



TEST REPORT: HDR-15-12

15W Ultra Slim Step Shape DIN Rail

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

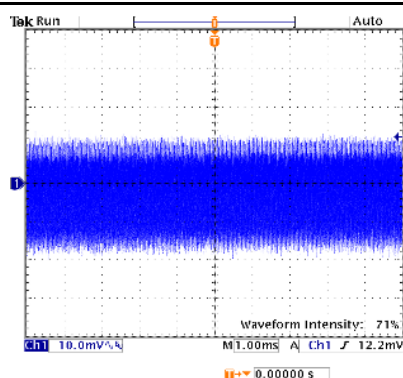
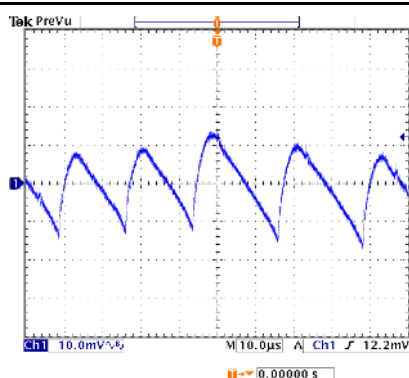
DESIGN VERIFY TEST OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.80V ~ 13.80V	I/P : 230VAC O/P: MIN LOAD TA: 25°C	CH1: 10.23V ~ 14.72V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 85VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.17% ~ -0.25%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 85VAC / 277VAC O/P: FULL LOAD TA: 25°C	V1: 0.17% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.17% ~ -0.25%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.3 %
	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 33.6 mVp-p

high frequency:

low frequency:

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SET UP TIME (MAX.)

230VAC : 2000ms
115VAC : 2000ms

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

230VAC : 688ms
115VAC : 1020ms

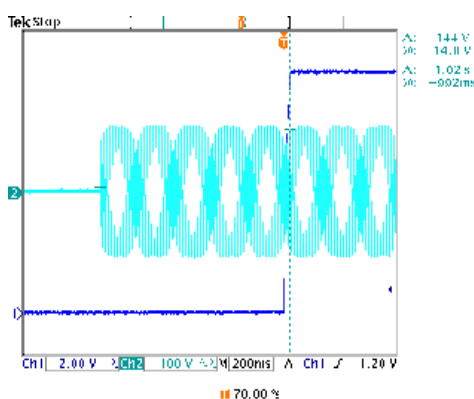
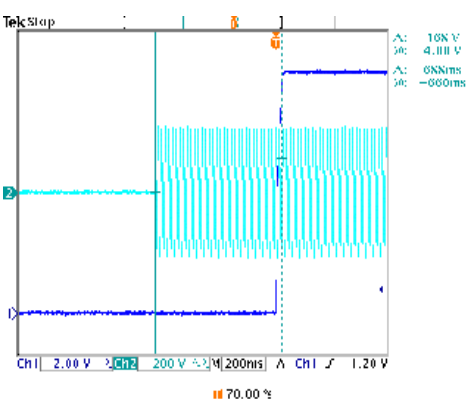
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

INPUT=115VAC/60HZ @ FULL LOAD

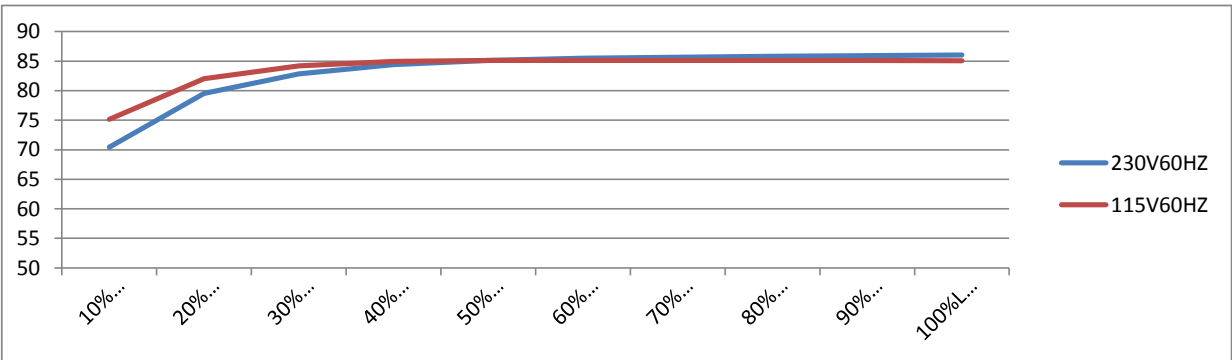
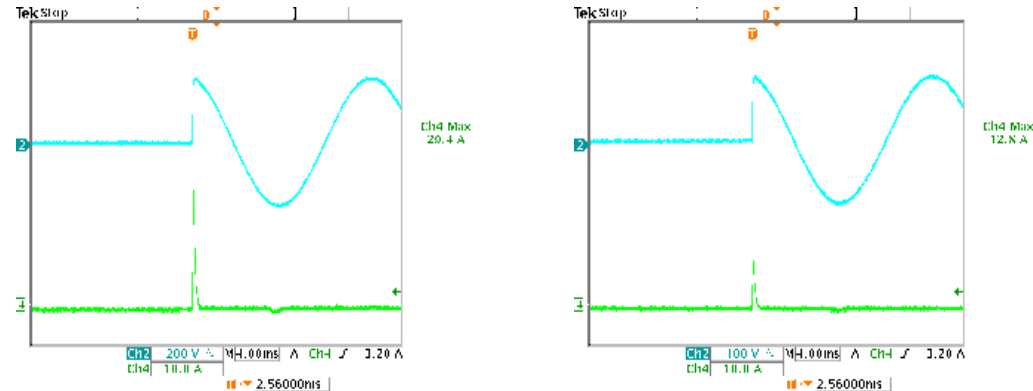
CH1 : Output Voltage CH2 : AC Input Voltage

