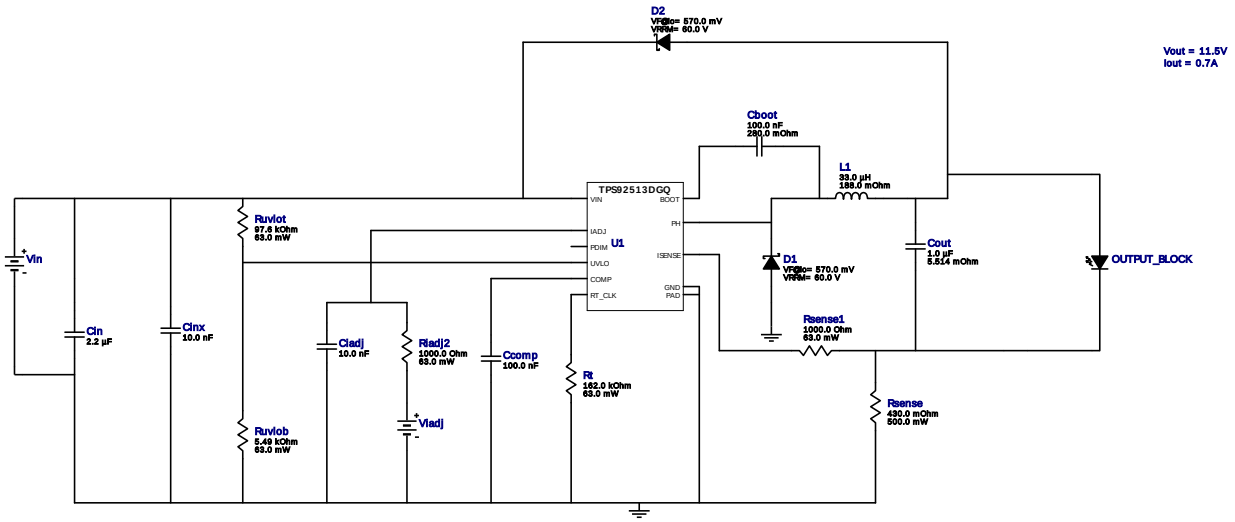
WEBENCH® Design Report

VinMin = 24.0V
VinMax = 32.0V
Vout = 11.5V
Iout = 0.7A

Device = TPS92513DGQR
Topology = Buck
Created = 9/29/16 7:29:06 PM
BOM Cost = $0.96
BOM Count = 17
Total Pd = 0.86W

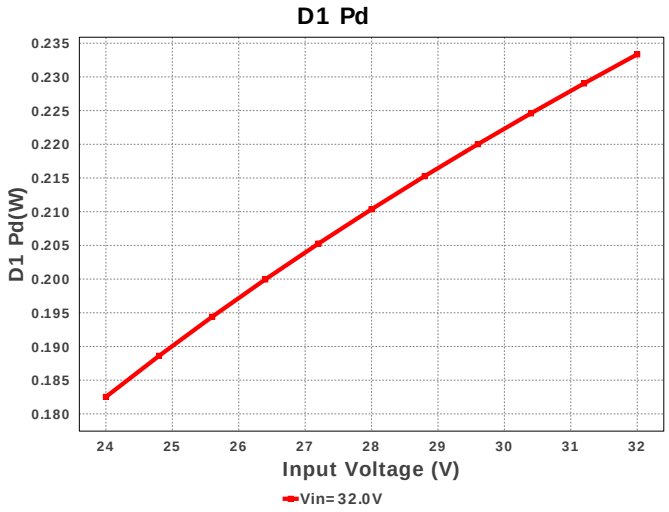
Design : 4807438/1 TPS92513DGQR
TPS92513DGQR 24.0V-32.0V to 11.50V @ 0.7A

