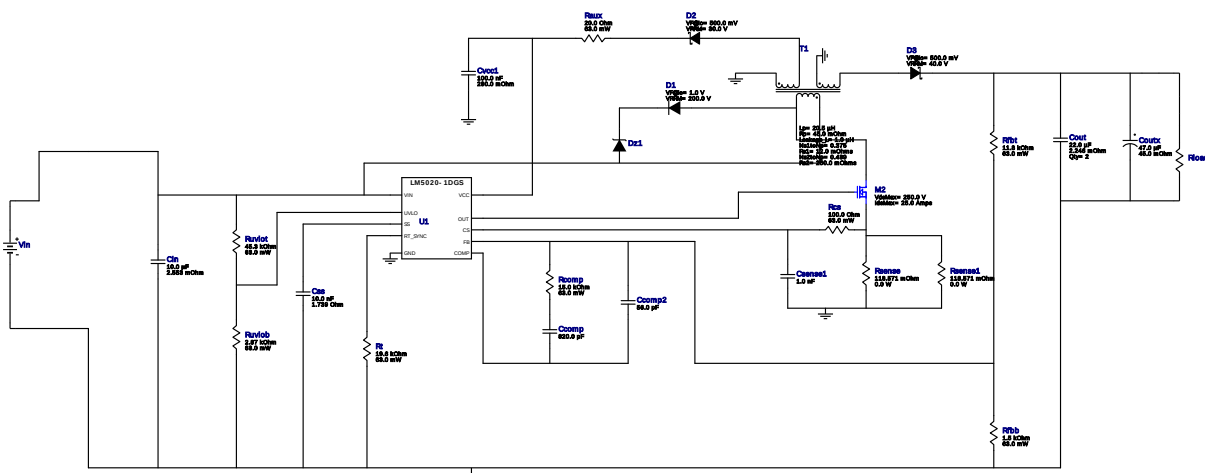
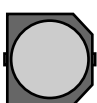


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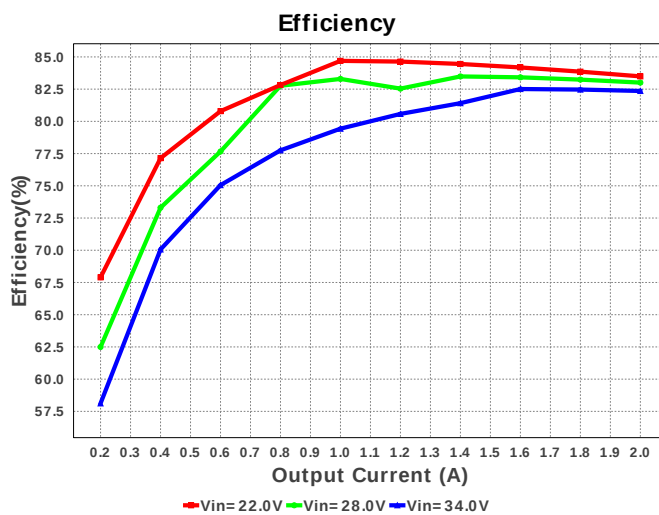
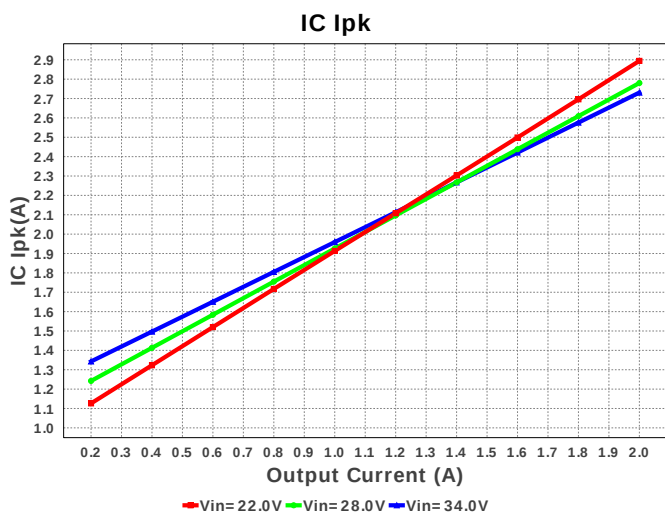
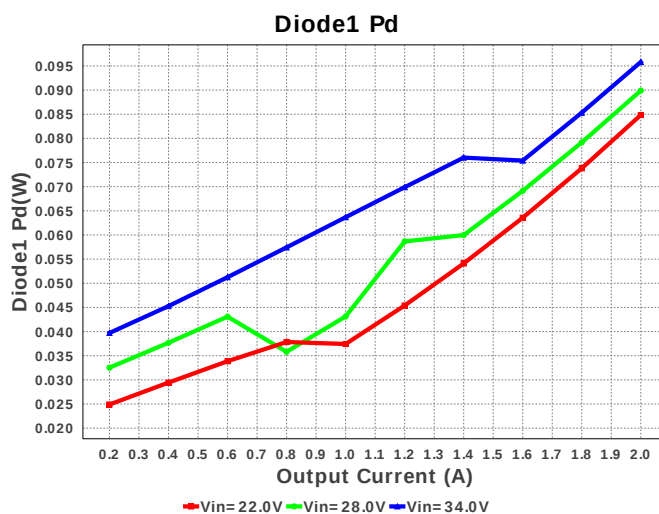
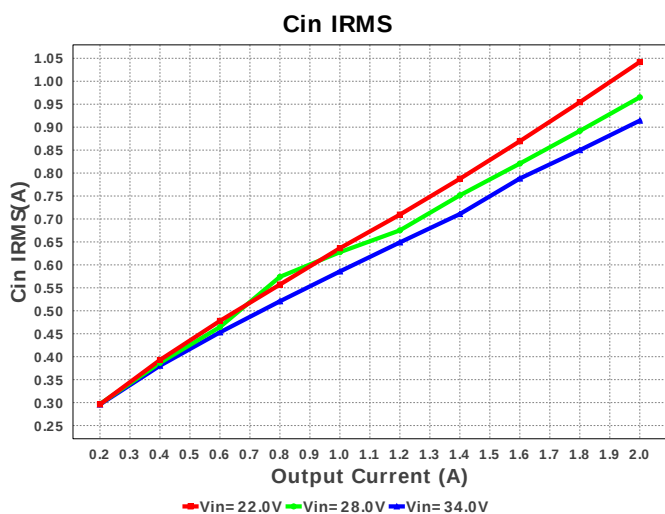
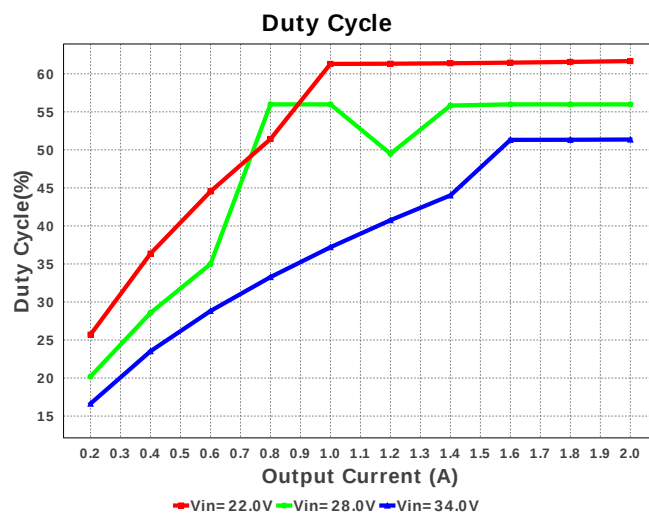
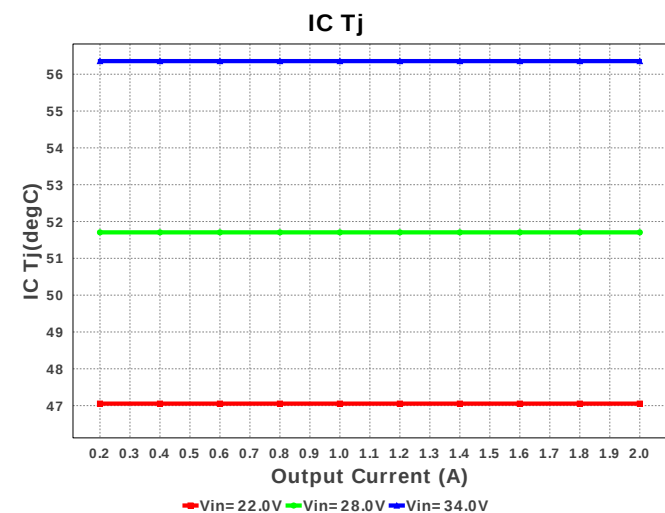
Design : 4738744/22 LM5020MM-1/NOPB
LM5020MM-1/NOPB 22.0V-34.0V to 11.00V @ 2.0A

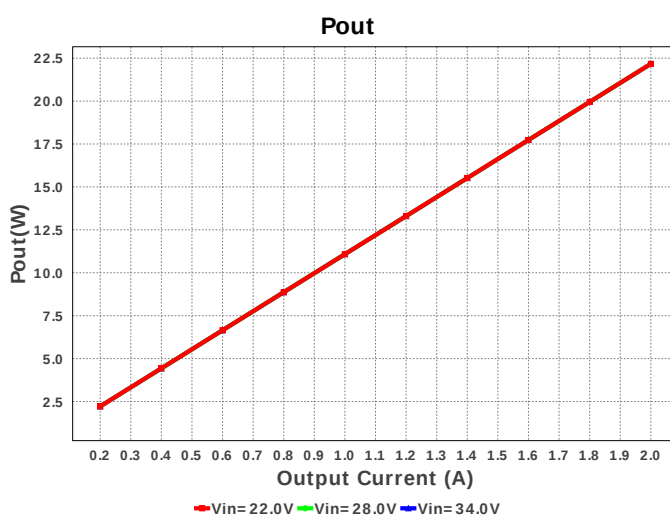
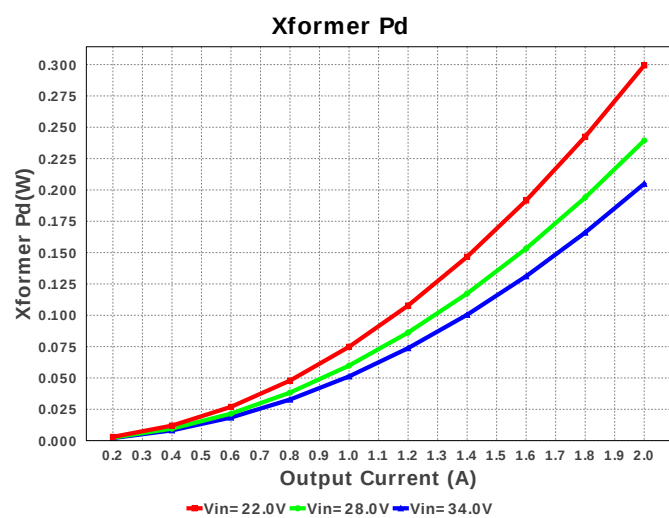
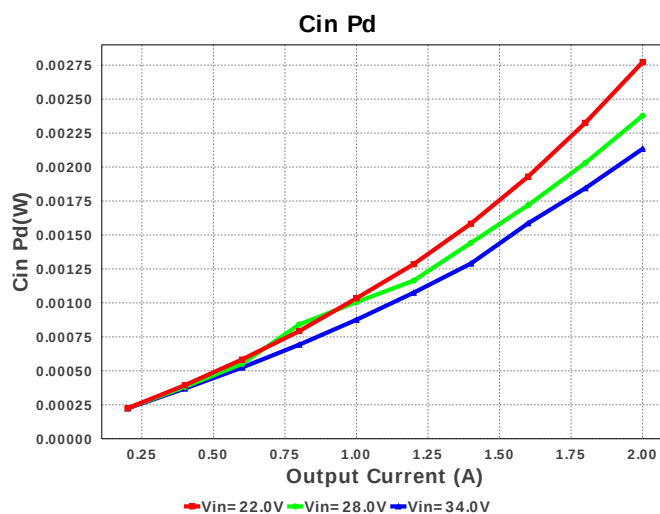
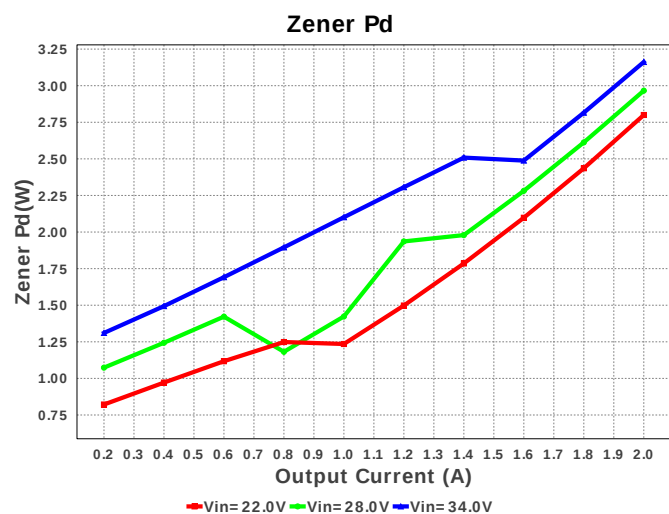
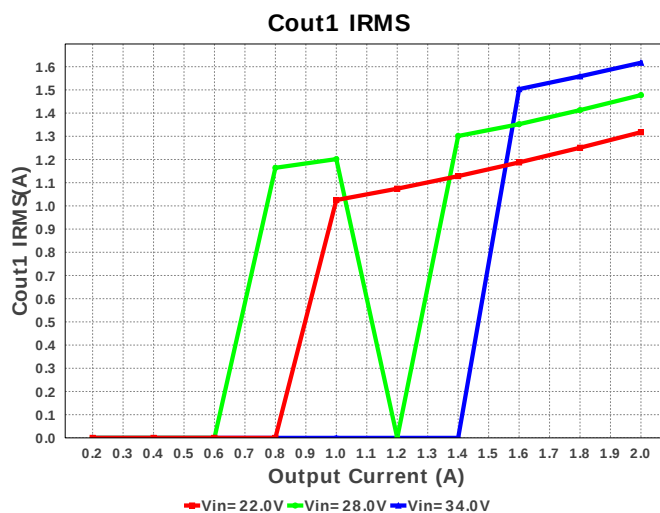
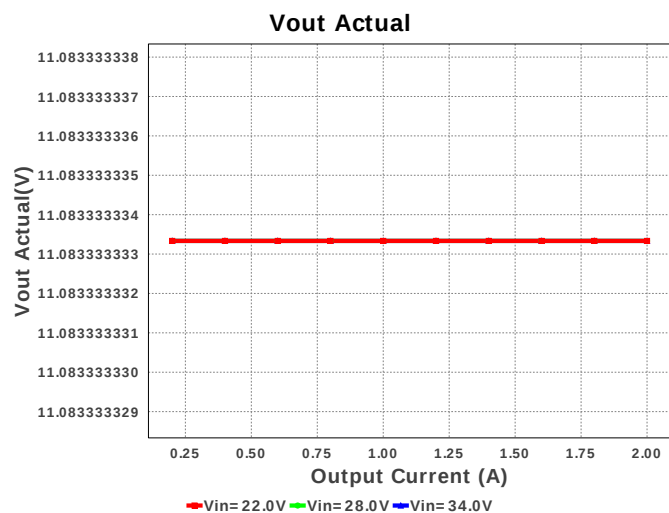


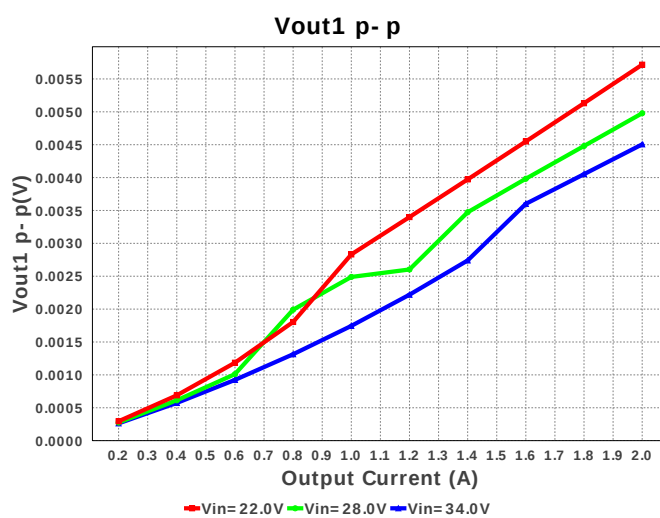
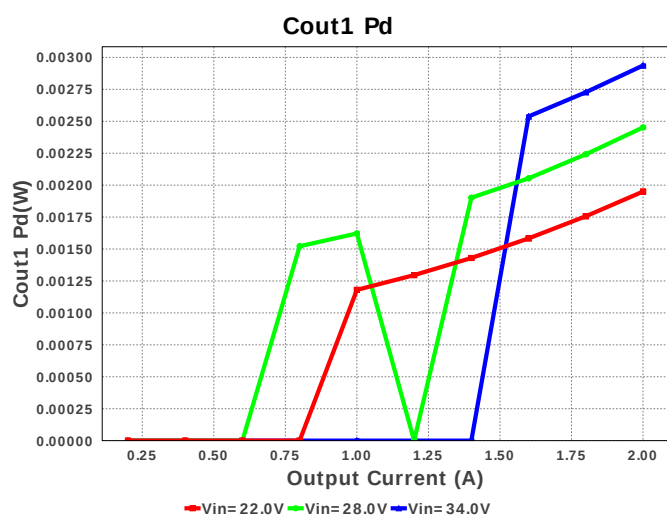
