

DESIGN FOR APPLICATION BASED ON Q2403

POWER SUPPLY BATTERY LI_ION 3.6V

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	Name / Nom	Function / Fonction	Date/ Date	Signature/ Signature
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1 INTRODUCTION

The goal of this document is to propose a design around the **Q2403** modules .
This document propose just some references of battery and PCM and one method to measure the important parameters.
References proposed are compatible with battery charging included in **Q2403**.

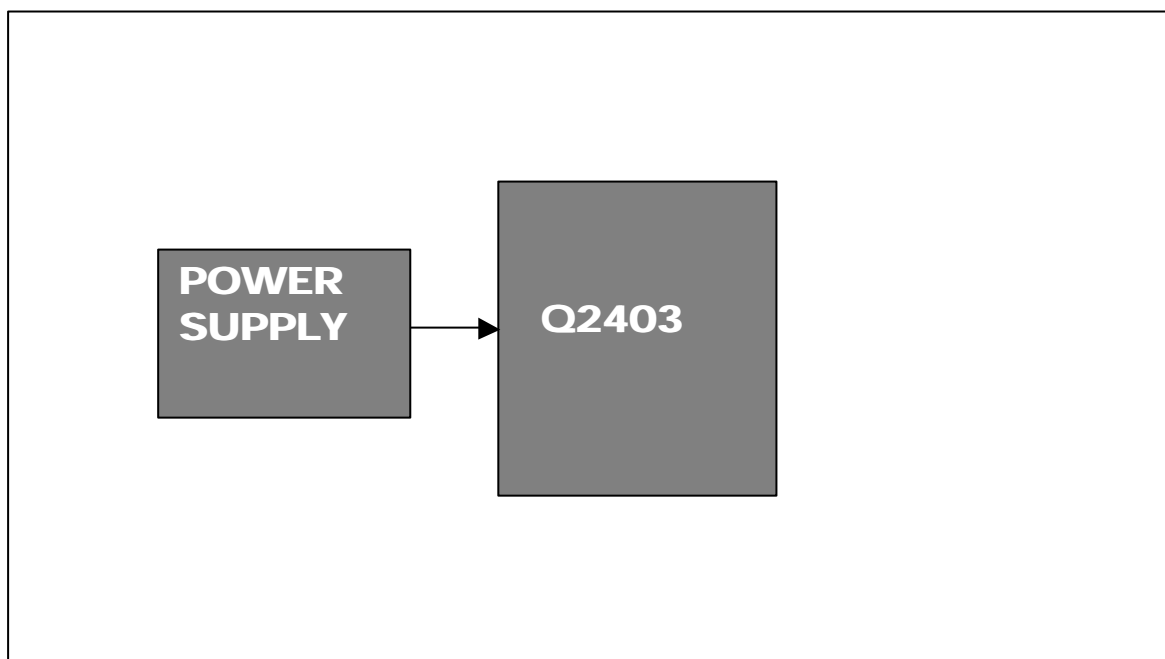
NOTES:

All schematics proposed in this document have been applied in a handset and have EMC tests in accordance with the following standards:

ETSI EN 300 342-1 edition 1997
EN 55022 Class B (emission)
EN 61000-4-2(CEM)
EN 61000-4-3(ESD).
CLIMATIC TEST OPERATING -20°C;+55°C
CLIMATIC TEST STORAGE -30°C;+85°C

2 MODULE INTERFACES

2.1 Block diagram



2.2 Interface description

- POWER SUPPLY: A battery Li-Ion of 3.6V is required to supply this design.

