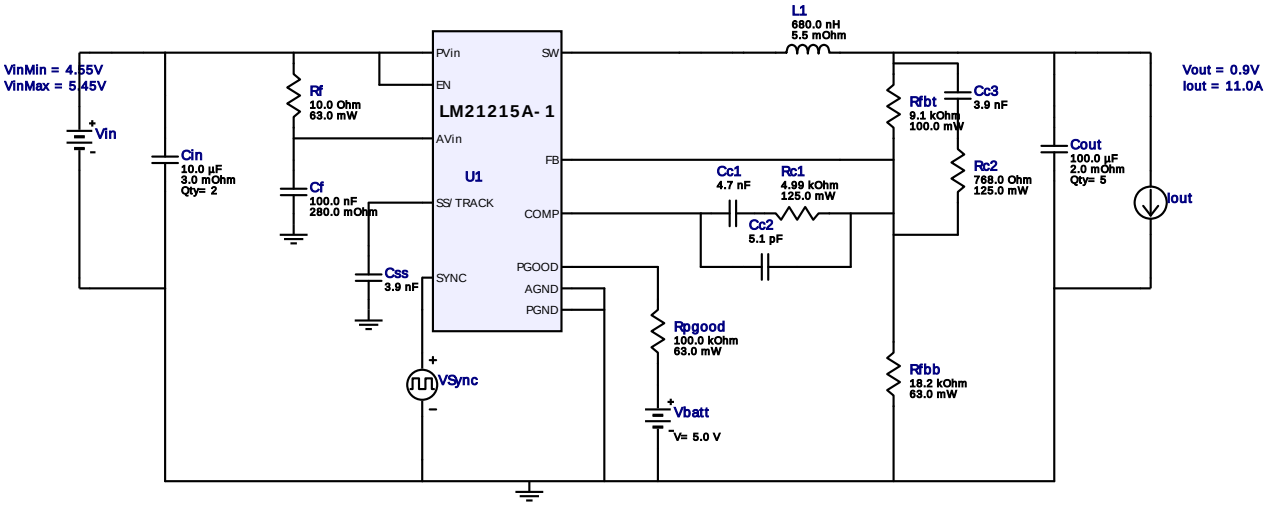
WEBENCH® Design Report

VinMin = 4.55V
VinMax = 5.45V
Vout = 0.9V
Iout = 11.0A

Device = LM21215AMHX-1/NOPB
Topology = Buck
Created = 4/1/15 10:53:23 PM
BOM Cost = $4.34
Footprint = 1,111.0 mm²
BOM Count = 20
Total Pd = 1.86W

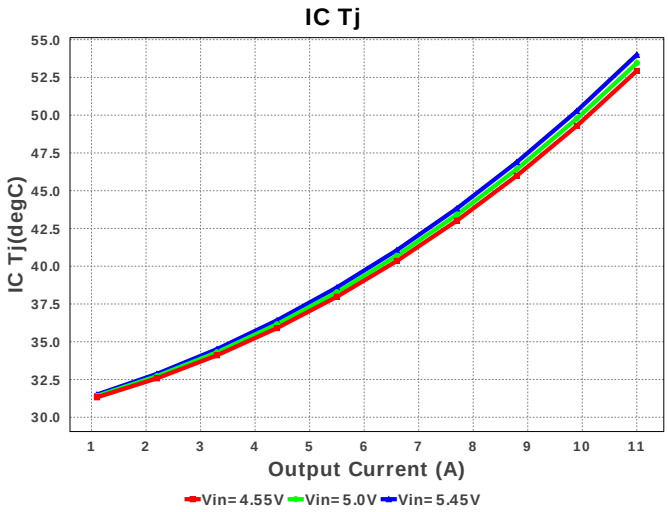
Design : 426461/120 LM21215AMHX-1/NOPB
LM21215AMHX-1/NOPB 4.55V-5.45V to .90V @ 11.0A

