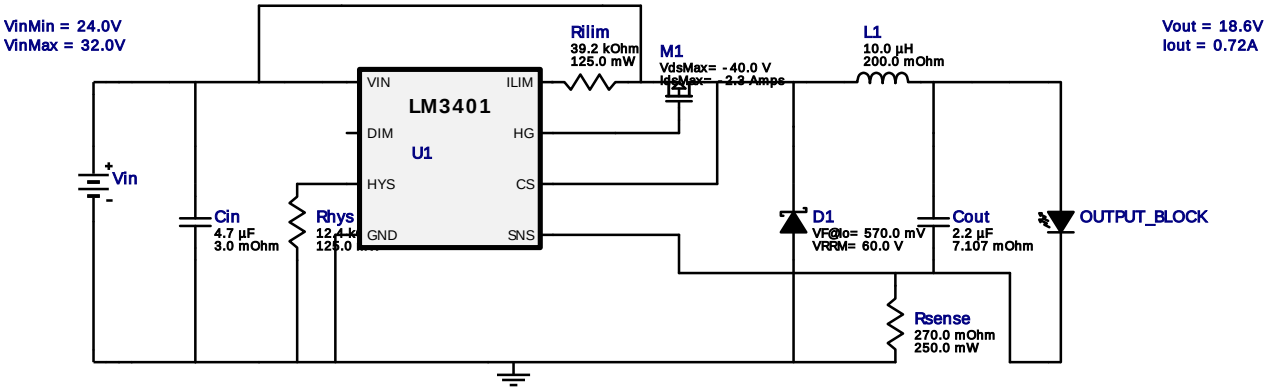
WEBENCH® Design Report

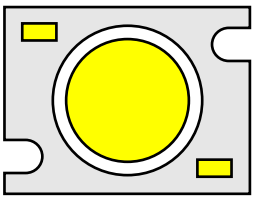
VinMin = 24.0V
VinMax = 32.0V
Vout = 18.6V
Iout = 0.72A

Device = LM3401MM/NOPB
Topology = Buck
Created = 6/8/15 8:48:07 PM
BOM Cost = $0.00
Footprint = 621.0 mm²
BOM Count = 10
Total Pd = 0.81W

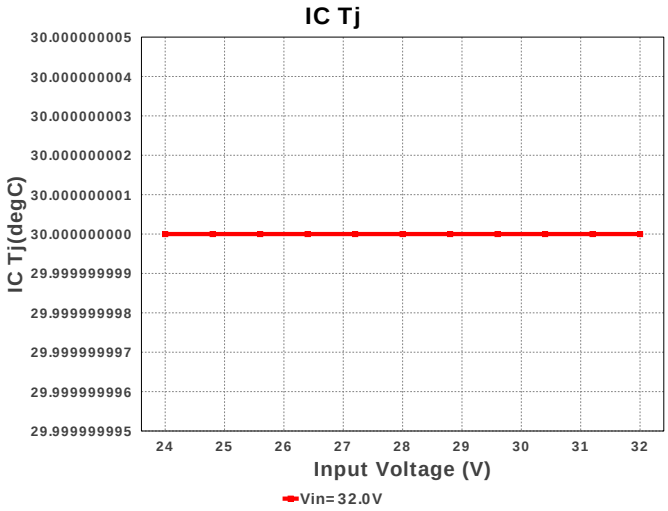
Design : 4393327/2 LM3401MM/NOPB
LM3401MM/NOPB 24.0V-32.0V to 18.60V @ 0.72A