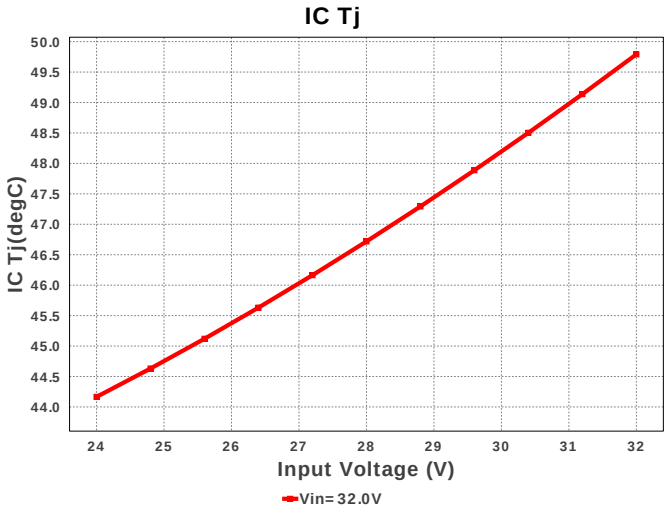


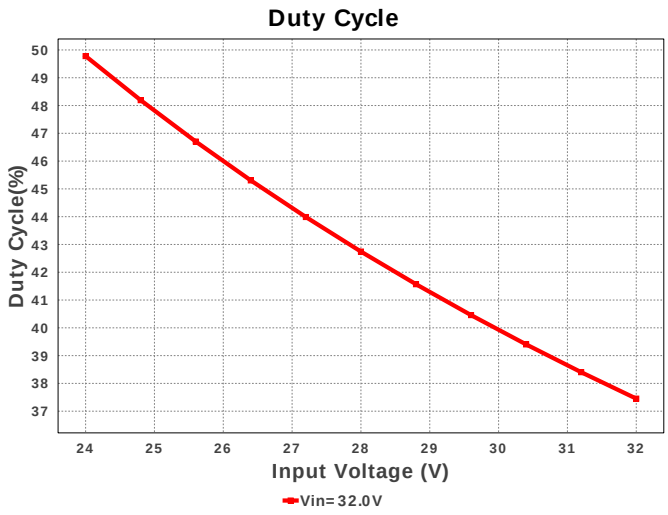
Electrical BOM

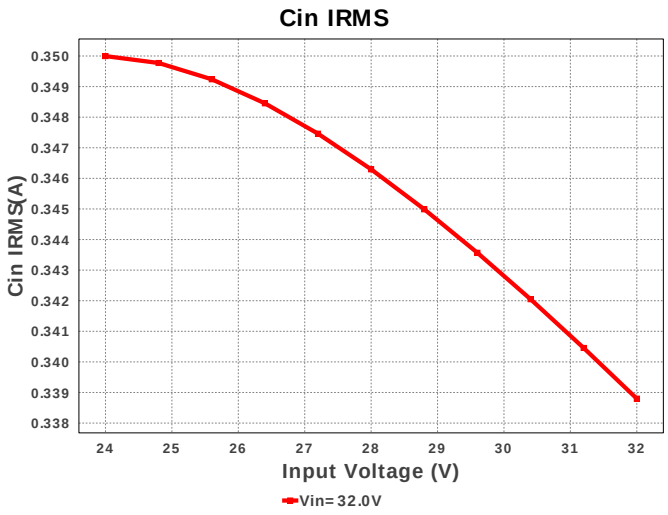
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ciadj	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	Taiyo Yuden	HMK325B7225KN-T Series= X7R	Cap= 2.2 uF VDC= 100.0 V IRMS= 0.0 A	1	$0.13	1210 15 mm²
5.	Cinx	MuRata	GRM188R72A103KA01D Series= X7R	Cap= 10.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.01	0603 5 mm²
6.	Cout	MuRata	GRM21BR71E105KA99L Series= X7R	Cap= 1.0 uF ESR= 5.514 mOhm VDC= 25.0 V IRMS= 1.47583 A	1	$0.02	0805 7 mm²
7.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	SOD-123F 12 mm²
8.	D2	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	SOD-123F 12 mm²
9.	D_LED	Cree	XHP50A-00-0000-0D0BJ40CB	LED	1	$5.18	xlampxhp 0 mm²
10.	L1	Bourns	SRN6045-330M	L= 33.0 µH DCR= 188.0 mOhm	1	$0.16	SRN6045 64 mm²

