Test Report: ISI-501-124

500W True Sine Wave DC-AC Inverter with MPPT Solar Charger

■ DESIGN VERIFY TEST

INVERTER SECTION
BATTERY SECTION
MPPT / SOLAR SECTION
APPLICATION TEST
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■ SAFETY & E.M.C. TEST

SAFETY TEST
E.M.C. TEST

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

■ INVERTER SECTION

OUTPUT FUNCTION TEST :

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	READ POWER	500W	I/P：24VDC O/P：FULL LOAD Ta：25℃	500W
2	MAXIMUM OUTPUT POWER (Typ.)	550W(±5%) for 60 sec. surge power 1000W±10% for 30 cycles	I/P：26VDC O/P：TESTING Ta：25℃	553W 60 sec. 913.56W 31.3cycle/26VDC
3	AC VOLTAGE	110VAC	I/P：24VDC O/P：FULL/NO LOAD Ta：25℃	112.1V/100%LOAD 112.9V/0%LAOD
4	FREQUENCY	60HZ±0.1HZ	I/P：24VDC O/P：FULL/NO LOAD Ta：25℃	60HZ/100%LOAD 60HZ/ 0%LAOD
5	WAVEFORM	True sine wave (THD<3%) at rated input voltage	I/P：25VDC O/P：FULL LOAD Ta：25℃	2.098%
6	AC REGULATION	±3%	I/P：24VDC O/P：FULL/NO LOAD Ta：25℃	-0.91%~ 2.09 %

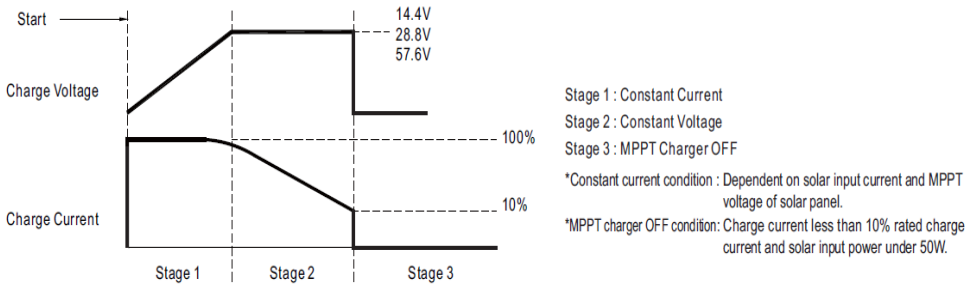
INPUT FUNCTION TEST :

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE	21VDC±1V~30VDC±1V	I/P：TESTING O/P：FULL LOAD Ta：25℃	21.56V ~ 29.9V
2	DC CURRENT	30A	I/P：24VDC O/P：FULL LOAD Ta：25℃	25.38A
3	NO LOAD CURRENT DRAW	0.63A	I/P：24/30VDC O/P：NO LOAD Ta：25℃	0.48A/24VDC 0.18A/30VDC
4	OFF MODE CURRENT DRAW	≦1mA	I/P：24/30VDC O/P：NO LOAD (SW OFF) Ta：25℃	0.61m A/24VDC 0.79mA/30VDC
5	EFFICIENCY (Typ.)	87%	I/P： 26VDC O/P：350W Ta：25℃	87.16%

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%(±5%) load for 60 sec	I/P： 24 VDC O/P：TESTING Ta：25℃	110.6% load for 60 sec Shut down Re-power ON
2	OVER TEMPERATURE PROTECTION	Shut down Re-power ON	I/P： 24VDC O/P：FULL LOAD	O.T.P. Active Shut down Re-power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P： 30VDC O/P：FULL LOAD Ta：25℃	NO DAMAGE Shut down Re-power ON

