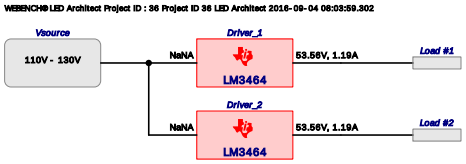
WEBENCH® LED Architect



Project Report

Project : 4009018/36 : Project ID 36
Created : 2016-09-04 08:03:59.302
LED Architect with light output=7500.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : $0.00
Total Footprint : 58,655 mm^2
Total BOM Count : 141
Total Efficiency : 17.7%
Total Efficacy : 59 lumens / Watt
Total Power Dissipation (loss) : 0.0 Watts

Design Input Specifications :

1.	VinMax	130.0	Maximum input voltage
2.	VinMin	110.0	Minimum input voltage
3.	acFrequency	60.0	AC Line Frequency
4.	color	cool white	LED Color
5.	inputSource	AC	Input Source Type
6.	lightOutput	7500.0	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 : LM3464MH/NOPB Dynamic Headroom Controller; Driver Efficiency = 98.31%

Drivers Electrical BOM

Manufacturer	Part Number	Quantity	Budgetary Price	Footprint (mm^2)
Kemet	C0805C222K5RACTU	2	$0.02	14
TDK	C1005X5R0J105M	2	$0.02	6
Vishay-Dale	CRCW040210K0FKED	4	$0.04	12
Vishay-Dale	CRCW040214K3FKED	2	$0.02	6
Vishay-Dale	CRCW0402243KFKED	2	$0.02	6
Vishay-Dale	CRCW04022K10FKED	2	$0.02	6
Vishay-Dale	CRCW04024K22FKED	2	$0.02	6
Vishay-Dale	CRCW04027K68FKED	2	$0.02	6
Bourns	CRM0805-FX-R510ELF	6	$0.18	40
Panasonic	ERT-J0EV104H	2	$0.16	6
Fairchild Semiconductor	FDD2572	6	$4.20	610
MuRata	GRM155C80J474KE19D	2	$0.02	6
MuRata	GRM155R71C224KA12D	2	$0.02	6
Texas Instruments	LM3464MH/NOPB	2	$4.80	197
Cree	XPCWHT-L1-R250-00A01	102	$3.66	119
Total		140	$13.22	1,046

LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm^2)
Cree	XPCWHT-L1-R250-00A01	102	$62.22	-
Aavid	60520	1	$18.06	586
Total			$80.28	586

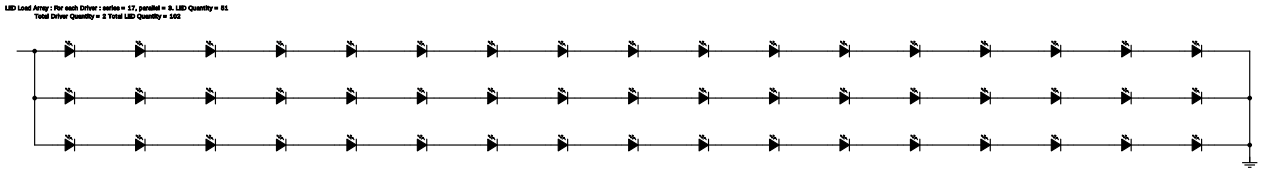
LED Array Solution

LED Array

Light Output : 7500 lumens
Color : cool white
LED quantity : 102Series = 17Parallel = 6
Total Vout : 53.6 Volts
Total Iload : 1.2 Amps
Total Light Output : 7500 lumens
Flux : 74 lumens
ThetaSA : 0.51 C / Watt
Junction Temp : 105 degrees
Operating Vf : 3.151 Volts
Operating Io : 0.395 Amps
Efficiency : 18%
Efficacy : 59 lumens / Watt
Total Footprint : 58655.1 mm^2
Total LED Cost : $80.28
Max LED Vout : 60.0 Volts

Selected LED

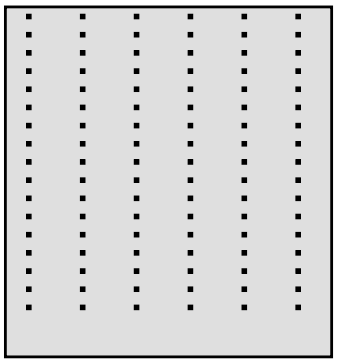
Manufacturer : Cree
Part Number : XPCWHT-L1-R250-00A01
Vf : 3.2 V
Io : 0.35 A
Angle : 110.0 degree
PhiV : 87.4
Color Temperature : 6500.0 K
Color : cool white
Tj : 150.0 deg C
IfMin : 0.1 Amps
IfMax : 0.5 Amps
RJC : 12.0 deg C/Ohm
Isat : 0.0 Amps
Package mount : SMT
Footprint : 19.8 mm2



