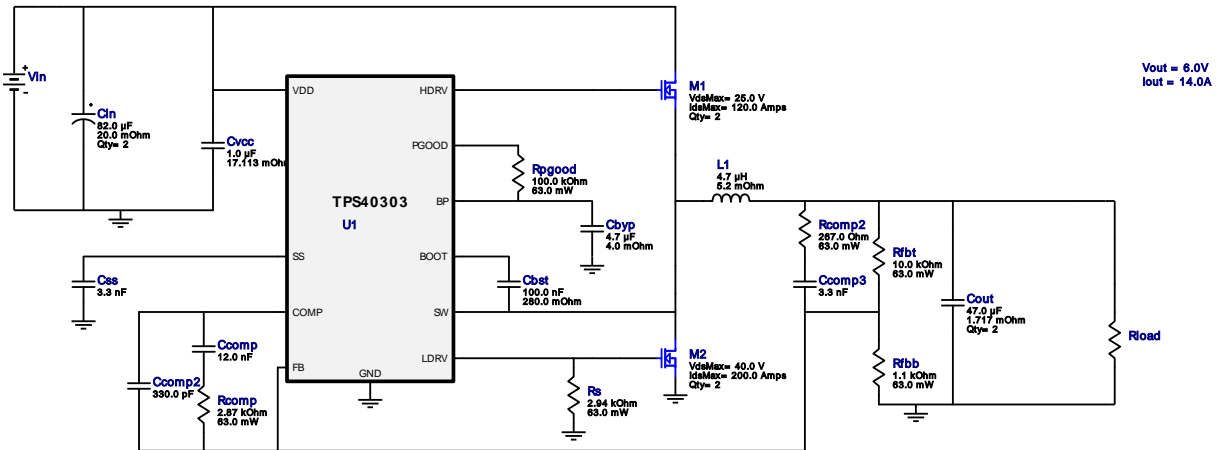


WEBENCH® Design Report

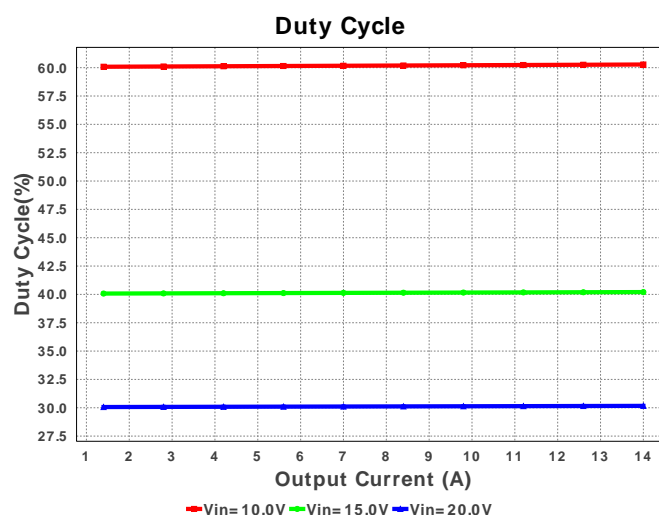
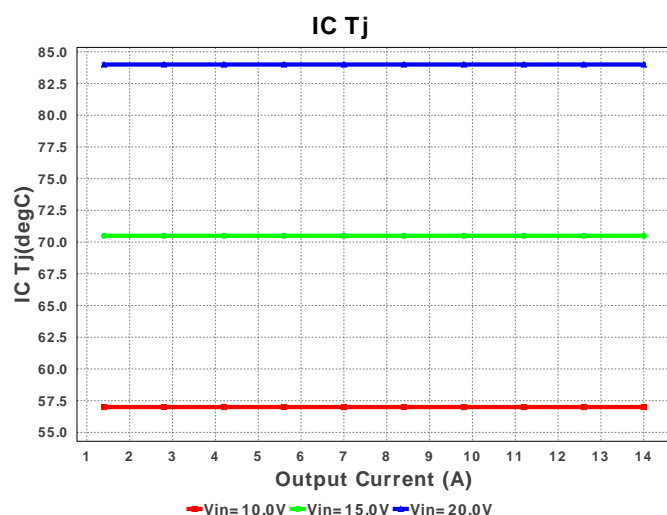
Design : 4613839/6 TPS40303DRCR
TPS40303DRCR 10.0V-20.0V to 6.00V @ 14.0A



