Test Report: DDR-240B-48

240W DIN Rail Type DC-DC Converter

■ 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

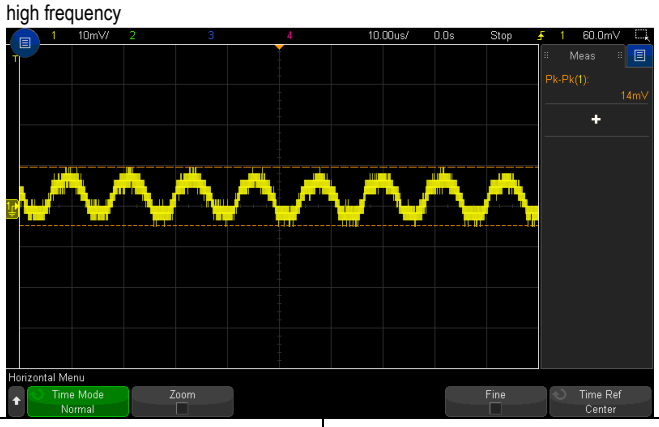
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

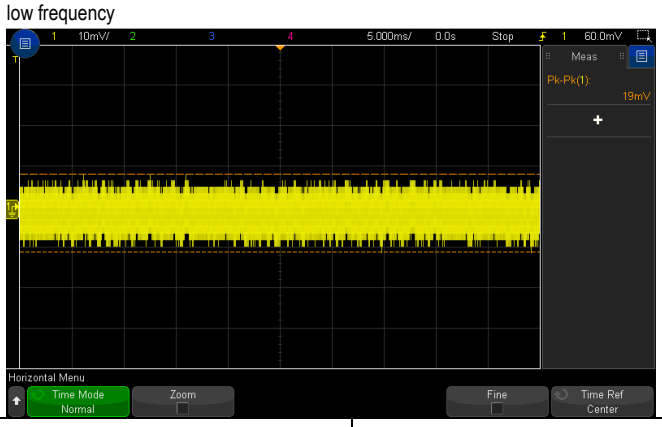
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 48V~56 V	I/P:NORMAL VOLTAGE O/P:MIN LOAD TA:25℃	CH1：45.95V~ 58.13V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: -1%~1 %	I/P: 16.8VDC /33.6VDC O/P:FULL/ MIN. LOAD Ta:25 ~	V1: -0.1%~ 0.05%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5%	I/P: 16.8 VDC /33.6VDC O/P:FULL LOAD Ta:25 ~	V1: 0%~ 0.03%
4	LOAD REGULATION (Max)	V1: -1 %~ 1 %	I/P: 24VDC O/P:FULL ~MIN LOAD Ta:25 ~	V1: -0.1%~ 0.05%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 24 VDC O/P:FULL LOAD Ta:25 ~	TEST:1.2%
6	RIPPLE & NOISE (Max)	V1:100mVp-p	I/P:24VDC O/P:FULL LOAD Ta:25 ~	V1: 19mVp-p

