Test Report: DRS-240-12

240W All-In-One Intelligent Security Power

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

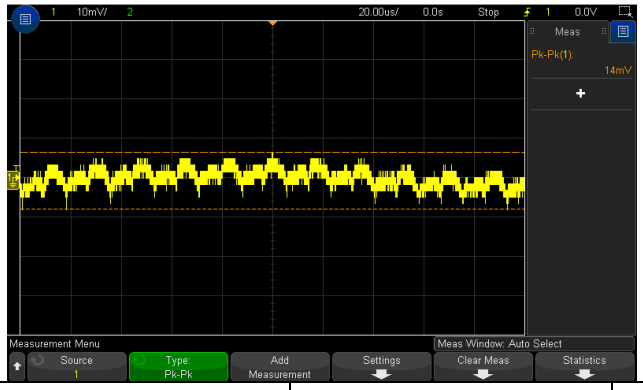
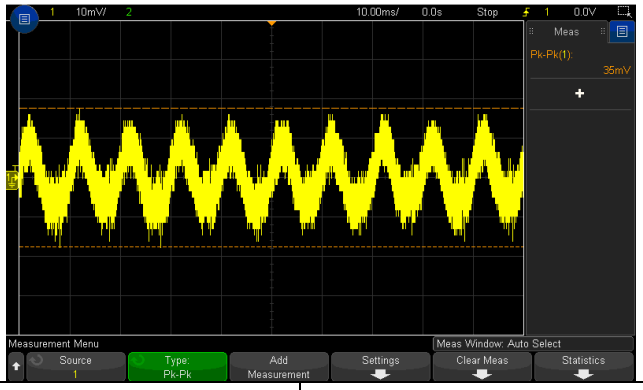
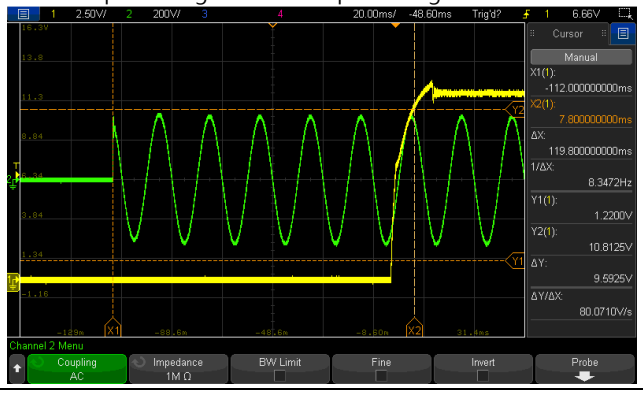
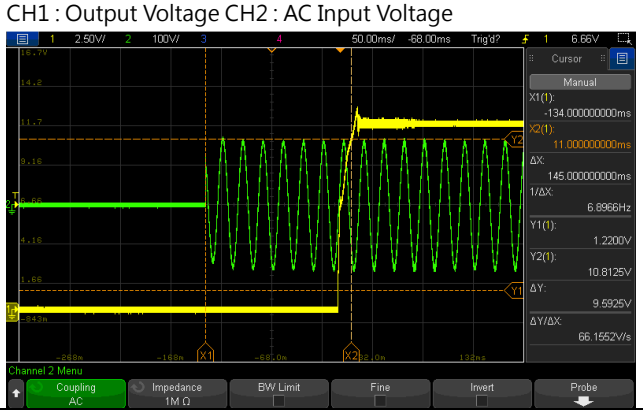
Safety Test
E.M.C. Test