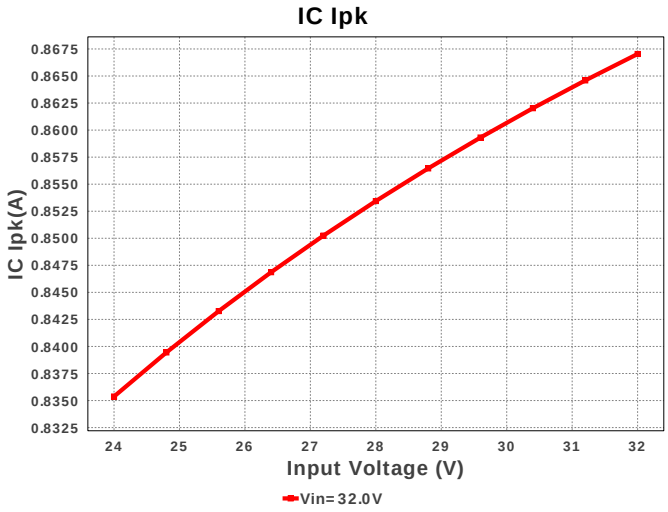
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Riadj2	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	Rsense	Rohm	MCR25JZHFLR430 Series= MCR25	Res= 430.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.03	1210 15 mm^2
13.	Rsense1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	Rt	Vishay-Dale	CRCW0402162KFKED Series= CRCW..e3	Res= 162.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
15.	Ruvlob	Vishay-Dale	CRCW04025K49FKED Series= CRCW..e3	Res= 5.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
16.	Ruvlot	Vishay-Dale	CRCW040297K6FKED Series= CRCW..e3	Res= 97.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
17.	U1	Texas Instruments	TPS92513DGQR	Switcher	1	$0.45	DGQ0010D_NV_N 24 mm^2

