

Connection of NC/NC1 Pins on AURIX™ TC3xx BGA packages

AURIX™ 32-bit microcontroller family

About this document

Scope and purpose

This Application note gives additional information to the TC3xx Data sheets for the listed devices regarding the handling of the balls marked as NC and NC1.

- TC336
- TC356
- TC366
- TC337
- TC357
- TC367
- TC377
- TC387
- TC397
- TC389
- TC399

In the Data sheet for the listed AURIX™ devices, the 'no connect' balls have been classified as:

- NC - These pins are reserved for future extensions and shall not be connected externally.
- NC1 - These pins are not connected on package level and will not be used for future extensions.

The general rule is that balls defined as NC or NC1 (Not Connected) must not be connected to any net including power supply or ground connections in the PCB routing. This rule is required because:

- To ensure compatibility across the AURIX™ product platforms.
- Because the connection of high-speed signals to NC balls may cause unwanted cross coupling effects in the BGA package interposer layer.
- Some balls should not be connected for package soldering reliability reasons.

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1 Introduction

1 Introduction

For the TC3xx devices mentioned, static and dynamic analyses have been performed to allow the data sheet constraints to be relaxed such that some of the 'no connect' balls can be connected to PCB signals. This information has been provided to help to simplify common PCB designs for applications that wish to take advantage of the AURIX™ family platform approach.

The ball out for different variants has been shown and the NC and NC1 ball have been marked in different colors, depicting the routability of each of these balls. The color codes are as follows:



To be avoided for routing



Allowed for routing

Attention: *General layout precautions for example for critical signal routing, are the responsibility of the customer. Infineon take no liability for signal integrity on a system level.*

Attention: *This Application Note is primarily intended for hardware designers involved in PCB routing.*

2 TC336 I/O ball configuration in the LFBGA180 package variant

2 TC336 I/O ball configuration in the LFBGA180 package variant

TC336L and LP

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
14	NC	P20_14	P20_10	P20_11	ESR0_N	P21_7	TCK	P21_5	P21_3	VSSOSC	XTAL1	VEXT_OSC	P23_1	NC
13	P15_0	VSS	P20_13	P20_12	PORST_N	P21_6	P20_2	P20_0	P21_4	P21_2	XTAL2	VDDOSC	VSSSCDC DC	NC
12	P15_1	P15_2	VSS	P20_9	P20_7	P20_8	P20_3	P21_0	P22_3	TRST_N	P22_1	VSSEXT	VCAPP	VCAPN
11	P15_6	P15_4	P14_3	VSS	ESR1_N	P20_6	TMS	P22_2	P22_0	NC	VSSEXT	NC	P33_10	VEXT
10	P15_3	P14_1	P14_4	P15_5	VSS					VSSEXT	P33_7	P33_12	P33_11	P33_9
9	P14_0	P14_5	P14_6	P14_2		VDD	VDD	VEVRSB	VEXT		P33_8	P33_0	P33_5	P33_6
8	P13_2	P13_3	NC	P15_7		VEXT	VSS	VSS	VDDO_B GA		P33_4	P33_1	P33_3	P33_2
7	P13_0	P13_1	NC	P15_8		VDDP3	VSS	VSS	VDD		AN0	P34_1	P34_2	P34_3
6	P11_2	P11_3	P11_6	P11_8		VEXT	VEXT	VDD	VSS		AN2	AN3	AN4	AN1
5	P11_9	P11_10	P11_11	VFLEX	VSSEXT					VSS	AN5	AN6	AN8	AN7
4	P11_12	P10_4	NC	VSSEXT	P10_6	P10_5	P00_0	P00_1	P40_9	AN35	AN14	AN10	AN11	VAREF1
3	P10_2	P10_1	VSSEXT	P02_3	P02_8	P00_2	P00_6	P00_5	P40_8	AN34	NC	AN12	AN9	VDDM
2	P10_3	VSSEXT	P02_2	P02_4	P02_7	P00_3	P00_7	P00_9	P40_7	P40_5	NC	NC	AN13	VSS
1	NC	P02_0	P02_1	P02_5	P02_6	P00_4	P00_8	P00_12	P40_6	P40_4	NC	NC	AN15	NC

Figure 1 TC336 L and LP I/O Configuration [1]

- There are total of 15 NC balls.

2 TC336 I/O ball configuration in the LFBGA180 package variant

TC336 DA

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
14	NC	P20_14	P20_10	P20_11	ESR0_N	P21_7	TCK	P21_5	P21_3	VSSOSC	XTAL1	VEXT_OSC	P23_1	NC
13	P15_0	VSS	P20_13	P20_12	PORST_N	P21_6	P20_2	P20_0	P21_4	P21_2	XTAL2	VDDOSC	VSSEXT	P32_4
12	P15_1	P15_2	VSS	P20_9	P20_7	P20_8	P20_3	P21_0	NC	TRST_N	NC	VSSEXT	P32_1	P32_0
11	P15_6	P15_4	P14_3	VSS	ESR1_N	P20_6	TMS	NC	NC	NC	VSSEXT	P33_13	P33_10	VEXT
10	P15_3	P14_1	P14_4	P15_5	VSS					VSSEXT	P33_7	P33_12	P33_11	P33_9
9	P14_0	P14_5	P14_6	P14_2		VDD	VDD	VEVRSB	VEXT		P33_8	P33_0	P33_5	P33_6
8	P12_1	P11_14	P12_0	NC		VEXT	VSS	VSS	VDD		P33_4	P33_1	P33_3	P33_2
7	P11_0	P11_1	P11_13	NC		VDDP3	VSS	VSS	VDD		NC	NC	NC	NC
6	P11_2	P11_4	P11_15	P11_11		VEXT	VEXT	VDD	VSS		AN2	AN3	AN0	AN1
5	P11_6	P11_5	P11_3	VFLEX	VSSEXT					VSS	AN4	AN5	AN8	AN10
4	P11_9	P11_7	P11_12	VSSEXT	P10_6	P10_5	P10_3	P02_1	AN17	AN16	AN9	AN12	AN11	VAREF1
3	P11_10	P11_8	VSSEXT	NC	P10_1	P10_2	P10_8	P10_7	P02_2	AN20	NC	AN21	AN13	VDDM
2	NC	VSSEXT	P50_1	P50_3	P50_5	P50_7	P50_9	P50_11	P02_5	P02_7	P02_6	P00_0	AN14	VSS
1	NC	NC	P50_0	P50_2	P50_4	P50_6	P50_8	P50_10	P02_4	P02_0	P02_8	P02_3	AN15	NC

Figure 2 TC336DA I/O Configuration [2]

- There are total of 19 NC balls.