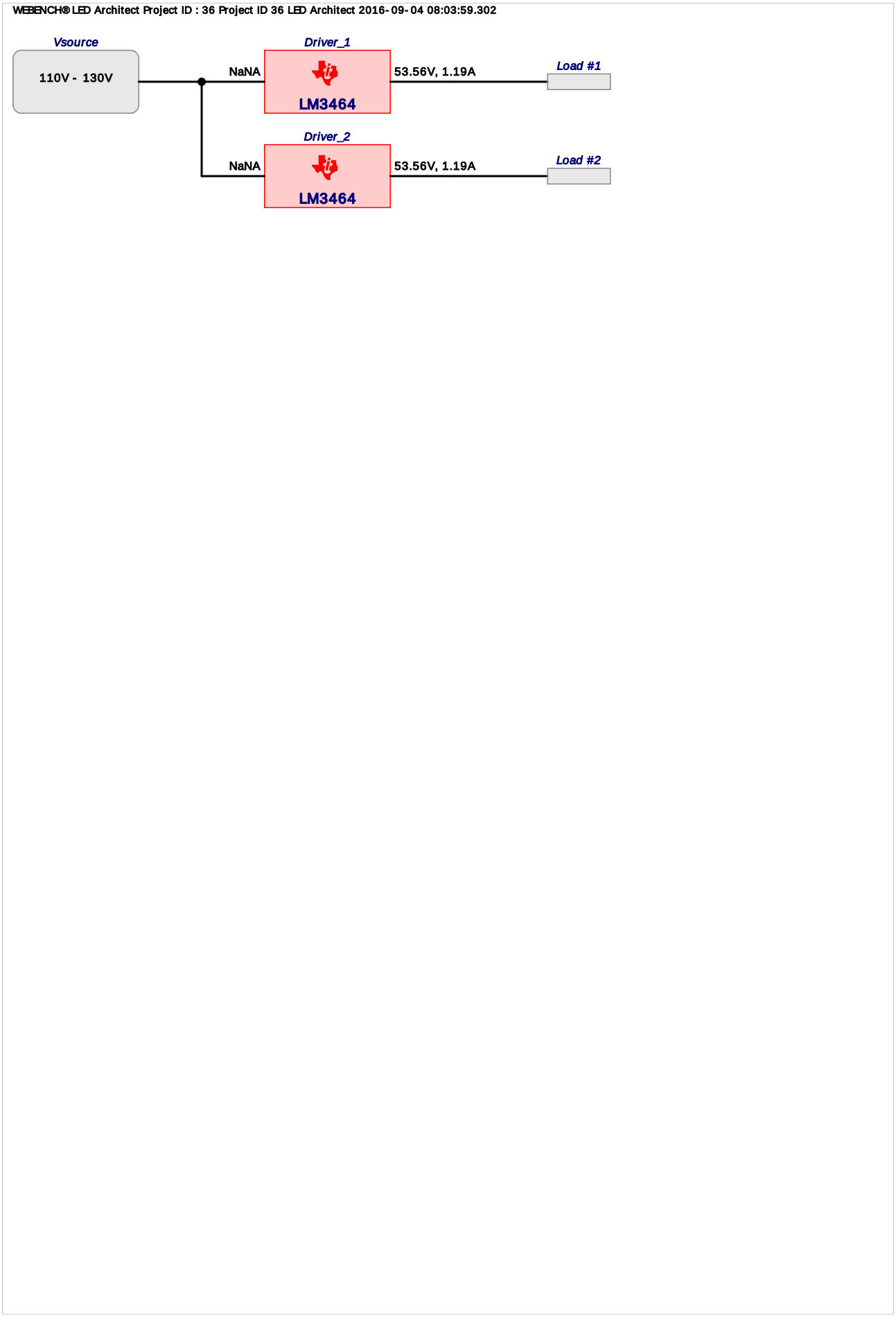
Heatsink

Length : 233.85 mm
Width : 250.82 mm
Height : 32.89 mm
Total Heatsink Footprint : 58655 mm^2
Total Heatsink Cost : $18.06

Manufacturer : Aavid
Part Number : 60520
ThetaSA : 0.51 C/W



Project Diagram



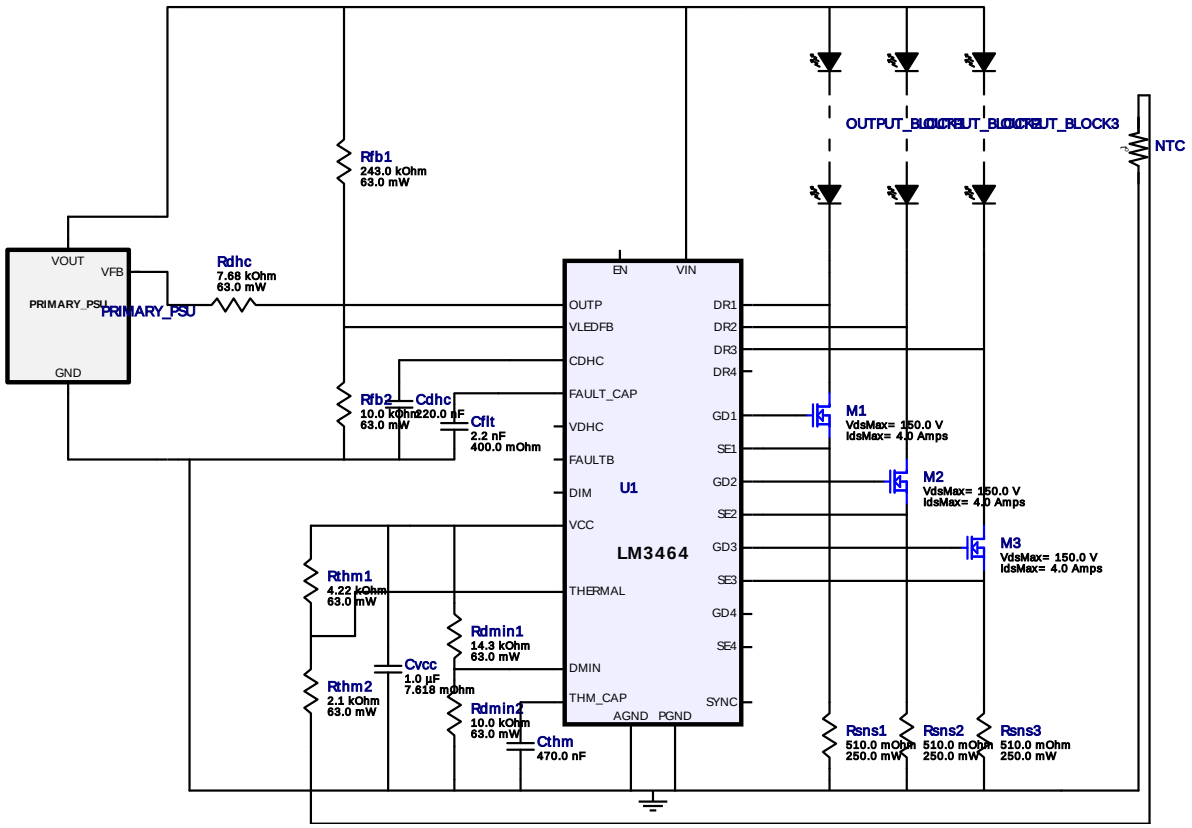
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 53.56V
Iout = 1.19A

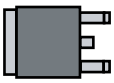
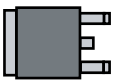
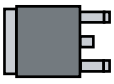
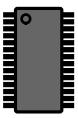
Device = LM3464MH/NOPB
Topology = Buck
Created = 9/4/16 8:03:58 AM
BOM Cost = $0.00
BOM Count = 70
Total Pd = 1.11W

