RT Box LaunchPad-Nucleo Interface

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HW Revision History:

HW rev. 1.0	First release
HW rev. 1.1	Enhanced board size and improved legend print
HW rev. 1.2	Added jumper TRACESWO/DOUT24

RT Box LaunchPad-Nucleo Interface

Contents

1

Introduction

The PLECS RT Box is a powerful real-time simulator based on a Xilinx Zynq system on a chip (SOC). With its digital and analog I/O signals, the RT Box is well-equipped for hardware-in-the-loop (HIL) testing as well as rapid control prototyping (RCP).

If employed for HIL testing, the RT Box typically emulates the power stage of a power electronic system. The power stage could be a simple DC/DC converter, an AC drive system or a complex multi-level inverter system. The device under test (DUT) is the control hardware connected to the RT Box. In such a setup, the complete controller can be tested without the real power stage.

To simplify the connection of external hardware and to provide convenient access to the RT Box inputs and outputs, Plexim offers a set of RT Box accessories.

The **RT Box LaunchPad-Nucleo Interface** described in this document facilitates a simple connection of the RT Box with the LaunchPad or LaunchPad XL development kits from Texas Instruments, and Nucleo-64 development boards from STMicroelectronics. It enables the user to test control algorithms implemented on TI C2000 and STM32 MCUs without developing their own interface hardware. The pinout of the LaunchPad-Nucleo Interface board has been optimized for the following boards:

TI C2000 LaunchPads:

- LaunchXL-F280039C
- LaunchXL-F280049C
- LaunchXL-F28069M
- LaunchXL-F28377S
- LaunchXL-F28379D
- LaunchXL-F28027
- LaunchXL-F28P650DK9

STM32 Nucleo-64 boards:

- STM32G4 Nucleo-64
- STM32F3 Nucleo-64

The LaunchPad-Nucleo Interface can also be used with other LaunchPad or Nucleo-64 boards not listed above, provided that the board physically aligns and connects with the header pins. Users will need to create their own pin assignment table, similar to the ones shown in the Appendix.

2

Interface Board Overview

The LaunchPad-Nucleo Interface board facilitates the connection between a TI C2000 LaunchPad, or an STM32 Nucleo-64 board and the RT Box. Fig. 2.1 shows the top view of the board without any MCU boards attached.

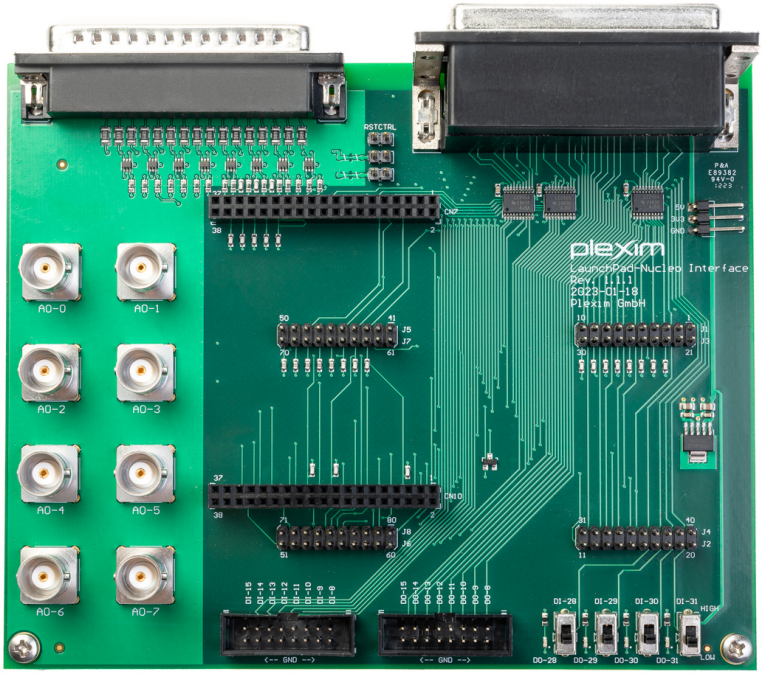

Figure 2.1: Top view of RT Box LaunchPad-Nucleo Interface

Additionally, the board provides access to some of the analog outputs of the RT

Box via BNC connectors, and to unused digital input and output signals via shrouded pin headers. For simple status communication with the RT Box, the board features four sliding switches and four LEDs.

Onboard Voltage Supply

The LaunchPad board is powered from the interface board, no external power supply is required. The interface board contains a linear voltage regulator that converts the 5 V supplied by the RT Box down to 3.3 V as required.

The Nucleo-64 board can also be powered from the interface board, since pin CN7-6, labeled “E5V” on the Nucleo-64 board, is supplied with 5 V from the RT Box. Set Jumper JP5 labeled “5V_SEL” to “E5V” on the Nucleo-64 board for the board to be powered by the RT Box.

Both supply voltages 5 V and 3.3 V are accessible at a 3-pin header on the interface board if the user wants to power external circuits. The maximum load for both voltage levels combined is 1.5 A. When an external circuit requires a 5 V supply it is recommended to draw the required power from the 3-pin header on the interface board and not from the LaunchPad or the Nucleo-64 board, to minimize losses and component stress.

Analog Output

The interface board connects all 16 analog outputs from the RT Box to the LaunchPad and Nucleo-64 headers. The lower 8 channels, AO-0 . . . AO-7, are also accessible via the BNC connectors.

To limit the current flowing through the DAC op-amps in the RT Box, a 92.9-ohm resistor is placed in series with each analog output channel. Furthermore, to safeguard the MCU inputs from overvoltage, each analog output channel is clamped to 0 V and 3.3 V with two Schottky diodes.

Digital I/O

Not all the digital inputs and outputs of the RT Box are connected to the LaunchPad or Nucleo-64 board headers. The unused digital inputs, DI-8 . . . DI-15, and outputs, DO-8 . . . DO-15, are freely accessible at the shrouded headers on the lower side of interface board. The digital outputs DO-28 . . . DO-31 are

connected to four orange LEDs in the lower right corner of the board. The digital inputs DI-28 . . . DI-31 can be set via four sliding switches.

All other digital inputs and outputs from the RT Box are connected to the LaunchPad and Nucleo-64 board headers. To protect the inputs of the MCU from voltages greater than 3.3 V, the corresponding outputs of the RT Box are buffered with bus transceivers.

DO-25 is connected to the MCU reset pin via the *RST* jumper. If the jumper is set, a low-level output at DO-25 will reset the MCU. Do not set this jumper unless you wish to use this feature.

