

Design Summary

IC: L6566BH - SO 16-N

Input: 300 - 590 Vac (47 - 53 Hz) - Nominal: 400 Vac

Output: 24 V (1 % ripple) - 96 W max

Switching Frequency: 30 kHz - 120 kHz

Expected Average Efficiency: 90 %

Max. Ambient Temperature: 50 °C

Transformer Specifications:

fsw range: 30 kHz - 120 kHz - **Lp:** 1.68 mH - **leakage:** 16.85 μ H

Primary - Ipk: 2.05 A - **Irms:** 608 mA

Secondary - Irms: 5.38 A - **Np/Ns:** 6.048

Auxiliary - Irms: 27 mA - **Iavg:** 20 mA - **Np/Naux:** 11.719

Transformer Design:

Core:

Manufacturer Würth Elektronik - **Core Part Number** 150-2171 - **Bobbin Part Number** 070-5783

Type ERL35 TH-H 14-Pin - **Area Product** 16238 mm⁴ - **Orientation** Horizontal

Volume (Ve) 9548 mm³ - **Cross-Sectional Area (Ae)** 103.00 mm² - **Bobbin Winding Area (Aw)** 157.65 mm²

Bobbin Average Turn Length 65.54 mm - **Bobbin Centr. Leg Length** 27.61 mm

Core Gap: 0.9 mm expected

Inductance factor (AL): 142 nH/N² expected

Primary: Turns 109 - **Layers** 6 - **Paralleled wires** 3

Wire: Manufacturer Würth Elektronik - **Part Number** 9262-0030 - **Type** TCA2 DIW

Number of strands 1 - **Strand copper** \varnothing 0.254 mm - **Wire gross** \varnothing 0.431 mm

Resistance per meter 0.3471 Ω /m

Secondary: Turns 18 - **Layers** 2 - **Paralleled wires** 2

Wire: Type Litz - **Number of strands** 60 - **Strand copper** \varnothing 0.120 mm

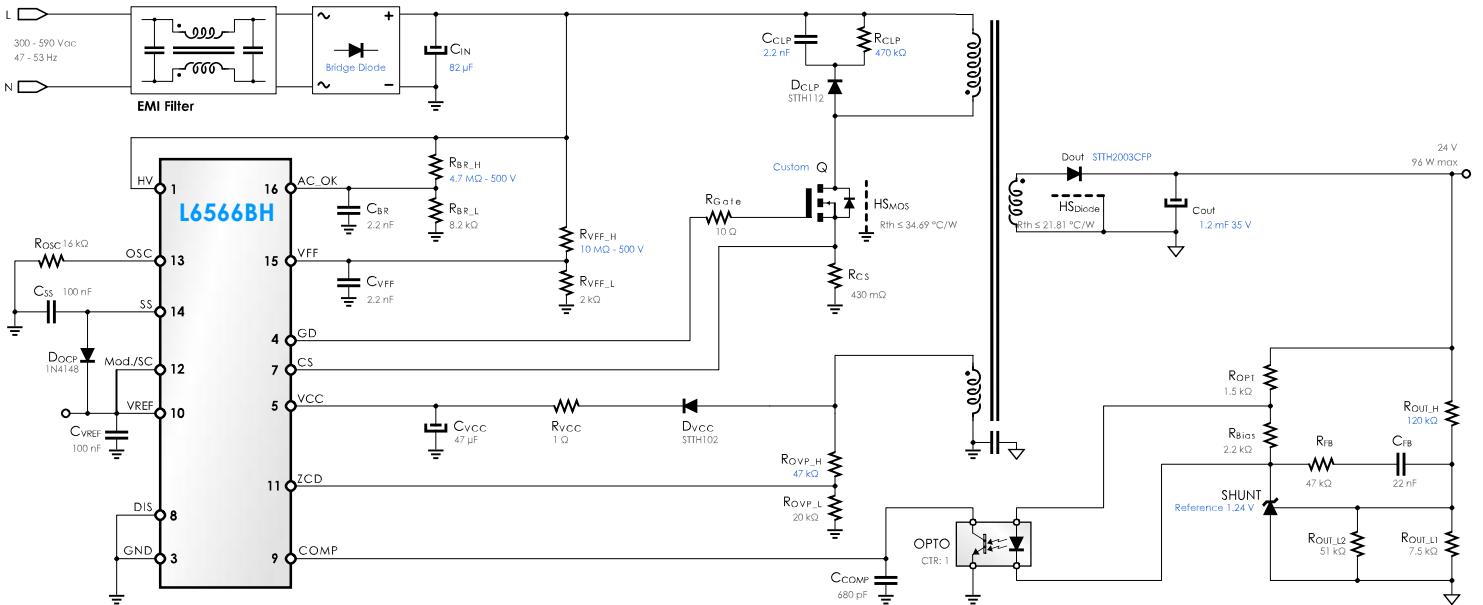
Wire gross \varnothing 1.467 mm - **Resistance per meter** 0.0297 Ω /m

