NXP TouchGFX

WEBINAR

Empower your embedded display with dashing graphics
fast and easy with a real-time WYSIWYG UI designer

Overview

Agenda:

- About TouchGFX
- TouchGFX Technology
- NXP LPC546xx Technology
- TouchGFX Development
  - Live demo
- TouchGFX services & Support
  – Getting started
- Questions

Presenters:

Brendon Slade
Director
MCU Tools & Ecosystem
NXP Semiconductors

Jørgen Mygind
Business Development
TouchGFX

Martin Stissing
Software Architect
TouchGFX

TouchGFX

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About TouchGFX

TouchGFX is a software framework written in C++ that unlocks the graphical user interface on your embedded hardware.

The technology lets you create high-end GUIs that meet today's smartphone standards at a fraction of the cost.

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About TouchGFX

Max Performance

TouchGFX enables you to achieve the highest level of smartphone UI performance on resource constrained devices like Cortex M based microcontrollers.

Create Anything

Through easy creation of custom widgets, TouchGFX is your perfect tool for developing one-of-a-kind applications with a smartphone look and feel.

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About TouchGFX

Modern GUI Features

TouchGFX enables:

- Transparency
- Alpha-Blending
- Anti-Aliased Fonts and Kerning
- Touch Gestures
- Animations
- Texture Mapping
- Screen Transitions
- Video Playback
- High-Resolution Displays
- High Frame Rate

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About TouchGFX

Easy Development

- Use our graphical WYSIWYG tool, TouchGFX Designer, and create your own prototype in minutes
- Run your application on a supported developer board, or port to your custom hardware
- Try before buying: Get our free and fully functional evaluation version
- Choose your preferred IDE for development, e.g. MCUXpresso
- Support for all major compilers: IAR, Keil, GCC

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About TouchGFX

Mettler Toledo

Application

- Display for precision balance
- Touch screen with intuitive control
- Shared code base for various screen sizes

Hardware Solution

- NXP - LPC

Full case descriptions at www.touchgfx.com/en/cases/

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About TouchGFX

OneBreath

Application

- Control display for ventilator
- Intuitive touch screen with low resource requirements
- Two-chip solution to enhance security

Hardware Solution

- NXP LPC 4357

Full case descriptions at www.touchgfx.com/en/cases/

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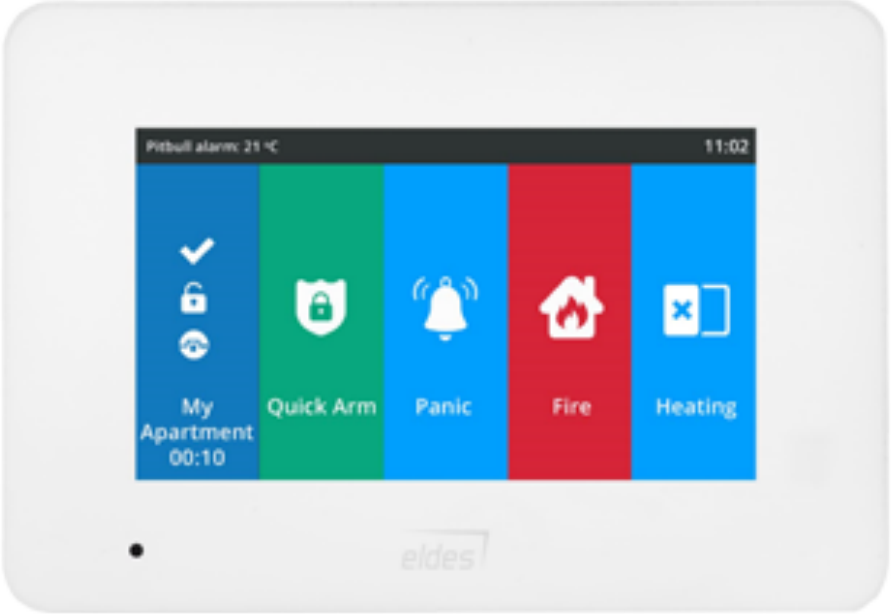
About TouchGFX

Eldes

Application

- Control pad for home security systems
- Touch based wireless and battery driven control pad
- Functionality and high-end design on low resources



Hardware Solution

- NXP LPC 185x

Full case descriptions at www.touchgfx.com/en/cases/

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About TouchGFX

Jeff Rowland

Application

- Control Panel for Amplifier
- Smartphone gestures for easy navigation and control integrated with physical buttons.

Hardware Solution

- NXP LPC4353
- 7” 800 x 480 capacitive touch

Full case descriptions at www.touchgfx.com/en/cases/

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Technology

DRAUPNER©
GRAPHICS

TouchGFX Technology
Key Concepts

Optimized for Microcontrollers

Highly optimized for performance, flash size, and memory consumption matching the constraints of microcontrollers.

MCU Offload:

- Compile and Run time Analysis
- Utilization of hardware acceleration

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TouchGFX Technology

Key Concepts

Advanced Rendering Algorithms

Optimized visible surface determination algorithm and customized invalidation techniques minimize the number of drawn pixels.

Easy Creation of Custom Controls

Create custom controls by extending or modifying existing widgets or by combining existing controls with custom functionality.

Advanced Graphical Objects

Draw lines, circles, custom shapes, and graphics, or apply scaling and 3D rotation to images at runtime with highly optimized and memory efficient algorithms.

