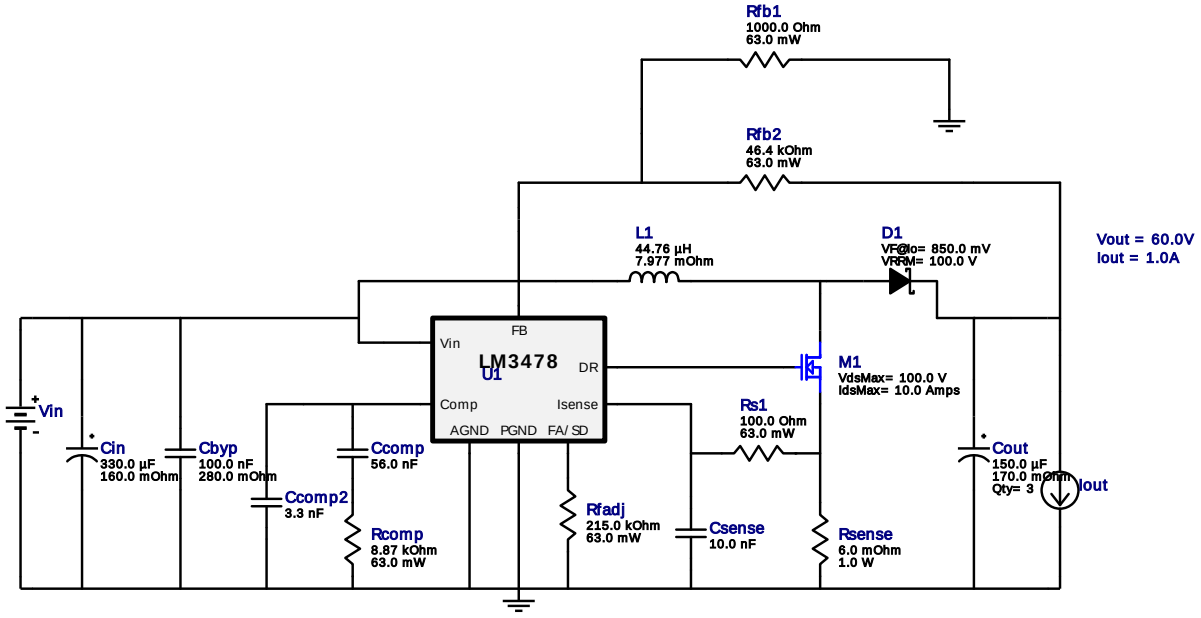
WEBENCH® Design Report

VinMin = 10.0V
VinMax = 14.4V
Vout = 60.0V
Iout = 1.0A

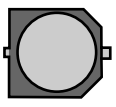
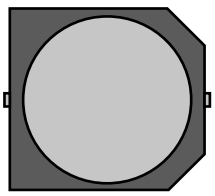
Device = LM3478MMX/NOPB
Topology = Boost
Created = 7/11/16 4:31:15 AM
BOM Cost = $0.00
BOM Count = 18
Total Pd = 3.72W

Design : 1641152/107 LM3478MMX/NOPB
LM3478MMX/NOPB 10.0V-14.4V to 60.00V @ 1.0A

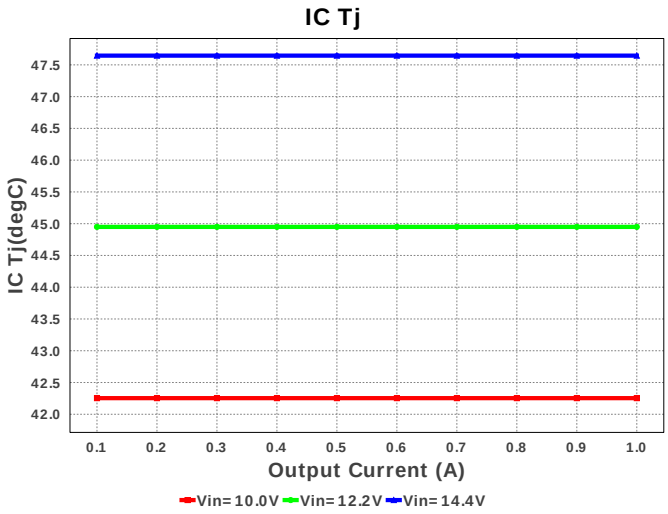


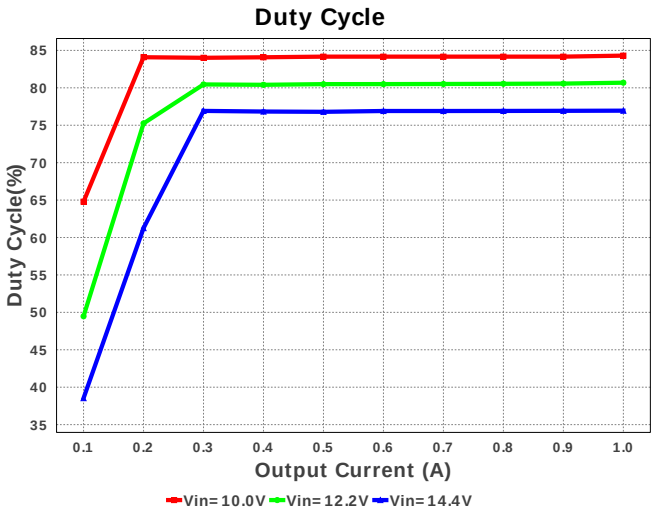
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower than your supply's rise time.