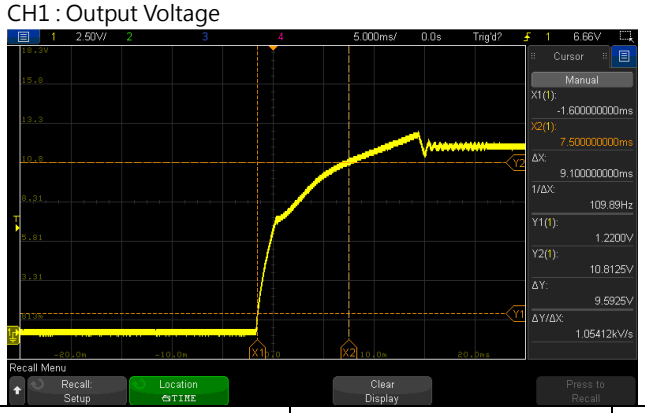
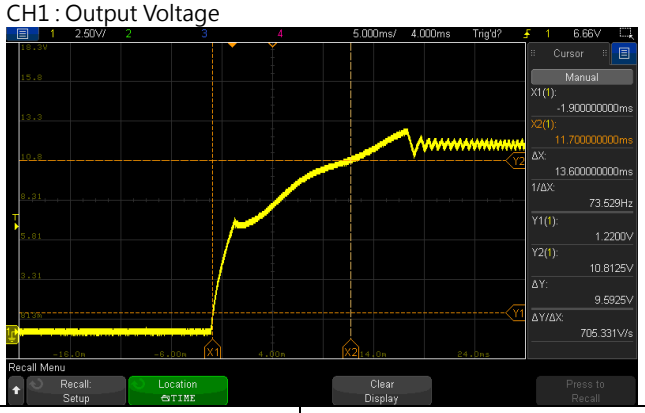
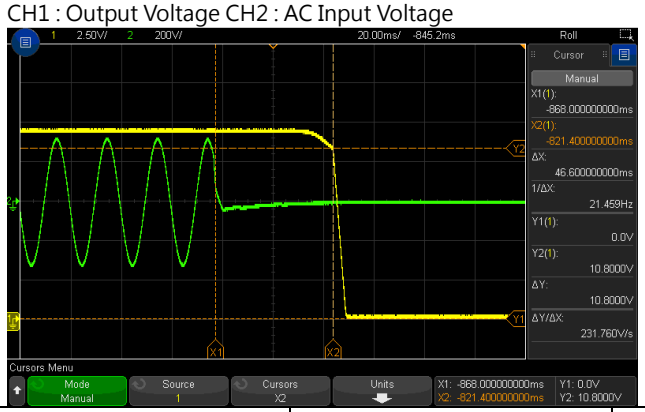
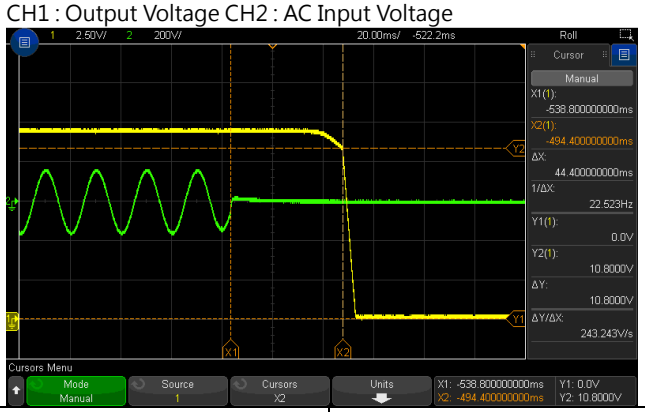
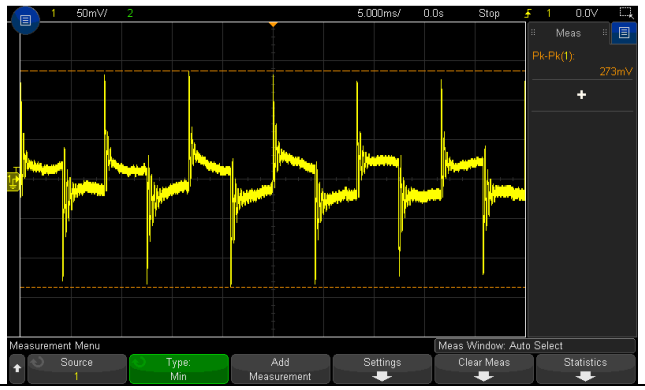
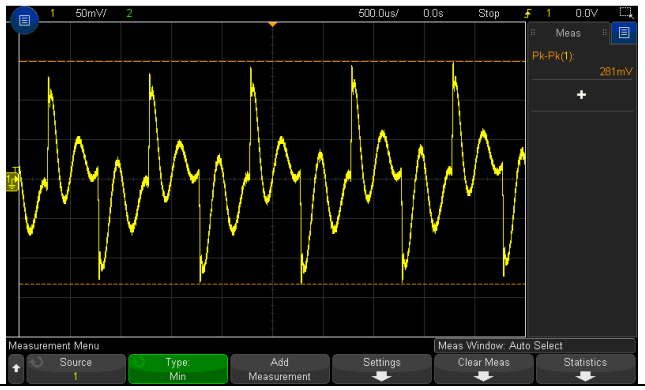
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0 %~ +1.0 %	I/P: 90VAC /305VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.36%~ 0.38%
2	LINE REGULATION (Max)	V1: -0.5 %~ +0.5 %	I/P: 90VAC~ 305VAC O/P:FULL LOAD Ta:25℃	V1: -0.01%~ -0.01%
3	LOAD REGULATION(Max)	V1: -0.5 %~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.36%~ 0.38%
4	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	1.5%
5	RIPPLE & NOISE(Max)	V1: 150mVp-p	I/P:230VAC O/P: TESTING LOAD Ta:25℃	V1: 35mVp-p
	high frequency :  low frequency : 			
6	SET UP TIME(Max)	230VAC/2400ms 115VAC/2400ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 119.8 ms 115VAC/ 145 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 			