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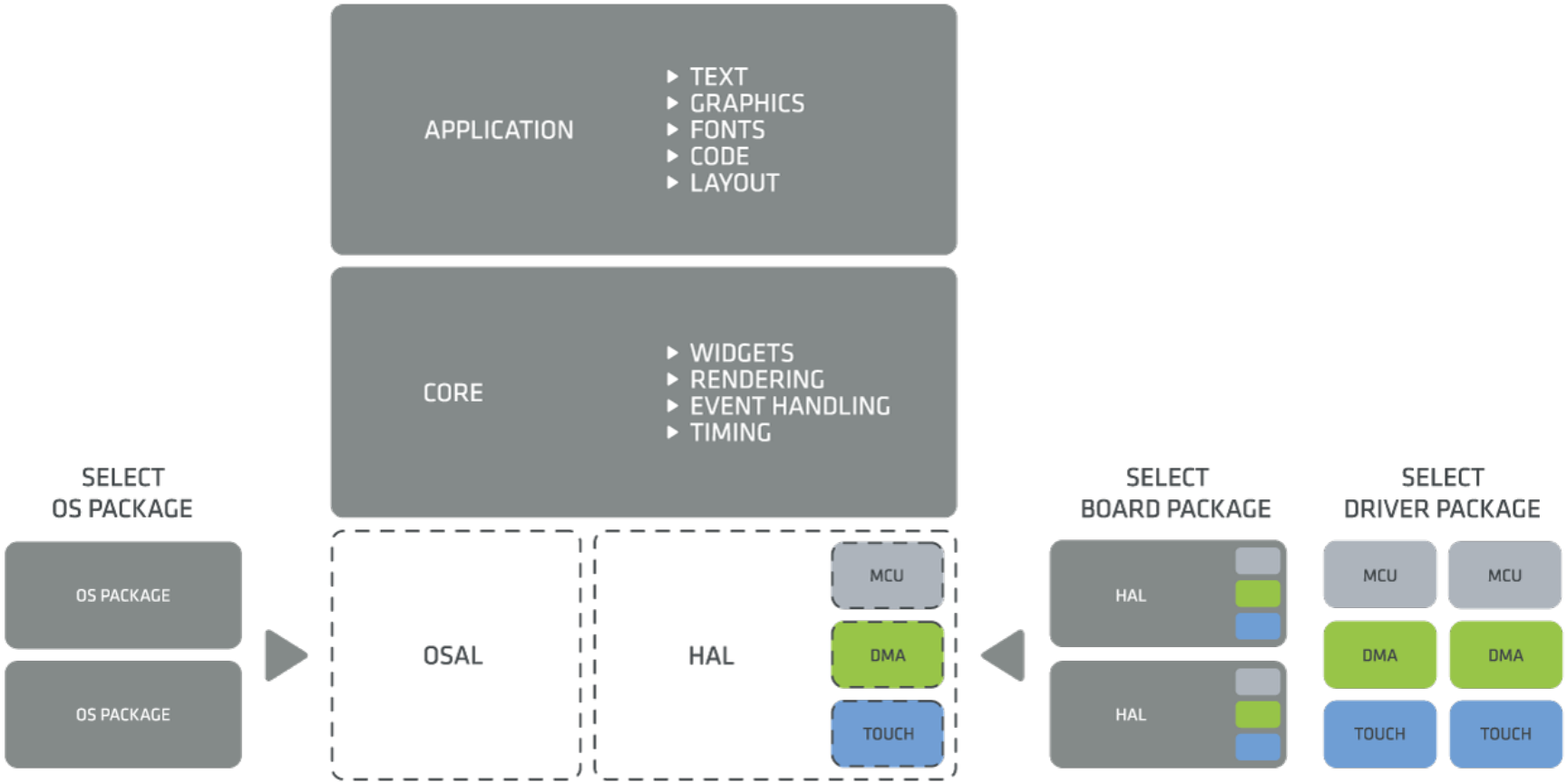
Software Layers



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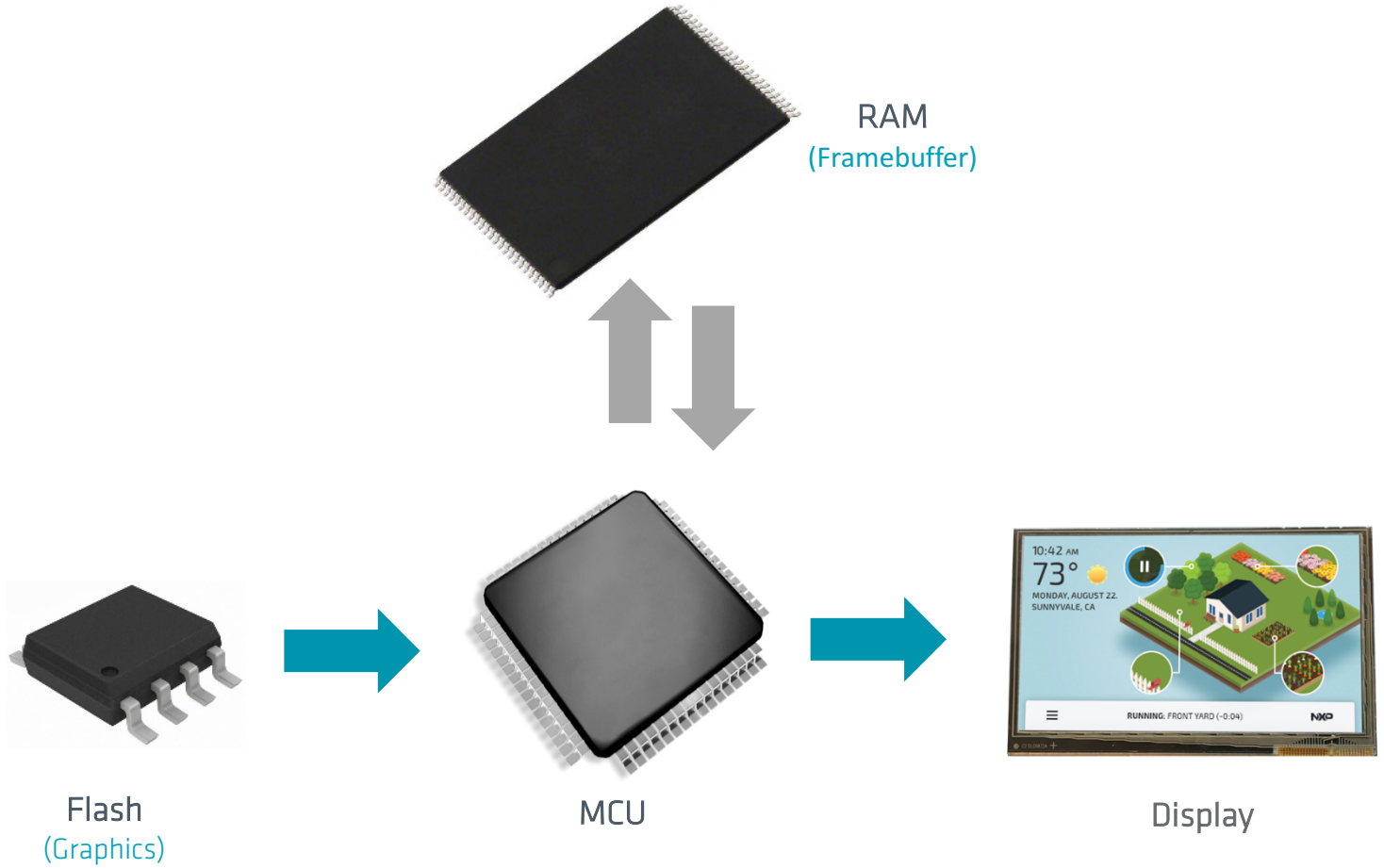
Hardware Setup

Required Hardware:

- **Display**
  e.g. TFT-LCD WQVGA
- **MCU – Microcontroller**
  E.g. LPC4088
- **Flash for Graphics**
  Internal or external
- **RAM**
  for 1-3 framebuffers
  Internal or external



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Required Memory Resources

Internal RAM for library:
- 10-20 kB (framework and stack)
- 1-15 kB (widgets)

Internal/External RAM for framebuffer(s):
Memory usage depends on display resolution, color depth and the number of framebuffers (1,2 or 3).
Example: 480x272, 16 bit color, 2 framebuffers:
480 x 272 x 2 bytes x 2 = 520 kB.
If internal RAM, one framebuffer is sufficient.

Internal/External Flash for library:
- 20 kB (framework)
- 1-100 kB (screen definitions, GUI logic)

Internal/External Flash for image data:
Depends on the total size of the graphical elements, typically 1-20 MB.

