



# Test Report: HEP-2300-115

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2300W Switching Power Supply for Harsh Environment

## ■ 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

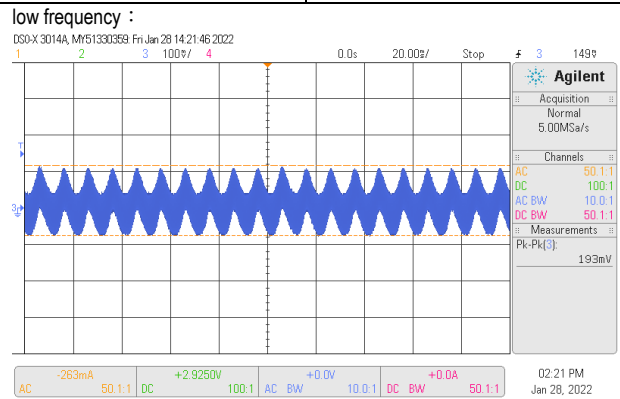
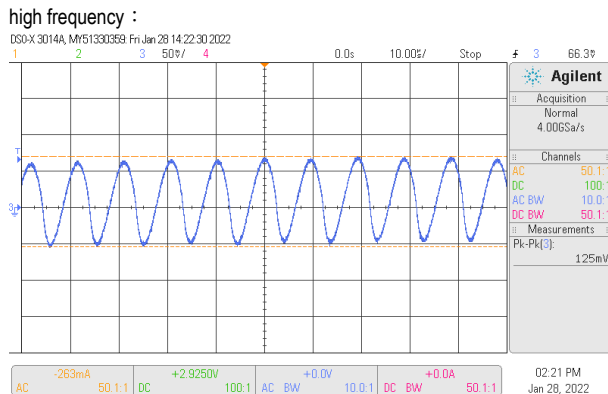
## ■ RELIABILITY TEST

- ENVIRONMENT TEST

## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

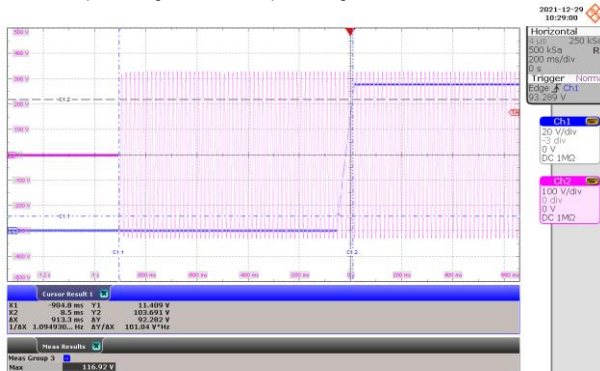
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 90V ~ 138V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	87.49V~141.59V/230VAC 87.48V~141.57V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1 : -1%~ +1%	I/P : 90VAC /305VAC O/P:FULL/ MIN. LOAD Ta : 25°C	V1 : 0.243%~ +0.139%
3	LINE REGULATION (Max)	V1 : -0.5%~ +0.5%	I/P : 220VAC~ 305VAC O/P : FULL LOAD Ta : 25°C	V1 : -0.03%~ +0.03%
4	LOAD REGULATION(Max)	V1 : -0.5%~ +0.5%	I/P : 230VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : -0.04%~ +0.04%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	<1.4 %
6	RIPPLE & NOISE(Max)	V1 : 1500mVp-p	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 193mVp-p

