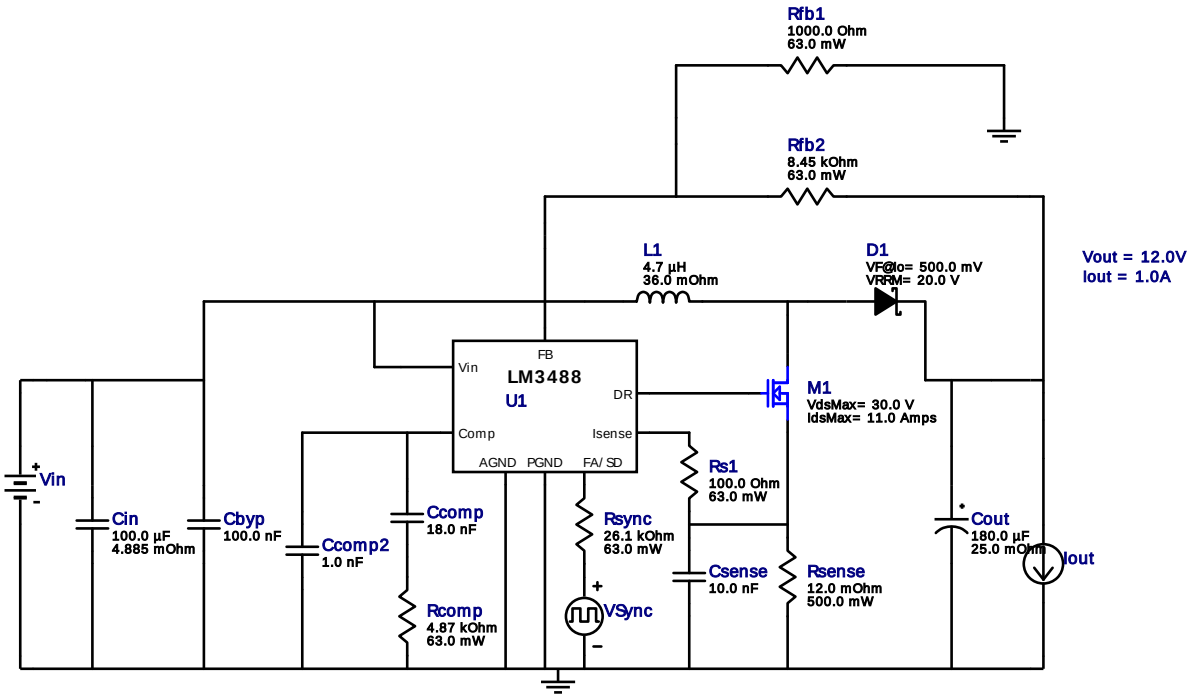
WEBENCH® Design Report

VinMin = 3.6V
VinMax = 4.2V
Vout = 12.0V
Iout = 1.0A

Device = LM3488MMX/NOPB
Topology = Boost
Created = 7/12/16 11:37:35 PM
BOM Cost = $2.58
BOM Count = 16
Total Pd = 1.81W

Design : 3893481/35 LM3488MMX/NOPB
LM3488MMX/NOPB 3.6V-4.2V to 12.00V @ 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. If you are not using the syncronization feature of the part use the LM3478.

