

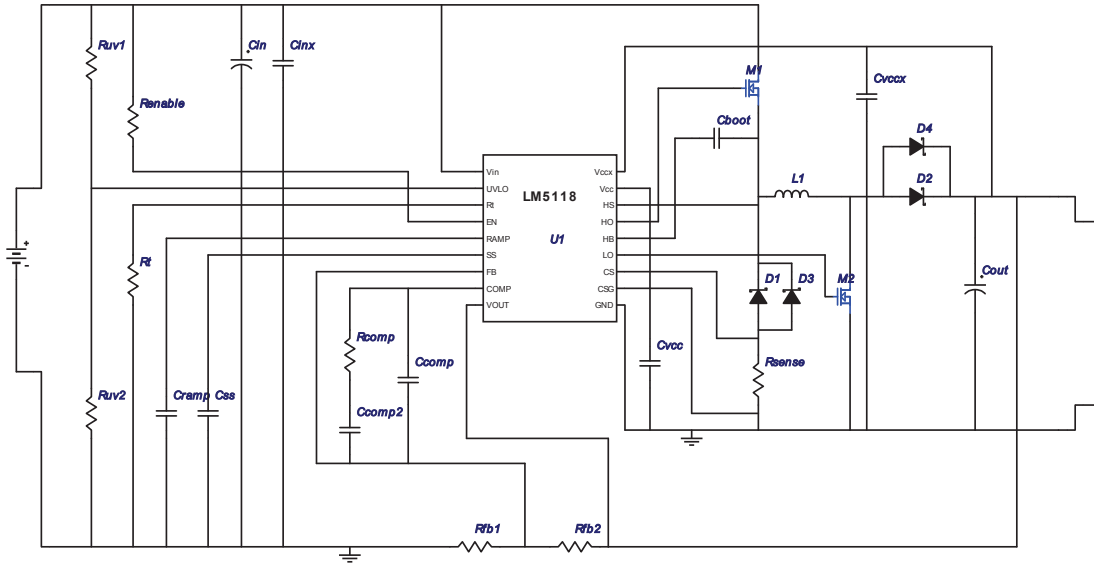
WEBENCH® Design Report

Design : 1151656/4 LM5118MH
Design 4 - LM5118MH



WEBENCH® Design : LM5118_nona_Buck_Boost_WITH_VOCX

VinMin = 6.0V
VinMax = 15.0V
Vout = 9.0V
Iout = 1.0A

Device = LM5118MH
Topology = Buck_Boost
Creation date = 2/11/11 10:50:56 PM
Total BOM Cost = \$5.04
Total Pd = 0.93 W
Footprint = 758.0 mm2
BOM Count = 26



Electrical BOM

#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
1.	Cboot	MuRata	GRM219R71C104KA01D Series= X7R	1	\$0.01	Cap= 100.0 nF ESR= 0.0 Ohm VDC= 16.0 V IRMS= 0.0 A	 0805 13mm2
2.	Ccomp	Yageo America	CC0805KRX7R9BB821 Series= X7R	1	\$0.01	Cap= 820.0 pF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	 0805 13mm2
3.	Ccomp2	Yageo America	CC0805KRX7R9BB183 Series= X7R	1	\$0.01	Cap= 18.0 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	 0805 13mm2
4.	Cin	TDK	C4532X7R1E226M Series= X7R	1	\$0.42	Cap= 22.0 µF ESR= 3.0 mOhm VDC= 25.0 V IRMS= 2.5 A	 1812 39mm2
5.	Cinx	AVX	08053C104KAT2A Series= X7R	1	\$0.01	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	 0805 13mm2
6.	Cout	Nippon Chemi-Con	APXE160ARA820MF80G Series= PXE	1	\$0.46	Cap= 82.0 µF ESR= 24.0 mOhm VDC= 16.0 V IRMS= 2.7 A	CAPSMT_62_F80 74mm2
7.	Cramp	Yageo America	CC0805KRX7R9BB271 Series= X7R	1	\$0.01	Cap= 270.0 pF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	 0805 13mm2
8.	Css	MuRata	GRM216R71H223KA01D Series= X7R	1	\$0.01	Cap= 22.0 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	 0805 13mm2

