Test Report: DUPS20

24V/20A DIN Rail Type Uninterruptible DC-UPS Module

■ DESIGN VERIFY TEST

DC UPS Output Test
DC UPS Input Test
Protection Test
Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

DC UPS Output Test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE	21 Vdc ~ 29Vdc	I/P: 24VDC O/P:FULL LOAD Ta:25℃	20.67Vdc ~ 30.13Vdc
2	DISCHARGE CURRENT RANGE	0 ~ 20A	I/P: 24VDC O/P: BATTERY Ta:25℃	TEST：OK
3	CHARGING CURRENT	2A	I/P: 24VDC O/P: CV LOAD Ta:25℃	1.99A

DC UPS Input Test

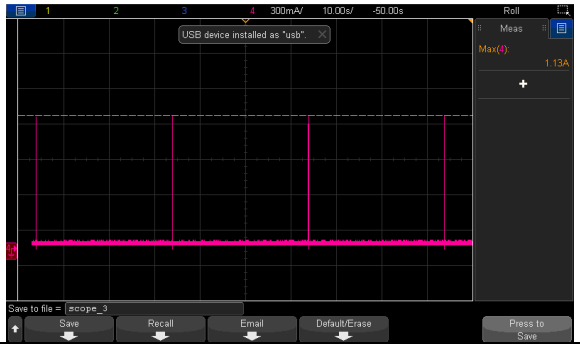
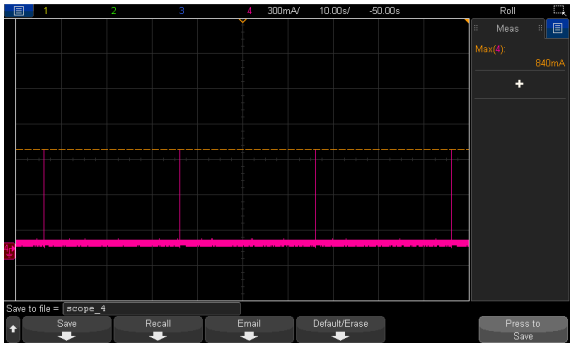
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	24VDC~ 29VDC	I/P:TESTING O/P: CV LOAD Ta:25℃	21.47VDC~ 30.05 VDC
			I/P: LOW-LINE-0.2= 23.8 V HIGH-LINE+2%=29.58V O/P:FULL/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST：OK
2	INPUT CURRENT(TYP)	24VDC/ 20 A	I/P: 24VDC O/P:FULL LOAD Ta:25℃	TEST：OK

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	BATTERY POLARITY	Protected by internal detection, No Damage, recovers automatically after fault conduction is removed.	I/P: 24VDC O/P:FULL LOAD Ta:25℃	TEST：OK
2.	SHORT CIRCUIT	This protection only works when batteries are not connected. External fuse is recommended when batteries are connected.	I/P: 24VDC O/P:FULL LOAD Ta:25℃	TEST：OK
3.	OVER DISCHARGE CURRENT	21~23A,After 3 sec., unit will cut-off battery discharging by relay	I/P: 24VDC O/P:FULL LOAD Ta:25℃	TEST：OK 21.6A

4.	BATTERY DEEP DISCHARGE	Cut-off battery discharging by relay	I/P: 24VDC O/P:FULL LOAD Ta:25℃	TEST：≤ 20.67 V

FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	RELAY CONTACT RATINGS (max.)	30VDC/1A resistive load	I/P: 30VDC O/P:1A Ta:25℃	TEST：OK
2.	DC BUS OK	Relay contact : Short when DC voltage between 21~29V(± 2%), relay contacts LED(Green) : DC BUS OK : light ; DC BUS fail : dark	I/P: TESTING O/P:FULL LOAD Ta:25℃	TEST：20.66V~29.54V
3.	BATTERY FAIL	Short when battery voltage falls below 22V(±2%) or battery failure is observed through the battery test function, relay contacts LED(Red):Battery over-discharge warning or battery broken: light; Battery OK : dark	I/P: 24VDC O/P:FULL LOAD Ta:25℃	TEST：OK BATTERY FAIL:22.19V BATTERY OK:22.39V
4.	BATTERY DISCHARGE	Relay contact : Short when battery in discharge condition, relay contacts LED(Yellow) : light : Battery discharging ; dark : Battery is not discharging or discharging current < 1.0A	I/P: TESTING O/P:FULL LOAD Ta:25℃	TEST： Battery discharging: 1.14 A Battery is not discharging: 0.93 A
5	BATTERY TEST	Every 30 seconds，unit will send out test signal through “Battery Fail” relay contact and LED indicator once the battery is fail.	I/P:21~29V O/P:Battery Ta:25℃ I(test)=0.7~1.2A	TEST: 1.13A/ I/P =21V 0.84A/ I/P =29V
		I/P =21V： 		I/P =29V: 

