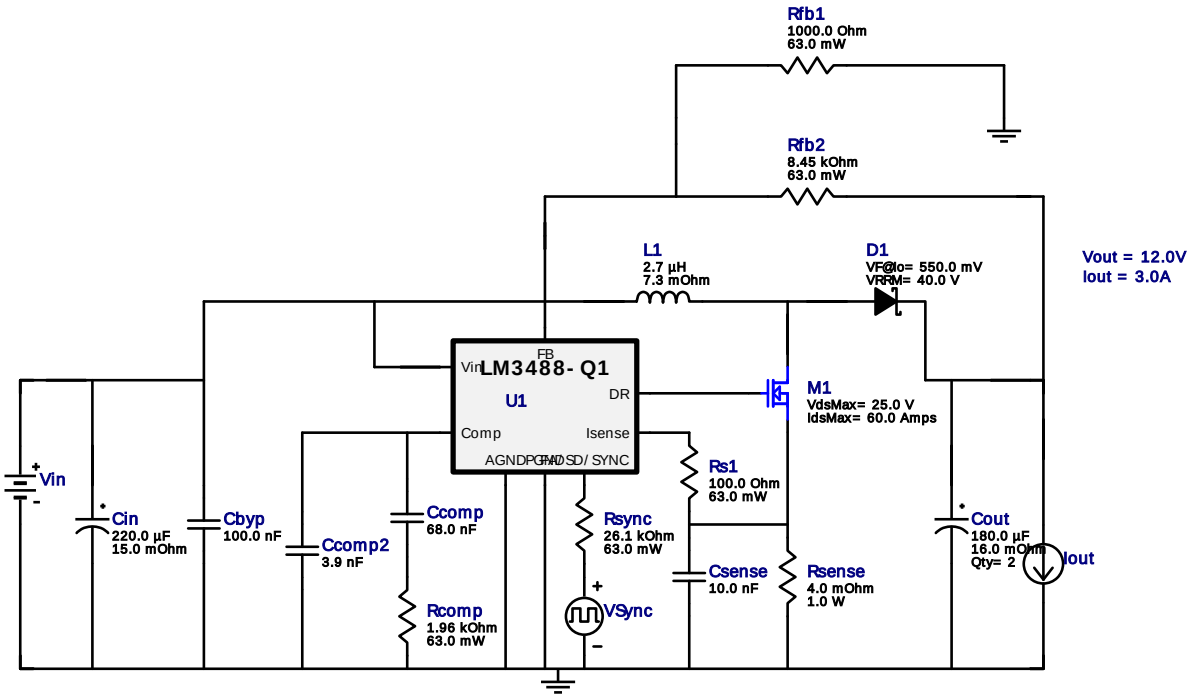
WEBENCH® Design Report

VinMin = 3.7V
VinMax = 4.2V
Vout = 12.0V
Iout = 3.0A

Device = LM3488QMMX/NOPB
Topology = Boost
Created = 7/12/16 12:28:02 AM
BOM Cost = $3.87
BOM Count = 17
Total Pd = 4.47W

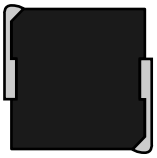
Design : 4737466/34 LM3488QMMX/NOPB
LM3488QMMX/NOPB 3.7V-4.2V to 12.00V @ 3.0A

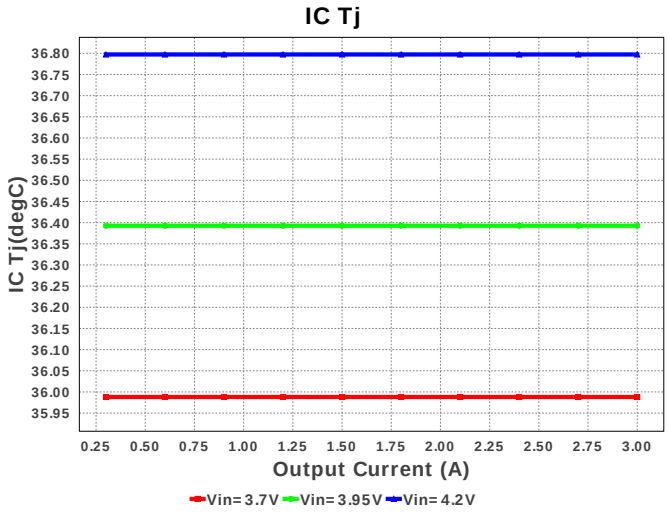


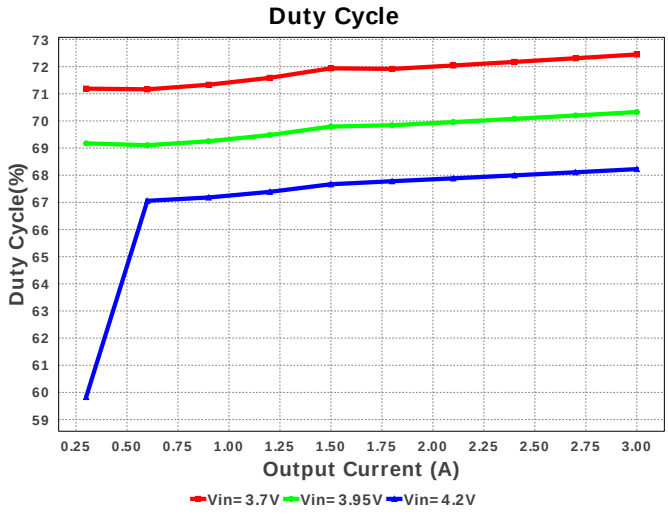
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower than your supply's rise time. If you are not using the syncronization feature of the part use the LM3478.