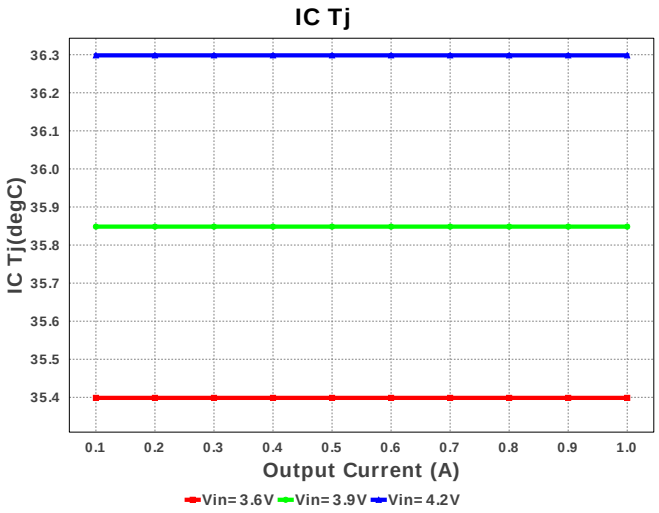
My Comments

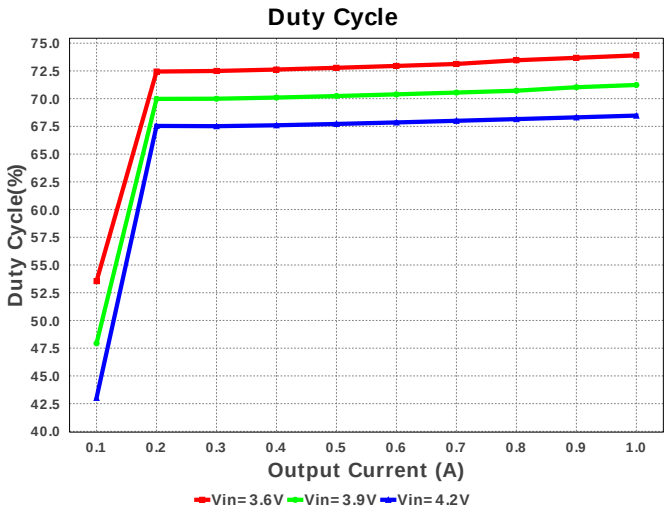
37

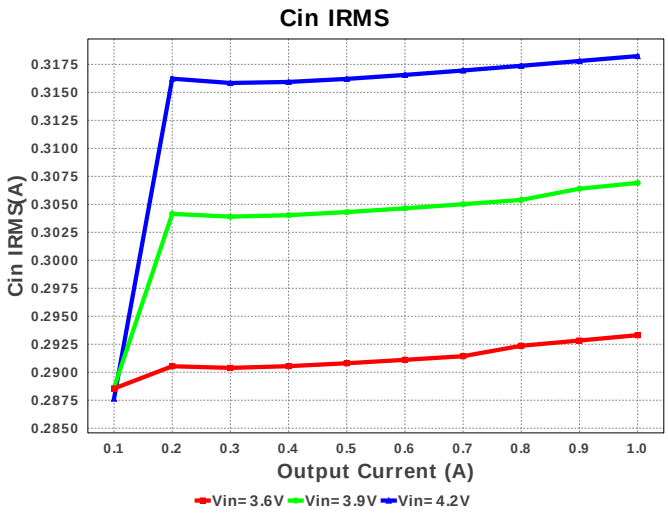
Electrical BOM

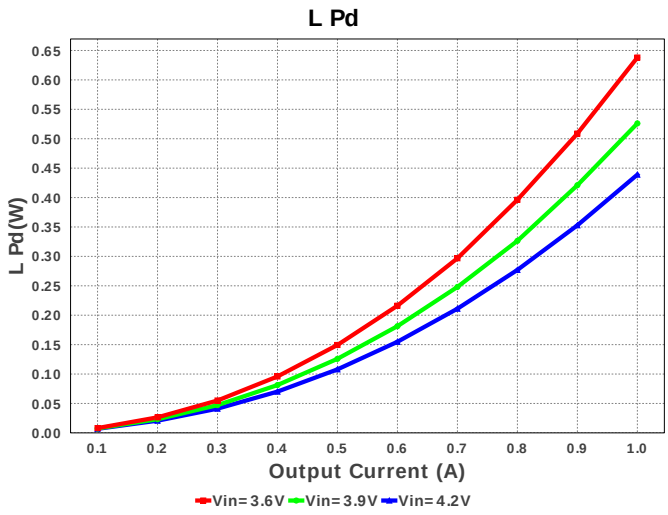
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	Yageo America	CC0805KRX7R9BB183 Series= X7R	Cap= 18.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	$0.14	1206_190 11 mm²
5.	Cout	Panasonic	20SVPF180M Series= ?	Cap= 180.0 uF ESR= 25.0 mOhm VDC= 20.0 V IRMS= 3.2 A	1	$0.50	CAPSMT_62_E7 106 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

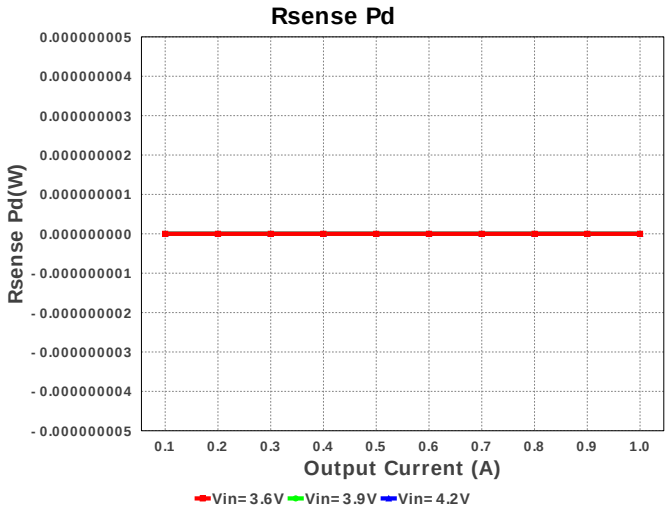
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	D1	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	SMB 44 mm^2
8.	L1	Coilcraft	XAL5030-472MEB	L= 4.7 µH DCR= 36.0 mOhm	1	$0.63	XAL5030 54 mm^2
9.	M1	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 11.0 Amps	1	$0.23	TRANS_NexFET_Q3A 18 mm^2
10.	Rcomp	Vishay-Dale	CRCW04024K87FKED Series= CRCW..e3	Res= 4.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
11.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	Rfb2	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
13.	Rs1	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rsense	Stackpole Electronics Inc	CSR1206FK12L0 Series= ?	Res= 12.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	1206 11 mm^2
15.	Rsync	Vishay-Dale	CRCW040226K1FKED Series= CRCW..e3	Res= 26.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
16.	U1	Texas Instruments	LM3488MMX/NOPB	Switcher	1	$0.80	MUA08A 24 mm^2

