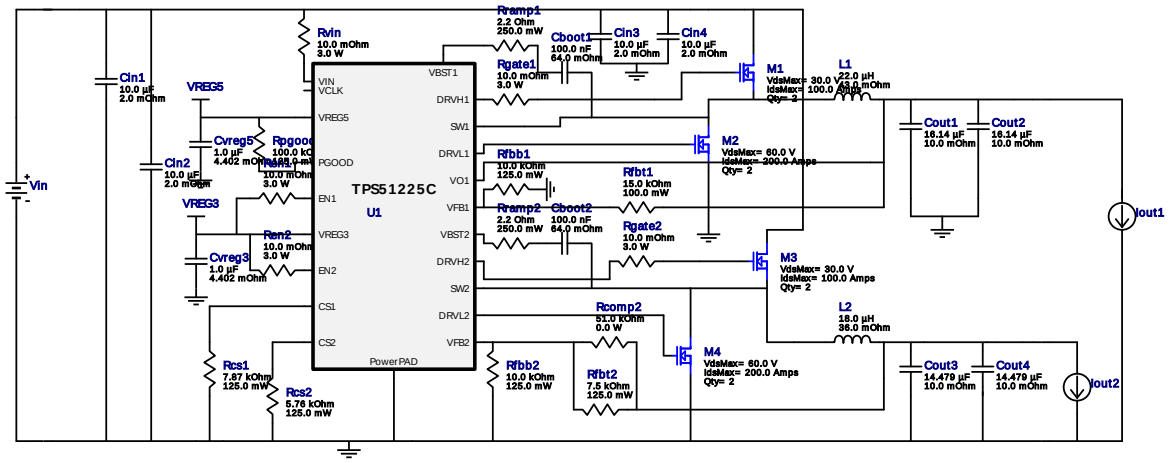
WEBENCH® Design Report

VinMin = 6.0V
VinMax = 22.0V
Vout = 5.0V
Iout = 2.0A

Device = TPS51225CRUKR
Topology = Buck
Created = 10/3/16 10:55:26 AM
BOM Cost = £0.00
BOM Count = 38
Total Pd = 0.31W

Design : 4116161/38 TPS51225CRUKR
TPS51225CRUKR 6.0V-22.0V to 5.00V @ 2.0A

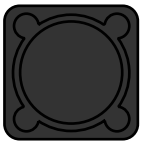
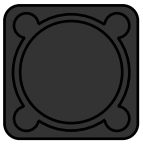


My Comments

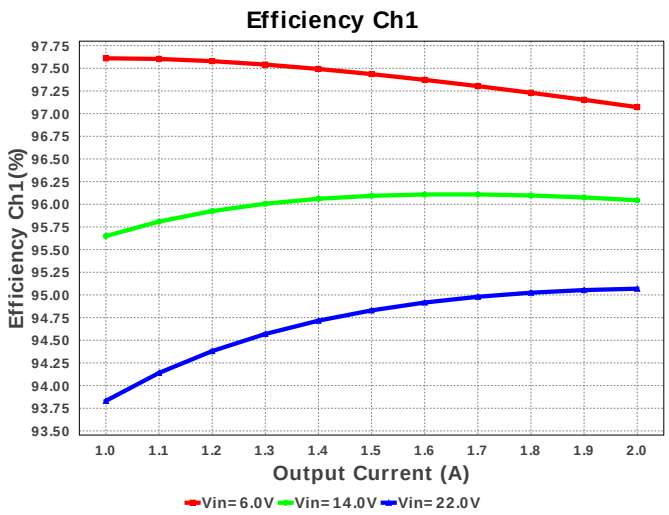
Efficiency: 92% Vin: 6..22V (8V typ) Vout1: 5V, 2A Vout2: 3.3V, 1.5A

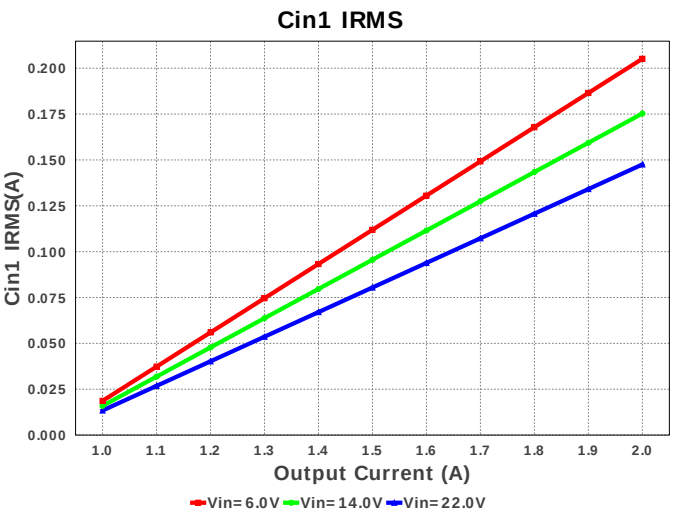
Electrical BOM

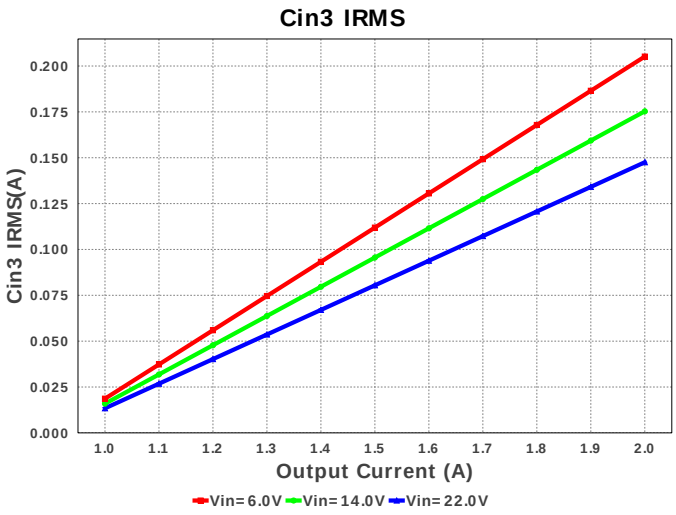
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot1	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	£0.01	0805 7 mm^2
2.	Cboot2	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	£0.01	0805 7 mm^2
3.	Cin1	CUSTOM	CUSTOM Series= ?	Cap= 10.0 uF ESR= 2.0 mOhm VDC= 24.2 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2
4.	Cin2	CUSTOM	CUSTOM Series= ?	Cap= 10.0 uF ESR= 2.0 mOhm VDC= 24.2 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2
5.	Cin3	CUSTOM	CUSTOM Series= ?	Cap= 10.0 uF ESR= 2.0 mOhm VDC= 24.2 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2
6.	Cin4	CUSTOM	CUSTOM Series= ?	Cap= 10.0 uF ESR= 2.0 mOhm VDC= 24.2 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2
7.	Cout1	CUSTOM	CUSTOM Series= ?	Cap= 16.14 uF ESR= 10.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2
8.	Cout2	CUSTOM	CUSTOM Series= ?	Cap= 16.14 uF ESR= 10.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm^2

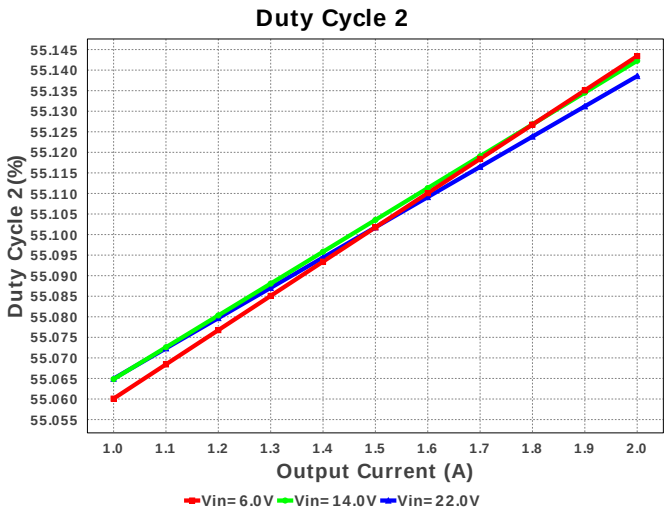
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cout3	CUSTOM	CUSTOM Series= ?	Cap= 14.479 uF ESR= 10.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm²
10.	Cout4	CUSTOM	CUSTOM Series= ?	Cap= 14.479 uF ESR= 10.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	NA	CUSTOM 0 mm²
11.	Cvreg3	MuRata	GRM21BR71H105KA12L Series= X7R	Cap= 1.0 uF ESR= 4.402 mOhm VDC= 50.0 V IRMS= 1.677 A	1	£0.09	0805 7 mm²
12.	Cvreg5	MuRata	GRM21BR71H105KA12L Series= X7R	Cap= 1.0 uF ESR= 4.402 mOhm VDC= 50.0 V IRMS= 1.677 A	1	£0.09	0805 7 mm²
13.	L1	Bourns	SRR1260-220M	L= 22.0 µH DCR= 43.0 mOhm	1	£0.47	 SRR1260 210 mm²
14.	L2	Bourns	SRR1260-180M	L= 18.0 µH DCR= 36.0 mOhm	1	£0.44	 SRR1260 210 mm²
15.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 100.0 Amps	2	£0.26	 DQG0008A 18 mm²
16.	M2	Texas Instruments	CSD18531Q5A	VdsMax= 60.0 V IdsMax= 200.0 Amps	2	£0.65	 TRANS_NexFET_Q5A 55 mm²
17.	M3	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 100.0 Amps	2	£0.26	 DQG0008A 18 mm²
18.	M4	Texas Instruments	CSD18531Q5A	VdsMax= 60.0 V IdsMax= 200.0 Amps	2	£0.65	 TRANS_NexFET_Q5A 55 mm²
19.	Rcomp2	CUSTOM	CUSTOM Series= ?	Res= 51.0 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
20.	Rcs1	Vishay-Dale	CRCW08057K87FKEA Series= CRCW..e3	Res= 7.87 kOhm Power= 125.0 mW Tolerance= 1.0%	1	£0.01	0805 7 mm²
21.	Rcs2	Vishay-Dale	CRCW08055K76FKEA Series= CRCW..e3	Res= 5.76 kOhm Power= 125.0 mW Tolerance= 1.0%	1	£0.01	0805 7 mm²
22.	Ren1	Bourns	CRA2512-FZ-R010ELF Series= CRA	Res= 10.0 mOhm Power= 3.0 W Tolerance= 1.0%	1	£0.16	 2512 43 mm²
23.	Ren2	Bourns	CRA2512-FZ-R010ELF Series= CRA	Res= 10.0 mOhm Power= 3.0 W Tolerance= 1.0%	1	£0.16	 2512 43 mm²
24.	Rfbb1	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	£0.01	0805 7 mm²

