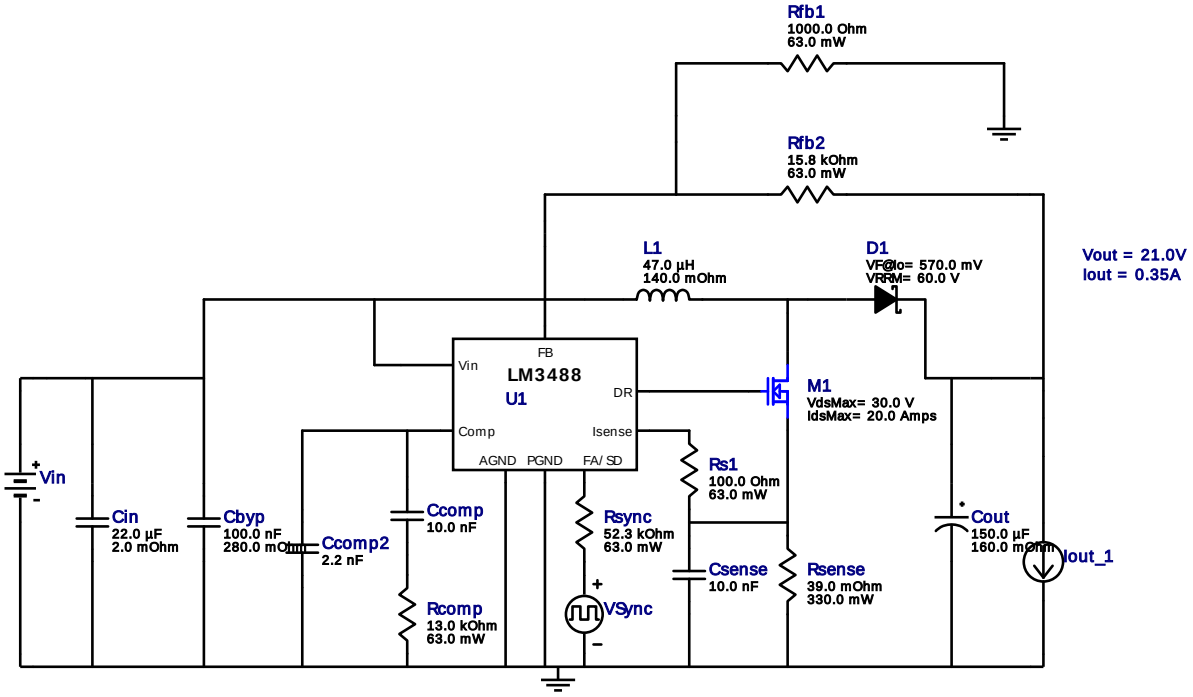
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 7.0V
VinMax = 18.0V
Vout = 21.0V
Iout = 0.35A

Device = LM3488MMX/NOPB
Topology = Boost
Created = 9/8/16 3:45:28 AM
BOM Cost = $1.79
BOM Count = 16
Total Pd = 0.63W

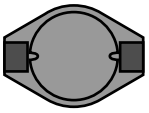
Design : 4551144/147 LM3488MMX/NOPB
LM3488MMX/NOPB 7.0V-18.0V to 21.00V @ 0.35A

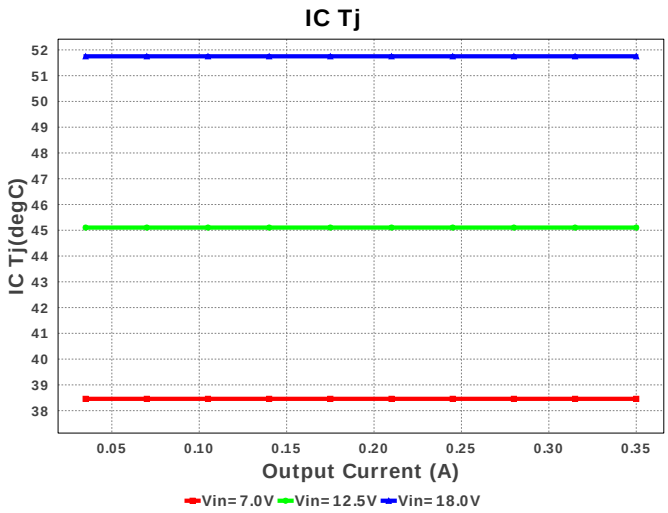


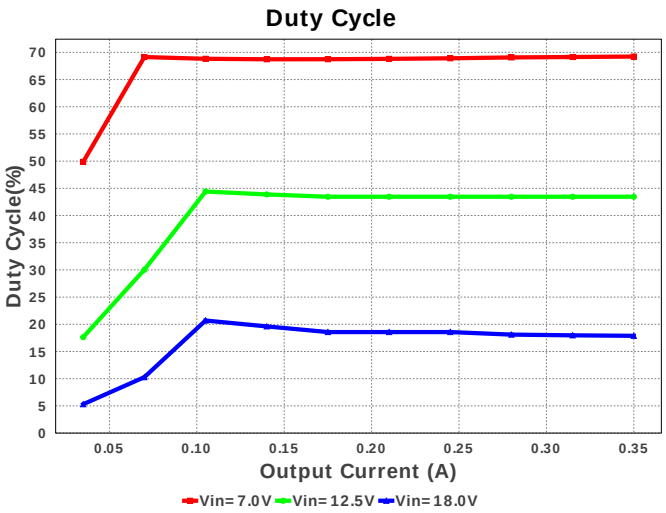
1. With the low turn of voltage of the LM34x8 your power supply may current limit before you reach your working input voltage. If this happens, or to preempt this from happening, you can include a low pass RC filter from input voltage to Vin on the IC. Make sure the rise time on the RC network is slower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

