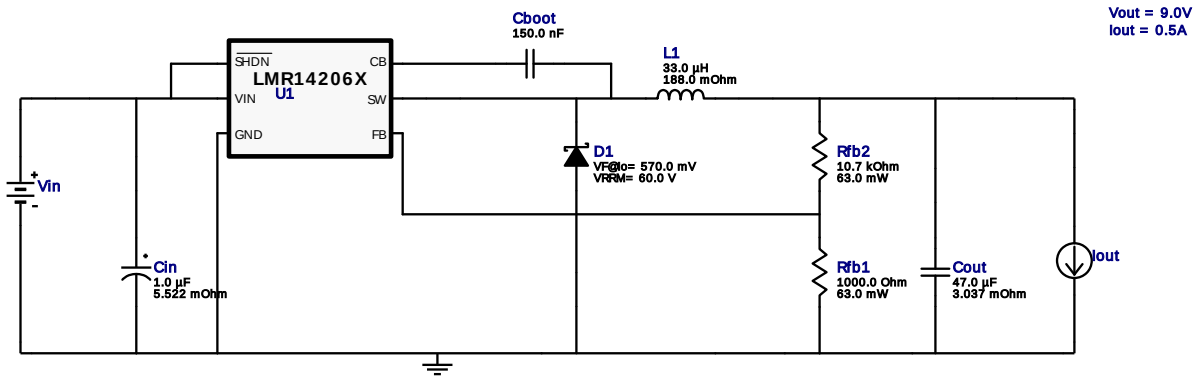
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 9.0V
Iout = 0.5A

Device = LMR14206XMKE/NOPB
Topology = Buck
Created = 8/4/16 1:47:55 AM
BOM Cost = $1.66
BOM Count = 8
Total Pd = 0.59W

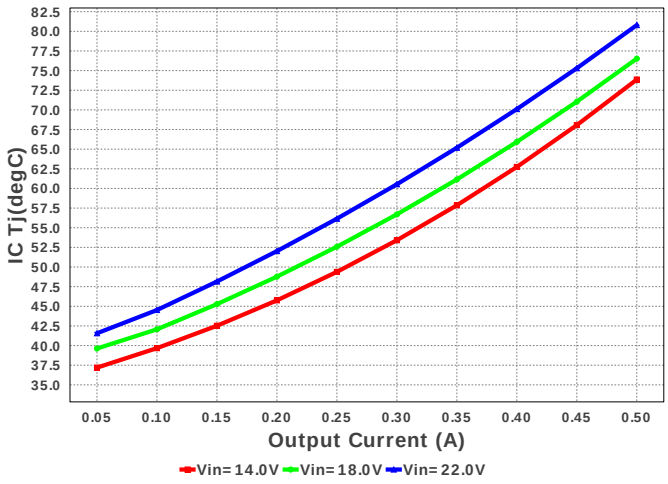
Design : 4743042/7 LMR14206XMKE/NOPB
LMR14206XMKE/NOPB 14.0V-22.0V to 9.00V @ 0.5A