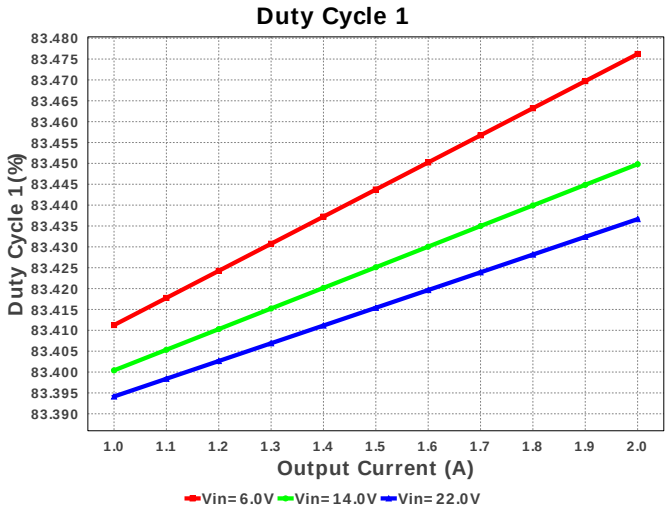
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25.	Rfbb2	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	£0.01	0805 7 mm²
26.	Rfbt1	Susumu Co Ltd	RR1220P-153-D Series= RR12	Res= 15.0 kOhm Power= 100.0 mW Tolerance= 0.5%	1	£0.01	0805 7 mm²
27.	Rfbt2	Vishay-Dale	CRCW08057K50FKEA Series= CRCW..e3	Res= 7.5 kOhm Power= 125.0 mW Tolerance= 1.0%	1	£0.02	0805 7 mm²
28.	Rgate1	Bourns	CRA2512-FZ-R010ELF Series= CRA	Res= 10.0 mOhm Power= 3.0 W Tolerance= 1.0%	1	£0.16	2512 43 mm²
29.	Rgate2	Bourns	CRA2512-FZ-R010ELF Series= CRA	Res= 10.0 mOhm Power= 3.0 W Tolerance= 1.0%	1	£0.16	2512 43 mm²
30.	Rpgood	Vishay-Dale	CRCW0805100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	£0.01	0805 7 mm²
31.	Rramp1	Yageo America	RC1206FR-072R2L Series= ?	Res= 2.2 Ohm Power= 250.0 mW Tolerance= 1.0%	1	£0.01	1206 11 mm²
32.	Rramp2	Yageo America	RC1206FR-072R2L Series= ?	Res= 2.2 Ohm Power= 250.0 mW Tolerance= 1.0%	1	£0.01	1206 11 mm²
33.	Rvin	Bourns	CRA2512-FZ-R010ELF Series= CRA	Res= 10.0 mOhm Power= 3.0 W Tolerance= 1.0%	1	£0.16	2512 43 mm²
34.	U1	Texas Instruments	TPS51225CRUKR	Switcher	1	£1.05	RUK0020B 16 mm²

