



SSL2102

Dimmable Greenchip driver for LED lighting

Rev. 1.1 — 2 December 2011

Product data sheet

1. General description

The SSL2102 is a Switched Mode Power Supply (SMPS) driver IC that operates in combination with a phase cut dimmer directly from rectified mains. It is designed to drive LED devices. The device includes a high-voltage power switch, a circuit to allow direct start-up from the rectified mains voltage and a high-voltage circuitry to supply the phase cut dimmer.

For dimmer applications, an integrated dedicated circuitry optimizes the dimming curve.

- SSL2101: fully integrated LED driver for lamps up to 10 W
- SSL2102: fully integrated LED driver for lamps up to 25 W
- SSL2103: gives the application designer flexibility to:
 - Use an external power switch to allow the IC to provide any power
 - Use external bleeder transistors to provide extended dimmer interoperability

2. Features and benefits

- Easy migration to existing lighting control infrastructure
- Supports most available dimming solutions
- Optimized efficiency with valley switching managed by a built-in circuitry
- Demagnetization detection
- OverTemperature Protection (OTP)
- Short-Winding Protection (SWP) and Over Current Protection (OCP)
- Internal V_{CC} generation allowing start-up from the rectified mains voltage
- Natural dimming curve by logarithmic correction, down to 1 %
- Limited external components required because of the high integration level
- Thermal enhanced SO20 wide body package
- Suitable for flyback and buck applications

3. Applications

- SSL applications below 25 W
- SSL retro-fit lamps (for example: GU10, E27)
- LED modules such as LED spots and down-lights
- LED strings suitable for retail displays, etc.



4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|----------------------------------|--|-----|-----|------|----------|
| R_{DSon} | drain-source on-state resistance | power switch; $I_{SOURCE} = -0.50$ A | | | | |
| | | $T_j = 25$ °C | 4.5 | 6.5 | 7.5 | Ω |
| | | $I_{SOURCE} = -0.20$ A | | | | |
| | | $T_j = 125$ °C | - | 9.5 | 10 | Ω |
| V_{CC} | supply voltage | | 8.5 | - | 40 | V |
| f_{osc} | oscillator frequency | | 10 | 100 | 200 | kHz |
| I_{DRAIN} | current on pin DRAIN | $V_{DRAIN} > 60$ V; no auxiliary supply | - | - | 2.2 | mA |
| | | $V_{DRAIN} > 60$ V; with auxiliary supply | - | 30 | 125 | μ A |
| V_{DRAIN} | voltage on pin DRAIN | | 40 | - | 600 | V |
| δ_{min} | minimum duty factor | | - | 0 | - | % |
| δ_{max} | maximum duty cycle | | - | 75 | - | % |
| T_{amb} | ambient temperature | | -40 | - | +100 | °C |

5. Ordering information

Table 2. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|----------|
| | Name | Description | |
| SSL2102T | SO20 | plastic small outline package; 20 leads; body width 7.5 mm | SOT163-1 |

6. Block diagram

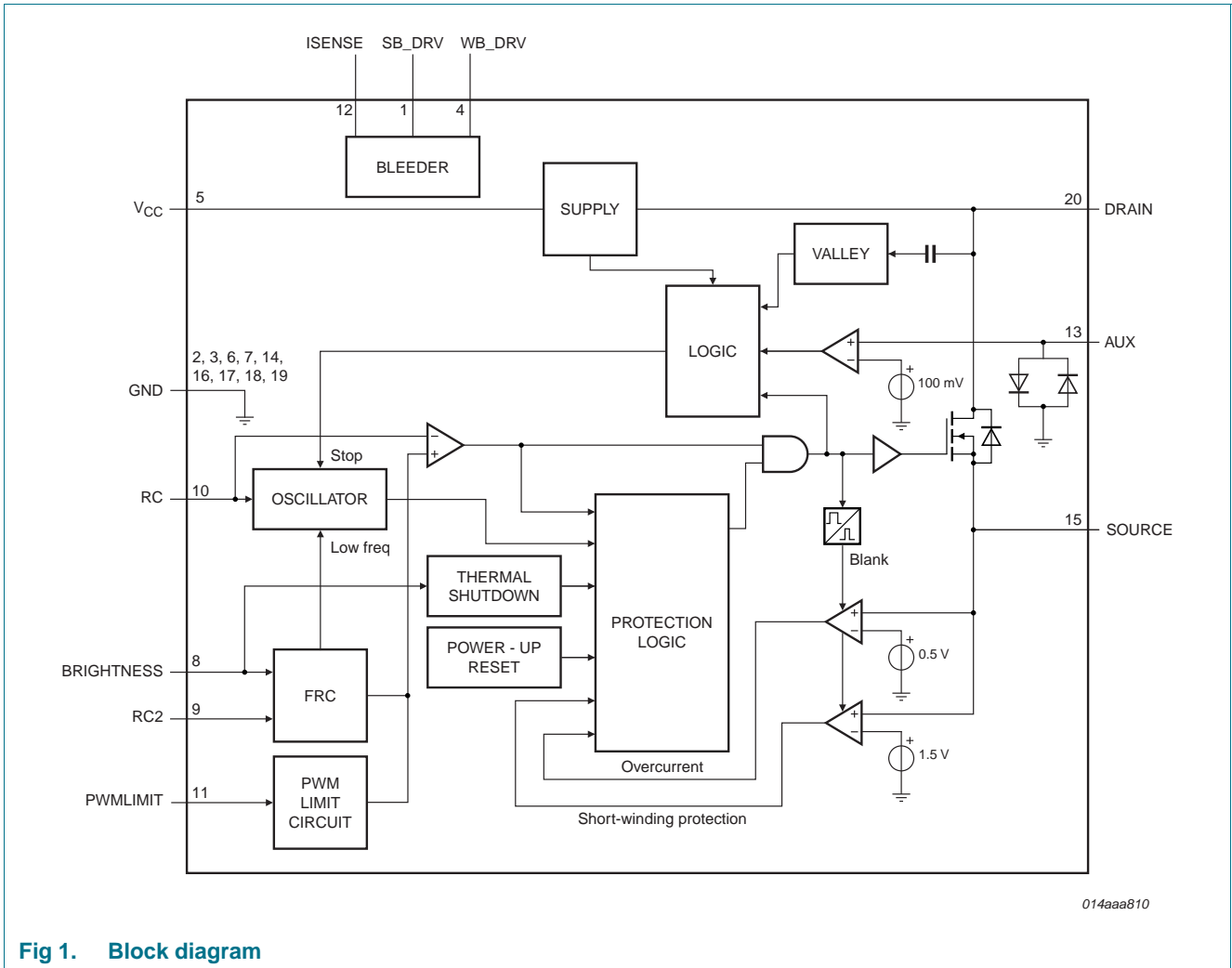
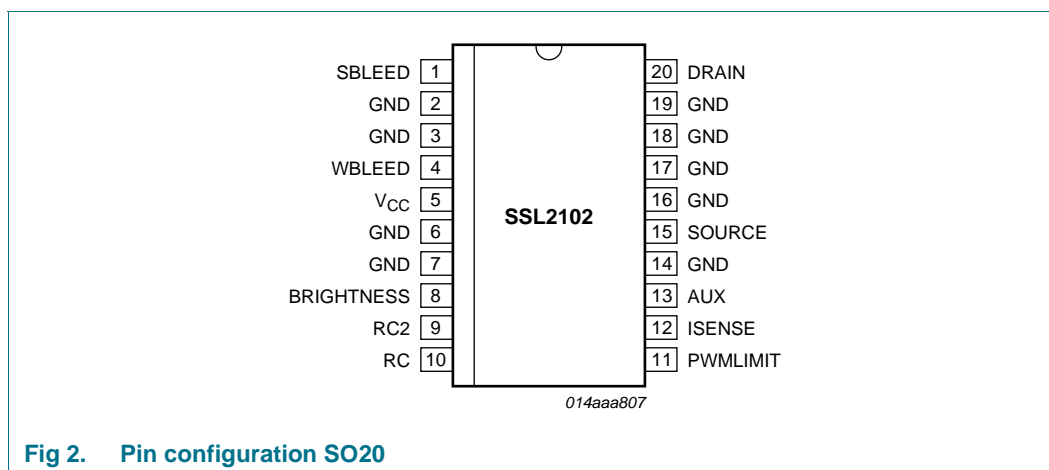


