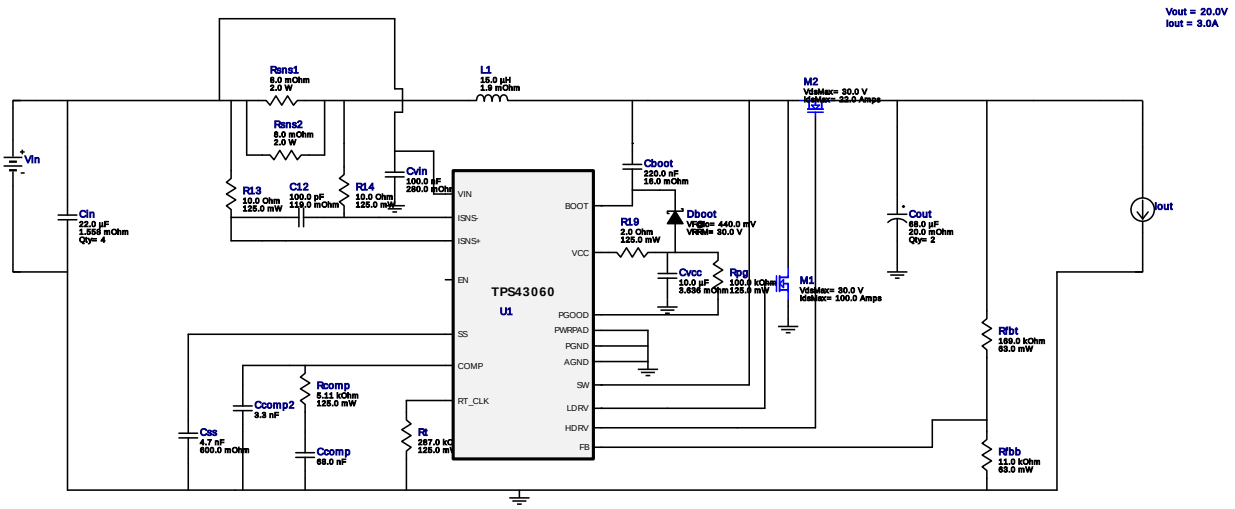
WEBENCH® Design Report

VinMin = 6.0V
VinMax = 15.0V
Vout = 20.0V
Iout = 3.0A

Device = TPS43060RTER
Topology = Boost
Created = 4/12/16 5:37:01 AM
BOM Cost = $8.69
BOM Count = 28
Total Pd = 1.94W

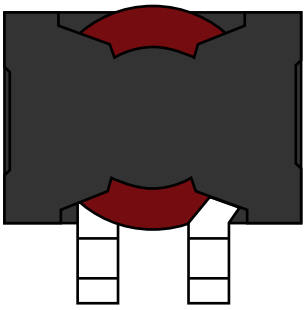
Design : 4116161/22 TPS43060RTER
TPS43060RTER 6.0V-15.0V to 20.00V @ 3.0A

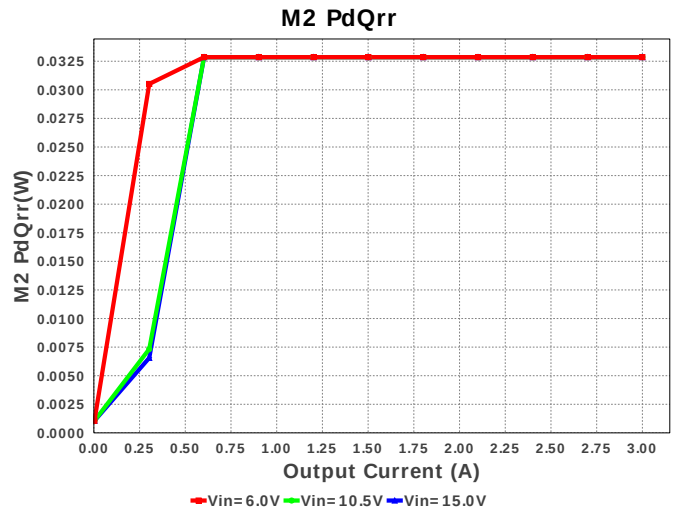


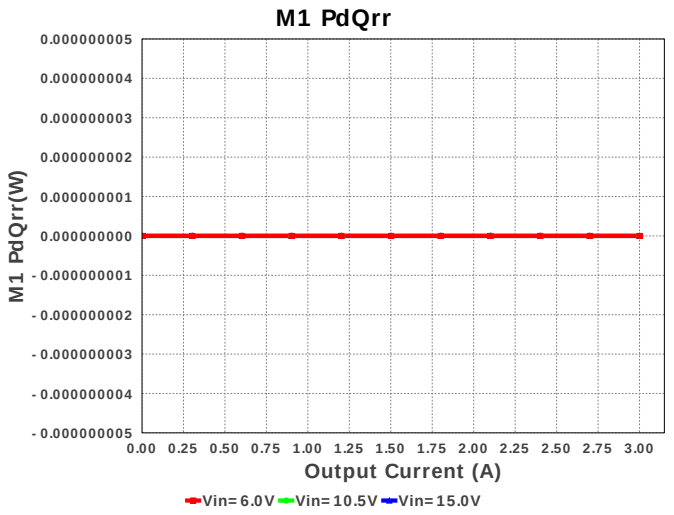
1. The pulse skip mode in the device has not been modeled. Efficiency and operational parameters of the model in pulse skip mode is not valid.

