

WEBENCH® Power Architect

Project Report

Project : 3456224/62 : TPS54394 PMU project
Created : 2017-07-06 18:15:52.072

Project Summary

1. Total System Efficiency	84.392 %
2. Total System BOM Count	22.0
3. Total System Footprint	281.0 mm ²
4. Total System BOM Cost	\$1.74
5. Total System Power Dissipation	943.2 mW

--> Launch WEBENCH Power Architect.

My Comments

No comments

Sequencer Flag Table

Supply	Sequencer Flag	Load	Load Name
PMU1_Ch1	0	LOAD_1	
PMU1_Ch2	0	LOAD_2	
PMU1	NA		

Power Supplies

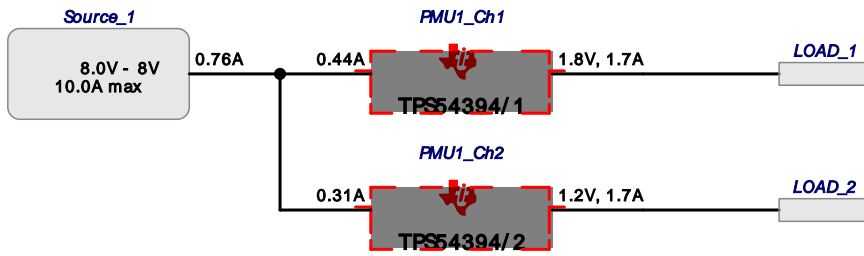
#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	PMU1_Ch1	TPS54394/1	Buck : 3A Dual Channel Synchronous Step-Down Switcher with Integrated FET	1.8 V	1.7 A	86.1%	167	\$1.43	1893	8
2.	PMU1_Ch2	TPS54394/2	Buck : 3A Dual Channel Synchronous Step-Down Switcher with Integrated FET	1.2 V	1.7 A	82%	169	\$1.50	1894	13
3.	PMU1	TPS54394	PMU : NA	V	NaN A	84.4%	281	\$1.74	1892	4

Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD_1	1.8 V	1.7 A	VoutRipple=10%
2.	LOAD_2	1.2 V	1.7 A	VoutRipple=10%

Project Diagram

WEBENCH® Power Architect Project ID : 62 TPS54394 PMU project Power Architect 2017-07-06 18:15:52.072



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	0805	8	\$0.01	54
Kemet	C0805C106K8PACTU	0805	8	\$0.02	27
Vishay-Dale	CRCW040212K7FKED	0402	2	\$0.01	6
Vishay-Dale	CRCW040222K1FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW040297K6FKED	0402	4	\$0.01	12
Vishay-Dale	CRCW04029K76FKED	0402	4	\$0.01	12
MuRata	GRM188R60J105KA01D	0603	1	\$0.01	5
MuRata	GRM21BC80G226ME39L	0805	4	\$0.04	27
NIC Components	NP154C2R2MTRF	IND_NP154C	2	\$0.09	122
Yageo America	RC0603FR-0730KL	0603	2	\$0.01	9
Bourns	SRN6045-1R8Y	SRN6045	2	\$0.16	128
Texas Instruments	TPS54394PWPR	PWPO016C	3	\$1.20	176
Total			44	\$4.67	589.94

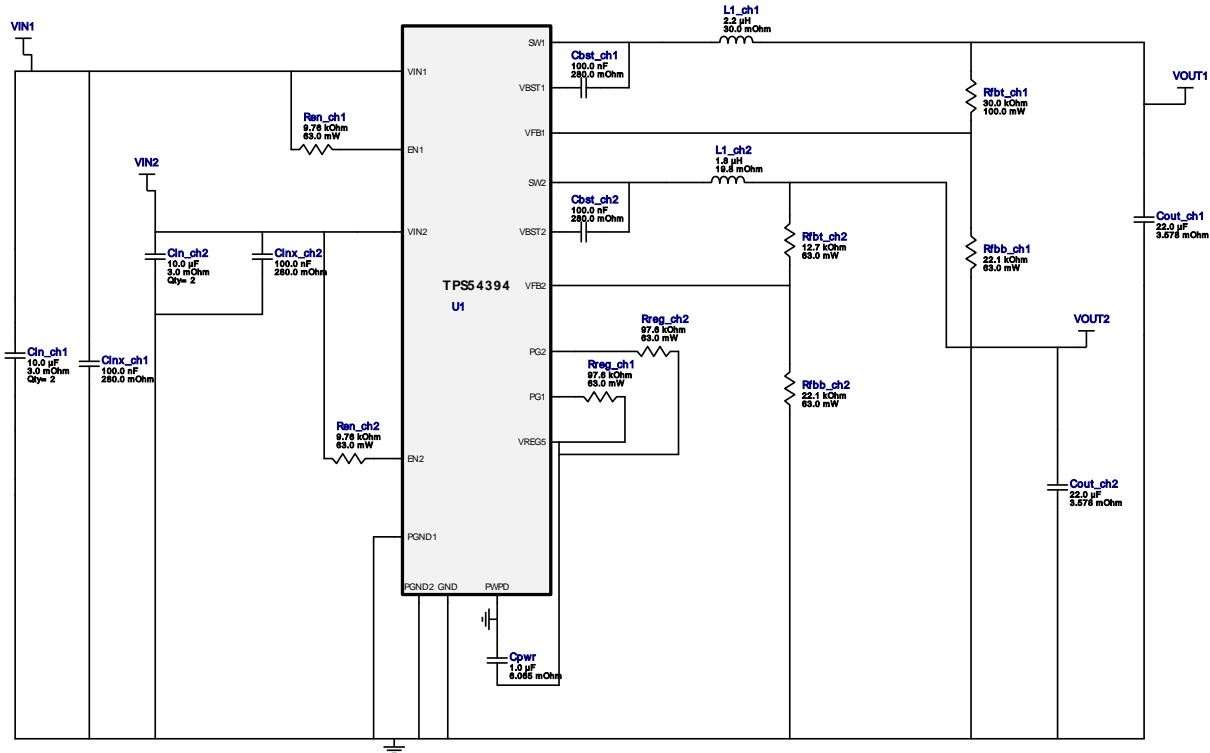


Vout = 1.8V
Iout = 1.7A

Device = TPS54394PWR
Topology = PMU
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BOM Cost = \$1.74
BOM Count = 22
Total Pd = 0.94W

