



Test Report: ISI-500-224

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	500W	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	500.9W	P
2	SURGE POWER (Typ.)	1000W	I/P : 26VDC O/P : TESTING Ta : 25°C	1013.88W / 47 cycle/26VDC	P
3	AC VOLTAGE	230VAC	I/P : 24VDC O/P : FULL/NO LOAD Ta : 25°C	232.9/100%LOAD 230.5/0%LAOD	P
4	FREQUENCY	50HZ±0.5HZ	I/P : 24VDC O/P : FULL/NO LOAD Ta : 25°C	50.04/100%LOAD 50.01/ 0%LAOD	P
5	AC REGULATION	±10%	I/P : 24VDC O/P : FULL/NO LOAD Ta : 25°C	1.04%~ -1.04 %	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	VOLTAGE RANGE	21VDC~30VDC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	21.5V~29.745 V	P
2	DC CURRENT	25A	I/P : 24VDC O/P : FULL LOAD Ta : 25°C	23.1A	P
3	NO LOAD CURRENT DRAW	0.4A	I/P : 24/30VDC O/P : NO LOAD Ta : 25°C	0.169A/24VDC 0.162 A/30VDC	P
4	OFF MODE CURRENT DRAW	≤ 1mA	I/P : 24/30VDC O/P : NO LOAD (SW OFF) Ta : 25°C	0.766 m A/24VDC 0.892m A/30VDC	P
5	EFFICIENCY (Typ.)	88%	I/P : 26VDC O/P : 350W Ta : 25°C	92.6%	P

BATTERY INPUT PROTECTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	BAT. LOW ALARM	22V	IP : TESTING O/P : FULL LOAD Ta : 25°C	22.1 V	P
2	BAT. LOW SHUTDOWN	21V	IP : TESTING O/P : FULL LOAD Ta : 25°C	21.5 V	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	>105% LOAD @ 60 SEC	I/P : 24 VDC O/P : TESTING Ta : 25°C	105.8 %/61SEC. 24 VDC Shut down o/p voltage Re-power on to recover	P
2	OVER TEMPERATURE PROTECTION	RTH9 =68°C±10°C O.T.P	I/P : 24 VDC O/P : TESTING Ta : 25°C	O.T.P. Active:68.6°C Shut down o/p voltage, re-power on to recover; by internal RTH9 detect power transistor	P
3	OUTPUT SHORT	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 30 VDC O/P : FULL LOAD Ta : 25°C	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 : 24 VDC O/P : TESTING Ta : 25°C	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	21.0V ~ 23.0V	Alarm activates every 2 seconds	22.1V	P
Battery low shutdown	20.0V ~ 22.0V	Shut-down. LED flash red light	21.5V	P
Shutdown recovery	25.0V ~ 27.0V	LED light turns to green from red and output recover to square wave.	26.034V	P
Battery OVP protection	29.0V ~ 31.0V	Shut-down. LED flash red light	29.745V	P
Battery OVP recovery	27.0V ~ 29.0V	LED light turns to green from red and output recover to square wave.	28.1V	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	41.2℃/82 W	P
Fan off	Rth9=30±5℃ and CHARGER POWER< 70W±30W	33.5℃/70 W	P

5. SOLAR charger test :

Status	System Status	RESULT	VERDICT
Charger ON	Bat.< 26V±1V	25.99	P
Charger OFF	Bat. > 29V±1V	29.07	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=600W; FF=0.68; IP:BATTERY					
	MPPT=35V		MPPT=45V		MPPT=60V	
INV=200W LOAD	500W±50W	523.43W	500W±50W	529.19W	500W±50W	539.21W
INV=500W LOAD	500W±50W	525.31W	500W±50W	533.96W	500W±50W	532.12W

