

## Reliability Test Report

Products type	Wireless Module	HW status	01
Panasonic number	ENW89832A6KF	SW status	3.3.0.0-D2
Customer Part No.	BlueRadios BR-LE4.0-D2A		

### Test Overview

Test No.	Name of the test	Result
	Initial Performance tests before Reliability Tests	OK
1.	MSL MSL3 Moisture sensitivity Test	OK
2.	TC Temperature Cycling Test @ -50/+125°C; 500 cycles	OK
3.	LTST Low Temperature Storage Life Test @ -40°C / 1000 h	OK
4.	HTSL High Temperature Storage Life Test / HTSL @ +125°C / 1000 h	OK
5.	THB Temperature Humidity Bias Test @ +85°C / 85%rH / 1000 h, monitored	OK
6.	VT Vibration Test @10-55-10 Hz / 1min., 2h each direction	OK
7.	DT Shock Drop Test from a height of 1m, 10 times - each side	OK
8.	HTOL High Temperature Operating Life Test @ -85°C Vcc = max. / 1000 h	OK
9.	ESD ESD Test HMB JESD-22a-114D (C=150 pF; R=330 Ω)	OK
	Final Performance tests after Reliability Tests	OK

### Test Result

**All tests PASSED**

### Conclusion

**The reliability tests were made on the BlueRadios module  
- ENW89832A6KF, BR-LE4.0-D2A, Dual Mode -  
and no problems were recognised.**

Issue Date 06.09.2013

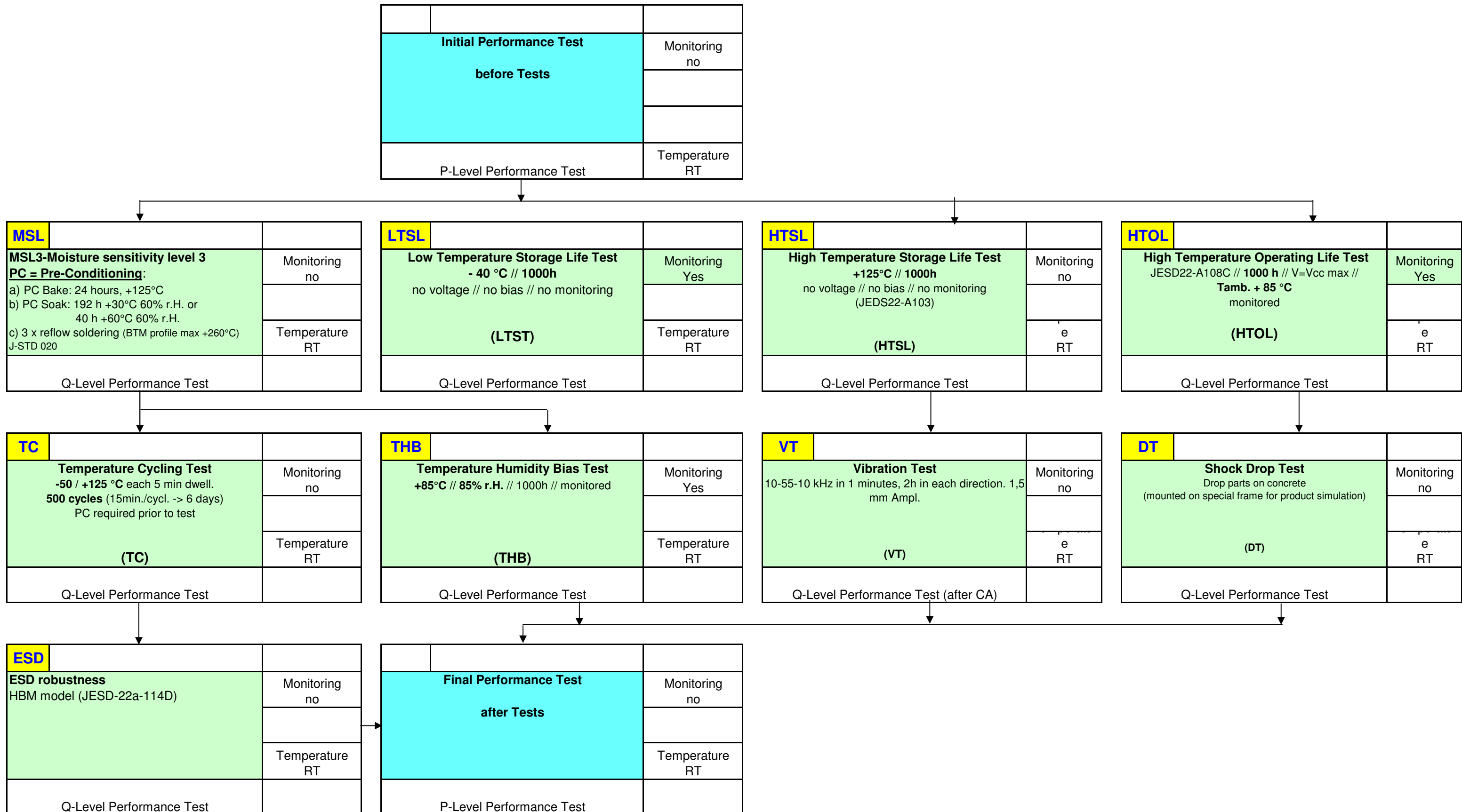
Approval: X  
 Conditional Approval: -  
 Failed: -

# Panasonic

Panasonic Industrial Devices Europe GmbH  
 Design Evaluation Group (DEG)  
 Zeppelinstr. 19  
 21337 Lüneburg Tel.: +49(0)4131-899-154  
 Germany

Prepared	Approved
02.09.2013	06.09.2013
 V. Bay	 O. Jahnke

# Reliability Test flow plan for BlueRadios BR-LE4.0-D2A Wireless Module



**Panasonic**Panasonic Industrial  
Devices Europe GmbH**list of modules in the tests**  
**BR-LE4.04-D2A**

Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013

**MSL3 and**  
**TC - Temperature cycling @ +125°C / -50°C**

Serial Number	Barcode:
ECFE7E110226	ECFE7E110226
ECFE7E10FC98	ECFE7E10FC98
ECFE7E10FB0F	ECFE7E10FB0F
ECFE7E1101B5	ECFE7E1101B5
ECFE7E110522	ECFE7E10F98B
ECFE7E10F98B	ECFE7E11022B
ECFE7E10FA0D	ECFE7E10FA0D
ECFE7E10F9FB	ECFE7E10F9FB
ECFE7E11026D	ECFE7E11026D
ECFE7E10F9F7	ECFE7E10F9F7