Fig 1. Block diagram

7. Pinning information

7.1 Pinning



7.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|---|
| SBLEED | 1 | drain of internal strong bleeder switch |
| GND | 2 | ground |
| GND | 3 | ground |
| WBLEED | 4 | drain of internal weak bleeder switch |
| V _{CC} | 5 | supply voltage |
| GND | 6 | ground |
| GND | 7 | ground |
| BRIGHTNESS | 8 | brightness input |
| RC2 | 9 | setting for frequency reduction |
| RC | 10 | frequency setting |
| PWMLIMIT | 11 | PWM limit input |
| ISENSE | 12 | current sense input for WBLEED |
| AUX | 13 | Input for voltage from auxiliary winding for timing (demagnetization) |
| GND | 14 | ground |
| SOURCE | 15 | source of internal power switch |
| GND | 16 | ground |
| GND | 17 | ground |
| GND | 18 | ground |
| GND | 19 | ground |
| DRAIN | 20 | drain of internal power switch; input for start-up current and valley sensing |

8. Functional description

The SSL2102 is an LED driver IC that operates directly from the rectified mains.

The SSL2102 uses on-time mode control and frequency control to control the LED brightness. The BRIGHTNESS and PWMLIMIT input of the IC can be used to control the LED light output in combination with an external dimmer. The PWMLIMIT input can also be used for Thermal Lumen Management (TLM) and for precision LED current control.

8.1 Start-up and UnderVoltage LockOut (UVLO)

Initially, the IC is self-supplying from the rectified mains voltage. The IC starts switching as soon as the voltage on pin V_{CC} passes the $V_{CC(\text{startup})}$ level. The supply can be taken over by the auxiliary winding of the transformer as soon as V_{CC} is high enough and the supply from the line is stopped for high efficiency operation. Alternatively the IC can be supplied via a bleeder resistor connected to a high voltage.

Remark: The maximum V_{CC} voltage rating of the IC.

If for some reason the auxiliary supply is not sufficient, the high-voltage supply can also supply the IC. As soon as the voltage on pin V_{CC} drops below the $V_{CC(\text{UVLO})}$ level, the IC stops switching and will restart from the rectified mains voltage, if the internal current delivered is sufficient.

8.2 Oscillator

An internal oscillator inside the IC provides the timing for the switching converter logics.

The frequency of the oscillator is set by the external resistors and the capacitor on pin RC and pin RC2. The external capacitor is charged rapidly to the $V_{RC(\text{max})}$ level and, starting from a new primary stroke, it discharges to the $V_{RC(\text{min})}$ level. Because the discharge is exponential, the relative sensitivity of the duty factor to the regulation voltage at low duty factor is almost equal to the sensitivity at high duty factors. This results in a more constant gain over the duty factor range compared to Pulse Width Modulated (PWM) systems with a linear sawtooth oscillator. Stable operation at low duty factors is easily realized. The frequency of the converter when $V_{\text{BRIGHTNESS}}$ is high can be estimated using [Equation 1](#):

$$RC = \frac{1}{3.5} \cdot \left(\frac{1}{f_{osc}} - t_{charge} \right) \quad (1)$$

R equals the parallel resistance of both oscillator resistors. C is the capacitor connected at the RC pin (pin 8).

The BRIGHTNESS input controls the frequency reduction mode. [Figure 3](#) shows that the oscillator switches over from an RC curve with $R1//R2$ to $R1$ only. A low BRIGHTNESS voltage will reduce the switching frequency.

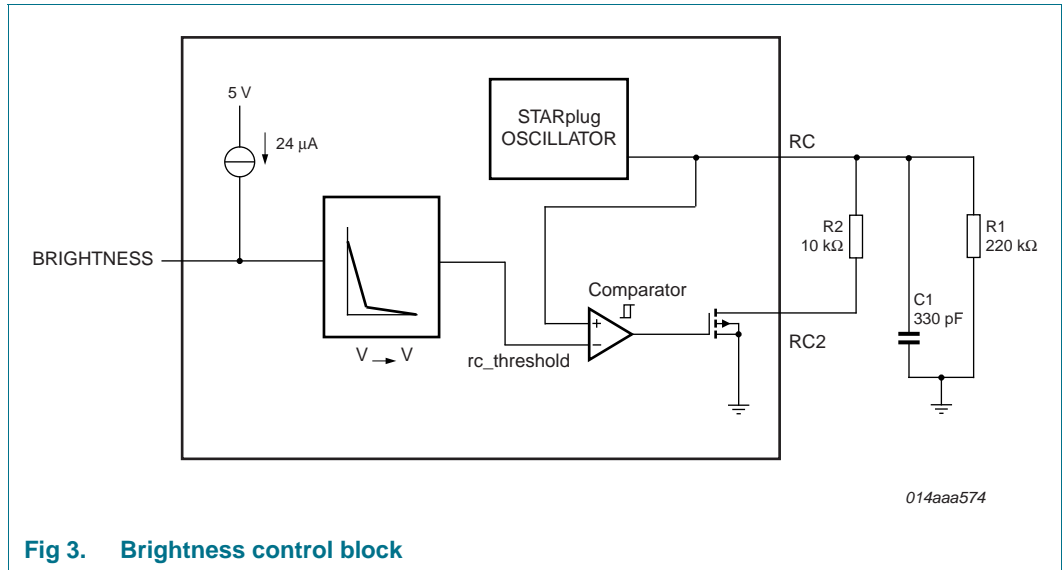


Fig 3. Brightness control block

A typical RC waveform is given in [Figure 4](#). The RC switch-over threshold is controlled by the BRIGHTNESS pin.

To ensure that the capacitor can be charged within the charge time, the value of the oscillator capacitor should be limited to 1 nF. Leakage current limits the value of the resistor connected between the RC pin and the ground should be limited to a maximum of 220 kΩ.

