

Application Note
Differences between GM47/GM48
and GM47r5/GM48r5

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1 Introduction

This document sets out the differences both in electrical interface and in software between the existing product, GM47 and the new enhanced product, the GM47r5

It shows the compatibility between the two products and gives an overview of the improvements implemented in the new product.

2 Pin Out Changes GM47/GM48 to GM47r5/GM48r5

2.1 GM47/GM48 Pinout

Default @ PU	Pin	Signal Name	Signal Name	Pin	Default @ PU
	1	VCC	DGND	2	
	3	VCC	DGND	4	
	5	VCC	DGND	6	
	7	VCC	DGND	8	
	9	VCC	DGND	10	
	11	VCC	DGND	12	
I/P 100K 2V7	13	RESERVED	ON/OFF	14	
	15	SIMVCC	SIMPRESENCE	16	
	17	SIMRST	SIMDAT	18	
	19	SIMCLK	DAC	20	
I/P 100K 2V7	21	I/O1	I/O2	22	I/P 100K 2V7
I/P 100K 2V7	23	I/O3	I/O4	24	I/P 100K 2V7
	25	VRTC	ADC1	26	
	27	ADC2	ADC3	28	
	29	SDA	SCL	30	
LO, pulse HI on sound	31	BUZZER	O5	32	HI for 10mS then LO
LO, pulse HI on LED on	33	LED	VIO	34	
LO, pulse 100ns appears 9ms after VIO	35	TX_ON	RI O6	36	HI for 350mS then LO for 350mS then HI
I/P 100K 2V7	37	DTR IN5	DCD O7	38	HI for 350mS then LO for 350mS then HI
I/P 100K 2V7	39	RTS	CTS	40	Hi 397mS then LO
LO	41	TD	RD	42	HI for 640ms then LO pulse for 13.3ms then HI
0.7V for 9ms then LO	43	TD3	RD3	44	HI but with LO pulses then HI
LO	45	TD2	RD2	46	HI for 9ms then LO spikes/pulses e.g. 2µs Then HI
	47	PCMULTD	PCMDLD	48	
	49	PCMO	PCMI	50	
	51	PCMSYN	PCMCLK	52	
	53	MICP	MICN	54	
	55	BEARP	BEARN	56	
	57	AFMS	SERVICE	58	
	59	ATMS	AGND	60	

PU = Power Up

2.2 GM47r5/GM48r5 Pinout

Default @ PU	Pin	Signal Name	Signal Name	Pin	Default @ PU
	1	VCC	DGND	2	
	3	VCC	DGND	4	
	5	VCC	DGND	6	
	7	VCC	DGND	8	
	9	VCC	DGND	10	
VCC – 0.5V	11	CHG_IN	DGND	12	
200µs rise RC	13	I/O5 ADC4	ON/OFF	14	
	15	SIMVCC	SIMPRESENCE	16	
	17	SIMRST	SIMDAT	18	
	19	SIMCLK	DAC	20	
I/P 100K 2V7	21	I/O1	I/O2 ADC5	22	200µs rise RC
I/P 100K 2V7	23	I/O3	I/O4	24	I/P 100K 2V7
	25	VRTC	ADC1	26	
	27	ADC2	ADC3	28	
	29	SDA	SCL	30	
LO, pulse on sound	31	BUZZER	O3 DSR	32	HI for 330mS then LO
LO, HI on LED light.	33	LED I/O6	VIO	34	
LO, pulse 1.2µs appears 1ms after VIO	35	TX_ON	RI O2	36	HI for 330mS then LO for 260mS then HI
I/P 100K 2V7	37	DTR IN1	DCD O1	38	HI for 330mS then LO for 260mS then HI
I/P 100K 2V7	39	RTS I/O9	CTS O4	40	HI for 330mS then LO
LO	41	TD	RD	42	HI for 90ms then low pulse for 1µs then HI
0.7V for 1ms then LO	43	TD3 I/O7	RD3 I/O8	44	HI, LO pulses then LO
0.7V for 1ms then LO	45	TD2	RD2	46	HI for 90ms then low pulse for 1µs then HI
	47	PCMULTD	PCMDLD	48	
	49	PCMO	PCMI	50	
	51	PCMSYN	PCMCLK	52	
	53	MICP	MICN	54	
	55	BEARP	BEARN	56	
	57	AFMS	SERVICE	58	
	59	ATMS	AGND	60	

PU = Power Up

2.3 *Bullet-point Differences*

Below the main differences in software are listed.

- DSR signal has been implemented sharing with a digital output.
- One new general purpose I/O pin added (dual function, allowing either digital I/O or analogue ADC).
- Two additional ADC inputs, sharing common pin with digital I/O (total ADC capability increased to five lines).
- Dual function pins provide 9 digital I/O, 4 digital outputs and 1 digital input.

3 Detailed Difference Description

3.1 IO# / ADC# (Pins 13, 22)

To increase analogue input capabilities, the GM47r5 optimises the IO by multiplexing or sharing different features on single pins. There are two digital IO pins which now have an additional ADC input. When configured as digital IO, the software will not read the voltages at the two new ADC inputs. When configured as ADC inputs the software will configure the digital IO pins as input or high impedance tri-state. In this state any applied voltage between 0V and 2.75V can be read as an 8 bit value.

