

ARM[®] Cortex[®]-M
32-bit Microcontroller

NuMicro[®] 家族
DALI 2nd从机
使用者手册

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1 简介

新唐DALI 2nd从机开发板，搭载着新唐NuMicro® NDA102 系列微控制器，最高运行频率高达 48 MHz，内嵌 29.5 KB 应用程序 Flash，及4 KB SRAM，在DALI 的应用中可支持多种的协议，例如，标准207的LED装置、标准202的紧急灯...等，开发板上也整合了DALI 总线接口，可连接到DALI 系统中，与其他DALI 设备互动，对于DALI 设备的开发者而言，可以带来极大的便利性。

在此方案中提供新一代的DALI 指令与协议的开发，实现了DALI 所需的多主机控制机制，并且此应用所需的硬件以及应用软件完全开源，是一个对于开发者极为友善的平台，藉由NuMicro® NDA102 系列的高运算能力，快速转化数据进行装置的控制，开发者甚至可以实现复合型装置的应用。

1.1 方案特色

- 相容于
 - IEC 62386-102:2014
 - IEC 62386-207:2009
 - IEC 62386-206:2009
 - IEC 62386-209:2011 (Colour Type Tc)
 - 未来支持 IEC 62386-103:2014, IEC 62384-2XX, IEC 62384-3XX
- 预留ADC、ECAP与UART接口供二次开发使用
- 提供DALI 2nd从机开发板代码库供二次开发使用
- 提供DALI主机与DALI控制器硬件原理图与源代码

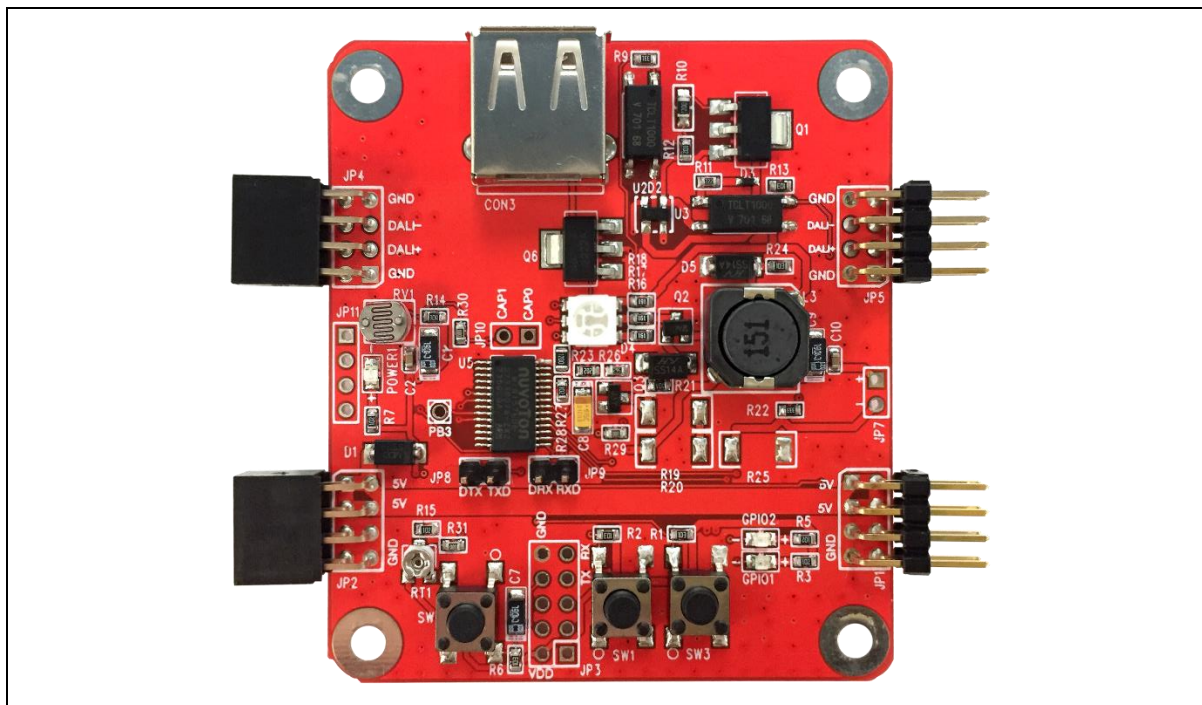


Figure 1-1 DALI 2nd 从机开发板

1.2 新唐NDA102 系列微控制器特色

- 主频 48 MHz
- 29.5 KB 应用程序 Flash
- 内嵌 4 KB SRAM
- 8 路16 位PWM 输出控制
- 8 路12 位ADC 输入检测
- PWM 可触发ADC
- 内置硬件除法器加速运算处理
- 工作温度：-40℃ ~ 105℃

2 DALI 2nd 从机开发板硬件介绍

新唐DALI 2nd 从机开发板搭载的NuMicro® NDA102系列微控制器带有ARM® Cortex®-M0 核心，主频最高可达 48 MHz。开发板具有DALI 总线接口，可将总线电压转换为微控制器电压准位，用以辨别DALI 讯号，板子周边预留有SPI、I²C、PWM、ADC 接口，板子上包含一个RGB LED，及两个事件触发按钮，还有一组可连接Nu-Link 进行刻录与排错的ICE接口，基于此开发板可发展出适合DALI 系统的各种不同装置。

