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## Features

- Single 3-V Supply Voltage
- High Power-added Efficient Power Amplifier ( $P_{out}$  typically 26.5 dBm)
- Ramp-controlled Output Power
- Low-noise Preamplifier (NF typically 1.8 dB)
- Biasing for External PIN Diode T/R Switch
- Current-saving Standby Mode
- Few External Components

Electrostatic sensitive device.  
Observe precautions for handling.



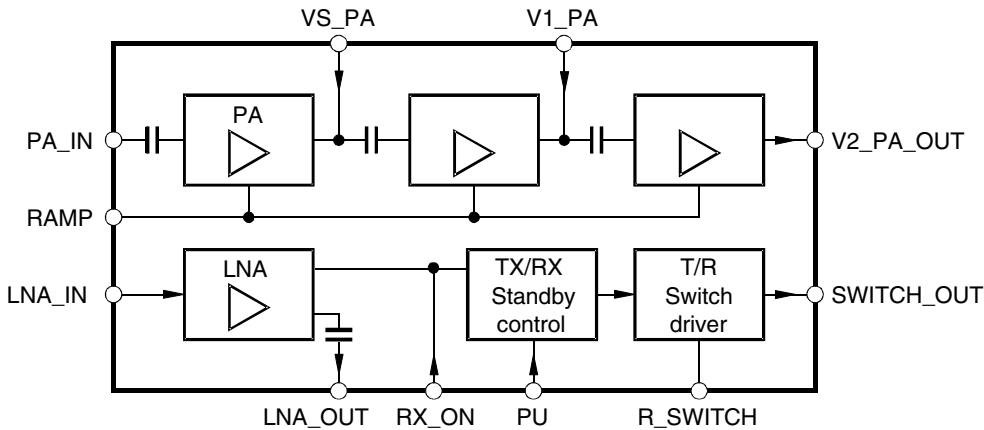
## DECT SiGe Front End IC

### U7004B

## Description

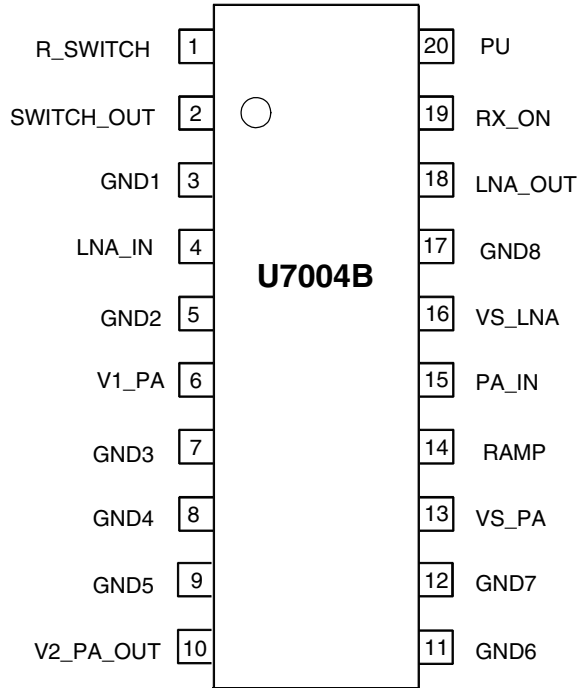
The U7004B is a monolithic SiGe transmit/receive front end IC with power amplifier, 50- $\Omega$  internal matching, low-noise amplifier and T/R switch driver. It is especially designed for operation in TDMA systems like DECT. Due to the ramp-control feature and a very low quiescent current, an external switch transistor for  $V_S$  is not required.

Figure 1. Block Diagram



## Pin Configuration

Figure 2. Pinning SSO20



## Pin Description

Pin	Symbol	Function
1	R_SWITCH	Resistor to GND sets the PIN diode current
2	SWITCH_OUT	Switched current output for PIN diode
3	GND1	Ground
4	LNA_IN	Low-noise amplifier input
5	GND2	Ground
6	V1_PA	Inductor to power supply for power amplifier
7	GND3	Ground
8	GND4	Ground
9	GND5	Ground
10	V2_PA_OUT	Inductor to power supply and matching network for power amplifier output
11	GND6	Ground
12	GND7	Ground
13	VS_PA	Supply voltage for power amplifier
14	RAMP	Power-ramping control input
15	PA_IN	Power amplifier input
16	VS_LNA	Supply-voltage input for low-noise amplifier
17	GND8	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 refer to GND (pins 3, 5, 7, 8, 9, 11, 12 and 17), ESD protection according to ESD-S5.2-1994, Class M1.

