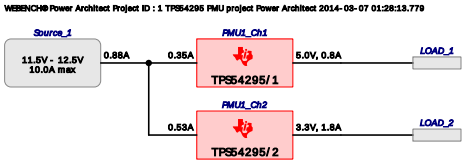
WEBENCH® Power Architect



Project Report

Project : 841840/1 : TPS54295 PMU project
Created : 2014-03-07 01:28:13.779

Project Summary

1.	Total System Efficiency	90.228 %
2.	Total System BOM Count	24.0
3.	Total System Footprint	237.0 mm2
4.	Total System BOM Cost	$1.94
5.	Total System Power Dissipation	1.076 W

--> Launch WEBENCH Power Architect.

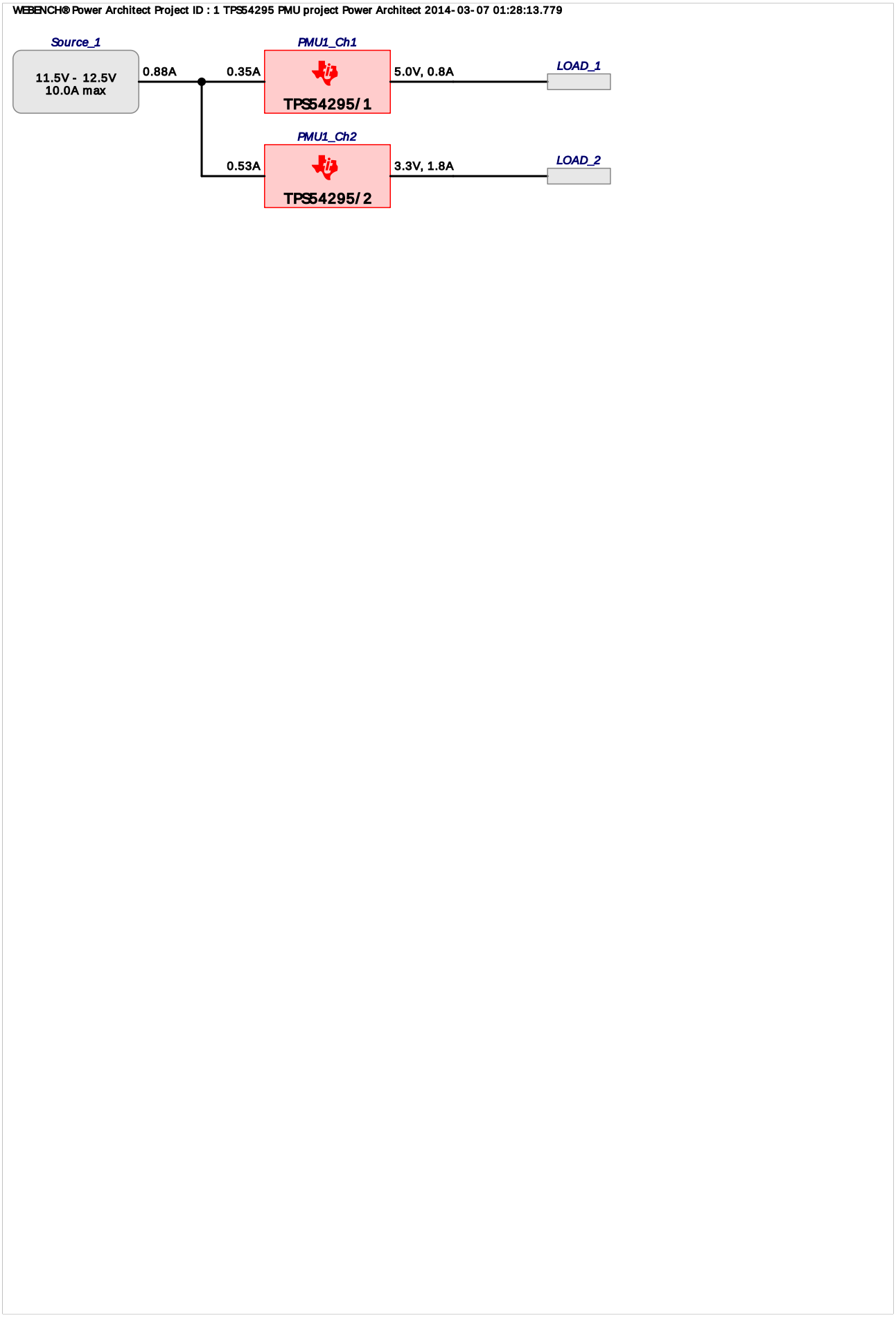
Power Supplies

#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	PMU1_Ch1	TPS54295/1	Buck : 2A Dual Channel Synchronous Step-Down Switcher with Integrated FET	5.0 V	0.8 A	92.2%	110	$0.00	14	8
2.	PMU1_Ch2	TPS54295/2	Buck : 2A Dual Channel Synchronous Step-Down Switcher with Integrated FET	3.3 V	1.8 A	88.9%	167	$0.00	15	13
3.	PMU1	TPS54295	PMU : NA	V	NaN A	90.2%	237	$1.94	13	4

Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD_1	5.0 V	0.8 A	VoutRipple=10%
2.	LOAD_2	3.3 V	1.8 A	VoutRipple=10%

Project Diagram



Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm^2)
AVX	08053C104KAT2A	0805	6	$0.01	40
TDK	C1005X5R0J104K	0402	2	$0.01	6
TDK	C1005X5R0J105M	0402	1	$0.01	3
TDK	C1005X7R1C103K	0402	4	$0.01	12
TDK	C3216X5R1C106M	1206	8	$0.06	44
Vishay-Dale	CRCW040210K0FKED	0402	4	$0.01	12
Vishay-Dale	CRCW0402121KFKED	0402	2	$0.01	6
Vishay-Dale	CRCW040222K1FKED	0402	4	$0.01	12
Vishay-Dale	CRCW040273K2FKED	0402	2	$0.01	6
MuRata	GRM21BR60J226ME39L	0805	8	$0.05	27
MuRata	LQM2HPN3R3MG0L	1008	2	$0.12	21
Bourns	SRN6045-3R3Y	SRN6045	2	$0.16	128
Texas Instruments	TPS54295PWP	R-PDSO-G16	0	$1.08	126
Total			**46**	**$2.78**	**443**

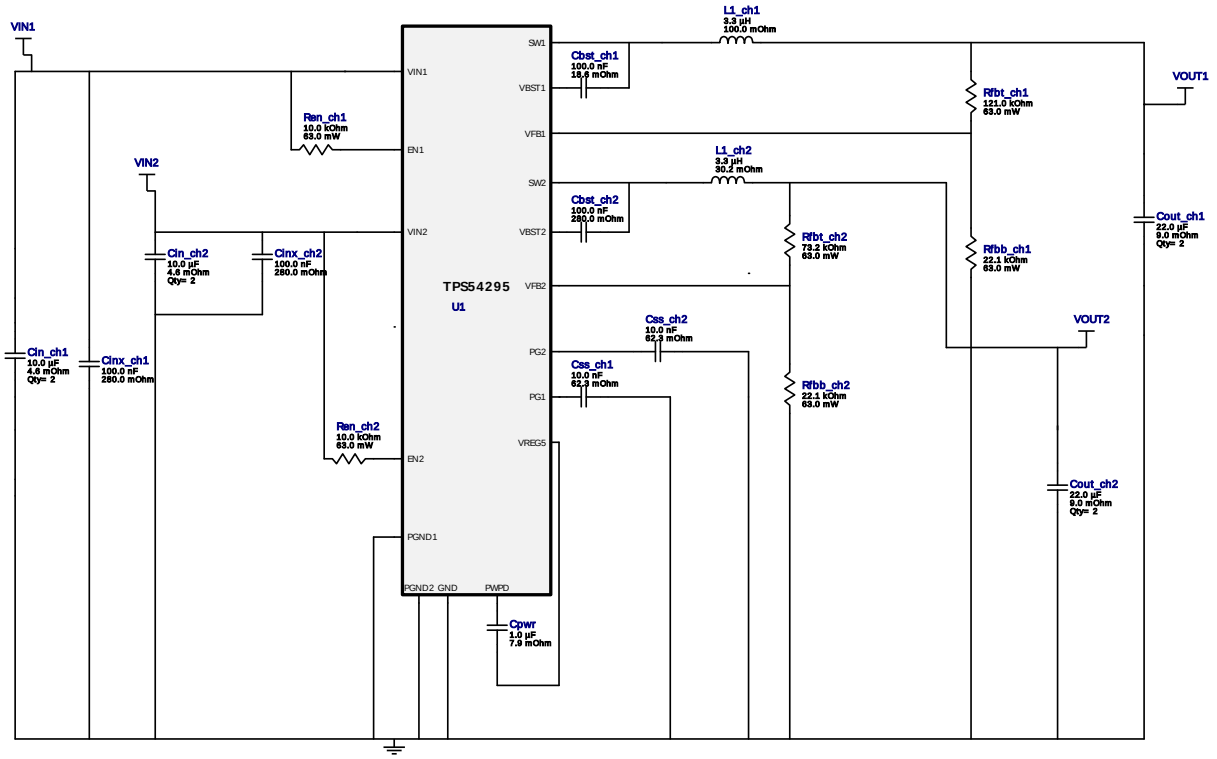
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = NaNV
VinMax = NaNV
Vout = 5.0V
Iout = 0.8A

