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℃)

Parameter		Symbol	Limits	Unit	Conditions
Power supply voltage		V_{DD}	7.0	V	
Power dissipation	BU8315S	Pd	1050 *1	mW	
	BU8315F		450 *2		
Operating temperature		Topr	−25~+75	℃	
Storage temperature		Tstg	−55~+125	℃	
Input voltage		V_{IN}	V_{SS}−0.3~V_{DD}+0.3	V	$\overline{CS}$, SCK, SD, $\overline{RST}$ pins
Output voltage		V_{OUT}	V_{SS}~7.0	V	$\overline{L1}$~$\overline{L14}$ pins
Input current		I_{OUT}	20	mA	$\overline{L1}$~$\overline{L14}$ pins

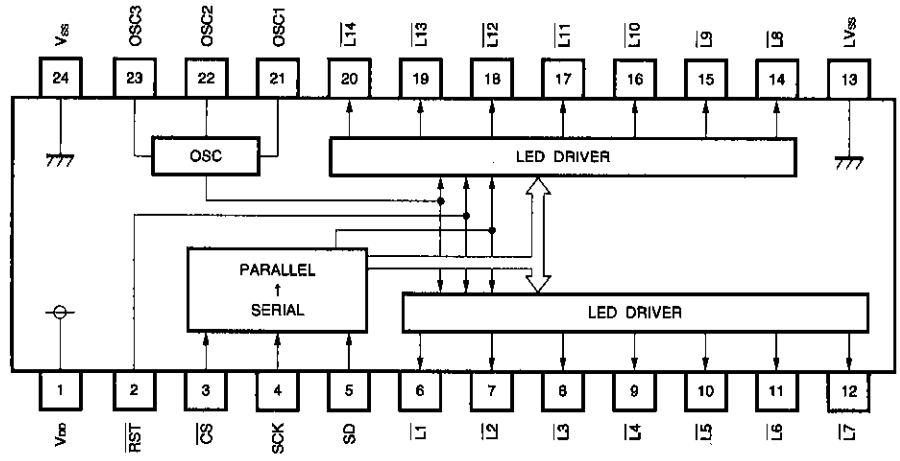
*1 Reduced by 10.5mW for each increase in Ta of 1℃ over 25℃.
*2 Reduced by 4.5mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Limits	Unit	Conditions
Power supply voltage	V_{DD}	2.0~5.5	V	*3
Oscillation frequency	fosc	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 description

Pin No.	Pin Name	Function/Operation	Model
7~12 14~20	$\overline{L1}$~$\overline{L7}$ $\overline{L8}$~$\overline{L14}$	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	OSC1 to OSC3 These are the I/O pins for the internal oscillator. The recommended values are as follows:R_I=1.0MΩ, R_X=270kΩ, 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	L_{VSS}	This is the V_{SS} pin for LED output.	—

