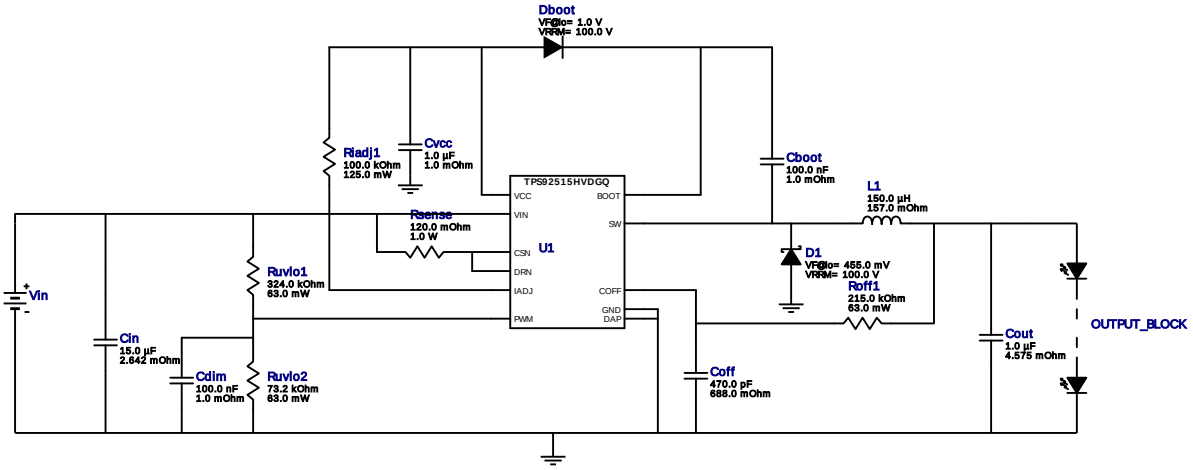
WEBENCH® Design Report

VinMin = 39.5V
VinMax = 42.0V
Vout = 36.0V
Iout = 1.64A

Device = TPS92515HVDGQR
Topology = Buck
Created = 2018-04-02 05:00:28.763
BOM Cost = $5.02
BOM Count = 39
Total Pd = 2.04W

