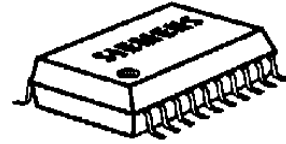


## PWM Power Unit

The device allows continuous power control for lamps, LEDs or inductive loads.



- Highside switch (Bootstrap)
- Overtemperature protection
- Short circuit / overload protection through pulse width reduction and overload shutdown
- Load dump protection
- Undervoltage and overvoltage shutdown with auto-restart and hysteresis
- Reverse battery protection <sup>1)</sup>
- Timing frequency adjustable
- Controlled switching rise and fall times
- Maximum current internally limited
- Protection against loss of GND <sup>2)</sup>
- Electrostatic discharge (ESD) protection
- Package: P-DSO-20-6 (SMD)

**Note:** Switching frequency is programmed with an external capacitor

| Type   | Ordering Code   | Marking | Package    |
|--------|-----------------|---------|------------|
| BTS730 | Q67060-S7007-A2 | -       | P-DSO-20-6 |

### Maximum Ratings

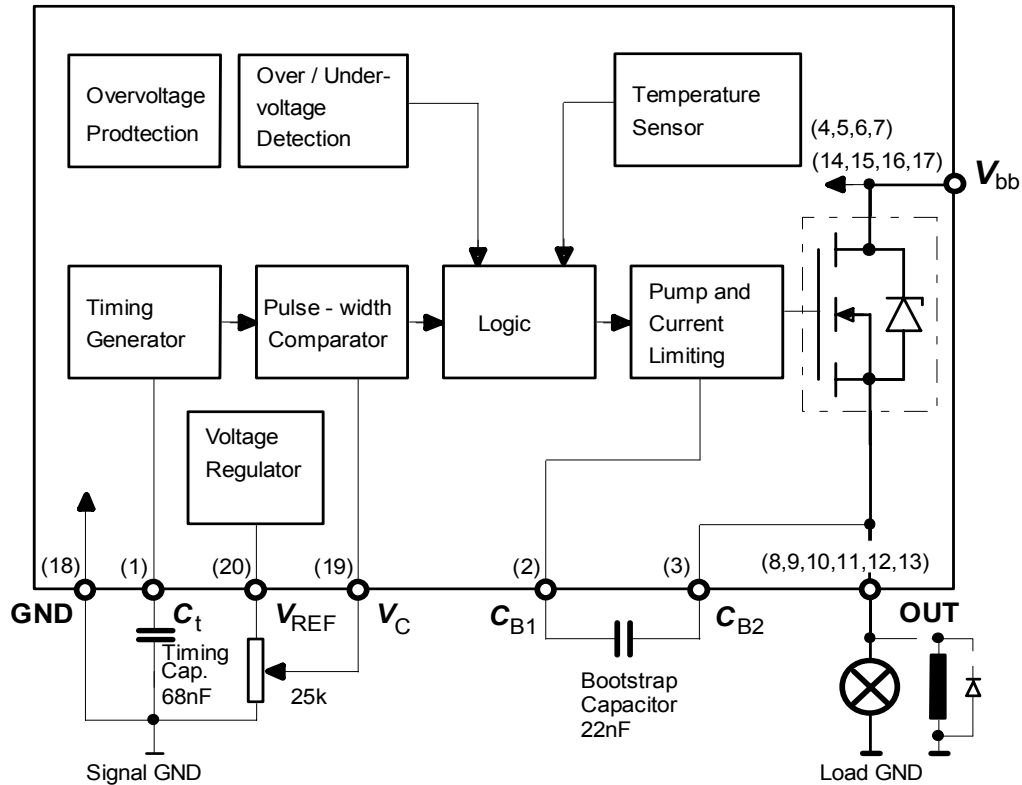
| Parameter                                                                                                                                           | Symbol       | Values       | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|------|
| Active overvoltage protection                                                                                                                       | $V_{bb(AZ)}$ | >40          | V    |
| Short circuit current                                                                                                                               | $I_{SC}$     | self-limited | -    |
| Input current (DC)                                                                                                                                  | $I_{Ct}$     | 2            | mA   |
| Pin1 ( $C_t$ ) and pin19 ( $V_C$ )                                                                                                                  | $I_{VC}$     | 2            | mA   |
| Operating temperature range                                                                                                                         | $T_j$        | -40...+150   | °C   |
| Storage temperature range                                                                                                                           | $T_{stg}$    | -50...+150   |      |
| Power dissipation <sup>3)</sup> $T_a=25^{\circ}C$                                                                                                   | $P_{tot}$    | 3            | W    |
| $T_a=85^{\circ}C$                                                                                                                                   |              | 2            | W    |
| Thermal resistance chip-case <sup>3)</sup>                                                                                                          | $R_{th JC}$  | ≤35          | K/W  |
| chip-ambient                                                                                                                                        | $R_{th JA}$  | ≤75          |      |
| Electrostatic discharge capability (ESD)<br>(Human Body Model)<br>acc. MIL-STD883D, method 3015.7 and ESD assn.<br>std. S5.1-1993; R=1.5KΩ; C=100pF | $V_{ESD}$    | ≤ 1          | kV   |

<sup>1)</sup> With 150Ω resistor in signal GND connection.

