



UM10794

SSL5031BDB1208 230 V 9 W buck converter

Rev. 1 — 23 October 2014

User manual

Document information

Info	Content
Keywords	SSL5031BDB1208, SSL5031BTS, non-dimmable, LED driver, buck converter, A19
Abstract	This user manual describes the operation of the SSL5031BDB1208 230 V 9 W non-dimmable LED driver featuring the SSL5031BTS. The demo board uses a buck topology. It has a form factor that is compatible with the base of a A19 LED lamp fitting used in Solid-State Lighting (SSL) applications.



Revision history

Rev	Date	Description
v.1	20141023	first issue

Contact information

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1. Introduction

WARNING

Lethal voltage and fire ignition hazard



The non-insulated high voltages that are present when operating this product, constitute a risk of electric shock, personal injury, death and/or ignition of fire.

This product is intended for evaluation purposes only. It shall be operated in a designated test area by personnel qualified according to local requirements and labor laws to work with non-insulated mains voltages and high-voltage circuits. This product shall never be operated unattended.

This user manual describes the operation of the SSL5031BDB1208 230 V 9 W eco-THD non-dimmable LED driver featuring the SSL5031BTS. The reference board has a A19 LED lamp compatible form factor. The buck converter topology provides a simple and efficient solution for mains non-dimmable LED recessed light applications.

The reference board complies with EMI and safety regulations.

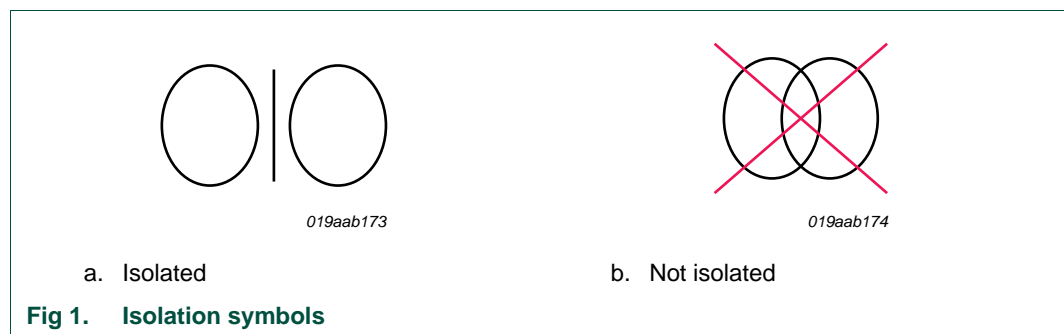
[Figure 2](#) shows the dimensions of the SSL5031BDB1208 demo board. The design of the board allows enough headroom for the board to fit into a A19 lamp base.

[Figure 3](#) shows the SSL5031BDB1208 assembled top and bottom views.

2. Safety warning

The demo board input is connected to the 230 V mains supply. Avoid touching the board while it is connected to the mains voltage and when it is in operation. An isolated housing is obligatory when used in uncontrolled, non-laboratory environments. Galvanic isolation from the mains phase using a fixed or variable transformer is always recommended.

[Figure 1](#) shows the symbols on how to recognize these devices.



3. Specifications

Table 1 lists the specification of the SSL5031BDB1208 demo board.

Table 1. SSL5031BDB1208 specifications

Symbol	Parameter	Value
V_{mains}	AC mains supply voltage	230 V (AC); $\pm 20\%$
I_{mains}	AC mains input current	40 mA
V_{LED}	output voltage	80 V
I_{LED}	output current	105 mA
$I_{\text{LED(ripple)}}$	output current ripple	< 30 %
$\Delta I_{\text{LED}}/\Delta V_{\text{mains}}$	line rejection	< 2 %
$\Delta I_{\text{LED}}/\Delta V_{\text{LED}}$	output voltage rejection	< 3 %
η	efficiency	> 91 % at 230 V (AC)/50 Hz
PF	power factor	> 0.9
THD	total harmonic distortion	< 30 %
T_{oper}	operating temperature	-40 °C to +100 °C
f_{sw}	switching frequency	60 kHz to 160 kHz
t_{startup}	start-up time	120 ms

Figure 2 shows the dimensions of the demo board.

