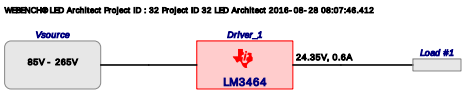

WEBENCH® LED Architect

Project Report

Project : 4009018/32 : Project ID 32
Created : 2016-08-28 08:07:46.412
LED Architect with light output=1000.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : $13.82
Total Footprint : 3,600 mm^2
Total BOM Count : 24
Total Efficiency : 19.27%
Total Efficacy : 68 lumens / Watt
Total Power Dissipation (loss) : 0.0 Watts

Design Input Specifications :

1.	VinMax	265.0	Maximum input voltage
2.	VinMin	85.0	Minimum input voltage
3.	acFrequency	60.0	AC Line Frequency
4.	color	cool white	LED Color
5.	inputSource	AC	Input Source Type
6.	lightOutput	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 = 96.33%

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	CRCW0402110KFKED	1	$0.01	3
Vishay-Dale	CRCW040214K3FKED	1	$0.01	3
Vishay-Dale	CRCW04021K82FKED	1	$0.01	3
Vishay-Dale	CRCW04023K65FKED	1	$0.01	3
Vishay-Dale	CRCW04026K65FKED	1	$0.01	3
Panasonic	ERJ-6RQFR33V	1	$0.04	7
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
Cree	XPEWHT-L1-R250-00C01	8	$1.02	20
Total		23	$4.35	266

LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm^2)
Cree	XPEWHT-L1-R250-00C01	8	$8.16	-
Aavid	64800	1	$2.33	33
Total			$10.49	33

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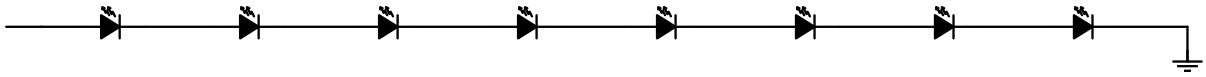
LED Array Solution

LED Array
Light Output : 1000 lumens
Color : cool white
LED quantity : 8Series = 8Parallel = 1
Total Vout : 24.4 Volts
Total Iload : 0.6 Amps
Total Light Output : 1000 lumens
Flux : 125 lumens
ThetaSA : 4.46 C / Watt
Junction Temp : 109 degrees
Operating Vf : 3.044 Volts
Operating Io : 0.604 Amps
Efficiency : 20%
Efficacy : 68 lumens / Watt
Total Footprint : 3353.6 mm^2
Total LED Cost : $10.49
Max LED Vout : 60.0 Volts

Selected LED

Manufacturer : Cree
Part Number : XPEWHT-L1-R250-00C01
Vf : 3.24 V
Io : 0.35 A
Angle : 115.0 degree
PhiV : 100.0
Color Temperature : 7500.0 K
Color : cool white
Tj : 150.0 deg C
IfMin : 0.1 Amps
IfMax : 1.0 Amps
RJC : 9.0 deg C/Ohm
Isat : 0.0 Amps
Package mount : SMT
Footprint : 19.8 mm2

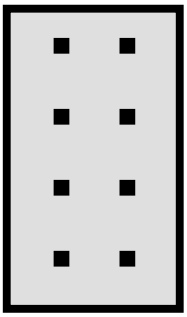
LED Load Array : For each Driver : series = 8, parallel = 1. LED Quantity = 8
Total Driver Quantity = 1 Total LED Quantity = 8



Heatsink

Length : 44.01 mm
Width : 76.2 mm
Height : 38.1 mm
Total Heatsink Footprint : 3354 mm^2
Total Heatsink Cost : $2.33

