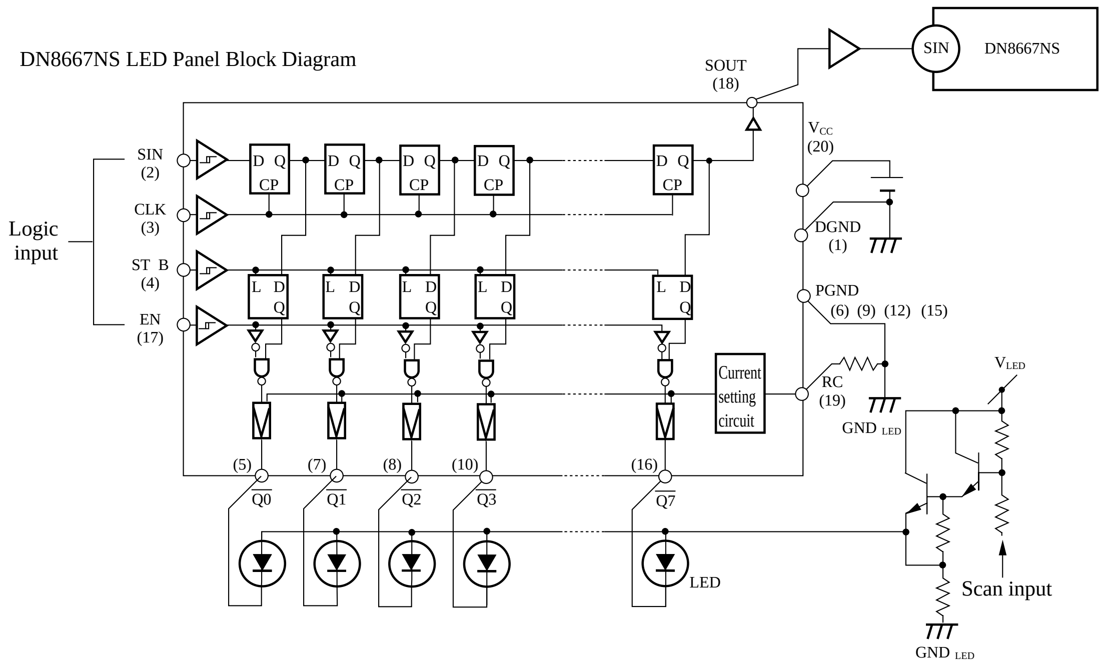
$I_O(\overline{Qn}) \approx 100mA$

** Calculation example
$V_{CC} = 5V$
$I_{RC} = 0.0025A$

$R_{RC} \approx \frac{1}{2}\left(\frac{5}{0.0025} - 180\right)$

$R_{RC} \approx 910\ (\Omega)$

■ Application Circuit



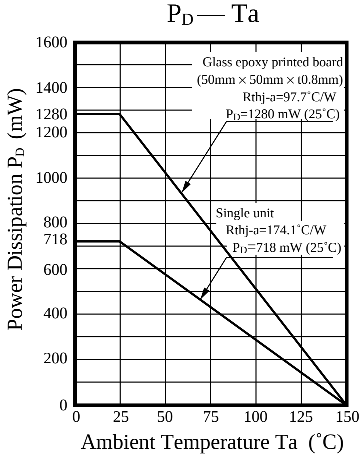
■ Function Table (Note)

Input				Output			
CLK	STB	EN	SIN	$\overline{Q_O}$	$\overline{Q_m}$	$\overline{Q_7}$	SOUT
↑	H	L	Q_n	$\overline{Q_n}$	$\overline{Q_{m-1}}$	$\overline{Q_6}$	Q_6
↑	L	L	Q_n	nc	nc	nc	Q_6
↑	×	H	Q_n	H	H	H	Q_6
↓	×	×	Q_n	nc	nc	nc	nc

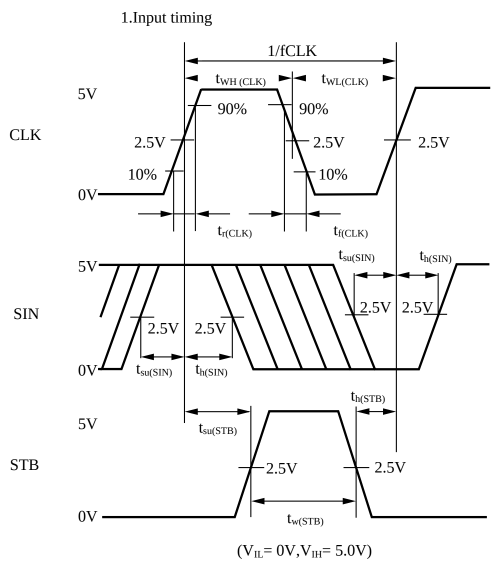
(Note)
H : High level,
L : Low level,
× : H or L
Q_m, Q_n : H or L.
However, for $\overline{Q_n}$, "H"= OFF, "L"= ON.
↑ : Shift from L to H,
↓ : Shift from H to L
nc : No change

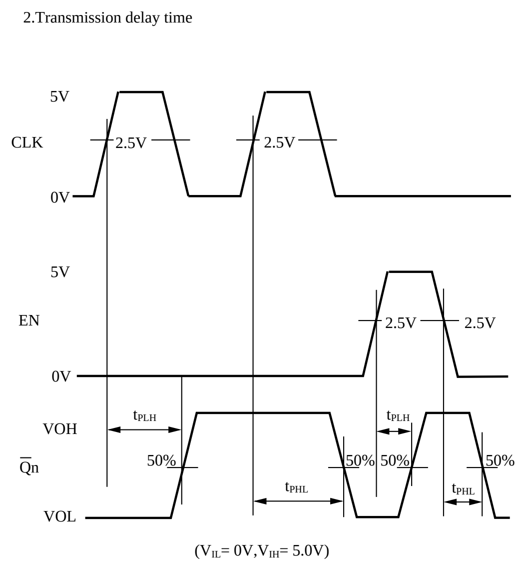
■ Characteristics Curve

P_D — Ta



■ Timing Chart





Request for your special attention and precautions in using the technical information and semiconductors described in this material

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.

(3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.

(6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.

Please read the following notes before using the datasheets

A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.

B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.