3 TC356 I/O ball configuration in the LFBGA180 package variant

3 TC356 I/O ball configuration in the LFBGA180 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
14	NC	P20_14	P20_10	P20_11	ESR0_N	P21_7	TCK	P21_5	P21_3	VSSOS_C	XTAL1	VEXT_O SC	P23_1	NC
13	P15_0	VSS	P20_13	P20_12	PORST_N	P21_6	P20_2	P20_0	P21_4	P21_2	XTAL2	VDDOS_C	VSSEXT	P32_4
12	P15_1	P15_2	VSS	P20_9	P20_7	P20_8	P20_3	P21_0	NC	TRST_N	NC	VSSEXT	P32_1	P32_0
11	P15_6	P15_4	P14_3	VSS	ESR1_N	P20_6	TMS	NC	NC	NC	VSSEXT	P33_13	P33_10	VEXT
10	P15_3	P14_1	P14_4	P15_5	VSS					VSSEXT	P33_7	P33_12	P33_11	P33_9
9	P14_0	P14_5	P14_6	P14_2		VDD	VDD	VEVRS_B	VEXT		P33_8	P33_0	P33_5	P33_6
8	P12_1	P11_14	P12_0	NC		VEXT	VSS	VSS	VDD		P33_4	P33_1	P33_3	P33_2
7	P11_0	P11_1	P11_13	NC		VDDP3	VSS	VSS	VDD		NC	NC	NC	NC
6	P11_2	P11_4	P11_15	P11_11		VEXT	VEXT	VDD	VSS		AN2	AN3	AN0	AN1
5	P11_6	P11_5	P11_3	VFLEX	VSSEXT					VSS	NC	NC	AN8	AN10
4	P11_9	P11_7	P11_12	VSSEXT	P10_6	P10_5	P10_3	P02_1	NC	NC	NC	AN12	AN11	VAREF1
3	P11_10	P11_8	VSSEXT	NC	P10_1	P10_2	P10_8	P10_7	P02_2	NC	NC	NC	NC	VDDM
2	NC	VSSEXT	P50_1	P50_3	P50_5	P50_7	P50_9	P50_11	P02_5	P02_7	P02_6	P00_0	NC	VSS
1	NC	NC	P50_0	P50_2	P50_4	P50_6	P50_8	P50_10	P02_4	P02_0	P02_8	P02_3	NC	NC

Figure 3 TC356 I/O Configuration [3]

- There are total of 28 NC balls.

4 TC366 I/O ball configuration in the LFBGA180 package variant

4 TC366 I/O ball configuration in the LFBGA180 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
14	NC	P20_14	P20_10	P20_11	ESR0_N	P21_7	TCK	P21_5	P21_3	VSSOSC	XTAL1	VEXT_OSC	P23_1	NC
13	P15_0	VSS	P20_13	P20_12	PORST_N	P21_6	P20_2	P20_0	P21_4	P21_2	XTAL2	VDDOSC	VSSEXT	P32_4
12	P15_1	P15_2	VSS	P20_9	P20_7	P20_8	P20_3	P21_0	P22_3	TRST_N	P22_1	VSSEXT	P32_1	P32_0
11	P15_6	P15_4	P14_3	VSS	ESR1_N	P20_6	TMS	P22_2	P22_0	P23_3	VSSEXT	P33_13	P33_10	VEXT
10	P15_3	P14_1	P14_4	P15_5	VSS					VSSEXT	P33_7	P33_12	P33_11	P33_9
9	P14_0	P14_5	P14_6	P14_2		VDD	VDD	VEVRSB	VEXT		P33_8	P33_0	P33_5	P33_6
8	P13_2	P13_3	P14_10	P15_7		VEXT	VSS	VSS	VDD		P33_4	P33_1	P33_3	P33_2
7	P13_0	P13_1	P14_8	P15_8		VDDP3	VSS	VSS	VDD		AN0	NC	NC	NC
6	P11_2	P11_3	P11_6	P11_8		VEXT	VEXT	VDD	VSS		AN2	AN3	AN4	AN1
5	P11_9	P11_10	P11_11	VFLEX	VSSEXT					VSS	AN5	AN6	AN8	AN7
4	P11_12	P10_4	P10_0	VSSEXT	P10_6	P10_5	P00_0	P00_1	P40_9	AN35	AN14	AN10	AN11	VAREF1
3	P10_2	P10_1	VSSEXT	P02_3	P02_8	P00_2	P00_6	P00_5	P40_8	AN34	NC	AN12	AN9	VDDM
2	P10_3	VSSEXT	P02_2	P02_4	P02_7	P00_3	P00_7	P00_9	P40_7	P40_5	P40_1	AN17	AN13	VSS
1	NC	P02_0	P02_1	P02_5	P02_6	P00_4	P00_8	P00_12	P40_6	P40_4	P40_0	AN16	AN15	NC

Figure 4 TC366 I/O ball configuration [4]

- There are total of 8 NC balls.