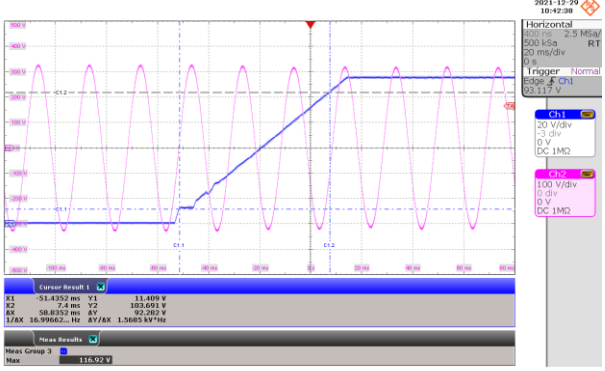
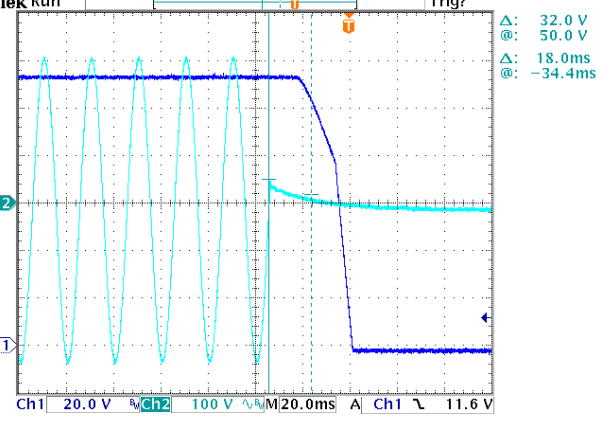
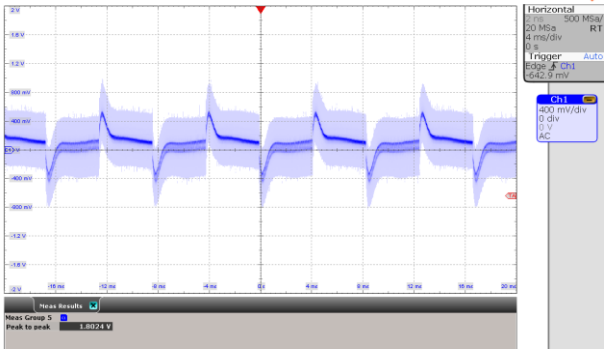
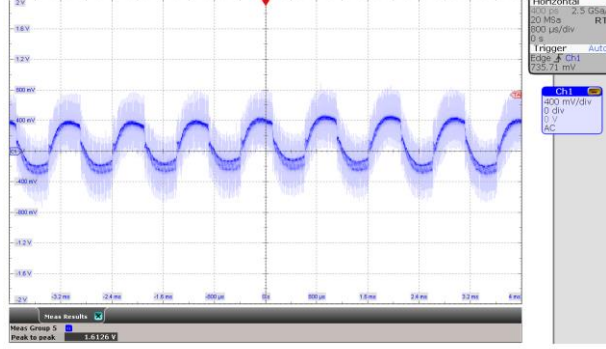


7	SET UP TIME(Max)	230VAC/1800ms	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 913ms
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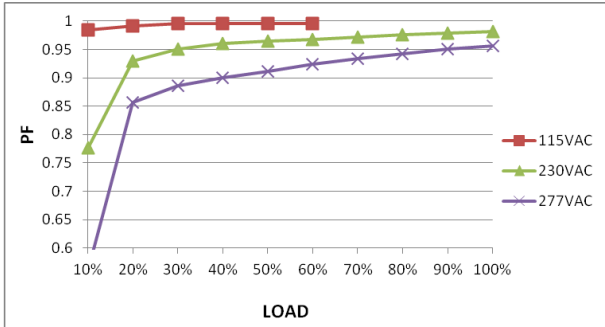
INPUT=230VAC/50HZ @ FULL LOAD