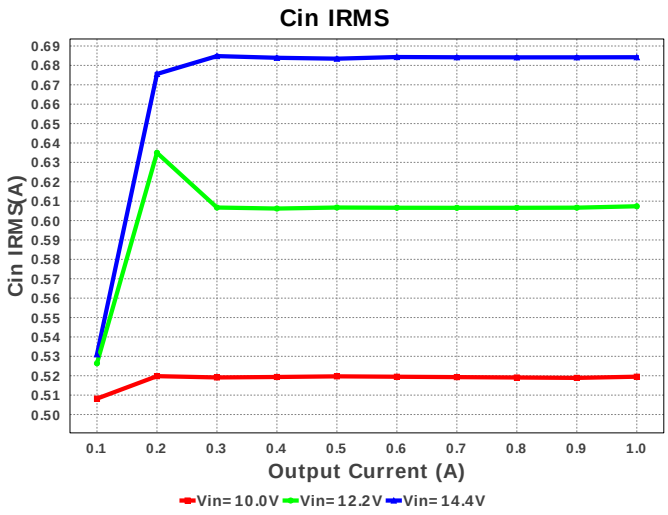
Electrical BOM

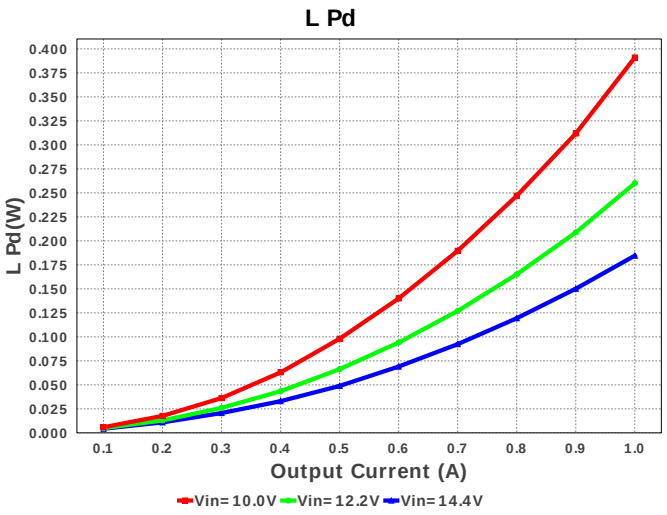
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	MuRata	GRM155R61A563KA01D Series= X5R	Cap= 56.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	MuRata	GRM216R71E332KA01D Series= X7R	Cap= 3.3 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	EEE-FK1E331P Series= FK	Cap= 330.0 uF ESR= 160.0 mOhm VDC= 25.0 V IRMS= 600.0 mA	1	$0.24	 SM_RADIAL_F 124 mm²
5.	Cout	Panasonic	EEV-FK2A151M Series= FK	Cap= 150.0 uF ESR= 170.0 mOhm VDC= 100.0 V IRMS= 793.0 mA	3	$0.78	 SM_RADIAL_J16 399 mm²
6.	Csense	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

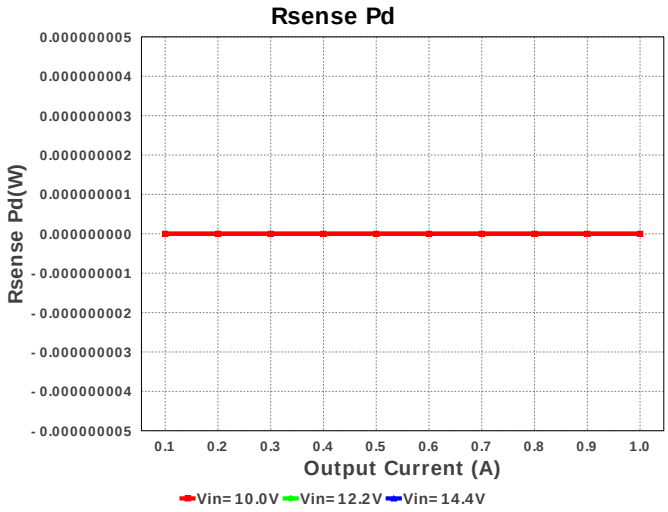
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	D1	Micro Commercial Components	SK310A-TP	VF@Io= 850.0 mV VRRM= 100.0 V	1	$0.10	SMA 37 mm²
8.	L1	CUSTOM	CUSTOM	L= 44.76 µH DCR= 7.977 mOhm	1	NA	CUSTOM 0 mm²
9.	M1	Texas Instruments	CSD19534Q5A	VdsMax= 100.0 V IdsMax= 10.0 Amps	1	$0.68	TRANS_NexFET_Q5A 55 mm²
10.	Rcomp	Vishay-Dale	CRCW04028K87FKED Series= CRCW..e3	Res= 8.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	Rfadj	Vishay-Dale	CRCW0402215KFKED Series= CRCW..e3	Res= 215.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
12.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
13.	Rfb2	Vishay-Dale	CRCW040246K4FKED Series= CRCW..e3	Res= 46.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
14.	Rs1	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
15.	Rsense	Susumu Co Ltd	PRL1632-R006-F-T1 Series= PRL1632	Res= 6.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.19	0612 11 mm²
16.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.80	MUA08A 24 mm²

