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1 Introduction

This document describes external protection circuits for 5V digital IOs of MLX81100 in a communication interface to an external ECU in automotive applications. This application note considers two cases:

1 PWM interface is running at 5V level
2 PWM interface is running at 12V level.

2 Principle protection circuits

All following schematics are sample schematics, which need to be adjusted depending on the application.

2.1 PWM interface 5V level

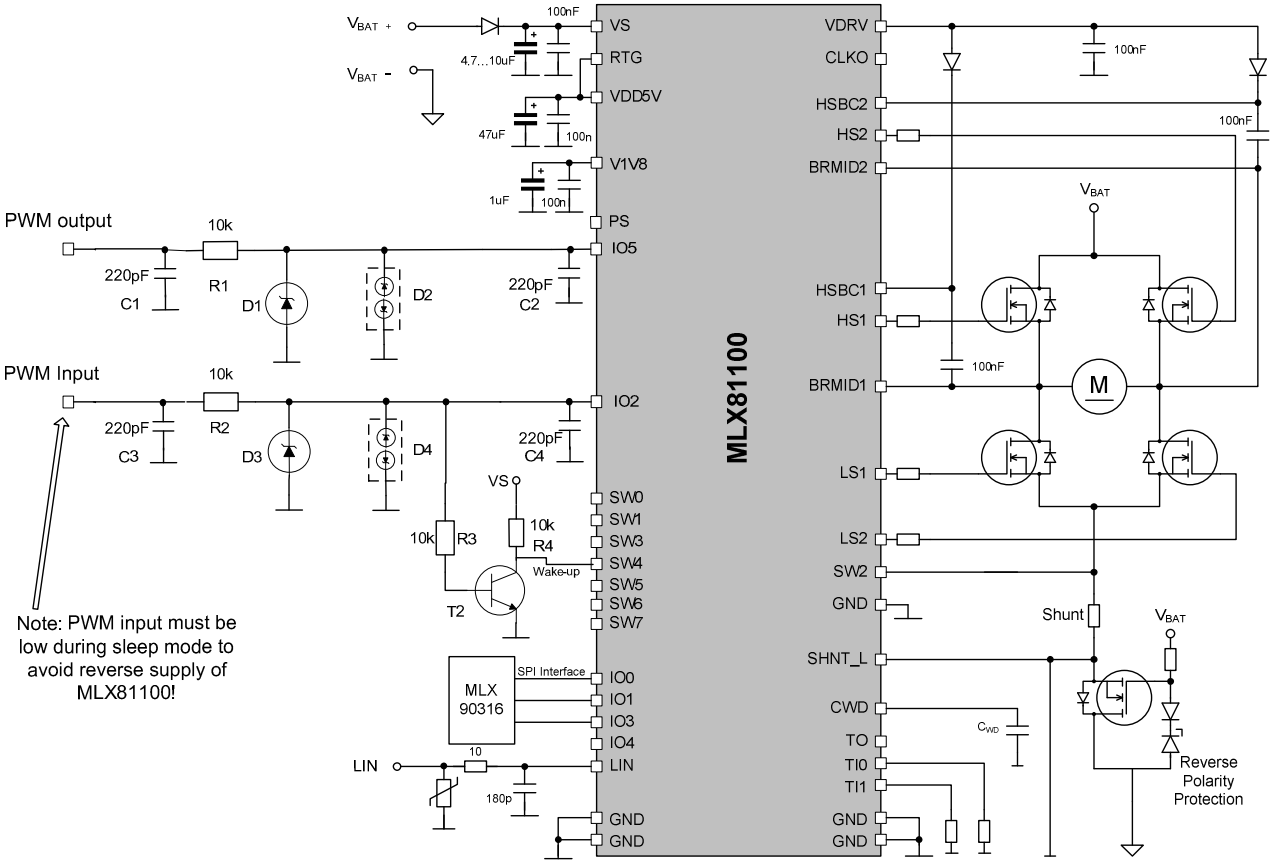

Fig. 1 Sample application circuitry for PWM interface at 5V level

2.2 Protection elements 5V level

Zener diodes D2 and D4: 5,6V zener voltage, different types are available, tests on real chip will help to sort out suitable type, trade-off between fast response according to ESD protection and high power dissipation according to short to Vbat has to be made.

In output path (MLX81100): 5,1V zener diode (D1) with high power dissipation for short circuit protection and fast 5,6V Back-to-back zener diode (D2) for ESD-protection are put in parallel.

Capacitors C1-C4: optional, for improved EMC-behaviour, also tests have to be done.

