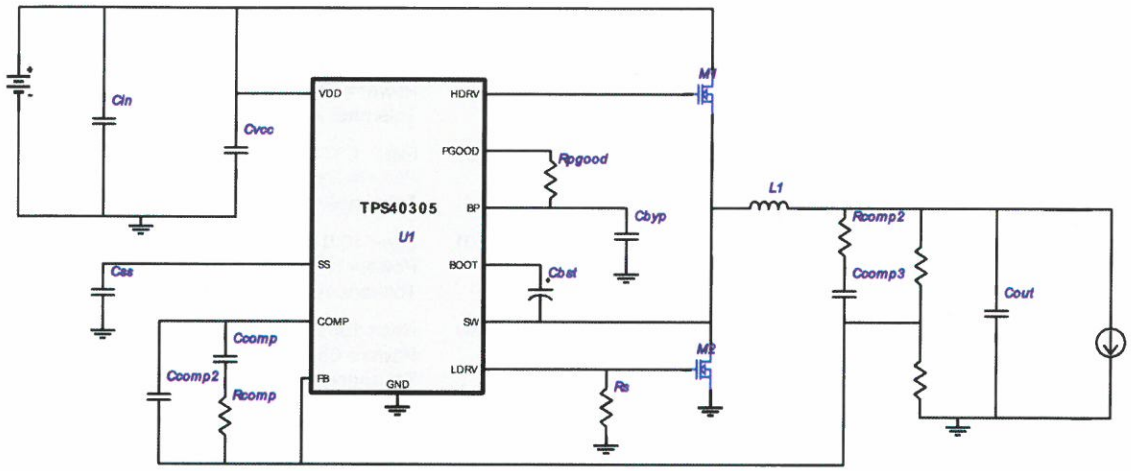
TEXAS INSTRUMENTS

WEBENCH® Design Report

VinMin = 10.0V
VinMax = 20.0V
Vout = 5.0V
Iout = 6.0A

Device = TPS40305DRCR
Topology = Buck
Created = 2/13/13 4:50:11 AM
BOM Cost = $3.19
Total Pd = 2.48 W
Footprint = 362.0 mm2
BOM Count = 21

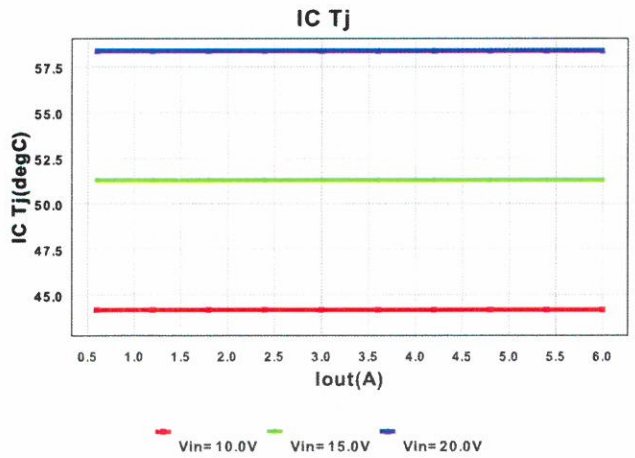
Design : 3662599/8 TPS40305DRCR
TPS40305DRCR 10.0V-20.0V to 5.0V @ 6.0A