#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
9.	Cvcc	MuRata	GRM155R61A105KE15D Series= X5R	1	\$0.01	Cap= 1.0 μ F ESR= 0.0 Ohm VDC= 10.0 V IRMS= 0.0 A	 0402 8mm2
10.	Cvccx	TDK	C2012Y5V1C105Z/0.85 Series= Y5V	1	\$0.01	Cap= 1.0 μ F ESR= 9.0 mOhm VDC= 16.0 V IRMS= 0.0 A	 0805 13mm2
11.	D1	Diodes Inc.	B230A-13-F	1	\$0.09	VF@Io= 500.0 mV VRRM= 30.0 V	 SMA 37mm2
12.	D2	Diodes Inc.	B220A-13-F	1	\$0.09	VF@Io= 500.0 mV VRRM= 20.0 V	 SMA 37mm2
13.	D3	Diodes Inc.	B230A-13-F	1	\$0.09	VF@Io= 500.0 mV VRRM= 30.0 V	 SMA 37mm2
14.	D4	Diodes Inc.	B220A-13-F	1	\$0.09	VF@Io= 500.0 mV VRRM= 20.0 V	 SMA 37mm2
15.	L1	Bourns	SRR1260-270M	1	\$0.43	L= 27.0 μ H DCR= 45.0 mOhm	 SRR1260 210mm2
16.	M1	Vishay-Siliconix	SI2316BDS-T1-E3	1	\$0.23	VdsMax= 30.0 V IdsMax= 4.5 Amps	 SOT-23 22mm2
17.	M2	Vishay-Siliconix	SI2316BDS-T1-E3	1	\$0.23	VdsMax= 30.0 V IdsMax= 4.5 Amps	 SOT-23 22mm2
18.	Rcomp	Vishay-Dale	CRCW040213K0FKED Series= CRCW..e3	1	\$0.01	Res= 13.0 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
19.	Renable	Vishay-Dale	CRCW04021M00FKED Series= CRCW..e3	1	\$0.01	Res= 1000.0 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
20.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	1	\$0.01	Res= 1,000 Ohm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
21.	Rfb2	Vishay-Dale	CRCW04026K34FKED Series= CRCW..e3	1	\$0.01	Res= 6.34 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
22.	Rsense	Stackpole Electronics Inc	CSR 1/2 0.05 1 I Series= ?	1	\$0.08	Res= 50.0 mOhm Power= 500.0 mW Tolerance= 1.0%	 1206 19mm2
23.	Rt	Vishay-Dale	CRCW040218K7FKED Series= CRCW..e3	1	\$0.01	Res= 18.7 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
24.	Ruv1	Vishay-Dale	CRCW040216K5FKED Series= CRCW..e3	1	\$0.01	Res= 16.5 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
25.	Ruv2	Vishay-Dale	CRCW04025K62FKED Series= CRCW..e3	1	\$0.01	Res= 5.62 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
26.	U1	National Semiconductor	LM5118MH	1	\$2.68	Switcher	 MXA20A 71mm2

