NCV7430 LIN RGB LED Driver Evaluation Board User's Manual

Introduction

The NCV74300V1GEVB is an evaluation board for single-chip RGB driver NCV7430, intended for dedicated multicolor LED applications. The RGB LED driver contains a LIN interface (slave) for parametric programming of LED color and intensity.

The device receives instructions through the LIN bus and subsequently drives the LEDs independently.

The NCV7430 acts as a slave on the LIN bus and the master can request specific status information (parameter values and error flags). The LIN address of the NCV7430 can be programmed in the internal memory of the device.

The design incorporates the lowest bill of materials, minimized board size and allows easy interconnection in case of multiple nodes network.

Features

- Small Size of PCB
- Two Parallelized Connectors for Easy Daisy-chain Connection

Applications

• Automotive Interior Lighting

Board Hardware





ON Semiconductor®

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EVAL BOARD USER'S MANUAL



PIN ASSIGNMENT



MARKING DIAGRAM



ABSOLUTE MAXIMUM RATINGS AND OPERATING RANGES

Table 1. ABSOLUTE MAXIMUM RATINGS

(The operation of the NCV7430 evaluation board works with the custom made ON Semiconductor LIN Interface in combination with the custom GUI interface. No additional power supply is needed other than the supplied 12 V AC/DC adapter which powers the LIN Interface through DC Power Input connector.)

| Symbol | Parameter | Min | Max | Unit |
|------------------|--------------------------------|------|-----|------|
| LIN INTERFAC | E | | | |
| V _{BUS} | USB Supply Voltage | -0.3 | 5.5 | V |
| V _{BAT} | External Supply Voltage | -0.3 | 42 | V |
| I _{BAT} | Maximum Supply Current | - | 2 | А |
| V _{LIN} | Maximum Voltage at LIN Bus Pin | -45 | 45 | V |
| T _A | Ambient Temperature | -40 | 85 | °C |
| NCV7430 EVB | | | | |
| V _{BAT} | Supply Voltage | -0.3 | 43 | V |
| V _{LIN} | Maximum Voltage at LIN Bus Pin | -45 | 45 | V |
| TJ | NCV7430 Junction Temperature | -40 | 150 | °C |
| T _A | Ambient Temperature | -40 | 125 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 2. RECOMMENDED OPERATING RANGES

NCV7430 Junction Temperature

Ambient Temperature

TJ

TA

| Symbol | Parameter | Min | Max | Unit |
|------------------|----------------------------------|------|------|------|
| LIN INTERFAC | E | | | |
| V _{BUS} | USB Supply Voltage | 4.75 | 5.25 | V |
| V _{BAT} | External Supply Voltage | 5.5 | 18 | V |
| V _{LIN} | Operating Voltage at LIN Bus Pin | 5.5 | 18 | V |
| T _A | Ambient Temperature | -40 | 85 | °C |
| NCV7430 EVB | | | | |
| V _{BAT} | Supply Voltage | 5.5 | 18 | V |
| V _{LIN} | Operating Voltage at LIN Bus Pin | 5.5 | 18 | V |

125

105

-40

-40

°C

°C

Table 3. PIN FUNCTION DESCRIPTION

| Connector | Pin | Pin Name | Description |
|---------------|-----|------------------|---|
| LIN INTERFACE | | | |
| Power | | | V _{BAT} External Power Supply Input (LIN Interface + NCV7430 EVB Supply) |
| LIN (RJ11) | 1 | V _{BAT} | V _{BAT} Supply Voltage Output/Input (LIN Interface can be supplied through this pin) |
| | 2 | LIN | LIN Bus Line |
| | 3 | GND | Ground Connection |
| | 4 | NC | Not Connected |
| USB | | | USB Connector |

NCV7430 EVB

| RJ11 (J1, J2) | 1 | V _{BAT} | Battery Supply Input/Output (Note 2) |
|---------------|---|------------------|--------------------------------------|
| (INOTE 1) | 2 | LIN | LIN Bus Line |
| | 3 | GND | Ground Connection |
| | 4 | NC | Not Connected |

1. Both connectors pinout is identical.

2. Connectors J1 and J2 are connected in parallel. Typically, J1 is a supply input while J2 is a supply output, which supplies the next board in the serial chain.