<sup>2)</sup> Potential between signal GND and load GND >0.5V

<sup>3)</sup> Device on 50mm×50mm×1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70μm thick) copper area for  $V_{bb}$  connection, PCB is vertical without air blowing.

### Block Diagram



### Pin Definitions and Functions

| Pin                    | Symbol    | Functions                            |
|------------------------|-----------|--------------------------------------|
| 1                      | $C_t$     | Timing capacitor for frequency       |
| 2                      | $C_{B1}$  | Bootstrap capacitor                  |
| 3                      | $C_{B2}$  |                                      |
| 4,5,6,7<br>14,15,16,17 | $V_{bb}$  | Supply voltage (Leadframe connected) |
| 8,9,10<br>11,12,13     | OUT       | Output                               |
| 18                     | GND       | Ground                               |
| 19                     | $V_C$     | Voltage for PWM-Control              |
| 20                     | $V_{REF}$ | Reference Voltage                    |

### Pin Configuration (top view)

|          |    |    |           |
|----------|----|----|-----------|
| $C_t$    | 1• | 20 | $V_{REF}$ |
| $C_{B1}$ | 2  | 19 | $V_C$     |
| $C_{B2}$ | 3  | 18 | GND       |
| $V_{bb}$ | 4  | 17 | $V_{bb}$  |
| $V_{bb}$ | 5  | 16 | $V_{bb}$  |
| $V_{bb}$ | 6  | 15 | $V_{bb}$  |
| $V_{bb}$ | 7  | 14 | $V_{bb}$  |
| OUT      | 8  | 13 | OUT       |
| OUT      | 9  | 12 | OUT       |
| OUT      | 10 | 11 | OUT       |

**Electrical Characteristics**

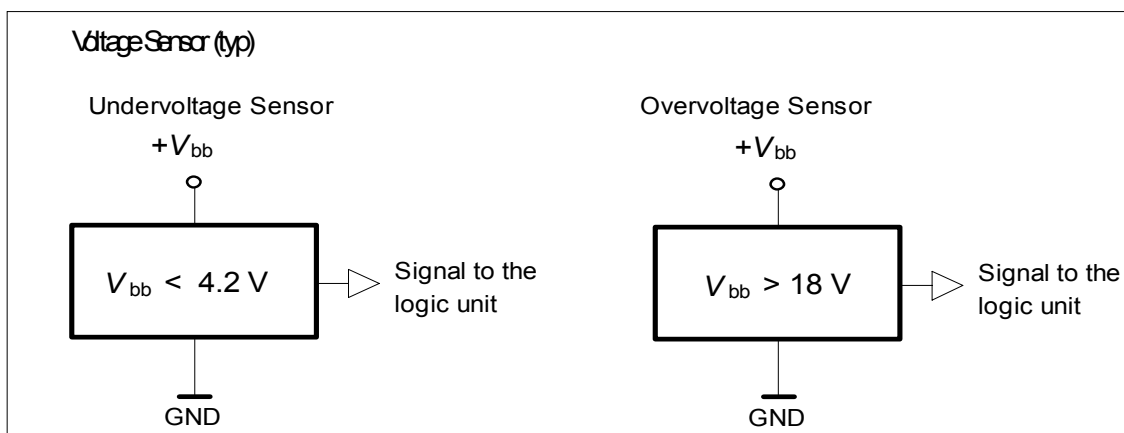
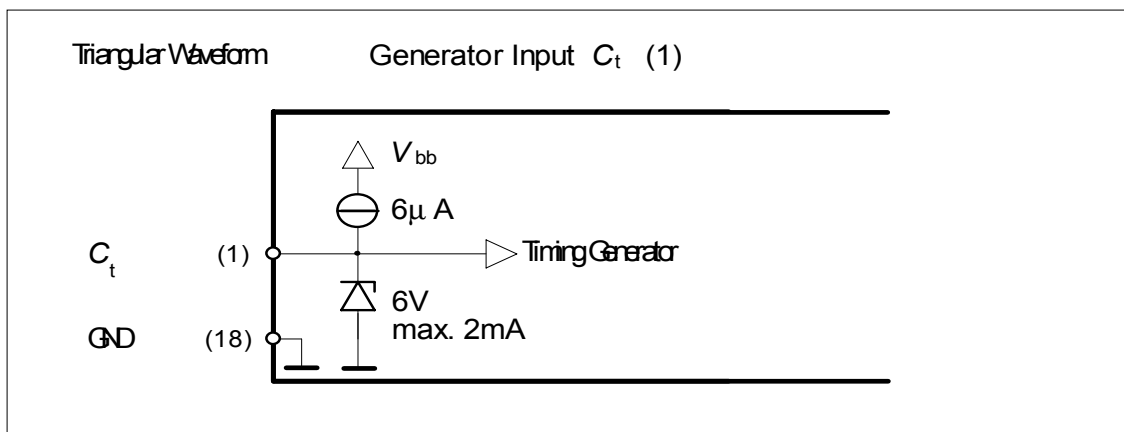
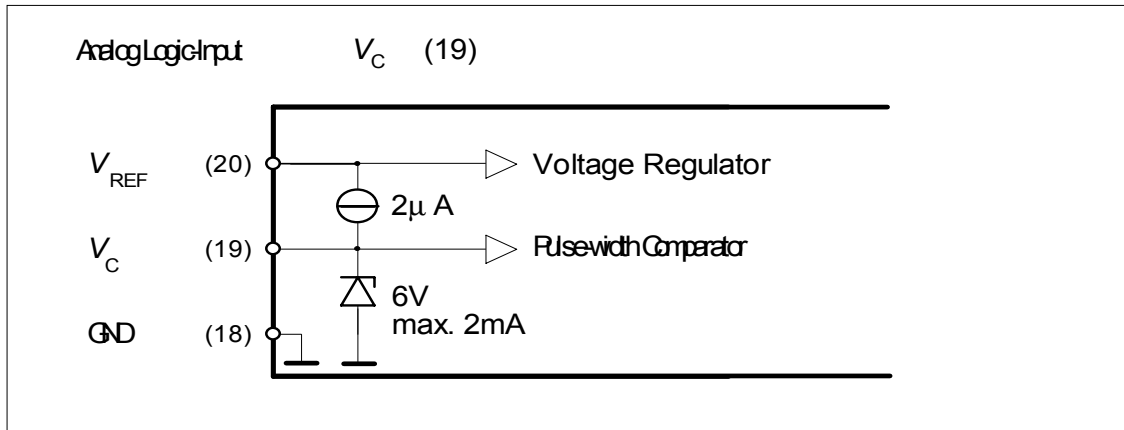
at  $T_C = 25^\circ\text{C}$ ,  $V_{bb} = 12\text{ V}$ , unless otherwise specified.  $C_{\text{Bootstrap}} = 22\text{ nF}$

