

# 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)

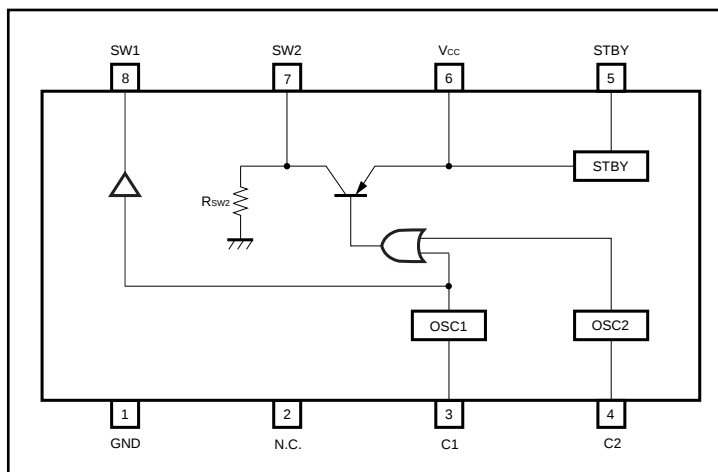
| Parameter               | Symbol           | Limits       | Unit |
|-------------------------|------------------|--------------|------|
| Power supply voltage    | V <sub>CC</sub>  | 8.0          | V    |
| Power dissipation       | P <sub>d</sub>   | 450*         | mW   |
| Operating temperature   | T <sub>opr</sub> | – 10 ~ + 60  | °C   |
| Storage temperature     | T <sub>stg</sub> | – 55 ~ + 125 | °C   |
| Maximum applied voltage | V <sub>ST</sub>  | 8.0          | V    |

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

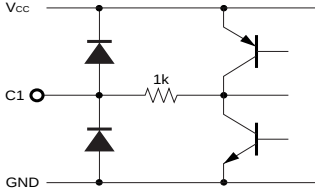
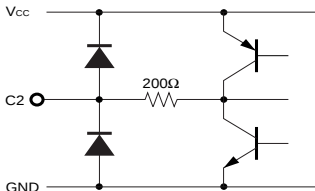
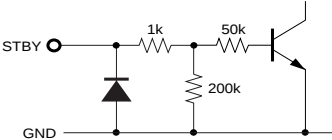
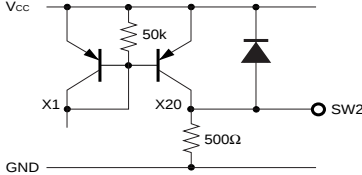
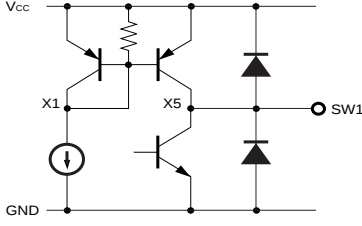
### ●Recommended operating conditions (Ta = 25°C)

| Parameter            | Symbol          | Min. | Typ. | Max. | Unit |
|----------------------|-----------------|------|------|------|------|
| Power supply voltage | V <sub>CC</sub> | 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;<br>external capacitor pin                                                                                                                  |
| 4       | C2              | I / O | —           |    | OSC2 oscillator circuit;<br>external capacitor pin                                                                                                                  |
| 5       | STBY            | I     | 0           |    | Standby control pin<br>(HIGH state: standby cancelled)<br><br>○When applying resistance, etc.<br>to the STBY pin, be careful not<br>to exceed the threshold values. |
| 6       | V <sub>CC</sub> | I     | —           | —                                                                                   | V <sub>CC</sub> input pin                                                                                                                                           |
| 7       | SW2             | O     | —           |  | SW2 switching output pin                                                                                                                                            |
| 8       | SW1             | O     | —           |  | SW1 switching output pin                                                                                                                                            |

●Electrical characteristics (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$ ,  $C_1 = 0.033\mu\text{F}$ ,  $C_2 = 1500\text{pF}$ )

| 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  | $\mu\text{A}$ | $V_{C1} = 1.0\text{V}$ , $V_{C2} = 0.05\text{V}$ , $V_{SW1} = 0\text{V}$    |
|                                       | Sink current         | $I_{SW1SI}$ | -40  | —    | —    | $\mu\text{A}$ | $V_{C1} = 0.05\text{V}$ , $V_{C2} = 0.05\text{V}$ , $V_{SW1} = 1.0\text{V}$ |
| SW2                                   | Source current       | $I_{SW2SO}$ | 3.2  | 4.4  | 6.1  | mA            | $V_{C1} = 0.05\text{V}$ , $V_{C2} = 0.05\text{V}$ , $V_{SW2} = 0\text{V}$   |
|                                       | Pull-down resistance | $R_{SW2}$   | 400  | 500  | 600  | $\Omega$      | $V_{ST} = 0.35\text{V}$ , $V_{SW2} = 0.3\text{V}$                           |
| 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  | $\mu\text{A}$ | —                                                                           |