Auxiliary: Turns 10

Wire: Manufacturer Würth Elektronik - **Part Number** PN180 9285-0039 - **Type** Heavy

Number of strands 1 - **Strand copper** \varnothing 0.089 mm - **Wire gross** \varnothing 0.109 mm

Resistance per meter 2.9432 Ω /m

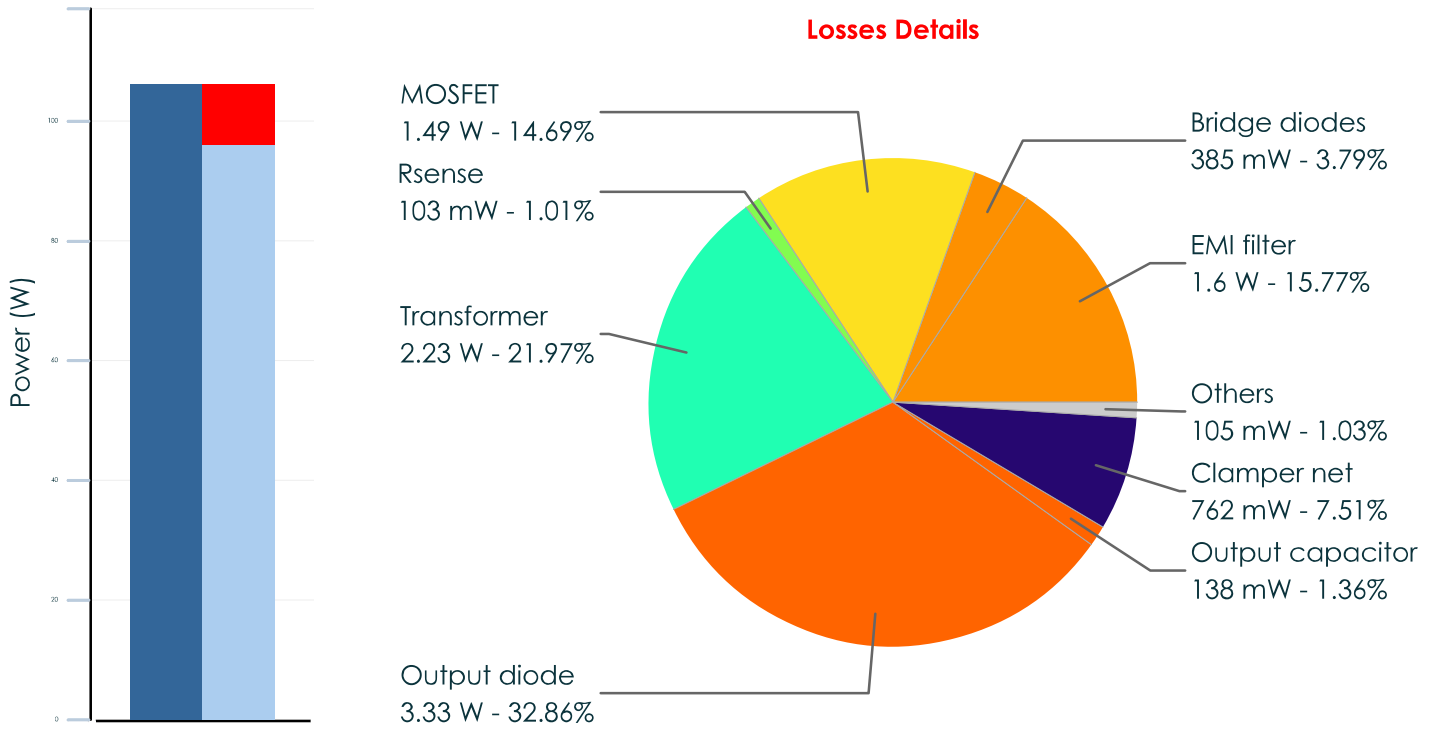


Bill of Materials

Reference	Value	Description
IC	L6566BH	PWM Controller
Q	Custom	Power MOSFET
HSmos	$R_{th} \leq 34.69 \text{ }^\circ\text{C/W}$	Heatsink
Rgate	10 Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
Cclp	2.2 nF	650 V capacitor
Rclp	470 k Ω	1W Resistor
Dclp	STTH112	1.2 kV Diode
Rosc	16 k Ω	Standard Resistor - 1% 100 ppm/ $^\circ\text{C}$
Css	100 nF	50 V Standard ceramic capacitor
Rcs	430 m Ω	1/4 W Resistor - 5% 250 ppm/ $^\circ\text{C}$
Rbr_h	4.7 M Ω - 500 V	High Voltage Resistor - 1% 100 ppm/ $^\circ\text{C}$
Rbr_l	8.2 k Ω	Standard Resistor - 1% 100 ppm/ $^\circ\text{C}$
Cbr	2.2 nF	50 V Standard ceramic capacitor
Rovp_h	47 k Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
Rovp_l	20 k Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
Docp	1N4148	Fast signal diode
Rvff_h	10 M Ω - 500 V	High Voltage Resistor - 1% 100 ppm/ $^\circ\text{C}$