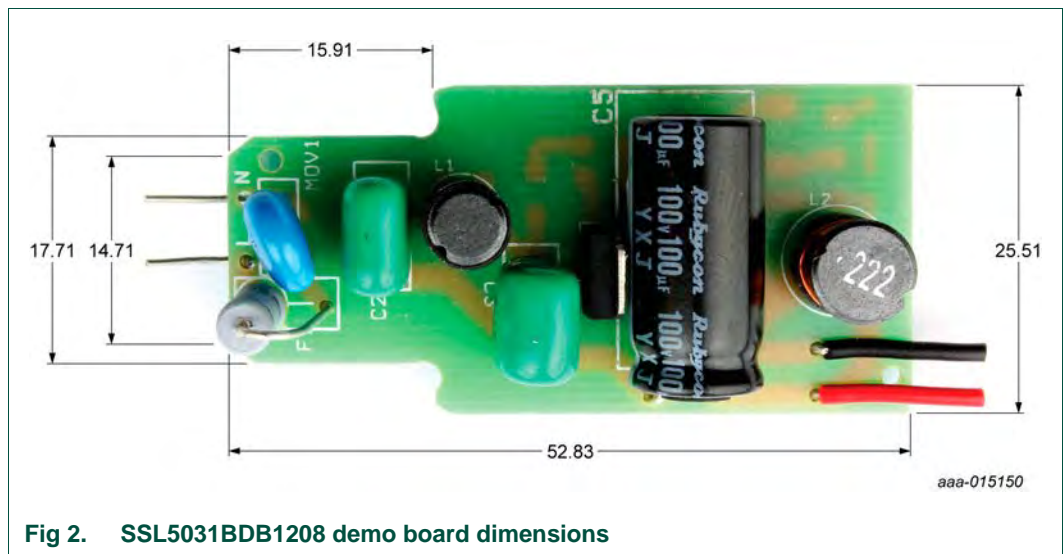
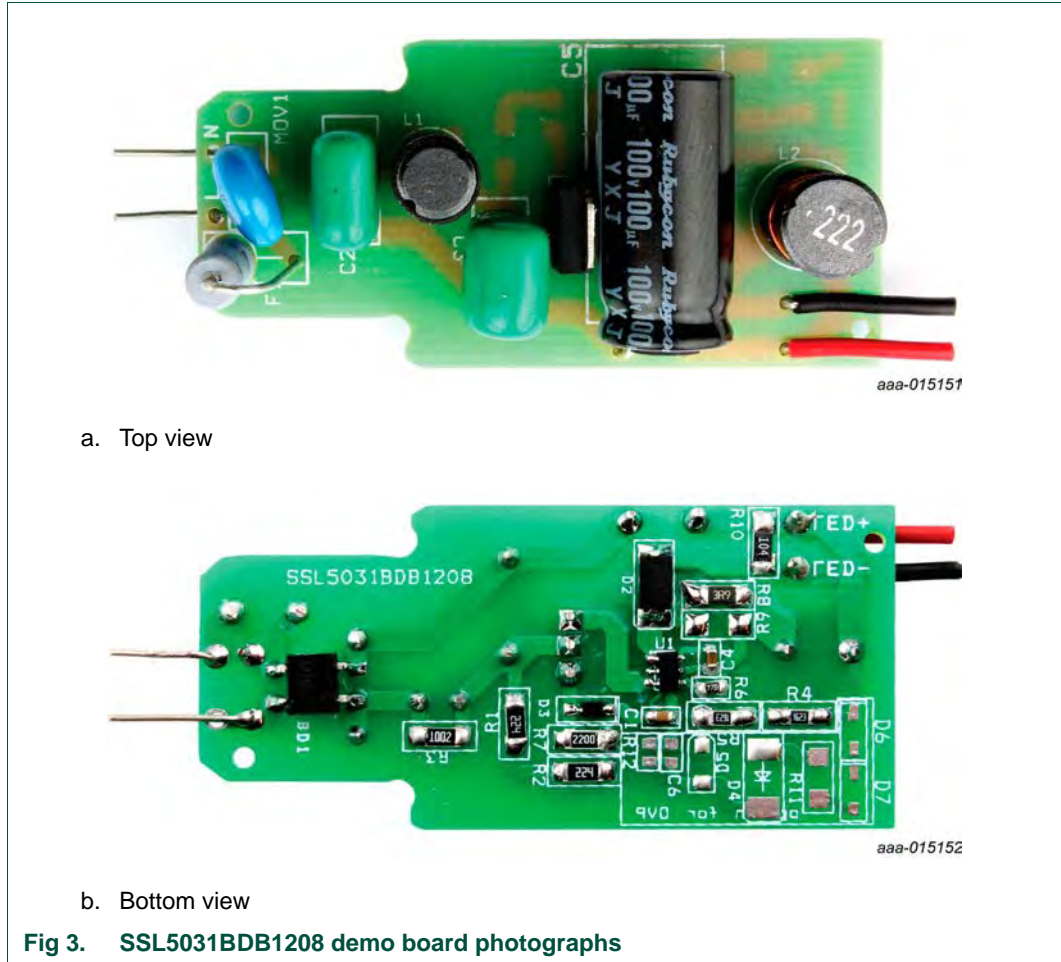