3 POWER SUPPLY

3.1 BATTERY POWER SUPPLY

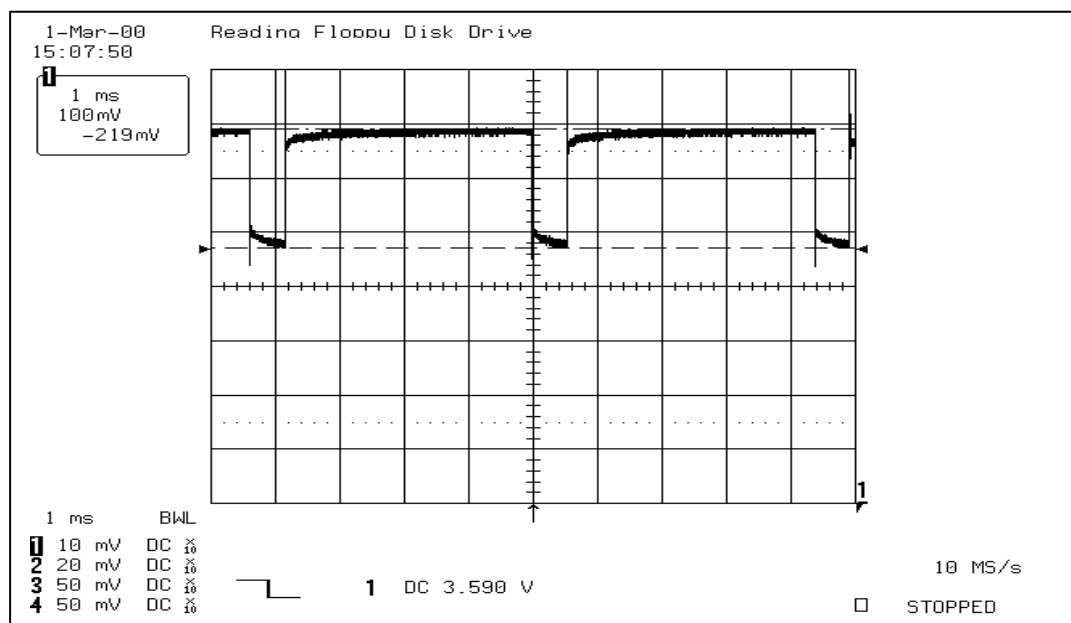
Power Supply is one of the key issue in the design of a GSM terminal
The purpose is to characterise a reference 3.6V battery to supply Q2403 module .
Li-ion appears as a good choice but requires a safety circuit. (PCM :Protection Circuit Module)

3.1.1 Power supply description

	Conditions	Min	Typ	Max	Unit
Operating Voltage		3.3V (*)	3.6 V	4.5 V	V
Drop Voltage			burst (with 2.0A Peak	0.3	V
Ripple Voltage	F < 200KHz			50	mV
Ripple Voltage	F > 200KHz			2	mV

(*) : This value has to be guaranted during the in GSM mode)

VBATT signal during the burst (for information) :



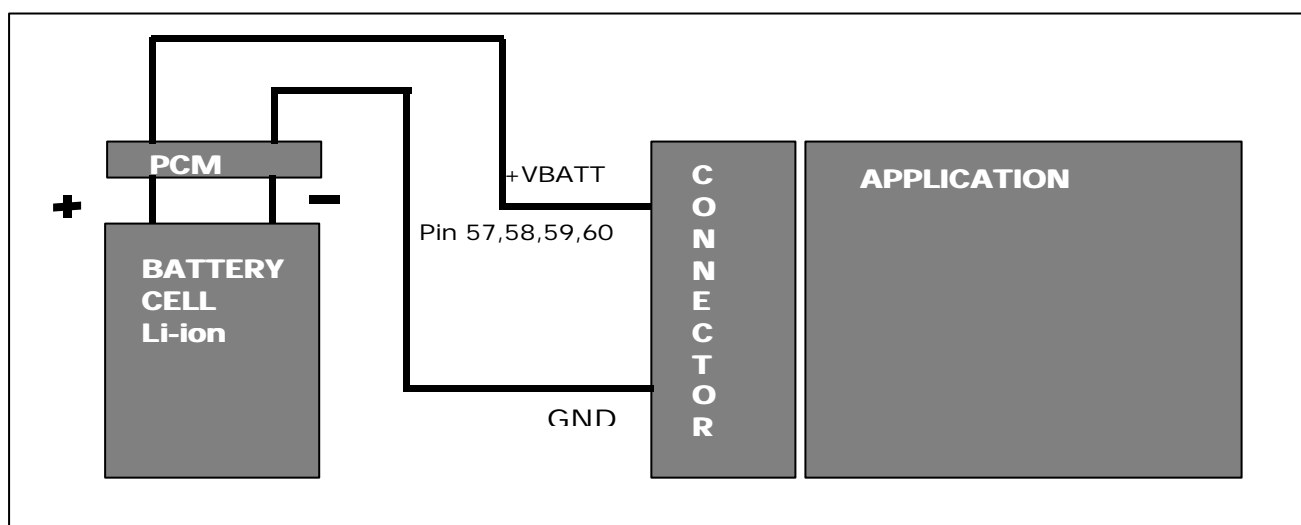
3.1.2 Battery Li-Ion reference

The Q2403 could be directly connected to a Li-Ion or Li-Po battery.