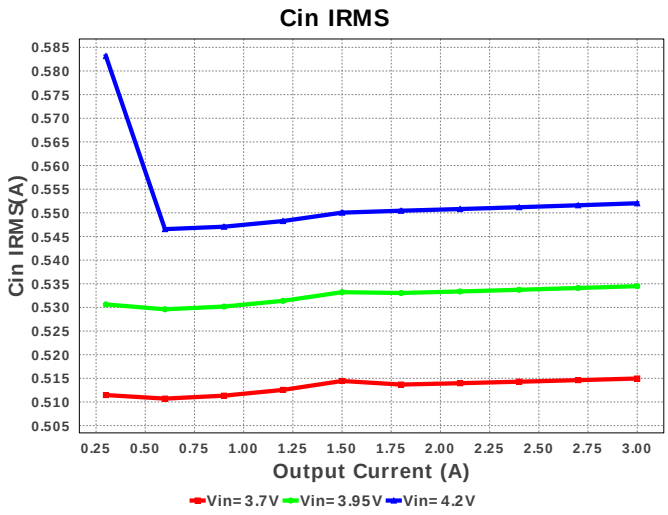
Electrical BOM

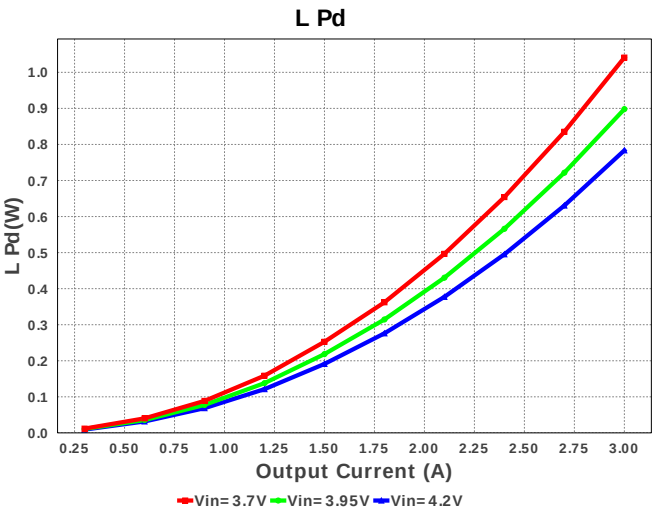
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp	MuRata	GRM155R61A683KA01D Series= X5R	Cap= 68.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB392 Series= X7R	Cap= 3.9 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Panasonic	6SVPE220MW Series= SVPE	Cap= 220.0 uF ESR= 15.0 mOhm VDC= 6.3 V IRMS= 3.15 A	1	$0.20	CAPSMT_62_E61 53 mm²
5.	Cout	Panasonic	25SVPF180M Series= ?	Cap= 180.0 uF ESR= 16.0 mOhm VDC= 25.0 V IRMS= 4.65 A	2	$0.61	CAPSMT_62_E12 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.	B540C-13-F	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.17	SMC 83 mm²

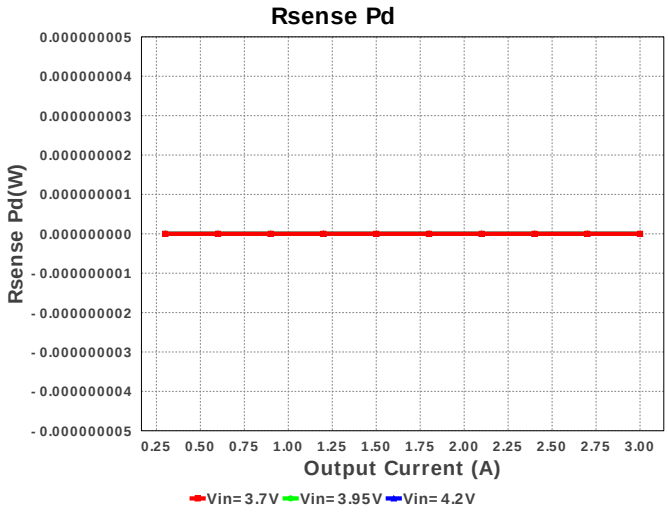
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	Bourns	SRP1250-2R7M	L= 2.7 µH DCR= 7.3 mOhm	1	$0.64	 SRP1250 253 mm²
9.	M1	Texas Instruments	CSD16323Q3	VdsMax= 25.0 V IdsMax= 60.0 Amps	1	$0.44	 TRANS_NexFET_Q3 18 mm²
10.	Rcomp	Vishay-Dale	CRCW04021K96FKED Series= CRCW..e3	Res= 1.96 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
11.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
12.	Rfb2	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rs1	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rsense	Panasonic	ERJ-M1WSF4M0U Series= ERJ	Res= 4.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.15	 2512 43 mm²
15.	Rsync	Vishay-Dale	CRCW040226K1FKED Series= CRCW..e3	Res= 26.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	U1	Texas Instruments	LM3488QMMX/NOPB	Switcher	1	$0.96	 MUA08A 24 mm²

