



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

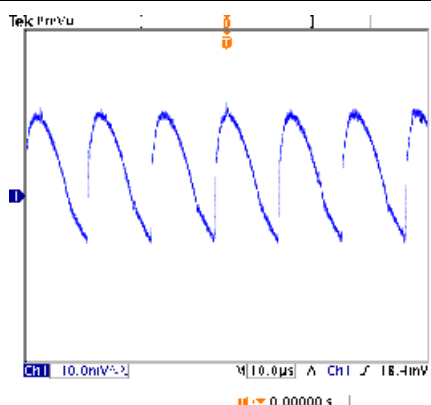
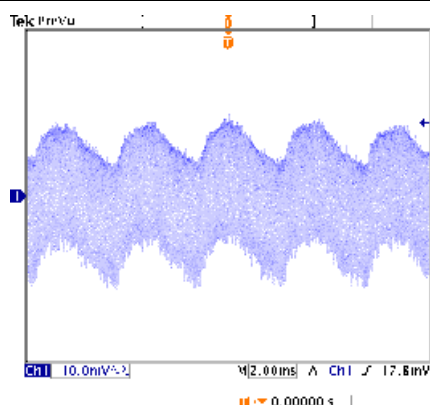
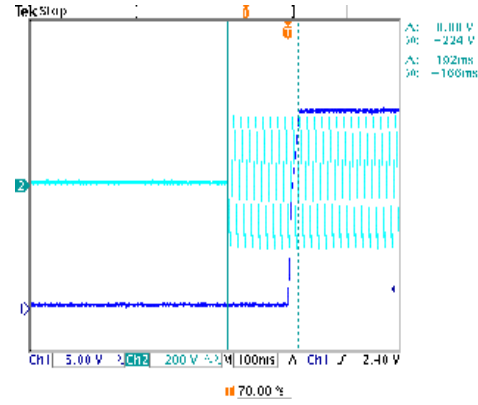
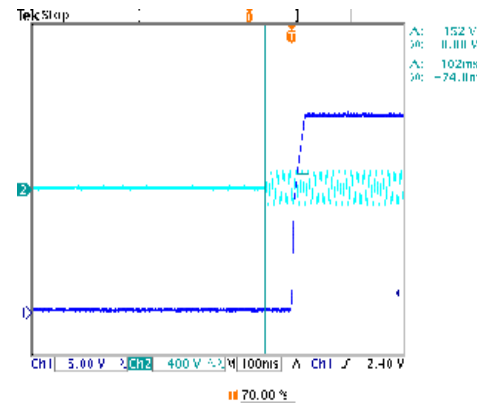
Safety Test

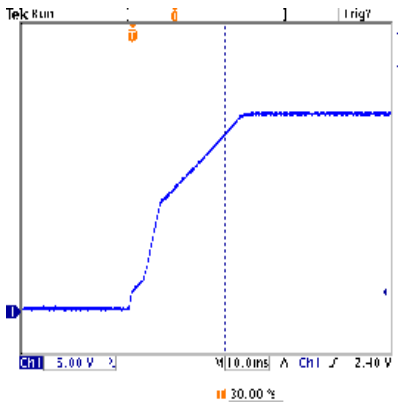
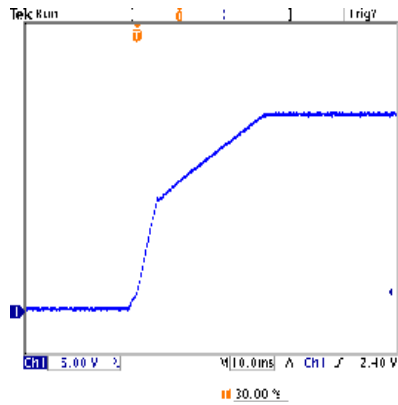
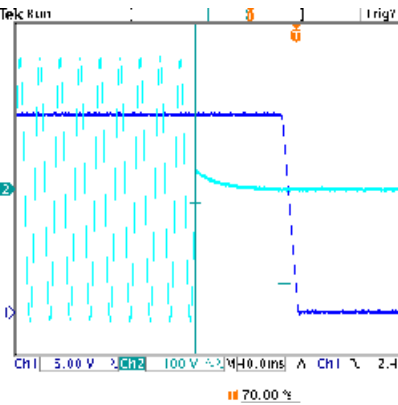
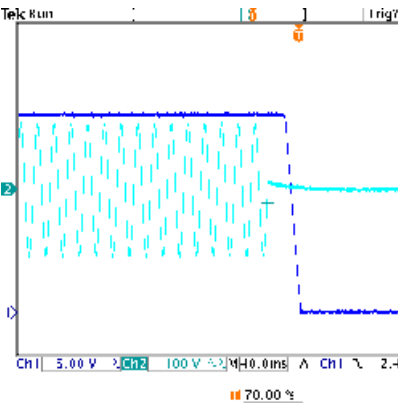
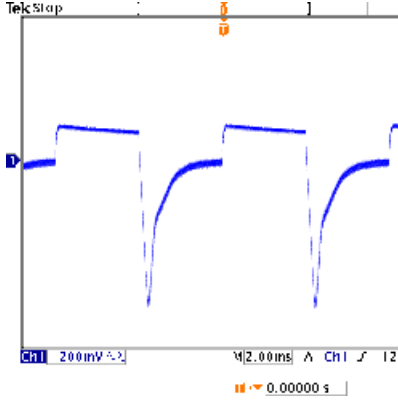
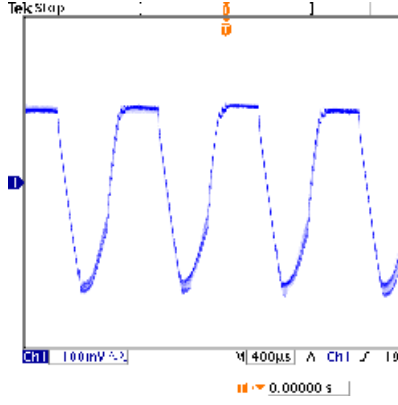
E.M.C. Test

