Test Report: HLG-600H-20

600W Single Output Switching Power Supply

■ 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	RIPPLE & NOISE	V1：150 mVp-p (Max)	I/P： 230VAC O/P：FULL LOAD Ta：25℃	V1： 28 mVp-p (Max)
2	CONSTANT CURRENT REGION	O/P：10 ~20V	I/P： 230VAC O/P：CV MODE Ta：25℃	CV= 10V ： 28.38A CV= 19V ： 28.59A
3	OUTPUT VOLTAGE ADJUST RANGE	CH1：17V ~21 V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	16.09 V ~ 22.19 V/ 230 VAC 16.09 V ~ 22.19 V/ 115 VAC
4	OUTPUT VOLTAGE TOLERANCE	V1： -1.5 %~ 1.5 % (Max)	I/P：100 VAC / 305 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.03 %~ -0.78 %
5	LINE REGULATION	V1：-0.5 %~ 0.5 % (Max)	I/P：100VAC ~ 305 VAC O/P：FULL LOAD Ta：25℃	V1： 0 %~ 0 %
6	LOAD REGULATION	V1： -1 % ~ 1 % (Max)	I/P： 230 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： -0.38 %~ 0.38 %
7	SET UP TIME	230VAC： 500 ms (Max) 115VAC： 500 ms(Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 102 ms 115VAC/ 108 ms
8	RISE TIME	230VAC： 80 ms (Max) 115VAC： 80 ms (Max)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 18.4 ms 115VAC/ 17.8 ms
9	HOLD UP TIME	230VAC： 15 ms (TYP) 115VAC： 15 ms (TYP)	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 19.2 ms 115VAC/ 19.2 ms
10	OVER/UNDERSHOOT TEST	< ±5%	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	TEST： 1.5 %
11	OUTPUT CURRENT ADJ RANGE	CH1： 14 A ~ 28 A	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	29.79A ~10.89 A/230VAC 29.81A ~ 10.91 A/115Vac

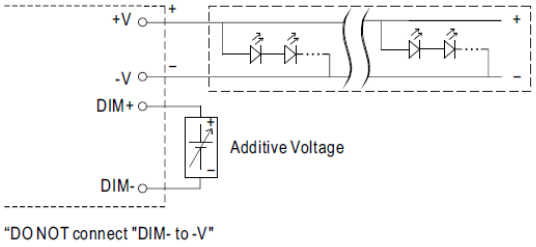
12	DYNAMIC LOAD	V1： 2000 mVp-p	I/P： 230 VAC (1).O/P：FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P：FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P：FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P：FULL /Min LOAD 50%DUTY/ 120HZ Ta：25℃	(1)1280 mVp-p (2)1240 mVp-p (3)1190 mVp-p (4)912 mVp-p

13 DIMMING OPERATION

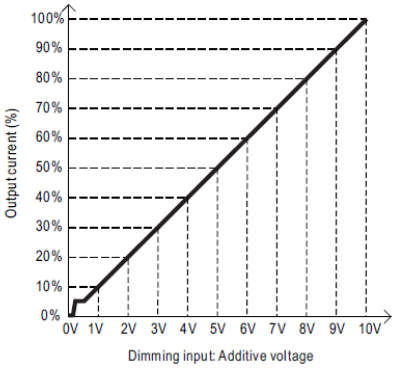
※ **3 in 1 dimming function (for B-Type)**

- Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10VDC, or 10V PWM signal or resistance.
- Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.
- Dimming source current from power supply: 100μA (typ.)

