Advanced Battery & Charger Solutions

UN TRANSPORTATION TEST REPORT

FOR

Fluke Electronics

PROJECT NAME

U80228

Totex Manufacturing, Inc. 2927 Lomita Blvd. Torrance, CA 90505
Phone (310) 326-2028 Fax (310) 326-2336
Website: http://www.totexusa.com Email: sales@totexusa.com

Advanced Battery & Charger Solutions

Certificate of Compliance

Certificate/Test Report Number: UNC U80228 Issue Date: 05/14/2009

The following product(s) have been evaluated and tested to comply with the Third Revised Edition of the United Nations Manual of Tests and Criteria, Section 38.3. Test report along with test specifications are given in the reference. Complete testing procedures for all tests are available upon request. The results obtained from this testing only relate to the actual products tested as described below.

Product Name:	U80228
Product Description:	Rechargeable Lithium Ion Battery
Cell Part Numbers:	Sanyo UR18650FM, Lithium-Ion Cell,2550mAh
Part Number:	3405566
Client Name:	Fluke Electronics
Client Address:	3550 Annapolis ,Lane North, Ste 70
Client City, State, Zip:	Plymouth, MN 55447
Testing Location:	Totex Manufacturing, Inc.
	2927 Lomita Blvd.
	Torrance, CA 90505

Test Conducted

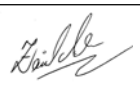
☐ Cells:

T1 - Altitude Simulation Test
T2 - Thermal Test
T3 - Vibration Test
T4 - Shock Test
T5 - External Short Circuit Test
T6 - Impact Test
T7 - Overcharge Test
T8 - Forced Discharge Test

☑ Batteries:

T1 - Altitude Simulation Test
T2 - Thermal Test
T3 - Vibration Test
T4 - Shock Test
T5 - External Short Circuit Test
T7 - Overcharge Test

Prepared by:

Signature:	
Date:	5/14/2009
Typed Name:	Zainal Abideen
Title:	Technican

Approved by:

Signature:	George Gao Digitally signed by George Gao DN: CN = George Gao, C = US, O = Totex, OU = Engineering Date: 2009.05.14 10:47:06 -07'00'
Date:	5/14/2009
Typed Name:	George Gao
Title:	Project Engineer

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UN Lithium Battery Transportation Testing Report

Report Number:	UNT U80228	Reviewed by:	George Gao
Product Number:	UNT U80228	Date:	05/14/09
Product Description:	Rechargeable Battery, Lithium-ion, 7.4 V, 2500mAh Sanyo UR18650FM Cell, 2500mAH , Lithium-Ion	Overall Results:	Passed
Submitter's Name:	Zainal Abideen		
Date Submitted:	05/14/09		

Comments

All the batteries comply with the United Nation test standards.

Mass of Battery/Cell	M_{min}
M < 1g	0.5%
1g < M < 5g	0.2%
M ≥ 5g	0.1%

M_{min} ==> 0.1%

Total Batteries Submitted **24**

Battery Identification

Advanced Battery & Charger Solutions

Battery Status	Test 1 to Test 5	Test 7
New Battery Fully Charged	4	4
New Battery Fully Discharged	4	N/A
50 Cycles Battery fully Charged	4	4
50 Cycles Battery Fully Discharged	4	N/A

Battery Status	Test 1 to Test 5	Test 7
New Battery Fully Charged	A1-A4	E1-E4
New Battery Fully Discharged	B1-B4	N/A
50 Cycles Battery fully Charged	C1-C4	F1-F4
50 Cycles Battery Fully Discharged	D1-D4	N/A

TEST 1 --- ALTITUDE SIMULATION TEST ---

(11.6 Kpa, 6 hours, 20 ± 5 ºC)

	Mass (g)		Mass Loss (%)	Pass If	Voltage (V)		Vmin	Pass If	Initial Condition	Final Condition
	Before Test	After Test	$100*(M_1 - M_2)/M_1$	$ML < M_{min}$	Before Test	After Test	(90% V_1)	$V_2 > V_{min}$	Note presence of leakage, venting, rupture, or fire.	Note changes from the initial condition and any leakage, venting, rupture, or fire.
	M_1	M_2	ML		V_1	V_2				
A1	121.98	121.98	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A2	121.72	121.72	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A3	122.28	122.28	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A4	121.94	121.94	0.00	Pass	8.30	8.30	7.47	Pass	None	None
B1	121.77	121.77	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B2	122.24	122.24	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B3	121.56	121.56	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B4	122.34	122.34	0.00	Pass	N/A	N/A	N/A	N/A	None	None
C1	121.77	121.77	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C2	121.93	121.93	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C3	121.56	121.56	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C4	121.45	121.45	0.00	Pass	8.20	8.20	7.38	Pass	None	None
D1	122.36	122.36	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D2	122.12	122.12	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D3	122.50	122.50	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D4	121.85	121.85	0.00	Pass	N/A	N/A	N/A	N/A	None	None