■ RELIABILITY TEST

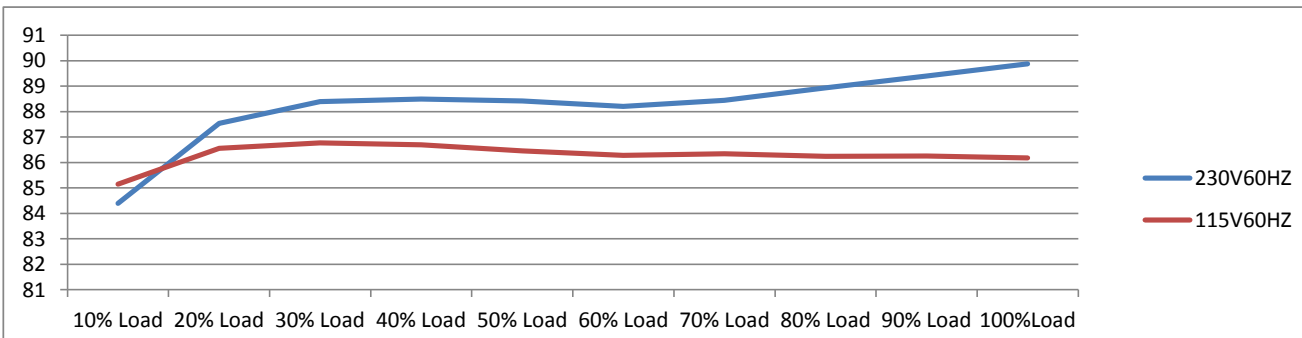
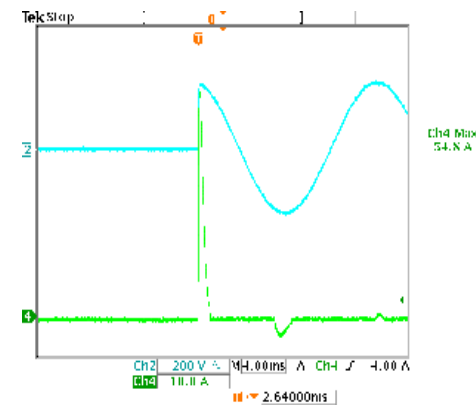
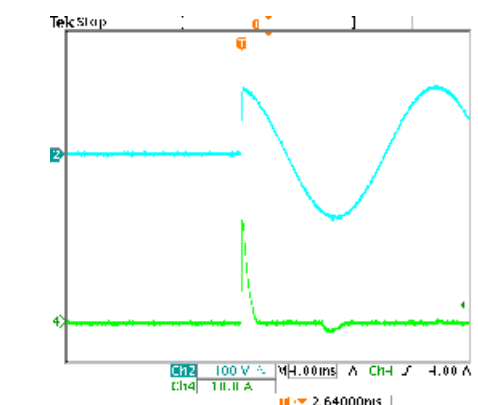
ENVIRONMENT TEST