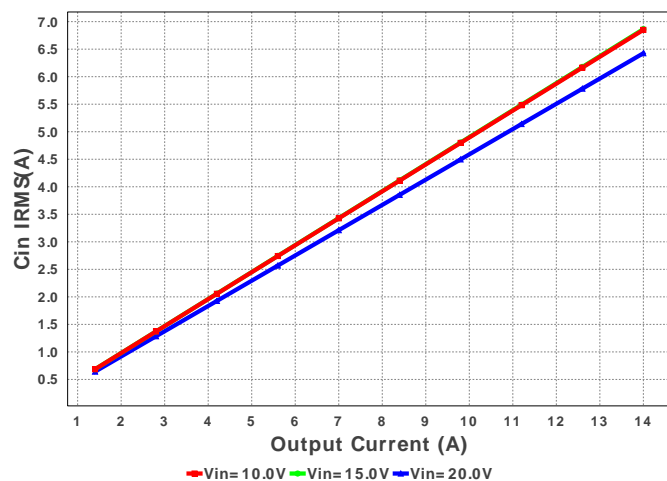
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	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
2.	Cbyp	Kemet	C0805C475K8PACTU Series= X5R	Cap= 4.7 uF ESR= 4.0 mOhm VDC= 10.0 V IRMS= 9.89 A	1	\$0.03	0805 7 mm ²
3.	Ccomp	MuRata	GRM033C80J123KE01D Series= X6S	Cap= 12.0 nF VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	0201 2 mm ²
4.	Ccomp2	Samsung Electro-Mechanics	CL21C331JBANFNC Series= C0G/NP0	Cap= 330.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
5.	Ccomp3	MuRata	GRM216R71E332KA01D Series= X7R	Cap= 3.3 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
6.	Cin	Panasonic	35SVPF82M Series= SVPF	Cap= 82.0 uF ESR= 20.0 mOhm VDC= 35.0 V IRMS= 4.0 A	2	\$0.61	CAPSMT_62_E12 106 mm ²
7.	Cout	TDK	C3216JB1A476M Series= JB	Cap= 47.0 uF ESR= 1.717 mOhm VDC= 10.0 V IRMS= 0.0 A	2	\$0.34	1206 11 mm ²
8.	Css	MuRata	GRM033R61A332KA01D Series= X5R	Cap= 3.3 nF VDC= 10.0 V IRMS= 0.0 A	1	\$0.01	0201 2 mm ²
9.	Cvcc	MuRata	GRM188R61E105KA12D Series= X5R	Cap= 1.0 uF ESR= 17.113 mOhm VDC= 25.0 V IRMS= 979.39 mA	1	\$0.01	0603 5 mm ²

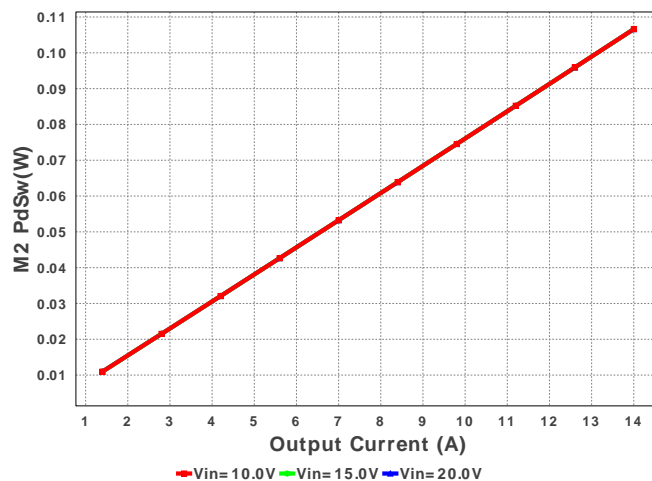
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	L1	Coilcraft	XAL1010-472MEB	L= 4.7 μ H DCR= 5.2 mOhm	1	\$1.71	 XAL1010 160 mm ²
11.	M1	Texas Instruments	CSD16323Q3	VdsMax= 25.0 V IdsMax= 120.0 Amps	2	\$0.44	 TRANS_NexFET_Q3 18 mm ²
12.	M2	Texas Instruments	CSD18501Q5A	VdsMax= 40.0 V IdsMax= 200.0 Amps	2	\$0.90	 TRANS_NexFET_Q5A 55 mm ²
13.	Rcomp	Vishay-Dale	CRCW04022K87FKED Series= CRCW..e3	Res= 2.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rcomp2	Vishay-Dale	CRCW0402267RFKED Series= CRCW..e3	Res= 267.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Rfbb	Vishay-Dale	CRCW04021K10FKED Series= CRCW..e3	Res= 1.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rs	Vishay-Dale	CRCW04022K94FKED Series= CRCW..e3	Res= 2.94 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	U1	Texas Instruments	TPS40303DRCR	Switcher	1	\$0.95	 S-PVSON-N10 17 mm ²



