



# UNIGRAND BM0400

## Generic Bluetooth Class II Module

### KEY FEATURES

Bluetooth 2.0+EDR

Power Level Class 2 (Max 4dBm)

External Antenna

BQB qualified

### APPLICATIONS

RS232 Replacement

Wireless HID Keyboard/Mouse

Wireless Barcode Scanner

Wireless Sensor Collector

Bluetooth File Transfer

Wii Remote Control

### PIN ASSIGNMENT

01 PIO10	38 GND
02 PIO11	37 RF OUT
03 PIO2	36 GND
04 AIO0	35 PIO9
05 AIO1	34 PIO8
06 PIO3	33 PIO1
07 USB D+	32 PIO0
08 USB D-	31 GND
09 UART RX	30 VOUT 1.8
10 UART CTS	29 SPI MISO
11 UART RTS	28 SPI CLK
12 UART TX	27 SPI CSB
13 V3.3	26 SPI MOSI
14 PIO4	25 PCM OUT
15 PIO5	24 PCM CLK
16 PIO6	23 RESETB
17 PCM IN	22 PCM SYNC
18 PIO7	21 GND
19 GND	20 V3.3

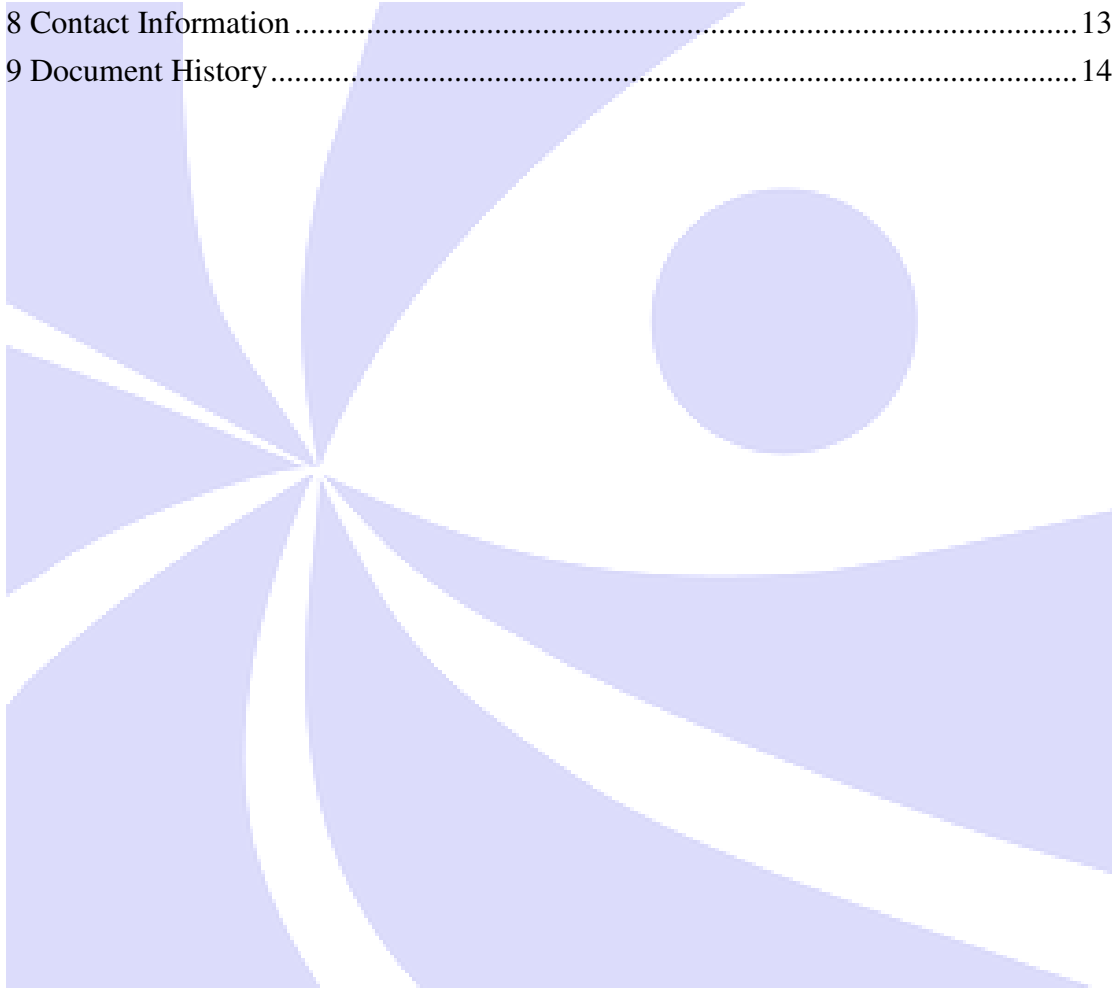
TOP VIEW

PHYSICAL SIZE 21mm X 12mm X 2mm



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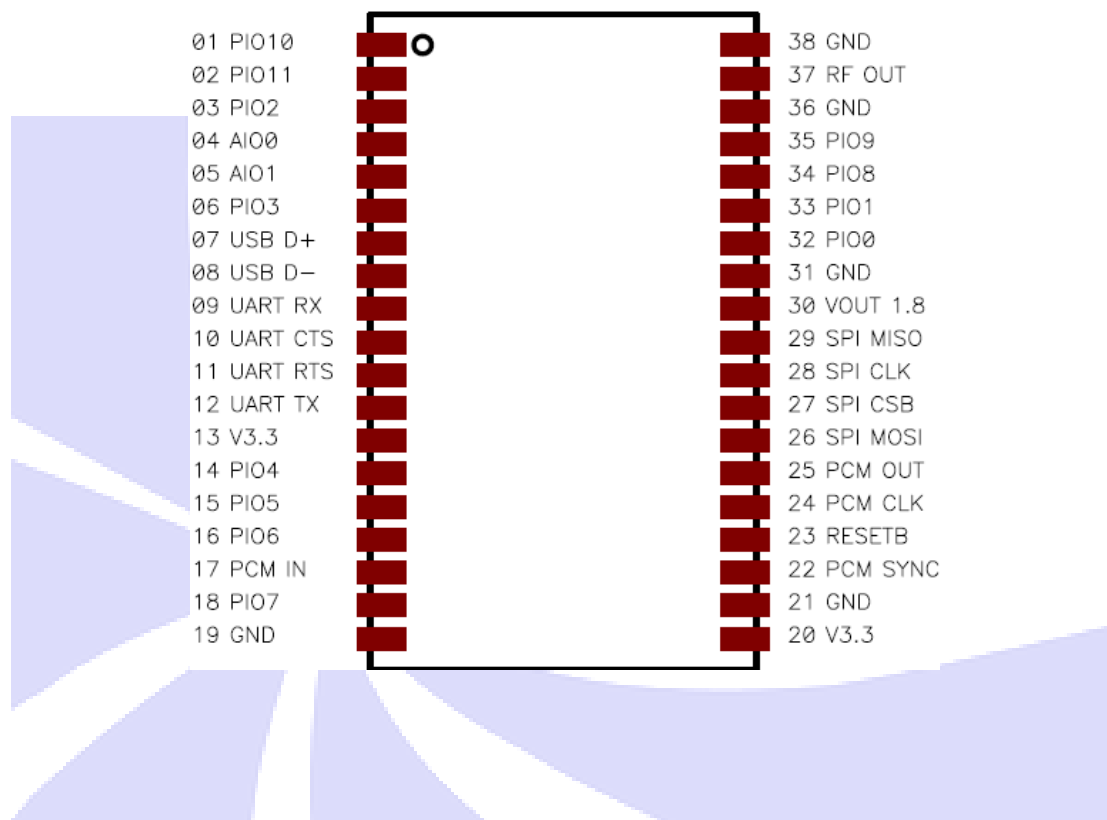
# 1 General Description

**B**M0400 is an integrated Bluetooth module to ease the design gap and increase time-to-market performance. BM0400 uses CSR BlueCore4-External as the major Bluetooth chip. It supports several profiles. With simple interface to communicate with BM0400, the host does not need to worry about the details and complexity of Bluetooth profiles.

CSR BlueCore4-External is a single chip radio and baseband IC for Bluetooth 2.4GHz systems including enhanced data rates (EDR) to 3Mbps. It interfaces to 8Mbit of external Flash memory. When used with the CSR Bluetooth software stack, it provides a fully compliant Bluetooth system to v2.0 of the specification for data and voice communications. All hardware and device firmware is fully compliant with the Bluetooth v2.0+EDR specification (all mandatory and optional features).



