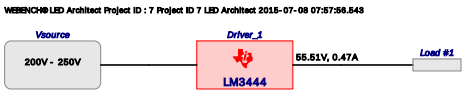


WEBENCH® LED Architect

Project Report

Project : 1836019/7 : Project ID 7
Created : 2015-07-08 07:57:56.543
LED Architect with light output=1000.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : $0.00
Total Footprint : 12,954 mm^2
Total BOM Count : 55
Total Efficiency : 10.77%
Total Efficacy : 38.7 lumens / Watt
Total Power Dissipation (loss) : 0.0 Watts

Design Inputs :

1.	VinMax	250.0	Maximum input voltage
2.	VinMin	200.0	Minimum input voltage
3.	line_fsw	50.0	AC Line Frequency
4.	color	red	LED Color
5.	source	AC	Input Source Type
6.	lightOutput	1000.0	Light Output in Lumen
7.	maxHeatSinkLength	200.0	Max Heat Sink Length
8.	maxHeatSinkWidth	50.0	Max Heat Sink Width
9.	maxJunctionTemp	150.0	Max LED Junction Temperature
10.	maxLEDStringVout	60.0	Max LED String Voltage
11.	optfactor	3	Optimization factor to tune up the design
12.	priceFactor	0	Price factor to tune up the design cost
13.	Ta	30.0	Ambient temperature

Regulators

Main Driver NSID : LM3444MM/NOPB AC Line Voltage Compatible Buck LED driver; Driver Efficiency = 74.65%

Drivers Electrical BOM

Manufacturer	Part Number	Quantity	Budgetary Price	Footprint (mm^2)
ON Semiconductor	BZX84C15LT1G	1	$0.02	14
ON Semiconductor	BZX84C5V1LT1G	1	$0.02	14
TDK	C3216X7R2A105M160AA	1	$0.11	11
TDK	C3216X7T2W104M	1	$0.09	11
Yageo America	CC0805JRNPO9BN221	1	$0.01	7
Bourns	CD1408-FU1400	4	$0.52	51
Vishay-Dale	CRCW04021R00FKED	1	$0.01	3
Vishay-Dale	CRCW040233K2FKED	1	$0.01	3
Vishay-Dale	CRCW040237K4FKED	1	$0.01	3
CUSTOM	CUSTOM	3	$0.00	0
Panasonic	EEE-FK1C470UR	1	$0.11	62
Panasonic	ERJ-8ENF1003V	1	$0.01	11
Fairchild Semiconductor	FCD4N60TM	1	$0.49	102
MuRata	GRM21BR71E104KA01L	2	$0.02	14
Diodes Inc.	HD04-T	1	$0.12	62
Texas Instruments	LM3444MM/NOPB	1	$0.55	0
ON Semiconductor	MBR0520LT1G	1	$0.06	13
Fairchild Semiconductor	MMBT4403	1	$0.03	14
ON Semiconductor	MURS360T3	1	$0.24	83
Stackpole Electronics Inc	RMCF2010FT1R50	1	$0.03	32
Bourns	SDR1307-331KL	1	$0.35	227
STMicroelectronics	STD3NK80ZT4	1	$0.46	102
Total		28	$3.27	838

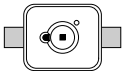
LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm^2)
OSRAM	LR W5AMHZJZ1	26	$60.58	-
Aavid	61085	1	$5.17	111
Total			$65.75	111

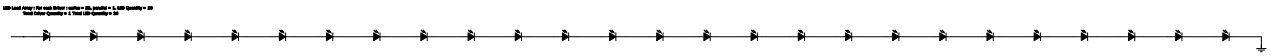
LED Array Solution

LED Array
Light Output : 1000 lumens
Color : red
LED quantity : 26Series = 26Parallel = 1
Total Vout : 55.5 Volts
Total Iload : 0.5 Amps
Total Light Output : 1000 lumens
Flux : 38 lumens
ThetaSA : 1.84 C / Watt
Junction Temp : 84 degrees
Operating Vf : 2.135 Volts
Operating Io : 0.466 Amps
Efficiency : 14%
Efficacy : 38.7 lumens / Watt
Total Footprint : 11113.7 mm^2
Total LED Cost : $65.75
Max LED Vout : 60.0 Volts

Selected LED



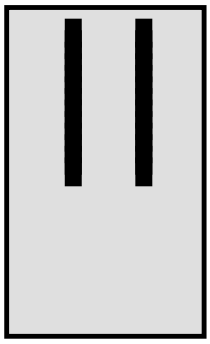
Manufacturer : OSRAM
Part Number : LR W5AMHZJZ1
Vf : 2.2 V
Io : 0.4 A
Angle : 170.0 degree
PhiV : 55.0
LamdaP : NaN
LamdaD : NaN
Color : red
Tj : 125.0 deg C
IfMin : 0.1 Amps
IfMax : 1.0 Amps
RJC : 6.5 deg C/Ohm
Isat : 0.0 Amps
Package mount : SMT
Footprint : 108.2 mm2



Heatsink

Length : 81.4 mm
Width : 136.52 mm
Height : 33.32 mm
Total Heatsink Footprint : 11114 mm^2
Total Heatsink Cost : $5.17

