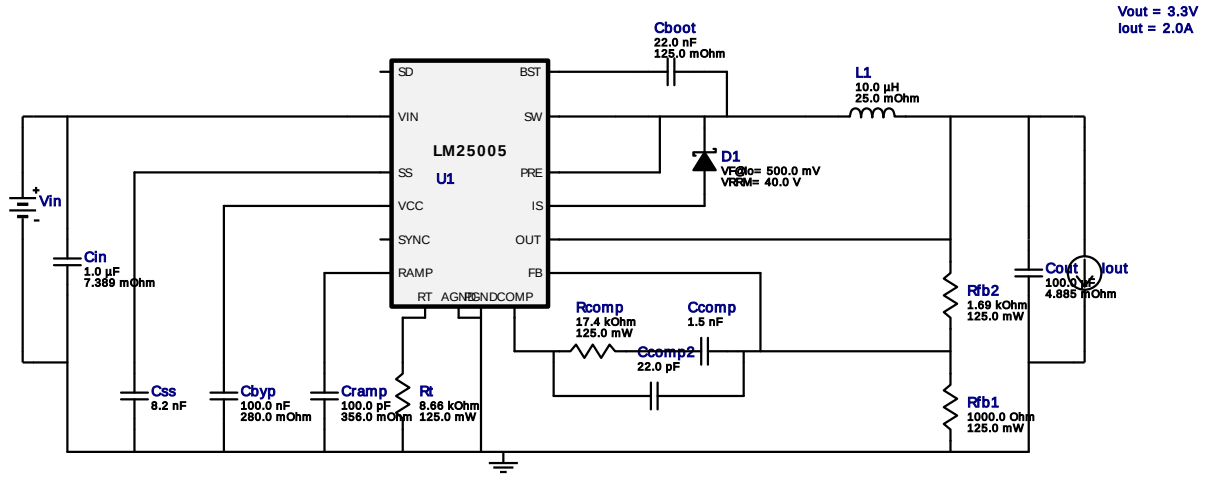
WEBENCH® Design Report

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

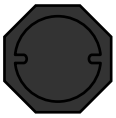
Device = LM25005MHX/NOPB
Topology = Buck
Created = 9/19/16 10:55:33 PM
BOM Cost = $2.11
BOM Count = 15
Total Pd = 1.22W

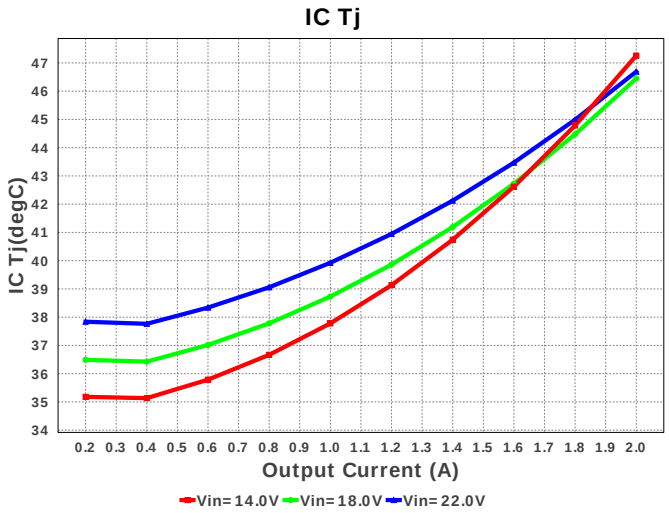
Design : 4796941/2 LM25005MHX/NOPB
LM25005MHX/NOPB 14.0V-22.0V to 3.30V @ 2.0A