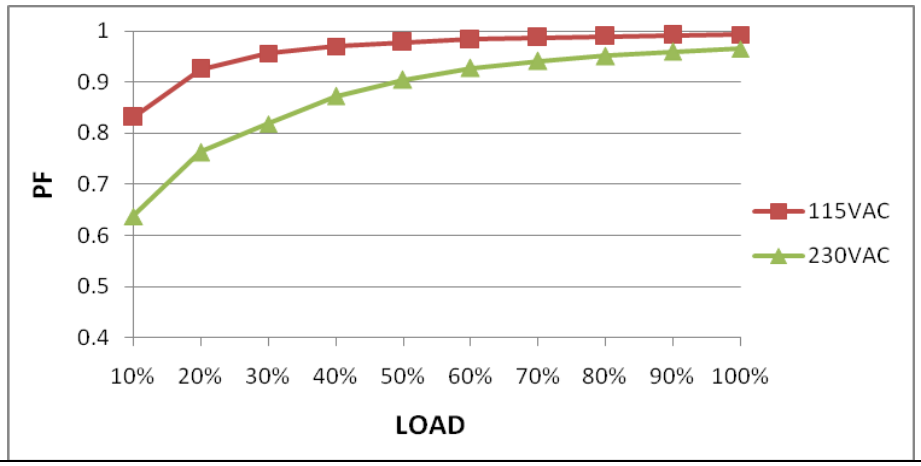
7	RISE TIME (Max)	230VAC/1000ms 115VAC/1000ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 9.1 ms 115VAC/ 13.6 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
8	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/10ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 46.6 ms 115VAC/ 44.4 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
9	DYNAMIC LOAD	V1: 1200mVp-p	I/P: 230VAC O/P: (1)FULL/MIN LOAD 50%DUTY/ 120HZ (2)FULL/MIN LOAD 50%DUTY/ 1KHZ Ta:25℃	273mVp-p 281mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	