Manufacturer : Aavid
Part Number : 61085
ThetaSA : 1.84 C/W



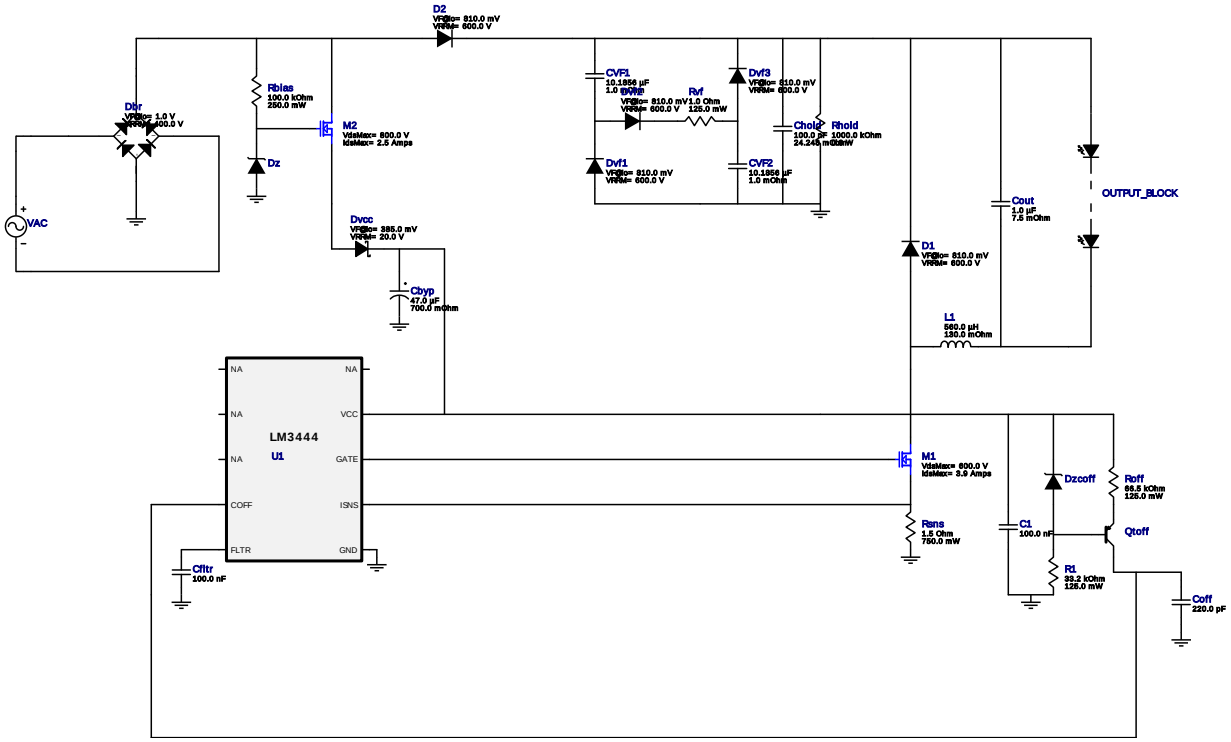
Project Diagram

WEBENCH® Design Report

VinMin = 200.0V
VinMax = 250.0V
Vout = 55.51V
Iout = 0.47A

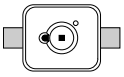
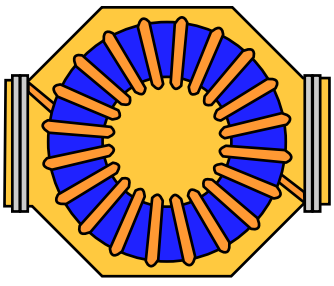
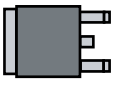
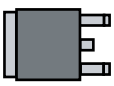
Device = LM3444MM/NOPB
Topology = Buck
Created = 7/8/15 7:58:04 AM
BOM Cost = $0.00
Footprint = 1,835.0 mm²
BOM Count = 54
Total Pd = 0.0W