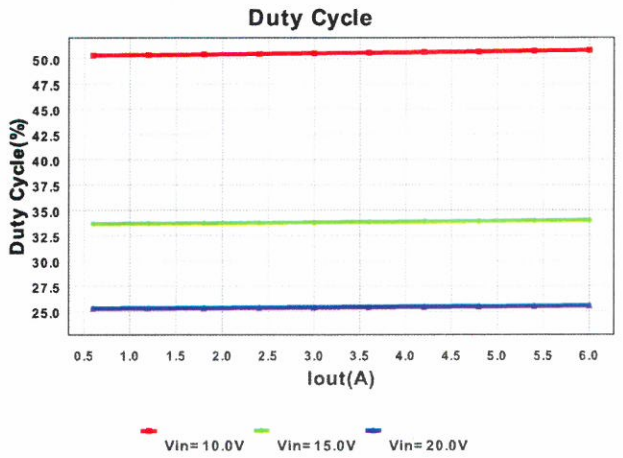


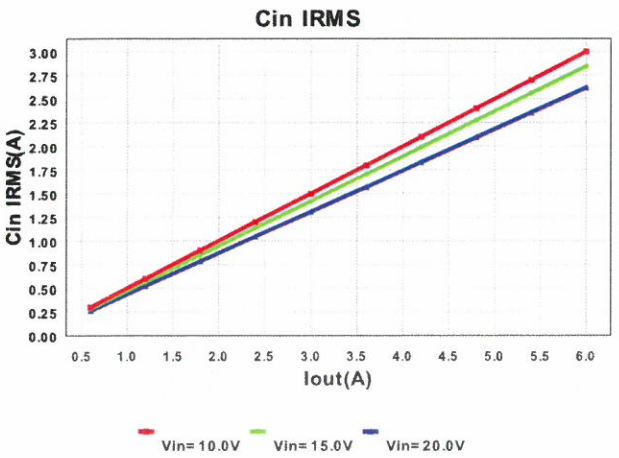
Electrical BOM

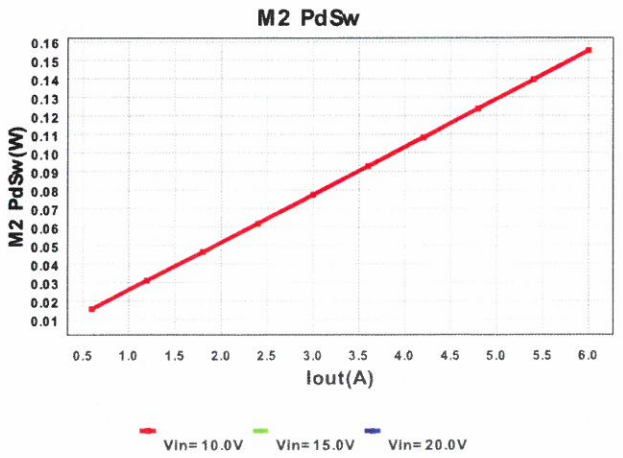
#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
1.	Cbst	Vishay-Sprague	293D104X9035A2TE3 Series= 293D	1	$0.12	Cap= 100.0 nF ESR= 20.0 Ohm VDC= 35.0 V IRMS= 60.0 mA	3216-18 19mm2
2.	Cbyp	TDK	C1608X5R1A474K Series= X5R	1	$0.01	Cap= 470.0 nF ESR= 10.1 mOhm VDC= 10.0 V IRMS= 0.0 A	0603 10mm2
3.	Ccomp	Yageo America	CC0805KRX7R9BB332 Series= X7R	1	$0.01	Cap= 3.3 nF VDC= 50.0 V IRMS= 0.0 A	0805 13mm2
4.	Ccomp2	Yageo America	CC0805JRNP09BN820 Series= C0G/NP0	1	$0.01	Cap= 82.0 pF VDC= 50.0 V IRMS= 0.0 A	0805 13mm2
5.	Ccomp3	Yageo America	CC0805KRX7R9BB821 Series= X7R	1	$0.01	Cap= 820.0 pF VDC= 50.0 V IRMS= 0.0 A	0805 13mm2
6.	Cin	TDK	C5750X7R1H106M Series= X7R	1	$0.68	Cap= 10.0 µF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 5.5 A	2220 60mm2
7.	Cout	Taiyo Yuden	JMK212BJ106KD-T Series= X5R	1	$0.03	Cap= 10.0 µF ESR= 2.0 mOhm VDC= 6.3 V IRMS= 0.0 A	0805 13mm2
8.	Css	MuRata	GRM033R71A332KA01D Series= X7R	1	$0.01	Cap= 3.3 nF VDC= 10.0 V IRMS= 0.0 A	0201 6mm2
9.	Cvcc	MuRata	GRM188R61E105KA12D Series= X5R	1	$0.02	Cap= 1.0 µF VDC= 25.0 V IRMS= 0.0 A	0603 10mm2
10.	L1	Coilcraft	XAL6030-182MEB	1	$0.60	L= 1.8 µH DCR= 10.0 mOhm	XAL6030 72mm2