**THB - Temperature Humidity Bias Test**  
**@+85°C / 85%rH**

Serial Number	Barcode:
ECFE7E10FA12	ECFE7E10FA12
ECFE7E10FAD9	ECFE7E10FAD9
ECFE7E10FAFD	ECFE7E10FAFD
ECFE7E10FC01	ECFE7E10FC01
ECFE7E10FC19	ECFE7E10FC19
ECFE7E110161	ECFE7E110161
ECFE7E1101BD	ECFE7E1101BD
ECFE7E1103B3	ECFE7E1103B3
ECFE7E1103CF	ECFE7E1103CF
ECFE7E110522	ECFE7E110522

**HTSL - High temperature storage and**  
**DT - Drop Test**

Serial Number	Barcode:
ECFE7E10FAA1	ECFE7E10FAA1
ECFE7E10FABC	ECFE7E10FABC
ECFE7E10FB25	ECFE7E10FB25
ECFE7E10FC24	ECFE7E10FC24
ECFE7E11016F	ECFE7E11016F
ECFE7E1101E5	ECFE7E1101E5
ECFE7E110261	ECFE7E110261
ECFE7E11027C	ECFE7E11027C
ECFE7E1102DE	ECFE7E1102DE
ECFE7E11042D	ECFE7E11042D

**HTOL - High temperature Load Life and**  
**VT - Vibration Test Test:**

Serial Number	Barcode:
ECFE7E10FADE	ECFE7E10FADE
ECFE7E10FAE1	ECFE7E10FAE1
ECFE7E10FAEF	ECFE7E10FAEF
ECFE7E10FAF1	ECFE7E10FAF1
ECFE7E10FBBD	ECFE7E10FBBD
ECFE7E10FC14	ECFE7E10FC14
ECFE7E10FC92	ECFE7E10FC92
ECFE7E10FF68	ECFE7E10FF68
ECFE7E110240	ECFE7E110240
ECFE7E1102C1	ECFE7E1102C1

**Low Temperature Storage Life Test**  
**@ -40°C // 1000h**

Serial Number	Barcode:
ECFE7E10FA3E	ECFE7E10FA3E
ECFE7E10FA56	ECFE7E10FA56
ECFE7E10FAD8	ECFE7E10FAD8
ECFE7E10FAE9	ECFE7E10FAE9
ECFE7E10FB14	ECFE7E10FB14
ECFE7E10FBE6	ECFE7E10FBE6
ECFE7E11006A	ECFE7E11006A
ECFE7E1101A5	ECFE7E1101A5
ECFE7E110201	ECFE7E110201
ECFE7E1103C1	ECFE7E1103C1

**ESD HMB Test**

Serial Number	Barcode:	
ECFE7E10FA3E	ECFE7E10FA3E	Positive
ECFE7E10FA56	ECFE7E10FA56	
ECFE7E10FAD8	ECFE7E10FAD8	
ECFE7E10FAE9	ECFE7E10FAE9	Negative
ECFE7E10FB14	ECFE7E10FB14	
ECFE7E10FBE6	ECFE7E10FBE6	
ECFE7E11006A	ECFE7E11006A	
ECFE7E1101A5	ECFE7E1101A5	
ECFE7E110201	ECFE7E110201	
ECFE7E1103C1	ECFE7E1103C1	

Department  
**DEG**Prepared  
V. BayApproved  
O. Jahnke

Judgement

Date  
06.09.2013



Panasonic Industrial  
Devices Europe GmbH

**MSL3 and Temperature Cycling Test**  
@ +125°C / -50°C  
**500cycles (15min. / cycl.)**  
**BR-LE4.0-D2A**

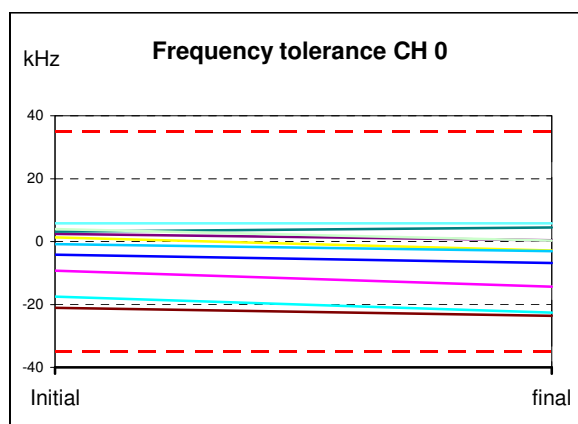
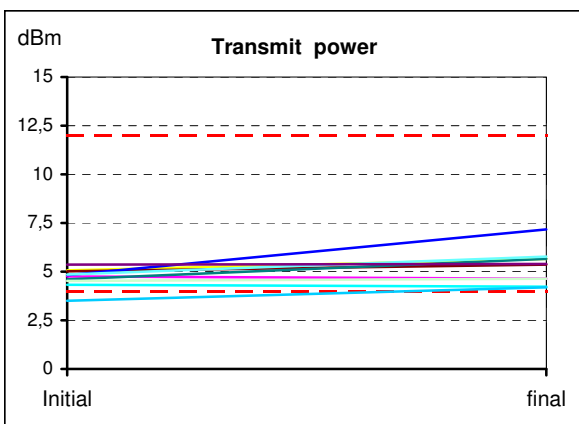
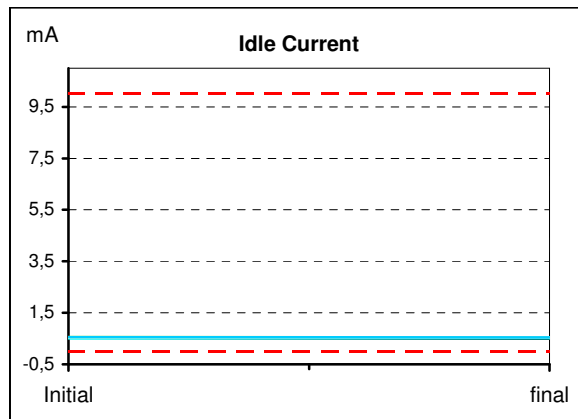
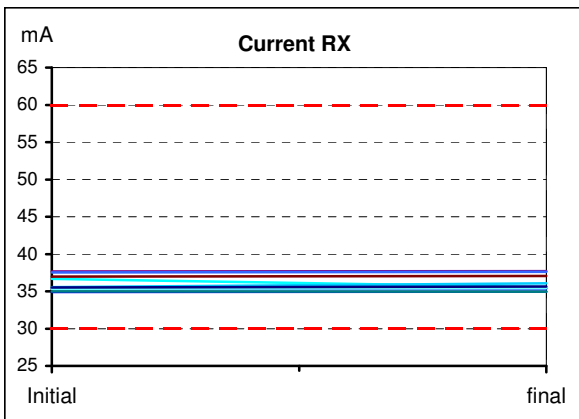
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013



