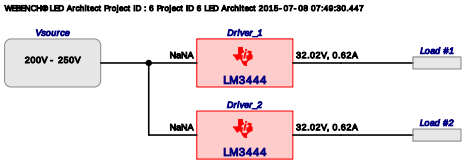
WEBENCH® LED Architect



Project Report

Project : 1836019/6 : Project ID 6
Created : 2015-07-08 07:49:30.447
LED Architect with light output=3000.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : $0.00
Total Footprint : 43,608 mm^2
Total BOM Count : 77
Total Efficiency : 16.82%
Total Efficacy : 75.4 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	cool white	LED Color
5.	source	AC	Input Source Type
6.	lightOutput	3000.0	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 = 76.44%

Drivers Electrical BOM

Manufacturer	Part Number	Quantity	Budgetary Price	Footprint (mm^2)
ON Semiconductor	BZX84C15LT1G	2	$0.04	28
ON Semiconductor	BZX84C5V1LT1G	2	$0.04	28
TDK	C3216X7T2W104M	2	$0.18	22
Yageo America	CC0805JRNPO9BN221	2	$0.02	14
Bourns	CD1408-FU1400	8	$1.04	102
Vishay-Dale	CRCW04021R00FKED	2	$0.02	6
Vishay-Dale	CRCW040233K2FKED	2	$0.02	6
Vishay-Dale	CRCW040266K5FKED	2	$0.02	6
CUSTOM	CUSTOM	8	$0.00	0
Panasonic	EEE-FK1C470UR	2	$0.22	124
Panasonic	ERJ-8ENF1003V	2	$0.02	22
Fairchild Semiconductor	FCD4N60TM	2	$0.98	203
MuRata	GRM21BR71E104KA01L	4	$0.04	27
MuRata	GRM31CR71H475KA12L	2	$0.14	22
Diodes Inc.	HD04-T	2	$0.24	124
Texas Instruments	LM3444MM/NOPB	2	$1.10	0
ON Semiconductor	MBR0520LT1G	2	$0.12	26
Fairchild Semiconductor	MMBT4403	2	$0.06	28
ON Semiconductor	MURS360T3	2	$0.48	167
Bourns	SRR1210-271M	2	$0.88	392
STMicroelectronics	STD3NK80ZT4	2	$0.92	203
Total		56	$6.58	1,550

LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm^2)
OSRAM	LUW CP7PKTLP5C8E	20	$43.80	-
Aavid	61915	1	$9.73	419
Total			$53.53	419

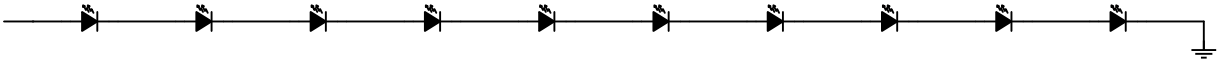
LED Array Solution

LED Array
Light Output : 3000 lumens
Color : cool white
LED quantity : 20Series = 10Parallel = 2
Total Vout : 32 Volts
Total Iload : 0.6 Amps
Total Light Output : 3000 lumens
Flux : 150 lumens
ThetaSA : 1.02 C / Watt
Junction Temp : 86 degrees
Operating Vf : 3.202 Volts
Operating Io : 0.621 Amps
Efficiency : 22%
Efficacy : 75.4 lumens / Watt
Total Footprint : 41968.5 mm^2
Total LED Cost : $53.53
Max LED Vout : 60.0 Volts

Selected LED

Manufacturer : OSRAM
Part Number : LUW CP7PKTLP5C8E
Vf : 3.2 V
Io : 0.35 A
Angle : 80.0 degree
PhiV : 112.0
Color Temperature : 6500.0 K
Color : cool white
Tj : 125.0 deg C
IfMin : 0.1 Amps
IfMax : 1.0 Amps
RJC : 7.0 deg C/Ohm
Isat : 0.0 Amps
Package mount : SMT
Footprint : 16.8 mm2

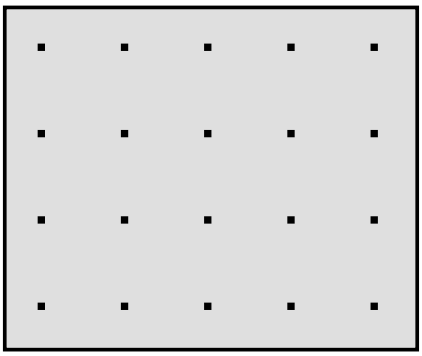
LED Load Array : For each Driver : series = 10, parallel = 1. LED Quantity = 10
Total Driver Quantity = 2 Total LED Quantity = 20



