



# Test Report: DUPS40

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24V/40A 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°C	20.87Vdc ~ 29.83Vdc
2	DISCHARGE CURRENT RANGE	0 ~ 40A	I/P: 24VDC O/P: BATTERY Ta:25°C	TEST : OK
3	CHARGING CURRENT	2A	I/P: 24VDC O/P: CV LOAD Ta:25°C	1.984A

### 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°C	21.14VDC~ 29.87 VDC
			I/P: LOW-LINE-0.2= 23.8 V HIGH-LINE+2%=29.58V 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 CURRENT(TYP)	24VDC/ 40 A	I/P: 24VDC O/P:FULL LOAD Ta:25°C	TEST : OK

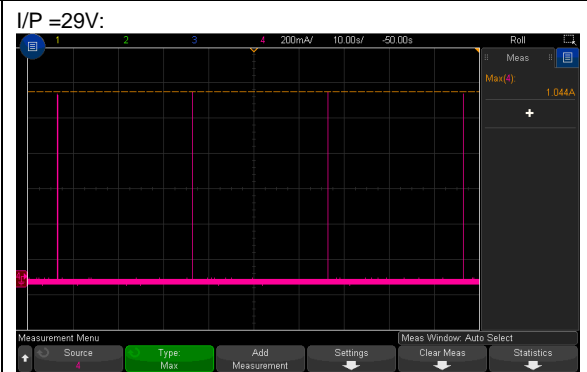
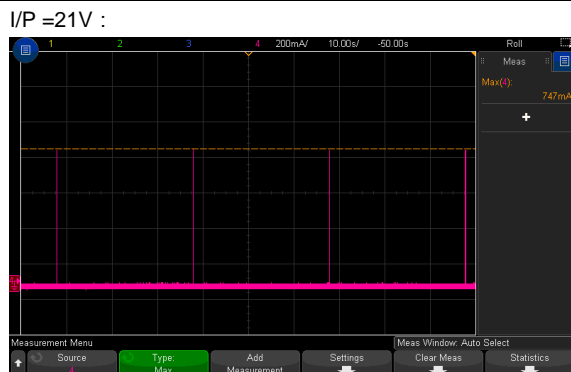
### PROTECTION TEST

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°C	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°C	TEST : OK
3.	OVER DISCHARGE CURRENT	42~46A,After 3 sec., unit will cut-off battery discharging by relay	I/P: 24VDC O/P:FULL LOAD Ta:25°C	TEST : OK 43.6A

4.	BATTERY DEEP DISCHARGE	Cut-off battery discharging by relay	I/P: 24VDC O/P: FULL LOAD Ta: 25°C	TEST : $\leq$ <u>20.87</u> V
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### FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	RELAY CONTACT RATINGS (max.)	30VDC/0.5A resistive load	I/P: 30VDC O/P: 0.5A Ta: 25°C	TEST : OK
2.	DC BUS OK	Relay contact : Short when DC voltage between 21~29V( $\pm$ 2%), relay contacts LED(Green) : DC BUS OK : light ; DC BUS fail : dark	I/P: TESTING O/P: FULL LOAD Ta: 25°C	TEST : 20.68V~29.55V
3.	BATTERY FAIL	Short when battery voltage falls below 22V( $\pm$ 2%) or battery failure is observed through the battery test function, relay contacts LED(Red): Battery over-discharge warning or battery broken: ight; Battery OK : dark	I/P: 24VDC O/P: FULL LOAD Ta: 25°C	TEST : BATTERY FAIL: 21.96 BATTERY OK: 22.13
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 $<$ 2.0A	I/P: TESTING O/P: FULL LOAD Ta: 25°C	TEST : Battery discharging: <u>2.34</u> A Battery is not discharging: <u>1.92</u> 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°C I(test)=0.7~1.2A	TEST: 0.747A/ I/P =21V 1.044A/ I/P =29V



## COMPONENT STRESS TEST

N O	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : 55 A/ 60 V	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°C	VDS: (1) 8.99V (2) 13.1V (3) 42.6V (4) 36.6V
2	Input Capacitor Voltage	C1 Rated: : 100 $\mu$ / 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°C	(1)29.6V (2)30.2V (3)31.2V (4)31.2V
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°C	U1 (1) 21.1V (2) 21.1V (3) 20.7V (4) 21.2V  U2 (1) 5.08V (2) 5.08V (3) 5.08V (4) 5.08  U101 (1) 3.38V (2) 3.38V (3) 3.38V (4) 3.38
4	Diode Peak Voltage	D1 Rated : 10A/ 60 V	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°C	(1) 8.3V (2) 13.3V (3) 44.4V (4) 43.5V

## 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°C	IP/OP - Chassis :0.013 mA IP/OP- Relay : 0.009mA 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°C	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°C	PASS  Test by certified Lab
3	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°C	PASS  Test by certified Lab
4	E.F.T	EN61000-4-4 INPUT: 2KV	I/P: 24VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
5	SURGE	IEC61000-4-5 0.5KV (DC input ports)	I/P: 24VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
6	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 : DUPS40 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 29VDC O/P : FULL LOAD Ta= 25.4 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 29VDC O/P : FULL LOAD Ta= 60.5 °C		

		NO	Position	ROOM AMBIENT Ta= 25.4 °C	HIGH AMBIENT Ta= 60.5 °C
				1	C1
		2	C2	73.6°C	100.0°C
		3	TB1	69.1°C	94.1°C
		4	D9	93.0°C	116.3°C
		5	D1	49.7°C	80.1°C
		6	Q1	47.9°C	78.6°C
		7	RY2	92.5°C	112.6°C
		8	RY1	74.7°C	99.5°C
		9	R5	72.8°C	100.3°C
		10	U2	63.5°C	92.4°C
		11	D2	63.5°C	91.8°C
		12	RG1	87.6°C	114.1°C
		13	J1	93.0°C	114.6°C
		14	PCB	91.0°C	113.1°C
		15	U101	57.8°C	87.0°C
		16	Q101	58.8°C	88.4°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P : 29 VDC O/P : 110.5 * LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 28VDC O/P : 100 * LOAD Ta= -35 °C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C/95 %R.H NO DAMAGE		I/P : 29 VDC O/P : FULL LOAD Ta= 60.2 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C(0~60°C)		I/P : 24 VDC O/P : FULL LOAD	± 0.0081%/°C(0~60°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	-30~60°C		1. Thermal shock Temperature : -35°C~ +65°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: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°C	



9	CAPACITOR LIFE CYCLE	SUPPOSE C2 IS THE MOST CRITICAL COMPONENT (1) I/P : 29VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 29VDC O/P : FULL LOAD Ta= 60 °C LIFE TIME (3) I/P : 29VDC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 29VDC O/P : 50% LOAD Ta= 60 °C LIFE TIME	(1) 102537HRS (2) 16564HRS (3) 39397HRS (4) 68594HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 467K hrs min. Telcordia SR-332 (Bellcore) ; 499.5K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 24VDC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		Wangdz

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