Test Report: SDR-960-48

960W Single Output Industrial DIN RAIL with PFC Function

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function 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	RIPPLE & NOISE	V1：250 mVp-p (Max)	I/P： 230VAC O/P：FULL LOAD Ta：25℃	V1： 53.9 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1： 48V ~ 55 V	I/P： 230 VAC I/P： 200 VAC O/P：MIN LOAD Ta：25℃	46.767 V ~ 56.18 V/ 230 VAC 46.77 V ~ 56.18 V/ 200 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1： 1 %~ -1 % (Max)	I/P：200 VAC / 264 VAC O/P：FULL/ MIN LOAD Ta：25℃	V1： 0.05 %~ -0.05 %	P
4	LINE REGULATION	V1：0.5 %~ -0.5 % (Max)	I/P：200 VAC ~ 264 VAC O/P：FULL LOAD Ta：25℃	V1： 0 %~ 0 %	P
5	LOAD REGULATION	V1：1 %~ -1 % (Max)	I/P： 230 VAC O/P：FULL ~MIN LOAD Ta：25℃	V1： 0.03 %~ -0.03 %	P
6	SET UP TIME	230VAC： 1000 ms (Max)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 682 ms	P
7	RISE TIME	230VAC： 100 ms (Max)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 21 ms	P
8	HOLD UP TIME	230VAC： 14 ms (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 18 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	TEST： <5 %	P
10	DYNAMIC LOAD	V1： 4800 mVp-p	I/P： 230 VAC (1).O/P：FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P：FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P：FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P：FULL /Min LOAD 50%DUTY/ 120HZ Ta：25℃	(1) 730 mVp-p (2) 880 mVp-p (3) 880 mVp-p (4) 2.39 Vp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	180VAC~264 VAC	I/P：TESTING O/P：FULL LOAD Ta：25℃	161 V~264V	P
			I/P： LOW-LINE-3V=177 V HIGH-LINE =280V O/P：FULL/MIN LOAD ON： 30 Sec . OFF： 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST： OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P：200VAC ~ 264 VAC O/P：FULL~MIN LOAD Ta：25℃	TEST： OK	P
3	POWER FACTOR	0.95 / 230 VAC(TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	PF= 0.9624 / 230 VAC	P
4	EFFICIENCY	94% (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	94.683 %	P
5	INPUT CURRENT	230V/ 6 A (TYP)	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 4.6047 A/ 230 VAC	P
6	INRUSH CURRENT	230V/ 50 A (TYP) COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I = 40 A/ 230 VAC	P
7	LEAKAGE CURRENT	< 3.5 mA / 240 VAC	I/P：240 VAC O/P：Min LOAD Ta：25℃	L-FG： 1 mA N-FG： 1 mA	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	1、105% ~ 130% 2、130%~ 150%	I/P： 230 VAC O/P：TESTING Ta：25℃	115%/ 230 VAC 137.5%/ 230 VAC Normally works within 105 ~ 130% rated output power for more than 3 seconds and then shut down o/p voltage with auto-recovery after 30 seconds if the peak load condition is removed Constant current limiting within 130 ~ 150% rated output power for more than 3 seconds and then shut down o/p voltage, re-power on to recover	P
2	OVER VOLTAGE PROTECTION	CH1：56V ~ 65V	I/P： 230 VAC I/P： 200 VAC O/P：MIN LOAD Ta：25℃	61.75V/ 230 VAC 61.67V/ 200VAC Shut down o/p voltage, with auto-recovery or re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	SPEC： TSW1： 90 ± 5℃ O.T.P. NO DAMAGE	I/P： 230 VAC O/P：FULL LOAD	O.T.P. Active Shut down o/p voltage，recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P： 264 VAC O/P：FULL LOAD Ta：25℃	NO DAMAGE Constant current limiting within 130 ~ 150% rated output power for more than 3 seconds and then shut down o/p voltage, re-power on to recover	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	DC OK REALY CONTACT RATINGS (max.)	60Vdc/0.3A, 24Vdc/1A, 30Vac/0.5A resistive load	I/P： 230 VAC O/P：FULL LOAD	TEST :OK	P
2	CURRENT SHARING	PSU1-PSU2- PSU3- PSU4 < 10%	I/P： 230 VAC O/P：90%/50% LOAD Ta：25℃	O/P：90% PSU1： 18.5A PSU2： 18.6A PSU3： 19.7A PSU4： 18.8A O/P：50% PSU1： 9.5A PSU2： 9.2A PSU3： 10.3A PSU4： 9.4A	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q301 Rated： STP26NM60N 20A/600V Q305 Rated： STP26NM60N 20A/600V	I/P：High-Line +3V = 267 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 Ta：25℃	(1) 470 V (2) 440 V (3) 444 V (1) 470 (2) 440 (3) 442	P
2	Diode Peak Voltage	Q105 Rated： IPP111N15N3G 83A/150V	I/P：High-Line +3V = 267 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 138 V (2) 18 V (3) 136 V	P
3	Input Capacitor Voltage	C 5 Rated： 150u/450V 105℃ 18*40 CXW	I/P：High-Line +3V = 267 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 438 V (2) 424 V (3) 434 V	P
4	Control IC Voltage Test	U301 Rated： PWM L6599AD 8.85V~16V	I/P：High-Line +3V = 267 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1) 14.9 V (2) 14.9 V (3) 15.1 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q53 Rated： STP26NM60N 20A/600V	I/P：High-Line +3V = 267 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 500 V (2) 432 V (3) 460 V	P