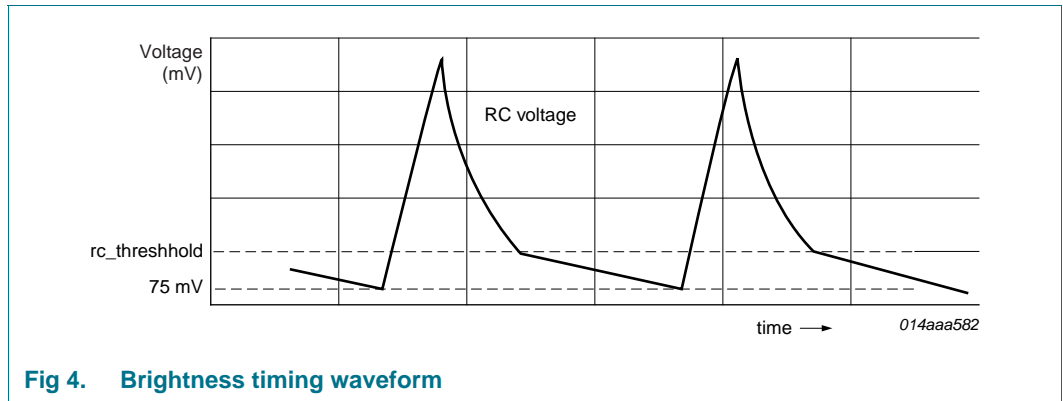


Fig 4. Brightness timing waveform

8.3 Duty factor control

The duty factor is controlled by an internally regulated voltage and the oscillator signal on pin RC. The internal regulation voltage is set by the voltage on the PWMLIMIT pin.

A low PWMLIMIT voltage will result in a low on-time for the internal power switch. The minimum duty factor of the switched mode power supply can be set to 0 %. The maximum duty factor is set to 75 %.

8.4 Bleeder for dimming applications

The SSL2102 IC contains some circuitry intended for mains dimmer compatibility. This circuit contains two current sinks that are called bleeders. A strong bleeder is used for zero-cross reset of the dimmer and TRIAC latching. A weak bleeder is added to maintain the hold current through the dimmer.

The strong bleeder switch is switched on when the maximum voltage on the WBLEED pin and the SBLEED pin is below the $V_{th(SBLEED)}$ level (52 V typically). The weak bleeder switch is switched on as soon as the voltage on pin ISENSE exceeds the $V_{th(high)(ISENSE)}$ level (-100 mV typically). The weak bleeder switch is switched off when the ISENSE voltage drops below the $V_{th(low)(ISENSE)}$ level (-250 mV typically). The weak bleeder switch is also switched off when the strong bleeder switch is switched on. See [Figure 5](#).

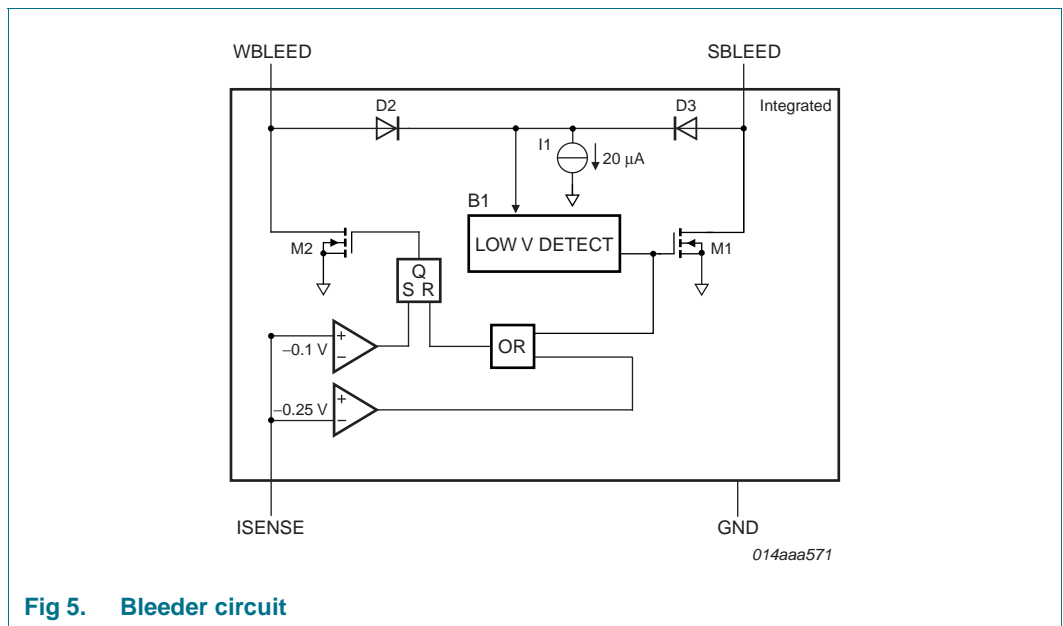


Fig 5. Bleeder circuit

8.5 Valley switching

A new cycle is started when the primary switch is switched on (see [Figure 6](#)). After a time determined by the oscillator voltage, RC and the internal regulation level, the switch is turned off and the secondary stroke starts. The internal regulation level is determined by the voltage on pin PWMLIMIT.

After the secondary stroke, the drain voltage shows an oscillation with a frequency of approximately:

$$\frac{I}{2 \times \pi \times \sqrt{(L_p \times C_p)}} \tag{2}$$

Where:

L_p = primary self inductance

C_p = parasitic capacitance on drain node

As soon as the oscillator voltage is high again and the secondary stroke has ended, the circuit waits for a low drain voltage before starting a new primary stroke.

Figure 6 shows the drain voltage together with the valley signal, the signal indicating the secondary stroke and the RC voltage.

The primary stroke starts some time before the actual valley at low ringing frequencies, and some time after the actual valley at high ringing frequencies.