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Targeted Platforms

Display:

- 1” to approximately 10” (1024x768)
- Also LCD with integrated framebuffers and controllers
- Types e.g: Parallel RGB, MIPI-DSI, 8080/SPI

Operating System:

- Runs on any RTOS
  (uses just one task and two semaphores)
- Runs on Bare Metal (no OS)
- Linux Support

CPU Frequency	Display Size
24-48 MHz	160 x 128 – 1,8” 320 x 240 – QVGA - 3,5”
48-128 MHz	320 x 240 – QVGA - 3,5” 480 x 272 – WQVGA, 4,3”
98-176 MHz	480 x 272 – WQVGA - 4,3 640 x 480 – VGA - 5”
148-204 MHz	640 x 480 – VGA - 5” * 800 x 480 – WVGA - 7”
180-300 MHz	800 x 480 – WVGA - 7” 1024 x 768 – XGA - 10”

* LPC546xx runs up to these display sizes

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LPC Technology

Why Developers Select LPC Microcontrollers

1. Product Innovation
2. Broad Ecosystem
3. Quality & Longevity
4. Local Support
5. Extensive Software & Tools

Investing in Innovative & Differentiated Technologies
to Maintain our Global Leadership in the Broad Market

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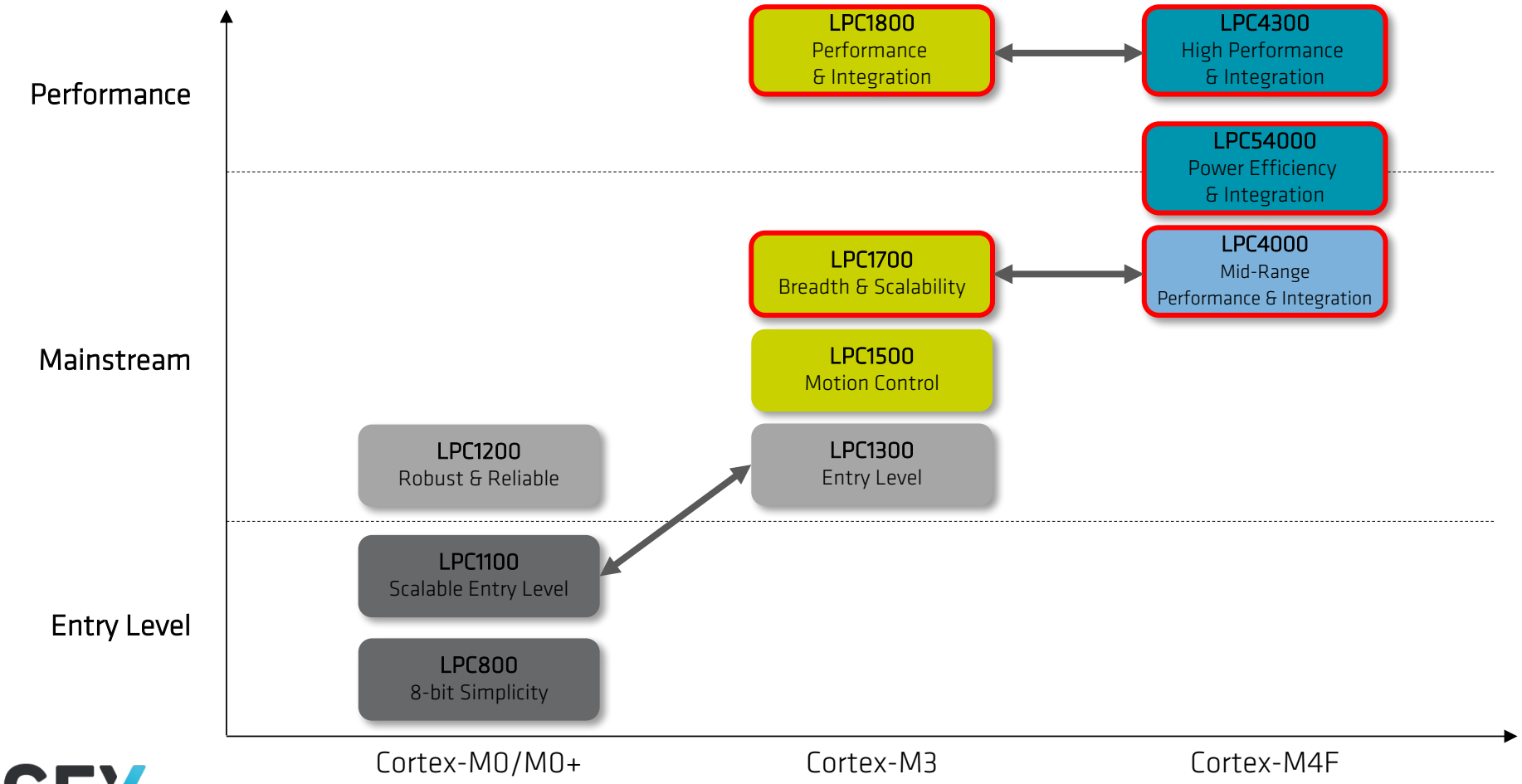
LPC Microcontroller Portfolio



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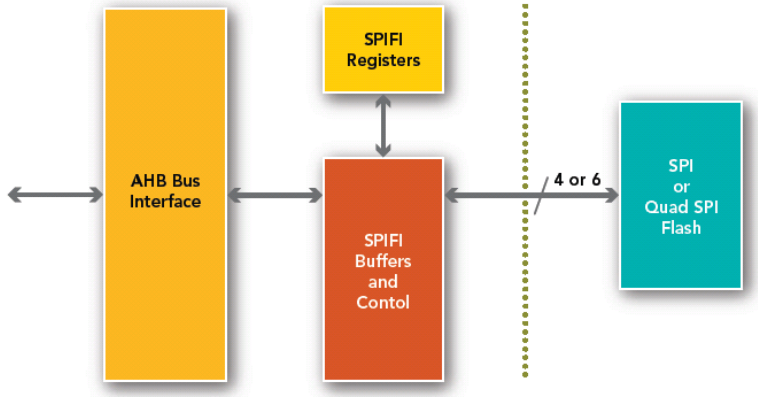
Key Feature
SPIFI (SPI Flash Interface)

SPIFI enables Flash to appear in MCU memory map and be read like other on-chip memory (including DMA).

Why use SPIFI?

- Cost: small, inexpensive serial Flash
- Performance: ~70% of internal Flash
- Space: Saves board space and pins
- App size: Ideal for storing image/data



Key Feature
Graphic LCD Interface

Key features

- Support for STN and TFT panels
- Up to 1024x768 resolution
- 24-bit LCD interface supports 24bpp (16M colors)
- Palette table allows display of up to 256 of 64K colors
- Adjustable LCD bus size supports various panel bus configurations
- Dedicated LCD DMA controller
  Hardware cursor support

Fully supported by MCUXpresso SDK Board Support Packages.

