Appendix I: GPIO Alternate Functions (STM32L4)

Software can program a GPIO pin to map this pin internally to the input or output of some on-chip peripheral. Thus, a GPIO pin usually can support more than one hardware functions, which are called *alternate functions*. The alternate function is selected by programming the `AFSEL[3:0]` bits defined in the Alternate Function Low or High Register. Alternate functions allow embedded system designers to better tailor the processor chip to the application's need.

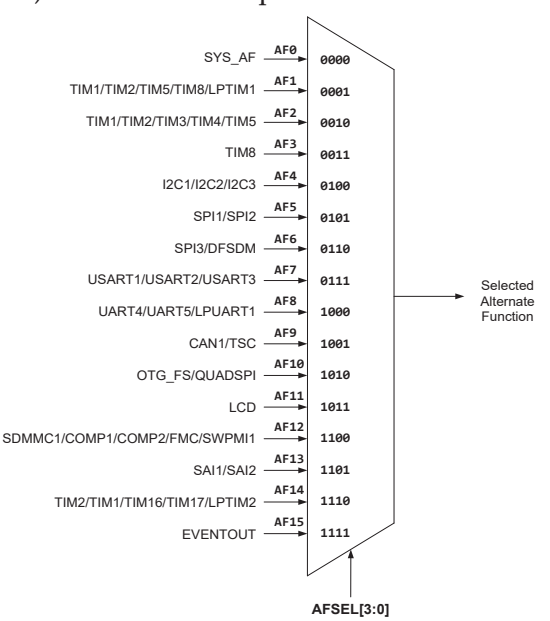
Alternate Function Low Register

31 30 29 28	27 26 25 24	23 22 21 20	19 18 17 16	15 14 13 12	11 10 9 8	7 6 5 4	3 2 1 0
AFSEL7[3:0]	AFSEL6[3:0]	AFSEL5[3:0]	AFSEL4[3:0]	AFSEL3[3:0]	AFSEL2[3:0]	AFSEL1[3:0]	AFSEL0[3:0]
AF of Pin 7	AF of Pin 6	AF of Pin 5	AF of Pin 4	AF of Pin 3	AF of Pin 2	AF of Pin 1	AF of Pin 0

Alternate Function High Register

31 30 29 28	27 26 25 24	23 22 21 20	19 18 17 16	15 14 13 12	11 10 9 8	7 6 5 4	3 2 1 0
AFSEL15[3:0]	AFSEL14[3:0]	AFSEL13[3:0]	AFSEL12[3:0]	AFSEL11[3:0]	AFSEL10[3:0]	AFSEL9[3:0]	AFSEL8[3:0]
AF of Pin 16	AF of Pin 15	AF of Pin 14	AF of Pin 13	AF of Pin 12	AF of Pin 11	AF of Pin 9	AF of Pin 8

The following tables list all alternate functions supported by each GPIO pin on STM32L4. All alternate functions are divided into the following 16 categories. For example, the alternate function 11 (`AF11`) is to set a GPIO pin to drive an LCD.



In the following tables, processor pins that have been extended to board pins on the STM32L4 discovery kit are shaded. To interface on-board peripherals, the alternative functions that should be selected are also shaded.

Port A: Alternate Functions (STM32L4)

