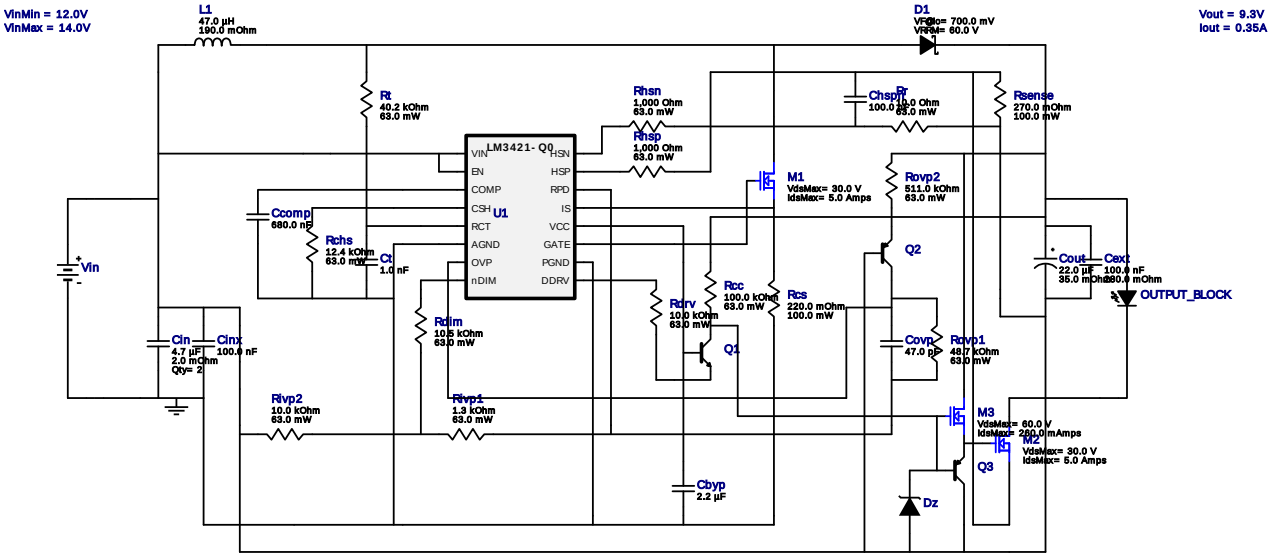
VinMin = 12.0V
VinMax = 14.0V
Vout = 9.3V
Iout = 0.35A

Device = LM3421Q0MH/NOPB
Topology = Buck_Boost
Created = 3/3/14 4:03:48 AM
BOM Cost = $0.00
Total Pd = 1.03W
Footprint = 943.0mm2
BOM Count = 35

WEBENCH® Design Report

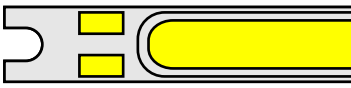
Design : 3840083/121 LM3421Q0MH/NOPB
LM3421Q0MH/NOPB 12.0V-14.0V to 4.261187165778521V @ 0.35034842293906804A



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.

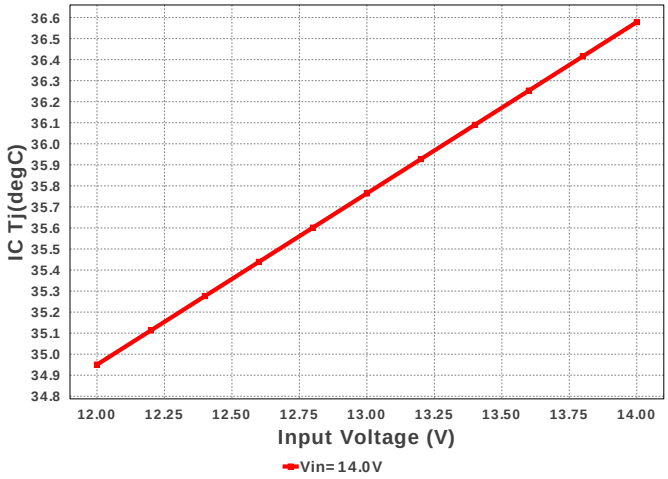
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbyp	Kemet	C0603C225K9PACTU Series= X5R	Cap= 2.2 µF VDC= 6.3 V IRMS= 0.0 A	1	$0.02	0603 5mm2
2.	Ccomp	MuRata	GRM155R60J684KE19D Series= X5R	Cap= 680.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.02	0402 3mm2
3.	Cext	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
4.	Chspn	MuRata	GRM21BR71H104KA01L Series= X7R	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
5.	Cin	MuRata	GRM21BR61E475MA12L Series= X5R	Cap= 4.7 µF ESR= 2.0 mOhm VDC= 25.0 V IRMS= 7.29 A	2	$0.06	0805 7mm2
6.	Cinx	Kemet	C0603C104K5RACTU Series= X7R	Cap= 100.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0603 5mm2
7.	Cout	Sanyo	35SVPF22M Series= 1273	Cap= 22.0 µF ESR= 35.0 mOhm VDC= 35.0 V IRMS= 2.6 A	1	$0.43	CAPSMT_62_F61 74mm2
8.	Covp	Yageo America	CC0805JRNP09BN470 Series= C0G/NP0	Cap= 47.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2
9.	Ct	Yageo America	CC0805KRX7R9BB102 Series= X7R	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7mm2

