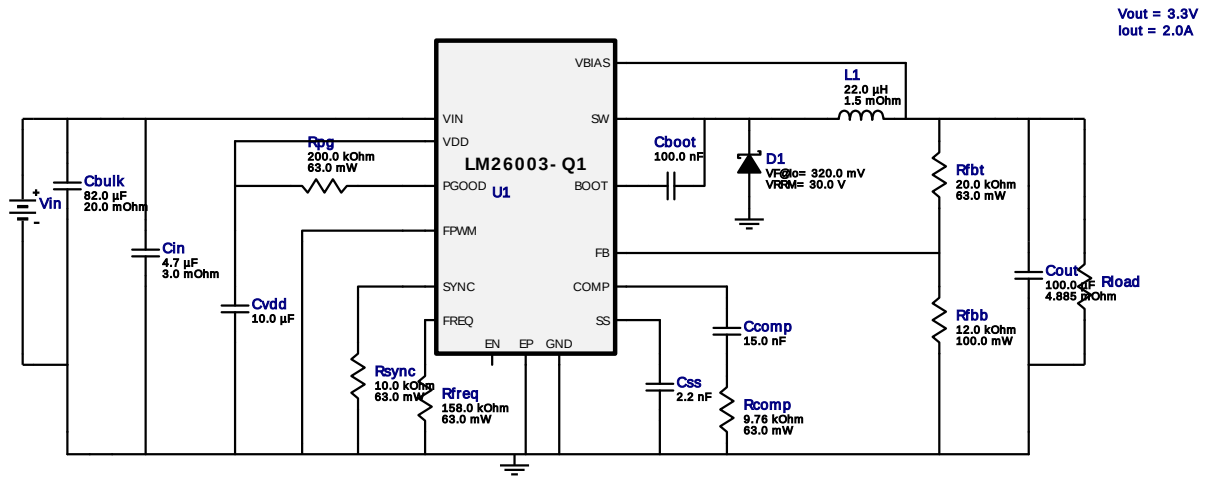
WEBENCH® Design Report

VinMin = 14.0V
VinMax = 22.0V
Vout = 3.3V
Iout = 2.0A

Device = LM26003QMH/NOPB
Topology = Buck
Created = 7/13/16 7:09:47 AM
BOM Cost = $5.14
BOM Count = 16
Total Pd = 0.59W

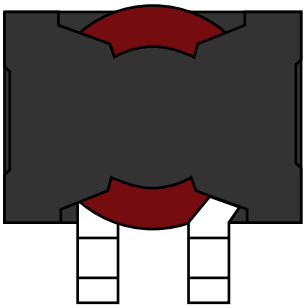
Design : 1194016/2100 LM26003QMH/NOPB
LM26003QMH/NOPB 14.0V-22.0V to 3.30V @ 2.0A