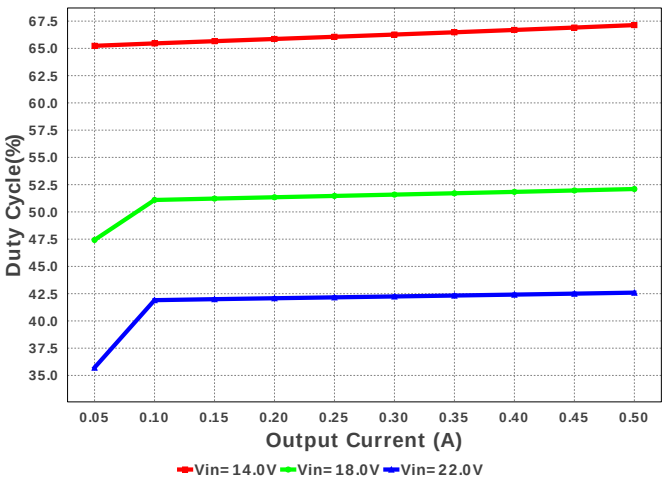
Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R60J154KE01D Series= X5R	Cap= 150.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Cin	TDK	C1608X7R1V105K080AC Series= X7R	Cap= 1.0 uF ESR= 5.522 mOhm VDC= 35.0 V IRMS= 2.2162 A	1	$0.05	0603 5 mm²
3.	Cout	MuRata	GRM32ER61C476ME15L Series= X5R	Cap= 47.0 uF ESR= 3.037 mOhm VDC= 16.0 V IRMS= 4.59346 A	1	$0.24	1210_280 15 mm²
4.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	$0.04	SOD-123F 12 mm²
5.	L1	Bourns	SRN6045-330M	L= 33.0 µH DCR= 188.0 mOhm	1	$0.16	SRN6045 64 mm²
6.	Rfb1	Vishay-Dale	CRCW04021K00FKED Series= CRCW..e3	Res= 1000.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
7.	Rfb2	Vishay-Dale	CRCW040210K7FKED Series= CRCW..e3	Res= 10.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
8.	U1	Texas Instruments	LMR14206XMKE/NOPB	Switcher	1	$1.14	MK06A 11 mm²

