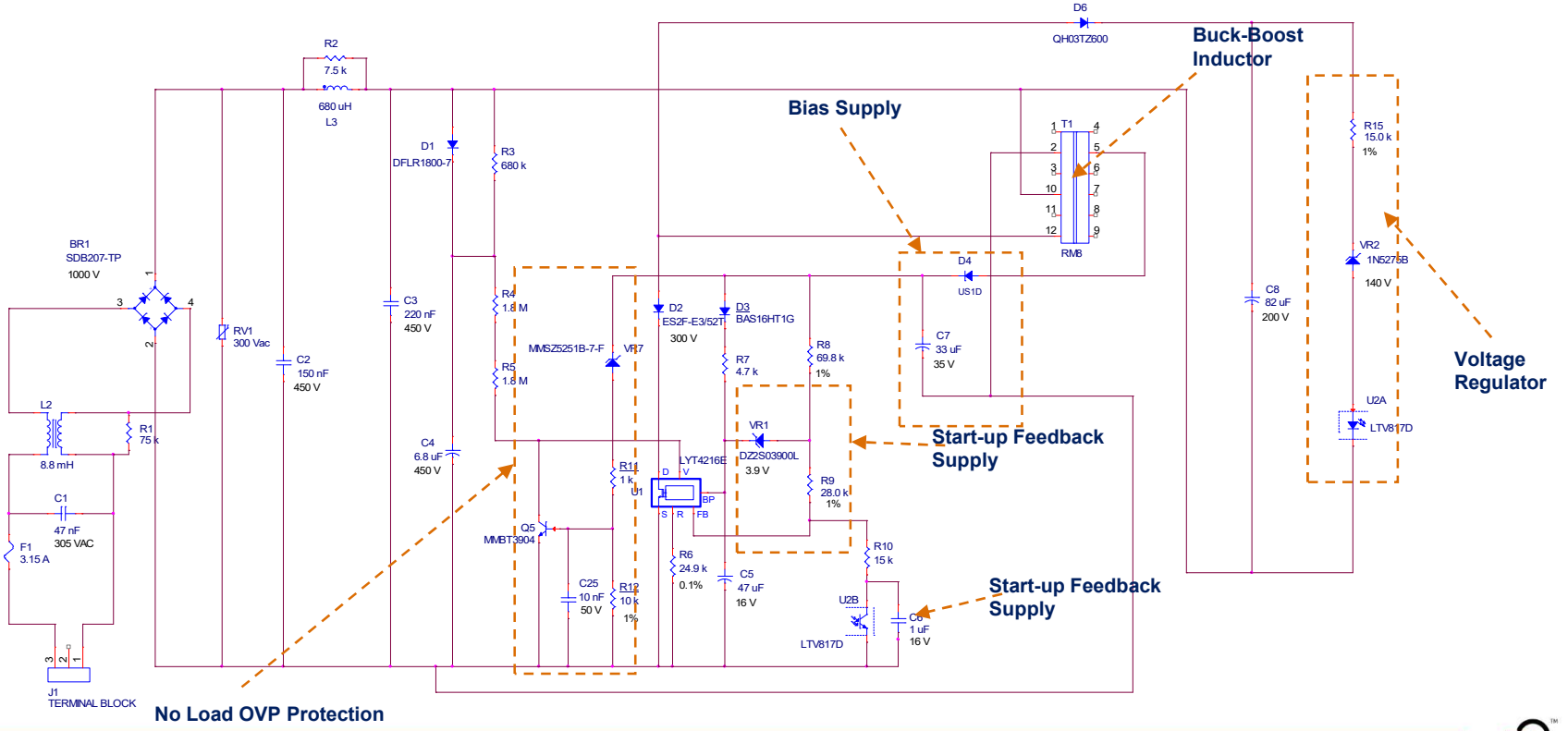
LYTSwitch-4 140V CV-Buck Boost Design



Circuit blocks for CV Application

- **Feedback Compensation –** Capacitor C6 slows down the response of the feedback circuit to synchronize its response to the input line frequency. This is to prevent oscillations and distorted input current sinusoidal wave shape that will lead to low PF and high current harmonics.
- **Start-up Feedback Supply** – To operate the device CV Mode operation, the bias supply is very slow to ramp up during full load start-up. VR1 is needed to provide feedback current from BP Pin to FB pin to prevent Ifb current from going down to auto-restart threshold.
- **Voltage Regulator –** To maintain the output voltage across the load, a close loop negative feedback control circuit is use comprising of zener diode VR2 and an optocoupler U2. VR2 senses the output voltage and conducts current with respect to its zener voltage threshold. The zener current drives the optocoupler U2 to control the U1 Feedback (FB) current. You can use LM431 from more accurate voltage regulation.
- **No Load OVP protection –** a more accurate output OVP detection is needed for CV application from 0-30% Load