The STM32-Nucleo boards have the TRACESWO line for the SWD (Serial Wire Debugger) on pin PB3 (connector CN10 - pin 31). To use the SWD communication the jumper TRACESWO/DOUT24 should not be populated. The state of delivery is without inserted jumper. The user must insert the jumper if the ST module pin is used as an input and to be connected to the RT Box channel DOUT24. This function is only for STM32-Nucleo board, TI LaunchPad is directly connected to the RT Box channel DOUT24. This jumper was introduced in HW revision 1.2.

Connectors

The following table contains the part numbers of the connectors used on the LaunchPad-Nucleo interface board. For dimensions of the front panel of the RT Box, refer to the RT Box manual.

Manufacturer	Part Number	Function
Sullins	PRPC010DAAN-RC	20-pin LaunchPad headers
Sullins	PPPC192LFBN-RC	38-pin Nucleo-64 headers
3M	961103-5604-AR	3-pin header to access 5 V and 3.3 V
Radiall	R141426161	BNC connector to access analog outs 0-7
On Shore Technology	302-S161	16-pin headers to access digital I/O 8-15
Assmann	A-DS 37 A/KG-T4S	37-pin DSUB to connect to RT Box Analog Out
Assmann	ASUB-277-37TP25	37-pin DSUB stacked to connect to RT Box Digital I/O

Table 2.1: Connectors on the LaunchPad-Nucleo Interface

LaunchPad Headers

A TI C2000 LaunchPad can be attached to the interface board using the corresponding pin headers. The LaunchPad will extend beyond the edge of the interface board. Fig. 2.2 shows the correct mounting position.

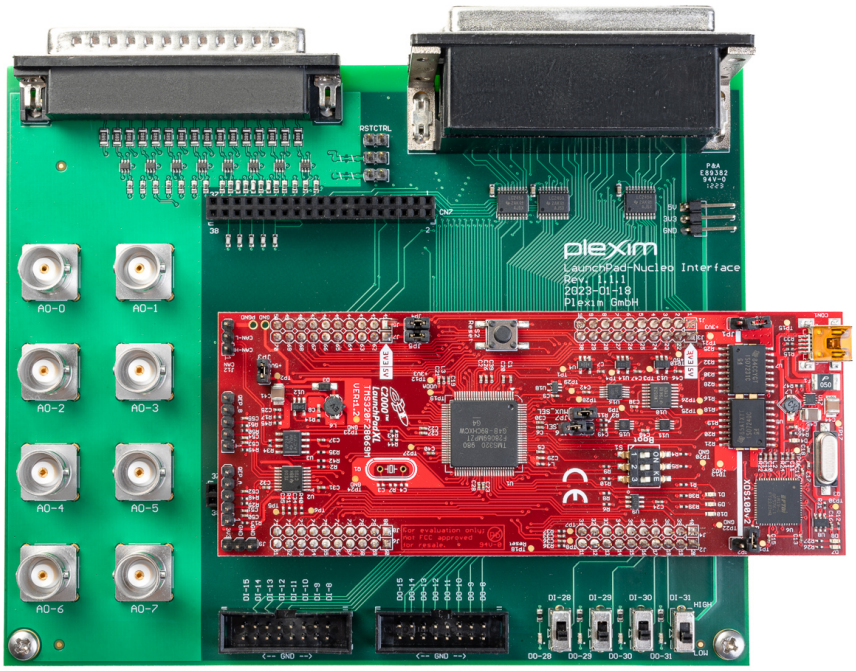

Figure 2.2: RT Box LaunchPad-Nucleo Interface with LaunchXL-F28069M

Tables 2.2 and 2.3 list the pin assignments of the LaunchPad headers and the RT Box signals. NC denotes no connection.

A more detailed table including the available processor functions at each pin for the supported LaunchPads can be found in the Appendix.

RT Box	J1	J3	RT Box
+3.3 V	1	21	NC
NC	2	22	GND
DO-0	3	23	AO-0
DO-1	4	24	AO-1
DO-2	5	25	AO-2
NC	6	26	AO-3
DI-24	7	27	AO-4
DI-25	8	28	AO-5
DI-26	9	29	AO-6
DO-27	10	30	AO-7

RT Box	J4	J2	RT Box
DI-0	40	20	GND
DI-1	39	19	DI-6
DI-2	38	18	DI-7
DI-3	37	17	NC
DI-4	36	16	**RESET** (DO-25)
DI-5	35	15	DI-27
DO-4	34	14	DO-26
DO-5	33	13	DO-6
NC	32	12	DO-7
NC	31	11	DO-3

Table 2.2: LaunchPad header pins - J1, J3, J4, J2

RT Box	J5	J7	RT Box
+3.3 V	41	61	NC
NC	42	62	GND
DO-16	43	63	AO-8
DO-17	44	64	AO-9
DO-18	45	65	AO-10
NC	46	66	AO-11
NC	47	67	AO-12
DO-19	48	68	AO-13
NC	49	69	AO-14
NC	50	70	AO-15

RT Box	J8	J6	RT Box
DI-16	80	60	GND
DI-17	79	59	DI-22
DI-18	78	58	DI-23
DI-19	77	57	NC
DI-20	76	56	NC
DI-21	75	55	DO-20
NC	74	54	DO-21
NC	73	53	DO-22
NC	72	52	DO-23
NC	71	51	DO-24

Table 2.3: LaunchPad header pins - J5, J7, J8, J6

Nucleo-64 Board Headers

An STM32 Nucleo-64 development board can be attached to the interface board using the corresponding pin headers, as shown in Fig. 2.3.

