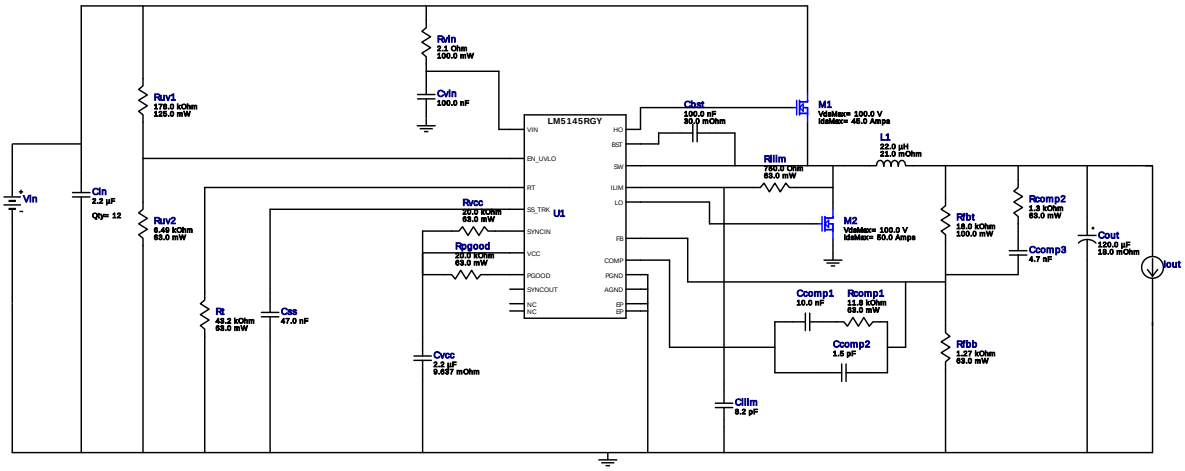
WEBENCH® Design Report

VinMin = 36.0V
VinMax = 75.0V
Vout = 12.0V
Iout = 6.0A

Device = LM5145RGYR
Topology = Buck
Created = 2017-07-20 14:34:01.938
BOM Cost = $8.44
BOM Count = 36
Total Pd = 2.59W

Design : 1225793/780 LM5145RGYR
LM5145RGYR 36.0V-75.0V to 12.00V @ 6.0A

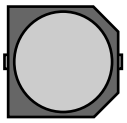


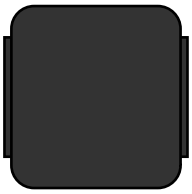
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific application.View WEBENCH(R) Disclaimer.