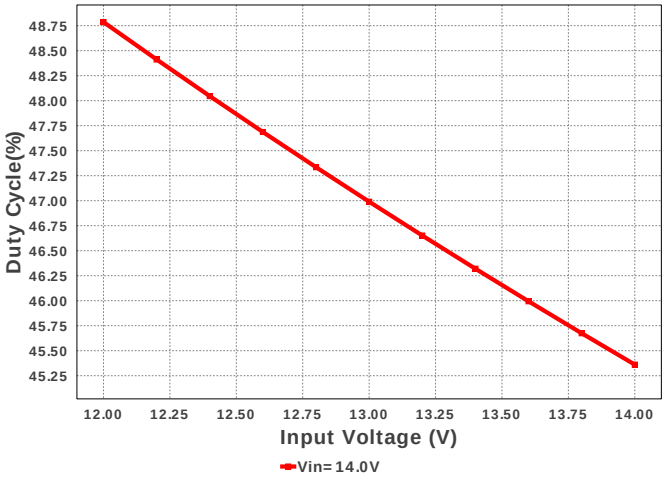
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	D1	Diodes Inc.	B160-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	$0.06	 SMA 37mm2
11.	D_LED	Citizen Electronics	CL-L103-MC3W1-C	LED	1	NA	 CIT_LED_3 486mm2
12.	Dz	Diodes Inc.	BZX84C11-7-F	Zener	1	$0.02	 SOT-23 14mm2
13.	L1	Bourns	SRN8040-470M	L= 47.0 µH DCR= 190.0 mOhm	1	$0.21	 SRN8040 100mm2
14.	M1	Texas Instruments	CSD17313Q2	VdsMax= 30.0 V IdsMax= 5.0 Amps	1	$0.17	 TRANS_NexFET_Q2 9mm2
15.	M2	Texas Instruments	CSD17313Q2	VdsMax= 30.0 V IdsMax= 5.0 Amps	1	$0.17	 TRANS_NexFET_Q2 9mm2
16.	M3	ON Semiconductor	2N7002ET1G	VdsMax= 60.0 V IdsMax= 260.0 mAmps	1	$0.02	 SOT-23 14mm2
17.	Q1	Diodes Inc.	MMBT3904-7-F	Bipolar Transistor	1	$0.02	 SOT-23 14mm2
18.	Q2	Diodes Inc.	MMBT3906-7-F	Bipolar Transistor	1	$0.02	 SOT-23 14mm2
19.	Q3	Diodes Inc.	MMBT3906-7-F	Bipolar Transistor	1	$0.02	 SOT-23 14mm2
20.	Rcc	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
21.	Rchs	Vishay-Dale	CRCW040212K4FKED Series= CRCW..e3	Res= 12.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
22.	Rcs	Panasonic	ERJ-3RQFR22V Series= 227	Res= 220.0 mOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.02	 0603 5mm2
23.	Rdim	Vishay-Dale	CRCW040210K5FKED Series= CRCW..e3	Res= 10.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
24.	Rdrv	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
25.	Rhsn	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1,000 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
26.	Rhsp	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1,000 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
27.	Rivp1	Vishay-Dale	CRCW04021K30FKED Series= CRCW..e3	Res= 1.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
28.	Rivp2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2
29.	Rovp1	Vishay-Dale	CRCW040248K7FKED Series= CRCW..e3	Res= 48.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3mm2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
30.	Rovp2	Vishay-Dale	CRCW0402511KFKED Series= CRCW..e3	Res= 511.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
31.	Rr	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
32.	Rsense	Panasonic	ERJ-3RQFR27V Series= 227	Res= 270.0 mOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.02	0603 5mm2
33.	Rt	Vishay-Dale	CRCW040240K2FKED Series= CRCW..e3	Res= 40.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3mm2
34.	U1	Texas Instruments	LM3421Q0MH/NOPB	Switcher	1	$1.40	MXA16A 59mm2