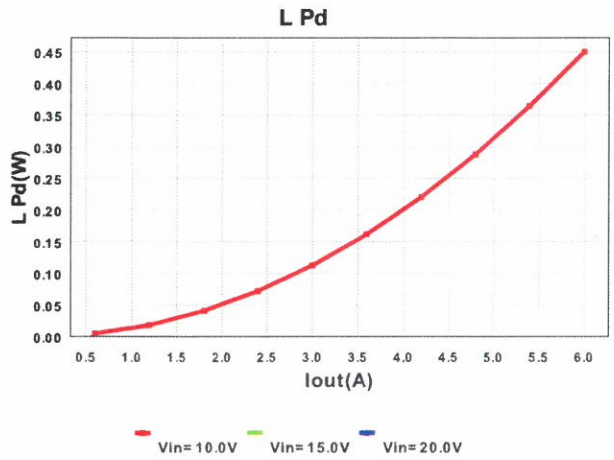
#	Name	Manufacturer	Part Number	Qty	Price	Properties	Footprint
11.	M1	Texas Instruments	CSD17313Q2	2	$0.17	VdsMax= 30.0 V IdsMax= 10.0 Amps	TRANS_NexFET_Q2 16mm2
12.	M2	Texas Instruments	CSD17313Q2	2	$0.17	VdsMax= 30.0 V IdsMax= 10.0 Amps	TRANS_NexFET_Q2 16mm2
13.	Rcomp	Vishay-Dale	CRCW04022K43FKED Series= CRCW..e3	1	$0.01	Res= 2.43 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
14.	Rcomp2	Vishay-Dale	CRCW0402274RFKED Series= CRCW..e3	1	$0.01	Res= 274.0 Ohm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
15.	Rfbb	Vishay-Dale	CRCW04021K37FKED Series= CRCW..e3	1	$0.01	Res= 1.37 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
16.	Rfbt	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	1	$0.01	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
17.	Rpgood	Vishay-Dale	CRCW0402100KFKED Series= CRCW..e3	1	$0.01	Res= 100.0 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
18.	Rs	Vishay-Dale	CRCW04026K19FKED Series= CRCW..e3	1	$0.01	Res= 6.19 kOhm Power= 63.0 mW Tolerance= 1.0%	0402 8mm2
19.	U1	Texas Instruments	TPS40305DRCR	1	$0.95	Switcher	DRC 25mm2