It is essential to keep a minimum voltage ripple at this connection in order to avoid any phase error and minimum drop voltage during the burst.

A protection circuit module (PCM) must be inserted between the cell and VBatt pin to protect the cell unit.

Directly connected power supply pinout



Battery requirements

Parameter	Min	Typ	Max	Unit
Rated Capacity	0.570		0.8	Ah
Rated Voltage		3.7		V
Maximum Charge Voltage			4.2	V
Battery Impedance (Z_b dynamic)			Z_b	mW
Operating Discharge Temperature	-20		60	°C
Operating Charge Temperature	0		45	°C

Battery references choice : References proposed are compatible with battery charging included in Q2403 .

- TOSHIBA BATTERY : LQG633048P (This choice has been validated with one module Q2403 in a handset).
- TOSHIBA BATTERY : LQG633048R (other choice compatible)
- HITACHI (other choice compatible)
- SANYO (other choice compatible) .

PCM references choice :

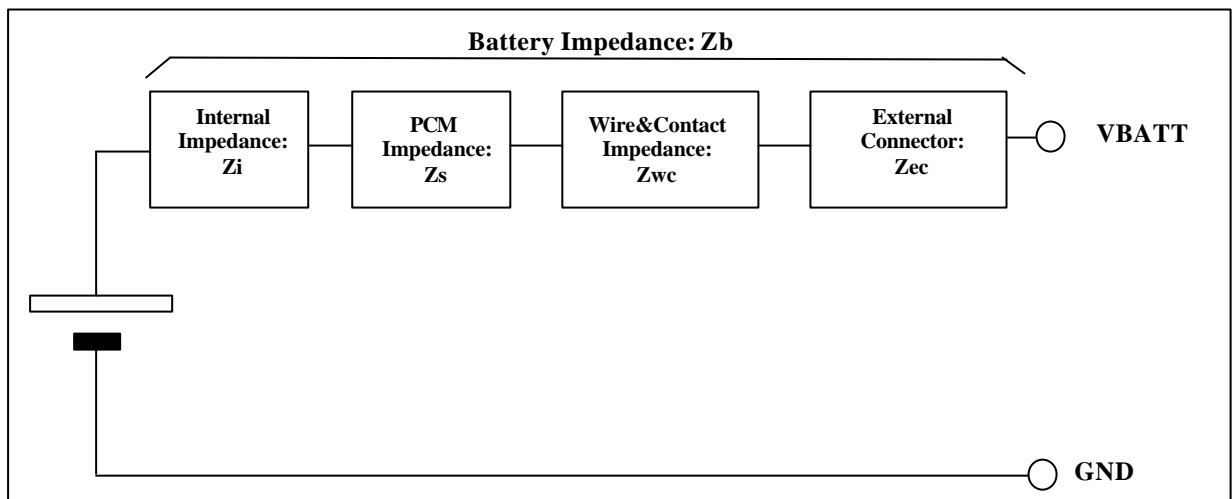
- PCM TOSHIBA : P144xxx (This choice has been validated with one module Q2403 in a handset ,FETs are integrated)
- PCM RICOH (other choice compatible)
- PCM MAXIM :MAX 1666 (other choice compatible)

- PCM ON Semiconductor:MC33348 (other choice compatible)
- PCM Phillips: SAA1502 (other choice compatible).

Total Battery Impedance parameter (Z_b , dynamic)

Memory: The Minimum VBATT voltage required is 3.3V in the burst. Nominal voltage is 3.6V. So Vdrop do not have to exceed 0.3V.

Vdrop is straightly related to the battery impedance ($V_{drop} = Z_b \times I_{max}$).



Z_i : Factory specification

Z_s : PCM Impedance (caution a FET has to be inserted with a $R_{dsON} = 20$ to 50 mOHM maximum)

Z_{wc} : Wire & Contact up to the connector of the application

Z_{ec} : Wire & Connector up to Q2403.

CAUTION : impedance has to be measured between pin VBATT OF Q2403 and GND pin of your application's interface .