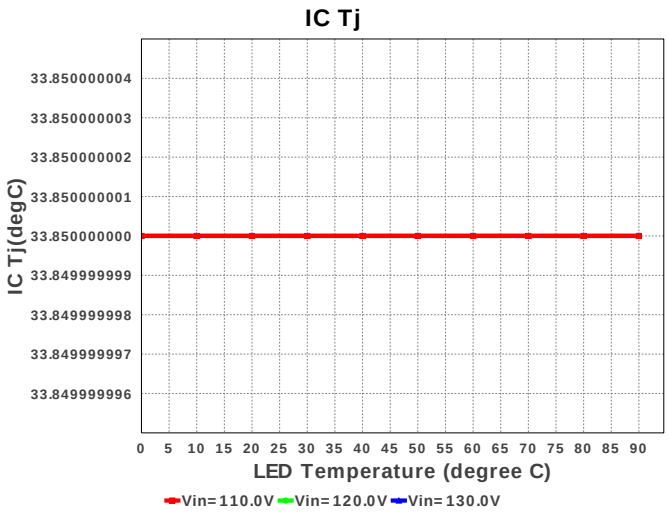
Design : 4009018/154 LM3464MH/NOPB
LM3464MH/NOPB 110.0V-130.0V to 54.46V @ 1.186A

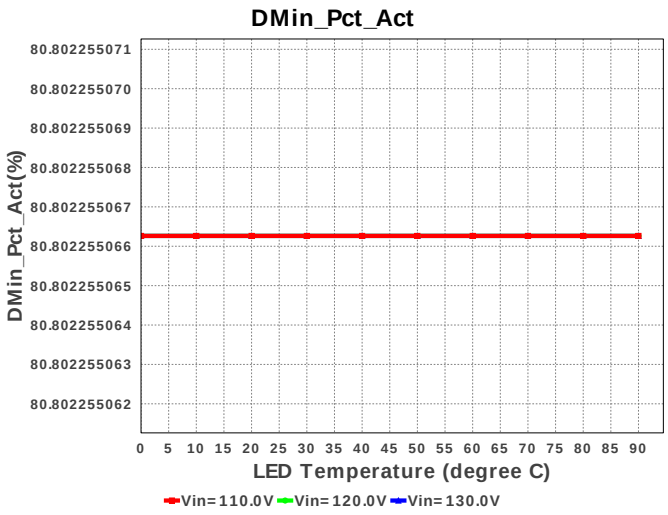


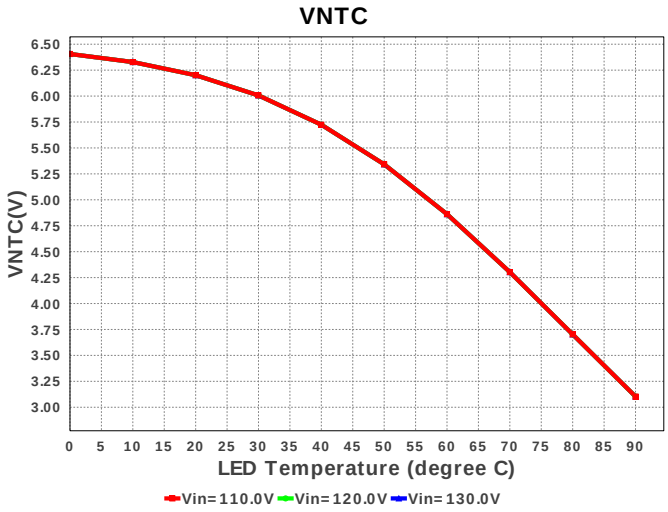
Electrical BOM

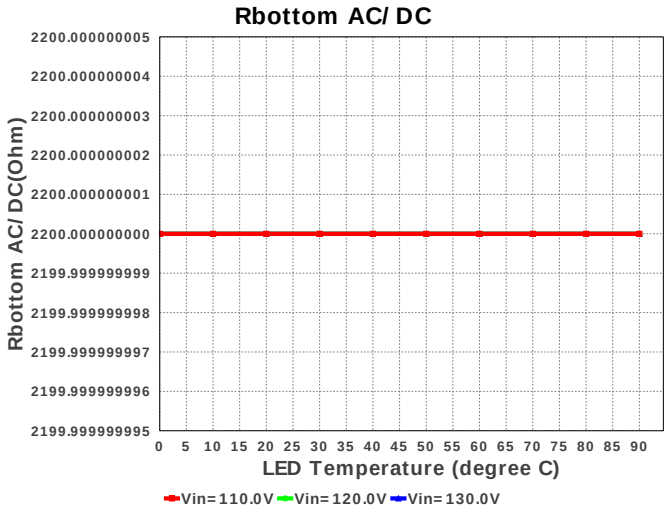
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cdhc	MuRata	GRM155R71C224KA12D Series= X7R	Cap= 220.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Cflt	Kemet	C0805C222K5RACTU Series= X7R	Cap= 2.2 nF ESR= 400.0 mOhm VDC= 50.0 V IRMS= 251.0 mA	1	$0.01	0805 7 mm²
3.	Cthm	MuRata	GRM155C80J474KE19D Series= X6S	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
4.	Cvcc	TDK	C1005X5R0J105M Series= X5R	Cap= 1.0 uF ESR= 7.618 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
5.	D_LED1	Cree	XPCWHT-L1-R250-00A01	LED	17	$0.61	xlampxpc 20 mm²
6.	D_LED2	Cree	XPCWHT-L1-R250-00A01	LED	17	$0.61	xlampxpc 20 mm²

