Features

- **Up to 33 dBm Output Power in CW Mode**
- **High Power Added Efficiency (PAE)**
- **Single Supply Operation at 2.4 V (1 W) or 3.2 V (2 W)**
- **Current Consumption in Power-down Mode ≤10 µA**
- **No External Power Supply Switch Required**
- **Power Ramp Control**
- **Simple Input and Output Matching for Maximum Flexibility**
- **SMD Package (PSSOP16 with Heat Slug)**
- **Wide Frequency Range**

Electrostatic sensitive device.
Observe precautions for handling.

SiGe Power Amplifier for CW Applications

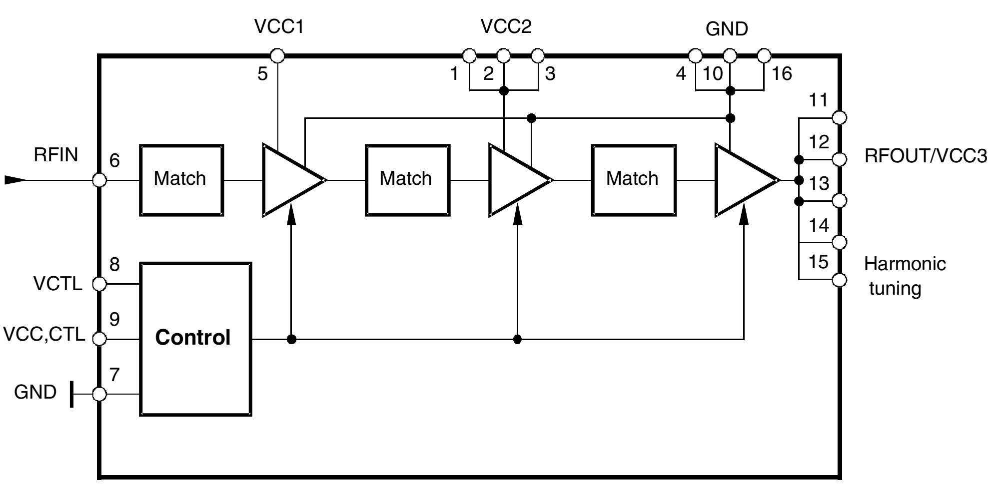
T0930

Description

The T0930 is a monolithic integrated power amplifier IC. The device is manufactured with Atmel's Silicon-Germanium (SiGe) technology and has been designed for use in 900-MHz two-way pagers, PDAs, meter readers and ISM phones.

With a single supply voltage of 1.8 V to 3.6 V and a neglectable leakage current in power-down mode, the pager amplifier only needs few external components and thus helps to reduce system costs. It is suited for operation in CW mode.