DESIGN VERIFY TEST OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 85VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.08% ~ -0.12%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 85VAC / 277VAC O/P: FULL LOAD TA: 25°C	V1: 0.04% ~ -0.08%
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%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.7 %
6	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 42.8 mVp-p
		high frequency:		low frequency:
				
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
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage
				

8	RISE TIME (MAX.)	230VAC : 50ms 115VAC : 50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 25.0ms 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 : 88.8ms 115VAC : 19.2ms
	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 : 2400 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA : 25°C	V1: (1). 904mv (2). 474mv 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	68.0VAC ~ 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.)	0.80A / 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
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.1125 W
5	EFFICIENCY (TYP.)	90.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	90.374 %
				
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= 54.8A / 230VAC I= 24.8A / 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	105% ~ 160%	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: TESTING TA : 25°C	132.40% 277VAC 132.40% 230VAC 132.40% 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	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
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,it will recover automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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
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
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
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
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

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: 1.64mA 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: 180MΩ 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℃	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25℃	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	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℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	TEMPERATURE RISE TEST	MODEL : HDR-60-24																																														
		1. ROOM AMBIENT BURN-IN : 1.0hrs																																														
		IP: 230VAC O/P: 100% LOAD TA= 21.2℃																																														
		2. HIGH AMBIENT BURN-IN : 1.0hrs																																														
		IP: 230VAC O/P: 100% LOAD TA= 49.8℃																																														
		<table><tr><td>NO.</td><td>Position</td><td>ROOM AMBIENT 21.2℃</td><td>HIGH AMBIENT Ta: 49.8℃</td></tr><tr><td>1</td><td>LF1</td><td>48.5℃</td><td>72.5℃</td></tr><tr><td>2</td><td>BD1</td><td>52.9℃</td><td>76.3℃</td></tr><tr><td>3</td><td>C5</td><td>54.6℃</td><td>79.6℃</td></tr><tr><td>4</td><td>Q1</td><td>66.3℃</td><td>88.6℃</td></tr><tr><td>5</td><td>D42</td><td>71.5℃</td><td>94.9℃</td></tr><tr><td>6</td><td>T1</td><td>84.6℃</td><td>105.7℃</td></tr><tr><td>7</td><td>C105</td><td>65.4℃</td><td>87.3℃</td></tr><tr><td>8</td><td>Q100</td><td>76.4℃</td><td>98.7℃</td></tr><tr><td>9</td><td>LF101</td><td>63.9℃</td><td>86.3℃</td></tr><tr><td>10</td><td>U1</td><td>58.2℃</td><td>81.4℃</td></tr></table>			NO.	Position	ROOM AMBIENT 21.2℃	HIGH AMBIENT Ta: 49.8℃	1	LF1	48.5℃	72.5℃	2	BD1	52.9℃	76.3℃	3	C5	54.6℃	79.6℃	4	Q1	66.3℃	88.6℃	5	D42	71.5℃	94.9℃	6	T1	84.6℃	105.7℃	7	C105	65.4℃	87.3℃	8	Q100	76.4℃	98.7℃	9	LF101	63.9℃	86.3℃	10	U1	58.2℃	81.4℃
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9	LF101	63.9℃	86.3℃																																													
10	U1	58.2℃	81.4℃																																													
2	OVER LOAD BURN-IN TEST	NO DAMAGE	I/P : 230VAC	TEST : OK																																												
		1 HOUR (MIN)	O/P : 123.10% LOAD Ta : 25℃																																													
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 277VAC / 100VAC O/P : FULL LOAD Ta : -30.0℃	TEST : OK																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45℃ NO DAMAGE	I/P : 287VAC O/P : FULL LOAD Ta : 45℃ HUMIDITY= 95.0% RH	TEST : OK																																												
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~50℃)	I/P : 230VAC O/P : FULL LOAD	±0.0072% /(0℃~50℃)																																												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40℃ ~ +85℃		TEST : OK																																												
		2. Temperature change rate : 25℃ / MIN																																														
7	THERMAL SHOCK TEST	3. Dwell time low and high temperature : 30 MIN/EACH		TEST : OK																																												
		4. Total test cycle : 5 CYCLE																																														
		5. Input/Output condition : STATIC																																														
		1. Thermal shock Temperature : -35℃ ~ +50℃		TEST : OK																																												
		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																																														



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 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
10	MTBF	Conducted by Parts Stress Analysis Prediction 927.6K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 45°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014