SiGe Power Amplifier for GSM 900

Description

The TST0912 is a monolithic integrated power amplifier IC. The device is manufactured using Atmel Wireless & Microcontrollers' Silicon-Germanium (SiGe) technology and has been designed for use in GSM 900-MHz mobile phones.

With a single supply voltage operation of 3 V and a neglectable leakage current in power-down mode, the TST0912 needs few external components and reduces system costs.

Electrostatic sensitive device.
Observe precautions for handling.

Features

- 35 dBm output power
- Power-added efficiency (PAE) 50%
- Single supply operation at 3 V
  no negative voltage necessary
- Current consumption in power-down mode ≤ 10 µA, no external power-supply switch required
- Power-ramp control
- Simple input and output matching
- Simple output matching for maximum flexibility
- SMD package (PSSOP16 with heat slug)

Block Diagram

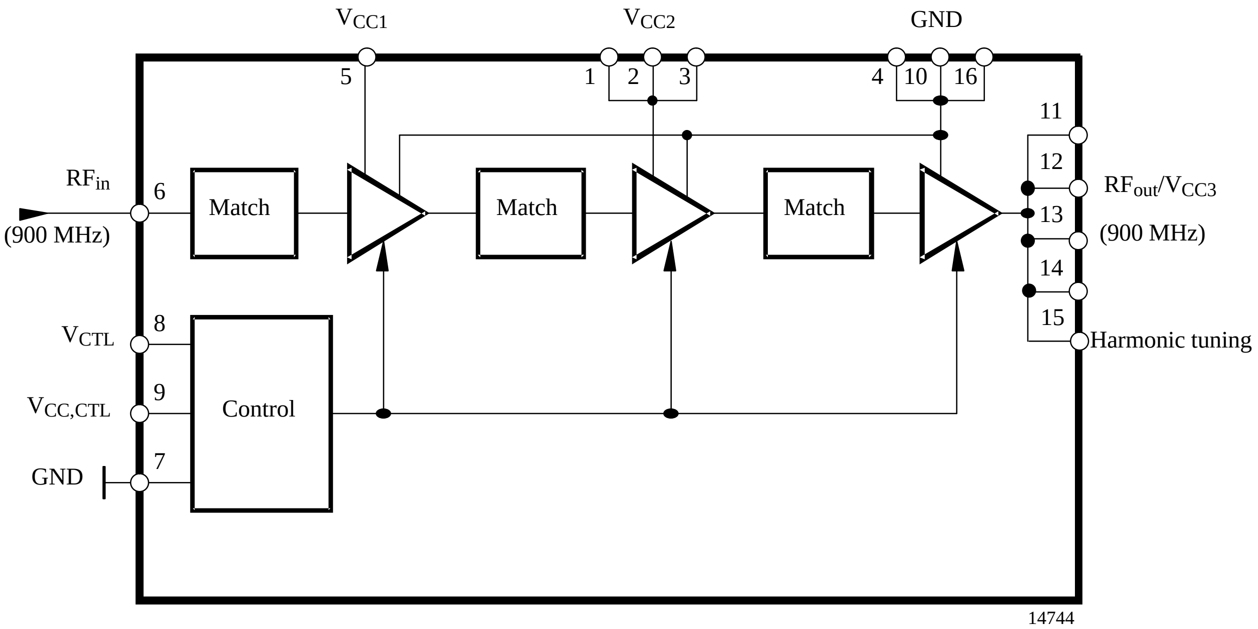


Figure 1. Block diagram

Ordering Information

Extended Type Number	Package	Remarks
TST0912-TJS	PSSO16	Tube
TST0912-TJQ	PSSO16	Taped and reeled

Preliminary Information

Pin Description

Pin	Symbol	Function
1	V_{CC2}	Supply voltage 2
2	V_{CC2}	Supply voltage 2
3	V_{CC2}	Supply voltage 2
4	GND	Ground
5	V_{CC1}	Supply voltage 1
6	RF_{in}	RF input
7	GND	Ground (control)
8	V_{CTL}	Control input
9	$V_{CC,CTL}$	Supply voltage for control
10	GND	Ground (optional)
11	RF_{out}/V_{CC3}	RF output / supply voltage 3
12	RF_{out}/V_{CC3}	RF output / supply voltage 3
13	RF_{out}/V_{CC3}	RF output / supply voltage 3
14	RF_{out}/V_{CC3}	RF output / supply voltage 3
15	RF_{out}/ V_{CC3}	RF output / harmonic tuning
16	GND	Ground