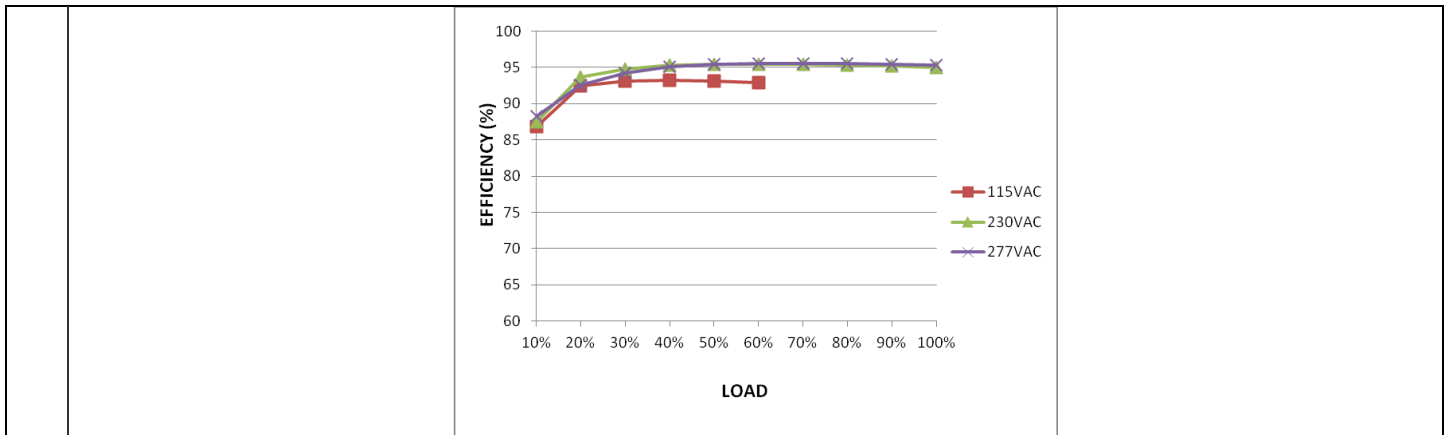
CH1 : Output Voltage CH2 : AC Input Voltage



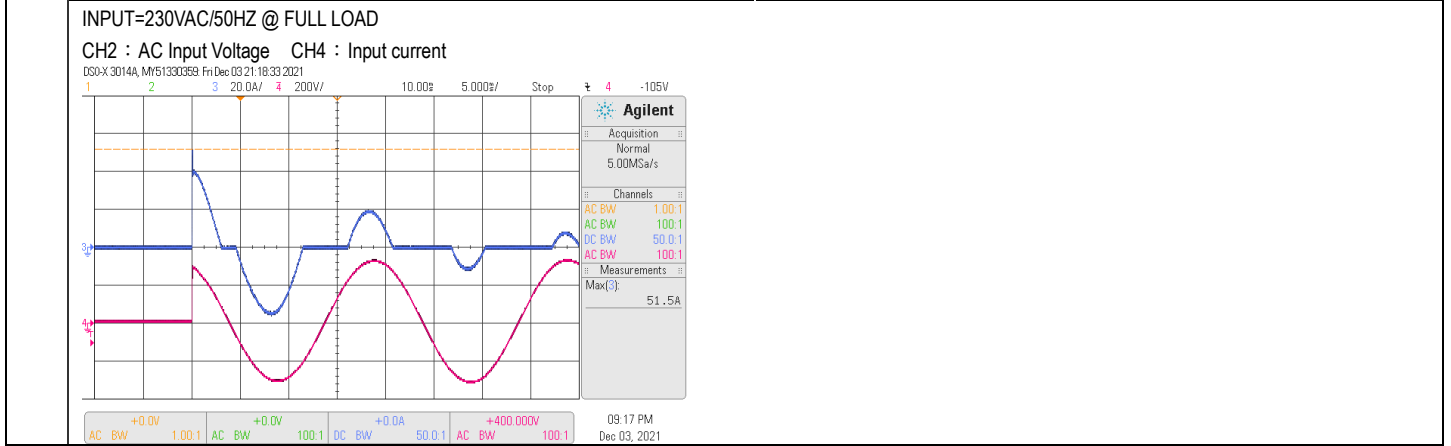
<p><b>8</b> RISE TIME (Max)</p>	<p>230VAC/100ms</p>	<p>I/P : 230 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 58.8 ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> 			
<p><b>9</b> HOLD UP TIME (Typ.)</p>	<p>230VAC/12ms @FULL LOAD</p>	<p>I/P : 230 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 18 ms@ FULL LOAD</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> 			
<p><b>10</b> DYNAMIC LOAD</p>	<p>V1: 11.5Vp-p</p>	<p>I/P : 230VAC O/P : (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta : 25°C</p>	<p>1.802Vp-p 1.612Vp-p</p>
<p>FULL /50% LOAD 50%DUTY / 120HZ</p> 		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p> 	