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 : STP80NF12:120V/80A Q71 Rated : IRF540N 33A/100V Q120 Rated : IRFB20N50K 20A/500V	I/P : High-Line = 29 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue (1)Full Load Turn on (2) Output Short (3)Full load continue (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 99.2 V (2) 66.4 V (3) 72.8 V (1) 71.4 V (2) 50.4 V (3) 50.8 V (1) 396 V (2) 386 V (3) 386 V	P
2	Diode Peak Voltage	D100 Rated : YG975C6R 20A/600V	I/P : High-Line = 29 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 436 V (2) 372 V (3) 400 V	P
3	Clamp Diode Peak Voltage	D71 Rated : SFRD US1D 1A/200V	I/P : High-Line = 29 V O/P : (1) Full Load Turn on (2)Full load continue Ta : 25°C	(1) 66.4 V (2) 50.4 V	P
4	Input Capacitor Voltage	C101 Rated : 100u/400V 105°C 22*25 HU	I/P : High-Line = 29 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 398 V (2) 399 V (3) 399 V	P
5	Control IC Voltage Test	U70 Rated : UC2845BD 4V~30V	I/P : High-Line = 29 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 11.874 V (2) 11.875 V (3) 11.856 V	P
6	SOLAR CHARGER (D to S) or (C to E) Peak Voltage	Q31 Rated SM1F01NFC-TUG 80A/150V	SOLAR PANEL POWER=500W O/P: (1)Full Load Ta:25°C	(1) 97 V	P
7	SOLAR CHARGER Diode Peak Voltage	D 32 Rated YA868C15RSC:150V/ 30A	SOLAR PANEL POWER=500W O/P: (1)Full Load Ta:25°C	(2) 125 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°C	BAT.I/P-AC.O/P : 5.33 mA AC O/P-FG : 4.84 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°C/70%RH	I/P-O/P : 11.9 GΩ I/P-FG : 16.4 GΩ O/P-FG : 3.80 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 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°C	PASS Test by certified Lab	P
2	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																																																																						
1	TEMPERATURE RISE TEST	MODEL : ISI-500-224 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 31.7 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 43.3 °C <table><thead><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 31.7 °C</th><th>HIGH AMBIENT Ta= 43.3 °C</th></tr></thead><tbody><tr><td>1</td><td>Q31</td><td>SM1F01NFC-TUG 80A/150V</td><td>40.3°C</td><td>50.2°C</td></tr><tr><td>2</td><td>Q71</td><td>IRF540N 33A/100V</td><td>37.5°C</td><td>47.8°C</td></tr><tr><td>3</td><td>D41</td><td>STPS30L60CT 30A/60V</td><td>38.2°C</td><td>49.0°C</td></tr><tr><td>4</td><td>C31</td><td>680u/100V UL10Kh 16*40 KY</td><td>37.1°C</td><td>47.5°C</td></tr><tr><td>5</td><td>D110</td><td>HER206 2A/600V T-52mm</td><td>36.8°C</td><td>48.7°C</td></tr><tr><td>6</td><td>D120</td><td>HER206 2A/600V T-52mm</td><td>36.1°C</td><td>47.4°C</td></tr><tr><td>7</td><td>L31</td><td>TR096-R3</td><td>35.5°C</td><td>46.2°C</td></tr><tr><td>8</td><td>T2</td><td>TF2346</td><td>35.7°C</td><td>46.3°C</td></tr><tr><td>9</td><td>Q3</td><td>STP80NF12 80A/120V</td><td>59.4°C</td><td>70.7°C</td></tr><tr><td>10</td><td>Q1</td><td>STP80NF12 80A/120V</td><td>57.5°C</td><td>69.0°C</td></tr><tr><td>11</td><td>Q115</td><td>IRFB20N50K 20A/500V</td><td>40.7°C</td><td>51.8°C</td></tr><tr><td>12</td><td>Q120</td><td>IRFB20N50K 20A/500V</td><td>46.9°C</td><td>57.2°C</td></tr><tr><td>13</td><td>C11</td><td>1000u/35V UL10Kh 12.5*25 KY</td><td>47.7°C</td><td>58.4°C</td></tr><tr><td>14</td><td>T1</td><td>TF2352</td><td>90.2°C</td><td>102.7°C</td></tr><tr><td>15</td><td>C101</td><td>100u/400V 105°C 22*25 