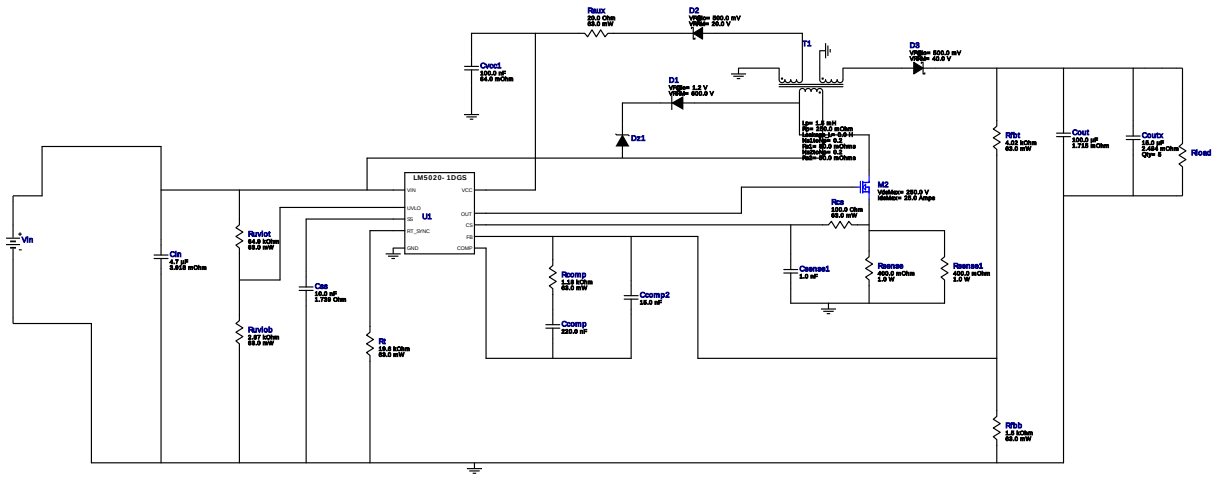
VinMin = 32.0V
VinMax = 34.0V
Vout = 4.6V
Iout = 2.0A

Device = LM5020MM-1/NOPB
Topology = Flyback
Created = 7/13/16 1:19:52 AM
BOM Cost = $0.00
BOM Count = 29
Total Pd = 1.7W