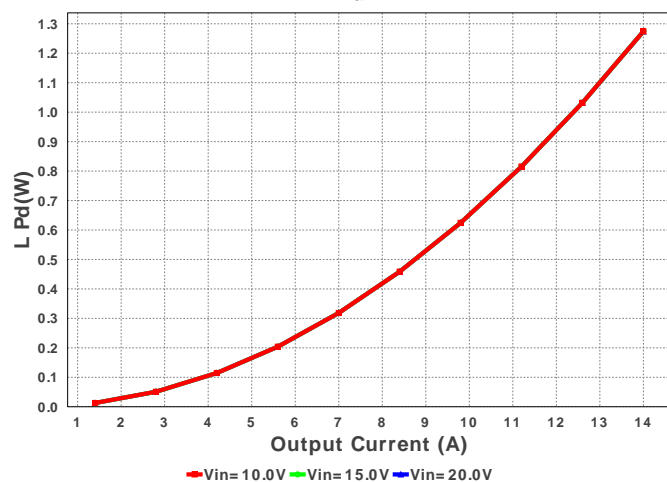
Cin IRMS



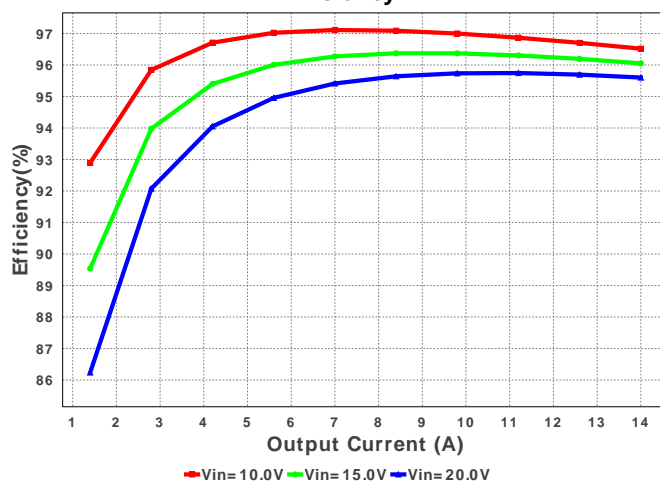
M2 PdSw



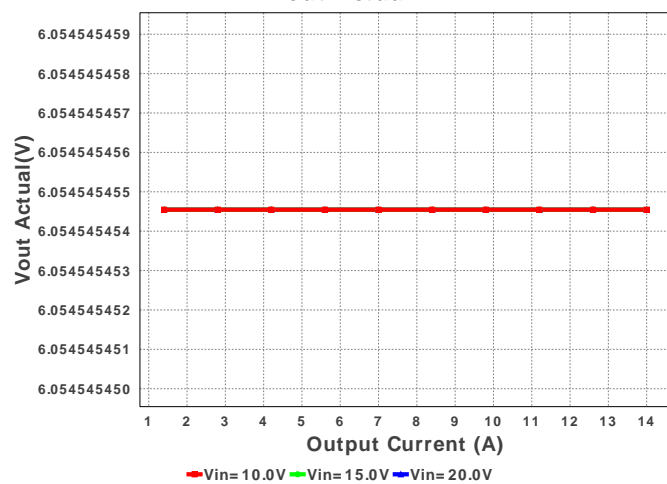
L Pd



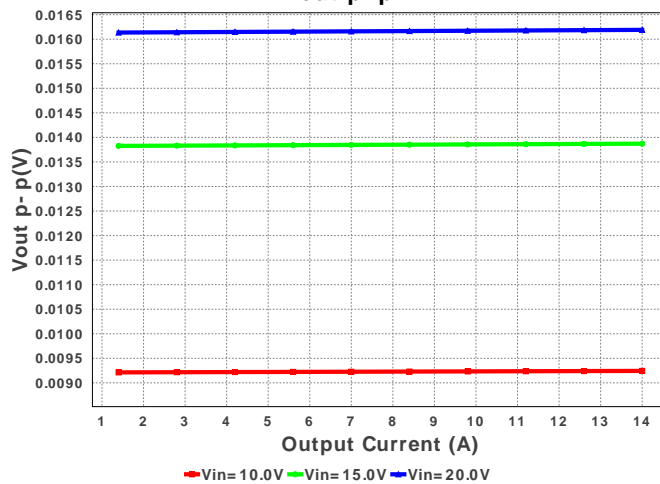
