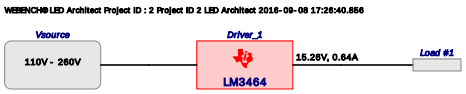

WEBENCH® LED Architect

Project Report

Project : 3876120/2 : Project ID 2
Created : 2016-09-08 17:26:40.856
LED Architect with light output=1000.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : $0.00
Total Footprint : 2,216 mm^2
Total BOM Count : 21
Total Efficiency : 28.33%
Total Efficacy : 102.4 lumens / Watt
Total Power Dissipation (loss) : 0.0 Watts

Design Inputs :

1.	VinMax	260.0	Maximum input voltage
2.	VinMin	110.0	Minimum input voltage
3.	line_fsw	60.0	AC Line Frequency
4.	color	cool white	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 : LM3464MH/NOPB Dynamic Headroom Controller; Driver Efficiency = 94.44%

Drivers Electrical BOM

Manufacturer	Part Number	Quantity	Budgetary Price	Footprint (mm^2)
Kemet	C0805C222K5RACTU	1	$0.01	7
TDK	C1005X5R0J105M	1	$0.01	3
Vishay-Dale	CRCW040210K0FKED	2	$0.02	6
Vishay-Dale	CRCW040214K3FKED	1	$0.01	3
Vishay-Dale	CRCW04022K43FKED	1	$0.01	3
Vishay-Dale	CRCW04024K75FKED	1	$0.01	3
Vishay-Dale	CRCW04025K49FKED	1	$0.01	3
Vishay-Dale	CRCW040266K5FKED	1	$0.01	3
Panasonic	ERT-J0EV104H	1	$0.08	3
Fairchild Semiconductor	FDD2572	1	$0.70	102
MuRata	GRM155C80J474KE19D	1	$0.01	3
MuRata	GRM155R71C224KA12D	1	$0.01	3
Texas Instruments	LM3464MH/NOPB	1	$2.40	98
Rohm	MCR25JZHFLR300	1	$0.03	15
Cree	XPGWHT-L1-0000-00H51	5	$1.60	20
Total		20	$4.92	274

LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm^2)
Cree	XPGWHT-L1-0000-00H51	5	$8.00	-
Aavid	66365	1	$1.42	22
Total			$9.42	22

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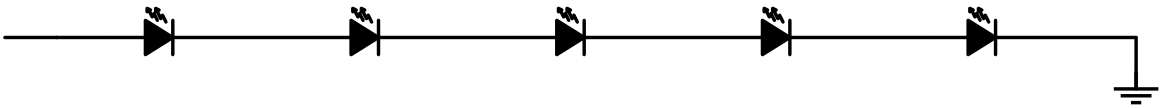
LED Array Solution

LED Array
Light Output : 1000 lumens
Color : cool white
LED quantity : 5Series = 5Parallel = 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 mm^2
Total LED Cost : $9.42
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

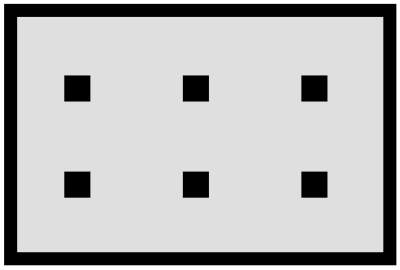
LED Load Array : For each Driver : series = 5, parallel = 1. LED Quantity = 5
Total Driver Quantity = 1 Total LED Quantity = 5



Heatsink

Length : 58.16 mm
Width : 38.1 mm
Height : 16.0 mm
Total Heatsink Footprint : 2216 mm^2
Total Heatsink Cost : $1.42