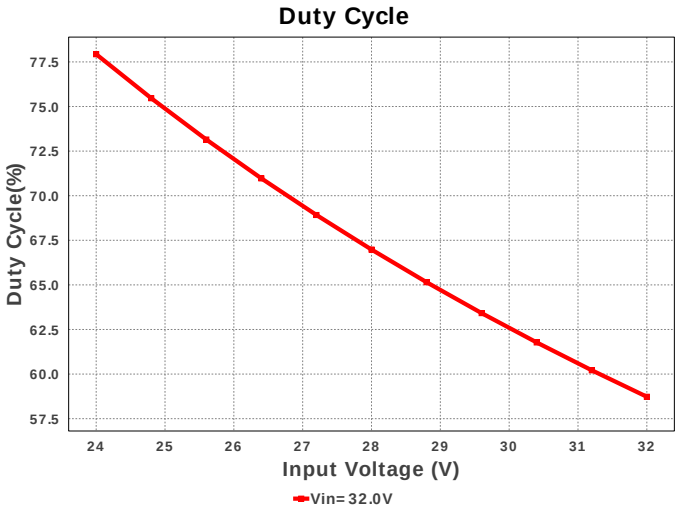


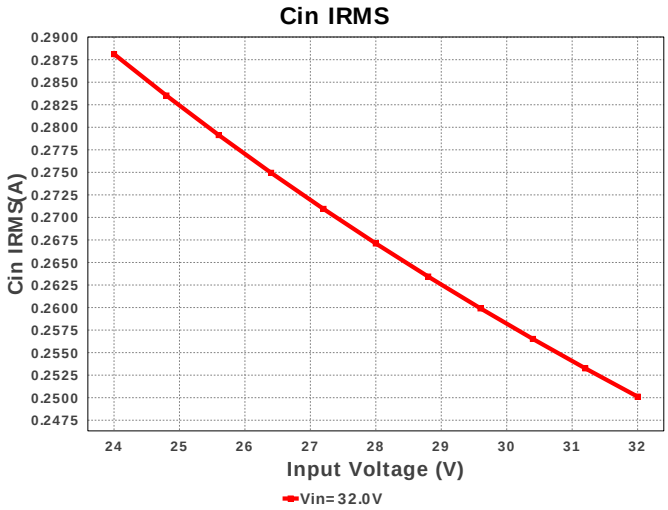
Electrical BOM

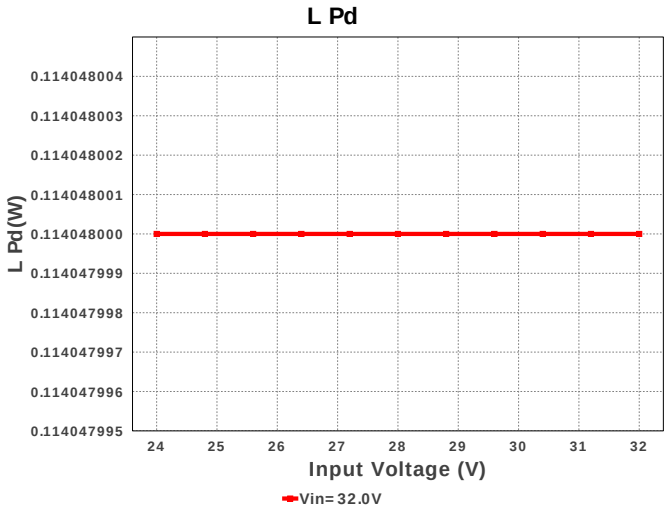
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	$0.07	1206 11 mm²
2.	Cout	TDK	C3216X7S2A225K Series= 479	Cap= 2.2 uF ESR= 7.107 mOhm VDC= 100.0 V IRMS= 0.0 A	1	$0.18	1206 11 mm²
3.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.11	SOD-123F 12 mm²
4.	D_LED	Citizen Electronics	CL-L233-C13N1-C	LED	1	NA	 CIT_LED_5 501 mm²
5.	L1	Coilcraft	LPS4018-103MRB	L= 10.0 µH DCR= 200.0 mOhm	1	$0.35	LPS4018 24 mm²
6.	M1	Vishay-Siliconix	SI2319DS-T1-E3	VdsMax= -40.0 V IdsMax= -2.3 Amps	1	$0.28	SOT-23 14 mm²
7.	Rhys	Panasonic	ERJ-6ENF1242V Series= 225	Res= 12.4 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
8.	Rilim	Panasonic	ERJ-6ENF3922V Series= 225	Res= 39.2 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
9.	Rsense	Panasonic	ERJ-8RQFR27V Series= 229	Res= 270.0 mOhm Power= 250.0 mW Tolerance= 1.0%	1	$0.04	1206 11 mm²

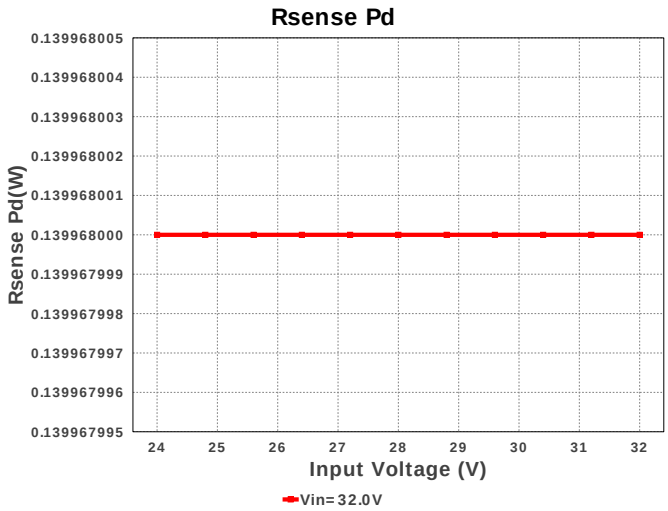
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	U1	Texas Instruments	LM3401MM/NOPB	Switcher	1	$0.60	MUA08A 24 mm²