## 2 Hardware Pad Functions



Power Supplies and Control	Pad and Number	Pad Type	Description
GND	GND 19 GND 21 GND 31	Ground	Ground connections for digital and analogy
AGND	GND 36 GND 38	Ground	Ground connections for RF circuitry
VCC3.3	V3.3 20 V3.3 13	Regulator input	Voltage supplier from 2.8 to 4V
VCC1.8	VOUT1.8 30	Regulator output	Regulated voltage 1.8V output



PIO Port	Pad and Number	Pad Type	Description
PIO[0]	PIO0 <b>32</b>	Bi-directional	Programmable input/output line
PIO[1]	PIO1 <b>33</b>	Bi-directional	Programmable input/output line
PIO[2]	PIO2 <b>03</b>	Bi-directional	Programmable input/output line
PIO[3]	PIO3 <b>06</b>	Bi-directional	Programmable input/output line
PIO[4]	PIO4 <b>14</b>	Bi-directional	Programmable input/output line
PIO[5]	PIO5 <b>15</b>	Bi-directional	Programmable input/output line
PIO[6]	PIO6 <b>16</b>	Bi-directional	Programmable input/output line
PIO[7]	PIO7 <b>18</b>	Bi-directional	Programmable input/output line
PIO[8]	PIO8 <b>34</b>	Bi-directional	Programmable input/output line
PIO[9]	PIO9 <b>35</b>	Bi-directional	Programmable input/output line
PIO[10]	PIO10 <b>01</b>	Bi-directional	Programmable input/output line
PIO[11]	PIO11 <b>02</b>	Bi-directional	Programmable input/output line
AIO[0]	AIO0 <b>04</b>	Bi-directional	Programmable input/output line
AIO[1]	AIO1 <b>05</b>	Bi-directional	Programmable input/output line

Radio	Pad and Number	Pad Type	Description
RF	RF OUT <b>37</b>	RF	RF Output

USB and UART	Pad and Number	Pad Type	Description
UART_TX	UART_TX <b>12</b>	CMOS output, tri-state, with weak internal pull-up	UART data output
UART_RX	UART_RX <b>09</b>	CMOS input with weak internal	UART data input
UART_RTS	UART_RTS <b>11</b>	CMOS output, tri-state, with weak internal pull-up	UART request to send active low
UART_CTS	UART_CTS <b>10</b>	CMOS input with weak internal pull-down	UART clear to send active low
USB_DP	USB+ <b>07</b>	Bi-directional	USB data plus with selectable internal 1.5 ohm pull-up resistor
USB_DN	USB- <b>08</b>	Bi-directional	USB data minus