Manufacturer : Aavid
Part Number : 64800
ThetaSA : 4.46 C/W



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Project Diagram

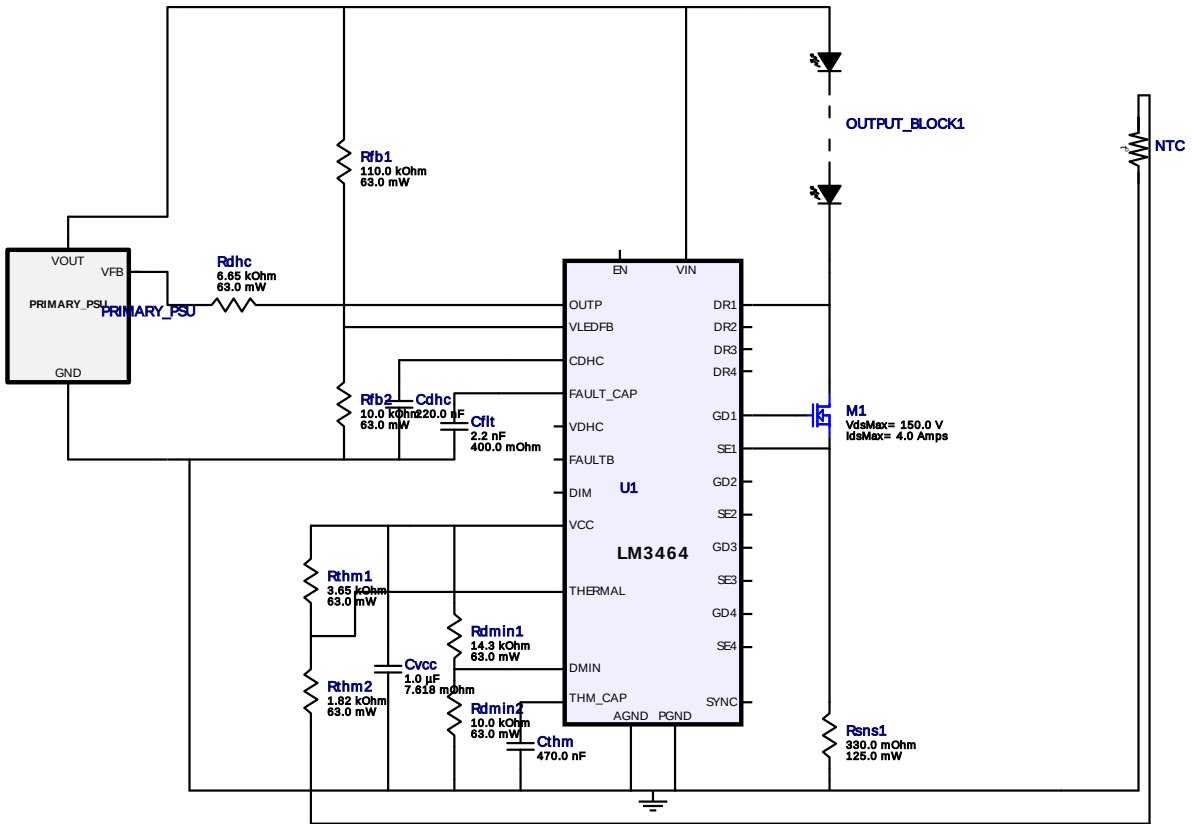
TEXAS INSTRUMENTS

WEBENCH® Design Report

Vout = 24.35V
Iout = 0.6A

Device = LM3464MH/NOPB
Topology = Buck
Created = 8/28/16 8:07:46 AM
BOM Cost = $3.33
BOM Count = 23
Total Pd = 0.58W

Design : 4009018/137 LM3464MH/NOPB
LM3464MH/NOPB 85.0V-265.0V to 25.25V @ 0.604A



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	XPEWHT-L1-R250-00C01	LED	8	$1.02	xlampxpe 20 mm²

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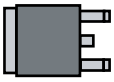
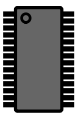
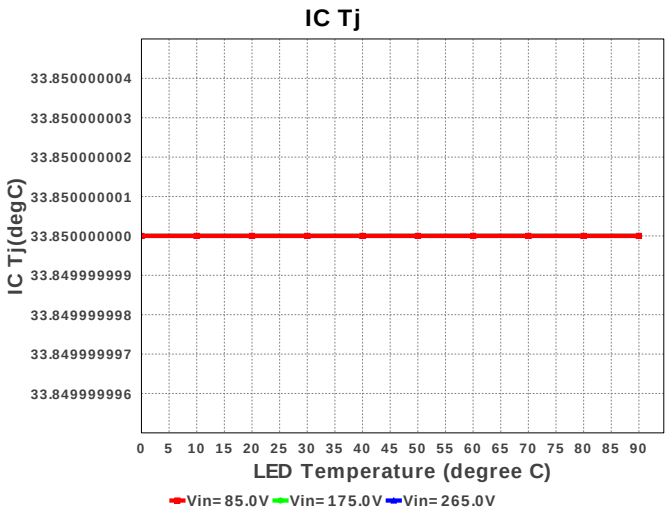
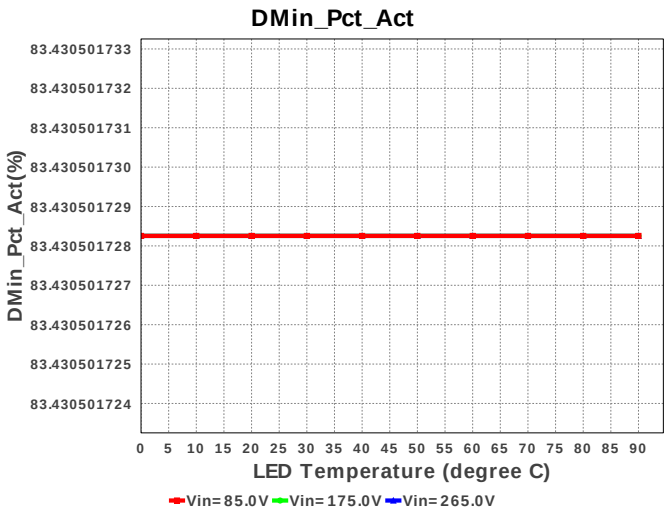
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