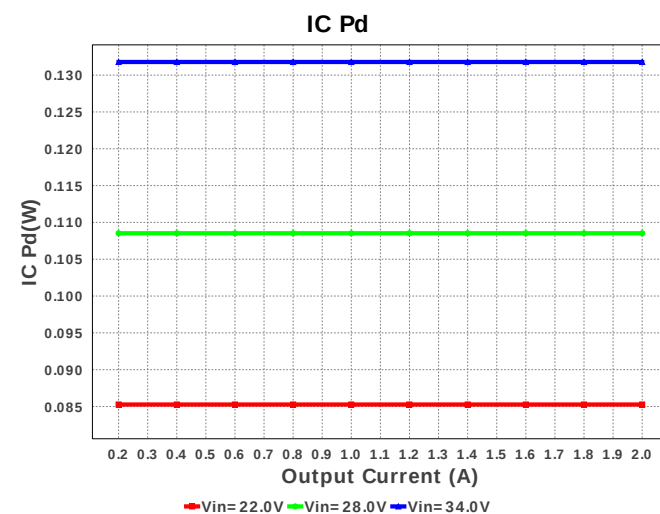
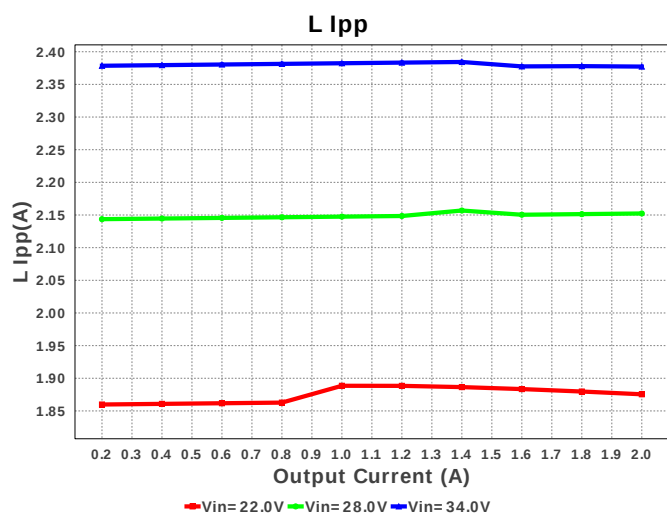
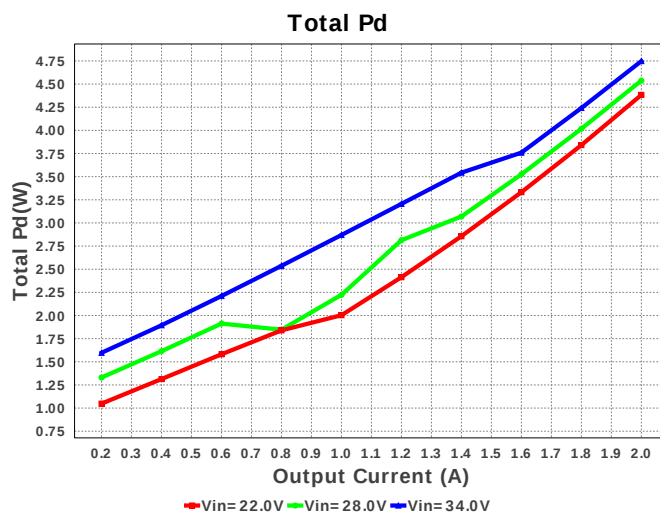
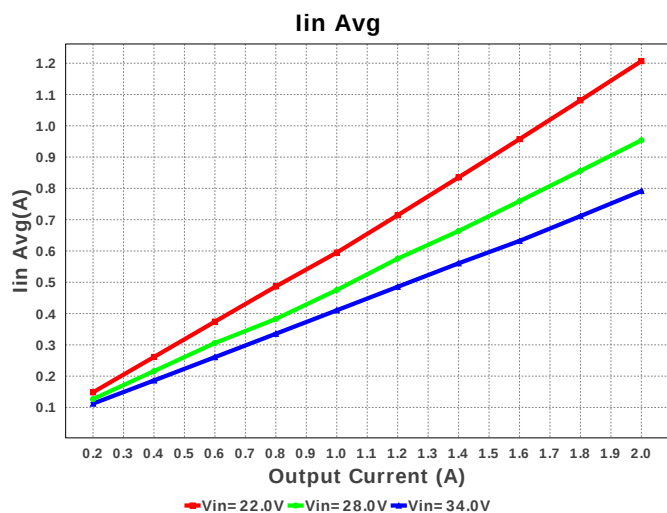
Electrical BOM

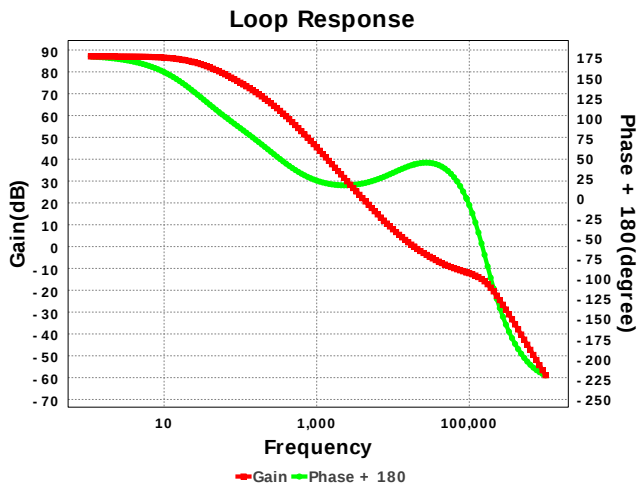
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Ccomp	Yageo America	CC0805KRX7R9BB821 Series= X7R	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm²
2.	Ccomp2	Yageo America	CC0805JRNPO9BN560 Series= C0G/NP0	Cap= 56.0 pF VDC= 50.0 V IRMS= 0.0 A	1	\$0.01	 0805 7 mm²
3.	Cin	TDK	C3216X6S1V106K Series= X6S	Cap= 10.0 uF ESR= 2.553 mOhm VDC= 35.0 V IRMS= 0.0 A	1	\$0.14	 1206 11 mm²
4.	Cout	TDK	C3216JB1E226M Series= JB	Cap= 22.0 uF ESR= 2.246 mOhm VDC= 25.0 V IRMS= 0.0 A	2	\$0.55	 1206 11 mm²
