User's Manual

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V850E2/Fx4 Application Board

User's Manual: Hardware

RENESAS MCU
V850 F Series

AB-050-FX4-MB-L-Q-DEV-V2
AB-050-FX4-MB-L-Q-TCT-V2
AB-050-FX4-MB-X-Q-NONE-V2

Renesas Electronics
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1. Introduction

The V850E2/Fx4 Application Board serves as a simple and easy to use platform for evaluating the features and performance of Renesas Electronics' 32-bit V850E2/Fx4™ microcontrollers. The *Main Board* (AB-050-FX4-MB-x-x-xxx-V2) can be used as a standalone board, or can be mated with one of several *Piggyback Boards* (AB-050-FX4-PB-x-x-xxx-V2) for extended functionality.

Features:

- Connections for on-chip debugging and flash memory programming
- Access to all microcontroller I/O
- User interaction through switches, buttons, and LEDs
- Serial interface connections for RS232, LIN, CAN, and FlexRay
- High density piggyback board connectors
- Multiple, configurable voltage regulators (9V to 12V DC input)
- Blank, through-hole prototyping area

This document will describe the functionality provided by the Application Board and guide the user through its operation. For details regarding the operation of the microcontroller, refer to the V850E2/Fx4 User's Manual.

This document is valid for the following versions of the Application Board:

- AB-050-Fx4-MB-L-Q-TCT-V2
  Application Board with populated socket for the V850E2/FL4 device
- AB-050-Fx4-MB-X-Q-DEV-V2
  Application Board populated with the V850E2/FL4 device
- AB-050-Fx4-MB-X-Q-NONE-V2
  Application board unpopulated device.
  AB-050-Fx4-PB-X-XXX-V2 Piggyback Boards can be mounted on this Application Board.

2. Board Overview

Figure 1 provides a top level view of the Main Board. Highlighted in the image are several areas of functionality.

Blue: Microcontroller Area

Red: Power Supply Area

Green: Functional Areas

These areas are described in detail in the following sections.

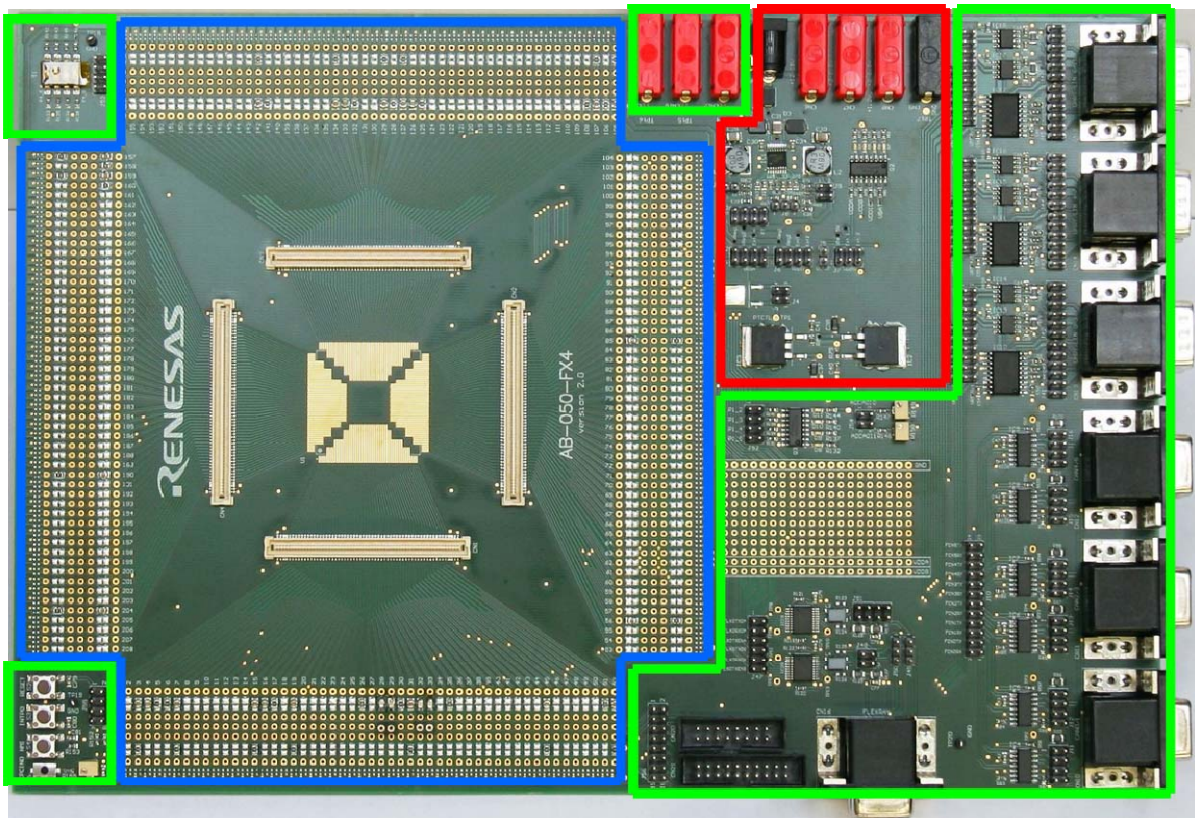


Figure 1. AB-050-Fx4-MB-X-Q-NONE-V2 top view

3. Microcontroller Area

The Microcontroller Area of the Main Board includes the following features:

- Interfaces to all microcontroller I/O pins
- High density piggyback board connectors

3.1 Multi-QFP Footprint

The Main Board provides a multi-QFP footprint that allows for the soldering of any of the Fx4 microcontroller package sizes.

