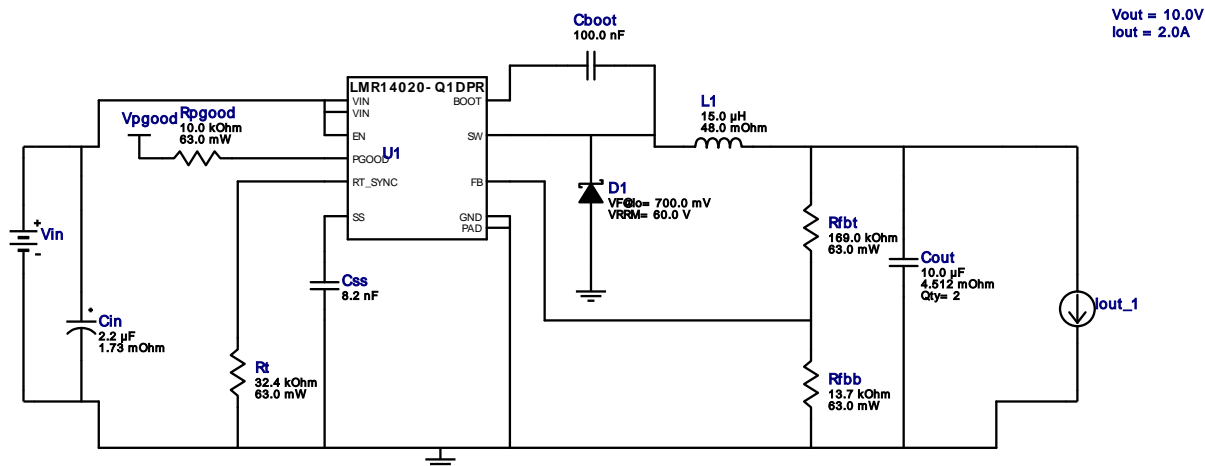


WEBENCH® Design Report

Design : 4352199/63 LMR14020SQDPRRQ1
LMR14020SQDPRRQ1 20.0V-40.0V to 10.00V @ 2.000164203612479A

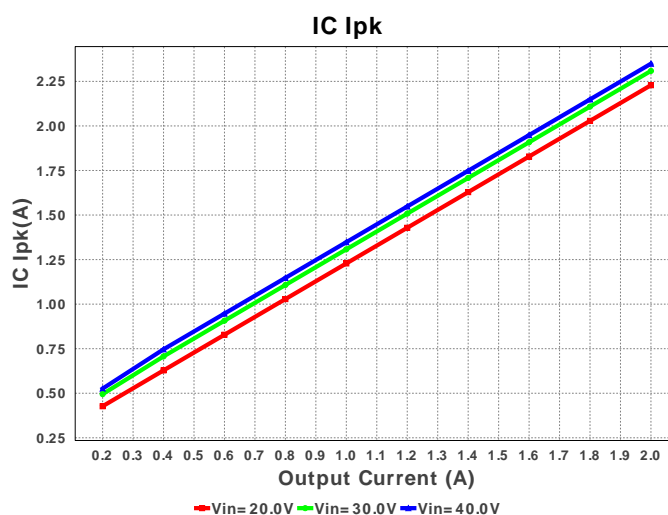
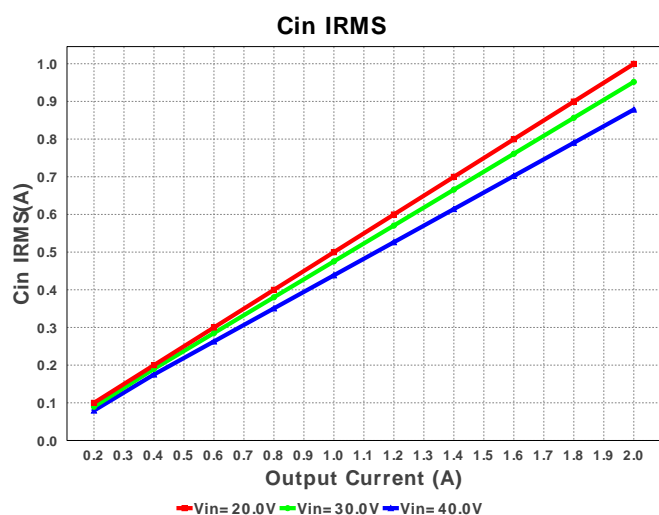
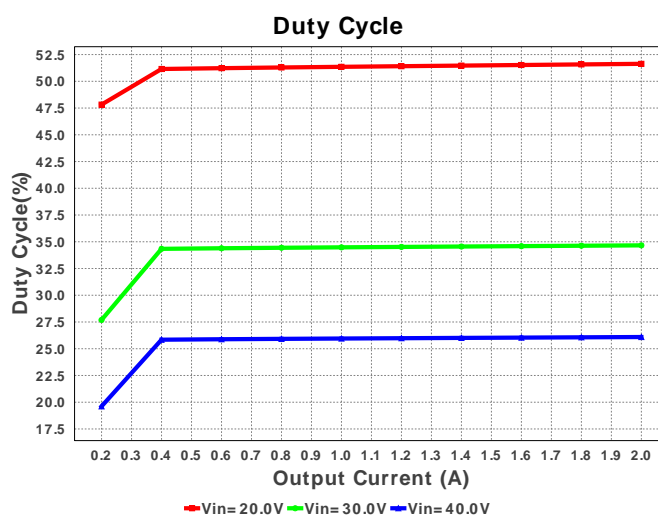
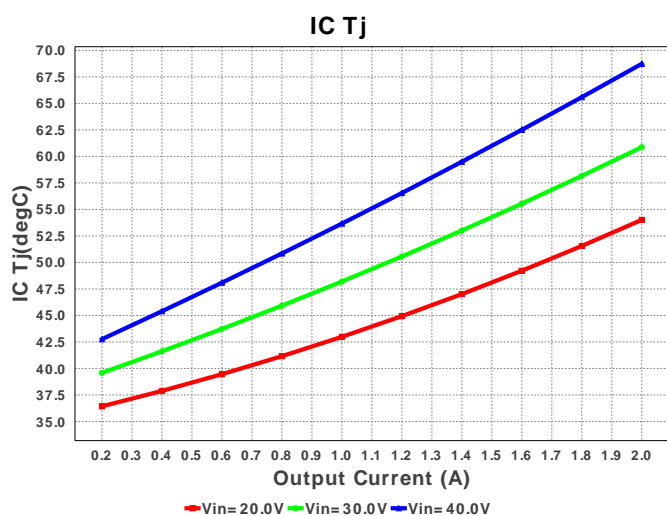


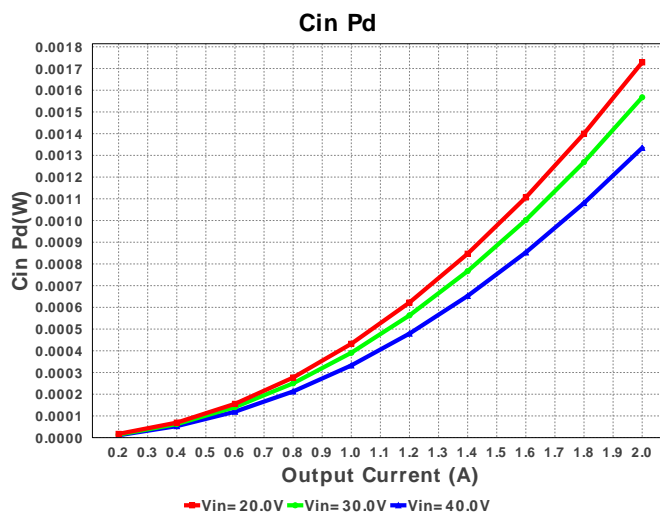
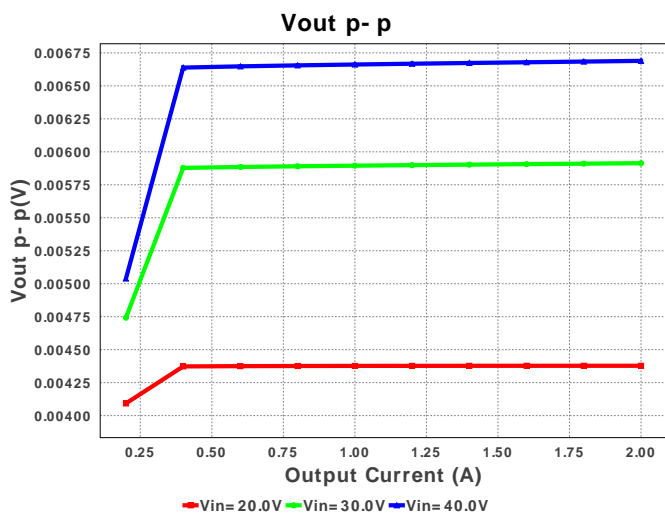
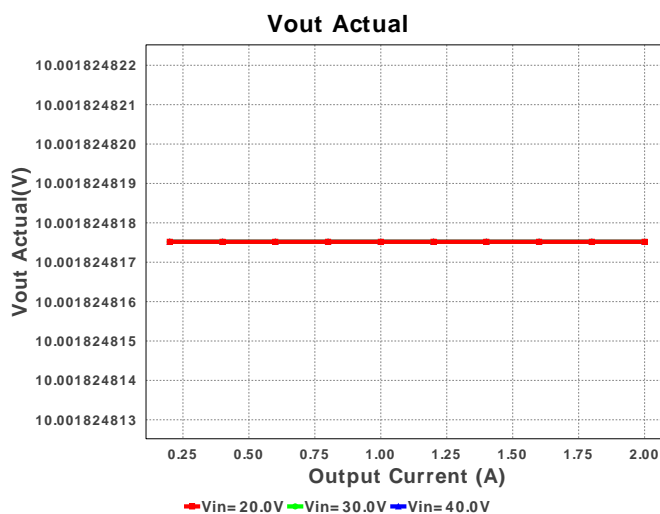
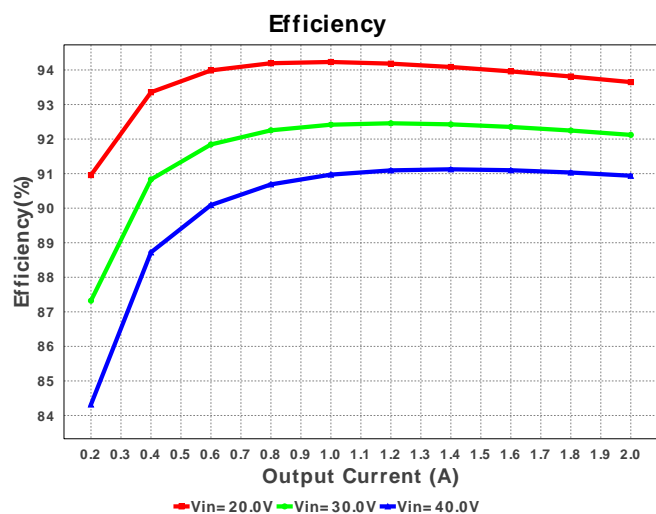
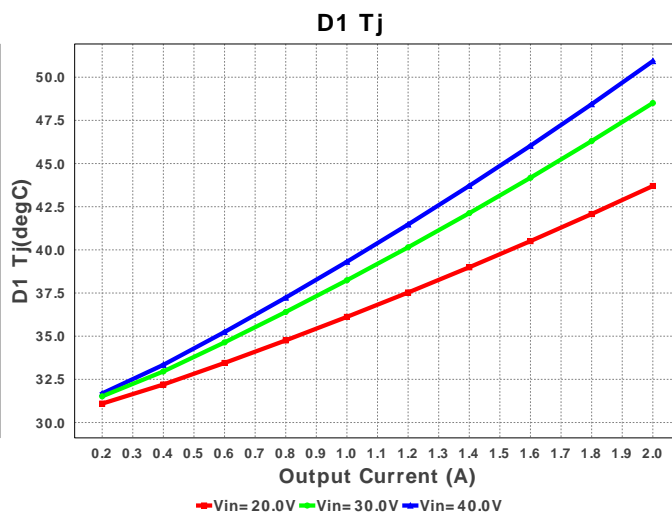
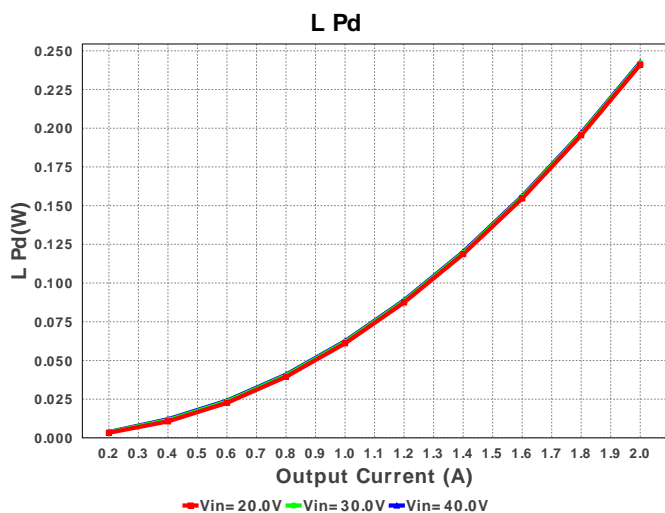
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

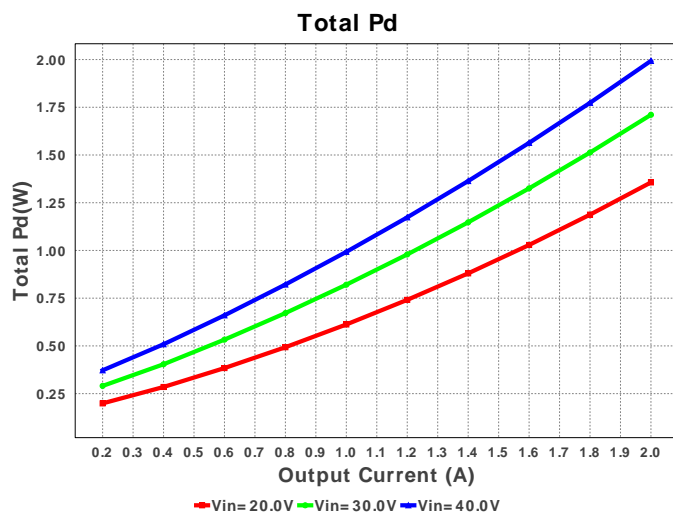
