DVK90132

MLX90132 Development Kit User Manual

Features and Benefits

- ❑ Conforms with ISO/IEC 18092 (NFC)
- ❑ Conforms with ISO/IEC 14443 A and B,
- ❑ Conforms with ISO/IEC 15693
- ❑ Conforms with ISO/IEC 18000-3 mode 1
- ❑ High speed communication (848kbit/s)
- ❑ Embedded RF field and TAG detectors

Application Example

- ❑ NFC enabled car for access and start

Ordering Information

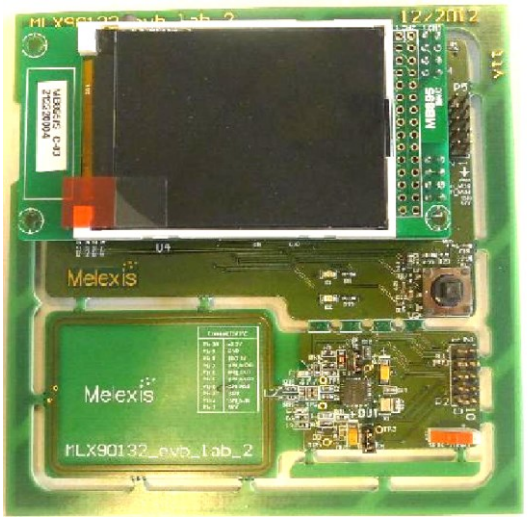
Part Code	Temperature Code	Package Code	Option Code	Packing Form Code
MLX90132	R (-40°C to 105°C)	LQ (Lead free QFN 5x5 32 leads)	AEA-000	RE
MLX90132	R (-40°C to 105°C)	LQ (Lead free QFN 5x5 32 leads)	AEA-000	TU

General Description

The MLX90132 is a 13.56MHz RFID/NFC transceiver IC developed by Melexis. The DVK90132 is an assembled printed circuit board simplifying the evaluation of the MLX90132 and allowing the development of specific applications like NFC reader for car access.

The DVK90132 embeds a minimum set of components around the MLX90132 IC to make it functional as an NFCIP-2 reader conforms to ISO/IEC14443 (type A and type B up to 848kbps), ISO/IEC18092 (up to 424kbps) and ISO/IEC15693 international protocols. The development kit DVK90132 also features on-PCB printed RFID antennas with optimized matching network for the maximum RFID performances.

The DVK90132 is connected to a microcontroller board based on a STM32F103 ARM CORTEX M3 from the company STMicroelectronics®. This microcontroller embeds the required firmware for a stand-alone easy and quick evaluation of the MLX90132. A Development mode can also be selected to control the device through a set of TCL script examples allowing the development of higher layer applications.



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1 DVK90132 global description

The development kit DVK90132 is composed of two boards connected together with a specific PCB connection.

The first board embeds the MLX90132 NFC/RFID reader IC and the minimum required components to make it functional as an NFCIP-2 reader conforms with ISO/IEC14443 (type A and type B up to 848kbps), ISO/IEC18092 (up to 424kbps) and ISO/IEC15693 international protocols. Two on-PCB printed RFID antennas are available and selected through 0ohm bridge resistors. An optimized matching network is also available for maximum RFID performances.

The second board forming the DVK90132 is a microcontroller PCB based on a STM32F103 ARM CORTEX M3 form the company STMicroelectronics®. This microcontroller embeds the required firmware for a stand-alone easy and quick evaluation of the MLX90132. A Development mode can also be selected to control the device through a set of TCL script examples allowing the development of higher layer applications. The board is featuring an LCD displaying information in stand-alone mode and also an on-PCB joystick use for user selection.

