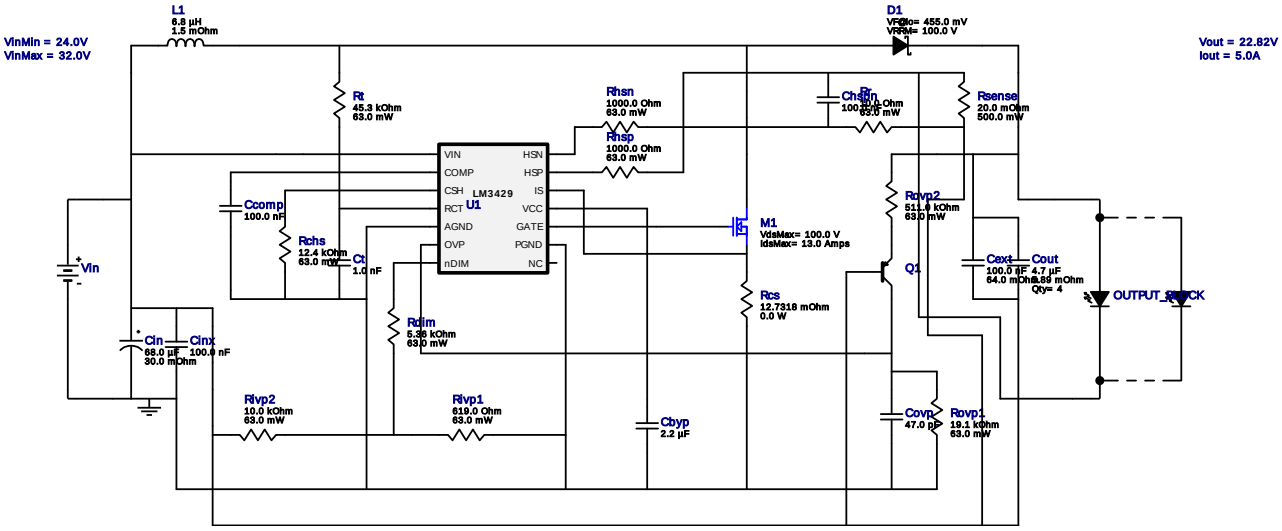
WEBENCH ® Design Report

VinMin = 24.0V
VinMax = 32.0V
Vout = 22.82V
Iout = 5.0A

Device = LM3429MH/NOPB
Topology = Buck_Boost
Created = 7/16/15 7:04:02 PM
BOM Cost = $0.00
Footprint = 1,253.0 mm²
BOM Count = 34
Total Pd = 5.47W

Design : 4232493/11 LM3429MH/NOPB
LM3429MH/NOPB 24.0V-32.0V to 22.78V @ 4.979828709677419A



1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.View WEBENCH(R) Disclaimer.

Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	Taiyo Yuden	EMK212B7225KG-T Series= X7R	Cap= 2.2 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
2.	Ccomp	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Cext	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
4.	Chspn	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Cin	Panasonic	EEHZA1H680P Series= ZA	Cap= 68.0 uF ESR= 30.0 mOhm VDC= 50.0 V IRMS= 1.8 A	1	$0.97	SM_RADIAL_8MM 113 mm²
6.	Cinx	MuRata	GRM188R72A104KA35D Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0603 5 mm²
7.	Cout	TDK	C3225X7S2A475M200AB Series= X7S	Cap= 4.7 uF ESR= 5.89 mOhm VDC= 100.0 V IRMS= 6.7739 A	4	$0.42	1210 15 mm²
8.	Covp	Kemet	C0805C470K5GACTU Series= C0G/NP0	Cap= 47.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²

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#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Ct	Yageo America	CC0805JRNPO9BN102 Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
10.	D1	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	$1.33	DDPAK 210 mm²
11.	D_LED	Cree	XHP50A-00-0000-0D0BJ40D	LED	5	$6.35	xlampxhp 0 mm²
12.	L1	Coilcraft	SER2915L-682KL	L= 6.8 µH DCR= 1.5 mOhm	1	$2.05	SER2915L 652 mm²
13.	M1	Texas Instruments	CSD19533Q5A	VdsMax= 100.0 V IdsMax= 13.0 Amps	1	$0.83	TRANS_NexFET_Q5A 55 mm²
14.	Q1	Diodes Inc.	MMBT3906-7-F	Bipolar Transistor	1	$0.02	SOT-23 14 mm²
15.	Rchs	Vishay-Dale	CRCW040212K4FKED Series= CRCW..e3	Res= 12.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
16.	Rcs	CUSTOM	CUSTOM Series= ?	Res= 12.7318 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
17.	Rdim	Vishay-Dale	CRCW04025K36FKED Series= CRCW..e3	Res= 5.36 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
18.	Rhsn	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
19.	Rhsp	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
20.	Rivp1	Vishay-Dale	CRCW0402619RFKED Series= CRCW..e3	Res= 619.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
21.	Rivp2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
22.	Rovp1	Vishay-Dale	CRCW040219K1FKED Series= CRCW..e3	Res= 19.1 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
23.	Rovp2	Vishay-Dale	CRCW0402511KFKED Series= CRCW..e3	Res= 511.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
24.	Rr	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²