Rvff_l	2 k Ω	Standard Resistor - 1% 100 ppm/ $^\circ\text{C}$
Cvff	2.2 nF	50 V Standard ceramic capacitor
Cvref	100 nF	50 V Standard ceramic capacitor
Cvcc	47 μF	35 V Electrolytic capacitor
Rvcc	1 Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
Dvcc	STTH102	High efficiency ultrafast diode
SHUNT	Reference 1.24 V	Shunt voltage reference
Rout_h	120 k Ω	Standard Resistor - 1% 100 ppm/ $^\circ\text{C}$
Rout_l1	7.5 k Ω	Standard Resistor - 1% 100 ppm/ $^\circ\text{C}$
Rout_l2	51 k Ω	Standard Resistor - 1% 100 ppm/ $^\circ\text{C}$
Cin	82 μF	900 V Electrolytic capacitor
BD	Bridge Diode	1.2 kV Bridge rectifier
Cout	1.2 mF 35 V	35 V - ESR \leq 13 m Ω - Electrolytic capacitor
Dout	STTH2003CFP	High efficiency ultrafast diode

Reference	Value	Description
HSdiode	$R_{th} \leq 21.81 \text{ } ^\circ\text{C/W}$	Heatsink
Ccomp	680 pF	50 V Standard ceramic capacitor
Cfb	22 nF	50 V Standard ceramic capacitor
Rfb	47 k Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
Ropto	1.5 k Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
Rbias	2.2 k Ω	Standard Resistor - 5% 250 ppm/ $^\circ\text{C}$
OPTO	CTR: 1	Optocoupler - CTR: 1

