EL driver for portable sets

BA3899F

The BA3899F is an IC developed for EL drive applications. It uses a more compact interface than transformer systems, and is ideal for use in thin sets.

●Applications

Pagers, electronic notebooks and other portable devices

●Features

1) Drive oscillation frequency can be set using external capacitance.
2) Equipped with standby control pin.

●Absolute maximum ratings (Ta = 25°C)

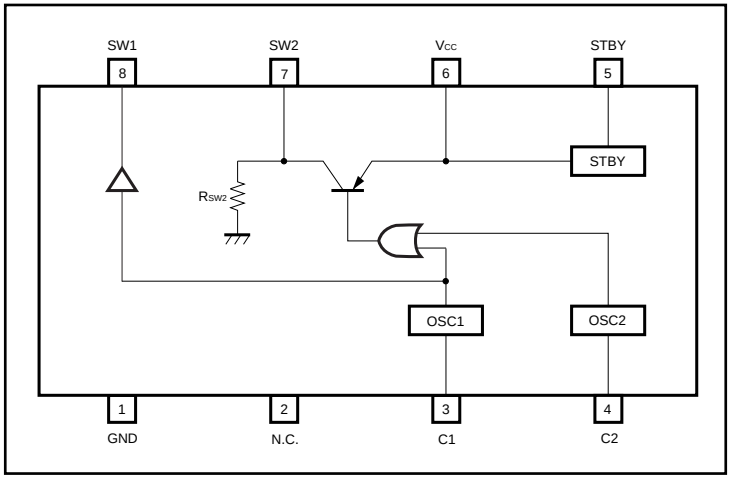
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	8.0	V
Power dissipation	Pd	450*	mW
Operating temperature	Topr	– 10 ~ + 60	°C
Storage temperature	Tstg	– 55 ~ + 125	°C
Maximum applied voltage	V_{ST}	8.0	V

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

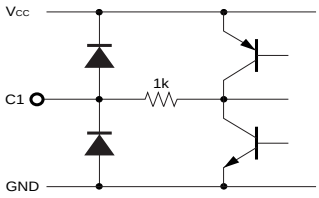
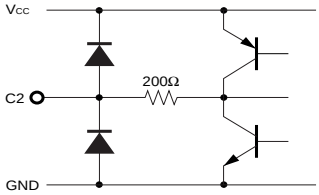
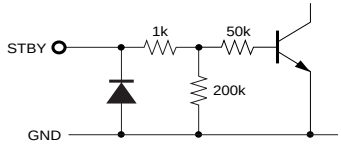
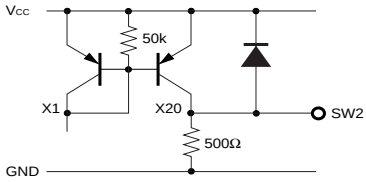
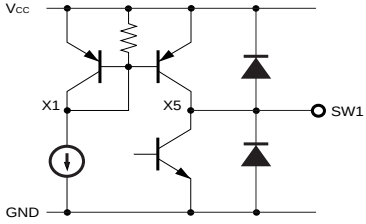
●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	1.0	5.0	7.0	V

●Block diagram



●Pin descriptions

Pin No.	Pin name	I / O	Pin voltage	Internal equivalent circuit	Function
1	GND	I	—	—	GND pin
2	N.C.	—	—	—	—
3	C1	I / O	—		OSC1 oscillator circuit; external capacitor pin
4	C2	I / O	—		OSC2 oscillator circuit; external capacitor pin
5	STBY	I	0		Standby control pin (HIGH state: standby cancelled) ○When applying resistance, etc. to the STBY pin, be careful not to exceed the threshold values.
6	Vcc	I	—	—	Vcc input pin
7	SW2	O	—		SW2 switching output pin
8	SW1	O	—		SW1 switching output pin

