



Test Report: PWM-120-12KN

120W PWM Output KNX LED Driver

■ 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

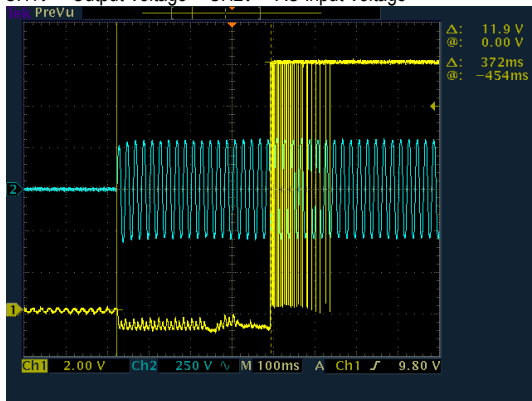
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM FREQUENCY	200~4000Hz	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	200~4000Hz
2	OVER/UNDERSHOOT TEST	<±5 %	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	<5 %
3	SET UP TIME(Max)	230VAC/ 500ms 115VAC/ 500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 372ms 115VAC/ 366ms

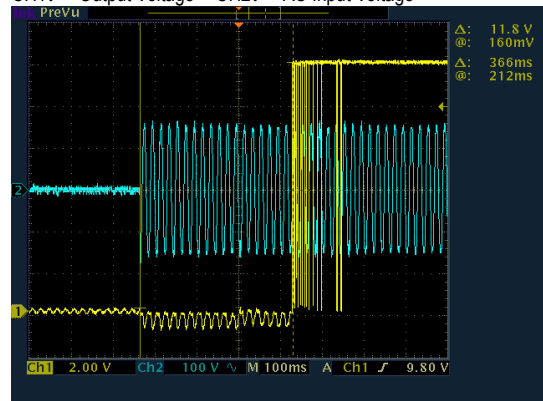
INPUT=230VAC/50HZ @ FULL LOAD

CH1: Output Voltage CH2: AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

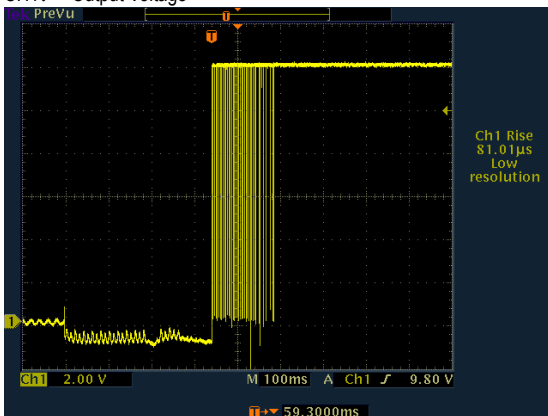
CH1: Output Voltage CH2: AC Input Voltage



4	RISE TIME (Max)	230VAC/ 80ms 115VAC/ 80ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/0.081ms 115VAC/0.081ms
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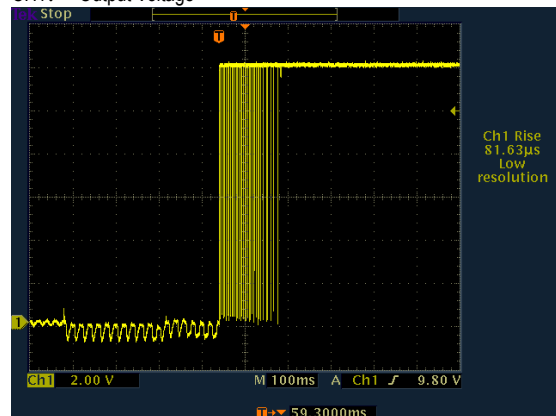
INPUT=230VAC/50HZ @ FULL LOAD

CH1: Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1: Output Voltage



120W PWM Output KNX LED Driver **PWM-120-KN series**

5	HOLD UP TIME(Typ)	230VAC/ 16ms 115VAC/ 16ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/23.2ms 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				

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	87V~305V
			I/P: LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P: FULL/NO LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 90 VAC ~305 VAC O/P: FULL~NO LOAD Ta: 25°C	TEST: OK
3	AC CURRENT	0.55A/277VAC 0.65A/230VAC 1.3A/115VAC	I/P: 277 VAC I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I=0.490A/ 277VAC I=0.571A/ 230VAC I=1.127A/ 115VAC
4	LEAKAGE CURRENT	< 0.25mA / 277VAC	I/P: 277 VAC O/P: NO LOAD Ta: 25°C	L-FG: 0.003 mA N-FG: 0.003 mA

