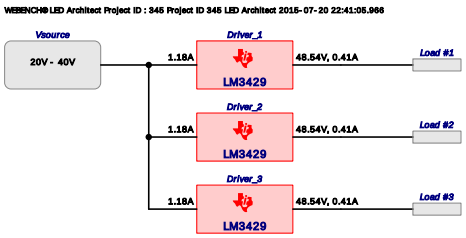
WEBENCH® LED Architect



Project Report

Project : 906020/345 : Project ID 345
Created : 2015-07-20 22:41:05.966
LED Architect with light output=3500.0

Launch WEBENCH LED Architect.

Project Summary

Total BOM Cost : $740.01
Total Footprint : 880,590 mm^2
Total BOM Count : 91
Total Efficiency : 15.83%
Total Efficacy : 54.2 lumens / Watt
Total Power Dissipation (loss) : 4.87 Watts

Design Input Specifications :

1.	VinMax	40.0	Maximum input voltage
2.	VinMin	20.0	Minimum input voltage
3.	color	cool white	LED Color
4.	inputSource	DC	Input Source Type
5.	lightOutput	3500.0	Light Output in Lumen
6.	maxHeatSinkLength	200.0	Max Heat Sink Length
7.	maxHeatSinkWidth	50.0	Max Heat Sink Width
8.	maxJunctionTemp	150.0	Max LED Junction Temperature
9.	maxLEDStringVout	60.0	Max LED String Voltage
10.	optfactor	3	Optimization factor to tune up the design
11.	pricefactor	0	Price factor to tune up the design cost
12.	ta	40.0	Ambient temperature

Regulators

Main Driver NSID : LM3429MH/NOPB Boost Controller for LED; Driver Efficiency = 93.14%

Drivers Electrical BOM

Manufacturer	Part Number	Quantity	Budgetary Price	Footprint (mm^2)
Diodes Inc.	B260A-13-F	3	$0.27	112
Infineon Technologies	BSC600N25NS3 G	3	$3.81	165
Kemet	C0805C470K5GACTU	3	$0.03	20
TDK	C2012X7R2A104K	3	$0.09	20
TDK	C3225X7S2A335K200AB	3	$0.72	44
Yageo America	CC0805JRNPO9BN102	3	$0.03	20
Vishay-Dale	CRCW040210K0FKED	3	$0.03	9
Vishay-Dale	CRCW040210R0FKED	3	$0.03	9
Vishay-Dale	CRCW040212K4FKED	3	$0.03	9
Vishay-Dale	CRCW04021K00FKED	6	$0.06	18
Vishay-Dale	CRCW0402511KFKED	3	$0.03	9
Vishay-Dale	CRCW040259K0FKED	3	$0.03	9
Vishay-Dale	CRCW04026K34FKED	3	$0.03	9
Vishay-Dale	CRCW0402750RFKED	3	$0.03	9
Vishay-Dale	CRCW04029K53FKED	3	$0.03	9
Panasonic	EEE-FK1J100P	3	$0.39	253
Taiyo Yuden	EMK212B7225KG-T	3	$0.09	20
Panasonic	ERJ-3RQFR22V	3	$0.06	14
MuRata	GRM155C80G474KE01D	3	$0.03	9
MuRata	GRM188R72A104KA35D	3	$0.09	14
MuRata	GRM21BR71E104KA01L	3	$0.03	20
Texas Instruments	LM3429MH/NOPB	3	$3.60	176
Rohm	MCR25JZHFLR150	3	$0.09	44
Bourns	SDR1307-121KL	3	$1.05	680
Total		75	$10.68	1,703

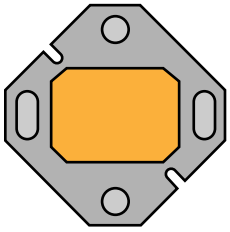
LED Array Solution BOM = LEDs + Heatsink

Manufacturer	Part Number	Quantity	Cost	Footprint (cm^2)
SHARP Electronics	GW5BNF15L10	15	$231.15	-
Aavid	62335	1	$498.18	8,788
Total			$729.33	8,788

LED Array Solution

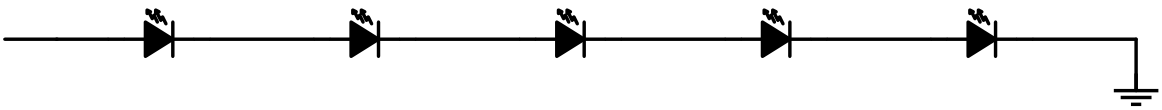
LED Array
Light Output : 3500 lumens
Color : cool white
LED quantity : 15Series = 5Parallel = 3
Total Vout : 48.5 Volts
Total Iload : 0.4 Amps
Total Light Output : 3500 lumens
Flux : 233 lumens
ThetaSA : 0.14 C / Watt
Junction Temp : 68 degrees
Operating Vf : 9.707 Volts
Operating Io : 0.41 Amps
Efficiency : 17%
Efficacy : 58.6 lumens / Watt
Total Footprint : 878886.2 mm^2
Total LED Cost : $729.33
Max LED Vout : 60.0 Volts

Selected LED



Manufacturer : SHARP Electronics
Part Number : GW5BNF15L10
Vf : 10.5 V
Io : 0.64 A
Angle : 120.0 degree
PhiV : 350.0
Color Temperature : 6500.0 K
Color : cool white
Tj : 90.0 deg C
IfMin : 0.0 Amps
IfMax : 0.7 Amps
RJC : 4.5 deg C/Ohm
Isat : 0.0 Amps
Package mount : SMT
Footprint : 400.0 mm2

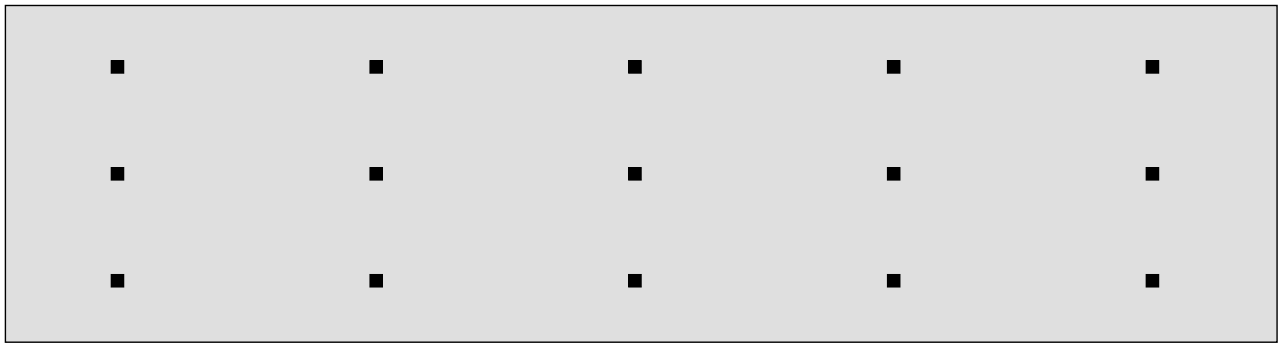
LED Load Array : For each Driver : series = 5, parallel = 1. LED Quantity = 5
Total Driver Quantity = 3 Total LED Quantity = 15