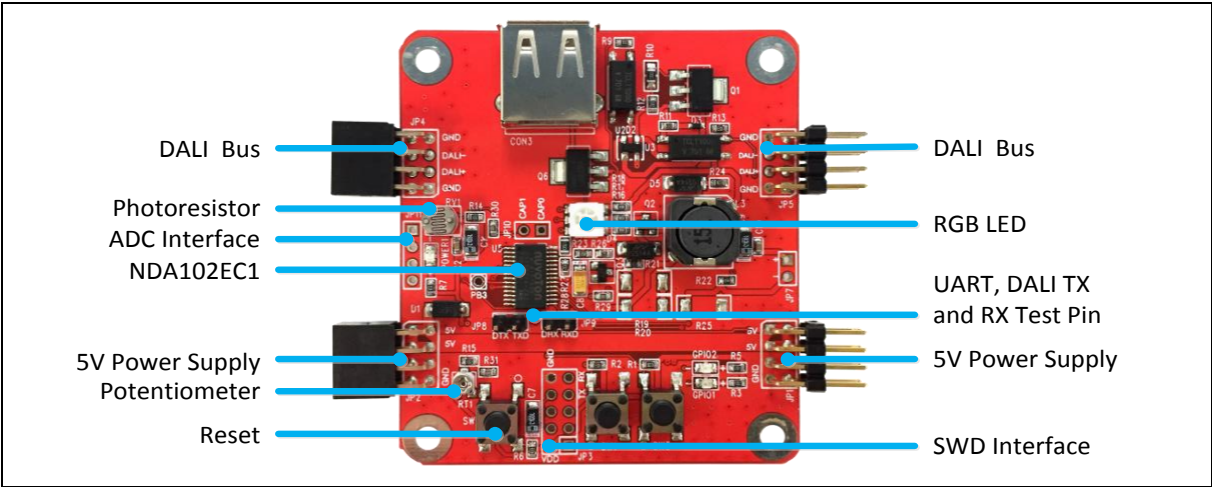


Figure 2-1 DALI 2nd 从机开发板功能介绍图

● JP1 & JP2 – 电源接口

JP1 & JP2	接口信号名称	芯片脚位名称
Pin 1~4	5V	VDD
Pin 5~8	GND	VSS

● JP3 - Nu-Link ICE 接口

JP3	接口信号名称	芯片脚位名称
Pin 2	VDD	VDD
Pin 4	ICE_DAT	ICE_DAT
Pin 6	ICE_CLK	ICE_CLK
Pin 8	ICE_RST	nRESET
Pin 10	GND	VSS
Pin 7	UART0_TX	UART0_TX
Pin 9	UART0_RX	UART0_RX

● JP4 & JP5 – DALI 总线接口

JP4 & JP5	接口信号名称	芯片脚位名称
Pin 1~2 & 7~8	GND	VSS
Pin 3~4	DALI+	DALI+
Pin 5~6	DALI-	DALI-

● JP8 – DALI_TX & Tiny_TX

JP6	接口信号名称	芯片脚位名称
Pin 1	DALI_TX	PC.2
Pin 2	Tiny_TX	UART1_TX / PD.3

● JP9 – DALI_RX & Tiny_RX

JP6	接口信号名称	芯片脚位名称
Pin 1	DALI_RX	PB.0
Pin 2	Tiny_RX	UART1_RX / PD.4

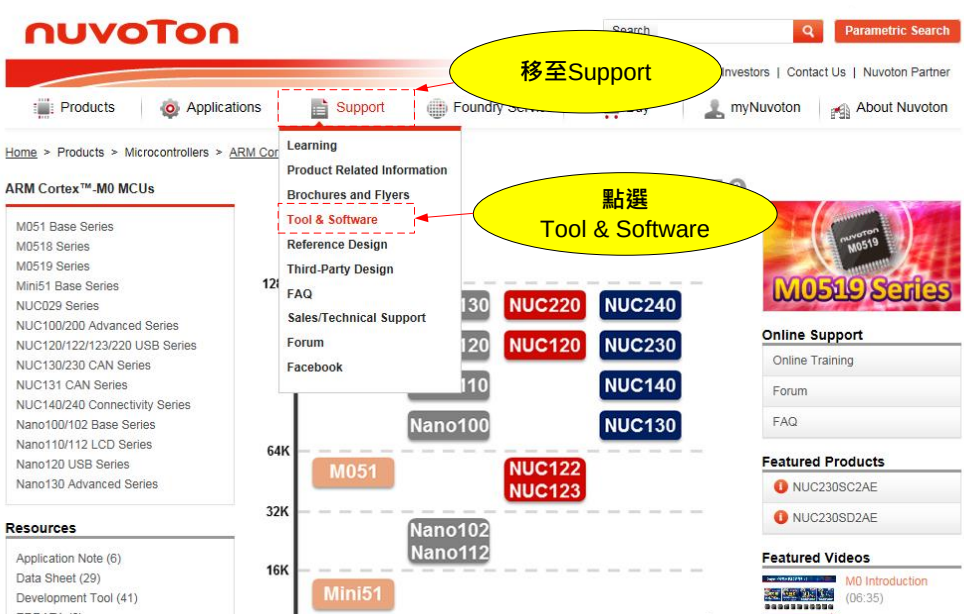
3 新唐DALI 2nd 从机开发板开发环境准备

3.1 支援 IDE

- IAR Embedded Workbench
- Keil μ Vision[®] IDE

3.2 安装 Nu-Link 驱动程序

请至新唐科技官方网站 (<http://www.nuvoton.com/NuMicro>), 依使用者使用的开发环境下载 “NuMicro[®] Keil μ Vision[®] IDE driver” 或 “NuMicro[®] IAR Embedded Workbench driver” 后, 解压缩下载文件并执行 Nu-Link_Keil_Driver.exe” 或 “Nu-Link_IAR_Driver.exe” 安装驱动程序。

