Universidad de Alcalá

LPC1768-Mini-DK2 Development board

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Departamento de Electrónica

Tarjeta LPC1768-Mini-DK2

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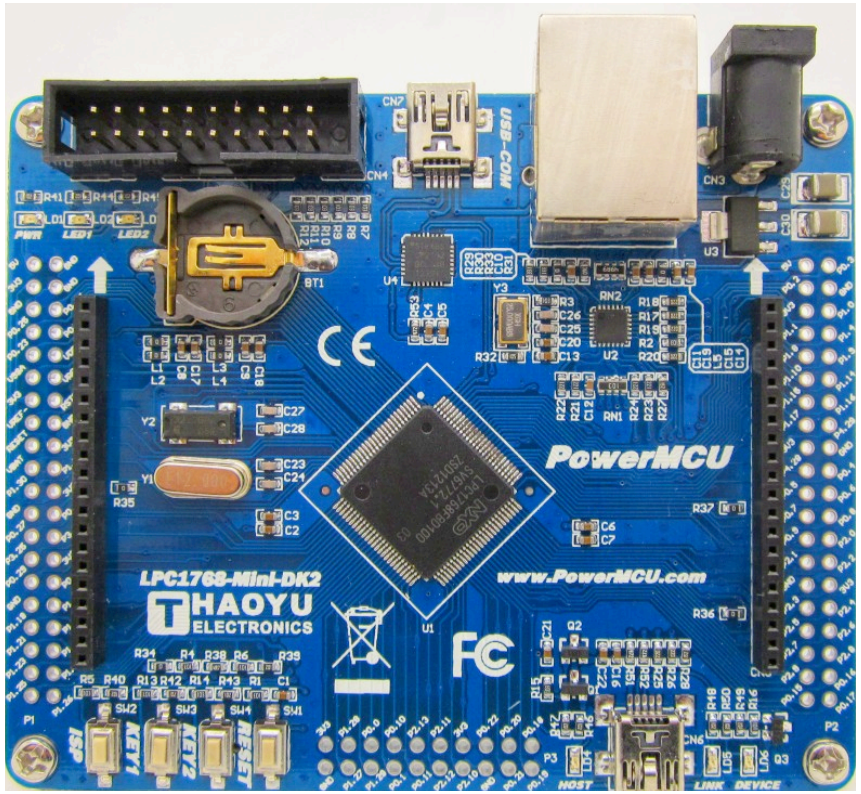
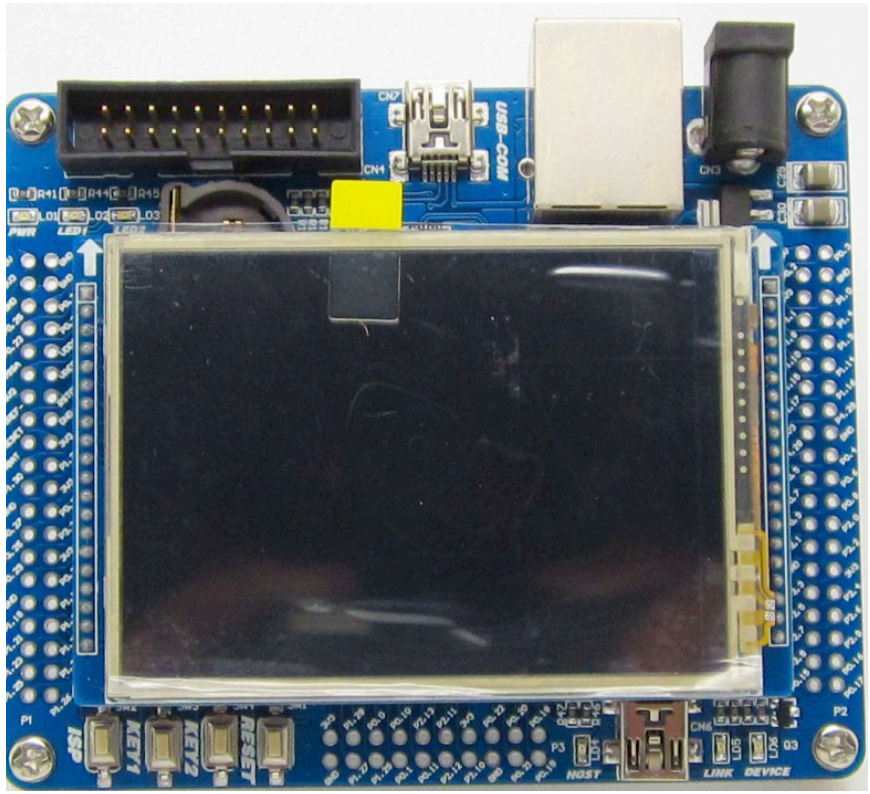
Tarjeta LPC1768-Mini-DK2

Nombre de la tarjeta: Tarjeta LPC1768-Mini-DK2 Development Board

Fabricante: THAOYU Electronics (http://www.hotmcu.com)

Descripción: Tarjeta basada en el LPC1768 de NXP

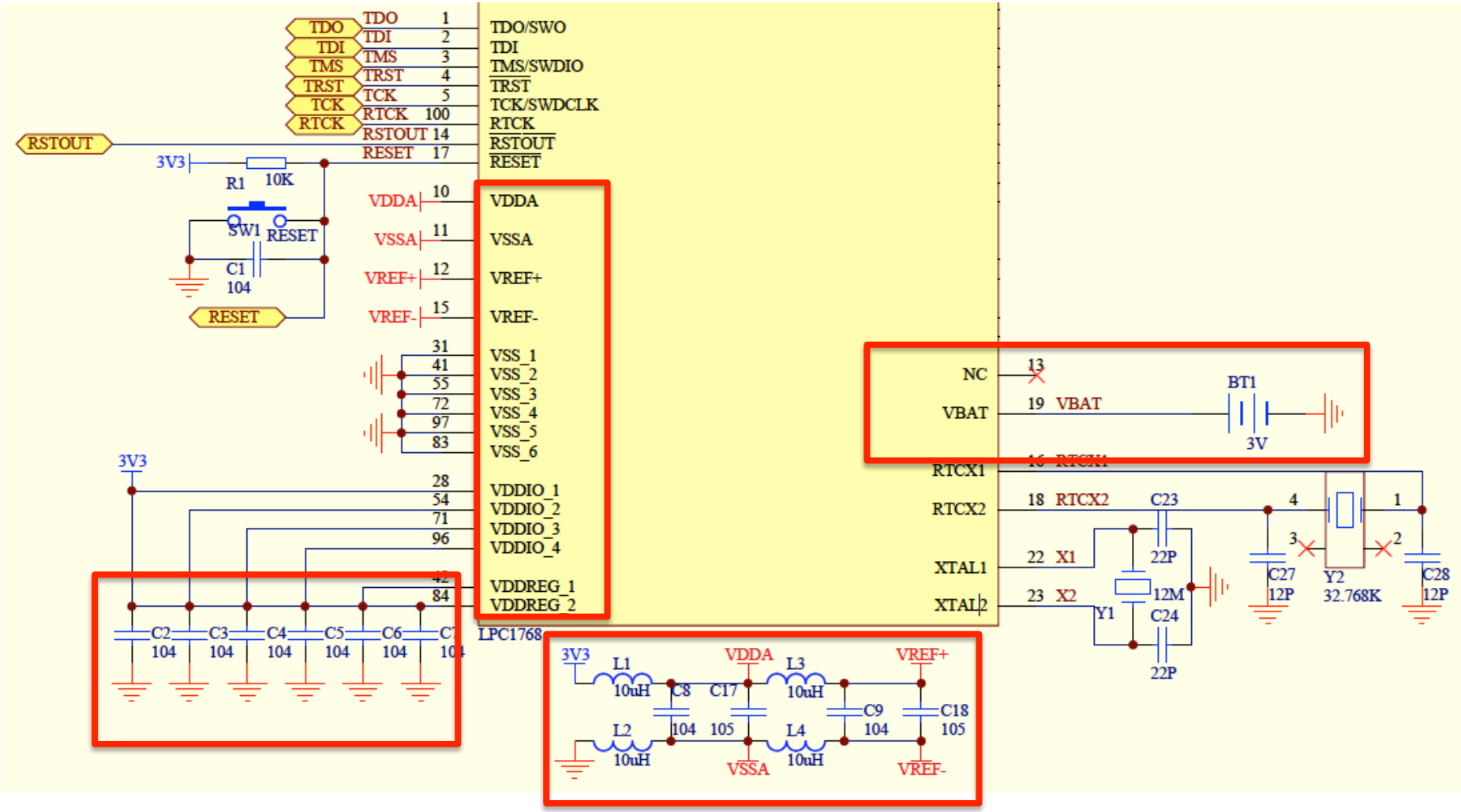




Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

Líneas de alimentación (Digital, Analógica, Puertos). Todo a 3.3 V



Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

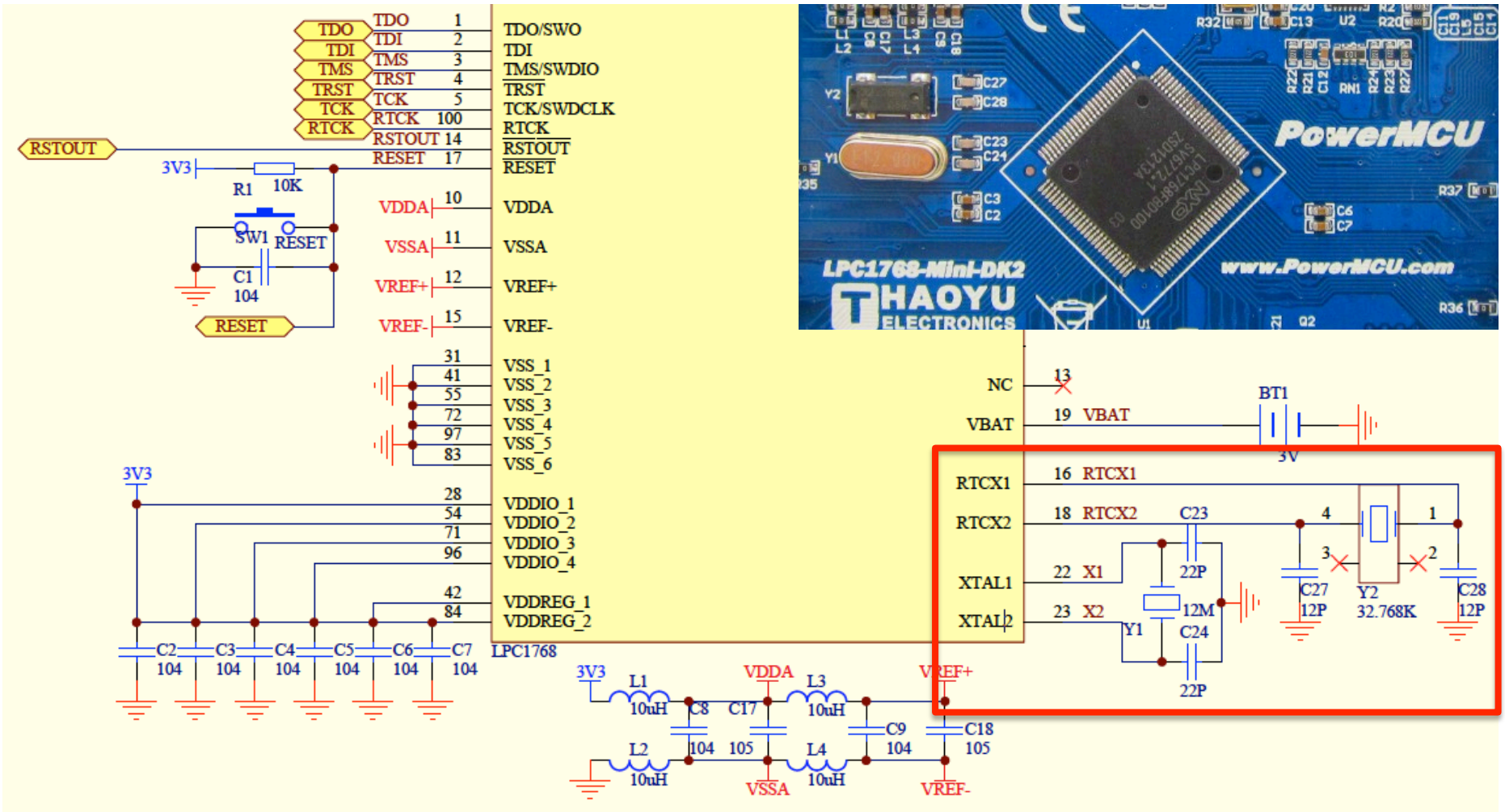
Líneas de alimentación (Digital, Analógica, Puertos). Todo a 3.3V