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	INPUT VOLTAGE RANGE	90VAC~305VAC	I/P : TESTING O/P : Derating Load Ta : 25°C	78.8V~305V																																												
			I/P : LOW-LINE-3V=87 V HIGH-LINE+10V=315 V O/P : FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON : 30 Sec OFF : 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK																																												
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P : 90 VAC ~305 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK																																												
3	INPUT CURRENT (Typ.)	277/ 9.3A 230V/ 11A 115V/ 13.3A	I/P : 277 VAC O/P : FULL LOAD I/P : 230 VAC O/P : FULL LOAD I/P : 115 VAC O/P : 60% LOAD Ta : 25°C	I=9.18A/ 277VAC I=10.7A/ 230VAC I=12.8A/ 115VAC																																												
4	LEAKAGE CURRENT	<1.8mA(peak)/240V <2 mA(peak)/277V	I/P : 264 VAC I/P : 305 VAC O/P : Min LOAD Ta : 25°C	L-FG : 1.28 mA / 264V N-FG : 1.28 mA /264V L-FG : 1.52 mA /305V N-FG : 1.52 mA /305V																																												
5	POWER FACTOR (Typ.)	0.93/277VAC 0.95/230VAC 0.99/115VAC	I/P : 277AC O/P : FULL LOAD I/P : 230 VAC O/P : FULL LOAD I/P : 115 VAC O/P : 60% LOAD Ta : 25°C	PF=0.956 /277VAC PF=0.982 /230VAC PF=0.996 /115VAC																																												
P.F vs LOAD  <table border="1"> <caption>Power Factor vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>115VAC PF</th> <th>230VAC PF</th> <th>277VAC PF</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.99</td><td>0.75</td><td>0.60</td></tr> <tr><td>20%</td><td>0.99</td><td>0.92</td><td>0.85</td></tr> <tr><td>30%</td><td>0.99</td><td>0.95</td><td>0.88</td></tr> <tr><td>40%</td><td>0.99</td><td>0.96</td><td>0.90</td></tr> <tr><td>50%</td><td>0.99</td><td>0.97</td><td>0.91</td></tr> <tr><td>60%</td><td>0.99</td><td>0.97</td><td>0.92</td></tr> <tr><td>70%</td><td>0.99</td><td>0.98</td><td>0.93</td></tr> <tr><td>80%</td><td>0.99</td><td>0.98</td><td>0.94</td></tr> <tr><td>90%</td><td>0.99</td><td>0.98</td><td>0.95</td></tr> <tr><td>100%</td><td>0.99</td><td>0.99</td><td>0.95</td></tr> </tbody> </table>					Load (%)	115VAC PF	230VAC PF	277VAC PF	10%	0.99	0.75	0.60	20%	0.99	0.92	0.85	30%	0.99	0.95	0.88	40%	0.99	0.96	0.90	50%	0.99	0.97	0.91	60%	0.99	0.97	0.92	70%	0.99	0.98	0.93	80%	0.99	0.98	0.94	90%	0.99	0.98	0.95	100%	0.99	0.99	0.95
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6	EFFICIENCY(Typ.)	95%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	95.4 %																																												
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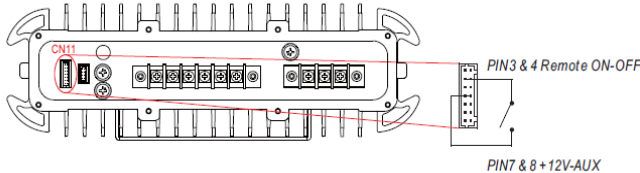
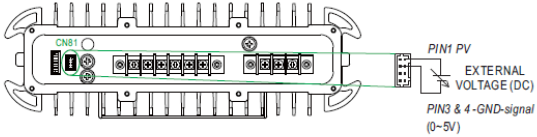
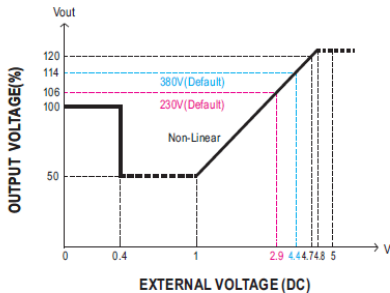
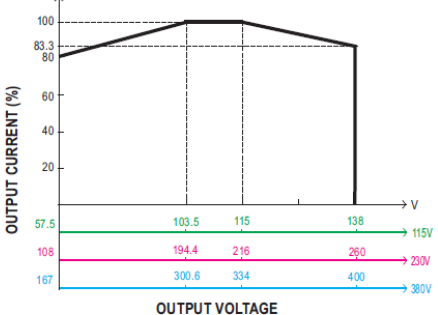
7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I =51.5A / 230VAC T50= 1.44 ms /230V
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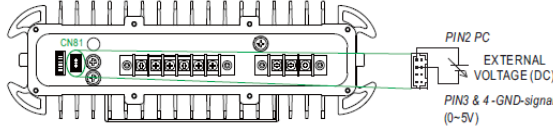
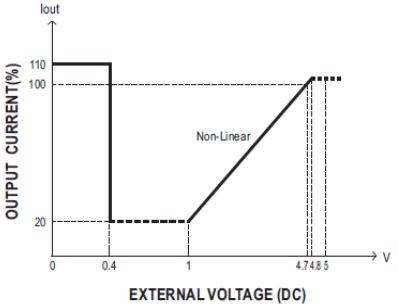


## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~115% PROTECTION TYPE : Constant current limiting,unit will shutdown after 5 sec,re-power on to recover.	I/P : 305VAC I/P : 90V O/P : TESTING Ta : 25°C	111.0% / 305VAC 53.5% /90VAC
2	OVER VOLTAGE PROTECTION	145V ~ 166V Protection type : Shut down O/P voltage,re-power on to recover.	I/P : 305VAC I/P : 90VAC O/P : MIN LOAD Ta : 25°C	148.3V/ 305VAC 148.3V/ 90VAC
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down O/P voltage,, recovers automatically after temperature goes down	I/P : 305VAC O/P : FULL LOAD I/P : 90VAC O/P : 50% LOAD	O.T.P. Active Shutdown 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 shutdown after 5 sec,re-power on to recover.	I/P : 305VAC I/P : 90VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE

## CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT															
1	AUXILIARY POWER (AUX)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C Test Result : <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>AUX</th> <th>TOLERANCE</th> <th>RIPPLE</th> <th>TEST RESULT</th> </tr> </thead> <tbody> <tr> <td>12V / 0.5A</td> <td>10.8~13.2 V</td> <td>150mVp-p</td> <td>11.948V/45mv</td> </tr> </tbody> </table>	AUX	TOLERANCE	RIPPLE	TEST RESULT	12V / 0.5A	10.8~13.2 V	150mVp-p	11.948V/45mv									
AUX	TOLERANCE	RIPPLE	TEST RESULT																
12V / 0.5A	10.8~13.2 V	150mVp-p	11.948V/45mv																
2	REMOTE ON/OFF CONTROL	<b>3.Remote ON-OFF Control</b> The power supply can be turned ON/OFF individually or along with other units in parallel by using the "Remote ON-OFF" function. <div style="display: flex; align-items: center; margin-top: 10px;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Remote ON-OFF</th> <th>Power Supply Status</th> </tr> </thead> <tbody> <tr> <td>Short circuit</td> <td>ON</td> </tr> <tr> <td>Open circuit</td> <td>OFF</td> </tr> </tbody> </table> </div> <p style="margin-top: 10px;">I/P : 230 VAC O/P : FULL LOAD Ta : 25°C Test Result :</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Between 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>	Remote ON-OFF	Power Supply Status	Short circuit	ON	Open circuit	OFF	Between ON/OFF and +5V-AUX	Power Supply Status	SW SHORT	ON	SW OPEN	OFF					
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3	OUTPUT VOLTAGE PROGRAMMABLE(PV)	<b>1.Output Voltage Programming (or, PV / remote voltage programming / remote adjust / margin programming / dynamic voltage trim)</b> ※ In addition to the adjustment via the built-in potentiometer, the output voltage can be trimmed by applying EXTERNAL VOLTAGE. <div style="display: flex; align-items: center; margin-top: 10px;">  </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>© The 100% output voltage is 115/216/334V.</p> </div> <div style="text-align: center;">  <p>© The rated current should change with the Output Voltage Programming accordingly.</p> </div> </div> <p style="margin-top: 10px;">I/P : 230 VAC O/P : FULL LOAD Ta : 25°C TEST RESULT :</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>MODEL</th> <th>PV</th> <th>&lt;0.4V</th> <th>1V</th> <th>5V</th> </tr> </thead> <tbody> <tr> <td>SPEC</td> <td></td> <td>115±5%</td> <td>57.5±5%</td> <td>138±5%</td> </tr> <tr> <td>Vout</td> <td></td> <td>115.5V</td> <td>55.39V</td> <td>140.44V</td> </tr> </tbody> </table>	MODEL	PV	<0.4V	1V	5V	SPEC		115±5%	57.5±5%	138±5%	Vout		115.5V	55.39V	140.44V		
MODEL	PV	<0.4V	1V	5V															
SPEC		115±5%	57.5±5%	138±5%															
Vout		115.5V	55.39V	140.44V															