5 TC337 I/O ball configuration in the LFBGA292 package variant

5 TC337 I/O ball configuration in the LFBGA292 package variant

TC377LP

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y
20	VSSE XT	P15_0	P20_1 4	P20_1 3	P20_1 1	P20_8	P20_3	P20_0	P21_5	P21_4	VSSO SC	XTAL 1	VEXT_OSC	P22_0	P22_2	NC	NC	NC	VEXT	VSSE XT
19	VDDP 3	VSSE XT	P15_2	P20_1 2	P20_1 0	P20_7	P20_1	P20_2	P21_3	P21_2	TRST_N	XTAL 2	VDDO SC	P22_1	P22_3	NC	P23_1	VEXT	VSSE XT	NC
18	P15_1	VDDP 3																	P32_4	NC
17	P15_4	P15_3		VSSE XT	P20_9	P20_6	PORS T_N	P21_6	P21_1	P21_0	NC	NC	NC	NC	NC	P23_5	VSSE XT		VCAP P	VCAP N
16	P15_6	P14_0		VDD	VSSE XT	ESR0_N	ESR1_N	P21_7	TCK	TMS	NC	NC	NC	P22_4	NC	VSSE XT	NC		P33_1 2	NC
15	P14_1	P14_4		P15_7	VDD											NC	NC		P33_1 0	P33_1 1
14	P14_5	P14_3		P15_8	P15_5			VDD	VSS	NC	VSS	VSS	VDD			NC	NC		P33_8	P33_9
13	P14_8	P14_6		P14_7	P14_2			VDD		VSS	VSS	VSS	VSS		VDD	NC	NC		P33_6	P33_7
12	P13_1	P13_0		P14_9	NC			VSS	VSS		VSS	VSS		VSS	VSS	P34_2	P34_3		P33_4	P33_5
11	P13_3	P13_2		P14_1 0	NC			VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VEVR SB	P34_1		P33_2	P33_3
10	P11_2	P11_3		NC	NC			VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	AN0	AN1		P33_0	P33_1
9	P11_9	P11_10		P11_6	NC			VSS	VSS		VSS	VSS		VSS	VSS	AN4	AN3		AN2	AN5
8	P11_11	P11_12		NC	NC			VDD		VSS	VSS	VSS	VSS		VDD	AN6	AN7		AN8	AN10
7	P10_0	P10_1		NC	P11_8			VDD	VSS	VSS	VSS	VSS	VDD			AN12	AN9		AN11	VSS
6	P10_3	P10_4		NC	NC											AN15	AN14		AN13	VARE F1
5	P10_2	P10_5		VFLE X	VSSE XT	NC	NC	NC	NC	P00_1 0	NC	NC	P40_8	AN34	NC	NC	NC		NC	VDDM
4	P10_6	P10_8		VSSE XT	NC	NC	NC	NC	P00_6	P00_8	NC	NC	P40_6	P40_4	NC	NC	NC1		NC	VSS
3	P10_7	VEXT																	NC	NC
2	VEXT	VSSE XT	P02_1	P02_3	P02_5	P02_7	P00_1	P00_3	P00_5	P00_9	P00_1 2	NC	NC	P40_7	AN35	NC	NC	NC	NC	NC
1	NC1	P02_0	P02_2	P02_4	P02_6	P02_8	P00_0	P00_2	P00_4	P00_7	P00_1 1	NC	NC	P40_9	P40_5	NC	NC	NC	NC	NC1

Figure 5 TC337LP I/O ball configuration [1]

- There are total of 68 NC balls and 3 NC1 balls.

5 TC337 I/O ball configuration in the LFBGA292 package variant

TC337DA and DZ

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y
20	VSSE XT	P15_0	P20_1 4	P20_1 3	P20_1 1	P20_8	P20_3	P20_0	P21_5	P21_4	VSSD SC	XTAL1	VEXT _OSC	P22_0	P22_2	NC	NC	NC	VEXT	VSSE XT
19	VDDP 3	VSSE XT	P15_2	P20_1 2	P20_1 0	P20_7	P20_1	P20_2	P21_3	P21_2	TRST _N	XTAL 2	VDDO SC	P22_1	P22_3	NC	P23_1	VEXT	VSSE XT	NC
18	P15_1	VDDP 3																	P32_4	NC
17	P15_4	P15_3		VSSE XT	P20_9	P20_6	PORS T_N	P21_6	P21_1	P21_0	NC	NC	NC	P22_5	NC	P23_5	VSSE XT		P32_1	P32_0
16	P15_6	P14_0		VDD	VSSE XT	ESR0 _N	ESR1 _N	P21_7	TCK	TMS	NC	NC	NC	P22_4	NC	VSSE XT	NC		P33_1 2	P33_1 3
15	P14_1	P14_4		P15_7	VDD											NC	NC		P33_1 0	P33_1 1
14	P14_5	P14_3		P15_8	P15_5			VDD	VSS	DAPE 0	ERR_ SIG	VSS	VDD			NC	NC		P33_8	P33_9
13	P14_8	P14_6		P14_7	P14_2		VDD		VSS	VSS	VSS	VSS		VDD		NC	NC		P33_6	P33_7
12	P11_2	P11_3		P14_9	P12_0		VSS	VSS		VSS	VSS		VSS	VSS		P34_2	P34_3		P33_4	P33_5
11	P11_9	P11_0		P14_1 0	P12_1		DAPE 1	VSS	VSS	VSS	VSS	VSS	VSS	TX_P		VEVR SB	P34_1		P33_2	P33_3
10	P11_11	P11_1 2		P11_4	P11_0		DAPE 2	VSS	VSS	VSS	VSS	VSS	VSS	TX_N		AN0	AN1		P33_0	P33_1
9	NC	NC		P11_6	P11_1		VSS	VSS		VSS	VSS		VSS	VSS		AN4	AN3		AN2	AN5
8	NC	NC		P11_5	P11_7		VDD		VSS	VSS	VSS	VSS		VDD		AN6	AN7		AN8	AN10
7	NC	NC		P11_1 4	P11_8		VDD	VSS	CLK_ P	CLK_ N	VSS	VDD				AN12	AN9		AN11	VSS
6	NC	NC		P11_1 5	P11_1 3											AN15	AN14		AN13	VARE F1
5	NC	NC		VFLE X	VSSE XT	P10_2	P10_4	P10_6	P10_7	P02_5	P02_8	P00_4	P00_5	NC	AN23	AN22	AN17		AN16	VDDM
4	NC	NC		VSSE XT	P10_0	P10_1	P10_3	P10_5	P10_8	P02_4	P02_7	P00_3	P00_6	NC	NC	NC	NC1		AN18	VSS
3	NC	VEXT																	AN19	AN20
2	VEXT	VSSE XT	P50_0	P50_2	P50_4	P50_6	P50_8	P50_1 0	P02_1	P02_3	P00_0	P00_1	P00_7	P00_9	P00_1 2	NC	NC	NC	NC	AN21
1	NC1	NC	P50_1	P50_3	P50_5	P50_7	P50_9	P50_1 1	P02_0	P02_2	P02_6	P00_2	P00_8	NC	NC	NC	NC	NC	NC	NC1

Figure 6 TC337DA and DZ I/O ball configuration [2]

- There are total of 49 NC balls and 3 NC1 balls.