Design : 5018515/15 TPS92515HVDGQR
TPS92515HVDGQR 39.5V-42.0V to 36.00V @ 1.64A

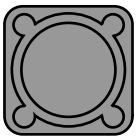


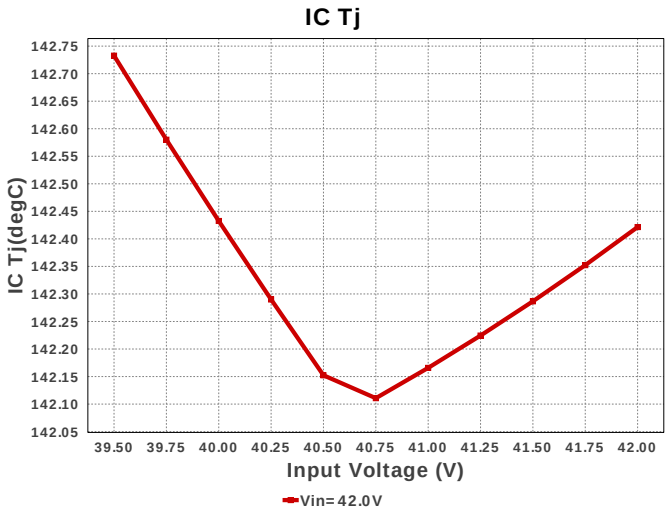
My Comments

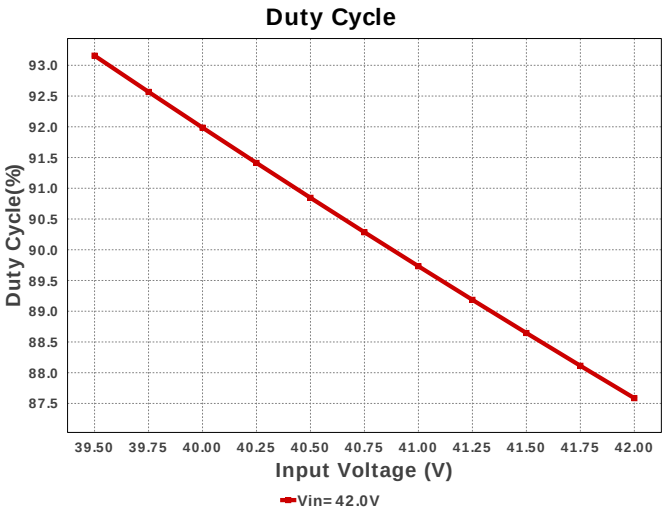
No comments

Electrical BOM

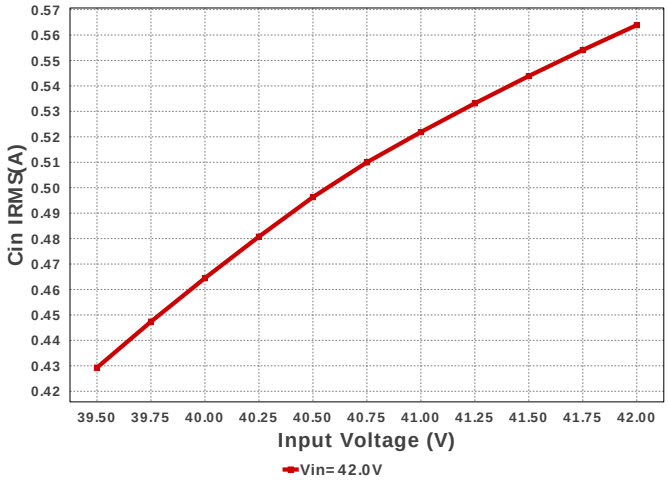
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R61A104KA01D Series= X5R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
2.	Cdim	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF ESR= 1.0 mOhm VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	Cin	TDK	CGA9P3X7S2A156M250KB Series= X7S	Cap= 15.0 uF ESR= 2.642 mOhm VDC= 100.0 V IRMS= 5.6162 A	1	$1.36	2220_280 54 mm^2
4.	Coff	Kemet	C0805C471K5RACTU Series= X7R	Cap= 470.0 pF ESR= 688.0 mOhm VDC= 50.0 V IRMS= 213.0 mA	1	$0.01	0805 7 mm^2
5.	Cout	TDK	C3216X7R2A105K160AA Series= X7R	Cap= 1.0 uF ESR= 4.575 mOhm VDC= 100.0 V IRMS= 3.39639 A	1	$0.14	1206_180 11 mm^2
6.	Cvcc	Kemet	C0603C105Z8VACTU Series= Y5V	Cap= 1.0 uF ESR= 1.0 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm^2
7.	D1	STMicroelectronics	STPS20M100SG-TR	VF@Io= 455.0 mV VRRM= 100.0 V	1	$1.39	DDPAK 210 mm^2
8.	D_LED	CUSTOM	CUSTOM	LED	24	NA	CUSTOM 0 mm^2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Dboot	ON Semiconductor	MMSD4148T1G	VF@Io= 1.0 V VRRM= 100.0 V	1	$0.04	 SOD-123 13 mm^2
10.	L1	Coilcraft	MSS1210-154KEB	L= 150.0 µH DCR= 157.0 mOhm	1	$0.81	 MSS1210 204 mm^2
11.	Riadj1	Panasonic	ERJ-6ENF1003V Series= ERJ-6E	Res= 100.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm^2
12.	Roff1	Vishay-Dale	CRCW0402215KFKED Series= CRCW..e3	Res= 215.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
13.	Rsense	Vishay-Dale	WSLT2010R1200FEB18 Series= WSL...18	Res= 120.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.35	 2010 32 mm^2
14.	Ruvlo1	Vishay-Dale	CRCW0402324KFKED Series= CRCW..e3	Res= 324.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Ruvlo2	Vishay-Dale	CRCW040273K2FKED Series= CRCW..e3	Res= 73.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	U1	Texas Instruments	TPS92515HVDGQR	Switcher	1	$0.85	 DGQ0010E 24 mm^2

