

WEBENCH® Design Report

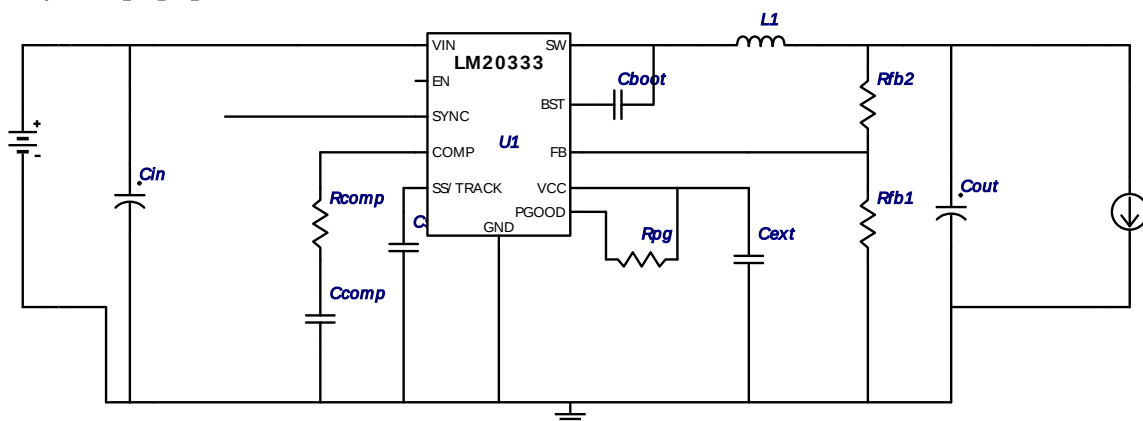
Design : 1169470/15 LM20333MH

Design 15 - LM20333MH

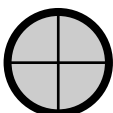
WEBENCH® Design : LM20333_none_Buck_None

VinMin = 9.0V
VinMax = 36.0V
Vout = 4.8V
Iout = 3.0A

Device = LM20333MH
Topology = Buck
Creation date = 9/2/11 1:49:16 PM
Total BOM Cost = \$3.97
Total Pd = 2.34 W
Footprint = 823.0 mm2
BOM Count = 15



Electrical BOM

#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
1.	Cboot	MuRata	GRM21BR71E104KA01L Series= X7R	1	\$0.01	Cap= 100.0 nF ESR= 0.0 Ohm VDC= 25.0 V IRMS= 0.0 A	 0805 13mm2
2.	Ccomp	Yageo America	CC0805KRX7R9BB682 Series= X7R	1	\$0.01	Cap= 6.8 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	 0805 13mm2
3.	Cext	MuRata	GRM155R61A105KE15D Series= X5R	1	\$0.01	Cap= 1.0 µF ESR= 0.0 Ohm VDC= 10.0 V IRMS= 0.0 A	 0402 8mm2
4.	Cin	Panasonic	EEUED2D330 Series= 286	3	\$0.19	Cap= 33.0 µF ESR= 542.573 mOhm VDC= 200.0 V IRMS= 650.0 mA	 CAPPR5-10X20 144mm2
5.	Cout	TDK	C3225X5R1A226M Series= X5R	2	\$0.16	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 10.0 V IRMS= 3.2 A	 1210 23mm2
6.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	1	\$0.01	Cap= 6.8 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	 0805 13mm2
7.	L1	Bourns	SRR1210-270M	1	\$0.50	L= 27.0 µH DCR= 40.0 mOhm	 SRR1210 196mm2
8.	Rcomp	Vishay-Dale	CRCW040211K5FKED Series= CRCW..e3	1	\$0.01	Res= 11.5 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
9.	Rfb1	Vishay-Dale	CRCW040211K8FKED Series= CRCW..e3	1	\$0.01	Res= 11.8 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2

#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
10.	Rfb2	Vishay-Dale	CRCW040259K0FKED Series= CRCW..e3	1	\$0.01	Res= 59.0 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
11.	Rpg	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	1	\$0.01	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
12.	U1	National Semiconductor	LM20333MH	1	\$2.50	Switcher	 MXA20A 71mm2

Op Vals

#	Name	Value	Category	Description
1.	Cin IRMS	1.061 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	244.374 m A	Current	Output capacitor RMS ripple current
3.	IC Ipk	3.423 A	Current	Peak switch current in IC
4.	Iin Avg	464.88 m A	Current	Average input current
5.	L Ipp	846.535 m A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	1.148 A	Current	Q lavg
7.	BOM Count	15.0	General	Total Design BOM count
8.	FootPrint	823.0 mm2	General	Total Foot Print Area of BOM components
9.	Frequency	200.0 k Hz	General	Switching frequency
10.	IC Tolerance	12.0 m V	General	IC Feedback Tolerance
11.	M Vds Act	181.125 m V	General	
12.	Mode	CCM	General	Conduction Mode
13.	Pout	14.4 W	General	Total output power
14.	Total BOM	\$3.97	General	Total BOM Cost
15.	Cross Freq	48.286 k Hz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	14.652 %	Op_point	Duty cycle
17.	Efficiency	86.043 %	Op_point	Steady state efficiency
18.	IC Tj	75.419 degC	Op_point	IC junction temperature
19.	ICThetaJA	27.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	3.0 A	Op_point	Iout operating point
21.	Phase Marg	66.937 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	36.0 V	Op_point	Vin operating point
23.	Vout p-p	12.871 m V	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	203.544 m W	Power	Input capacitor power dissipation
25.	Cout Pd	59.718 μ W	Power	Output capacitor power dissipation
26.	IC Drive Pd	28.8 m W	Power	Driver power dissipation
27.	IC Iq Pd	180.0 m W	Power	IC Iq Pd
28.	IC Pd	1.682 W	Power	IC power dissipation
29.	L Pd	450.0 m W	Power	Inductor power dissipation
30.	M1 PdCond	207.99 m W	Power	M1 MOSFET switching losses
31.	M1 PdSw	140.4 m W	Power	M1 MOSFET switching losses
32.	M1 PdCond	1.039 W	Power	M2 MOSFET switching losses
33.	Total Pd	2.336 W	Power	Total Power Dissipation
34.	M2 Pbody	28.8 m W	Unknown	Power dissipation through lower FET
35.	Vout OP	4.8 V	Unknown	Operational Output Voltage

Design Inputs

#	Name	Value	Description
1.	ErrorFeature	I	Error feature
2.	Iout	3.0 A	Maximum Output Current
3.	Iout1	3.0 Amps	Output Current #1
4.	SoftStart	0.0 ms	Soft Start Time (ms)
5.	SyncFeature	I	External Sync feature
6.	VinMax	36.0 V	Maximum input voltage
7.	VinMin	9.0 V	Minimum input voltage
8.	Vout	4.8 V	Output Voltage
9.	Vout1	4.8 Volt	Output Voltage #1
10.	base_pn	LM20333	National Based Product Number
11.	UseCustomFsw	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. Tip: The external sync feature can be enabled by checking the 'User Sync Frequency' check box. Please note that the default frequency internal to the device is below the external sync frequency range. (For example, LM20333 default frequency is 200KHz, but the synchable frequency range is from 250KHz to 1.5MHz)

2. **LM20333** Product Folder : <http://www.national.com/pf/LM/LM20323.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.

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

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