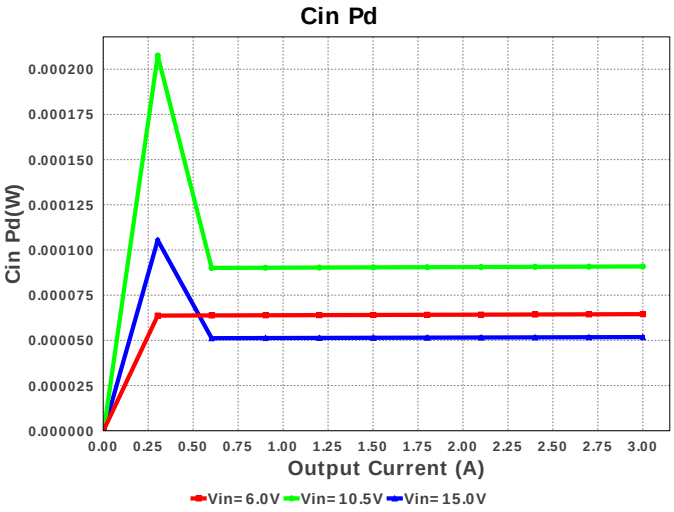
Electrical BOM

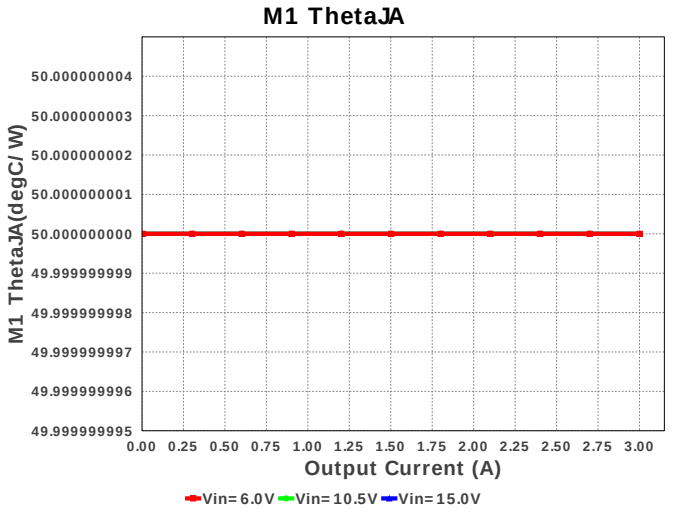
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C12	AVX	06035A101JAT2A Series= C0G/NP0	Cap= 100.0 pF ESR= 119.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
2.	Cboot	AVX	0805YC224KAT2A Series= X7R	Cap= 220.0 nF ESR= 16.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm^2
3.	Ccomp	MuRata	GRM219R71C683KA01D Series= X7R	Cap= 68.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm^2
4.	Ccomp2	MuRata	GRM216R71E332KA01D Series= X7R	Cap= 3.3 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
5.	Cin	TDK	C5750JB1E226M Series= JB	Cap= 22.0 uF ESR= 1.558 mOhm VDC= 25.0 V IRMS= 0.0 A	4	$0.48	2220 54 mm^2
6.	Cout	Panasonic	50SVPF68M Series= SVPF	Cap= 68.0 uF ESR= 20.0 mOhm VDC= 50.0 V IRMS= 4.3 A	2	$0.92	CAPSMT_62_F12 151 mm^2
7.	Css	MuRata	GRM188R71E472KA01D Series= X7R	Cap= 4.7 nF ESR= 600.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
8.	Cvcc	MuRata	GRM188R61C106MA73D Series= X5R	Cap= 10.0 uF ESR= 3.636 mOhm VDC= 16.0 V IRMS= 2.8889 A	1	$0.07	0603 5 mm^2

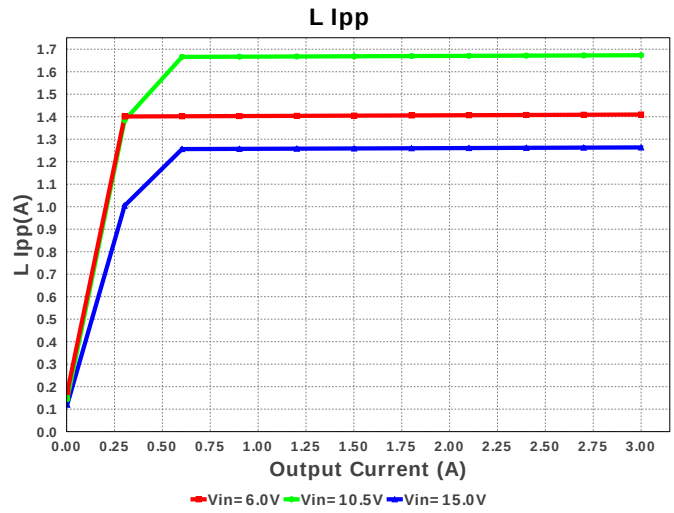
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvin	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm^2
10.	Dboot	Vishay-Semiconductor	SL23-E3/52T	VF@Io= 440.0 mV VRRM= 30.0 V	1	$0.21	 SMB 44 mm^2
11.	L1	Coilcraft	SER2915H-153KL	L= 15.0 µH DCR= 1.9 mOhm	1	$1.95	 SER2915H 652 mm^2
12.	M1	Texas Instruments	CSD17506Q5A	VdsMax= 30.0 V IdsMax= 100.0 Amps	1	$0.50	 TRANS_NexFET_Q5A 55 mm^2
13.	M2	Texas Instruments	CSD17577Q5A	VdsMax= 30.0 V IdsMax= 22.0 Amps	1	$0.30	 TRANS_NexFET_Q5A 55 mm^2
14.	R13	Vishay-Dale	CRCW080510R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
15.	R14	Vishay-Dale	CRCW080510R0FKEA Series= CRCW..e3	Res= 10.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
16.	R19	Vishay-Dale	CRCW08052R00FKEA Series= CRCW..e3	Res= 2.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
17.	Rcomp	Panasonic	ERJ-6ENF5111V Series= ERJ-6E	Res= 5.11 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
18.	Rfbb	Vishay-Dale	CRCW040211K0FKED Series= CRCW..e3	Res= 11.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
19.	Rfbt	Vishay-Dale	CRCW0402169KFKED Series= CRCW..e3	Res= 169.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Rpg	Panasonic	ERJ-6ENF1003V Series= ERJ-6E	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
21.	Rsns1	Rohm	PMR100HZPFU8L00 Series= PMR100	Res= 8.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	$0.16	 2512 43 mm^2
22.	Rsns2	Rohm	PMR100HZPFU8L00 Series= PMR100	Res= 8.0 mOhm Power= 2.0 W Tolerance= 1.0%	1	$0.16	 2512 43 mm^2
23.	Rt	Panasonic	ERJ-6ENF2873V Series= ERJ-6E	Res= 287.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
24.	U1	Texas Instruments	TPS43060RTER	Switcher	1	$1.40	 S-PVQFN-N16 25 mm^2

