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# TEST REPORT: HDR-100-15

## 100W Single Output Switching Power Supply

### ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Control Function Test

Component Stress Test

### ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

### ■ RELIABILITY TEST

ENVIRONMENT TEST



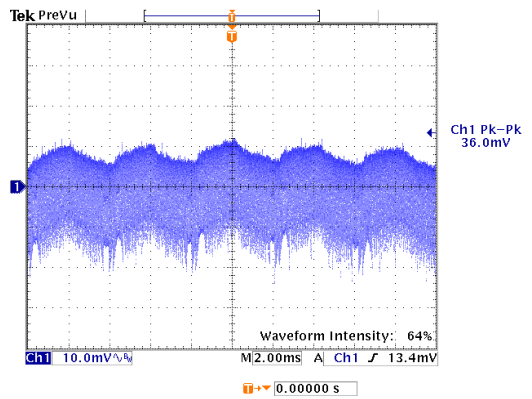
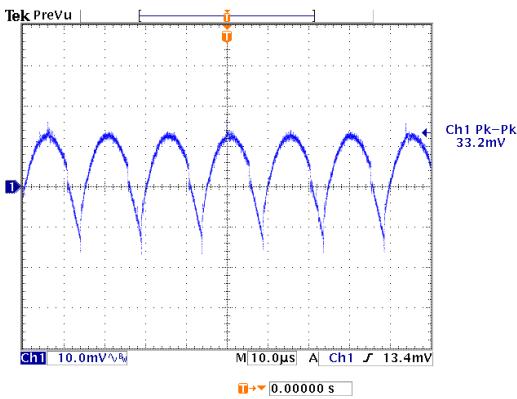
DESIGN VERIFY TEST  
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 13.50V ~ 18.00V	I/P : 230VAC O/P: MIN LOAD TA : 25°C	CH1: 12.33V ~ 19.15V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.67% ~ -0.07%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL LOAD TA : 25°C	V1: 0.00% ~ -0.07%
4	LOAD REGULATION(MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.33% ~ -0.33%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 2.0 %
	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 36 mVp-p

high frequency:

low frequency:

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SET UP TIME (MAX.)

230VAC	: 500ms
115VAC	: 500ms

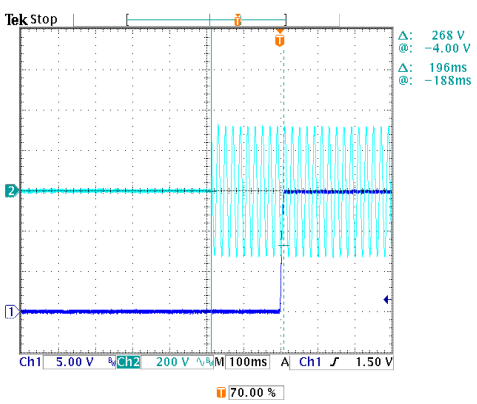
I/P : 230VAC	
I/P : 115VAC	
O/P: FULL LOAD	
TA : 25°C	

230VAC	: 196ms
115VAC	: 180ms

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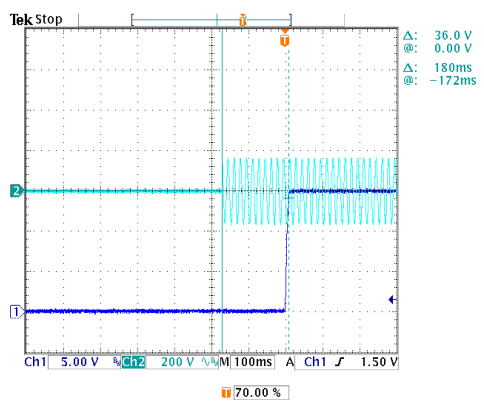
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



