



Test Report: DBUF20-24

24V/20A 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

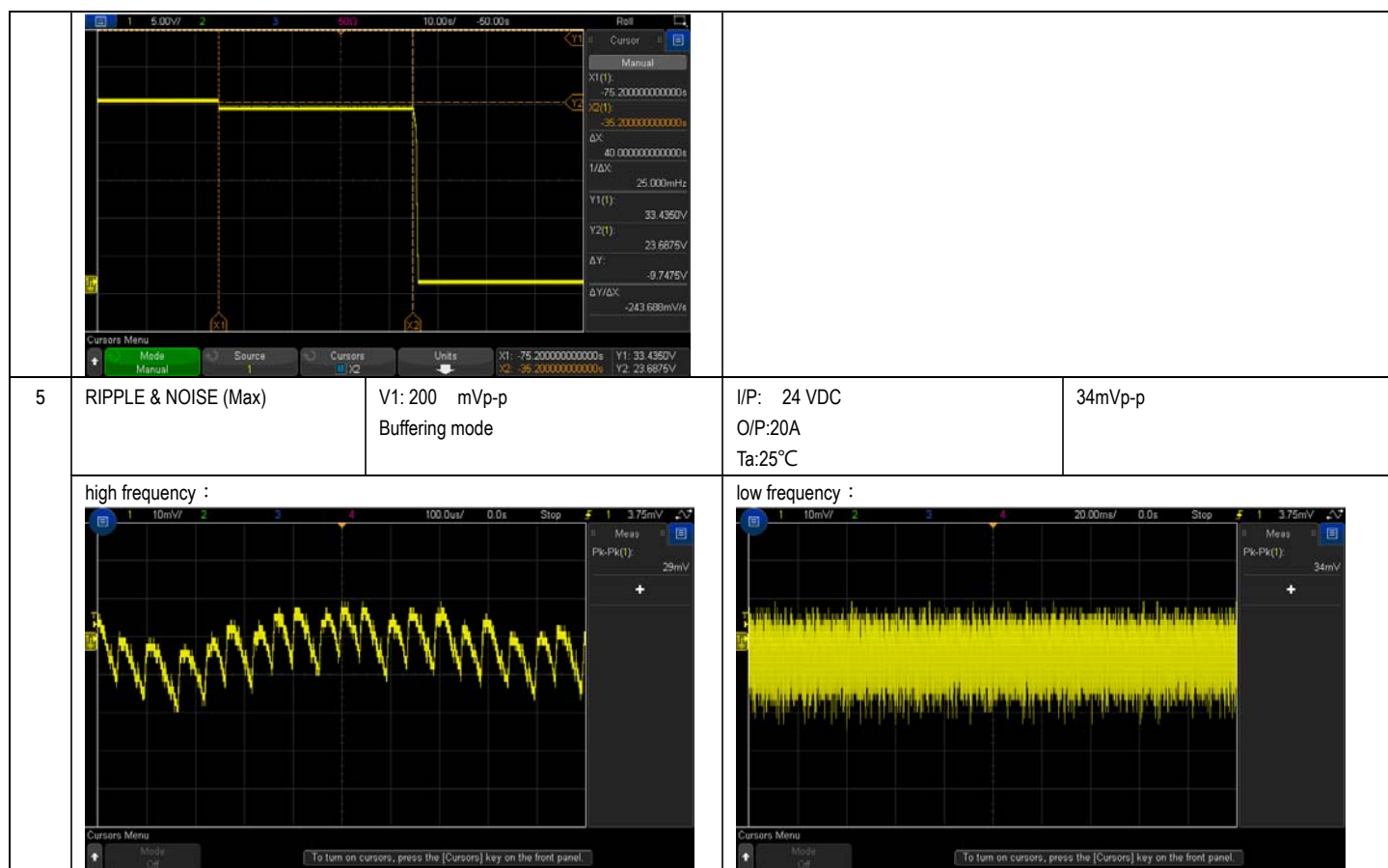
DESIGN VERIFY TEST

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	79.39mA
4	CHARGING TIME	15s Typ. 25s Max.	I/P:24V O/P:FULL LOAD Ta:25°C	13.9s

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.)	20A	I/P: 23~30Vdc O/P:20A Ta:25°C	OK
4	BUFFER TIME	>250ms/20A >500ms/10A >30s/0.1A	I/P: 24VDC O/P: 20A 10A 0.1A Ta:25°C	385ms/20A 802ms/10A 40s/0.1A
INPUT=24VDC @ 20A CH1 : Output Voltage				
INPUT=24VDC @ 0.1A 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	115.5% 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	32.4V 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℃	TEST :OK
2	INHIBIT (I)	BUFFER MODULE ON : +VS-V(I)< 6V dc BUFFER MODULE OFF : +VS-V(I)> 10V dc 35Vdc/4mA	I/P: 24 VDC O/P: FULL LOAD Ta:25℃	BUFFER MODULE TEST : OK 3.7mA/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℃	TEST OK 9.6mA/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℃	TEST : OK 9.6 mA/35VDC
	SUPPLY VOLTAGE (+Vs)	+Vs :10~35 VDC/10mA NO DAMAGE	I/P: 24 VDC O/P: FULL LOAD Ta:25℃	TEST : OK 4.2mA/35VDC 0.5mA/10VDC
3	LED STATUS DISPLAY	ON: READY; OFF:DISCHARGED/VIN<22V; FLASHING SLOWLY(1HZ):CHARGING; FLASHING QUICKLY(10HZ):BUFFERING	I/P:24VDC O/P:FULL LOAD Ta:25℃	TEST :OK
4	PARALLEL CONNECTION	POWER OK	I/P:24VDC O/P:FULL LOAD Ta:25℃	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 : 45 A/ 250 V	DC ON/OFF I/P:27 V VDS: O/P: (1)Full Load /BUFFER (2)Output Short Ta:25℃	Q3 VDS: (1) 212V (2) 208
2	Transistor (D to S) or (C to E) Peak Voltage	Q2 Rated : 7.5 A/ 600 V VGS ± 25 V	I/P:27 V DC ON/OFF O/P: (1)Full Load/CHARGING (2)Output Short (3)Continue Ta:25℃	VDS: (1) 202V (2) 192V (3) 190V
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℃	Q101: VDS: (1) 194V (2) 186V