Figure 1. NCV7430 EVB Pins Connections



Figure 2. LIN Cable with RJ11 4P4C Connectors (Top View and Side View)



Figure 3. USB-LIN Interface Connectors

GETTING STARTED

This section contains instructions for the NCV7430 setup configuration and first connection. Only a few steps need be proceeded to get fully working simple LIN RGB LED network.

Please take the following steps to get a functional setup:

- 1. Install the NCV7430 Evaluation Software (see the NCV7430 Evaluation Software section for details). The USB drivers are included in the installation package. This installation requires administrator rights.
- 2. Connect LIN Interface to USB and wait until the device is installed. This step requires administrator rights.
- 3. Connect the boards according to figure below. Initially all the nodes have address set to default value 0. In case the node addresses haven't been set previously, connect only one node to USB–LIN interface to avoid having two nodes with same address connected to the network.



Figure 4. NCV7430 Evaluation Setup Connection (Configuration 1)



Figure 5. NCV7430 Evaluation Setup Connection (Configuration 2)

4. Run the NCV7430 Evaluation Software.

5. Select one of the nodes from "Nodes" table (detected nodes are highlighted in yellow).

| 10 NC | 2774 | 130 Ev | /aluati | on 3.0 | | | | | | | | | | | | | |
|-------|--------|-----------|----------|-------------|-----------|------------|---------|-----------|---------|-----------|-----------------------------|------------|----------|---------|----------|------|------------------------------|
| Main | Ν | etwork | configur | ation N | lode con | figuration | Node | calibrati | ion LIN | l comma | nds U: | ser script | languag | e Misc | settings | | |
| Nod | es: | | | | | | | | | | | | | | | | |
| AD | 0 | AD1 | AD2 | AD3 | AD4 | AD5 | AD6 | AD7 | AD8 | AD9 | AD10 | AD11 | AD12 | AD13 | AD14 | AD15 | Status readout |
| AD' | 16 | AD17 | AD18 | AD19 | AD20 | AD21 | AD22 | AD23 | AD24 | AD25 | AD26 | AD27 | AD28 | AD29 | AD 30 | AD31 | Get_Full_Status Send request |
| AD: | 32 | AD 33 | AD34 | AD35 | AD36 | AD37 | AD 38 | AD 39 | AD40 | AD41 | AD42 | AD43 | AD44 | AD45 | AD46 | AD47 | |
| AD- | 48 | AD49 | AD50 | AD51 | AD52 | AD53 | AD54 | AD55 | AD56 | AD57 | AD58 | AD59 | AD60 | AD61 | AD62 | AD63 | J |
| Grou | aps : | | | | | | | | | | | | | | | | |
| 0 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | |
| Sel | t colo | y | | | | | | | Se | t I ED co | ntrol | | | | | | |
| | Upo | late mo | de: | 0: undat | e immedi | iatelu | | ~ | | | Calibrati | on C | Enable | ο n | lisable | | |
| | | Eadi | na: | | e minodi | о О П# | | | | | | | 10011- | 00 | 44.11- | | |
| | | 1 44 | | - UN | | UII UII | | _ | M | oquiation | rrequen | icy: C |) 122 Hz | · • 2 | 44 HZ | | |
| | Fa | ading tir | ne : | Y | | | 0.0 | \$ | | Ther | mal cont | rnl · 🧕 🧕 |) Fnahle | O D | lisahle | | |
| | Fac | ding slo | pe: (| 🔵 Linea | ar (| 💿 Loga | rithmic | | | LE | Ds Enal | ole: 🧿 |) On | 0 0 | ff | | |
| | LED | Os Enat | ole: (| 🖲 On | (| 🔿 Off | | | | | 1.51 | 54. G | 0 | 0.0 | " | | |
| | LE | ED1 (Re | ed) : | | | | 21 | \$ | | | LEI | JI: @ | Un | 00 | m | | |
| | | 2.6 | | <u>-</u> 10 | | 1 1 1 1 | | _ | | | LEI | 02: 🧿 |) On | 00 | ff | | |
| | LEL | /2 (ulea | erij . | P | | | U | \$ | | | LEI | 03: 🧿 |) On | 00 | ff | | |
| | LE | ED3 (Blu | ie) : | P | | | 0 | * | | | | Tran | smit | | | | |
| | | Intens | ity : | | | | 15 | * | | | | | | | | | |
| | | Co | lor : | | Set color | | | | Sle | ep/Wa | <mark>ke up</mark> Sleep | | 0 ₩ | 'ake up | | | |
| | Set | color | | * | | Transm | nit | | | | | Tran | smit | | | | |