Heatsink

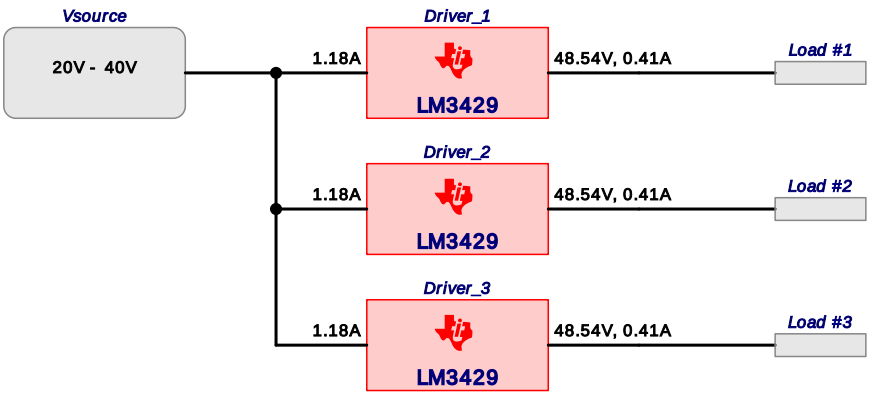
Length : 1821.15 mm
Width : 482.6 mm
Height : 33.32 mm
Total Heatsink Footprint : 878886 mm^2
Total Heatsink Cost : $498.18

Manufacturer : Aavid
Part Number : 62335
ThetaSA : 0.15 C/W



Project Diagram

WEBENCH® LED Architect Project ID : 345 Project ID 345 LED Architect 2015-07-20 22:41:05.966



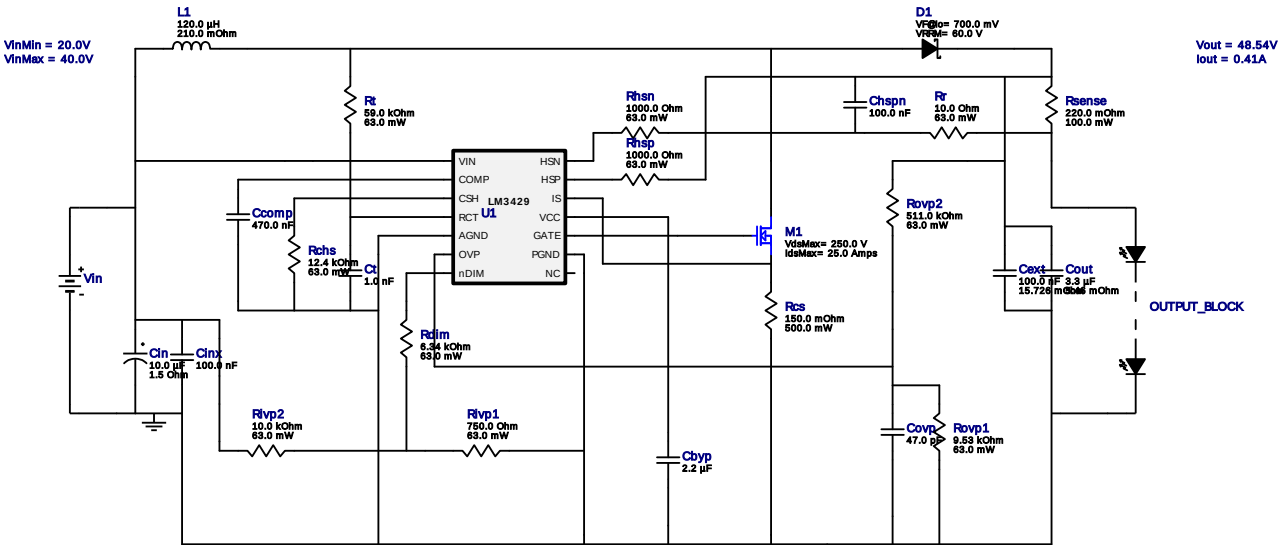
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 20.0V
VinMax = 40.0V
Vout = 48.54V
Iout = 0.41A

Device = LM3429MH/NOPB
Topology = Boost
Created = 7/20/15 10:41:05 PM
BOM Cost = $3.56
Footprint = 568.0 mm^2
BOM Count = 30
Total Pd = 1.62W

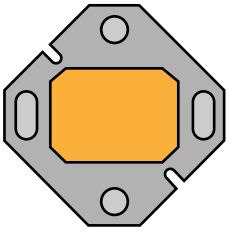
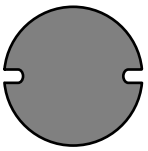
Design : 906020/2114 LM3429MH/NOPB
LM3429MH/NOPB 20.0V-40.0V to 48.54V @ 0.45270260997067446A



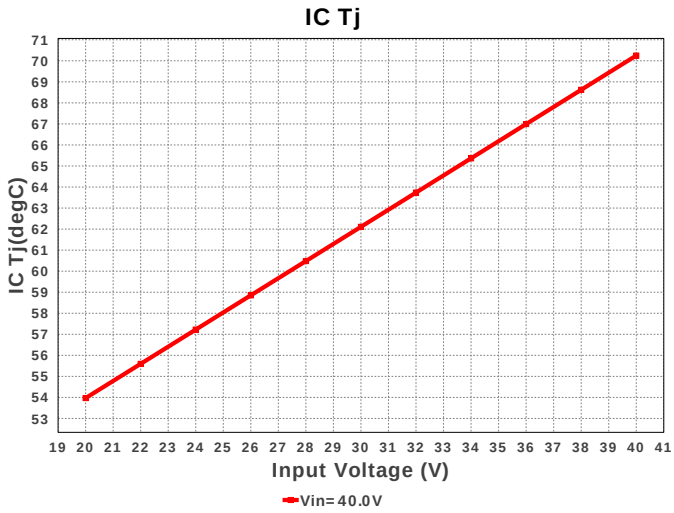
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

