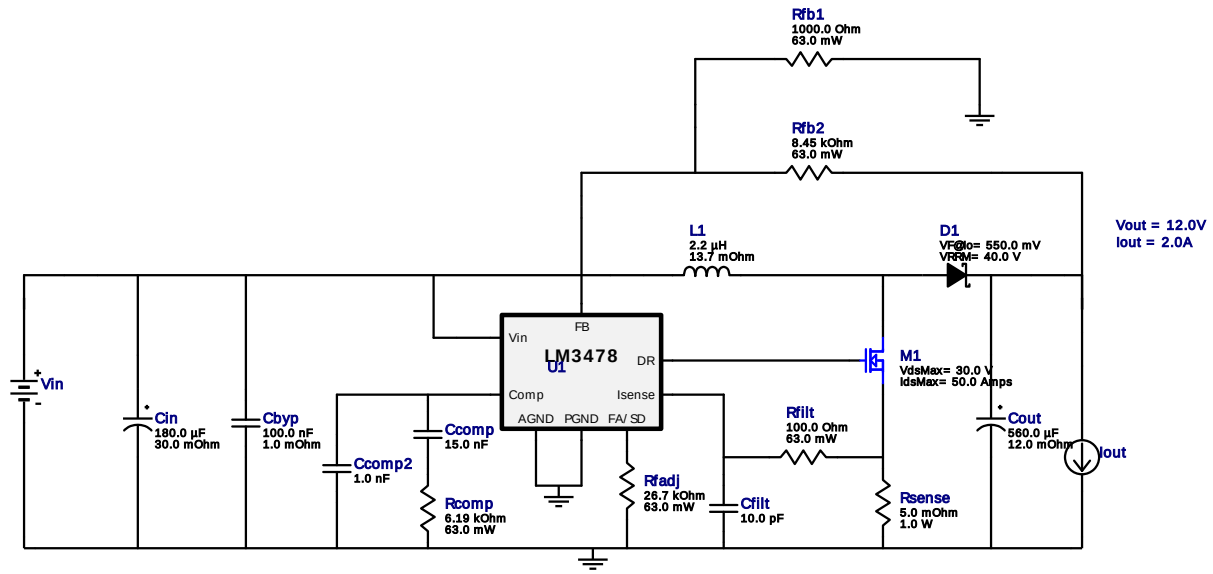
WEBENCH® Design Report

VinMin = 3.3V
VinMax = 5.5V
Vout = 12.0V
Iout = 2.0A

Device = LM3478MMX/NOPB
Topology = Boost
Created = 2020-03-06 00:00:06.079
BOM Cost = $3.59
BOM Count = 16
Total Pd = 2.6W

LM3478MMX/NOPB 3.3V-5.5V to 12.00V @ 2A

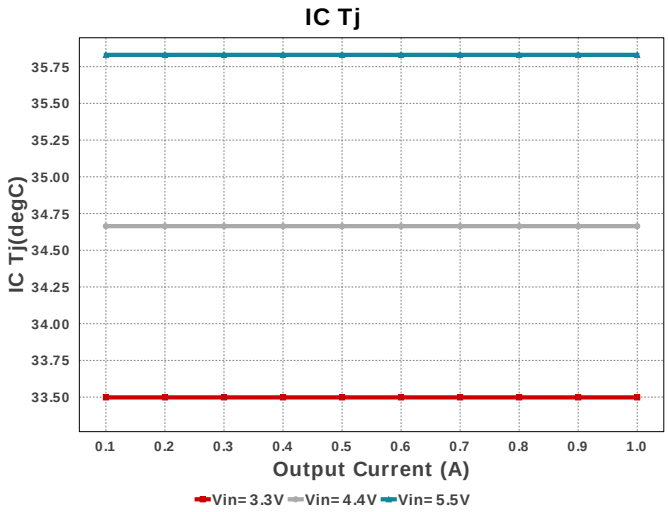


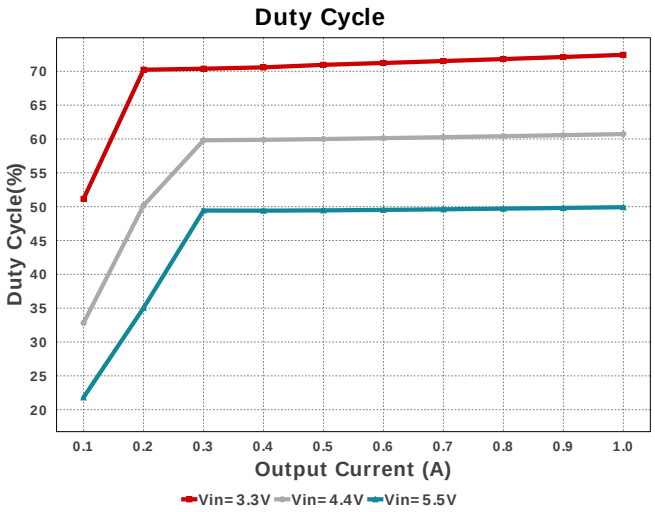
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

