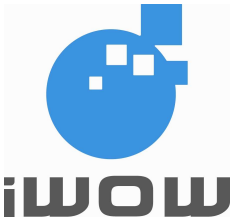

TR-800 GSM/GPRS MODULE

PRODUCT TECHNICAL SPECIFICATIONS

Date	:	08 June 2006
Document Version	:	2.4
Our Reference	:	02000B06

Document Information

Revision	Date	Document History	Author
0.0	24 Jun 04	▪ Initial release version 000	BYKhoo
0.1	26 July 04	▪ Module dimension specification & drawing were amended.	BYKhoo
0.2	03 Sept 04	▪ UART port naming was changed to standard DCE format. ▪ NiBOOT was replaced with GND on the pin connectors. ▪ DSR was replaced with DTR on the pin connectors. ▪ Mechanical drawing was updated with pin number location.	BYKhoo
1.0	15 Sept 04	▪ Module mechanical drawing was updated.	BYKhoo
	20 Sept 04	▪ Detailed audio description was updated with example circuits ▪ Current consumption data was updated.	BYKhoo
1.1	23 Sept 04	▪ UART naming convention was amended at Chapter 3: Pins Description section.	BYKhoo
1.2	30 Nov 04	▪ Description of RF antenna connection was amended.	BYKhoo
2.0	09 Dec 04	▪ Module mechanical drawing was updated.	BYKhoo
	19 Jan 05	▪ Pin out configuration was updated with DAI pins. ▪ GPIO information was modified. ▪ Updated RF interface connector details.	BYKhoo
2.1	23 Aug 05	▪ Included references to new quad-band operation. ▪ Included references to the extended -40°C to +85°C operating temperature range (reduced specification). ▪ Included references to the Parallel Bus. ▪ RF connection methods update. ▪ Updated mechanical drawing for P4 hardware.	BYKhoo
2.2	08 Sept 05	▪ Updated mechanical drawing for P5 hardware (RF pad changes). ▪ Updated pin description ▪ Updated GPIO info	BYKhoo
2.3	15 Nov 05	▪ Updated the supply input voltage VBAT specification	BYKhoo
2.4	08 Jun 06	▪ Added safety precaution section. ▪ Added comments for CE application ▪ Updated GPIO Info	BYKhoo / Vince

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1. GENERAL INFORMATION

- Network Type: Tri-band GSM/GPRS (optional quad-band)
- Supported Band: GSM850 (optional) / EGSM900 / DCS1800 / PCS1900
- GPRS: Type B, Multislot Class 10
- Output power:
  - GSM 850 : Class 4 (2W)
  - EGSM 900: Class 4 (2W)
  - DCS1800: Class 1 (1W)
  - PCS1900: Class 1 (1W)
- Dimensions: 41.2 x 36.0 x 3.0mm (exclude tolerance)
- Weight: 8.3g
- Operating Temperature: -20°C to +55°C
  -40°C to +85°C (Reduce specification)

- AT Command interface compliant to GSM 07.05 and GSM 07.07 recommendations.

- GSM Audio
  - Telephony
  - Emergency call
  - Half Rate, Full Rate and Enhanced Full Rate (HR/FR/EFR)
  - Echo Cancellation
  - Noise Reduction
  - DTMF
  - Adaptive Multi-rate (AMR)
- GSM Data/ Fax
  - Circuit Switched Data (CSD) up to 14.4 kbps
  - Fax Group 3, Class 2
- GSM Supplementary Services
  - Call Forwarding, Barring, Waiting, Hold
  - Multiparty Conference Call
  - Advice of Charge
  - Calling Line Identification

RF functionalities comply with the GSM Phase 2 recommendations. The frequencies covered are:

- Tx GSM850: (824 ~ 849 MHz) Rx GSM850: (869 ~ 894 MHz)
- Tx EGSM900: (880 ~ 915 MHz) Rx EGSM900: (925 ~ 960 MHz)
- Tx DCS1800: (1710 ~ 1785 MHz) Rx DCS1800: (1805 ~ 1880 MHz)
- Tx PCS1900: (1850 ~ 1910 MHz) Rx PCS1900: (1930 ~ 1990 MHz)

2. INTERFACES

2.1. General-Purpose Connector (GPC)

The 80-pins General-Purpose Connector is provided to interface the TR-800 module with a board containing a power supply connection along with a Battery-Charging Interface (BCI), UART level shifters, a LCD module, a keypad, SIM card connection and/or audio circuitry.

2.2. Power Supply and Ground

The power supply design is one of the key design areas for a GSM terminal due to the burst characteristics of GSM transmission. The supply must be able to deliver very high current peaks in a very short time during a GSM transmit burst, typically up to 2A. During these bursts, it is recommended that the voltage drop do not exceed 400mV. Also, the voltage ripple should not exceed 50mV at frequencies up to 200 kHz and 2mV at frequencies above 200 kHz.

The supply to the module is provided from the five dedicated VBAT pins of the GPC. The module's RF power amplifier is supplied directly from VBAT. Power to other parts of the module is regulated internally. The VBAT supply to the module must be externally regulated according to the modules supply input limits.

Ground connection to the target board is via the shield of the module and also via GPC's pin 48. All four legs of the shield must be soldered onto the target PCB. The ground connection of the target PCB has to go through a full ground plane on the PCB.

