



# Test Report: ISI-501-148

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

## ■ DESIGN VERIFY TEST

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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 : 48VDC 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 : 52VDC O/P : TESTING Ta : 25°C	554W      60 sec. 1050W      30.7cycle/52VDC
3	AC VOLTAGE	110VAC	I/P : 48VDC O/P : FULL/NO LOAD Ta : 25°C	111.6V /100%LOAD 112.5V /0%LAOD
4	FREQUENCY	60HZ±0.1HZ	I/P : 48VDC O/P : FULL/NO LOAD Ta : 25°C	60.008HZ/100%LOAD 60.01HZ / 0%LAOD
5	WAVEFORM	True sine wave (THD<3%) at rated input voltage	I/P : 50VDC O/P : FULL LOAD Ta : 25°C	1.95%
6	AC REGULATION	±3%	I/P : 48VDC O/P : FULL/NO LOAD Ta : 25°C	1.48%~ 1.67 %

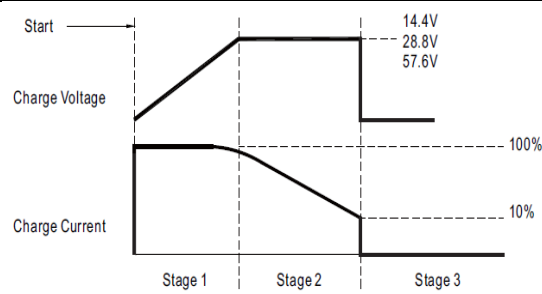
INPUT FUNCTION TEST :

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE	42VDC~60VDC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	41.9V~ 58.8 V
2	DC CURRENT	15A	I/P : 48VDC O/P : FULL LOAD Ta : 25°C	11.99A
3	NO LOAD CURRENT DRAW	0.32A	I/P : 48/60VDC O/P : NO LOAD Ta : 25°C	0.307A/48VDC 0.25A/60VDC
4	OFF MODE CURRENT DRAW	≤ 1mA	I/P : 48/60VDC O/P : NO LOAD (SW OFF) Ta : 25°C	0.363mA/48VDC 0.8mA/60VDC
5	EFFICIENCY (Typ.)	87%	I/P : 52VDC O/P : 350W Ta : 25°C	87.33%

**PROTECTION FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%(±5%) load for 60 sec	I/P : 48VDC O/P : TESTING Ta : 25°C	110.8% load for 60 sec Shut down Re-power ON
2	OVER TEMPERATURE PROTECTION	Shut down Re-power ON	I/P : 48VDC 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 : 60VDC 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.)	8.5A	I/P BAT : 48VDC~56VDC I/P Vmppt : 110VDC O/P : FULL LOAD Ta : 25°C	9.16A
2	CHARGING CURVE	 <p>Start</p> <p>Charge Voltage</p> <p>Charge Current</p> <p>14.4V 28.8V 57.6V</p> <p>100%</p> <p>10%</p> <p>Stage 1 Stage 2 Stage 3</p> <p>Stage 1 : Constant Current Stage 2 : Constant Voltage Stage 3 : MPPT Charger OFF</p> <p>*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.</p>		
3	BAT. LOW ALARM	43V~47V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	44.6V
4	BAT. LOW SHUTDOWN	40V~44V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	42V
5	BAT. LOW Shutdown recovery	48.8V~52.8V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	52.35V
6	Battery OVP protection	58V~62V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	58.8V
7	Battery OVP recovery	56V~60V	I/P : TESTING O/P : FULL LOAD Ta : 25°C	57.2V
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 : 48VDC I/P Vmppt : 110VDC O/P : FULL LOAD Ta : 25°C	99.26%
2	OPEN CIRCUIT VOLTAGE RANGE	90V~160V	I/P BAT : 48VDC I/P Vmppt : 80VDC~144VDC O/P : FULL LOAD Ta : 25°C	89.47V~161.04V
3	MPPT RANGE	70V~160V	I/P BAT : 48VDC I/P Voc : 90VDC~160VDC(FF=0.85) O/P : FULL LOAD Ta : 25°C	85.67V~145.2V
4	SOLAR INPUT CURRENT (Typ.)	4A~5A	I/P BAT : 48VDC I/P Vmppt : 70VDC O/P : FULL LOAD Ta : 25°C	4.714A

**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 > 50.0V ; Charger OFF.	
Flash Green	Battery > 50.0V ; Charger ON.	
Orange	44V < Bat. < 50V ; Charger OFF.	
Flash Orange	44V < Bat. < 50V ; Charger ON.	
Red	Battery < 44.0V ; Charger OFF.	
Flash Red	Battery < 44.0V ; Charger ON.	