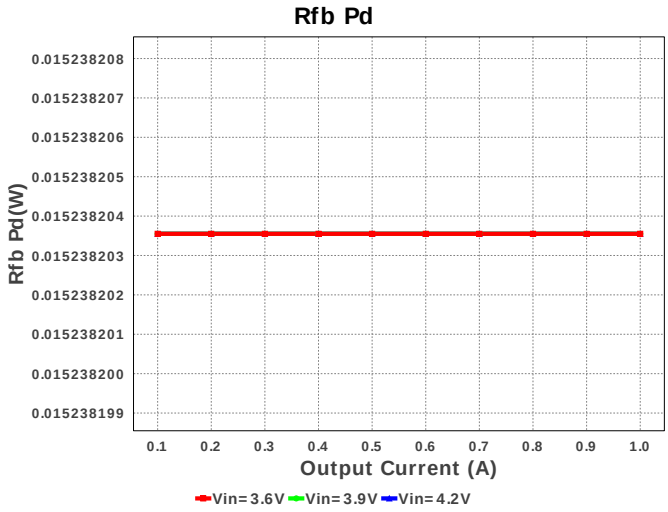


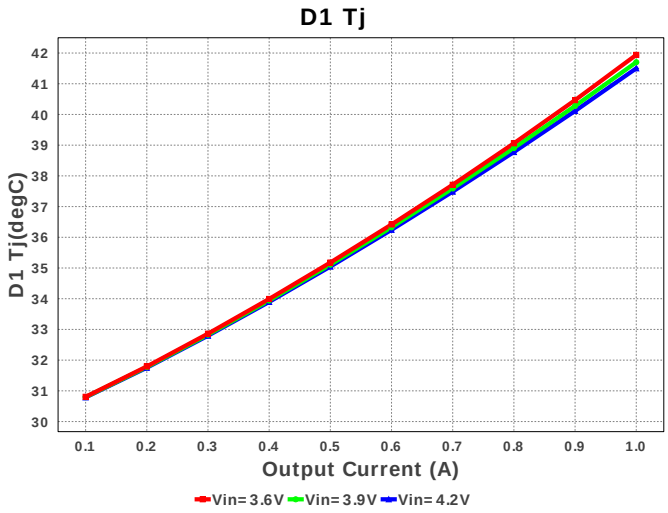


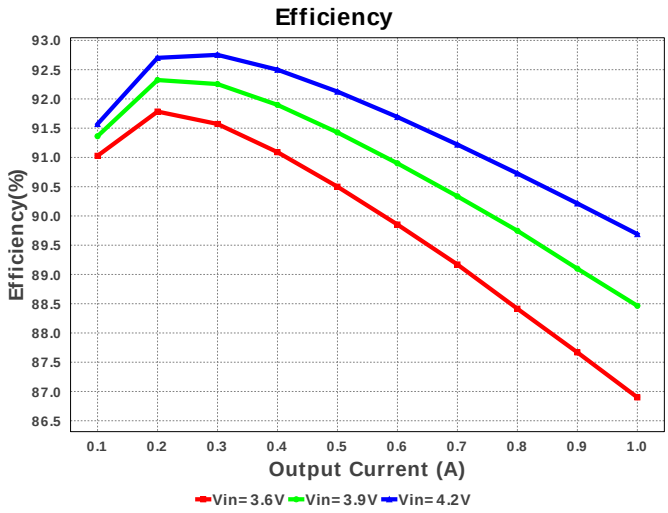


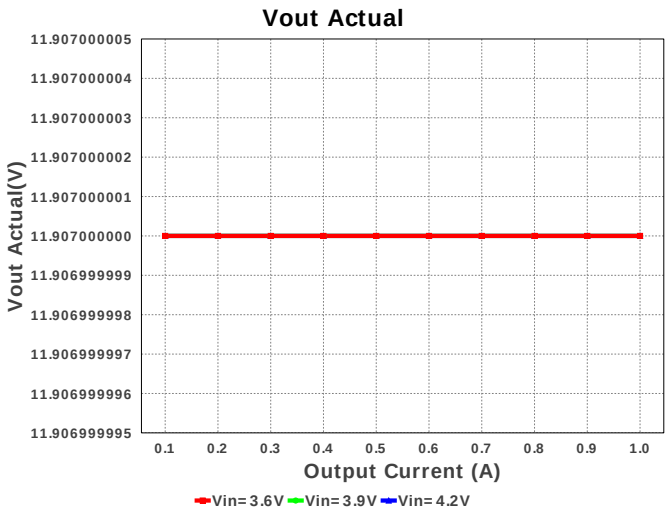


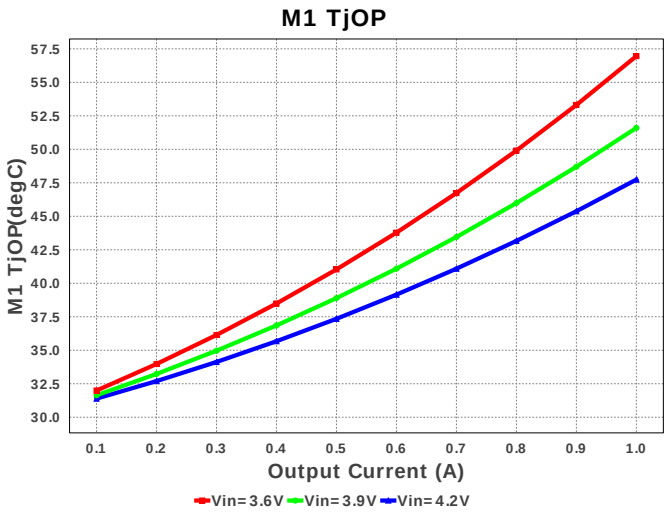


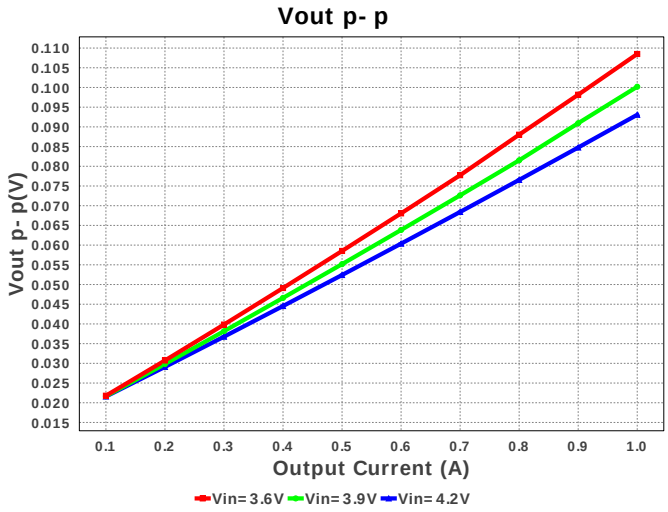


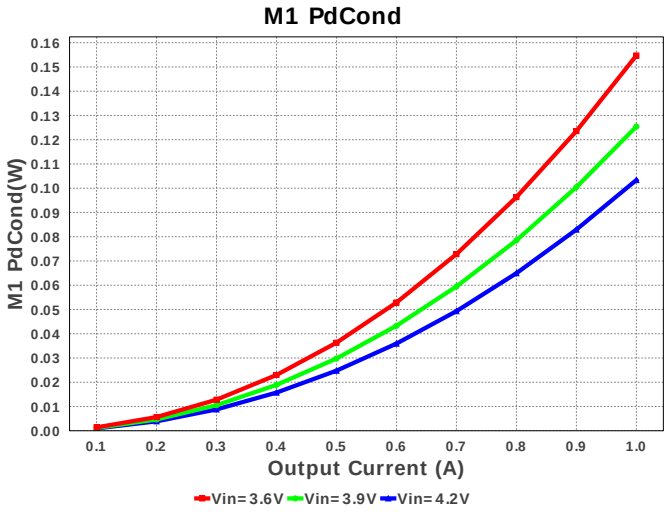


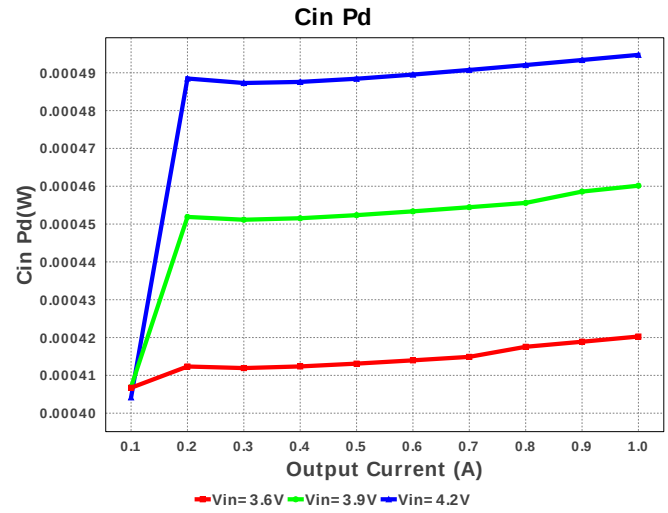


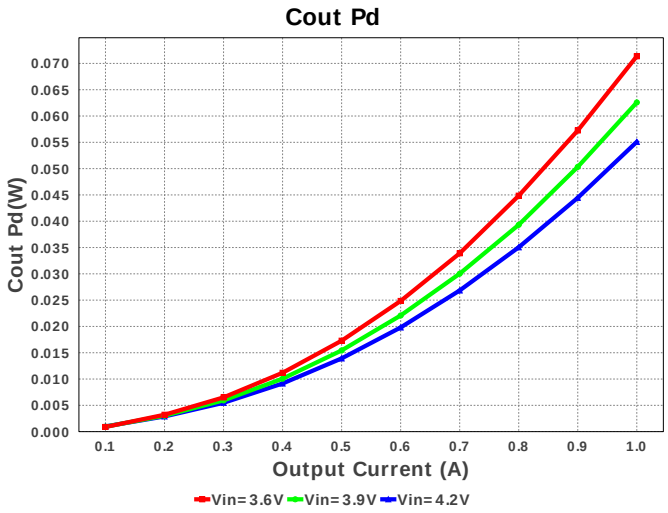


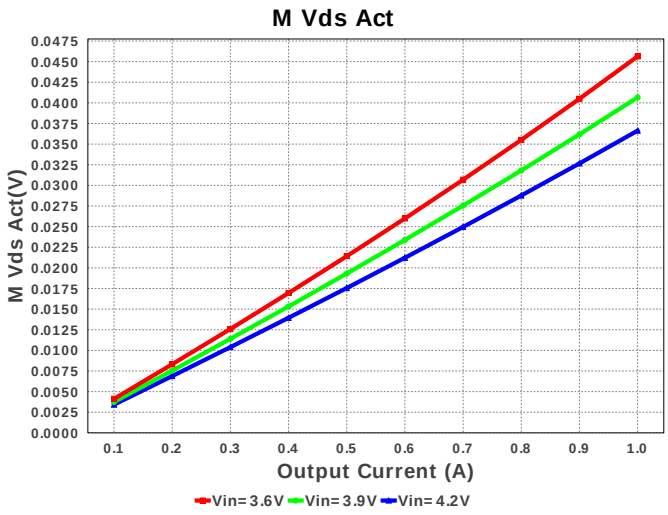


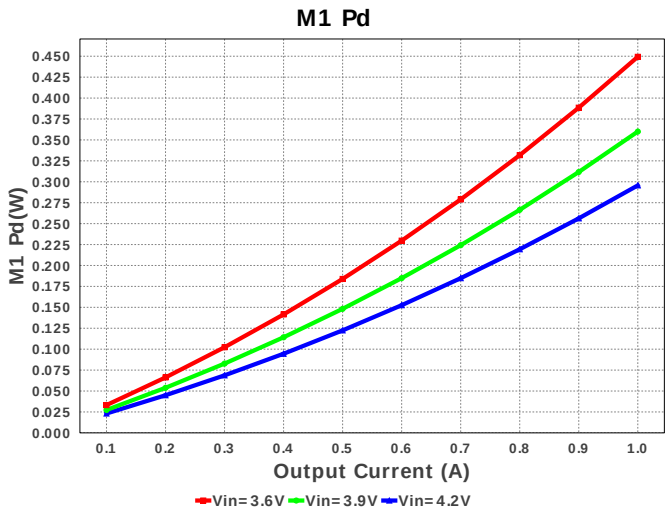


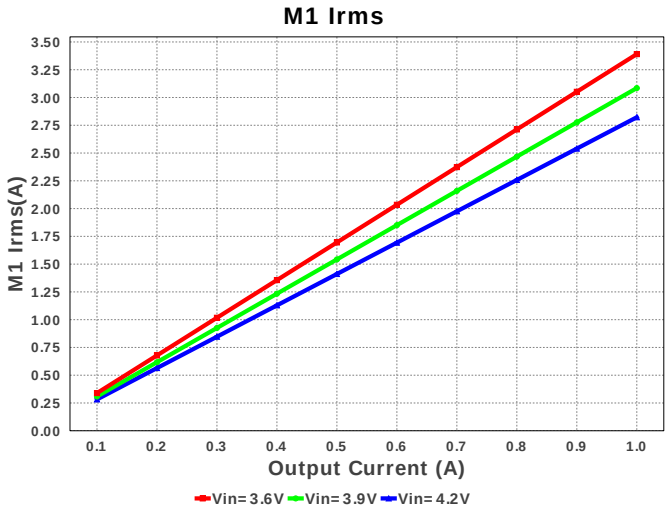


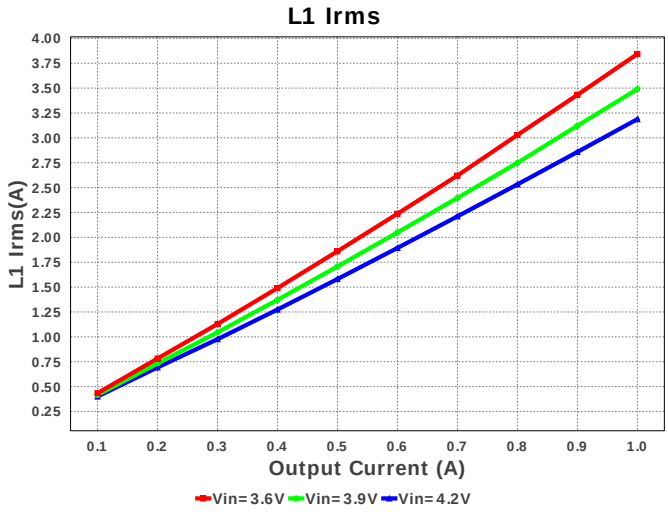


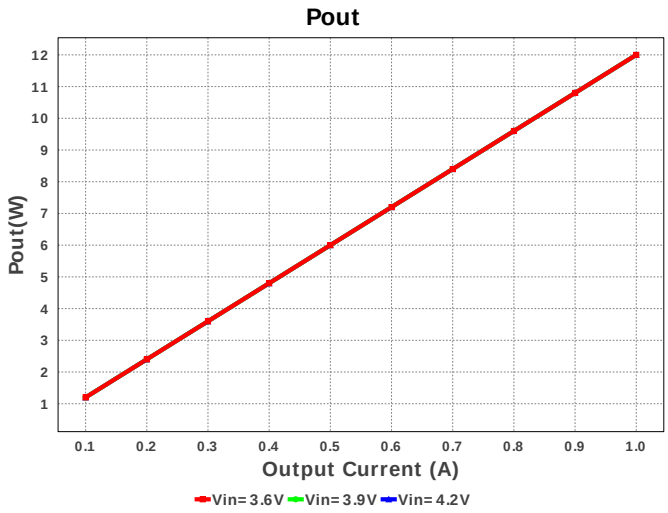


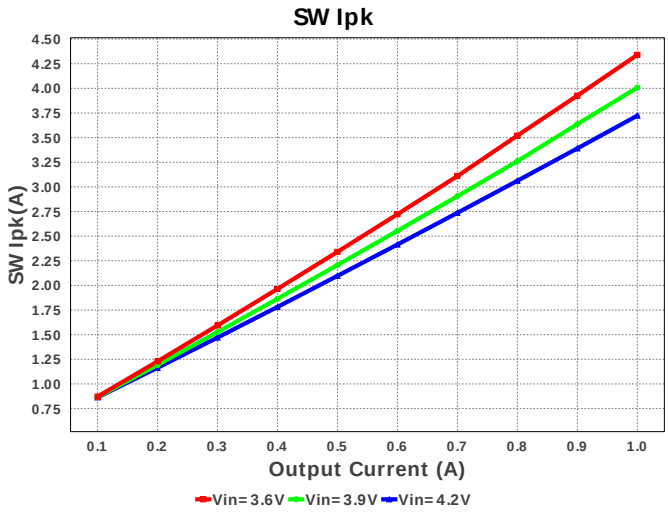


