



Test Report: RSP-1600-27

1600W Power Supply with Single Output

■ 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

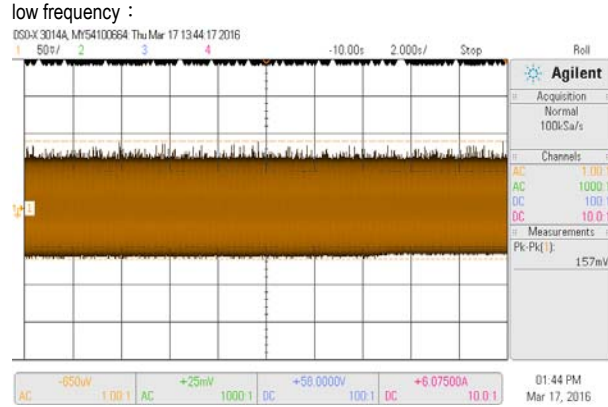
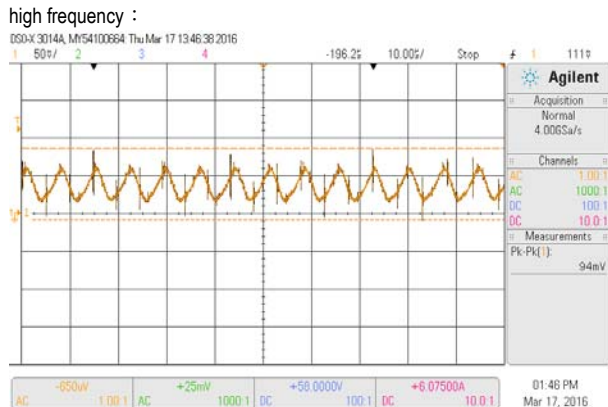
■ RELIABILITY TEST

ENVIRONMENT TEST

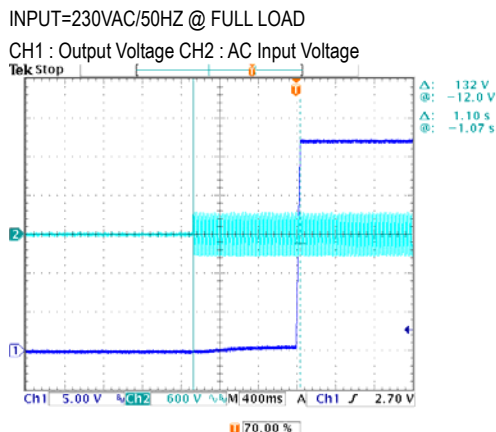
■ DESIGN VERIFY TEST

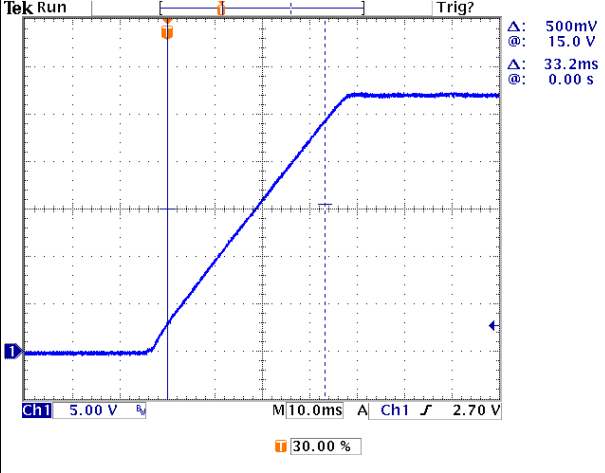
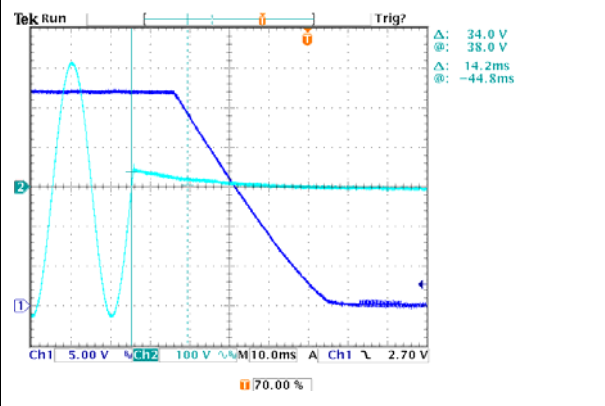