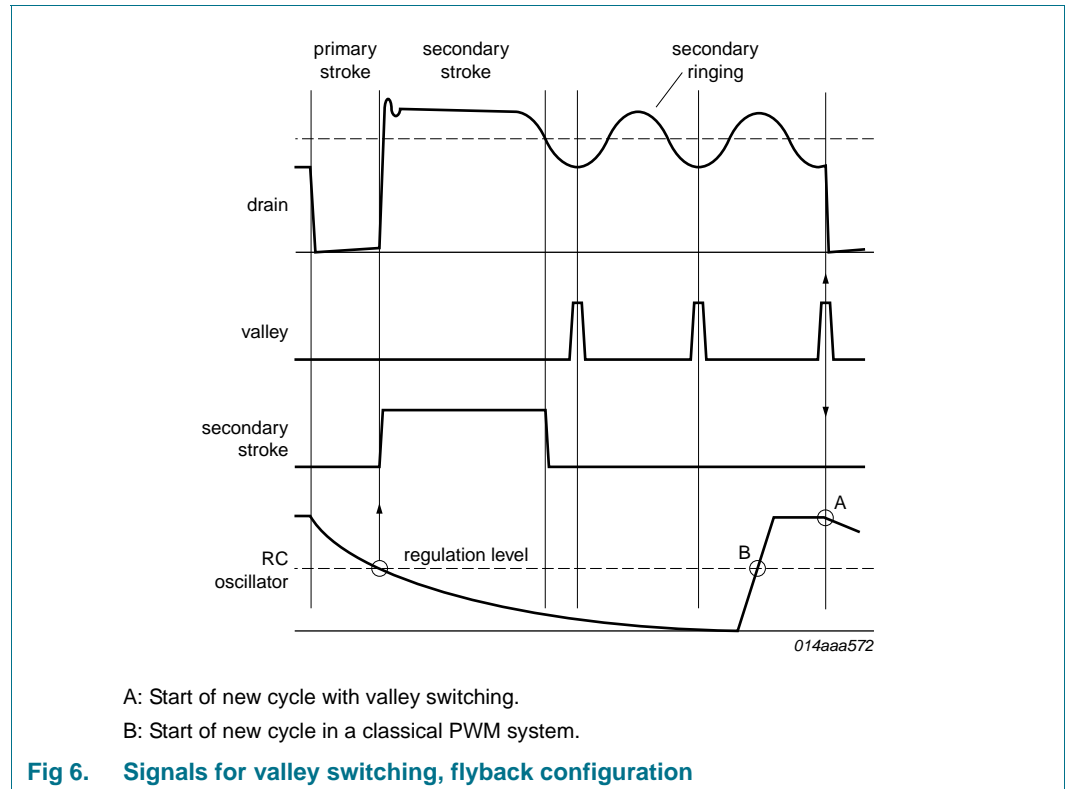
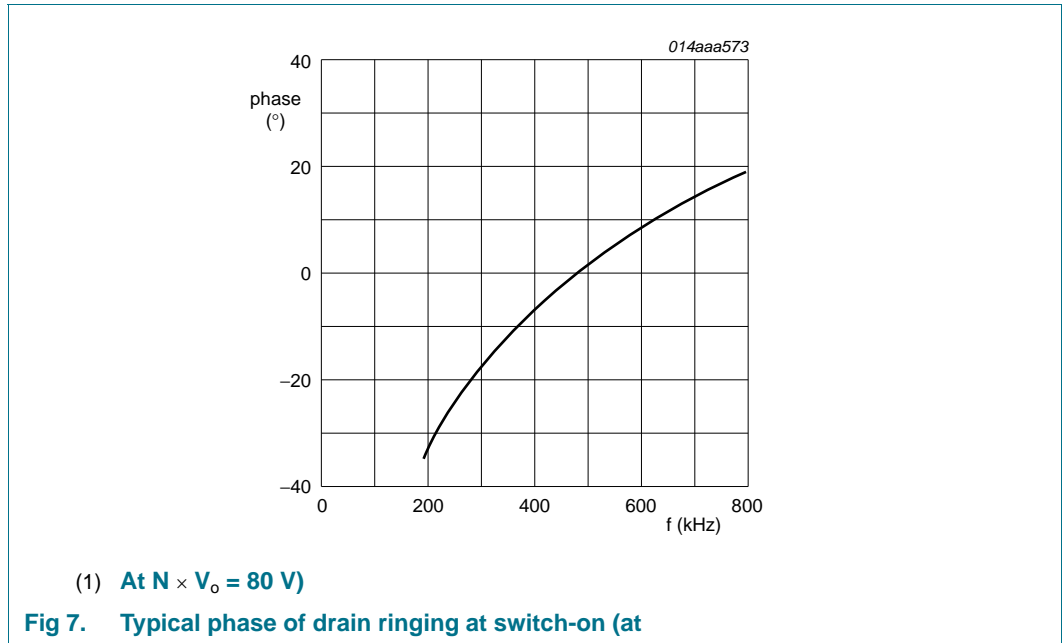


Figure 7 shows a typical curve for a reflected output voltage N at an output voltage of 80 V. This voltage is the output voltage transferred to the primary side of the transformer with the factor N (determined by the turns ratio of the transformer). It shows that the system switches exactly at minimum drain voltage for ringing frequencies of 480 kHz, thus reducing the switch-on losses to a minimum. At 200 kHz, the next primary stroke is started at 33 ° before the valley. The switch-on losses are still reduced significantly.



8.6 Demagnetization

The system operates in discontinuous conduction mode if the AUX pin is connected. As long as the secondary stroke has not ended, the oscillator will not start a new primary stroke. During the first $t_{sup(xfmr_ring)}$ seconds, demagnetization recognition is suppressed. This suppression may be necessary in applications where the transformer has a large leakage inductance and at low output voltages.

8.7 Overcurrent protection

The cycle-by-cycle peak drain current limit circuit uses the external source resistor R_{SENSE}^1 to measure the current. The circuit is activated after the leading edge blanking time t_{leb} . The protection circuit limits the source voltage over the R_{SENSE} resistor to $V_{th(ocp)SOURCE}$ and thus limits the primary peak current.

8.8 Short-winding protection

The short-winding protection circuit is also activated after the leading edge blanking time. If the source voltage exceeds the short-winding protection threshold voltage $V_{th(swp)SOURCE}$, the IC stops switching. Only a power-on reset will restart normal operation. The short-winding protection also protects in case of a secondary diode short circuit.

8.9 Overtemperature protection

Accurate temperature protection is provided in the device. When the junction temperature exceeds the thermal shut-down temperature, the IC stops switching. During thermal protection, the IC current is lowered to the start-up current. The IC continues normal operation as soon as the overtemperature situation has disappeared.

1. R_{SENSE} is the resistor between the SOURCE pin and GND

9. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). All voltages are measured with respect to ground; positive currents flow into the device; pins V_{CC} and RC cannot be current driven. Pins ISENSE and AUX cannot be voltage driven.

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|---------------------------|---|------|------|------|
| Voltages | | | | | |
| V_{CC} | supply voltage | continuous | -0.4 | +40 | V |
| V_{RC} | voltage on pin RC | | -0.4 | +3 | V |
| V_{RC2} | voltage on pin RC2 | | -0.4 | +3 | V |
| $V_{BRIGHTNESS}$ | voltage on pin BRIGHTNESS | | -0.4 | +5 | V |
| $V_{PWMLIMIT}$ | voltage on pin PWMLIMIT | | -0.4 | +5 | V |
| V_{SOURCE} | voltage on pin SOURCE | | -0.4 | +5 | V |
| V_{DRAIN} | voltage on pin DRAIN | DMOS power transistor; $T_{amb} = 25\text{ °C}$ | -0.4 | +600 | V |
| V_{SBLEED} | voltage on pin SBLEED | off-state; $T_j = 125\text{ °C}$ | -0.4 | +600 | V |
| | | on-state; $V_{VCC} > 8.5\text{ V};$ $T_j < 125\text{ °C}$ | -0.4 | +16 | V |
| V_{WBLEED} | voltage on pin WBLEED | off-state; $T_j < 125\text{ °C}$ | -0.4 | +600 | V |
| | | on-state; $V_{VCC} > 8.5\text{ V};$ $T_j < 125\text{ °C}$ | -0.4 | +12 | V |
| Currents | | | | | |
| I_{ISENSE} | current on pin ISENSE | | -20 | +5 | mA |
| I_{AUX} | current on pin AUX | | -10 | +5 | mA |
| I_{SOURCE} | current on pin SOURCE | | -2 | +2 | A |
| I_{DRAIN} | current on pin DRAIN | | -2 | +2 | A |
| General | | | | | |
| P_{tot} | total power dissipation | $T_{amb} = 70\text{ °C}$ | - | 1.6 | W |
| T_{stg} | storage temperature | | -55 | +150 | °C |
| T_{amb} | ambient temperature | | -40 | +100 | °C |
| T_j | junction temperature | | -40 | +150 | °C |

Table 4. Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134). All voltages are measured with respect to ground; positive currents flow into the device; pins V_{CC} and RC cannot be current driven. Pins ISENSE and AUX cannot be voltage driven.

