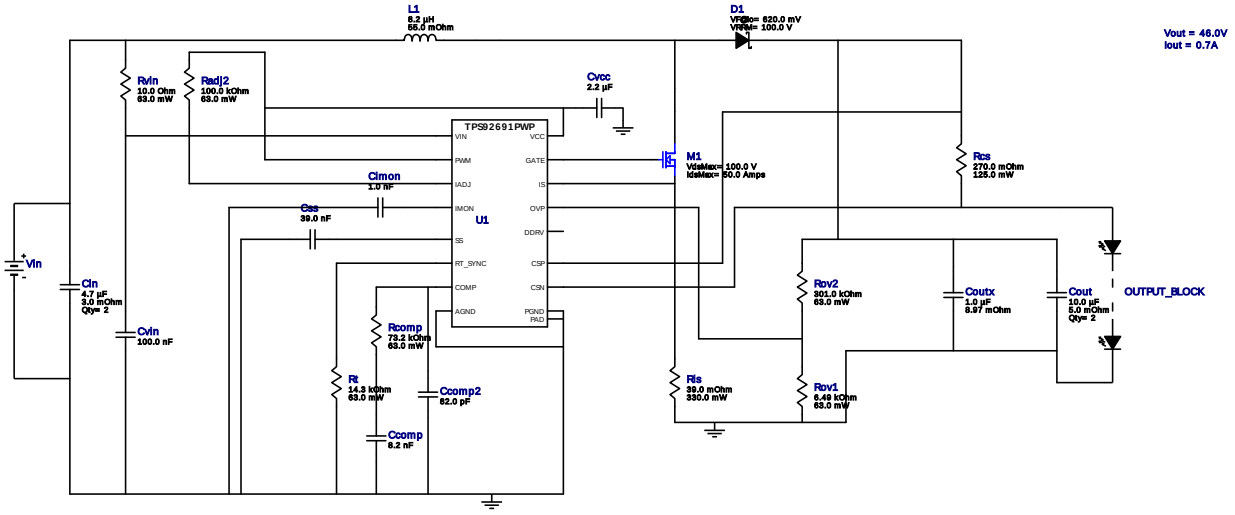
WEBENCH® Design Report

VinMin = 24.0V
VinMax = 32.0V
Vout = 46.0V
Iout = 0.7A

Device = TPS92691PWPR
Topology = Boost
Created = 9/29/16 5:57:20 AM
BOM Cost = $0.00
BOM Count = 28
Total Pd = 2.84W

Design : 4790845/62 TPS92691PWPR
TPS92691PWPR 24.0V-32.0V to 46.00V @ 0.7A

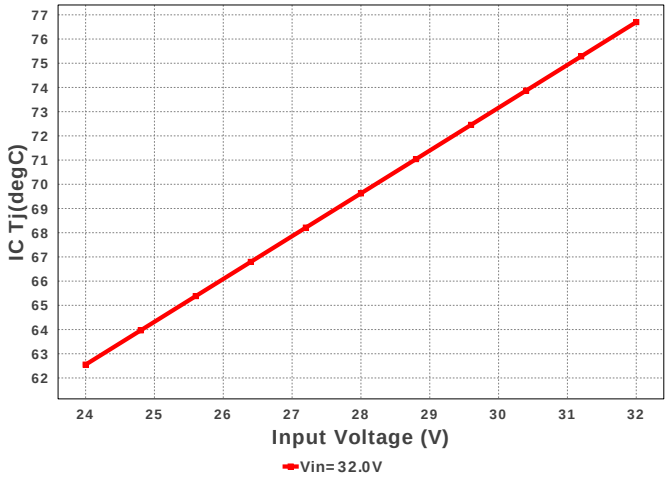


Electrical BOM

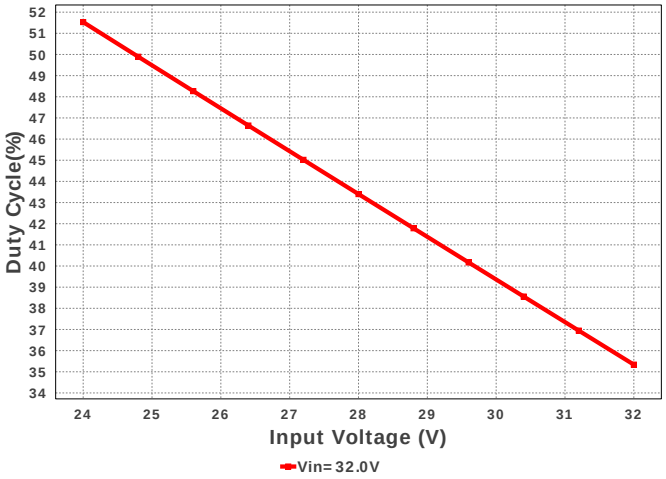
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccomp	MuRata	GRM033R61A822KA01D Series= X5R	Cap= 8.2 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm^2
2.	Ccomp2	Yageo America	CC0805JRNPO9BN820 Series= C0G/NP0	Cap= 82.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
3.	Cimon	MuRata	GRM033R71C102KA01D Series= X7R	Cap= 1.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm^2
4.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	2	$0.07	1206 11 mm^2
5.	Cout	TDK	C5750X7S2A106M230KB Series= X7S	Cap= 10.0 uF ESR= 5.0 mOhm VDC= 100.0 V IRMS= 6.45 A	2	NA	2220 54 mm^2
6.	Coutx	TDK	C3216X5R1H105K Series= X5R	Cap= 1.0 uF ESR= 8.97 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.02	1206 11 mm^2
7.	Covp	MuRata	GRM033R71C102KA01D Series= X7R	Cap= 1.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm^2
8.	Css	MuRata	GRM033C80G393KE01D Series= X6S	Cap= 39.0 nF VDC= 4.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm^2
9.	Cvcc	Kemet	C0603C225K9PACTU Series= X5R	Cap= 2.2 uF VDC= 6.3 V IRMS= 0.0 A	1	$0.02	0603 5 mm^2
10.	Cvin	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	D1	Vishay-Semiconductor	SS2PH10-M3	VF@Io= 620.0 mV VRRM= 100.0 V	1	$0.14	 DO-220AA 14 mm^2
12.	D_LED	Cree	XHP50A-00-0000-0D0BJ40DV	LED	4	$5.42	 xlampxhp 0 mm^2
13.	L1	Bourns	SRN6045-8R2Y	L= 8.2 µH DCR= 55.0 mOhm	1	$0.16	 SRN6045 64 mm^2
14.	M1	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	$0.50	 DQG0008A 18 mm^2
15.	Radj2	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rcomp	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rcs	Panasonic	ERJ-6RQFR27V Series= ERJ-6R	Res= 270.0 mOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.04	 0805 7 mm^2
18.	Ris	Panasonic	ERJ-L14KF39MU Series= ERJ-L14	Res= 39.0 mOhm Power= 330.0 mW Tolerance= 1.0%	1	$0.11	 1210 15 mm^2
19.	Rov1	Vishay-Dale	CRCW04026K49FKED Series= CRCW..e3	Res= 6.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Rov2	Vishay-Dale	CRCW0402301KFKED Series= CRCW..e3	Res= 301.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
21.	Rt	Vishay-Dale	CRCW040214K3FKED Series= CRCW..e3	Res= 14.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
22.	Rvin	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
23.	U1	Texas Instruments	TPS92691PWPR	Switcher	1	$0.80	 PWP0016J_N 59 mm^2