OUTPUT FUNCTION TEST

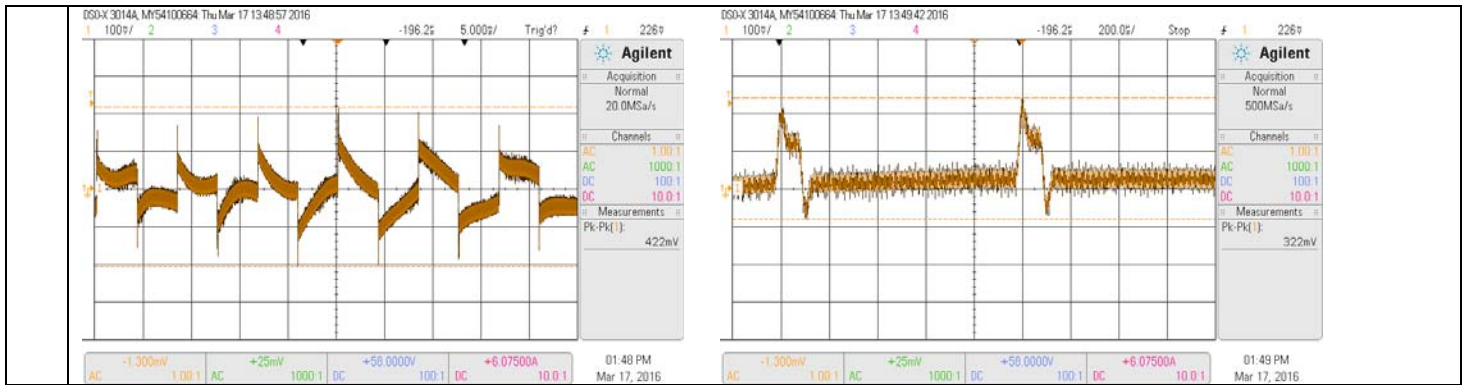
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 26.5 V~ 33.5V	I/P : 230 VAC I/P : 90 VAC O/P : MIN LOAD Ta : 25°C	25.65V~34.83V/230VAC 25.66V~34.83V/90VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1%~ -1%	I/P: 180VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:-0.15 %~0 %
3	LINE REGULATION (Max)	V1: 0.5%~ -0.5%	I/P: 180VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1:-0.03%~ 0%
4	LOAD REGULATION(Max)	V1: 0.5%~ -0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:-0.03%~0.07 %
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	0.48 %
6	RIPPLE & NOISE(Max)	V1: 200 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 157 mVp-p



