

## RT9490 Application Note

### 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 I<sup>2</sup>C interface.

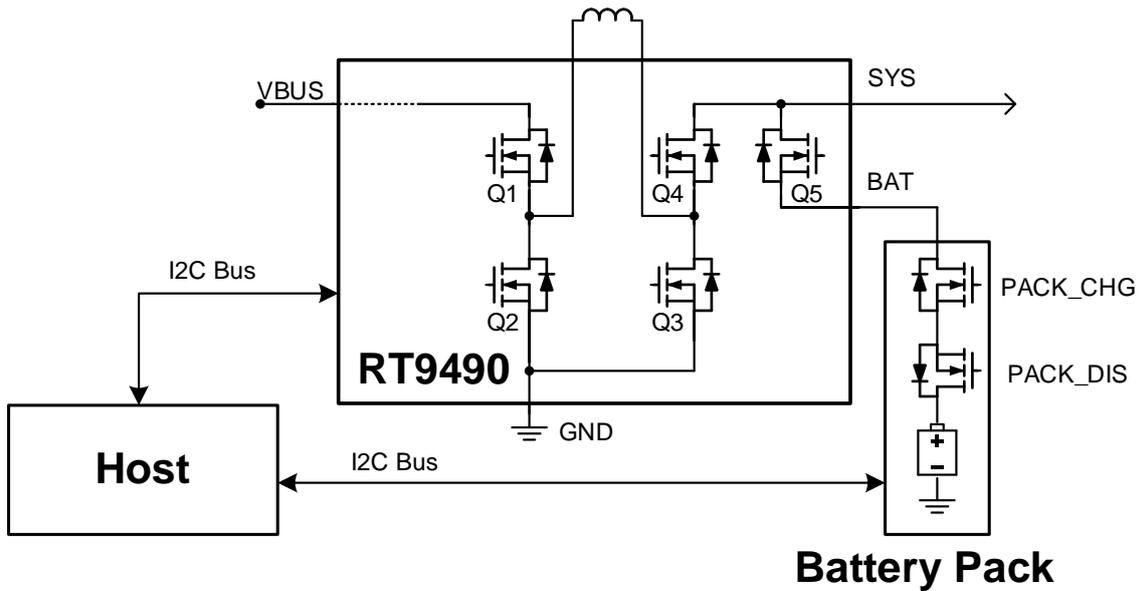


Figure 1. FunctionBlock of Charging System

## 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.

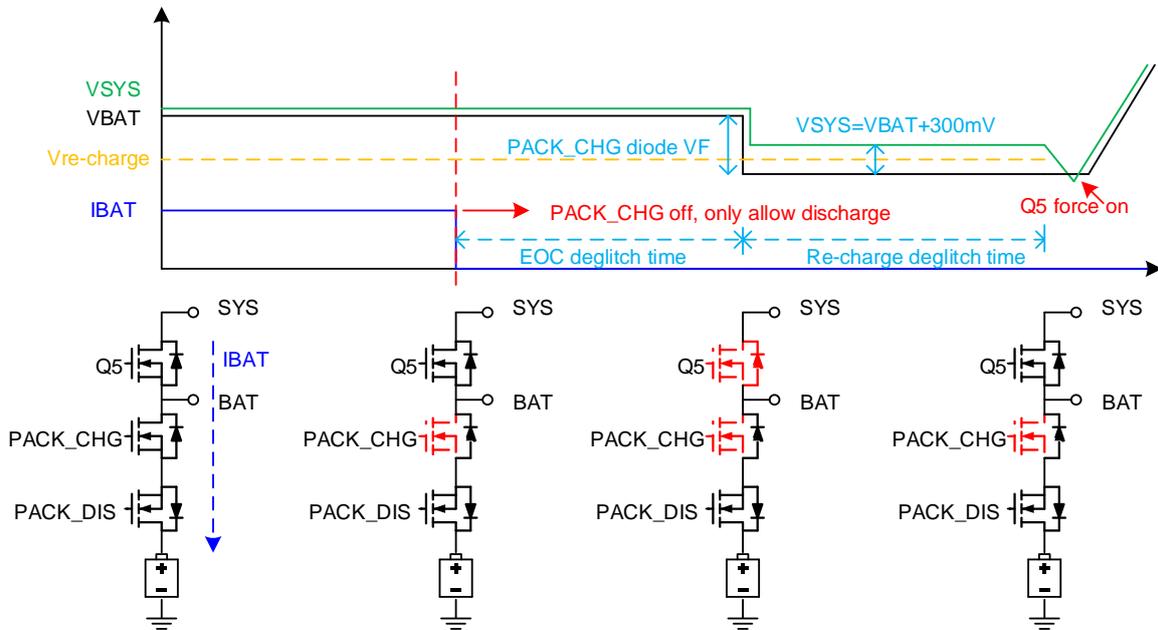


Figure 2. Charging Behavior When Battery Pack Stops Charging (not scaled)