Caution: Refer to the pinout information in the V850E2/Fx4 User's Manual to determine the appropriate Pin Interface connections for each package size.

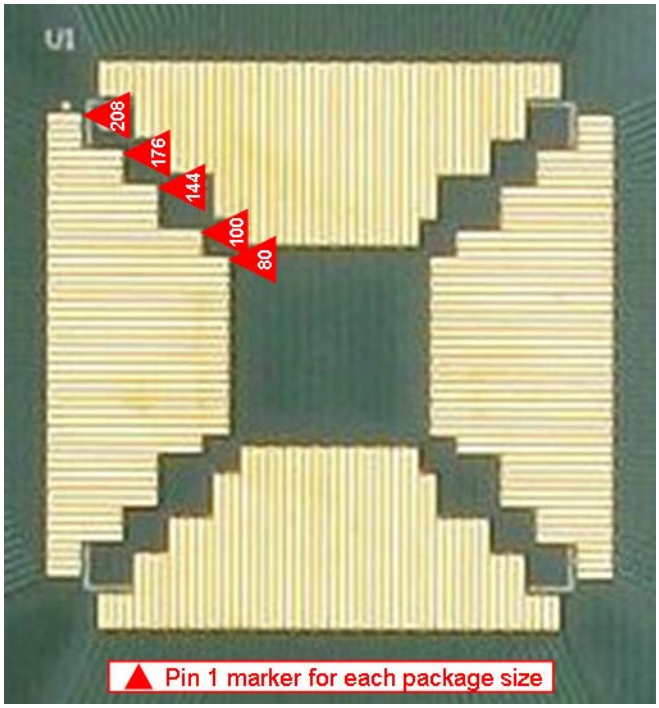


Figure 2. Multi-QFP Footprint

On the following board versions a device or a device socket are assembled:

- AB-050-Fx4-MB-L-Q-TCT-V2 (with socket for V850E2/FL4)
- AB-050-Fx4-MB-X-Q-DEV-V2 (with V850E2/FL4 device)

3.2 Pin Interfaces

Each microcontroller I/O pin is connected to a *Pin Interface*. The Pin Interface is a group of pads that allow easy probing of I/O pins, and provide the ability to selectively connect the I/O pins to power, ground or other signals. Figure 3 shows a picture of unpopulated pin interfaces along with a diagram of the circuit. Through-hole pads with 0.1" spacing are provided for signal probing and connections. These pads can be populated with standard 0.1" headers to facilitate signal probing.

Standard size surface mount pads are also provided. These pads can be populated with standard resistors, capacitors or jumpers to connect the microcontroller I/O pin to ground or one of two voltage rails: VDDA or VDDB. For further details regarding the voltage rails, refer to section 4.3.

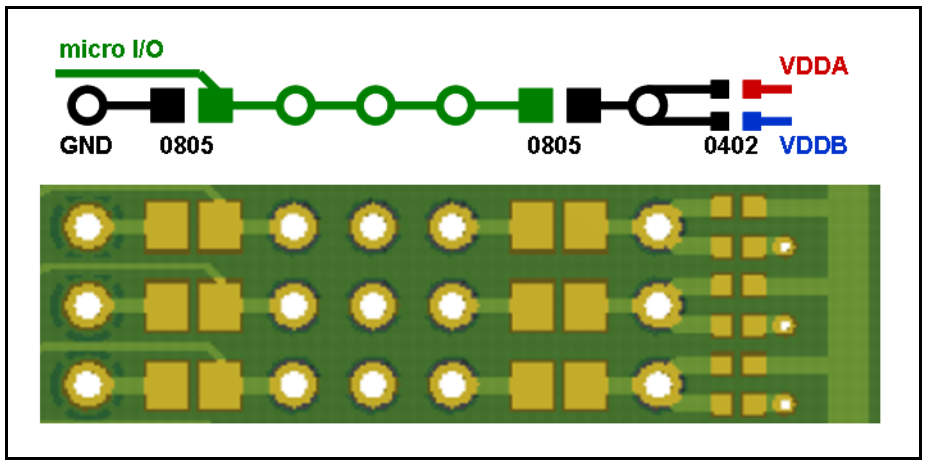


Figure 3. Pin Interfaces

3.3 Piggyback Board Connectors

Surrounding the QFP microcontroller footprints are four high density connectors. These connectors allow the Main Board to be interfaced with *Piggyback Boards* to extend the functionality offered by the Main Board. All microcontroller I/O, as well as power and ground are passed through these connectors to the Piggyback Board. A detailed listing of the connector signals can be found in Table 1.

