Test Report: ISI-500-212

Modified Sine Wave DC-AC Inverter with MPPT Solar Charger

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
SOLAR PANEL INPUT
BATTERY INPUT PROTECTION
PROTECTION FUNCTION TEST
FUNCTION TEST
APPLICATION 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	VERDICT
1	READ POWER	350W	I/P：12VDC O/P：FULL LOAD Ta：25℃	354.2W	P
2	SURGE POWER (Typ.)	700W	I/P：13VDC O/P：TESTING Ta：25℃	852.11W /62 cycle/13VDC	P
3	AC VOLTAGE	230VAC	I/P：12VDC O/P：FULL/NO LOAD Ta：25℃	232.8 /100%LOAD 231.9/0%LAOD	P
4	FREQUENCY	50HZ±0.5HZ	I/P：12VDC O/P：FULL/NO LOAD Ta：25℃	50.02/100%LOAD 50.03/ 0%LAOD	P
5	AC REGULATION	±10%	I/P：12VDC O/P：FULL/NO LOAD Ta：25℃	0.4 %~ -0.4 %	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	VOLTAGE RANGE	10.5VDC~15VDC	I/P：TESTING O/P：FULL LOAD Ta：25℃	10.84V~14.998 V	P
2	DC CURRENT	35A	I/P：24VDC O/P：FULL LOAD Ta：25℃	34.9 A	P
3	NO LOAD CURRENT DRAW	0.8A	I/P：12/15VDC O/P：NO LOAD Ta：25℃	0.341 A/12VDC 0.381A/15VDC	P
4	OFF MODE CURRENT DRAW	≦1mA	I/P：12/15VDC O/P：NO LOAD (SW OFF) Ta：25℃	0.497 m A/12VDC 0.601m A/15VDC	P
5	EFFICIENCY (Typ.)	86%	I/P： 13VDC O/P：350W Ta：25℃	88.79%	P

BATTERY INPUT PROTECTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	BAT. LOW ALARM	11V	IP：TESTING O/P：FULL LOAD Ta：25℃	11.3 V	P
2	BAT. LOW SHUTDOWN	10.5V	IP：TESTING O/P：FULL LOAD Ta：25℃	10.84 V	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	>105% LOAD @ 60 SEC	I/P： 12 VDC O/P：TESTING Ta：25℃	106 %/ 60 sec. 12 VDC Shut down o/p voltage Re-power on to recover	P
2	OVER TEMPERATURE PROTECTION	RTH9 = 52℃±10℃ O.T.P	I/P： 24 VDC O/P：TESTING Ta：25℃	O.T.P. Active: 51.4 ℃ Shut down o/p voltage, re-power on to recover; by internal RTH9 detect power transistor	P
3	OUTPUT SHORT	SHORT EVERY OUTPUT NO DAMAGE	I/P： 15 VDC O/P：FULL LOAD Ta：25℃	NO DAMAGE Shut down o/p voltage Re-power on to recover	P

FUNCTION TEST

1. Battery low RELAY contact test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Battery low RELAT contact test	Relay open: Battery low Relay short: Battery ok	I/P： 12 VDC O/P：TESTING Ta：25℃	Relay open: Battery low Relay short: Battery ok	P

2. Voltage protection function test:

Test function	Voltage protection range	note	RESULT	VERDICT
Battery low alarm	10.5V ~ 11.5V	Alarm activates every 2 seconds	11.3	P
Battery low shutdown	10V ~ 11V	Shut-down. LED flash red light	10.84	P
Shutdown recovery	12.5V ~ 13.50V	LED light turns to green from red and output recover to square wave.	13.130	P
Battery OVP protection	14.5V ~ 15.5V	Shut-down. LED flash red light	14.998	P
Battery OVP recovery	13.5V ~ 14.5V	LED light turns to green from red and output recover to square wave.	14.03	P

3. **LED INDICATOR** :