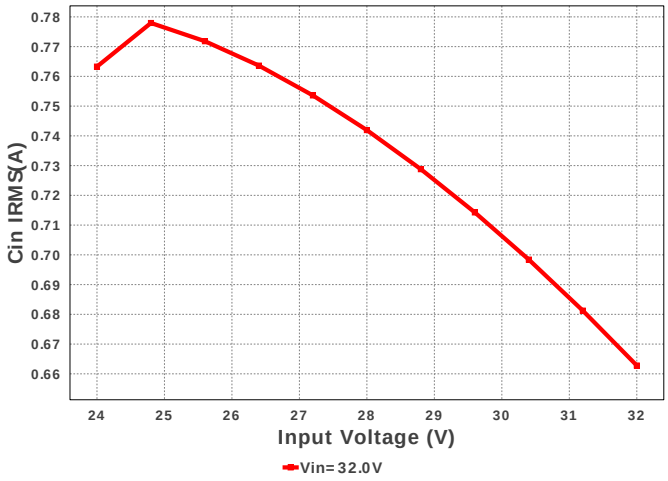
IC Tj



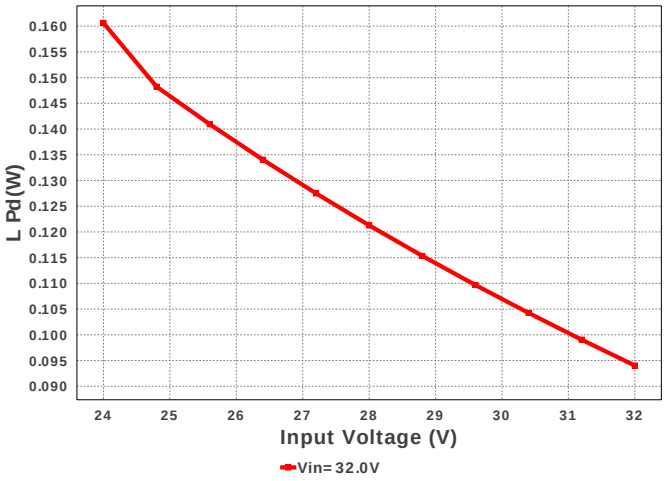
Duty Cycle



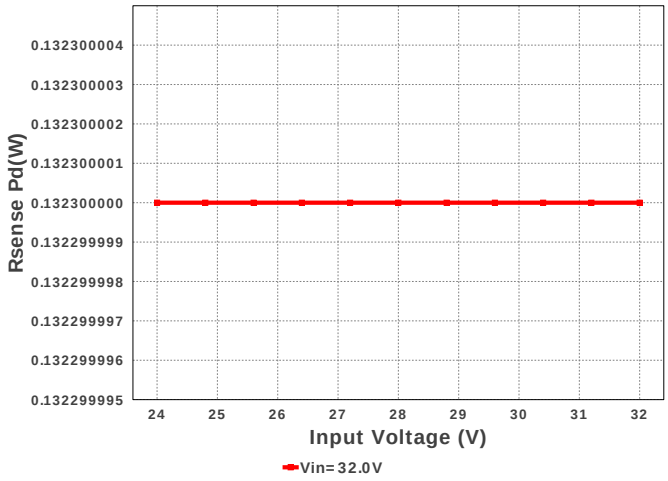
Cin IRMS



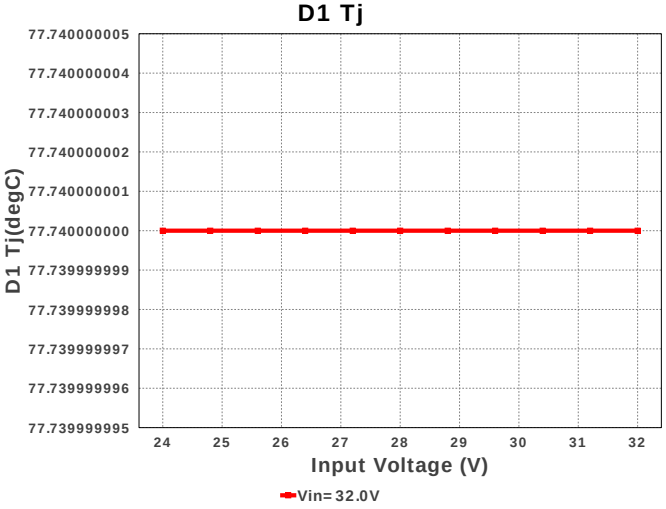
L Pd

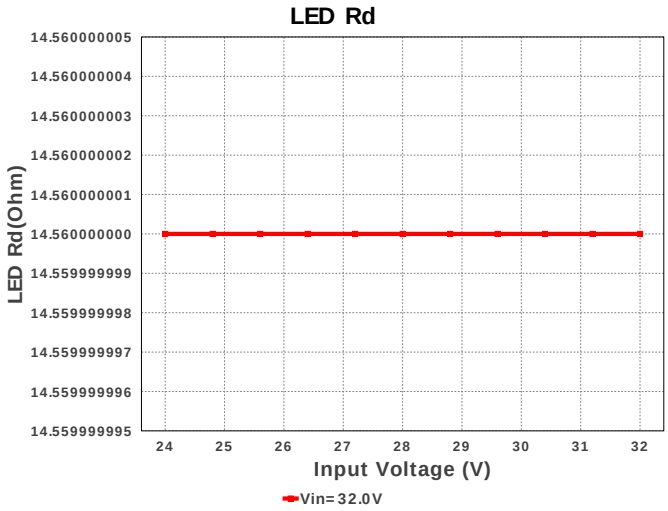


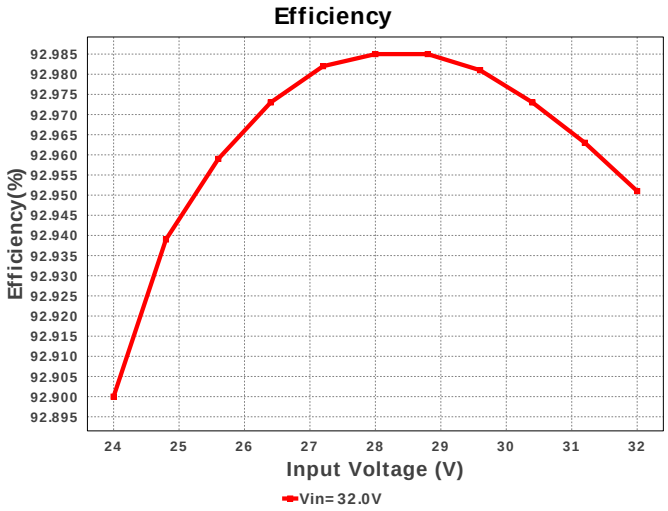
Rsense Pd

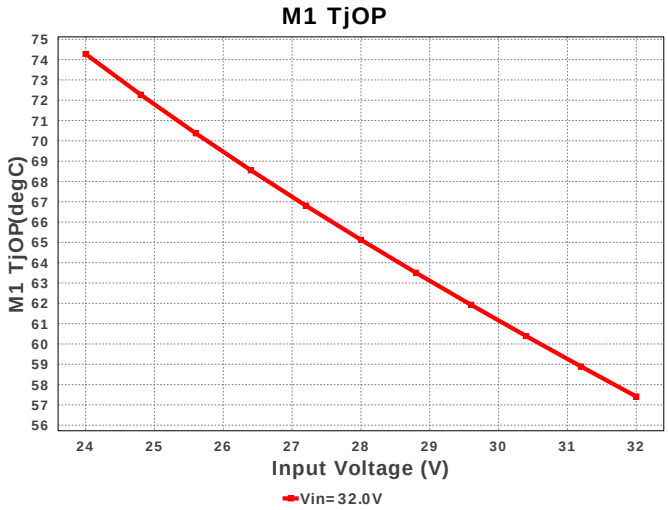


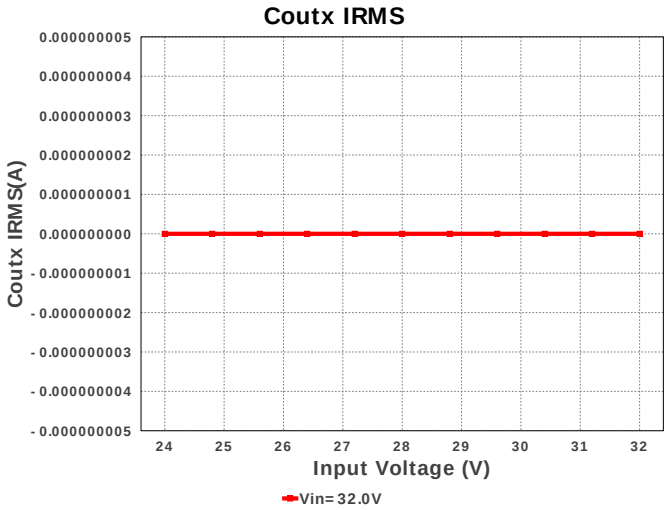
D1 Tj

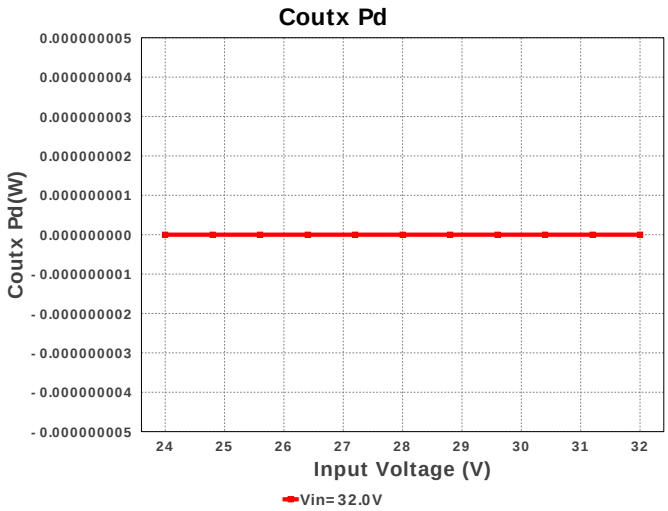


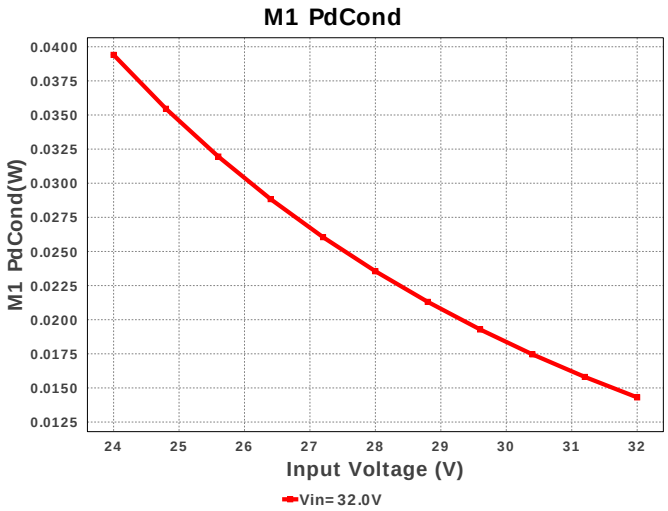


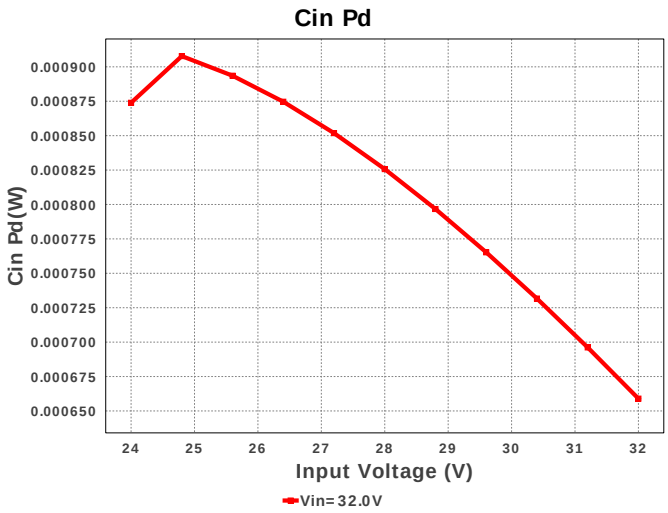


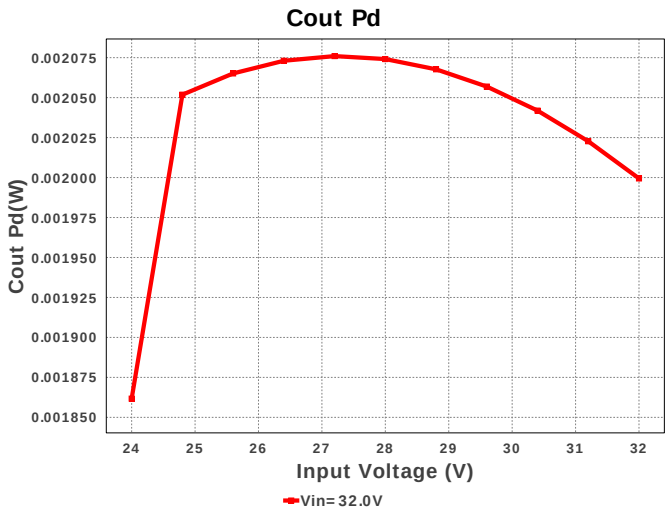


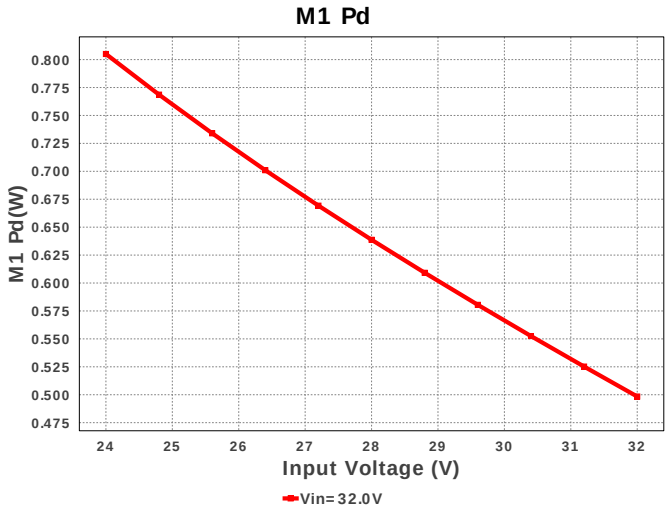


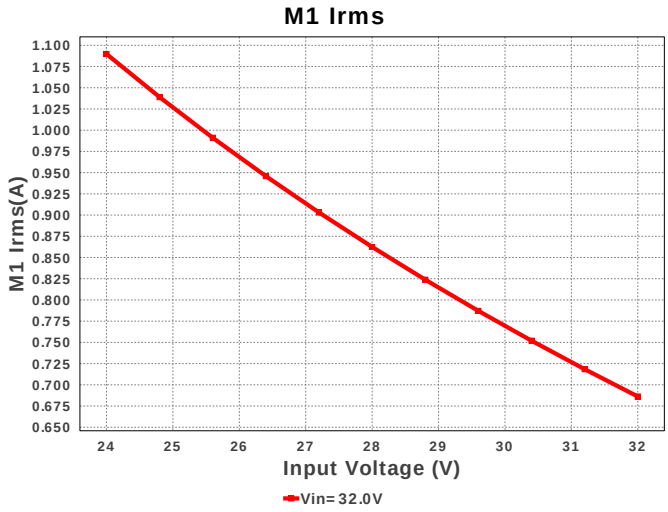