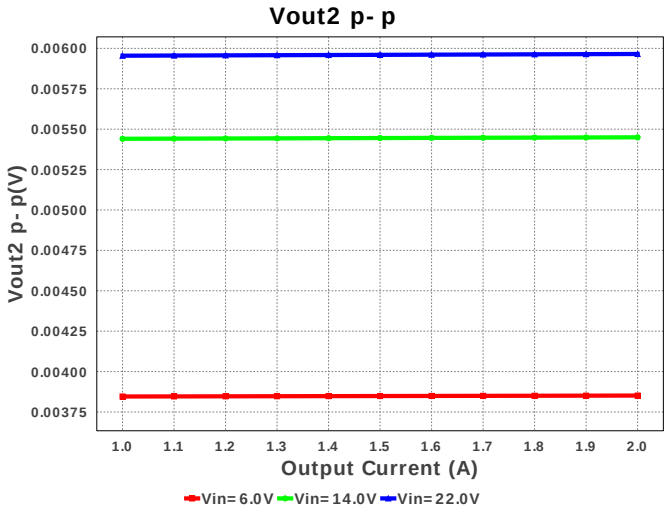


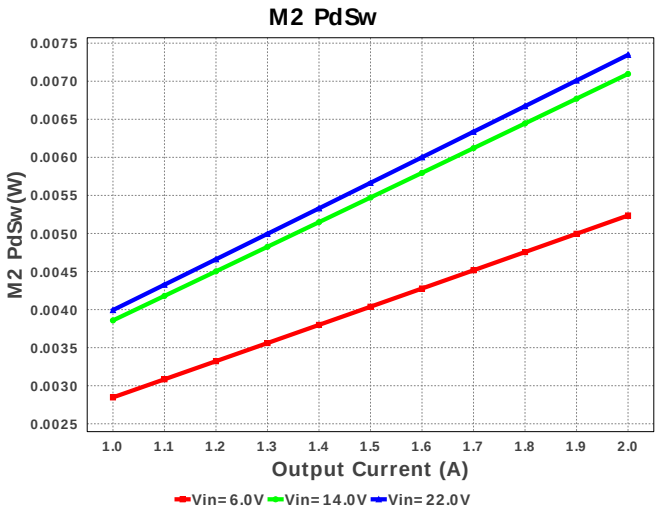


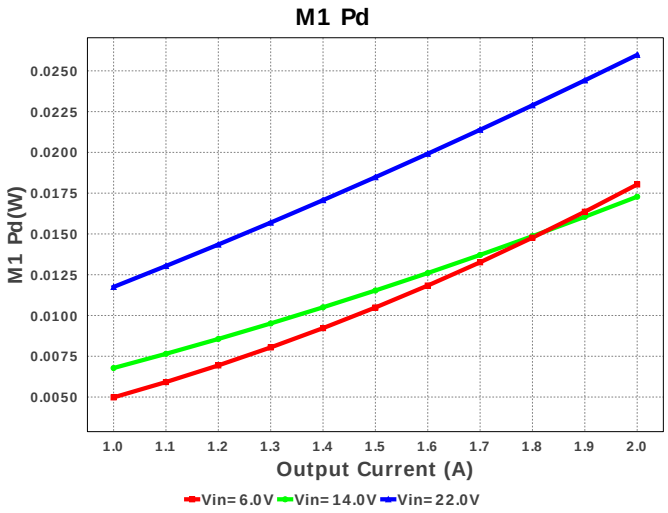


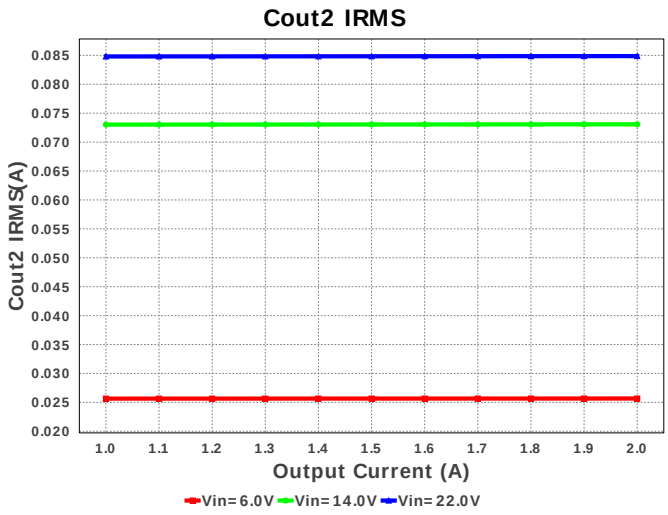


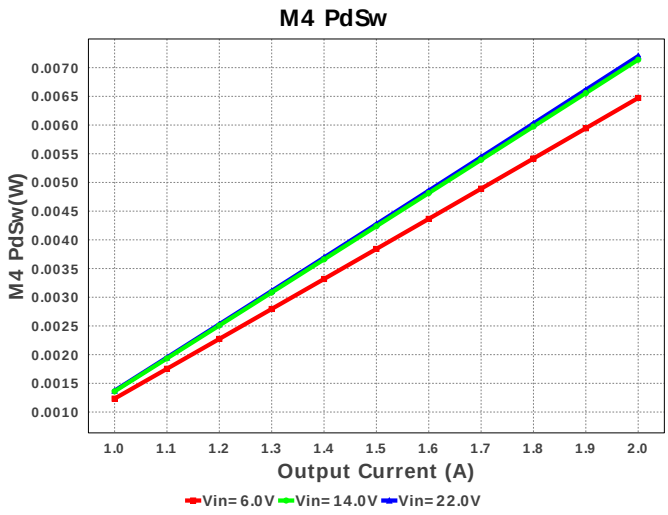


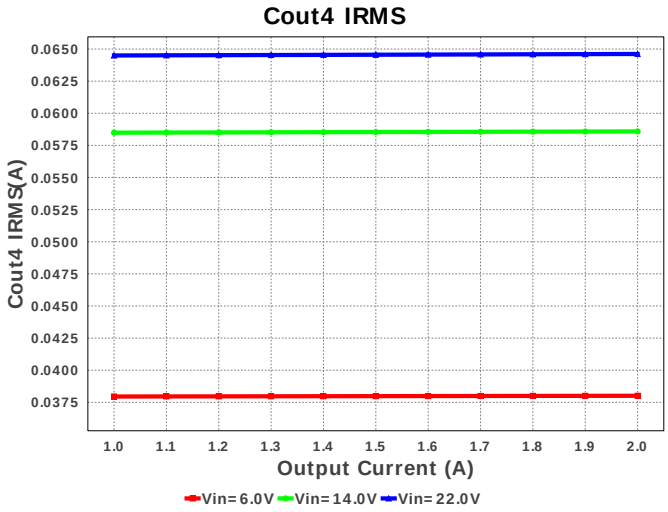


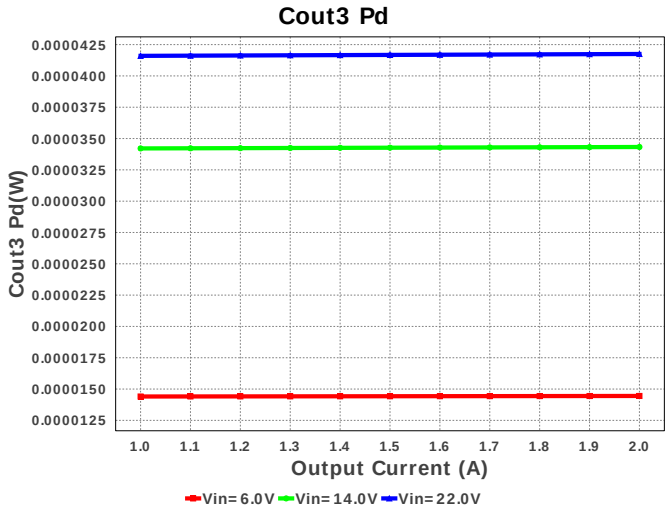


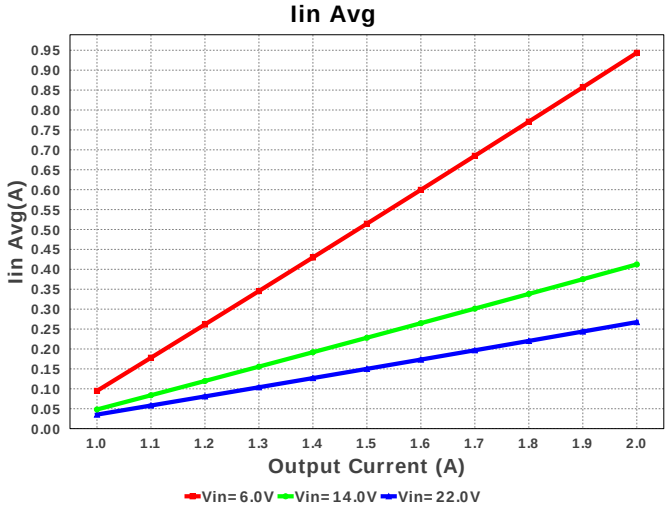


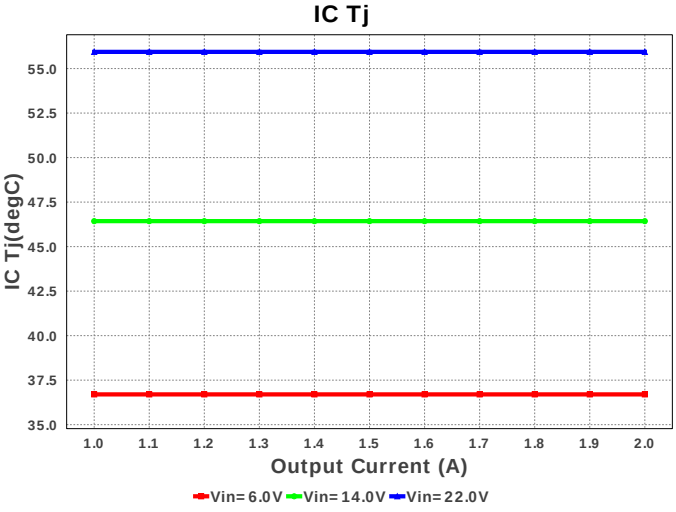


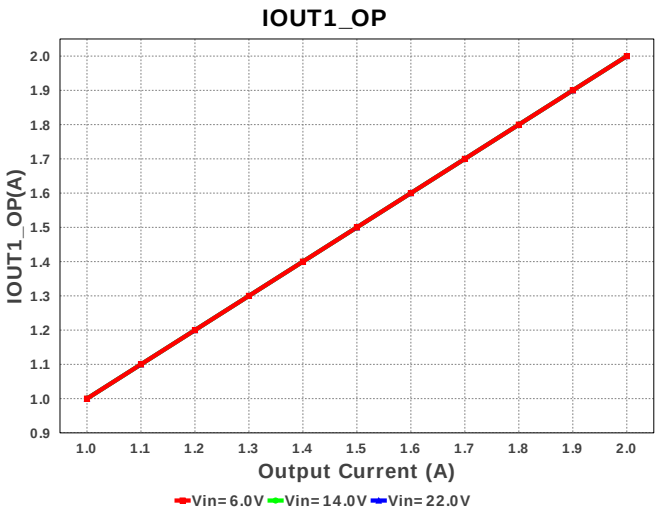


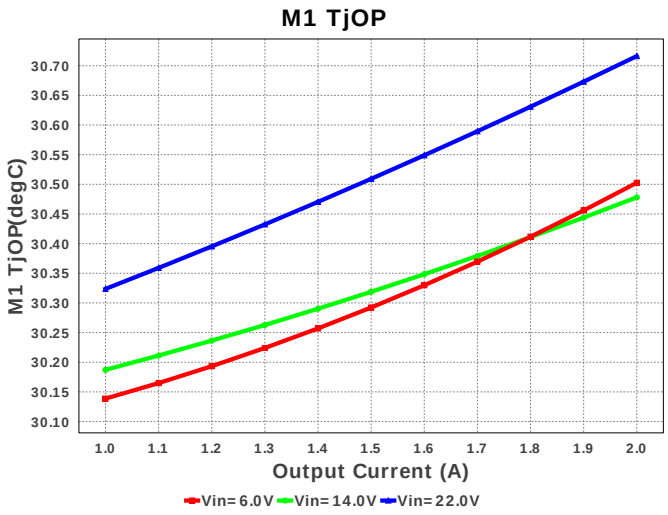


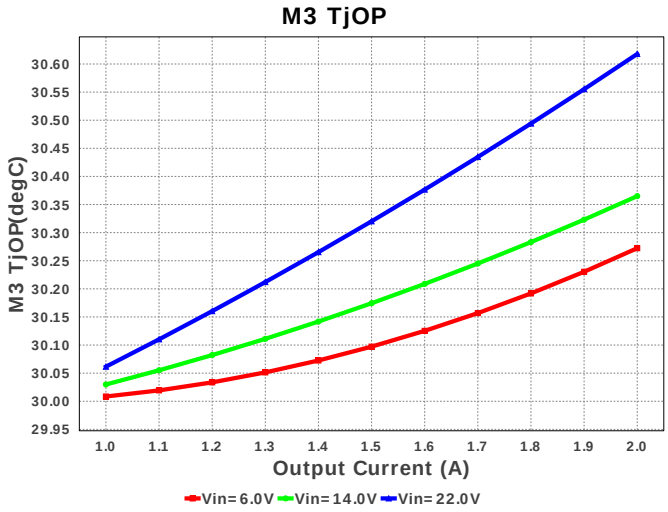


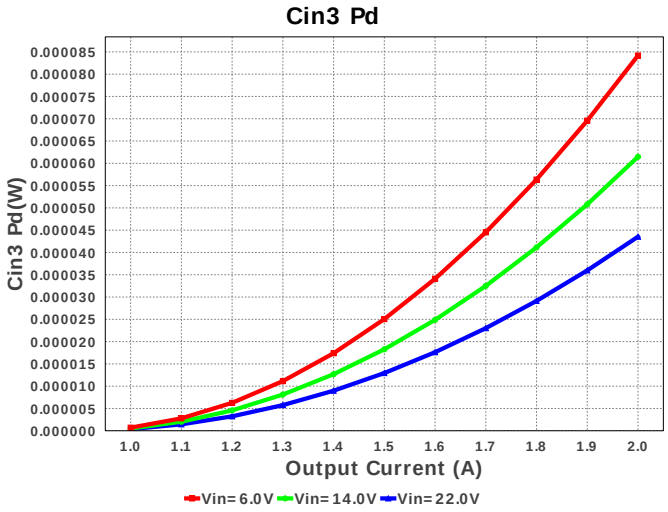


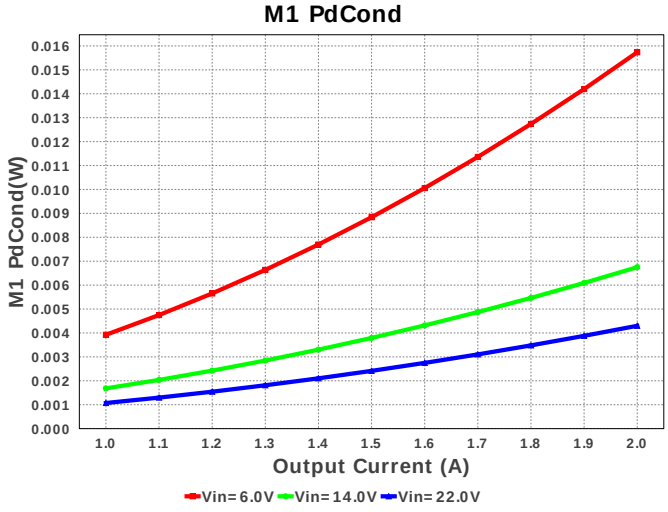


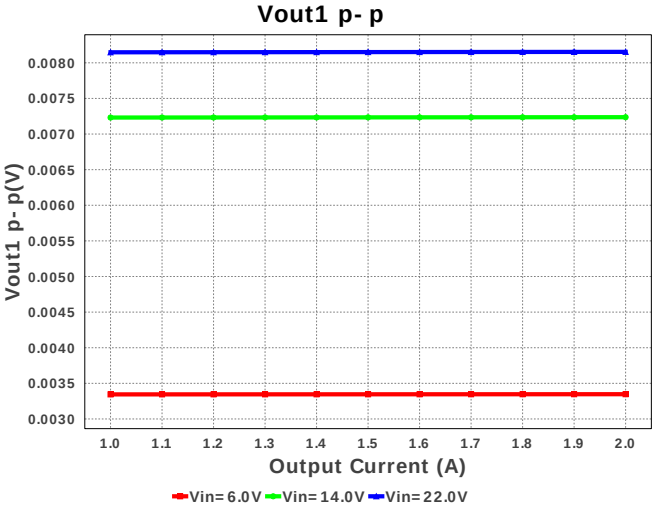


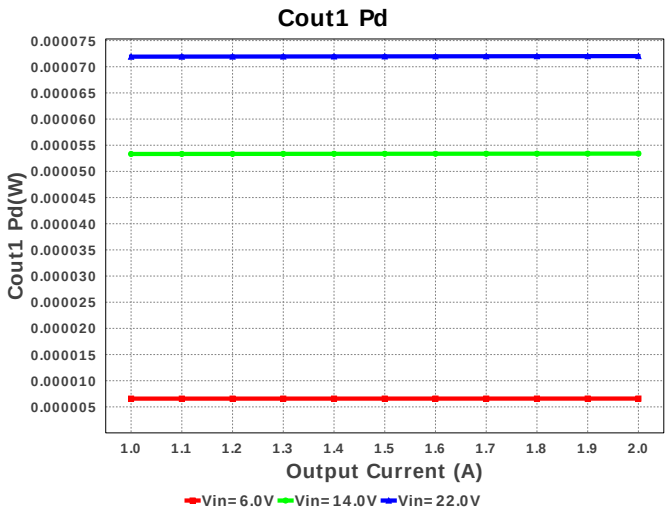


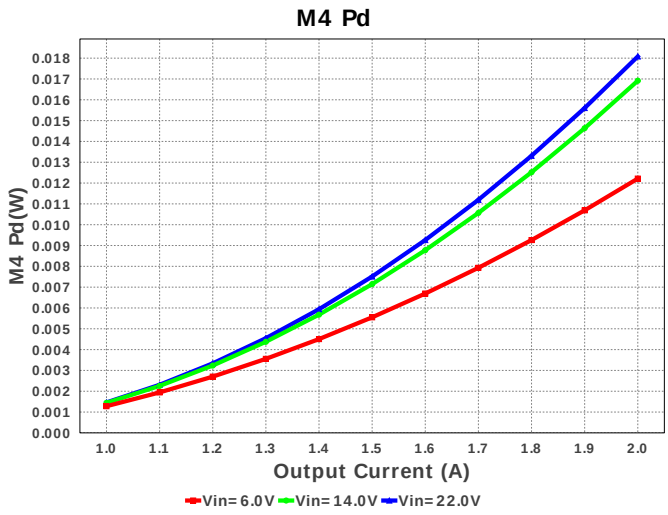


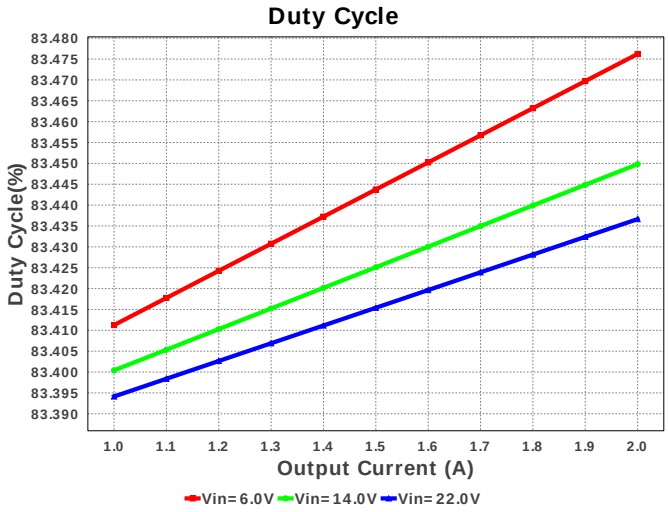


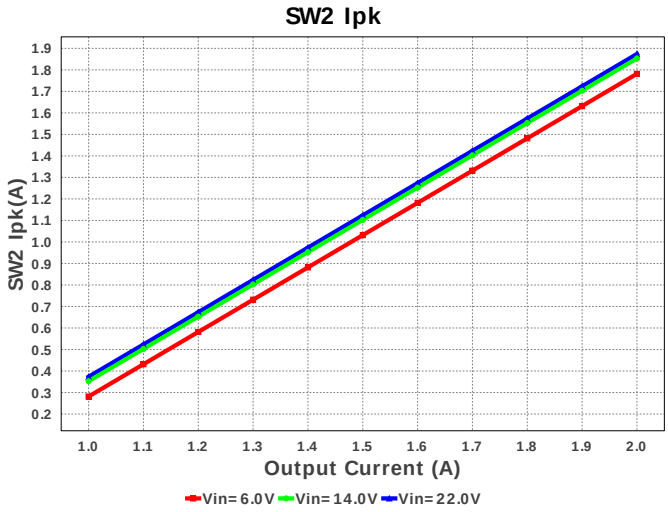


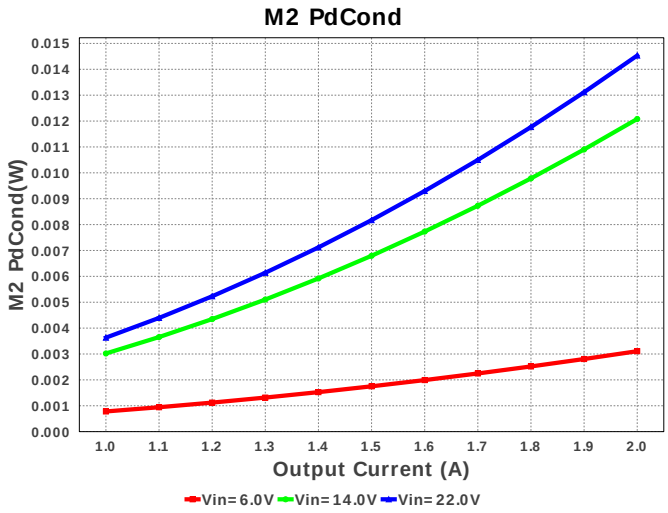


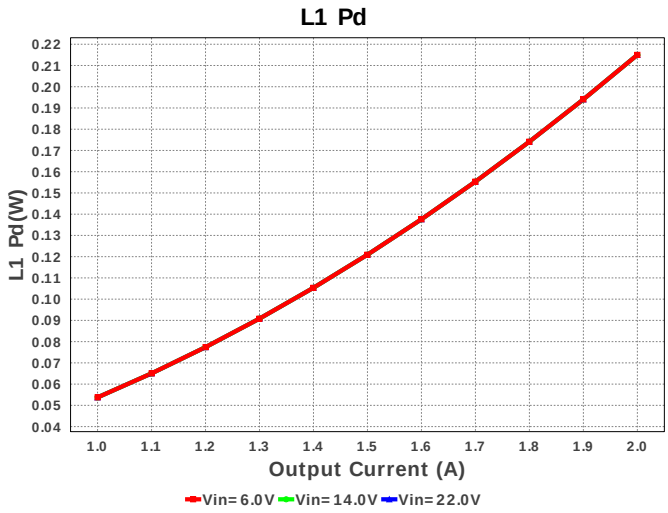


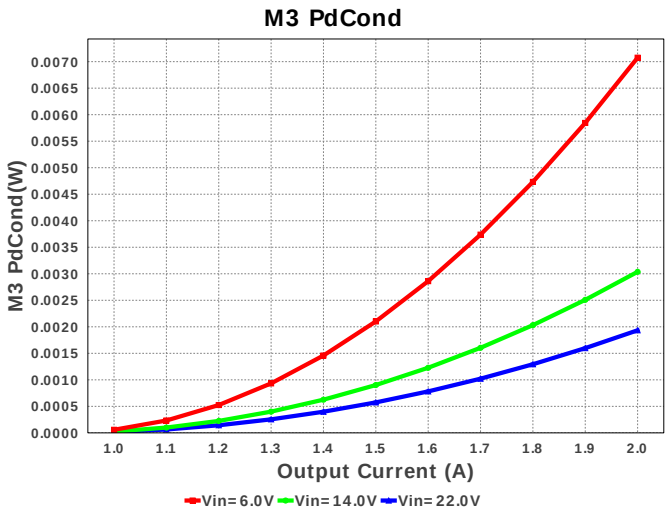


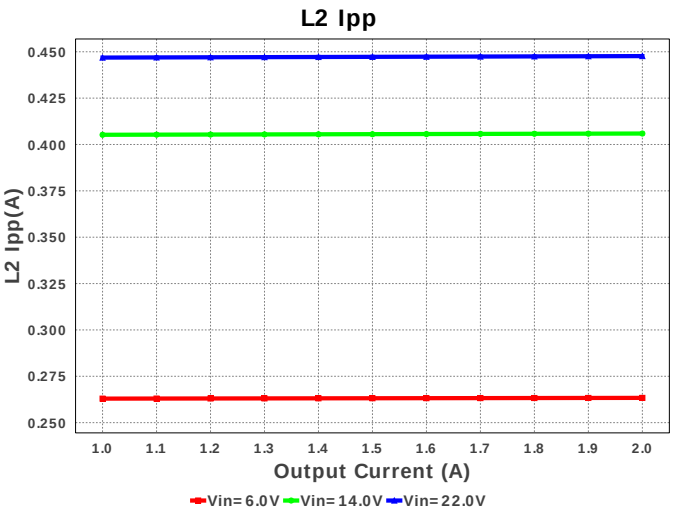


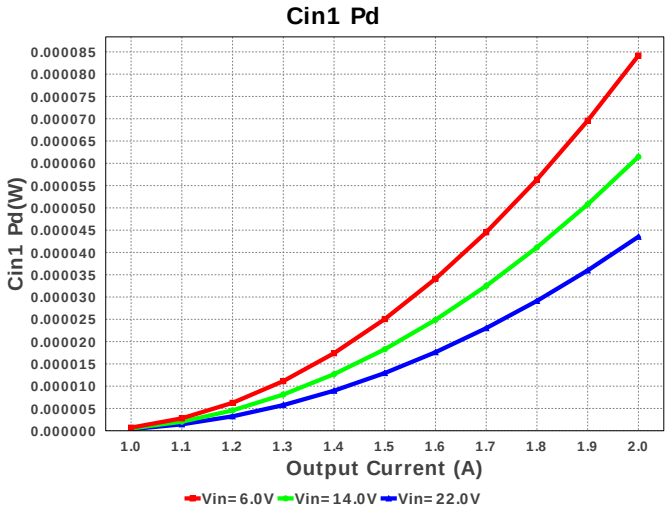


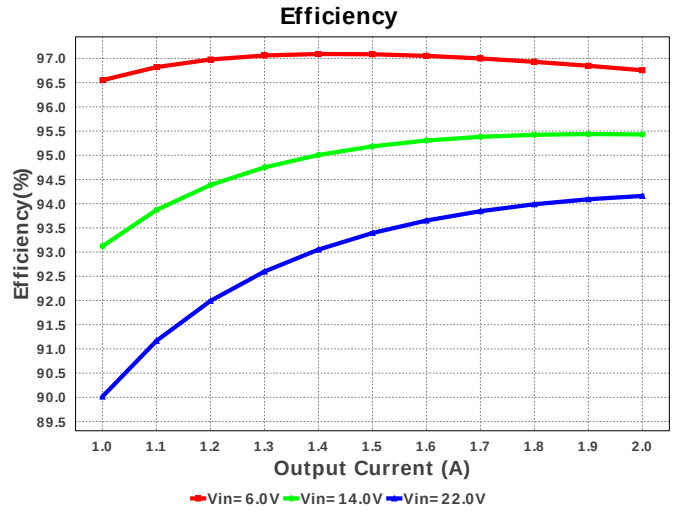


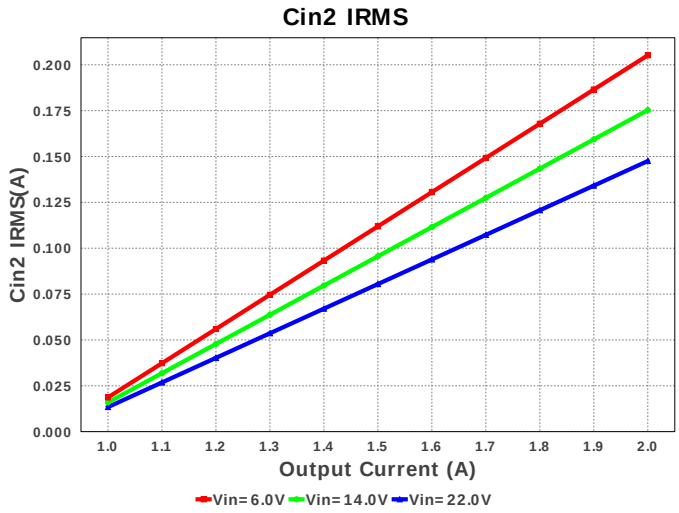