The result has to be less than 150 mOhm (V_{drop}/I_{max} in the burst).

$$Z_b = Z_i + Z_s + Z_{wc} + Z_{ec} \leq 150 \text{mOHM}$$

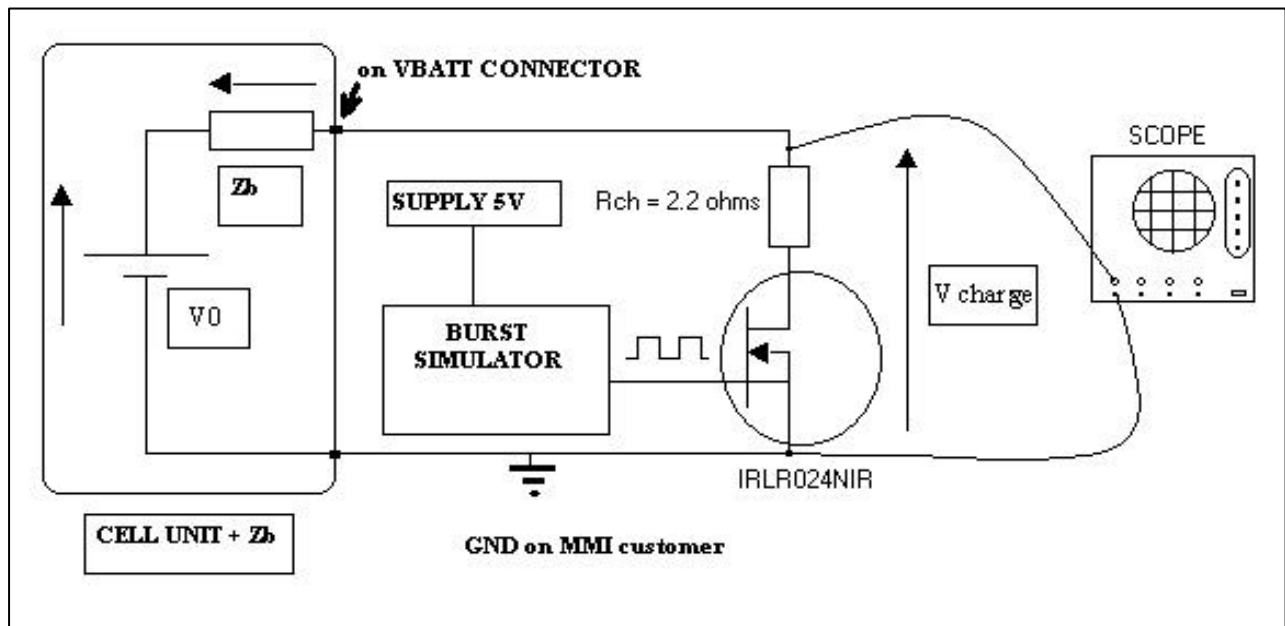
Example of how to measure the impedance :

1. Aim:
the internal impedance in dynamic mode has to be measured.

2. Methods:

- First step is to measure the cell unit voltage when it is disconnected from the circuit (**V0**).
- Second step is to set the following schematic to determine the internal impedance.

Description of the system to measure Zb :



3. Calculation:

$$R_{ch} = 2.2 \text{ W}$$

$$V_0 = 4.22 \text{ v}$$

$$\text{Voltage drop during the Burst: } V_{burst} = 0.260 \text{ v}$$

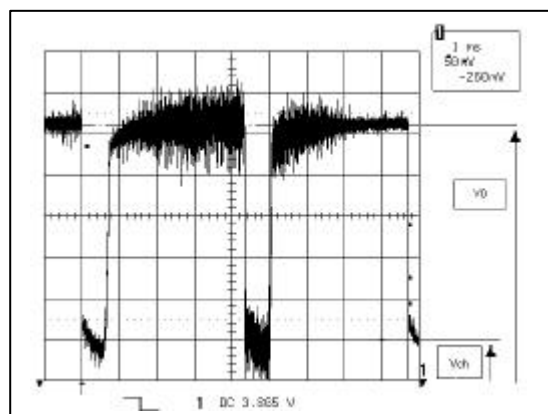
$$V_{ch} = V_0 - V_{burst} = 4.22 - 0.260 = 3.96 \text{ v}$$

