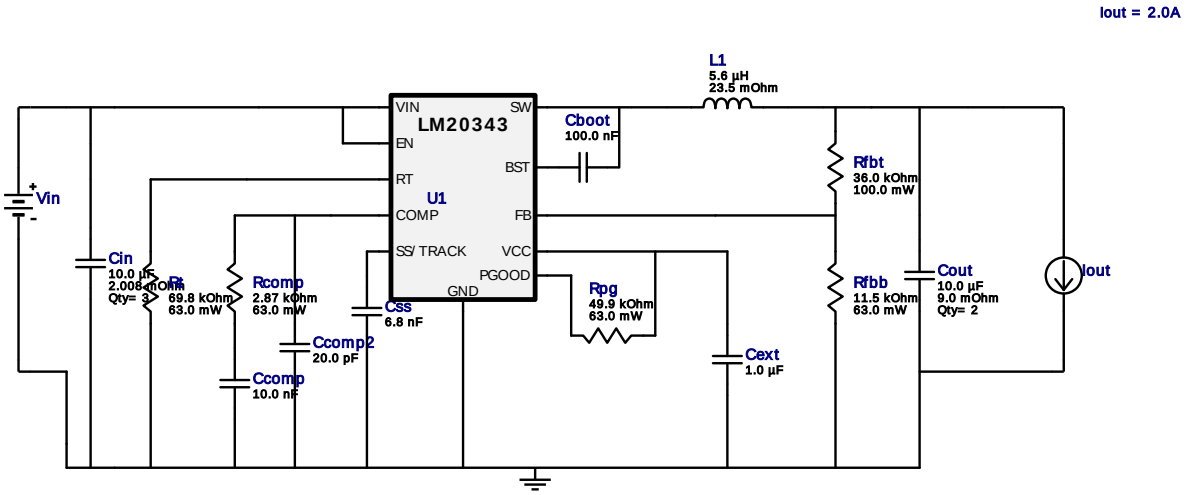
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 3.3V
Iout = 2.0A

Device = LM20343MH/NOPB
Topology = Buck
Created = 7/17/16 8:03:11 AM
BOM Cost = $3.95
BOM Count = 17
Total Pd = 1.15W

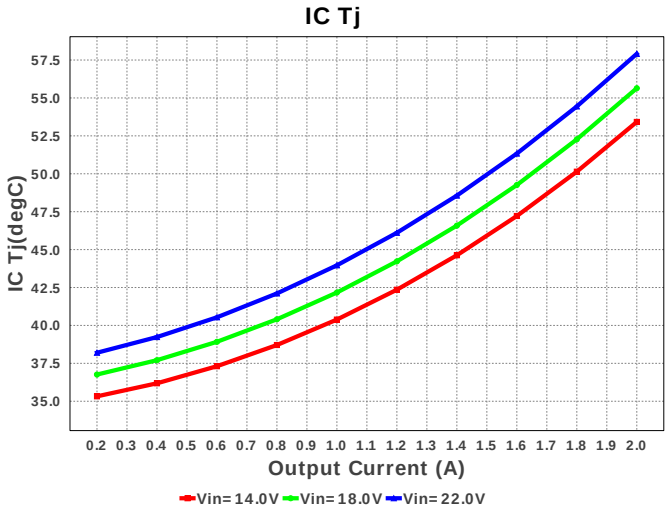
Design : 4352199/22 LM20343MH/NOPB
LM20343MH/NOPB 14.0V-22.0V to 3.30V @ 2.0A