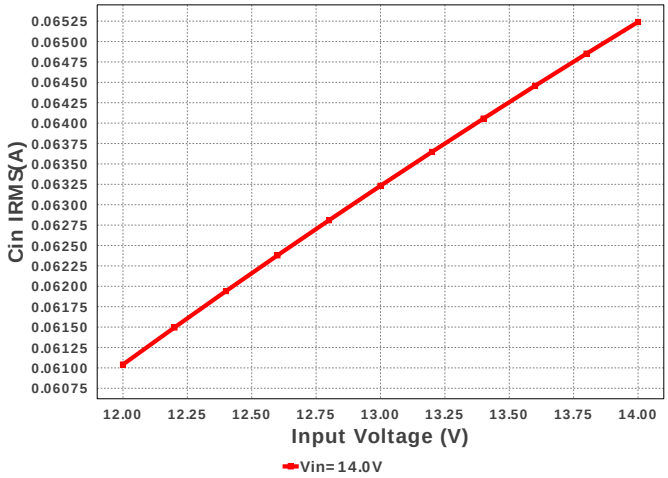
IC Tj



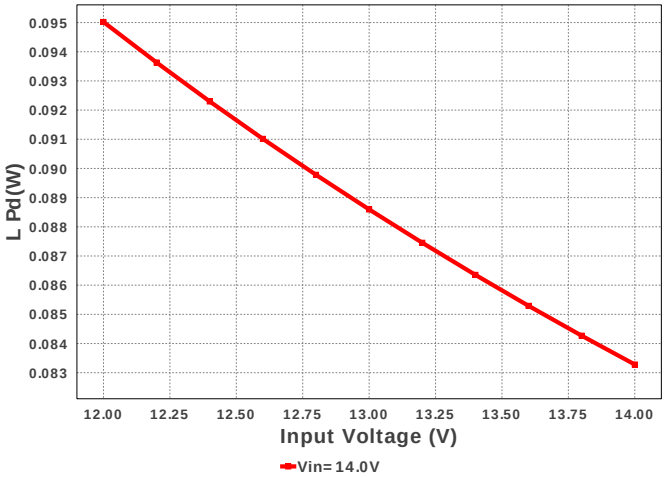
Duty Cycle

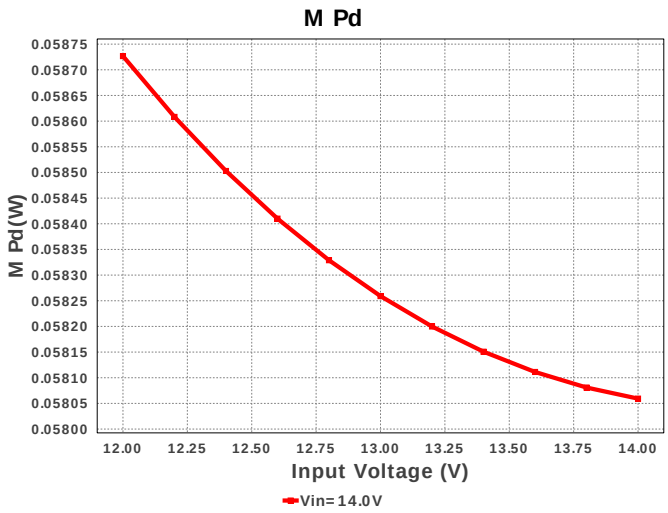


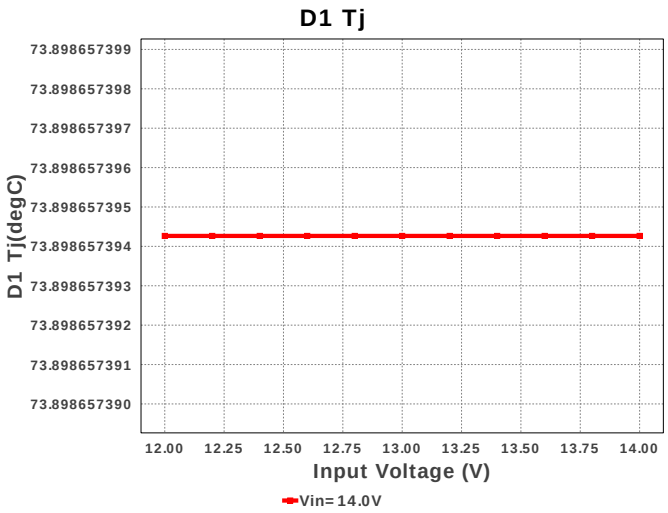
Cin IRMS

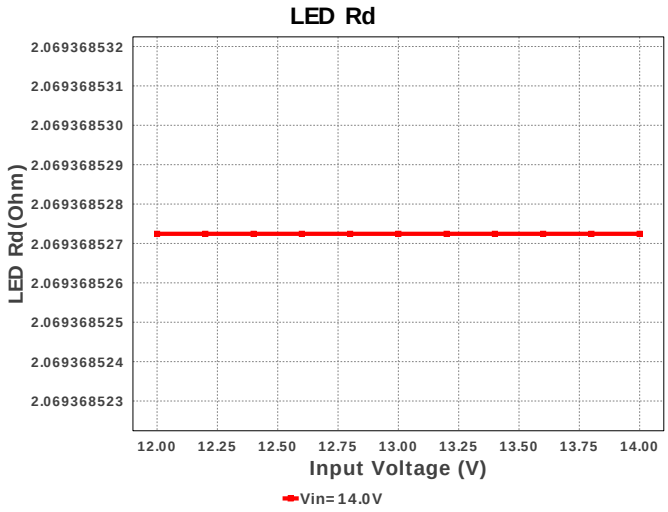


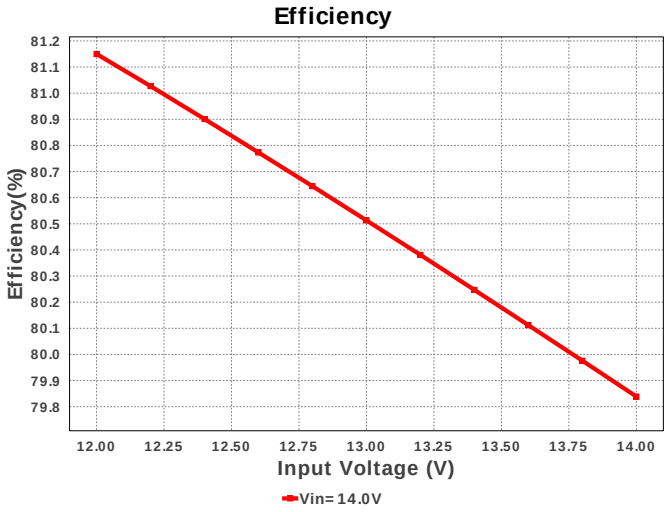
L Pd

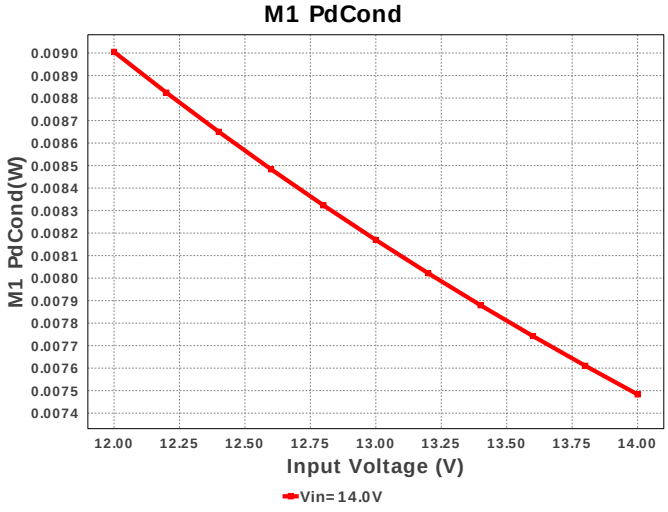


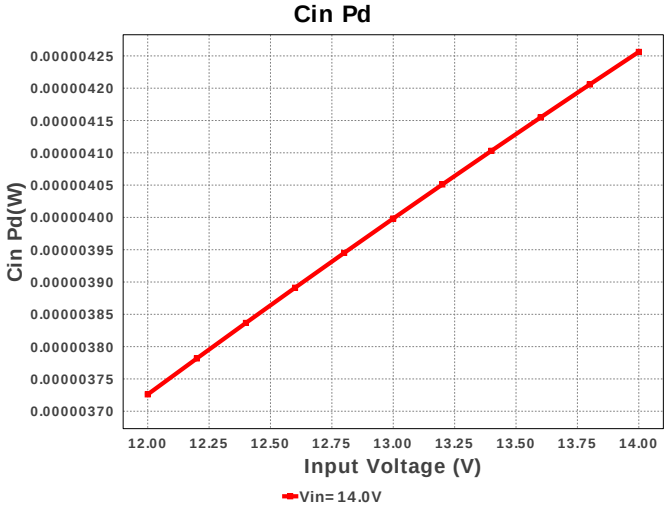


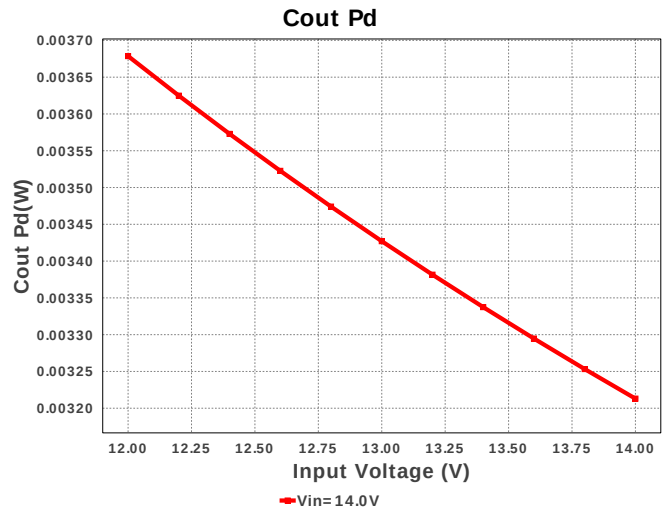


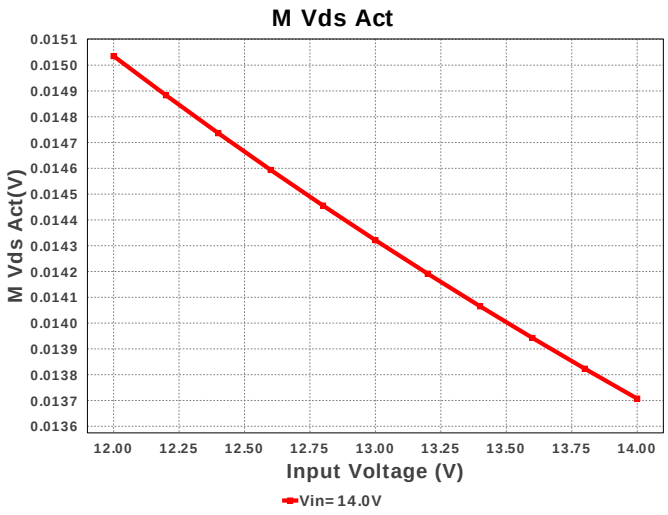


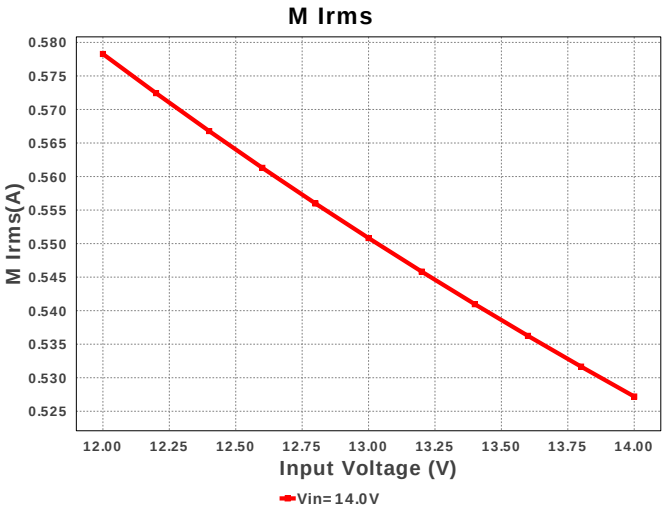


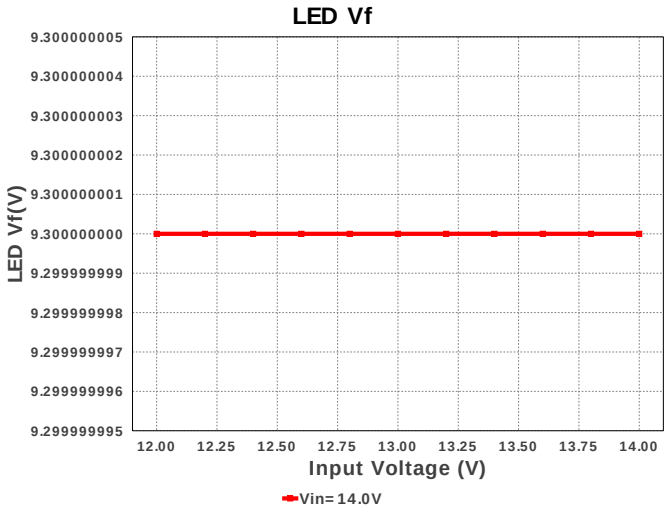


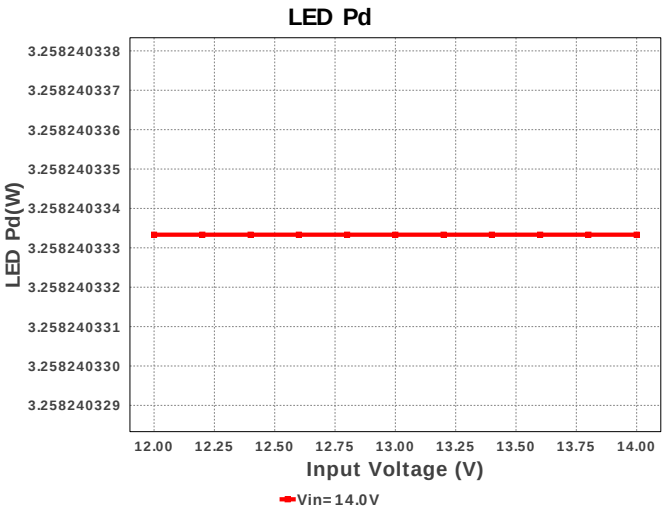


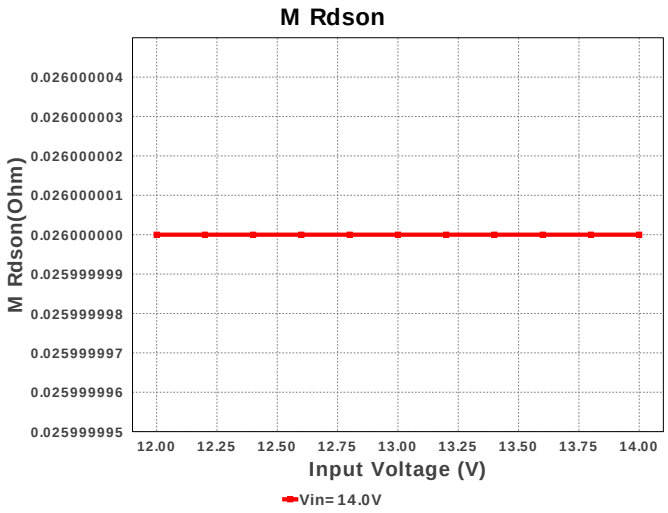


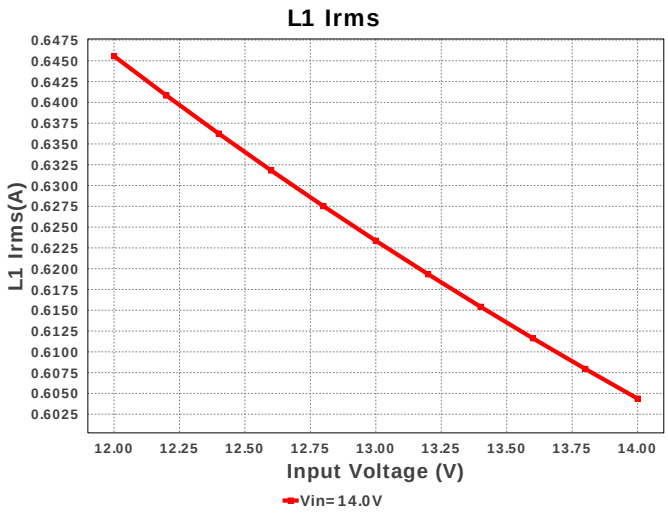


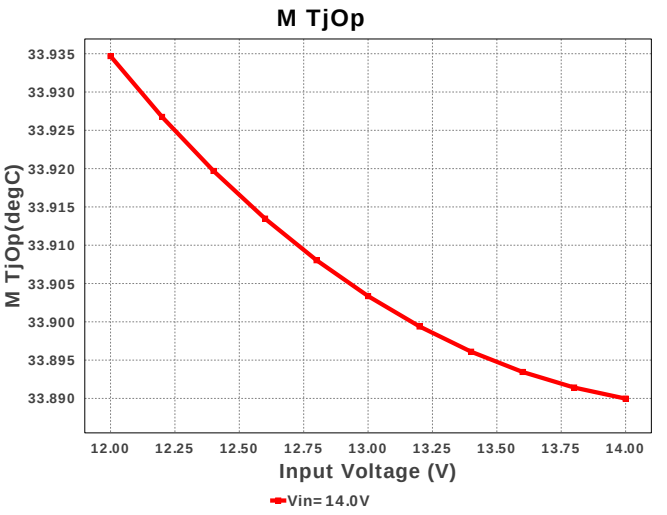