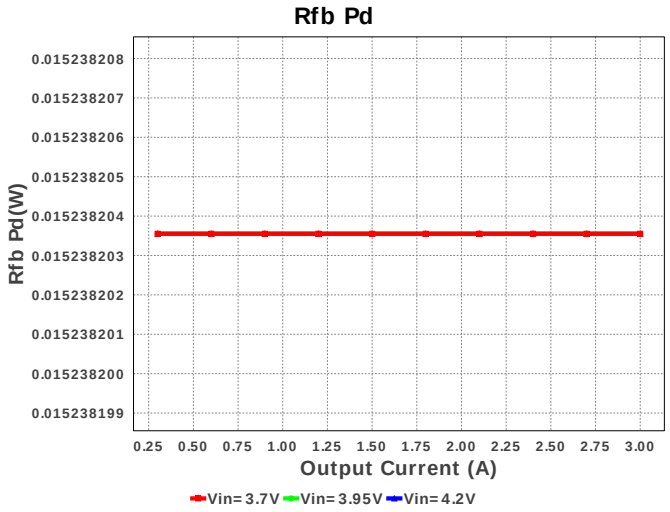


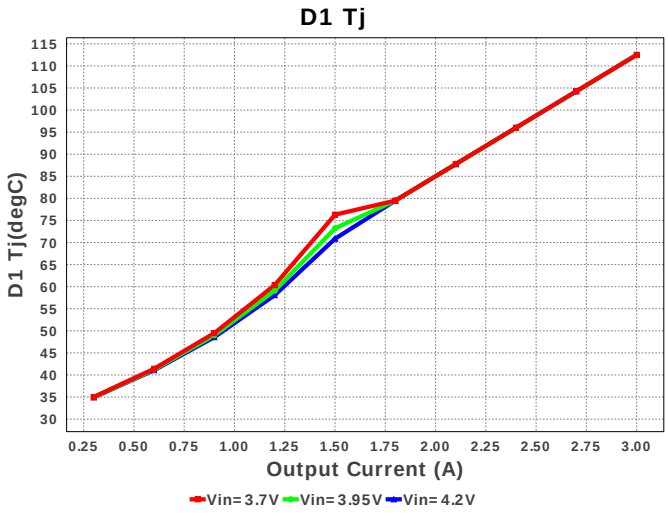


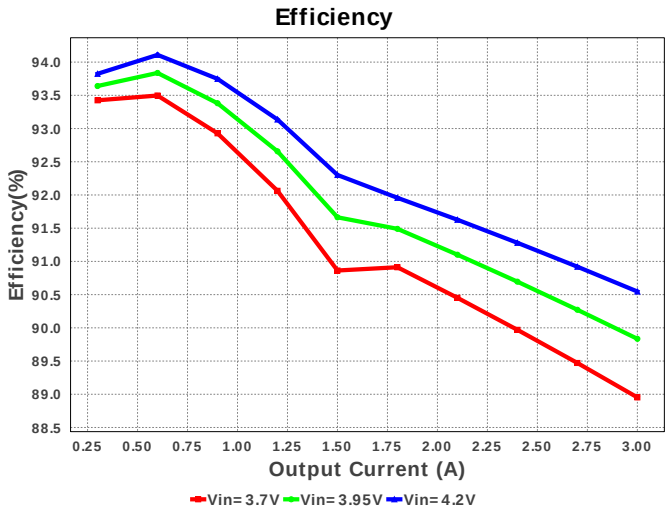


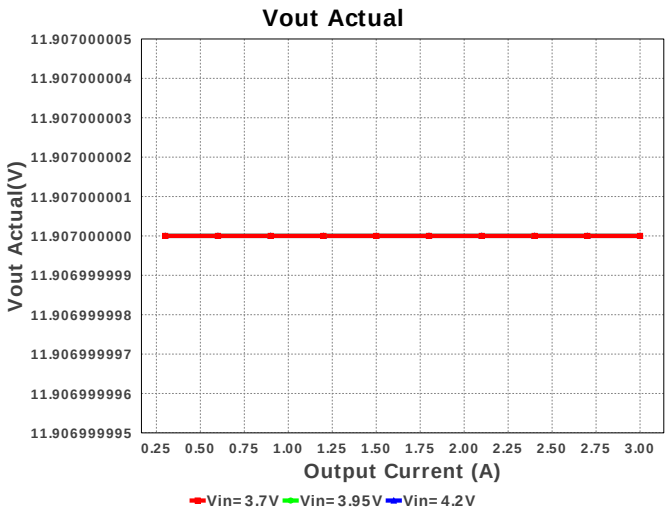


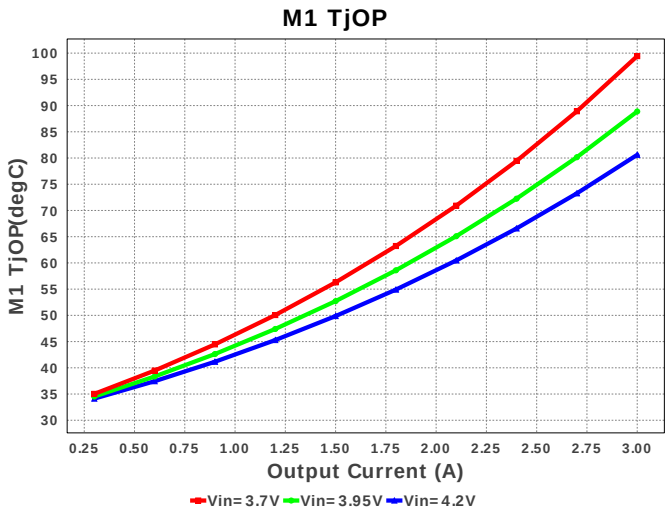


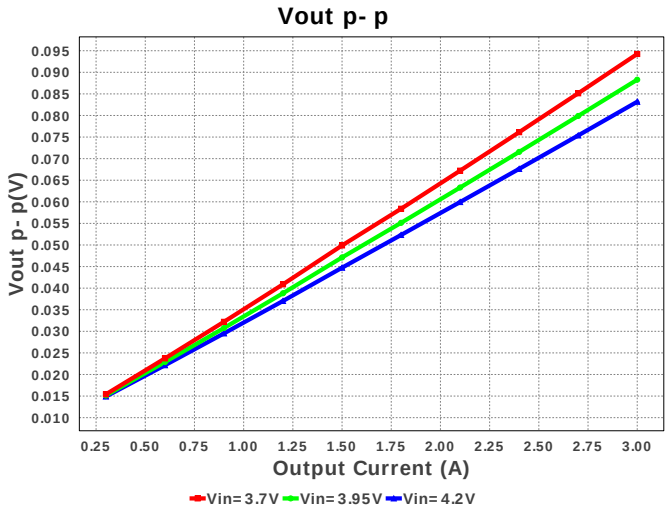


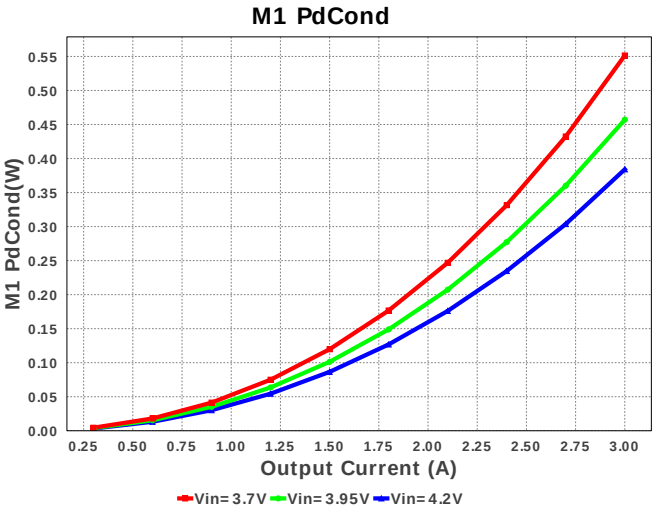


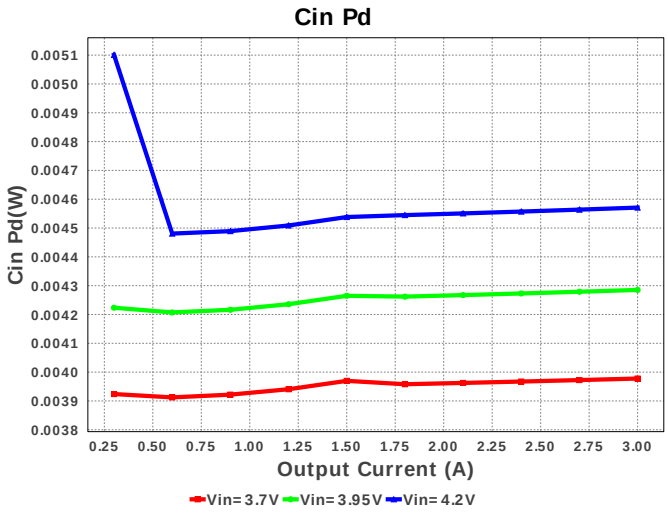


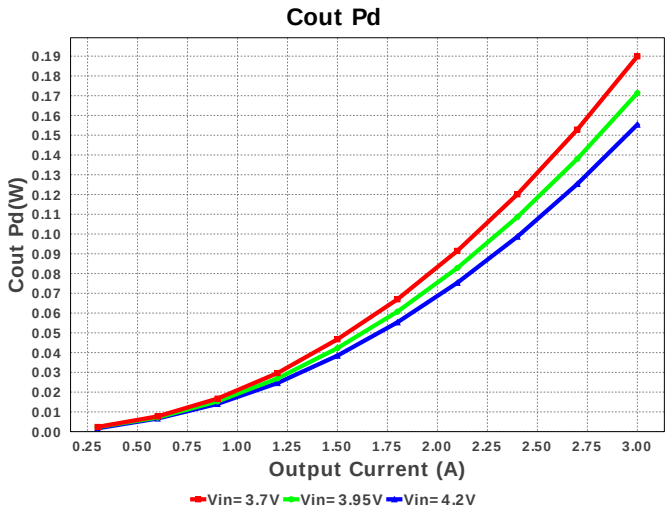


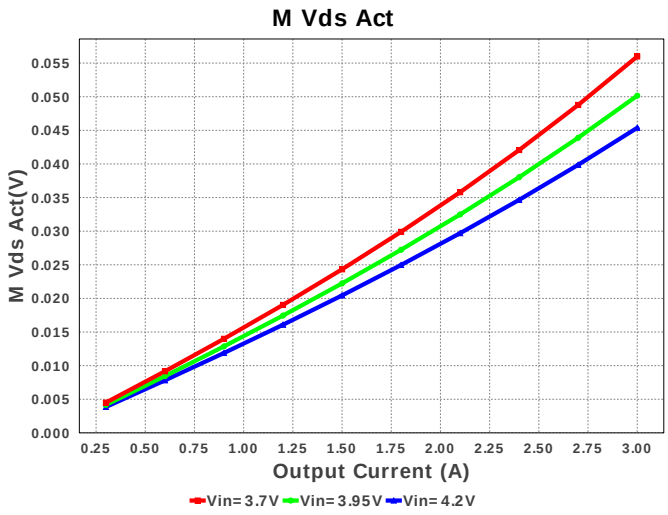


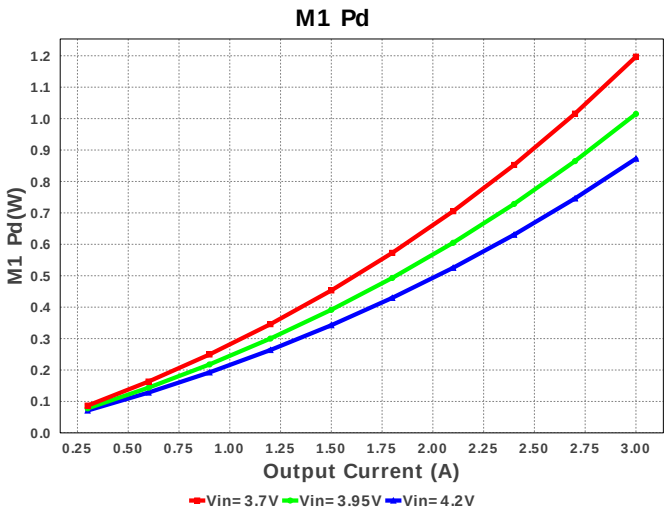


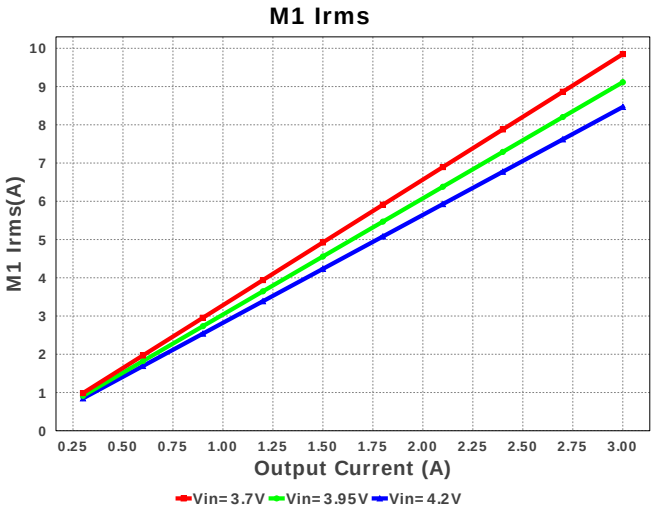


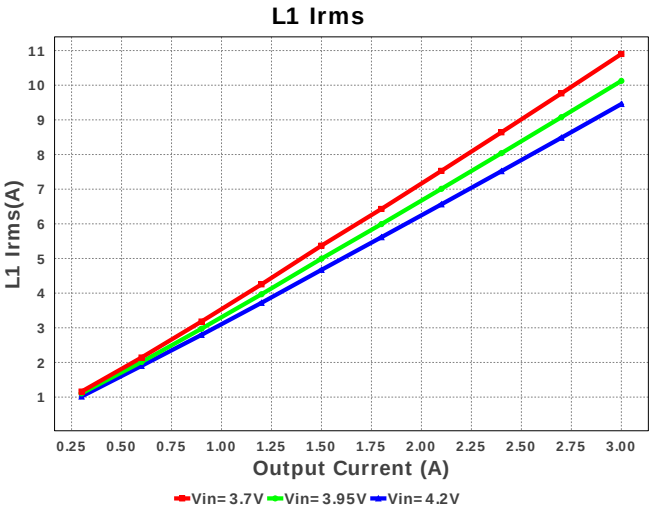


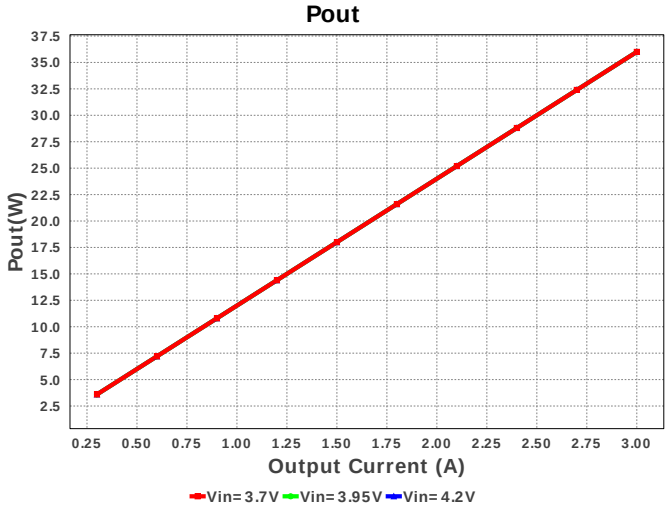