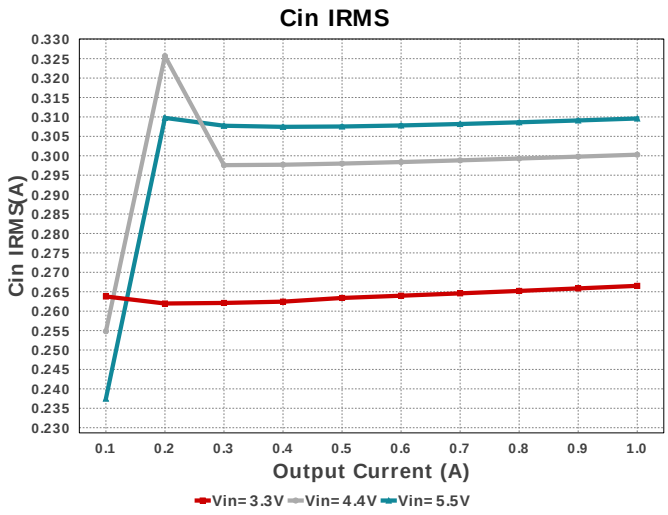
Electrical BOM

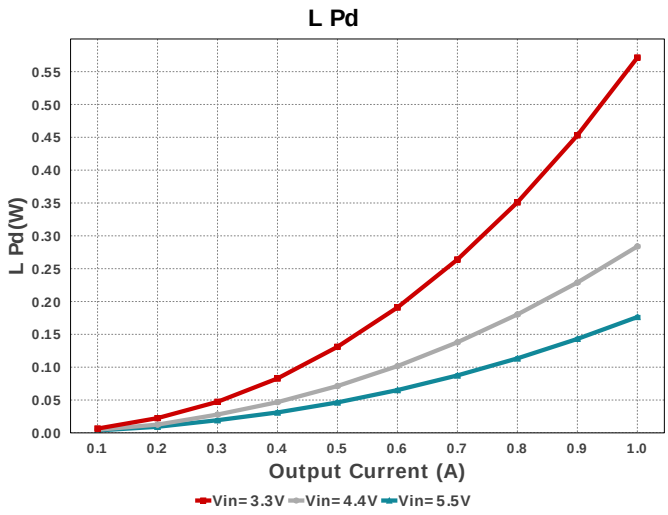
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R70J104KA01D Series= X7R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	TDK	CGA4F2C0G1H153J085AA Series= C0G/NP0	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.07	0805 7 mm²
3.	Ccomp2	MuRata	GRM1555C1H102JA01J Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
4.	Cfilt	Samsung Electro-Mechanics	CL21C100JBANNNC Series= C0G/NP0	Cap= 10.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Cin	Panasonic	16SVP180MX Series= SVP	Cap= 180.0 uF ESR= 30.0 mOhm VDC= 16.0 V IRMS= 3.02 A	1	$0.30	SM_RADIAL_10AMM 160 mm²
6.	Cout	Panasonic	20SVPF560M Series= SVPF	Cap= 560.0 uF ESR= 12.0 mOhm VDC= 20.0 V IRMS= 5.4 A	1	$0.73	CAPSMT_62_F12 151 mm²
7.	D1	Diodes Inc.	B540C-13-F	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.17	SMC 83 mm²

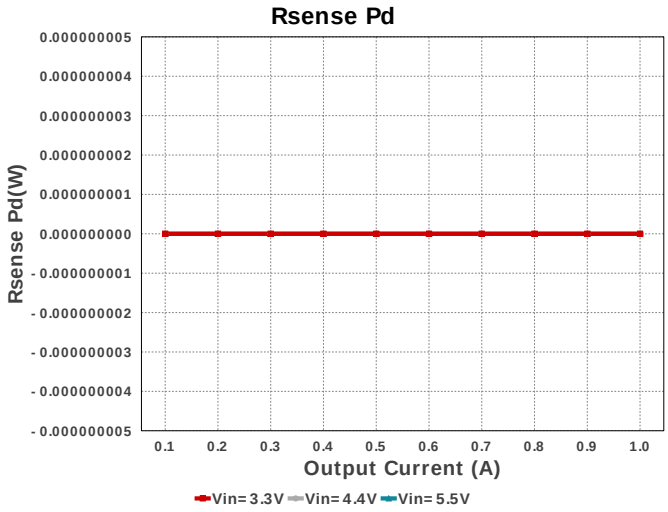
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Coilcraft	XAL7030-222MEB	L= 2.2 µH DCR= 13.7 mOhm	1	$0.99	 XAL7030 100 mm^2
9.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 50.0 Amps	1	$0.22	 DQG0008A 18 mm^2
10.	Rcomp	Vishay-Dale	CRCW04026K19FKED Series= CRCW..e3	Res= 6190.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
11.	Rfadj	Vishay-Dale	CRCW040226K7FKED Series= CRCW..e3	Res= 26700.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
12.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
13.	Rfb2	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8450.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
14.	Rfilt	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rsense	Susumu Co Ltd	PRL1632-R005-F-T1 Series= PRL1632	Res= 0.005Ohm Power= 1.0 W Tolerance= 1.0%	1	$0.20	 0612 11 mm^2
16.	U1	Texas Instruments	LM3478MMX/NOPB	Switcher	1	$0.83	 MUA08A 24 mm^2