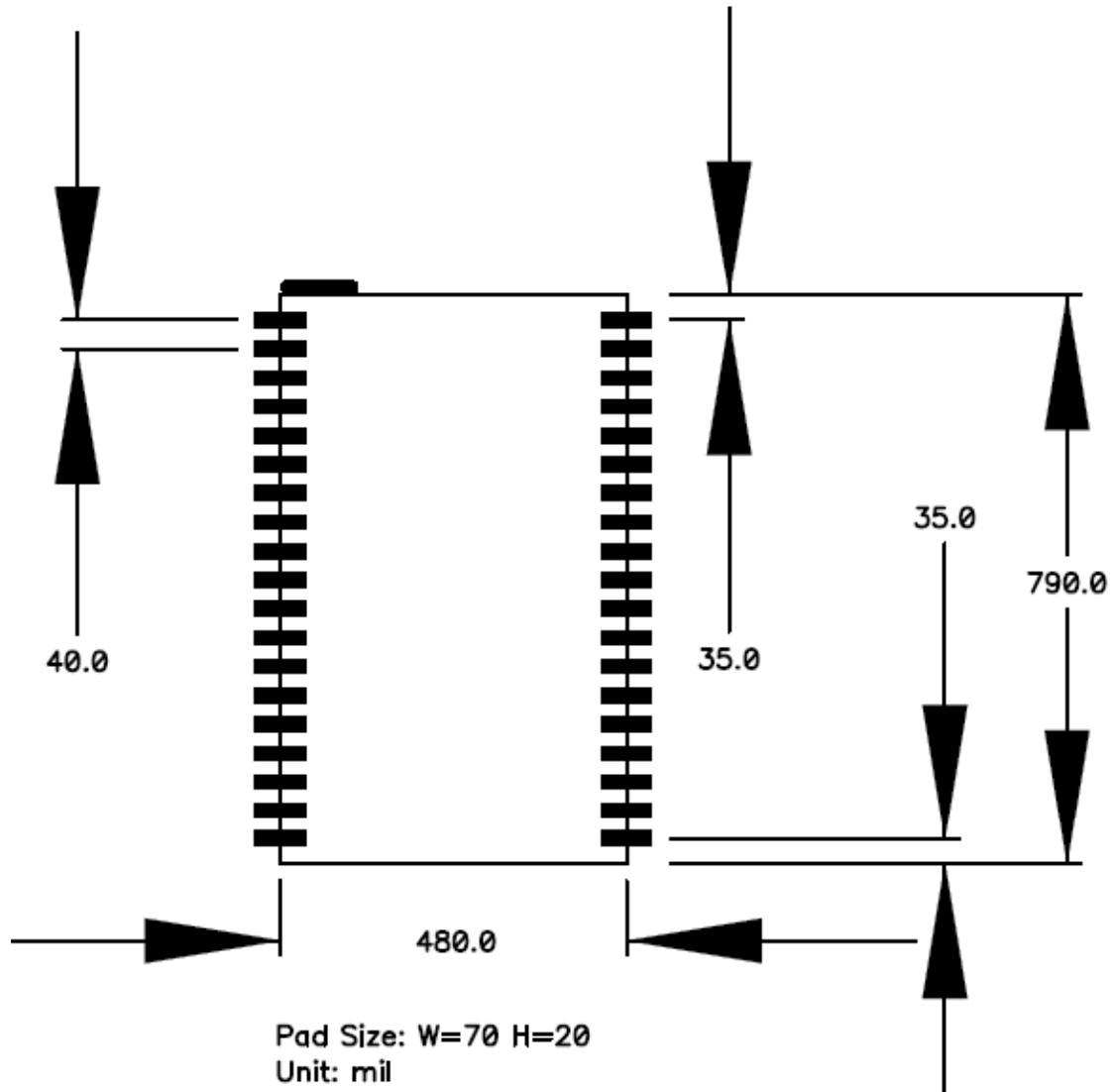


Test and Debug	Pad and Number	Pad Type	Description
Reset#	RESETB 23	Reset	Reset if <b>LOW</b> . Input debounced so must be high for > 5ms to cause a reset
SPI_MISO	SPI_MISO 29	CMOS output, tri-state, with weak internal pull-down	Serial Peripheral Interface data output
SPI_CSB	SPI_CSB 27	CMOS input with weak internal pull-up	Chip select for Synchronous Serial Interface, active low
SPI_CLK	SPI_CLK 28	CMOS input with weak internal pull-down	Serial Peripheral Interface clock
SPI_MOSI	SPI_MOSI 26	CMOS input with weak internal pull-down	Serial Peripheral Interface data input

PCM Interface	Pad and Number	Pad Type	Description
PCM_OUT	PCM_OUT 25	CMOS output, tri-state, with weak internal pull-down	Synchronous data output
PCM_IN	PCM_IN 17	CMOS input, with weak internal pull-down	Synchronous data input
PCM_SYNC	PCM_SYNC 22	Bi-directional with weak internal pull-down	Synchronous data sync
PCM_CLK	PCM_CLK 24	Bi-directional with weak internal pull-down	Synchronous data clock