WEBENCH® Design Report
















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Design 1892 - TPS54394PWR

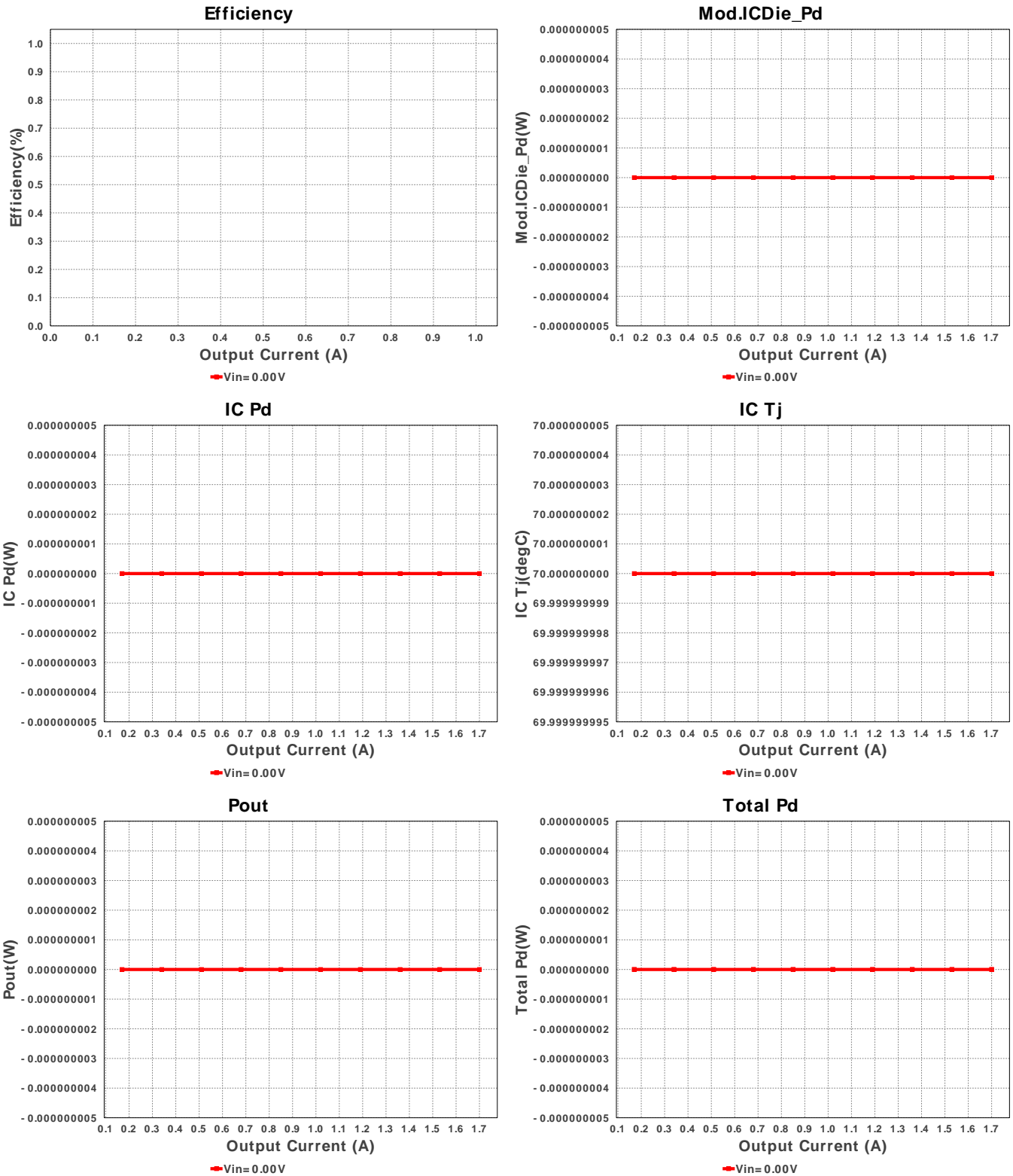


1. This schematic shows all the components for this Power Management Unit. The block diagram on the left shows how the channels are connected. Use the drop down PMU Options selector below the optimization dial on the summary page to get the details for each channel. Or click on the block diagram on the left to select a specific channel.

Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst_ch1	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.	Cbst_ch2	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
3.	Cin_ch1	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	2	\$0.02	0805 7 mm ²
4.	Cin_ch2	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	2	\$0.02	0805 7 mm ²
5.	Cinx_ch1	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

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	Cinx_ch2	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
7.	Cout_ch1	MuRata	GRM21BC80G226ME39L Series= X6S	Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A	1	\$0.04	 0805 7 mm ²
8.	Cout_ch2	MuRata	GRM21BC80G226ME39L Series= X6S	Cap= 22.0 uF ESR= 3.578 mOhm VDC= 4.0 V IRMS= 3.29633 A	1	\$0.04	 0805 7 mm ²
9.	Cpwr	MuRata	GRM188R60J105KA01D Series= X5R	Cap= 1.0 uF ESR= 6.065 mOhm VDC= 6.3 V IRMS= 1.36934 A	1	\$0.01	 0603 5 mm ²
10.	L1_ch1	NIC Components	NP154C2R2MTRF	L= 2.2 μH DCR= 30.0 mOhm	1	\$0.09	 IND_NP154C 61 mm ²
11.	L1_ch2	Bourns	SRN6045-1R8Y	L= 1.8 μH DCR= 19.8 mOhm	1	\$0.16	 SRN6045 64 mm ²
12.	Ren_ch1	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
13.	Ren_ch2	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rfbb_ch1	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Rfbb_ch2	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Rfbt_ch1	Yageo America	RC0603FR-0730KL Series= ?	Res= 30.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	 0603 5 mm ²
17.	Rfbt_ch2	Vishay-Dale	CRCW040212K7FKED Series= CRCW..e3	Res= 12.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
18.	Rreg_ch1	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
19.	Rreg_ch2	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
20.	U1	Texas Instruments	TPS54394PWPR	Switcher	1	\$1.20	 PWP0016C 59 mm ²



Operating Values

#	Name	Value	Category	Description
1.	BOM Count	22	General	Total Design BOM count
2.	FootPrint	281.0 mm ²	General	Total PMU footprint area of BOM components
3.	Pout	5.1 W	General	Total PMU output power
4.	Total BOM	\$1.74	General	Total BOM Cost
5.	Efficiency	84.392 %	Op_point	PMU steady state efficiency
6.	IC Tj	101.508 degC	Op_point	PMU IC junction temperature
7.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
8.	Cin_ch1 Pd	813.454 μW	Power	Input capacitor power dissipation
9.	Cin_ch2 Pd	623.127 μW	Power	Input capacitor power dissipation
10.	Cout_ch1 Pd	430.712 μW	Power	Output capacitor power dissipation
11.	Cout_ch2 Pd	393.527 μW	Power	Output capacitor power dissipation

#	Name	Value	Category	Description
12.	IC Pd	761.062 mW	Power	IC Pd
13.	L1_ch1 Pd	108.375 mW	Power	Inductor power dissipation
14.	L1_ch2 Pd	71.527 mW	Power	Inductor power dissipation
15.	Mod. ICDie_Pd	761.062 mW	Power	IC Pd
16.	Total Pd	943.22 mW	Power	PMU total power dissipation
17.	Total Pd	943.22 mW	Power	PMU total power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.7	Maximum Output Current
2.	Iout1	1.7	Output Current #1
3.	Iout2	1.7	Output Current #2
4.	Vin1Max	8.0	Maximum Input Voltage #1
5.	Vin1Min	8.0	Minimum Input Voltage #1
6.	Vin2Max	8.0	Maximum Input Voltage #2
7.	Vin2Min	8.0	Minimum Input Voltage #2
8.	Vout	1.8	Output Voltage
9.	Vout1	1.8	Output Voltage #1
10.	Vout2	1.2	Output Voltage #2
11.	base_pn	TPS54394	Texas Instruments Base Part Number
12.	source	DC	Input Source Type
13.	ta	70.0	Ambient temperature