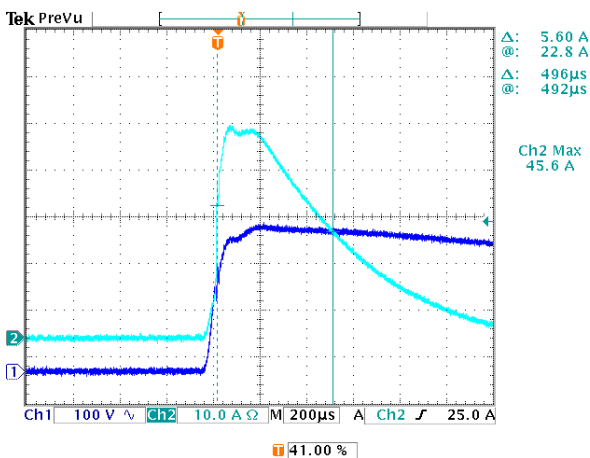


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5	STANDBY POWER CONSUMPTION	< 0.5W	I/P: 230VAC O/P: NO LOAD Ta: 25°C	0.173W
6	INRUSH CURRENT(Typ)	60A/230VAC Twidth =520 us measured at 50% Ipeak COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I=45.6A/ 230VAC Twidth =496us

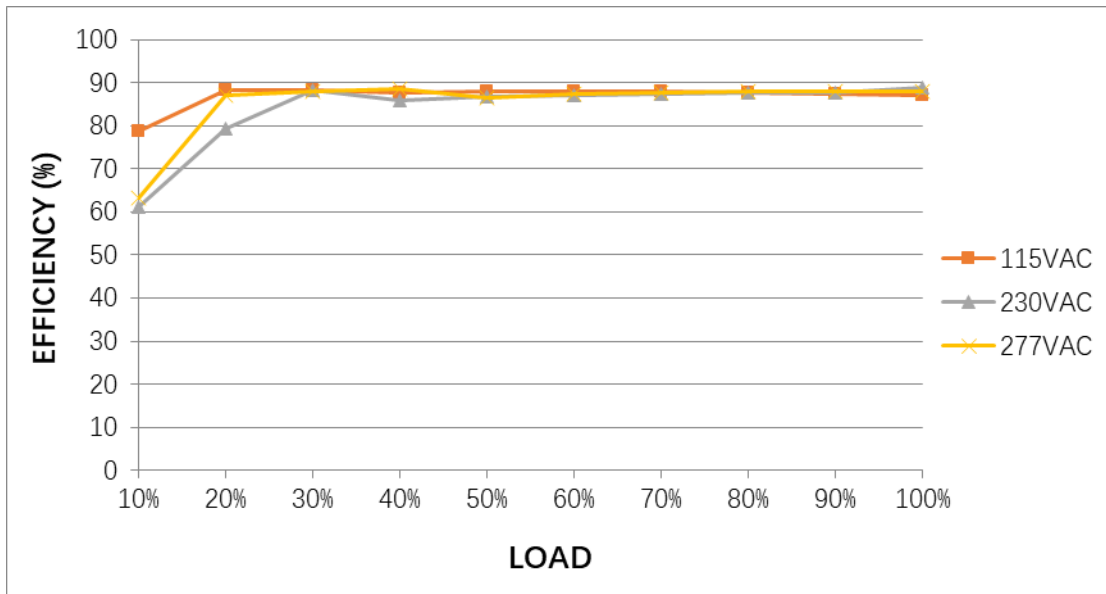
INPUT=230VAC/50HZ @ FULL LOAD

CH2: Input current CH1: AC Input Voltage



7	EFFICIENCY(Typ)	88.5%	I/P: 230VAC O/P: FULL LOAD Ta: 25°C	88.75%
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EFFICIENCY vs LOAD