WEBENCH® Design Report

Design : 4738744/16 LM5020MM-1/NOPB
LM5020MM-1/NOPB 32.0V-34.0V to 4.60V @ 2.0A

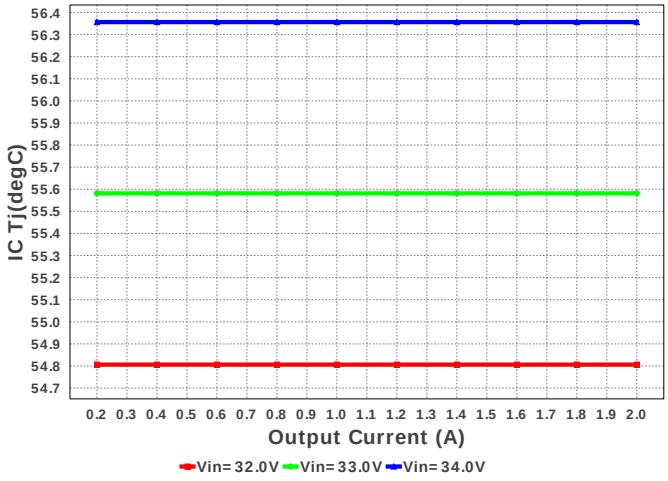


Electrical BOM

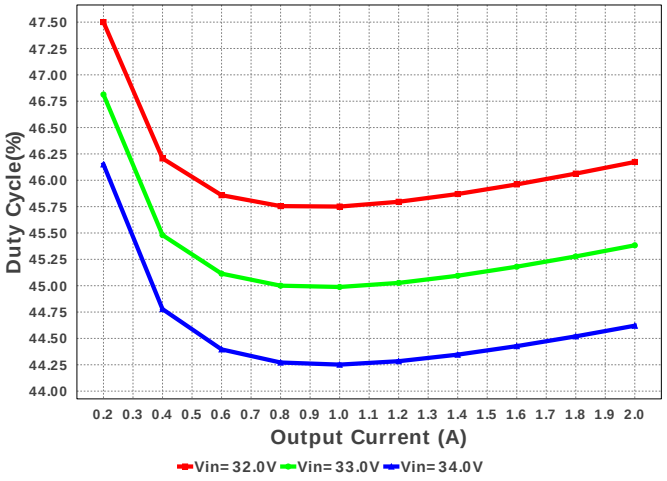
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccomp	MuRata	GRM155C80G224KE01D Series= X6S	Cap= 220.0 nF VDC= 4.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp2	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Cin	TDK	C3216JB1V475K Series= JB	Cap= 4.7 uF ESR= 3.918 mOhm VDC= 35.0 V IRMS= 0.0 A	1	$0.13	1206 11 mm²
4.	Cout	TDK	C3216X5R1A107M Series= X5R	Cap= 100.0 uF ESR= 1.715 mOhm VDC= 10.0 V IRMS= 0.0 A	1	$0.67	1206 11 mm²
5.	Coutx	TDK	C4532X5R1E156M Series= X5R	Cap= 15.0 uF ESR= 2.494 mOhm VDC= 25.0 V IRMS= 0.0 A	5	$0.51	1812 23 mm²
6.	Csense1	MuRata	GRM033R71C102KA01D Series= X7R	Cap= 1.0 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
7.	Css	Kemet	C0805C103K5RACTU Series= X7R	Cap= 10.0 nF ESR= 1.739 Ohm VDC= 50.0 V IRMS= 411.0 mA	1	$0.01	0805 7 mm²
8.	Cvcc1	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	$0.01	0805 7 mm²
9.	D1	Bourns	CD214B-F3600	VF@Io= 1.2 V VRRM= 600.0 V	1	$0.14	SMB 44 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	D2	Vishay-Semiconductor	SS12-E3/61T	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	 SMA 37 mm^2
11.	D3	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.11	 SMA 37 mm^2
12.	Dz1	Micro Commercial Components	3SMAJ5937B-TP	Zener	1	$0.12	 SMA 37 mm^2
13.	M2	Infineon Technologies	BSC600N25NS3 G	VdsMax= 250.0 V IdsMax= 25.0 Amps	1	$1.41	 PG-TDSON-8 55 mm^2
14.	Raux	Vishay-Dale	CRCW040220R0FKED Series= CRCW..e3	Res= 20.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
15.	Rcomp	Vishay-Dale	CRCW04021K18FKED Series= CRCW..e3	Res= 1.18 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
16.	Rcs	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
17.	Rfbb	Vishay-Dale	CRCW04021K50FKED Series= CRCW..e3	Res= 1.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
18.	Rfbt	Vishay-Dale	CRCW04024K02FKED Series= CRCW..e3	Res= 4.02 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
19.	Rsense	Stackpole Electronics Inc	CSRN2010FKR400 Series= ?	Res= 400.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.11	 2010 32 mm^2
20.	Rsense1	Stackpole Electronics Inc	CSRN2010FKR400 Series= ?	Res= 400.0 mOhm Power= 1.0 W Tolerance= 1.0%	1	$0.11	 2010 32 mm^2
21.	Rt	Vishay-Dale	CRCW040219K6FKED Series= CRCW..e3	Res= 19.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
22.	Ruvlob	Vishay-Dale	CRCW04022K87FKED Series= CRCW..e3	Res= 2.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
23.	Ruvlot	Vishay-Dale	CRCW040264K9FKED Series= CRCW..e3	Res= 64.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
24.	T1	GCI Technologies	G044050	Lp= 1.5 mH Rp= 250.0 mOhm Leakage_L= 0.0 H Ns1toNp= 0.2 Rs1= 50.0 mOhms Ns2toNp= 0.2 Rs2= 50.0 mOhms	1	NA	GCI_G044050 0 mm^2
25.	U1	Texas Instruments	LM5020MM-1/NOPB	Switcher	1	$0.80	mpds035b 35 mm^2