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 5.0V, C1 = 0.033µF, C2 = 1500pF)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply current		I_{CC}	3.0	4.6	6.2	mA	When used as stand-alone unit
C1 pin oscillation frequency		f_{SW1}	75	95	120	Hz	—
C2 pin oscillation frequency		f_{SW2}	17	23	29	kHz	—
SW1	Source current	I_{SW1SO}	100	140	180	µA	V_{C1} = 1.0V, V_{C2} = 0.05V, V_{SW1} = 0V
	Sink current	I_{SW1SI}	– 40	—	—	µA	V_{C1} = 0.05V, V_{C2} = 0.05V, V_{SW1} = 1.0V
SW2	Source current	I_{SW2SO}	3.2	4.4	6.1	mA	V_{C1} = 0.05V, V_{C2} = 0.05V, V_{SW2} = 0V
	Pull-down resistance	R_{SW2}	400	500	600	Ω	Vst = 0.35V, V_{SW2} = 0.3V
Standby pin control voltage condition	Operating	V_{STON}	1.0	—	—	V	—
	Non-operating	V_{STOFF}	—	—	0.3	V	—
Quiescent current in standby state		$I_{Q\,(ST)}$	—	0	2.0	µA	—

●Measurement circuit

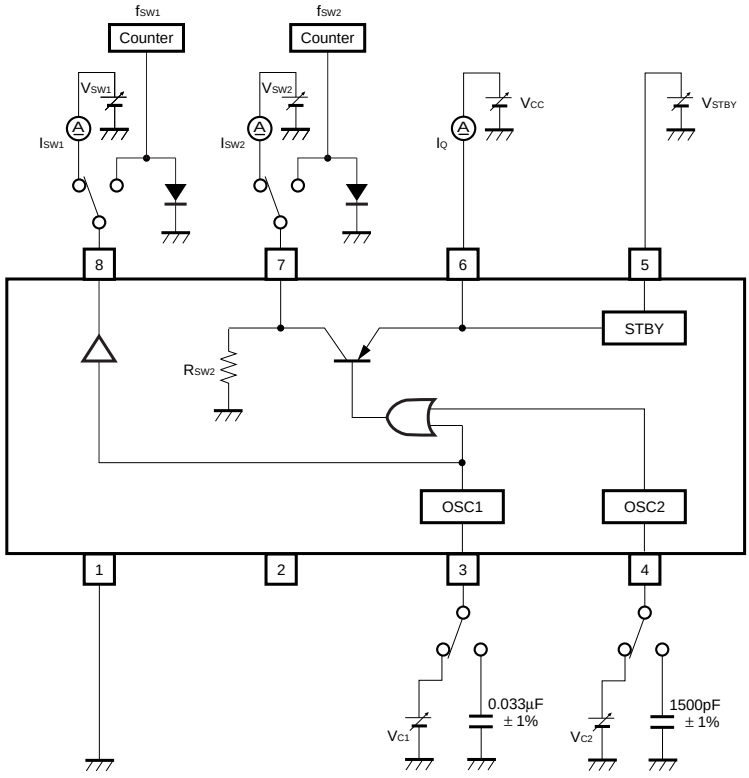


Fig.1

●Application example

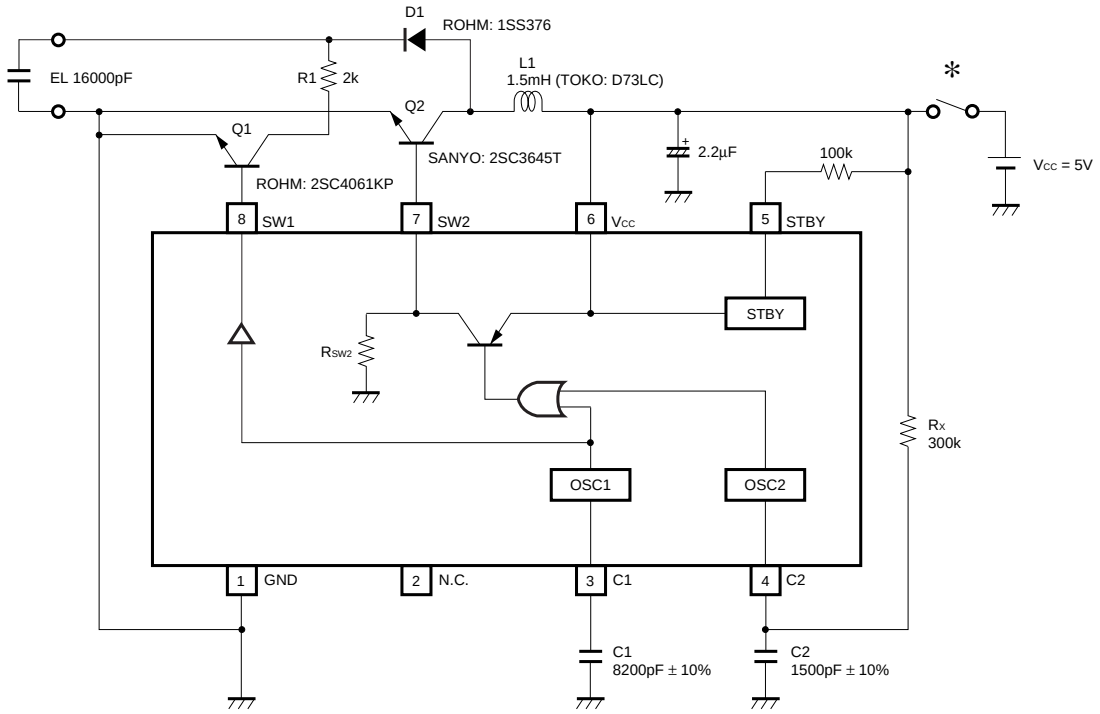


Fig. 2

∗ Because of the characteristics of the EL element, continuous application of particularly high DC power supply voltage can shorten the lifetime of the element. To avoid this, we recommend inserting a switch in the power supply line.

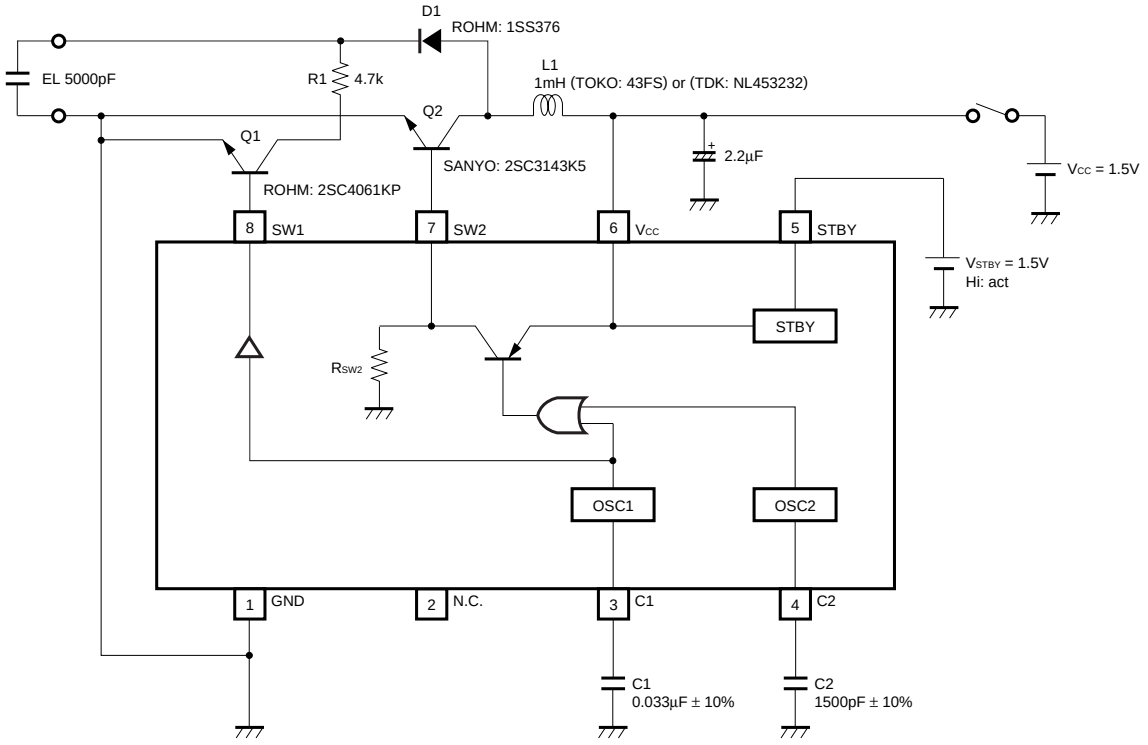

D1
ROHM: 1SS376
EL 5000pF
R1 4.7k
L1
1mH (TOKO: 43FS) or (TDK: NL453232)
Q1
Q2
SANYO: 2SC3143K5
ROHM: 2SC4061KP
2.2µF
VCC = 1.5V
8 SW1
7 SW2
6 VCC
5 STBY
VSTBY = 1.5V
Hi: act
STBY
RSW2
OSC1
OSC2
1 GND
2 N.C.
3 C1
4 C2
C1
0.033µF ± 10%
C2
1500pF ± 10%