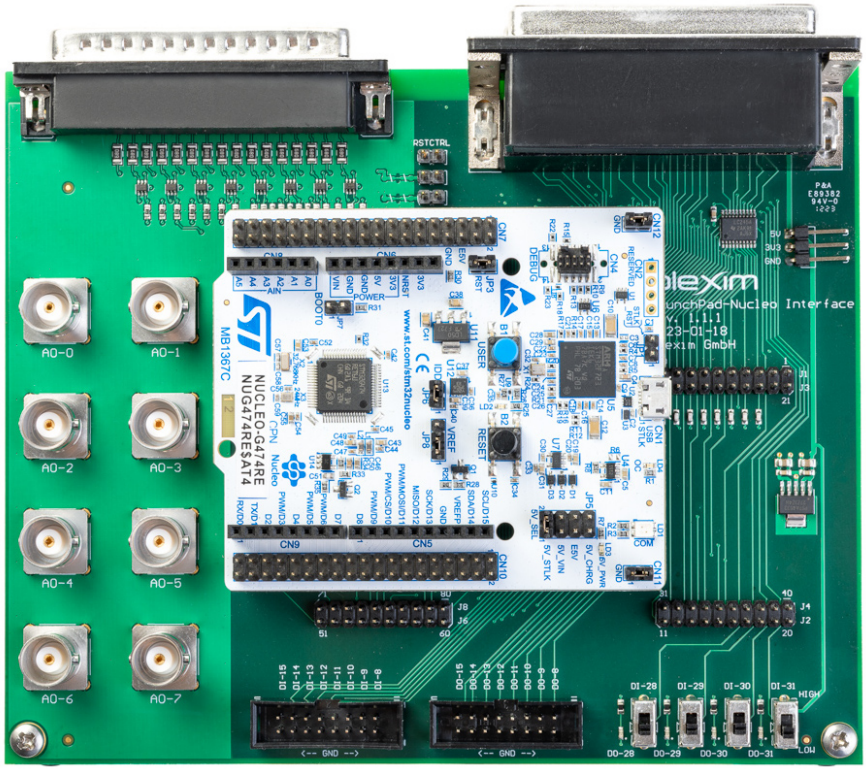

Figure 2.3: RT Box LaunchPad-Nucleo Interface with Nucleo-G474RE

Tables 2.4 and 2.5 list the pin assignments of the Nucleo-64 board headers and the RT Box signals. NC denotes no connection.

A more detailed table including the available processor functions at each pin for the supported Nucleo-64 boards can be found in the Appendix.

RT Box	CN7		RT Box
DO-27	1	2	DI-24
DO-26	3	4	DI-25
NC	5	6	+5 V
NC	7	8	GND
NC	9...12		NC
NC	13	14	**RESET** (DO-25)
NC	15	16	+3.3 V
DO-0	17	18	NC
GND	19	20	GND

RT Box	CN7		RT Box
DO-16	21	22	GND
DI-26	23	24	NC
DO-18	25	26	NC
DO-19	27	28	AO-0
NC	29	30	AO-1
NC	31	32	AO-2
NC	33	34	AO-3
AO-6	35	36	AO-4
AO-7	37	38	AO-5

Table 2.4: Nucleo-64 board header pins - CN7

RT Box	CN10		RT Box
DI-6	1	2	DI-20
DO-3	3	4	DI-16
DI-23	5	6	AO-8
NC	7	8	NC
GND	9	10	NC
DI-27	11	12	DO-20
DO-1	13	14	DI-7
DI-17	15	16	DI-22
DO-21	17	18	AO-9

RT Box	CN10		RT Box
DI-18	19	20	GND
DI-2	21	22	DO-22
DI-0	23	24	AO-10
DO-23	25	26	DI-5
DI-19	27	28	DI-3
DI-21	29	30	DI-1
DO-24	31	32	GND
DI-4	33	34	NC
NC	35...38		NC

Table 2.5: Nucleo-64 board header pins - CN10

3

Appendix

The tables on the next pages provide more detailed information on the connectivity of the LaunchPad-Nucleo Interface. For each TI C2000 LaunchPad and STM32 Nucleo-64 board, the RT Box I/O is shown beside the header pins, and the processor peripherals available at those pins. Note that not all peripherals are listed. Refer to the datasheet of the MCU board for a complete list of available peripherals. NC denotes no connection.

LAUNCHXL-F280039C Pin Map

Table 3.1: F280039C LaunchPad Pin Map - J1, J3

MCU Function	RT Box	J1	J3	RT Box	MCU Function
3.3 V power supply	+3.3 V	1	21	NC	
	NC	2	22	GND	
GPIO28, SCIA_RX	DO-0	3	23	AO-0	ADCINA6
GPIO29, SCIA_TX	DO-1	4	24	AO-1	ADCINA2/B6/C9
	DO-2	5	25	AO-2	ADCINA3/B9/C7
	NC	6	26	AO-3	ADCINA14/B14/C4
GPIO9, EPWM5B, SPIA_CLK	DI-24	7	27	AO-4	ADCINA11/B10/C0
GPIO24, BOOT1	DI-25	8	28	AO-5	ADCINB12/C2
GPIO51, I2CB_SCL	DI-26	9	29	AO-6	ADCINA7/C3
GPIO34, I2CB_SDA	DO-27	10	30	AO-7	ADCINA1/B7

Table 3.2: F280039C LaunchPad Pin Map - J5, J7

MCU Function	RT Box	J5	J7	RT Box	MCU Function
3.3 V power supply	+3.3 V	41	61	NC	
	NC	42	62	GND	
GPIO15, SCIB_RX	DO-16	43	63	AO-8	ADCINB11
GPIO56, SCIB_TX	DO-17	44	64	AO-9	ADCINA10/B1/C10
	DO-18	45	65	AO-10	ADCINA5
	NC	46	66	AO-11	ADCINA4/B8
	NC	47	67	AO-12	ADCINB4/C8
GPIO4, CANA_TX	DO-19	48	68	AO-13	ADCINB5

Table 3.2: F280039C LaunchPad Pin Map - J5, J7 (continued)

MCU Function	RT Box	J5	J7	RT Box	MCU Function
	NC	**49**	**69**	AO-14	ADCINA12/C5
	NC	**50**	**70**	AO-15	ADCINA0/B15/C15, DACA_OUT

Table 3.3: F280039C LaunchPad Pin Map - J4, J2

MCU Function	RT Box	J4	J2	RT Box	MCU Function
GPIO0, PWM1A	DI-0	**40**	**20**	GND	
GPIO1, PWM1B	DI-1	**39**	**19**	DI-6	GPIO5, SPIA_STE, CANA_RX
GPIO2, PWM2A	DI-2	**38**	**18**	DI-7	GPIO32, BOOT2
GPIO3, PWM2B	DI-3	**37**	**17**	NC	
GPIO10, PWM6A	DI-4	**36**	**16**	DO-25	**RESET**
GPIO11, PWM6B	DI-5	**35**	**15**	DI-27	GPIO8, EPWM5A, SPIA_SIMO
GPIO33	DO-4	**34**	**14**	DO-26	GPIO17, SPIA_SOMI
GPIO48	DO-5	**33**	**13**	DO-6	GPIO37, EQEP1B
	NC	**32**	**12**	DO-7	GPIO22, LED5
	NC	**31**	**11**	DO-3	GPIO23, EQEP1I

Table 3.4: F280039C LaunchPad Pin Map - J8, J6

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO12, PWM7A	DI-16	**80**	**60**	GND	
GPIO13, PWM7B	DI-17	**79**	**59**	DI-22	GPIO27, SPIB_STE
GPIO6, PWM4A	DI-18	**78**	**58**	DI-23	GPIO47
GPIO7, PWM4B	DI-19	**77**	**57**	NC	

