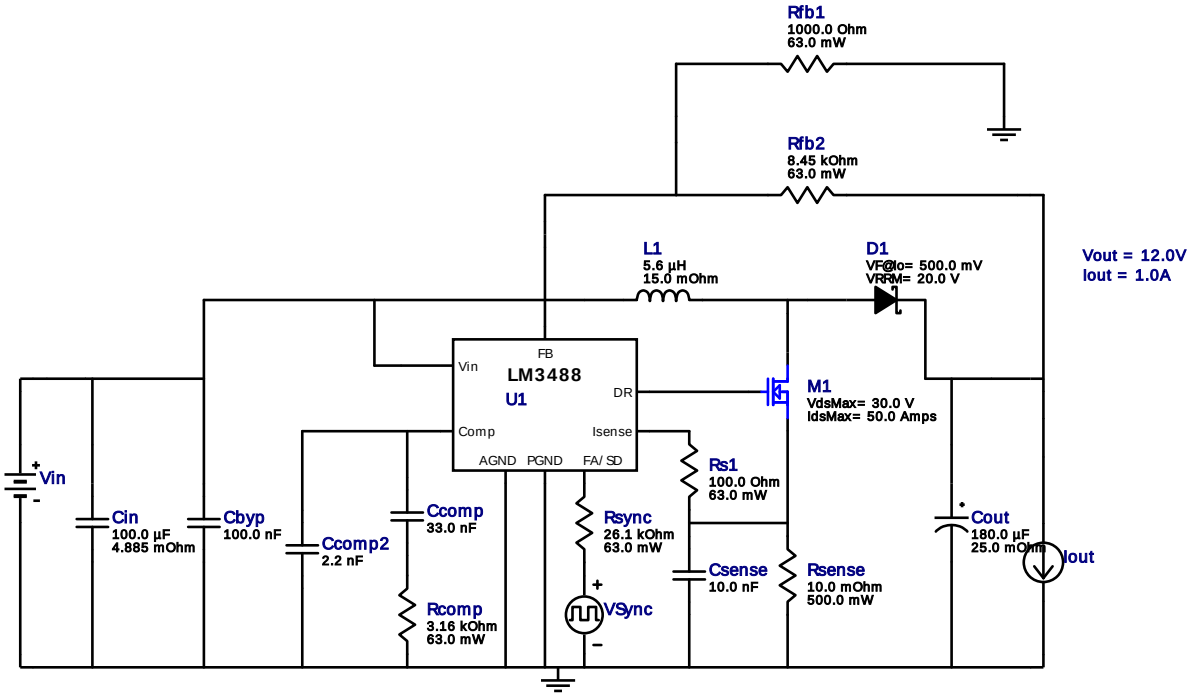
WEBENCH® Design Report

VinMin = 3.3V
VinMax = 4.5V
Vout = 12.0V
Iout = 1.0A

Device = LM3488MMX/NOPB
Topology = Boost
Created = 8/29/16 11:20:23 PM
BOM Cost = $2.35
BOM Count = 16
Total Pd = 1.43W

Design : 4349779/5 LM3488MMX/NOPB
LM3488MMX/NOPB 3.3V-4.5V 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.

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	MuRata	GRM033R60J333KE01D Series= X5R	Cap= 33.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 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
7.	D1	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	SMB 44 mm²

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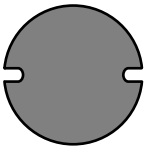
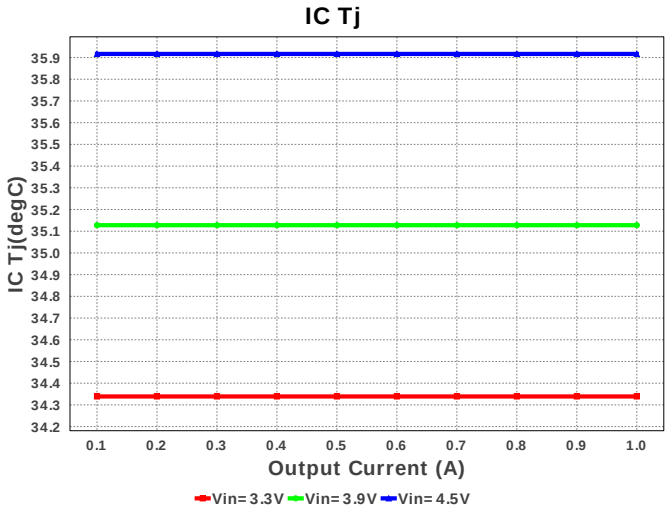
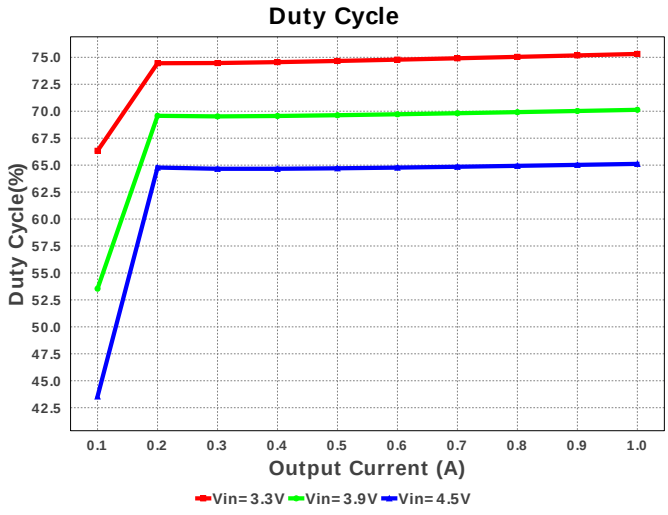
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SDR1307-5R6ML	L= 5.6 µH DCR= 15.0 mOhm	1	$0.35	 SDR1307 227 mm^2
9.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 50.0 Amps	1	$0.28	 DQG0008A 18 mm^2
10.	Rcomp	Vishay-Dale	CRCW04023K16FKED Series= CRCW..e3	Res= 3.16 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	CSR1206FK10L0 Series= ?	Res= 10.0 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





