

XC800 Family

AP08105

DALI Demo using Touch Sense Control

Application Note

V1.0, 2010-06

Edition 2010-06

**Published by
Infineon Technologies AG
81726 Munich, Germany**

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XC82x**Revision History: V1.0 2010-06**

Previous Version(s):

Page	Subjects (major changes since last revision)
–	This is the first release ...

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1 Overview

Digital Addressable Lighting Interface (DALI) is a communication protocol for lighting control in buildings. The interface was first described in Annex E, IEC60929 standard for fluorescent lamp ballast. The standard was subsequently updated to IEC-62386, to include other lighting devices, like LED, HID etc. The complete standard for control interface of electronic control gears was published in June 2009, while the standard for lighting control devices is scheduled to be published in 2012.

DALI requires only a pair of wires to form the bus for communication to all devices on a single DALI network. Each piece of operating equipment with a DALI interface can be communicated with, over DALI, individually. Using a bi-directional data exchange, a DALI controller can query and set the status of each connected lighting device. As a standalone system, DALI can be operated with a maximum of 64 devices. Alternatively, DALI can be used as a subsystem via DALI gateways for connection to building management systems.

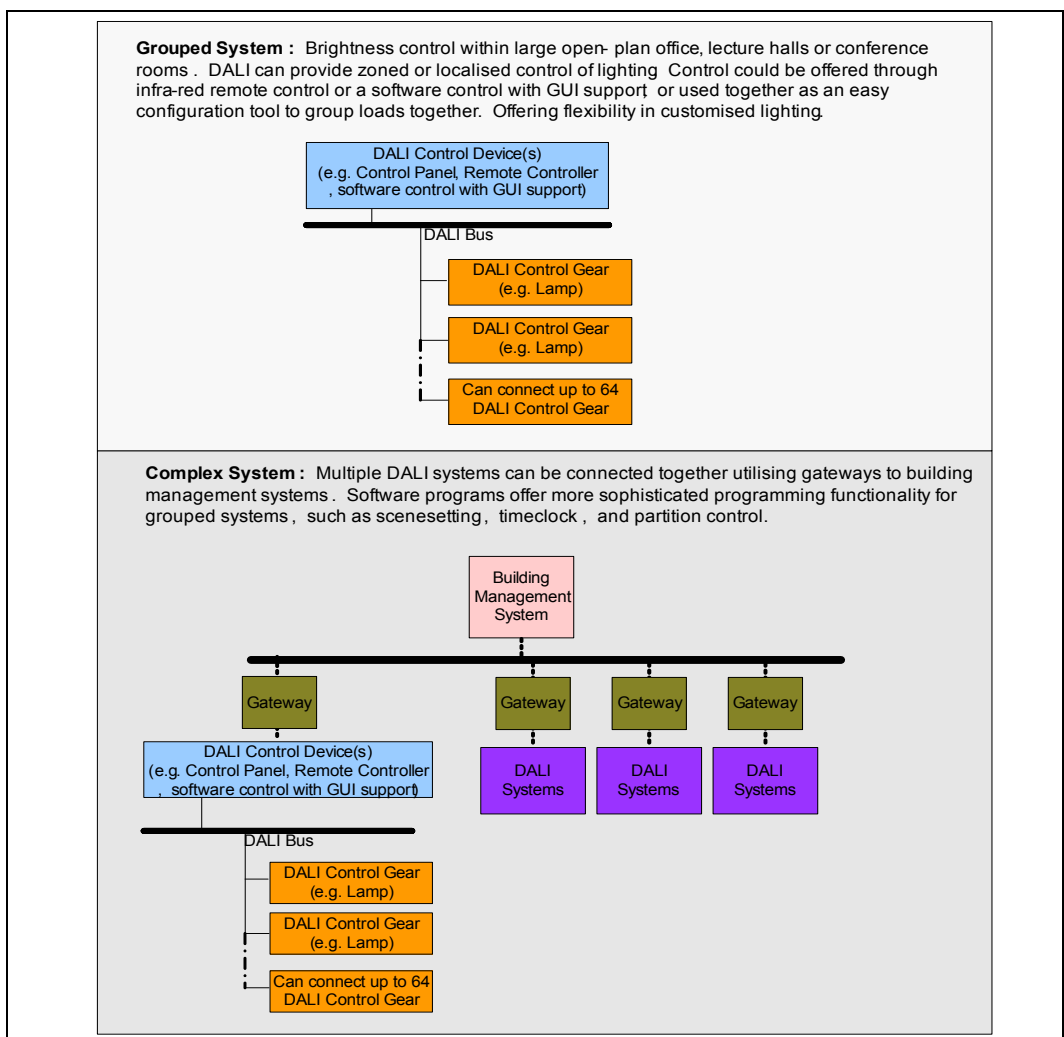


Figure 1 DALI system types

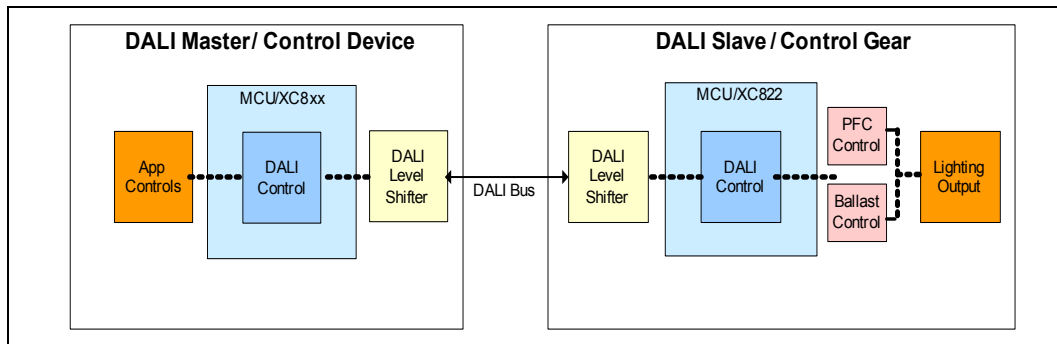


Figure 2 Block Diagram for DALI Control Device and Control Gear

The example solution “Touch Sense Control for DALI Control Devices” has been developed using Infineon’s XC822 devices and allows the user to use the available touch sense pads on the XC822 Easy Kit to control the brightness of an attached LED module. This example has been tested with a 1-to-1 device setup.

This document describes how the DALI control device software has been constructed and demonstrates the supported software functions.

The following items are required for use with this application note:

- 2x XC822 Easy Kit including DALI Control Gear Software Stack (AP08102).

2 Hardware Setup

This chapter describes the hardware setup. The XC822 Easy kit has 6 built-in touch sense pads that are used for the LED light brightness control of the DALI control gear.

The setup for the DALI control gear is not discussed in this document, but details can be found in AP08102, 'DALI Control Gear Software Stack'.

Figure 3 and Figure 4 below, show an overview and the physical connections achieving the hardware setup.