Pin Description:

Signal	Pin Number	Type
VBAT	1, 2, 3, 4, 5	Supply Input
GND	48, Shielding	-

Power Supply Voltage:

Parameters	Min	Nom	Max	Unit
VBAT	3.4*	3.8	5.5	V

**Must be guaranteed to ensure compliance with the GSM certification requirements.*

2.2.1. Power Consumption

Operating Mode	Conditions	I_{NOM}	I_{MAX}	Units
Module OFF/BACKUP		50	100	µA
Module IDLE	DRX=6 (Ave) with SLEEP mode enabled	3	-	mA
Active VOICE call	EGSM - PCL 5 (Ave)	230	260	mA
	DCS/PCS - PCL 0 (Ave)	190	220	mA
GPRS DATA (3Rx/2Tx)	EGSM – PCL 5 (Ave)	420	460	mA
	DCS/PCS – PCL 0 (Ave)	380	420	mA

**Test Condition: T_{amb}=25℃, V_{bat}=3.8V*

2.3. Backup Power Supply

Backup supply can be provided to the module via Pin 6, VBACKUP. It is used as a backup power supply to the internal Real Time Clock (RTC). This feature is required to maintain the date and time when the module is powered-off to reduce the power consumption. Pin 6 can be tied to an external backup battery or can be left open when it is not in use.

Pin Description:

Signal	Pin Number	Type	Description
VBACKUP	6	Supply input	Backup supply to RTC

Electrical Characteristics

Parameters	Conditions	Min	Nom	Max	Unit
Output voltage	Backup battery connected on VBACKUP	2.7	3.0	3.6	V

2.4. Battery-Charging Interface (BCI)

This feature is provided mainly for controlling the charging of a 1-cell Li-Ion battery. It can also be used to perform some auxiliary functions such as battery pre-charging and backup battery charging. This feature is not enabled in the standard firmware release and must be customized per customer. Please contact us at iWOW for more information on the BCI.

Pin Description:

Signal	Pin Number	Type	Description
PCHG	14	Analog Output	Battery pre-charge output current
VCHG	15	Analog Input	Charger voltage input
ICTL	16	Analog Output	Charger external transistor control
VCCS	17	Analog Input	Charging current sense

2.5. Analog to Digital Converter (ADC)

The module provides two 10-bit ADC inputs that were designed to be used for battery type and battery temperature sensing functions relating to the BCI. They can also be customized for other analog signal measurements. These ADC features are not enabled in the standard firmware release and must be customized per customer. Please contact us at iWOW for more information on the ADC.

Pin Description:

Signal	Pin Number	Type	Description
ADIN1	7	Analog Input	ADC input 1, for battery type sensing
ADIN2	8	Analog Input	ADC input 2, for battery temperature sensing

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
Resolution		-	10	-	Bits
Reference voltage		-	1.75	-	V
Differential non-linearity	Input range 0 to 1.75V	-2	-	2	LSB
Integral non-linearity	Best fitting, input range 0 to 1.5V	-1	-	1	LSB
	Best fitting, input range 1.5V to 1.75V	-3	-	3	LSB
Switching running frequency, F		-	1	-	MHz
Clock period, t		-	1	-	μs
Conversion time		-	16t + 8.5t	-	
Input resistance		-	5.7	-	kΩ

2.6. ON/OFF Control

This input PWON pin 18 is used to switch the module ON or OFF. A switch-ON or switch-OFF interruption is triggered in the module at the detection of a falling edge of this signal pin. Debouncing is provided by embedded hardware. Debounce time is about 30ms. A capacitor of value about 15nF can be placed close to the pin on the GPC to improve its ESD shielding. Note that the module should be properly switched OFF before all power supplies are removed. This is to avoid any unforeseen corruption of internal data.

Pin Description:

Signal	Pin Number	Type	Description
PWON	18	Input	Module switch ON/OFF

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
High level input voltage, V_{IH}		0.7VBAT	-	-	V
Low level input voltage, V_{IL}		-	-	0.3VBAT	V

2.6.1. State definitions

- NOBAT: Module is not powered by any supply.
- BACKUP: Module is powered only by the VBACKUP and maintains only the RTC supply.
- OFF: Module is powered by the main supply VBAT and maintains only the RTC supply.
- ACTIVE: Module is powered by the main supply VBAT, all internal supplies are enabled and all internal hardware are active.
- SLEEP: Module is powered by the main supply VBAT, only selected supplies are enabled and the module is in low consumption mode.

2.6.2. State transitions

- Power-OFF: Module is not powered by any supply, main or backup.
- Power-ON: Charged main supply or backup supply is plugged in.
- Switch-OFF: Module is powered and switched from ACTIVE or SLEEP state to reach the OFF or BACKUP state.
- Switch-ON: Module is powered and awaken from the OFF state to reach the ACTIVE state.

2.6.3. Switch-ON condition

The module has to be in the OFF state. This condition will switch-ON the module:

- When a falling edge, after debouncing, is detected on the PWON pin. The PWON pin is debounced by embedded hardware. The debounce time is approximately 30ms.
- When a charger voltage is detected at the VCHG pin. This voltage must be above VBAT+0.4V for the switch-ON to occur. This switch-ON condition is available only with the Battery Charging Interface.

There are two cases when this switch-ON sequence does not happen:

- When the main supply is under 3.2V.
- When the system is in BACKUP state (power is supplied via the VBACKUP pin only).