<p>4 OUTPUT CURRENT PROGRAMMABLE (PC)</p>	<p><b>2.Output Current Programming (or, PC / remote current programming / dynamic current trim)</b>          ※ The output current can be trimmed to 20~100% of the rated current by applying EXTERNAL VOLTAGE.</p>   <p>I/P : 230 VAC          O/P : TESTING          Ta : 25°C</p> <table border="1" data-bbox="494 806 1157 907"> <tr> <td>ADJ V</td> <td>&lt;0.4V</td> <td>1V</td> <td>5V</td> </tr> <tr> <td>SPEC</td> <td>22A±5%</td> <td>4A±10%</td> <td>20A±5%</td> </tr> <tr> <td>TEST</td> <td>21.93A</td> <td>4.16A</td> <td>20.43A</td> </tr> </table> <p>◎ The 100% output current is rated current.          ◎ Maximum operation current &lt;100% is recommended.</p>			ADJ V	<0.4V	1V	5V	SPEC	22A±5%	4A±10%	20A±5%	TEST	21.93A	4.16A	20.43A
ADJ V	<0.4V	1V	5V												
SPEC	22A±5%	4A±10%	20A±5%												
TEST	21.93A	4.16A	20.43A												
<p>5 DC-OK SIGNAL</p>	<p>The TTL signal out,          PSU turn on = 4.5 ~ 5.5V          PSU turn off = -0.5V ~ 0.5V          Please refer to the Function Manual</p>	<p>I/P : 230VAC          O/P : FULL LOAD          Ta : 25°C</p>	<p>PSU turn on = 5.127 V          PSU turn off = -0.005 V</p>												
<p>6 LED Indicators</p>	<p>※ LED Status Indicators</p> <table border="1" data-bbox="422 1064 1220 1176"> <thead> <tr> <th>LED</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>● Green</td> <td>The power supply functions normally.</td> </tr> <tr> <td>● Red</td> <td>Abnormal status (Over temperature protection, Overload protection)</td> </tr> <tr> <td>● Red (Flashing)</td> <td>The LED will flash with the red light when the internal temperature reaches 95°C; under this condition, the unit still operates normally without entering OTP. (In the meantime, an alarm signal will be sent out through the PMBus/CANBus/MODBus interface.)</td> </tr> </tbody> </table>		LED	Description	● Green	The power supply functions normally.	● Red	Abnormal status (Over temperature protection, Overload protection)	● Red (Flashing)	The LED will flash with the red light when the internal temperature reaches 95°C; under this condition, the unit still operates normally without entering OTP. (In the meantime, an alarm signal will be sent out through the PMBus/CANBus/MODBus interface.)	<p>PASS</p>				
LED	Description														
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## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q903 Rated 76A/600V VGS : ± 30V	AC ON/OFF I/P : High-Line +3V =308V 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. (8)CV-1V(CHARGE MODE)  I/P : Low-Line -3V = 217V 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	VDS : (1) 485.0V (2) 490.0V (3) 485.7V (4) 481.8V (5) 481.8V (6) 485.1V (7) 481.2V (8) 482.1V  VDS : (1) 454.2V (2) 458.1V (3) 458.1V (4) 454.2V (5) 454.2V (6) 450.4V