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8	RISE TIME (MAX.)	230VAC : 80ms 115VAC : 80ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 27.6ms 115VAC : 26.8ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage			
9	HOLD UP TIME (TYP.)	230VAC : 30ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 72.8ms 115VAC : 15.2ms
	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 : 1200 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA: 25°C	(1). 199mv (2). 132mv 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 = 82VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	72.0VAC ~ 277VAC TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 85VAC ~ 277VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	0.25A / 230VAC 0.50A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.13A / 230VAC I= 0.24A / 115VAC
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.105 W
5	EFFICIENCY (TYP.)	85.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	86.028 %
				
6	INRUSH CURRENT (TYP.)	45A / 230VAC 25A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 29.4A / 230VAC I= 12.8A / 115VAC
	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	110% ~ 145%	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: TESTING TA: 25°C	125.60% 277VAC 125.60% 230VAC 123.68% 85VAC Hiccup mode when output voltage<50%, recovers automatically after fault condition is removed; Constant current limiting within 50%~100% rated output voltage, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	14.20V ~ 16.20V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA: 25°C	14.80V 277VAC 14.80V 230VAC 14.80V 85VAC Shut off o/p voltage,clamping by zener diode
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 277VAC I/P: 85VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Hiccup mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated : 600V 4.0A	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). 528.00V (2). 404.00V (3). 526.00V
2	O/P Diode	D100 Rated : 100V 10.0A	I/P : 280VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	D100 VDS : (1). 65.40V (2). 58.00V (3). 65.20V
3	Input Capacitor	C5 Rated : 27uf 400V	I/P : 280VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1). 348.00V (2). 348.00V (3). 348.00V
4	Control IC	U1 Rated : 35V (max) 9V (min)	I/P : 280VAC O/P : (1)Full Load (2)Output Short (3)O.L.P (4)Low Line No Load Vo(min) Ta : 25°C	U1 (1). 21.50V (2). 21.50V (3). 21.50V (5). 21.50V
6	Clamp Diode	D5 Rated : 1000V 1.0A	I/P : 280VAC O/P : (1)Dynamic Load Full/Min Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1). 498.00V (2). 496.00V

SAFETY & E.M.C. TEST
SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 4.000KVAC /min	I/P-O/P: 4.400KVAC /min Ta : 25°C	I/P-O/P: 2.04mA 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	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-15-5			
		1. ROOM AMBIENT BURN-IN : 1.0hrs			
		IP: 230VAC O/P: 100% LOAD TA= 23.1℃			
		2. HIGH AMBIENT BURN-IN : 1.0hrs			
		IP: 230VAC O/P: 100% LOAD TA= 48.5℃			
		NO.	Position	ROOM AMBIENT 23.1℃	HIGH AMBIENT Ta: 48.5℃
		1	LF1	42.8℃	68.4℃
		2	C5	52.6℃	77.5℃
		3	Q1	71.4℃	96.8℃
		4	T1 PRIM	68.6℃	92.6℃
		5	T1 SEC	73.5℃	97.0℃
		6	C40	54.5℃	79.4℃
		7	C105	73.7℃	96.3℃
2	OVER LOAD BURN-IN TEST	NO DAMAGE	I/P : 230VAC	TEST : OK	
		1 HOUR (MIN)	O/P : 119.00% LOAD		
			Ta : 25℃		
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE	I/P : 277VAC / 100VAC	TEST : OK	
		1 HOUR (MIN)	O/P : FULL LOAD		
			Ta : -30.0℃		
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS	I/P : 287VAC	TEST : OK	
		IN CHAMBER ON	O/P : FULL LOAD		
		CONTROL 50℃	Ta : 50℃		
5	TEMPERATURE COEFFICIENT	NO DAMAGE	HUMIDITY= 95.0% RH	±0.0160% /(0℃~50℃)	
		±0.03% /(0℃~50℃)	I/P : 230VAC		
6	STORAGE TEMPERATURE TEST		O/P : FULL LOAD	TEST : OK	
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40℃ ~ +85℃		TEST : OK	
		2. Temperature change rate : 25℃ / MIN			
		3. Dwell time low and high temperature : 30 MIN/EACH			
		4. Total test cycle : 5 CYCLE			
		5. Input/Output condition : STATIC			



7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35℃ ~ +55℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec	TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60 min in each axis (X.Y.Z) (6) Ta : 25℃	TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0℃ LIFE TIME	(1). 284850.6 HRS (2). 56761.6 HRS (3). 91181.6 HRS (4). 162241.9 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1166K hrs min. MIL-HDBK-217F (25℃)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50℃	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

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