



TEST REPORT: HDR-60-48

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: 43.20V ~ 55.20V	I/P : 230VAC O/P: MIN LOAD TA: 25°C	CH1: 42.225V ~ 57.415V	PASS
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.10% ~ 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% ~ -0.02%	PASS
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.02% ~ 0.00%	PASS
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 2.9 %	PASS
6	RIPPLE & NOISE(Max)	V1 : 240 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 44.4 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 : 208ms 115VAC : 128ms	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



<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 : 23.4ms 115VAC : 22.2ms</p>		
<p>8</p>	<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>PASS</p>
<p>9</p>	<p>HOLD UP TIME (TYP.) 230VAC : 30ms 115VAC : 12ms</p>	<p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p>	<p>230VAC : 91.2ms 115VAC : 20.8ms</p>	<p>PASS</p>	
<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>			
<p>10</p>	<p>DYNAMIC LOAD V1 : 4800 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: 936mv 512mv unit:mVp-p</p>		
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>		<p>FULL /MIN% LOAD 50%DUTY / 1KHZ</p>		<p>PASS</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= 0.50A / 230VAC I= 0.93A / 115VAC	PASS
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.2198 W	PASS
5	EFFICIENCY (TYP.)	91.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	91.355 %	PASS
6	INRUSH CURRENT (TYP.)	60A / 230VAC 30A / 115VAC twidh= 555 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 54.2A / 230VAC I= 24.6A / 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	133.60% 277VAC 133.60% 230VAC 133.60% 100VAC Constant Current Limiting	PASS
2	OVER VOLTAGE PROTECTION	56.50V ~ 64.80V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta: 25°C	63.60V 277VAC 63.60V 230VAC 63.60V 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). 584.00V (2). 492.00V (3). 564.00V	PASS
2	O/P MOSFET	Q100 Rated : 400V 10.0A	I/P : 280VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q100 VDS : (1). 205.00V (2). 145.00V (3). 204.00V	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). 398.00V (2). 398.00V (3). 374.00V	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). 24.50V 24.70V (2). 0.68V 11.50V (3). 3.24V 11.40V (4). 24.50V 30.90V (5). 24.50V 21.00V	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). 494.00V (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: 1.32mA 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
		EN55022	I/P : 230VAC /50HZ	PASS	



3	RADIATION	CLASS B	O/P : FULL LOAD Ta : 25°C	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	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT 21.2°C</th> <th>HIGH AMBIENT Ta: 49.8°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>48.5°C</td><td>72.5°C</td></tr> <tr><td>2</td><td>BD1</td><td>52.9°C</td><td>76.3°C</td></tr> <tr><td>3</td><td>C5</td><td>54.6°C</td><td>79.6°C</td></tr> <tr><td>4</td><td>Q1</td><td>66.3°C</td><td>88.6°C</td></tr> <tr><td>5</td><td>D42</td><td>71.5°C</td><td>94.9°C</td></tr> <tr><td>6</td><td>T1</td><td>84.6°C</td><td>105.7°C</td></tr> <tr><td>7</td><td>C105</td><td>65.4°C</td><td>87.3°C</td></tr> <tr><td>8</td><td>Q100</td><td>76.4°C</td><td>98.7°C</td></tr> <tr><td>9</td><td>LF101</td><td>63.9°C</td><td>86.3°C</td></tr> <tr><td>10</td><td>U1</td><td>58.2°C</td><td>81.4°C</td></tr> </tbody> </table>	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	TEST : OK	PASS
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																																														
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

2007/3/20 A50-S014