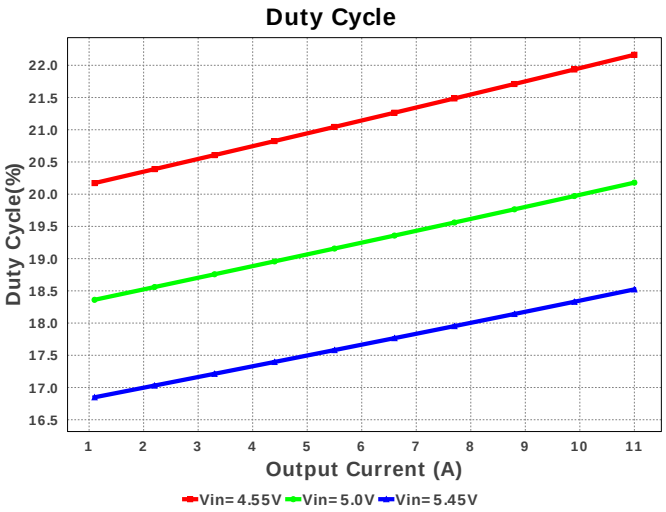


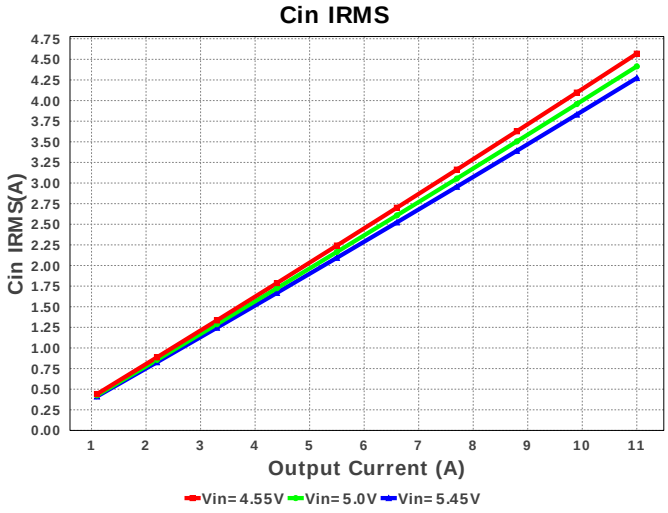
Electrical BOM

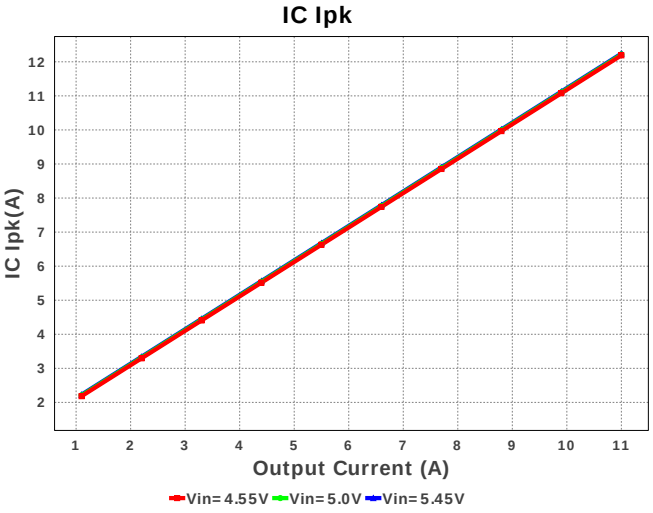
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cc1	Yageo America	CC0805KRX7R9BB472 Series= X7R	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cc2	MuRata	GRM1555C1H5R1CA01D Series= C0G/NP0	Cap= 5.1 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
3.	Cc3	Yageo America	CC0805KRX7R9BB392 Series= X7R	Cap= 3.9 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cf	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
5.	Cin	Kemet	C0805C106K8PACTU Series= X5R	Cap= 10.0 uF ESR= 3.0 mOhm VDC= 10.0 V IRMS= 11.43 A	2	$0.04	0805 7 mm²
6.	Cout	CUSTOM	CUSTOM_CAP_MD Series= CUSTOM	Cap= 100.0 uF ESR= 2.0 mOhm VDC= 2.0 V IRMS= 4.0 A	5	$0.10	1210 31 mm²
7.	Css	MuRata	GRM033R61A392KA01D Series= X5R	Cap= 3.9 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
8.	L1	CUSTOM(USERCUSTOMIZED)	CUSTOM_INDUCTOR_MD	L= 680.0 nH DCR= 5.5 mOhm	1	$0.10	DR127 42 mm²
9.	Rc1	Panasonic	ERJ-6ENF4991V Series= 225	Res= 4.99 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²