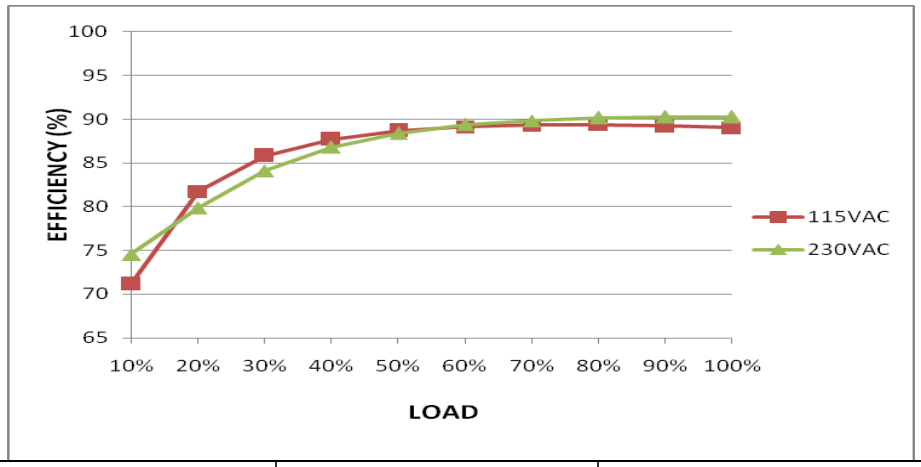
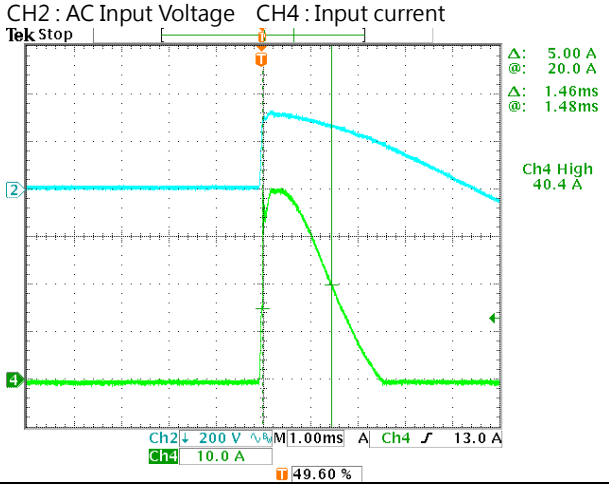
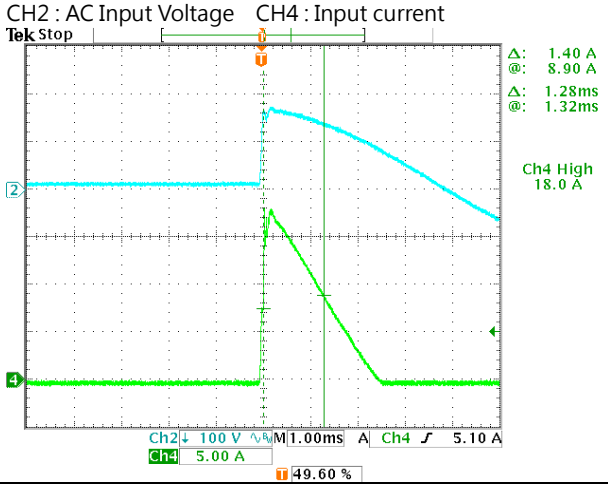
10	TRANSIENT RECOVERY TIME	V1: 1200mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	436mVp-p

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305VAC 127VDC~ 431VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L: + N: -) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25℃	(1) 88.9V~305V/full load (2) 119Vdc~431Vdc/FULL LOAD 119Vdc~431Vdc/50% LOAD (3) 119Vdc~431Vdc/FULL LOAD 119Vdc~431Vdc/50% LOAD
			I/P: LOW-LINEV=90 V HIGH-LINE+10=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 ~305VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 1.4 A 115V/ 2.8 A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.19A/ 230VAC I =2.36A/ 115VAC
4	POWER FACTOR (Typ.)	0.95/ 230VAC 0.98/115VAC	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	PF=0.965/230VAC PF=0.992/115VAC

P.F vs LOAD



5	EFFICIENCY(Typ.)	89.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	90.4%
	EFFICIENCY vs LOAD 			
6	INRUSH CURRENT(Typ.)	230V/60A 115V/30A COLD START	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =40.4A/ 230VAC I =18.0A/ 115VAC T50=1.46ms/230V
	INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current 			INPUT=115VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current 	

