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# TEST REPORT: HDR-100-48

## 100W Ultra Slim Step Shape DIN Rail

### ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Control Function Test

Component Stress Test

### ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

### ■ RELIABILITY TEST

ENVIRONMENT TEST

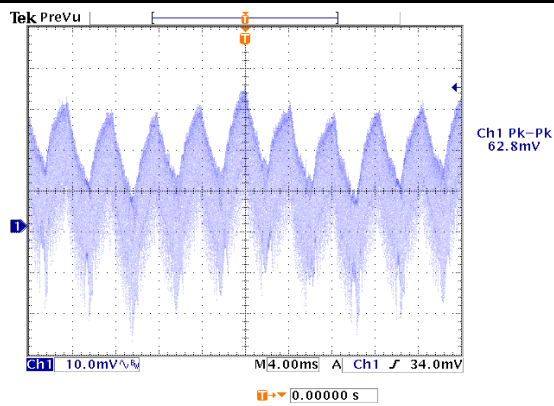
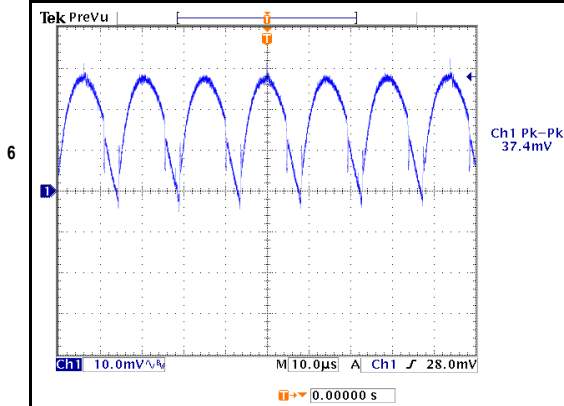


DESIGN VERIFY TEST  
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43.20V ~ 55.20V	I/P : 230VAC O/P: MIN LOAD TA : 25°C	CH1: 42.28V ~ 56.68V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.37% ~ -0.08%
3	LINE REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 277VAC O/P: FULL LOAD TA : 25°C	V1: 0.00% ~ -0.04%
4	LOAD REGULATION(MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.23% ~ -0.08%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 0.3 %
	RIPPLE & NOISE(Max)	V1 : 240 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 62.8 mVp-p

high frequency:

low frequency:



SET UP TIME (MAX.)

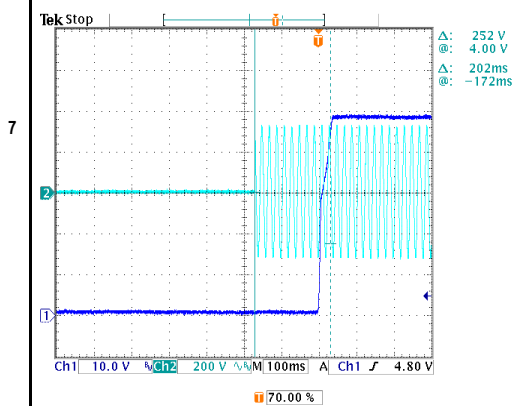
230VAC : 500ms  
115VAC : 500ms

I/P : 230VAC  
I/P : 115VAC  
O/P: FULL LOAD  
TA : 25°C

230VAC : 202ms  
115VAC : 196ms

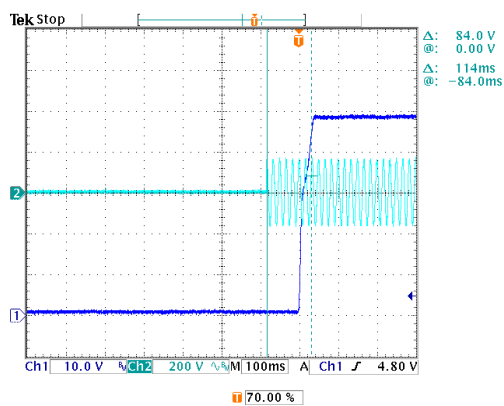
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

