
RT9490 Workaround for Battery Charging Process

Abstract

In portable device applications, the [RT9490](#) is useful for battery charging. Usually, devices use [RT9490](#) to stop charging. This application note provides the register control settings of [RT9490](#) to stop charging by using battery pack back-to-back MOSFET. Please note that users must follow this application note for charging process.

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1. Charging System Structure

The general function block of charging system is shown in Figure 1. First, the host controls register settings of the [RT9490](#) for charge profile. The main duty of the [RT9490](#) is to complete charge cycle with the charge profile and to inform the host of the charge status. The gauge device in the battery pack controls the back-to-back MOSFET to charge and discharge. The host communicates with the [RT9490](#) and the gauge via the I²C interface.

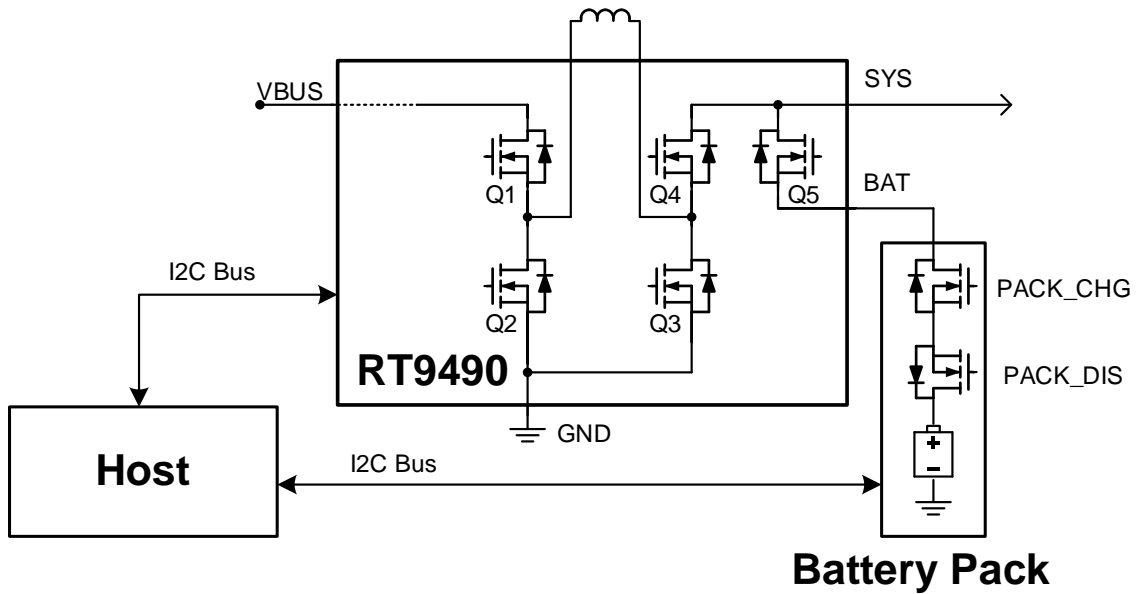


Figure 1. FunctionBlock of Charging System

2. Charging Behavior When Battery Pack Stops Charging

Figure 2 shows the charging behavior in the condition where battery pack stops charging. When the charging current is stopped by PACK_CHG MOSFET turn- off, [RT9490](#) Q5 turns off after charging is done. After Q5 turns off, the voltage on [RT9490](#) VBAT is below the battery voltage with forward diode VF, which triggers re-charge to turn on Q5 again. In Figure 3, when Q5 turns on and enters Q5 forced-on mode, without charging current, the converter target is VBAT tracking mode. Therefore, the converter stops switching until VBAT/VSYS OVP is triggered.

