



Wireless Components

ASK/FSK Transmitter 868/433 MHz

TDA 5100 Version 2.1

Addendum for the extended temperature range -40 to +105°C

Specification June 2001

Revision History		
Current Version: 2.1 as of 12.06..2001		
Previous Version: 2.0, November 2000		
Page (in previous Version)	Page (in current Version)	Subjects (major changes since last revision)
2-7	2-7	Limits tightened for: Supply Current, Saturation Voltage of Clock Driver Output and Output Power
4,7	4,7	Supply-voltage dependency of Output Power added as footnote
4,7	4,7	Limits corrected for Input current CSEL

ABM®, AOP®, ARCOFI®, ARCOFI®-BA, ARCOFI®-SP, DigiTape®, EPIC®-1, EPIC®-S, ELIC®, FALC®54, FALC®56, FALC®-E1, FALC®-LH, IDEC®, IOM®, IOM®-1, IOM®-2, IPAT®-2, ISAC®-P, ISAC®-S, ISAC®-S TE, ISAC®-P TE, ITAC®, IWE®, MUSAC®-A, OCTAT®-P, QUAT®-S, SICAT®, SICOFI®, SICOFI®-2, SICOFI®-4, SICOFI®-4μC, SLICOFI® are registered trademarks of Infineon Technologies AG.

Edition 30.11.2000

**Published by Infineon Technologies AG,
Balanstraße 73,
81541 München**

© Infineon Technologies AG 2001.
All Rights Reserved.

Attention please!

As far as patents or other rights of third parties are concerned, liability is only assumed for components, not for applications, processes and circuits implemented within components or assemblies.

The information describes the type of component and shall not be considered as assured characteristics.

Terms of delivery and rights to change design reserved.

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies AG is an approved CECC manufacturer.

Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport.

For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

Components used in life-support devices or systems must be expressly authorized for such purpose!

Critical components¹ of the Infineon Technologies AG, may only be used in life-support devices or systems² with the express written approval of the Infineon Technologies AG.

- 1 A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or effectiveness of that device or system.
- 2 Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health of the user may be endangered.

1. Extended Absolute Maximum Ratings

The AC/DC characteristic limits are not guaranteed. The maximum ratings must not be exceeded under any circumstances, not even momentarily and individually, as permanent damage to the IC may result.

Table 1-1

Parameter	Symbol	Limit Values		Unit	Remarks
		Min	Max		
Junction Temperature	T_J	-40	150	°C	
Storage Temperature	T_S	-40	125	°C	
Thermal Resistance	R_{thSA}		230	K/W	
ESD integrity, all pins	V_{ESD}	-1	+1	kV	100pF, 1500 Ω

Ambient Temperature under bias: T_A = -40 to +105°C

2. Extended Operating Range

Within the operational range the IC operates as described in the circuit description. The AC / DC characteristic limits are not guaranteed

Table 2-1

Parameter	Symbol	Limit Values		Unit	Test Conditions
		Min	Max		
Supply voltage	V_S	2.1	4.0	V	-40°C to +85°C
Supply voltage	V_S	2.2	4.0	V	+85°C to +105°C
Ambient temperature	T_A	-40	105	°C	

3. Extended AC/DC Characteristics

3.1. AC/DC Characteristics at 3 V, -40°C ... +105°C

Table 3-1 Supply Voltage V _S = 3 V, Ambient temperature T _{amb} = -40°C ... +105°C						
Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min	Typ	Max		
Current consumption						
Stand-by mode	I _{S PDWN}			1000	nA	V (Pins 1, 6 and 7) < 0.2 V
PLL enable mode	I _{S PLL_EN}		3.3	4.6	mA	
Transmit mode	I _{S TRANSM}		7	8.7	mA	Load tank see Specification TDA5100V2.1 Figures 4-1 and 4-2
Power Down Mode Control (Pin 1)						
Stand-by mode	V _{PDWN}	0		0.5	V	V _{ASKDTA} < 0.2 V V _{FSKDTA} < 0.2 V
PLL enable mode	V _{PDWN}	1.5		V _S	V	V _{ASKDTA} < 0.5 V
Transmit mode	V _{PDWN}	1.5		V _S	V	V _{ASKDTA} > 1.5 V
Input bias current PDWN	I _{PDWN}			30	μA	V _{PDWN} = V _S
Low Power Detect Output (Pin 2)						
Internal pull up current	I _{LPD1}	30			μA	V _S = 2.3 V ... V _S
Input current low voltage	I _{LPD2}	0.7			mA	V _S = 1.9 V ... 2.05 V
Loop Filter (Pin 4)						
VCO tuning voltage	V _{LF}	V _S - 1.91		V _S - 0.45	V	f _{VCO} = 869 MHz
Output frequency range 868 MHz-band	f _{OUT, 868}	865	869	874	MHz	V _S -V _{LF} = 0.38...2.01V V _{FSEL} = V _S
Output frequency range 433 MHz-band	f _{OUT, 433}	432.5	434.5	437.5	MHz	V _S -V _{LF} = 0.38...2.01V V _{FSEL} = 0 V
ASK Modulation Data Input (Pin 6)						
ASK Transmit disabled	V _{ASKDTA}	0		0.5	V	
ASK Transmit enabled	V _{ASKDTA}	1.5		V _S	V	
Input bias current ASKDTA	I _{ASKDTA}			30	μA	V _{ASKDTA} = V _S
Input bias current ASKDTA	I _{ASKDTA}	-20			μA	V _{ASKDTA} = 0 V
ASK data rate	f _{ASKDTA}			20	kHz	