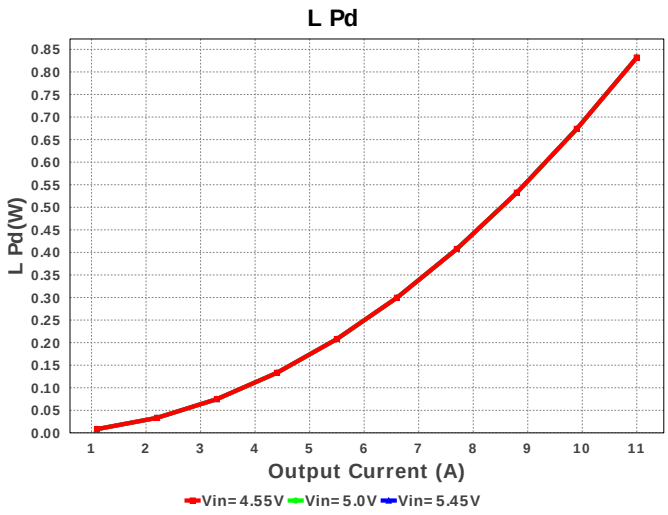
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rc2	Vishay-Dale	CRCW0805768RFKEA Series= CRCW..e3	Res= 768.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
11.	Rf	Vishay-Dale	CRCW040210R0FKED Series= CRCW..e3	Res= 10.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
12.	Rfbb	Vishay-Dale	CRCW040218K2FKED Series= CRCW..e3	Res= 18.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
13.	Rfbt	Susumu Co Ltd	RR1220P-912-D Series= 264	Res= 9.1 kOhm Power= 100.0 mW Tolerance= 0.5%	1	$0.01	0805 7 mm²
14.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
15.	U1	Texas Instruments	LM21215AMHX-1/NOPB	Switcher	1	$3.55	MYB20AA 678 mm²