			<p>(5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz</p> <p>(6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz</p> <p>(7)0%→400% Load.</p> <p>(8)CV-1V(CHARGE MODE)</p> <p>Ta : 25°C</p>	<p>(7) 454.1V</p> <p>(8) 450.5V</p>
2	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	<p>Q66 Rated 40A/650V VGS : ± 30V</p>	<p>I/P : High-Line +3V =308V</p> <p>AC ON/OFF</p> <p>O/P : (1)Full Load</p> <p>(2)Output Short</p> <p>(3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz</p> <p>(4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz</p> <p>(5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz</p> <p>(6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz</p> <p>(7)0%→400% Load.</p> <p>I/P : Low-Line -3V = 217V</p> <p>AC ON/OFF</p> <p>O/P : (1)Full Load</p> <p>(2)Output Short</p> <p>(3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz</p> <p>(4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz</p> <p>(5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz</p> <p>(6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz</p> <p>(7)0%→400% Load.</p> <p>Ta : 25°C</p>	<p>VDS :</p> <p>(1) 588.7V</p> <p>(2) 577.5V</p> <p>(3) 580.6V</p> <p>(4) 581.3V</p> <p>(5) 581.1V</p> <p>(6) 580.8V</p> <p>(7) 556.9V</p> <p>VDS:</p> <p>(1) 545.1V</p> <p>(2) 485.7V</p> <p>(3) 537.2V</p> <p>(4) 537.2V</p> <p>(5) 537.2V</p> <p>(6) 509.6V</p> <p>(7) 481.8V</p>
3	P.F.C DIODE	<p>D14 Rated 10A/650V</p>	<p>I/P : High-Line +3V =308V</p> <p>AC ON/OFF</p> <p>O/P : (1)Full Load</p> <p>(2)Output Short</p> <p>(3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz</p> <p>(4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz</p> <p>I/P : Low-Line -3V = 217V</p> <p>AC ON/OFF</p> <p>O/P : (1)Full Load</p> <p>(2)Output Short</p> <p>(3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz</p> <p>(4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz</p> <p>Ta : 25°C</p>	<p>(1) 509V</p> <p>(2) 549V</p> <p>(3) 541.1V</p> <p>(4) 539.8V</p> <p>(1) 505.5V</p> <p>(2) 489.7V</p> <p>(3) 481.8V</p> <p>(4) 500.3V</p>
4	Diode Peak Voltage	<p>Q201 Rated 18A/600V VGS : ± 20V</p> <p>Q207 Rated</p>	<p>AC ON/OFF</p> <p>I/P : High-Line +3V =308V</p> <p>O/P : (1)Full Load</p> <p>(2)Output Short</p>	<p>Q201 :                      Q207 :</p> <p>VDS :                              VDS :</p> <p>(1) 292.0 V                      (1) 306.0V</p> <p>(2) 294.3V                      (2) 294.3V</p>