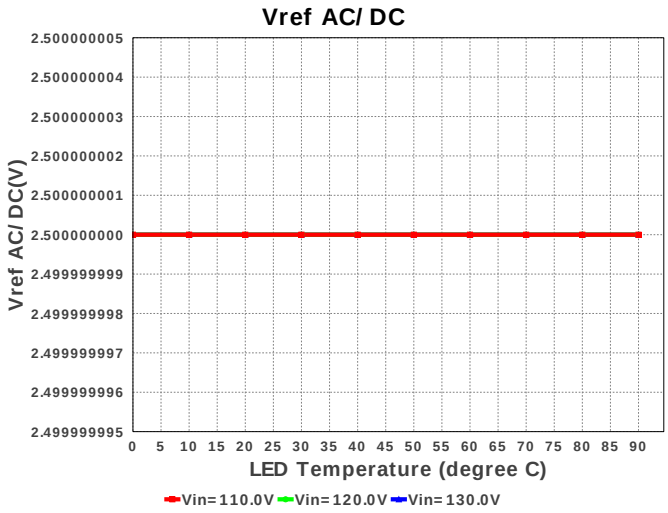
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
7.	D_LED3	Cree	XPCWHT-L1-R250-00A01	LED	17	$0.61	 xlampxpc 20 mm²
8.	M1	Fairchild Semiconductor	FDD2572	VdsMax= 150.0 V IdsMax= 4.0 Amps	1	$0.70	 DPAK 102 mm²
9.	M2	Fairchild Semiconductor	FDD2572	VdsMax= 150.0 V IdsMax= 4.0 Amps	1	$0.70	 DPAK 102 mm²
10.	M3	Fairchild Semiconductor	FDD2572	VdsMax= 150.0 V IdsMax= 4.0 Amps	1	$0.70	 DPAK 102 mm²
11.	NTC	Panasonic	ERT-J0EV104H Series= ERT-J	Thermistor	1	$0.08	0402 3 mm²
12.	Rdhc	Vishay-Dale	CRCW04027K68FKED Series= CRCW..e3	Res= 7.68 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
13.	Rdmin1	Vishay-Dale	CRCW040214K3FKED Series= CRCW..e3	Res= 14.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
14.	Rdmin2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
15.	Rfb1	Vishay-Dale	CRCW0402243KFKED Series= CRCW..e3	Res= 243.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
16.	Rfb2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
17.	Rsns1	Bourns	CRM0805-FX-R510ELF Series= ?	Res= 510.0 mOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.03	0805 7 mm²
18.	Rsns2	Bourns	CRM0805-FX-R510ELF Series= ?	Res= 510.0 mOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.03	0805 7 mm²
19.	Rsns3	Bourns	CRM0805-FX-R510ELF Series= ?	Res= 510.0 mOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.03	0805 7 mm²
20.	Rthm1	Vishay-Dale	CRCW04024K22FKED Series= CRCW..e3	Res= 4.22 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
21.	Rthm2	Vishay-Dale	CRCW04022K10FKED Series= CRCW..e3	Res= 2.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
22.	U1	Texas Instruments	LM3464MH/NOPB	Switcher	1	$2.40	 MXA28A 98 mm²