5	Input Capacitor Voltage	C5 Rated: : 2200 μ / 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) 184V (2) 184V (3) 184V (4) 184V
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 (2)Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD (LOW LINE) Ta:25°C	(5) 12.3V (6) 12.3V (7) 12.3V (8) 12.3V (9) 12.3V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	IEC62368-1, UL62368-1 IP/O-FGP:2.2KVDC/min SIGNALS-FG:2.2KVDC/min	IP/OP-FG:2.64KVDC/min SIGNALS-FG:2.64KVDC/min Ta:25°C	IP/OP-FG: 0.3uA 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: 7923MΩ SIGNALS-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	EN 60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	6mΩ

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 : DBUF20-24 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 26.5 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 24 VDC O/P : FULL LOAD Ta= 75.9 °C <table><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 26.5 °C</th><th>HIGH AMBIENT Ta= 75.9 °C</th></tr><tr><td>1</td><td>ZRN1</td><td>34.4°C</td><td>81.1°C</td></tr><tr><td>2</td><td>C53</td><td>34.4°C</td><td>81.1°C</td></tr><tr><td>3</td><td>Q1</td><td>33.5°C</td><td>78.6°C</td></tr><tr><td>4</td><td>R106</td><td>36.6°C</td><td>83.4°C</td></tr><tr><td>5</td><td>RT1</td><td>37.2°C</td><td>83.8°C</td></tr><tr><td>6</td><td>L1</td><td>36.0°C</td><td>83.8°C</td></tr><tr><td>7</td><td>Q2</td><td>33.8°C</td><td>81.9°C</td></tr><tr><td>8</td><td>C8</td><td>32.1°C</td><td>79.3°C</td></tr><tr><td>9</td><td>C7</td><td>31.0°C</td><td>78.4°C</td></tr><tr><td>10</td><td>C9</td><td>34.5°C</td><td>81.4°C</td></tr><tr><td>11</td><td>U1</td><td>52.2°C</td><td>97.9°C</td></tr><tr><td>12</td><td>U2</td><td>40.8°C</td><td>87.0°C</td></tr><tr><td>13</td><td>U3</td><td>41.9°C</td><td>88.7°C</td></tr><tr><td>14</td><td>L2</td><td>34.2°C</td><td>81.1°C</td></tr><tr><td>15</td><td>D99</td><td>34.0°C</td><td>81.2°C</td></tr><tr><td>16</td><td>D98</td><td>33.2°C</td><td>81.1°C</td></tr><tr><td>17</td><td>Q3</td><td>31.9°C</td><td>80.7°C</td></tr><tr><td>18</td><td>Q4</td><td>32.2°C</td><td>80.8°C</td></tr><tr><td>19</td><td>U6</td><td>40.6°C</td><td>87.6°C</td></tr><tr><td>20</td><td>T1</td><td>31.3°C</td><td>80.8°C</td></tr><tr><td>21</td><td>D12</td><td>33.9°C</td><td>81.6°C</td></tr><tr><td>22</td><td>PCB</td><td>35.1°C</td><td>81.7°C</td></tr><tr><td>23</td><td>U5</td><td>42.0°C</td><td>88.5°C</td></tr><tr><td>24</td><td>U9</td><td>33.8°C</td><td>81.6°C</td></tr><tr><td>25</td><td>TB1</td><td>33.0°C</td><td>79.2°C</td></tr></table>			NO	Position	ROOM AMBIENT Ta= 26.5 °C	HIGH AMBIENT Ta= 75.9 °C	1	ZRN1	34.4°C	81.1°C	2	C53	34.4°C	81.1°C	3	Q1	33.5°C	78.6°C	4	R106	36.6°C	83.4°C	5	RT1	37.2°C	83.8°C	6	L1	36.0°C	83.8°C	7	Q2	33.8°C	81.9°C	8	C8	32.1°C	79.3°C	9	C7	31.0°C	78.4°C	10	C9	34.5°C	81.4°C	11	U1	52.2°C	97.9°C	12	U2	40.8°C	87.0°C	13	U3	41.9°C	88.7°C	14	L2	34.2°C	81.1°C	15	D99	34.0°C	81.2°C	16	D98	33.2°C	81.1°C	17	Q3	31.9°C	80.7°C	18	Q4	32.2°C	80.8°C	19	U6	40.6°C	87.6°C	20	T1	31.3°C	80.8°C	21	D12	33.9°C	81.6°C	22	PCB	35.1°C	81.7°C	23	U5	42.0°C	88.5°C	24	U9	33.8°C	81.6°C	25	TB1	33.0°C	79.2°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE	I/P : 24 VDC O/P : 115.5 % 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) 86823HRS (2) 3160HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 513.46K hrs min. Telcordia TR/SR-332 (Bellcore) (25°C) ; 164.84K hrs min. MIL-HDBK-217F (25°C) 255.89K hrs min. Telcordia TR/SR-332 (Bellcore) (25°C) ; 107.97K 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

2018.4.30 GP-A50-F010