Figure 1. Block Diagram



Rev. 4722B–SIGE–04/04

Pin Configuration

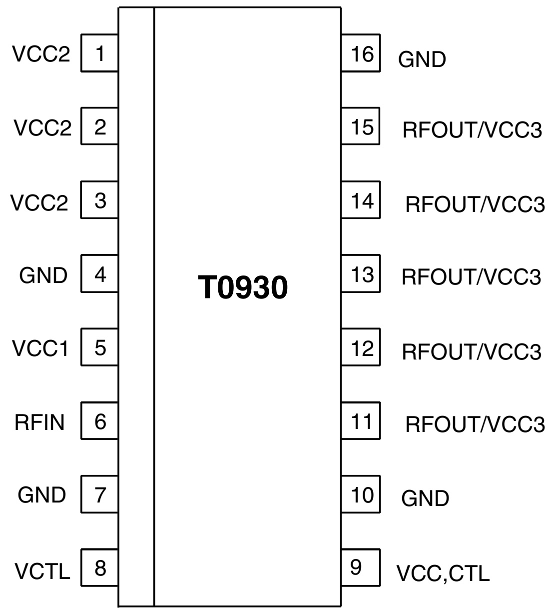


Figure 2. Pinning PSSOP16

Pin Description

Pin	Symbol	Function
1	VCC2	Supply voltage 2
2	VCC2	Supply voltage 2
3	VCC2	Supply voltage 2
4	GND	Ground
5	VCC1	Supply voltage 1
6	RFIN	RF input
7	GND	Ground (control)
8	VCTL	Ramp control input
9	VCC,CTL	Supply voltage for control
10	GND	Ground (optional)
11	RFOUT/VCC3	RF output/supply voltage 3
12	RFOUT/VCC3	RF output/supply voltage 3
13	RFOUT/VCC3	RF output/supply voltage 3
14	RFOUT/VCC3	RF output/supply voltage 3
15	RFOUT/VCC3	RF output/harmonic tuning
16	GND	Ground

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

All voltages refer to GND

Parameters	Symbol	Min.	Max.	Unit
Supply voltage V_{CC} at V_{CTL} = 1.7 V Pin 5 Pin 1, 2, 3 Pins 11, 12, 13, 14 and 15 Pin 9	 V_{CC1} V_{CC2} V_{CC3} $V_{CC,\ CTL}$		 4 4 4 4	V
Input power, pin 6	P_{IN}		12	dBm
Gain control voltage(1), pin 8	V_{CTL}	0	2	V
Duty cycle for operation			100	%
Junction temperature	T_j		+150	°C
Storage temperature	T_{stg}	-40	+150	°C

Note: 1. The gain control voltage should always be 0.2 V below the supply voltage. RF should be applied before ramp-up.

Operating Range

All voltages referred to GND

Parameters	Symbol	Min.	Typ.	Max.	Unit
Supply voltage V_{CC}(1) 1 W application	V_{CC1}, V_{CC2}, V_{CC3}, $V_{CC,\ CTL}$	1.8	2.4	3	V
Supply voltage V_{CC}(1) 2 W application	V_{CC1}, V_{CC2}, V_{CC3}, $V_{CC,\ CTL}$	2.6	3.2	3.6	V
Ambient temperature	T_{amb}	-25		+85	°C
Input frequency	f_{IN}		900		MHz

Note: 1. The gain control voltage should be always 0.2 V below the supply voltage. RF should be applied before ramp-up.

Electrical Characteristics for 1 W Application

$V_{CC} = V_{CC1}$, ... , V_{CC3}, $V_{CC, CTL}$ = 2.4 V, V_{CTL} = 1.7 V, T_{amb} = +25°C, external 50-Ω input and 50-Ω output match, P_{IN} = 5 dBm, f_{IN} = 900 MHz

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1	**Power Supply**								
1.1	Supply voltage			V_{CC}	1.8	2.4	3.0	V	D
1.2	Current consumption in active mode			I		0.9		A	A
1.3	Current consumption (leakage current) in power-down mode	V_{CTL} ≤ 0.2 V		I			10	µA	A
2	**RF Input**								
2.1	Frequency range			f_{IN}	880	900	935	MHz	D
2.2	Input impedance(1)			Z_i		50		Ω	C
2.3	Input power			P_{IN}		5	12	dBm	C
2.4	Input VSWR(1)	P_{IN} = 0 to 12 dBm P_{OUT} = 30 dBm					2:1		C
3	**RF Output**								
3.1	Output impedance(1)			Z_o		50		Ω	C
3.2	Output power in normal conditions	V_{CC} = 2.4 V V_{CC} = 1.8 V		P_{OUT} P_{OUT}		30 27		dBm dBm	A
3.3	Minimum output power	V_{CTL} = 0.3 V				- 20		dBm	A
3.4	Power-added efficiency	V_{CC} = 2.4 V, P_{OUT} = 30 dBm V_{CC} = 1.8 V, P_{OUT} = 27 dBm		PAE PAE		47 40		% %	A
3.5	Stability	Temp = -25 to +85° C no spurious ≥ -60 dBc		VSWR			8:1		C
3.6	Load mismatch (stable, no damage)	P_{OUT} = 30 dBm, all phases		VSWR			8:1		C
3.7	Second harmonic distortion			2fo			-30	dBc	A
3.8	Third harmonic distortion			3fo			-30	dBc	A
3.9	Noise power f = 925 to 935 MHz f ≥ 935 MHz	P_{OUT} = 30 dBm RBW = 100 kHz				-73 -85	-70 -82	dBm dBm	C
3.10	Rise and fall time					TBD		ms	C
3.11	Isolation between input and output	P_{IN} = 0 to 10 dBm V_{CTL} ≤ 0.2 V (power down)			50			dB	C
4	**Power Control**								
4.1	Control curve	P_{OUT} ≥ 25 dBm					150	dB/V	C
4.2	Power control range	V_{CTL} = 0.3 to 2.0 V			50			dB	C
4.3	Control voltage range			V_{CTL}	0.3		2.0	V	D
4.4	Control current	P_{IN} = 0 to 10 dBm, V_{CTL} = 0 to 2.0 V		I_{CTL}			200	µA	A