Parameters	Symbol	Value	Unit
Supply voltage pins 6, 10, 13 and 16 (no RF)	$V_S$	5	V
Duty cycle PA		50	%
Burst duration PA		5	ms
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-40 to +125	°C
Input power PA pin 15	$P_{inPA}$	+10	dBm
Input power LNA pin 4	$P_{inLNA}$	-5	dBm

## Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient	$R_{thJA}$	95	K/W

## Operating Range

All voltages refer to GND (Pins 3, 5, 7, 8, 9, 11, 12 and 17). The following table represents the sum of all supply currents depending on the TX/RX mode. Power supply points are VS\_LNA, VS\_PA, V1\_PA, V2\_PA\_OUT.

Parameters	Symbol	Min.	Typ.	Max.	Unit
Supply voltage pins 6, 10 and 13	$V_S$	2.7	3.6	4.6	V
Supply voltage pin 16	$V_S$	2.7	3.6	4.6	V
Supply current TX	$I_S$		450		mA
RX	$I_S$		8		mA
Standby current PU = 0	$I_S$		10		µA
Ambient temperature	$T_{amb}$	-25	+25	+70	°C

## Electrical Characteristics

Test conditions (unless otherwise specified):  $V_S = 3.6\text{ V}$ ,  $T_{amb} = 25^\circ\text{C}$ , pulsed mode, duty cycle 4.17%,  $t_{on} = 417\ \mu\text{s}$

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
<b>Power Amplifier <sup>(1)</sup></b>						
Supply voltage	Pins 6, 10 and 13	$V_S$	2.7	3.6	4.6	V
Supply current	TX	$I_{S\_TX}$		450		mA
Supply current	RX (PA off)	$I_{S\_RX}$			10	µA
Standby current	Standby	$I_{S\_standby}$			10	µA
Frequency range	TX	f	1.88		1.94	GHz
Power gain	TX, pin 15 to pin 10	Gp		28		dB
Gain-control range	TX	$\Delta Gp$		48		dB

- Notes:
1. Power amplifier shall be unconditionally stable, maximum duty cycle 50%, maximum load mismatch and duration: load VSWR = 20:1 (all phases) 10 s,  $Z_G = 50\ \Omega$
  2. With external matching network (see Figure 13 and Figure 14)
  3. Low-noise amplifier shall be unconditionally stable

## Electrical Characteristics (Continued)

Test conditions (unless otherwise specified):  $V_S = 3.6\text{ V}$ ,  $T_{\text{amb}} = 25^\circ\text{C}$ , pulsed mode, duty cycle 4.17%,  $t_{\text{on}} = 417\ \mu\text{s}$