7	SET UP TIME(Max)	230VAC/1500ms	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC/1104 ms
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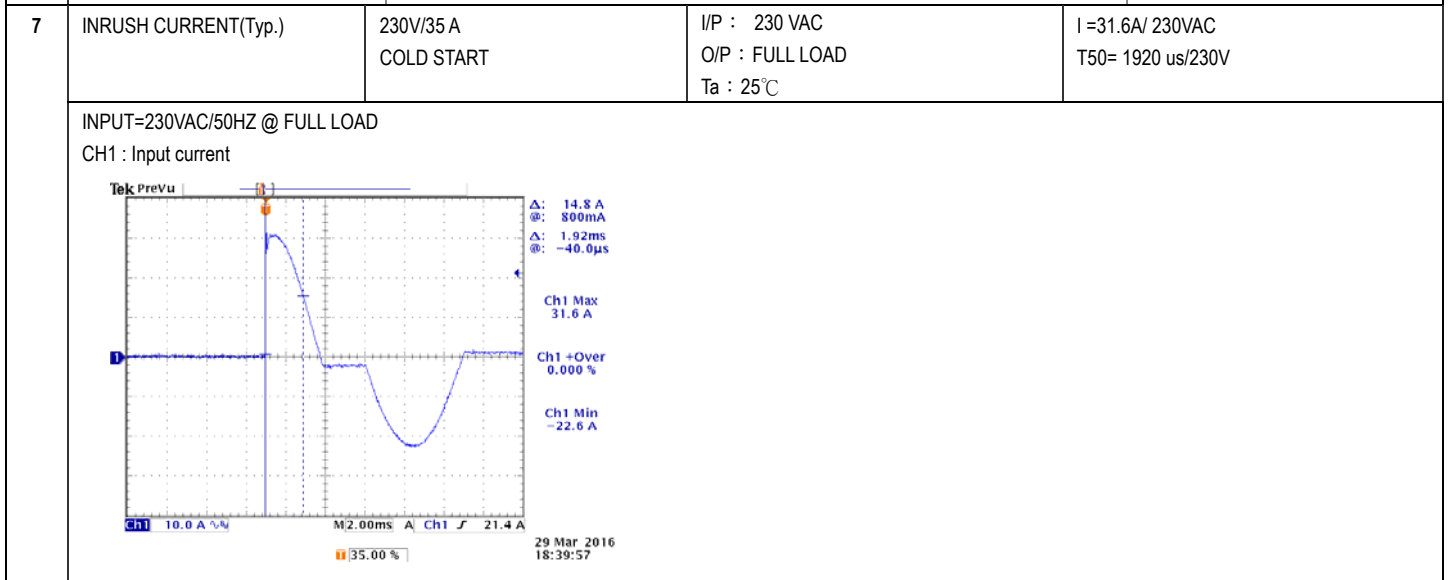
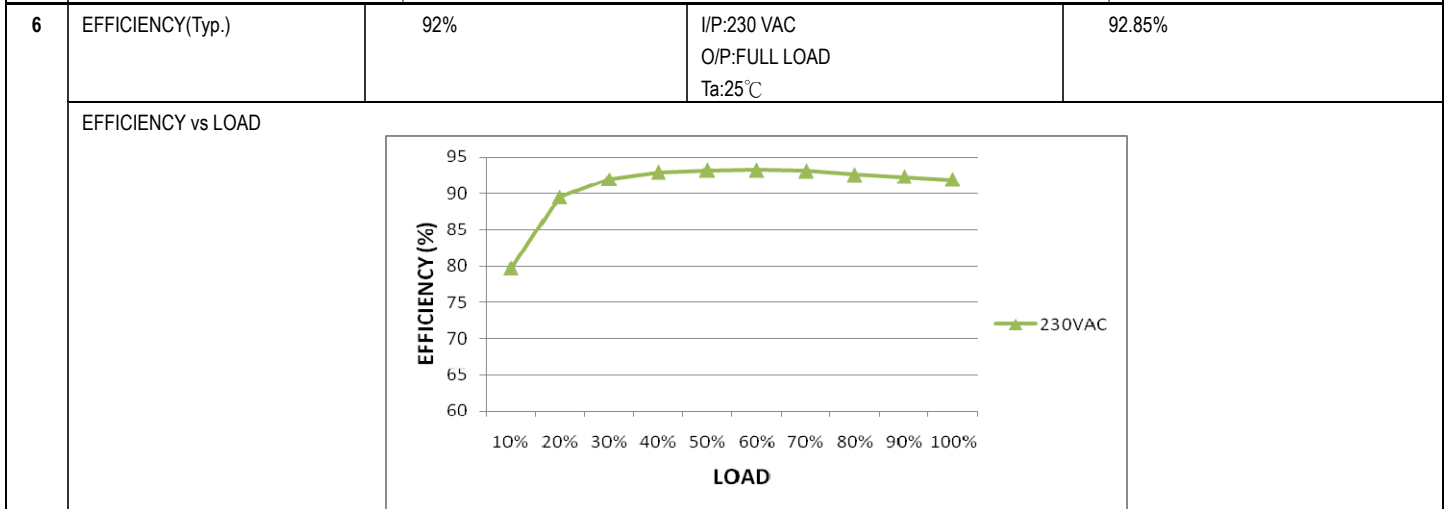
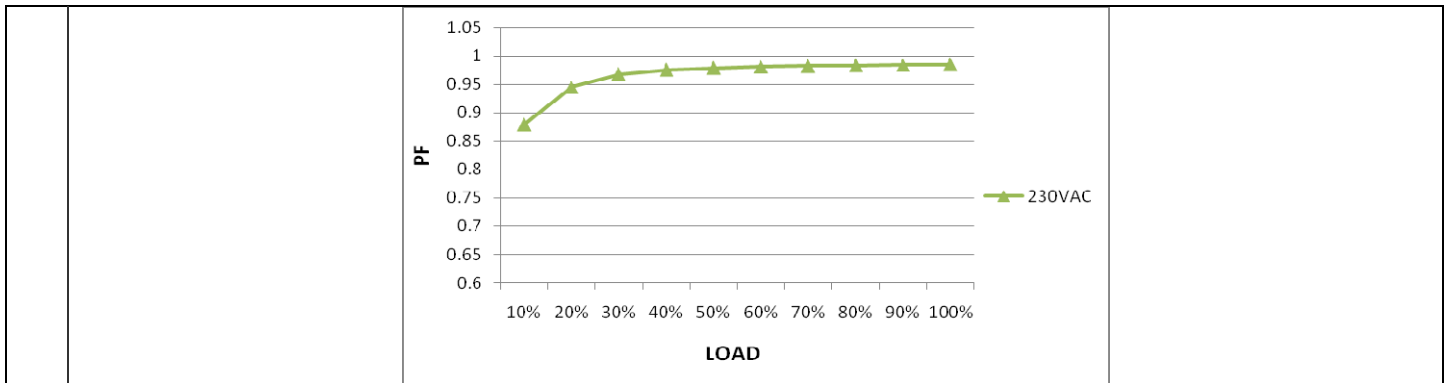


