AN1529
APPLICATION NOTE

EXTENDING THE CURRENT & VOLTAGE CAPABILITY ON THE ST7265 VDDF SUPPLY

by Microcontroller Division Applications

INTRODUCTION

The ST7265 features a VDDF pin to make it easier to interface between the its own MCU supply (V_{DD}) and external devices with a lower voltage supply. This VDDF pin can be used as a selectable 2.4 to 3.6V power supply to external devices and to supply some of the ST7265 I/Os: consequently, a device supplied by the VDDF pin can interface with the ST7265 directly without any electrical voltage adaptation.

In some cases, the programmable voltage values or the current capability of the embedded regulator may not match the application needs. An alternative solution is required.

This application note describes two such solutions, based on practical implementations: A 3.3V/500mA power supply for driving a Microdrive Storage media on the ST7265x_EVAL/MS “5in1” USB Mass Storage evaluation board from STMicroelectronics.

1 FEATURE OVERVIEW

Two implementations are described in this application note, covering two different requirements:

– The required voltage value is outside the range of the embedded programmable regulator

– Higher current capability

Both solutions feature a low power mode to meet the USB suspend mode specification.

1.1 REPLACING THE EMBEDDED REGULATOR

An external regulator can be used to obtain an output voltage that is outside the range of the embedded programmable regulator. This solution can also be a way to bypass the output current limitations. A dedicated MCU I/O pin is needed to reduce the consumption of the external circuitry to typically 50µA when in suspend mode.

1.2 ADDING A CURRENT AMPLIFIER

This solution is a cost-effective way to extend the output current capability of the internal regulator. This solution involves a voltage follower which is referenced on the VDDF output from the internal regulator. Zero consumption is reached by turning off the VDDF output from the embedded regulator.

2 REPLACING EMBEDDED REGULATOR BY THE STMICROELECTRONICS KF33

The proposed solution is based on the STMicroelectronics KF33 regulator device and features the following caracteristics:

– 3.3V output voltage.

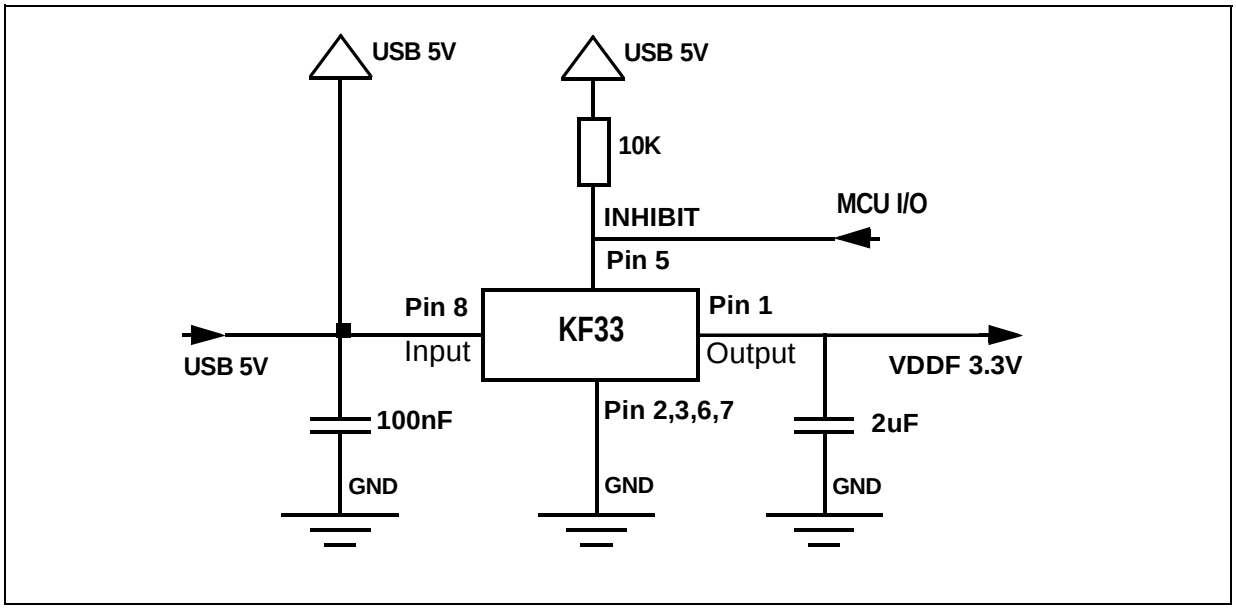
– 500mA output current.

– 50µA low power mode consumption.

This schematic can be adapted for other voltage regulators.

Refer to STMicroelectronics **KFxx specification.**

Figure 1. Example Schematic for connecting external KF33 Regulator



– With this type of implementation, the OUTPUT of the regulator must be connected to the VDDF pin of the MCU in order to supply its I/O pins. In this case VDDF is an input for the ST7265.

