



TEST REPORT: HDR-60-12

60W 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	VERDICT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.80V ~ 13.80V	I/P : 230VAC O/P: MIN LOAD TA: 25°C	CH1: 10.45V ~ 14.80V	PASS
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.25% ~ 0.08%	PASS
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL LOAD TA: 25°C	V1: 0.00% ~ -0.08%	PASS
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.08% ~ 0.00%	PASS
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.7 %	PASS
6	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 75.2 mVp-p	PASS
7	SET UP TIME (MAX.)	230VAC : 500ms 115VAC : 500ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 344ms 115VAC : 336ms	PASS
		<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		



8	<p>RISE TIME (MAX.)</p>	<p>230VAC : 50ms 115VAC : 50ms</p>	<p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p>	<p>230VAC : 8.4ms 115VAC : 8.4ms</p>	PASS
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>			
9	<p>HOLD UP TIME (TYP.)</p>	<p>230VAC : 30ms 115VAC : 12ms</p>	<p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p>	<p>230VAC : 85.6ms 115VAC : 18.4ms</p>	PASS
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>			
10	<p>DYNAMIC LOAD</p>	<p>V1 : 1200 mVp-p</p>	<p>I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA: 25°C</p>	<p>V1: 652mv 332mv unit:mVp-p</p>	PASS
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>		<p>FULL /MIN% LOAD 50%DUTY / 1KHZ</p>			

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT	
1	INPUT VOLTAGE RANGE	85VAC ~ 277VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	68.0VAC ~ 277VAC	PASS	
			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)	TEST : OK		
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 100VAC ~ 277VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK	PASS	
3	INPUT CURRENT (TYP.)	0.80A / 230VAC 1.20A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.54A / 230VAC I= 0.89A / 115VAC	PASS	
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.1019 W	PASS	
5	EFFICIENCY (TYP.)	88.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	88.381 %	PASS	
6	INRUSH CURRENT (TYP.)	60A / 230VAC 30A / 115VAC twidth= 555 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 56.0A / 230VAC I= 29.0A / 115VAC	PASS	
		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	VERDICT
1	OVER LOAD PROTECTION	105% ~ 160%	I/P: 277VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta: 25°C	135% 277VAC 135% 230VAC 135% 100VAC Constant Current Limiting	PASS
2	OVER VOLTAGE PROTECTION	14.20V ~ 16.20V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta: 25°C	15.80V 277VAC 15.80V 230VAC 15.80V 85VAC Shut down Re- power ON	PASS
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 Constant Current Limiting	PASS

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	PWM Power Transistor	Q1 Rated : 600V 13.0A	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). 582V (2). 534.00V (3). 588.00V	PASS
2	O/P MOSFET	Q100 Rated : 120V 20.0A	I/P : 280VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q100 VDS : (1). 52.40V (2). 39.20V (3). 52.40V	PASS
3	Input Capacitor	C5 Rated : 120uf 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). 380.00V (2). 384.00V (3). 378.00V	PASS
4	Control IC	U101 Rated : 38V (max) 0V (min) U1 Rated : 35V (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	U101 U1 (1). 12.50V 24.20V (2). 0.85V 11.60V (3). 3.18V 11.60V (4). 15.90V 28.80V (5). 10.10V 17.80V	PASS
6	Clamp Diode	D42 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). 502.00V (2). 492.00V	PASS

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.000KVAC /min	I/P-O/P: 3.600KVAC /min Ta : 25°C	I/P-O/P: 0.94mA NO DAMAGE	PASS
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	PASS



E.M.C. TEST

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

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	TEMPERATURE RISE TEST	MODEL : HDR-60-5 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 21.2°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 49.8°C	NO. Position ROOM AMBIENT 21.2°C HIGH AMBIENT Ta: 49.8°C 1 LF1 41.9°C 65.6°C 2 BD1 44.5°C 67.9°C 3 C5 46.1°C 69.9°C 4 Q1 56.1°C 74.9°C 5 D42 64.9°C 80.1°C 6 T1 74.2°C 97.1°C 7 C105 67.0°C 90.1°C 8 Q100 69.7°C 92.2°C 9 LF101 68.0°C 90.9°C 10 U1 51.2°C 73.8°C		PASS
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 133.85% LOAD Ta : 25°C	TEST : OK	PASS
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 100VAC O/P : FULL LOAD Ta : -30.0°C	TEST : OK	PASS
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 45°C HUMIDITY= 95.0% RH	TEST : OK	PASS
5	TEMPERATURE COEFFICIENT	±0.03% ((0°C~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.0070% ((0°C~50°C)	PASS
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40°C ~ +85°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	PASS
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +50°C 2. Temperature change rate : 25°C / 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	PASS



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°C	TEST : OK	PASS
9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 45.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45.0°C LIFE TIME	(1). 158118 HRS (2). 50019 HRS (3). 125618 HRS (4). 158118 HRS	PASS
10	MTBF	Conducted by Parts Stress Analysis Prediction 927.6K hrs min. MIL-HDBK-217F (25°C)		PASS
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 45°C		PASS

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

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