Fig 2. SSL5031BDB1208 demo board dimensions

4. Board photographs



5. Board connections

The SSL5031BDB1208 demo board is optimized for a 230 V (AC)/50 Hz supply. It is designed to work with multiple LEDs or an LED module.

Remark: The maximum rated voltage of the board is 264 V (AC).

The anode of the LED load is connected to LED+. The cathode is connected to LED-. Use an LED string with a forward voltage up to 80 V on this reference board. Under the expected conditions, the output current is 105 mA.

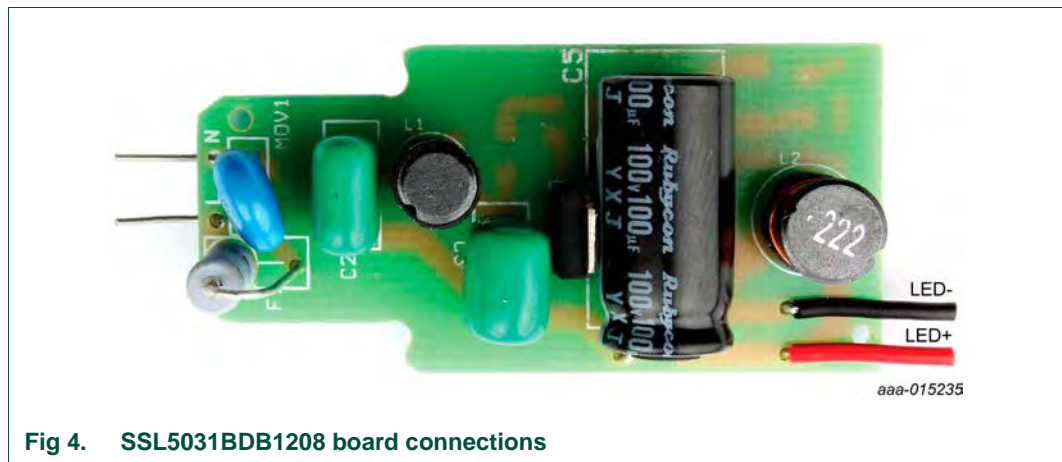
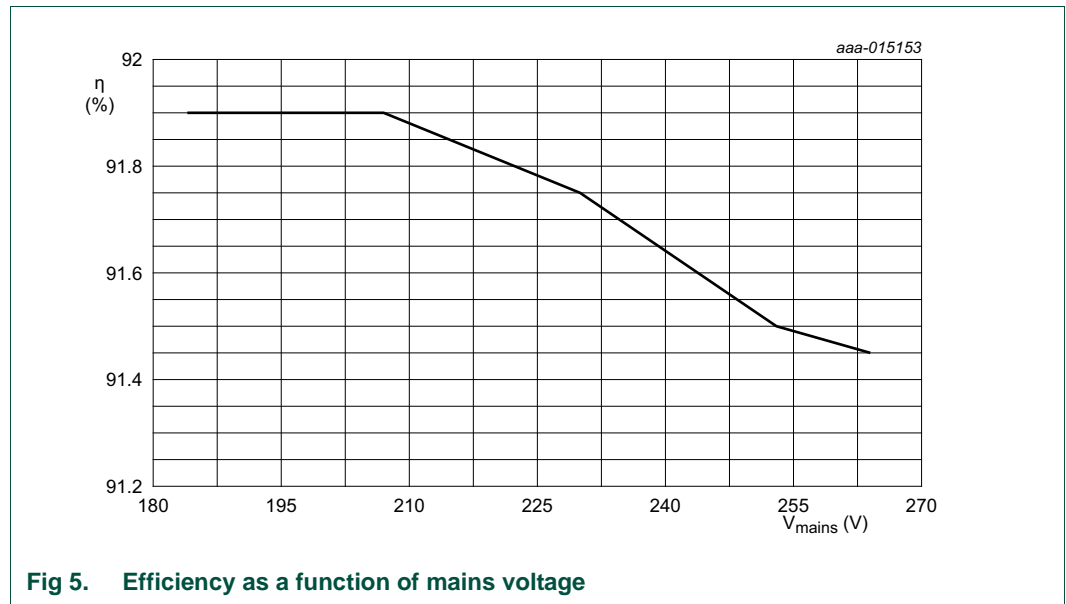