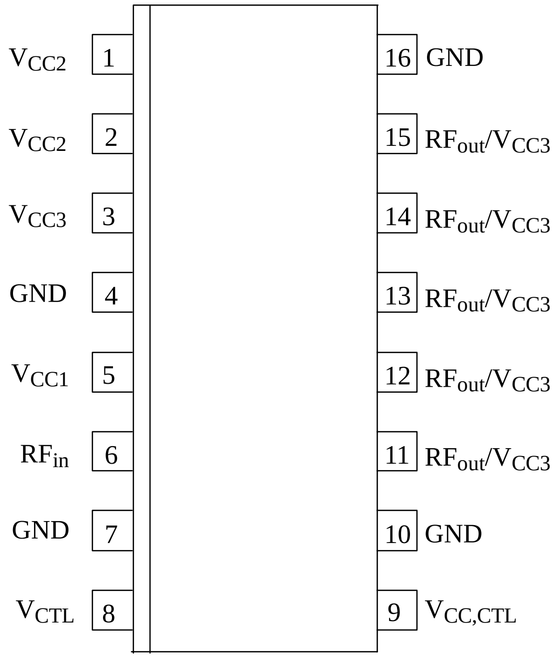


Figure 2. Pinning

Absolute Maximum Ratings

All voltages refer to GND

Parameter		Symbol	Min.	Max.	Unit
Supply voltage V_{CC}	Pin 5 Pins 1, 2 and 3 Pins 11, 12, 13 and 14 Pin 9	V_{CC1} V_{CC2} V_{CC3} $V_{CC, CTL}$		5.0	V
Input power	Pin 6	P_{in}		12	dBm
Gain control voltage	Pin 8	V_{CTL}	0	2.2	V
Duty cycle for operation				25	%
Burst duration		t_{burst}		1.2	ms
Junction temperature		T_j		+150	°C
Storage temperature		T_{stg}	– 40	+150	°C

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction ambient	R_{thJA}	t.b.d.	K/W

Operating Range

All voltages refer to GND

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage V_{CC}	V_{CC1}, V_{CC2}, V_{CC3}, $V_{CC, CTL}$	2.4	3.5	4.5	V
Ambient temperature	T_{amb}	– 25		+ 85	°C
Input frequency	f_{in}		900		MHz

Electrical Characteristics

Test conditions: V_{CC} = V_{CC1} to V_{CC3}, $V_{CC, CTL}$ = 3.5 V, V_{CTL} = 1.5 V, T_{amb} = + 25°C, t_{burst} = 0.577 ms, t_{period} = 4.615 ms (see application circuit)

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Power supply						
Supply voltage		V_{CC}	2.4	3.5	4.5	V
Current consumption	Active mode P_{out} = 34.5 dBm, PAE = 50%	I		1.7		A
Current consumption (leakage current)	Power-down mode V_{CTL} ≤ 0.2 V	I			10	µA
RF input						
Frequency range		f_{in}	880	900	915	MHz
Input impedance *)		Z_i		50		Ω
Input power		P_{in}		3	12	dBm
Input VSWR *)	P_{in} = 0 to 12 dBm, P_{out} = 34.5 dBm	VSWR			2 : 1	
RF output						
Output impedance *)		Z_o		50		Ω
Output power	P_{in} = 3 dBm, R_L = R_G = 50 Ω V_{CC} = 3.5 V, T_{amb} = +25°C V_{CC} = 2.7 V, T_{amb} = +85°C	P_{out}	34.3 32.0	34.8 33.0		dBm dBm
Minimum output power	V_{CTL} = 0.3 V			– 20		dBm
Power-added efficiency	V_{CC} = 3 V, P_{out} = 28 dBm V_{CC} = 3 V, P_{out} = 30 dBm V_{CC} = 3 V, P_{out} = 33.5 dBm	PAE	25 35 50			%
Stability	T_{amb} = –25 to + 85 °C no spurious ≥ –60 dBc	VSWR			10 : 1	
Load mismatch (stable, no demage)	P_{out} = 34.5 dBm, all phases	VSWR			10 : 1	
Second harmonic distortion		2fo			–35	dBc
Third harmonic distortion		3fo			–35	dBc
Noise power	P_{out} = 34 dBm, RBW = 100 kHz f = 925 to 935 MHz f ≥ 935 MHz			– 73 – 85	– 70 – 82	dBm dBm

