



# Test Report: DBUF40-24

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24V/40A DIN rail Type Buffer Module

## ■ DESIGN VERIFY TEST

Charging Mode Test

Buffer Mode 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

CHARGING MODE TEST

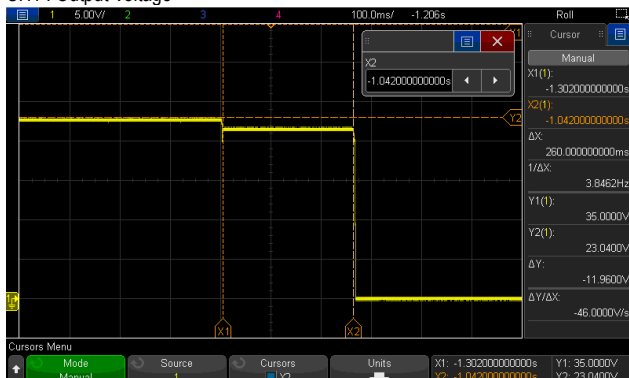
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	DC OPERATING VOLTAGE RANGE	23~30Vdc	I/P : 23~30Vdc O/P : FULL LOAD Ta : 25°C	OK
2	CURRENT(CHARGING MODE)	900mA	I/P:24V O/P:FULL LOAD Ta:25°C	830mA
3	CURRENT CONSUMPTION (STANDBY MODE)	100mA	I/P:24V O/P:FULL LOAD Ta:25°C	86.6mA
4	CHARGING TIME	25s Typ. 35s Max.	I/P:24V O/P:FULL LOAD Ta:25°C	23s

BUFFER MODE TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	DC NORMAL OPERATING VOLTAGE	22Vdc/Vin-1Vdc	I/P:24Vdc O/P:FULL LOAD Ta:25°C	OK
2	DC OPERATING VOLTAGE RANGE	22~29Vdc	I/P:23~30Vdc O/P:FULL LOAD Ta:25°C	OK
3	OUTPUT CURRENT (max.)	40A	I/P: 23~30Vdc O/P:20A Ta:25°C	OK
4	BUFFER TIME	> 160ms/40A > 320ms/20A > 42s/0.1A	I/P: 24VDC O/P: 40A 20A 0.1A Ta:25°C	260ms/40A 550ms/20A 69s/0.1A