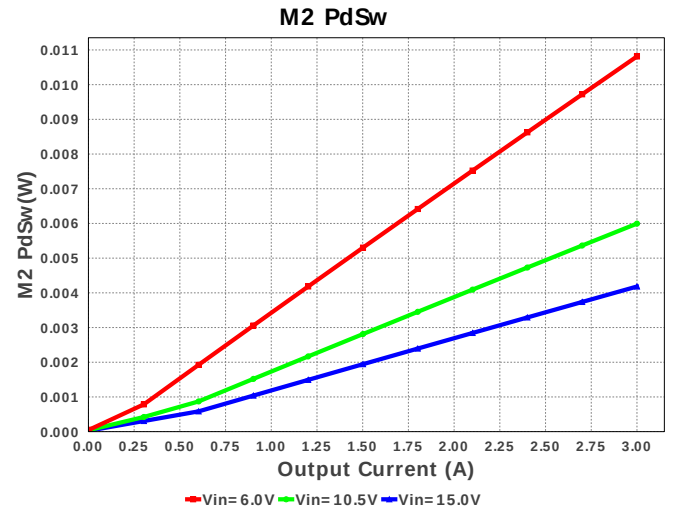


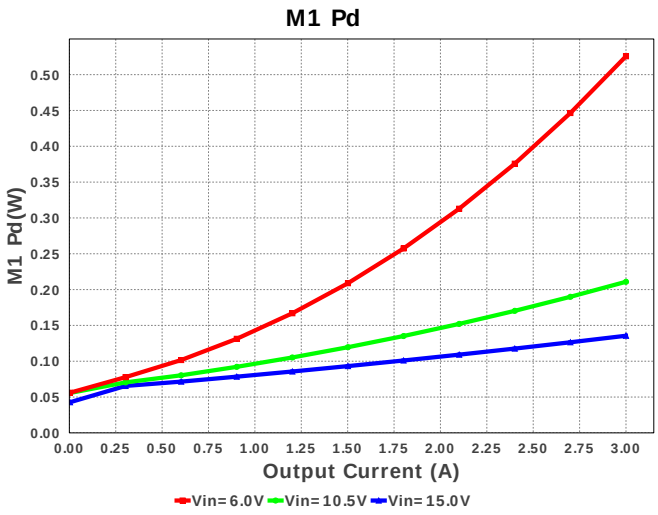


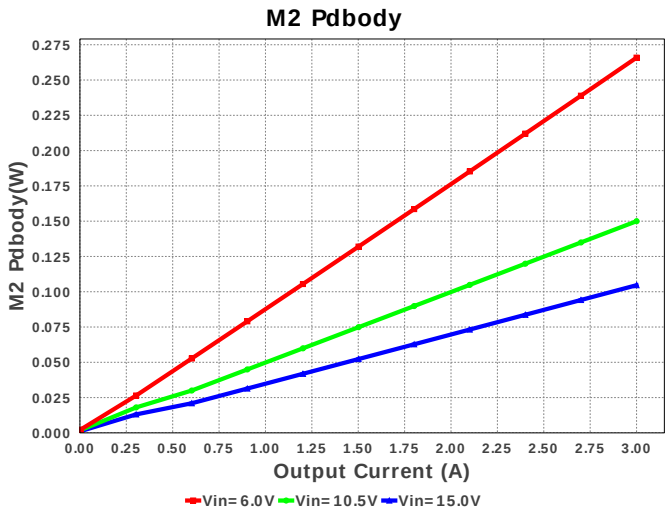


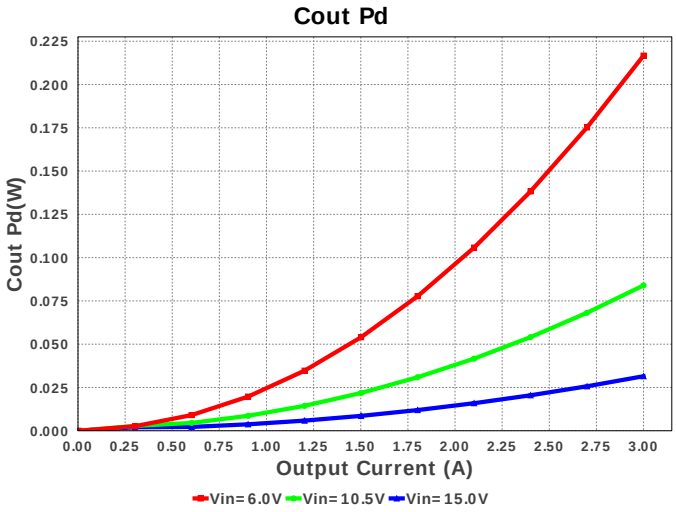


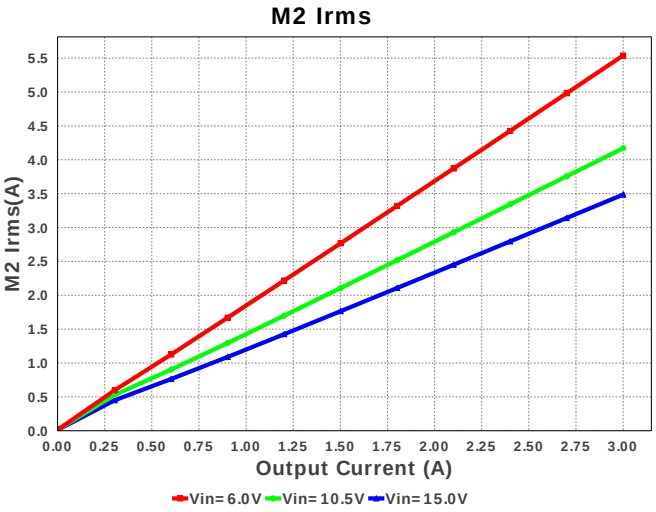


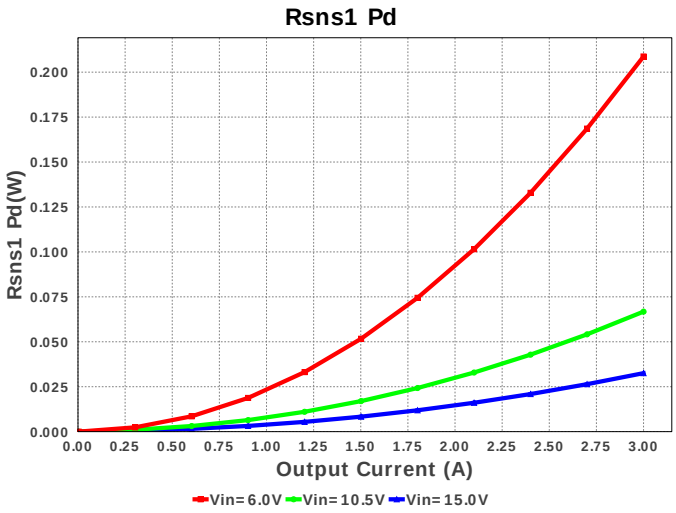


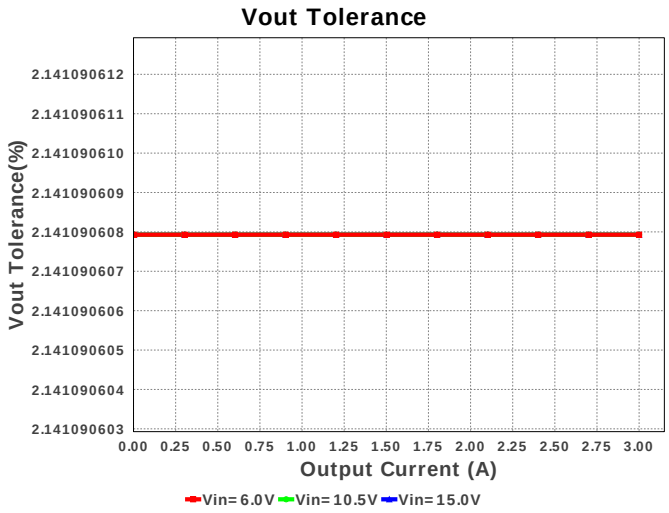




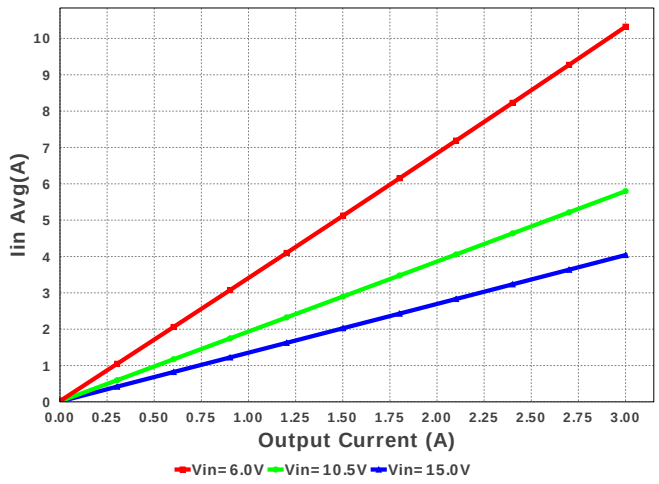




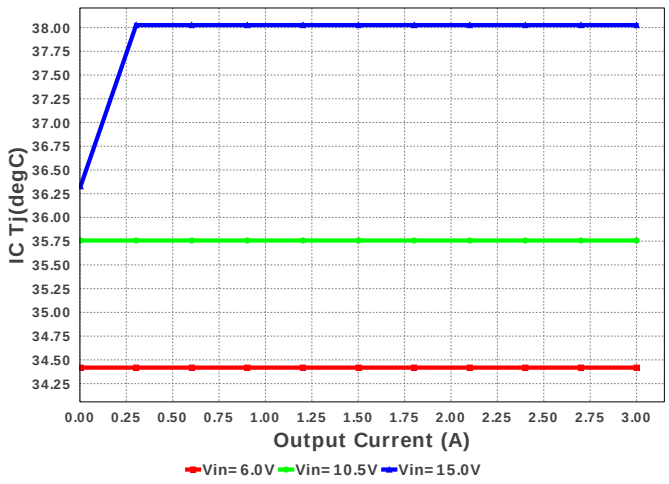




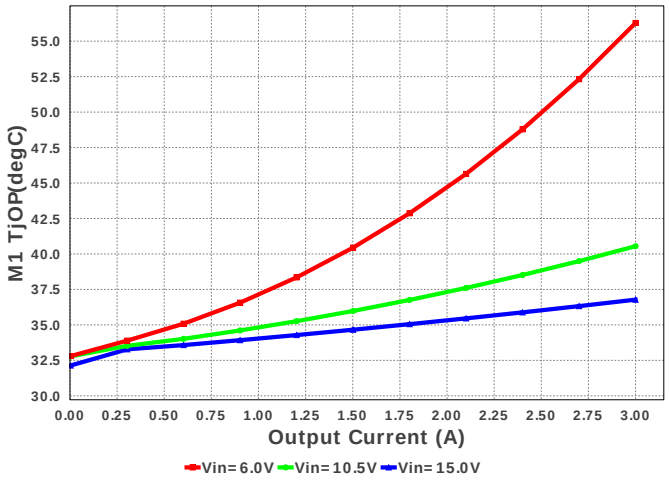
Iin Avg



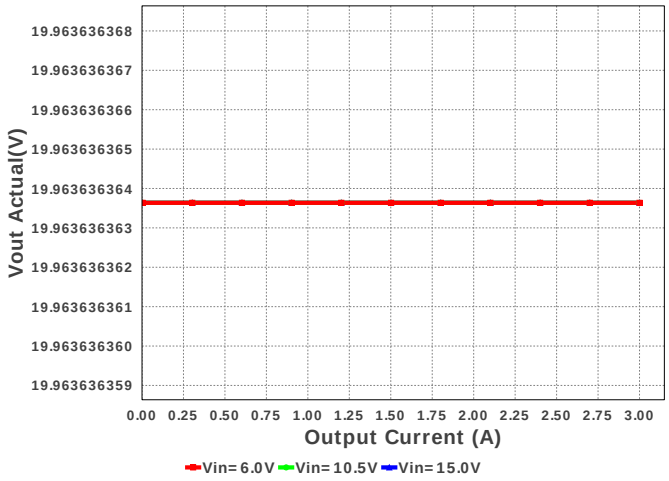
IC Tj



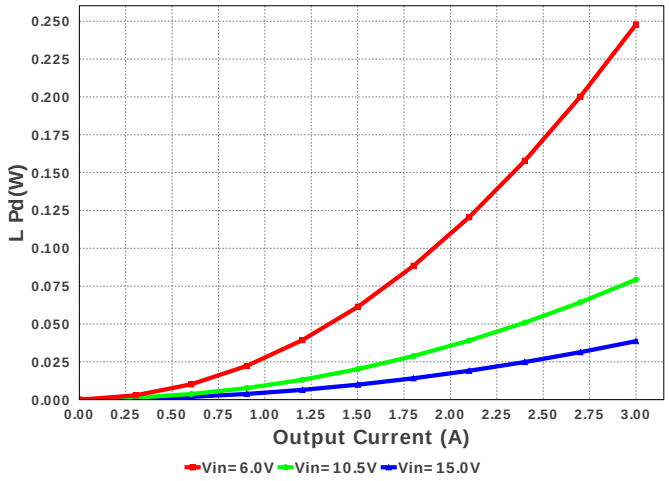
M1 TjOP



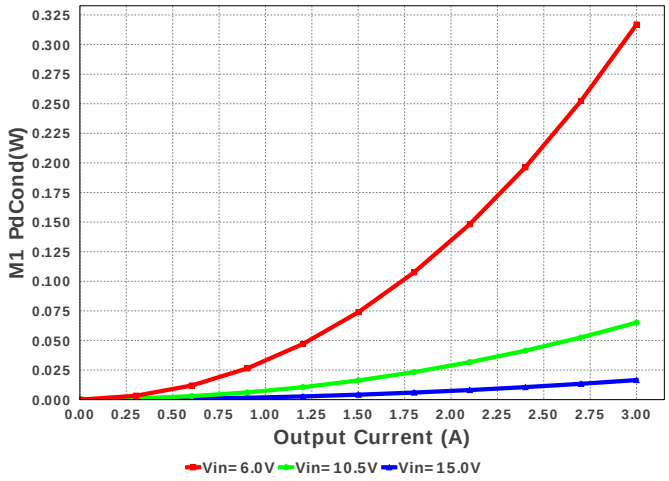
Vout Actual

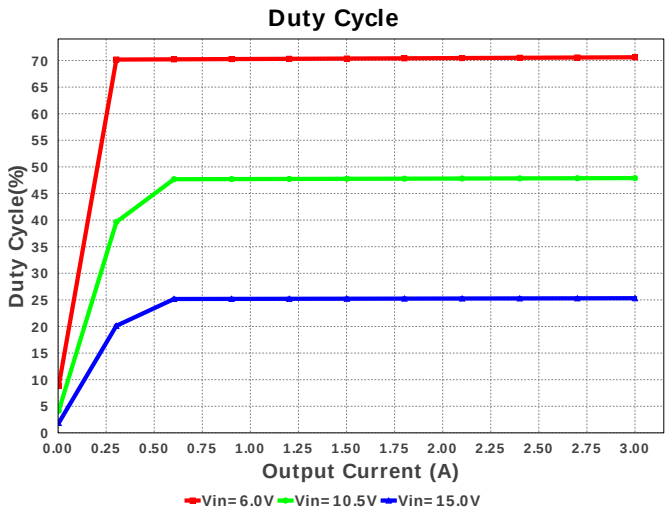


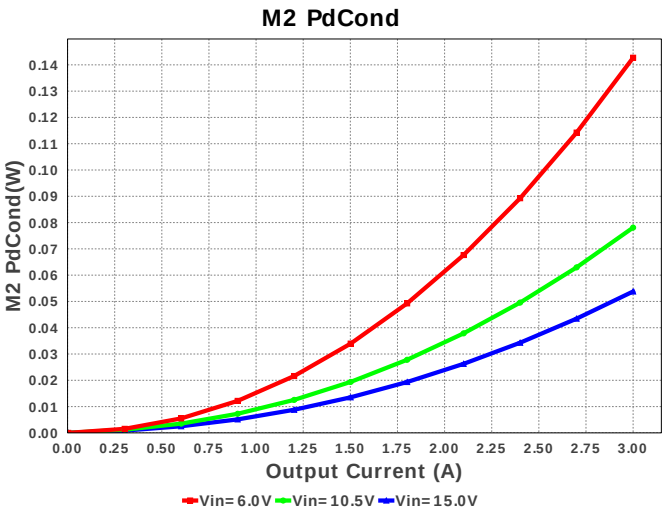
L Pd

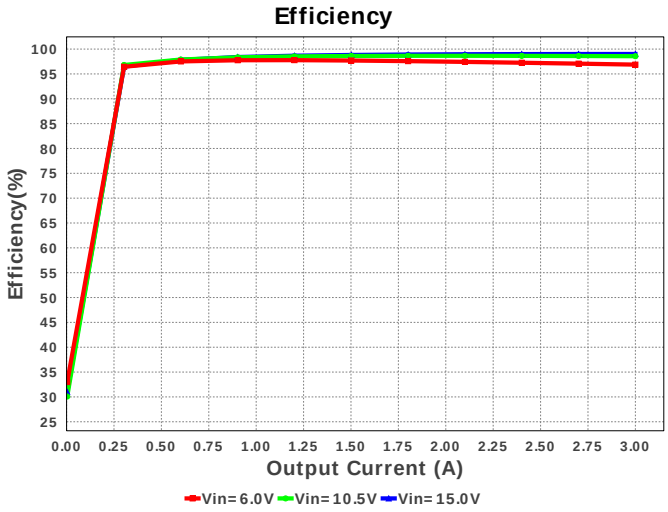


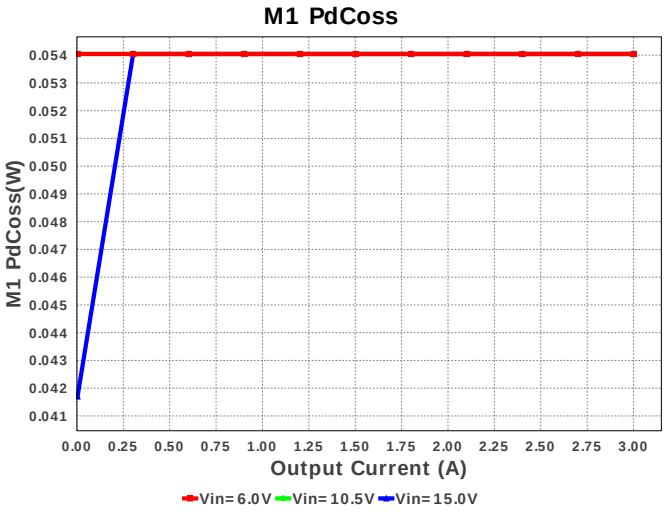
M1 PdCond