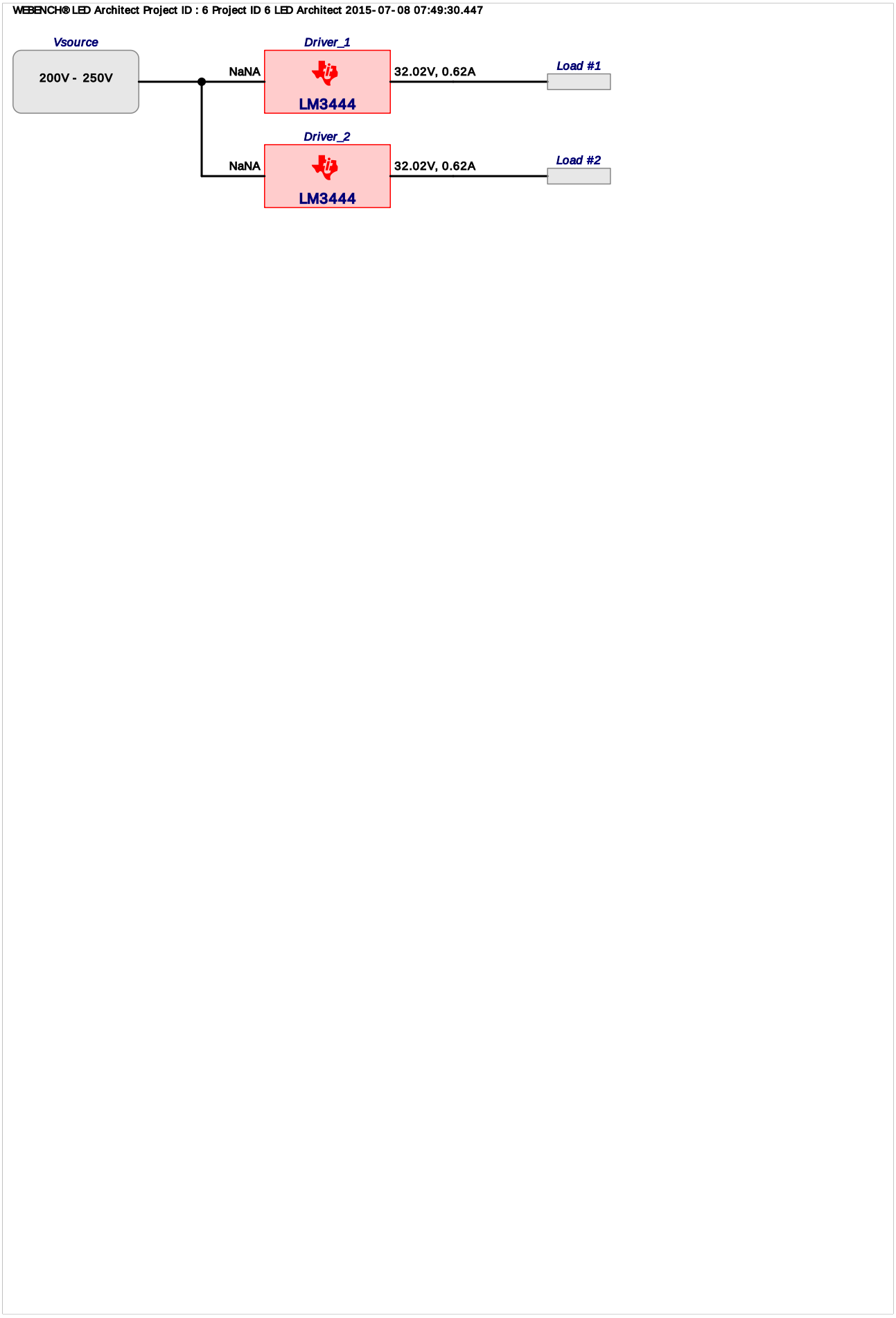
Heatsink

Length : 225.11 mm
Width : 186.44 mm
Height : 22.22 mm
Total Heatsink Footprint : 41968 mm^2
Total Heatsink Cost : $9.73

Manufacturer : Aavid
Part Number : 61915
ThetaSA : 1.05 C/W



Project Diagram



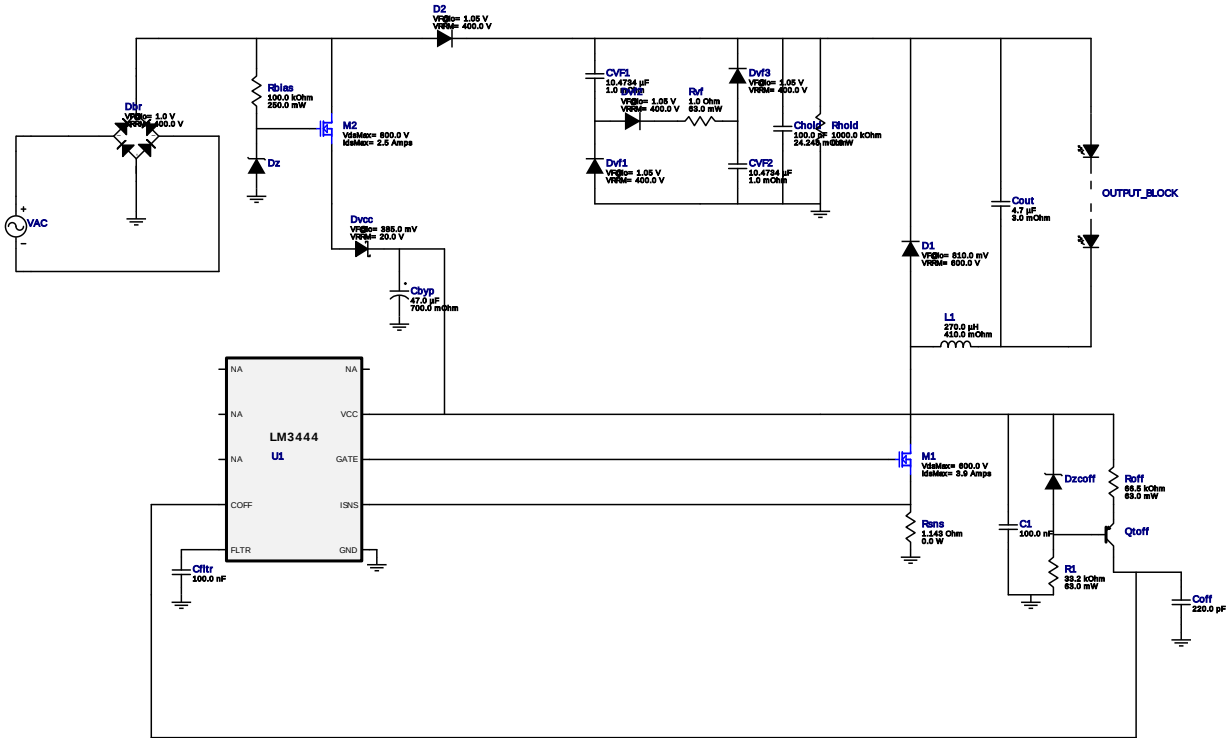
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 200.0V
VinMax = 250.0V
Vout = 32.02V
Iout = 0.62A

