



# **RADIO PRE-TEST REPORT**

**Model Name** : BM2502-64-1, BM2502-68-1  
**Test Regulation** : ETSI EN 300 220-2 V3.1.1 (2017-02)  
**Received Date** : 2021/11/4  
**Test Date** : 2021/11/4

PRE-TEST REPORT

**Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX ) :+886-3-583-7948

Doc No: 17-EM-F0946 / 2.0

| Summary of Test Results             |                                           |         |
|-------------------------------------|-------------------------------------------|---------|
| Clause                              | Test Item                                 | Results |
| Clause 4.2.2<br>(ETSI EN 300 220-2) | Unwanted Emissions in the Spurious Domain | PASS    |
| Clause 4.4.2<br>(ETSI EN 300 220-2) | Blocking                                  | PASS    |

## Notes:

1. The EUT has been tested according to the following specifications.
2. The EUT is a Receiver Category 2 device.

| Receiver Category | Description                                                                                                                                                                                                                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                 | Category 1 is a high performance level of receiver. In particular to be used where the operation of a SRD may have inherent safety of human life implications.                                                                                                                                                                                    |
| 1.5               | Category 1.5 is an improved performance level of receiver category 2.                                                                                                                                                                                                                                                                             |
| 2                 | Category 2 is standard performance level of a receiver.                                                                                                                                                                                                                                                                                           |
| 3                 | Category 3 is a low performance level of receiver. Manufacturers have to be aware that category 3 receivers are not able to work properly in case of coexistence with some services such as mobile radio service in adjacent bands. The manufacturer shall provide another mean to overcome the weakness of the radio link or accept the failure. |

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## Table of Contents

|                                                             |           |
|-------------------------------------------------------------|-----------|
| <b>1. Attestation of Test Results .....</b>                 | <b>4</b>  |
| <b>2. Facilities and Accreditation .....</b>                | <b>4</b>  |
| <b>3. Equipment under Test.....</b>                         | <b>5</b>  |
| 3.1 Description of EUT.....                                 | 5         |
| 3.2 Test Mode Applicability and Tested Channel Detail ..... | 5         |
| <b>4. Test Result .....</b>                                 | <b>6</b>  |
| <b>4.1. Unwanted emissions in the spurious domain .....</b> | <b>6</b>  |
| 4.1.1 Requirements .....                                    | 6         |
| 4.1.2 Test Procedures.....                                  | 6         |
| 4.1.3 Test Data.....                                        | 7         |
| <b>4.2. Blocking .....</b>                                  | <b>11</b> |
| 4.2.1 Requirements .....                                    | 11        |
| 4.2.1 Test Procedures.....                                  | 11        |
| 4.2.1 Test Data.....                                        | 12        |



## 1. Attestation of Test Results

### Applicant

Company Name: Holtek Semiconductor Inc.

## 2. Facilities and Accreditation

|                                  |                                                                                                       |
|----------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>Test Location</b>             | Underwriters Laboratories Taiwan Co., Ltd.                                                            |
| <b>Address</b>                   | Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan |
| <b>Accreditation Certificate</b> | Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.                |

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### 3. Equipment under Test

#### 3.1 Description of EUT

|                     |                                                   |
|---------------------|---------------------------------------------------|
| Model Name          | BM2502-64-1, BM2502-68-1                          |
| Operating Frequency | BM2502-64-1: 433.92 MHz<br>BM2502-68-1: 868.3 MHz |
| Number of Channels  | BM2502-64-1: 1<br>BM2502-68-1: 1                  |

#### 3.2 Test Mode Applicability and Tested Channel Detail

| Test item                                 | Available Frequency (MHz) |
|-------------------------------------------|---------------------------|
| Unwanted Emissions in the Spurious Domain | BM2502-64-1: 433.92 MHz   |
| Blocking                                  | BM2502-68-1: 868.3 MHz    |

#### 4. Test Result

##### 4.1. Unwanted emissions in the spurious domain

##### 4.1.1 Requirements

Limits of Transmitter Spurious Emissions

| State                  | Frequency Range                                                             |                                    |                           |
|------------------------|-----------------------------------------------------------------------------|------------------------------------|---------------------------|
|                        | 47MHz to 74MHz<br>87.5MHz to 118MHz<br>174MHz to 230MHz<br>470MHz to 790MHz | Other<br>Frequencies<br>Below 1GHz | Frequencies<br>Above 1GHz |
| TX mode                | 4nW (-54dBm)                                                                | 250nW (-36dBm)                     | 1μW (-30dBm)              |
| RX and all other modes | 2nW (-57dBm)                                                                | 2nW (-57dBm)                       | 20nW (-47dBm)             |