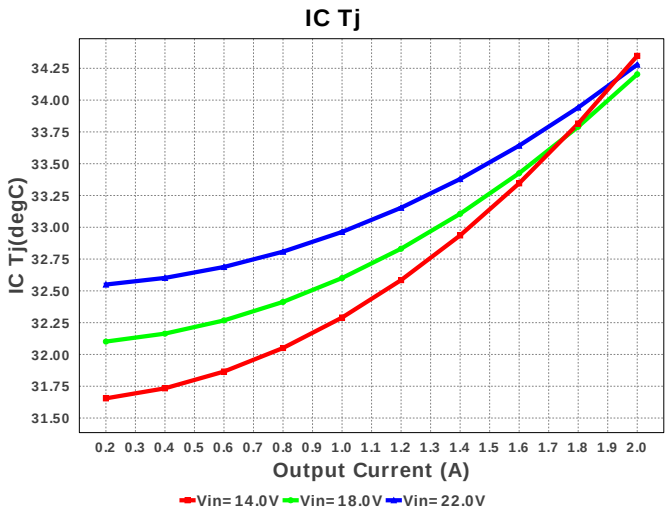


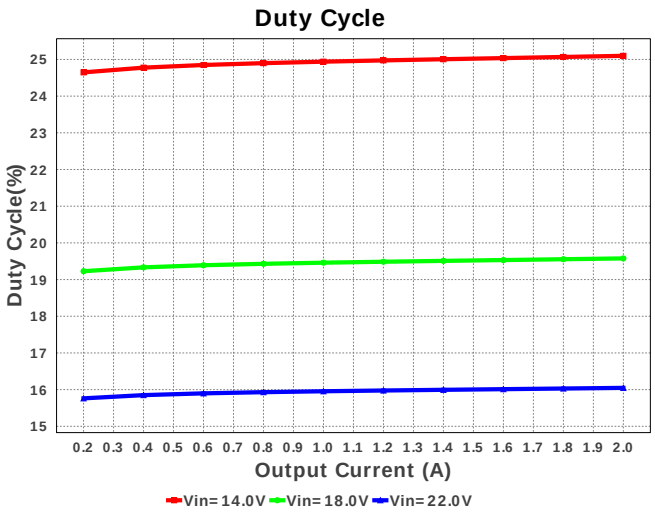
1. This regulator device is qualified for Automotive applications. All passives and other components selected in this design may not be qualified for Automotive applications. The user is required to verify that all components in the design meet the qualification and safety requirements for their specific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

Electrical BOM

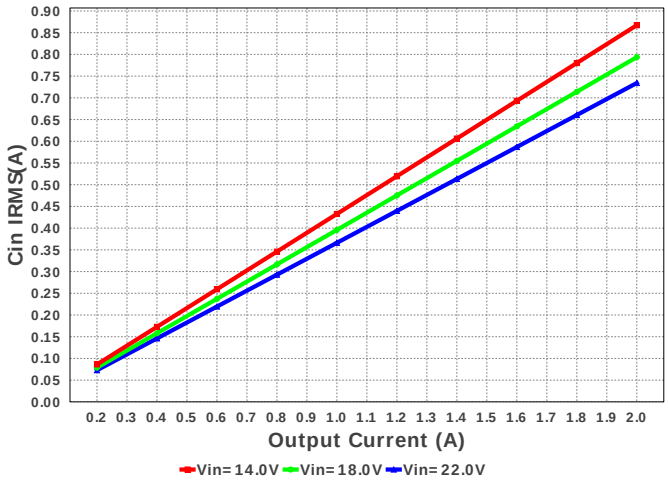
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	MuRata	GRM21BR71E104KA01L Series= X7R	Cap= 100.0 nF VDC= 25.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cbulk	Panasonic	35SVPF82M Series= ?	Cap= 82.0 uF ESR= 20.0 mOhm VDC= 35.0 V IRMS= 4.0 A	1	$0.61	CAPSMT_62_E12 106 mm²
3.	Ccomp	Yageo America	CC0805KRX7R9BB153 Series= X7R	Cap= 15.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
4.	Cin	MuRata	GRM31CR71H475KA12L Series= X7R	Cap= 4.7 uF ESR= 3.0 mOhm VDC= 50.0 V IRMS= 4.98 A	1	$0.07	1206 11 mm²
5.	Cout	MuRata	GRM31CR60J107ME39L Series= X5R	Cap= 100.0 uF ESR= 4.885 mOhm VDC= 6.3 V IRMS= 4.4118 A	1	$0.14	1206_190 11 mm²
6.	Css	Yageo America	CC0805KRX7R9BB222 Series= X7R	Cap= 2.2 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
7.	Cvdd	Taiyo Yuden	LMK212BJ106KG-T Series= X5R	Cap= 10.0 uF VDC= 10.0 V IRMS= 0.0 A	1	$0.03	0805 7 mm²
8.	D1	Toshiba	CMS06	VF@Io= 320.0 mV VRRM= 30.0 V	1	$0.19	M-FLAT 19 mm²

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
9.	L1	Coilcraft	SER2915L-223KL	L= 22.0 µH DCR= 1.5 mOhm	1	$1.88	 SER2915L 652 mm²
10.	Rcomp	Vishay-Dale	CRCW04029K76FKED Series= CRCW..e3	Res= 9.76 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
11.	Rfbb	Yageo America	RC0603FR-0712KL Series= ?	Res= 12.0 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	 0603 5 mm²
12.	Rfbt	Vishay-Dale	CRCW040220K0FKED Series= CRCW..e3	Res= 20.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
13.	Rfreq	Vishay-Dale	CRCW0402158KFKED Series= CRCW..e3	Res= 158.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
14.	Rpg	Vishay-Dale	CRCW0402200KFKED Series= CRCW..e3	Res= 200.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
15.	Rsync	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	 0402 3 mm²
16.	U1	Texas Instruments	LM26003QMH/NOPB	Switcher	1	$2.13	 MXA20A 71 mm²