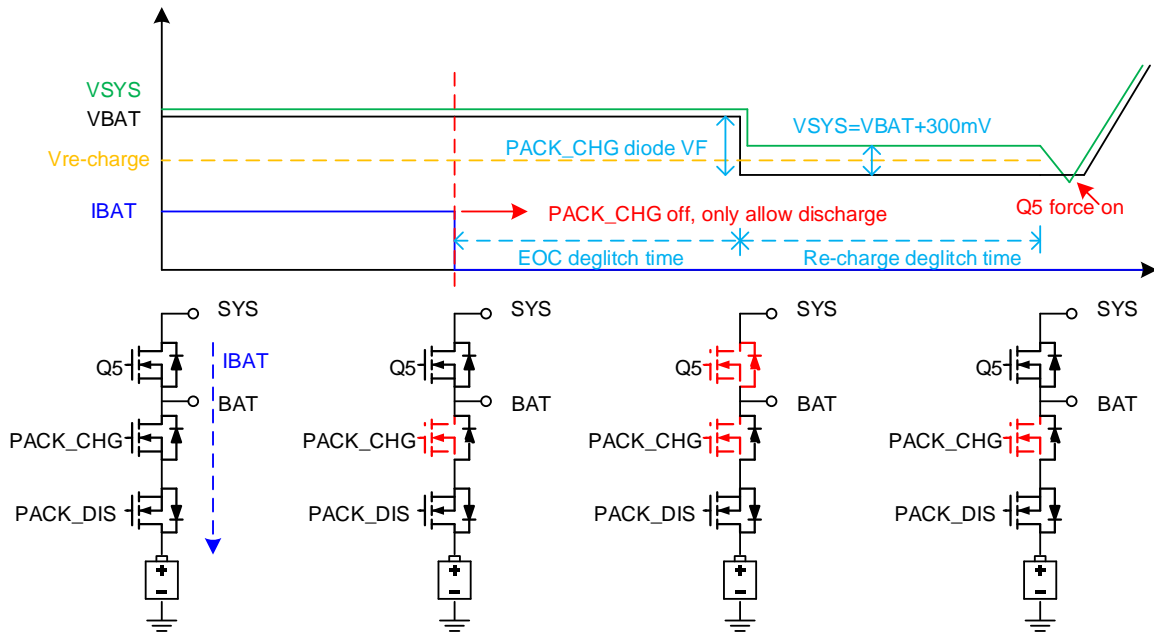


Figure 2. Charging Behavior When Battery Pack Stops Charging (not scaled)

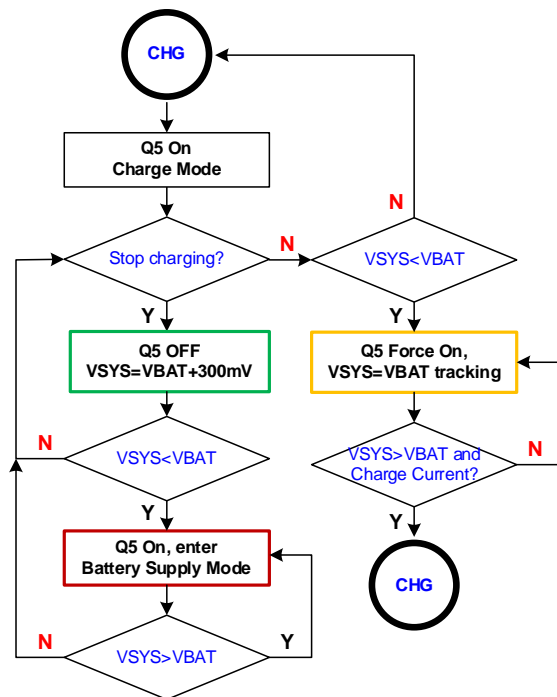


Figure 3. RT9490 Converter Behavior

3. Charging Behavior with RT9490 Software Workaround

As shown in Figure 2, the [RT9490](#) stops switching until VBAT/VSYS OVP. To prevent triggering this protection, the host must set the [RT9490](#) registers step by step. The programming steps are shown as below:

1. Write REG0xF1 = 0x69, hidden mode pass code.
2. Write REG0xF2 = 0x96, hidden mode pass code.
3. Write REG0x6F[5] = 0, disable BAT tracking mode.
4. Write REG0xF1 = 0x00, exit hidden mode.
5. Write REG0xF2 = 0x00, exit hidden mode.

After the above register setting is done, the converter behavior is shown in Figure 4.

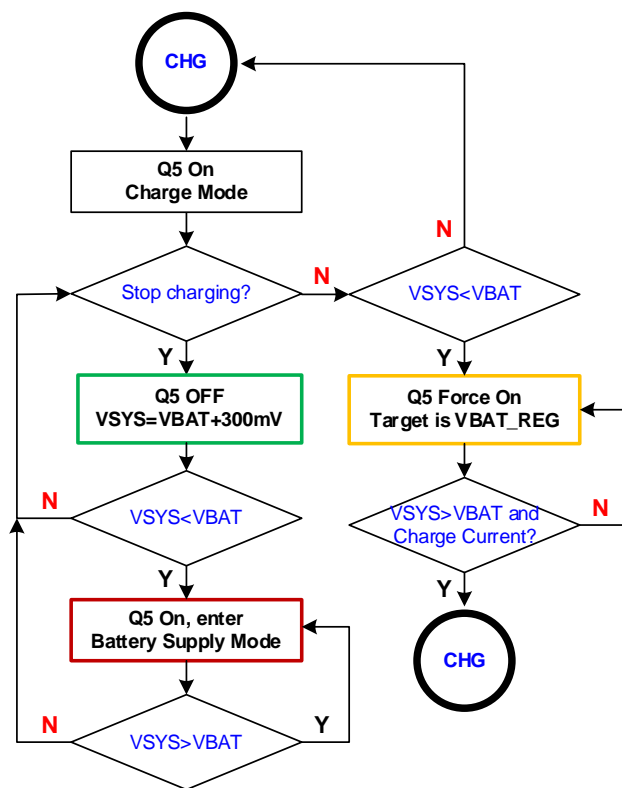


Figure 4. RT9490 Converter Behavior with Software Workaround

4. Experiment Waveform with the Software Workaround

Test Condition: VBAT_REG = 9.06V, battery pack OVP = 9.06V, trigger pack OVP protection to turn off the charging path. In Figure 5, the converter works in BAT tracking mode, VSYS/VBAT rise until triggering [RT9490](#) VSYS/VBAT OVP protection.