Fig. 3

●Operation notes

(1) EL drive output

As shown in Figure 4, the EL drive output consists of charging (rise in voltage caused by switching) and discharging waveforms. The switching frequency is determined by f_{SW2} and the charging and discharging timing by f_{SW1}.

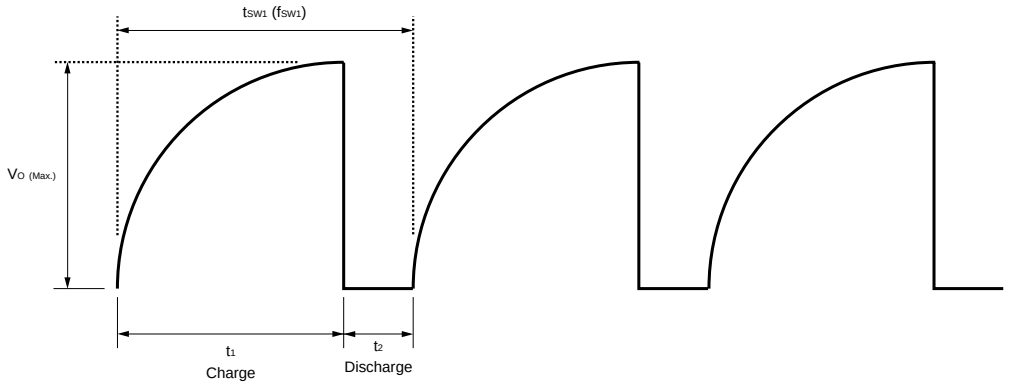


Fig.4

(2) Setting f_{SW1}

The oscillation frequency is determined by charging and discharging of the external capacitance of the C1 pin. The value for C1 should be set based on the following equation.

$$C1 = \frac{1}{V_{C1} \times \left(\frac{1}{I_1} + \frac{1}{I_2} \right)} \times \frac{1}{f_{SW1}}$$

$$= (3.14E-6) \times \frac{1}{f_{SW1}} \qquad (V_{CC} = 5V)$$

The recommended setting range for f_{SW1} is 40Hz to 800Hz. However, the V_O (Max.) shown in Figure 4 is determined by f_{SW1}, so caution is required concerning the pressure withstand values of Q1, Q2, and D1.

(3) f_{SW2}

f_{SW2} is the switching pressure rise frequency, and is determined by the external capacitance of the C2 pin. This value (1500pF) is determined by the inductance value and the Q2 transistor capability. When changing this value, the drive capability of Q2 must be taken into consideration in order to avoid the possibility of malfunction.

(4) Q1, Q2, and D1

The V_O (Max.) shown in Figure 4 is applied to the output V_O, so if using any transistor other than that recommended, caution is required concerning the pressure withstand value. Also, Q2 must have characteristics which allow it to keep pace with the switching speed of f_{SW2}.

(5) R_X (resistor for adjusting light volume)

With a configuration like that shown in Figure 5, the volume of light can be adjusted. However, R_X should be set so that I_X satisfies the following condition.

$$I_X \left(= \frac{Vx - 0.2V}{Rx} \right) < 40\mu A$$

If I_X > 40µA, LSI dispersion, temperature fluctuation, and other elements can cause oscillation of the C2 pin to stop. Be sure the above condition is satisfied.