Step1	拜访新唐 NuMicro [®] 网站 : http://www.nuvoton.com/NuMicro
Step2	 The screenshot shows the NuMicro website interface. The top navigation bar includes links for Products, Applications, Support, Foundry Services, and myNuvoton. A red dashed box highlights the 'Support' menu, which contains options like Learning, Product Related Information, Brochures and Flyers, Tool & Software, Reference Design, Third-Party Design, FAQ, Sales/Technical Support, Forum, and Facebook. A yellow oval points to the 'Tool & Software' option. Another yellow oval points to the 'Support' link in the top navigation bar. The main content area displays a list of ARM Cortex-M0 MCUs, including M051 Base Series, M0518 Series, M0519 Series, Mini51 Base Series, NUC029 Series, NUC100/200 Advanced Series, NUC120/122/123/220 USB Series, NUC130/230 CAN Series, NUC131 CAN Series, NUC140/240 Connectivity Series, Nano100/102 Base Series, Nano110/112 LCD Series, Nano120 USB Series, and Nano130 Advanced Series. The Resources section includes Application Note (6), Data Sheet (29), Development Tool (41), and ERRATA (6). The right sidebar features a search bar, Parametric Search, Online Support (Online Training, Forum, FAQ), Featured Products (NUC230SC2AE, NUC230SD2AE), and Featured Videos (M0 Introduction (06:35)).

Step3



Step4

Programmer Software Tools Package

File name	Description	Version	Date
ICP Programming Tool V1.31.6535.zip Revision History	NuMicro ICP tool & user manual	V1.31.6535	2016-2-24
ISP Programming Tool V1.47.zip Revision History	NuMicro ISP Programming Tool & user manual	V1.47	2015-7-28
NuGang Programmer V7.02.zip Revision History	NuMicro Gang Programmer user manual	V7.02	2015-11-27

Nu-Link Driver

File name	Description	Version	Date
Nu-Link Driver for Keil RVMDK V1.31.6535.zip Revision History	This driver is to support Nu-Link to work under Keil RVMDK Development Environment for all NuMicro Family Devices.	V1.31.6535	2016-2-24
Nu-Link Driver for IAR EWARM V1.31.6535.zip Revision History	This driver is to support Nu-Link to work under IAR EWARM Development Environment for all NuMicro Family Devices.	V1.31.6535	2016-2-24

依照使用者的開發環境
下載相應的檔案

Step5

下载 NuMicro[®] μVision[®] IDE driver 或 NuMicro[®] IAR Embedded Workbench 驱动程序。

3.3 连接 Nu-Link

将 Nu-Link 接口连接至DALI 2nd 控制单元开发板的 ICE 接口上，并将 Nu-Link 的 USB 接口与计算机连接，此时计算机端会开始搜索 USB 装置，并且会辨识 Nu-Link 为 USB ICE 显示在控制面板的设备管理器上，并且 Nu-Link 与 DALI 2nd 从机开发板的电源指示灯会亮起。

