

# **PAMS Technical Documentation**

## **TFF-3 WLL Terminal**

# **System Module JM1**

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## Terminal TFF-3 System Module JM1

### Introduction

The Baseband module controls the internal operation of the phone. It controls the user interface and audio interface functions. The module performs all signalling towards the system and carries out audio-frequency signal processing. The module controls the operation of the transceiver and stores the tuning data for the phone. Also the subscriber line interface between the WLL terminal and a land-line phone is performed in the baseband module. In addition there is an immobilizer switch to detect movement of the terminal after mounting.

### System Module

All functional blocks of the baseband are mounted on a single multi layer printed circuit board. This board contains also the RF-parts. The chassis of the transceiver unit comprises separating walls for baseband and RF. Components of the baseband are surface mounted, except a few. The surface mountable components are soldered using reflow and the axial ones manually. The connections to accessories are fed through the system connector of the transceiver unit. There is no physical connector between the RF and baseband.

Name of submodule	Notes
CTRLU	Control Unit for the phone
PWRU	Power supply unit
AUDIO	Audio unit
SLIC	Subscriber Line Interface module for land-line phone
RX	Receiver
TX	Transmitter
SYNTH	Synthesizer

These blocks are only functional blocks and therefore have no type nor material codes. The circuit diagram is found in the Schematics section.

The nominal supply voltage is 13.5V. Actual supply voltage can vary 10.6V to 14.5V. The baseband and logic supply voltage is nominal 2.8V.

## CTRLU

The control block controls all of the functions of the phone and it comprises the memories and the SIS-processor. An immobilizer switch is included.

### Block description

#### – CTRLU – PWRU

The MCU controls the watchdog timer in the PSA. It sends a positive pulse at approximately 1 s intervals to the XPWROFF pin of the PSA to keep the power on. If the CTRLU fails to deliver this pulse, the PSA will remove power from the system. After the watchdog has elapsed the PSA cuts off the supply voltages from the phone and starts again.

The flash voltage control connects programming voltage to the flash memory and also disables the watchdog reset.

#### – CTRLU – AUDIO

The interface between the MCU and the MASI circuit is a bidirectional 8-bit data bus with 4 address lines. Address, data and control lines are used in the MCU as I/O-port pins. Data lines direction must be controlled with the MCU data direction register. Interface includes address outputs MA0-4, data inputs (read) / outputs (write) MD0-7, chip select control output XCS, read control output XRD, write control output XWR and interrupt input XINT. When CPU is in sleep state, control signals XRD and XCS must be in '0' state and address output NA0-3 and NWR in '1' state and data lines ND0-7 must be in '0' state.

A valid DTMF tone is detected from interrupt line via DTMF receiver. DTMF receiver sends the valid DTMF tone code via 4-bit bus.

#### – CTRLU – SLIC

The MCU sets and controls the SLIC circuit and detects actions. There is only one landline port connected to connector.

The MCU generates the clock signal for SLIC DC/DC converter for synchronization purposes.

The metering pulse is controlled by MCU for payphone usage.

#### – CTRLU – RECEIVER

The RX circuit power is connected on/off by RXE signal.

The received signal strength is measured over the RSSI and intermediate frequency is measured over the IF. The LNA gain is controlled by the AGC signal.

#### – CTRLU – SYNTHESIZER

The RF temperature is measured over the RFTEMP. The frequency is controlled by the AFC signal. The synthesizer is controlled via the syn-

chronous serial bus SDAT/SCLK. The data is latched to the synthesizer by the positive edge of the SLE line. The TX synthesizer power on/off (TXSYNE) line is controlled via the PLL circuit. The 1st buffer is switched on/of via the TXBUFF signal.

– CTRLU – TRANSMIT

The TXE line activates the power module. The power is controlled via the TXC line which is a PWM-controlled output port.

**MCU Processor**

H8/2322 is a CMOS microcontroller. The CPU is ROMless version so all memory needed is located outside the chip.

MCU operating clock (=7.3728 or 14.7456 MHz) is generated in the MASI.

The MCU pins are listed in the table below.

NC=not connected, I=Input, O=Output, I/O=Input/Output.

Pin number	Symbol	Description	Pin type
1	Vcc	to VL	
2–5, 7–14, 16–25	A0–A20	FLASH, MASI and RAM addresses (A20, pin 25 not connected)	Address
6, 15, 24	Vss		
26	PA5	SLIC_DET	I
27	PA6	NC	
28	PA7	NC	
29	P67	NC	
30	P66	NC	
31	P65	NC	
32	_IRQ0	XINT, interrupt signal from MASI	I
33	Vcc	to VL	
34–37, 39–46, 48–51	D0–D15	Data bus	Data
38, 47	Vss	GND	
52	Vcc	to VL	
53	P30/TxD0	MSBUSTX, serial data to M2BUS	O
54	P31/TxD1	TXBUFF	O
55	P32/RxD0	MBUSRX, serial data from M2BUS	I
56	P33/RxD1	FLASH_PROG, flash voltage control and PSA watchdog disable	O
57	P34/SCK0	IMMO_SET, Immobilizer set signal	O
58	P34/SCK1	AGC	I/O
59	Vss	GND	

Pin number	Symbol	Description	Pin type
60	P60/CS4/_DREQ0	NC	I
61	P61/CS5/TEND0	NC	I
62	P62/_DREQ1	ECLK, serial clock (EEPROM)	I
63	P63/_TEND1	SISDATA, (SIS serial data)	I/O
64	P27	SLE, synthesizer enable	O
65	P26	SLIC_CLK2 SLIC gate clock for SMPS	O
66	P25	MBUSRX, timeout timer start signal from M2BUS	I
67	P24	SCLK serial clock for synthesizer	O
68	P23	SDAT, synthesizer data	O
69	P22	TXE	I/O
70	P21	SIS RESET	O
71	P20	RXE	O
72	WDTOVF	NC	
73	_RES	XRES reset for MCU, FLASH, MASI from PSA	I
74	NMI	1	I
75	STDBY	1	I
76	Vcc	to VL	
77	XTAL	NC	
78	EXTAL	CLKMCU from MASI	I
79	Vss	GND	
80	PF7	DTMF (4)	I
81	Vcc	VL	
82	AS	NC	
83	RD	FLASH, MASI, SRAM Read	
84	HWR	MASI, SRAM Write	
85	LWR	FLASH Write	
86	PF2	DTMF (3)	I
87	PF1	DTMF (2)	I
88	PF0	DTMF (1)	I
89	P50/TxD2	FBUSTX	O
90	P51/RxD2	FBUSRX	I
91	P52/SCK2	MBUSRX for FBUS CLK	I
92	P53	Serial Clock for SIS	O
93	AVcc	VA	
94	Vref	VA	
95	AN0	VBATSW, not used	Analog
96	AN1	VCHARSW	Analog

Pin number	Symbol	Description	Pin type
97	AN2	RSSI	Analog
98	AN3	NC	Analog
99	AN4	NC	Analog
100	AN5	NC	Analog
101	AN6	RFTEMP	Analog
102	AN7	IMMO_DET	Analog
103	AVss	GND	
104	Vss	GND	
105	P17	RING_CLK	O
106	P16	TTX_CLK	O
107	P15	SDA (serial data, EEPROM)	I/O
108	P14	TXC	O
109	P13	SEL1	O
110–111	P12–P11	SLIC_CTRL (1–0)	I/O
112	P10	XPWROFF	O
113	MD0	0 (mode 4)	I
114	MD1	0 (mode 4)	I
115	MD2	1 (mode 4)	I
116	PG0	NC	
117	PG1	NC	
118	PG2	RAMCS	O
119	PG3	MASICS	O
120	PG4	FLASHCS	O

## SIS MCU

AT90S2343 is a SIS (subscriber identification) circuit connected to the controller over serial bus IIC.

Pin no.	Symbol	Description
1	_RESET	Reset input
2	XTAL1	Clock input from MASI
4	GND	GND
5	MOSI	IIC bus data
7	SCL/T0	IIC bus clock
8	Vcc	VSIS

## EEPROM

There is one 16k EEPROMs in phone. EEPROM is a nonvolatile memory into which is stored the tuning data for the phone.

Pin no.	Pin	Description
4	GND	GND
5	SDA	IIC bus data
6	SCL	IIC bus clock
8	Vcc	VL

### Flash memory and Flash programming

Flash memory size is 512kx16 (8MB). The Flash is a nonvolatile memory for the program code.

Flash memory has a pre-programmed boot program. This program controls itself when the final program is stored in the memory via the FBUS and the MBUS.

During programming only the system connector is used and the TFF-3 is powered via the flash loading adapter (FLA-5).

### RAM

The MCU has no internal memories, instead there is a SRAM circuit connected to the parallel data bus and the address bus. The size of the SRAM is 64kB.

### Immobilizer

The immobilizer uses two I/O pins of the MCU. The Output pin is used for writing to the immobilizer and the input pin is used to read the state of the flip-flop.

When the immobilizer is activated, the state of the flip-flop is set by the switch and by the software via MCU output pin. After that, in the run-time, the state of the flip-flop is read every 4 seconds. As long as the terminal stays in its original location, the state is "1".

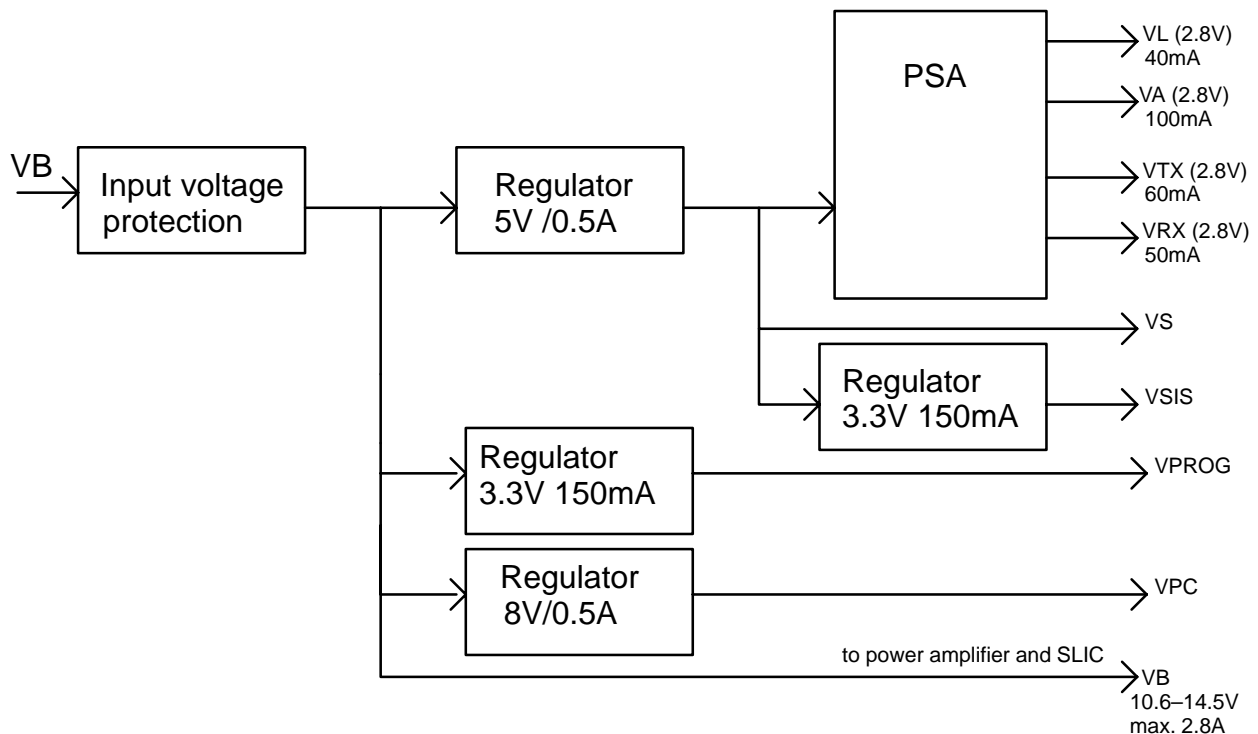
When the terminal is moved, the immobilizer switch opens and causes a state transition. After that the state of the flip-flop is found to be "0" and the software sets the terminal to "terminal moved" -state. In that state the message "terminal moved" can be seen in the service PC software.