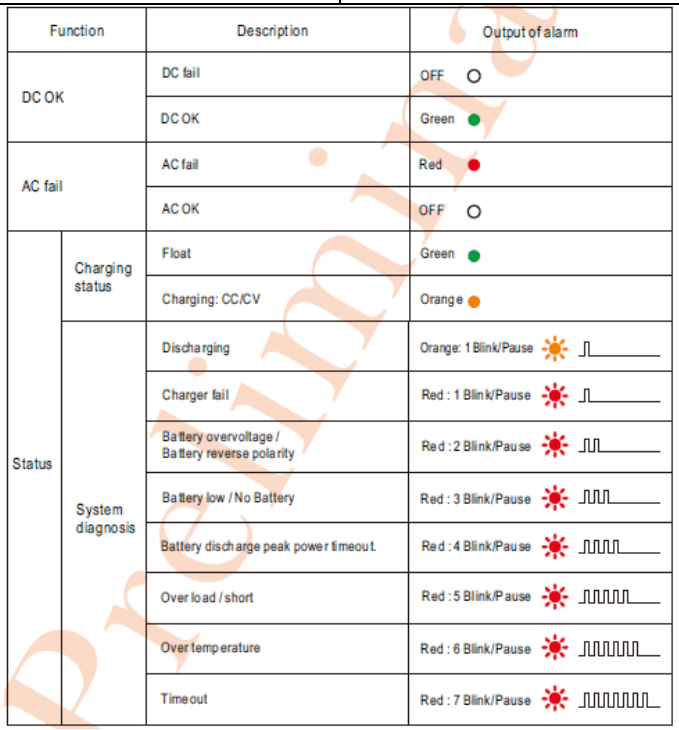
PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135 % Protection type: Constant current limiting, shutdown output voltage after 5 sec	I/P: 305VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25℃	117.2%/ 305VAC 117.2%/ 230VAC 117.2%%/100VAC Protection type: Constant current limiting, shutdown output voltage after 5 sec

2	OVER VOLTAGE PROTECTION	Load main output : 16.2V~18.6V Protection type : Shut down o/p voltage, re-power on to recover	I/P: 305VAC I/P: 230VAC I/P: 90VAC O/P:MIN LOAD Ta:25℃	17.2V/ 305VAC 17.2V/ 230VAC 17.2V/ 90VAC Protection type : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	Automatically drop load with temperature only for bat. load Shut down o/p voltage, recovers automatically after temperature goes down	I/P: 305VAC I/P: 90VAC O/P:FULL LOAD	O.T.P. Active Automatically drop load with temperature only for bat. load Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	Constant current Range：21~28A 1 HOUR NO DAMAGE	I/P: 305VAC I/P: 90VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE Constant current Range：23.4 A PROTECTION TYPE : Constant current limiting, shutdown output voltage after 5 sec, re-power on
5	BATTER CUT OFF	10.5±0.3V	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	10.40 V
6	REVERSE POLARITY	By internal MOSFET, no damage, recovers automatically after fault condition is removed.	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	By internal MOSFET, no damage, recovers automatically after fault condition is removed.

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	FORM-C RELAY	AC FAIL	Signals AC failure and activates when input voltage drops below : 79~89V of 120VAC, 132~187V of 220VAC. Relay contact output, ON : AC OK ; OFF : AC Fail ; max. rating : 30V/1A	TEST : OK 85.5 V of 120VAC, 173.4 V of 220VAC.
		CHARGER FAIL	Relay contact output, ON : Charger OK ; OFF : Charger Fail ; max. rating : 30V/1A	TEST : OK