Design Assistance

1. TPS54394 Product Folder : <http://www.ti.com/product/tps54394> : contains the data sheet and other resources.

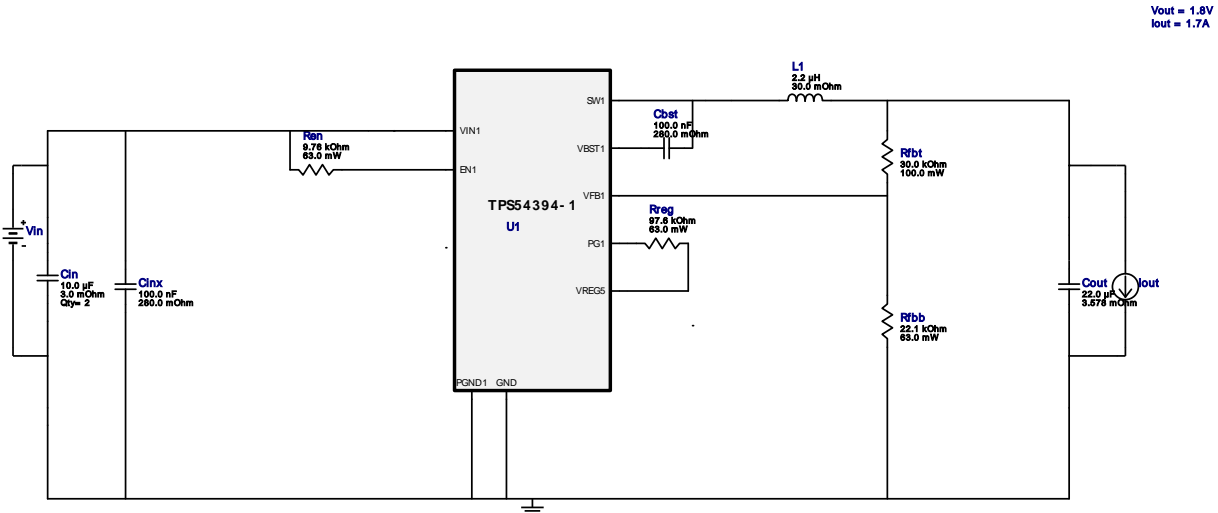


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Iout = 1.7A

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
WEBENCH® Design Report

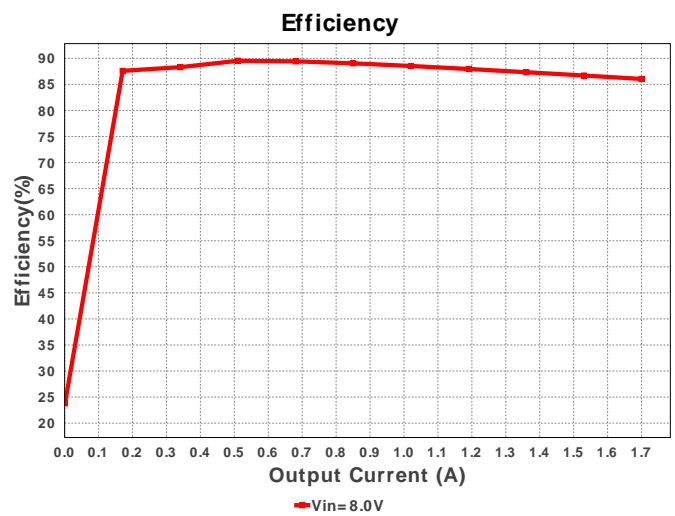
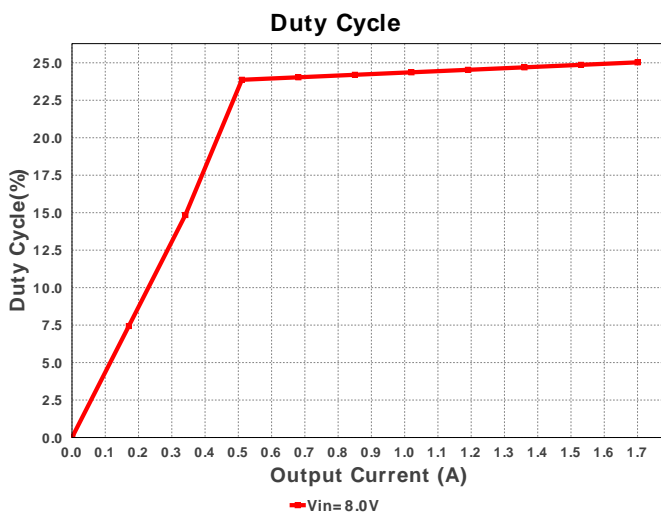
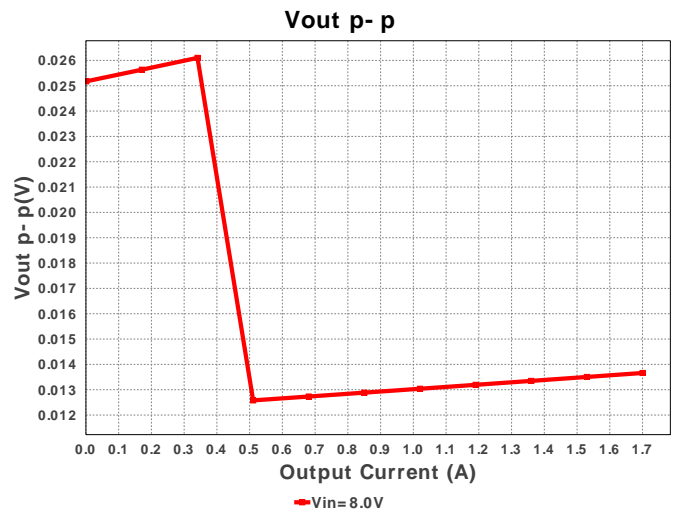
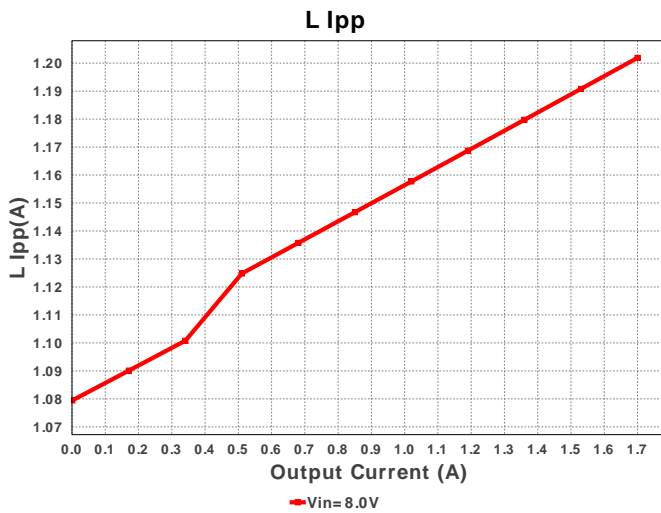
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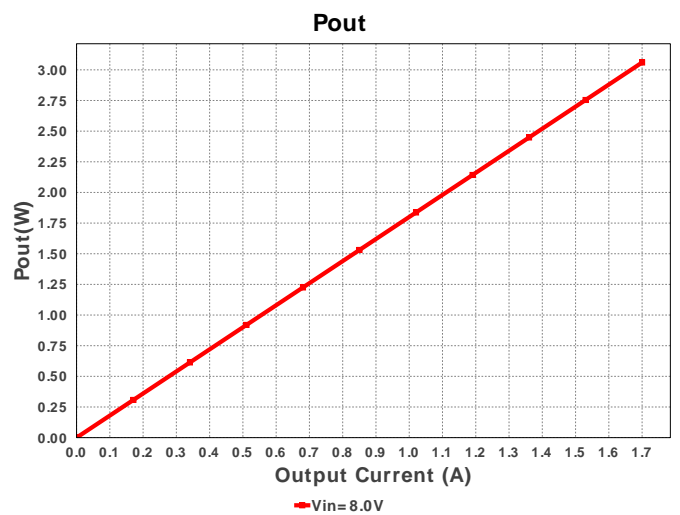
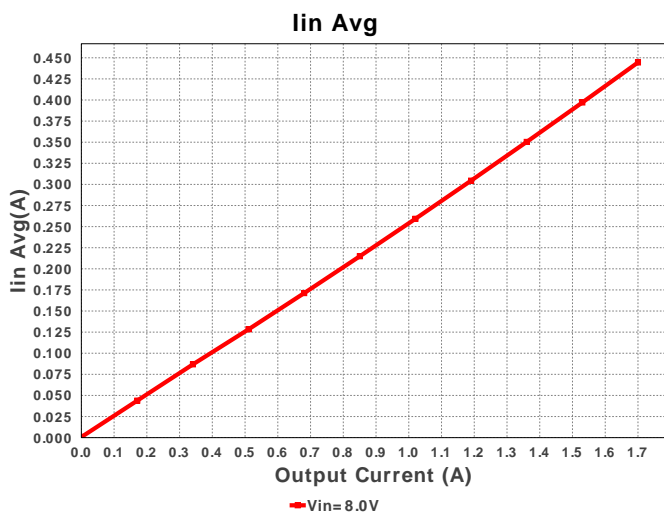
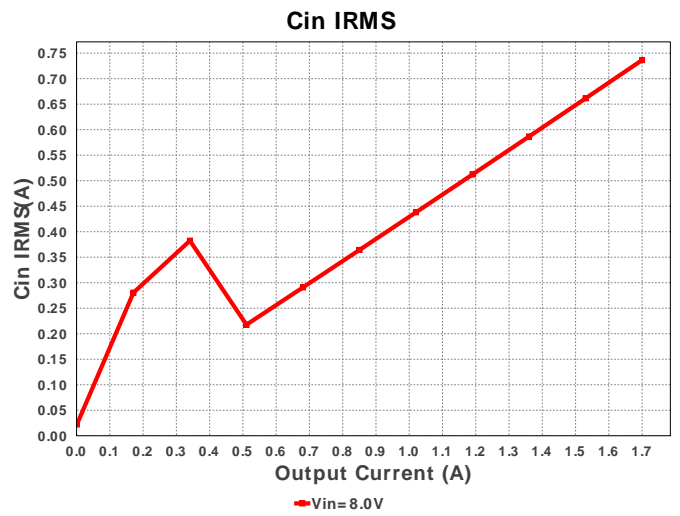
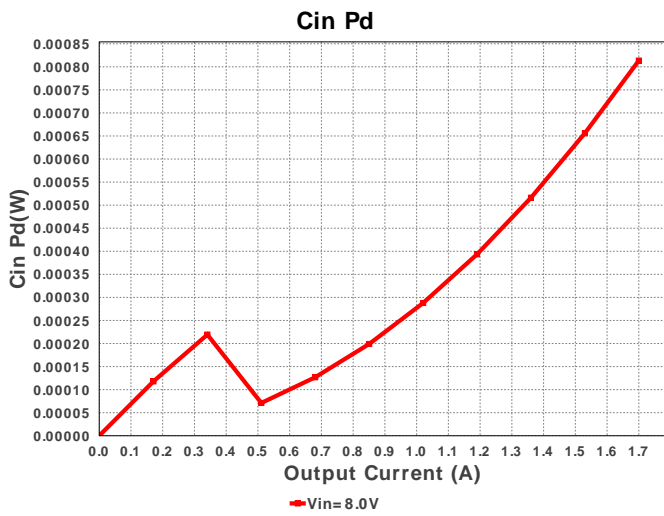
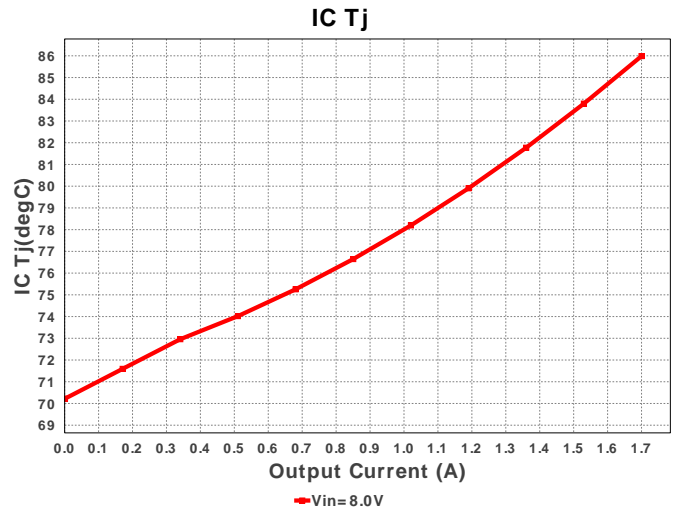
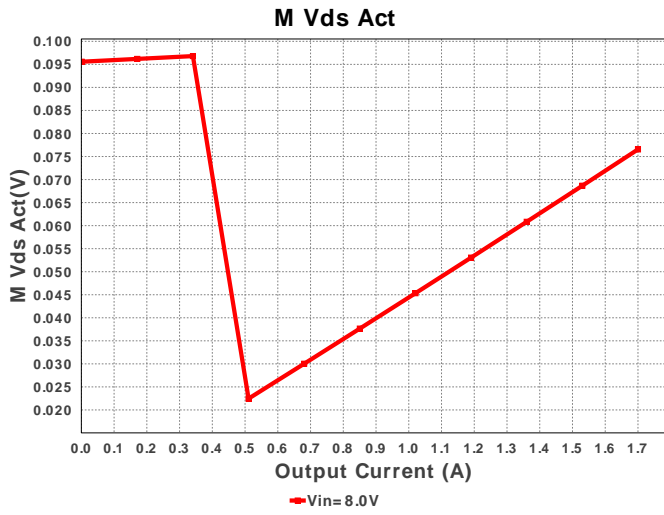