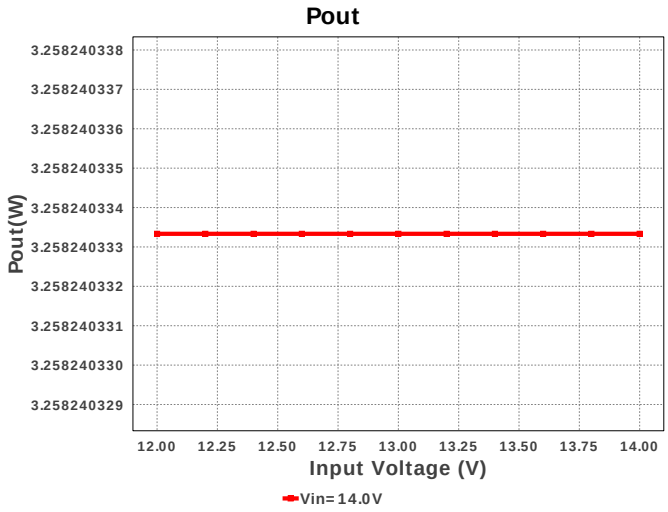


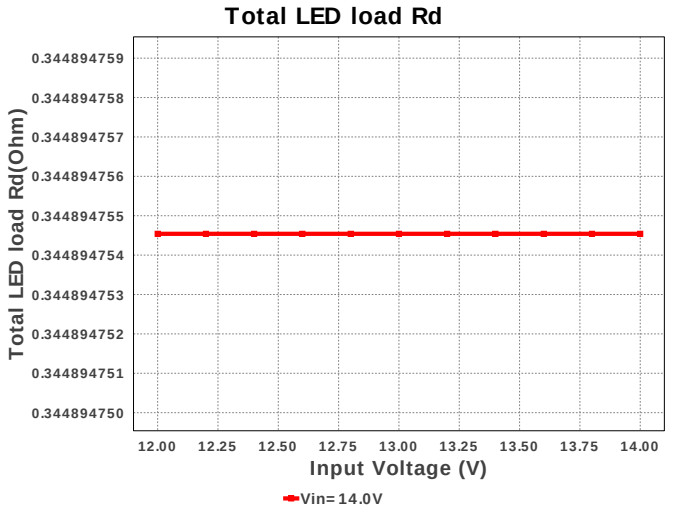


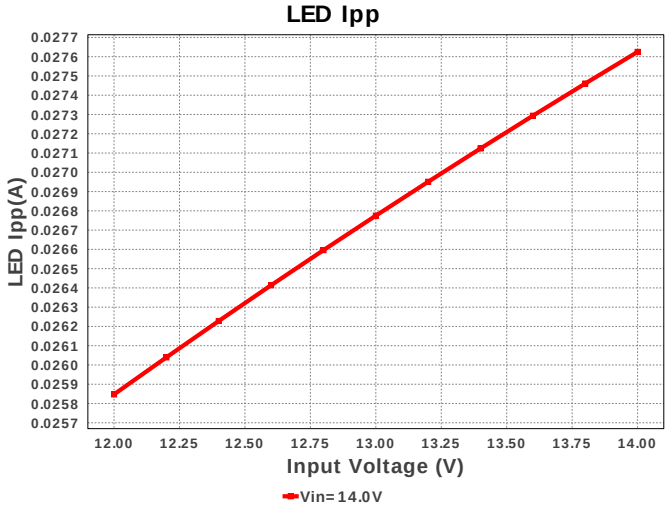


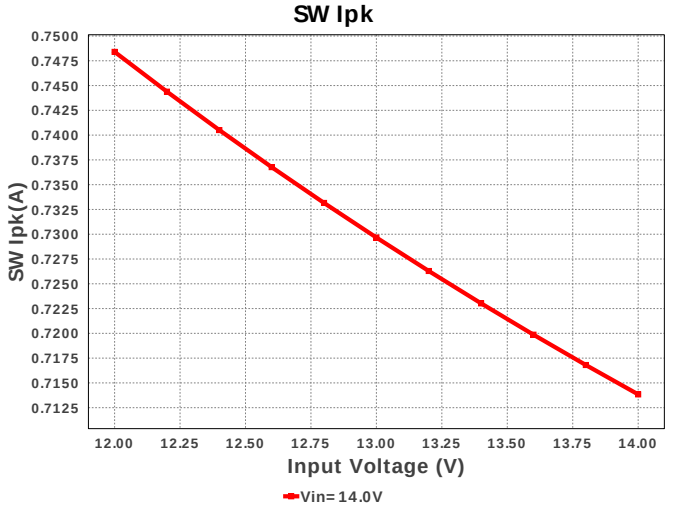


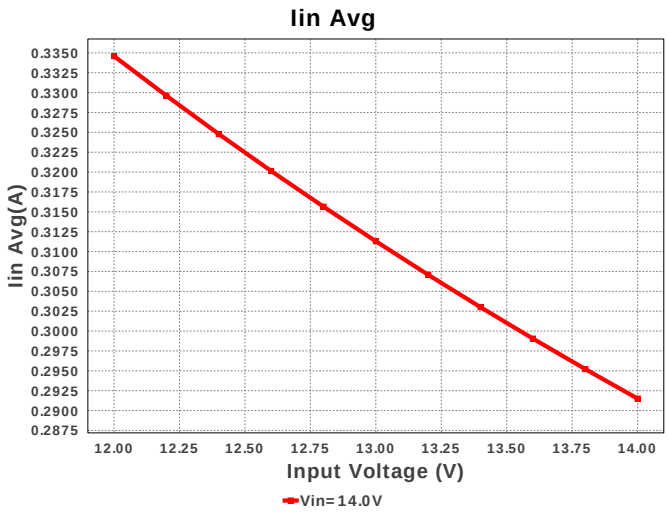


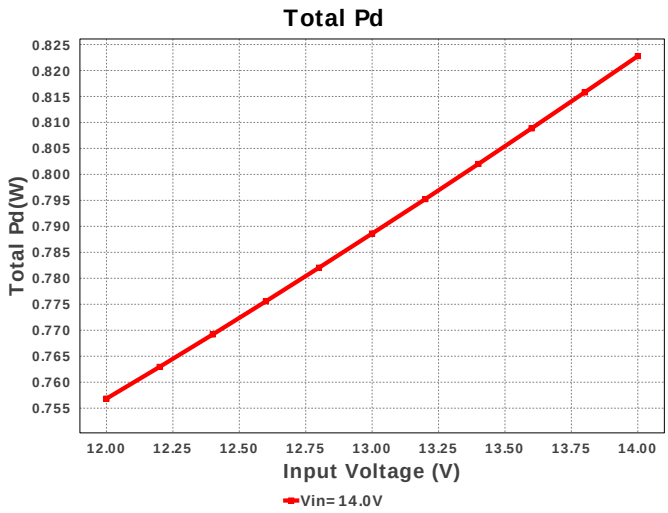


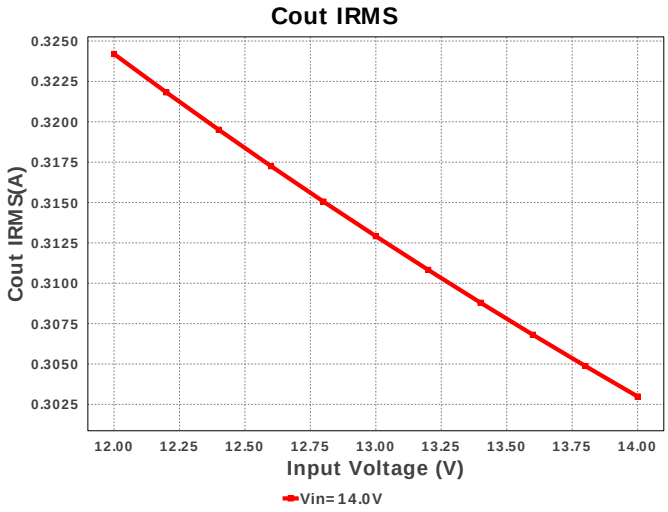


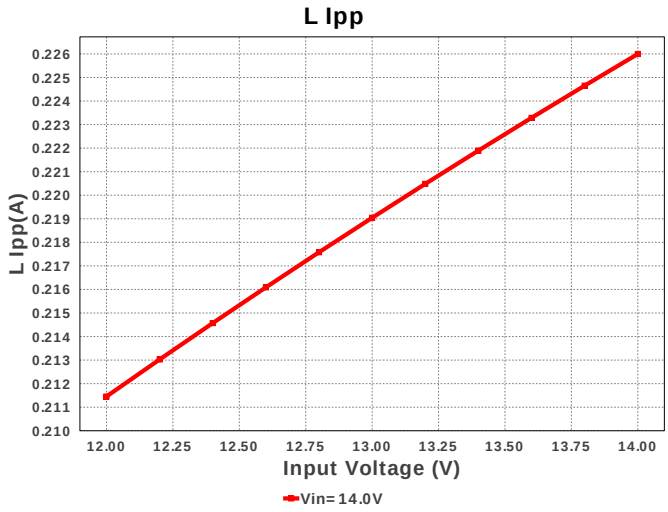


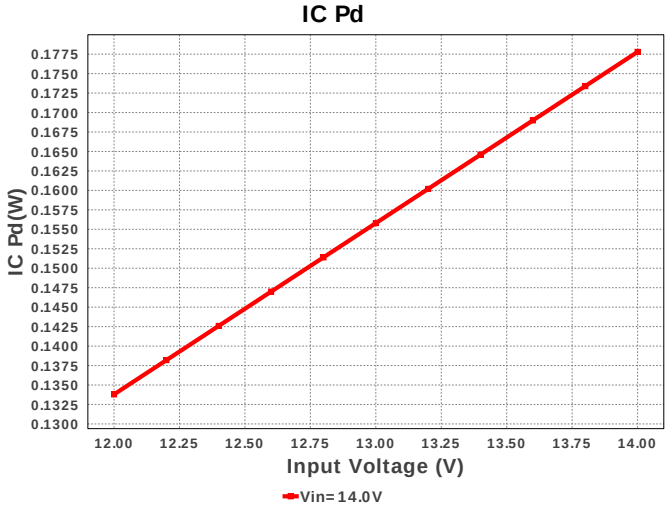


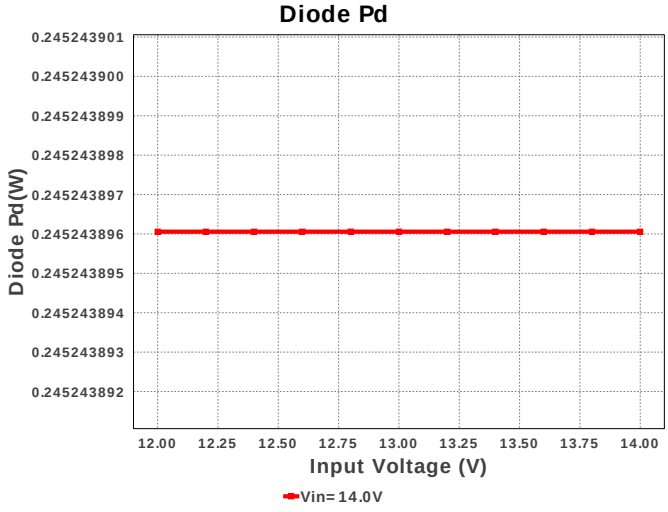


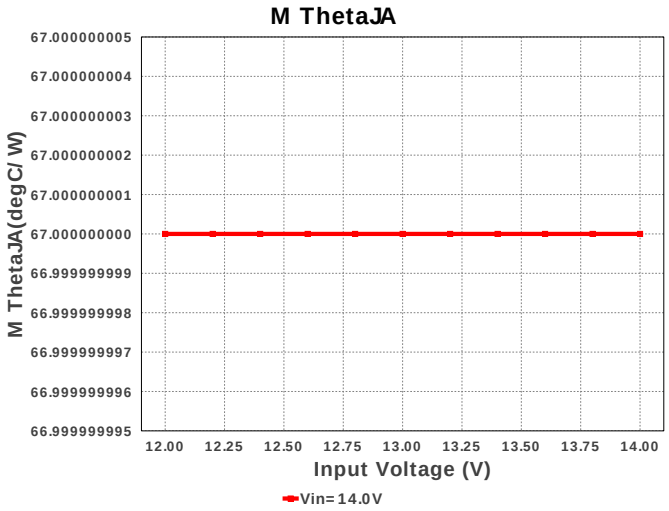


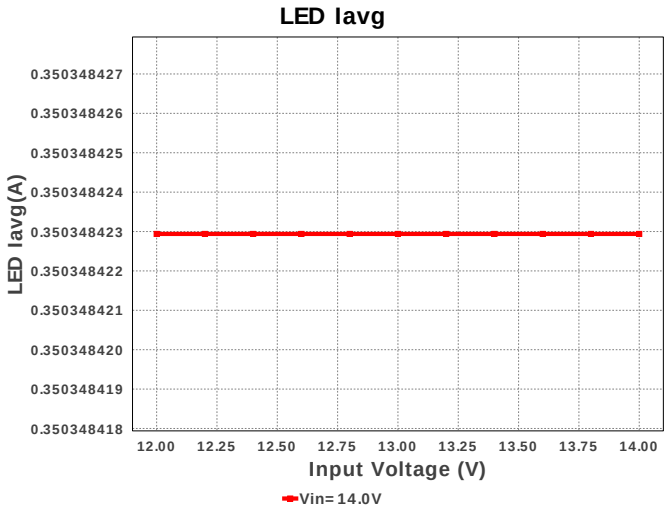


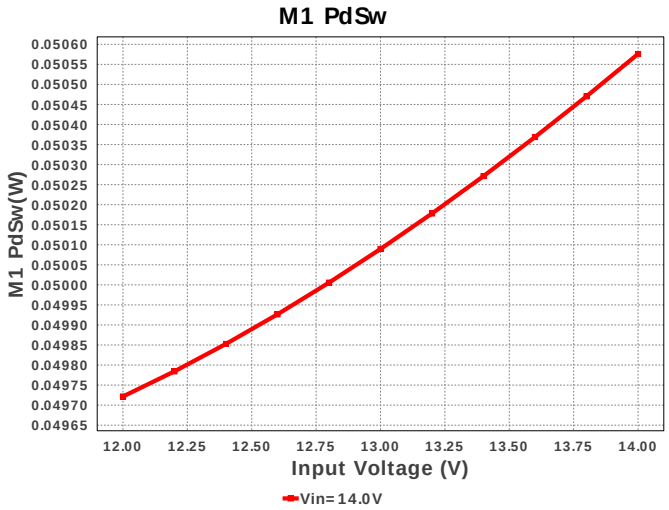












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	39.563 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	241.609 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	209.98 mA	Current	Average input current
