Test Report: GST360A12

360W AC-DC High Reliability Industrial Adaptor

■ 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

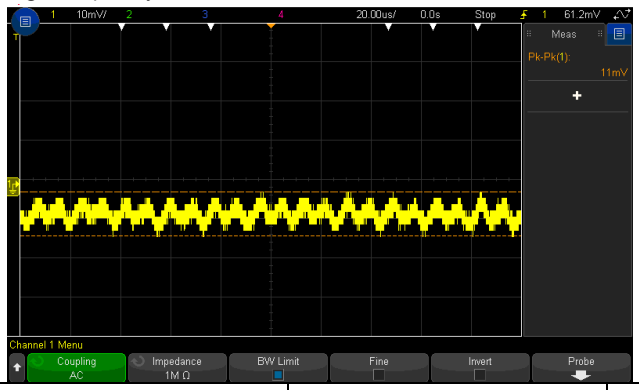
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

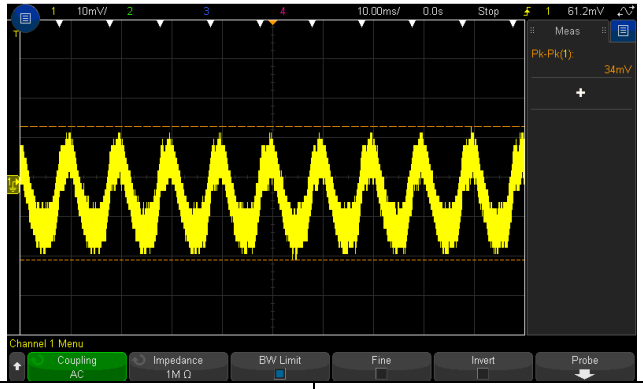
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -5.0%~ +5.0 %	I/P: 85VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -1.97%~2.00%
2	LINE REGULATION (Max)	V1: -1.0%~ +1.0 %	I/P: 85VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: -0.015%~0.012%
3	LOAD REGULATION(Max)	V1: -5.0%~ +5.0 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -1.97%~2.00%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	4.5%
5	RIPPLE & NOISE(Max)	V1: 120mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 34mVp-p

high frequency :

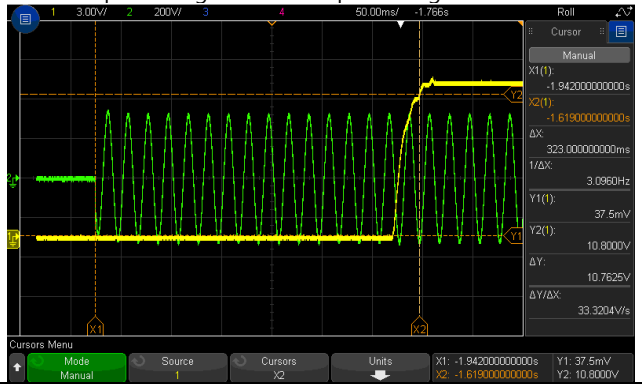


low frequency :

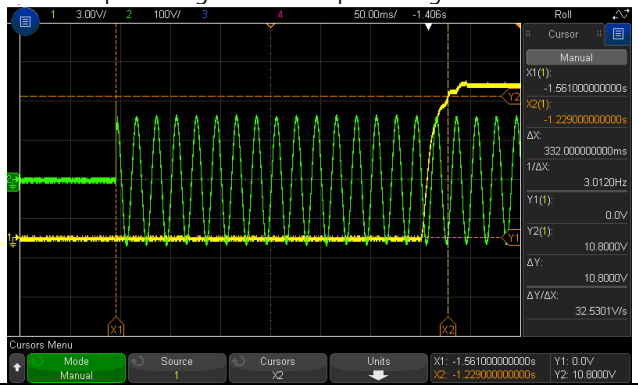


6	SET UP TIME(Max)	230VAC/2000ms 115VAC/2000ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/323ms 115VAC/332ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