The operating voltage of the immobilizer (VSLIM) is obtained from the voltage supply (VS). There is also a 0.5mAh lithium battery for backup purpose, which is used as power supply in the situations when the terminal is not powered. This means, that the terminal can not be moved even if it has no power. In this case the flip-flop will change its state when the switch is opened. When the terminal is powered again the movement will be detected.

## PWRU

The main function of the PWRU is to feed suitable voltages in every block. It consists of Input voltage connectors, protection circuits, separate regulators and the PSA ASIC. The PSA circuit has also another function, the MBUS handling and watchdog.

The Power distribution diagram is below.



The input voltage is protected against accidental interference and fault actions. The RF –power amplifier and SLIC functions use this unregulated voltage.

Supply voltages for PSA, flash programming, SIS MCU and RF transmitter are fed from separate regulators.

### Input supply voltage

Input voltage is protected against overcurrent, overvoltage and reverse voltage.

Also the input voltage is protected against overvoltage and reverse voltage. RF –power amplifier and SLIC functions use this unregulated voltage.

Overcurrent:

There is slow type fuse, breakdown value 5A

Overvoltage and reverse voltage:

There is transient suppressor diode which work as fast Zener voltage over 16V nom. (max. 20V). Also it work like diode in forward direction.

Also input voltage is filtered against interference from external power supply unit.

## PSA

The PSA is a multi function **P**ower **S**upply and charging control circuit for **A**nalog handportable phones. It has two separate power supplies for baseband (VL,VA) and two externally controllable power supplies for RF (VRX, VTX). The main functions are voltage regulators, power on/off and charge control and reset logic (including watchdog), supply voltage and charger detection functions and buffer for the M2BUS.

Main features of PSA:

- Voltage outputs are isolated from other regulators and from each other
- Buffer for the M2BUS
- Power on/off and reset logic
- Power off logic can be used as a watchdog
- Supply voltage monitor and automatic reset/power-off
- Battery charger detection
- Automatic on-chip current limiting
- On-chip thermal shutdown
- Surface mounted package SSOP28

## PSA pinout

Control pins:

Signal	Pin number	Type	Description
PWRONX	22	IN	PoWeR ON control input (pulled down )
VRX_ENA	2	IN	VRX regulator ENable
VTX_ENA	27	IN	VTX regulator ENable
WD_DISX	24	IN	WatchDog DISable (internal pull up)
PWROFFX	23	IN	Watchdog reset from MCU
PURX	16	OUT	Power Up Reset signal

Input pins:

Signal	Pin number	Description
VBAT1	3	Battery voltage for VRX regulator
VBAT2	11	Battery voltage for VL regulator, battery voltage monitoring and internal logic
VBAT3	18	Battery voltage for VA regulator and internal analog functions

Signal	Pin number	Description
VBAT4	26	Battery voltage for VTX regulator
GND1	1	Ground for VRX regulator
GND2	6	Ground for internal reference voltage
GND3	12	Ground for VL regulator and internal logic
GND4	19	Ground for VA regulator and internal analog functions
GND5	28	Ground for VTX regulator
TEST	5	Test specific pin (internal pull down)
M2BUSIN	14	M2BUS data input
VCHAR	9	Divided CHARger input Voltage

Output pins:

Signal	Pin number	Description
VA	17	Output Voltage for Analog circuitry (2.8V@100mA)
VL	13	Output Voltage for Logic circuitry (2.8V@40mA)
VRX	4	Output Voltage for RF or Analog circuitry (2.8V@50mA)
VTX	25	Output Voltage for RF or Analog circuitry (2.8V@60mA)
VBATSW	20	SWitched internally divided VBAT voltage
VCHARSW	8	SWitched VCHAR voltage
COSC	10	Connection for an external timing Capacitor defining watchdog elapse time
CREF	7	Connection for an external Capacitor of the internal REF-erence voltage
M2BUSOUT	15	M2BUS data out (open drain)
PWRONBUFF	21	inverted PWRONX state

PWRONX and WD\_DISX inputs have internal pull-up resistors.

M2BUSIN, VRX\_ENA, VTX\_ENA, TEST and PWROFFX inputs have internal pull-down resistors.

## Functional descriptions

### PSA

The linear regulators are high performance regulators. Regulators have internal current limiting. All the regulators have low quiescent currents thus extending the battery life.

VA and VL are intended for baseband circuits, VRX and VTX for RF circuitry.

### Voltage monitor

This function is used to monitor VBAT voltage level. The threshold level is set by internal resistor divider.

The circuit monitors the voltage at the VBAT input and forces the circuit to Reset if the voltage level is below allowed limit voltage, VBAT<sub>coff</sub>-. A hysteresis is included to prevent oscillation between different states.

#### Thermal protection

Thermal shutdown protects PSA from overheating. Thermal shutdown includes hysteresis in order to prevent oscillation during the thermal protection.

#### Power supply voltage detection

Thermal shutdown protects PSA from overheating. Thermal shutdown includes hysteresis in order to prevent oscillation during the thermal protection.

#### M2BUS buffer

M2BUS is a serial bus between mobile and accessories.

M2BUS baud rate is 9600 bps.

The buffer translates the logical input signal to open-drain output.

Rgw M2BUS buffer truth table is below.

Input	Output
LOW	LOW
HIGH	Z

#### Separate regulators

Separate supply voltages:

- Regulator 5V is for PSA and some RF purposes.
- Regulator 8V is used for RF TX buffers
- Regulator 3.3V is used for flash programming
- Regulator 3.3V is used for SIS MCU

## AUDIO

The Audio block includes the MASI ASIC, the DTMF circuitry and the SYSTEM connector.

### MASI ASIC

MASI is a single chip audio/signalling processor in a 64 TQFP package for the NMT450 system.

#### Main features

- Low power consumption modes
- 8 bit parallel interface with pull ups
- FM demodulator

#### FFSK modem features

- Full duplex 1200 baud signalling
- FSK indicator and level detector
- FII filter and gain control
- DMS facility

#### Audio features

- Low noise microphone amplifier
- Input for a handset microphone or an accessory
- Microphone sensitivity compensation +24/–7 dB range (5 bits)
- Compander
- RX and TX filters
- Tx hard limiter
- Tx AGC
- Transmitter compensation amplifier with +1.875/–1.875 dB range (4 bits)
- Compensation amplifier for different RX deviations with +7.5/0 dB range (4 bits)
- Volume control amplifier with –20/+17.5 range (4 bits)
- Earphone amplifier with drive capability for ceramic earpiece
- Buffered output for a handset or an accessory
- Mute switches
- Speech scrambler and descrambler

#### Other features

- Dual and single tone multifrequency generator
- IF counter
- 8 bit general purpose DAC
- Programmable output clocks with clock stop for MCU, LCD and SIS
- Two external interrupt sources
- Programmable timer
- Summing stage for voice/data, signalling and fii

## MASI Pinout

Pin no	Symbol	Pin type	Notes
1	<b>VDD1</b>	PWR	+2.7 ... 3.5 V Supply voltage for digital part
2	XCS	DIN/pd	Chip select signal, active state LOW, pull-down > 50 kΩ
3	A4	DIN/pu	5-bit address bus, MSB, pull-up > 50 kΩ
4	A3	DIN/pu	5-bit address bus, pull-up > 50 kΩ
5	A2	DIN/pu	5-bit address bus, pull-up > 50 kΩ
6	A1	DIN/pu	5-bit address bus, pull-up > 50 kΩ
7	A0	DIN/pu	5-bit address bus, LSB, pull-up > 50 kΩ
8	D7	DIO	8-bit bidirectional data bus MSB
9	D6	DIO	8-bit bidirectional data bus
10	D5	DIO	8-bit bidirectional data bus
11	D4	DIO	8-bit bidirectional data bus
12	D3	DIO	8-bit bidirectional data bus
13	D2	DIO	8-bit bidirectional data bus
14	D1	DIO	8-bit bidirectional data bus
15	D0	DIO	8-bit bidirectional data bus LSB
16	NMI	DOUT	Non maskable Interrupt request
17	<b>VSS1</b>	PWR	0 V Supply voltage, ground for digital part
18	XCLR	DIN	HW reset input, active state LOW
19	TMODE	DIN/pd	Test mode selection, pull-down > 50 kΩ
20	TSEL	DIN/pd	Scan test selection, pull-down > 50 kΩ
21	XINT	DOUT	Interrupt request to MCU, active state LOW
22	EXTINT1	DIN	External interrupt request, falling edge active (note: this pin is test scan select when TMODE is high)
23	EXTINT2	DIN	External interrupt request, falling edge active
24	<b>VDD2</b>	PWR	+2.7 ... 3.5 V Supply voltage for digital in Analog part
25	IF	AIN	IF input
26	DAF	AIN	Audio input
27	FILO	AOUT	Rxfilter output
28	EXPI	AIN	Expander/Descrambler input
29	EXPO	AOUT	Expander/Descrambler output
30	VOLI	AIN	Volume control amplifier input
31	<b>VSA1</b>	PWR	0 V Supply voltage, ground for RX Analog (including EARAMP & EXTEAR)
32	EXTEAR	AOUT	Buffered output for handset or an accessory
33	EARP	AOUT	Earphone driver output, positive
34	<b>VDA1</b>	PWR	+ 2.7 ... 3.5 V Supply voltage for RX Analog (including EARAMP & EXTEAR)

Pin no	Symbol	Pin type	Notes
35	EARN	AOUT	Earphone driver output, negative
36	DACO	AOUT	DA converter output
37	CALLCNT	AIN	Voltage sensor input for battery change during call
38	REF	AOUT	Internal analog signal ground, stabilization capacitor
39	ATOUT	AOUT	Analog test circuit output
40	MIC	AIN	Microphone amplifier input,
41	BIMIC	AOUT	Microphone bias output
42	CMIC	AIN	Microphone bias current stabilizing capacitor
43	EXTMIC	AIN	Audio input for a handset or an accessory
44	TXPBO	AOUT	Transmit bandpass filter (scrambler) output
45	COMI	AIN	Compressor input
46	MOD	AOUT	transmit path output
47	ATST	AOUT	Analog test output
48	<b>VDA2</b>	PWR	+ 2.7 ... 3.5 V Supply voltage for TX Analog & NVSGEN
49	NSV	AOUT	Negative supply voltage, -7V output
50	NSV2	AOUT	negative supply voltage -4.66V, for external capacitor
51	NSV1	AOUT	negative supply voltage -2.33V, for external capacitor
52	NCPP	AOUT	Negative supply charge pump (external) capacitor positive
53	NCPN	AOUT	Negative supply charge pump (external) capacitor negative
54	<b>VSA2</b>	PWR	0 V Supply voltage, ground for TX Analog & NVSGEN
55	TOUT	DOUT	Test scan data output
56	CLKIN	CIN	14.7456 MHz crystal oscillator input or input for the external clock
57	CLKOUT	COUT	14.7456 MHz crystal oscillator output
58	<b>VSS2</b>	PWR	0 V Supply voltage, ground for digital in Analog part & Buzzer
59	BUZZ	AOUT	Buzzer output, open collector
60	CLKLCD	DOUT	Clock signal for LCD, 230.4 kHz, 57.6 kHz or 14.4 kHz
61	CLKSIS	DOUT	Clock signal for SIS processor, 3.6864MHz or 7.3728MHz
62	CLKMCU	DOUT	Clock signal for MCU, 3.6864 MHz, 7.3728 MHz or 14.7456 MHz
63	XWR	DIN/pu	Write control signal, active state LOW, pull-up > 50 kΩ
64	XRD	DIN/pd	Read control signal, active state LOW, pull-down > 50 kΩ

### SLIC block

The TFF–3 line adapter hardware is implemented using the STLC3065 SLIC custom–designed for wireless applications. The pins of the STLC3065 are listed below.