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



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Project Diagram

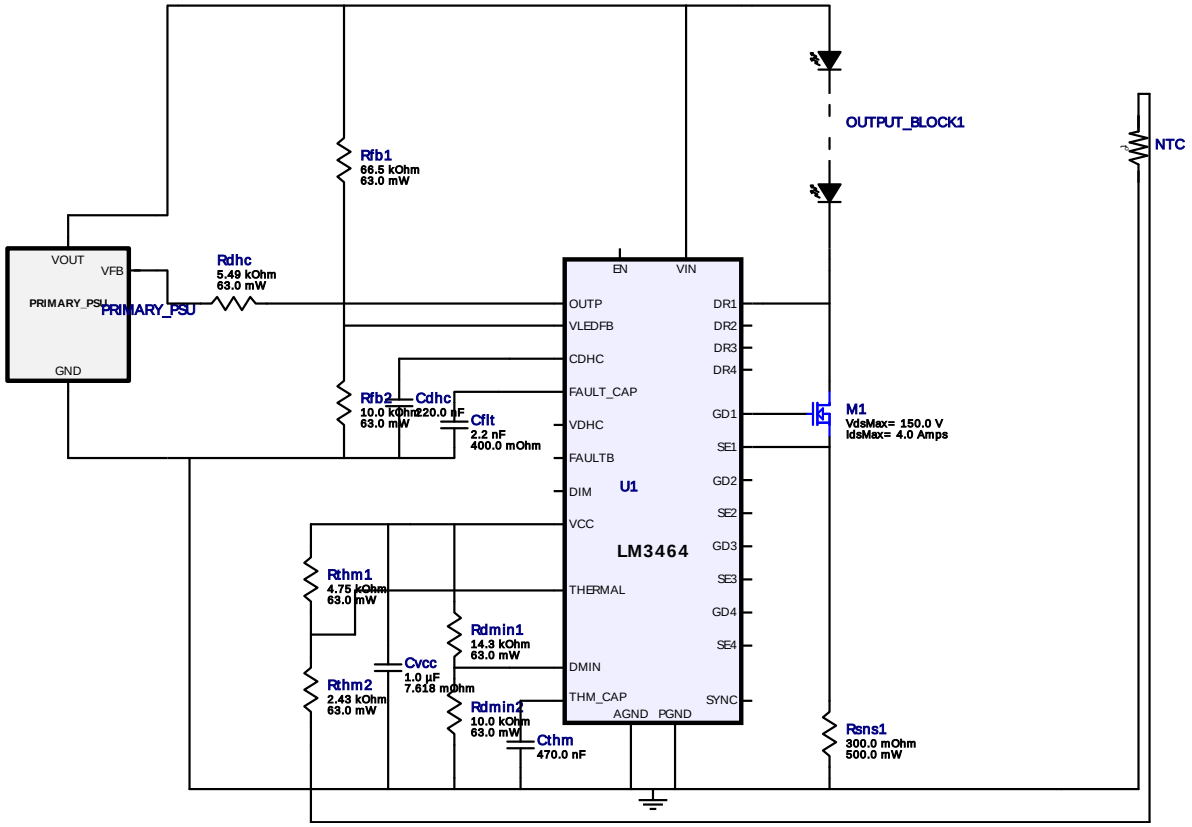
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 15.26V
Iout = 0.64A

Device = LM3464MH/NOPB
Topology = Buck
Created = 9/8/16 5:26:40 PM
BOM Cost = $0.00
BOM Count = 20
Total Pd = 0.61W

Design : 3876120/13 LM3464MH/NOPB
LM3464MH/NOPB 110.0V-260.0V to 16.16V @ 0.64A



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	XPGWHT-L1-0000-00H51	LED	5	$1.60	xlampxpg 20 mm²

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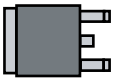
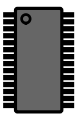
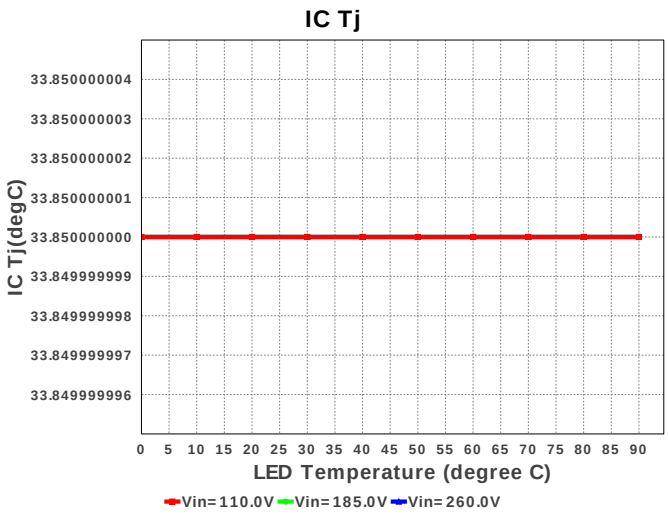
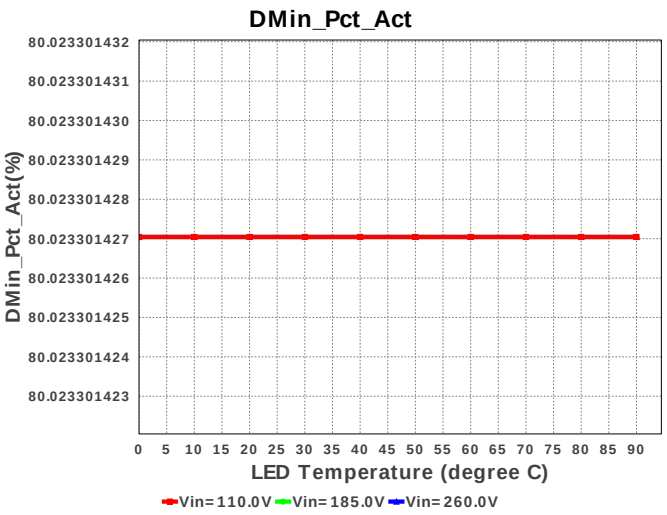
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	M1	Fairchild Semiconductor	FDD2572	VdsMax= 150.0 V IdsMax= 4.0 Amps	1	$0.70	 DPAK 102 mm²
7.	NTC	Panasonic	ERT-J0EV104H Series= ERT-J	Thermistor	1	$0.08	 0402 3 mm²
8.	Rdhc	Vishay-Dale	CRCW04025K49FKED Series= CRCW..e3	Res= 5.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
9.	Rdmin1	Vishay-Dale	CRCW040214K3FKED Series= CRCW..e3	Res= 14.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
10.	Rdmin2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
11.	Rfb1	Vishay-Dale	CRCW040266K5FKED Series= CRCW..e3	Res= 66.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
12.	Rfb2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rsns1	Rohm	MCR25JZHFLR300 Series= MCR25	Res= 300.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.03	 1210 15 mm²
14.	Rthm1	Vishay-Dale	CRCW04024K75FKED Series= CRCW..e3	Res= 4.75 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rthm2	Vishay-Dale	CRCW04022K43FKED Series= CRCW..e3	Res= 2.43 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	U1	Texas Instruments	LM3464MH/NOPB	Switcher	1	$2.40	 MXA28A 98 mm²