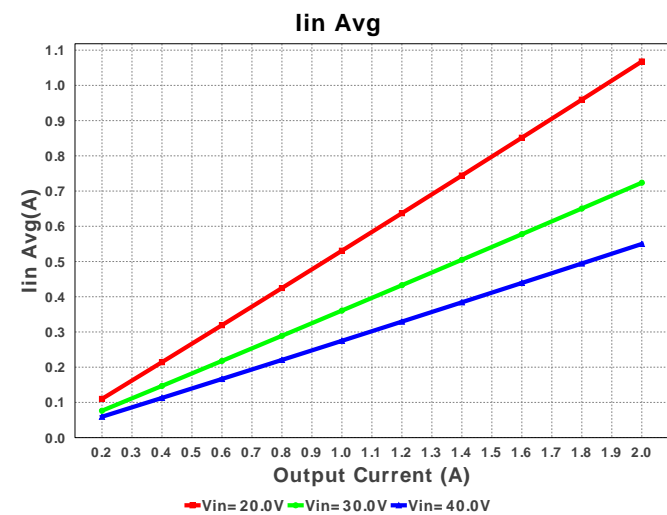
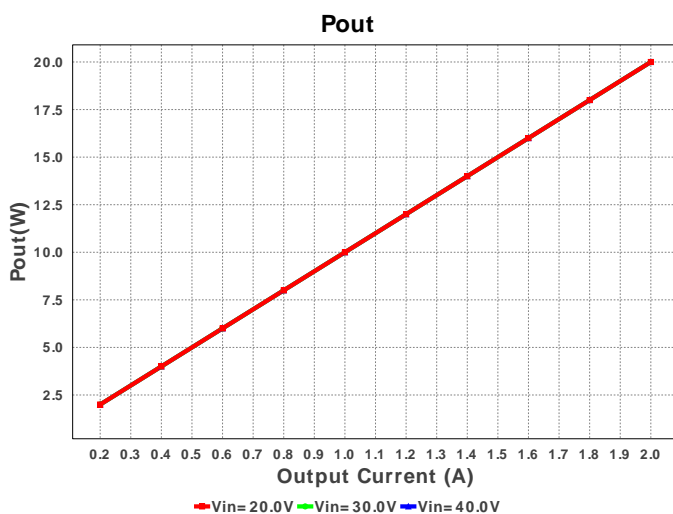
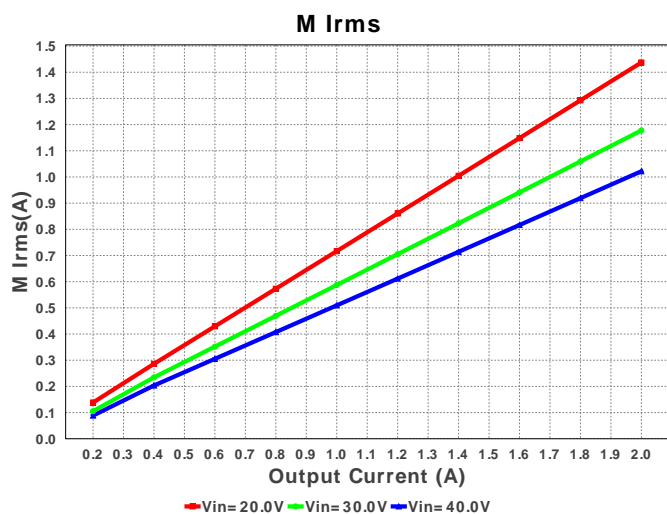
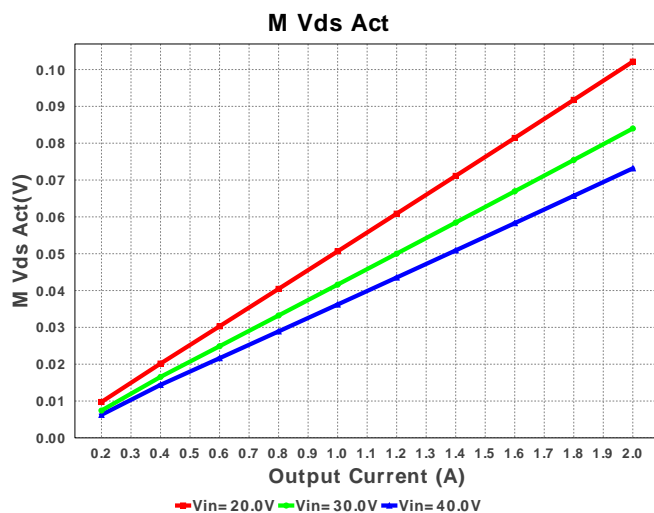
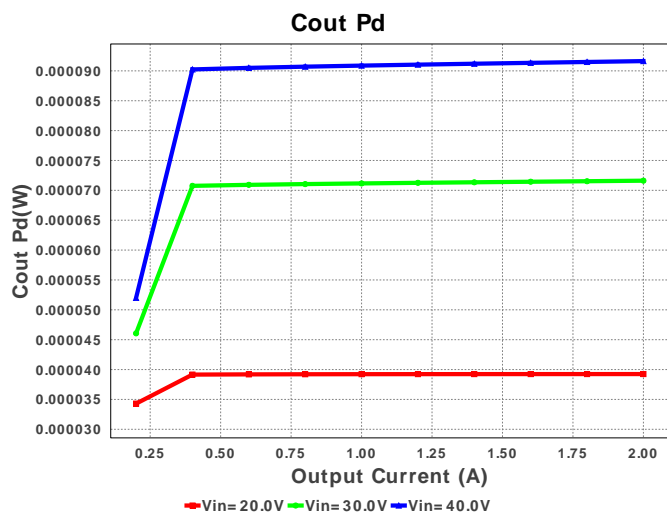
Electrical BOM

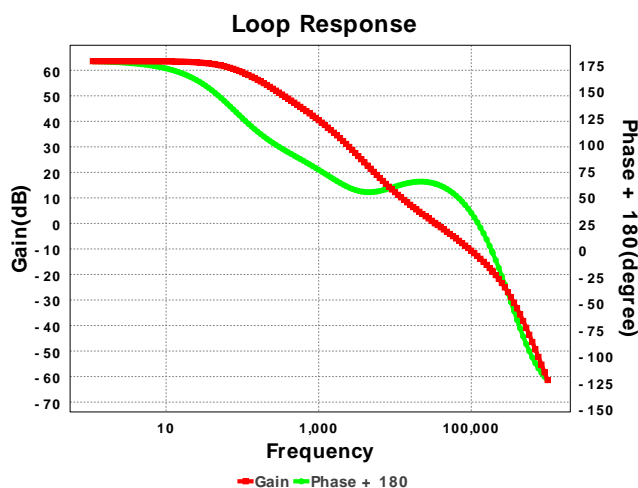
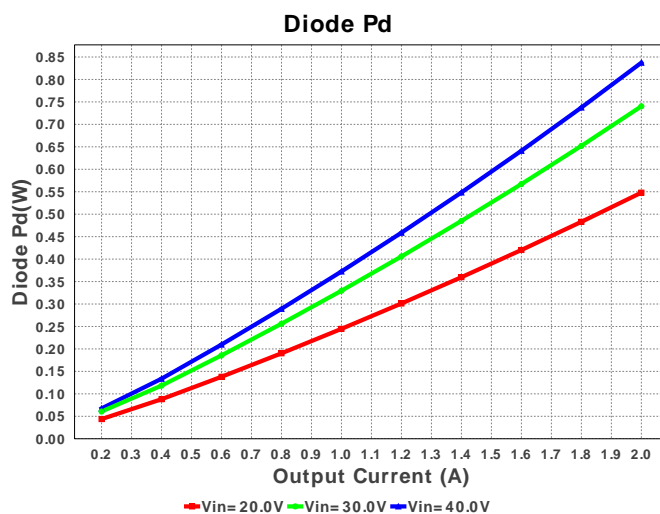
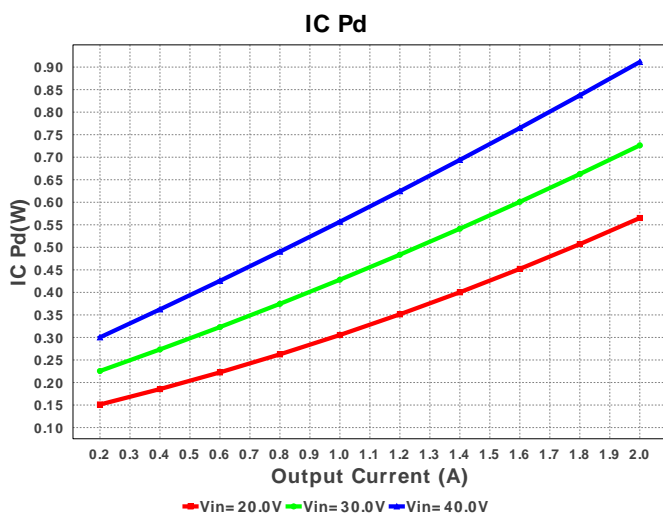
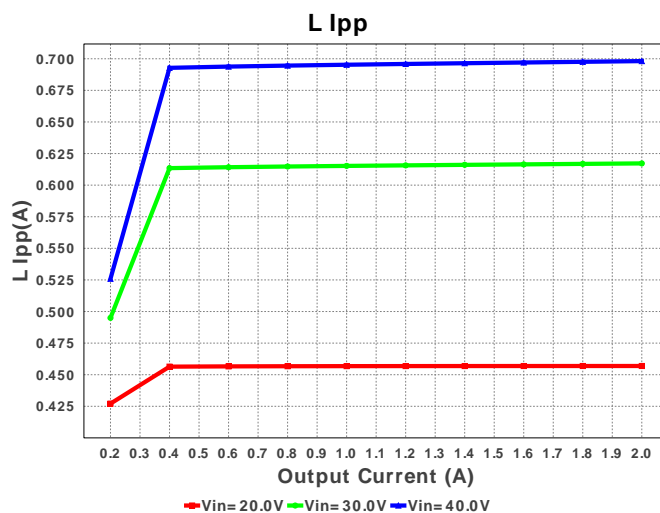
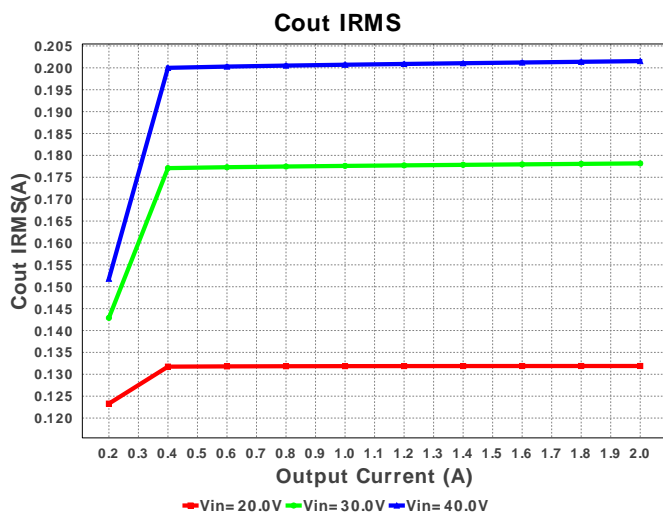
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Taiyo Yuden	HMK212B7104KG-T Series= X7R	Cap= 100.0 nF VDC= 100.0 V IRMS= 0.0 A	1	\$0.03	 0805 7 mm ²