##### 4.1.2 Test Procedures

Refer to chapter 5.9.3 of EN 300 220-1 V3.1.1.

| Measurement Method                             |                                                          |
|------------------------------------------------|----------------------------------------------------------|
| <input type="checkbox"/> Conducted measurement | <input checked="" type="checkbox"/> Radiated measurement |



### 4.1.3 Test Data

#### Rx mode

Above 1 GHz

|      |             |         |           |
|------|-------------|---------|-----------|
| Mode | BM2502-64-1 | Channel | 433.92MHz |
|------|-------------|---------|-----------|

| Polarization | Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|--------------|-----------------|---------------|------------|--------------|-------------|-------------|--------|
| Horizontal   | 1342.000        | -64.47        | 4.43       | -60.04       | -47.00      | -13.04      | PK     |
|              | 2019.500        | -65.54        | 7.61       | -57.93       | -47.00      | -10.93      | PK     |
|              | 2626.667        | -65.11        | 8.50       | -56.61       | -47.00      | -9.61       | PK     |
|              | 3600.833        | -66.40        | 10.40      | -56.00       | -47.00      | -9.00       | PK     |
|              | 4513.167        | -67.95        | 13.38      | -54.57       | -47.00      | -7.57       | PK     |
|              | 5842.667        | -71.89        | 17.72      | -54.17       | -47.00      | -7.17       | PK     |
| Vertical     | 1344.500        | -64.53        | 4.48       | -60.05       | -47.00      | -13.05      | PK     |
|              | 1956.000        | -65.66        | 7.74       | -57.92       | -47.00      | -10.92      | PK     |
|              | 3046.833        | -66.08        | 9.96       | -56.12       | -47.00      | -9.12       | PK     |
|              | 3916.333        | -66.77        | 10.91      | -55.86       | -47.00      | -8.86       | PK     |
|              | 4508.667        | -68.36        | 13.39      | -54.97       | -47.00      | -7.97       | PK     |
|              | 4952.333        | -69.13        | 14.58      | -54.55       | -47.00      | -7.55       | PK     |

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|      |             |         |          |
|------|-------------|---------|----------|
| Mode | BM2502-68-1 | Channel | 868.3MHz |
|------|-------------|---------|----------|

| Polarization | Frequency<br>(MHz) | Reading<br>(dBm) | Correct<br>dB | Result<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) | Remark |
|--------------|--------------------|------------------|---------------|-----------------|----------------|----------------|--------|
| Horizontal   | 1395.000           | -63.89           | 4.45          | -59.44          | -47.00         | -12.44         | PK     |
|              | 1829.333           | -63.04           | 6.48          | -56.56          | -47.00         | -9.56          | PK     |
|              | 2977.167           | -66.71           | 10.12         | -56.59          | -47.00         | -9.59          | PK     |
|              | 4428.000           | -68.13           | 13.00         | -55.13          | -47.00         | -8.13          | PK     |
|              | 4989.500           | -69.19           | 14.82         | -54.37          | -47.00         | -7.37          | PK     |
|              | 5857.833           | -71.65           | 17.80         | -53.85          | -47.00         | -6.85          | PK     |
| Vertical     | 1410.833           | -64.53           | 4.38          | -60.15          | -47.00         | -13.15         | PK     |
|              | 2010.500           | -65.07           | 7.51          | -57.56          | -47.00         | -10.56         | PK     |
|              | 2595.667           | -65.96           | 8.59          | -57.37          | -47.00         | -10.37         | PK     |
|              | 3724.833           | -66.26           | 10.41         | -55.85          | -47.00         | -8.85          | PK     |
|              | 4523.167           | -68.84           | 13.36         | -55.48          | -47.00         | -8.48          | PK     |
|              | 5583.500           | -70.53           | 15.97         | -54.56          | -47.00         | -7.56          | PK     |