Table 3.4: F280039C LaunchPad Pin Map - J8, J6 (continued)

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO16, PWM5A	DI-20	**76**	**56**	NC	
GPIO35, PWM5B	DI-21	**75**	**55**	DO-20	GPIO60, SPIB_SIMO
	NC	**74**	**54**	DO-21	GPIO61, SPIB_SOMI
	NC	**73**	**53**	DO-22	GPIO20, LED4
	NC	**72**	**52**	DO-23	GPIO26
	NC	**71**	**51**	DO-24	GPIO25, EQEP1A

LAUNCHXL-F280049C Pin Map

Table 3.5: F280049C LaunchPad Pin Map - J1, J3

MCU Function	RT Box	J1	J3	RT Box	MCU Function
3.3 V power supply	+3.3 V	1	21	NC	
	NC	2	22	GND	
GPIO13	DO-0	3	23	AO-0	ADCINA5
GPIO40	DO-1	4	24	AO-1	ADCINB0
	DO-2	5	25	AO-2	ADCINC2
	NC	6	26	AO-3	ADCINB1
GPIO56, SPICLKA	DI-24	7	27	AO-4	ADCINB2
ADCINC4	DI-25	8	28	AO-5	ADCINC0
GPIO37, EQEP1B	DI-26	9	29	AO-6	ADCINA9
GPIO35, EQEP1A	DO-27	10	30	AO-7	ADCINA1

Table 3.6: F280049C LaunchPad Pin Map - J5, J7

MCU Function	RT Box	J5	J7	RT Box	MCU Function
3.3 V power supply	+3.3 V	41	61	NC	
	NC	42	62	GND	
GPIO28, EQEP1A	DO-16	43	63	AO-8	ADCINA6
GPIO29, EQEP1B	DO-17	44	64	AO-9	ADCINB6
ADCINB4	DO-18	45	65	AO-10	ADCINC14
	NC	46	66	AO-11	ADCINC1
	NC	47	67	AO-12	ADCINC3

Table 3.6: F280049C LaunchPad Pin Map - J5, J7 (continued)

MCU Function	RT Box	J5	J7	RT Box	MCU Function
ADCINA8	DO-19	**48**	**68**	AO-13	ADCINC5
	NC	**49**	**69**	AO-14	ADCINA3
	NC	**50**	**70**	AO-15	ADCINA0

Table 3.7: F280049C LaunchPad Pin Map - J4, J2

MCU Function	RT Box	J4	J2	RT Box	MCU Function
GPIO10, EPWM6A, EQEP1A	DI-0	**40**	**20**	GND	
GPIO11, EPWM6B, EQEP1B	DI-1	**39**	**19**	DI-6	GPIO57, SPISTEA
GPIO8, EPWM5A	DI-2	**38**	**18**	DI-7	
GPIO9, EPWM5B, EQEP1I, OUTXBAR6	DI-3	**37**	**17**	NC	
GPIO4, EPWM3A	DI-4	**36**	**16**	DO-25	**RESET**
GPIO5, EPWM3B, OUTXBAR3	DI-5	**35**	**15**	DI-27	GPIO16, SPISIMOA
GPIO58, OUTXBAR1	DO-4	**34**	**14**	DO-26	GPIO17, SPISOMIA
GPIO30, OUTXBAR7	DO-5	**33**	**13**	DO-6	GPIO39
	NC	**32**	**12**	DO-7	GPIO23
	NC	**31**	**11**	DO-3	GPIO59, EQEP1I

Table 3.8: F280049C LaunchPad Pin Map - J8, J6

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO0, EPWM1A	DI-16	**80**	**60**	GND	
GPIO1, EPWM1B	DI-17	**79**	**59**	DI-22	GPIO27, SPISTEB

Table 3.8: F280049C LaunchPad Pin Map - J8, J6 (continued)

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO6, EPWM4A	DI-18	**78**	**58**	DI-23	
GPIO7, EPWM4B, OUTXBAR5	DI-19	**77**	**57**	NC	
GPIO2, EPWM2A	DI-20	**76**	**56**	NC	
GPIO3, EPWM2B, OUTXBAR2	DI-21	**75**	**55**	DO-20	GPIO24, SPISIMOB
	NC	**74**	**54**	DO-21	GPIO31, SPISOMIB
	NC	**73**	**53**	DO-22	GPIO33, SPISTEB
	NC	**72**	**52**	DO-23	GPIO34
	NC	**71**	**51**	DO-24	GPIO12

LAUNCHXL-F28069M Pin Map

Table 3.9: F28069M LaunchPad Pin Map - J1, J3

MCU Function	RT Box	J1	J3	RT Box	MCU Function
3.3 V power supply	+3.3 V	**1**	**21**	NC	
	NC	**2**	**22**	GND	
J1.3	DO-0	**3**	**23**	AO-0	ADCINA7
J1.4	DO-1	**4**	**24**	AO-1	ADCINB1
GPIO12, TZ1, SPISIMOB	DO-2	**5**	**25**	AO-2	ADCINA2
	NC	**6**	**26**	AO-3	ADCINB2
GPIO18, SPICLKA	DI-24	**7**	**27**	AO-4	ADCINA0
GPIO22, EQEP1S	DI-25	**8**	**28**	AO-5	ADCINB0
GPIO33, EPWMSYNCO	DI-26	**9**	**29**	AO-6	ADCINA1
GPIO32, EPWMSYNCI	DO-27	**10**	**30**	AO-7	NC

Table 3.10: F28069M LaunchPad Pin Map - J5, J7

MCU Function	RT Box	J5	J7	RT Box	MCU Function
3.3 V power supply	+3.3 V	**41**	**61**	NC	
	NC	**42**	**62**	GND	
J7.3	DO-16	**43**	**63**	AO-8	ADCINB7
J7.4	DO-17	**44**	**64**	AO-9	ADCINB4
GPIO20, EQEP1A	DO-18	**45**	**65**	AO-10	ADCINA5
	NC	**46**	**66**	AO-11	ADCINB5
	NC	**47**	**67**	AO-12	ADCINA3

Table 3.10: F28069M LaunchPad Pin Map - J5, J7 (continued)

MCU Function	RT Box	J5	J7	RT Box	MCU Function
GPIO21, EQEP1B	DO-19	**48**	**68**	AO-13	ADCINB3
	NC	**49**	**69**	AO-14	ADCINA4
	NC	**50**	**70**	AO-15	NC