Device = TPS54295PWP
Topology = PMU
Created = 3/7/14 1:28:08 AM
BOM Cost = $1.94
Footprint = 237.0mm2
BOM Count = 24
Total Pd = 1.08W

Design : 841840/13 TPS54295PWP
Design 13 - TPS54295PWP

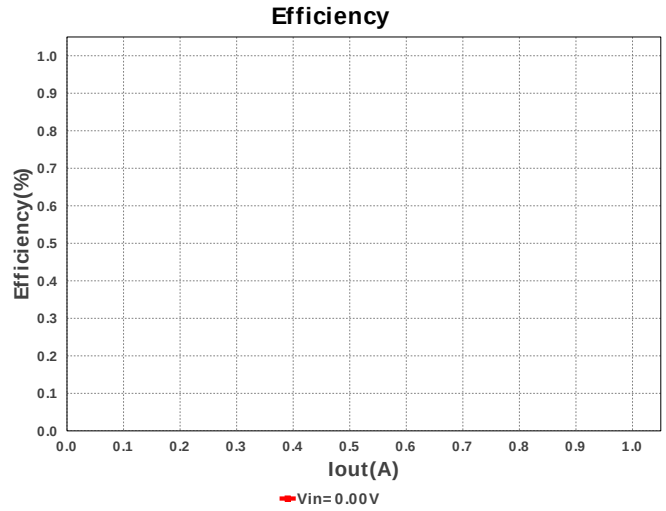


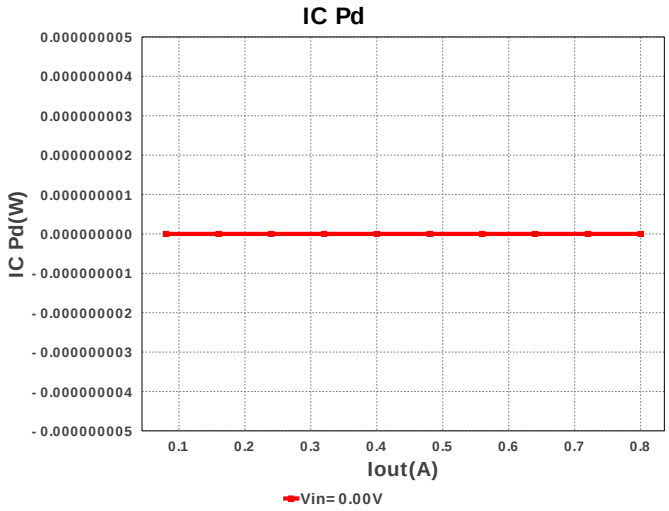
1. This schematic shows all the components for this Power Management Unit. The block diagram on the left shows how the channels are connected. Use the drop down PMU Options selector below the optimization dial on the summary page to get the details for each channel. Or click on the block diagram on the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

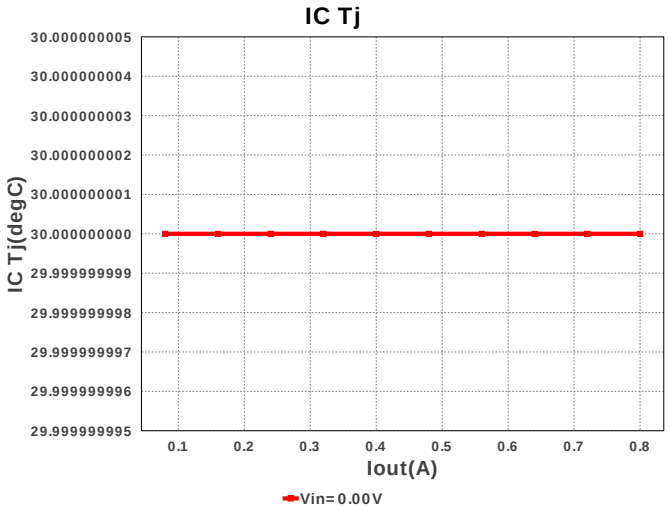
Electrical BOM

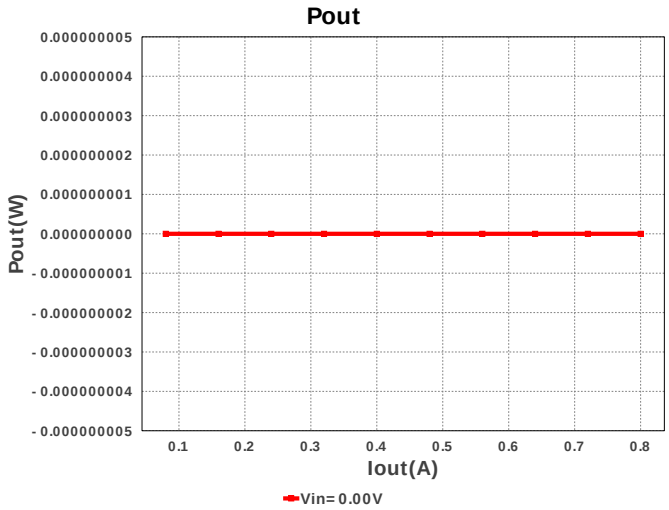
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst_ch1	TDK	C1005X5R0J104K Series= X5R	Cap= 100.0 nF ESR= 18.6 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3mm2
2.	Cbst_ch2	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
3.	Cin_ch1	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	$0.06	1206 11mm2
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 11mm2
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 7mm2

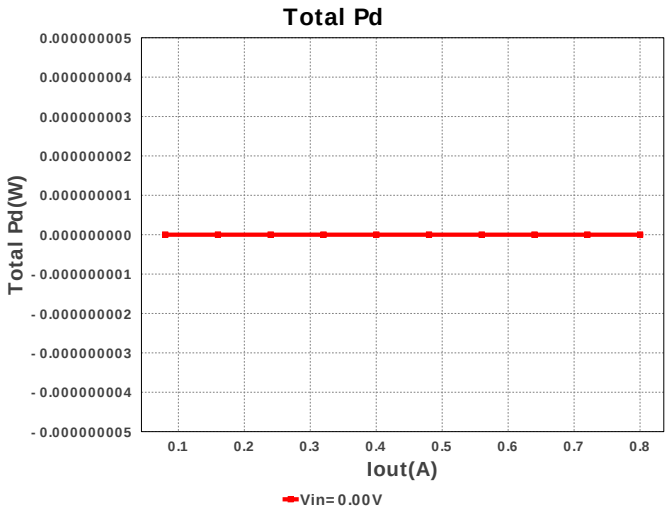
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	Cinx_ch2	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	 0805 7mm2
7.	Cout_ch1	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 µF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	2	$0.05	 0805 7mm2
8.	Cout_ch2	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 µF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	2	$0.05	 0805 7mm2
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 3mm2
10.	Css_ch1	TDK	C1005X7R1C103K Series= X7R	Cap= 10.0 nF ESR= 62.3 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	 0402 3mm2
11.	Css_ch2	TDK	C1005X7R1C103K Series= X7R	Cap= 10.0 nF ESR= 62.3 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	 0402 3mm2
12.	L1_ch1	MuRata	LQM2HPN3R3MG0L	L= 3.3 µH DCR= 100.0 mOhm	1	$0.12	 1008 10mm2
13.	L1_ch2	Bourns	SRN6045-3R3Y	L= 3.3 µH DCR= 30.2 mOhm	1	$0.16	 SRN6045 64mm2
14.	Ren_ch1	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
15.	Ren_ch2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
16.	Rfbb_ch1	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
17.	Rfbb_ch2	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
18.	Rfbt_ch1	Vishay-Dale	CRCW0402121KFKED Series= CRCW..e3	Res= 121.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
19.	Rfbt_ch2	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
20.	U1	Texas Instruments	TPS54295PWP	Switcher	1	$1.08	 R-PDSO-G16 42mm2