6 TC357 I/O ball configuration in the LFBGA292 package variant

6 TC357 I/O ball configuration in the LFBGA292 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y
20	VSS	P15_0	P20_4	P20_3	P20_1	P20_8	P20_3	P20_0	P21_5	P21_4	VSSO_SC	XTAL_1	VEXT_OSC	P22_0	P22_2	P23_4	P23_2	P23_0	VEXT	VSSE_XT
19	VDD_P3	VSS	P15_2	P20_2	P20_0	P20_7	P20_1	P20_2	P21_3	P21_2	TRST_N	XTAL_2	VDD_OSC	P22_1	P22_3	P23_3	P23_1	VEXT	VSSE_XT	P32_3
18	P15_1	VDD_P3																	P32_4	P32_2
17	P15_4	P15_3		VSS	P20_9	P20_6	POR_ST_N	P21_6	P21_1	P21_0	NC	NC	NC	P22_5	NC	P23_5	VSSE_XT		P32_1	P32_0
16	P15_6	P14_0		VDD	VSS	ESR0_N	ESR1_N	P21_7	TCK	TMS	NC	NC	NC	P22_4	NC	VSSE_XT	NC		P33_1_2	P33_1_3
15	P14_1	P14_4		P15_7	VDD											P32_5	P32_6		P33_1_0	P33_1_1
14	P14_5	P14_3		P15_8	P15_5			VDD	VSS	DAP_E0	ERR_SIG	VSS	VDD			NC	NC		P33_8	P33_9
13	P14_8	P14_6		P14_7	P14_2		VDD		VSS	VSS	VSS	VSS		VDD		NC	NC		P33_6	P33_7
12	P11_2	P11_3		P14_9	P12_0		VSS	VSS		VSS	VSS		VSS	VSS		P34_2	P34_3		P33_4	P33_5
11	P11_9	P11_1_0		P14_1_0	P12_1		DAP_E1	VSS	VSS	VSS	VSS	VSS	VSS	TX_P		VEVR_SB	P34_1		P33_2	P33_3
10	P11_11	P11_1_2		P11_4	P11_0		DAP_E2	VSS	VSS	VSS	VSS	VSS	VSS	TX_N		AN0	AN1		P33_0	P33_1
9	P51_1	P51_0		P11_6	P11_1		VSS	VSS		VSS	VSS		VSS	VSS		AN4	AN3		AN2	AN5
8	P51_3	P51_2		P11_5	P11_7		VDD		VSS	VSS	VSS	VSS		VDD		AN6	AN7		AN8	AN10
7	P51_5	P51_4		P11_1_4	P11_8		VDD	VSS	CLK_P	CLK_N	VSS	VDD				AN12	AN9		AN11	VSS
6	P51_7	P51_6		P11_1_5	P11_1_3											AN15	AN14		AN13	VARE_FLN_ET
5	P51_9	P51_8		VFLX	VSS	P10_2	P10_4	P10_6	P10_7	P02_5	P02_8	P00_4	P00_5	NC	NC	NC	NC		NC	VDD_M
4	P51_1_1	P51_1_0		VSS	P10_0	P10_1	P10_3	P10_5	P10_8	P02_4	P02_7	P00_3	P00_6	NC	NC	NC	NC1		NC	VSS
3	NC	VEXT																	NC	NC
2	VEXT	VSS	P50_0	P50_2	P50_4	P50_6	P50_8	P50_1_0	P02_1	P02_3	P00_0	P00_1	P00_7	P00_9	P00_2	NC	NC	NC	NC	NC
1	NC1	NC	P50_1	P50_3	P50_5	P50_7	P50_9	P50_1_1	P02_0	P02_2	P02_6	P00_2	P00_8	P00_1_0	P00_1_1	NC	NC	NC	NC	NC1

Figure 7 TC357 I/O ball configuration [3]

- There are total of 35 NC balls and 3 NC1 balls.

7 TC367 I/O ball configuration in the LFBGA292 package variant

7 TC367 I/O ball configuration in the LFBGA292 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y
20	VSSE XT	P15_0	P20_14	P20_13	P20_11	P20_8	P20_3	P20_0	P21_5	P21_4	VSSO SC	XTAL 1	VEXT_OSC	P22_0	P22_2	P23_4	P23_2	P23_0	VEXT	VSSE XT
19	VDD P3	VSSE XT	P15_2	P20_12	P20_10	P20_7	P20_1	P20_2	P21_3	P21_2	TRST_N	XTAL 2	VDD OSC	P22_1	P22_3	P23_3	P23_1	VEXT	VSSE XT	P32_3
18	P15_1	VDD P3																	P32_4	P32_2
17	P15_4	P15_3		VSSE XT	P20_9	P20_6	PORS T_N	P21_6	P21_1	P21_0	NC	NC	NC	NC	NC	P23_5	VSSE XT		P32_1	P32_0
16	P15_6	P14_0		VDD	VSSE XT	ESR0_N	ESR1_N	P21_7	TCK	TMS	NC	NC	NC	NC	NC	VSSE XT	NC		P33_12	P33_13
15	P14_1	P14_4		P15_7	VDD											NC	NC		P33_10	P33_11
14	P14_5	P14_3		P15_8	P15_5			VDD	VSS	NC	VSS	VSS	VDD			NC	NC		P33_8	P33_9
13	P14_8	P14_6		P14_7	P14_2			VDD		VSS	VSS	VSS	VSS		VDD	NC	NC		P33_6	P33_7
12	P13_1	P13_0		P14_9	P12_0			VSS	VSS		VSS	VSS		VSS	VSS	NC	NC		P33_4	P33_5
11	P13_3	P13_2		P14_10	P12_1			VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VEY RSB	NC		P33_2	P33_3
10	P11_2	P11_3		P11_4	P11_0			VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	AN0	AN1		P33_0	P33_1
9	P11_9	P11_10		P11_6	P11_1			VSS	VSS		VSS	VSS		VSS	VSS	AN4	AN3		AN2	AN5
8	P11_11	P11_12		P11_5	P11_7			VDD		VSS	VSS	VSS	VSS		VDD	AN6	AN7		AN8	AN10
7	P10_0	P10_1		P11_14	P11_8			VDD	VSS	VSS	VSS	VSS	VDD			AN12	AN9		AN11	VSS
6	P10_3	P10_4		P11_15	P11_3											AN15	AN14		AN13	VAR EF1
5	P10_2	P10_5		VFLE X	VSSE XT	NC	NC	NC	NC	P00_10	AN42	AN40	P40_8	AN34	AN23	AN22	AN17		AN16	VDD M
4	P10_6	P10_8		VSSE XT	NC	NC	NC	NC	P00_6	P00_8	AN43	AN41	P40_6	P40_4	AN31	AN30	NC		AN18	VSS
3	P10_7	VEXT																	AN19	AN20
2	VEXT	VSSE XT	P02_1	P02_3	P02_5	P02_7	P00_1	P00_3	P00_5	P00_9	P00_12	AN47	AN45	P40_7	AN35	NC	AN28	P40_2	P40_0	AN21
1	NC	P02_0	P02_2	P02_4	P02_6	P02_8	P00_0	P00_2	P00_4	P00_7	P00_11	AN46	AN44	P40_9	P40_5	NC	AN29	P40_3	P40_1	NC

Figure 8 TC367 I/O ball configuration [4]

- There are total of 34 NC balls and 3 NC1 balls.