**Result: OK, Passed**

**All parameters in spec. after reliability tests.**

**All Deviations are less than the specified max allowed deviations.**

Panasonic Industrial  
Devices Europe GmbH

### Low Temperature Storage Life Test @ -40°C // 1000h

BR-LE4.0-D2A

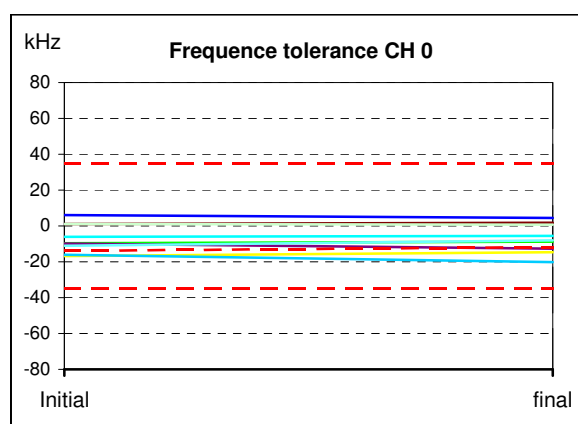
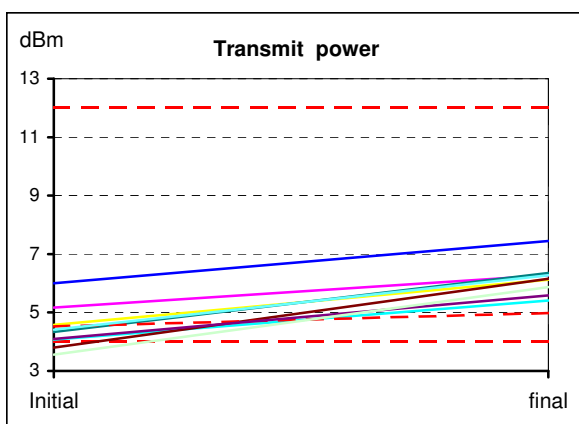
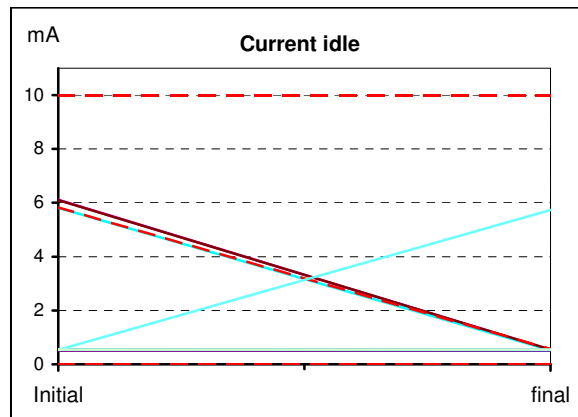
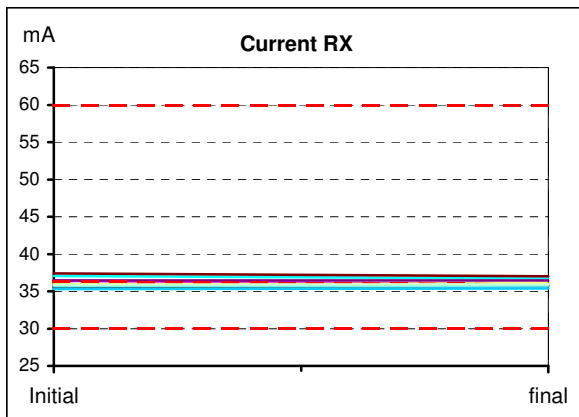
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013



**Result:** OK, Passed

All parameters in spec. after reliability tests.

All Deviations are less than the specified max allowed deviations.

**Remark:**

Idle mode currents are usually below 1 mA, but sometimes were measured 6 mA.  
This 6 mA are still in spec. of max. 10 mA.

