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

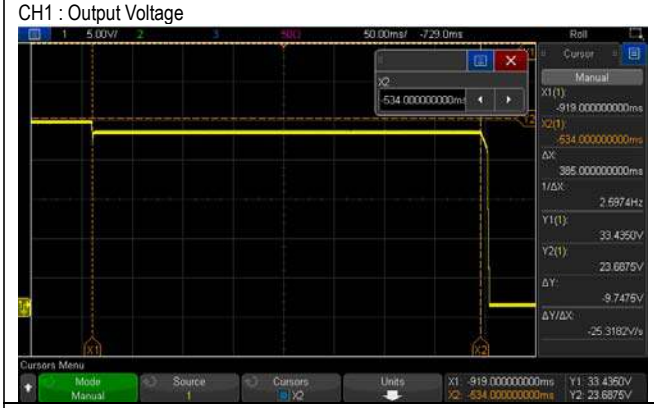
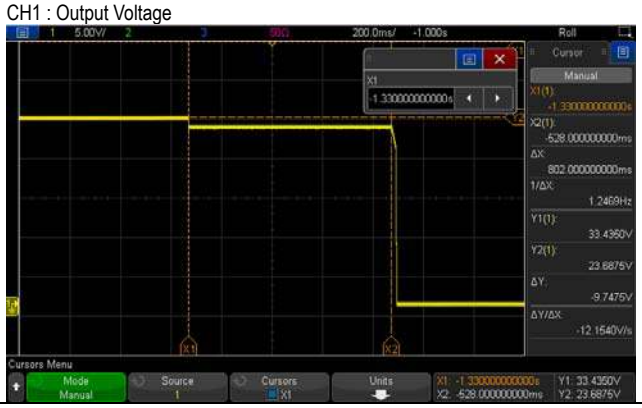
ENVIRONMENT TEST

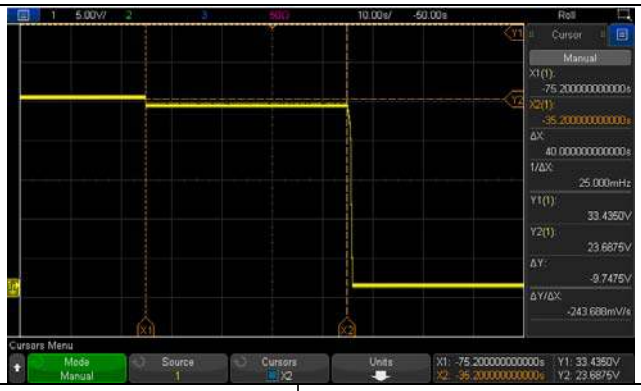
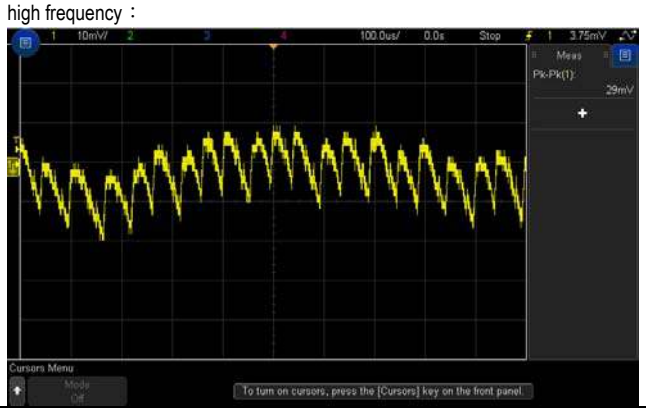
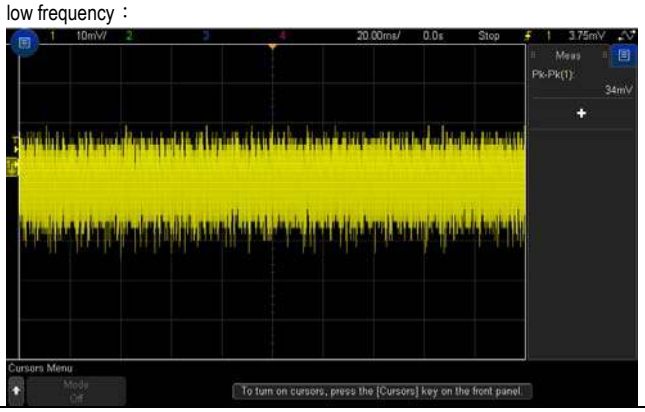
■ DESIGN VERIFY TEST

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℃	OK
2	CURRENT(CHARGING MODE)	900mA	I/P:24V O/P:FULL LOAD Ta:25℃	830mA
3	CURRENT CONSUMPTION (STANDBY MODE)	100mA	I/P:24V O/P:FULL LOAD Ta:25℃	79.39mA
4	CHARGING TIME	15s Typ. 25s Max.	I/P:24V O/P:FULL LOAD Ta:25℃	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℃	OK
2	DC OPERATING VOLTAGE RANGE	22~29Vdc	I/P:23~30Vdc O/P:FULL LOAD Ta:25℃	OK
3	OUTPUT CURRENT（max.）	20A	I/P: 23~30Vdc O/P:20A Ta:25℃	OK
4	BUFFER TIME	＞250ms/20A ＞500ms/10A ＞30s/0.1A	I/P: 24VDC O/P: 20A 10A 0.1A Ta:25℃	385ms/20A 802ms/10A 40s/0.1A
	INPUT=24VDC @ 20A CH1 : Output Voltage 		INPUT=24VDC @ 10A CH1 : Output Voltage 	
	INPUT=24VDC @ 0.1A CH1 : Output Voltage			