4 新唐DALI 2nd 从机开发板快速指南

此章节主要介绍新唐DALI 2nd 从机开发板使用方式，依照此章节步骤即可了解模块如何使用，进而发展出所需要的产品。

4.1 连接DALI 总线及电源

连接DALI+及DALI-至DALI 总线，基于DALI规范，两条讯号可任意交换；5 V电源可供给开发板电源使用。

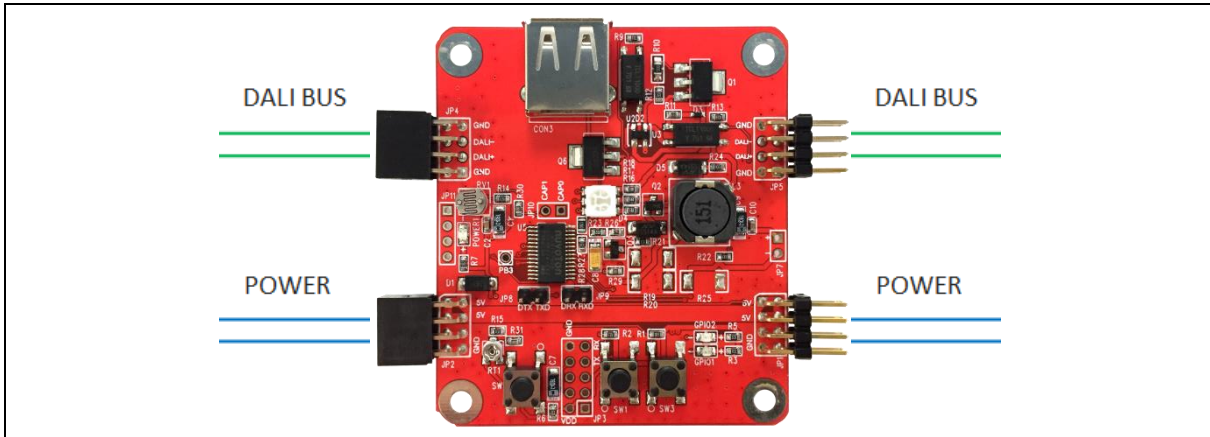


Figure 4-1 连接DALI 总线及电源

建议搭配新唐DALI 主机进行使用，连接方式Figure 4-2，请使用16V电源适配器连接DALI 主机。

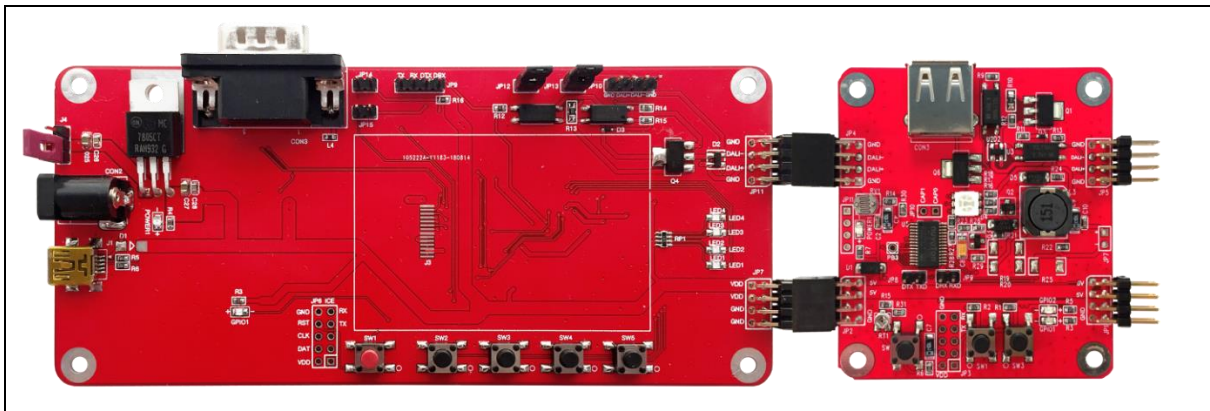


Figure 4-2 连接DALI 主机与DALI 2nd 从机开发板

4.2 DALI 控制器进行初始化

使用DALI 控制器勾选“New initialization” 进行“Discover”流程，可将DALI系统中的所有装置进行初始化，以分配适当的DALI短地址，如 Figure 4-3 所示。DALI 2nd 从机的默认型态是IEC 62386-207 LED 模块。

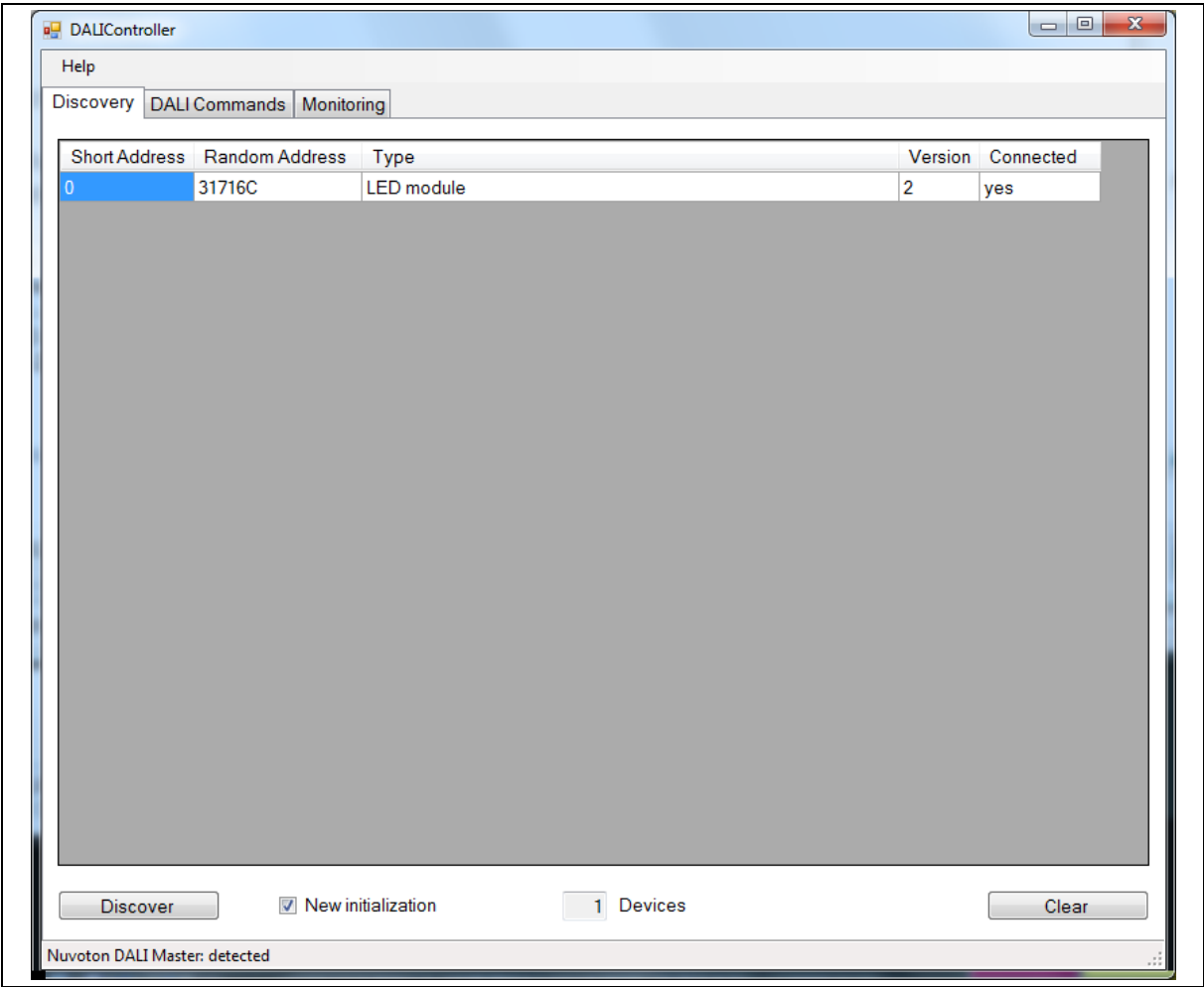


Figure 4-3 搜寻DALI 2nd 从机开发板

4.3 使用DALI控制器下达指令

可以使用DALI 控制器选择需要发送的指令，及设定发送的DALI 装置地址，按下”Send”后即可发送至 DALI 总线，进而控制DALI 装置，下方会将发送的数值及响应的数值进行显示，如 Figure 4-4 所示。

