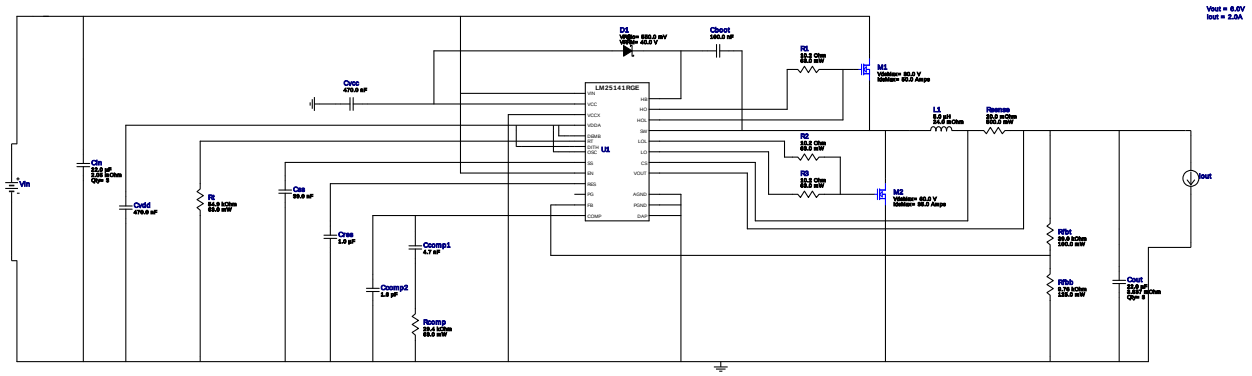
WEBENCH® Design Report

VinMin = 23.0V
VinMax = 24.0V
Vout = 6.0V
Iout = 2.0A

Device = LM25141RGER
Topology = Buck
Created = 2017-10-24 17:00:04.147
BOM Cost = $4.15
BOM Count = 26
Total Pd = 0.76W

Design : 1104891/89 LM25141RGER
LM25141RGER 23.0V-24.0V to 6.00V @ 2.0A

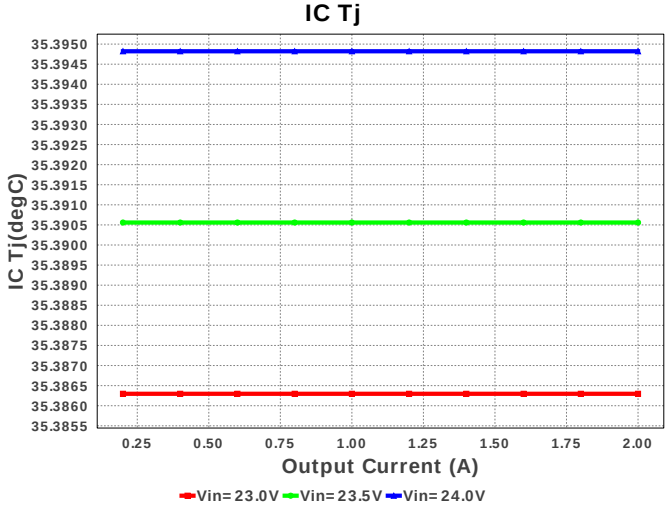


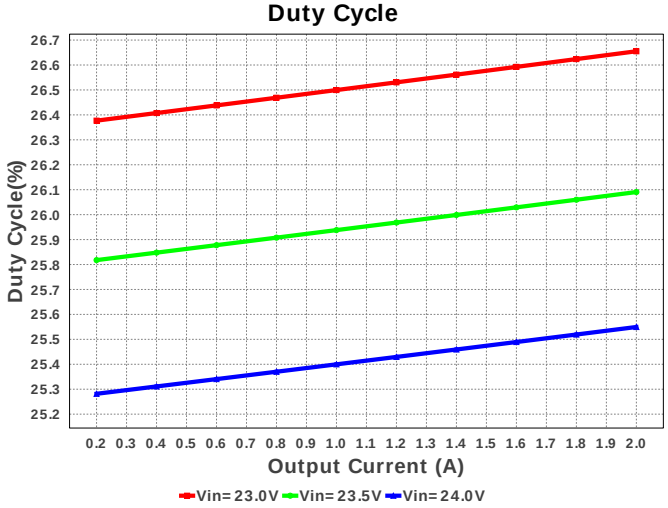
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