Figure 6. NCV7430 Evaluation Software Preview

- 6. To switch the LED to On state set the parameters in Set Color group box according to picture below and select Transmit. The color setting can be freely modified. Then set the parameters in Set LED Control group box and select Transmit. These two commands can be sent in any order.
- 7. LED should be turned on with preset color.

NCV7430 EVALUATION SOFTWARE

Minimum Requirements

Operating system

- Windows XP, SP3 (32/64-bit)
- Windows Vista, SP1 (32/64-bit)
- Windows 7 (32/64-bit)
- Microsoft .NET Framework 4.0

Hardware requirements

- Processor: 1 GHz
- RAM: 512 MB
- Disk Space: 850 MB (32-bit system) 2 GB (64-bit system)

- Monitor resolution: minimum 800x600 pixels
- USB port

(The minimum disk space requirement is based on Microsoft .NET Framework 4.0 system requirements)

Installation Procedure

- Please check if Microsoft .NET Framework 4.0 is installed on your computer. If not, run dotNetFx40_Full_setup.exe prior to the NCV7430 Evaluation software installation.
- 2. Run **NCV7430 Evaluation Setup.exe** and follow the installation wizard instructions.

Driver Setup

USB drivers should be installed automatically with the software. Once installed, you can plug the LIN Interface into the USB port. The hardware should be installed automatically and following message should be displayed:



The installation can be checked in Device Manager. When the hardware is connected, you should be able to find *USB Serial Converter A* and *B* in *Universal Serial Bus controllers* group.

In case you encounter any problem with the drivers, try installing the drivers manually. The drivers can be found on <u>http://www.ftdichip.com/Drivers/D2XX.htm</u> – D2XX drivers – also available as executable file.

NCV7430 SOFTWARE OVERVIEW

NCV7430 Evaluation is a graphical user interface (GUI) for NCV7430 RGB LED driver. The software provide several screens organized in tab layout.

- Main
- Network Configuration
- Node Configuration
- Node Calibration
- LIN Commands
- User Script Language (USL)

Main Tab

Main tab provides following frames:

| Writing Frame | Reading Frame |
|-----------------|-------------------|
| Set_Color | Get_Full_Status |
| Set_LED_Control | Get_ Status |
| | Get_LED_Control |
| | Get_Color |
| | Get_Actual_Param1 |
| | Get_Actual_Param2 |





The first step is to select the node, then configure respective frame and click Transmit, or Send Request.

Selecting the Node

The node you want to use can be selected by clicking on its node address (ADx) in the nodes table. You can also select

> Nodes AD2 AD3 AD15 AD1 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD16 AD17 AD18 AD19 AD20 AD21 AD22 AD23 AD24 AD25 AD26 AD27 AD28 AD29 AD 30 AD31 AD32 AD35 AD38 AD 39 AD40 AD42 AD45 AD46 AD47 AD33 AD34 AD36 AD37 AD41 AD43 AD44 AD53 AD48 AD49 AD50 AD51 AD52 AD54 AD55 AD56 AD57 AD58 AD59 AD60 AD61 AD62 AD63

| Groups | : | | | | | | | | | | | | | | |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

Figure 8. Selecting the Node

Enabling the LEDs

The LEDs can be enabled by sending Set_LED_Control command with *LEDs Enabled* and all the individual LED1, LED2 and LED3 set to On.

| LEDs Enable : | 💿 On | O Off |
|---------------|----------|-------|
| LED1 : | 💿 On | 🔿 Off |
| LED2 : | 💿 On | 🔿 Off |
| LED3: | 💿 On | 🔘 Off |
| | Transmit | |



When LEDs Enable is set to On, the individual LED's can be enabled and disabled independently by setting LED1 – LED3 to On/Off. LED Enable status can be checked by sending *Get_Full_Status* frame. Please note that even with LED correctly enabled, you can see no output light in case the LED modulation registers are set to 0.