HU</td><td>38.8°C</td><td>49.7°C</td></tr><tr><td>16</td><td>D200</td><td>21DQ10 2A/100V T-52mm</td><td>38.8°C</td><td>49.5°C</td></tr><tr><td>17</td><td>D100</td><td>YG975C6R 20A/600V</td><td>56.1°C</td><td>67.3°C</td></tr><tr><td>18</td><td>D101</td><td>BYV29X-600 7A/600V</td><td>43.3°C</td><td>54.3°C</td></tr><tr><td>19</td><td>C93</td><td>220u/16V UL8Kh 6.3*11 ZLH</td><td>36.4°C</td><td>46.8°C</td></tr><tr><td>20</td><td>C81</td><td>100u/25V L5Kh 6.3*11 KY</td><td>38.7°C</td><td>49.4°C</td></tr><tr><td>21</td><td>RTH9</td><td>10KΩ 1% NA1033F12D5</td><td>43.0°C</td><td>54.6°C</td></tr><tr><td>22</td><td>C95</td><td>10u/50V UL10Kh 5*11 YXM</td><td>33.5°C</td><td>43.7°C</td></tr><tr><td>23</td><td>C975</td><td>100u/25V UL10Kh 6.3*11 YXM</td><td>38.8°C</td><td>50.7°C</td></tr><tr><td>24</td><td>C974</td><td>100u/25V UL10Kh 6.3*11 YXM</td><td>35.9°C</td><td>47.4°C</td></tr><tr><td>25</td><td>C200</td><td>220u/25V UL7Kh 8*11.5 KY</td><td>37.3°C</td><td>48.8°C</td></tr><tr><td>26</td><td>D71</td><td>SFRD US1D 1A/200V SMA t=2</td><td>41.8°C</td><td>51.9°C</td></tr><tr><td>27</td><td>U70</td><td>UC2845BD SO-8</td><td>47.3°C</td><td>57.4°C</td></tr><tr><td>28</td><td>CHOKE WIRE</td><td>TR1014</td><td>38.7°C</td><td>49.7°C</td></tr><tr><td>29</td><td>CHOKE CORE</td><td>TR1014</td><td>39.6°C</td><td>50.8°C</td></tr></tbody></table>			NO	Position	P/N	ROOM AMBIENT Ta= 31.7 °C	HIGH AMBIENT Ta= 43.3 °C	1	Q31	SM1F01NFC-TUG 80A/150V	40.3°C	50.2°C	2	Q71	IRF540N 33A/100V	37.5°C	47.8°C	3	D41	STPS30L60CT 30A/60V	38.2°C	49.0°C	4	C31	680u/100V UL10Kh 16*40 KY	37.1°C	47.5°C	5	D110	HER206 2A/600V T-52mm	36.8°C	48.7°C	6	D120	HER206 2A/600V T-52mm	36.1°C	47.4°C	7	L31	TR096-R3	35.5°C	46.2°C	8	T2	TF2346	35.7°C	46.3°C	9	Q3	STP80NF12 80A/120V	59.4°C	70.7°C	10	Q1	STP80NF12 80A/120V	57.5°C	69.0°C	11	Q115	IRFB20N50K 20A/500V	40.7°C	51.8°C	12	Q120	IRFB20N50K 20A/500V	46.9°C	57.2°C	13	C11	1000u/35V UL10Kh 12.5*25 KY	47.7°C	58.4°C	14	T1	TF2352	90.2°C	102.7°C	15	C101	100u/400V 105°C 22*25 HU	38.8°C	49.7°C	16	D200	21DQ10 2A/100V T-52mm	38.8°C	49.5°C	17	D100	YG975C6R 20A/600V	56.1°C	67.3°C	18	D101	BYV29X-600 7A/600V	43.3°C	54.3°C	19	C93	220u/16V UL8Kh 6.3*11 ZLH	36.4°C	46.8°C	20	C81	100u/25V L5Kh 6.3*11 KY	38.7°C	49.4°C	21	RTH9	10KΩ 1% NA1033F12D5	43.0°C	54.6°C	22	C95	10u/50V UL10Kh 5*11 YXM	33.5°C	43.7°C	23	C975	100u/25V UL10Kh 6.3*11 YXM	38.8°C	50.7°C	24	C974	100u/25V UL10Kh 6.3*11 YXM	35.9°C	47.4°C	25	C200	220u/25V UL7Kh 8*11.5 KY	37.3°C	48.8°C	26	D71	SFRD US1D 1A/200V SMA t=2	41.8°C	51.9°C	27	U70	UC2845BD SO-8	47.3°C	57.4°C	28	CHOKE WIRE	TR1014	38.7°C	49.7°C	29	CHOKE CORE	TR1014	39.6°C	50.8°C	P
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 24 VDC O/P : 100%LOAD Ta= -30 °C	TEST : OK	P																																																																																																																																																						
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL °C NO DAMAGE	I/P : 29 VDC O/P : FULL LOAD Ta= 40 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																																																																																						

5	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
6	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 : 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°C	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°C LIFE TIME (2) I/P : 24 VDC O/P : FULL LOAD Ta= 40°C 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