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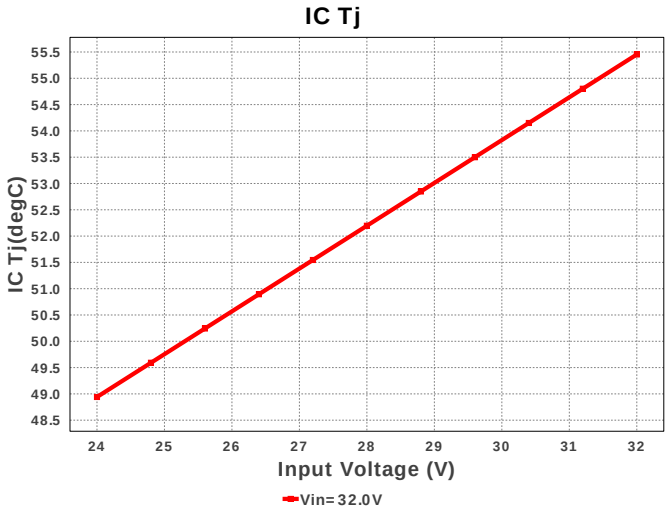
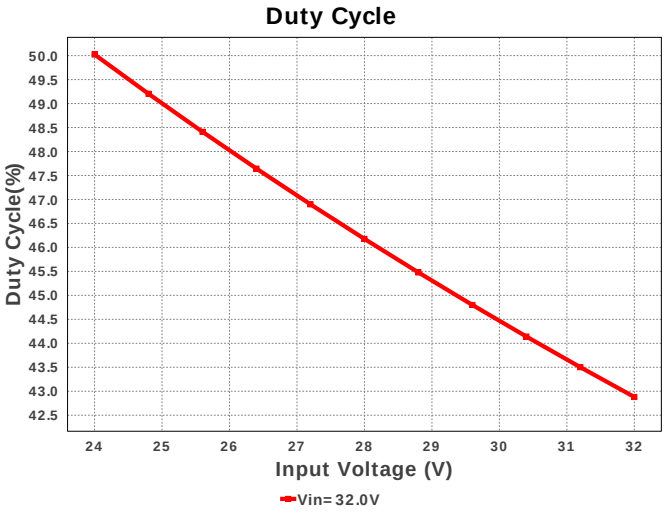
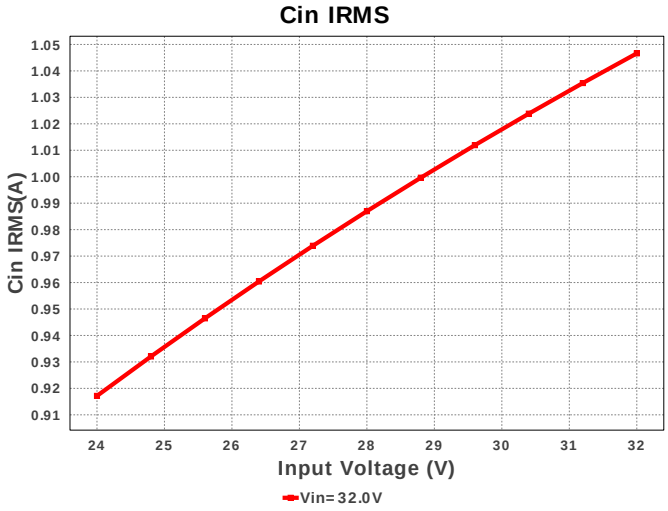
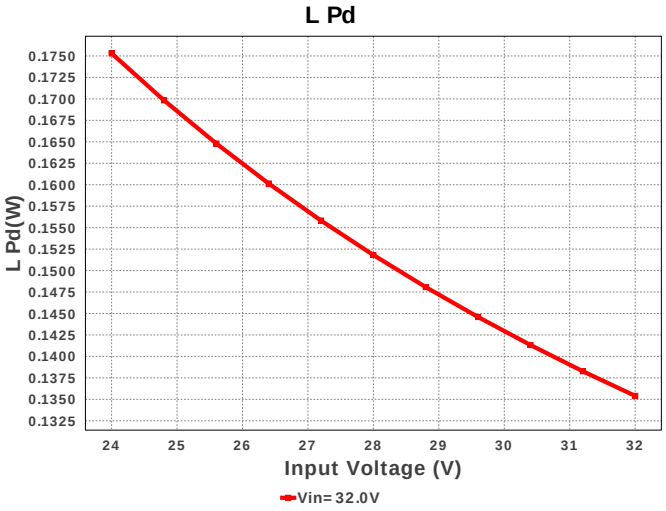
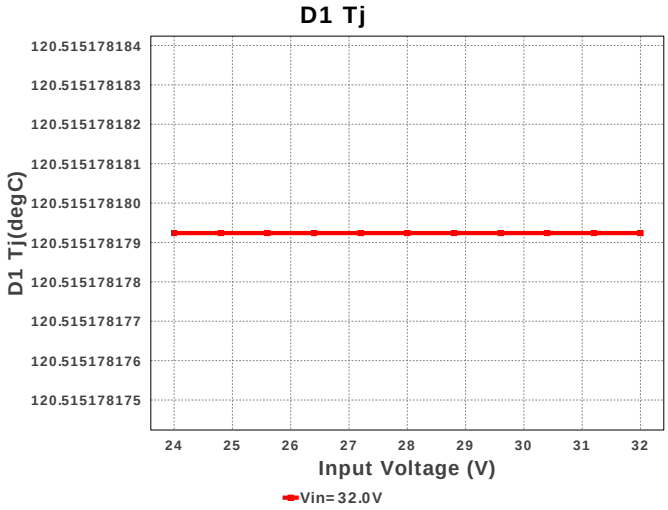
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
25.	Rsense	Stackpole Electronics Inc	CSR1206FK20L0 Series= ?	Res= 20.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	1206 11 mm²
26.	Rt	Vishay-Dale	CRCW040245K3FKED Series= CRCW..e3	Res= 45.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
27.	U1	Texas Instruments	LM3429MH/NOPB	Switcher	1	$1.20	MXA14A 59 mm²