Panasonic Industrial  
Devices Europe GmbH

**HTSL @+125°C// 1000h  
and Shock Drop Test from height 1m**

**BR-LE4.0-D2A**

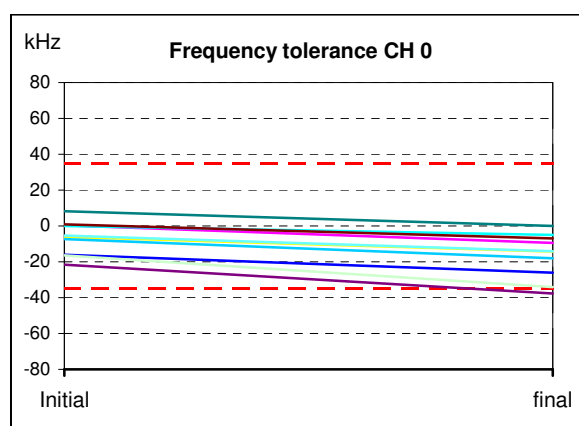
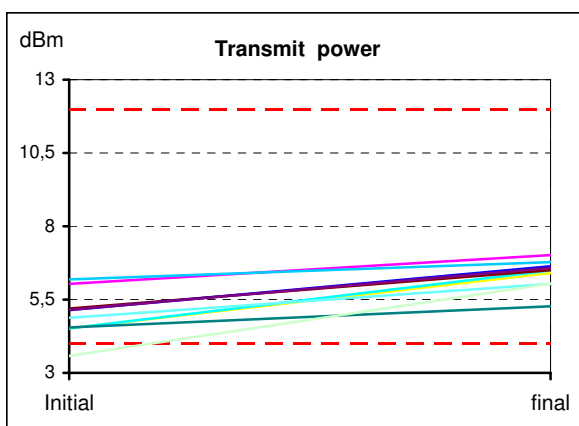
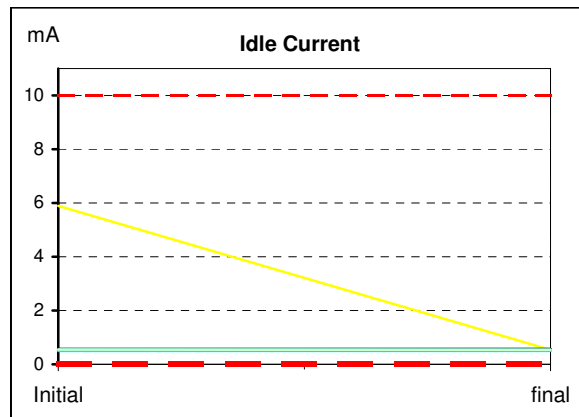
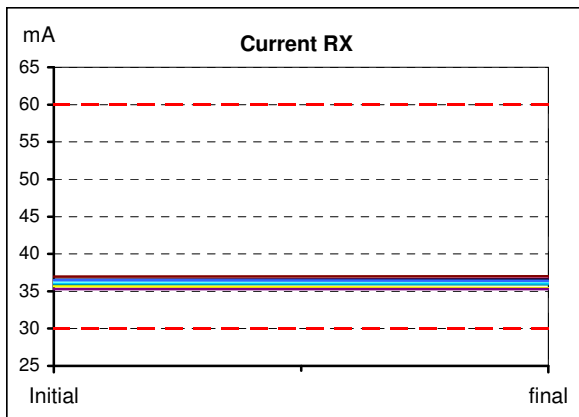
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013





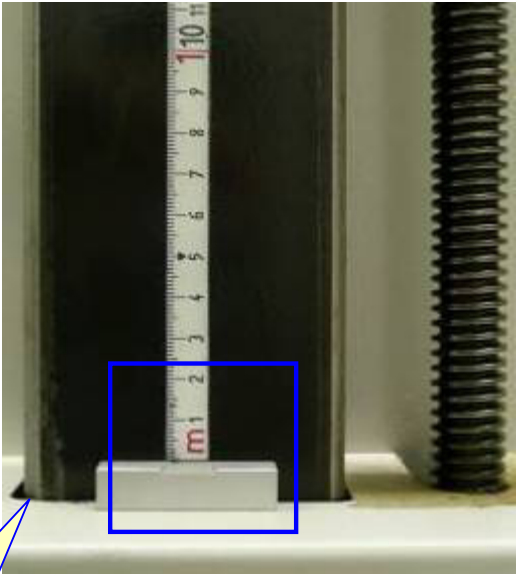
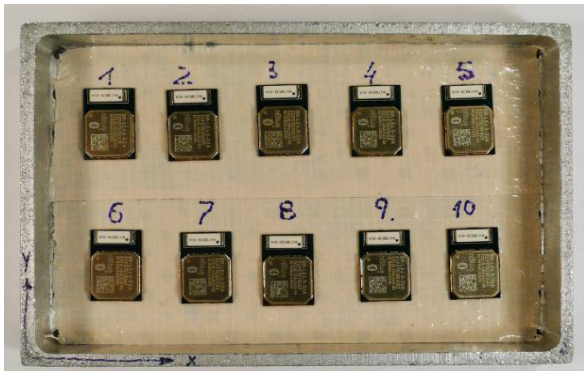
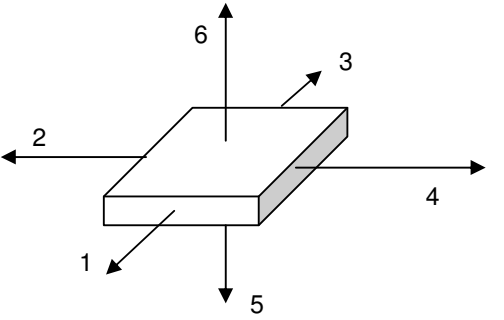
**Result: OK, Passed**

**All parameters in spec. after reliability tests.**

**All Deviations are less than the specified max allowed deviations.**

**Remark:**

Idle mode currents are usually below 1 mA, but sometimes were measured 6 mA.  
This 6 mA are still in spec. of max. 10 mA.

 Panasonic Industrial Devices Europe GmbH	<b>1m height Drop test</b>  <b>BR-LE4.0-D2A</b>	Prepared: V. Bay Approved: O. Jahnke 06.09.2013		
<p><b>Test:</b>          Drop test with 10 pcs of module BR-LE4.0-D2A ( no. 1 - 10 ) from production in Slovakia on a mounting block of app. 110 grams for test of soldering concept</p> <p><b>Test Conditions:</b></p> <ul style="list-style-type: none"> <li>- Drop parts on concrete ( mounted on special frame for product simulation )</li> <li>- Height of <b>100 cm</b></li> <li>- Quantity of drops:             <ul style="list-style-type: none"> <li>a) specified: 3 times one drop in each of the 6 directions (Total 3x6=18 drops)</li> <li>b) extended target: 10 times one drop in each of the 6 directions (Total 10x6= 60 drops)</li> </ul> </li> <li>- DUT modules are fixed at a special mounting block with a weight of app. 110 grams - see below</li> </ul> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div data-bbox="240 719 544 1178" style="text-align: center;"> <p>Drop machine</p>  </div> <div data-bbox="791 719 1310 1290" style="text-align: center;">  </div> </div> <div style="text-align: center; margin: 10px 0;"> <p>Height of 1,00 m</p> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div data-bbox="288 1429 874 1798" style="text-align: center;">  </div> <div data-bbox="911 1429 1417 1776" style="text-align: center;"> <p>Fall direction</p>  </div> </div> <p><b>modules are fixed on a mounting block</b>          The weight of this mounting block simulates the weight of the final application equipment at end-customer of 150 - 200g</p>				
Department <b>DEG</b>	Checked <b>V. Bay</b>	Approved <b>O. Jahnke</b>	Judgement	Date 06.09.2013