My Comments

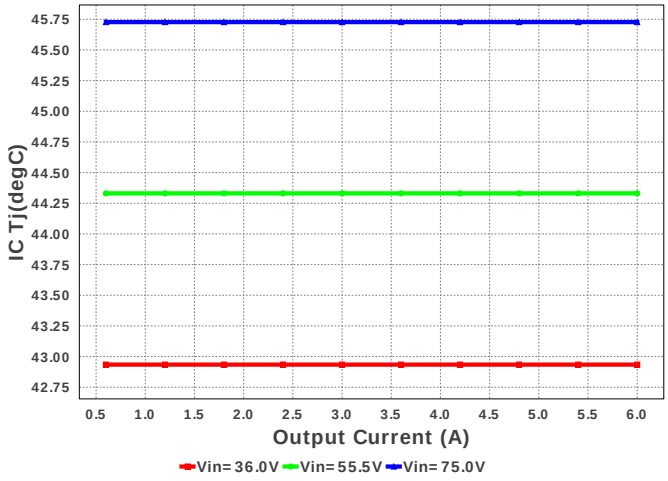
No comments

Electrical BOM

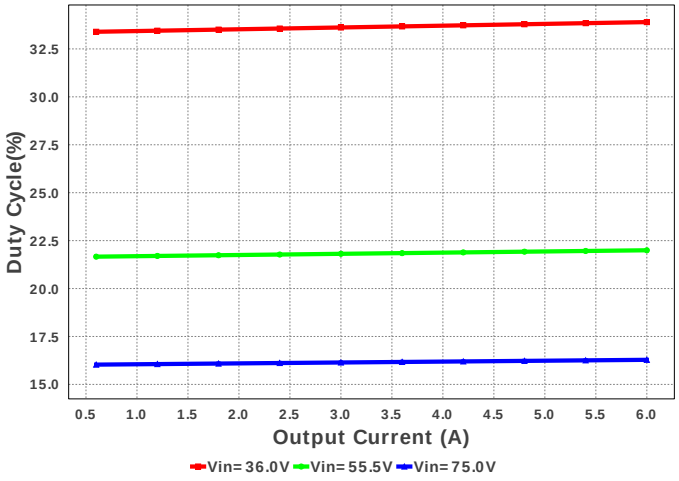
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cbst	MuRata	GRM188R71E104KA01D Series= X7R	Cap= 100.0 nF ESR= 30.0 mOhm VDC= 25.0 V IRMS= 1.51 A	1	$0.01	0603 5 mm^2
2.	Ccomp1	MuRata	GRM155R60J103KA01D Series= X5R	Cap= 10.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
3.	Ccomp2	MuRata	GRM1555C1H1R5CA01D Series= C0G/NP0	Cap= 1.5 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
4.	Ccomp3	AVX	04025A471JAT2A Series= C0G/NP0	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2
5.	Cilim	AVX	06031U8R2BAT2A Series= C0G/NP0	Cap= 8.2 pF VDC= 100.0 V IRMS= 0.0 A	1	$0.07	0603 5 mm^2
6.	Cin	Taiyo Yuden	HMK325B7225KN-T Series= X7R	Cap= 2.2 uF VDC= 100.0 V IRMS= 0.0 A	12	$0.14	1210 15 mm^2
7.	Cout	Panasonic	35SVPF120M Series= SVPF	Cap= 120.0 uF ESR= 18.0 mOhm VDC= 35.0 V IRMS= 4.4 A	1	$0.74	 CAPSMT_62_F12 151 mm^2
8.	Css	MuRata	GRM155R71A473KA01D Series= X7R	Cap= 47.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm^2

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	Cvcc	MuRata	GRM188R61C225KE15D Series= X5R	Cap= 2.2 uF ESR= 9.637 mOhm VDC= 16.0 V IRMS= 1.20373 A	1	$0.02	 0603 5 mm²
10.	Cvin	MuRata	GRM188R72A104KA35D Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	$0.04	 0603 5 mm²
11.	L1	Vishay-Dale	IHLP6767GZER220M11	L= 22.0 µH DCR= 21.0 mOhm	1	$2.55	 IHLP-6767GZ 367 mm²
12.	M1	Infineon Technologies	BSC196N10NS G	VdsMax= 100.0 V IdsMax= 45.0 Amps	1	$0.48	 PG-TDSON-8 55 mm²
13.	M2	Texas Instruments	CSD19537Q3	VdsMax= 100.0 V IdsMax= 50.0 Amps	1	$0.41	 DQG0008A 18 mm²
14.	Rcomp1	Vishay-Dale	CRCW040211K8FKED Series= CRCW..e3	Res= 11.8 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rcomp2	Vishay-Dale	CRCW04021K30FKED Series= CRCW..e3	Res= 1.3 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	Rfbb	Vishay-Dale	CRCW04021K27FKED Series= CRCW..e3	Res= 1.27 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
17.	Rfbt	Yageo America	RC0603FR-0718KL Series= ?	Res= 18.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
18.	Rilim	Vishay-Dale	CRCW0402750RFKED Series= CRCW..e3	Res= 750.0 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
19.	Rpgood	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
20.	Rt	Vishay-Dale	CRCW040243K2FKED Series= CRCW..e3	Res= 43.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
21.	Ruv1	Panasonic	ERJ-6ENF1783V Series= ERJ-6E	Res= 178.0 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	 0805 7 mm²
22.	Ruv2	Vishay-Dale	CRCW04026K49FKED Series= CRCW..e3	Res= 6.49 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
23.	Rvcc	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
24.	Rvin	Vishay-Dale	CRCW06032R10FKEA Series= CRCW..e3	Res= 2.1 Ohm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
25.	U1	Texas Instruments	LM5145RGYR	Switcher	1	$2.30	 RGY0020B 25 mm²