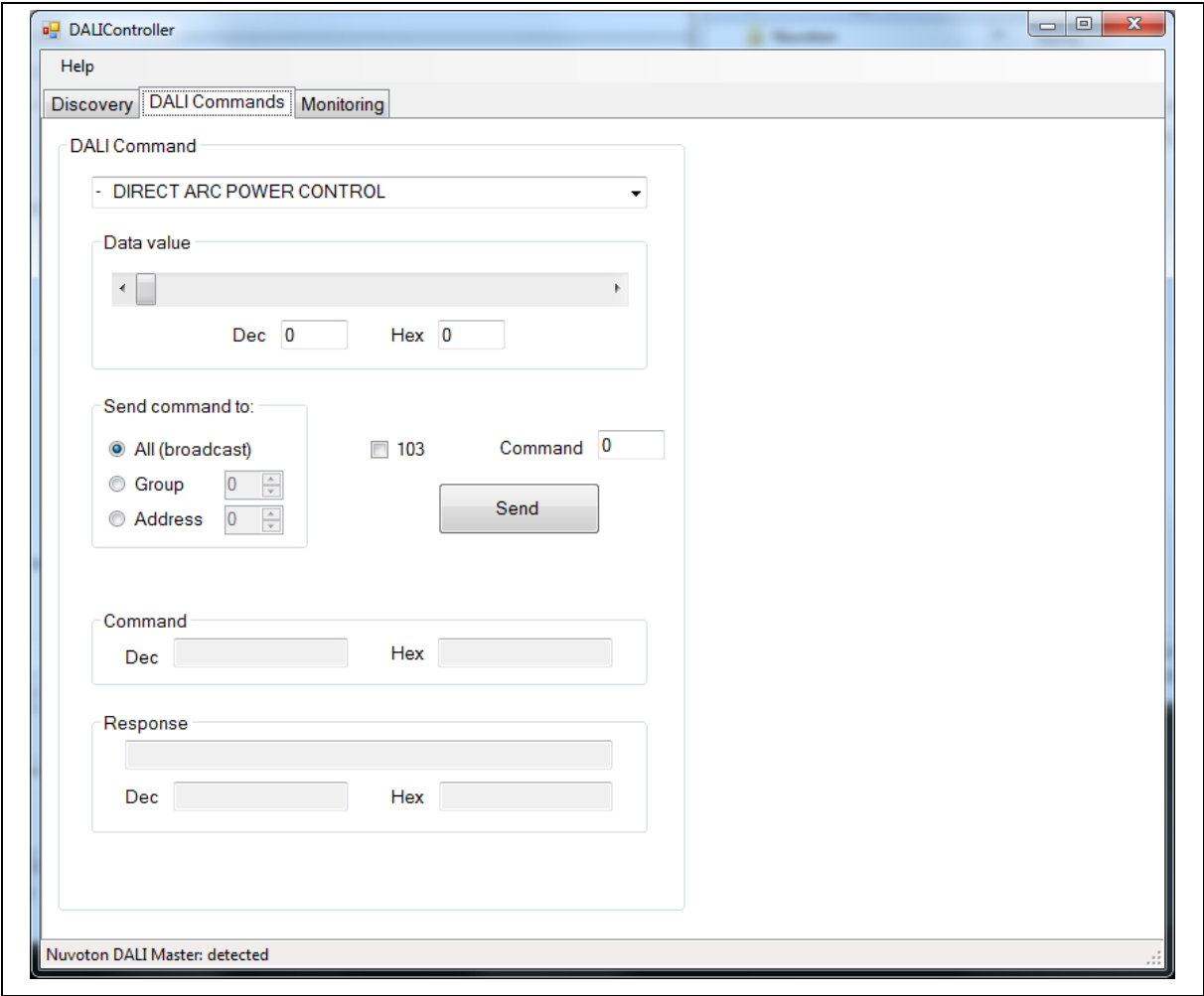


Figure 4-4 DALI 指令控制功能

在DALI 控制器中所发送及接收的所有指令，会实时记录于指令监视器页面，可随时进行查看。

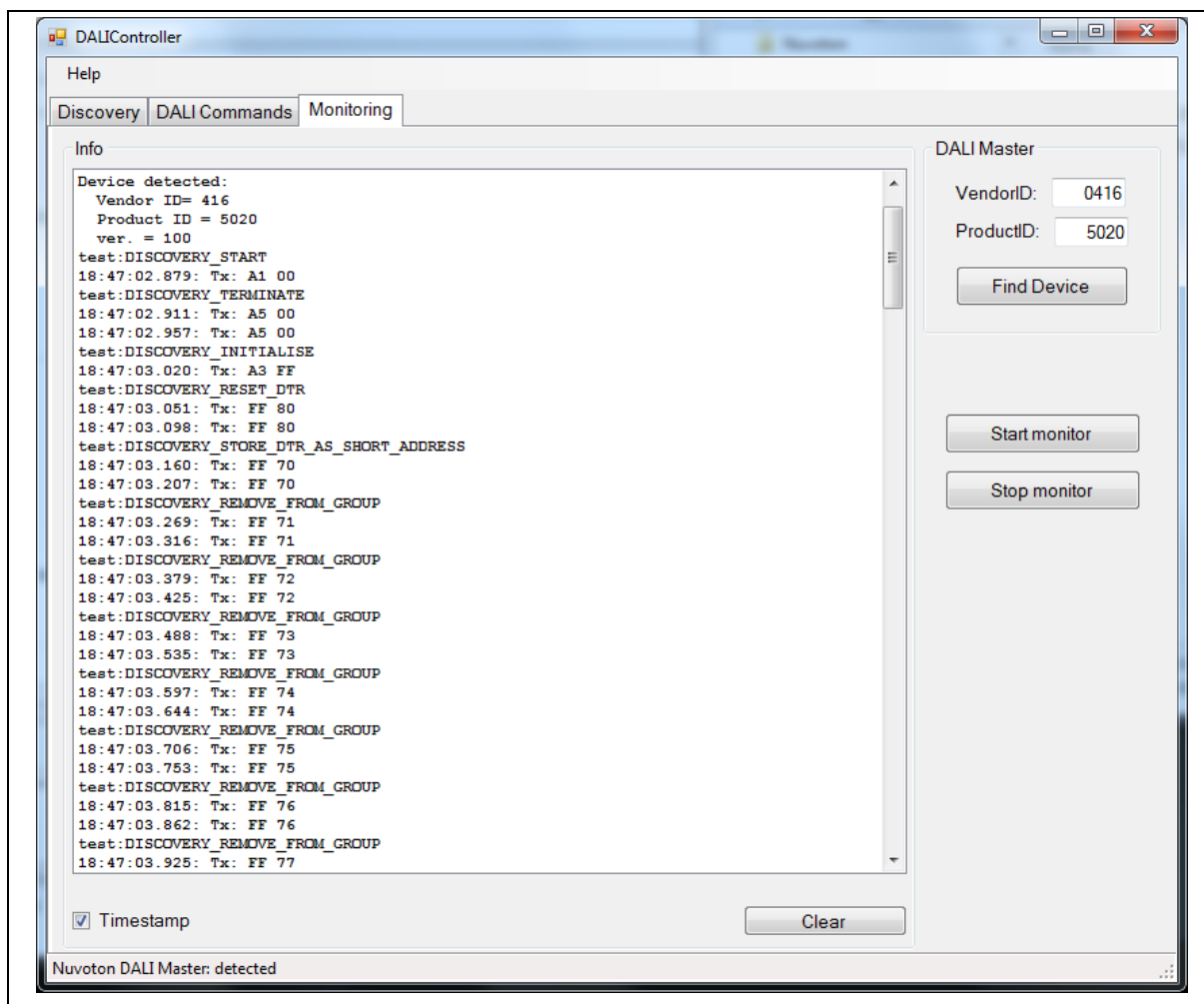


Figure 4-5 DALI 控制器监控功能

4.4 事件触发按钮操作

