Original question: ⓘ

[FAQ] BQ24190: BQ2419x/BQ2429x FAQs

BQ24190: Battery pack stops charging after the battery has drained to 3.1V

TI Thinks Resolved

Replies: 12

Krishna Balekai12

Views: 68

Part Number: BQ24190

Hi,

We are using a combination of BQ24190 and BQ27531 in our battery packs and every so often we land into a scenario wherein BQ24190 does not charge the battery

On probing I found that when USB VBUS is connected and supplying 5V there is now current drawn and the voltage at the sw pins are 0V

CE is connected to GND

OTG= NC

Battery voltage =3.1V (3.6V lithium ion battery with a charging voltage of 4.2V)

ILIM = 422 ohms (~1.25A charging current)

I did try to read the status register of BQ27351 over BQ_Studio using EV2400 but was not able to register the device, all cells in BQ-Studio was greyed out

The only way I could recover the unit from this state was to disconnect all power (USB VBUS and Battery) and reconnect Battery after which I could see 3.4V on the SW pins and 0.3A at 5V at USB VBUS

What could have disabled BQ24190 SW pins preventing it from charging the battery.

Thanks and Best Regards

Krishna

🏷 BQ24190	🏷 EV2400	🏷 BQ2419x	🏷 bq27531

Krishna Balekai12

Ning T

Krishna,

Which power supports the I2C pull-up for the charger?

Thanks,

Ning.

Please click "This resolved my issue" button if this post answers your question.
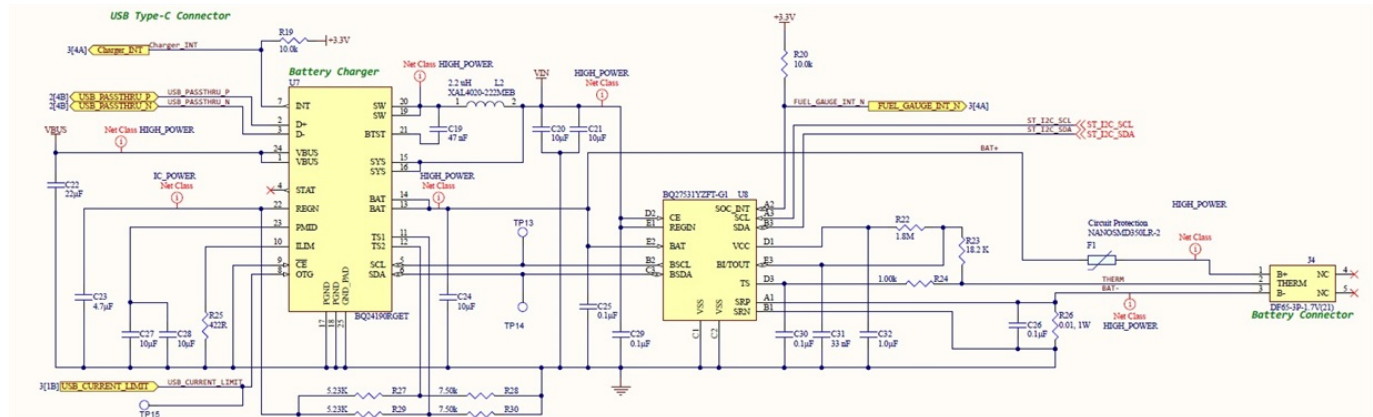
Krishna Balekai12

In reply to Ning T:

Hello Ning,

I2C lines of BQ24190 connect to BQ27531 and I2C line of BQ27531 are pulled up to 3.3V generated from SYS supply

Since the sw outputs are off, I2C rails are floating.

CE of BQ27531 is connected to SYS supply hence the system is in a lock-up state

The big question for me is how did the sw outputs get disabled?

Best Regards

Krishna

Ning T

In reply to Krishna Balekai12:

Krishna,

The key issue here is that when the device enters ship mode, the I2C pull-up goes away in the middle of I2C communication. If I2C pull-up stays high when the device enters ship mode, the issue can be solved. Please refer to https://e2e.ti.com/support/power-management/f/196/t/680331 for the detailes.

Thanks,

Ning.

Please click "This resolved my issue" button if this post answers your question.

Krishna Balekai12

In reply to Ning T:

Hello Ning,

The Battery pack is in mission mode so its not expected to be in ship mode.

I tried too recreate the scenario by disconnecting temperature sensor connection so the fuel gauge is reading -41.35 deg C, I confirmed that charging current is 0mA (charging disabled at 0 deg C as per battery spec).

Voltage at SW pins without USB_VBUS= 2.976

Voltage at SW pins when USB_VBUS connected = 3.681

Charging current as seen on BQSTUDIO = 0mA (I guess the BATFET is off at this stage)

Overall I was not able to recreate the same issue wherein both BATFET and SW are all off

Would you be able to let us know what conditions could set the device to

1. Disable the SW pins even when we have USB_VBUS connected

2. Disable BATFET

Best Regards

Krishna

Krishna Balekai12

In reply to Ning T:

Hello Ning,

Not sure how sw pins on the BQ24190 could be disabled, I have tried to disable charging but that only turns the BATFET off similar to ship mode

I have tried disable charging and put the unit into ship mode but it still does not disable sw pins, however there is no charging current voltage at battery is different from sys pin which confirms that BATFET is off

would a multi master access on the I2C bus cause this kind of lockup?

we have an MCU which should back-off from the I2C bus if its plugged into the unit at which time access to fuel gauge is dedicated for access to the main processor.

I am not sure what could have disabled sw pins which prevents supply rail to be active even when +5V is applied at USB_VBUS.

Thanks and Regards

Krishna

Ning T

In reply to Krishna Balekai12:

Krishna,

What are your test conditions such as VBUS (voltage at VBUS pin), IVBUS, VBAT (voltage at BAT pin), IBAT, VSYS, ISYS? Could you please provide the corresponding all register values of the charger?

Thanks,
Ning.

Please click "This resolved my issue" button if this post answers your question.

Krishna Balekai12

In reply to Ning T:

Hello Ning,

Please find details below,

VBUS= 5V (5V, 2A wall adapter)

IVBUS = 0mA (no power is being drawn by the battery charger

VBAT= 3.1V (3.6V, 5900mAh battery connected)

IBAT = 0mA (no power is drawn from the battery

VSYS = 0V

ISYS = 0mA

I was able to recover from the above condition only after disconnecting the battery and vbus (remove all power source) and re-connect battery.

Please find the attached spreadsheet for register configuration, the attached spreadsheet is a register export of the battery pack in question after recovering the device from lockup (by disconnecting and reconnecting the battery)

Thanks and Best Regards

KrishnaBattery_Reg_19Nov2020.gg.csv

Ning T

In reply to Krishna Balekai12:

Krishna,

When the battery drained to 3.1V, what was the VBUS pin voltage?

Is there any battery protection circuitry in between BAT pin and the battery pack or does the battery have built-in battery protection?

Thanks,

Ning.

Please click "This resolved my issue" button if this post answers your question.

Krishna Balekai12

In reply to Ning T:

Hello Ning,

Yes the The lithium-ion Battery has an internal protection circuit which has not in protection mode during the above issue.

Typical Threshold for the protection circuit

Over discharge: 2.3V

Recommended Constant Operating Current: 3A

Discharge Overcurrent: 4A

Redundant Safety Fuse: 6A

Best Regards

Krishna

Ning T

In reply to Krishna Balekai12:

Krishna,

Please check if the battery protection disconnects the battery from the BAT pin of the charger.

Thanks,

Ning.

Please click <mark>"This resolved my issue"</mark> button if this post answers your question.