BATTERY SECTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CHARGER CURRENT (Typ.)	17A	I/P BAT：TESTING I/P Vmppt：70VDC O/P：FULL LOAD Ta：25℃	17.6A
2	CHARGING CURVE	 Stage 1 : Constant Current Stage 2 : Constant Voltage Stage 3 : MPPT Charger OFF *Constant current condition : Dependent on solar input current and MPPT voltage of solar panel. *MPPT charger OFF condition: Charge current less than 10% rated charge current and solar input power under 50W.		
3	BAT. LOW ALARM	21.5V~23.5V	I/P：TESTING O/P：FULL LOAD Ta：25℃	22.77V
4	BAT. LOW SHUTDOWN	20V~22V	I/P：TESTING O/P：FULL LOAD Ta：25℃	21.56V
5	BAT. LOW Shutdown recovery	24.4V~26.4V	I/P：TESTING O/P：FULL LOAD Ta：25℃	25V
6	Battery OVP protection	29V~31V	I/P：TESTING O/P：FULL LOAD Ta：25℃	29.9V
7	Battery OVP recovery	28V~30V	I/P：TESTING O/P：FULL LOAD Ta：25℃	28.35V
8	REVERSE POLARITY	By internal fuse open	I/P：BAT. REVERSE O/P：FULL LOAD Ta：25℃	TEST:OK

MPPT / SOLAR SECTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	MPPT CHARGER EFFICIENCY	98%	I/P BAT ：24VDC I/P Vmppt：70VDC O/P：FULL LOAD Ta：25℃	99.11%
2	OPEN CIRCUIT VOLTAGE RANGE	45V~90V	I/P BAT ：24VDC I/P Vmppt：40VDC~81VDC O/P：FULL LOAD Ta：25℃	44.73V~90.58 V
3	MPPT RANGE	35V~90V	I/P BAT ：24VDC I/P Voc：40VDC~81VDC (FF=0.85) O/P：FULL LOAD Ta：25℃	43.39V~81.87V
4	SOLAR INPUT CURRENT (Typ.)	6A~8A	I/P BAT ：24VDC I/P Vmppt：35VDC O/P：FULL LOAD Ta：25℃	6.98A

OTHER FUNCTION

Light test

Led Status	System Status	RESULT
Green	Inverter OK.	●
Orange	R.C. OFF.	●
Red	Inverter NG. (OTP、OLP、Fan lock、Bat. OVP、Bat. UVP)	●

Led Status	System Status	RESULT
Green	Battery > 25.0V；Charger OFF.	●
Flash Green	Battery > 25.0V；Charger ON.	★
Orange	22V < Bat. < 25V；Charger OFF.	●
Flash Orange	22V < Bat. < 25V；Charger ON.	★
Red	Battery < 22.0V；Charger OFF.	●
Flash Red	Battery < 22.0V；Charger ON.	★

Charger ON/OFF Threshold Voltage

Charger Table	124	TEST
Charger ON	Vbat. < 26V±1V	OK
Charger OFF (OFF only when all conditions are met)	Vbat > 29V±1V	OK
	SOLAR POWER<50W	

Inverter State & Charger State

Inverter State	R.C off	UVP	OVP	OLP	OTP	SHORT
Charger State	ON	ON	OFF	OFF	OFF	OFF
TEST	OK	OK	OK	OK	OK	OK

Voltage & Frequency Mode Selection

		100V (200V)	110V (220V)	115V (230V)	120V (240V)
50Hz	Status LED	●	●	●	●
	Battery LED	●	★	●	★
60Hz	Status LED	★	★	★	★
	Battery LED	●	★	●	★

★:flashing ； ●:light

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q142 Rated 57A/100V Q1 Rated 83A/150V	I/P：High-Line = 29VDC O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue I/P ： 26VDC O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 77.5 V (2) 74.3 V (3) 78.2 V (1) 114 V (2) 87 V (3) 114 V
2	DCTO DC Diode Peak Voltage	D 401 Rated 20A/300V	I/P：High-Line = 29VDC O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 258 V (2) 240 V (3) 243 V
3	DC BUS Capacitor Voltage	C401 Rated 220u/250V	I/P：High-Line = 29VDC O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 245 V (2) 242 V (3) 240 V
4	Control IC Voltage Test	U141 Rated： 4V~30V	I/P：High-Line = 29VDC O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 11.9 V (2) 11.9 V (3) 11.5 V
5	DC TO AC Power Transistor (D to S) or (C to E) **Peak Voltage**	Q501 Rated 20A/600V	I/P：High-Line = 29VDC O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 285 V (2) 285 V (3) 286 V