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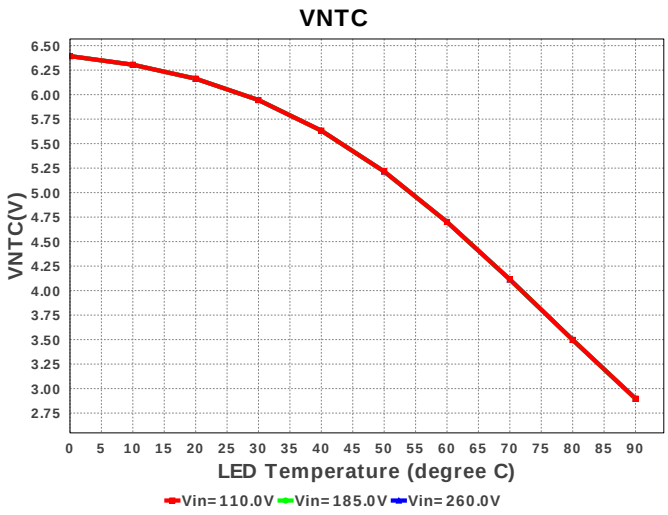

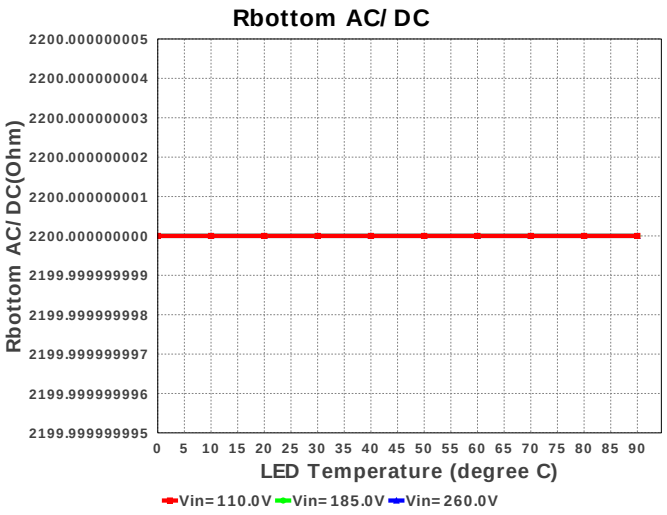

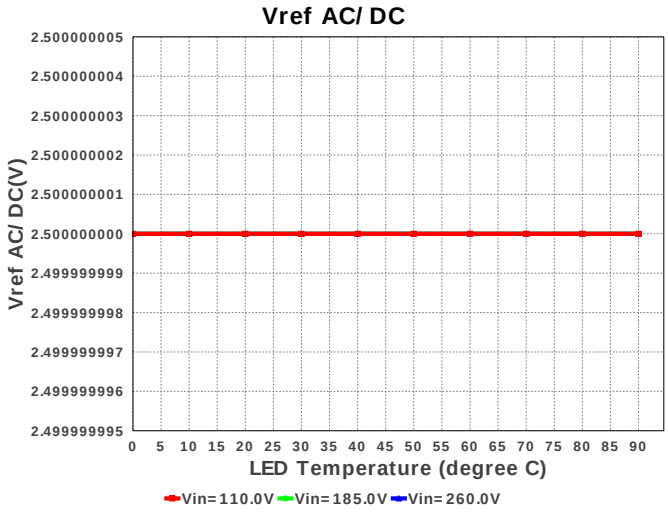