Table 3.11: F28069M LaunchPad Pin Map - J4, J2

MCU Function	RT Box	J4	J2	RT Box	MCU Function
GPIO0, EPWM1A	DI-0	**40**	**20**	GND	
GPIO1, EPWM1B	DI-1	**39**	**19**	DI-6	GPIO19, SPISTEA
GPIO2, EPWM2A	DI-2	**38**	**18**	DI-7	GPIO44, EPWM7B
GPIO3, EPWM2B, SPISOMIA	DI-3	**37**	**17**	NC	
GPIO4, EPWM3A	DI-4	**36**	**16**	DO-25	**RESET**
GPIO5, EPWM3B, SPISIMOA	DI-5	**35**	**15**	DI-27	GPIO16, SPISIMOA
GPIO13, TZ2, SPISOMIB	DO-4	**34**	**14**	DO-26	GPIO17, SPISOMIA, TZ3
NC	DO-5	**33**	**13**	DO-6	GPIO50, EQEP1A, TZ1
	NC	**32**	**12**	DO-7	GPIO51, EQEP1B, TZ2
	NC	**31**	**11**	DO-3	GPIO55, SPISOMIA, EQEP2B

Table 3.12: F28069M LaunchPad Pin Map - J8, J6

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO6, EPWM4A, EPWM-SYNCO	DI-16	**80**	**60**	GND	
GPIO7, EPWM4B	DI-17	**79**	**59**	DI-22	GPIO27, SPISTEB

Table 3.12: F28069M LaunchPad Pin Map - J8, J6 (continued)

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO8, EPWM5A, ADCSOCAO-	DI-18	**78**	**58**	DI-23	GPIO26, SPICLKB
GPIO9, EPWM5B	DI-19	**77**	**57**	NC	
GPIO10, EPWM6A, ADCSOCBO	DI-20	**76**	**56**	NC	
GPIO11, EPWM6B	DI-21	**75**	**55**	DO-20	GPIO24, EQEP2A
	NC	**74**	**54**	DO-21	GPIO25, EQEP2B
	NC	**73**	**53**	DO-22	GPIO52, EQEP1S, TZ3
	NC	**72**	**52**	DO-23	GPIO53, EQEP1I
	NC	**71**	**51**	DO-24	GPIO56, EQEP2I

LAUNCHXL-F28377S Pin Map

Table 3.13: F28377S LaunchPad Pin Map - J1, J3

MCU Function	RT Box	J1	J3	RT Box	MCU Function
3.3 V power supply	+3.3 V	**1**	**21**	NC	
	NC	**2**	**22**	GND	
GPIO90	DO-0	**3**	**23**	AO-0	ADCIN14
GPIO89	DO-1	**4**	**24**	AO-1	ADCINB1
GPIO41	DO-2	**5**	**25**	AO-2	ADCINB4
	NC	**6**	**26**	AO-3	ADCINB2
GPIO60, SPICLKA, OUTXBAR3	DI-24	**7**	**27**	AO-4	ADCINA0
GPIO61, SPISTEA, OUTXBAR4	DI-25	**8**	**28**	AO-5	ADCINB0
GPIO43	DI-26	**9**	**29**	AO-6	ADCINA1
NC	DO-27	**10**	**30**	AO-7	NC

Table 3.14: F28377S LaunchPad Pin Map - J5, J7

MCU Function	RT Box	J5	J7	RT Box	MCU Function
3.3 V power supply	+3.3 V	**41**	**61**	NC	
	NC	**42**	**62**	GND	
GPIO87	DO-16	**43**	**63**	AO-8	ADCIN15
GPIO86	DO-17	**44**	**64**	AO-9	ADCINA2
NC	DO-18	**45**	**65**	AO-10	ADCINA5
	NC	**46**	**66**	AO-11	ADCINB5
	NC	**47**	**67**	AO-12	ADCINA3

Table 3.14: F28377S LaunchPad Pin Map - J5, J7 (continued)

MCU Function	RT Box	J5	J7	RT Box	MCU Function
NC	DO-19	**48**	**68**	AO-13	ADCINB3
	NC	**49**	**69**	AO-14	ADCINA4
	NC	**50**	**70**	AO-15	NC

Table 3.15: F28377S LaunchPad Pin Map - J4, J2

MCU Function	RT Box	J4	J2	RT Box	MCU Function
GPIO12, EPWM7A	DI-0	**40**	**20**	GND	
GPIO13, EPWM7B	DI-1	**39**	**19**	DI-6	GPIO4, EPWM3A, OUTXBAR3
GPIO14, EPWM8A, OUTXBAR3	DI-2	**38**	**18**	DI-7	GPIO62
GPIO15, EPWM8B, OUTXBAR4	DI-3	**37**	**17**	NC	
GPIO16, EPWM9A, SPISIMOA, OUTXBAR7	DI-4	**36**	**16**	DO-25	**RESET**
GPIO17, EPWM9B, OUTXBAR8	DI-5	**35**	**15**	DI-27	GPIO58, SPICLKB, OUTXBAR1, SPISIMOA
GPIO20, EQEP1A, SD1_D3	DO-4	**34**	**14**	DO-26	GPIO59, SD2_C2, SPISOMIA
GPIO21, EQEP1B, SD1_C3	DO-5	**33**	**13**	DO-6	GPIO72
	NC	**32**	**12**	DO-7	GPIO73
	NC	**31**	**11**	DO-3	GPIO78, EQEP2A

Table 3.16: F28377S LaunchPad Pin Map - J8, J6

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO2, EPWM2A, OUTXBAR1	DI-16	**80**	**60**	GND	

Table 3.16: F28377S LaunchPad Pin Map - J8, J6 (continued)

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO3, EPWM2B, OUTXBAR2	DI-17	**79**	**59**	DI-22	GPIO91
GPIO10, EPWM6A	DI-18	**78**	**58**	DI-23	NC
GPIO11, EPWM6B, OUTXBAR7	DI-19	**77**	**57**	NC	
GPIO18, SPICLKA, EPWM10A	DI-20	**76**	**56**	NC	
GPIO19, SPISTEA, EPWM10B	DI-21	**75**	**55**	DO-20	GPIO63, EQEP3B, SD2_C4
	NC	**74**	**54**	DO-21	GPIO64, EQEP3S, SPISOMIB
	NC	**73**	**53**	DO-22	GPIO99, EQEP1I
	NC	**72**	**52**	DO-23	GPIO92
	NC	**71**	**51**	DO-24	NC

