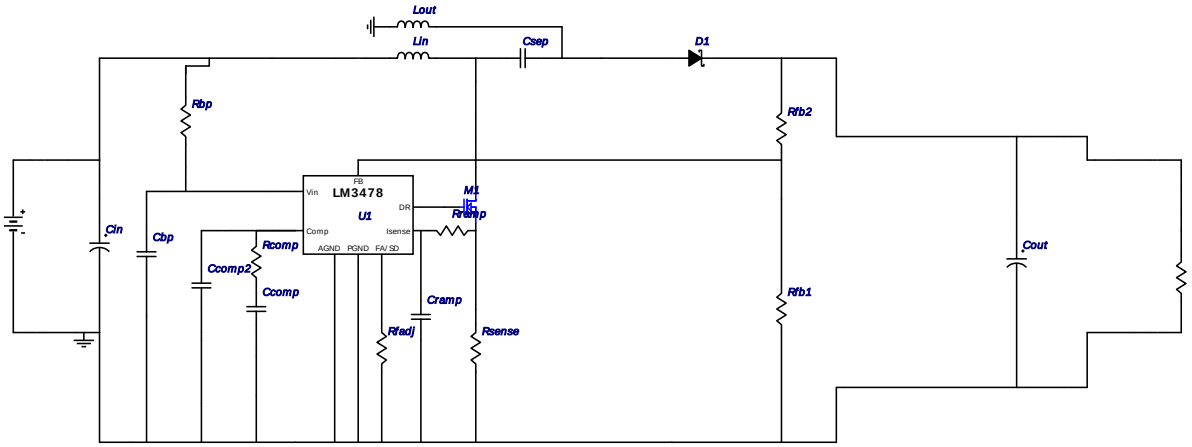
WEBENCH® Design Report

VinMin = 4.0V
VinMax = 36.0V
Vout = 6.25V
Iout = 6.0A

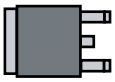
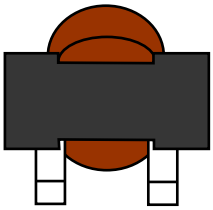
Device = LM3478MM
Topology = SEPIC
Created = 4/5/12 6:37:30 AM
BOM Cost = $10.25
Total Pd = 10.88 W
Footprint = 2,368.0 mm2
BOM Count = 26

Design : 682565/8 LM3478MM
LM3478MM 4.0V-36.0V to 6.25V @ 6.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
1.	Cbp	MuRata	GRM188R72A104KA35D Series= X7R	1	$0.03	Cap= 100.0 nF ESR= 0.0 Ohm VDC= 100.0 V IRMS= 0.0 A	0603 10mm2
2.	Ccomp	MuRata	GRM155R60J334KE01D Series= X5R	1	$0.02	Cap= 330.0 nF ESR= 0.0 Ohm VDC= 6.3 V IRMS= 0.0 A	0402 8mm2
3.	Ccomp2	MuRata	GRM2165C1H112JA01D Series= C0G/NP0	1	$0.02	Cap= 1.1 nF ESR= 0.0 Ohm VDC= 50.0 V IRMS= 0.0 A	0805 13mm2
4.	Cin	Panasonic	EEV-FK1H331Q Series= FK	3	$0.48	Cap= 330.0 µF ESR= 120.0 mOhm VDC= 50.0 V IRMS= 900.0 mA	SM_RADIAL_H13 264mm2
5.	Cout	Nippon Chemi-Con	APXA100ARA561MJC0G Series= PXA	3	$1.03	Cap= 560.0 µF ESR= 12.0 mOhm VDC= 10.0 V IRMS= 5.3 A	CAPSMT_62_JC0 156mm2
6.	Cramp	MuRata	GRM2165C2A162JA01D Series= C0G/NP0	1	$0.02	Cap= 1.6 nF ESR= 0.0 Ohm VDC= 100.0 V IRMS= 0.0 A	0805 13mm2

#	Name	Manufacturer	Part Number	Quantity	Price	Properties	Footprint
7.	Csep	TDK	C4532X7R1H475M Series= X7R	4	$0.35	Cap= 4.7 µF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 2.9 A	 1812 39mm2
8.	D1	Vishay-Semiconductor	12CWQ10FNPBF	1	$0.69	VF@Io= 950.0 mV VRRM= 100.0 V	 DPAK 102mm2
9.	Lin	Coilcraft	SER2013-472MLB	1	$0.95	L= 4.7 µH DCR= 1.7 mOhm	 SER2013 438mm2
10.	Lout	Coilcraft	XAL1010-153MEB	1	$1.08	L= 15.0 µH DCR= 20.0 mOhm	 XAL1010 160mm2
11.	M1	Infineon Technologies	BSC110N06NS3G	1	$0.37	VdsMax= 60.0 V IdsMax= 50.0 Amps	 PG-TDSON-8 55mm2
12.	Rbp	Vishay-Dale	CRCW080520R0FKEA Series= CRCW..e3	1	$0.01	Res= 20.0 Ohm Power= 125.0 mW Tolerance= 1.0%	 0805 13mm2
13.	Rcomp	Vishay-Dale	CRCW08051K58FKEA Series= CRCW..e3	1	$0.01	Res= 1.58 kOhm Power= 125.0 mW Tolerance= 1.0%	 0805 13mm2
14.	Rfadj	Vishay-Dale	CRCW080586K6FKEA Series= CRCW..e3	1	$0.01	Res= 86.6 kOhm Power= 125.0 mW Tolerance= 1.0%	 0805 13mm2
15.	Rfb1	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	1	$0.01	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	 0805 13mm2
16.	Rfb2	Vishay-Dale	CRCW080539K2FKEA Series= CRCW..e3	1	$0.01	Res= 39.2 kOhm Power= 125.0 mW Tolerance= 1.0%	 0805 13mm2
17.	Rramp	Vishay-Dale	CRCW0805100RFKEA Series= CRCW..e3	1	$0.01	Res= 100.0 Ohm Power= 125.0 mW Tolerance= 1.0%	 0805 13mm2
18.	Rsense	Panasonic	ERJ-M1WSF4M0U Series= 1119	1	$0.15	Res= 4.0 mOhm Power= 1.0 W Tolerance= 1.0%	 2512 43mm2
19.	U1	Texas Instruments	LM3478MM	1	$0.93	Switcher	 MUA08A 34mm2