Fig 4. SSL5031BDB1208 board connections

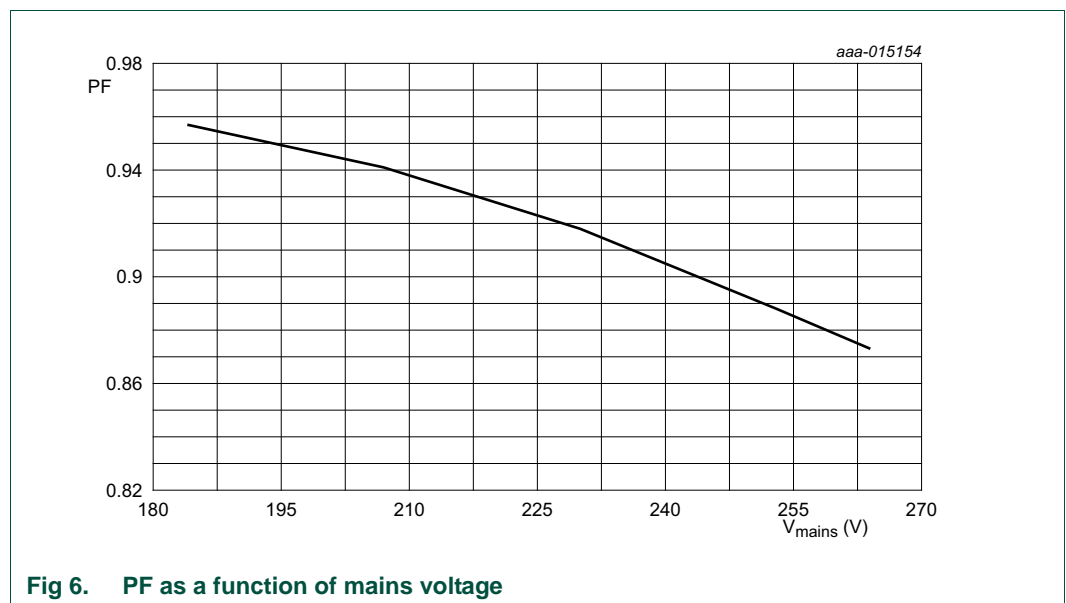
6. Performance

The performance was measured with an 80 V at an LED output load of 105 mA. [Figure 5](#) to [Figure 10](#) show the performance data.