V_{SS}	31, 41, 55, 72, 83, 97[1]	24, 33, 43, 57, 66, 78[1]	I	**ground:** 0 V reference.
V_{SSA}	11[1]	9[1]	I	**analog ground:** 0 V reference. This should be the same voltage as V_{SS}, but should be isolated to minimize noise and error.
$V_{DD(3V3)}$	28, 54, 71, 96[1]	21, 42, 56, 77[1]	I	**3.3 V supply voltage:** This is the power supply voltage for I/O other than pins in the Vbat domain.
$V_{DD(REG)(3V3)}$	42, 84[1]	34, 67[1]	I	**3.3 V voltage regulator supply voltage:** This is the supply voltage for the on-chip voltage regulator only.
V_{DDA}	10[1]	8[1]	I	**analog 3.3 V pad supply voltage:** This can be connected to the same supply as $V_{DD(3V3)}$ but should be isolated to minimize noise and error. This voltage is used to power the ADC and DAC. **Note: this pin should be tied to 3.3v if the ADC and DAC are not used.**
V_{REFP}	12[1]	10[1]	I	**ADC positive reference voltage:** This should be nominally the same voltage as V_{DDA} but should be isolated to minimize noise and error. The voltage level on this pin is used as a reference for ADC and DAC. **Note: this pin should be tied to 3.3v if the ADC and DAC are not used.**
V_{REFN}	15[1]	12[1]	I	**ADC negative reference voltage:** This should be the same voltage as V_{SS} but should be isolated to minimize noise and error. Level on this pin is used as a reference for ADC and DAC.
V_{BAT}	19[1]	16[1]	I	**RTC domain power supply:** 3.3 V on this pin supplies the power to the RTC peripheral.
n.c.	13	-	-	not connected

Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

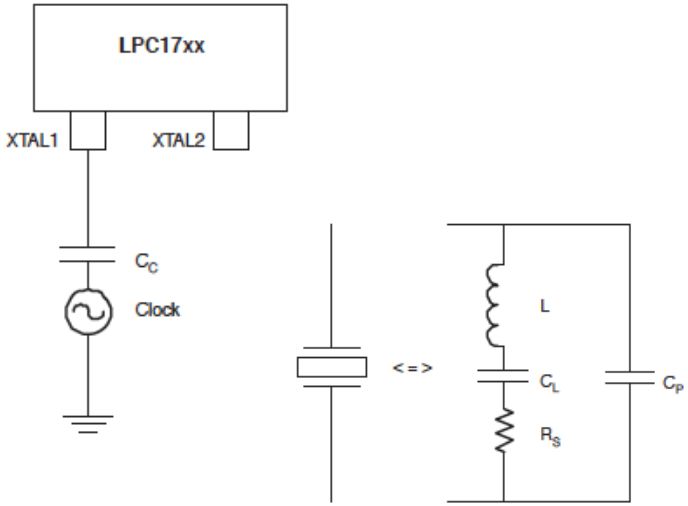
Circuitos de reloj externos (12MHz y 23,768KHz)



Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

Circuitos de reloj externos (12MHz y 23,768KHz)



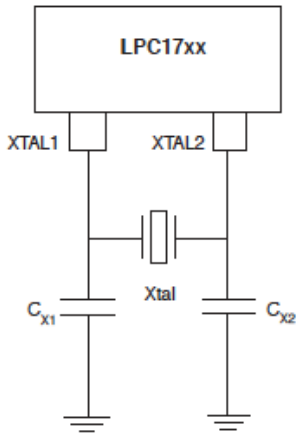


Table 15. Recommended values for $C_{X1/X2}$ in oscillation mode (crystal and external components parameters) low frequency mode (OSCRANGE = 0, see Table 13)

Fundamental oscillation frequency F_{osc}	Crystal load capacitance C_L	Maximum crystal series resistance R_S	External load capacitors C_{X1}, C_{X2}
1 MHz - 5 MHz	10 pF	< 300 Ω	18 pF, 18 pF
	20 pF	< 300 Ω	39 pF, 39 pF
	30 pF	< 300 Ω	57 pF, 57 pF
5 MHz - 10 MHz	10 pF	< 300 Ω	18 pF, 18 pF
	20 pF	< 200 Ω	39 pF, 39 pF
	30 pF	< 100 Ω	57 pF, 57 pF
10 MHz - 15 MHz	10 pF	< 160 Ω	18 pF, 18 pF
	20 pF	< 60 Ω	39 pF, 39 pF
15 MHz - 20 MHz	10 pF	< 80 Ω	18 pF, 18 pF

Table 16. Recommended values for $C_{X1/X2}$ in oscillation mode (crystal and external components parameters) high frequency mode (OSCRANGE = 1, see Table 13)

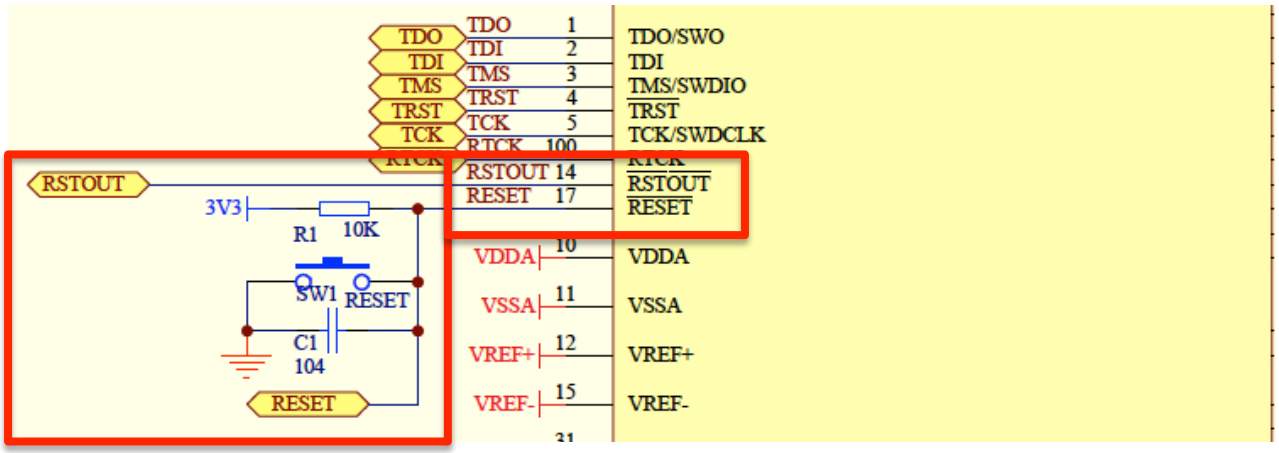
Fundamental oscillation frequency F_{osc}	Crystal load capacitance C_L	Maximum crystal series resistance R_S	External load capacitors C_{X1}, C_{X2}
15 MHz - 20 MHz	10 pF	< 180 Ω	18 pF, 18 pF
	20 pF	< 100 Ω	39 pF, 39 pF
20 MHz - 25 MHz	10 pF	< 160 Ω	18 pF, 18 pF
	20 pF	< 80 Ω	39 pF, 39 pF

Después del reset comienza con el internal rc-oscilator (4MHz)

Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

Reset (Activo a nivel bajo)

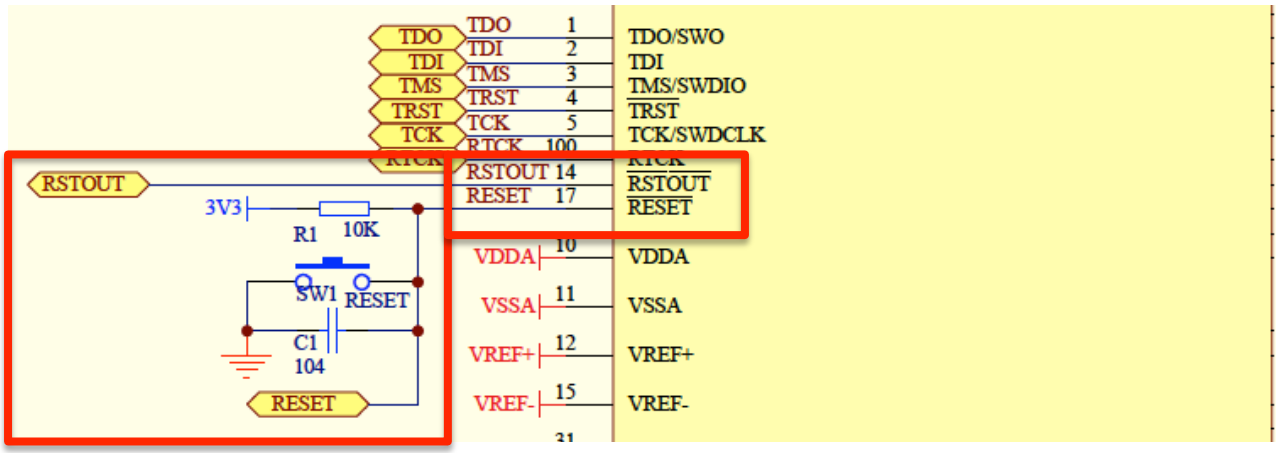


$\overline{\text{RSTOUT}}$	14	11	O	**$\overline{\text{RSTOUT}}$** — This is a 3.3 V pin. A LOW output on this pin indicates that the device is in the reset state, for any reason. This reflects the RESET input pin and all internal reset sources.
$\overline{\text{RESET}}$	17	14	I	**External reset input:** A LOW on this pin resets the device, causing I/O ports and peripherals to take on their default states, and processor execution to begin at address 0. This is a 5 V tolerant pad with a 20 ns glitch filter, TTL levels and hysteresis.

Tarjeta LPC1768-Mini-DK2

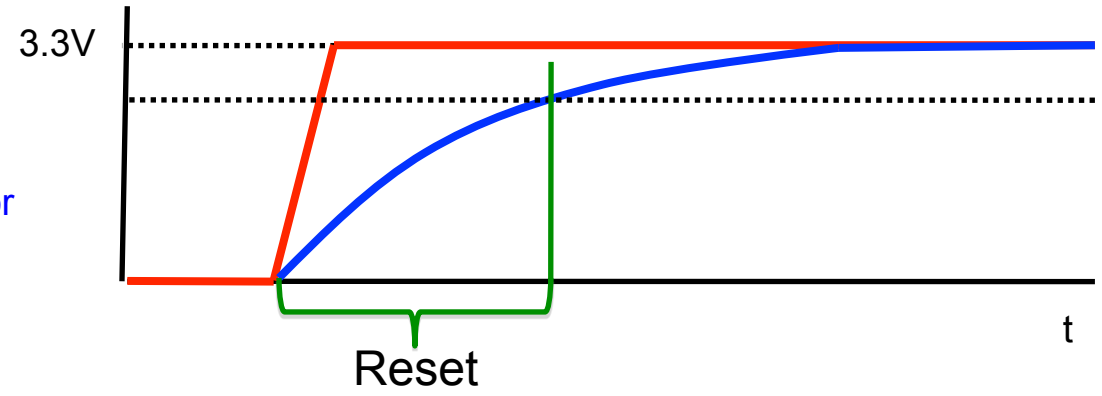
Conexiones básicas del microcontrolador

Reset (Activo a nivel bajo)



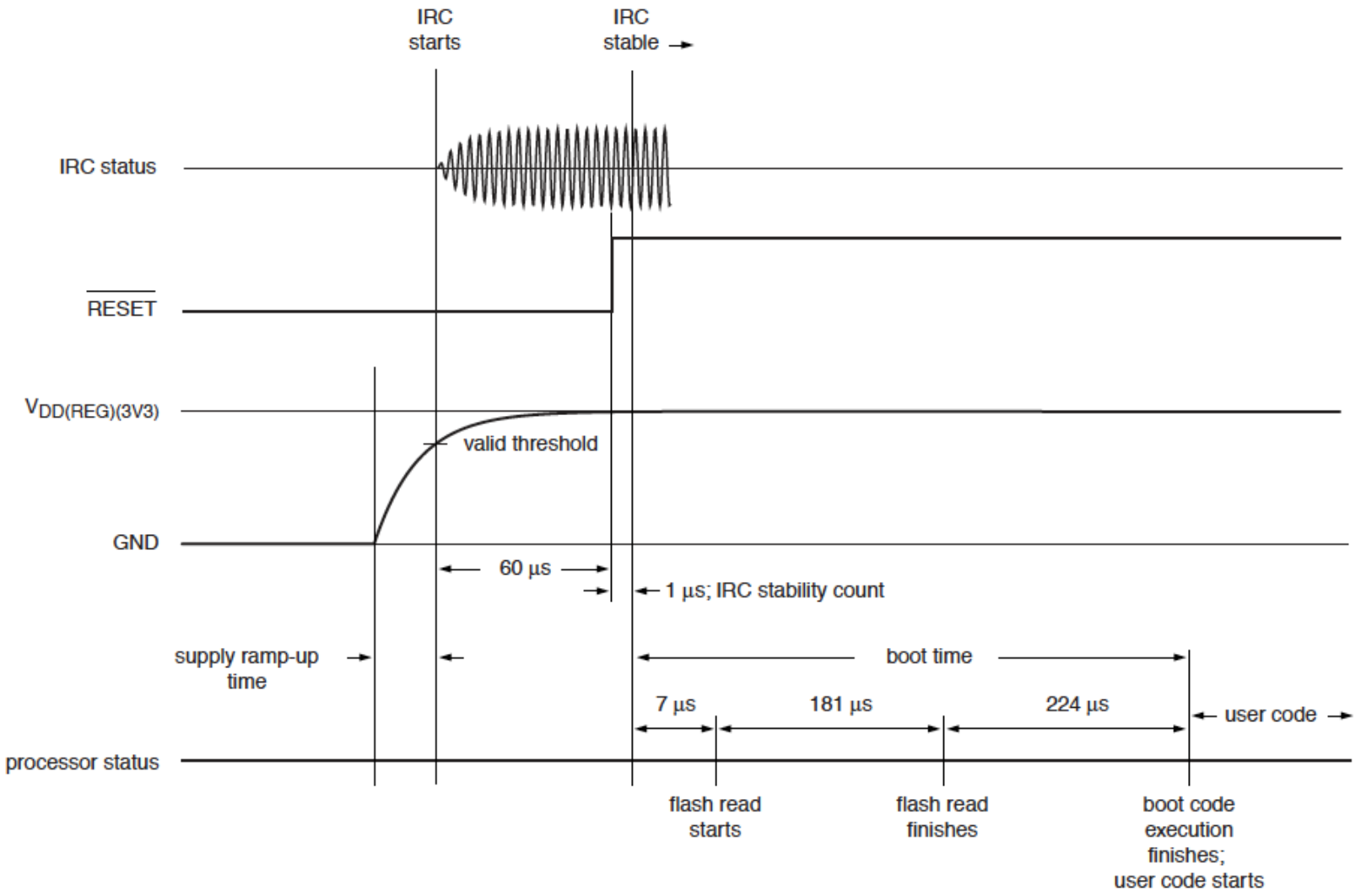
Al conectar la alimentación de la tarjeta, VDD sube rápido pero la señal RESET# tarda más en subir debido al circuito RC formado por R1 y C1 que mantiene RESET# a 0 el tiempo necesario para que el procesador se inicialice. La entrada RESET# es Schmitt-Trigger.