Operating Values

#	Name	Value	Category	Description
1.	BOM Count	24	General	Total Design BOM count
2.	FootPrint	237.0 mm2	General	Total PMU footprint area of BOM components
3.	Pout	9.94 W	General	Total PMU output power
4.	Total BOM	$1.94	General	Total BOM Cost
5.	Efficiency	90.228 %	Op_point	PMU steady state efficiency
6.	IC Tj	65.331 degC	Op_point	PMU IC junction temperature
7.	ICThetaJA	41.4 degC/W	Op_point	IC junction-to-ambient thermal resistance
8.	IC Pd	853.409 mW	Power	IC Pd
9.	Total Pd	1.077 W	Power	PMU total power dissipation
10.	Total Pd	1.077 W	Power	PMU total power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	800.0 mA	Maximum Output Current
2.	Iout1	800.0 mAmps	Output Current #1
3.	Iout2	1.8 Amps	Output Current #2
4.	Vout	5.0 V	Output Voltage
5.	Vout1	5.0 Volt	Output Voltage #1
6.	Vout2	3.3 Volt	Output Voltage #2
7.	base_pn	TPS54295	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

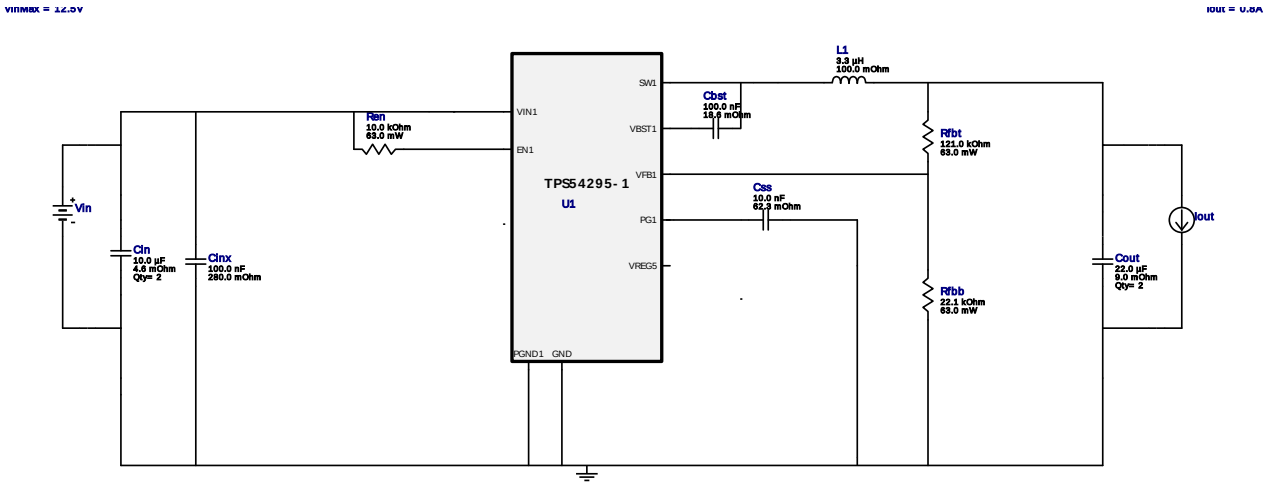
1. **TPS54295** Product Folder : http://www.ti.com/pr : contains the data sheet and other resources.

WEBENCH® Design Report

VinMin = 11.5V
VinMax = 12.5V
Vout = 5.0V
Iout = 0.8A

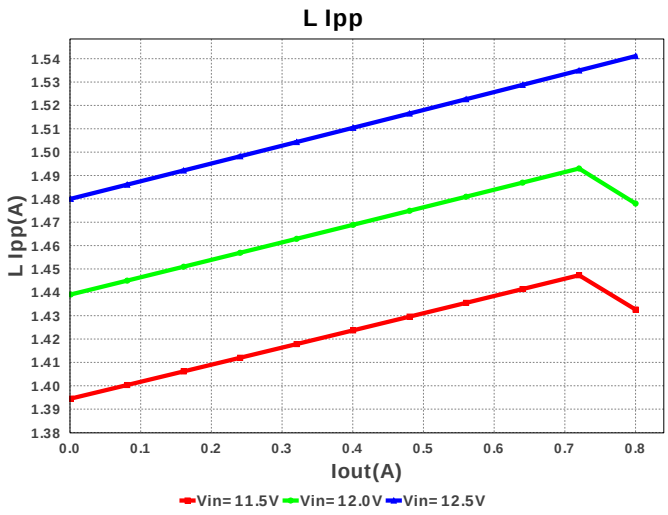
Device = TPS54295PWP
Topology = Buck
Created = 3/7/14 1:28:10 AM
BOM Cost = $NaN
Footprint = NaN
BOM Count = NaN
Total Pd = 0.34W

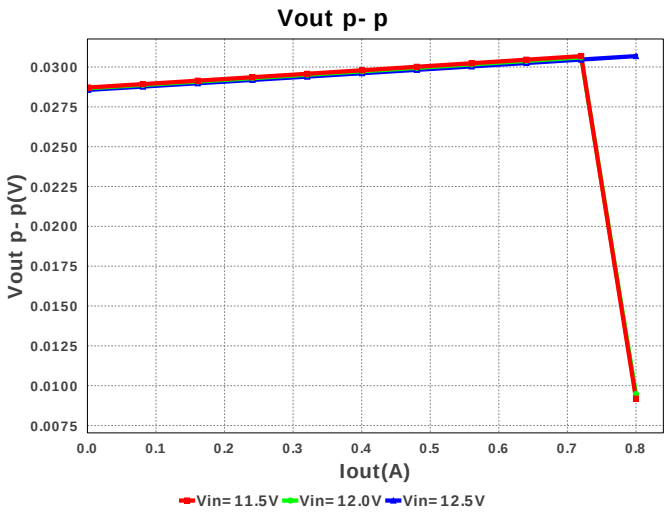
Design : 841840/14 TPS54295PWP
TPS54295PWP 11.5V-12.5V to 5.0V @ 0.8A

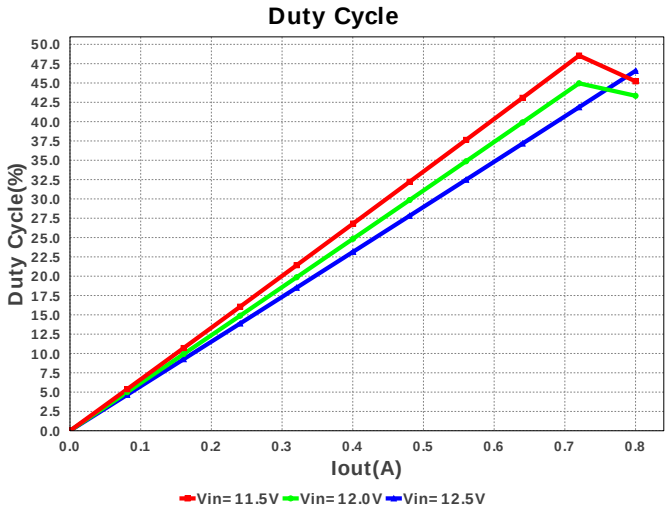


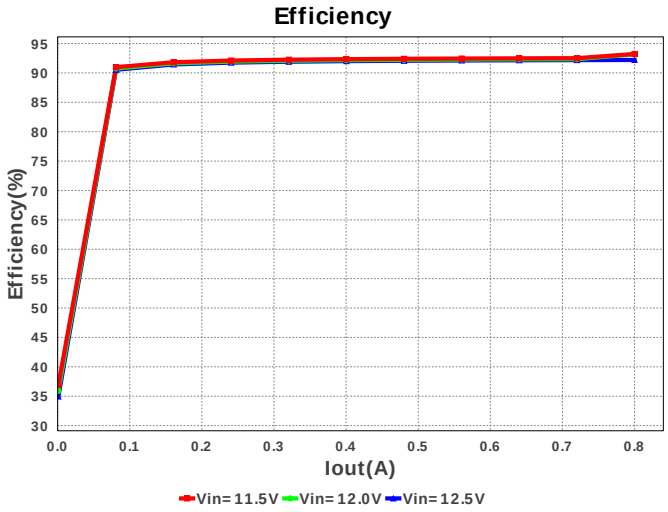
Electrical BOM

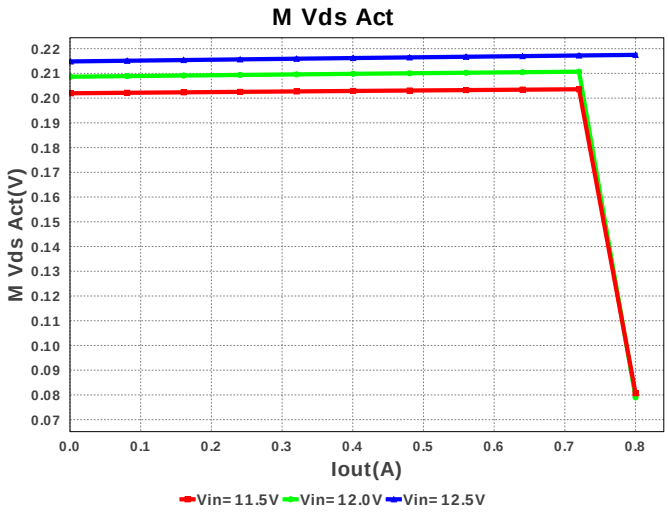
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	TDK	C1005X5R0J104K Series= X5R	Cap= 100.0 nF ESR= 18.6 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3mm2
2.	Cin	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	$0.06	1206 11mm2
3.	Cinx	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
4.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 µF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	2	$0.05	0805 7mm2
5.	Css	TDK	C1005X7R1C103K Series= X7R	Cap= 10.0 nF ESR= 62.3 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3mm2
6.	L1	MuRata	LQM2HPN3R3MG0L	L= 3.3 µH DCR= 100.0 mOhm	1	$0.12	1008 10mm2
7.	Ren	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
8.	Rfbb	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
9.	Rfbt	Vishay-Dale	CRCW0402121KFKED Series= CRCW..e3	Res= 121.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
10.	U1	Texas Instruments	TPS54295PWP	Switcher	0	$1.08	R-PDSO-G16 42mm2

