

# PBL 403 10

## 3.5 V GSM 900 MHz Power Amplifier

### Description.

The PBL 40310 is a highly integrated single-ended silicon MMIC power amplifier intended for use in GSM terminals. It delivers 35 dBm at 900 MHz with 55 % power added efficiency into a 50  $\Omega$  unbalanced load using a single 3.5 V supply.

The circuit has an analog ramp signal to control output power level and a logical on/off signal for power down mode. It can be used in dual-band amplifiers using the band select logical signal. It can be operated up to 50 % duty cycle with minimum performance degradation. The circuit is housed in a specially designed QSOP16 (150 mil body) package and the implementation requires only few external components.

25 GHz  $f_t$  state-of-the-art deep trench isolated double-poly silicon bipolar process with additional features for improved wireless performance has been used. On-chip capacitors and inductors are used for the integrated internal matching network. Special front-side metallized substrate contacts provide excellent ground paths from active devices to the highly doped semiconductor substrate and package ground.

### Key features.

- 2.7 to 5.0 V single supply operation
- 35 dBm output power at 3.5 V
- 55 % Power Added Efficiency
- Input matched to 50  $\Omega$
- Complete on chip input and interstage matching
- Analog power control
- Less than 10  $\mu$ A current consumption in power down mode
- Proven RF Silicon Technology Reliability
- Minimum number of external components for low overall solution cost

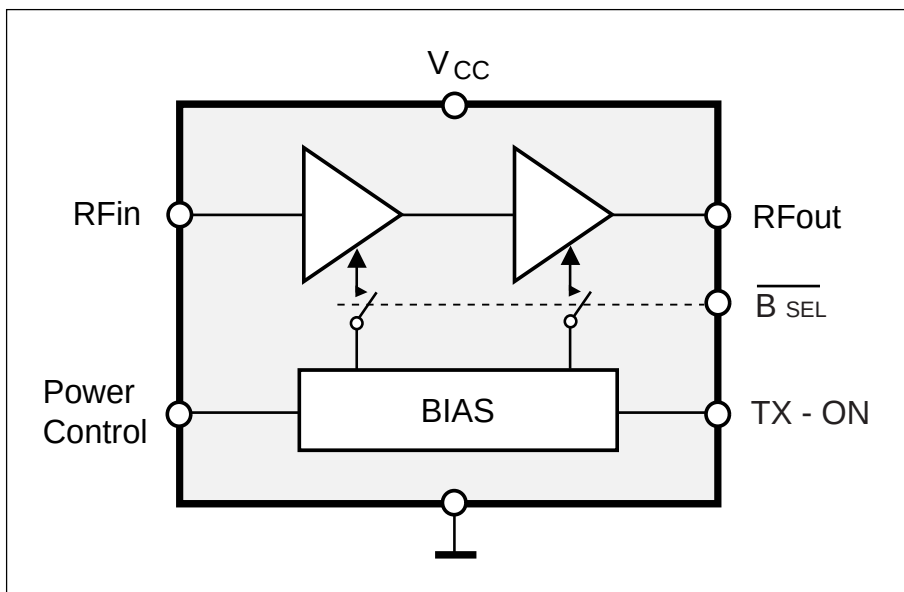


Figure 1. Block diagram.

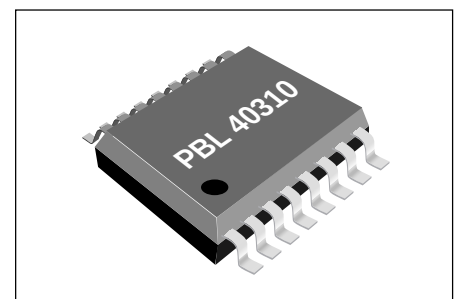


Figure 2. Package outlook.

**Maximum Ratings**

| Parameter                  | Conditions | Symbol        | Min. | Typ. | Max. | Unit |
|----------------------------|------------|---------------|------|------|------|------|
| Supply voltage, continuous |            | $V_{CC}$      | -0.5 |      | 6.0  | V    |
| Power control voltage      |            | $V_{APC}$     | -0.5 |      | 6.0  | V    |
| Input power                |            | $P_{IN}$      |      |      | +20  | dBm  |
| Operating Case Temperature |            | $T_{OP}$      | -40  |      | +85  | °C   |
| Storage Temperature Range  |            | $T_{STORAGE}$ | -30  |      | +100 | °C   |

**DC Electrical Characteristics**

$V_{CC} = 3.5$  V,  $T_A = +25^\circ\text{C}$  unless otherwise stated.