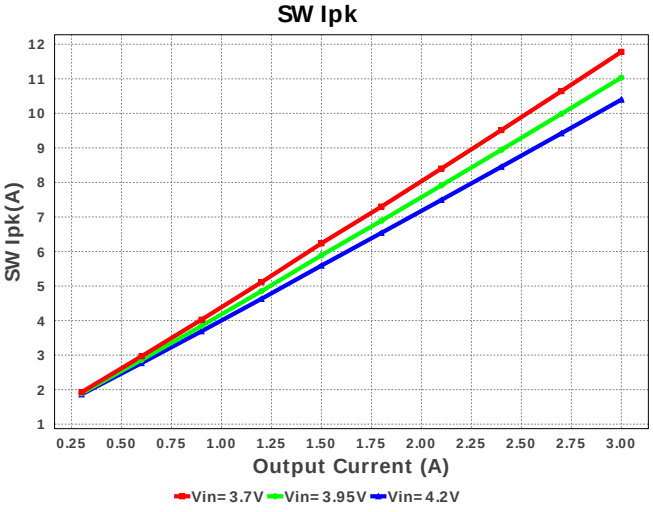


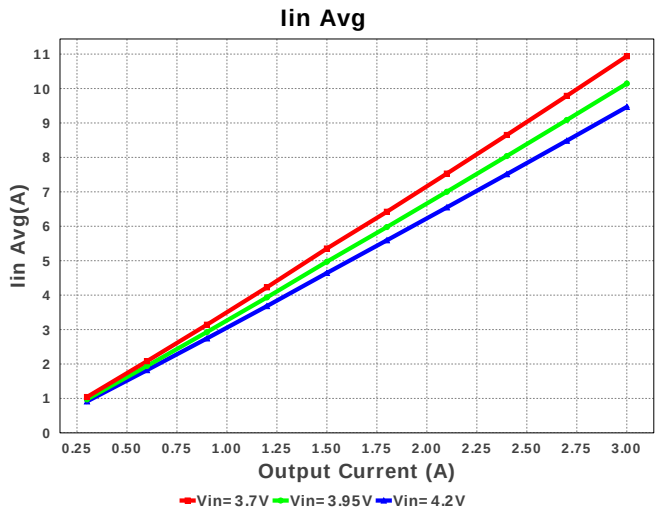


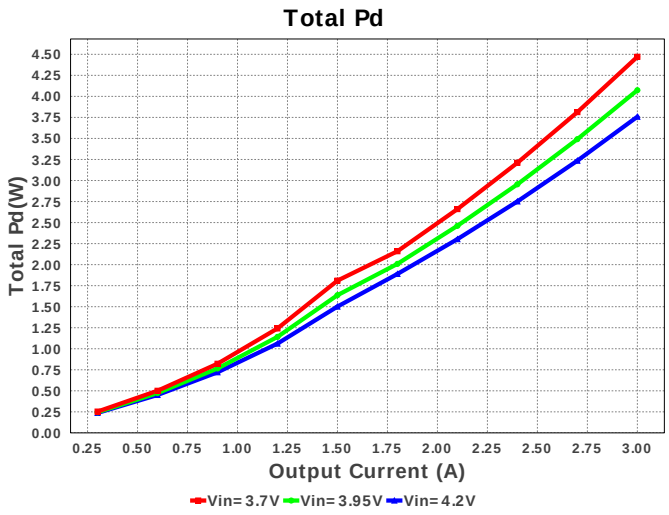


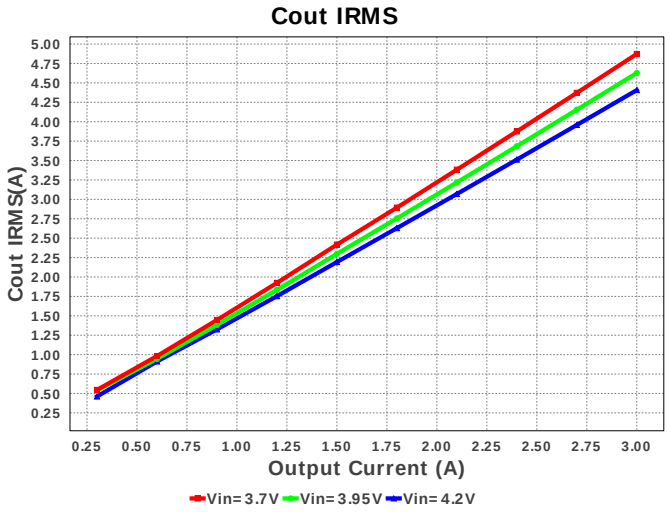


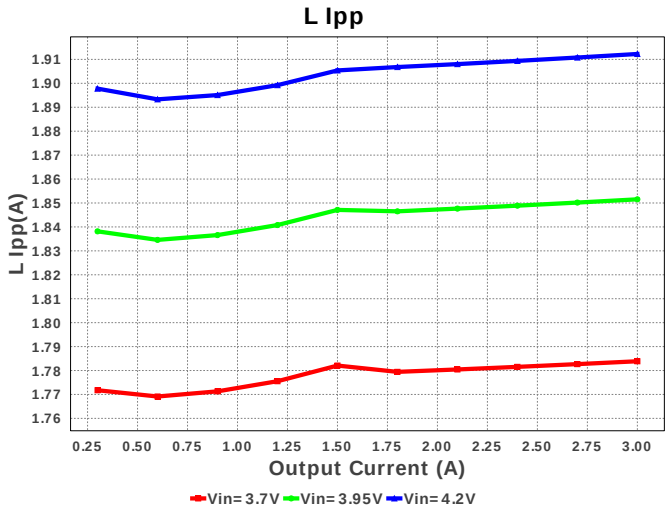


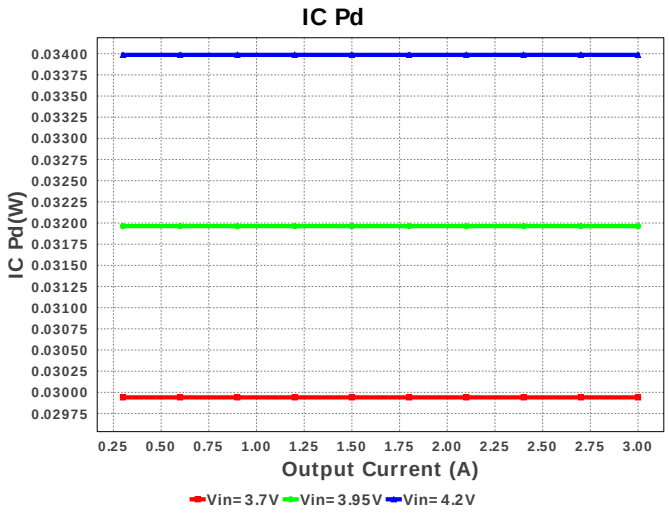


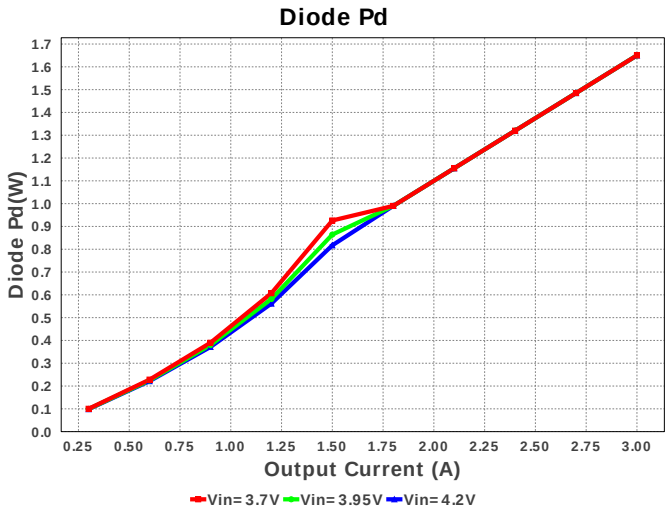


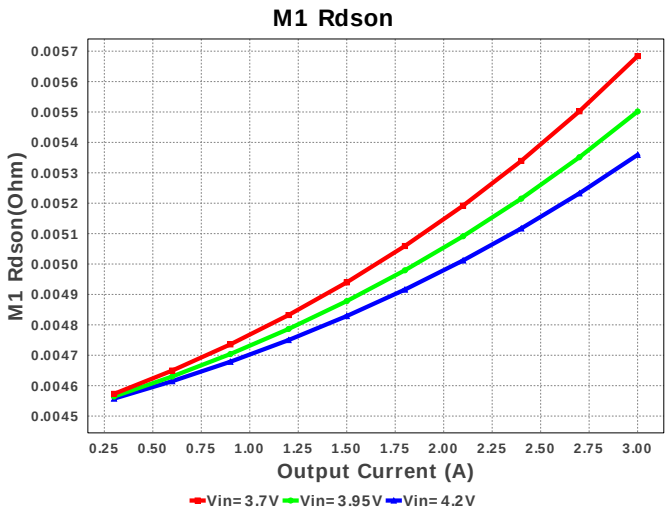


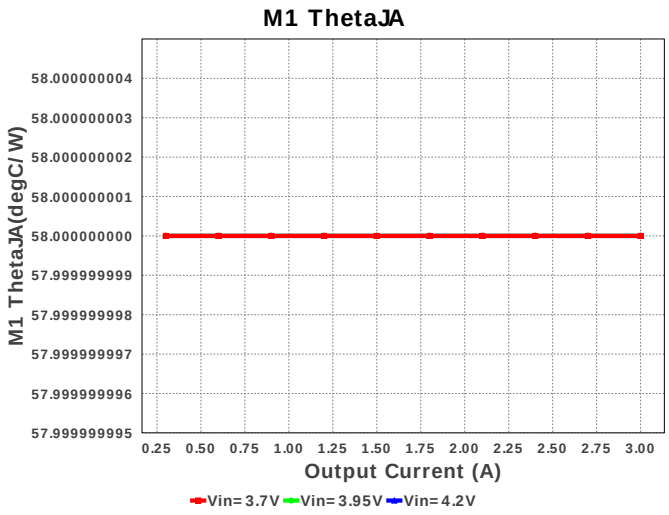


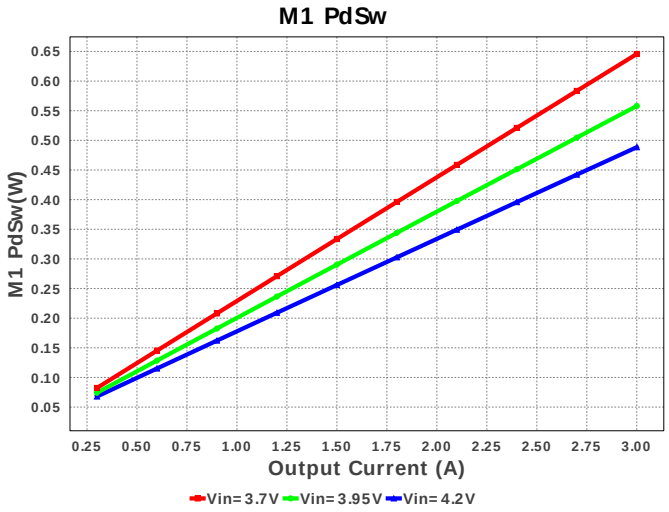


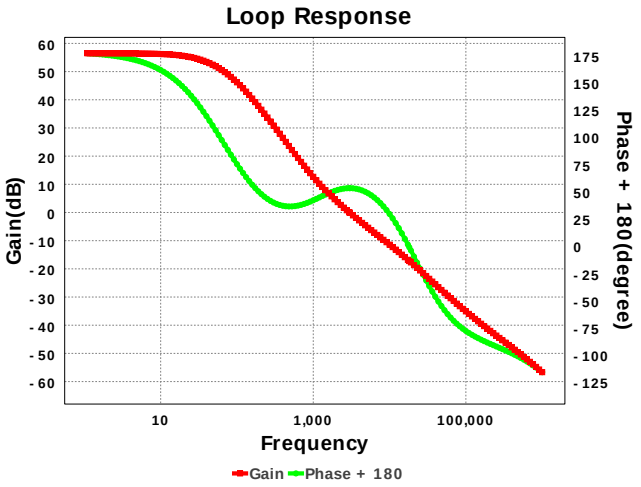












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	514.958 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	4.872 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	10.938 A	Current	Average input current