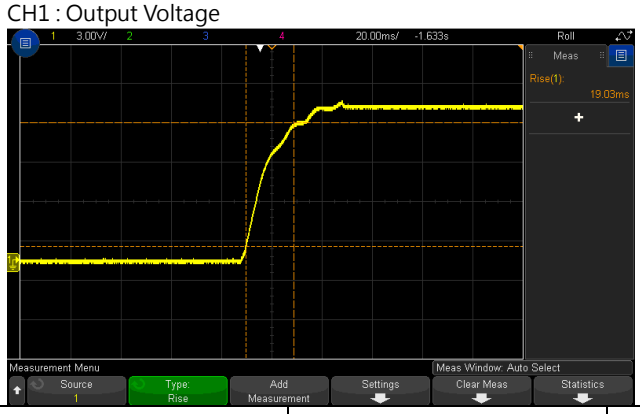


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

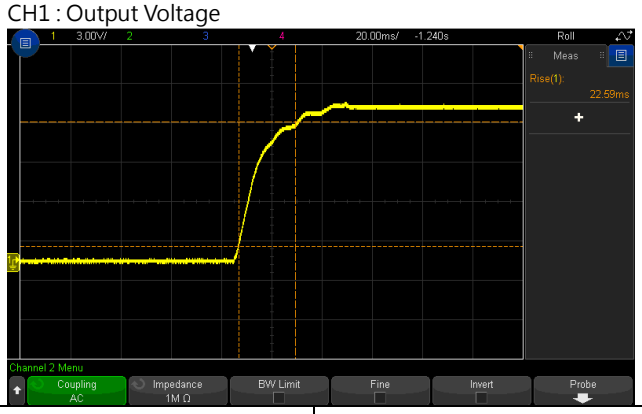


7	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25℃	230VAC/19.03 ms 115VAC/22.59ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage

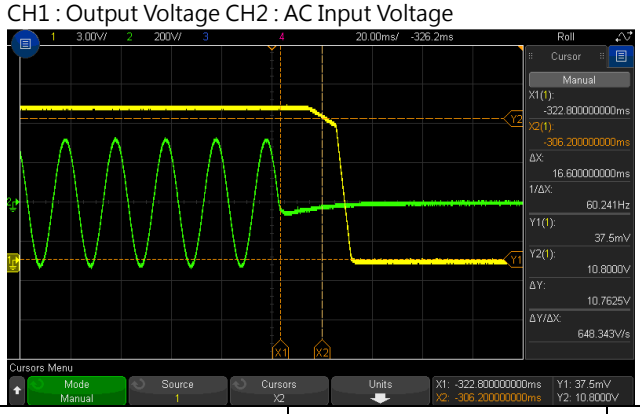


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

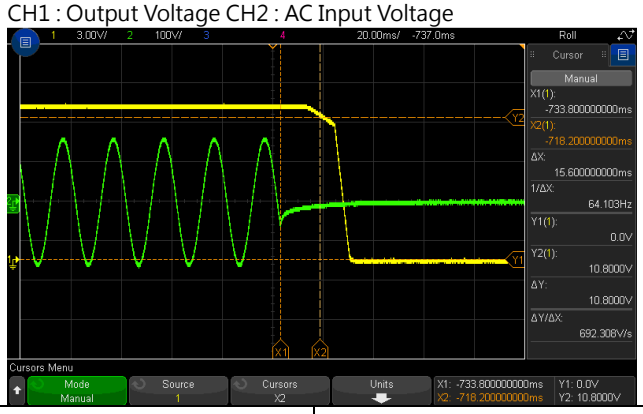


8	HOLD UP TIME (Typ.)	230VAC/8ms 115VAC/8ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25℃	230VAC/16.6ms 115VAC/15.6ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