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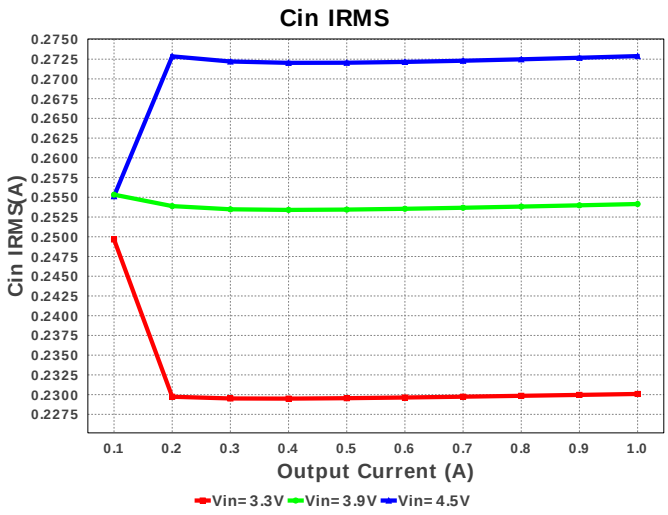

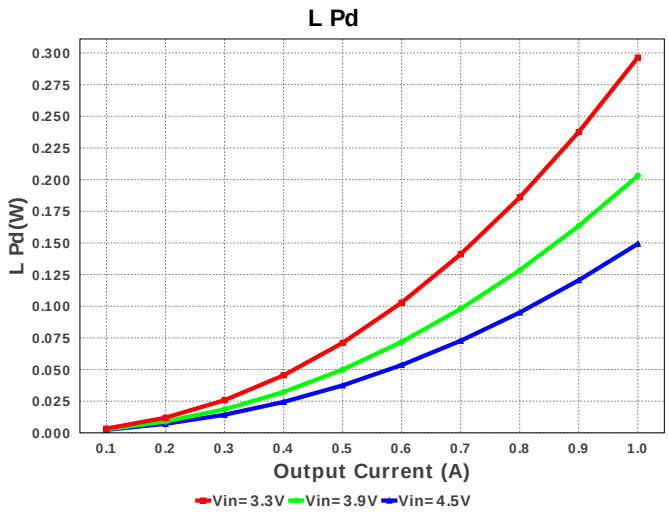

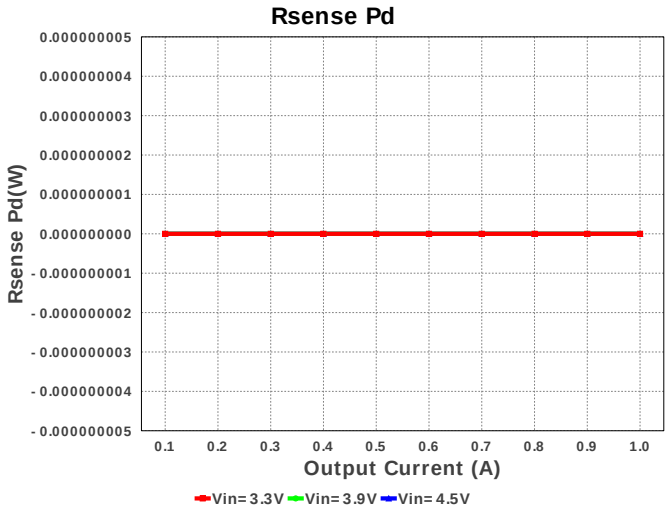