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 55 A/ 60V	DC ON/OFF I/P:High-Line +2% = 29.6V VDS: O/P: (1)CV(max) (2)CV(min) (3)no load (4)Output Short Ta:25℃	VDS: (1) 11.12V (2) 8.95V (3) 30.0V (4) 32.0V
2	Input Capacitor Voltage	C1 Rated: : 100 μ / 35 V	I/P:High-Line +2% = 29.6V O/P: (1)CV(max) (2)CV(min) (3)no load (4)Output Short Ta:25℃	(1)30.8V (2)31.0V (3)30.0V (4)30.8V
3	Control IC Voltage Test	PWM IC U1 Rated : 3V ~ 30V PWM IC U2 Rated : 4V ~ 36V MCU IC U101 Rated : 1.7V ~ 3.6V	DC ON/OFF I/P:High-Line +2% = 29.6V O/P: (1)CV(max) (2)CV(min) (3)no load (4)Output Short Ta:25℃	U1 (1) 20.7V (2) 20.5V (3) 20.3V (4) 20.7V U2 (1) 6.03V (2) 5.99V (3) 5.99V (4) 5.71V U101 (1) 3.38V (2) 3.38V (3) 3.38V (4) 3.38V
4	Diode Peak Voltage	D1 Rated : 60 V 10 A	DC ON/OFF I/P:High-Line +2% = 29.6V O/P : (1)CV(max) (2)CV(min) (3)no load (4)Output Short Ta : 25℃	(1) 9.01V (2) 9.42V (3) 29.6V (4) 30.6V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	IP/OP - Chassis : 0.5KVac ; /min IP/OP- Relay :0.5KVac/min Relay - Chassis :0.5KVac/min	IP/OP - Chassis : 0.6KVac ; /min IP/OP- Relay :0.6KVac/min Relay - Chassis :0.6KVac/min Ta:25℃	IP/OP - Chassis :0.015 mA IP/OP- Relay :0.01 mA Relay - Chassis :0.008 mA NO DAMAGE
2	ISOLATION RESISTANCE	IP/OP - Chassis : 500VDC>100MΩ IP/OP- Relay : 500VDC>100MΩ Relay - Chassis : 500VDC>100MΩ	IP/OP - Chassis : 600VDC IP/OP- Relay : 600VDC Relay - Chassis :600VDC Ta:25℃	IP/OP - Chassis :9999MΩ IP/OP- Relay : 9999MΩ Relay - Chassis : 9999MΩ NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS B	I/P: 24VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
2	E.S.D	EN61000-4-2 CRITERIA A (AIR:4KV/Contact:2KV) CRITERIA B (AIR:8KV/Contact:4KV)	I/P: 24VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
3	E.F.T	EN61000-4-4 INPUT: 2KV	I/P: 24VDC O/P:FULL LOAD Ta:25℃	CRITERIA A
4	SURGE	IEC61000-4-5 0.5KV（DC input ports）	I/P: 24VDC O/P:FULL LOAD Ta:25℃	CRITERIA A
5	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 : DPUS20 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 29VDC O/P : FULL LOAD Ta= 24.7 ℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 29VDC O/P : FULL LOAD Ta= 60.5 ℃		

NO	Position	ROOM AMBIENT Ta= 24.7 ℃	HIGH AMBIENT Ta= 60.5 ℃
1	R5	55.2℃	89.4℃
2	C1	64.8℃	98.9℃
3	C2	70.1℃	103.1℃
4	RY2	84.7℃	114.2℃
5	RY1	82.7℃	96.5℃
6	D1	44.2℃	78.2℃
7	Q1	43.5℃	80.4℃
8	D9	78.2℃	109.7℃
9	U101	60.8℃	92.7℃
10	J1	77.5℃	107.5℃
11	RG1	83.5℃	111.5℃
12	PCB	71.6℃	103.5℃
13	J3	51.6℃	84.5℃
14	D2	54.3℃	87.3℃
15	TB1	64.9℃	95.8℃
16	U2	56.8℃	86.6℃
17	Q101	62.0℃	94.8℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 29 VDC O/P：110 % LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 28VDC 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 60 ℃/95 %R.H NO DAMAGE	I/P： 29 VDC O/P：FULL LOAD Ta= 60.3 ℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03%/℃(0~60℃)	I/P： 24 VDC O/P：FULL LOAD	± 0.0051 %/℃(0~60℃)
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	-30~60℃	1. Thermal shock Temperature： -35℃~ +65℃ 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:24V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:24V/ FULL LOAD Burn In Test	

8	VIBRATION TEST	10 ~ 500Hz, 2G 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：3G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C2 IS THE MOST CRITICAL COMPONENT (1) I/P： 29VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 29VDC O/P：FULL LOAD Ta= 60 ℃ LIFE TIME (3) I/P： 29VDC O/P：75% LOAD Ta= 60 ℃ LIFE TIME (4) I/P： 29VDC O/P：50% LOAD Ta= 60 ℃ LIFE TIME	 (1) 120259HRS (2) 14026HRS (3) 32000HRS (4) 56886HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1252.0K hrs min. Telcordia SR-332 (Bellcore) ; 482.1K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P：24VDC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

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