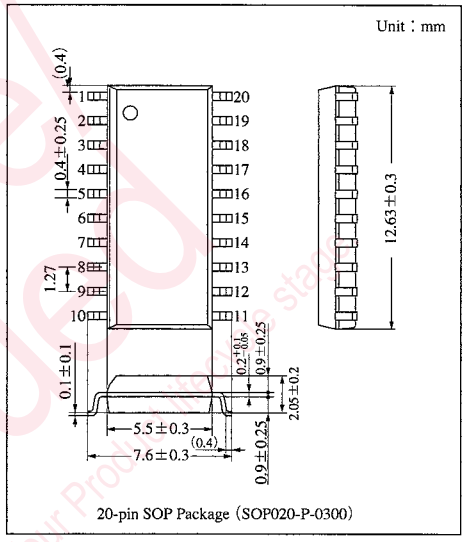
DN8665S

8-Bit Shift Register Latch Constant Current Driver IC

■ Overview

The DN8665S 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.



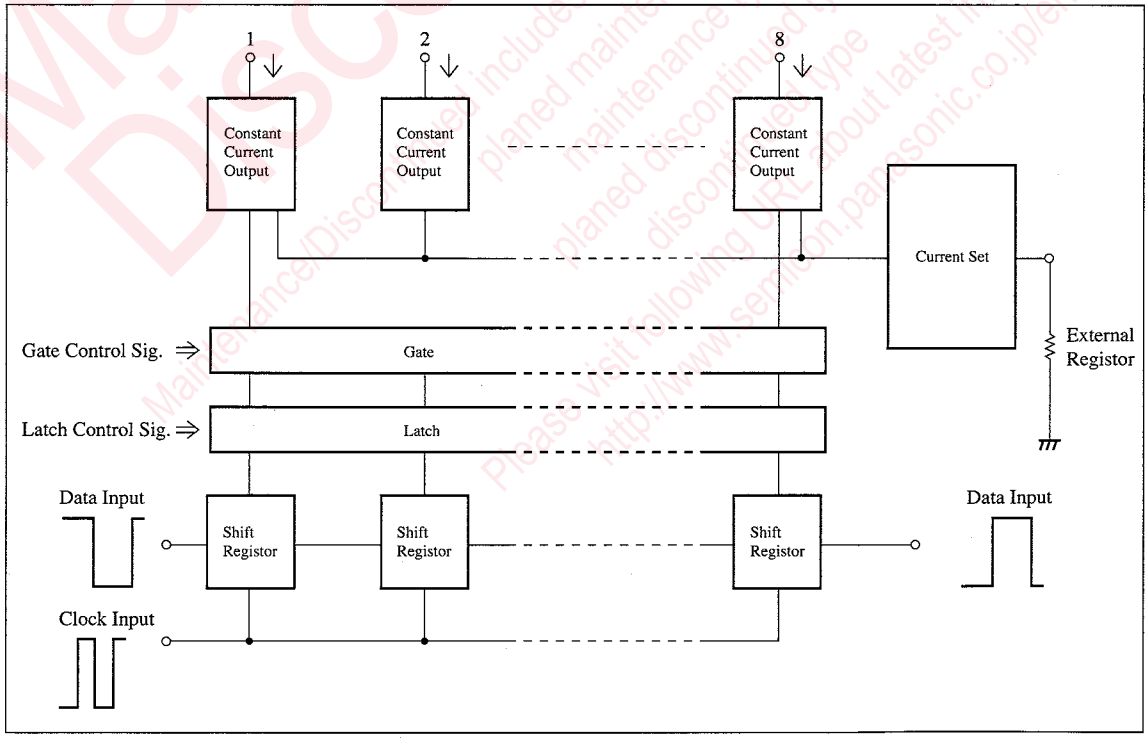
■ Features

- Serial-in, serial-out/parallel-out
- Cascade connection possible
- Constant current output (0 to 60 mA able to be set by one external resistor)
- Output-forced ON/OFF pin provided (EN)
- Input/Output CMOS compatible

■ Application

- LED panel drive

■ Block Diagram



Others

■ Absolute Maximum Rating (Ta=25 ℃)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	0 to +7.0	V
Input voltage	V_I	−0.4 to V_{CC}+0.4	V
Output voltage Note 1)	V_O	0 to +30	V
Output current	I_O	80	mA
Single unit IC power dissipation Note 2)	P_D	0.718	W
Reference printed board mounting power dissipation Note 2)	P_D	1.374	W
Operating ambient temperature	T_{opr}	−20 to +85	℃
Storage temperature	T_{stg}	−55 to +150	℃

Note 1) When output is off
Note 2) It is specified for reference printed board SM (glass epoxy printed board : 50×50×0.8mm) .
It decreases with rate of 11.0 mW/℃ from Ta=25 ℃.