| Parameter                  | Conditions                              | Symbol     | Min. | Typ. | Max. | Unit          |
|----------------------------|-----------------------------------------|------------|------|------|------|---------------|
| Supply voltage range       |                                         | $V_{CC}$   | 2.7  |      | 5.0  | V             |
| Supply current             | $V_{APC} = 2.5$ V, no RF signal applied | $I_{CC}$   |      | 150  |      | mA            |
| Standby supply current     | $V_{APC} \leq 0.5$ V, TX-ON=HIGH        | $I_{STBY}$ |      |      | 3.0  | mA            |
| Power down leakage current | $V_{APC} \leq 0.5$ V, TX-ON=LOW         | $I_{LEAK}$ |      |      | 5.0  | $\mu\text{A}$ |
| Input current, $V_{APC}$   | $0 < V_{APC} < 3.5$ V                   |            |      | 2.0  | 3.0  | mA            |

**AC Electrical Characteristics**

$V_{CC} = 3.5$  V,  $f_{IN} = 900$  MHz,  $P_{IN} = 8$  dBm,  $V_{APC} = 2.5$  V, TX-ON = high ( $V_{CC}$ ),  $\overline{BSEL}$  = low (GND), duty cycle = 12.5 %, pulse width = 577  $\mu\text{s}$ ,  $T_A = +25^\circ\text{C}$  unless otherwise stated. All data measured on evaluation board.

| Parameter                        | Conditions                                     | Symbol    | Min. | Typ. | Max. | Unit     |
|----------------------------------|------------------------------------------------|-----------|------|------|------|----------|
| Frequency range                  |                                                | $f_{IN}$  | 880  |      | 915  | MHz      |
| Input impedance                  |                                                | $Z_{IN}$  |      | 50   |      | $\Omega$ |
| Input VSWR                       | $P_{IN} = -10$ to $+20$ dBm                    | VSWR      |      | 2:1  |      |          |
| Recommended input power          |                                                | $P_{IN}$  | 8.0  |      | 12.0 | dBm      |
| Power gain                       | $P_{IN} = 0$ dBm                               | $G_P$     | 30   | 31   |      | dB       |
| Output power                     |                                                | $P_{OUT}$ | 34.5 | 35   |      | dBm      |
| Power added efficiency           |                                                | $\eta$    | 50   | 55   |      | %        |
| Output power                     | $V_{CC} = 2.9$ V                               | $P_{OUT}$ |      | 33   |      | dBm      |
| 2 <sup>nd</sup> harmonic         |                                                | 2 fo      |      | tbd  |      | dBc      |
| 3 <sup>rd</sup> harmonic         |                                                | 3 fo      |      | tbd  |      | dBc      |
| Output Noise                     | RBW=100 kHz, f=925 to 935 MHz                  |           |      | tbd  |      | dBm      |
| Output Noise                     | RBW=100 kHz, f=925 to 960 MHz                  |           |      | tbd  |      | dBm      |
| Forward isolation                | $V_{APC} < 0.5$ V, $P_{IN} = -10$ to $+10$ dBm |           |      | -25  |      | dB       |
| Stability, load VSWR             | All phases, no oscillations.                   | VSWR      |      |      | 6:1  |          |
| Ruggedness, load VSWR            | All phases, no damage.                         | VSWR      |      |      | 10:1 |          |
| Power control for max. $P_{OUT}$ |                                                | $V_{APC}$ | 2.5  |      |      | V        |
| Power control for min. $P_{OUT}$ | $P_{OUT} < -30$ dBm                            | $V_{APC}$ |      |      | 0.5  | V        |
| Power control slope              | $-10$ dBm $< P_{OUT} < 35$ dBm                 |           |      | tbd  | tbd  | dB/V     |

This document contains advance information of a new product. Data given in this document shall be considered as preliminary and may be changed without notice.

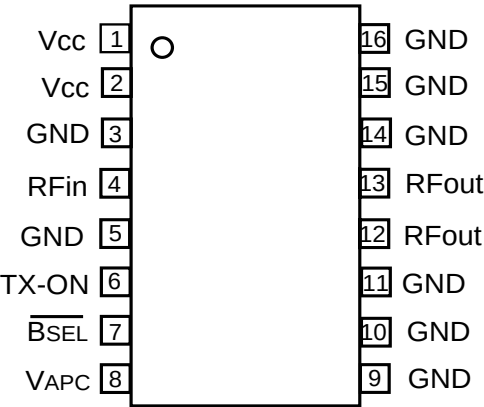


Figure 3. Pin configuration.

Pin Descriptions:

Refer to pin configuration.

| SO | Name  | Function              | SO | Name  | Function      |
|----|-------|-----------------------|----|-------|---------------|
| 1  | Vcc   | Supply voltage        | 9  | GND   | Common ground |
| 2  | Vcc   | Supply voltage        | 10 | GND   | Common ground |
| 3  | GND   | Common ground         | 11 | GND   | Common ground |
| 4  | RFin  | RF input              | 12 | RFout | RF output     |
| 5  | GND   | Common ground         | 13 | RFout | RF output     |
| 6  | TX-ON | Transmit ON           | 14 | GND   | Common ground |
| 7  | BSEL  | Band select           | 15 | GND   | Common ground |
| 8  | VAPC  | Power control voltage | 16 | GND   | Common ground |