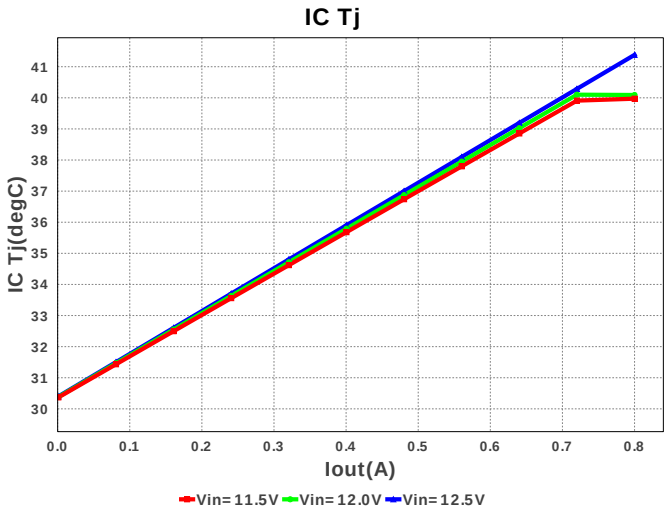




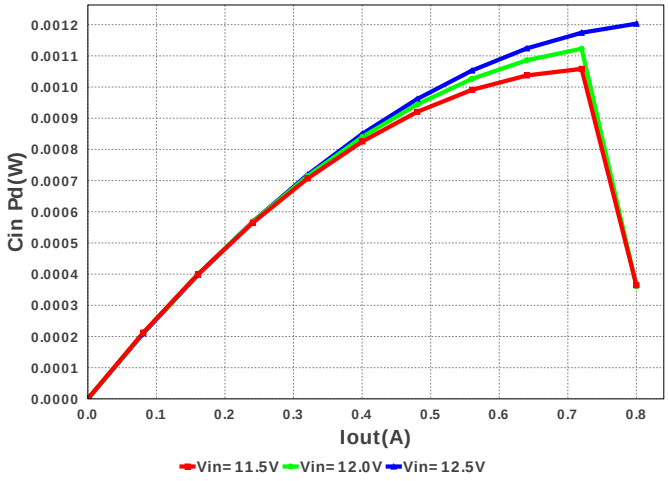




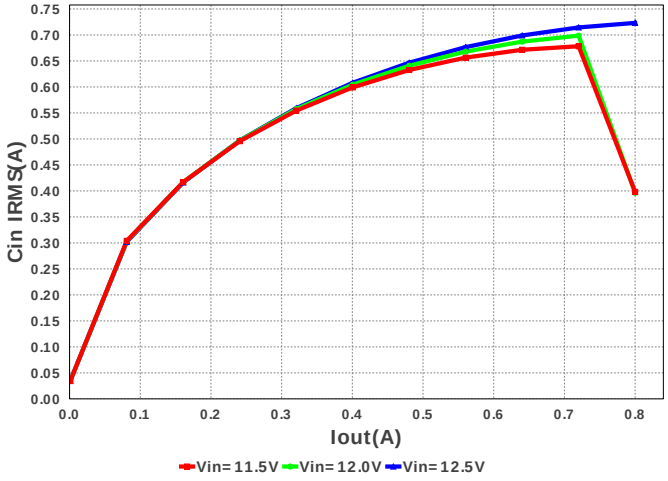




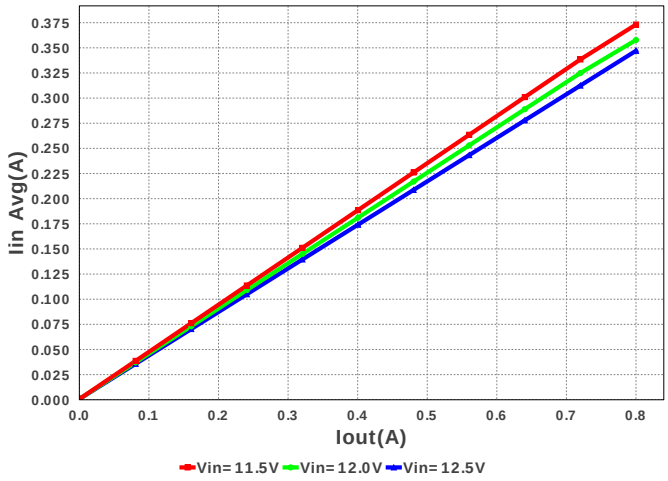
Cin Pd



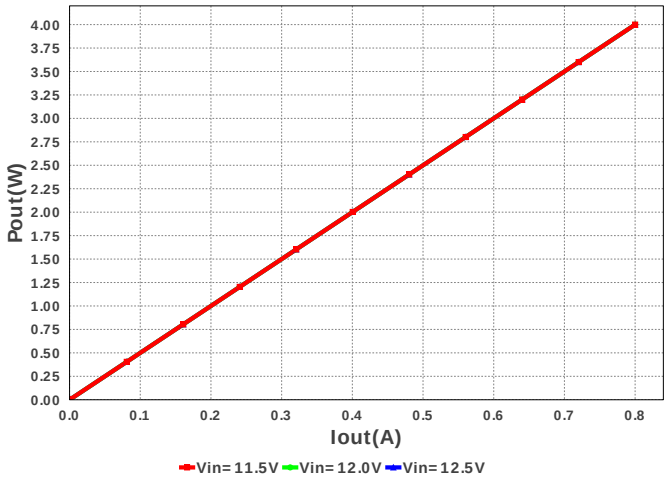
Cin IRMS



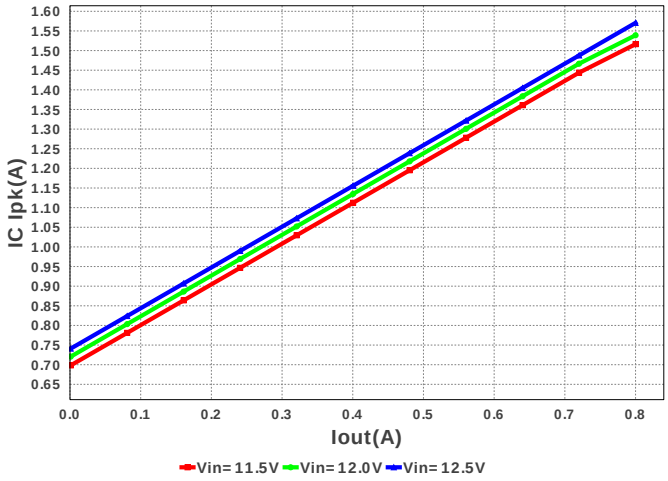
Iin Avg



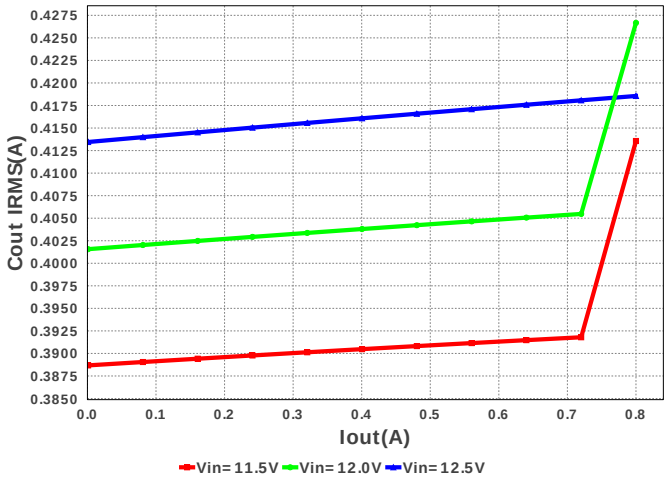
Pout

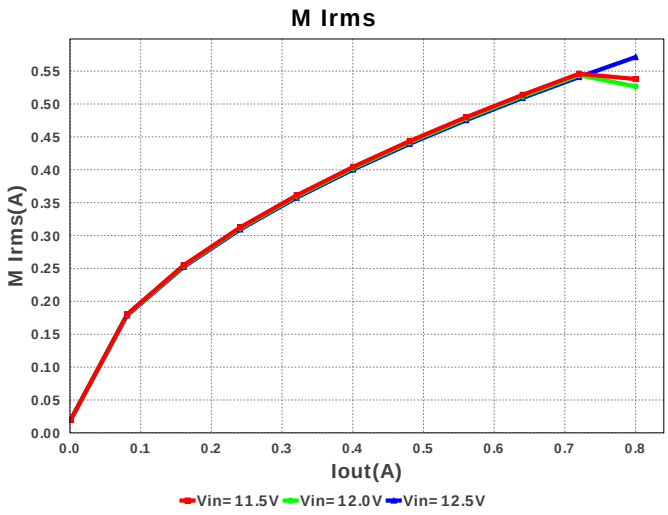


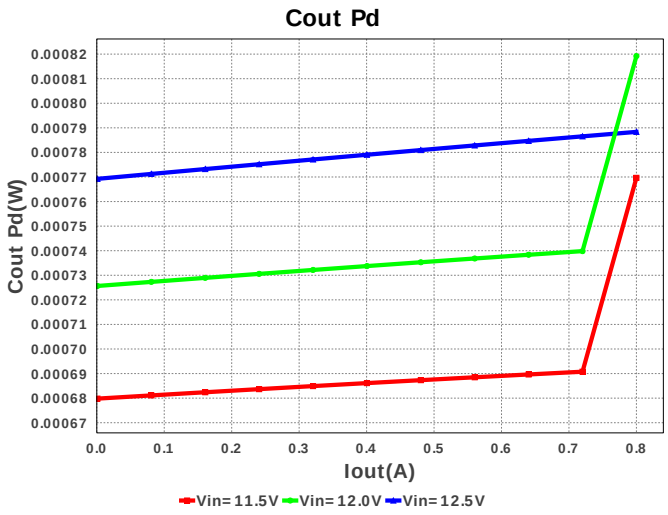
IC Ipk

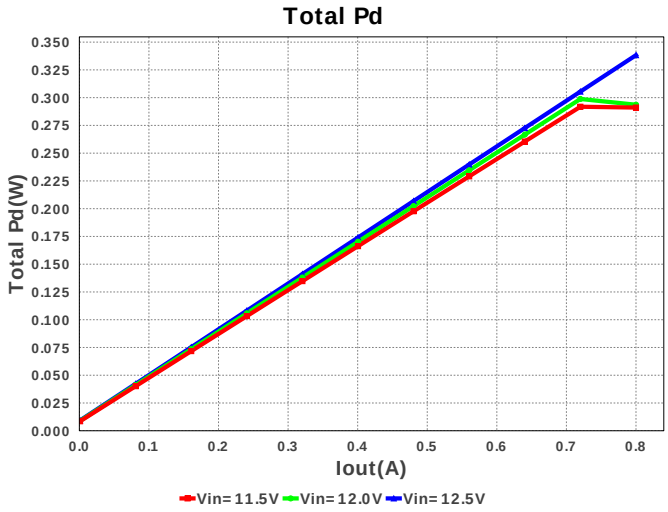


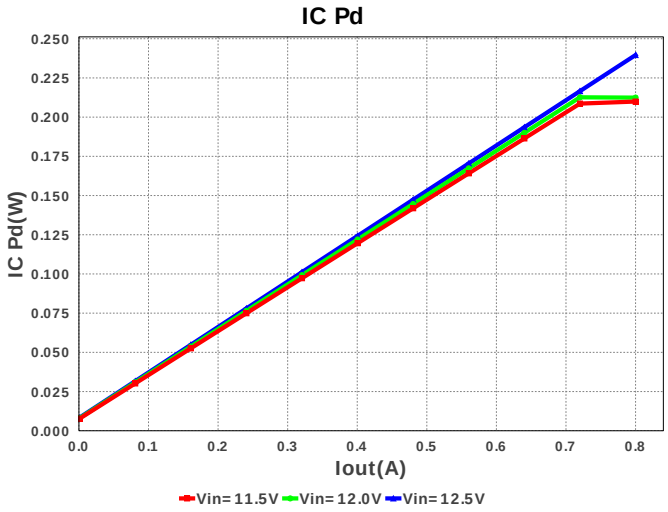
Cout IRMS

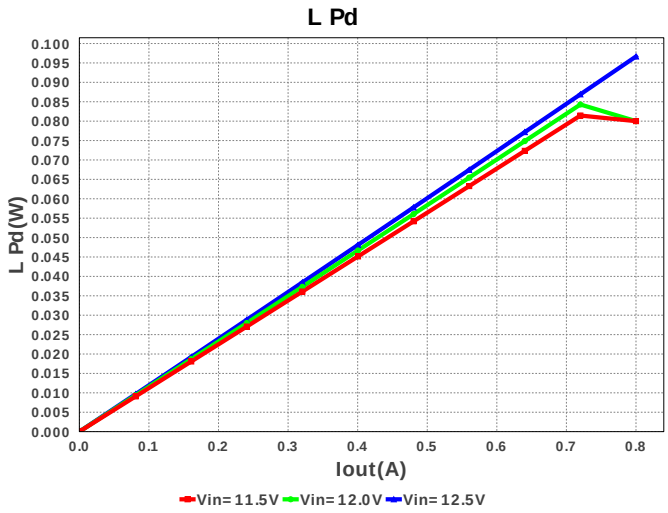


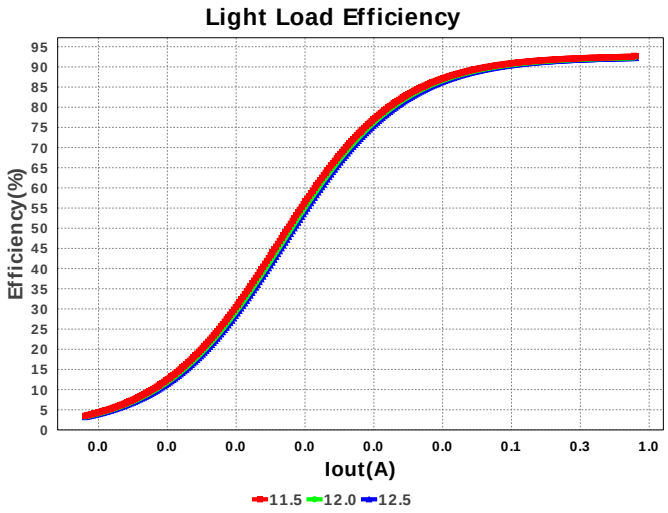












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	723.256 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	418.557 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.571 A	Current	Peak switch current in IC
4.	Iin Avg	347.06 mA	Current	Average input current
5.	L Ipp	1.541 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	571.276 mA	Current	Q Iavg
7.	Frequency	686.808 kHz	General	Switching frequency
8.	IC Tolerance	7.6 mV	General	IC Feedback Tolerance
9.	M Vds Act	217.489 mV	General	Voltage drop across the MosFET
10.	Pout	4.0 W	General	Total output power
11.	Vout OP	5.0 V	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