Pin no	Symbol	Pin type	Notes
1	<b>D0</b>	I	Control interface,input bit 0
2	<b>D1</b>	I	Control interface,input bit 1
3	<b>D2</b>	I	Control interface,input bit 2
4	<b>P1</b>	I	Control interface, port selection bit
5	<b>P2</b>	I	Control interface, port selection bit
6	<b>_DET1</b>	O	Logic interface output of the line port 1 detector, open drain
7	<b>_DET2</b>	O	Logic interface output of the line port 2 detector, open drain
8	<b>_DET</b>	O	Logic interface output of the supervision line detector, open drain
9	<b>CKTTX</b>	I	Metering pulse clock input
10	<b>CTTX1</b>		Metering burst shaping external capacitor
11	<b>CTTX2</b>		Metering burst shaping external capacitor
12	<b>RTTX</b>	O	Metering pulse cancellation buffer output
13	<b>FTTX</b>	O	Metering pulse buffer
14	<b>RX</b>	I	4 wire input port (RX input)
15	<b>ZAC1</b>	O	RX buffer output
16	<b>ZAC</b>	I	AC impedance synthesis
17	<b>RS</b>		Protection resistor image
18	<b>ZB</b>		Balance network for 2 to 4 wire conversion
19	<b>CAC</b>	I	AC feedback input
20	<b>TX</b>	O	4 wire output (TX output)
21	<b>VF</b>	I	Feedback input for DC/DC converter controller
22	<b>CLK</b>	I	Power switch controller clock
23	<b>GATE</b>	O	Driver for external PowerMOSFET
24	<b>RSENSE</b>	I	Voltage input for current sensing
25	<b>VPOS</b>	I	Positive supply input voltage
26	<b>CVCC</b>		Internal positive voltage supply filter
27	<b>AGND</b>		Analog ground
28	<b>RLIM</b>	I	Constant current feed programming pin.
29	<b>IREF</b>	I	Internal bias current setting pin
30	<b>RTH</b>	I	Off–hook threshold programming pin
31	<b>RD</b>	I	DC feedback and ring trip input

Pin no	Symbol	Pin type	Notes
32Imm	<b>ILTF</b>	O	Transversal line current image output
33	<b>CSVR</b>		Battery supply filter capacitor
34	<b>BGND</b>		Battery ground
35	<b>VBAT</b>		Regulated battery voltage self generated
36	<b>RING2</b>		2 wire port 2, RING wire (Ib is the current sunk into this pin)
37	<b>RING1</b>		2 wire port 1, RING wire (Ib is the current sunk into this pin)
38	<b>NC</b>		
39	<b>NC</b>		
40	<b>NC</b>		
41	<b>TIP1</b>		2 wire port 1, TIP wire (Ia is the current source from this pin)
42	<b>TIP2</b>		2 wire port 2, TIP wire (Ia is the current source from this pin)
43	<b>CREV</b>		Reverse polarity transition time control
44	<b>VBAT1</b>		Frame connection

## Immobilizer

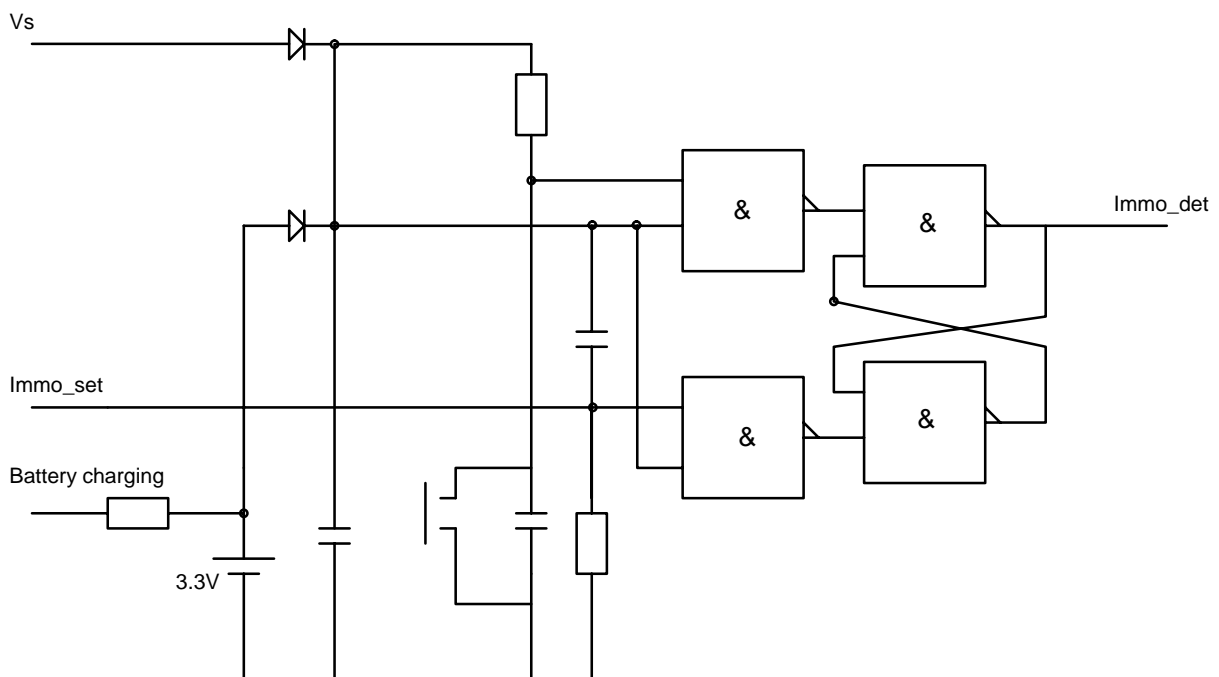
The immobilizer uses two I/O pins of MCU. Output pin is used for writing to the immobilizer and from input pin the state of the flip-flop can be read.

When the immobilizer is activated, the state of the flip-flop is set by the switch and by the software via MCU output pin. After that, in the run-time, the state of the flip-flop is read every 4 seconds. As long as the terminal stays in its original location, the state is "1".

When the terminal is moved, the immobilizer switch opens and causes a state transition. After that the state of the flip-flop is found to be "0" and the software sets the terminal to "terminal moved" –state. In that state the message "terminal moved" can be seen in the service PC software.

The operating voltage (VSLIM) of the immobilizer is obtained from the voltage supply (VS). There is also a 0.5mAh lithium battery for backup purpose, which is used as power supply in the situations when the terminal is not powered. This means, that the terminal can not be moved even if it has no power. In this case the flip-flop will change its state when the switch is opened. When the terminal is powered again the movement will be detected.

Immobilizer circuitry below:



## RF Module

### Introduction

The RF module is designed for a WLL cellular phone which operates in the NMT-450i system. The purpose of the module is to receive and demodulate the radio frequency signal from base station and to transmit modulated RF signal to base station.

The modulation method used in the phone is FM modulation (F3E).

Name of submodule
Rx module
Tx module
Synthesizer module

All submodules are only functional blocks, They are constructed on same PCB and have no material codes by themselves.

#### RX

The RX module receives and demodulates the radio frequency signal from the base station.

#### SYNT

The transmitter synthesizer generates a frequency modulated RF signal for the transmitter section. The transmission frequency is generated by a phase-locked loop (PLL). The synthesizer circuit contains VCO, synthesizer logic and loop filter.

The receiver synthesizer generates the first injection frequency to the receiver module. The local frequency is generated by a phase-locked loop as in transmitter synthesizer. The synthesizer circuit contains VCO, synthesizer logic and loop filter.

#### TX

The Transmitter module generates and amplifies the RF signal to be transmitted to the base station.

## Technical Specifications

### Maximum ratings

The maximum power supply voltage during transmission must not exceed 17 V. Higher power supply voltages may destroy the power amplifier module.

Parameter	Value
Power Supply max.VB	14.5 V
Switched mode power supply with regulated output	13.5 V
Regulated supply voltage, VPC	8.0 V
Regulated supply voltage, VS	5.0 V
Regulated supply voltages VRX, VTX	2.82 V +/- 5 %
Operating temperature range	-25 ... +55 °C

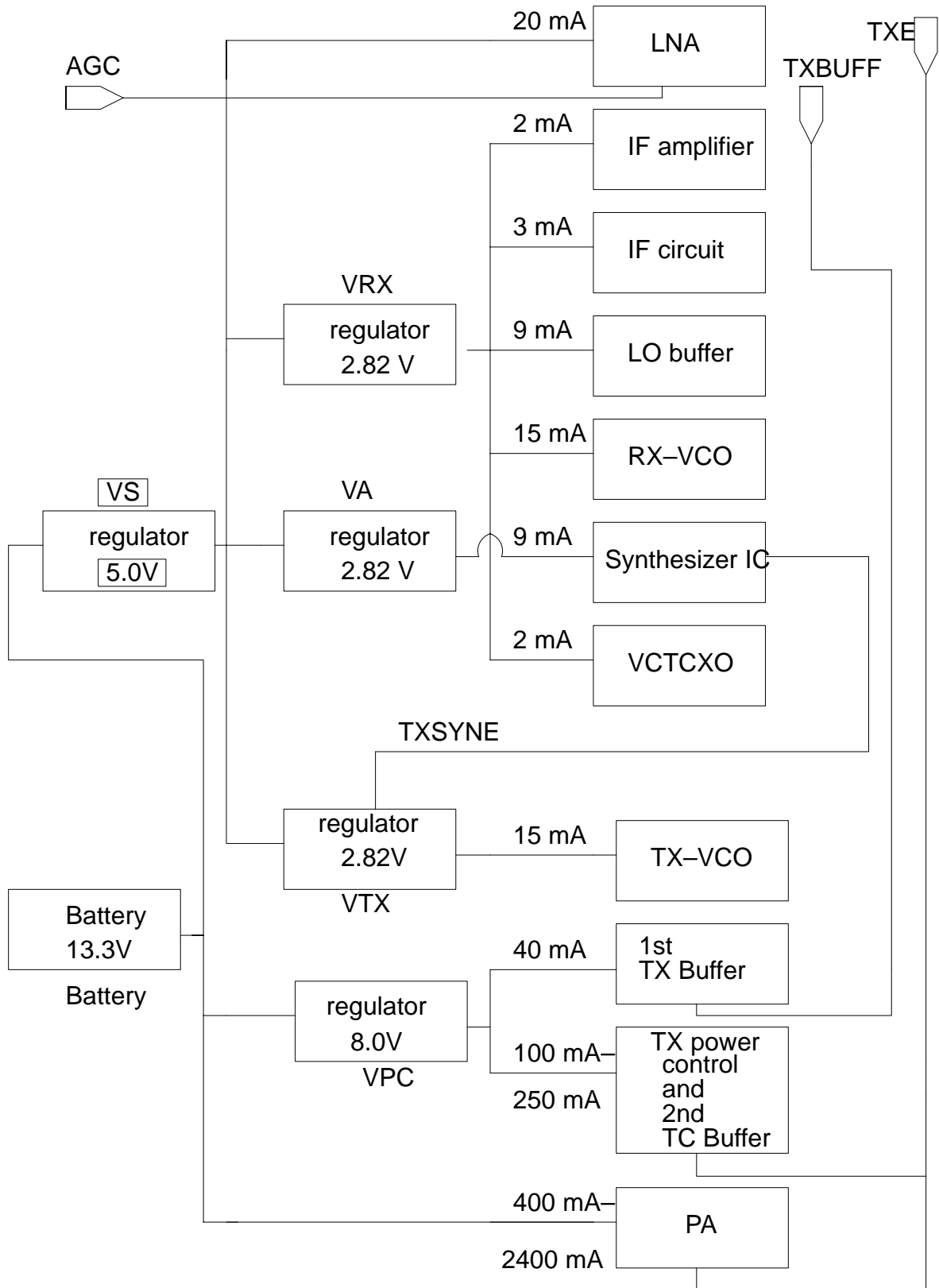
### Control Signals

In the following table the RF current consumption can be seen in different modes.