Design : 1836019/31 LM3444MM/NOPB
LM3444MM/NOPB 200.0V-250.0V to 90.51V @ 0.466A

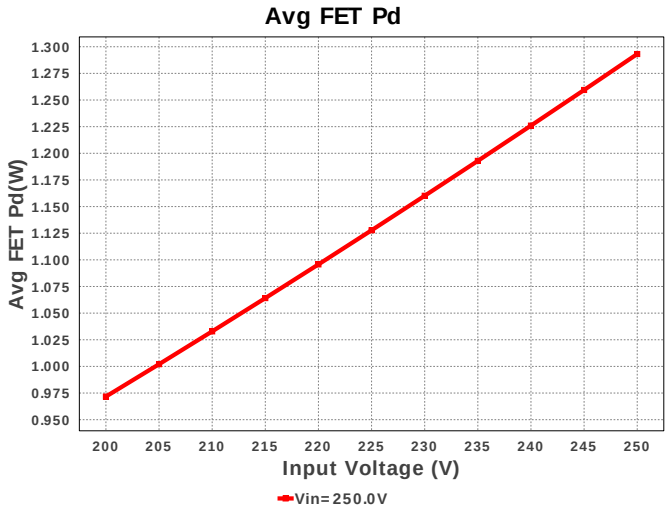


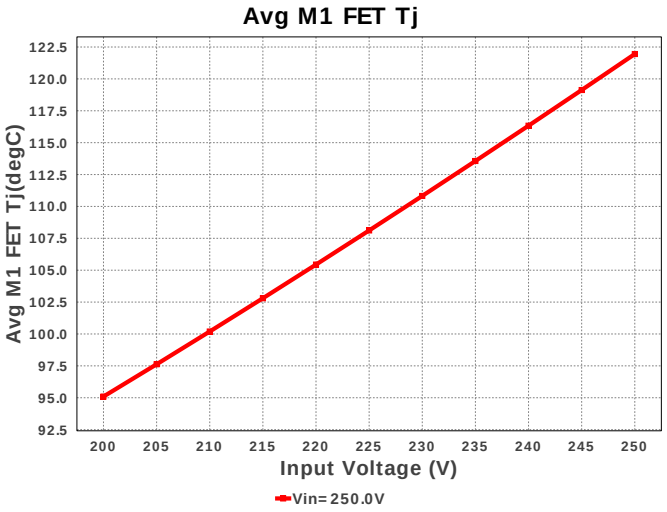
Electrical BOM

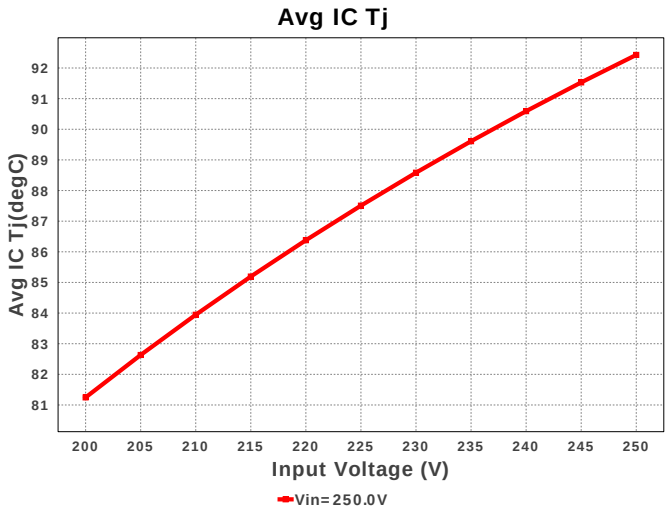
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C1	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	CVF1	CUSTOM	CUSTOM Series= ?	Cap= 10.1856 uF ESR= 1.0 mOhm VDC= 282.843 V IRMS= 779.77 mA	1	NA	CUSTOM 0 mm²
3.	CVF2	CUSTOM	CUSTOM Series= ?	Cap= 10.1856 uF ESR= 1.0 mOhm VDC= 282.843 V IRMS= 779.77 mA	1	NA	CUSTOM 0 mm²
4.	Cbyp	Panasonic	EEE-FK1C470UR Series= FK	Cap= 47.0 uF ESR= 700.0 mOhm VDC= 16.0 V IRMS= 160.0 mA	1	$0.11	SM_RADIAL_C 62 mm²
5.	Cfltr	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
6.	Chold	TDK	C3216X7T2W104M Series= 480	Cap= 100.0 nF ESR= 24.248 mOhm VDC= 400.0 V IRMS= 0.0 A	1	$0.09	1206 11 mm²
7.	Coff	Yageo America	CC0805JRNPO9BN221 Series= C0G/NP0	Cap= 220.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