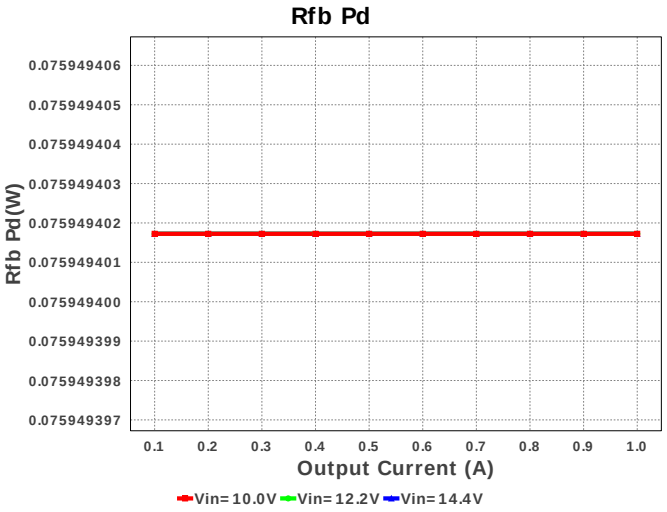


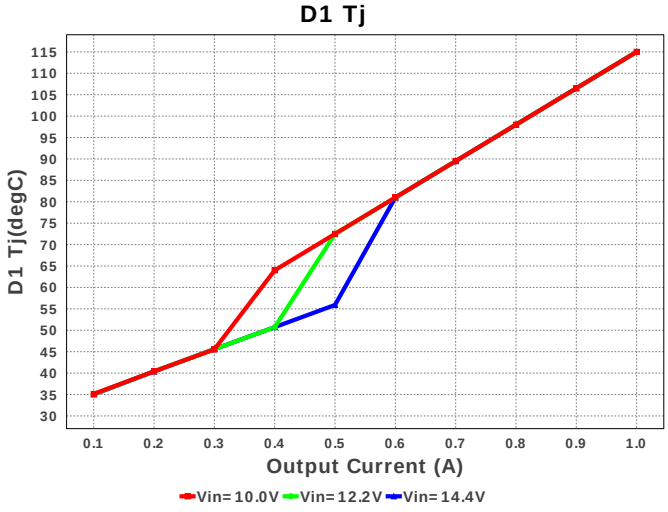


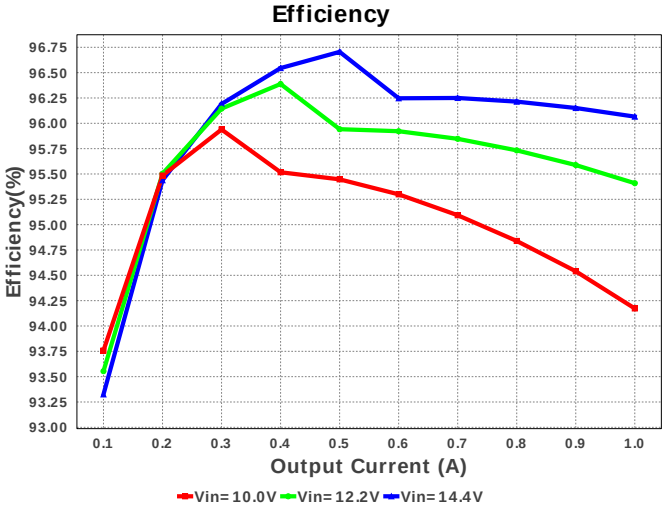


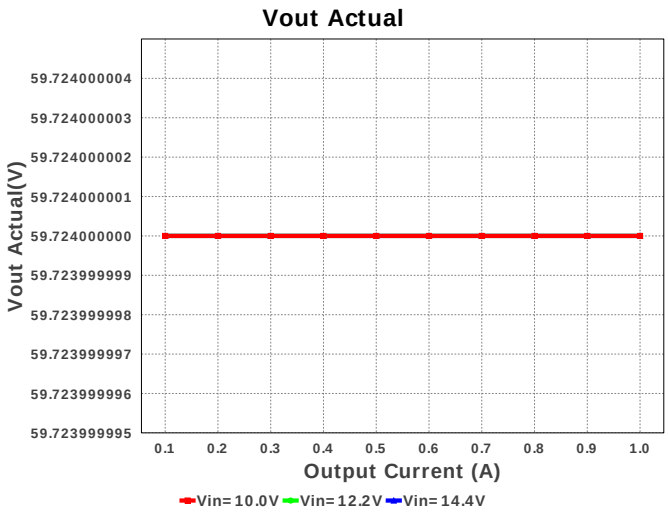


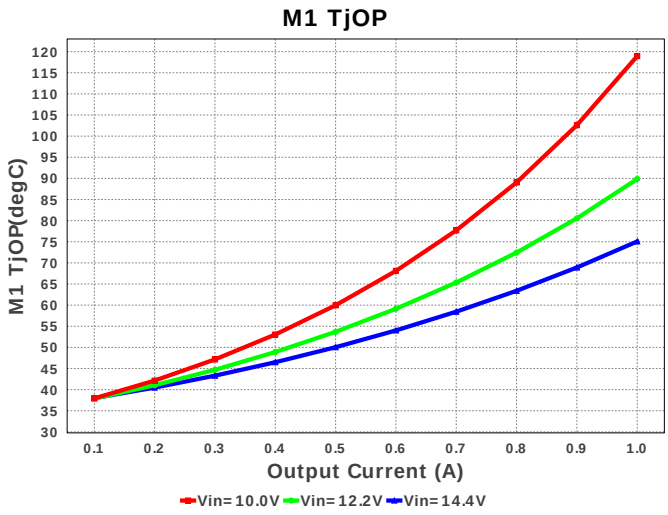


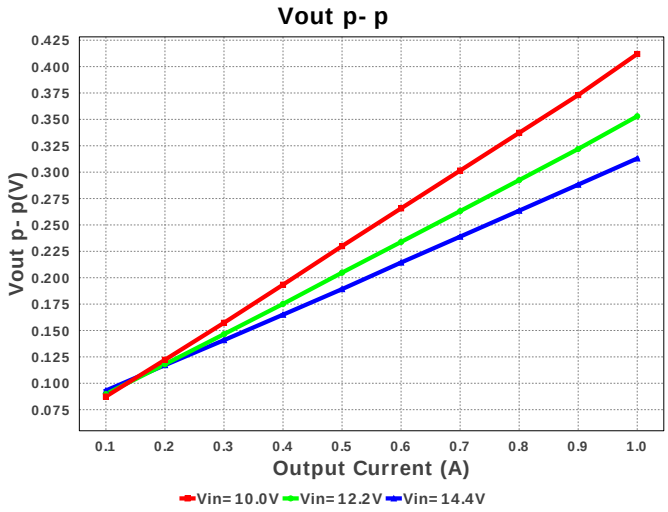


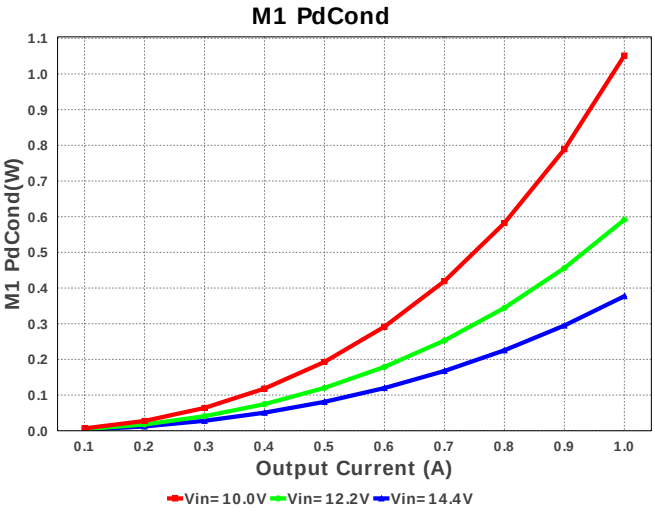


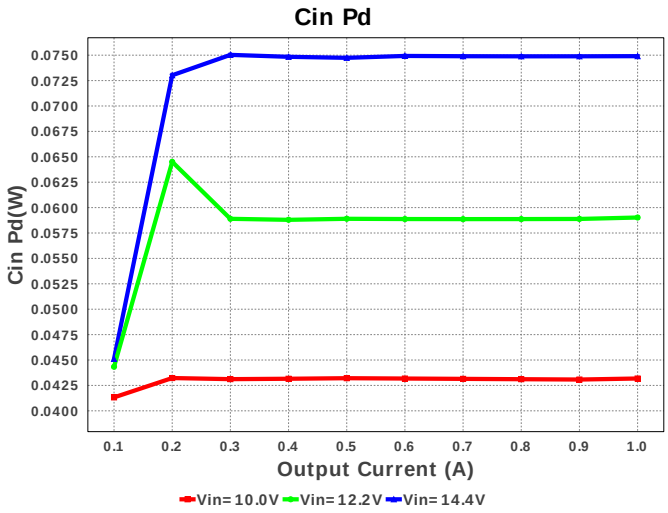


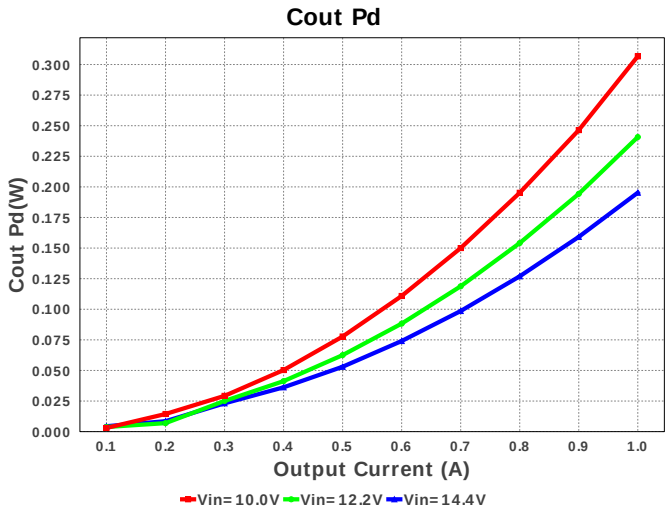


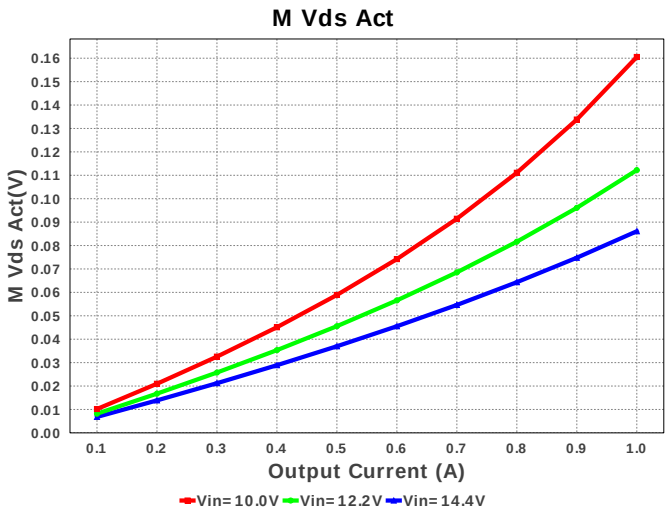


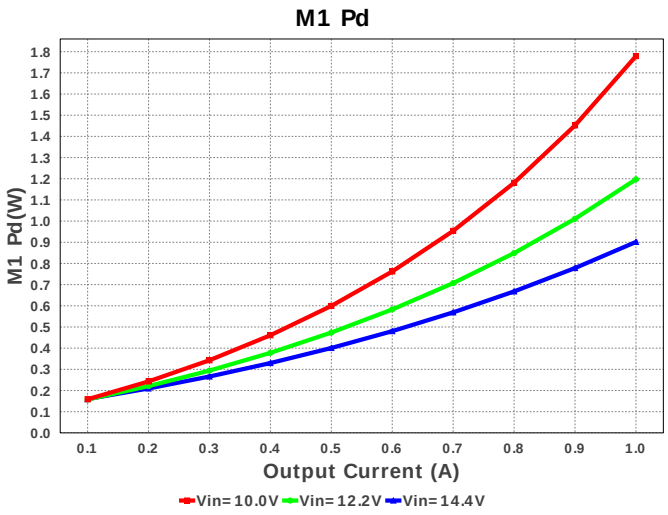


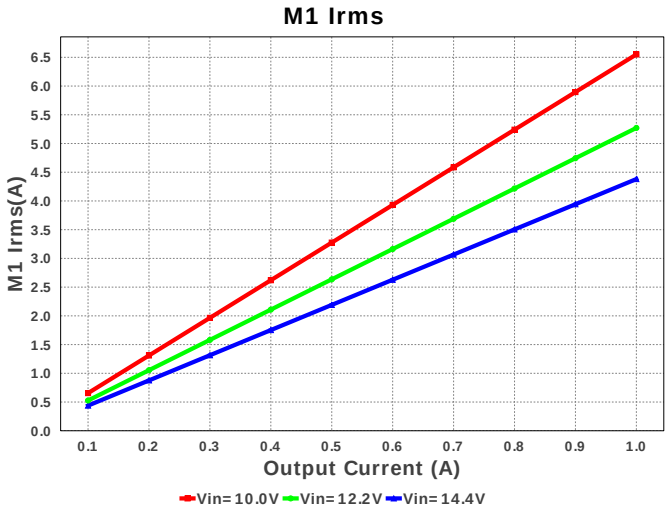


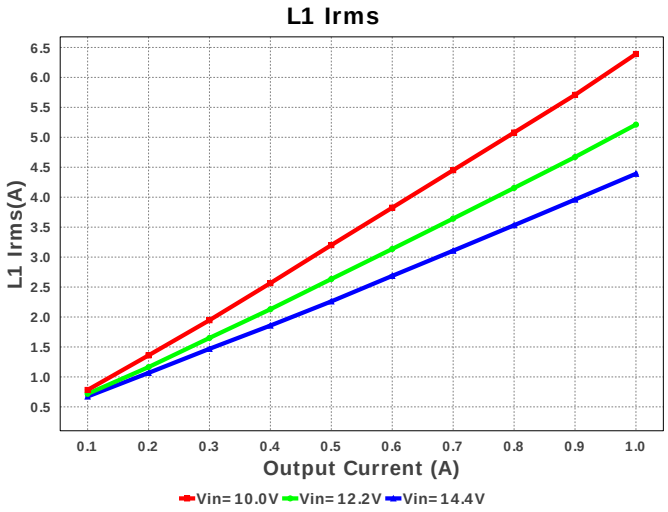


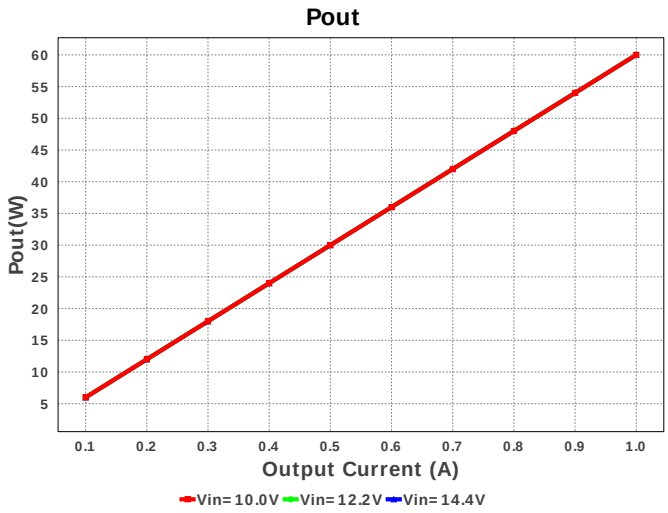