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8	TOTAL HARMONIC DISTORTION	THD < 20% (@load ≥ 60% / 115VAC, 230VAC; @load ≥ 75% / 277VAC)	I/P: 115 VAC / 60% LOAD I/P: 230 VAC / 60% LOAD I/P: 277 VAC / 75% LOAD Ta: 25°C	THD: 5.94% @ 60% load / 115VAC THD: 14.36% @ 60% load / 230VAC THD: 16.93% @ 75% load / 277VAC																																												
<table border="1"> <caption>THD (%) vs LOAD</caption> <thead> <tr> <th>LOAD (%)</th> <th>115VAC (%)</th> <th>230VAC (%)</th> <th>277VAC (%)</th> </tr> </thead> <tbody> <tr><td>50%</td><td>7.5</td><td>16.5</td><td>22.5</td></tr> <tr><td>60%</td><td>6.0</td><td>14.5</td><td>19.5</td></tr> <tr><td>70%</td><td>5.0</td><td>12.5</td><td>17.5</td></tr> <tr><td>80%</td><td>4.5</td><td>11.5</td><td>15.5</td></tr> <tr><td>90%</td><td>4.0</td><td>10.5</td><td>14.5</td></tr> <tr><td>100%</td><td>3.8</td><td>9.5</td><td>13.0</td></tr> </tbody> </table>					LOAD (%)	115VAC (%)	230VAC (%)	277VAC (%)	50%	7.5	16.5	22.5	60%	6.0	14.5	19.5	70%	5.0	12.5	17.5	80%	4.5	11.5	15.5	90%	4.0	10.5	14.5	100%	3.8	9.5	13.0																
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9	POWER FACTOR	0.94 / 277VAC 0.96 / 230VAC 0.97 / 115VAC	I/P: 277 VAC I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	PF=0.951 / 277VAC PF=0.981 / 230VAC PF=0.997 / 115VAC																																												
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PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	108% ~ 130%	I/P: 230VAC O/P: TESTING Ta: 25°C	115.4% / 230VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	15V ~ 17V	I/P: 230VAC O/P: NO LOAD Ta: 25°C	16.83V / 230VAC Shut down o/p voltage, re-power on to recover



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3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Shut down o/p voltage, re-power on to recover

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 2 Rated 730V/10A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 702V (2) 716V (3) 672V
2	Diode Peak Voltage	Q101 Rated 75V/80A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 71.2V (2) 73.8V (3) 70.0V
3	Input Capacitor Voltage	C5 Rated 100u/ 450V	I/P: High-Line +3V =308 V O/P: (1) Full Load input on/off (2) NO load input on /Off (3) Full Load /NO load Change Ta: 25°C	(1) 446V (2) 440V (3) 448V
4	Control IC Voltage Test	U1 Rated 28V	I/P: High-Line +3V =308 V O/P: (1) Full Load input on/off (2) NO load input on /Off (3) Full Load /NO load Change Ta: 25°C	(1) 17.4V (2) 17.0V (3) 17.4V
5	PFC Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 600V/15A	I/P: High-Line +3V =308V O/P: (1) Full Load Turn on (2) Output Short (3) Full load continue Ta: 25°C	(1) 482V (2) 454V (3) 478V



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SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min	I/P-O/P: 4.125KVAC/min Ta: 25°C	I/P-O/P: 1.724mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500VDC Ta: 25°C	I/P-O/P: >9999MΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P: 230VAC/50HZ O/P: 60% / FULL LOAD Ta:25°C	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR: 8KV Contact: 4KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
6	SURGE	EN61000-4-5 INDUSTRY L-N: 2KV	I/P: 230 VAC/50HZ O/P: FULL LOAD Ta: 25°C	PASS
7	Test by certified Lab & Test Report Prepare			