6.	M1	Fairchild Semiconductor	FDD2572	VdsMax= 150.0 V IdsMax= 4.0 Amps	1	$0.70	 DPAK 102 mm²
7.	NTC	Panasonic	ERT-J0EV104H Series= ERT-J	Thermistor	1	$0.08	 0402 3 mm²
8.	Rdhc	Vishay-Dale	CRCW04026K65FKED Series= CRCW..e3	Res= 6.65 kOhm Power= 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	CRCW0402110KFKED Series= CRCW..e3	Res= 110.0 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	Panasonic	ERJ-6RQFR33V Series= ERJ-6R	Res= 330.0 mOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.04	 0805 7 mm²
14.	Rthm1	Vishay-Dale	CRCW04023K65FKED Series= CRCW..e3	Res= 3.65 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rthm2	Vishay-Dale	CRCW04021K82FKED Series= CRCW..e3	Res= 1.82 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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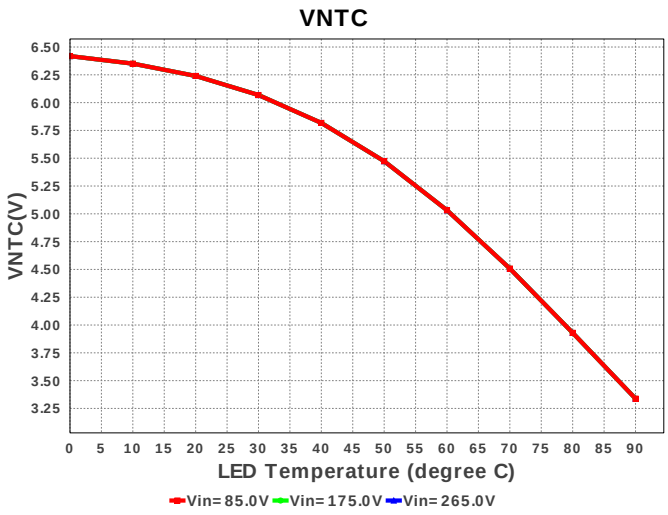