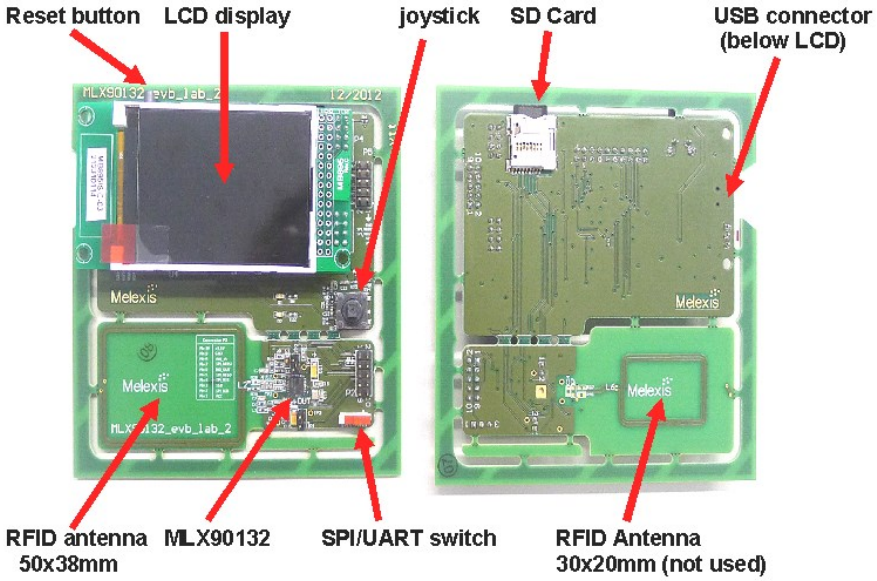

Figure 1: **DVK90132 top and bottom views**

2 DVK90132 Schematic & BOM

2.1 Schematics

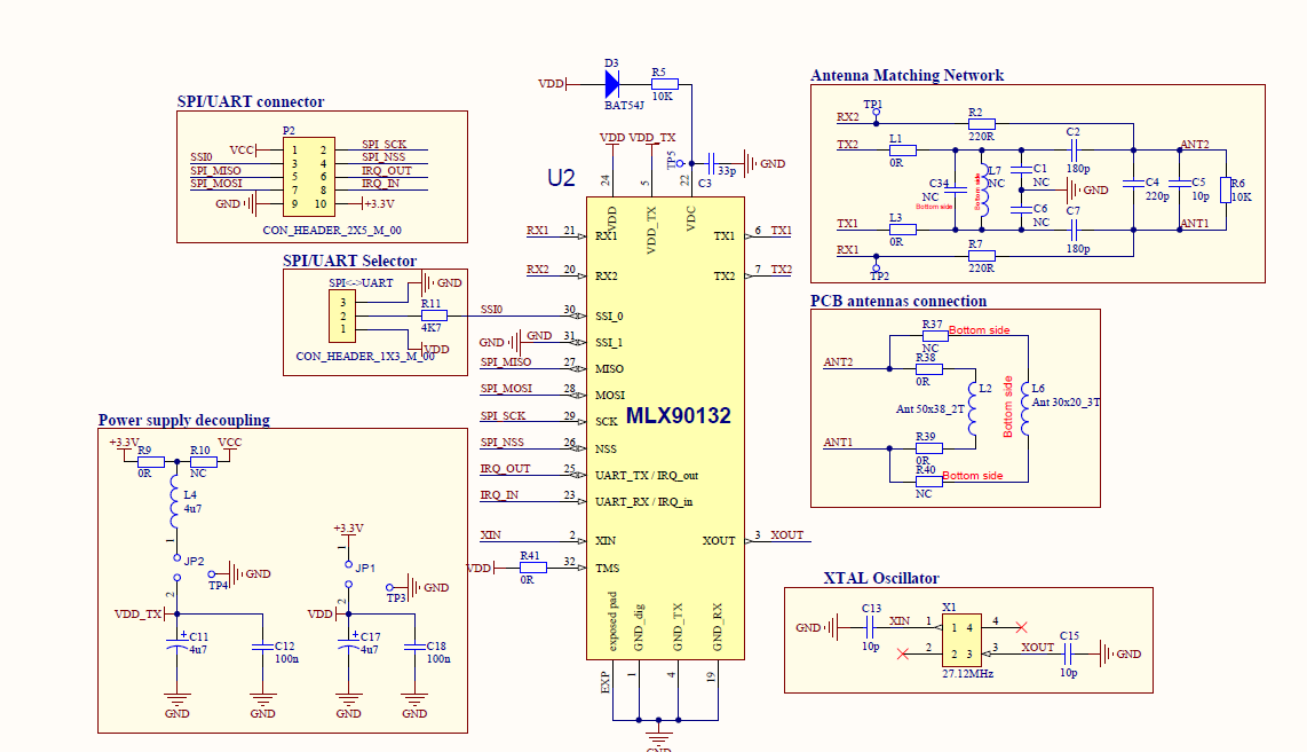

Figure 2: **Schematics MLX90132**

Notes:

- The driver supply VDD_TX can be changed on the board from +3.3V to +5V (VCC) by disconnecting the resistor R9 and connecting a 0 ohm resistor in place of R10 (please refer to the schematic portion “Power supply decoupling”.
- It is possible to supply the MLX90132 by an external source by removing the jumpers JP1/JP2 and plugging the power supply on JP1[2] / TP3 for supplying VDD (resp JP2[2] / TP4 for supplying VDD_TX)
- The antenna used can be changed on the board with the jumper resistors R37 to R40. For more information concerning the on-board PCB trace antenna, please refer to the chapter DVK90132 Printed RFID antennas below.
- The matching network depends on the PCB trace antenna and the VDD_TX to be used. If those values are changed on the DVK90132, the values of the matching network might have to be recalculated accordingly. For more information on how to calculate it, please refer to the application note MLX90130/32 antenna design guide available on **Melexis SoftDist**, in directory MLX90132/MLX90132_Documentation/ MLX90132_Application_notes.
- V_{DC} is an output which has to be stabilized externally with the 33pF capacitor C3. The external diode D3 might also be added to connect V_{DC} to V_{DD}, allowing to improve the performance of the Field detection and TAG detection feature
- The user should take care that the device might be potentially supplied over SPI pins and the pin IRQ_IN. To guarantee a proper POR, the SPI-input might be set in high impedance state by the host MCU and an external pull-up on IRQ_IN would be connected

