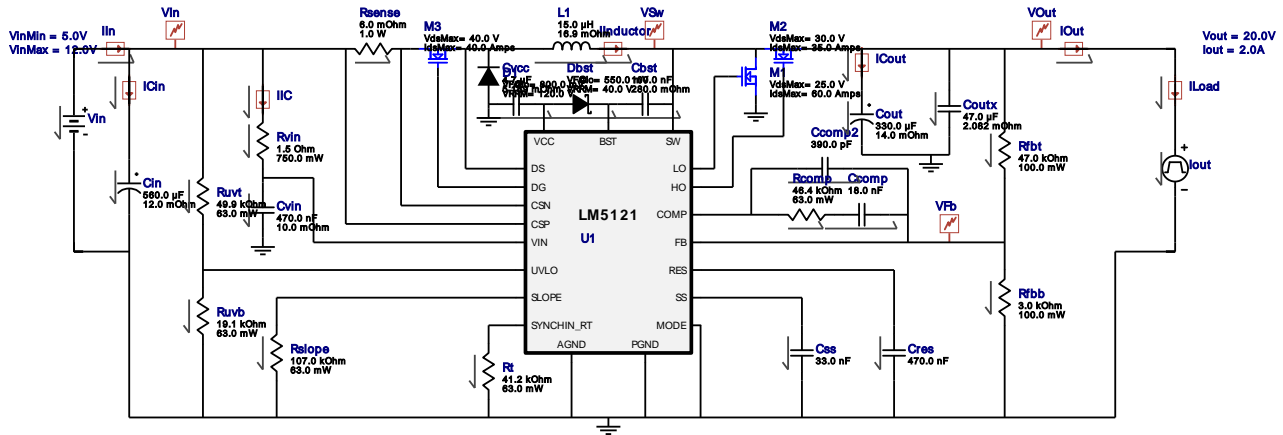


WEBENCH® Electrical Simulation Report




















My Comments

No comments

Electrical BOM

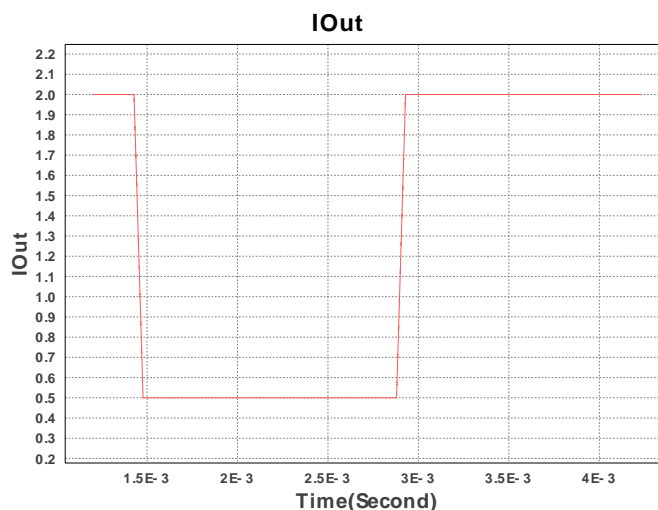
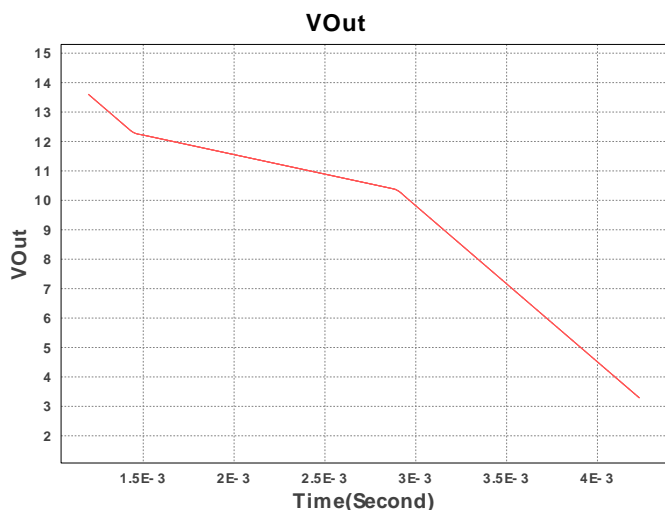
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Ccomp	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB391 Series= X7R	Cap= 390.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
4.	Cin	Panasonic	20SVPF560M Series= ?	Cap= 560.0 µF ESR= 12.0 mOhm VDC= 20.0 V IRMS= 5.4 A	1	\$0.70	CAPSMT_62_F12 151 mm ²
5.	Cout	Panasonic	25SVPF330M Series= ?	Cap= 330.0 µF ESR= 14.0 mOhm VDC= 25.0 V IRMS= 5.0 A	1	\$0.70	CAPSMT_62_F12 151 mm ²
6.	Coutx	TDK	C3216X5R1E476M160AC Series= X5R	Cap= 47.0 µF ESR= 2.082 mOhm VDC= 25.0 V IRMS= 5.028 A	1	\$0.35	1206 11 mm ²
7.	Cres	Taiyo Yuden	TMK212BJ474KD-T Series= X5R	Cap= 470.0 nF VDC= 20.0 V IRMS= 0.0 A	1	\$0.02	0805 7 mm ²
8.	Css	MuRata	GRM155R71E333KA88D Series= X7R	Cap= 33.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0402 3 mm ²
9.	Cvcc	MuRata	GRM21BR61E475KA12L Series= X5R	Cap= 4.7 µF ESR= 5.189 mOhm VDC= 25.0 V IRMS= 2.035 A	1	\$0.02	0805 7 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Cvin	MuRata	GRM188R71C474KA88D Series= X7R	Cap= 470.0 nF ESR= 10.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	\$0.02	 0603 5 mm ²
11.	D1	Vishay-Semiconductor	V12P12-M3/86A	VF@Io= 800.0 mV VRRM= 120.0 V	1	\$0.40	 TO-277A 57 mm ²
12.	Dbst	Fairchild Semiconductor	SS24FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	\$0.07	 SOD-123F 12 mm ²
13.	L1	Coilcraft	XAL1010-153MEB	L= 15.0 μH DCR= 16.9 mOhm	1	\$1.71	 XAL1010 160 mm ²
14.	M1	Texas Instruments	CSD16323Q3	VdsMax= 25.0 V IdsMax= 60.0 Amps	1	\$0.36	 DQG0008A 18 mm ²