2.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 1.73 mOhm VDC= 100.0 V IRMS= 5.5932 A	1	\$0.19	 1210_250 15 mm ²
3.	Cout	MuRata	GRM31CR61E106KA12L Series= X5R	Cap= 10.0 uF ESR= 4.512 mOhm VDC= 25.0 V IRMS= 2.447 A	2	\$0.05	 1206_190 11 mm ²
4.	Css	MuRata	GRM155R71C822KA01D Series= X7R	Cap= 8.2 nF VDC= 16.0 V IRMS= 0.0 A	1	\$0.01	 0402 3 mm ²
5.	D1	Diodes Inc.	B260A-13-F	VF@Io= 700.0 mV VRRM= 60.0 V	1	\$0.09	 SMA 37 mm ²
6.	L1	TDK	CLF10040T-150M	L= 15.0 uH DCR= 48.0 mOhm	1	\$0.46	 CLF10040 148 mm ²
7.	Rfbb	Vishay-Dale	CRCW040213K7FKED Series= CRCW..e3	Res= 13.7 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
8.	Rfht	Vishay-Dale	CRCW0402169KFKED Series= CRCW..e3	Res= 169.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²
9.	Rpgood	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm ²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
10.	Rt	Vishay-Dale	CRCW040232K4FKED Series= CRCW..e3	Res= 32.4 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	0402 3 mm ²
11.	U1	Texas Instruments	LMR14020SQDPRRQ1	Switcher	1	\$2.02	DPR0010A 25 mm ²









Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	878.319 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	201.54 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.349 A	Current	Peak switch current in IC
4.	Iin Avg	549.83 mA	Current	Average input current