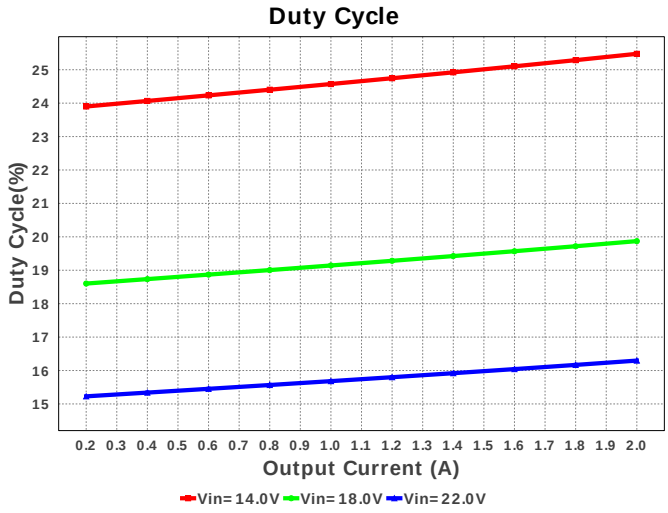


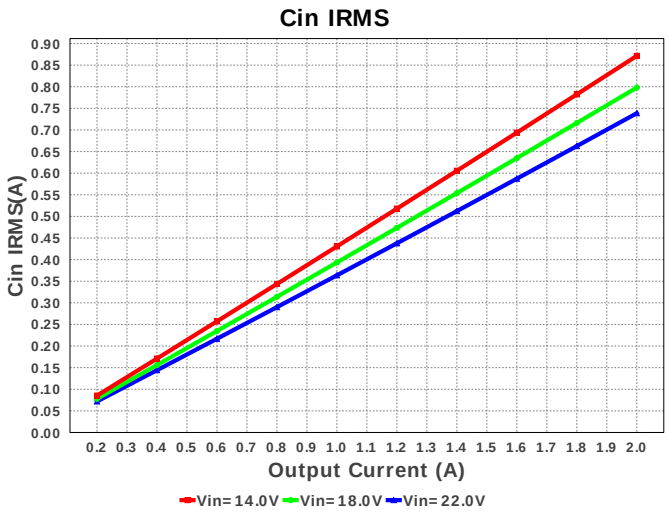
Electrical BOM

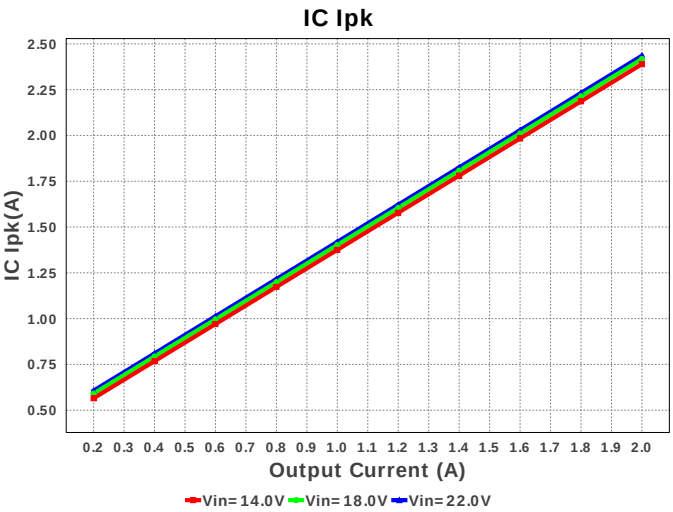
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Ccomp	MuRata	GRM216R71H103KA01D Series= X7R	Cap= 10.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	Samsung Electro-Mechanics	CL21C200JBANNNC Series= C0G/NP0	Cap= 20.0 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cext	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
5.	Cin	MuRata	GRM32ER7YA106KA12L Series= X7R	Cap= 10.0 uF ESR= 2.008 mOhm VDC= 35.0 V IRMS= 4.6772 A	3	$0.22	1210_280 15 mm²
6.	Cout	MuRata	GRM188R60J106ME47D Series= X5R	Cap= 10.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 2.74 A	2	$0.02	0603 5 mm²
7.	Css	Yageo America	CC0805KRX7R9BB682 Series= X7R	Cap= 6.8 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
8.	L1	Coilcraft	XAL5050-562MEB	L= 5.6 µH DCR= 23.5 mOhm	1	$0.92	XAL5050 54 mm²
9.	Rcomp	Vishay-Dale	CRCW04022K87FKED Series= CRCW..e3	Res= 2.87 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfbb	Vishay-Dale	CRCW040211K5FKED Series= CRCW..e3	Res= 11.5 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
11.	Rfbt	Yageo America	RC0603FR-0736KL Series= ?	Res= 36.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²

