



# TEST REPORT: HDR-15-12

## 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

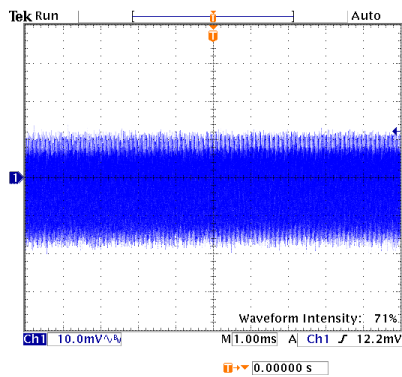
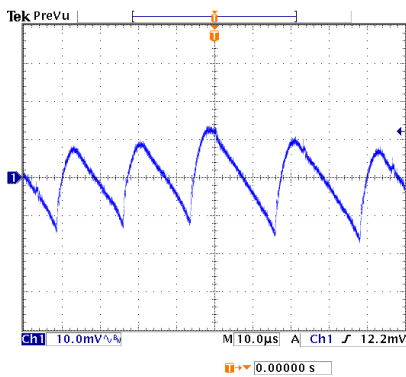
■ DESIGN VERIFY TEST  
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.80V ~ 13.80V	I/P: 230VAC O/P: MIN LOAD TA: 25°C	CH1: 10.23V ~ 14.72V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1.0% ~ -1.0%	I/P: 85VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.17% ~ -0.25%
3	LINE REGULATION (MAX.)	V1: 1.0% ~ -1.0%	I/P: 85VAC / 277VAC O/P: FULL LOAD TA: 25°C	V1: 0.17% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1: 1.0% ~ -1.0%	I/P: 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.17% ~ -0.25%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.3 %
	RIPPLE & NOISE(Max)	V1: 120 mVp-p	I/P: 230VAC O/P: FULL LOAD TA: 25°C	V1: 33.6 mVp-p

high frequency:

low frequency:

6



SET UP TIME (MAX.)	230VAC : 2000ms 115VAC : 2000ms	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 688ms 115VAC : 1020ms
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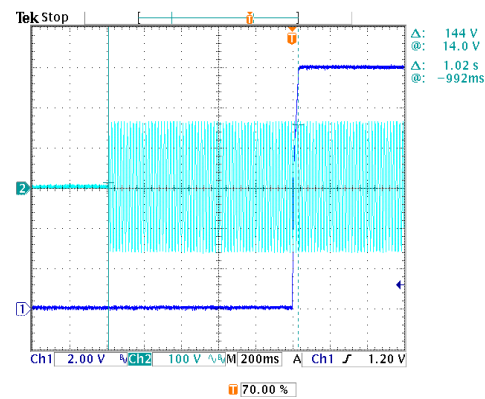
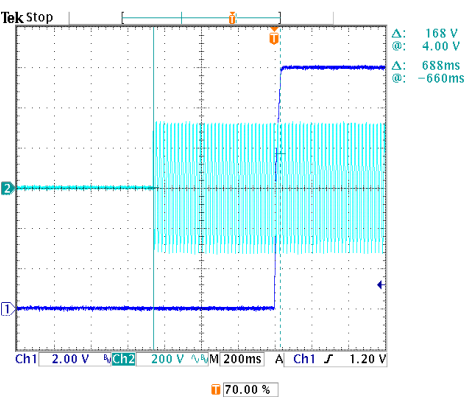
INPUT=230VAC/50HZ @ FULL LOAD

