



Test Report: LRS-200-24

200W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY TEST

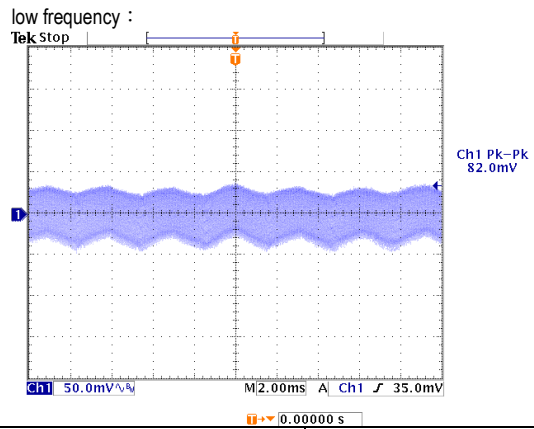
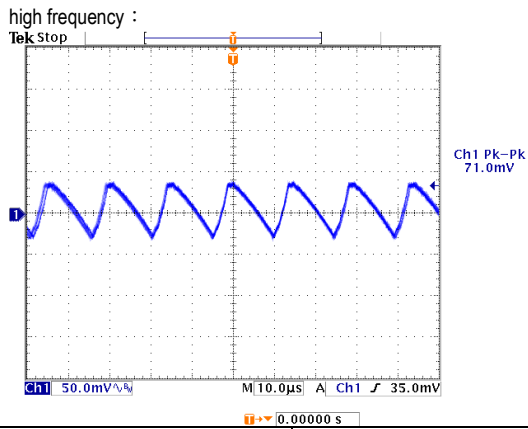
■ RELIABILITY TEST

ENVIRONMENT TEST

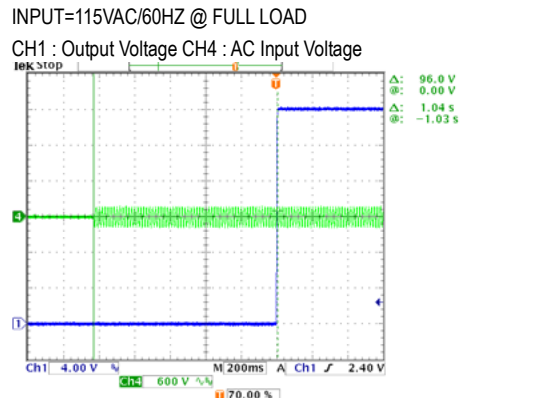
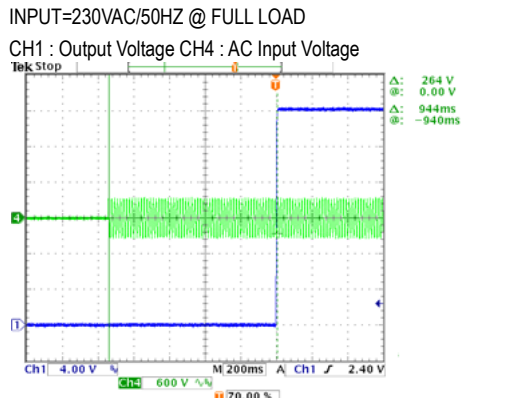
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6~ 28.8V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	21.329V~30.081V/230VAC 21.274V~30.073V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0%~ 1.0%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.04%~ 0.04%
3	LINE REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.02%~-0.02%
4	LOAD REGULATION(Max)	V1:-0.5%~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.0%~ 0%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 82.0mVp-p



