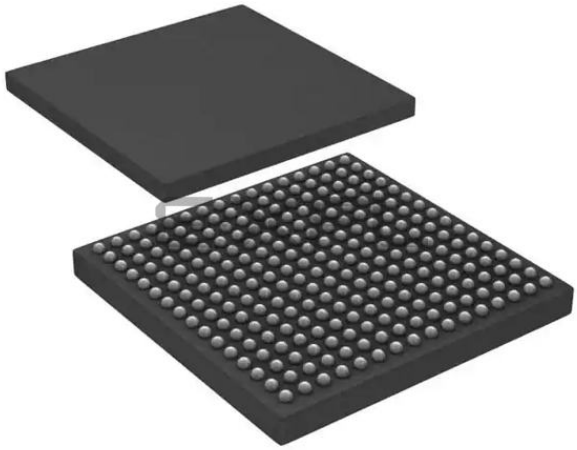

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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	ARM® Cortex®-M4/M0
Core Size	32-Bit Dual-Core
Speed	204MHz
Connectivity	CANbus, EBI/EMI, Ethernet, I²C, IrDA, Microwire, QEI, SD, SPI, SSI, SSP, UART/USART, USB, USB OTG
Peripherals	Brown-out Detect/Reset, DMA, I²S, Motor Control PWM, POR, PWM, WDT
Number of I/O	164
Program Memory Size	1MB (1M x 8)
Program Memory Type	FLASH
EEPROM Size	16K x 8
RAM Size	136K x 8
Voltage - Supply (Vcc/Vdd)	2.2V ~ 3.6V
Data Converters	A/D 8x10b; D/A 1x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	256-LBGA
Supplier Device Package	256-LBGA (17x17)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/lpc4337jet256y