Panasonic Industrial  
Devices Europe GmbH

## 1m height Drop test

### BR-LE4.0-D2A

Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013

#### a) Test Result after 3 times 6 drops (18 drops)

Module No.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	
Fall cycle	1										2										
Fall-direction	1	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	4	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	5	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	6	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Module No.	1	2	3	4	5	6	7	8	9	10
Falling cycle	3									
Fall-direction	1	OK	OK	OK	OK	OK	OK	OK	OK	OK
	2	OK	OK	OK	OK	OK	OK	OK	OK	OK
	3	OK	OK	OK	OK	OK	OK	OK	OK	OK
	4	OK	OK	OK	OK	OK	OK	OK	OK	OK
	5	OK	OK	OK	OK	OK	OK	OK	OK	OK
	6	OK	OK	OK	OK	OK	OK	OK	OK	OK

#### Remark:

These 3 times fall cycles (yellow marked) are the minimum requirements what the 10 DUTs have to survive without any damages.

#### 1 fall cycle:

each one fall/drop in the 6 directions = 6 falls/drops

#### b) Test Result after in total 10 times 6 drops (60 drops) - extended tests

Module No.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	
Falling cycle	4										5										
Fall-direction	1	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	4	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	5	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	6	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Module No.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	
Falling cycle	6										7										
Fall-direction	1	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	4	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	5	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	6	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Module No.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	
Falling cycle	8										9										
Fall-direction	1	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	4	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	5	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	6	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Module No.	1	2	3	4	5	6	7	8	9	10
Falling cycle	10									
Fall-direction	1	OK	OK	OK	OK	OK	OK	OK	OK	OK
	2	OK	OK	OK	OK	OK	OK	OK	OK	OK
	3	OK	OK	OK	OK	OK	OK	OK	OK	OK
	4	OK	OK	OK	OK	OK	OK	OK	OK	OK
	5	OK	OK	OK	OK	OK	OK	OK	OK	OK
	6	OK	OK	OK	OK	OK	OK	OK	OK	OK

#### CONCLUSION:

**PASSED, no problems**

Visually were no damages observed and electrical function was OK after in total 60 drops.

Department  
**DEG**

Checked  
**V. Bay**

Approved  
**O. Jahnke**

Judgement

**OK**

Date  
06.09.2013





Panasonic Industrial  
Devices Europe GmbH

### MSL3 and Temperature Humidity

#### Bias Test

@ +85°C // 85%rH

BR-LE4.0-D2A

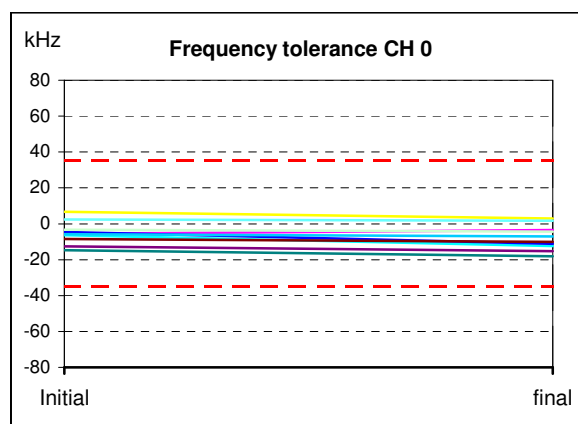
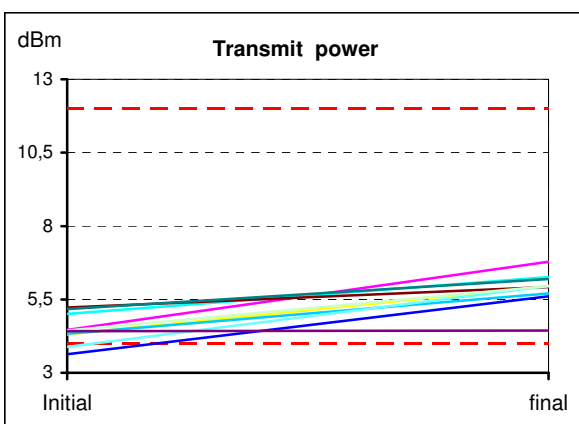
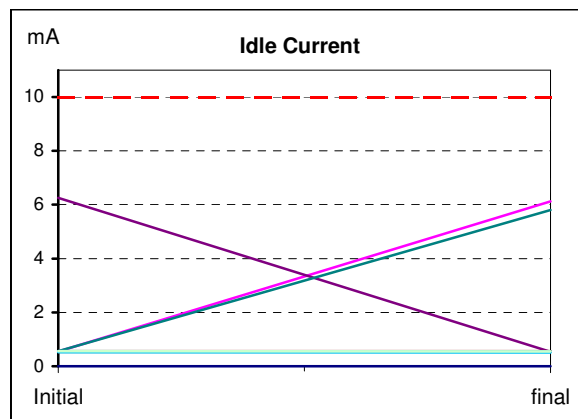
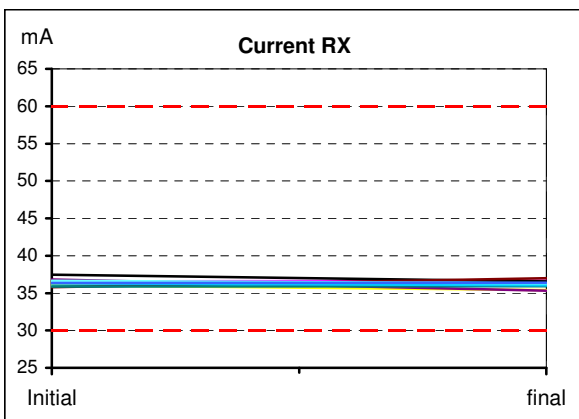
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013



