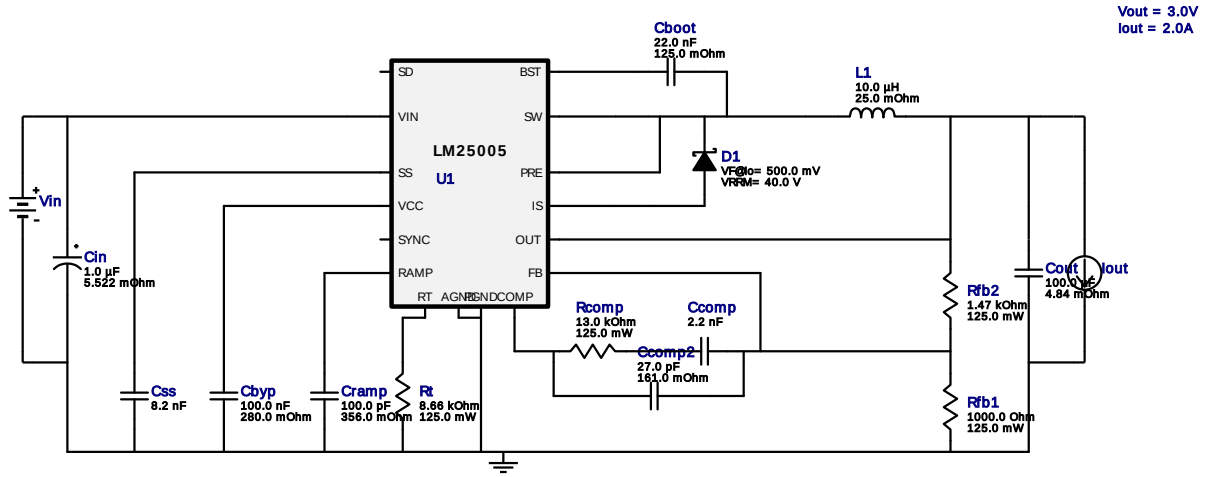
WEBENCH® Design Report

VinMin = 12.0V
VinMax = 21.0V
Vout = 3.0V
Iout = 2.0A

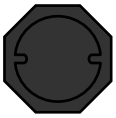
Device = LM25005MHX/NOPB
Topology = Buck
Created = 7/19/16 6:52:41 AM
BOM Cost = $2.13
BOM Count = 15
Total Pd = 1.2W

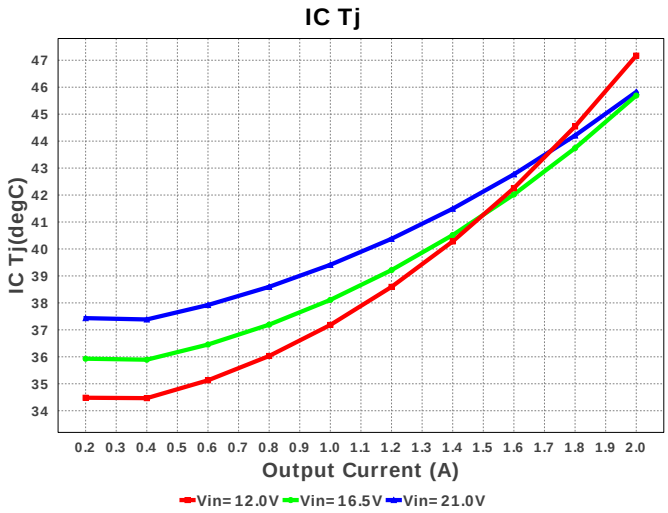
Design : 4648186/20 LM25005MHX/NOPB
LM25005MHX/NOPB 12.0V-21.0V to 3.00V @ 2.0A