●Measurement circuit

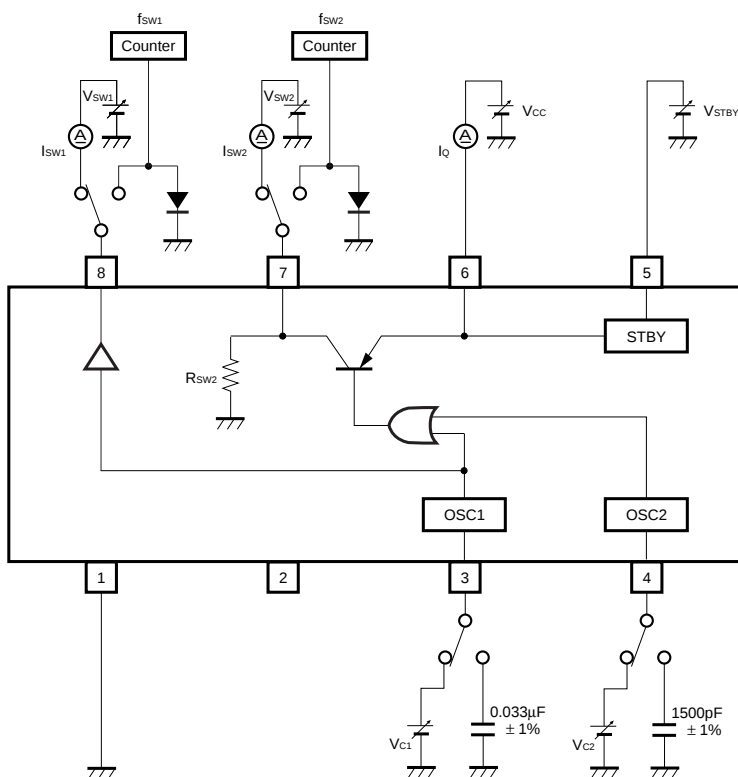


Fig.1

## ●Application example

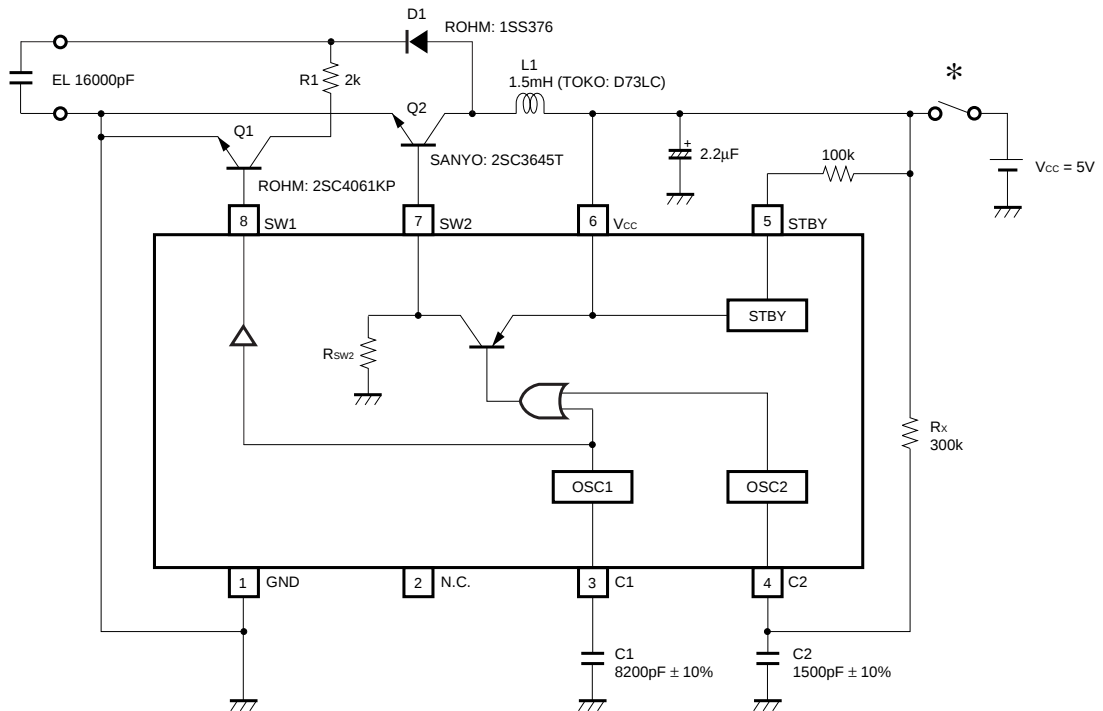


Fig. 2

\* 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.