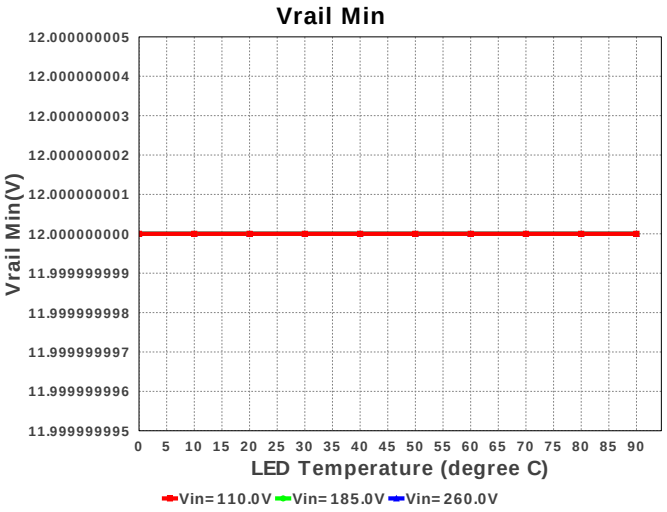

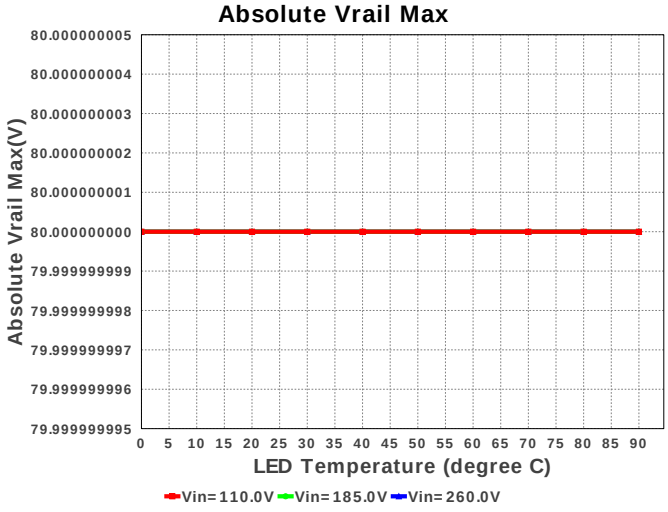

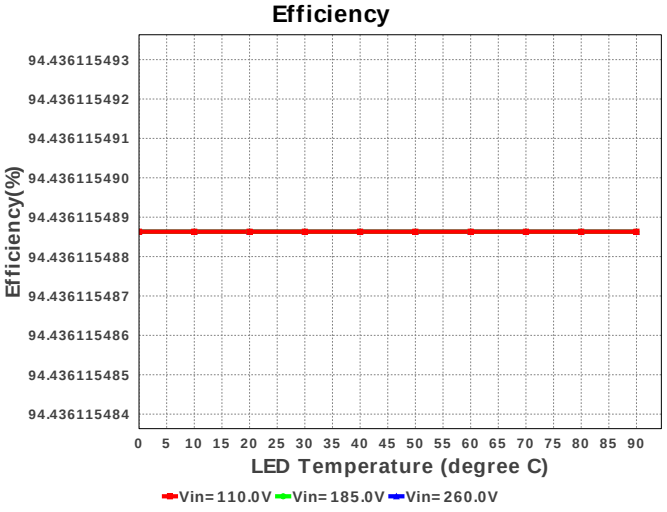

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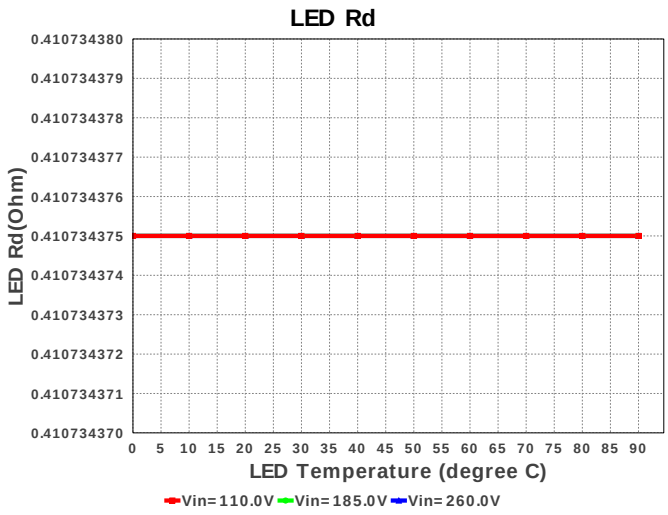