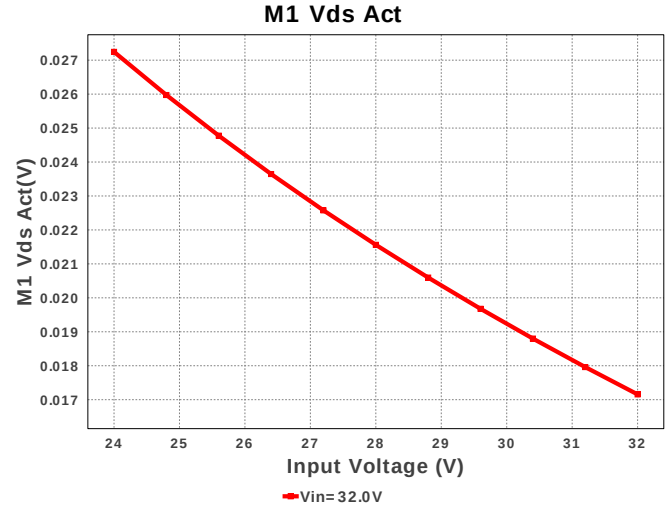


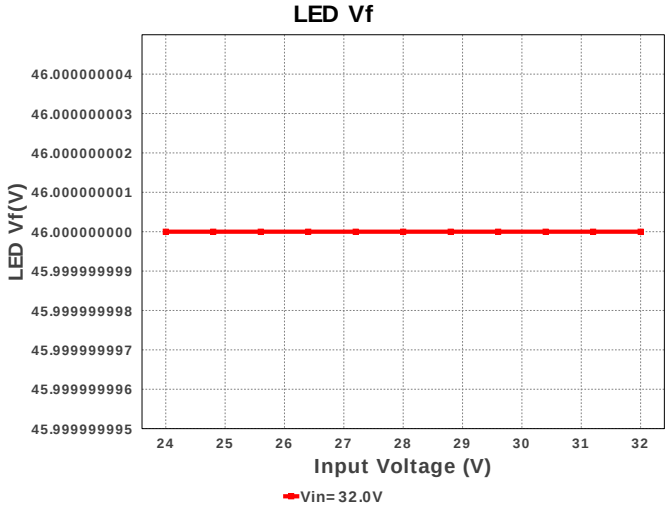


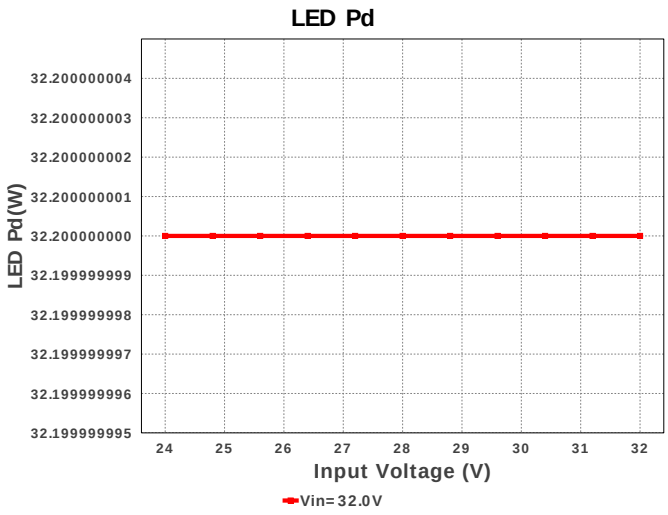


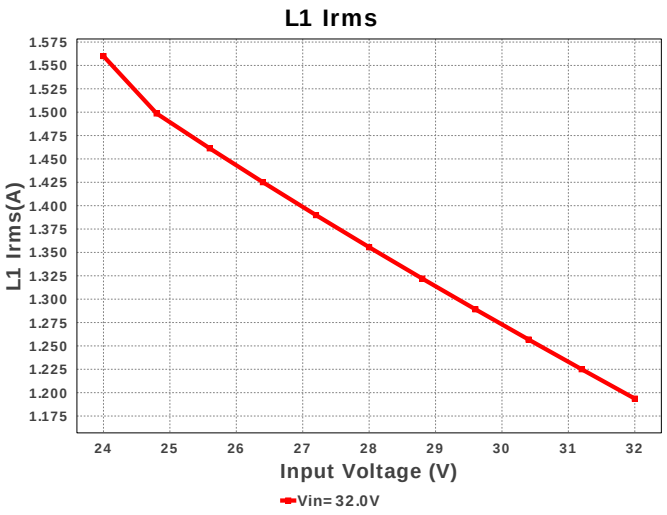


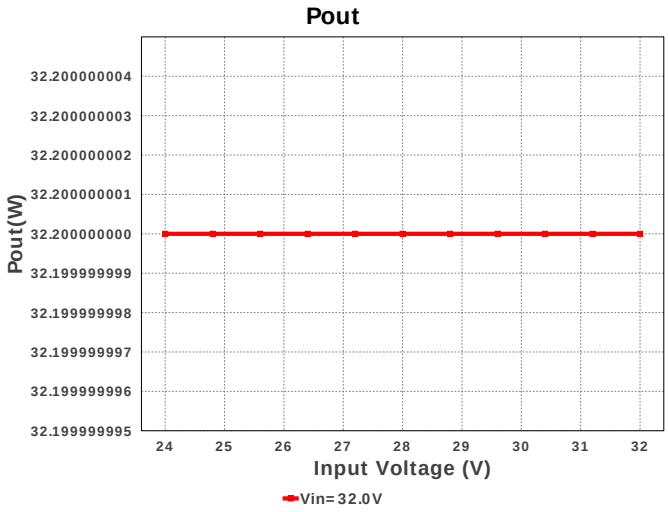


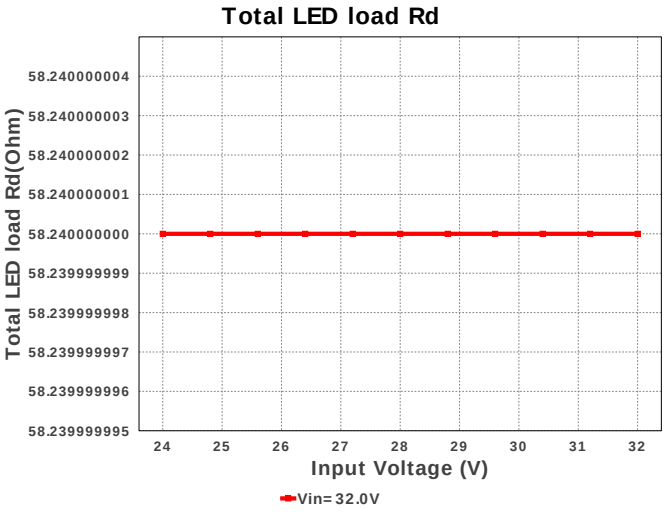


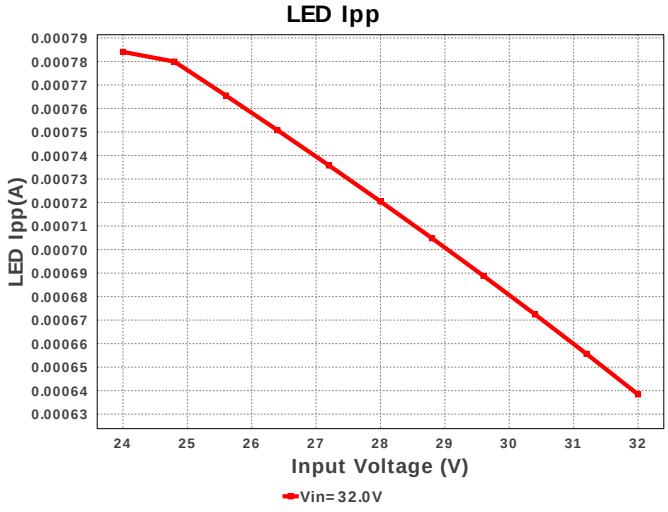


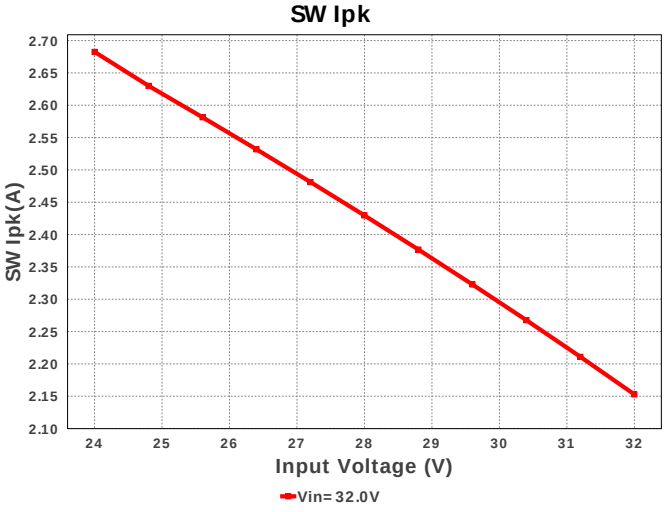


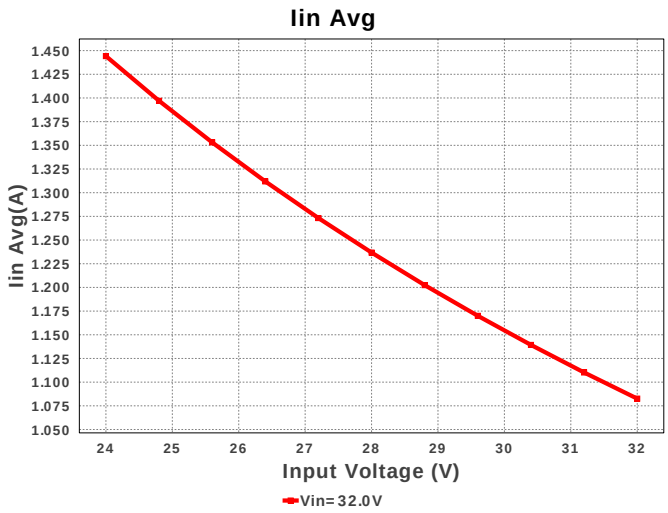


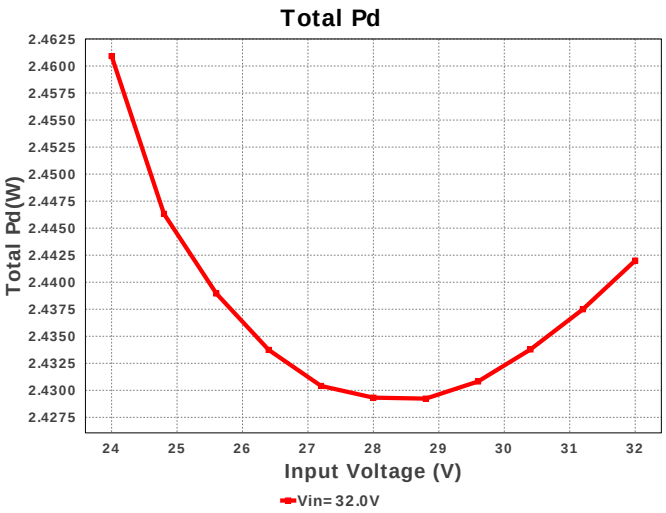


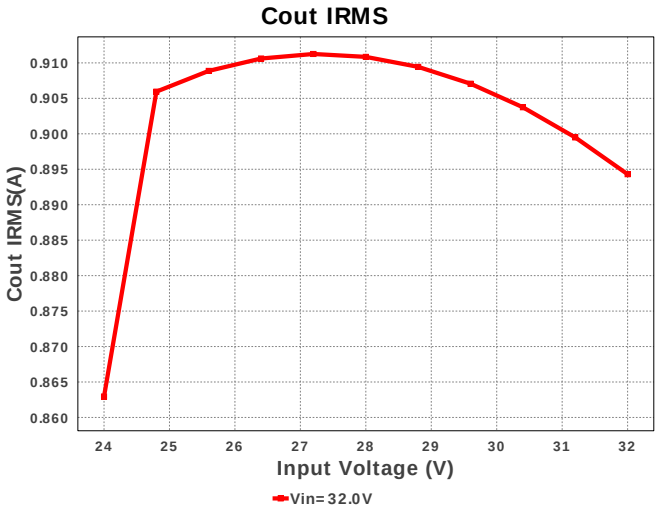


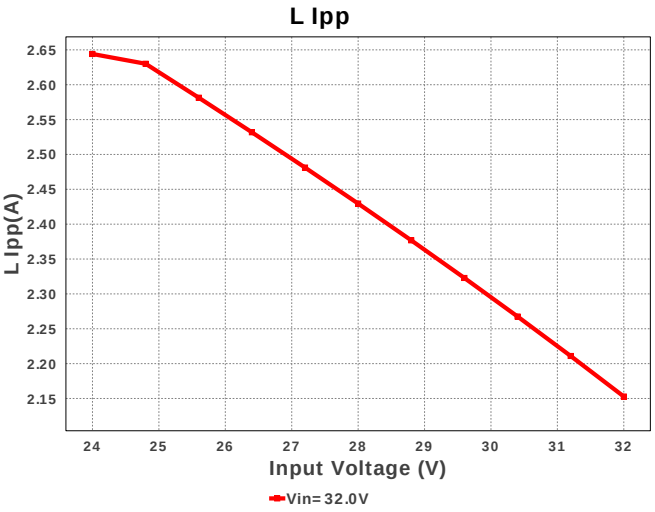


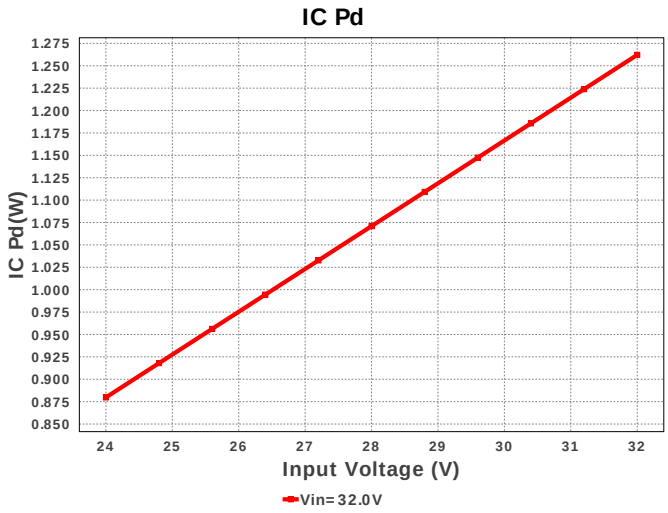


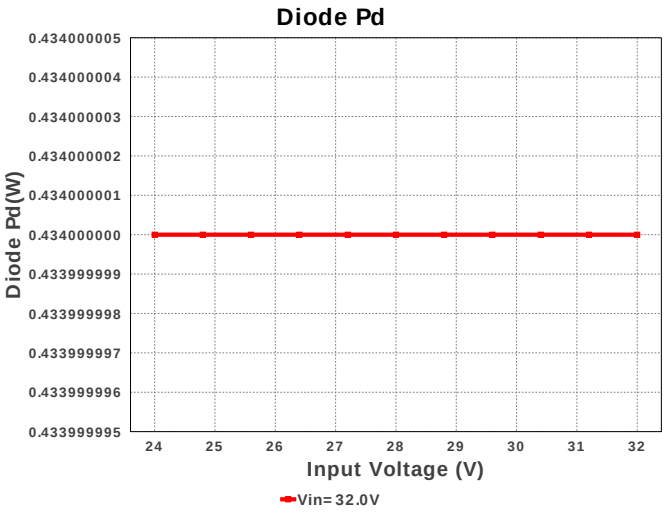


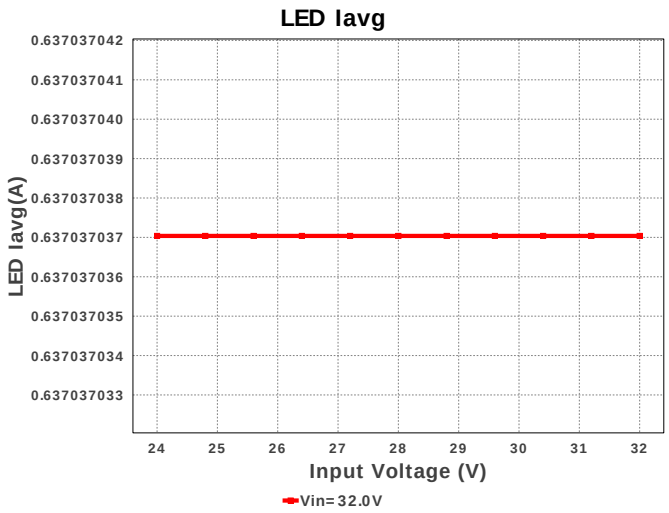