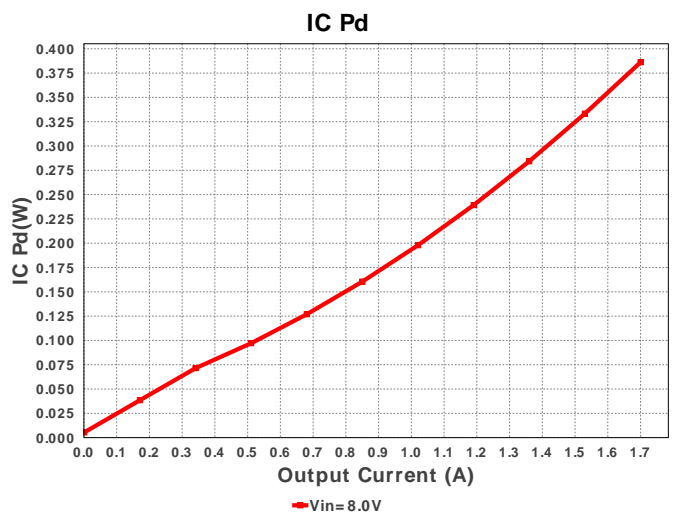
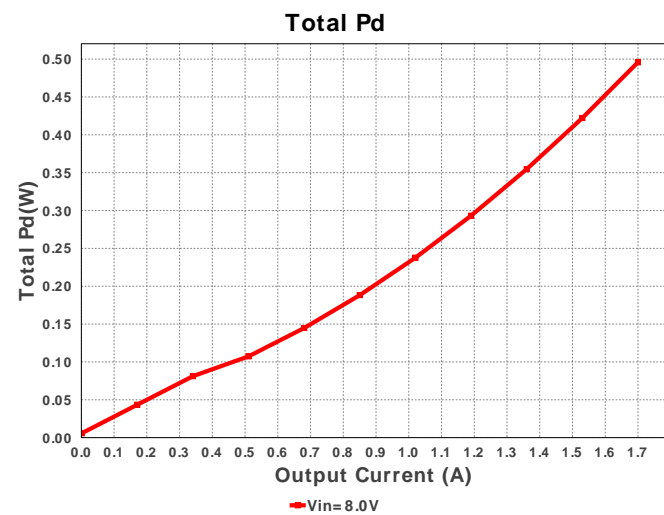
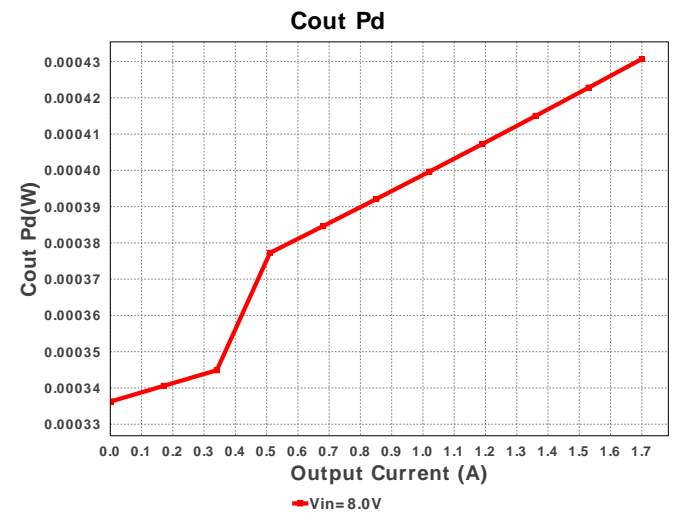
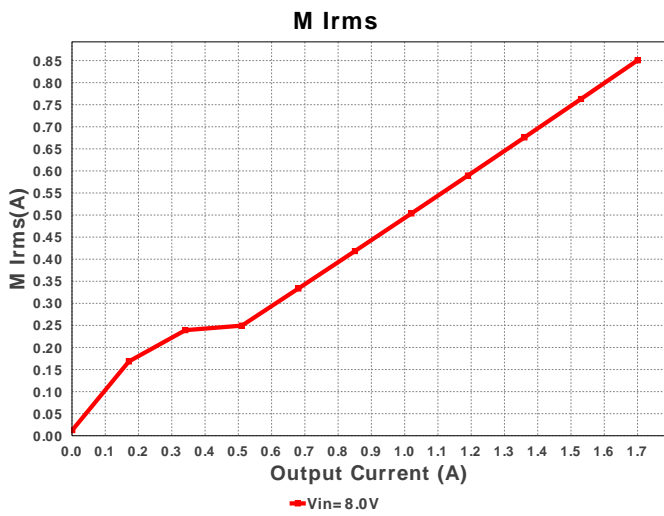
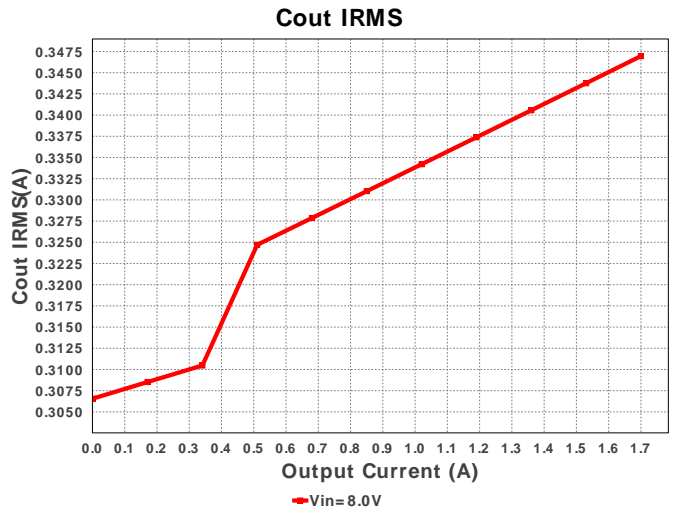
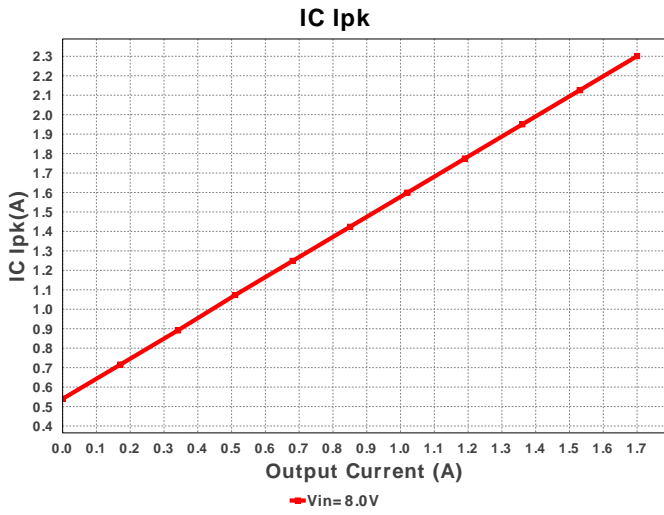
Electrical BOM

