

WEBENCH® LED Architect

Project Report

Project : 3917516/13 : Project ID 13
 Created : 2017-05-12 16:46:47.325
 LED Architect with light output=1000.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : \$9.52
 Total Footprint : 2,216 mm²
 Total BOM Count : 23
 Total Efficiency : 28.23%
 Total Efficacy : 96.2 lumens / Watt
 Total Power Dissipation (loss) : 0.63 Watts

Design Inputs :

1. VinMax	24.0	Maximum input voltage
2. VinMin	24.0	Minimum input voltage
3. color	cool white	LED Color
4. source	DC	Input Source Type
5. lightOutput	1000.0	Light Output in Lumen
6. maxHeatSinkLength	200.0	Max Heat Sink Length
7. maxHeatSinkWidth	50.0	Max Heat Sink Width
8. maxJunctionTemp	150.0	Max LED Junction Temperature
9. maxLEDStringVout	60.0	Max LED String Voltage
10. optfactor	3	Optimization factor to tune up the design
11. priceFactor	0	Price factor to tune up the design cost
12. Ta	30.0	Ambient temperature

My Comments

No comments

Regulators

Main Driver NSID : TPS92513DGQR 1.5A,BuckLED Driver with Integrated Analog Current Adjust; Driver Efficiency = 94.08%

Drivers Electrical BOM

Manufacturer	Part Number	Quantity	Budgetary Price	Footprint (mm ²)
AVX	08053C104KAT2A	1	\$0.01	7
Yageo America	CC0805KRX7R8BB104	1	\$0.01	7
Yageo America	CC0805KRX7R9BB103	1	\$0.01	7
Vishay-Dale	CRCW0402162KFKED	1	\$0.01	3
Vishay-Dale	CRCW04025K49FKED	1	\$0.01	3
Vishay-Dale	CRCW0402976RFKED	2	\$0.02	6
Vishay-Dale	CRCW040297K6FKED	1	\$0.01	3
Bourns	CRM0805-FX-R510ELF	1	\$0.03	7
MuRata	GCM155R71H103KA55D	1	\$0.01	3
Taiyo Yuden	GMK212B7105KG-T	1	\$0.04	7
MuRata	GRM31MR71H105KA88L	2	\$0.03	11
Nexperia	PMEG6010CEH,115	2	\$0.08	23
Bourns	SRN6045-330M	1	\$0.16	64
Texas Instruments	TPS92513DGQR	1	\$0.39	24
Total		17	\$0.82	174

LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm ²)
Cree	XPGWHT-L1-0000-00H51	5	\$7.25	-
Aavid	66365	1	\$1.42	22
Total			\$8.67	22

LED Array Solution

LED Array

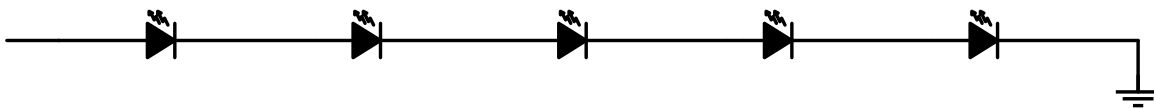
Light Output : 1000 lumens
 Color : cool white
 LED quantity : 5 Series = 5 Parallel = 1
 Total Vout : 15.3 Volts
 Total Iload : 0.6 Amps
 Total Light Output : 1000 lumens
 Flux : 200 lumens
 ThetaSA : 7.46 C / Watt
 Junction Temp : 101 degrees
 Operating Vf : 3.052 Volts
 Operating Io : 0.64 Amps
 Efficiency : 30%
 Efficacy : 102.4 lumens / Watt
 Total Footprint : 2215.8 mm²
 Total LED Cost : \$8.67
 Max LED Vout : 60.0 Volts

Selected LED



Manufacturer : Cree
 Part Number : XPGWHT-L1-0000-00H51
 Vf : 3.0 V
 Io : 0.35 A
 Angle : 125.0 degree
 PhiV : 139.0
 Color Temperature : 6650.0 K
 Color : cool white
 Tj : 150.0 deg C
 IfMin : 0.1 Amps
 IfMax : 1.5 Amps
 RJC : 6.0 deg C/Ohm
 Isat : 0.0 Amps
 Package mount : SMT
 Footprint : 19.8 mm²

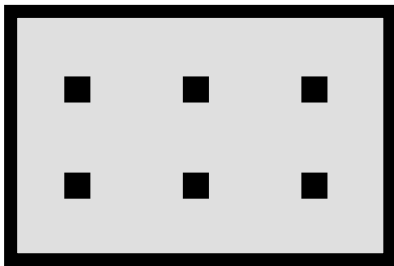
LED Load Array : For each Driver : series = 5, parallel = 1. LED Quantity = 5
 Total Driver Quantity = 1 Total LED Quantity = 5



