

# WEBENCH® Power Architect

## Project Report

Project : 1228111/4 : TPS54494 PMU project  
Created : 2013-05-30 06:51:12.059

### Project Summary

- |                                   |                       |
|-----------------------------------|-----------------------|
| 1. Total System Efficiency        | 89.344 %              |
| 2. Total System BOM Count         | 22.0                  |
| 3. Total System Footprint         | 400.0 mm <sup>2</sup> |
| 4. Total System BOM Cost          | \$4.35                |
| 5. Total System Power Dissipation | 989.9 mW              |

--> Launch WEBENCH Power Architect.

## Power Supplies

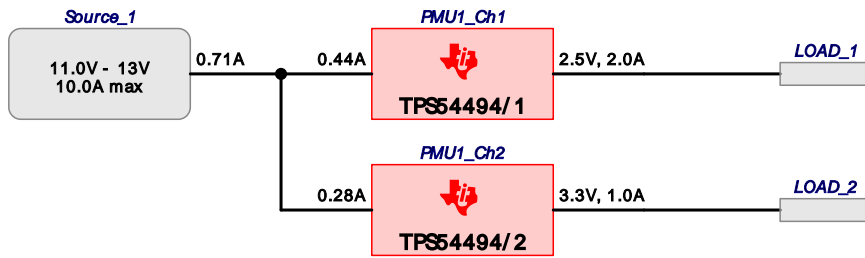
#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	PMU1_Ch1	TPS54494/1	N/A : 4A Dual Channel Synchronous Step-Down Switcher with Integrated FET	2.5 V	2.0 A	88.3%	240	\$0.00	67	6
2.	PMU1_Ch2	TPS54494/2	N/A : 2A Dual Channel Synchronous Step-Down Switcher with Integrated FET	3.3 V	1.0 A	90.9%	194	\$0.00	68	11
3.	PMU1	TPS54494	PMU : NA	V	NaN A	89.3%	400	\$4.35	66	4

## Power Loads

#	Name	VLoad	Iload	Description
1.	LOAD_1	2.5 V	2.0 A	VoutRipple=10%
2.	LOAD_2	3.3 V	1.0 A	VoutRipple=10%

## Project Diagram

WEBENCH® Power Architect Project ID : 4 TPS54494 PMU project Power Architect 2013-05-30 06:51:12.059



## Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm <sup>2</sup> )
AVX	08053C104KAT2A	0805	8	\$0.01	104
TDK	C1005X5R0J105M	0402	1	\$0.01	8
TDK	C3216X5R0J226K	1206	4	\$0.11	75
TDK	C3216X5R1C106M	1206	8	\$0.06	75
Vishay-Dale	CRCW0805100KFKEA	0805	4	\$0.01	52
Vishay-Dale	CRCW080510K0FKEA	0805	4	\$0.01	52
Vishay-Dale	CRCW080522K1FKEA	0805	4	\$0.01	52
Vishay-Dale	CRCW080549K9FKEA	0805	2	\$0.01	26
Vishay-Dale	CRCW080573K2FKEA	0805	2	\$0.01	26
MuRata	LQM2HPN2R2MG0L	1008	2	\$0.12	36
Bourns	SRN6045-2R2Y	SRN6045	2	\$0.16	128
Texas Instruments	TPS54494PWP	R-PDSO-G16	0	\$3.48	126
<b>Total</b>			<b>42</b>	<b>\$5.21</b>	<b>759</b>



VinMin = NaNV  
 VinMax = NaNV  
 Vout = 2.5V  
 Iout = 2.0A

Device = TPS54494PWP  
 Topology = PMU  
 Created = 5/30/13 6:51:09 AM  
 BOM Cost = \$4.35  
 Total Pd = 0.99W  
 Footprint = 400.0mm2  
 BOM Count = 22

## WEBENCH® Design Report

Design : 1228111/66 TPS54494PWP  
 Design 66 - TPS54494PWP

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 13mm2
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 13mm2
3.	Cin_ch1	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	\$0.06	 1206 19mm2
4.	Cin_ch2	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	\$0.06	 1206 19mm2
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 13mm2
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 13mm2
7.	Cout_ch1	TDK	C3216X5R0J226K Series= X5R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.62 A	1	\$0.11	 1206 19mm2
8.	Cout_ch2	TDK	C3216X5R0J226K Series= X5R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.62 A	1	\$0.11	 1206 19mm2
9.	Cpwr	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 µF ESR= 7.9 mOhm VDC= 6.3 V IRMS= 0.0 A	1	\$0.01	 0402 8mm2
10.	L1_ch1	Bourns	SRN6045-2R2Y	L= 2.2 µH DCR= 25.1 mOhm	1	\$0.16	 SRN6045 64mm2
11.	L1_ch2	MuRata	LQM2HPN2R2MG0L	L= 2.2 µH DCR= 80.0 mOhm	1	\$0.12	 1008 18mm2
12.	Ren_ch1	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
13.	Ren_ch2	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
14.	Rfbb_ch1	Vishay-Dale	CRCW080522K1FKEA Series= CRCW..e3	Res= 22.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
15.	Rfbb_ch2	Vishay-Dale	CRCW080522K1FKEA Series= CRCW..e3	Res= 22.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
16.	Rfbb_ch1	Vishay-Dale	CRCW080549K9FKEA Series= CRCW..e3	Res= 49.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
17.	Rfbb_ch2	Vishay-Dale	CRCW080573K2FKEA Series= CRCW..e3	Res= 73.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
18.	Rreg_ch1	Vishay-Dale	CRCW0805100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
19.	Rreg_ch2	Vishay-Dale	CRCW0805100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	 0805 13mm2
20.	U1	Texas Instruments	TPS54494PWP	Switcher	1	\$3.48	 R-PDSO-G16 42mm2

## Operating Values

#	Name	Value	Category	Description
1.	BOM Count	22	General	Total Design BOM count
2.	FootPrint	400.0 mm2	General	Total PMU footprint area of BOM components
3.	Pout	8.3 W	General	Total PMU output power
4.	Total BOM	\$4.35	General	Total BOM Cost
5.	Efficiency	89.344 %	Op_point	PMU steady state efficiency
6.	IC Tj	61.521 degC	Op_point	PMU IC junction temperature
7.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
8.	IC Pd	761.367 mW	Power	IC Pd
9.	Total Pd	989.915 mW	Power	PMU total power dissipation
10.	Total Pd	989.915 mW	Power	PMU total power dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	Iout2	1.0 Amps	Output Current #2
4.	Vout	2.5 V	Output Voltage
5.	Vout1	2.5 Volt	Output Voltage #1
6.	Vout2	3.3 Volt	Output Voltage #2
7.	base_pn	TPS54494	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

## Design Assistance

1. **TPS54494** Product Folder : <http://www.ti.com/pr> : contains the data sheet and other resources.