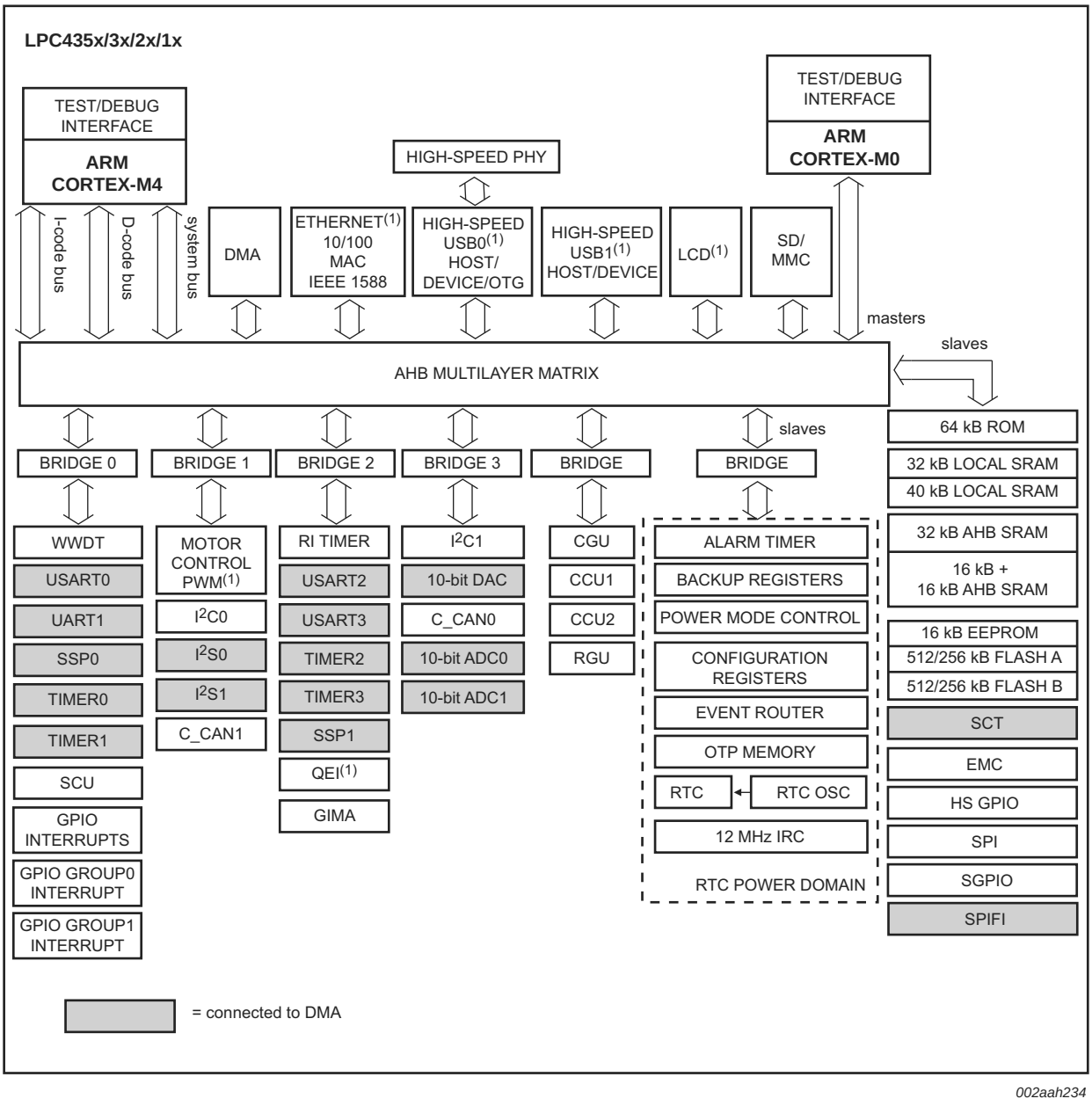
4.1 Ordering options

Table 2. Ordering options

Type number	Flash total	Flash bank A	Flash bank B	Total SRAM	LCD	Ethernet	USB0 (Host, Device, OTG)	USB1 (Host, Device)/ ULPI interface	Motor control PWM	QEI	ADC channels	Temperature range[1]	GPIO
LPC4357FET256	1 MB	512 kB	512 kB	136 kB	yes	yes	yes	yes/yes	yes	yes	8	F	164
LPC4357JET256	1 MB	512 kB	512 kB	136 kB	yes	yes	yes	yes/yes	yes	yes	8	J	164
LPC4357JBD208	1 MB	512 kB	512 kB	136 kB	yes	yes	yes	yes/yes	yes	yes	8	J	142
LPC4353FET256	512 kB	256 kB	256 kB	136 kB	yes	yes	yes	yes/yes	yes	yes	8	F	164
LPC4353JET256	512 kB	256 kB	256 kB	136 kB	yes	yes	yes	yes/yes	yes	yes	8	J	164
LPC4353JBD208	512 kB	256 kB	256 kB	136 kB	yes	yes	yes	yes/yes	yes	yes	8	J	142
LPC4337FET256	1 MB	512 kB	512 kB	136 kB	no	yes	yes	yes/yes	yes	yes	8	F	164
LPC4337JET256	1 MB	512 kB	512 kB	136 kB	no	yes	yes	yes/yes	yes	yes	8	J	164
LPC4337JBD144	1 MB	512 kB	512 kB	136 kB	no	yes	yes	yes/yes	yes	no	8	J	83
LPC4337JET100	1 MB	512 kB	512 kB	136 kB	no	yes	yes	yes/no	no	no	4	J	49
LPC4333FET256	512 kB	256 kB	256 kB	136 kB	no	yes	yes	yes/yes	yes	yes	8	F	164
LPC4333JET256	512 kB	256 kB	256 kB	136 kB	no	yes	yes	yes/yes	yes	yes	8	J	164
LPC4333JBD144	512 kB	256 kB	256 kB	136 kB	no	yes	yes	yes/yes	yes	no	8	J	83
LPC4333JET100	512 kB	256 kB	256 kB	136 kB	no	yes	yes	yes/no	no	no	4	J	49
LPC4327JBD144	1 MB	512 kB	512 kB	136 kB	no	no	yes	no/no	yes	no	8	J	83
LPC4327JET100	1 MB	512 kB	512 kB	136 kB	no	no	yes	no/no	no	no	4	J	49
LPC4325JBD144	768 kB	384 kB	384 kB	136 kB	no	no	yes	no/no	yes	no	8	J	83
LPC4325JET100	768 kB	384 kB	384 kB	136 kB	no	no	yes	no/no	no	no	4	J	49
LPC4323JBD144	512 kB	256 kB	256 kB	104 kB	no	no	yes	no/no	yes	no	8	J	83
LPC4323JET100	512 kB	256 kB	256 kB	104 kB	no	no	yes	no/no	no	no	4	J	49
LPC4322JBD144	512 kB	512 kB	0 kB	104 kB	no	no	yes	no/no	yes	no	8	J	83
LPC4322JET100	512 kB	512 kB	0 kB	104 kB	no	no	yes	no/no	no	no	4	J	49
LPC4317JBD144	1 MB	512 kB	512 kB	136 kB	no	no	no	no/no	yes	no	8	J	83
LPC4317JET100	1 MB	512 kB	512 kB	136 kB	no	no	no	no/no	no	no	4	J	49
LPC4315JBD144	768 kB	384 kB	384 kB	136 kB	no	no	no	no/no	yes	no	8	J	83
LPC4315JET100	768 kB	384 kB	384 kB	136 kB	no	no	no	no/no	no	no	4	J	49
LPC4313JBD144	512 kB	256 kB	256 kB	104 kB	no	no	no	no/no	yes	no	8	J	83
LPC4313JET100	512 kB	256 kB	256 kB	104 kB	no	no	no	no/no	no	no	4	J	49
LPC4312JBD144	512 kB	512 kB	0 kB	104 kB	no	no	no	no/no	yes	no	8	J	83
LPC4312JET100	512 kB	512 kB	0 kB	104 kB	no	no	no	no/no	no	no	4	J	49

[1] J = -40 °C to +105 °C; F = -40 °C to +85 °C.

5. Block diagram



(1) Not available on all parts. See Table 2.