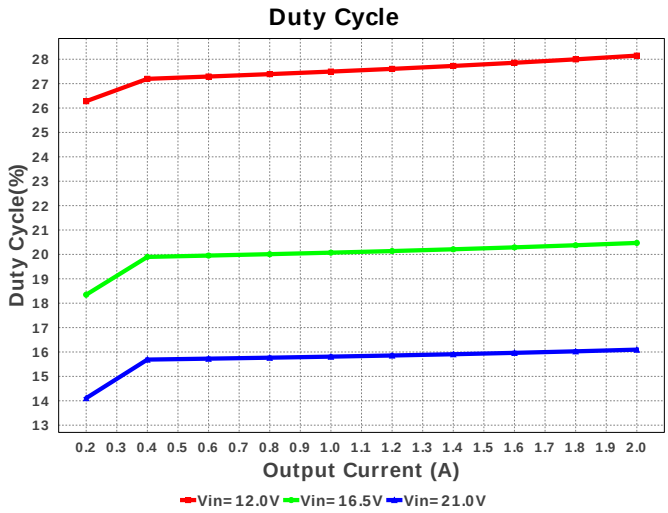


Electrical BOM

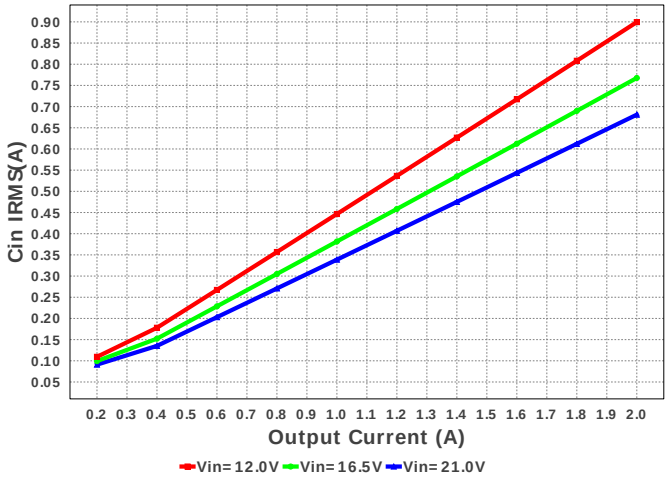
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C223K5RACTU Series= X7R	Cap= 22.0 nF ESR= 125.0 mOhm VDC= 50.0 V IRMS= 645.0 mA	1	$0.01	0805 7 mm²
2.	Cbyp	AVX	08053C104KAT2A Series= X7R	Cap= 100.0 nF ESR= 280.0 mOhm VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp	MuRata	GRM033R71C222KA88D Series= X7R	Cap= 2.2 nF VDC= 16.0 V IRMS= 0.0 A	1	$0.01	0201 2 mm²
4.	Ccomp2	Kemet	C0805C270J5GACTU Series= C0G/NP0	Cap= 27.0 pF ESR= 161.0 mOhm VDC= 50.0 V IRMS= 524.0 mA	1	$0.01	0805 7 mm²
5.	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
6.	Cout	MuRata	GRM31CD80G107ME39L Series= X6T	Cap= 100.0 uF ESR= 4.84 mOhm VDC= 4.0 V IRMS= 4.3381 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-6ENF1302V Series= ERJ-6E	Res= 13.0 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-6ENF1471V Series= ERJ-6E	Res= 1.47 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