2.6.4. Switch-OFF condition

The module has to be in the ON state. This condition will switch-OFF the module:

- A falling edge signal is detected on the PWON pin after deboucing and the signal remains low for a minimum period of 900ms. The PWON signal must be released back to high after the module has switched-OFF.
- When the level of the main supply VBAT decreases below 2.8V and below the level of the backup supply.

Note that when the switch-OFF sequence is started, the sequence is completed even if a switch-ON condition occurs.

2.7. Reset Signal

This reset Pin 21 provides an unconditional hardware reset input to the module. A low level signal will trigger the reset of the module. This pin is meant for testing purposes only. When the pin is not used, it can be left unconnected. It is internally pulled up by a 100 kOhm resistor. A capacitor of value about 15nF can be placed close to the pin on the GPC to improve its ESD shielding.

Pin Description:

Signal	Pin Number	Type	Description
RESET	21	Input	Module reset input. Test only.

2.8. VIO Digital Supply Output

This internally regulated digital supply output can be used to supply external peripherals like a LED circuitry. It will only be available after the module is switched-ON and as such, this pin can also be used to signalize the module's state.

Pin Description:

Signal	Pin Number	Type	Description
VIO	9	Supply output	Digital supply output

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
Output voltage	At rated current	2.7	2.8	2.9	V
Output current		-	-	100	mA

2.9. Subscriber Identity Module (SIM) Interface

The SIM card interface is composed of an internally dedicated voltage regulator and I/O level shifters. It is able to support both 1.8V and 3V SIM cards. 5V SIM cards can be supported by using external level shifters.

It is recommended that the routing traces of the SIM interface lines be kept as short as possible. ESD diodes can be added to the signals connected to the SIM socket to prevent any ESD-related issues. The diodes shall be placed as close to the SIM socket as possible. Also, a decoupling capacitor of about 100nF should be added on the VSIM line near the SIM socket.

Pin Description:

Signal	Pin Number	Type	Description
VSIM	11	Output	Internal voltage regulator output
SIMIO	10	I/O	Data. Internal 10kΩ resistor pulled up to VSIM.
SIMCLK	12	Output	Clock
SIMRST	13	Output	Reset

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
VSIM	SIM 3V	2.75	2.85	3.00	V
	SIM 1.8V	1.65	1.80	1.95	V
SIMIO low level voltage, V_{OL}	I_{OL} = 1mA	-	-	0.4	V
SIMCLK low level voltage, V_{OL}	I_{OL} = 20µA	-	-	0.2VSIM	V
SIMCLK high level voltage, V_{OH}	I_{OH} = 20µA	0.7VSIM	-	-	V
SIMRST low level voltage, V_{OL}	I_{OL} = 20µA	-	-	0.2VSIM	V
SIMRST high level voltage, V_{OH}	I_{OH} = 20µA	0.7VSIM	-	-	V

2.10. UART Interfaces

The module supports two UART interfaces, Port 1 and Port 2. Both ports are compatible with the 16C750 compliant devices. The naming of the UART pins follows the DCE convention. All the UART signals are active-low.

2.10.1. UART Port 1 – Modem port

This port is devoted to the module communication with the host device using AT Commands.

The port integrates two 64-word (9 and 11 bits) receive and transmit FIFOs. Transmission parity can be even, odd or none (default). Number of stop bits can be 1 (default), 1.5 or 2. All modem port operations are controllable using hardware flow control signals (default).

Baud-rates up to 115200 bps (default) are supported. Auto-bauding feature is also supported with the possibility to match baud-rate from 1200 to 115200 bps.

Three additional serial signals, Data Terminal Ready (DTR), Data Carrier Detect (DCD) and Ring Indicator (RI) can be implemented using GPIOs.

Pin Description:

Signal	Pin Number	Type	Description
TXD	51	Input	DCE Data Receive
RXD	52	Output	DCE Data Transmit
CTS	53	Output	Clear To Send. Hardware flow control
RTS	54	Input	Ready To Send. Hardware flow control

2.10.2. UART Port 2 – Debug port

UART Port 2 incorporates transmit and receive signal of a serial link. It is originally designed for debugging. This port can be customized to become a second serial communication port. Default baud-rate is 115200 bps.

Pin Description:

Signal	Pin Number	Type	Description
TXD2	49	Input	DCE Receive Data 2
RXD2	50	Output	DCE Transmit Data 2

2.11. Audio Interfaces

Two different audio ports, phone and auxiliary are supported. This allows connection of up to 2 different audio devices but note that only one audio port can be enabled at any one time. The audio interfaces include internal audio input amplifiers (microphone) and output amplifiers (speaker) for both ports. By default, the phone audio port is enabled.

2.11.1. Microphone input

A programmable microphone uplink path gain is possible using AT command and can be set from –12 dB to +12 dB in 1-dB steps.

