

Panel interface

BU8315S / BU8315F

The BU8315S and BU8315F are LED drivers with a flashing function.

They can be connected in series to panel PCBs in equipment such as telephones, facsimile machines, and copying machines, and to microcomputers of main PCBs, and significantly reduce the amount of wiring required.

●Applications

Sets with operation panels, such as telephones, facsimile machines, and copying machines

●Features

- 1) LED interface (14-bit serial in/parallel out).
- 2) Built-in LED automatic flashing function.

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit	Conditions
Power supply voltage	V _{DD}	7.0	V	
Power dissipation	BU8315S	1050* ¹	mW	
	BU8315F	450 * ²		
Operating temperature	T _{opr}	-25~+75	°C	
Storage temperature	T _{stg}	-55~+125	°C	
Input voltage	V _{IN}	V _{SS} -0.3~V _{DD} +0.3	V	$\overline{\text{CS}}$, SCK, SD, $\overline{\text{RST}}$ pins
Output voltage	V _{OUT}	V _{SS} ~7.0	V	L1~L14 pins
Input current	I _{OUT}	20	mA	L1~L14 pins

*1 Reduced by 10.5mW for each increase in Ta of 1°C over 25°C.

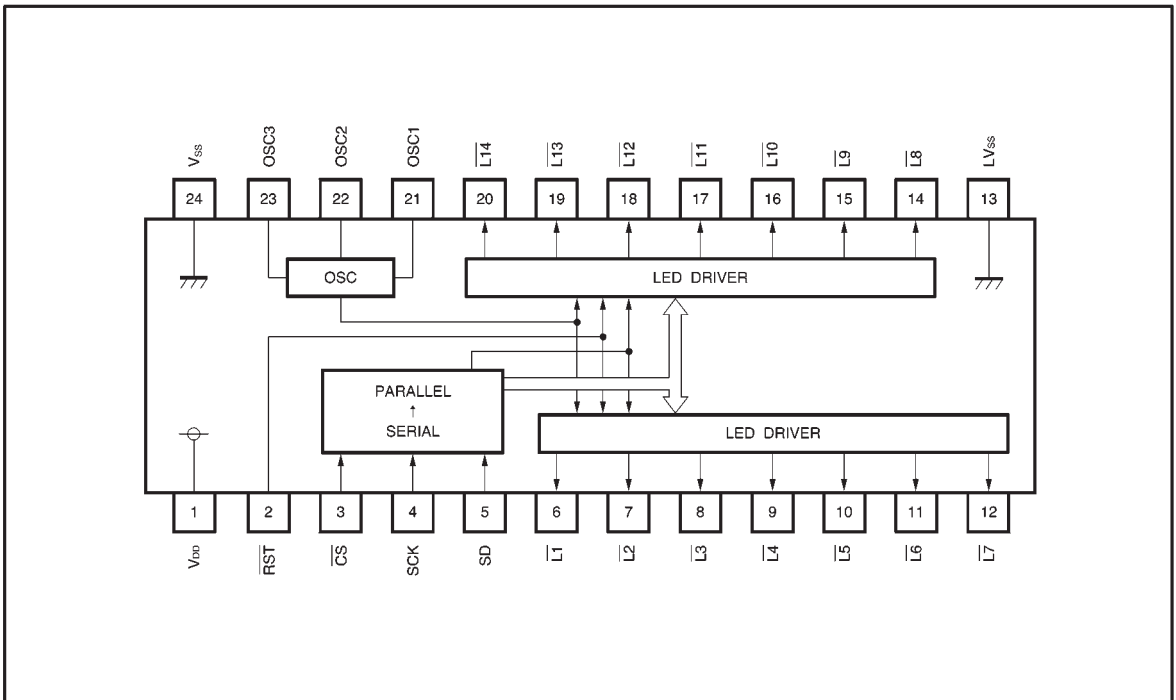
*2 Reduced by 4.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit	Conditions
Power supply voltage	V _{DD}	2.0~5.5	V	*3
Oscillation frequency	f _{osc}	500	Hz	R _I =1.0MΩ, R _X =270kΩ, C _X =3.3nF

*3 Please be aware that LED lighting also depends on the characteristics of the LED.