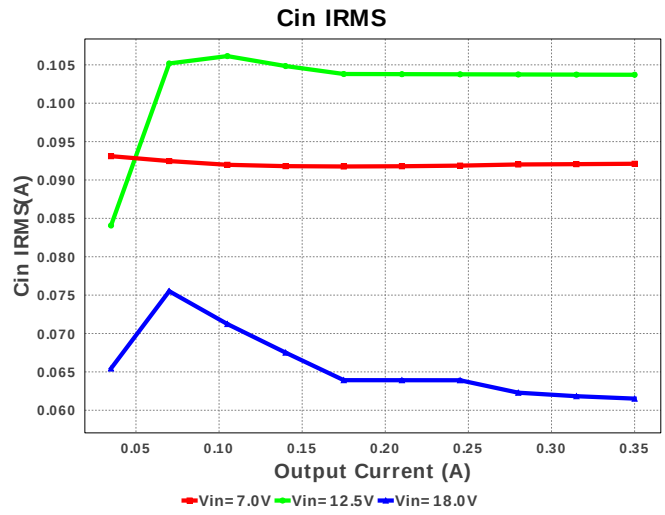
Electrical BOM

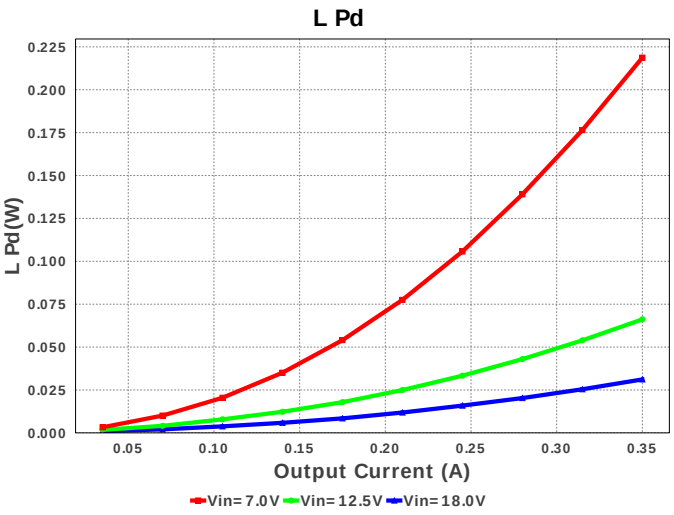
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM32ER61E226KE15L Series= X5R	Cap= 22.0 uF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 3.67 A	1	$0.16	1210 15 mm²
5.	Cout	Panasonic	EEE-FK1V151P Series= FK	Cap= 150.0 uF ESR= 160.0 mOhm VDC= 35.0 V IRMS= 600.0 mA	1	$0.21	SM_RADIAL_F 124 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	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	SOD-123F 12 mm²

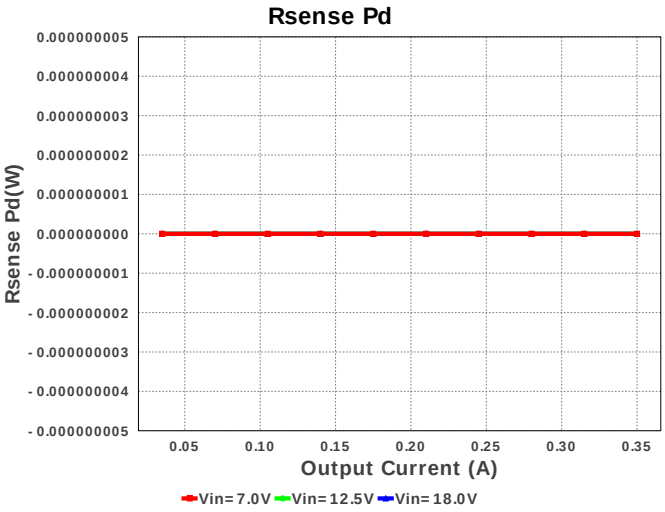
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	L1	NIC Components	NPI31W470MTRF	L= 47.0 µH DCR= 140.0 mOhm	1	$0.18	 IND_NPI31W 172 mm²
9.	M1	Texas Instruments	CSD17579Q3A	VdsMax= 30.0 V IdsMax= 20.0 Amps	1	$0.19	 DNH0008A 18 mm²
10.	Rcomp	Vishay-Dale	CRCW040213K0FKED Series= CRCW..e3	Res= 13.0 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	CRCW040215K8FKED Series= CRCW..e3	Res= 15.8 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-L14KF39MU Series= ERJ-L14	Res= 39.0 mOhm Power= 330.0 mW Tolerance= 1.0%	1	$0.11	 1210 15 mm²
15.	Rsync	Vishay-Dale	CRCW040252K3FKED Series= CRCW..e3	Res= 52.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	U1	Texas Instruments	LM3488MMX/NOPB	Switcher	1	$0.80	 MUA08A 24 mm²