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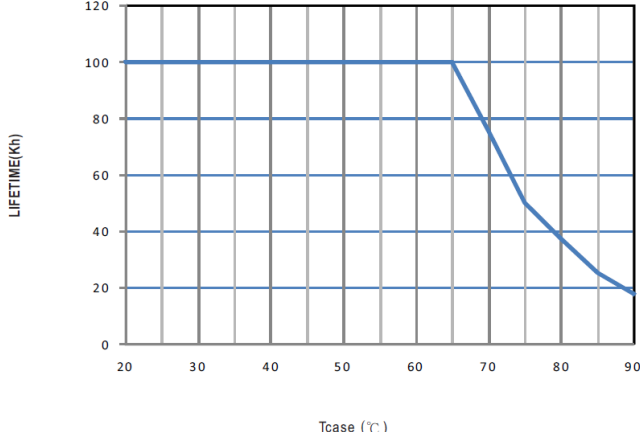
■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																				
1	TEMPERATURE RISE TEST	MODEL: PWM-120-12KN 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 25.9 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta= 44.8°C																																																																																						
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25.9 °C</th> <th>HIGH AMBIENT Ta=44.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>80.5°C</td><td>97.2°C</td></tr> <tr><td>2</td><td>L1</td><td>78.5°C</td><td>95.5°C</td></tr> <tr><td>3</td><td>Q1</td><td>85.5°C</td><td>102.7°C</td></tr> <tr><td>4</td><td>D6</td><td>85.7°C</td><td>103.2°C</td></tr> <tr><td>5</td><td>R5</td><td>87.6°C</td><td>104.6°C</td></tr> <tr><td>6</td><td>C5</td><td>79.0°C</td><td>96.7°C</td></tr> <tr><td>7</td><td>D10</td><td>99.7°C</td><td>117.9°C</td></tr> <tr><td>8</td><td>R7</td><td>95.5°C</td><td>114.7°C</td></tr> <tr><td>9</td><td>Q2</td><td>95.8°C</td><td>112.9°C</td></tr> <tr><td>10</td><td>U1</td><td>75.1°C</td><td>92.8°C</td></tr> <tr><td>11</td><td>C41</td><td>71.7°C</td><td>90.7°C</td></tr> <tr><td>12</td><td>T1</td><td>79.4°C</td><td>100.4°C</td></tr> <tr><td>13</td><td>Q101</td><td>74.9°C</td><td>98.0°C</td></tr> <tr><td>14</td><td>Q102</td><td>73.1°C</td><td>96.1°C</td></tr> <tr><td>15</td><td>C105</td><td>76.4°C</td><td>98.6°C</td></tr> <tr><td>16</td><td>C106</td><td>74.1°C</td><td>96.4°C</td></tr> <tr><td>17</td><td>C107</td><td>72.4°C</td><td>94.0°C</td></tr> <tr><td>18</td><td>RTH3</td><td>73.4°C</td><td>91.5°C</td></tr> <tr><td>19</td><td>R415</td><td>62.2°C</td><td>82.4°C</td></tr> <tr><td>20</td><td>TC</td><td>64.5°C</td><td>82.2°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25.9 °C	HIGH AMBIENT Ta=44.8 °C	1	BD1	80.5°C	97.2°C	2	L1	78.5°C	95.5°C	3	Q1	85.5°C	102.7°C	4	D6	85.7°C	103.2°C	5	R5	87.6°C	104.6°C	6	C5	79.0°C	96.7°C	7	D10	99.7°C	117.9°C	8	R7	95.5°C	114.7°C	9	Q2	95.8°C	112.9°C	10	U1	75.1°C	92.8°C	11	C41	71.7°C	90.7°C	12	T1	79.4°C	100.4°C	13	Q101	74.9°C	98.0°C	14	Q102	73.1°C	96.1°C	15	C105	76.4°C	98.6°C	16	C106	74.1°C	96.4°C	17	C107	72.4°C	94.0°C	18	RTH3	73.4°C	91.5°C	19	R415	62.2°C	82.4°C	20	TC	64.5°C	82.2°C
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13	Q101	74.9°C	98.0°C																																																																																					
14	Q102	73.1°C	96.1°C																																																																																					
15	C105	76.4°C	98.6°C																																																																																					
16	C106	74.1°C	96.4°C																																																																																					
17	C107	72.4°C	94.0°C																																																																																					
18	RTH3	73.4°C	91.5°C																																																																																					
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P: 305VAC/100VAC O/P: FULL LOAD Ta= -45°C/-30°C	TEST: OK																																																																																				
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P: 315VAC O/P: FULL LOAD Ta=40 °C HUMIDITY= 95% R.H	TEST: OK																																																																																				
4	TEMPERATURE COEFFICIENT	±0.03%/°C(0~50°C)	I/P: 230 VAC O/P: FULL LOAD	±0.004%/°C(0~50°C)																																																																																				



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5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: $-45^{\circ}\text{C} \sim +85^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle: 5 CYCLE 5. Input/Output condition: STATIC	TEST: OK
6	THERMAL SHOCK TEST	1. Thermal shock Temperature: $-45^{\circ}\text{C} \sim +45^{\circ}\text{C}$ 2. Temperature change rate : $25^{\circ}\text{C} / \text{MIN}$ 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 58 sec, turn off 2 sec;	TEST: OK
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (3) Sweep Time: 12min/sweep cycle (4) Acceleration: 5G (5) Test Time: 72min in each axis (X.Y.Z) (6) Ta: 25°C	TEST: OK
8	CAPACITOR LIFE CYCLE	PWM-120-12KN: 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= 40°C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 40°C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 40°C LIFE TIME	(1) 66445 HRS (2) 31602 HRS (3) 72226 HRS (4) 170205 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 1915.2K hrs min. Telcordia SR-332 (Bellcore) ; 205.8K hrs min. MIL-HDBK-217F (25°C)	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50000 hours @ TC 75°C 	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	ZHANGZJ/ZHUOKB	SKY	LIUWY