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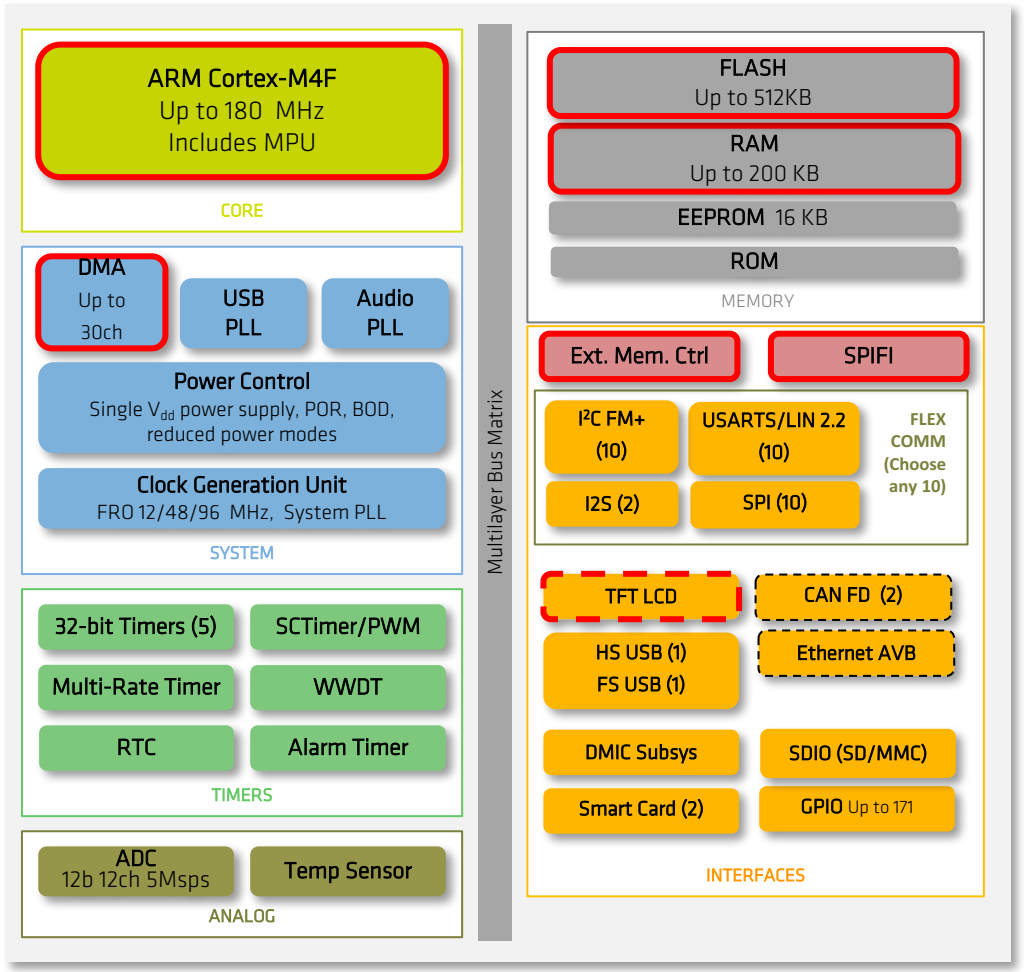
LPC546xx Block Diagram



CPU

- 180MHz Cortex-M4F

Memory

- Up to 512 KB Flash, Up to 200 KB RAM
- 16 KB EEPROM

Interfaces for connectivity & sensors

- Stereo DMIC subsystem
- 1x HS USB (H/D) w/ on-chip HS PHY, XTAL-less FS USB (H/D)
- 10 SPI, 10 I2C, 10 UART, 2 I2S channels (max 10 channels total)
- Graphic LCD with resolutions up to 1024x768
- Ethernet AVB
- 2 x CAN-FD controller
- Quad SPI flash interface
- External Memory interface (up to 32 bits)

Packages

- LQFP208 (28 x 28 mm), TFBGA180 (12 x 12 mm)
- LQFP100, TFBGA100

Other

- Operating voltage: 1.71 to 3.6V
- Temperature range: -40 to 105 °C

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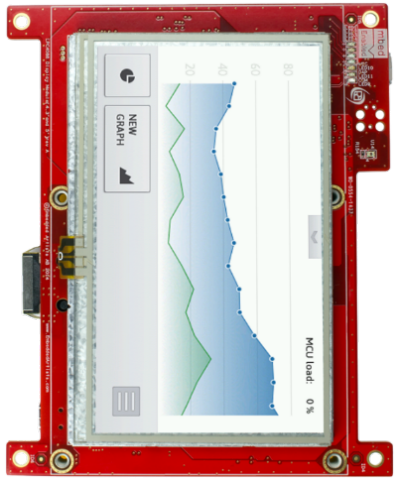
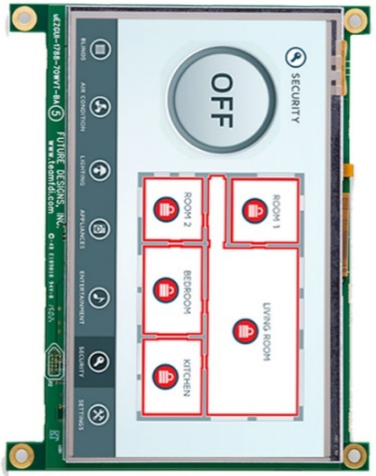
Supported LPC based Hardware

TouchGFX Supported Boards



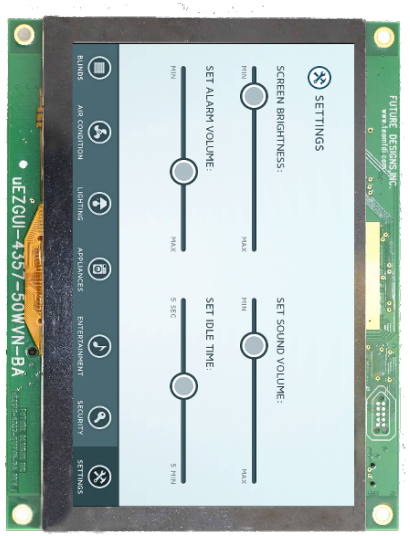
Embedded Artists
Display Module
LPC 4088

Display:
4.3”, 5.0”

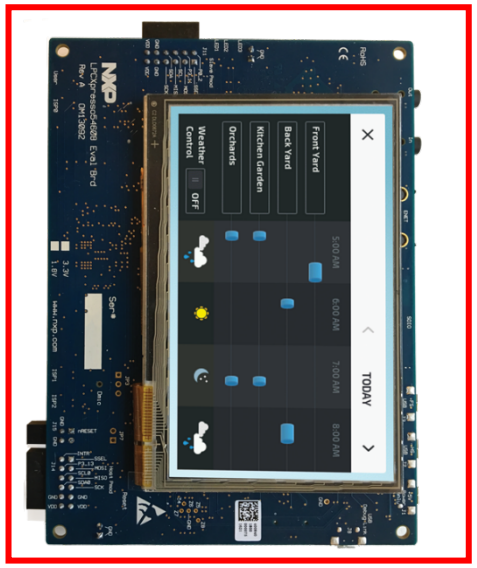


FDI Tech
µEZ GUI Standalone
LPC1788
ARM Cortex-M3,
120 MHz
Display:
4.3”

FDI Tech
µEZ GUI Standalone
LPC4088
ARM Cortex-M4F
120 MHz
Display:
4.3”



FDI Tech
µEZ GUI-4357
LPC4357
ARM Cortex-M4F
204 MHz
Display:
5.0”