Pin Description:

Signal	Pin Number	Type	Description
MICBIAS	23	Output	Microphone bias supply
MICIN	20	Input	Microphone amplifier input (-ve)
MICIP	22	Input	Microphone amplifier input (+ve)
AUXI	19	Input	Auxiliary speech signal input

Electrical Characteristics

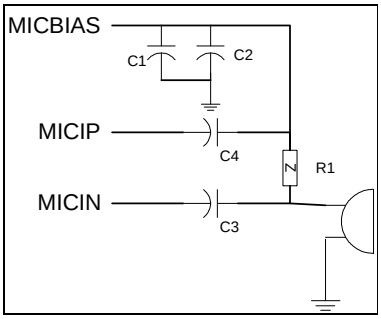
Parameters	Conditions	Min	Nom	Max	Unit
Maximum input range (MICIP-MICIN)	Inputs 3 dBm0	-	32.5	-	mVrms
Maximum input range (AUXI)	+AUXN=0	-	365	-	mVrms
	+AUXN=1	-	24	-	mVrms
Nominal reference level (MICIP-MICIN)		-	-10	-	dBm0
Nominal reference level (AUXI)		-	-10	-	dBm0
Differential input resistance (MICIP-MICIN)		-	36	-	kΩ
Input resistance (AUXI)		100	160	240	kΩ
MICBIAS output voltage	+MICB=0	1.9	-	2.1	V
	+MICB=1	2.4	-	2.6	V
MICBIAS rated output current		0	-	2	mA

2.11.1.1. Microphone bias output

A dedicated output pin on the GPC provides a programmable voltage of 2.0V or 2.5V to the microphone. The output voltage is controlled by AT Command.

2.11.1.2. Phone microphone input

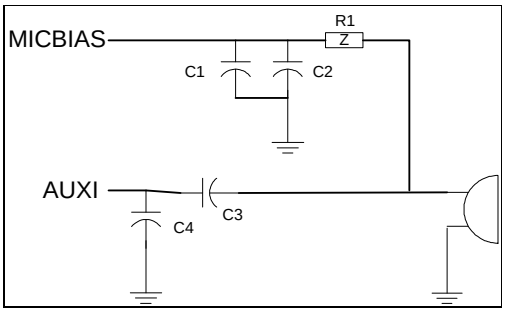
The microphone amplifier is compatible with electret microphones containing a FET buffer with open drain output. A typical implementation circuitry is as below:



Typical values:
R1: 2.2kΩ
C1: 10pF to 33pF
C2: 4.7µF
C3, C4: 100nF

2.11.1.3. Auxiliary microphone input

The auxiliary audio microphone input internally performs single-ended-to-differential conversion and provides a programmable gain of 4.6dB or 28.2dB that can be controlled using an AT Command. A typical implementation circuitry is as below (Impedance of the microphone is usually around 2kΩ):



Typical Values:
R1: 2.2kΩ
C3: 100nF
C1, C2, C4: 47pF to 100pF

2.11.2. Speaker output

The earphone amplifier provides a full differential signal on the EARP and EARNS terminals. The auxiliary output amplifier provides a differential signal on the AUXOP and AUXON terminals.

The volume control and the programmable gain can be accessed via AT Commands. Volume control performs in steps of 6dB from 0 dB to –24 dB. In mute state, attenuation is higher than 40 dB. A fine adjustment of the programmable gain is possible from –6 dB to +6 dB in 1-dB steps.

Pin Description:

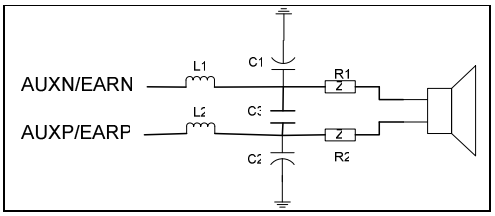
Signal	Pin Number	Type	Description
EARP	24	Output	Earphone amplifier output (+ve)
EARN	26	Output	Earphone amplifier output (-ve)
AUXOP	25	Output	Auxiliary speech signal output (+ve)
AUXON	27	Output	Auxiliary speech signal output (-ve)

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
Maximum output swing (EARP-EARN)	Load 120 Ω	3.1	3.92	-	Vpp
	Load 33 Ω	1.2	1.5	-	Vpp
Maximum output swing (AUXOP-AUXON)	Load 1 kΩ	1.6	1.96	-	Vpp
Power supply rejection		40	-	-	dB

2.11.2.1. Typical speaker output circuitry

A typical speaker implementation circuitry is shown below. Note that this is a differential circuitry:



Typical values:
R1, R2: 0 to 100 Ω
C1, C2: 33pF to 100pF
C3: 10pF to 33pF
L1, L2: about 100nH

2.12. Light Pulse Generator (LPG)

This pin 55 is a pseudo-noise pulse width light modulator that produces the paging activity signal for the blinking LED. Blink period and duration indicates different levels of activity. It can also be customized to control the backlight of LCD and keypad.

Pin Description:

Signal	Pin Number	Type	Description
LPG	55	Output	Blinking LED control signal

Blinking Characteristics:

Module status	LED activity
In OFF mode	OFF
ON mode, not registered to network	Permanently ON
ON mode, registered to network, communication inactive	Slow flashing
ON mode, registered to network, communication in progress	Quick flashing

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
High level input voltage, V_{IH}		0.7VIO	-	VIO+0.5	V
Low level input voltage, V_{IL}		-0.5	-	0.3VIO	V
High level output voltage, V_{OH}	At rated current	0.8VIO	-	-	V
Low level output voltage, V_{OL}	At rated current	-	-	0.22VIO	V
Rated output high current, I_{OH}		-	-	2	mA
Rated output low current, I_{OL}		-	-	2	mA

2.13. General Purpose Input Output (GPIO)

The module provides 8 GPIOs. The GPIOs are fully programmable either as input or output using AT Commands. They can be used to control external devices such as LCD or keyboard backlight. Also, they can be customized to simulate certain control functions such as a serial link's DCD, DTR and/ or RI control signals.