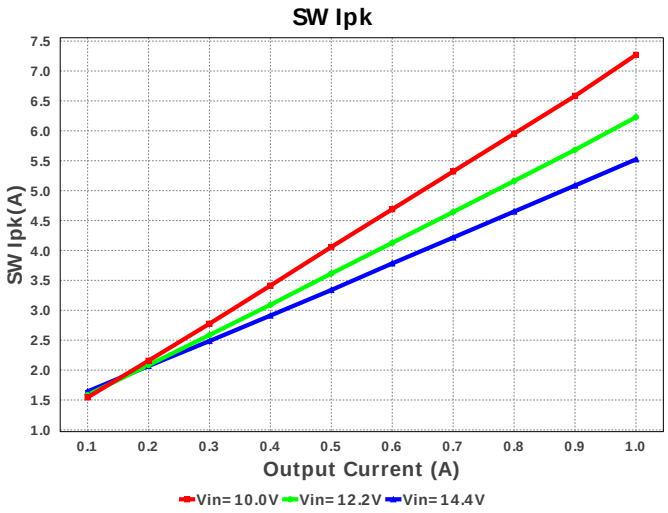


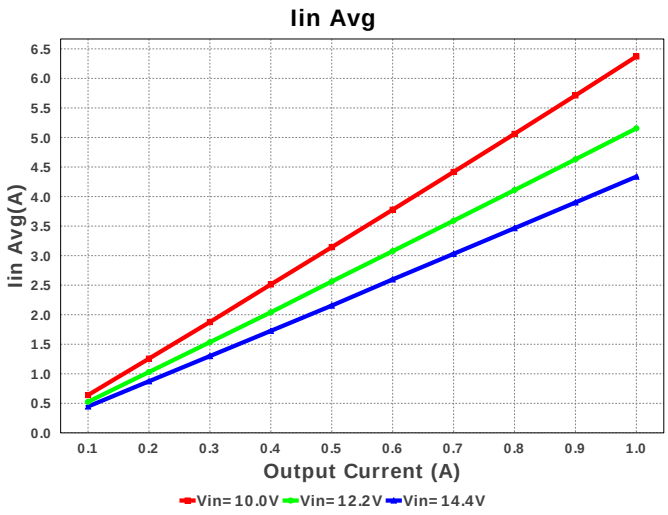


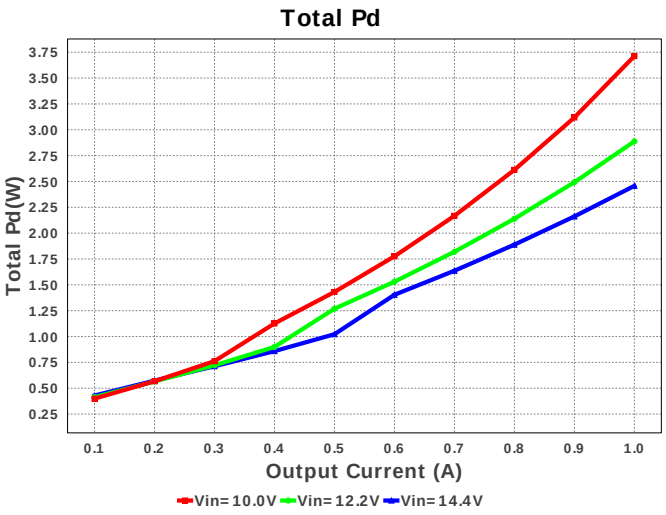


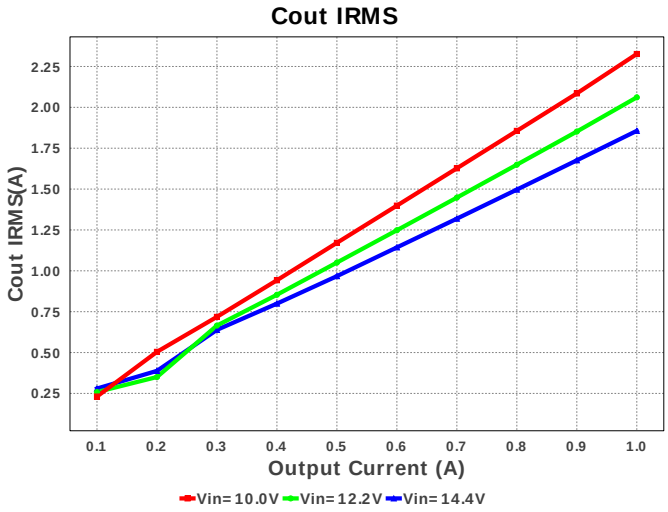


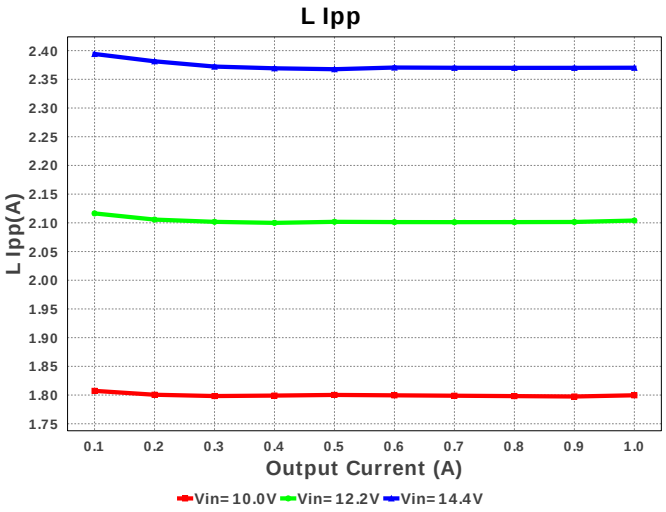


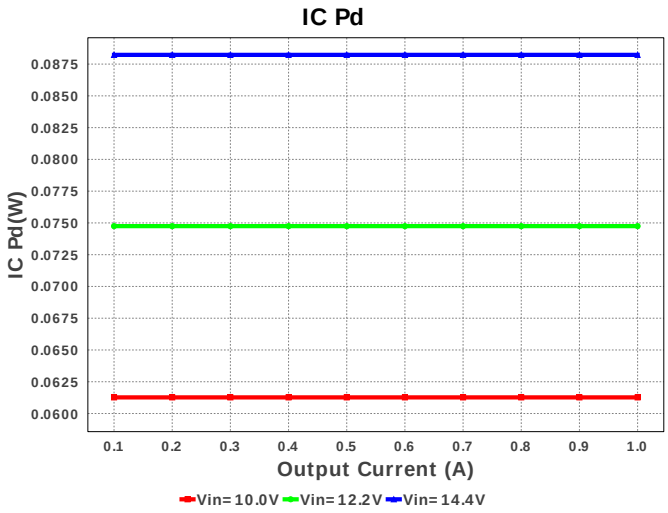


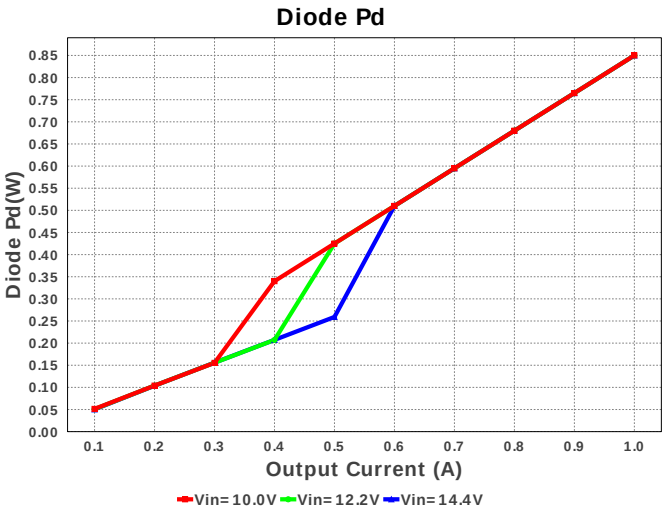


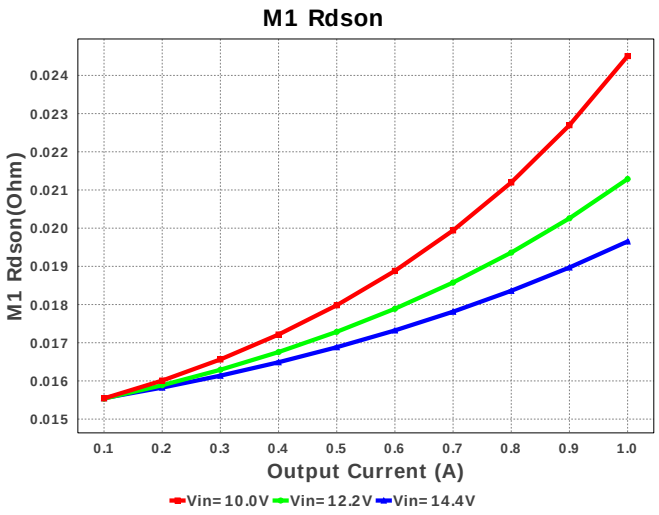


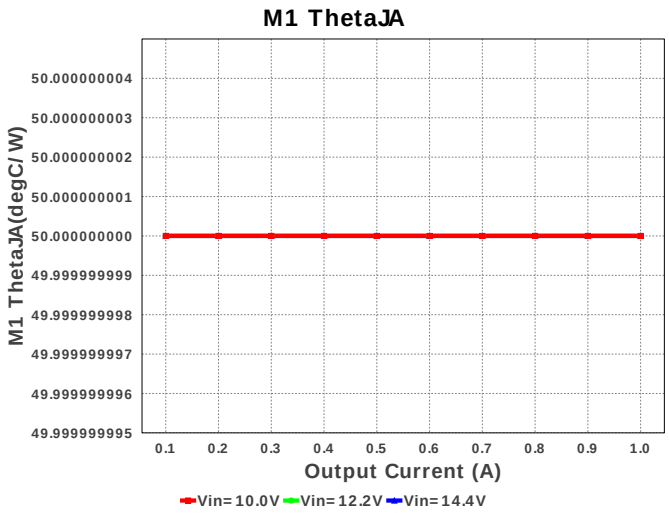


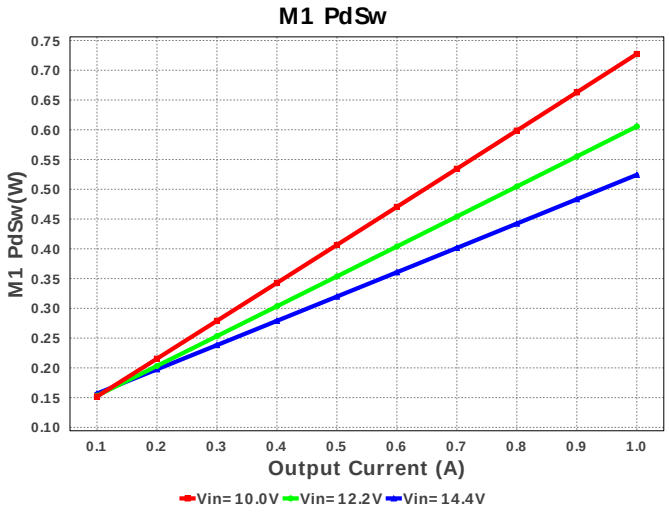


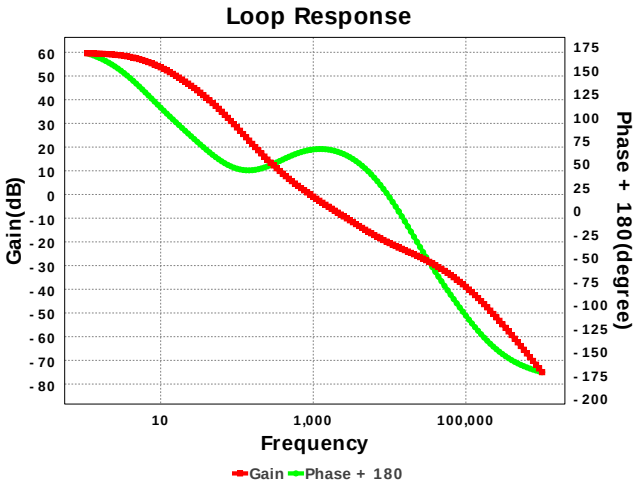












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	519.511 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	2.327 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	6.372 A	Current	Average input current