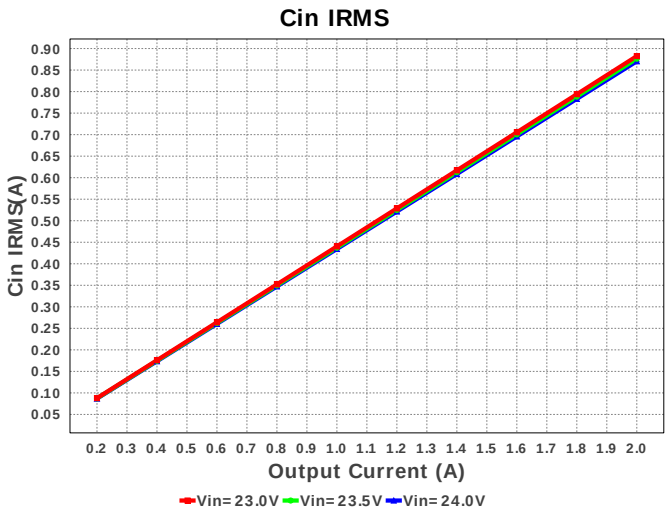
Electrical BOM

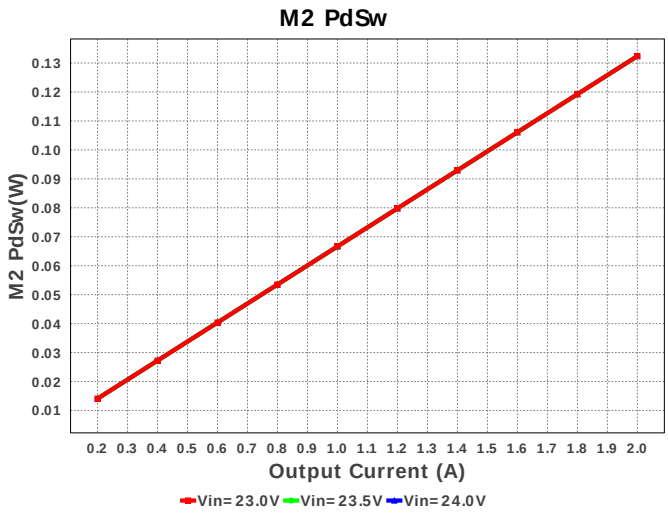
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM155R60J104KA01D Series= X5R	Cap= 100.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
2.	Ccomp1	Yageo America	CC0805KRX7R9BB472 Series= X7R	Cap= 4.7 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
3.	Ccomp2	MuRata	GRM1555C1H1R6CA01D Series= C0G/NP0	Cap= 1.6 pF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
4.	Cin	TDK	C2012X5R1V226M125AC Series= X5R	Cap= 22.0 uF ESR= 2.05 mOhm VDC= 35.0 V IRMS= 4.5559 A	3	$0.33	0805 7 mm²
5.	Cout	MuRata	GRM31CR61A226KE19L Series= X5R	Cap= 22.0 uF ESR= 3.637 mOhm VDC= 10.0 V IRMS= 3.56456 A	3	$0.08	1206_190 11 mm²
6.	Cres	Taiyo Yuden	EMK212B7105KG-T Series= X7R	Cap= 1.0 uF VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
7.	Css	MuRata	GRM155R71A393KA01D Series= X7R	Cap= 39.0 nF VDC= 10.0 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
8.	Cvcc	MuRata	GRM155R60J474KE19D Series= X5R	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
9.	Cvdd	MuRata	GRM155R60J474KE19D Series= X5R	Cap= 470.0 nF VDC= 6.3 V IRMS= 0.0 A	1	$0.01	0402 3 mm²
10.	D1	Fairchild Semiconductor	SS24FL	VF@Io= 550.0 mV VRRM= 40.0 V	1	$0.07	SOD-123F 12 mm²
11.	L1	Bourns	SRR6038-5R0Y	L= 5.0 µH DCR= 24.0 mOhm	1	$0.27	SRR6038 77 mm²

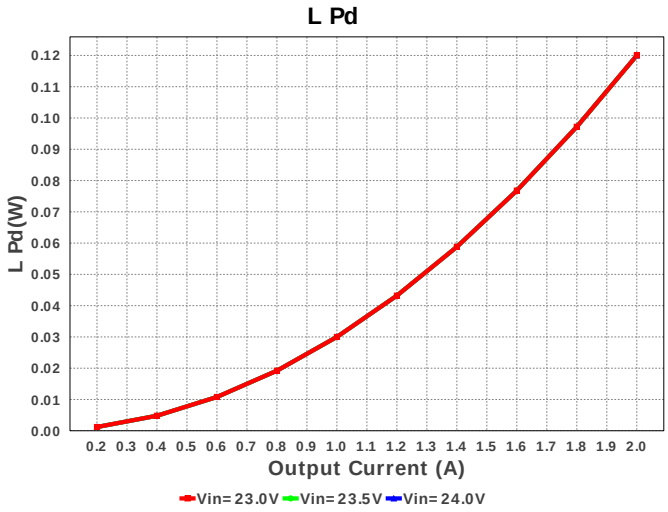
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
12.	M1	Texas Instruments	CSD17308Q3	VdsMax= 30.0 V IdsMax= 50.0 Amps	1	$0.25	DQG0008A 18 mm²
13.	M2	Texas Instruments	CSD18543Q3A	VdsMax= 60.0 V IdsMax= 35.0 Amps	1	$0.33	DNH0008A 18 mm²
14.	R1	Vishay-Dale	CRCW040210R2FKED Series= CRCW..e3	Res= 10.2 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
15.	R2	Vishay-Dale	CRCW040210R2FKED Series= CRCW..e3	Res= 10.2 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
16.	R3	Vishay-Dale	CRCW040210R2FKED Series= CRCW..e3	Res= 10.2 Ohm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
17.	Rcomp	Vishay-Dale	CRCW040229K4FKED Series= CRCW..e3	Res= 29.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
18.	Rfbb	Panasonic	ERJ-6ENF9761V Series= ERJ-6E	Res= 9.76 kOhm Power= 125.0 mW Tolerance= 1.0%	1	$0.01	0805 7 mm²
19.	Rfbt	Yageo America	RC0603FR-0739KL Series= ?	Res= 39.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²
20.	Rsense	Stackpole Electronics Inc	CSR1206FK20L0 Series= ?	Res= 20.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.10	1206 11 mm²
21.	Rt	Vishay-Dale	CRCW040254K9FKED Series= CRCW..e3	Res= 54.9 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
22.	U1	Texas Instruments	LM25141RGER	Switcher	1	$1.75	RGE0024J 25 mm²