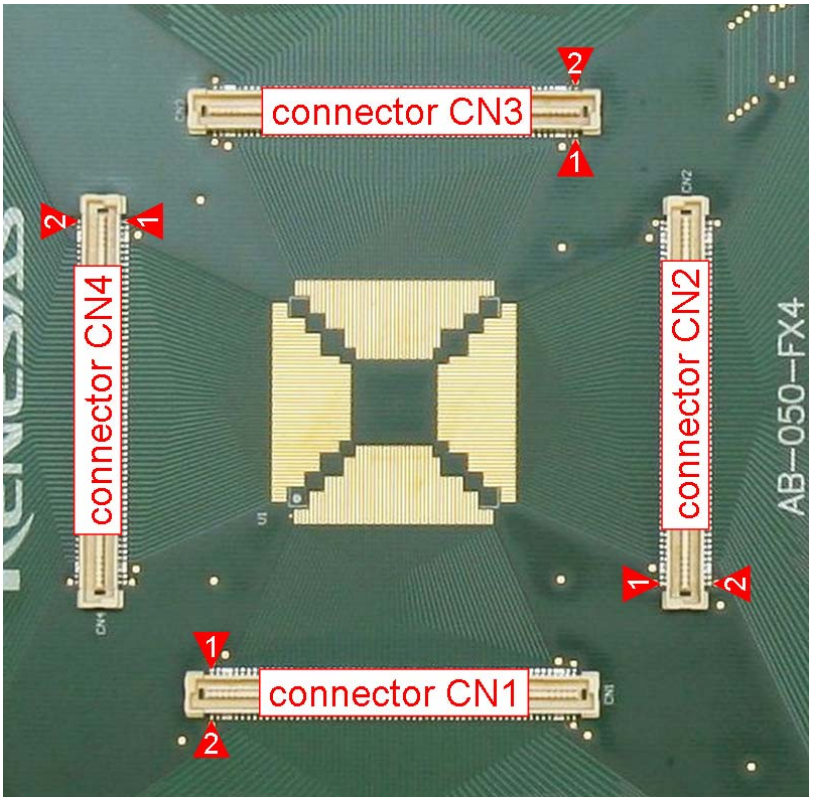


Figure 4. Piggyback Board Connectors

CN1 Pin		Micro Pin / Signal
1	2	VDDA
3	4	VDDA
5	6	GND
7	8	GND
9	10	1
11	12	2
13	14	3
15	16	4
17	18	5
19	20	6
21	22	7
23	24	8
25	26	9
27	28	10
29	30	11
31	32	12
33	34	13
35	36	14
37	38	15
39	40	16

CN2 Pin		Micro Pin / Signal
1	2	VDDA
3	4	VDDA
5	6	GND
7	8	GND
9	10	53
11	12	54
13	14	55
15	16	56
17	18	57
19	20	58
21	22	59
23	24	60
25	26	61
27	28	62
29	30	63
31	32	64
33	34	65
35	36	66
37	38	67
39	40	68

CN3 Pin		Micro Pin / Signal
1	2	VDDA
3	4	VDDA
5	6	GND
7	8	GND
9	10	105
11	12	106
13	14	107
15	16	108
17	18	109
19	20	110
21	22	111
23	24	112
25	26	113
27	28	114
29	30	115
31	32	116
33	34	117
35	36	118
37	38	119
39	40	120

CN4 Pin		Micro Pin / Signal
1	2	VDDA
3	4	VDDA
5	6	GND
7	8	GND
9	10	157
11	12	158
13	14	159
15	16	160
17	18	161
19	20	162
21	22	163
23	24	164
25	26	165
27	28	166
29	30	167
31	32	168
33	34	169
35	36	170
37	38	171
39	40	172

CN1 Pin		Micro Pin / Signal
41	42	17
43	44	18
45	46	19
47	48	20
49	50	21
51	52	22
53	54	23
55	56	24
57	58	25
59	60	26
61	62	27
63	64	28
65	66	29
67	68	30
69	70	31
71	72	32
73	74	33
75	76	34
77	78	35
79	80	36
81	82	37
83	84	38
85	86	39
87	88	40
89	90	41
91	92	42
93	94	43
95	96	44
97	98	45
99	100	46
101	102	47
103	104	48
105	106	49
107	108	50
109	110	51
111	112	52
113	114	GND
115	116	GND
117	118	VDDB
119	120	VDDB

CN2 Pin		Micro Pin / Signal
41	42	69
43	44	70
45	46	71
47	48	72
49	50	73
51	52	74
53	54	75
55	56	76
57	58	77
59	60	78
61	62	79
63	64	80
65	66	81
67	68	82
69	70	83
71	72	84
73	74	85
75	76	86
77	78	87
79	80	88
81	82	89
83	84	90
85	86	91
87	88	92
89	90	93
91	92	94
93	94	95
95	96	96
97	98	97
99	100	98
101	102	99
103	104	100
105	106	101
107	108	102
109	110	103
111	112	104
113	114	GND
115	116	GND
117	118	VDDB
119	120	VDDB

CN3 Pin		Micro Pin / Signal
41	42	121
43	44	122
45	46	123
47	48	124
49	50	125
51	52	126
53	54	127
55	56	128
57	58	129
59	60	130
61	62	131
63	64	132
65	66	133
67	68	134
69	70	135
71	72	136
73	74	137
75	76	138
77	78	139
79	80	140
81	82	141
83	84	142
85	86	143
87	88	144
89	90	145
91	92	146
93	94	147
95	96	148
97	98	149
99	100	150
101	102	151
103	104	152
105	106	153
107	108	154
109	110	155
111	112	156
113	114	GND
115	116	GND
117	118	VDDB
119	120	VDDB