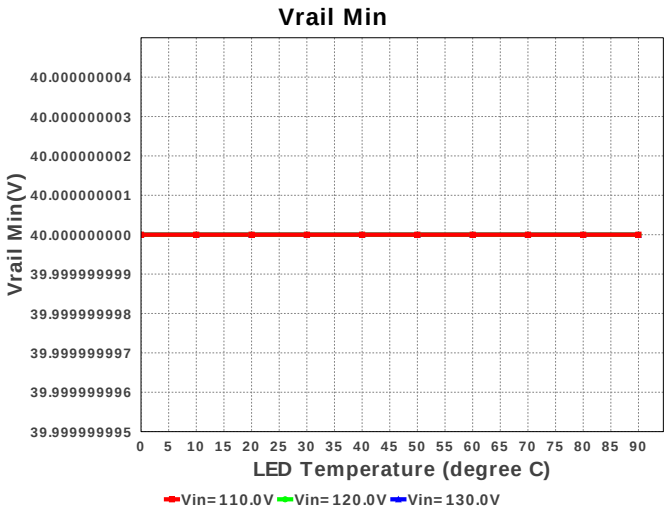


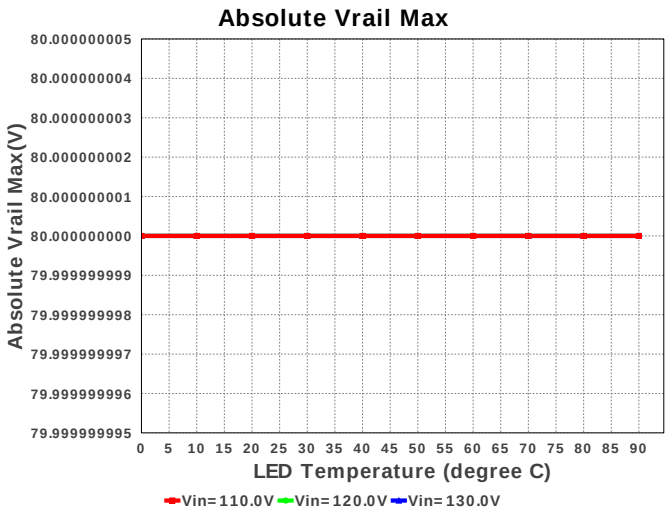


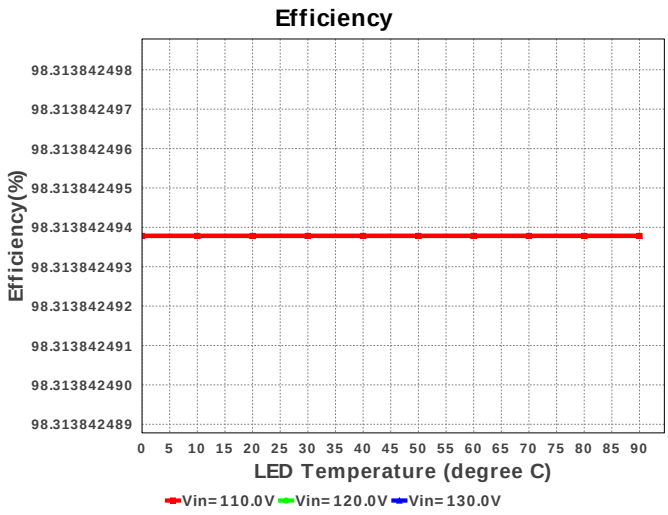


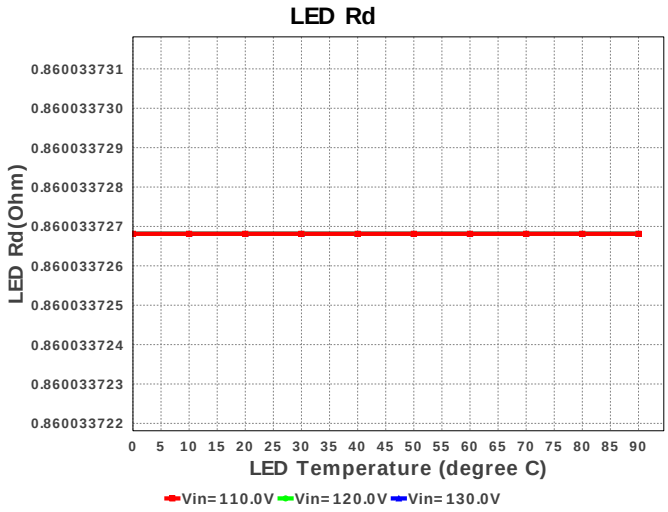


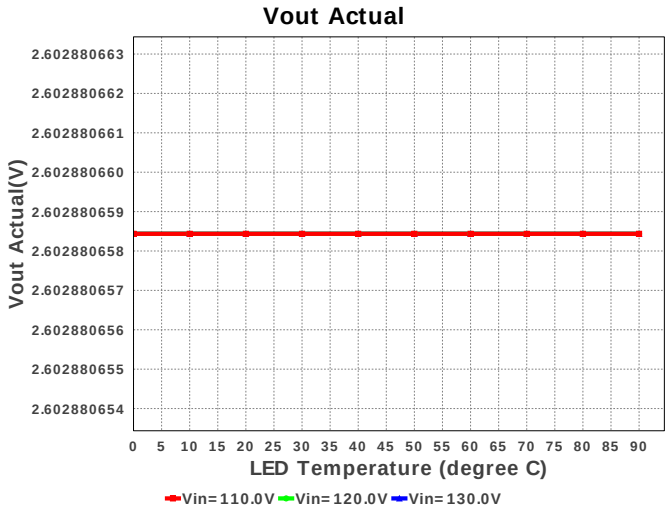


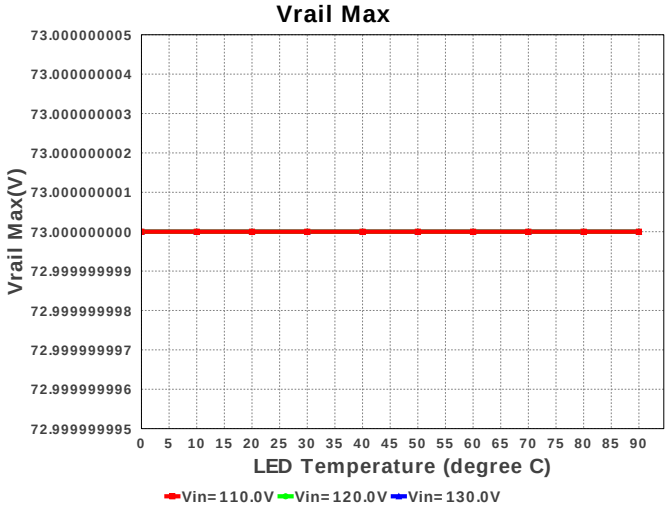


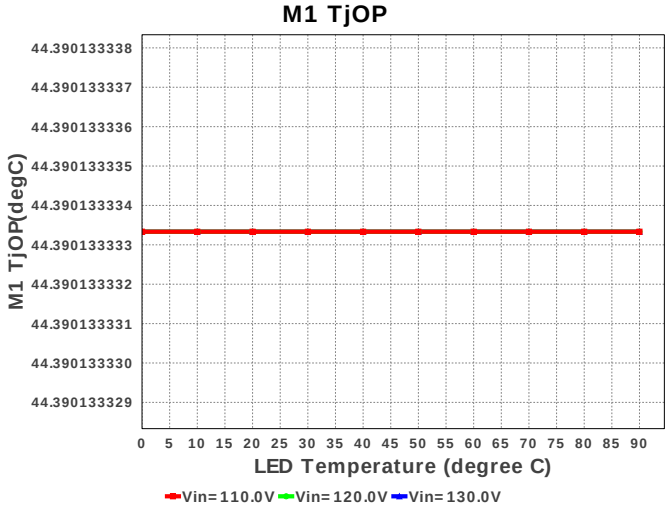


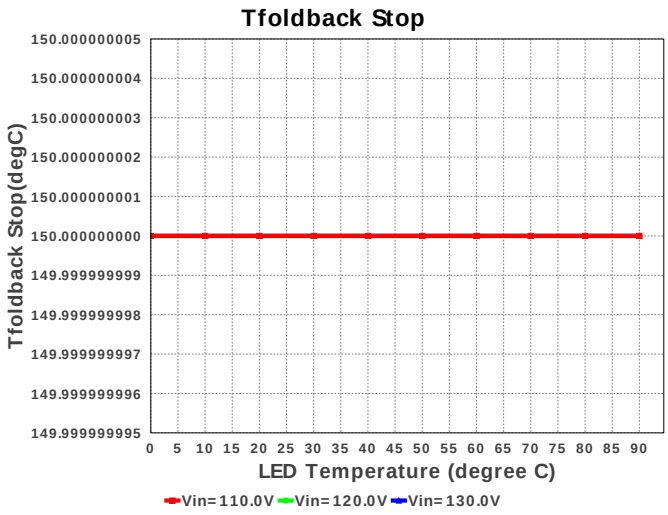


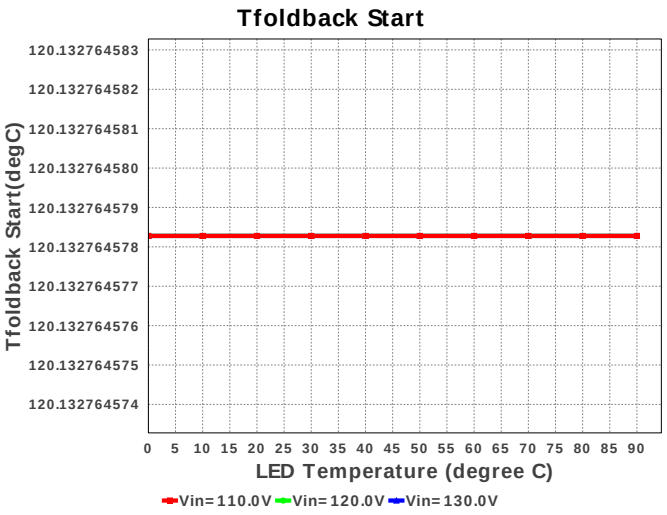


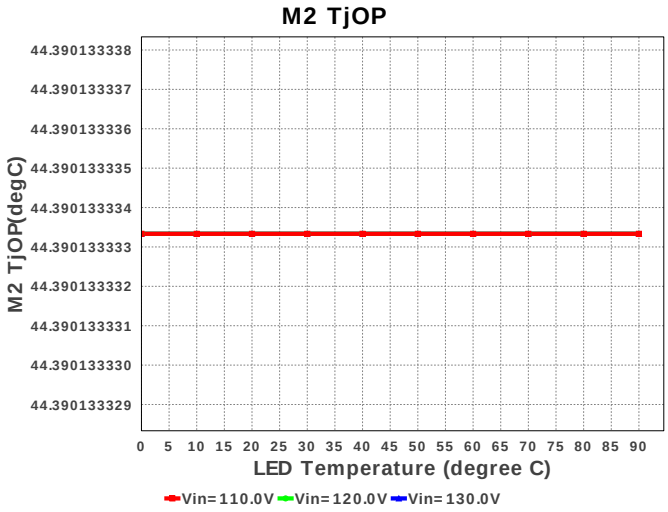


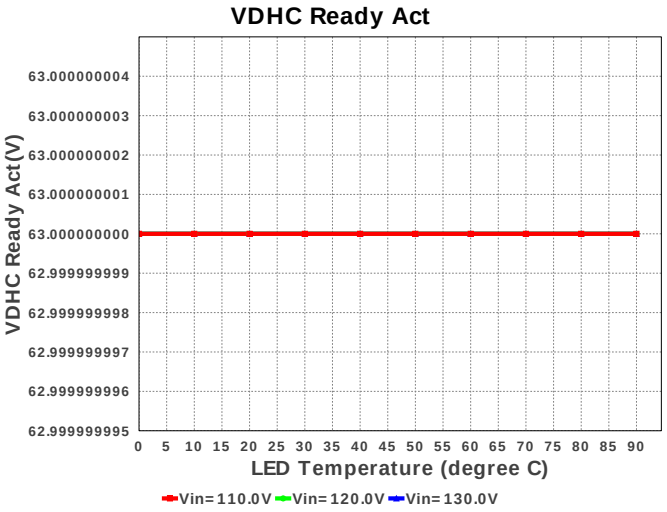


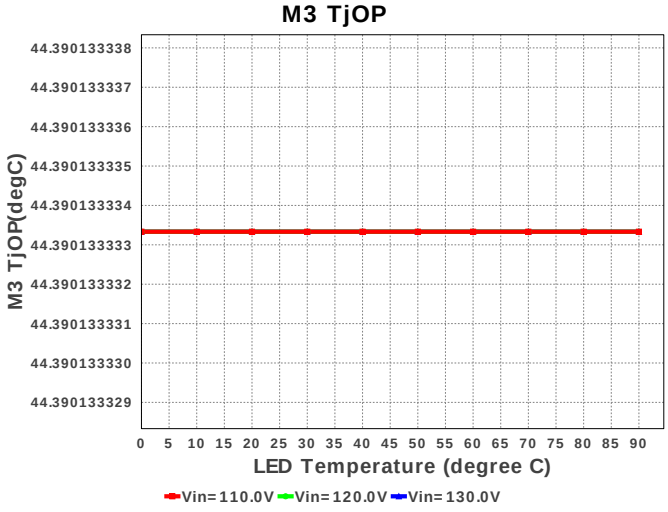


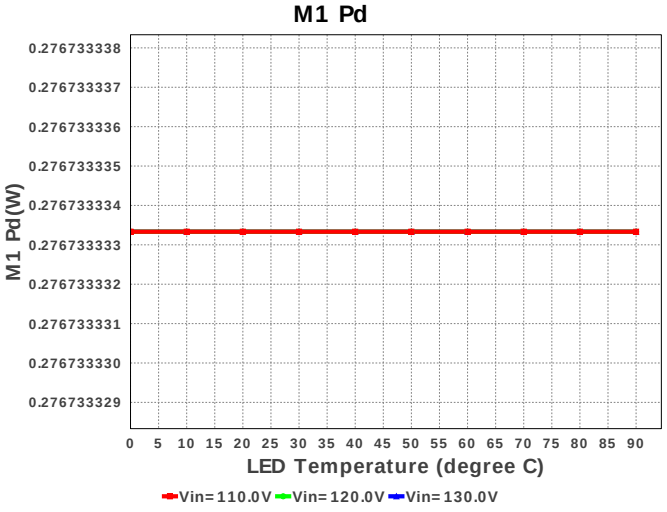


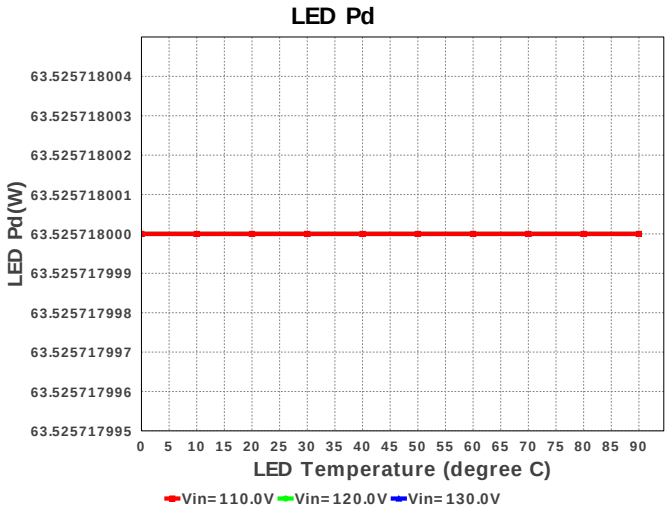


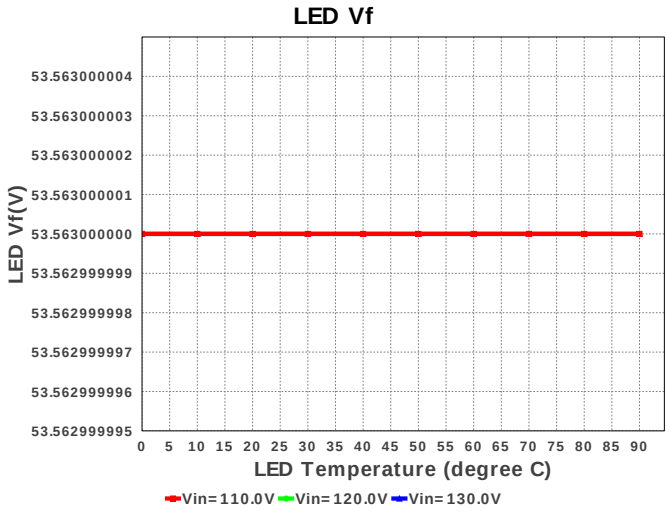


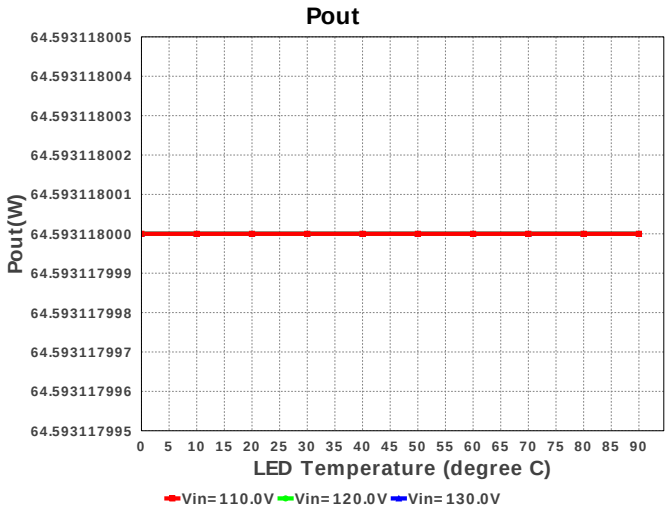


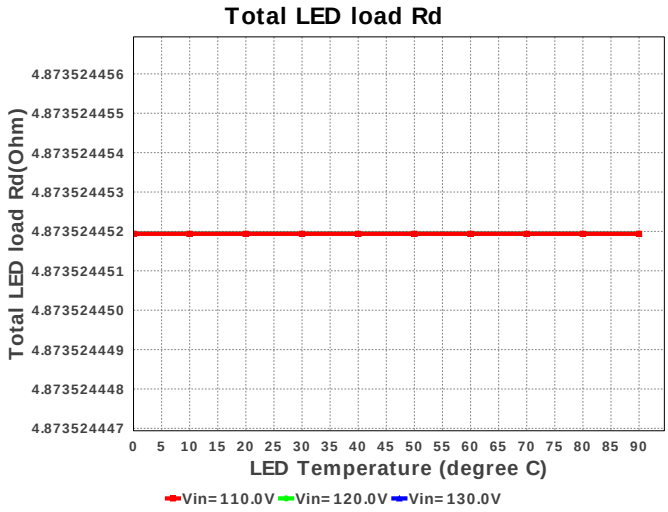


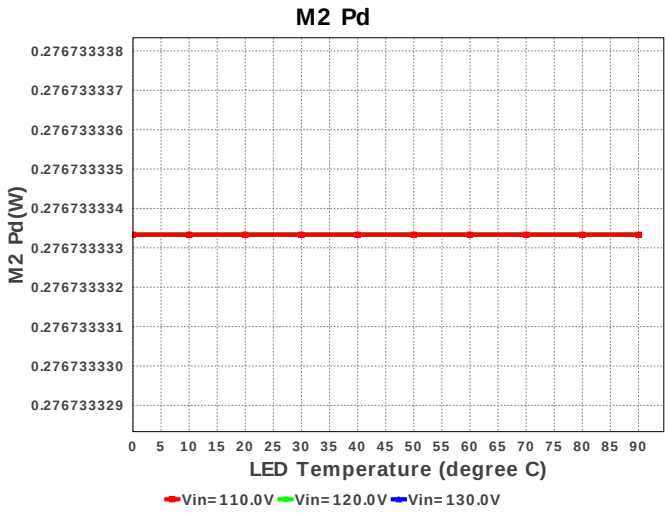


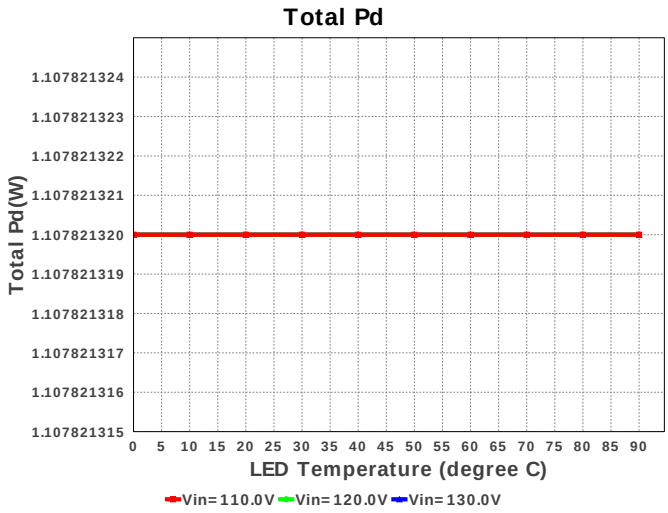


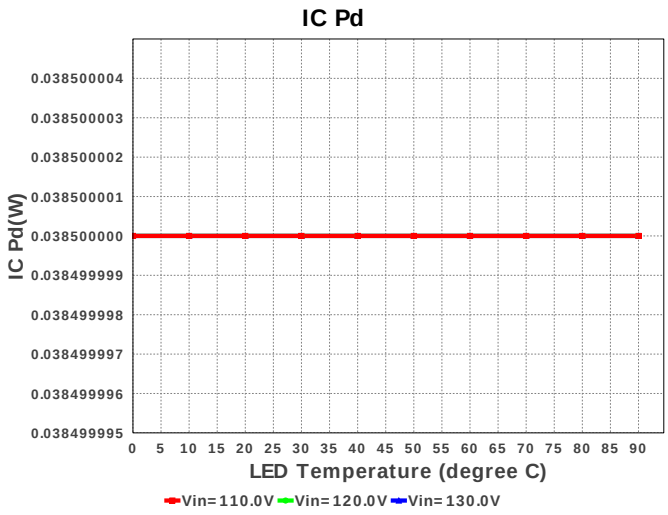


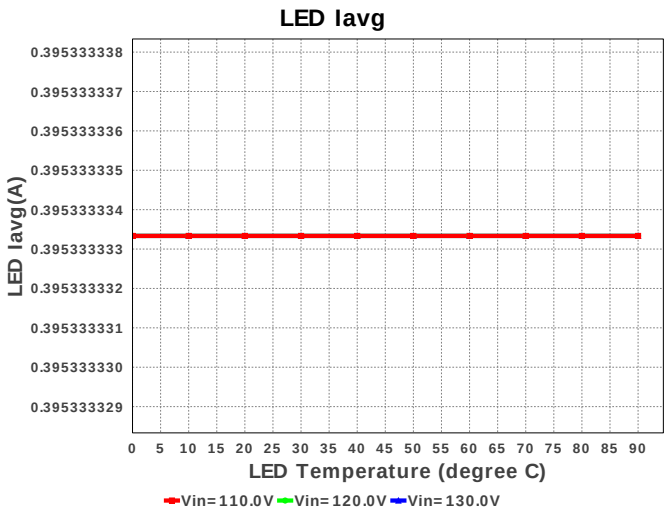


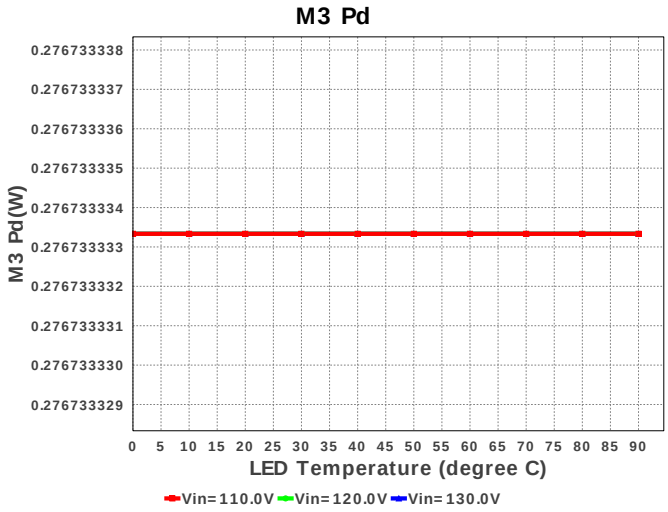


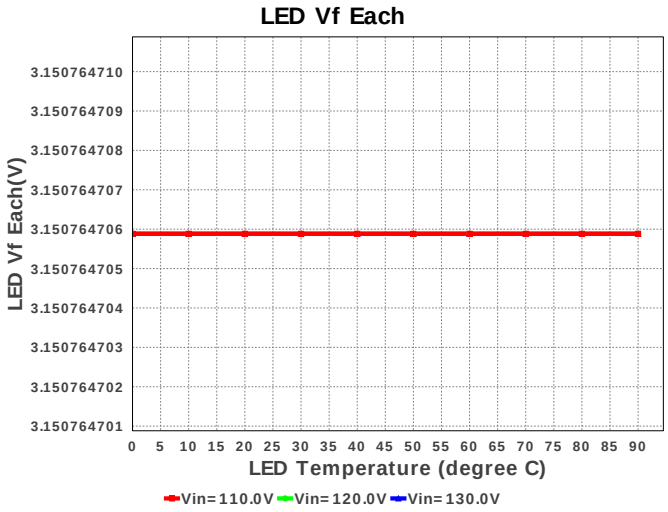












Operating Values

#	Name	Value	Category	Description
1.	LED Iavg	395.333 mA	Current	LED Average Current
2.	BOM Count	70	General	Total Design BOM count
3.	Frequency	0.0 Hz	General	Switching frequency
4.	Pout	64.59 W	General	Total output power
5.	Total BOM	$0.0	General	Total BOM Cost
