



Test Report: ISI-501-224

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

■ DESIGN VERIFY TEST

INVERTER SECTION

BATTERY SECTION

MPPT / SOLAR SECTION

APPLICATION TEST

OTHER FUNCTION

COMPONENT STRESS TEST

■ 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°C	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°C	496.8W 60 sec. 1076.2W/ 31.3cycle/26VDC
3	AC VOLTAGE	230VAC	I/P : 24VDC O/P : FULL/NO LOAD Ta : 25°C	234.8VAC/100%LOAD 236.4VAC/0%LAOD
4	FREQUENCY	50HZ±0.1HZ	I/P : 24VDC O/P : FULL/NO LOAD Ta : 25°C	50.006HZ/100%LOAD 50.006HZ/ 0%LAOD
5	WAVEFORM	True sine wave (THD<3%) at rated input voltage	I/P : 25VDC O/P : FULL LOAD Ta : 25°C	1.76%
6	AC REGULATION	±3%	I/P : 24VDC O/P : FULL/NO LOAD Ta : 25°C	2.08%~ 2.19%

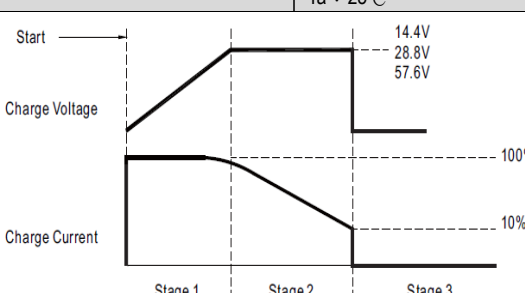
INPUT FUNCTION TEST :

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE	21VDC±1V~30VDC±1V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	20.8V~29.4 V
2	DC CURRENT	30A	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	23.56A
3	NO LOAD CURRENT DRAW	0.63A	I/P : 24/30VDC O/P : NO LOAD Ta : 25°C	0.62A/24VDC 0.5A/30VDC
4	OFF MODE CURRENT DRAW	≤ 1mA	I/P : 24/30VDC O/P : NO LOAD (SW OFF) Ta : 25°C	0.37mA/24VDC 0.75mA/30VDC
5	EFFICIENCY (Typ.)	88%	I/P : 26VDC O/P : 350W Ta : 25°C	90.32%

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°C	110.4% 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°C	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°C	17.18A
2	CHARGING CURVE	 Start ———→ Charge Voltage Charge Current Stage 1 Stage 2 Stage 3 14.4V 28.8V 57.6V 100% 10% 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°C	22.27V
4	BAT. LOW SHUTDOWN	20V~22V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	20.8V
5	BAT. LOW Shutdown recovery	24.4V~26.4V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	25V
6	Battery OVP protection	29V~31V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	29.4V
7	Battery OVP recovery	28V~30V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	28.46V
8	REVERSE POLARITY	By internal fuse open	I/P : BAT. REVERSE O/P : FULL LOAD Ta : 25°C	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°C	99.1%
2	OPEN CIRCUIT VOLTAGE RANGE	45V~90V	I/P BAT : 24VDC I/P Vmppt : 40VDC~81VDC O/P : FULL LOAD Ta : 25°C	44.8V~90.3V
3	MPPT RANGE	35V~90V	I/P BAT : 24VDC I/P Voc : 40VDC~81VDC(FF=0.85) O/P : FULL LOAD Ta : 25°C	43V~82V
4	SOLAR INPUT CURRENT (Typ.)	6A~8A	I/P BAT : 24VDC I/P Vmppt : 35VDC O/P : FULL LOAD Ta : 25°C	6.99A

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	224	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 150V/83A	I/P : High-Line = 29 VDC 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) 68.8 (2) 66.4 (3) 66.4 (1) 54.6 (2) 51.4 (3) 54.6	V V V V V V
2	DCTO DC Diode Peak Voltage	D 401 Rated :600V/20A	I/P : High-Line = 29 VDC O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25℃	(1) 421 (2) 429 (3) 409	V V V
3	DC BUS Capacitor Voltage	C401 Rated 100u/450V	I/P : High-Line = 29 VDC O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25℃	(1) 425 (2) 441 (3) 441	V V V
4	Control IC Voltage Test	U141 Rated : 4V~30V	I/P : High-Line = 29 VDC O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25℃	(1) 12.2 (2) 13.33 (3) 11.6	V V V
5	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q501 Rated 20A/600V	I/P : High-Line = 29 VDC O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25℃	(1) 404 (2) 429 (3) 417	V V V