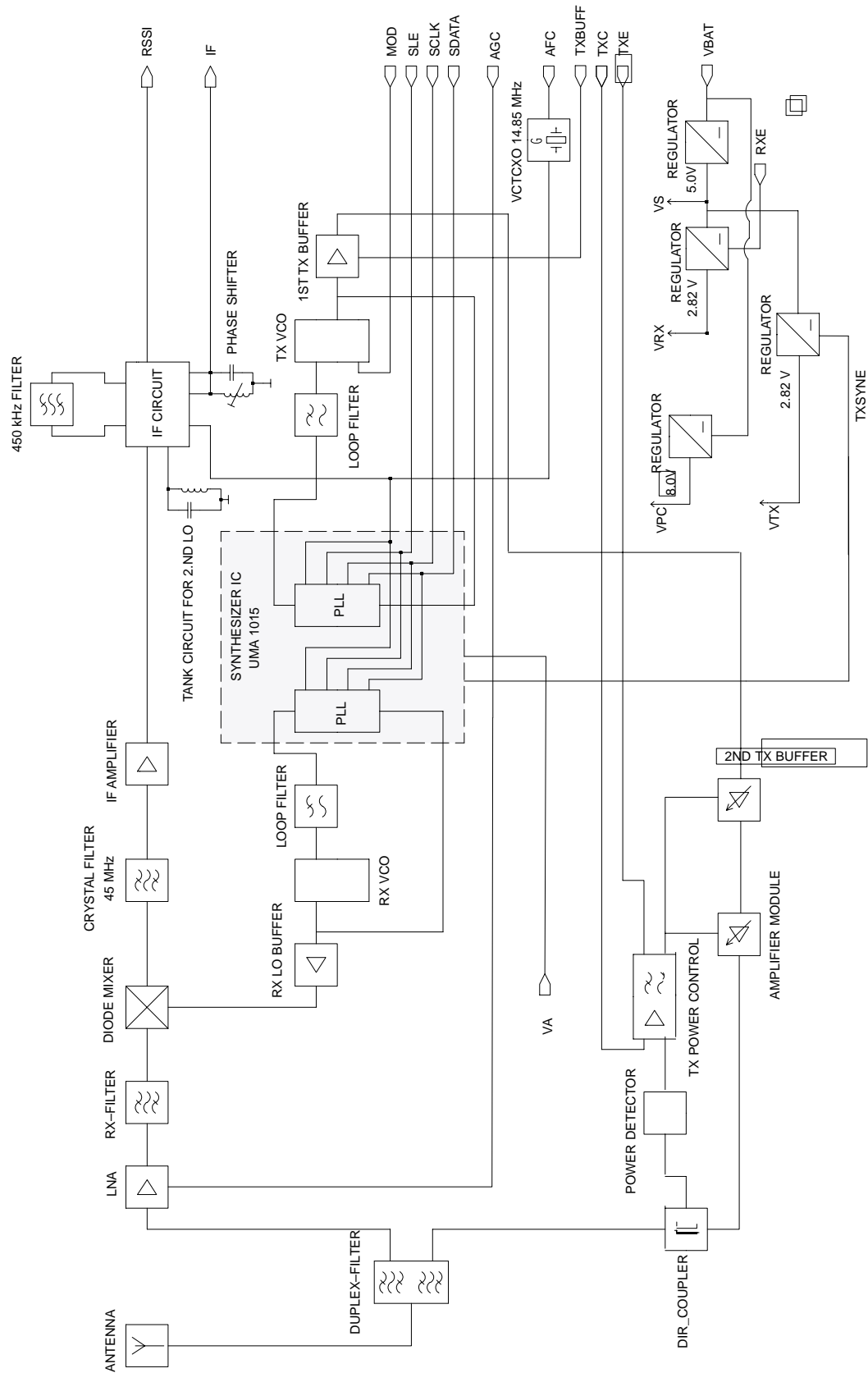
control signals				current consumption (mA)	Notes
RXE	TXSYNE	TXBUFF	TXE		
H	H	H	H	2200–2800 1300–1500 600–800	power level 2 power level 1 power level 0
H	H	H	L	200	RX on, TX–synthesizer on, TX–buffer on
H	H	L	L	160	RX on, TX–synthesizer on
H	L	L	L	150	RX on
L	L	L	L	120	all RF parts powered down

The current consumption of different RF parts can be seen in the following block diagram.

**Power consumption Diagram**



Block diagram of Radio sub-module



## Connections

### Connections to Baseband sub-module

Signal Name	Type	Function
AFC	Analog in	The reference oscillator frequency adjust.
IF	Analog out	2nd IF signal
MOD	Analog in	Modulation signal for transmitter (Audio + data)
RFTEMP	Analog out	RF temperature, which is determined by NTC resistor.
RSSI	Analog out	Received signal strength indicator. Voltage measurement.
SCLK	Digital in	Serial clock for synthesizer. Active state: Rising edge
SDAT	Digital in	Serial data for synthesizer. Active state: High
SLE	Digital in	Synthesizer enable. Active state: High
TXBUFF	Digital in	1st TX buffer on/off. High when on.
TXE	Digital in	Transmitter on/off. High when on.
TXSYNE	Analog out	TX synthesizer power control
VB	Power	Battery voltage
VA	Power	Regulated voltage for synthesizer IC
VRX	Power	Regulated voltage for receiver & receiver synth
VTX	Power	Regulated voltage for transmitter synth
VS	Power	Regulated voltage for receiver LNA
VPC	Power	Regulated voltage for 1 st. TX buffer and Power control
AGC	Digital in	RX low noise amp. gain control

Function	Digital Control Signal name	Value
Supply voltage	VDD	2.82 V
Logical 1	VOH	$VDD \cdot 0,7 \dots VDD + 0,3V$
Logical 0	VOL	$-0,3V \dots VDD \cdot 0,3$
Logical 1	IOH	$< 5\mu A$
Logical 0	IOL	$< 5\mu A$

CLKIN	14.85 MHz VCTCXO signal	Value
Level		1 Vpp min
Load impedance		10 k $\Omega$ \ 10pF +/- 10%
Start time		< 60 mS after Vref rising

AFC	VCTCXO control voltage	
Type		analog signal (DC-level)
Level		0.1...2.7 V DC
Load impedance		$Z_L > 10 \text{ k}\Omega$
Control step size		< 12 mV

IF	450 kHz 2nd IF signal	
Level		300 mVp-p (typical) not specified by manufacturer
Source impedance		< 1.0 k $\Omega$

MOD	Modulation signal MOD for transmitter (Audio + data)	
Type		Analog signal
Nominal level		300 mV <sub>rms</sub> @3.0 kHz deviation
Load impedance		$Z_L > 22 \text{ k}\Omega$

RSSI	Received signal RSSI strength indicator	
DC-level		0,5...1.6 V (-115...-45 dBm)
dynamic range		70 dB
Source impedance		56 k $\Omega$

SCLK	Serial clock for synthesizer	
Type		digital signal
Pulse width		> 1 us

SDAT	Serial data for synthesizer	
Type		digital signal
Pulse width		> 1 us
VALUES		
Control byte		xx100 000x x10000xx (synte_initial_const)
Reference divider		1188 (25 kHz channel)
Divider formulas for TX oscillator		$N = 2 \cdot \text{ch} + 36238$ (TX_synte_base_const1 8D,8E)
Divider formulas for RX oscillator		$N = 2 \cdot \text{ch} + 33438$ (RX_synte_base_const1 82,9E)

SLE	Synthesizer enable	
Type		Digital signal
Function		0 = synthesizer enabled 1 = synthesizer disabled

<b>RXE</b>	<b>Receiver enable</b>	
Type		Digital signal
Function		0 = Receiver off 1 = Receiver on
On-state current		< 100 uA
<b>AGC</b>	<b>Automatic Gain Control</b>	
Type		Digital signal
Function		0 = Gain high 1 = Gain low
On-state current		< 100 uA

<b>TXC</b>	<b>Transmitter power control</b>	
Type		PWM signal
Function		Duty cycle of the TXC signal defines the TX power level.
PWM frequency		14 kHz (7.2 kHz)
Level		0...3.3 V DC
Number of duty cycle steps		256
Load impedance		> 100 kohm

<b>TXBUFF</b>	<b>Transmitter on/off control</b>	
Type		Digital signal
Function		0 = TX off 1 = TX on

<b>TXE</b>	<b>Transmitter on/off control</b>	
Type		Digital signal
Function		0 = TX off 1 = TX on

<b>VBAT</b>	<b>Battery voltage</b>	
Nominal value		13.5 V
Minimum value		10.6 V
Absolute maximum		14.5 V
Max. input current		3.4 A

## Key RF components

<b>Name</b>	<b>Manufacturer</b>	<b>Type</b>	<b>NMP code</b>
Antenna	ALGON	G1-U1/NN1.HH	0660064
Duplexer	LK-Products	Q8-A9/NP1	4508216
Saw filter	Hitachi	HWAB219	4510135

Name	Manufacturer	Type	NMP code
45 MHz IF filter	KDS	DSF753SB	4510085
450 kHz IF filter	NTK / Kyocera	MLF-Q-type, PBFC450R12DR	455P005
IF circuit	Toshiba	TA31136F	4349694
VCTCXO	KDS	DTO-432H1	4510171
PLL IC	Philips	UMA1015AM	4340393
RX VCO	Alps	URAY8XR02A	4350169
TX VCO	Alps	URAY8XT02A	4350167
Power amplifier	Mitsubishi	M57704L	4352537

## Antenna

Phone uses a fixed antenna. The electrical length of antenna is 1/2 wave length.

## Receiver

The receiver is a dual-conversion superheterodyne using two intermediate frequencies, 45 MHz and 450 kHz.

The RF signal from the duplexer RX port is applied to the low noise RF amplifier. The amplifier is realized with transistor V910. Amplifier stage input matching is accomplished by C903 and L901. R901 and R924 are used for biasing. Output matching is carried out by L911. C902 and C912 are used for RF bypassing. Stability is ensured with serial connection of R913 and C901 to the ground.

Next the signal is filtered with Z930. The filter is followed by a single balanced diode mixer, comprising Z931, Z932, Z950 and V930.

After the mixer the 45 MHz IF signal is filtered with crystal filter Z940. The matching between mixer and the filter comprises L940, R940 and C940. After that the IF signal is amplified by V960. Input matching is performed by L980 and L981. The biasing elements comprise R960, R961, R962 and R963. Output matching elements comprise L961. Capacitors C960 and C962 are used for RF bypassing.

The second mixer, IF amplifier and quadrature detector are all integrated in the circuit N970. The second LO frequency, 44.55 MHz, is the third harmonic of the VCTCXO frequency. LO signal is realized with tank circuit C972 and L971. After the mixer the 450kHz IF signal is filtered with ceramic filter Z970. The IF amplifier output signal is phase shifted by resonance circuit C977, R971 and L970. After this the signal is rectified to square wave.

The RSSI and 2nd IF signal (450 kHz) are fed to the audio/logic unit.

## RX Synthesizer

The first injection frequency is generated by a digital phase locked loop (PLL). The PLL consists of a VCO, a loop filter and a PLL IC which in-

cludes reference and main dividers. The output frequency of the loop (LO) is obtained from a voltage-controlled oscillator (VCO) G520. The output level of VCO is 0 dBm +/- 2 dB. The VCO output signal is amplified by transistor V950 and fed to the receiver mixer via Z950. A portion of output signal is fed back to the synthesizer.

The overall divisor of the chain is selected according to the desired channel.

The internal dividers of N400 are programmed with 17 bits, which are transferred serially on the SDATA (synthesizer data) line from the processor into an internal shift register also located in N400. Data transfer is timed with SCLK clock pulses.

The divided frequency is compared with a highly stable reference frequency from VCTCXO by a phase comparator in the PLL circuit (N400). The phase comparator controls the VCO frequency by means of a DC voltage through the loop filter so as to keep the divided frequency applied to the phase comparator equal to the fixed reference frequency.

The reference frequency is 12.5 kHz. This reference frequency is obtained from voltage controlled temperature compensated crystal oscillator (VCTCXO). Oscillator frequency is 14.85 MHz. The VCTCXO frequency is divided by 1188.

### **RX loop filter**

The Phase comparator output is pin 3. If the VCO frequency is too high, the output goes low and discharge integrator capacitor C421. After this, the DC control voltage and the VCO frequency will decrease.

If the VCO frequency is too low, the output goes high and charge the integrator capacitor C421. Thereafter the DC control voltage and the VCO frequency will go up.

Output pulses from the phase detector have to be supplied to the loop filter. The function of the integrator is to convert positive and negative pulses to DC voltage. The remaining ripple and AC components are filtered in the three stage lowpass filter.

### **TX Synthesizer**

The transmitter synthesizer generates a frequency modulated transmitter signal to the transmitter section. The injection frequency for the transmitter is generated by a digital phase locked loop (PLL). The modulated TX frequency is generated in the TX-VCO (G420). Output level of the VCO is 0 dBm +/- 2 dB. After VCO, the TX signal is amplified in the 1st TX buffer V440 before the 2nd TX buffer V610 and power amplifier module. Gain in the 1st TX buffer is about 14 dB. Gain in 2nd TX buffer is controlled with variation of supply voltage coming from power control circuit.

### **TX Loop Filter**

Output pulses from the phase detector N400 pin 17 are supplied to the loop filter. The integrator, which is constituted of R433, C435 and C436,

converts positive and negative pulses to DC voltage. The remaining ripple is filtered in the three stage low-pass filter.