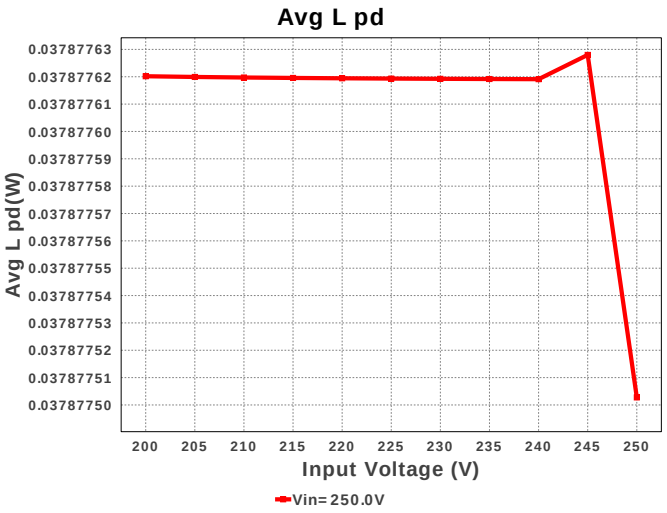
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Cout	TDK	C3216X7R2A105M160AA Series= X7R	Cap= 1.0 uF ESR= 7.5 mOhm VDC= 100.0 V IRMS= 5.9235 A	1	$0.11	 1206 11 mm^2
9.	D1	ON Semiconductor	MURS360T3	VF@Io= 810.0 mV VRRM= 600.0 V	1	$0.24	 SMC 83 mm^2
10.	D2	ON Semiconductor	MURS360T3	VF@Io= 810.0 mV VRRM= 600.0 V	1	$0.24	 SMC 83 mm^2
11.	D_LED	OSRAM	LR W5AMHZJZ1	LED	26	$2.33	 goldendragon_nolens 108 mm^2
12.	Dbr	Diodes Inc.	HD04-T	VF@Io= 1.0 V VRRM= 400.0 V	1	$0.12	 MiniDIP 62 mm^2
13.	Dvcc	ON Semiconductor	MBR0520LT1G	VF@Io= 385.0 mV VRRM= 20.0 V	1	$0.06	 SOD-123 13 mm^2
14.	Dvf1	ON Semiconductor	MURS360T3	VF@Io= 810.0 mV VRRM= 600.0 V	1	$0.24	 SMC 83 mm^2
15.	Dvf2	ON Semiconductor	MURS360T3	VF@Io= 810.0 mV VRRM= 600.0 V	1	$0.24	 SMC 83 mm^2
16.	Dvf3	ON Semiconductor	MURS360T3	VF@Io= 810.0 mV VRRM= 600.0 V	1	$0.24	 SMC 83 mm^2
17.	Dz	ON Semiconductor	BZX84C15LT1G	Zener	1	$0.02	 SOT-23 14 mm^2
18.	Dzcoff	ON Semiconductor	BZX84C5V1LT1G	Zener	1	$0.02	 SOT-23 14 mm^2
19.	L1	Bourns	PM2120-561K-RC	L= 560.0 µH DCR= 130.0 mOhm	1	$1.33	 PM2120 890 mm^2
20.	M1	Fairchild Semiconductor	FCD4N60TM	VdsMax= 600.0 V IdsMax= 3.9 Amps	1	$0.49	 DPAK 102 mm^2
21.	M2	STMicroelectronics	STD3NK80ZT4	VdsMax= 800.0 V IdsMax= 2.5 Amps	1	$0.46	 DPAK 102 mm^2
22.	Qtoff	Fairchild Semiconductor	MMBT4403	Bipolar Transistor	1	$0.03	 SOT-23 14 mm^2

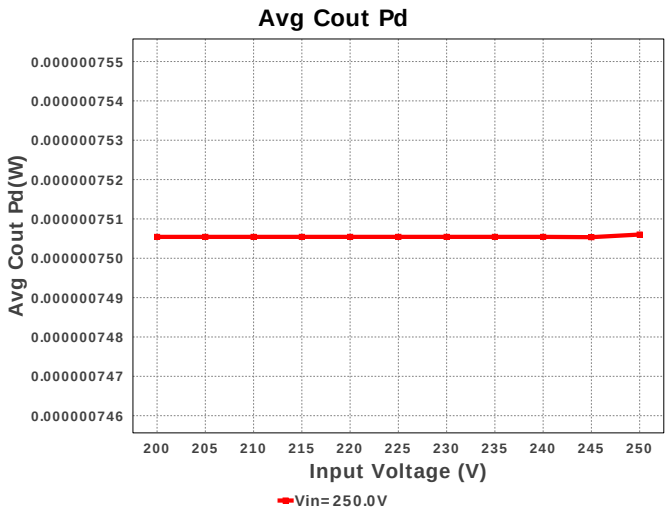
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
23.	R1	Panasonic	ERJ-6ENF3322V Series= 225	Res= 33.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
24.	Rbias	Panasonic	ERJ-8ENF1003V Series= ERJ-8E	Res= 100.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	1206 11 mm²
25.	Rhold	CUSTOM	CUSTOM Series= ?	Res= 1000.0 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
26.	Roff	Panasonic	ERJ-6ENF6652V Series= 225	Res= 66.5 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
27.	Rsns	Stackpole Electronics Inc	RMCF2010FT1R50 Series= ?	Res= 1.5 Ohm Power= 750.0 mW Tolerance= 1.0%	1	$0.03	2010 32 mm²
28.	Rvf	Vishay-Dale	CRCW08051R00FKEA Series= CRCW..e3	Res= 1.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
29.	U1	Texas Instruments	LM3444MM/NOPB	Switcher	1	$0.55	0 mm²