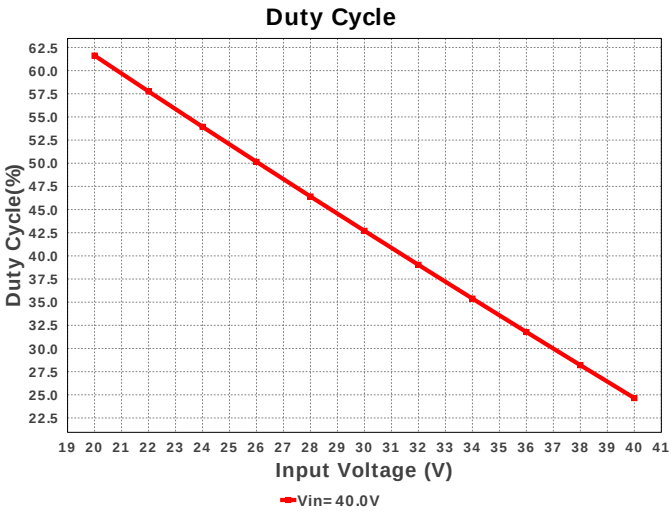
Electrical BOM

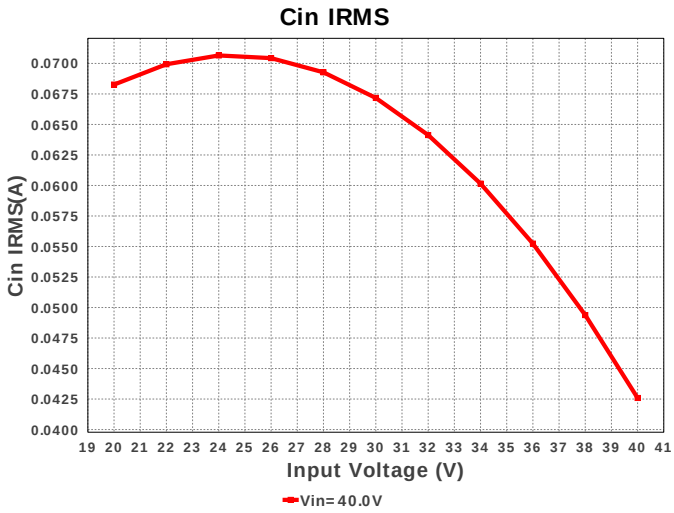
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	Taiyo Yuden	EMK212B7225KG-T Series= X7R	Cap= 2.2 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm^2
2.	Ccomp	MuRata	GRM155C80G474KE01D Series= X6S	Cap= 470.0 nF VDC= 4.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	Cext	TDK	C2012X7R2A104K Series= X7R	Cap= 100.0 nF ESR= 15.726 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm^2
4.	Chspn	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2
5.	Cin	Panasonic	EEE-FK1J100P Series= FK	Cap= 10.0 uF ESR= 1.5 Ohm VDC= 63.0 V IRMS= 80.0 mA	1	$0.13	SM_RADIAL_D 84 mm^2
6.	Cinx	MuRata	GRM188R72A104KA35D Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.03	0603 5 mm^2
7.	Cout	TDK	C3225X7S2A335K200AB Series= X7S	Cap= 3.3 uF ESR= 5.46 mOhm VDC= 100.0 V IRMS= 7.0356 A	1	$0.24	1210 15 mm^2
8.	Covp	Kemet	C0805C470K5GACTU Series= C0G/NP0	Cap= 47.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm^2

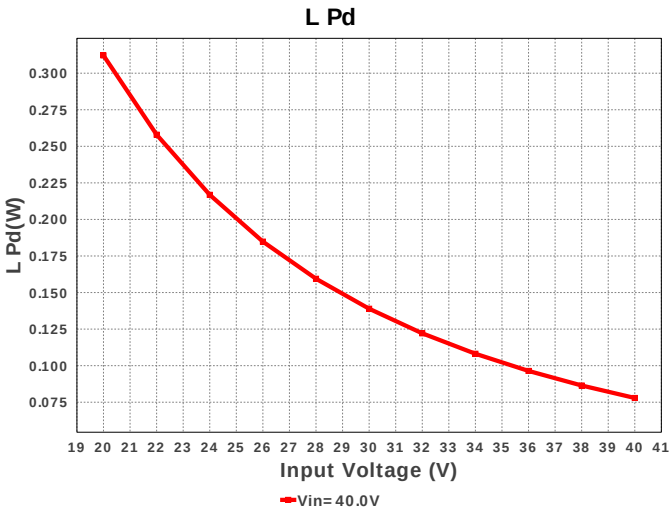
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Ct	Yageo America	CC0805JRNPO9BN102 Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	 0805 7 mm^2
10.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.09	 SMA 37 mm^2
11.	D_LED	SHARP Electronics	GW5BNF15L10	LED	5	$15.41	 gw5b 400 mm^2
12.	L1	Bourns	SDR1307-121KL	L= 120.0 µH DCR= 210.0 mOhm	1	$0.35	 SDR1307 227 mm^2
13.	M1	Infineon Technologies	BSC600N25NS3 G	VdsMax= 250.0 V IdsMax= 25.0 Amps	1	$1.27	 PG-TDSON-8 55 mm^2
14.	Rchs	Vishay-Dale	CRCW040212K4FKED Series= CRCW..e3	Res= 12.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rcs	Rohm	MCR25JZHFLR150 Series= MCR25	Res= 150.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.03	 1210 15 mm^2
16.	Rdim	Vishay-Dale	CRCW04026K34FKED Series= CRCW..e3	Res= 6.34 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rhsn	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
18.	Rhsp	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
19.	Rivp1	Vishay-Dale	CRCW0402750RFKED Series= CRCW..e3	Res= 750.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
20.	Rivp2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
21.	Rovp1	Vishay-Dale	CRCW04029K53FKED Series= CRCW..e3	Res= 9.53 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
22.	Rovp2	Vishay-Dale	CRCW0402511KFKED Series= CRCW..e3	Res= 511.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
23.	Rr	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
24.	Rsense	Panasonic	ERJ-3RQFR22V Series= ERJ-3R	Res= 220.0 mOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.02	 0603 5 mm^2
25.	Rt	Vishay-Dale	CRCW040259K0FKED Series= CRCW..e3	Res= 59.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2

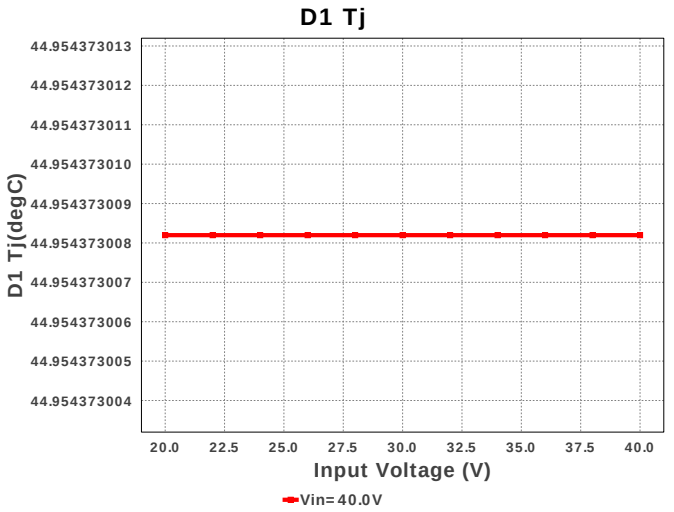
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
26.	U1	Texas Instruments	LM3429MH/NOPB	Switcher	1	$1.20	MXA14A 59 mm²