CN4 Pin		Micro Pin / Signal
41	42	173
43	44	174
45	46	175
47	48	176
49	50	177
51	52	178
53	54	179
55	56	180
57	58	181
59	60	182
61	62	183
63	64	184
65	66	185
67	68	186
69	70	187
71	72	188
73	74	189
75	76	190
77	78	191
79	80	192
81	82	193
83	84	194
85	86	195
87	88	196
89	90	197
91	92	198
93	94	199
95	96	200
97	98	201
99	100	202
101	102	203
103	104	204
105	106	205
107	108	206
109	110	207
111	112	208
113	114	GND
115	116	GND
117	118	VDDB
119	120	VDDB

Table 1. Piggyback Board Connector Signals

4. Power Supply Area

The power supply area includes multiple connectors for providing a variety of power supply options to the Main Board and Piggyback Boards. On board voltage regulators are available to regulate the board's DC input voltage to the levels required for the integrated circuits. To provide flexible prototyping capabilities, the voltage regulator outputs and IC voltage rails are selectable. Indicator LEDs are provided to easily observe the state of the IC voltage rails.

Caution: See precaution 6.2 for details regarding the voltage rail indicator LEDs.

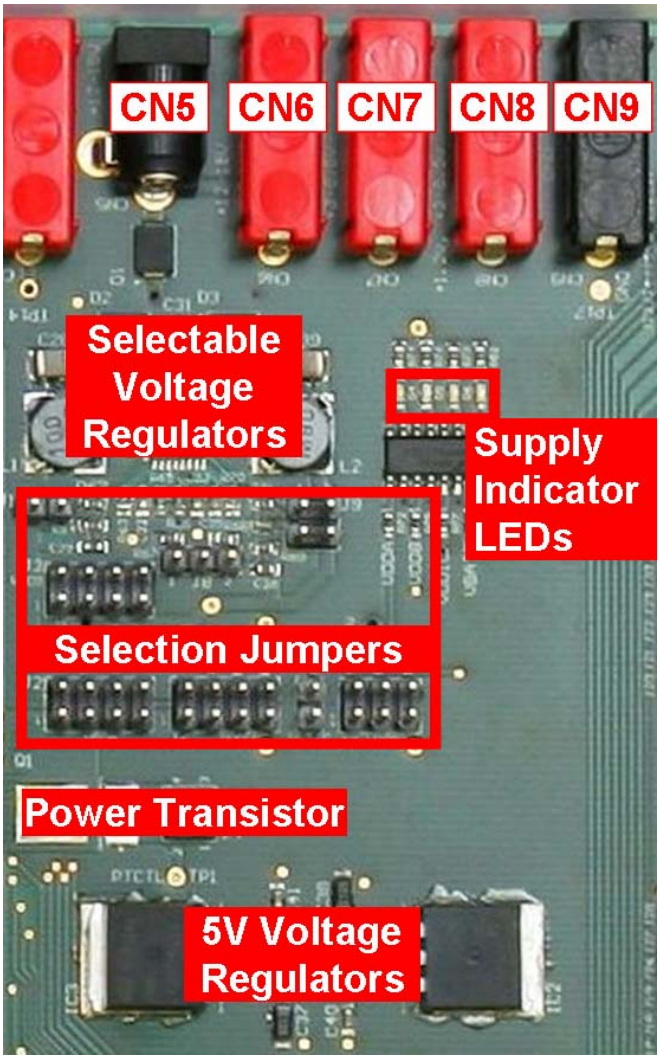


Figure 5. Power Supply Area

4.1 Board Power Supply Connectors

Power is supplied externally to the board using the connectors described in Table 2. If VBAT is supplied using connectors CN5 or CN6, the on-board regulators can be used to regulate the

supply voltages required for the integrated circuits. If desired, connector CN7 and/or connector CN8 can be used to supply the IC voltage rails directly.

In order to achieve LIN or FlexRay bus communication it is necessary to supply VBAT. This supply is used directly by the LIN and FlexRay transceivers, and can be used to generate the 5 volt supply voltage required by the FlexRay transceiver.

In order to achieve CAN bus communication, the 5 volt supply voltage required by the CAN transceiver can either be directly supplied to the board using connectors CN7 or CN8, or it can be generated from VBAT, which is supplied to the board using connectors CN5 or CN6.

Caution: The voltage rails provided by connectors CN7 and CN8 are not regulated and can be directly supplied to the integrated circuits. Damage may occur if a voltage greater than that described in Table 2 is supplied.

Connector	Description	Rail	Input Voltage Range
CN5	DC Power Jack ID=2.1mm, center positive	Ext_VBAT	+9v to +15v
CN6	Red Banana Jack		+9v to +15v
CN7	Red Banana Jack	Ext_VDD1	+3v to +5.5v
CN8	Red Banana Jack	Ext_VDD2	+3v to +5.5v or +1.0v to +1.3v
CN9	Black Banana Jack	GND	0v

Table 2. Power Supply Connectors

4.2 Voltage Regulators

Three on board voltage regulators are provided to regulate the external DC input voltage (Ext_VBAT) to the levels required for the integrated circuits. The voltage level of regulator outputs 1 and 2 are selectable. These regulators can be used to supply the I/O and core voltages to the microcontroller. The output of the third regulator is fixed at 5 volts, and is used to supply the necessary 5 volt rail to the CAN and FlexRay transceivers in the functional areas.