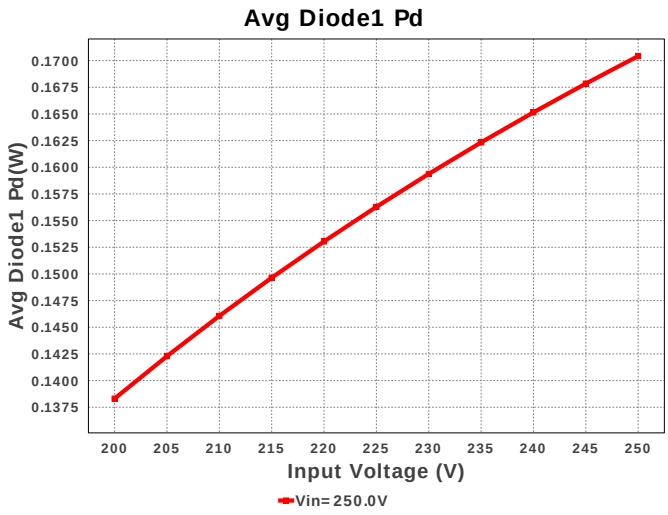


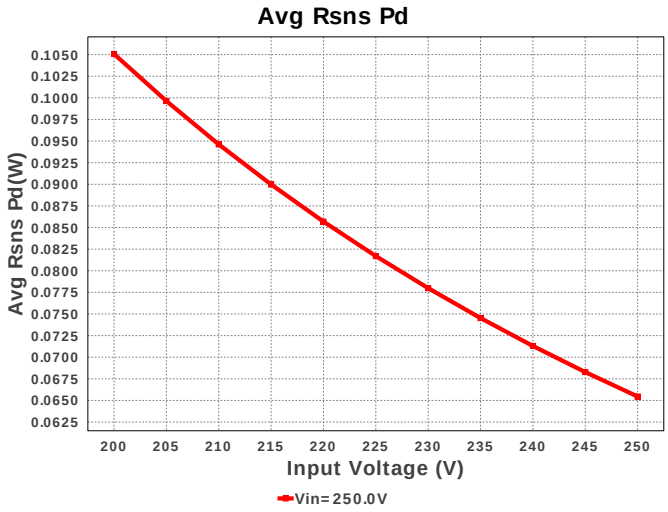


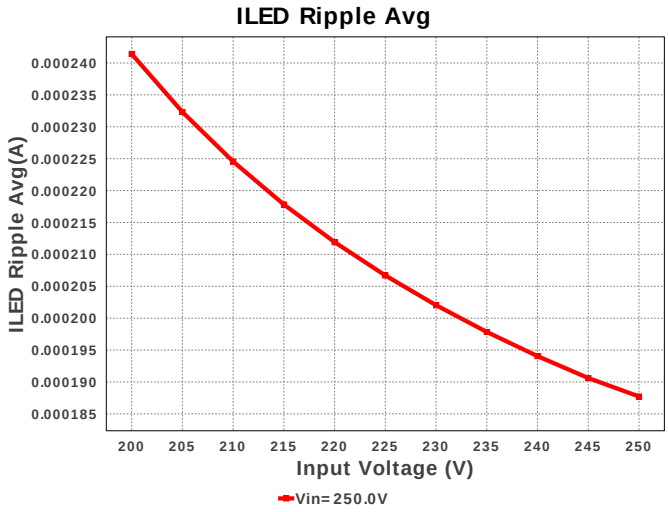


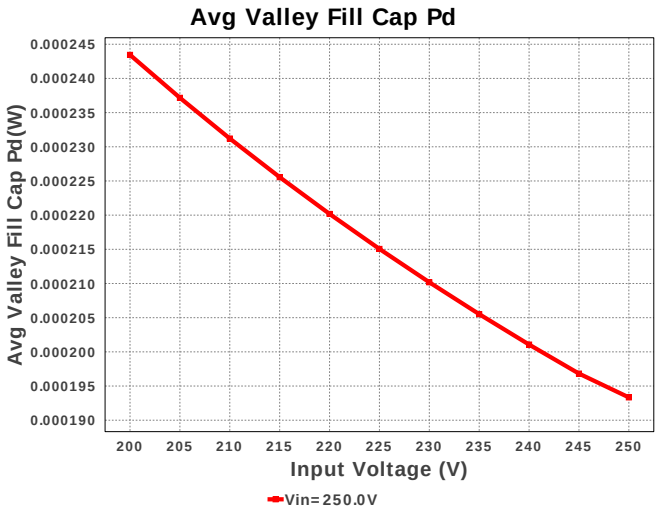


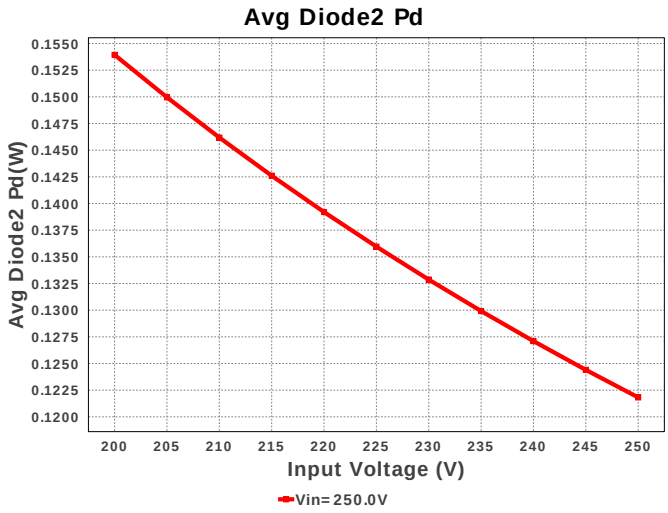


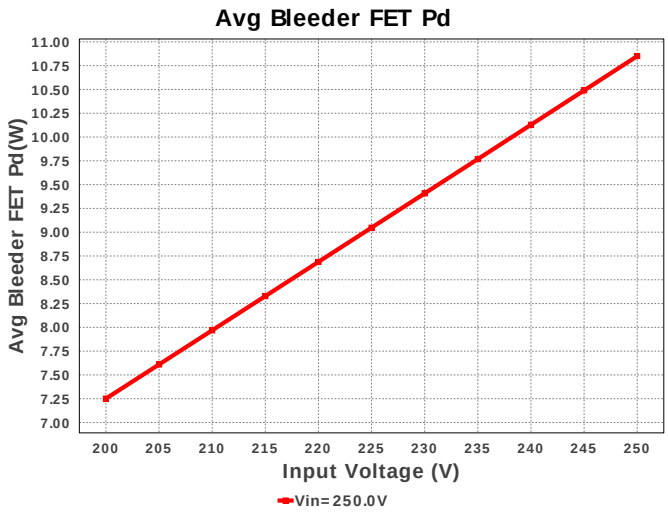


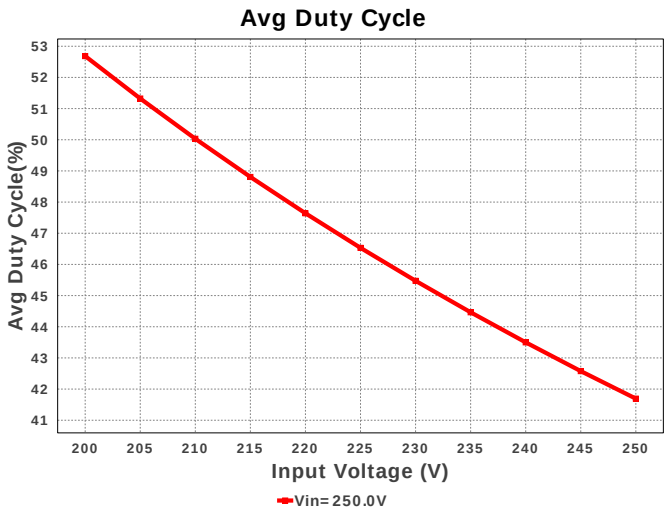


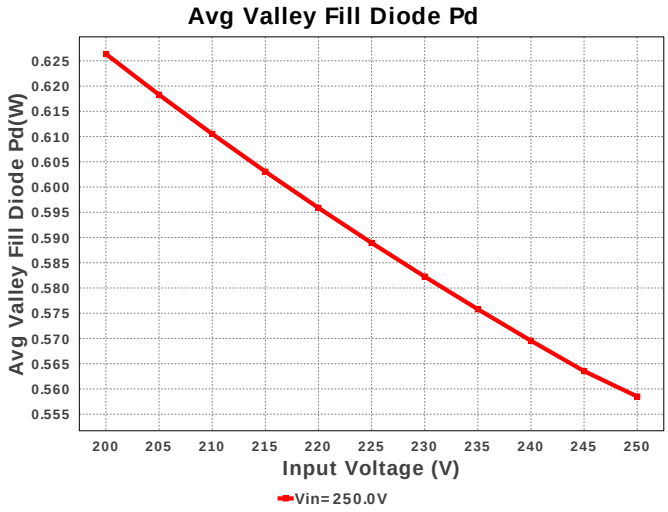


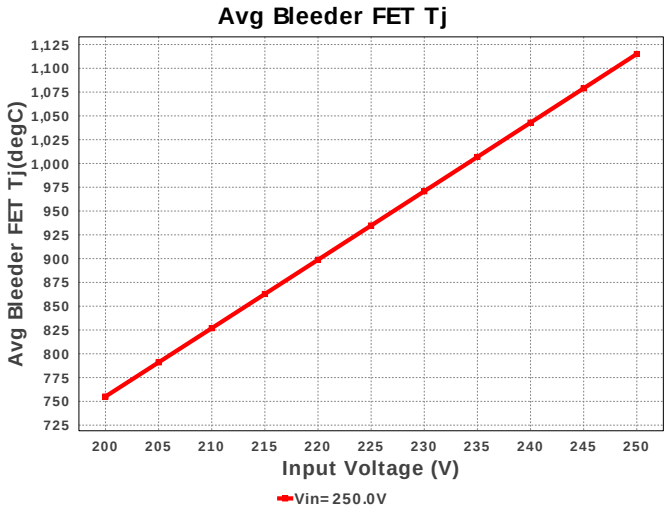


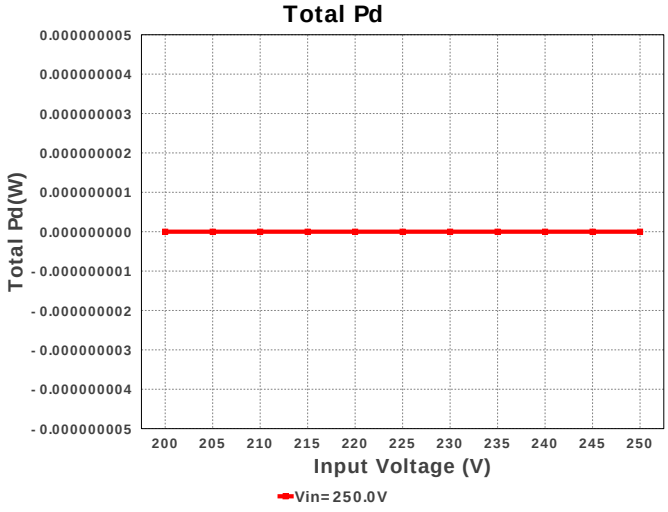


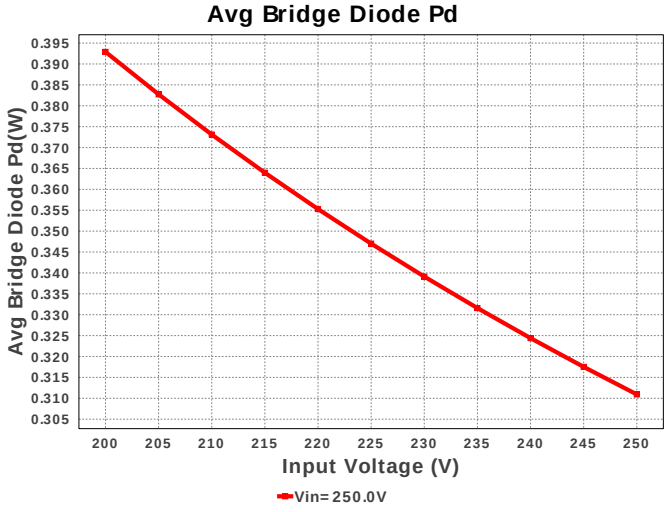


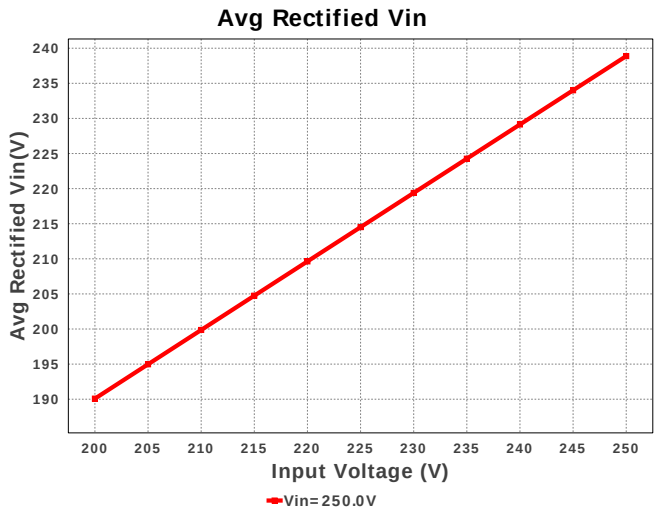


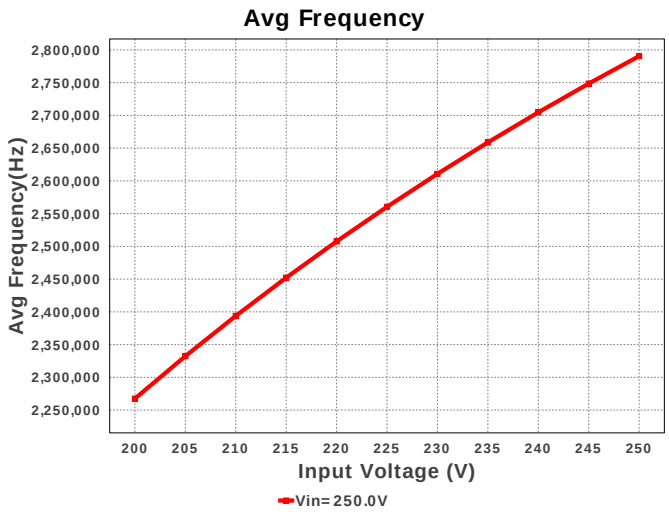


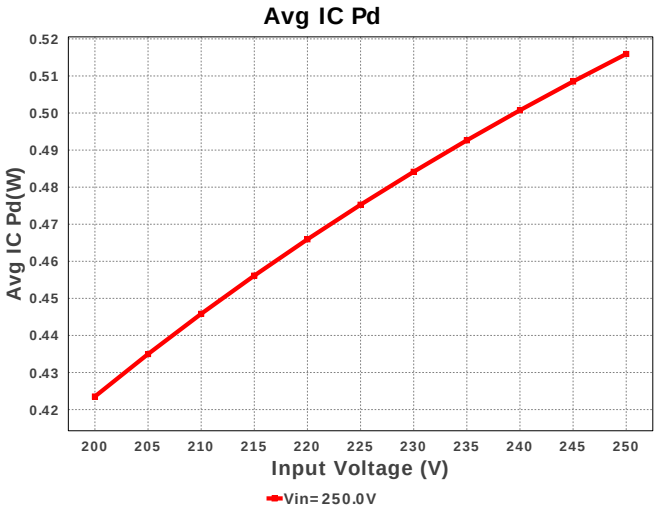


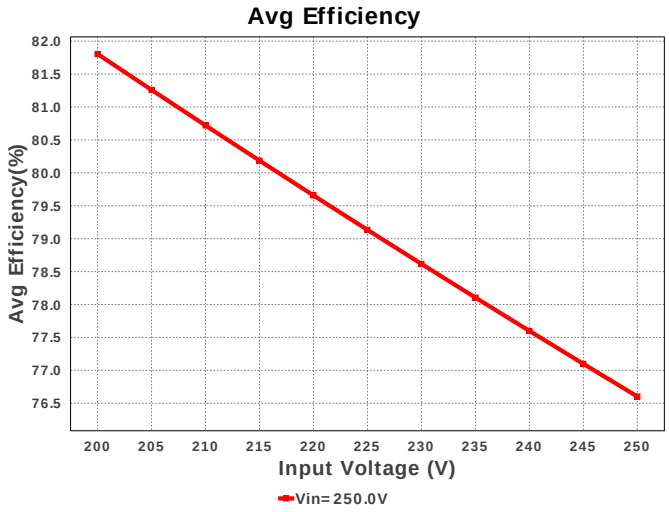


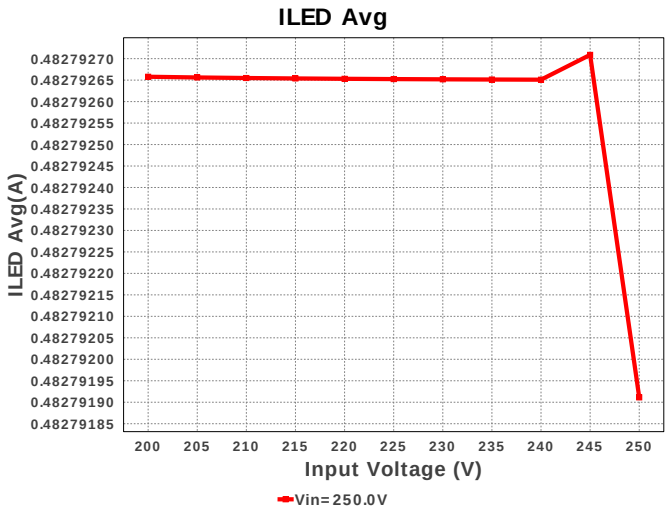












Operating Values

#	Name	Value	Category	Description
1.	ILED Avg	482.797 mA	Current	Average Current per LED for the AC line period
2.	ILED Ripple Avg	186.805 µA	Current	Average LED Ripple Current for the AC line period