**Result: OK, Passed**

**All parameters in spec. after reliability tests.**

**All Deviations are less than the specified max allowed deviations.**

**Remark:**

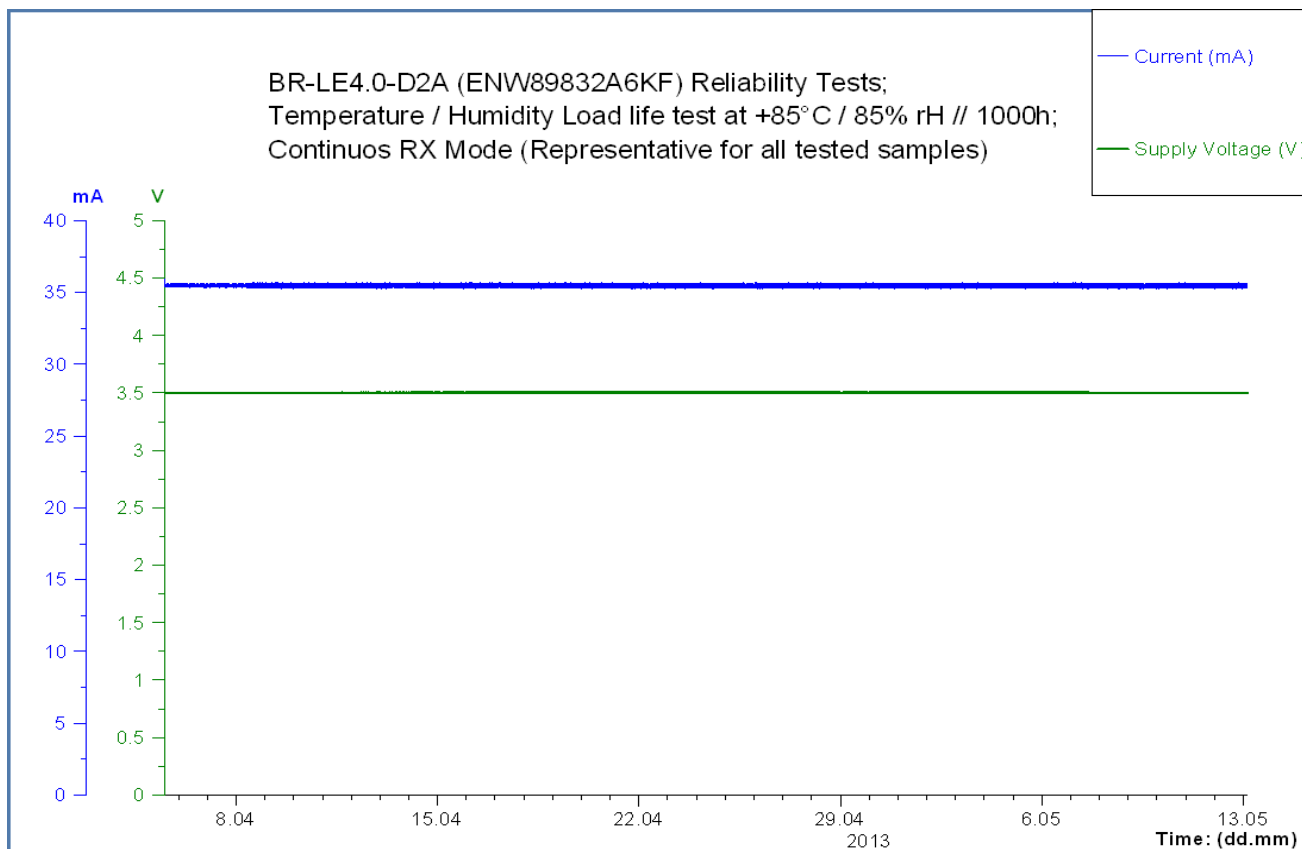
Idle mode currents are usually below 1 mA, but sometimes were measured 6 mA.  
This 6 mA are still in spec. of max. 10 mA.



Panasonic Industrial  
Devices Europe GmbH

**Temperature Humidity Bias Test**  
**@+85°C/ 85%rH //1000h // V=Vcc max**  
**MONITORING RESULTS**  
**BR-LE4.0-D2A**

Prepared: V. Bay  
 Approved: O. Jahnke  
 06.09.2013



These graphs is representative for all DUTs

**Conclusion:** DUTs passed this test without any performance loss.  
 There are no voltage- and current interruptions, drop outs or problems visible while the test.  
 Parameter Deviations after these tests are less than the specified max allowed deviations

**Judgement:** OK

Department <b>DEG</b>	Checked <b>V. Bay</b>	Approved <b>O. Jahnke</b>	Judgement	Date 06.09.2013
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Panasonic Industrial  
Devices Europe GmbH