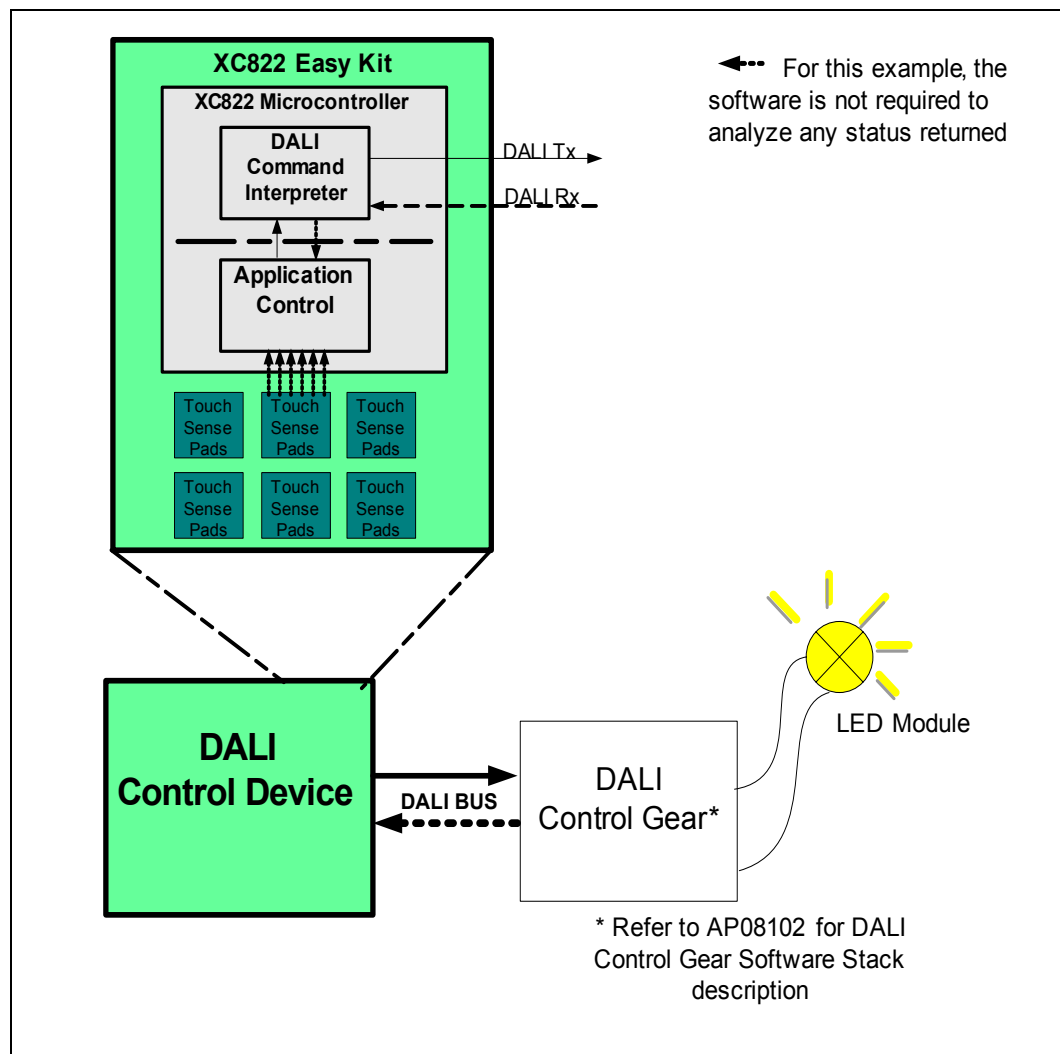


Figure 3 Overview of hardware setup

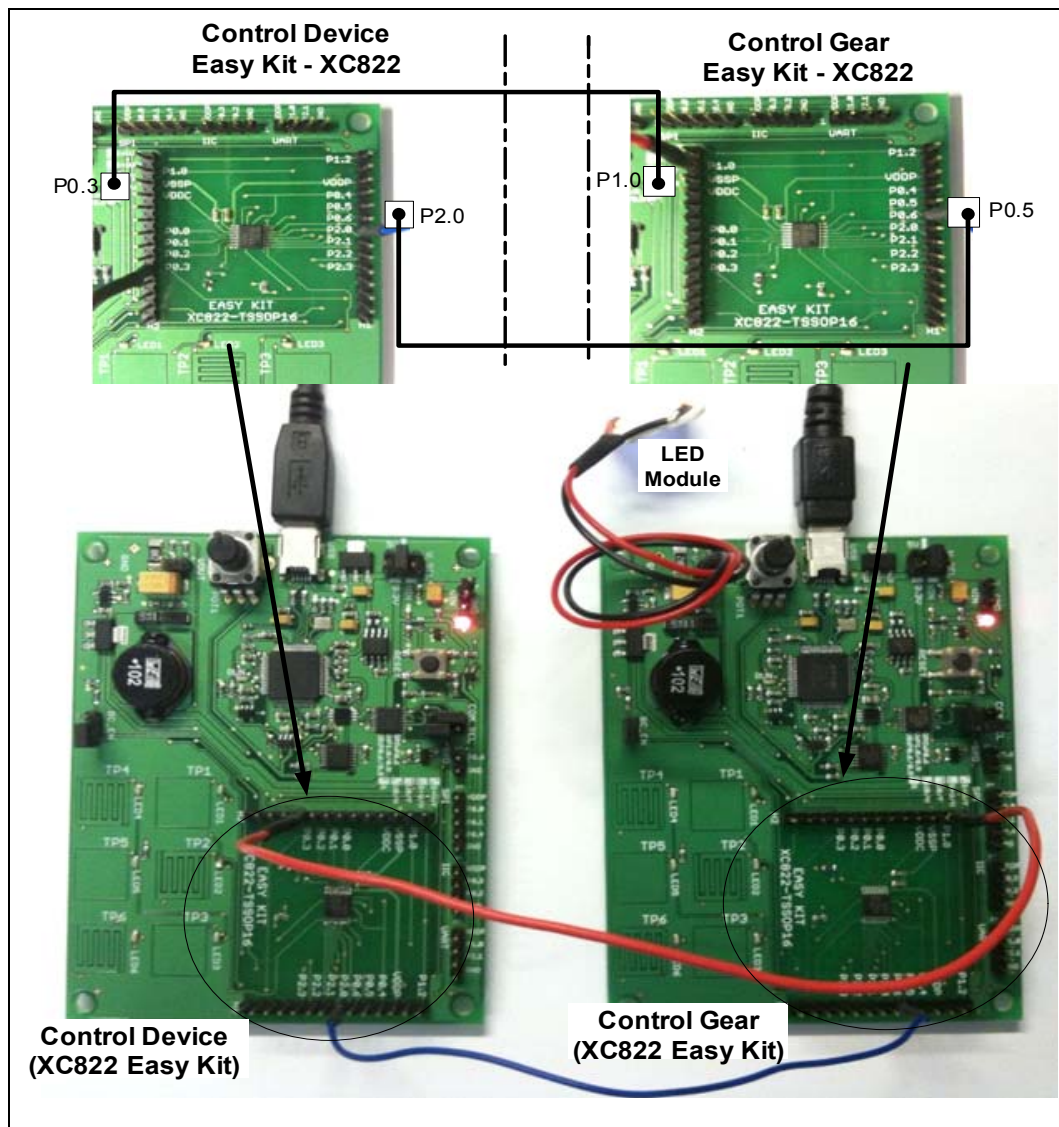


Figure 4 DALI Demo hardware connections

3 DALI Control Device Software

This section describes the software structure used for developing this example solution. The software is divided into 2 main layers; the DALI protocol layer and the application code layer.

The DALI protocol layer supports and translates user commands into the desired DALI format to be sent through the DALI bus.

The application code layer provides the user commands through the touch sense pads.

3.1 DALI Protocol Layer

In the control device, the DALI protocol layer provides the translation of user commands into the desired DALI format to be sent through the DALI bus. For our example, the DALI bus chosen is P0.3 (Txd) and P2.0 (Rxd).

3.2 Application Layer

The application layer provides the interface control through the touch sense pads for user commands selection. The touch sense pads are configured with the functions as described in [Table 1](#) and shown in [Figure 5](#).

Table 1 Touch Pad Function Description

Touch Pad	Function	Function Description
TP1	ON & STEP UP	Turns on LED module. If the LED is already on, the LED arc power is set to one step higher.
TP2	DIM UP	LED brightness fades up for 200ms
	OFF (long hold)	Turns off LED module
TP3	DIM DOWN	LED brightness fades down for 200ms
TP4	GO TO SCENE 0	Fade up / down to Scene 0 brightness
TP5	MIN	Set LED brightness to minimum level
TP6	MAX	Set LED brightness to maximum level