Setting the Color

LED output color can be set either by Set_Color or Set_Color_Short command.

Once the LED's are enabled, in Set Color Group box:

- 1. Select Set Color command. (see Figure 10)
- 2. Set LED's Enable to On.
- 3. Select any color by setting LED1, LED2 and LED3 modulation values.
- 4. Select any Intensity.
- 5. Click on Transmit button.

or

- 1. Select Set Color Short command. (see Figure 11)
- 2. Select any color by setting LED1, LED2 and
- LED3 modulation values.
- 3. Click on Transmit button.

The required color can be also chosen in a Color dialog (see Figure 12). To open the CIE Color Diagram click on the colored "Set color..." field in Set Color group box.



one of the 16 groups instead of specific node. Only writing

frames can be sent to a Group. All the reading frames need

to be sent to one specific node.

Figure 10. Set Color Command



Figure 11. Set Color Short Command



NOTE: With selecting "Online set color", the LED module follows the color chosen in the diagram.

Figure 12. Color Dialog

Setting the Intensity

The overall intensity of the LEDs is programmable with a four bit scaling factor that is applied over the LED modulation. The scaling is linear (factor n/16, n = 15 is mapped to 1.0). LED intensity can be set either by Set_Color or Set_Intensity command.

In Set Color Group box:

- 1. Select Set Color Command or Set intensity command.
- 2. Set Intensity level.
- 3. Click to Transmit.

Theatre Dimming Function

The NCV7430 has a fading function to give a theater dimming effect when changing color and/or intensity settings. The effect presents itself as a smooth transition between colors, or increases or decreases in intensity.

The fading effect can be enabled by setting Set_Color command (see Figure 13):

In Set Color Group box:

- 1. Set Fading to On.
- 2. Select any Fading Time.
- 3. Choose Linear or Logarithmic fading.
- 4. Click on Transmit.
- 5. With enabled fading function, Change Color or intensity.



Figure 13. Set_Color Command

The fading time can be also set by Set_intensity command (see Figure 14).

| Set color | | |
|----------------|-------------------------|--|
| Update mode : | 0: update immediately 💉 | |
| Fading : | 🖲 On 🔷 Off | |
| Fading time : | 2.0 | |
| Fading slope : | 🔿 Linear 💿 Logarithmic | |
| LEDs Enable : |) On Off | |
| LED1 (Red): | 133 | |
| LED2 (Green) : | 107 🗘 | |
| LED3 (Blue) : | | |
| Intensity : | 33 | |
| Color : | Set color | |
| Set intensity | Transmit | |

Figure 14. Set_Intensity Command

LED Modulation Frequency

The LED modulation frequency can be chosen to be 122 Hz or 244 Hz.

In Set LED Control Group box

- 1. Select 122 Hz or 244 Hz PWM Frequency and Click Transmit.
- 2. The PWM frequency can be measured by oscilloscope on LEDxC or LEDxR pin.

Modulation frequency: 🔘 122 Hz 💿 244 Hz

Figure 15. LED Modulation Frequency

LED Update Modes

The Set_Color Command can be sent in following update modes:

- Immediate Update
- Store and Do Not Update
- Update to the Already Stored Values
- Discard

When "Immediate update" mode is selected, the changed are applied right after the Set_Color command is sent.

In "Store and do not update" mode, the values selected in Set Color Group box are stored in internal memory and are applied only when the Set_Color Command is sent in "Update to the already stored values" mode.

Sleep Mode and Wakeup

In sleep mode, LEDs are turned OFF and the VBIAS output is brought to 0 V, turning OFF the optional bypass transistor. The internal circuitry of the NCV7430, including the band gap reference, internal oscillator and current

sources are put in low power mode and the internal registers are reset. In Sleep mode the total battery current consumption is reduced.