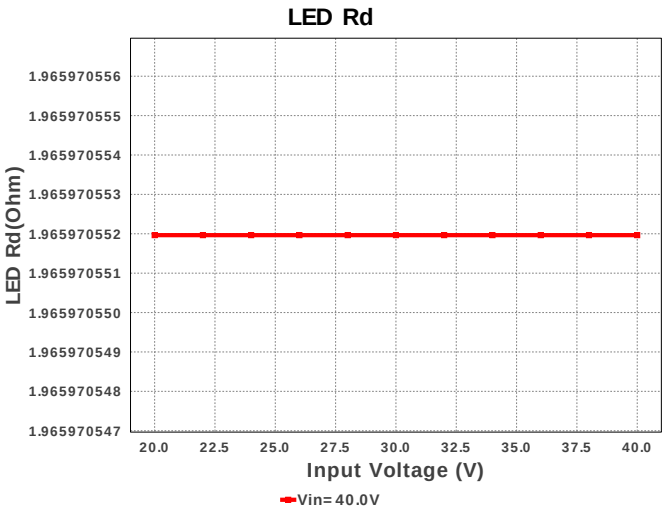




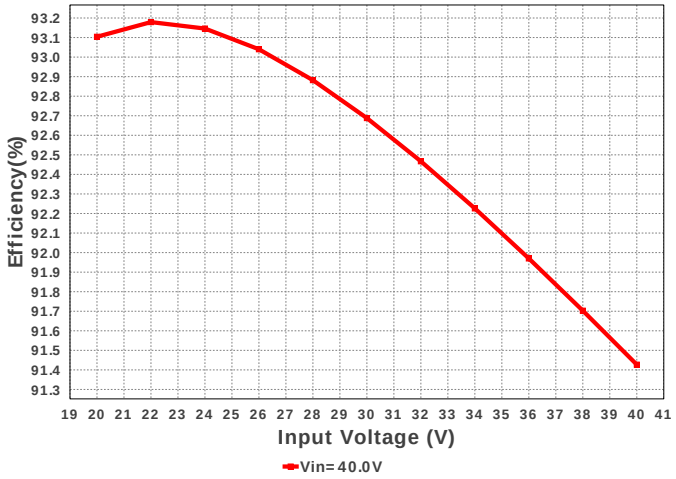




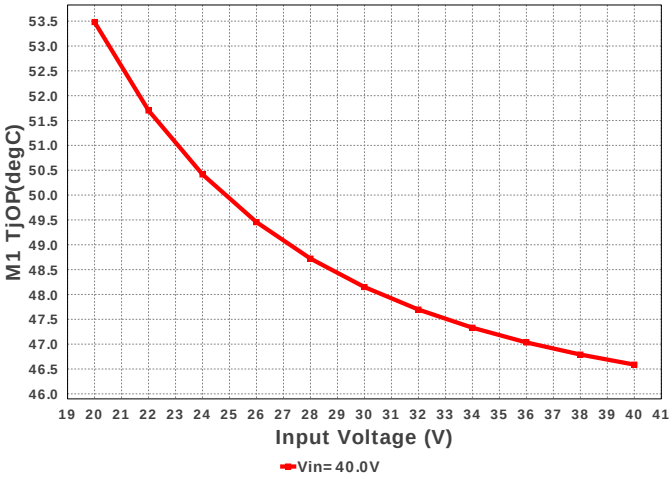




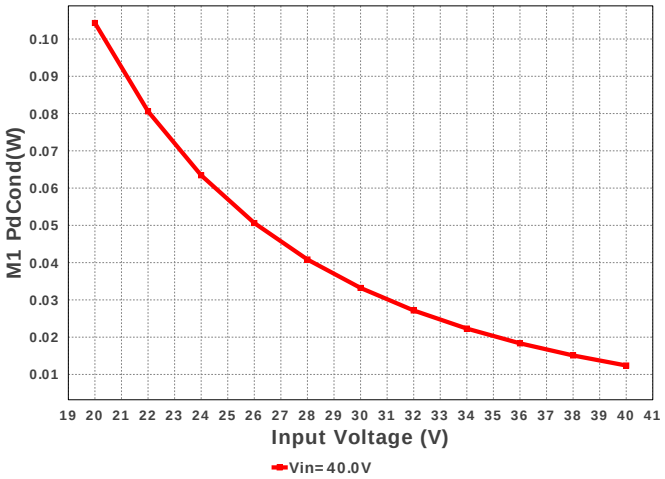
Efficiency



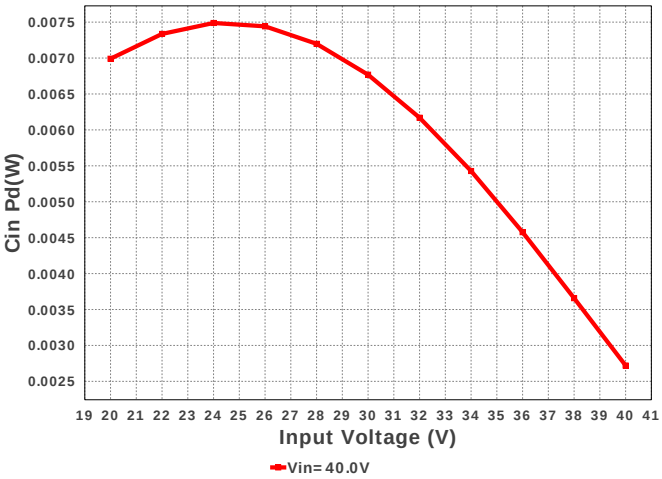
M1 TjOP



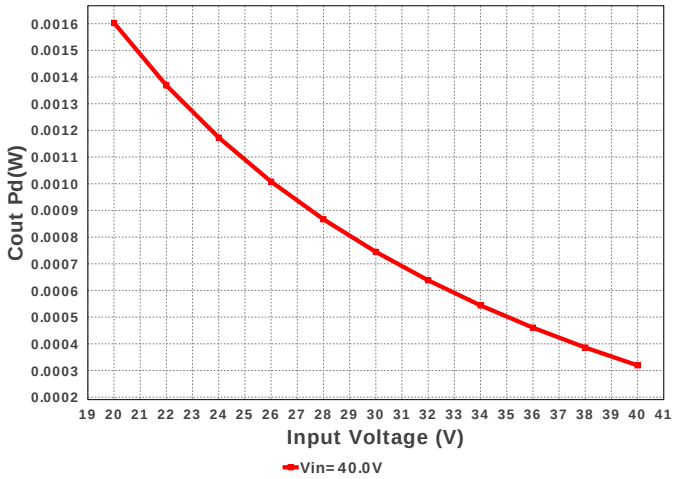
M1 PdCond



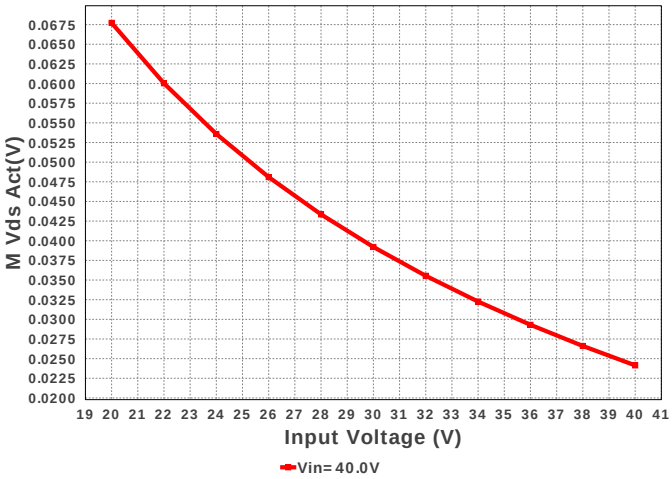
Cin Pd

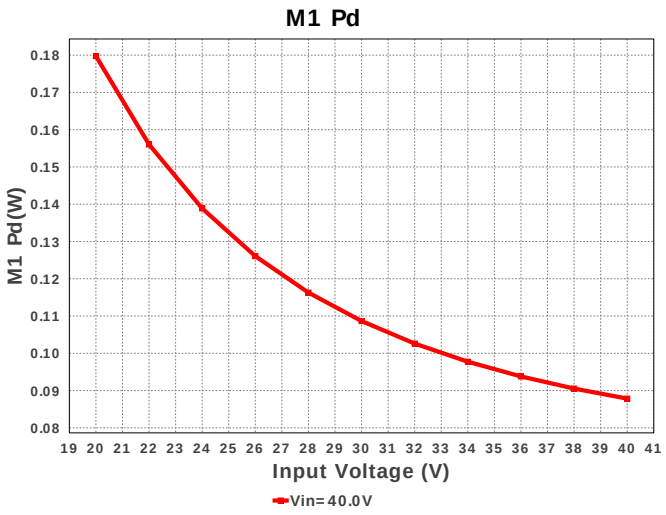


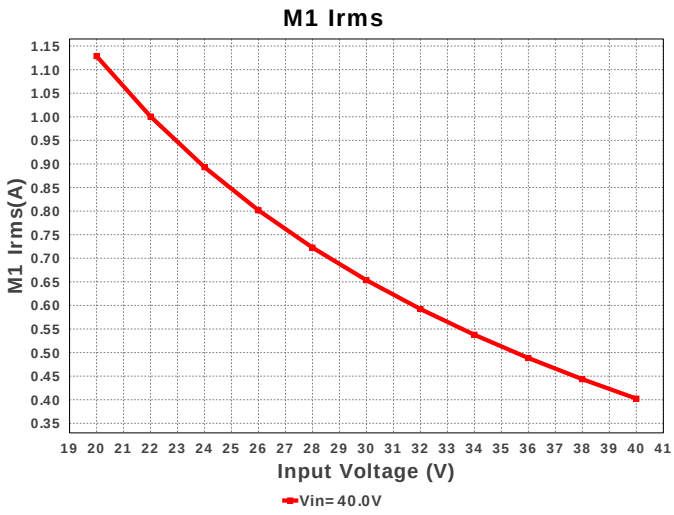
Cout Pd

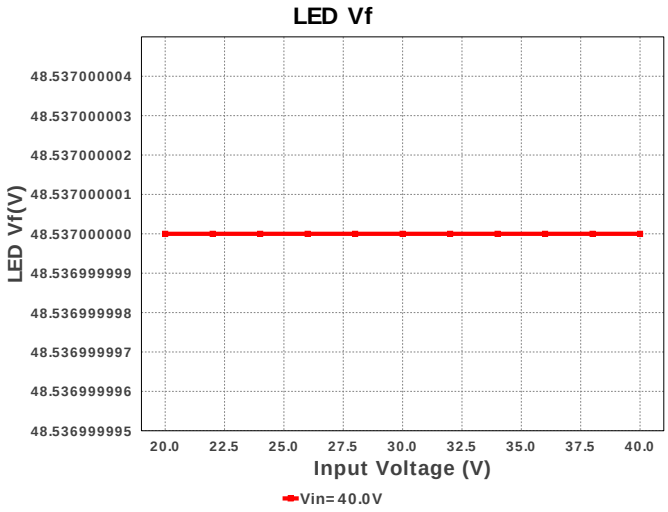


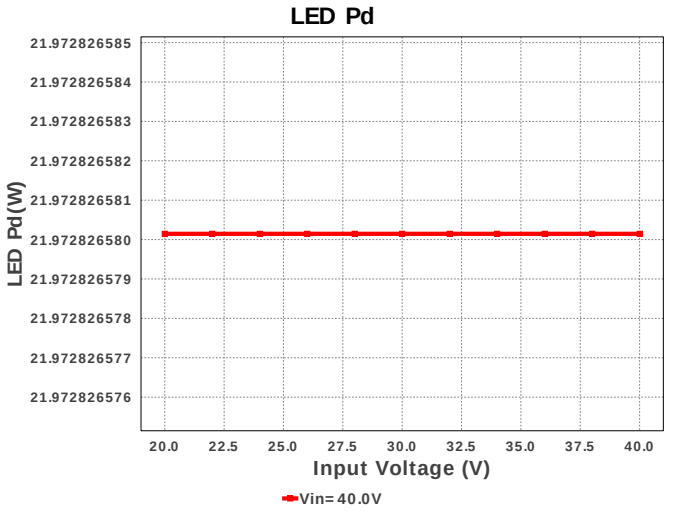
M Vds Act

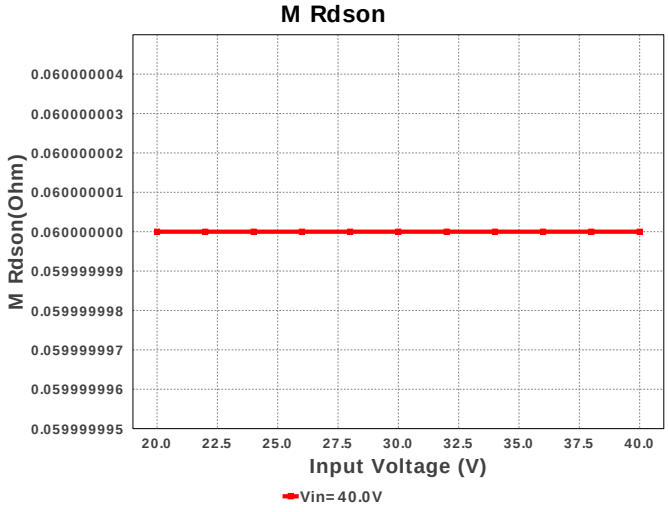


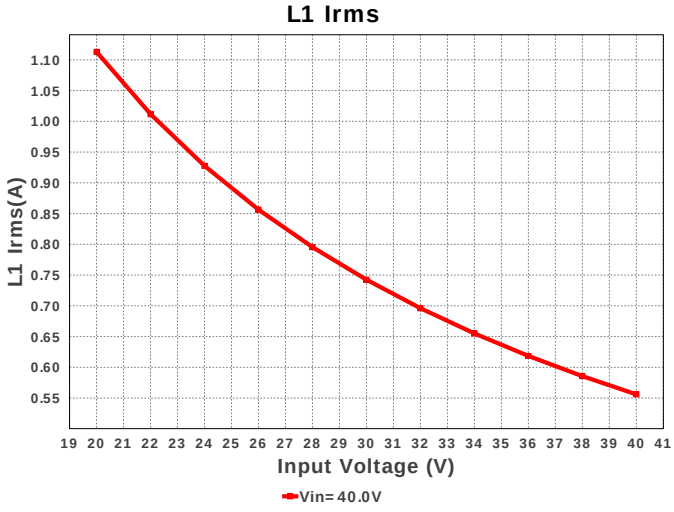


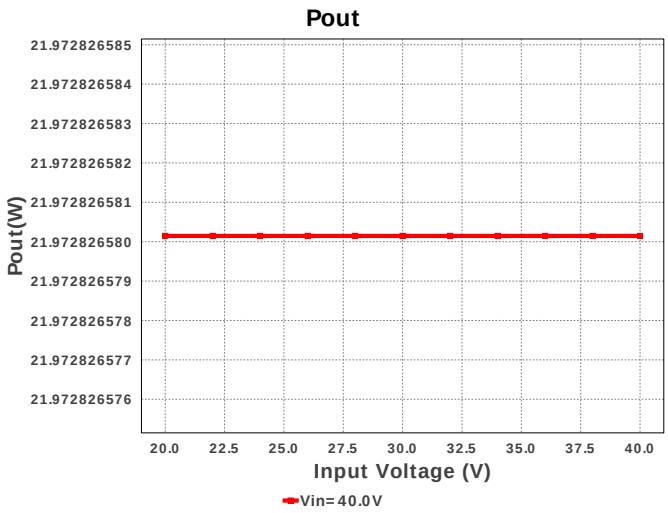


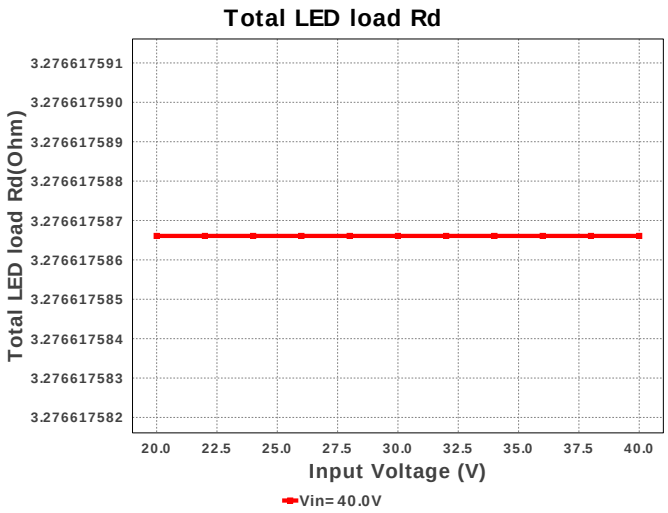


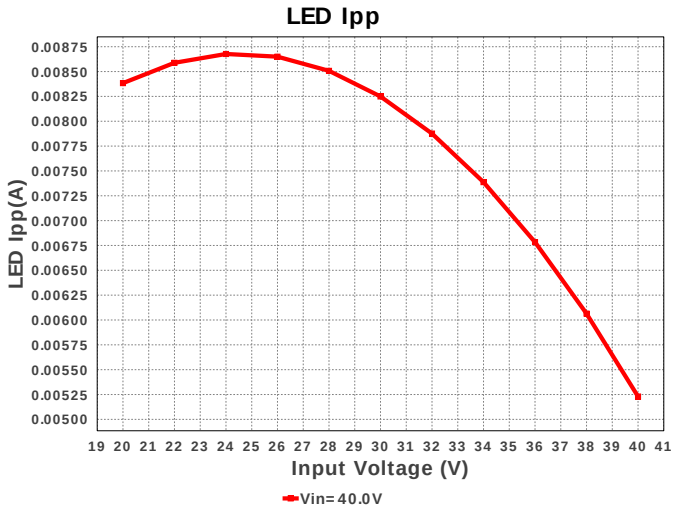


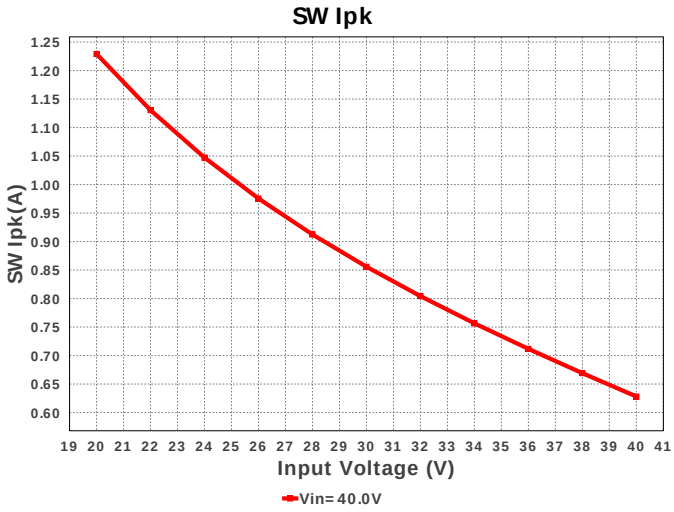