3.	Avg Rectified Vin	238.878 V	General	Average Rectified Voltage for the AC Line Period
4.	BOM Count	54	General	Total Design BOM count
5.	FootPrint	1.835 k mm^2	General	Total Foot Print Area of BOM components
6.	Total BOM	$0.0	General	Total BOM Cost
7.	Avg Bleeder FET Tj	1.117 kdegC	Op_Point	Bleeder MOSFET average junction temperature over the AC Line Period
8.	Avg M1 FET Tj	122.05 degC	Op_Point	M1 MOSFET average junction temperature over the AC Line Period
9.	Avg Duty Cycle	41.536 %	Op_point	Average Duty Cycle over the AC Line Period
10.	Avg Efficiency	76.95 %	Op_point	Average Efficiency over the AC Line Period

#	Name	Value	Category	Description
11.	Avg Frequency	2.798 MHz	Op_point	Average Switching Frequency over the AC Line Period
12.	Avg IC Tj	92.588 degC	Op_point	Average IC junction temperature for the AC line period
13.	VIN_OP	250.0 V	Op_point	AC Input RMS Voltage
14.	Avg Bleeder FET Pd	10.872 W	Power	Average power dissipation in the bleeder FET over the AC line period
15.	Avg Bridge Diode Pd	295.964 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
16.	Avg Cout Pd	750.181 nW	Power	Average Power Dissipation in the Output Capacitor over the AC Line Period
17.	Avg Diode1 Pd	164.677 mW	Power	Average Power Dissipation in D1 over the AC Line Period
18.	Avg Diode2 Pd	121.362 mW	Power	Average Power Dissipation in D1 over the AC Line Period
19.	Avg FET Pd	1.07 W	Power	Average power dissipation in the switching FET over the AC line period
20.	Avg IC Pd	517.253 mW	Power	Average Power Dissipation in the IC over the AC line period
21.	Avg L pd	37.878 mW	Power	Average Inductor power disspation over the AC line period
22.	Avg Rsns Pd	64.922 mW	Power	Average power dissipation in the Current limit resistor over the AC line period
23.	Avg Valley Fill Cap Pd	192.737 µW	Power	Average Power Dissipation in the Valley Fill Capacitors over the AC Line Period
24.	Avg Valley Fill Diode Pd	537.987 mW	Power	Average Power Dissipation in the Valley Fill Diodes over the AC Line Period
25.	Total Pd	0.0 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	466.0 m	Maximum Output Current
2.	Iout1	466.0 m	Output Current #1
3.	VinMax	250.0	Maximum input voltage
4.	VinMin	200.0	Minimum input voltage
5.	Vout	55.507	Output Voltage
6.	Vout1	55.507	Output Voltage #1
7.	line_fsw	50.0	Light Output in Lumen
8.	application	LED_DRIVER	LED Application
9.	base_pn	LM3444	Base Product Number
10.	LED_Architect	Y	LED Architect Project
11.	ledparallel	1.0	Number of LED in parallel
12.	ledpartnumber	LR W5AMHZJZ1	LED Part number
13.	ledseries	26.0	Number of LED in series
14.	line_fsw	50.0	AC Line Frequency
15.	source	AC	Input Source Type
16.	Ta	30.0	Ambient temperature
17.	UserFsw	785.03 k	Customer Selected Frequency

Design Assistance

1. **LM3444** Product Folder : http://www.ti.com/product/LM3444 : contains the data sheet and other resources.