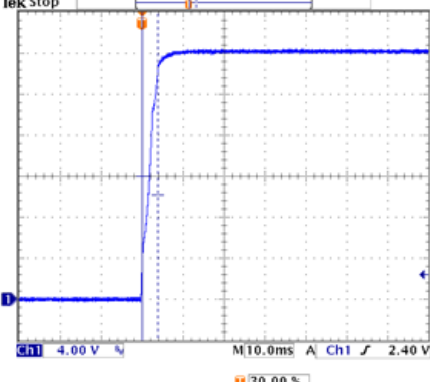
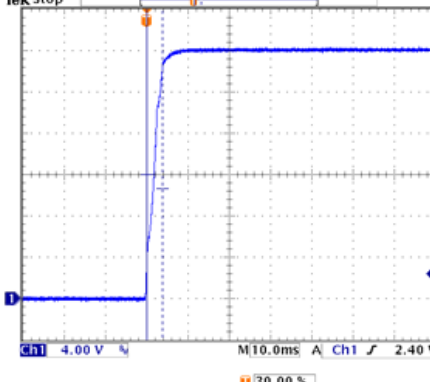
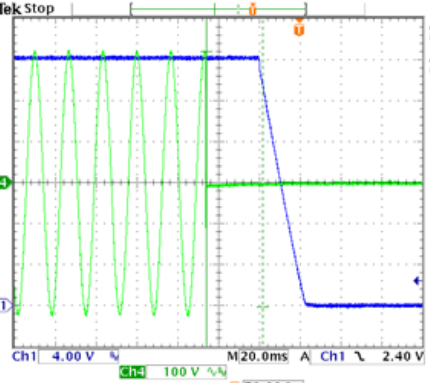
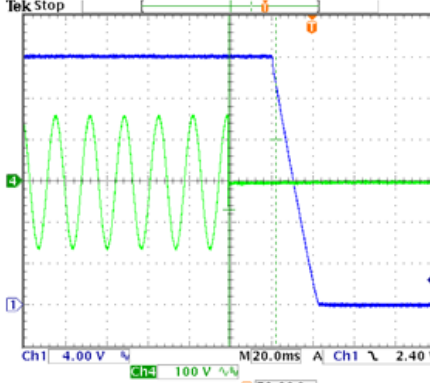
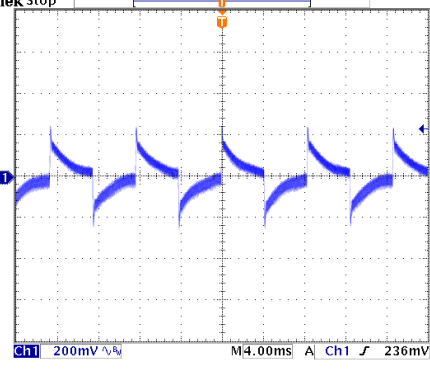
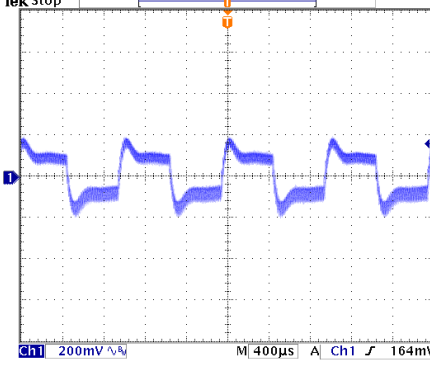
7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 944ms 115VAC/ 1042ms
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200W Single Output Switching Power Supply

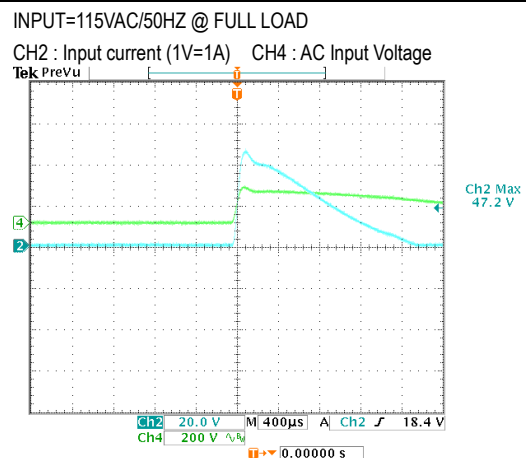
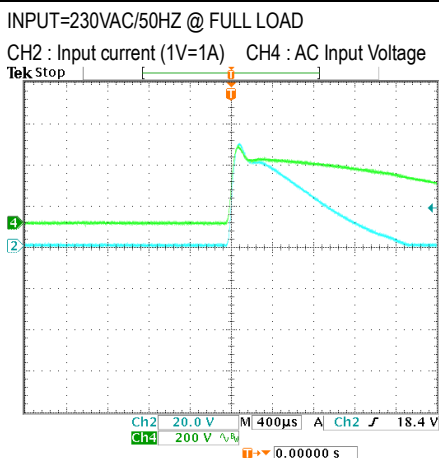
LRS-200 series