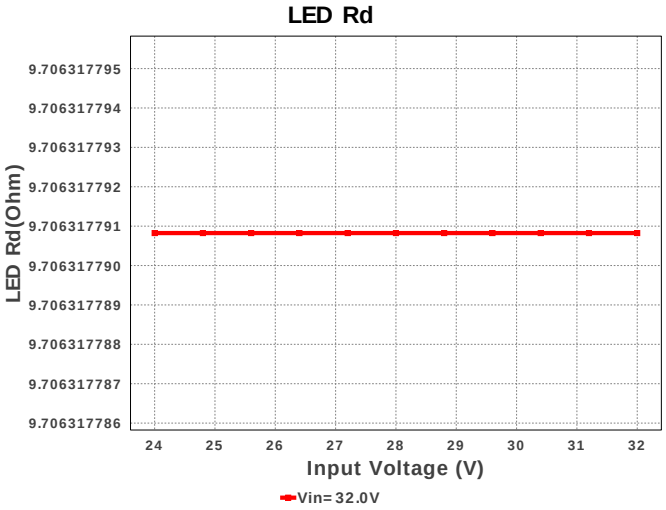












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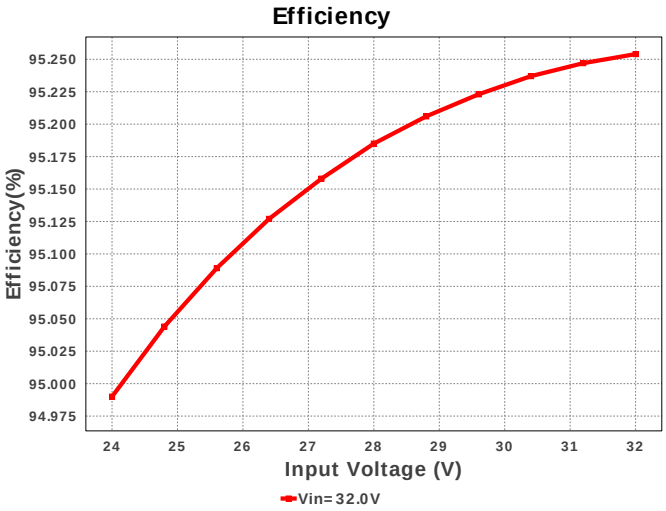