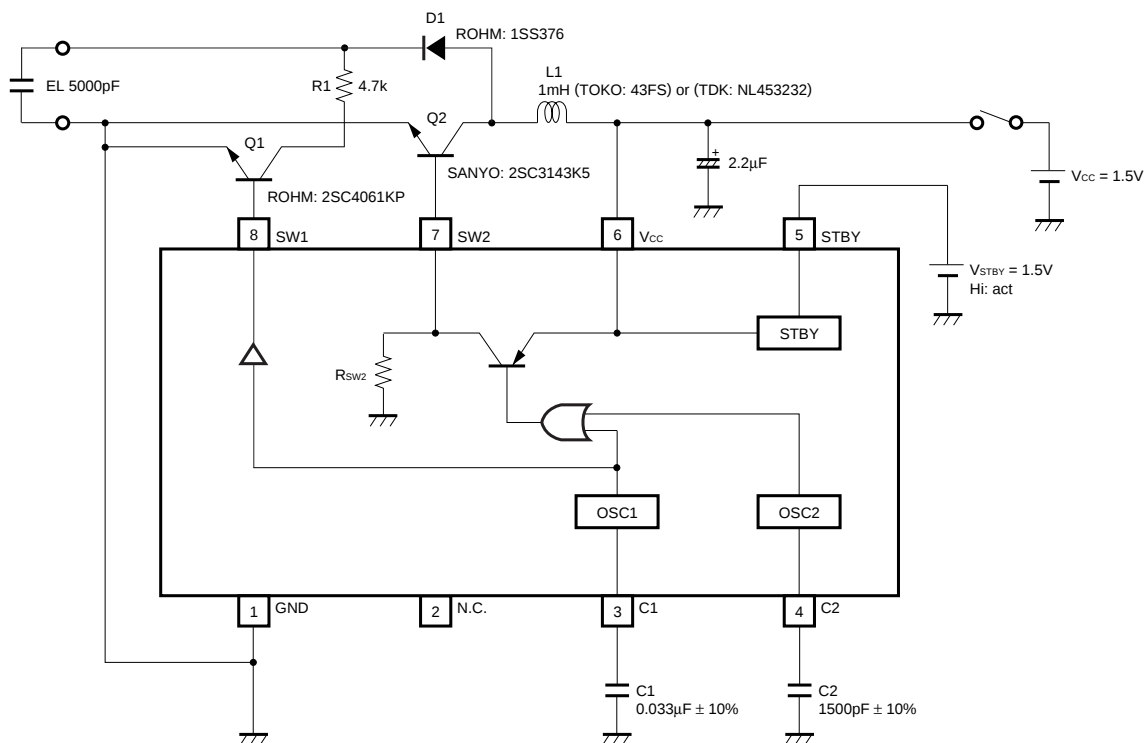


Fig. 3

### ● 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  $f_{SW1}$ .

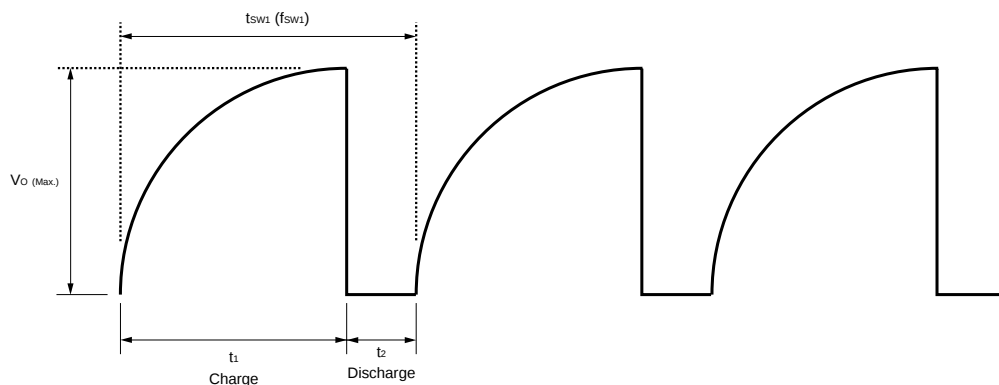


Fig.4

#### (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.

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

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

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.

$$I_x \left( = \frac{V_x - 0.2V}{R_x} \right) < 40\mu A$$

If  $I_x > 40\mu A$ , LSI dispersion, temperature fluctuation, and other elements can cause oscillation of the C2 pin to stop. Be sure the above condition is satisfied.

