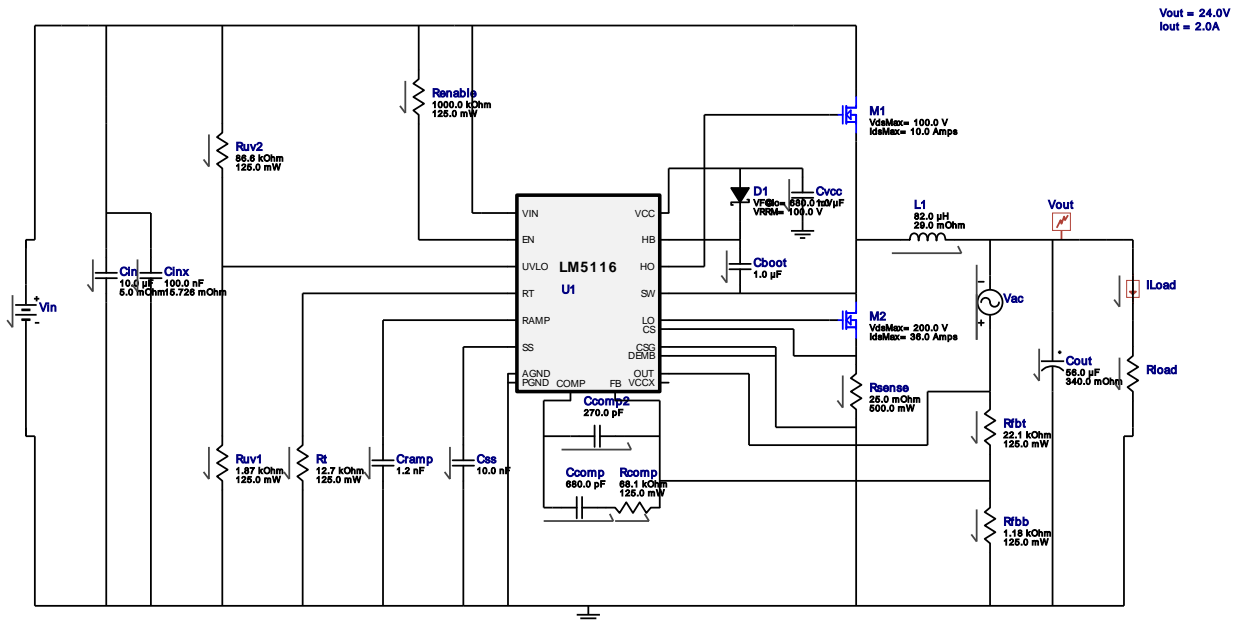



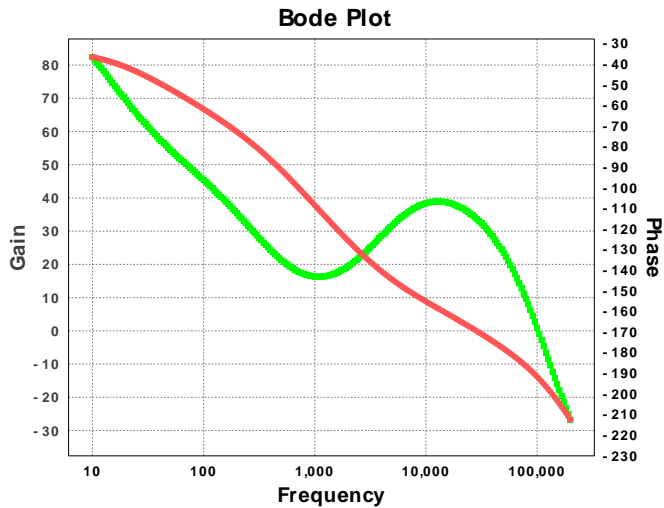
WEBENCH® Electrical Simulation Report

Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR61C105KA01L Series= X5R	Cap= 1.0 μ F VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
2.	Ccomp	Yageo America	CC0805KRX7R9BB681 Series= X7R	Cap= 680.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
3.	Ccomp2	TDK	C2012C0G1H271J Series= C0G/NP0	Cap= 270.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
4.	Cin	TDK	C5750X7S2A106M Series= X7S	Cap= 10.0 μ F ESR= 5.0 mOhm VDC= 100.0 V IRMS= 6.45 A	1	\$0.84	 2220 54 mm ²
5.	Cinx	TDK	C2012X7R2A104K Series= X7R	Cap= 100.0 nF ESR= 15.726 mOhm VDC= 100.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm ²
6.	Cout	Nichicon	UUD1V560MCL1GS Series= uD	Cap= 56.0 μ F ESR= 340.0 mOhm VDC= 35.0 V IRMS= 280.0 mA	1	\$0.11	 SM_RADIAL_6.3BMM 80 mm ²
7.	Cramp	Samsung Electro-Mechanics	CL21C122JBFNNWE Series= C0G/NP0	Cap= 1.2 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
8.	Css	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
9.	Cvcc	MuRata	GRM21BR61C105KA01L Series= X5R	Cap= 1.0 μ F VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	D1	International Rectifier	10MQ100NTRPBF	VF@Io= 680.0 mV VRRM= 100.0 V	1	\$0.13	 SMA 37 mm ²
11.	L1	Bourns	PM2110-820K-RC	L= 82.0 µH DCR= 29.0 mOhm	1	\$1.21	 PM2110 890 mm ²
12.	M1	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 10.0 Amps	1	\$0.68	 TRANS_NexFET_Q5A 55 mm ²
13.	M2	Infineon Technologies	BSC320N20NS3 G	VdsMax= 200.0 V IdsMax= 36.0 Amps	1	\$1.19	 PG-TDSON-8 55 mm ²
14.	Rcomp	Panasonic	ERJ-6ENF6812V Series= ERJ-6E	Res= 68.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
15.	Renable	Panasonic	ERJ-6ENF1004V Series= ERJ-6E	Res= 1000.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
16.	Rfbb	Panasonic	ERJ-6ENF1181V Series= ERJ-6E	Res= 1.18 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
17.	Rfbt	Panasonic	ERJ-6ENF2212V Series= ERJ-6E	Res= 22.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
18.	Rsense	Stackpole Electronics Inc	CSR1206FK25L0 Series= ?	Res= 25.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	\$0.10	 1206 11 mm ²
19.	Rt	Panasonic	ERJ-6ENF1272V Series= ERJ-6E	Res= 12.7 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
20.	Ruv1	Panasonic	ERJ-6ENF1871V Series= ERJ-6E	Res= 1.87 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
21.	Ruv2	Panasonic	ERJ-6ENF8662V Series= ERJ-6E	Res= 86.6 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 7 mm ²
22.	U1	Texas Instruments	LM5116MHX/NOPB	Switcher	1	\$2.42	 MXA20A 71 mm ²

Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Cinj	C	Injection Isolation Capacitance	1000 F
2.	Linj	L	Injection Isolation Inductance	1000 H
3.	Vinj	AC	AC Voltage Source Amplitude	1 V
4.	Rload	R	Load Resistance	12.0 Ohm



Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	921.513 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	240.224 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	636.27 mA	Current	Average input current
4.	L Ipp	832.16 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	2.014 A	Current	Inductor ripple current
6.	M1 Irms	1.106 A	Current	MOSFET RMS ripple current
7.	M2 Irms	1.666 A	Current	MOSFET RMS ripple current
8.	SW Ipk	2.416 A	Current	Peak switch current
9.	BOM Count	23	General	Total Design BOM count
10.	FootPrint	1.356 k mm ²	General	Total Foot Print Area of BOM components
11.	Frequency	246.5 kHz	General	Switching frequency
12.	IC Tolerance	16.0 mV	General	IC Feedback Tolerance
13.	M1 Rdson	14.112 mOhm	General	Drain-Source On-resistance
14.	M2 Rdson	32.0 mOhm	General	Drain-Source On-resistance
15.	Mode	CCM	General	Conduction Mode
16.	Pout	48.0 W	General	Total output power
17.	Total BOM	\$6.85	General	Total BOM Cost
18.	Low Freq Gain	106.529 dB	Op_Point	Gain at 10Hz
19.	Cross Freq	33.865 kHz	Op_point	Bode plot crossover frequency
20.	Duty Cycle	30.583 %	Op_point	Duty cycle
21.	Efficiency	95.493 %	Op_point	Steady state efficiency
22.	Gain Marg	-14.116 dB	Op_point	Bode Plot Gain Margin
23.	IC Tj	89.49 degC	Op_point	IC junction temperature
24.	IOUT_OP	2.0 A	Op_point	Iout operating point
25.	M1 Tj	47.532 degC	Op_point	M1 MOSFET junction temperature
26.	M2 Tj	44.818 degC	Op_point	M2 MOSFET junction temperature
27.	Phase Marg	68.058 deg	Op_point	Bode Plot Phase Margin
28.	VIN_OP	79.0 V	Op_point	Vin operating point
29.	Vout p-p	7.536 mV	Op_point	Peak-to-peak output ripple voltage
30.	Cin Pd	4.246 mW	Power	Input capacitor power dissipation
31.	Cout Pd	19.621 mW	Power	Output capacitor power dissipation
32.	IC Pd	1.487 W	Power	IC power dissipation
33.	L Pd	145.0 mW	Power	Inductor power dissipation
34.	M1 Pd	349.949 mW	Power	M1 MOSFET total power dissipation
35.	M1 PdCond	19.613 mW	Power	M1 MOSFET conduction losses
36.	M1 PdSw	330.336 mW	Power	M1 MOSFET switching losses
37.	M2 Pd	189.879 mW	Power	M2 MOSFET total power dissipation
38.	M2 PdCond	109.333 mW	Power	M2 MOSFET conduction losses
39.	M2 PdSw	80.546 mW	Power	M2 MOSFET switching losses
40.	Rsense Pd	69.417 mW	Power	LED Current Rsns Power Dissipation
41.	Total Pd	2.265 W	Power	Total Power Dissipation
42.	IC Icc Nom	19.536 mA	Unknown	IC Icc gate driver current

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	VinMax	79.0 V	Maximum input voltage
4.	VinMin	72.0 V	Minimum input voltage
5.	Vout	24.0 V	Output Voltage
6.	Vout1	24.0 Volt	Output Voltage #1

#	Name	Value	Description
7.	base_pn	LM5116	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM5116** Product Folder : <http://www.ti.com/product/LM5116> : contains the data sheet and other resources.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.

Use of Texas Instruments' WEBENCH simulation tools is subject to [Texas Instruments' Site Terms and Conditions of Use](#). Prototype boards based on WEBENCH created designs are provided AS IS without warranty of any kind for evaluation and testing purposes and are subject to the terms of the [Evaluation License Agreement](#).