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes: 1. With external matching (see "Application Circuit").

4722B–SIGE–04/04

Electrical Characteristics for 2 W Application

$V_{CC} = V_{CC1}$, ... , V_{CC3}, $V_{CC, CTL}$ = 3.2 V, V_{CTL} = 1.9 V, T_{amb} = +25°C, external 50-Ω input and 50-Ω output match, P_{IN} = 5 dBm, f_{IN} = 900 MHz

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
5	**Power Supply**								
5.1	Supply voltage			V_{CC}	2.6	3.2	3.6	V	D
5.2	Current consumption in active mode			I		1.33		A	A
5.3	Current consumption (leakage current) in power-down mode	V_{CTL} ≤ 0.2 V		I			10	µA	A
6	**RF Input**								
6.1	Frequency range			f_{IN}	880	900	935	MHz	D
6.2	Input impedance[(1)]			Z_i		50		Ω	C
6.3	Input power			P_{IN}		5	12	dBm	C
6.4	Input VSWR[(1)]	P_{IN} = 0 to 12 dBm P_{OUT} = 30 dBm					2:1		C
7	**RF Output**								
7.1	Output impedance[(1)]			Z_o		50		Ω	C
7.2	Output power in normal conditions	V_{CC} = 3.2 V V_{CC} = 2.6 V		P_{OUT} P_{OUT}		33 30		dBm dBm	A
7.3	Minimum output power	V_{CTL} = 0.3 V				- 20		dBm	A
7.4	Power-added efficiency			PAE		47		%	A
7.5	Stability	Temp = -25 to + 85° C no spurious ≥ -60 dBc		VSWR			8:1		C
7.6	Load mismatch (stable, no damage)	P_{OUT} = 33 dBm, all phases		VSWR			8:1		C
7.7	Second harmonic distortion			2fo			-30	dBc	A
7.8	Third harmonic distortion			3fo			-30	dBc	A
7.9	Noise power f = 925 to 935 MHz f ≥ 935 MHz	P_{OUT} = 33 dBm RBW = 100 kHz				-73 -85	-70 -82	dBm dBm	C
7.10	Rise and fall time					TBD		µs	C
7.11	Isolation between input and output	P_{IN} = 0 to 10 dBm V_{CTL} ≤ 0.2 V (power down)			50			dB	C
8	**Power Control**								
8.1	Control curve	P_{OUT} ≥ 25 dBm					150	dB/V	C
8.2	Power control range	V_{CTL} = 0.3 to 2.0 V			50			dB	C
8.3	Control voltage range			V_{CTL}	0.3		2.0	V	D
8.4	Control current	P_{IN} = 0 to 10 dBm, V_{CTL} = 0 to 2.0 V		I_{CTL}			200	µA	A

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes: 1. With external matching (see "Application Circuit").