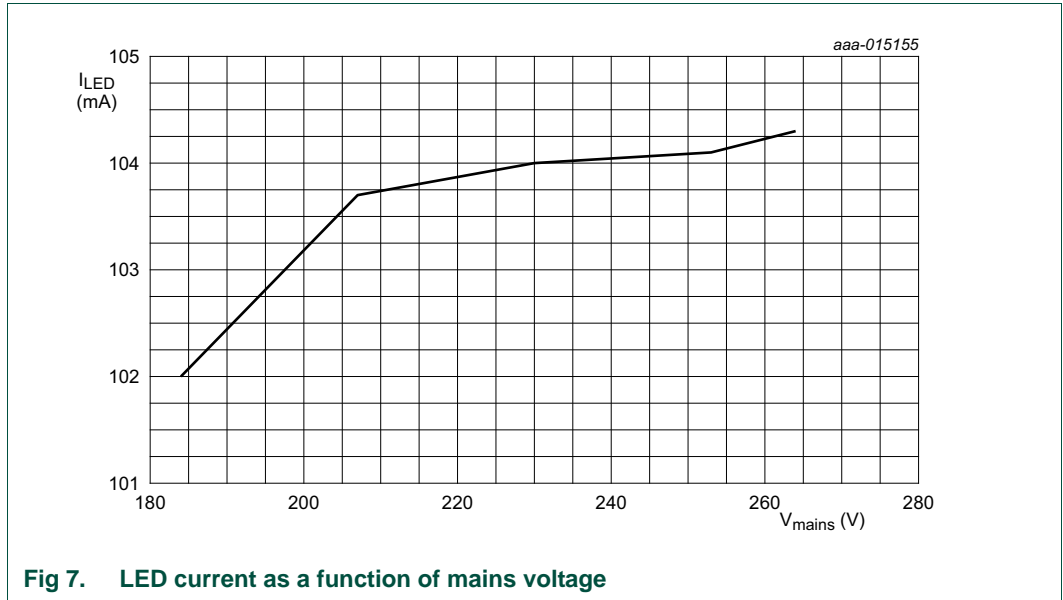
6.1 Efficiency



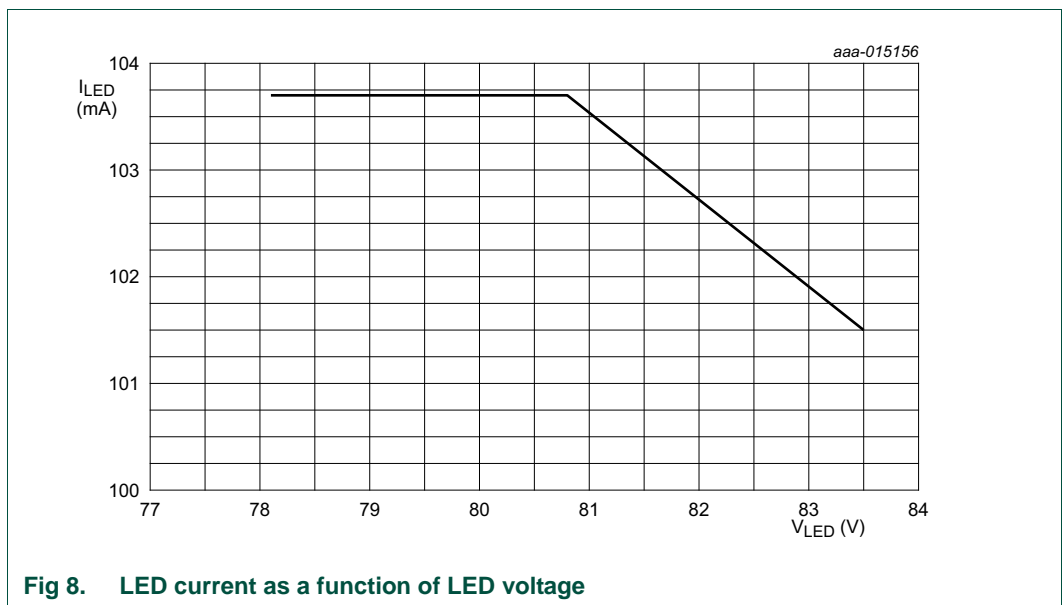
6.2 Power Factor (PF)