Table 3-1 Supply Voltage $V_S = 3\text{ V}$, Ambient temperature $T_{\text{amb}} = -40^\circ\text{C} \dots +105^\circ\text{C}$

Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min	Typ	Max		
FSK Modulation Data Input (Pin 7)						
FSK Switch on	V _{FSKDTA}	0		0.5	V	
FSK Switch off	V _{FSKDTA}	1.5		V _S	V	
Input bias current FSKDTA	I _{FSKDTA}			30	μA	V _{FSKDTA} = V _S
Input bias current FSKDTA	I _{FSKDTA}	-20			μA	V _{FSKDTA} = 0 V
FSK data rate	f _{FSKDTA}			20	kHz	
Clock Driver Output (Pin 8)						
Output current (Low)	I _{CLKOUT}	0.95			mA	V _{CLKOUT} = V _S
Output current (High)	I _{CLKOUT}			5	μA	V _{CLKOUT} = V _S
Saturation Voltage (Low) ¹⁾	V _{SATL}			0.49	V	I _{CLKOUT} = 0.75 mA
Clock Divider Control (Pin 9)						
Setting Clock Driver output frequency f _{CLKOUT} =3.39 MHz	V _{CLKDIV}	0		0.2	V	
Setting Clock Driver output frequency f _{CLKOUT} =847.5kHz	V _{CLKDIV}				V	pin open
Input bias current CLKDIV	I _{CLKDIV}			30	μA	V _{CLKDIV} = V _S
Input bias current CLKDIV	I _{CLKDIV}	-20			μA	V _{CLKDIV} = 0 V
Crystal Oscillator Input (Pin 10)						
Load capacitance	C _{COSCmax}			5	pF	
Serial Resistance of the crystal				100	Ω	f = 6.78 MHz
Input inductance of the COSC pin			12		μH	f = 6.78 MHz
Serial Resistance of the crystal				100	Ω	f = 13.56 MHz
Input inductance of the COSC pin			11		μH	f = 13.56 MHz
FSK Switch Output (Pin 11)						
On resistance	R _{FSKOUT}			220	Ω	V _{FSKDTA} = 0 V
On capacitance	C _{FSKOUT}			6	pF	V _{FSKDTA} = 0 V
Off resistance	R _{FSKOUT}	10			kΩ	V _{FSKDTA} = V _S
Off capacitance	C _{FSKOUT}			1.5	pF	V _{FSKDTA} = V _S

Table 3-1 Supply Voltage $V_S = 3\text{ V}$, Ambient temperature $T_{\text{amb}} = -40^\circ\text{C} \dots +105^\circ\text{C}$

Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min	Typ	Max		
Power Amplifier Output (Pin 14)						
Output Power ²⁾ at 434 MHz transformed to 50 Ohm	P _{OUT434}	2.3	5	6.5	dBm	f _{OUT} = 434 MHz V _{FSEL} = 0 V
Output Power ³⁾ at 868 MHz transformed to 50 Ohm.	P _{OUT868}	-2.8	2	5.1	dBm	f _{OUT} = 868 MHz V _{FSEL} = V _S
Frequency Range Selection (Pin 15)						
Transmit frequency 434 MHz	V _{FSEL}	0		0.5	V	
Transmit frequency 868 MHz	V _{FSEL}				V	pin open
Input bias current FSEL	I _{FSEL}			30	μA	V _{FSEL} = V _S
Input bias current FSEL	I _{FSEL}	-20			μA	V _{FSEL} = 0 V
Crystal Frequency Selection (Pin 16)						
Crystal frequency 6.78 MHz	V _{CSEL}	0		0.2	V	
Crystal frequency 13.56 MHz	V _{CSEL}				V	pin open
Input bias current CSEL	I _{CSEL}			50	μA	V _{CSEL} = V _S
Input bias current CSEL	I _{CSEL}	-25			μA	V _{CSEL} = 0 V