high frequency



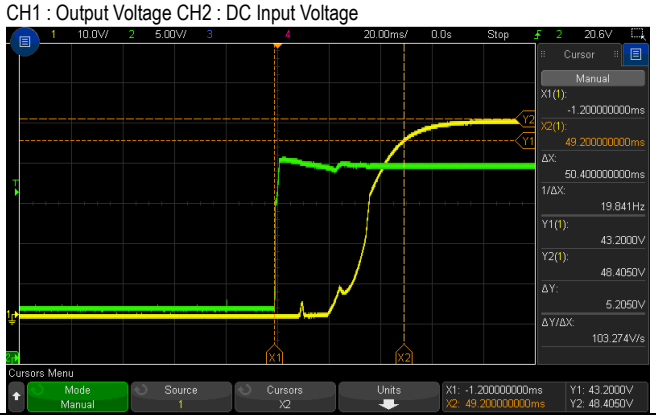
low frequency

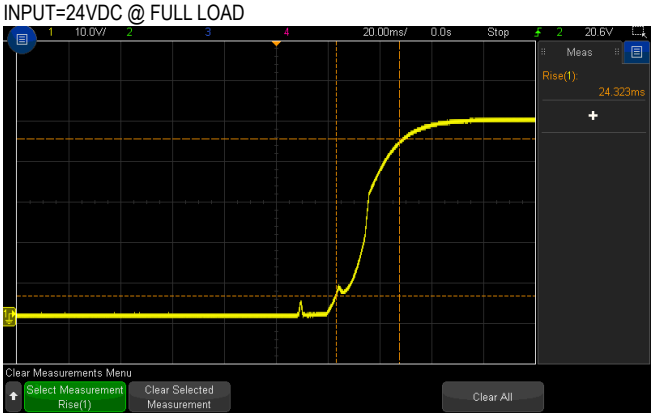
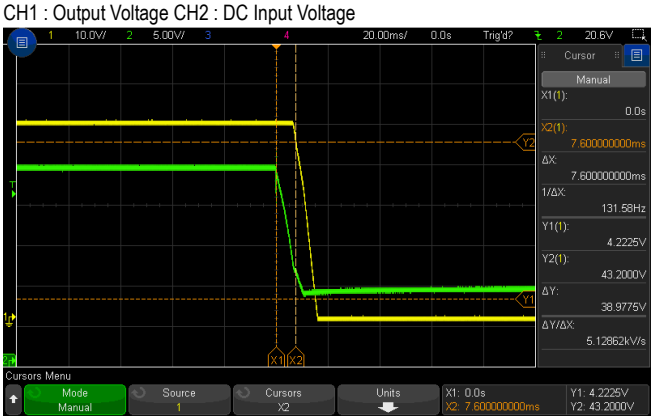
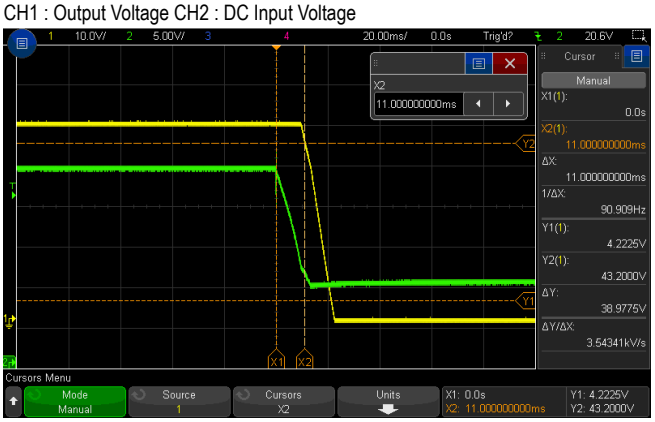
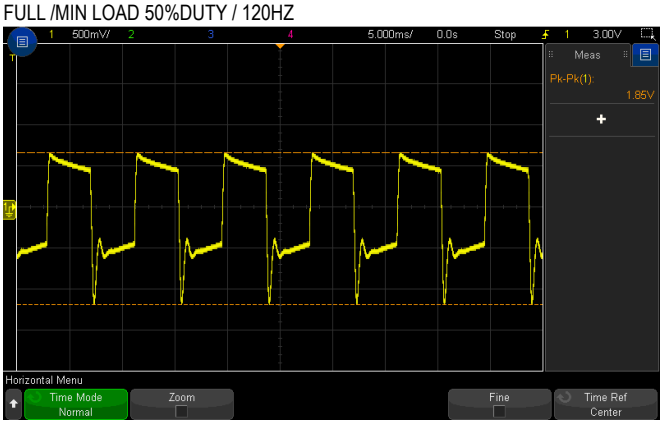
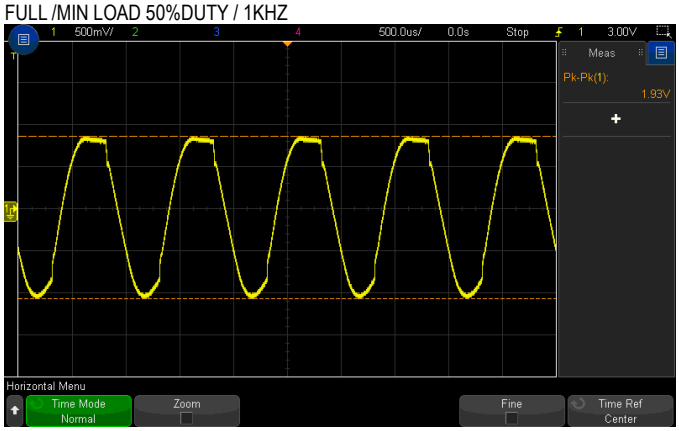