●Block diagram



●Pin descriptions

Pin No.	Pin name	Function	Model
7~12 14~20	$\overline{L1} \sim \overline{L7}$ $\overline{L8} \sim \overline{L14}$	These are the LED output pins, and are ON at "1" (LOW) and OFF at "0" (Z (high impedance)).	C
3	\overline{CS}	This is the chip select input pin. Serial input is enabled when this pin is LOW. Serial data is read internally at the rising edge.	B
4	SCK	This is the shift clock input pin for serial data. Serial data is read from the SD pin one bit at a time, at the rising edge of a Schmitt trigger input.	B
5	SD	This is the serial data input pin. Data is input and output in the pertinent data format.	A
21~23	OSC1~OSC3	These are the I/O pins for the internal oscillator. The recommended values are as follows: $R_i=1.0M\Omega$, $R_x=270k\Omega$, $C_x=3.3nF$.	D
2	\overline{RST}	This is the reset signal input pin. Normal operation is carried out when this pin is HIGH. When this pin is LOW, all data is reset, and the internal oscillator stops.	B
1	V _{DD}	This is the V _{DD} pin.	
24	V _{SS}	This is the V _{SS} pin.	
13	LV _{SS}	This is the V _{SS} pin for LED output.	

● Input/output circuits

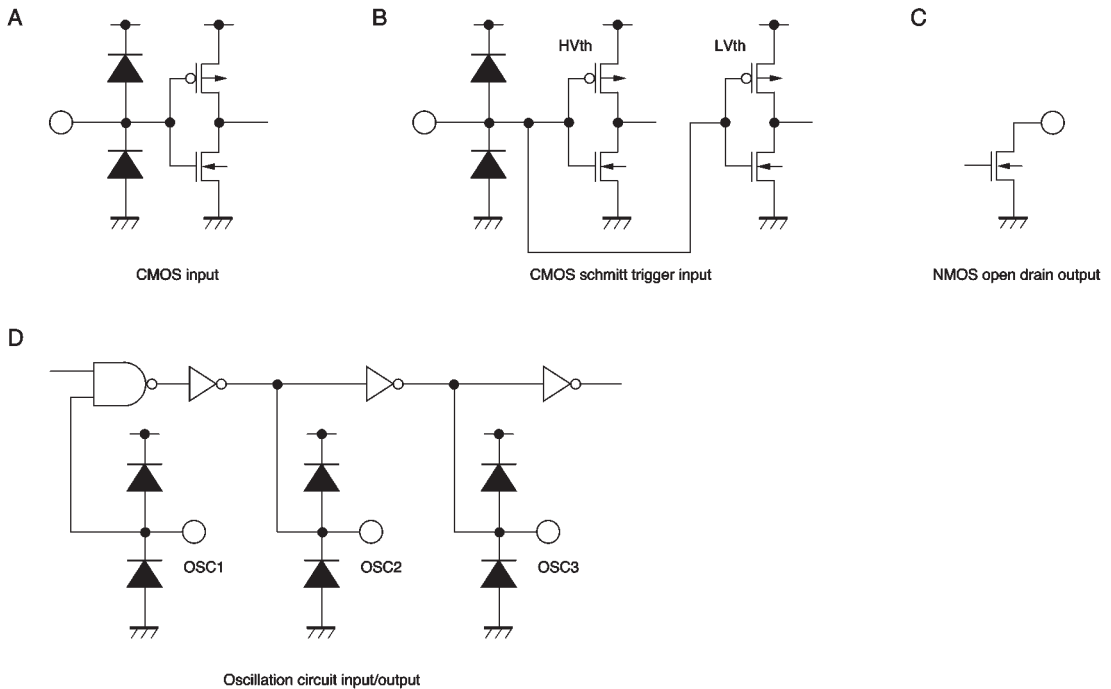


Fig. 1

● Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$, $V_{DD} = 3 \sim 5.5\text{V}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Supply current 1	I_{DD1}	—	0.01	1.0	μA	At rest ($\overline{\text{RST}}=\text{L}$)	Fig.3
Supply current 2	I_{DD2}	—	7	20	μA	When operating $V_{DD}=3.0\text{V}$	Fig.3
Supply current 3	I_{DD3}	—	—	200	μA	When operating $V_{DD}=5.5\text{V}$	Fig.3
Input high level voltage	V_{IH}	$0.8V_{DD}$	—	V_{DD}	V	*1	Fig.3
Input low level voltage	V_{IL}	0	—	$0.2V_{DD}$	V	*1	Fig.3
Input high level current	I_{IH}	—	—	1	μA	*1	Fig.3
Input low level current	I_{IL}	—	—	1	μA	*1	Fig.3
Output voltage	V_O	0	—	0.5	V	*2	Fig.3
Setup time S	t_{sus}	100	—	—	ns		Fig.4
Setup time I	t_{suI}	100	—	—	ns		Fig.4
Hold time I	t_{hI}	100	—	—	ns		Fig.4
Serial clock cycle	t_{cyc}	500	—	—	ns	DUTY=50%	Fig.4
Setup time W	t_{suW}	100	—	—	ns		Fig.4