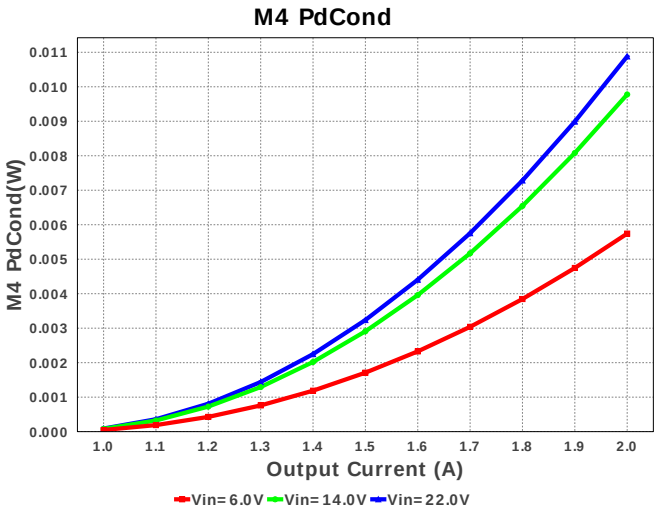


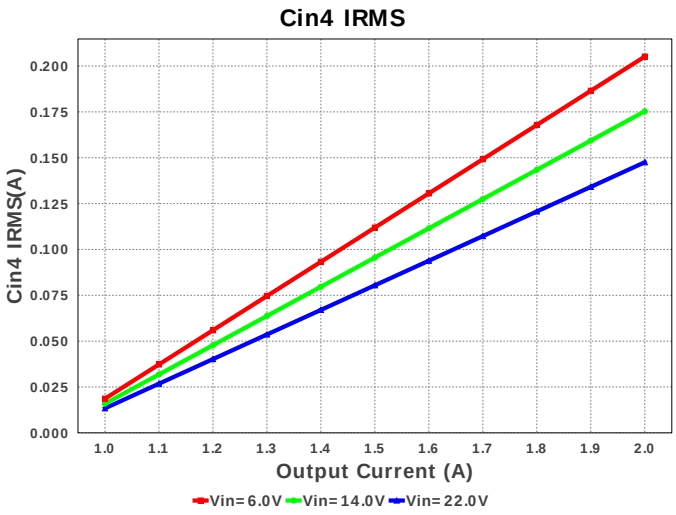


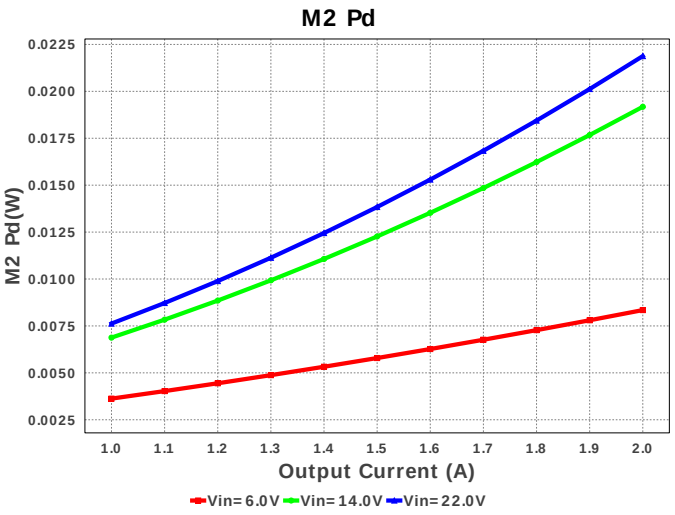


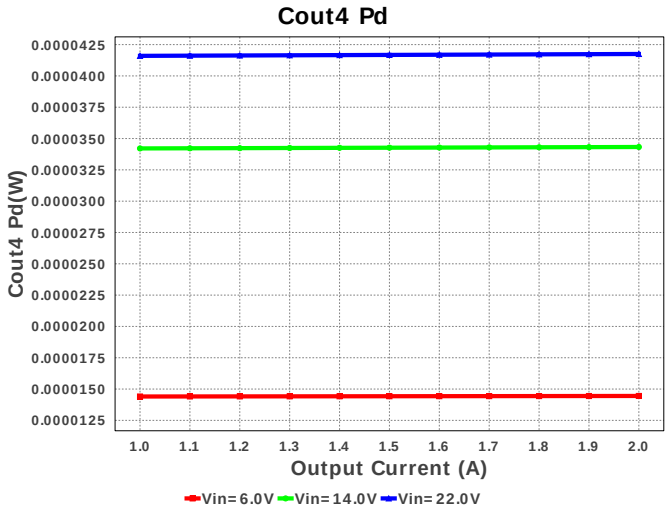


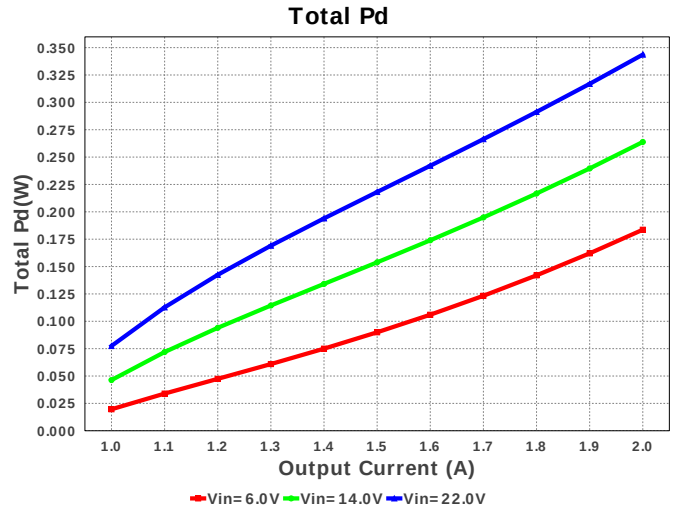


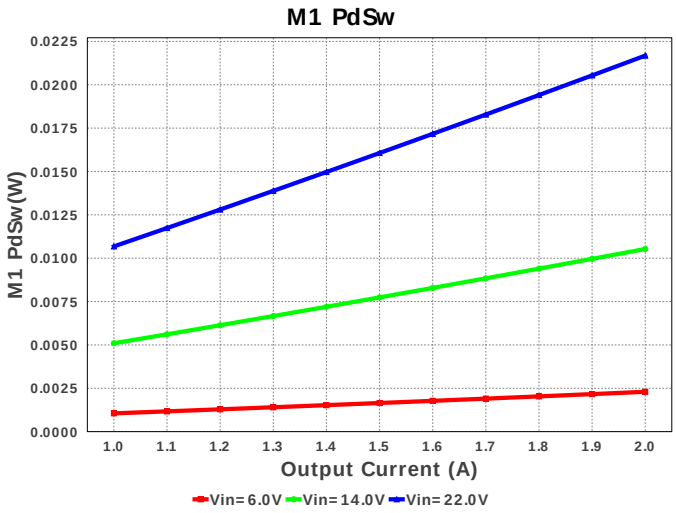


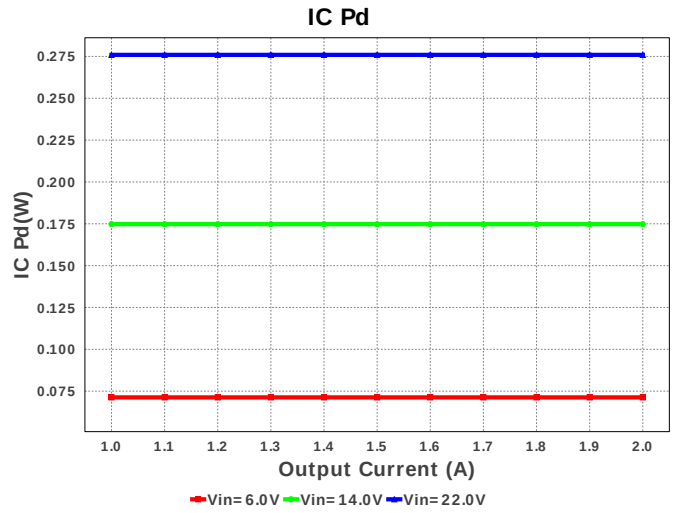


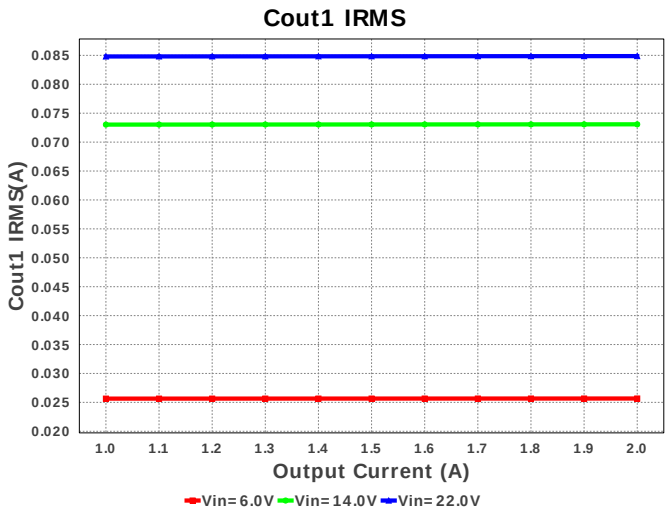


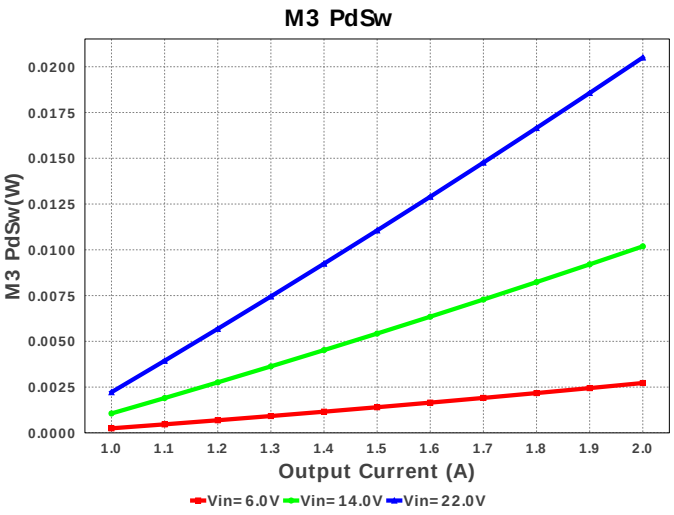


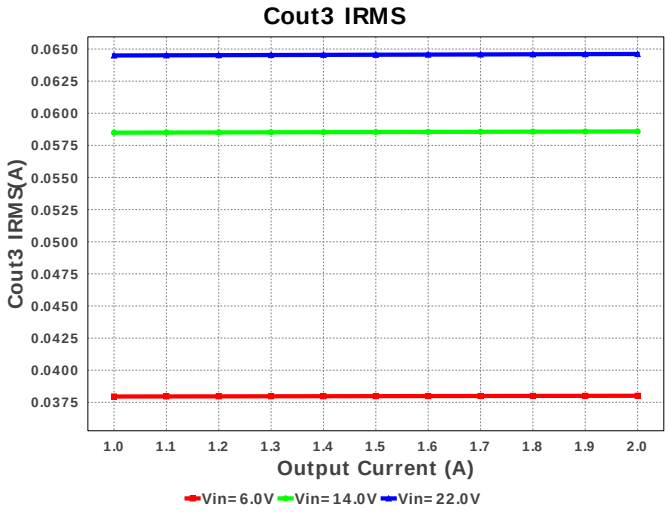


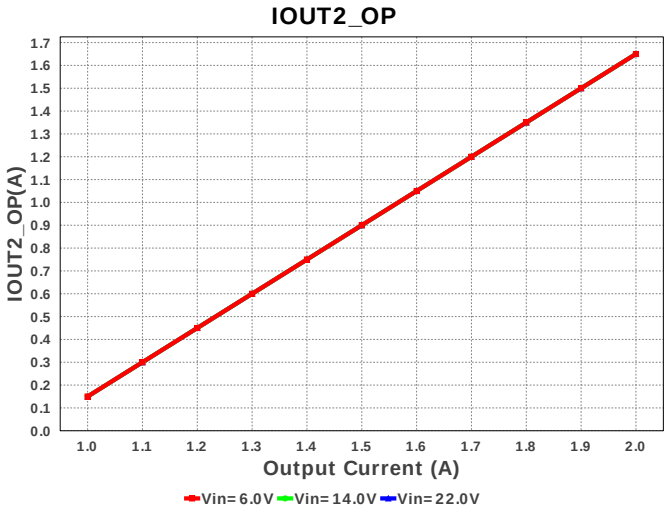


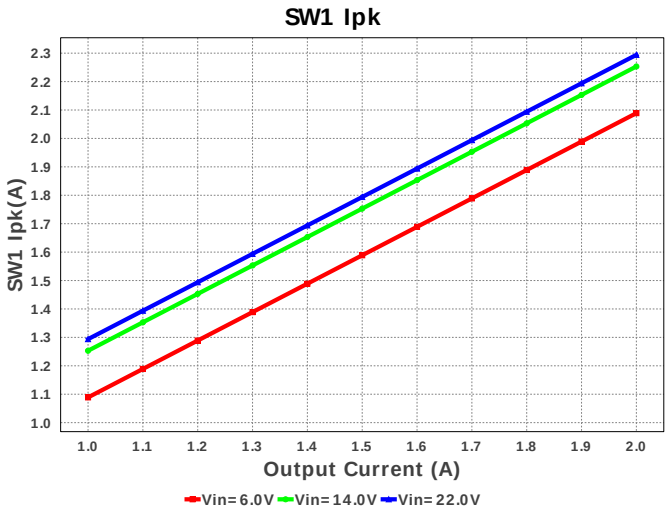


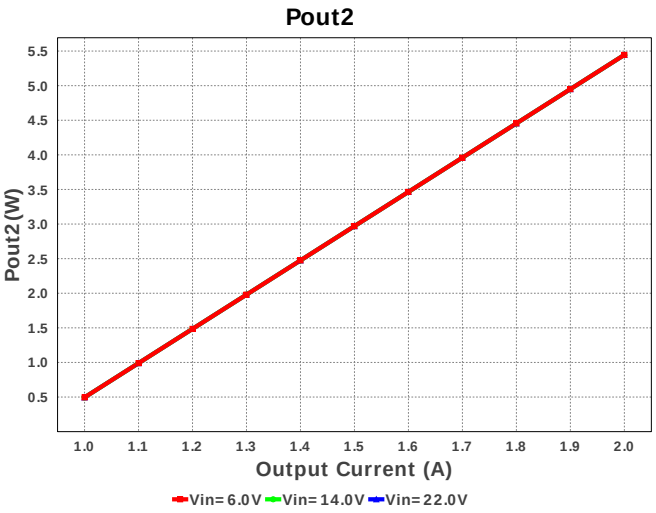


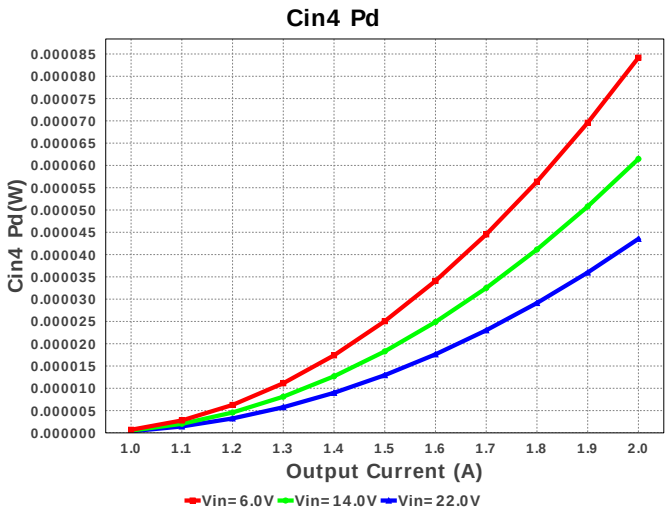


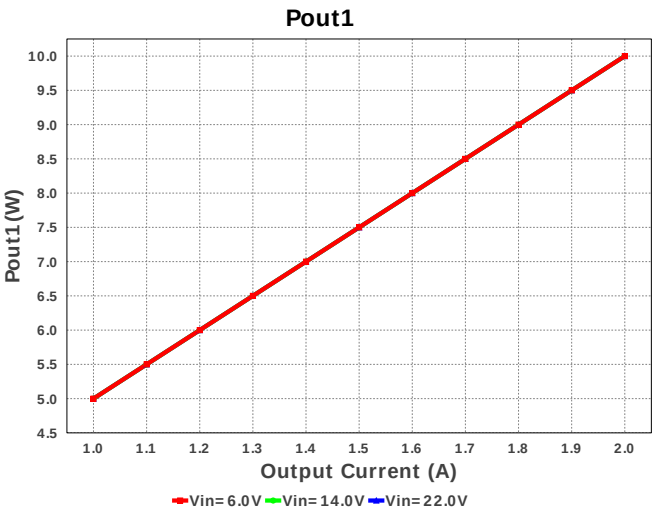


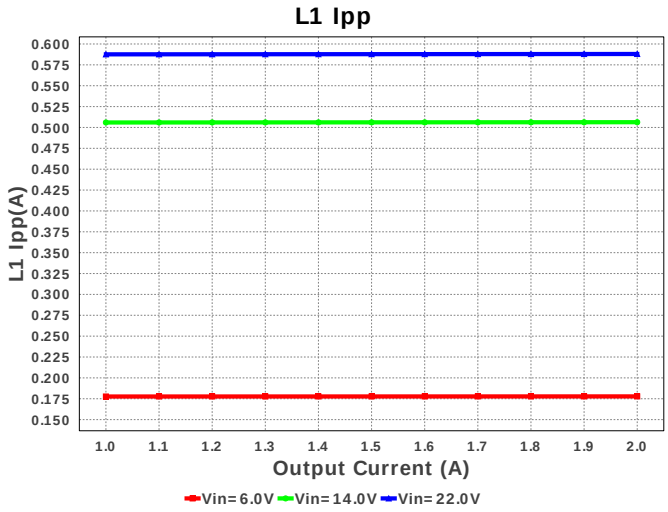


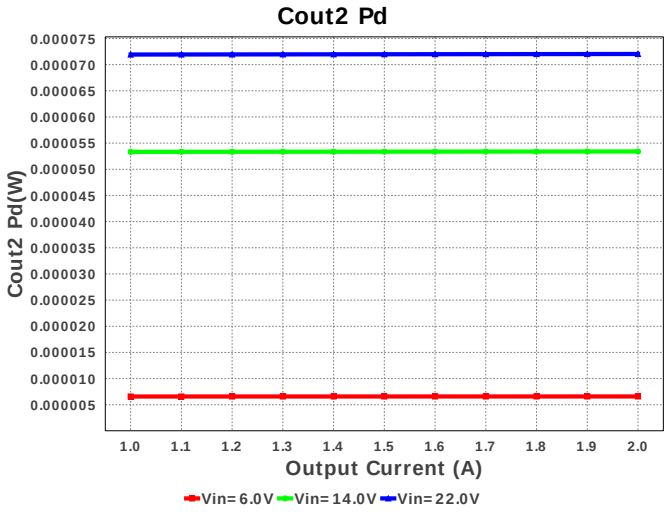


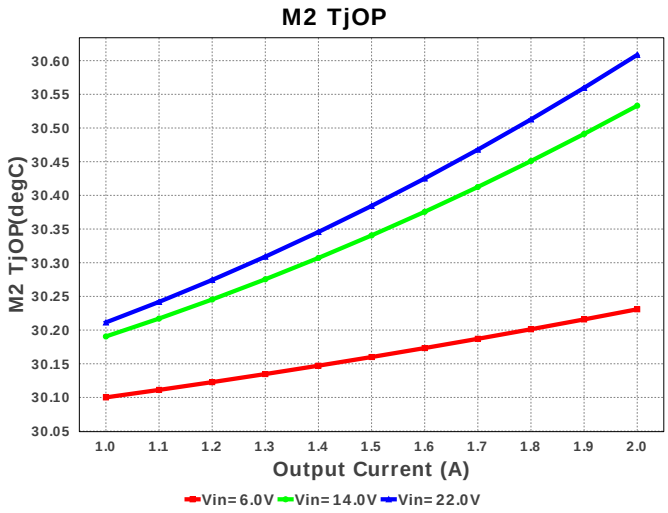


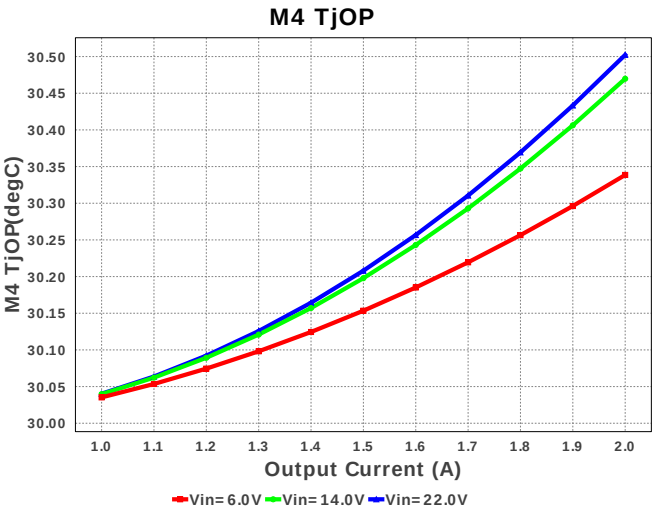


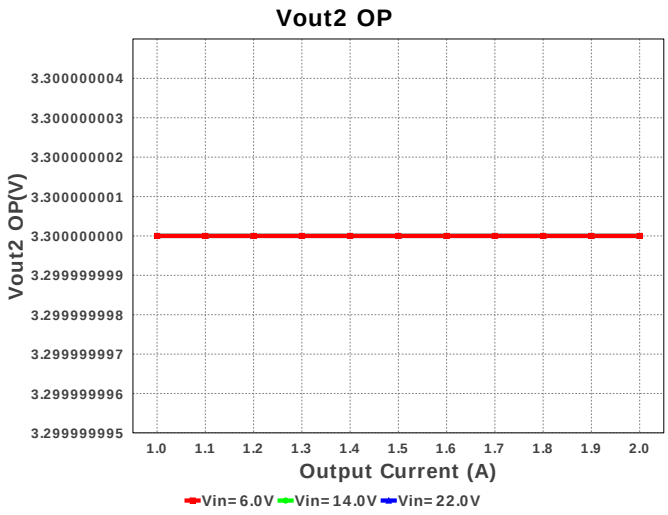


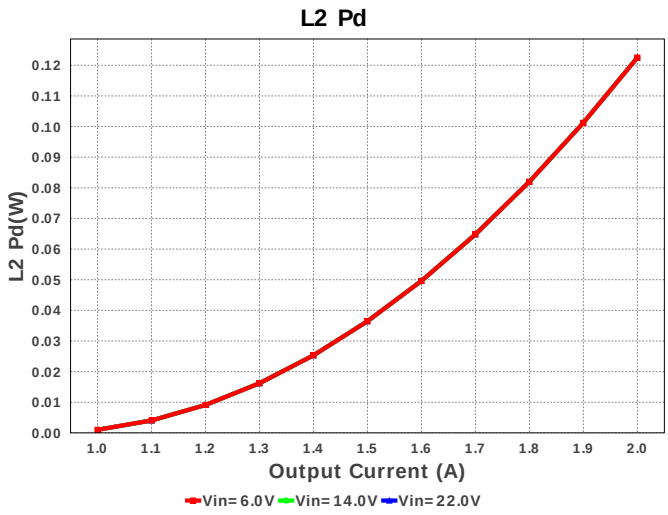


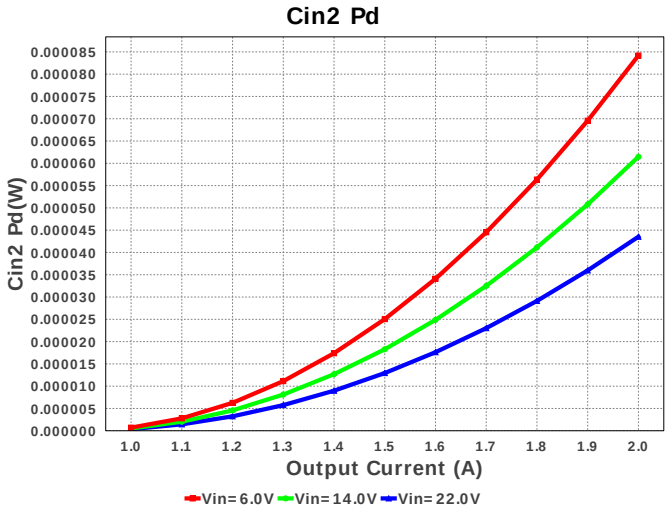


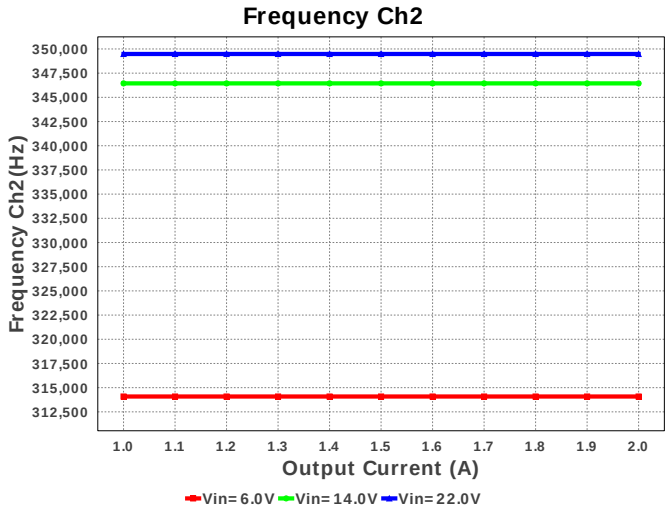


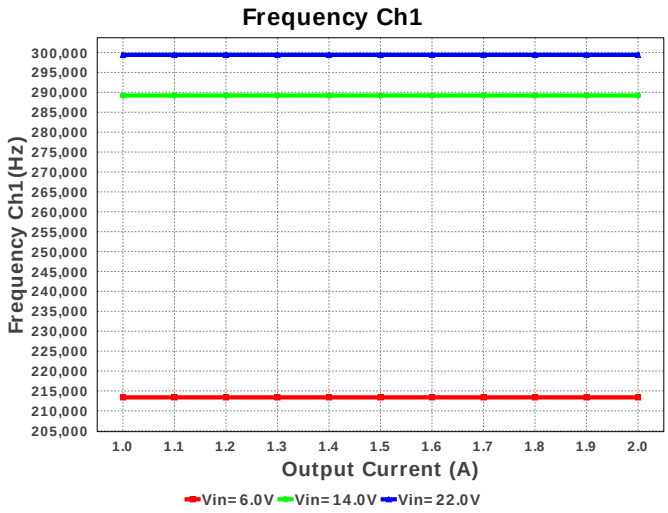


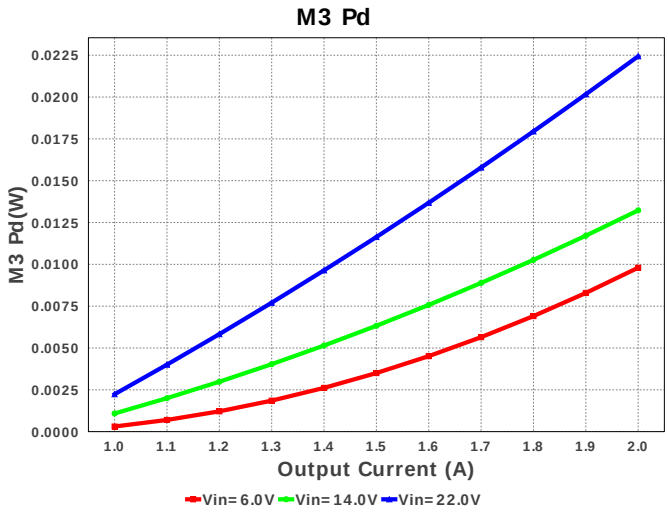


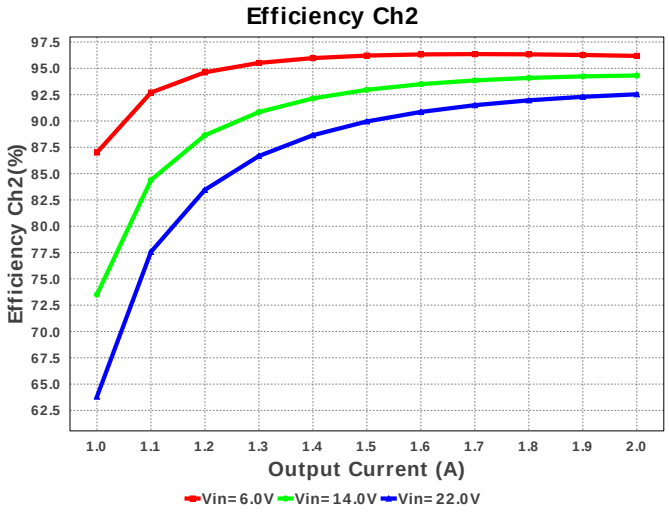