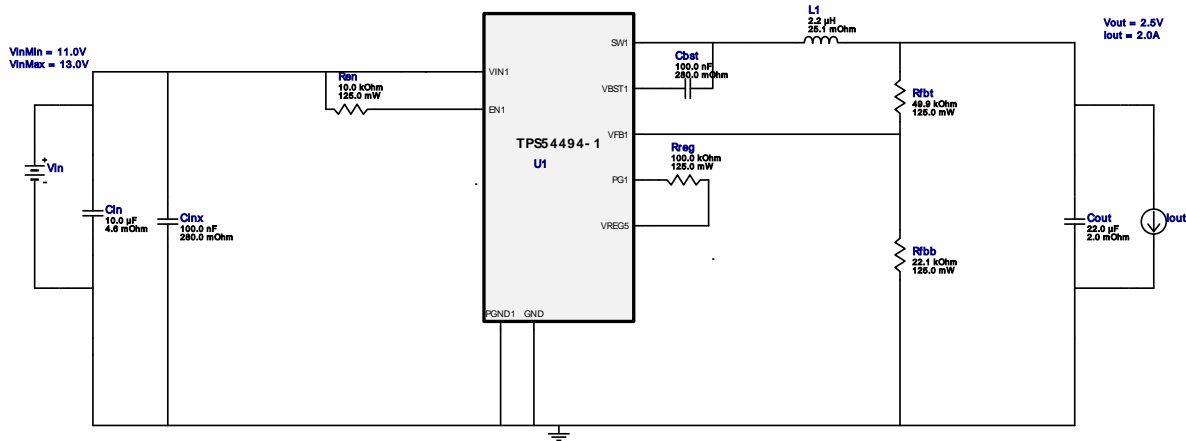


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 VinMax = 13.0V  
 Vout = 2.5V  
 Iout = 2.0A

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 Topology = Buck  
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
## WEBENCH® Design Report