| Parameter                                                                                                                    | Symbol                 | Values            |      |                    | Unit              |
|------------------------------------------------------------------------------------------------------------------------------|------------------------|-------------------|------|--------------------|-------------------|
|                                                                                                                              |                        | min.              | typ. | max.               |                   |
| On-state resistance<br>$I_L = 3\text{ A}$ , $V_{bb} = 12\text{ V}$                                                           | $R_{\text{ON}}$        | -                 | -    | 70                 | m $\Omega$        |
| Operating voltage<br>$T_C = -40 \dots +150^\circ\text{C}$                                                                    | $V_{bb}$               | 5.9 <sup>1)</sup> | -    | 16.9 <sup>2)</sup> | V                 |
| Nominal current, calculated value<br>ISO-standard: $V_{bb} - V_{\text{OUT}} \leq 0.5\text{ V}$ , $T_C = 85^\circ\text{C}$    | $I_L\text{-ISO}$       | 3                 | -    | -                  | A                 |
| Load current limit<br>$V_{bb} - V_{\text{OUT}} > 1\text{ V}$ , $T_C = -40 \dots +150^\circ\text{C}$                          | $I_{\text{LLim}}$      | -                 | 20   | -                  | A                 |
| Undervoltage shutdown<br>$I_L = 3\text{ A}$ , $T_C = -40 \dots +150^\circ\text{C}$                                           | $V_{bb(\text{LOW})}$   | 3                 | 4.2  | 5.4                | V                 |
| Overvoltage shutdown<br>$I_L = 3\text{ A}$ , $T_C = -40 \dots +150^\circ\text{C}$                                            | $V_{bb(\text{HI})}$    | 17                | 18   | 19                 | V                 |
| Max. output voltage (RMS)<br>$I_L = 3\text{ A}$ , $V_{bb} > 12\text{ V}$<br>$T_C = -40 \dots +150^\circ\text{C}$             | $V_{\text{RMSmax}}$    | 12                | -    | 14                 | V                 |
| Reference voltage<br>$I_{\text{REF}} = 10\text{ mA}$ , $T_C = -40 \dots +150^\circ\text{C}$                                  | $V_{\text{REF}}$       | 2                 |      | 3                  | V                 |
| Reference current<br>pin 18 (GND) to pin 20 ( $V_{\text{REF}}$ ) short                                                       | $I_{\text{REF}}$       | -                 | 150  | -                  | mA                |
| Internal current consumption during operation, measured in PWM gap<br>$T_C = -40 \dots +150^\circ\text{C}$                   | $I_R$                  | -                 |      | 5                  | mA                |
| Bootstrap voltage, pin 2 ( $C_{B1}$ ) to pin 3 ( $C_{B2}$ )<br>$V_{bb} = 12\text{ V}$ , $T_C = -40 \dots +150^\circ\text{C}$ | $V_B$                  | -                 | 10   | -                  | V                 |
| PWM frequency<br>$T_C = -40 \dots +150^\circ\text{C}$ , $C_t = 68\text{ nF}$                                                 | $f_{\text{PWM}}$       | 50                | -    | 100                | Hz                |
| Max. pulse duty factor<br>$I_L = 3\text{ A}$ , $V_C = 0\text{ V}$ , (50% $V_{\text{OUT}}$ )                                  | $D_{\text{imax}}$      | 95                | 98   | -                  | %                 |
| Min. pulse duty factor<br>$I_L = 3\text{ A}$ , $V_C = 0\text{ V}$ , (50% $V_{\text{OUT}}$ )                                  | $D_{\text{imin}}$      | 3                 | 8    | 14                 | %                 |
| Slew rate "on"<br>10 ... 90% $I_{\text{OUT}}$                                                                                | $du/dt_{(\text{on})}$  | 20                | -    | 120                | mV/ $\mu\text{s}$ |
| Slew rate "off"<br>90 ... 10% $I_{\text{OUT}}$                                                                               | $du/dt_{(\text{off})}$ | 20                | -    | 120                | mV/ $\mu\text{s}$ |
| Thermal overload trip temperature                                                                                            | $T_j$                  | 150               | -    | -                  | $^\circ\text{C}$  |

