

ISM 2.4 GHz Front End IC

Description

The T7024 is a monolithic SiGe transmit/ receive front end IC with power amplifier, low-noise amplifier and T/R switch driver. It is especially designed for operation in TDMA systems like Bluetooth and DECT. Due to the ramp-control feature and a very low quiescent current an external switch transistor for V_S is not required.



Electrostatic sensitive device.
Observe precautions for handling.



Features

- D** Single 3-V supply voltage
- D** High-power-added efficient power amplifier (P_{out} typ. 23 dBm)
- D** Ramp-controlled output power
- D** Low-noise preamplifier (NF typ. 2 dB)
- D** Biasing for external PIN diode T/R switch
- D** Current-saving standby mode
- D** Few external components
- D** PSSO20 plastic package with down set paddle heat slug

Block Diagram

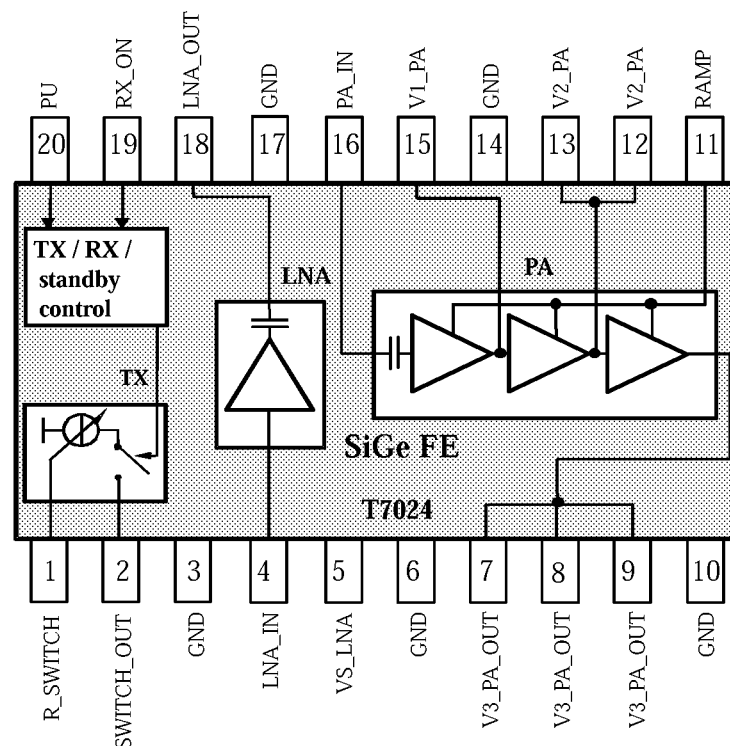


Figure 1. Block diagram

Ordering Information

Extended Type Number	Package	Remarks
T7024-LSS	PSSO20	Tube
T7024-LSQ	PSSO20	Taped and reeled

Pin Description

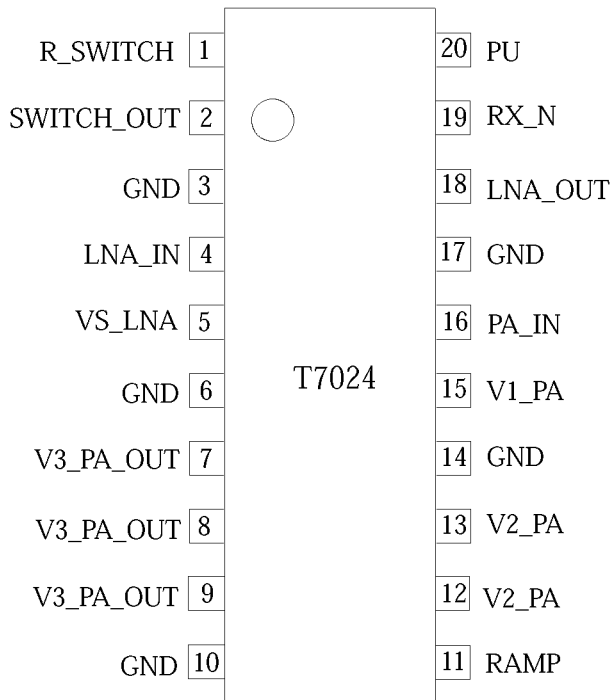


Figure 2. Pinning

Pin	Symbol	Function
1	R_SWITCH	Resistor to GND sets the PIN diode current
2	SWITCH_OUT	Switched current output for PIN diode
3	GND	Ground
4	LNA_IN	Low-noise amplifier input
5	VS_LNA	Supply voltage input for low-noise amplifier
6	GND	Ground
7	V3_PA_OUT	Inductor to power supply and matching network for power amplifier output
8		
9		
10	GND	Ground
11	RAMP	Power ramping control input
12	V2_PA	Inductor to power supply for power amplifier
13		
14	GND	Ground
15	V1_PA	Supply voltage for power amplifier
16	PA_IN	Power amplifier input
17	GND	Ground
18	LNA_OUT	Low-noise amplifier output
19	RX_ON	RX active high
20	PU	Power-up active high