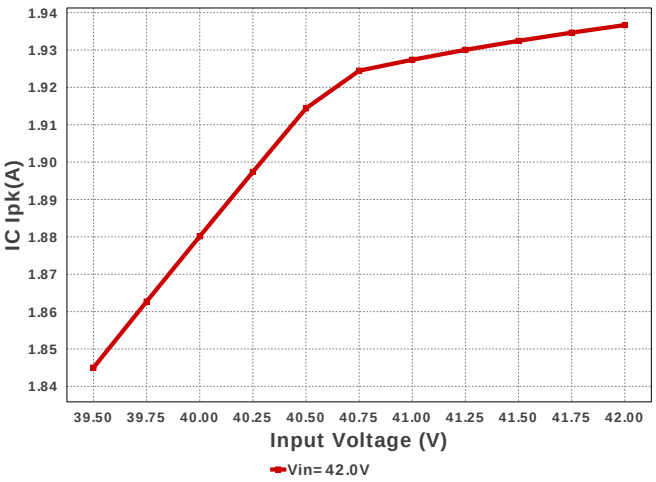




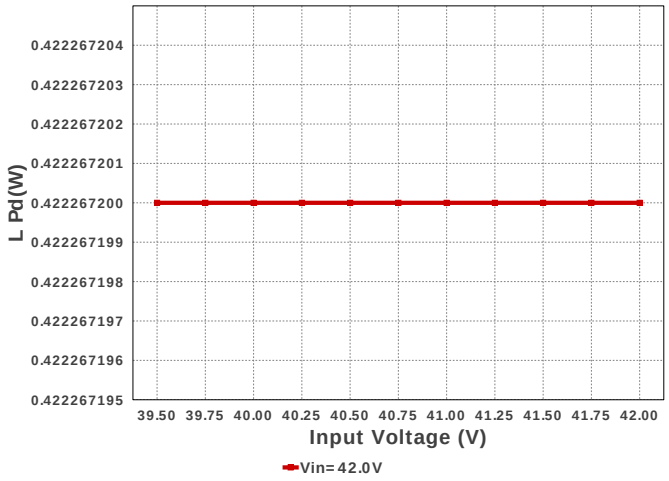
Cin IRMS



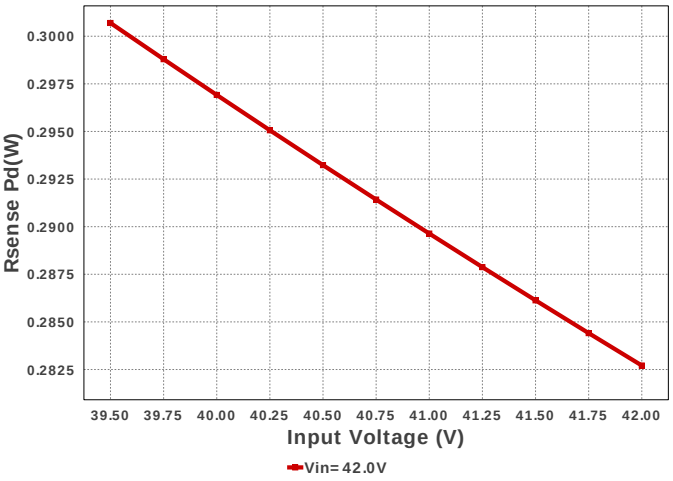
IC Ipk



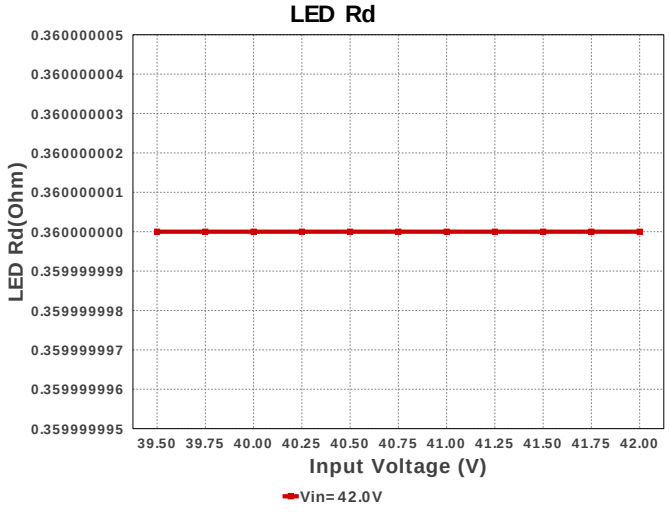
L Pd



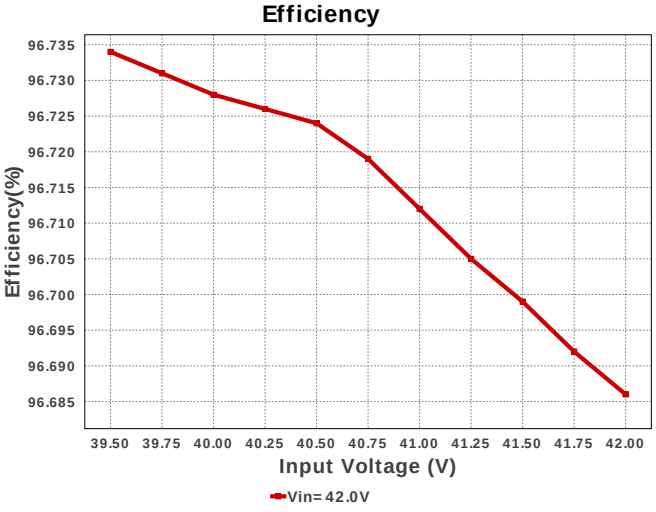
Rsense Pd

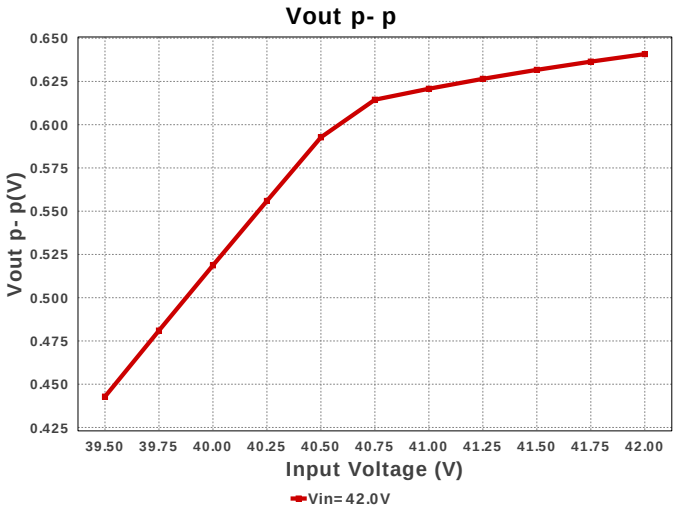


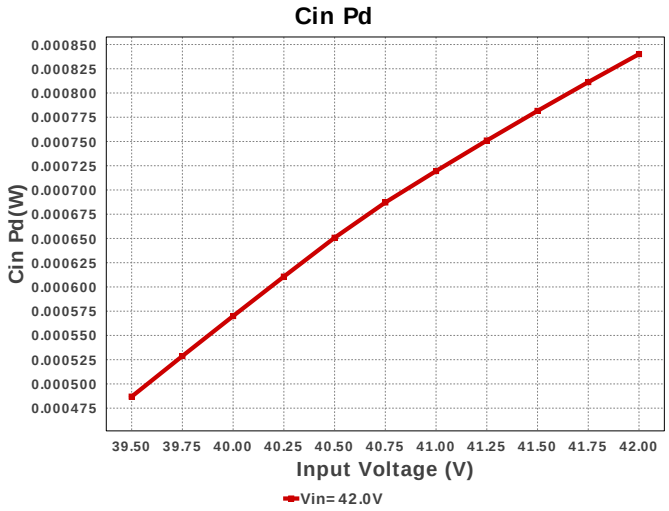
LED Rd

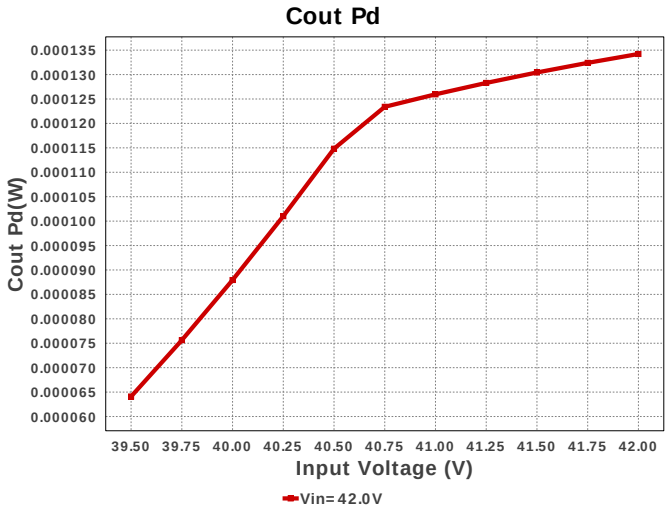


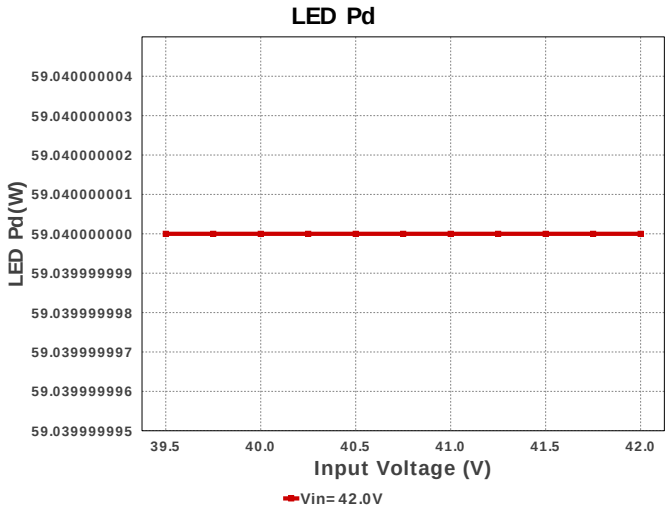
Efficiency

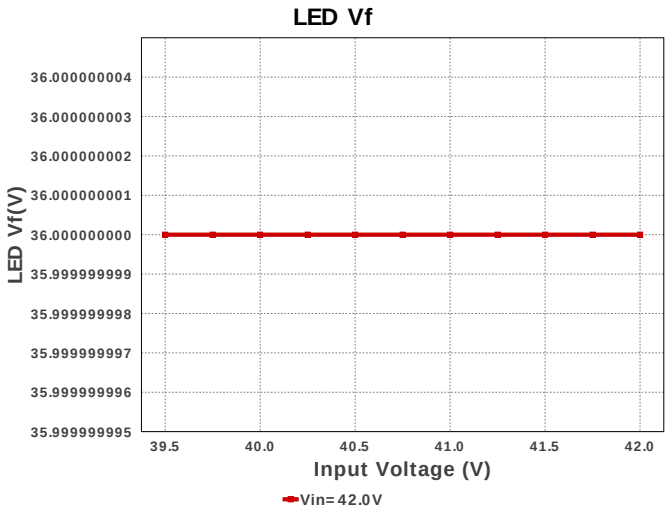


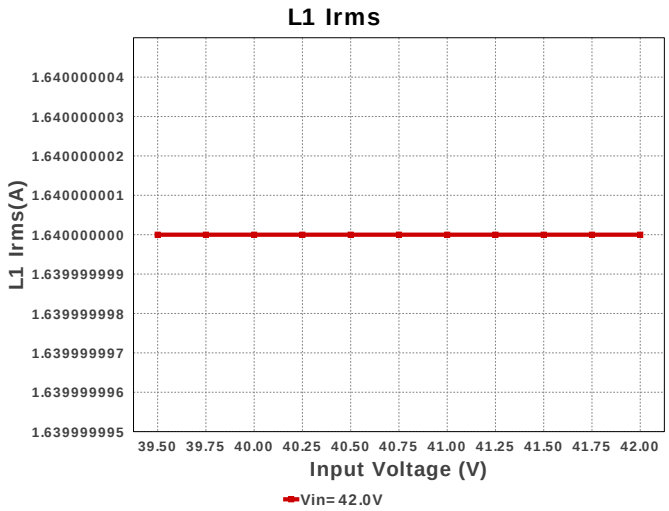


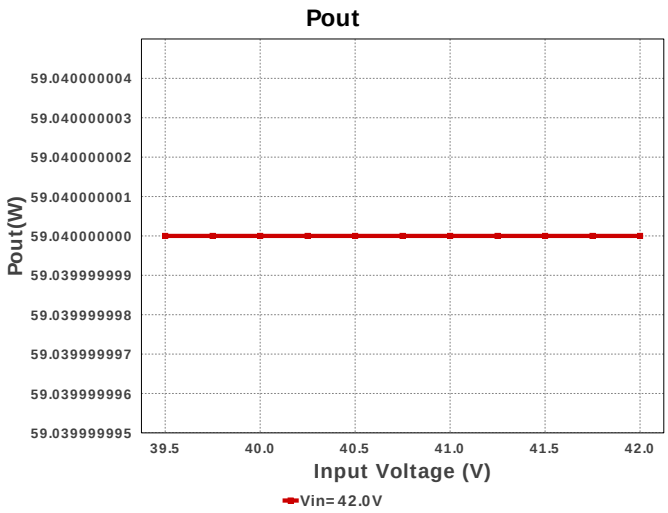


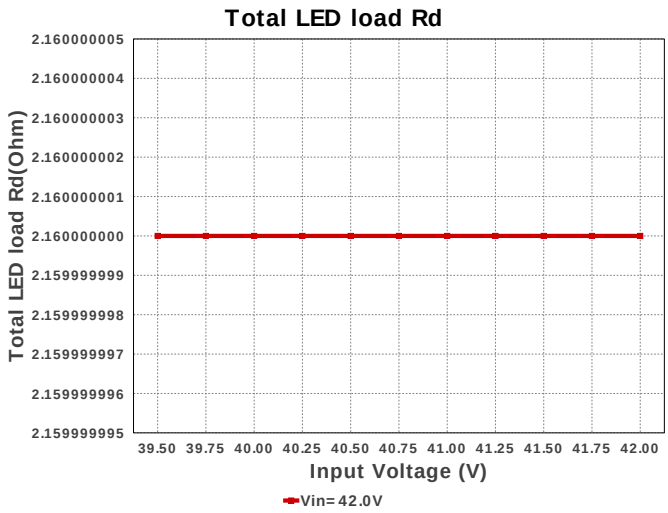


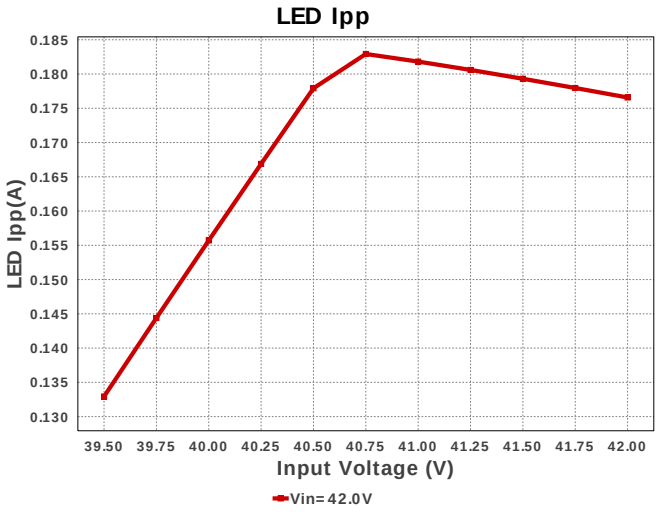