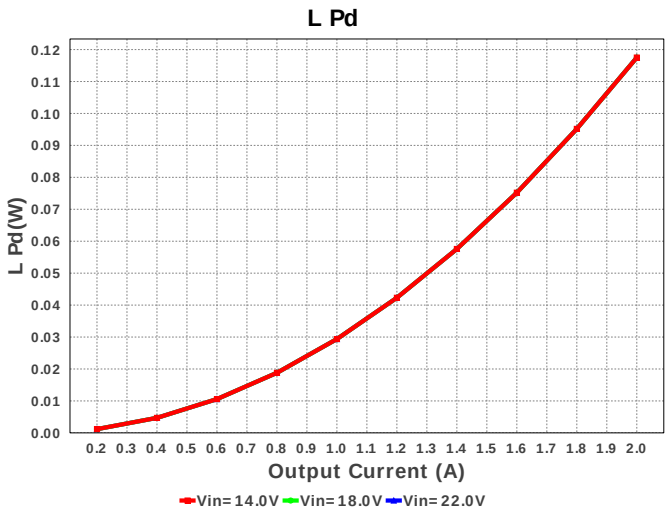
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	Rpg	Vishay-Dale	CRCW040249K9FKED Series= CRCW..e3	Res= 49.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
13.	Rt	Vishay-Dale	CRCW040269K8FKED Series= CRCW..e3	Res= 69.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm^2
14.	U1	Texas Instruments	LM20343MH/NOPB	Switcher	1	$2.22	 MXA20A 71 mm^2