8	RISE TIME (Max)	230VAC/60ms I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC/33.2 ms
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>  <p>Δ: 500mV @: 15.0 V Δ: 33.2ms @: 0.00 s</p> <p>30.00 %</p>			
9	HOLD UP TIME (Typ.)	230VAC/10ms /FULL LOAD 230VAC/16ms /75% LOAD I/P : 230 VAC O/P : FULL LOAD /75% LOAD Ta : 25°C	230VAC/ 14.2 ms /FULL LOAD 230VAC/ 22 ms /75% LOAD
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  <p>Δ: 34.0 V @: 38.0 V Δ: 14.2ms @: -44.8ms</p> <p>70.00 %</p> <p>INPUT=230VAC/50HZ @75% LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  <p>Agilent</p> <p>Channels</p> <ul style="list-style-type: none"> DC 100.0 AC 1000.0 DC 100.0 DC 10.0 <p>Cursors</p> <ul style="list-style-type: none"> ΔX: +22.00000000ms 1/ΔX: +45.455Hz ΔY1: +24.3125V <p>11:24 AM Mar 17, 2016</p>			
10	DYNAMIC LOAD	V1:2700 mVp-p I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	422mVp-p 322 mVp-p
FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	



INPUT FUNCTION TEST

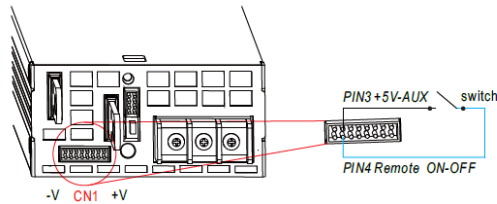
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC/180VAC~264VAC	I/P:TESTING O/P:FULL LOAD/60% Ta:25°C	86V/150 V~264V
			I/P: (1)LOW-LINE-3V=180 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 8.5 A 115V/ 15 A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD (PLEASE CHECK DERATING CURVE) Ta : 25°C	I =7.88A/ 230VAC I =10.88A/ 115VAC
4	LEAKAGE CURRENT	<2 mA / 230 VAC	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.76 mA N-FG : 0.76 mA
5	POWER FACTOR (Typ.)	0.97 / 230VAC	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	PF=0.9854/230VAC
	P.F vs LOAD			