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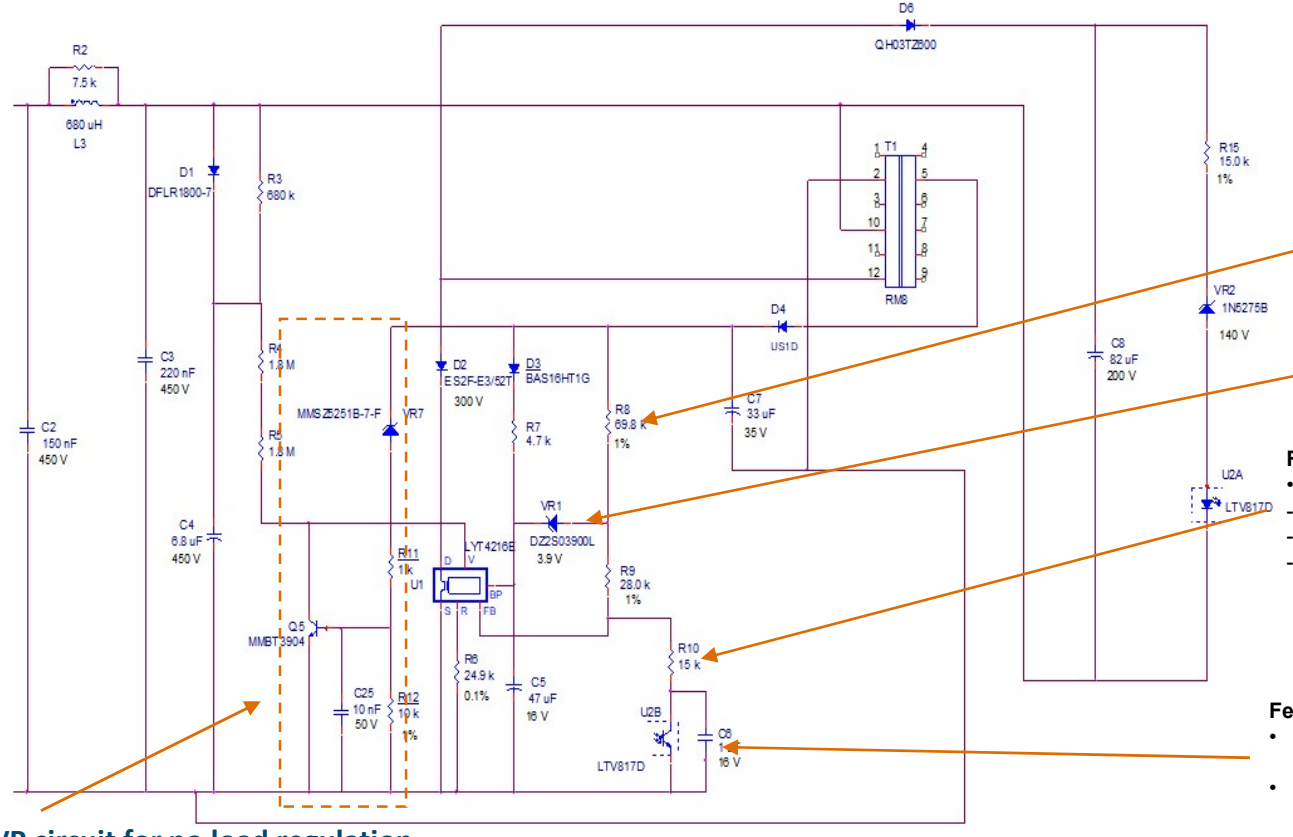
Vin= 90-305VAC



Feedback Resistor (R8)

- R_{VALUE} = (Vbias-2V)/(IFB + 0.5 x 150uA)
- At normal full load operation the Optocoupler collector current is set at 0.5 of its saturation current (150uA).

Start- up Feedback Supply (VR1, R9)

- VR1: VZ_{RATED} < 5.7V
- R9 : R_{VALUe} = (6V-2V)/(17.5uA + 2V/R10)

R10

- R_{VALUE} > (2V-Vcesat)/150uA
- 150uA is the optocoupler saturation current
- Vcesat is Optocoupler C-E saturation voltage.
- Resistance is optimize to prevent Auto-restart at no load operation (Ifb <20uA) and for the device to operate at lowest dutycyle. At lowest duty Cycle the burst width is long enough to power up the DC-DC at start-up.

Feedback Compensation (C6)

- C_{VALUE} > 1 / 2πfR10, where f is less than the line frequency
- Optimized value to achieve higher PF and %ATHD at low and high line frequency