按下SW3 可触发Lamp Failure 事件，可用来观察DALI装置的Lamp Failure 状态。

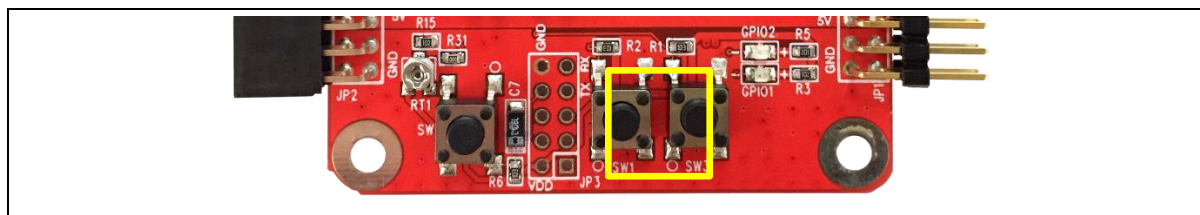


Figure 4-6 SW3 触发Lamp Failure

5 新唐DALI 2nd 从机开发板电路图

5.1 微控制器电路图

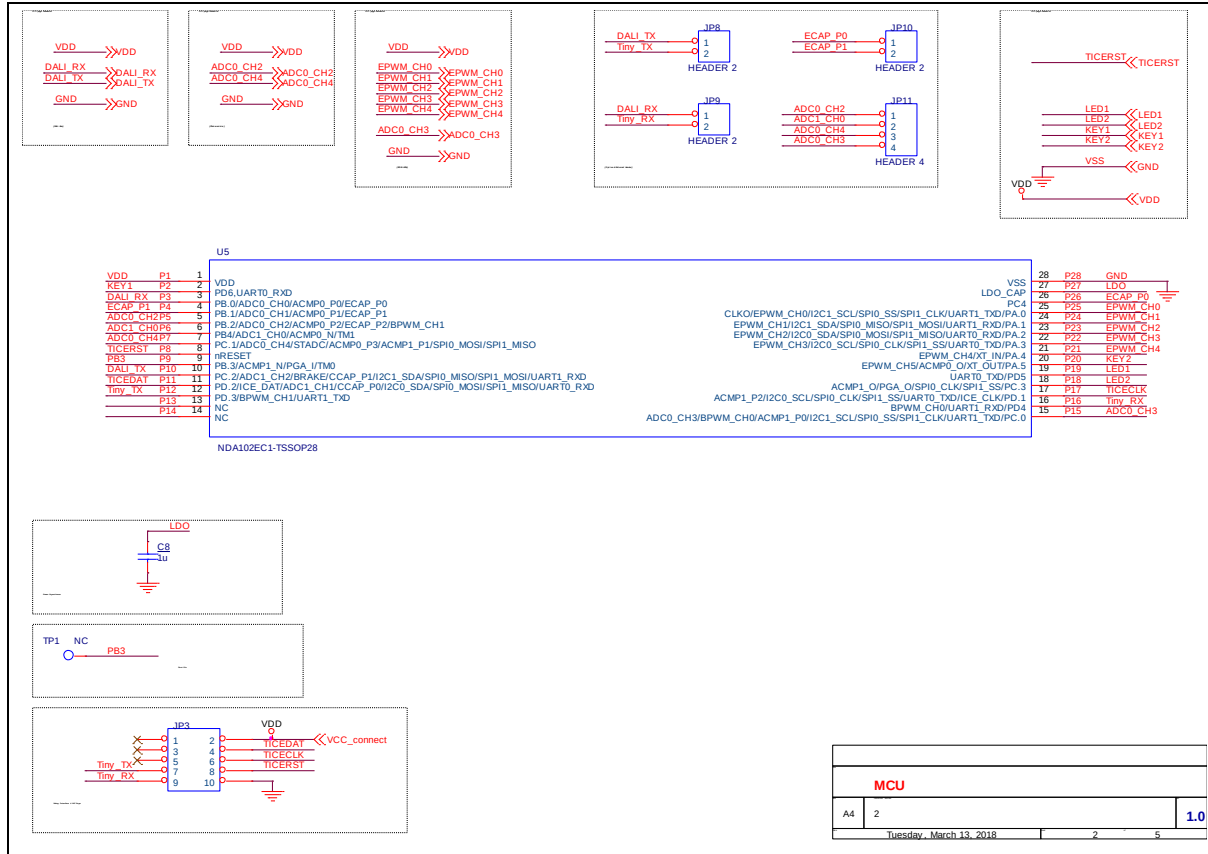