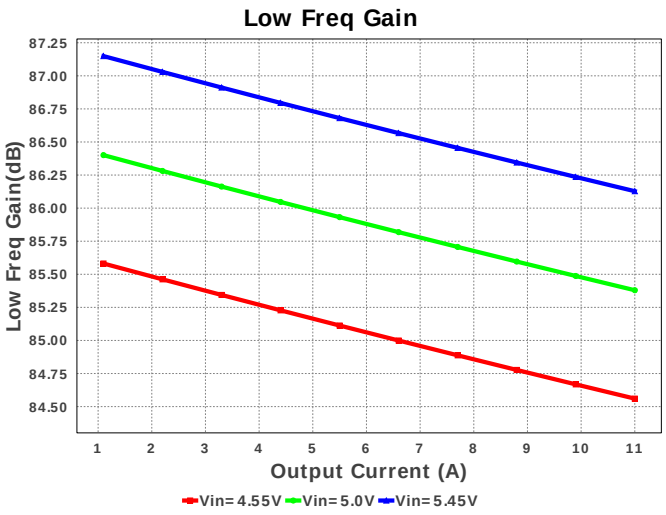


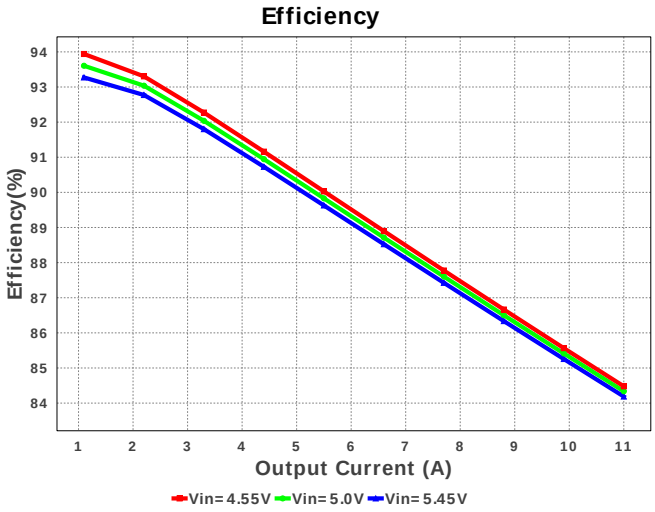


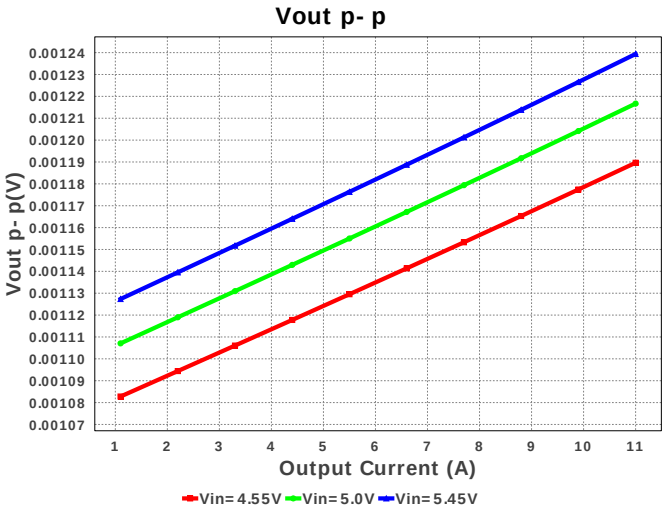


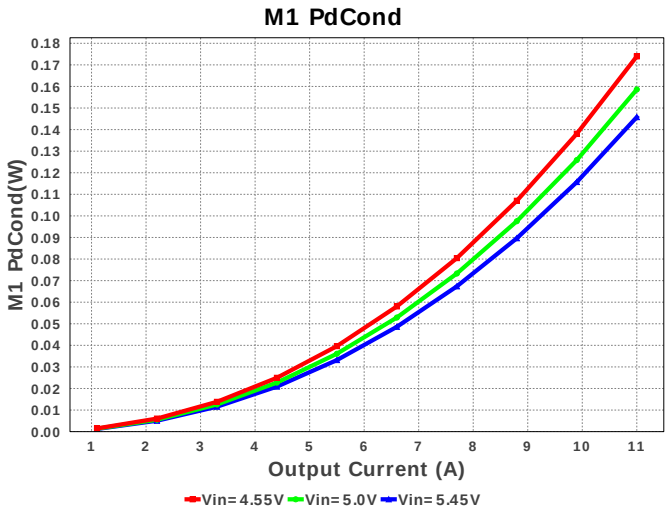


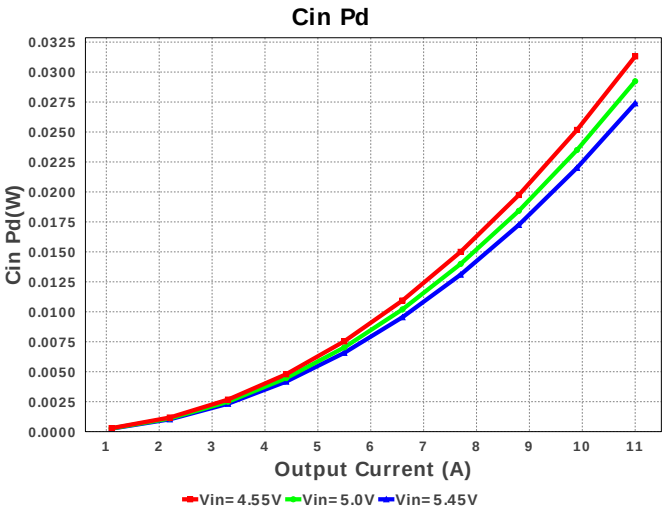


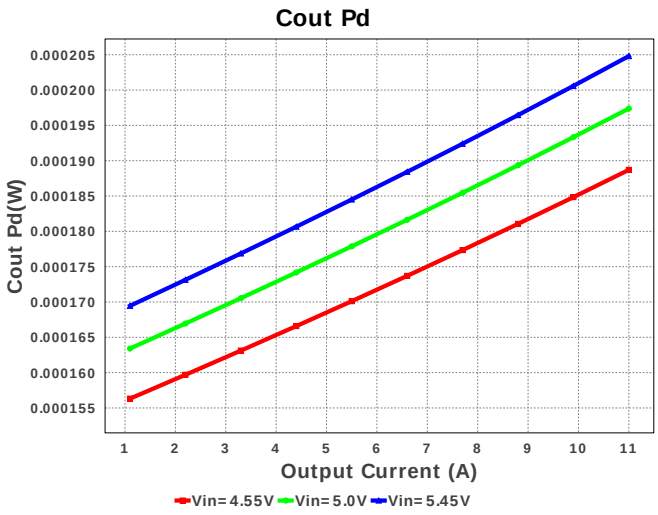


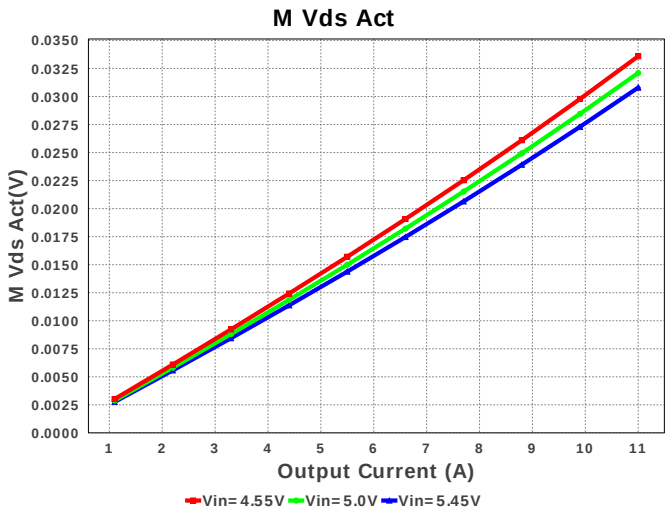


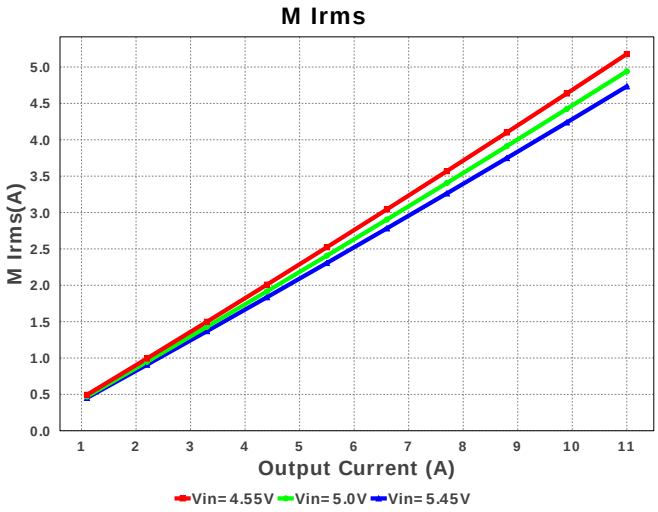


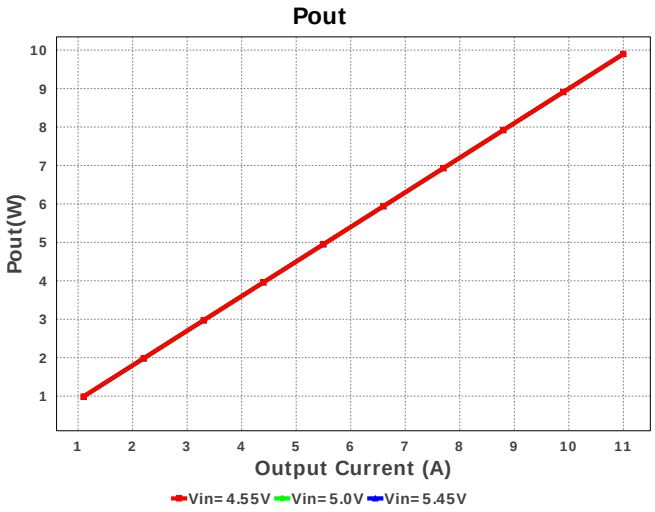


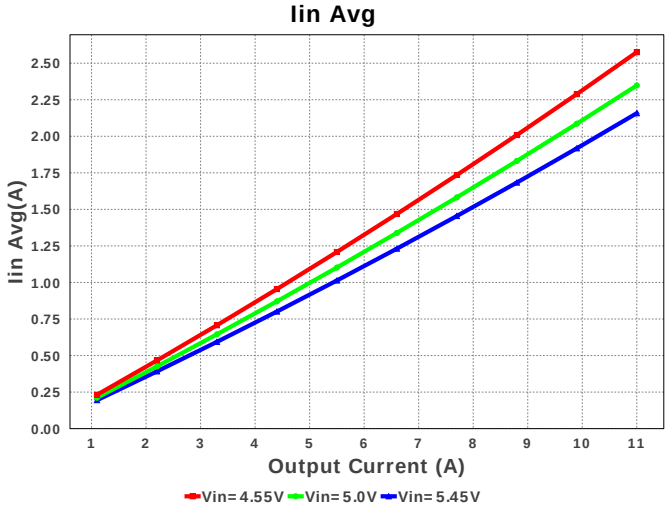


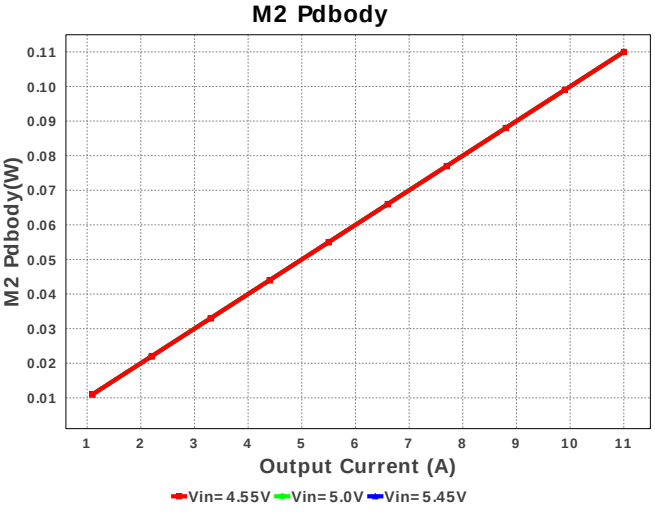


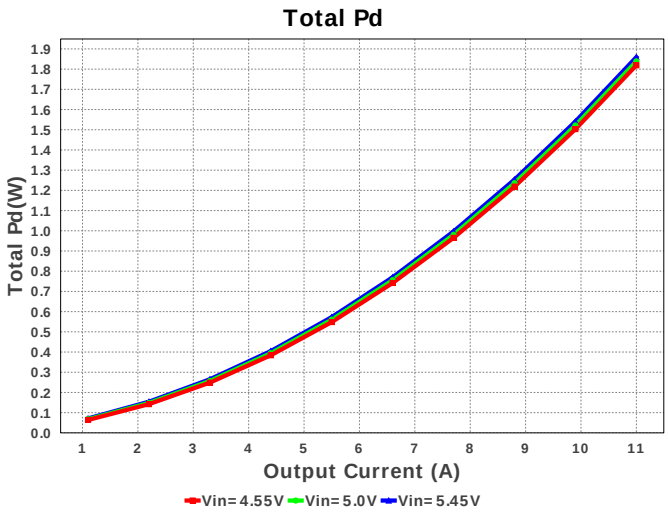


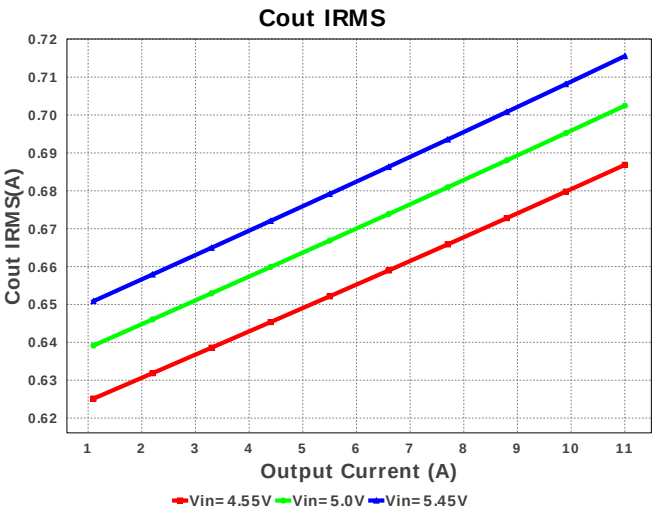


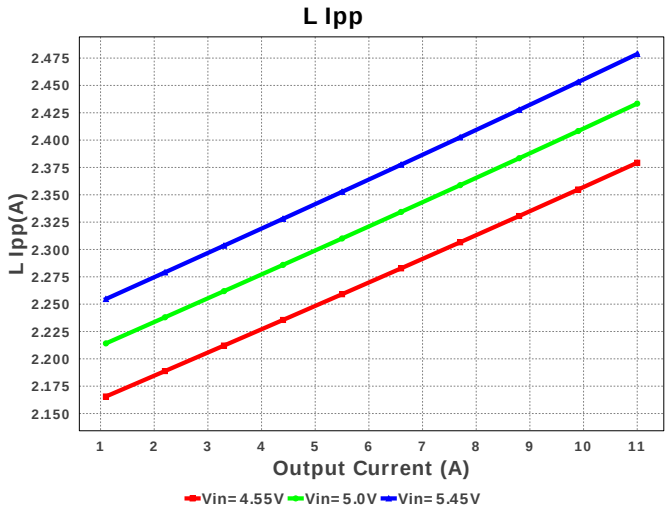


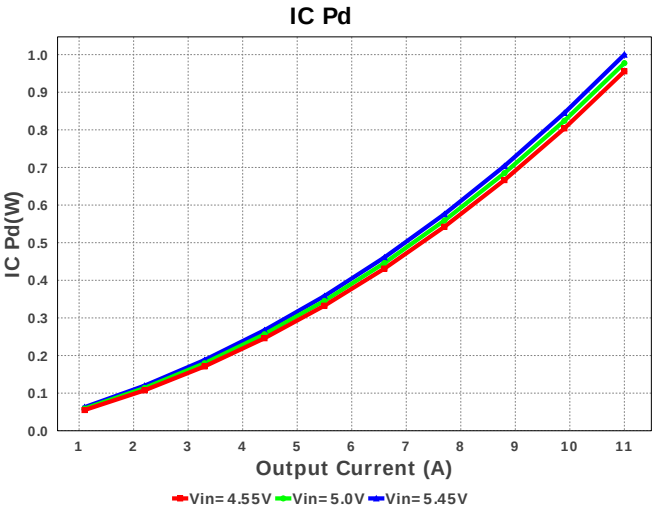


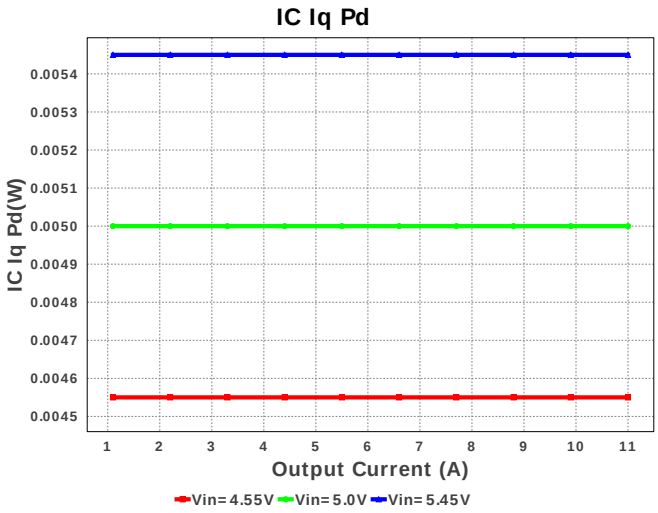


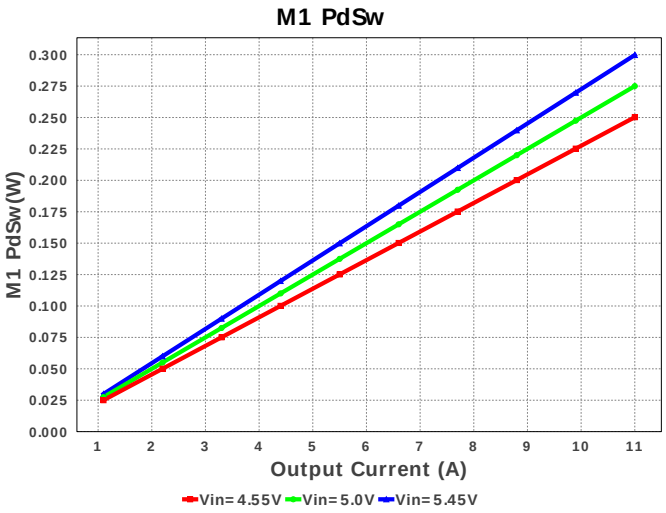