Figure 3. P_{OUT} and PAE versus V_{CC} (1 W Application)

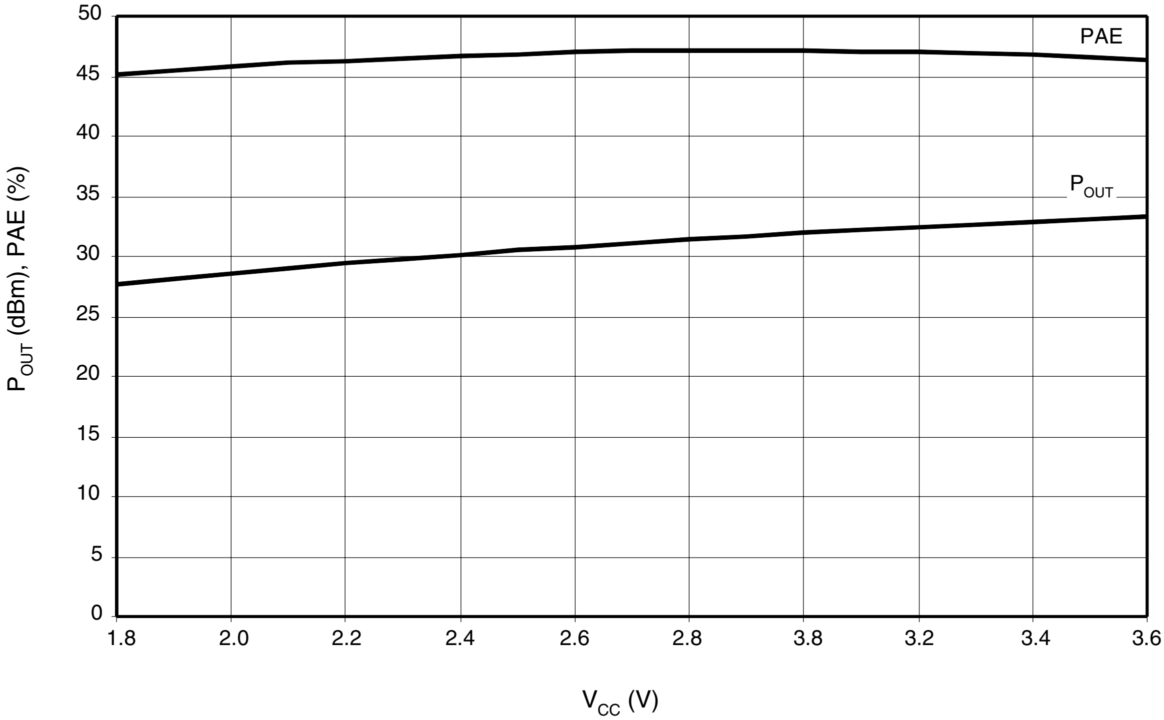


Figure 4. P_{OUT} and PAE versus V_{ramp} (1 W Application)