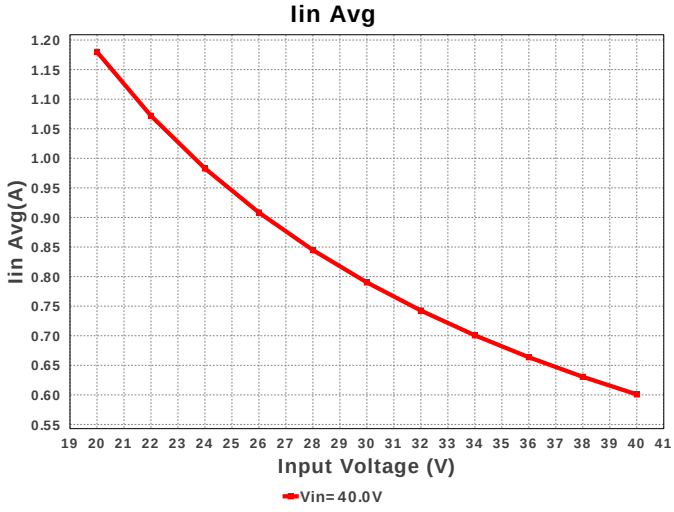


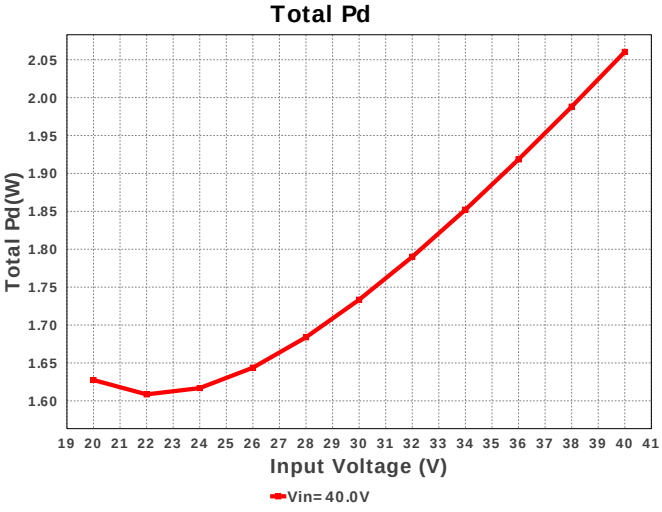


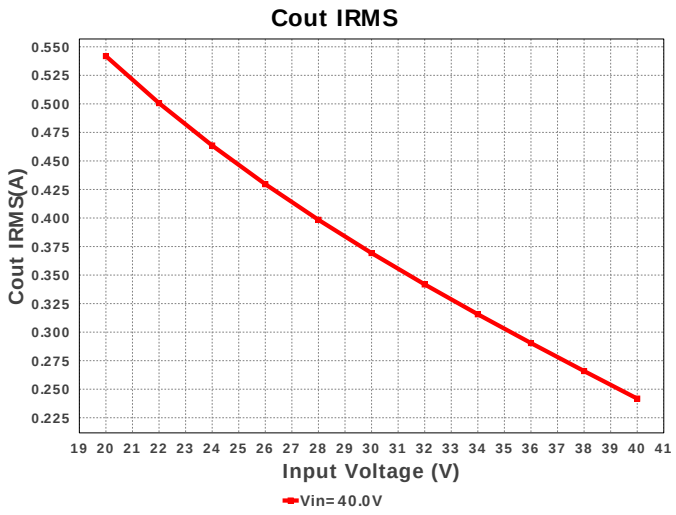


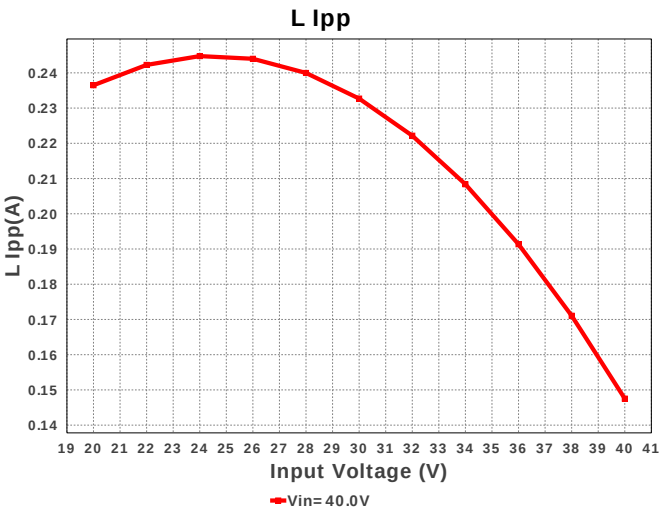


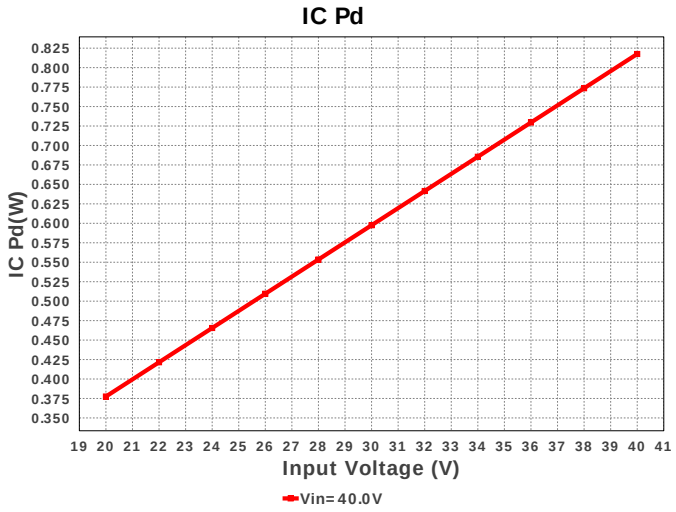


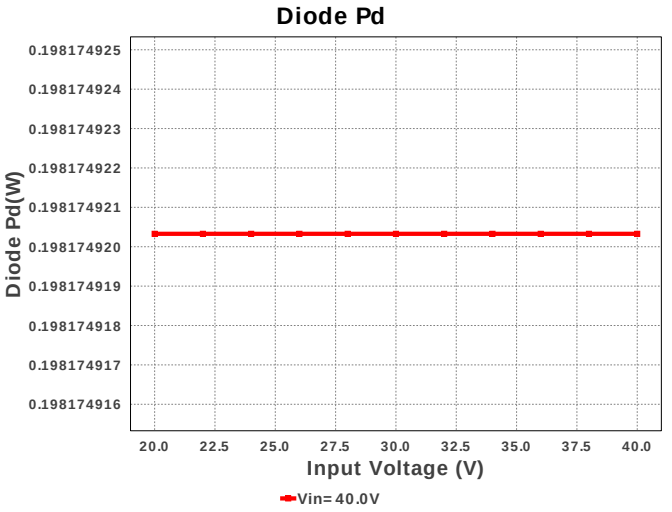


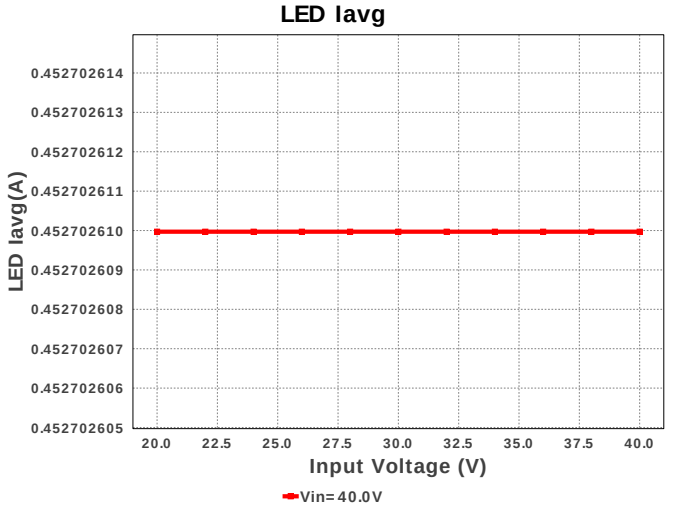


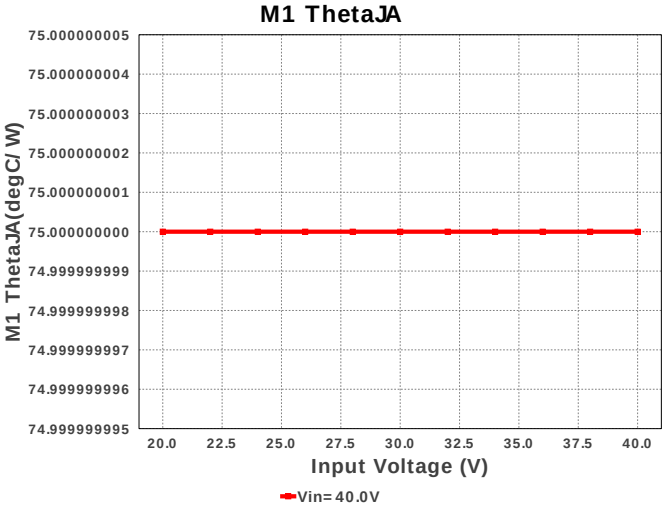


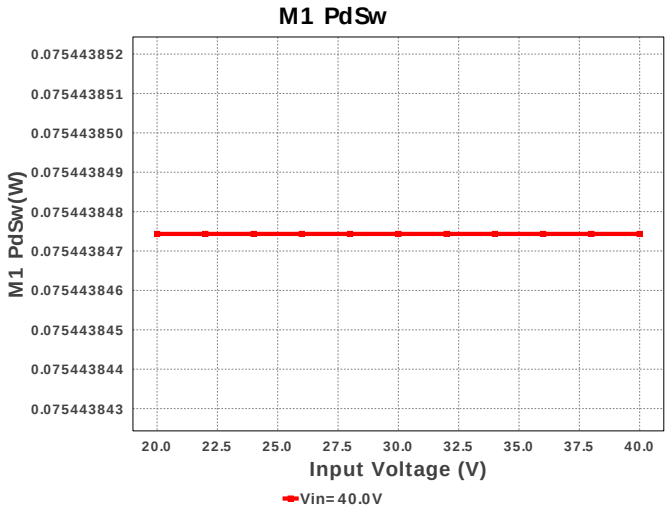












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	68.469 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	541.873 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.18 A	Current	Average input current
4.	L Ipp	237.18 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	1.113 A	Current	Inductor ripple current
6.	LED Iavg	452.703 mA	Current	LED Average Current
7.	LED Ipp	8.408 mA	Current	LED Ripple Current