LAUNCHXL-F28379D Pin Map

Table 3.17: F28379D LaunchPad Pin Map - J1, J3

MCU Function	RT Box	J1	J3	RT Box	MCU Function
3.3 V power supply	+3.3 V	1	21	NC	
	NC	2	22	GND	
GPIO19, SD1_C2	DO-0	3	23	AO-0	ADCINA14, CMPIN4P
GPIO18, SD1_D2	DO-1	4	24	AO-1	ADCINC3, CMPIN6N
GPIO67	DO-2	5	25	AO-2	ADCINB3, CMPIN3N
	NC	6	26	AO-3	ADCINA3, CMPIN1N
GPIO60, SPICLKA, OUTXBAR3, SPISIMOB	DI-24	7	27	AO-4	ADCINC2, CMPIN6P
GPIO22, EPWM12A, SPICLKB	DI-25	8	28	AO-5	ADCINB2, CMPIN3P
GPIO105	DI-26	9	29	AO-6	ADCINA2, CMPIN1P
GPIO104, EQEP3A	DO-27	10	30	AO-7	ADCINA0

Table 3.18: F28379D LaunchPad Pin Map - J5, J7

MCU Function	RT Box	J5	J7	RT Box	MCU Function
3.3 V power supply	+3.3 V	41	61	NC	
	NC	42	62	GND	
GPIO139	DO-16	43	63	AO-8	ADCIN15, CMPIN4N
GPIO56, EQEP2S, SD2_D1	DO-17	44	64	AO-9	ADCINC5, CMPIN5N
GPIO97, EQEP1B	DO-18	45	65	AO-10	ADCINB5
	NC	46	66	AO-11	ADCINA5, CMPIN2N
	NC	47	67	AO-12	ADCINC4, CMPIN5P

Table 3.18: F28379D LaunchPad Pin Map - J5, J7 (continued)

MCU Function	RT Box	J5	J7	RT Box	MCU Function
GPIO52, EQEP1S, SD1_D3	DO-19	**48**	**68**	AO-13	ADCINB4
	NC	**49**	**69**	AO-14	ADCINA4, CMPIN2P
	NC	**50**	**70**	AO-15	ADCINA1

Table 3.19: F28379D LaunchPad Pin Map - J4, J2

MCU Function	RT Box	J4	J2	RT Box	MCU Function
GPIO0, EPWM1A	DI-0	**40**	**20**	GND	
GPIO1, EPWM1B	DI-1	**39**	**19**	DI-6	GPIO61, SPISTEA, OUTXBAR4
GPIO2, EPWM2A, OUTXBAR1	DI-2	**38**	**18**	DI-7	GPIO123
GPIO3, EPWM2B, OUTXBAR2	DI-3	**37**	**17**	NC	
GPIO4, EPWM3A, OUTXBAR3	DI-4	**36**	**16**	DO-25	**RESET**
GPIO5, EPWM3B, OUTXBAR3	DI-5	**35**	**15**	DI-27	GPIO58, SPICLKB, SPISIMOA, OUTXBAR1
GPIO24, EQEP2A, SD2_D1	DO-4	**34**	**14**	DO-26	GPIO59, SPISOMIA, SD2_C2
GPIO16, SD1_D1	DO-5	**33**	**13**	DO-6	GPIO124, SD1_D2
	NC	**32**	**12**	DO-7	GPIO125, SD1_C2
	NC	**31**	**11**	DO-3	GPIO29, EQEP3B, SD2_C3

Table 3.20: F28379D LaunchPad Pin Map - J8, J6

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO6, EPWM4A, OUTXBAR4	DI-16	**80**	**60**	GND	
GPIO7, EPWM4B, OUTXBAR5	DI-17	**79**	**59**	DI-22	GPIO66, SPISTEB

Table 3.20: F28379D LaunchPad Pin Map - J8, J6 (continued)

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO8, EPWM5A, ADCSOCAO-	DI-18	**78**	**58**	DI-23	GPIO131
GPIO9, EPWM5B, OUTXBAR6	DI-19	**77**	**57**	NC	
GPIO10, EPWM6A, ADCSOCBO	DI-20	**76**	**56**	NC	
GPIO11, EPWM6B, OUTXBAR 7	DI-21	**75**	**55**	DO-20	GPIO63, EQEP3B, SD2_C4
	NC	**74**	**54**	DO-21	GPIO64, EQEP3S, SPISOMIB
	NC	**73**	**53**	DO-22	GPIO26, EQEP2I, SD2_D2
	NC	**72**	**52**	DO-23	GPIO27, EQEP2S, SD2_C2
	NC	**71**	**51**	DO-24	GPIO25, EQEP2B, SPISOMIB, SD2_C1

LAUNCHXL-F28027 Pin Map

Table 3.21: F28027 LaunchPad Pin Map - J1, J3/J5

MCU Function	RT Box	J1	J3/J5	RT Box	MCU Function
3.3 V power supply	+3.3 V	**1**	**21/1**	NC	
	NC	**2**	**22/2**	GND	
GPIO28, TZ2	DO-0	**3**	**23/3**	AO-0	ADCINA7
GPIO29, TZ3	DO-1	**4**	**24/4**	AO-1	ADCINA3
GPIO34	DO-2	**5**	**25/5**	AO-2	ADCINA1
	NC	**6**	**26/6**	AO-3	ADCINA0
GPIO18, SPICLK	DI-24	**7**	**27/7**	AO-4	ADCINB1
	DI-25	**8**	**28/8**	AO-5	ADCINB3
	DI-26	**9**	**29/9**	AO-6	ADCINB7
	DO-27	**10**	**30/10**	AO-7	NC

Table 3.22: F28027 LaunchPad Pin Map - J4/J6, J2/J2

MCU Function	RT Box	J4/J6	J2/J2	RT Box	MCU Function
GPIO0, EPWM1A	DI-0	**40/1**	**20/1**	GND	
GPIO1, EPWM1B	DI-1	**39/2**	**19/2**	DI-6	GPIO19, SPISTEA
GPIO2, EPWM2A	DI-2	**38/3**	**18/3**	DI-7	GPIO12
GPIO3, EPWM2B	DI-3	**37/4**	**17/4**	NC	
GPIO4, EPWM3A	DI-4	**36/5**	**16/5**	DO-25	**RESET**
GPIO5, EPWM3B	DI-5	**35/6**	**15/6**	DI-27	GPIO16/32, SPISIMOA(16), ADCSOCA(32)

Table 3.22: F28027 LaunchPad Pin Map - J4/J6, J2/J2 (continued)

MCU Function	RT Box	J4/J6	J2/J2	RT Box	MCU Function
GPIO16/32, EPWMSYNCI(32), TZ2(16)	DO-4	**34/7**	**14/7**	DO-26	GPIO17/33, SPISOMIA(17), TZ3(17)
GPIO17/33, SPISOMIA(17), TZ3(17)	DO-5	**33/8**	**13/8**	DO-6	GPIO6, EPWMSYNCI
	NC	**32/9**	**12/9**	DO-7	GPIO7
	NC	**31/10**	**11/10**	DO-3	NC