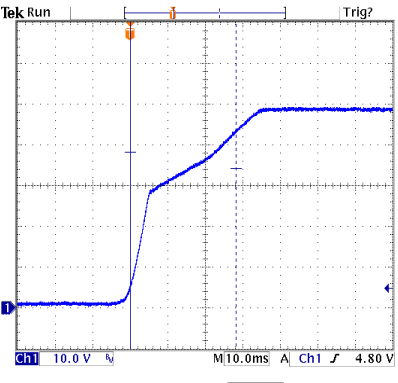
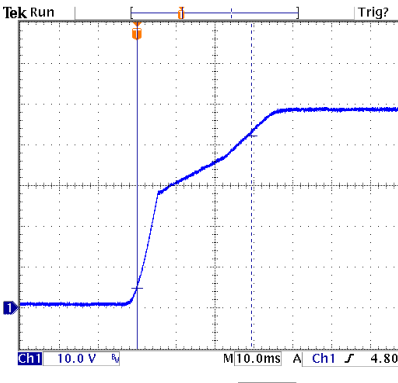
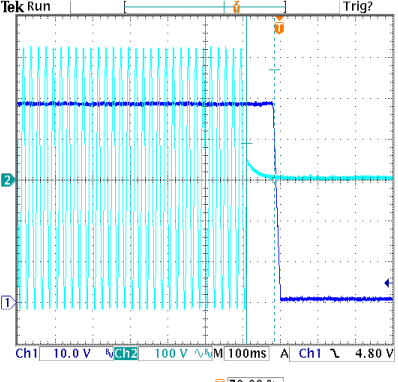
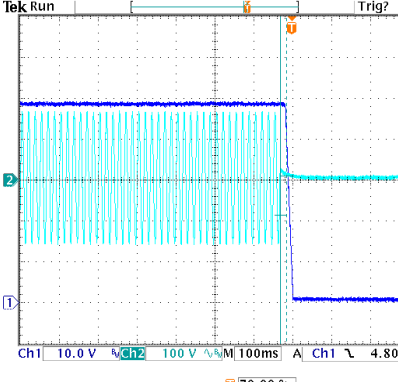
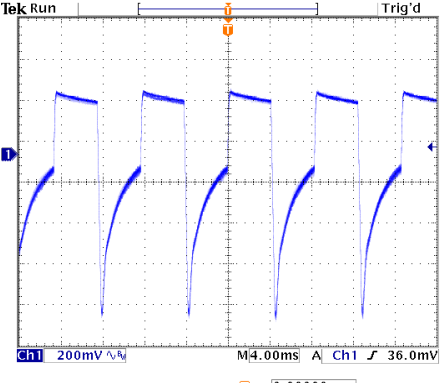
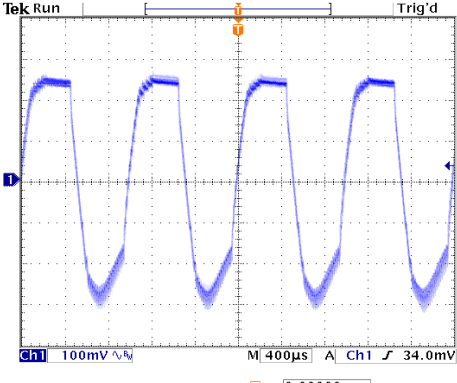


INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



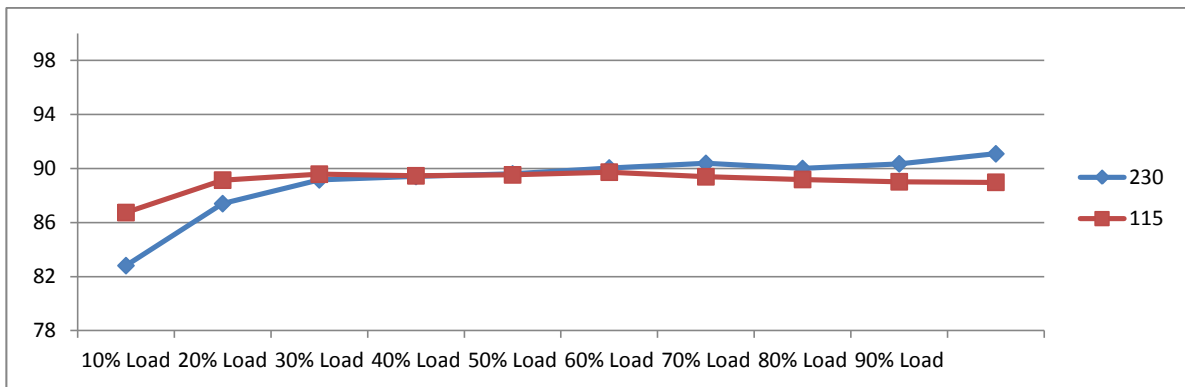


8	<b>RISE TIME (MAX.)</b>	230VAC : 60ms 115VAC : 60ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 28.2ms 115VAC : 29.4ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	<b>HOLD UP TIME (TYP.)</b>	230VAC : 30ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 74.0ms 115VAC : 16.0ms
	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	<b>DYNAMIC LOAD</b>	V1 : 4800 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). 1110mv (2). 568mv 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.)	1.6A / 230VAC 3A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.736A / 230VAC I= 1.34A / 115VAC
5	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.2202 W
	EFFICIENCY (TYP.)	90.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	91.34 %



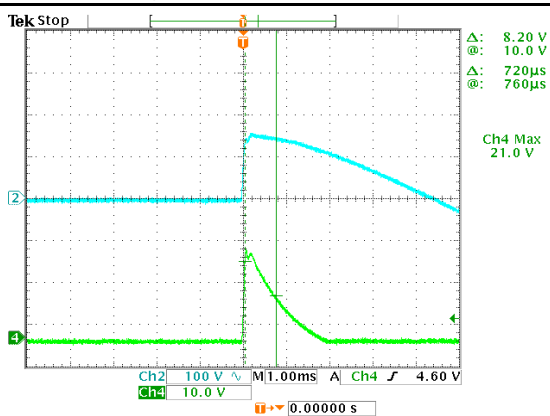
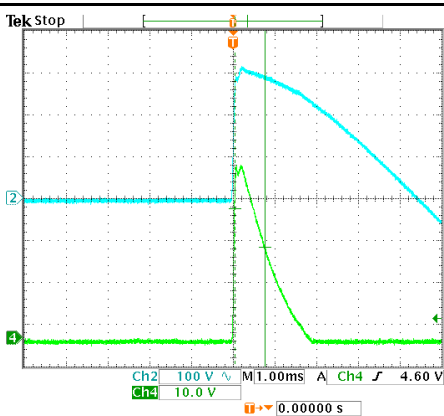
7	INRUSH CURRENT (TYP.)	70A / 230VAC 35A / 115VAC * COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 41.2A / 230VAC I= 21.0A / 115VAC T50= 720.0us / 230VAC

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)



8



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	102% ~ 110%	I/P: 277VAC I/P: 230VAC I/P: 100VAC O/P: TESTING  TA : 25°C	108.90% 277VAC 108.90% 230VAC 108.90% 100VAC  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	56.50V ~ 64.80V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA : 25°C	59.88V 277VAC 60.07V 230VAC 60.41V 85VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 277VAC I/P: 85VAC O/P: FULL LOAD	O.T.P. Active Shut down Re- power ON
4	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 : 650V 11.0A	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). 518.00V (2). 422.00V (3). 516.00V
2	O/P MOSFET	Q100 Rated : 300V 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). 273.00V (2). 209.00V (3). 272.00V
3	Input Capacitor	C5 Rated : 180uf 420V	I/P : 280VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change (4)Full Load Continue Ta : 25°C	(1). 374.00V (2). 382.00V (3). 376.00V (4). 374.00V
4	Control IC	U1 Rated : 35V (max) 0V (min)  U200 Rated : 38V (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	U1 U200 (1). 19.90V 19.20V (2). 12.10V 1.51V (3). 12.20V 3.30V (4). 19.90V 18.50V (5). 19.30V 17.90V
6	Clamp Diode	D5 Rated : 1000V 2.0A	I/P : 280VAC O/P : (1)Dynamic Load Full/Min Load (2)Full load continue Ta : 25°C	(1). 474.00V (2). 470.00V