Pin Description:

Signal	Pin Number	Type	Alternate Function
GPIO1	29	I/O	UART Port 1 RI (default)
GPIO2	30	I/O	UART Port 1 DCD (default)
GPIO3	31	I/O	UART Port 1 DTR (default)
GPIO4	35	I/O	RESETOUT
GPIO5	34	I/O	M_TXD
GPIO6	32	I/O	M_RXD
GPIO7	28	I/O	M_CLK
GPIO8	33	I/O	M_FSYNCH

Note:
All the GPIOs must be configured as GPIOs using AT-Commands first before they can be used.

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
High level input voltage, V_{IH}		0.7VIO	-	VIO+0.5	V
Low level input voltage, V_{IL}		-0.5	-	0.3VIO	V
High level output voltage, V_{OH}	At rated current	0.8VIO	-	-	V
Low level output voltage, V_{OL}	At rated current	-	-	0.22VIO	V
Rated output high current, I_{OH}		-	-	1	mA
Rated output low current, I_{OL}		-	-	1	mA

2.14. Keyboard Interface

This interface is not available with AT Commands. A total of 10 connections are provided: 5 row inputs and 5 column outputs. The 5 output lines can alternatively be used as general purpose outputs while the 5 input lines can alternatively be used as general purpose inputs. Please contact iWOW directly for more information on these extended customization to this interface.

Pin Description:

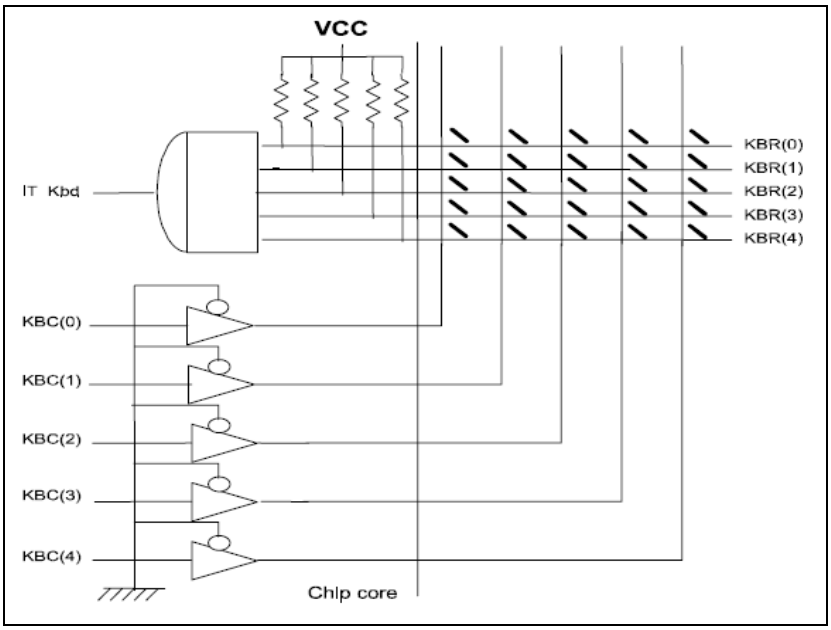
Signal	Pin Number	Type	Description
KBC0	36	Output	Keyboard column 0
KBC1	37	Output	Keyboard column 1
KBC2	38	Output	Keyboard column 2
KBC3	39	Output	Keyboard column 3
KBC4	40	Output	Keyboard column 4
KBR0	41	Input	Keyboard row 0. Internal pull-up to VCC
KBR1	42	Input	Keyboard row 1. Internal pull-up to VCC
KBR2	43	Input	Keyboard row 2. Internal pull-up to VCC
KBR3	44	Input	Keyboard row 3. Internal pull-up to VCC
KBR4	45	Input	Keyboard row 4. Internal pull-up to VCC

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
High level input voltage, V_{IH}		0.7VIO	-	VIO+0.5	V
Low level input voltage, V_{IL}		-0.5	-	0.3VIO	V
High level output voltage, V_{OH}	At rated current	0.8VIO	-	-	V
Low level output voltage, V_{OL}	At rated current	-	-	0.22VIO	V
Rated output high current, I_{OH}		-	-	2	mA
Rated output low current, I_{OL}		-	-	2	mA

2.14.1. Implementation of a 5x5 keyboard

If a key button of the keyboard matrix is pressed, the corresponding row and column lines are shorted together. To allow key press detection, all input pins (KBR) are pulled up to VCC and all output pins (KBC) are driving a low level. Any action on a button will generate an interrupt thru the input pin to the micro-controller that will, as answer, scan the column lines. The scanning is a digital one with the debouncing done in the module itself. A 33pF capacitor is recommended for each of the keypad input lines to eliminate ghosting effect. ESD diodes are also recommended to eliminate ESD issues. In the standard default module firmware, these combination functions are already included while the rest remains without any function:
KBC(0) + KBR(0) = “CALL”
KBC(0) + KBR(1) = “1”
Keyboard implementation diagram is shown below:



2.15. I2C Master Serial Interface

The I2C is a half-duplex serial port using 2-lines for data transmission. This feature is not enabled in the standard module firmware as it requires a certain level of customization depending on its intended application. Please contact us at iWOW for more information on the I2C interface.