Pin	AF0	AF1	AF2	AF3	AF4	AF5	AF6	AF7	AF8	AF9	AF10	AF11	AF12	AF13	AF14
	SYS _AF	TIM1/ TIM2/ TIM5/ TIM8/ LPTIM1	TIM1/ TIM2/ TIM3/ TIM4/ TIM5	TIM8	I2C1/ I2C2/ I2C3	SPI1/ SPI2	SPI3/ DFSDM	USART1/ USART2/ USART3	UART4/ UART5/ LPUART1	CAN1/ TSC	OTG_FS/ QUADSPI	LCD	SDMMC1/ COMP1/ COMP2/ FMC/ SWPMI1	SAI1/ SAI2	TIM2/ TIM1/ TIM16/ TIM17/ LPTIM2
PA0		TIM2 _CH1	TIM5 _CH1	TIM8 _ETR	-	-	-	USART2 _CTS	UART4 _TX	-	-	-	-	SAI1 _EXTCLK	TIM2_ETR
PA1	-	TIM2 _CH2	TIM5 _CH2	-	-	-	-	USART2 _RTS_ DE	UART4 _RX	-	-	LCD _SEG0	-	-	TIM15_CH1N
PA2	-	TIM2 _CH3	TIM5 _CH3	-	-	-	-	USART2 _TX	-	-	-	LCD _SEG1	-	SAI2 _EXTCLK	TIM15_CH1
PA3	-	TIM2 _CH4	TIM5 _CH4	-	-	-	-	USART2 _RX	-	-	-	LCD _SEG2	-	-	TIM15_CH2
PA4	-	-	-	-	-	SPI1 _NSS	SPI3 _NSS	USART2 _CK	-	-	-	-	-	SAI1 _FS_B	LPTIM2 _OUT
PA5	-	TIM2 _CH1	TIM2 _ETR	TIM8 _CH1N	-	SPI1 _SCK	-	-	-	-	-	-	-	-	LPTIM2 _ETR
PA6	-	TIM1 _BKIN	TIM3 _CH1	TIM8 _BKIN	-	SPI1 _MISO	-	USART3 _CTS	-	-	QUADSPI _BK1_IO3	LCD _SEG3	TIM1 _BKIN _COMP2	TIM8 _BKIN _COMP2	TIM16_CH1
PA7	-	TIM1 _CH1N	TIM3 _CH2	TIM8 _CH1N	-	SPI1 _MOSI	-	-	-	-	QUADSPI _BK1_IO2	LCD _SEG4	-	-	TIM17_CH1
PA8	MCO	TIM1 _CH1	-	-	-	-	-	USART1 _CK	-	-	OTG_FS _SOF	LCD _COM0	-	-	LPTIM2_OUT
PA9	-	TIM1 _CH2	-	-	-	-	-	USART1 _TX	-	-	-	LCD _COM1	-	-	TIM15_BKIN
PA10	-	TIM1 _CH3	-	-	-	-	-	USART1 _RX	-	-	OTG_FS _ID	LCD _COM2	-	-	TIM17_BKIN
PA11	-	TIM1 _CH4	TIM1 _BKIN2	-	-	-	-	USART1 _CTS	-	CAN1 _RX	OTG_FS _DM	-	TIM1 _BKIN2 _COMP1	-	-
PA12	-	TIM1 _ETR	-	-	-	-	-	USART1 _RTS_ DE	-	CAN1 _TX	OTG_FS _DP	-	-	-	-
PA13	JTMS/ SWDIO	IR _OUT	-	-	-	-	-	-	-	-	OTG_FS _NOE	-	-	-	-
PA14	JTCK/ SWCLK	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PA15	JTDI	TIM2 _CH1	TIM2 _ETR	-	-	SPI1 _NSS	SPI3 _NSS	-	UART4 _RTS_DE	TSC_G3 _IO1	-	LCD _SEG17	-	SAI2 _FS_B	-

Port B: Alternate Functions (STM32L4)