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Ramping voltage	TX, power gain (max), pin 14	$V_{\text{RAMP max}}$		2.1		V
Ramping current	TX, power gain (max), pin 14	$I_{\text{RAMP}}$		0.5	2.0	mA
Power-added efficiency	TX	PAE		30		%
Saturated output power	TX, refer to pin 10	$P_{\text{sat}}$		26.5		dBm
Input matching <sup>(2)</sup>	TX, pin 15	VSWRin		< 2:1		
Output matching <sup>(2)</sup>	TX, pin 10	VSWRout		< 2:1		
Harmonics at P 1dB	TX, pin 10	2 fo 3 fo		-30		dBc
Maximum input power	Pin 15	$P_{\text{inPA}}$		10		dBm
Stability (non harmonic emission)	TX, pin 10 $P_{\text{in}} = 2\ \text{dBm}$ , $V_{\text{RAMP}} = 2\ \text{V}$ VSWRout < 10:1 (all phases)			-60		dBc
<b>T/R Switch Driver (Currently Programmed by External Resistor from R_SWITCH to GND)</b>						
Switch-out current output	Standby, pin 2	$I_{\text{S}_O\_standby}$			2	$\mu\text{A}$
Switch-out current output	RX	$I_{\text{S}_O\_RX}$			2	$\mu\text{A}$
Switch-out current output	TX at 100 $\Omega$	$I_{\text{S}_O\_100}$		1		mA
Switch-out current output	TX at 1.2 k $\Omega$	$I_{\text{S}_O\_1k2}$		3		mA
Switch-out current output	TX at 33 k $\Omega$	$I_{\text{S}_O\_33k}$		10		mA
<b>Low-noise Amplifier <sup>(3)</sup></b>						
Supply voltage	All, pin 16	$V_S$	2.7	3.6	4.6	V
Supply current	RX	$I_S$		8		mA
Supply current (LNA and control logic)	TX (control logic active), pin 16	$I_S$		300		$\mu\text{A}$
Standby current	Standby, pin 16	$I_S$		1	10	$\mu\text{A}$
Frequency range	RX	f	1.88		1.94	GHz
Power gain	RX, pin 4 to pin 18	Gp	17	19		dB
Noise figure	RX	NF		1.8	2.0	dB
Gain compression	RX, refer to pin 18	P1dB		-7		dBm
3rd-order input interception point	RX	IIP3		-15		dBm
Input matching	RX	VSWRin		< 2:1		
Output matching	RX	VSWRin		< 2:1		
<b>Logic Input Levels (RX_ON, PU)</b>						
High input level	= 1, pins 19 and 20	$V_{\text{iH}}$	2.4		$V_S$	V
Low input level	= 0	$V_{\text{iL}}$	0		0.5	V
High input current	= 1	$I_{\text{iH}}$		40		$\mu\text{A}$
Low input current	= 0	$I_{\text{iL}}$		0		$\mu\text{A}$

Notes: 1. Power amplifier shall be unconditionally stable, maximum duty cycle 50%, maximum load mismatch and duration: load VSWR = 20:1 (all phases) 10 s,  $Z_G = 50\ \Omega$

2. With external matching network (see Figure 13 and Figure 14)

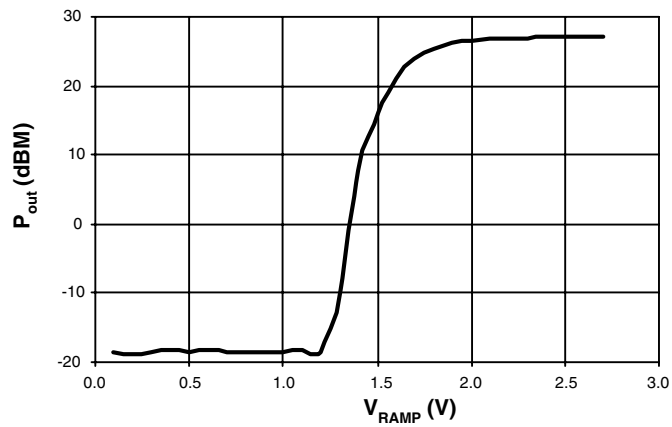
3. Low-noise amplifier shall be unconditionally stable

## Control Logic

**Table 1.** Control Logic for LNA and T/R Switch Driver

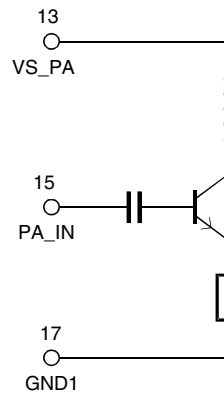
Operation Mode	PU	RX_ON
Standby	0	0
TX	1	0
RX	1	1

**Figure 3.** Output Power versus Ramp Voltage

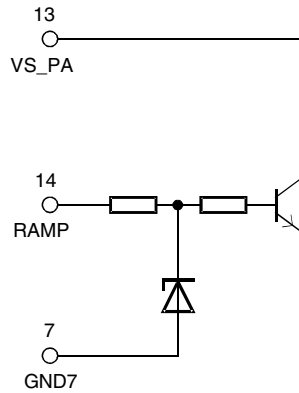


## Input/Output Circuits

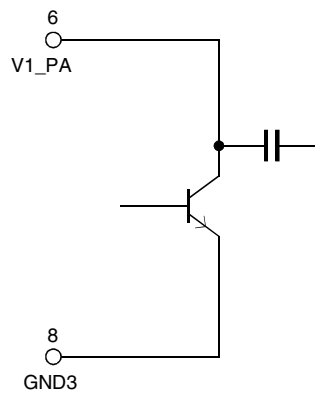
**Figure 4.** Input Circuit PA\_IN/VS\_PA