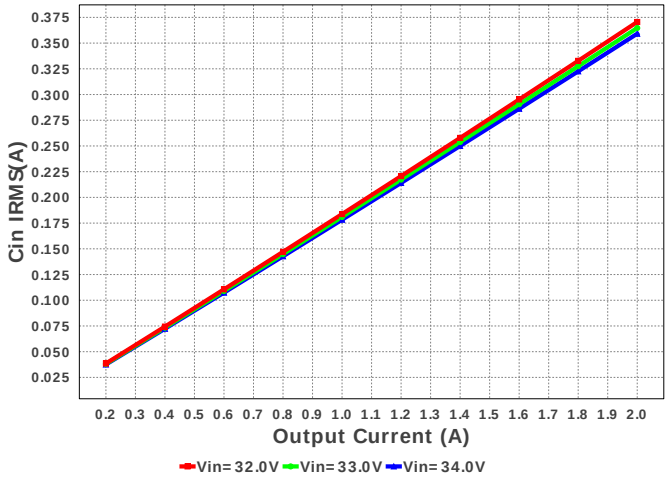
IC Tj



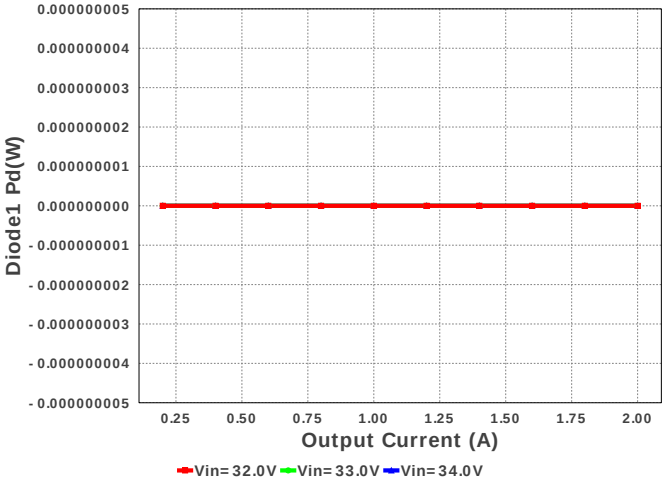
Duty Cycle



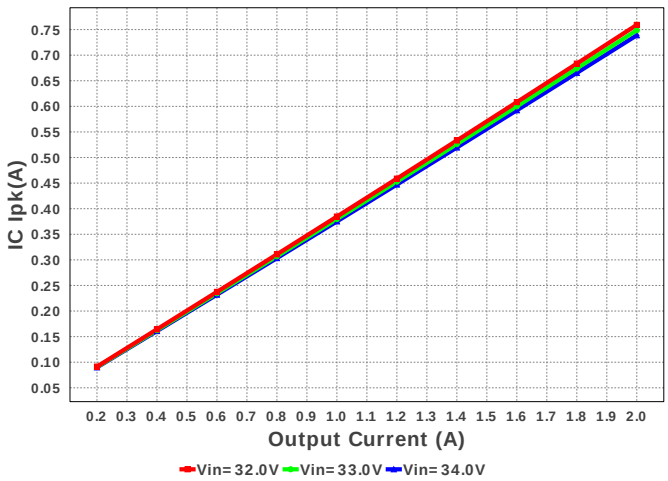
Cin IRMS



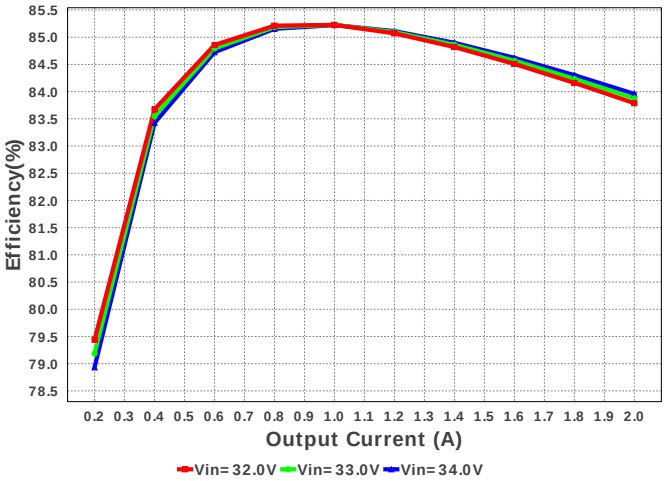
Diode1 Pd

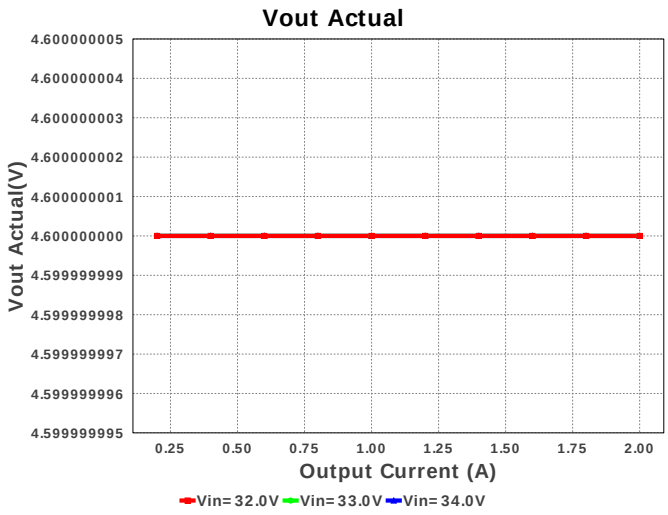


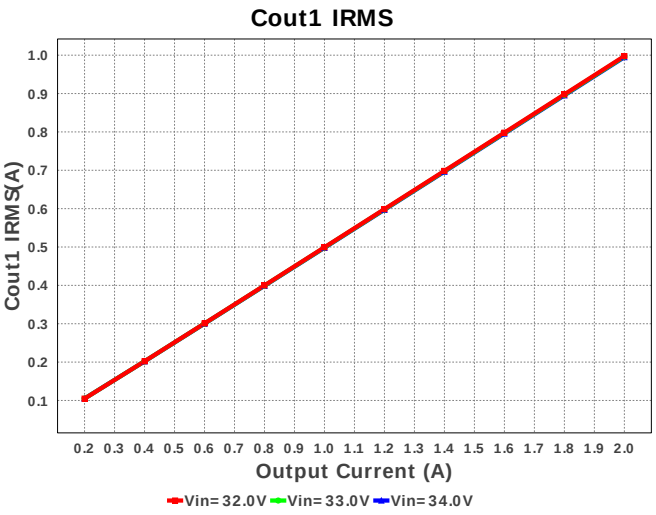
IC Ipk

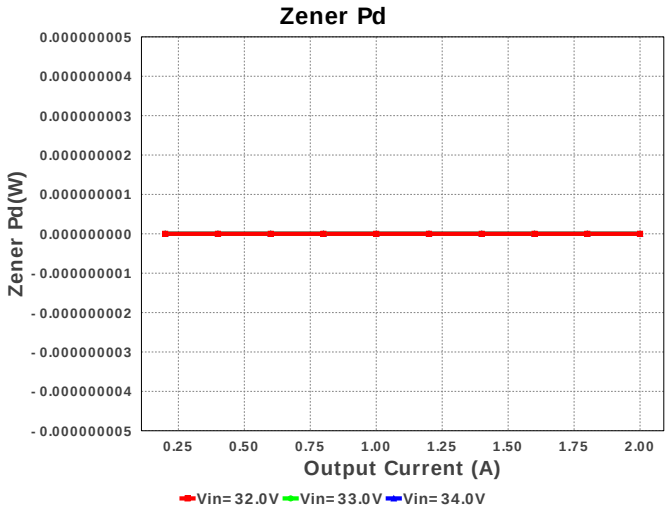


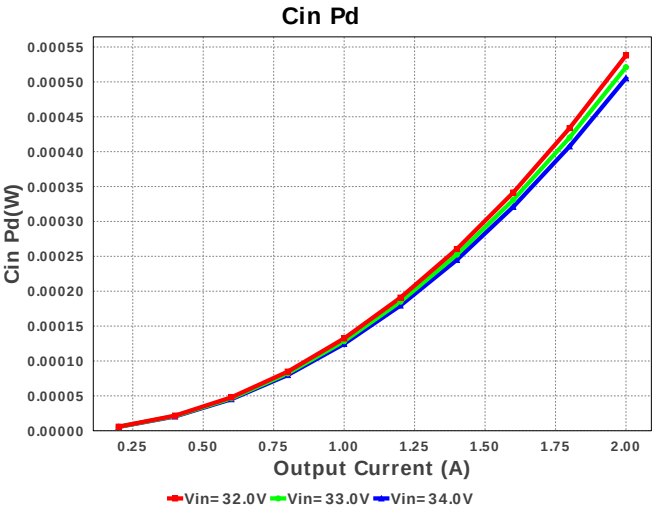
Efficiency

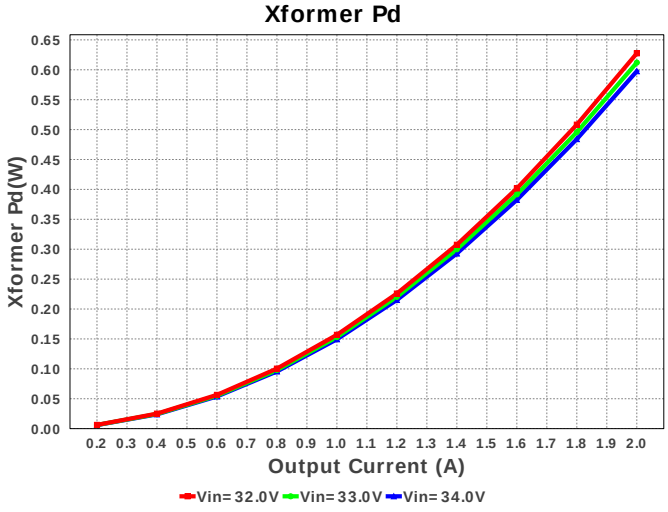


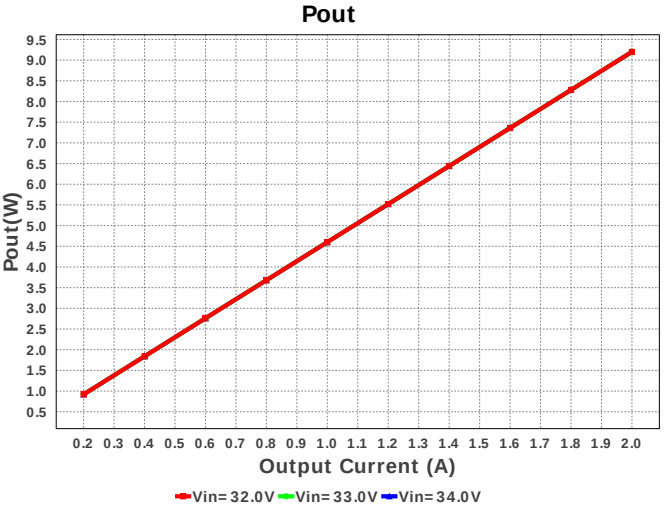


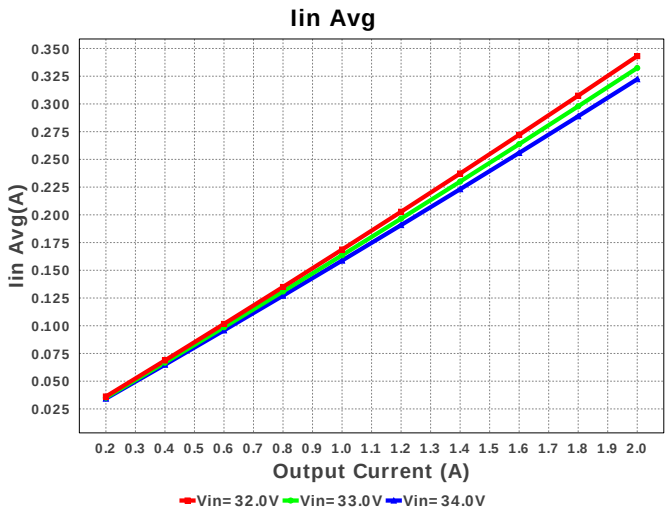


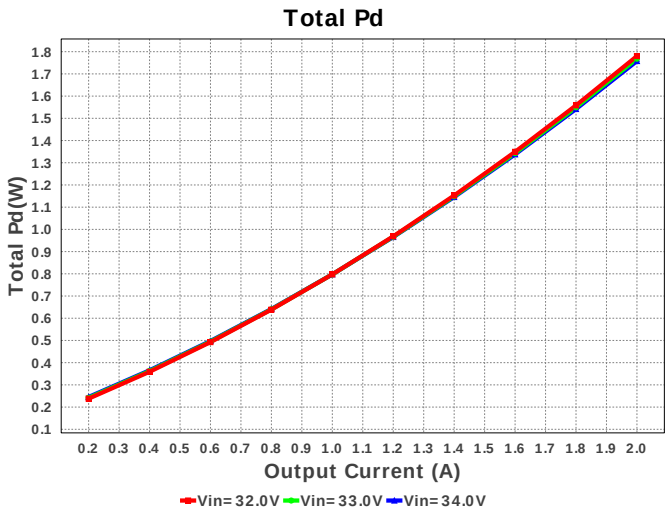


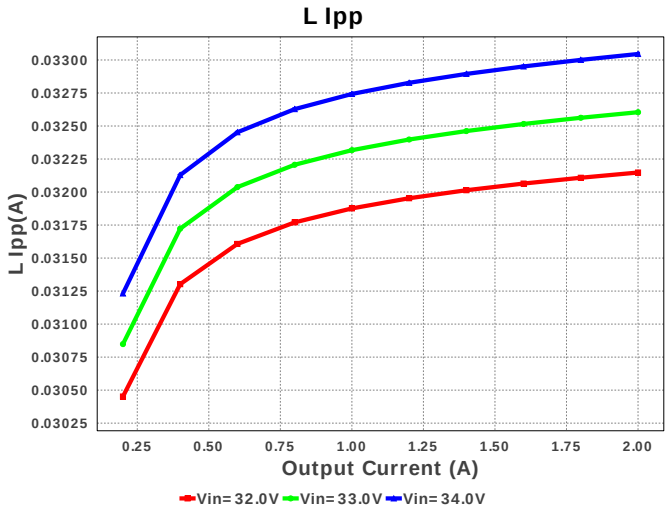


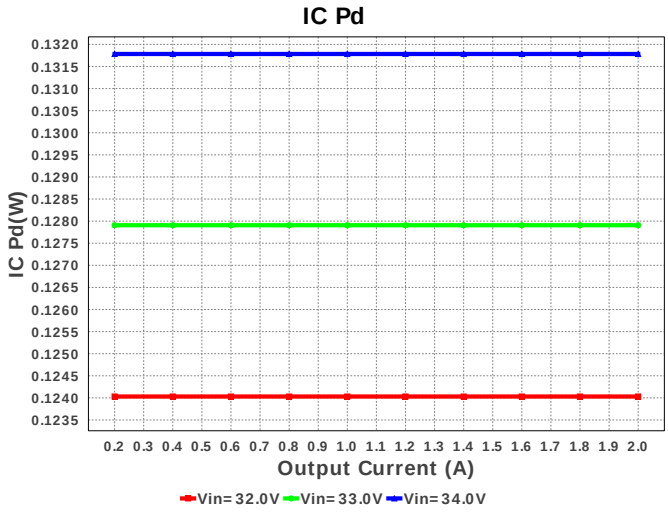