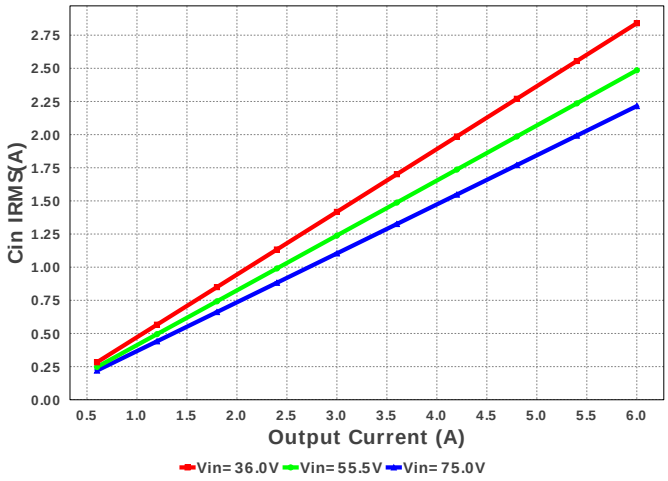
IC Tj



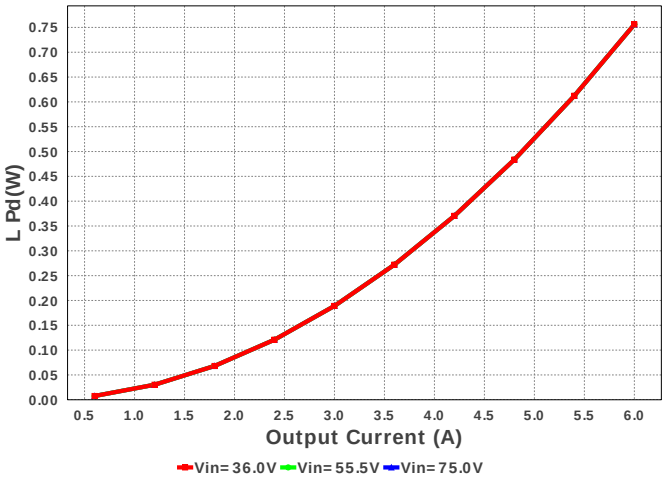
Duty Cycle



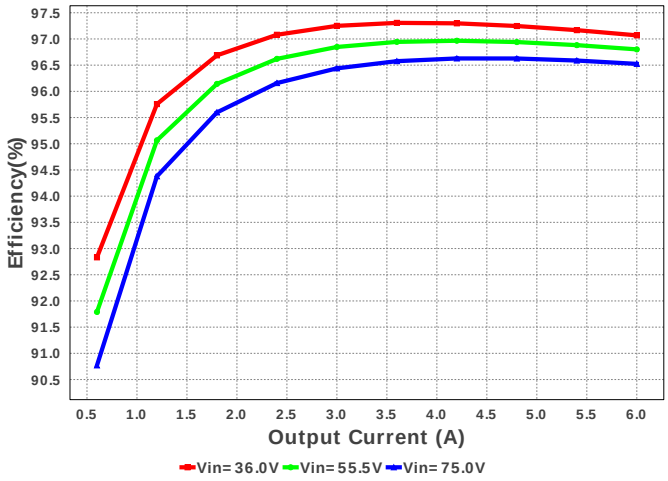
Cin IRMS



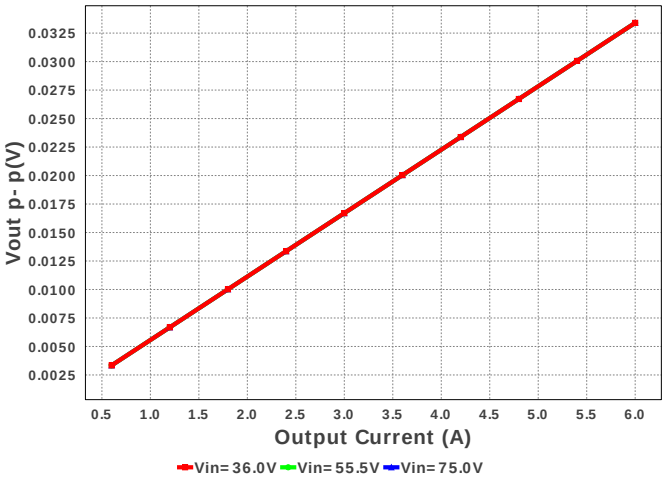
L Pd

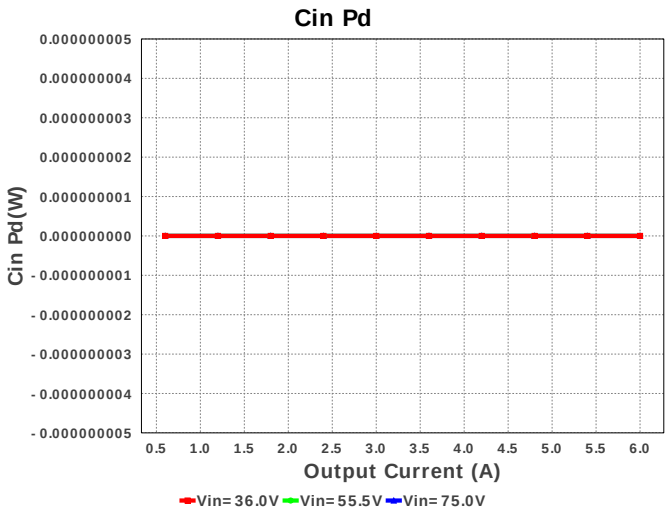


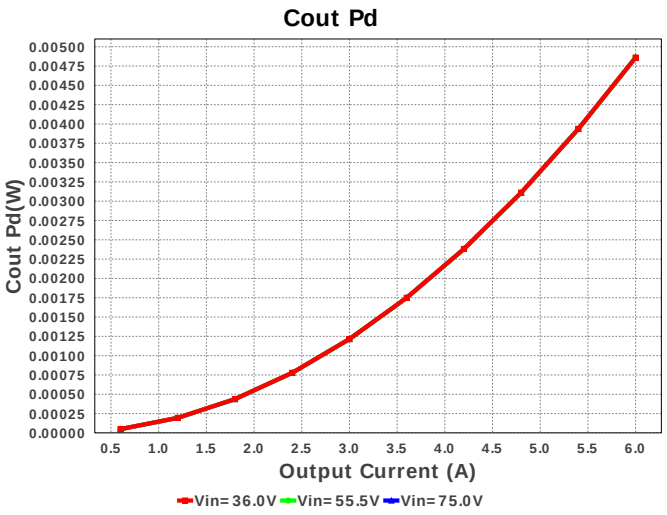
Efficiency

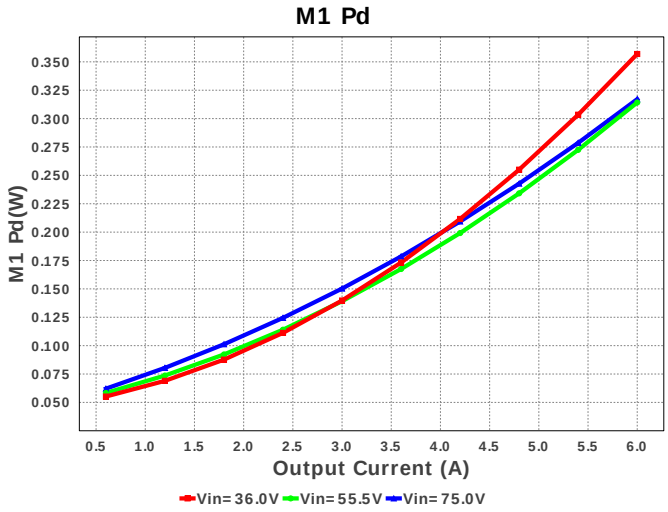


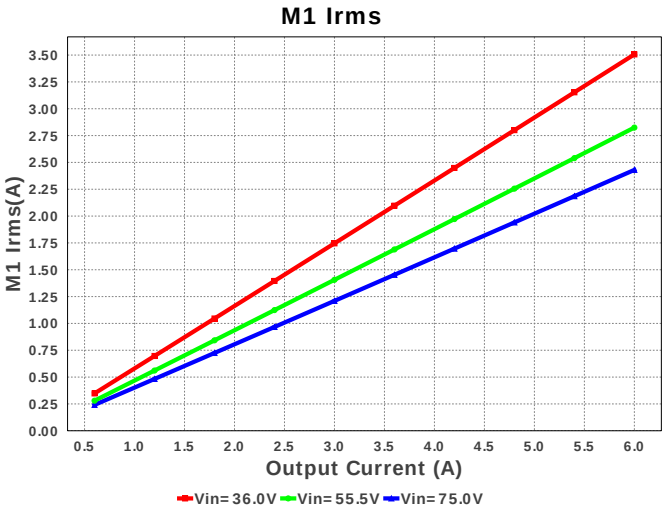
Vout p- p

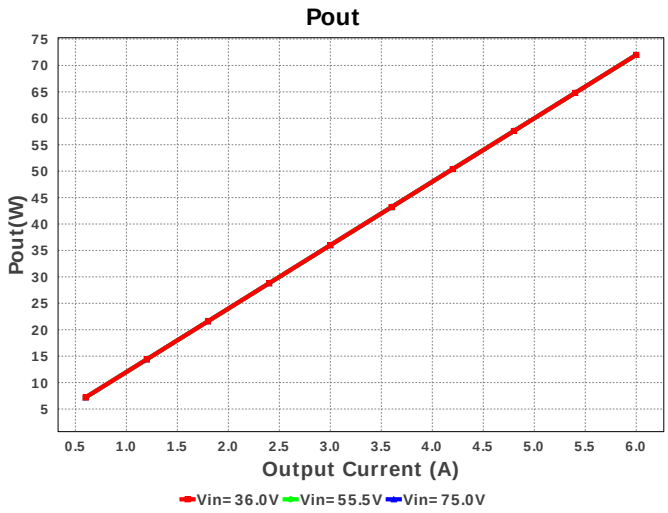


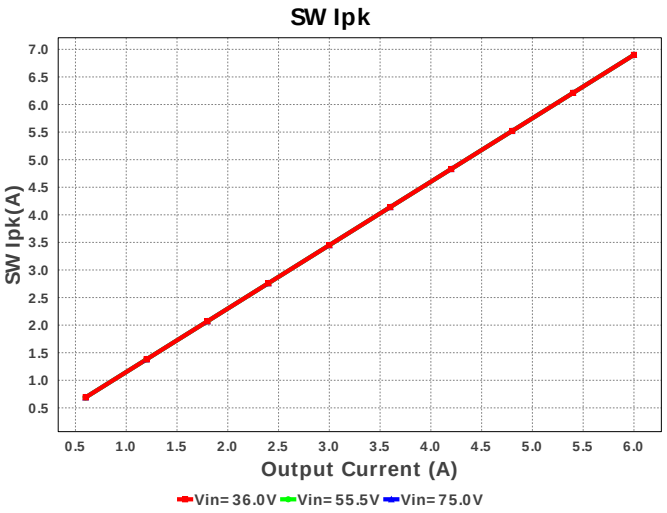


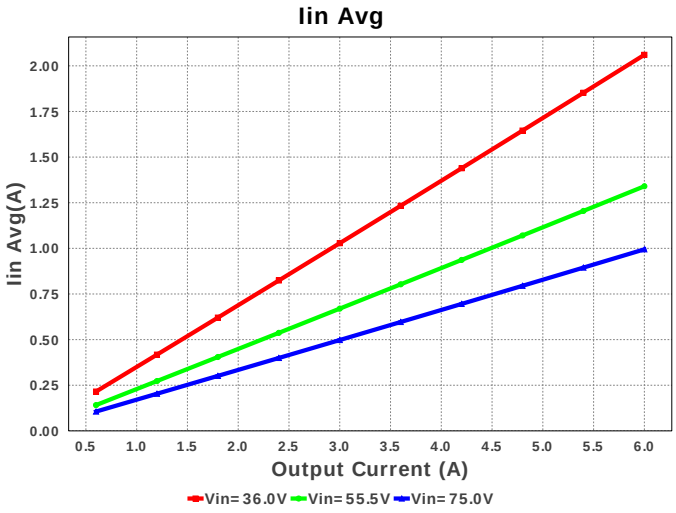