7	SET UP TIME (Max)	24VDC/ 500 ms	I/P: 24VDC O/P:FULL LOAD Ta:25 ~	24VDC/ 50.4ms

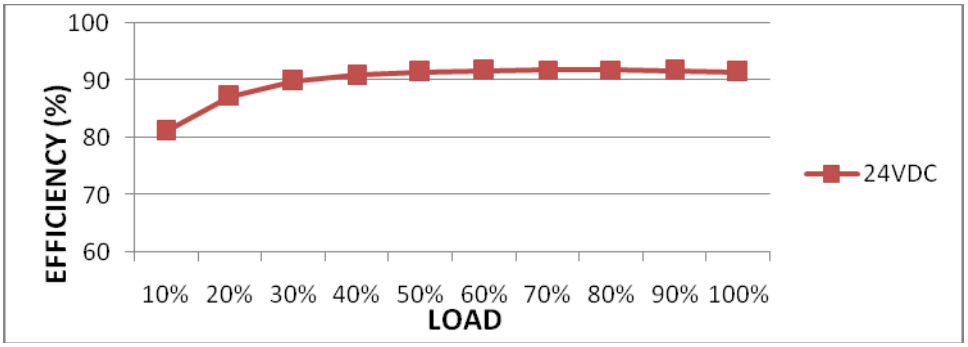
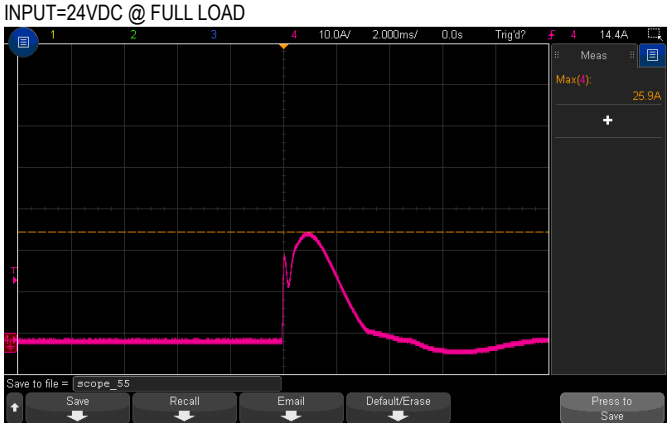
INPUT=24VDC @ FULL LOAD

CH1 : Output Voltage CH2 : DC Input Voltage



8	RISE TIME (Max)	24VDC/ 60ms	I/P: 24 VDC O/P:FULL LOAD Ta:25 ~	24VDC/ 24.32ms
	INPUT=24VDC @ FULL LOAD 			
9	HOLD UP TIME (TYP)	24VDC/6ms 24VDC/10ms@70%LOAD	I/P: 24 VDC O/P:F ULL LOAD Ta:25 ~	24VDC/ 7.6ms 24VDC/ 11.0ms@70%LOAD
	INPUT=24VDC @ FULL LOAD CH1 : Output Voltage CH2 : DC Input Voltage 	INPUT=24VDC @ 70% LOAD CH1 : Output Voltage CH2 : DC Input Voltage 	
10	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 24VDC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25 ~	 1850mVp-p 1930mVp-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	16.8VDC~ 33.6VDC	I/P:TESTING O/P:FULL LOAD Ta:25 ~	15.867V~ 33.6V
			I/P: LOW-LINE-0.2=16.6V HIGH-LINE+3V=36.6V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST：OK
2	INPUT CURRENT(TYP)	24VDC/11.2 A	I/P: 24VDC O/P:FULL LOAD Ta:25 ~	I =10.89A/24VDC
3	EFFICIENCY(TYP)	90%	I/P: VDC O/P:FULL LOAD Ta:25 ~	90.92%
	EFFICIENCY vs LOAD 			
4	INRUSH CURRENT(TYP)	24VDC/30 A COLD START	I/P:24 VDC O/P:FULL LOAD Ta:25 ~	I =25.9A/ 24VDC
	INPUT=24VDC @ FULL LOAD 			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~135 %RATED OUTPUT POWER	I/P: 33.6VDC I/P: 24 VDC I/P: 16.8 VDC O/P:TESTING Ta:25 ~	127.5%/ 33.6 VDC 126.9%/ 24 VDC 127.0%/ 16.8 VDC PROTECTION TYPE Normally works within 150% rated output power for more than 3 seconds and then constant current protection 105~135% rated output power with auto-recovery
2	OVER VOLTAGE PROTECTION	CH: 57.6V~ 65.0V	I/P: 33.6 VDC I/P: 24VDC I/P: 16.8 VDC O/P:MIN LOAD Ta:25 ~	62.1V/ 33.6 VDC 62.1V/ 24 VDC 62.5V/ 16.8 VDC PROTECTION TYPE Shut down O/P voltage,re-power on to recover
3	OVER TEMPERATURE PROTECTION	SPEC: NO DAMAGE Shut down o/p voltage, re-power on to recover	I/P:24VDC O/P: FULL LOAD Ta:25 ~	O.T.P. PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P:33.6VDC O/P: FULL LOAD Ta:25 ~	NO DAMAGE PROTECTION TYPE constant current protection 105~135% rated output power with auto-recovery
5	INPUT REVERSE	POWER OK	I/P: 33.6VDC O/P: NO LOAD Ta:25 ~	NO DAMAGE

FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	DC OK RELAY CONTACT RATINGS (max.)	30VDC/1A resistive load	I/P: 30VDC O/P:30 Ω Ta:25℃	TEST：OK
2.	CURRENT SHARING	Up to 960W (3+1 units)	I/P: 24VDC O/P:960W Ta:25℃	TEST：OK
3	REMOTE ON-OFF CONTROL	TB1 PIN2,4 Open or 4~10VDC Power supply ON Short or 0~0.8VDC Power supply OFF	I/P: 24VDC O/P:Min Load Ta:25℃	TEST：OK Pin=0.082W

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q11 Rated : 100 V	I/P:High-Line +3V =36.6V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Full Load Continue Ta:25 ~	 VDS: (1)60.6V (2)47.0V (3)52.6V

2	Clamp MOSFET (D to S) or (C to E) Peak Voltage	Q 6 Rated : 100V	I/P:High-Line +3V =36.6V DC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Full load Continue Ta:25 ~	VDS: (1) 58.2V (2) 38.9V (3)52.6 V
3	Diode Peak Voltage	D100 Rated : 20A/ 400V D102 Rated : 20A/ 400V	I/P:High-Line +3V =36.6V DC ON/OFF O/P: (1)Full Load (2)Output Short (3)Full Load Continue Ta:25 ~	D100: D102: (1)275V (1)323V (2)68.7V (2)267V (3)93.6V (3)331V
4	Input Capacitor Voltage	C7 Rated [illegible] V	I/P:High-Line +3V =36.6V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta:25 ~	(1) 34.2V (2)34.8V (3)34.2V (4)34.2v
5	Control IC Voltage Test	PWM IC U1 Rated -0.3V~16V	I/P:High-Line +3V =36.6V DC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR [illegible].LOW LINE Ta:25 ~	(1) 14.0V (2) 7.9V (3) 14.0V (4) 13.5V (5) 9.3V

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P:4KVDC/min I/P-FG:2.5 KVDC/min O/P-FG:0.71KVDC/min	I/P-O/P: 4.4KVDC/min I/P-FG: 3 KVDC/min O/P-FG:0.85KVDC/min Ta:25 ~	I/P-O/P: 0 mA I/P-FG: 0 mA O/P-FG: 0 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 ~	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 ~	**10mΩ**

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	☑EN55032 ; EN55011 ; CLASS A ☑CLASS B	I/P:24VDC O/P:FULL LOAD Ta:25 ~	☑PASS ; FAIL Test by certified Lab