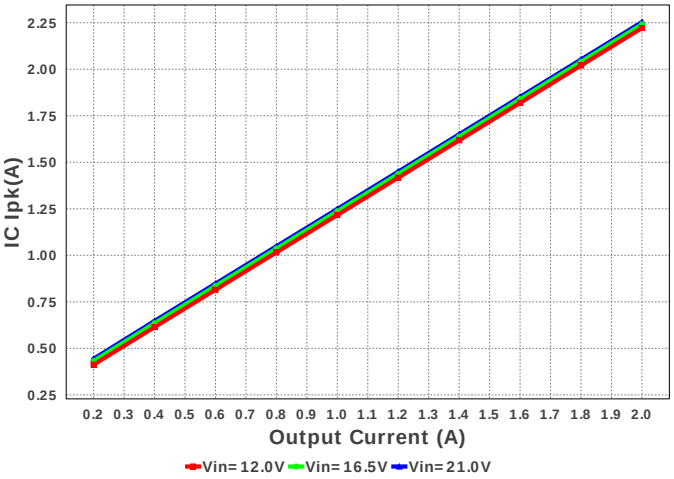




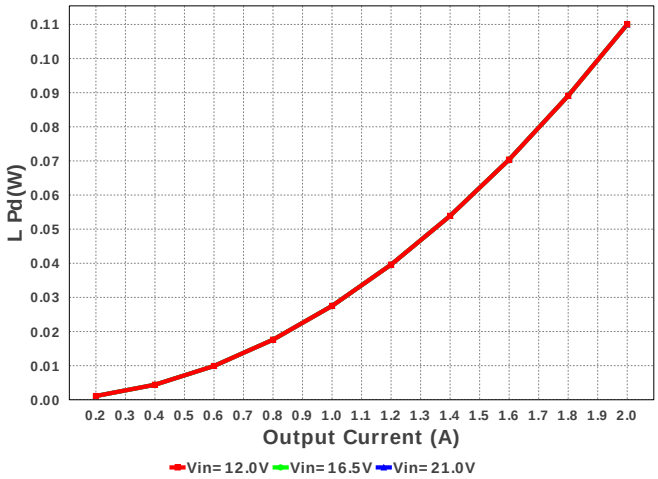
Cin IRMS



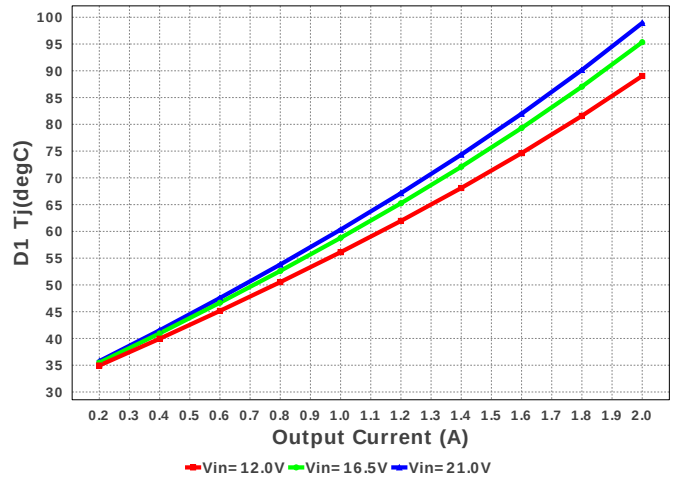
IC Ipk



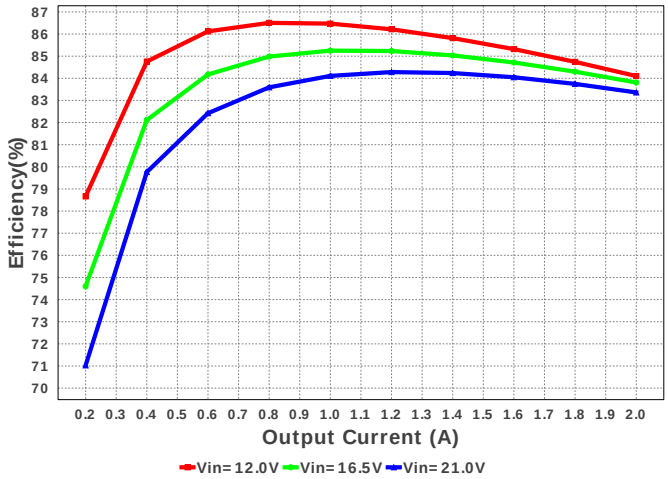
L Pd



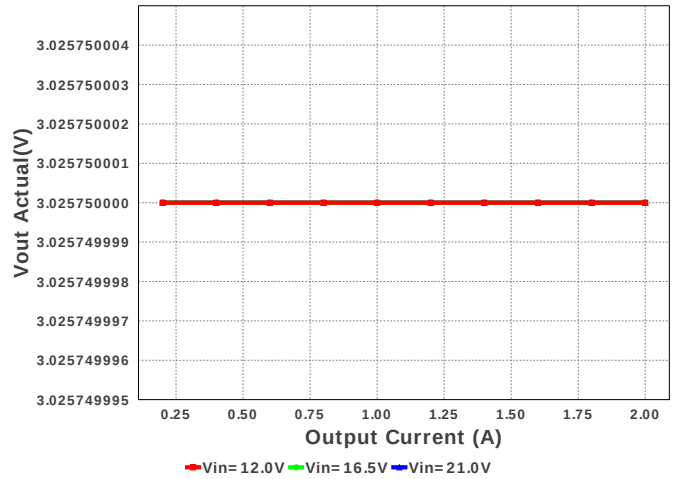
D1 Tj

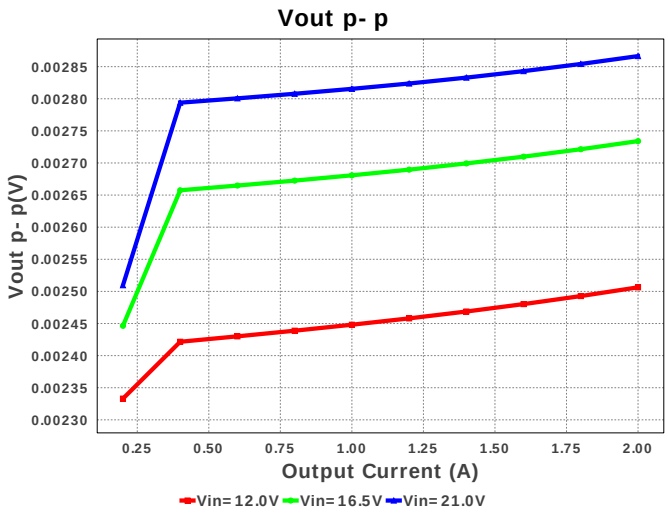


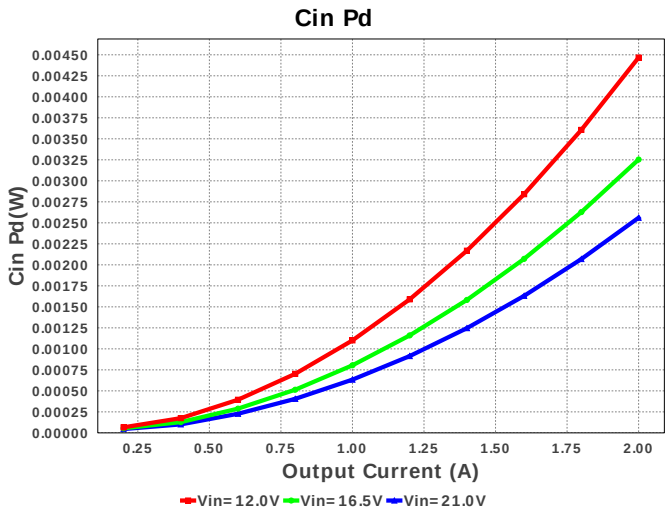
Efficiency

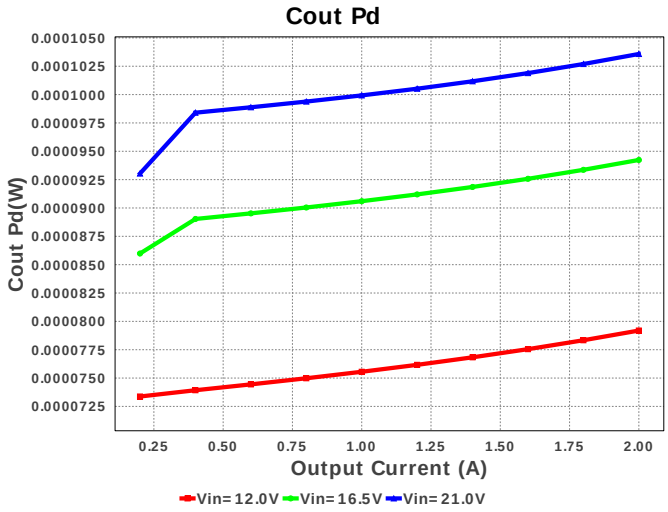


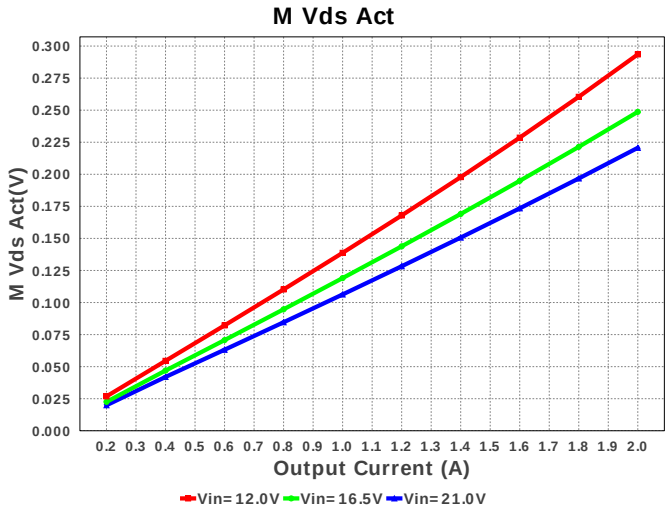
Vout Actual

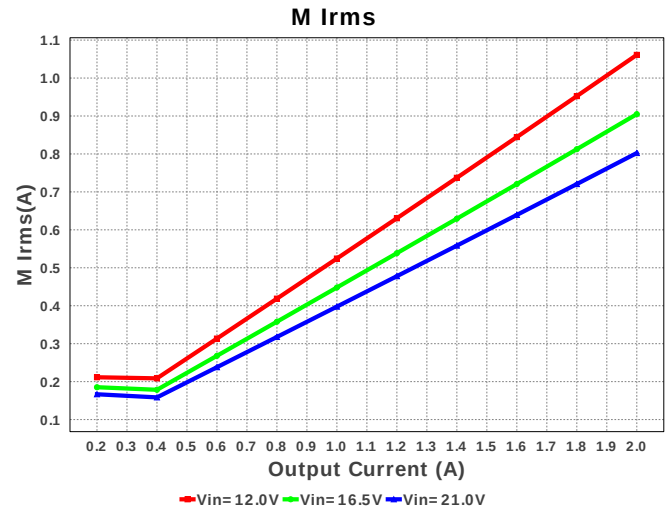