Heatsink

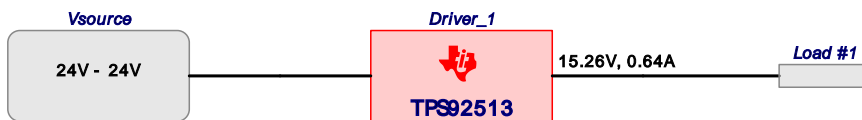
Length : 58.16 mm
 Width : 38.1 mm
 Height : 16.0 mm
 Total Heatsink Footprint : 2216 mm²
 Total Heatsink Cost : \$1.42

Manufacturer : Aavid
 Part Number : 66365
 ThetaSA : 8.16 C/W



Project Diagram

WEBENCH® LED Architect Project ID : 13 Project ID 13 LED Architect 2017-05-12 16:46:47.325



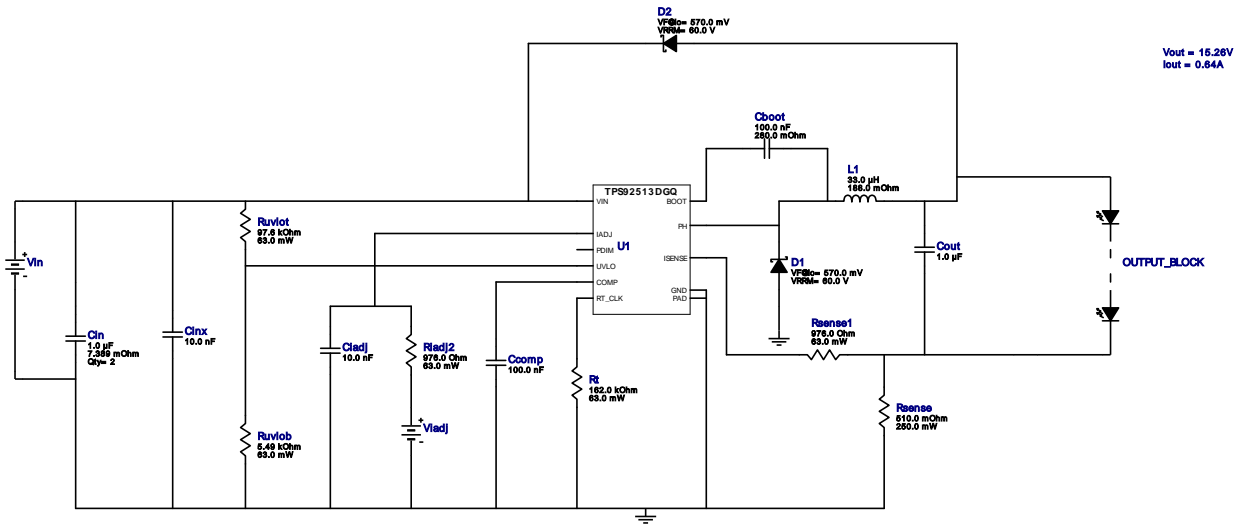


Vout = 15.26V
Iout = 0.64A











Device = TPS92513DGQR
Topology = Buck
Created = 5/12/17 4:46:46 PM
BOM Cost = \$0.85
BOM Count = 22
Total Pd = 0.63W








WEBENCH[®] Design Report

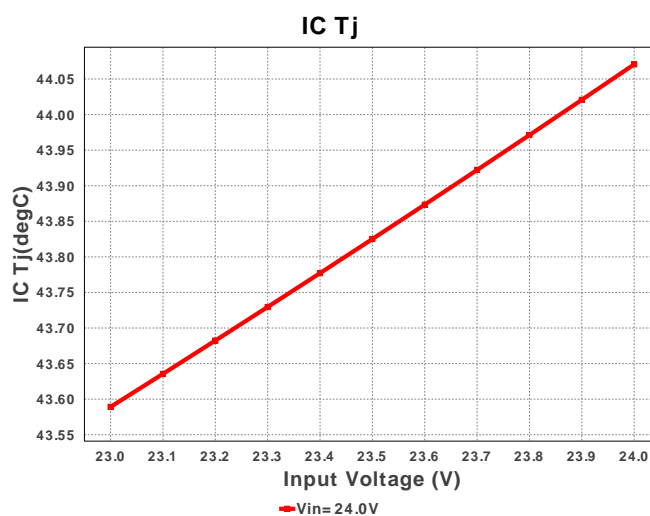
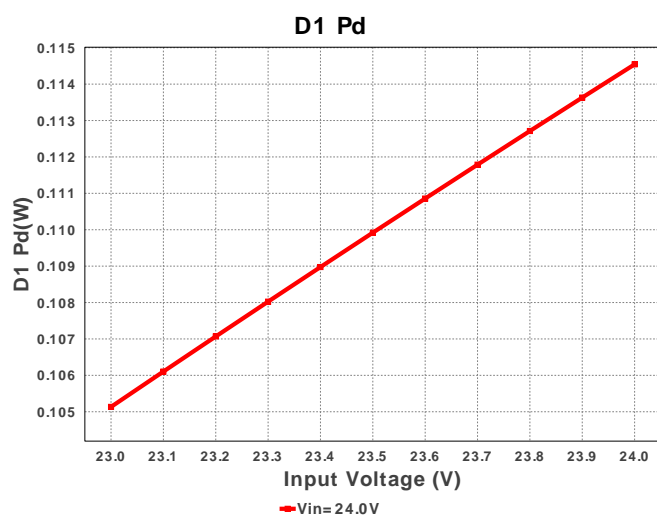
Design : 3917516/102 TPS92513DGQR
TPS92513DGQR 24.0V-24.0V to 15.85V @ 0.64A