Figure 5-1 微控制器电路图

5.2 DALI 总线电路图

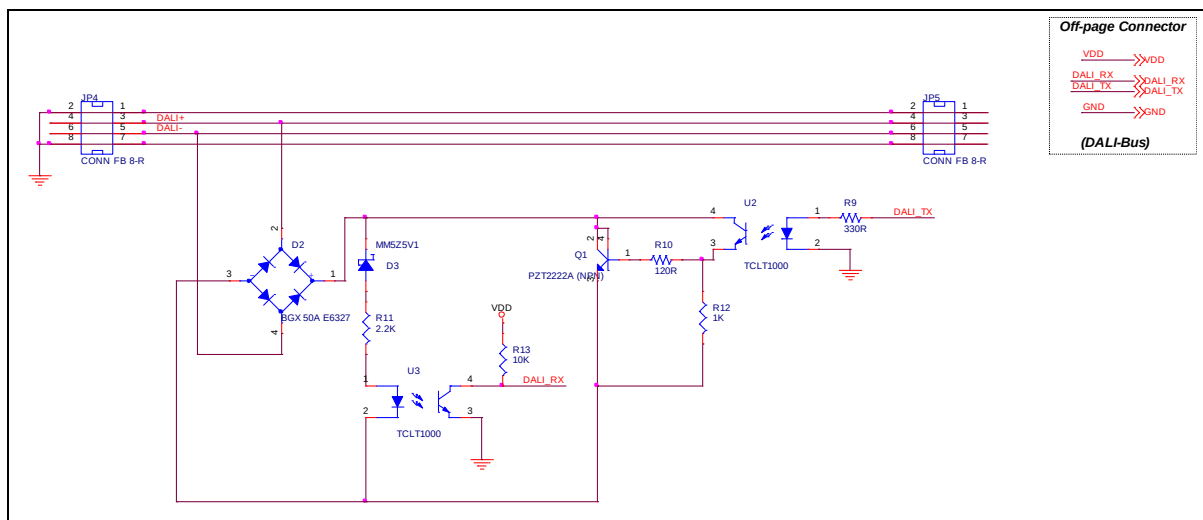


Figure 5-2 DALI 总线电路图

5.3 LED电路图

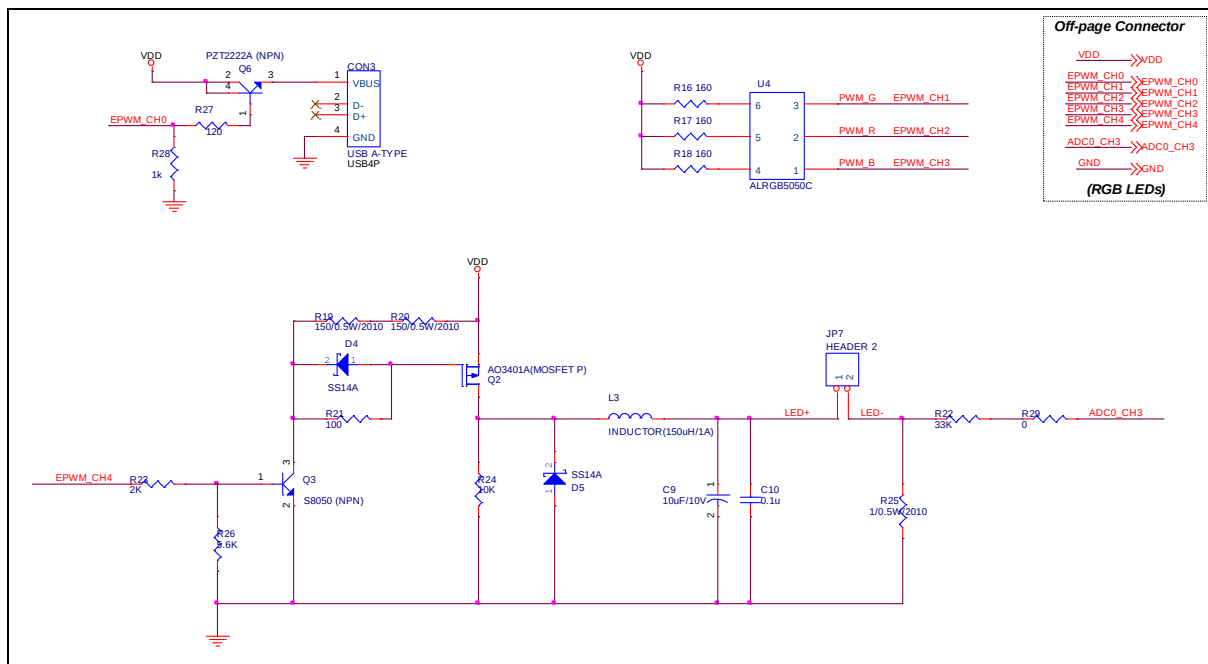


Figure 5-3 LED电路图

5.4 电源及周边电路图