12.	Duty Cycle	46.572 %	Op_point	Duty cycle
13.	Efficiency	92.203 %	Op_point	PMU channel steady state efficiency
14.	ICThetaJA	47.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	800.0 mA	Op_point	Iout operating point
16.	VIN_OP	12.5 V	Op_point	Vin operating point
17.	Vout p-p	13.31 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	1.203 mW	Power	Input capacitor power dissipation
19.	Cout Pd	788.355 µW	Power	Output capacitor power dissipation
20.	IC Iq Pd	8.125 mW	Power	IC Iq Pd
21.	IC Pd	239.597 mW	Power	IC power dissipation
22.	L Pd	96.662 mW	Power	Inductor power dissipation
23.	M1 PdCond	48.953 mW	Power	M1 MOSFET switching losses
24.	M1 PdSw	14.145 mW	Power	M1 MOSFET switching losses
25.	M1 PdCond	44.694 mW	Power	M2 MOSFET switching losses
26.	M2 Pdbody	74.686 mW	Power	Power dissipation through lower FET
27.	Total Pd	338.253 mW	Power	PMU channel power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	800.0 mA	Maximum Output Current
2.	Iout1	800.0 mAmps	Output Current #1
3.	VinMax	12.5 V	Maximum input voltage
4.	VinMin	11.5 V	Minimum input voltage
5.	Vout	5.0 V	Output Voltage
6.	Vout1	5.0 Volt	Output Voltage #1
7.	base_pn	TPS54295/1	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