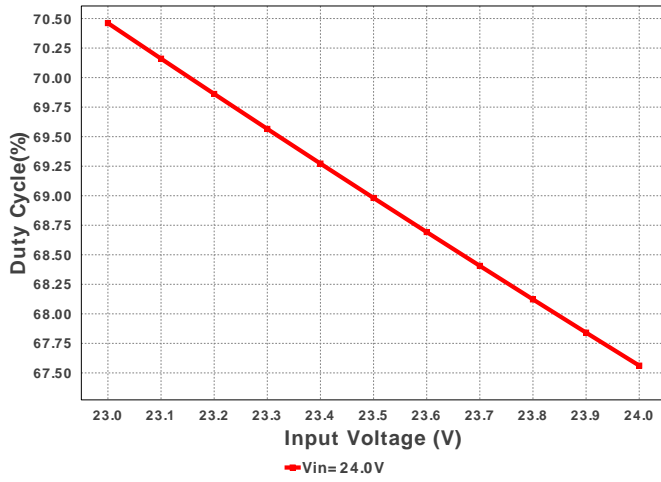
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	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.	Ccomp	Yageo America	CC0805KRX7R8BB104 Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
3.	Ciadj	Yageo America	CC0805KRX7R9BB103 Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm ²
4.	Cin	MuRata	GRM31MR71H105KA88L Series= X7R	Cap= 1.0 uF ESR= 7.389 mOhm VDC= 50.0 V IRMS= 979.22 mA	2	\$0.03	 1206 11 mm ²
5.	Cinx	MuRata	GCM155R71H103KA55D Series= C0G/NP0	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
6.	Cout	Taiyo Yuden	GMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 35.0 V IRMS= 0.0 A	1	\$0.04	 0805 7 mm ²
7.	D1	Nexperia	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	\$0.04	 SOD-123F 12 mm ²
8.	D2	Nexperia	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	\$0.04	 SOD-123F 12 mm ²
9.	D_LED	Cree	XPGWHT-L1-0000-00H51	LED	5	\$1.45	 xlampxpg 20 mm ²
10.	L1	Bourns	SRN6045-330M	L= 33.0 uH DCR= 188.0 mOhm	1	\$0.16	 SRN6045 64 mm ²

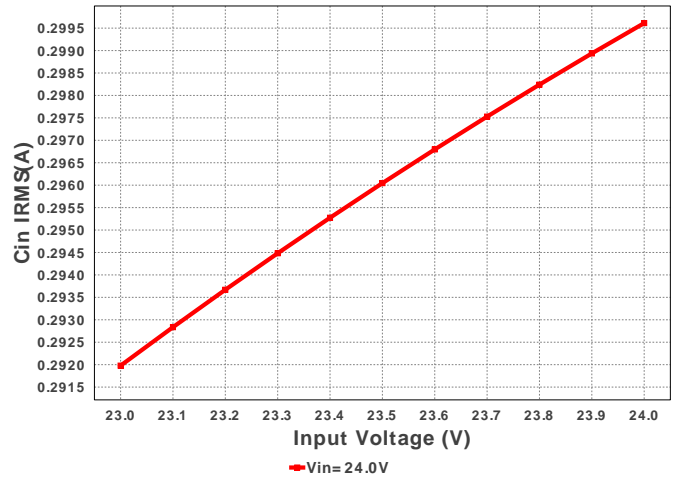
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Riadj2	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
12.	Rsense	Bourns	CRM0805-FX-R510ELF Series= ?	Res= 510.0 mOhm Power= 250.0 mW Tolerance= 1.0%	1	\$0.03	 0805 7 mm ²
13.	Rsense1	Vishay-Dale	CRCW0402976RFKED Series= CRCW..e3	Res= 976.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
14.	Rt	Vishay-Dale	CRCW0402162KFKE Series= CRCW..e3	Res= 162.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
15.	Ruvlob	Vishay-Dale	CRCW04025K49FKED Series= CRCW..e3	Res= 5.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
16.	Ruvlot	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
17.	U1	Texas Instruments	TPS92513DGQR	Switcher	1	\$0.39	 DGQ0010D_NV_N 24 mm ²