Pin Description:

Signal	Pin Number	Type	Description
SDI_SDA	46	I/O	I2C bi-directional data
SCS0_SCL	47	O	I2C master serial clock

2.16. Parallel Bus

The 16-bit data parallel bus can be used to control and drive external peripherals such as a LCD display. This feature is not included in the standard module firmware. Please contact us at iWOW for more information on the parallel bus.

Pin Description:

Signal	Pin Number	Type	Description
A1-A4	57-60	O	Address bus
/RD	61	I/O	Read cycle from peripheral signal (Active low)
/WR	62	I/O	Write cycle to peripheral signal (Active low)
/CS2	63	O	Chip select 2 (Active low)
/CS3	64	O	Chip select 3 (Active low)
D0-D15	65-80	I/O	Data bus

Electrical Characteristics:

Parameters	Conditions	Min	Nom	Max	Unit
Parallel bus reference voltage, Vf		2.7	2.8	2.9	V
High level input voltage, V_{IH}		0.7Vf	-	Vf+0.5	V
Low level input voltage, V_{IL}		-0.5	-	0.3Vf	V
High level output voltage, V_{OH}	At rated current	0.8Vf	-	-	V
Low level output voltage, V_{OL}	At rated current	-	-	0.22Vf	V
Rated output high current, I_{OH}		-	-	4	mA
Rated output low current, I_{OL}		-	-	4	mA

3. PINS DESCRIPTION

Pin	Name	I/O	Description	Reset
1	VBAT	I	Battery input	Input
2	VBAT	I	Battery input	Input
3	VBAT	I	Battery input	Input
4	VBAT	I	Battery input	Input
5	VBAT	I	Battery input	Input
6	VBACKUP	I	Backup battery/supply input	Input
7	ADIN1	I	ADC input 1 (Battery type)	Input
8	ADIN2	I	ADC input 2 (Battery temperature)	Input
9	VIO	O	Digital supply output	N/A
10	SIMIO	I/O	SIM data input/output	0
11	VSIM	O	SIM voltage supply	N/A
12	SIMCLK	O	SIM clock	0
13	SIMRST	O	SIM reset	0
14	PCHG	O	Battery pre-charge output current	
15	VCHG	I	Charger voltage input	Input
16	ICTL	O	Charger external transistor control	
17	VCCS	I	Charging current sense	Input
18	PWON	I	On button input	Input
19	AUXI	I	Auxiliary speech signal input	Input
20	MICIN	I	Microphone amplifier input (-ve)	Input
21	RESET	I	Reset input (Test mode only)	Input
22	MICIP	I	Microphone amplifier input (+ve)	Input
23	MICBIAS	O	Microphone bias supply	
24	EARP	O	Earphone amplifier output (+ve)	Z
25	AUXOP	O	Auxiliary speech signal output (+ve)	Z
26	EARN	O	Earphone amplifier output (-ve)	Z
27	AUXON	O	Auxiliary speech signal output (-ve)	Z
28	MCLK or GPIO7	I/O I/O	Bit synchronization clock. *Alt. function: GPIO7*	Input
29	GPIO1	I/O	General purpose IO	Input
30	GPIO2	I/O	General purpose IO	Input
31	GPIO3	I/O	General purpose IO	Input
32	M_RXD or GPIO6	I I/O	Receive serial data. *Alt. function: GPIO6*	Input
33	M_FSYNCH or GPIO8	I/O I/O	Frame synchronization clock or SS reset. *Alt. function: GPIO8*	Input
34	M_TXD or GPIO5	O I/O	Transmit serial data. *Alt. function: GPIO5*	Input
35	RESETOUT or GPIO4	O I/O	Reset output. *Alt. function: GPIO4*	Input
36	KBC0	O	Keypad column 0	1
37	KBC1	O	Keypad column 1	1
38	KBC2	O	Keypad column 2	1
39	KBC3	O	Keypad column 3	1
40	KBC4	O	Keypad column 4	1
41	KBR0	I	Keypad row 0 (Interrupt input)	Input
42	KBR1	I	Keypad row 1 (Interrupt input)	Input
43	KBR2	I	Keypad row 2 (Interrupt input)	Input
44	KBR3	I	Keypad row 3 (Interrupt input)	Input
45	KBR4	I	Keypad row 4 (Interrupt input)	Input