Equipment Listing

EQP #	Description	Serial #	CAL Date	CAL Due
1	Piab H40 Vacuum Pump	H40B6-EN	Mar-09	Mar-10
2	Air Supply	B07-202-A1KA	N/A	N/A
3	Pelican 1550 case	N/A	N/A	N/A
4	Fluke 115 True RMS Multimeter	98270622	Mar-09	Mar-10
5	Precisa XT2220M-DR (Scale)	2442-258	Apr-09	Apr-10

Comments

The mass losses were all less than 0.1%. For batteries that were charged, the open circuit voltages after the test were all greater than 90% of the pre-test. There was no leakage, venting, rupture, or fire outside of the specified tolerances.

Technician	Zainal	Technician	Zainal
Session 1	A1-A4 & B1-B4	Session 2	C1-C4 & D1-D4
Date Start	4/27/2009	Date Start	4/27/2009
Date Finish	4/27/2009	Date Finish	4/27/2009

TEST 2 --- THERMAL TEST ---

(75 ± 2 ºC 6-hrs, transitions 30-min max, -40 ± 2 ºC 6-hrs, repeat 10X, store 24-hrs before evaluation)

	Mass (g)		Mass Loss (%)	Pass If	Voltage (V)		Vmin	Pass If	Initial Condition	Final Condition
	Before Test	After Test	$100*(M_1 - M_2)/M_1$	$ML < M_{min}$	Before Test	After Test	(90% V_1)	$V_2 > V_{min}$	Note presence of leakage, venting, rupture, or fire.	Note changes from the initial condition and any leakage, venting, rupture, or fire.
	M_1	M_2	ML		V_1	V_2				
A1	121.98	121.89	0.07	Pass	8.30	8.16	7.47	Pass	None	None
A2	121.72	121.65	0.06	Pass	8.30	8.16	7.47	Pass	None	None
A3	122.28	122.21	0.06	Pass	8.30	8.16	7.47	Pass	None	None
A4	121.94	121.87	0.06	Pass	8.30	8.16	7.47	Pass	None	None
B1	121.77	121.71	0.05	Pass	N/A	N/A	N/A	N/A	None	None
B2	122.24	122.19	0.04	Pass	N/A	N/A	N/A	N/A	None	None
B3	121.56	121.50	0.05	Pass	N/A	N/A	N/A	N/A	None	None
B4	122.34	122.28	0.05	Pass	N/A	N/A	N/A	N/A	None	None
C1	121.77	121.68	0.07	Pass	8.20	8.10	7.38	Pass	None	None
C2	121.93	121.85	0.07	Pass	8.20	8.10	7.38	Pass	None	None
C3	121.56	121.50	0.05	Pass	8.20	8.10	7.38	Pass	None	None
C4	121.45	121.38	0.06	Pass	8.20	8.10	7.38	Pass	None	None
D1	122.36	122.30	0.05	Pass	N/A	N/A	N/A	N/A	None	None
D2	122.12	122.08	0.03	Pass	N/A	N/A	N/A	N/A	None	None
D3	122.50	122.42	0.07	Pass	N/A	N/A	N/A	N/A	None	None
D4	121.85	121.81	0.03	Pass	N/A	N/A	N/A	N/A	None	None

Equipment Listing

EQP #	Description	Serial #	CAL Date	CAL Due
1	Precisa XT2220M-DR (Scale)	2442-258	Apr-09	Apr-10
2	Fluke 115 True RMS Multimeter	98270622	Mar-09	Mar-10
3	Tenney Environmental Chamber Model TUJR	28967-03	Jan-09	Jan-10
4	Watlow Process Controller, Model F-4	1324	Aug-08	Aug-09

Comments

The mass losses were all less than 0.1%. For batteries that were charged, the open circuit voltages after the test were all greater than 90% of the pre-test. There was no leakage, venting, rupture, or fire outside of the specified tolerances.