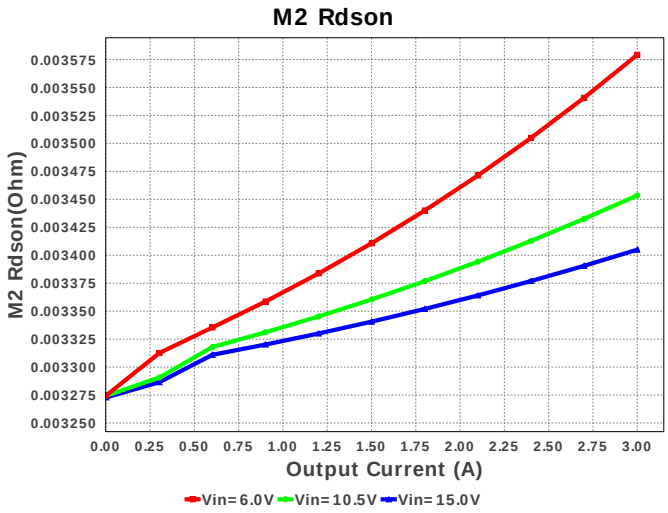


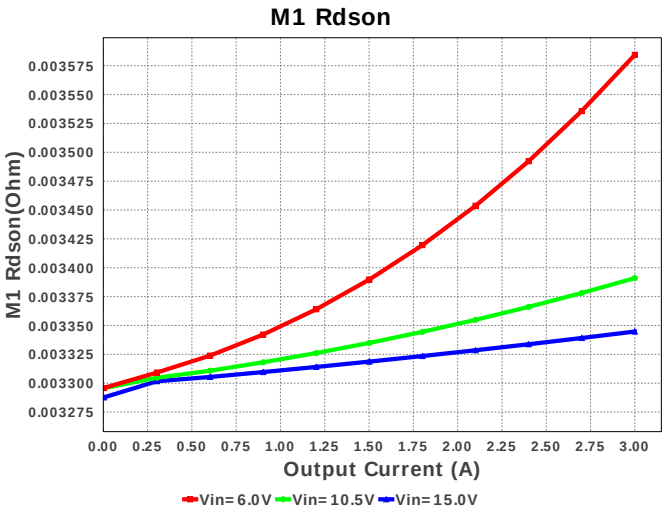


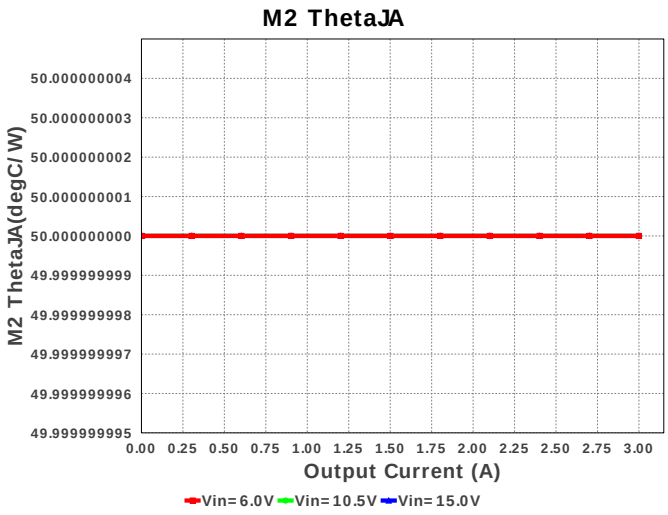


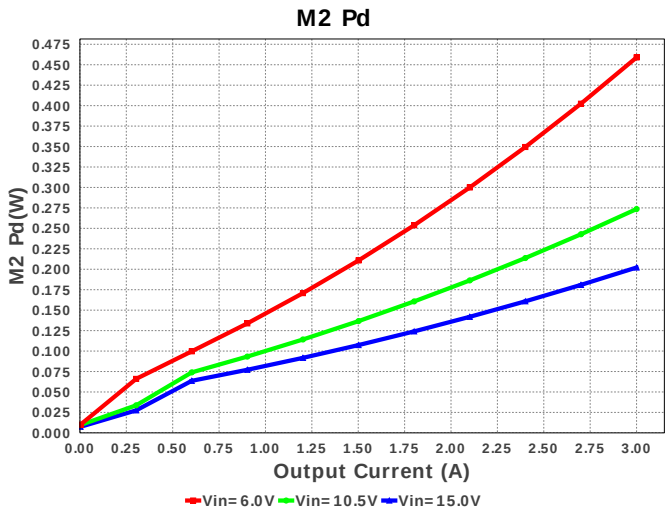


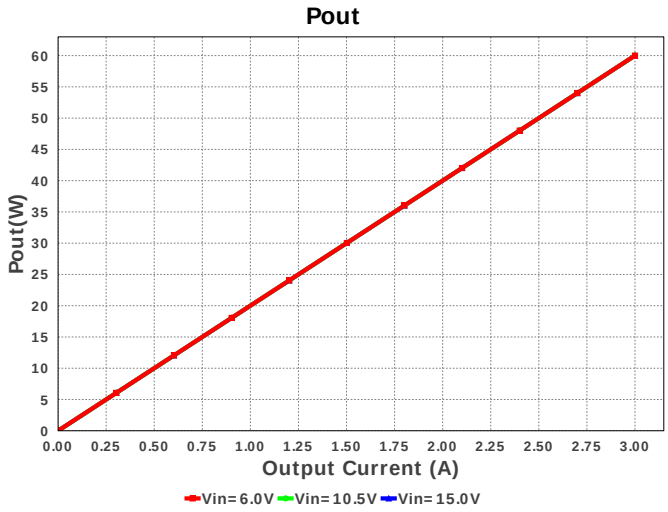


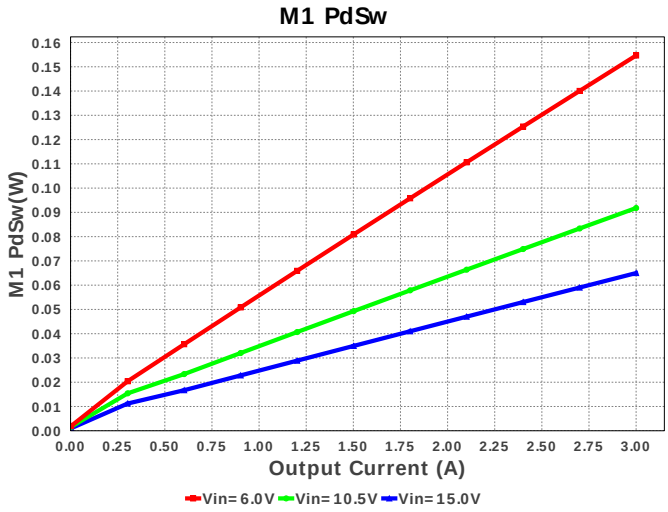


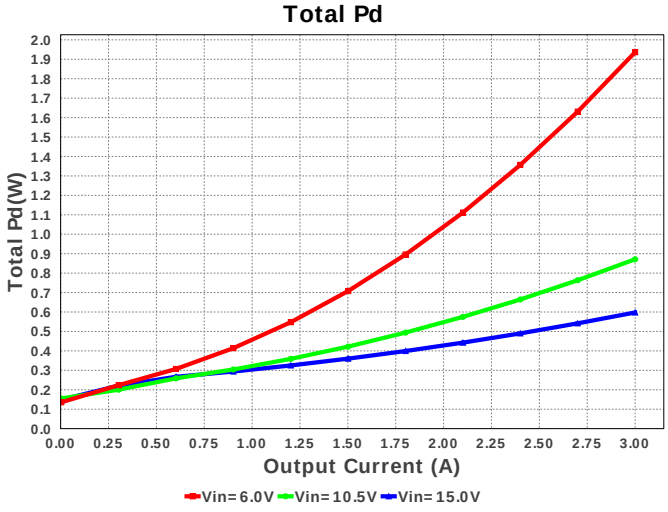


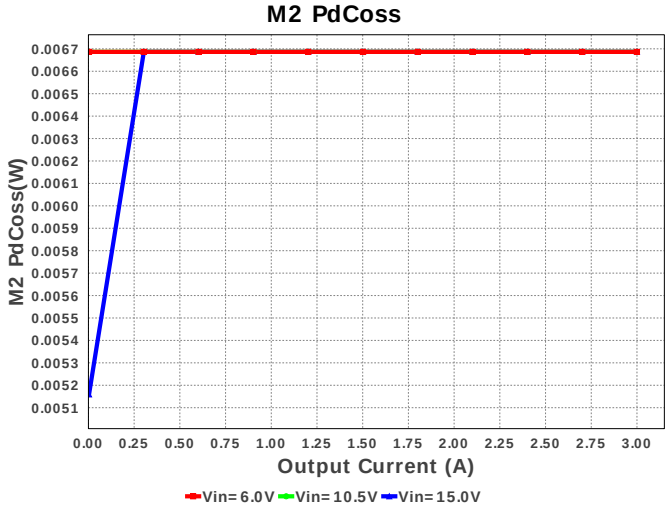


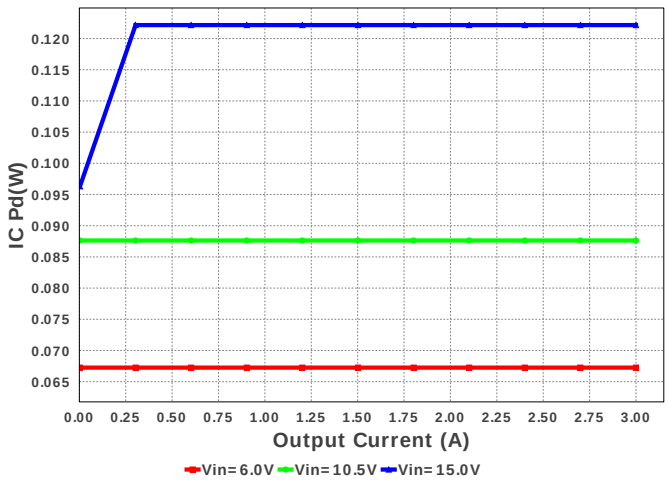


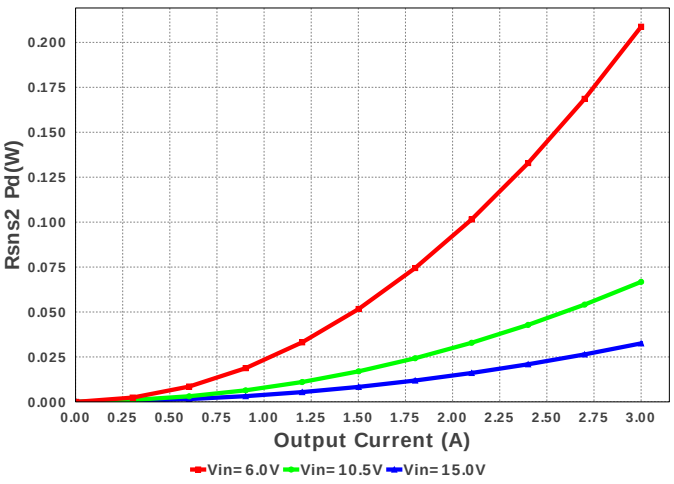


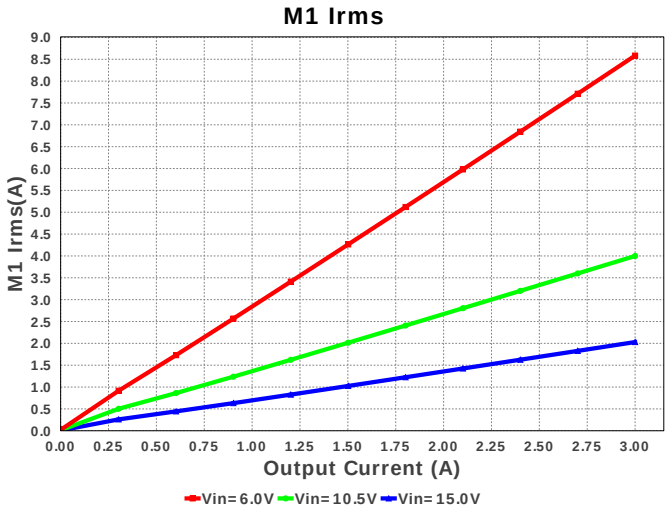


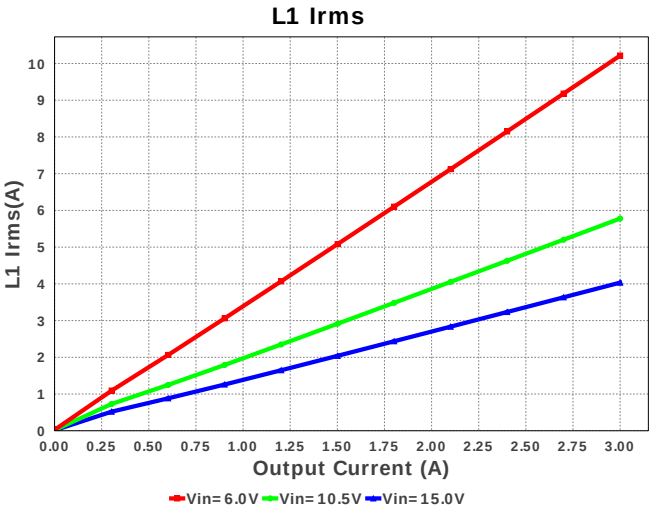


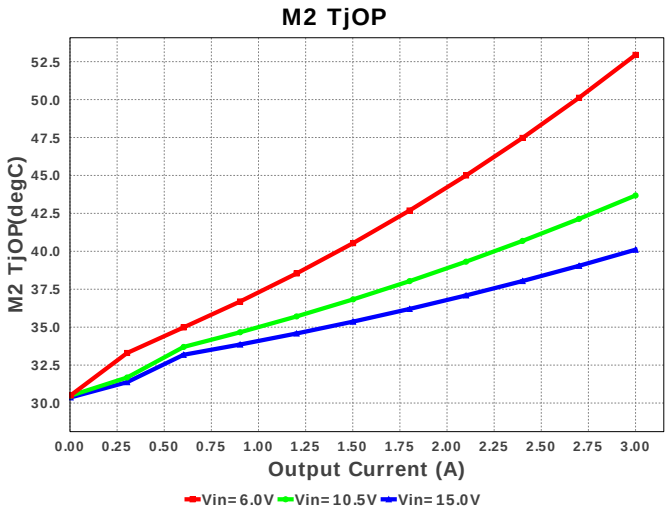


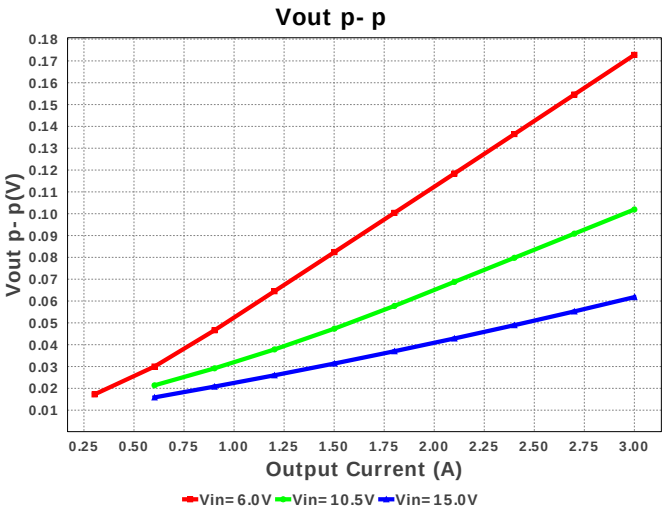


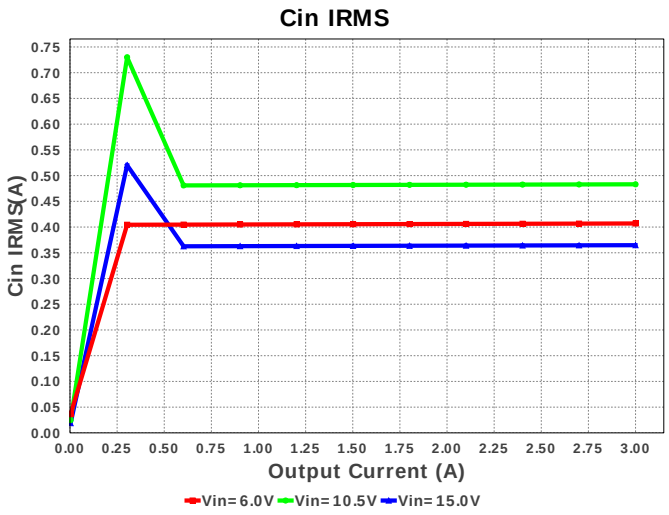


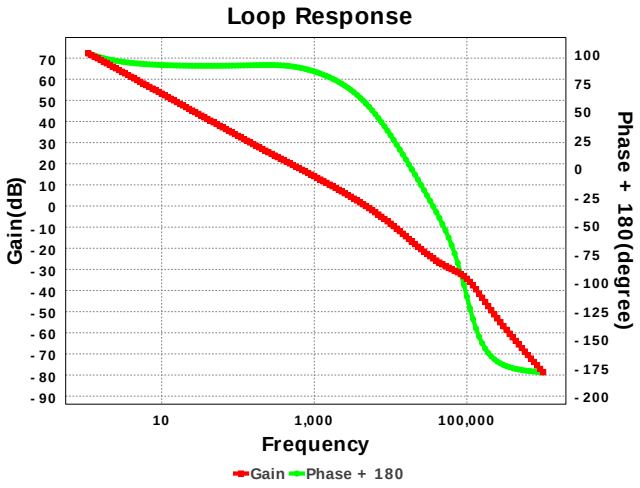












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	406.955 mA	Current	Input capacitor RMS ripple current
