



TEST REPORT: HDR-15-15

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

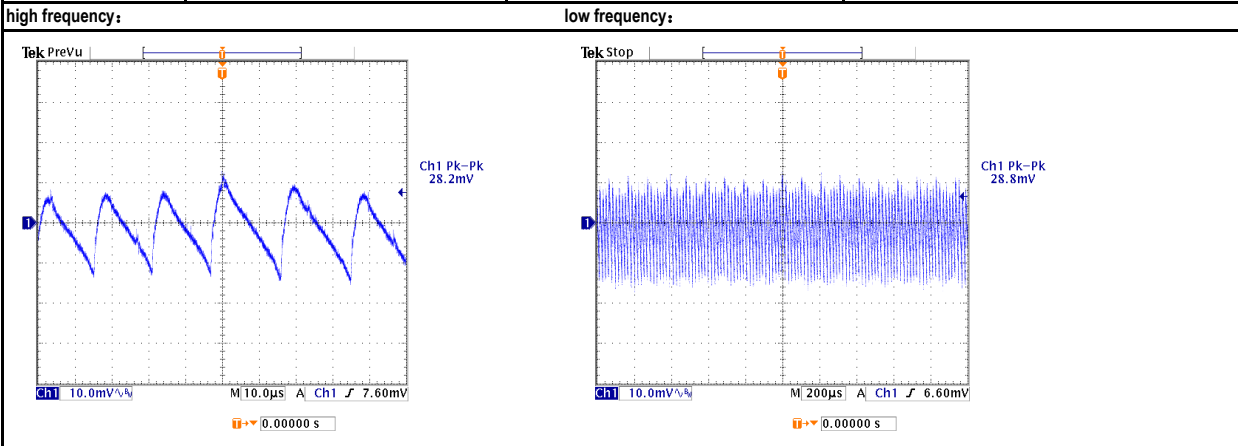
E.M.C. Test

■ RELIABILITY TEST

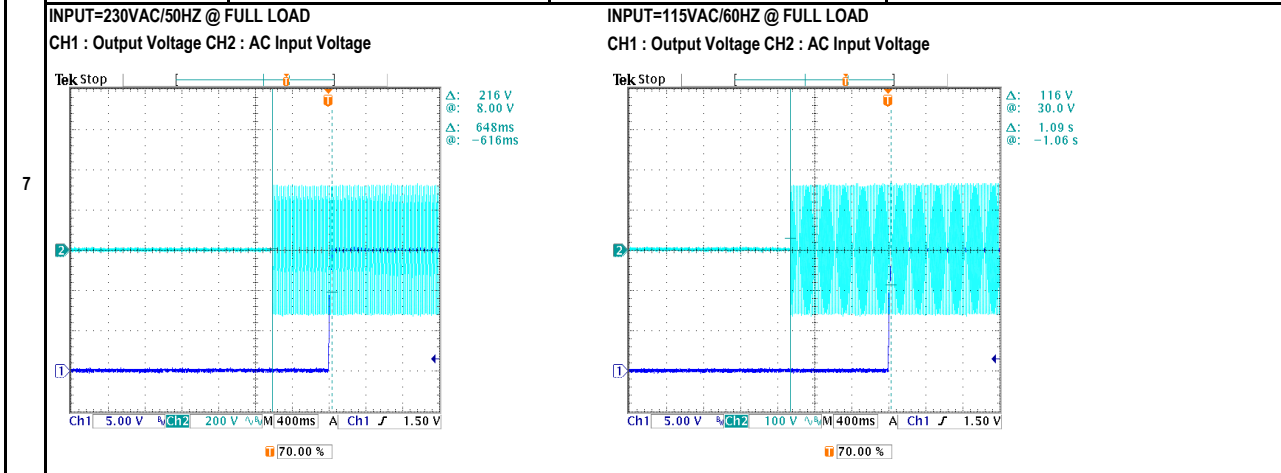
ENVIRONMENT TEST

DESIGN VERIFY TEST
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 13.50V ~ 18.00V	I/P : 230VAC O/P: MIN LOAD TA: 25°C	CH1: 12.88V ~ 18.46V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 85VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.47% ~ 0.13%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 85VAC / 277VAC O/P: FULL LOAD TA: 25°C	V1: 0.07% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.13% ~ -0.20%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 2.6 %
	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 28.8 mVp-p