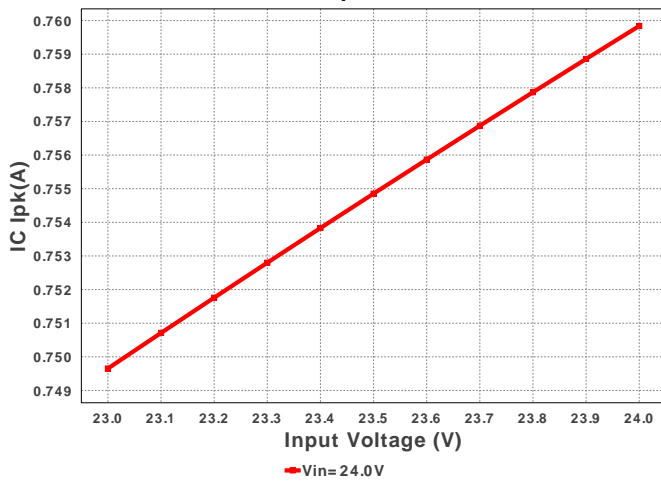
Duty Cycle



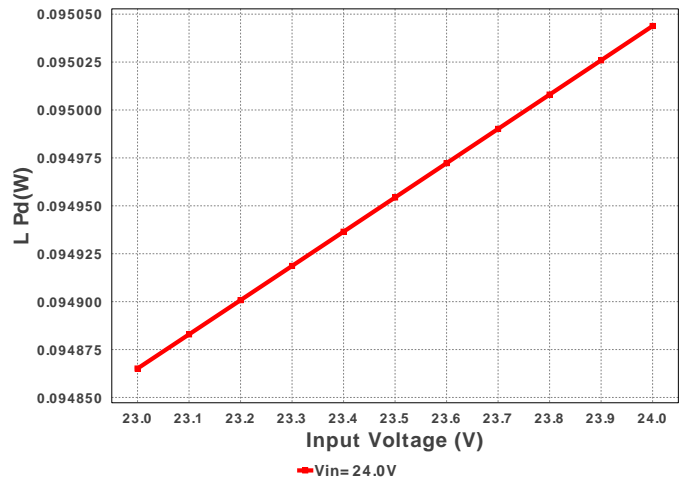
Cin IRMS



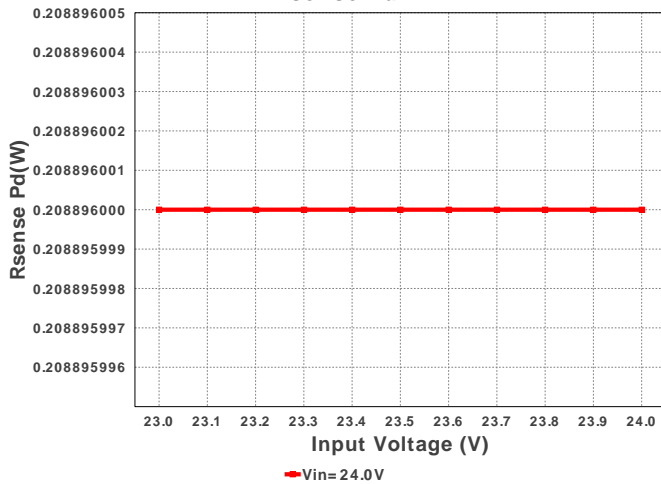
IC Ipk



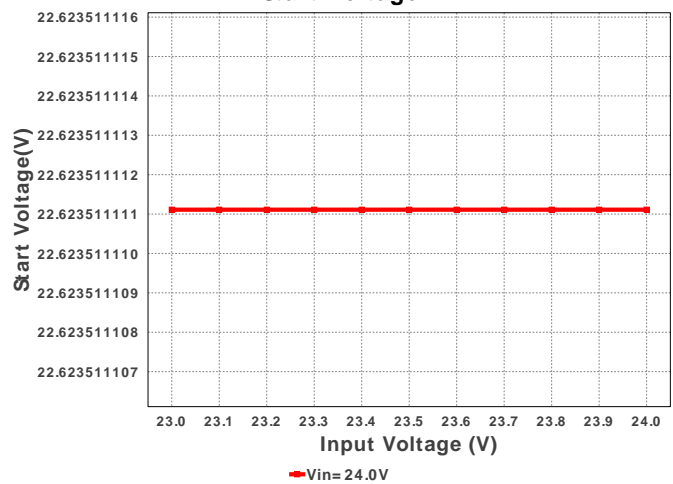
L Pd

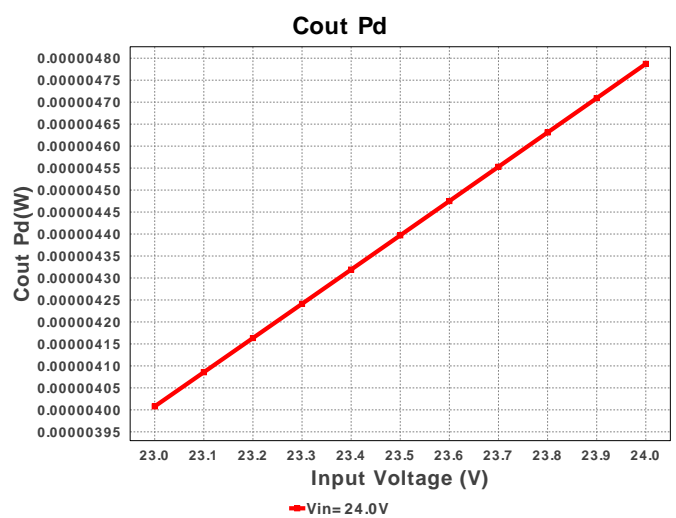