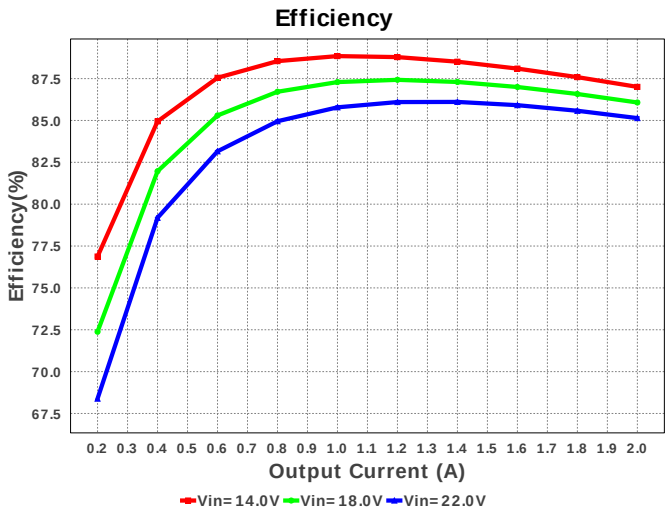


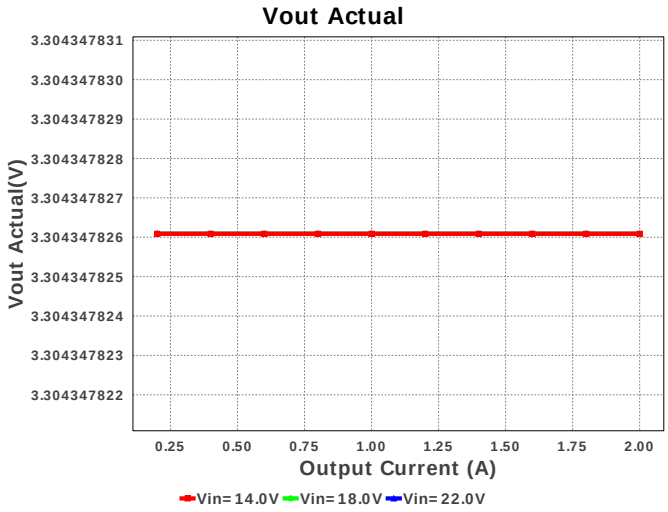


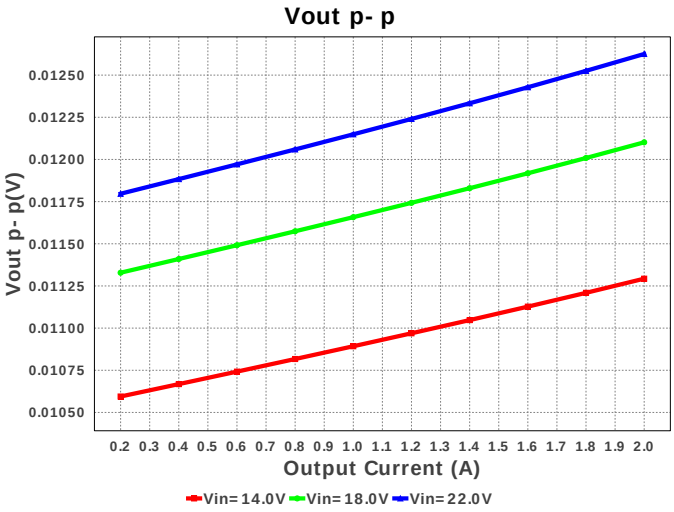


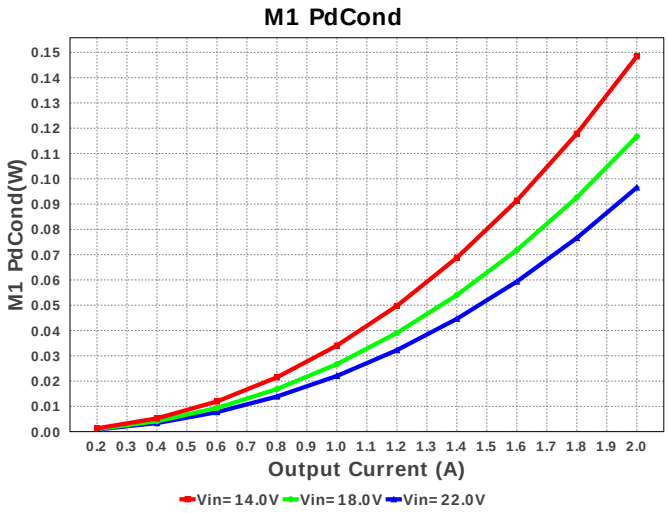


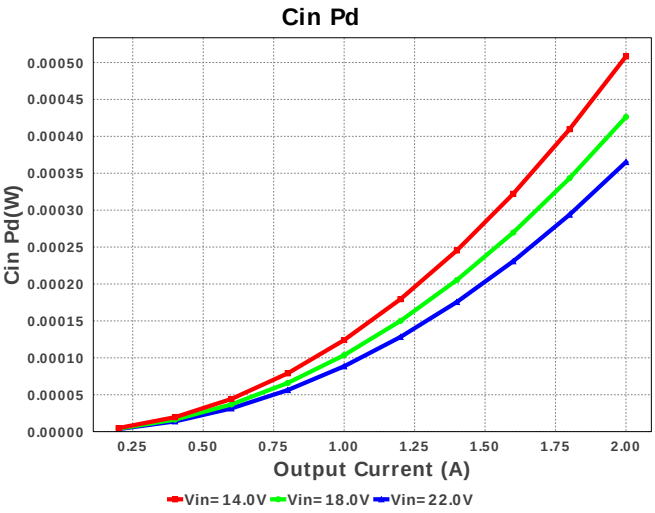


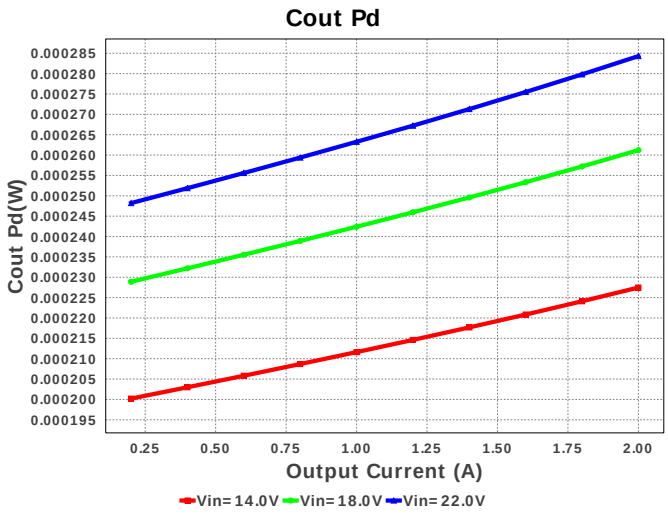


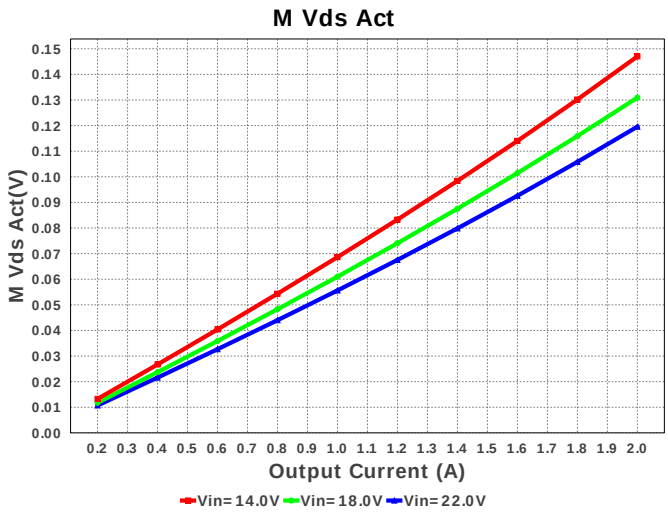


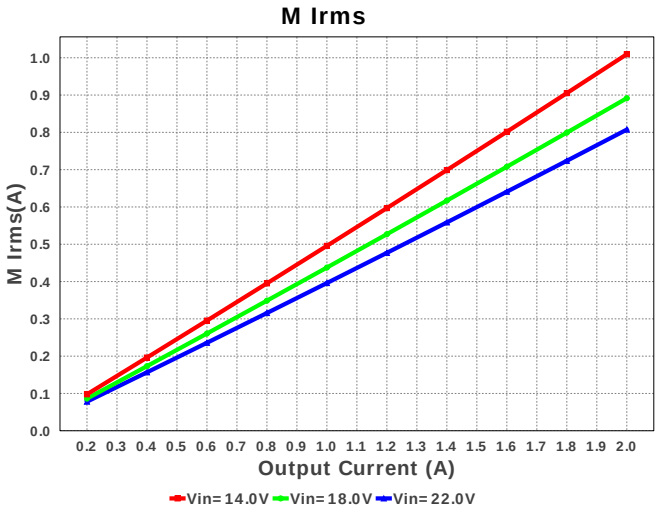


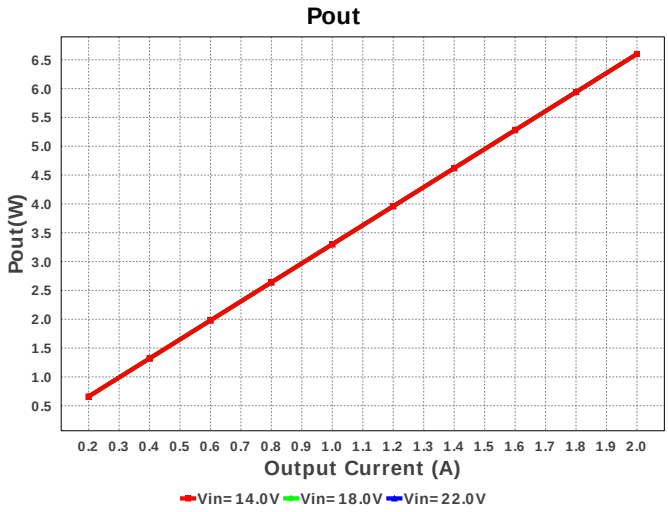


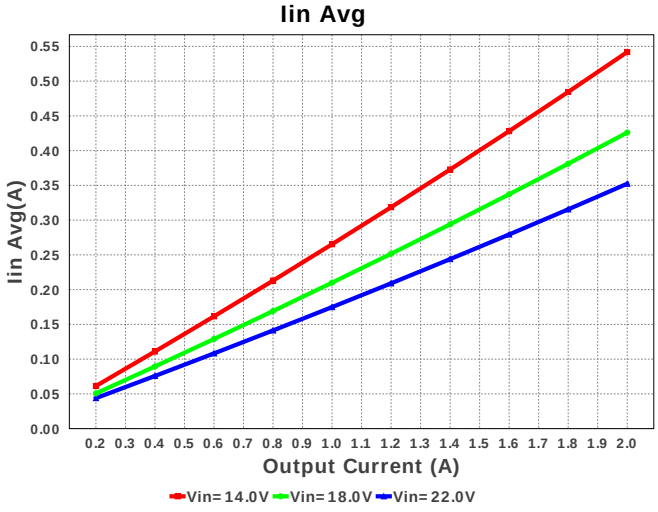


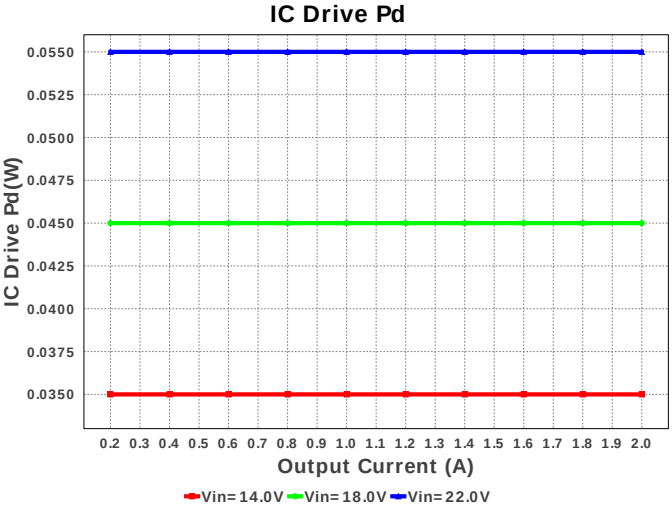


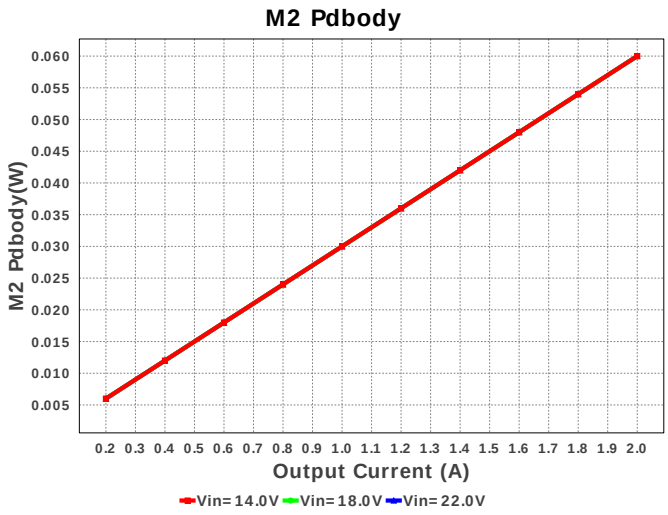


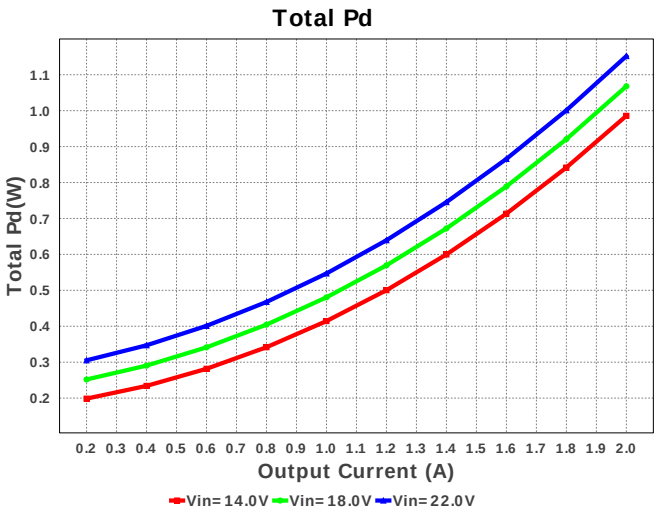


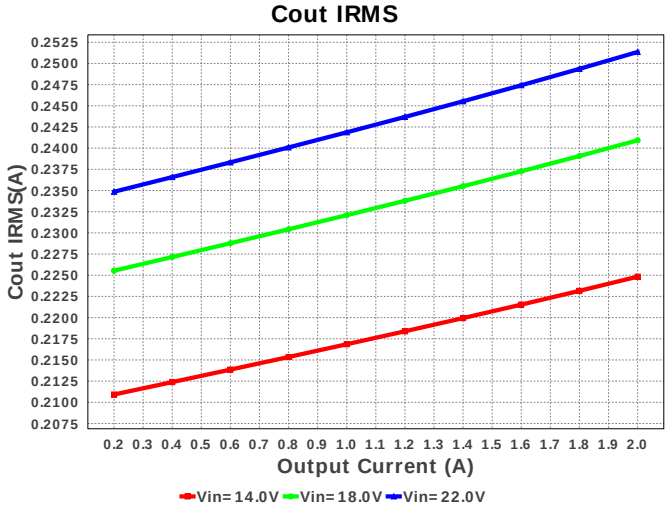


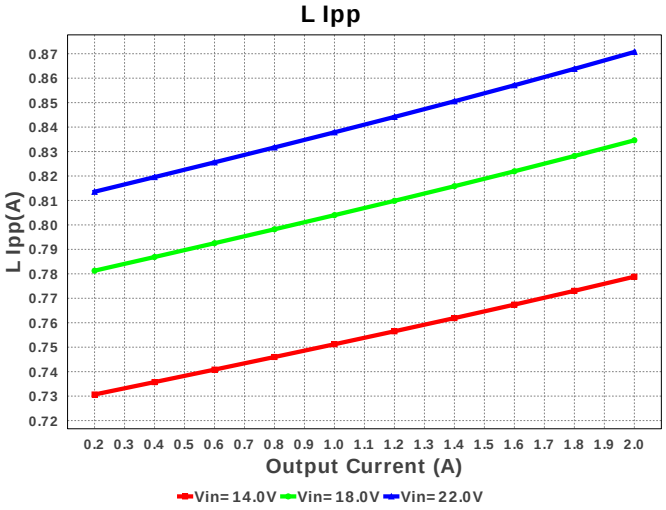