8 TC377 I/O ball configuration in the LFBGA292 package variant

8 TC377 I/O ball configuration in the LFBGA292 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y
20	VSSEX _T	P15_0	P20_14	P20_13	P20_11	P20_8	P20_3	P20_0	P21_5	P21_4	VSSOSC	XTAL1	VEXT _{OSC}	P22_0	P22_2	P23_4	P23_2	P23_0	VEXT	VSSEX _T
19	VDDP3	VSSEX _T	P15_2	P20_12	P20_10	P20_7	P20_1	P20_2	P21_3	P21_2	TRST _N	XTAL2	VDDOSC	P22_1	P22_3	P23_3	P23_1	VEXT	VSSEX _T	P32_3
18	P15_1	VDDP3																	P32_4	P32_2
17	P15_4	P15_3		VSSEX _T	P20_9	P20_6	PORS _{TN}	P21_6	P21_1	P21_0	P22_11	P22_9	P22_7	P22_5	P23_6	P23_5	VSSEX _T		P32_1	P32_0
16	P15_6	P14_0		VDD	VSSEX _T	ESR0 _N	ESR1 _N	P21_7	TCK	TMS	P22_10	P22_8	P22_6	P22_4	P23_7	VSSEX _T	P32_7		P33_12	P33_13
15	P14_1	P14_4		P15_7	VDD											P32_5	P32_6		P33_10	P33_11
14	P14_5	P14_3		P15_8	P15_5			VDD	VSS	NC	VSS	VSS	VDD			P33_14	P33_15		P33_8	P33_9
13	P14_8	P14_6		P14_7	P14_2			VDD		VSS	VSS	VSS	VSS		VDD	P34_4	P34_5		P33_6	P33_7
12	P13_1	P13_0		P14_9	P12_0			VSS	VSS		VSS	VSS		VSS	VSS	P34_2	P34_3		P33_4	P33_5
11	P13_3	P13_2		P14_10	P12_1			VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	VEVRS _B	P34_1		P33_2	P33_3
10	P11_2	P11_3		P11_4	P11_0			VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS	AN0	AN1		P33_0	P33_1
9	P11_9	P11_10		P11_6	P11_1			VSS	VSS		VSS	VSS		VSS	VSS	AN4	AN3		AN2	AN5
8	P11_11	P11_12		P11_5	P11_7			VDD		VSS	VSS	VSS	VSS		VDD	AN6	AN7		AN8	AN10
7	P10_0	P10_1		P11_14	P11_8			VDD	VSS	VSS	VSS	VSS	VDD			AN12	AN9		AN11	VSS
6	P10_3	P10_4		P11_15	P11_13											AN15	AN14		AN13	VAREF ₁
5	P10_2	P10_5		VFLEX	VSSEX _T	P02_10	P01_3	P01_5	P01_7	P00_10	AN42	AN40	P40_8	AN34	AN23	AN22	P40_10		AN16	VDDM
4	P10_6	P10_8		VSSEX _T	P02_9	P02_11	P01_4	P01_6	P00_6	P00_8	AN43	AN41	P40_6	P40_4	AN31	AN30	NC1		P40_11	VSS
3	P10_7	VEXT																	P40_12	AN20
2	VEXT	VSSEX _T	P02_1	P02_3	P02_5	P02_7	P00_1	P00_3	P00_5	P00_9	P00_12	AN47	AN45	P40_7	AN35	VSS	P40_13	P40_2	P40_0	AN21
1	NC1	P02_0	P02_2	P02_4	P02_6	P02_8	P00_0	P00_2	P00_4	P00_7	P00_11	AN46	AN44	P40_9	P40_5	VAREF _{2_NET}	P40_14	P40_3	P40_1	NC1

Figure 9 TC377 I/O ball configuration [5] [6]

- There are total of 1 NC balls and 3 NC1 balls.
- The Ballout is from TC377TP. This analysis is also valid for TC377TE and TC377TX