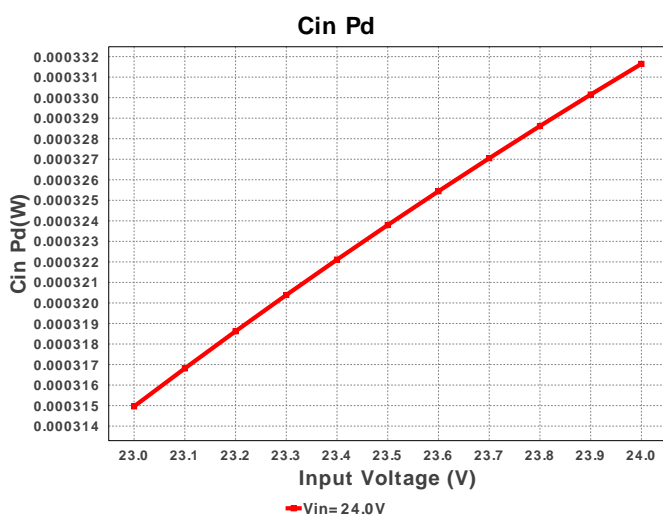
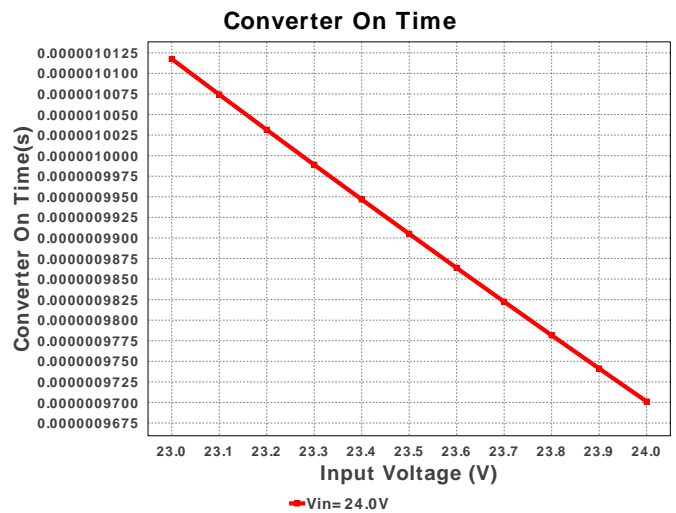
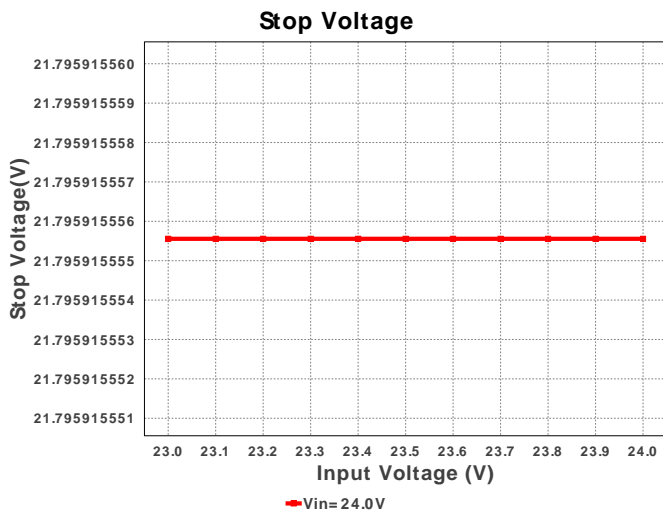
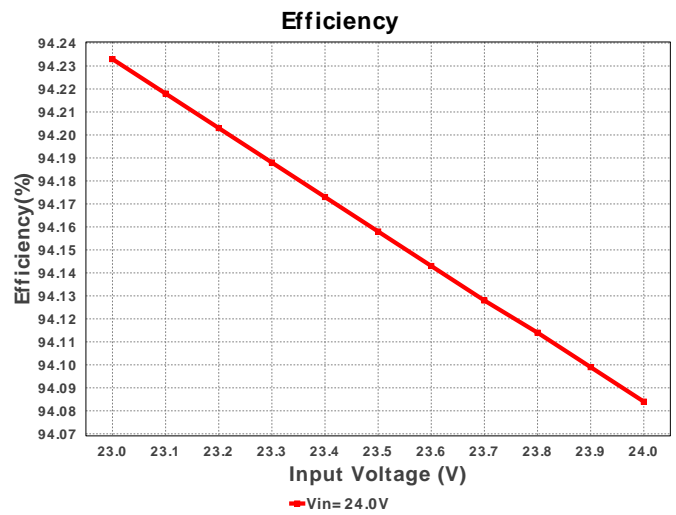
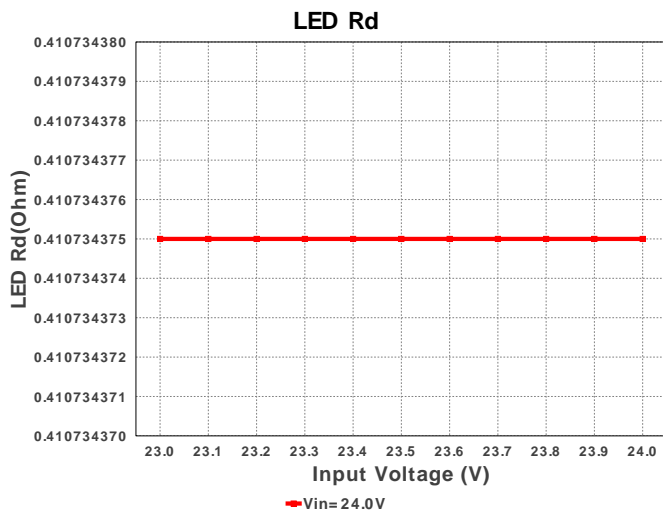