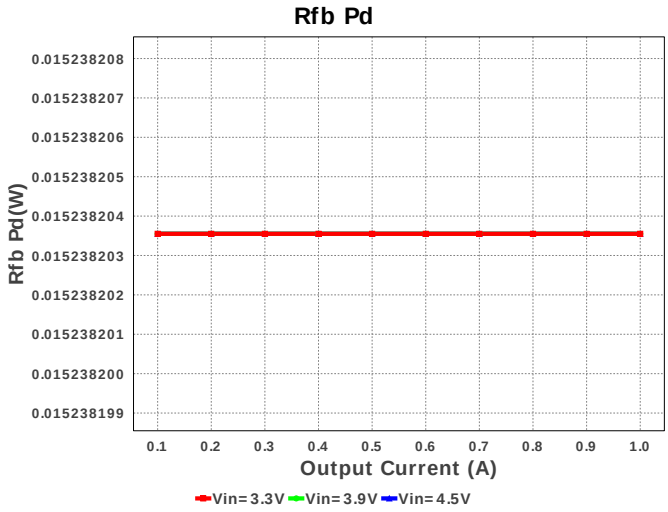

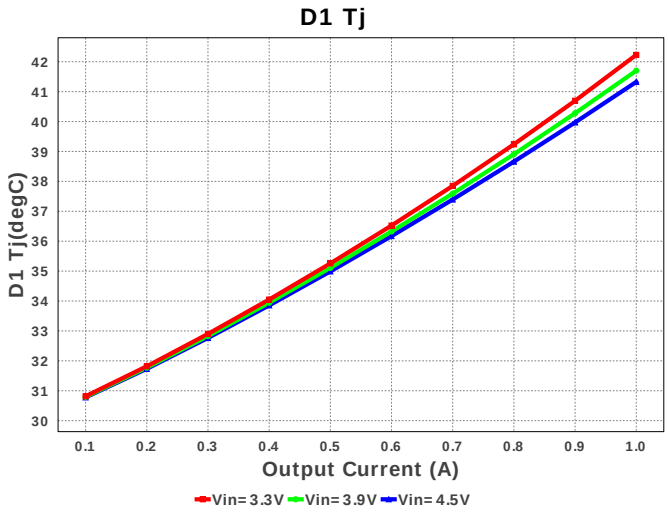

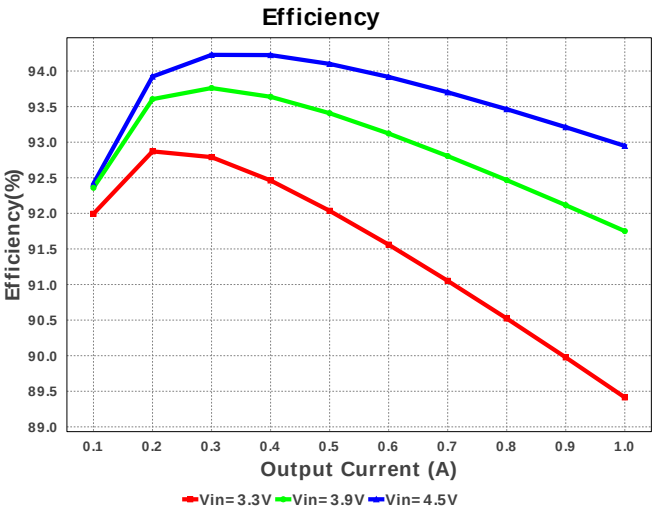

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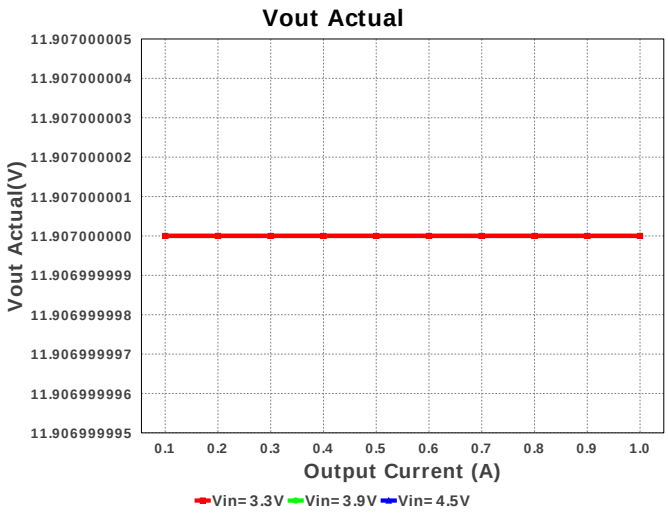