8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 3.80ms 115VAC/3.80ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 		
9	HOLD UP TIME(Typ)	230VAC/ 16ms 115VAC/ 12ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 27.6ms 115VAC/ 22.8ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		
10	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	496mVp-p 388mVp-p
FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 		

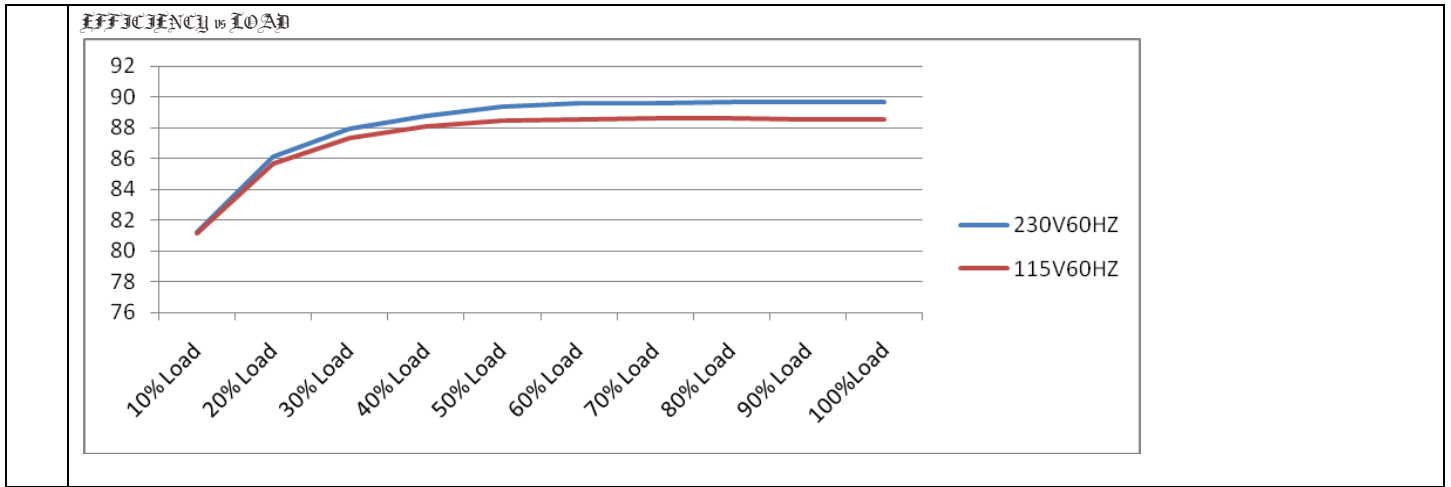


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 240 ~ 370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25°C	78V~132V 136V~264V 230VDC ~ 370VDC(switch on 230VAC)
			I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 180 VAC ~264 VAC 90 VAC ~132 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 2.2A 115V/ 4A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I=2.03A/ 230VAC I=3.74A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.460 mA N-FG: 0.460 mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.57W < 0.52 W
6	INRUSH CURRENT(Typ)	230V/ 60A 115V/ 60A COLD START	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I=50.0A/ 230VAC I=47.2A/ 115VAC



7	EFFICIENCY(Typ)	89.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.61%
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PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 140 %	I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	128.63%/ 230VAC 127.61%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH: 28.8 V~ 33.6 V	30.7V/ 230VAC 31.8V/115VAC O/P: MIN LOAD Ta:25°C	Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Hiccup mode, recovers automatically after fault condition is removed
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE Hiccup mode, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 13 A/600V	I/P: High-Line +3V =267V O/P: (1) Full Load Turn on (2) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	(1)436V (2)440V (3)440V
2	Diode Peak Voltage	Q102 Rated 20 A/150V Q103 Rated 20A/200V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output Short Ta:25°C	Q102: (1)118V (2)122V Q103: (1)170V (2)160V
3	Input Capacitor Voltage	C5 Rated: 330 μ / 200V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off	(1)180V (2)186V