Efficiency



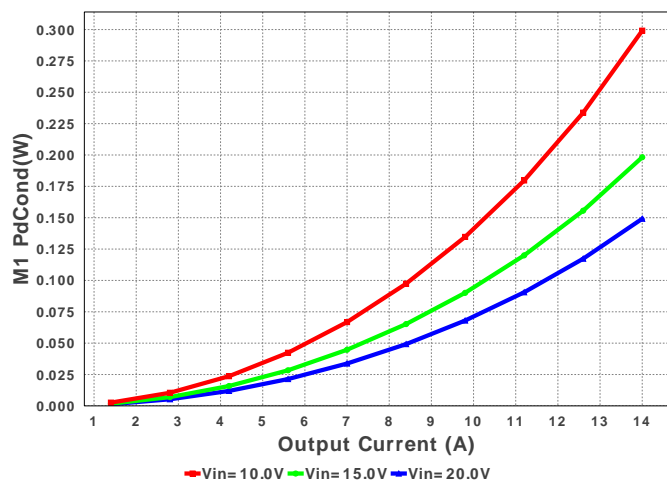
Vout Actual



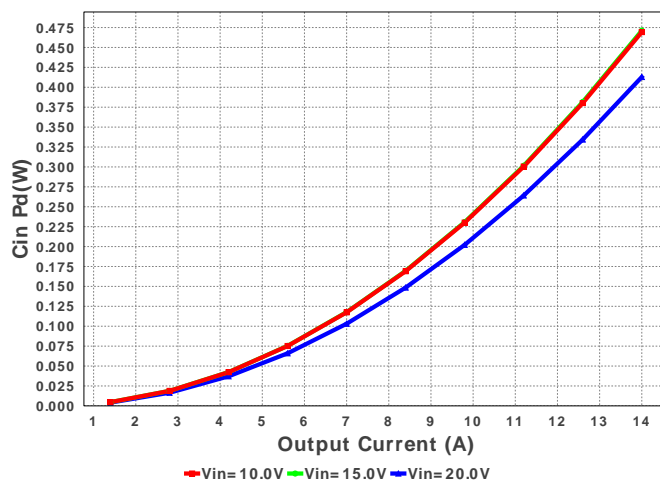
Vout p-p



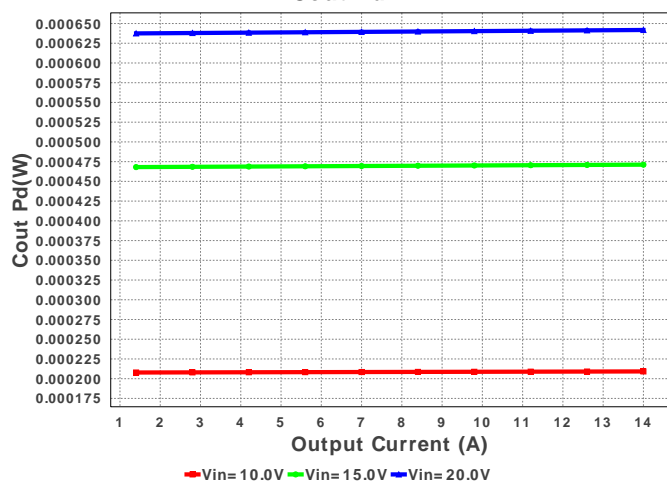
M1 PdCond