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|-----------|---------------------------------|----------------------|-------|-------|------|---|
| V_{ESD} | electrostatic discharge voltage | human body model; | [1] | | | |
| | | Pins 20, 1, 4 | -1000 | +1000 | V | |
| | | All other pins | -2000 | +2000 | V | |
| | | machine model | [2] | -200 | +200 | V |
| | | charged device model | [3] | -500 | +500 | V |

[1] Human body model: equivalent to discharging a 100 pF capacitor through a 1.5 k Ω series resistor.

[2] Machine model: equivalent to discharging a 200 pF capacitor through a 0.75 μ H coil and a 10 Ω series resistor.

[3] Charged device model: equivalent to charging the IC up to 1 kV and the subsequent discharging of each pin down to 0 V over a 1 Ω resistor.

10. Thermal characteristics

The heat sink for SSL2102 applications is provided by the Printed-Circuit Board (PCB) copper. The SSL2102 uses thermal leads (pins 2, 3, 6, 7, 16, 17, 18 and 19) for heat transfer from the die to PCB.

Enhanced thermal lead connection may drastically reduce thermal resistance.

The following equation shows the relationship between the maximum allowable power dissipation P and the thermal resistance from junction to ambient.

$$R_{th(j-a)} = (T_{j(max)} - T_{amb}) / P$$

Where:

$R_{th(j-a)}$ = thermal resistance from junction to ambient

$T_{j(max)}$ = maximum junction temperature

T_{amb} = ambient temperature

P = power dissipation

The thermal resistance as a function of the PCB area (Board: 0.8 mm thickness, 2 layers, Bottom Cu coverage 90 %, Cu thickness 70 μ m

(390 W/mK), Core material conductivity: 0.5 W/mK, 10 vias dia 0.3 mm) is shown in [Figure 8](#)

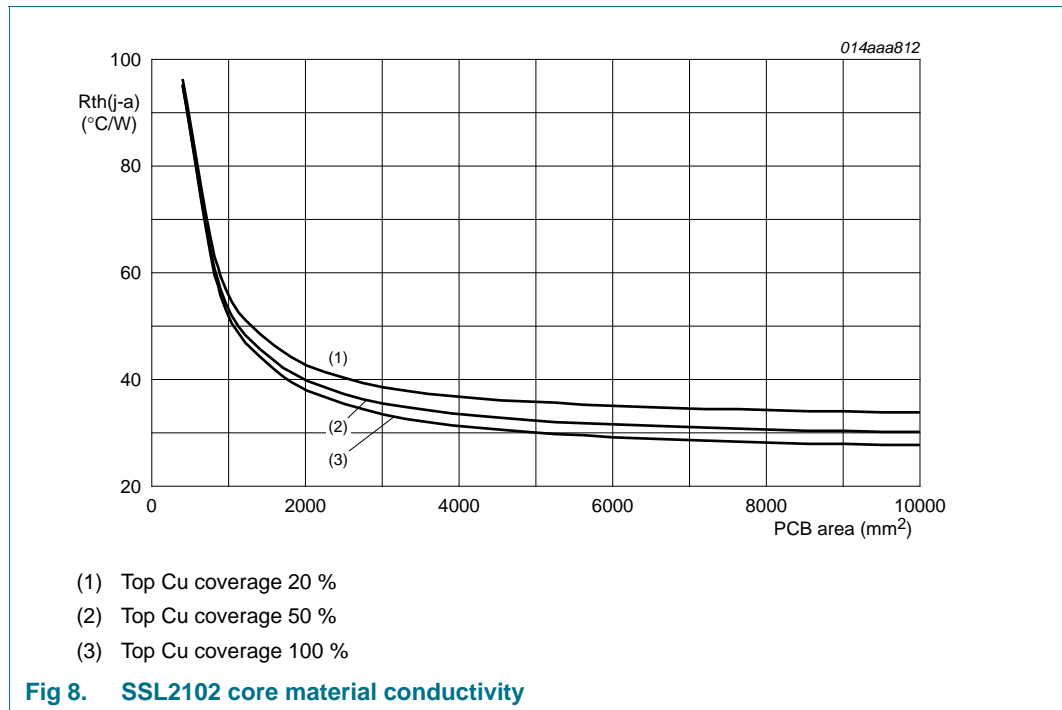


Table 5: Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|---------------|---|------------|------------------------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | | [1] 62 | KW |

[1] Measured on a JEDEC test board (standard EIA/JESD 51-3) in free air with natural convection.

11. Characteristics

Table 6. Characteristics

$T_{amb} = 25\text{ °C}$; no overtemperature; all voltages are measured with respect to ground; currents are positive when flowing into the IC and PWMLIMIT and BRIGHTNESS pins are disconnected unless otherwise specified. Typical frequency 100 kHz.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------|-------------------------------------|--|------|-------|-------|------|
| Supply | | | | | | |
| I_{CC} | supply current | normal operation; $V_{DRAIN} = 60\text{ V}$; $V_{CC} = 20\text{ V}$ | - | 1.7 | 2 | mA |
| $I_{CC(ch)}$ | charge supply current | $V_{DRAIN} > 60\text{ V}$; $V_{CC} = 0\text{ V}$ | -6 | -4.5 | - | mA |
| V_{CC} | supply voltage | | 8.5 | - | 40 | V |
| $V_{CC(startup)}$ | start-up supply voltage | | 9.75 | 10.25 | 10.75 | V |
| $V_{CC(UVLO)}$ | undervoltage lockout supply voltage | | 7.9 | 8.2 | 8.5 | V |