Pin	Name	I/O	Description	Reset
46	SDI_SDA	I/O	I2C bi-directional data	Z
47	SCS0_SCL	O	I2C master serial clock	Z
48	GND	I	Ground	N/A
49	TXD2	I	Serial port 2 – Receive data (Active low)	Input
50	RXD2	O	Serial port 2 – Transmit data (Active low)	1
51	TXD	I	Serial port 1 – Receive data (Active low)	Input
52	RXD	O	Serial port 1 – Transmit data (Active low)	1
53	CTS	O	Serial port 1 – Clear to send (Active low)	1
54	RTS	I	Serial port 1 – Ready to send (Active low)	Input
55	LPG	O	Blinking LED signal output.	1
56	CLK13M	O	13MHz output clock	0
57	A1	O	Address bus	0
58	A2	O	Address bus	0
59	A3	O	Address bus	0
60	A4	O	Address bus	0
61	/RD	I/O	Read cycle from peripheral signal (Active low)	1
62	/WR	I/O	Write cycle to peripheral signal (Active low)	1
63	/CS2	O	Chip select 2 (active low)	1
64	/CS3	O	Chip select 3 (active low)	1
65	D0	I/O	Data bus	Output
66	D1	I/O	Data bus	Output
67	D2	I/O	Data bus	Output
68	D3	I/O	Data bus	Output
69	D4	I/O	Data bus	Output
70	D5	I/O	Data bus	Output
71	D6	I/O	Data bus	Output
72	D7	I/O	Data bus	Output
73	D8	I/O	Data bus	Output
74	D9	I/O	Data bus	Output
75	D10	I/O	Data bus	Output
76	D11	I/O	Data bus	Output
77	D12	I/O	Data bus	Output
78	D13	I/O	Data bus	Output
79	D14	I/O	Data bus	Output
80	D15	I/O	Data bus	Output

Note:
The reset values are defined as follows:
0: Driven low (output)
1: Driven high (output)
Z: High impedance (output disabled)
N/A: Not applicable

4. ELECTRICAL CHARACTERISTICS

Parameter	Description	Min	Nom	Max	Unit
Supply Input:					
VBAT	Battery Input Voltage	3.40	3.80	5.50	V
I_{BURST}	Burst peak current	-	-	2.0	A
Regulated Output:					
VIO	Internal regulated output voltage	2.70	2.80	2.90	V
I_{OUT}	Rated output current	-	-	100	mA
SIM Card Related:					
VSIM	Output voltage to 3V SIM card	2.75	2.85	3.00	V
I_{SIM}	Rated output current	-	-	10	mA
V_{OL}	SIMIO low level voltage, I_{OL} = 1mA	-	-	0.4	V
V_{OL}	SIMCLK low level voltage, I_{OL} = 20μA	-	-	0.2VSIM	V
V_{OH}	SIMCLK high level voltage, I_{OH} = 20μA	0.7VSIM	-	-	V
V_{OL}	SIMRST low level voltage, I_{OL} = 20μA	-	-	0.2VSIM	V
V_{OH}	SIMRST high level voltage, I_{OH} = 20μA	0.7VSIM	-	-	V
ON/OFF Switch:					
V_{IH}	High level input voltage	0.7VBAT	-	-	V
V_{IL}	Low level input voltage	-	-	0.3VBAT	V
Digital Signal Characteristic (GPIO,UART,LPG,Keyboard):					
V_{IH}	High-level input voltage	0.7VIO	-	VIO+0.5	V
V_{IL}	Low-level input voltage	-0.5	-	0.3VIO	V
V_{OH}	High-level output voltage at rated current	0.8VIO	-	-	V
V_{OL}	Low-level output voltage at rated current	-	-	0.22VIO	V
I_{OH}	Rated output high current	-	-	1	mA
I_{OL}	Rated output low current	-	-	1	mA

Note:

Due to the burst emission in GSM, the power supply (VBAT) must be able to handle high current peaks (2A max in EGSM band) in a short time. For a GPRS Class 2 device, the module emits a 577us radio burst every 4.615ms during communication. For a GPRS Class 10 device, the module emits two of these 577us bursts within the 4.615ms frame during communication.

5. TECHNICAL SPECIFICATIONS

5.1. General-Purpose Connector

The General-Purpose Connector mounted on the module is Harwin's 80-pin 0.5mm-pitch board-to-board socket. The part reference is **M402F2-8005**.

The 80-pin mating header (for the target board) part reference is **M402M1-8005**.

The mated-connector stacking height is 2.0mm.

5.2. RF Interface

TR-800's RF interface has a characteristic impedance of 50 Ohm. The matching networks for an external antenna connection are not included in the module and should be placed on the host application.

Three methods of RF connections are possible to the host's application antenna.

5.2.1. Coaxial Receptacle

An ultra-miniature coaxial receptacle is provided on the bottom side of the module (80-pin connector side). For this receptacle, Harwin's UMC-series connector is adopted. Its part reference is **M601-100-0004-035**.

