Backup Circuit for A1080 & A1035-D

A description of the power supply and backup building block and the implication for the external circuit for Tyco Electronics' GPS modules A1080-A, A1035-D

Application Note

Version 1.1
Hardware Revisions 01, 02 and 03 (A1080)
Hardware Revisions 01 and 02 (A1035-D)

Revision History

Rev.	Date	Description
1.0	07-09-07	Initial draft
1.1	08-21-08	New style; moved to Vincotech
	mm-dd-yy	

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1 Introduction

This document briefly describes the power supply and backup block built into the GPS receivers A1080 and A1035-D and the implications for the external circuitry.

2 Backup and Main Power Supply

2.1 Power Supply Building Block of the A1080 and A1035-D

Fig. 1 shows the simplified power supply circuit of the A1080 and A1035-D. Basically two different supply domains are present. The main voltage regulator (IC1, 2.8V) is responsible for all the loads present at full operation (e.g. CPUs, RF oscillator, down-converter), the backup voltage regulator (IC2, 1.5V) supplies current to all parts of the circuit that should continue to work if only V_{BAK} is supplied (mainly battery backed SRAM and real time clock).

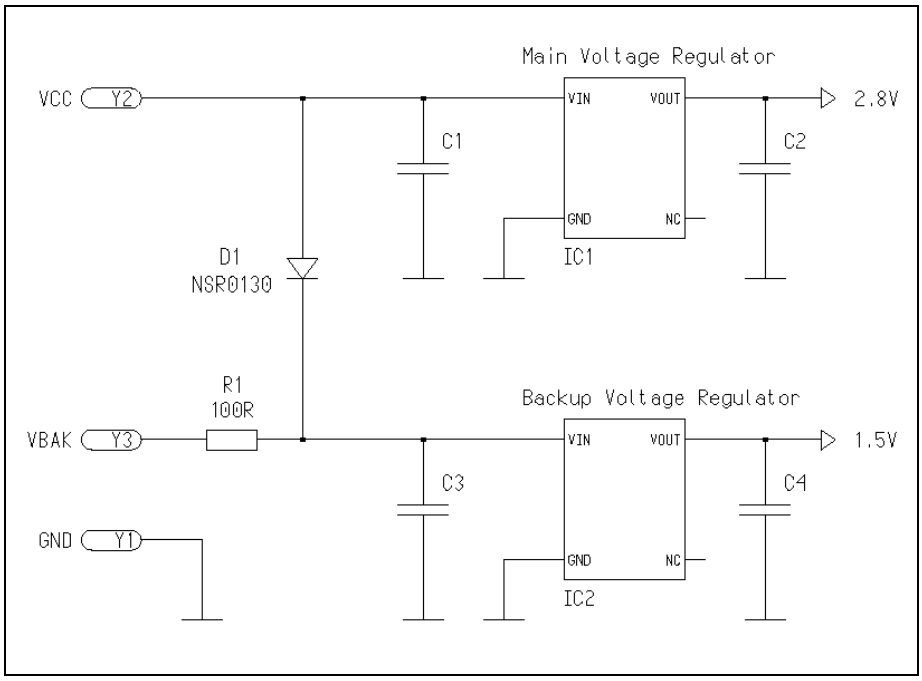


Fig. 1: Voltage Regulators on GPS Receiver A1080 and A1035-D

For further understanding it is important to notice that both regulators need to be active during fully operational mode of the GPS module.

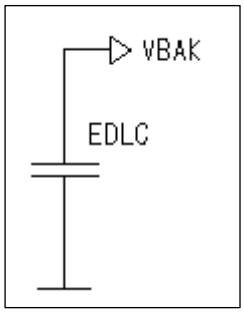
2.2 Application Examples

This section presents some common applications examples of how to use the V_{BAK} pin of the A1080 and A1035-D GPS receiver module. It covers situation with no backup at all and solutions with fixed voltages and several rechargeable devices. Each example provides a schematic of the circuit that is typically connected to the V_{BAK} pin for that specific application.

2.2.1 Application without Backup Support

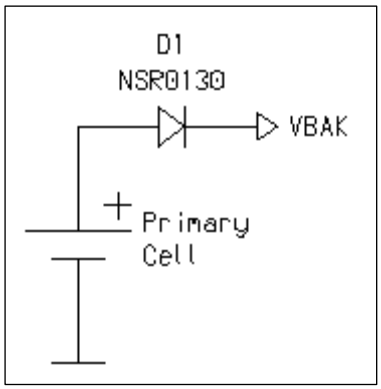
In application that do not demand SRAM and RTC backup at all it is safe to power the A1080 only through the VCC pin. The diode D1 provides power also to the backup domain. In that case it is suggested to leave the V_{BAK} pin open.