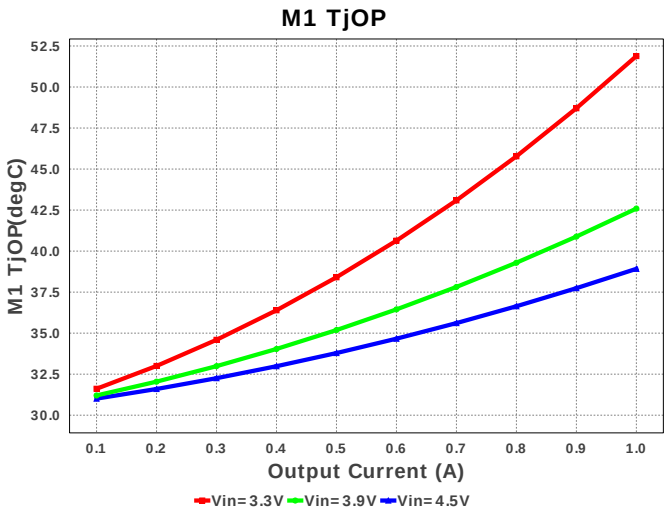

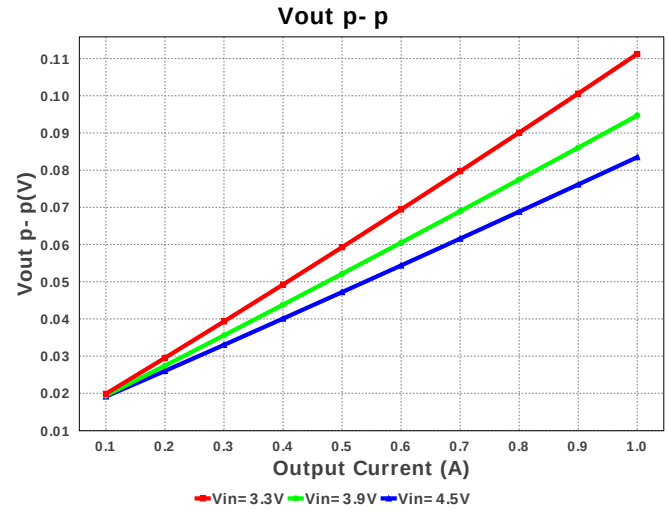

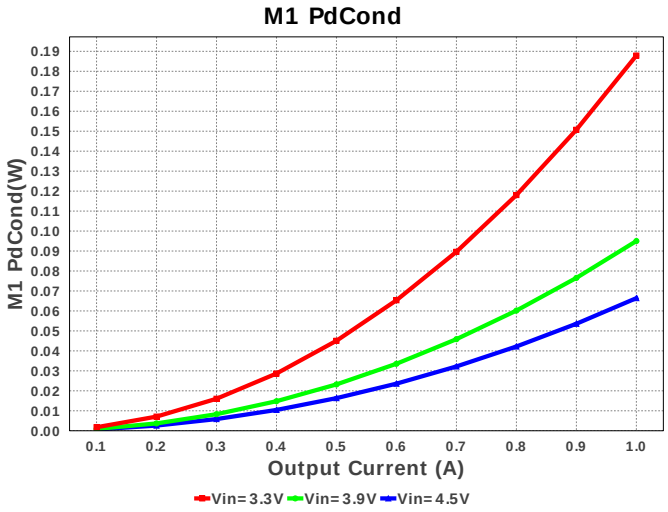

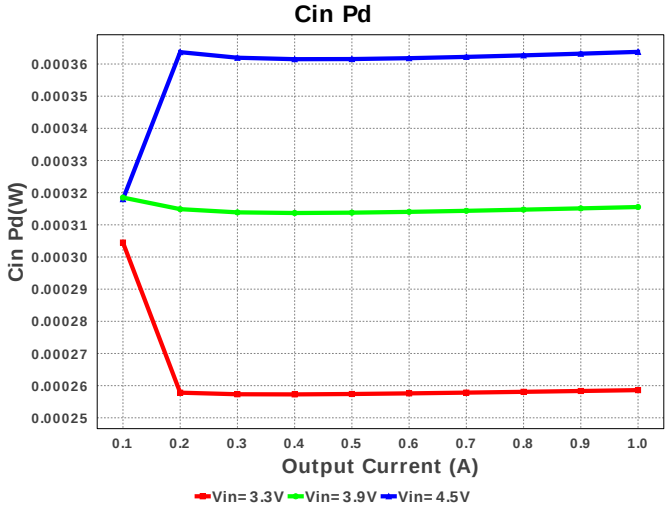