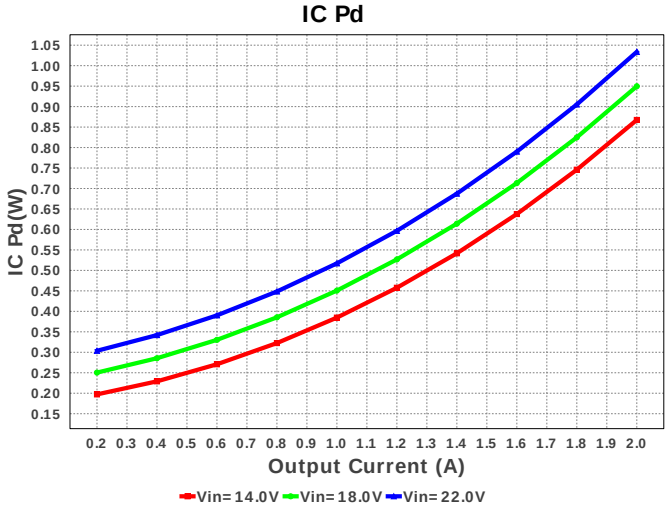


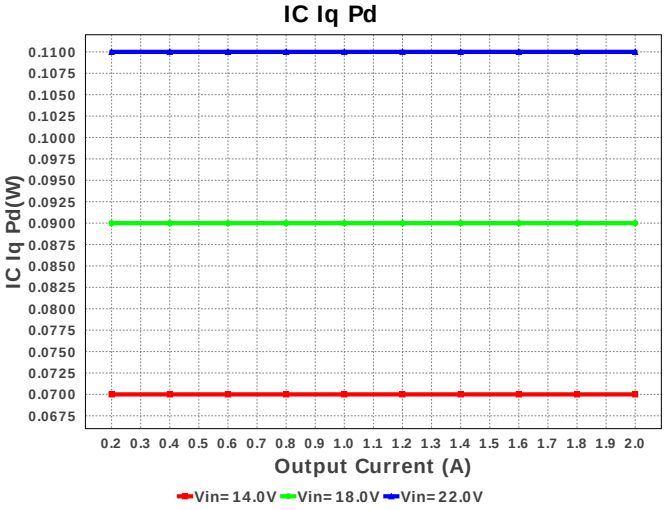


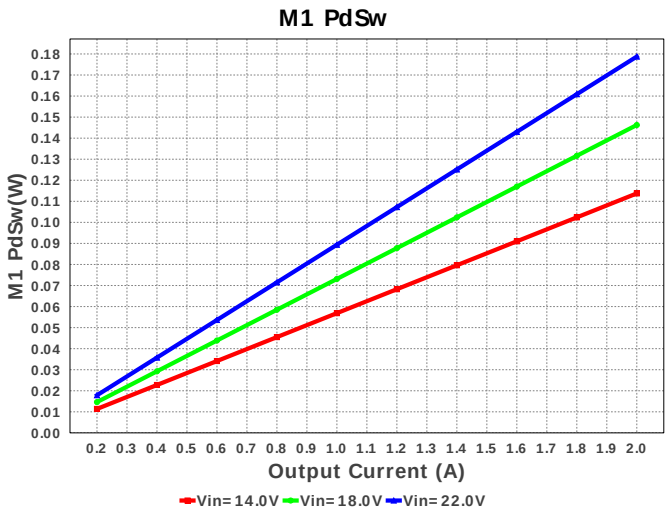


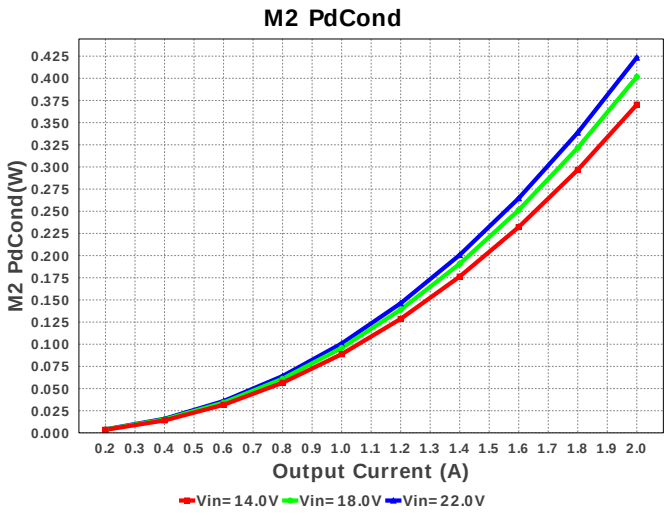


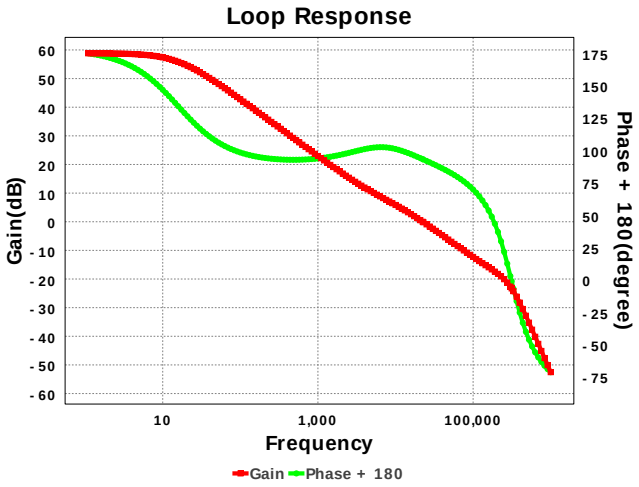












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	738.671 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	251.352 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.435 A	Current	Peak switch current in IC
4.	Iin Avg	352.36 mA	Current	Average input current
5.	L Ipp	870.71 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	807.383 mA	Current	Q Iavg
7.	BOM Count	17	General	Total Design BOM count