OVP circuit for no load regulation

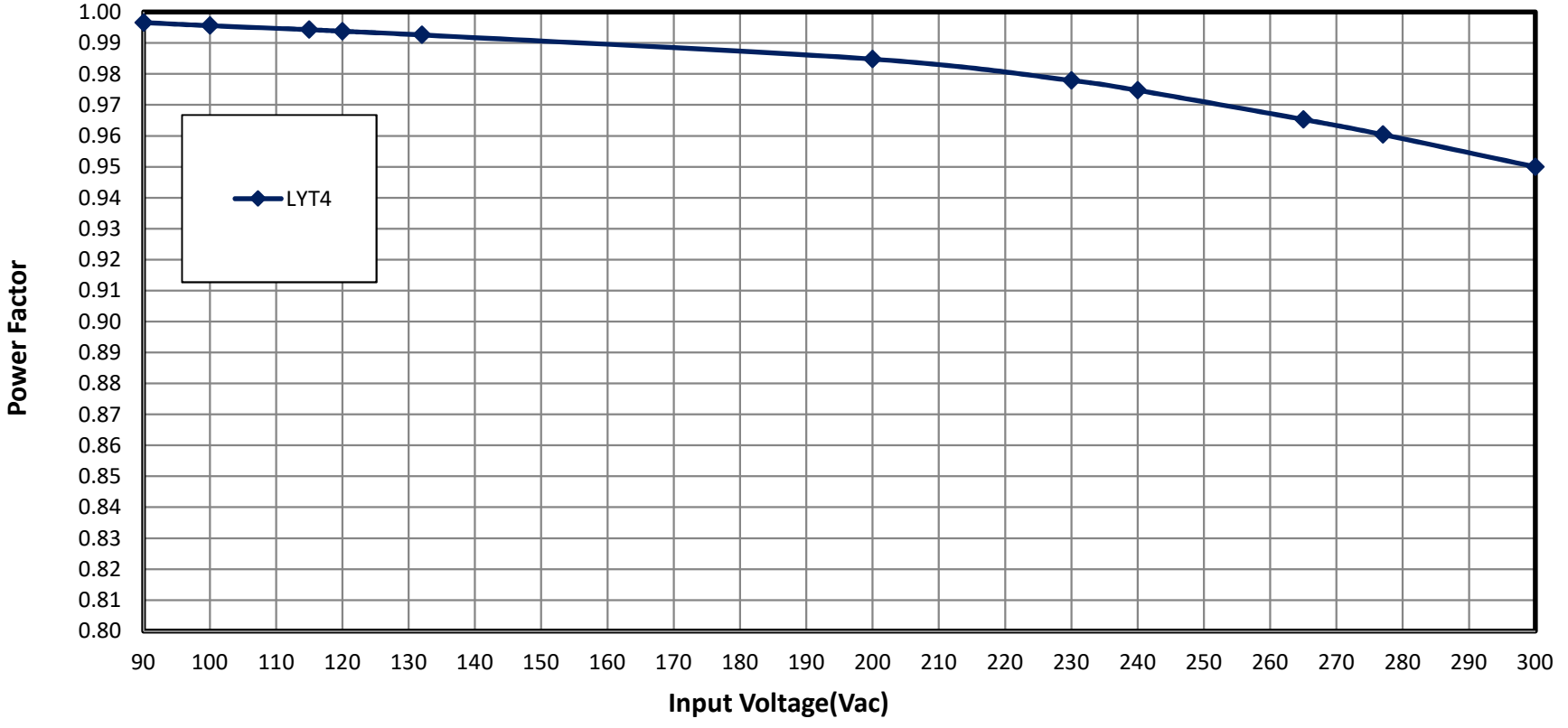
Spreadsheet

ACDC_LYTSwitch-4_080614; Rev.1.5; Copyright Power Integrations 2014	INPUT	OUTPUT	UNIT
ENTER APPLICATION VARIABLES			
VACMIN	90	90	V
VACMAX	305	305	V
VO	140.00	140.00	V
IO	0.330	0.330	A
n	0.95	0.95	
VB		20.00	V
ENTER LYTSwitch-4 VARIABLES			
LYTSwitch-4	**LYT4X16**	**LYT4216**	
Current Limit Mode	**RED**	**RED**	
IFB	156.00	156.00	uA
Key Design Parameters			
KP	0.45	0.45	
LP		1082	uH
VOR	140.00	140.00	V
Expected IO (average)		0.329	A
KP_VNOM		0.42	
TON_MIN		1.86	us
PCLAMP		0.42	W
ENTER TRANSFORMER CORE/CONSTRUCTION VARIABLES			
Core Type	**RM8/I**	**RM8/I**	
CURRENT WAVEFORM SHAPE PARAMETERS			
DMAX		0.54	
IAVG		0.41	A
IP		1.31	A
IRMS		0.54	A
TRANSFORMER PRIMARY DESIGN PARAMETERS			
LP		1082	uH
LP_TOL	5	5	
NP		83	
NB		12	
ALG		158	nH/T^2
BM		2718	Gauss
BP		4257	Gauss

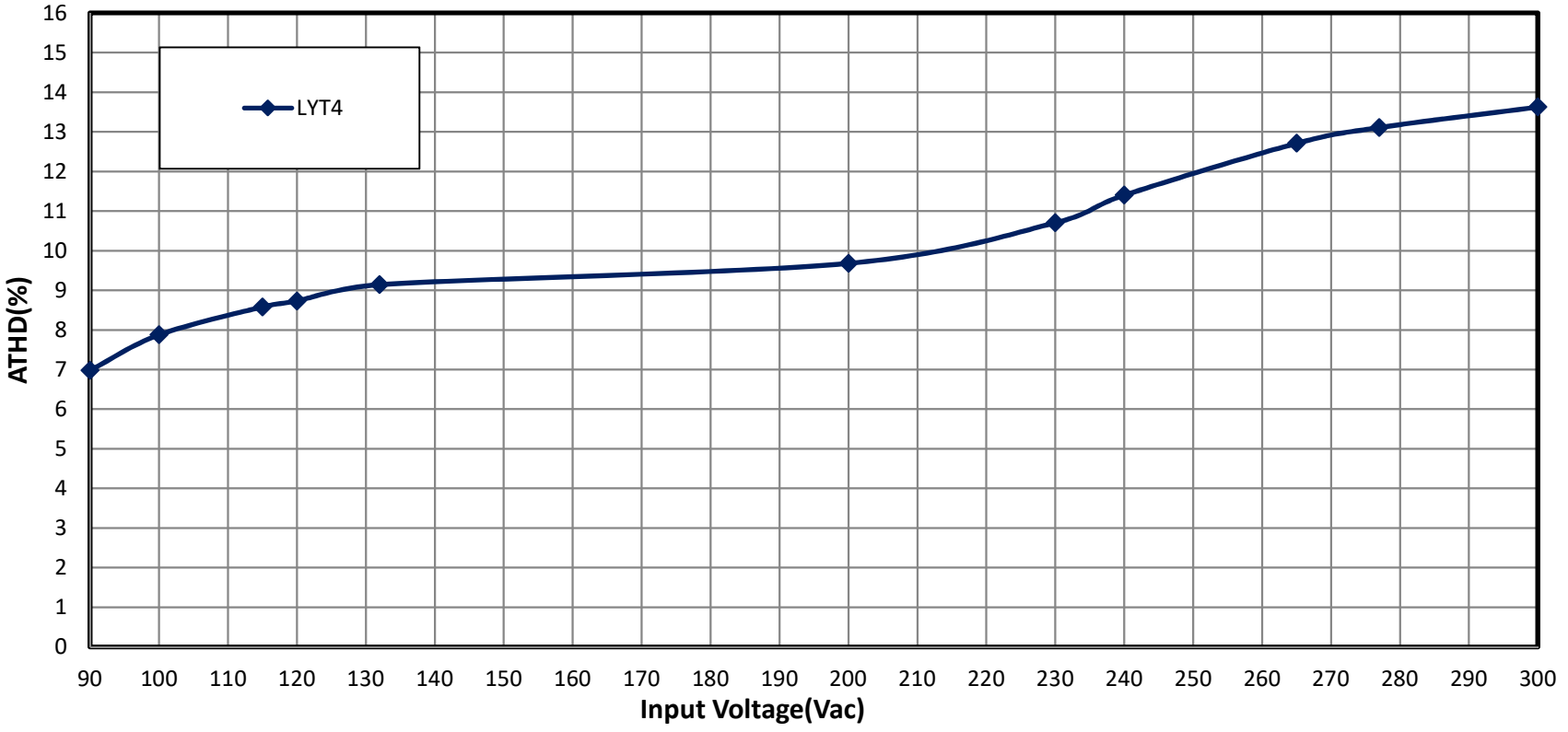
Transformer Construction

Parts	LYT4
Core	RM8
Core Material	PC95
Np	83(3XAWG32) With Interlayer tape every layer
NB	11.5
Lp	1.080mH