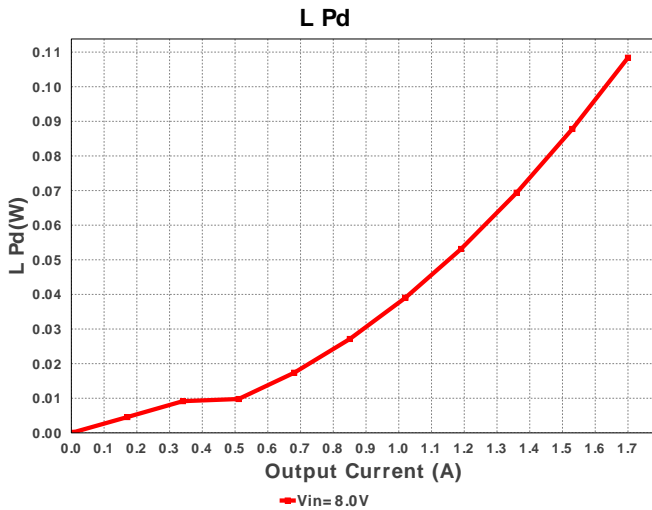
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Cin	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	2	\$0.02	0805 7 mm ²
3.	Cinx	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
4.	Cout	MuRata	GRM21BC80G226ME39L Series= X6S	Cap= 22.0 uF ESR= 3.576 mOhm VDC= 4.0 V IRMS= 3.29633 A	1	\$0.04	0805 7 mm ²
5.	L1	NIC Components	NPI54C2R2MTRF	L= 2.2 uH DCR= 30.0 mOhm	1	\$0.09	IND_NPI54C 61 mm ²
6.	Ren	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	Rfbb	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
8.	Rfbs	Yageo America	RC0603FR-0730KL Series= ?	Res= 30.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	\$0.01	0603 5 mm ²
9.	Rreg	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	TPS54394PWR	Switcher	0	\$1.20	 PWP0016C 59 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	736.412 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	346.955 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.301 A	Current	Peak switch current in IC
4.	Iin Avg	444.47 mA	Current	Average input current
5.	L Ipp	1.202 A	Current	Peak-to-peak inductor ripple current
6.	M Irms	850.504 mA	Current	MOSFET RMS current
7.	Frequency	586.89 kHz	General	Switching frequency
8.	IC Tolerance	7.6 mV	General	IC Feedback Tolerance
9.	M Vds Act	76.545 mV	General	Voltage drop across the MosFET
10.	Mode	CCM	General	Conduction Mode
11.	Pout	3.06 W	General	Total output power
12.	Vout Actual	1.803 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	1.8 V	Op_Point	Operational Output Voltage
14.	Duty Cycle	25.03 %	Op_point	Duty cycle
15.	Efficiency	86.057 %	Op_point	PMU channel steady state efficiency
16.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	1.7 A	Op_point	Iout operating point
18.	VIN_OP	8.0 V	Op_point	Vin operating point
19.	Vout p-p	15.936 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	813.454 μ W	Power	Input capacitor power dissipation
21.	Cout Pd	430.712 μ W	Power	Output capacitor power dissipation
22.	IC Iq Pd	5.2 mW	Power	IC Iq Pd
23.	IC Pd	386.152 mW	Power	IC power dissipation
24.	L Pd	108.375 mW	Power	Inductor power dissipation
25.	M1 PdCond	65.102 mW	Power	M1 MOSFET switching losses
26.	M1 PdSw	11.61 mW	Power	M1 MOSFET switching losses
27.	M2 PdCond	129.999 mW	Power	M2 MOSFET switching losses
28.	M2 Pdbody	149.658 mW	Power	Power dissipation through lower FET
29.	Total Pd	495.78 mW	Power	PMU channel power dissipation
30.	Vout Tolerance	2.168 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.7	Maximum Output Current
2.	VinMax	8.0	Maximum input voltage
3.	VinMin	8.0	Minimum input voltage
4.	Vout	1.8	Output Voltage
5.	base_pn	TPS54394/1	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	70.0	Ambient temperature