$$I_{ch} = V_{ch} / R_{ch} = 3.96 / 2.2 = 1.8 \text{ A}$$

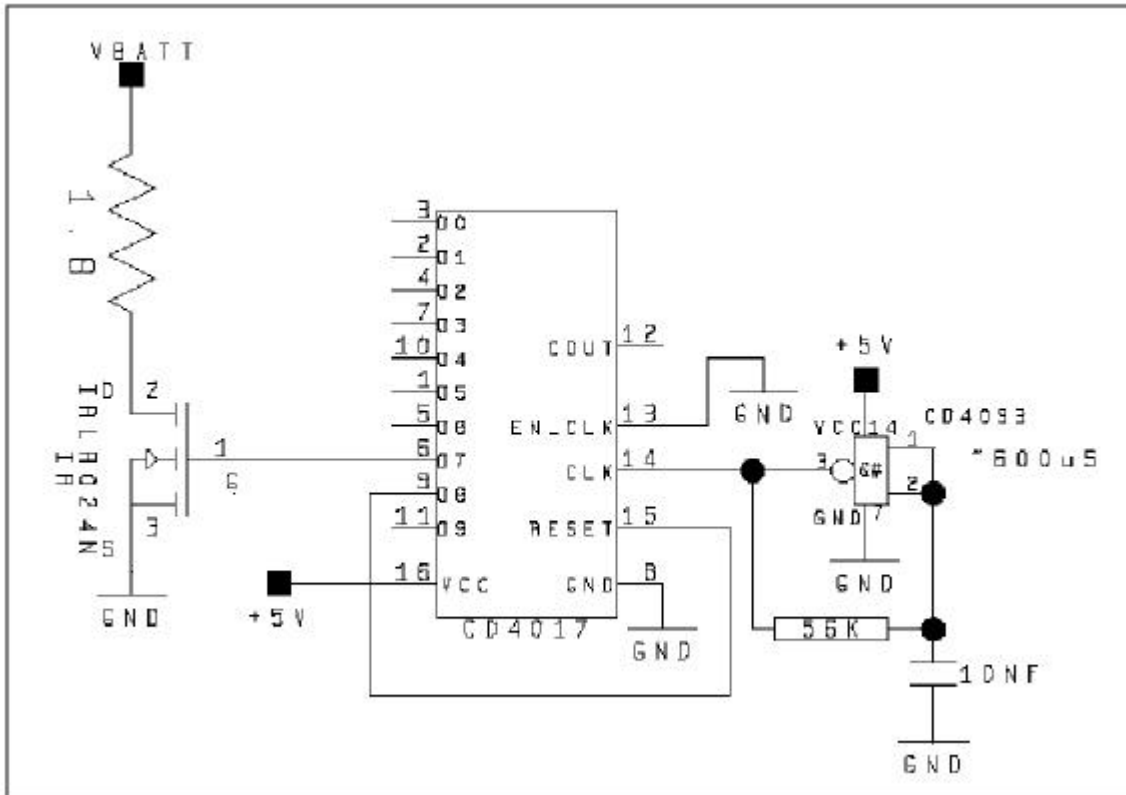
$$Z_b(\text{internal impedance}) = V_{burst} / I_{ch} = 0.260 / 1.8 = 144.44 \text{ m}\Omega$$

4. Results.

Drop in the burst



5. Burst simulator for example:



3.1.3 Layout restrictions

- **GND** :
 - The line between battery contact and Q2403 module has to be direct.
- **VBATT** :
 - The V+ of the battery has to be in front of the Vbatt of the module.
 - The track between battery and module connectors has to be 2mm large.
 - It is recommended to get the track not to close from the audio circuit.

4 MMI layout restrictions

To avoid any EMI/RFI problem, do not place any electrical function around the antenna connection on module or too close to the antenna.

Especially for Low frequency devices: DC/DC converter, microprocessors, memories..

RF lines or cables shall be as short as possible to minimize losses and must have a characteristic impedance of 50 Ohms until $F \geq 2$ GHz.

A micro strip line, as above, or a strip line can be used.

4.1 Power supply connection

Since the maximum peak current is around 2 A, to avoid voltage loss between the external power supply and the module power supply, WAVECOM strongly recommends a large width for the layout of this signal.

A total impedance line $\leq 10 \text{ m}\Omega$ @ 217 Hz shall be routed, including through holes.

4.2 Ground connection

The ground connection on module is assumed by mechanical fixing points, and not 60pts connector. All of these 4 points shall be connected together to assume the module ground. An extra ground plane is recommended on application board just behind module.