Led Status	System Status	RESULT	VERDICT
Green	Inverter OK.	●	P
Flash Green	Inverter OK & Solar charging、BAT. Low alarm	★	P
Red	Inverter NG. (OTP、OLP、FAN LOCK)	●	P
Flash Red	Battery OVP / low shut-down.	★	P
Orange	O.L.P exceeds 105%, protection mode on in 60Seconds, Led turns red.	●	P
Flash Orange	Battery low shut-down & Solar charging.	★	P

NOTE：Led Status (★Flash ●light)

4.Fan on/off test：

Status	System Status	RESULT	VERDICT
Fan on	Rth9=35±5℃ or CHARGER POWER>80W±30W	40.2 ℃/95 W	P
Fan off	Rth9=30±5℃ and CHARGER POWER< 70W±30W	32.7 ℃/75 W	P

5. SOLAR charger test：

Status	System Status	RESULT	VERDICT
Charger ON	Bat. <13V±0.5V	13.14	P
Charger OFF	Bat. > 14.5V±0.5V	14.65	P

6.INVERTER & SOLAR STATUS TEST

INVERTER Status	UVP	OLP	SHORT	OTP
SOLAR charger	ON	OFF	OFF	OFF
VERDICT	P	P	P	P

7. SOLAR STATUS TEST

	SOLAR INPUT=400W; FF=0.68; IP:BATTERY					
	MPPT=20V		MPPT=25V		MPPT=30V	
INV=200W LOAD	350W±50W	344.82W	350W±50W	361.48W	350W±50W	372.28W
INV=350W LOAD	350W±50W	343.79W	350W±50W	363.91W	350W±50W	374.56W

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q3 Rated： IRFB3307 130A/75V	I/P：High-Line = 14.5 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue	(1) 42.6 V (2) 31.8 V (3) 35.2 V	P
		Q71 Rated： IRFZ44V 55A/60V	(1)Full Load Turn on (2) Output Short (3)Full load continue	(1) 48.2 V (2) 52.2 V (3) 26.6 V	
		Q120 Rated： IRFB20N50K 20A/500V	(1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 398 V (2) 397 V (3) 390 V	
2	Diode Peak Voltage	D100 Rated： YG975C6R 20A/600V	I/P：High-Line = 14.5V O/P： (1)Full Load Turn on (2)Output Short (3)Fulll load continue Ta：25℃	(1) 426 V (2) 418 V (3) 390 V	P
3	Clamp Diode Peak Voltage	D71 Rated： SFRD US1D 1A/200V	I/P：High-Line =14.5 V O/P： (1) Full Load Turn on (2)Fulll load continue Ta：25℃	(1) 43.4 V (2) 25.6 V	P
4	Input Capacitor Voltage	C101 Rated： 100u/400V 105℃ 22*25 HU	I/P：High-Line = 14.5 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 398 V (2) 399 V (3) 399 V	P
5	Control IC Voltage Test	U70 Rated： UC2845BD 4V~30V	I/P：High-Line = 14.5 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 11.986 V (2) 11.990 V (3) 11.978 V	P
6	SOLAR CHARGER (D to S) or (C to E) Peak Voltage	Q31 Rated SM1F01NFC-TUG 80A/150V	SOLAR PANEL POWER=350W O/P: (1)Full Load Ta:25℃	(1) 60.45 V	P
7	SOLAR CHARGER Diode Peak Voltage	D 32 Rated YA868C15RSC:150V/ 30A	SOLAR PANEL POWER=350W O/P: (1)Full Load Ta:25℃	(2) 33.2 V	P