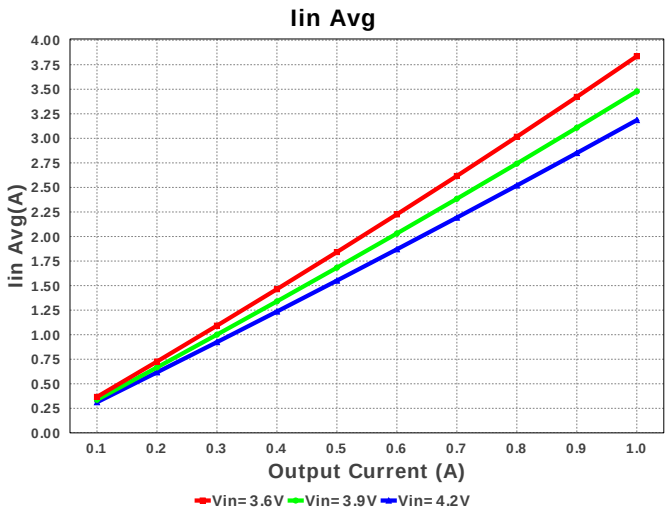


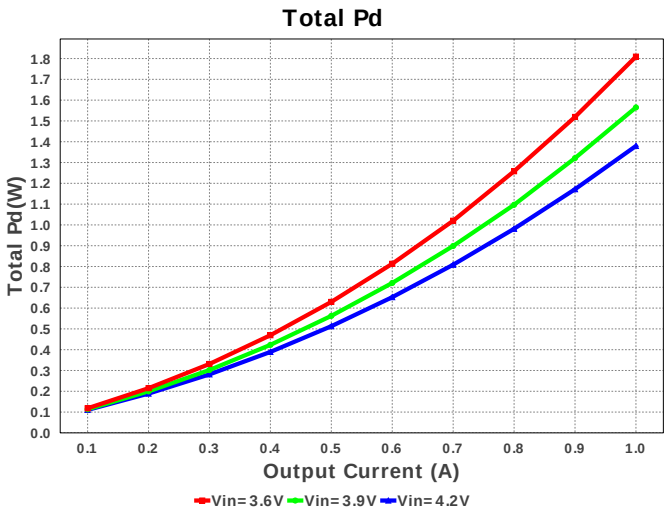


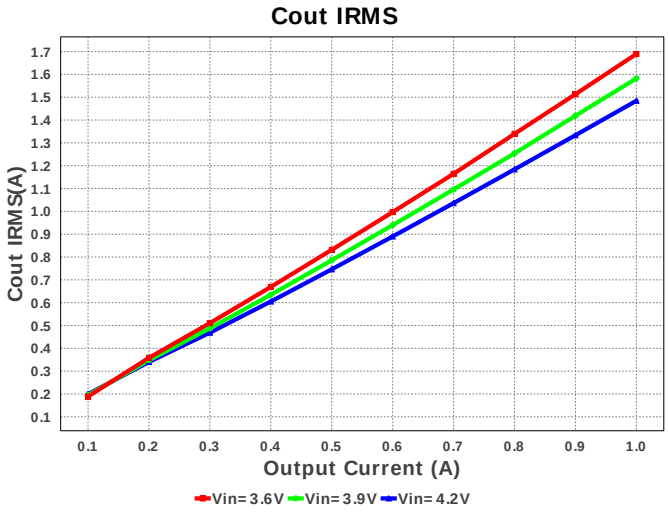


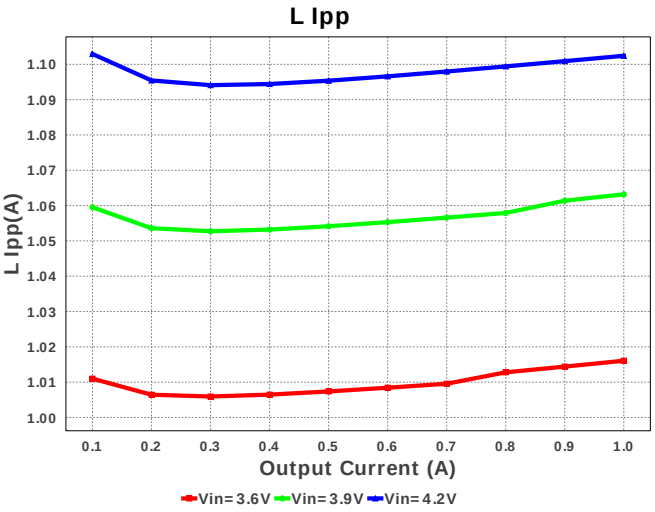


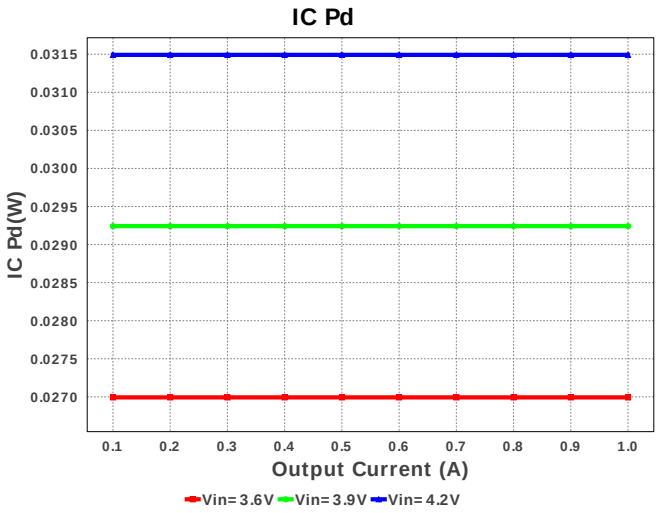


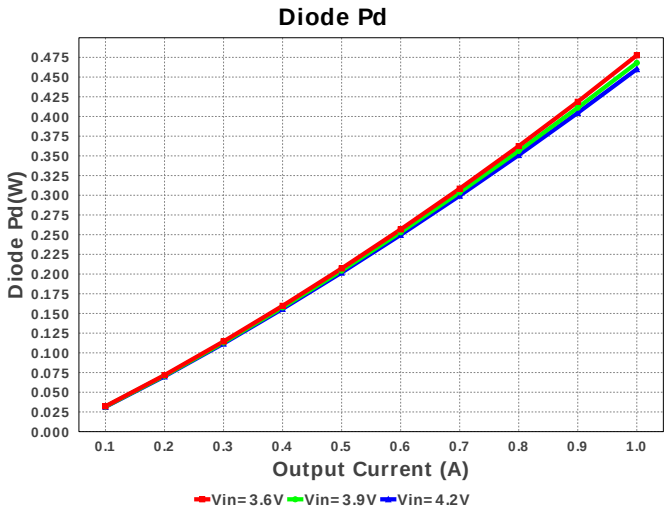


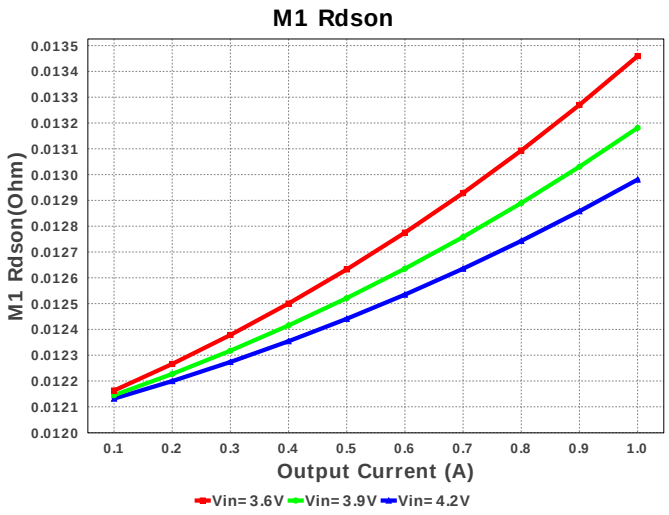


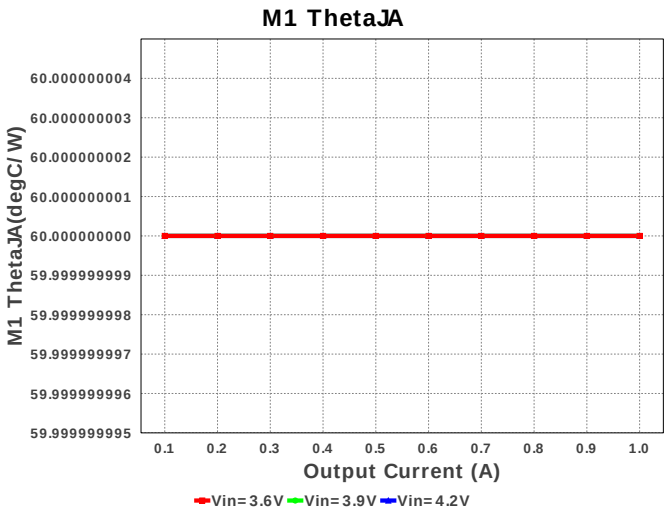


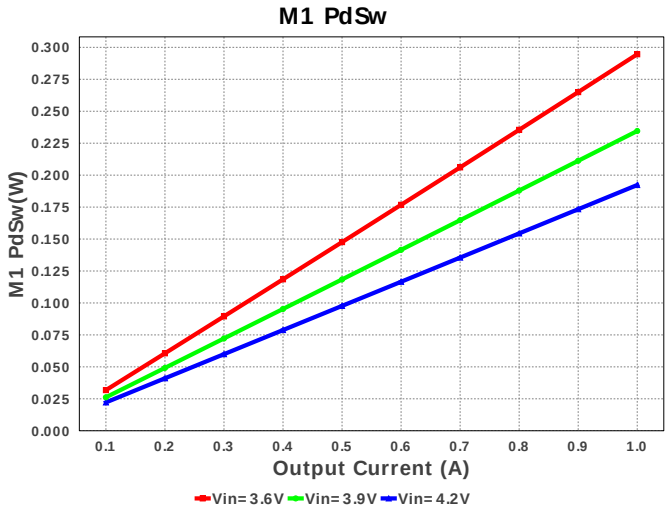


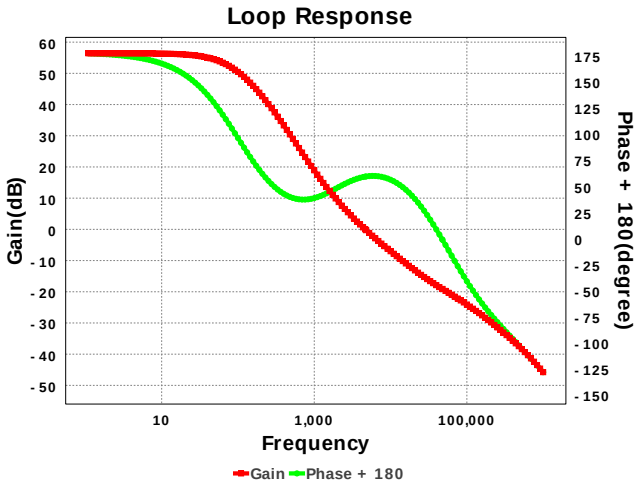












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	293.312 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.689 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	3.836 A	Current	Average input current