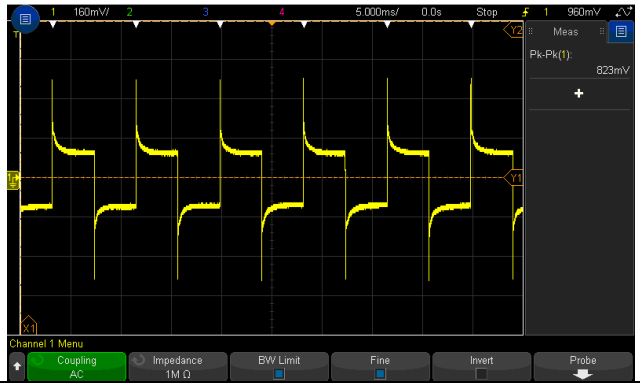


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

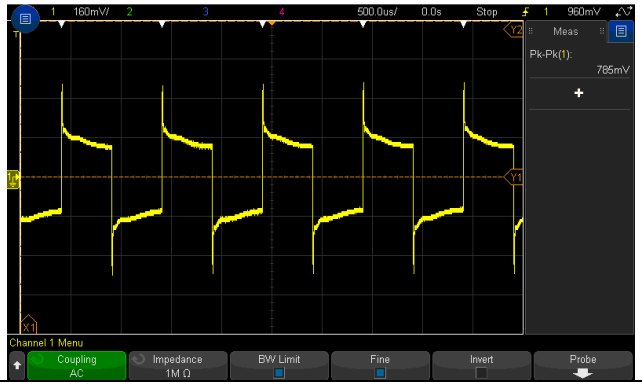


9	DYNAMIC LOAD	V1: 1200mVp-p	I/P: 230VAC O/P: (1)FULL/50%LOAD50%DUTY/120HZ (2)FULL/50%LOAD50%DUTY / 1KHZ Ta:25℃	(1) 823mVp-p (2) 785mVp-p

FULL /50% LOAD 50%DUTY / 120HZ



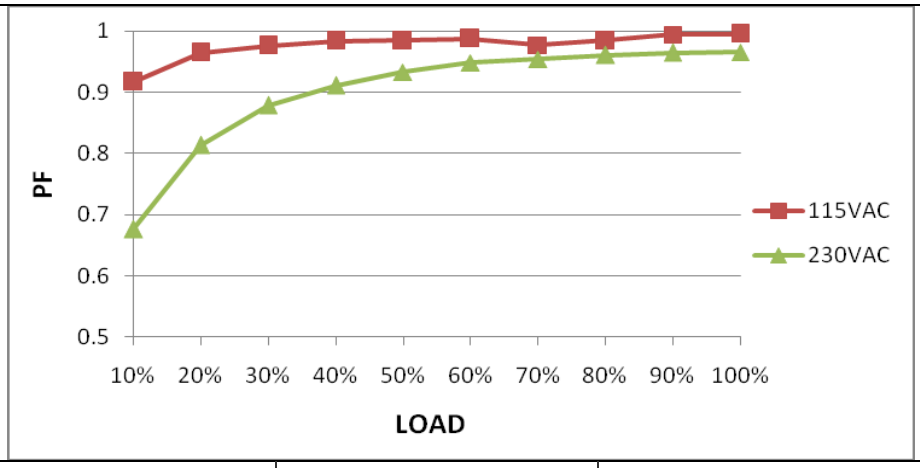
FULL /50% LOAD 50%DUTY / 1KHZ



10	TRANSIENT RECOVERY TIME	V1: 1200mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	682mVp-p

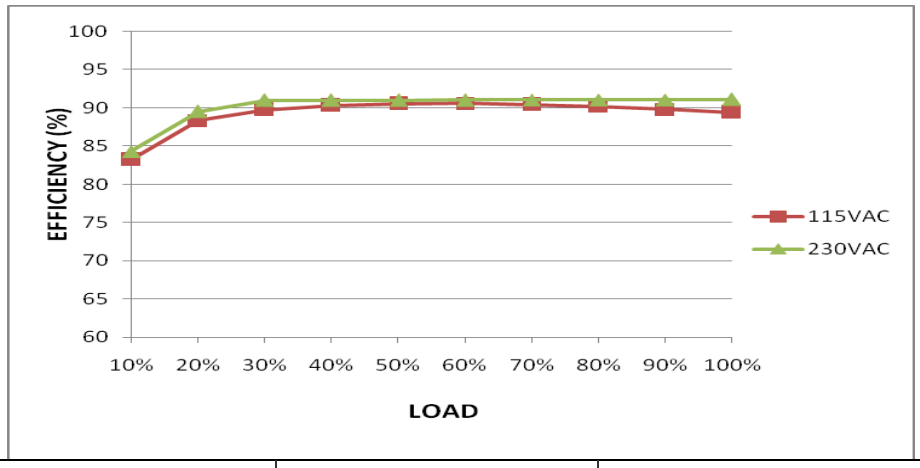
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC 120VDC~ 370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25℃	(1)77.5V~264V (2)110Vdc~370Vdc/FULL LOAD 1107Vdc~370Vdc/50% LOAD (3) 110Vdc~370Vdc/FULL LOAD 110Vdc~370Vdc/50% LOAD
			I/P: LOW-LINE-3V=82 V HIGH-LINE+15%=300 V 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 FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:85VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 2 A 115V/ 3.8 A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.58A/ 230VAC I =3.14A/ 115VAC
4	LEAKAGE CURRENT	< 1.5mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	0.53 mA
5	NO LOAD CONSUMPTION	< 0.5W	I/P：230VAC O/P：NO LOAD Ta：25℃	0.275W
6	POWER FACTOR (Typ.)	0.95/ 230VAC 0.98/115VAC	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	PF=0.964/230VAC PF=0.993/115VAC
	P.F vs LOAD			