2.	Iin Avg	10.323 A	Current	Average input current
3.	L Ipp	1.41 A	Current	Peak-to-peak inductor ripple current
4.	L1 Irms	10.215 A	Current	Inductor ripple current
5.	M1 Irms	8.584 A	Current	MOSFET RMS ripple current
6.	M2 Irms	5.538 A	Current	MOSFET RMS ripple current
7.	BOM Count	28	General	Total Design BOM count
8.	FootPrint	1.523 k mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	200.348 kHz	General	Switching frequency
10.	M1 Rdson	3.584 mOhm	General	Drain-Source On-resistance
11.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
12.	M2 Rdson	3.579 mOhm	General	Drain-Source On-resistance
13.	M2 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
14.	Pout	60.0 W	General	Total output power
15.	Total BOM	$8.69	General	Total BOM Cost
16.	Low Freq Gain	66.72 dB	Op_Point	Gain at 10Hz
17.	Vout Actual	19.964 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
18.	Vout OP	20.0 V	Op_Point	Operational Output Voltage
19.	Cross Freq	2.021 kHz	Op_point	Bode plot crossover frequency
20.	Duty Cycle	70.609 %	Op_point	Duty cycle
21.	Efficiency	96.874 %	Op_point	Steady state efficiency
22.	Gain Marg	-9.66 dB	Op_point	Bode Plot Gain Margin
23.	IC Tj	34.418 degC	Op_point	IC junction temperature
24.	ICThetaJA	65.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	3.0 A	Op_point	Iout operating point
26.	M1 TjOP	56.282 degC	Op_point	M1 MOSFET junction temperature
27.	M2 TjOP	52.943 degC	Op_point	MOSFET junction temperature
28.	Phase Marg	57.024 deg	Op_point	Bode Plot Phase Margin
29.	VIN_OP	6.0 V	Op_point	Vin operating point
30.	Vout p-p	172.768 mV	Op_point	Peak-to-peak output ripple voltage