●Input/output circuits

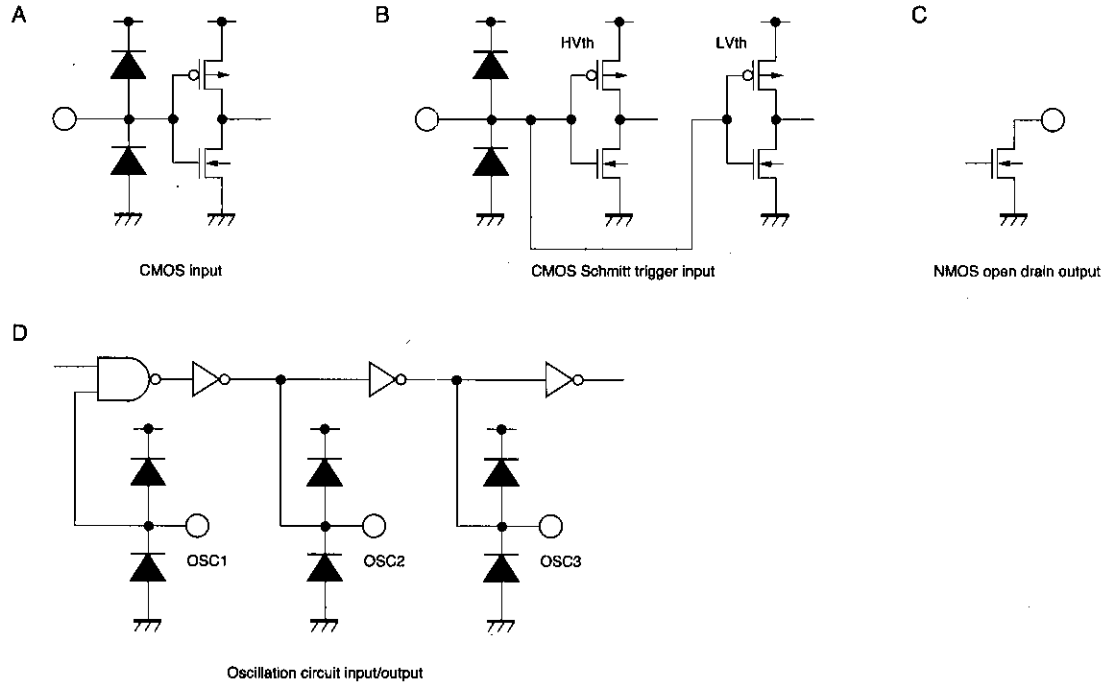


Fig. 1 I/O circuit diagrams

●Electrical characteristics (Unless otherwise noted : Ta=25℃, V_{DD}=3 ~ 5.5V)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Circuit current 1		I_{DD1}	—	0.01	1.0	μA	At rest ($\overline{RST}$=L)	Fig.3
Circuit current 2		I_{DD2}	—	7	20	μA	When operating V_{DD}=3.0V	Fig.3
Circuit current 3		I_{DD3}	—	—	200	μA	When operating V_{DD}=5.5V	Fig.3
Input voltage	H	V_{IH}	0.8V_{DD}	—	V_{DD}	V	*1	Fig.3
	L	V_{IL}	0	—	0.2V_{DD}	V	*1	Fig.3
Input current	H	I_{IH}	—	—	1	μA	*1	Fig.3
	L	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 period		t_{CYC}	500	—	—	nS	DUTY=50%	Fig.4
Setup time W		t_{SUW}	100	—	—	nS		Fig.4

*1 $\overline{CS}$, SCK, SD, $\overline{RST}$ pins
*2 For Pins $\overline{L1}$ to $\overline{L14}$, when V_{DD} = 5 V and I_{OL} = 10 mA