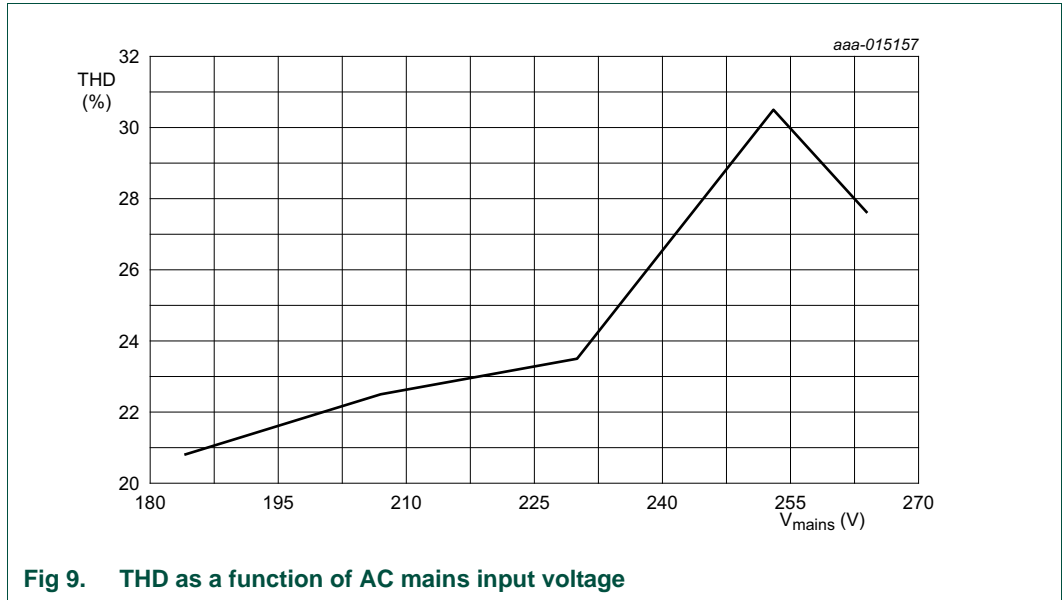
6.3 Line regulation



6.4 Load regulation

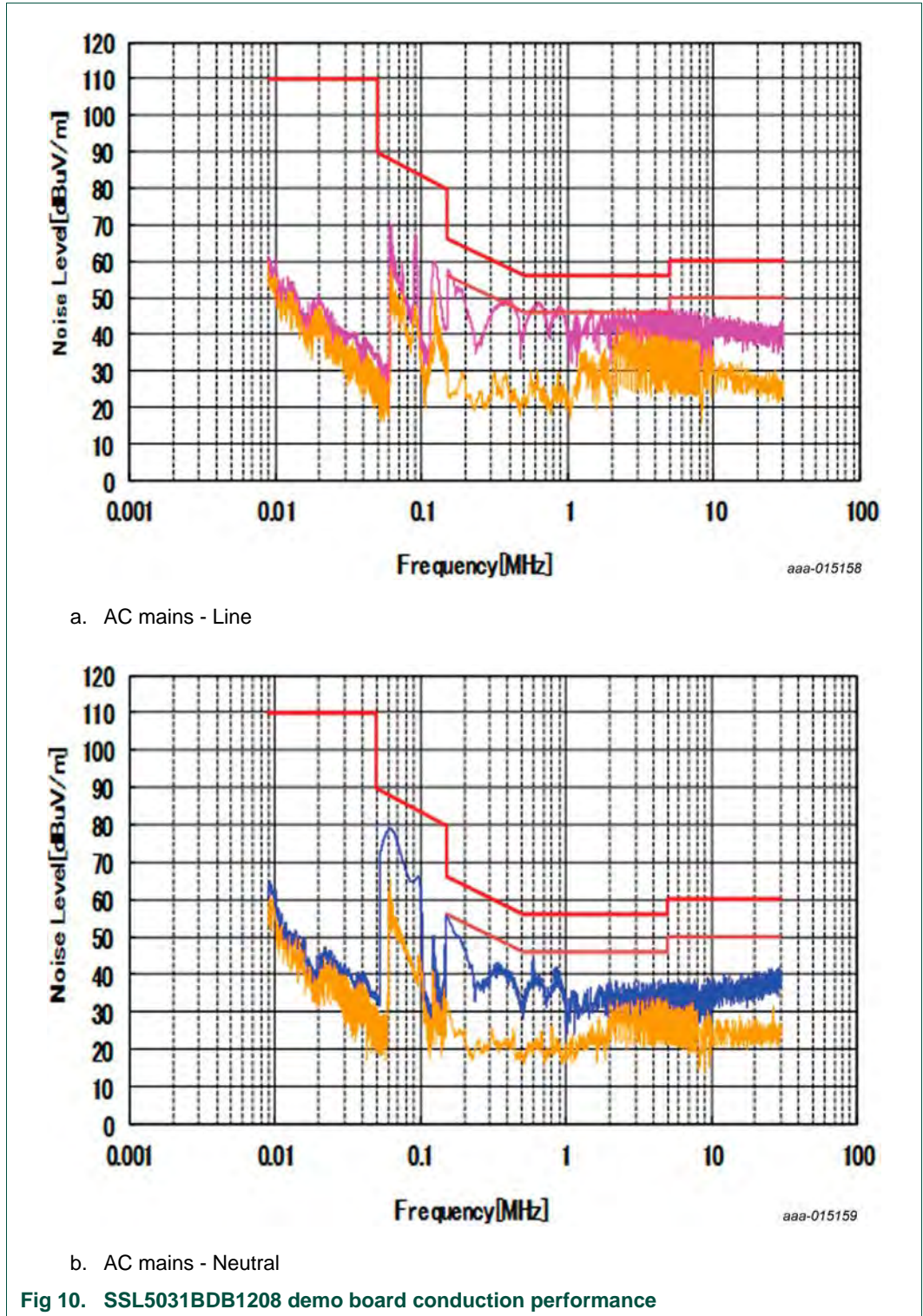


6.5 Total Harmonic Distortion (THD)



6.6 ElectroMagnetic Interference (EMI)

Figure 10 shows the EMI performance. The board complies with the EN55015 standard requirements.



7. Protections

The IC incorporates the following protections:

- UnderVoltage LockOut (UVLO)
- OverCurrent Protection (OCP)
- Output Short Protection (OSP)
- Output open OverVoltage Protection (OVP)
- Internal OverTemperature Protection (OTP)
- External thermal foldback (optional)

All protections are not latched and lead to a safe restart of the converter. For more information about protections, see the *SSL5031BTS data sheet* ([Ref. 1](#)).