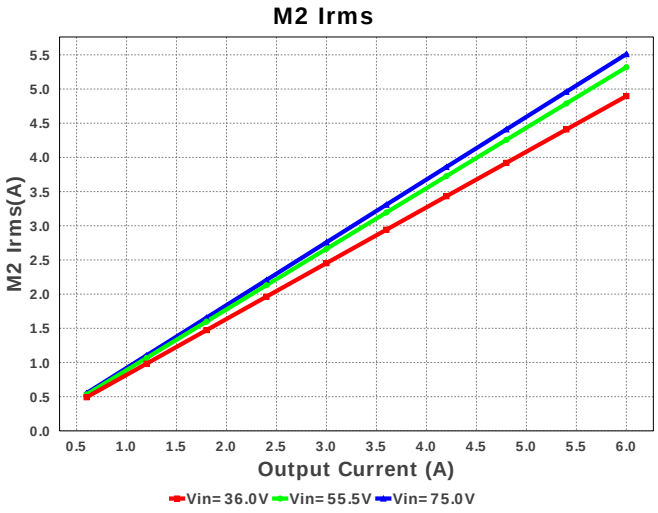


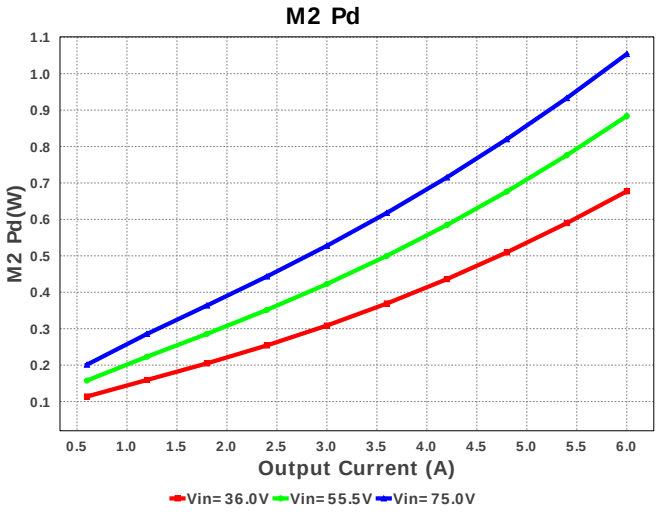


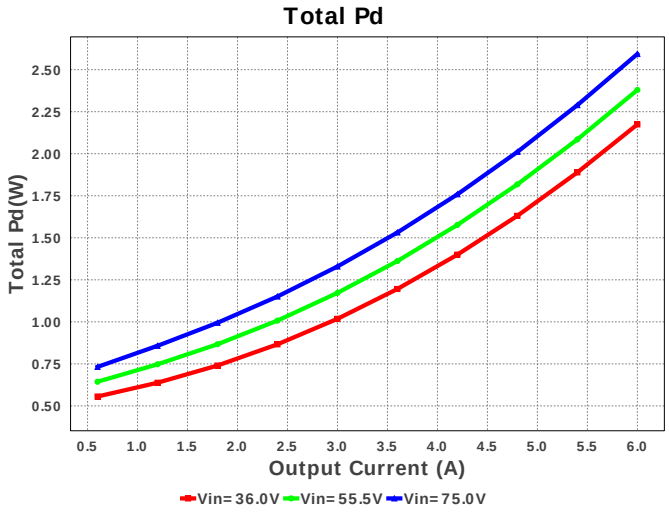


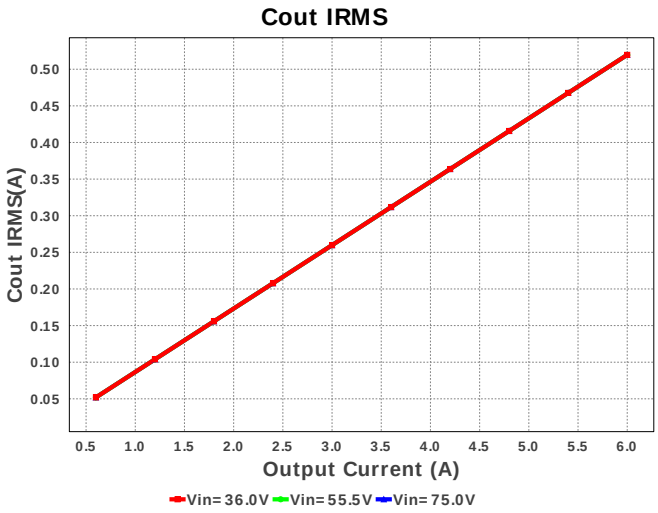


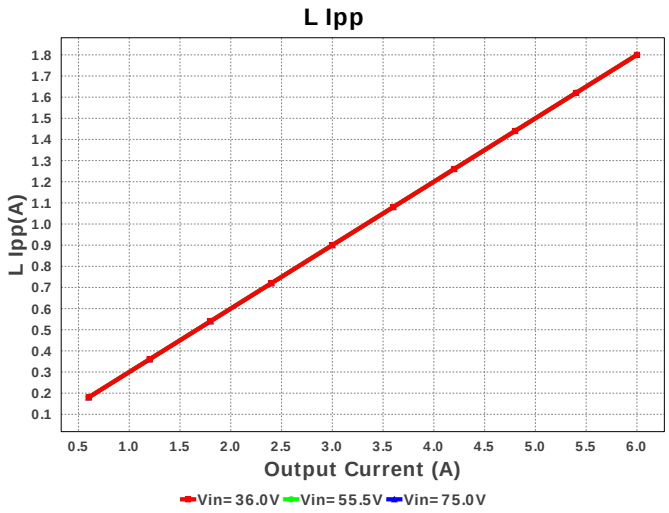


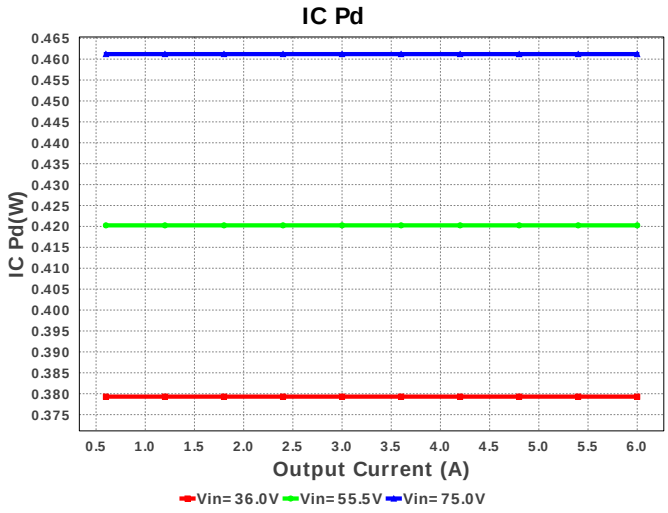


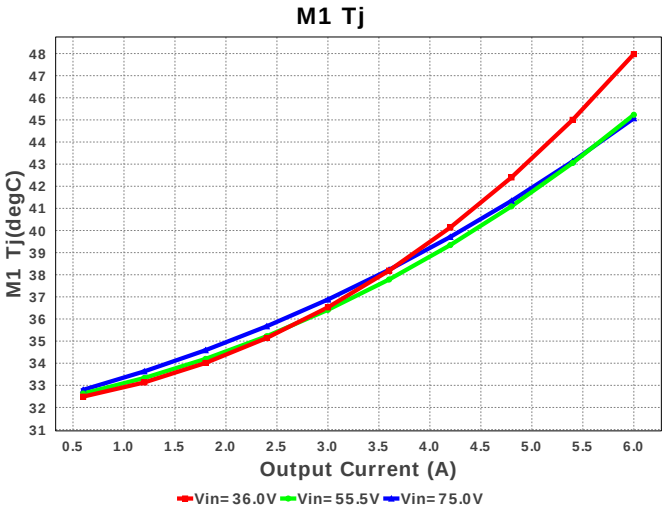


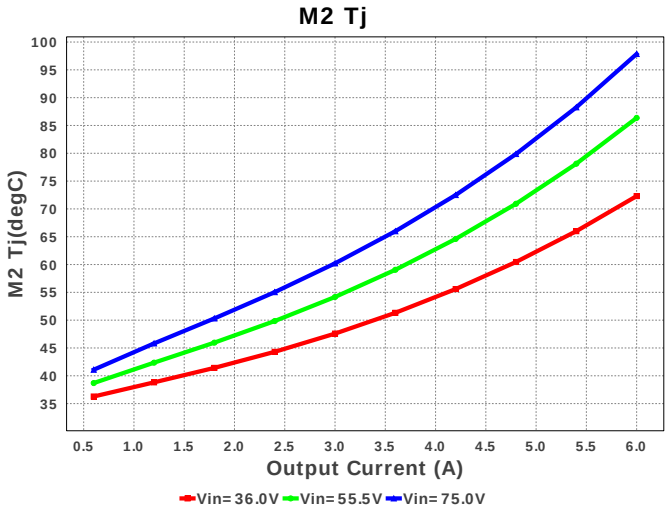


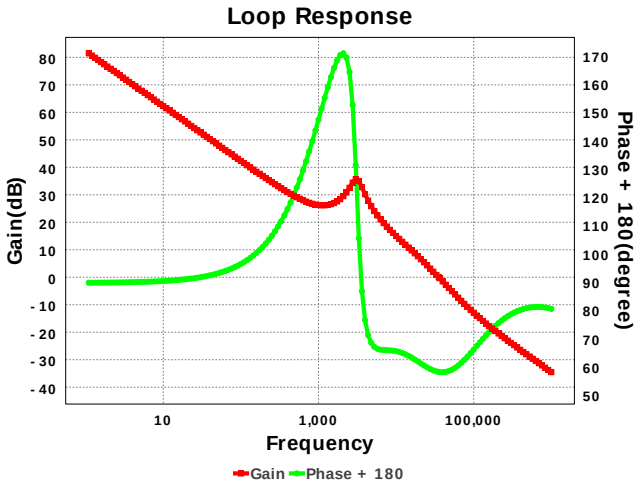












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	2.215 A	Current	Input capacitor RMS ripple current