LAUNCHXL-F28P650DK9 Pin Map

Table 3.23: F28P650DK9 LaunchPad Pin Map - J1, J3

MCU Function	RT Box	J1	J3	RT Box	MCU Function
3.3 V power supply	+3.3 V	1	21	NC	
	NC	2	22	GND	
GPIO43, SCIA_RX, EPWM14B, EQEP4B	DO-0	3	23	AO-0	ADCINA14/B14/C14, CMPIN4P
GPIO42, SCIA_TX, EPWM14A,	DO-1	4	24	AO-1	ADCINA4, CMPIN2P
EQEP4A	DO-2	5	25	AO-2	ADCINB4, CMPIN5P
	NC	6	26	AO-3	ADCINC4, CMPIN5P
GPIO18, SPIA_CLK, CANA_RX, EPWM10A, MCANA_RX, EQEP5I	DI-24	7	27	AO-4	ADCINA7, CMPIN9P
GPIO72, EPWM12B, OUT-XBAR8, MCANB_RX, SPIC_CS	DI-25	8	28	AO-5	ADCINB7, CMPIN7P
GPIO105, EPWM18B, EQEP3B	DI-26	9	29	AO-6	ADCINC7, CMPIN11P
GPIO104, EPWM18A, EQEP3A	DO-27	10	30	AO-7	ADCINA0, DACA_OUT, CMPIN1P

Table 3.24: F28P650DK9 LaunchPad Pin Map - J5, J7

MCU Function	RT Box	J5	J7	RT Box	MCU Function
3.3 V power supply	+3.3 V	41	61	NC	
	NC	42	62	GND	
GPIO55, SPIA_POCI, EPWM16B, EQEP2B	DO-16	43	63	AO-8	ADCINA15/B15/C15, CMPIN4P
GPIO38, EPWM18B	DO-17	44	64	AO-9	ADCINA8, CMPIN8P

Table 3.24: F28P650DK9 LaunchPad Pin Map - J5, J7 (continued)

MCU Function	RT Box	J5	J7	RT Box	MCU Function
	DO-18	**45**	**65**	AO-10	ADCINB3, CMPIN1P
	NC	**46**	**66**	AO-11	ADCINC5, CMPIN2P
	NC	**47**	**67**	AO-12	ADCINA10, CMPIN8P
GPIO82, EPWM12A	DO-19	**48**	**68**	AO-13	ADCINB6, CMPIN7P
	NC	**49**	**69**	AO-14	ADCINC6, CMPIN10P
	NC	**50**	**70**	AO-15	ADCINB1, DACC_OUT, CMPIN3P

Table 3.25: F28P650DK9 LaunchPad Pin Map - J4, J2

MCU Function	RT Box	J4	J2	RT Box	MCU Function
GPIO8, EPWM5A, MCANA_TX	DI-0	**40**	**20**	GND	
GPIO9, EPWM5B, OUTXBAR6, EQEP3I	DI-1	**39**	**19**	DI-6	GPIO57, SPIA_CS, EPWM17B, EQEP2I
GPIO6, EPWM4A, OUTXBAR4, EQEP3A, MCANB_TX	DI-2	**38**	**18**	DI-7	GPIO84, EPWM12B, EQEP6A
GPIO7, EPWM4B, OUTXBAR5, EQEP3B, MCANB_RX	DI-3	**37**	**17**	NC	
GPIO10, EPWM6A, EQEP1A, MCANA_RX	DI-4	**36**	**16**	DO-25	**RESET**
GPIO11, EPWM6B, OUTXBAR7, EQEP1B	DI-5	**35**	**15**	DI-27	GPIO16, SPIA_PICO, OUT-XBAR7, EPWM9A, EQEP5B
GPIO14, EPWM8A, EQEP5I, OUTXBAR3, OUTXBAR8	DO-4	**34**	**14**	DO-26	GPIO17, SPIA_POCI, OUT-XBAR8, EPWM9B
GPIO15, EPWM8B, OUTXBAR4, EQEP5A	DO-5	**33**	**13**	DO-6	GPIO12, EPWM7A

Table 3.25: F28P650DK9 LaunchPad Pin Map - J4, J2 (continued)

MCU Function	RT Box	J4	J2	RT Box	MCU Function
	NC	**32**	**12**	DO-7	GPIO23, EQEP1I, EPWM12B, SPIB_CS, MCANA_RX, SPIC_CS
	NC	**31**	**11**	DO-3	GPIO133, EPWM9A

Table 3.26: F28P650DK9 LaunchPad Pin Map - J8, J6

MCU Function	RT Box	J8	J6	RT Box	MCU Function
GPIO2, EPWM2A, OUTXBAR1	DI-16	**80**	**60**	GND	
GPIO3, EPWM2B, OUTXBAR2	DI-17	**79**	**59**	DI-22	GPIO94, EPWM17B, SPID_CS
GPIO0, EPWM1A	DI-18	**78**	**58**	DI-23	GPIO24, OUTXBAR1, EQEP2A, SPIB_PICO, EPWM13A
GPIO1, EPWM1B	DI-19	**77**	**57**	NC	
GPIO99, EPWM8A, EQEP1I	DI-20	**76**	**56**	NC	
GPIO75, EPWM8B, EQEP5B, SPID_CLK, MCANA_RX	DI-21	**75**	**55**	DO-20	GPIO91, EPWM16A, SPID_PICO
	NC	**74**	**54**	DO-21	GPIO92, EPWM16B, SPID_POCI
	NC	**73**	**53**	DO-22	GPIO13, EPWM7B, EQEP1I
	NC	**72**	**52**	DO-23	GPIO103, EPWM8B, EQEP2I, SPIC_CS
	NC	**71**	**51**	DO-24	GPIO25, OUTXBAR2, EQEP2B, SPIB_POCI, EQEP5B, EPWM13B