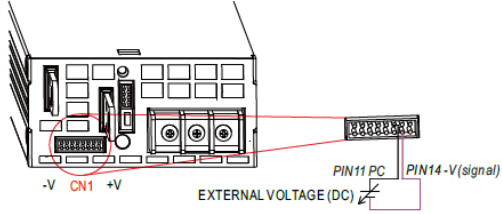
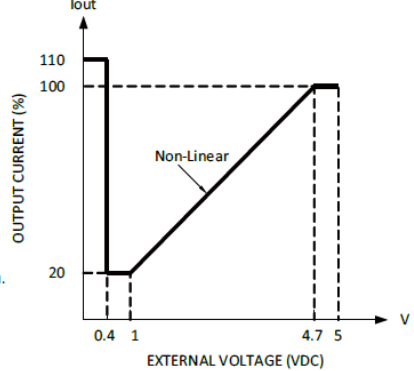
PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~115% PROTECTION TYPE : Constant current limiting, unit will shut down when O/P voltage is down very low or shut down after 5 sec. Re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 180VAC O/P: TESTING Ta:25°C	111.37%/ 264VAC 111.10%/ 230VAC 111.32%/180VAC PROTECTION TYPE : Constant current limiting, unit will shut down when O/P voltage is down very low or shut down after 5 sec. Re-power on to recover
2	OVER VOLTAGE PROTECTION	35.2 V~ 41.9 V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	38.6V/ 264VAC 39.0V/230VAC 38.60V/90VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE PROTECTION TYPE : Shut down o/p voltage, recovers automatically after temperature goes down	I/P: 264VAC I/P: 180VAC O/P: FULL LOAD	O.T.P. Active PROTECTION TYPE : Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Constant current limiting, unit will shut down when O/P voltage is down very low or shut down after 5 sec. Re-power on to recover	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting, unit will shut down when O/P voltage is down very low or shut down after 5 sec. Re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT												
1	AUXILIARY POWER (AUX)	1. 5V±10%@0.3A ripple:150mVp-p 2. 12V±10%@0.8A ripple:250mVp-p	I/P: 230 VAC O/P: FULL LOAD Ta:25°C	5.02V 0.3A / 72mVp-p 11.28V 0.8 A / 201mVp-p												
2	REMOTE ON/OFF CONTROL	<p>※ The power supply can be turned ON/OFF individually or along with other units by using the "Remote ON-OFF" function.</p>  <p>I/P: 230 VAC O/P: FULL LOAD Ta:25°C Test Result :</p> <table border="1" data-bbox="470 1863 1078 1966"> <thead> <tr> <th>Between Remote ON-OFF and +5V-AUX</th> <th>Power Supply Status</th> </tr> </thead> <tbody> <tr> <td>SW SHORT</td> <td>ON</td> </tr> <tr> <td>SW OPEN</td> <td>OFF</td> </tr> </tbody> </table>	Between Remote ON-OFF and +5V-AUX	Power Supply Status	SW SHORT	ON	SW OPEN	OFF		<table border="1" data-bbox="1043 1592 1490 1688"> <thead> <tr> <th>Between Remote ON-OFF and +5V-AUX</th> <th>Power Supply Status</th> </tr> </thead> <tbody> <tr> <td>Switch Short</td> <td>ON</td> </tr> <tr> <td>Switch Open</td> <td>OFF</td> </tr> </tbody> </table>	Between Remote ON-OFF and +5V-AUX	Power Supply Status	Switch Short	ON	Switch Open	OFF
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3	REMOTE SENSE	S+ / S- >0.5V Compensate voltage drop on the	I/P: 230 VAC O/P: FULL LOAD Ta:25°C	> 0.5 V												

