Advance Data Sheet
March 1995

AT&T Microelectronics

W2011 ES2
1 GHz Quadrature Modulator

Features

- Operation over 2.7 to 5.5 V supply voltage
- Output power of -5 dBm into 50 Ω load (single ended) with 3 V operation
- Direct conversion or built-in VCO offset mixer
- Automatic power control (APC) capability
- Accurate 90° phase-shifter for local oscillator
- Double balanced active mixers minimize carrier feedthrough
- Low current sleep mode

Applications

- GSM, PDC, and American Digital Cellular Mobile Terminals
- Central Cellular Radio Stations
- Digital Satellite Communications
- Multisymbol Signaling Transmitters
- CDPD

Description

The W2011 1 GHz Quadrature Modulator is a monolithic integrated circuit that provides direct quadrature modulation of an RF carrier by I and Q baseband inputs. The function performed by the W2011 is particularly suited for use in mobile and hand-held cellular telephones designed to IS54 (North American), GSM (European), PDC (Japanese), and other digital personal-communications standards.

The circuit block diagram is shown in Figure 1. From two LO input signals, LOL and LOH, the offset mixer produces the internal LO signal. This prevents the external VCO or the local oscillator from being "pulled" by the large transmitted signal. The phase shifter splits the LO signal into two LO's with 90° phase separation and equal amplitude. The LO signals are fed to the in-phase (I) and quadrature-phase (Q) double balanced mixers. The resulting signals are summed and fed into the output power amplifier. The output power amplifier provides up to -5 dBm output power into a 50 Ω load.

The output power can be attenuated up to 50 dB by applying a control voltage to the APC input. Nominally, the output power is at maximum (-5 dBm) with $V_{APC} > 2.2$ V and at minimum (-55 dBm) with $V_{APC} < 1.1$ V. This control range can also be changed to accomodate specific input ranges from an external source.

A CMOS/TTL compatible logic input allows the device to be put into a powerdown mode, in which the device consumes less than 10 µA of supply current.

15-1

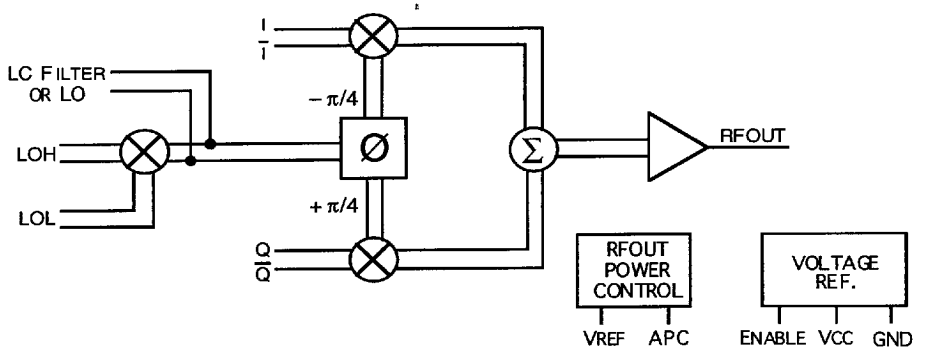


Figure 1. W2011 Block Diagram

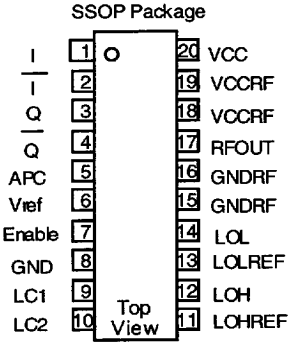


Figure 2. W2011 Pin Configuration

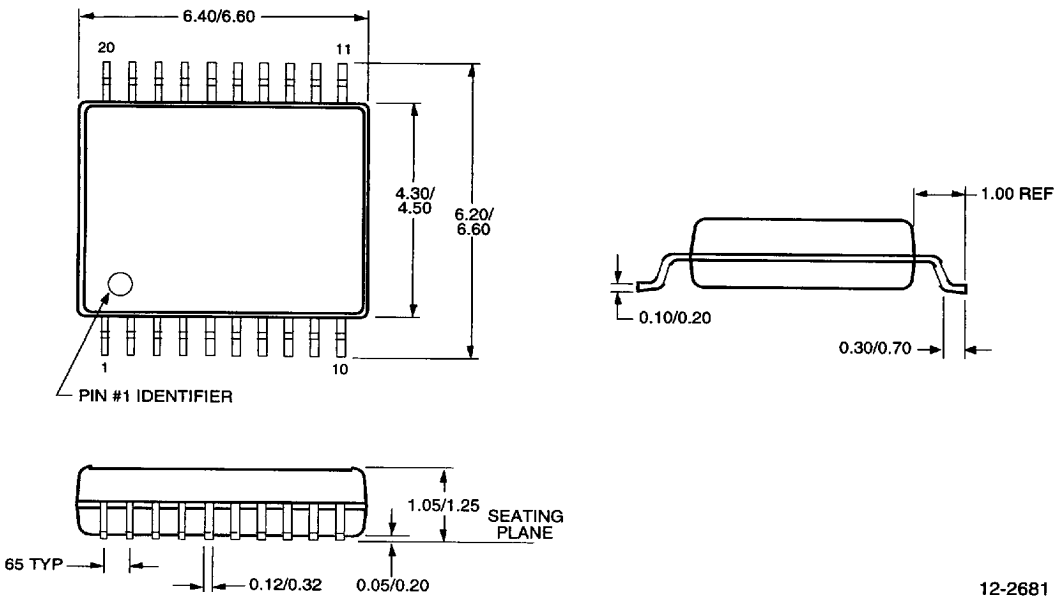
Table 1. Pin Descriptions

Pin	Name	Description
1, 2	I, Ī	I inputs. Differential baseband inputs of quadrature modulator I mixer.
3, 4	Q, Q̄	Q inputs. Differential baseband inputs of quadrature modulator Q mixer.
5	APC	Power control voltage input.
6	VREF	APC reference voltage. Used to modify control voltage input range.
7	ENABLE	Enable input. Powerup, powerdown (sleep mode) logic control.
8	GND	dc ground.
9	LC1	LC filter or direct LO input.
10	LC2	LC filter or direct LO input.
11	LOHREF	High frequency local reference input.
12	LOH	High frequency local input.
13	LOLREF	Low frequency local reference input.
14	LOL	Low frequency local input.
15, 16	GNDRF	RF ground.
17	RFOUT	RF output.
18, 19	VCCRF	RF power supply.
20	VCC	Power supply.

Outline Diagram

20-Pin SSOP

All dimensions are in millimeters.



Evaluation Board Note

The ATTW2011 Evaluation Board is available for customer demonstration of device performance characteristics. The board allows full characterization with RF laboratory bench equipment. Various applications of the device can be demonstrated on the evaluation board.