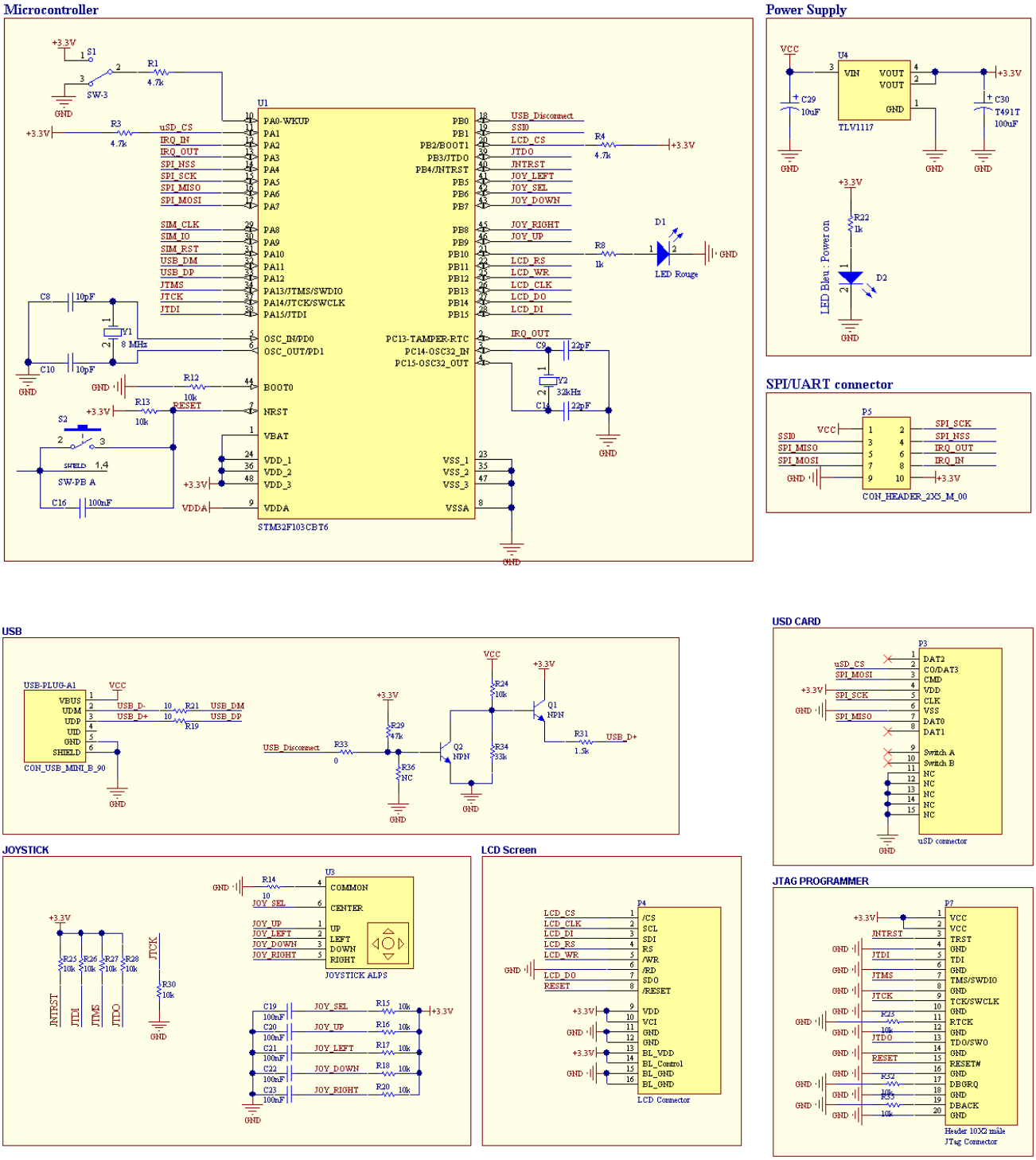

Figure 3: **Schematics Microcontroller & Peripherals**

2.2 Bill of materials

The tables below give an overview of all components that compose the development kit DVK90132.

Reference	Value	Description
C1, C6	Not Connected	Antenna matching, EMI filter capacitors
C4	220pF	Antenna matching network, parallel resonance capacitor Cp
C2, C7	180pF	Antenna matching network, serial resonance capacitor Cs
C3	33pF	VDC decoupling capacitor
C5	10pF	Antenna matching network, additional parallel resonance capacitor Cp
C11, C17	4.7uF	VDD_TX / VDD decoupling capacitor
C12, C18	100nF	VDD_TX / VDD decoupling capacitor
C13, C15	10pF	27.12MHz crystal load capacitors
D3	BAT54	Diode to connect VDC to VDD
L1, L3	0R (shortcut)	Antenna matching, footprint for EMI filter inductors
L2	430nH	50x38mm RFID antenna, 2 turns
L4	BLM18AG601SN1	VDD EMI filter inductor
L6	500nH	20x30mm RFID antenna, 3 turns
L7	Not Connected	Antenna matching, footprint for EMI filter inductors
C34	Not Connected	Antenna matching, footprint for EMI filter capacitors
P2	CON_HEADER_2X5	UART/SPI connector
R2, R7	220R	Antenna matching network, feedback Rx resistors
R5	10k	Pull-up resistor for Vdc linked to the diode D3
R6	10k	Antenna matching network, resonance damping resistor
R9	0R	VDD_TX = 3V bridge resistor
R10	Not Connected	VDD_TX = 5V bridge resistor
R11	4.7k	Pull-up/down resistor SSI_0
R36	Not Connected	
R38, R39	0R	Bridge resistors for antenna L2
R37, R40	Not Connected	Bridge resistor for antenna L6
R41	0R	Connect TMS pin to VDD
SPI<->UART	CON_HEADER_1X3	SPI/UART jumper selection
JP1	JUMPER	VDD supply
JP2	JUMPER	VDD_TX supply
U2	MLX90132	MLX90132 RFID/NFC reader IC
X1	NX2520SA 27.12MHz EXS00A-CS05164	27.12 MHz crystal from NDK