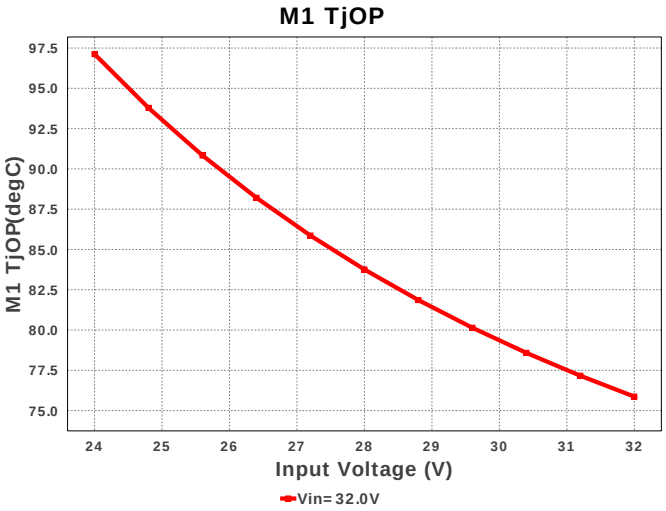

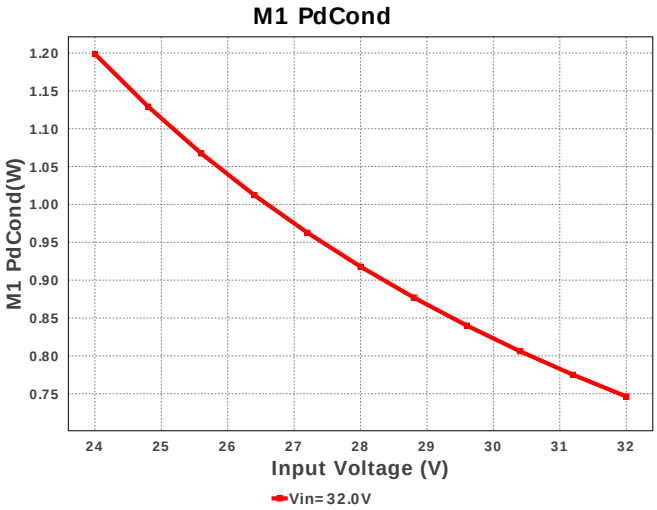

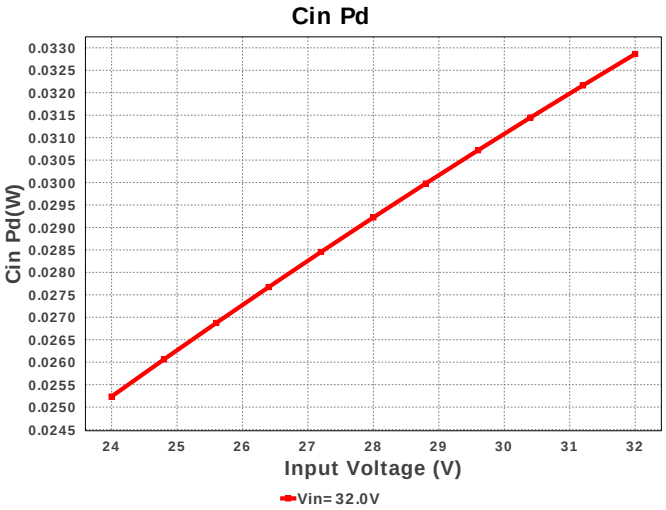

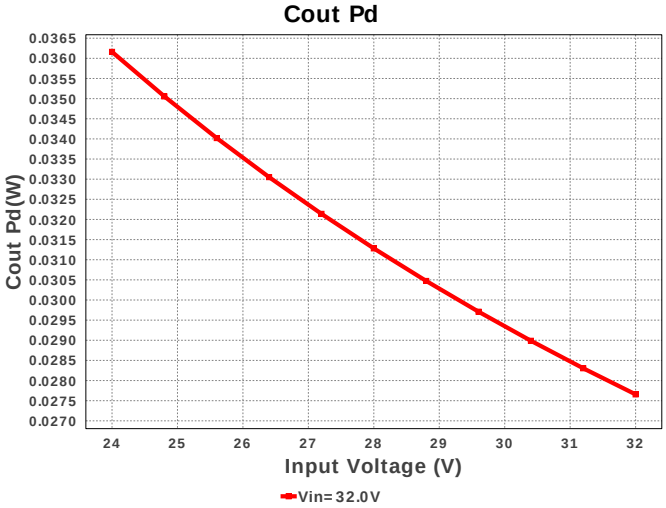

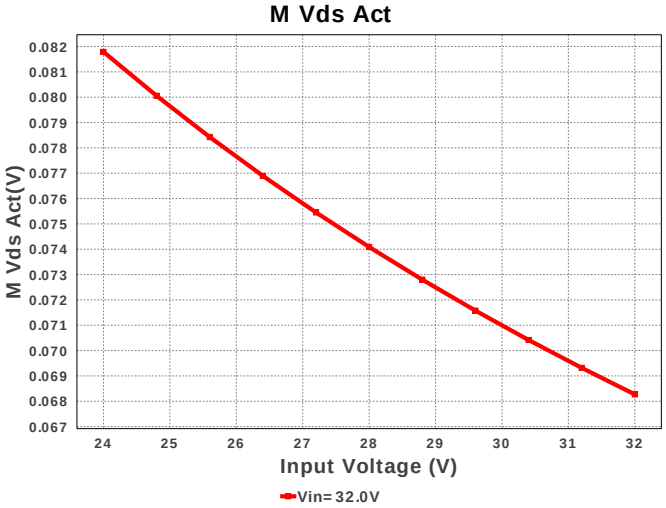

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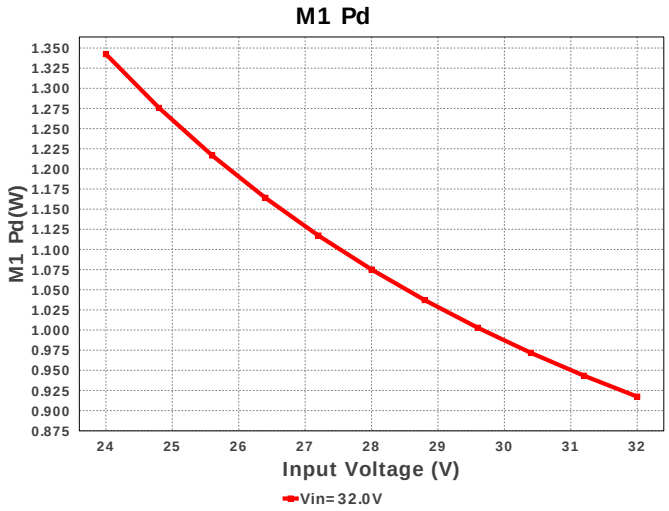