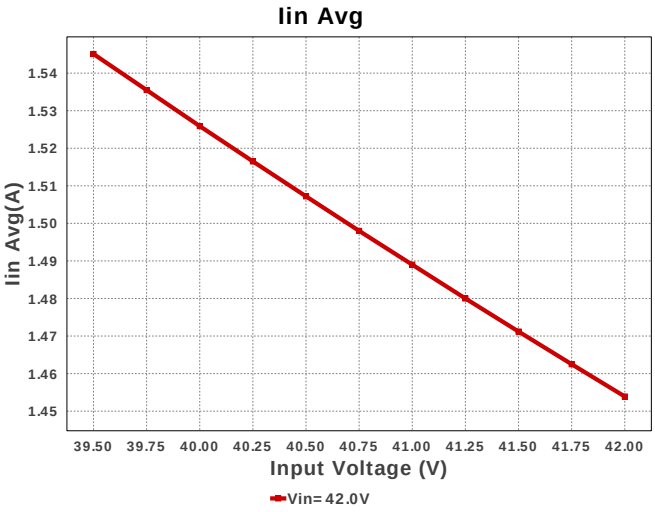


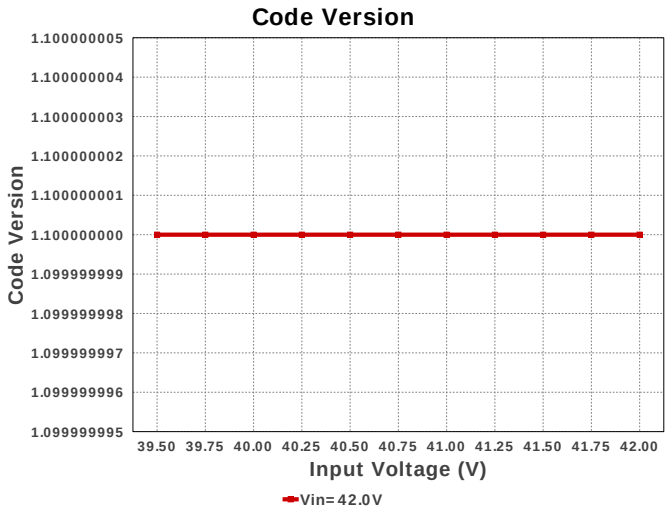


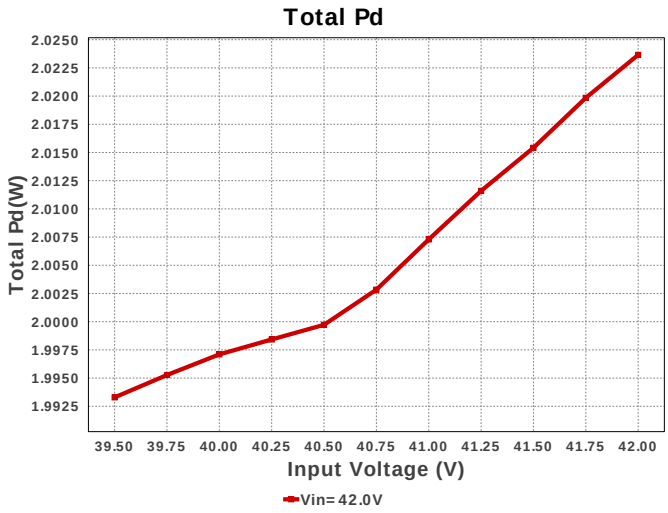


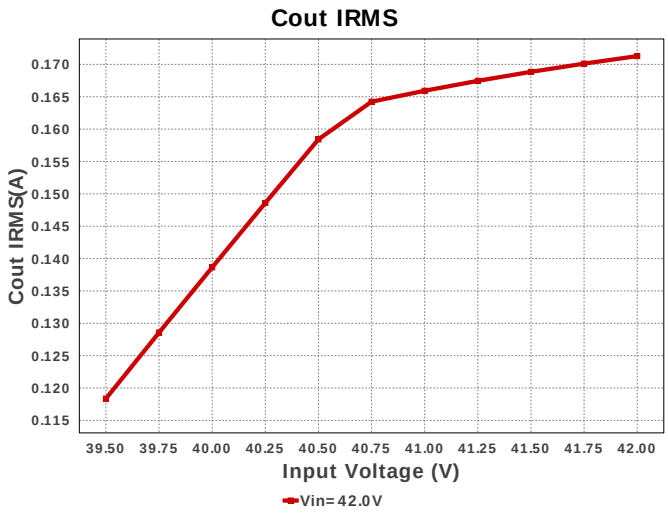


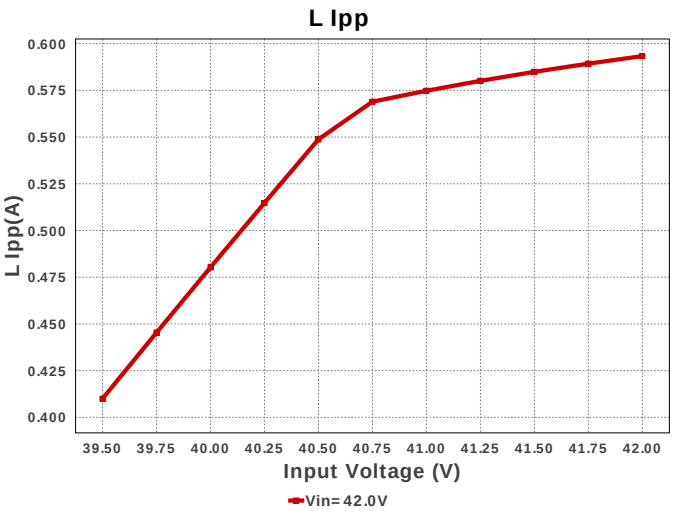


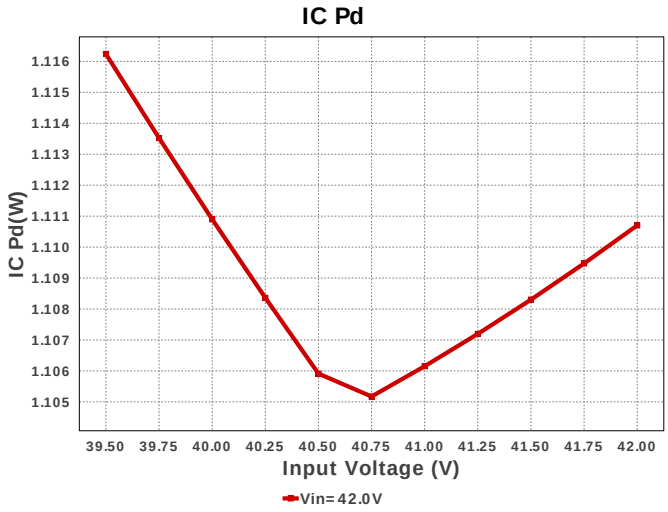


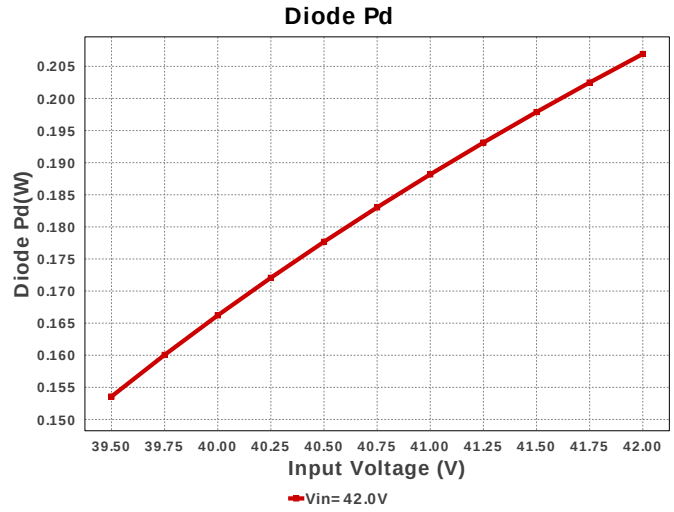


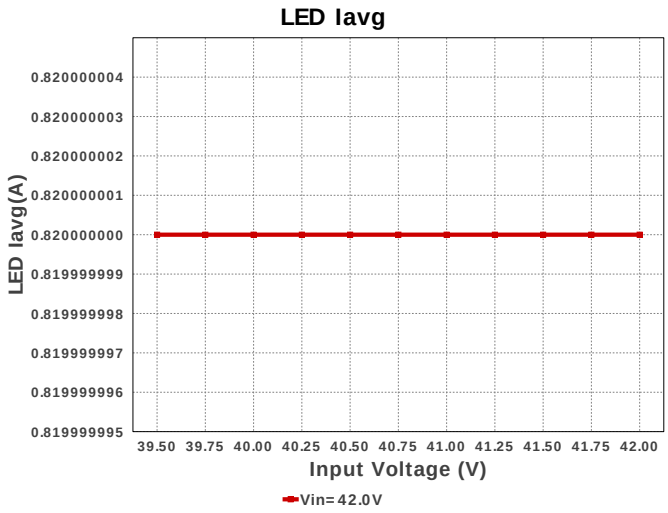


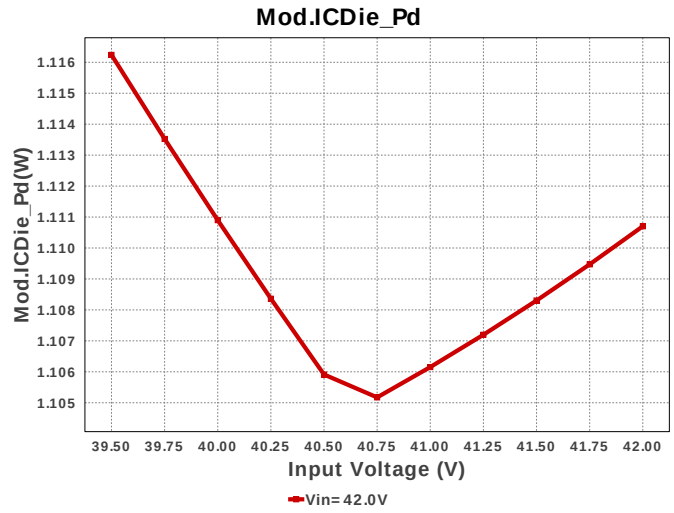












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	563.757 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	171.187 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	1.937 A	Current	Peak switch current in IC
4.	Iin Avg	1.454 A	Current	Average input current