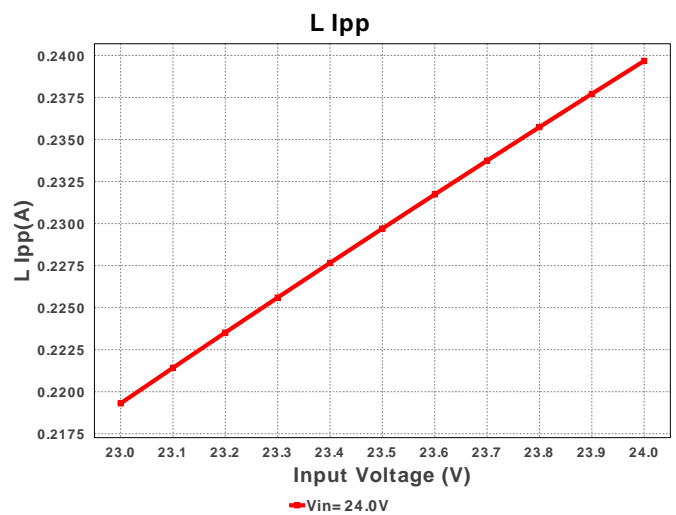
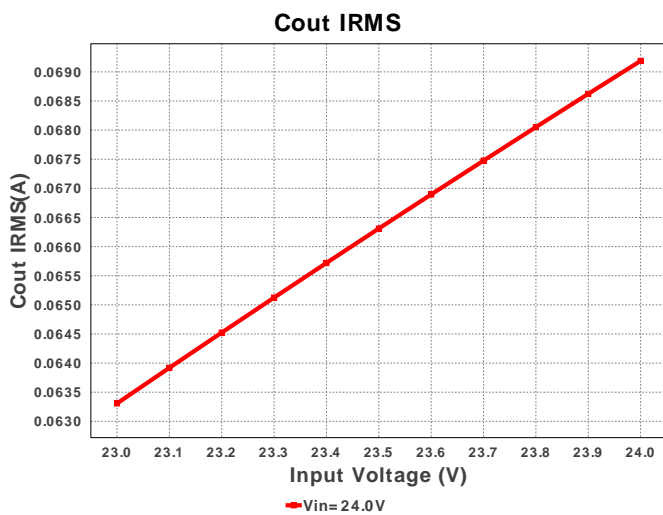
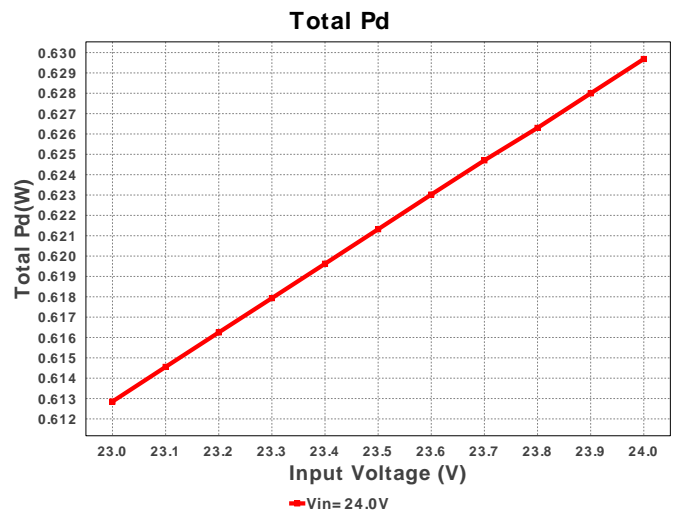