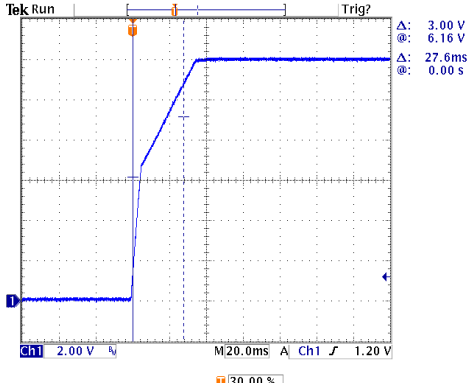
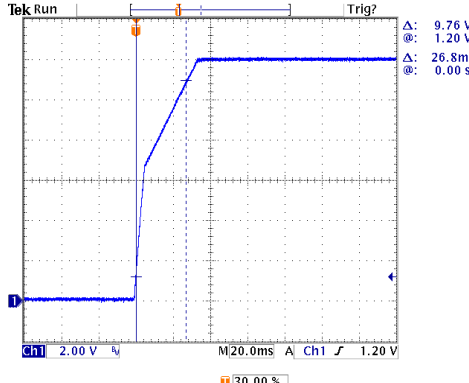
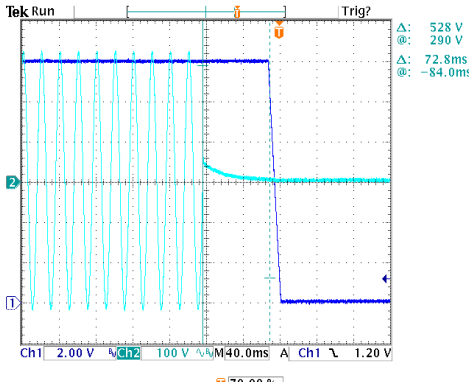
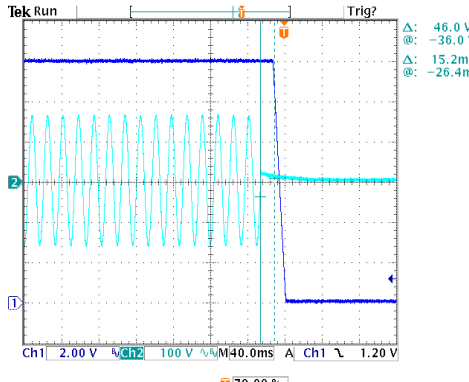
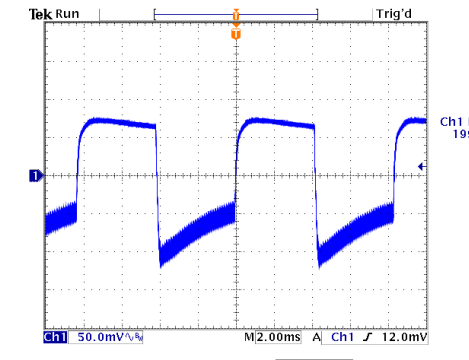
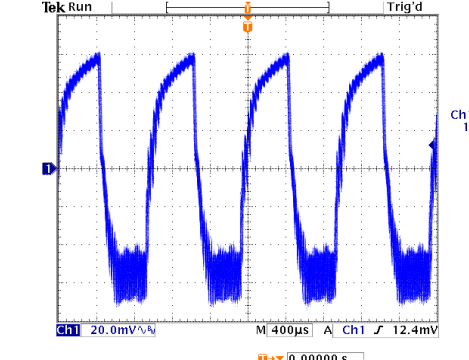
CH1 : Output Voltage CH2 : AC Input Voltage

INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

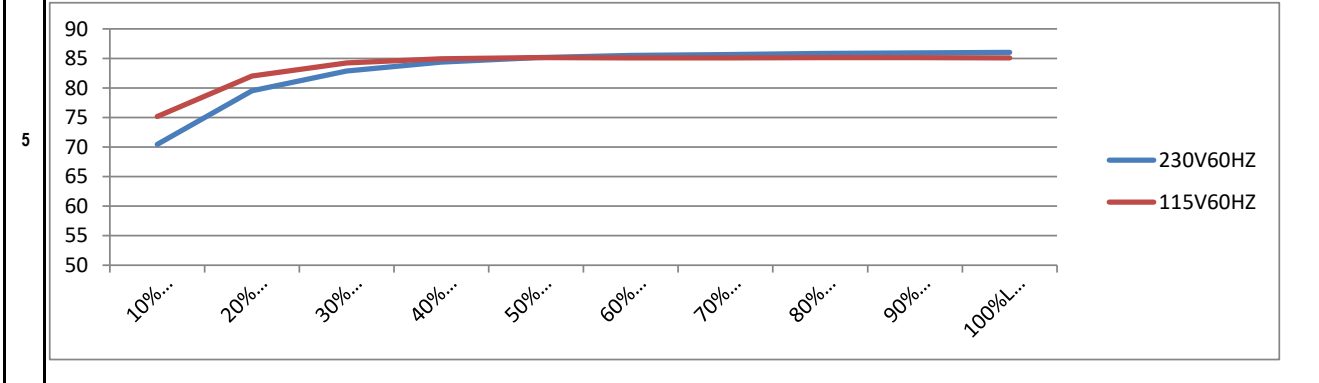
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<p>RISE TIME (MAX.)</p>	<p>230VAC : 80ms 115VAC : 80ms</p>	<p>I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA: 25°C</p>	<p>230VAC : 27.6ms 115VAC : 26.8ms</p>
<p>8</p>	<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> 
<p>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 : 72.8ms 115VAC : 15.2ms</p>
<p>10</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>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: (1). 199mv (2). 132mv unit:mVp-p</p> <p>FULL /MIN LOAD 50%DUTY / 120HZ</p>  <p>FULL /MIN% LOAD 50%DUTY / 1KHZ</p> 

