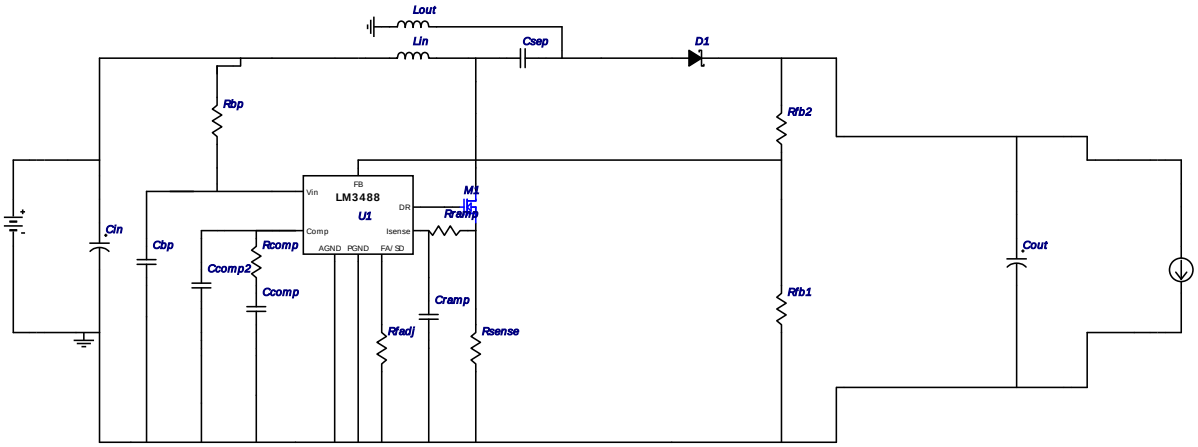
WEBENCH® Design Report

VinMin = 3.0V
VinMax = 40.0V
Vout = 13.8V
Iout = 0.5A

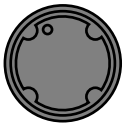
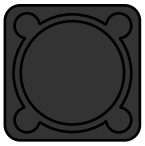
Device = LM3488MM
Topology = SEPIC
Created = 11/5/11 11:17:40 AM
BOM Cost = $5.02
Total Pd = 2.29 W
Footprint = 1,175.0 mm2
BOM Count = 21

Design : 1191190/20 LM3488MM
Design 20 - LM3488MM



Electrical BOM

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
1.	Cbp	Taiyo Yuden	HMK212B7104KG-T Series= X7R	1	$0.02	Cap= 100.0 nF ESR= 0.0 Ohm VDC= 100.0 V IRMS= 0.0 A	0805 13mm2
2.	Ccomp	Taiyo Yuden	EMK212B7474KD-T Series= X7R	1	$0.02	Cap= 470.0 nF ESR= 0.0 Ohm VDC= 16.0 V IRMS= 0.0 A	0805 13mm2
3.	Ccomp2	MuRata	GRM1885C1H362JA01D Series= C0G/NP0	1	$0.02	Cap= 3.6 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	0603 10mm2
4.	Cin	Panasonic	EEE-FK1J680UP Series= FK	2	$0.24	Cap= 68.0 µF ESR= 350.0 mOhm VDC= 63.0 V IRMS= 400.0 mA	SM_RADIAL_G 172mm2
5.	Cout	Kemet	T495D686K020ZTE070 Series= T495	2	$0.59	Cap= 68.0 µF ESR= 70.0 mOhm VDC= 20.0 V IRMS= 1.317 A	7343-31 59mm2
6.	Cramp	MuRata	GRM216R71E122KA01D Series= X7R	1	$0.01	Cap= 1.2 nF ESR= 0.0 Ohm VDC= 25.0 V IRMS= 0.0 A	0805 13mm2
7.	Csep	MuRata	GRM32ER72A225KA35L Series= X7R	1	$0.50	Cap= 2.2 µF ESR= 7.0 mOhm VDC= 100.0 V IRMS= 4.4 A	1210 23mm2