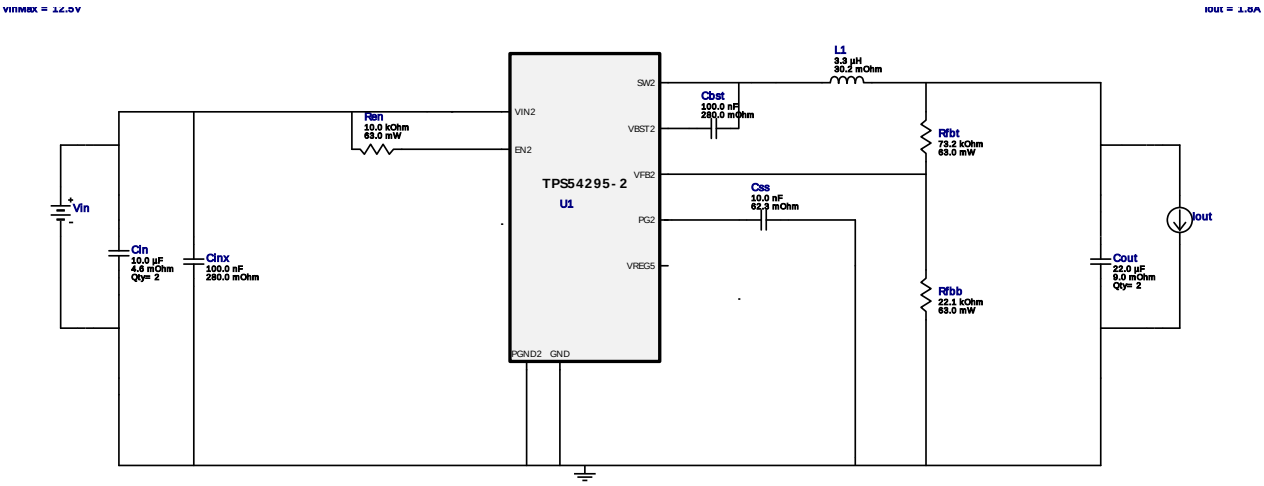
1. **TPS54295/1** Product Folder : http://www.ti.com/product/tps54295 : contains the data sheet and other resources.

WEBENCH® Design Report

VinMin = 11.5V
VinMax = 12.5V
Vout = 3.3V
Iout = 1.8A

Device = TPS54295PWP
Topology = Buck
Created = 3/7/14 1:28:11 AM
BOM Cost = $NaN
Footprint = NaN
BOM Count = NaN
Total Pd = 0.74W

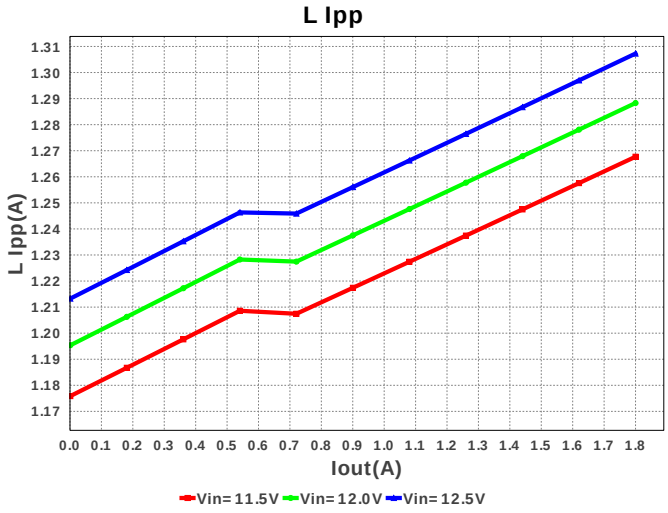
Design : 841840/15 TPS54295PWP
TPS54295PWP 11.5V-12.5V to 3.3V @ 1.8A

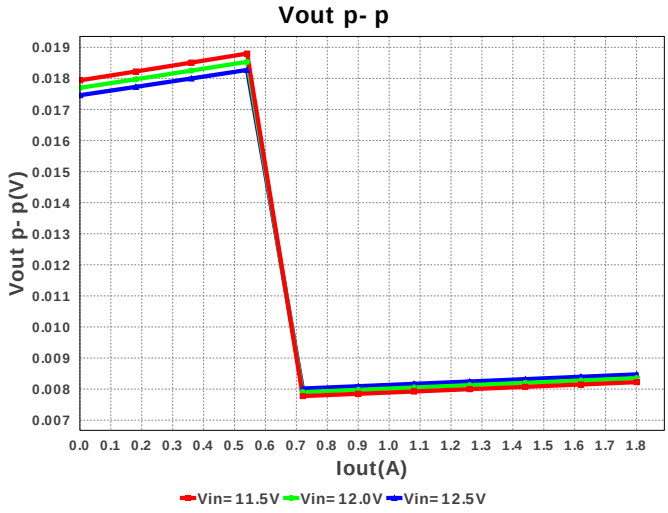


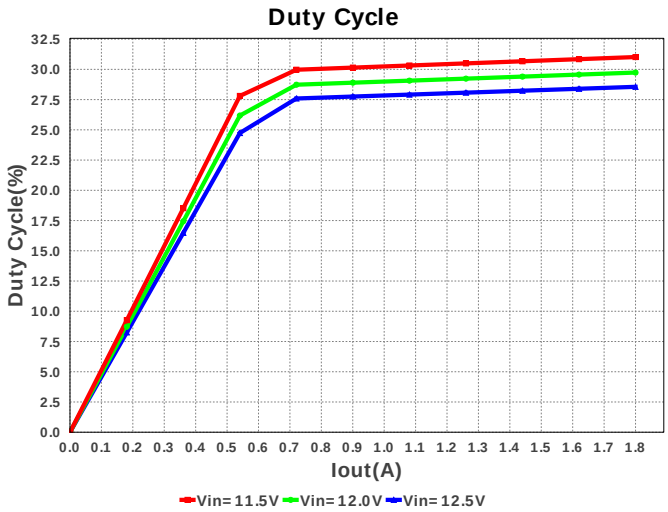
Electrical BOM

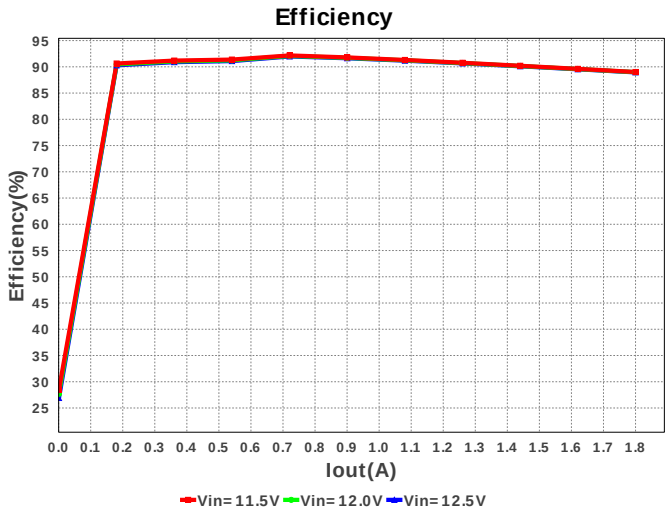
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
2.	Cin	TDK	C3216X5R1C106M Series= X5R	Cap= 10.0 µF ESR= 4.6 mOhm VDC= 16.0 V IRMS= 2.7 A	2	$0.06	1206 11mm2
3.	Cinx	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
4.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 µF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	2	$0.05	0805 7mm2
5.	Css	TDK	C1005X7R1C103K Series= X7R	Cap= 10.0 nF ESR= 62.3 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3mm2
6.	L1	Bourns	SRN6045-3R3Y	L= 3.3 µH DCR= 30.2 mOhm	1	$0.16	SRN6045 64mm2
7.	Ren	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
8.	Rfbb	Vishay-Dale	CRCW040222K1FKED Series= CRCW..e3	Res= 22.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
9.	Rfbt	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2

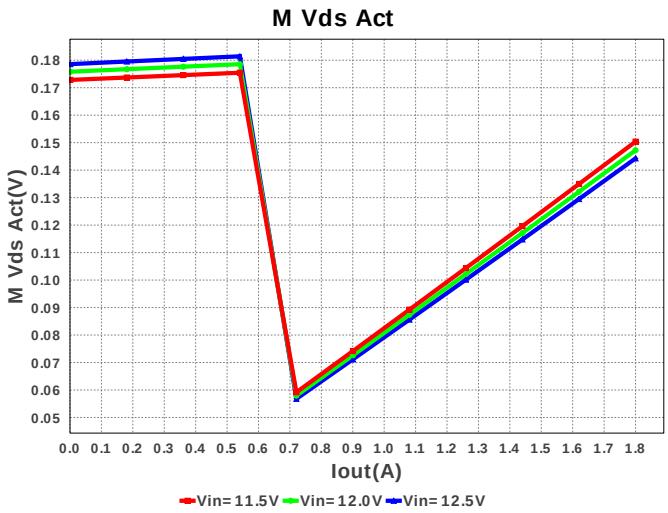
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	TPS54295PWP	Switcher	0	$1.08	 R-PDSO-G16 42mm2