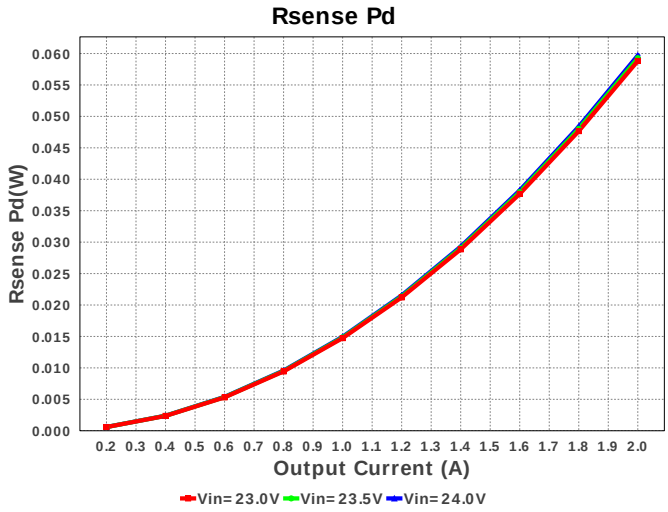


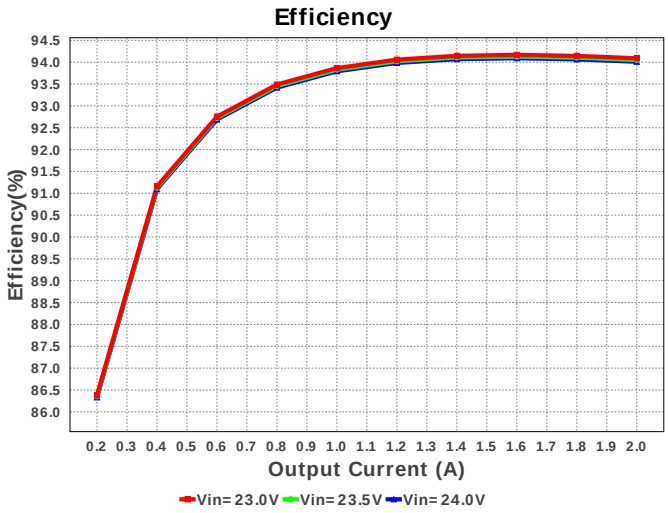


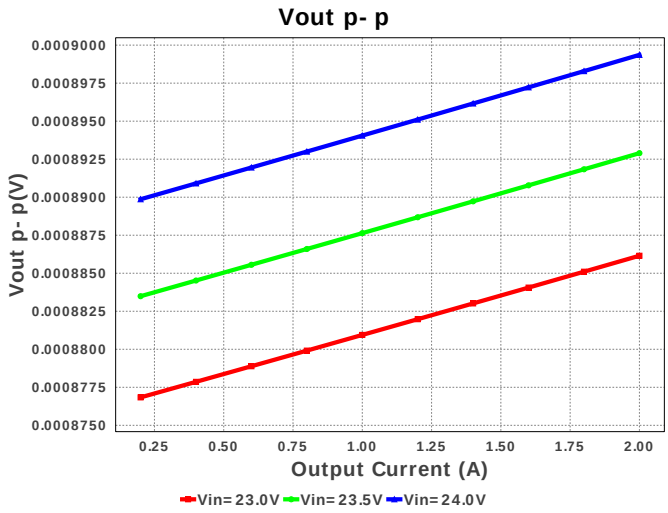


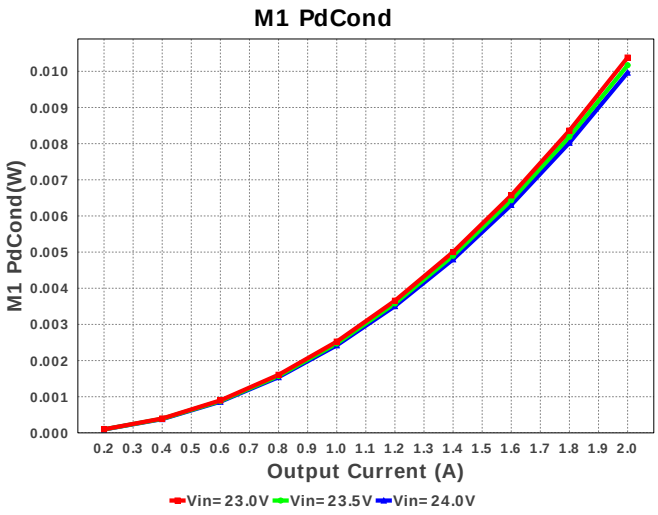


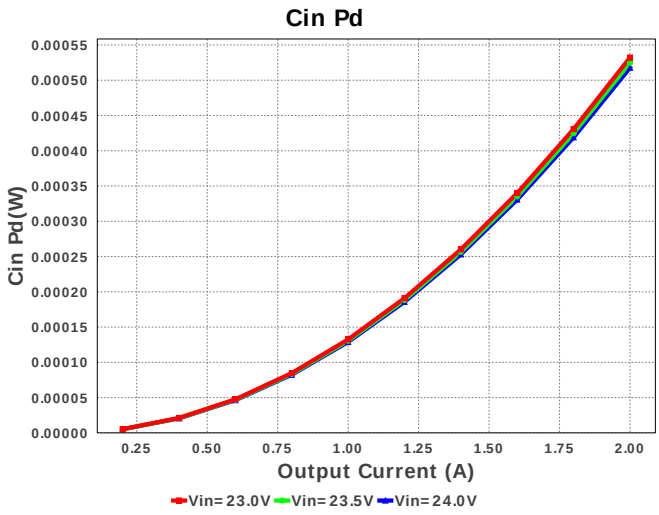


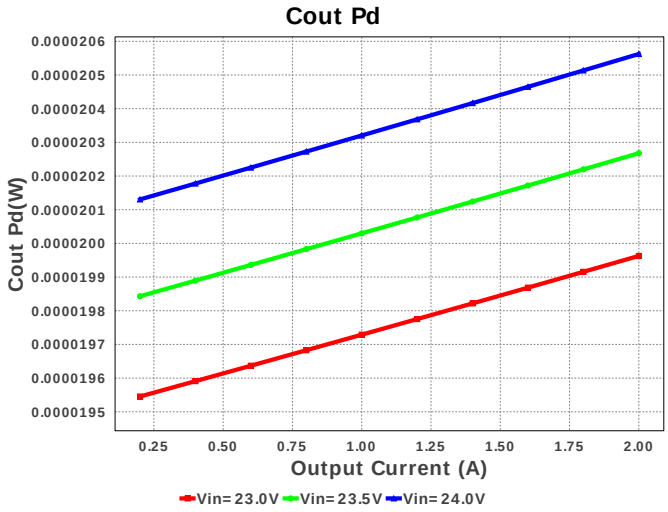


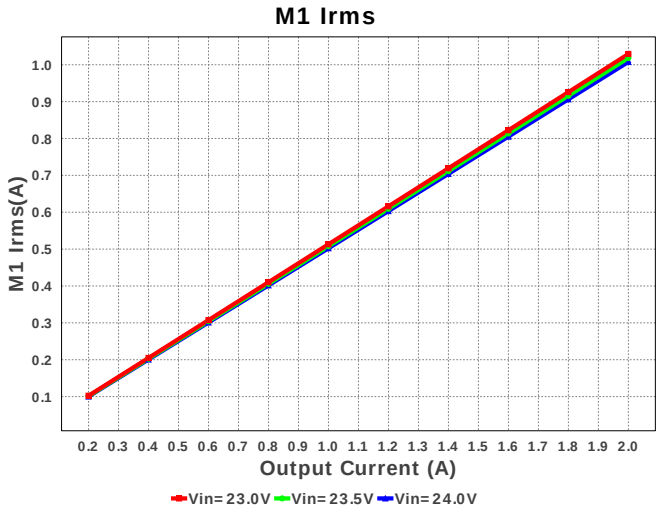


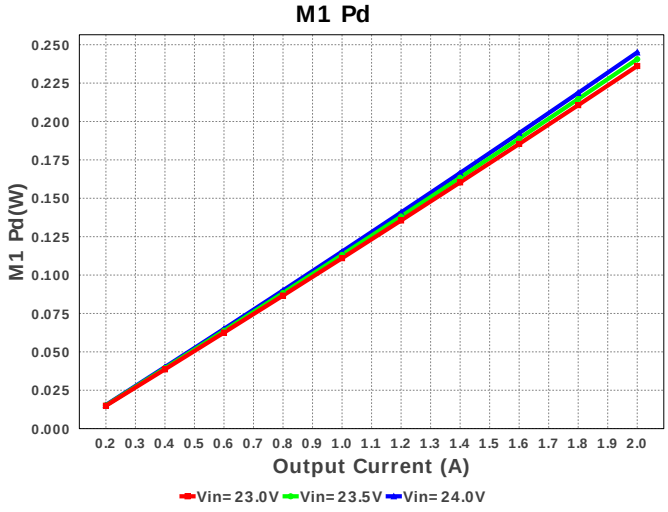


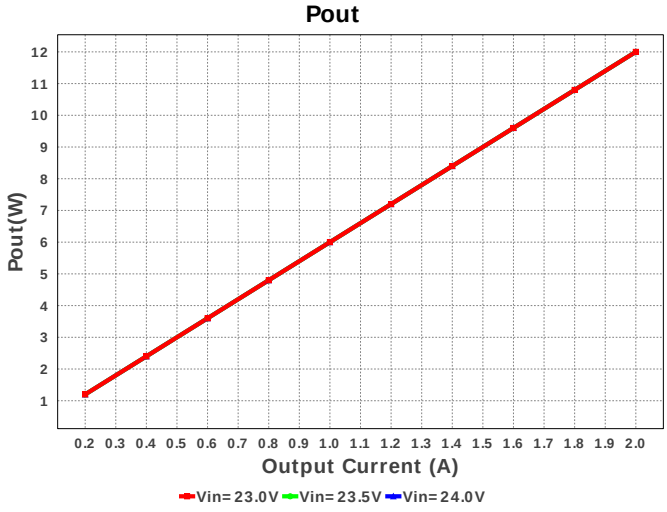


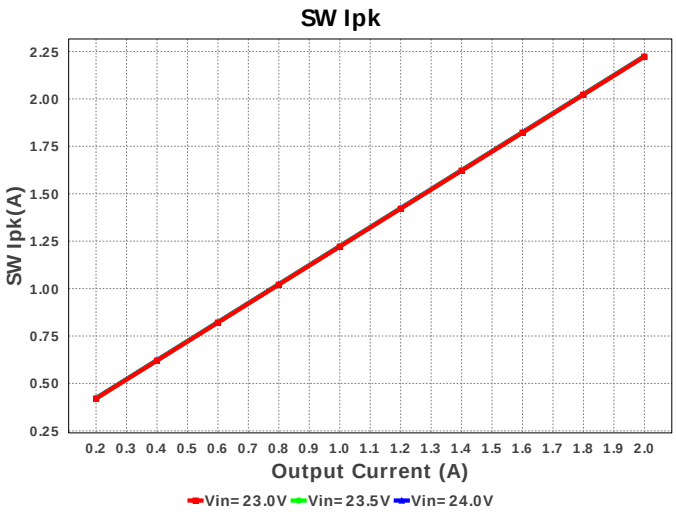


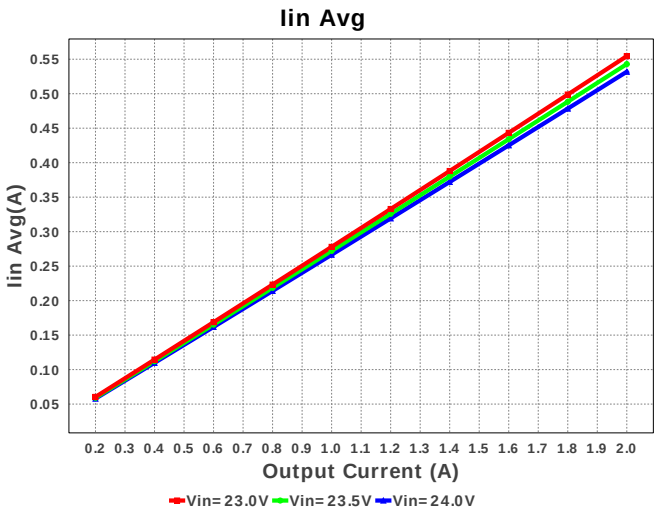


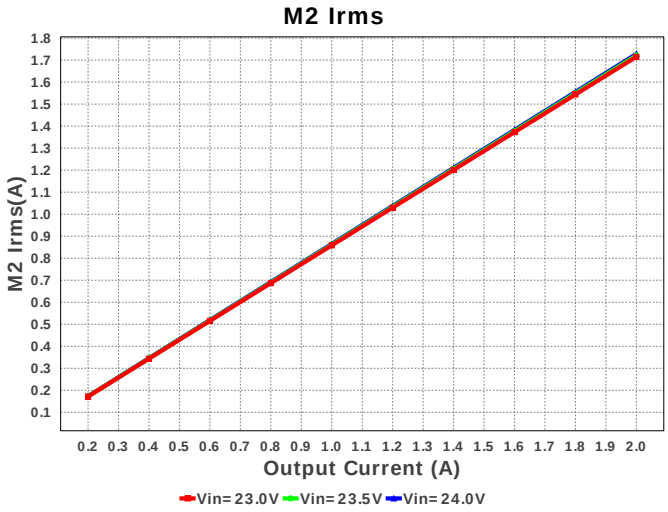


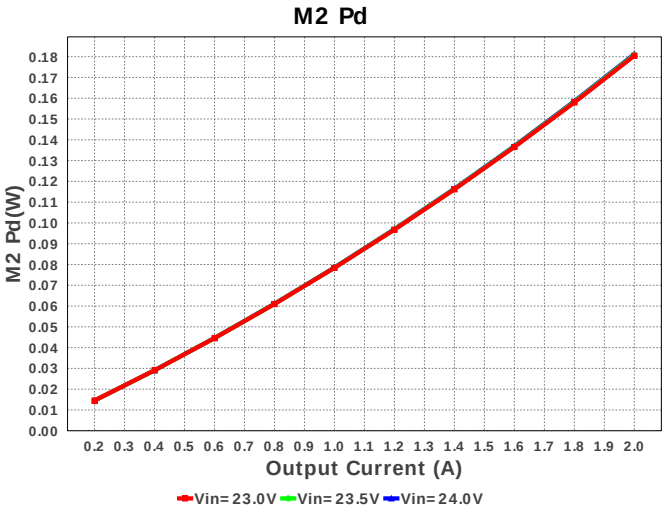


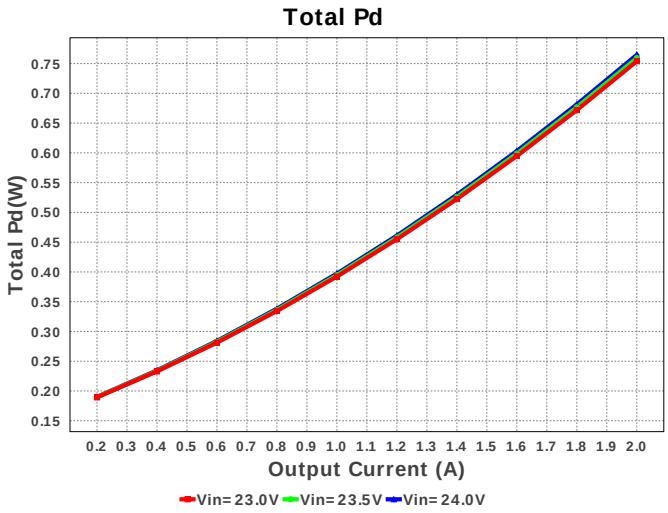


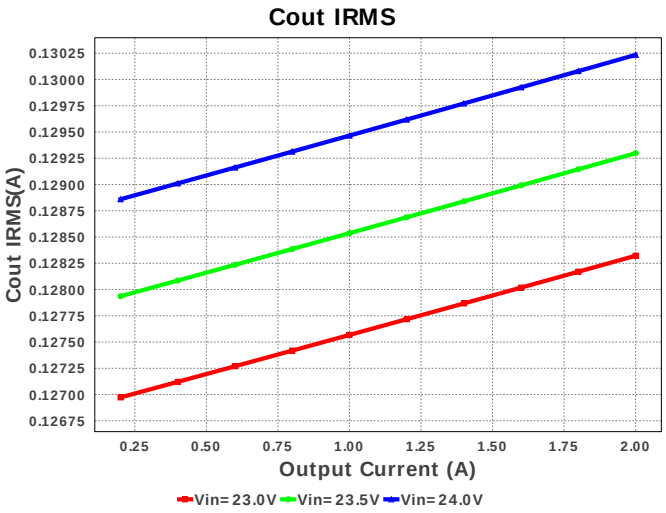