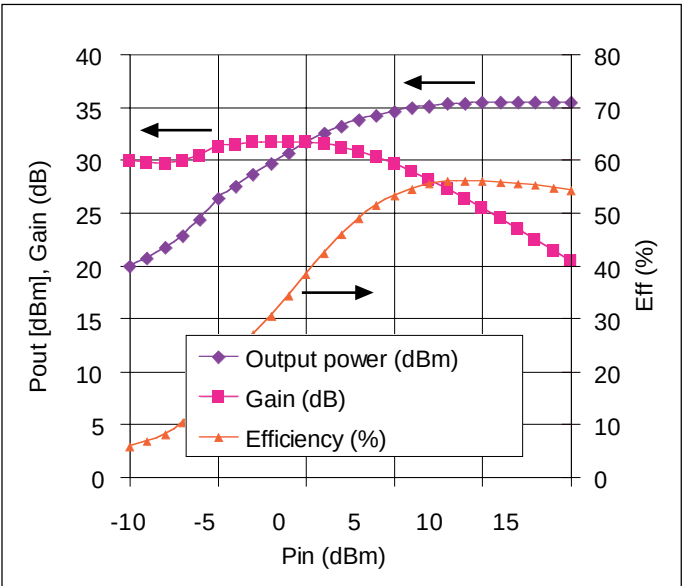


Figure 4. RF performance.

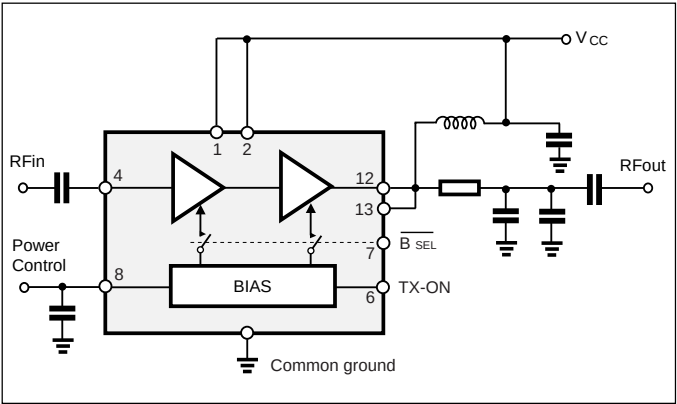
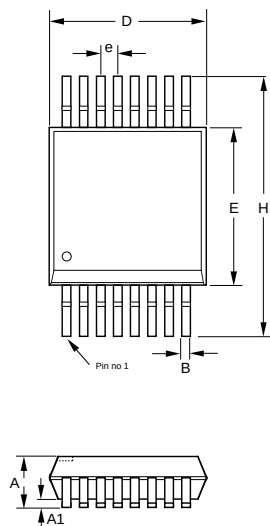
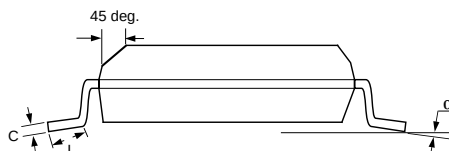


Figure 5. Evaluation setup including network for unbalanced input/output.

## Package drawing, QSOP 16



| Dim.                        | millimeters |      | inches          |        |
|-----------------------------|-------------|------|-----------------|--------|
|                             | min.        | max. | min.            | max.   |
| A                           | 1.35        | 1.75 | 0.532           | 0.688  |
| A1                          | 0.10        | 0.25 | 0.004           | 0.0098 |
| B                           | 0.21        | 0.31 | 0.008           | 0.012  |
| C                           | 0.19        | 0.25 | 0.0075          | 0.0098 |
| D                           | 9.80        | 9.98 | 0.386           | 0.393  |
| E                           | 3.81        | 3.99 | 0.150           | 0.157  |
| e                           | 0.635mm     |      | 0.025 inch ref. |        |
| H                           | 5.70        | 6.20 | 0.2284          | 0.2240 |
| L                           | 0.41        | 1.27 | 0.016           | 0.050  |
| $\alpha = 0-8 \text{ deg.}$ |             |      |                 |        |



Note: This package has been chosen as a preliminary package. It will possibly be changed to a smaller solution.

This document contains advance information of a new product. Data given in this document shall be considered as preliminary and may be changed without notice.

Information given in this data sheet is believed to be accurate and reliable. However no responsibility is assumed for the consequences of its use nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Ericsson Microelectronics AB. These products are sold only according to Ericsson Microelectronics AB's general conditions of sale, unless otherwise confirmed in writing.

Specifications subject to change without notice.

1522-PBL 403 10 Uen Rev.A  
© Ericsson Microelectronics AB  
March 2001

**ERICSSON** 

**Ericsson Microelectronics AB**  
S-164 81 Kista-Stockholm, Sweden  
Telephone: (08) 757 50 00  
[www.ericsson.se/microe](http://www.ericsson.se/microe)