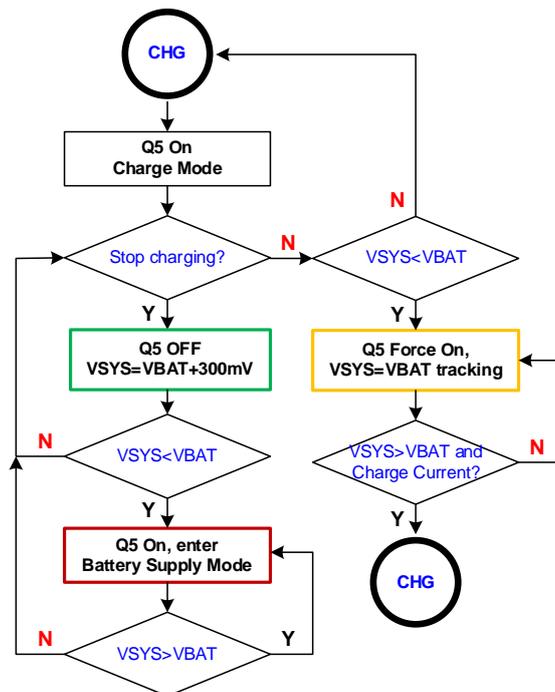


Figure 3. RT9490 Converter Behavior

### 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.

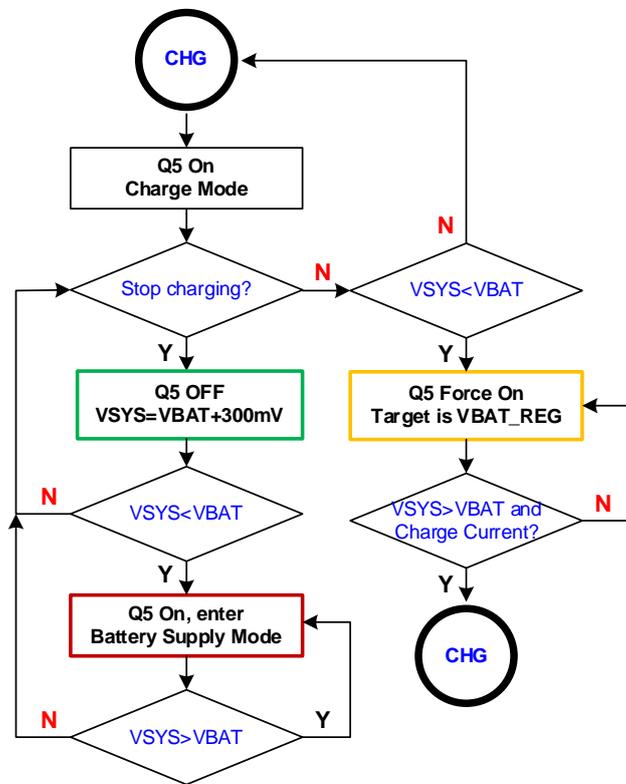


Figure 4. RT9490 Converter Behavior with Software Workaround

## 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.

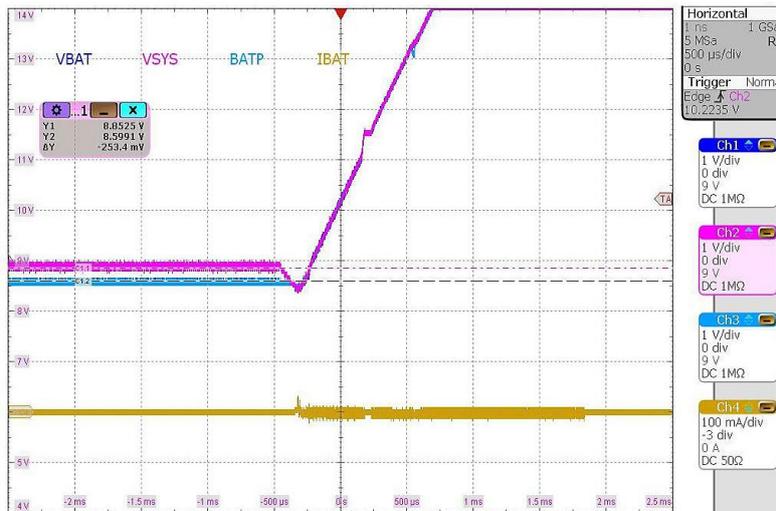


Figure 5. PACK\_CHG off, without Software Workaround

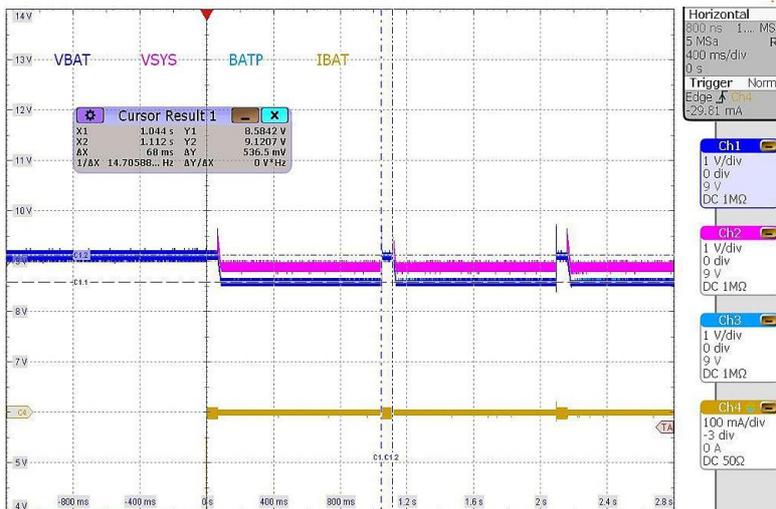


Figure 6. PACK\_CHG off, with Software Workaround

## 5. Appendix

### Register Description

I<sup>2</sup>C 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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