- 1) Derating linearly to a saturation voltage of max. 150 mV at $I_{\text{CLKOUT}} = 0\text{ mA}$
- 2) Matching circuitry as used in the 50 Ohm-Output Testboard for 434 MHz operation.
Range @ 3.0 V, +25°C: 5.0 dBm +/- 1.0 dBm
Temperature dependency at 3.0 V: +0.5 dBm@-40°C and -1.7 dBm@+105°C, reference +25°C
- 3) Matching circuitry as used in the 50 Ohm-Output Testboard for 868 MHz operation.
Range @ 3.0 V, +25°C: 2.0 dBm +/- 2.0 dBm
Temperature dependency at 3.0 V: +1.1 dBm@-40°C and -2.8 dBm@+105°C, reference +25°C

A higher load impedance reduces the temperature dependency.

3.2. AC/DC Characteristics at 2.1 V ... 4.0 V, -40°C ... +105°C

Table 3-2 Supply Voltage $V_S = 2.1 \text{ V} \dots 4.0 \text{ V}$, Ambient temperature $T_{\text{amb}} = -40^\circ\text{C} \dots +105^\circ\text{C}$

Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min	Typ	Max		
Current consumption						
Stand-by mode	I _{S PDWN}			1000	nA	V (Pins 1, 6 and 7) < 0.2 V
PLL enable mode	I _{S PLL_EN}		3.3	4.8	mA	
Transmit mode	I _{S TRANSM}		7	9.2	mA	Load tank see Specification TDA5100V2.1 Figures 4-1 and 4-2
Power Down Mode Control (Pin 1)						
Stand-by mode	V _{PDWN}	0		0.5	V	V _{ASKDTA} < 0.2 V V _{FSKDTA} < 0.2 V
PLL enable mode	V _{PDWN}	1.5		V _S	V	V _{ASKDTA} < 0.5 V
Transmit mode	V _{PDWN}	1.5		V _S	V	V _{ASKDTA} > 1.5 V
Input bias current PDWN	I _{PDWN}			30	μA	V _{PDWN} = V _S
Low Power Detect Output (Pin 2)						
Internal pull up current	I _{LPD1}	30			μA	V _S = 2.3 V ... V _S
Input current low voltage	I _{LPD2}	0.7			mA	V _S = 1.9 V ... 2.1 V
Loop Filter (Pin 4)						
VCO tuning voltage	V _{LF}	V _S - 1.91		V _S - 0.45	V	f _{VCO} = 869 MHz
Output frequency range 868 MHz-band	f _{OUT, 868}	865	869	874	MHz	V _S -V _{LF} = 0.38...2.01V V _{FSEL} = V _S
Output frequency range 433 MHz-band	f _{OUT, 433}	432.5	434.5	437	MHz	V _S -V _{LF} = 0.38...2.01V V _{FSEL} = 0 V
ASK Modulation Data Input (Pin 6)						
ASK Transmit disabled	V _{ASKDTA}	0		0.5	V	
ASK Transmit enabled	V _{ASKDTA}	1.5		V _S	V	
Input bias current ASKDTA	I _{ASKDTA}			30	μA	V _{ASKDTA} = V _S
Input bias current ASKDTA	I _{ASKDTA}	-20			μA	V _{ASKDTA} = 0 V
ASK data rate	f _{ASKDTA}			20	kHz	

Table 3-2 Supply Voltage $V_S = 2.1\text{ V} \dots 4.0\text{ V}$, Ambient temperature $T_{\text{amb}} = -40^\circ\text{C} \dots +105^\circ\text{C}$

Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min	Typ	Max		
FSK Modulation Data Input (Pin 7)						
FSK Switch on	V _{FSKDTA}	0		0.5	V	
FSK Switch off	V _{FSKDTA}	1.5		V _S	V	
Input bias current FSKDTA	I _{FSKDTA}			30	μA	V _{FSKDTA} = V _S
Input bias current FSKDTA	I _{FSKDTA}	-20			μA	V _{FSKDTA} = 0 V
FSK data rate	f _{FSKDTA}			20	kHz	
Clock Driver Output (Pin 8)						
Output current (Low)	I _{CLKOUT}	0.9			mA	V _{CLKOUT} = V _S
Output current (High)	I _{CLKOUT}			5	μA	V _{CLKOUT} = V _S
Saturation Voltage (Low) ¹⁾	V _{SATL}			0.47	V	I _{CLKOUT} = 0.7 mA
Clock Divider Control (Pin 9)						
Setting Clock Driver output frequency f _{CLKOUT} =3.39 MHz	V _{CLKDIV}	0		0.2	V	
Setting Clock Driver output frequency f _{CLKOUT} =847.5kHz	V _{CLKDIV}				V	pin open
Input bias current CLKDIV	I _{CLKDIV}			30	μA	V _{CLKDIV} = V _S
Input bias current CLKDIV	I _{CLKDIV}	-20			μA	V _{CLKDIV} = 0 V
Crystal Oscillator Input (Pin 10)						
Load capacitance	C _{COSCmax}			5	pF	
Serial Resistance of the crystal				100	Ω	f = 6.78 MHz
Input inductance of the COSC pin			12		μH	f = 6.78 MHz
Serial Resistance of the crystal				100	Ω	f = 13.56 MHz
Input inductance of the COSC pin			11		μH	f = 13.56 MHz
FSK Switch Output (Pin 11)						
On resistance	R _{FSKOUT}			220	Ω	V _{FSKDTA} = 0 V
On capacitance	C _{FSKOUT}			6	pF	V _{FSKDTA} = 0 V
Off resistance	R _{FSKOUT}	10			kΩ	V _{FSKDTA} = V _S
Off capacitance	C _{FSKOUT}			1.5	pF	V _{FSKDTA} = V _S