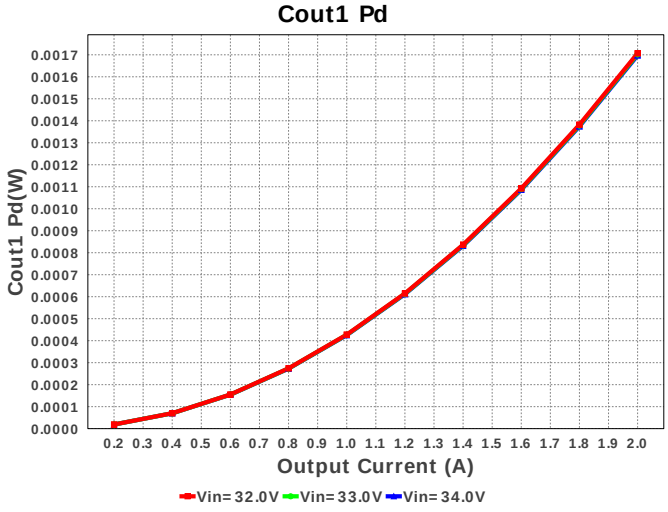


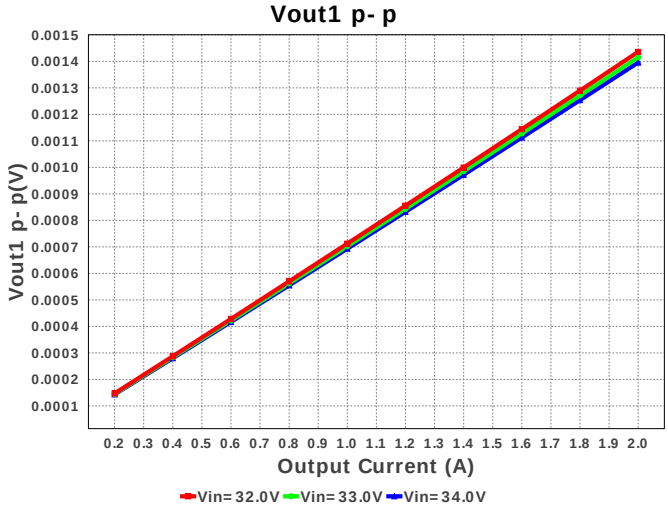


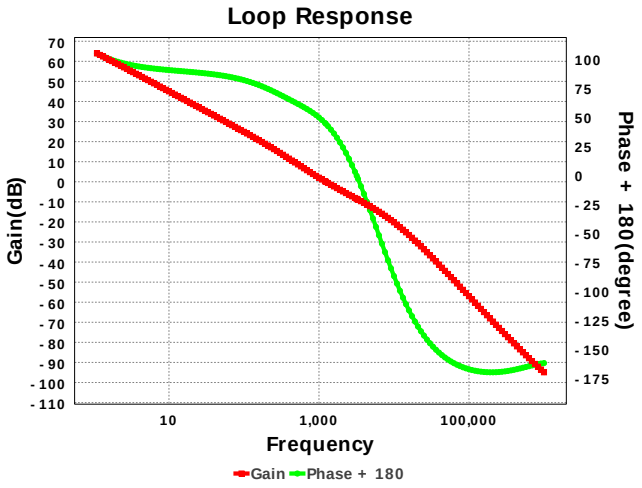












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	369.217 mA	Current	Input capacitor RMS ripple current
2.	Cout1 IRMS	1.032 A	Current	Output capacitor1 RMS ripple current
3.	IC Ipk	756.727 mA	Current	Peak switch current
4.	Iin Avg	340.7 mA	Current	Average input current
5.	L Ipp	32.043 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	29	General	Total Design BOM count
7.	FootPrint	501.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	325.0 kHz	General	Switching frequency