**Figure 5.** Input Circuit RAMP/VS\_PA



**Figure 6.** Input Circuit V1\_PA



**Figure 7.** Input/Output Circuit V2\_PA

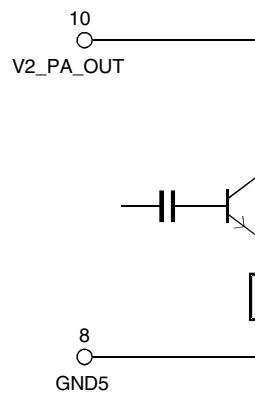


Figure 8. Input Circuit LNA\_IN/VS\_LNA

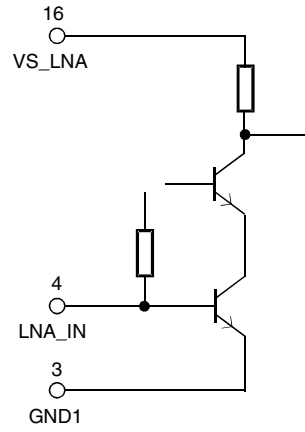
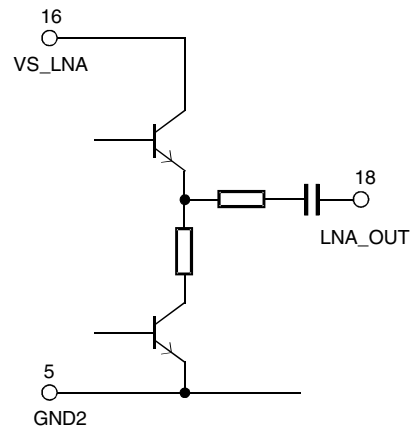
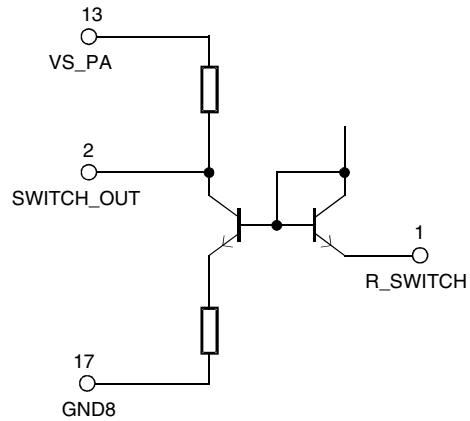


Figure 9. Output Circuit LNA\_OUT

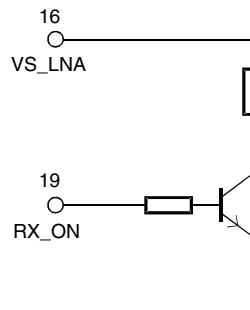




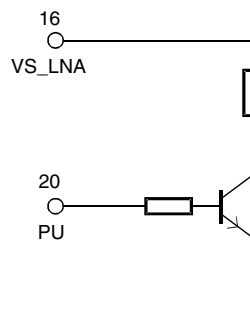
**Figure 10.** Input Circuit SWITCH\_OUT/R\_SWITCH