Component	Regulator Output	Jumper	Setting	Output Level
IC1	VReg output 1 (Reg_VDD1)	J1	open	5 volts
			closed	3.3 volts
	VReg output 2 (Reg_VDD2)	J9	open	5 volts
			1 – 2	3.3 volts
			1 – 2 and 3 – 4	1.2 volts
IC2, IC3	VReg 5 volt output (Reg_VDD5V)	–	–	5 volts

Table 3. Voltage Regulators

4.3 IC Voltage Rails

The Main Board provides several options for powering the board's integrated circuits. Jumpers are provided to select from the available voltage sources, or to completely disconnect the rail. Indicator LEDs, D4 to D7, are provided to easily observe the state of the VDDA, VDDB, VDDIOF and VBATF voltage rails.

Caution: See precaution 6.2 for details regarding the voltage rail indicator LEDs.

Caution: Ensure that only one voltage source is selected for each voltage rail.

Voltage Rail	Description	Jumper	Setting	Source
VDDA	supply voltage to microcontroller	J2	1 – 2	VReg output 1
			3 – 4	VReg output 2
			5 – 6	connector CN7
			7 – 8	connector CN8
VDDB	supply voltage to microcontroller	J3	1 – 2	VReg output 1
			3 – 4	VReg output 2
			5 – 6	connector CN7
			7 – 8	transistor Q1
VBATF	battery level supply voltage to ICs	J5	1 – 2	connector CN5 or CN6
VDDIOF	I/O level supply voltage to ICs	J6	1 – 2	VReg output 1
			3 – 4	VReg output 2
			5 – 6	connector CN7
			7 – 8	connector CN8
VDD5F	5 volt supply to ICs	J7	1 – 2	VReg 5 volt output
			3 – 4	connector CN7
			5 – 6	connector CN8

Table 4. Voltage Rail Selections

4.4 External Power Transistor

The M2 version of V850E2/Fx4 microcontrollers is capable of controlling an external power transistor to regulate its core logic voltage. Transistor Q1 is provided for use with M2 version microcontrollers. Jumper J4 can be used to connect the control signal and core logic voltage rail (PT_CVDD). Jumper J3, described in Table 4, is used to connect the core logic rail to the microcontroller.

5. Functional Areas

The functional areas provide various circuits and components useful for interacting with the microcontroller's I/O. All microcontroller I/O signals provided to the functional area circuits are connector via jumpers. This allows for isolation of the microcontroller, as well as the opportunity to substitute signals other than the microcontroller I/O routed on the board. The I/O signals selected to be provided to the functional area circuits are based on the pinout of the V850E2/FL4 208-pin microcontroller. When prototyping with other microcontrollers, the appropriate signals may not be routed to each functional area circuit. In this case, wires can be added between the pin interfaces and the jumper headers to supply the correct signals.