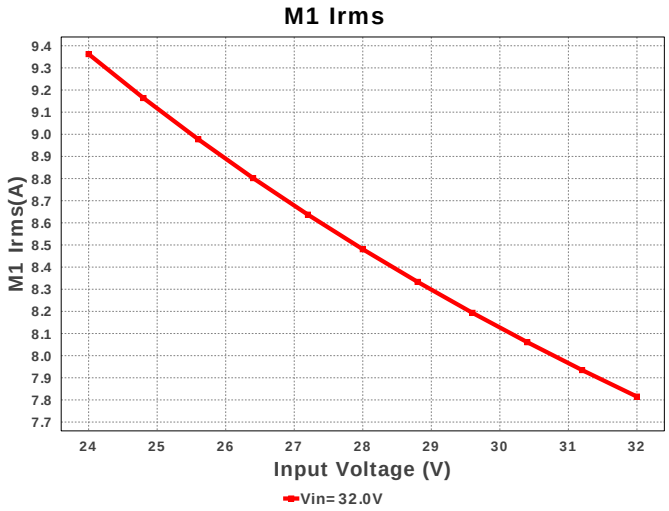

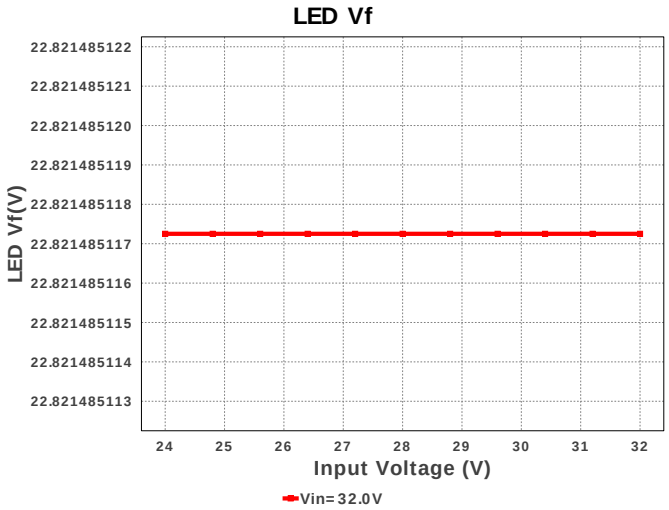

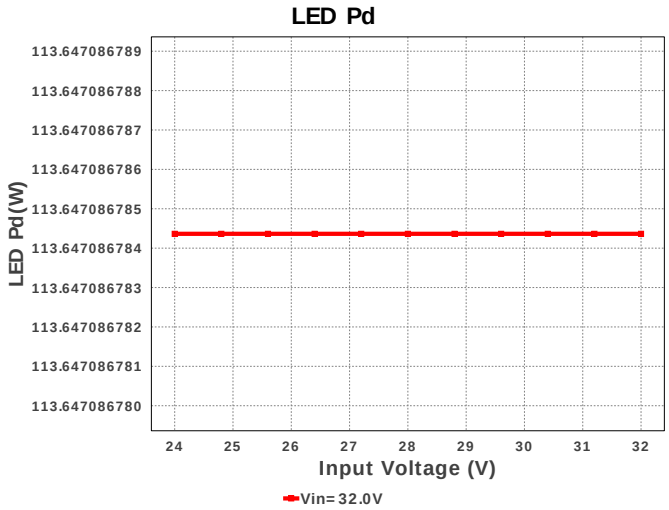

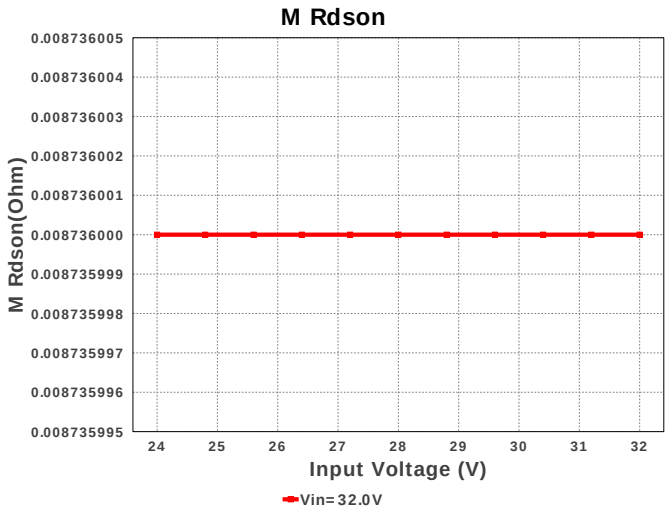

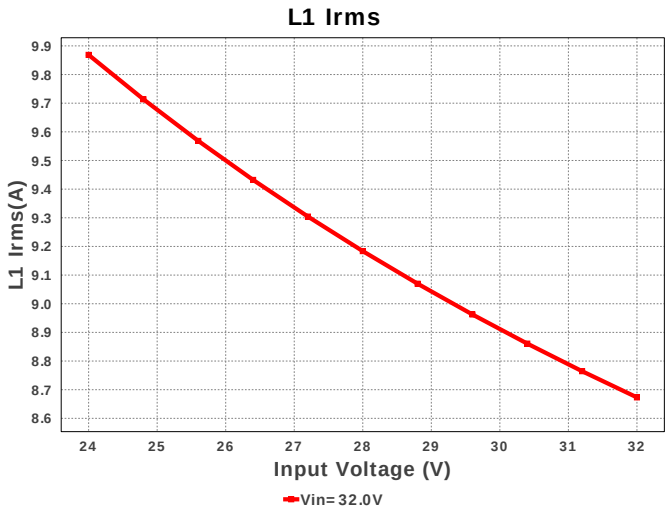

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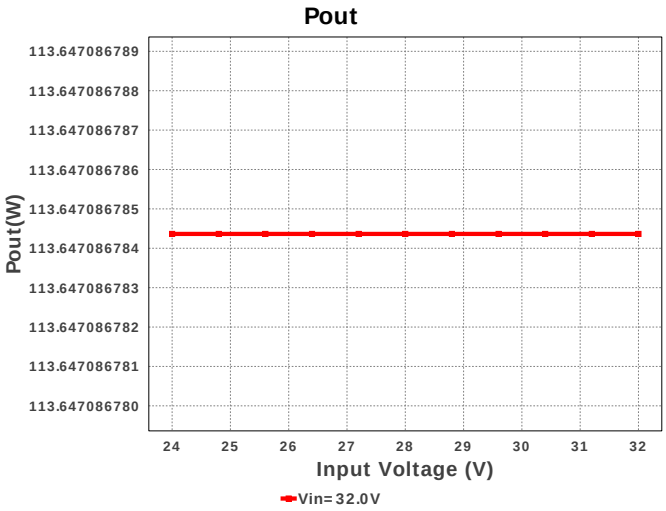
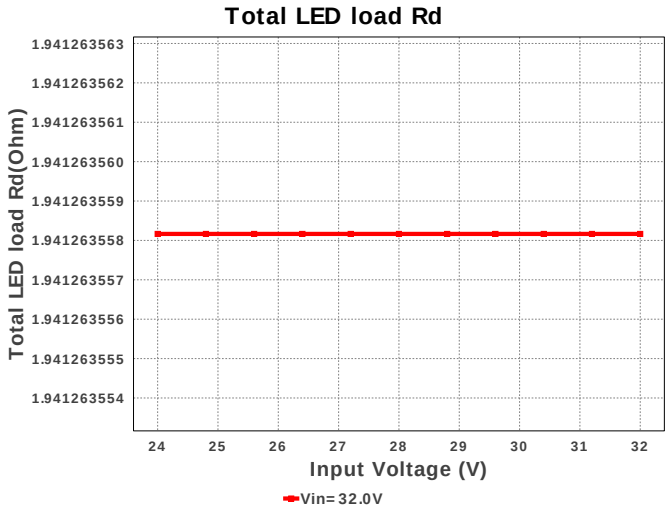
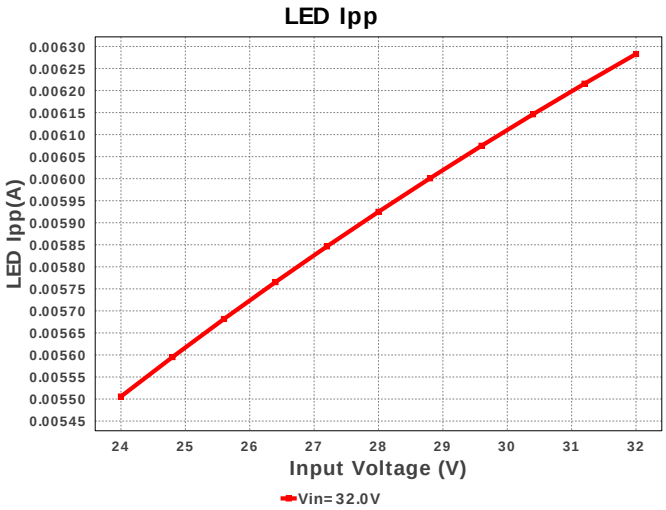
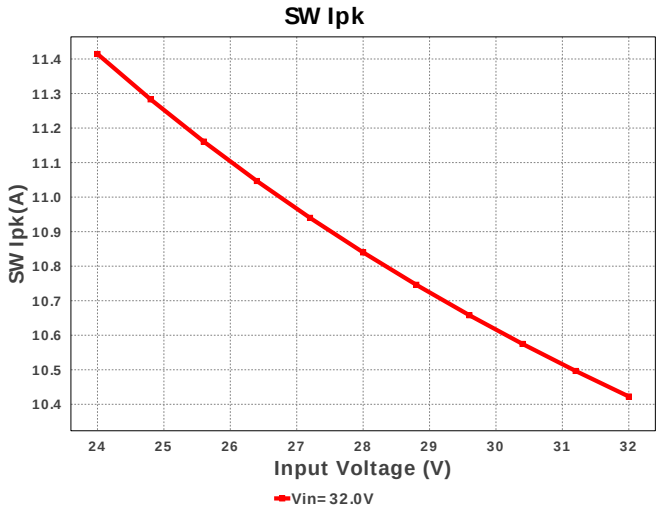
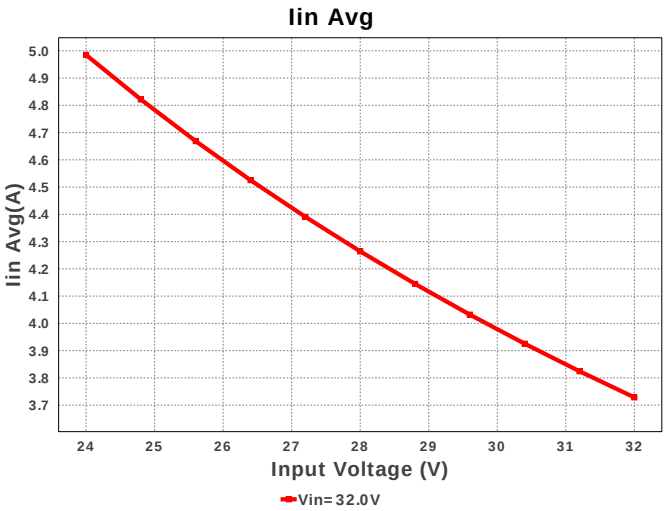