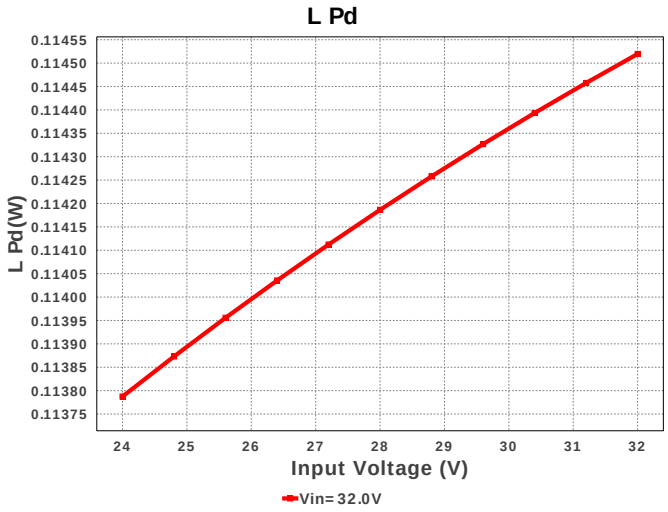


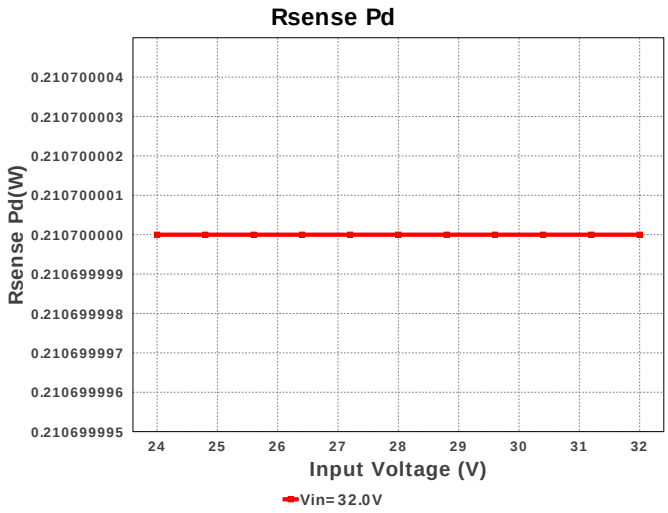


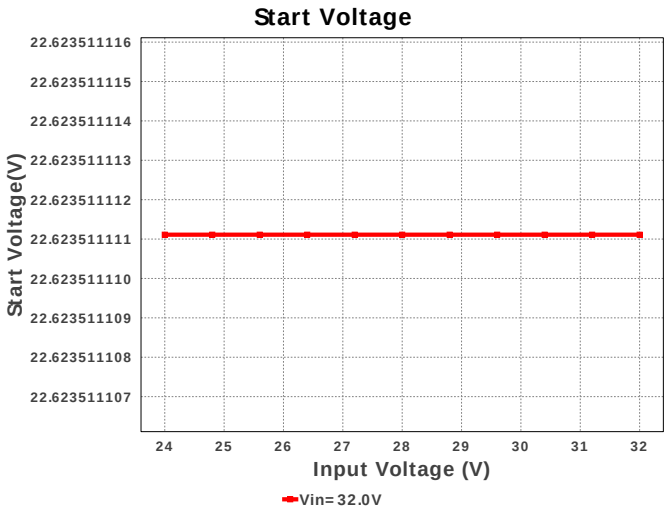




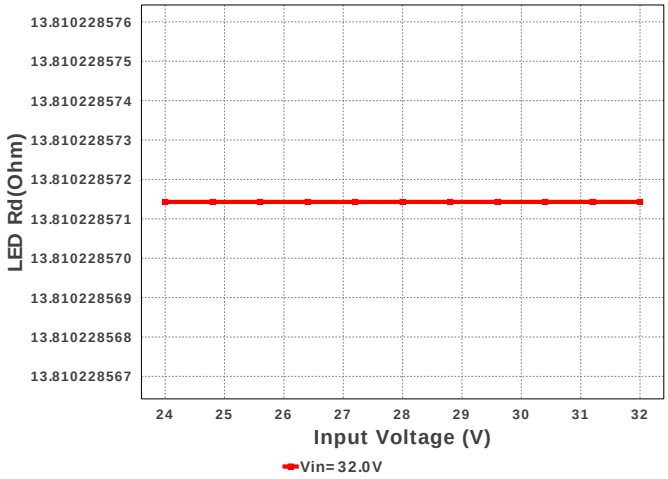




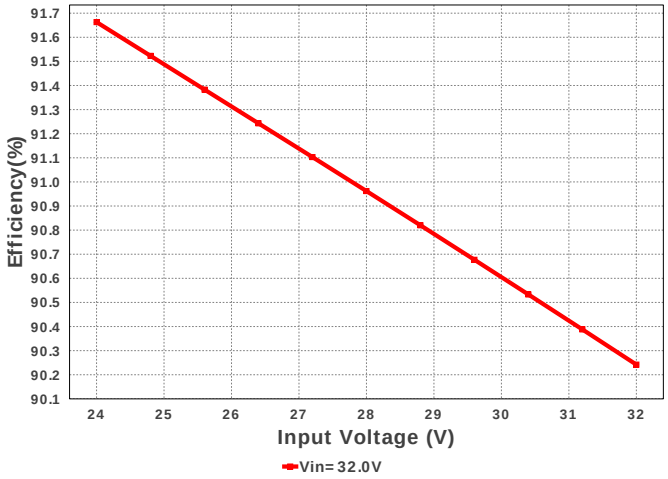




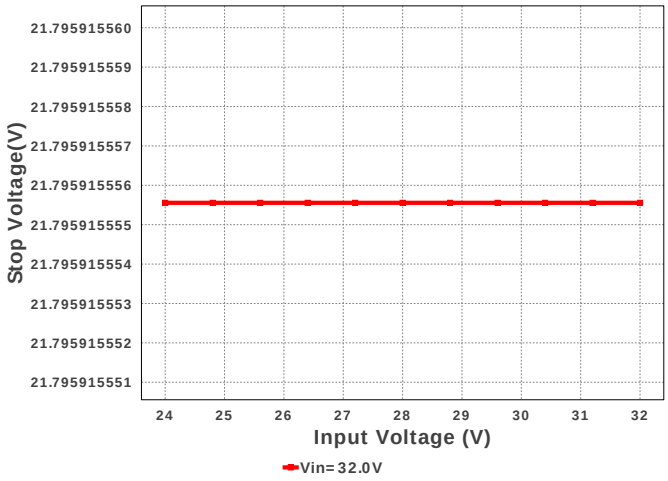
LED Rd



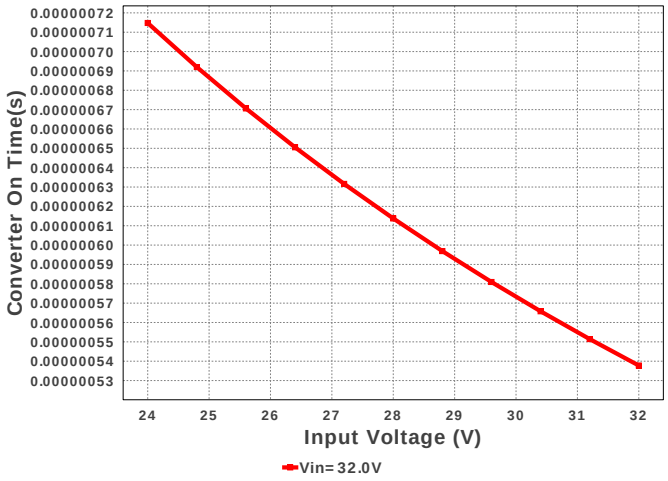
Efficiency



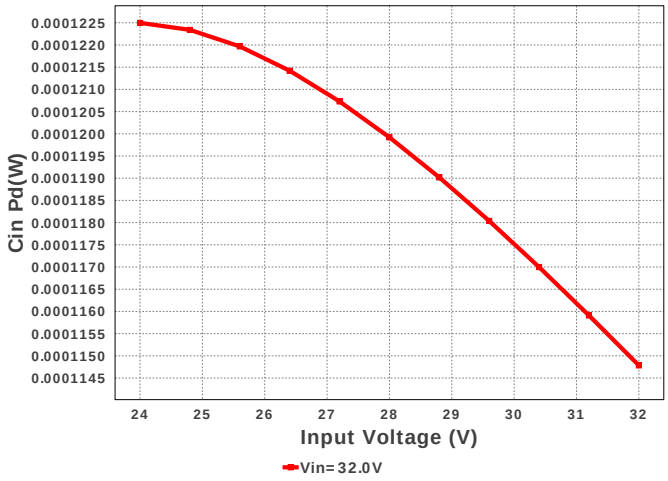
Stop Voltage



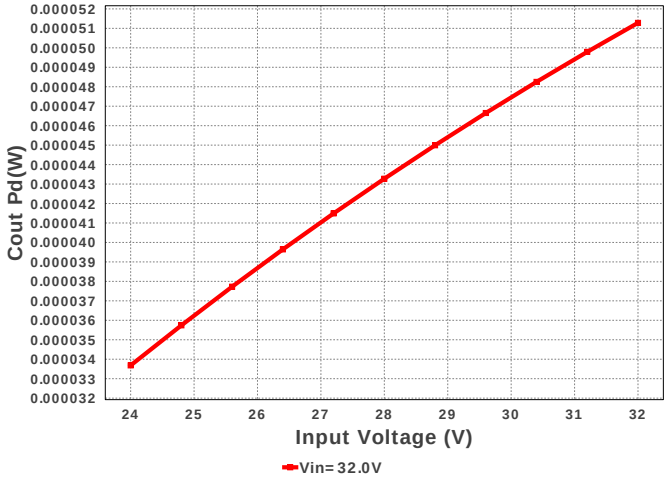
Converter On Time

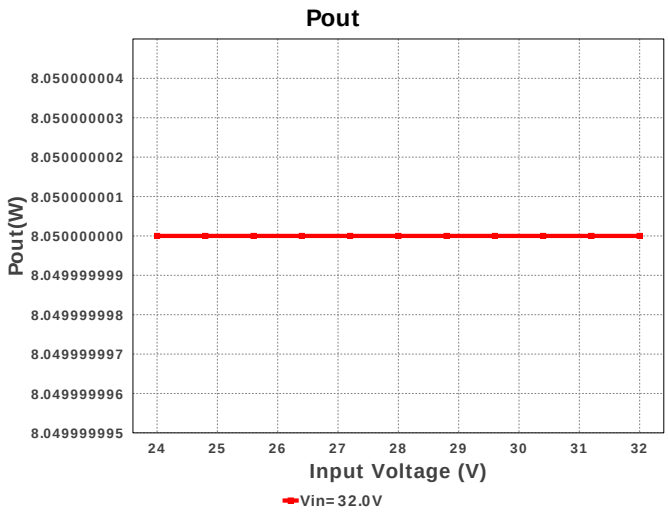


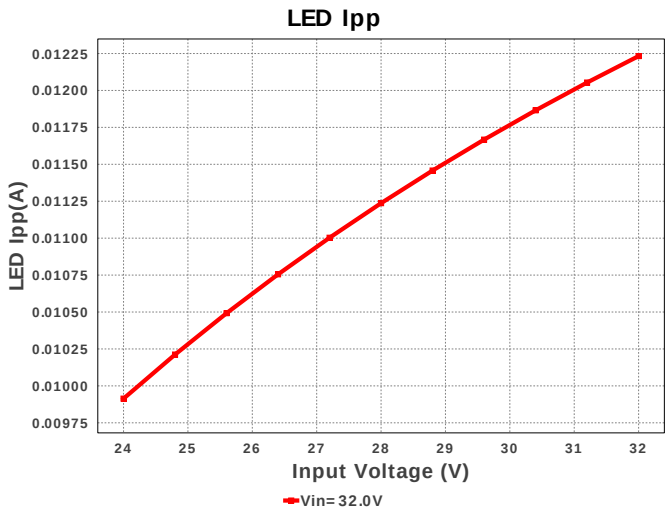
Cin Pd

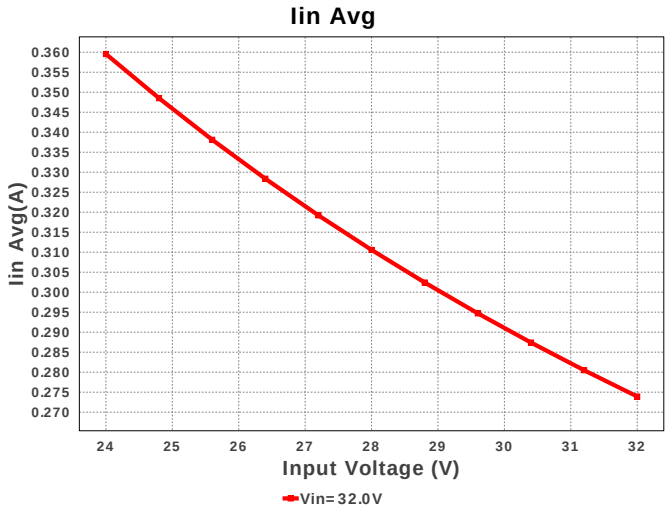


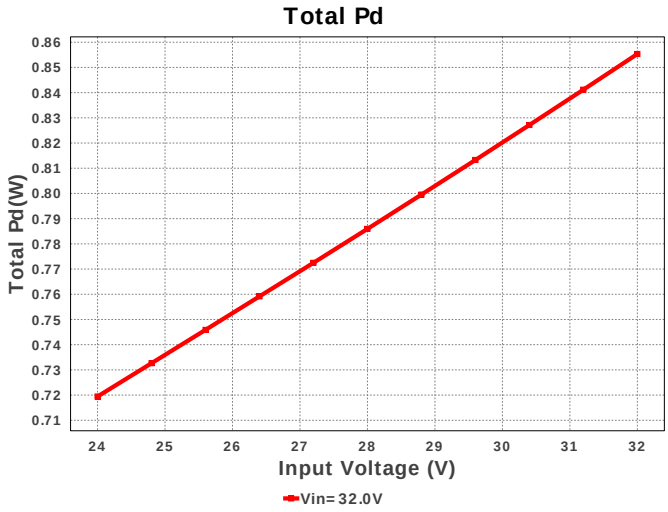
Cout Pd

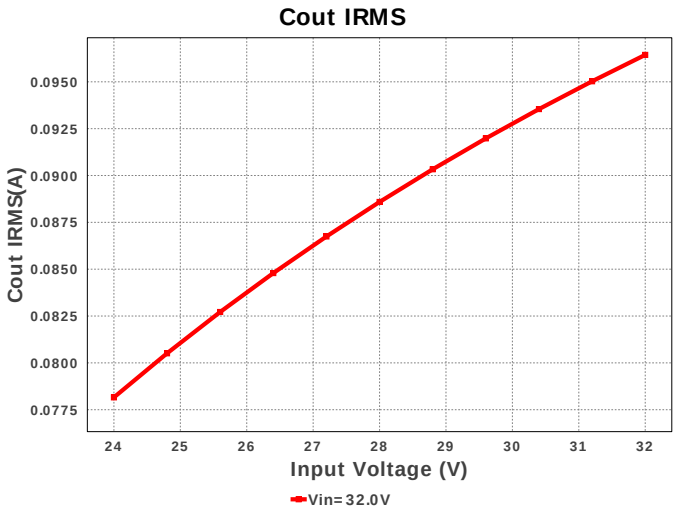