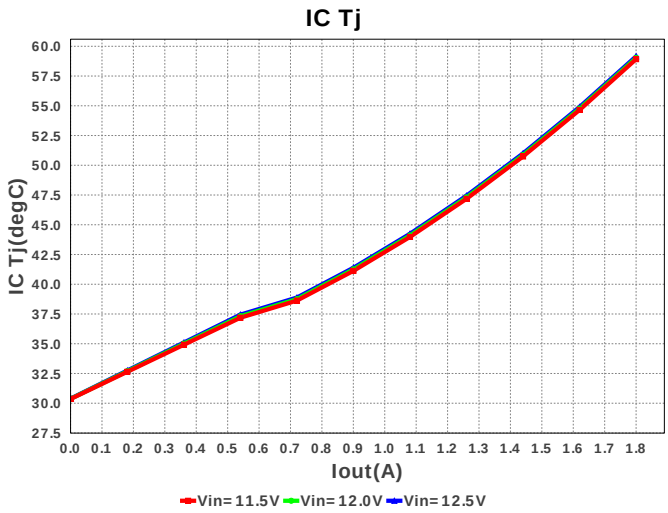




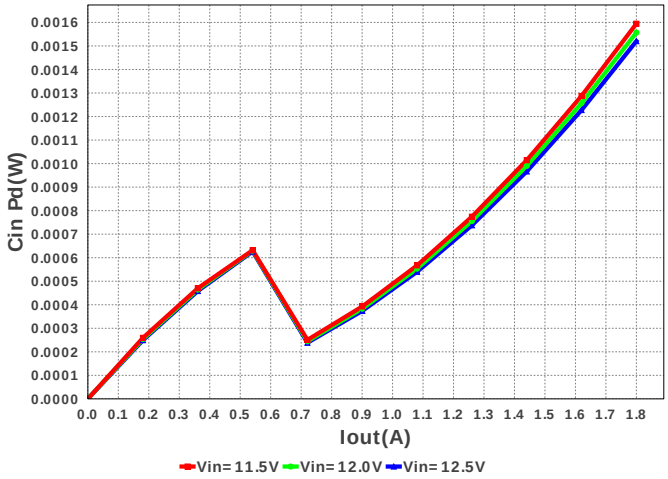




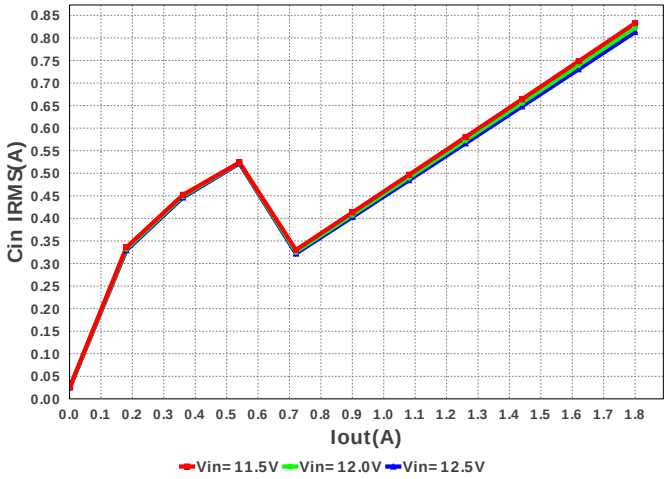




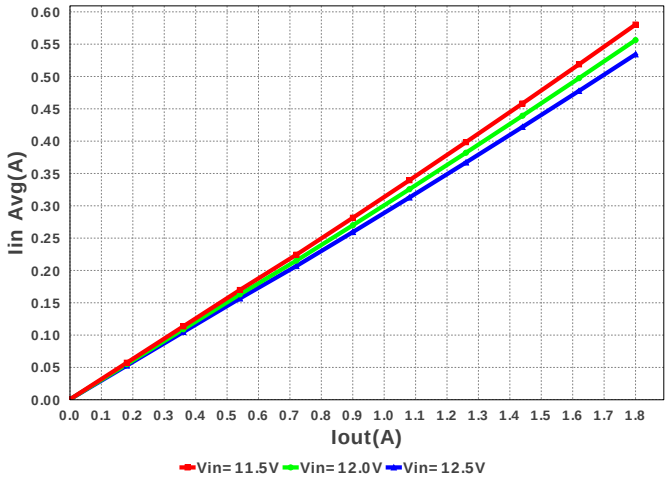
Cin Pd



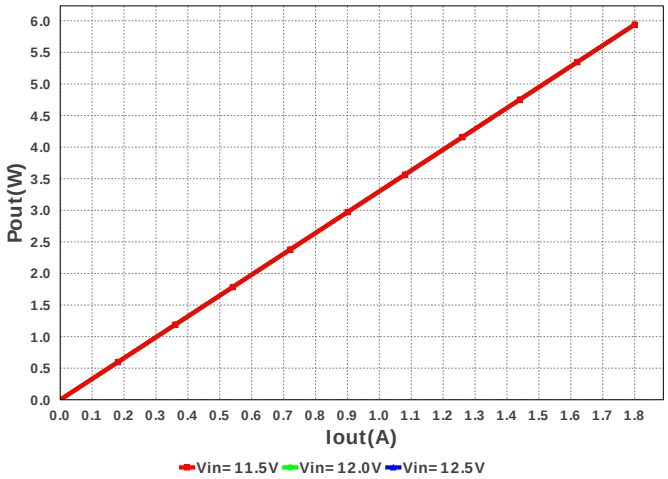
Cin IRMS



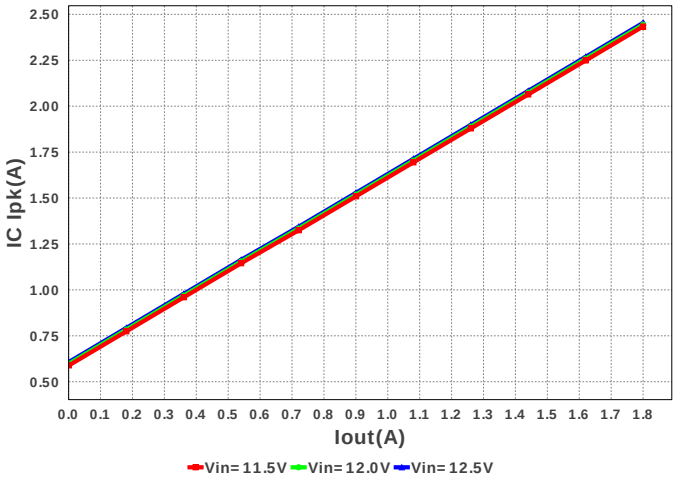
Iin Avg



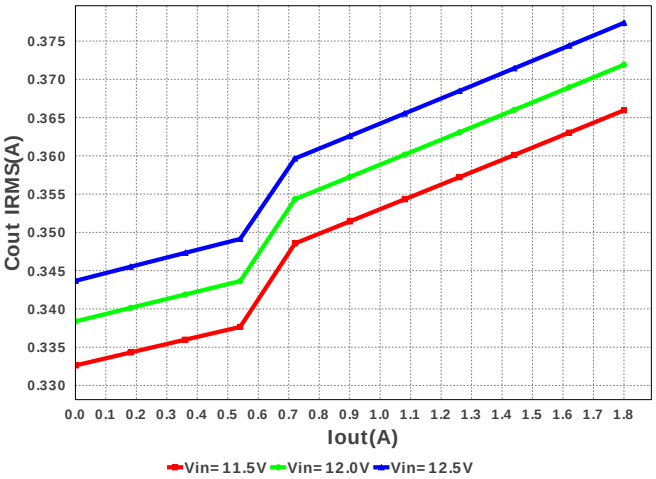
Pout

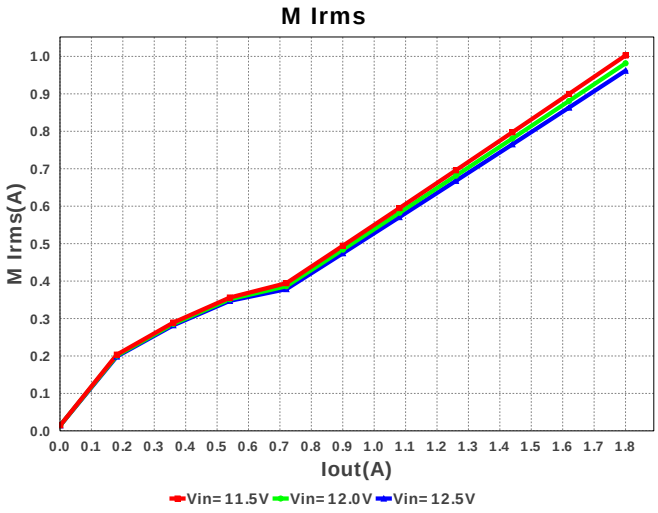


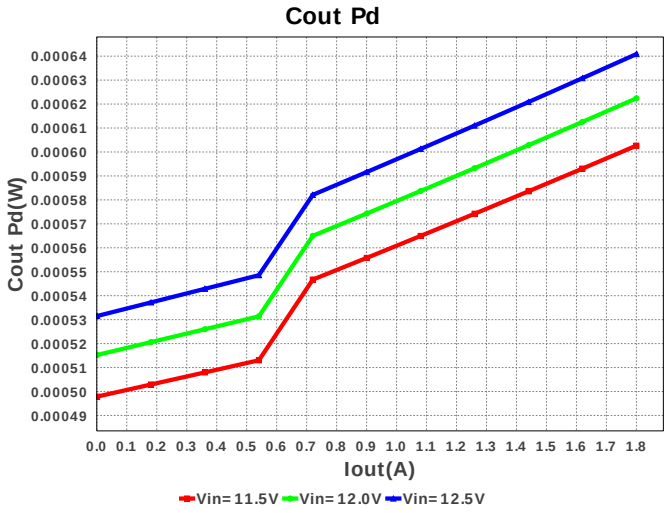
IC Ipk

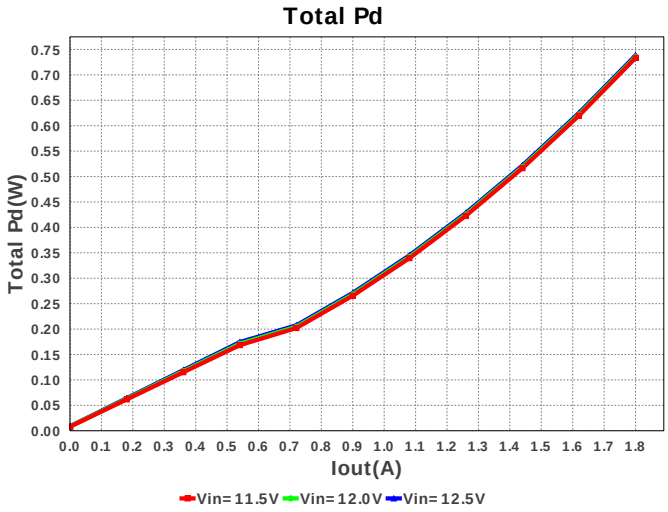


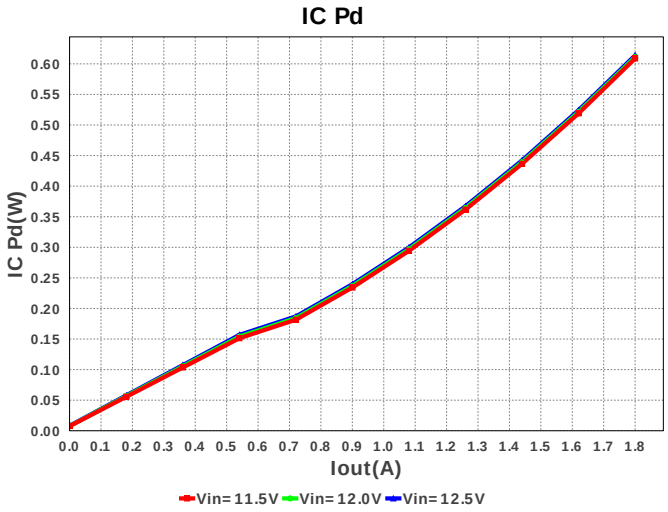
Cout IRMS

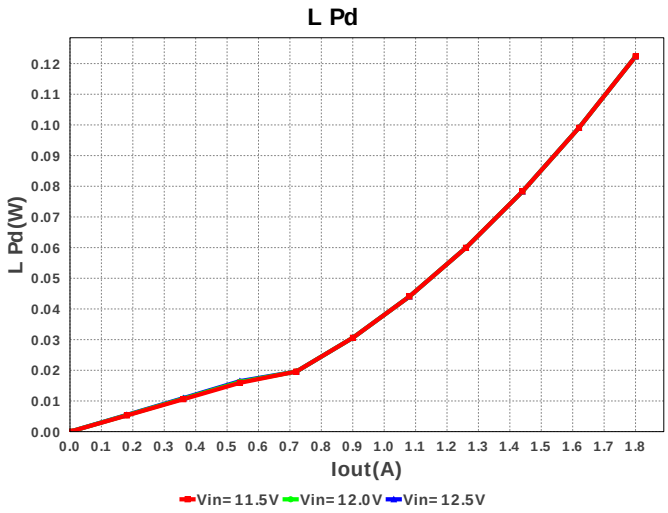


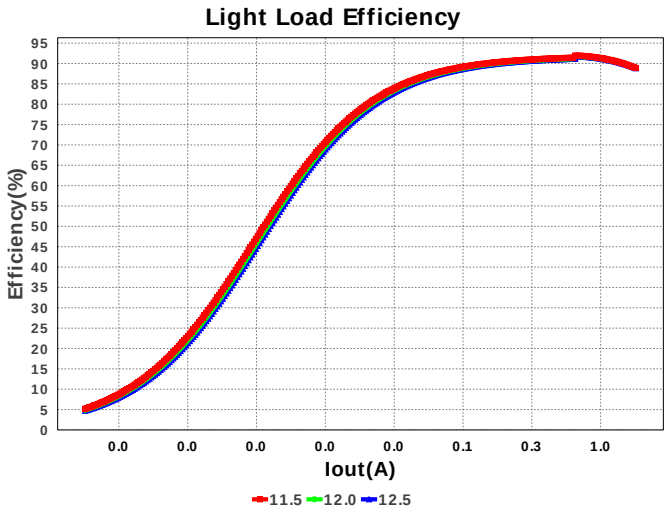












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	813.027 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	377.377 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.454 A	Current	Peak switch current in IC
4.	Iin Avg	534.26 mA	Current	Average input current
5.	L Ipp	1.307 A	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	961.884 mA	Current	Q Iavg
7.	Frequency	608.986 kHz	General	Switching frequency
8.	IC Tolerance	7.6 mV	General	IC Feedback Tolerance
9.	M Vds Act	144.283 mV	General	Voltage drop across the MosFET
10.	Pout	5.94 W	General	Total output power
11.	Vout OP	3.3 V	Op_Point	Operational Output Voltage

#	Name	Value	Category	Description
12.	Duty Cycle	28.556 %	Op_point	Duty cycle