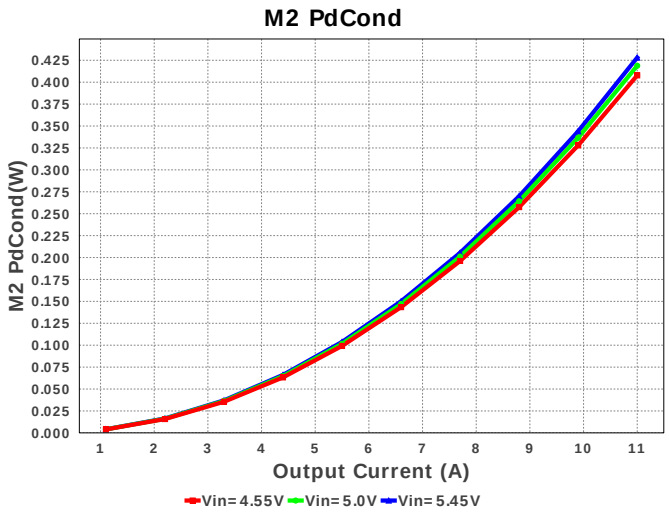


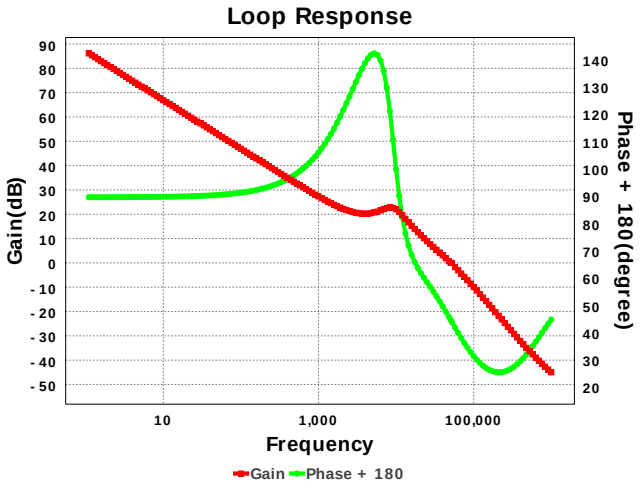












Operating Values

#	Name	Value	Category	Description
1.	BOM Count	20		Total Design BOM count
2.	Total BOM	$4.34		Total BOM Cost
3.	Cin IRMS	4.273 A	Current	Input capacitor RMS ripple current
4.	Cout IRMS	715.555 mA	Current	Output capacitor RMS ripple current
5.	IC Ipk	12.239 A	Current	Peak switch current in IC
6.	Iin Avg	2.158 A	Current	Average input current
7.	L Ipp	2.479 A	Current	Peak-to-peak inductor ripple current
8.	M1 Irms	4.734 A	Current	Q Iavg
9.	FootPrint	1.111 k mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	500.0 kHz	General	Switching frequency
11.	IC Tolerance	6.0 mV	General	IC Feedback Tolerance
12.	M Vds Act	30.794 mV	General	Voltage drop across the MosFET