5.	L Ipp	698.15 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	1.022 A	Current	MOSFET RMS current
7.	BOM Count	12	General	Total Design BOM count
8.	FootPrint	268.0 mm ²	General	Total Foot Print Area of BOM components
9.	Frequency	745.705 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	72.601 mV	General	Voltage drop across the MosFET

#	Name	Value	Category	Description
12.	Pout	20.0 W	General	Total output power
13.	Total BOM	\$2.94	General	Total BOM Cost
14.	D1 Tj	50.934 degC	Op_Point	D1 junction temperature
15.	Vout Actual	10.002 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
16.	Vout OP	10.0 V	Op_Point	Operational Output Voltage
17.	Cross Freq	33.903 kHz	Op_point	Bode plot crossover frequency
18.	Duty Cycle	26.094 %	Op_point	Duty cycle
19.	Efficiency	90.94 %	Op_point	Steady state efficiency
20.	IC Tj	53.68 degC	Op_point	IC junction temperature
21.	ICThetaJA	26.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
22.	IOUT_OP	2.0 A	Op_point	Iout operating point
23.	Phase Marg	63.577 deg	Op_point	Bode Plot Phase Margin
24.	VIN_OP	40.0 V	Op_point	Vin operating point
25.	Vout p-p	6.69 mV	Op_point	Peak-to-peak output ripple voltage
26.	Cin Pd	1.335 mW	Power	Input capacitor power dissipation
27.	Cout Pd	91.635 µW	Power	Output capacitor power dissipation
28.	Diode Pd	837.352 mW	Power	Diode power dissipation
29.	IC Pd	910.755 mW	Power	IC power dissipation
30.	L Pd	242.45 mW	Power	Inductor power dissipation
31.	Total Pd	1.993 W	Power	Total Power Dissipation
32.	Vout Tolerance	4.314 %		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	40.0	Maximum input voltage
3.	VinMin	20.0	Minimum input voltage
4.	Vout	10.0	Output Voltage
5.	base_pn	LMR14020DPR-Q1	Texas Instruments Base Part Number
6.	source	DC	Input Source Type
7.	ta	30.0	Ambient temperature

Design Assistance

1. LMR14020DPR-Q1 Product Folder : <http://www.ti.com/product/LMR14020%2DQ1> : contains the data sheet and other resources.

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