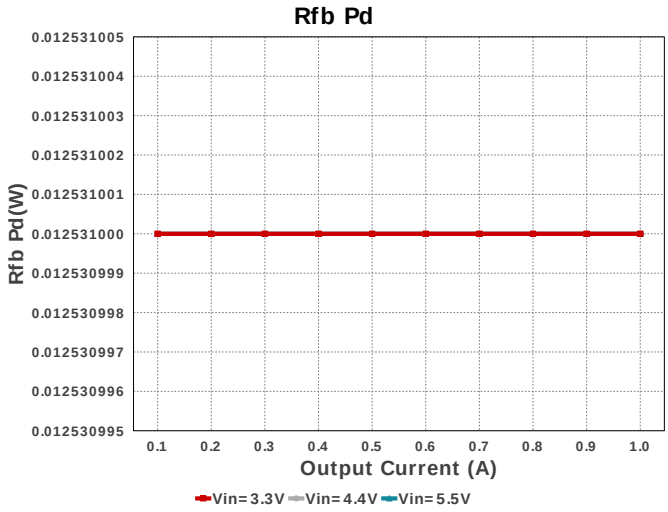


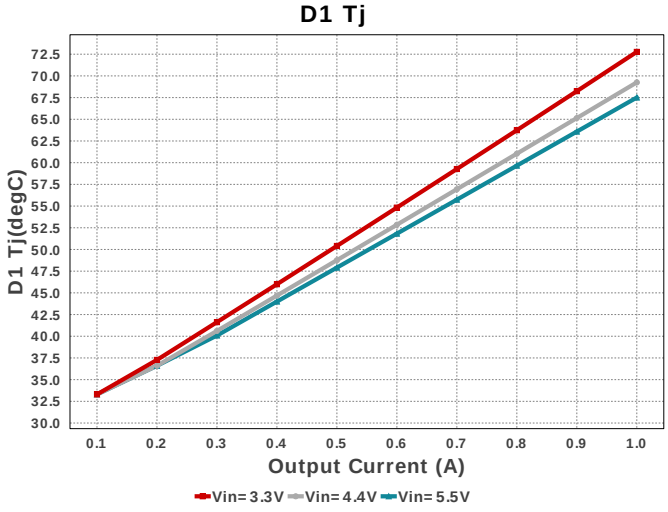


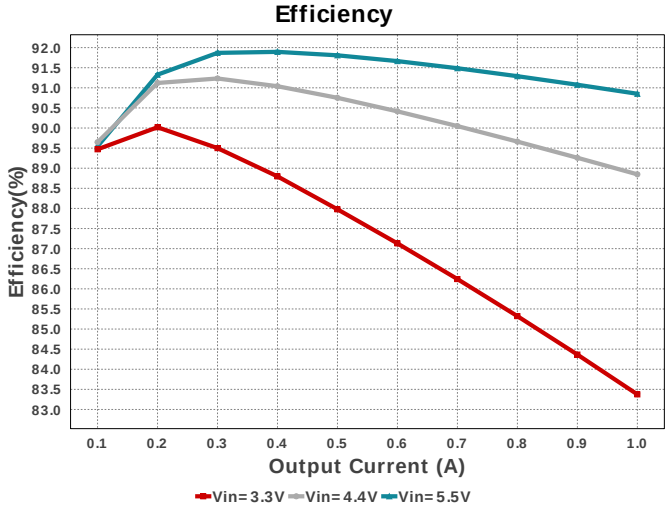


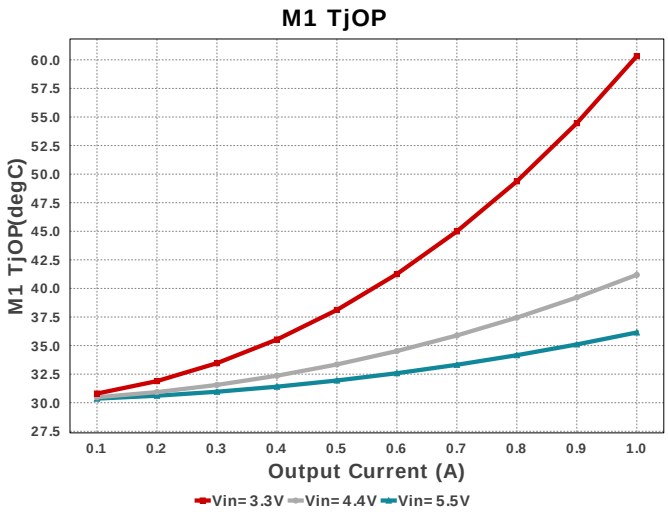


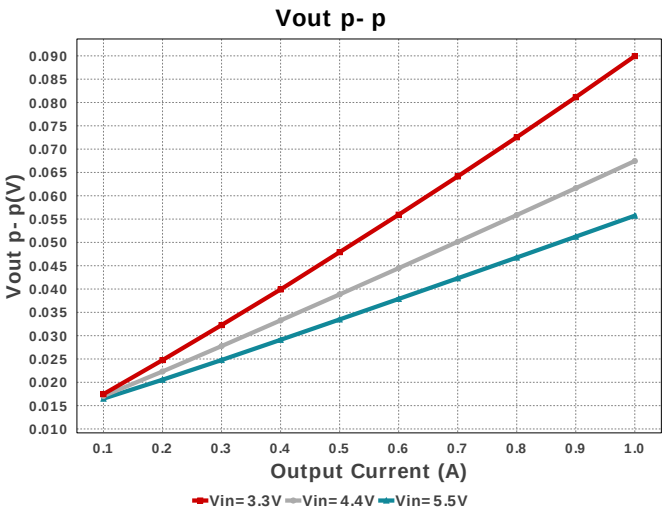


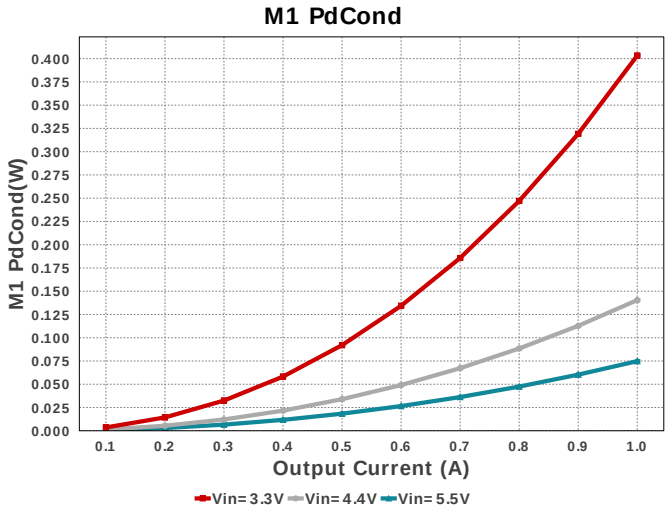


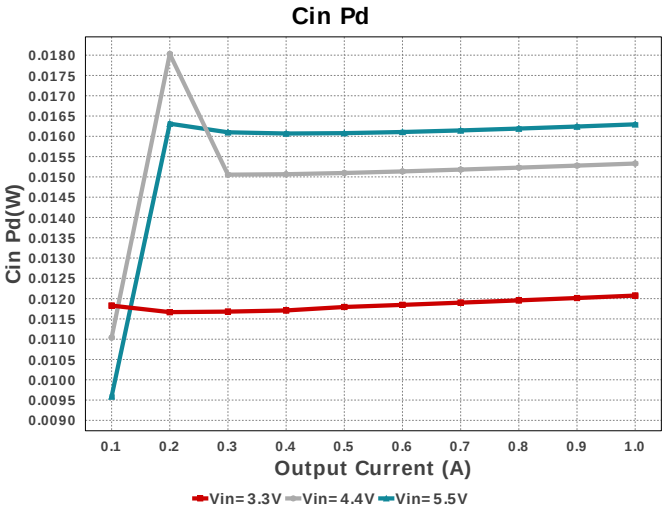


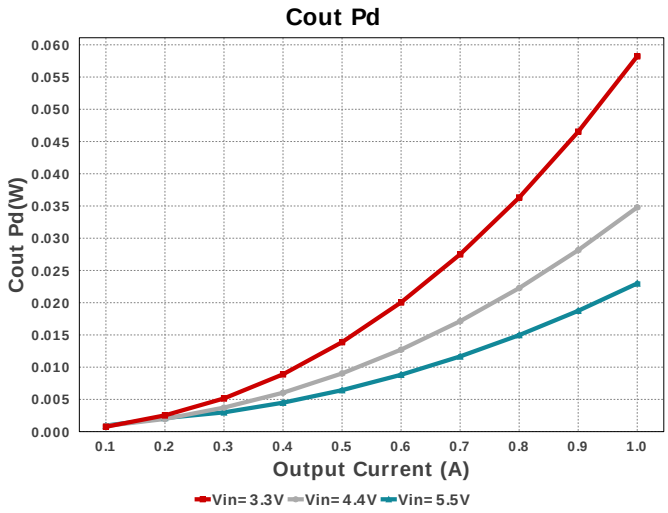


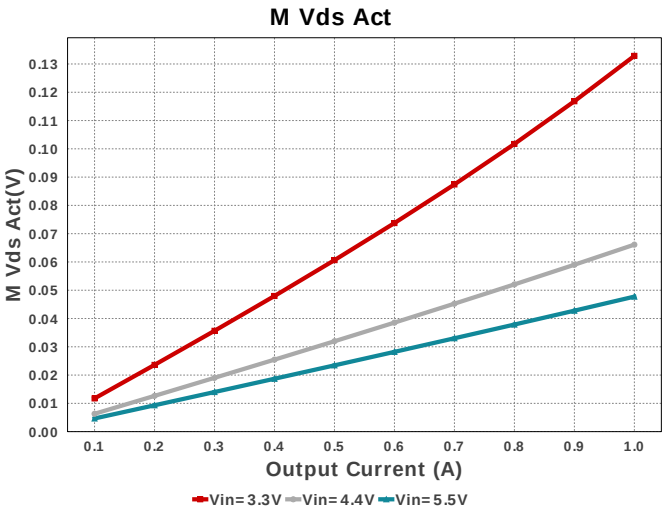


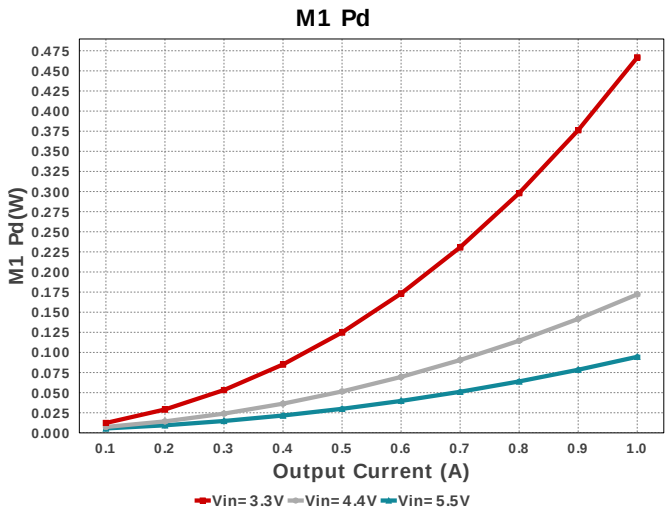


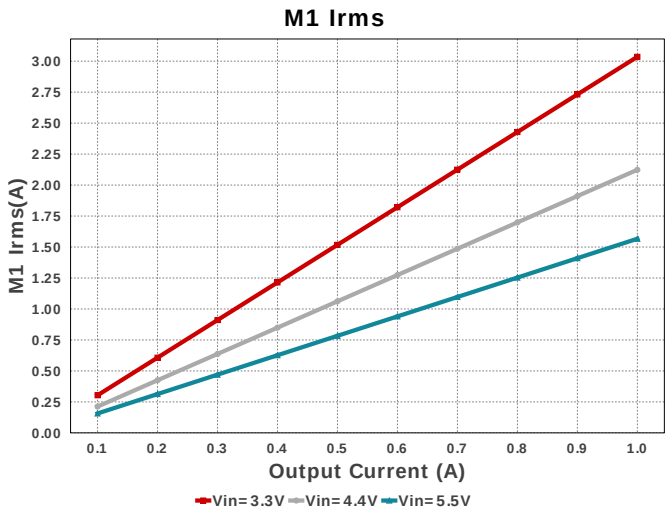


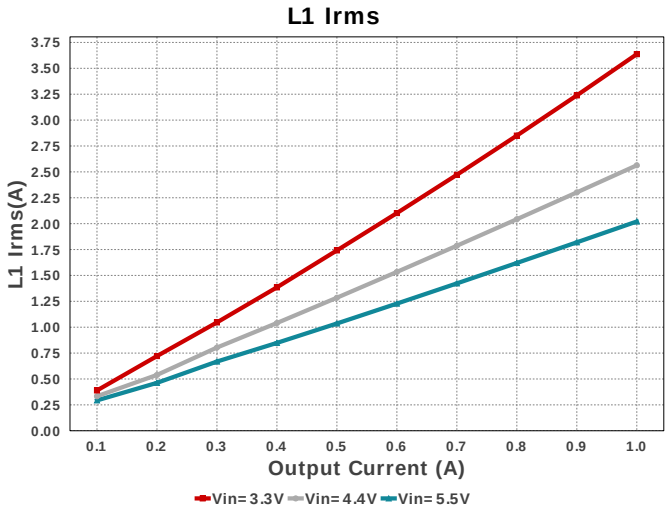


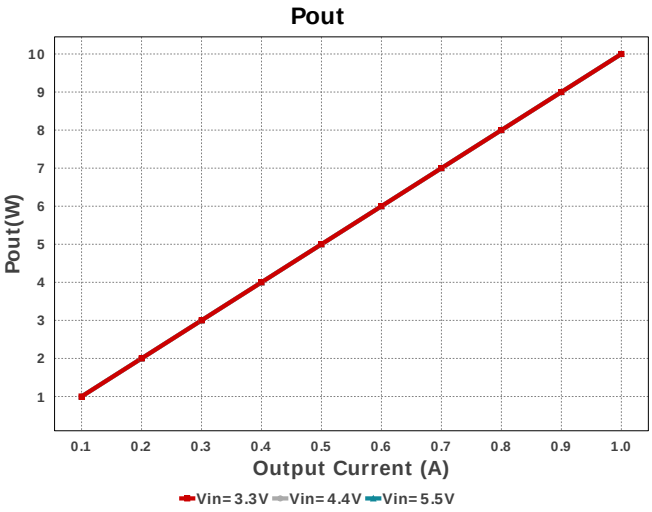


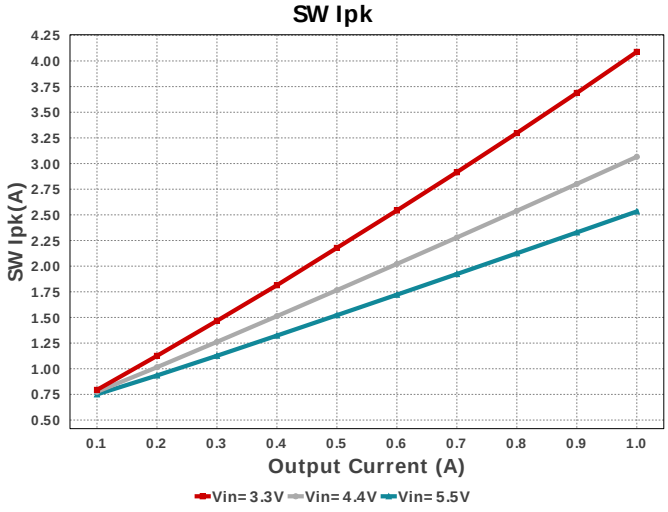


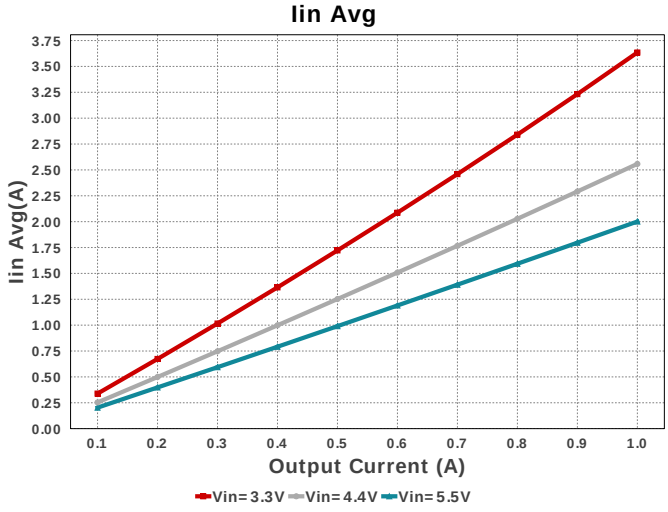


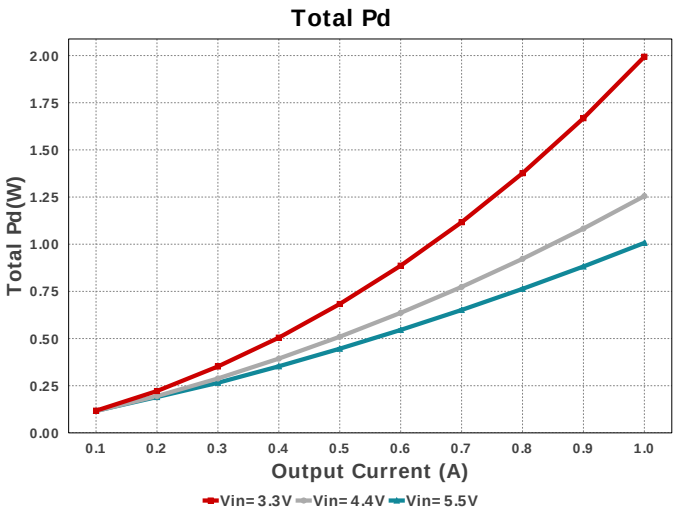


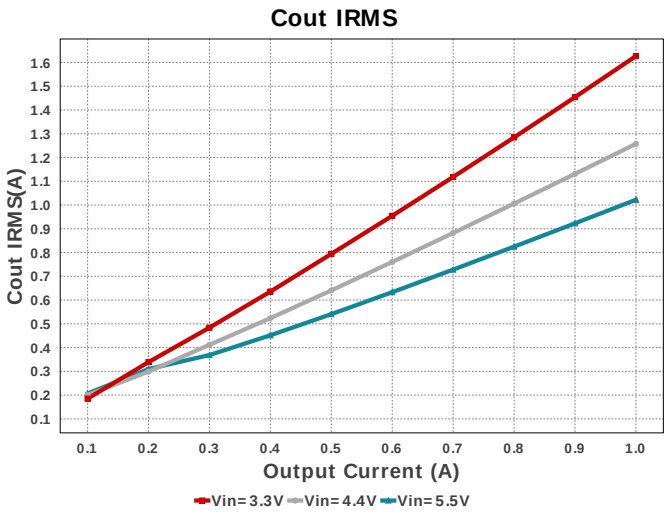


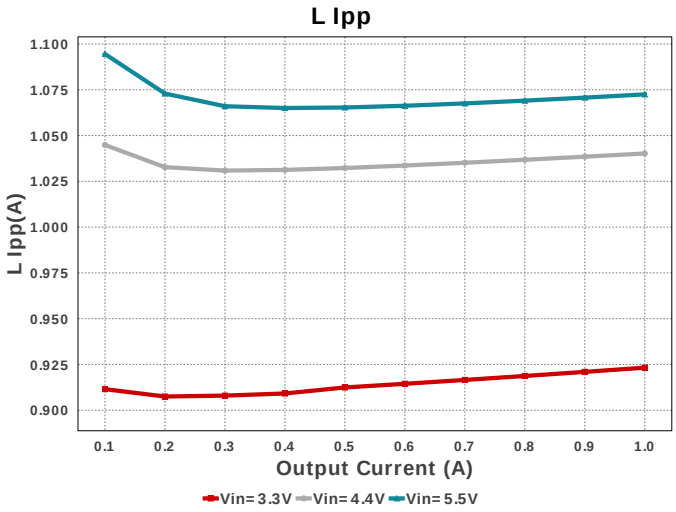