**Charger ON/OFF Threshold Voltage**

Charger Table	148	TEST
Charger ON	Vbat. < 52V±2V	OK
Charger OFF (OFF only when all conditions are met)	Vbat > 58V±2V	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 18A/200V	I/P : High-Line = 58VDC O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue	(1)	157 V
		Q1 Rated 46A/250V	I/P : 52VDC O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(2)	130 V
2	DCTO DC Diode Peak Voltage	D 401 Rated 20A/300V	I/P : High-Line = 58VDC O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(3)	136 V
				(1)	186 V
3	DC BUS Capacitor Voltage	C401 Rated 220u/250V	I/P : High-Line = 58VDC O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(2)	166 V
				(3)	186 V
4	Control IC Voltage Test	U141 Rated : 4V~30V	I/P : High-Line = 58VDC O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1)	253 V
				(2)	240 V
5	DC TO AC Power Transistor ( D to S) or (C to E) Peak Voltage	Q501 Rated 20A/600V	I/P : High-Line = 58VDC O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(3)	240 V
				(1)	277 V
				(2)	285 V
				(3)	280 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°C	BAT.I/P-AC.O/P : 4.5 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°C /70%RH	I/P-O/P : 1.38 GΩ I/P-FG : 0.87 GΩ O/P-FG : 1.73 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: 48VDC O/P: FULL/50% LOAD Ta: 25°C	PASS Test by certified Lab
2	RADIATION	EN55022 CLASS B	I/P: 48VDC 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	VERDICT																																																												
1	TEMPERATURE RISE TEST	MODEL : ISI-501-112 1. ROOM AMBIENT BURN-IN : 16 HRS I/P : 12VDC O/P : FULL LOAD Ta= 31.9 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 12VDC O/P : FULL LOAD Ta= 42.2 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT</th> <th>HIGH AMBIENT</th> </tr> </thead> <tbody> <tr><td>1</td><td>Q341</td><td>69.2°C</td><td>80.7°C</td></tr> <tr><td>2</td><td>C333</td><td>68.5°C</td><td>80.1°C</td></tr> <tr><td>4</td><td>T310</td><td>87.1°C</td><td>97.5°C</td></tr> <tr><td>5</td><td>D401</td><td>61.2°C</td><td>71.7°C</td></tr> <tr><td>6</td><td>L1</td><td>38.4°C</td><td>49.1°C</td></tr> <tr><td>7</td><td>L500</td><td>53.4°C</td><td>64.3°C</td></tr> <tr><td>8</td><td>RTH1</td><td>45.8°C</td><td>56.2°C</td></tr> <tr><td>9</td><td>RTH2</td><td>54.7°C</td><td>65.4°C</td></tr> <tr><td>10</td><td>Q2</td><td>46.7°C</td><td>57.2°C</td></tr> <tr><td>11</td><td>Q4</td><td>47.5°C</td><td>57.8°C</td></tr> <tr><td>12</td><td>C335</td><td>76.3°C</td><td>87.0°C</td></tr> <tr><td>13</td><td>Q531</td><td>54.2°C</td><td>64.2°C</td></tr> <tr><td>14</td><td>T102</td><td>49.2°C</td><td>59.9°C</td></tr> <tr><td>15</td><td>U801</td><td>40.3°C</td><td>51.2°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT	HIGH AMBIENT	1	Q341	69.2°C	80.7°C	2	C333	68.5°C	80.1°C	4	T310	87.1°C	97.5°C	5	D401	61.2°C	71.7°C	6	L1	38.4°C	49.1°C	7	L500	53.4°C	64.3°C	8	RTH1	45.8°C	56.2°C	9	RTH2	54.7°C	65.4°C	10	Q2	46.7°C	57.2°C	11	Q4	47.5°C	57.8°C	12	C335	76.3°C	87.0°C	13	Q531	54.2°C	64.2°C	14	T102	49.2°C	59.9°C	15	U801	40.3°C	51.2°C		P
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 11.5VDC/14.5VDC O/P : 100 % LOAD Ta= -25 °C	TEST : OK	P																																																												
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 14.5 VDC O/P : FULL LOAD Ta=40 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																												
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	P																																																												
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 : 12VDC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec		OK	P																																																												
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	P																																																												



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

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

12.10.30 A50-F031