9. Bill Of Materials (BOM)

Table 2. SSL5031BDB1208 bill of materials

Reference	Description and values	Part number	Manufacturer
BD1	bridge rectifier; 600 V; 500 mA; MBS-1	MB6S	MCC
C1	capacitor; 1 μ F; 25 V; 0603	GRM188R71E105KA12D	Murata
C2	capacitor; film; 100 nF; 250 V; CL21; pitch = 7.5 mm	-	-
C3	capacitor; film; 150 nF; 250 V; CL21; pitch = 7.5 mm	-	-
C4	capacitor; 220 nF; 25 V; 0603	GRM188R71E224KA88D	Murata
C5	capacitor; 100 μ F; 100 V; pitch = 5 mm; 10 mm \times 16 mm	OLKE22A101MF	Shanghai Yongming Electronics
C6	capacitor; not mounted	-	-
D2	diode; ultrafast; 600 V; 1 A; SMA	ES1J	Taiwan Semiconductor
D3	diode; ultrafast; 75 V; 150 mA; SOD323	1N4148	Diodes Zetex Semiconductors
D4; D5	diode; not mounted	-	-
FR1	fuse resistor; 47 Ω ; 1 W; 5 %	RF10-1W47J	TY-OHM
L1	inductor; 2.2 mH; $I_{\text{sat}} = 0.16$ A; pitch = 3 mm; 6 mm \times 8 mm	DR0608-222 A	KEE
L2	inductor; 2.2 mH; $I_{\text{sat}} = 0.35$ A; pitch = 5 mm; 8 mm \times 10 mm	744 772 022 2	Würth Elektronik
M1	MOSFET; $R_{\text{DSon}} = 6$ Ω ; $I_{\text{d}} = 0.8$ A; $V_{\text{ds}} = 650$ V; TO-251	SPS01N60C3	Infineon
MOV1	varistor; 275 V (AC); 350 V (DC); $\varnothing = 7$ mm	431KD07	BrightKing
R1; R2	resistor; 300 k Ω ; 5 %; 1206	-	-
R3	resistor; 10 k Ω ; 5 %; 1206	-	-
R4; R5	resistor; 162 k Ω ; 1 %; 1206	-	-
R6	resistor; 6.19 k Ω ; 1 %; 0603	-	-
R7	resistor; 220 Ω ; 5 %; 1206	-	-
R8	resistor; 3.9 Ω ; 1 %; 1206	-	-
R9	resistor; not mounted	-	-
R10	resistor; 100 k Ω ; 5 %; 1206	-	-
R11; R12	resistor; not mounted	-	-
U1	controller; TSOP6	SSL5031BTS	NXP Semiconductors
ZD6; ZD7	diode; Zener; not mounted	-	-

10. Board layout

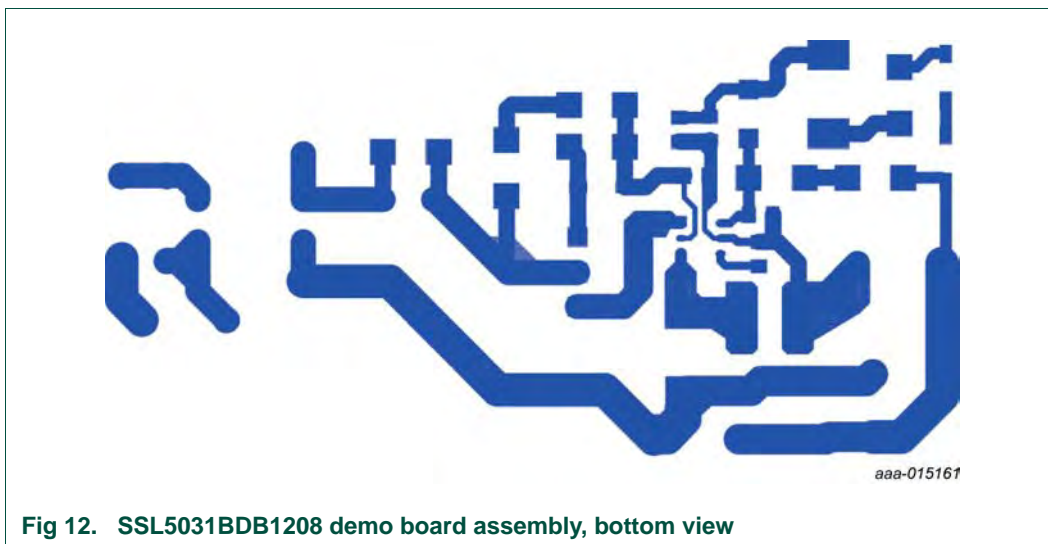


Fig 12. SSL5031BDB1208 demo board assembly, bottom view

11. Abbreviations

Table 3. Abbreviations

Acronym	Description
EMI	ElectroMagnetic Interference
LED	Light-Emitting Diode
OCP	OverCurrent Protection
OSP	Output Short Protection
OTP	OverTemperature Protection
OVP	OverVoltage Protection
PF	Power Factor
SSL	Solid-State Lighting
THD	Total Harmonic Distortion
UVLO	UnderVoltage LockOut

12. References

- [1] **SSL5031BTS data sheet** — Compact high power factor/low-THD buck LED driver IC

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Date of release: 23 October 2014

Document identifier: UM10794

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