Absolute Maximum Ratings

All voltages are referred to GND (Pin 3, 6, 10, 14, 17 and slug), no RF

Parameters	Symbol	Value	Unit
Supply voltage Pins 5, 7, 8, 9, 12, 13 and 15	V_S	6	V
Junction temperature	T_j	150	C
Storage temperature	T_{stg}	-40 to +125	C

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient	R_{thJA}	19	K/W

Operating Range

All voltages are referred to GND (Pins 3, 6, 10, 14, 17 and slug). Power supply points are VS_LNA, V1_PA, V2_PA, V3_PA_OUT. The following table represents the sum of all supply currents depending on the TX/RX mode.

Parameters		Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Pins 7, 8, 9, 12, 13 and 15	V _S	2.7	3.0	4.6	V
Supply voltage	Pin 5	V _S	2.7	3.0	5.5	V
Supply current	TX	I _S		190		mA
	RX	I _S		8		mA
Standby current	PU = 0	I _S		10		mA
Ambient temperature		T _{amb}	-25	+25	+70	C

Electrical Characteristics

Test conditions (unless otherwise specified): V_S = 3.0 V, T_{amb} = 25 C

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Power amplifier ¹⁾						
Supply voltage	Pins 7, 8, 9, 12, 13 and 15	V _S	2.7	3.0	4.6	V
Supply current	TX	I _{S_TX}		190		mA
	RX (PA off)	I _{S_RX}			10	mA
Standby current	Standby	I _{S_standby}			10	mA
Frequency range	TX	f	2.4		2.5	GHz
Power gain max.	TX Pin 16 to Pins 7, 8, 9	G _p		25		dB
Power gain min.	TX Pin 16 to Pins 7, 8, 9	G _p		-17		
Gain-control range	TX	? G _p		42		dB
Ramping voltage max.	TX, power gain (max) Pin 11	V _{RAMP max}		2.0		V
Ramping voltage min.	TX, power gain (min) Pin 11	V _{RAMP min}		0.1		V
Power-added efficiency	TX	PAE		35		%
Saturated output power	TX, input power = 0 dBm referred to Pins 7, 8 and 9	P _{sat}		23		dBm
Input matching ²⁾	TX Pin 16	Load VSWR		<1.5:1		
Output matching ²⁾	TX Pins 7, 8, 9	Load VSWR		<1.5:1		
Harmonics @P 1dBCP	TX Pins 7, 8, 9	2 fo		-30		dBc
		3 fo				
T/R-switch driver (current programming by external resistor from R_SWITCH to GND)						
Switch-out current output	Standby Pin 2	I _{S_O_standby}			1	mA
	RX	I _{S_O_RX}			1	mA
	TX @ 100 W	I _{S_O_100}		1		mA
	TX @ 1.2 kW	I _{S_O_1k2}		3		mA
	TX @ 33 kW	I _{S_O_33k}		10		mA

Note: 1) Power amplifier shall be unconditional stable, maximum duty cycle 100%, true cw operation, maximum load mismatch and duration t.b.d.

2) With external matching network, load impedance 50 W

Electrical Characteristics (continued)

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Low-noise amplifier ³⁾						
Supply voltage	All Pin 5	V _S	2.7	3.0	5.5	V
Supply current	RX	I _S		8		mA
Supply current (LNA and control logic)	TX (control logic active) Pin 5	I _S		1		mA
Standby current	Standby Pin 5	I _{S_standby}		1	10	mA
Frequency range	RX	f	2.4		2.5	GHz
Power gain	RX Pin 4 to Pin 18	G _p		16		dB
Noise figure	RX	NF		2.0		dB
Gain compression	RX, referred to Pin 18	O1dB		-7		dBm
3rd-order input interception point	RX	IIP3		-14		dBm
Input matching ⁴⁾	RX Pin 4	VSWR _{in}		<2:1		
Output matching ⁴⁾	RX Pin 18	VSWR _{out}		<2:1		
Logic input levels (RX_ON, PU)						
High input level	= '1' Pins 19 and 20	V _{iH}	2.4		V _S , LNA	V
Low input level	= '0'	V _{iL}	0		0.5	V
High input current	= '1'	I _{iH}		40		mA
Low input current	= '0'	I _{iL}			0.2	mA

3) Low-noise amplifier shall be unconditional stable

4) with external matching components

Control Logic

	PU		RX_ON
Power up	1	RX mode	1
Standby	0	TX mode	0

Package Information

Package PSSO20
 Dimensions in mm