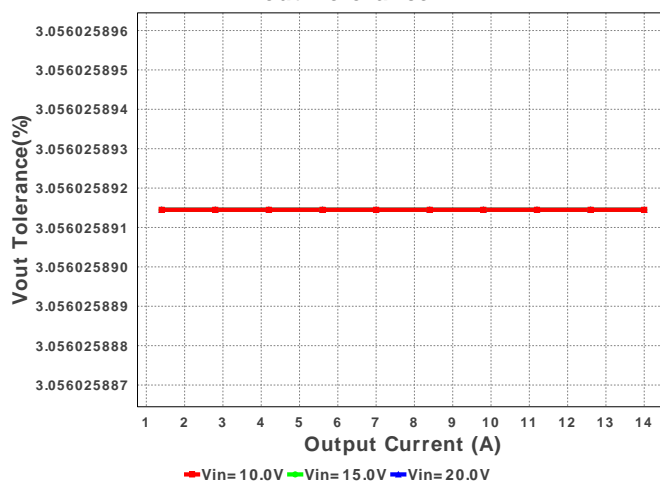
Cin Pd



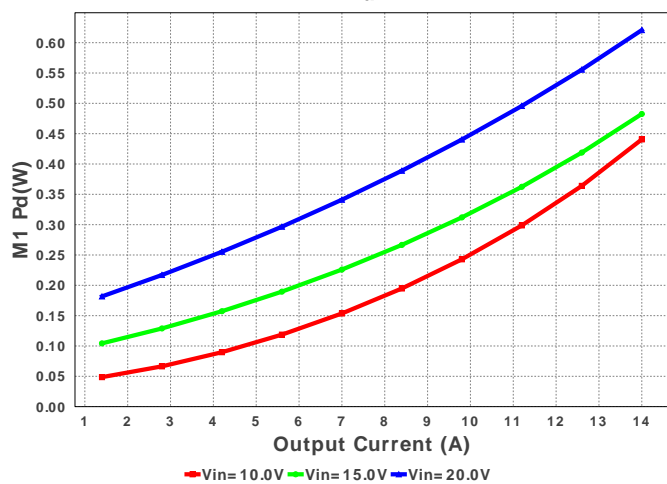
Cout Pd



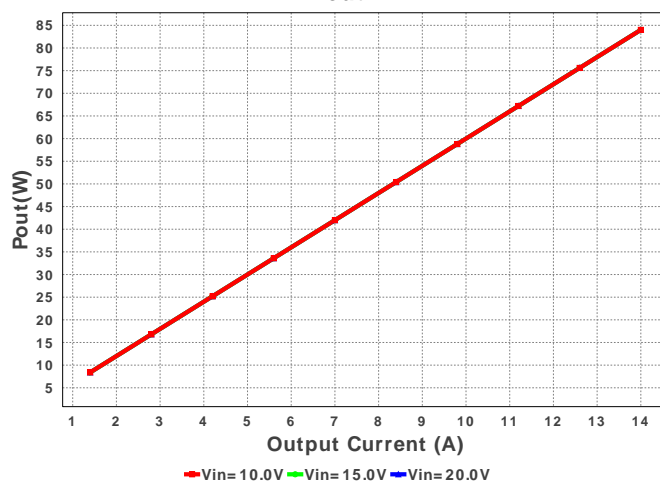
Vout Tolerance

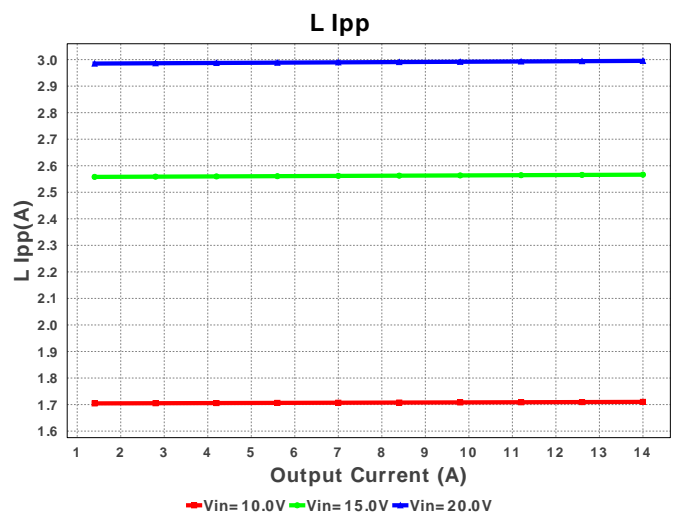