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	163.005 m A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	8.371 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	8.421 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	10.259 A	Current	D1 Irms
5.	IC Ipk	8.062 m A	Current	Peak switch current in IC
6.	Iin Avg	12.096 A	Current	Average input current
7.	Lin Ipk	13.329 A	Current	Lin peak current
8.	Lin Ipp	2.527 A	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	12.154 A	Current	Lin ripple current
10.	Lout Ipk	6.072 A	Current	Lout peak current
11.	Lout Ipp	790.067 m A	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	5.711 A	Current	Lout ripple current
13.	M1 Irms	14.625 A	Current	M1 MOSFET Irms

#	Name	Value	Category	Description
14.	BOM Count	26.0	General	Total Design BOM count
15.	FootPrint	2.368 k mm2	General	Total Foot Print Area of BOM components
16.	Frequency	202.5 k Hz	General	Switching frequency
17.	IC Tolerance	24.3 m V	General	IC Feedback Tolerance
18.	Mode	CCM	General	Conduction Mode
19.	Total BOM	$10.25	General	Total BOM Cost
20.	D1 Tj	92.727 degC	Op_Point	D1 junction temperature
21.	SEPIC Resonance Freq	13.294 k Hz	Op_Point	SEPIC Resonance Frequency
22.	V SEPIC damping factor	109.149 m	Op_Point	V SEPIC damping factor
23.	Vin p-p	20.279 m V	Op_Point	Peak-to-peak input voltage
24.	Vsep p-p	1.055 V	Op_Point	Peak-to-peak sepic voltage
25.	Cross Freq	2.171 k Hz	Op_point	Bode plot crossover frequency
26.	Duty Cycle	67.0 %	Op_point	Duty cycle
27.	Efficiency	77.504 %	Op_point	Steady state efficiency
28.	Gain Marg	11.126 db	Op_point	Bode Plot Gain Margin
29.	IC Tj	88.05 degC	Op_point	IC junction temperature
30.	IOUT_OP	6.0 A	Op_point	Iout operating point
31.	M1 TjOP	30.3 degC	Op_point	M1 MOSFET junction temperature
32.	Phase Marg	69.123 deg	Op_point	Bode Plot Phase Margin
33.	Phase Shift	69.978 deg	Op_point	Bode Plot Phase Shift
34.	VIN_OP	4.0 V	Op_point	Vin operating point
35.	Vout p-p	79.1 m V	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	1.063 m W	Power	Input capacitor power dissipation
37.	Cout Pd	280.27 m W	Power	Output capacitor power dissipation
38.	Csep Pd	53.182 m W	Power	SEPIC capacitor power dissipation
39.	D1 Pd	5.702 W	Power	Diode power dissipation
40.	D1 PdCond	5.7 W	Power	Diode conduction losses
41.	D1 PdSw	2.429 m W	Power	Diode switching losses
42.	IC Pd	290.25 m W	Power	IC power dissipation
43.	Lin Pd	280.154 m W	Power	Lin power dissipation
44.	Lout Pd	654.874 m W	Power	Lout power dissipation
45.	M1 Pd	1.567 W	Power	M1 MOSFET total power dissipation
46.	M1 PdCond	1.766 W	Power	M1 MOSFET conduction losses
47.	M1 PdSw	-198.035 m W	Power	M1 MOSFET switching losses
48.	Rsense Pd	855.542 m W	Power	LED Current Rsns Power Dissipation
49.	Total Pd	10.884 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	6.0 A	Maximum Output Current
2.	Iout1	6.0 Amps	Output Current #1
3.	VinMax	36.0 V	Maximum input voltage
4.	VinMin	4.0 V	Minimum input voltage
5.	Vout	6.25 V	Output Voltage
6.	Vout1	6.25 Volt	Output Voltage #1
7.	base_pn	LM3478	National Based Product Number
8.	Ta	30.0 degC	Ambient temperature
9.	UserFsw	202.5 kHz	Customer Selected Frequency

Design Assistance

1. **LM3478** Product Folder : http://www.national.com/pf/LM/LM3478.html : contains the data sheet and other resources.