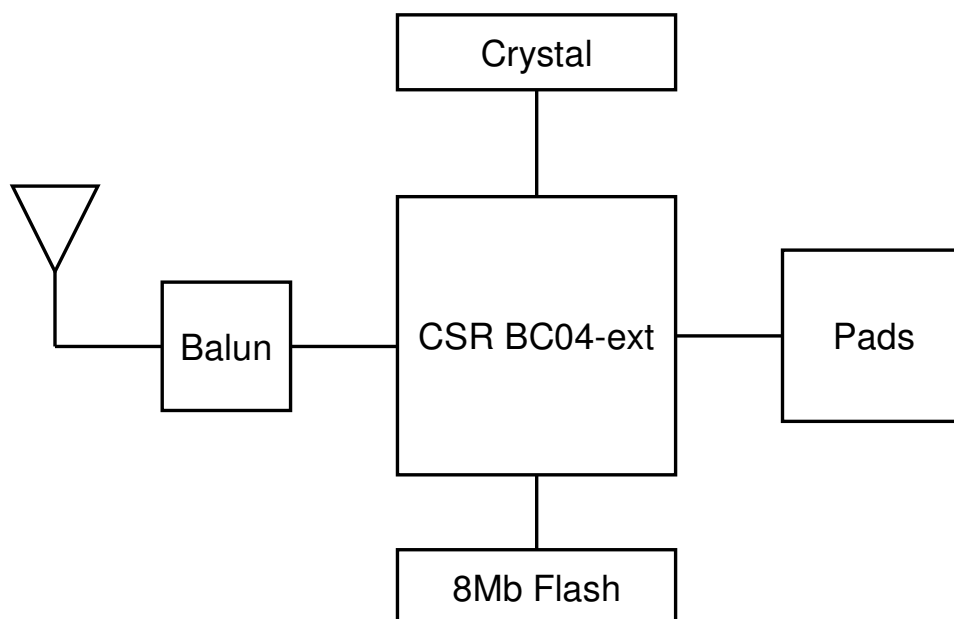


### 3 PCB Footprint





## 4 Hardware Block Diagram







## 5 Electrical Characteristics

Absolute Maximum Ratings		
Rating	Min	Max
Storage temperature	-40 °C	+150 °C
Supply Voltage	-0.4 V	4 V
Other terminal voltages	-0.4	3.7 V

Recommended Operating Conditions		
Operating Condition	Min	Max
Operating temperature range	-40 °C	+105 °C
Guaranteed RF performance range	-40 °C	+105 °C
Supply voltage	1.7V	3.6V



## 6 Radio Characteristics

### 6.1 Transmitter

Radio Characteristics	VDD = 1.8V			Temperature = +20°C	
	Min	Typ	Max	Bluetooth Specification	Unit
Maximum RF transmit power <sup>(a)</sup> <sup>(b)</sup>	-	5	-	-6 to +4 <sup>(c)</sup>	dBm
RF power variation over temperature range with compensation enabled <sup>(±)</sup> <sup>(d)</sup>	-	1.5	-	-	dB
RF power variation over temperature range with compensation disabled <sup>(±)</sup> <sup>(d)</sup>	-	2	-	-	dB
RF power control range	25	35	-	≥16	dB
RF power range control resolution <sup>(e)</sup>	-	0.5	1.2	-	dB
20dB bandwidth for modulated carrier	-	790	1000	≤1000	kHz
Adjacent channel transmit power $F = F_0 \pm 2\text{MHz}$ <sup>(f)</sup> <sup>(g)</sup>	-	-35	-20	≤-20	dBm
Adjacent channel transmit power $F = F_0 \pm 3\text{MHz}$ <sup>(f)</sup> <sup>(g)</sup>	-	-45	-40	≤-40	dBm
Adjacent channel transmit power $F = F_0 \pm > 3\text{MHz}$ <sup>(f)</sup> <sup>(g)</sup>	-	-50	-40	≤-40	dBm
$\Delta f_{1\text{avg}}$ Maximum Modulation	140	163	175	$140 < f_{1\text{avg}} < 175$	kHz
$\Delta f_{2\text{max}}$ Minimum Modulation	115	154	-	115	kHz
$\Delta f_{1\text{avg}}/\Delta f_{2\text{avg}}$	0.80	0.98	-	≥0.80	-
Initial carrier frequency tolerance	-75	6	75	≤75	kHz
Drift Rate	-	7	20	≤20	kHz/50μs
Drift (single slot packet)	-	8	25	≤25	kHz
Drift (five slot packet)	-	9	40	≤40	kHz
2 <sup>nd</sup> Harmonic Content	-	-60	-30	≤-30	dBm
3 <sup>rd</sup> Harmonic Content	-	-45	-40	≤-30	dBm

- (a) The BlueCore4-External firmware maintains the transmit power within Bluetooth v2.0+EDR specification limits
- (b) Measurement using PSKEY\_LC\_MAX\_TX\_POWER setting corresponding to a PSKEY\_LC\_POWER\_TABLE power table entry = 63
- (c) Class 2 RF transmit power range, Bluetooth specification v2.0+EDR
- (d) These parameters are dependent on matching circuit used, and its behaviour over temperature, therefore these parameters are not under CSR's direct control
- (e) Resolution guaranteed over the range -5dB to -25dB relative to maximum power for Tx Level > 20
- (f) Measured at  $F_0 = 2441\text{MHz}$
- (g) BlueCore4-External guaranteed to meet ACP performance in Bluetooth v2.0+EDR specification, three exceptions allowed.