				
5	RIPPLE & NOISE (Max)	V1: 200 mVp-p Buffering mode	I/P: 24 VDC O/P:20A Ta:25℃	34mVp-p
	high frequency： 		low frequency： 	

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℃	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℃	32.4V PROTECTION TYPE： Shut down O/P voltage
3	SHORT PROTECTION	SHORT EVERY OUTPUT	I/P: 24 VDC O/P:TESTING Ta:25℃	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℃	TEST : OK
5	INPUT REVERSE	POWER OK	I/P: 24 VDC O/P:FULL Ta:25℃	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）	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℃	BUFFFER 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 SLOWIY(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℃	(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℃	(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℃	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℃	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℃	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℃	PASS Test by certified Lab
2	CONDUCTION	EN55032 CLASS B	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 Din rail Model : AIR：15KV / Contact：8KV	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	CRITERIA A
4	E.F.T	EN61000-4-4 INPUT: 2KV	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	CRITERIA A
5	SURGE	IEC61000-4-5 L-L :1KV L,L-PE:2KV	I/P: 24 VDC O/P:FULL LOAD Ta:25℃	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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：DBUF20-24
1. ROOM AMBIENT BURN-IN：2 HRS
I/P：24 VDC O/P： FULL LOAD Ta= 26.5 ℃
2. HIGH AMBIENT BURN-IN：2 HRS
I/P：24 VDC O/P： FULL LOAD Ta= 75.9 ℃</td></tr>
<tr><td colspan="5">
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 26.5 ℃</th><th>HIGH AMBIENT Ta= 75.9 ℃</th></tr>
<tr><td>1</td><td>ZRN1</td><td>34.4℃</td><td>81.1℃</td></tr>
<tr><td>2</td><td>C53</td><td>34.4℃</td><td>81.1℃</td></tr>
<tr><td>3</td><td>Q1</td><td>33.5℃</td><td>78.6℃</td></tr>
<tr><td>4</td><td>R106</td><td>36.6℃</td><td>83.4℃</td></tr>
<tr><td>5</td><td>RT1</td><td>37.2℃</td><td>83.8℃</td></tr>
<tr><td>6</td><td>L1</td><td>36.0℃</td><td>83.8℃</td></tr>
<tr><td>7</td><td>Q2</td><td>33.8℃</td><td>81.9℃</td></tr>
<tr><td>8</td><td>C8</td><td>32.1℃</td><td>79.3℃</td></tr>
<tr><td>9</td><td>C7</td><td>31.0℃</td><td>78.4℃</td></tr>
<tr><td>10</td><td>C9</td><td>34.5℃</td><td>81.4℃</td></tr>
<tr><td>11</td><td>U1</td><td>52.2℃</td><td>97.9℃</td></tr>
<tr><td>12</td><td>U2</td><td>40.8℃</td><td>87.0℃</td></tr>
<tr><td>13</td><td>U3</td><td>41.9℃</td><td>88.7℃</td></tr>
<tr><td>14</td><td>L2</td><td>34.2℃</td><td>81.1℃</td></tr>
<tr><td>15</td><td>D99</td><td>34.0℃</td><td>81.2℃</td></tr>
<tr><td>16</td><td>D98</td><td>33.2℃</td><td>81.1℃</td></tr>
<tr><td>17</td><td>Q3</td><td>31.9℃</td><td>80.7℃</td></tr>
<tr><td>18</td><td>Q4</td><td>32.2℃</td><td>80.8℃</td></tr>
<tr><td>19</td><td>U6</td><td>40.6℃</td><td>87.6℃</td></tr>
<tr><td>20</td><td>T1</td><td>31.3℃</td><td>80.8℃</td></tr>
<tr><td>21</td><td>D12</td><td>33.9℃</td><td>81.6℃</td></tr>
<tr><td>22</td><td>PCB</td><td>35.1℃</td><td>81.7℃</td></tr>
<tr><td>23</td><td>U5</td><td>42.0℃</td><td>88.5℃</td></tr>
<tr><td>24</td><td>U9</td><td>33.8℃</td><td>81.6℃</td></tr>
<tr><td>25</td><td>TB1</td><td>33.0℃</td><td>79.2℃</td></tr>
</table>
</td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE</td><td>I/P：24 VDC
O/P：115.5 % LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P：23 VDC / 30 VDC
O/P：100 % LOAD
Ta= -30 ℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 75 ℃ / 95 %R.H
NO DAMAGE</td><td>I/P：30 VDC
O/P：FULL LOAD
Ta= 75 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>±0.03%/℃(0~75℃)</td><td>I/P：24 VDC
O/P：FULL LOAD</td><td>±0.01%/℃(0~75℃)</td></tr>
</table>

6	STORAGE TEMPERATURE TEST	-25~80℃	1. Thermal shock Temperature： -30℃~ +85℃ 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	-25~75℃	1. Thermal shock Temperature： -30℃~ +80℃ 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: 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℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C5 IS THE MOST CRITICAL COMPONENT (1) I/P： 24VDC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 24VDC O/P：FULL LOAD Ta= 75 ℃ LIFE TIME	(1) 86823HRS (2) 3160HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 513.46K hrs min. Telcordia TR/SR-332 (Bellcore) (25℃) ; 164.84K hrs min. MIL-HDBK-217F (25℃) 255.89K hrs min. Telcordia TR/SR-332 (Bellcore) (25℃) ; 107.97K 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

2018.4.30 GP-A50-F010