To bring the NCV7430 to the Sleep mode, select Sleep in the Sleep/Wakeup Group box and click Transmit.

| Sleep / Wake up | | |
|-----------------|-----------|---|
| 📀 Sleep |) 🔿 🔿 🔿 🔿 | р |
| | Transmit | |

Figure 16. Sleep/Wakeup Mode

The NCV7430 wakes up from sleep after detection of a transition of LIN recessive state to dominant state followed by a dominant level for a time period of t_{wake} and again a rising edge from dominant to recessive. Select Wake-up in the Sleep/Wakeup Group box and click Transmit. As internal register are reset after entering Sleep mode, the LED's are not enabled after Wake-up. Set_Color and Set_LED_Control frames are required after Wakeup to set LED's on again.

Network Configuration Tab

This screen provides network scanning function and Groups configuration.

Scan Network

Whenever new node is connected to the network, the network scan should be perform in order to detect all the available node addresses.

Use the Scan Network button to perform the network scan. It can take few seconds to complete this action. Once completed, all the detected nodes are listed in the Nodes table.

Groups Configuration – Group Address

Each node can be added to one specific Group. Choose the desired group with right mouse button click, select *Add nodes* menu and select the node you want to add to this group or simply select one of the nodes and then click the new group. The changes are not applied immediately, but will appear in the *List of Changes* on the right side. User can cancel any prepared change by clicking with right mouse button in the List of changes table and selecting *Cancel Change*. Once all the needed changes are prepared, click on the Apply changes button to program the Group Address OTP's.

In the Figure 17, three nodes are attached to the network. AD0 and AD2 belongs to Group0 and AD3 belongs to Group3.

To add Node AD2 to Group 5:

- 1. Select Node AD2.
- 2. Click the Group 5.
- 3. The modification will appear in the List of changes.
- 4. Click the *Apply changes* button to write the new setting to the device.

| NCV | 7430 | Evaluat | tion 3.(|) | | | | | | | | | | | | | | | | | × |
|-----|--------------------|-------------------------|-----------------|------------|------------|-------|-------------|---------|------------|--------------|-------------|---------|-------------|------|-----------|------|----|--------------|------------------|--------------|---|
| ain | Networ | rk configu | uration [| Node cor | figuration | Node | calibration | LIN c | ommands | User | script lang | juage N | lisc settin | gs | | | | | | | |
| N | lodes : | | 1. | | | | | | | | | | | | | | | List of cha | nges: | | |
| | AD0 G0 | AD1 | AD2 G0 | AD3 G3 | AD4 | AD5 | AD6 | AD7 | AD8 | AD9 | AD10 | AD11 | AD12 | AD13 | AD14 | AD15 | | Node (| Current Group | New Group | |
| | AD16 | AD17 | AD18 | AD19 | AD20 | AD21 | AD22 | AD23 | AD24 | AD25 | AD26 | AD27 | AD28 | AD29 | AD 30 | AD31 | 3. | AD00 AD02 | 00 | 05 | |
| | AD 32 | AD 33 | AD34 | AD 35 | AD 36 | AD37 | AD 38 | AD 39 | AD40 | AD41 | AD42 | AD43 | AD44 | AD45 | AD46 | AD47 | | AD03 | 03 | 03 | |
| | AD48 | AD49 | AD 50 | AD51 | AD52 | AD53 | AD54 | AD55 | AD56 | AD57 | AD58 | AD59 | AD60 | AD61 | AD62 | AD63 | | | | | |
| _ | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| G | iroups : | 4 | Select r | new group |) for node | AD2 2 | | ~ | 0 | | 10 | | 10 | 10 | 14 | 15 | | | | | |
| L | U | | 2 | J | 4 | وپ | k right n | ouse bu | tton for c | ə hange n | odes assi | gnment | 12 | | 14 | 1.2 | | | | | |
| | | | | | | | | | | | | | | 9 | ican netv | vork | | | | | |
| N | letwork i | report : | | | | | | | | | | | | | | | | | | | |
| 1 | Scannin n netwo | g networl irk are av | c ailable no | odes: 0, 2 | ., 3, | | | | | | | | | | | | | | | | |
| ľ | 45500180 | eu to gio | ups. u, a | , | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | Appl | y chang | es | |
| | | | | | | | | | | | | | | | | | | | | | |

Figure 17. NCV7430 Evaluation – Network Configuration Tab

Node Configuration Tab

OTP's Programming

All OTP's except Group Address can be zapped from Node Configuration Tab. Group Address OTP can be zapped from Network Configuration tab.