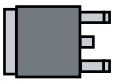
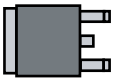
Device = LM3444MM/NOPB
Topology = Buck
Created = 7/8/15 7:49:30 AM
BOM Cost = $0.00
Footprint = 820.0 mm²
BOM Count = 38
Total Pd = 0.0W

Design : 1836019/30 LM3444MM/NOPB
LM3444MM/NOPB 200.0V-250.0V to 34.17V @ 0.621A

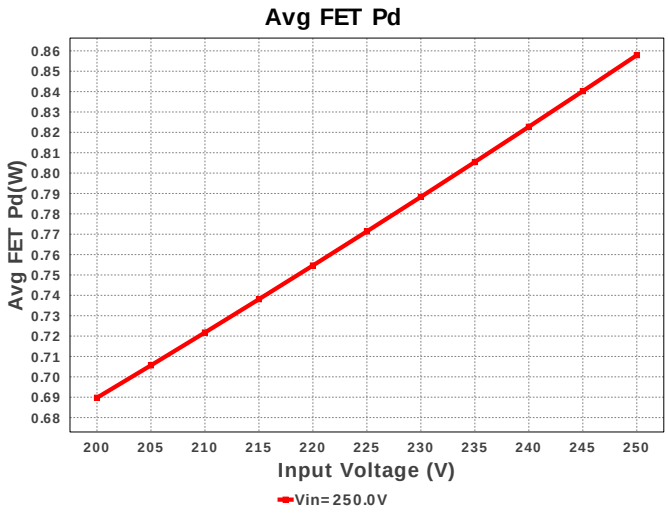


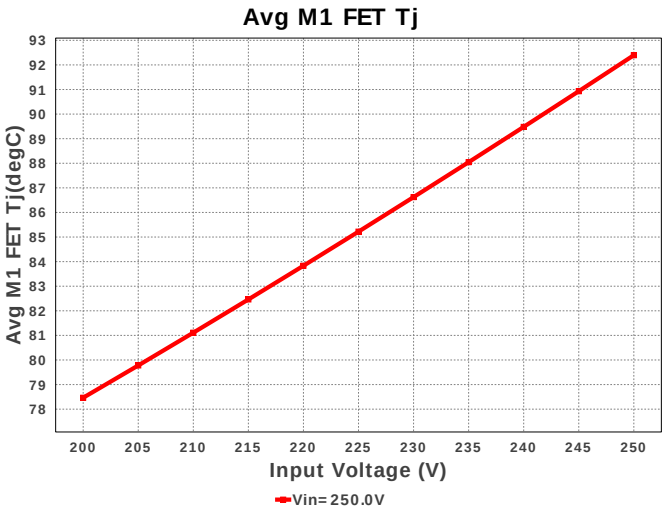
Electrical BOM

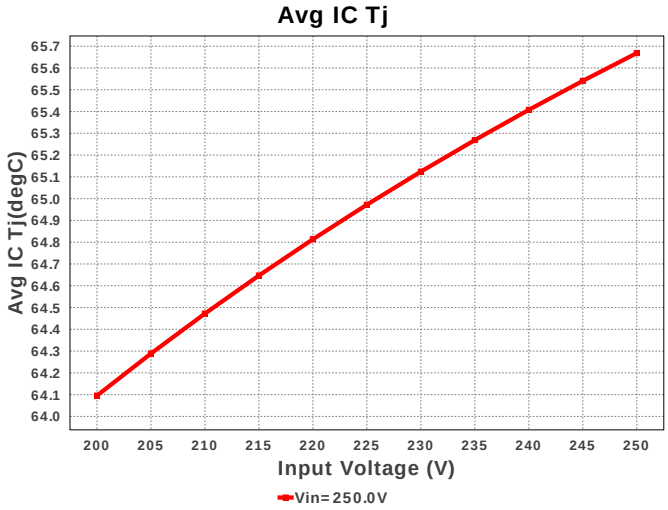
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	C1	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	CVF1	CUSTOM	CUSTOM Series= ?	Cap= 10.4734 uF ESR= 1.0 mOhm VDC= 282.843 V IRMS= 906.47 mA	1	NA	CUSTOM 0 mm²
3.	CVF2	CUSTOM	CUSTOM Series= ?	Cap= 10.4734 uF ESR= 1.0 mOhm VDC= 282.843 V IRMS= 906.47 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