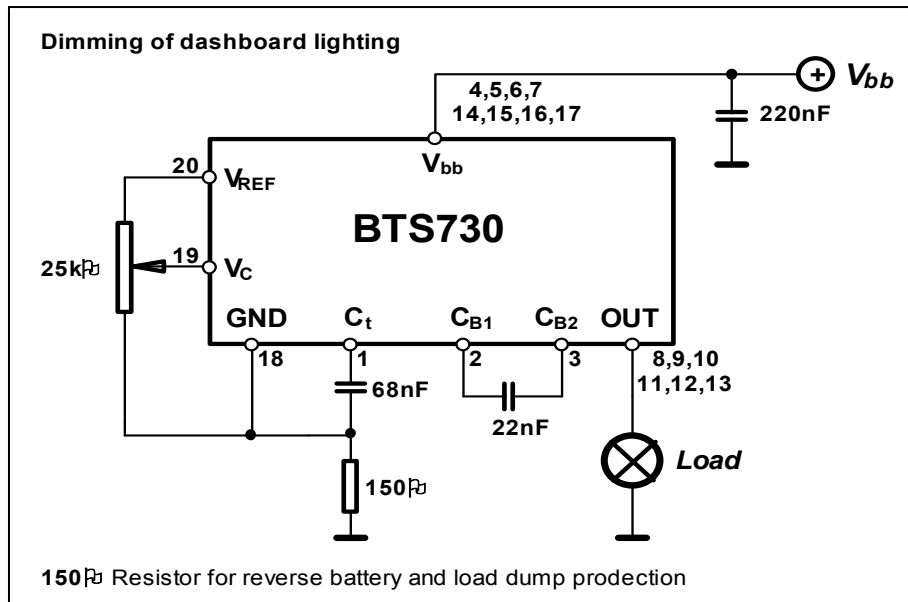
<sup>1)</sup> **Note:** undervoltage shutdown

<sup>2)</sup> **Note:** overvoltage shutdown

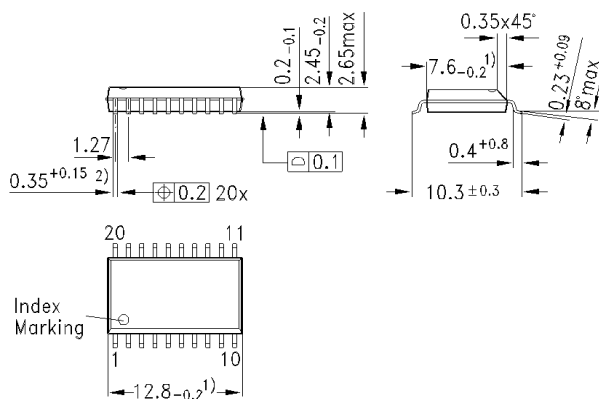
## Circuits



## Application Note



## Package Outline P-DSO-20-6



Dimensions in mm