4.	L Ipp	137.049 mA	Current	Peak-to-peak inductor ripple current
5.	L1 Irms	496.803 mA	Current	Inductor ripple current
6.	LED Iavg	350.348 mA	Current	LED Average Current
7.	LED Ipp	16.752 mA	Current	LED Ripple Current
8.	M Irms	380.455 mA	Current	MOSFET RMS ripple current
9.	SW Ipk	563.75 mA	Current	Peak switch current
10.	BOM Count	35	General	Total Design BOM count
11.	FootPrint	943.0 mm2	General	Total Foot Print Area of BOM components
12.	Frequency	555.224 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	2.587 mV	General	M Vds
16.	Pout	1.493 W	General	Total output power
17.	Total BOM	$0.0	General	Total BOM Cost
18.	D1 Tj	73.899 degC	Op_Point	D1 junction temperature
19.	Vout OP	4.261 V	Op_Point	Operational Output Voltage
20.	Duty Cycle	37.361 %	Op_point	Duty cycle
21.	Efficiency	59.248 %	Op_point	Steady state efficiency
22.	IC Tj	38.73 degC	Op_point	IC junction temperature
23.	ICThetaJA	37.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
24.	IOUT_OP	350.348 mA	Op_point	Iout operating point
25.	LED Rd	2.069 Ohm	Op_point	LED DynamicResistance
26.	LED Vf	4.261 V	Op_point	Total LED Forward Calculated Voltage
27.	M ThetaJA	50.0 degC/W	Op_point	MOSFET junction-to-ambient thermal resistance
28.	M TjOp	39.586 degC	Op_point	MOSFET junction temperature
29.	VIN_OP	12.0 V	Op_point	Vin operating point
30.	Cin Pd	1.565 µW	Power	Input capacitor power dissipation