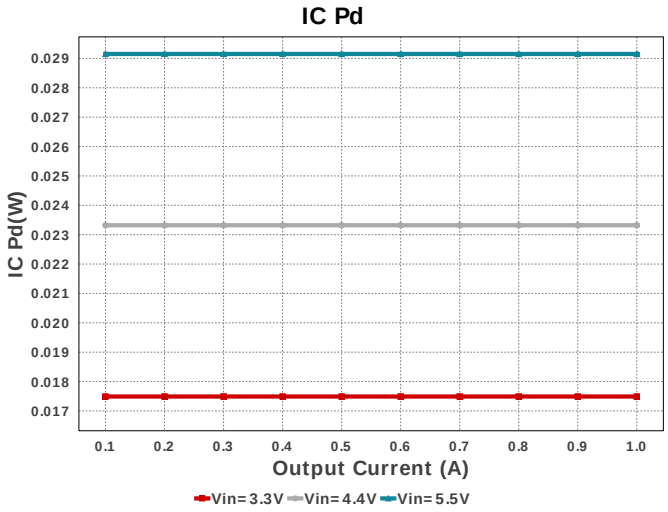


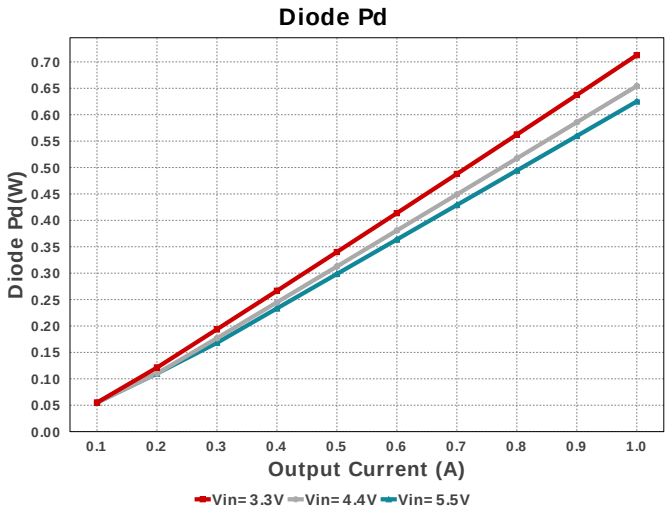


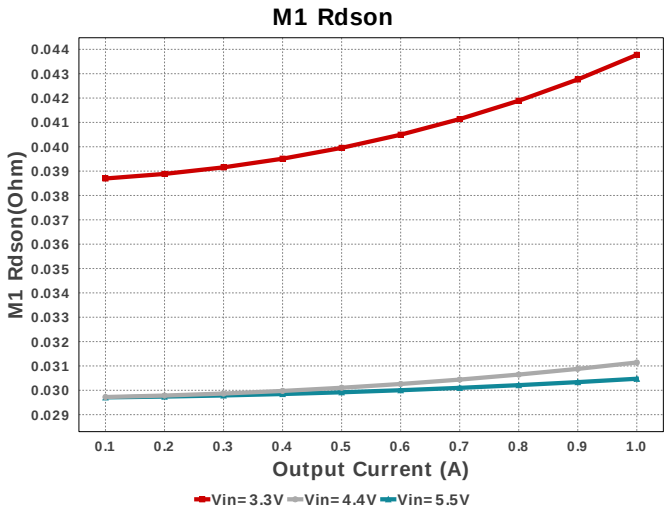


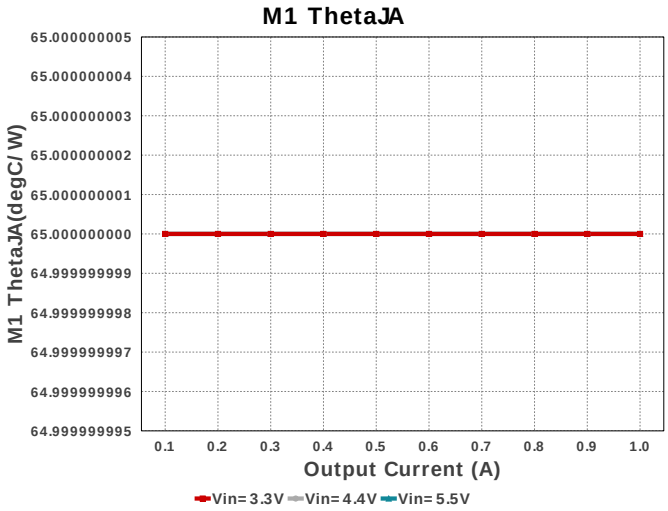


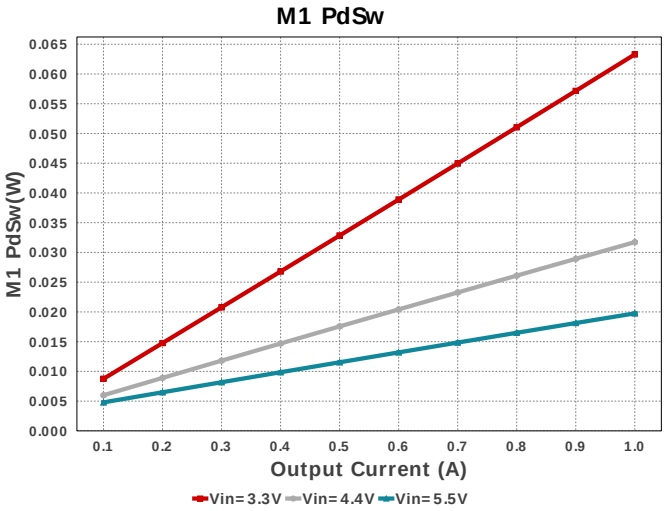


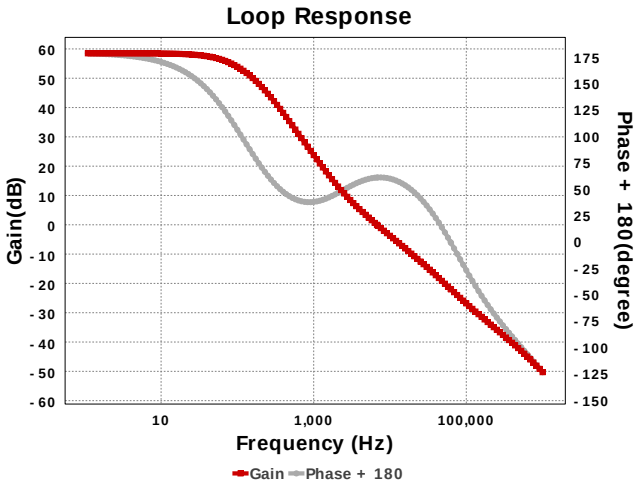












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	592.715 mA	Capacitor	Input capacitor RMS ripple current
2.	Cin Pd	10.539 mW	Capacitor	Input capacitor power dissipation
3.	Cout IRMS	3.483 A	Capacitor	Output capacitor RMS ripple current
4.	Cout Pd	145.56 mW	Capacitor	Output capacitor power dissipation
5.	D1 Tj	85.0 degC	Diode	D1 junction temperature
6.	Diode Pd	1.1 W	Diode	Diode power dissipation
7.	IC Pd	21.694 mW	IC	IC power dissipation
8.	IC Tj	34.339 degC	IC	IC junction temperature
9.	IC Tolerance	24.3 mV	IC	IC Feedback Tolerance