Op Vals

#	Name	Value	Category	Description
1.	Cin IRMS	486.294 mA	Current	Input capacitor RMS ripple current

#	Name	Value	Category	Description
2.	Cout IRMS	131.779 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	661.8 mA	Current	Average input current
4.	L Ipp	456.495 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	1.009 A	Current	Inductor ripple current
6.	M1 Irms	785.028 mA	Current	MOSFET RMS ripple current
7.	SW Ipk	1.228 A	Current	Peak switch current
8.	BOM Count	26.0	General	Total Design BOM count
9.	FootPrint	758.0 mm2	General	Total Foot Print Area of BOM components
10.	Frequency	300.0 kHz	General	Switching frequency
11.	M1 Rdson	80.0 mOhm	General	Drain-Source On-resistance
12.	M1 ThetaJA	130.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
13.	Mode	CCM	General	Conduction Mode
14.	Pout	9.0 W	General	Total output power
15.	Total BOM	\$5.04	General	Total BOM Cost
16.	Cross Freq	6.992 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	61.627 %	Op_point	Duty cycle
18.	Efficiency	90.66 %	Op_point	Steady state efficiency
19.	IC Tj	34.281 degC	Op_point	IC junction temperature
20.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	1.0 A	Op_point	Iout operating point
22.	M1 TjOP	37.186 degC	Op_point	MOSFET junction temperature
23.	Operating Topology	Buck	Op_point	The current operating topology of the device
24.	Phase Marg	63.446 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	15.0 V	Op_point	Vin operating point
26.	Vout p-p	11.199 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	709.445 µW	Power	Input capacitor power dissipation
28.	Cout Pd	416.776 µW	Power	Output capacitor power dissipation
29.	IC Pd	107.018 mW	Power	IC power dissipation
30.	L Pd	56.25 mW	Power	Inductor power dissipation
31.	M1 Pd	69.442 mW	Power	MOSFET power dissipation
32.	M1 PdCond	66.497 mW	Power	M1 MOSFET conduction losses
33.	M1 PdSw	2.945 mW	Power	M1 MOSFET switching losses
34.	Total Pd	927.182 mW	Power	Total Power Dissipation
35.	Diode 1 Power Dissipation	95.933 mOpvalUnits.PD	Unknown	Power dissipation in the diode
36.	Diode 2 Power Dissipation	250.0 mOpvalUnits.PD	Unknown	Power dissipation in the diode
37.	Diode 3 Power Dissipation	95.933 mOpvalUnits.PD	Unknown	Power dissipation in the diode
38.	Diode 4 Power Dissipation	250.0 mOpvalUnits.PD	Unknown	Power dissipation in the diode
39.	IC Tolerance	18.0 mV	Unknown	IC Feedback Tolerance
40.	Vout OP	9.0 V	Unknown	Vin operating point

Design Inputs

#	Name	Value	Description
1.	ErrorFeature	I	Error feature
2.	Iout	1.0 A	Maximum Output Current
3.	Iout1	1.0 Amps	Output Current #1
4.	SoftStart	0.0 ms	Soft Start Time (ms)
5.	SyncFeature	I	External Sync feature
6.	VinMax	15.0 V	Maximum input voltage
7.	VinMin	6.0 V	Minimum input voltage
8.	Vout	9.0 V	Output Voltage
9.	Vout1	9.0 Volt	Output Voltage #1
10.	base_pn	LM5118	National Based Product Number
11.	customfreq	Y	Use Customer Frequency
12.	onOff	I	On/Off feature
13.	optfactor	3.0	Optimization factor to tune up the design
14.	pricefactor	0.0	Price factor to tune up the design cost
15.	ta	30.0 degC	Ambient temperature

Design Assist

1. The LM5118 is a wide range buck-boost controller which is operable in an ultra wide input range of 3 to 75V. A buck-boost regulator can maintain regulation for input voltages either higher or lower than the output voltage. The challenge is that buck-boost power converters are not as efficient as buck regulators. The LM5118 has been designed as a dual mode controller whereby the power converter acts as a buck regulator while the input voltage is above the output. As the input voltage approaches the output voltage, a gradual transition to the buck-boost mode occurs. This gradual transition between modes eliminates disturbances at the output during transitions.

2. **LM5118 Product Folder** : <http://www.national.com/pf/LM/LM5118.html> : contains the data sheet and other resources.

National's WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using National's published specifications as well as the published specifications of other device manufacturers. While National does update this information periodically, this information may not be current at the time the simulation is built. National does not warrant the accuracy or completeness of the specifications or any information contained therein. National 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. National does not warrant that the designs are production worthy.

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