31.	Cout Pd	2.043 mW	Power	Output capacitor power dissipation
32.	Diode Pd	245.244 mW	Power	Diode power dissipation

#	Name	Value	Category	Description
33.	IC Pd	235.933 mW	Power	IC power dissipation
34.	L Pd	56.273 mW	Power	Inductor power dissipation
35.	LED Pd	1.493 W	Power	LED Power Dissipation
36.	M Pd	191.727 mW	Power	MOSFET power dissipation
37.	M1 PdCond	1.042 mW	Power	M1 MOSFET conduction losses
38.	M1 PdSw	190.685 mW	Power	M1 MOSFET switching losses
39.	Total Pd	1.027 W	Power	Total Power Dissipation
40.	Total LED load Rd	344.895 mOhm	Unknown	Total LED Load DynamicResistance

Design Inputs

#	Name	Value	Description
1.	Iout	350.0 mA	Maximum Output Current
2.	Iout1	350.0 mAmps	Output Current #1
3.	VinMax	14.0 V	Maximum input voltage
4.	VinMin	12.0 V	Minimum input voltage
5.	Vout	9.3 V	Output Voltage
6.	Vout1	9.3 Volt	Output Voltage #1
7.	application	LED_DRIVER	LED Application
8.	base_pn	LM3421-Q0	Texas Instruments Base Part Number
9.	isLEDArchitect	N	LED Architect Project
10.	ledparallel	1.0	Number of LED in parallel
11.	ledpartnumber	CL-L103-MC3W1-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 degC	Ambient temperature

Design Assistance

1. Feature Highlights: Automotive Qualified LED Driver. Please consult product datasheet for detailed specifications.

2. The LM3421-Q0 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

3. LM3421-Q0 Product Folder : http://www.ti.com/product/lm3421-q1 : contains the data sheet and other resources.