Pin	AF0	AF1	AF2	AF3	AF4	AF5	AF6	AF7	AF8	AF9	AF10	AF11	AF12	AF13	AF14
	SYS_AF	TIM1/ TIM2/ TIM5/ TIM8/ LPTIM1	TIM1/ TIM2/ TIM3/ TIM4/ TIM5	TIM8	I2C1/ I2C2/ I2C3	SPI1/ SPI2	SPI3/ DFSDM	USART1/ USART2/ USART3	UART4/ UART5/ LPUART1	CAN1/ TSC	OTG_FS/ QUADSPI	LCD	SDMMC1/ COMP1/ COMP2/ FMC/ SWPMI1	SAI1/ SAI2	TIM2/TIM1/ TIM16/ TIM17/ LPTIM2
PB0	-	TIM1 _CH2N	TIM3 _CH3	TIM8 _CH2N	-	-	-	USART3 _CK	-	-	QUADSPI _BK1_IO1	LCD _SEG5	COMP1 _OUT	-	-
PB1	-	TIM1 _CH3N	TIM3 _CH4	TIM8 _CH3N	-	-	DFSDM _DATIN0	USART3 _RTS_DE	-	-	QUADSPI _BK1_IO0	LCD _SEG6	-	-	LPTIM2 _IN1
PB2	RTC _OUT	LPTIM1 _OUT	-	-	I2C3 _SMBA	-	DFSDM _CKIN0	-	-	-	-	-	-	-	-
PB3	JTDO/ TRACES WO	TIM2 _CH2	-	-	-	SPI1 _SCK	SPI3 _SCK	USART1 _RTS_DE	-	-	-	LCD _SEG7	-	SAI1 _SCK_B	-
PB4	NJTRST	-	TIM3 _CH1	-	-	SPI1 _MISO	SPI3 _MISO	USART1 _CTS	UART5 _RTS_DE	TSC_G2 _IO1	-	LCD _SEG8	-	SAI1 _MCLK_ B	TIM17 _BKIN
PB5	-	LPTIM1 _IN1	TIM3 _CH2	-	I2C1 _SMBA	SPI1 _MOSI	SPI3 _MOSI	USART1 _CK	UART5 _CTS	TSC_G2 _IO2	-	LCD _SEG9	COMP2 _OUT	SAI1 _SD_B	TIM16 _BKIN
PB6	-	LPTIM1 _ETR	TIM4 _CH1	TIM8 _BKIN2	I2C1 _SCL	-	DFSDM _DATIN5	USART1 _TX	-	TSC_G2 _IO3	-	-	TIM8_BKIN2 _COMP2	SAI 1_FS_B	TIM16 _CH1N
PB7	-	LPTIM1 _IN2	TIM4 _CH2	TIM8 _BKIN	I2C1 _SDA	-	DFSDM _CKIN5	USART1 _RX	UART4 _CTS	TSC_G2 _IO4	-	LCD _SEG21	FMC_NL	TIM8_BKIN _COMP1	TIM17 _CH1N
PB8	-	-	TIM4 _CH3	-	I2C1 _SCL	-	DFSDM _DATIN6	-	-	CAN1 _RX	-	LCD _SEG16	SDMMC1 _D4	SAI1 _MCLK_ A	TIM16 _CH1
PB9	-	IR _OUT	TIM4 _CH4	-	I2C1 _SDA	SPI2 _NSS	DFSDM _CKIN6	-	-	CAN1 _TX	-	LCD _COM3	SDMMC1 _D5	SAI1 _FS_A	TIM17 _CH1
PB10	-	TIM2 _CH3	-	-	I2C2 _SCL	SPI2 _SCK	DFSDM _DATIN7	USART3 _TX	LPUART1 _ RX	-	QUADSPI _CLK	LCD _SEG10	COMP1 _OUT	SAI1 _SCK_A	-
PB11	-	TIM2 _CH4	-	-	I2C2 _SDA	-	DFSDM _CKIN7	USART3 _RX	LPUART1 _TX	-	QUADSPI _NCS	LCD _SEG11	COMP2 _OUT	-	-
PB12	-	TIM1 _BKIN	-	TIM1 _BKIN_ COMP2	I2C2 _SMBA	SPI2 _NSS	DFSDM _DATIN1	USART3 _CK	LPUART1 _ RTS_DE	TSC_G1 _IO1	-	LCD _SEG12	SWPMI1 _IO	SAI2 _FS_A	TIM15 _BKIN
PB13	-	TIM1 _CH1N	-	-	I2C2 _SCL	SPI2 _SCK	DFSDM _CKIN1	USART3 _CTS	LPUART1 _ CTS	TSC_G1 _IO2	-	LCD _SEG13	SWPMI1 _TX	SAI2 _SCK_A	TIM15 _CH1N
PB14	-	TIM1 _CH2N	-	TIM8 _CH2N	I2C2 _SDA	SPI2 _MISO	DFSDM _DATIN2	USART3 _RTS_ DE	-	TSC_G1 _IO3	-	LCD _SEG14	SWPMI1 _RX	SAI2 _MCLK_ A	TIM15 _CH1
PB15	RTC _REFIN	TIM1 _CH3N	-	TIM8 _CH3N	-	SPI2 _MOSI	DFSDM _CKIN2	-	-	TSC_G1 _IO4	-	LCD _SEG15	SWPMI1 _SUSPEND	SAI2 _SD_A	TIM15 _CH2