INPUT=24VDC @ 40A

CH1 : Output Voltage

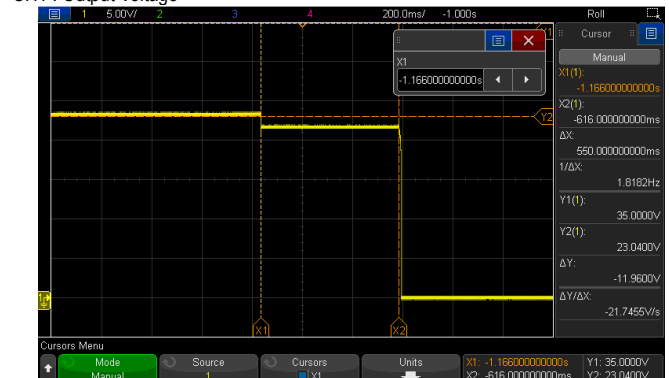


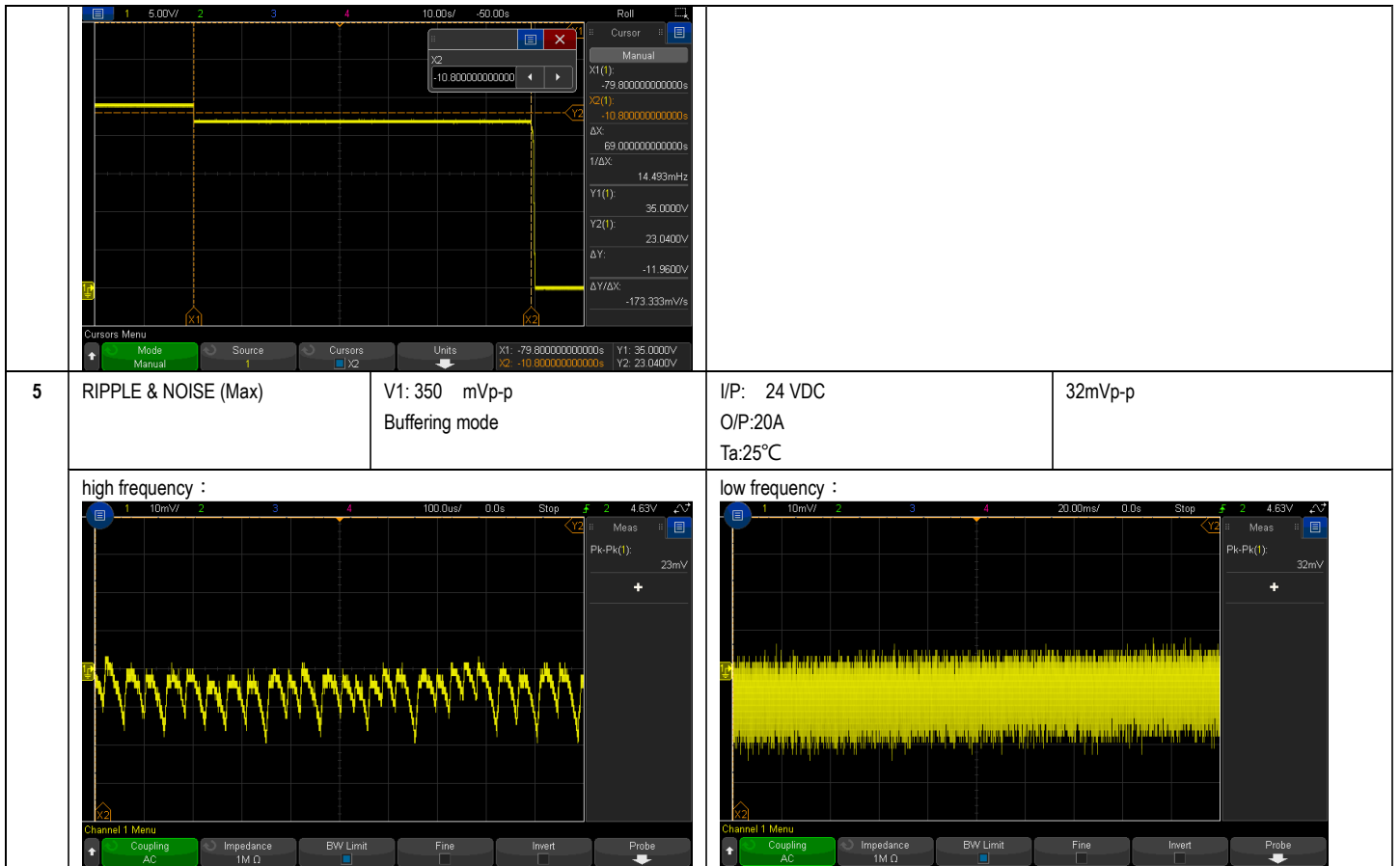
INPUT=24VDC @ 0.1A

CH1 : Output Voltage

INPUT=24VDC @ 20A

CH1 : Output Voltage





### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 125% rated output power at buffer mode	I/P: 24 VDC O/P:TESTING Ta:25°C	111.5% PROTECTION TYPE : Shut down O/P voltage ,re-power on to recover.
2	OVER VOLTAGE PROTECTION	31 V~ 37.5 V at buffer mode only	I/P: 24 VDC O/P:MIN LOAD (BUFFERING MODE) Ta:25°C	32.3V PROTECTION TYPE : Shut down O/P voltage
3	SHORT PROTECTION	SHORT EVERY OUTPUT	I/P: 24 VDC O/P:TESTING Ta:25°C	NO DAMAGE PROTECTION TYPE : Shut down O/P voltage ,re-power on to recover.
4	TVS FOR SIGNALS(MAX)	+Vs :35 VDC NO DAMAGE	I/P: 24 VDC O/P: FULL LOAD Ta:25°C	TEST : OK
5	INPUT REVERSE	POWER OK	I/P: 24 VDC O/P:FULL Ta:25°C	NO DAMAGE

### CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	SWITCH	1="Fix 22 V" 2= "Vin-1"	I/P: 23VDC~ 30VDC O/P:TESTING Ta:25°C	TEST :OK

2	INHIBIT (I)	BUFFFER MODULE ON : +VS-V(I)< 6V dc BUFFFER MODULE OFF : +VS-V(I)> 10V dc 35Vdc/4mA	I/P: 24 VDC O/P: FULL LOAD Ta:25°C	TEST : OK 3.78mA/35VDC
	READY (R)	Charged ready:V(R) > +Vs-2Vdc Unready: V(R)<1Vdc 35Vdc/10mA	I/P: 24 VDC O/P: FULL LOAD +Vs :Max 35 VDC/10mA Ta:25°C	TEST OK 9.7mA/35VDC
	BUFFERING (B)	Buffering:V(B) > +Vs-2Vdc Other mode: V(B)<1Vdc 35Vdc/10mA	I/P: 24 VDC O/P: FULL LOAD +Vs :Max 35 VDC/10mA Ta:25°C	TEST : OK 9.7 mA/35VDC
	SUPPLY VOLTAGE (+Vs)	+Vs :10~35 VDC/10mA  NO DAMAGE	I/P: 24 VDC O/P: FULL LOAD Ta:25°C	TEST : OK 4.12mA/35VDC 0.58mA/10VDC
3	LED STATUS DISPLAY	ON: READY; OFF:DISCHARGED/VIN<22V; FLASHING SLOWIY(1HZ):CHARGING; FLASHING QUICKLY(10HZ):BUFFERING	I/P:24VDC O/P:FULL LOAD Ta:25°C	TEST :OK
4	PARALLEL CONNECTION	POWER OK	I/P:24VDC O/P:FULL LOAD Ta:25°C	TEST :OK

