

bq20z655 to bq20z655-R1 Change Document

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PMP-BMS Notebook

Introduction

The bq20z655 is an SMBus Gas Gauge enabled with Impedance Track™ Technology that has the ability to drive an LCD display of RSOC, as well as a traditional LED display. The bq20z655-R1 provides three enhancements to improve system level interactions.

1. Improved FET Turn-On Time Upon Exit of Shutdown
2. RemainingCapacity() and FullChargeCapacity() Update Change
3. SBS 1.1 Master Mode Bus Start Collision Update

For information on the features of the bq20z655 device, refer to the *bq20z655 Technical Reference Manual* ([SLUU493](#)). This change document provides all of the details on the bq20z655-R1 enhancements to the bq20z655 device. For further information on the bq20z655-R1 device, refer to the *bq20z655-R1 Data Sheet* ([SLUSAN9](#)).

1 Improved FET Turn-On Time Upon Exit of Shutdown

An option was added to shorten the time it takes for the charge and discharge FETs to turn on coming out of shutdown or reset. If the **[FAST_FET]** bit in **Operation cfg C** is set to 1, the FETs turn on in less than 1.5 s after power-on reset. If copper deposition (SUV) is configured for use at power-on reset, then FETs are off for SUV time. To use Fast FET turn-on time, SUV should be configured to be used in Normal Mode, not at start up. If the Fast FET turn-on time option is used, initial capacity estimation may be off by 10–30% due to initialization of IT data with current. However, this would be corrected upon a Qmax update.

Two data flash parameters, **Transient Factor Charge** and **Transient Factor Discharge**, are added to allow the adjustment of resistance due to transient voltage readings with Fast FET turn on.

Transient Factor Discharge and Transient Factor Charge

Value from 0 to 255 (default 180) has meaning as a factor from 0 to 1 to adjust resistance

So: $R_{adj} = R * TransFactorDisch / 256$.

Class	Subclass	Name	Units	Type	Default
Gas Gauging	IT Cfg(93)	Transient Factor Charge	—	Hex	180
Gas Gauging	IT Cfg(94)	Transient Factor Discharge	—	Hex	180

2 RemainingCapacity() and FullChargeCapacity() Update Change

Upon wake from sleep the values of FullChargeCapacity() and Remaining Capacity are updated on a 5-hour interval based on the measured temperature at that time.

3 SBS 1.1 Master Mode Bus Start Collision Update

When any SMBus compatible device is used in a multi-master system, master mode collisions are inevitable. To account for this, the SMBus standard includes a bus arbitration definition. However, to support improved robust communication conditions when the bq20z655-R1 is enabled to broadcast, it has been enabled with additional SMBus control. The bq20z655-R1 ensures a delay between receipt of a transaction and mastering the bus. A collision could still occur but only if both masters attempt to begin a transaction at exactly the same time.

The bq20z655-R1 introduces a delay between the selected host command and the gas gauge master transaction. An internal timer is started at the end of the selected SMBus host transaction (**SMB Sync Command**), generating an interrupt when the timer reaches the end of the delay time. This interrupt sets up the SMBus hardware to generate the master transaction. The start occurs only if there is a master transaction request pending, which means the device must be configured for broadcast and SMBus synchronization, and there must be an alarm condition or charger update pending.

SMB Sync Delay sets the duration of the delay. Units are 488 μ s, which is the low-frequency oscillator input divided by 16. There is an additional delay of about 700 μ s for the execution of the end of SMBus handling and timer setup. This means the units are 488 + 700 μ s. Such precision is unlikely to be necessary, since there should be a reliable "dead time" after a given command.

Setting the delay time to zero disables SMBus synchronization and returns the gauge to the previous completely asynchronous operation.

SMB Sync Command sets the host command which will trigger the delay to the subsequent SMBus master transaction. Setting the command to 0xff will enable triggering after any command.

Selecting a useful command will require monitoring the host communication to determine its repeatable patterns. A command will need to be determined which is used somewhat frequently in all operational modes and is followed by a predictable "dead time." If communication is particularly sparse, it is advisable to use the "any command" setting of 0xff.

3.1 Features Removed to Support This Change

Where present, the SMBus command and associated data flash of **Manufacturer Block Command 4** was removed to recover data flash space necessary for the new configuration constants.

Class	Subclass	Name	Units	Type	Default
System Data	Manufacturer Info	Manuf Block 4	—	String	0123456789ABCDE F012

3.2 Additional Data Flash Configuration Constants

Class	Subclass	Name	Units	Type	Default
Configuration	AFE	SBM Sync Command	Hex	Uchar	0xff
Configuration	AFE	SBM Sync Delay	488 μ s	Uchar	50

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