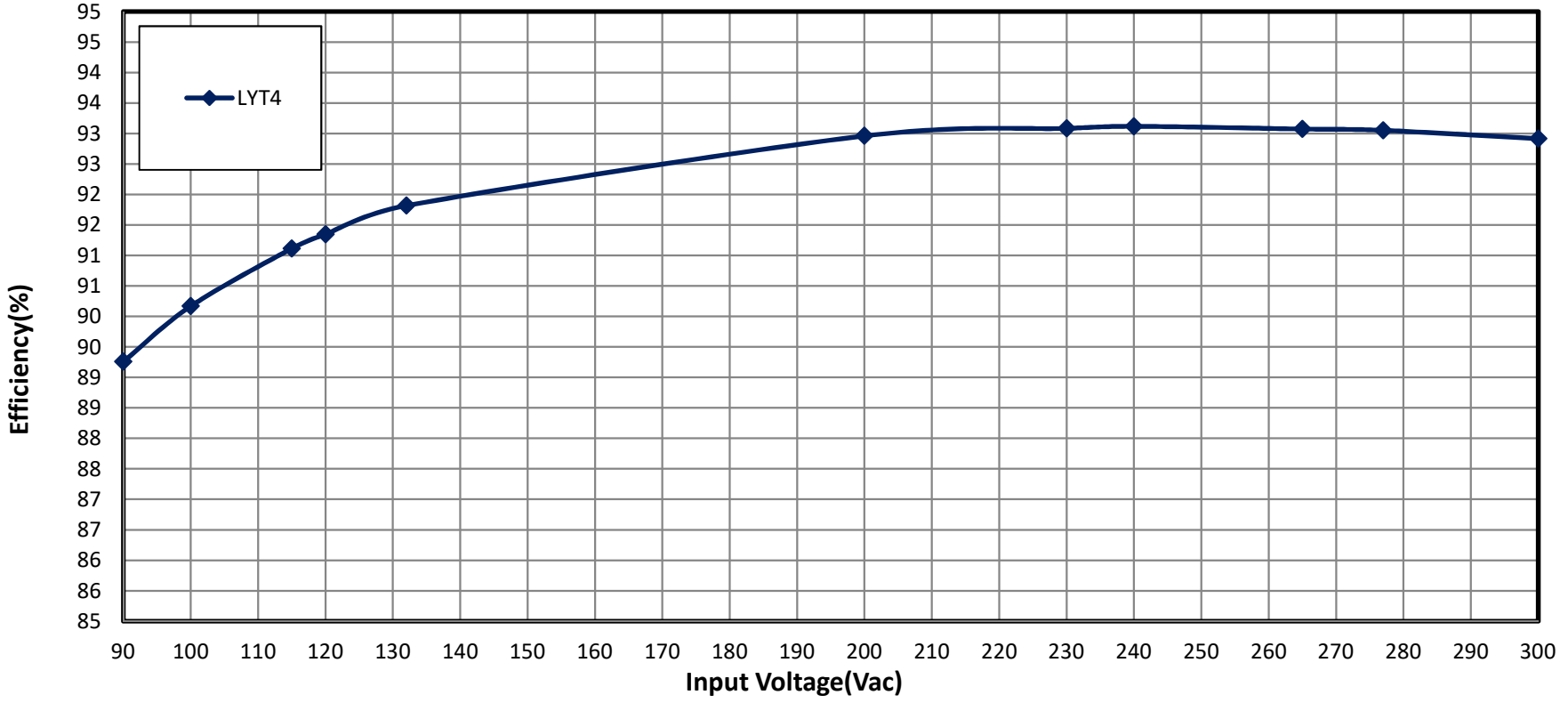
Power Factor VS Line at 39.5W Load



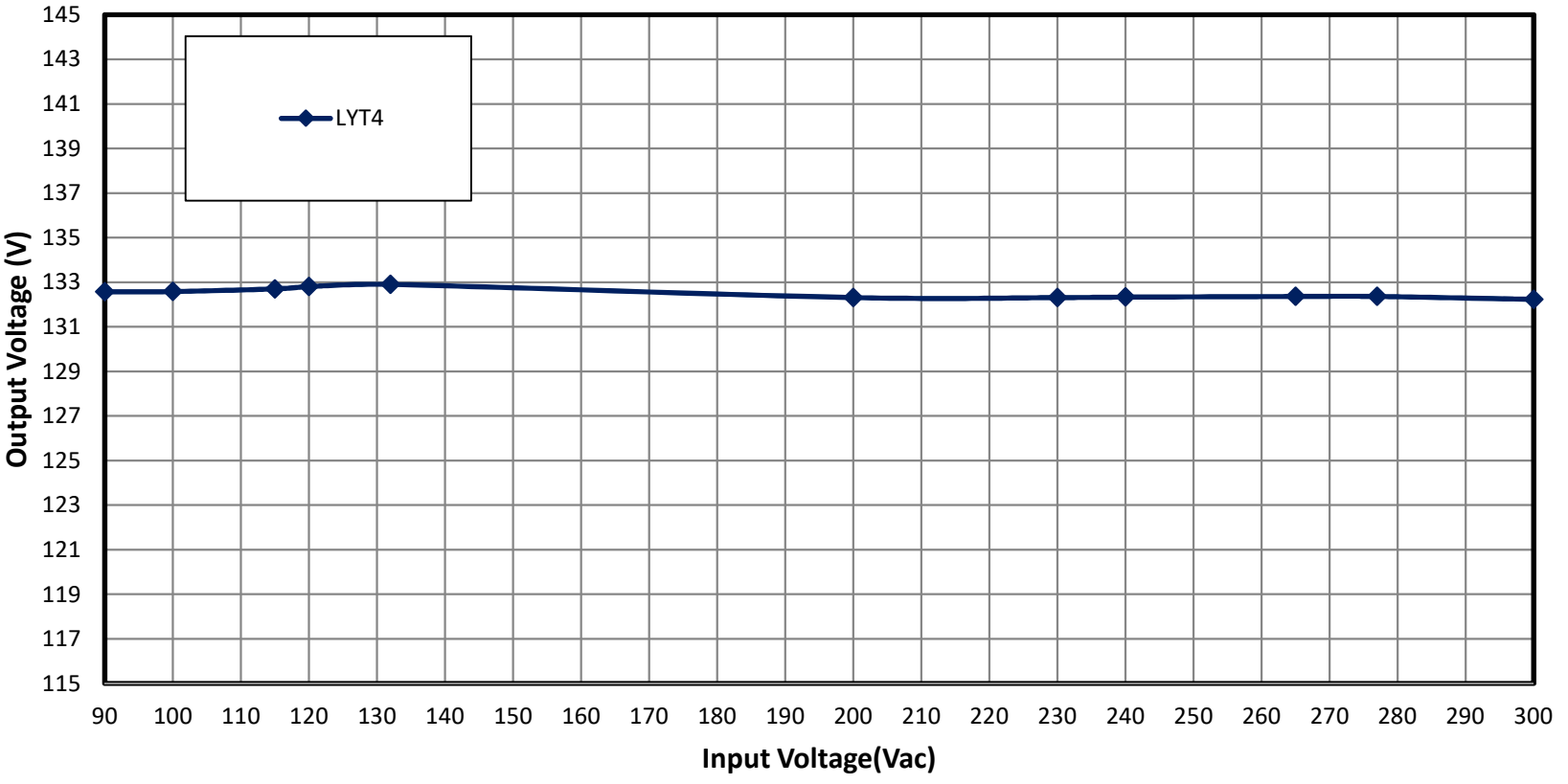