Table 6. Characteristics ...continued

$T_{amb} = 25\text{ °C}$; no overtemperature; all voltages are measured with respect to ground; currents are positive when flowing into the IC and PWMLIMIT and BRIGHTNESS pins are disconnected unless otherwise specified. Typical frequency 100 kHz.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------------------|--|--|-----|------|-----|---------------|
| I_{DRAIN} | current on pin DRAIN | $V_{DRAIN} > 60\text{ V}$; no auxiliary supply | - | - | 2.2 | mA |
| | | $V_{DRAIN} > 60\text{ V}$; with auxiliary supply | - | 30 | 125 | μA |
| V_{DRAIN} | voltage on pin DRAIN | | 40 | - | 600 | V |
| Pulse width modulator | | | | | | |
| δ_{min} | minimum duty factor | | - | 0 | - | % |
| δ_{max} | maximum duty cycle | $f = 100\text{ kHz}$ | - | 75 | - | % |
| SOPS | | | | | | |
| $V_{det(demag)}$ | demagnetization detection voltage | | 50 | 100 | 150 | mV |
| $t_{sup(xfmr_ring)}$ | transformer ringing suppression time | at start of secondary stroke | 1.0 | 1.5 | 2.0 | μs |
| RC oscillator | | | | | | |
| $V_{RC(min)}$ | minimum voltage on pin RC | | 60 | 75 | 90 | mV |
| $V_{RC(max)}$ | maximum voltage on pin RC | | 2.4 | 2.5 | 2.6 | V |
| $t_{ch(RC)}$ | charge time on pin RC | | - | 1 | - | μs |
| $V_{BRIGHTNESS}$ | voltage on pin BRIGHTNESS | 2.5 V RC2 trip level | - | 0.5 | - | V |
| | | 180 mV RC2 trip level | - | 1.25 | - | V |
| | | 75 mV RC2 trip level | - | 2.3 | - | V |
| f_{osc} | oscillator frequency | | 10 | 100 | 200 | kHz |
| $I_{BRIGHTNESS}$ | current on pin BRIGHTNESS | $V_{BRIGHTNESS} = 0\text{ V}$ | -20 | -24 | -28 | μA |
| Bleeder | | | | | | |
| $V_{th(SBLEED)}$ | threshold voltage on pin SBLEED | | 46 | 52 | 56 | V |
| $V_{th(low)ISENSE}$ | low threshold voltage on pin ISENSE | | - | -250 | - | mV |
| $V_{th(high)ISENSE}$ | high threshold voltage on pin ISENSE | | - | -100 | - | mV |
| $R_{DSon(SBLEED)}$ | drain-source on-state resistance on pin SBLEED | $I_{SBLEED} = 25\text{ mA}$ | | | | |
| | | $T_j = 25\text{ °C}$ | 140 | 170 | 200 | Ω |
| | | $T_j = 125\text{ °C}$ | 220 | 270 | 320 | Ω |

Table 6. Characteristics ...continued

$T_{amb} = 25\text{ °C}$; no overtemperature; all voltages are measured with respect to ground; currents are positive when flowing into the IC and PWMLIMIT and BRIGHTNESS pins are disconnected unless otherwise specified. Typical frequency 100 kHz.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|--|---|----------------------|------|------|------------------|
| $R_{DSon(WBLEED)}$ | drain-source on-state resistance on pin WBLEED | $I_{WBLEED} = 10\text{ mA}$ | | | | |
| | | $T_j = 25\text{ °C}$ | 250 | 310 | 350 | Ω |
| | | $T_j = 125\text{ °C}$ | 400 | 500 | 600 | Ω |
| Duty factor regulator: pin PWMLIMIT | | | | | | |
| $I_{PWMLIMIT}$ | current on pin PWMLIMIT | | -25 | - | -18 | μA |
| $V_{PWMLIMIT}$ | voltage on pin PWMLIMIT | maximum duty cycle = 3 V | - | 3 | - | V |
| | | minimum duty factor threshold | - | 0.45 | - | V |
| Valley switching | | | | | | |
| $(\Delta V/\Delta t)_{vrec}$ | valley recognition voltage change with time | minimum absolute value | 11 - | 100 | - | V/ μs |
| f_{ring} | ringing frequency | $N \times V_O = 100\text{ V}$ | 200 | 550 | 800 | kHz |
| $t_{d(vrec-swon)}$ | valley recognition to switch-on delay time | | - | 150 | - | ns |
| Current and short circuit winding protection | | | | | | |
| $V_{th(ocp)SOURCE}$ | overcurrent protection threshold voltage on pin SOURCE | $dV/dt = 0.1\text{ V}/\mu\text{s}$ | 0.47 | 0.50 | 0.53 | V |
| $V_{th(swp)SOURCE}$ | short-winding protection threshold voltage on pin SOURCE | $dV/dt = 0.1\text{ V}/\mu\text{s}$ | - | 1.5 | - | V |
| $t_{d(ocp-swoff)}$ | delay time from overcurrent protection to switch-off | $dV/dt = 0.5\text{ V}/\mu\text{s}$ | - | 160 | 185 | ns |
| t_{leb} | leading edge blanking time | | 250 | 350 | 450 | ns |
| FET output stage | | | | | | |
| $I_{L(DRAIN)}$ | leakage current on pin DRAIN | $V_{DRAIN} = 600\text{ V}$ | - | - | 125 | μA |
| $V_{BR(DRAIN)}$ | breakdown voltage on pin DRAIN | $T_{amb} = 25\text{ °C}$ | 600 | - | - | V |
| R_{DSon} | drain-source on-state resistance | power switch; $I_{SOURCE} = -0.50\text{ A}$ | | | | |
| | | $T_j = 25\text{ °C}$ | 4.50 | 6.5 | 7.5 | Ω |
| | | $I_{SOURCE} = -0.20\text{ A}$ | | | | |
| | | $T_j = 125\text{ °C}$ | - | 9.5 | - | Ω |

Table 6. Characteristics ...continued

$T_{amb} = 25\text{ }^{\circ}\text{C}$; no overtemperature; all voltages are measured with respect to ground; currents are positive when flowing into the IC and PWMLIMIT and BRIGHTNESS pins are disconnected unless otherwise specified. Typical frequency 100 kHz.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|------------------------|---|-----|-----|-----|------|
| $t_{f(DRAIN)}$ | fall time on pin DRAIN | input voltage: 300 V; no external capacitor at drain | - | 75 | - | ns |

Temperature protection

| | | | | | | |
|----------------|--|----------------------|-----|-----|-----|--------------------|
| T_{otp} | overtemperature protection trip | junction temperature | 150 | 160 | 170 | $^{\circ}\text{C}$ |
| $T_{otp(hys)}$ | overtemperature protection trip hysteresis | junction temperature | - | 2 | - | $^{\circ}\text{C}$ |

[1] Voltage change in time for valley recognition.