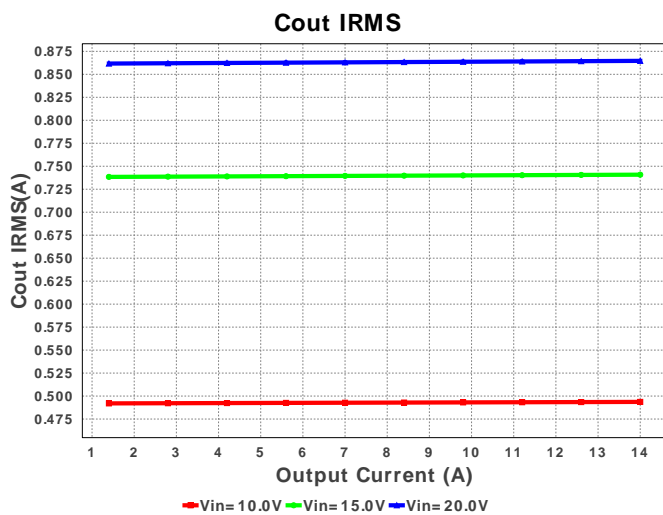
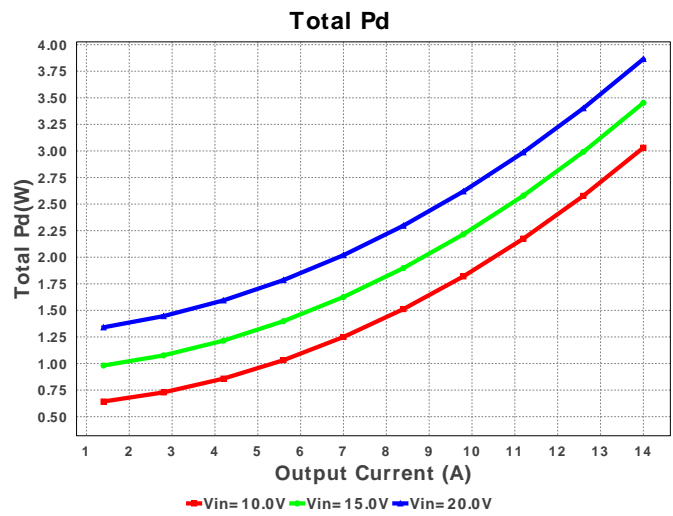
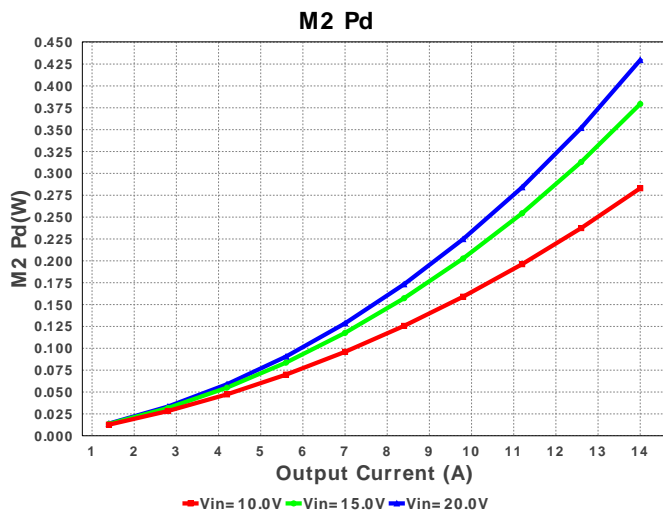
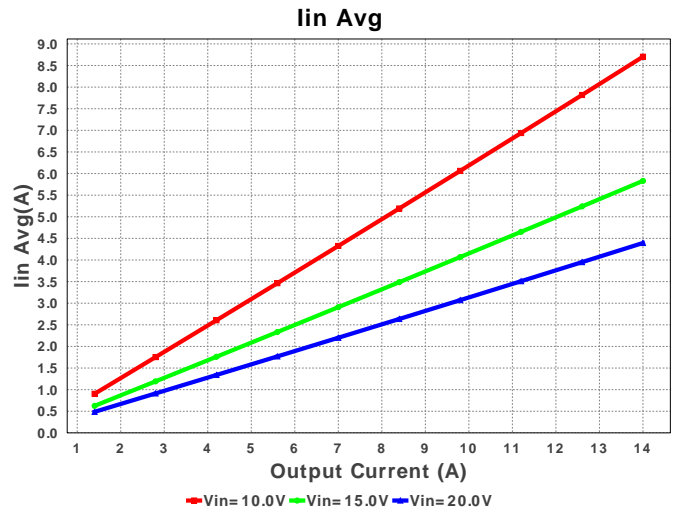
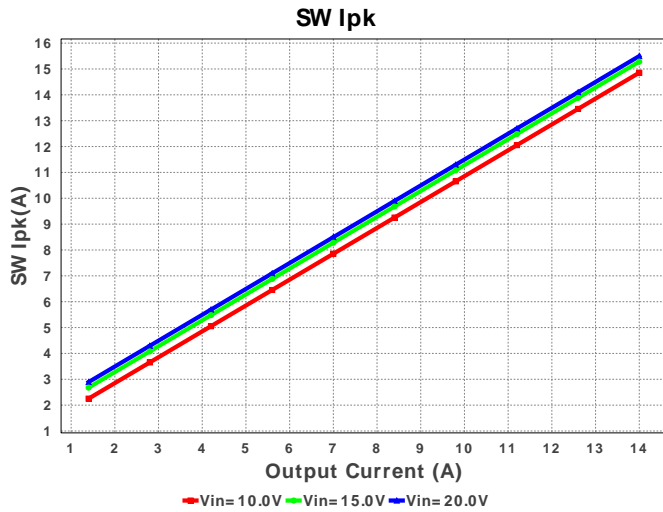