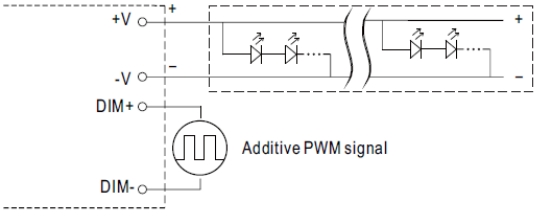
◎ Applying additive 0 ~ 10VDC



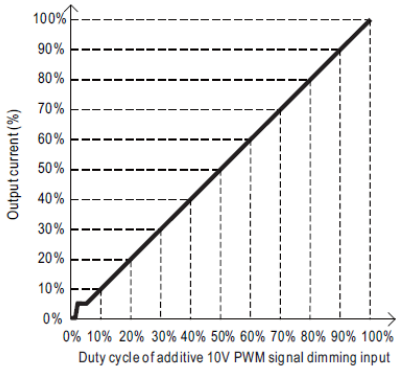
"DO NOT connect "DIM- to -V"



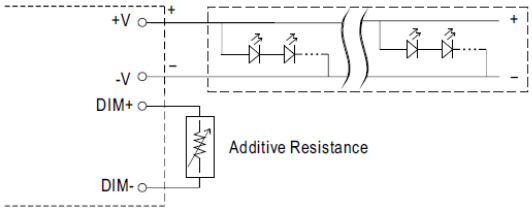
◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



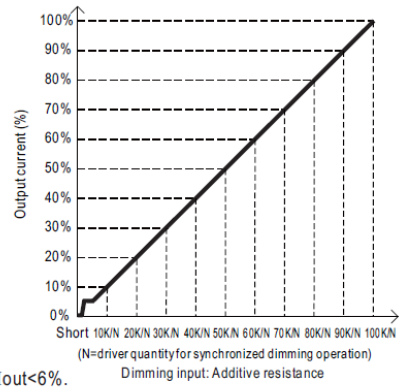
"DO NOT connect "DIM- to -V"



◎ Applying additive resistance:



"DO NOT connect "DIM- to -V"



Note : 1. Min. dimming level is about 6% and the output current is not defined when 0%< Iout<6%.
2. The output current could drop down to 0% when dimming input is about 0kΩ or 0Vdc, or 10V PWM signal with 0% duty cycle.

I/P： 230VAC

O/P：DIMMING TEST

TA：25℃

R	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
O/P CURRENT	0	3.225A	6.640A	9.080A	12.500A	15.300A	17.800A	20.500A	23.100A	26.100A	28.600A	28.600A
%	0.00%	11.52%	23.71%	32.43%	44.64%	54.64%	63.57%	73.21%	82.50%	93.21%	102.14%	102.14%
V	SHORT	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
O/P CURRENT	0	3.120A	6.600A	9.160A	12.000A	15.200A	17.800A	20.700A	23.400A	26.300A	28.600A	28.600A
%	0.00%	11.14%	23.57%	32.71%	42.86%	54.29%	63.57%	73.93%	83.57%	93.93%	102.14%	102.14%
PWM (100HZ)	SHORT	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
O/P CURRENT	0	3.038A	6.0187	9.600A	11.612	14.493	17.231	19.95	23.700A	26.200A	28.700A	28.700A
%	0.00%	10.85%	21.50%	34.29%	41.65%	51.76%	61.54%	71.25%	84.64%	93.57%	102.50%	102.50%