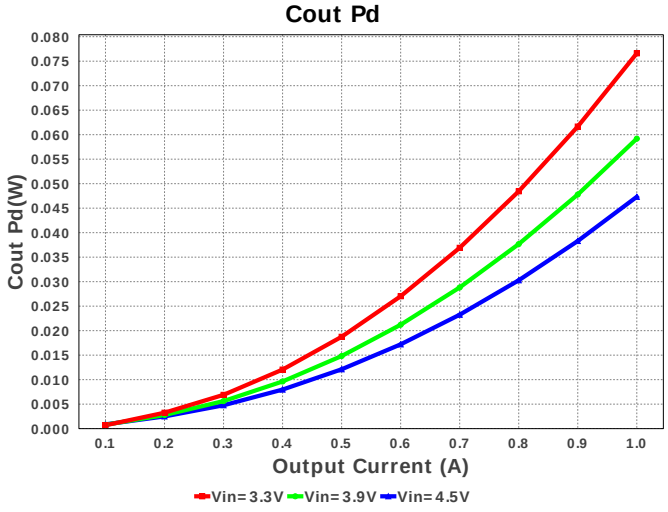

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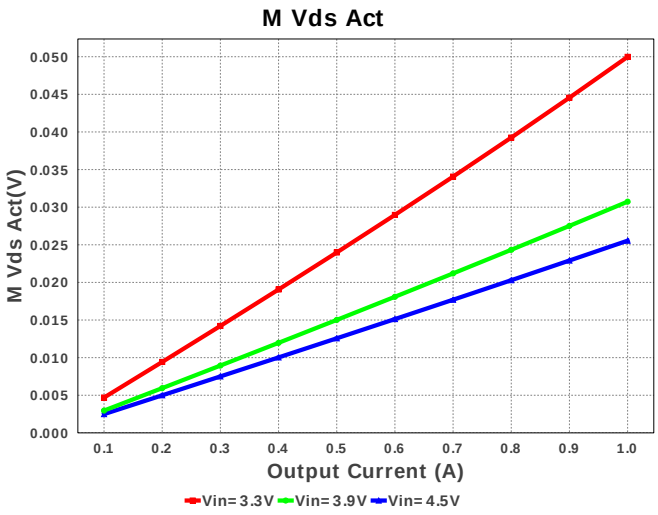