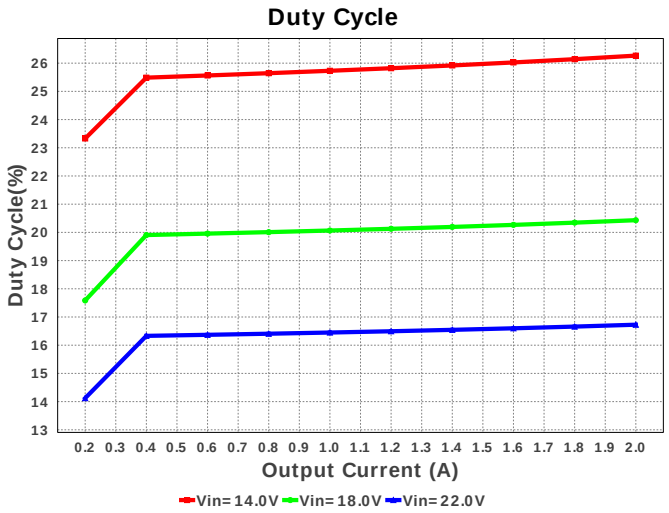


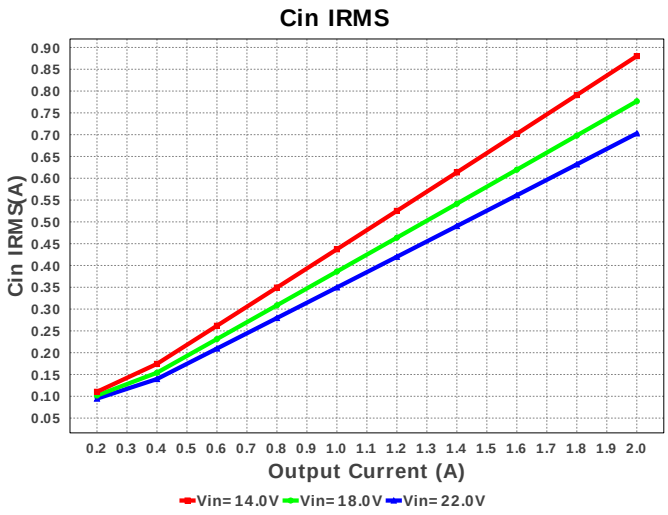
Electrical BOM

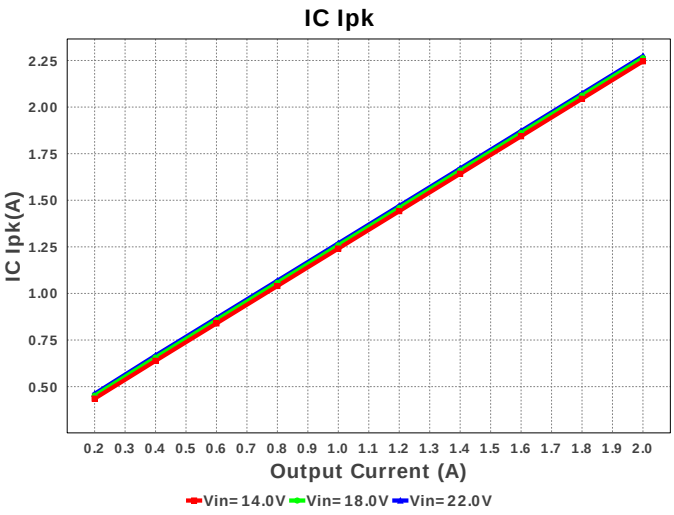
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C223K5RACTU Series= X7R	Cap= 22.0 nF ESR= 125.0 mOhm VDC= 50.0 V IRMS= 645.0 mA	1	$0.01	0805 7 mm²
2.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp	MuRata	GRM033R71E152KA01D Series= X7R	Cap= 1.5 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
4.	Ccomp2	Kemet	C0805C220K3GACTU Series= C0G/NP0	Cap= 22.0 pF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
5.	Cin	MuRata	GRM31MR71H105KA88L Series= X7R	Cap= 1.0 uF ESR= 7.389 mOhm VDC= 50.0 V IRMS= 979.22 mA	1	$0.03	1206 11 mm²
6.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	$0.14	1206_190 11 mm²
7.	Cramp	AVX	08055A101JAT2A Series= C0G/NP0	Cap= 100.0 pF ESR= 356.0 mOhm VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
8.	Css	MuRata	GRM155R71E822KA01D Series= X7R	Cap= 8.2 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
9.	D1	Diodes Inc.	B340A-13-F	VF@Io= 500.0 mV VRRM= 40.0 V	1	$0.11	SMA 37 mm²