LPCXpresso54608
LPC546xx
ARM Cortex-M4
180 MHz

Display:
4.3”

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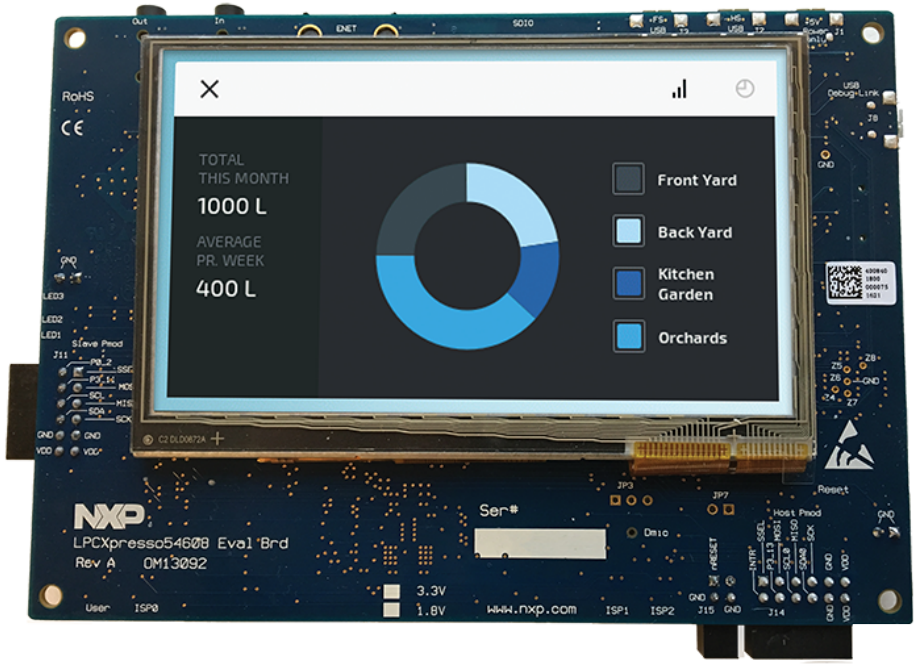
LPCXpresso54608

Development platform for LPC546xx Series

- LPC54608 MCU running at 180MHz
- 4.3” TFT LCD (272x480) cap touch display
- 128Mb Micron SDRAM
- 128Mb Micron quad SPI flash
- Built-in CMSIS-DAP/J-link debug probe
- Ethernet, DMIC, SD card, USB HS/FS ports
- Stereo audio codec
- Arduino UNO R3 compatible expansion ports



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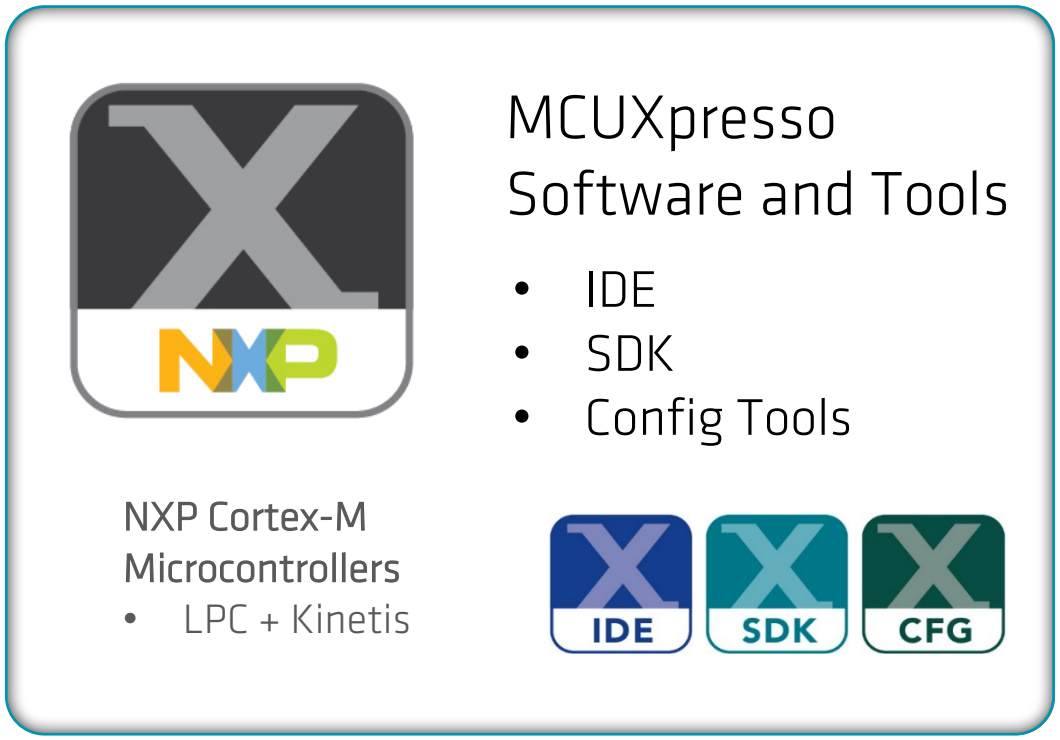
MCUXpresso Software and Tools

For LPC & Kinetis Microcontrollers



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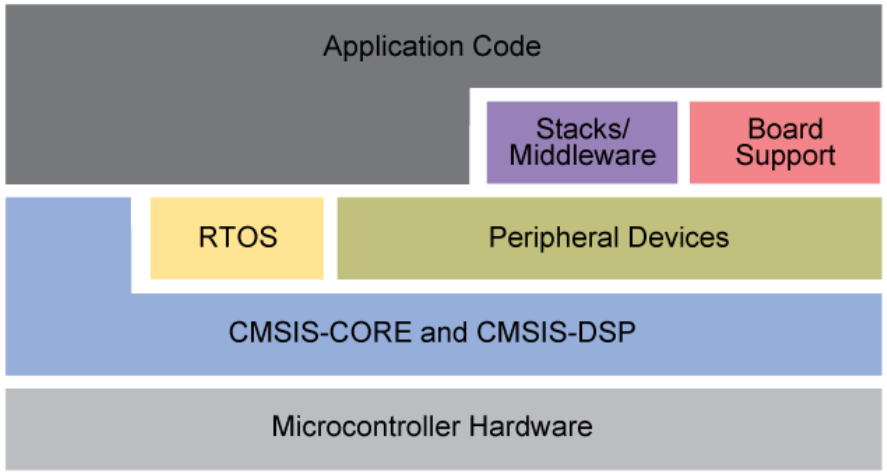
MCUXpresso SDK

Software framework and reference for LPC & Kinetis MCU application development



Features

Architecture:

- CMSIS-CORE compatible
- Single driver for each peripheral
- Transactional APIs w/ optional DMA support for communication peripherals

Integrated RTOS support (optional):

- FreeRTOS
- RTOS-native driver wrappers

Integrated Stacks and Middleware

- USB Host, Device and OTG, lwIP, FatFS
- Crypto acceleration wolfSSL & mbedTLS
- SD card support

Reference Software:

- Peripheral driver usage examples
- Application demos
- FreeRTOS usage demos

License:

- BSD 3-clause for startup/drivers/USB

Toolchains:

- IAR®, Keil®, MCUXpresso IDE*

Quality

- Production-grade software
- MISRA 2004 compliance
- Checked with Coverity® static analysis tools

*Support for MCUXpresso IDE in March 2017

Learn more at: www.nxp.com/mcuxpresso/sdk

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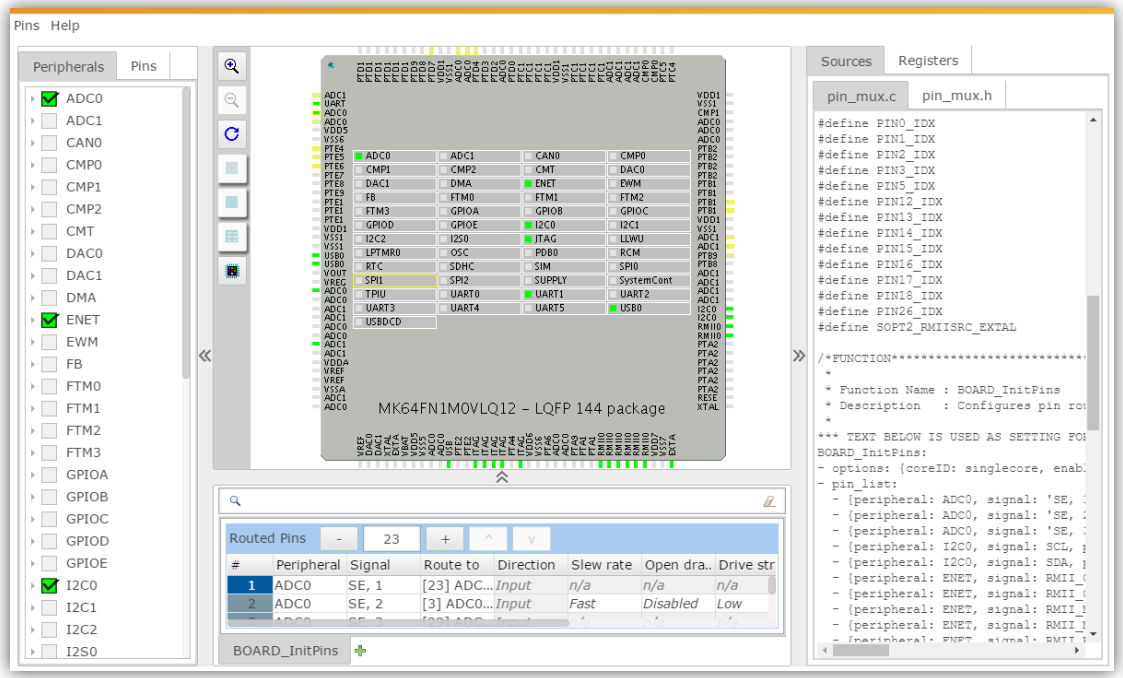
MCUXpresso Config - Pins Tool

Easy-to-use Muxing and Pin Assignments for Kinetis & LPC Microcontrollers



Features:

- Muxing and pin configuration with consistency checking
- Graphical processor package view
- Multiple configuration blocks/functions
- Optimized assignments of functionality to pins
  - Selection of Pins and Peripherals
  - Package with IP blocks
  - Routed pins with electrical characteristics
  - Registers with configured and reset values
- Generates documented, easy to understand ANSI C/C++

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Learn more at: www.nxp.com/mcuxpresso/config

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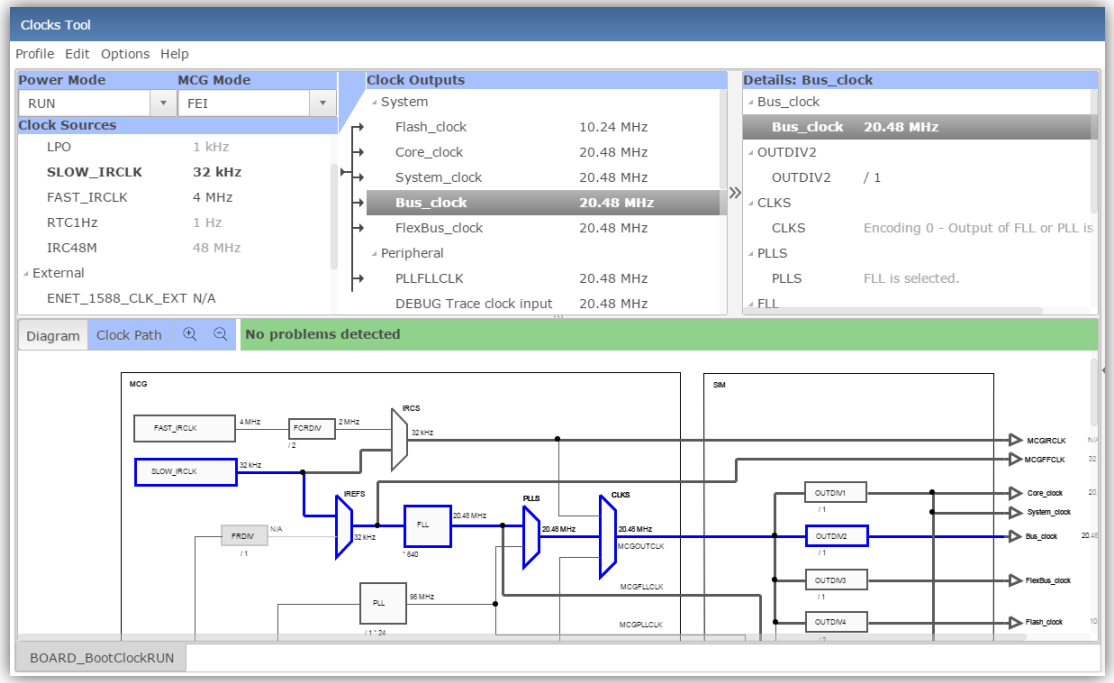
MCUXpresso Config - Clocks Tool

Easy-to-use clock configuration for Kinetis & LPC



Features:

- System clock configuration with consistency checking
- ANSI-C initialization code
- Graphical clock diagrams
- Easy-to-use guided graphical user interface
  - Selection of Clock Sources
  - Configuration of prescalers and clock outputs
  - Details and Full Diagram views with clock path
  - Registers with configured and reset values
- Generates documented, easy to understand ANSI C/C++

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Coming for LPC546xx in March 2017
Learn more at: www.nxp.com/mcuxpresso/config