4.	L Ipp	1.784 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	10.901 A	Current	Inductor ripple current
6.	M1 Irms	9.849 A	Current	M1 MOSFET Irms
7.	SW Ipk	11.781 A	Current	Peak switch current
8.	BOM Count	17	General	Total Design BOM count
9.	FootPrint	721.0 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	55.982 mV	General	M Vds
13.	M1 Rdson	5.684 mOhm	General	Drain-Source On-resistance
14.	M1 ThetaJA	58.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
15.	Pout	36.0 W	General	Total output power
16.	Total BOM	$3.87	General	Total BOM Cost
17.	D1 Tj	112.5 degC	Op_Point	D1 junction temperature
18.	Low Freq Gain	55.244 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	2.651 kHz	Op_point	Bode plot crossover frequency
22.	Duty Cycle	72.449 %	Op_point	Duty cycle
23.	Efficiency	88.953 %	Op_point	Steady state efficiency
24.	Gain Marg	-16.23 dB	Op_point	Bode Plot Gain Margin
25.	IC Tj	35.988 degC	Op_point	IC junction temperature
26.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
27.	IOUT_OP	3.0 A	Op_point	Iout operating point
28.	M1 TjOP	99.432 degC	Op_point	M1 MOSFET junction temperature
29.	Phase Marg	52.16 deg	Op_point	Bode Plot Phase Margin
30.	VIN_OP	3.7 V	Op_point	Vin operating point
31.	Vout p-p	94.245 mV	Op_point	Peak-to-peak output ripple voltage

#	Name	Value	Category	Description
32.	Cin Pd	3.978 mW	Power	Input capacitor power dissipation
33.	Cout Pd	189.914 mW	Power	Output capacitor power dissipation
34.	Diode Pd	1.65 W	Power	Diode power dissipation
35.	IC Pd	29.94 mW	Power	IC power dissipation
36.	L Pd	1.041 W	Power	Inductor power dissipation
37.	M1 Pd	1.197 W	Power	M1 MOSFET total power dissipation
38.	M1 PdCond	551.385 mW	Power	M1 MOSFET conduction losses
39.	M1 PdSw	645.715 mW	Power	M1 MOSFET switching losses
40.	Rfb Pd	15.238 mW	Power	Rfb Power Dissipation
41.	Rsense Pd	421.129 mW	Power	Rsense Power Dissipation
42.	Total Pd	4.471 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	3.0	Maximum Output Current
2.	VinMax	4.2	Maximum input voltage
3.	VinMin	3.7	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM3488-Q1	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. Feature Highlights: Automotive Qualified, 40V Wide Vin Low-Side N-Channel Controller for Switching Regulators

2. LM3488-Q1 Product Folder : http://www.ti.com/product/lm3488q%2Dq1 : contains the data sheet and other resources.