**Figure 11.** Input Circuit RX\_ON

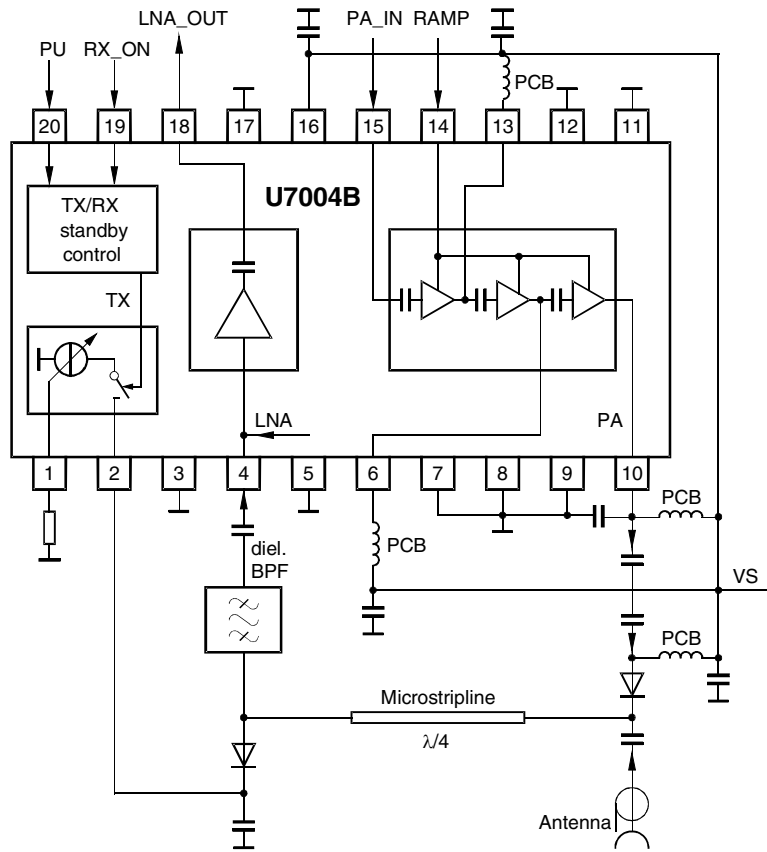


**Figure 12.** Input Circuit PU

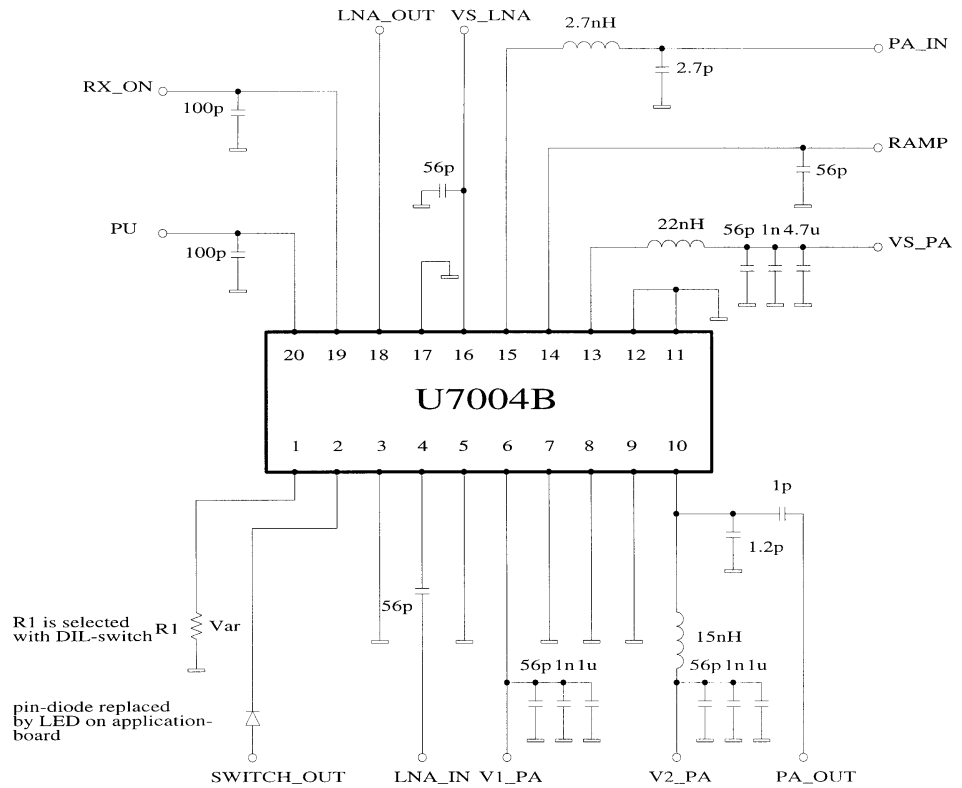


# Typical Application Circuit

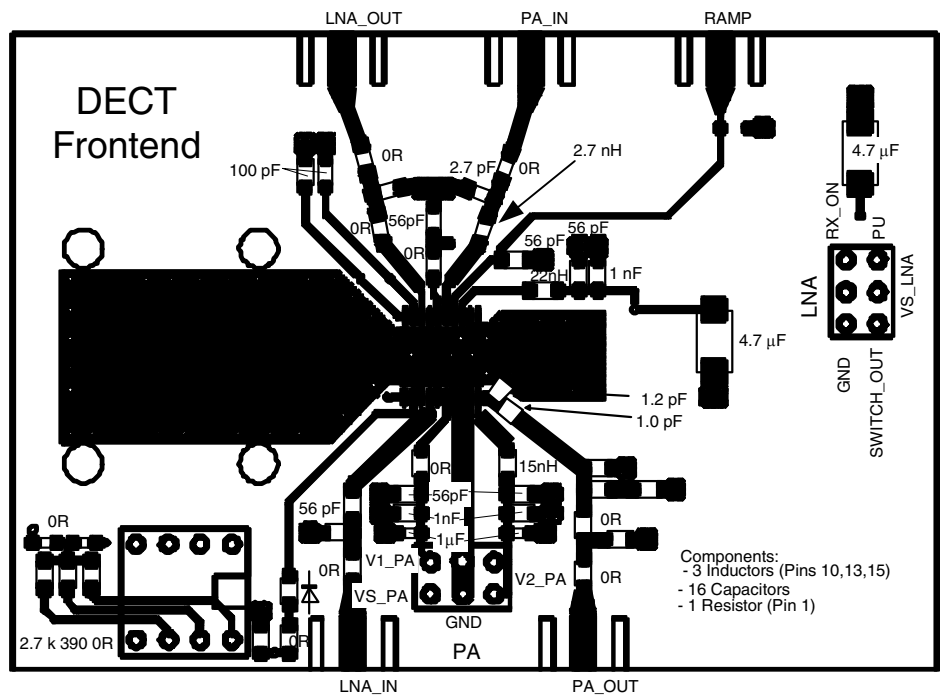
Figure 13. Typical Schematic



**Figure 14. U7004B Application Board Schematic**



**Figure 