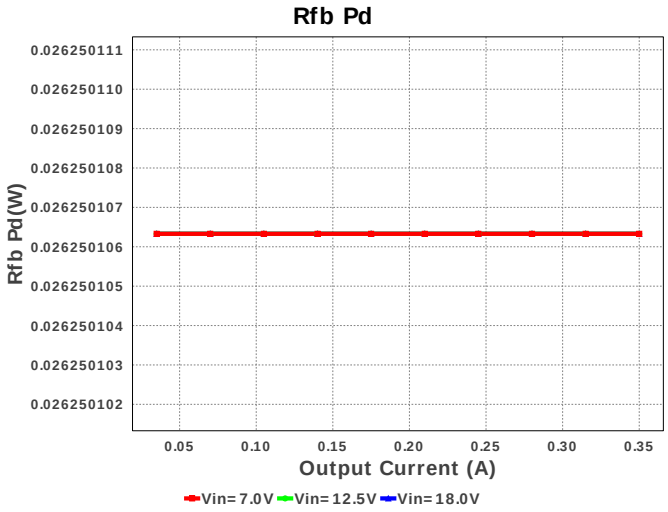


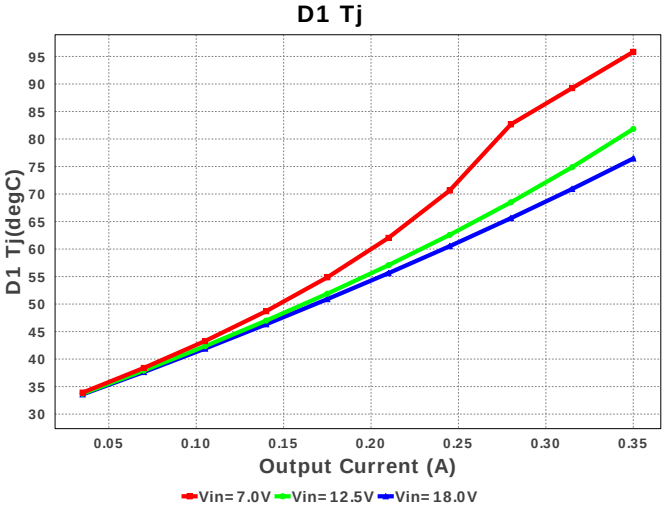


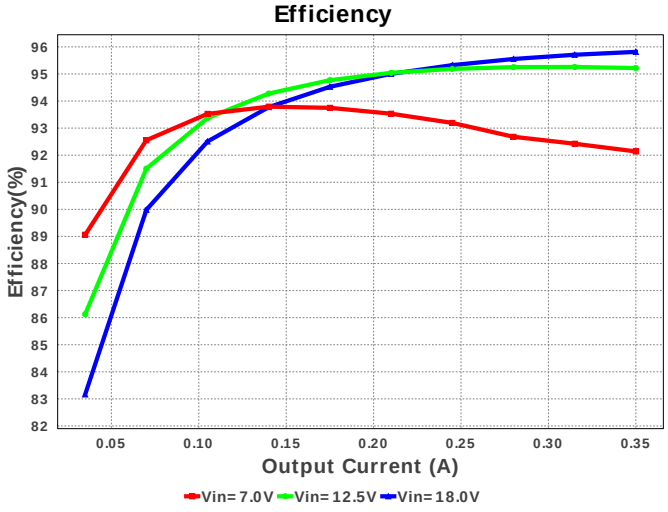


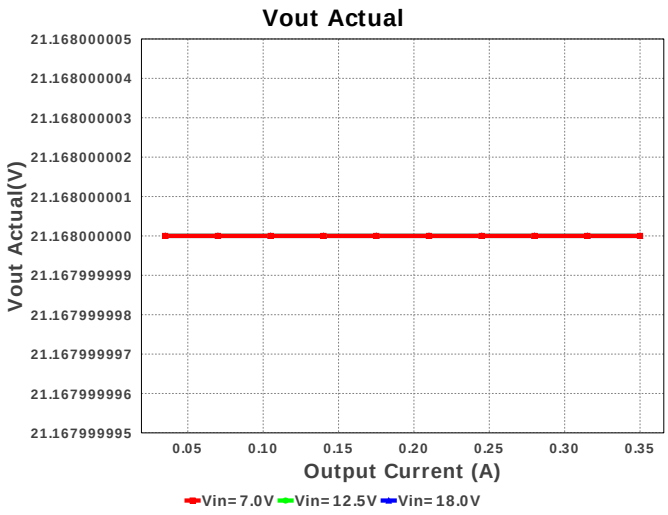


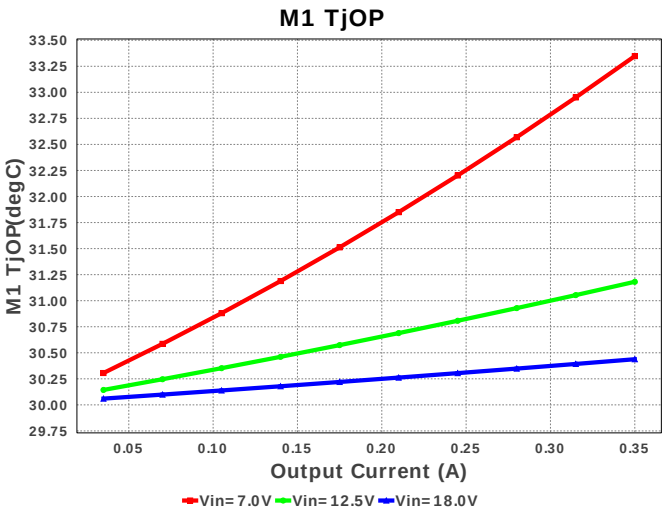


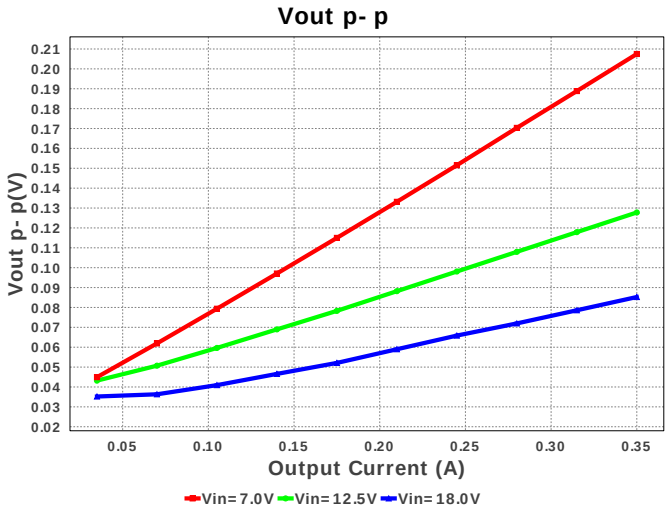


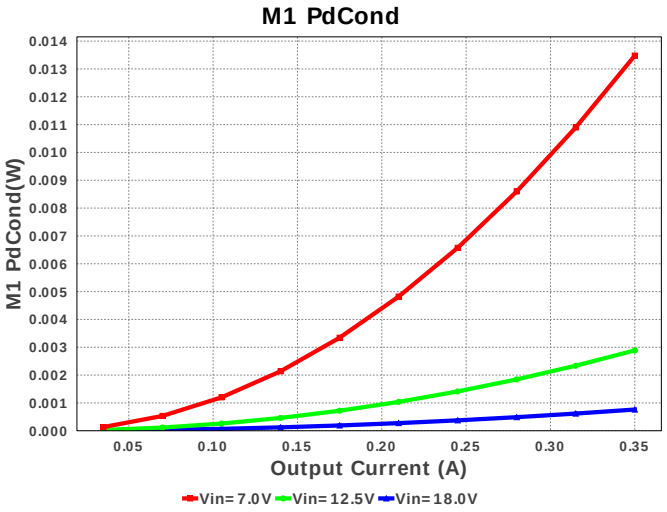


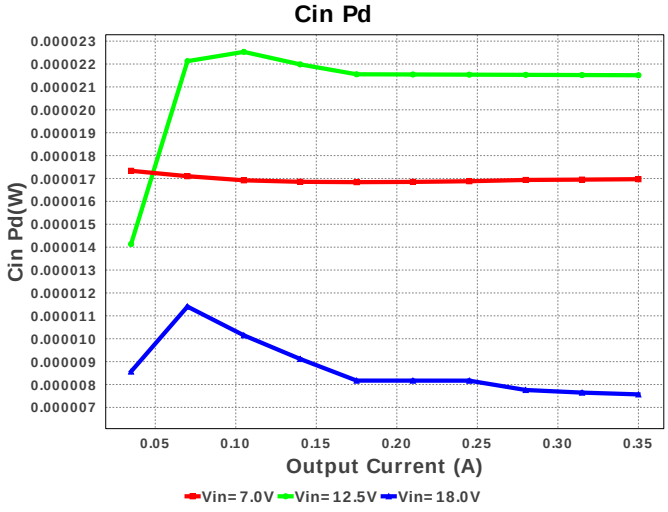


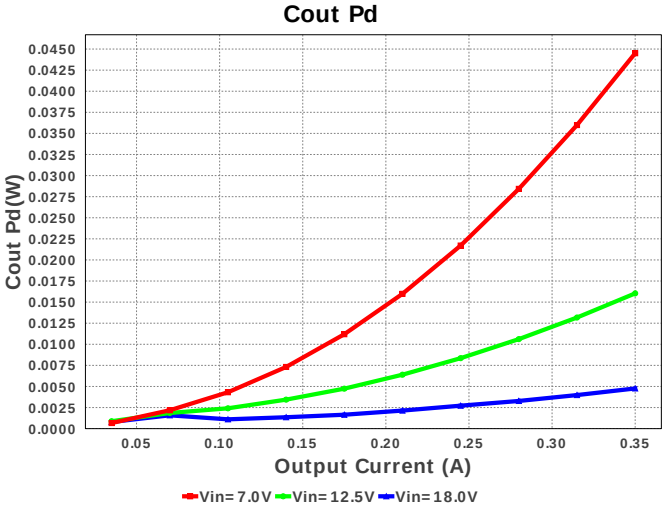


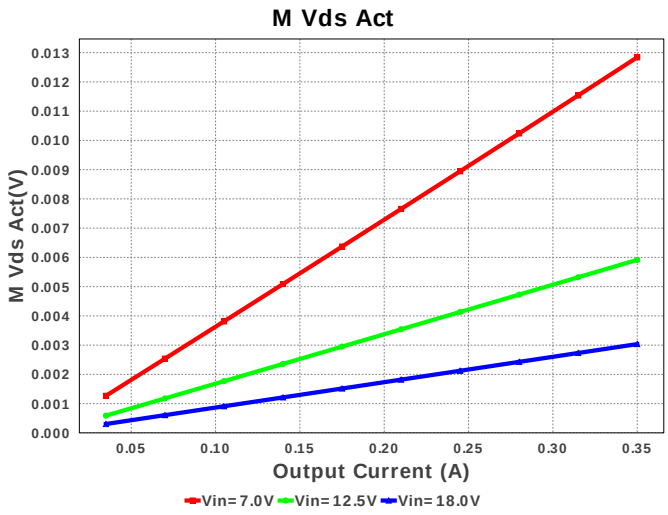


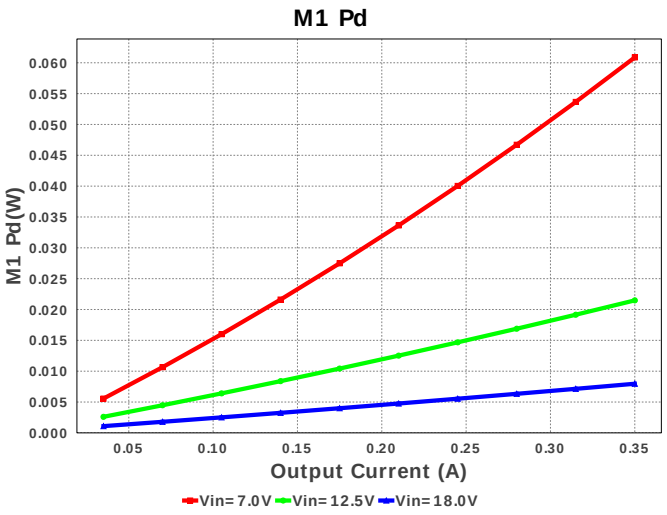


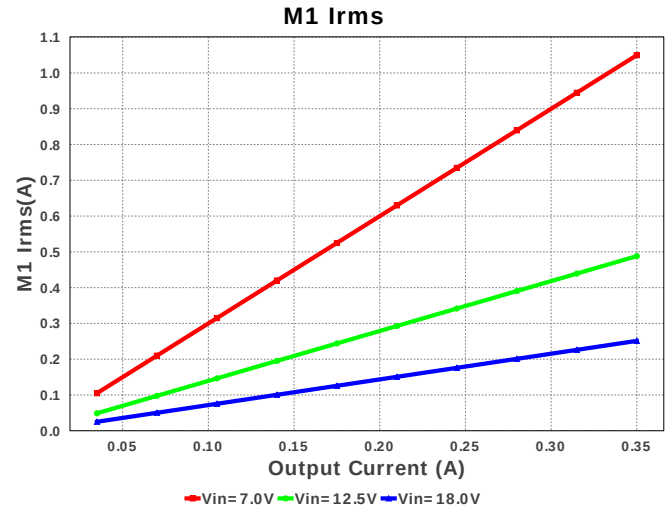


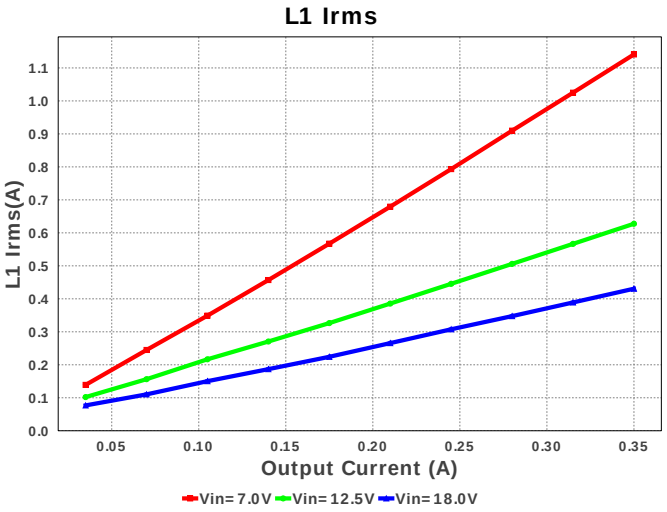


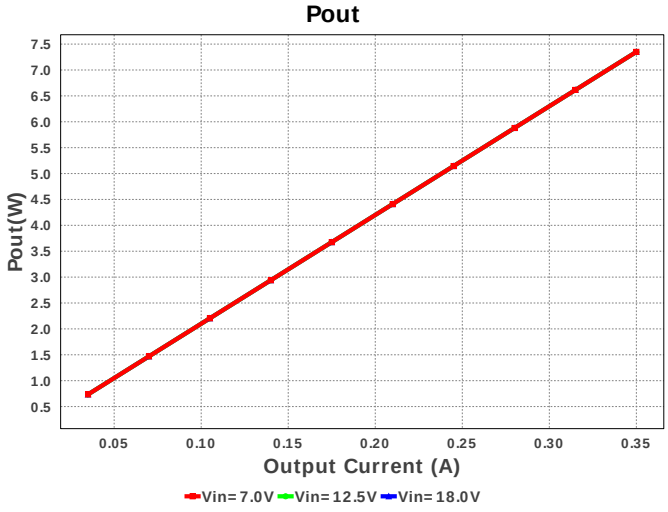


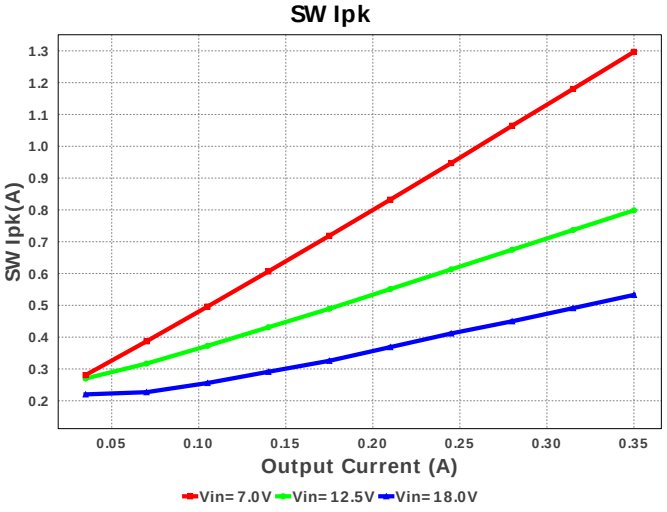