## **Transmitter**

The transmitter is basing on the power amplifier module (N620). The modulated RF signal from the TX synthesizer is applied to the 50 ohm input of the transmitter module. The power level is controlled by the voltage which is supplied to pin 2 of PA module and pin 4 of V610 (2nd TX buffer's supply voltage). A voltage proportional to the output power is rectified from a coupler strip by DC-biased Schottky diode V640. This rectified voltage is fed to a differential amplifier which consists of transistor V631 and V632 .

The reference voltage to control PA module is filtered from the PWM signal TXC to DC voltage by two stage lowpass filter. The differential amplifier adjusts the source voltage of the transistor V630 so that the reference voltage and the voltage proportional to the output power are equal. The transmitter is switched on when TXE goes high (logic 1), which enables the transmitter power control circuit by transistor V633 . When the transmitter is inactive (TXE low) the RF level from the transmitter is reduced below -57 dBm.

## RF Characteristics

### Temperature range

Line Symbol	Minimum	Typical / Nominal	Maximum	Unit / Notes
Operating temperature	-25		+55	°C

### Duplexer specification

	Transmitter		Receiver	
Frequency	452.5...457.5 MHz		462.5...467.5 MHz	
Insertion loss max	2.2 dB		4.8 dB	
Ripple at BW max	1.0 dB		2.0 dB	
Termination impedance	50 Ω		50 Ω	
Permissible input power	25 W		1 W	
V.S.W.R. at BW	1.6 max.		1.6 max.	
	Frequency [MHz]	Att. [dB]	Frequency [MHz]	Att. [dB]
Attenuation min	462.5...467.5	65	452.5 ...457.5	65
	905 ...915	40		
	1357 ...1373	40		
	1810 ...1830	40		

### RX submodule specifications

N=Normal E=Extreme conditions	Parameter	Unit / Notes
	Frequency range	462.500...467.475 MHz
	Type	FM receiver, 2 IFs
	Intermediate Frequencies	45 MHz, 450 kHz
N	RF-sensitivity	< -113 dBm (SINAD 20 dB)
E	RF-sensitivity	< -110 dBm (SINAD 20 dB)
N	Adjacent channel selectivity	> 67 dB (25 kHz)
E	Adjacent channel selectivity	> 60 dB (25 kHz)
N	Spurious response rejection	> 67 dB
N	Intermodulation rejection	> 67 dB
	Blocking :	

N=Normal E=Extreme conditions	Parameter	Unit / Notes
N	RX-band excluding the receiver freq. $\pm$ 10 MHz	> -80dB
N	Spurious emissions	
N	100 kHz ... 1000 MHz	< -57 dBm
N	1000 MHz ... 4000 MHz	< -47 dBm
N / E	Audio harmonic distortion	< 5 % (third harmonic)
N / E	Noise & hum	< -35 dB
N / E	RSSI dynamic range	> 65 dB
N / E	AGC attenuation	5...10 dB

### Preamplifier

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Supply voltage		5.0		V
Frequency band	462.5		467,475	MHz
Current consumption (AGC off)		18	20	mA
Current consumption (AGC on)		7 - 9		mA
Insertion gain (AGC off)	19		22	dB
Insertion gain (AGC on)		10		dB
Gain flatness		$\pm$ 1		dB
Noise figure		1.6	1.8	dB
Reverse isolation	30	40		dB
IIP3		-5		dBm
Input return loss ( $Z_0=50\Omega$ )		-4		dB
Output return loss ( $Z_0=50\Omega$ )		-11		dB

### RX-filter

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Center frequency, $f_0$		464,5		MHz
Bandwidth (-0,8 dB)		$\pm$ 3		MHz
Stopband attenuation				
$f_0 - 10$ MHz	12	15		dB
$f_0 - 90$ MHz	45	50		dB
Insertion loss		3,7	4	dB
Passband ripple		0,7	1,0	dB
Terminating impedance		50 $\Omega$ // 18nH		

### 1st mixer

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency band				
RF	462.500		467.475	MHz
LO	417.500		422.475	MHz
IF		45		MHz
Conversion loss		6	8	dB
IIP3		12		dBm
IIP2		18		dBm
LO power level		0		dBm
LO–RF isolation		30		dB

### 1st IF–filter

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Type				Crystal 4–pole
Center frequency, $f_0$		45.000		MHz
Operating temperature	–25		+85	°C
3dB bandwidth	$\pm 7,5$			kHz Passband
Stopband attenuation				
$f_0 \pm 22$ kHz	25			dB adj channel
$f_0 - 900$ kHz $\pm 10$ kHz	80			dB 2nd mirror
Spurious response rejection $f_0 \pm 150 \dots \pm 1000$ kHz	40			dB
Insertion loss			3	dB
Passband ripple			1	dB
Terminating impedance		600 // 2		$\Omega$ // pF
Group delay distortion			30	$\mu$ s at $f_0 \pm 5$ kHz

### IF–amplifier

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Operating frequency		45		MHz
Supply voltage		2.82		V
Input impedance		800 // 1.5		$\Omega$ // pF
Output impedance		1000		$\Omega$

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Insertion gain	15		18	dB
Noise figure			3	dB
IIP3	-30			dBm

## 2nd IF-filter

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Center frequency		450		kHz
Temperature range	+10 (-30)		+50 (+70)	°C
6 dB bandwidth	± 6.0 (5,5)			kHz
26 dB bandwidth			± 9.0 (10,0)	kHz
50 dB bandwidth			± 12,5 (13,0)	kHz
Insertion loss			5,0 (6,0)	dB
Ripple			3,0 (4,0)	dB
Stopband attenuation				
$f_0 \pm 13 \dots 25$ kHz	40			dB
$f_0 \pm 25 \dots 100$ kHz	35			dB
Spurious response rejection 0,1...1MHz	20			dB
Group delay time		100 (120)		µs at $f_0 \pm 4$ kHz
Input & output impedance	1,35	1,5	1,65	kΩ

## IF-circuit

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Supply voltage		2.82		V
Current consumption		2,0		mA
2. I <sub>o</sub> frequency		44.550		MHz
RSSI dynamic range	70			dB
Case				16 SSOP

## TX submodule specification

### Power amplifier

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Supply voltage		13.5	17	V
Current consumption			2.8A	mA (at $P_{out} = 7W$ )
Input power			26	dBm
Output power		38.5		dBm (7W)
Efficiency		35	40	% (at operation point)
Harmonic level			-30	dB (at $2 \cdot f_{carrier}$ )
Harmonic level				dB (at $3 \cdot f_{carrier}$ and higher)
Input VSWR			2.8	
Output VSWR				No degradation or destroy
Output VSWR				No parasitic oscillation

### Power control and 2nd TX buffer

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Supply voltage		8,0		V
Drive current	70	150	250	mA
Power control range	20		24	dB
Control step size		0.2		dB

### Coupler lines

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency range	403		520	MHz
Coupling coefficient	18	20	22	dB
VSWR input ( $Z_0=50\Omega$ )			1:1.2	
Isolation	15			dB (with 50 ohm in/out)
Insertion loss			0.25	dB (with 50 ohm in/out)

## Synthesizer submodule specifications

### PLL

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency band	400		1100	MHz
Channel separation		25		kHz
Supply voltage	2.6	2.82	5,5	V
Current consumption		9,0		mA

### RX VCO

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency band	416.000		425.000	MHz
Operating temperature	-30		+80	°C
Output level	-2,5	0	+2,5	dBm / 50 Ω
Harmonic attenuation			12	dB (2nd)
Frequency pulling				
due to load variations			± 200	kHz (VSWR = 2.0)
due to supply voltage			± 100	kHz (Vcc ± 0.5 V)
Supply voltage	2.7	2.82	3.0	V
Current consumption		12	15	mA
SSB phase noise			-118	dBc/Hz (20 kHz offset, 1Hz BW)
Control Voltage	1.75		4.75	
SNR without vibration			-44	dB (± 3 kHz dev at 1kHz)
SNR with vibration			-34	dB (± 3 kHz dev at 1kHz, at 55 to 150 Hz, for 15 m/s <sup>2</sup> acceleration)

### TX VCO

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency band	450.000		460.000	MHz
Operating temperature	-30		+80	°C
Output level	-2,5	0	+2,5	dBm / 50 Ω
Harmonic attenuation			12	dB (2nd)

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency pulling				
due to load variations			±200	kHz (VSWR = 2.0)
due to supply voltage			± 100	kHz (Vcc ± 0.5 V)
Modulation				
mod. sensitivity	48	49,5	51	dBmV (±1.5 kHz dev at 1 kHz)
Supply voltage	2.7	2.82	3.0	V
Current consumption		12	15	mA
SSB phase noise			-116	dBc/Hz (20 kHz offset, 1Hz BW)
SNR without vibration			-44	dB (± 3 kHz dev at 1kHz)
SNR with vibration			-34	dB (± 3 kHz dev at 1kHz, at 55 to 150 Hz, for 15 m/s <sup>2</sup> acceleration)

### Isolation amplifier (1st TX buffer)

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency range	410		490	MHz
Input power	-1	0	+1	dBm
Output power	13	14	15	dBm
Reverse isolation		30		dB
Supply voltage		8,0		V
Current consumption		40		mA

### VCTCXO

	Minimum	Typical / Nominal	Maximum	Unit / Notes
Frequency		14,85		MHz
Control voltage	0.3		3,0	V
frequency accuracy			± 2.5	ppm
Output level		1		Vpp AC
Supply voltage		2.82		V
Current consumption		2		mA

## Parts list of WN1 Basic Module

(EDMS Issue 3.3) Code: 0201416)

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R101	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R102	1430690	Chip jumper		0402
R103	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R104	1430734	Chip resistor	220	5 % 0.063 W 0402
R106	1430803	Chip resistor	4.7 k	1 % 0.063 W 0402
R107	1430734	Chip resistor	220	5 % 0.063 W 0402
R108	1430803	Chip resistor	4.7 k	1 % 0.063 W 0402
R109	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R110	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R150	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R151	1430690	Chip jumper		0402
R200	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R201	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R202	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R203	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R204	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R205	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R206	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R211	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R212	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R230	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R231	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R250	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R251	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R252	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R260	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R261	1430135	Chip resistor	10 M	5 % 0.063 W 0603
R262	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R263	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R265	1430800	Chip resistor	68 k	5 % 0.063 W 0402
R267	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R268	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R269	1430814	Chip resistor	270 k	5 % 0.063 W 0402
R401	1430710	Chip resistor	22	5 % 0.063 W 0402
R402	1430710	Chip resistor	22	5 % 0.063 W 0402
R403	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R405	1430794	Chip resistor	39 k	5 % 0.063 W 0402
R406	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R410	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R412	1430710	Chip resistor	22	5 % 0.063 W 0402
R414	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R420	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R421	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402

R422	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R423	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R424	1430734	Chip resistor	220	5 % 0.063 W 0402
R425	1430734	Chip resistor	220	5 % 0.063 W 0402
R430	1430690	Chip jumper		0402
R431	1430690	Chip jumper		0402
R433	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R434	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R435	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R436	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R440	1430734	Chip resistor	220	5 % 0.063 W 0402
R441	1430734	Chip resistor	220	5 % 0.063 W 0402
R443	1430728	Chip resistor	120	5 % 0.063 W 0402
R444	1430772	Chip resistor	5.6 k	5 % 0.063 W 0402
R445	1430720	Chip resistor	56	5 % 0.063 W 0402
R446	1430700	Chip resistor	10	5 % 0.063 W 0402
R447	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R448	1430716	Chip resistor	39	5 % 0.063 W 0402
R450	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R451	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R452	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R454	1430710	Chip resistor	22	5 % 0.063 W 0402
R477	1430690	Chip jumper		0402
R479	1430690	Chip jumper		0402
R496	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R497	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R498	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R499	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R611	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R612	1430756	Chip resistor	1.2 k	5 % 0.063 W 0402
R613	1430710	Chip resistor	22	5 % 0.063 W 0402
R614	1430710	Chip resistor	22	5 % 0.063 W 0402
R630	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R631	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R632	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R633	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R634	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R635	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R636	1430752	Chip resistor	820	5 % 0.063 W 0402
R637	1430728	Chip resistor	120	5 % 0.063 W 0402
R638	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R639	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R641	1430718	Chip resistor	47	5 % 0.063 W 0402
R642	1430726	Chip resistor	100	5 % 0.063 W 0402
R643	1430718	Chip resistor	47	5 % 0.063 W 0402
R644	1430718	Chip resistor	47	5 % 0.063 W 0402
R645	1430716	Chip resistor	39	5 % 0.063 W 0402
R650	1430690	Chip jumper		0402