%ATHD VS Line at 39.5W Load



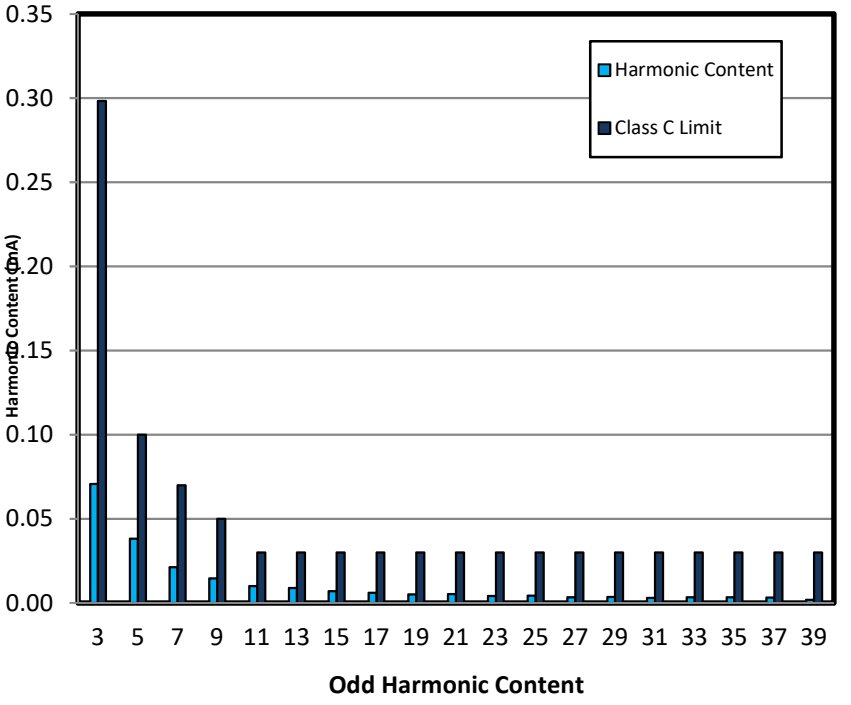
Efficiency VS Line at 39.5W Load



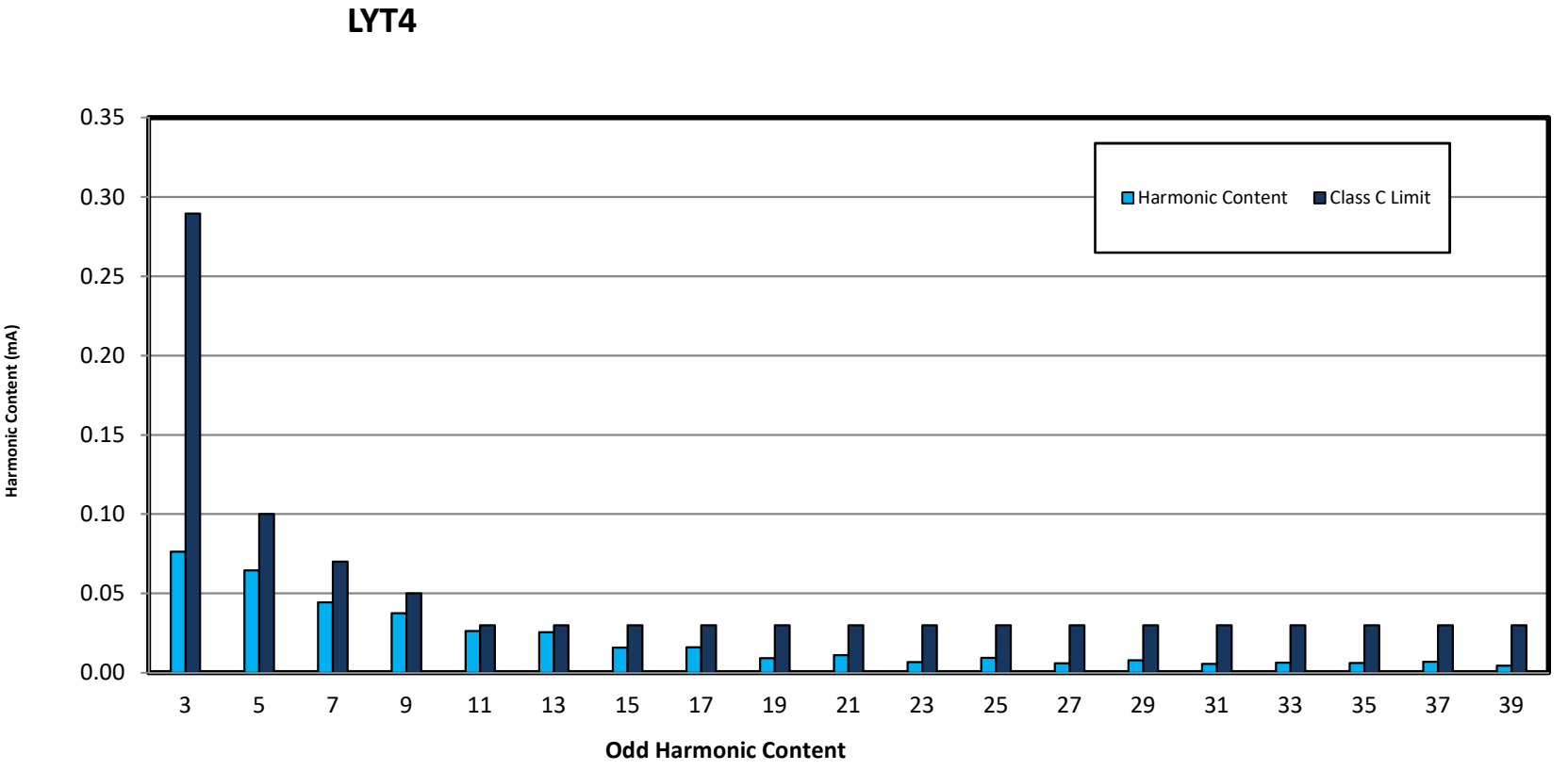