Port C: Alternate Functions (STM32L4)

Pin	AF0	AF1	AF2	AF3	AF4	AF5	AF6	AF7	AF8	AF9	AF10	AF11	AF12	AF13	AF14
	SYS_AF	TIM1/ TIM2/ TIM5/ TIM8/ LPTIM1	TIM1/ TIM2/ TIM3/ TIM4/ TIM5	TIM8	I2C1/ I2C2/ I2C3	SPI1/ SPI2	SPI3/ DFSDM	USART1/ USART2/ USART3	UART4/ UART5/ LPUART1	CAN1/ TSC	OTG_FS/ QUADSPI	LCD	SDMMC1/ COMP1/ COMP2/ FMC/ SWPMI1	SAI1/ SAI2	TIM2/ TIM1/ TIM16/ TIM17/ LPTIM2
PC0	-	LPTIM1_IN1	-	-	I2C3_SCL	-	DFSDM_DATIN4	-	LPUART1_RX	-	-	LCD_SEG18	-	-	LPTIM2_IN1
PC1	-	LPTIM1_OUT	-	-	I2C3_SDA	-	DFSDM_CKIN4	-	LPUART1_TX	-	-	LCD_SEG19	-	-	-
PC2	-	LPTIM1_IN2	-	-	-	SPI2_MISO	DFSDM_CKOUT	-	-	-	-	LCD_SEG20	-	-	-
PC3	-	LPTIM1_ETR	-	-	-	SPI2_MOSI	-	-	-	-	-	LCD_VLCD	-	SAI1_SD_A	LPTIM2_ETR
PC4	-	-	-	-	-	-	-	USART3_TX	-	-	-	LCD_SEG22	-	-	-
PC5	-	-	-	-	-	-	-	USART3_RX	-	-	-	LCD_SEG23	-	-	-
PC6	-	-	TIM3_CH1	TIM8_CH1	-	-	DFSDM_CKIN3	-	-	TSC_G4_IO1	-	LCD_SEG24	SDMMC1_D6	SAI2_MCLK_A	-
PC7	-	-	TIM3_CH2	TIM8_CH2	-	-	DFSDM_DATIN3	-	-	TSC_G4_IO2	-	LCD_SEG25	SDMMC1_D7	SAI2_MCLK_B	-
PC8	-	-	TIM3_CH3	TIM8_CH3	-	-	-	-	-	TSC_G4_IO3	-	LCD_SEG26	SDMMC1_D0	-	-
PC9	-	TIM8_BKIN2	TIM3_CH4	TIM8_CH4	-	-	-	-	-	TSC_G4_IO4	OTG_FS_NOE	LCD_SEG27	SDMMC1_D1	SAI2_EXTCLK	TIM8_BKIN2_COMP1
PC10	-	-	-	-	-	-	SPI3_SCK	USART3_TX	UART4_TX	TSC_G3_IO2	-	LCD_COM4/ LCD_SEG28/ LCD_SEG40	SDMMC1_D2	SAI2_SCK_B	-
PC11	-	-	-	-	-	-	SPI3_MISO	USART3_RX	UART4_RX	TSC_G3_IO3	-	LCD_COM5/ LCD_SEG29/ LCD_SEG41	SDMMC1_D3	SAI2_MCLK_B	-
PC12	-	-	-	-	-	-	SPI3_MOSI	USART3_CK	UART5_TX	TSC_G3_IO4	-	LCD_COM6/ LCD_SEG30/ LCD_SEG42	SDMMC1_CK	SAI2_SD_B	-
PC13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PC14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PC15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Port D: Alternate Functions (STM32L4)