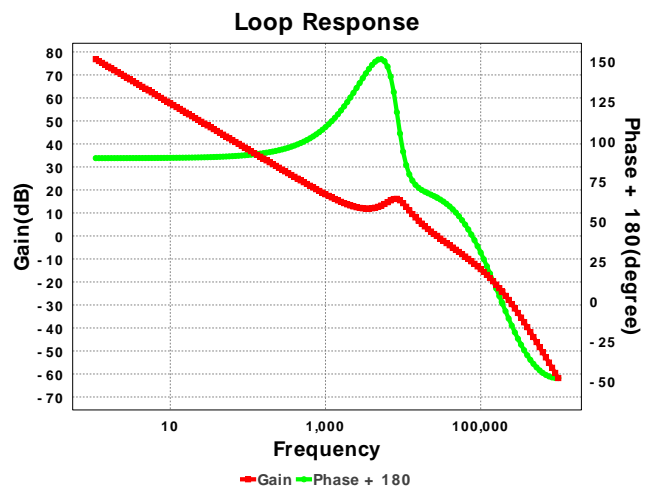
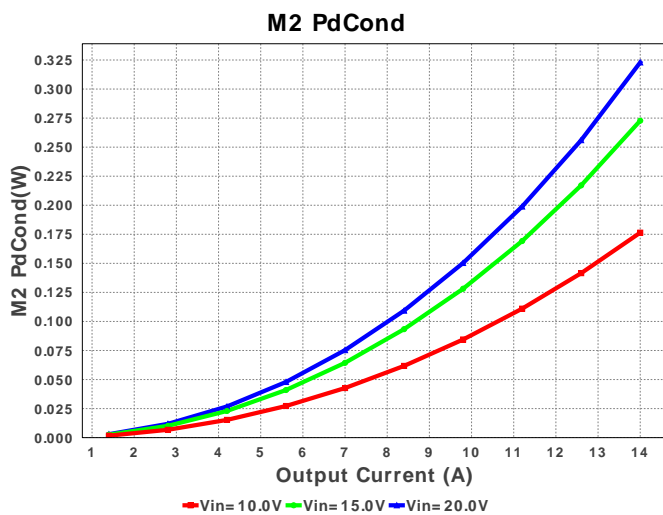
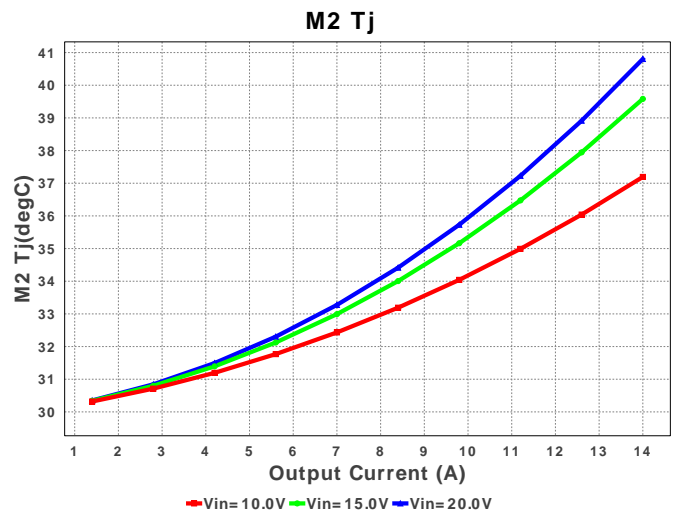
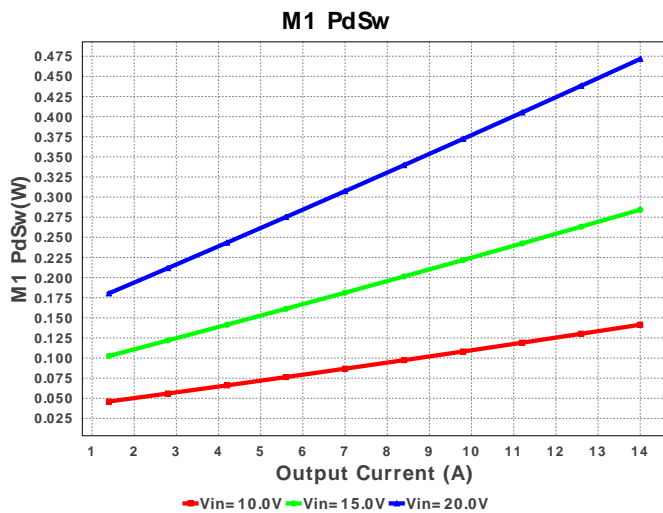
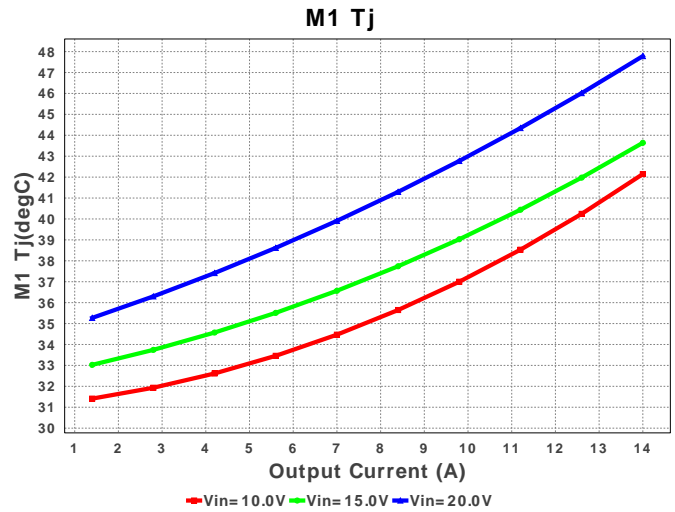
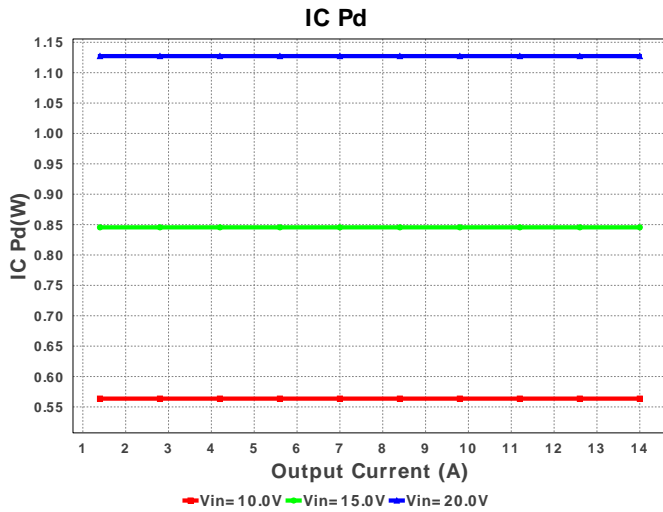
M1 Pd