TEST RESULT：OK

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305 VAC	I/P：TESTING O/P：FULL LOAD Ta：25℃	69.437V~305V
			I/P： LOW-LINE-3V= 87 V (PLEASE CHECK DERATING CURVE) HIGH-LINE+10V=315 V O/P：FULL/MIN LOAD 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：100 VAC ~ 305 VAC O/P：FULL~MIN LOAD Ta：25℃	TEST： OK
3	POWER FACTOR	0.95 / 230 VAC(TYP) 0.98 / 115 VAC(TYP) 0.93 / 277 VAC(TYP)	I/P： 230 VAC I/P： 115 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	PF= 0.969 / 230 VAC PF= 0.99 / 115 VAC PF= 0.949 / 277 VAC
4	EFFICIENCY	94.5% (TYP) 94.5% (TYP)	I/P： 230 VAC I/P： 277 VAC O/P：FULL LOAD Ta：25℃	94.92 % 95.1 %
5	INPUT CURRENT	277V/ 2.9 A (TYP) 230V/ 3.3 A (TYP) 115V/ 7 A (TYP)	I/P： 277 VAC I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I = 2.2033 A/ 277 VAC I = 2.6148 A/ 230 VAC I = 5.2677 A/ 115 VAC
6	INRUSH CURRENT	230V/ 70 A (TYP) (twidth=1000us measured at 50% Ipeak) COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 54.4 A/ 230 VAC T50= 990 us
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P： 277 VAC O/P：Min LOAD Ta：25℃	L-FG： 0.32 mA N-FG： 0.32 mA
8	NO LOAD CONSUMPTION	< 0.5 W	I/P：115VAC I/P：230VAC O/P：NO LOAD AT REMOTE OFF Ta：25℃	< 0.15 W < 0.37 W
9	TOTAL HARMONIC DISTORTION	THD< 20% when output loading ≧ 50% at 115VAC/230VAC input and output loading ≧ 75% at 277VAC input	I/P： 115VAC I/P： 230VAC O/P：50% LOAD Ta：25℃ I/P： 277VAC O/P：75% LOAD Ta：25℃	THD： 10.2 % THD： 9.48 % THD： 12.44 %

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95% ~108 %	I/P： 230 VAC I/P： 115 VAC O/P：TESTING Ta：25℃	102.32 %/ 230 VAC 102.32 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed

2	OVER VOLTAGE PROTECTION	CH1： 22 V ~ 26 V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	23.3V/ 230 VAC 23.2V/ 115 VAC Shut down o/p voltage, re-power on to recover
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： 305 VAC O/P：FULL LOAD Ta：25℃	NO DAMAGE Constant current limiting, recovers automatically after fault condition is removed

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	Power on : "Hi" (Open circuit) or ">2 ~ 5V" Power off : "Low" (Short circuit) or "<0 ~ 0.5V"	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	1.4 V~5 V POWER ON 0 V~1.3 V POWER OFF
2	5V STANDBY	5V@0.5A TOLERANCE ± 5% RIPPLE 100mVp-p	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	4.955V 51mVp-p/230 VAC 4.955V 51mVp-p/115 VAC

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 12 Rated 600 V/ 20 A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 450 V (2) 448 V (3) 446 V
2	Diode Peak Voltage	Q100 Rated 60 V /100 A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 45.8 V (2) 5.2 V (3) 44.8 V
3	Input Capacitor Voltage	C5 Rated 220 u / 450V SURGE VOLTAGE 495V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 440 V (2) 436 V (3) 454 V
4	Control IC Voltage Test	U 2 Rated MAX 16 V MIN 8.85V	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 13.7 V (2) 13.7 V (3) 13.7 V
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 600 V /20.2 A	I/P：High-Line +3V = 308 V O/P： (1)Full Load Turn on	(1) 466 V (2) 454 V

			(2) Output Short (3)Full load continue Ta：25℃	(3) 464 V

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P： 3.75KVAC/min I/P-FG： 2 KVAC/min O/P-FG： 0.5 KVAC/min	I/P-O/P： 4KVAC/min I/P-FG： 2.4 KVAC/min O/P-FG： 0.6 KVAC/min Ta：25℃	I/P-O/P： 3.42 mA I/P-FG： 2.69 mA O/P-FG： 3.64 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℃/70% RH	I/P-O/P： 30 GΩ I/P-FG： 21.5 GΩ O/P-FG： 27.4 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ /70% RH	21 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A CLASSC	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	PASS
2	CONDUCTION	EN55015 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N ：2KV L,N-PE：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
7	Test by certified Lab & Test Report Prepare. Any contradictions of the test results, please refer to the latest EMC test report.			