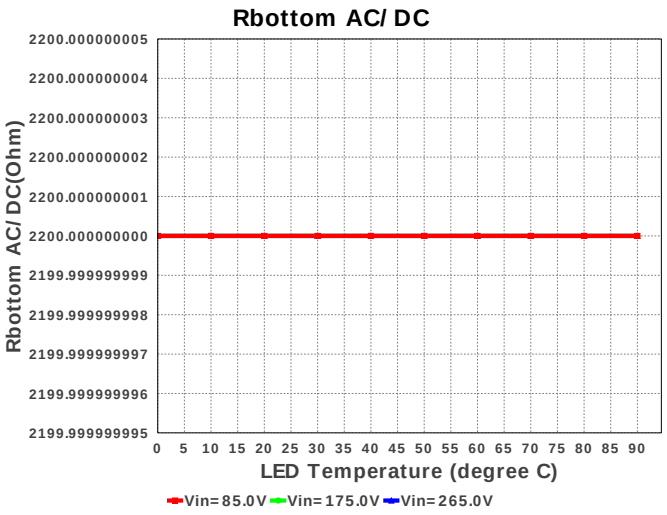

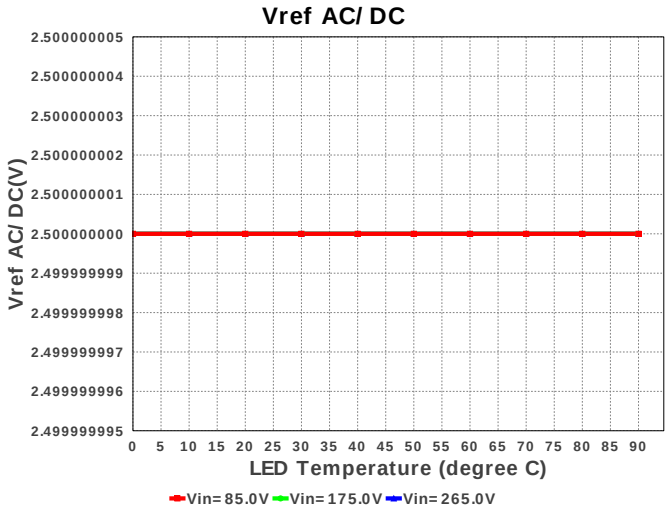

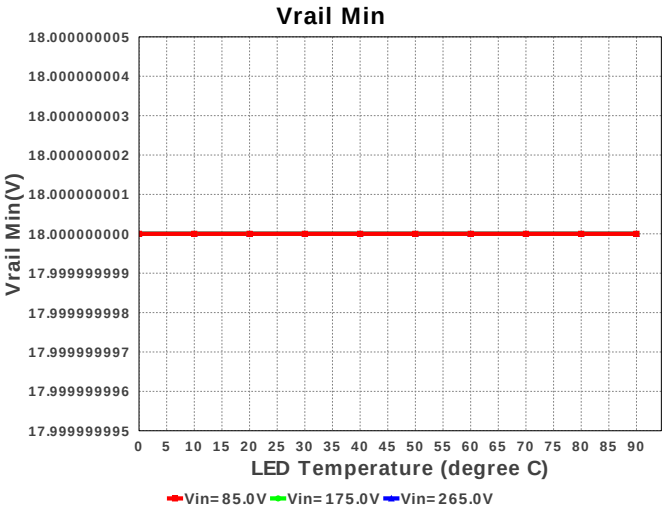

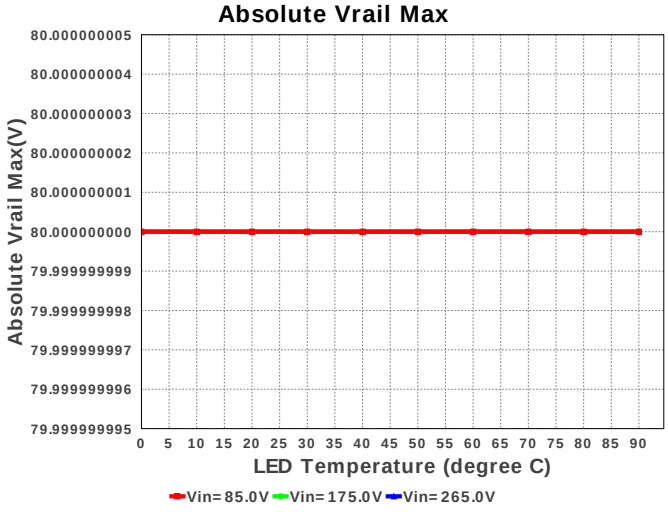