Fig 1. LPC435x/3x/2x/1x Block diagram

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
P1_8	R7	H5	71	51	[2]	N; PU	I/O	**GPIO1[1] —** General purpose digital input/output pin.
							O	**U1_DTR —** Data Terminal Ready output for UART1.
							O	**CTOUT_12 —** SCT output 12. Match output 3 of timer 3.
							I/O	**EMC_D1 —** External memory data line 1.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							O	**SD_VOLT0 —** SD/MMC bus voltage select output 0.
P1_9	T7	J5	73	52	[2]	N; PU	I/O	**GPIO1[2] —** General purpose digital input/output pin.
							O	**U1_RTS —** Request to Send output for UART1.
							O	**CTOUT_11 —** SCT output 11. Match output 3 of timer 2.
							I/O	**EMC_D2 —** External memory data line 2.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**SD_DAT0 —** SD/MMC data bus line 0.
P1_10	R8	H6	75	53	[2]	N; PU	I/O	**GPIO1[3] —** General purpose digital input/output pin.
							I	**U1_RI —** Ring Indicator input for UART1.
							O	**CTOUT_14 —** SCT output 14. Match output 2 of timer 3.
							I/O	**EMC_D3 —** External memory data line 3.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**SD_DAT1 —** SD/MMC data bus line 1.
P1_11	T9	J7	77	55	[2]	N; PU	I/O	**GPIO1[4] —** General purpose digital input/output pin.
							I	**U1_CTS —** Clear to Send input for UART1.
							O	**CTOUT_15 —** SCT output 15. Match output 3 of timer 3.
							I/O	**EMC_D4 —** External memory data line 4.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**SD_DAT2 —** SD/MMC data bus line 2.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
P1_12	R9	K7	78	56	[2]	N; PU	I/O	**GPIO1[5] —** General purpose digital input/output pin.
							I	**U1_DCD —** Data Carrier Detect input for UART1.
							-	**R —** Function reserved.
							I/O	**EMC_D5 —** External memory data line 5.
							I	**T0_CAP1 —** Capture input 1 of timer 0.
							-	**R —** Function reserved.
							I/O	**SGPIO8 —** General purpose digital input/output pin.
							I/O	**SD_DAT3 —** SD/MMC data bus line 3.
P1_13	R10	H8	83	60	[2]	N; PU	I/O	**GPIO1[6] —** General purpose digital input/output pin.
							O	**U1_TXD —** Transmitter output for UART1.
							-	**R —** Function reserved.
							I/O	**EMC_D6 —** External memory data line 6.
							I	**T0_CAP0 —** Capture input 0 of timer 0.
							-	**R —** Function reserved.
							I/O	**SGPIO9 —** General purpose digital input/output pin.
							I	**SD_CD —** SD/MMC card detect input.
P1_14	R11	J8	85	61	[2]	N; PU	I/O	**GPIO1[7] —** General purpose digital input/output pin.
							I	**U1_RXD —** Receiver input for UART1.
							-	**R —** Function reserved.
							I/O	**EMC_D7 —** External memory data line 7.
							O	**T0_MAT2 —** Match output 2 of timer 0.
							-	**R —** Function reserved.
							I/O	**SGPIO10 —** General purpose digital input/output pin.
							-	**R —** Function reserved.
P1_15	T12	K8	87	62	[2]	N; PU	I/O	**GPIO0[2] —** General purpose digital input/output pin.
							O	**U2_TXD —** Transmitter output for USART2.
							I/O	**SGPIO2 —** General purpose digital input/output pin.
							I	**ENET_RXD0 —** Ethernet receive data 0 (RMII/MII interface).
							O	**T0_MAT1 —** Match output 1 of timer 0.
							-	**R —** Function reserved.
							I/O	**EMC_D8 —** External memory data line 8.
							-	**R —** Function reserved.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
P2_2	M15	F5	121	84	[2]	N; PU	I/O	**SGPIO6 —** General purpose digital input/output pin.
							I/O	**U0_UCLK —** Serial clock input/output for USART0 in synchronous mode.
							I/O	**EMC_A11 —** External memory address line 11.
							O	**USB0_IND1 —** USB0 port indicator LED control output 1.
							I/O	**GPIO5[2] —** General purpose digital input/output pin.
							I	**CTIN_6 —** SCT input 6. Capture input 1 of timer 3.
							I	**T3_CAP2 —** Capture input 2 of timer 3.
							O	**$\overline{\text{EMC\_CS1}}$ —** LOW active Chip Select 1 signal.
P2_3	J12	D8	127	87	[3]	N; PU	I/O	**SGPIO12 —** General purpose digital input/output pin.
							I/O	**I2C1_SDA —** I^2C1 data input/output (this pin does not use a specialized I2C pad).
							O	**U3_TXD —** Transmitter output for USART3. See Table 4 for ISP mode.
							I	**CTIN_1 —** SCT input 1. Capture input 1 of timer 0. Capture input 1 of timer 2.
							I/O	**GPIO5[3] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							O	**T3_MAT0 —** Match output 0 of timer 3.
							O	**USB0_PPWR —** VBUS drive signal (towards external charge pump or power management unit); indicates that VBUS must be driven (active HIGH). Add a pull-down resistor to disable the power switch at reset. This signal has opposite polarity compared to the USB_PPWR used on other NXP LPC parts.
P2_4	K11	D9	128	88	[3]	N; PU	I/O	**SGPIO13 —** General purpose digital input/output pin.
							I/O	**I2C1_SCL —** I^2C1 clock input/output (this pin does not use a specialized I2C pad).
							I	**U3_RXD —** Receiver input for USART3. See Table 4 for ISP mode.
							I	**CTIN_0 —** SCT input 0. Capture input 0 of timer 0, 1, 2, 3.
							I/O	**GPIO5[4] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							O	**T3_MAT1 —** Match output 1 of timer 3.
							I	**USB0_PWR_FAULT —** Port power fault signal indicating overcurrent condition; this signal monitors over-current on the USB bus (external circuitry required to detect over-current condition).