Design Assistance

1. TPS54394/1 Product Folder : <http://www.ti.com/product/TPS54394> : contains the data sheet and other resources.

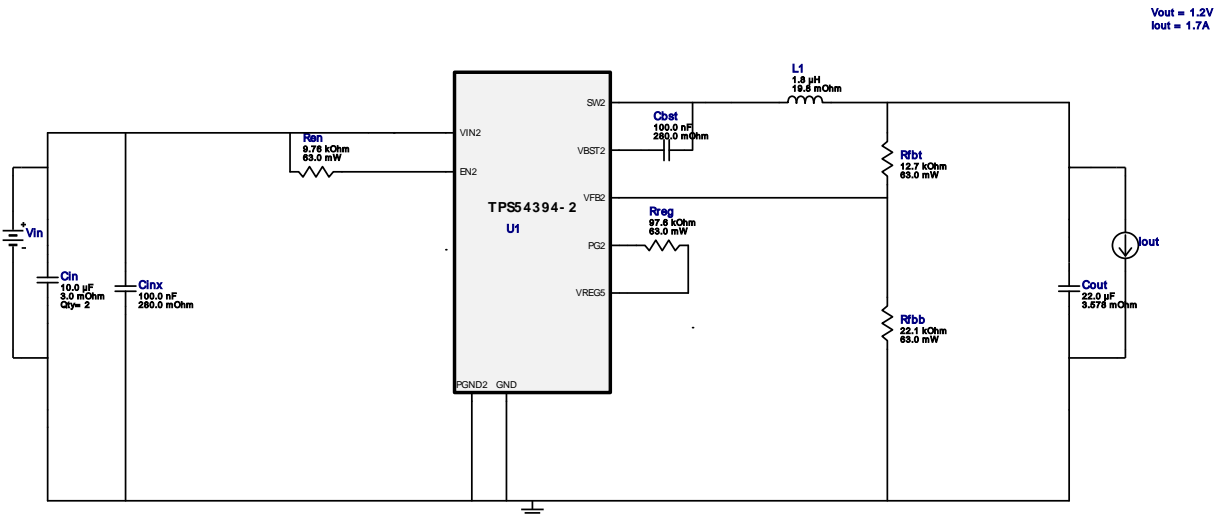


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Iout = 1.7A

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Topology = Buck
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BOM Count = NaN
Total Pd = 0.45W


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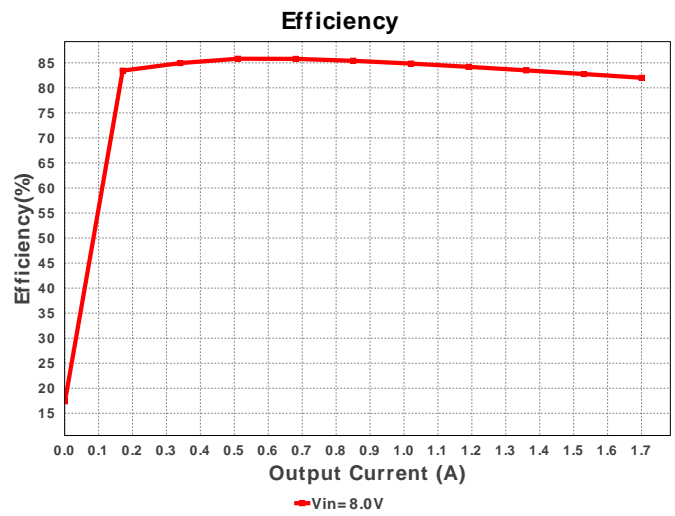
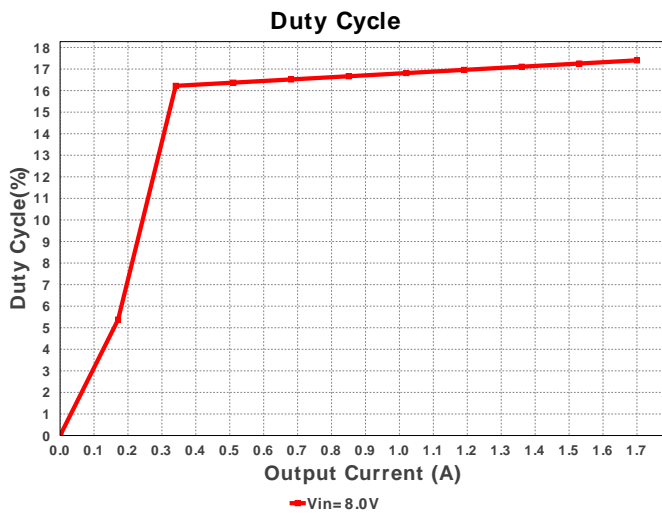
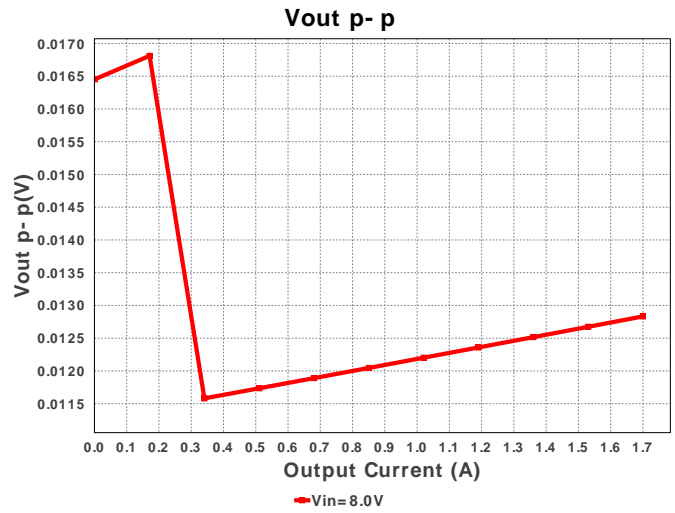
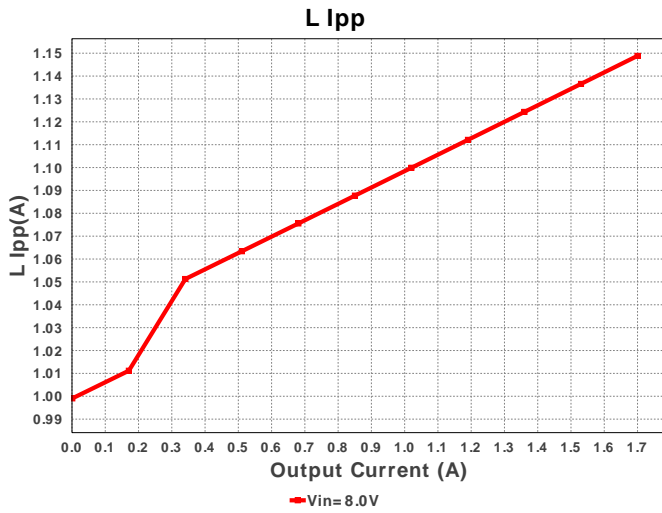
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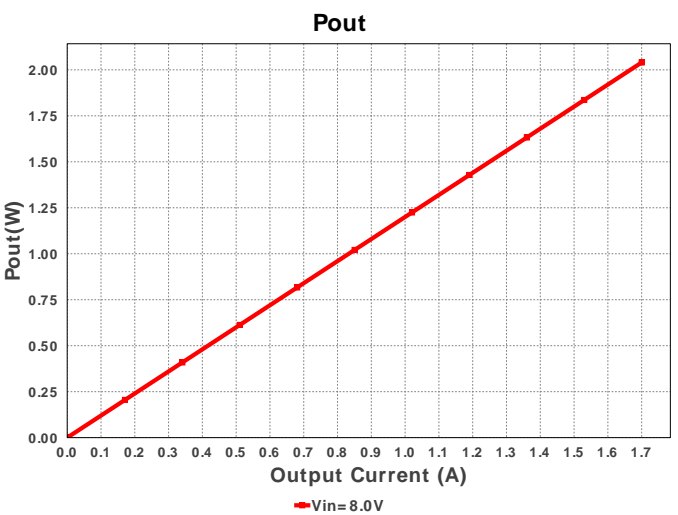
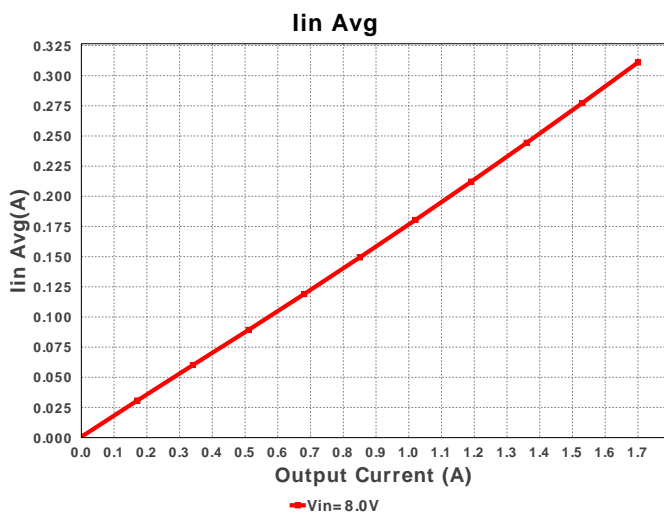
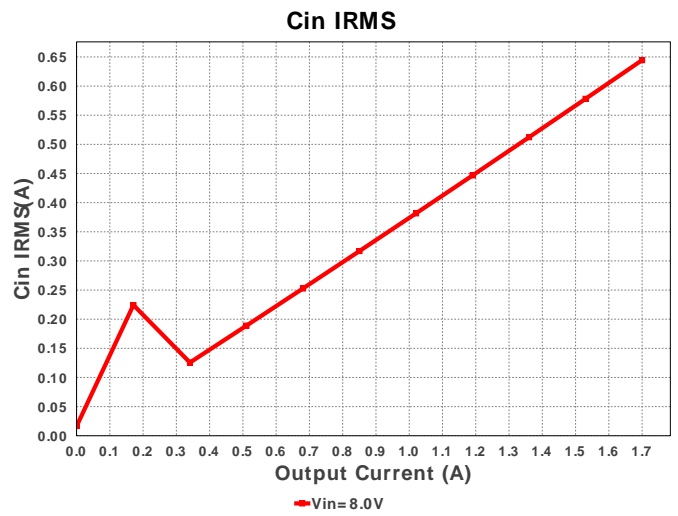
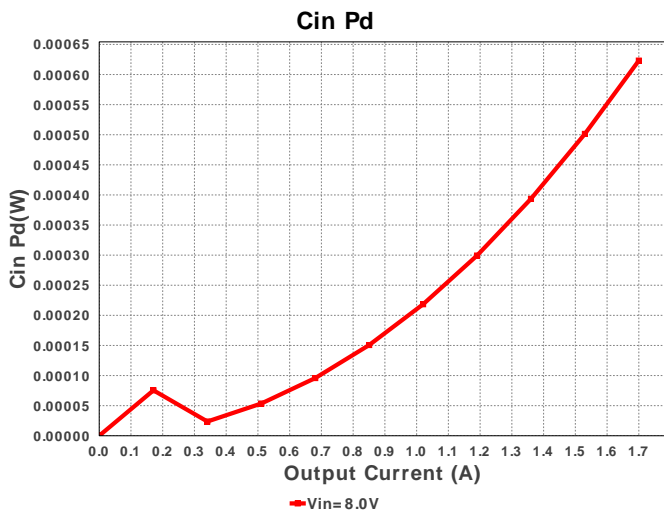
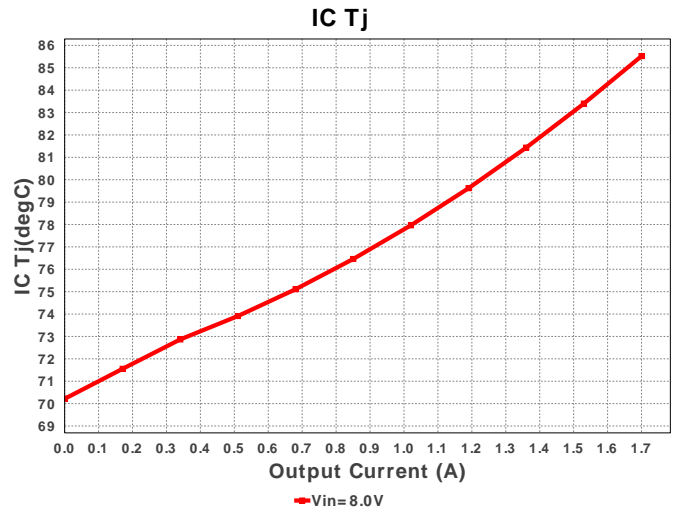
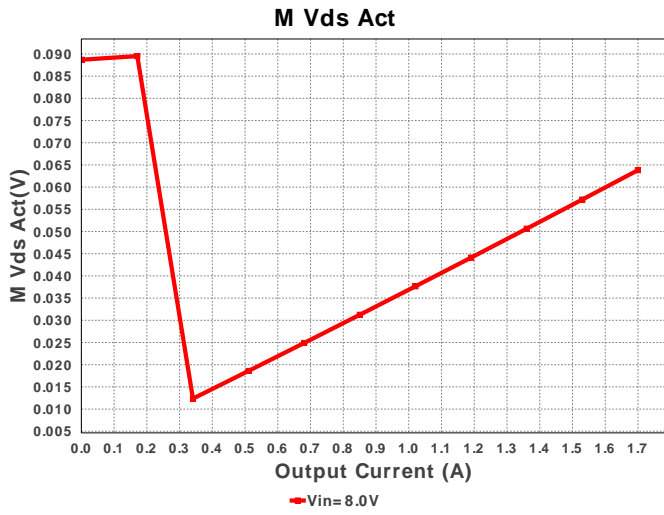