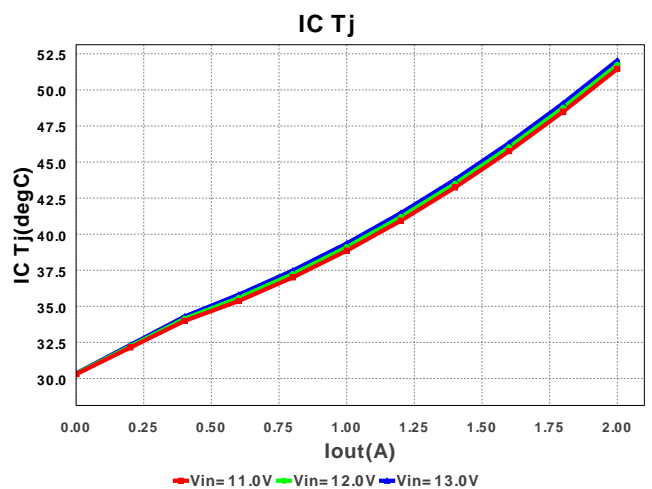
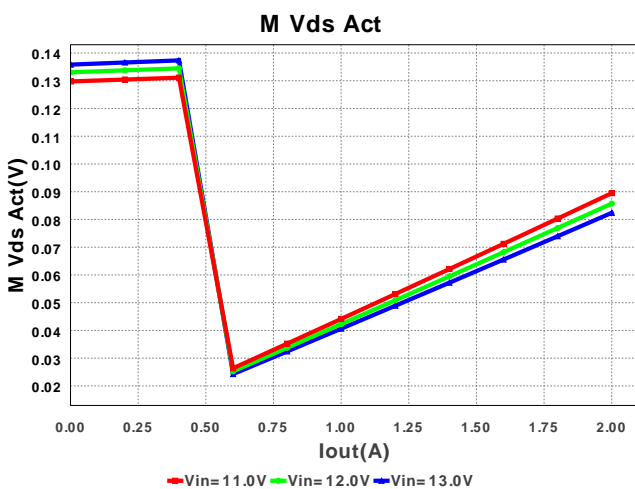
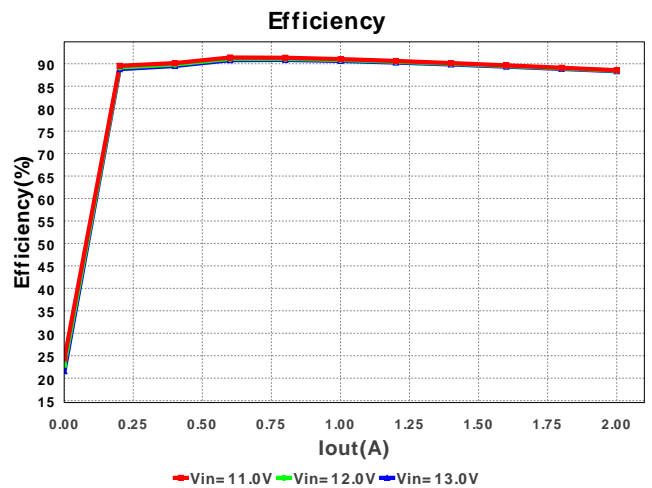
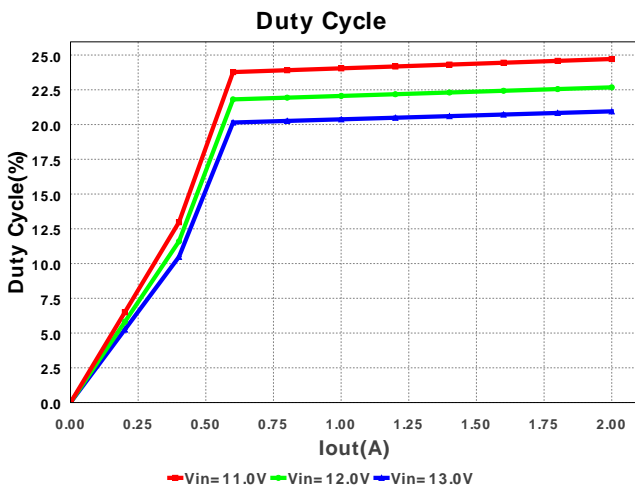
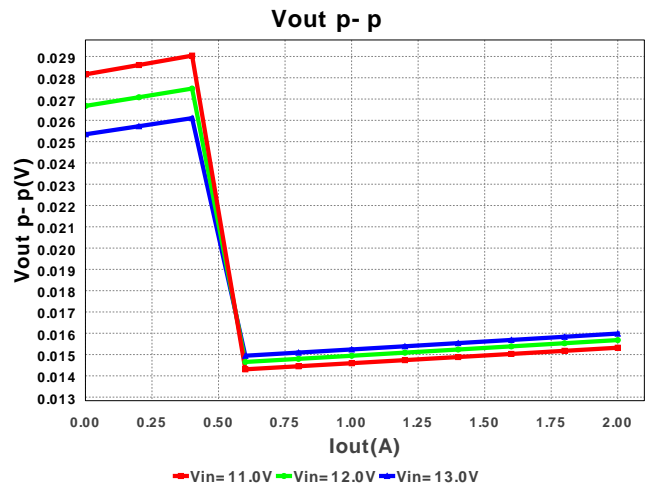
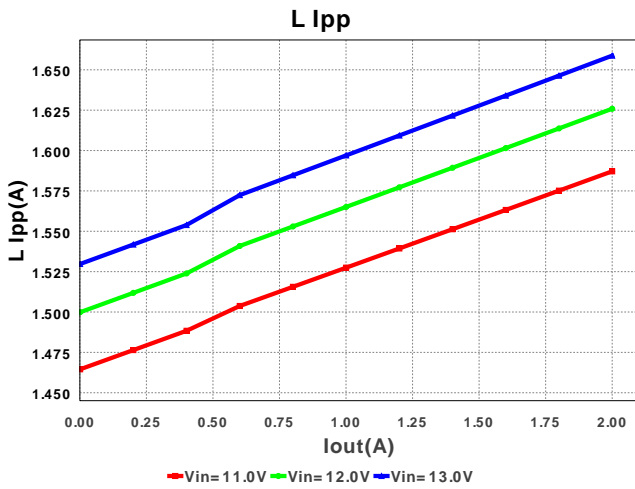
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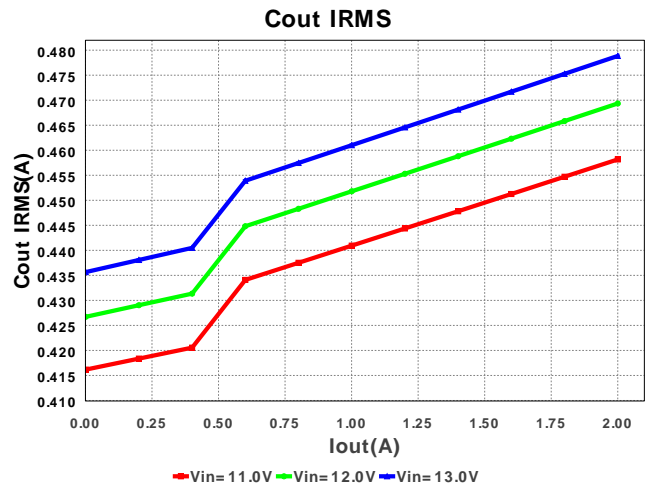
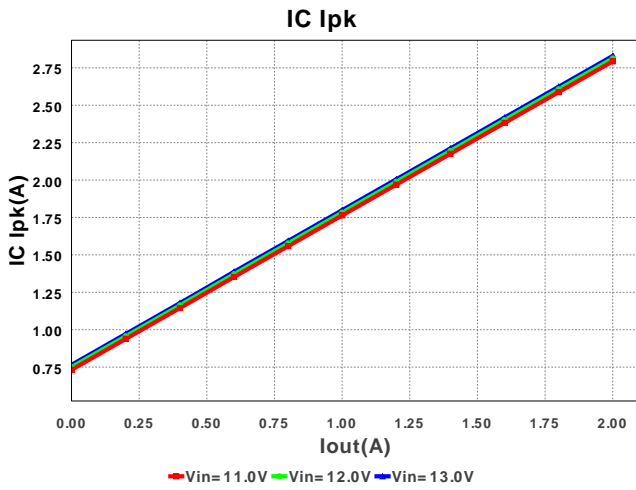
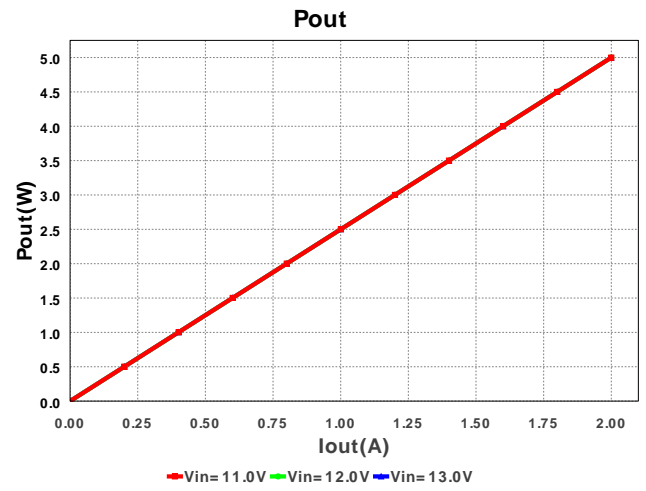
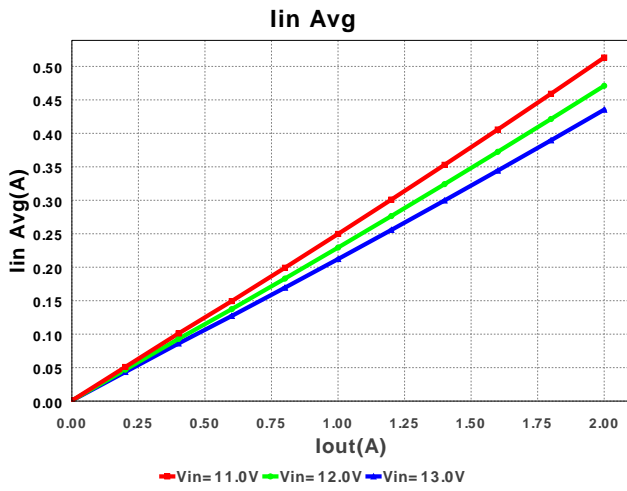
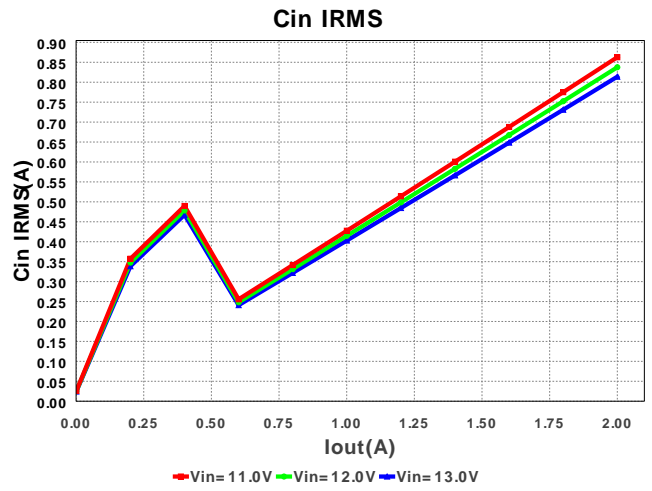
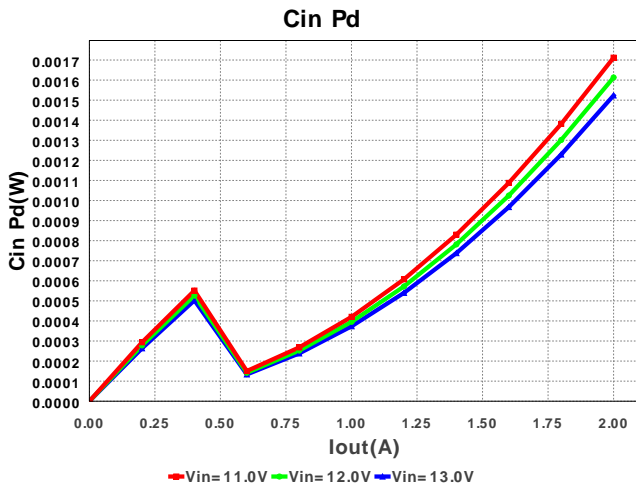