9 TC387 I/O ball configuration in the LFBGA292 package variant

9 TC387 I/O ball configuration in the LFBGA292 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y		
20	VSS	P15_0	P20_1_4	P20_1_3	P20_1_1	P20_8	P20_3	P20_0	P21_5	P21_4	VSSOSC	XTAL_1	VEXT_OSC	P22_0	P22_2	P23_4	P23_2	P23_0	VEXT	VSSE_XT		
19	VDD_P3	VSS	P15_2	P20_1_2	P20_1_0	P20_7	P20_1	P20_2	P21_3	P21_2	TRST_N	XTAL_2	VDD_OSC	P22_1	P22_3	P23_3	P23_1	VEXT	VSSE_XT	P32_3		
18	P15_1	VDD_P3																	P32_4	P32_2		
17	P15_4	P15_3		VSS	P20_9	P20_6	PORST_N	P21_6	P21_1	P21_0	P22_1_1	P22_9	P22_7	P22_5	P23_6	P23_5	VSSE_XT		P32_1	P32_0		
16	P15_6	P14_0		VDD	VSS	ESR0_N	ESR1_N	P21_7	TCK	TMS	P22_1_0	P22_8	P22_6	P22_4	P23_7	VSSE_XT	P32_7		P33_1_2	P33_1_3		
15	P14_1	P14_4		P15_7	VDD											P32_5	P32_6		P33_1_0	P33_1_1		
14	P14_5	P14_3		P15_8	P15_5			VDD	VSS	NC	VSS	VSS	VDD				P33_1_4	P33_1_5		P33_8	P33_9	
13	P14_8	P14_6		P14_7	P14_2		VDD		VSS	VSS	VSS	VSS		VDD				P34_4	P34_5		P33_6	P33_7
12	P13_1	P13_0		P14_9	P12_0		VSS	VSS		VSS	VSS		VSS	VSS				P34_2	P34_3		P33_4	P33_5
11	P13_3	P13_2		P14_1_0	P12_1		VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS				VEVR_SB	P34_1		P33_2	P33_3
10	P11_2	P11_3		P11_4	P11_0		VSS	VSS	VSS	VSS	VSS	VSS	VSS	VSS				AN0	AN1		P33_0	P33_1
9	P11_9	P11_1_0		P11_6	P11_1		VSS	VSS		VSS	VSS		VSS	VSS				AN4	AN3		AN2	AN5
8	P11_11	P11_1_2		P11_5	P11_7		VDD		VSS	VSS	VSS	VSS		VDD				AN6	AN7		AN8	AN10
7	P10_0	P10_1		P11_1_4	P11_8		VDD	VSS	VSS	VSS	VSS	VSS	VDD				AN12	AN9		AN11	VSS	
6	P10_3	P10_4		P11_1_5	P11_1_3											AN15	AN14				AN13	VARE_F1
5	P10_2	P10_5		VFLX	VSS	P02_1_0	P01_3	P01_5	P01_7	P00_1_0	AN42	AN40	P40_8	AN34	AN23	AN22	P40_1_0				AN16	VDD_M
4	P10_6	P10_8		VSS	P02_9	P02_1_1	P01_4	P01_6	P00_6	P00_8	AN43	AN41	P40_6	P40_4	AN31	AN30	NC1				P40_1_1	VSS
3	P10_7	VEXT																		P40_1_2	AN20	
2	VEXT	VSS	P02_1	P02_3	P02_5	P02_7	P00_1	P00_3	P00_5	P00_9	P00_1_2	AN47	AN45	P40_7	AN35	VSS	P40_1_3	P40_2	P40_0			
1	NC1	P02_0	P02_2	P02_4	P02_6	P02_8	P00_0	P00_2	P00_4	P00_7	P00_1_1	AN46	AN44	P40_9	P40_5	VARE_F2	P40_1_4	P40_3	P40_1			

Figure 10 TC387 I/O ball configuration [7]

- There are total of 1 NC balls and 3 NC1 balls.

10 TC397 I/O ball configuration in the LFBGA292 package variant

10 TC397 I/O ball configuration in the LFBGA292 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y		
20	VSS	P15_0	P20_1_4	P20_1_3	P20_1_1	P20_8	P20_3	P20_0	P21_5	P21_4	VSSO_SC	XTAL_1	VEXT_OSC	P22_0	P22_2	P23_4	P23_2	P23_0	VEXT	VSS		
19	VDD_P3	VSS	P15_2	P20_1_2	P20_1_0	P20_7	P20_1	P20_2	P21_3	P21_2	TRST_N	XTAL_2	VDD_OSC	P22_1	P22_3	P23_3	P23_1	VEXT	VSS	P32_3		
18	P15_1	VDD_P3																	P32_4	P32_2		
17	P15_4	P15_3	VSS		P20_9	P20_6	POR_ST_N	P21_6	P21_1	P21_0	P22_1_1	P22_9	P22_7	P22_5	P23_6	P23_5	VSS		P32_1	P32_0		
16	P15_6	P14_0	VDD		VSSE_XT	ESR0_N	ESR1_N	P21_7	TCK	TMS	P22_1_0	P22_8	P22_6	P22_4	P23_7	VSS		P32_7	P33_1_2	P33_1_3		
15	P14_1	P14_4	P15_7		VDD												P32_5	P32_6	P33_1_0	P33_1_1		
14	P14_5	P14_3	P15_8		P15_5		VDD		VSS	DAP_E0	ERR_SIG	VSS	VDD				P33_1_4	P33_1_5	P33_8	P33_9		
13	P14_8	P14_6	P14_7		P14_2		VDD				VSS	VSS	VSS	VSS	VDD		P34_4	P34_5	P33_6	P33_7		
12	P13_1	P13_0	P14_9		P12_0		VSS		VSS				VSS	VSS	VSS		P34_2	P34_3	P33_4	P33_5		
11	P13_3	P13_2	P14_1_0		P12_1		DAP_E1		VSS		VSS	VSS	VSS	VSS	TX_P		VEYR_SB	P34_1	P33_2	P33_3		
10	P11_2	P11_3	P11_4		P11_0		DAP_E2		VSS		VSS	VSS	VSS	VSS	TX_N		AN0	AN1	P33_0	P33_1		
9	P11_9	P11_1_0	P11_6		P11_1		VSS		VSS				VSS	VSS			AN4	AN3	AN2	AN5		
8	P11_11	P11_1_2	P11_5		P11_7		VDDSB				VSS	VSS	VSS	VSS	VDD		AN6	AN7	AN8	AN10		
7	P10_0	P10_1	P11_1_4		P11_8		VDDSB		VSS		CLK_P	CLK_N	VSS	VDD				AN12	AN9	AN11	VSS	
6	P10_3	P10_4	P11_1_5		P11_3														AN15	AN14	AN13	VARE_F1
5	P10_2	P10_5	VFLEX		VSSE_XT	P02_1_0	P01_3	P01_5	P01_7	P00_1_0	AN42	AN40	P40_8	AN34	AN23	AN22	P40_1_0	AN16		VDD_M		
4	P10_6	P10_8	VSSE_XT		P02_9	P02_1_1	P01_4	P01_6	P00_6	P00_8	AN43	AN41	P40_6	P40_4	AN31	AN30	NC1	P40_1_1		VSS		
3	P10_7	VEXT																	P40_1_2	AN20		
2	VEXT	VSS	P02_1	P02_3	P02_5	P02_7	P00_1	P00_3	P00_5	P00_9	P00_1_2	AN47	AN45	P40_7	AN35	VSS	P40_1_3	P40_2	P40_0	AN21		
1	NC	P02_0	P02_2	P02_4	P02_6	P02_8	P00_0	P00_2	P00_4	P00_7	P00_1_1	AN46	AN44	P40_9	P40_5	VARE_F2	P40_1_4	P40_3	P40_1	NC1		

Figure 11 TC397 I/O ball configuration [8]

- There are total of 1 NC balls and 2 NC1 balls.