		load wiring up to 0.5V.																							
4	ALARM SIGNAL	<p>1. DC OK SIGNAL High (4.5 ~ 5.5V) : When the $V_{out} \leq 80\% \pm 5\%$. Low (-0.1 ~ 0.5V) : When $V_{out} \geq 80\% \pm 5\%$. The maximum sourcing current is 10mA and only for output. I/P: 230 VAC O/P: FULL LOAD Ta: 25°C</p> <table border="1"> <thead> <tr> <th>Vout</th> <th>DC OK SIGNAL</th> </tr> </thead> <tbody> <tr> <td>$V_{out} \leq 75\%$</td> <td>5.34 V</td> </tr> <tr> <td>$V_{out} \geq 85\%$</td> <td>0.003V</td> </tr> </tbody> </table> <p>2. T-ALARM</p> <table border="1"> <thead> <tr> <th>P.S.U STATUS</th> <th>Vo</th> <th>T-ALARM</th> </tr> </thead> <tbody> <tr> <td>NORMAL</td> <td>100%±2%</td> <td>-0.1 ~ 0.5V</td> </tr> <tr> <td>OTP OR FAN LOCK</td> <td>0V</td> <td>4.5~5.5V</td> </tr> </tbody> </table> <p>I/P: 230 VAC O/P: FULL LOAD Ta: 25°C</p> <p>Test Result :</p> <table border="1"> <thead> <tr> <th>P.S.U STATUS</th> <th>T-ALARM</th> </tr> </thead> <tbody> <tr> <td>NORMAL</td> <td>-0.09 V</td> </tr> <tr> <td>OTP OR FAN LOCK</td> <td>4.936V</td> </tr> </tbody> </table>	Vout	DC OK SIGNAL	$V_{out} \leq 75\%$	5.34 V	$V_{out} \geq 85\%$	0.003V	P.S.U STATUS	Vo	T-ALARM	NORMAL	100%±2%	-0.1 ~ 0.5V	OTP OR FAN LOCK	0V	4.5~5.5V	P.S.U STATUS	T-ALARM	NORMAL	-0.09 V	OTP OR FAN LOCK	4.936V		
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5	OUTPUT VOLTAGE PROGRAMMABLE(PV)	<p>※ In addition to the adjustment via the built-in potentiometer, the output voltage can be trimmed by applying EXTERNAL VOLTAGE.</p> <p>For Remote Sense / Local Sense, please refer to "Voltage Drop Compensation" section.</p> <div style="display: flex; justify-content: space-around;"> <div> <p>EXTERNAL VOLTAGE (DC)</p> </div> <div> </div> </div> <p>© The rated current should change with the Output Voltage Programming accordingly. © For Remote Sense / Local Sense, please refer to "Voltage Drop Compensation" section.</p> <p>I/P: 230 VAC O/P: FULL LOAD Ta: 25°C</p> <p>Test Result :</p> <table border="1"> <thead> <tr> <th>PV</th> <th><0.4V</th> <th>1V</th> <th>4.7V</th> </tr> </thead> <tbody> <tr> <td>MODEL</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SPEC</td> <td>27V±5%</td> <td>10.8V±5%</td> <td>33.5V±5%</td> </tr> <tr> <td>Vout</td> <td>27.054V</td> <td>11.178V</td> <td>34.02V</td> </tr> </tbody> </table>	PV	<0.4V	1V	4.7V	MODEL				SPEC	27V±5%	10.8V±5%	33.5V±5%	Vout	27.054V	11.178V	34.02V							
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<p>6</p>	<p>OUTPUT CURRENT PROGRAMMABLE (PC)</p>	 <p>© For Remote Sense / Local Sense, please refer to "Voltage Drop Compensation" section.</p> <p>I/P: 230 VAC O/P: TESTING Ta: 25°C Test Result :</p> <table border="1" data-bbox="470 806 1244 907"> <tr> <td>ADJ V</td> <td>1V</td> <td>4.7V</td> <td>5V</td> </tr> <tr> <td>SPEC</td> <td>20%±10%</td> <td>100%±10%</td> <td>100%±10%</td> </tr> <tr> <td>lout</td> <td>20.3%</td> <td>101.18%</td> <td>101.01%</td> </tr> </table>	ADJ V	1V	4.7V	5V	SPEC	20%±10%	100%±10%	100%±10%	lout	20.3%	101.18%	101.01%	
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SPEC	20%±10%	100%±10%	100%±10%												
lout	20.3%	101.18%	101.01%												
<p>7</p>	<p>CURRENT SHARING</p>	<p>< ±5%</p>	<p>I/P : 230 VAC O/P : FULL/50% LOAD Ta : 25°C</p> <p>O/P : 100%</p> <p>PSU1 : 59.7 A PSU2 : 61 A PSU3 : 58.4 A PSU4 : 59.8 A PSU5 : 57.8 A PSU6 : 58.6 A</p> <p>O/P : 50%</p> <p>PSU1 : 29.62 A PSU2 : 29.82 A PSU3 : 28.51 A PSU4 : 29.48 A PSU5 : 28 A PSU6 : 29.12 A</p>												