■ RELIABILITY TEST

ENVIRONMENT TEST

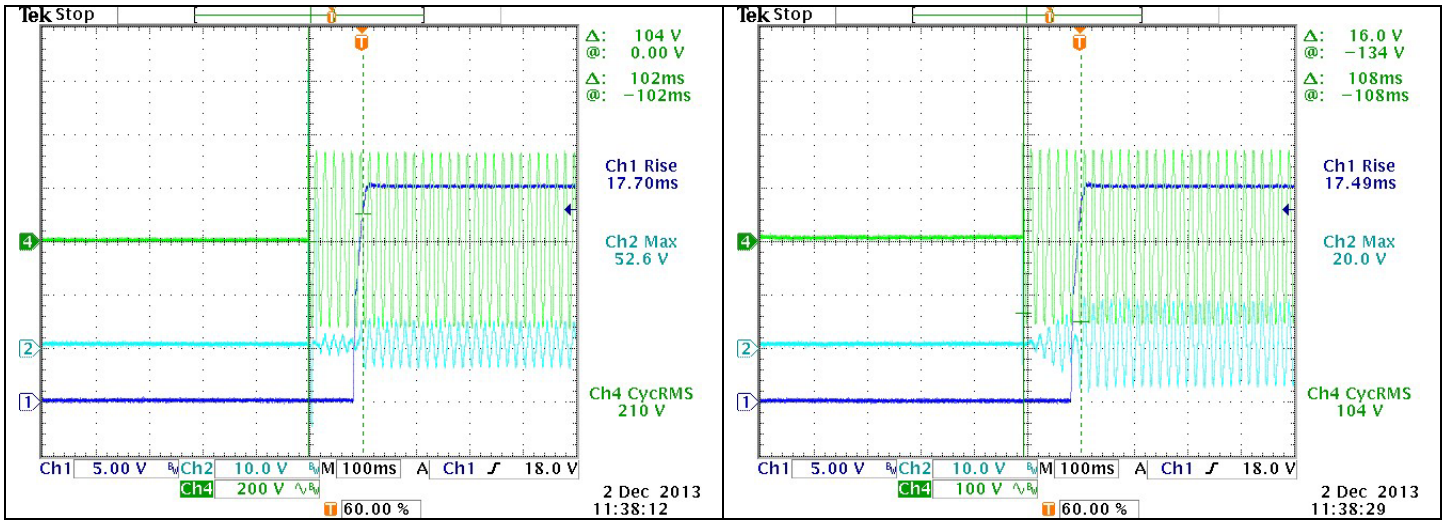
<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： HLG-600H-24
1. ROOM AMBIENT BURN-IN：2.5 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 29 ℃
2. HIGH AMBIENT BURN-IN： 14.5HRS
I/P： 230VAC O/P： FULL LOAD Ta= 61.9 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 29 ℃</th><th>HIGH AMBIENT Ta= 61.9 ℃</th></tr>
<tr><td>1</td><td>BD1</td><td>66.7℃</td><td>95.9℃</td></tr>
<tr><td>2</td><td>C10</td><td>63.4℃</td><td>92.7℃</td></tr>
<tr><td>3</td><td>ZNR3</td><td>64.0℃</td><td>93.3℃</td></tr>
<tr><td>4</td><td>C2</td><td>60.3℃</td><td>89.7℃</td></tr>
<tr><td>5</td><td>LF3</td><td>61.2℃</td><td>90.6℃</td></tr>
<tr><td>6</td><td>Q1</td><td>63.6℃</td><td>93.0℃</td></tr>
<tr><td>7</td><td>L2</td><td>65.6℃</td><td>95.6℃</td></tr>
<tr><td>8</td><td>L3</td><td>65.6℃</td><td>95.6℃</td></tr>
<tr><td>9</td><td>T1</td><td>72.5℃</td><td>103.8℃</td></tr>
<tr><td>10</td><td>T2</td><td>69.3℃</td><td>99.9℃</td></tr>
<tr><td>11</td><td>C5</td><td>61.0℃</td><td>90.4℃</td></tr>
<tr><td>12</td><td>RTH2</td><td>62.8℃</td><td>92.7℃</td></tr>
<tr><td>13</td><td>D9</td><td>65.8℃</td><td>96.0℃</td></tr>