Electrical Characteristics (continued)

Test conditions: $V_{CC} = V_{CC1}$ to V_{CC3}, $V_{CC,\,CTL}$ = 3.5 V, V_{CTL} = 1.5 V, T_{amb} = + 25°C, t_{burst} = 0.577 ms, t_{period} = 4.615 ms (see application circuit)

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Rise and fall time		t_r, t_f			0.5	µs
Isolation between input and output	P_{in} = 0 to 10 dBm, $V_{CTL} \leq 0.2$ V (power down)		50			dB
Power control						
Control curve slope	$P_{out} \geq 25$ dBm				150	dB/ V
Power-control range	V_{CTRL} = 0.3 to 2.0 V		50			dB
Control-voltage range		V_{CTL}	0.3		2.0	V
Control current	P_{in} = 0 to 10 dBm, V_{CTL} = 0 to 2.0 V	I_{CTL}			200	µA

*) with external matching (see application circuit)

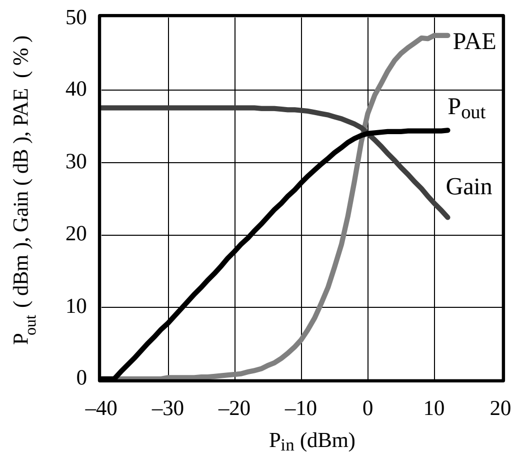


Figure 3. Gain, P_{out} and PAE versus P_{in}

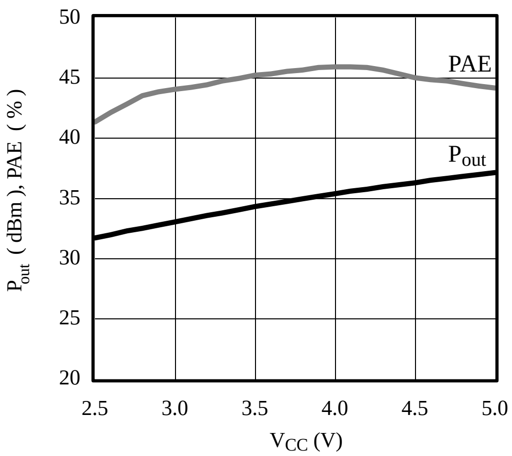


Figure 5. P_{out}, PAE versus V_{CC}

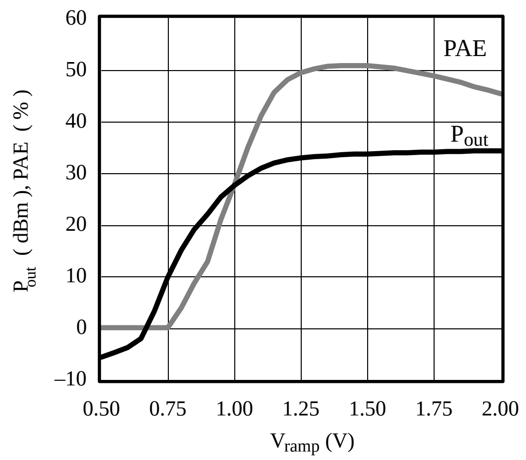


Figure 4. P_{out}, PAE versus V_{ramp}

Remarks for the Application Circuit

All components Tx are microstrip lines:
FR4, epsilon(r) = 4.3, metal: Cu 3.5 µm;
distance: 1. layer to RF ground = 0.5 mm

Name	l mm	w mm	Name	l mm	w mm
T1	20.5	1.0	T5	2.5	1.0
T2	1.3	1.0	T6	43.1	0.5
T3	14.8	0.5	T7	6.0	1.25
T4	14.2	0.5	T8	10.0	0.5