Node Address (NAD)

Node Address can be set by Node Address Programming command on Node Configuration (see Figure 18).

- To change the node default address:
 - 1. Select appropriate node from the list.
 - Select the new NAD address in "Node address programming" Groupbox. The valid addresses are marked in green. (New address AD4 selected to be programmed to Node AD0 in the picture below)
 - 3. Click Program New Address.

After programming, the network is automatically updated.

Node Address programming can be repeated while LockBit1 is not zapped. Each bit can be programmed only once (programming means setting from 1 to 0). E.g. it is possible to change address from 1 to 3 but not to 2.

Group Address

Group Address can be configured in *Network Configuration* Tab.

Node Calibration Tab

This part can be used to calculate the reference matrix and calibration factors and to write these factors to OTP shadow registers (see Figure 19).

- 1. Measure LED's.
- 2. Find the smallest triangle.
- 3. Calculate calibration factors.
- 4. Select node for calibration.
- 5. Set Calibration factors according to calculated values.
- 6. Click Write.
- 7. Enable calibration in "Main" tab.

For LED color calibration a measurement of XYZ trisimulus value for each individual LED is needed.

Use NCV7430 Calibration Calculator Excel file to calculate the calibration constants or to calculate the Reference Tristimulus values (the smallest triangle).

Then set the Calibration Factors in Node Calibration tab according to calculated values and click Write. The Calibration Factors can be also calculated from Reference and measured values if these are available. The Calibration values are stored in Shadow Registers and result of the calibration can be checked by enabling calibration by Set_LED_Control command.

| NCV7430 Evaluation 3.0 | | | | | |
|---|---|---------------------------|--|--|--|
| Main Network configuration Node configuration Node calibration LIN co | mmands User script language Misc settings | | | | |
| | Batch OTP programming | Read OTP | | | |
| Select node for configuration: | Load OTP from file Save OTP to file | DEFAULT ERROFF | | | |
| AD0 | DEFAULT ERROFF | CMDSOFF V TH_CONT | | | |
| Refresh | CMDSOFF TH_CONT | LED MOD FREQ | | | |
| | LED_MOD_FREQ LOW_BAUD | | | | |
| Node address programming | LOCKBT1 LOCKBT2 | LUCKBII | | | |
| Select new address: | TWPROG TWPROG2 | TWPROG Note: Reading of | | | |
| AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 | BALLAST | BALLAST | | | |
| | LED cal. a11 : 0 | | | | |
| AD24 AD25 AD26 AD27 AD28 AD29 AD30 AD31 | | Node address : 0 | | | |
| AD32 AD33 AD34 AD35 AD36 AD37 AD38 AD39 | LED cal. a22 : V | Calibration data a11 · 0 | | | |
| AD40 AD41 AD42 AD43 AD44 AD45 AD46 AD47 | LED cal. a33 : 🗸 🛛 🗘 | Calibration data a22 : 0 | | | |
| AD48 AD49 AD50 AD51 AD52 AD53 AD54 AD55 | | Calibration data a33 : 0 | | | |
| AD56 AD57 AD58 AD59 AD60 AD61 AD62 AD63 | | Calibration data a12 : 0 | | | |
| | LED cal. a13: 🗸 🛛 📚 | Calibration data a21 : 0 | | | |
| | | Calibration data a23 : 0 | | | |
| LOCKBT1 Program new address | LED cal. a21 : Y | Calibration data a31 : U | | | |
| | LED cal. a23: 📮 | | | | |
| | LED cal. a31 : 🔍 👔 | Group ID : 0 | | | |
| Value: Y,,,,,,,,, 0 🗘 | LED cal. a32 : 0 | | | | |
| OTP address: 2 🗘 Write OTP data | Program OTP | Head UTP Save UTP to file | | | |
| | | | | | |