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Below 1 GHz

|      |             |         |           |
|------|-------------|---------|-----------|
| Mode | BM2502-64-1 | Channel | 433.92MHz |
|------|-------------|---------|-----------|

| Polarization | Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|--------------|-----------------|---------------|------------|--------------|-------------|-------------|--------|
| Horizontal   | 198.5175        | -68.85        | -8.87      | -77.72       | -57.00      | -20.72      | PK     |
|              | 371.8075        | -69.53        | -6.34      | -75.87       | -57.00      | -18.87      | PK     |
|              | 509.5425        | -69.22        | -4.35      | -73.57       | -57.00      | -16.57      | PK     |
|              | 654.9474        | -68.69        | -2.31      | -71.00       | -57.00      | -14.00      | PK     |
|              | 909.9750        | -70.20        | 1.35       | -68.85       | -57.00      | -11.85      | PK     |
| Vertical     | 178.1074        | -65.49        | -11.75     | -77.24       | -57.00      | -20.24      | PK     |
|              | 348.6675        | -69.83        | -6.28      | -76.11       | -57.00      | -19.11      | PK     |
|              | 500.0200        | -69.06        | -4.47      | -73.53       | -57.00      | -16.53      | PK     |
|              | 611.3650        | -69.96        | -1.99      | -71.95       | -57.00      | -14.95      | PK     |
|              | 746.2725        | -70.18        | -0.15      | -70.33       | -57.00      | -13.33      | PK     |
|              | 948.6825        | -69.81        | 0.79       | -69.02       | -57.00      | -12.02      | PK     |

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|      |             |         |          |
|------|-------------|---------|----------|
| Mode | BM2502-68-1 | Channel | 868.3MHz |
|------|-------------|---------|----------|

| Polarization | Frequency (MHz) | Reading (dBm) | Correct dB | Result (dBm) | Limit (dBm) | Margin (dB) | Remark |
|--------------|-----------------|---------------|------------|--------------|-------------|-------------|--------|
| Horizontal   | 197.9975        | -69.16        | -8.67      | -77.83       | -57.00      | -20.83      | PK     |
|              | 345.8400        | -68.21        | -6.35      | -74.56       | -57.00      | -17.56      | PK     |
|              | 500.9624        | -69.69        | -4.45      | -74.14       | -57.00      | -17.14      | PK     |
|              | 609.0900        | -70.23        | -1.98      | -72.21       | -57.00      | -15.21      | PK     |
|              | 758.3300        | -69.88        | -0.23      | -70.11       | -57.00      | -13.11      | PK     |
|              | 896.1300        | -70.40        | 1.35       | -69.05       | -57.00      | -12.05      | PK     |
| Vertical     | 227.5074        | -68.92        | -8.32      | -77.24       | -57.00      | -20.24      | PK     |
|              | 373.7900        | -69.73        | -6.33      | -76.06       | -57.00      | -19.06      | PK     |
|              | 499.9875        | -68.55        | -4.47      | -73.02       | -57.00      | -16.02      | PK     |
|              | 641.5249        | -68.92        | -2.46      | -71.38       | -57.00      | -14.38      | PK     |
|              | 764.3100        | -70.06        | -0.36      | -70.42       | -57.00      | -13.42      | PK     |
|              | 923.3650        | -70.44        | 1.63       | -68.81       | -57.00      | -11.81      | PK     |

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## 4.2. Blocking

### 4.2.1 Requirements

Limit of Receiver Spurious Radiation

| Receiver category 1                                                           |                |
|-------------------------------------------------------------------------------|----------------|
| Requirement                                                                   | Limits         |
| Blocking at $\pm 2$ MHz from Centre Frequency                                 | $\geq -20$ dBm |
| Blocking at $\pm 10$ MHz from Centre Frequency                                | $\geq -20$ dBm |
| Blocking at $\pm 5$ % of Centre Frequency or 15 MHz, whichever is the greater | $\geq -20$ dBm |

| Receiver category 1.5                                                         |                |
|-------------------------------------------------------------------------------|----------------|
| Requirement                                                                   | Limits         |
| Blocking at $\pm 2$ MHz from OC edge $f_{\text{high}}$ and $f_{\text{low}}$   | $\geq -43$ dBm |
| Blocking at $\pm 10$ MHz from OC edge $f_{\text{high}}$ and $f_{\text{low}}$  | $\geq -33$ dBm |
| Blocking at $\pm 5$ % of Centre Frequency or 15 MHz, whichever is the greater | $\geq -33$ dBm |