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
8.	D1	Vishay-Semiconductor	BYS11-90-E3/TR	1	$0.10	VF@Io= 750.0 mV VRRM= 90.0 V	 SMA 37mm2
9.	Lin	Coilcraft	RFS1317-333KL	1	$0.50	L= 33.0 µH DCR= 50.0 mOhm	 RFS1317 234mm2
10.	Lout	Bourns	SRR1208-331KL	1	$0.41	L= 330.0 µH DCR= 670.0 mOhm	 SRR1208 216mm2
11.	M1	Infineon Technologies	BSC265N10LSF G	1	$0.63	VdsMax= 100.0 V IdsMax= 40.0 Amps	 PG-TDSON-8 55mm2
12.	Rbp	Vishay-Dale	CRCW040220R0FKED Series= CRCW..e3	1	$0.01	Res= 20.0 Ohm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
13.	Rcomp	Vishay-Dale	CRCW04021K50FKED Series= CRCW..e3	1	$0.01	Res= 1.5 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
14.	Rfadj	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	1	$0.01	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
15.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	1	$0.01	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
16.	Rfb2	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	1	$0.01	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
17.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	1	$0.01	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	 0402 8mm2
18.	Rsense	Stackpole Electronics Inc	CSR1206FK25L0 Series= ?	1	$0.10	Res= 25.0 mOhm Power= 500.0 mW Tolerance= 1.0%	 1206 19mm2
19.	U1	Texas Instruments	LM3488MM	1	$0.99	Switcher	 MUA08A 34mm2

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	4.424 m A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.18 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	1.183 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	1.278 A	Current	D1 Irms
5.	IC Ipk	6.68 m A	Current	Peak switch current in IC
6.	Iin Avg	3.062 A	Current	Average input current
7.	Lin Ipk	3.003 A	Current	Lin peak current
8.	Lin Ipp	256.558 m A	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	2.891 A	Current	Lin ripple current
10.	Lout Ipk	477.452 m A	Current	Lout peak current
11.	Lout Ipp	25.58 m A	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	467.092 m A	Current	Lout ripple current
13.	M1 Irms	3.106 A	Current	M1 MOSFET Irms
14.	BOM Count	21.0	General	Total Design BOM count
15.	FootPrint	1.175 k mm2	General	Total Foot Print Area of BOM components
16.	Frequency	255.0 k Hz	General	Switching frequency
17.	IC Tolerance	15.3 m V	General	IC Feedback Tolerance
18.	Mode	CCM	General	Conduction Mode
19.	Total BOM	$5.02	General	Total BOM Cost
20.	D1 Tj	86.856 degC	Op_Point	D1 junction temperature

#	Name	Value	Category	Description
21.	SEPIC Resonance Freq	7.262 k Hz	Op_Point	SEPIC Resonance Frequency
22.	V SEPIC damping factor	118.376 m	Op_Point	V SEPIC damping factor
23.	Vin p-p	2.43 m V	Op_Point	Peak-to-peak input voltage
24.	Vsep p-p	739.866 m V	Op_Point	Peak-to-peak sepic voltage
25.	Cross Freq	682.607 Hz	Op_point	Bode plot crossover frequency
26.	Duty Cycle	85.5 %	Op_point	Duty cycle
27.	Efficiency	75.113 %	Op_point	Steady state efficiency
28.	Gain Marg	13.473 db	Op_point	Bode Plot Gain Margin
29.	IC Tj	83.44 degC	Op_point	IC junction temperature
30.	IOUT_OP	500.0 m A	Op_point	Iout operating point
31.	M1 TjOP	76.97 degC	Op_point	M1 MOSFET junction temperature
32.	Phase Marg	65.549 deg	Op_point	Bode Plot Phase Margin
33.	Phase Shift	61.009 deg	Op_point	Bode Plot Phase Shift
34.	VIN_OP	3.0 V	Op_point	Vin operating point
35.	Vout p-p	125.862 m V	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	3.426 µ W	Power	Input capacitor power dissipation
37.	Cout Pd	48.735 m W	Power	Output capacitor power dissipation
38.	Csep Pd	9.79 m W	Power	SEPIC capacitor power dissipation
39.	D1 Pd	379.04 m W	Power	Diode power dissipation
40.	D1 PdCond	375.0 m W	Power	Diode conduction losses
41.	D1 PdSw	4.04 m W	Power	Diode switching losses
42.	IC Pd	267.2 m W	Power	IC power dissipation
43.	Lin Pd	418.216 m W	Power	Lin power dissipation
44.	Lout Pd	146.18 m W	Power	Lout power dissipation
45.	M1 Pd	939.565 m W	Power	M1 MOSFET total power dissipation
46.	M1 PdCond	430.071 m W	Power	M1 MOSFET conduction losses
47.	M1 PdSw	509.494 m W	Power	M1 MOSFET switching losses
48.	Rsense Pd	241.108 m W	Power	LED Current Rsns Power Dissipation
49.	Total Pd	2.286 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 mA	Maximum Output Current
2.	Iout1	500.0 mAmps	Output Current #1
3.	VinMax	40.0 V	Maximum input voltage
4.	VinMin	3.0 V	Minimum input voltage
5.	Vout	13.8 V	Output Voltage
6.	Vout1	13.8 Volt	Output Voltage #1
7.	base_pn	LM3488	National Based Product Number
8.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM3488** Product Folder : http://www.national.com/pf/LM/LM3488.html : contains the data sheet and other resources.