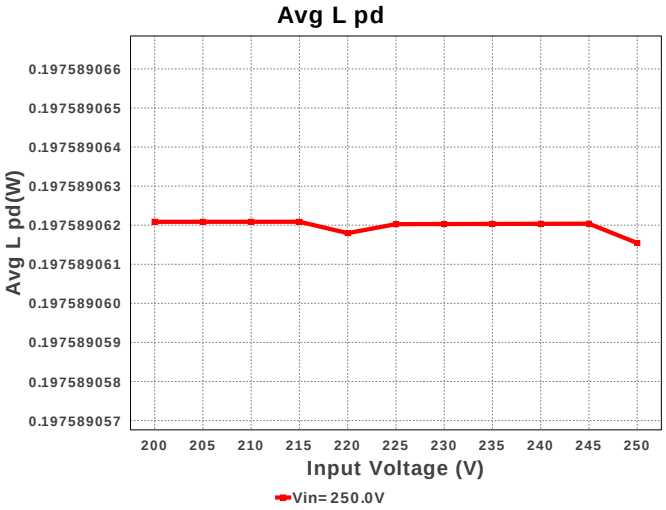
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
8.	Cout	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	$0.07	 1206 11 mm^2
9.	D1	ON Semiconductor	MURS360T3	VF@Io= 810.0 mV VRRM= 600.0 V	1	$0.24	 SMC 83 mm^2
10.	D2	Bourns	CD1408-FU1400	VF@Io= 1.05 V VRRM= 400.0 V	1	$0.13	 Diode_1408 13 mm^2
11.	D_LED	OSRAM	LUW CP7PKTLP5C8E	LED	10	$2.19	 oslon 17 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	Bourns	CD1408-FU1400	VF@Io= 1.05 V VRRM= 400.0 V	1	$0.13	 Diode_1408 13 mm^2
15.	Dvf2	Bourns	CD1408-FU1400	VF@Io= 1.05 V VRRM= 400.0 V	1	$0.13	 Diode_1408 13 mm^2
16.	Dvf3	Bourns	CD1408-FU1400	VF@Io= 1.05 V VRRM= 400.0 V	1	$0.13	 Diode_1408 13 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	SRR1210-271M	L= 270.0 µH DCR= 410.0 mOhm	1	$0.44	 SRR1210 196 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
23.	R1	Vishay-Dale	CRCW040233K2FKED Series= CRCW..e3	Res= 33.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
24.	Rbias	Panasonic	ERJ-8ENF1003V Series= ERJ-8E	Res= 100.0 kOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.01	 1206 11 mm^2
25.	Rhold	CUSTOM	CUSTOM Series= ?	Res= 1000.0 kOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm^2
26.	Roff	Vishay-Dale	CRCW040266K5FKED Series= CRCW..e3	Res= 66.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2

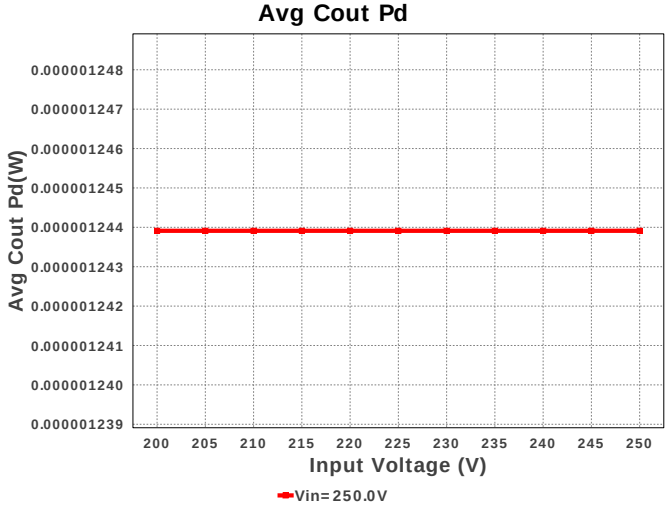
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
27.	Rsns	CUSTOM	CUSTOM Series= ?	Res= 1.143 Ohm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm^2
28.	Rvf	Vishay-Dale	CRCW04021R00FKED Series= CRCW..e3	Res= 1.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
29.	U1	Texas Instruments	LM3444MM/NOPB	Switcher	1	$0.55	0 mm^2