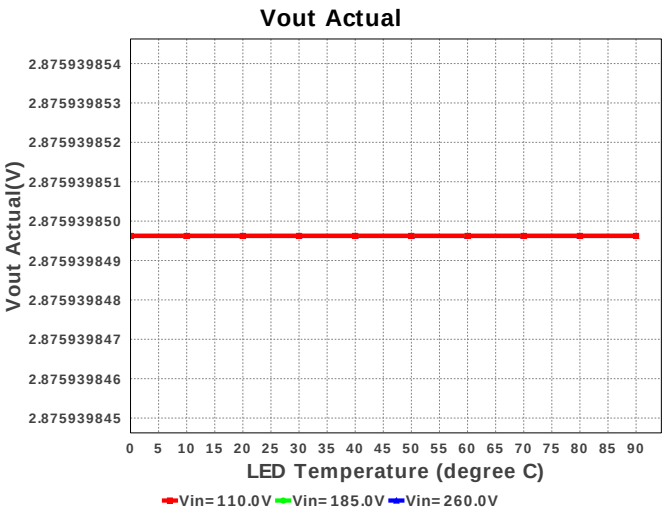

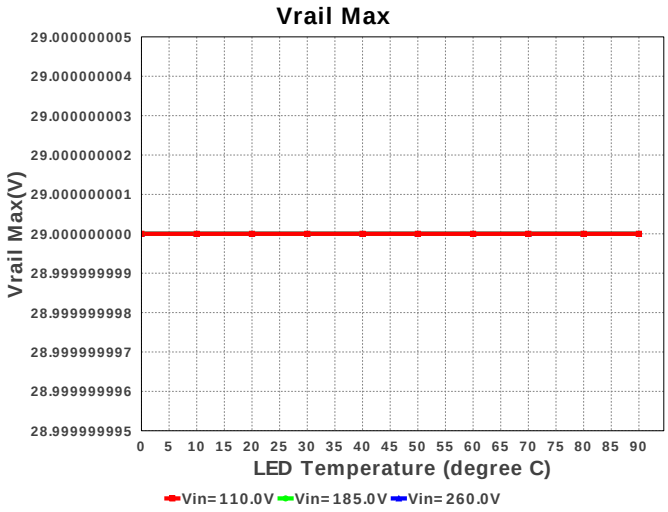

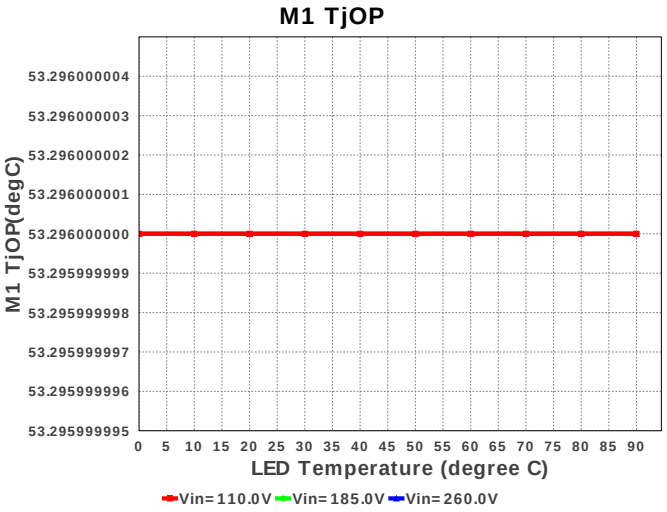

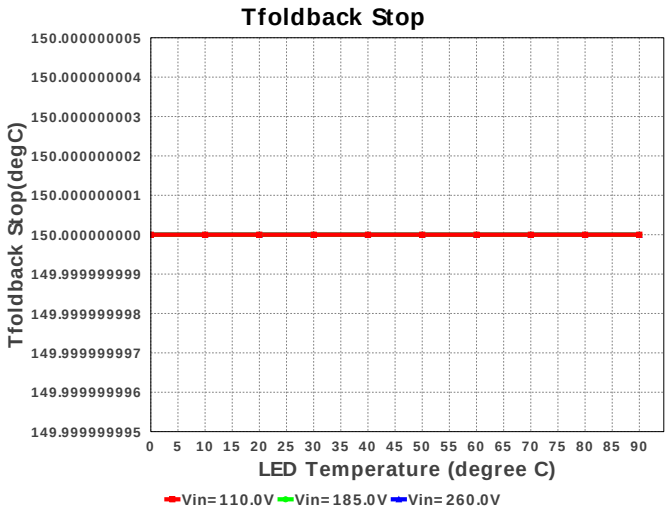

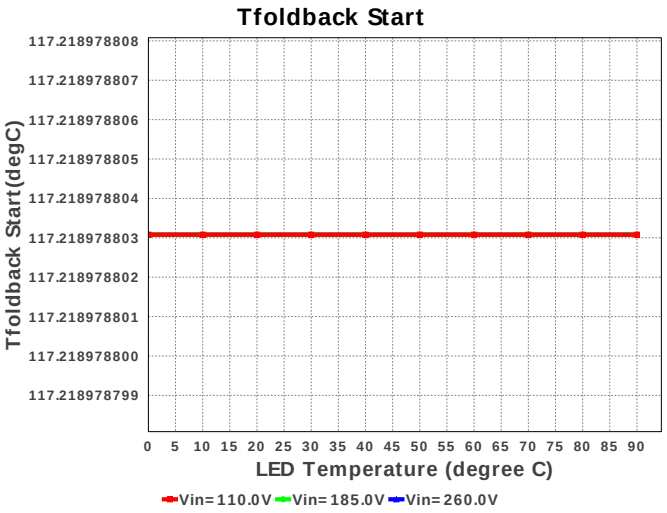

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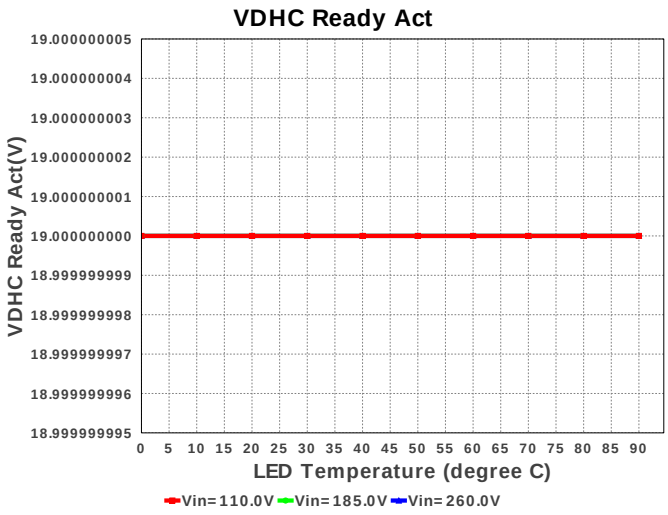