13.	Pout	9.9 W	General	Total output power
14.	Vout OP	900.0 mV	Op_Point	Operational Output Voltage
15.	Cross Freq	50.482 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	18.523 %	Op_point	Duty cycle
17.	Efficiency	84.188 %	Op_point	Steady state efficiency
18.	IC Tj	53.999 degC	Op_point	IC junction temperature
19.	ICThetaJA	24.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
20.	IOUT_OP	11.0 A	Op_point	Iout operating point
21.	Phase Marg	45.062 deg	Op_point	Bode Plot Phase Margin
22.	VIN_OP	5.45 V	Op_point	Vin operating point
23.	Vout p-p	1.239 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	27.391 mW	Power	Input capacitor power dissipation
25.	Cout Pd	204.808 µW	Power	Output capacitor power dissipation
26.	IC Iq Pd	5.45 mW	Power	IC Iq Pd
27.	IC Pd	999.969 mW	Power	IC power dissipation
28.	L Pd	831.875 mW	Power	Inductor power dissipation
29.	M1 PdCond	145.783 mW	Power	M1 MOSFET switching losses
30.	M1 PdSw	299.75 mW	Power	M1 MOSFET switching losses
31.	M1 PdCond	428.087 mW	Power	M2 MOSFET switching losses
32.	M2 Pdbody	110.0 mW	Power	Power dissipation through lower FET
33.	Total Pd	1.859 W	Power	Total Power Dissipation
34.	Low Freq Gain	86.128 dB	Unknown	Gain at 10Hz

Design Inputs

#	Name	Value	Description
1.	Iout	11.0	Maximum Output Current
2.	Iout1	11.0	Output Current #1
3.	SoftStart	1.0 ms	Soft Start Time (ms)
4.	VinMax	5.45	Maximum input voltage
5.	VinMin	4.55	Minimum input voltage
6.	Vout	900.0 m	Output Voltage
7.	Vout1	900.0 m	Output Voltage #1
8.	base_pn	LM21215A-1	Base Product Number
9.	source	DC	Input Source Type
10.	Ta	30.0	Ambient temperature
11.	UserFsw	500.0 k	Customer Selected Frequency

Design Assistance

1. The LM21K series has simple to use low voltage and high current voltage regulators. The LM21215A-1 is a synchronisable part. To synchronise the device to an frequency you need to provide an external clock signal as shown in the schematic. To simulate with the external frequency, enter the desired frequency in the 'Advanced User Inputs' section and click on 'Update'. If the 'Sync' pin is left open, it defaults to a fixed internal frequency.

2. **LM21215A-1** Product Folder : http://www.ti.com/product/lm21215a : contains the data sheet and other resources.