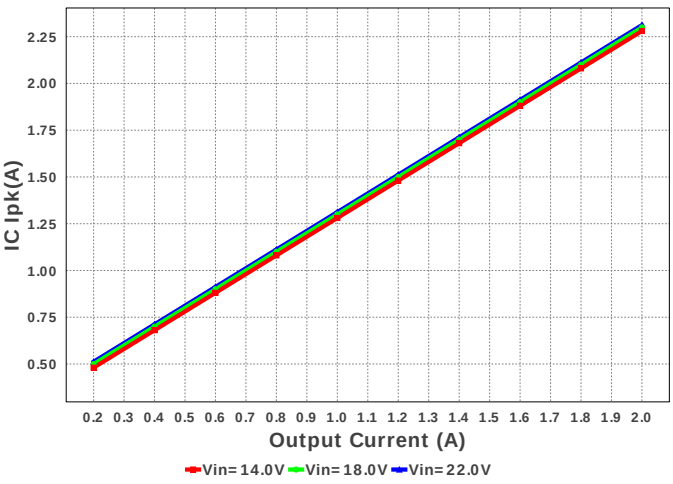




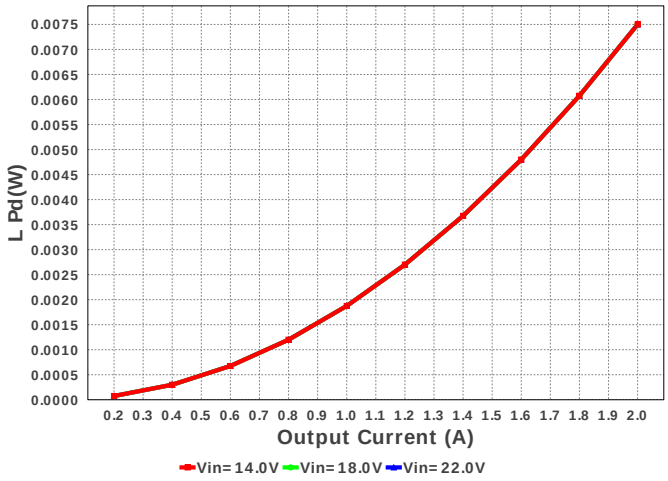
Cin IRMS



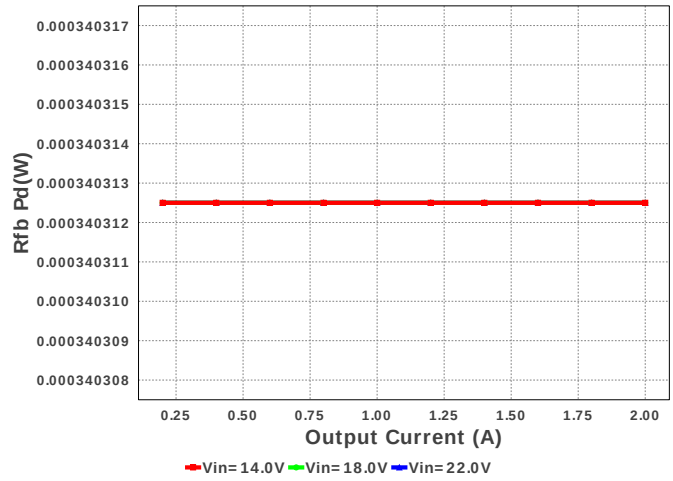
IC Ipk



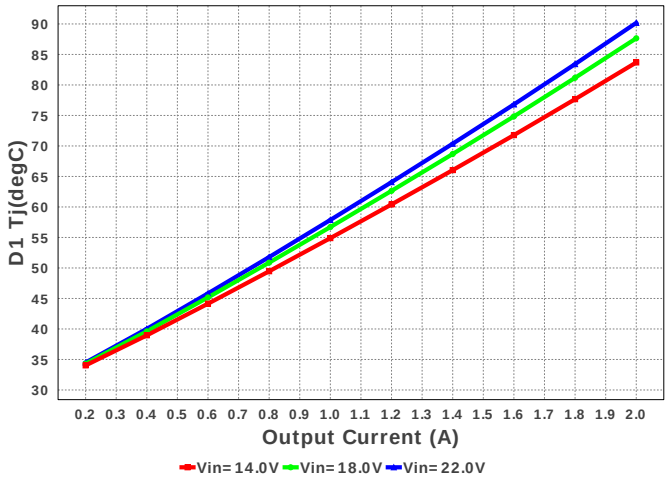
L Pd



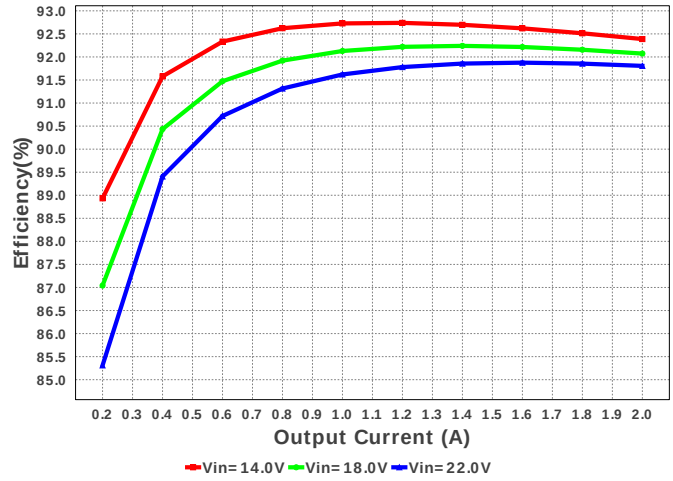
Rfb Pd

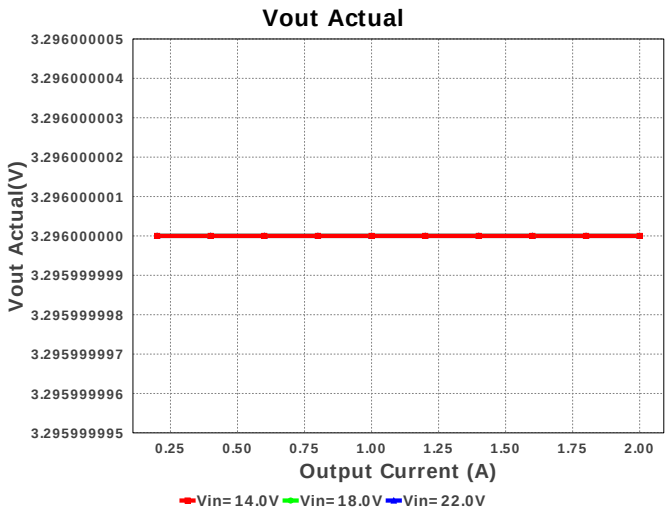


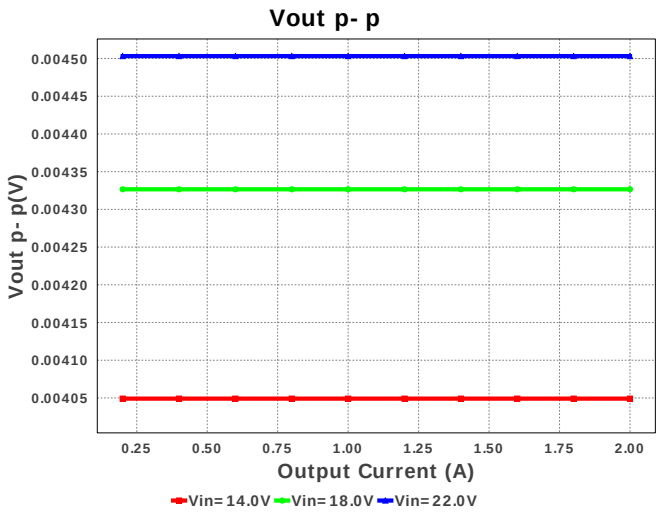
D1 Tj

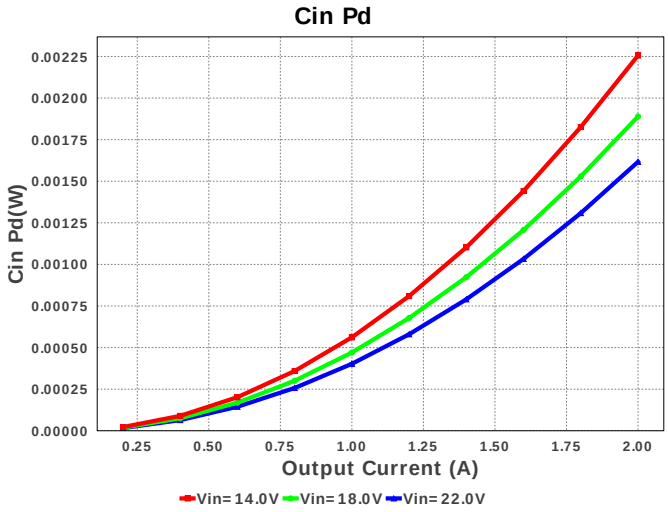


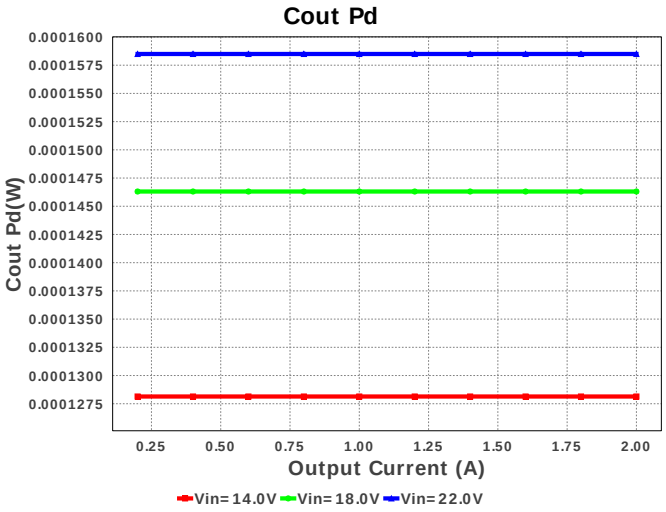
Efficiency

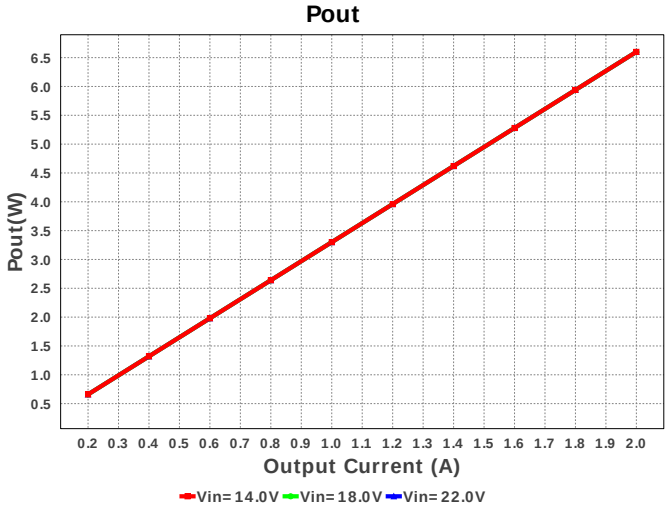


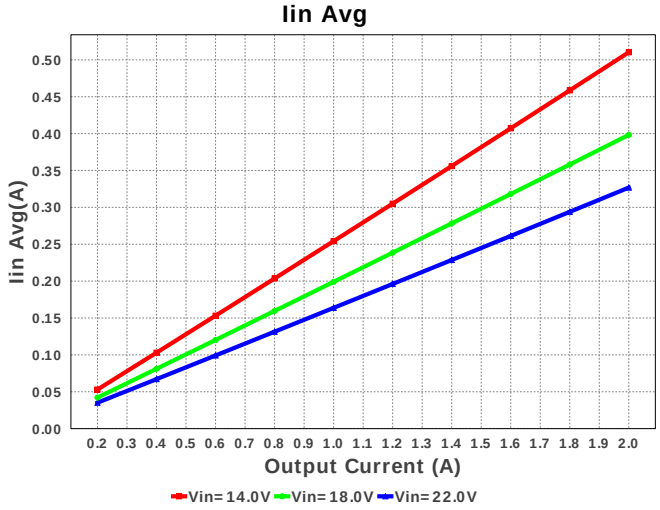


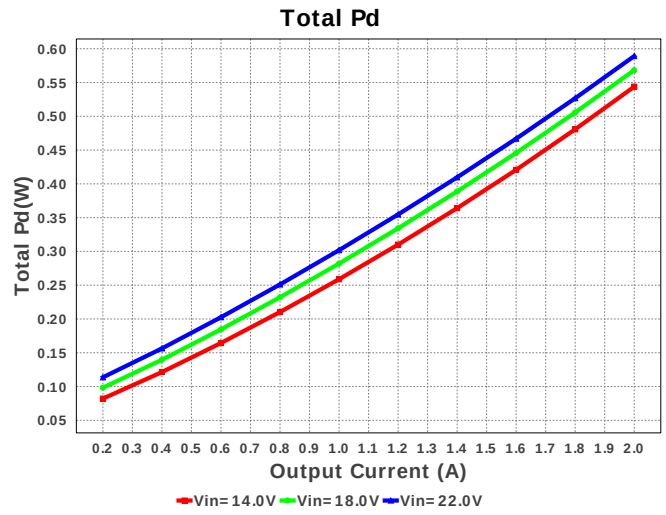


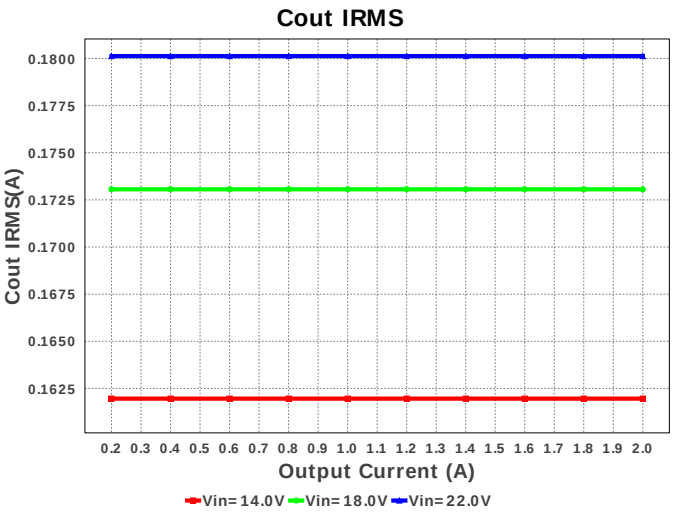