### Electrical BOM

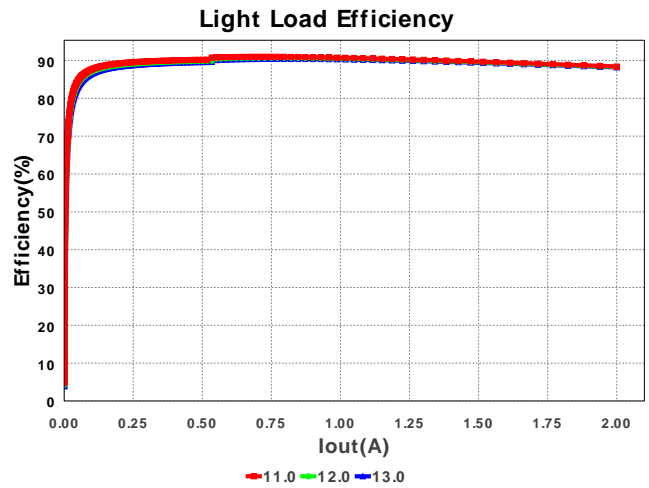
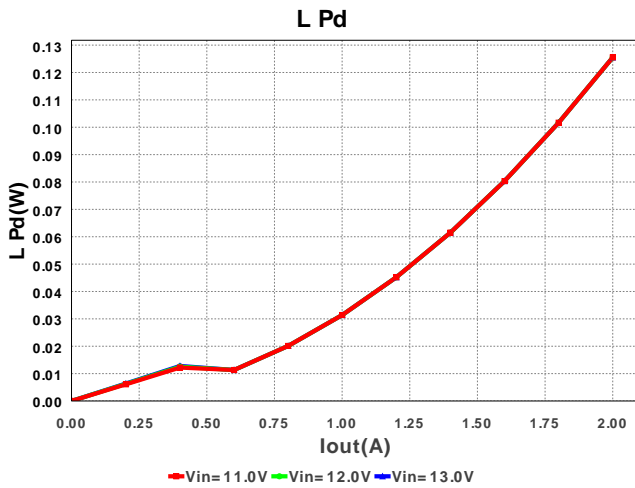
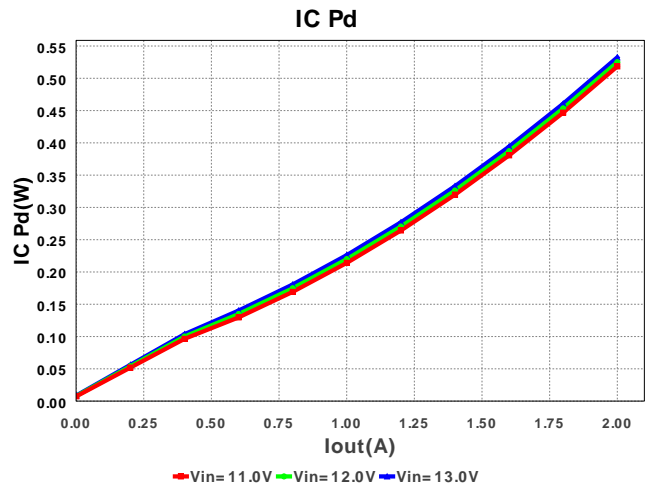
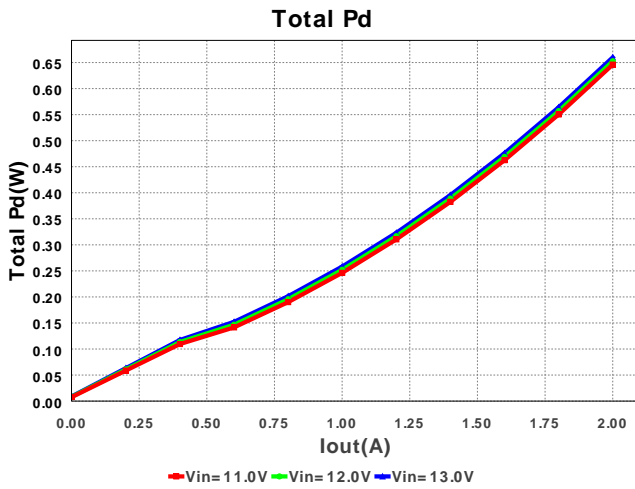
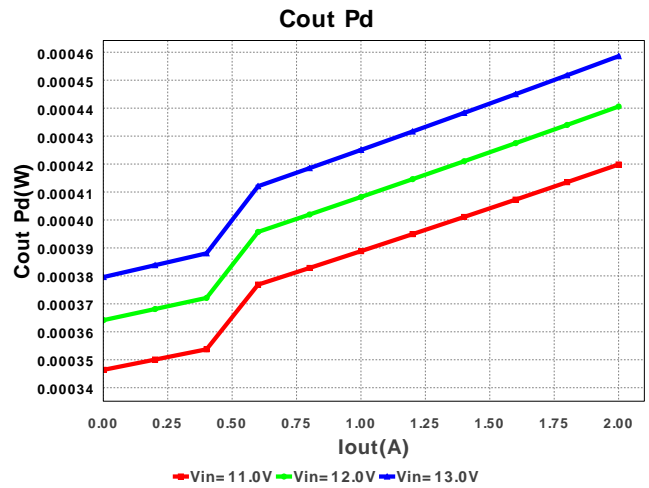
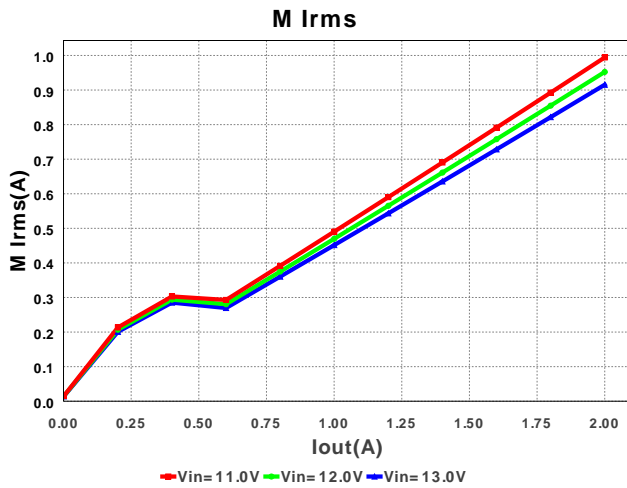
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
2.	Cin	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	\$0.06	1206 19mm2
3.	Cinx	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	0805 13mm2
4.	Cout	TDK	C3216X5R0J226K Series= X5R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.62 A	1	\$0.11	1206 19mm2
5.	L1	Bourns	SRN6045-2R2Y	L= 2.2 µH DCR= 25.1 mOhm	1	\$0.16	SRN6045 64mm2
6.	Ren	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
7.	Rfbb	Vishay-Dale	CRCW080522K1FKEA Series= CRCW..e3	Res= 22.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
8.	Rfbt	Vishay-Dale	CRCW080549K9FKEA Series= CRCW..e3	Res= 49.9 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
9.	Rreg	Vishay-Dale	CRCW0805100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	TPS54494PWP	Switcher	0	\$3.48	 R-PDSO-G16 42mm2









### Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	813.879 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	478.847 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.829 A	Current	Peak switch current in IC
4.	Iin Avg	435.38 mA	Current	Average input current
5.	L Ipp	1.659 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	915.385 mA	Current	Q Iavg
7.	Frequency	602.735 kHz	General	Switching frequency
8.	IC Tolerance	7.6 mV	General	IC Feedback Tolerance
9.	M Vds Act	82.385 mV	General	Voltage drop across the MosFET
10.	Mode	CCM	General	Conduction Mode
11.	Pout	5.0 W	General	Total output power

#	Name	Value	Category	Description
12.	Vout OP	2.5 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	20.948 %	Op_point	Duty cycle
14.	Efficiency	88.34 %	Op_point	PMU channel steady state efficiency
15.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	2.0 A	Op_point	Iout operating point
17.	VIN_OP	13.0 V	Op_point	Vin operating point
18.	Vout p-p	18.954 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	1.524 mW	Power	Input capacitor power dissipation
20.	Cout Pd	458.59 $\mu$ W	Power	Output capacitor power dissipation
21.	IC Iq Pd	8.45 mW	Power	IC Iq Pd
22.	IC Pd	532.476 mW	Power	IC power dissipation
23.	L Pd	125.5 mW	Power	Inductor power dissipation
24.	M1 PdCond	75.414 mW	Power	M1 MOSFET switching losses
25.	M1 PdSw	37.041 mW	Power	M1 MOSFET switching losses
26.	M1 PdCond	189.724 mW	Power	M2 MOSFET switching losses
27.	M2 Pbody	180.821 mW	Power	Power dissipation through lower FET
28.	Total Pd	659.949 mW	Power	PMU channel power dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	2.0 A	Maximum Output Current
2.	Iout1	2.0 Amps	Output Current #1
3.	VinMax	13.0 V	Maximum input voltage
4.	VinMin	11.0 V	Minimum input voltage
5.	Vout	2.5 V	Output Voltage
6.	Vout1	2.5 Volt	Output Voltage #1
7.	base_pn	TPS54494/1	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

## Design Assistance

1. **TPS54494/1** Product Folder : <http://www.ti.com/product/tps54494> : contains the data sheet and other resources.