10.	ICThetaJA	200.0 degC/W	IC	IC junction-to-ambient thermal resistance
11.	Iin Avg	8.06 A	IC	Average input current
12.	L Ipp	2.053 A	Inductor	Peak-to-peak inductor ripple current
13.	L Pd	1.064 W	Inductor	Inductor power dissipation
14.	L1 Irms	8.043 A	Inductor	Inductor ripple current
15.	M Vds Act	114.64 mV	Mosfet	M Vds
16.	M1 Irms	7.518 A	Mosfet	M1 MOSFET Irms
17.	M1 Pd	1.283 W	Mosfet	M1 MOSFET total power dissipation
18.	M1 PdCond	861.83 mW	Mosfet	M1 MOSFET conduction losses
19.	M1 PdSw	421.41 mW	Mosfet	M1 MOSFET switching losses
20.	M1 Rdson	15.249 mOhm	Mosfet	Drain-Source On-resistance
21.	M1 ThetaJA	55.0 degC/W	Mosfet	MOSFET junction-to-ambient thermal resistance
22.	M1 TjOP	100.58 degC	Mosfet	M1 MOSFET junction temperature
23.	Cin Pd	10.539 mW	Power	Input capacitor power dissipation
24.	Cout Pd	145.56 mW	Power	Output capacitor power dissipation
25.	Diode Pd	1.1 W	Power	Diode power dissipation
26.	IC Pd	21.694 mW	Power	IC power dissipation
27.	L Pd	1.064 W	Power	Inductor power dissipation
28.	M1 Pd	1.283 W	Power	M1 MOSFET total power dissipation
29.	M1 PdCond	861.83 mW	Power	M1 MOSFET conduction losses
30.	M1 PdSw	421.41 mW	Power	M1 MOSFET switching losses
31.	Rfb Pd	15.238 mW	Power	Rfb Power Dissipation
32.	Rsense Pd	289.26 mW	Power	LED Current Rsns Power Dissipation

#	Name	Value	Category	Description
33.	Total Pd	2.598 W	Power	Total Power Dissipation
34.	Rfb Pd	15.238 mW	Resistor	Rfb Power Dissipation
35.	Rsense Pd	289.26 mW	Resistor	LED Current Rsns Power Dissipation
36.	BOM Count	16	System Information	Total Design BOM count