8.	M1 Irms	1.126 A	Current	M1 MOSFET Irms
9.	SW Ipk	1.229 A	Current	Peak switch current
10.	BOM Count	30	General	Total Design BOM count
11.	FootPrint	568.0 mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	419.492 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	7.659 mV	General	M Vds
16.	M1 ThetaJA	50.0 degC/W	General	MOSFET junction-to-ambient thermal resistance
17.	Pout	21.973 W	General	Total output power
18.	Total BOM	$3.56	General	Total BOM Cost
19.	D1 Tj	45.921 degC	Op_Point	D1 junction temperature
20.	Vout OP	48.537 V	Op_Point	Operational Output Voltage
21.	Duty Cycle	61.614 %	Op_point	Duty cycle
22.	Efficiency	93.131 %	Op_point	Steady state efficiency
23.	IC Tj	54.229 degC	Op_point	IC junction temperature
24.	ICThetaJA	37.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
25.	IOUT_OP	452.703 mA	Op_point	Iout operating point
26.	LED Rd	1.966 Ohm	Op_point	LED DynamicResistance
27.	LED Vf	48.537 V	Op_point	Total LED Forward Calculated Voltage
28.	M1 TjOP	46.015 degC	Op_point	M1 MOSFET junction temperature
29.	VIN_OP	20.0 V	Op_point	Vin operating point
30.	Cin Pd	7.032 mW	Power	Input capacitor power dissipation
31.	Cout Pd	1.603 mW	Power	Output capacitor power dissipation
32.	Diode Pd	236.853 mW	Power	Diode power dissipation
33.	IC Pd	384.569 mW	Power	IC power dissipation
34.	L Pd	312.12 mW	Power	Inductor power dissipation
35.	LED Pd	21.973 W	Power	LED Power Dissipation
36.	M1 Pd	120.295 mW	Power	M1 MOSFET total power dissipation
37.	M1 PdCond	9.352 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	110.943 mW	Power	M1 MOSFET switching losses
39.	Total Pd	1.621 W	Power	Total Power Dissipation
40.	Total LED load Rd	3.277 Ohm	Unknown	Total LED Load DynamicResistance

Design Inputs

#	Name	Value	Description
1.	Iout	410.0 m	Maximum Output Current
2.	Iout1	410.0 m	Output Current #1
3.	VinMax	40.0	Maximum input voltage
4.	VinMin	20.0	Minimum input voltage
5.	Vout	48.537	Output Voltage
6.	Vout1	48.537	Output Voltage #1
7.	application	LED_DRIVER	LED Application
8.	base_pn	LM3429	Texas Instruments Base Part Number

#	Name	Value	Description
9.	isLEDArchitect	Y	LED Architect Project
10.	ledparallel	1.0	Number of LED in parallel
11.	ledpartnumber	GW5BNF15L10	LED Part number
12.	ledseries	5.0	Number of LED in series
13.	line_fsw	NaN	AC Line Frequency
14.	source	DC	Input Source Type
15.	ta	40.0	Ambient temperature

Design Assistance

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