In contrast, in Figure 6, the converter works with the software workaround by disabling BAT tracking mode. VSYS/VBAT rise to VBAT_REG to trigger “charge done”, and then VBAT falls to trigger “re-charge”. This cycle keeps looping for normal charging process.

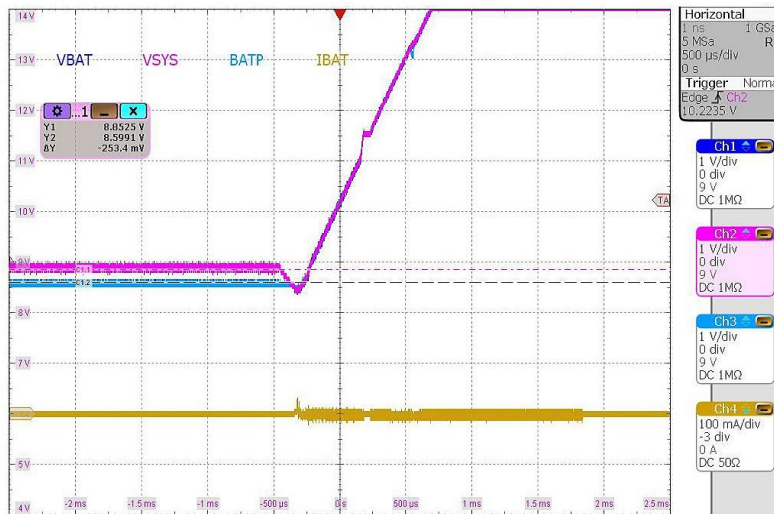


Figure 5. PACK_CHG off, without Software Workaround

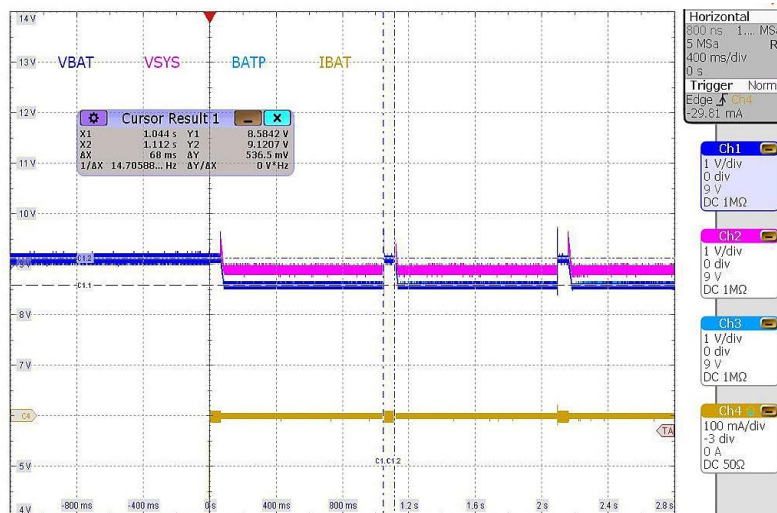


Figure 6. PACK_CHG off, with Software Workaround

5. Appendix

Register Description

I²C Slave Address: 1010011 (53H)

R/W: Read and write

RWC: Read and write, also automatically cleared by particular conditions

Register Address: 0xF1, Register Name: TM_PAS_CODE1

Bit	Bit Name	Default	WDT RST	REG RST	Type	Description
7:0	TM_PAS_CODE1	00000000	N	Y	RWC	Passcode 1 for hidden mode

Register Address: 0xF2, Register Name: TM_PAS_CODE2

Bit	Bit Name	Default	WDT RST	REG RST	Type	Description
7:0	TM_PAS_CODE2	00000000	N	Y	RWC	Passcode 2 for hidden mode

Register Address: 0x6F, Register Name: HD_ADD_CTRL 2

Bit	Bit Name	Default	WDT RST	REG RST	Type	Description
5	EN_FON_Q5_BAT_TRACK	1	N	Y	R/W	0: When Q5 is forced on, no BAT tracking 1: When Q5 is forced on, BAT tracking

Next Steps

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