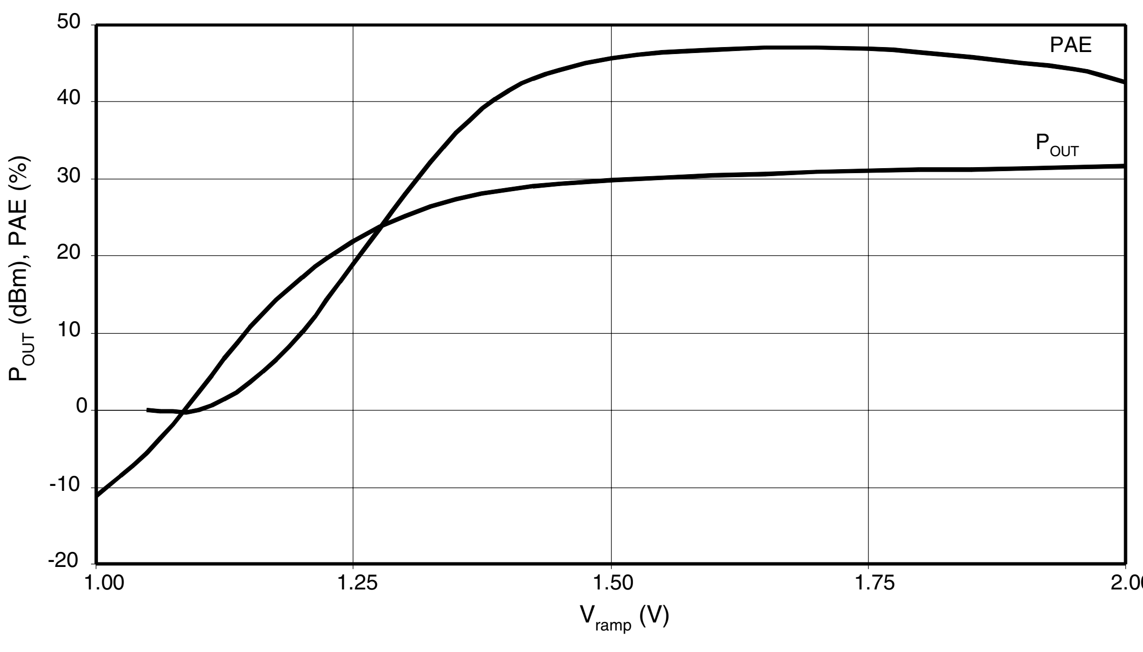


Figure 5. P_{OUT} and PAE versus V_{CC} (2 W Application)