Technician	Zainal	Technician	Zainal
Session 1	A1-A4 & B1-B4	Session 2	C1-C4 & D1-D4
Date Start	5/7/2009	Date Start	5/7/2009
Date Finish	5/13/2009	Date Finish	5/13/2009

TEST 3 ---VIBRATION TEST --- (Logarithmic Sine Sweep, 7-200-7 Hz in 15 min; Control at 1G (7-18 Hz), 0.8mm (18-50 Hz), 8G (50-200 Hz). Repeat 12 cycles for a total of 3 hrs for each of 3 planes.)

	Mass (g)		Mass Loss (%)	Pass If	Voltage (V)		Vmin	Pass If	Initial Condition	Final Condition
	Before Test	After Test	$100*(M_1 - M_2)/M_1$	$ML < M_{min}$	Before Test	After Test	(90% V_1)	$V_2 > V_{min}$	Note presence of leakage, venting, rupture, or fire.	Note changes from the initial condition and any leakage, venting, rupture, or fire.
	M_1	M_2	ML		V_1	V_2				
A1	121.98	121.98	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A2	121.72	121.72	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A3	122.28	122.28	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A4	121.94	121.94	0.00	Pass	8.30	8.30	7.47	Pass	None	None
B1	121.77	121.77	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B2	122.24	122.24	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B3	121.56	121.56	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B4	122.34	122.34	0.00	Pass	N/A	N/A	N/A	N/A	None	None
C1	121.77	121.77	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C2	121.93	121.93	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C3	121.56	121.56	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C4	121.45	121.45	0.00	Pass	8.20	8.20	7.38	Pass	None	None
D1	122.36	122.36	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D2	122.12	122.12	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D3	122.50	122.50	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D4	121.85	121.85	0.00	Pass	N/A	N/A	N/A	N/A	None	None

Equipment Listing

EQP #	Description	Serial #	CAL Date	CAL Due
1	Fluke 115 True RMS Multimeter	98270622	Mar-09	Mar-10
2	Precisa XT2220M-DR (Scale)	2442-258	Apr-09	Apr-10
3	Unholtz-Dickie Shaker, Model TA250-S062	214	N/A	N/A
4	Power Amplifier, Model TA250A	1017	N/A	N/A
5	10.5mV/G Dytran Accelerometer, Model 3030B4	11588	May-08	May-09
6	Current Source, Model 4102C	2985	Jun-08	Jun-09

Comments

The mass losses were all less than 0.1%. For batteries that were charged, the open circuit voltages after the test were all greater than 90% of the pre-test. There was no leakage, venting, rupture, or fire outside of the specified tolerances.

Technician	Zainal	Technician	Zainal
Session 1	A1-A4 & B1-B4	Session 2	C1-C4 & D1-D4
Date Start	4/24/2009	Date Start	4/24/2009
Date Finish	4/29/2009	Date Finish	4/29/2009

TEST 4 --- SHOCK TEST ---

(Small Batteries: Half-Sine, 150g, 6ms, 3 shocks in 6 mutually perpendicular axis for a total of 18 shocks.)
(Large Batteries: Half-Sine, 50g, 11ms, 3 shocks in 6 mutually perpendicular axis for a total of 18 shocks.)

	Mass (g)		Mass Loss (%)	Pass If	Voltage (V)		Vmin	Pass If	Initial Condition	Final Condition
	Before Test	After Test	$100*(M_1 - M_2)/M_1$	$ML < M_{min}$	Before Test	After Test	(90% V_1)	$V_2 > V_{min}$	Note presence of leakage, venting, rupture, or fire.	Note changes from the initial condition and any leakage, venting, rupture, or fire.
	M_1	M_2	ML		V_1	V_2				
A1	121.98	121.98	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A2	121.72	121.72	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A3	122.28	122.28	0.00	Pass	8.30	8.30	7.47	Pass	None	None
A4	121.94	121.94	0.00	Pass	8.30	8.30	7.47	Pass	None	None
B1	121.77	121.77	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B2	122.24	122.24	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B3	121.56	121.56	0.00	Pass	N/A	N/A	N/A	N/A	None	None
B4	122.34	122.34	0.00	Pass	N/A	N/A	N/A	N/A	None	None
C1	121.77	121.77	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C2	121.93	121.93	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C3	121.56	121.56	0.00	Pass	8.20	8.20	7.38	Pass	None	None
C4	121.45	121.45	0.00	Pass	8.20	8.20	7.38	Pass	None	None
D1	122.36	122.36	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D2	122.12	122.12	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D3	122.50	122.50	0.00	Pass	N/A	N/A	N/A	N/A	None	None
D4	121.85	121.85	0.00	Pass	N/A	N/A	N/A	N/A	None	None