2.	Cout IRMS	519.615 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	994.51 mA	Current	Average input current
4.	L Ipp	1.8 A	Current	Peak-to-peak inductor ripple current
5.	M1 Irms	2.43 A	Current	MOSFET RMS ripple current
6.	M2 Irms	5.51 A	Current	MOSFET RMS ripple current
7.	SW Ipk	6.9 A	Current	Peak switch current
8.	BOM Count	36	General	Total Design BOM count
9.	FootPrint	864.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	231.481 kHz	General	Switching frequency
11.	IC Tolerance	10.0 mV	General	IC Feedback Tolerance
12.	Mode	CCM	General	Conduction Mode
13.	Pout	72.0 W	General	Total output power
14.	Total BOM	$8.44	General	Total BOM Cost
15.	Low Freq Gain	81.477 dB	Op_Point	Gain at 1Hz
16.	Vout Actual	12.139 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
17.	Cross Freq	35.402 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	16.282 %	Op_point	Duty cycle
19.	Efficiency	96.53 %	Op_point	Steady state efficiency
20.	Gain Marg	-72.64 dB	Op_point	Bode Plot Gain Margin
21.	IC Tj	45.727 degC	Op_point	IC junction temperature
22.	IOUT_OP	6.0 A	Op_point	Iout operating point