8.	FootPrint	230.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	625.0 kHz	General	Switching frequency
10.	IC Tolerance	12.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	119.573 mV	General	Voltage drop across the MosFET
12.	Pout	6.6 W	General	Total output power
13.	Total BOM	$3.95	General	Total BOM Cost
14.	Low Freq Gain	58.82 dB	Op_Point	Gain at 10Hz
15.	Vout Actual	3.304 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
17.	Cross Freq	22.379 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	16.297 %	Op_point	Duty cycle
19.	Efficiency	85.141 %	Op_point	Steady state efficiency
20.	Gain Marg	-23.282 dB	Op_point	Bode Plot Gain Margin
21.	IC Tj	57.909 degC	Op_point	IC junction temperature
22.	ICThetaJA	27.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
23.	IOUT_OP	2.0 A	Op_point	Iout operating point
24.	Phase Marg	94.297 deg	Op_point	Bode Plot Phase Margin
25.	VIN_OP	22.0 V	Op_point	Vin operating point
26.	Vout p-p	12.625 mV	Op_point	Peak-to-peak output ripple voltage
27.	Cin Pd	365.212 µW	Power	Input capacitor power dissipation
28.	Cout Pd	284.301 µW	Power	Output capacitor power dissipation
29.	IC Drive Pd	55.0 mW	Power	Driver power dissipation
30.	IC Iq Pd	110.0 mW	Power	IC Iq Pd
31.	IC Pd	1.034 W	Power	IC power dissipation

#	Name	Value	Category	Description
32.	L Pd	117.5 mW	Power	Inductor power dissipation
33.	M1 PdCond	96.542 mW	Power	M1 MOSFET switching losses
34.	M1 PdSw	178.75 mW	Power	M1 MOSFET switching losses
35.	M1 PdCond	423.386 mW	Power	M2 MOSFET switching losses
36.	M2 Pdbody	60.0 mW	Power	Power dissipation through lower FET
37.	Total Pd	1.152 W	Power	Total Power Dissipation
38.	Vout Tolerance	3.054 %		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.	VinMax	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LM20343	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM20343** Product Folder : http://www.ti.com/product/LM20343 : contains the data sheet and other resources.