7	EFFICIENCY(Typ.)	91%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	91.1%

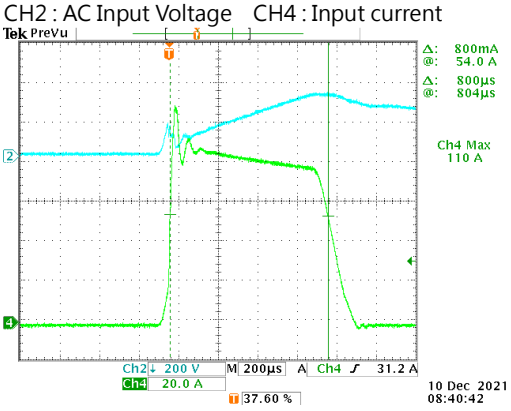
EFFICIENCY vs LOAD



8	INRUSH CURRENT(Typ.)	230V/120A 115V/95A COLD START	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =110A/ 230VAC I =90A/ 115VAC

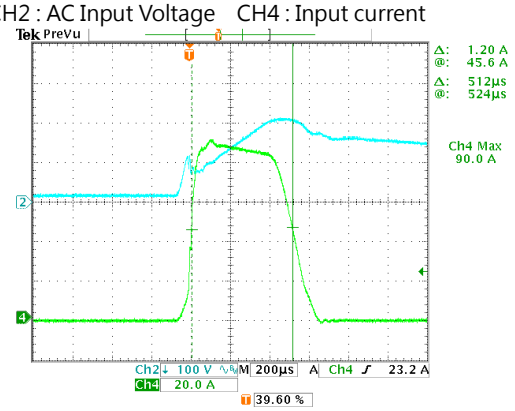
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



INPUT=115VAC/ 60HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	135%~155 % Protection type : Hiccup mode, recovers automatically after fault condition is removed	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25℃	149.3%/ 264VAC 149.1%/ 230VAC 149.0%/100VAC Protection type : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	105% ~ 135% rated output voltage Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25℃	14.5V / 264VAC 14.5V / 230VAC 14.5V / 85VAC Protection type : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 85VAC O/P:FULL LOAD	O.T.P. Active OK Protection type : 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	Q3/Q4 Rated : 21 A/ 600 V	AC ON/OFF I/P:High-Line +3V =267V VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25℃	Q3 VDS: (1) 438V (2) 452V (3) 444V (4) 432V (5) 444V (6) 428V (7) 444V Q4 VDS: (1) 456V (2) 448V (3) 444V (4) 444V (5) 444V (6) 448V (7) 448V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1/Q2 Rated : 18 A/ 600 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz	Q1 VDS: (1) 436V (2) 420V (3) 436V (4) 436V (5) 436V (6) 432V (7) 428V Q2 VDS: (1) 440V (2) 420V (3) 448V (4) 460V (5) 436V (6) 444V (7) 444V

			(7)0%→400% Load. Ta:25℃	
3	P.F.C DIODE	D21 Rated : 8A/ 600 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25℃	(1) 440V (2) 428V (3) 428V (4) 428V
4	Diode Peak Voltage	Q100/Q112 Rated :100A/ 60V Q152/Q154 Rated : 100 A/ 60V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8)NO LOAD (9)Before burst Mode Ta:25℃	Q100: Q112: VDS: VDS: (1) 40.6V (1) 34.4V (2) 40.1V (2) 40.1V (3) 41.0V (3) 37.7V (4) 43.4V (4) 33.2V (5) 40.1V (5) 33.2V (6) 44.2V (6) 38.5V (7) 42.2V (7) 39.3V (8) 37.3V (8) 37.7V (9) 51.4V (9) 40.5V Q152: Q154: VDS: VDS: (1) 29.2V (1) 30.0V (2) 29.6V (2) 30.8V (3) 32.0V (3) 32.8V (4) 28.8V (4) 29.2V (5) 29.2V (5) 29.2V (6) 31.6V (6) 32.0V (7) 31.2V (7) 30.8V (8) 28.8V (8) 34.0V (9) 27.6V (9) 33.6V
5	Input Capacitor Voltage	C5 Rated: : 220 μ / 400 V	I/P:High-Line +3V =267V 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)398V (2)394V (3)398V (4)394V
6	Control IC Voltage Test	PWM IC U3 Rated -0.3V~ 20 V PFC IC U1 Rated -0.3V~ 20 V O/P IC U100 Rated -0.3V~ 26 V	AC ON/OFF I/P:High-Line +3V =267 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD (LOW LINE) Ta:25℃	U3 U100 (1) 16.8V (1) 11.6V (2) 17.6V (2) 12.6V (3) 18.8V (3) 12.6V (4) 16.0V (4) 12.4V (5) 9.8V (5) 11.6V U1