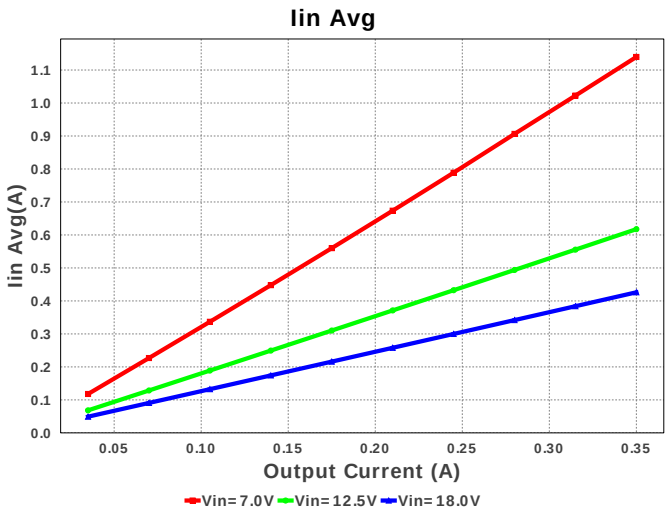


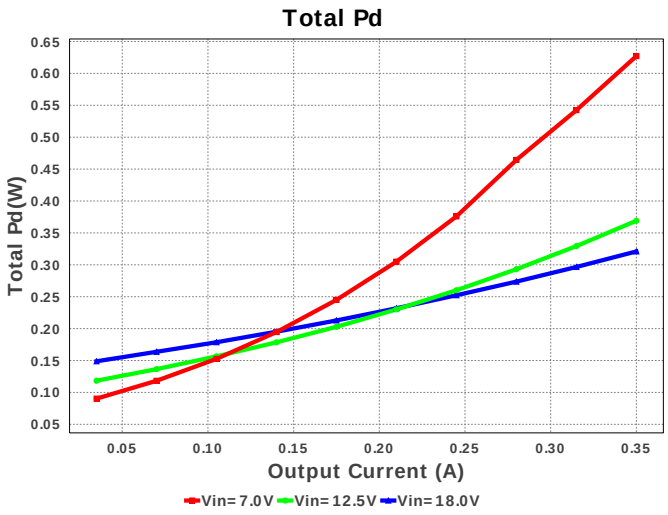


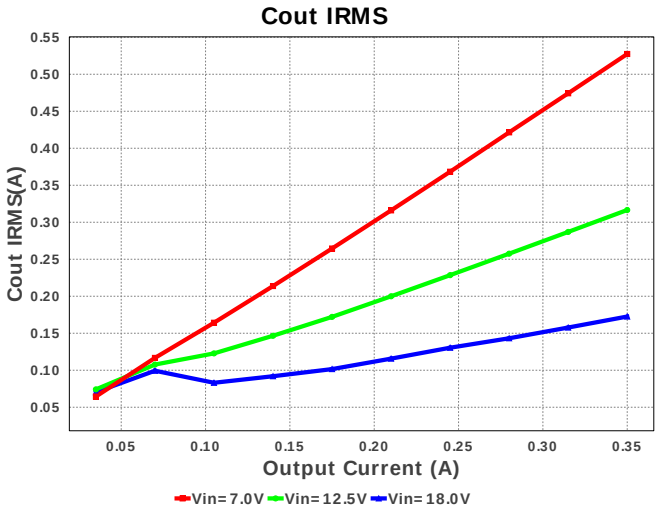


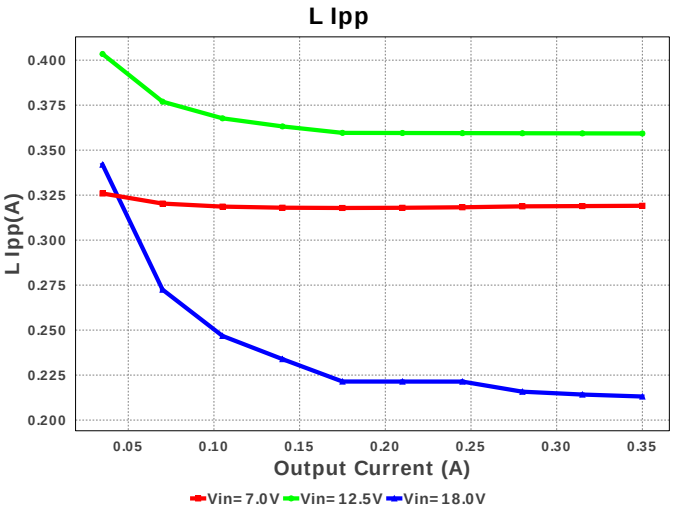


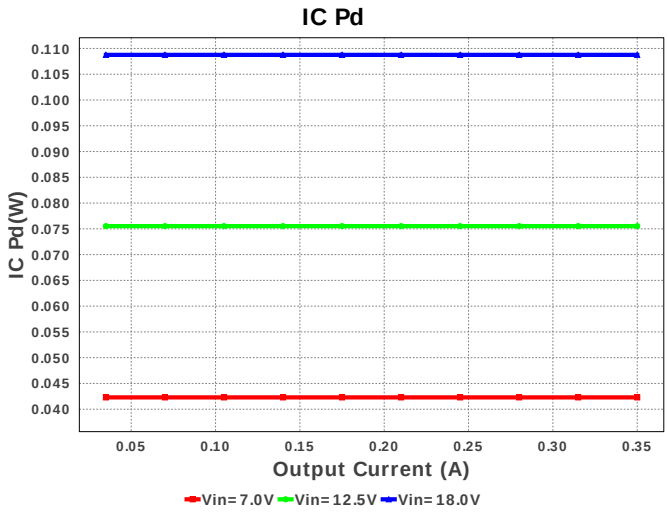


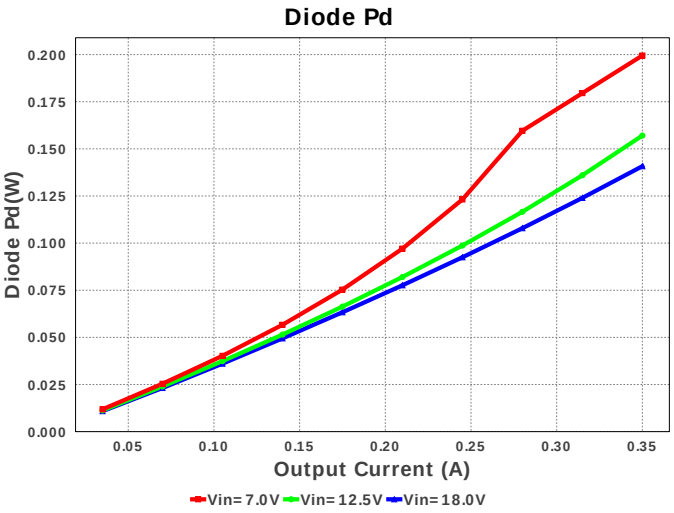


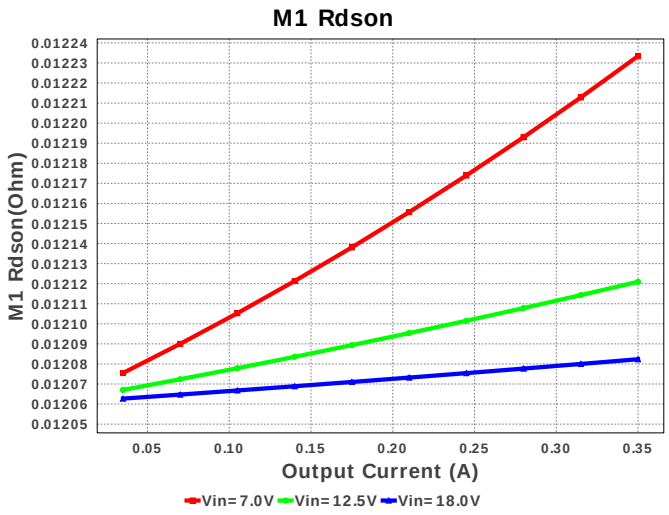


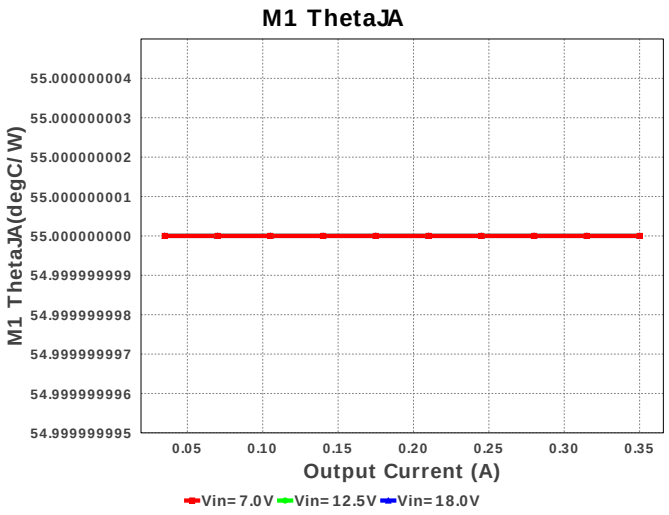


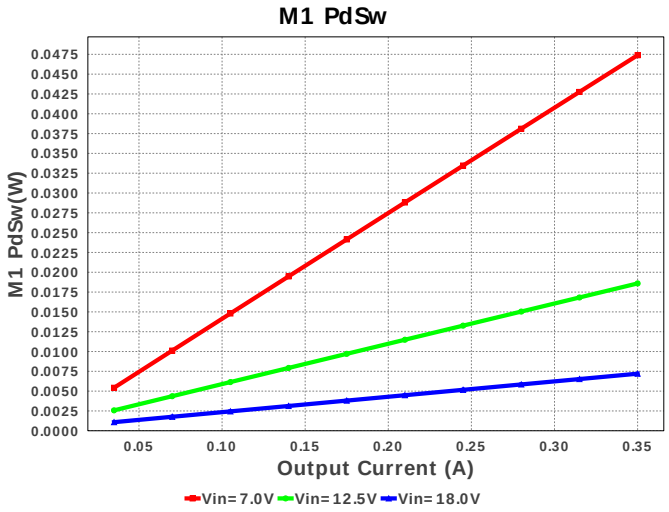


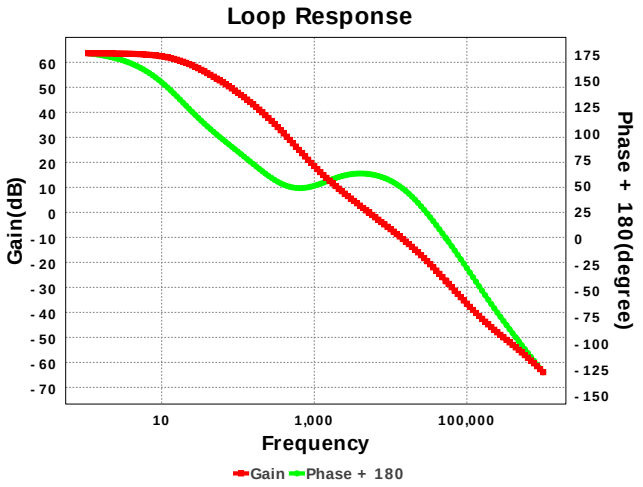












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	92.113 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	527.405 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.14 A	Current	Average input current