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
P3_5	C12	B7	173	121	[2]	N; PU	I/O	**GPIO1[15] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**SPIFI_SIO2 —** I/O lane 2 for SPIFI.
							I	**U1_RXD —** Receiver input for UART 1.
							I/O	**I2S0_TX_SDA —** I2S transmit data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the *I^2S-bus specification*.
							I/O	**I2S1_RX_WS —** Receive Word Select. It is driven by the master and received by the slave. Corresponds to the signal WS in the *I^2S-bus specification*.
							O	**LCD_VD12 —** LCD data.
P3_6	B13	C7	174	122	[2]	N; PU	I/O	**GPIO0[6] —** General purpose digital input/output pin.
							I/O	**SPI_MISO —** Master In Slave Out for SPI.
							I/O	**SSP0_SSEL —** Slave Select for SSP0.
							I/O	**SPIFI_MISO —** Input 1 in SPIFI quad mode; SPIFI output IO1.
							-	**R —** Function reserved.
							I/O	**SSP0_MISO —** Master In Slave Out for SSP0.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
P3_7	C11	D7	176	123	[2]	N; PU	-	**R —** Function reserved.
							I/O	**SPI_MOSI —** Master Out Slave In for SPI.
							I/O	**SSP0_MISO —** Master In Slave Out for SSP0.
							I/O	**SPIFI_MOSI —** Input I0 in SPIFI quad mode; SPIFI output IO0.
							I/O	**GPIO5[10] —** General purpose digital input/output pin.
							I/O	**SSP0_MOSI —** Master Out Slave in for SSP0.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
P3_8	C10	E7	179	124	[2]	N; PU	-	**R —** Function reserved.
							I	**SPI_SSEL —** Slave Select for SPI. Note that this pin in an input pin only. The SPI in master mode cannot drive the CS input on the slave. Any GPIO pin can be used for SPI chip select in master mode.
							I/O	**SSP0_MOSI —** Master Out Slave in for SSP0.
							I/O	**SPIFI_CS —** SPIFI serial flash chip select.
							I/O	**GPIO5[11] —** General purpose digital input/output pin.
							I/O	**SSP0_SSEL —** Slave Select for SSP0.
							-	**R —** Function reserved.
							-	**R —** Function reserved.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
P7_2	A16	-	165	115	[2]	N; PU	I/O	**GPIO3[10] —** General purpose digital input/output pin.
							I	**CTIN_4 —** SCT input 4. Capture input 2 of timer 1.
							I/O	**I2S0_TX_SDA —** I2S transmit data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the *I²S-bus specification*.
							O	**LCD_VD18 —** LCD data.
							O	**LCD_VD6 —** LCD data.
							-	**R —** Function reserved.
							I	**U2_RXD —** Receiver input for USART2.
							I/O	**SGPIO6 —** General purpose digital input/output pin.
P7_3	C13	-	167	117	[2]	N; PU	I/O	**GPIO3[11] —** General purpose digital input/output pin.
							I	**CTIN_3 —** SCT input 3. Capture input 1 of timer 1.
							-	**R —** Function reserved.
							O	**LCD_VD17 —** LCD data.
							O	**LCD_VD5 —** LCD data.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
P7_4	C8	-	189	132	[5]	N; PU	I/O	**GPIO3[12] —** General purpose digital input/output pin.
							O	**CTOUT_13 —** SCT output 13. Match output 3 of timer 3.
							-	**R —** Function reserved.
							O	**LCD_VD16 —** LCD data.
							O	**LCD_VD4 —** LCD data.
							O	**TRACEDATA[0] —** Trace data, bit 0.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							AI	**ADC0_4 —** ADC0 and ADC1, input channel 4. Configure the pin as GPIO input and use the ADC function select register in the SCU to select the ADC.
P7_5	A7	-	191	133	[5]	N; PU	I/O	**GPIO3[13] —** General purpose digital input/output pin.
							O	**CTOUT_12 —** SCT output 12. Match output 3 of timer 3.
							-	**R —** Function reserved.
							O	**LCD_VD8 —** LCD data.
							O	**LCD_VD23 —** LCD data.
							O	**TRACEDATA[1] —** Trace data, bit 1.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							AI	**ADC0_3 —** ADC0 and ADC1, input channel 3. Configure the pin as GPIO input and use the ADC function select register in the SCU to select the ADC.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
PC_10	M5	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							O	**USB1_ULPI_STP —** ULPI link STP signal. Asserted to end or interrupt transfers to the PHY.
							I	**U1_DSR —** Data Set Ready input for UART 1.
							-	**R —** Function reserved.
							I/O	**GPIO6[9] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							O	**T3_MAT3 —** Match output 3 of timer 3.
							I/O	**SD_CMD —** SD/MMC command signal.
PC_11	L5	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							I	**USB1_ULPI_DIR —** ULPI link DIR signal. Controls the ULPI data line direction.
							I	**U1_DCD —** Data Carrier Detect input for UART 1.
							-	**R —** Function reserved.
							I/O	**GPIO6[10] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**SD_DAT4 —** SD/MMC data bus line 4.
PC_12	L6	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							O	**U1_DTR —** Data Terminal Ready output for UART 1. Can also be configured to be an RS-485/EIA-485 output enable signal for UART 1.
							-	**R —** Function reserved.
							I/O	**GPIO6[11] —** General purpose digital input/output pin.
							I/O	**SGPIO11 —** General purpose digital input/output pin.
							I/O	**I2S0_TX_SDA —** I2S transmit data. It is driven by the transmitter and read by the receiver. Corresponds to the signal SD in the *I^2S-bus specification*.
							I/O	**SD_DAT5 —** SD/MMC data bus line 5.
PC_13	M1	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							O	**U1_TXD —** Transmitter output for UART 1.
							-	**R —** Function reserved.
							I/O	**GPIO6[12] —** General purpose digital input/output pin.
							I/O	**SGPIO12 —** General purpose digital input/output pin.
							I/O	**I2S0_TX_WS —** Transmit Word Select. It is driven by the master and received by the slave. Corresponds to the signal WS in the *I^2S-bus specification*.
							I/O	**SD_DAT6 —** SD/MMC data bus line 6.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
PD_15	T15	-	101	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**EMC_A17 —** External memory address line 17.
							-	**R —** Function reserved.
							I/O	**GPIO6[29] —** General purpose digital input/output pin.
							I	**SD_WP —** SD/MMC card write protect input.
							O	**CTOUT_8 —** SCT output 8. Match output 0 of timer 2.
							-	**R —** Function reserved.
PD_16	R14	-	104	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**EMC_A16 —** External memory address line 16.
							-	**R —** Function reserved.
							I/O	**GPIO6[30] —** General purpose digital input/output pin.
							O	**SD_VOLT2 —** SD/MMC bus voltage select output 2.
							O	**CTOUT_12 —** SCT output 12. Match output 3 of timer 3.
							-	**R —** Function reserved.
PE_0	P14	-	106	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**EMC_A18 —** External memory address line 18.
							I/O	**GPIO7[0] —** General purpose digital input/output pin.
							O	**CAN1_TD —** CAN1 transmitter output.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
PE_1	N14	-	112	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**EMC_A19 —** External memory address line 19.
							I/O	**GPIO7[1] —** General purpose digital input/output pin.
							I	**CAN1_RD —** CAN1 receiver input.
							-	**R —** Function reserved.
							-	**R —** Function reserved.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
PE_14	C15	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							O	**EMC_DYCS3 —** SDRAM chip select 3.
							I/O	**GPIO7[14] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
PE_15	E13	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							O	**CTOUT_0 —** SCT output 0. Match output 0 of timer 0.
							I/O	**I2C1_SCL —** I^2C1 clock input/output (this pin does not use a specialized I2C pad).
							O	**EMC_CKEOUT3 —** SDRAM clock enable 3.
							I/O	**GPIO7[15] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
PF_0	D12	-	159	-	[2]	O; PU	I/O	**SSP0_SCK —** Serial clock for SSP0.
							I	**GP_CLKIN —** General purpose clock input to the CGU.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							-	**R —** Function reserved.
							O	**I2S1_TX_MCLK —** I2S1 transmit master clock.
PF_1	E11	-	-	-	[2]	N; PU	-	**R —** Function reserved.
							-	**R —** Function reserved.
							I/O	**SSP0_SSEL —** Slave Select for SSP0.
							-	**R —** Function reserved.
							I/O	**GPIO7[16] —** General purpose digital input/output pin.
							-	**R —** Function reserved.
							I/O	**SGPIO0 —** General purpose digital input/output pin.
							-	**R —** Function reserved.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
Debug pins								
DBGEN	L4	A6	41	28	[2]	I	I	JTAG interface control signal. Also used for boundary scan. To use the part in functional mode, connect this pin in one of the following ways: • Leave DBGEN open. The DBGEN pin is pulled up internally by a 50 kΩ resistor. • Tie DBGEN to VDDIO. • Pull DBGEN up to VDDIO with an external pull-up resistor.
TCK/SWDCLK	J5	H2	38	27	[2]	I; F	I	Test Clock for JTAG interface (default) or Serial Wire (SW) clock.
$\overline{\text{TRST}}$	M4	B4	42	29	[2]	I; PU	I	Test Reset for JTAG interface.
TMS/SWDIO	K6	C4	44	30	[2]	I; PU	I	Test Mode Select for JTAG interface (default) or SW debug data input/output.
TDO/SWO	K5	H3	46	31	[2]	O	O	Test Data Out for JTAG interface (default) or SW trace output.
TDI	J4	G3	35	26	[2]	I; PU	I	Test Data In for JTAG interface.
USB0 pins								
USB0_DP	F2	E1	26	18	[6]	-	I/O	USB0 bidirectional D+ line. Do not add an external series resistor.
USB0_DM	G2	E2	28	20	[6]	-	I/O	USB0 bidirectional D− line. Do not add an external series resistor.
USB0_VBUS	F1	E3	29	21	[6][7]	-	I	VBUS pin (power on USB cable). This pin includes an internal pull-down resistor of 64 kΩ (typical) ± 16 kΩ.
USB0_ID	H2	F1	30	22	[8]	-	I	Indicates to the transceiver whether connected as an A-device (USB0_ID LOW) or B-device (USB0_ID HIGH). For OTG this pin has an internal pull-up resistor.
USB0_RREF	H1	F3	32	24	[8]	-		12.0 kΩ (accuracy 1 %) on-board resistor to ground for current reference.
USB1 pins								
USB1_DP	F12	E9	129	89	[9]	-	I/O	USB1 bidirectional D+ line. Add an external series resistor of 33 Ω +/- 2 %.
USB1_DM	G12	E10	130	90	[9]	-	I/O	USB1 bidirectional D− line. Add an external series resistor of 33 Ω +/- 2 %.
I^2C-bus pins								
I2C0_SCL	L15	D6	132	92	[10]	I; F	I/O	I^2C clock input/output. Open-drain output (for I^2C-bus compliance).
I2C0_SDA	L16	E6	133	93	[10]	I; F	I/O	I^2C data input/output. Open-drain output (for I^2C-bus compliance).
Reset and wake-up pins								
$\overline{\text{RESET}}$	D9	B6	185	128	[11]	I; IA	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 pin does not have an internal pull-up.