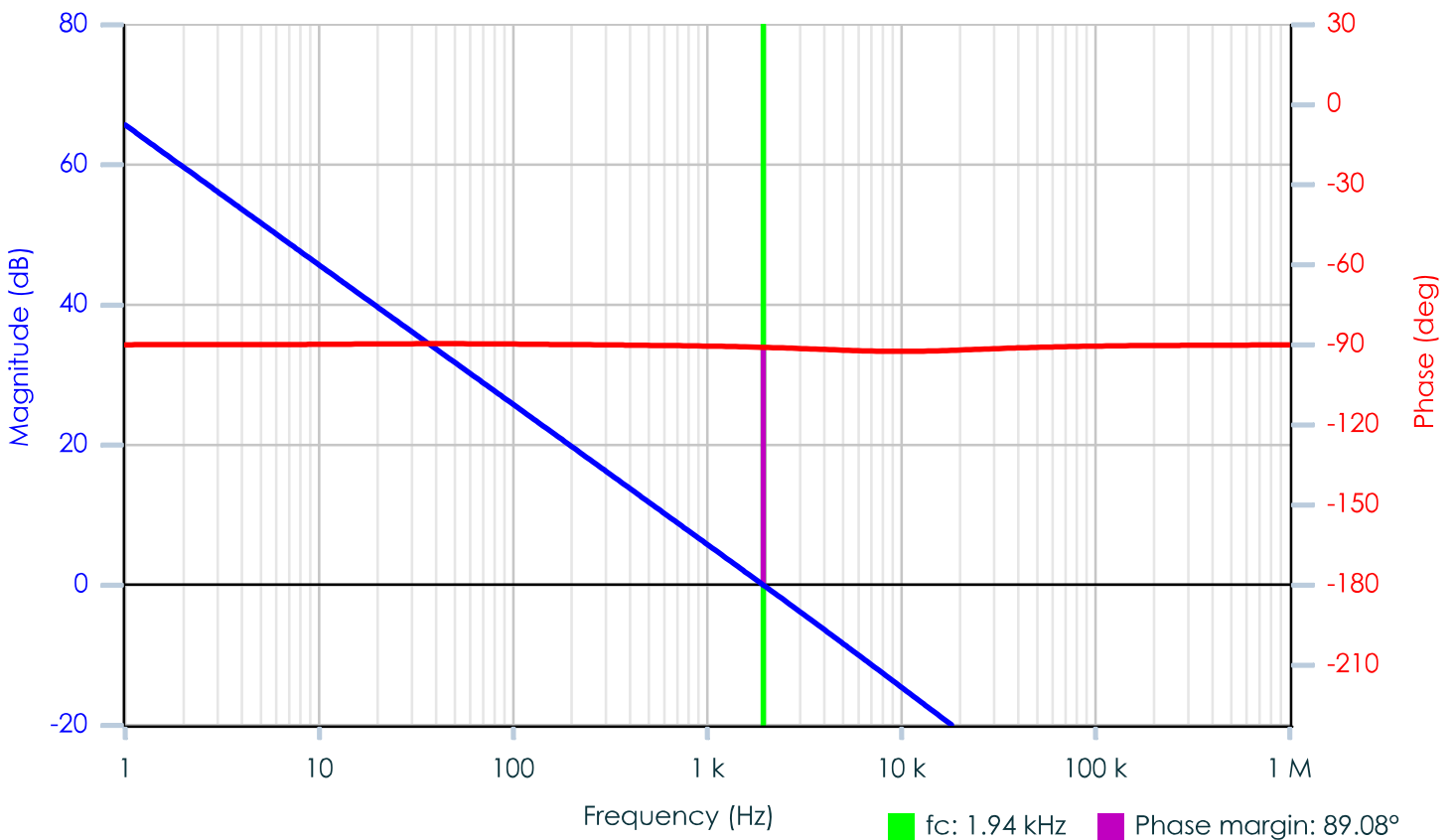
Power Losses @ (Vin 400 Vac - Pout 96 W)