		18A/600V VGS : ± 20V	(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 (9)CV-1V(CHARGE MODE) Ta : 25°C	(3) 290.3V (4) 290.3V (5) 290.3V (6) 292.4V (7) 294.2V (8) 260.7V (9) 290.1V (10) 288.7V	(3) 290.3V (4) 290.3V (5) 290.3V (6) 290.0V (7) 292.3V (8) 286.4V (9) 282.1V (10) 288.3V
5	Input Capacitor Voltage	C5 Rated : 220u/450V -40~105°C Surge Voltage 495V	I/P : High-Line +3V =308V O/P : (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue Ta : 25°C	(1) 449V (2) 448V (3) 449V (4) 445V	
6	Control IC Voltage Test	PWM IC U900 Rated 8.9 V ~ 15.5V  PFC IC U301 Rated 23V ~ 27 V  O/P IC U203 Rated -0.3V ~37 V  MCU IC U701 Rated 2.0V ~3.6V  AUX IC U601 Rated 10.5V~25V	AC ON/OFF  I/P : High-Line +3V =308V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin (LOW LINE) Ta : 25°C	U900 : (1) 13.2V (2) 12.9V (3) 13.2V (4) 13.0V (5) 13.0V U301 : (1) 13.6V (2) 13.0V (3) 13.4V (4) 12.7V (5) 12.8V U203 : (1) 12.4V (2) 12.5V (3) 12.4V (4) 12.2V (5) 12.2V	U701 : (1) 3.37V (2) 3.39V (3) 3.59V (4) 3.37V (5) 3.39V U601 : (1) 14.4V (2) 14.3V (3) 14.4V (4) 14.0V (5) 14.4V
7	TOP SWITCHING STAND BY POWER	U601 Rated 3.5 A/ 800 V	AC ON/OFF I/P:High-Line +3V =308V O/P : (1)Full Load (2)Remote On/Off I/P : Low-Line -3V =217V O/P : (1)Full Load (2)Remote On/Off Ta : 25°C	U601 : (1) 564.8V (2) 576.7V  (1) 529.2V (2) 541.1V	

## SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 6KVDC/min I/P-FG : 4KVDC/min O/P-FG : 4KVDC/min	I/P-O/P : 6.6KVDC/min I/P-FG : 4.8KVDC /min O/P-FG : 4.8KVDC /min Ta : 25°C	PASS 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 : 4.3GΩ I/P-FG : >30GΩ O/P-FG : 3.31GΩ NO DAMAGE

3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta : 25°C	26 mΩ
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## E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P : 230VAC/50HZ O/P : FULL LOAD Ta : 25°C	PASS
2	CONDUCTION	EN55032 (CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS
3	RADIATION	EN55032 (CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS
4	E.S.D	EN61000-4-2 Level 3, 8KV air Level 2, 4KV contact	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 Level 3	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-6-2 INDUSTRY 2KV/Line-Line 4KV/Line-Earth	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
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1	TEMPERATURE RISE TEST	MODEL : HEP-2300-115																																																																																																																																				
		<p>1. ROOM AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.5 °C</p> <p>2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 51.2 °C</p>																																																																																																																																				
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			37	D14	83.4°C	112.1°C
			38	Q901	69.9°C	100.6°C
			39	Q904	69.5°C	101.2°C
			40	Q202	75.2°C	104.2°C
			41	Q204	67.7°C	95.9°C
			42	Q206	73.8°C	101.2°C
			43	Q209	74.0°C	103.0°C
			44	Q214	71.2°C	98.4°C
			45	U201	69.0°C	97.0°C
			46	RT31	63.1°C	91.6°C
			47	RT5	66.6°C	94.7°C
			48	U601	76.4°C	104.9°C
			49	C611	65.4°C	93.8°C
			50	T601	67.6°C	95.9°C
			51	D651	67.0°C	94.5°C
			52	C652	65.2°C	92.9°C
			53	C675	61.0°C	88.1°C
			54	R613	74.3°C	103.0°C
			55	U751	61.5°C	88.6°C
			56	RG75	58.0°C	84.8°C
			57	L751	59.5°C	86.7°C
			58	RG65	62.8°C	90.1°C
			59	TC	57.6°C	85.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 108.5%LOAD Ta : 25°C		TEST : OK	
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/220VAC O/P : 100 %LOAD Ta= -45 °C		TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C/95 %R.H NO DAMAGE	I/P : 315 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		± 0.003 %/°C(0~50°C)	

6	STORAGE TEMPERATURE TEST	-40~85°C	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 : 10 CYCLE 5. Input/Output condition : STATIC
7	THERMAL SHOCK TEST	-40~50°C	1. Thermal shock Temperature : -45°C~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test
8	VIBRATION TEST	20~500Hz, 10G 12min./1cycle, 72min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 20~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 10G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C111 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	(1) 201245HRS (2) 26590HRS (3) 96451HRS (4) 267975HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 478K hrs min. Telcordia SR-332 (Bellcore) ; 44.8K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 55,000 hours	

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

2020.10.1 TAG-QA-009