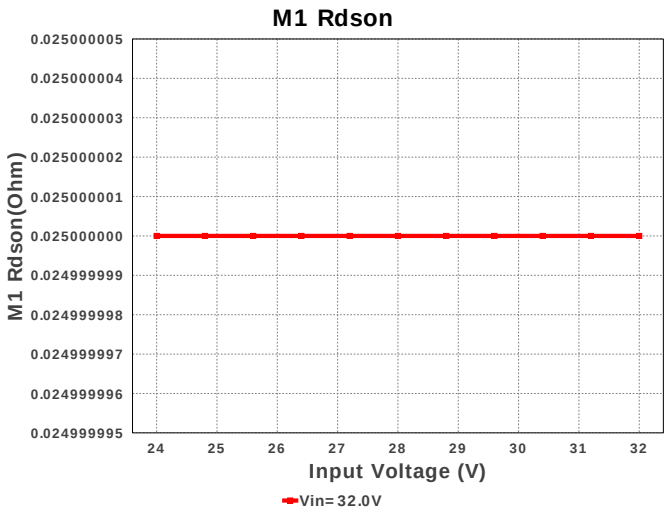


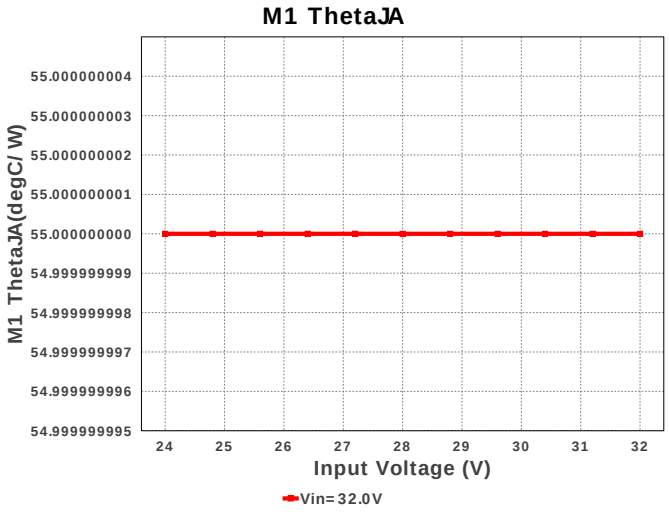


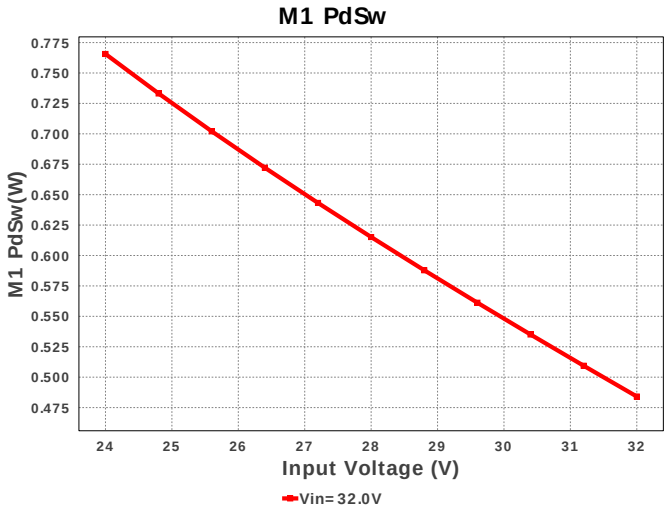












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	763.698 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	860.864 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.46 A	Current	Average input current
4.	L Ipp	2.646 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	1.56 A	Current	Inductor ripple current
6.	LED Iavg	637.037 mA	Current	LED Average Current
7.	LED Ipp	827.093 µA	Current	LED Ripple Current
8.	M1 Irms	1.088 A	Current	M1 MOSFET Irms
9.	SW Ipk	2.678 A	Current	Peak switch current