5.	L Ipp	593.01 mA	Current	Peak-to-peak inductor ripple current
6.	L1 Irms	1.64 A	Current	Inductor ripple current
7.	LED Iavg	820.0 mA	Current	LED Average Current
8.	LED Ipp	176.48 mA	Current	LED Ripple Current
9.	BOM Count	39	General	Total Design BOM count
10.	FootPrint	580.0 mm^2	General	Total Foot Print Area of BOM components
11.	Frequency	50.184 kHz	General	Switching frequency

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	59.04 W	General	Total output power
14.	Total BOM	$5.02	General	Total BOM Cost
15.	Duty Cycle	87.592 %	Op Point	Duty cycle
16.	Efficiency	96.666 %	Op Point	Steady state efficiency
17.	IC Tj	142.425 degC	Op Point	IC junction temperature
18.	ICThetaJA	56.2 degC/W	Op Point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	1.64 A	Op Point	Iout operating point
20.	LED Rd	360.0 mOhm	Op Point	LED DynamicResistance
21.	LED Vf	36.0 V	Op Point	Total LED Forward Calculated Voltage
22.	VIN_OP	42.0 V	Op Point	Vin operating point
23.	Vout OP	36.0 V	Op Point	Operational Output Voltage
24.	Vout p-p	640.449 mV	Op Point	Peak-to-peak output ripple voltage
25.	Cin Pd	839.687 µW	Power	Input capacitor power dissipation
26.	Cout Pd	134.07 µW	Power	Output capacitor power dissipation
27.	Diode Pd	219.852 mW	Power	Diode power dissipation
28.	IC Pd	1.111 W	Power	IC power dissipation
29.	L Pd	422.267 mW	Power	Inductor power dissipation