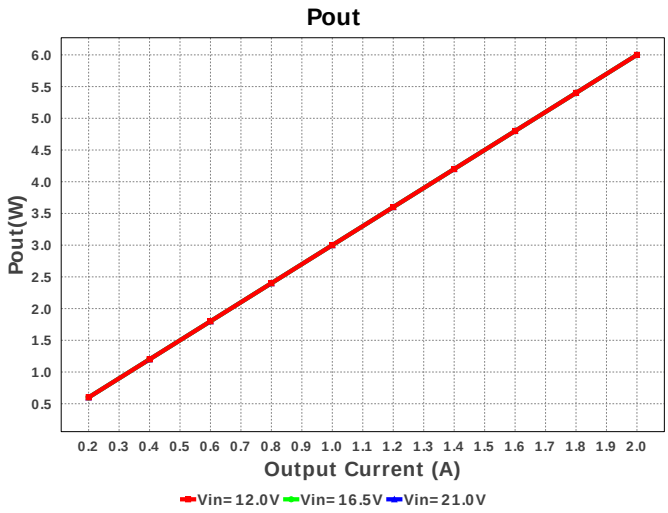


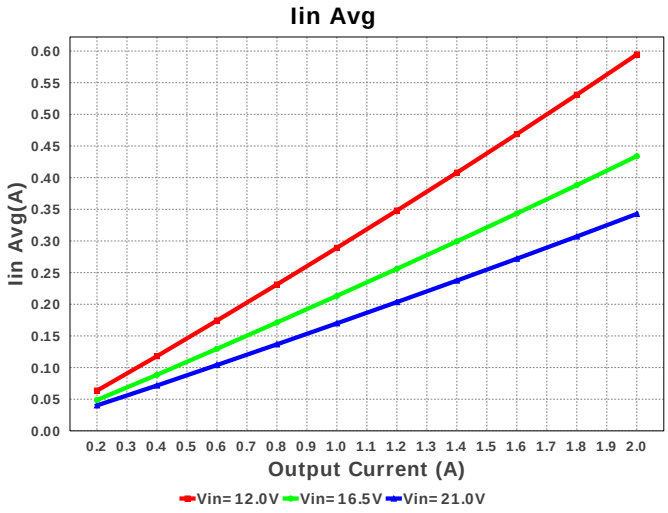


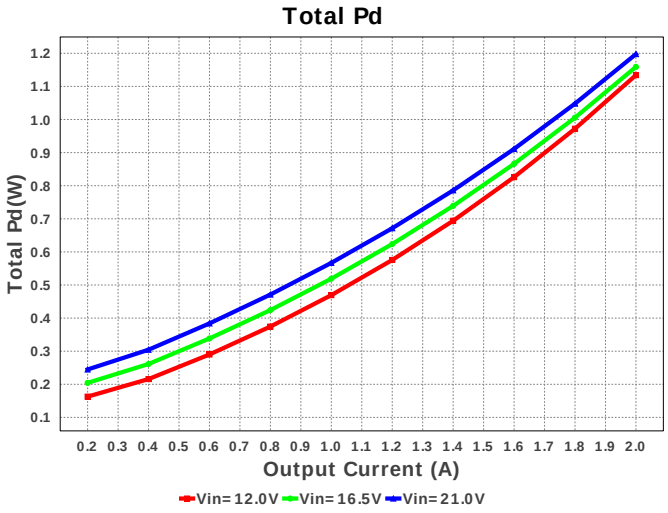


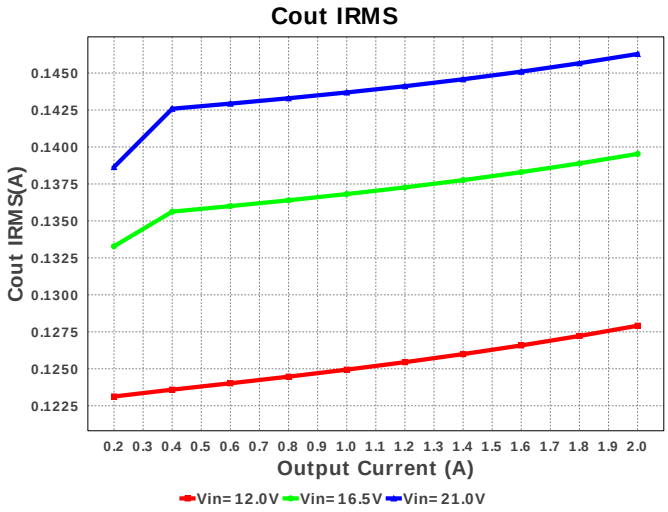


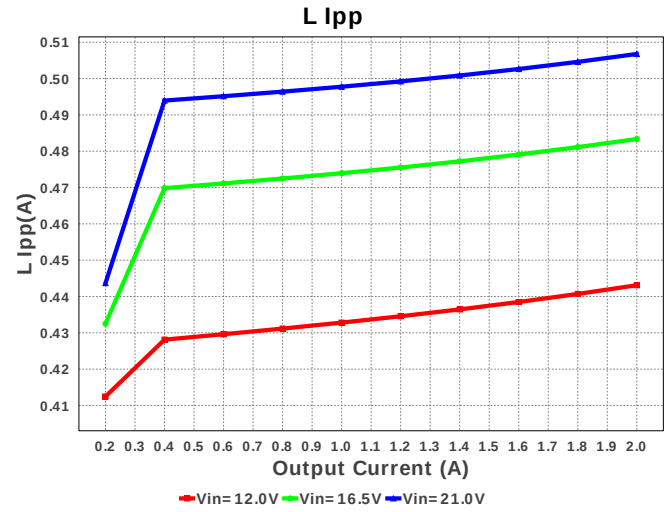


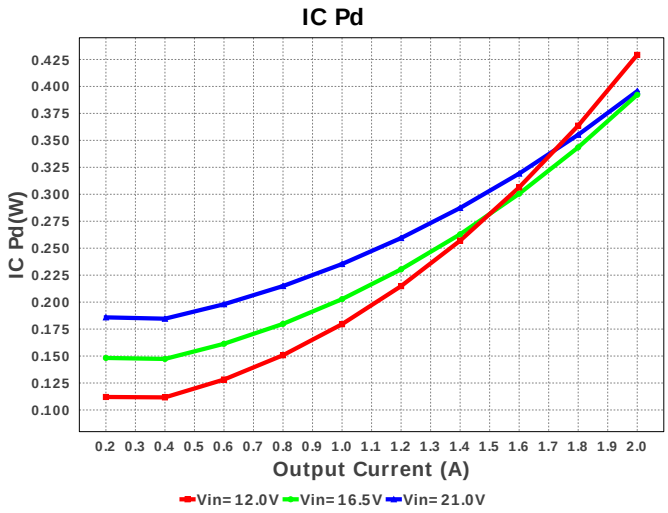


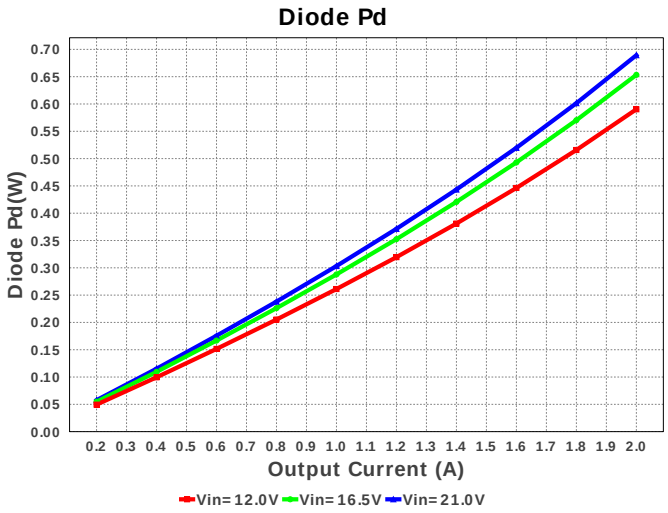












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	680.953 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	146.291 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.252 A	Current	Peak switch current in IC