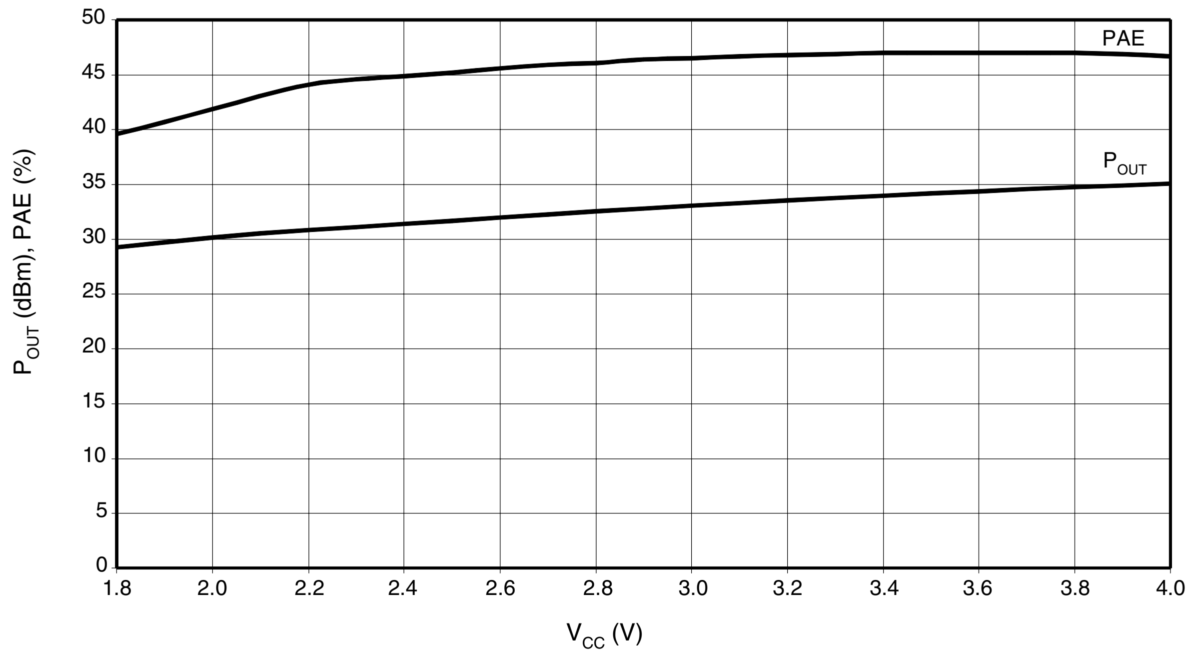
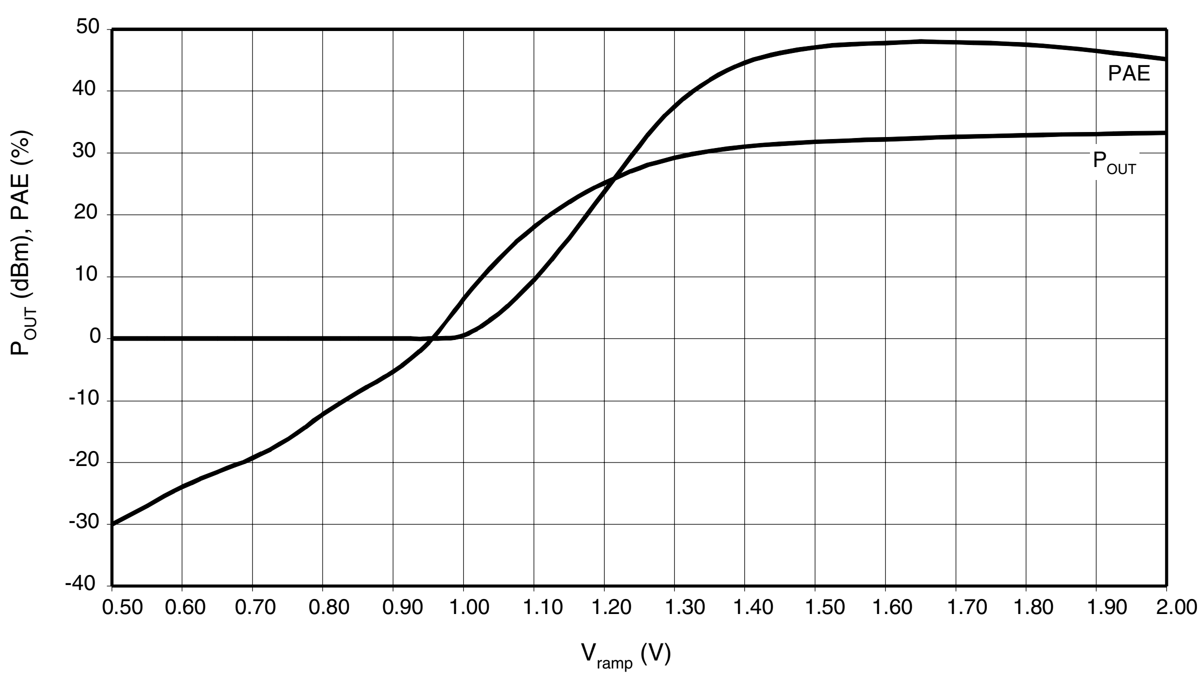
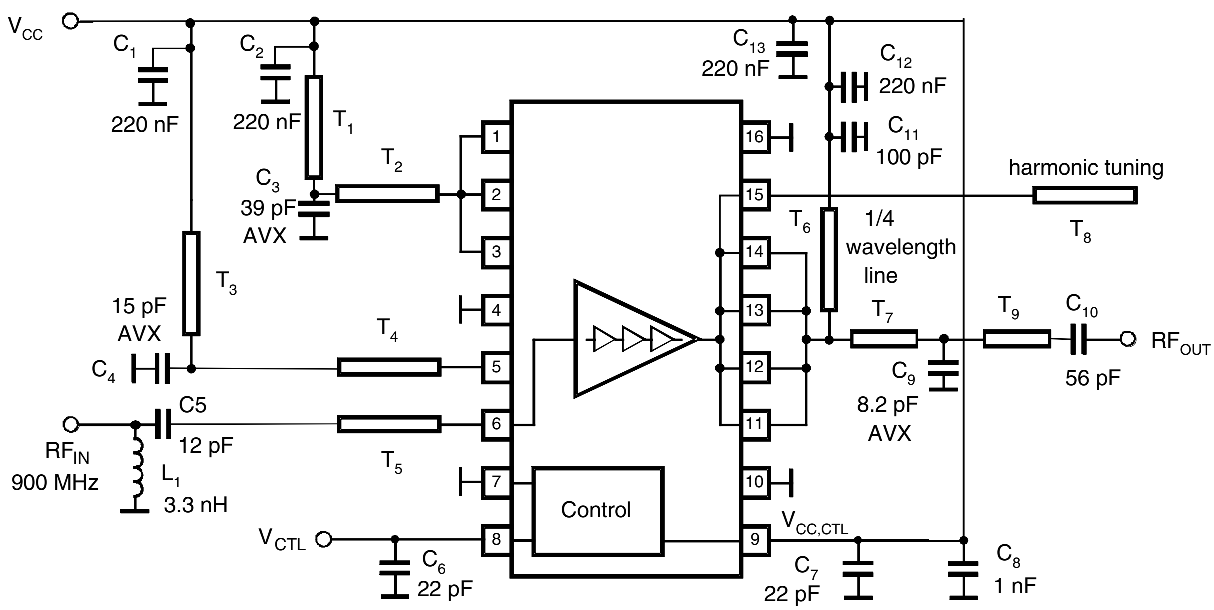