■ SAFETY & E.M.C. TEST

■ SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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： 4.9 mA AC O/P-FG： 3.8 mA NO DAMAGE
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： 1.16 GΩ I/P-FG： 1.04 GΩ O/P-FG： 1.36 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ / 70%RH	15 mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	EN55022 CLASS B	I/P: 24VDC O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
2	RADIATION	EN55022 CLASS B	I/P:24VDC O/P: :FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A

■ 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： ISI-501-112
1. ROOM AMBIENT BURN-IN：16 HRS
I/P： 12VDC O/P： FULL LOAD Ta= 31.9 ℃
2. HIGH AMBIENT BURN-IN： 1 HRS
I/P： 12VDC O/P： FULL LOAD Ta= 42.2 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT</th><th>HIGH AMBIENT</th></tr>
<tr><td>1</td><td>Q341</td><td>69.2℃</td><td>80.7℃</td></tr>
<tr><td>2</td><td>C333</td><td>68.5℃</td><td>80.1℃</td></tr>
<tr><td>4</td><td>T310</td><td>87.1℃</td><td>97.5℃</td></tr>
<tr><td>5</td><td>D401</td><td>61.2℃</td><td>71.7℃</td></tr>
<tr><td>6</td><td>L1</td><td>38.4℃</td><td>49.1℃</td></tr>
<tr><td>7</td><td>L500</td><td>53.4℃</td><td>64.3℃</td></tr>
<tr><td>8</td><td>RTH1</td><td>45.8℃</td><td>56.2℃</td></tr>
<tr><td>9</td><td>RTH2</td><td>54.7℃</td><td>65.4℃</td></tr>
<tr><td>10</td><td>Q2</td><td>46.7℃</td><td>57.2℃</td></tr>
<tr><td>11</td><td>Q4</td><td>47.5℃</td><td>57.8℃</td></tr>
<tr><td>12</td><td>C335</td><td>76.3℃</td><td>87.0℃</td></tr>
<tr><td>13</td><td>Q531</td><td>54.2℃</td><td>64.2℃</td></tr>
<tr><td>14</td><td>T102</td><td>49.2℃</td><td>59.9℃</td></tr>
<tr><td>15</td><td>U801</td><td>40.3℃</td><td>51.2℃</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： 11.5VDC/14.5VDC
O/P： 100 % LOAD
Ta= -25 ℃</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 40 ℃
NO DAMAGE</td><td>I/P： 14.5 VDC
O/P：FULL LOAD
Ta=40 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>4</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>
<tr><td>5</td><td>THERMAL SHOCK TEST</td><td colspan="2">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：12VDC/Full Load AC ON/OFF TEST
turn on 58sec；turn off 2sec</td><td>OK</td></tr>
<tr><td>6</td><td>VIBRATION TEST</td><td colspan="2">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℃</td><td>TEST：OK</td></tr>
</table>

7	CAPACITOR LIFE CYCLE	SUPPOSE C333 IS THE MOST CRITICAL COMPONENT (1) I/P： 12VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 12VDC O/P：FULL LOAD Ta= 40 ℃ LIFE TIME (3) I/P： 12VDC O/P：75% LOAD Ta= 40℃ LIFE TIME (4) I/P： 12VDC O/P：50% LOAD Ta=40 ℃ LIFE TIME	(1) 165847HRS (2) 53562HRS (3) 217362HRS (4) 431694HRS
8	MTBF	MIL-HDBK-217F NOTICE S2 PARTS COUNT TOTAL FAILURE RATE：57.8 KHRS	
9	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 40℃	

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

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