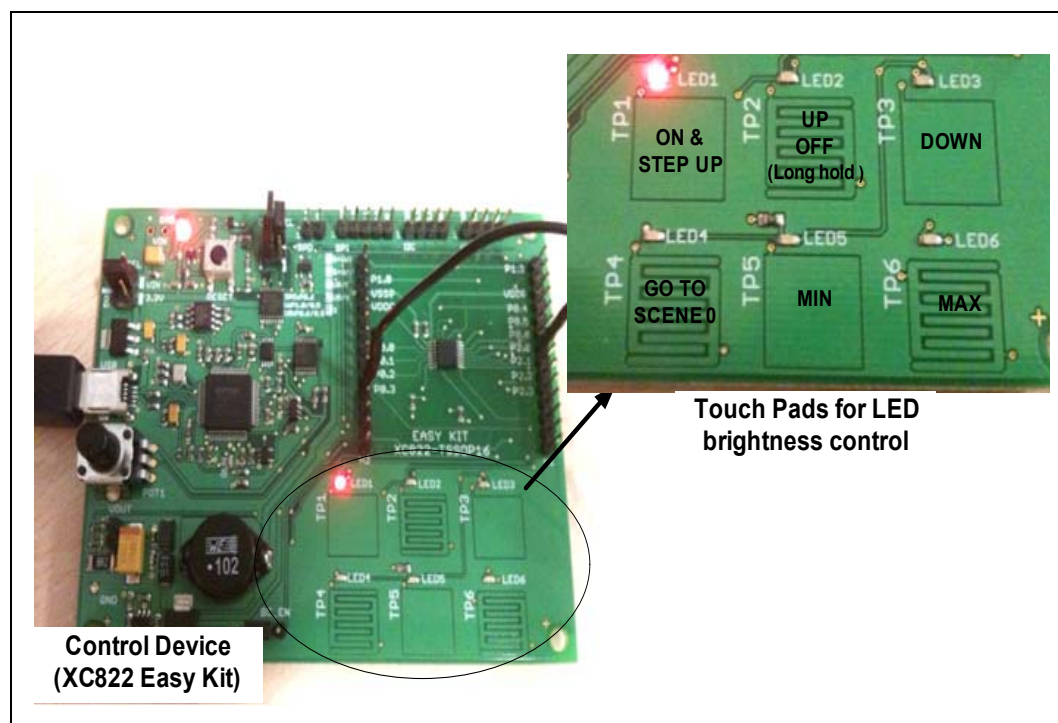


Figure 5 Control Device Touch Pads for LED Brightness Control

4 Getting started

This chapter describes the contents of the software package and gives details on how functions on the touch sense pads can be customised.

4.1 Software Package

The file description for the software package is documented in [Table 2](#) and [Table 3](#).

Table 2 Source files description

Filename	Description (must be specific what is done here)
Dali_master.uvproj	Uvision project
IO.c	Performs GPIO module initialisation
MAIN.c	Performs main program initialisation
T01.c	Performs Timer 0 module initialisation for application control functions inclusive of touch pads functions assignment.
T2.c	Performs Timer 2 module initialisation for DALI command interpreter functions
START_XC.A51	Start up code for XC8xx device. This is part of the C51 Compiler package.
LTS.c	Performs LED and Touch-Sense Controller module initialisation
BOOTROM_ADDR.A51	Library address for bootrom user routines
SHARED_INT.c	Shared interrupts; LEDTS interrupt handling sections;

Table 3 Header files description

Filename	Description
reg.h	SFR Header file for XC82x/XC83x Microcontroller
Intrins.h	Intrinsic functions for C51
io.h	GPIO function prototypes and macros
int.h	Interrupt functions prototypes and macros
uart.h	Function prototypes and macros for the DALI Software module
t01.h	Timer 01 function prototypes and macros
lts.h	LED and Touch-Sense Controller function prototypes and macros
shared_int.h	Shared interrupt function prototypes and macros
config.h	Definitions of DALI commands and user selection of touch sense pad functions

4.2 Customising Touch Sense Pad functions

The configuration file (config.h) can be used to customise the DALI functions relating to the touch sense pads.

[Table 4](#) and [Table 5](#) show the supported DALI commands and default touch sense commands given, respectively.