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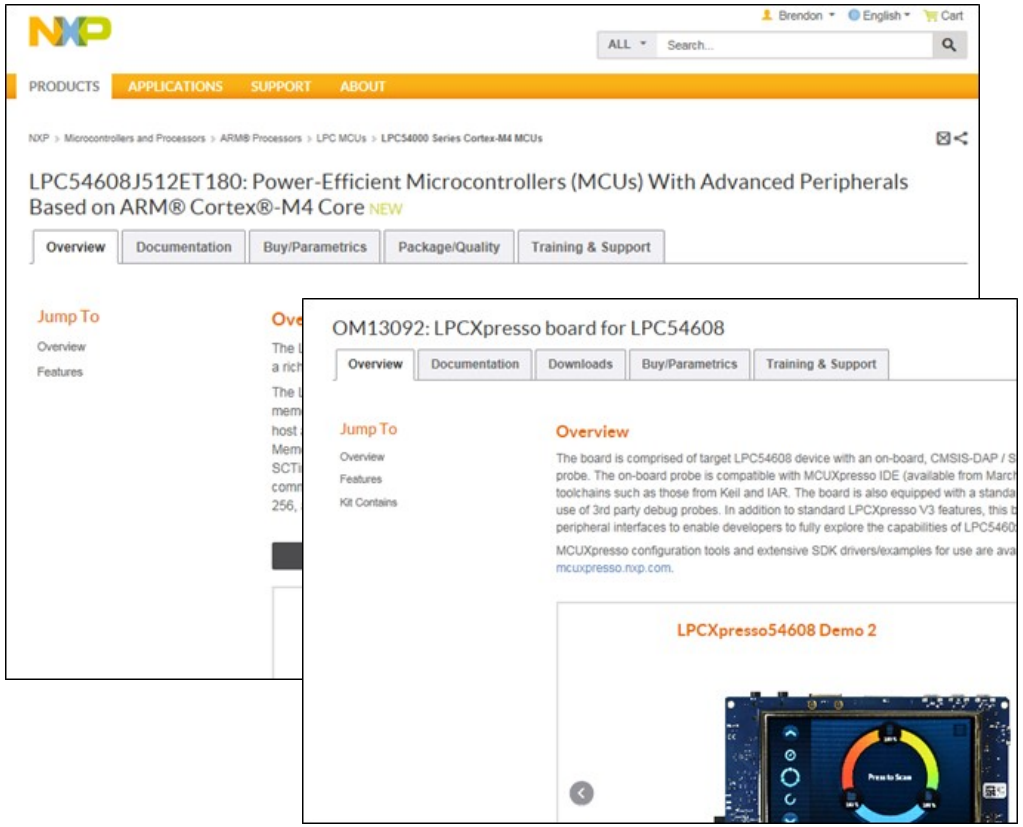
Where to Find Information on NXP MCUs

Visit nxp.com for information on:

- The LPC range of MCUs nxp.com/lpc
- The LPCXpresso54608 board nxp.com/demoboard/om13092



TouchGFX Irrigation (Sprinkler) system concept:

- Source code provided; use with eval version of TouchGFX tools
- Ready for IAR (late Feb) and MCUXpresso (late March)
- www.nxp.com/NXPdesigns

Site also provides contacts for your local distributors

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TouchGFX

Development

DRAUPNER© GRAPHICS

TouchGFX Development

Developer-Friendly Framework

To create the perfect environment for fast development of advanced and rich graphical interfaces, TouchGFX combines:

- The simplicity of a WYSIWYG designer
- The efficiency and flexibility of C++
- The convenience of a PC simulator

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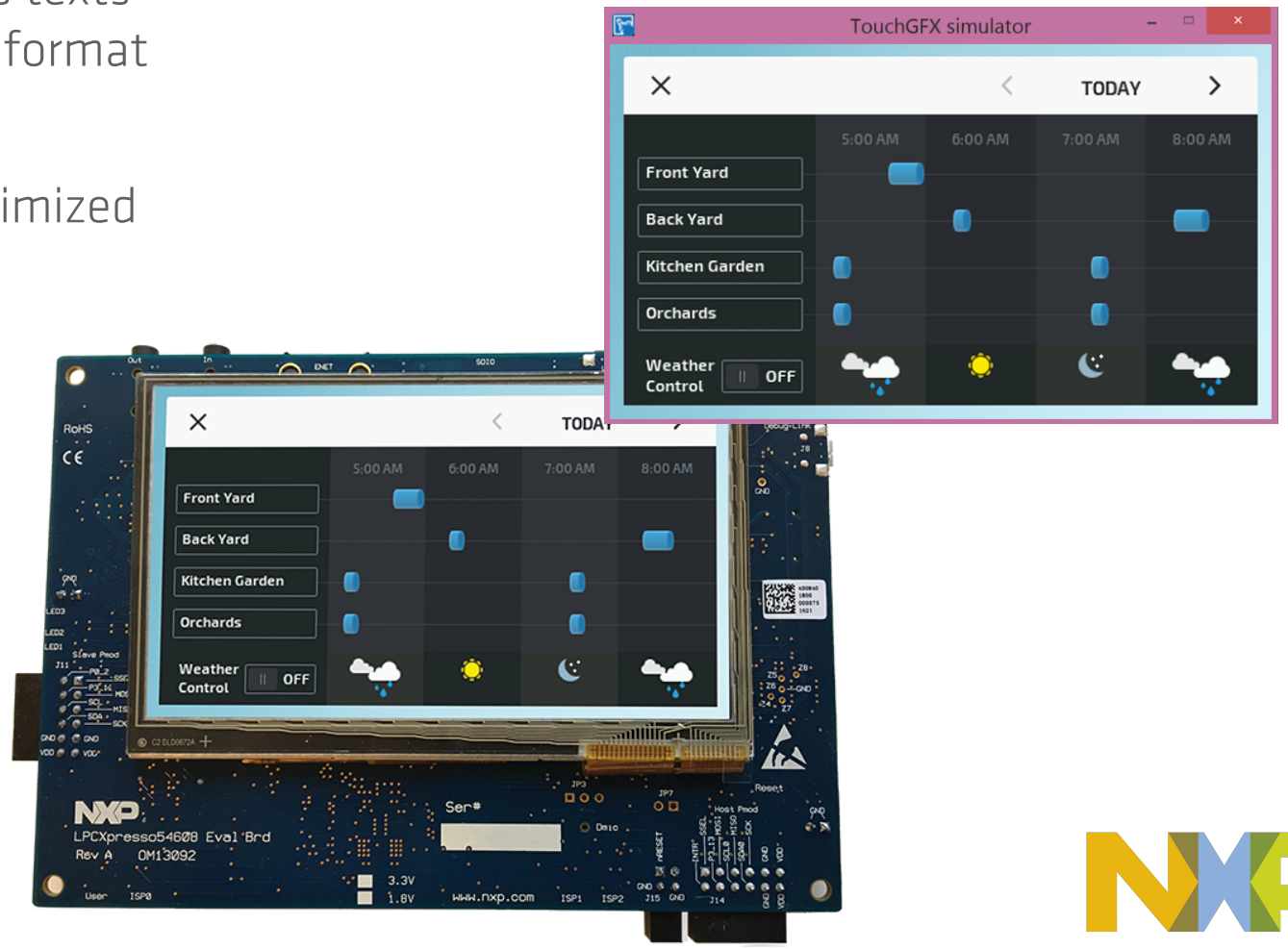
TouchGFX Development

TouchGFX Tools

- **Text Converter**
  Manages multiple languages and converts texts and translations into an optimized target format
- **Image Converter**
  Converts application images to target optimized format
- **Font Converter**
  Converts .ttf font files into target optimized format
- **PC Simulator**
  For easy validation and testing of your application during development