10.	BOM Count	28	General	Total Design BOM count
11.	FootPrint	358.0 mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	538.566 kHz	General	Switching frequency
13.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
14.	M1 Rdson	25.0 mOhm	General	Drain-Source On-resistance
15.	M1 ThetaJA	55.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
16.	Mode	CCM	General	Conduction Mode
17.	Pout	32.2 W	General	Total output power
18.	Total BOM	$0.0	General	Total BOM Cost
19.	D1 Tj	77.74 degC	Op_Point	D1 junction temperature
20.	Vout OP	46.0 V	Op_Point	Operational Output Voltage
21.	Duty Cycle	52.054 %	Op_point	Duty cycle
22.	Efficiency	91.896 %	Op_point	Steady state efficiency
23.	IC Tj	62.551 degC	Op_point	IC junction temperature
24.	ICThetaJA	37.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	700.0 mA	Op_point	Iout operating point
26.	LED Rd	13.81 Ohm	Op_point	LED DynamicResistance
27.	LED Vf	46.0 V	Op_point	Total LED Forward Calculated Voltage
28.	M1 TjOP	95.129 degC	Op_point	MOSFET junction temperature
29.	VIN_OP	24.0 V	Op_point	Vin operating point
30.	Cin Pd	874.853 µW	Power	Input capacitor power dissipation
31.	Cout Pd	1.853 mW	Power	Output capacitor power dissipation

#	Name	Value	Category	Description
32.	Diode Pd	434.0 mW	Power	Diode power dissipation
33.	IC Pd	879.753 mW	Power	IC power dissipation