HTOL @+85°C//1000h // V=Vcc max  
and Vibration Test

BR-LE4.0-D2A

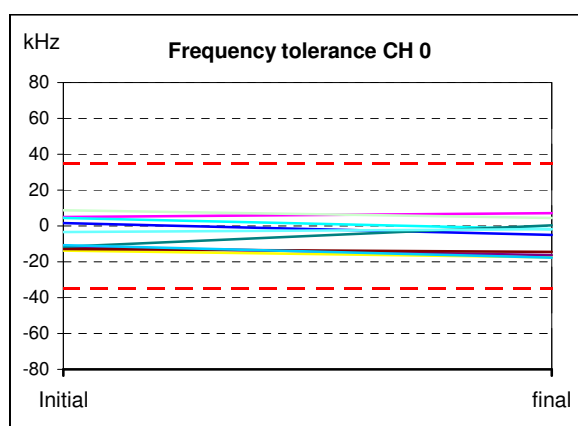
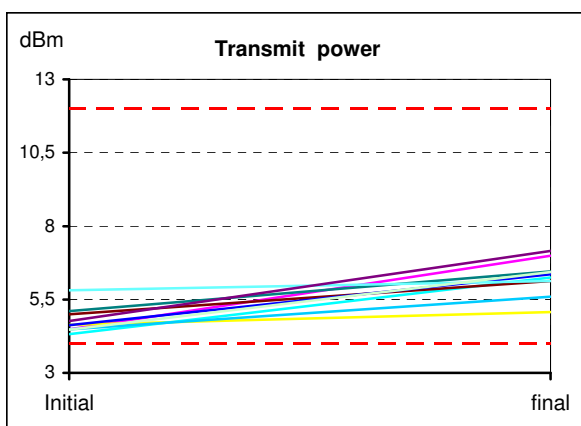
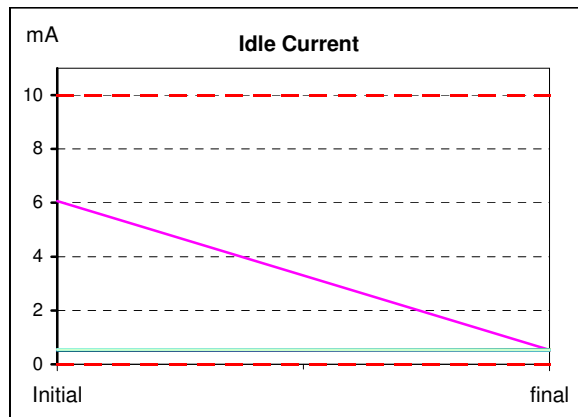
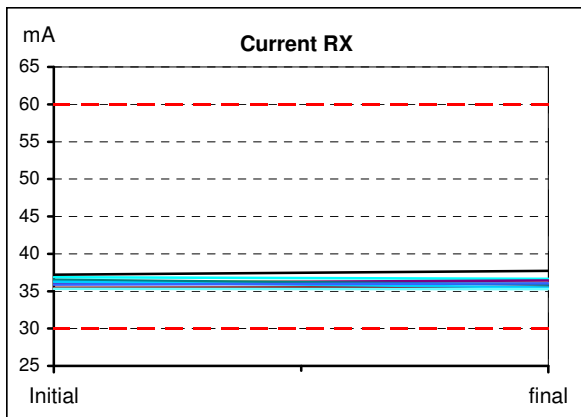
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013



**Result:** OK, Passed

All parameters in spec. after reliability tests.

All Deviations are less than the specified max allowed deviations.

**Remark:**

Idle mode currents are usually below 1 mA, but sometimes were measured 6 mA.  
This 6 mA are still in spec. of max. 10 mA.

# Panasonic

Panasonic Industrial  
Devices Europe GmbH

**High Temperature Operation Life Test**  
**MONITORING RESULTS**  
**@+85°C//1000h // V=Vcc max**  
**BR-LE4.0-D2A**

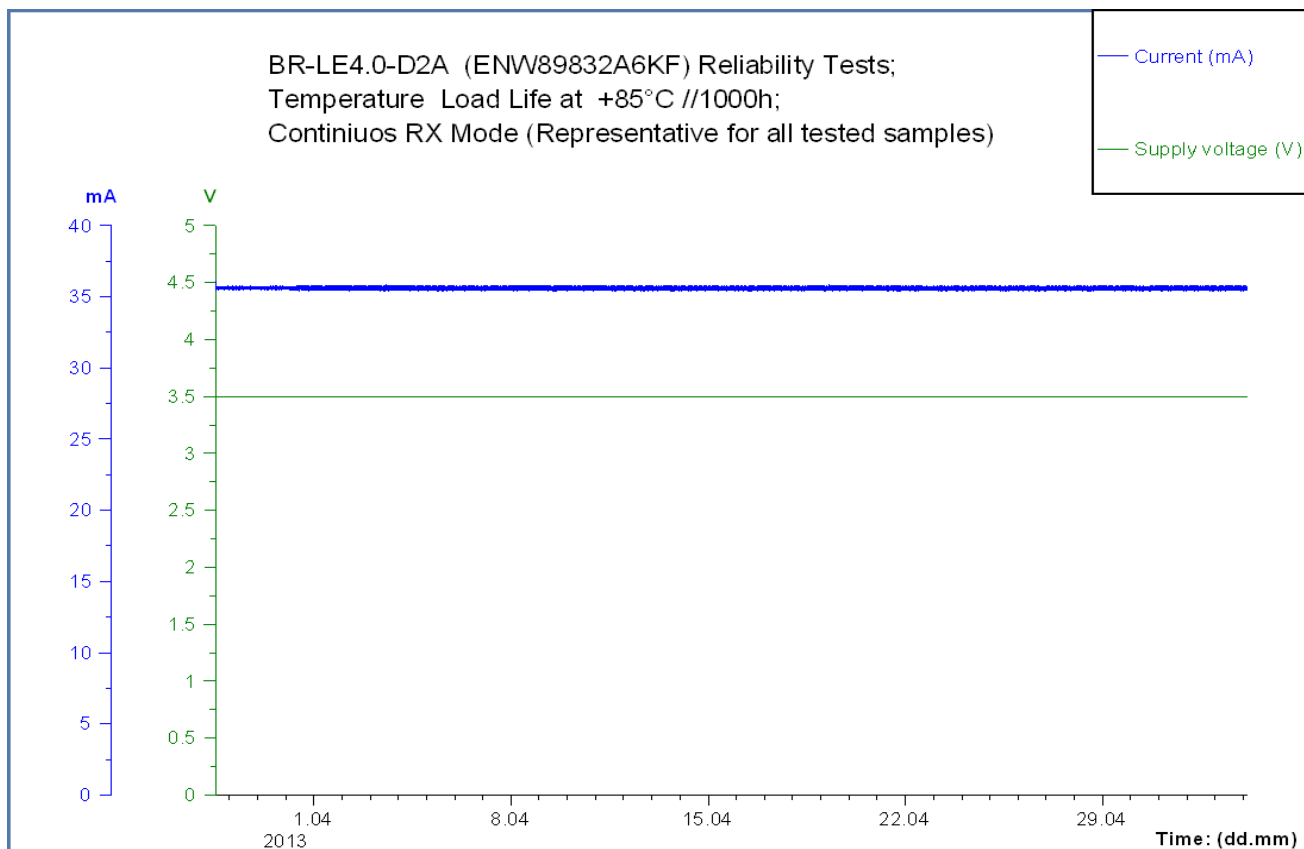
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013