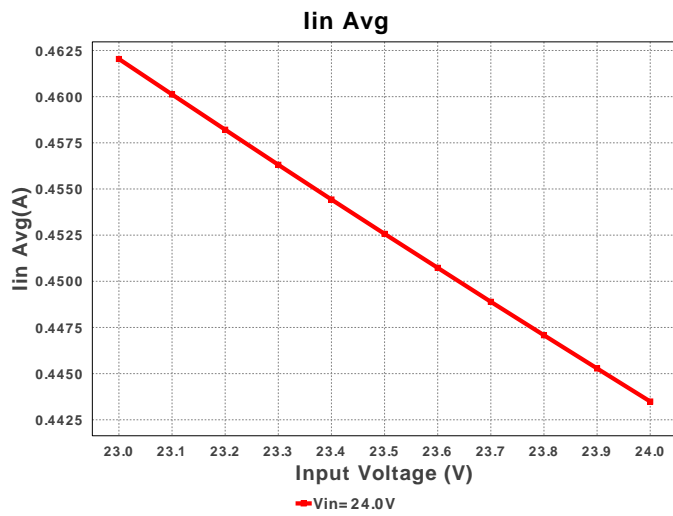
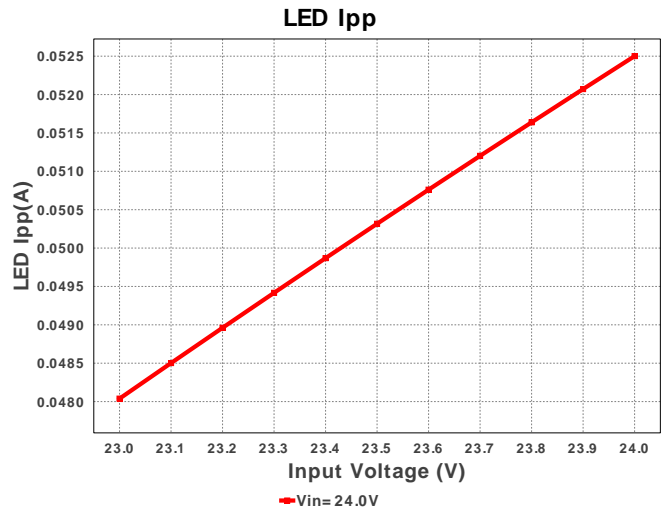
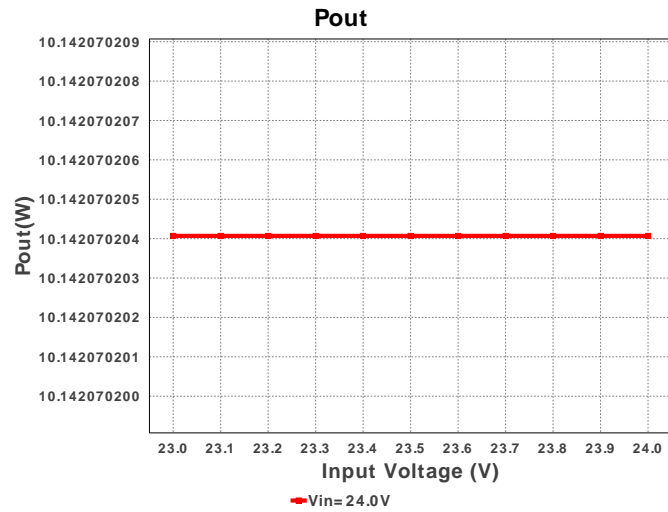
Rsense Pd