R651	1430690	Chip jumper		0402
R652	1430690	Chip jumper		0402
R654	1430690	Chip jumper		0402
R698	1430690	Chip jumper		0402
R699	1430690	Chip jumper		0402
R707	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R712	1430830	Chip resistor	1.0 M	5 % 0.063 W 0402
R713	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R720	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R721	1430841	Chip resistor	6.8 k	1 % 0.063 W 0402
R731	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R732	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R733	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R734	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R735	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R736	1430855	Chip resistor	300 k	1 % 0.063 W 0402
R752	1430718	Chip resistor	47	5 % 0.063 W 0402
R753	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R754	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R756	1825005	Chip varistor vwm14v vc30v	0805	0805
R757	1825005	Chip varistor vwm14v vc30v	0805	0805
R762	1430734	Chip resistor	220	5 % 0.063 W 0402
R763	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R764	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R766	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R800	1800673	NTC resistor	15 k	10 % 0.12 W 0805
R801	1420200	Chip resistor	0.22	5 % 0.2 W 1206
R802	1420200	Chip resistor	0.22	5 % 0.2 W 1206
R804	1430337	Chip resistor	9.1 k	1 % 0.063 W 0603
R805	1430339	Chip resistor	300 k	1 % 0.063 W 0603
R806	1430329	Chip resistor	24.9 k	1 % 0.063 W 0603
R807	1430335	Chip resistor	5.1 k	1 % 0.063 W 0603
R808	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R809	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R816	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R817	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R818	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R819	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R821	1430331	Chip resistor	26.1 k	1 % 0.063 W 0603
R822	1430165	Chip resistor	39	5 % 0.063 W 0603
R823	1430165	Chip resistor	39	5 % 0.063 W 0603
R827	1430798	Chip resistor	56 k	5 % 0.063 W 0402
R828	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R830	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R831	1430335	Chip resistor	5.1 k	1 % 0.063 W 0603
R832	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R833	1430329	Chip resistor	24.9 k	1 % 0.063 W 0603
R834	1430329	Chip resistor	24.9 k	1 % 0.063 W 0603

R856	1430690	Chip jumper		0402
R901	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R902	1430690	Chip jumper		0402
R903	1430690	Chip jumper		0402
R910	1430726	Chip resistor	100	5 % 0.063 W 0402
R911	1430700	Chip resistor	10	5 % 0.063 W 0402
R913	1430724	Chip resistor	82	5 % 0.063 W 0402
R921	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R924	1430766	Chip resistor	3.9 k	5 % 0.063 W 0402
R930	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R931	1430808	Chip resistor	150 k	5 % 0.063 W 0402
R932	1430756	Chip resistor	1.2 k	5 % 0.063 W 0402
R935	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R940	1430734	Chip resistor	220	5 % 0.063 W 0402
R941	1430690	Chip jumper		0402
R950	1430690	Chip jumper		0402
R951	1430728	Chip resistor	120	5 % 0.063 W 0402
R952	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R953	1430772	Chip resistor	5.6 k	5 % 0.063 W 0402
R954	1430760	Chip resistor	1.8 k	5 % 0.063 W 0402
R955	1430740	Chip resistor	330	5 % 0.063 W 0402
R960	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R961	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R962	1430710	Chip resistor	22	5 % 0.063 W 0402
R963	1430746	Chip resistor	560	5 % 0.063 W 0402
R970	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R971	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R973	1430714	Chip resistor	33	5 % 0.063 W 0402
R974	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R981	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
C101	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C102	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C103	2611668	Tantalum cap.	4.7 u	20 % 10 V
3.2x1.6x1.6				
C104	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C105	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C106	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C107	2604431	Tantalum cap.	10 u	20 % 16 V
6.0x3.2x2.5				
C108	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C109	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C110	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C111	2604431	Tantalum cap.	10 u	20 % 16 V
6.0x3.2x2.5				
C112	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C113	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C114	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C116	2320045	Ceramic cap.	27 p	5 % 50 V 0603

C117	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C118	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C119	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C120	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C121	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C122	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C123	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C124	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C125	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C126	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C127	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C128	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C129	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C130	2312211	Ceramic cap.	3.3 u	10 % 0805
C131	2320045	Ceramic cap.	27 p	5 % 50 V 0603
C140	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C141	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C143	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C150	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C151	2312211	Ceramic cap.	3.3 u	10 % 0805
C185	2320120	Ceramic cap.	22 n	10 % 25 V 0603
C200	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C201	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C202	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C203	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C206	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C207	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C210	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C220	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C230	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C250	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C260	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C261	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C262	2610013	Tantalum cap. 7.3x4.3x4.1	220 u	10 % 10 V
C263	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C264	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C401	2312293	Ceramic cap.		Y5 V 1206
C402	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C403	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C404	2312293	Ceramic cap.		Y5 V 1206
C405	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C406	2312293	Ceramic cap.		Y5 V 1206
C407	2312293	Ceramic cap.		Y5 V 1206

C410	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C411	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C413	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C414	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C420	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C421	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C422	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C423	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C424	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C425	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C426	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C427	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C428	2312293	Ceramic cap.		Y5 V 1206
C430	2312293	Ceramic cap.		Y5 V 1206
C431	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C433	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C434	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C435	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C436	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C437	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C438	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C439	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C441	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C443	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C444	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C445	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C449	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C481	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C485	2604248	Tantalum cap.	4.7 u	20 % 16 V
6.0x3.2x2.5				
C603	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C612	2604209	Tantalum cap.	1.0 u	20 % 16 V
3.2x1.6x1.6				
C613	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C614	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C620	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C621	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C622	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C623	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C624	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C625	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C626	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C631	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C632	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C633	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C634	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C641	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C642	2320620	Ceramic cap.	10 n	5 % 16 V 0402

C643	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C644	2320023	Ceramic cap.	3.3 p	0.25 % 50 V 0603
C645	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C668	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C669	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C670	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C700	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C701	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C702	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C703	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C704	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C705	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C706	2320099	Ceramic cap.	4.7 n	5 % 50 V 0603
C708	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C709	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C710	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C711	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C712	2312296	Ceramic cap.		Y5 V 1210
C715	2310017	Ceramic cap.	22 n	10 % 100 V 0805
C716	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C717	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C718	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C719	2312296	Ceramic cap.		Y5 V 1210
C721	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C730	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C733	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C736	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C741	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C742	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C743	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C744	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C751	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C752	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C754	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C755	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C756	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C757	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C758	2320120	Ceramic cap.	22 n	10 % 25 V 0603
C801	2320576	Ceramic cap.	470 p	5 % 50 V 0402
C802	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C803	2611701	Tantalum cap.	47 u	20 % 25 V 7.3x4.3x2.9
C804	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C805	2517805	Electrol. cap.	47 u	20 % 100 V 10x10x10.5
C806	2517805	Electrol. cap.	47 u	20 % 100 V 10x10x10.5
C807	2320003	Ceramic cap.	100 p	5 % 100 V 0603

C808	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C809	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C810	2320562	Ceramic cap.	120 p	5 % 50 V 0402
C811	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C812	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C813	2320562	Ceramic cap.	120 p	5 % 50 V 0402
C814	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C815	2610021	Tantalum cap.	33 u	10 % 25 V
7.3x4.3x2.9				
C817	2320592	Ceramic cap.	2.2 n	5 % 50 V 0402
C819	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C820	2320120	Ceramic cap.	22 n	10 % 25 V 0603
C821	2320003	Ceramic cap.	100 p	5 % 100 V 0603
C822	2320003	Ceramic cap.	100 p	5 % 100 V 0603
C823	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C825	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C826	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C827	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C828	2611701	Tantalum cap.	47 u	20 % 25 V
7.3x4.3x2.9				
C829	2320576	Ceramic cap.	470 p	5 % 50 V 0402
C830	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C831	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C901	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C902	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C903	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C910	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C911	2312293	Ceramic cap.		Y5 V 1206
C912	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C930	2320548	Ceramic cap.	33 p	5 % 50 V 0402
C931	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C933	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C939	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C940	2320604	Ceramic cap.	18 p	5 % 50 V 0402
C942	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C950	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C951	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C952	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C953	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C954	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C960	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C961	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C962	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C963	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C970	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C971	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C972	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C973	2320778	Ceramic cap.	10 n	10 % 16 V 0402

C974	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C975	2312296	Ceramic cap.		Y5 V 1210
C976	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C977	2310490	Ceramic cap.	360 p	2 % 50 V 0805
C978	2320556	Ceramic cap.	68 p	5 % 50 V 0402
C980	2320107	Ceramic cap.	10 n	5 % 50 V 0603
C981	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C982	2320560	Ceramic cap.	100 p	5 % 50 V 0402
L101	3640465	Choke		20 % 3.8 A
12.95x9.40				
L102	3640465	Choke		20 % 3.8 A
12.95x9.40				
L103	3203701	Ferrite bead 33r/100mhz	0805	0805
L104	3203701	Ferrite bead 33r/100mhz	0805	0805
L105	3203701	Ferrite bead 33r/100mhz	0805	0805
L440	3641548	Chip coil	100 n	10 % Q=40/150 MHz
0805				
L611	3641548	Chip coil	100 n	10 % Q=40/150 MHz
0805				
L621	3640605	Chip coil	43 n	5 % Q=106/150 MHz
SMD				
L622	3640605	Chip coil	43 n	5 % Q=106/150 MHz
SMD				
L623	3640605	Chip coil	43 n	5 % Q=106/150 MHz
SMD				
L801	3640463	Choke	100 u	20 % 2.4 A SMD
L802	3640011	Filt z>600r/100m 0r6max 0.2a	0805	0805
L803	3640011	Filt z>600r/100m 0r6max 0.2a	0805	0805
L804	3203701	Ferrite bead 33r/100mhz	0805	0805
L901	3645175	Chip coil	12 n	5 % Q=12/100 MHz
0603				
L910	3641548	Chip coil	100 n	10 % Q=40/150 MHz
0805				
L911	3645191	Chip coil	8 n	5 % Q=10/100 MHz
0603				
L931	3641572	Chip coil	22 n	5 % Q=45/250 MHz
0805				
L940	3645027	Chip coil	470 n	10 % Q=25/25 MHz
0805				
L960	3643021	Chip coil	47 n	5 % Q=40/200 MHz
0805				
L961	3645015	Chip coil	560 n	10 % Q=15/25 MHz
0603				
L970	3640103	Chip coil	320 u	2 % Q=40/796 kHz
1812				
L971	3645027	Chip coil	470 n	10 % Q=25/25 MHz
0805				
L980	3645015	Chip coil	560 n	10 % Q=15/25 MHz

0603				
L981	3645013	Chip coil	220 n	10 % Q=15/25 MHz
0603				
B700	4510155	Crystal	14.7456 M	+−50PPM
B730	4510231	Crystal	3.579545 M	+−50PPM
G260	4700057	Cell assy. polyacene	0.05mah 3.3v	3.3V
G410	4510171	VCTCXO	14.85 M	+−2PPM 3.0V
F101	5110019	SM, fuse s 5a 125v sp_tff_3 only		
F102	5119002	SM, fuse f2.0a 32v	120	1206
Z701	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z702	3640035	Filt z>450r/100m 0r7max 0.2a 0603		0603
Z940	4510085	XTAL filter	45 M	+−7.5KHZ 4POLE
Z970	4510061	Cer.filt 450+−6khz	11.8x7.5	11.8x7.5
V100	4210100	Transistor	BC848W	nnp 30 V SOT323
V101	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V102	4110028	Trans. supr.	16V	23 A 600 W
DO214AA				
V104	4110028	Trans. supr.	16V	23 A 600 W
DO214AA				
V105	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V107	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V108	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V260	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V261	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V262	4210100	Transistor	BC848W	nnp 30 V SOT323
V263	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V440	4210091	Transistor	BFG540W/X	nnp 15 V SOT343
V450	4219922	Transistor x 2		UM6
V610	4210003	Transistor	BLT80	nnp 10 V 0.22 A
SOT223				
V630	4202456	MosFet		p−ch 50 V 8 A TO252
V631	4200917	Transistor	BC848B/BCW32	nnp 30 V 100 mA
SOT23				
V632	4200917	Transistor	BC848B/BCW32	nnp 30 V 100 mA
SOT23				
V633	4200917	Transistor	BC848B/BCW32	nnp 30 V 100 mA
SOT23				
V640	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V641	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V642	4100285	Diode x 2	BAV99	70 V 200 mA
SER.SOT23				
V645	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V751	4113651	Trans. supr.	QUAD	6 V SOT23−5
V760	4210100	Transistor	BC848W	nnp 30 V SOT323