These graphs is representative for all DUTs

**Conclusion:** DUTs passed this test without any performance loss.  
There are no voltage- and current interruptions, drop outs or problems visible while the test.  
Parameter Deviations after these tests are less than the specified max allowed deviations

**Judgement:** OK

Department  
**DEG**

Checked  
**V. Bay**

Approved  
**O. Jahnke**

Judgement

Date  
06.09.2013



Panasonic Industrial  
Devices Europe GmbH

**ESD HMB**  
**(150pF & 330Ω)**

**BR-LE4.0-D2A**

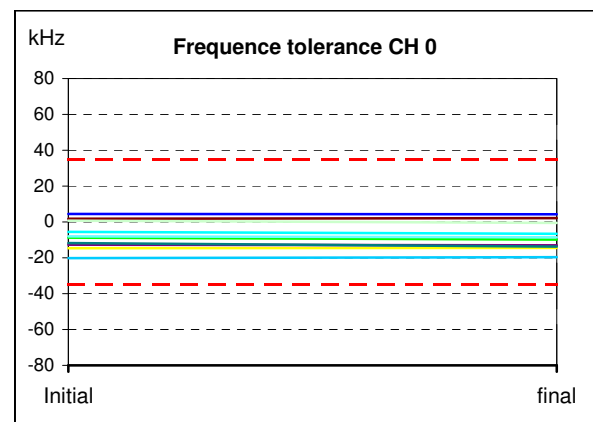
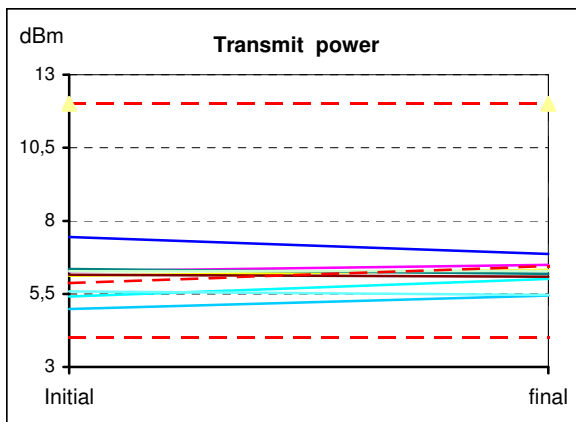
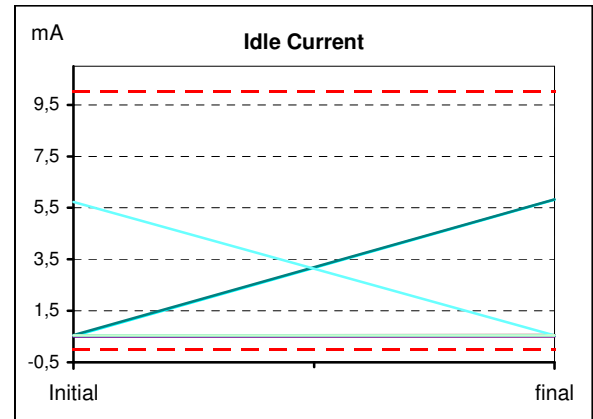
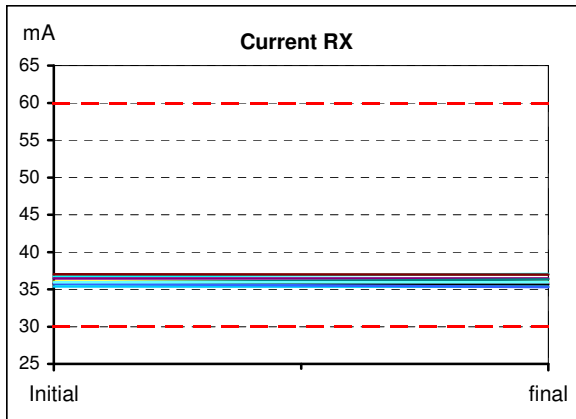
Prepared:

V. Bay

Approved:

O. Jahnke

06.09.2013




**Result:** OK, Passed

All parameters in spec. after reliability tests.

All Deviations are less than the specified max allowed deviations.

**Remark:**

Idle mode currents are usually below 1 mA, but sometimes were measured 6 mA.  
This 6 mA are still in spec. of max. 10 mA.

 <p>Panasonic Industrial Devices Europe</p>	<b>ESD Investigation Report</b> <b>BR-LE4.0-D2A</b>	Prepared: V. Bay Approved: O. Jahnke 06.09.2013
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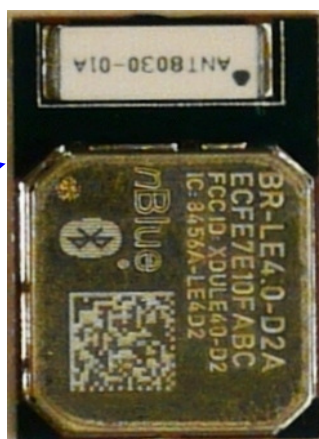
**Test:** ESD test on 6 pcs of module BR-LE4.0-D2A. Three times on each pin.

**Before and after each ESD test electrical test were made**

ESD measure equipment



ESD measure object



**ESD test R - 8.1 conditions:**

3pcs ( each pin with **+ 2,0 kV** (150pF & 330Ω) measurement, until **+ 3,0kV**)

3pcs ( each pin with **- 2,0 kV** (150pF & 330Ω) measurement, until **- 3,0kV**)

Serial Number	ESD	2,0 kV	3,0 kV
ECFE7E10FA3E	Positive	OK	OK
ECFE7E10FA56	Positive	OK	OK
ECFE7E10FAD8	Positive	OK	OK
ECFE7E10FAE9	Negative	OK	OK
ECFE7E10FB14	Negative	OK	OK
ECFE7E10FBE6	Negative	OK	OK

**Comments:**

**Result:** **Passed without any problems**

Department <b>DEG</b>		Approved <b>O. Jahnke</b>	Judgement	Date 06.09.2013
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