Table 4 Supported DALI commands

DALI Commands	Description
LIGHT_OFF	Turns light off
DIM_UP	Set lighting level up by 1 level
DIM_DOWN	Set lighting level down by 1 level

Table 4 Supported DALI commands

DALI Commands	Description
STEP_UP	Fades lighting level up for 200ms
STEP_DOWN	Fades lighting level down for 200ms
RECALL_MIN	Sets connected lighting device level to minimum level
RECALL_MAX	Sets connected lighting device level to maximum supported level
ON_N_STEP_UP	Turns on connected lighting device. If already on, set the arc power level up one level.
GO_TO_SCENE_XX	This is a Scene Selection commands. Choosing this enables device for user configured Scene XX, where XX represents 00 to 15.
STORE_TO_SCENE_XX	This is a Store to Scene command. Choosing this stores user selected level to Scene XX, where XX represents 00 to 15.

Table 5 Touch Sense User Selection

Touch Sense Pad Function	Description
TP1_FUNCTION	<p>Function is activated when Touch Sense Pad 1 is applied to.</p> <p><i>For example, if ON & STEP UP is assigned to TP1_FUNCTION.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP1_FUNCTION <SPACE> ON & STEP UP</p>
TP2_FUNCTION	<p>Function is activated when Touch Sense Pad 2 is applied to.</p> <p><i>For example, if DIM_UP is assigned to TP2_FUNCTION.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP2_FUNCTION <SPACE> DIM_UP</p>
TP3_FUNCTION	<p>Function is activated when Touch Sense Pad 3 is applied to.</p> <p><i>For example, if DIM_DOWN is assigned to TP3_FUNCTION.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP3_FUNCTION <SPACE> DIM_DOWN</p>
TP4_FUNCTION	<p>Function is activated when Touch Sense Pad 4 is applied to.</p> <p><i>For example, if GOTO_SCENE_00 is assigned to TP4_FUNCTION.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP4_FUNCTION <SPACE> GOTO_SCENE_00</p>

Table 5 Touch Sense User Selection

Touch Sense Pad Function	Description
TP5_FUNCTION	<p>Function is activated when Touch Sense Pad 5 is applied to.</p> <p><i>For example, if RECALL_MIN is assigned to TP5_FUNCTION.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP5_FUNCTION <SPACE> RECALL_MIN</p>
TP6_FUNCTION	<p>Function is activated when Touch Sense Pad 6 is applied to.</p> <p><i>For example, if RECALL_MAX is assigned to TP6_FUNCTION.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP6_FUNCTION <SPACE> RECALL_MAX</p>
TP2_FUNCTION_LONGHOLD	<p>Function is activated when a long hold to Touch Sense Pad 2 is applied.</p> <p><i>For example, if LIGHT_OFF is assigned to TP2_FUNCTION_LONGHOLD.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP2_FUNCTION_LONGHOLD <SPACE> LIGHT_OFF</p>
USER_SCENE_SELECT	<p>This configures the user selected scene. In order for the desired scene information to set on connected device. This helps to store the desired user scene level and information. Configuration will only be necessary if a Scene Selection command is configured to any touch sense pads.</p> <p><i>For example, if GO_TO_SCENE_00 is assigned to TP4_FUNCTION and a scene level of 0x50 is desired. The corresponding STORE_TO_SCENE_00 needs to be assigned.</i></p> <p><i>In the config.h file,</i> #define <SPACE> TP4_FUNCTION <SPACE> GO_TO_SCENE_00 ... #define <SPACE> USER_SCENE_SELECT <SPACE> STORE_TO_SCENE_00 #define <SPACE> USER_SCENE_LEVEL <SPACE> 0x50</p>
USER_SCENE_LEVEL	User selected scene arc power selection from 0x01 to 0x255.

5 Summary

The touch-sense capability of Infineon microcontrollers provides a great deal of flexibility for the creation of a wide variety of robust applications. This application note demonstrates the ease of creating a LED brightness control for a DALI system, using the touch sense module in XC822. From the information provided in this document, the user can customise this solution to their own application with ease.

6 References

- [1] IEC 62386 Digital addressable lighting interface; Part 101: General requirements - System (Edition 1.0, 2009-06)
- [2] IEC 62386 Digital addressable lighting interface; Part 102: General requirements - Control gear (Edition 1.0, 2009-06)
- [3] AP08102 DALI Control Gear Software Stack
- [4] XC822 User Manual 1.0
- [5] Hardware Manual Easy Kit XC822-TSSOP16 board V1.0

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