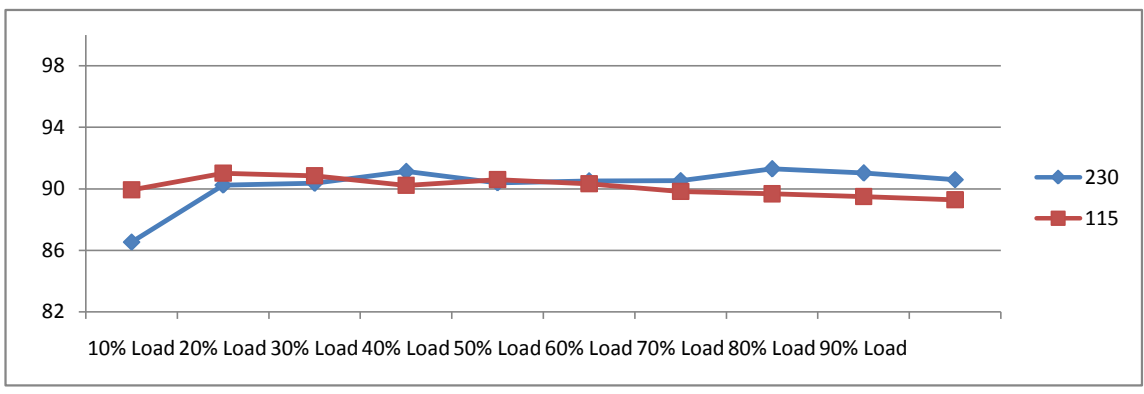


8	RISE TIME (MAX.)	230VAC : 50ms 115VAC : 50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 8.2ms 115VAC : 8.4ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage		
9	HOLD UP TIME (TYP.)	230VAC : 50ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 72.0ms 115VAC : 16.0ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		
10	DYNAMIC LOAD	V1 : 1500 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50% duty/120HZ (2)Full/Min load 50% duty/1KHZ TA : 25°C	V1: (1). 812mv (2). 550mv unit:mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ	FULL /MIN% LOAD 50%DUTY / 1KHZ		



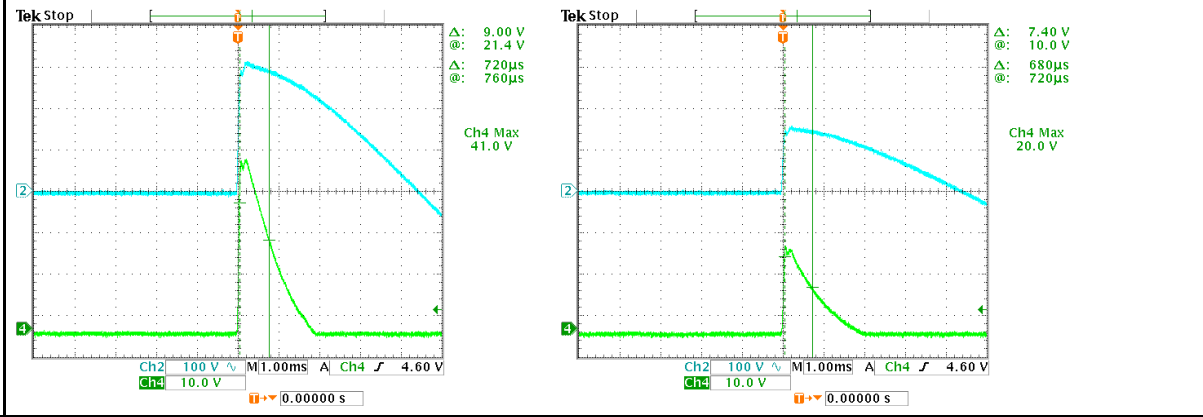
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC ~ 277VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C I/P : LOW-LINE = 97VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	68.0VAC ~ 277VAC  TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 100VAC ~ 277VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	1.6 / 230VAC 3 / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.72 / 230VAC I= 1.35 / 115VAC
5	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.1445 W
	EFFICIENCY (TYP.)	89.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	90.6 %



INRUSH CURRENT (TYP.)	70A / 230VAC	I/P : 230VAC	I= 41.0A / 230VAC
	40A / 115VAC	I/P : 115VAC	I= 20.0A / 115VAC
	COLD START	O/P : FULL LOAD	T50= 720.0us / 230VAC
		TA : 25°C	