Figure 18. NCV7430 Evaluation – Node Configuration Tab





LIN Commands Tab

The LIN commands tab has two functions. It monitors all the LIN bus traffic and allows sending a custom frame. Transmitted or received commands are listed in a table together with a time stamp and description of the frame. In the Frame Creator group box, fill all the necessary fields and click the Data transfer button to send the custom frame.

| NCV7430 Evaluation 3.0 | | | | | | | | | | | | | |
|--|---|-------------------------|------|---------|----------------------------------|--|--|--|--|--|--|--|--|
| Main Network configuration Node configuration Node calibration LIN commands User script language Misc settings | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Time | ID | Frame Data | Chsm | Target | Comment | Frame creator | | | | | | | |
| 09:34:55.791 | 23 | C0 00 00 7F | BF | Node 0 | Set LED Control command | | | | | | | | |
| 09:34:59.619 | 09:34:59.619 24 C0 00 00 14 BF 66 00 AD | | 57 | Node 0 | Set Color command | | | | | | | | |
| 09:35:01.88 | 09:35:01.88 3C 80 81 C0 FF FF FF | | 3D | Node 0 | Get_Full_Status request command | | | | | | | | |
| 09:35:01.119 | 3D | C0 FF F8 C0 F0 88 F0 FF | 1B | Node 0 | Get_Full_Status response command | | | | | | | | |
| 09:35:16.793 | J9:35:16.793 23 40 01 00 7F | | ЗF | Group 0 | Set_LED_Control command | Writing frame Reading frame | | | | | | | |
| 09:35:17.715 | 09:35:17.715 24 40 01 00 14 BF 66 00 AD | | D6 | Group 0 | Set_color command | | | | | | | | |
| | | | | | | Data bytes count 8 | | | | | | | |
| | | | | | | Frame data: | | | | | | | |
| | | | | | | Expected bytes: 8 | | | | | | | |
| | | | | | | Received data: | | | | | | | |
| | | | | | | Data transfer | | | | | | | |
| < | | | | ш | , , | ● Decimal | | | | | | | |
| | | | | | Clear history |] | | | | | | | |

Figure 20. NCV7430 Evaluation – LIN Commands Tab

User Script Language Tab

User Script Language is a simple tool for automatic execution of basic functions of NCV7430 LED Driver. You can create your own script in built-in editor using supported functions, and one-row comments starting with "//". This USL is not case-sensitive. For correct syntax please see description of supported functions or code example.

The cripts can be saved or opened to/from text file. Files created in built-in editor are saved with *.usl extension.

