

SiGe Power Amplifier for GSM 900

Description

The TST0912 is a monolithic integrated power amplifier IC. The device is manufactured using TEMIC Semiconductors' 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.



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 $\leq 10 \mu\text{A}$, 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

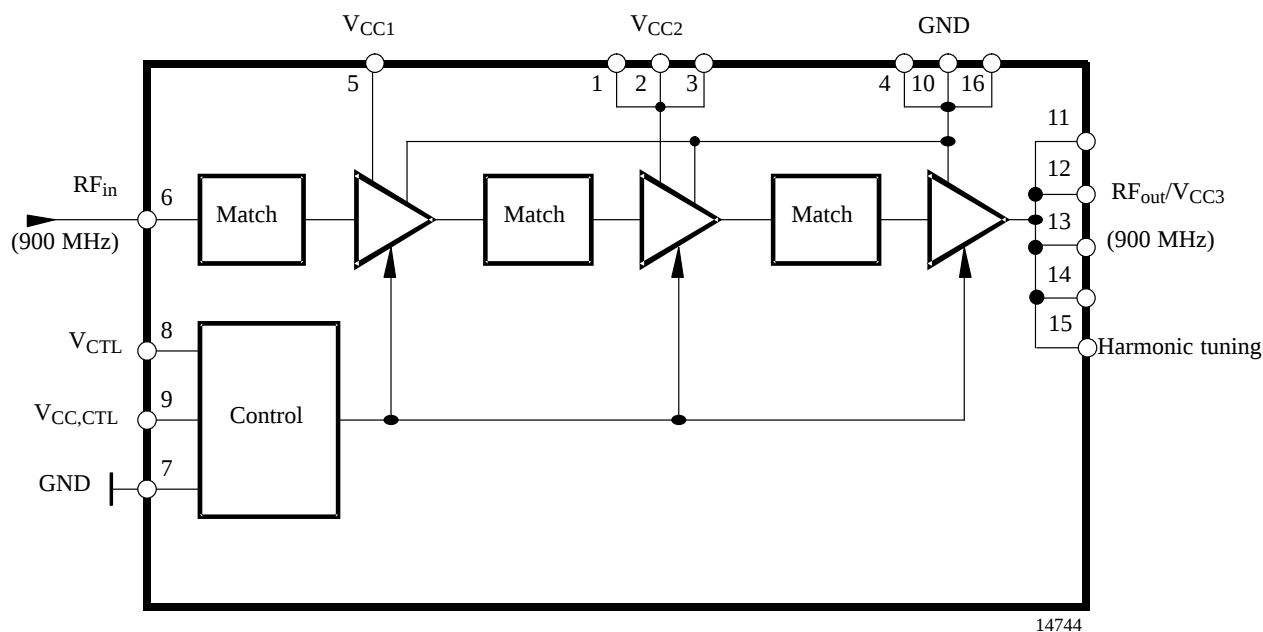


Figure 1. Block diagram

Ordering Information

Extended Type Number	Package	Remarks
TST0912-M	PSSOP16	Tube
TST0912-M	PSSOP16	Taped and reeled

Pin diagram of the 14963 device:

Pin Number	Pin Name	Function
1	V_{CC2}	
2	V_{CC2}	
3	V_{CC3}	
4	GND	
5	V_{CC1}	
6	RF_{in}	
7	GND	
8	V_{CTL}	
9		$V_{CC,CTL}$
10		GND
11		RF_{out}/V_{CC3}
12		RF_{out}/V_{CC3}
13		RF_{out}/V_{CC3}
14		RF_{out}/V_{CC3}
15		RF_{out}/V_{CC3}
16		GND

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

Absolute Maximum Ratings

All voltages are referred to GND

Parameter	Symbol	Min.	Typ.	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

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

All voltages are referred to GND

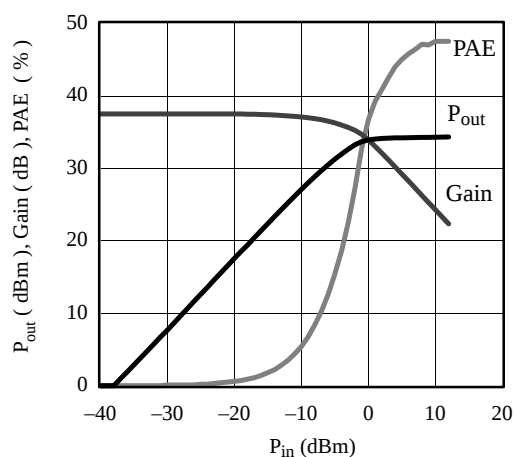
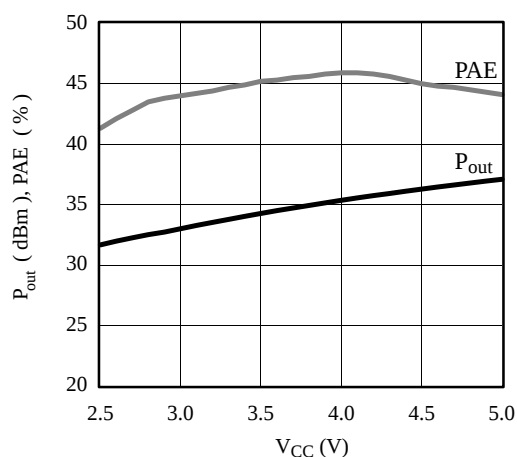
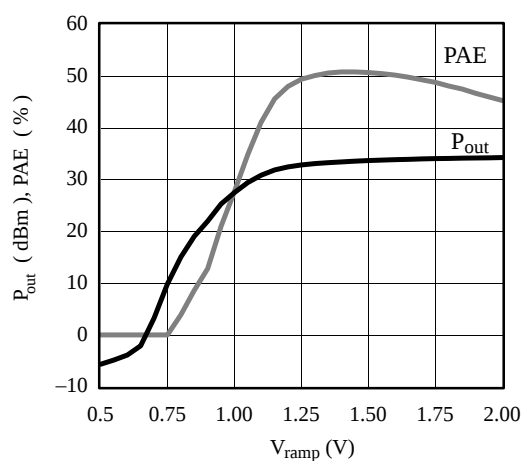
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage V_{CC}	$V_{CC1}, V_{CC2}, V_{CC3}, V_{CC}, CTL$	2.4	3.5	4.5	V
Ambient temperature	T_{amb}	- 25		+ 85	°C
Input frequency	f_{in}		900		MHz