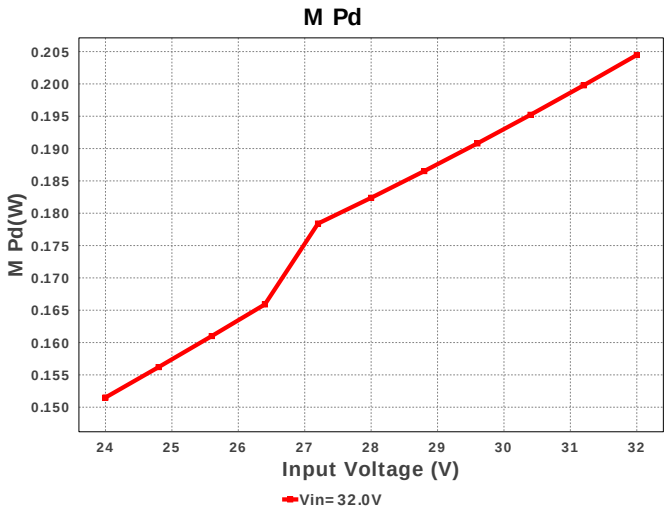


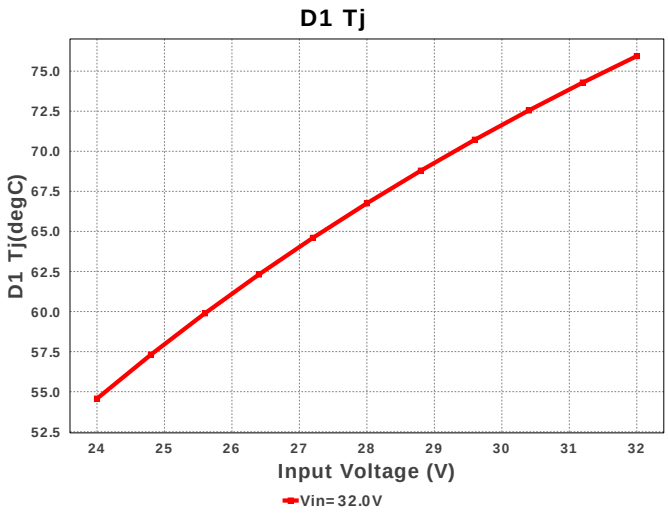


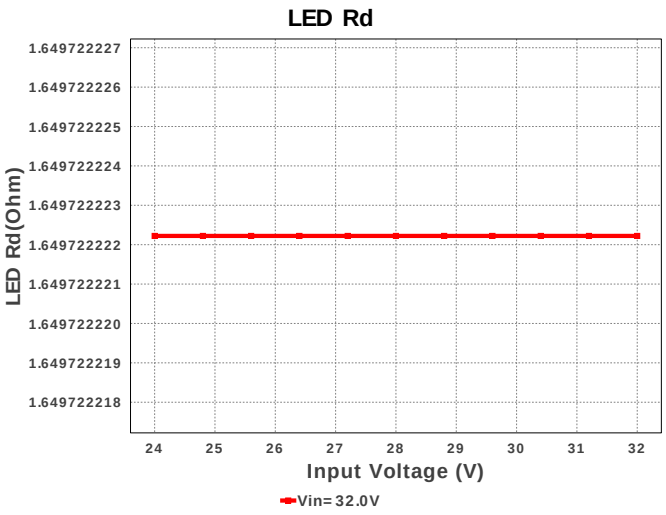


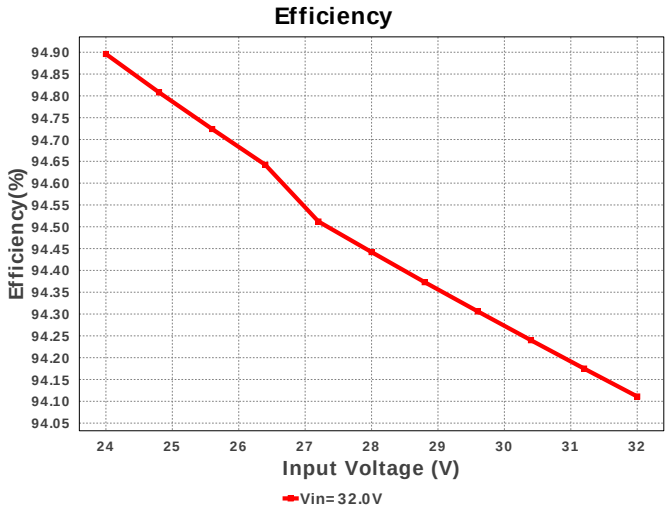


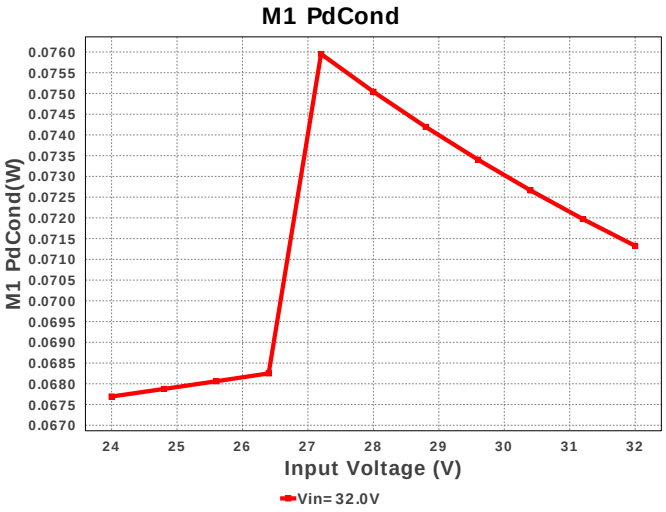


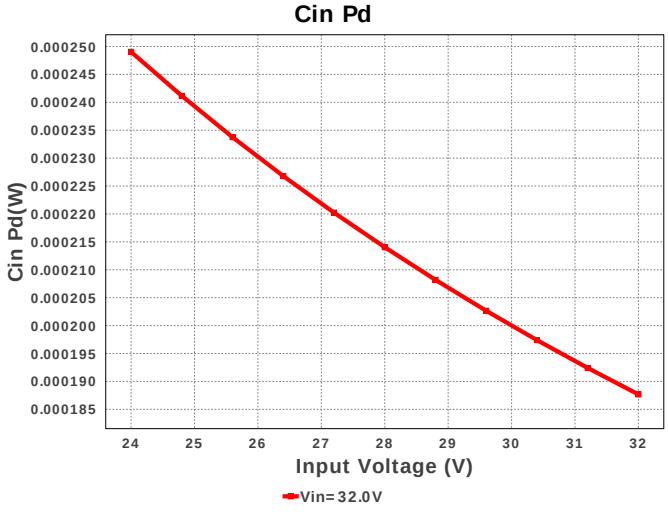


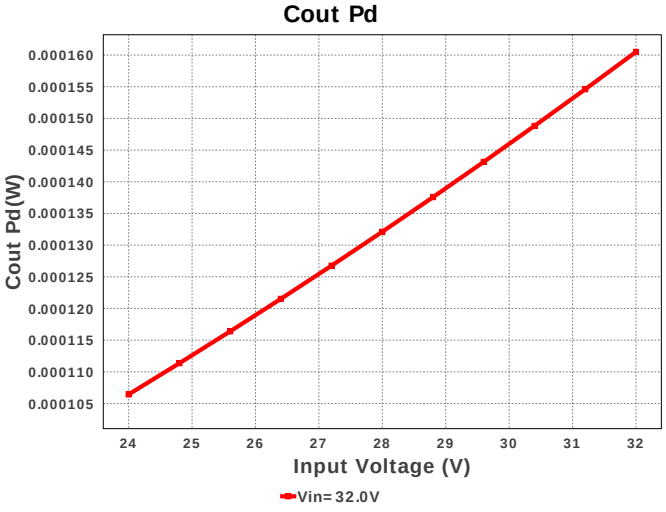


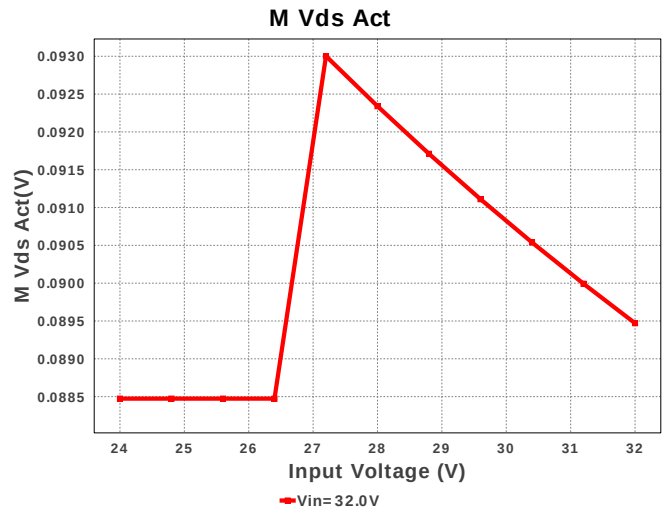


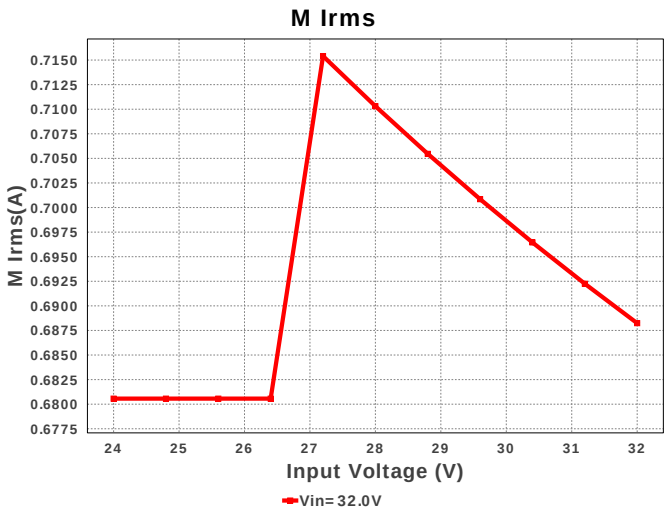


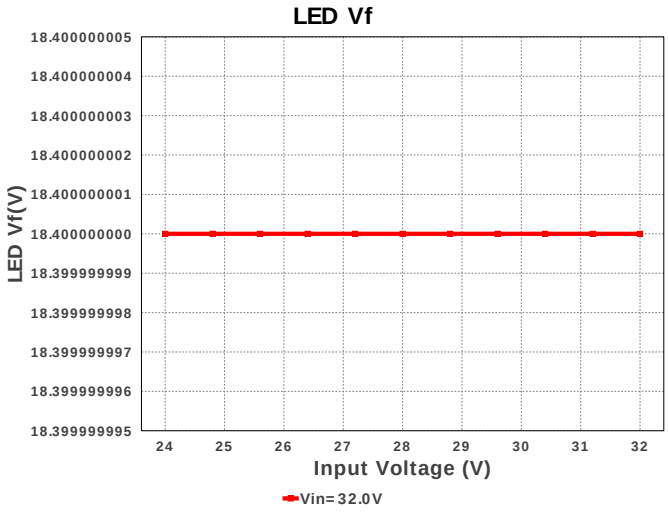


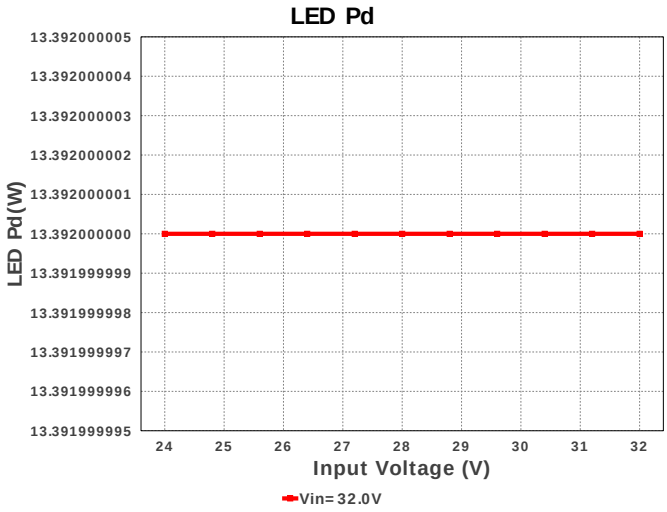


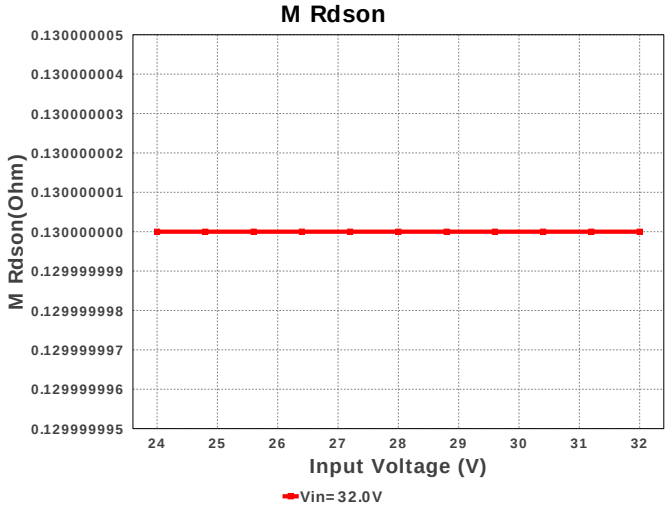


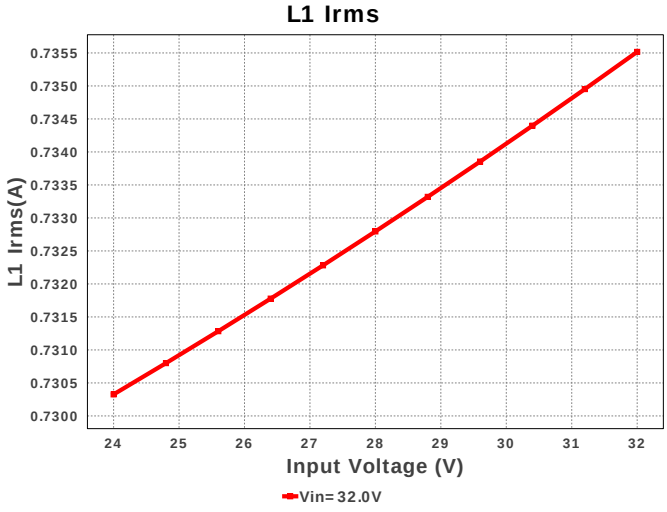


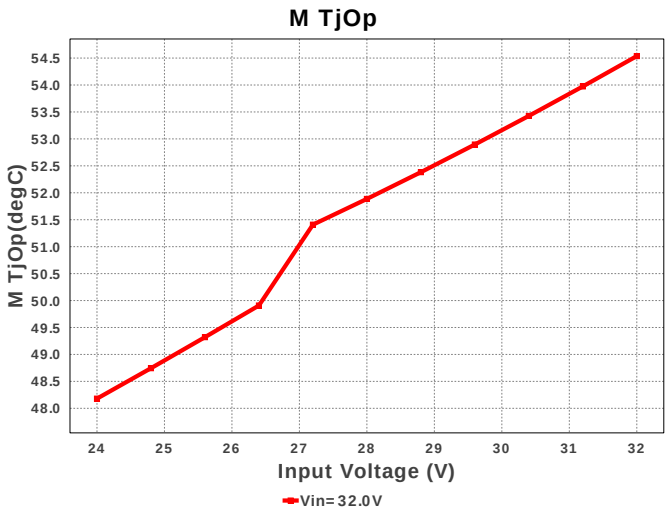


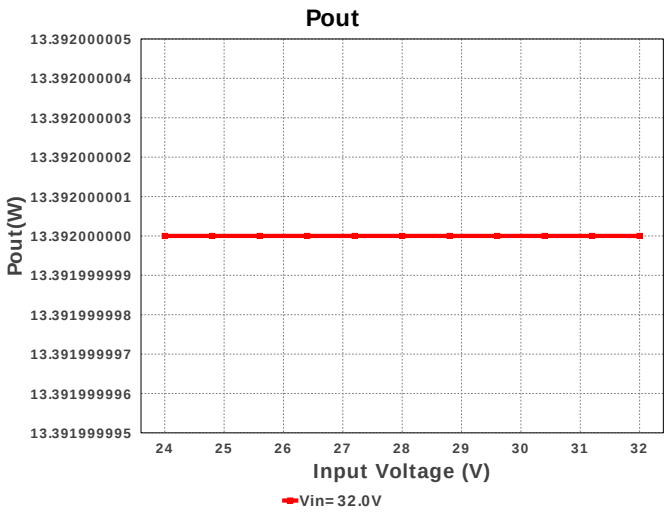