Al activar el Pulsador
RST# = 0 → Microcontrolador Reseteado



Tarjeta LPC1768-Mini-DK2

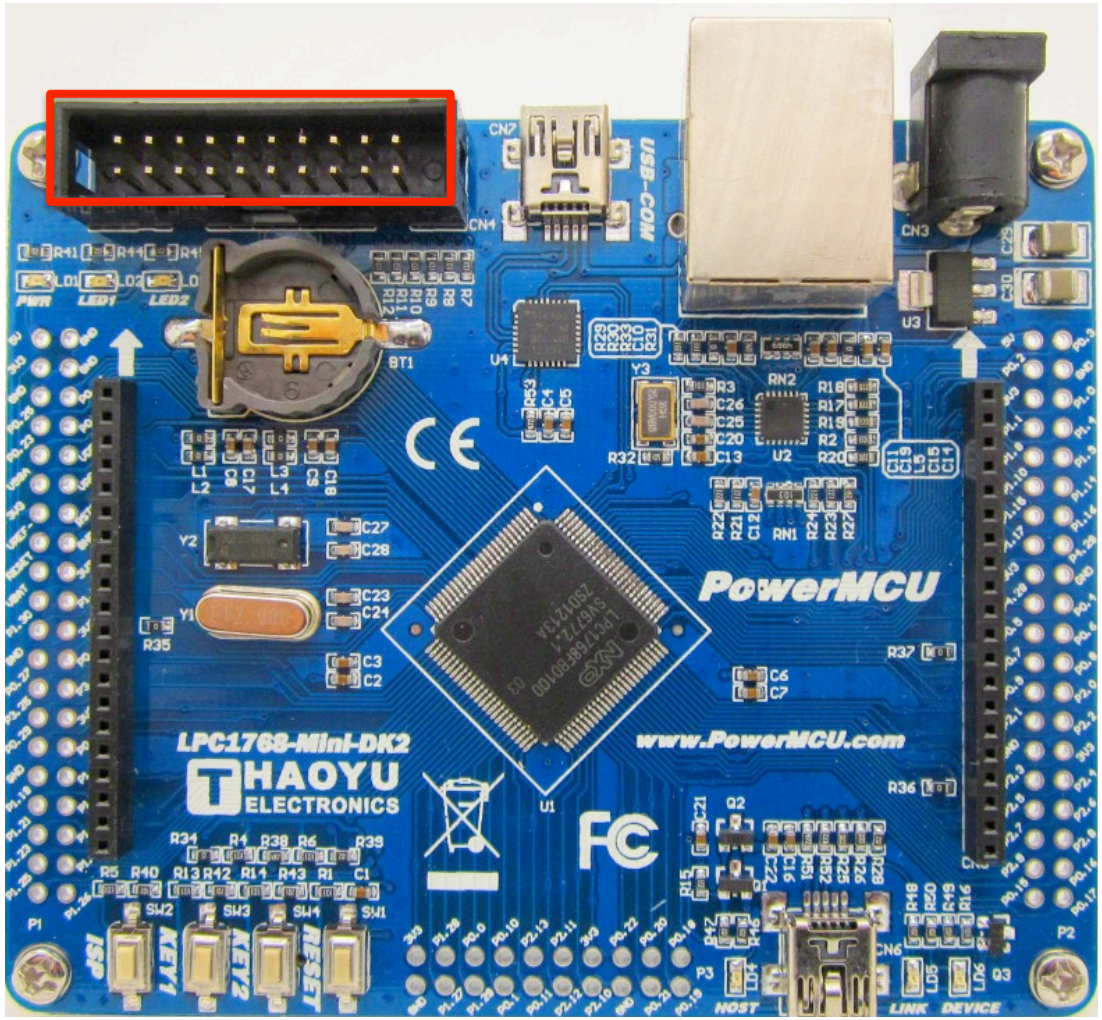
Conexiones básicas del microcontrolador



Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

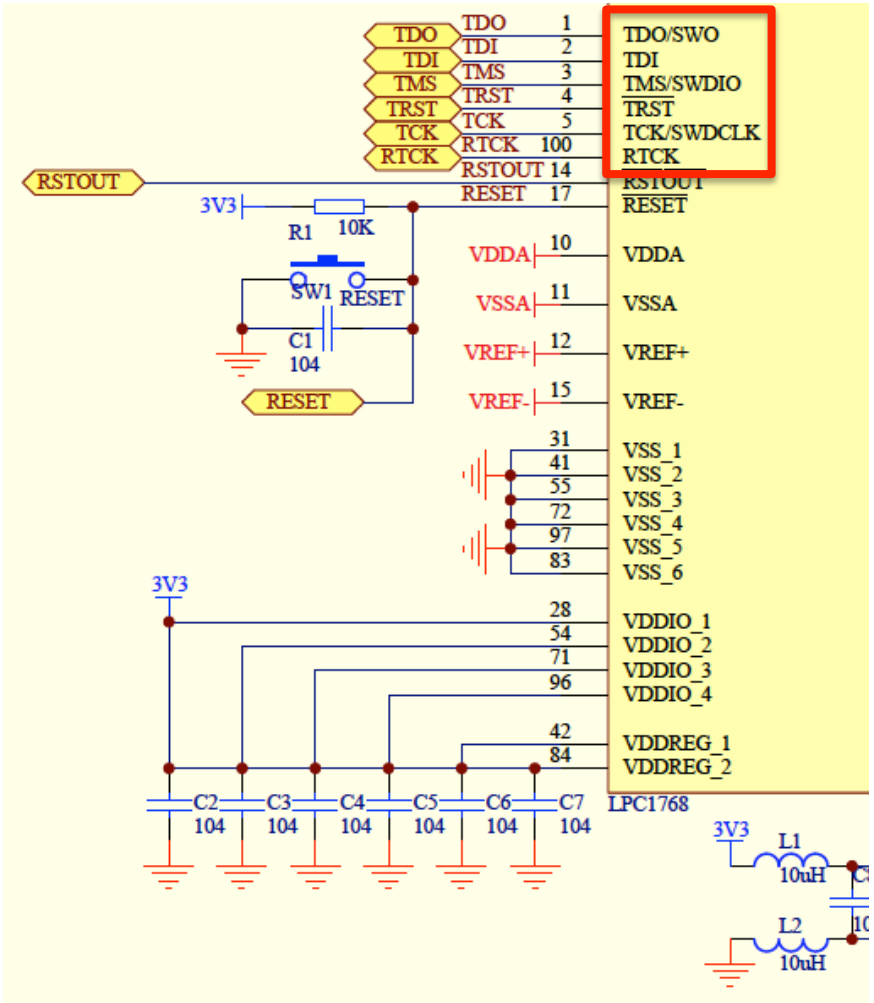
JTAG (Joint Test Action Group)

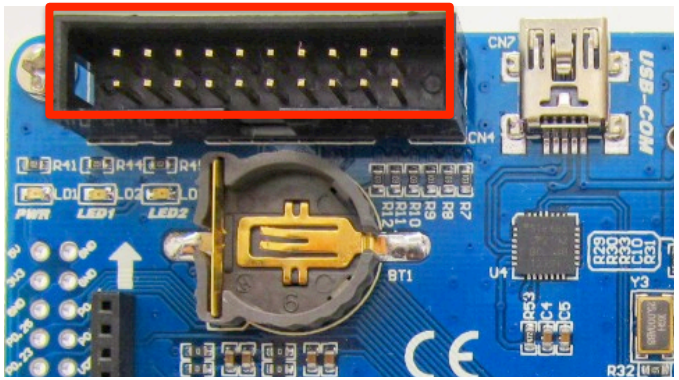


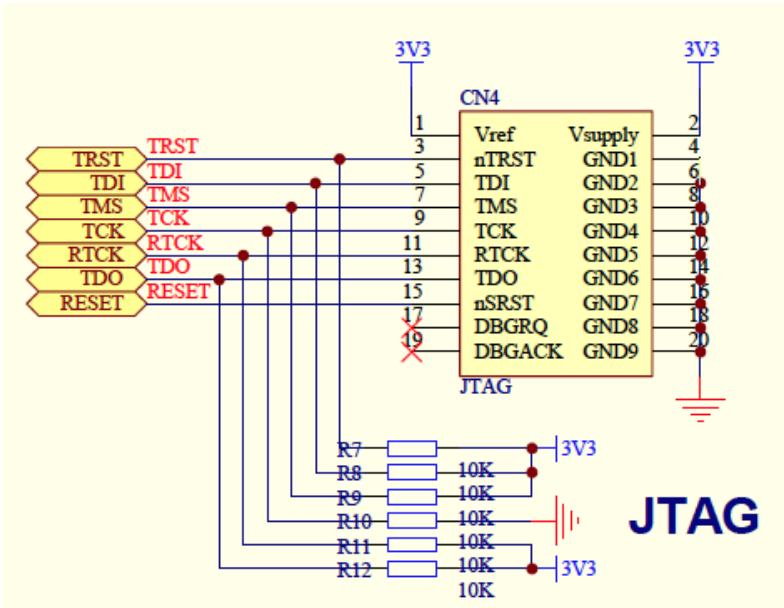
Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

JTAG (Joint Test Action Group)







Tarjeta LPC1768-Mini-DK2

Conexiones básicas del microcontrolador

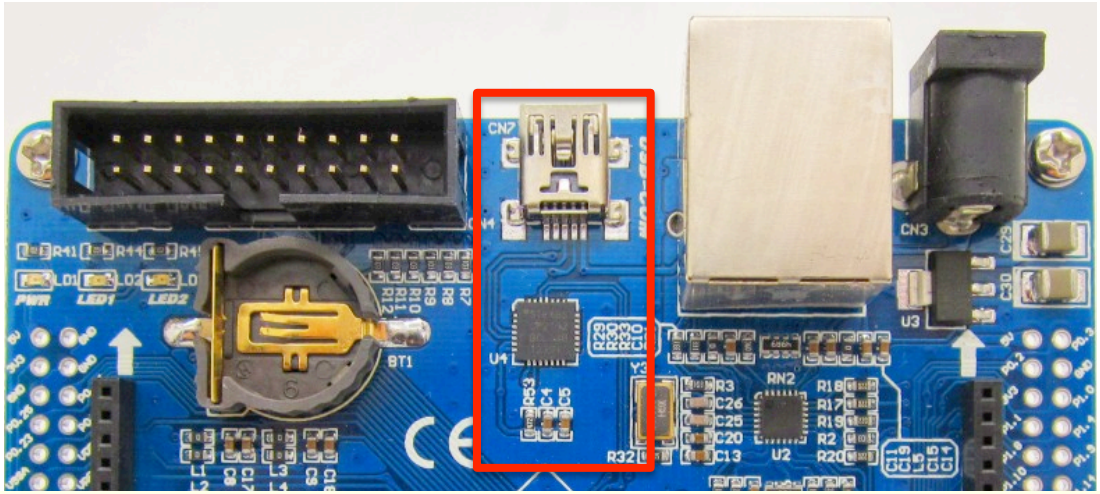
JTAG (Joint Test Action Group)