2	CONDUCTION	☑EN55032 ; EN55011 ; CLASS A ☑CLASS B	I/P:24VDC O/P:FULL LOAD Ta:25 ~	☑PASS ; FAIL Test by certified Lab
3	E.S.D	EN61000-4-2 □Din rail Model : AIR：8KV / Contact：6KV	I/P:24VDC O/P:FULL LOAD Ta:25 ~	☑CRITERIA A ; CRITERIA B
4	E.F.T	EN61000-4-4 ; INDUSTRY INPUT: 2KV	I/P: 24VDC O/P:FULL LOAD Ta:25 ~	☑CRITERIA A ; CRITERIA B
5	SURGE	IEC61000-4-5 ; INDUSTRY L-N :1KV L,N-FG:2KV	I/P: 24VDC O/P:FULL LOAD Ta:25 ~	☑CRITERIA A ; CRITERIA B
6	Test by certified Lab Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL DDR-240B-24 1. ROOM AMBIENT BURN-IN 2 HRS I/P 24VDC O/P FULL LOAD Ta= 24.2 ~ 2. HIGH AMBIENT BURN-IN 2 HRS I/P 24VDC O/P FULL LOAD Ta= 50.8 ~		

NO	Position	ROOM AMBIENT Ta= 24.2 ~	HIGH AMBIENT Ta= 50.8 ~
1	LF1	74.0 ~	105.3 ~
2	Q3	63.0 ~	92.2 ~
3	LF100	77.8 ~	107.8 ~
4	LF2	71.7 ~	103.8 ~
5	T1	72.3 ~	102.7 ~
6	T2	75.9 ~	106.8 ~
7	L100	77.6 ~	108.8 ~
8	C3	66.5 ~	98.8 ~
9	D100	90.0 ~	120.0 ~
10	D105	83.2 ~	116.2 ~
11	C103	75.4 ~	106.7 ~
12	C104	72.9 ~	103.8 ~
13	Q6	67.8 ~	98.8 ~
14	Q12	71.1 ~	102.1 ~
15	C21	68.0 ~	99.0 ~
16	R43	61.9 ~	90.8 ~
17	U1	72.7 ~	102.8 ~
18	C109	68.2 ~	97.9 ~
19	TSW1	79.8 ~	108.0 ~

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P 24 VDC O/P 125 LOAD Ta 25 ~	TEST OK

<table>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P 21.6 VDC/ 33.6 VDC
O/P 100 LOAD
Ta= -43 ~</td><td>TEST OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 55 ~
NO DAMAGE</td><td>I/P 36.6 VDC
O/P FULL LOAD
Ta= 50 ~
HUMIDITY= 95 %R.H</td><td>TEST OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>±0.03 %(0~55 ~)</td><td>I/P 24 VDC
O/P FULL LOAD</td><td>±0.0079%%(0~50 ~)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
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： STATIC</td><td>TEST OK</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +55℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：16 CYCLE
5. Input/Output condition：24VDC/Full Load DC ON/OFF TEST
turn on 3sec；turn off 1sec@15cycle\ 24VDC/Full Load DC ON@1cycle</td><td>TEST OK</td></tr>
<tr><td>8</td><td>VIBRATION TEST</td><td colspan="2">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 ~
2 Din Rail
<table>
<tr><td></td><td>Displacement</td><td>Acceleration</td></tr>
<tr><td>2 (+3/-0) Hz up to 15Hz</td><td>±2.5mm</td><td>————</td></tr>
<tr><td>15Hz up to 50Hz</td><td>————</td><td>2.3g</td></tr>
<tr><td>Sweep rate</td><td colspan="2">Max 1 Octave/minute</td></tr>
</table></td><td>TEST TEST OK</td></tr>
<tr><td>9</td><td>CAPACITOR
LIFE CYCLE</td><td colspan="2">SUPPOSE C103 IS THE MOST CRITICAL COMPONENT
(1) I/P 24VDC O/P FULL LOAD Ta= 25 ~ LIFE TIME
(2) I/P 24VDC O/P FULL LOAD Ta= 50 ~ LIFE TIME
(3) I/P 24VDC O/P 75% LOAD Ta= 50 ~ LIFE TIME
(4) I/P 24VDC O/P 50% LOAD Ta= 50 ~ LIFE TIME</td><td>(1) 296685 HRS
(2) 37833.8 HRS
(3) 106068.1 HRS
(4) 246886.5 HRS</td></tr>
<tr><td>10</td><td>MTBF</td><td colspan="3">Conducted by Parts Stress Analysis Prediction
484.9K hrs min. Telcordia SR-332 (Bellcore) ; 189.9K hrs min. MIL-HDBK-217F (25 ~)</td></tr>
<tr><td>12</td><td>DMTBF/Accelerated Life Test</td><td colspan="3">Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50 ~</td></tr>
</table>

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010