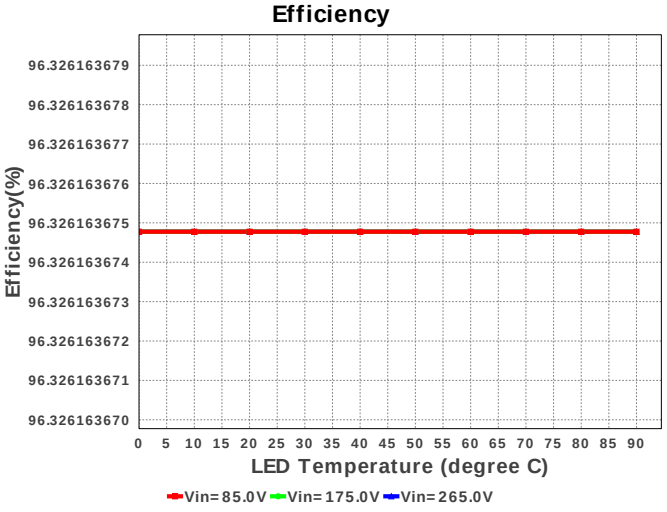

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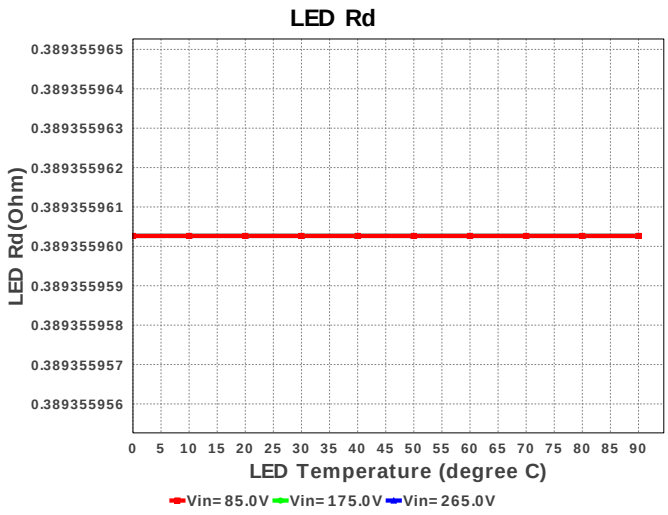

