WEBENCH® Design Report

VinMin = 5.5V
VinMax = 8.4V
Vout = 6.0V
Iout = 2.0A

Device = LM3478MM/NOPB
Topology = SEPIC
Created = 7/31/13 9:49:15 AM
BOM Cost = $1.58
Total Pd = 3.35W
Footprint = 269.0mm2
BOM Count = 14

Design : 3729827/5 LM3478MM/NOPB
LM3478MM/NOPB 5.5V-8.4V to 6.0V @ 2.0A

Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbp	Kemet	C0603C104Z4VACTU Series= Y5V	Cap= 100.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0603 10mm2
2.	Ccomp	Taiyo Yuden	TMK212B7473KD-T Series= X7R	Cap= 47.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
3.	Ccomp2	MuRata	GRM1885C1H162JA01D Series= C0G/NP0	Cap= 1.6 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.02	0603 10mm2
4.	Cin	TDK	C3225X7R1C226M Series= X7R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 16.0 V IRMS= 8.11 A	1	$0.22	1210 23mm2
5.	Cout	Nippon Chemi-Con	APXE100ARA151MF80G Series= PXE	Cap= 150.0 µF ESR= 21.0 mOhm VDC= 10.0 V IRMS= 2.88 A	1	$0.53	CAPSMT_62_F80 74mm2
6.	Cramp	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 13mm2
7.	Csep	Kemet	C0805C225K4RACTU Series= X7R	Cap= 2.2 µF ESR= 8.0 mOhm VDC= 16.0 V IRMS= 15.55 A	1	$0.08	0805 13mm2
8.	D1	Vishay-Semiconductor	50WQ04FNPBF	VF@Io= 510.0 mV VRRM= 40.0 V	1	$0.40	DPAK 102mm2
9.	Lin	Bourns	SRP5030T-6R8M	L= 6.8 µH DCR= 76.2 mOhm	1	$0.54	SRP5030T 59mm2
10.	Lout	Coilcraft	XAL5050-153MEB	L= 15.0 µH DCR= 69.7 mOhm	1	$0.60	XAL5050 54mm2
11.	M1	Vishay-Siliconix	SI2316BDS-T1-E3	VdsMax= 30.0 V IdsMax= 4.5 Amps	1 1	$0.16	SOT-23 22mm2
12.	Rbp	Vishay-Dale	CRCW040220R0FKED Series= CRCW..e3	Res= 20.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2
13.	Rcomp	Vishay-Dale	CRCW04021K62FKED Series= CRCW..e3	Res= 1.62 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2
14.	Rfadj	Vishay-Dale	CRCW040238K3FKED Series= CRCW..e3	Res= 38.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2
15.	Rfb1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2
16.	Rfb2	Vishay-Dale	CRCW040237K4FKED Series= CRCW..e3	Res= 37.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 8mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
17.	Rramp	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 8mm2
18.	Rsense	Stackpole Electronics Inc	CSR1206FK15L0 Series= ?	Res= 15.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	 1206 19mm2
19.	U1	Texas Instruments	LM3478MM/NOPB	Switcher	1	$0.80	 MUA08A 34mm2

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	132.904 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.294 A	Current	Output capacitor RMS ripple current
3.	Csep IRMS	2.312 A	Current	SEPIC capacitor RMS ripple current
4.	D1 Irms	3.024 A	Current	D1 Irms
5.	IC Ipk	4.248 mA	Current	Peak switch current in IC
6.	Iin Avg	2.792 A	Current	Average input current
7.	Lin Ipk	3.221 A	Current	Lin peak current
8.	Lin Ipp	1.035 A	Current	Peak-to-peak input inductor ripple current
9.	Lin Irms	2.736 A	Current	Lin ripple current
10.	Lout Ipk	2.156 A	Current	Lout peak current
11.	Lout Ipp	466.059 mA	Current	Peak-to-peak output inductor ripple current
12.	Lout Irms	1.938 A	Current	Lout ripple current
13.	M1 Irms	3.562 A	Current	M1 MOSFET Irms
14.	BOM Count	14	General	Total Design BOM count
15.	FootPrint	269.0 mm2	General	Total Foot Print Area of BOM components
16.	Frequency	395.0 kHz	General	Switching frequency
17.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
18.	Mode	CCM	General	Conduction Mode
19.	Total BOM	$1.58	General	Total BOM Cost
20.	D1 Tj	76.481 degC	Op_Point	D1 junction temperature
21.	SEPIC Resonance Freq	24.892 kHz	Op_Point	SEPIC Resonance Frequency
22.	V SEPIC damping factor	122.52 m	Op_Point	V SEPIC damping factor
23.	Vin p-p	7.658 mV	Op_Point	Peak-to-peak input voltage
24.	Vsep p-p	1.473 V	Op_Point	Peak-to-peak sepic voltage
25.	Cross Freq	8.214 kHz	Op_point	Bode plot crossover frequency
26.	Duty Cycle	58.0 %	Op_point	Duty cycle
27.	Efficiency	78.154 %	Op_point	Steady state efficiency

#	Name	Value	Category	Description
28.	Gain Marg	9.994 db	Op_point	Bode Plot Gain Margin
29.	IC Tj	34.673 degC	Op_point	IC junction temperature
30.	IOUT_OP	2.0 A	Op_point	Iout operating point
31.	M1 TjOP	30.3 degC	Op_point	M1 MOSFET junction temperature
32.	Phase Marg	58.335 deg	Op_point	Bode Plot Phase Margin
33.	Phase Shift	59.114 deg	Op_point	Bode Plot Phase Shift
34.	VIN_OP	8.4 V	Op_point	Vin operating point
35.	Vout p-p	112.411 mV	Op_point	Peak-to-peak output ripple voltage
36.	Cin Pd	35.327 µW	Power	Input capacitor power dissipation
37.	Cout Pd	110.543 mW	Power	Output capacitor power dissipation
38.	Csep Pd	42.75 mW	Power	SEPIC capacitor power dissipation
39.	D1 Pd	1.033 W	Power	Diode power dissipation
40.	D1 PdCond	1.02 W	Power	Diode conduction losses
41.	D1 PdSw	12.901 mW	Power	Diode switching losses
42.	IC Pd	23.365 mW	Power	IC power dissipation
43.	Lin Pd	580.245 mW	Power	Lin power dissipation
44.	Lout Pd	263.701 mW	Power	Lout power dissipation
45.	M1 Pd	1.036 W	Power	M1 MOSFET total power dissipation
46.	M1 PdCond	870.546 mW	Power	M1 MOSFET conduction losses
47.	M1 PdSw	165.165 mW	Power	M1 MOSFET switching losses
48.	Rsense Pd	190.364 mW	Power	LED Current Rsns Power Dissipation
49.	Total Pd	3.354 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	VinMax	8.4 V	Maximum input voltage
4.	VinMin	5.5 V	Minimum input voltage
5.	Vout	6.0 V	Output Voltage
6.	Vout1	6.0 Volt	Output Voltage #1
7.	base_pn	LM3478	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **LM3478** Product Folder : http://www.ti.com/product/lm3478 : contains the data sheet and other resources.