31.	Cin Pd	64.506 µW	Power	Input capacitor power dissipation
32.	Cout Pd	216.692 mW	Power	Output capacitor power dissipation
33.	IC Pd	67.251 mW	Power	IC power dissipation
34.	L Pd	247.845 mW	Power	Inductor power dissipation
35.	M1 Pd	525.63 mW	Power	MOSFET power dissipation
36.	M1 PdCond	316.939 mW	Power	M1 MOSFET conduction losses
37.	M1 PdCoss	54.043 mW	Power	M1 MOSFET Coss Losses
38.	M1 PdQrr	0.0 W	Power	M1 MOSFET switching losses
39.	M1 PdSw	154.649 mW	Power	M1 MOSFET switching losses
40.	M2 Pd	458.86 mW	Power	MOSFET power dissipation
41.	M2 PdCond	142.707 mW	Power	M2 MOSFET conduction losses
42.	M2 PdCoss	6.686 mW	Power	M2 MOSFET Coss Losses
43.	M2 PdQrr	32.8 mW	Power	Synchronous Boost High Side Reverse Recovery
44.	M2 PdSw	10.812 mW	Power	M2 MOSFET switching losses
45.	M2 Pdbody	265.854 mW	Power	Power dissipation through lower FET
46.	Rsns1 Pd	208.712 mW	Power	Rsns1 Power Dissipation
47.	Rsns2 Pd	208.712 mW	Power	Rsns2 Power Dissipation
48.	Total Pd	1.936 W	Power	Total Power Dissipation
49.	Vout Tolerance	2.141 %		Vout Tolerance based on IC Tolerance and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	3.0	Maximum Output Current
2.	VinMax	15.0	Maximum input voltage
3.	VinMin	6.0	Minimum input voltage
4.	Vout	20.0	Output Voltage
5.	base_pn	TPS43060	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. Feature Highlights: Low Quiescent Current Boost Controller, Wide Vin Range 4.5V to 38V Vin, 58V Vout, 7.5V Gate Drive optimized for standard MOSFET Thresholds Thermal Shutdown

2. **TPS43060** Product Folder : http://www.ti.com/product/TPS43060 : contains the data sheet and other resources.