*1 CS, SCK, SD, $\overline{\text{RST}}$ pins

*2 For Pins L1 to L14, when $V_{DD} = 5\text{V}$ and $I_{OL} = 10\text{mA}$

● Serial data input timing

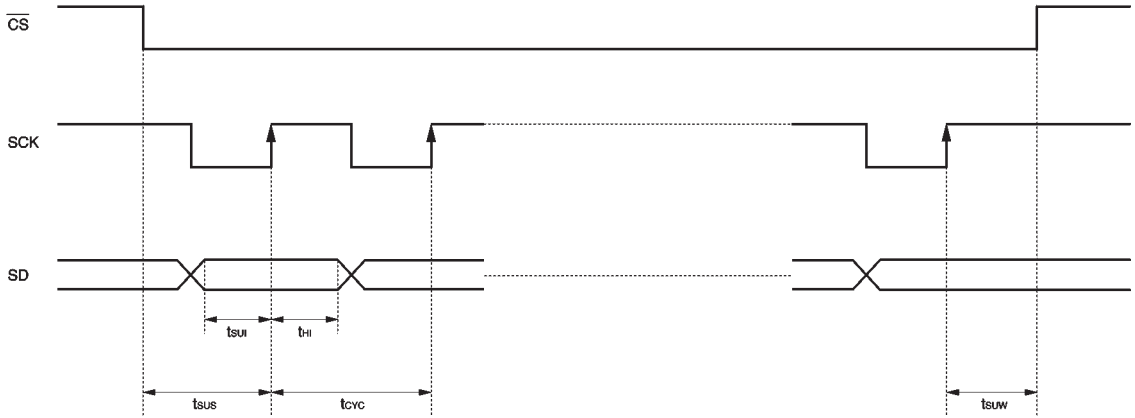


Fig. 2 Data input timing

● Measurement circuits

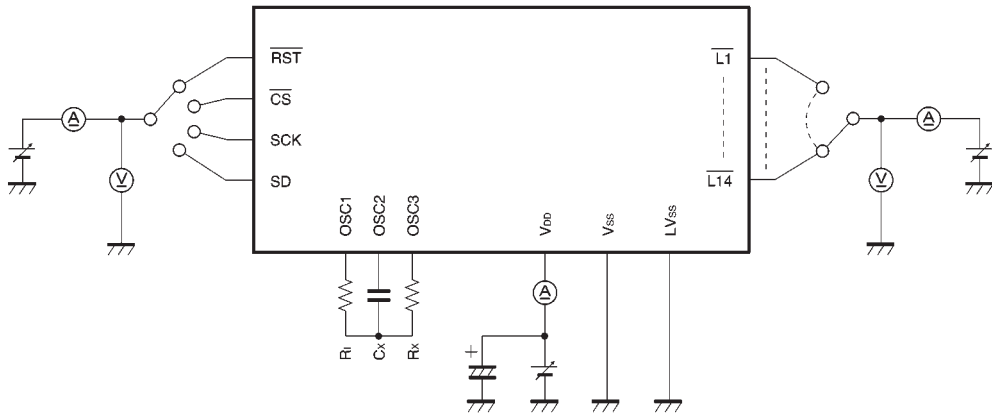


Fig. 3 DC characteristics measurement circuit

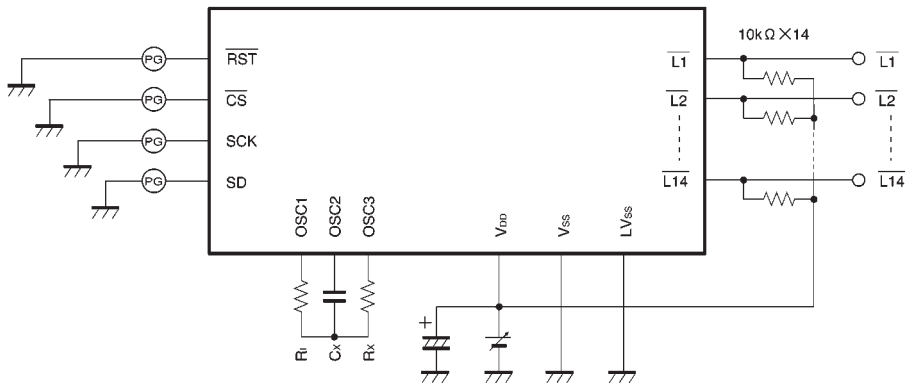


Fig. 4 AC characteristics measurement circuit

●Circuit operation

(1) LED control command data format (for serial data, the MSB is first)



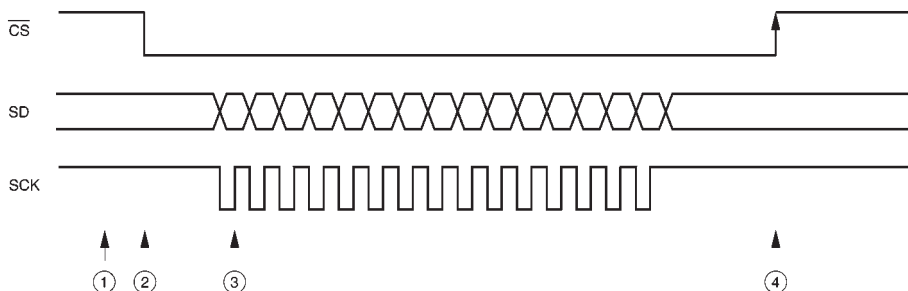
P2	P1	Flashing pattern (sec)	
		ON	OFF
0	0	—	Always
0	1	0.125	0.125
1	0	0.5	0.5
1	1	Always	—

L14~L1	Operation (LED output)
0	Does not change (status before input)
1	Changes to pattern set with P1 and P2

(2) Shifts in flashing pattern based on LED control commands (example of data input)

MSB	Input data		RST	LED output	
	Pattern	Bit		Odd-numbered	Even-numbered
			L	OFF	OFF
01	0	1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	H	FAST	↓
10	1	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	↓	↓	SLOW
11	0	1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	↓	ON	↓