<tr><td>14</td><td>Q13</td><td>65.5℃</td><td>95.9℃</td></tr>
<tr><td>15</td><td>C115</td><td>64.9℃</td><td>96.0℃</td></tr>
<tr><td>16</td><td>C124</td><td>63.4℃</td><td>94.3℃</td></tr>
<tr><td>17</td><td>C140</td><td>59.2℃</td><td>89.0℃</td></tr>
<tr><td>18</td><td>LF100</td><td>64.0℃</td><td>95.0℃</td></tr>
<tr><td>19</td><td>U1</td><td>59.0℃</td><td>88.5℃</td></tr>
<tr><td>20</td><td>U2</td><td>59.9℃</td><td>89.1℃</td></tr>
<tr><td>21</td><td>C560</td><td>62.6℃</td><td>92.0℃</td></tr>
<tr><td>22</td><td>C562</td><td>62.6℃</td><td>92.4℃</td></tr>
<tr><td>23</td><td>C510</td><td>62.0℃</td><td>91.5℃</td></tr>
<tr><td>24</td><td>C523</td><td>62.4℃</td><td>91.6℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 230VAC/115VAC
O/P： 95 % LOAD
Ta= -45℃</td><td>TEST：OK</td></tr>
<tr><td>3</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： 305 VAC
O/P：FULL LOAD
Ta= 55 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %/℃(0~55℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0 %/℃(0~55℃)</td></tr>
<tr><td>5</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：5 CYCLE
5. Input/Output condition： STATIC</td><td>OK</td></tr>
</table>

