

APPLICATION NOTE

Protection against Pulses Exceeding the Rated Tolerance

ATA6823C/ATA6824C

Scope of Document

This document provides additional information designed to protect Atmel[®] ATA6823C/ATA6824C integrated circuits from exceeding the maximum pulse rating.

Preface

Pulses exceeding the maximum rating cause damage to integrated circuits. Some pins are subject to greater risk when deployed in an automotive environment.

The pins involved:

- The VRES charge pump pin
- The S1 and S2 sense pins

1. Hints for Protecting the Pins

1.1 Charge Pump Pin VRES

The purpose of the charge pump is to provide adequate voltage to control the external high side MOSFETs.

In an H-bridge configuration, the high side MOSFETs are referred to the H-bridge supply voltage PBAT while in high side ON phase.

The charge pump capacitor CVRES should therefore be referred to the PBAT bridge supply pin (see Figure 1-1 on page 2).

Figure 1-1. Charge Pump Block Diagram

H-bridge supply PBAT **PGND** - C_{VRES} CCP - CP C_{VG} **VBAT** PBAT VG **CPLO** CPHI **VRES** 12V HS Charge Pump Driver Regulator LS CPOK ATA6823C/ATA6824C Driver V_{THOV} Logic Control

The charge pump works for VBAT voltages below the overvoltage threshold V_{THOV} . In the event of overvoltage at VBAT (voltage higher than V_{THOV}), the charge pump switches off.

1.1.1 Charge Pump Switch-off

The charge pump can only switch off when overvoltage is detected. The overvoltage is only monitored at the VBAT pin.

In the event of a voltage peak at the PBAT pin, the charge pump would not switch off but would still pump VRES voltage about 15V higher than the PBAT voltage level. If the VRES pin maximum rating voltage of 40V is exceeded, this increase would continue until the VRES pin is destroyed.

The procedure for avoiding this is to switch off the charge pump via the VBAT pin. For this reason, the VBAT supply pin needs to be connected with at least one diode to the PBAT charge pump reference pin.

1.1.2 Adapting VRES Energy

In the event of overvoltage at VBAT (voltage higher than V_{THOV}), the charge pump switches off. Switching off is delayed by internal filtering about 100 μ s. Based on a charge pump frequency of 100kHz, the filtering delay leads to 10 additional shuffle cycles.

It is not possible to avoid the additional pump cycles.

Compared to the 100µs switch-off delay time, automotive jump start pulses are slow. Jump start pulses would therefore not cause any damage.

In a DC motor environment, faster voltage peaks can occur. To avoid destruction, we recommend adapting the size of the CCP shuffle capacitor and CVRES charge pump capacitor according to the external MOSFETs and PWM frequency being used.



1.1.3 The S1 and S2 Sense Pins

The maximum ratings for the S1 and S2 sense pins are mandatory. Voltages exceeding this will lead to destruction. To reduce energy into S1 and S2, serial resistances of a few ohms are sufficient. In the event of an additional sense resistor, the cross conduction timer needs to be adapted.

For further details please refer to the Atmel[®] datasheets ATA6823C/ATA6824C or contact info@atmel.com





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