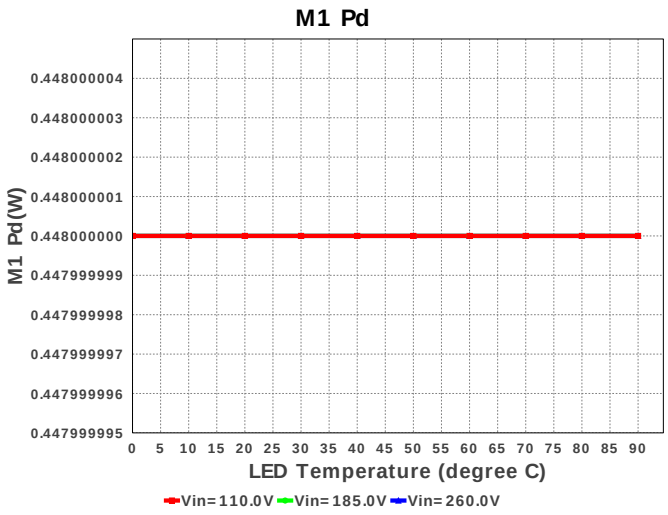

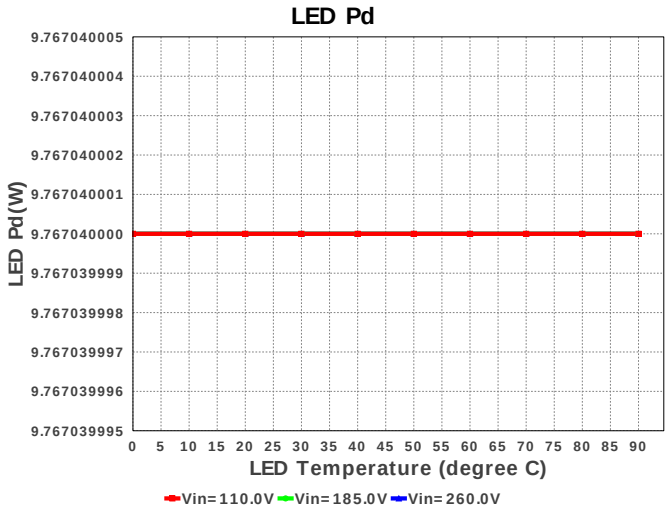

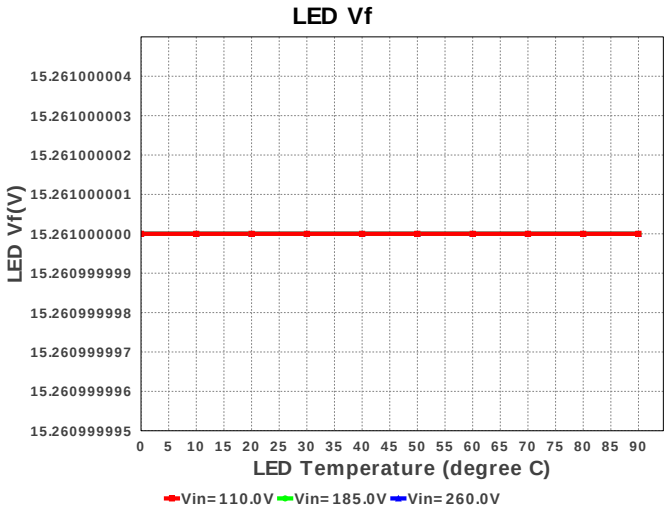

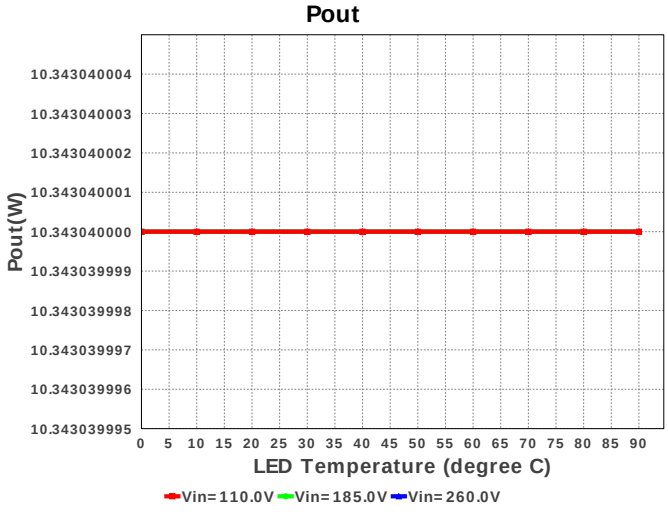

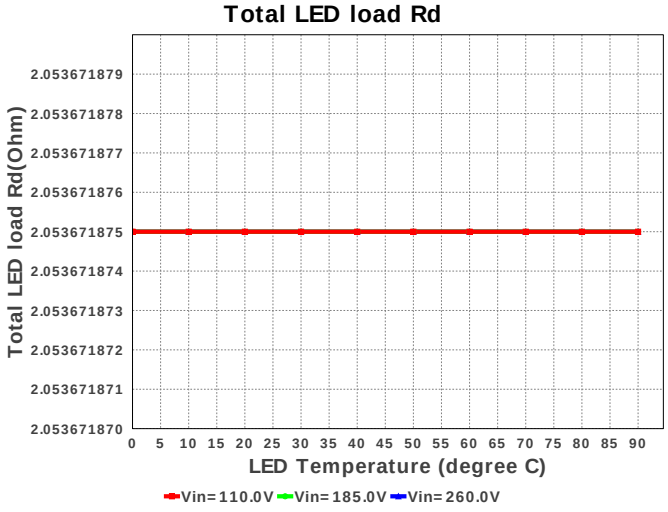

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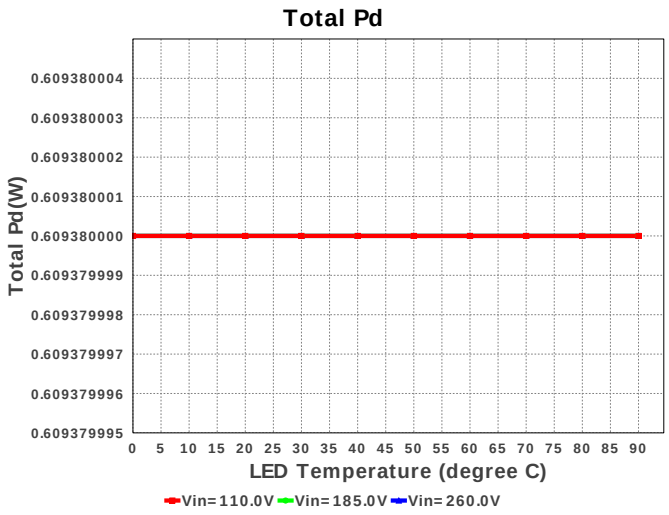