Operating Values

#	Name	Value	Category	Description
1.	Cin1 IRMS	134.11 mA	Current	Input Capacitor Cin1 RMS Ripple Current
2.	Cin2 IRMS	134.11 mA	Current	Input Capacitor Cin2 RMS Ripple Current
3.	Cin3 IRMS	134.11 mA	Current	Input capacitor3 RMS ripple current
4.	Cin4 IRMS	134.11 mA	Current	Input capacitor4 RMS ripple current
5.	Cout1 IRMS	84.873 mA	Current	Output capacitor1 RMS ripple current
6.	Cout2 IRMS	84.873 mA	Current	Output capacitor2 RMS ripple current
7.	Cout3 IRMS	64.603 mA	Current	Output capacitor3 RMS ripple current
8.	Cout4 IRMS	64.603 mA	Current	Output capacitor4 RMS ripple current
9.	Iin Avg	243.78 mA	Current	Average input current
10.	L1 Ipp	588.017 mA	Current	Peak-to-peak inductor ripple current
11.	L2Ipp	447.584 mA	Current	Channel 2 Inductor Peak to peak Current
12.	SW1 Ipk	2.294 A	Current	Peak switch current
13.	SW2 Ipk	1.724 A	Current	Peak switch current
14.	BOM Count	38	General	Total Design BOM count
15.	FootPrint	1.344 k mm^2	General	Total Foot Print Area of BOM components
16.	Frequency Ch1	299.41 kHz	General	Channel 1 Switching Frequency
17.	Frequency Ch2	349.481 kHz	General	Channel 2 Switching Frequency