Table 3. Pin description *…continued*

Pin name	LBGA256	TFBGA100	LQFP208	LQFP144		Reset state [1]	Type	Description
WAKEUP0	A9	A4	187	130	[11]	I; IA	I	External wake-up input; can raise an interrupt and can cause wake-up from any of the low power modes. A pulse with a duration of at least 45 ns wakes up the part. Input 0 of the event monitor.No internal pull-up is enabled when this pin is configured as input.
WAKEUP1	A10	-	-	-	[11]	I; IA	I	External wake-up input; can raise an interrupt and can cause wake-up from any of the low power modes. A pulse with a duration of at least 45 ns wakes up the part. Input 1 of the event monitor. No internal pull-up is enabled when this pin is configured as input.
WAKEUP2	C9	-	-	-	[11]	I; IA	I	External wake-up input; can raise an interrupt and can cause wake-up from any of the low power modes. A pulse with a duration of at least 45 ns wakes up the part. Input 2 of the event monitor. This pin does not have an internal pull-up.
WAKEUP3	D8	-	-	-	[11]	I; IA	I	External wake-up input; can raise an interrupt and can cause wake-up from any of the low power modes. A pulse with a duration of at least 45 ns wakes up the part. This pin does not have an internal pull-up.
ADC pins								
ADC0_0/ ADC1_0/DAC	E3	A2	8	6	[8]	I; IA	I	ADC input channel 0. Shared between 10-bit ADC0/1 and DAC.
ADC0_1/ ADC1_1	C3	A1	4	2	[8]	I; IA	I	ADC input channel 1. Shared between 10-bit ADC0/1.
ADC0_2/ ADC1_2	A4	B3	206	143	[8]	I; IA	I	ADC input channel 2. Shared between 10-bit ADC0/1.
ADC0_3/ ADC1_3	B5	A3	200	139	[8]	I; IA	I	ADC input channel 3. Shared between 10-bit ADC0/1.
ADC0_4/ ADC1_4	C6	-	199	138	[8]	I; IA	I	ADC input channel 4. Shared between 10-bit ADC0/1.
ADC0_5/ ADC1_5	B3	-	208	144	[8]	I; IA	I	ADC input channel 5. Shared between 10-bit ADC0/1.
ADC0_6/ ADC1_6	A5	-	204	142	[8]	I; IA	I	ADC input channel 6. Shared between 10-bit ADC0/1.
ADC0_7/ ADC1_7	C5	-	197	136	[8]	I; IA	I	ADC input channel 7. Shared between 10-bit ADC0/1.
RTC								
RTC_ALARM	A11	C3	186	129	[11]	-	O	RTC controlled output.
RTCX1	A8	A5	182	125	[8]	-	I	Input to the RTC 32 kHz ultra-low power oscillator circuit.
RTCX2	B8	B5	183	126	[8]	-	O	Output from the RTC 32 kHz ultra-low power oscillator circuit.
$\overline{\text{SAMPLE}}$	B9	-	-	-	[11]	O	O	Event monitor sample output.
Crystal oscillator pins								

Remark: Any interrupt can wake up the ARM Cortex-M4 from sleep mode if enabled in the NVIC.

7.9 Global Input Multiplexer Array (GIMA)

The GIMA allows to route signals to event-driven peripheral targets like the SCTimer/PWM, timers, event router, or the ADCs.

7.9.1 Features

- Single selection of a source.
- Signal inversion.
- Can capture a pulse if the input event source is faster than the target clock.
- Synchronization of input event and target clock.
- Single-cycle pulse generation for target.

7.10 On-chip static RAM

The LPC435x/3x/2x/1x support up to 136 kB SRAM with separate bus master access for higher throughput and individual power control for low power operation.

7.11 On-chip flash memory

The LPC435x/3x/2x/1x contain up to 1 MB of dual-bank flash program memory. With dual-bank flash memory, the user code can write or erase one flash bank while reading the other flash bank without interruption. A two-port flash accelerator maximizes the flash performance.

In-System Programming (ISP) and In-Application Programming (IAP) routines for programming the flash memory are provided in the Boot ROM.

7.12 EEPROM

The LPC435x/3x/2x/1x contain 16 kB of on-chip byte-erasable and byte-programmable EEPROM memory.

The EEPROM memory is divided into 128 pages. The user can access pages 1 through 127. Page 128 is protected.

7.13 Boot ROM

The internal ROM memory is used to store the boot code of the LPC435x/3x/2x/1x. After a reset, the ARM processor will start its code execution from this memory.

The boot ROM memory includes the following features:

- The ROM memory size is 64 kB.
- Supports booting from external static memory such as NOR flash, SPI flash, quad SPI flash, USB0, and USB1.
- Includes API for OTP programming.
- Includes a flexible USB device stack that supports Human Interface Device (HID), Mass Storage Class (MSC), and Device Firmware Upgrade (DFU) drivers.