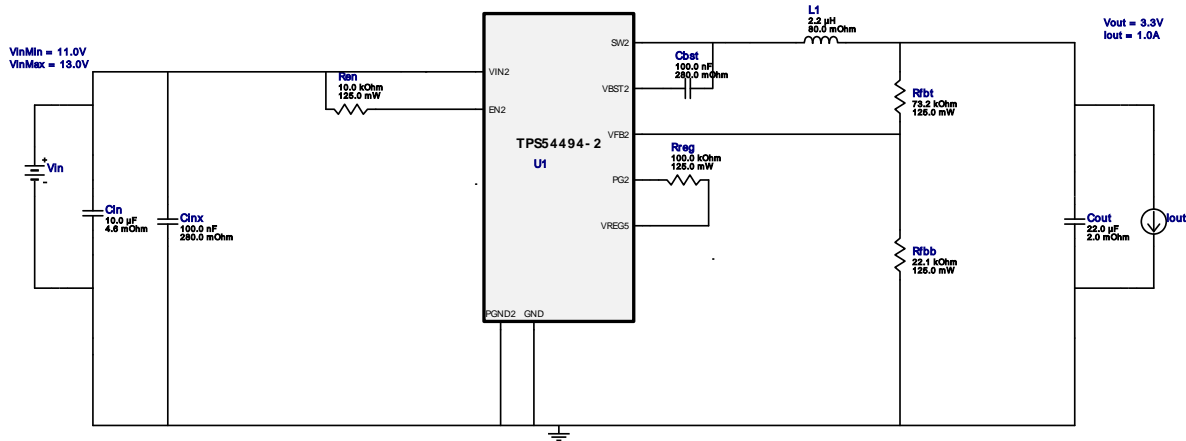


VinMin = 11.0V  
 VinMax = 13.0V  
 Vout = 3.3V  
 Iout = 1.0A

Device = TPS54494PWP  
 Topology = Buck  
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 Total Pd = 0.33W  
 Footprint = NaN  
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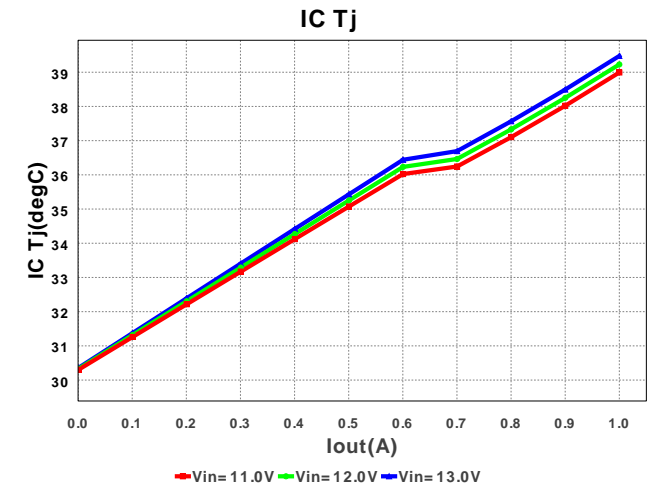
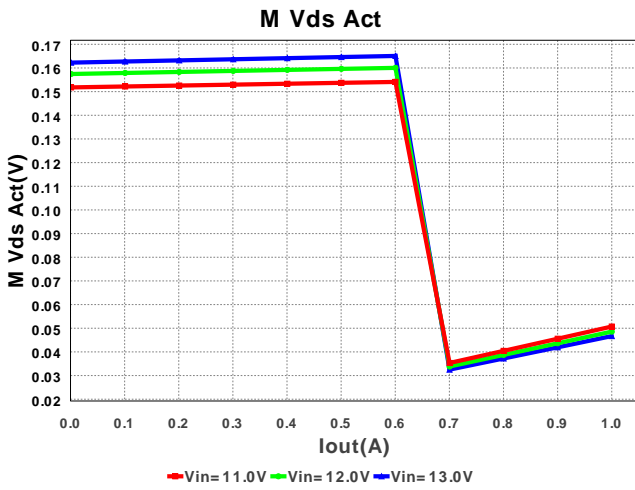
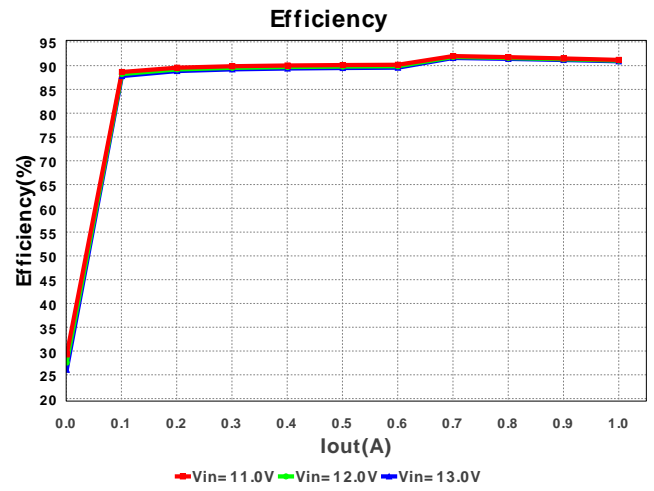
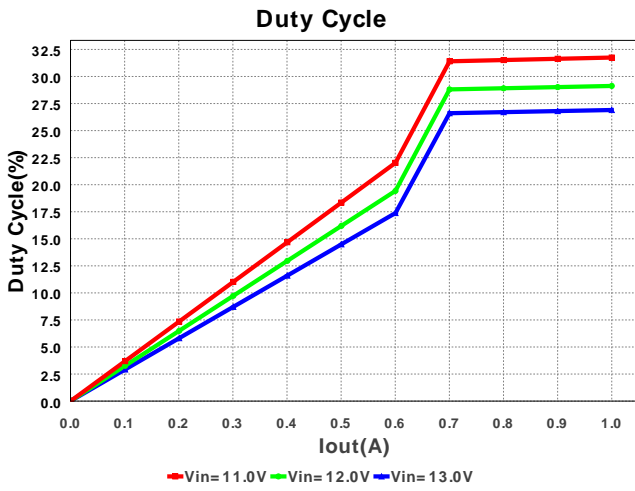
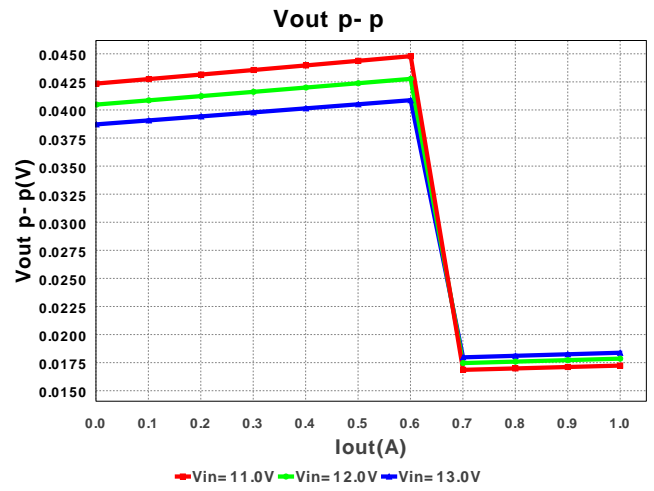
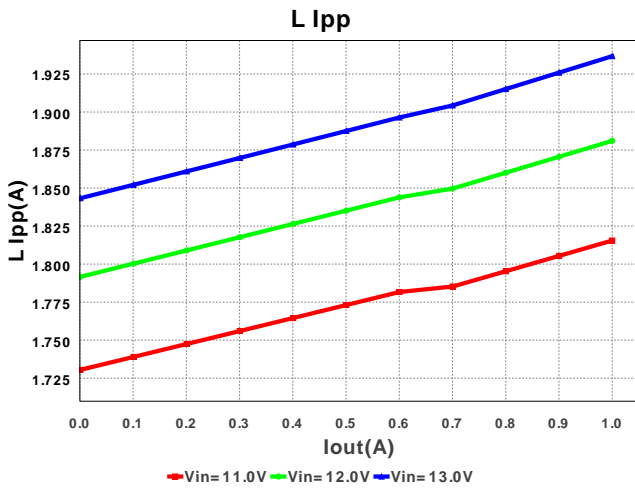
## WEBENCH® Design Report