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			(2) Min load input on /Off (3) Full Load /Min load Change Ta:25°C	(3)181V
4	Control IC Voltage Test	PWM IC U1 Rated 28 V (MAX.) 10V (MIN.)	I/P:High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output short (3) No load VR (min) Ta:25°C	U1 (1) 20.5V (2) 20.3V (3) 20.5V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P: 2. 431mA I/P-FG: 3. 34mA O/P-FG:2. 72 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	22mΩ

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																												
1	TEMPERATURE RISE TEST	MODEL: LRS-200-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=24.6°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=48.4°C																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 24.6 °C</th> <th>HIGH AMBIENT Ta=48.4 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U1</td><td>58.3°C</td><td>79.7°C</td></tr> <tr><td>2</td><td>LF1</td><td>50.5°C</td><td>73.3°C</td></tr> <tr><td>3</td><td>BD1</td><td>54.0°C</td><td>75.8°C</td></tr> <tr><td>4</td><td>C36</td><td>62.8°C</td><td>86.5°C</td></tr> <tr><td>5</td><td>C5</td><td>59.3°C</td><td>80.1°C</td></tr> <tr><td>6</td><td>C6</td><td>60.1°C</td><td>80.6°C</td></tr> <tr><td>7</td><td>T2</td><td>59.2°C</td><td>81.1°C</td></tr> <tr><td>8</td><td>Q1</td><td>64.5°C</td><td>88.4°C</td></tr> <tr><td>9</td><td>Q2</td><td>60.4°C</td><td>83.9°C</td></tr> <tr><td>10</td><td>T1coil</td><td>85.4°C</td><td>108.6°C</td></tr> <tr><td>11</td><td>RTH3</td><td>79.2°C</td><td>102.2°C</td></tr> <tr><td>12</td><td>L100</td><td>84.3°C</td><td>108.8°C</td></tr> <tr><td>13</td><td>C106</td><td>49.5°C</td><td>73.9°C</td></tr> <tr><td>14</td><td>Q102</td><td>68.0°C</td><td>89.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 24.6 °C	HIGH AMBIENT Ta=48.4 °C	1	U1	58.3°C	79.7°C	2	LF1	50.5°C	73.3°C	3	BD1	54.0°C	75.8°C	4	C36	62.8°C	86.5°C	5	C5	59.3°C	80.1°C	6	C6	60.1°C	80.6°C	7	T2	59.2°C	81.1°C	8	Q1	64.5°C	88.4°C	9	Q2	60.4°C	83.9°C	10	T1coil	85.4°C	108.6°C	11	RTH3	79.2°C	102.2°C	12	L100	84.3°C	108.8°C	13	C106	49.5°C	73.9°C	14	Q102	68.0°C	89.7°C
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		NO	Position	ROOM AMBIENT Ta= 24.6 °C	HIGH AMBIENT Ta=48.4 °C
		15	Q103	71.7°C	93.7°C
		16	C201	56.7°C	80.2°C
		17	C200	64.6°C	88.1°C
		18	L101	65.9°C	88.5°C
		19	RTH1	86.7°C	106.9°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)		I/P: 230 VAC O/P: 125% LOAD Ta: 25°C	TEST: OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P: 264VAC/100VAC O/P: 100 % LOAD Ta= -25 °C	TEST: OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE		I/P: 272 VAC O/P: FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST: OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50°C)		I/P: 230 VAC O/P: FULL LOAD	±0.005%/°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			OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°C ~ 70°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			OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (3) Sweep Time: 10min/sweep cycle (4) Acceleration: 5G (5) Test Time: 60min 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 °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) 553675HRS (2) 93919HRS (3) 138388HRS (4) 183951HRS
10	MTBF	2346.6K hrs min. Telcordia SR-332 (Bellcore) ; 279.4Khrs min. MIL-HDBK-217F (25°C)			
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C			

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