15.	M2	Texas Instruments	CSD17577Q3A	VdsMax= 30.0 V IdsMax= 35.0 Amps	1	\$0.21	 DNH0008A 18 mm ²
16.	M3	Infinion Technologies	BSZ042N04NS G	VdsMax= 40.0 V IdsMax= 40.0 Amps	1	\$0.40	 PG-TSDSON-8 19 mm ²
17.	Rcomp	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rfbb	Yageo America	RC0603FR-073KL Series= ?	Res= 3.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
19.	Rfbt	Yageo America	RC0603FR-0747KL Series= ?	Res= 47.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
20.	Rsense	Susumu Co Ltd	PRL1632-R006-F-T1 Series= PRL1632	Res= 6.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	\$0.19	 0612 11 mm ²
21.	Rslope	Vishay-Dale	CRCW0402107KFKED Series= CRCW..e3	Res= 107.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
22.	Rt	Vishay-Dale	CRCW040241K2FKED Series= CRCW..e3	Res= 41.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
23.	Ruvb	Vishay-Dale	CRCW040219K1FKED Series= CRCW..e3	Res= 19.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
24.	Ruvt	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
25.	Rvin	Stackpole Electronics Inc	RMCF2010FT1R50 Series= ?	Res= 1.5 Ohm Power= 750.0 mW Tolerance= 1.0%	1	\$0.03	 2010 32 mm ²
26.	U1	Texas Instruments	LM5121MH/NOPB	Switcher	1	\$2.46	 MXA20A 71 mm ²

Simulation Parameters

#	Name	Parameter Name	Description	Values
1.	Cbst	IC	Intial Condition	8.5 V
2.	Cout	IC	Initial Voltage	20.0 V
3.	Coutx	IC	Initial Condition	20.0 V

#	Name	Parameter Name	Description	Values
4.	Css	IC	Initial Voltage	1.2 V
5.	Iout	signal_type	Signal Type	PULSE
		I1	Initial Load Current	2.0 A
		I2	Minimum Load Current	0.5 A
		Td	Initial Time Delay	0.0014280967969306035 s
		Tf	Fall Time	50u s
		Tr	Rise Time	50u s
		Pw	Pulse Width	0.0014009639468168078 s



Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	VinMax	12.0 V	Maximum input voltage
3.	VinMin	5.0 V	Minimum input voltage
4.	Vout	20.0 V	Output Voltage
5.	base_pn	LM5121	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0 degC	Ambient temperature

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	3.477 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.954 A	Current	Output capacitor RMS ripple current
3.	Coutx IRMS	1.51 A	Current	Output capacitor_x RMS ripple current
4.	Iin Avg	4.547 MA	Current	Average input current
5.	L Ipp	1.148 A	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	8.331 A	Current	Inductor ripple current
7.	M1 Irms	6.98 A	Current	MOSFET RMS ripple current
8.	M2 Irms	2.309 A	Current	MOSFET RMS ripple current
9.	SW Ipk	8.62 A	Current	Peak switch current
10.	BOM Count	26	General	Total Design BOM count
11.	FootPrint	778.0 mm ²	General	Total Foot Print Area of BOM components
12.	Frequency	218.447 kHz	General	Switching frequency
13.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	2.977 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	M2 Rdson	3.792 mOhm	General	Drain-Source On-resistance
17.	M2 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
18.	M2 Vds Act	8.757 mV	General	M Vds
19.	Mode	CCM	General	Conduction Mode
20.	Pout	40.0 W	General	Total output power
21.	Total BOM	\$7.75	General	Total BOM Cost
22.	M3 TjOP	-194.388 degC	Op_Point	M3 MOSFET junction temperature
23.	Vout Actual	20.0 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
24.	Vout OP	20.0 V	Op_Point	Operational Output Voltage
25.	Duty Cycle	75.142 %	Op_point	Duty cycle
26.	Efficiency	175.93 μ%	Op_point	Steady state efficiency
27.	IC Tj	43.295 degC	Op_point	IC junction temperature

#	Name	Value	Category	Description
28.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
29.	IOUT_OP	2.0 A	Op_point	Iout operating point
30.	M1 TJOP	71.525 degC	Op_point	M1 MOSFET junction temperature
31.	M2 TJOP	53.599 degC	Op_point	MOSFET junction temperature
32.	VIN_OP	5.0 V	Op_point	Vin operating point
33.	Vout p-p	81.773 mV	Op_point	Peak-to-peak output ripple voltage
34.	Cin Pd	145.098 mW	Power	Input capacitor power dissipation
35.	Cout Pd	58.187 mW	Power	Output capacitor power dissipation
36.	Coutx Pd	0.0 W	Power	Output capacitor_x power loss
37.	IC Pd	332.37 mW	Power	IC power dissipation
38.	L Pd	1.173 W	Power	Inductor power dissipation
39.	M1 Pd	755.008 mW	Power	MOSFET power dissipation
40.	M1 Pd	755.008 mW	Power	MOSFET power dissipation
41.	M1 PdCond	145.075 mW	Power	M1 MOSFET conduction losses
42.	M1 PdSw	609.934 mW	Power	M1 MOSFET switching losses
43.	M2 Pd	429.073 mW	Power	MOSFET power dissipation
44.	M2 PdCond	21.233 mW	Power	M2 MOSFET conduction losses
45.	M2 PdQrr	23.374 mW	Power	Synchronous Boost High Side Reverse Recovery
46.	M2 Pdbody	384.466 mW	Power	Power dissipation through lower FET
47.	M3 Pd	-3.74 W	Power	M3 MOSFET total power dissipation
48.	M3 Rdson	327.542 kOhm	Power	Drain-Source On-resistance
49.	Total Pd	22.736 MW	Power	Total Power Dissipation
50.	M1 Vds Act	20.783 mV	Unknown	M Vds
51.	M3 ThetaJA	60.0 degC/W	Unknown	MOSFET junction-to-ambient thermal resistance
52.	Vout Tolerance	3.428 %	Unknown	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Assistance

1. The LM5121 is a wide range boost controller which is operable in an ultra wide input range of 4.5 to 65V. A boost regulator can maintain regulation for input voltages lower than the output voltage.
2. LM5121 Product Folder : <http://www.ti.com/product/LM5121> : contains the data sheet and other resources.

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