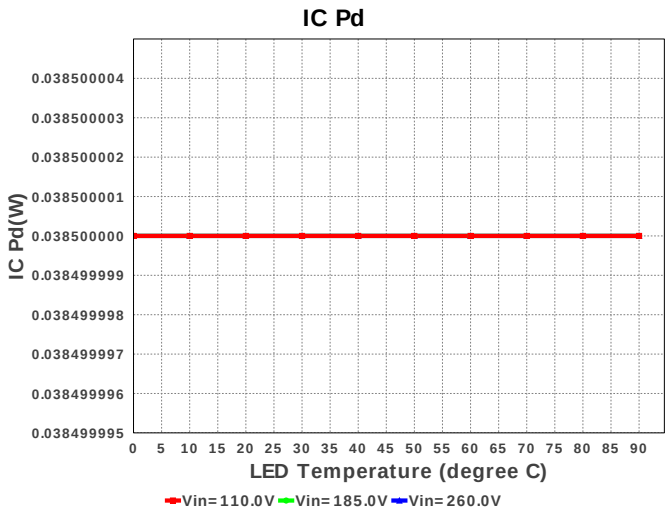

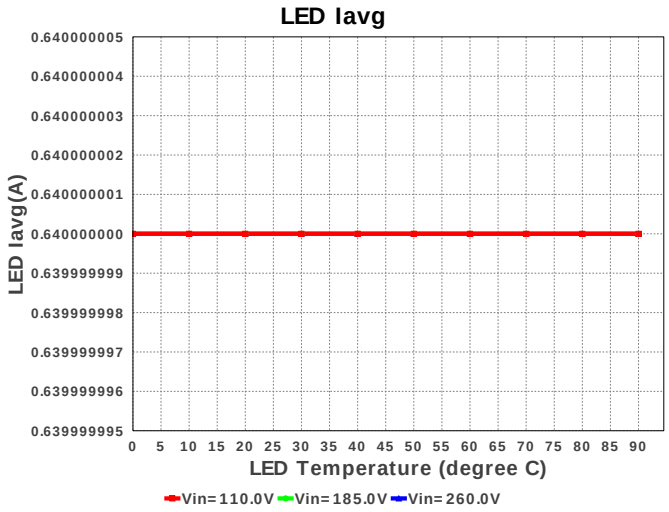

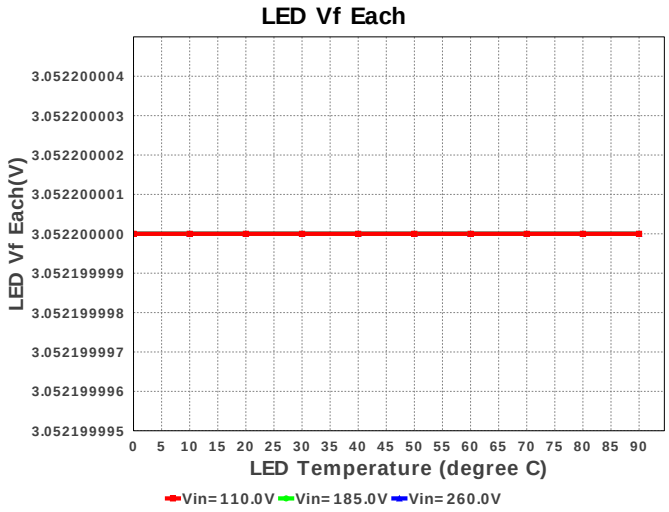

Operating Values

#	Name	Value	Category	Description
1.	LED Iavg	640.0 mA	Current	LED Average Current
2.	BOM Count	20	General	Total Design BOM count
3.	Frequency	0.0 Hz	General	Switching frequency
4.	Pout	10.342 W	General	Total output power
5.	Total BOM	$0.0	General	Total BOM Cost
6.	Tfoldback Stop	150.0 degC	Op_Point	Stop Temperature for Thermal Foldback
7.	Vout Actual	2.876 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
8.	Efficiency	94.436 %	Op_point	Steady state efficiency
9.	IC Tj	33.85 degC	Op_point	IC junction temperature
10.	IOUT_OP	640.0 mA	Op_point	Iout operating point
11.	LED Rd	410.734 mOhm	Op_point	LED DynamicResistance
12.	LED Vf	15.26 V	Op_point	Total LED Forward Calculated Voltage
13.	M1 TjOP	53.296 degC	Op_point	MOSFET junction temperature
14.	VIN_OP	260.0 V	Op_point	Maximum AC voltage input to power supply
15.	IC Pd	38.5 mW	Power	IC power dissipation
16.	LED Pd	9.767 W	Power	LED Power Dissipation
17.	M1 Pd	448.0 mW	Power	Average power dissipation in the switching FET over the AC line period
18.	Total Pd	609.38 mW	Power	Total Power Dissipation
19.	Absolute Vrail Max	80.0 V		Absolute Vrail Maximum
20.	DMin_Pct_Act	80.023 %		Minimum Duty Cycle Limit when LEDs are Hot
21.	Single LED Vf	3.052 V		Calculated Forward Voltage of Each LED
22.	Rbottom AC/DC	2.2 kOhm		Bottom Resistor in Feedback Loop of Power Supply Unit
23.	Tfoldback Start	117.219 degC		Start Temperature for Thermal Foldback
24.	Total LED load Rd	2.054 Ohm		Total LED Load DynamicResistance
25.	VDHC Ready Act	19.0 V		Ready Voltage for DHC Startup
26.	VNTC	2.3 V		Voltage across NTC resistor
27.	Vout Tolerance	264.08 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
28.	Vrail Max	29.0 V		Maximum Rail voltage that can be pushed up by the LM3464
29.	Vrail Min	11.0 V		Minimum Rail voltage of Power Supply Unit
30.	Vref AC/DC	2.5 V		Reference Voltage for Circuit in Power Supply Unit

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Design Inputs

#	Name	Value	Description
1.	Iout	640.0 m	Maximum Output Current
2.	VinMax	260.0	Maximum input voltage
3.	VinMin	110.0	Minimum input voltage
4.	Vout	15.261	Output Voltage
5.	line_fsw	60.0	Light Output in Lumen
6.	application	LED_DRIVER	LED Application
7.	base_pn	LM3464	Base Product Number
8.	LED_Architect	Y	LED Architect Project
9.	ledparallel	1.0	Number of LED in parallel
10.	ledpartnumber	XPGWHT-L1-0000-00H51	LED Part number
11.	ledseries	5.0	Number of LED in series
12.	line_fsw	60.0	AC Line Frequency
13.	source	AC	Input Source Type
14.	Thermal Foldback Start Temperature	116.15	Thermal Foldback Start Temperature
15.	Thermal Foldback Stop Temperature	146.15	Thermal Foldback Stop Temperature
16.	Ta	30.0	Ambient temperature
17.	Use 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.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.

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