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q3 Rated : 60 A/ 250 V	DC ON/OFF I/P:27 V VDS: O/P: (1)Full Load /BUFFER (2)Output Short Ta:25°C	Q3 VDS: (1) 228V (2) 216V
2	Transistor (D to S) or (C to E) Peak Voltage	Q2 Rated : 7.5 A/ 600 V	I/P:27 V DC ON/OFF O/P: (1)Full Load/CHARGING (2)Output Short (3)Continue Ta:25°C	VDS: (1) 200V (2) 196V (3) 200V
4	Diode Peak Voltage	D99 Rated : 60 A/ 300 V	DC ON/OFF I/P:27 V O/P: (1)Full Load/BUFFER (2)Output Short Ta:25°C	Q101: VDS: (1) 188V (2) 188V
5	Input Capacitor Voltage	C5 Rated: : 2200 $\mu$ / 200 V	I/P:27 V 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) 188V (2) 188V (3) 188V (4) 188V
6	Control IC Voltage Test	IC U1 Rated 11.52 V~ 12.48 V	DC ON/OFF I/P:27 V O/P: (1)FULL LOAD	(5) 12.38V (6) 12.27V (7) 12.35V (8) 12.38V

			(2)Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD (LOW LINE) Ta:25°C	(9) 12.27V
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### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	IEC62368-1 IP/O-FGP:2.2KVAC/min SIGNALS-FG:2.2KVAC/min	IP/OP-FG:2.64KVAC/min SIGNALS-FG:2.64KVAC/min Ta:25°C	IP/OP-FG: 0.5uA SIGNALS-FG: 0uA NO DAMAGE
2	ISOLATION RESISTANCE	IP/OP-FG:500VDC>100MΩ SIGNALS-FG: 500VDC>100MΩ	IP/OP-FG:600VDC SIGNALS-FG: 600VDC Ta:25°C	IP/OP-FG: 9999MΩ SIGNALS-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	5mΩ

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS B	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS B	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 <u>Din rail Model</u> : AIR: 15KV / Contact: 8KV	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 INPUT: 2KV	I/P: 24 VDC O/P:FULL LOAD Ta:25°C	CRITERIA A
5	SURGE	IEC61000-4-5 L-L :1KV L,L-PE:2KV	I/P: 24 VDC 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 : DBUF40-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 27.1 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 77.9 °C		

		NO	Position	ROOM AMBIENT Ta= 27.1 °C	HIGH AMBIENT Ta= 77.9 °C
		1	ZRN1	35.0°C	80.3°C
		2	C53	35.3°C	80.6°C
		3	Q1	36.7°C	81.7°C
		4	R106	36.7°C	82.8°C
		5	RT1	37.1°C	83.0°C
		6	L1	35.7°C	82.8°C
		7	Q2	33.4°C	80.8°C
		8	C8	33.2°C	78.6°C
		9	C7	33.0°C	78.9°C
		10	C9	34.8°C	80.1°C
		11	U1	54.2°C	98.4°C
		12	U2	41.2°C	86.7°C
		13	U3	42.9°C	89.5°C
		14	L2	35.3°C	81.2°C
		15	D98	33.8°C	79.8°C
		16	Q4	32.7°C	79.1°C
		17	U6	40.8°C	86.2°C
		18	T1	31.9°C	79.6°C
		19	D11	33.4°C	80.8°C
		20	PCB	49.6°C	93.3°C
		21	U5	44.3°C	89.5°C
		22	U9	33.7°C	80.6°C
		23	TB1	35.2°C	80.1°C
		24	U7	42.5°C	87.3°C
		25	C114	46.0°C	91.2°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE		I/P : 24 VDC O/P : 111.5 % LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 23 VDC / 30 VDC O/P : 100 % LOAD Ta= -30 °C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 75 °C / 95 %R.H NO DAMAGE		I/P : 30 VDC O/P : FULL LOAD Ta= 75 °C HUMIDITY= 95 %R.H	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03%/°C (0~75°C)		I/P : 24 VDC O/P : FULL LOAD	±0.01%/°C (0~75°C)
6	STORAGE TEMPERATURE TEST	-25~80°C		1. Thermal shock Temperature : -30°C~ +85°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	-25~75°C		1. Thermal shock Temperature : -30°C~ +80°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: 24 VDC / FULL LOAD DC ON 3sec/DC OFF 1sec TEST 1cycle: 24 VDC / 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 C5 IS THE MOST CRITICAL COMPONENT (1) I/P : 24VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 24VDC O/P : FULL LOAD Ta= 75 °C LIFE TIME	(1) 85036HRS (2) 3732HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1420.2K hrs min. Telcordia TR/SR-332 (Bellcore) (25°C) ; 162.6K hrs min. MIL-HDBK-217F (25°C) 717.2K hrs min. Telcordia TR/SR-332 (Bellcore) (40°C) ; 106.8K hrs min. MIL-HDBK-217F (40°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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