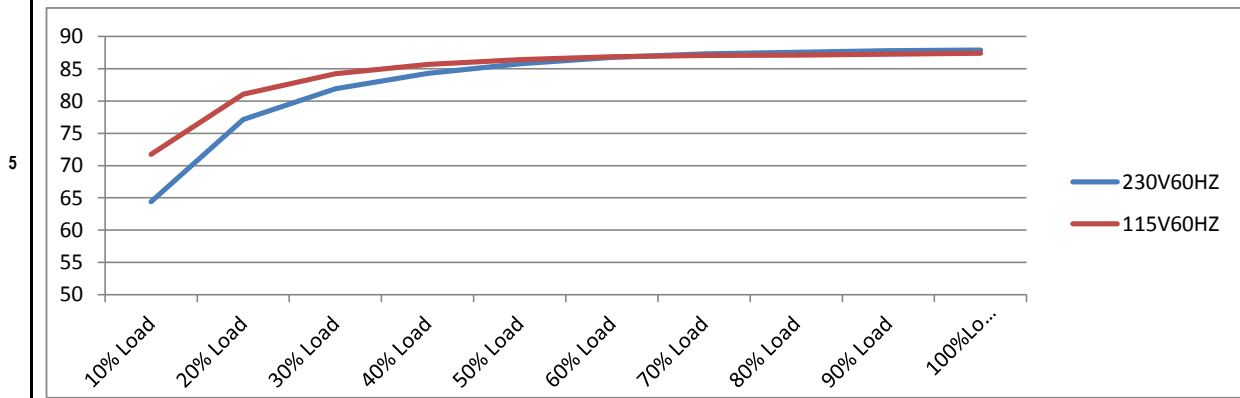
SET UP TIME (MAX.)	230VAC : 2000ms 115VAC : 2000ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 648ms 115VAC : 1088ms
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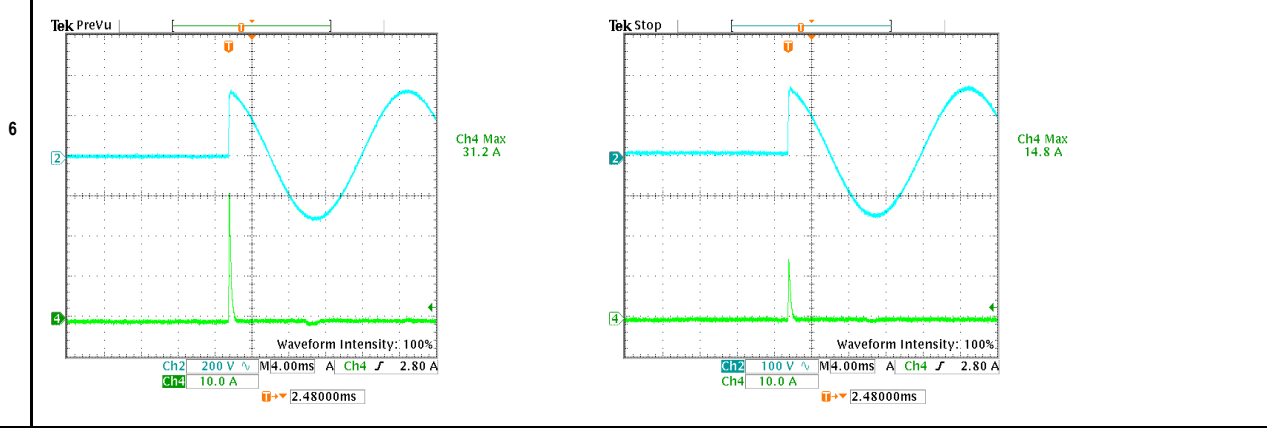
8	RISE TIME (MAX.)	230VAC : 80ms 115VAC : 80ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 30.0ms 115VAC : 27.6ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME (TYP.)	230VAC : 30ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 72.0ms 115VAC : 14.4ms
	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	(1). 213mv (2). 158mv 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	72.0VAC ~ 277VAC
			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)	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= 0.131A / 230VAC I= 0.236A / 115VAC
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.1468 W
	EFFICIENCY (TYP.)	85.5%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	86.463 %



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= 31.2A / 230VAC I= 14.8A / 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	124.50% 277VAC 123.80% 230VAC 120.40% 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	18.80V ~ 22.50V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA: 25°C	19.80V 277VAC 19.80V 230VAC 19.80V 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). 554.00V (2). 402.00V (3). 548.00V
2	O/P Diode	D100 Rated : 150V 5.0A	I/P : 280VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	D100 VDS : (1). 63.20V (2). 51.20V (3). 63.00V
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). 354.00V (2). 344.00V (3). 352.00V
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). 26.10V (2). 21.10V (3). 21.10V (5). 21.00V
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). 518.00V (2). 510.00V

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: 1.99mA 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°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 48.5°C	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT 23.1°C</th> <th>HIGH AMBIENT Ta: 48.5°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>42.8°C</td><td>68.4°C</td></tr> <tr><td>2</td><td>C5</td><td>52.6°C</td><td>77.5°C</td></tr> <tr><td>3</td><td>Q1</td><td>71.4°C</td><td>96.8°C</td></tr> <tr><td>4</td><td>T1 PRI</td><td>68.6°C</td><td>92.6°C</td></tr> <tr><td>5</td><td>T1 SEC</td><td>73.5°C</td><td>97.0°C</td></tr> <tr><td>6</td><td>C40</td><td>54.5°C</td><td>79.4°C</td></tr> <tr><td>7</td><td>C105</td><td>73.7°C</td><td>96.3°C</td></tr> <tr><td>8</td><td>D100</td><td>87.8°C</td><td>111.2°C</td></tr> <tr><td>9</td><td>C106</td><td>56.9°C</td><td>80.6°C</td></tr> <tr><td>10</td><td>LF101</td><td>58.8°C</td><td>82.7°C</td></tr> <tr><td>11</td><td>U1</td><td>50.2°C</td><td>75.0°C</td></tr> <tr><td>12</td><td>BD1</td><td>54.4°C</td><td>79.0°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT 23.1°C	HIGH AMBIENT Ta: 48.5°C	1	LF1	42.8°C	68.4°C	2	C5	52.6°C	77.5°C	3	Q1	71.4°C	96.8°C	4	T1 PRI	68.6°C	92.6°C	5	T1 SEC	73.5°C	97.0°C	6	C40	54.5°C	79.4°C	7	C105	73.7°C	96.3°C	8	D100	87.8°C	111.2°C	9	C106	56.9°C	80.6°C	10	LF101	58.8°C	82.7°C	11	U1	50.2°C	75.0°C	12	BD1	54.4°C	79.0°C	
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 119.00% 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 : 287VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK																																																				
5	TEMPERATURE COEFFICIENT	±0.03% /(0°C~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.0160% /(0°C~50°C)																																																				
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																																																				



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 : 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°C	TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C106 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= 50.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0°C 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°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A5