■ Recommended Operation Range (Ta=25 ℃)

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

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

Parameter		Symbol	Condition	min	typ	max	Unit
Input voltage	Positive direction	V_{T+}	V_{SOUT}=0.1, V_{CC}−0.1V; I_{SOUT}=20 µA	0.35V_{CC}	—	0.7V_{CC}	V
Input voltage	Negative direction	V_{T-}	I_O ($\overline{Qn}$) =10 µ, 22mA; V_O ($\overline{Qn}$) =1.0V I_{ref}=−12mA	0.2V_{CC}	—	0.55V_{CC}	V
Input current		I_{IH}	V_{IH}=5.0V	—	—	25	µA
Input current		I_{IL}	V_{IL}=0V	−25	—	—	µA
Output voltage (SOUT)		V_{OH}	V_{CC}=5.0V, I_{OH}=−0.4mA	4.0	—	—	V
Output voltage (SOUT)		V_{OL}	V_{CC}=5.0V, I_{OL}=1.6mA	—	—	0.5	V
Output current		I_O	V_O ($\overline{Qn}$) =0.8V	—	—	60	mA
Output current error between bits		ΔI_O	V_{CC}=5.0V, I_{ref}=−12mA; V_O ($\overline{Qn}$) =1.0V	—	—	±6	%
Output leak current		I_{OLK}	V_O=30V (Output OFF)	—	—	50	µA
Output leak current		I_{OLK}	V_O=15V (Output OFF)	—	—	25	µA
Supply current		I_{CC1}	Total Driver Output OFF, V_{CC}=5.5V, I_{ref}=0mA	—	—	6	mA
Supply current		I_{CC2}	Total Driver Output OFF, V_{CC}=5.5V, I_{ref}=−12mA	—	—	45	mA
Supply current		I_{CC3}	Total Driver Output ON, V_{CC}=5.5V, I_{ref}=−12mA	—	—	55	mA
Maximum clock frequency		f_{max}	CLK; V_{CC}=5.0V, R_L=50Ω, C_L=15pF	12	—	—	MHz
Transmission delay time		t_{PLH}	CLK → SOUT; V_{CC}=5.0V, R_L=50Ω, C_L=15pF	—	—	100	ns
Transmission delay time		t_{PHL}	CLK → SOUT	—	—	100	ns
Transmission delay time		t_{PLH}	CLK → $\overline{Qn}$	—	—	350	ns
Transmission delay time		t_{PHL}	CLK → $\overline{Qn}$	—	—	350	ns
Transmission delay time		t_{PLH}	EN → $\overline{Qn}$	—	—	350	ns
Transmission delay time		t_{PHL}	EN → $\overline{Qn}$	—	—	350	ns
Transmission delay time		t_{PLH}	STB → $\overline{Qn}$	—	—	350	ns
Transmission delay time		t_{PHL}	STB → $\overline{Qn}$	—	—	350	ns

■ Recommended Operation Conditions (Ta = −20 ~ +85℃)

Parameter		Symbol	Condition	min	typ	max	Unit
Supply voltage		V_{CC}		4.5	5.0	5.5	V
Output voltage		V_O		—	—	30	V
Input voltage		V_I		0	—	V_{CC}	V
Clock frequency		f_{CLK}	Input Duty 40 to 60%	—	—	12	MHz
Input pulse width	CLK	t_W		33	—	—	ns
	STB			33	—	—	ns
Setting-up time	SIN	t_{su}		25	—	—	ns
	STB			33	—	—	ns
Holding time	SIN	t_h		20	—	—	ns
	STB			10	—	—	ns
Clock pulse rise time		tr		—	—	500	ns
Clock pulse fall time		tf		—	—	500	ns
Output current Note)	$\overline{Qn}$	I_{OUT}		—	—	60	mA
	SOUT	I_{OH}		—	—	−0.4	mA
		I_{OL}		—	—	1.6	mA