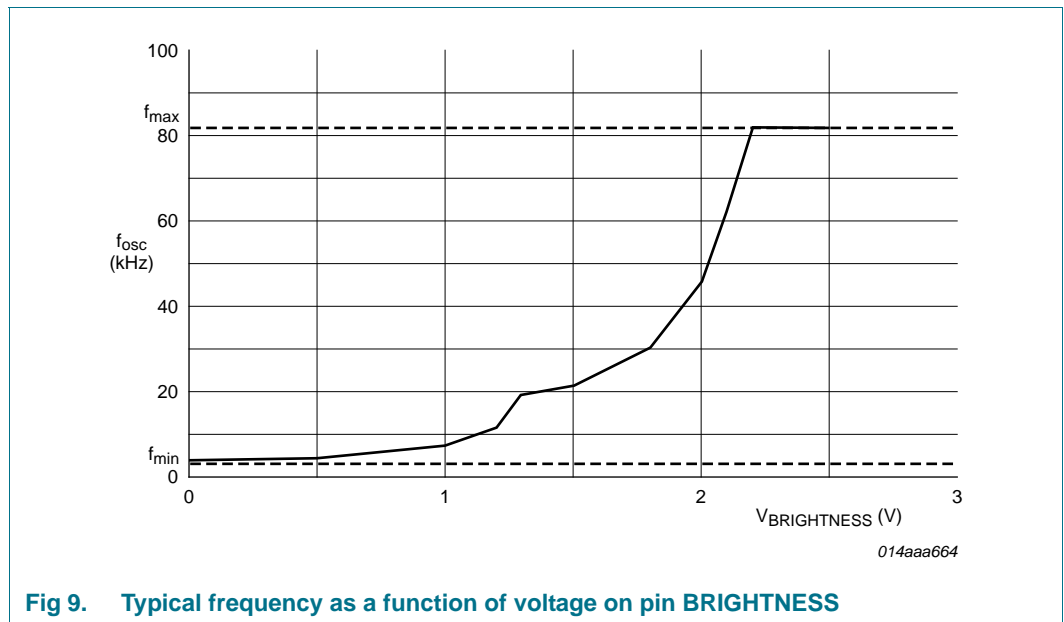
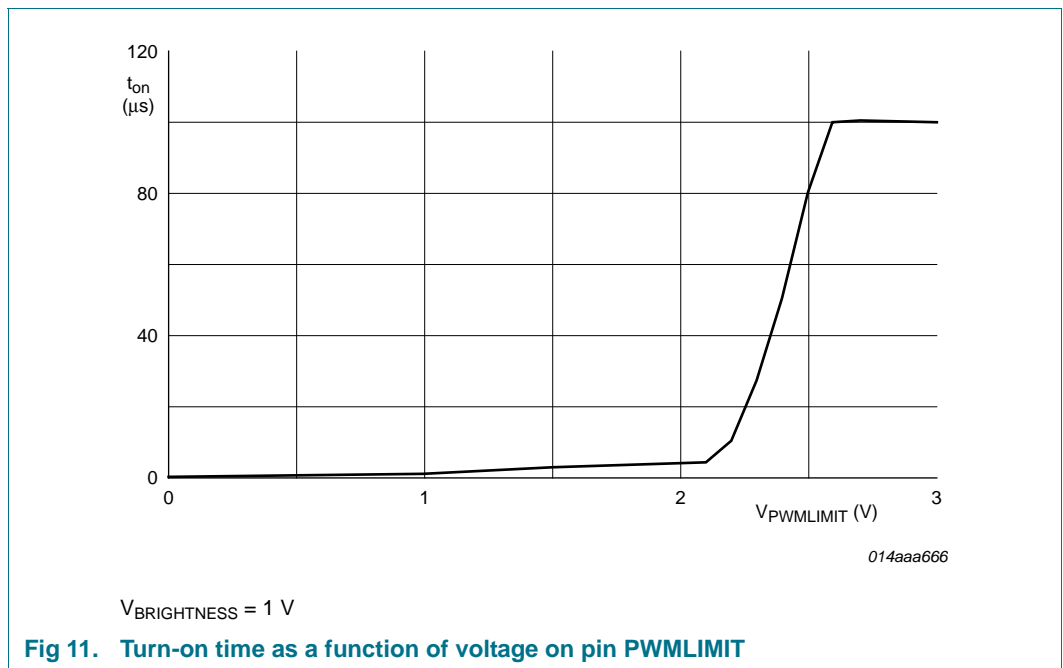
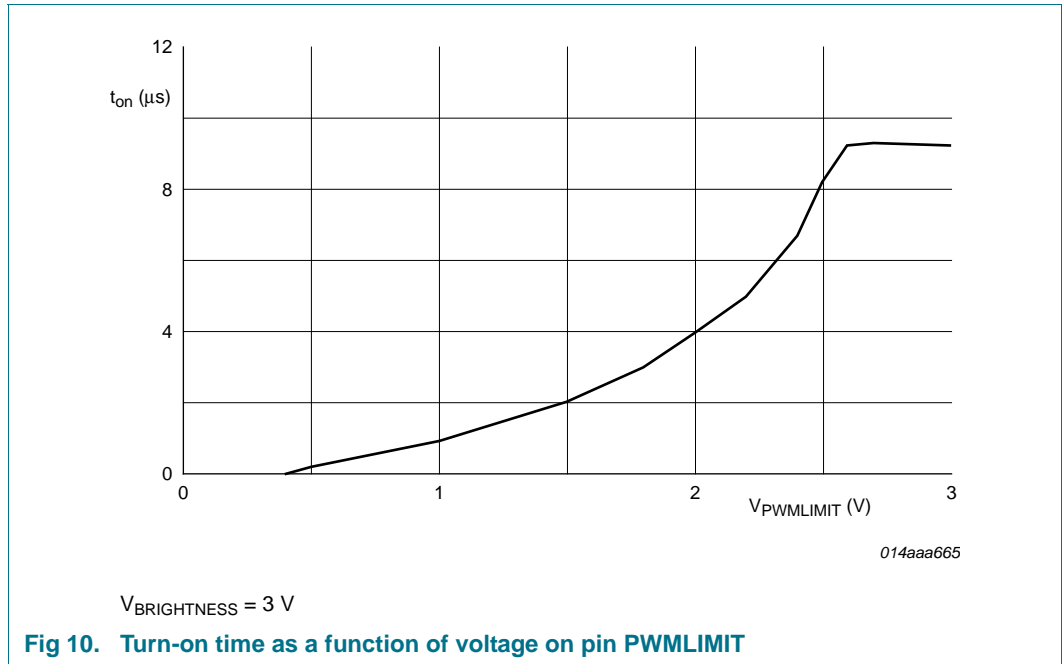