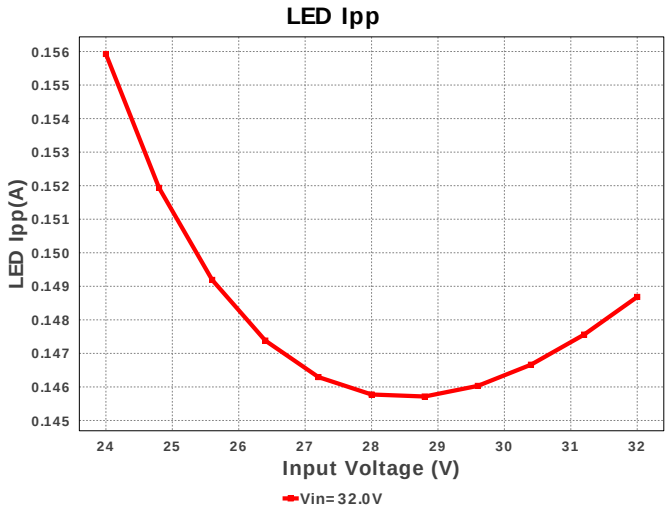


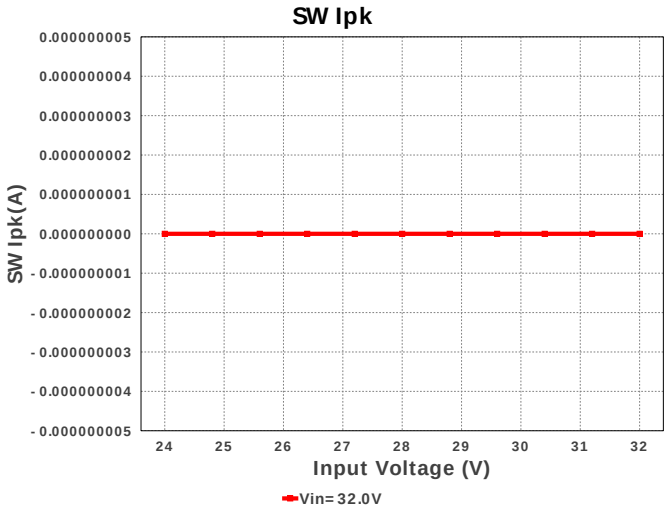


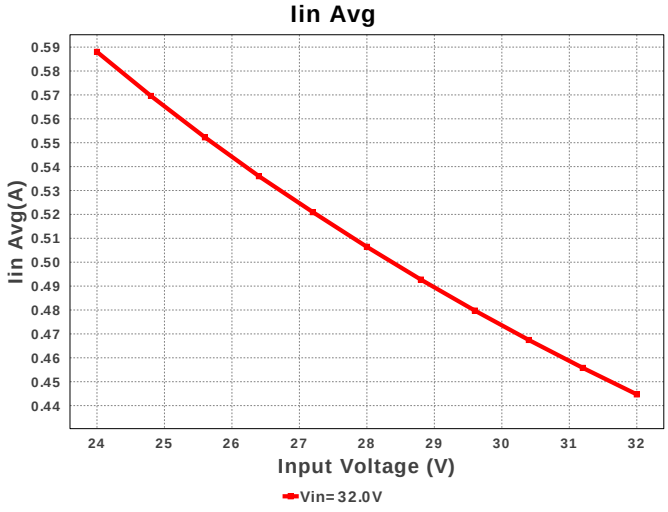


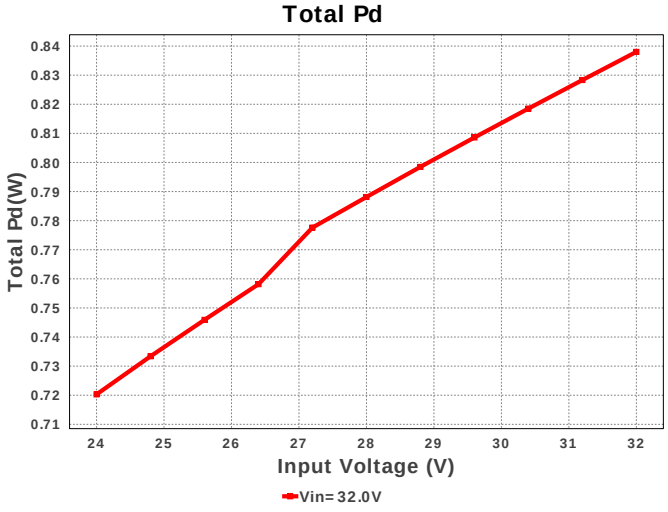


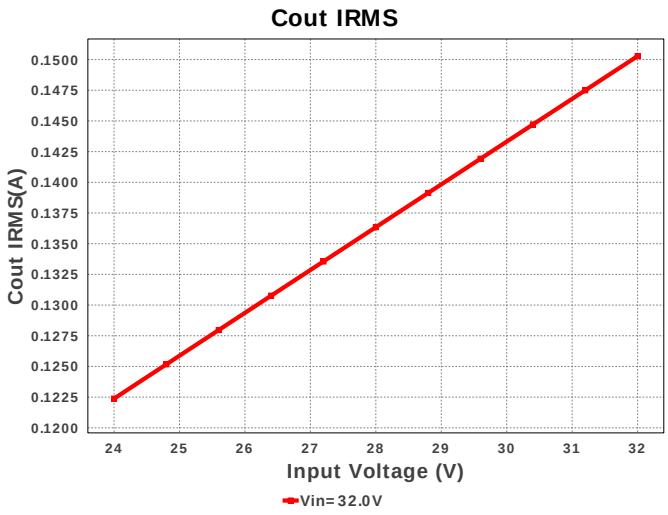


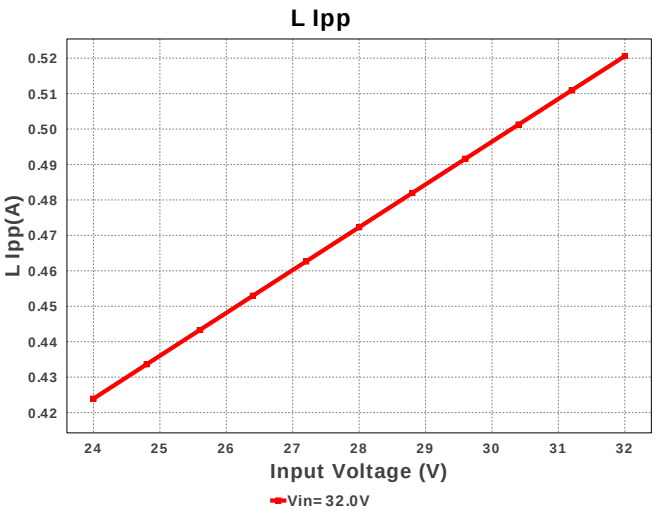


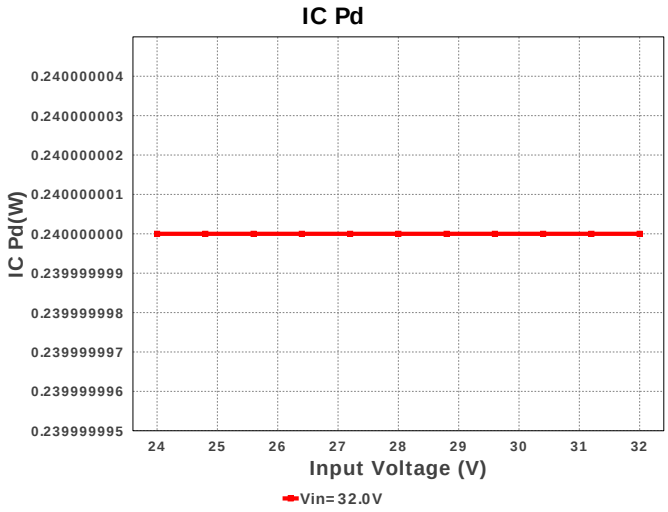


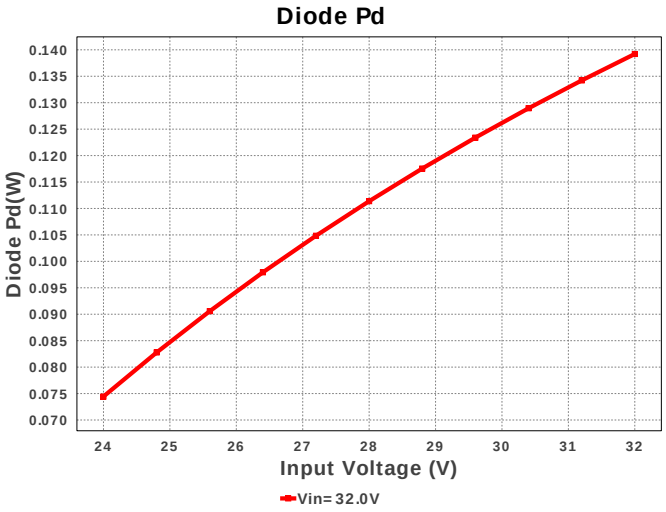


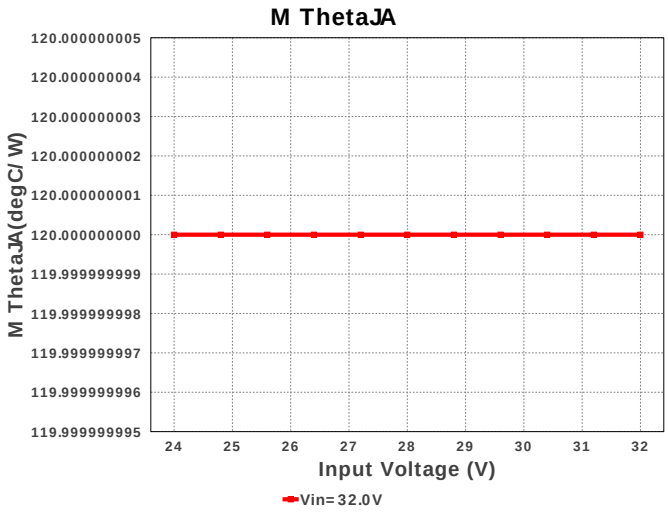


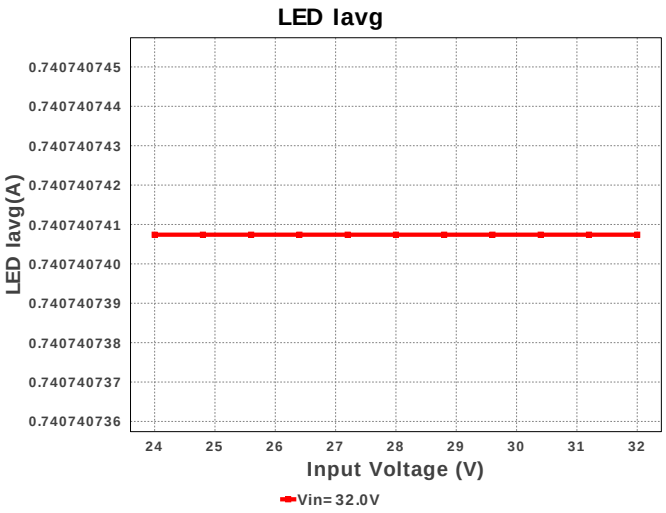


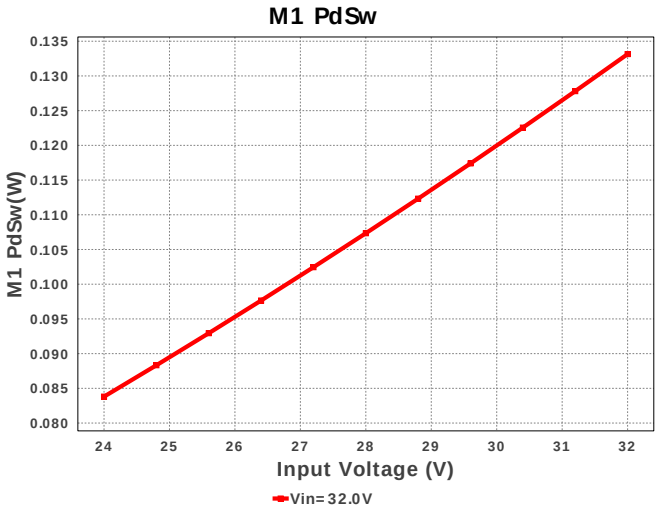












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	248.073 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	150.511 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	448.44 mA	Current	Average input current