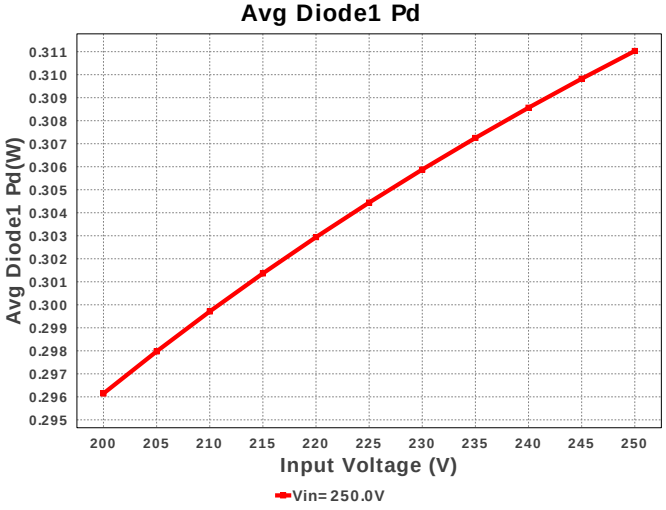




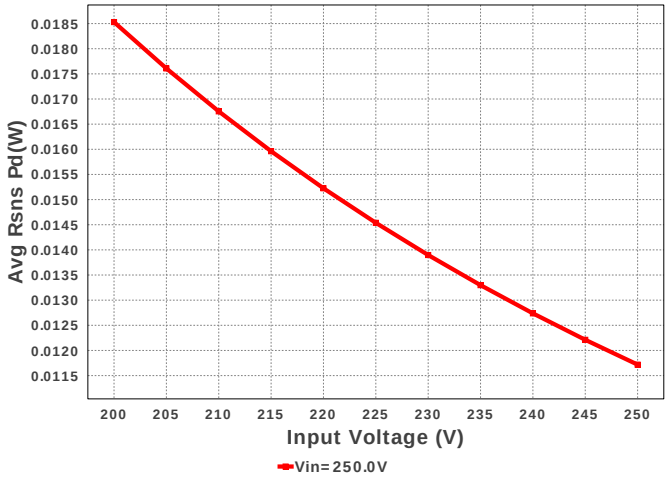




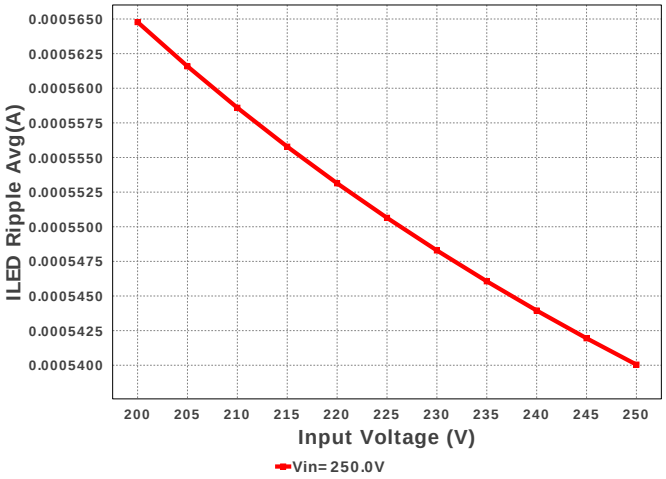




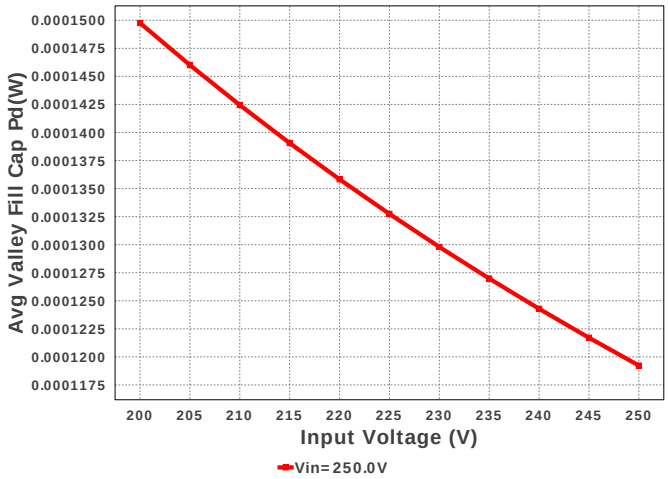
Avg Rsns Pd



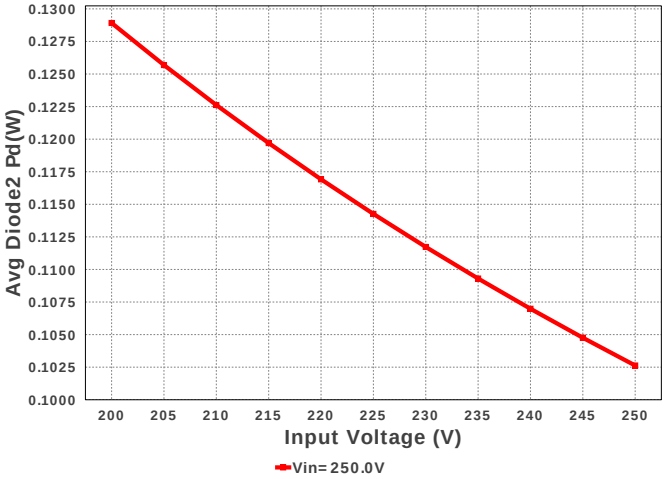
ILED Ripple Avg



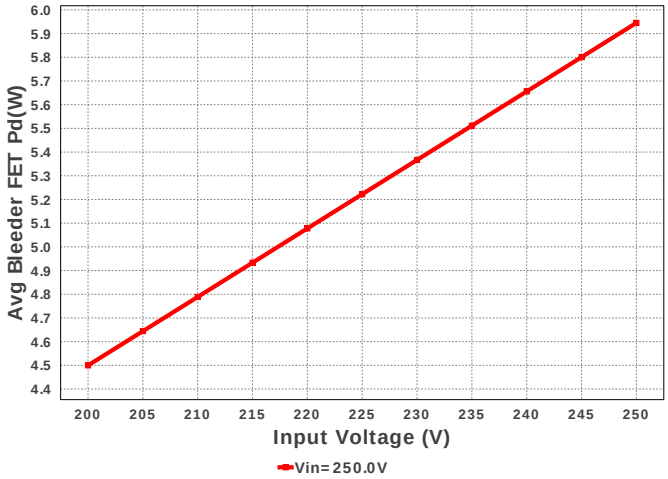
Avg Valley Fill Cap Pd



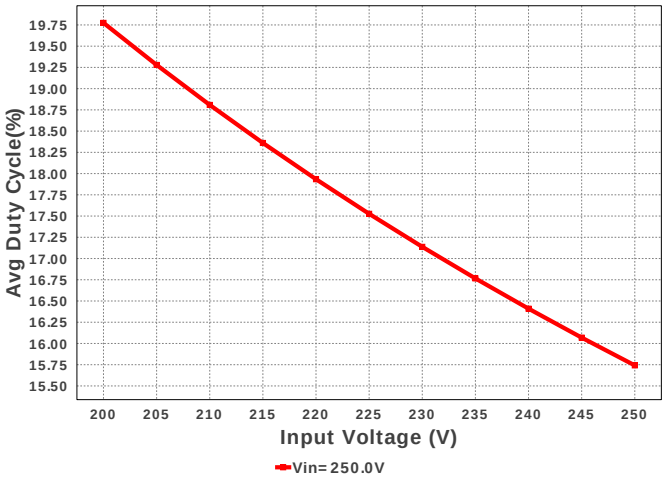
Avg Diode2 Pd

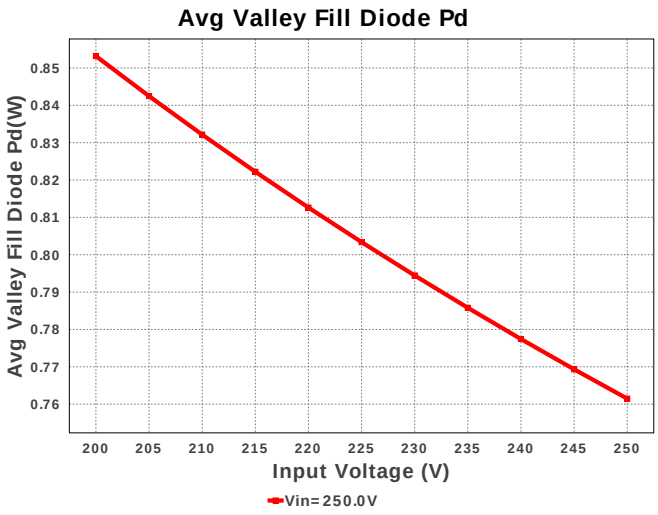


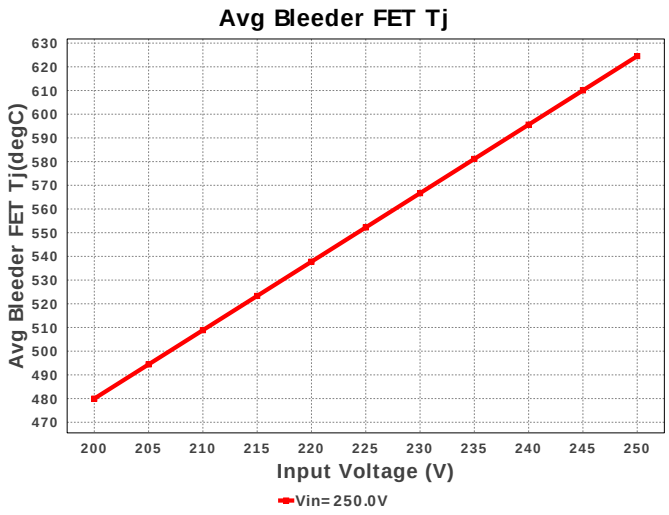
Avg Bleeder FET Pd

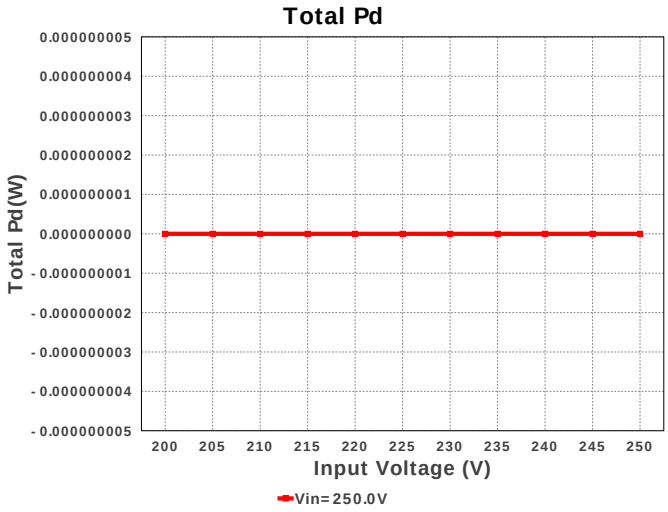


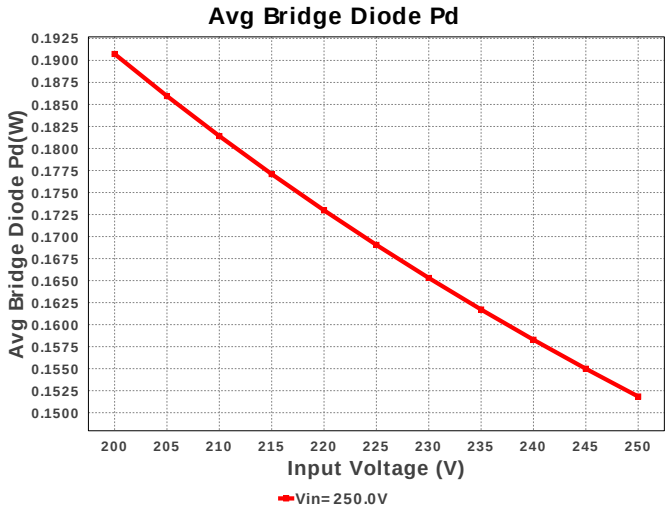
Avg Duty Cycle

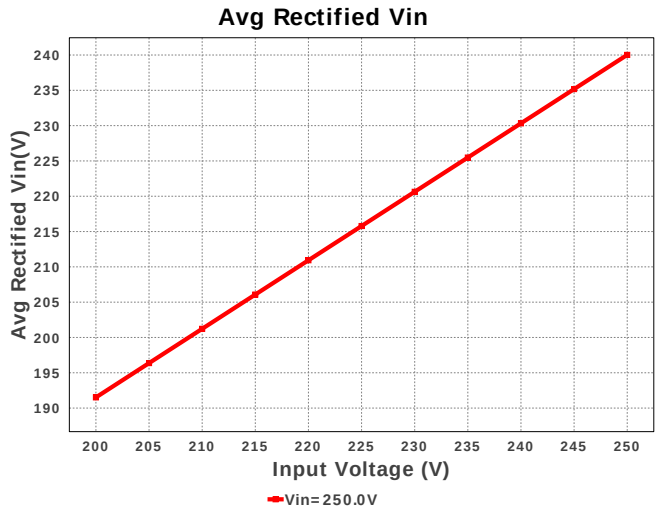


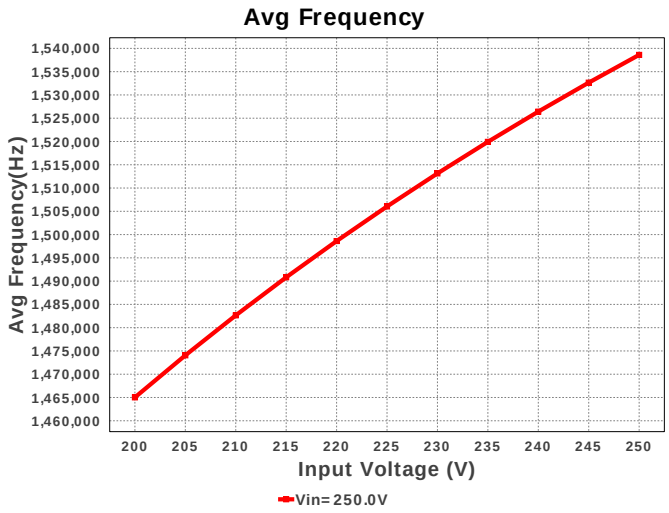


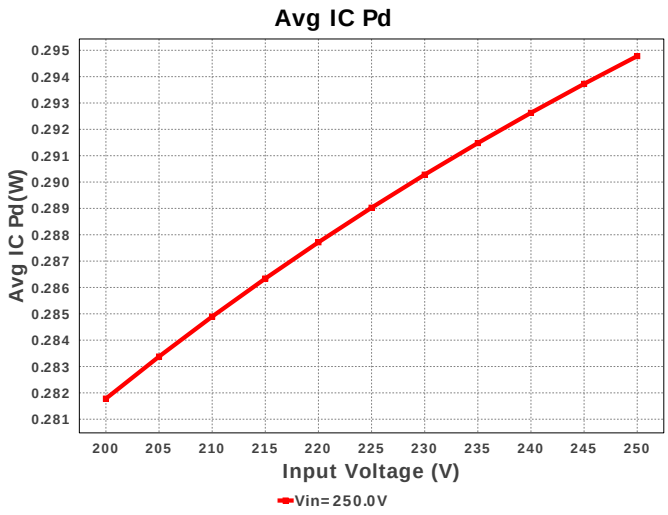


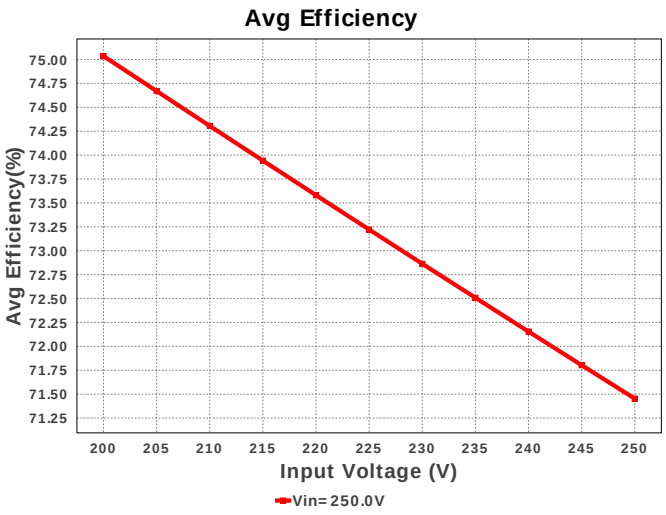


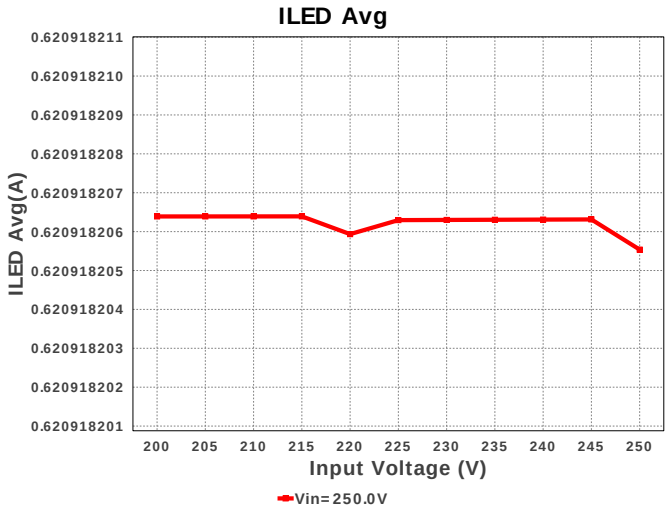












Operating Values