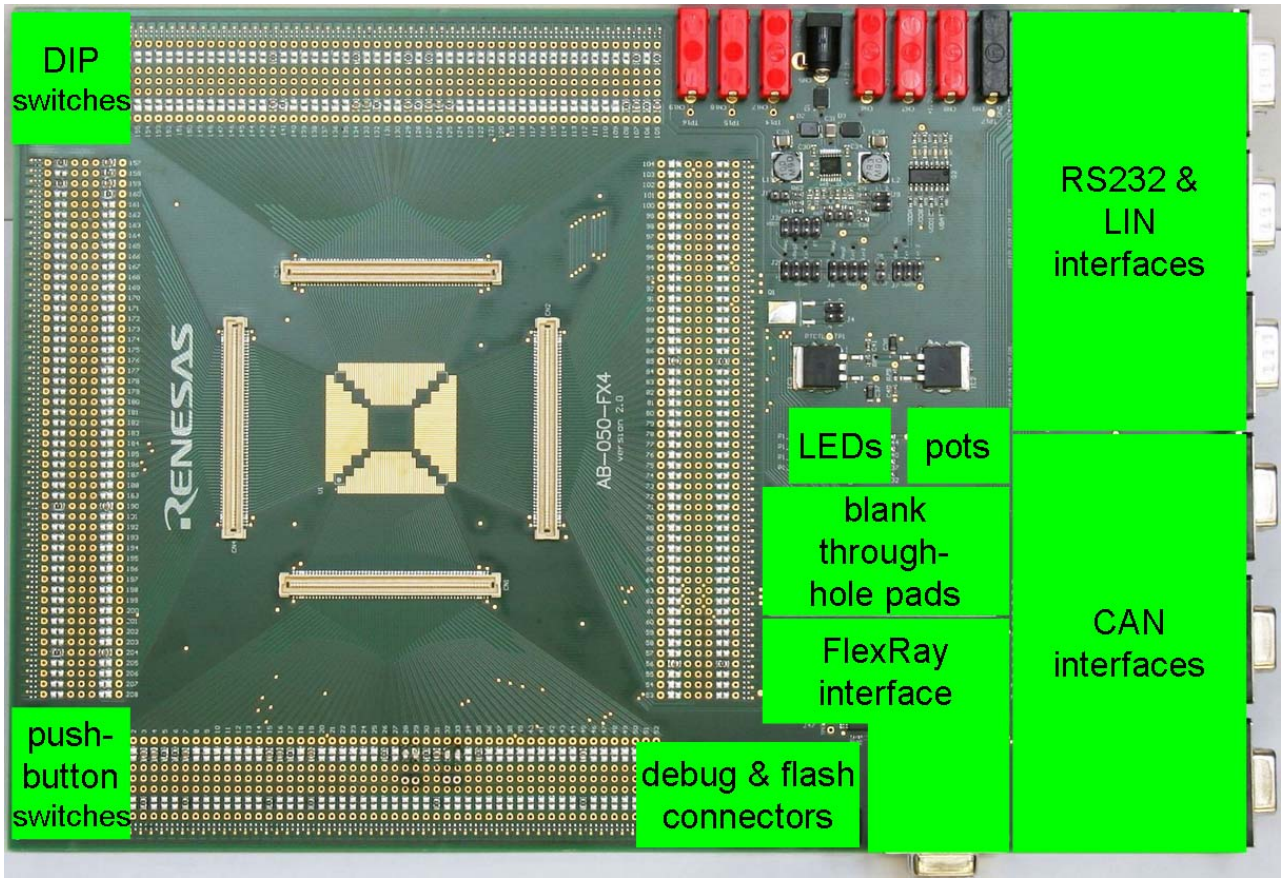


Figure 6. Functional Areas

5.1 LEDs

Four LEDs, D8 to D11, are provided to allow visual observation of microcontroller output port states. The LEDs are connected to the microcontroller via jumper J52. The LED signals are active high.

LED	J52 Setting	Device Port
D8	1 – 2	P1_2
D9	3 – 4	P1_3
D10	5 – 6	P1_4
D11	7 – 8	P1_5

Table 5. LED Signals

Caution: See precaution 6.2 for details of the usage restriction regarding this feature.

5.2 DIP Switches

A four signal DIP switch, S1, is provided to allow the setting of microcontroller input port states. The switches are connected to the microcontroller via jumper J53. The switch signals are active high.

Switch	J53 Setting	Device Port
S1 – 1	1 – 2	P4_5
S1 – 2	3 – 4	P4_6
S1 – 3	5 – 6	P4_7
S1 – 4	7 – 8	P4_8

Table 6. DIP Switch Signals

5.3 Pushbutton Switches

Four pushbutton switches, S2 to S5, are provided to allow the switching of microcontroller input port states. The switches are connected to the microcontroller via jumper J55. Switches S2 and S3 are active low. Switches S4 and S5 are active high. Switches S2, S3 and S4 are normally open switches. Switch S5 is normally closed.

Switch	J55 Setting	Device signal	Active Level	Inactive State
S2	1 – 2	RESET	low	open
S3	3 – 4	INTP0	low	open
S4	5 – 6	NMI	high	open
S5	7 – 8	VCMP0IN	high	closed

Table 7. Pushbutton Switch Signals

5.4 Analog Input Potentiometers

Potentiometers R149 and R150 are provided to generate analog voltages to the microcontroller's analog inputs. The potentiometers are connected to the microcontroller via jumper J54. By adjusting the potentiometer screws, a voltage between GND and VDDIOF can be created.

Potentiometer	J54 Setting	Analog Input
R149	1 – 2	ADCA0I0
R150	3 – 4	ADCA0I1

Table 8. Analog Input Signals

5.5 Serial Communications Interfaces

RS232 transceivers, IC10 to IC12, are supplied to provide up to 6 serial interfaces. Each transceiver can be selectively connected to one of the microcontroller's UART interfaces (URTE) via jumpers J17 to J34. The serial interfaces are connected to the DB9 connectors CN13 to CN15 via jumpers J41 to J46.

Caution: The microcontroller's UART interfaces and the DB9 connectors are shared between the board's RS232 and LIN interfaces. Ensure that each interface is configured for the operation of only one, RS232 or LIN, using jumpers J17 to J47.

Transceiver	UART instance	Jumper Settings	Device signal
IC10	URTE0	J17 1 – 2	URTE0TX
		J18 1 – 2, J19 open	URTE0RX
	URTE2	J17 2 – 3	URTE2TX
		J18 2 – 3, J19 open	URTE2RX
	URTE1	J26 1 – 2	URTE1TX
		J27 1 – 2, J28 open	URTE1RX
	URTE3	J26 2 – 3	URTE3TX
		J27 2 – 3, J28 open	URTE3RX
IC11	URTE4	J20 1 – 2	URTE4TX
		J21 1 – 2, J22 open	URTE4RX
	URTE6	J20 2 – 3	URTE6TX
		J21 2 – 3, J22 open	URTE6RX
	URTE5	J29 1 – 2	URTE5TX
		J30 1 – 2, J31 open	URTE5RX
	URTE7	J29 2 – 3	URTE7TX
		J30 2 – 3, J31 open	URTE7RX
IC12	URTE8	J23 1 – 2	URTE8TX
		J24 1 – 2, J25 open	URTE8RX
	URTE10	J23 2 – 3	URTE10TX
		J24 2 – 3, J25 open	URTE10RX
	URTE9	J32 1 – 2	URTE9TX
		J33 1 – 2, J34 open	URTE9RX
	URTE11	J32 2 – 3	URTE11TX
		J33 2 – 3, J34 open	URTE11RX