11 TC389 I/O ball configuration in the LFBGA516 package variant

11 TC389 I/O ball configuration in the LFBGA516 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK		
30	VSS	VSS	NC	NC	NC	NC	NC	VSS EXT	VEX T	P24 _15	P24 _13	P24 _11	P24 _9	P24 _7	P24 _5	P24 _3	P24 _1	NC1	NC	P25 _15	P25 _13	P25 _11	P25 _9	P25 _5	P25 _3	P25 _1	P25 _0	VEX T	VEX T	VSS		
29	VDD P3	VSS	NC	NC	NC	NC	NC	VSS EXT	VEX T	P24 _14	P24 _12	P24 _10	P24 _8	P24 _6	P24 _4	P24 _2	P24 _0	NC1	P25 _6	P25 _14	P25 _12	P25 _10	P25 _8	P25 _7	P25 _4	P25 _2	P25 _0	VEX T	VSS	VEX T		
28	NC	VDD P3																											P30 _14	P30 _15		
27	NC	NC																											P30 _12	P30 _13		
26	NC	NC																											P30 _10	P30 _11		
25	NC	NC						VSS	P15 _0	P20 _14	P20 _13	P20 _11	P20 _8	P20 _3	P20 _0	P21 _5	P21 _4	VSS OSC	XTA L1	VEX T_O SC	P22 _0	P22 _2	P23 _4	P23 _2	P23 _0	VEX T	VSS EXT		P30 _8	P30 _9		
24	P15 _11	P15 _10						VDD P3	VSS	P15 _2	P20 _12	P20 _10	P20 _7	P20 _1	P20 _2	P21 _3	P21 _2	TRS T_N	XTA L2	VDD OSC	P22 _1	P22 _3	P23 _3	P23 _1	VEX T	VSS EXT	P32 _3		P30 _6	P30 _7		
23	P15 _13	P15 _12						P15 _1	VDD P3																	P32 _4	P32 _2		P30 _4	P30 _5		
22	P15 _15	P15 _14						P15 _4	P15 _3	VSS	P20 _9	P20 _6	POR ST_N	P21 _6	P21 _1	P21 _0	P22 _11	P22 _9	P22 _7	P22 _5	P22 _6	P23 _5	P23 _5	VSS EXT		P32 _1	P32 _0		P30 _2	P30 _3		
21	NC	NC						P15 _6	P14 _0	VDD	VSS	ESR O_N	ESR L_N	P21 _7	TCK	TMS	P22 _10	P22 _8	P22 _6	P22 _4	P23 _7	P23 _7	VSS EXT	P32 _7		P33 _12	P33 _13		P30 _0	P30 _1		
20	P14 _11	NC						P14 _1	P14 _4	P15 _7	VDD													P32 _5	P32 _6		P33 _10	P33 _11	NC	VEX T		
19	P14 _13	P14 _12						P14 _5	P14 _3	P15 _8	P15 _5			VDD	VSS	NC	VSS	VSS	VSS	VDD				P33 _14	P33 _15		P33 _8	P33 _9		P31 _14	P31 _15	
18	P14 _15	P14 _14						P14 _8	P14 _6	P14 _7	P14 _2			VDD		VSS	VSS	VSS	VSS		VDD			P34 _4	P34 _5		P33 _6	P33 _7		P31 _12	P31 _13	
17	NC	NC						P13 _1	P13 _0	P14 _9	P12 _0			VSS	VSS		VSS	VSS		VSS	VSS			P34 _2	P34 _3		P33 _4	P33 _5		P31 _10	P31 _11	
16	P13 _5	P13 _4						P13 _3	P13 _2	P14 _10	P12 _1			VSS	VSS	VSS	VSS	VSS	VSS	VSS				VEV RSB	P34 _1		P33 _2	P33 _3		P31 _8	P31 _9	
15	P13 _7	P13 _6						P1L 2	P1L 3	P1L 4	P1L 0			VSS	VSS	VSS	VSS	VSS	VSS	VSS				AN0	AN1		P33 _0	P33 _1		P31 _6	P31 _7	
14	P13 _9	NC						P1L 9	P1L 10	P1L 6	P1L 1			VSS	VSS		VSS	VSS		VSS	VSS			AN4	AN3		AN2	AN5		P31 _4	P31 _5	
13	P13 _11	P13 _10						P1L 11	P1L 12	P1L 5	P1L 7			VDD		VSS	VSS	VSS	VSS		VDD			AN6	AN7		AN8	AN1 0		P31 _2	P31 _3	
12	P13 _13	P13 _12						P1L 14	P1L 8					VDD	VSS	VSS	VSS	VSS	VDD					AN1 2	AN9		AN1 1	VSS		P31 _0	P31 _1	
11	P13 _15	P13 _14						P1L 15	P1L 13															AN1 5	AN1 4		AN1 3	VAR EF1		VEX T	VEX T	
10	NC	NC						P10 _2	P10 _5	VFL EX	VSS	P02 _10	P01 _3	P01 _5	P01 _7	P00 _10	AN4 2	AN4 0	P40 _8	AN3 4	AN2 3	AN2 2	P40 _10		AN1 6	VDD M		VSS EXT	VSS EXT			
9	NC	NC						P10 _6	P10 _8	VSS	P02 _9	P02 _11	P01 _4	P01 _6	P00 _8	AN4 3	AN4 1	P40 _6	P40 _4	AN3 1	AN3 0	NC1		P40 _11	VSS		VDD M	VDD M				
8	NC	P10 _9						P10 _7	VEX T															P40 _12	AN2 0		VSS	VSS				
7	P10 _11	P10 _10						VEX T	VSS	P02 _1	P02 _3	P02 _5	P02 _7	P00 _1	P00 _3	P00 _5	P00 _9	P00 _12	AN4 7	AN4 5	P40 _7	AN3 5	VSS	P40 _13	P40 _2	P40 _0	AN2 1		AN4 9	AN4 8		
6	P10 _13	NC						NC1	P02 _0	P02 _2	P02 _4	P02 _6	P02 _8	P00 _0	P00 _2	P00 _4	P00 _7	P00 _11	AN4 6	AN4 4	P40 _9	P40 _5	VAR EF2	P40 _14	P40 _3	P40 _1	NC1		AN5 0	AN5 1		
5	P10 _15	P10 _14																											AN5 2	AN5 3		
4	NC	NC																											P41 _4	P41 _5		
3	NC	VEX T																											NC	NC		
2	VEX T	VSS EXT	NC	NC	NC	NC	NC	P02 _12	P02 _14	NC	P01 _0	P01 _2	P01 _9	P01 _10	P01 _12	P01 _14	NC	P00 _13	P00 _14	NC	P41 _3	P41 _1	AN6 6	P41 _8	P41 _6	AN6 1	AN5 8	AN5 7	VAG ND3	NC	NC	NC
1	NC1	NC	NC	NC	NC	NC	NC	P02 _13	P02 _15	NC	NC	P01 _1	P01 _8	P01 _11	P01 _13	P01 _15	NC	NC	P00 _15	NC	P41 _2	P41 _0	P40 _15	AN6 5	P41 _7	AN6 0	AN5 9	AN5 6	VAR EF3	NC	NC	NC1

Figure 12 TC389 I/O ball configuration [7]

- There are total of 57 NC balls and 7 NC1 balls.