In the two-counter case, the following operational elements are global to the SCTimer/PWM, but the last three can use match conditions from either counter:

- Clock selection
- Inputs
- Events
- Outputs
- Interrupts

7.17.1.1 Features

- Two 16-bit counters or one 32-bit counter.
- Counters clocked by bus clock or selected input.
- Up counters or up-down counters.
- State variable allows sequencing across multiple counter cycles.
- The following conditions define an event: a counter match condition, an input (or output) condition, a combination of a match and/or and input/output condition in a specified state.
- Events control outputs, interrupts, and DMA requests.
  - Match register 0 can be used as an automatic limit.
  - In bi-directional mode, events can be enabled based on the count direction.
  - Match events can be held until another qualifying event occurs.
- Selected events can limit, halt, start, or stop a counter.
- Supports:
  - 8 inputs
  - 16 outputs
  - 16 match/capture registers
  - 16 events
  - 32 states
  - Match register 0 to 5 support a fractional component for the dither engine

7.17.2 Serial GPIO (SGPIO)

The Serial GPIOs offer standard GPIO functionality enhanced with features to accelerate serial stream processing.

7.17.2.1 Features

- Each SGPIO input/output slice can be used to perform a serial to parallel or parallel to serial data conversion.
- 16 SGPIO input/output slices each with a 32-bit FIFO that can shift the input value from a pin or an output value to a pin with every cycle of a shift clock.
- Each slice is double-buffered.
- Interrupt is generated on a full FIFO, shift clock, or pattern match.
- Slices can be concatenated to increase buffer size.

- Compatible with Motorola SPI, 4-wire Texas Instruments SSI, and National Semiconductor Microwire buses
- Synchronous serial communication
- Master or slave operation
- 8-frame FIFOs for both transmit and receive
- 4-bit to 16-bit frame
- DMA transfers supported by GPDMA

7.19.5 I²C-bus interface

Remark: The LPC435x/3x/2x/1x each contain two I²C-bus interfaces.

The I²C-bus is bidirectional for inter-IC control using only two wires: a Serial Clock line (SCL) and a Serial Data line (SDA). Each device is recognized by a unique address and can operate as either a receiver-only device (for example an LCD driver) or a transmitter with the capability to both receive and send information (such as memory). Transmitters and/or receivers can operate in either master or slave mode, depending on whether the chip has to initiate a data transfer or is only addressed. The I²C is a multi-master bus and can be controlled by more than one bus master connected to it.

7.19.5.1 Features

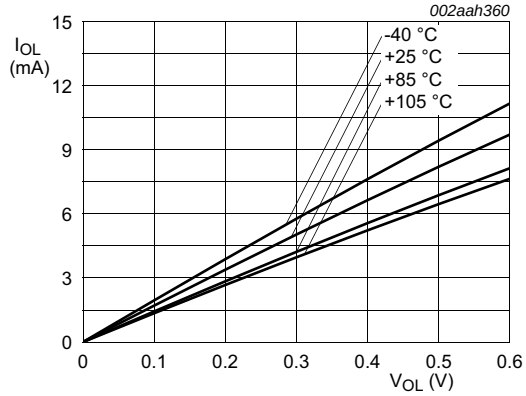
- I²C0 is a standard I²C compliant bus interface with open-drain pins. I²C0 also supports Fast mode plus with bit rates up to 1 Mbit/s.
- I²C1 uses standard I/O pins with bit rates of up to 400 kbit/s (Fast I²C-bus).
- Easy to configure as master, slave, or master/slave.
- Programmable clocks allow versatile rate control.
- Bidirectional data transfer between masters and slaves.
- Multi-master bus (no central master).
- Arbitration between simultaneously transmitting masters without corruption of serial data on the bus.
- Serial clock synchronization allows devices with different bit rates to communicate via one serial bus.
- Serial clock synchronization can be used as a handshake mechanism to suspend and resume serial transfer.
- The I²C-bus can be used for test and diagnostic purposes.
- All I²C-bus controllers support multiple address recognition and a bus monitor mode.

7.19.6 I²S interface

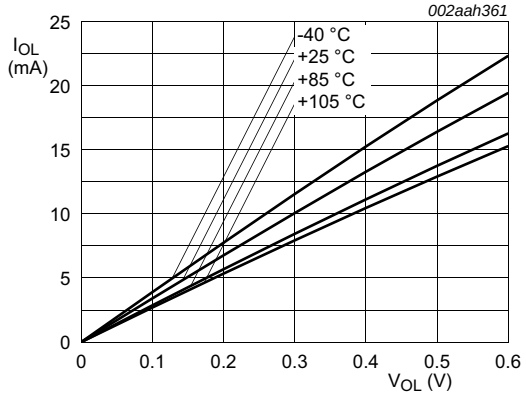
Remark: The LPC435x/3x/2x/1x each contain two I²S-bus interfaces.

The I²S-bus provides a standard communication interface for digital audio applications.

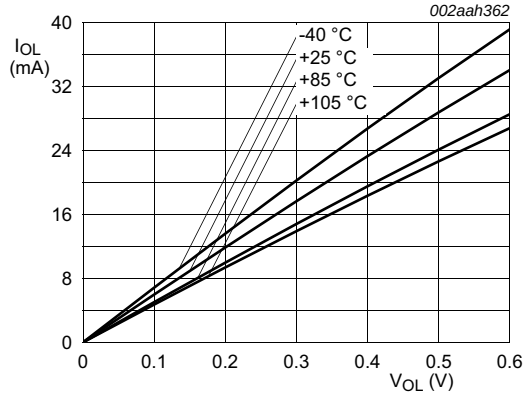
The *I²S-bus specification* defines a 3-wire serial bus using one data line, one clock line, and one word select signal. The basic I²S-bus connection has one master, which is always the master, and one slave. The I²S-bus interface provides a separate transmit and receive channel, each of which can operate as either a master or a slave.



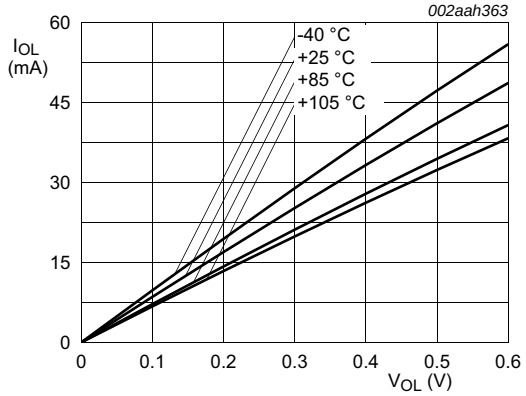
Conditions: $V_{DD(REG)(3V3)} = V_{DD(IO)} = 3.3$ V; normal-drive; EHD = 0x0.