#	Name	Value	Category	Description
1.	ILED Avg	620.941 mA	Current	Average Current per LED for the AC line period
2.	ILED Ripple Avg	539.472 µA	Current	Average LED Ripple Current for the AC line period
3.	Avg Rectified Vin	240.021 V	General	Average Rectified Voltage for the AC Line Period
4.	BOM Count	38	General	Total Design BOM count
5.	FootPrint	820.0 mm^2	General	Total Foot Print Area of BOM components
6.	Total BOM	$0.0	General	Total BOM Cost
7.	Avg Bleeder FET Tj	624.747 degC	Op_Point	Bleeder MOSFET average junction temperature over the AC Line Period
8.	Avg M1 FET Tj	92.388 degC	Op_Point	M1 MOSFET average junction temperature over the AC Line Period
9.	Avg Duty Cycle	15.7 %	Op_point	Average Duty Cycle over the AC Line Period
10.	Avg Efficiency	71.772 %	Op_point	Average Efficiency over the AC Line Period
11.	Avg Frequency	1.539 MHz	Op_point	Average Switching Frequency over the AC Line Period
12.	Avg IC Tj	65.685 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	5.947 W	Power	Average power dissipation in the bleeder FET over the AC line period
15.	Avg Bridge Diode Pd	141.71 mW	Power	Average Power Dissipation in the Bridge Diode over the AC Line Period
16.	Avg Cout Pd	1.242 µW	Power	Average Power Dissipation in the Output Capacitor over the AC Line Period
17.	Avg Diode1 Pd	299.512 mW	Power	Average Power Dissipation in D1 over the AC Line Period
18.	Avg Diode2 Pd	102.36 mW	Power	Average Power Dissipation in D1 over the AC Line Period
19.	Avg FET Pd	750.824 mW	Power	Average power dissipation in the switching FET over the AC line period
20.	Avg IC Pd	294.914 mW	Power	Average Power Dissipation in the IC over the AC line period
21.	Avg L pd	197.603 mW	Power	Average Inductor power disspation over the AC line period
22.	Avg Rsns Pd	11.653 mW	Power	Average power dissipation in the Current limit resistor over the AC line period
23.	Avg Valley Fill Cap Pd	119.24 µW	Power	Average Power Dissipation in the Valley Fill Capacitors over the AC Line Period
24.	Avg Valley Fill Diode Pd	761.506 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	621.0 m	Maximum Output Current
2.	Iout1	621.0 m	Output Current #1
3.	VinMax	250.0	Maximum input voltage
4.	VinMin	200.0	Minimum input voltage
5.	Vout	32.016	Output Voltage
6.	Vout1	32.016	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	LUW CP7PKTLP5C8E	LED Part number
13.	ledseries	10.0	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

Design Assistance

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