Table 1: **DVK90132 Bill of materials "Schematics MLX90132"**

Reference	Value	Description
C8, C10	10pF	8MHz crystal load capacitors
C9, C14	22pF	32kHz crystal load capacitors
C16, C19, C20, C21, C22, C23, C24, C25, C26	100nF	Decoupling capacitors (Ceramic)
C27, C29, C31, C32, C33	10uF	Decoupling capacitors (Tantalum, 20% Tolerance)
C28	10nF	Decoupling capacitor (Ceramic)
C30	100uF	T491T Decoupling capacitor (Tantalum, 20% Tolerance)
D1, D2	LED green/red	LED
L5	BLM18AG601SN1	VDD EMI ferrite
P3	uSD connector	uSD connector
P4	LCD Connector	LCD Connector
P5	CON_HEADER_2X5	UART/SPI connector
P7	CON_HEADER_2X10	JTAG Connector
Q1, Q2	NPN	NPN Bipolar Transistor
R1, R3, R4	4.7k	Thick Film Chip Resistor, 1 Ohm to 2.2M Ohm Range, 5% Tolerance, 0402 Size, 0.063 W
R8, R22	1k	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063 W
R12, R15, R16, R17, R18, R20, R23, R25, R26, R27, R28, R30, R32, R35	10k	Thick Film Chip Resistor, 1 Ohm to 2.2M Ohm Range, 5% Tolerance, 0402 Size, 0.063 W
R13, R24	10k	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063 W
R14, R19, R21	10	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063 W
R29	47k	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063 W
R31	1.5k	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063 W
R33	0	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063
R34	33k	Rectangular Thick Film Chip Resistor, 10 Ohm to 330k Ohm Range, 0.1% and 0.5% Tolerance, 0603 Size, 0.063 W
S1	SW-3	Switch 2 positions (microcontroller Wake-up)
S2	SW-PB A	Push-Button (Reset)
U1	STM32F103CBT6	STM32 ARM-based 32-bit MCU with 128 Kbytes Flash, 48-pin LQFP
U3	JOYSTICK ALPS	4 directions + 1 selection buttons
U4	TLV1117	800 mA, Low Voltage, Low Quiescent Current LDO Regulator, 3-Pin SOT-223
USB-PLUG-A1	CON_USB_MINI_B_90	Connector USB-MINI-B, SMD, Right Angled
Y1	NX5032GA 8MHz S1-2070-5030-10	8MHz Crystal Oscillator from NDK
Y2	32kHz	32kHz Crystal Oscillator

Table 2: **DVK90132 Bill of materials "Schematics Microcontroller & Peripherals"**

* Components not mounted

2.3 DVK90132 Printed RFID antennas

Antenna	Outer dim.	Inner dim.	Track width	Dist. Btwn tracks	Nbr of Turn	Inductor [nH]	Resistor [ohm]
L2	1880 x 1340 mils 4475 x 3404 mm	1700 x 1169 mils 4318 x 2969 mm	40 mils 101.16 mm	10 mils 25.4 mm	2	430	0.6
L6	1170 x 790 mils 2972 x 2007 mm	1064 x 684 mils 2703 x 269 mm	20 mils 50.8 mm	10 mils 25.4 mm	3	500	0.2

Table 3: On-PCB printed RFID antennas

3 Firmware of the DVK90132

The embedded firmware of the DVK90132 is available on **Melexis SoftDist,** with other examples, in the directory MLX90132/MLX90132_Firmware.

Those examples can easily be opened and recompiled using the free licence KEIL compiler for the STMicroelectronics ARM microcontroller STM32F103 cortex M3.

The DVK90132 is built with a 20-pin JTAG connector available below the LCD screen. This allows to easily reprogram the firmware of the DVK90132 using the ST-LINK programmer with the ST_LINK utility software which can be directly downloaded from the link below. Note that the ST_LINK programmer is not provided with the DVK90132 but can be easily bought from the link below.

The following procedure should be followed to reprogram the DVK90132:

1. Connect the ST-LINK to the USB of the computer
2. Connect the 20-pin flat cable to the JTAG connector of the DVK90132 (P7 below the LCD screen)
3. Connect the USB of the DVK90132 to the computer to power-up (green LED D2 switched ON)
4. Open the ST_LINK UTILITY firmware
5. Select FILE -> OPEN FILE and choose the required .hex file
6. Select TARGET -> CONNECT
7. Select TARGET -> PROGRAM & VERIFY
8. Press PROGRAM, at the end green text should be displayed in the window below
9. Select TARGET DISCONNECT

- Link to Keil Compiler: http://www.keil.com/stmicroelectronics/arm_overview.asp
- Link to ST-LINK programmer: http://www.st.com/internet/evalboard/product/219866.jsp
- Link to the T_LINK utility: http://www.st.com/internet/evalboard/product/219866.jsp

4 Installing the Software

The following paragraphs describe how to download and install the TCL software and the USB driver.