| Receiver category 2                                                           |                |
|-------------------------------------------------------------------------------|----------------|
| Requirement                                                                   | Limits         |
| Blocking at $\pm 2$ MHz from OC edge $f_{\text{high}}$ and $f_{\text{low}}$   | $\geq -69$ dBm |
| Blocking at $\pm 10$ MHz from OC edge $f_{\text{high}}$ and $f_{\text{low}}$  | $\geq -44$ dBm |
| Blocking at $\pm 5$ % of Centre Frequency or 15 MHz, whichever is the greater | $\geq -44$ dBm |

| Receiver category 3                                                           |                |
|-------------------------------------------------------------------------------|----------------|
| Requirement                                                                   | Limits         |
| Blocking at $\pm 2$ MHz from OC edge $f_{\text{high}}$ and $f_{\text{low}}$   | $\geq -80$ dBm |
| Blocking at $\pm 10$ MHz from OC edge $f_{\text{high}}$ and $f_{\text{low}}$  | $\geq -60$ dBm |
| Blocking at $\pm 5$ % of Centre Frequency or 15 MHz, whichever is the greater | $\geq -60$ dBm |

### 4.2.1 Test Procedures

Refer to chapter 5.18.6 of EN 300 220-1 V3.1.1.

| Measurement Method                                        |                                               |
|-----------------------------------------------------------|-----------------------------------------------|
| <input checked="" type="checkbox"/> Conducted measurement | <input type="checkbox"/> Radiated measurement |

#### 4.2.1 Test Data

##### Test Lowest Frequency: 433.92MHz

| Offset from Centre Frequency (MHz) |        | Minimum Blocking Level (dBm) | Measured Blocking Level (dBm) | Result | Pmin (dBm) |
|------------------------------------|--------|------------------------------|-------------------------------|--------|------------|
| -2 MHz from OC edge                | 431.05 | -69.00                       | -49.60                        | PASS   | -94.28     |
| -10 MHz from OC edge               | 423.05 | -44.00                       | -31.60                        | PASS   |            |
| -5 % of CF or -15MHz(greater)      | 412.22 | -44.00                       | -26.90                        | PASS   |            |

##### Test Highest Frequency: 433.92MHz

| Offset from Centre Frequency (MHz) |        | Minimum Blocking Level (dBm) | Measured Blocking Level (dBm) | Result | Pmin (dBm) |
|------------------------------------|--------|------------------------------|-------------------------------|--------|------------|
| +2 MHz from OC edge                | 436.79 | -69.00                       | -49.60                        | PASS   | -94.28     |
| +10 MHz from OC edge               | 444.79 | -44.00                       | -32.80                        | PASS   |            |
| +5 % of CF or +15MHz(greater)      | 455.62 | -44.00                       | -27.50                        | PASS   |            |

##### Test Lowest Frequency: 868.3MHz

| Offset from Centre Frequency (MHz) |        | Minimum Blocking Level (dBm) | Measured Blocking Level (dBm) | Result | Pmin (dBm) |
|------------------------------------|--------|------------------------------|-------------------------------|--------|------------|
| -2 MHz from OC edge                | 866.00 | -69.00                       | -53.60                        | PASS   | -94.28     |
| -10 MHz from OC edge               | 858.00 | -44.00                       | -38.30                        | PASS   |            |
| -5 % of CF or -15MHz(greater)      | 824.88 | -44.00                       | -25.50                        | PASS   |            |

##### Test Highest Frequency: 868.3MHz

| Offset from Centre Frequency (MHz) |        | Minimum Blocking Level (dBm) | Measured Blocking Level (dBm) | Result | Pmin (dBm) |
|------------------------------------|--------|------------------------------|-------------------------------|--------|------------|
| +2 MHz from OC edge                | 870.60 | -69.00                       | -53.20                        | PASS   | -94.28     |
| +10 MHz from OC edge               | 878.60 | -44.00                       | -37.40                        | PASS   |            |
| +5 % of CF or +15MHz(greater)      | 911.72 | -44.00                       | -27.50                        | PASS   |            |

### END OF REPORT

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