Table 9. Serial Communications Interfaces Signals

Connector	UART instance	Jumper Settings		Signal
CN13B Lower	URTE0/2	J41	1 – 2	RS232 0 TX
			3 – 4	RS232 0 RX
			5 – 6	GND
			all others open	–
CN13A Upper	URTE1/3	J42	1 – 2	RS232 1 TX
			3 – 4	RS232 1 RX
			5 – 6	GND
			all others open	–
CN14B Lower	URTE4/6	J43	1 – 2	RS232 2 TX
			3 – 4	RS232 2 RX
			5 – 6	GND
			all others open	–
CN14A Upper	URTE5/7	J44	1 – 2	RS232 3 TX
			3 – 4	RS232 3 RX
			5 – 6	GND
			all others open	–
CN15B Lower	URTE8/10	J45	1 – 2	RS232 4 TX
			3 – 4	RS232 4 RX
			5 – 6	GND
			all others open	–
CN15A Upper	URTE9/11	J46	1 – 2	RS232 5 TX
			3 – 4	RS232 5 RX
			5 – 6	GND
			all others open	–

Table 10. Serial Communications Interfaces Connectors

5.6 LIN Interfaces

LIN transceivers, IC13 to IC18, are supplied to provide up to 6 LIN bus interfaces. Each transceiver can be selectively connected to one of the microcontroller's LIN capable UART interfaces (URTE) via jumpers J17 to J34. The LIN bus interfaces are connected to the DB9 connectors CN13 to CN15 via jumpers J41 to J46.

In order to achieve LIN bus communication, it is necessary to supply the transceivers with the VBAT supply voltage in addition to the I/O voltage. See section 4 for board power supply details.

Caution: The microcontroller's UART interfaces and the DB9 connectors are shared between the board's RS232 and LIN interfaces. Ensure that each interface is configured for the operation of only one, RS232 or LIN, using jumpers J17 to J47.

Transceiver	UART instance	Jumper Settings	Device signal
IC13	URTE0	J17 1 – 2	URTE0TX
		J18 open, J19 1 – 2	URTE0RX
	URTE2	see precaution 6.1	URTE2TX
		see precaution 6.1	URTE2RX
IC14	URTE1	J26 1 – 2	URTE1TX
		J27 open, J28 1 – 2	URTE1RX
	URTE3	J26 2 – 3	URTE3TX
		J27 open, J28 2 – 3	URTE3RX
IC15	URTE4	J20 1 – 2	URTE4TX
		J21 open, J22 1 – 2	URTE4RX
	URTE6	J20 2 – 3	URTE6TX
		J21 open, J22 2 – 3	URTE6RX
IC16	URTE5	J29 1 – 2	URTE5TX
		J30 open, J31 1 – 2	URTE5RX
	URTE7	J29 2 – 3	URTE7TX
		J30 open, J31 2 – 3	URTE7RX
IC17	URTE8	J23 1 – 2	URTE8TX
		J24 open, J25 1 – 2	URTE8RX
	URTE10	J23 2 – 3	URTE10TX
		J24 open, J25 2 – 3	URTE10RX
IC18	URTE9	J32 1 – 2	URTE9TX
		J33 open, J34 1 – 2	URTE9RX
	URTE11	J32 2 – 3	URTE11TX
		J33 open, J34 2 – 3	URTE11RX

Table 11. LIN Interfaces Signals

Connector	UART instance	Jumper Settings		Signal
CN13B Lower	URTE0/2	J41	7 – 8	LIN 0
			9 – 10	VBAT
			11 – 12	GND
			all others open	–
CN13A Upper	URTE1/3	J42	7 – 8	LIN 1
			9 – 10	VBAT
			11 – 12	GND
			all others open	–
CN14B Lower	URTE4/6	J43	7 – 8	LIN 2
			9 – 10	VBAT
			11 – 12	GND
			all others open	–
CN14A Upper	URTE5/7	J44	7 – 8	LIN 3
			9 – 10	VBAT
			11 – 12	GND
			all others open	–
CN15B Lower	URTE8/10	J45	7 – 8	LIN 4
			9 – 10	VBAT
			11 – 12	GND
			all others open	–
CN15A Upper	URTE9/11	J46	7 – 8	LIN 5
			9 – 10	VBAT
			11 – 12	GND
			all others open	–

Table 12. LIN Interfaces Connectors

5.7 CAN Interfaces

CAN transceivers, IC4 to IC9, are supplied to provide up to 6 CAN bus interfaces. Each transceiver can be selectively connected to one of the microcontroller's CAN interfaces (FCN, DCN) via jumper J10. The CAN bus interfaces are connected to the DB9 connectors CN10 to CN12. Jumpers J11 to J16 provide additional CAN bus interface configuration options including the ability to selectively interconnect CAN bus interfaces on-board CAN.

In order to achieve CAN bus communication, it is necessary to supply the transceivers with a nominal 5 volt supply voltage in addition to the I/O voltage. An on-board, 5 volt output regulator is provided to generate this voltage. See section 4 for board power supply details.