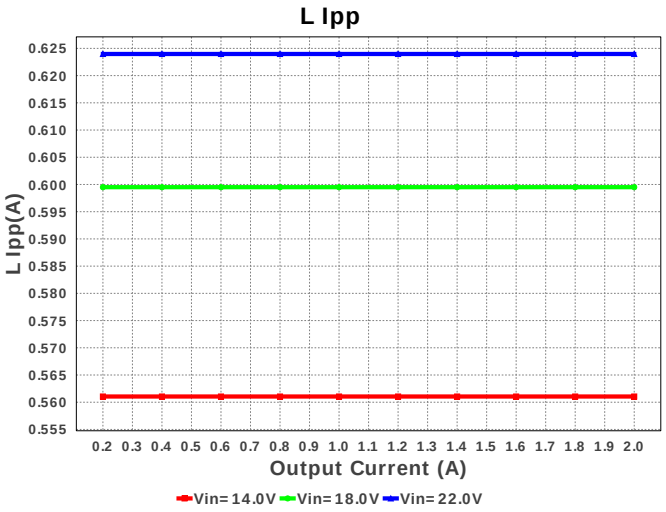


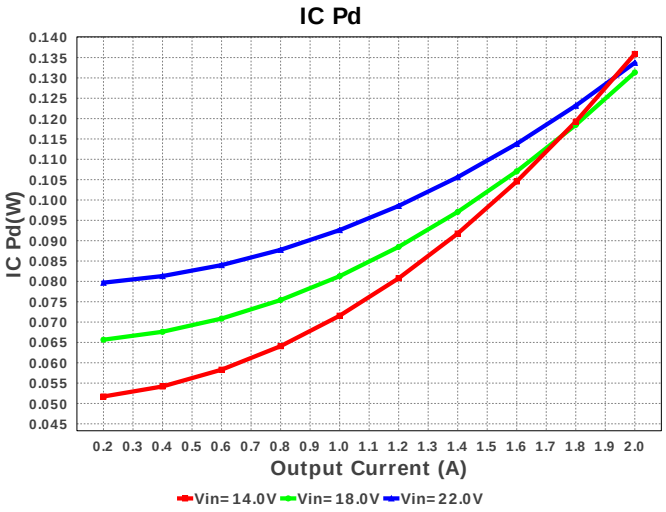


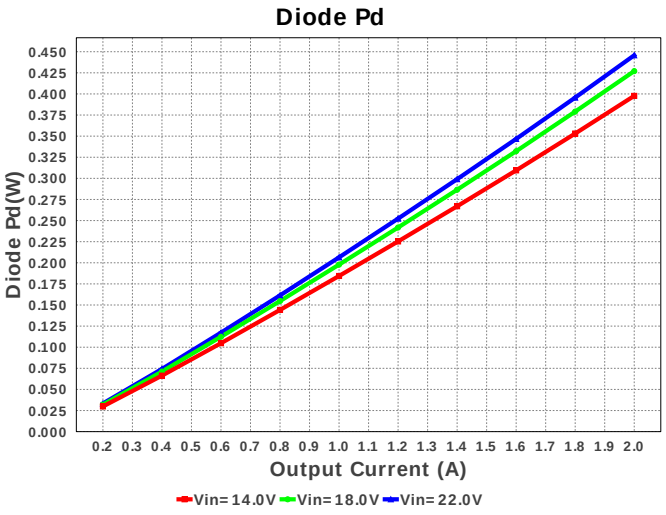


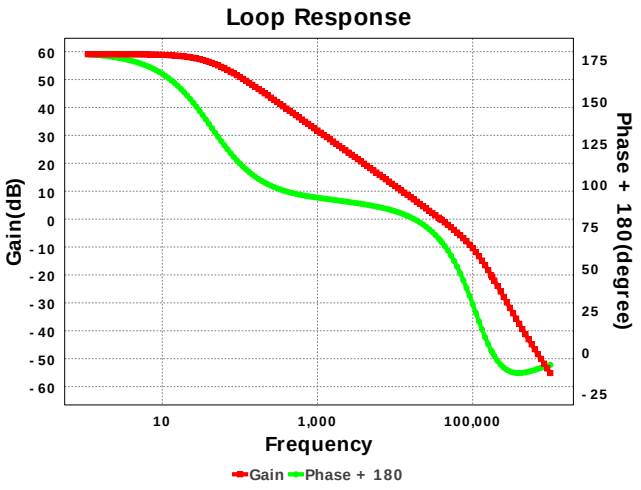












Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	734.096 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	180.125 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	2.312 A	Current	Peak switch current in IC
4.	Iin Avg	326.78 mA	Current	Average input current
5.	L Ipp	623.97 mA	Current	Peak-to-peak inductor ripple current
6.	BOM Count	16	General	Total Design BOM count