## 6.2 Receiver

Radio Characteristics		VDD = 1.8V			Temperature = +20°C	
	Frequency (GHz)	Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.1% BER for all packet types	2.402	-	-80.0	-	≤-70	dBm
	2.441	-	-80.0	-		
	2.480	-	-80.0	-		
Maximum received signal at 0.1% BER		-20	10	-	≥-20	dBm
	Frequency (MHz)	Min	Typ	Max	Bluetooth Specification	Unit
Continuous power required to block Bluetooth reception (for input power of -67dBm with 0.1% BER) measured at the unbalanced port of the balun.	30-2000	-10	0	-	≥-10	dBm
	2000-2400	-27	0	-	≥-27	
	2500-3000	-27	0	-	≥-27	
C/I co-channel		-	6	11	≤11	dB
Adjacent channel selectivity C/I $F = F_0 + 1\text{MHz}^{(a) (b)}$		-	-5	0	≤0	dB
Adjacent channel selectivity C/I $F = F_0 - 1\text{MHz}^{(a) (b)}$		-	-4	0	≤0	dB
Adjacent channel selectivity C/I $F = F_0 + 2\text{MHz}^{(a) (b)}$		-	-44	-30	≤-30	dB
Adjacent channel selectivity C/I $F = F_0 - 2\text{MHz}^{(a) (b)}$		-	-23	-20	≤-20	dB
Adjacent channel selectivity C/I $F = F_0 + 3\text{MHz}^{(a) (b)}$		-	-45	-40	≤-40	dB
Adjacent channel selectivity C/I $F = F_0 - 5\text{MHz}^{(a) (b)}$		-	-45	-40	≤-40	dB
Adjacent channel selectivity C/I $F = F_{\text{Image}}^{(a) (b)}$		-	-22	-9	≤-9	dB
Maximum level of intermodulation interferers <sup>(c)</sup>		-39	-30	-	≥-39	dBm
Spurious output level <sup>(d)</sup>		-	-150	-	-	dBm/Hz

(a) Up to five exceptions are allowed in v2.0+EDR of the Bluetooth specification. BlueCore4-External is guaranteed to meet the C/I performance as specified by the Bluetooth specification v2.0+EDR.

(b) Measured at  $F = 2441\text{MHz}$

(c) Measured at  $f_1 - f_2 = 5\text{MHz}$ . Measurement is performed in accordance with Bluetooth RF test RCV/CA/05/c., i.e., wanted signal at -64dBm.

(d) Measured at unbalanced port of the balun. Integrated in 100kHz bandwidth and normalised to 1Hz. Actual figure is typically below -150dBm/Hz except for peaks of -70dbm at 1600MHz, -60dBm inband at 2.4GHz and -70dBm at 3.2GHz.



## 7 Applications

Available Application Code	Brief Description
01	SPP (Serial Port Profile) Application: Support SPP Master and Slave.
02	1 to 3 SPP Application: Support simultaneous 3 SPP-slave connections.
03	FEA (File Exchange Application): Support OPP, BIP, and FTP. Simplified interface for hosts.
04	HID (Human Input Device) Applications for: Mouse, Keyboard, Joystick/Remote
More ...	Contact us for possible applications.

**Code Convention:**

BM0400 + Application Code

For example, 'BM0401' means that it uses BM0400 hardware and its application is for SPP (code 01).



## 8 Contact Information

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## 9 Document History

Date	Revision	Reason of Change
03 FEB 07	a	Original publication
27 MAR 07	b	Correct typos
14 MAR	c	Address information changes
12 AUG 08	d	Footprint correction Integration for applications
12 AUG 08	e	Radio Characteristics Typos
12 MAR 11	f	Post address changed

**UNIGRAND BM0400**

**Datasheet**

**BM0400-datasheet-f**