6.	M3 TjOP	44.39 degC	Op_Point	MOSFET junction temperature
7.	Tfoldback Stop	150.0 degC	Op_Point	Stop Temperature for Thermal Foldback
8.	Vout Actual	2.603 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
9.	Efficiency	98.314 %	Op_point	Steady state efficiency
10.	IC Tj	33.85 degC	Op_point	IC junction temperature
11.	IOUT_OP	1.186 A	Op_point	Iout operating point
12.	LED Rd	860.034 mOhm	Op_point	LED DynamicResistance
13.	LED Vf	53.56 V	Op_point	Total LED Forward Calculated Voltage
14.	M1 TjOP	44.39 degC	Op_point	MOSFET junction temperature
15.	M2 TjOP	44.39 degC	Op_point	MOSFET junction temperature
16.	VIN_OP	130.0 V	Op_point	Maximum AC voltage input to power supply
17.	IC Pd	38.5 mW	Power	IC power dissipation
18.	LED Pd	63.526 W	Power	LED Power Dissipation
19.	M1 Pd	276.733 mW	Power	Average power dissipation in the switching FET over the AC line period
20.	M2 Pd	276.733 mW	Power	Average power dissipation in the switching FET over the AC line period
21.	M3 Pd	276.733 mW	Power	Average power dissipation in the switching FET over the AC line period
22.	Total Pd	1.108 W	Power	Total Power Dissipation
23.	Absolute Vrail Max	80.0 V		Absolute Vrail Maximum
24.	DMin_Pct_Act	80.802 %		Minimum Duty Cycle Limit when LEDs are Hot