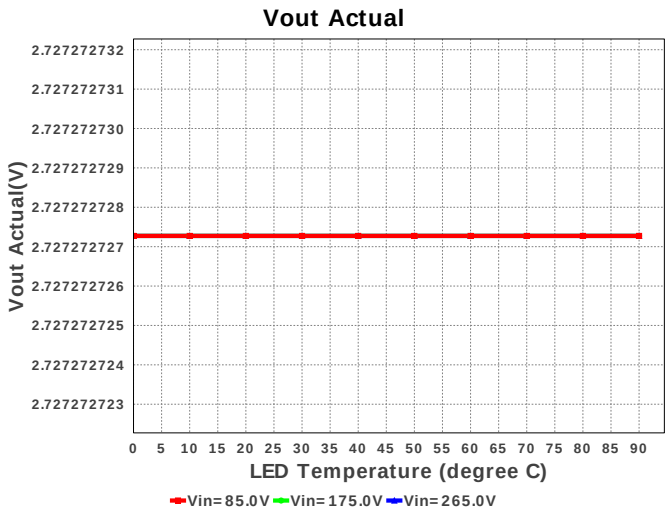

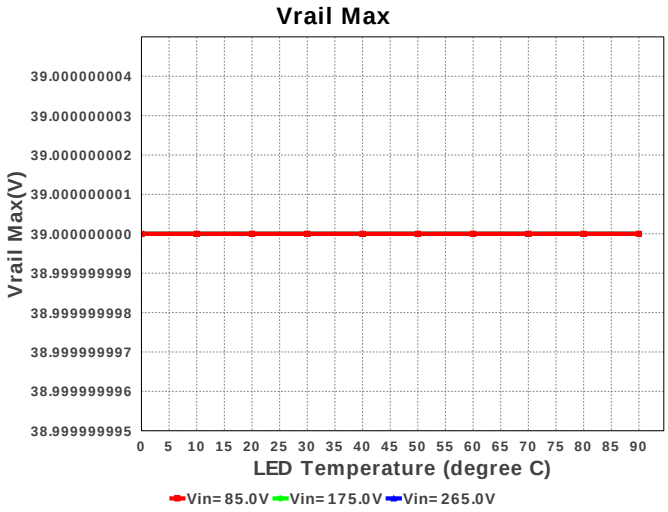

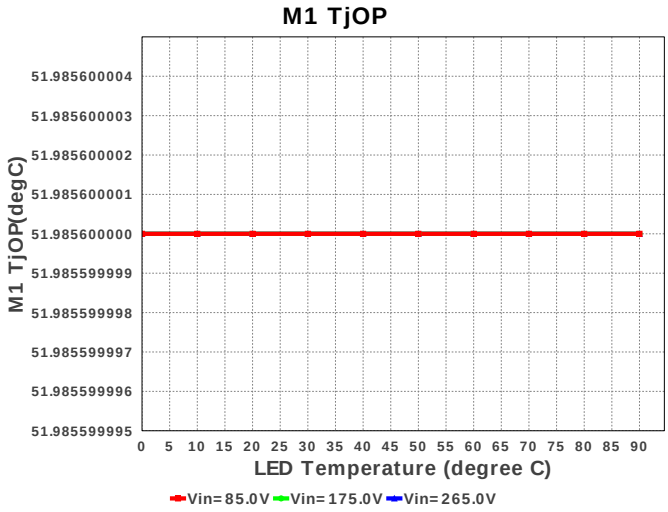

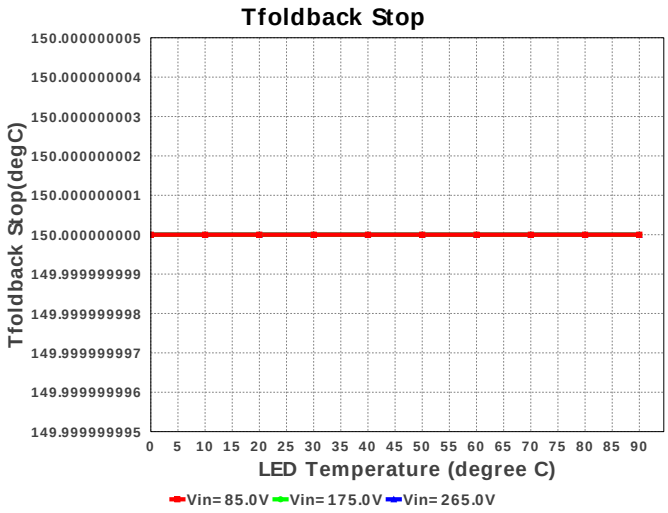

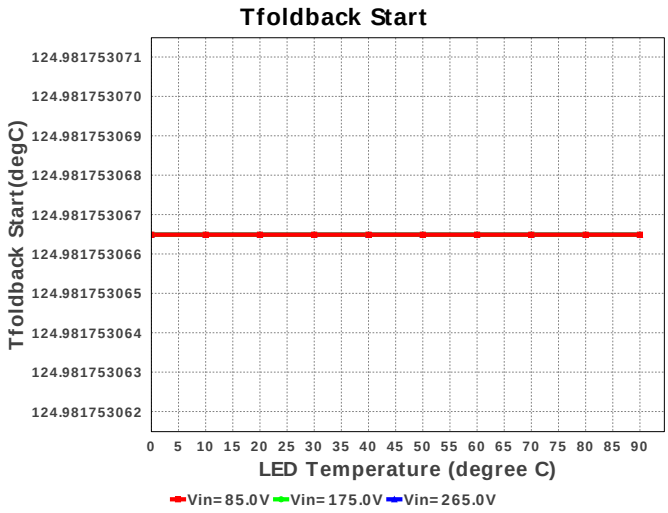

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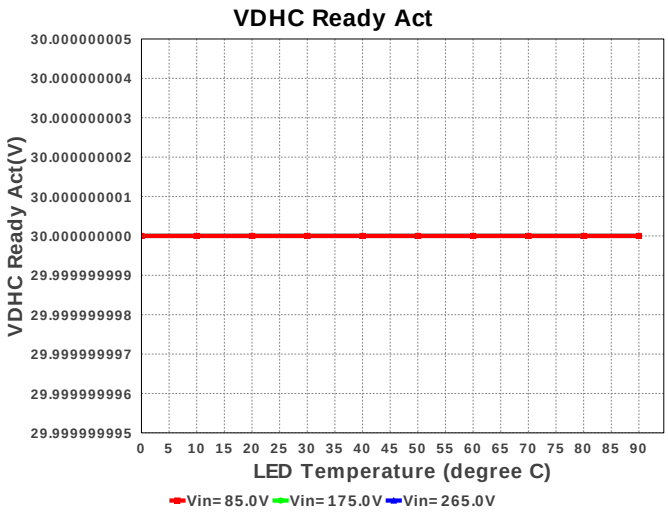