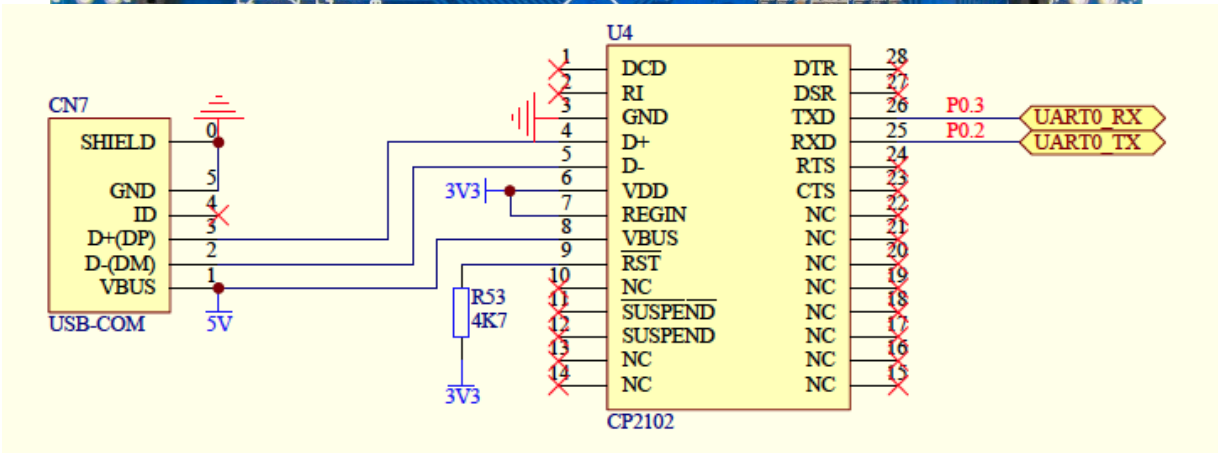
Tarjeta LPC1768-Mini-DK2

Conversor USB – Serie integrado

Basado en el circuito integrado CP2112

También se puede utilizar como entrada de alimentación (5V)



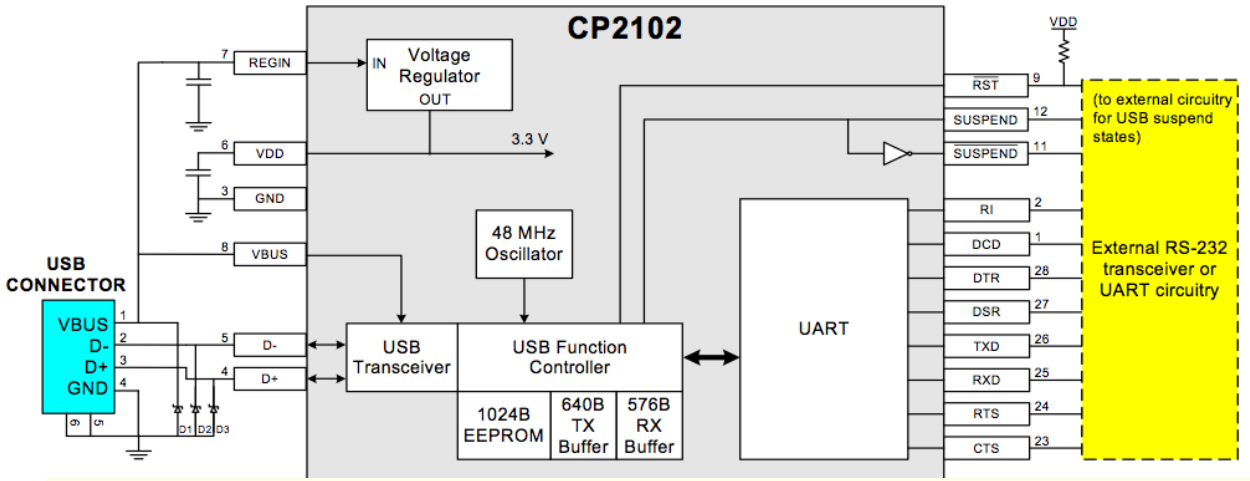


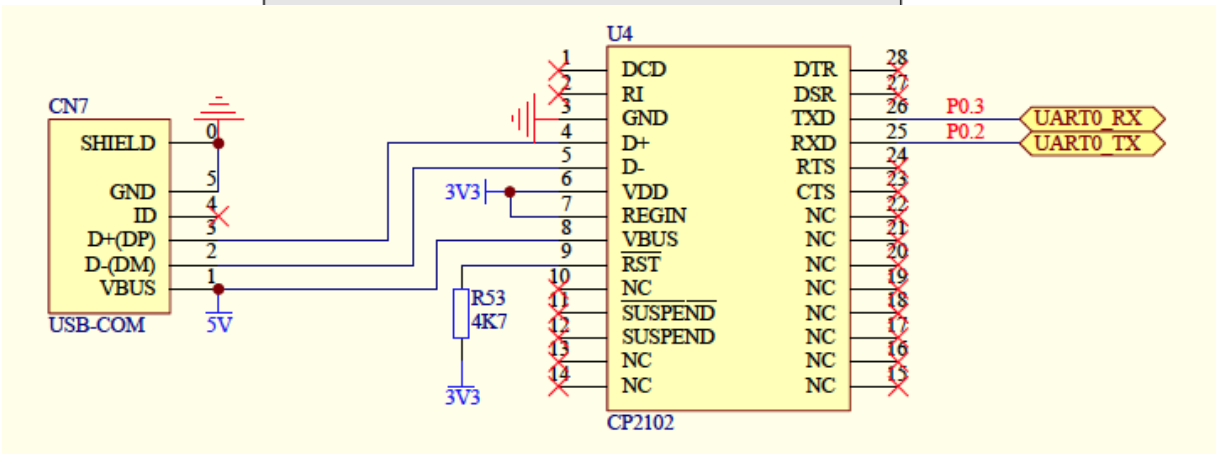
Tarjeta LPC1768-Mini-DK2

Conversor USB – Serie integrado

Basado en el circuito integrado CP2112

También se puede utilizar como entrada de alimentación (5V)

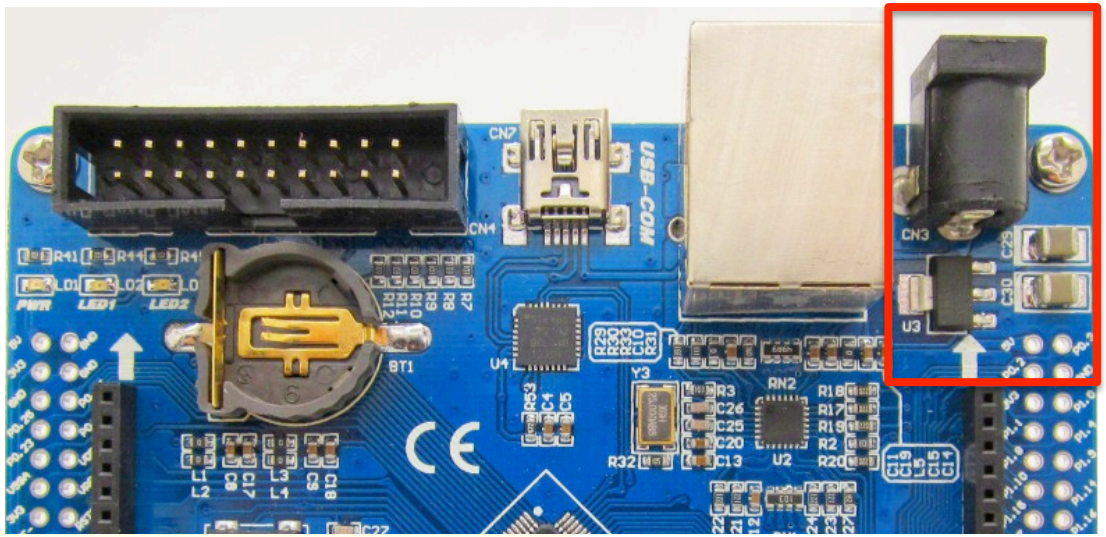


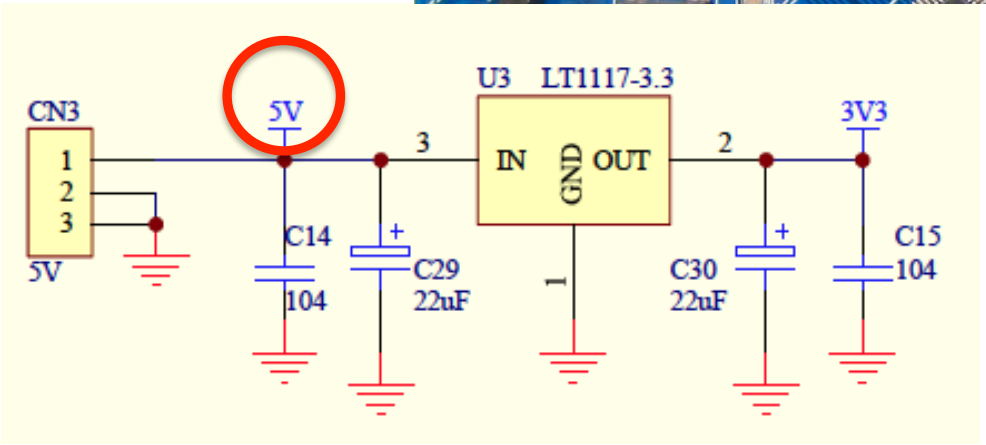


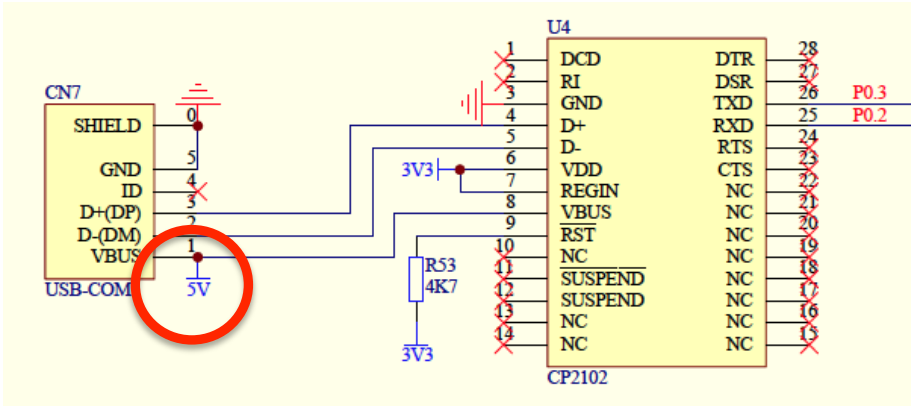
Tarjeta LPC1768-Mini-DK2

Alimentación Externa (5.0 V)