7.	FootPrint	917.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	235.296 kHz	General	Switching frequency
9.	Pout	6.6 W	General	Total output power

#	Name	Value	Category	Description
10.	Total BOM	$5.14	General	Total BOM Cost
11.	D1 Tj	90.177 degC	Op_Point	D1 junction temperature
12.	Low Freq Gain	59.077 dB	Op_Point	Gain at 10Hz
13.	Vout Actual	3.296 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
15.	Cross Freq	38.421 kHz	Op_point	Bode plot crossover frequency
16.	Duty Cycle	16.048 %	Op_point	Duty cycle
17.	Efficiency	91.806 %	Op_point	Steady state efficiency
18.	Gain Marg	-20.791 dB	Op_point	Bode Plot Gain Margin
19.	IC Tj	34.279 degC	Op_point	IC junction temperature
20.	ICThetaJA	32.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	2.0 A	Op_point	Iout operating point
22.	Phase Marg	66.97 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	22.0 V	Op_point	Vin operating point
24.	Vout p-p	4.503 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	1.617 mW	Power	Input capacitor power dissipation
26.	Cout Pd	158.494 µW	Power	Output capacitor power dissipation
27.	Diode Pd	445.757 mW	Power	Diode power dissipation
28.	IC Pd	133.725 mW	Power	IC power dissipation
29.	L Pd	7.5 mW	Power	Inductor power dissipation
30.	Rfb Pd	340.312 µW	Power	Rfb Power Dissipation
31.	Total Pd	589.08 mW	Power	Total Power Dissipation
32.	Vout Tolerance	2.819 %		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	22.0	Maximum input voltage
3.	VinMin	14.0	Minimum input voltage
4.	Vout	3.3	Output Voltage
5.	base_pn	LM26003-Q1	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. The LM26003-Q1 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

2. **LM26003-Q1** Product Folder : http://www.ti.com/product/LM26003%2DQ1 : contains the data sheet and other resources.