Pin	AF0	AF1	AF2	AF3	AF4	AF5	AF6	AF7	AF8	AF9	AF10	AF11	AF12	AF13	AF14
	SYS _AF	TIM1/ TIM2/ TIM5/ TIM8/ LPTIM1	TIM1/ TIM2/ TIM3/ TIM4/ TIM5	TIM8	I2C1/ I2C2/ I2C3	SPI1/ SPI2	SPI3/ DFSDM	USART1/ USART2/ USART3	UART4/ UART5/ LPUART1	CAN1/ TSC	OTG_FS/ QUADSPI	LCD	SDMMC1/ COMP1/ COMP2/ FMC/ SWPMI1	SAI1/ SAI2	TIM2/ TIM1/ TIM16/ TIM17/ LPTIM2
PD0	-	-	-	-	-	SPI2 _NSS	DFSDM _DATIN7	-	-	CAN1 _RX	-	-	FMC_D2	-	-
PD1	-	-	-	-	-	SPI2 _SCK	DFSDM _CKIN7	-	-	CAN1 _TX	-	-	FMC_D3	-	-
PD2	-	-	TIM3_ETR	-	-	-	-	USART3 _RTS_ DE	UART5 _RX	TSC _SYNC	-	LCD_COM7/ LCD_SEG31/ LCD_SEG43	SDMMC1 _CMD	-	-
PD3	-	-	-	-	-	SPI2 _MISO	DFSDM _DATIN0	USART2 _CTS	-	-	-	-	FMC_CLK	-	-
PD4	-	-	-	-	-	SPI2 _MOSI	DFSDM _CKIN0	USART2 _RTS_ DE	-	-	-	-	FMC_NOE	-	-
PD5	-	-	-	-	-	-	-	USART2 _TX	-	-	-	-	FMC_NWE	-	-
PD6	-	-	-	-	-	-	DFSDM _DATIN1	USART2 _RX	-	-	-	-	FMC_NWAIT	SAI1 _SD_A	-
PD7	-	-	-	-	-	-	DFSDM_ CKIN1	USART2 _CK	-	-	-	-	FMC_NE1	-	-
PD8	-	-	-	-	-	-	-	USART3 _TX	-	-	-	LCD_SEG28	FMC_D13	-	-
PD9	-	-	-	-	-	-	-	USART3 _RX	-	-	-	LCD_SEG29	FMC_D14	SAI2 _MCLK_ A	-
PD10	-	-	-	-	-	-	-	USART3 _CK	-	TSC_G6 _IO1	-	LCD_SEG30	FMC_D15	SAI2 _SCK_A	-
PD11	-	-	-	-	-	-	-	USART3 _CTS	-	TSC_G6 _IO2	-	LCD_SEG31	FMC_A16	SAI2 _SD_A	LPTIM2 _ETR
PD12	-	-	TIM4_CH1	-	-	-	-	USART3_ RTS_ DE	-	TSC_G6 _IO3	-	LCD_SEG32	FMC_A17	SAI2 _FS_A	LPTIM2 _IN1
PD13	-	-	TIM4_CH2	-	-	-	-	-	-	TSC_G6 _IO4	-	LCD_SEG33	FMC_A18	-	LPTIM2 _OUT
PD14	-	-	TIM4_CH3	-	-	-	-	-	-	-	-	LCD_SEG34	FMC_D0	-	-
PD15	-	-	TIM4_CH4	-	-	-	-	-	-	-	-	LCD_SEG35	FMC_D1	-	-