Precaución: conectada también la alimentación al USB





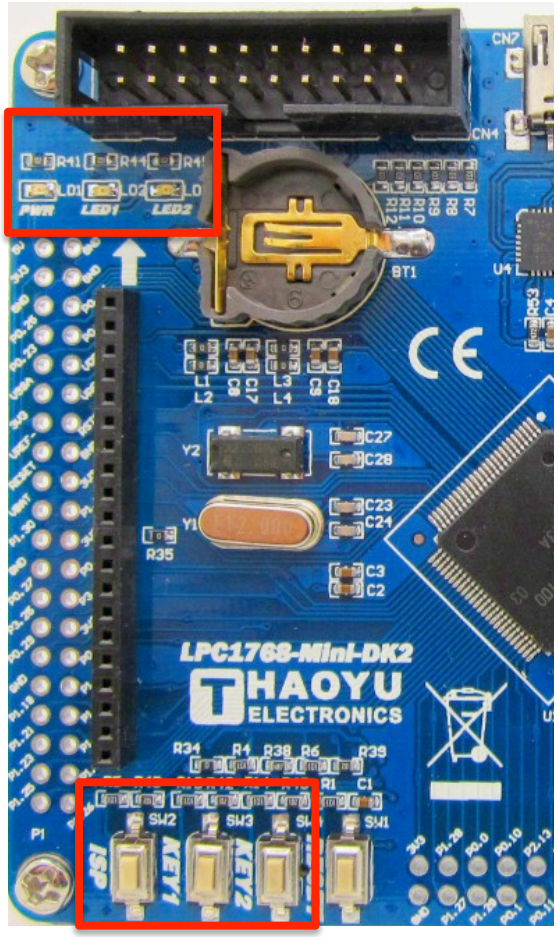


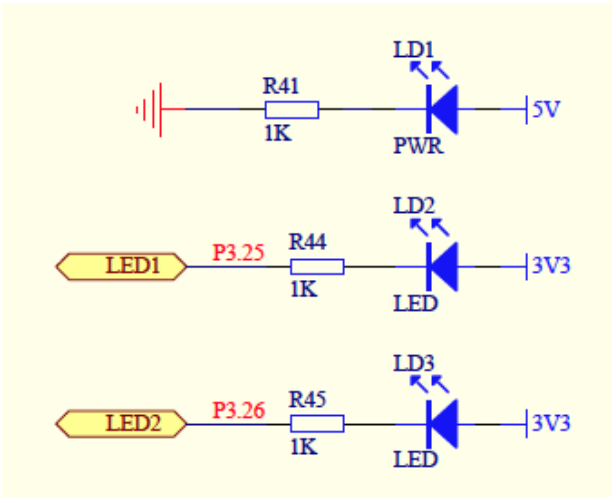
Tarjeta LPC1768-Mini-DK2

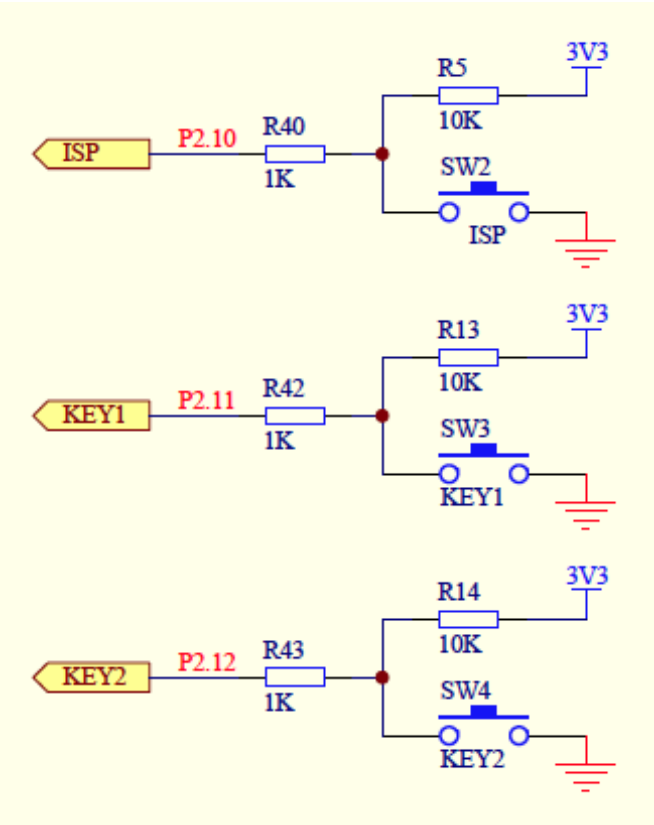
Pulsadores y LEDs

2 LEDs: P1.25 y P1.26 activos a nivel bajo

3 pulsadores de propósito general: P2.10 (ISP), P2.11 y P2.12







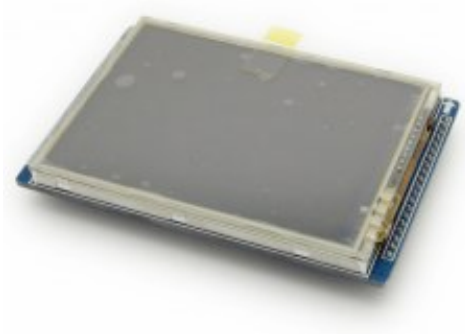
Tarjeta LPC1768-Mini-DK2

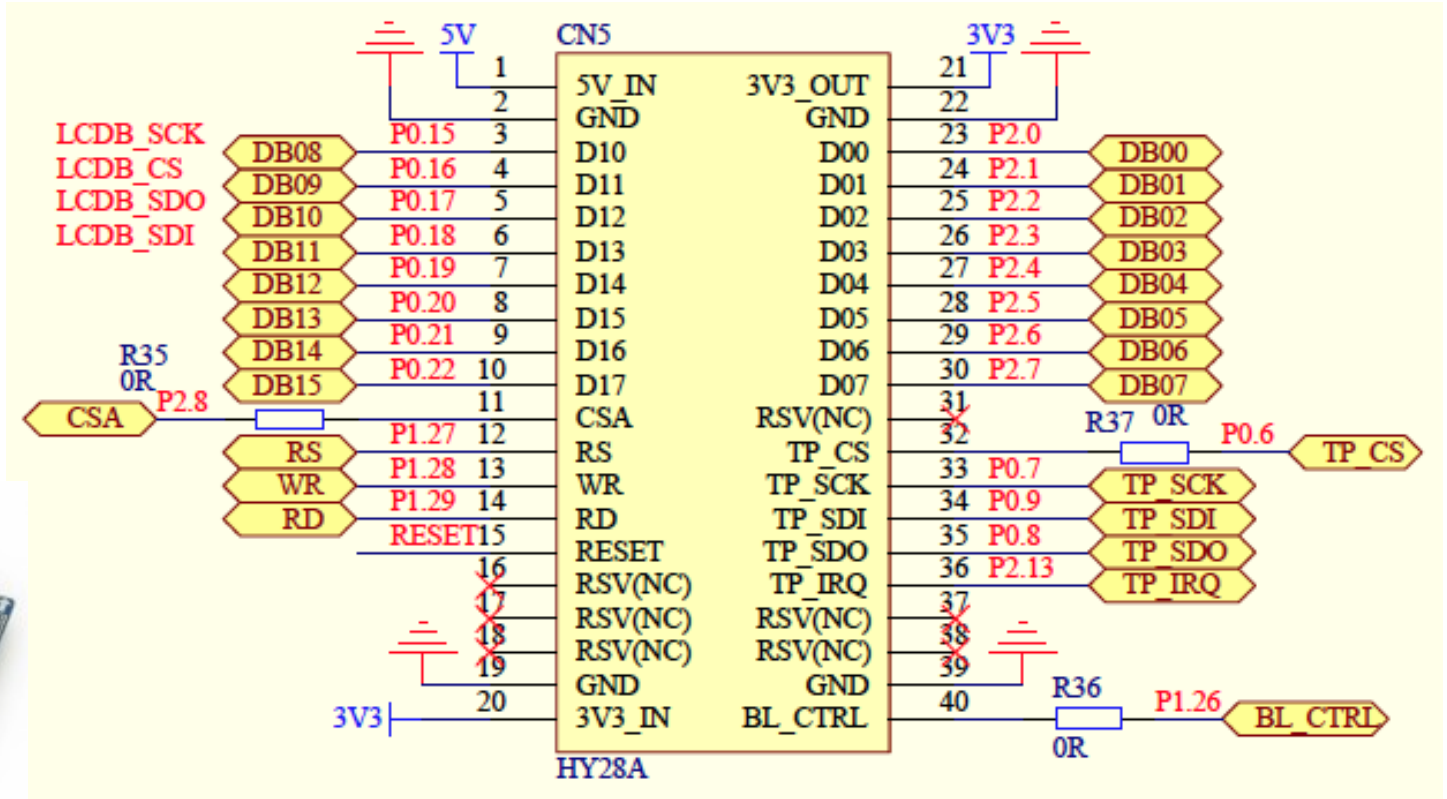
Conector para TFT Color de 2.8 pulgadas (320x240 65536 colores)

LCDA (16 bits) → Controlador LCD SPFD5408B

LCDB (SPI) → Controlador ILI9320

Touch Panel (SPI) → Controlador ADS7843 o XPT2046





Tarjeta LPC1768-Mini-DK2

Conector para TFT Color de 2.8 pulgadas (320x240 65536 colores)

LCDA (16bits) → Controlador SPFD5408

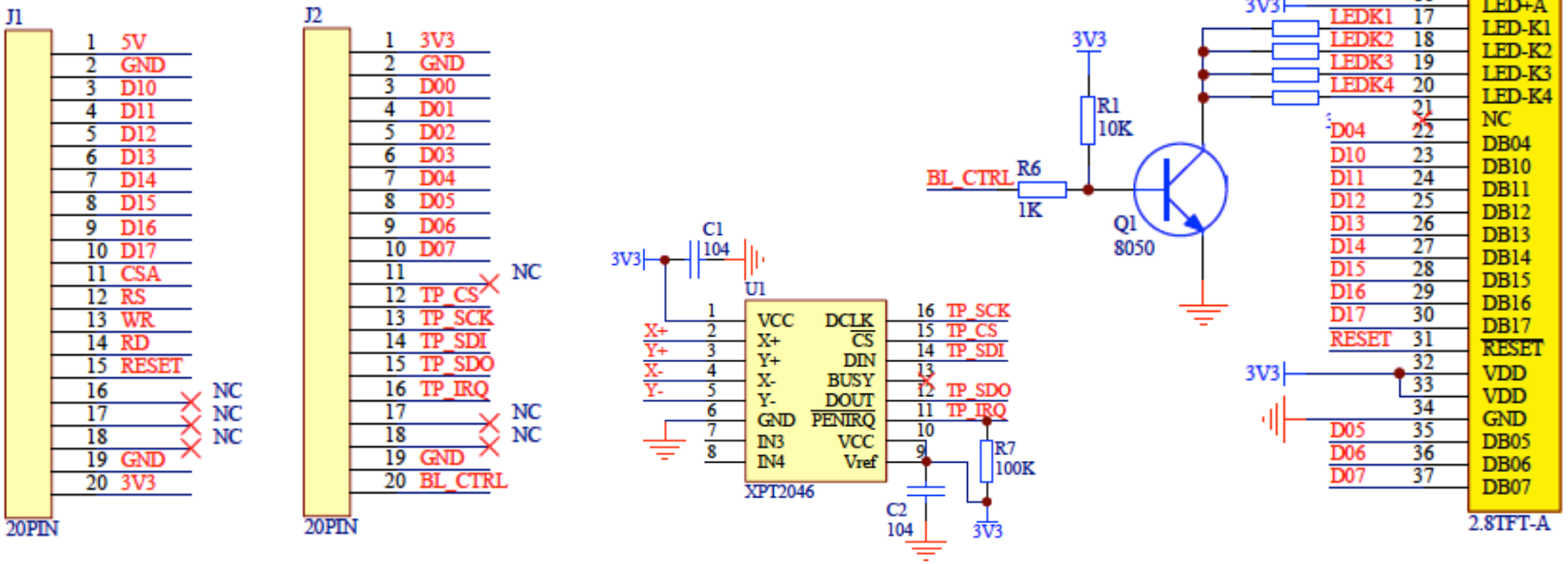
Touch Panel (SPI) → Controlador XPT2046

Pines ocupados:

Touch Panel → SSP1 (P0.6, P0.7, P0.8, P0.9, P2.13)

LCD Control → P1.26, P1.27, P1.28, P1.29, P2.8

LCD Data → P2.0 a P2.7 y P0.15 a P0.22



Tarjeta LPC1768-Mini-DK2

Conector para TFT Color de 2.8 pulgadas (320x240 65536 colores)

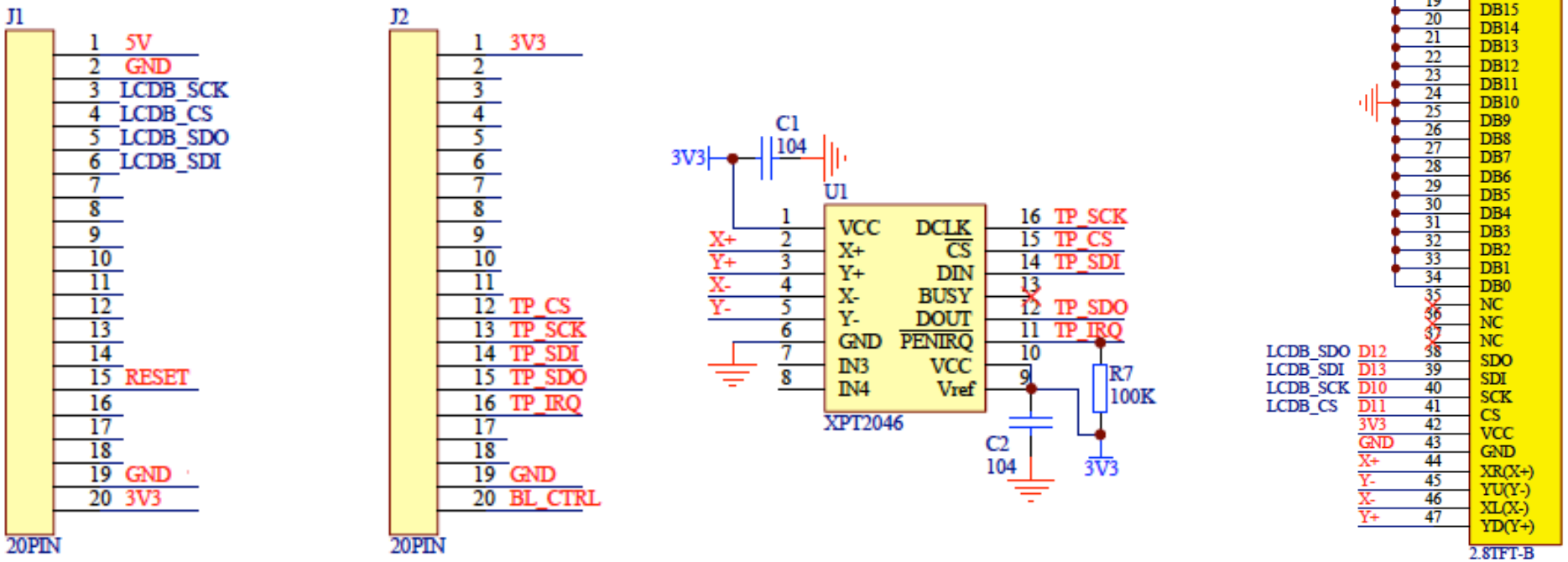
LCDB (SPI) → Controlador ILI9320

Touch Panel (SPI) → Controlador XPT2046

Pines ocupados:

Touch Panel → SSP1 (P0.6, P0.7, P0.8, P0.9, P2.13)