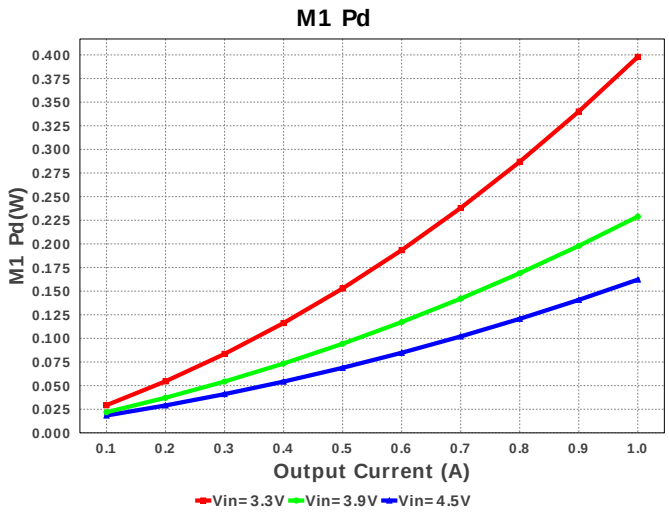

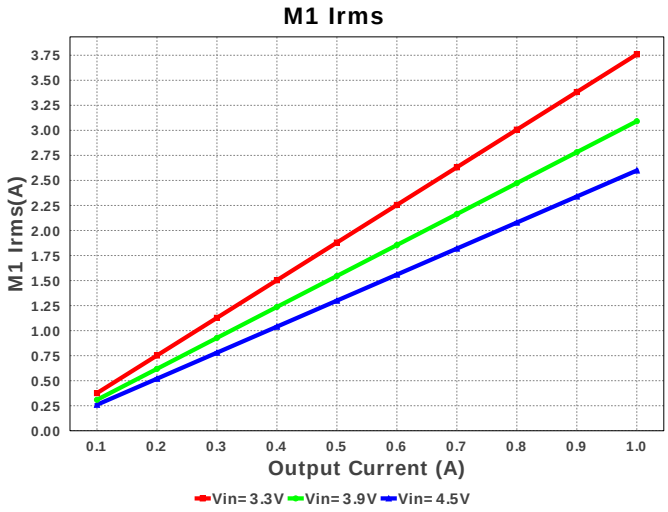

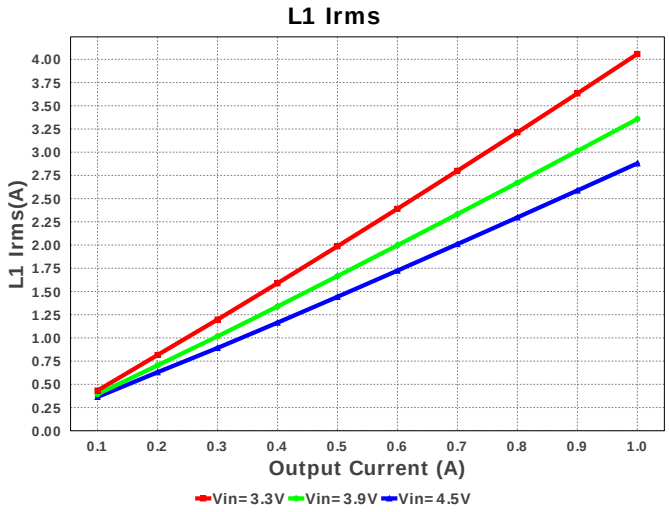

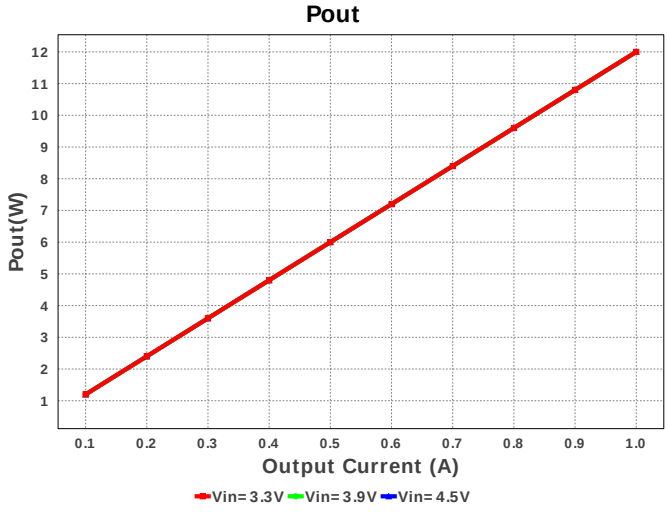

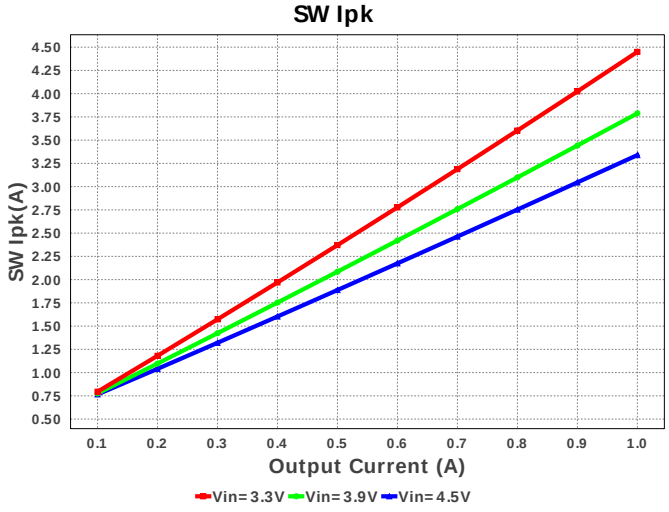

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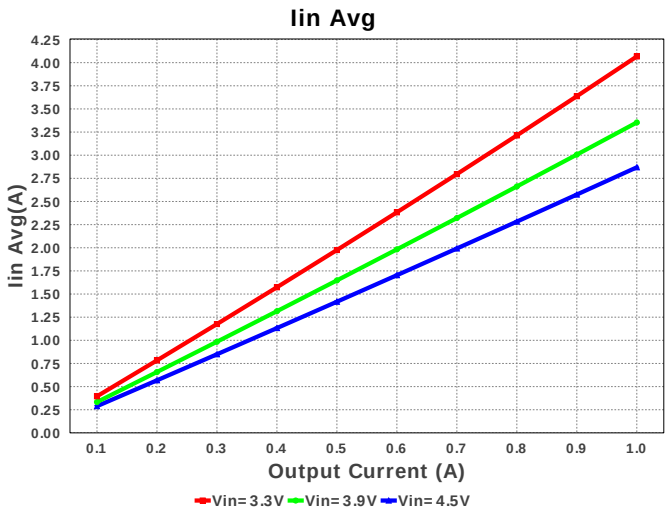