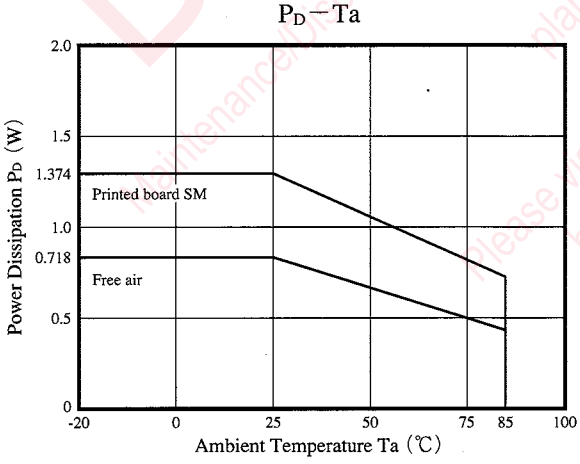
Note) Allowable value is changed,depending on the number of simultaneous ON circuits and duty.
The power dissipation should be reviewed enough for use of DN8665S.

■ 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

■ Package Power Dissipation



Note) For SM to printed board (glass epoxy printed board : 50×50×0.8mm).
it decreases with rate of 11.0mW/℃ from Ta=25 ℃.
For free air, it decreases with rate of 5.74mW/℃ from Ta=25 ℃.

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 and 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 : $I_{O}\ (\overline{Qn})\ (A) \fallingdotseq \frac{5 \times V_{CC}\ (V)}{2 \times R_{RC}\ (\Omega) + 50}$ ** RC terminal setting calculation : $I_{RC}\ (A) \fallingdotseq \frac{V_{CC}\ (V)}{2 \times R_{RC}\ (\Omega) + 50}$ or $R_{RC}\ (\Omega) \fallingdotseq \frac{1}{2}\left(\frac{V_{CC}\ (V)}{I_{RC}\ (A)} - 50\right)$
20	V_{CC}	V_{CC}	Supply terminal

* Calculation example

$V_{CC}=5V \quad I_{O}\ (\overline{Qn}) \fallingdotseq \frac{5 \times 5}{2 \times 183 + 50} \fallingdotseq 60mA$

$R_{RC}=183\,\Omega$

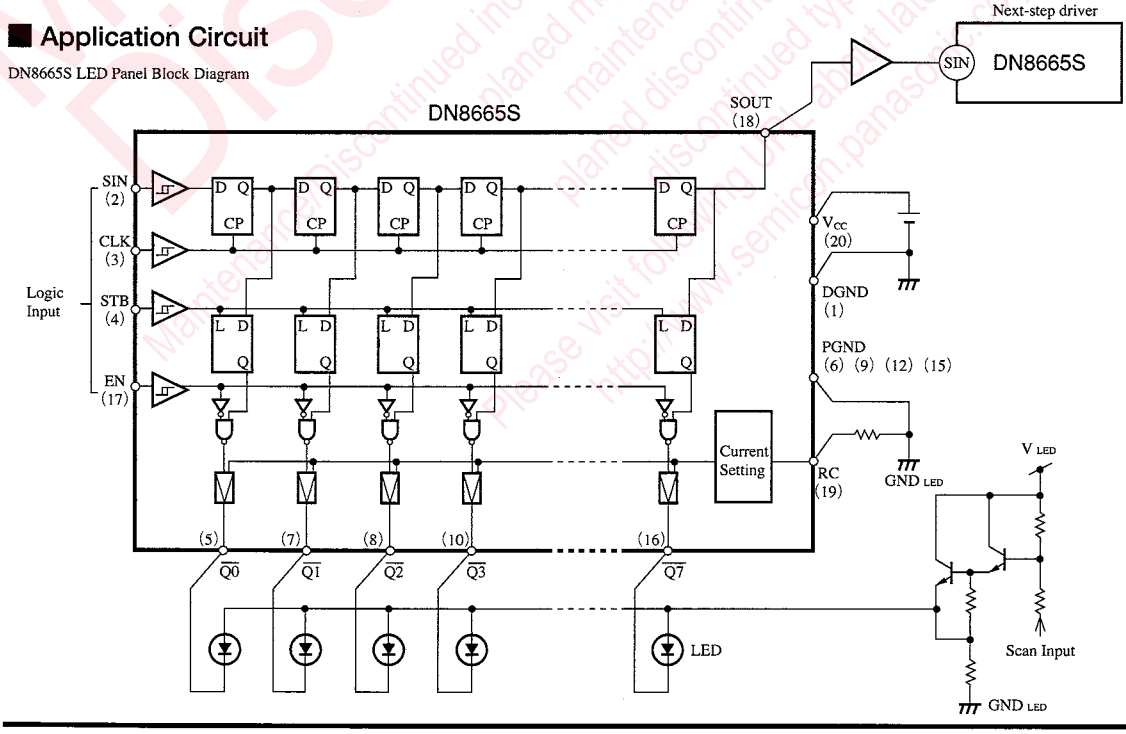
** Calculation example

$V_{CC}=5V \quad R_{RC} \fallingdotseq \frac{1}{2}\left(\frac{5}{0.012} - 50\right) \fallingdotseq 183\ (\Omega)$