		DC OK	Signals normal DC output and activates when output voltage > 90% rated value. Relay contact output, ON : DC OK ; OFF : DC Fail ; max. rating : 30V/1A	TEST : 10.79V
		BATTERY LOW/ ABNORMAL/ DISCONNECTED	Relay contact output, ON : Battery OK ; OFF : Battery Low ; max. rating : 30V/1A ; Battery low voltage : < 11V	TEST : OK Vbat ＜ 10.9 V
2	BATTER START	Restart system directly from battery and does not require AC power	I/P: BAT O/P:FULL LOAD Ta:25℃	TEST : OK
3	DC-UPS	UPS switch to battery power within 10ms of AC failure	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	TEST : OK
4	ADJUSTABLE CURRENT RANGE	20%~100% charging current adjustable by VR	I/P : 230 VAC O/P : TESTING LOAD Ta : 25℃	17.5% ~99.8%
5	LED INDICATOR	 I/P: TESTING VAC O/P:TESTING LOAD Ta:25℃	TEST : OK
6	FORCE BUTTON	Bat over discharge protection ＜85%Bat rated	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	TEST : OK
7	Battery Discharge Peak power	a) 2 Peak power＞4 min ; b) 3 Peak power＞4 s ;	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	a) TEST : OK b) TEST : OK

8	TEMPERATURE COMPENSATION	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃

Constant Voltage			
SPEC:	Ta=0℃ (17KΩ)	Ta=25℃ (5KΩ)	Ta=50℃ (1.7KΩ)
	14.85±0.12V	14.4±0.12V	14.13±0.12V
TEST RESULT:	14.738V	14.293V	14.026V

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 15/Q16Rated : 18 A/ 600 V	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. Ta:25℃	Q15 VDS: (1) 454V (2) 478V (3) 458V (4) 454V (5) 450V (6) 458V (7) 442V Q16 VDS: (1) 450V (2) 466V (3) 454V (4) 450V (5) 446V (6) 454V (7) 434V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1Rated : 13A/600 V	I/P: High-Line +3V =308V 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℃	Q1 VDS: (1) 574V (2) 574V (3) 574V (4) 574V (5) 574V (6) 574V (7) 511V
3	AUX MOS	U505 Rated : 1.04A/ 725 V Q504 Rated : 28 A/ 150 V	I/P: High-Line +3V =308 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Dynamic Load Full Load/	U505 VDS: (1) 649V (2) 656V (3) 649V Q504 VDS: (1) 47.0V (2) 47.0V (3) 47.4V

			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℃	(4) 649V (5) 649V (6) 649V (7) 649V	(4) 45.8V (5) 45.8V (6) 45.8V (7) 45.8V
4	P.F.C DIODE	D 8 Rated : 8 A/ 600 V	I/P:High-Line +3V =308V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25℃	(1) 532V (2) 532V (3) 532V (4) 496V	
5	Diode Peak Voltage	Q101 Rated : 140A/ 85 V Q102 Rated : 140A/ 85 V	AC ON/OFF I/P:High-Line +3V =308V 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℃	Q101: VDS: (1) 43.0V (2) 42.6V (3) 45.4V (4) 45.8V (5) 45.4V (6) 44.6V (7) 40.6V (8) 35.8V	Q102: VDS: (1) 40.6V (2) 41.8V (3) 43.8V (4) 43.4V (5) 43.4V (6) 43.0V (7) 41.0V (8) 33.0V
6	Input Capacitor Voltage	C5 Rated : 150 μ / 450 V	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℃	(1)449 (2)426V (3)447V (4)436V	
7	Control IC Voltage Test	PWM IC U3 Rated 8.9V~ 15.5 V PFC IC U1 Rated 9.75V~ 35 V O/P IC U100 Rated 8V~ 24 V IC U801 Rated 4.5V~ 36 V	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 (LOW LINE) Ta:25℃	U3 (1) 13.7V (2) 13.8V (3) 13.5V (4) 13.5V (5) 13.8V U1 (1) 14.5V (2) 14.5V	U801 (1) 12.4V (2) 12.4V (3) 12.4V (4) 12.4V (5) 12.4V U502 (1) 11.7V (2) 11.7V