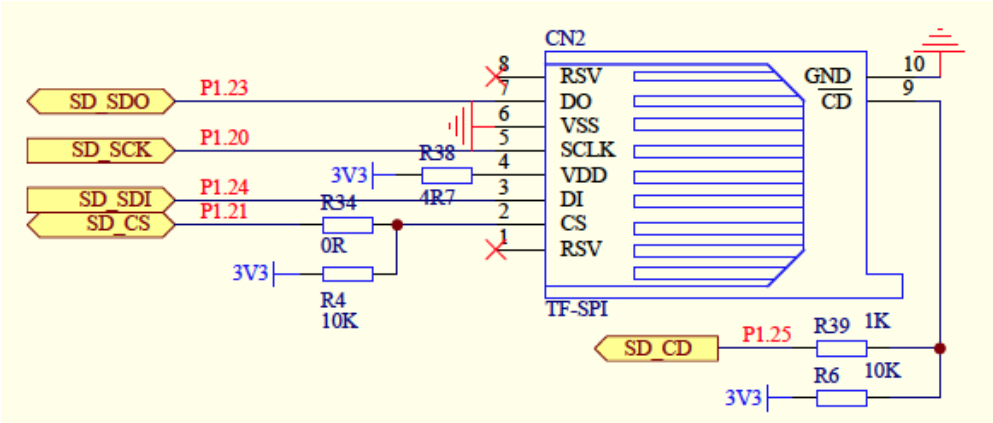
LCD Data → SSP0 (P0.15, P0.16, P0.17, P0.18) y P1.26

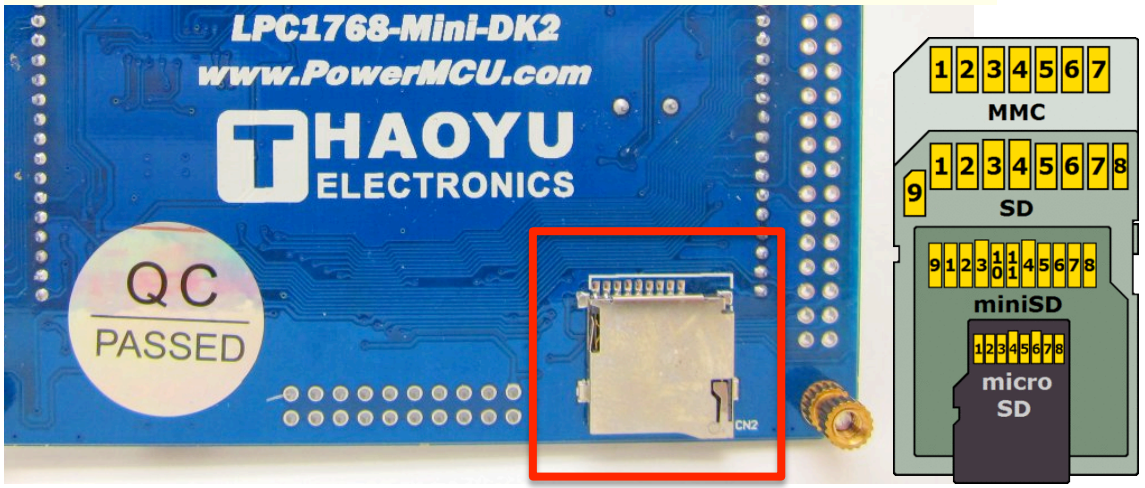


Tarjeta LPC1768-Mini-DK2

Tarjeta SD

microSD card interface (SPI)





http://en.wikipedia.org/wiki/Secure_Digital

SPI Bus Mode

microSD Pin	Name	I/O	Logic	Description
2	nCS	I	PP	SPI Card Select [CS] (Negative Logic)
3	DI	I	PP	SPI Serial Data In [MOSI]
	VSS	S	S	Ground
4	VDD	S	S	Power
5	CLK	I	PP	SPI Serial Clock [SCLK]
6	VSS	S	S	Ground
7	DO	O	PP	SPI Serial Data Out [MISO]
8	NC nIRQ	. O	. OD	Unused (memory cards) Interrupt (SDIO cards) (Negative Logic)

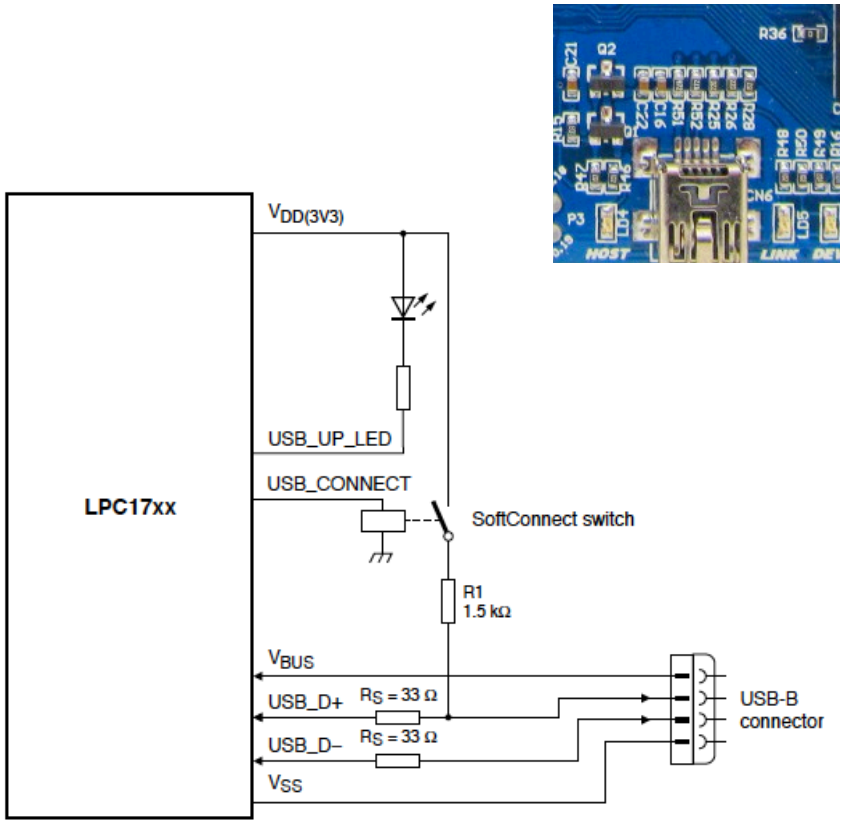
One-Bit SD Bus Mode

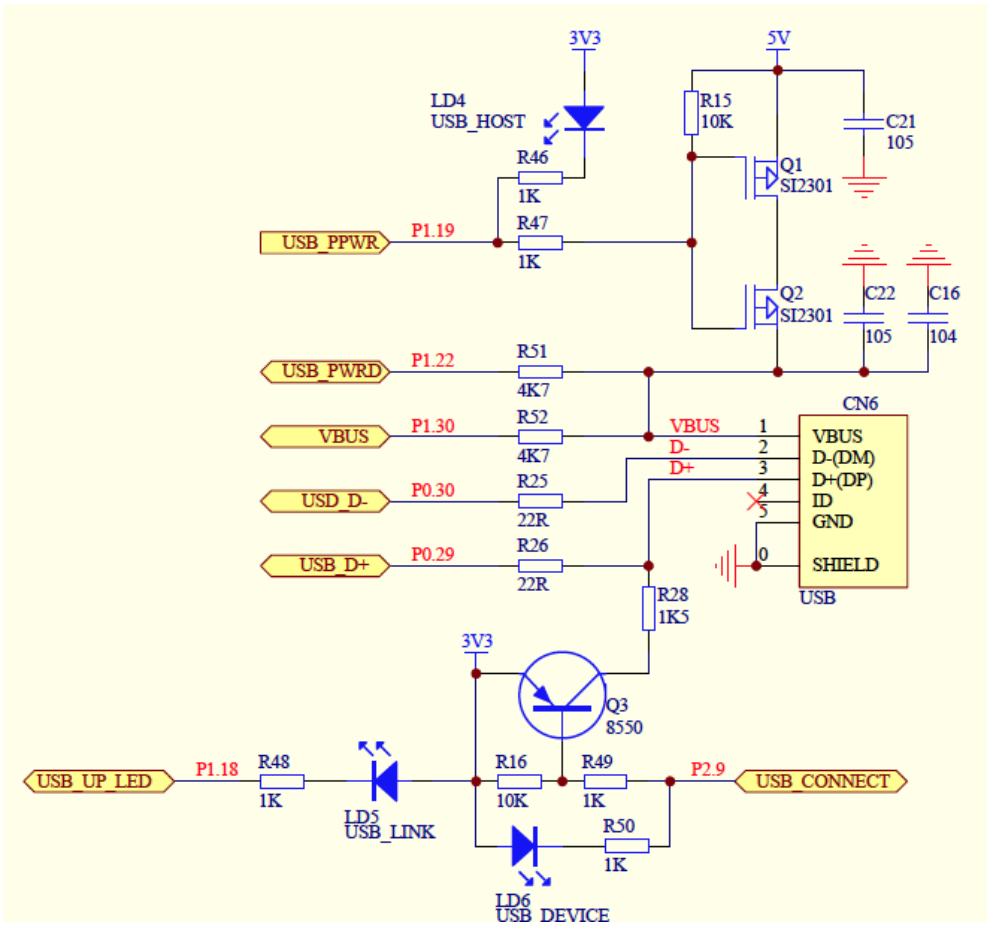
microSD Pin	Name	I/O	Logic	Description
2	NC	.	.	Unused
3	CMD	I/O	PP, OD	Command, Response
	VSS	S	S	Ground
4	VDD	S	S	Power
5	CLK	I	PP	Serial Clock
6	VSS	S	S	Ground
7	DAT0	I/O	PP	SD Serial Data 0
8	NC nIRQ	. O	. OD	Unused (memory cards) Interrupt (SDIO cards) (Negative Logic)
1	NC	.	.	Unused

Tarjeta LPC1768-Mini-DK2

USB Host/Device

El fabricante recomienda la conexión de la figura de la izquierda que mediante la salida USB_CONNECT pone la resistencia de 1.5K a VDD o no.



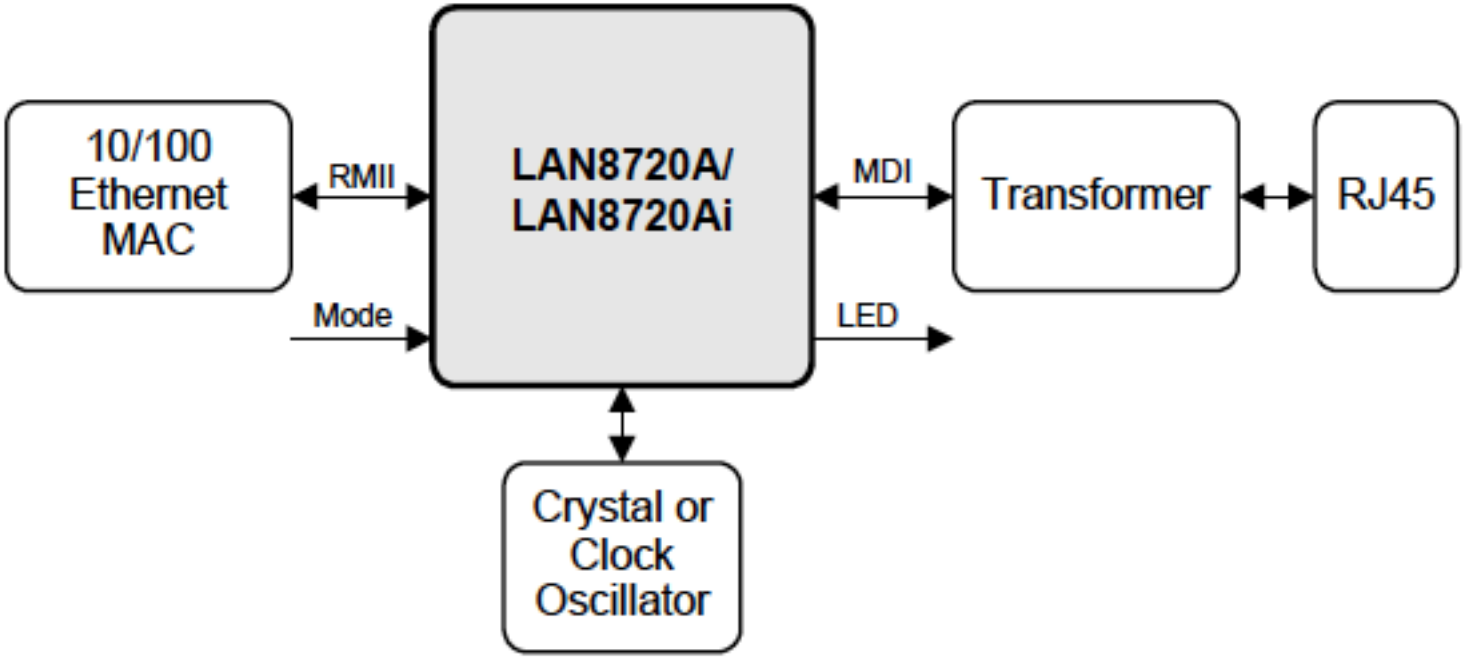


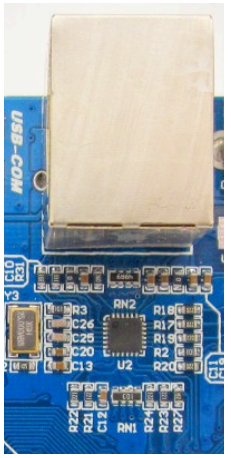
Tarjeta LPC1768-Mini-DK2

Adaptador Ethernet

LAN8720A: 10/100 Ethernet Physical Layer Transceiver (PHY)