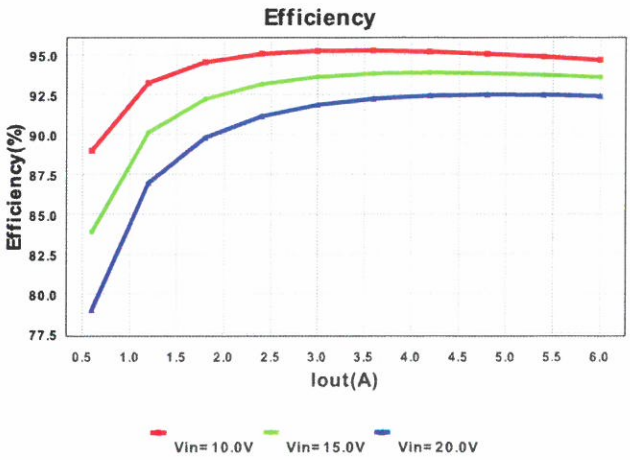


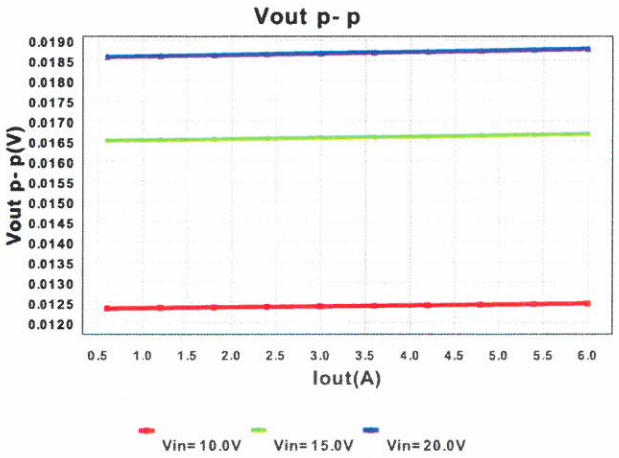


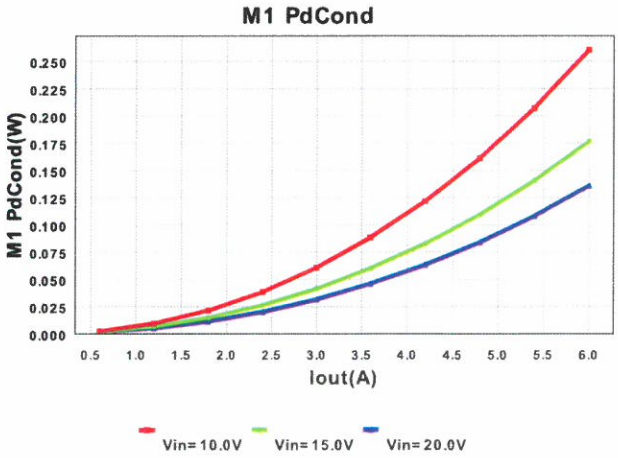


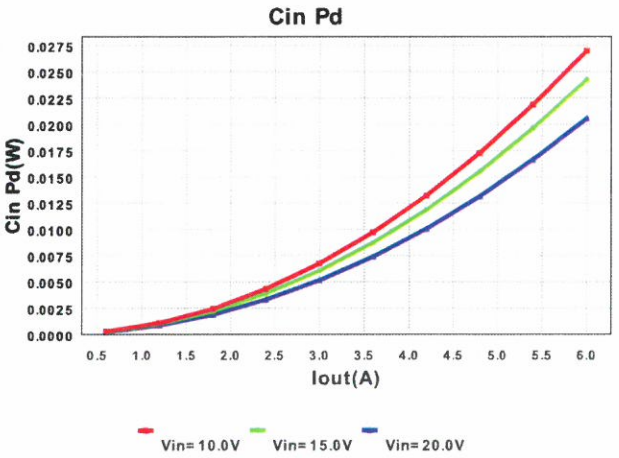


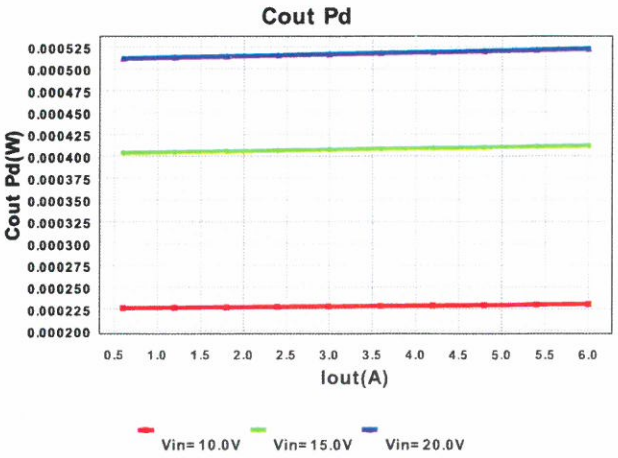


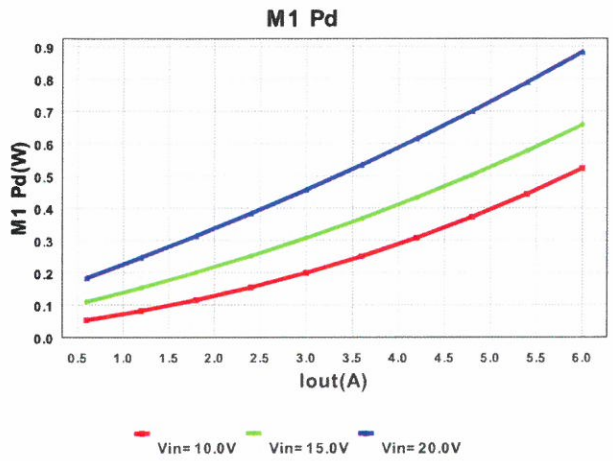


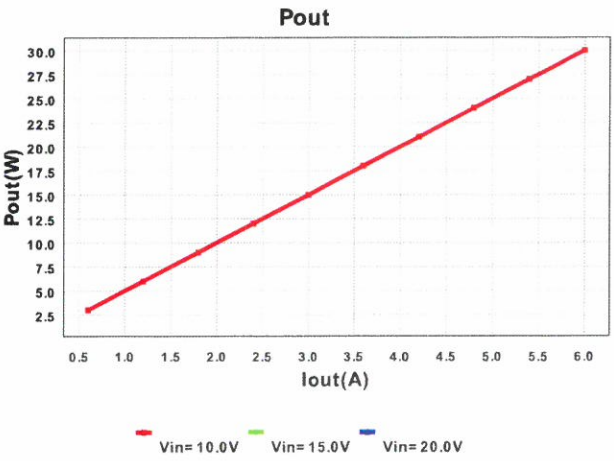


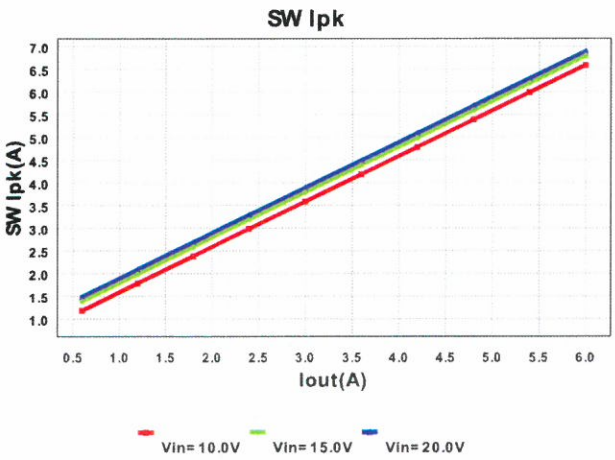


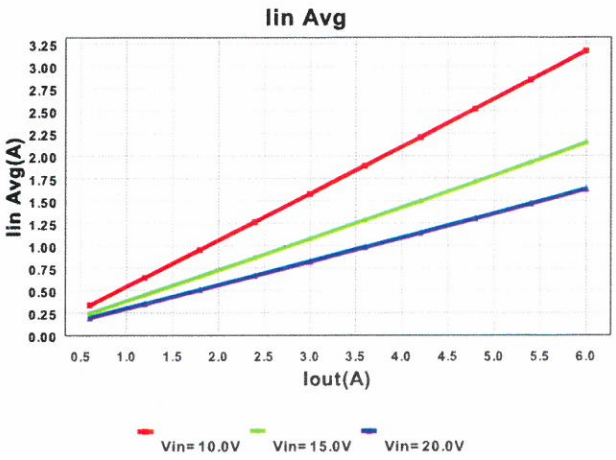


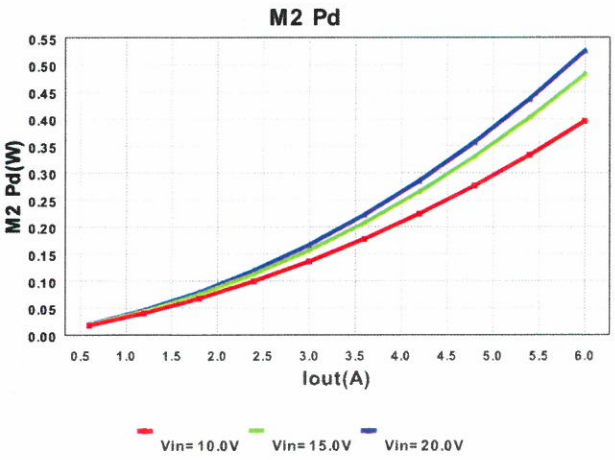


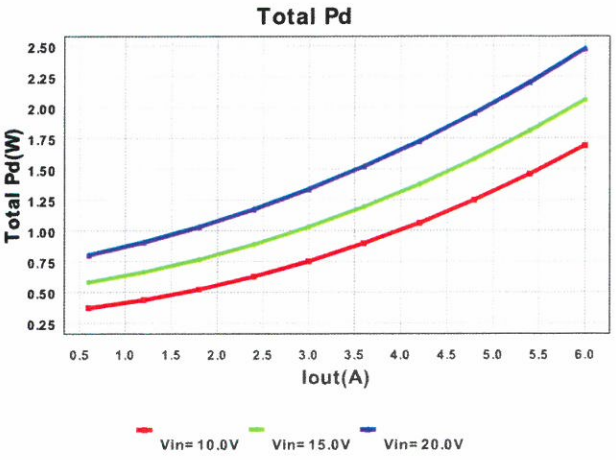


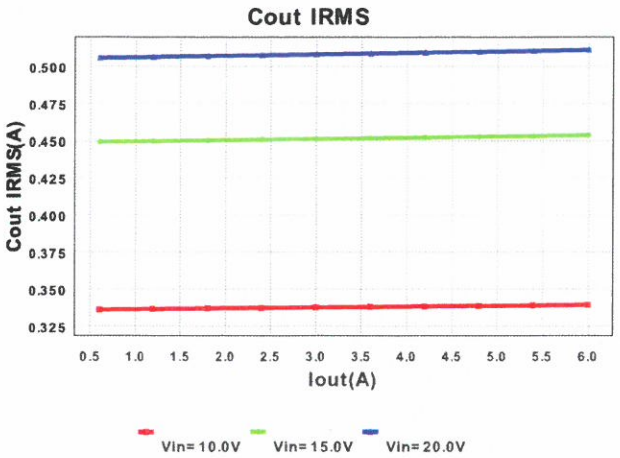


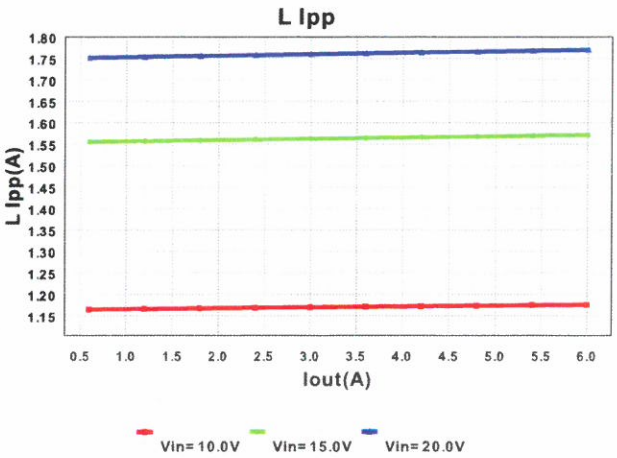


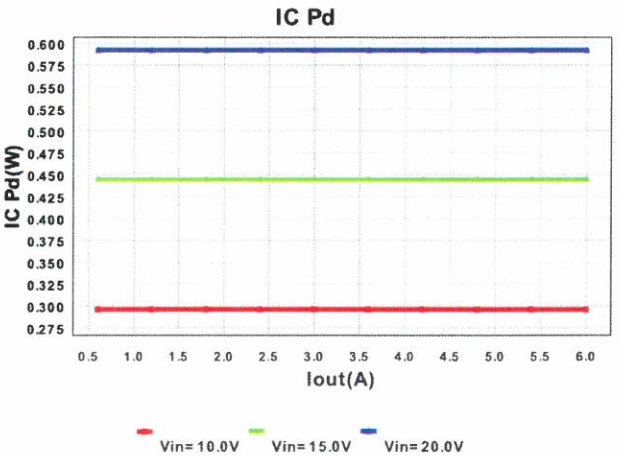


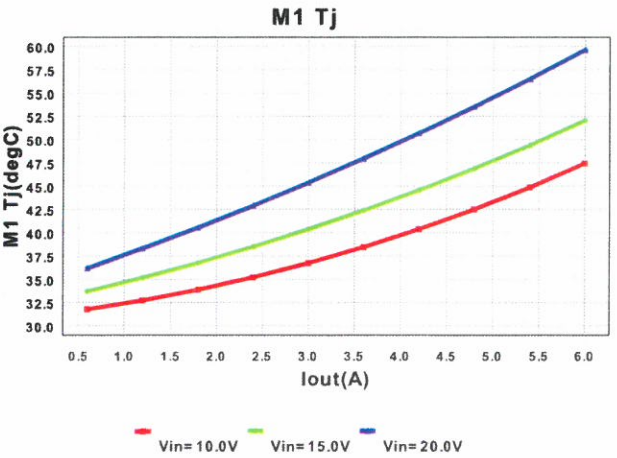