4.	L Ipp	521.39 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	735.563 mA	Current	Inductor ripple current
6.	LED Iavg	740.741 mA	Current	LED Average Current
7.	LED Ipp	149.634 mA	Current	LED Ripple Current
8.	M Irms	689.923 mA	Current	MOSFET RMS ripple current
9.	SW Ipk	0.0 A	Current	Peak switch current
10.	BOM Count	10	General	Total Design BOM count
11.	FootPrint	621.0 mm^2	General	Total Foot Print Area of BOM components
12.	Frequency	1.5 MHz	General	Switching frequency
13.	IC Tolerance	12.0 mV	General	IC Feedback Tolerance
14.	M Rdson	130.0 mOhm	General	Drain-Source On-resistance
15.	M Vds Act	89.69 mV	General	M Vds
16.	Pout	13.536 W	General	Total output power
17.	Total BOM	$0.0	General	Total BOM Cost
18.	D1 Tj	67.888 degC	Op_Point	D1 junction temperature
19.	Vout OP	18.8 V	Op_Point	Operational Output Voltage
20.	Duty Cycle	59.248 %	Op_point	Duty cycle
21.	Efficiency	94.327 %	Op_point	Steady state efficiency
22.	IC Tj	30.0 degC	Op_point	IC junction temperature
23.	ICThetaJA	151.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	720.0 mA	Op_point	Iout operating point
25.	LED Rd	1.65 Ohm	Op_point	LED DynamicResistance
26.	LED Vf	18.6 V	Op_point	Total LED Forward Calculated Voltage
27.	M ThetaJA	120.0 degC/W	Op_point	MOSFET junction-to-ambient thermal resistance