Voltage Regulation VS Line at 39.5W Load



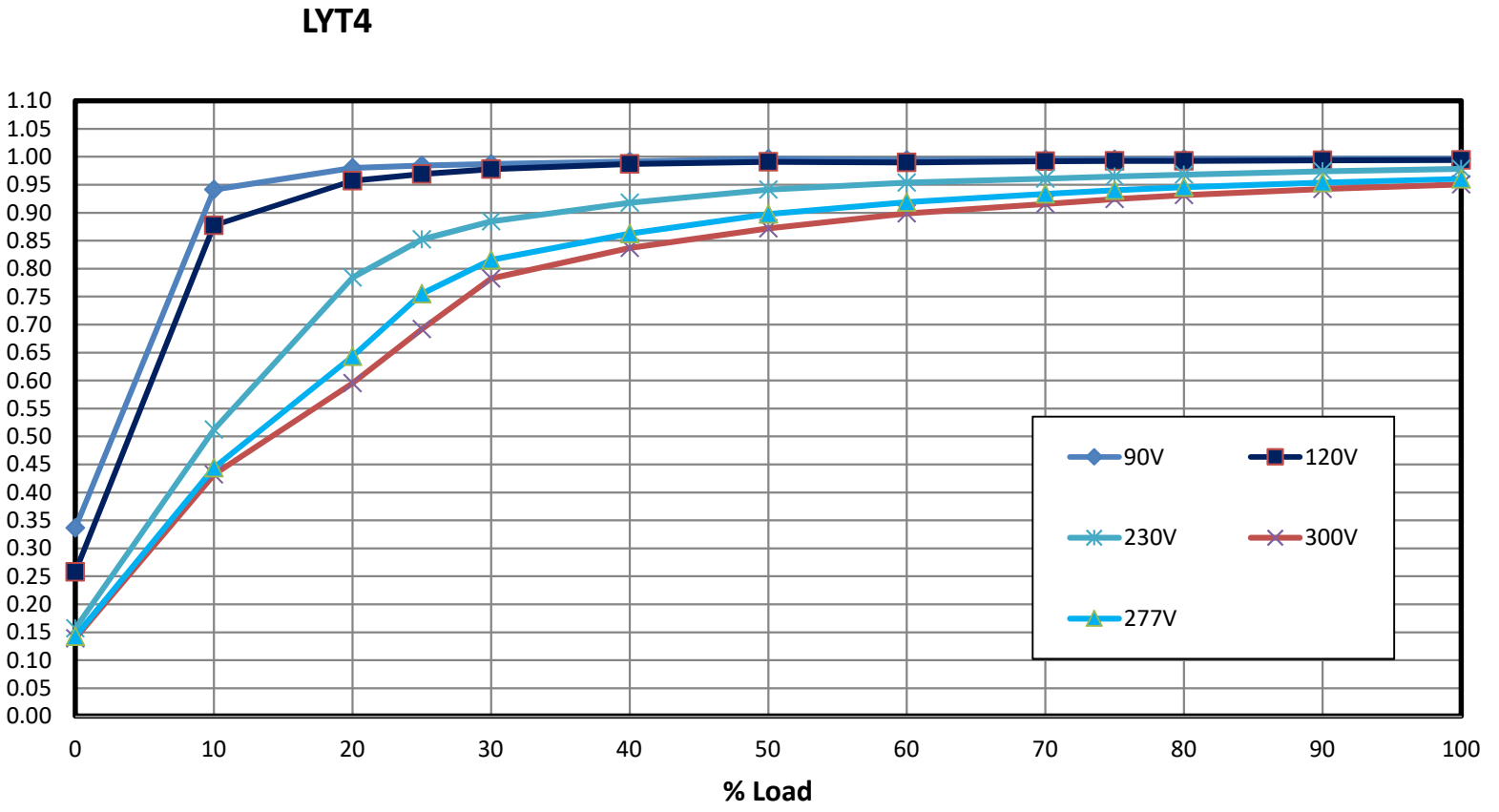
Individual Harmonics at 120V, 39.5W Load