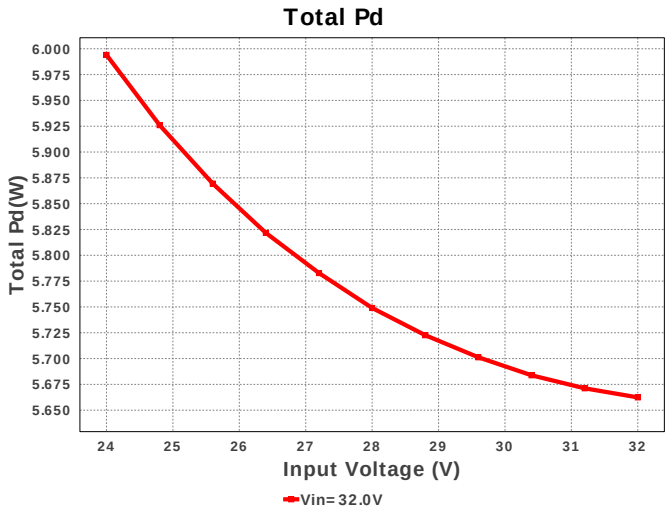

Pout
Pout(W)
113.647086789
113.647086788
113.647086787
113.647086786
113.647086785
113.647086784
113.647086783
113.647086782
113.647086781
113.647086780
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

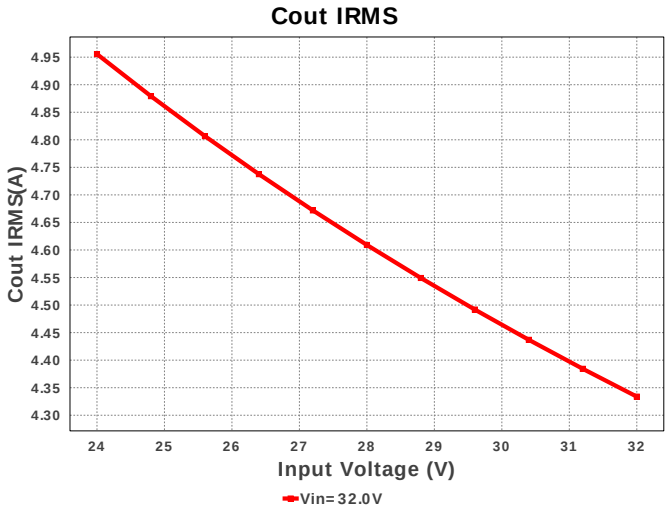

Total LED load Rd
Total LED load Rd(Ohm)
1.941263563
1.941263562
1.941263561
1.941263560
1.941263559
1.941263558
1.941263557
1.941263556
1.941263555
1.941263554
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