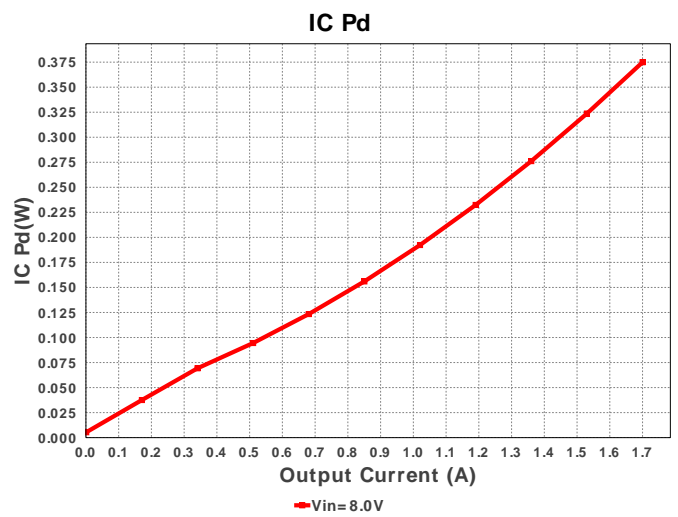
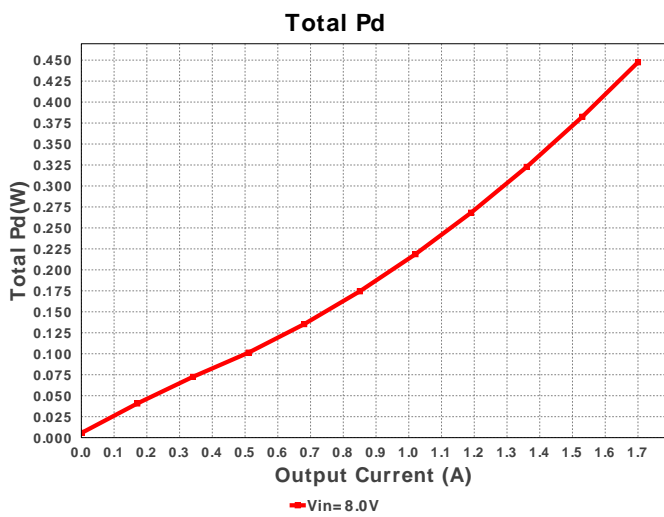
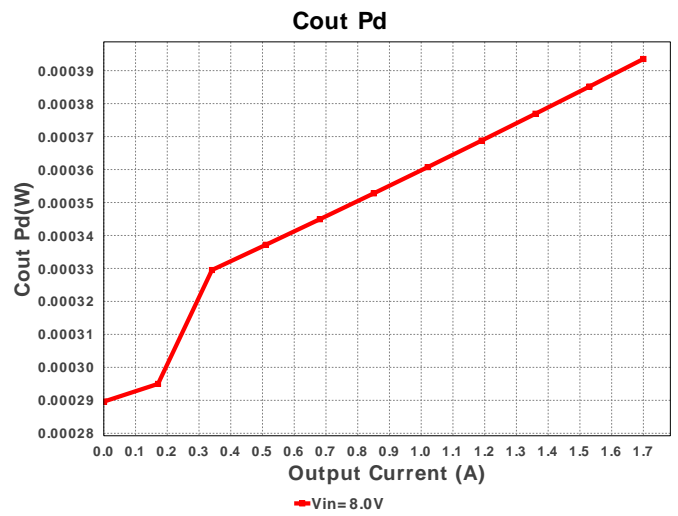
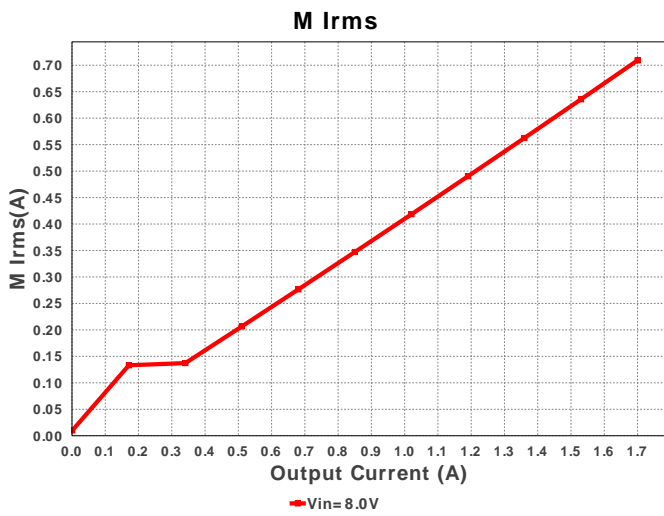
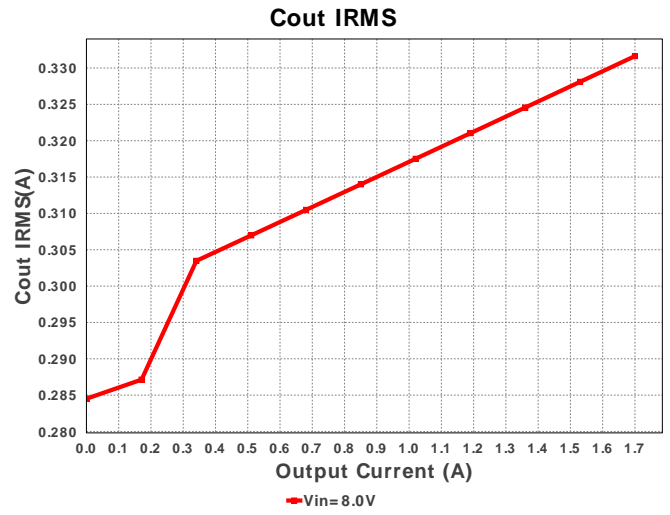
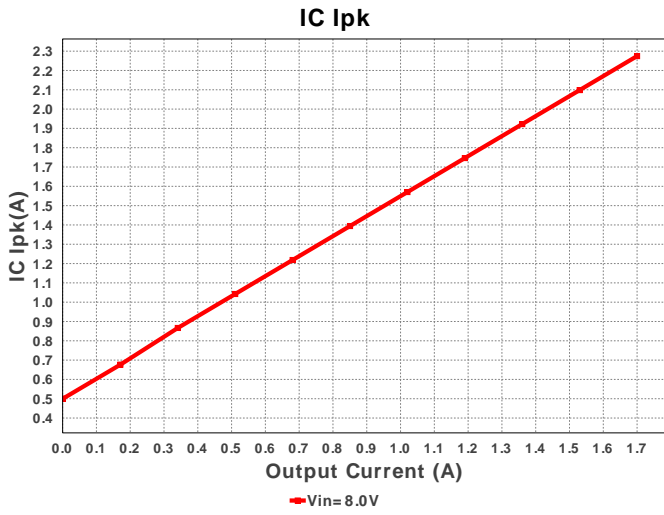
Electrical BOM