28.	M TjOp	54.58 degC	Op_point	MOSFET junction temperature
29.	VIN_OP	32.0 V	Op_point	Vin operating point
30.	Cin Pd	184.62 µW	Power	Input capacitor power dissipation
31.	Cout Pd	160.999 µW	Power	Output capacitor power dissipation
32.	Diode Pd	114.813 mW	Power	Diode power dissipation
33.	IC Pd	240.0 mW	Power	IC power dissipation
34.	L Pd	114.048 mW	Power	Inductor power dissipation
35.	LED Pd	13.392 W	Power	LED Power Dissipation
36.	M Pd	204.835 mW	Power	MOSFET power dissipation
37.	M1 PdCond	71.69 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	133.145 mW	Power	M1 MOSFET switching losses
39.	Rsense Pd	139.968 mW	Power	LED Current Rsns Power Dissipation
40.	Total Pd	814.08 mW	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	720.0 m	Maximum Output Current
2.	Iout1	720.0 m	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	24.0	Minimum input voltage
5.	Vout	18.6	Output Voltage
6.	Vout1	18.6	Output Voltage #1
7.	application	LED_DRIVER	LED Application
8.	base_pn	LM3401	Texas Instruments Base Part Number

#	Name	Value	Description
9.	isLEDArchitect	N	LED Architect Project
10.	ledparallel	1.0	Number of LED in parallel
11.	ledpartnumber	CL-L233-C13N1-C	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. LM3401 Product Folder : http://www.ti.com/product/LM3401 : contains the data sheet and other resources.