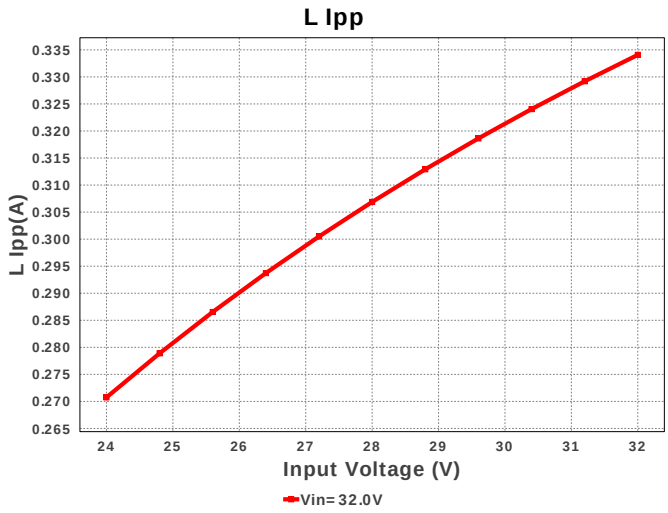


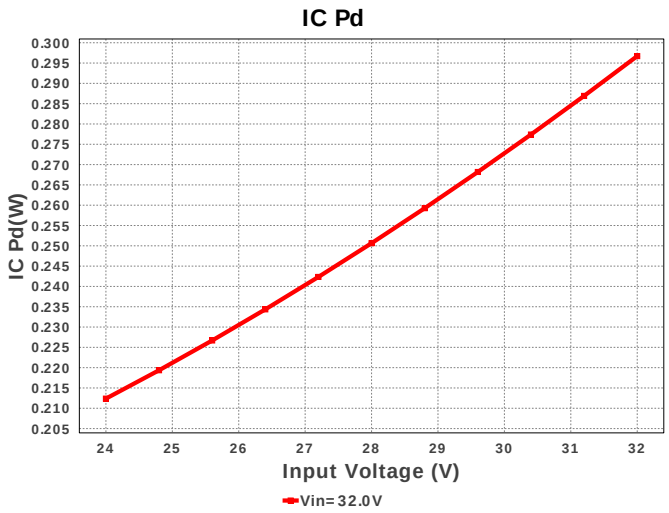


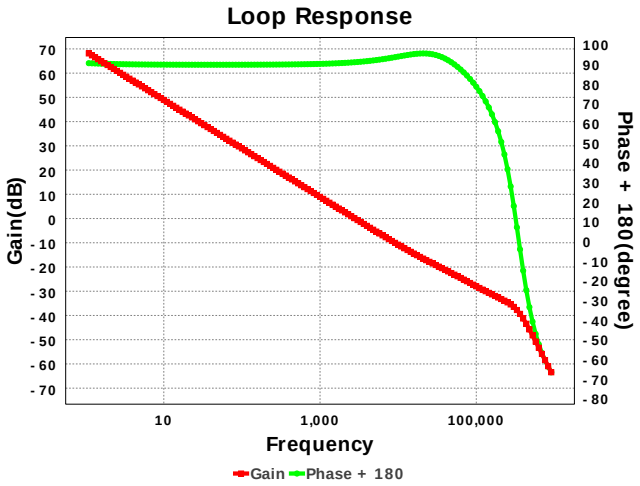












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	338.8 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	95.946 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	866.184 mA	Current	Peak switch current in IC
4.	Iin Avg	273.92 mA	Current	Average input current
5.	L Ipp	332.37 mA	Current	Peak-to-peak inductor ripple current
6.	LED Ipp	12.17 mA	Current	LED Ripple Current
7.	BOM Count	17	General	Total Design BOM count
8.	FootPrint	187.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	696.429 kHz	General	Switching frequency