Utiliza el interfaz RMII (Reduced Media Independent Interface)

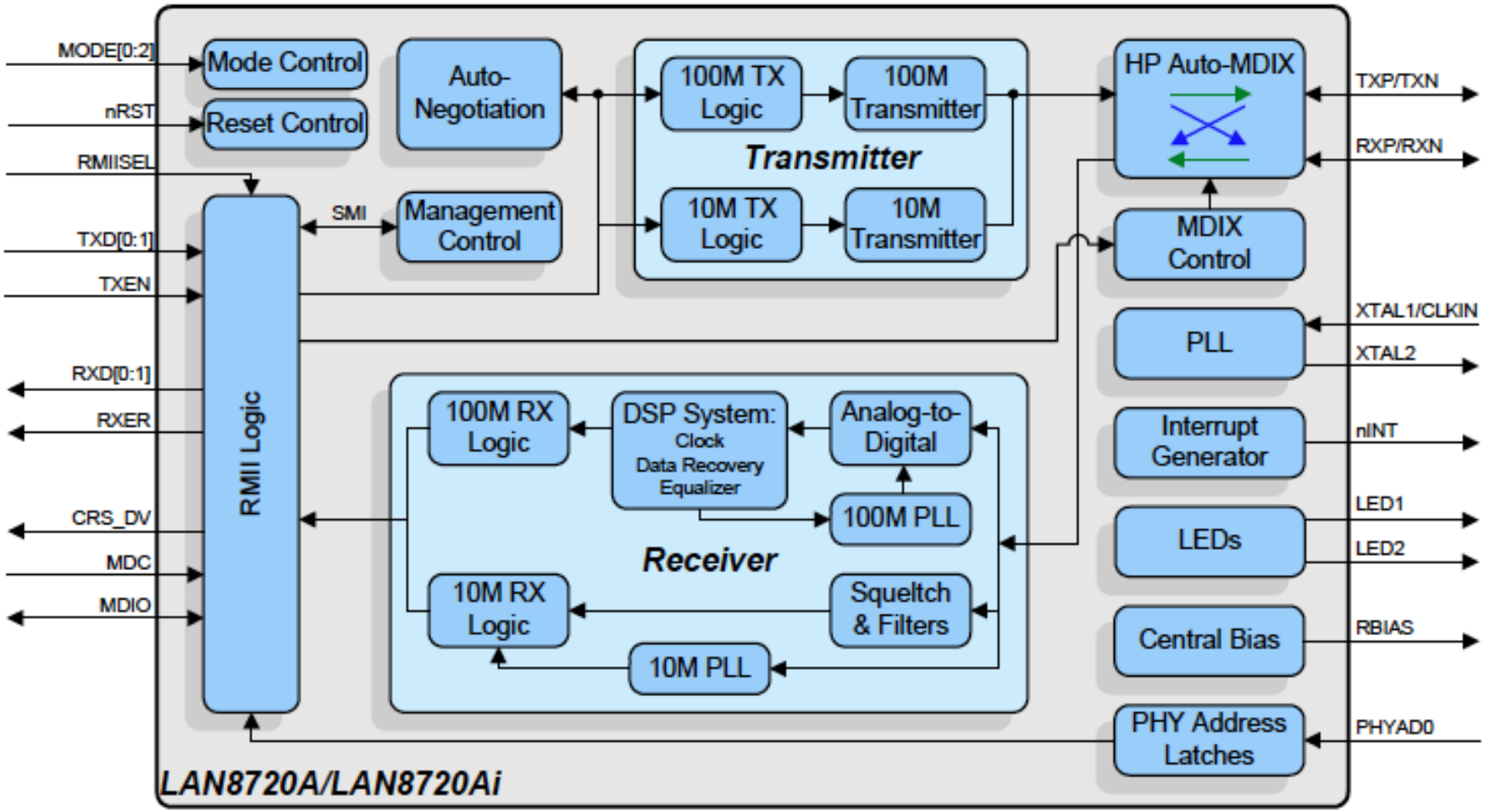




Tarjeta LPC1768-Mini-DK2

Adaptador Ethernet

LAN8720A: 10/100 Ethernet Physical Layer Transceiver (PHY)



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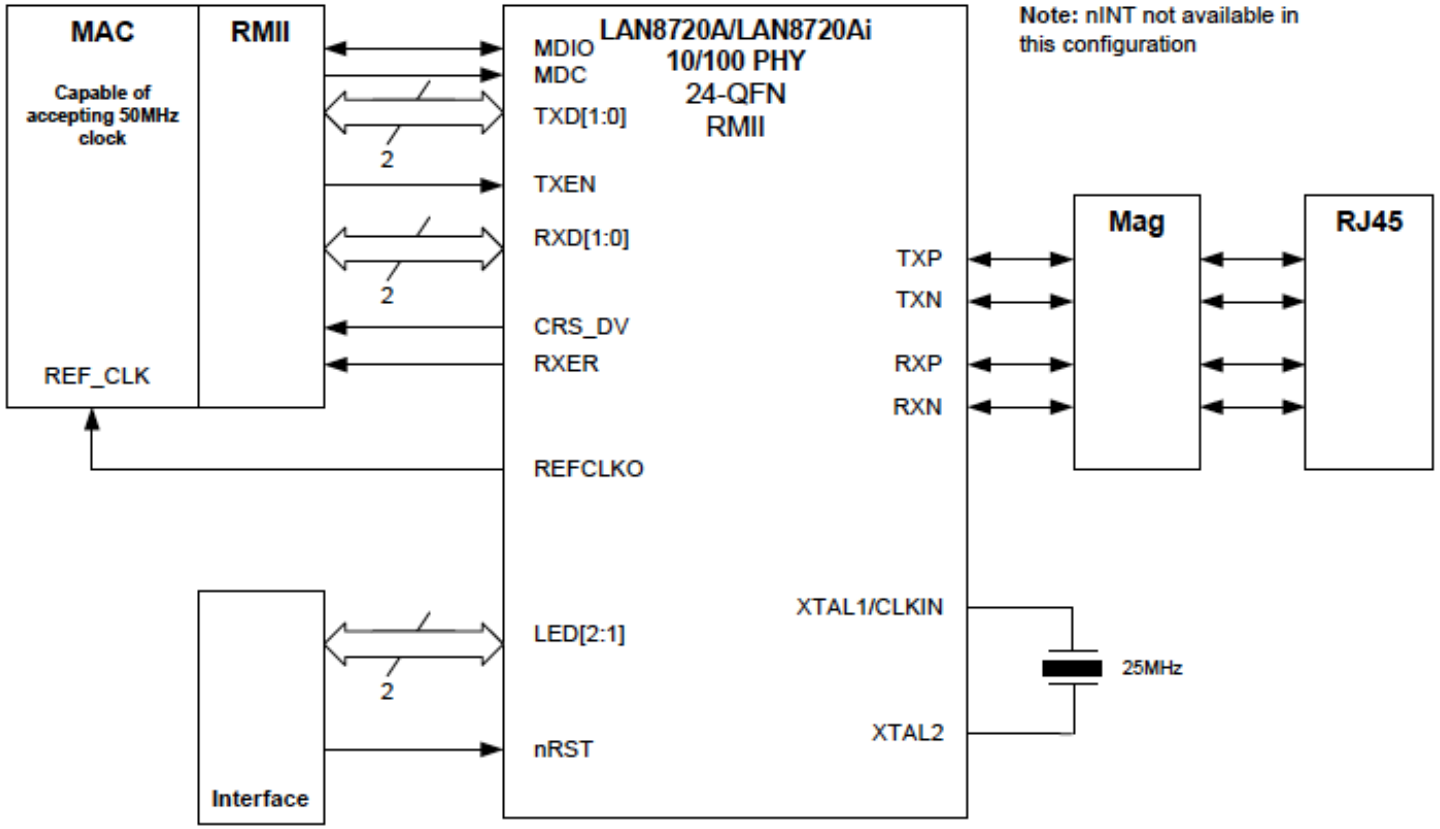
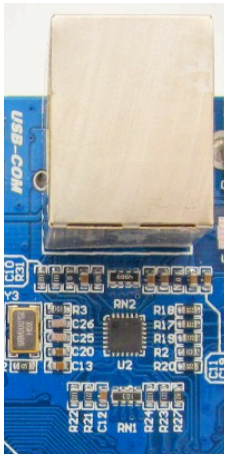
Adaptador Ethernet

LAN8720A: 10/100 Ethernet Physical Layer Transceiver (PHY)





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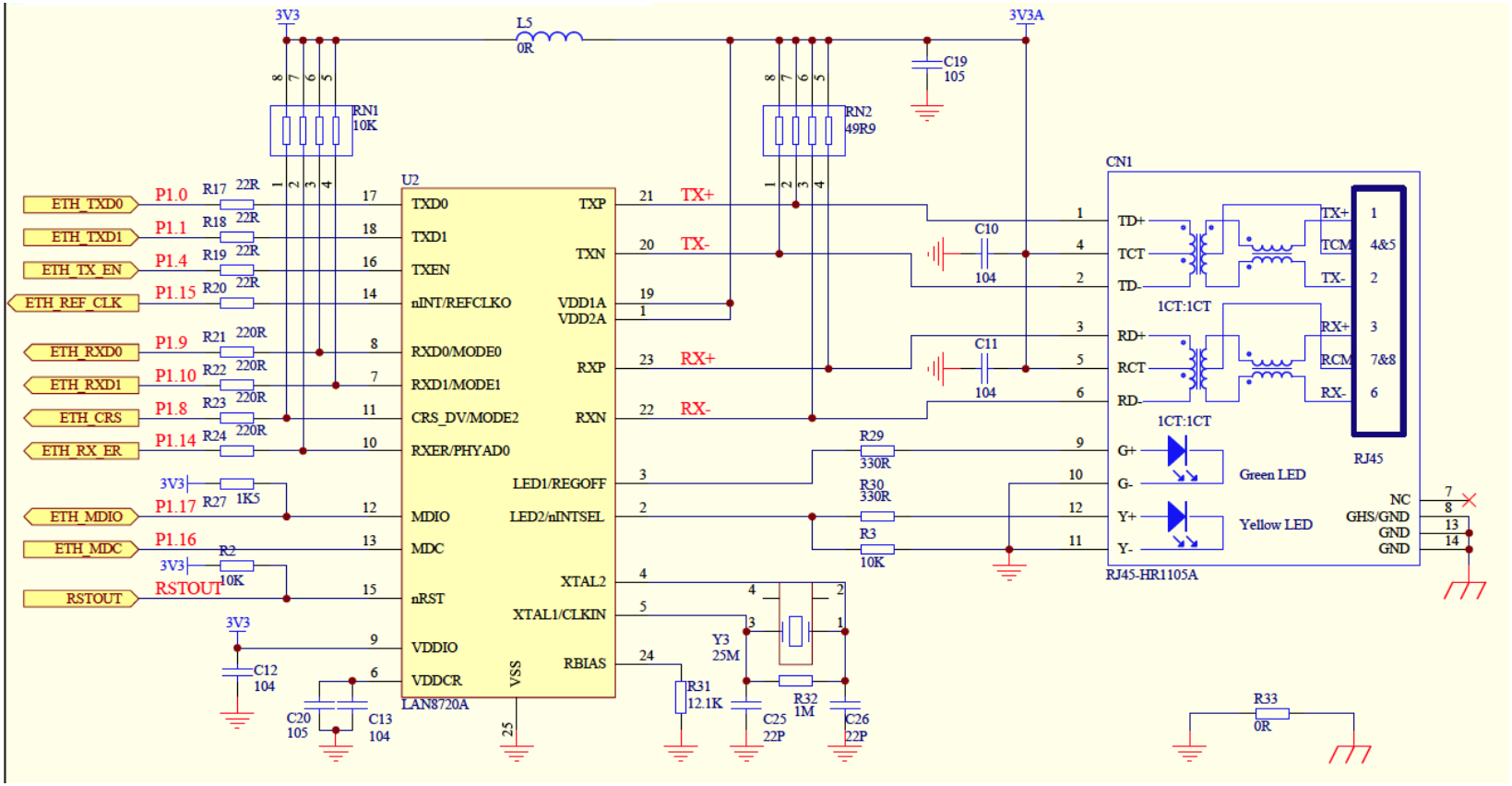
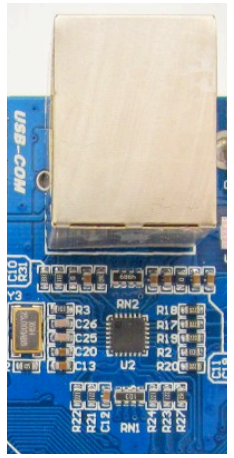
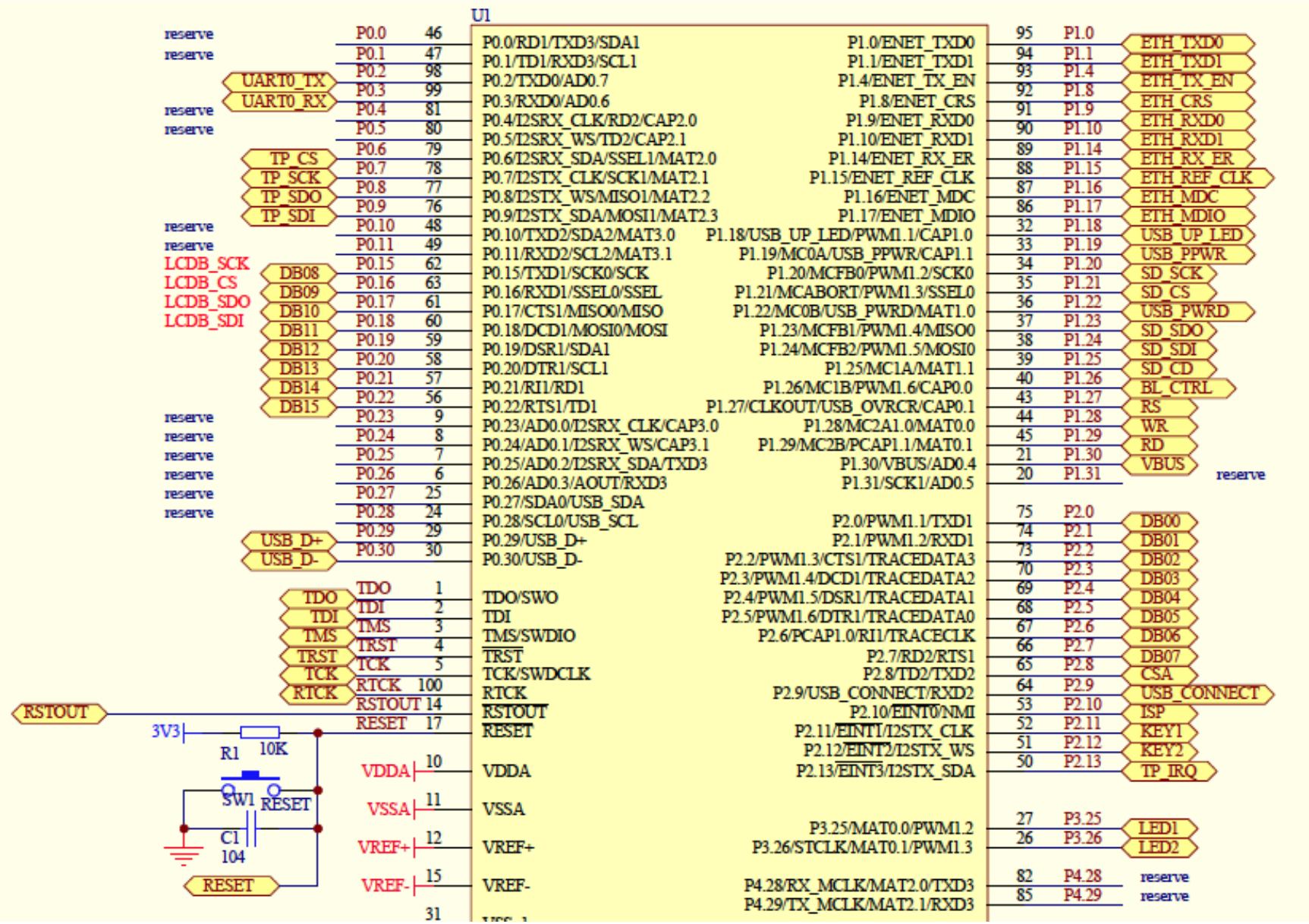
Adaptador Ethernet