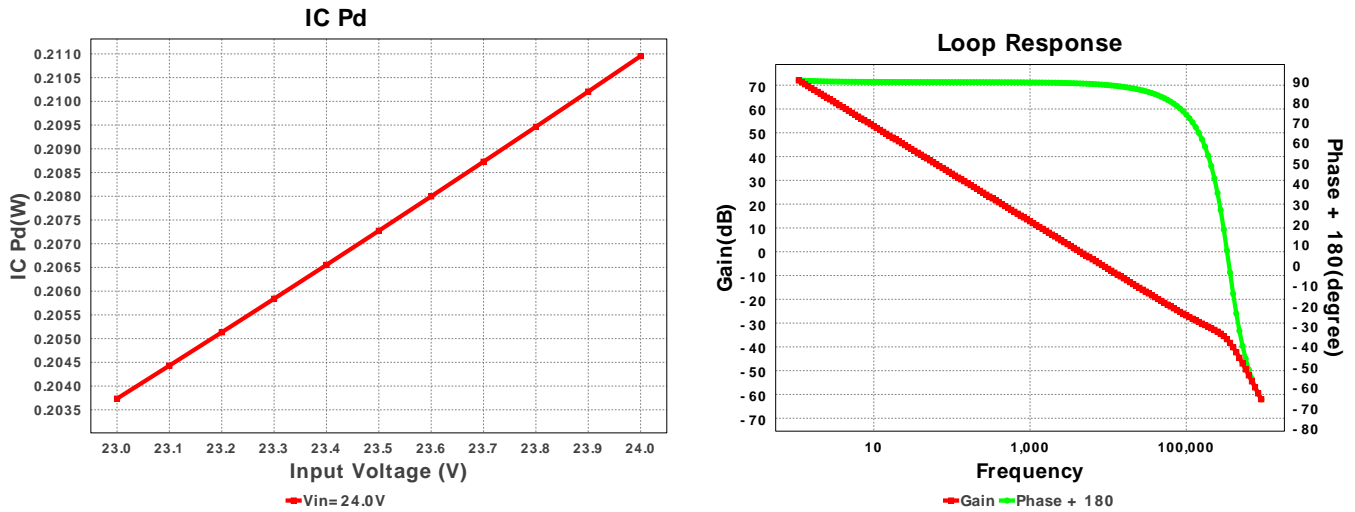


Start Voltage









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	299.612 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	68.836 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	759.228 mA	Current	Peak switch current in IC
4.	Iin Avg	443.49 mA	Current	Average input current
5.	L Ipp	238.46 mA	Current	Peak-to-peak inductor ripple current
6.	LED Ipp	47.51 mA	Current	LED Ripple Current
7.	BOM Count	22	General	Total Design BOM count
8.	Frequency	696.43 kHz	General	Switching frequency
9.	IC Tolerance	0.0 V	General	IC Feedback Tolerance
10.	Mode	CCM	General	Conduction Mode
11.	Pout	10.142 W	General	Total output power
12.	Total BOM	\$0.85	General	Total BOM Cost
13.	Vout OP	15.847 V	Op_Point	Operational Output Voltage
14.	Cross Freq	4.367 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	67.562 %	Op_point	Duty cycle
16.	Efficiency	94.084 %	Op_point	Steady state efficiency
17.	IC Tj	44.071 degC	Op_point	IC junction temperature
18.	ICThetaJA	66.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	640.0 mA	Op_point	Iout operating point
20.	LED Rd	410.734 mOhm	Op_point	LED DynamicResistance
21.	Phase Marg	89.334 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	24.0 V	Op_point	Vin operating point
23.	Cin Pd	331.646 μW	Power	Input capacitor power dissipation
24.	Cout Pd	4.738 μW	Power	Output capacitor power dissipation
25.	D1 Pd	114.543 mW	Power	Output Diode Power Dissipation
26.	IC Pd	210.954 mW	Power	IC power dissipation
27.	L Pd	95.033 mW	Power	Inductor power dissipation
28.	Rsense Pd	208.896 mW	Power	LED Current Rsns Power Dissipation
29.	Total Pd	629.685 mW	Power	Total Power Dissipation
30.	Start Voltage	22.624 V	UVLO	Start Voltage with External UVLO Resistors
31.	Stop Voltage	21.796 V	UVLO	Stop Voltage with External UVLO Resistors
32.	Converter On Time	965.167 ns		Approximate Converter On Time

Design Inputs

#	Name	Value	Description
1.	Iout	640.0 m	Maximum Output Current
2.	VinMax	24.0	Maximum input voltage
3.	VinMin	24.0	Minimum input voltage
4.	Vout	15.261	Output Voltage
5.	application	LED_DRIVER	LED Application
6.	base_pn	TPS92513	Base Product Number
7.	LED_Architect	Y	LED Architect Project
8.	ledparallel	1.0	Number of LED in parallel
9.	ledpartnumber	XPGWHT-L1-0000-00H51	LED Part number
10.	ledseries	5.0	Number of LED in series
11.	line_fsw	NaN	AC Line Frequency
12.	source	DC	Input Source Type
13.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS92513** Product Folder : <http://www.ti.com/product/TPS92513> : contains the data sheet and other resources.

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