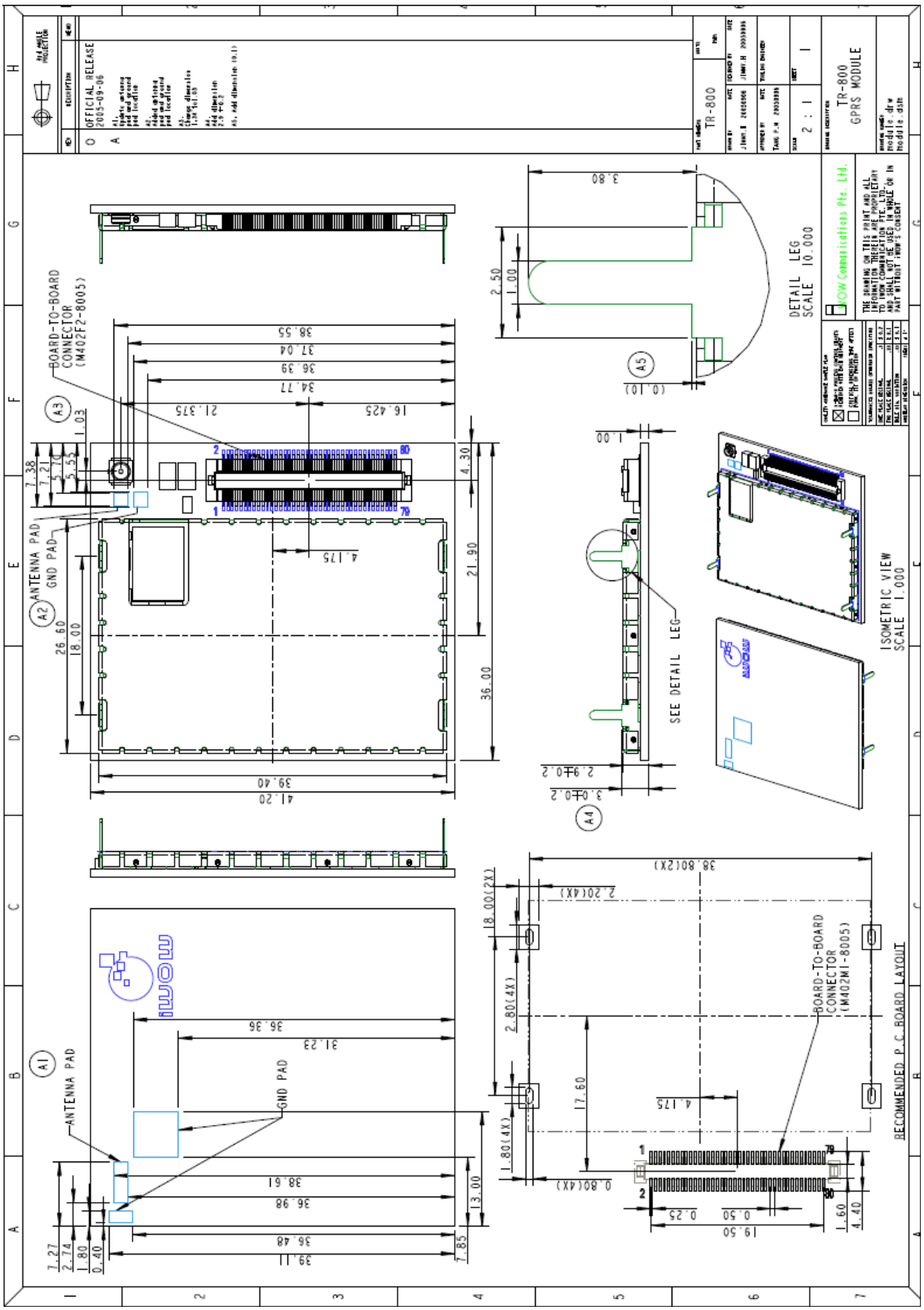
5.2.2. RF pad for coaxial cable

An RF pad along with two ground pads are provided on the top side of the module (iWOW logo side) for direct connection to an antenna or coaxial cable. Please refer to the mechanical drawing for the location and dimensions of these pads.

5.2.3. RF pad for spring contact

An RF pad with a ground pad is also provided on the bottom side of the module for use with spring contact directly to the host PCB.

6. MECHANICAL DRAWING



7. SAFETY PRECAUTIONS

For your safety, please follow the safety precautions listed below during all phases of the operation, usage, service or repair of any cellular terminal or mobile incorporating the TR-800. All manufacturers of these cellular terminal or mobile are advised to include the following safety precautions into all manuals provided with their terminal or mobile device; and also to pass these information to device users and operating persons. Failure to comply with these precautions may be dangerous or illegal.

Road safety
Do not use a mobile device while driving. Park the vehicle first or use a hand free earphone. It is illegal in some countries to use a mobile device while driving.

Switch off in aircraft
Cellular terminal or mobile devices can cause interference to aircraft electronics. Using them on aircraft is both illegal and dangerous.

Switch off when refueling vehicle
Do not use the cellular terminal or mobile device at a refueling station or near fuels or chemicals.

Forbidden Usage
Always switch off your cellular terminal or mobile device when it is forbidden to be used in any areas like a hospital.

Interference
All cellular terminals or mobile devices may be subjected to radio interference, which could affect their performance.

Emergency calls
As the GPRS/GSM module is based on GSM standard for radio signals and cellular networks, this connection cannot be guaranteed at all times under all conditions. It should never be entirely relied upon for essential communications such as an emergency call.

Note on compliance with international rules and regulations

The TR-800 module is a fully certified GSM/GPRS engine. The module has been tested and certified for compliance to international safety and GSM standard requirements at the modular level.

Manufacturers of cellular terminal or mobile equipment incorporating the TR-800 are advised to test their final products to ensure compliance to these EMC tests/requirements:

- ESD
- Radiated Spurious Emissions
- Conducted Emissions, if applicable
- Further tests if applicable

The module was not assessed against the essential requirement ‘health’. Manufacturers of the final products are also responsible to ensure that their products are tested for compliance to any other health requirements that might be applicable.

A few other important notes regarding safety in implementation and usage of the module:

- The module shall be supplied by a Limited Power Supply (LPS) according to EN 60950:2000.
- No necessary spacing (creepage and clearance distance) shall be reduced by installing the module into the final equipment.
- Provisions shall be made for fastening the module securely in the end product.

Instructions and equipment markings related to safety shall be in a language, which is acceptable in the country in which the equipment is to be installed.

~ END OF DOCUMENT ~