Conditions: $V_{DD(REG)(3V3)} = V_{DD(IO)} = 3.3$ V; medium-drive; EHD = 0x1.



Conditions: $V_{DD(REG)(3V3)} = V_{DD(IO)} = 3.3$ V; high-drive; EHD = 0x2.



Conditions: $V_{DD(REG)(3V3)} = V_{DD(IO)} = 3.3$ V; ultra high-drive; EHD = 0x3.

Fig 22. High-drive pins; typical LOW level output current I_{OL} versus LOW level output voltage V_{OL}

Table 32. Dynamic characteristics: Dynamic external memory interface

Simulated data over temperature and process range; C_L = 10 pF for $\overline{EMC\_DYCSn}$, $\overline{EMC\_RAS}$, $\overline{EMC\_CAS}$, $\overline{EMC\_WE}$, EMC_An; C_L = 9 pF for EMC_Dn; C_L = 5 pF for EMC_DQMOUTn, EMC_CLKn, EMC_CKEOUTn; T_{amb} = −40 °C to 105 °C; 2.4 V ≤ $V_{DD(REG)(3V3)}$ ≤ 3.6 V; $V_{DD(IO)}$ = 3.3 V ± 10 %; RD = 1 (see LPC43xx User manual); EMC_CLKn delays CLK0_DELAY = CLK1_DELAY = CLK2_DELAY = CLK3_DELAY = 0.

Symbol	Parameter	Min	Typ	Max	Unit
$T_{cy(clk)}$	clock cycle time	8.4	-	-	ns
Common to read and write cycles					
$t_{d(DYCSV)}$	dynamic chip select valid delay time	-	3.1 + 0.5 × $T_{cy(clk)}$	5.1 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(DYCS)}$	dynamic chip select hold time	0.3 + 0.5 × $T_{cy(clk)}$	0.9 + 0.5 × $T_{cy(clk)}$	-	ns
$t_{d(RASV)}$	row address strobe valid delay time	-	3.1 + 0.5 × $T_{cy(clk)}$	4.9 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(RAS)}$	row address strobe hold time	0.5 + 0.5 × $T_{cy(clk)}$	1.1 + 0.5 × $T_{cy(clk)}$	-	ns
$t_{d(CASV)}$	column address strobe valid delay time	-	2.9 + 0.5 × $T_{cy(clk)}$	4.6 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(CAS)}$	column address strobe hold time	0.3 + 0.5 × $T_{cy(clk)}$	0.9 + 0.5 × $T_{cy(clk)}$	-	ns
$t_{d(WEV)}$	write enable valid delay time	-	3.2 + 0.5 × $T_{cy(clk)}$	5.9 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(WE)}$	write enable hold time	1.3 + 0.5 × $T_{cy(clk)}$	1.4 + 0.5 × $T_{cy(clk)}$	-	ns
$t_{d(DQMOUTV)}$	DQMOUT valid delay time	-	3.1 + 0.5 × $T_{cy(clk)}$	5.0 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(DQMOUT)}$	DQMOUT hold time	0.2 + 0.5 × $T_{cy(clk)}$	0.8 + 0.5 × $T_{cy(clk)}$	-	ns
$t_{d(AV)}$	address valid delay time	-	3.8 + 0.5 × $T_{cy(clk)}$	6.3 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(A)}$	address hold time	0.3 + 0.5 × $T_{cy(clk)}$	0.9 + 0.5 × $T_{cy(clk)}$	-	ns
$t_{d(CKEOUTV)}$	CKEOUT valid delay time	-	3.1 + 0.5 × $T_{cy(clk)}$	5.1 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(CKEOUT)}$	CKEOUT hold time	0.5 × $T_{cy(clk)}$	0.7 + 0.5 × $T_{cy(clk)}$	-	ns
Read cycle parameters					
$t_{su(D)}$	data input set-up time	−1.5	−0.5	-	ns
$t_{h(D)}$	data input hold time	2.2	0.8	-	ns
Write cycle parameters					
$t_{d(QV)}$	data output valid delay time	-	3.8 + 0.5 × $T_{cy(clk)}$	6.2 + 0.5 × $T_{cy(clk)}$	ns
$t_{h(Q)}$	data output hold time	0.5 × $T_{cy(clk)}$	0.7 + 0.5 × $T_{cy(clk)}$	-	ns