30.	LED Pd	59.04 W	Power	LED Power Dissipation
31.	Module ICPd	1.111 W	Power	IC power dissipation
32.	Rsense Pd	282.731 mW	Power	LED Current Rsns Power Dissipation
33.	Total Pd	2.036 W	Power	Total Power Dissipation
34.	Code Version	1.1		Vin operating point
35.	Total LED load Rd	2.16 Ohm		Total LED Load DynamicResistance

Design Inputs

#	Name	Value	Description
1.	Iout	1.64	Maximum Output Current
2.	VinMax	42.0	Maximum input voltage
3.	VinMin	39.5	Minimum input voltage
4.	Vout	36.0	Output Voltage
5.	application	LED_DRIVER	LED Application
6.	base_pn	TPS92515HV	Base Product Number
7.	LED_Architect	N	LED Architect Project
8.	ledparallel	2.0	Number of LED in parallel
9.	ledpartnumber	Custom	LED Part number
10.	ledseries	12.0	Number of LED in series
11.	line_fsw	60.0	AC Line Frequency
12.	source	DC	Input Source Type
13.	Ta	80.0	Ambient temperature

Design Assistance

1. Feature Highlights: Constant Average Current, up to 2A, 5.5 V to 65 V Input Voltage Range, Simple Constant Off-time Control, No Loop Compensation and fast transient response, Integrated 290mohm(typ) Internal N-Channel FET, Multiple Dimming Methods, Adjustable UVLO, Inherent Cycle-by-Cycle Current Limit, Integrated Thermal Protection

2. **TPS92515HV** Product Folder : http://www.ti.com/product/TPS92515HV : contains the data sheet and other resources.