$I_{RC}=0.012\ (A)$

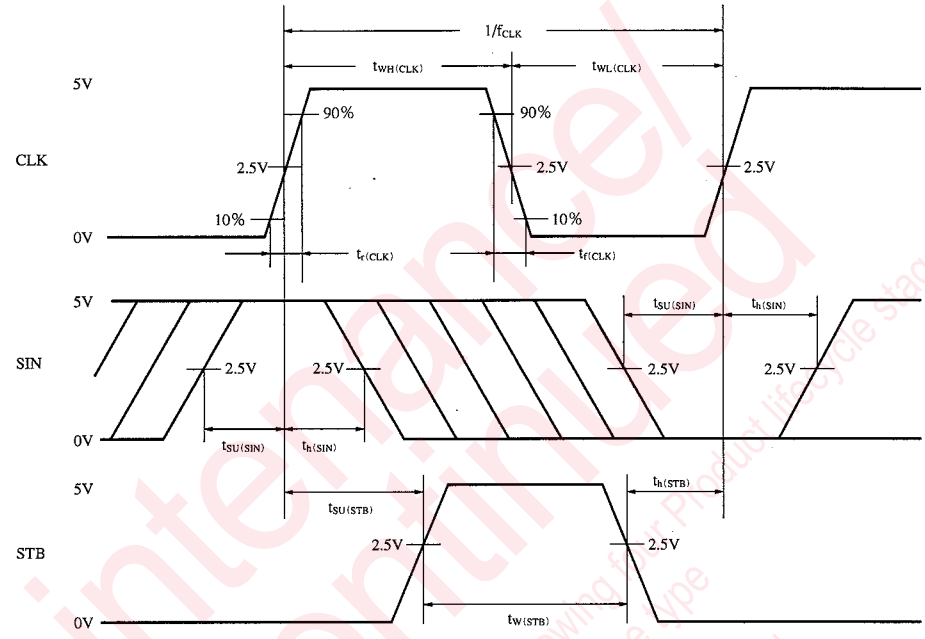
Application Circuit

DN8665S LED Panel Block Diagram

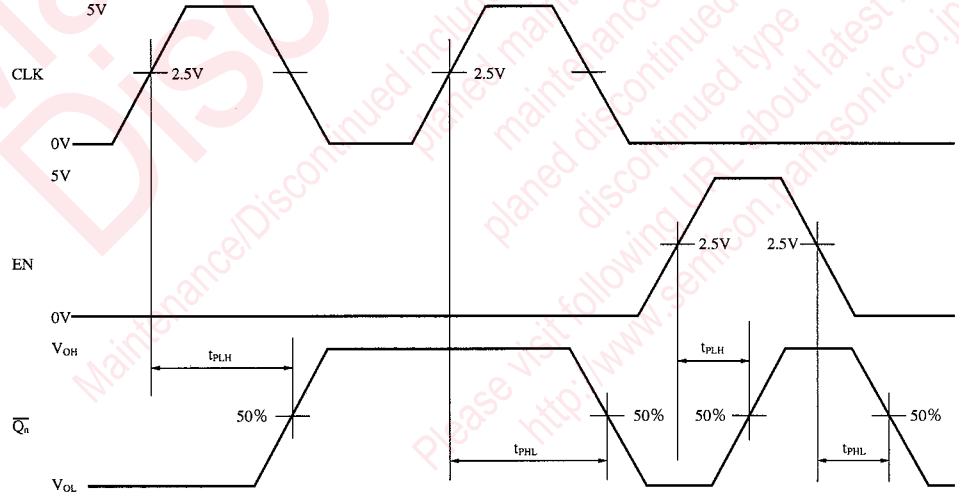


■ Timing Chart

1. Input timing (V_{IL}=0V,V_{IH}=5.0V)



2. Transmission delay time (V_{IL}=0V,V_{IH}=5.0V)



Others

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

(1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

(2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.

(3) The products described in this book 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 book are subject to change without notice for 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 range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. 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, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

20080805