



# SP6003 EVM

12 Watts Open Frame with SP6003 Synchronous Rectifier Control

## FEATURES

- Wide Range AC Input
- Fully Regulated Output
- High Efficiency
- High Quality

## ENVIRONMENTAL

- Operating Temperature
  - 0°C ~ 45°C
- Storage Temperature
  - -20°C ~ 85°C

## ELECTRICAL SPECIFICATIONS

### INPUT

- Voltage
  - 90 ~ 240 VAC (Wide Range)
- Current
  - 0.6A RMS Max
- Frequency
  - 47Hz ~ 63 Hz

## CONFIGURATION

## ELECTRICAL SPECIFICATIONS

### OUTPUT

- Voltage
  - +3.3V / 3.64A
- Tolerance
  - 5 %
- Power ( Po )
  - 12W (max)
- Hold Up Time
  - 10ms (min) , full load , 115VAC
- OverVoltage Protection
  - 5.6V(max)
- OverPower Protection
  - 115% ~ 160%
- ShortCircuit Protection
  - Pulse Mode, Auto recovery
- Efficiency
  - 69.5 % typ. , full load , 115VAC
- Ripple/Noise(Vp-p)
  - 1.5% ( 20MHz bandwidth)

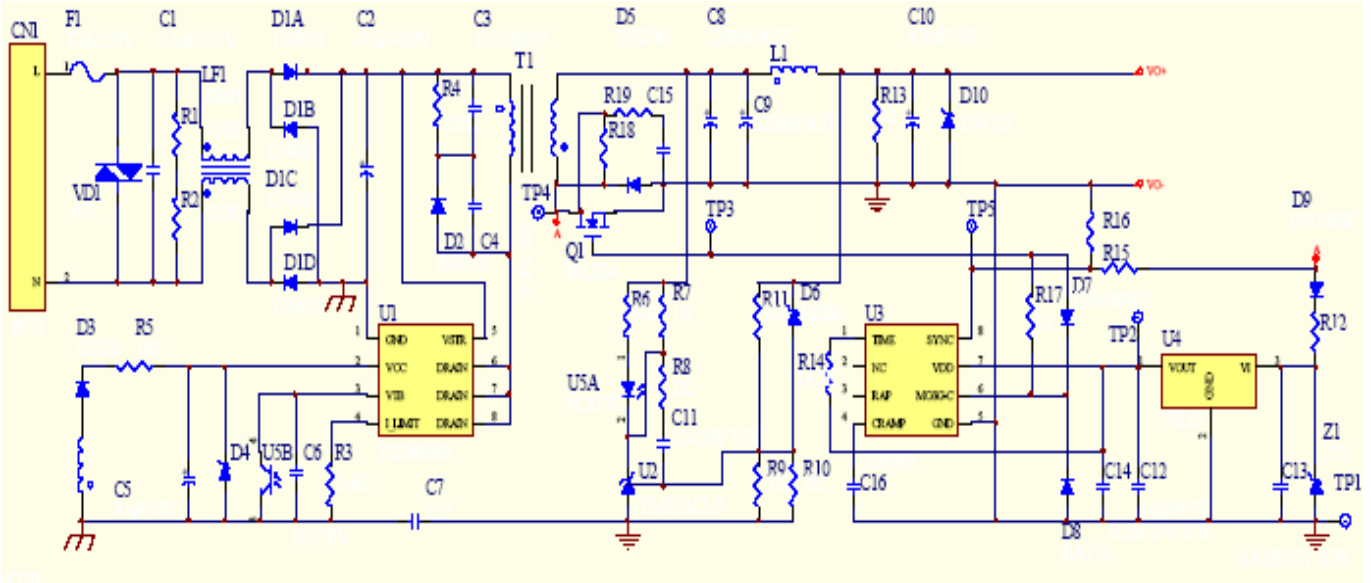




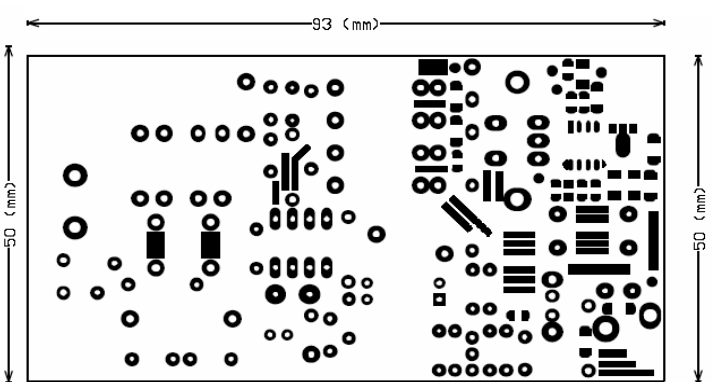
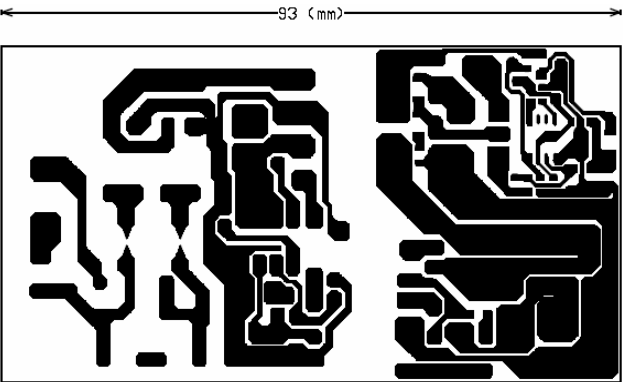
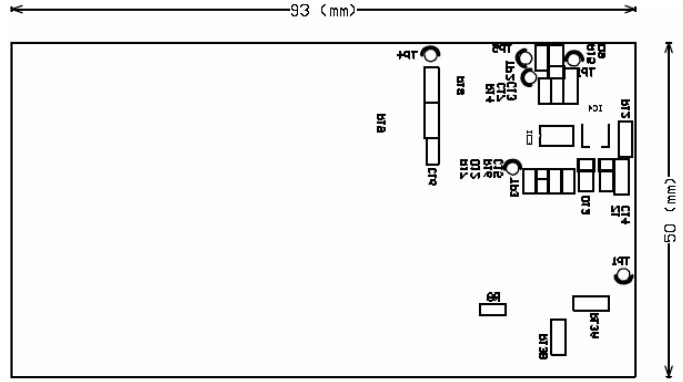
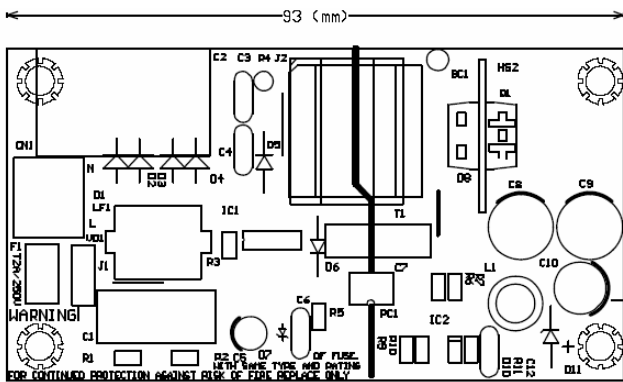