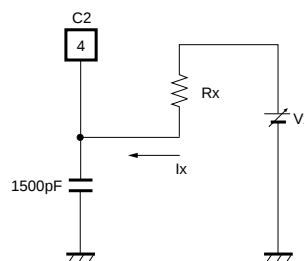


Fig.5

## ●Electrical characteristic curves

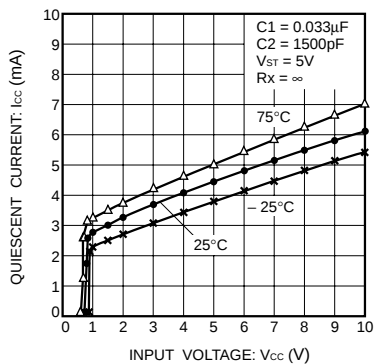


Fig. 6 Supply current (when used as stand-alone unit) vs. power supply voltage

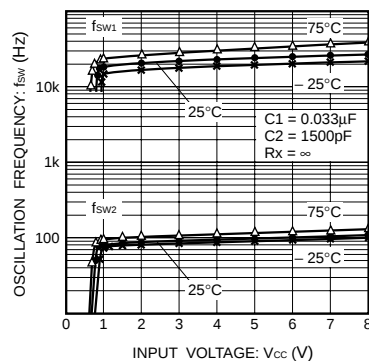


Fig. 7 Oscillation frequency of C1 and C2 pins vs. power supply voltage

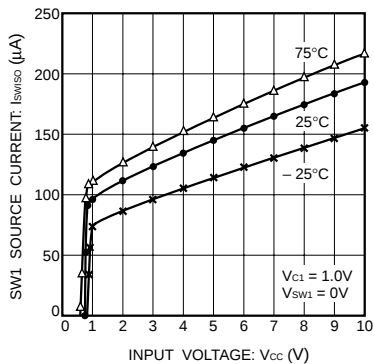


Fig. 8 SW1 sink current vs. power supply voltage

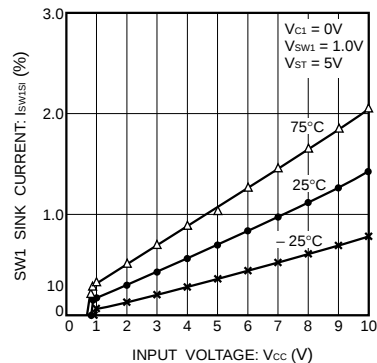


Fig. 9 SW1 source current vs. power supply voltage

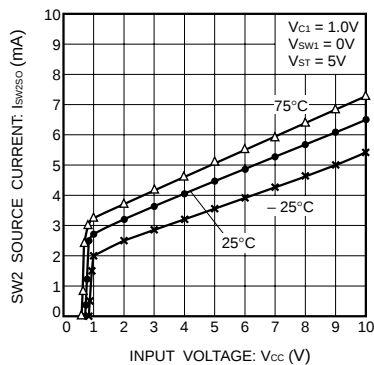


Fig. 10 SW2 source current vs. power supply voltage

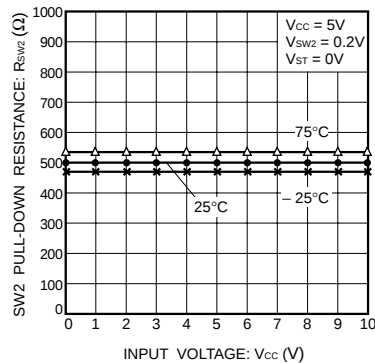
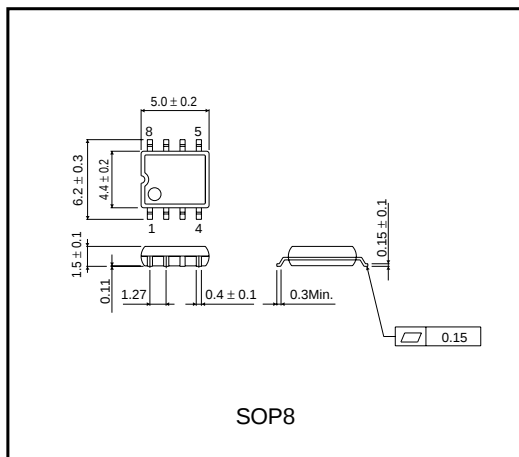


Fig. 11 SW2 pull-down resistance vs. power supply voltage

## ● External dimensions (Units: mm)



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**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
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