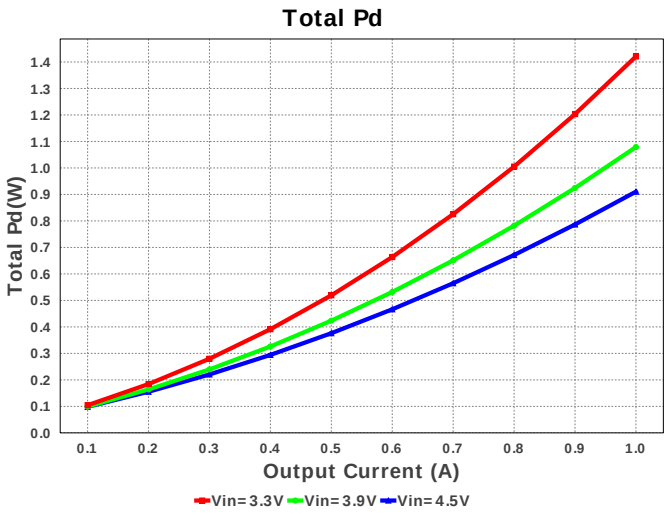

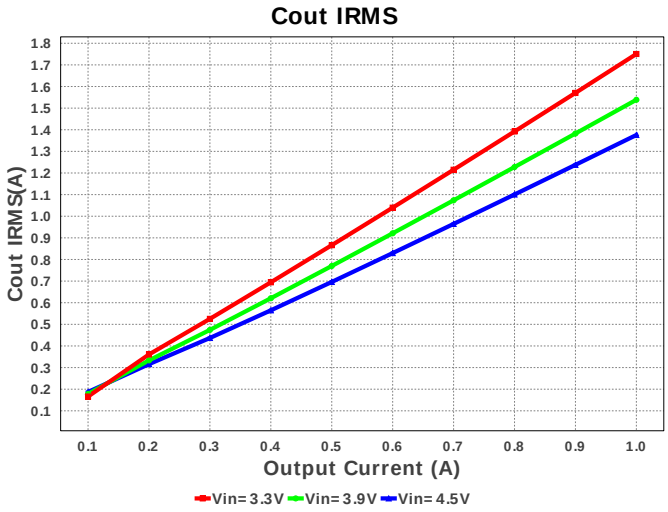

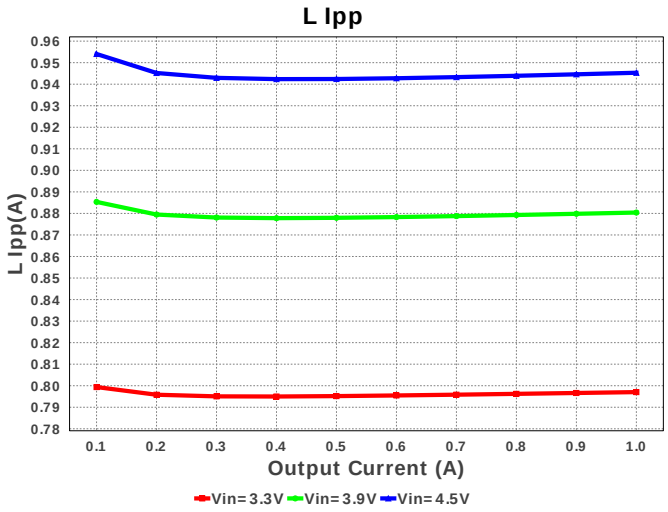

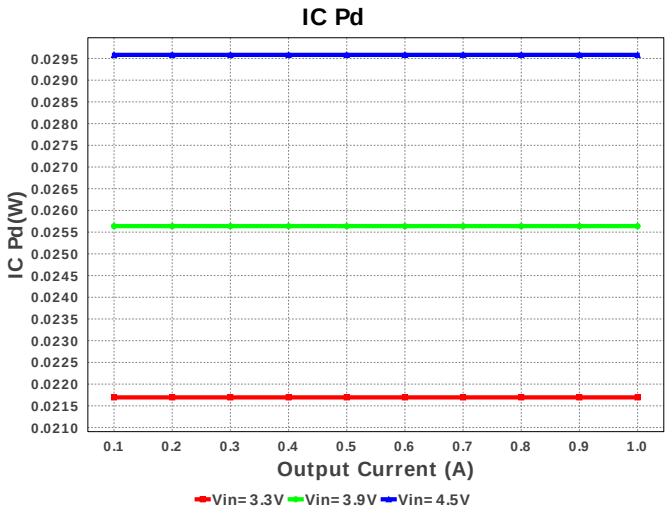

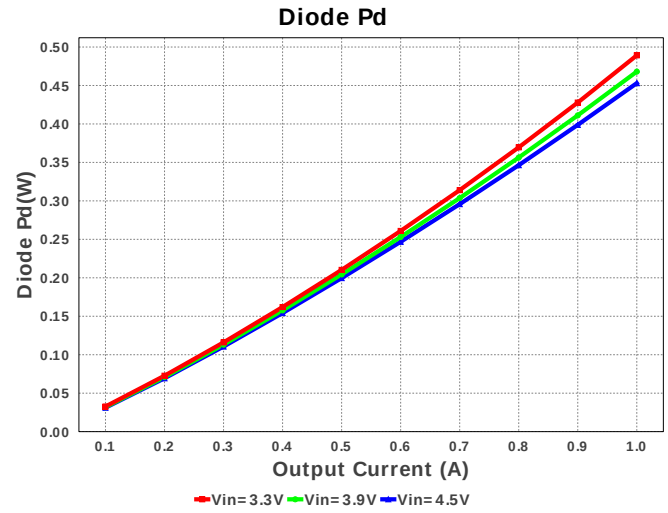

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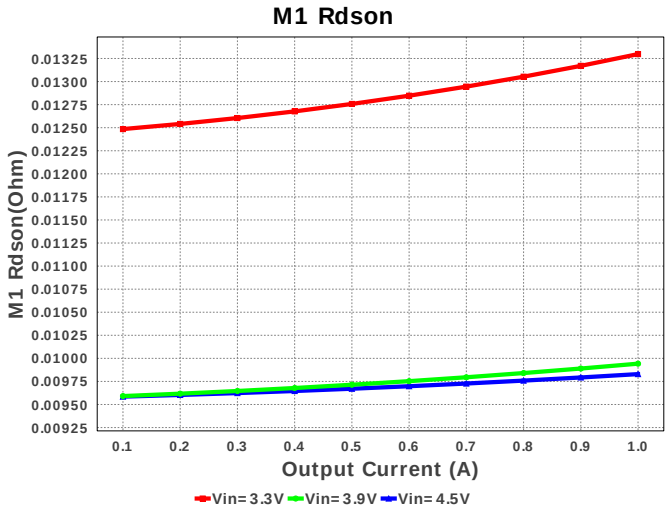