■ SAFETY & E.M.C. TEST

■ SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT./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°C	BAT./P-AC.O/P : 4.82 mA AC O/P-FG : 3.72 mA NO DAMAGE
2	ISOLATION RESISTANCE	BAT./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°C /70%RH	I/P-O/P : 2.39 GΩ I/P-FG : 3.97 GΩ O/P-FG : 2.61 GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 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°C	PASS Test by certified Lab
2	RADIATION	EN55022 CLASS B	I/P:24VDC O/P: :FULL/50% LOAD Ta:25°C	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°C	CRITERIA A

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																												
1	TEMPERATURE RISE TEST	MODEL : ISI-501-248 1. ROOM AMBIENT BURN-IN : 16 HRS I/P : 12VDC O/P : FULL LOAD Ta= 26.4 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 12VDC O/P : FULL LOAD Ta= 44.1 °C <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>43.5°C</td><td>62.6°C</td></tr><tr><td>2</td><td>C333</td><td>35.6°C</td><td>54.2°C</td></tr><tr><td>4</td><td>L331</td><td>54.1°C</td><td>73.7°C</td></tr><tr><td>5</td><td>D401</td><td>47.6°C</td><td>65.9°C</td></tr><tr><td>6</td><td>L1</td><td>30.0°C</td><td>48.3°C</td></tr><tr><td>7</td><td>L500</td><td>57.8°C</td><td>77.2°C</td></tr><tr><td>8</td><td>RTH1</td><td>34.2°C</td><td>52.0°C</td></tr><tr><td>9</td><td>RTH2</td><td>39.4°C</td><td>57.7°C</td></tr><tr><td>10</td><td>Q2</td><td>34.9°C</td><td>52.8°C</td></tr><tr><td>11</td><td>Q4</td><td>35.5°C</td><td>53.2°C</td></tr><tr><td>12</td><td>C335</td><td>40.5°C</td><td>59.7°C</td></tr><tr><td>13</td><td>Q531</td><td>42.6°C</td><td>60.3°C</td></tr><tr><td>14</td><td>T102</td><td>39.6°C</td><td>58.2°C</td></tr><tr><td>15</td><td>U801</td><td>32.5°C</td><td>50.7°C</td></tr></table>			NO	Position	ROOM AMBIENT	HIGH AMBIENT	1	Q341	43.5°C	62.6°C	2	C333	35.6°C	54.2°C	4	L331	54.1°C	73.7°C	5	D401	47.6°C	65.9°C	6	L1	30.0°C	48.3°C	7	L500	57.8°C	77.2°C	8	RTH1	34.2°C	52.0°C	9	RTH2	39.4°C	57.7°C	10	Q2	34.9°C	52.8°C	11	Q4	35.5°C	53.2°C	12	C335	40.5°C	59.7°C	13	Q531	42.6°C	60.3°C	14	T102	39.6°C	58.2°C	15	U801	32.5°C	50.7°C
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 46VDC/58.3VDC O/P : 100 % LOAD Ta= -25 °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 : 58.3 VDC O/P : FULL LOAD Ta=40 °C HUMIDITY= 95 %R.H	TEST : OK																																																												
4	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK																																																												
5	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30°C~ +45°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 48VDC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec		OK																																																												
6	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°C		TEST : OK																																																												

7	CAPACITOR LIFE CYCLE	SUPPOSE C333 IS THE MOST CRITICAL COMPONENT (1) I/P : 48VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 48VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME (3) I/P : 48VDC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 48VDC O/P : 50% LOAD Ta=40 °C LIFE TIME	(1) 1606011HRS (2) 533437HRS (3) 744011HRS (4) 878736HRS
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 °C	

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

12.10.30 A50-F031