Equipment Listing

EQP #	Description	Serial #	CAL Date	CAL Due
1	LAB/MTI, Model SD-10-114-30	5520130	N/A	N/A
2	Fluke 115 True RMS Multimeter	98270622	Mar-09	Mar-10
3	Precisa XT2220M-DR (Scale)	2442-258	Apr-09	Apr-10
4	10.5mV/G Dytran Accelerometer, Model 3030B4	11588	Jun-08	Jun-09
5	Current Source, Model 4102C	2985	Jul-08	Jul-09
6	Lecroy 9310AL Dual 400Mhz Oscilloscope	93105906	N/A	N/A

Comments

The mass losses were all less than 0.1%. For batteries that were charged, the open circuit voltages after the test were all greater than 90% of the pre-test. There was no leakage, venting, rupture, or fire outside of the specified tolerances.

Technician	Zainal	Technician	Zainal
Session 1	A1-A4 & B1-B4	Session 2	C1-C4 & D1-D4
Date Start	4/30/2009	Date Start	4/30/2009
Date Finish	5/5/2009	Date Finish	5/5/2009

TEST 5 ---EXTERNAL SHORT CIRCUIT TEST --- (Thermally stabilized to external case temp of 55 ± 2 ºC; 0.1 ohm short applied and held for at least 1-hr after external case temp returns to 55 ± 2 ºC; observed for additional 6-hrs.)

	Pass if the case temperature remained below 170 º C within 6 hrs of the test.	**Pass if no disassembly, rupture, or fire within 6 hrs of the test.**
A1	Pass	Pass
A2	Pass	Pass
A3	Pass	Pass
A4	Pass	Pass
B1	Pass	Pass
B2	Pass	Pass
B3	Pass	Pass
B4	Pass	Pass
C1	Pass	Pass
C2	Pass	Pass
C3	Pass	Pass
C4	Pass	Pass
D1	Pass	Pass
D2	Pass	Pass
D3	Pass	Pass
D4	Pass	Pass

Equipment Listing

EQP #	Description	Serial #	CAL Date	CAL Due
1	Tenney Environmental Chamber Model TUJR	8967	Jan-09	Jan-10
2	0.1Ω Short Circuit Fixture	FX0647	N/A	N/A
3	Fluke 115 True RMS Multimeter	98270622	Mar-09	Mar-10
4	Omega Thermometer, Model HH309	70701514	Jul-08	Jul-09

Comments

The temperature of all the batteries remained below 170 º C at all times. There was no disassembly, rupture, or fire outside of the specified tolerances within the 6-hour observation period.

Technician	Zainal	Technician	Zainal
Session 1	A1-A4 & B1-B4	Session 2	C1-C4 & D1-D4
Date Start	5/5/2009	Date Start	5/5/2009
Date Finish	5/6/2009	Date Finish	5/6/2009

TEST 7 ---OVERCHARGE TEST ---

The charge current (0.7 X Battery capacity) shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

(b) When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

Requirement: Rechargeable batteries meet this requirement if there is no disassembly and no fire within seven days of the test.

	Pass if no disassembly, rupture, or fire within 7 days of the test.
E1	Pass
E2	Pass
E3	Pass
E4	Pass

F1	Pass
F2	Pass
F3	Pass
F4	Pass

Comments

The batteries were charged at 16.8V at 3.57A for 24 hours. There was no disassembly, rupture, or fire outside of the specified tolerances within the 7 days.

Equipment Listing

EQP #	Description	Serial #	Calibration Date	CAL Due
1	GW INSTEK PSH Series Programmable Power Supply	PSH-3630A	N/A	N/A
2	Wavetek Voltmeter	103865	Mar-09	Mar-10

Technician	Zainal
Session 1	E1-E4
Date Start	4/21/2009
Date Finish	4/28/2009

Technician	Zainal
Session 2	F1-F4
Date Start	4/21/2009
Date Finish	4/28/2009