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## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

### DEMO BOARD CIRCUIT DIAGRAM



### PCB LAYOUT DIAGRAM





# SP6003 EVM

12 Watts Open Frame with SP6003 Synchronous Rectifier Control

## DEMO BOARD BOM

Quantity	Part Number	Description	Note
1	CN1	8673	
1	VRD1	471	
4	D1A ~ D1D	1N4005	
1	D2	RGP10J	
1	D3	UF102	
1	D4		
1	D5	F5KF40	
1	D6	HZ2B1	
1	D7	1N4148WS	
1	D8	BAT54	
1	D9	1N4148W	
1	D10	1N4729	
1	C1	0.1uF/275V	
1	C2	47uF/400V	
1	C3	103/1000V	
1	C4	101/500V	
1	C5	47uF/50V	
1	C6	103/50V	
1	C7	222	
2	C8 ~ C9	2200uF /6.3V	
1	C10	470uF /10V	
1	C11	224 / 50V	
1	C12	10uF / 6.3V	
1	C13	0.47uF / 25V	
1	C14	10uF / 25V	
1	C15	2200pF	
1	C16	20pF	
2	R1 ~ R2	510K	
1	R3	2.4K	
1	R4	100K	
1	R5	180	
2	R6 , R11	330	
4	R7 ~ R10	1K	
1	R11	330	
1	R12	4.7	
1	R13	22	
1	R14	14.7K	
1	R15	2.42K	
1	R16	2.0K	
1	R17	5.1	
1	R18	10	
1	R19	10	
1	F1	T2A/250V	
1	LF1	28mH	
1	L1		
1	U5A	PC817C	
1	Z1	25V	
1	U5B		
1	Q1	NTP60N06L	On Semiconductor
1	U1	FSDM0365	FAIRCHILD
1	U2	TI431ACL	
1	U3	SP6003	SYNC POWER
1	U4	78L05	



# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

**EFFICIENCY COMPARE** (TA=25°C, Input Voltage : 110V ; f = 60Hz )

### Diode

V <sub>o</sub> (V)	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.3	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
I <sub>o</sub> (A)	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6	3.64	
W <sub>i</sub> (W)	1.84	2.78	3.57	4.49	5.43	6.27	7.13	8.11	9.09	9.98	10.8	11.8	12.8	13.8	14.7	15.6	16.5	17.6	17.8	
efficiency(%)	35.87	47.48	55.46	58.80	60.77	63.16	64.80	65.10	65.35	66.26	67.02	66.92	66.83	66.75	67.14	67.49	67.79	67.30	67.28	

### SP6003

V <sub>o</sub> (V)	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
I <sub>o</sub> (A)	0.2	0.4	0.6	0.8	1	1.2	1.4	1.6	1.8	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6	3.64	
W <sub>i</sub> (W)	1.92	2.84	3.57	4.42	5.12	6.08	6.99	7.78	8.53	9.4	10.43	11.37	12.3	13.1	13.9	14.9	16	17	17.2	
efficiency(%)	34.38	46.48	55.46	59.73	64.45	65.67	66.09	67.66	69.43	70.00	69.40	69.45	69.54	70.32	71.01	70.66	69.91	69.67	69.63	