9.	IC Tolerance	25.0 mV	General	IC Feedback Tolerance
10.	Pout	9.2 W	General	Total output power
11.	Total BOM	$0.0	General	Total BOM Cost
12.	Low Freq Gain	63.713 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	4.6 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Cross Freq	1.215 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	45.997 %	Op_point	Duty cycle
16.	Efficiency	84.384 %	Op_point	Steady state efficiency
17.	Gain Marg	-8.188 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	54.966 degC	Op_point	IC junction temperature
19.	ICThetaJA	200.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	2.0 A	Op_point	Iout operating point
21.	Phase Marg	43.883 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	32.0 V	Op_point	Vin operating point
23.	Vout1 OP	4.6 V	Op_point	Operational Voltage 1
24.	Vout1 p-p	1.431 mV	Op_point	Peak-to-peak output1 ripple voltage
25.	Cin Pd	534.108 µW	Power	Input capacitor power dissipation
26.	Cout1 Pd	1.827 mW	Power	Output capacitor1 power dissipation
27.	Cout1 Pd	1.827 mW	Power	Output capacitor1 power dissipation
28.	Diode1 Pd	0.0 W	Power	Diode1 power dissipation
29.	IC Pd	124.832 mW	Power	IC power dissipation
30.	Total Pd	1.703 W	Power	Total Power Dissipation
31.	Xformer Pd	731.477 mW	Power	Transformer power dissipation
32.	Zener Pd	0.0 W	Power	Zener power dissipation
33.	Vout Tolerance	3.501 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	Iout1	2.0	Output Current #1
3.	Iout2	3.0	Output Current #2
4.	Iout3	2.0	Output Current #3
5.	VinMax	34.0	Maximum input voltage
6.	VinMin	32.0	Minimum input voltage
7.	Vout	4.6	Output Voltage
8.	Vout1	4.6	Output Voltage #1
9.	Vout2	5.0	Output Voltage #2
10.	Vout3	5.0	Output Voltage #3
11.	base_pn	LM5020-1	Texas Instruments Base Part Number
12.	source	DC	Input Source Type
13.	ta	30.0	Ambient temperature

Design Assistance

1. LM5020-1 Product Folder : http://www.ti.com/product/LM5020-1 : contains the data sheet and other resources.