V801	4211421	MosFet		p-ch 20 V TO263
V802	4115805	Diode	ES1C	ULTR A D0214AC
V803	4110053	Trans. supr.	82V	(SMB)DO214AA
V804	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V805	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V910	4210013	Transistor	BFP450	npn 4. V SOT343
V929	4210102	Transistor	BC858W	pnnp 30 V 100 mA
200MWSOT323				
V930	4100567	Sch. diode x 2	BAS70-04	70V15 mA SER-
SOT23				
V931	4219922	Transistor x 2		UM6
V950	4210066	Transistor	BFR93AW	npn 12 V 35 mA
SOT323				
V960	4210066	Transistor	BFR93AW	npn 12 V 35 mA
SOT323				
D200	4370501	IC, MCU		TQFP120
D230	4340357	IC, EEPROM		SO8
D250	4370405	IC, MCU		8S2
D260	4303679	IC, 4 x nand	74HC00	SO14
N101	4340639	IC, regulator	LM29375 V 500 mA	TO263
N102	4340641	IC, regulator	LM29378 V 500 m	TO263
N103	4370471	Power asic for etacs/nmt450		
N105	4340663	IC, regulator LP2985	3.3 V 150 mA	SOT23-5
N150	4340663	IC, regulator LP2985	3.3 V 150 mA	SOT23-5
N400	4340393	IC, 2xsynth 1.1ghz	UMA1015AM	SSOP20
N700	4370381	IC, nmt audio/signalling	MASI	TQFP64
N731	4340703	Mt88170 dtmf receiver	3v	SO18
N801	4340627	Stlc3065 wll subscr i/face		TQFP44
N970	4349694	IC, if amp+fm detector	TA31136	SSO16
S260	5200914	Push button switch 2-pole	6x7	SMD
X101	5414943	Dc-jack d6.3/2		PCB
X640	5426384	Tnc conn 50ohm		PCB
X750	5416518	Modular jack 8 pole		smd
X801	5409043	SM, modular jack 6pol right a		ANGLE
A601	9517013	SM, d rf shield pa-can		dmc00455
A901	9517013	SM, d rf shield pa-can		dmc00455
A902	9517013	SM, d rf shield pa-can		dmc00455
	9854359	PCB JM1	110.0X195.0X1.6	M4 1/PA
	0240809	IC, SWmodulator	SW NMT450	

## Parts list of WN1 Basic Module

(EDMS Issue 3.8) Code: 0201416)

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R101	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R102	1430690	Chip jumper		0402
R103	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R104	1430734	Chip resistor	220	5 % 0.063 W 0402
R106	1430803	Chip resistor	4.7 k	1 % 0.063 W 0402
R107	1430734	Chip resistor	220	5 % 0.063 W 0402
R108	1430803	Chip resistor	4.7 k	1 % 0.063 W 0402
R109	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R110	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R150	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R151	1430690	Chip jumper		0402
R200	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R201	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R202	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R203	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R204	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R205	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R206	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R211	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R212	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R230	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R231	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R250	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R251	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R252	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R260	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R261	1430135	Chip resistor	10 M	5 % 0.063 W 0603
R262	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R263	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R265	1430800	Chip resistor	68 k	5 % 0.063 W 0402
R267	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R268	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R269	1430814	Chip resistor	270 k	5 % 0.063 W 0402
R401	1430710	Chip resistor	22	5 % 0.063 W 0402
R402	1430710	Chip resistor	22	5 % 0.063 W 0402
R403	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R405	1430794	Chip resistor	39 k	5 % 0.063 W 0402
R406	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R410	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R412	1430710	Chip resistor	22	5 % 0.063 W 0402
R414	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R420	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R421	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402

R422	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R423	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R424	1430734	Chip resistor	220	5 % 0.063 W 0402
R425	1430734	Chip resistor	220	5 % 0.063 W 0402
R430	1430690	Chip jumper		0402
R431	1430690	Chip jumper		0402
R433	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R434	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R435	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R436	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R440	1430734	Chip resistor	220	5 % 0.063 W 0402
R441	1430734	Chip resistor	220	5 % 0.063 W 0402
R443	1430728	Chip resistor	120	5 % 0.063 W 0402
R444	1430772	Chip resistor	5.6 k	5 % 0.063 W 0402
R445	1430712	Chip resistor	27	5 % 0.063 W 0402
R446	1430700	Chip resistor	10	5 % 0.063 W 0402
R447	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R450	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R451	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R452	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R477	1430690	Chip jumper		0402
R479	1430690	Chip jumper		0402
R496	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R497	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R498	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R499	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R611	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R612	1430756	Chip resistor	1.2 k	5 % 0.063 W 0402
R613	1430710	Chip resistor	22	5 % 0.063 W 0402
R614	1430710	Chip resistor	22	5 % 0.063 W 0402
R630	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R631	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R632	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R633	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R634	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R635	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R636	1430752	Chip resistor	820	5 % 0.063 W 0402
R637	1430728	Chip resistor	120	5 % 0.063 W 0402
R638	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R639	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R641	1430718	Chip resistor	47	5 % 0.063 W 0402
R642	1430726	Chip resistor	100	5 % 0.063 W 0402
R643	1430718	Chip resistor	47	5 % 0.063 W 0402
R644	1430718	Chip resistor	47	5 % 0.063 W 0402
R645	1430716	Chip resistor	39	5 % 0.063 W 0402
R650	1430690	Chip jumper		0402
R651	1430690	Chip jumper		0402
R652	1430690	Chip jumper		0402

R654	1430690	Chip jumper		0402
R698	1430690	Chip jumper		0402
R699	1430690	Chip jumper		0402
R707	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R712	1430830	Chip resistor	1.0 M	5 % 0.063 W 0402
R713	1430812	Chip resistor	220 k	5 % 0.063 W 0402
R720	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R721	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R731	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R732	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R733	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R734	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R735	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R736	1430855	Chip resistor	300 k	1 % 0.063 W 0402
R752	1430718	Chip resistor	47	5 % 0.063 W 0402
R753	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R754	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R756	1825005	Chip varistor vwm14v vc30v		0805
R757	1825005	Chip varistor vwm14v vc30v		0805
R762	1430734	Chip resistor	220	5 % 0.063 W 0402
R763	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R764	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R766	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R800	1800673	NTC resistor	15 k	10 % 0.12 W 0805
R801	1420200	Chip resistor	0.22	5 % 0.2 W 1206
R802	1420200	Chip resistor	0.22	5 % 0.2 W 1206
R804	1430337	Chip resistor	9.1 k	1 % 0.063 W 0603
R805	1430339	Chip resistor	300 k	1 % 0.063 W 0603
R806	1430329	Chip resistor	24.9 k	1 % 0.063 W 0603
R807	1430335	Chip resistor	5.1 k	1 % 0.063 W 0603
R808	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R809	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R816	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R817	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R818	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R819	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R821	1430331	Chip resistor	26.1 k	1 % 0.063 W 0603
R822	1430165	Chip resistor	39	5 % 0.063 W 0603
R823	1430165	Chip resistor	39	5 % 0.063 W 0603
R827	1430798	Chip resistor	56 k	5 % 0.063 W 0402
R828	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R830	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R831	1430335	Chip resistor	5.1 k	1 % 0.063 W 0603
R832	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R833	1430329	Chip resistor	24.9 k	1 % 0.063 W 0603
R834	1430329	Chip resistor	24.9 k	1 % 0.063 W 0603
R856	1430690	Chip jumper		0402
R901	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402

R902	1430690	Chip jumper		0402
R903	1430690	Chip jumper		0402
R910	1430726	Chip resistor	100	5 % 0.063 W 0402
R911	1430700	Chip resistor	10	5 % 0.063 W 0402
R913	1430724	Chip resistor	82	5 % 0.063 W 0402
R921	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R924	1430766	Chip resistor	3.9 k	5 % 0.063 W 0402
R930	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R931	1430808	Chip resistor	150 k	5 % 0.063 W 0402
R932	1430756	Chip resistor	1.2 k	5 % 0.063 W 0402
R935	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R940	1430734	Chip resistor	220	5 % 0.063 W 0402
R941	1430690	Chip jumper		0402
R950	1430690	Chip jumper		0402
R951	1430728	Chip resistor	120	5 % 0.063 W 0402
R952	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R953	1430772	Chip resistor	5.6 k	5 % 0.063 W 0402
R954	1430760	Chip resistor	1.8 k	5 % 0.063 W 0402
R955	1430740	Chip resistor	330	5 % 0.063 W 0402
R960	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R961	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R962	1430710	Chip resistor	22	5 % 0.063 W 0402
R963	1430746	Chip resistor	560	5 % 0.063 W 0402
R973	1430714	Chip resistor	33	5 % 0.063 W 0402
R974	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R981	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
C101	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C102	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C103	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C104	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C105	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C106	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C107	2604431	Tantalum cap. 6.0x3.2x2.5	10 u	20 % 16 V
C108	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C109	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C110	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C111	2604431	Tantalum cap. 6.0x3.2x2.5	10 u	20 % 16 V
C112	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C113	2310752	Ceramic cap.	10 n	20 % 50 V 0805
C114	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C116	2320045	Ceramic cap.	27 p	5 % 50 V 0603
C117	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C118	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C119	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C120	2320546	Ceramic cap.	27 p	5 % 50 V 0402

C121	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C122	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C123	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C124	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C125	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C126	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C127	2611668	Tantalum cap. 3.2x1.6x1.6	4.7 u	20 % 10 V
C128	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C129	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C130	2312211	Ceramic cap.	3.3 u	10 % 0805
C131	2320045	Ceramic cap.	27 p	5 % 50 V 0603
C140	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C141	2310424	Ceramic cap.	100 p	5 % 50 V 0805
C142	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C143	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C150	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C151	2312211	Ceramic cap.	3.3 u	10 % 0805
C185	2320120	Ceramic cap.	22 n	10 % 25 V 0603
C200	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C201	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C202	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C203	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C206	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C207	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C210	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C220	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C230	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C250	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C260	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C261	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C262	2610013	Tantalum cap. 7.3x4.3x4.1	220 u	10 % 10 V
C263	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C264	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C401	2312293	Ceramic cap.		Y5 V 1206
C402	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C403	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C404	2312293	Ceramic cap.		Y5 V 1206
C405	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C406	2312293	Ceramic cap.		Y5 V 1206
C407	2312293	Ceramic cap.		Y5 V 1206
C410	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C411	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C413	2320536	Ceramic cap.	10 p	5 % 50 V 0402

C414	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C420	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C421	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C422	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C423	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C424	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C425	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C426	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C427	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C428	2312293	Ceramic cap.		Y5 V 1206
C430	2312293	Ceramic cap.		Y5 V 1206
C431	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C433	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C434	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C435	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C436	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C437	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C438	2320596	Ceramic cap.	3.3 n	5 % 50 V 0402
C439	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C441	2320540	Ceramic cap.	15 p	5 % 50 V 0402
C443	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C444	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C445	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C449	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C481	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C485	2604248	Tantalum cap.	4.7 u	20 % 16 V
6.0x3.2x2.5				
C603	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C612	2604209	Tantalum cap.	1.0 u	20 % 16 V
3.2x1.6x1.6				
C613	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C614	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C620	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C621	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C622	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C623	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C624	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C625	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C626	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C631	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C632	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C633	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C634	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C641	2320059	Ceramic cap.	100 p	5 % 50 V 0603
C642	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C643	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C644	2320023	Ceramic cap.	3.3 p	0.25 % 50 V 0603
C645	2320560	Ceramic cap.	100 p	5 % 50 V 0402