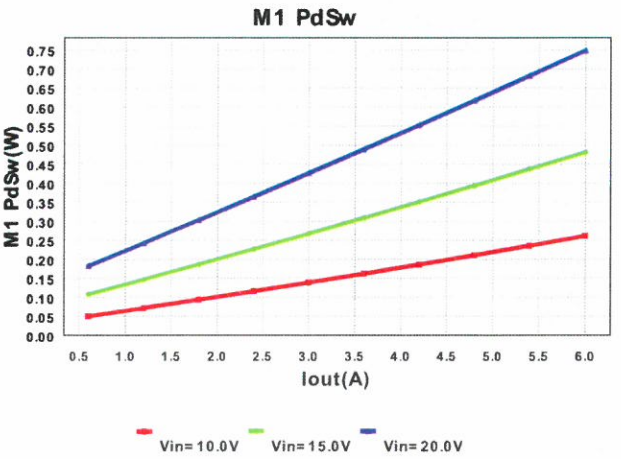


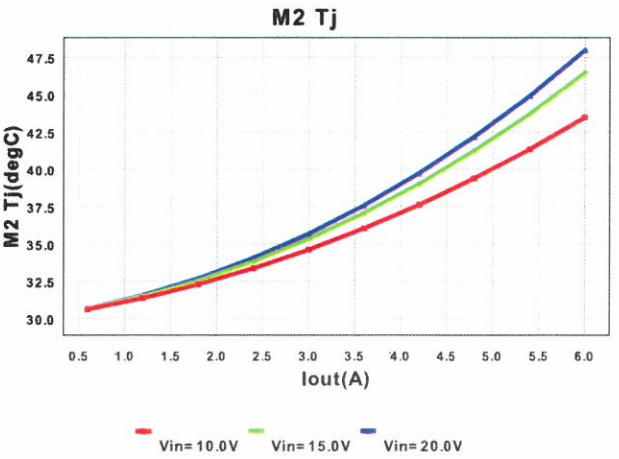


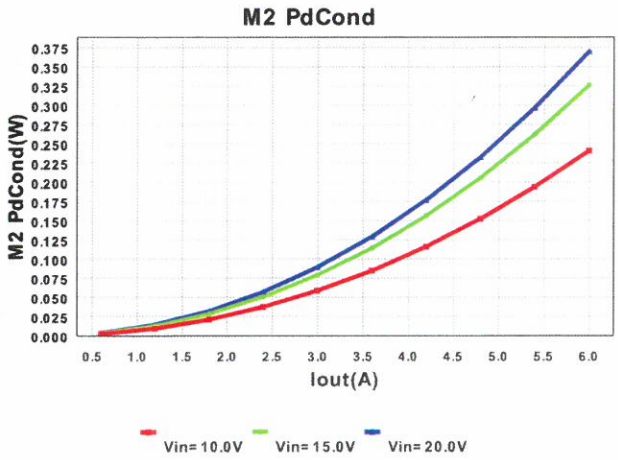












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.615 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	511.016 m A	Current	Output capacitor RMS ripple current
3.	Iin Avg	1.624 A	Current	Average input current
4.	L Ipp	1.77 A	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	6.885 A	Current	Peak switch current
6.	BOM Count	21.0	General	Total Design BOM count
7.	FootPrint	362.0 mm2	General	Total Foot Print Area of BOM components
8.	Frequency	1.2 M Hz	General	Switching frequency