4.	L Ipp	319.09 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	1.141 A	Current	Inductor ripple current
6.	M1 Irms	1.047 A	Current	M1 MOSFET Irms
7.	SW Ipk	1.297 A	Current	Peak switch current
8.	BOM Count	16	General	Total Design BOM count
9.	FootPrint	421.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	321.062 kHz	General	Switching frequency
11.	IC Tolerance	15.3 mV	General	IC Feedback Tolerance
12.	M Vds Act	12.815 mV	General	M Vds
13.	M1 Rdson	12.234 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	7.35 W	General	Total output power
17.	Total BOM	$1.79	General	Total BOM Cost
18.	D1 Tj	95.835 degC	Op_Point	D1 junction temperature
19.	Low Freq Gain	55.073 dB	Op_Point	Gain at 10Hz
20.	Vout Actual	21.168 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
21.	Vout OP	21.0 V	Op_Point	Operational Output Voltage
22.	Cross Freq	2.297 kHz	Op_point	Bode plot crossover frequency
23.	Duty Cycle	69.225 %	Op_point	Duty cycle
24.	Efficiency	92.138 %	Op_point	Steady state efficiency
25.	Gain Marg	-20.069 dB	Op_point	Bode Plot Gain Margin
26.	IC Tj	38.459 degC	Op_point	IC junction temperature
27.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
28.	IOUT_OP	350.0 mA	Op_point	Iout operating point