34.	L Pd	160.522 mW	Power	Inductor power dissipation
35.	LED Pd	32.2 W	Power	LED Power Dissipation
36.	M1 Pd	1.184 W	Power	M1 MOSFET total power dissipation
37.	M1 PdCond	43.337 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	1.141 W	Power	M1 MOSFET switching losses
39.	Rsense Pd	132.3 mW	Power	Rsense Power Dissipation
40.	Total Pd	2.84 W	Power	Total Power Dissipation
41.	M1 Vds Act	27.188 mV		M Vds
42.	Total LED load Rd	55.241 Ohm		Total LED Load DynamicResistance
43.	Vout Tolerance	54.348 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	700.0 m	Maximum Output Current
2.	SoftStart	4.5 ms	Soft Start Time (ms)
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	24.0	Minimum input voltage
5.	Vout	46.0	Output Voltage
6.	application	LED_DRIVER	LED Application
7.	base_pn	TPS92691	Texas Instruments Base Part Number
8.	isLEDArchitect	N	LED Architect Project
9.	ledparallel	1.0	Number of LED in parallel
10.	ledpartnumber	XHP50A-00-0000-0D0BU40DY	LED Part number
11.	ledseries	4.0	Number of LED in series
12.	line_fsw	60.0	AC Line Frequency
13.	source	DC	Input Source Type
14.	ta	30.0	Ambient temperature
15.	userfsw	390.917 k	Customer Selected Frequency

Design Assistance

1. TPS92691 Product Folder : http://www.ti.com/product/TPS92691 : contains the data sheet and other resources.