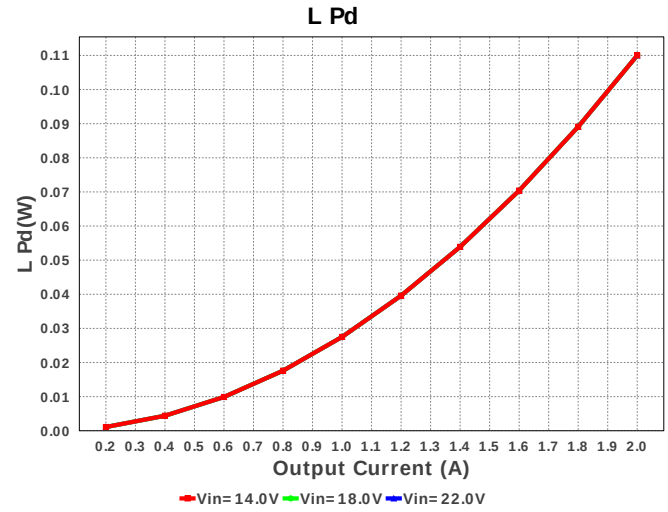
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	L1	Bourns	SRU1038-100Y	L= 10.0 µH DCR= 25.0 mOhm	1	$0.33	 SRU1038 144 mm²
11.	Rcomp	Panasonic	ERJ-6ENF1742V Series= ERJ-6E	Res= 17.4 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
12.	Rfb1	Panasonic	ERJ-6ENF1001V Series= ERJ-6E	Res= 1000.0 Ohm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
13.	Rfb2	Panasonic	ERJ-6ENF1691V Series= ERJ-6E	Res= 1.69 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
14.	Rt	Panasonic	ERJ-6ENF8661V Series= ERJ-6E	Res= 8.66 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
15.	U1	Texas Instruments	LM25005MHX/NOPB	Switcher	1	$1.40	 MXA20A 71 mm²