INPUT=230VAC/50HZ @ FULL LOAD      INPUT=115VAC/50HZ @ FULL LOAD  
 CH2 : AC Input Voltage CH4 : Input current (1V=1A)      CH2 : AC Input Voltage CH4 : Input current (1V=1A)





PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	102% ~ 110%	I/P: 277VAC I/P: 230VAC I/P: 100VAC O/P: TESTING TA: 25°C	107.30% 277VAC 107.17% 230VAC 107.10% 100VAC Constant Current Limiting
2	OVER VOLTAGE PROTECTION	18.80V ~ 22.50V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA: 25°C	19.99V 277VAC 19.97V 230VAC 20.01V 85VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 277VAC I/P: 85VAC O/P: FULL LOAD	O.T.P. Active Shut down Re- power ON
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 277VAC I/P: 85VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Constant Current Limiting

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated : 650V 11.0A	I/P : 280VAC  VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 280VAC VDS: (1). 510.00V (2). 462.00V (3). 506.00V
2	O/P MOSFET	Q100 Rated : 120V 75.0A	I/P : 280VAC  VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q100 VDS : (1). 92.00V (2). 74.00V (3). 91.60V
3	Input Capacitor	C5 Rated : 180uf 420V	I/P : 280VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change (4)Full Load Continue Ta : 25°C	(1). 376.00V (2). 378.00V (3). 374.00V (4). 368.00V
4	Control IC	U1 Rated : 35V (max) 0V (min)  U100 Rated : 27V (max) 0V (min)	I/P : 280VAC O/P : (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta : 25°C	U1 U100 (1). 19.80V 17.10V (2). 12.10V 1.30V (3). 12.30V 3.60V (4). 19.80V 17.10V (5). 15.70V 12.60V
6	Clamp Diode	D5 Rated : 1000V 2.0A	I/P : 280VAC O/P : (1)Dynamic Load Full/Min Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1). 458.00V (2). 456.00V



SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.000KVAC /min	I/P-O/P: 3.600KVAC /min Ta : 25°C	I/P-O/P: 2.41mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P: 500VDC Ta : 25°C/70%RH	I/P-O/P: 9999MΩ NO DAMAGE

E.M.C. TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR: 8KV/Contact: 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N: 2KV/LN-PE: 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	
1	TEMPERATURE RISE TEST	MODEL : HDR-100-15			
		1. ROOM AMBIENT BURN-IN : 1HRS			
		IP: 230VAC O/P: 100% LOAD TA= 19.2°C			
		2. HIGH AMBIENT BURN-IN : 1HRS			
		IP: 230VAC O/P: 100% LOAD TA= 47.8°C			

NO	Position	ROOM AMBIENT Ta=19.2°C	HIGH AMBIENT Ta=47.8°C
1	LF1	35.9°C	62.4°C
2	LF2	46.9°C	73.7°C
3	BD1	54.9°C	82.9°C
4	ZNR1	36.9V	63.6°C
5	CS	51.7°C	79.6°C
6	C40	60.1°C	83.9°C
7	T1	70.5°C	94.2°C
8	Q1	66.4°C	96.2°C
9	Q100	75.7°C	99.1°C
10	C105	70.9°C	92.3°C
11	C106	68.3°C	90.2°C
12	L101	85.7°C	105.6°C
13	R8	69.4°C	96.2°C
14	U1	66.1V	85.2°C
15	D5	67.0°C	94.9°C
16	D40	62.2°C	84.0°C
17	RT H2	52.2°C	76.4°C



2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230VAC O/P : 106% LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 277VAC / 100VAC O/P : FULL LOAD Ta : -30.0°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C NO DAMAGE	I/P : 285VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03% /°C (0~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.03% /°C (0~50°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~+90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ 55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 3sec ; turn off 1sec @ 15cycle Full Load burn in@ 1cycle		TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME (3) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME		(1). 48916 HRS (2). 14241 HRS (3). 38169 HRS (4). 78717 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 159K hrs min. Telcordia SR-332 (Bellcore) ; 46.3K hrs min. MIL-HDBK-217F (25°C)		
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): 30000HRS @ TA 50°C		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

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