●Serial data input timing

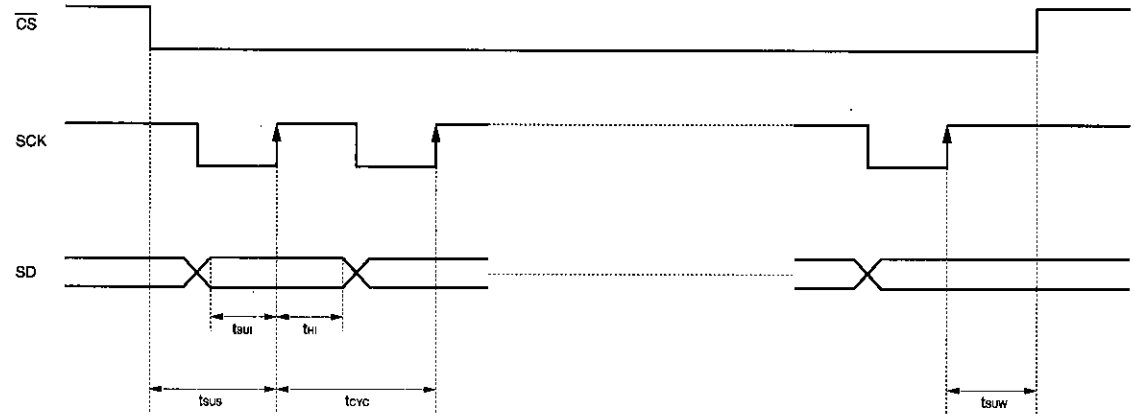


Fig. 2 Data input timing

●Measurement circuits

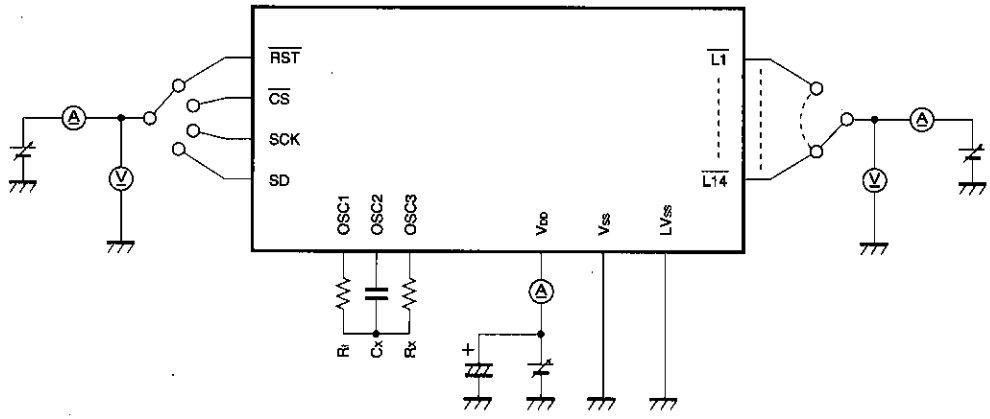


Fig. 3 DC characteristics measurement circuit

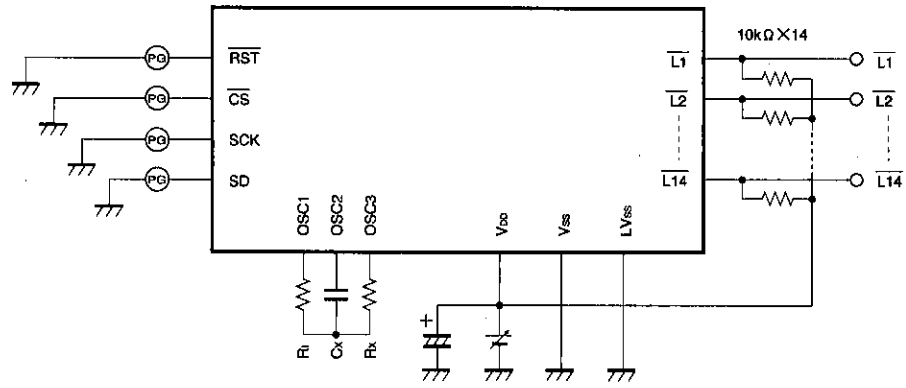
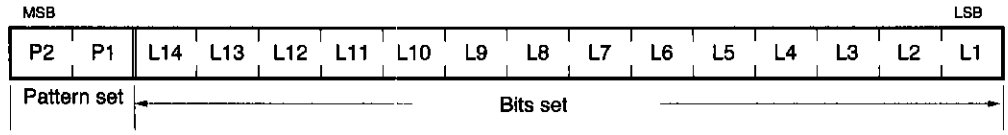


Fig. 4 AC characteristics measurement circuit

●Circuit operation

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



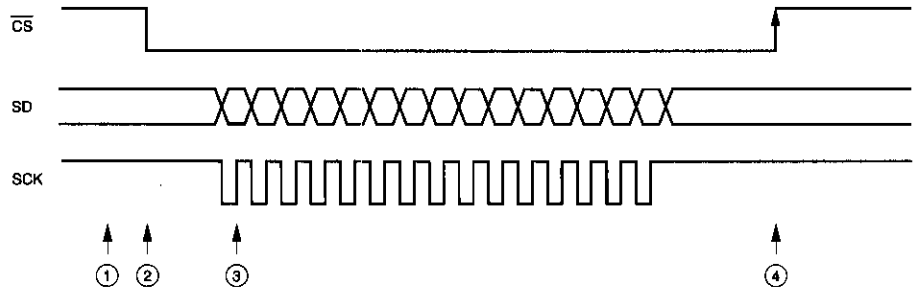
P2	P1	Flashing pattern (sec)	
		ON	OFF
0	0	—	Always
0	1	0.125	0.125
1	0	0.5	0.5
1	1	Always	—

L14~L1	Operation (LED output)
0	Doesn't 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 Pattern	Input data Bit LSB	RST	LED output	
			Odd-numbered	Even-numbered
		L	OFF	OFF
01	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	↓	↓	SLOW
11	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	↓	↓	ON
10	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	↓	↓	FAST
00	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	When waiting, $\overline{CS}$ = 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 $\overline{RST}$ 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

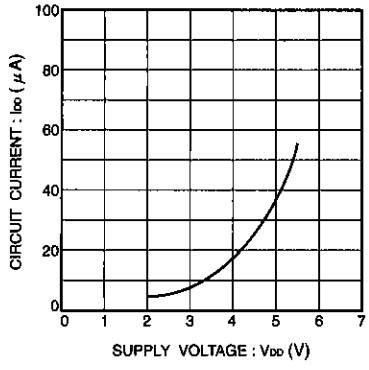


Fig. 5 Circuit current vs. supply voltage characteristic

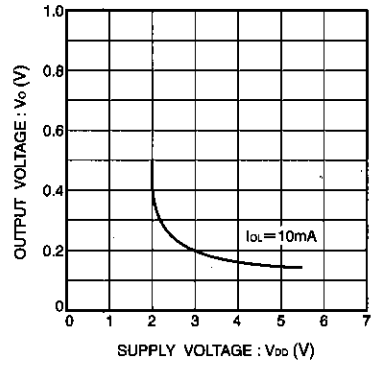
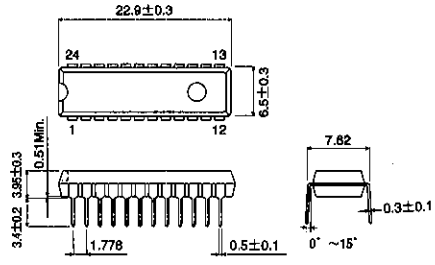


Fig. 6 Output voltage vs. supply voltage characteristic

●External dimensions (Units: mm)

BU8315S



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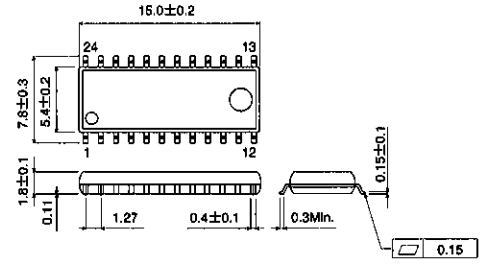
BU8315F



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