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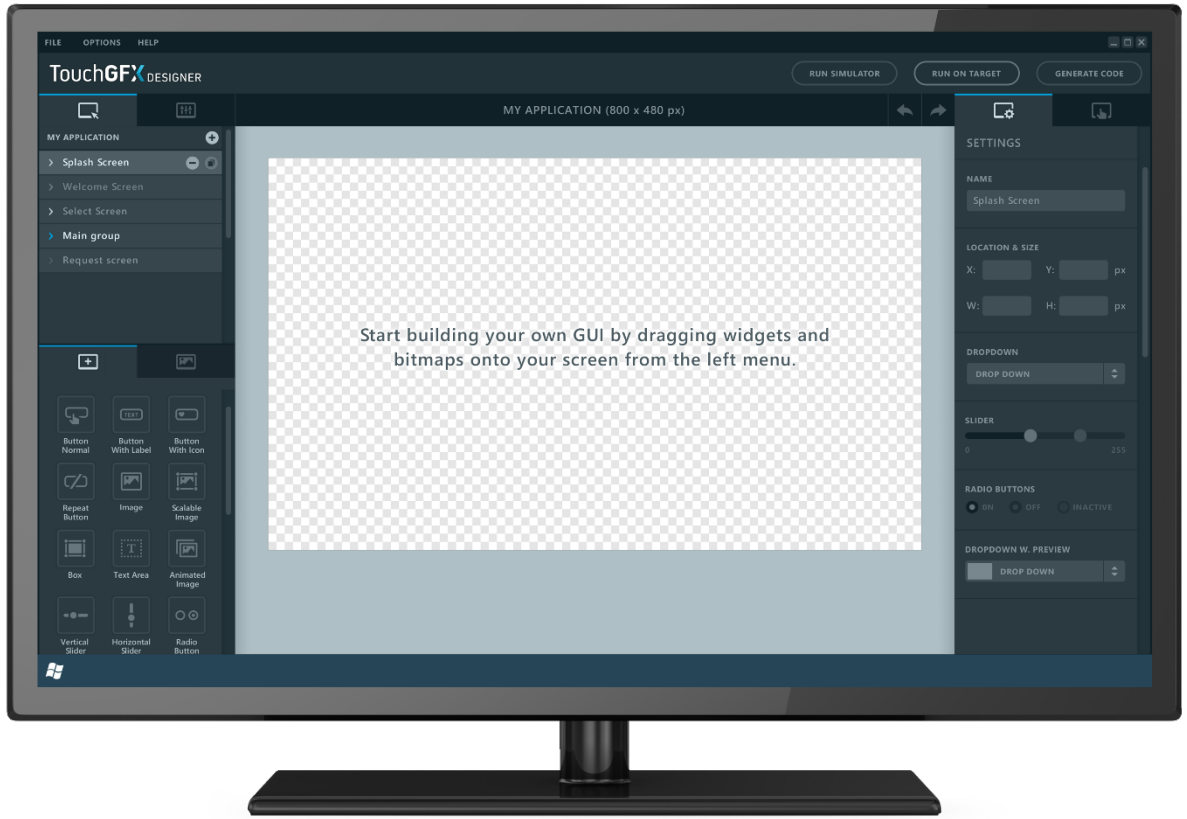
TouchGFX Development
Live Demo

TouchGFX Designer

A graphical tool for designing the visual appearance of your TouchGFX application in a fast and effective manner.

A simple drag n' drop approach combined with ready-to-use high quality sample graphics (skins) enables you to create stunning prototypes in minutes with no need for advanced design and programming skills or TouchGFX knowledge



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Services & Support

Getting started

Services and Support
Try Before You Buy

TouchGFX comes in a fully functional evaluation version, free-of-charge.

Evaluate and create a proof-of-concept before buying:

1. Order a TouchGFX Free Evaluation version here
2. Explore the demos and create your own test apps
   - Sprinkler demo for LPC546xx board available here
3. Deploy on the PC-simulator, supported board, or port TouchGFX to your custom hardware
4. Select and buy your TouchGFX license

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TouchGFX Support
Self-Service Solutions

Free Resources: Anytime, Anywhere

The TouchGFX Help Center is your gateway to TouchGFX knowledge and support.

Visit our thriving community to exchange solutions with peers and the TouchGFX team, get started easily with tutorials, or dig into our free articles and videos in our knowledge base.

Getting Started

Learn the basics of TouchGFX

Knowledge Base

Discover helpful articles

Community

Get help and help others

Links provided for more information.

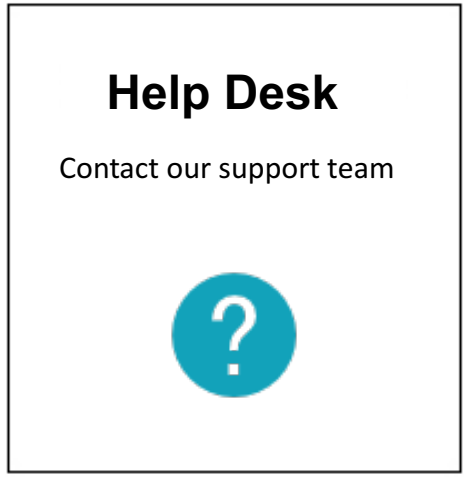
TouchGFX

TouchGFX Support
Help Desk Service

Paid Dedicated and Personal Technical Support

TouchGFX Help Desk offers dedicated and personal technical support concerning general bug and framework issues, such as:

- Installation & compilation assistance
- Troubleshooting of porting & application development issues
- Advice on design & architecture
- Specific problems or bugs in the TouchGFX framework



Link provided for more information.

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TouchGFX Services
We Help You Get There

Make your work process fast and efficient
with our assorted Service solutions.

Choose from our four categories and get the support you need:

Support Coupons | Software | Hardware | Design

Links provided for more information.

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TouchGFX Services

Draupner Graphics provides:

- Porting of the TouchGFX Framework to Custom Hardware Platform
- Performance Optimization
- UX and Graphical Design Consultancy
- Developer Training
- On-Site Assistance
- Rapid Prototyping
- Design and Development

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TouchGFX Licenses

Evaluation
€ 0
Production Volume:
None/Year

- Full Precompiled Library
- BSPs, Demos, & Examples in Source Code
- Community Access
- Knowledge Base Access

Product Line Small
€ 5,000.-
Production Volume:
3,000/Year

- Full Precompiled Library
- BSPs, Demos, & Examples in Source Code
- Community Access
- Knowledge Base Access
- Support and Update Agreement (SUA), 1st Year
  (SUA after 1st year: € 1,000.-/year)

Product Line Large
€ 15,000.-
Production Volume:
50,000/Year

- Full Precompiled Library
- BSPs, Demos, & Examples in Source Code
- Community Access
- Knowledge Base Access
- Support and Update Agreement (SUA), 1st Year
  (SUA after 1st year: € 3,000.-/year)

TouchGFX

Note:
All license prices are one-time payments.
Customized license available

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Free Resources

- NXP TouchGFX page
- Help Center
- Evaluation version
- TouchGFX Designer Beta
  (official release: Early March 2017)

TouchGFX

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More information:

TouchGFX Distribution

NXP LPC546xx

TouchGFX

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