11	1	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	↓	↓	ON
10	0	1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	↓	SLOW	↓
01	1	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	↓	↓	FAST
00	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	↓	OFF	OFF

(3) Example of serial input of LED control command



State	CPU operation (#)
①	During standby, \overline{CS} = HIGH, SCK = LOW
②	\overline{CS} is set LOW
③	Serial data is input to SD in sequential order, at the rising edge of SCK.
④	After 16 bits have been input, a \overline{CS} rising edge is applied, and data is read internally.

● Operation notes

(1) When the power supply is turned on, the contents of the register are unstable, so the $\overline{\text{RST}}$ pin should be set to LOW and a reset initiated.

(2) The maximum LED output per bit is 20mA, so that the maximum LED output for a total of 14 bits is 140mA.

● Electrical characteristic curves

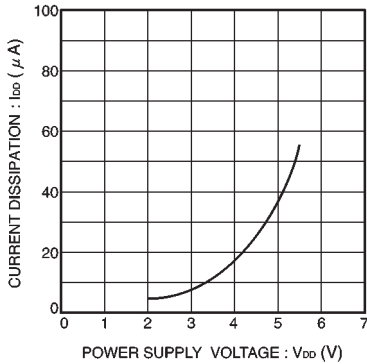


Fig. 5 Current dissipation vs. power supply voltage

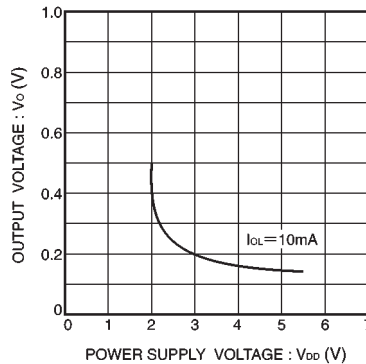


Fig. 6 Output voltage vs. power supply voltage

● External dimensions (Units: mm)