9.	IC Tolerance	10.0 m V	General	IC Feedback Tolerance
10.	Mode	CCM	General	Conduction Mode
11.	Pout	30.0 W	General	Total output power
12.	Total BOM	$3.19	General	Total BOM Cost
13.	Cross Freq	113.916 k Hz	Op_point	Bode plot crossover frequency
14.	Duty Cycle	25.491 %	Op_point	Duty cycle
15.	Efficiency	92.368 %	Op_point	Steady state efficiency
16.	IC Tj	58.353 degC	Op_point	IC junction temperature
17.	IOUT_OP	6.0 A	Op_point	Iout operating point
18.	M1 Tj	59.586 degC	Op_point	M1 MOSFET junction temperature
19.	M2 Tj	47.949 degC	Op_point	M2 MOSFET junction temperature
20.	Phase Marg	66.421 deg	Op_point	Bode Plot Phase Margin
21.	VIN_OP	20.0 V	Op_point	Vin operating point
22.	Vout p-p	18.776 m V	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	20.513 m W	Power	Input capacitor power dissipation
24.	Cout Pd	522.274 µ W	Power	Output capacitor power dissipation
25.	IC Pd	591.92 m W	Power	IC power dissipation
26.	L Pd	450.0 m W	Power	Inductor power dissipation
27.	M1 Pd	884.987 m W	Power	M1 MOSFET total power dissipation
28.	M1 PdCond	137.623 m W	Power	M1 MOSFET conduction losses
29.	M1 PdSw	747.364 m W	Power	M1 MOSFET switching losses
30.	M2 Pd	530.686 m W	Power	M2 MOSFET total power dissipation
31.	M2 PdCond	375.6 m W	Power	M2 MOSFET conduction losses
32.	M2 PdSw	155.086 m W	Power	M2 MOSFET switching losses
33.	Total Pd	2.479 W	Power	Total Power Dissipation

Design Inputs

#	Name	Value	Description
1.	Iout	6.0 A	Maximum Output Current
2.	Iout1	6.0 Amps	Output Current #1
3.	VinMax	20.0 V	Maximum input voltage
4.	VinMin	10.0 V	Minimum input voltage
5.	Vout	5.0 V	Output Voltage
6.	Vout1	5.0 Volt	Output Voltage #1
7.	base_pn	TPS40305	National Based Product Number
8.	source	DC	Input Source Type
9.	Ta	30.0 degC	Ambient temperature

Design Assistance

1. **TPS40305** Product Folder : http://www.ti.com/product/tps40305 : contains the data sheet and other resources.