5.	Coutx	Chemi-Con	APXH200ARA470MH70G Series= PXH	Cap= 47.0 uF ESR= 45.0 mOhm VDC= 20.0 V IRMS= 2.0 A	1	\$0.61	 CAPSMT_62_H70 110 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	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
9.	D1	Central Semiconductor	CMR1U-02M	VF@Io= 1.0 V VRRM= 200.0 V	1	\$0.17	 SMA 37 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	D2	Bourns	CD214A-B130LF	VF@Io= 500.0 mV VRRM= 30.0 V	1	\$0.08	 SMA 37 mm²
11.	D3	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	\$0.11	 SMA 37 mm²
12.	Dz1	Micro Commercial Components	3SMAJ5937B-TP	Zener	1	\$0.12	 SMA 37 mm²
13.	M2	Infineon Technologies	BSC600N25NS3 G	VdsMax= 250.0 V IdsMax= 25.0 Amps	1	\$1.41	 PG-TDSON-8 55 mm²
14.	Raux	Vishay-Dale	CRCW040220R0FKED Series= CRCW..e3	Res= 20.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
15.	Rcomp	Vishay-Dale	CRCW040215K0FKED Series= CRCW..e3	Res= 15.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
16.	Rcs	Vishay-Dale	CRCW0402100RFKED Series= CRCW..e3	Res= 100.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
17.	Rfbb	Vishay-Dale	CRCW04021K50FKED Series= CRCW..e3	Res= 1.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
18.	Rfbt	Vishay-Dale	CRCW040211K8FKED Series= CRCW..e3	Res= 11.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
19.	Rsense	CUSTOM	CUSTOM Series= ?	Res= 118.571 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
20.	Rsense1	CUSTOM	CUSTOM Series= ?	Res= 118.571 mOhm Power= 0.0 W Tolerance= 0.0%	1	NA	CUSTOM 0 mm²
21.	Rt	Vishay-Dale	CRCW040219K6FKED Series= CRCW..e3	Res= 19.6 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
22.	Ruvlob	Vishay-Dale	CRCW04022K87FKED Series= CRCW..e3	Res= 2.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