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P： 3 KVAC/min I/P-FG： 2 KVAC/min O/P-FG： 0.5 KVAC/min	I/P-O/P： 3.6 KVAC/min I/P-FG： 2.4 KVAC/min O/P-FG： 0.6 KVAC/min Ta：25℃	I/P-O/P： 13.71 mA I/P-FG： 13.39 mA O/P-FG： 9.71 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P：500VDC>100MΩ I/P-FG： 500VDC>100MΩ 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： 30 GΩ I/P-FG： 22.3 GΩ O/P-FG： 30 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta：25℃ /70% RH	15 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS D	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	PASS	P
2	CONDUCTION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab	P
3	RADIATION	EN55032 CLASS A	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 INDUSTRY AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A	P
6	SURGE	IEC61000-4-5 INDUSTRY L-N ：2KV L,N-PE：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report				

■ 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：SDR-960-24
1. ROOM AMBIENT　BURN-IN：13 HRS
I/P： 230VAC　O/P： FULL LOAD　Ta=31.8 ℃
2. HIGH AMBIENT　BURN-IN： 13 HRS
I/P： 230VAC　O/P： FULL LOAD　Ta=52.4 ℃</td><td>P</td></tr>
<tr><td colspan="6">
<table>
<tr><th>NO</th><th>Position</th><th>PART NUMBER</th><th>ROOM AMBIENT Ta=31.8 ℃</th><th>HIGH AMBIENT Ta=52.4 ℃</th></tr>
<tr><td>1</td><td>BD1</td><td>30A/800V　SILICON US30KB80R</td><td>83.8℃</td><td>95.1℃</td></tr>
<tr><td>2</td><td>LF2</td><td>TR1055</td><td>83.1℃</td><td>93.8℃</td></tr>
<tr><td>3</td><td>L1</td><td>TR1043</td><td>64.5℃</td><td>72.8℃</td></tr>
<tr><td>4</td><td>L180</td><td>TR1000</td><td>86.2℃</td><td>99.1℃</td></tr>
<tr><td>5</td><td>C14</td><td>155/450V 10% P=15 MEX</td><td>75.1℃</td><td>86.6℃</td></tr>
<tr><td>6</td><td>C183</td><td>470u/35V UL10Kh 10*16 ZLH</td><td>83.8℃</td><td>96.8℃</td></tr>
<tr><td>7</td><td>Q51</td><td>STP26NM60N 20A/600V</td><td>74.6℃</td><td>86.8℃</td></tr>
<tr><td>8</td><td>Q52</td><td>STP26NM60N 20A/600V</td><td>72.1℃</td><td>84.5℃</td></tr>
<tr><td>9</td><td>T50</td><td>TF2505</td><td>79.4℃</td><td>90.5℃</td></tr>
<tr><td>10</td><td>D50</td><td>STPSC606D 6A/600V</td><td>76.3℃</td><td>88.8℃</td></tr>
<tr><td>11</td><td>C5</td><td>150u/450V 105℃ 18*40 CXW</td><td>61.8℃</td><td>73.3℃</td></tr>
<tr><td>12</td><td>C7</td><td>150u/450V 105℃ 18*40 CXW</td><td>58.5℃</td><td>68.8℃</td></tr>
<tr><td>13</td><td>C43</td><td>220u/35V UL8Kh 8*11.5 ZLH</td><td>73.4℃</td><td>84.1℃</td></tr>
<tr><td>14</td><td>C44</td><td>330u/25V UL8Kh 8*11.5 ZLH</td><td>74.7℃</td><td>85.5℃</td></tr>
<tr><td>15</td><td>C36</td><td>470u/35V UL10Kh 10*16 ZLH</td><td>76.3℃</td><td>87.0℃</td></tr>
<tr><td>16</td><td>U601</td><td>UCC28070PWR 20-TSSOP</td><td>75.2℃</td><td>86.3℃</td></tr>
<tr><td>17</td><td>C205</td><td>220u/35V UL8Kh 8*11.5 ZLH</td><td>87.7℃</td><td>99.6℃</td></tr>
<tr><td>18</td><td>C252</td><td>470u/16V UL8Kh 8*11.5 ZLH</td><td>66.4℃</td><td>79.7℃</td></tr>