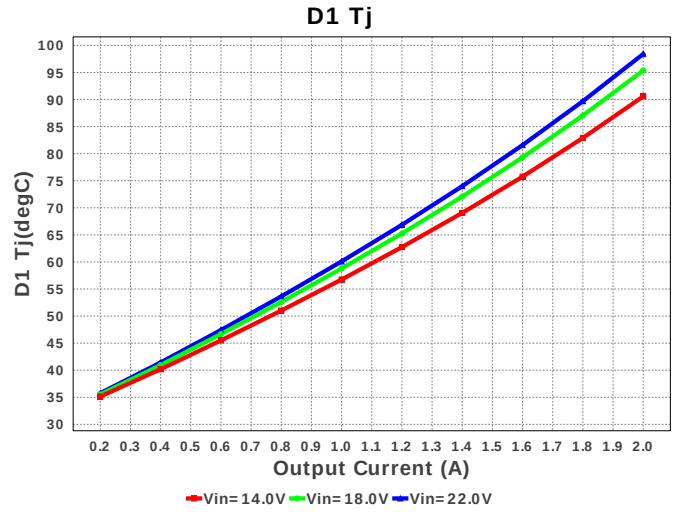


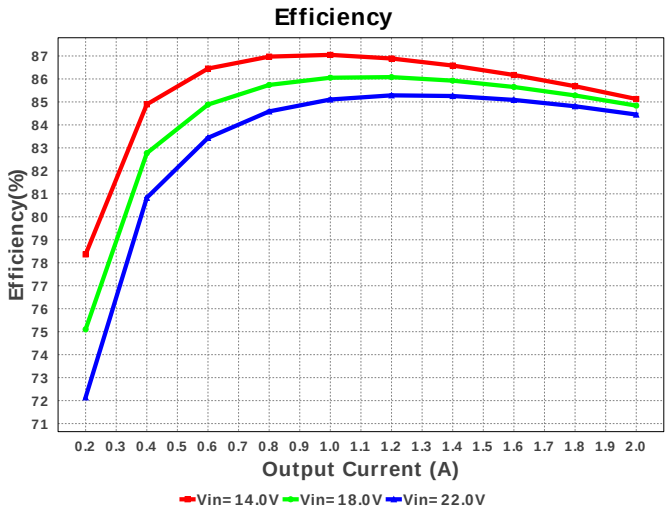


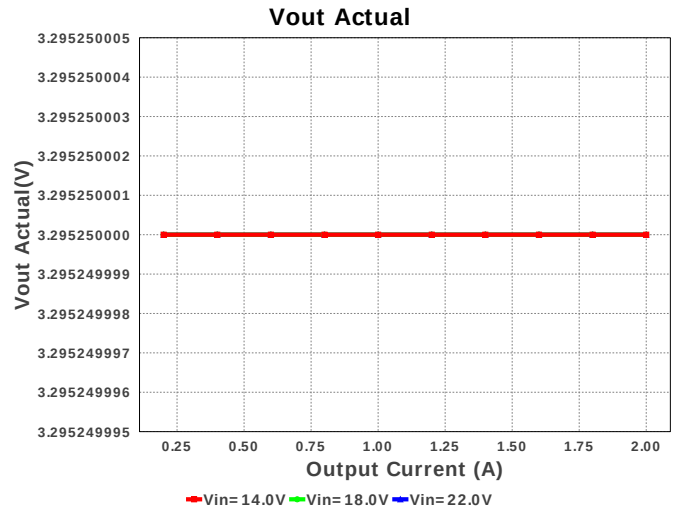


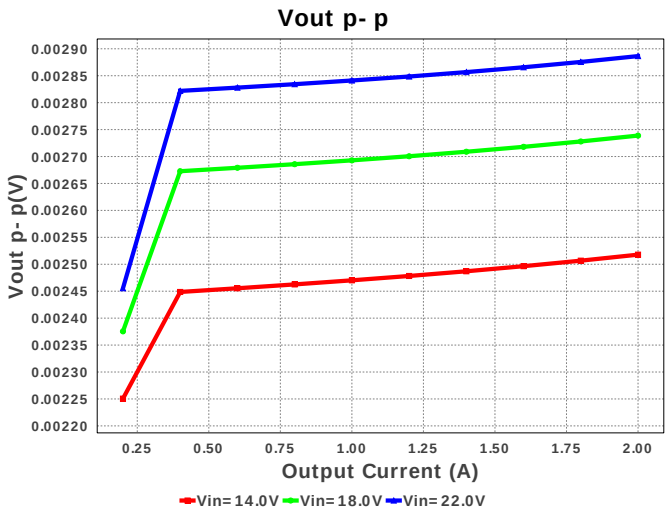


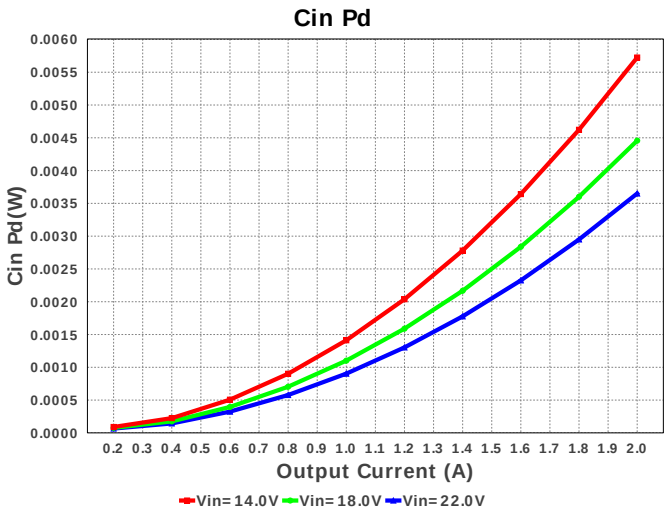


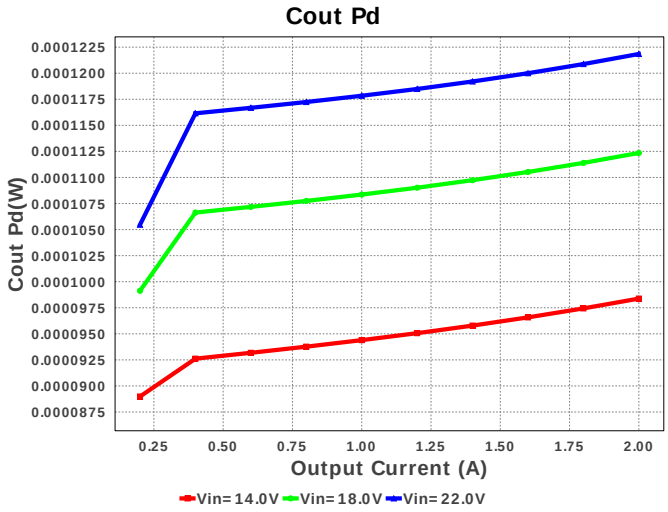


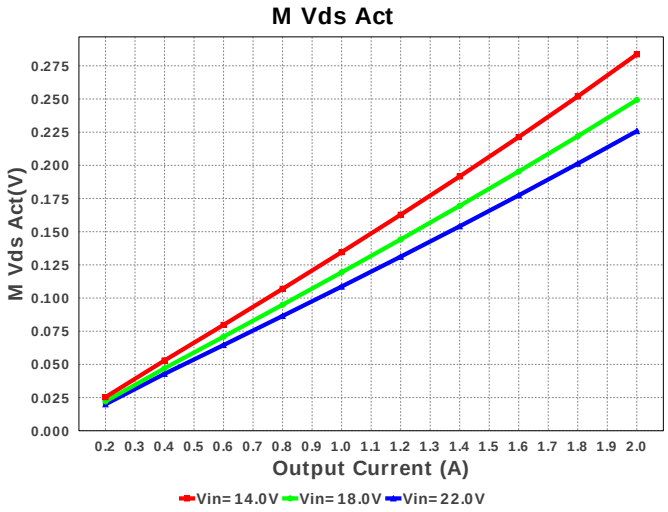


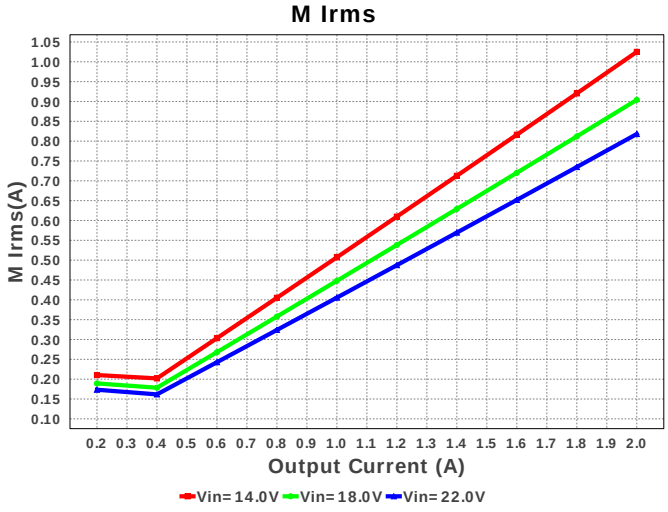


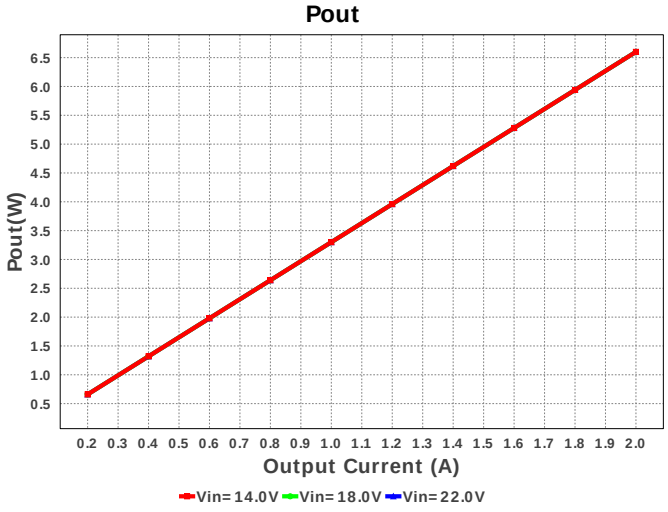


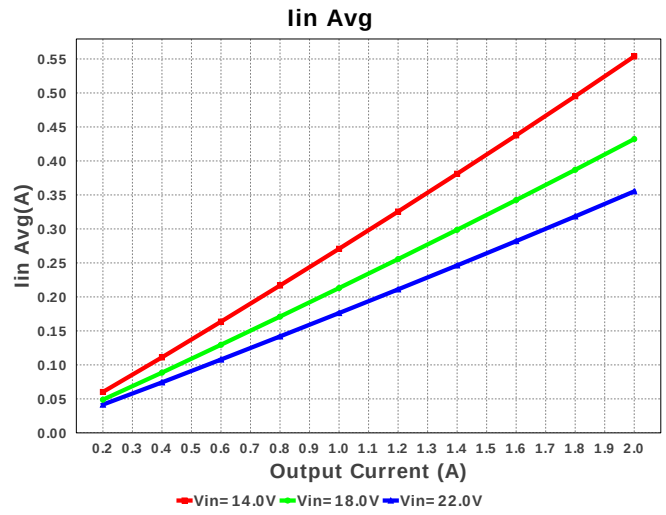


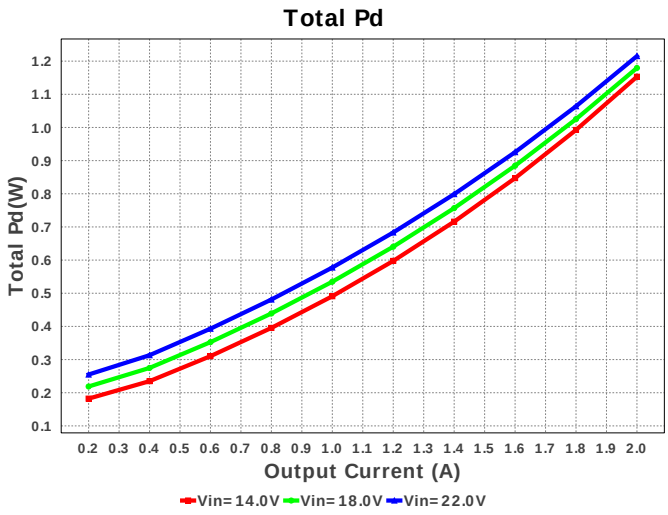


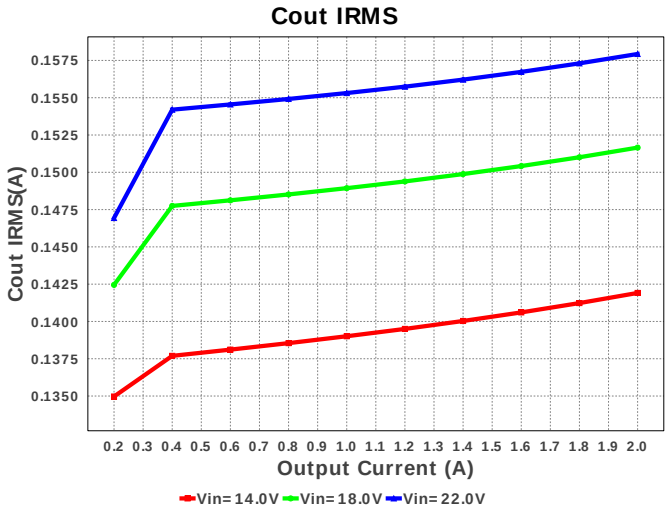


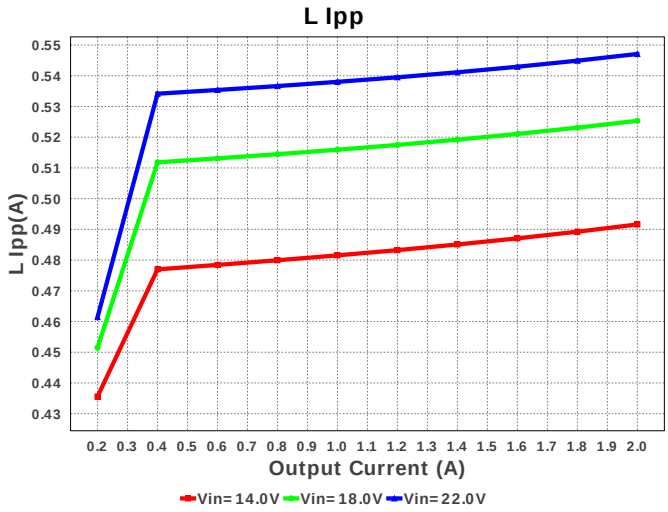


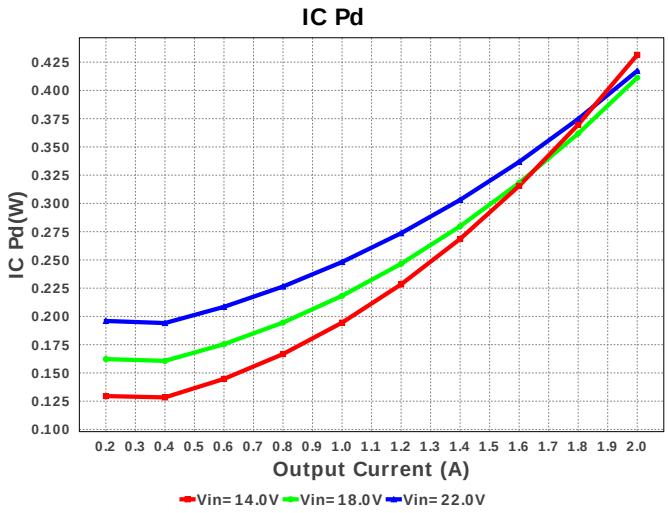