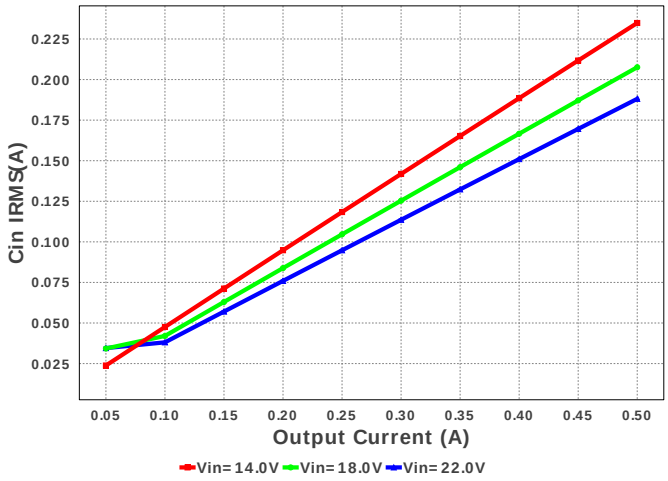
IC Tj



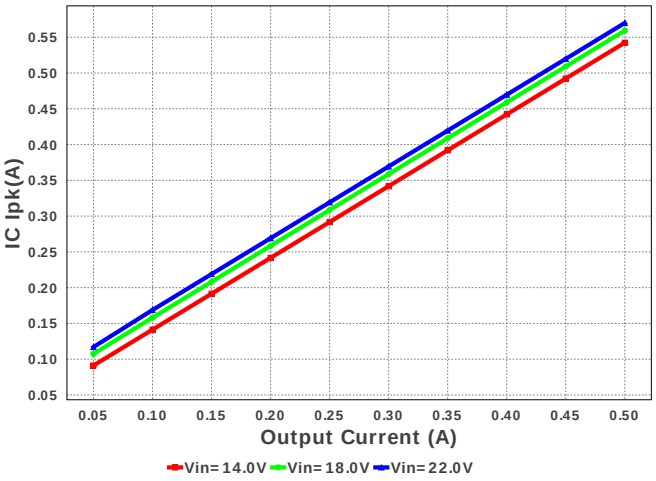
Duty Cycle



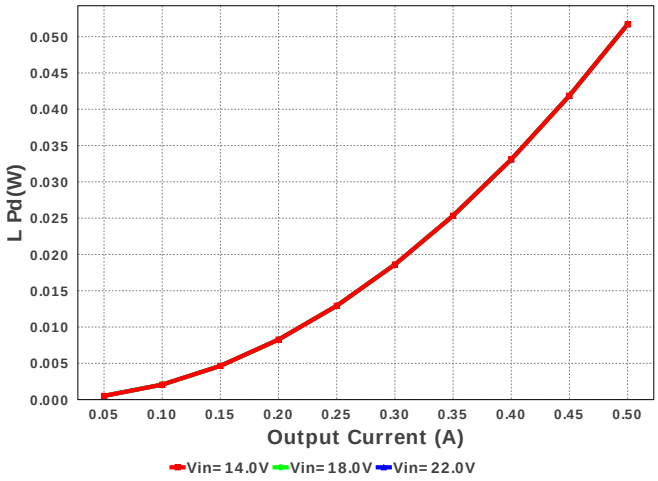
Cin IRMS



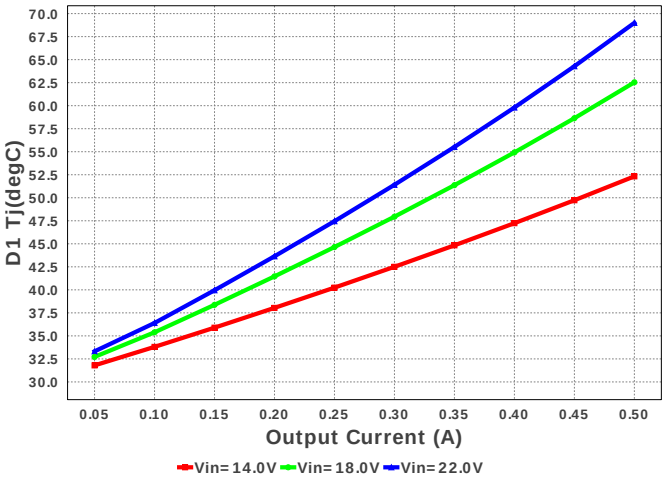
IC Ipk



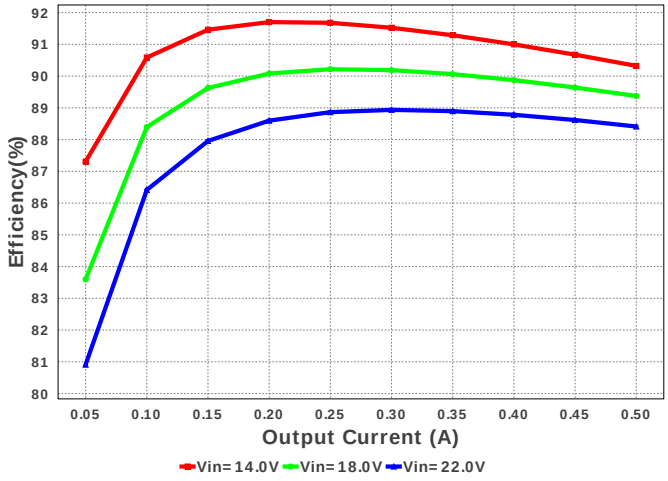
L Pd



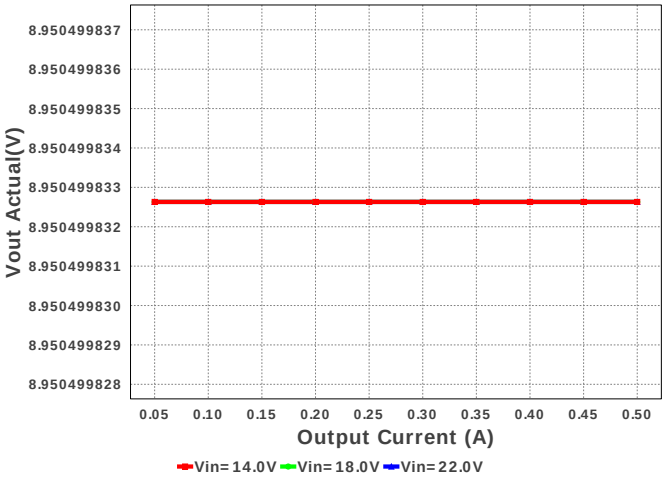
D1 Tj



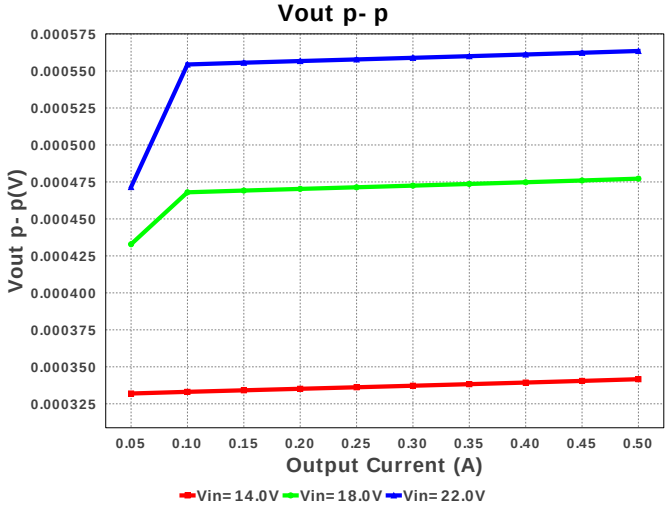
Efficiency



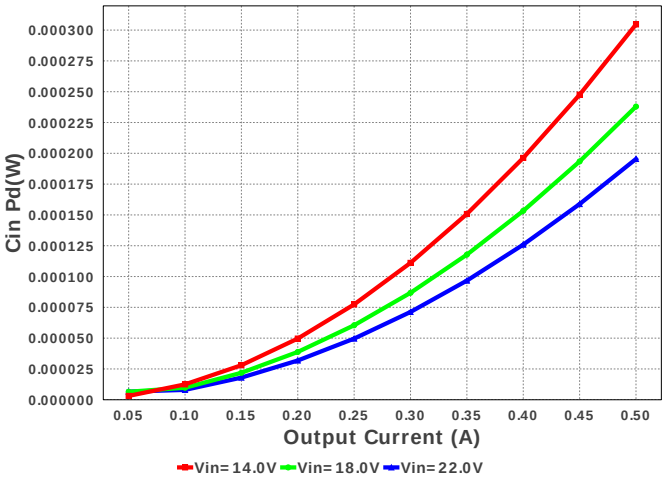
Vout Actual



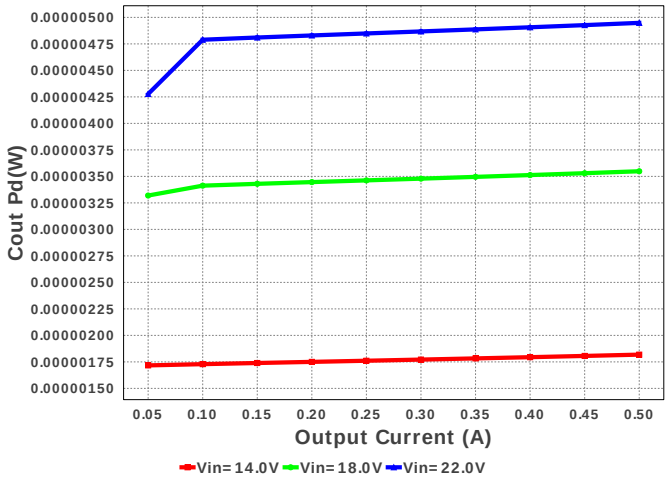
Vout p- p



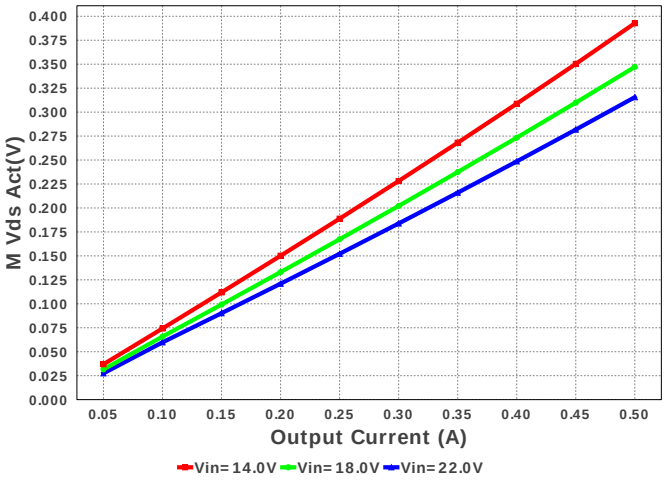
Cin Pd

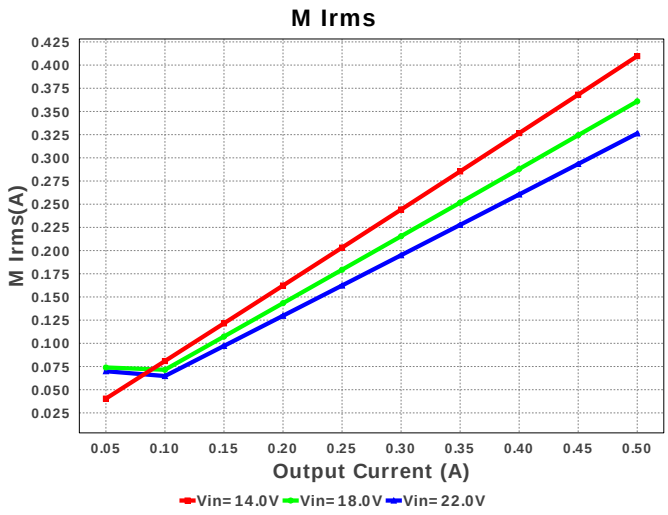