29.	M1 TjOP	33.352 degC	Op_point	M1 MOSFET junction temperature
30.	Phase Marg	54.997 deg	Op_point	Bode Plot Phase Margin
31.	VIN_OP	7.0 V	Op_point	Vin operating point

#	Name	Value	Category	Description
32.	Vout p-p	207.49 mV	Op_point	Peak-to-peak output ripple voltage
33.	Cin Pd	16.97 µW	Power	Input capacitor power dissipation
34.	Cout Pd	44.505 mW	Power	Output capacitor power dissipation
35.	Diode Pd	199.5 mW	Power	Diode power dissipation
36.	IC Pd	42.294 mW	Power	IC power dissipation
37.	L Pd	218.714 mW	Power	Inductor power dissipation
38.	M1 Pd	60.941 mW	Power	M1 MOSFET total power dissipation
39.	M1 PdCond	13.423 mW	Power	M1 MOSFET conduction losses
40.	M1 PdSw	47.518 mW	Power	M1 MOSFET switching losses
41.	Rfb Pd	26.25 mW	Power	Rfb Power Dissipation
42.	Rsense Pd	45.472 mW	Power	Rsense Power Dissipation
43.	Total Pd	627.167 mW	Power	Total Power Dissipation
44.	Vout Tolerance	3.137 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	350.0 m	Maximum Output Current
2.	VinMax	18.0	Maximum input voltage
3.	VinMin	7.0	Minimum input voltage
4.	Vout	21.0	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	321.062 k	Customer Selected Frequency

Design Assistance

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