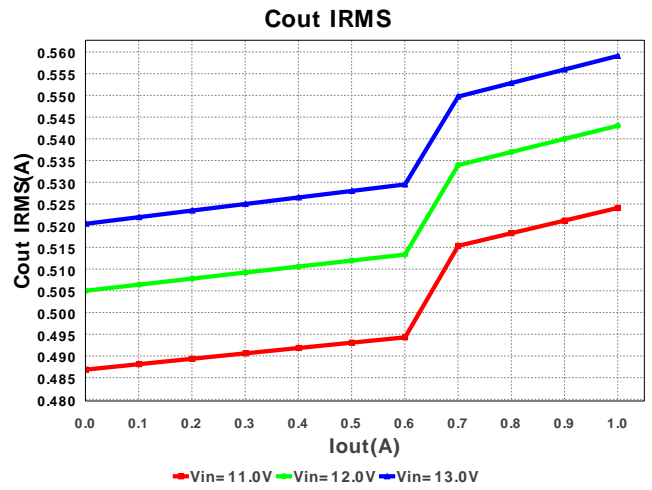
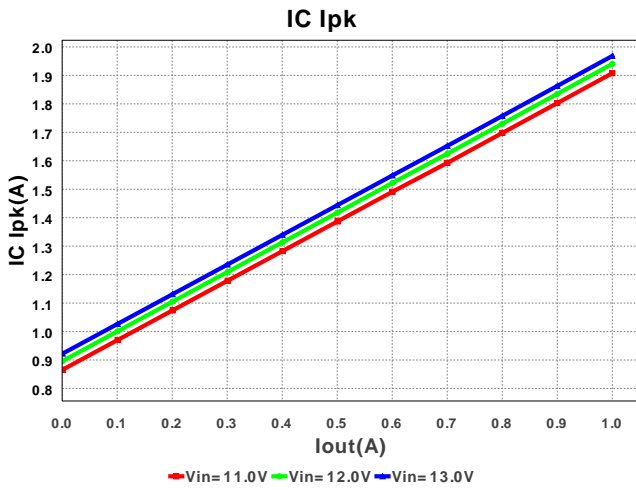
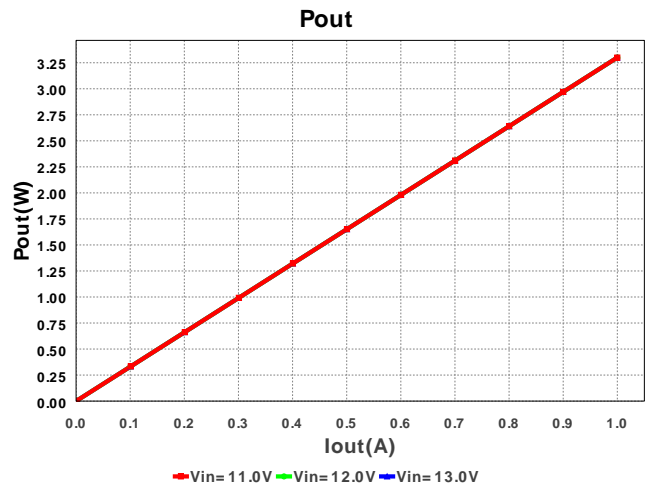
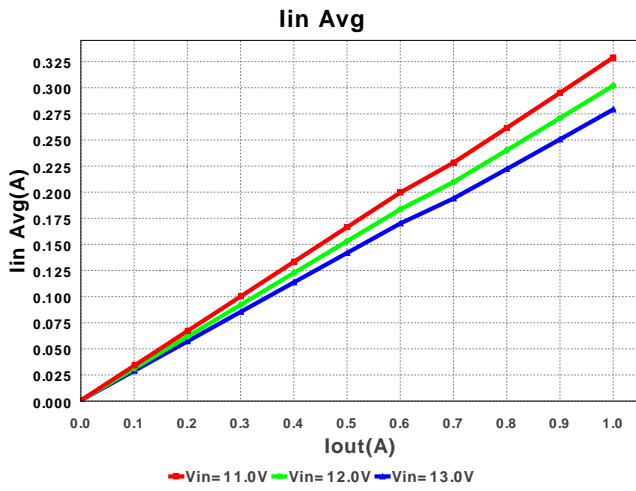
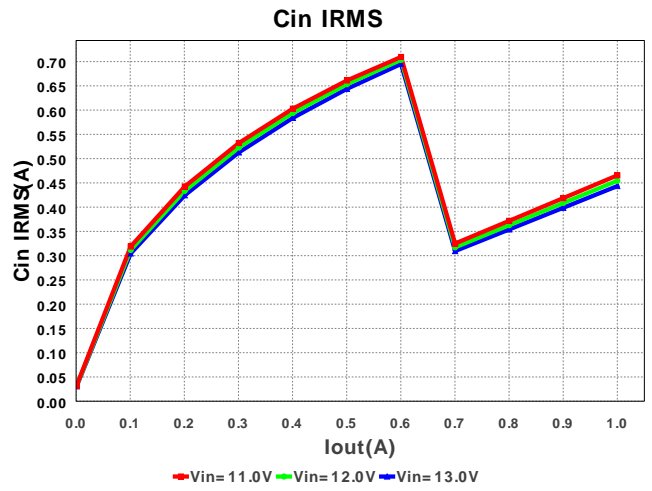
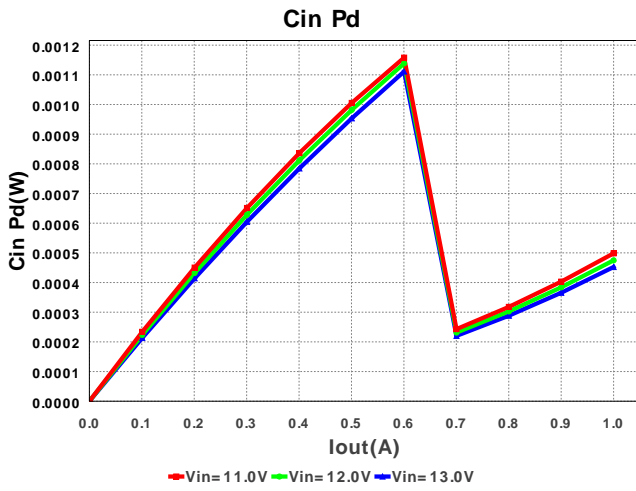
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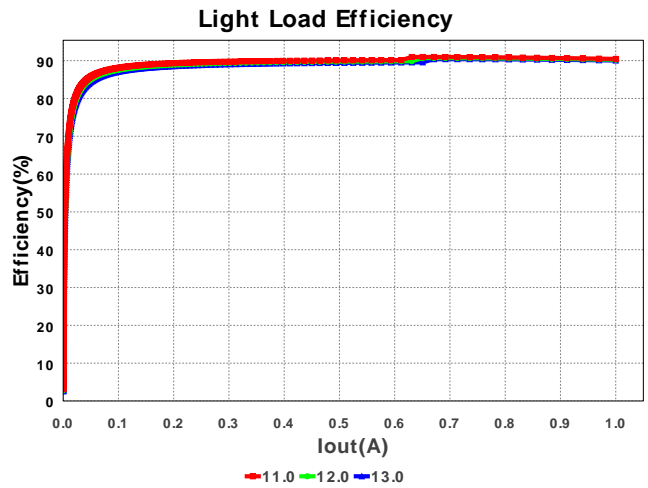
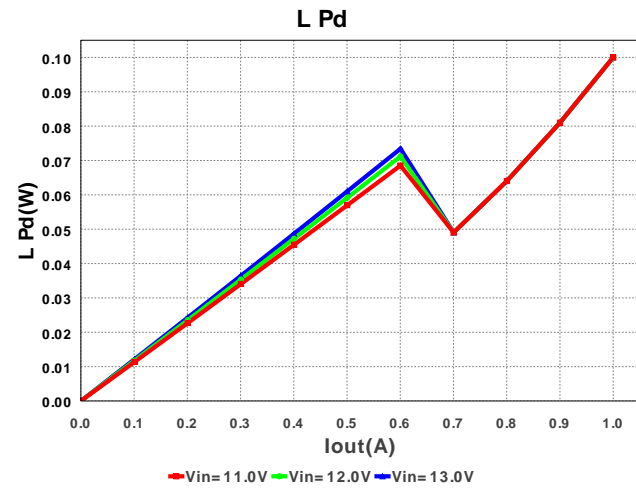
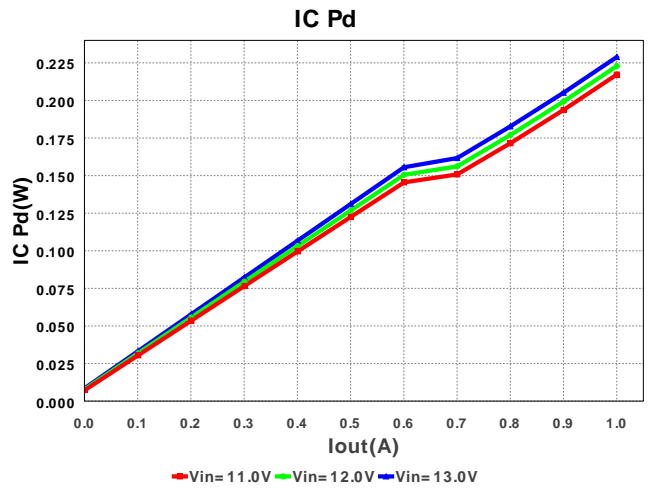
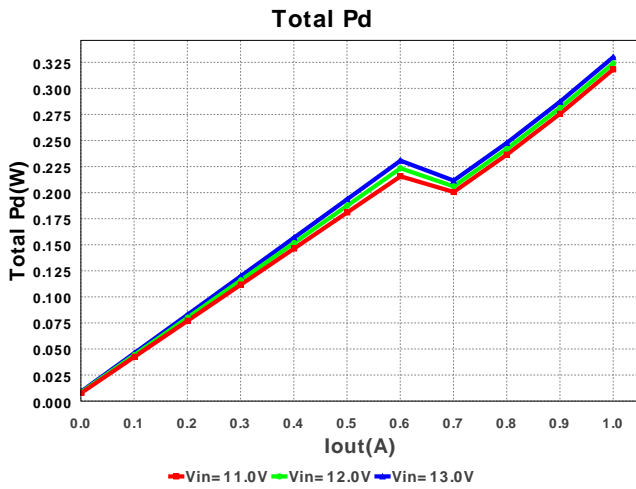
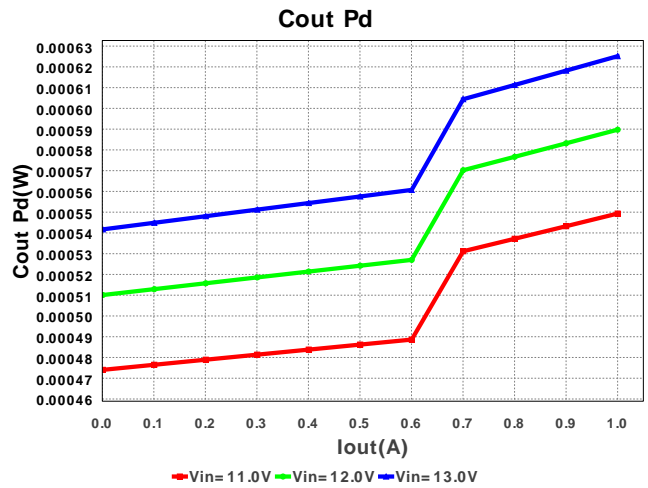
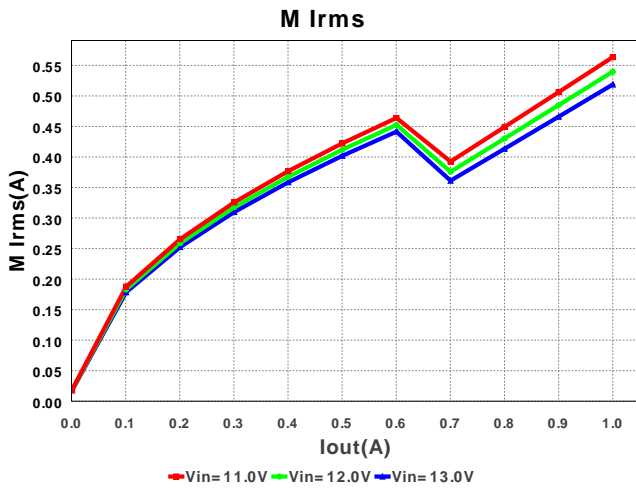