		MCU IC U303 Rated 2.4V~ 3.6 V AUX IC U502 Rated 8.5V~30V		(3) 14.2V (4) 14.2V (5) 1.6V U100 (1) 12.3V (2) 14.0V (3) 12.3V (4) 12.3V (5) 12.3V	(3) 11.6V (4) 11.6V (5) 11.6V U303 (1) 3.33V (2) 3.33V (3) 3.33V (4) 3.33V (5) 3.33V

■ SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4 KVAC/min I/P-FG: 2 KVAC/min O/P-FG:1.5 KVAC/min	I/P-O/P: 4.2 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.8 KVAC/min Ta:25℃	I/P-O/P:10.78mA I/P-FG:8.78mA O/P-FG:19.43m 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℃	I/P-O/P:9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	6mΩ

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℃	PASS
2	CONDUCTION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	■ CRITERIA A
5	E.F.T	EN61000-4-4 INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	■ CRITERIA A

6	SURGE	IEC61000-4-5 L-N : 1KV L,N-PE : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	■ CRITERIA A
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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : DRS-240-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.0 ℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50.0 ℃		

NO	Position	ROOM AMBIENT Ta= 25.0℃	HIGH AMBIENT Ta= 50.0 ℃
1	LF1	37.9℃	66.5℃
2	C3	42.5℃	78.8℃
3	LF2	43.2℃	75.9℃
4	RTH4	45.1℃	71.7℃
5	RTH1	47.5℃	77.5℃
6	C26	51.9℃	80.9℃
7	BD1	61.5℃	89.3℃
8	C10	49.3℃	77.1℃
9	L3	48.2℃	76.1℃
10	C5	43.5℃	75.9℃
11	D12	51.6℃	79.8℃
12	L1	52.4℃	79.3℃
13	Q2	54.6℃	82.9℃
14	R4	56.0℃	83.0℃
15	U1	47.5℃	75.2℃
16	U4	47.5℃	74.0℃
17	C39	46.6℃	74.2℃
18	U502	57.1℃	85.1℃
19	T600	48.0℃	76.8℃
20	T500	55.5℃	83.0℃
21	U3	50.8℃	80.9℃
22	Q504	52.9℃	80.5℃
23	Q15	54.8℃	83.6℃
24	T1coil	73.3℃	95.1℃

NO	Position	ROOM AMBIENT Ta= 25.0℃	HIGH AMBIENT Ta= 50.0 ℃
25	T1core	61.8℃	89.2℃
26	C60	58.3℃	84.9℃
27	RTH5	56.5℃	82.3℃
28	C106	62.9℃	90.1℃
29	LF100	82.3℃	101.9℃
30	U100	76.8℃	92.5℃
31	Q102	98.4℃	96.2℃
32	Q522	38.6℃	66.7℃
33	C103	72.9℃	93.2℃
34	Q303	40.6℃	67.9℃
35	Q350	53.7℃	81.9℃
36	D503	55.2℃	83.6℃
37	U505	66.1℃	94.4℃
38	Q500	56.0℃	84.7℃
39	J101	73.5℃	99.3℃
40	D651	60.6℃	88.5℃
41	U303	52.7℃	81.8℃
42	U801	50.0℃	79.2℃
43	U150	63.8℃	92.1℃
44	R171	53.7℃	82.1℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：116%LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 264VAC/100VAC O/P： 100%LOAD Ta= -35℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃/95 %R.H NO DAMAGE	I/P： 272 VAC O/P：FULL LOAD Ta=50.7℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03%/℃(0~50℃)	I/P： 230 VAC O/P：FULL LOAD	±0.006%/℃(0~50℃)
6	STORAGE TEMPERATURE TEST	-40~85℃	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：10 CYCLE 5. Input/Output condition： STATIC	
7	THERMAL SHOCK TEST	-30~50℃	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：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	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：6G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C103 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) 115366.8HRS (2) 28248.1HRS (3) 48993.9HRS (4) 134604.1HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 564.7K hrs min. Telcordia SR-332 (Bellcore) ; 73.3K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Liutt		Wangdz

2020.10.1 TAG-QA-009