LAN8720A: 10/100 Ethernet Physical Layer Transceiver (PHY)



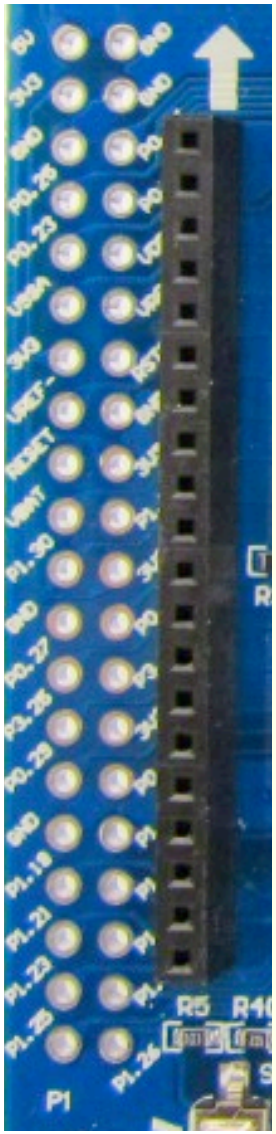


Tarjeta LPC1768-Mini-DK2



Tarjeta LPC1768-Mini-DK2

Conectores



P1

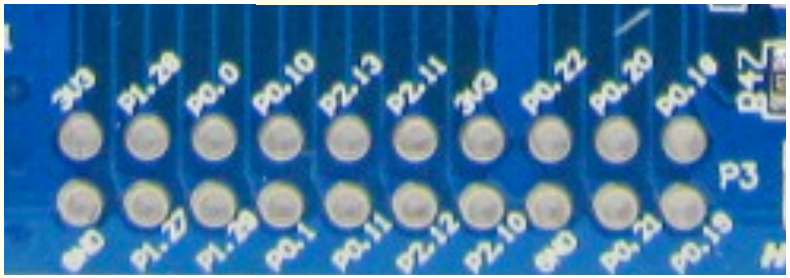
1	5V
2	GND
3	3V3
4	GND
5	GND
6	P0.26
7	P0.25
8	P0.24
9	P0.23
10	VDDA
11	VSSA
12	VREF+
13	3V3
14	RSTOUT
15	VREF-
16	GND
17	RESET
18	3V3
19	VBAT
20	P1.31
21	P1.30
22	3V3
23	GND
24	P0.28
25	P0.27
26	P3.26
27	P3.25
28	3V3
29	P0.29
30	P0.30
31	GND
32	P1.18
33	P1.19
34	P1.20
35	P1.21
36	P1.22
37	P1.23
38	P1.24
39	P1.25
40	P1.26

40PIN

P3

GND	1
3V3	2
P1.27	3
P1.28	4
P1.29	5
P0.0	6
P0.1	7
P0.10	8
P0.11	9
P2.13	10
P2.12	11
P2.11	12
P2.10	13
3V3	14
GND	15
P0.22	16
P0.21	17
P0.20	18
P0.19	19
P0.18	20

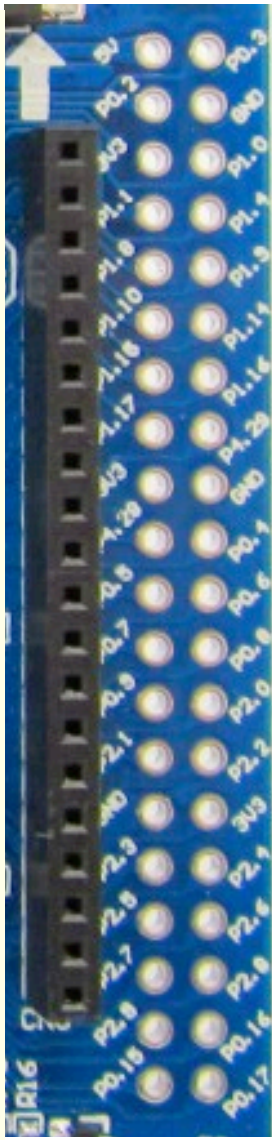
20PIN



P2

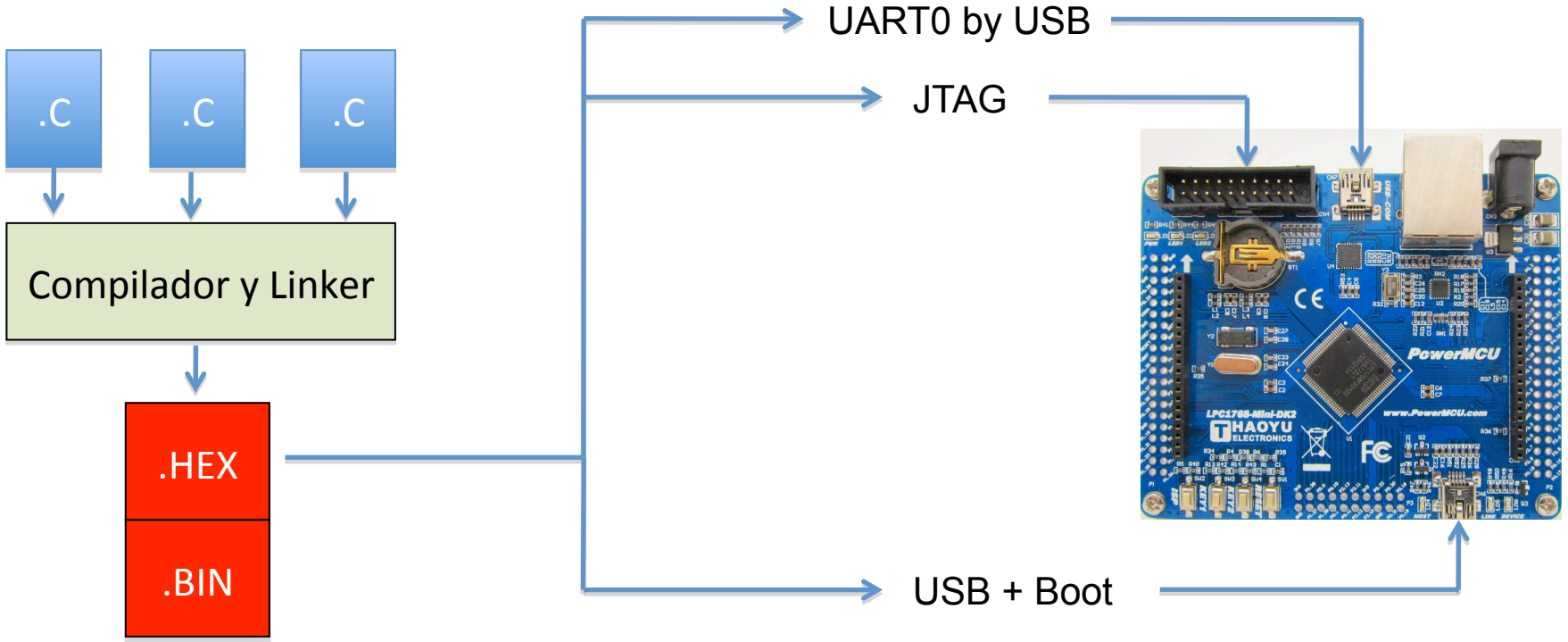
5V	1
P0.3	2
P0.2	3
GND	4
3V3	5
P1.0	6
P1.1	7
P1.4	8
P1.8	9
P1.9	10
P1.10	11
P1.14	12
P1.15	13
P1.16	14
P1.17	15
P4.29	16
3V3	17
GND	18
P4.28	19
P0.4	20
P0.5	21
P0.6	22
P0.7	23
P0.8	24
P0.9	25
P2.0	26
P2.1	27
P2.2	28
GND	29
3V3	30
P2.3	31
P2.4	32
P2.5	33
P2.6	34
P2.7	35
P2.8	36
P2.9	37
P0.16	38
P0.15	39
P0.17	40

40PIN



Elementos de Carga y Depuración

- La tarjeta permite cargar un programa al LPC1768 de tres formas diferentes:
  - Utilizando un adaptador JTAG
  - Mediante el puerto serie (UART0)
  - Mediante el puerto USB



Elementos de Carga y Depuración

- **Carga y depuración mediante el adaptador JTAG**
  - La tarjeta presenta un conector para conectar directamente un adaptador JTAG
  - Se recomiendan utilizar adaptadores que sean compatibles con el software de desarrollo:
    - Adaptador J-Link de Segger
    - Adaptador ULINK2 de Keil
    - Otro compatible
  - La carga del programa es muy rápida y la depuración muy potente permitiendo poner puntos de ruptura que detengan la aplicación y ejecutar la aplicación paso a paso.

Elementos de Carga y Depuración

- **Carga mediante comunicación serie con la UART0**
  - El LPC1768 dispone de un modo de programación denominado ISP (In System Programming) utilizando una comunicación serie por la UART0 con el software FlashMagic (**http://www.flashmagictool.com/**).
  - Se puede encontrar información del funcionamiento del ISP en el Capítulo 32 (*LPC17xx Flash memory interface and programming*) del *LPC17xx User manual* proporcionado por NXP.
  - La tarjeta LPC1768 Mini-DK2 tiene incorporado el adaptador USB – Serie CP2112 que permitirá un cable mini-USB normal para descargar el programa. La conexión debe hacerse por el conector USB-COM
  - Para entrar en modo ISP hay que mantener a nivel bajo el pin P2.10 al liberar el Reset (pulsar ISP cuando se libera el RESET).

Elementos de Carga y Depuración

- **Carga mediante USB**
  - En la página web de NXP viene información de un Bootloader mediante USB (USB HOST) que es posible utilizar.
    - Es necesario descargar el Bootloader USB usando el JTAG o el ISP.
    - Se debe configurar el proyecto de Keil para que el código de usuario no sobrescriba el bootloader USB.
    - Al entrar en modo BootUSB la tarjeta se compota como un disco duro USB presentando una carpeta donde hay que guardar el programa de usuarios compilado.
  - Se puede utilizar la conexión USB para alimentar la tarjeta.

Universidad de Alcalá

LPC1768-Mini-DK2 Development board

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