### Electrical BOM

#	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 13mm2
2.	Cin	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	\$0.06	1206 19mm2
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 13mm2
4.	Cout	TDK	C3216X5R0J226K Series= X5R	Cap= 22.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 3.62 A	1	\$0.11	1206 19mm2
5.	L1	MuRata	LQM2HPN2R2MG0L	L= 2.2 µH DCR= 80.0 mOhm	1	\$0.12	1008 18mm2
6.	Ren	Vishay-Dale	CRCW080510K0FKEA Series= CRCW..e3	Res= 10.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
7.	Rfbb	Vishay-Dale	CRCW080522K1FKEA Series= CRCW..e3	Res= 22.1 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
8.	Rfbt	Vishay-Dale	CRCW080573K2FKEA Series= CRCW..e3	Res= 73.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
9.	Rreg	Vishay-Dale	CRCW0805100KFKEA Series= CRCW..e3	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	\$0.01	0805 13mm2
10.	U1	Texas Instruments	TPS54494PWP	Switcher	0	\$3.48	R-PDSO-G16 42mm2







### Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	443.448 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	559.084 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.968 A	Current	Peak switch current in IC
4.	Iin Avg	279.23 mA	Current	Average input current
5.	L Ipp	1.937 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	518.668 mA	Current	Q lavg
7.	Frequency	612.434 kHz	General	Switching frequency
8.	IC Tolerance	7.6 mV	General	IC Feedback Tolerance
9.	M Vds Act	46.68 mV	General	Voltage drop across the MosFET
10.	Mode	CCM	General	Conduction Mode
11.	Pout	3.3 W	General	Total output power

#	Name	Value	Category	Description
12.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
13.	Duty Cycle	26.902 %	Op_point	Duty cycle
14.	Efficiency	90.91 %	Op_point	PMU channel steady state efficiency
15.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
16.	IOUT_OP	1.0 A	Op_point	Iout operating point
17.	VIN_OP	13.0 V	Op_point	Vin operating point
18.	Vout p-p	21.841 mV	Op_point	Peak-to-peak output ripple voltage
19.	Cin Pd	452.287 $\mu$ W	Power	Input capacitor power dissipation
20.	Cout Pd	625.15 $\mu$ W	Power	Output capacitor power dissipation
21.	IC Iq Pd	8.45 mW	Power	IC Iq Pd
22.	IC Pd	228.891 mW	Power	IC power dissipation
23.	L Pd	100.0 mW	Power	Inductor power dissipation
24.	M1 PdCond	24.211 mW	Power	M1 MOSFET switching losses
25.	M1 PdSw	18.818 mW	Power	M1 MOSFET switching losses
26.	M1 PdCond	43.859 mW	Power	M2 MOSFET switching losses
27.	M2 Pbody	91.865 mW	Power	Power dissipation through lower FET
28.	Total Pd	329.966 mW	Power	PMU channel power dissipation

## Design Inputs

#	Name	Value	Description
1.	Iout	1.0 A	Maximum Output Current
2.	Iout1	1.0 Amps	Output Current #1
3.	VinMax	13.0 V	Maximum input voltage
4.	VinMin	11.0 V	Minimum input voltage
5.	Vout	3.3 V	Output Voltage
6.	Vout1	3.3 Volt	Output Voltage #1
7.	base_pn	TPS54494/2	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

## Design Assistance

1. **TPS54494/2** Product Folder : <http://www.ti.com/product/tps54494> : contains the data sheet and other resources.

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