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q901 Rated 29A/600V	I/P: High-Line +3V = 267V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90% Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90% Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90% Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50% Duty/120Hz (7) 0% → 400% Load. (6) NO LOAD Ta: 25°C	VDS: (1) 468V (2) 540V (3) 444V (4) 460V (5) 452V (6) 472V (7) 460V

2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q52 Rated 52A/ 600V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C	VDS: (1)452V (2) 408V (3) 444V (4) 448V (5)456 V (6)432V (7)379V
3	Diode Peak Voltage	Q101 Rated 104A/ 150 V Q104 Rated 104A/ 150 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25°C	Q101: Q104: VDS: VDS: (1)100.6V (1)99.8V (2)98.2V (2)92.6V (3)99.8V (3)100.6V (4)98.2V (4)99.0V (5)99V (5)99.0V (6)105.4V (6)103.8V (7)95V (7)93.4V (8)114.3V (8)115.9V
4	Input Capacitor Voltage	C5 Rated:: 680µ/400V (450V for Surge Voltage)	I/P:High-Line +3V =267 V O/P: (1)Full Load Ta:25°C	(1)395V
5	Control IC Voltage Test	PWM IC U901 Rated 6.5 V~24V PFC IC U51 Rated 4.5V~ 15V	I/P:High-Line +3V =267 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	(1) 13.75V (2) 14.2V (3) 14.8V (4) 13.75 (1)14.06V (2)13.87V (3)13.87V (4)13.75V (5)13.37V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.8 KVAC/min Ta:25°C	I/P-O/P:7.23mA I/P-FG:6.9mA O/P-FG:7.25m A NO DAMAGE
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°C	I/P-O/P: 26.9GΩ I/P-FG: 29GΩ O/P-FG: 11.5GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	17mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:100% LOAD Ta:25°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

■ **RELIABILITY TEST**

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																								
1	TEMPERATURE RISE TEST	MODEL : RSP-1600-24 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 28.3 °C 2. HIGH AMBIENT BURN-IN : 3 HRS I/P : 230VAC O/P : FULL LOAD Ta= 52.5 °C																																																																																																										
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 105% LOAD Ta : 25°C	TEST : OK																																																																																																								
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230VAC/180VAC O/P : 100 % LOAD Ta= -35°C/-30°C	TEST : OK																																																																																																								
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																								
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0-50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.002 %/°C (0-50°C)																																																																																																								



6	STORAGE TEMPERATURE TEST	<p>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</p>	OK
7	THERMAL SHOCK TEST	<p>1. Thermal shock Temperature : -35°C~ +55°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 :</p> <p>15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST(13500 TIMES) 1cycle:230V/ FULL LOAD Burn In Test</p>	OK
8	VIBRATION TEST	<p>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</p>	TEST : OK
9	CAPACITOR LIFE CYCLE	<p>SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50°C LIFE TIME</p>	<p>(1) 2451612HRS (2) 445544HRS (3) 480914HRS (4) 490935HRS</p>
10	MTBF	<p>Conducted by Parts Stress Analysis Prediction 160.9K hrs min. Telcordia SR-332 (Bellcore) ; 42.1K hrs min. MIL-HDBK-217F (25°C)</p>	
11	DMTBF/Accelerated Life Test	<p>Demonstration Mean Time Between Failure (Expected Life): Above 50,000 hours @ TA 50°C</p>	

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

12.10.30 A50-F031