<tr><td>19</td><td>C106</td><td>1800u/35V UL10Kh 12.5*35 ZLH</td><td>81.5℃</td><td>94.1℃</td></tr>
<tr><td>20</td><td>C109</td><td>1800u/35V UL10Kh 12.5*35 ZLH</td><td>90.1℃</td><td>102.1℃</td></tr>
<tr><td>21</td><td>Q101</td><td>IPP034NE7N3G 100A/75V</td><td>82.0℃</td><td>94.3℃</td></tr>
<tr><td>22</td><td>Q104</td><td>IPP034NE7N3G 100A/75V</td><td>89.9℃</td><td>102.3℃</td></tr>
<tr><td>23</td><td>TSW</td><td>BW-DCP-R0 90℃ 60mm HH (H110</td><td>69.5℃</td><td>82.0℃</td></tr>
<tr><td>24</td><td>Q301</td><td>STP26NM60N 20A/600V</td><td>73.2℃</td><td>85.9℃</td></tr>
<tr><td>25</td><td>Q304</td><td>STP26NM60N 20A/600V</td><td>76.3℃</td><td>89.0℃</td></tr>
<tr><td>26</td><td>T300</td><td>TF2367</td><td>86.9℃</td><td>101.4℃</td></tr>
<tr><td>27</td><td>U270</td><td>OPA4171 SO14</td><td>67.8℃</td><td>80.1℃</td></tr>
<tr><td>28</td><td>U301</td><td>L6599AD SO-16N</td><td>68.0℃</td><td>81.3℃</td></tr>
<tr><td>29</td><td>C305</td><td>100u/50V UL9Kh 8*11.5 ZLJ</td><td>68.1℃</td><td>81.7℃</td></tr>
<tr><td>30</td><td>T1</td><td>TF2365</td><td>98.2℃</td><td>109.6℃</td></tr>
<tr><td>31</td><td>ZNR2</td><td>0.6W 470V 14Φ TVR14471-D(KSW)</td><td>74.2℃</td><td>84.8℃</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 230 VAC
O/P：118 % LOAD
Ta：25℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER　2　HOUR</td><td>I/P： 264VAC/100VAC
O/P： 100 % LOAD
Ta= -35 ℃</td><td>TEST：OK</td><td>P</td></tr>
</table>

4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ NO DAMAGE	I/P： 272 VAC O/P：FULL LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H	TEST：OK	P
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~50℃)	I/P： 230 VAC O/P：FULL LOAD	± 0 %/℃(0~50℃)	P
6	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
7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -35℃~ +55℃ 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： 230VAC/Full Load AC ON/OFF TEST turn on 58sec；turn off 2sec		OK	P
8	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
9	CAPACITOR LIFE CYCLE	SDR-960-24:SUPPOSE C109 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta=25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta=50 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 50 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta=50 ℃ LIFE TIME		(1) 54810HRS (2) 17539HRS (3) 48720HRS (4) 103043HRS	P
10	MTBF	Conducted by Parts Stress Analysis Prediction 660.2K hrs min. Telcordia SR-332 (Bellcore) ; 70.7K hrs min. MIL-HDBK-217F (25℃)			P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50,000 hours @ TA 50℃			P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2012/7/3	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2012/8/15	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2012/10/17	PRODUCT SAMPLE W1210A24	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023