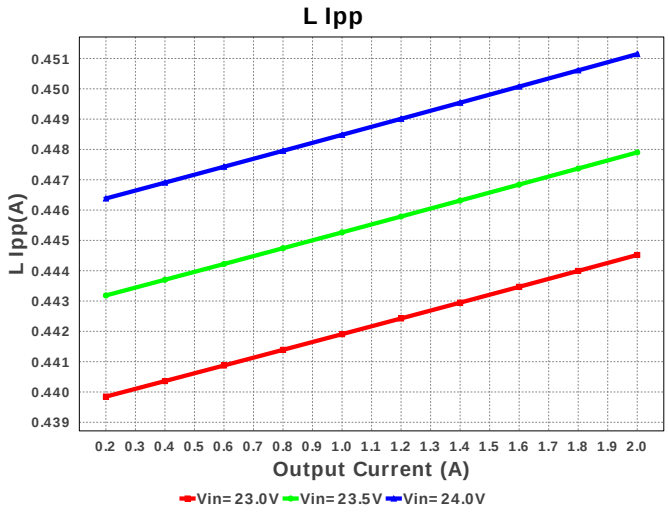


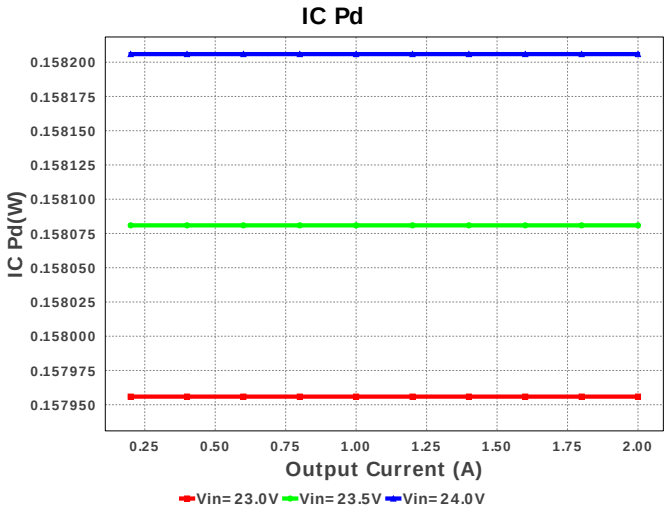


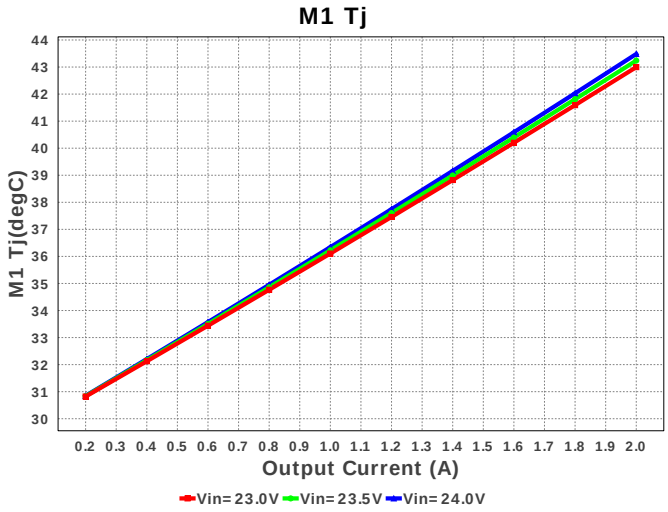


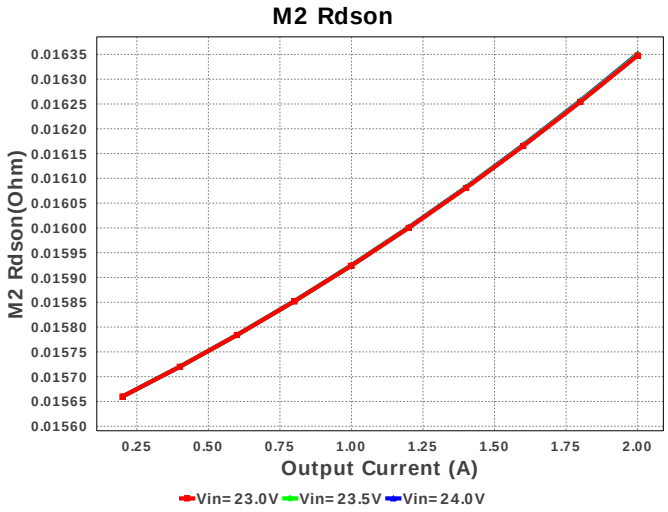


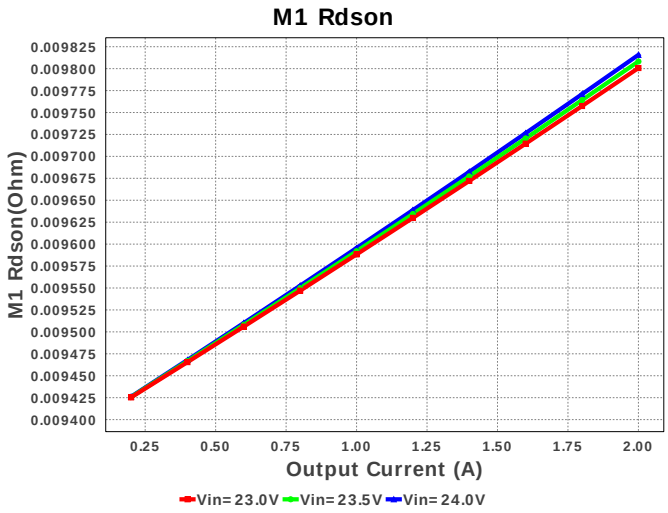


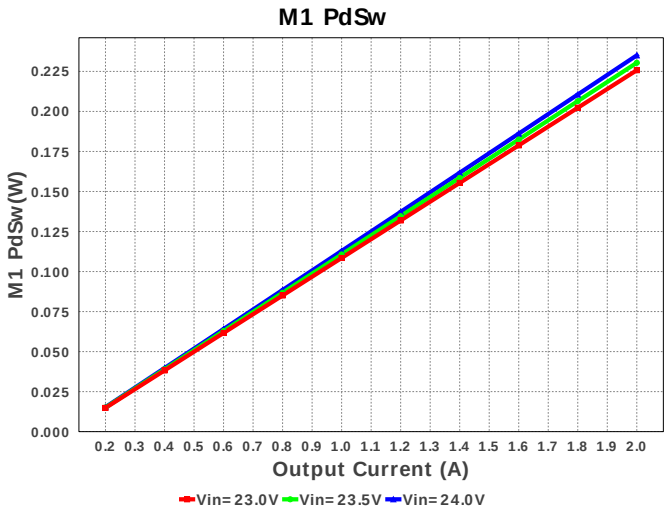


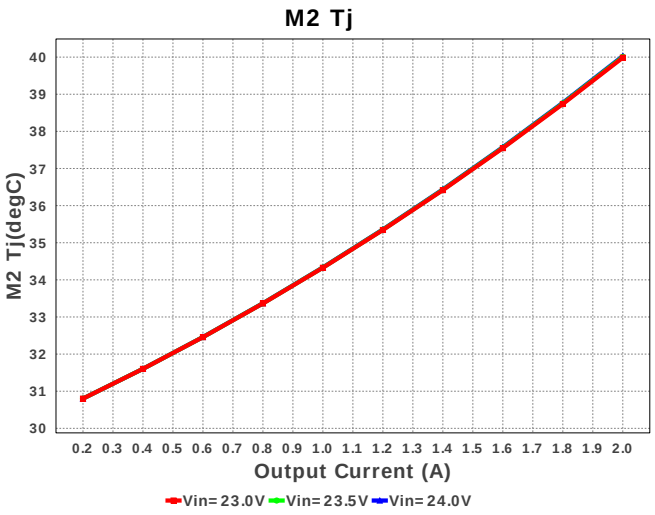


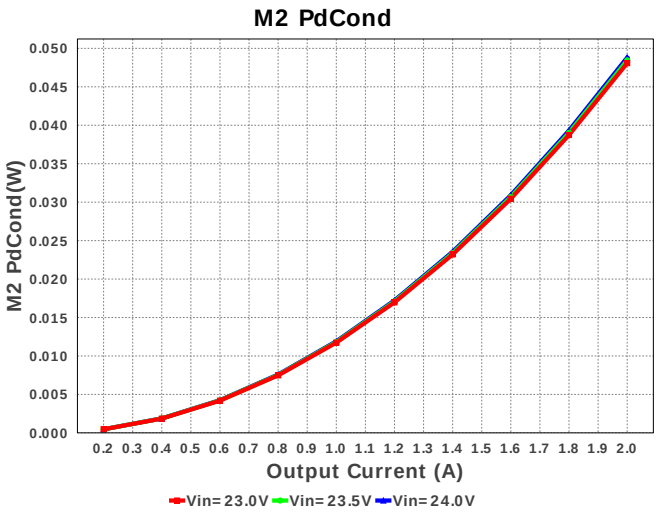


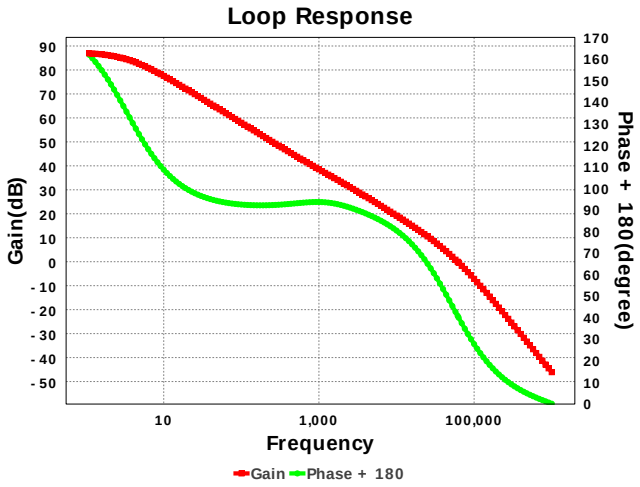












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	870.385 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	130.234 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	531.86 mA	Current	Average input current