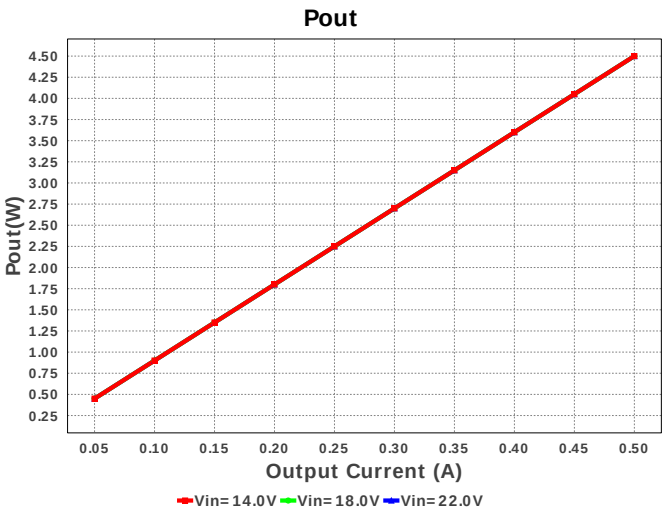
Cout Pd

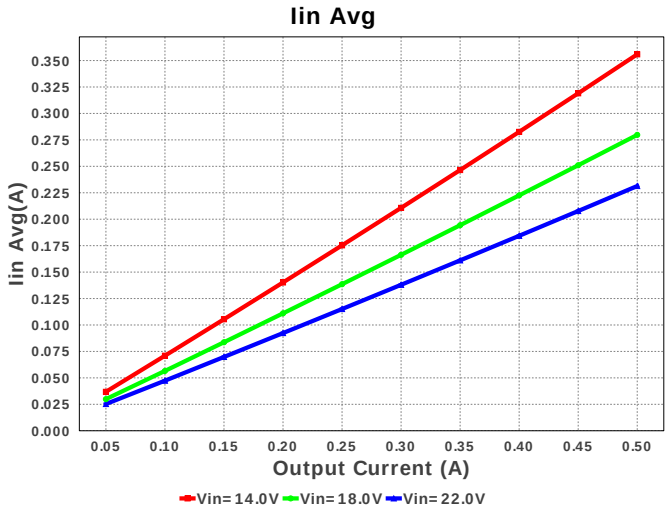


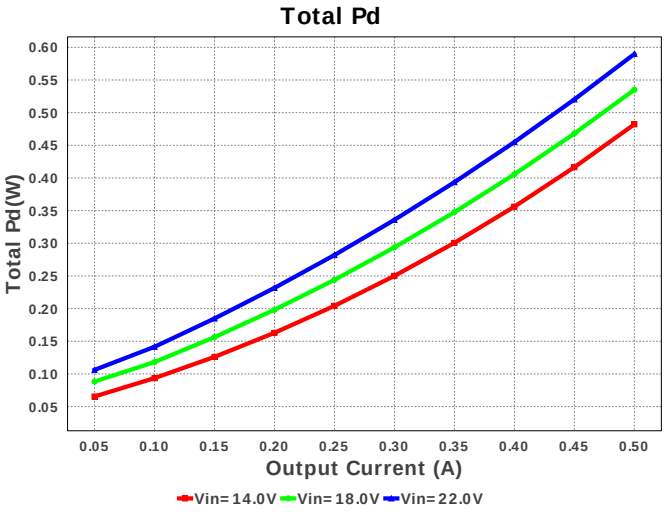
M Vds Act

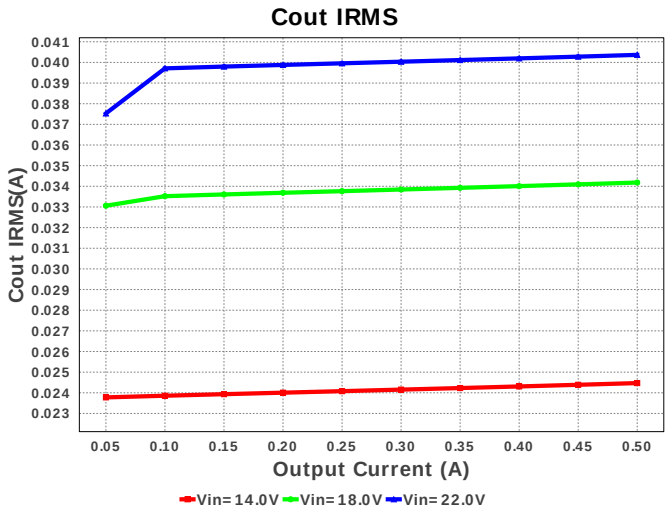


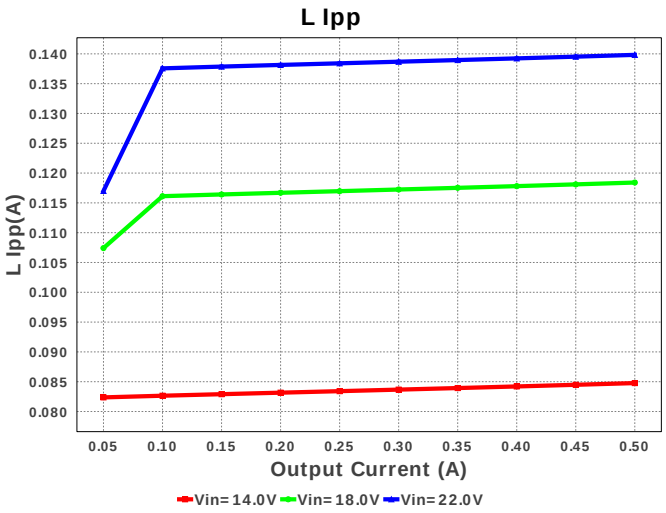


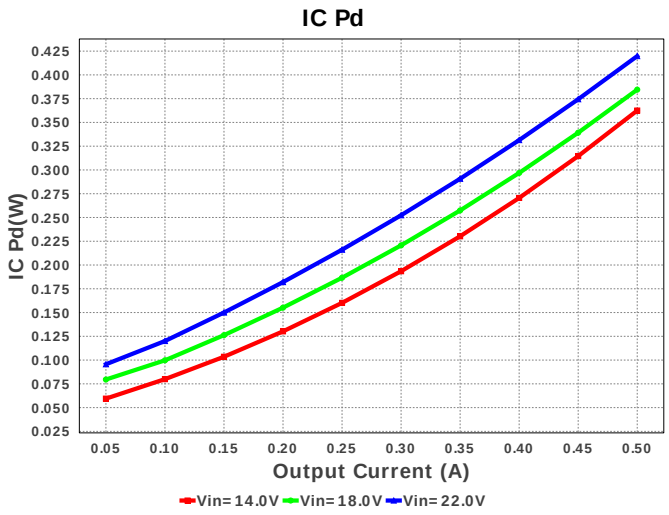


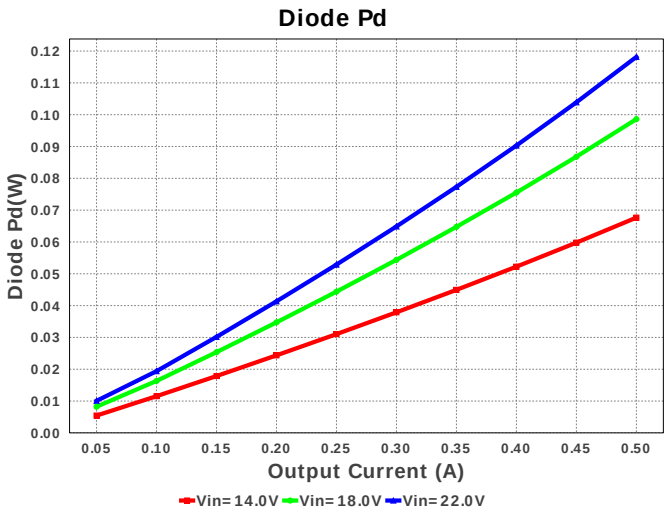












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	188.116 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	40.365 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	569.915 mA	Current	Peak switch current in IC
4.	Iin Avg	231.36 mA	Current	Average input current