4.	Iin Avg	342.74 mA	Current	Average input current
5.	L Ipp	506.77 mA	Current	Peak-to-peak inductor ripple current
6.	M1 Irms	802.398 mA	Current	Q Iavg
7.	BOM Count	15	General	Total Design BOM count
8.	FootPrint	327.0 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	220.651 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	6.0 W	General	Total output power
13.	Total BOM	$2.13	General	Total BOM Cost
14.	D1 Tj	98.931 degC	Op_Point	D1 junction temperature
15.	Vout Actual	3.026 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	3.0 V	Op_Point	Operational Output Voltage
17.	Duty Cycle	16.096 %	Op_point	Duty cycle
18.	Efficiency	83.361 %	Op_point	Steady state efficiency
19.	IC Tj	45.825 degC	Op_point	IC junction temperature
20.	ICThetaJA	40.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	2.0 A	Op_point	Iout operating point
22.	VIN_OP	21.0 V	Op_point	Vin operating point
23.	Vout p-p	2.866 mV	Op_point	Peak-to-peak output ripple voltage
24.	Cin Pd	2.561 mW	Power	Input capacitor power dissipation
25.	Cout Pd	103.58 µW	Power	Output capacitor power dissipation
26.	Diode Pd	689.314 mW	Power	Diode power dissipation
27.	IC Pd	395.627 mW	Power	IC power dissipation
28.	L Pd	110.0 mW	Power	Inductor power dissipation
29.	Total Pd	1.198 W	Power	Total Power Dissipation
30.	Vout Tolerance	2.689 %		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	21.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	3.0	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.