4.	L Ipp	1.016 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	3.843 A	Current	Inductor ripple current
6.	M1 Irms	3.39 A	Current	M1 MOSFET Irms
7.	SW Ipk	4.34 A	Current	Peak switch current
8.	BOM Count	16	General	Total Design BOM count
9.	FootPrint	307.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	550.0 kHz	General	Switching frequency
11.	IC Tolerance	15.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	45.633 mV	General	M Vds
13.	M1 Rdson	13.459 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	60.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	12.0 W	General	Total output power
16.	Total BOM	$2.58	General	Total BOM Cost
17.	D1 Tj	41.94 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	54.775 dB	Op_Point	Gain at 10Hz
19.	Vout Actual	11.907 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
20.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
21.	Cross Freq	3.969 kHz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	73.903 %	Op_point	Duty cycle
23.	Efficiency	86.899 %	Op_point	Steady state efficiency
24.	Gain Marg	-17.541 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	35.399 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	56.958 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	57.015 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	3.6 V	Op_point	Vin operating point
31.	Vout p-p	108.496 mV	Op_point	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
32.	Cin Pd	420.265 µW	Power	Input capacitor power dissipation
33.	Cout Pd	71.357 mW	Power	Output capacitor power dissipation
34.	Diode Pd	477.615 mW	Power	Diode power dissipation
35.	IC Pd	26.993 mW	Power	IC power dissipation
36.	L Pd	638.017 mW	Power	Inductor power dissipation
37.	M1 Pd	449.303 mW	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	154.719 mW	Power	M1 MOSFET conduction losses
39.	M1 PdSw	294.585 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	15.238 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	146.473 mW	Power	Rsense Power Dissipation
42.	Total Pd	1.809 W	Power	Total Power Dissipation
43.	Vout Tolerance	3.043 %		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	4.2	Maximum input voltage
3.	VinMin	3.6	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM3488	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature
8.	userfsw	550.0 k	Customer Selected Frequency

Design Assistance

1. LM3488 Product Folder : http://www.ti.com/product/LM3488 : contains the data sheet and other resources.