18.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
19.	Pout1	10.0 W	General	Channel 1 output Power
20.	Pout2	4.95 W	General	Channel 2 output Power
21.	Total BOM	0.0 GBP	General	Total BOM Cost
22.	M3 TjOP	30.555 degC	Op_Point	M3 MOSFET junction temperature
23.	M4 TjOP	30.433 degC	Op_Point	M4 MOSFET junction temperature
24.	Duty Cycle	83.437 %	Op_point	Duty cycle
25.	Duty Cycle 1	83.437 %	Op_point	Duty cycle for Channel 1
26.	Duty Cycle 2	55.131 %	Op_point	Duty cycle for Channel 2
27.	Efficiency	94.133 %	Op_point	Steady state efficiency
28.	Efficiency Ch1	95.069 %	Op_point	Channel 1 Efficiency
29.	Efficiency Ch2	92.296 %	Op_point	Channel 2 Efficiency
30.	IC Tj	55.937 degC	Op_point	IC junction temperature
31.	ICThetaJA	94.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
32.	IOUT1_OP	2.0 A	Op_point	Iout1 operating point
33.	IOUT2_OP	1.5 A	Op_point	Iout2 operating point
34.	M1 TjOP	30.716 degC	Op_point	M1 MOSFET junction temperature
35.	M2 TjOP	30.609 degC	Op_point	M2 MOSFET junction temperature
36.	VIN_OP	22.0 V	Op_point	Vin operating point
37.	Vout1 OP	5.0 V	Op_point	Operational Voltage 1