23.	M1 Tj	45.002 degC	Op_point	M1 MOSFET junction temperature
24.	M2 Tj	97.623 degC	Op_point	M2 MOSFET junction temperature
25.	Phase Marg	58.524 deg	Op_point	Bode Plot Phase Margin
26.	VIN_OP	75.0 V	Op_point	Vin operating point
27.	Vout p-p	33.397 mV	Op_point	Peak-to-peak output ripple voltage
28.	Cin Pd	0.0 W	Power	Input capacitor power dissipation
29.	Cout Pd	4.86 mW	Power	Output capacitor power dissipation
30.	IC Pd	461.204 mW	Power	IC power dissipation
31.	L Pd	756.0 mW	Power	Inductor power dissipation

#	Name	Value	Category	Description
32.	M1 Pd	315.598 mW	Power	M1 MOSFET total power dissipation
33.	M2 Pd	1.05 W	Power	M2 MOSFET total power dissipation
34.	Total Pd	2.588 W	Power	Total Power Dissipation
35.	Vout Tolerance	3.161 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	6.0	Maximum Output Current
2.	VinMax	75.0	Maximum input voltage
3.	VinMin	36.0	Minimum input voltage
4.	Vout	12.0	Output Voltage
5.	base_pn	LM5145	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM5145** Product Folder : http://www.ti.com/product/lm5145 : contains the data sheet and other resources.