4.1 STM32 USB driver

The USB drivers are automatically installed and recognized by the operating system when connected to the user computer; there is no need for a specific driver installation.

4.2 TCL software

There are several possibilities to interface the DVK90132 and software available to write TCL scripts. The following paragraphs propose a suite of software which can be downloaded and used for free. The user has to agree with the respective software license.

4.2.1 TCL engine: ActiveTcl

The software can be downloaded on: http://www.activestate.com/activetcl/downloads, but is also available on **Melexis SoftDist**, in directory MLX90132/MLX90132_Software.
Select the version corresponding to your computer OS - for example, the **version 8.6.1 for Windows (x86)** if you are working under Windows7 - and install it. This software includes the TCL compiler.

4.2.2 TCL editor: Ezdit

The software (also available on **Melexis SoftDist** in directory MLX90132/MLX90132_Software) can be downloaded on: http://code.google.com/p/ezdit/downloads/detail?name=ezdit-windows-0.9.1.zip&can=2&q,

This editor allows to edit, to create and to execute TCL scripts. It can be used without installation. To link the editor to the TCL engine installed with ActiveTCL (named wish85 or wish86 depending on the version), it is necessary to do the following:

- Select TOOLS and click on run
- In the second row write the path to the executable tclsh85.exe or tclsh86.exe and add the command {%F} with a space in-between
- In our example the path is C:/Tcl/bin/tclsh85.exe {%F}

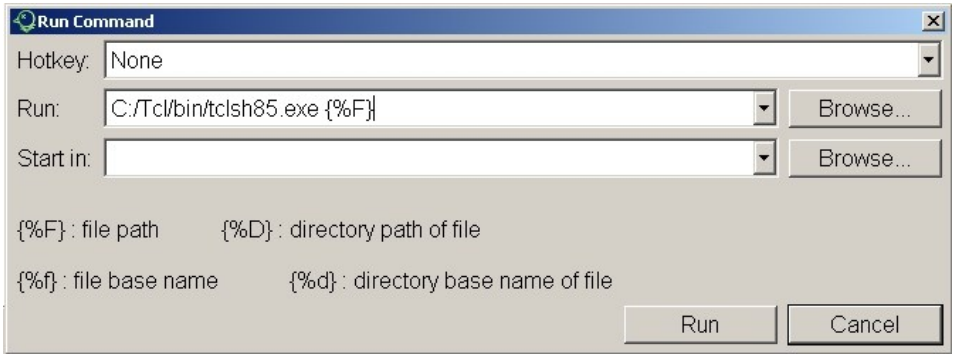

Figure 4: **Ezdit TCL editor configuration**

4.2.3 DVK90132 DLL

This DLL is used to link the DVK90132 with the TCL scripts. After having downloaded it from **Melexis SoftDist** (directory MLX90132/MLX90132_Software) it has to be placed at the root of the D:/ or C:/ drive.

- Examples: D:\ strfnfcaplugin.dll or C:\ strfnfcaplugin.dll.

At the beginning of each TCL script the DLL has to be loaded with the following command, specifying the path of the DLL location:

- Examples: load D:// strfnfcaplugin.dll or load C:// strfnfcaplugin.dll

More information about TCL script can be found on Internet. As it is an open source language there are a large number of dedicated websites such as http://wiki.tcl.tk/.

5 Getting started with the DVK90132

The DVK90132 allows very quick and easy evaluation of the MLX90132 NFC/RFID reader IC. By simply connecting the USB port to the user computer, the DVK90132 is supplied and Start-up menu appears. Then the user simply has to select the mode by moving left/right the Joystick on the board (a blue square shows the mode currently selected) and press on it.

The communication interface UART or SPI is selected with the switch “SPI <-> UART” at power-up of the DVK90132. ***Any change of this jumper after power-up will not have any impact anymore without a complete reset of the board by removing the USB connection***. The selected communication interface is displayed at bottom-right side of the LCD screen.

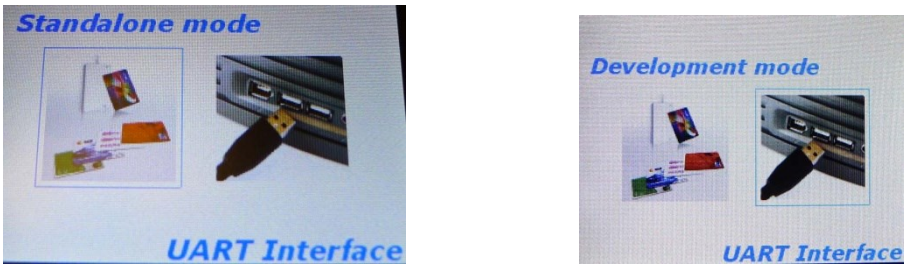

Figure 5: **Start-up menu (Standalone/Development mode selection when UART is selected)**

5.1 Standalone mode

The standalone mode can be used for quick and easy evaluation; the DVK90132 is continuously sensing the HF field for presence of any ISO/IEC14443 (A and B) and ISO/IEC18092 (Felica) compatible transponders and displays its unique identifier when found.