– It is also mandatory to use a ST7265 I/O supplied by MCU VDD for the INHIBIT control.

2.1 HARDWARE IMPLEMENTATION ON THE 5 IN 1 EVALUATION BOARD

Figure 1 shows how to connect the regulator to the board.

USB 5V is the USB bus power.

VDDF 3.3V is the media card supply.

The INHIBIT pin is used to control the regulator through the PF2 port of the ST7265.

2.2 MODIFICATION OF THE 5-IN-1 FIRMWARE

The Media Configuration Layer of the Mass Storage firmware has to be modified so that the external regulator is controlled instead of the internal one and to use the PF2 port control IN-HIBIT pin of the external regulator.

PF2 is initialized before MAL_POWER_ON in the USER_init() function, in the Appli.c file:

```
SetBit(PFDR,2);  // Ext Reg OFF
SetBit(PFDDR,2);// PF2 Output, INHIBIT ctrl
```

You should remove the PF2 configuration from the Init_port() function, in the Appli.c file:

```
//ClrBit(PFDDR,2);// PF2 Input: SLOT1
```

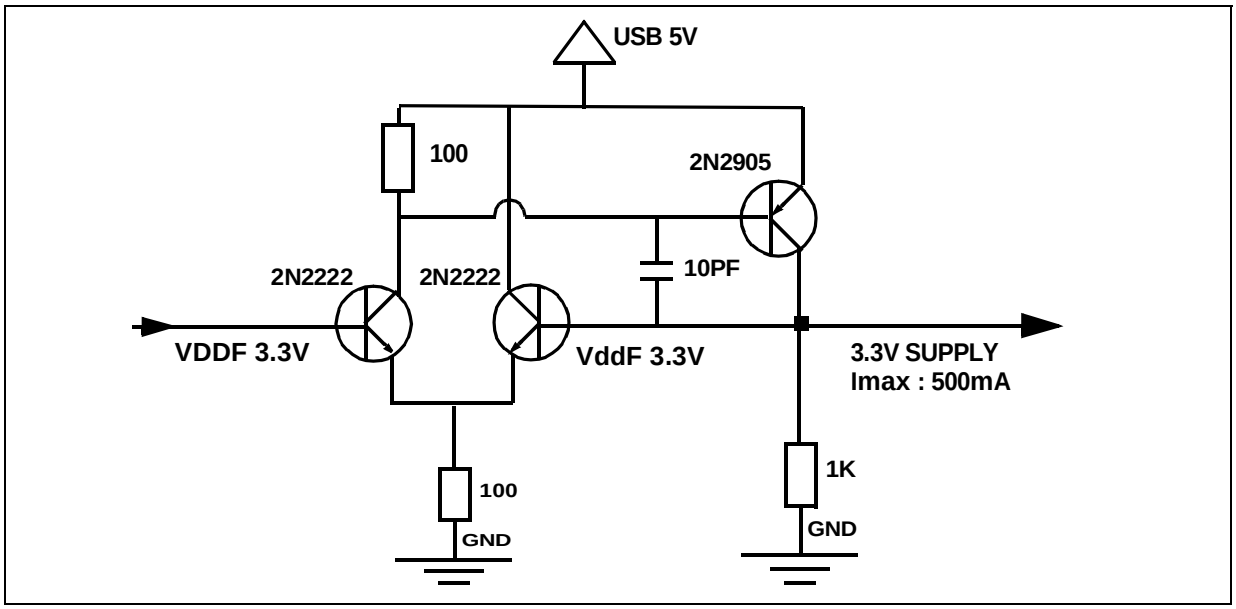
The MAL_POWER_ON & MAL_POWER_OFF functions in the Mconfig.h file are redefined as follows:

```
#define MAL_POWER_ON {PEDDR |= 0x08; PFDR &= ~0x04;}
#define MAL_POWER_OFF {PEDDR &= ~0x08; PFDR |= 0x04;}
```

3 ADDING A CURRENT AMPLIFIER

The VDDF voltage output from the internal regulator is the voltage reference of the current amplifier. The output voltage follows VDDF. When the reference voltage is 0V, the current amplifier stage is conumes 0mA. This is a good solution for USB suspend mode.

Figure 2. Example current amplifier schematic



The PNP 2N2905 transistor can be replaced to increase the output current value.

3.1 HARDWARE IMPLEMENTATION ON THE 5 IN 1 EVALUATION BOARD

Figure 2 shows how to connect the current amplifier to the board.

USB 5V is the USB bus power.

VDDF 3.3V is the internal regulator output.

3.3V supply is the MICRODRIVE supply

Low power mode is controlled by cutting VDDF.

3.2 MODIFICATION OF THE 5-IN-1 FIRMWARE

No modification needed.

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