Figure 6. P_{OUT} and PAE versus V_{ramp} (2 W Application)



Application Circuit

Figure 7. Application Circuit GSM Pager (900 MHz)



Microstrip line : FR4 ; Epsilon(r) : 4.3 ; metal Cu : 35 µm
distance 1. layer -rf ground : 0.5 mm

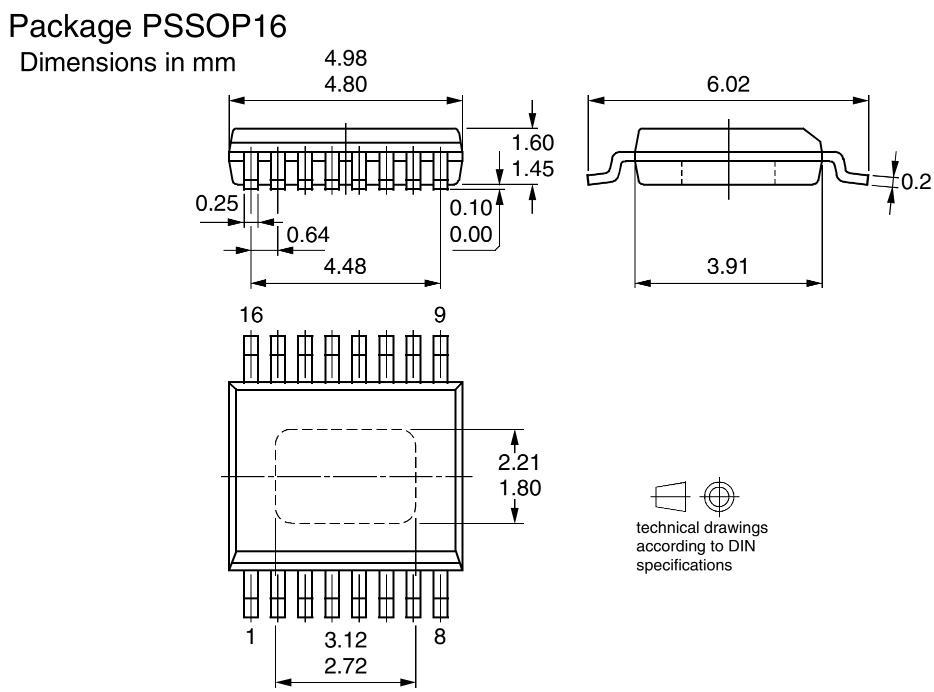
	l/mm		w/mm
T_1	20.5	x	1.0
T_2	1.3	x	1.0
T_3	14.8	x	0.5
T_4	14.2	x	0.5
T_5	2.5	x	1.0

	l/mm		w/mm
T_6	43.1	x	0.5
T_7	6.0	x	1.25
T_8	10.0	x	0.5
T_9	4.0	x	1.25

Ordering Information

Extended Type Number	Package	Remarks
T0930-TJT	PSSOP16	Tube
T0930-TJQ	PSSOP16	Taped and reeled

Package Information



Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe
Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia
Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards
Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive
Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Biometrics/Imaging/Hi-Rel MPU/
High Speed Converters/RF Datacom
Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

Literature Requests
www.atmel.com/literature

4722B–SIGE–04/04