37.	Cross Freq	3.652 kHz	System Information	Bode plot crossover frequency
38.	Duty Cycle	75.066 %	System Information	Duty cycle
39.	Efficiency	90.232 %	System Information	Steady state efficiency
40.	FootPrint	582.0 mm^2	System Information	Total Foot Print Area of BOM components
41.	Frequency	541.734 kHz	System Information	Switching frequency
42.	Gain Marg	-17.59 dB	System Information	Bode Plot Gain Margin
43.	Iout	2.0 A	System Information	Iout operating point
44.	Low Freq Gain	55.961 dB	System Information	Gain at 1Hz
45.	Mode	CCM	System Information	Conduction Mode
46.	Phase Marg	58.124 deg	System Information	Bode Plot Phase Margin
47.	Pout	24.0 W	System Information	Total output power
48.	SW Ipk	9.048 A	System Information	Peak switch current
49.	Total BOM	$3.59	System Information	Total BOM Cost
50.	Vin	3.3 V	System Information	Vin operating point
51.	Vout	12.0 V	System Information	Operational Output Voltage
52.	Vout Actual	11.907 V	System Information	Vout Actual calculated based on selected voltage divider resistors
53.	Vout Tolerance	3.77 %	System Information	Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
54.	Vout p-p	108.572 mV	System Information	Peak-to-peak output ripple voltage

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	5.5	Maximum input voltage
3.	VinMin	3.3	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	acFrequency	60.0	AC Frequency
6.	base_pn	LM3478	Base Product Number
7.	source	DC	Input Source Type
8.	Ta	30.0	Ambient temperature

Design Assistance

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