Pin: 106.15 W Pout: 96 W
Power losses: 10.15 W - 9.56% details

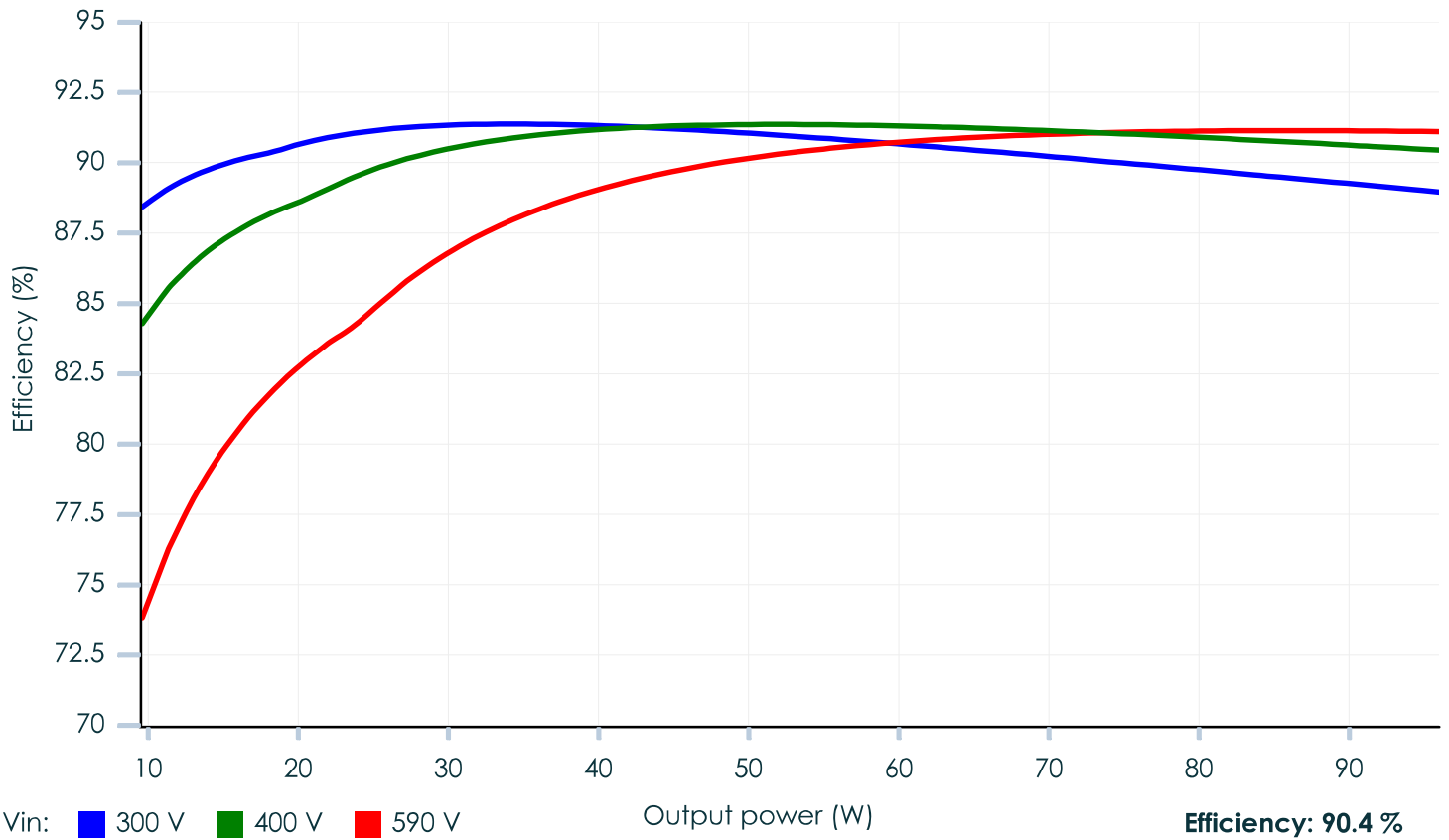
Efficiency: 90.44%

Bode @ (Vin 400 Vac - Pout 96 W)