Table 3-2 Supply Voltage $V_S = 2.1\text{ V} \dots 4.0\text{ V}$, Ambient temperature $T_{\text{amb}} = -40^\circ\text{C} \dots +105^\circ\text{C}$

Parameter	Symbol	Limit Values			Unit	Test Conditions
		Min	Typ	Max		
Power Amplifier Output (Pin 14)						
Output Power ²⁾ at 434 MHz transformed to 50 Ohm. V _{FSEL} = 0 V	P _{OUT, 434}	0.6	2.5	3.6	dBm	V _S = 2.2 V
	P _{OUT, 434}	2.3	5	6.5	dBm	V _S = 3.0 V
	P _{OUT, 434}	2.6	6.8	9.4	dBm	V _S = 4.0 V
Output Power ³⁾ at 868 MHz transformed to 50 Ohm. V _{FSEL} = V _S	P _{OUT, 868}	-2.9	0.5	2.2	dBm	V _S = 2.2 V
	P _{OUT, 868}	-2.8	2	5.1	dBm	V _S = 3.0 V
	P _{OUT, 868}	-2.7	3.2	7.4	dBm	V _S = 4.0 V
Frequency Range Selection (Pin 15)						
Transmit frequency 433 MHz	V _{FSEL}	0		0.5	V	
Transmit frequency 868 MHz	V _{FSEL}				V	pin open
Input bias current FSEL	I _{FSEL}			30	μA	V _{FSEL} = V _S
Input bias current FSEL	I _{FSEL}	-20			μA	V _{FSEL} = 0 V
Crystal Frequency Selection (Pin 16)						
Crystal frequency 6.78 MHz	V _{CSEL}	0		0.2	V	
Crystal frequency 13.56 MHz	V _{CSEL}				V	pin open
Input bias current CSEL	I _{CSEL}			50	μA	V _{CSEL} = V _S
Input bias current CSEL	I _{CSEL}	-25			μA	V _{CSEL} = 0 V

- 1) Derating linearly to a saturation voltage of max. 150 mV at $I_{\text{CLKOUT}} = 0\text{ mA}$
- 2) Matching circuitry as used in the 50 Ohm-Output Testboard for 434 MHz operation.
 Range @ 2.2 V, +25°C: 2.5 dBm +/- 0.7 dBm
 Temperature dependency at 2.2 V: +0.4 dBm@-40°C and -1.2 dBm@+105°C, reference +25°C
 Range @ 3.0 V, +25°C: 5.0 dBm +/- 1.0 dBm
 Temperature dependency at 3.0 V: +0.5 dBm@-40°C and -1.7 dBm@+105°C, reference +25°C
 Range @ 4.0 V, +25°C: 6.8 dBm +/- 2.0 dBm
 Temperature dependency at 4.0 V: +0.6 dBm@-40°C and -2.2 dBm@+105°C, reference +25°C
- 3) Matching circuitry as used in the 50 Ohm-Output Testboard for 868 MHz operation.
 Range @ 2.2 V, +25°C: 0.5 dBm +/- 1.0 dBm
 Temperature dependency at 2.2 V: +0.7 dBm@-40°C and -2.4 dBm@+105°C, reference +25°C
 Range @ 3.0 V, +25°C: 2.0 dBm +/- 2.0 dBm
 Temperature dependency at 3.0 V: +1.1 dBm@-40°C and -2.8 dBm@+105°C, reference +25°C
 Range @ 4.0 V, +25°C: 3.2 dBm +/- 2.7 dBm
 Temperature dependency at 4.0 V: +1.5 dBm@-40°C and -3.2 dBm@+105°C, reference +25°C

A smaller load impedance reduces the supply-voltage dependency.
 A higher load impedance reduces the temperature dependency.