12 TC399 I/O ball configuration in the LFBGA292 package variant

12 TC399 I/O ball configuration in the LFBGA292 package variant

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	Y	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK
30	VSS	VSS	NC	NC	NC	NC	NC	VSS	VEB U	P24 _15	P24 _13	P24 _11	P24 _9	P24 _7	P24 _5	P24 _3	P24 _1	NC1	NC	P25 _15	P25 _13	P25 _11	P25 _9	P25 _5	P25 _3	P25 _1	P25 _0	VEB U	VEX T	VSS
29	VDD P3	VSS	NC	NC	NC	NC	NC	VSS	VEB U	P24 _14	P24 _12	P24 _10	P24 _8	P24 _6	P24 _4	P24 _2	P24 _0	NC1	P25 _6	P25 _14	P25 _12	P25 _10	P25 _8	P25 _7	P25 _4	P25 _2	P26 _0	VEX T	VSS	VEB U
28	NC	VDD P3																											P30 _14	P30 _15
27	NC	NC																											P30 _12	P30 _13
26	NC	NC																											P30 _10	P30 _11
25	NC	NC							VSS	P15 _0	P20 _14	P20 _13	P20 _11	P20 _8	P20 _3	P20 _0	P21 _5	P21 _4	VSS OSC	XTA L1	VEX T_O SC	P22 _0	P22 _2	P23 _4	P23 _2	P23 _0	VEX T	VSS	P30 _8	P30 _9
24	P15 _11	P15 _10							VDD P3	VSS	P15 _12	P20 _10	P20 _7	P20 _2	P20 _1	P21 _3	P21 _2	TRS T_N	XTA L2	VDD OSC	P22 _1	P22 _3	P23 _3	P23 _1	VEX T	VSS	P32 _3		P30 _6	P30 _7
23	P15 _13	P15 _12							P15 _1	VDD P3																			P30 _4	P30 _5
22	P15 _15	P15 _14							P15 _4	P15 _3																			P30 _2	P30 _3
21	NC	NC							P15 _6	P14 _0																			P30 _0	P30 _1
20	P14 _11	NC							P14 _1	P14 _4																			NC	VEB U
19	P14 _13	P14 _12							P14 _5	P14 _3																			P31 _14	P31 _15
18	P14 _15	P14 _14							P14 _8	P14 _6																			P31 _12	P31 _13
17	NC	NC							P13 _1	P13 _0																			P31 _10	P31 _11
16	P13 _5	P13 _4							P13 _3	P13 _2																			P31 _8	P31 _9
15	P13 _7	P13 _6							P11 _2	P11 _3																			P31 _6	P31 _7
14	P13 _9	NC							P11 _9	P11 _10																			P31 _4	P31 _5
13	P13 _11	P13 _10							P11 _11	P11 _12																			P31 _2	P31 _3
12	P13 _13	P13 _12							P11 _0	P10 _1																			P31 _0	P31 _1
11	P13 _15	P13 _14							P11 _3	P10 _4																			VEB U	VEB U
10	NC	NC							P10 _2	P10 _5																			VSS	VSS
9	NC	NC							P10 _6	P10 _8																			VDD M	VDD M
8	NC	P10 _9							P10 _7	VEX T																			VSS M	VSS M
7	P10 _11	P10 _10							VEX T	VSS	P02 _1	P02 _3	P02 _5	P02 _7	P00 _1	P00 _3	P00 _5	P00 _9	P00 _12	AN4 7	AN4 5	P40 _7	AN3 5	VSS	P40 _13	P40 _12	P40 _0	AN2 1	AN4 9	AN4 8
6	P10 _13	NC							NC1	P02 _0	P02 _2	P02 _4	P02 _6	P02 _8	P00 _0	P00 _2	P00 _4	P00 _7	P00 _11	AN4 6	AN4 4	P40 _9	P40 _5	VAR EF2	P40 _14	P40 _3	P40 _1	NC1	AN5 0	AN5 1
5	P10 _15	P10 _14																											AN5 2	AN5 3
4	NC	NC																											P41 _4	P41 _5
3	NC	VEX T																											NC	NC
2	VEX T	VSS	NC	NC	NC	P02 _12	P02 _14	NC	P01 _0	P01 _2	P01 _3	P01 _9	P01 _10	P01 _12	P01 _14	NC	P00 _13	P00 _14	AN7 3	P41 _3	P41 _1	AN6 6	P41 _8	P41 _6	AN6 1	AN5 8	AN5 7	VSS	NC	NC
1	NC1	NC	NC	NC	NC	P02 _13	P02 _15	NC	P01 _1	P01 _8	P01 _11	P01 _13	P01 _15	NC	NC	P00 _15	AN7 2	P41 _2	P41 _0	P40 _15	AN6 5	P41 _7	AN6 0	AN5 9	AN5 6	VAR EF3	NC	NC	NC1	

Figure 13 TC399 I/O ball configuration [8]

- There are total of 54 NC balls and 7 NC1 balls.

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Revision history

Revision history

Document version	Date of release	Description of changes
V1.0	2018-11	First release
V1.1	2019-01	Device TC356 added
V1.2	2021-04	Editorial Changes <ul style="list-style-type: none">• Refurbished headings Devices added <ul style="list-style-type: none">• TC337LP• TC337DA and DZ• TC367• TC377• TC336L and LP• TC336DA• TC356 updated• TC366
V1.3	2024-03-08	Template update; no content update.

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Edition 2024-08-14

Published by

Infineon Technologies AG
81726 Munich, Germany

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Document reference
IFX-wtl1709875639305

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