STM32G4x Nucleo-64 Pin Map

Table 3.27: STM32G4x Nucleo-64 Pin Map - CN7

MCU Function	RT Box	CN7 connector pins			RT Box	MCU Function	
		Name	Nbr.	Nbr.	Name		
SPI3_SCK	DO-27	PC10	1	2	PC11	DI-24	SPI3_MISO, TIM8_CH2N
SPI3_MOSI	DO-26	PC12	3	4	PD2	DI-25	
	NC	VDD	5	6	E5V	+5 V	5 V power supply
	NC	BOOT0	7	8	GND	GND	
	NC	-	9	10	-	NC	
	NC	-	11	12	IOREF	NC	
	NC	PA13	13	14	RESET	DO-25	**RESET**
	NC	PA14	15	16	+3.3 V	+3.3 V	3.3 V power supply
SPI3_NSS	DO-0	PA15	17	18	+5 V	NC	5 V power available
	GND	GND	19	20	GND	GND	
TIM4_CH2	DO-16	PB7	21	22	GND	GND	
User button	DI-26	PC13	23	24	VIN	NC	7 to 12 V power suppl
	DO-18	PC14	25	26	-	NC	
	DO-19	PC15	27	28	PA0	AO-0	ADC12_IN1, COMP1
	NC	PF0	29	30	PA1	AO-1	ADC12_IN2
	NC	PF1	31	32	PA4	AO-2	ADC2_IN17
	NC	VBAT	33	34	PB0	AO-3	ADC1_IN15, ADC3_IN12
ADC12_IN8	AO-6	PC2	35	36	PC1	AO-4	ADC12_IN7
ADC12_IN9	AO-7	PC3	37	38	PC0	AO-5	ADC12_IN6

Table 3.28: STM32G4x Nucleo-64 Pin Map - CN10

MCU Function	RT Box	CN10 connector pins			RT Box	MCU Function
		Name	Nbr.	Nbr.	Name	
HRTIM1_CHE2	DI-6	PC9	1	2	PC8	DI-20	TIM8_CH3, HRTIM1_CHE1
	DO-3	PB8	3	4	PC6	DI-16	TIM8 _CH1, HRTIM1_CHF1
	DI-23	PB9	5	6	PC5	AO-8	ADC 2_IN11
	NC	AVDD	7	8	U5V	NC	
	GND	GND	9	10	-	NC	
SPI1_SCK	DI-27	PA5	11	12	PA12	DO-20	
SPI1_MISO	DO-1	PA6	13	14	PA11	DI-7	TIM1_CH1N, HRTIM1_CHB2
TIM8_CH1N, TIM1_CH1N, SPI1_MOSI	DI-17	PA7	15	16	PB12	DI-22	HRTIM1_CHC1
TIM4_CH1	DO-21	PB6	17	18	PB11	AO-9	ADC12_IN14
TIM8_CH2, HRTIM1_CHF2	DI-18	PC7	19	20	GND	GND	
TIM1_CH2, HRTIM1_CHA2	DI-2	PA9	21	22	PB2	DO-22	
TIM1_CH1, HRTIM1_CHA1	DI-0	PA8	23	24	PB1	AO-10	ADC 1_IN12, ADC3_IN1
TIM1_BKIN	DO-23	PB10	25	26	PB15	DI-5	TIM1 _CH3N, HRTIM1 _CHD2
TIM8_CH2N	DI-19	PB4	27	28	PB14	DI-3	TIM1_CH2N, HRTIM1_CHD1
TIM8_CH3N	DI-21	PB5	29	30	PB13	DI-1	TIM1_CH1N, HRTIM1_CHC2

Table 3.28: STM32G4x Nucleo-64 Pin Map - CN10 (continued)

MCU Function	RT Box	CN10 connector pins			RT Box	MCU Function	
TIM4_ETR	DO-24	PB3	**31**	**32**	AGND	GND	Analog ground
TIM1_CH3, HRTIM1_CHB1	DI-4	PA10	**33**	**34**	PC4	NC	
	NC	PC4	**35**	**36**	-	NC	
	NC	PC5	**37**	**38**	-	NC	

STM32F3x Nucleo-64 Pin Map

Table 3.29: STM32F3x Nucleo-64 Pin Map - CN7

MCU Function	RT Box	CN7 connector pins			RT Box	MCU Function	
		Name	Nbr.	Nbr.	Name		
	DO-27	PC10	1	2	PC11	DI-24	
	DO-26	PC12	3	4	PD2	DI-25	
	NC	VDD	5	6	E5V	+5 V	5 V power supply
	NC	BOOT0	7	8	GND	GND	
	NC	-	9	10	-	NC	
	NC	-	11	12	IOREF	NC	
	NC	PA13	13	14	RESET	DO-25	**RESET**
	NC	PA14	15	16	+3.3 V	+3.3 V	3.3 V power supply
	DO-0	PA15	17	18	+5 V	NC	5 V power available
	GND	GND	19	20	GND	GND	
	DO-16	PB7	21	22	GND	GND	
User button	DI-26	PC13	23	24	VIN	NC	7 to 12 V power suppl
	DO-18	PC14	25	26	-	NC	
	DO-19	PC15	27	28	PA0	AO-0	ADC1_IN1
	NC	PF0	29	30	PA1	AO-1	ADC1_IN2
	NC	PF1	31	32	PA4	AO-2	ADC2_IN1
	NC	VBAT	33	34	PB0	AO-3	ADC1_IN11
ADC12_IN8	AO-6	PC2	35	36	PC1	AO-4	ADC12_IN7
ADC12_IN9	AO-7	PC3	37	38	PC0	AO-5	ADC12_IN6

Table 3.30: STM32F3x Nucleo-64 Pin Map - CN10

MCU Function	RT Box	CN10 connector pins			RT Box	MCU Function
		Name	Nbr.	Nbr.	Name	
	DI-6	PC9	1	2	PC8	DI-20
	DO-3	PB8	3	4	PC6	DI-16
	DI-23	PB9	5	6	PC5	AO-8 ADC2_IN11
	NC	AVDD	7	8	U5V	NC
	GND	GND	9	10	-	NC
SPI1_SCK	DI-27	PA5	11	12	PA12	DO-20
SPI1_MISO	DO-1	PA6	13	14	PA11	DI-7 TIM1_CH1N
SPI1_MOSI	DI-17	PA7	15	16	PB12	DI-22
TIM1_CH1N	DO-21	PB6	17	18	PB11	AO-8
	DI-18	PC7	19	20	GND	GND
TIM1_CH2	DI-2	PA9	21	22	PB2	DO-22
TIM1_CH1	DI-0	PA8	23	24	PB1	AO-10 ADC1_IN12
TIM1_BKIN	DO-23	PB10	25	26	PB15	DI-5 TIM1 _CH3N
	DI-19	PB4	27	28	PB14	DI-3 TIM1_CH2N
	DI-21	PB5	29	30	PB13	DI-1 TIM1_CH1N
	DO-24	PB3	31	32	AGND	GND Analog ground
TIM1_CH3	DI-4	PA10	33	34	PC4	NC
	NC	PC4	35	36	-	NC
	NC	PC5	37	38	-	NC

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