



# TEST REPORT: HDR-60-24

## 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: 21.60V ~ 29.00V	I/P : 230VAC O/P : MIN LOAD TA : 25°C	CH1: 20.97V ~ 29.87V	PASS
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P : FULL / MINLOAD TA = 25°C	V1: 0.58% ~ 0.29%	PASS
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P : FULL LOAD TA : 25°C	V1: 0.04% ~ -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% ~ -0.12%	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 : 150 mVp-p	I/P : 230VAC O/P : FULL LOAD TA : 25°C	V1 : 42.8 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 : 192ms 115VAC : 102ms	PASS
7	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		PASS

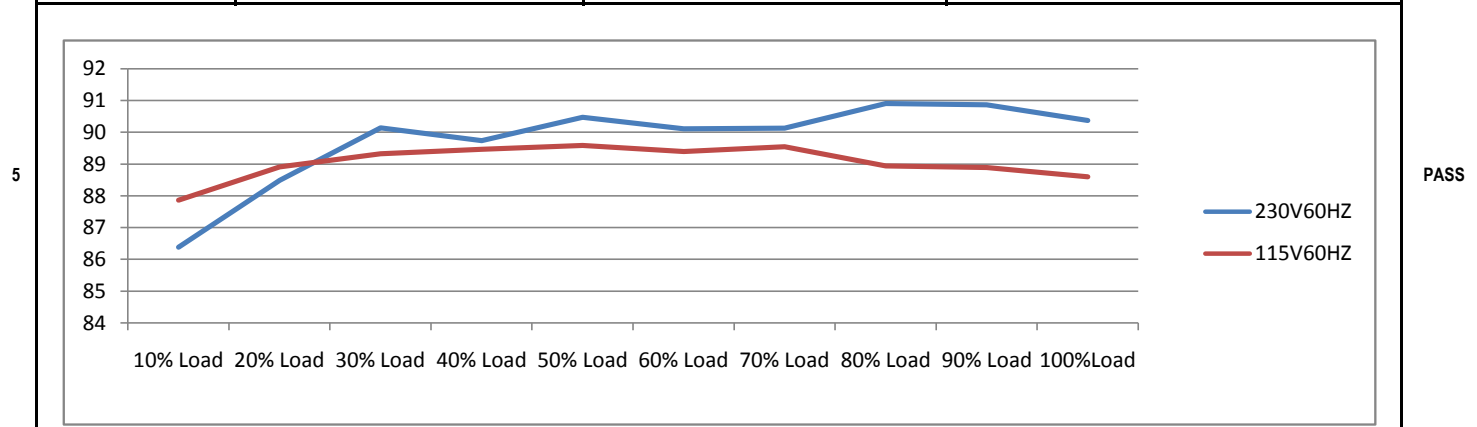


8	<p>RISE TIME (MAX.)</p>	<p>230VAC : 50ms 115VAC : 50ms</p>	<p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p>	<p>230VAC : 25.0ms 115VAC : 27.6ms</p>	PASS
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>			
9	<p>HOLD UP TIME (TYP.)</p>	<p>230VAC : 30ms 115VAC : 12ms</p>	<p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p>	<p>230VAC : 88.8ms 115VAC : 19.2ms</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 : 2400 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: 904mv 474mv unit:mVp-p</p>	PASS
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>		<p>FULL /MIN% LOAD 50%DUTY / 1KHZ</p>			



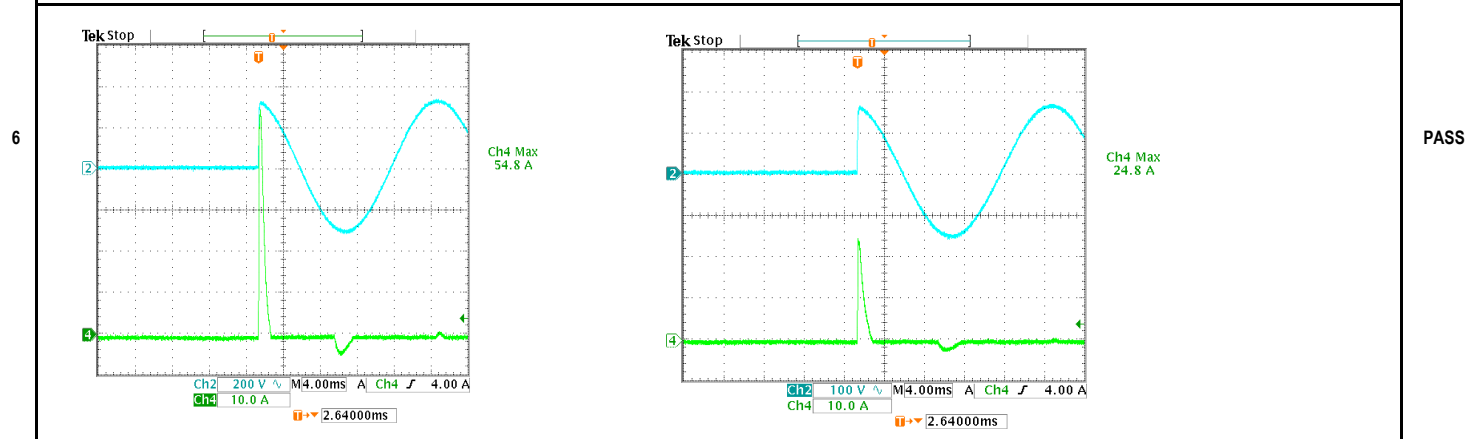
INPUT FUNCTION TEST

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= 0.52A / 230VAC I= 0.92A / 115VAC	PASS
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.1125 W	PASS
	EFFICIENCY (TYP.)	90.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	90.374 %	



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= 54.8A / 230VAC I= 24.8A / 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	132.40% 277VAC 132.40% 230VAC 132.40% 100VAC Constant Current Limiting	PASS
2	OVER VOLTAGE PROTECTION	30.00V ~ 36.00V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta: 25°C	33.10V 277VAC 33.10V 230VAC 33.10V 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). 560.00V (2). 502.00V (3). 558.00V	PASS
2	O/P MOSFET	Q100 Rated : 200V 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). 105.00V (2). 78.40V (3). 105.00V	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). 374.00V (2). 398.00V (3). 376.00V	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). 24.40V 22.20V (2). 0.62V 11.40V (3). 3.24V 11.40V (4). 33.10V 29.80V (5). 21.20V 18.20V	PASS
5	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). 492.00V (2). 288.00V	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: 1.64mA 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: 180MΩ 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-60-24 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 48.5°C 72.5°C 2 BD1 52.9°C 76.3°C 3 C5 54.6°C 79.6°C 4 Q1 66.3°C 88.6°C 5 D42 71.5°C 94.9°C 6 T1 84.6°C 105.7°C 7 C105 65.4°C 87.3°C 8 Q100 76.4°C 98.7°C 9 LF101 63.9°C 86.3°C 10 U1 58.2°C 81.4°C		PASS
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230VAC O/P : 123.10% 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	±0.0072% /(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). 120198 HRS (2). 47838 HRS (3). 73808.8 HRS (4). 153816 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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