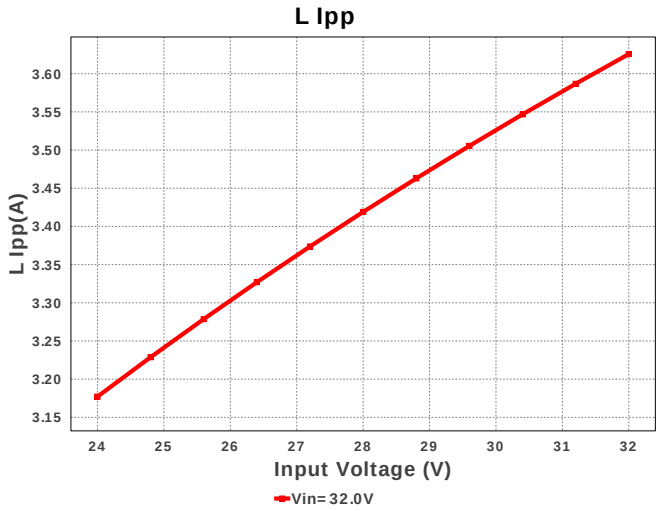

LED Ipp
LED Ipp(A)
0.00630
0.00625
0.00620
0.00615
0.00610
0.00605
0.00600
0.00595
0.00590
0.00585
0.00580
0.00575
0.00570
0.00565
0.00560
0.00555
0.00550
0.00545
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

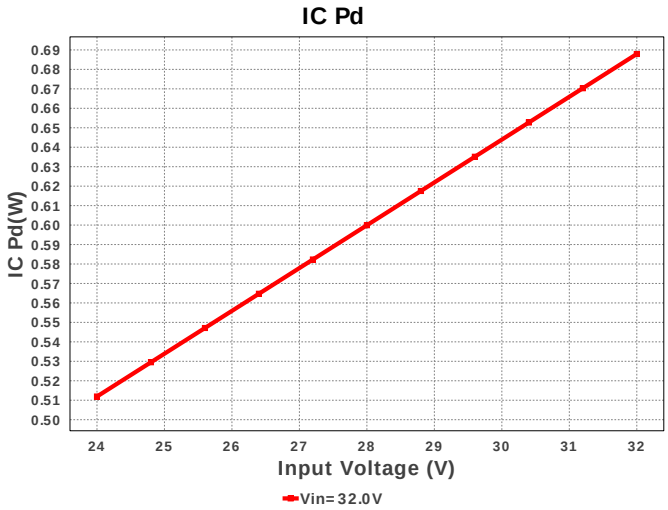

SW Ipk
SW Ipk(A)
11.4
11.3
11.2
11.1
11.0
10.9
10.8
10.7
10.6
10.5
10.4
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

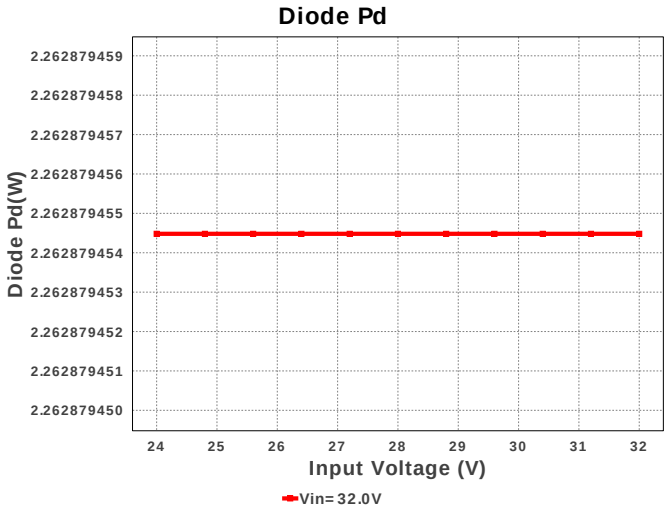

Iin Avg
Iin Avg(A)
5.0
4.9
4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
4.0
3.9
3.8
3.7
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

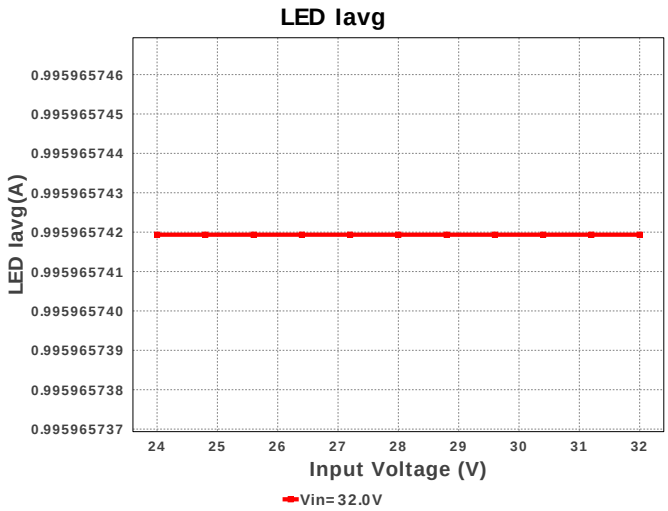

Total Pd
Total Pd(W)
6.000
5.975
5.950
5.925
5.900
5.875
5.850
5.825
5.800
5.775
5.750
5.725
5.700
5.675
5.650
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

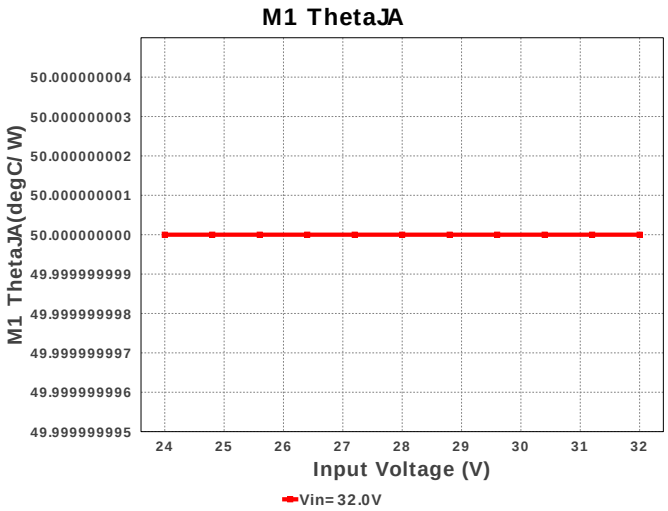

Cout IRMS
Cout IRMS(A)
4.95
4.90
4.85
4.80
4.75
4.70
4.65
4.60
4.55
4.50
4.45
4.40
4.35
4.30
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V