6	THERMAL SHOCK TEST	1. Thermal shock Temperature： -45℃~ +60℃ 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： 230VAC/Full Load AC ON/OFF TEST turn on 58sec；turn off 2sec	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℃	TEST：OK
8	CAPACITOR LIFE CYCLE	HLG-600H-12：SUPPOSE C115 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Tc= 75 ℃ LIFE TIME (2) I/P： 230VAC O/P：75% LOAD Tc= 75℃ LIFE TIME (3) I/P： 230VAC O/P：50% LOAD Tc=75℃ LIFE TIME	(1) 46126HRS (2) 63320HRS (3) 63534HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 913.4K hrs min. Telcordia SR-332 (Bellcore) ; 76.9K hrs min. MIL-HDBK-217F (25℃)	
10	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 62,000 hours	

Auto Test System Data

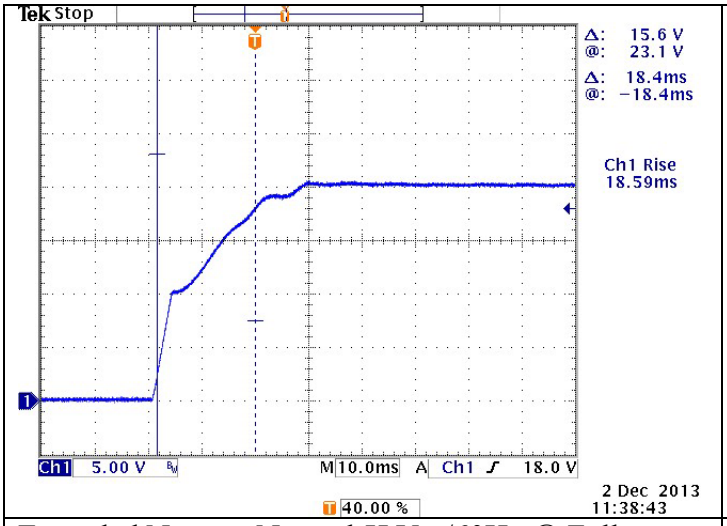
Model Name : HLG-600H-20

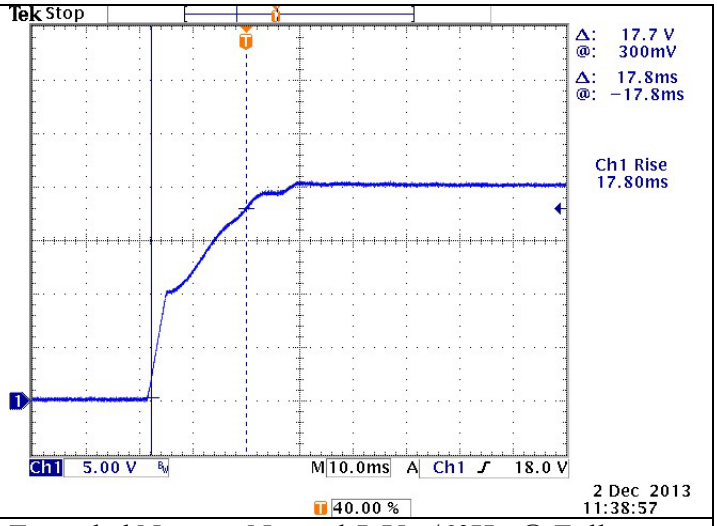
SETUP TIME		SPEC :	230Vac:	500	Unit:(ms)
			115Vac:	500	
Test Condition		TEST RESULT		VERDICT	
Vin(Vac)	Fin(HZ)				
230	60	102.00		PASS	
115	60	108.00		PASS	



Extended Name = Normal-H Vac/60Hz @ Full LOAD SET UP TIME & Inrush Current TEST INPUT=230VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : Inrush Current CH4 : AC Input Voltage	Extended Name = Normal-L Vac/60Hz @ Full LOAD SET UP TIME & Inrush Current TEST INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : Inrush Current CH4 : AC Input Voltage

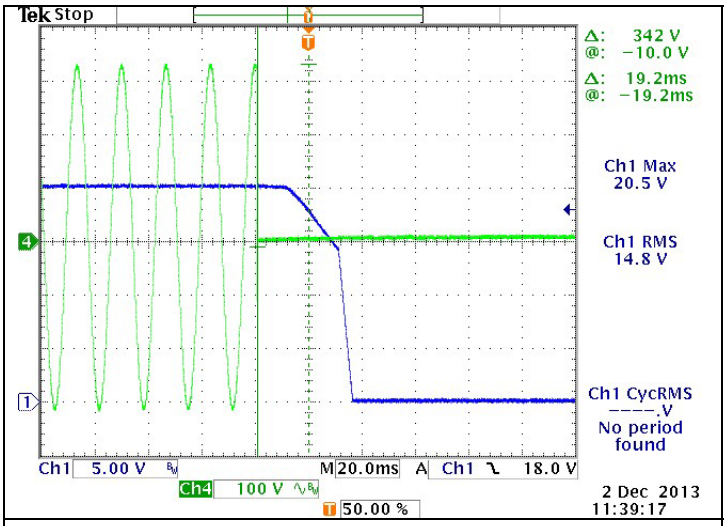
RISE TIME		SPEC :	230Vac:	80	Unit:(ms)
			115Vac:	80	
Test Condition		TEST RESULT		VERDICT	
Vin(Vac)	Fin(HZ)				
230	60	18.40		PASS	
115	60	17.80		PASS	