5.	L Ipp	139.83 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	326.321 mA	Current	Q Iavg
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	115.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	1.2 MHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	315.536 mV	General	Voltage drop across the MosFET
12.	Pout	4.5 W	General	Total output power
13.	Total BOM	$1.66	General	Total BOM Cost
14.	D1 Tj	68.993 degC	Op_Point	D1 junction temperature
15.	Vout Actual	8.95 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	9.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	9.511 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	42.594 %	Op_point	Duty cycle
19.	Efficiency	88.412 %	Op_point	Steady state efficiency
20.	IC Tj	80.792 degC	Op_point	IC junction temperature
21.	ICThetaJA	121.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	500.0 mA	Op_point	Iout operating point
23.	Phase Marg	50.491 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	22.0 V	Op_point	Vin operating point
25.	Vout p-p	563.537 µV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	195.41 µW	Power	Input capacitor power dissipation
27.	Cout Pd	4.948 µW	Power	Output capacitor power dissipation
28.	Diode Pd	118.161 mW	Power	Diode power dissipation
29.	IC Pd	419.766 mW	Power	IC power dissipation
30.	L Pd	51.7 mW	Power	Inductor power dissipation
31.	Total Pd	589.82 mW	Power	Total Power Dissipation
32.	Vout Tolerance	4.244 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	VinMax	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	9.0	Output Voltage
5.	base_pn	LMR14206X	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LMR14206X** Product Folder : http://www.ti.com/product/LMR14206 : contains the data sheet and other resources.