25.	LED Vf Each	3.151 V		Calculated Forward Voltage of Each LED
26.	Rbottom AC/DC	2.2 kOhm		Bottom Resistor in Feedback Loop of Power Supply Unit
27.	Tfoldback Start	120.133 degC		Start Temperature for Thermal Foldback
28.	Total LED load Rd	4.874 Ohm		Total LED Load DynamicResistance
29.	VDHC Ready Act	63.0 V		Ready Voltage for DHC Startup
30.	VNTC	2.29 V		Voltage across NTC resistor
31.	Vout Tolerance	79.85 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

#	Name	Value	Category	Description
32.	Vrail Max	73.0 V		Maximum Rail voltage that can be pushed up by the LM3464
33.	Vrail Min	40.0 V		Minimum Rail voltage of Power Supply Unit
34.	Vref AC/DC	2.5 V		Reference Voltage for Circuit in Power Supply Unit

Design Inputs

#	Name	Value	Description
1.	Iout	1.186	Maximum Output Current
2.	VinMax	130.0	Maximum input voltage
3.	VinMin	110.0	Minimum input voltage
4.	Vout	53.563	Output Voltage
5.	acFrequency	60.0	Light Output in Lumen
6.	application	LED_DRIVER	LED Application
7.	base_pn	LM3464	Texas Instruments Base Part Number
8.	isLEDArchitect	Y	LED Architect Project
9.	ledparallel	3.0	Number of LED in parallel
10.	ledpartnumber	XPCWHT-L1-R250-00A01	LED Part number
11.	ledseries	17.0	Number of LED in series
12.	line_fsw	60.0	AC Line Frequency
13.	source	AC	Input Source Type
14.	start_foldback_temperature	120.75	Thermal Foldback Start Temperature
15.	stop_foldback_temperature	150.0	Thermal Foldback Stop Temperature
16.	ta	30.0	Ambient temperature
17.	used_thermal_foldback	Y	Use Thermal Foldback

Design Assistance

1. Thermal foldback is necessary in many applications due to the extreme temperatures created in LED environments. In general, two functions are necessary a temperature break-point after which the nominal operating current needs to be reduced, and a slope corresponding to the amount of LED current decrease per temperature increase.

2. The user can set the 'Start' and 'Stop' temperatures for the thermal foldback by changing the default settings on the 'Thermal Foldback start and end temperatures' in the 'Advanced Options' menu on the left side bar. These values are then updated on the 'Op-Vals' section. The 'Op-Vals' section has a slider to simulate the increase or decrease in temperature. The operating value 'Thermal Resistance' changes based on the change in temperature. This is the resistance of the thermistor at the selected temperature and it's value is then updated in the simulation directly

3. LM3464 Product Folder : http://www.ti.com/product/LM3464 : contains the data sheet and other resources.