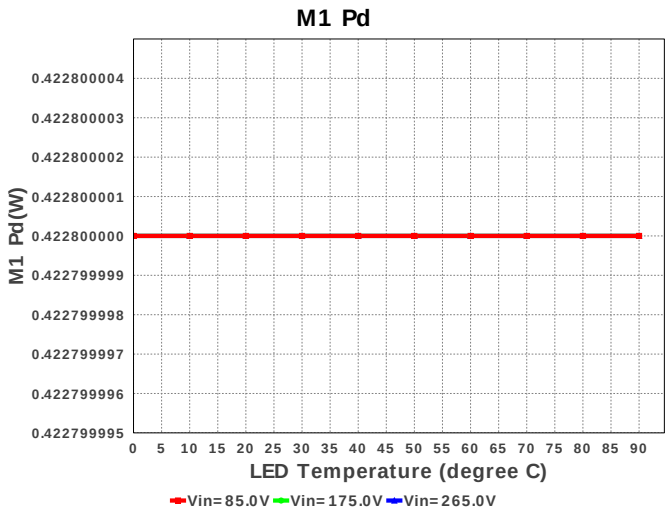

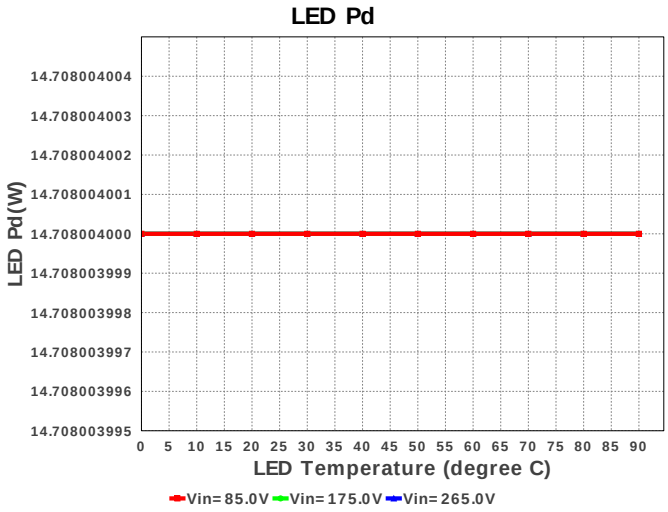

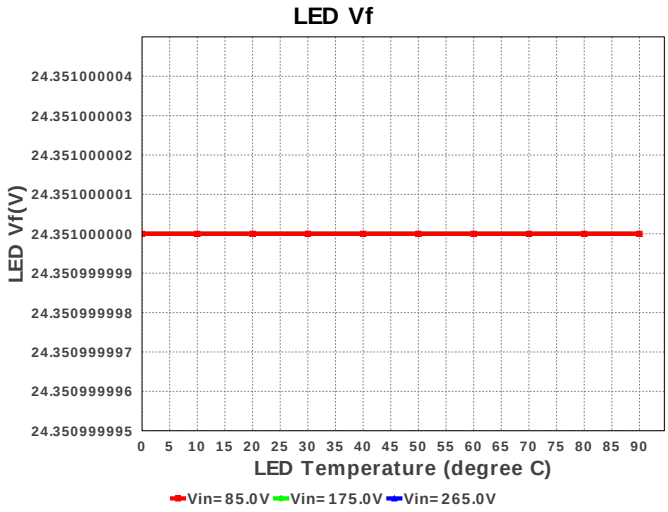

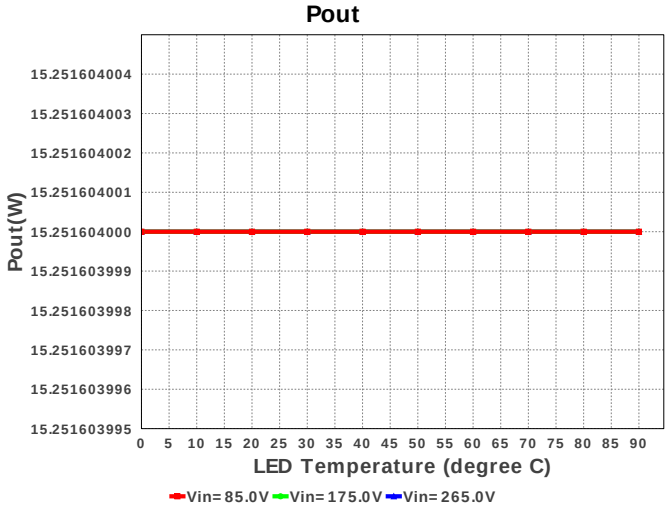

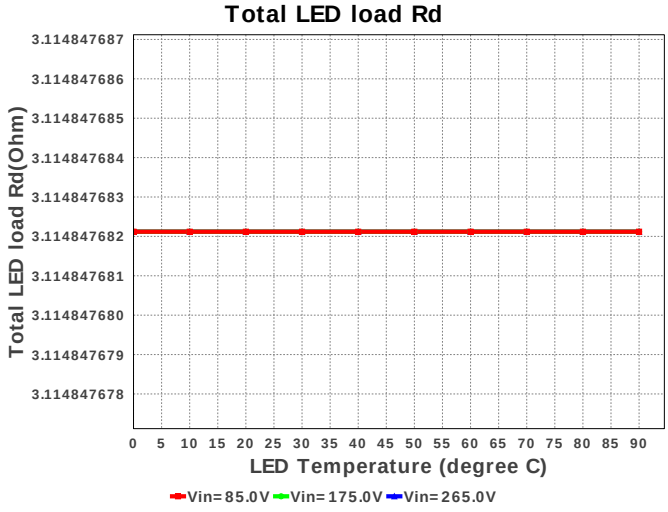

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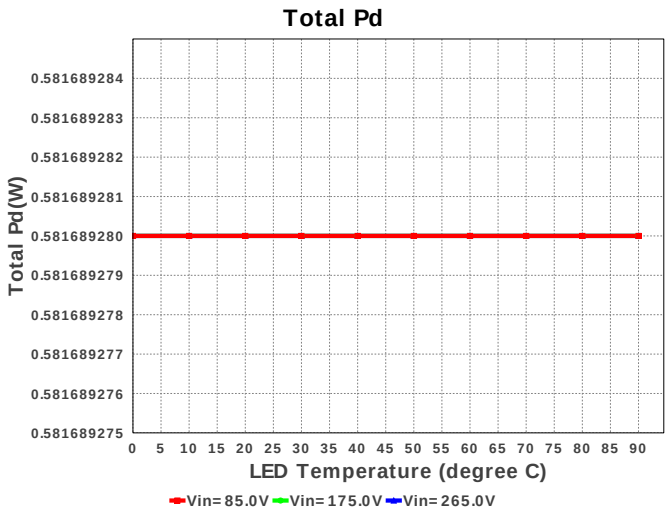