C668	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C669	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C670	2517850	Electrol. cap.	220 u	20 % 35 V 10x10
C700	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C701	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C702	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C703	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C704	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C705	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C706	2320099	Ceramic cap.	4.7 n	5 % 50 V 0603
C708	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C709	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C710	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C711	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C712	2312296	Ceramic cap.		Y5 V 1210
C715	2310017	Ceramic cap.	22 n	10 % 100 V 0805
C716	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C717	2320620	Ceramic cap.	10 n	5 % 16 V 0402
C718	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C719	2312296	Ceramic cap.		Y5 V 1210
C721	2320131	Ceramic cap.	33 n	10 % 16 V 0603
C730	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C733	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C736	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C741	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C742	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C743	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C744	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C751	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C752	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C754	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C755	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C756	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C757	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C758	2320120	Ceramic cap.	22 n	10 % 25 V 0603
C777	2340010	Ceramic cap.	27 n	10 % 50 V 0805
C801	2320576	Ceramic cap.	470 p	5 % 50 V 0402
C802	2320781	Ceramic cap.	47 n	20 % 16 V 0603
C803	2611701	Tantalum cap.	47 u	20 % 25 V
7.3x4.3x2.9				
C804	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C805	2517805	Electrol. cap.	47 u	20 % 100 V
10x10x10.5				
C806	2517805	Electrol. cap.	47 u	20 % 100 V
10x10x10.5				
C807	2320003	Ceramic cap.	100 p	5 % 100 V 0603
C808	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C809	2310013	Ceramic cap.	100 n	10 % 100 V 1210

C810	2320562	Ceramic cap.	120 p	5 % 50 V 0402
C811	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C812	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C813	2320562	Ceramic cap.	120 p	5 % 50 V 0402
C814	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C815	2610021	Tantalum cap.	33 u	10 % 25 V
7.3x4.3x2.9				
C817	2320592	Ceramic cap.	2.2 n	5 % 50 V 0402
C819	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C820	2320120	Ceramic cap.	22 n	10 % 25 V 0603
C821	2320003	Ceramic cap.	100 p	5 % 100 V 0603
C822	2320003	Ceramic cap.	100 p	5 % 100 V 0603
C823	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C825	2310013	Ceramic cap.	100 n	10 % 100 V 1210
C826	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C827	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C828	2611701	Tantalum cap.	47 u	20 % 25 V
7.3x4.3x2.9				
C829	2320576	Ceramic cap.	470 p	5 % 50 V 0402
C830	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C831	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C901	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C902	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C903	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C910	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C911	2312293	Ceramic cap.		Y5 V 1206
C912	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C930	2320548	Ceramic cap.	33 p	5 % 50 V 0402
C931	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C933	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C939	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C940	2320604	Ceramic cap.	18 p	5 % 50 V 0402
C942	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C950	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C951	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C952	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C953	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C954	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C960	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C961	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C962	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C963	2320530	Ceramic cap.	5.6 p	0.25 % 50 V 0402
C970	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C971	2320584	Ceramic cap.	1.0 n	5 % 50 V 0402
C972	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C973	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C974	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C975	2312296	Ceramic cap.		Y5 V 1210

C976	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C981	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C982	2320560	Ceramic cap.	100 p	5 % 50 V 0402
L101	3640465	Choke		20 % 3.8 A
12.95x9.40				
L102	3640465	Choke		20 % 3.8 A
12.95x9.40				
L103	3203701	Ferrite bead 33r/100mhz	0805	0805
L104	3203701	Ferrite bead 33r/100mhz	0805	0805
L105	3203701	Ferrite bead 33r/100mhz	0805	0805
L440	3641548	Chip coil	100 n	10 % Q=40/150 MHz
0805				
L611	3641548	Chip coil	100 n	10 % Q=40/150 MHz
0805				
L621	3640605	Chip coil	43 n	5 % Q=106/150 MHz
SMD				
L622	3640605	Chip coil	43 n	5 % Q=106/150 MHz
SMD				
L623	3640605	Chip coil	43 n	5 % Q=106/150 MHz
SMD				
L801	3640463	Choke	100 u	20 % 2.4 A SMD
L802	3640011	Filt z>600r/100m 0r6max 0.2a	0805	0805
L803	3640011	Filt z>600r/100m 0r6max 0.2a	0805	0805
L804	3203701	Ferrite bead 33r/100mhz	0805	0805
L901	3645175	Chip coil	12 n	5 % Q=12/100 MHz
0603				
L910	3641548	Chip coil	100 n	10 % Q=40/150 MHz
0805				
L911	3645191	Chip coil	8 n	5 % Q=10/100 MHz
0603				
L931	3641572	Chip coil	22 n	5 % Q=45/250 MHz
0805				
L940	3645027	Chip coil	470 n	10 % Q=25/25 MHz
0805				
L960	3643021	Chip coil	47 n	5 % Q=40/200 MHz
0805				
L961	3645015	Chip coil	560 n	10 % Q=15/25 MHz
0603				
L971	3645027	Chip coil	470 n	10 % Q=25/25 MHz
0805				
L980	3645015	Chip coil	560 n	10 % Q=15/25 MHz
0603				
L981	3645013	Chip coil	220 n	10 % Q=15/25 MHz
0603				
B700	4510155	Crystal	14.7456 M	+–50PPM
B730	4510231	Crystal	3.579545 M	+–50PPM
G260	4700057	Cell assy. polyacene	0.05mah 3.3v	3.3VG410 4510171
VCTCXO	14.85 M	+–2PPM	3.0V	

F101	5110019	SM, fuse s 5a 125v sp_tff_3 only		
F102	5119002	SM, fuse f2.0a 32v	120	1206
Z701	3640035	Filt z>450r/100m Or7max 0.2a 0603		0603
Z702	3640035	Filt z>450r/100m Or7max 0.2a 0603		0603
Z940	4510085	XTAL filter	45 M	+−7.5KHZ 4POLE
Z970	4510061	Cer.filt 450+−6khz	11.8x7.5	11.8x7.5
V100	4210100	Transistor	BC848W	npn 30 V SOT323
V101	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V102	4110028	Trans. supr.	16V	23 A 600 W
DO214AA				
V104	4110028	Trans. supr.	16V	23 A 600 W
DO214AA				
V105	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
V107	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V260	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V261	4110072	Diode x 2	BAV99W	70 V 0.2 A
SOT323V262	4210100	Transistor	BC848W	npn 30 V
SOT323				
V263	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V440	4210091	Transistor	BFG540W/X	npn 15 V SOT343
V450	4219922	Transistor x 2		UM6
V610	4210003	Transistor	BLT80	npn 10 V 0.22 A
SOT223				
V630	4202456	MosFet		p−ch 50 V 8 A TO252
V631	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA
SOT23				
V632	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA
SOT23				
V633	4200917	Transistor	BC848B/BCW32	npn 30 V 100 mA
SOT23				
V640	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V641	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V642	4100285	Diode x 2	BAV99	70 V 200 mA
SER.SOT23				
V645	4100567	Sch. diode x 2	BAS70−04	70V15 mA SER-
SOT23				
V751	4113651	Trans. supr.	QUAD	6 V SOT23−5
V760	4210100	Transistor	BC848W	npn 30 V SOT323
V801	4211421	MosFet		p−ch 20 V TO263
V802	4115805	Diode	ES1C	ULTR A D0214AC
V803	4110053	Trans. supr.	82V	(SMB)DO214AA
V804	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V805	4110072	Diode x 2	BAV99W	70 V 0.2 A SOT323
V910	4210013	Transistor	BFP450	npn 4. V SOT343
V929	4210102	Transistor	BC858W	pnp 30 V 100 mA

200MWSOT323

V930	4100567	Sch. diode x 2	BAS70-04	70V15 mA SER-
SOT23				
V931	4219922	Transistor x 2		UM6
V950	4210066	Transistor	BFR93AW	npn 12 V 35 mA
SOT323				
V960	4210066	Transistor	BFR93AW	npn 12 V 35 mA
SOT323				
D200	4370501	IC, MCU		TQFP120
D230	4340357	IC, EEPROM		SO8
D250	4370405	IC, MCU		8S2
D260	4303679	IC, 4 x nand	74HC00	SO14
N101	4340639	IC, regulator	LM2937	5 V 500 mA TO263
N102	4340641	IC, regulator	LM2937	8 V 500 mA TO263
N103	4370471	Power asic for etacs/nmt450		
N105	4340663	IC, regulator	LP2985	3.3 V 150 mA
SOT23-5				
N150	4340663	IC, regulator	LP2985	3.3 V 150 mA
SOT23-5				
N400	4340393	IC, 2xsynth 1.1ghz ssop	UMA1015AM	SSOP20
N700	4370381	IC, nmt audio/signalling tqfp6	MASI	TQFP64
N731	4340703	Mt88l70 dtmf receiver 3v so18		SO18
N801	4340627	Stlc3065 wll subscr i/face tqfp44		TQFP44
N970	4349694	IC, if amp+fm detector sso	TA31136	SSO16
S260	5200914	Push button switch 2-pole 6x7 smd		SMD
X101	5414943	Dc-jack d6.3/2 pcb		
X640	5426384	Tnc conn 50ohm pcb		PCB
X750	5416518	Modular jack 8 pole smd		
X801	5409043	SM, modular jack 6pol right angl		ANGLE
A601	9517013	SM, d rf shield pa-can dmc00455		
A901	9517013	SM, d rf shield pa-can dmc00455		
A902	9517013	SM, d rf shield pa-can dmc00455		
	9854359	PCB JM1 110.0X195.0X1.6 M4 1/PA		
	9854359	PC board JM1		110.0x195.0x1.6 m4
1/pa				
	0240809	IC, SWmodulator	SW NMT450	

## Parts list of WN1F Variation Module (Poland)

0201421 WN1F VARIATION MODULE v.1.1

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R432	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R485	1430690	Chip jumper		0402
C601	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C616	2320550	Ceramic cap.	39 p	5 % 50 V 0402
L612	3645175	Chip coil	12 n	5 % Q=12/100 MHz
G420	4350167	Vco 450–460mhz 2.8v 15ma		NMT450
G520	4350169	Vco 416–425mhz 2.8v 12ma		NMT450
Z640	4508216	Dupl 453–457.4/463–467.5mhz		88x51
Z930	4510135	Saw filter	464.5+–3 M	/4DB 5.2x5.2
N620	4352537	RF pow.hybr.		

## Parts list of WN1F Variation Module (Poland)

0201421 WN1F VARIATION MODULE v.1.4

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R432	1430784	Chip resistor	15 k	5 % 0.063 W 0402
R454	1430690	Chip jumper		0402
R485	1430690	Chip jumper		0402
C601	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C616	2320550	Ceramic cap.	39 p	5 % 50 V 0402
L612	3645175	Chip coil	12 n	5 % Q=12/100 MHz
G420	4350167	Vco 450–460mhz 2.8v 15ma		NMT450
G520	4350169	Vco 416–425mhz 2.8v 12ma		NMT450
Z640	4508216	Dupl 453–457.4/463–467.5mhz		88x51
Z930	4510135	Saw filter	464.5+–3 M	/4DB 5.2x5.2
V108	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
N620	4352537	RF pow.hybr.		

## Parts list of WN1T Variation Module (Thailand)

0201422 WN1F VARIATION MODULE v.1.3

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R432	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R454	1430690	Chip jumper		0402
R486	1430690	Chip jumper		0402
C601	2320520	Ceramic cap.	2.2 p	0.25 % 50 V 0402
C616	2320548	Ceramic cap.	33 p	5 % 50 V 0402
L612	3645017	Chip coil	5 n	10 % Q=10/100 MHz
G420	4350199	Vco 475–485mhz 2.8v 15ma tx nmt		
G520	4350195	Vco 441–450mhz 2.8v 12ma rx nmt		
Z640	4508238	Dupl 479–483.5/489–493.5mhz		88x51
Z930	4511005	Saw filter	491.25+–2.25 M	5.2x5.2
V108	3640103	Chip coil	320u	2 % Q=40/796 kHz
N620	4352534	RF pow.hybr.		

## Parts list of WN1C Variation Module (Czech)

0201423 WN1F VARIATION MODULE v.1.4

ITEM	CODE	DESCRIPTION	VALUE	TYPE
R432	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R454	1430690	Chip jumper		0402
R485	1430690	Chip jumper		0402
C601	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C616	2320550	Ceramic cap.	39 p	5 % 50 V 0402
L612	3645175	Chip coil	12 n	5 % Q=12/100 MHz
G420	4350167	Vco 450–460mhz 2.8v 15ma		NMT450
G520	4350169	Vco 416–425mhz 2.8v 12ma		NMT450
Z640	4508286	Dupl 451–456/461–466mhz		87.5x51
Z930	4510135	Saw filter	464.5+–3 M	/4DB 5.2x5.2
V108	4110074	Schottky diode	STPS340U	40 V 3 A SOD6
N620	4352537	RF pow.hybr.		

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