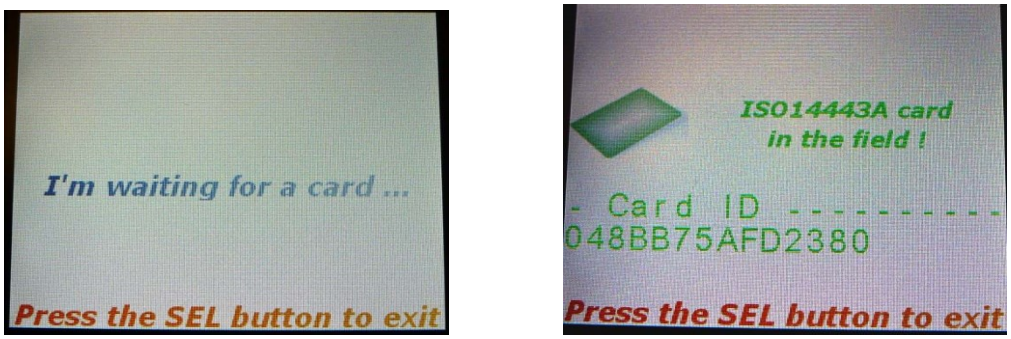

Figure 6: **Standalone mode, examples of displayed messages**

5.2 Development mode

The development mode allows controlling the MLX90132 through a set of TCL scripts. Examples of such TCL scripts are available on **Melexis SoftDist** in directory MLX90132/MLX90132_TCL_Scripts.
This mode requires a USB connection between the microcontroller board and the computer, as well as the installation of TCL software.
Once the Development mode is selected, the USB connection will be automatically established with the computer and the following picture will be displayed on the LCD screen.

Figure 7: **development mode selected, USB communication successfully established**

Note: The USB drivers are automatically installed and recognized by the operating system when connected to the computer via the USB cable. There is no need for a specific driver installation.

5.2.1 TCL script examples

Once the DVK90132 is connected to the computer, it can be controlled through TCL scripts. To open the scripts provided on **Melexis SoftDist** please follow the procedure describes below:

- Download the file DVK90132_TCL_Scripts_zip from **Melexis SoftDist** (available in the directory MLX90132/MLX90132_TCL_Scripts) and unzip its whole content in a new folder called: DVK90132_TCL_Scripts.
- Open the ezdit editor
- Go to “Project” -> “Open project”
- Select the folder “DVK90132” in the folder “DVK90132_TCL_Scripts”
- All the scripts will appear in the window of Ezdit. Simply double click on the script to open it.

The following chapters show some examples of TCL scripts provided with the DVK90132:

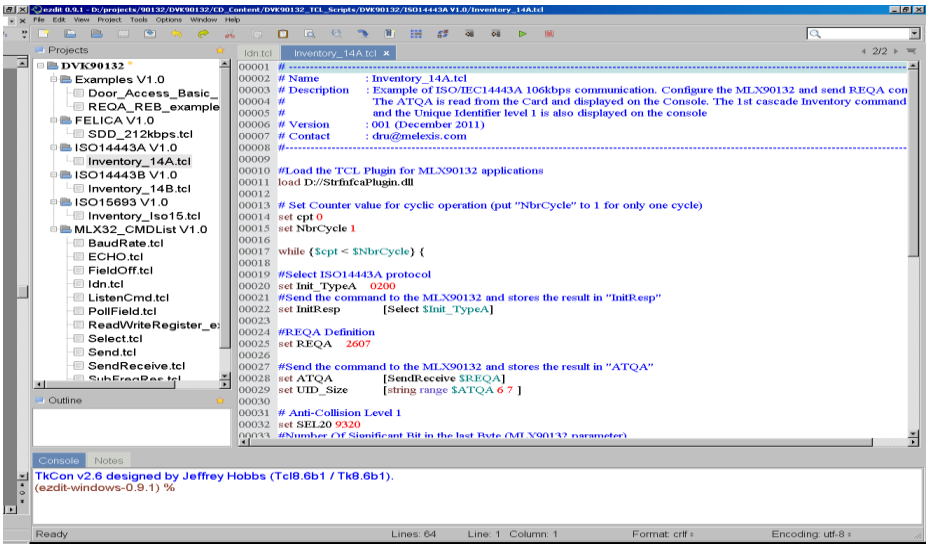

Figure 8: Script examples provided with the DVK90132

5.2.1.1 Idn

The command “Idn” is used to get the identification string of the MLX90132. This basic command is defined in the MLX90132 plug-in DLL (please refer to chapter
DVK90132 global description DVK90132 DLL).

Script example and MLX90132 response:

```
ldn.tcl* x
00001  #Load the TCL Plugin for MLX90132 applications
00002  load D://StrfnfcaPlugin.dll
00003
00004  #Turn the field off
00005  FieldOff
00006
00007  #Test IDN
00008  #Sends the command Idn through the STM32 to MLX90132 and stores the result in "Idn"
00009  set Idn                [Idn]
00010
00011  #Displays the command and the result in the console
00012  puts "Resp = $Idn"
00013
```

Script run:

```
Run Command : C:/Tcl/bin/tclsh85.exe {D:/projects/Pro
Resp = 000F4E4643204653324A4153543000A998
Exit
(Ezdit) %
```

Note: The Identification string of the device may differ from the example illustrated above.