Pout







Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	6.426 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	864.633 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	4.392 A	Current	Average input current
4.	L Ipp	2.995 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	15.498 A	Current	Peak switch current
6.	BOM Count	23	General	Total Design BOM count
7.	FootPrint	612.0 mm ²	General	Total Foot Print Area of BOM components
8.	Frequency	300.0 kHz	General	Switching frequency
9.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
10.	Pout	84.0 W	General	Total output power
11.	Total BOM	\$7.39	General	Total BOM Cost

#	Name	Value	Category	Description
12.	Low Freq Gain	76.875 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	6.055 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Cross Freq	27.154 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	30.166 %	Op_point	Duty cycle
16.	Efficiency	95.618 %	Op_point	Steady state efficiency
17.	Gain Marg	-23.967 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	83.997 degC	Op_point	IC junction temperature
19.	IOUT_OP	14.0 A	Op_point	Iout operating point
20.	M1 Tj	47.785 degC	Op_point	M1 MOSFET junction temperature
21.	M2 Tj	40.804 degC	Op_point	M2 MOSFET junction temperature
22.	Phase Marg	65.227 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	20.0 V	Op_point	Vin operating point
24.	Vout p-p	16.19 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	412.894 mW	Power	Input capacitor power dissipation
26.	Cout Pd	641.807 μ W	Power	Output capacitor power dissipation
27.	IC Pd	1.127 W	Power	IC power dissipation
28.	L Pd	1.274 W	Power	Inductor power dissipation
29.	M1 Pd	613.415 mW	Power	M1 MOSFET total power dissipation
30.	M1 PdCond	141.833 mW	Power	M1 MOSFET conduction losses
31.	M1 PdSw	471.581 mW	Power	M1 MOSFET switching losses
32.	M2 Pd	421.504 mW	Power	M2 MOSFET total power dissipation
33.	M2 PdCond	314.892 mW	Power	M2 MOSFET conduction losses
34.	M2 PdSw	106.612 mW	Power	M2 MOSFET switching losses
35.	Total Pd	3.85 W	Power	Total Power Dissipation
36.	Vout Tolerance	3.056 %	Unknown	Vout Tolerance based on IC Tolerance and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	14.0	Maximum Output Current
2.	VinMax	20.0	Maximum input voltage
3.	VinMin	10.0	Minimum input voltage
4.	Vout	6.0	Output Voltage
5.	base_pn	TPS40303	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS40303** Product Folder : <http://www.ti.com/product/TPS40303> : contains the data sheet and other resources.

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