4.	L Ipp	451.15 mA	Current	Peak-to-peak inductor ripple current
5.	M1 Irms	1.008 A	Current	MOSFET RMS ripple current
6.	M2 Irms	1.728 A	Current	MOSFET RMS ripple current
7.	SW Ipk	2.226 A	Current	Peak switch current
8.	BOM Count	26	General	Total Design BOM count
9.	FootPrint	270.0 mm^2	General	Total Foot Print Area of BOM components
10.	Frequency	2.025 MHz	General	Switching frequency
11.	IC Tolerance	12.0 mV	General	IC Feedback Tolerance
12.	M1 Rdson	9.816 mOhm	General	Drain-Source On-resistance
13.	M2 Rdson	16.351 mOhm	General	Drain-Source On-resistance
14.	Mode	CCM	General	Conduction Mode
15.	Pout	12.0 W	General	Total output power
16.	Total BOM	$4.15	General	Total BOM Cost
17.	Low Freq Gain	86.943 dB	Op_Point	Gain at 1Hz
18.	Vout Actual	5.995 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
19.	Cross Freq	61.5 kHz	Op_point	Bode plot crossover frequency
20.	Duty Cycle	25.381 %	Op_point	Duty cycle
21.	Efficiency	94.01 %	Op_point	Steady state efficiency
22.	Gain Marg	-46.203 dB	Op_point	Bode Plot Gain Margin
23.	IC Tj	35.395 degC	Op_point	IC junction temperature
24.	IOUT_OP	2.0 A	Op_point	Iout operating point
25.	M1 Tj	43.483 degC	Op_point	M1 MOSFET junction temperature
26.	M2 Tj	40.027 degC	Op_point	M2 MOSFET junction temperature