				(1) 16.2V (2) 16.9V (3) 18.1V (4) 15.2V (5) 9.2V

■ SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min Ta:25℃	I/P-O/P:3.66mA I/P-FG:3.59mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ	I/P-O/P: 600 VDC I/P-FG: 600 VDC Ta:25℃	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	BS EN/EN61000-3-2 GB9254	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	CLASS A
2	CONDUCTION	BS EN/EN55032(CISPR32),FCC PART 15 / CISPR22 ,CNS13438,GB17625.1 EAC TP TC 020,MSIP KN32	I/P： 230 VAC (50HZ)/120 VAC（60HZ） O/P：FULL/50% LOAD Ta：25℃	CLASS B
3	RADIATION	BS EN/EN55032(CISPR32),FCC PART 15 / CISPR22 ,CNS13438,GB17625.1 EAC TP TC 020,MSIP KN32	I/P： 230 VAC (50HZ)/120 VAC（60HZ） O/P：FULL LOAD/50% LOAD Ta：25℃	CLASS B
4	E.S.D	BS EN/EN61000-4-2 AIR：15KV / Contact：8KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	BS EN/EN61000-4-4 INPUT： 1KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
6	SURGE	BS EN/EN61000-4-5 L-N ：1KV L,N-PE：2KV	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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL： GST360A12 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 25.8 ℃ 2. HIGH AMBIENT BURN-IN：2HRS I/P： 230VAC O/P： FULL LOAD Ta= 43.1 ℃		

NO	Position	ROOM AMBIENT Ta= 25.8℃	HIGH AMBIENT Ta=43.1℃
1	LF2	68.1℃	83.9℃
2	LF3	70.6℃	86.4℃
3	BD2	72.9℃	88.6℃
4	C3	68.5℃	84.2℃
5	C6	71.9℃	87.8℃
6	Q1	75.7℃	91.4℃
7	Q2	74.3℃	90.0℃
8	T1coil	80.7℃	96.5℃
9	T1core	80.4℃	95.6℃
10	T2 coil	80.2℃	95.9℃
11	T2 core	79.3℃	93.8℃
12	L1	74.9℃	90.9℃
13	C33	79.3℃	95.1℃
14	L3	71.8℃	87.7℃
15	L4	75.0℃	90.9℃
16	C5	77.3℃	93.2℃
17	C41	77.6℃	93.4℃
18	U1	77.4℃	93.4℃
19	RTH2	77.4℃	93.3℃
20	U3	80.1℃	96.1℃
21	C114	85.4℃	101.5℃
22	RTH4	78.1℃	93.7℃
23	C101	80.3℃	96.2℃
24	C105	85.3℃	101.4℃
25	Q112	89.4℃	106.1℃
26	Q100	89.3℃	105.9℃
27	Q152	86.5℃	103.0℃
28	Q154	84.4℃	101.0℃
29	U101	79.4℃	95.4℃
30	U4	77.9℃	93.8℃
31	Q3	84.9℃	102.1℃
32	Q4	85.6℃	102.7℃
33	LF100	91.3℃	108.1℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 123%LOAD Ta : 25℃	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100%LOAD Ta= -35℃	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40℃/95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40.5℃ HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03%/℃(0~40℃)	I/P : 230 VAC O/P : FULL LOAD	± 0.0061 %/℃(0~40℃)
6	STORAGE TEMPERATURE TEST	-40~85℃	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	
7	THERMAL SHOCK TEST	-30~40℃	1. Thermal shock Temperature : -35℃~ +45℃ 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 : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test	
8	VIBRATION TEST	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25℃	
9	CAPACITOR LIFE CYCLE	SUPPOSE C IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 40 ℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 ℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40 ℃ LIFE TIME	(1) 41769.5HRS (2) 34401HRS (3) 58762.9HRS (4) 144660.6HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 2068.5K hrs min. Telcordia SR-332 (Bellcore) ; 269K hrs min. MIL-HDBK-217F (25℃)		
11	Ongoing Reliability Test	I/P : 230VAC O/P : 80% LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009