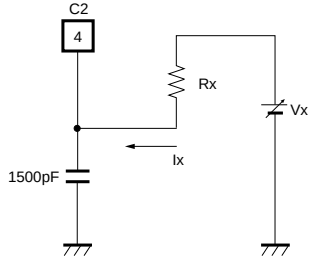


Fig.5

●Electrical characteristic curves

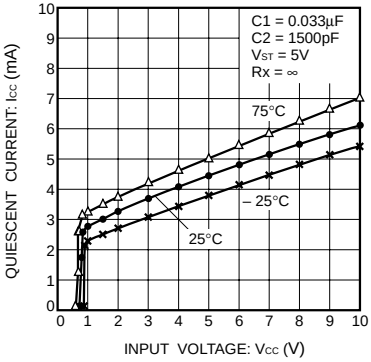


Fig. 6 Supply current (when used as stand-alone unit) vs. power supply voltage

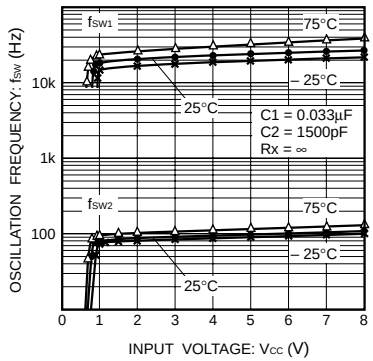


Fig. 7 Oscillation frequency of C1 and C2 pins vs. power supply voltage

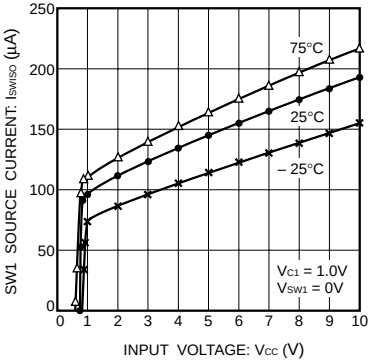


Fig. 8 SW1 sink current vs. power supply voltage

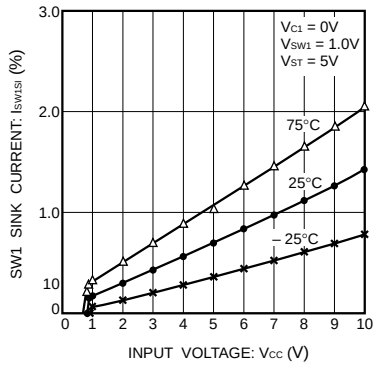


Fig. 9 SW1 source current vs. power supply voltage

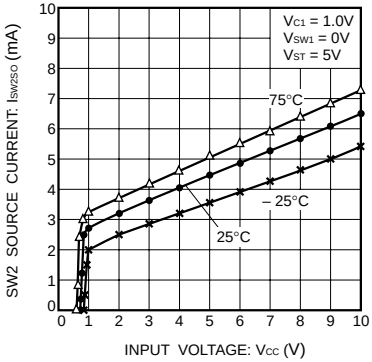


Fig. 10 SW2 source current vs. power supply voltage

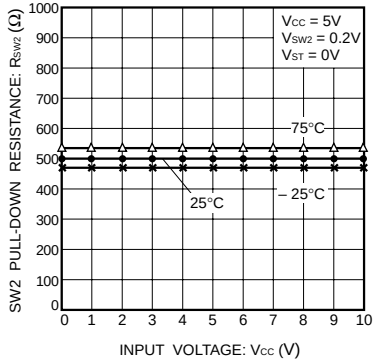
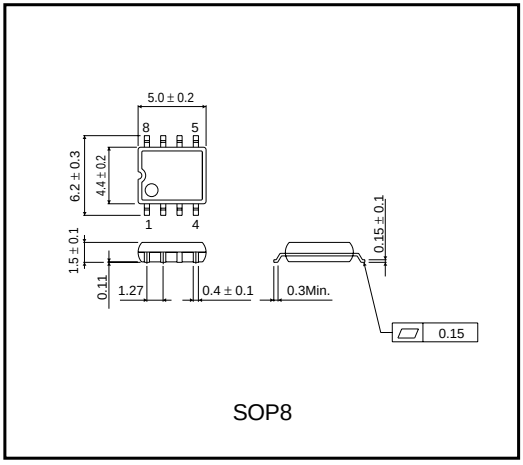


Fig. 11 SW2 pull-down resistance vs. power supply voltage

●External dimensions (Units: mm)



SOP8

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Телефон: 8 (812) 309-75-97 (многоканальный)
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Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А