Supported Functions

- Set_Color function To send writing frame Set_Color
- Set_LED_Control function To send writing frame Set_LED_Control
- **Delay** function To define time space between two commands
- Custom Frame function To send arbitrary Lin frame
- Repeat function Allows to create loops

```
//* Delay(d)
//*
  d - time delay in milliseconds
Delay(3000)
         // time delay of 3 seconds
                             ******
//* Set Color(target,R,G,B,[intensity],[fading enable],[fading slope],[LEDs enable],[fading time],[update mode])
//*
   target - node address "Nxx" (0 < xx < 64)
              - group ID "Gxx" (0 < xx < 16)
//*
//*
             - group mask "GM0xXXXX" (Hex number 0x0000 - 0xFFFF)
//* R,G,B
   R,G,B - color modulation values, integer number (0 - 255)
intensity - intensity factor, integer number (0-15), optional (default: 15)
//*
//*
    fading enable - Boolean value (true or false), optional (default: false)
//*
   fading slope - Boolean value (true or false), optional (default: false)
//*
   LEDs enable - Boolean value (true or false), optional (default: true)
//*
   fading time - fading time in seconds, double number (0.0 - 6.3), optional (default: 0.0)
//* update mode \, - update mode, integer number (0-3), optional (default: 0)
Set Color(n15,10,200,220,15,true,false,true,2.0,0) // set color applied on node 15
Set_Color(gm0xFF00,10,200,220,15,true,false,true,2.0,0) // set color applied to groups 8 to 15
//**
                        //* Set LED Control(target, LEDs enable,[LED1 enable],[LED2 enable],[LED3 enable],[cal. enable])
//*
   target - node address "Nxx" (0 < xx < 64)
//*
             - group ID "Gxx" (0 < xx < 16)
//*
            - group mask "GM0xXXXX" (Hex number 0x0000 - 0xFFFF)
//* LEDs enable - Boolean value (true or false)
//* LED1 enable - Boolean value (true or false), optional (default: true)
//*
   LED2 enable - Boolean value (true or false), optional (default: true)
//*
   LED3 enable - Boolean value (true or false), optional (default: true)
//*
   cal. enable - Boolean value (true or false), optional (default: false)
Set_LED_Control(g10,true) // set LED control applied on group 10
Set LED Control(gm0x00FF,true) // set LED control applied on groups 0 to 7
            *****
//*********
//* Custom Frame(Frame ID, Frame data)
//* Frame ID - Frame ID without parity in decimal format (0-63)
//*
   Frame data - 2 to 8 comma-separated decimal values as a frame bytes in range (0-255)
Custom Frame (25,100,255,0,10) // Frame with ID= 25 and four data bytes
*****
//* Repeat(n) - end
//* n - number of repetitions (Set n = -1 for infinite loop)
*****
                    // start of infinite loop
Repeat (-1)
 Set_LED_Control(g10,true)
                    // repeat 5 times following code
 Repeat(5)
  Set Color(n5,100,0,0)
  Delay(1000)
  Set Color(n5,0,100,0)
  Delay(1000)
                    // end of inner repeat section
 end
 Set_LED_Control(g10, false)
 Delay(500)
                    // end of infinite loop
end
```

NOTE: The built-in text editor supports Find (CTRL+F) and Replace (CTRL+H) functions.

Misc Settings Tab

The last Misc settings tab is used to set LIN baud-rate and additional OTP programming actions:







SCHEMATIC

Figure 22. NCV7430 Schematic

Table 4. NCV74300V1GEVB BILL OF MATERIALS

| Designator | Qty. | Description | Value | Tolerance | Footprint | Manufacturer | Manufacturer Part Number | Substitution Allowed |
|------------|------|---|--------------|-----------|-----------------|------------------|-----------------------------|-------------------------|
| C1 | 1 | VBB Filter Capacitor | 100 nF, 50 V | ±10% | 0603 | Murata | GCM188R71H104KA57D | Yes |
| C2 | 1 | VBAT Filter Capacitor | 10 nF, 50 V | ±10% | 0603 | Murata | GCM188R71H103KA37D | Yes |
| C3 | 1 | LIN Filter Capacitor | 100 pF, 50 V | ±5% | 0603 | Murata | GCM1885C1H101JA16D | Yes |
| D1 | 1 | Reverse Battery Diode | | | SMA | ON Semiconductor | MRA4003T3G | Yes |
| D2 | 1 | LIN Bus Protector | | | SOT23 | ON Semiconductor | NUP1105L | Yes |
| J1, J2 | 2 | RJ11 RIGHT ANGLE SOCKET | | | FCI_87180-044LF | FCI | 87180–044LF | Yes |
| LED | 1 | RBG LED | | | LRTB_G6TG | OSRAM | LRTBG6TG | Yes |
| Rr, Rg, Rb | 3 | LED Current Programming Resistors | 12 Ω | ±1% | 0603 | MULTICOMP | MC 0.063W 0603 1% 12R | Yes |
| U1 | 1 | NCV7430 SOIC-14 | | | SOIC-14 | ON Semiconductor | NCV7430D20G | No |

PCB DRAWINGS

Assembly Drawings



Figure 23. NCV7430 EVB PCB Top Assembly Drawing

Composite Drawings



30.226 (mm)-

Figure 25. NCV7430 EVB PCB Top Composite Drawing



Figure 24. NCV7430 EVB PCB Bottom Assembly Drawing



Figure 26. NCV7430 EVB PCB Bottom Composite Drawing

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