Port E: Alternate Functions (STM32L4)

Pin	AF0	AF1	AF2	AF3	AF4	AF5	AF6	AF7	AF8	AF9	AF10	AF11	AF12	AF13	AF14
	SYS_AF	TIM1/ TIM2/ TIM5/ TIM8/ LPTIM1	TIM1/ TIM2/ TIM3/ TIM4/ TIM5	TIM8	I2C1/ I2C2/ I2C3	SPI1/ SPI2	SPI3/ DFSDM	USART1/ USART2/ USART3	UART4/ UART5/ LPUART1	CAN1/ TSC	OTG_FS/ QUADSPI	LCD	SDMMC1/ COMP1/ COMP2/ FMC/ SWPMI1	SAI1/ SAI2	TIM2/ TIM1/ TIM16/ TIM17/ LPTIM2
PE0	-	-	TIM4_ETR	-	-	-	-	-	-	-	-	LCD _SEG36	FMC_NBL0	-	TIM16 _CH1
PE1	-	-	-	-	-	-	-	-	-	-	-	LCD _SEG37	FMC_NBL1	-	TIM17 _CH1
PE2	TRACECK	-	TIM3_ETR	-	-	-	-	-	-	TSC_G7 _IO1	-	LCD _SEG38	FMC_A23	SAI1 _MCLK_ A	-
PE3	TRACED0	-	TIM3_CH1	-	-	-	-	-	-	TSC_G7 _IO2	-	LCD _SEG39	FMC_A19	SAI1 _SD_B	-
PE4	TRACED1	-	TIM3_CH2	-	-	-	DFSDM _DATIN3	-	-	TSC_G7 _IO3	-	-	FMC_A20	SAI1 _FS_A	-
PE5	TRACED2	-	TIM3_CH3	-	-	-	DFSDM _CKIN3	-	-	TSC_G7 _IO4	-	-	FMC_A21	SAI1 _SCK_A	-
PE6	TRACED3	-	TIM3_CH4	-	-	-	-	-	-	-	-	-	FMC_A22	SAI1 _SD_A	-
PE7	-	TIM1 _ETR	-	-	-	-	DFSDM _DATIN2	-	-	-	-	-	FMC_D4	SAI1 _SD_B	-
PE8	-	TIM1 _CH1N	-	-	-	-	DFSDM _CKIN2	-	-	-	-	-	FMC_D5	SAI1 _SCK_B	-
PE9	-	TIM1 _CH1	-	-	-	-	DFSDM _CKOUT	-	-	-	-	-	FMC_D6	SAI1 _FS_B	-
PE10	-	TIM1 _CH2N	-	-	-	-	DFSDM _DATIN4	-	-	TSC_G5 _IO1	QUADSPI _CLK	-	FMC_D7	SAI1 _MCLK_ B	-
PE11	-	TIM1 _CH2	-	-	-	-	DFSDM _CKIN4	-	-	TSC_G5 _IO2	QUADSPI _NCS	-	FMC_D8	-	-
PE12	-	TIM1 _CH3N	-	-	-	SPI1 _NSS	DFSDM _DATIN5	-	-	TSC_G5 _IO3	QUADSPI _BK1_IO0	-	FMC_D9	-	-
PE13	-	TIM1 _CH3	-	-	-	SPI1 _SCK	DFSDM _CKIN5	-	-	TSC_G5 _IO4	QUADSPI _BK1_IO1	-	FMC_D10	-	-
PE14	-	TIM1 _CH4	TIM1 _BKIN2	TIM1 _BKIN2_ COMP2	-	SPI1 _MISO	-	-	-	-	QUADSPI _BK1_IO2	-	FMC_D11	-	-
PE15	-	TIM1 _BKIN	-	TIM1 _BKIN_ COMP1	-	SPI1 _MOSI	-	-	-	-	QUADSPI _BK1_IO3	-	FMC_D12	-	-