5.2.1.2 FieldOff

The command “FieldOff” is used to switch off the electromagnetic field generated by the MLX90132 (corresponds to a Protocol select command with parameters to 0). This basic command is defined in the MLX90132 plug-in DLL (please refer to chapter DVK90132 DLL)

Script example and MLX90132 response:

FieldOff.tcl

```
00001 #Load the TCL Plugin for MLX90132 applications
00002 load D://StrfnfcaPlugin.dll
00003
00004 #Turn the field off
00005 set AnsFieldOFF  [FieldOff]
00006
00007 #Displays the command and the result in the console
00008 puts "\nField OFF"
00009 puts "Resp = $AnsFieldOFF"
```

Script run:

```
Field OFF
Resp = 0000
Exit
(Ezdit) %
```

5.2.1.3 Select

The command “Select” is used to select the RFID communication mode of the MLX90132. The parameters are described in the MLX90132 datasheet and this basic command is defined in the MLX90132 plug-in DLL (please refer to chapter DVK90132 DLL)

Script example and MLX90132 response:

Select.tcl

```
00001 #Load the TCL Plugin for MLX90132 applications
00002 load D://StrfnfcaPlugin.dll
00003
00004 #Turn the field off
00005 FieldOff
00006
00007 #Select ISO14443A protocol
00008 set Init_TypeA    0200
00009 #Sends the command Idn through the STM32 to MLX90132 and stores the result in "Init_TypeA"
00010 set InitResp          [Select $Init_TypeA]
00011
00012 #Displays the command and the result in the console
00013 puts "\nInit Card Type A"
00014 puts "Cmd  =  $Init_TypeA"
00015 puts "Resp = $InitResp"
```

Script run:

```
Init Card Type A
Cmd  =  0200
Resp = 0000
Exit
(Ezdit) %
```

5.2.1.4 SendReceive

The command “SendReceive” is used to manage the RFID communication in Reader mode. This command sends a request to the TAG or Target and gets the corresponding answer from the TAG or Target. The “SendReceive” command has to be used after the RFID protocol is selected with the command “Select”. The parameters are described in the MLX90132 datasheet and this basic command is defined in the MLX90132 plug-in DLL (please refer to chapter DVK90132 DLL).

Script example and MLX90132 response:

SendReceive.tcl

```
00001 #Load the TCL Plugin for MLX90132 applications
00002 load D://StrfnfcaPlugin.dll
00003
00004 #Turn the field off
00005 FieldOff
00006
00007 #Select ISO14443A protocol
00008 set Init_TypeA    0200
00009 #Sends the command Idn through the STM32 to MLX90132 and stores the result in "Init_TypeA"
00010 set InitResp          [Select $Init_TypeA]
00011
00012 #Displays the command and the result in the console
00013 puts "\nInit Card Type A"
00014 puts "Cmd  =  $Init_TypeA"
00015 puts "Resp = $InitResp"
00016
00017 #REQA Attempt
00018 set REQA    2607
00019 #Sends the command through the STM32 to MLX90132 and stores the result in "ATQA"
00020 set ATQA    [SendReceive $REQA]
00021
00022 #Displays the command and the result in the console
00023 puts "\nREQ A"
00024 puts "Cmd  =  $REQA"
00025 puts "Resp = $ATQA"
```

Script run:

```
Init Card Type A
Cmd  =  0200
Resp = 0000

REQ A
Cmd  =  2607
Resp = 80054400280000
Exit
(Ezdit) %
```

5.2.1.5 TAG detector example

This script provides an example on how to use the TAG detector function of the MLX90132. For more information, please refer to the application note MLX90130/32 Tag Detector available on **Melexis SoftDist**, in directory MLX90132/MLX90132_Documentation/MLX90132_Application_notes.
This script allows the user to define the parameters of the TAG detector and then performs the calibration to output the two threshold levels. After calibration is performed, the MLX90132 is programmed with those two thresholds and the system is waiting during approximately 10s. The message “a TAG was detected” is displayed if a TAG – or any other object able to modify the near environment of the DVK90132 antenna - is detected during the next 10s.

Script example and MLX90132 response:

TagDetector_calib.tcl

```
00001 # ----------------------------------------------------------------------------------------------------------------------
00002 # Name          : Tag detector Calibartion
00003 # Description   : This script performs an automatic calibration on the TAG detector, by using the IDLE command.
00004 #               : Once finished, it automatically enters the tag detector mode for around 10s, (set by the timeout counter)
00005 #               : At the end of timeout, it will tell if  a TAG has been detected or not during this period
00006 # Version       : 001 (December 2011)
00007 # Contact       : dru@melexis.com
00008 #----------------------------------------------------------------------------------------------------------------------
00009 #Load the TCL Plugin for MLX90132 applications
00010 load D://Strfnfcaplugin.dll
00011
00012 set WUflags  03
00013 set EnterCtrlL  22
00014 set EnterCtrlH  00
00015 set WUCtrlL 38
00016 set WUCtrlH 01
00017 set LeaveCtrlL  18
00018 set LeaveCtrlH  00
00019 set WUperiod  22
00020 set OscStart  60
00021 set Dacstart 60
00022 set dacL 24
00023 set dacH FC
00024 set Swingcnt 3F
00025 set MaxSleep 00
00026
00027 #read back command
00028 set ReadBack_IDLE 01000000
00029
00030 # delay
00031 set ms 300
00032 #set CheckAnswer  [STCmd $ReadBack]
00033 #puts "empty buffer= $CheckAnswer"
00034
00035 # Set Field OFF
00036 FieldOff
00037
00038 #algorythme to check DacCal and genearte DacCabH, DacCabL
```

Script run:

```
Console  Notes
Run Command : D:/TCL/tclsh85.exe {D:/projects/90132/DVK90132/CD_Cont
Low Threshold calibrated value: 94
High Threshold calibrated value: a0
Set TagDetector mode in loop with timeout of 10s
Wait for 10s ....
TAG detector mode result:  000102, a TAG was detected
Exit
(Desktop) %
```

5.2.1.6 ISO/IEC14443 REQA and REQB requests

In the following example, the MLX90132 is configured to send commands requests compatible with ISO/IEC14443 type A and type B. These commands allow getting the UID of the compatible TAGs present in the field.

Note: ISO/IEC14443 international standard is available on the ISO/IEC web-site www.iso.org.

REQA_REB_example.tcl

```
00001 #Load the TCL Plugin for MLX90132 applications
00002 load D://StrfnfcaPlugin.dll
00003
00004 #Turn the field off
00005 FieldOff
00006
00007
00008 #Select ISO14443A protocol
00009 puts "\nInit Card Type A"
00010 set Init_TypeA    0200
00011 #Sends the command through the STM32 to MLX90132 and stores the result in "Init_TypeA"
00012 set InitResp          [Select $Init_TypeA]
00013
00014 #REQA Attempt
00015 set REQA    2607
00016 #Sends the command through the STM32 to MLX90132 and stores the result in "ATQA"
00017 set ATQA    [SendReceive $REQA]
00018 puts "UID type A (ATQA) = $ATQA"
00019
00020 #Select ISO14443B protocol
00021 puts "\nInit Card Type B"
00022 set Init_TypeB    0301
00023 #Sends the command through the STM32 to MLX90132 and stores the result in "Init_TypeB"
00024 set InitResp          [Select $Init_TypeB]
00025
00026 #REQB Attempt
00027 set REQB    050000
00028 #Sends the command through the STM32 to MLX90132 and stores the result in "ATQB"
00029 set ATQB    [SendReceive $REQB]
00030 puts "UID type B (ATQB) = $ATQB"
```

Script run:

```
Init Card Type A
UID type A (ATQA) = 80054400280000

Init Card Type B
UID type B (ATQB) = 800F5092000606000000000007171A65800
Exit
(Ezdit) %
```

5.2.1.7 Basic door access

This example describes the basic script to implement a door access with a card or an NFC compliant mobile phone. The UID of the golden card/NFC phone is stored in the script. The script runs a continuous inventory and checks the answer with the golden UID. If it matches, a message “door open” is displayed otherwise the message “door close” remains.

Door_Access_Basic_14A_.tcl

```
00001 #Load the TCL Plugin for MLX90132 applications
00002 load D://StrfnfcaPlugin.dll
00003
00004 #Turn the field off
00005 FieldOff
00006
00007 #Select ISO14443A protocol
00008 puts "\nInit Card Type A"
00009 set Init_TypeA   0200
00010 #Sends the command through the STM32 to MLX90132and stores the result in "Init_TypeA"
00011 set InitResp          [Select $Init_TypeA]
00012
00013 #REQA Attempt
00014 set REQA   2607
00015 #Sends the command through the STM32 to MLX90132 and stores the result in "ATQA"
00016 set ATQA   [SendReceive $REQA]
00017
00018 # define the UID of the golden key
00019 set Golden_key "80050200280000"
00020
00021 puts "---------------------- "
00022 puts "   Door Closed  "
00023 puts "---------------------- "
00024
00025 #set i 0
00026 while {$ATQA != $Golden_key } {
00027 #incr i
00028 set REQA   2607
00029 set ATQA   [SendReceive $REQA]
00030 }
00031
00032 puts "------------------------------------------------------ "
00033 puts "   Golden key detected  =>  Door Open  "
00034 puts "------------------------------------------------------ "
00035 puts ""
```

Script run:

No valid card placed in front of DVK90132 antenna

```
Init Card Type A
----------------------
   Door Closed
----------------------
(Ezdit) %
```

Valid TAG in front of DVK90132 antenna (Golden key detected)

```
Init Card Type A
----------------------
   Door Closed
----------------------
------------------------------------------------------
   Golden key detected  =>  Door Open
------------------------------------------------------

Exit
(Ezdit) %
```

The following picture shows when a NFC compliant mobile phone with a valid key is placed on the DVK90132 antenna, the golden UID is recognized and displayed.

Figure 9: **NFC enabled car for access and start**

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