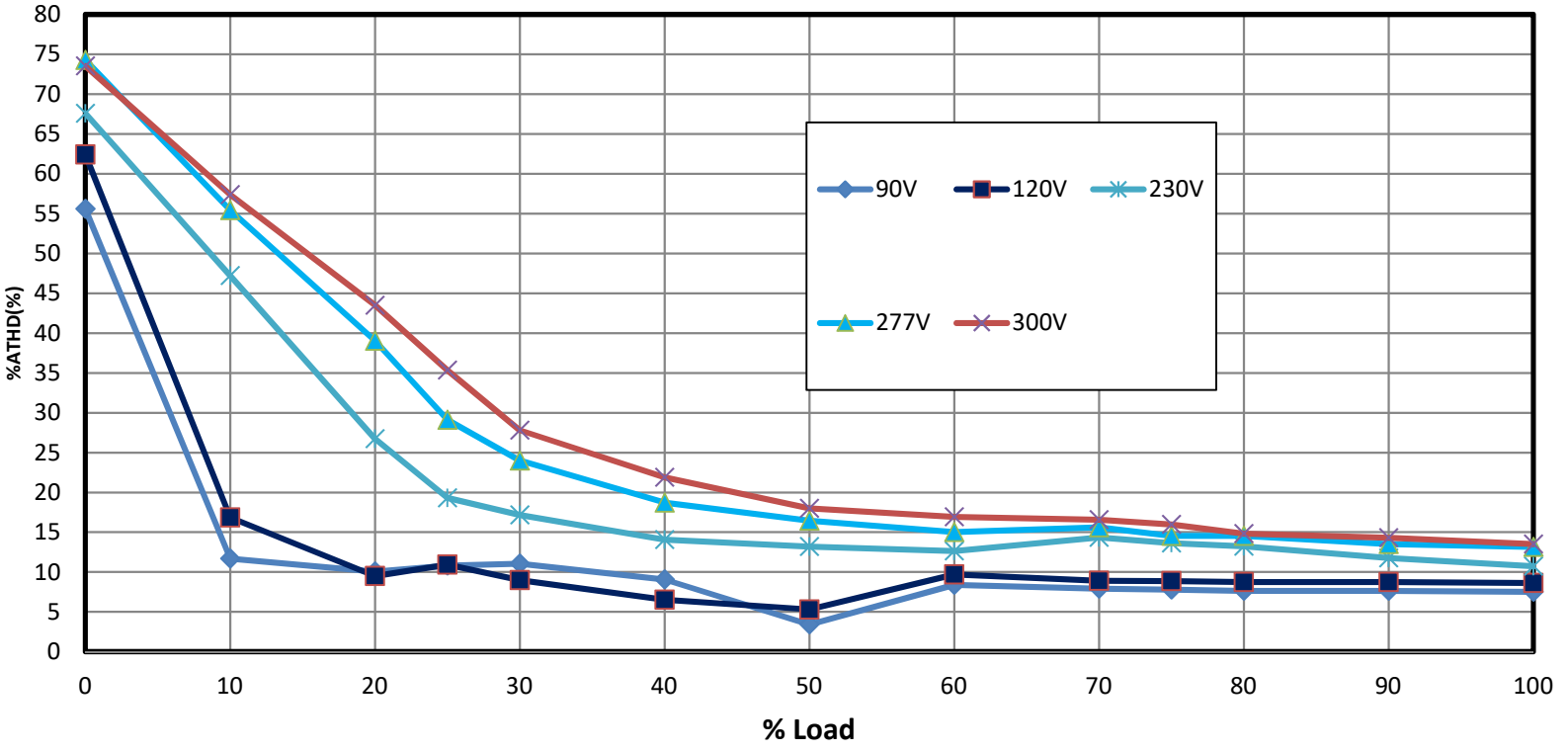
Individual Harmonics at 277V, 39.5W Load