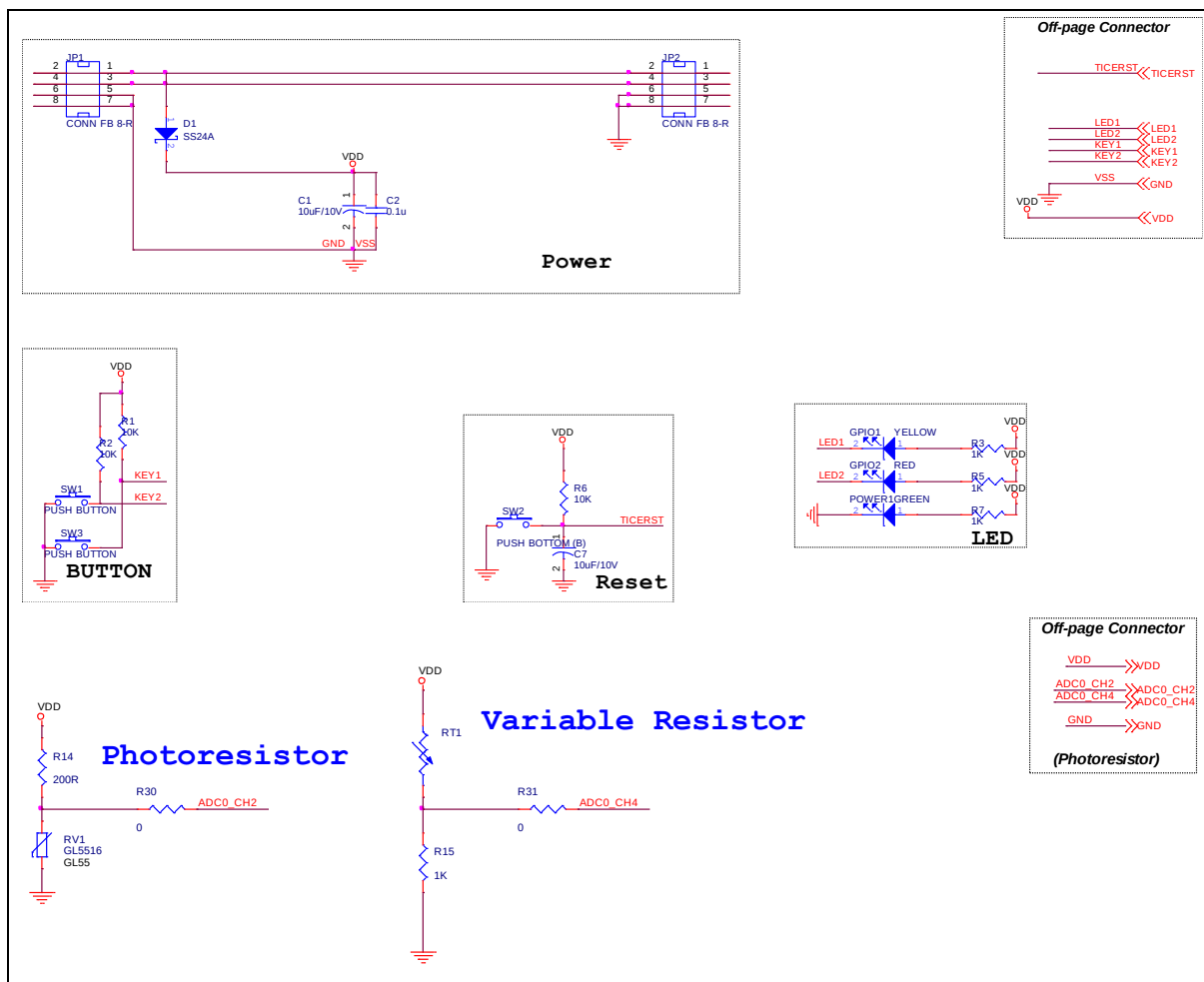


Figure 5-4 电源及周边电路图

6 REVISION HISTORY

Date	Revision	Description
2019.07.11	1.00	1. Initially issued.

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