2.2.2 Application using a Electrochemical Double Layer Capacitor



One common device to store backup power is an electrochemical double layer capacitor (EDLC, often referred to as Gold- or Supercap). Before this device is able to supply power it needs to be charged. An EDLC connected between GND and V_{BAK} is charged through D1 and R1 up to supply voltage applied to the V_{CC} pin. As with any capacitor there is no risk of destroying the device due to excessive charging, thus no special care has to be taken. Charge current will automatically drop to zero as soon as the voltage over the capacitor has reached the supply voltage. If the main power supply is removed the backup domain is still supplied by the EDLC through the V_{BAK} pin. Now D1 prevents current from flowing towards the main power regulator. As long as the voltage is above the minimum voltage necessary for SRAM and RTC retention the data remains valid. Please see the separate application note for more details about EDLCs.

2.2.3 Application using a Primary Cell

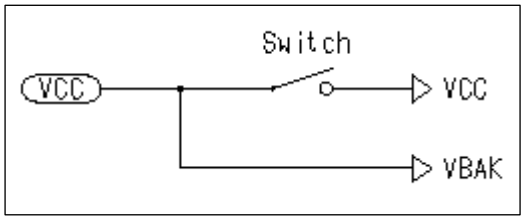


In order to avoid severe problems with leaking or even exploding primary cells (e.g. lithium button cells) any current into the battery should be avoided under all circumstances. As the A1080 and A1035-D were deliberately designed to charge a capacitor attached to the V_{BAK} pin an external diode D1 connected in series is strongly recommended.

However, there is one very important detail to consider. Due to the fact that the backup domain is fed by two sources (main power and external battery) decoupled through diodes the actual current (approximately 20µA) is delivered by the source

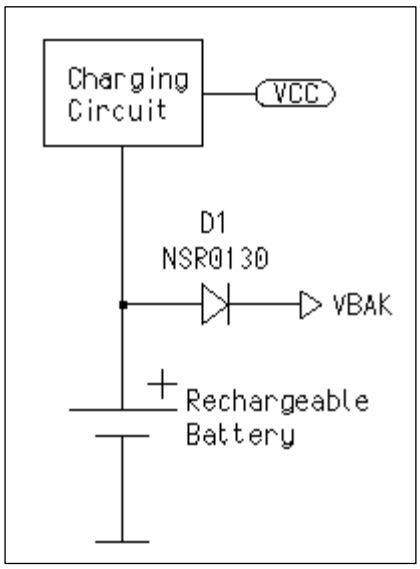
with the higher voltage. Thus, to avoid unnecessary draining of the backup battery, it is strongly recommended to set the main voltage V_{CC} slightly higher than the battery voltage V_{BAK}. Please check the receiver manuals for absolute maximum ratings.

2.2.4 Application using a Fixed Voltage Source



The primary cell (see section 2.2.3) can be replaced by a fixed voltage source, e.g. some standby supply available in the system anyway. In case the voltage level is different from the main power supply the same restriction as mentioned in section 2.2.3 apply. In case the voltage level is identical the diode can be omitted. Replacing the mechanical switch in the schematic by a transistor (e.g. a p-channel power MOSFET) will provide functionality similar to the ENABLE pin present on the A1029 GPS receiver.

2.2.5 Application using a Rechargeable Battery



The A1080 and A1035-D GPS receivers are designed to charge an EDLC attached to the V_{BAK} pin. However, this is not an appropriate solution for a rechargeable battery since to provision against excessive charging is implemented. Thus it is strongly recommended to use an external charging circuit suitable for the specific chemistry of the battery. Again, the decoupling diode D1 is essential and the comments regarding voltage levels and resulting currents as described in section 2.2.3 apply.

3 Related Information

3.1 Contact

This manual was created with due diligence. We hope that it will be helpful to the user to get the most out of the GPS module.

Anyway, inputs about errors or mistakable verbalizations and comments or proposals to Vincotech, Germany, for further improvements are highly appreciated.

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3.2 Related Documents

- GPS Receiver A1080 (Vincotech)
- GPS Receiver A1035-D (Vincotech)
- AppNote GPS EDLC Backup A1080 & A1035-D (Vincotech)
- GPS Receiver A1029 (Vincotech)