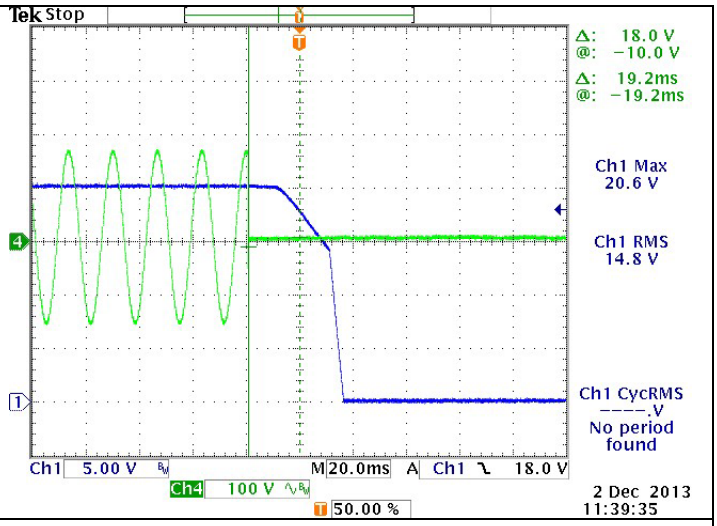


Extended Name = Normal-H Vac/60Hz @ Full LOAD CH1:Vout Rise Time Test INPUT=230VAC/60HZ @ FULL LOAD CH1 : Output Voltage	Extended Name = Normal-L Vac/60Hz @ Full LOAD CH1:Vout Rise Time Test INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage

HOLD UP TIME		SPEC :	230Vac:	15	Unit:(ms)
			115Vac:	15	
Test Condition		TEST RESULT		VERDICT	
Vin(Vac)	Fin(HZ)				
230	60	19.20		PASS	
115	60	19.20		PASS	



Extended Name = Normal-H Vac/60Hz @ Full LOAD
Hold up Time Test
INPUT=230VAC/60HZ @ FULL LOAD
CH1 : Output Voltage
CH4 : AC Input Voltage



Extended Name = Normal-L Vac/60Hz @ Full LOAD
Hold up Time Test
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage
CH4 : AC Input Voltage

Efficiency Test									SPEC:	230VAC:	94.5	Unit:(%)
Test Condition		TEST RESULT										
Vin(Vac)	Fin(HZ)	MIN Load	10% Load	20% Load	30% Load	40% Load	50% Load	60% Load	70% Load	80% Load	90% Load	100% Load
230	50	0.00	89.11	92.75	93.88	94.44	94.82	95.14	95.22	95.13	95.03	94.93
230	60	0.00	89.07	92.75	93.90	94.46	94.83	95.16	95.21	95.13	95.04	94.92
115	50	0.00	88.19	91.74	92.81	93.33	93.63	93.92	93.93	93.82	93.66	93.45
115	60	0.00	88.18	91.73	92.82	93.33	93.71	93.95	93.95	93.80	93.68	93.46
277	50	0.00	89.12	92.91	93.90	94.27	94.78	95.10	95.38	95.32	95.22	95.12
277	60	0.00	89.09	92.86	93.89	94.27	94.75	95.17	95.38	95.30	95.22	95.10

PF Test										SPEC:	230VAC:	0.95	Unit:()
											115VAC:	0.98	
											277VAC:	0.93	
Test Conditon		TEST RESULT											
Vin(Vac)	Fin(HZ)	MIN Load	10% Load	20% Load	30% Load	40% Load	50% Load	60% Load	70% Load	80% Load	90% Load	100% Load	
230	50	0.087	0.671	0.827	0.891	0.925	0.943	0.954	0.958	0.962	0.965	0.968	
230	60	0.067	0.622	0.790	0.867	0.910	0.931	0.946	0.953	0.959	0.963	0.969	
115	50	0.002	0.925	0.965	0.975	0.981	0.980	0.980	0.987	0.985	0.993	0.988	
115	60	0.235	0.912	0.961	0.974	0.982	0.982	0.984	0.991	0.987	0.993	0.990	
277	50	0.044	0.573	0.746	0.831	0.878	0.906	0.923	0.935	0.944	0.950	0.953	
277	60	0.038	0.522	0.699	0.796	0.852	0.886	0.910	0.924	0.936	0.944	0.949	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

12.10.30 A50-F031