27.	Phase Marg	40.733 deg	Op_point	Bode Plot Phase Margin
28.	VIN_OP	24.0 V	Op_point	Vin operating point
29.	Vout p-p	903.739 µV	Op_point	Peak-to-peak output ripple voltage
30.	Cin Pd	517.673 µW	Power	Input capacitor power dissipation
31.	Cout Pd	20.562 µW	Power	Output capacitor power dissipation

#	Name	Value	Category	Description
32.	IC Pd	158.206 mW	Power	IC power dissipation
33.	L Pd	120.0 mW	Power	Inductor power dissipation
34.	M1 Pd	244.982 mW	Power	M1 MOSFET total power dissipation
35.	M1 PdCond	9.965 mW	Power	M1 MOSFET conduction losses
36.	M1 PdSw	235.016 mW	Power	M1 MOSFET switching losses
37.	M2 Pd	181.2 mW	Power	M2 MOSFET total power dissipation
38.	M2 PdCond	48.803 mW	Power	M2 MOSFET conduction losses
39.	M2 PdSw	132.397 mW	Power	M2 MOSFET switching losses
40.	Rsense Pd	59.695 mW	Power	LED Current Rsns Power Dissipation
41.	Total Pd	764.621 mW	Power	Total Power Dissipation
42.	Vout Tolerance	2.632 %		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	24.0	Maximum input voltage
3.	VinMin	23.0	Minimum input voltage
4.	Vout	6.0	Output Voltage
5.	base_pn	LM25141	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. **LM25141** Product Folder : http://www.ti.com/product/LM25141 : contains the data sheet and other resources.