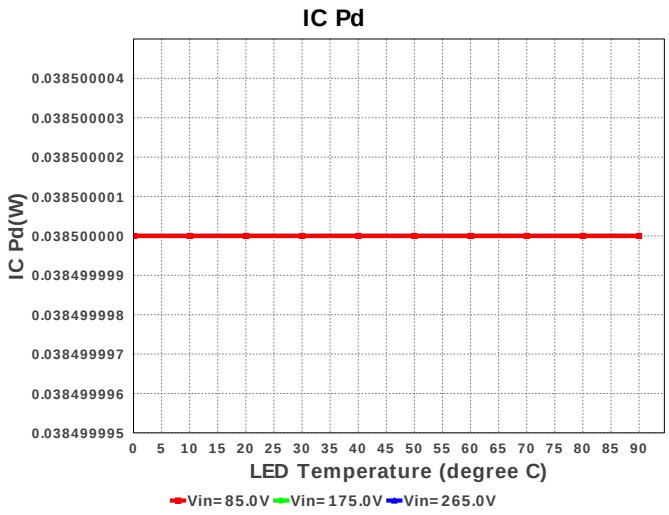

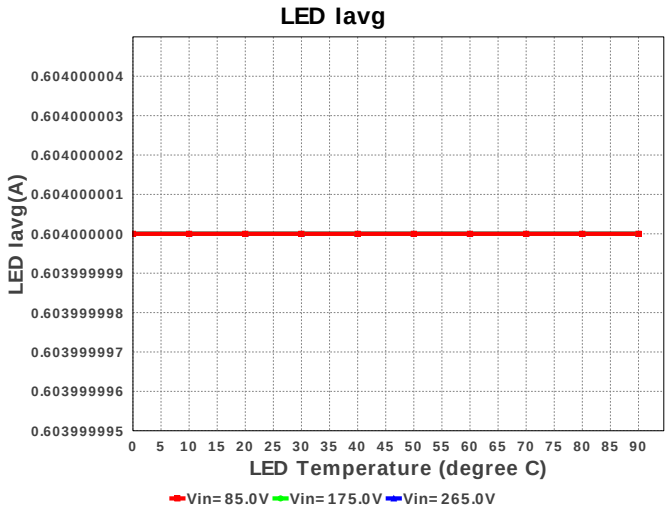

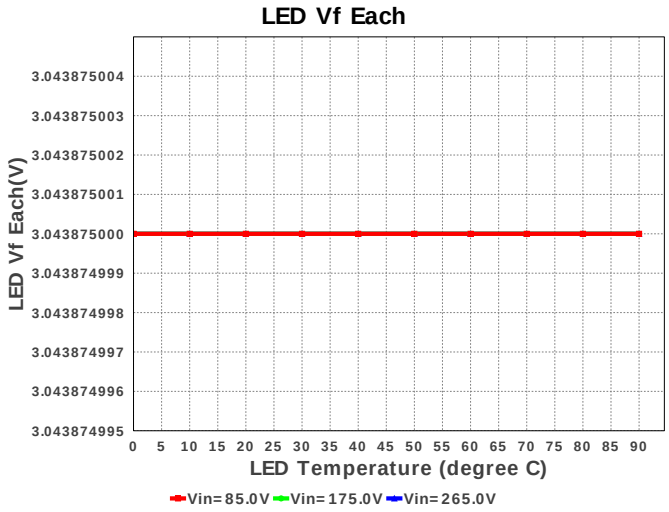

Operating Values

#	Name	Value	Category	Description
1.	LED Iavg	604.0 mA	Current	LED Average Current
2.	BOM Count	23	General	Total Design BOM count
3.	FootPrint	246.0 mm^2	General	Total Foot Print Area of BOM components
4.	Frequency	0.0 Hz	General	Switching frequency
5.	Pout	15.251 W	General	Total output power
6.	Total BOM	$3.33	General	Total BOM Cost
7.	Tfoldback Stop	150.0 degC	Op_Point	Stop Temperature for Thermal Foldback
8.	Vout Actual	2.727 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
9.	Efficiency	96.326 %	Op_point	Steady state efficiency
10.	IC Tj	33.85 degC	Op_point	IC junction temperature
11.	IOUT_OP	604.0 mA	Op_point	Iout operating point
12.	LED Rd	389.356 mOhm	Op_point	LED DynamicResistance
13.	LED Vf	24.35 V	Op_point	Total LED Forward Calculated Voltage
14.	M1 TjOP	51.986 degC	Op_point	MOSFET junction temperature
15.	VIN_OP	265.0 V	Op_point	Maximum AC voltage input to power supply
16.	IC Pd	38.5 mW	Power	IC power dissipation
17.	LED Pd	14.708 W	Power	LED Power Dissipation
18.	M1 Pd	422.8 mW	Power	Average power dissipation in the switching FET over the AC line period
19.	Total Pd	581.689 mW	Power	Total Power Dissipation
20.	Absolute Vrail Max	80.0 V		Absolute Vrail Maximum
21.	DMin_Pct_Act	83.431 %		Minimum Duty Cycle Limit when LEDs are Hot
22.	LED Vf Each	3.044 V		Calculated Forward Voltage of Each LED
23.	Rbottom AC/DC	2.2 kOhm		Bottom Resistor in Feedback Loop of Power Supply Unit
24.	Tfoldback Start	124.982 degC		Start Temperature for Thermal Foldback
25.	Total LED load Rd	3.115 Ohm		Total LED Load DynamicResistance
26.	VDHC Ready Act	30.0 V		Ready Voltage for DHC Startup
27.	VNTC	2.309 V		Voltage across NTC resistor
28.	Vout Tolerance	168.35 m%		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable
29.	Vrail Max	39.0 V		Maximum Rail voltage that can be pushed up by the LM3464
30.	Vrail Min	18.0 V		Minimum Rail voltage of Power Supply Unit

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#	Name	Value	Category	Description
31.	Vref AC/DC	2.5 V		Reference Voltage for Circuit in Power Supply Unit

Design Inputs

#	Name	Value	Description
1.	Iout	604.0 m	Maximum Output Current
2.	VinMax	265.0	Maximum input voltage
3.	VinMin	85.0	Minimum input voltage
4.	Vout	24.351	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	1.0	Number of LED in parallel
10.	ledpartnumber	XPEWHT-L1-R250-00C01	LED Part number
11.	ledseries	8.0	Number of LED in series
12.	line_fsw	60.0	AC Line Frequency
13.	source	AC	Input Source Type
14.	start_foldback_temperature	125.35	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.

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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