10.	IC Tolerance	0.0 V	General	IC Feedback Tolerance
11.	Mode	CCM	General	Conduction Mode
12.	Pout	8.05 W	General	Total output power
13.	Total BOM	$0.96	General	Total BOM Cost
14.	Vout OP	11.5 V	Op_Point	Operational Output Voltage
15.	Cross Freq	2.799 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	37.452 %	Op_point	Duty cycle
17.	Efficiency	90.242 %	Op_point	Steady state efficiency
18.	IC Tj	49.791 degC	Op_point	IC junction temperature
19.	ICThetaJA	66.7 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	700.0 mA	Op_point	Iout operating point
21.	LED Rd	13.81 Ohm	Op_point	LED DynamicResistance
22.	Phase Marg	90.432 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	32.0 V	Op_point	Vin operating point
24.	Cin Pd	114.785 µW	Power	Input capacitor power dissipation
25.	Cout Pd	50.76 µW	Power	Output capacitor power dissipation
26.	D1 Pd	233.347 mW	Power	Output Diode Power Dissipation
27.	IC Pd	296.712 mW	Power	IC power dissipation
28.	L Pd	114.498 mW	Power	Inductor power dissipation
29.	Rsense Pd	210.7 mW	Power	LED Current Rsns Power Dissipation
30.	Total Pd	855.332 mW	Power	Total Power Dissipation
31.	Start Voltage	22.624 V	UVLO	Start Voltage with External UVLO Resistors
32.	Stop Voltage	21.796 V	UVLO	Stop Voltage with External UVLO Resistors
33.	Converter On Time	535.032 ns		Approximate Converter On Time

Design Inputs

#	Name	Value	Description
1.	Iout	700.0 m	Maximum Output Current
2.	VinMax	32.0	Maximum input voltage
3.	VinMin	24.0	Minimum input voltage
4.	Vout	11.5	Output Voltage
5.	application	LED_DRIVER	LED Application
6.	base_pn	TPS92513	Base Product Number
7.	LED_Architect	N	LED Architect Project
8.	ledparallel	1.0	Number of LED in parallel
9.	ledpartnumber	XHP50A-00-0000-0D0BL400E	LED Part number
10.	ledseries	1.0	Number of LED in series
11.	line_fsw	60.0	AC Line Frequency
12.	source	DC	Input Source Type
13.	Ta	30.0	Ambient temperature

Design Assistance

1. **TPS92513** Product Folder : http://www.ti.com/product/TPS92513 : contains the data sheet and other resources.