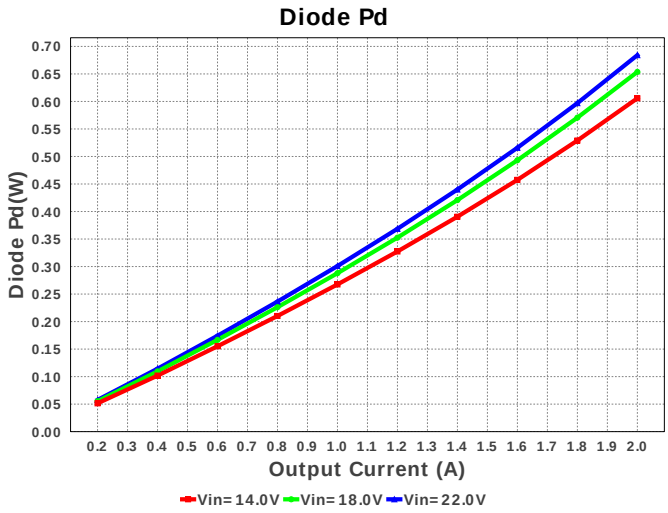












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	702.876 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	157.932 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.272 A	Current	Peak switch current in IC
4.	Iin Avg	355.24 mA	Current	Average input current
5.	L Ipp	547.09 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	817.961 mA	Current	Q Iavg
7.	BOM Count	15	General	Total Design BOM count
8.	FootPrint	334.0 mm^2	General	Total Foot Print Area of BOM components
9.	Frequency	571.723 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	225.781 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Mode	CCM	General	Conduction Mode
13.	Pout	6.6 W	General	Total output power
14.	Total BOM	$2.11	General	Total BOM Cost
15.	D1 Tj	98.413 degC	Op_Point	D1 junction temperature
16.	Vout Actual	3.295 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
18.	Duty Cycle	16.727 %	Op_point	Duty cycle
19.	Efficiency	84.451 %	Op_point	Steady state efficiency
20.	IC Tj	46.691 degC	Op_point	IC junction temperature
21.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	2.0 A	Op_point	Iout operating point
23.	VIN_OP	22.0 V	Op_point	Vin operating point
24.	Vout p-p	2.886 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	3.65 mW	Power	Input capacitor power dissipation
26.	Cout Pd	121.845 µW	Power	Output capacitor power dissipation
27.	Diode Pd	684.135 mW	Power	Diode power dissipation
28.	IC Pd	417.265 mW	Power	IC power dissipation
29.	L Pd	110.0 mW	Power	Inductor power dissipation
30.	Total Pd	1.215 W	Power	Total Power Dissipation
31.	Vout Tolerance	2.757 %		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	LM25005	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM25005** Product Folder : http://www.ti.com/product/LM25005 : contains the data sheet and other resources.