Electrical Characteristics

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

Parameters	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 $V_{CTL} \leq 0.2$ 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, $T_{amb} = +25^{\circ}\text{C}$ $V_{CC} = 2.7$ V, $T_{amb} = +85^{\circ}\text{C}$	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 $+85^{\circ}\text{C}$ no spurious ≥ -60 dBc	VSWR			10 : 1	
Load mismatch (stable, no damage)	$P_{out} = 34.5$ 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 $f \geq 935$ MHz			-73 -85	-70 -82	dBm dBm
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 $3.5 \mu\text{m}$;
 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

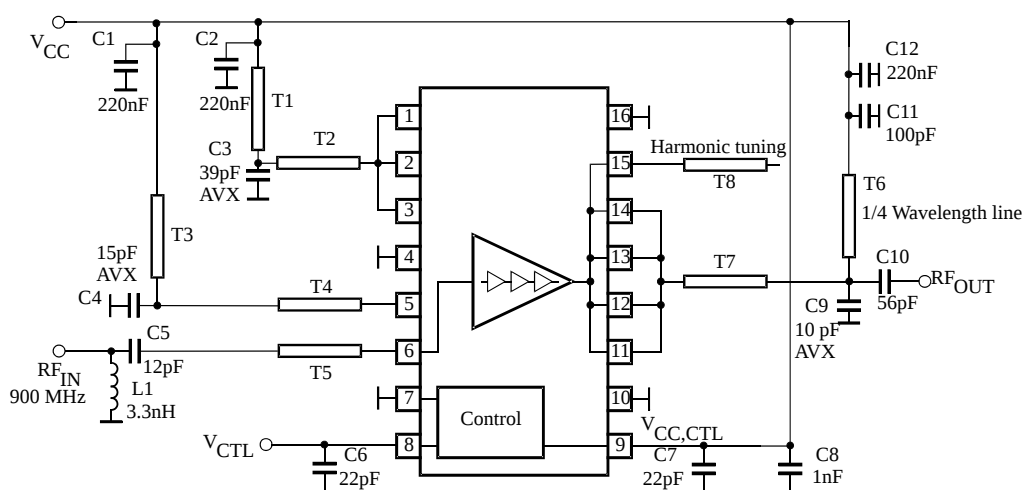


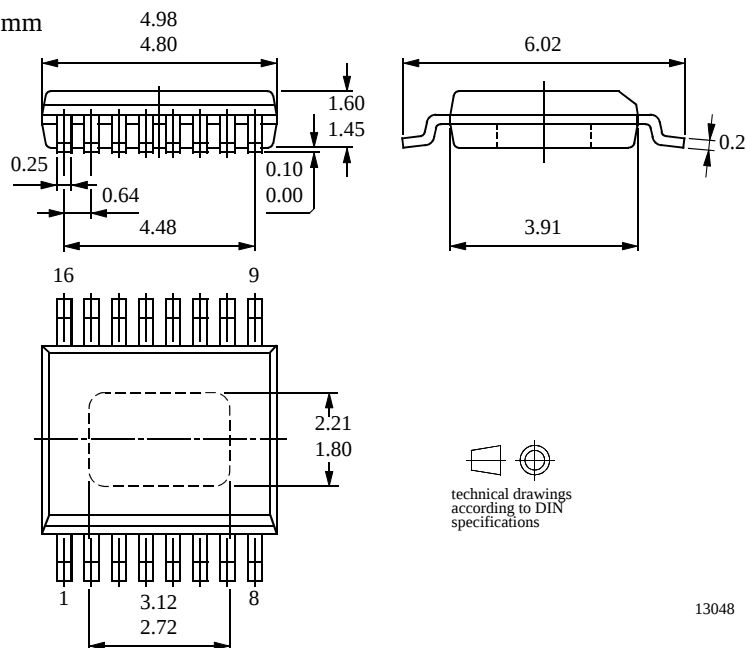
Figure 6.

14250

Package Information

Package PSSOP16

Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC Semiconductor 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.

TEMIC Semiconductor 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.

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

We reserve the right to make changes to improve technical design and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use TEMIC Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify TEMIC Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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