3.1.1 Backwards compatibility

Default operation designation is as an I/O pin set to an input.

This is as GM47.

3.2 RS232 Flow Control (Pins 32, 36, 37, 38, 39, 40)

In order to increase the flexibility and variety of GM47r5 peripherals, the RS232 hardware flow control shares its physical interface with an extended general purpose IO capability. Due to the nature of this sharing, it is not feasible to operate all these features concurrently (although, with care, dynamic switching from one feature to another and back is possible but may require additional external circuitry).

When a particular feature is required of an IO, the software sets the states of the relevant IO blocks disabling one set and enabling others. This is most noticeable with the RS232 hardware flow control when switching to the general purpose IO functionality.

If full hardware flow control and handshaking is required there will be no additional general purpose IO sharing these pins. If intermediate hardware flow control is selected (RTS and CTS only), the unused flow control pins (DTR, DCD, RI, DSR) are made available general purpose outputs.

If RS232 hardware flow control is switched off altogether, the remaining general purpose IO is enabled.

3.2.1 Backwards compatibility

The only difference is that the RS232 pins that double as Input and Output pins when addressed in AT*E2IO will now return error when trying to manipulate them, unless AT*E2RS232 is used to change which RS232 pins are in use. Previously GM47 allowed both IO operations and RS232 functions to occur concurrently.

Default operation designation is as RS232 interface with full hardware flow control.

This is as GM47 except pin 32 (DSR/03) was a digital output pin only, OUT5. The power up default of OUT5 is commensurate with that of DSR (OUT5; HI for 10mS then LO, DSR/03; HI for 330mS then LO).

3.3 LED / IO6 (Pin 33)

The LED function pin can be used as a general purpose digital IO when the flashing LED function is not required. However, this pin does not have an on-board pull-up resistor. It is required that an external pull-up or pull-down resistor be provided by the host circuitry when either not used or when used as a digital input.

3.3.1 Backwards compatibility

Default operation designation is as LED.

This is as GM47.

3.4 IN# / O# (Pins 37 / 32, 36, 38, 40)

When not being used for an alternative function the pins labelled I# and O# may be used for general purpose inputs or outputs respectively. The inputs have an on-board 100k pull-up resistor and the outputs are driven rail-to-rail at 2.75V levels.

3.4.1 Backwards compatibility

Default operation designation is as RS232 interface with full hardware flow control.

This is as GM47 except pin 32 (DSR/03) was a digital output pin (OUT5).

3.5 UART3 / IO# (Pins 43, 44)

UART3 has been given an alternative function as general purpose I/O. Both pins may be used for either input or output. However, the TX pin has a 100k Ω pull-down resistor to ground and the RX pin has a 100k Ω pull-up resistor to 2.75V. This must be taken into consideration when designing the host circuit.

3.5.1 Backwards compatibility

Default operation is general purpose inputs.

4 Software Differences

4.1 AT Commands

4.1.1 AT*E2IO

Changed designators:

With the exception of the four items listed below the GM47r5/GM48r5 will operate successfully in any application designed for the GM47/GM48.

PIN	GM47 Signal	GM47r5 Signal
32	O5	O3
36	O6	O2
37	I5	I1
38	O7	O1

Addressing these inputs and outputs with the designations referred to for GM47 using the AT*E2IO command will return error when used on GM47r5.

The GM47r5 will accept an extra parameter, 6, allowing pins to switch functionality as required.

Note: Pin 37 - GM47 '5' and GM47r5 'I1' is now not a triggerable input. The trigger functionality on this pin is lost in GM47r5. However - the GM47r5 AT*E2IO command now supports the extra IO, 'IO5', which is triggerable, and has the same functionality as 'IO1' to 'IO4'.

4.1.2 AT*E2RS232

This is a new command recognised by the GR modules, not the GM. When 'Full RS232' is selected (Factory default) all IO commands on these pins will return 'error'.

E.G. AT*E2IO commands on 'I1', 'O1', 'O2' and 'O3' will return error unless AT*E2RS232 status is modified to allow operation on these pins.

4.2 Input & Output Cross Reference

SIGNAL	GM47	GM47r5
I/O1	21	21
I/O2	22	22
I/O3	23	23
I/O4	24	24
I/O5	N/A	13
I/O6	N/A	33
I/O7	N/A	43
I/O8	N/A	44
I/O9	N/A	39
IN1	N/A	37
IN5	37	Now IN1
O1	N/A	38
O2	N/A	36
O3	N/A	32
O4	N/A	40
OUT5	32	Now O3
OUT6	36	Now O2
OUT7	38	Now O1
ADC1	26	26
ADC2	27	27
ADC3	28	28
ADC4	N/A	13
ADC5	N/A	22
DSR	N/A	32
RI	36	36
DTR	37	37
DCD	38	38
RTS	39	39
CTS	40	40

Key:	Unchanged	New	Altered
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