Fig 9. Typical frequency as a function of voltage on pin BRIGHTNESS



12. Application information

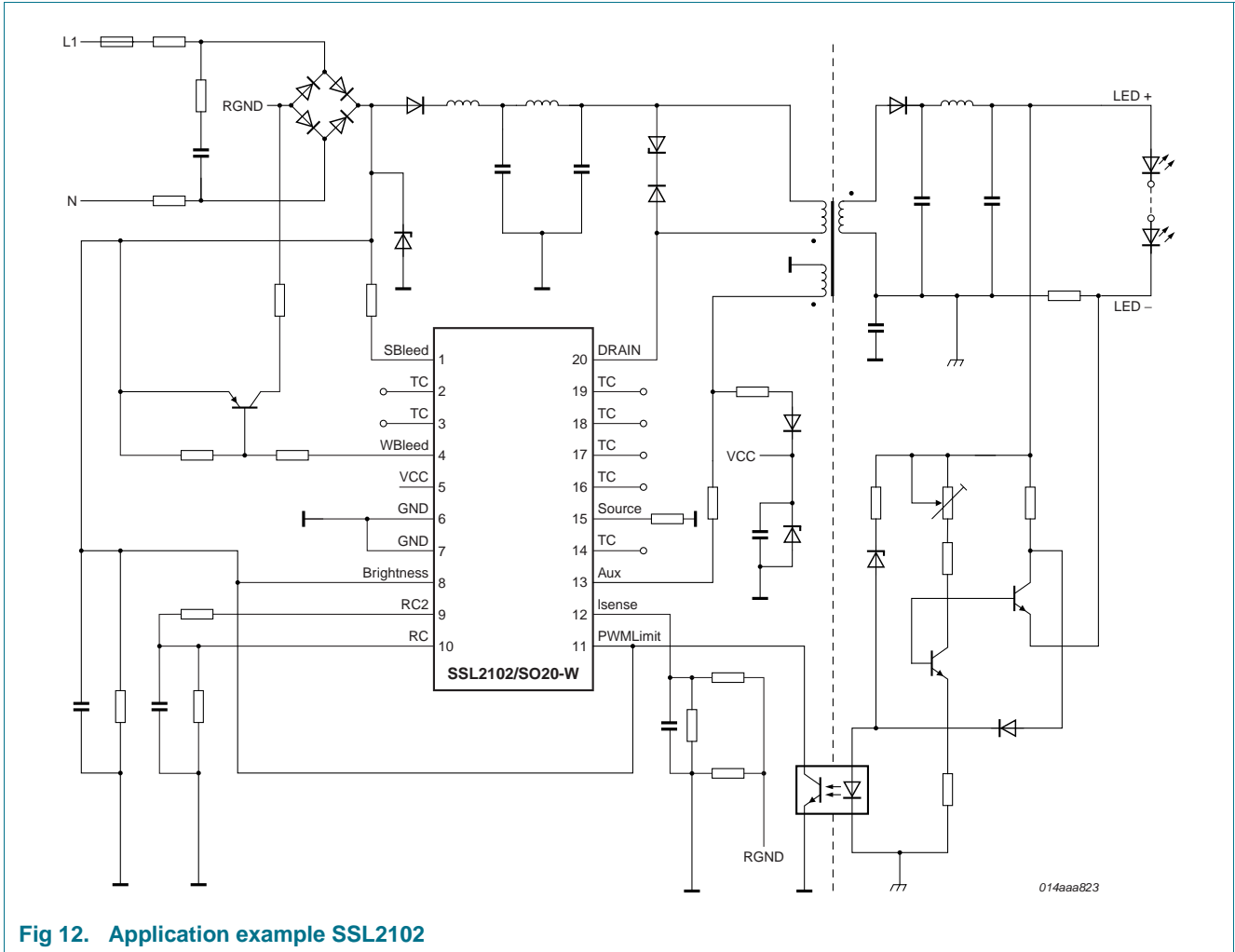


Fig 12. Application example SSL2102

13. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

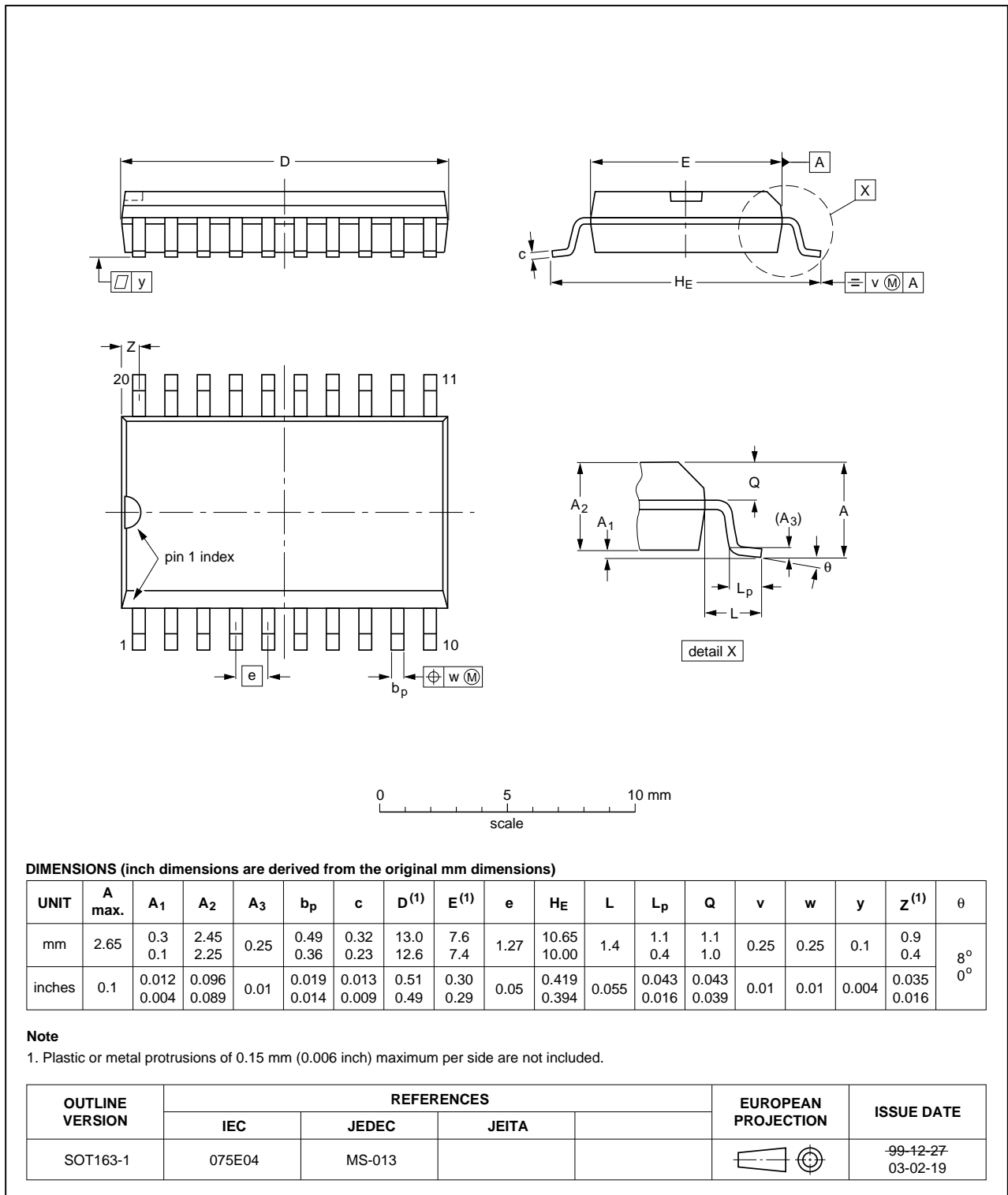


Fig 13. Package outline SOT163-1 (SO20)

14. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|--|---------------|-------------|
| SSL2102 v.1.1 | 20111202 | Product data sheet | - | SSL2102 v.1 |
| Modifications: | | <ul style="list-style-type: none">• GreenChip trademark has been added.• Section 1 "General description" has been updated.• Section 2 "Features and benefits" has been updated.• Section 3 "Applications" has been updated. | | |
| SSL2102 v.1 | 20090629 | Product data sheet | - | - |

15. Legal information

15.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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