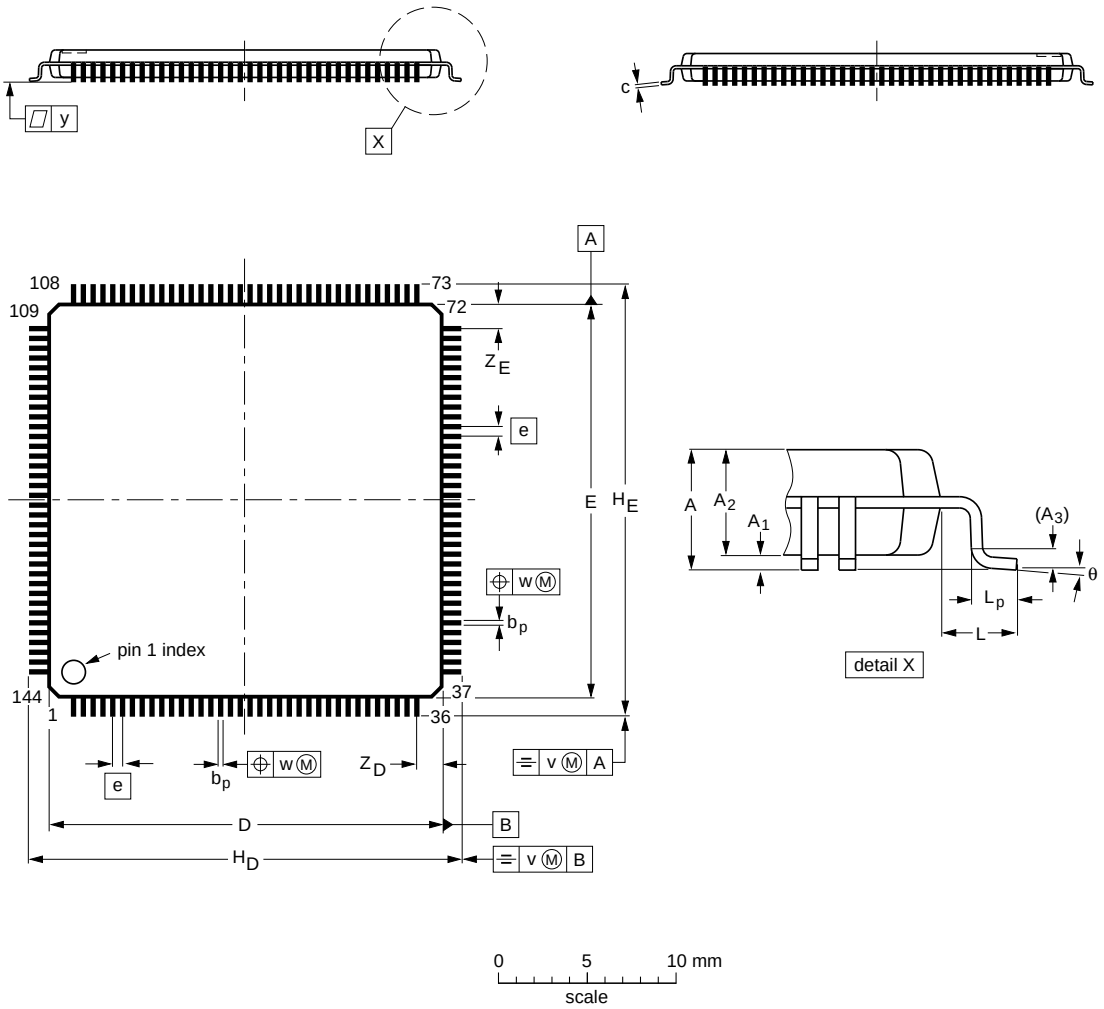
Table 33. Dynamic characteristics: Dynamic external memory interface; EMC_CLK[3:0] delay values

T_{amb} = −40 °C to 105 °C; $V_{DD(IO)}$ = 3.3 V ± 10 %; 2.4 V ≤ $V_{DD(REG)(3V3)}$ ≤ 3.6 V.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_d	delay time	delay value	[1]				
		CLKn_DELAY = 0		0.0	0.0	0.0	ns
		CLKn_DELAY = 1	[1]	0.4	0.5	0.8	ns
		CLKn_DELAY = 2	[1]	0.7	1.0	1.7	ns
		CLKn_DELAY = 3	[1]	1.1	1.6	2.5	ns
		CLKn_DELAY = 4	[1]	1.4	2.0	3.3	ns
		CLKn_DELAY = 5	[1]	1.7	2.6	4.1	ns
		CLKn_DELAY = 6	[1]	2.1	3.1	4.9	ns
		CLKn_DELAY = 7	[1]	2.5	3.6	5.8	ns

[1] Program the EMC_CLKn delay values in the EMCDELAYCLK register (see the *LPC43xx User manual*). The delay values must be the same for all SDRAM clocks EMC_CLKn: CLK0_DELAY = CLK1_DELAY = CLK2_DELAY = CLK3_DELAY.

LQFP144: plastic low profile quad flat package; 144 leads; body 20 x 20 x 1.4 mm **SOT486-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_D	H_E	L	L_p	v	w	y	$Z_D^{(1)}$	$Z_E^{(1)}$	θ
mm	1.6	0.15 0.05	1.45 1.35	0.25	0.27 0.17	0.20 0.09	20.1 19.9	20.1 19.9	0.5	22.15 21.85	22.15 21.85	1	0.75 0.45	0.2	0.08	0.08	1.4 1.1	1.4 1.1	7^o 0^o

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT486-1	136E23	MS-026				~~00-03-14~~ 03-02-20

Fig 54. Package outline for the LQFP144 package

18. Revision history

Table 47. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
LPC435X_3X_2X_1X v.5.3	20160315	Product data sheet	-	LPC435X_3X_2X_1X v.5.2
	• Updated Table 32 “Dynamic characteristics: Dynamic external memory interface”: Read cycle parameters $t_{h(D)}$ min value is 2.2 ns and max value is “-”.			
LPC435X_3X_2X_1X v.5.2	20151126	Product data sheet		LPC435X_3X_2X_1X v.5.1
Modifications:	• Fixed cross references in Table 3 “Pin description”.			
LPC435X_3X_2X_1X v.5.1	20151116	Product data sheet	2015110041	LPC435X_3X_2X_1X v.5
Modifications:	• Updated Table 2 “Ordering options”. TFBGA100 packages do not support ULPI interface. • Changed the EMC on TFBGA100 packages from 8 bit to 16 bit. See Section 7.18.4 “External Memory Controller (EMC)” • Fixed the sentence: the voltage divider should provide a reduction of 3.6 V/5.25 V or ~0.686 V to read the voltage divider should provide a reduction of 3.6 V/5.25 V or ~0.686 in Section 13.5.2 “Suggested USB interface solutions” on page 141. • Changed footnote 12 in Table 3 “Pin description” with the text: VPP is internally connected to VDDIO for all packages with the exception of the LFBGA256 package. • Updated the features of the SSP functional description: Maximum SSP speed in full-duplex mode of 25.5 Mbit/s; for transmit only 51 Mbit/s (master) and 11 Mbit/s (slave), see Section 7.19.4.1 “Features”. • Updated SSP slave and SSP master values in Table 27 “Dynamic characteristics: SSP pins in SPI mode”. Updated footnote 2 to: $T_{cy(clk)} \geq 12 \times T_{cy(PCLK)}$. – removed $t_{v(Q)}$, data output valid time in SPI mode, minimum value of 3 ´ (1/PCLK) from SSP slave mode. – added units to t_d, delay time, for SSP slave and master mode. • Updated Figure 29 “I2S-bus timing (receive)”. • Added GPCLKIN section and table. See Section 11.7 “GPCLKIN” and Table 22 “Dynamic characteristic: GPCLKIN”. • Updated Table 11 “Static characteristics”. I_{BAT} in deep power-down mode; RTC running; $V_{DD(REG)}$ = VDDA = VDDIO = 0 V; Was: $V_{DD(REG)(3V3)}$ floating.			
LPC435X_3X_2X_1X v.5	20150428	Product data sheet	201408004F01	LPC435X_3X_2X_1X v.4

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