2.3 PWM interface 12V level

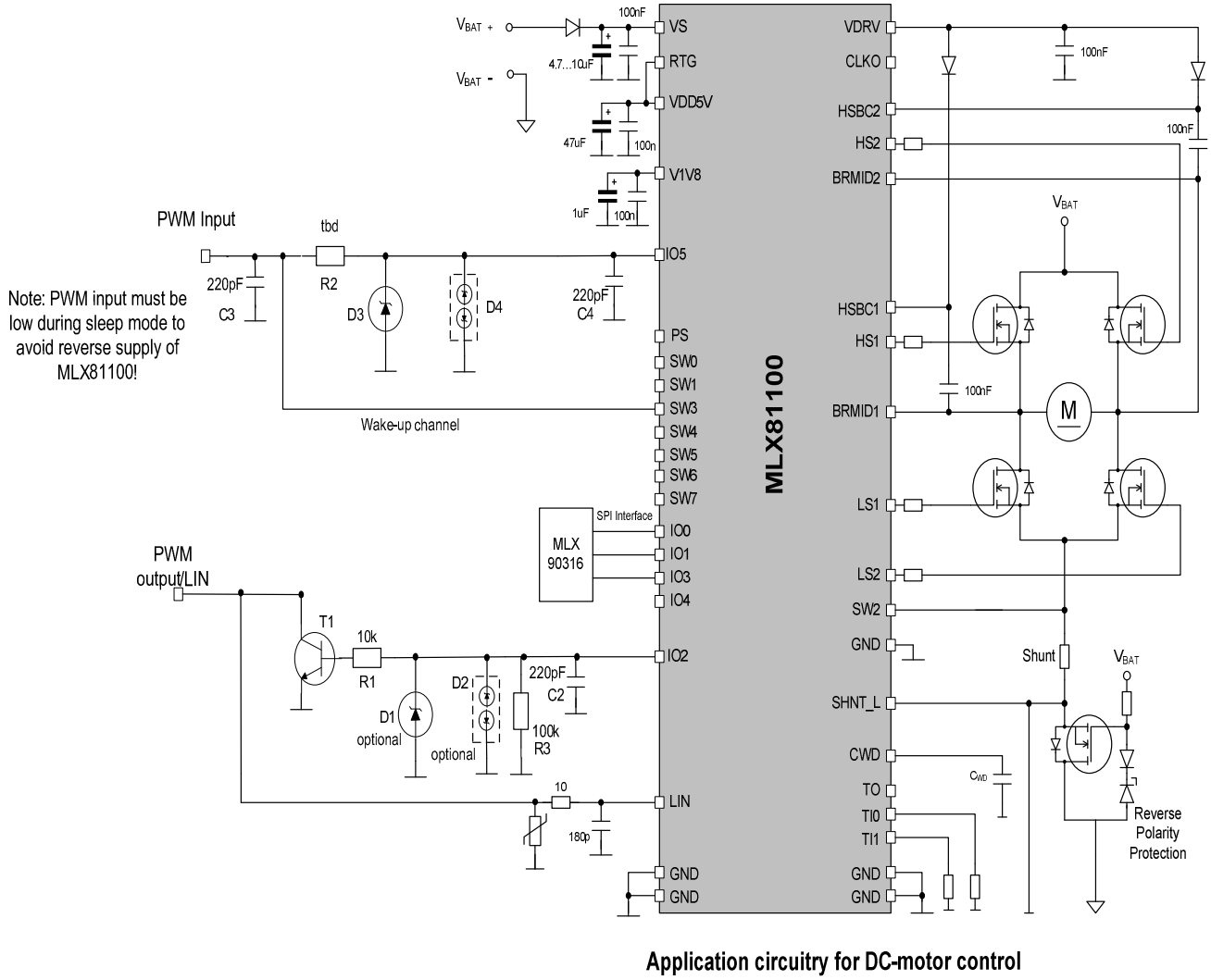

Fig. 2 Sample application circuitry for PWM interface at 12V level

2.4 Protection elements 12V level

Zener diodes: 5,6V zener voltage, different types are available, tests on real chip will help to sort out suitable type, trade-off between fast response according to ESD protection and high power dissipation according to short to Vbat has to be made.

Optional:

- In output path (MLX81100): 5,1V zener diode (D1) with high power dissipation for short circuit protection and fast 5,6V Back-to-back zener diode (D2) for ESD-protection in parallel.
- Capacitors C1-C4: for improved EMC-behaviour, also tests have to be done.

3 General constraints

This chapter contains general constraints to be considered when working out an application with PWM interface to an external ECU:

1 PWM input of MLX81100 actuator module must be Zero during sleep mode to avoid reverse supply of the chip, which will cause damage or unpredictable behaviour. The soft-/hardware in external ECU has to take care of this.

2 In chapter 2.3 the NPN-Transistor T1 inverts the PWM duty cycle, the application software in MLX81100 has to take care of this issue.

3 To make the module wake up capable via PWM input a SW pin was connected in both cases in parallel to the PWM input. The general purpose IOs of MelexCM are not wake up capable.

4 The general purpose IOs of MelexCM are used because of the need to capture the incoming PWM precisely. At the general purpose IOs of MelexCM a 16-bit timer capture module is present which allows a precise PWM interface. It is not possible to capture the incoming PWM signal with the SW pins directly, there a polling method has to be used.

5 To generate a PWM output signal a general purpose IO of MelexCM is connected to the output of PWM block of MelexCM. Advantages of using a PWM block are: it is easy to use and to configure, it is more precise than doing a PWM signal in software, load for the CPU is minimized.

History record

Rev.	No.	Change	Date
1.0	1	Creation	22/03/07
1.1	2	adapted schematics, GND potential inside RPP	01/02/08

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