13.	Efficiency	88.945 %	Op_point	PMU channel steady state efficiency
14.	ICThetaJA	47.5 degC/W	Op_point	IC junction-to-ambient thermal resistance
15.	IOUT_OP	1.8 A	Op_point	Iout operating point
16.	VIN_OP	12.5 V	Op_point	Vin operating point
17.	Vout p-p	11.981 mV	Op_point	Peak-to-peak output ripple voltage
18.	Cin Pd	1.52 mW	Power	Input capacitor power dissipation
19.	Cout Pd	640.861 µW	Power	Output capacitor power dissipation
20.	IC Iq Pd	8.125 mW	Power	IC Iq Pd
21.	IC Pd	613.812 mW	Power	IC power dissipation
22.	L Pd	122.31 mW	Power	Inductor power dissipation
23.	M1 PdCond	138.783 mW	Power	M1 MOSFET switching losses
24.	M1 PdSw	31.141 mW	Power	M1 MOSFET switching losses
25.	M1 PdCond	231.478 mW	Power	M2 MOSFET switching losses
26.	M2 Pdbody	164.426 mW	Power	Power dissipation through lower FET
27.	Total Pd	738.281 mW	Power	PMU channel power dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	1.8 A	Maximum Output Current
2.	Iout1	1.8 Amps	Output Current #1
3.	VinMax	12.5 V	Maximum input voltage
4.	VinMin	11.5 V	Minimum input voltage
5.	Vout	3.3 V	Output Voltage
6.	Vout1	3.3 Volt	Output Voltage #1
7.	base_pn	TPS54295/2	Base Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **TPS54295/2** Product Folder : http://www.ti.com/product/tps54295 : contains the data sheet and other resources.