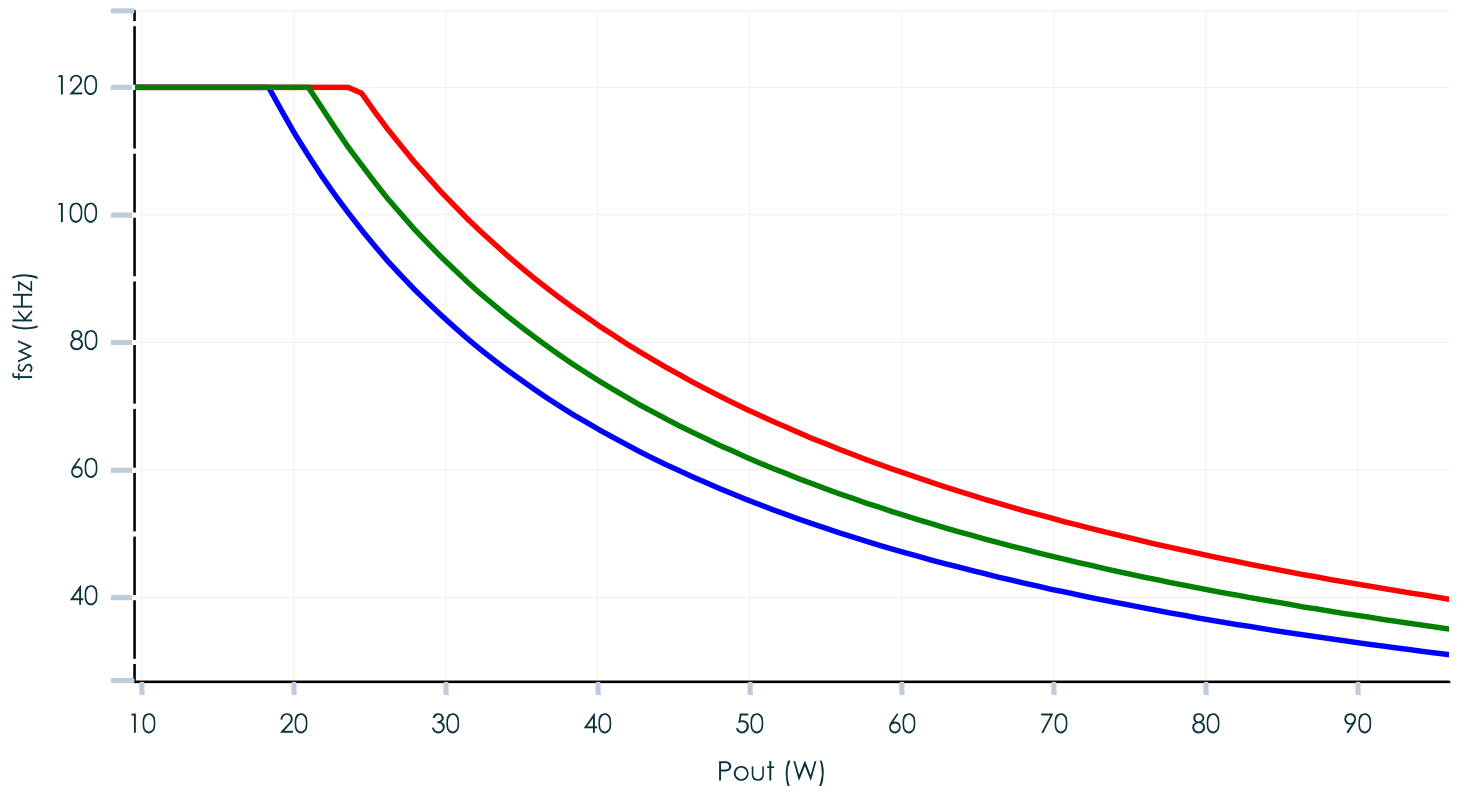
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Efficiency @ (Vin 400 Vac - Pout 96 W)



Simulation @ (Vin 400 Vac - Pout 96 W)

■ @Vin 300 Vac ■ @Vin 590 Vac ■ @Vin 400 Vac



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