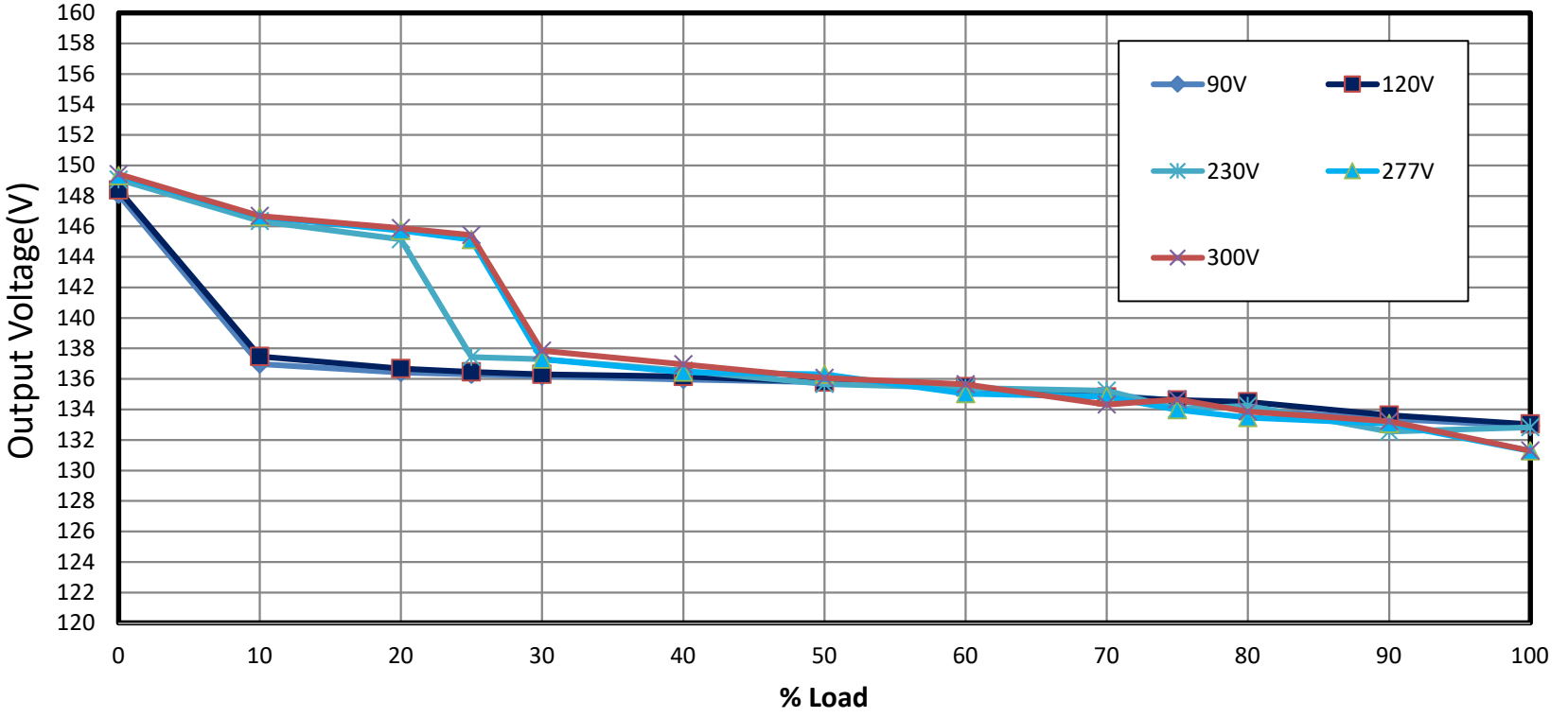
Power Factor VS Load



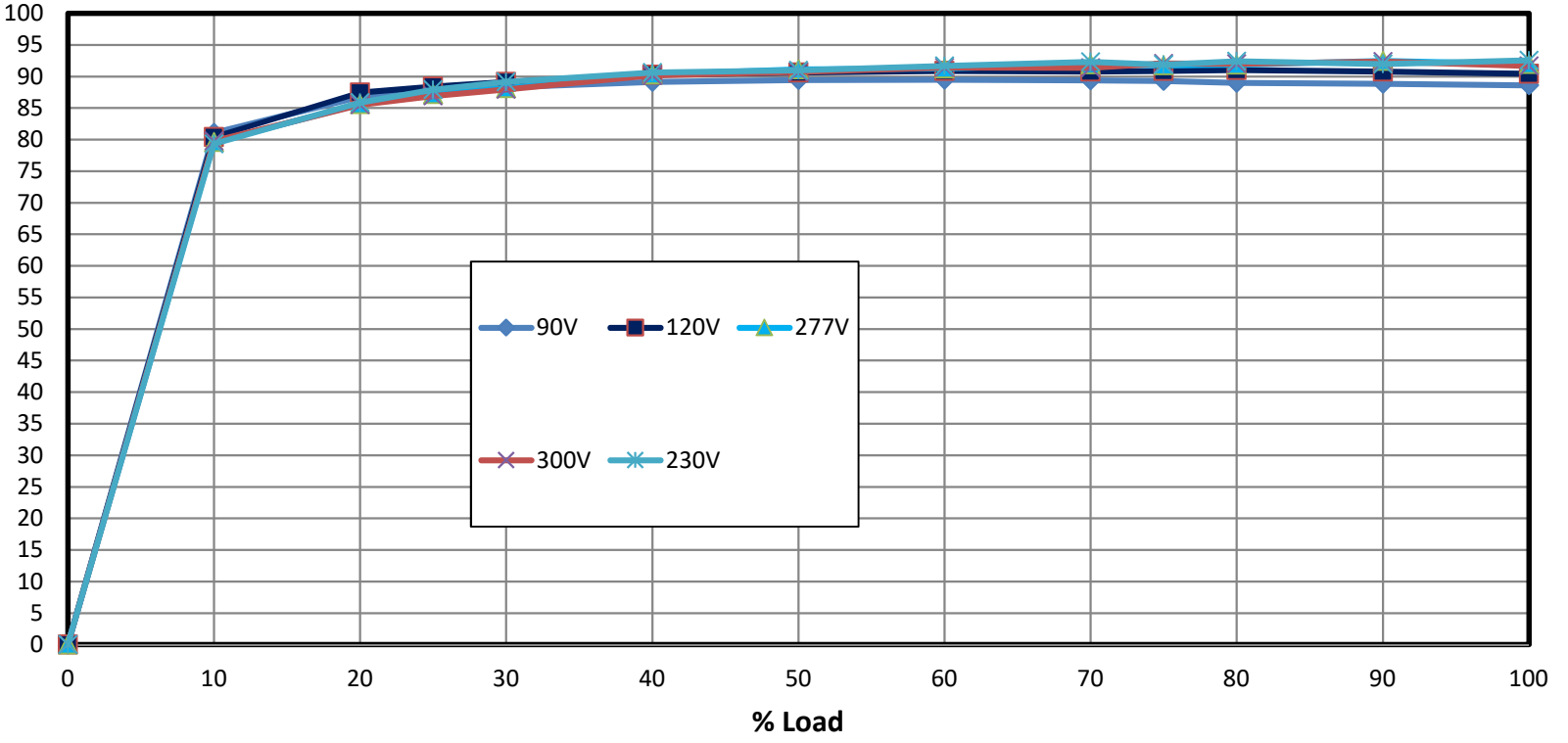
%ATHD VS LOAD


80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
%ATHD(%)
0
10
20
30
40
50
60
70
80
90
100
% Load
90V
120V
230V
277V
300V

Load Regulation VS Load



Efficiency VS % LOAD



Thank You!