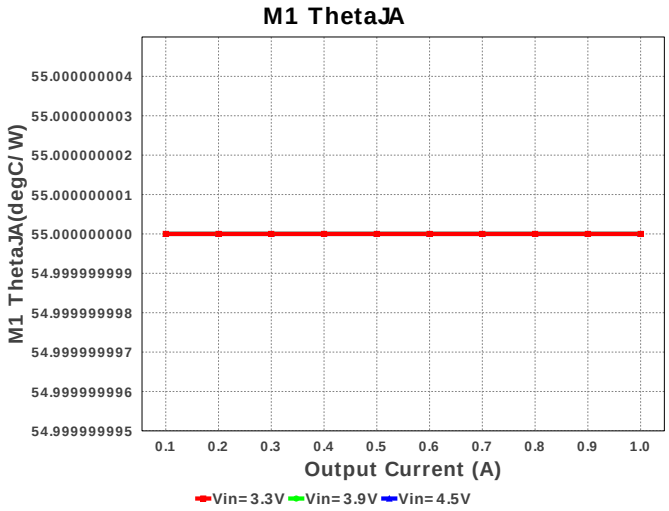

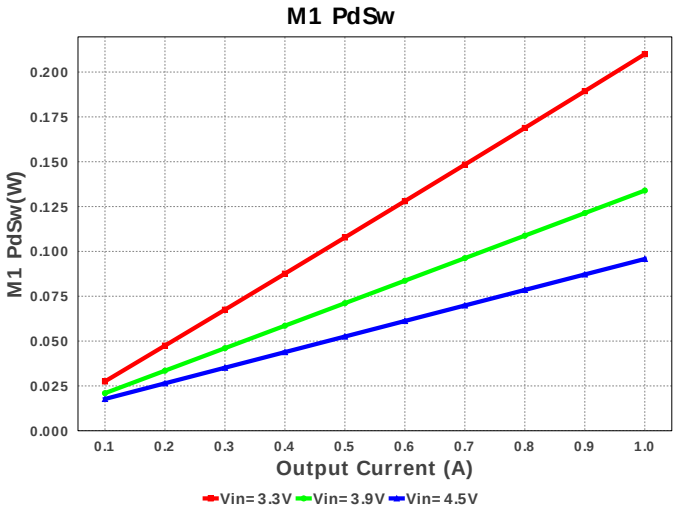

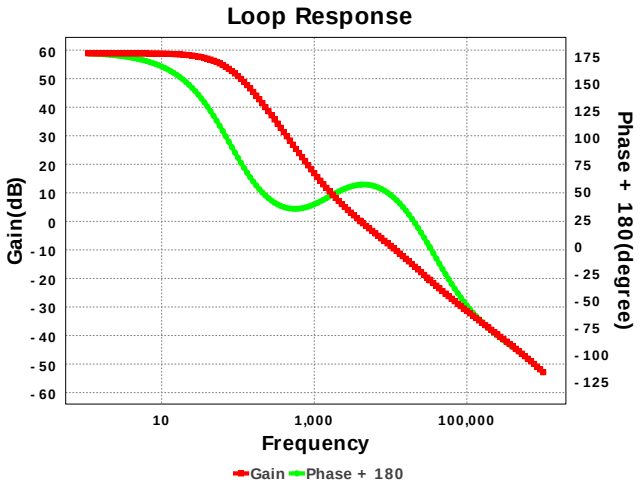

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	230.136 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	1.751 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	4.07 A	Current	Average input current
4.	L Ipp	797.21 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	4.06 A	Current	Inductor ripple current
6.	M1 Irms	3.751 A	Current	M1 MOSFET Irms
7.	SW Ipk	4.452 A	Current	Peak switch current
8.	BOM Count	16	General	Total Design BOM count
9.	FootPrint	474.0 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	49.959 mV	General	M Vds
13.	M1 Rdson	13.319 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Mode	CCM	General	Conduction Mode
16.	Pout	12.0 W	General	Total output power
17.	Total BOM	$2.35	General	Total BOM Cost
18.	D1 Tj	42.229 degC	Op_Point	D1 junction temperature
19.	Low Freq Gain	55.869 dB	Op_Point	Gain at 10Hz
20.	Vout Actual	11.907 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
21.	Vout OP	12.0 V	Op_Point	Operational Output Voltage
22.	Cross Freq	3.055 kHz	Op_point	Bode plot crossover frequency
23.	Duty Cycle	75.332 %	Op_point	Duty cycle
24.	Efficiency	89.345 %	Op_point	Steady state efficiency
25.	Gain Marg	-17.468 dB	Op_point	Bode Plot Gain Margin
26.	IC Tj	34.339 degC	Op_point	IC junction temperature
27.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
28.	IOUT_OP	1.0 A	Op_point	Iout operating point
29.	M1 TjOP	52.408 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	51.773 deg	Op_point	Bode Plot Phase Margin
31.	VIN_OP	3.3 V	Op_point	Vin operating point

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#	Name	Value	Category	Description
32.	Vout p-p	111.311 mV	Op_point	Peak-to-peak output ripple voltage
33.	Cin Pd	258.722 µW	Power	Input capacitor power dissipation
34.	Cout Pd	76.673 mW	Power	Output capacitor power dissipation
35.	Diode Pd	489.171 mW	Power	Diode power dissipation
36.	IC Pd	21.694 mW	Power	IC power dissipation
37.	L Pd	296.759 mW	Power	Inductor power dissipation
38.	M1 Pd	407.422 mW	Power	M1 MOSFET total power dissipation
39.	M1 PdCond	187.4 mW	Power	M1 MOSFET conduction losses
40.	M1 PdSw	220.022 mW	Power	M1 MOSFET switching losses
41.	Rfb Pd	15.238 mW	Power	Rfb Power Dissipation
42.	Rsense Pd	146.216 mW	Power	LED Current Rsns Power Dissipation
43.	Total Pd	1.431 W	Power	Total Power Dissipation
44.	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	4.5	Maximum input voltage
3.	VinMin	3.3	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM3488	Base Product 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.

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