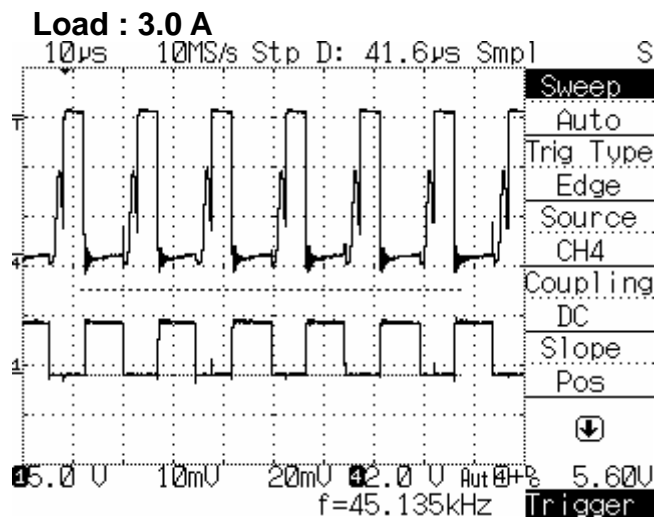
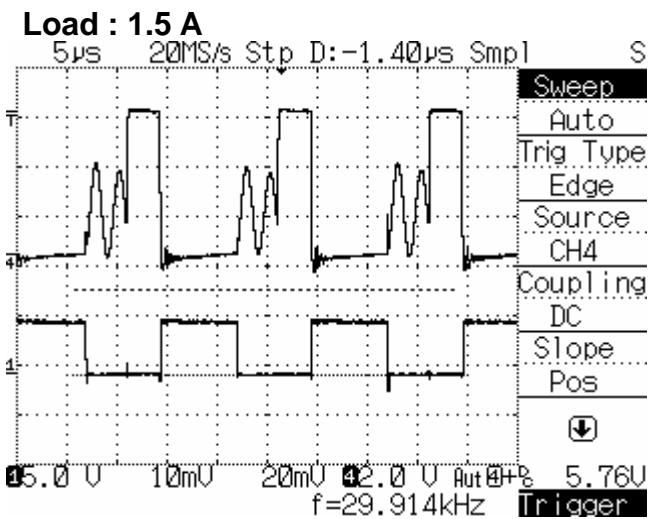
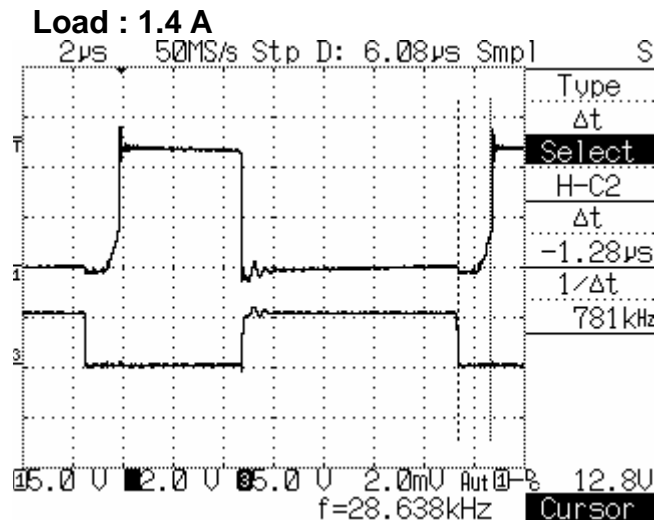
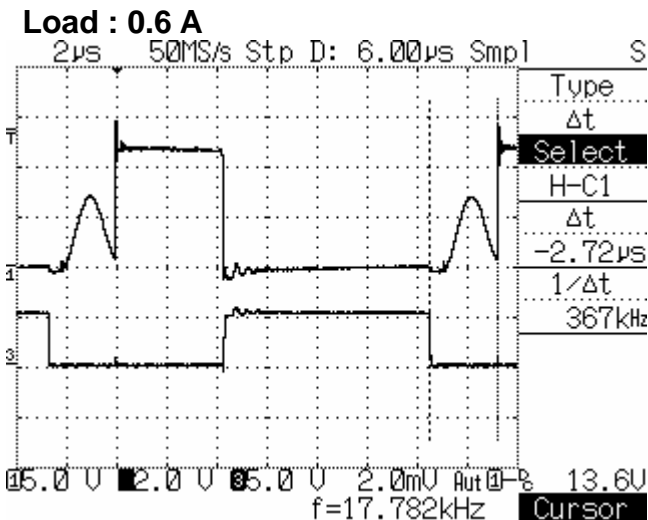
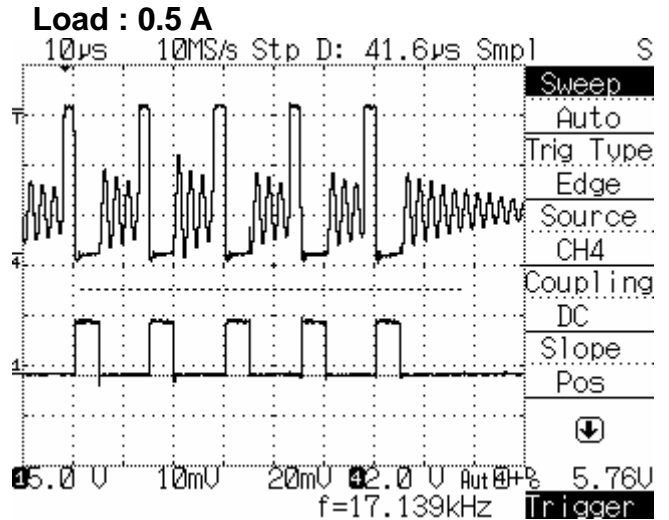
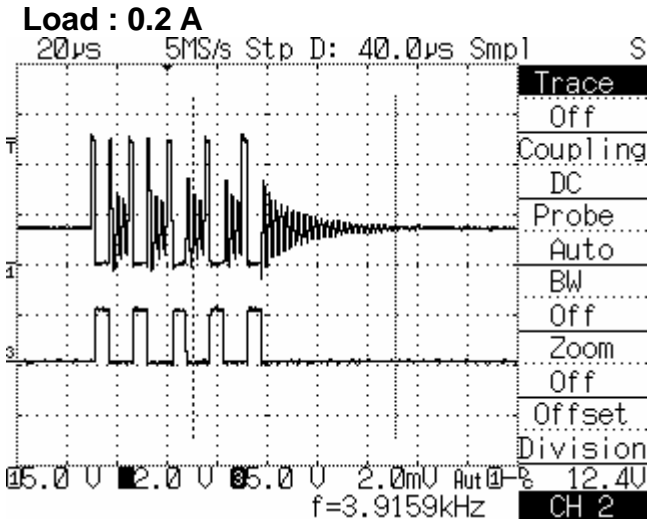




# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

### CHARACTERISTIC WAVEFORMS (TA=25°C, Input Voltage : 110V ; f = 60Hz)





# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

**EFFICIENCY COMPARE** (TA=25°C, Input Voltage : 220V ; f = 60Hz )

Diode

Vo(V)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.30	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Io(A)	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.64
Wi(W)	1.84	2.78	3.57	4.49	5.43	6.27	7.13	8.11	9.09	9.93	10.8	11.8	12.8	13.8	14.7	15.6	16.5	17.6	17.8
efficiency(%)	35.87	47.48	55.46	58.80	60.77	63.16	64.80	65.10	65.15	66.26	67.02	66.92	66.83	66.75	67.14	67.49	67.79	67.30	67.28

SP6003

Vo(V)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
Io(A)	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.64
Wi(W)	1.92	2.84	3.57	4.42	5.12	6.03	6.99	7.78	8.53	9.4	10.43	11.37	12.3	13.1	13.9	14.9	16	17	17.2
efficiency(%)	34.38	46.48	55.46	59.73	64.45	65.67	66.09	67.87	69.43	70.00	69.40	69.45	69.54	70.32	71.01	70.66	69.91	69.67	69.63

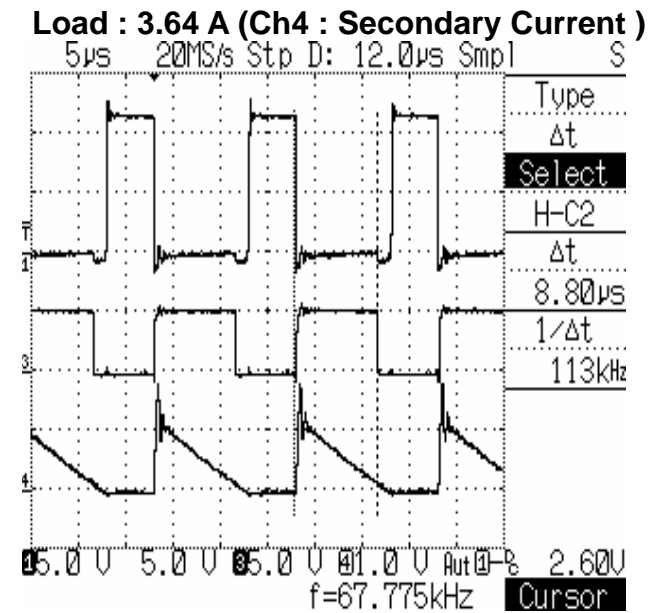
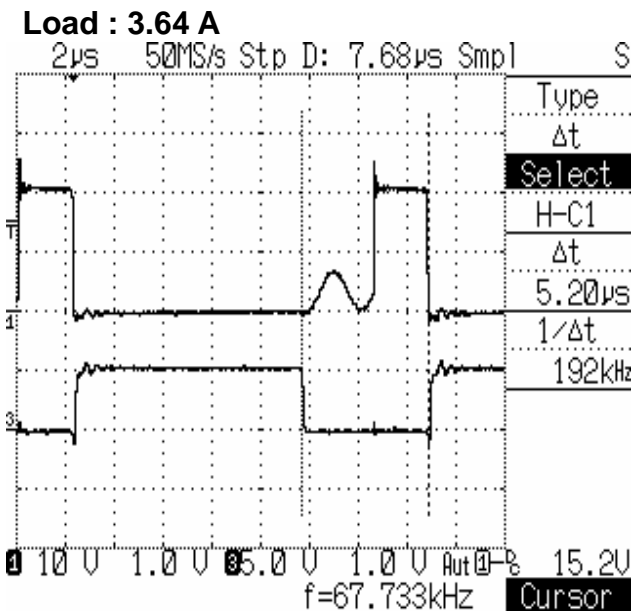
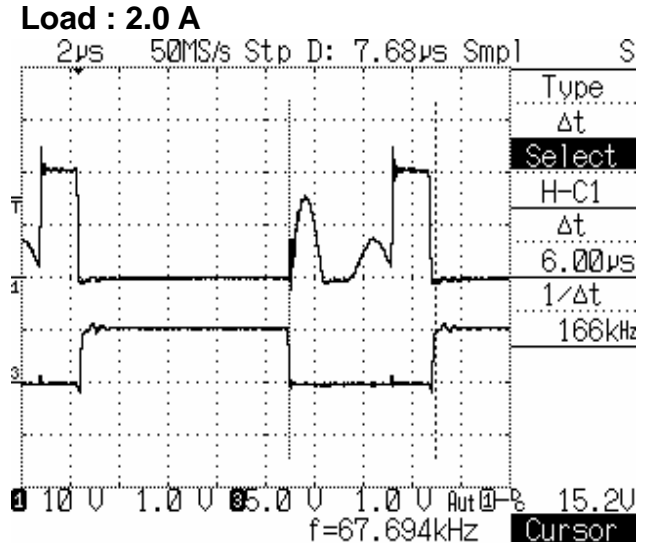
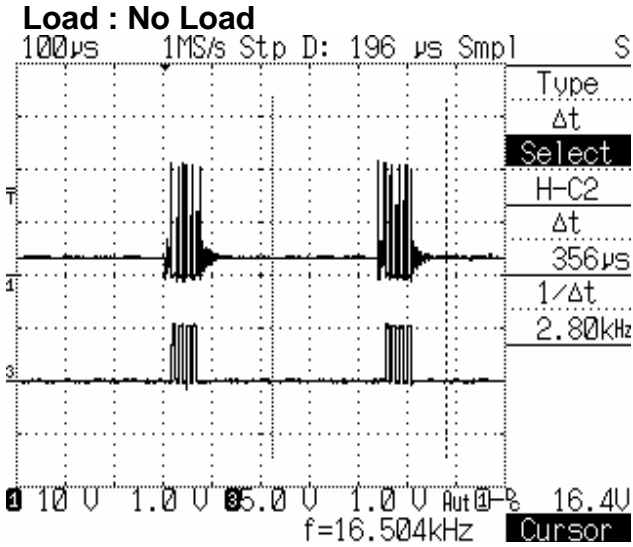




# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

**CHARACTERISTIC WAVEFORMS** (TA=25°C, Input Voltage : 220V ; f = 60Hz)



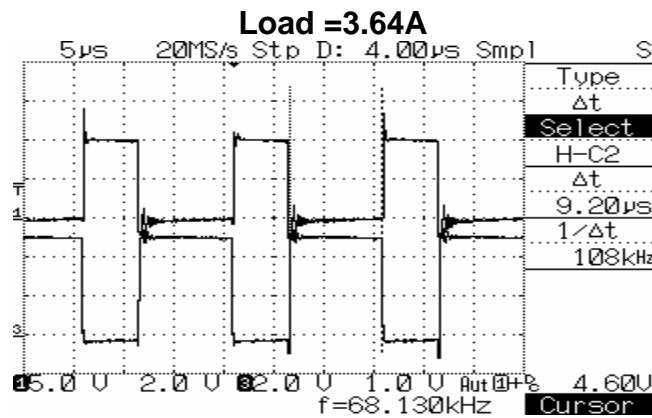
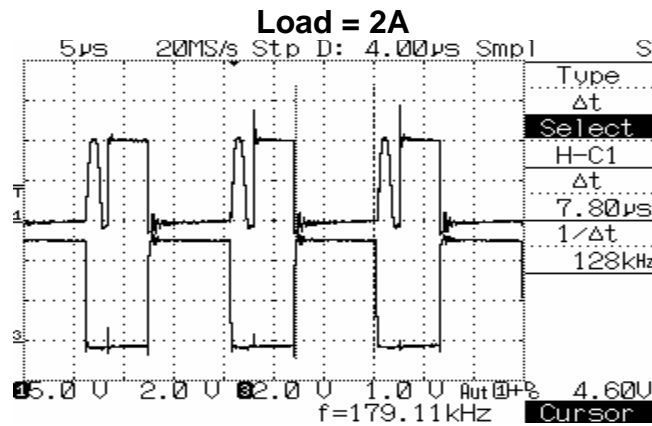
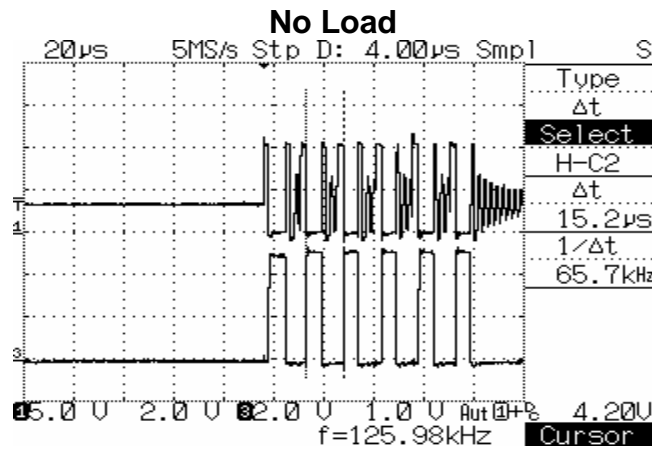


# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

### CHARACTERISTIC WAVEFORMS (TA=25°C, Input Voltage : 90V ; f = 60Hz)

Io(A)	standby	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.64	
V <sub>o</sub> (V)	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
W <sub>i</sub> (W)	1.01	1.88	2.84	3.6	4.35	5.31	6.16	6.91	7.82	8.78	9.73	10.7	11.5	12.4	13.4	14.4	15.3	16.3	17.3	17.5	
η (%)		35.21	46.62	55.17	60.87	62.34	64.48	67.06	67.72	67.65	67.83	67.85	68.87	69.19	68.96	68.75	69.02	68.83	68.67	68.64	



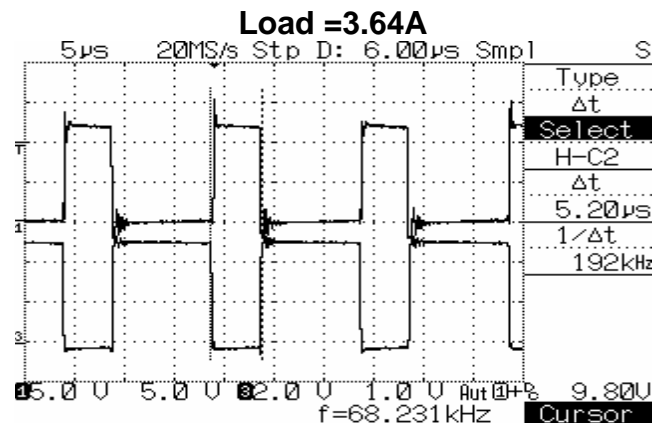
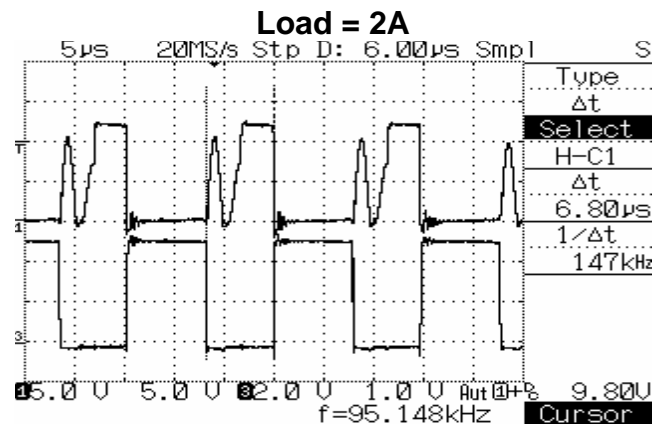
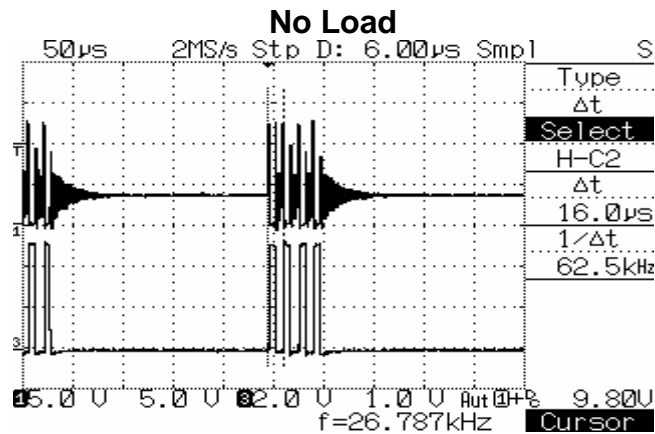


# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

### CHARACTERISTIC WAVEFORMS (TA=25°C, Input Voltage : 110V ; f = 60Hz)

Io(A)	standby	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.64	
V <sub>o</sub> (V)	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30	3.30
W <sub>i</sub> (W)	0.98	1.92	2.84	3.62	4.46	5.21	6.02	7.01	7.88	8.66	9.46	10.43	11.45	12.4	13.4	14.2	15.1	16.1	17.1	17.3	
$\eta$ (%)		34.48	46.62	54.86	59.37	63.53	65.98	66.11	67.01	68.59	69.77	69.61	69.17	69.19	68.96	69.72	69.98	69.69	69.47	69.43	



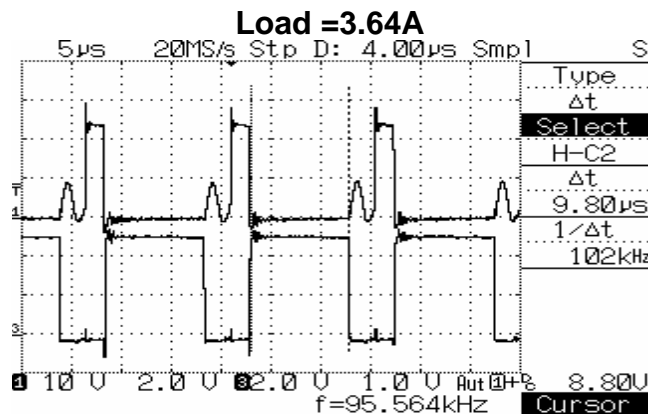
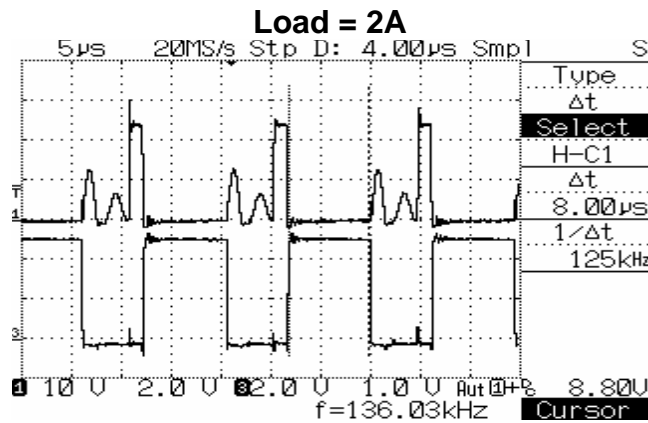
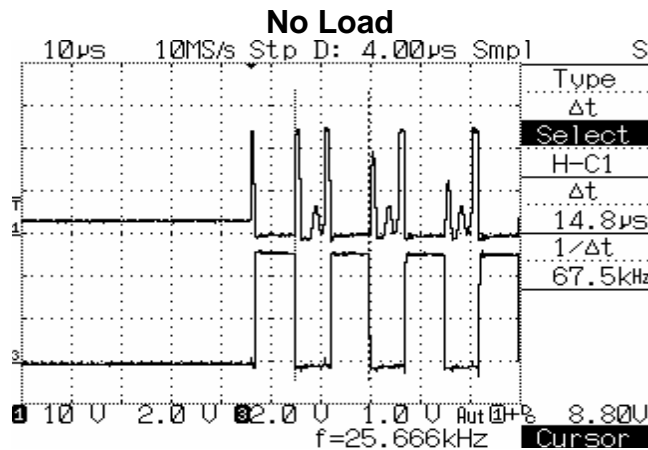


# SP6003 EVM

## 12 Watts Open Frame with SP6003 Synchronous Rectifier Control

### CHARACTERISTIC WAVEFORMS (TA=25°C, Input Voltage : 265V ; f = 60Hz)

Io(A)	standby	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20	3.40	3.60	3.64
V <sub>o</sub> (V)	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.31	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
W <sub>i</sub> (W)	1.48	2.6	3.52	4.77	5.75	6.6	7.15	7.86	8.59	9.53	10.61	11.54	12.35	13.08	13.77	14.63	15.6	16.51	17.36	17.54
η (%)		25.46	37.61	41.64	46.05	50.15	55.55	58.96	61.65	62.33	62.21	62.91	64.13	65.6	67.1	67.67	67.69	67.96	68.43	68.48





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12 Watts Open Frame with SP6003 Synchronous Rectifier Control

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SYNC Power Corporation

9F-5, No.3-2, Park Street

NanKang District (NKSP), Taipei, Taiwan, 115, R.O.C

Phone: 886-2-2655-8178

Fax: 886-2-2655-8468

<http://www.syncpower.com>