38.	Vout1 p-p	8.154 mV	Op_point	Peak-to-peak output1 ripple voltage
39.	Vout2 OP	3.3 V	Op_point	Operational Voltage 2
40.	Vout2 p-p	5.964 mV	Op_point	Peak-to-peak output2 ripple voltage
41.	Cin1 Pd	35.971 µW	Power	Input capacitor power dissipation
42.	Cin2 Pd	35.971 µW	Power	Input capacitor power dissipation
43.	Cin3 Pd	35.971 µW	Power	Input capacitor power dissipation
44.	Cin4 Pd	35.971 µW	Power	Input capacitor power dissipation
45.	Cout1 Pd	72.034 µW	Power	Output capacitor1 power dissipation
46.	Cout2 Pd	72.034 µW	Power	Output capacitor2 power dissipation
47.	Cout3 Pd	41.736 µW	Power	Output capacitor3 power dissipation
48.	Cout4 Pd	41.736 µW	Power	Output capacitor 4 power loss
49.	IC Pd	275.93 mW	Power	IC power dissipation
50.	L1 Pd	215.0 mW	Power	Inductor power dissipation
51.	L2 Pd	101.25 mW	Power	Average Power Dissipation in the Inductor Over the AC Line Period
52.	M1 Pd	25.979 mW	Power	M1 MOSFET total power dissipation

#	Name	Value	Category	Description
53.	M1 PdCond	4.299 mW	Power	M1 MOSFET conduction losses
54.	M1 PdSw	21.68 mW	Power	M1 MOSFET switching losses