Application Circuit

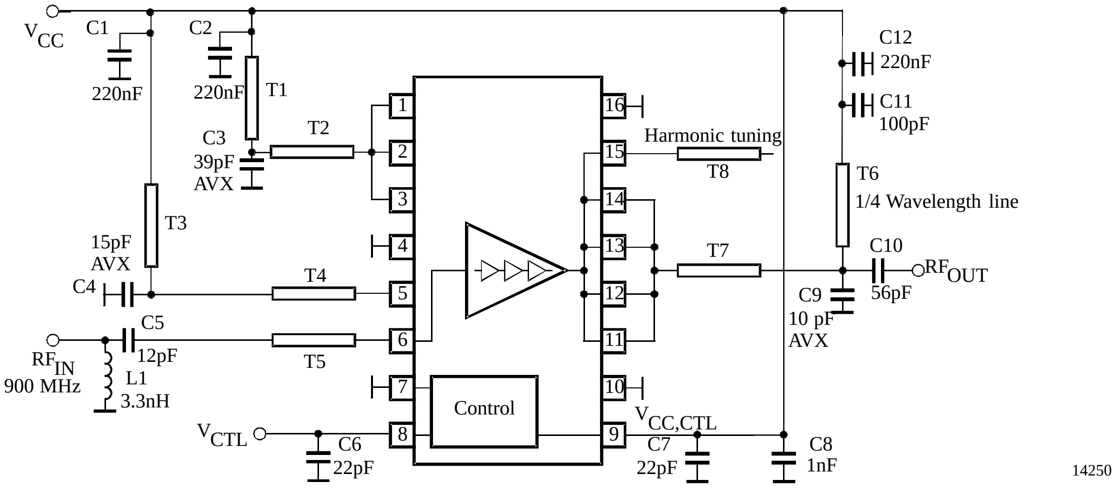
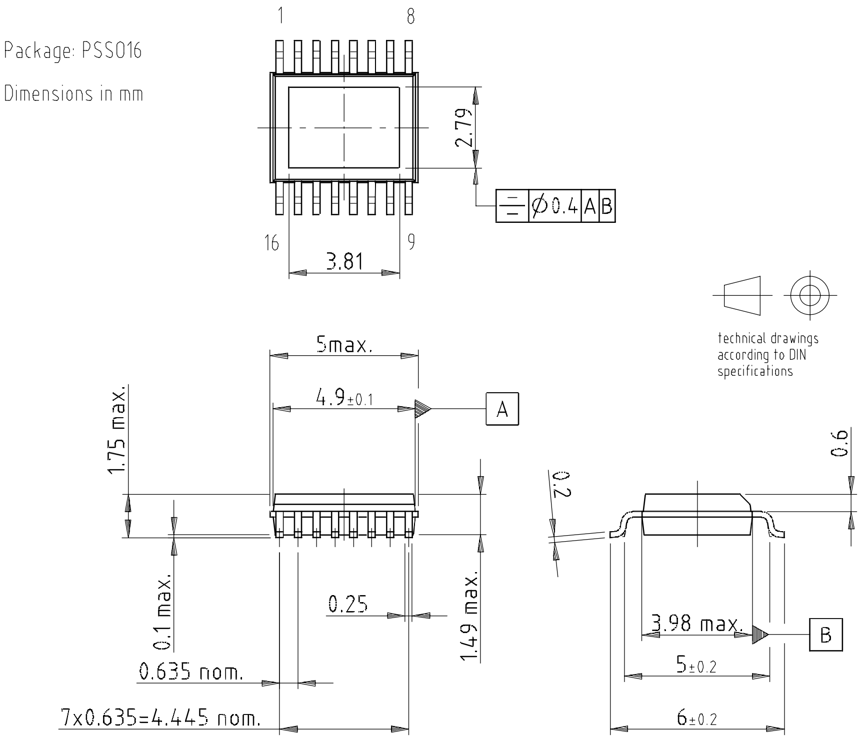


Figure 6.

Package Information



Preliminary Information

Ozone Depleting Substances Policy Statement

It is the policy of **Atmel Germany GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Atmel Germany GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Atmel Germany GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Data sheets can also be retrieved from the Internet: http://www.atmel–wm.com

Atmel Germany GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2594, Fax number: 49 (0)7131 67 2423