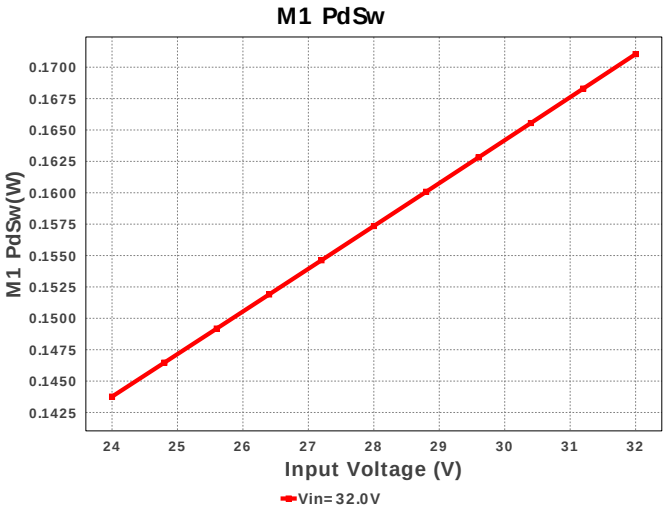

L Ipp
L Ipp(A)
3.60
3.55
3.50
3.45
3.40
3.35
3.30
3.25
3.20
3.15
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V


IC Pd
IC Pd(W)
0.69
0.68
0.67
0.66
0.65
0.64
0.63
0.62
0.61
0.60
0.59
0.58
0.57
0.56
0.55
0.54
0.53
0.52
0.51
0.50
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V


Diode Pd
Diode Pd(W)
2.262879459
2.262879458
2.262879457
2.262879456
2.262879455
2.262879454
2.262879453
2.262879452
2.262879451
2.262879450
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V


LED Iavg
LED Iavg(A)
0.995965746
0.995965745
0.995965744
0.995965743
0.995965742
0.995965741
0.995965740
0.995965739
0.995965738
0.995965737
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V


M1 ThetaJA
M1 ThetaJA(degC/ W)
50.000000004
50.000000003
50.000000002
50.000000001
50.000000000
49.999999999
49.999999998
49.999999997
49.999999996
49.999999995
24 25 26 27 28 29 30 31 32
Input Voltage (V)
Vin=32.0V



Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	916.738 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	4.95 A	Current	Output capacitor RMS ripple current
3.	Iin Avg	4.955 A	Current	Average input current
4.	L Ipp	3.176 A	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	9.857 A	Current	Inductor ripple current
6.	LED Iavg	995.966 mA	Current	LED Average Current
7.	LED Ipp	5.503 mA	Current	LED Ripple Current
8.	M1 Irms	9.332 A	Current	M1 MOSFET Irms
9.	SW Ipk	11.402 A	Current	Peak switch current
10.	BOM Count	34	General	Total Design BOM count
11.	FootPrint	1.253 k mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	546.358 kHz	General	Switching frequency
13.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
14.	M Rdson	6.8 mOhm	General	Drain-Source On-resistance
15.	M Vds Act	63.46 mV	General	M Vds
16.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
17.	Pout	113.452 W	General	Total output power
18.	Total BOM	$0.0	General	Total BOM Cost
19.	D1 Tj	120.633 degC	Op_Point	D1 junction temperature
20.	Vout OP	22.782 V	Op_Point	Operational Output Voltage
21.	Duty Cycle	49.981 %	Op_point	Duty cycle
22.	Efficiency	95.403 %	Op_point	Steady state efficiency
23.	IC Tj	48.431 degC	Op_point	IC junction temperature
24.	ICThetaJA	37.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	4.98 A	Op_point	Iout operating point
26.	LED Rd	9.706 Ohm	Op_point	LED DynamicResistance
27.	LED Vf	22.782 V	Op_point	Total LED Forward Calculated Voltage
28.	M1 TjOP	72.102 degC	Op_point	M1 MOSFET junction temperature
29.	VIN_OP	24.0 V	Op_point	Vin operating point
30.	Cin Pd	25.212 mW	Power	Input capacitor power dissipation
31.	Cout Pd	36.076 mW	Power	Output capacitor power dissipation
32.	Diode Pd	2.266 W	Power	Diode power dissipation
33.	IC Pd	498.146 mW	Power	IC power dissipation
34.	L Pd	174.886 mW	Power	Inductor power dissipation
35.	LED Pd	113.452 W	Power	LED Power Dissipation
36.	M1 Pd	842.037 mW	Power	M1 MOSFET total power dissipation
37.	M1 PdCond	703.818 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	138.218 mW	Power	M1 MOSFET switching losses
39.	Total Pd	5.467 W	Power	Total Power Dissipation
40.	Total LED load Rd	1.941 Ohm	Unknown	Total LED Load DynamicResistance

Design Inputs

#	Name	Value	Description
1.	Iout	5.0	Maximum Output Current
2.	Iout1	5.0	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	24.0	Minimum input voltage
5.	Vout	22.82	Output Voltage
6.	Vout1	22.82	Output Voltage #1
7.	application	LED_DRIVER	LED Application
8.	base_pn	LM3429	Texas Instruments Base Part Number

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#	Name	Value	Description
9.	isLEDArchitect	N	LED Architect Project
10.	ledparallel	5.0	Number of LED in parallel
11.	ledpartnumber	XHP50A-00-0000-0D0BLE0D7	LED Part number
12.	ledseries	1.0	Number of LED in series
13.	line_fsw	60.0	AC Line Frequency
14.	source	DC	Input Source Type
15.	ta	30.0	Ambient temperature

Design Assistance

1. LM3429 Product Folder : http://www.ti.com/product/LM3429 : contains the data sheet and other resources.

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