15. U7004B Application Board Layout**

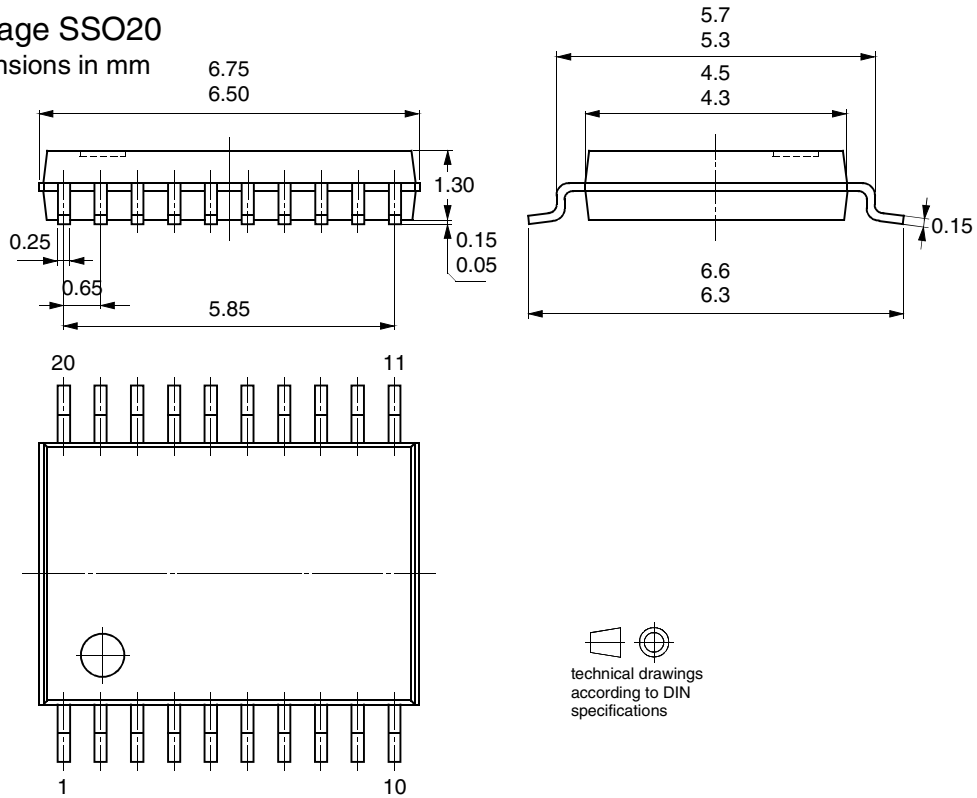


### Ordering Information

Extended Type Number	Package	Remarks
U7004B-MFS	SSO20	Tube
U7004B-MFSG3	SSO20	Taped and reeled

### Package Information

Package SSO20  
Dimensions in mm





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