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: 2.55mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P: 600VDC 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-100-24																																																																						
		1. ROOM AMBIENT BURN-IN : 1HRS																																																																						
		IP: 230VAC O/P: 100% LOAD TA= 19.2°C																																																																						
		2. HIGH AMBIENT BURN-IN : 1HRS																																																																						
		IP: 230VAC O/P: 100% LOAD TA= 47.8°C																																																																						
			<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=19.2°C</th> <th>HIGH AMBIENT Ta=47.8°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>40.7°C</td><td>68.4°C</td></tr> <tr><td>2</td><td>LF2</td><td>48.8°C</td><td>76.9°C</td></tr> <tr><td>3</td><td>BD1</td><td>49.3°C</td><td>78.6°C</td></tr> <tr><td>4</td><td>ZNR1</td><td>38.3V</td><td>67.0°C</td></tr> <tr><td>5</td><td>C5</td><td>48.2°C</td><td>77.4°C</td></tr> <tr><td>6</td><td>C40</td><td>55.3°C</td><td>83.3°C</td></tr> <tr><td>7</td><td>T1</td><td>73.5°C</td><td>99.0°C</td></tr> <tr><td>8</td><td>Q1</td><td>55.9°C</td><td>86.1°C</td></tr> <tr><td>9</td><td>Q100</td><td>82.3°C</td><td>108.7°C</td></tr> <tr><td>10</td><td>C105</td><td>66.7°C</td><td>92.9°C</td></tr> <tr><td>11</td><td>C106</td><td>66.7°C</td><td>93.7°C</td></tr> <tr><td>12</td><td>L101</td><td>75.7°C</td><td>100.7°C</td></tr> <tr><td>14</td><td>U1</td><td>62.7V</td><td>89.8°C</td></tr> <tr><td>15</td><td>D5</td><td>59.3°C</td><td>88.3°C</td></tr> <tr><td>16</td><td>D40</td><td>57.5°C</td><td>85.6°C</td></tr> <tr><td>17</td><td>RTH2</td><td>48.3°C</td><td>76.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=19.2°C	HIGH AMBIENT Ta=47.8°C	1	LF1	40.7°C	68.4°C	2	LF2	48.8°C	76.9°C	3	BD1	49.3°C	78.6°C	4	ZNR1	38.3V	67.0°C	5	C5	48.2°C	77.4°C	6	C40	55.3°C	83.3°C	7	T1	73.5°C	99.0°C	8	Q1	55.9°C	86.1°C	9	Q100	82.3°C	108.7°C	10	C105	66.7°C	92.9°C	11	C106	66.7°C	93.7°C	12	L101	75.7°C	100.7°C	14	U1	62.7V	89.8°C	15	D5	59.3°C	88.3°C	16	D40	57.5°C	85.6°C	17	RTH2	48.3°C	76.7°C	
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230VAC O/P : 105.0% 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 : 285VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03% /°C(0~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.02% /°C(0~50°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°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 : 16 CYCLE 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 3sec ; turn off 1sec @ 15cycle Full Load burn in@ 1cycle		TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60min 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°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50°C LIFE TIME	(1). 128860 HRS (2). 25474 HRS (3). 48115 HRS (4). 94380 HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 856.5K hrs min. MIL-HDBK-217F (25°C)		
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life):	30000HRS @ TA 50°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014