23.	Ruvlot	Vishay-Dale	CRCW040245K3FKED Series= CRCW..e3	Res= 45.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm²
24.	T1	Any	ATS-1410R-WNC	Lp= 20.5 µH Rp= 45.0 mOhm Leakage_L= 1.0 µH Ns1toNp= 0.375 Rs1= 12.0 mOhms Ns2toNp= 0.439 Rs2= 250.0 mOhms	1	NA	Atech_ATS-1410R-WNC 756 mm²
25.	U1	Texas Instruments	LM5020MM-1/NOPB	Switcher	1	\$0.80	mpds035b 35 mm²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	1.039 A	Current	Input capacitor RMS ripple current
2.	Cout1 IRMS	1.47 A	Current	Output capacitor1 RMS ripple current
3.	IC Ipk	2.885 A	Current	Peak switch current
4.	Iin Avg	1.201 A	Current	Average input current
5.	L Ipp	1.869 A	Current	Peak-to-peak inductor ripple current
6.	BOM Count	26	General	Total Design BOM count
7.	FootPrint	1.202 k 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	22.167 W	General	Total output power
11.	Total BOM	\$0.0	General	Total BOM Cost
12.	Low Freq Gain	85.017 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	11.083 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Cross Freq	15.953 kHz	Op_point	Bode plot crossover frequency
15.	Duty Cycle	61.545 %	Op_point	Duty cycle
16.	Efficiency	83.921 %	Op_point	Steady state efficiency
17.	Gain Marg	-10.809 dB	Op_point	Bode Plot Gain Margin
18.	IC Tj	47.164 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	34.903 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	22.0 V	Op_point	Vin operating point
23.	Vout1 OP	11.083 V	Op_point	Operational Voltage 1
24.	Vout1 p-p	5.698 mV	Op_point	Peak-to-peak output1 ripple voltage
25.	Cin Pd	2.756 mW	Power	Input capacitor power dissipation
26.	Cout1 Pd	2.428 mW	Power	Output capacitor1 power dissipation
27.	Cout1 Pd	2.428 mW	Power	Output capacitor1 power dissipation
28.	Diode1 Pd	85.112 mW	Power	Diode1 power dissipation
29.	IC Pd	85.822 mW	Power	IC power dissipation
30.	Total Pd	4.247 W	Power	Total Power Dissipation
31.	Xformer Pd	315.821 mW	Power	Transformer power dissipation
32.	Zener Pd	2.809 W	Power	Zener power dissipation
33.	Vout Tolerance	3.828 %		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	5.0	Output Current #2
4.	Iout3	2.0	Output Current #3
5.	VinMax	34.0	Maximum input voltage
6.	VinMin	22.0	Minimum input voltage
7.	Vout	11.0	Output Voltage
8.	Vout1	11.0	Output Voltage #1
9.	Vout2	5.0	Output Voltage #2
10.	Vout3	4.0	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.

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