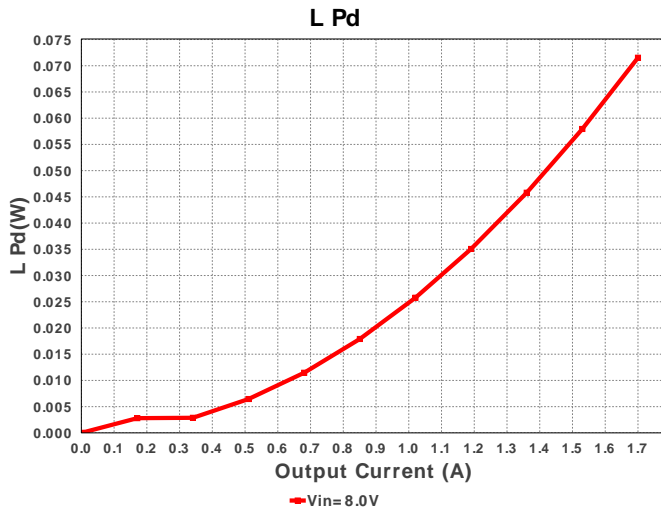
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 7 mm ²
2.	Cin	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	2	\$0.02	0805 7 mm ²
3.	Cinx	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
4.	Cout	MuRata	GRM21BC80G226ME39L Series= X6S	Cap= 22.0 uF ESR= 3.576 mOhm VDC= 4.0 V IRMS= 3.29633 A	1	\$0.04	0805 7 mm ²
5.	L1	Bourns	SRN6045-1R8Y	L= 1.8 uH DCR= 19.8 mOhm	1	\$0.16	SRN6045 64 mm ²
6.	Ren	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
7.	Rfbb	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
8.	Rfbt	Vishay-Dale	CRCW040212K7FKED Series= CRCW..e3	Res= 12.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
9.	Rreg	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	TPS54394PWPR	Switcher	0	\$1.20	 PWP0016C 59 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	644.53 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	331.64 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.274 A	Current	Peak switch current in IC
4.	Iin Avg	310.93 mA	Current	Average input current
5.	L Ipp	1.149 A	Current	Peak-to-peak inductor ripple current
6.	M Irms	709.187 mA	Current	MOSFET RMS current
7.	Frequency	572.27 kHz	General	Switching frequency
8.	IC Tolerance	7.6 mV	General	IC Feedback Tolerance
9.	M Vds Act	63.827 mV	General	Voltage drop across the MosFET
10.	Mode	CCM	General	Conduction Mode
11.	Pout	2.04 W	General	Total output power
12.	Vout Actual	1.205 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
13.	Vout OP	1.2 V	Op_Point	Operational Output Voltage
14.	Duty Cycle	17.403 %	Op_point	Duty cycle
15.	Efficiency	82.012 %	Op_point	PMU channel steady state efficiency
16.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
17.	IOUT_OP	1.7 A	Op_point	Iout operating point
18.	VIN_OP	8.0 V	Op_point	Vin operating point
19.	Vout p-p	15.517 mV	Op_point	Peak-to-peak output ripple voltage
20.	Cin Pd	623.127 μ W	Power	Input capacitor power dissipation
21.	Cout Pd	393.527 μ W	Power	Output capacitor power dissipation
22.	IC Iq Pd	5.2 mW	Power	IC Iq Pd
23.	IC Pd	374.909 mW	Power	IC power dissipation
24.	L Pd	71.527 mW	Power	Inductor power dissipation
25.	M1 PdCond	45.265 mW	Power	M1 MOSFET switching losses
26.	M1 PdSw	11.321 mW	Power	M1 MOSFET switching losses
27.	M2 PdCond	143.223 mW	Power	M2 MOSFET switching losses
28.	M2 Pdbody	145.929 mW	Power	Power dissipation through lower FET
29.	Total Pd	447.441 mW	Power	PMU channel power dissipation
30.	Vout Tolerance	1.738 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	1.7	Maximum Output Current
2.	VinMax	8.0	Maximum input voltage
3.	VinMin	8.0	Minimum input voltage
4.	Vout	1.2	Output Voltage
5.	base_pn	TPS54394/2	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	70.0	Ambient temperature

Design Assistance

1. TPS54394/2 Product Folder : <http://www.ti.com/product/TPS54394> : contains the data sheet and other resources.

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