55.	M2 Pd	21.887 mW	Power	M2 MOSFET total power dissipation
56.	M2 PdCond	14.54 mW	Power	M2 MOSFET conduction losses
57.	M2 PdSw	7.346 mW	Power	M2 MOSFET switching losses
58.	M3 Pd	20.164 mW	Power	M3 MOSFET total power dissipation
59.	M3 PdCond	1.598 mW	Power	M3 MOSFET conduction losses
60.	M3 PdSw	18.566 mW	Power	M3 MOSFET switching losses
61.	M4 Pd	15.611 mW	Power	M4 MOSFET total power dissipation
62.	M4 PdCond	8.997 mW	Power	M4 MOSFET conduction losses
63.	M4 PdSw	6.614 mW	Power	M4 MOSFET switching losses
64.	Total Pd	314.657 mW	Power	Total Power Dissipation
65.	Vout Tolerance	200.0 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	Iout1	2.0	Output Current #1
3.	Iout2	1.5	Output Current #2
4.	VinMax	22.0	Maximum input voltage
5.	VinMin	6.0	Minimum input voltage
6.	VinTyp	8.0	Typical input voltage
7.	Vout	5.0	Output Voltage
8.	Vout1	5.0	Output Voltage #1
9.	Vout2	3.3	Output Voltage #2
10.	base_pn	TPS51225C	Base Product Number
11.	source	DC	Input Source Type
12.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS51225C** Product Folder : http://www.ti.com/product/TPS51225C : contains the data sheet and other resources.