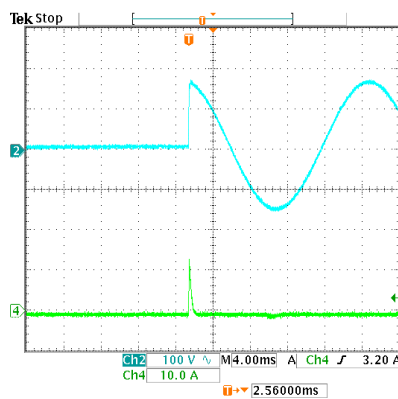
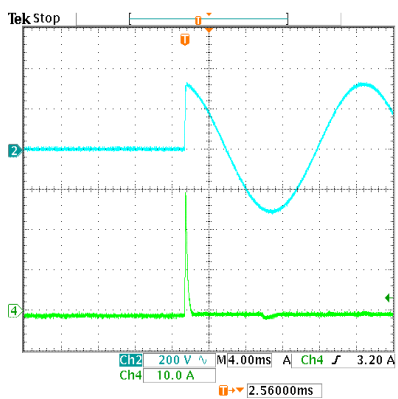
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC ~ 277VAC 120VDC ~ 390VDC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	72.0VAC ~ 277VAC 101.81VDC ~ 390VDC
			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= 0.13A / 230VAC I= 0.24A / 115VAC
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P: 230VAC O/P: MIN LOAD TA: 25°C	< 0.105 W
	EFFICIENCY (TYP.)	85.0%	I/P: 230VAC O/P: FULL LOAD TA: 25°C	86.028 %



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= 29.4A / 230VAC I= 12.8A / 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	125.60% 277VAC 125.60% 230VAC 123.68% 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	14.20V ~ 16.20V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA: 25°C	14.80V 277VAC 14.80V 230VAC 14.80V 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). 528.00V (2). 404.00V (3). 526.00V
2	O/P Diode	D100 Rated: 100V 10.0A	I/P: 280VAC  VDS : O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	D100 VDS : (1). 65.40V (2). 58.00V (3). 65.20V
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). 348.00V (2). 348.00V (3). 348.00V
4	Control IC	U1 Rated: 35V (max) 9V (min)	I/P: 280VAC O/P: (1) Full Load (2) Output Short Change (4) Low Line No Load Vo(min) Ta: 25°C	U1 (1). 21.50V (2). 21.50V (3). 21.50V (5). 21.50V
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). 498.00V (2). 496.00V

**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: 2.04mA 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	BS EN/EN55032(CISPR32), CNS13438 CLASS B	I/P: 230VAC /50HZ O/P: FULL LOAD / 50% LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032(CISPR32), CNS13438 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 Ta</th> <th>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></td><td>68.4°C</td></tr> <tr><td>2</td><td>C5</td><td>52.6°C</td><td></td><td>77.5°C</td></tr> <tr><td>3</td><td>Q1</td><td>71.4°C</td><td></td><td>96.8°C</td></tr> <tr><td>4</td><td>T1 PRI</td><td>68.6°C</td><td></td><td>92.6°C</td></tr> <tr><td>5</td><td>T1 SEC</td><td>73.5°C</td><td></td><td>97.0°C</td></tr> <tr><td>6</td><td>C40</td><td>54.5°C</td><td></td><td>79.4°C</td></tr> <tr><td>7</td><td>C105</td><td>73.7°C</td><td></td><td>96.3°C</td></tr> <tr><td>8</td><td>D100</td><td>87.8°C</td><td></td><td>111.2°C</td></tr> <tr><td>9</td><td>C106</td><td>56.9°C</td><td></td><td>80.6°C</td></tr> <tr><td>10</td><td>LF101</td><td>58.8°C</td><td></td><td>82.7°C</td></tr> <tr><td>11</td><td>U1</td><td>50.2°C</td><td></td><td>75.0°C</td></tr> <tr><td>12</td><td>BD1</td><td>54.4°C</td><td></td><td>79.0°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT Ta	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	
NO.	Position	ROOM AMBIENT Ta	23.1°C	HIGH AMBIENT Ta: 48.5°C																																																																	
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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																																																																	
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	3724.3K hrs min. Telcordia SR-332 (Bellcore) ; 1166.1K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50°C O/P: FULL LOAD	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S01