4.	L Ipp	1.8 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	6.392 A	Current	Inductor ripple current
6.	M1 Irms	6.551 A	Current	M1 MOSFET Irms
7.	SW Ipk	7.27 A	Current	Peak switch current
8.	BOM Count	18	General	Total Design BOM count
9.	FootPrint	2.286 k mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	104.257 kHz	General	Switching frequency
11.	IC Tolerance	24.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	160.774 mV	General	M Vds
13.	M1 Rdson	24.543 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	60.0 W	General	Total output power
16.	Total BOM	$0.0	General	Total BOM Cost
17.	D1 Tj	115.0 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	56.232 dB	Op_Point	Gain at 10Hz
19.	Vout Actual	59.724 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	60.0 V	Op_Point	Operational Output Voltage
21.	Cross Freq	654.78 Hz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	84.303 %	Op_point	Duty cycle
23.	Efficiency	94.163 %	Op_point	Steady state efficiency
24.	Gain Marg	-19.24 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	42.284 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	1.0 A	Op_point	Iout operating point
28.	M1 TjOP	119.284 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	58.917 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	10.0 V	Op_point	Vin operating point
31.	Vout p-p	411.988 mV	Op_point	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
32.	Cin Pd	43.183 mW	Power	Input capacitor power dissipation
33.	Cout Pd	306.732 mW	Power	Output capacitor power dissipation
34.	Diode Pd	850.0 mW	Power	Diode power dissipation
35.	IC Pd	61.42 mW	Power	IC power dissipation
36.	L Pd	391.083 mW	Power	Inductor power dissipation
37.	M1 Pd	1.786 W	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	1.053 W	Power	M1 MOSFET conduction losses
39.	M1 PdSw	732.5 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	75.949 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	225.641 mW	Power	LED Current Rsns Power Dissipation
42.	Total Pd	3.719 W	Power	Total Power Dissipation
43.	Vout Tolerance	3.944 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.0	Maximum Output Current
2.	VinMax	14.4	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	60.0	Output Voltage
5.	base_pn	LM3478	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

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