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	BAT.I/P-AC O/P：3 KVAC/min AC O/P -FG： 1.5 KVAC/min	I/P-O/P： 3.6 KVAC/min I/P-FG： 1.8 KVAC/min Ta：25℃	BAT.I/P-AC.O/P： 5.34 mA AC O/P-FG： 4.28 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	BAT.I/P-AC O/P：500VDC>100MΩ BAT. I/P-FG： 500VDC>100MΩ AC 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： 18 GΩ I/P-FG： 20.5 GΩ O/P-FG： 4.30 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ / 70%RH	16 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RADIATION	EN55022 CLASS A	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab	P
2	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th><th>VERDICT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： ISI-500-224
1. ROOM AMBIENT BURN-IN： 2 HRS
I/P：24 VDC O/P： FULL LOAD Ta= 31.7 ℃
2. HIGH AMBIENT BURN-IN： 2 HRS
I/P：24 VDC O/P： FULL LOAD Ta= 43.3 ℃</td><td>P</td></tr>
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NO	Position	P/N	ROOM AMBIENT Ta= 31.7 ℃	HIGH AMBIENT Ta= 43.3 ℃
1	Q31	SM1F01NFC-TUG 80A/150V	40.3℃	50.2℃
2	Q71	IRF540N 33A/100V	37.5℃	47.8℃
3	D41	STPS30L60CT 30A/60V	38.2℃	49.0℃
4	C31	680u/100V UL10Kh 16*40 KY	37.1℃	47.5℃
5	D110	HER206 2A/600V T-52mm	36.8℃	48.7℃
6	D120	HER206 2A/600V T-52mm	36.1℃	47.4℃
7	L31	TR096-R3	35.5℃	46.2℃
8	T2	TF2346	35.7℃	46.3℃
9	Q3	STP80NF12 80A/120V	59.4℃	70.7℃
10	Q1	STP80NF12 80A/120V	57.5℃	69.0℃
11	Q115	IRFB20N50K 20A/500V	40.7℃	51.8℃
12	Q120	IRFB20N50K 20A/500V	46.9℃	57.2℃
13	C11	1000u/35V UL10Kh 12.5*25 KY	47.7℃	58.4℃
14	T1	TF2352	90.2℃	102.7℃
15	C101	100u/400V 105℃ 22*25 HU	38.8℃	49.7℃
16	D200	21DQ10 2A/100V T-52mm	38.8℃	49.5℃
17	D100	YG975C6R 20A/600V	56.1℃	67.3℃
18	D101	BYV29X-600 7A/600V	43.3℃	54.3℃
19	C93	220u/16V UL8Kh 6.3*11 ZLH	36.4℃	46.8℃
20	C81	100u/25V L5Kh 6.3*11 KY	38.7℃	49.4℃
21	RTH9	10KΩ 1% NA1033F12D5	43.0℃	54.6℃
22	C95	10u/50V UL10Kh 5*11 YXM	33.5℃	43.7℃
23	C975	100u/25V UL10Kh 6.3*11 YXM	38.8℃	50.7℃
24	C974	100u/25V UL10Kh 6.3*11 YXM	35.9℃	47.4℃
25	C200	220u/25V UL7Kh 8*11.5 KY	37.3℃	48.8℃
26	D71	SFRD US1D 1A/200V SMA t=2	41.8℃	51.9℃
27	U70	UC2845BD SO-8	47.3℃	57.4℃
28	CHOKE WIRE	TR1014	38.7℃	49.7℃
29	CHOKE CORE	TR1014	39.6℃	50.8℃

2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P：24 VDC O/P： 100%LOAD Ta= -30 ℃	TEST：OK	P
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL ℃ NO DAMAGE	I/P：29 VDC O/P：FULL LOAD Ta= 40 ℃ HUMIDITY= 95 %R.H	TEST：OK	P

5	STORAGE TEMPERATURE TEST	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	OK	P
6	THERMAL SHOCK TEST	1. Thermal shock Temperature： -30℃~ +45℃ 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： 24VDC/Full Load AC ON/OFF TEST turn on 58sec；turn off 2sec	OK	P
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：12min/sweep cycle (4) Acceleration：2G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK	P
8	CAPACITOR LIFE CYCLE	SUPPOSE C11 IS THE MOST CRITICAL COMPONENT (1) I/P：24 VDC O/P：FULL LOAD Ta= 25℃ LIFE TIME (2) I/P：24 VDC O/P：FULL LOAD Ta= 40℃ LIFE TIME	(1) 972864 HRS (2) 366105HRS	P
9	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE： 81.1 KHRS		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2011/8/16	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

■ 2009/08/04 A50-F023