Transceiver	FCAN instance	J10 Setting	Device signal
IC4 (CAN0)	FCN0	1 – 2	FCN0RX
		3 – 4	FCN0TX
IC5 (CAN1)	FCN1	5 – 6	FCN1RX
		7 – 8	FCN1TX
IC6 (CAN2)	FCN2	9 – 10	FCN2RX
		11 – 12	FCN2TX
IC7 (CAN3)	FCN3	13 – 14	FCN3RX
		15 – 16	FCN3TX
IC8 (CAN4)	FCN4	17 – 18	FCN4RX
		19 – 20	FCN4TX
IC9 (CAN5)	FCN5	21 – 22	FCN5RX
		23 – 24	FCN5TX

Table 13. CAN Interfaces Signals

Connector	FCAN instance	Jumper Settings		Description
CN10B lower	FCN0	J11	1 – 2	enable termination resistor
			3 – 4	connect to on-board CAN bus
			5 – 6	connect to on-board CAN bus
			7 – 8	connect DB9 pin 3 to GND
CN10A upper	FCN1	J12	1 – 2	enable termination resistor
			3 – 4	connect to on-board CAN bus
			5 – 6	connect to on-board CAN bus
			7 – 8	connect DB9 pin 3 to GND
CN11B lower	FCN2	J13	1 – 2	enable termination resistor
			3 – 4	connect to on-board CAN bus
			5 – 6	connect to on-board CAN bus
			7 – 8	connect DB9 pin 3 to GND
CN11A upper	FCN3	J14	1 – 2	enable termination resistor
			3 – 4	connect to on-board CAN bus
			5 – 6	connect to on-board CAN bus
			7 – 8	connect DB9 pin 3 to GND
CN12B lower	FCN4	J15	1 – 2	enable termination resistor
			3 – 4	connect to on-board CAN bus
			5 – 6	connect to on-board CAN bus
			7 – 8	connect DB9 pin 3 to GND
CN10A upper	FCN5	J16	1 – 2	enable termination resistor
			3 – 4	connect to on-board CAN bus
			5 – 6	connect to on-board CAN bus
			7 – 8	connect DB9 pin 3 to GND

Table 14. CAN Bus Interface Jumpers

5.8 FlexRay Interfaces

FlexRay transceivers, IC19 and IC20, provide a single FlexRay bus interface. The transceivers can be selectively connected to the microcontroller's FlexRay interface via jumper J47. The FlexRay bus interface is connected to the DB9 connectors CN16A and CN16B. Jumpers J48 to J51 provide additional FlexRay bus interface configuration options.

In order to achieve FlexRay bus communication, it is necessary to supply the transceivers with the VBAT supply voltage and a nominal 5 volt supply voltage in addition to the I/O voltage. See section 4 for board power supply details.

Transceiver	FlexRay instance	J47 Setting	Device signal
IC19	FLX0	1 – 2	FLX0TXDA
		3 – 4	FLX0RXDA
		5 – 6	FLX0TXENA
IC20		7 – 8	FLX0TXDB
		9 – 10	FLX0RXDB
		11 – 12	FLX0TXENB

Table 15. FlexRay Interfaces Signals

Jumper Settings		Description
J51	1 – 2	enable termination resistor
	3 – 4	enable termination resistor
	5 – 6	connect BP A to CN16A pin 7
	7 – 8	connect BM A to CN16A pin 2
J48	1 – 2	enable termination resistor
	3 – 4	enable termination resistor
J49	1 – 2	connect BP B to CN16A pin 7
	2 – 3	connect BP B to CN16A pin 8
J50	1 – 2	connect BM B to CN16A pin 2
	2 – 3	connect BM B to CN16A pin 4

Table 16. FlexRay Bus Interface Jumpers

5.9 On-chip Debug and Flash Programming Connectors

Connectors CN20 and CN21 are provided to allow the connection of microcontroller debug and flash programming tools. The debug and flash programming signals are connected to the microcontroller via jumper J56. Connector CN20 is a 16 pin, 0.1" pin pitch connector. The pinout of this connector allows the connection of the Renesas PG-FP4 and PG-FP5 flash programmers, or the Renesas MINICUBE2 debugger. Connector CN21 is a 20 pin, 0.1" pin pitch connector. The pinout of this connector allows the connection of the Renesas MINICUBE debugger.

J56 Setting	Device signal
1 – 12	DCUTDI/FLCS0SI/FLUR0RX
3 – 10	DCUTDO/FLCS0SO/FLUR0TX
5 – 8	DCUTCK/FLCS0SCI
7 – 6	DCUTMS
9 – 4	DCUTRST
11 – 2	DCURDY
13 – 14	RESET
15 – 16	FLMD0

Table 17. Debug and Flash Programming Signals

CN20 Pin	Device signal
1	GND
2	RESET
3	DCUTDO/FLCS0SO/FLUR0TX
4	VDDIOF
5	DCUTDI/FLCS0SI/FLUR0RX
6	–
7	DCUTCK/FLCS0SCI
8	DCUTRDY
9	DCUTRST
10	–
11	–
12	DCUTMS
13	–
14	FLMD0
15	–
16	–

CN21 Pin	Device signal
1	GND
2	DCUTCK
3	GND
4	DCUTMS
5	GND
6	DCUTDI
7	GND
8	DCUTRST
9	GND
10	–
11	GND
12	RESET
13	GND
14	FLMD0
15	GND
16	DCUTRDY
17	GND
18	DCUTDO
19	GND
20	VDDIOF

Table 18. Debug and Flash Programming Connectors

6. Precautions

6.1 Limitation of URTE2 for LIN communication

URTE2 cannot be used for LIN communication. The URTE2RX pin is multiplexed with the FLMD1 function, and requires pull-down resistor R60. The RXD pin of the LIN transceiver is an open-drain output, and requires pull-up resistor R107. When URTE2 is connected to LIN0 via jumpers J17 and J19, the resulting receive signal is invalid. As a result, URTE2 cannot be used for LIN communication and pins 2 and 3 of jumper J19 should be left, unconnected.

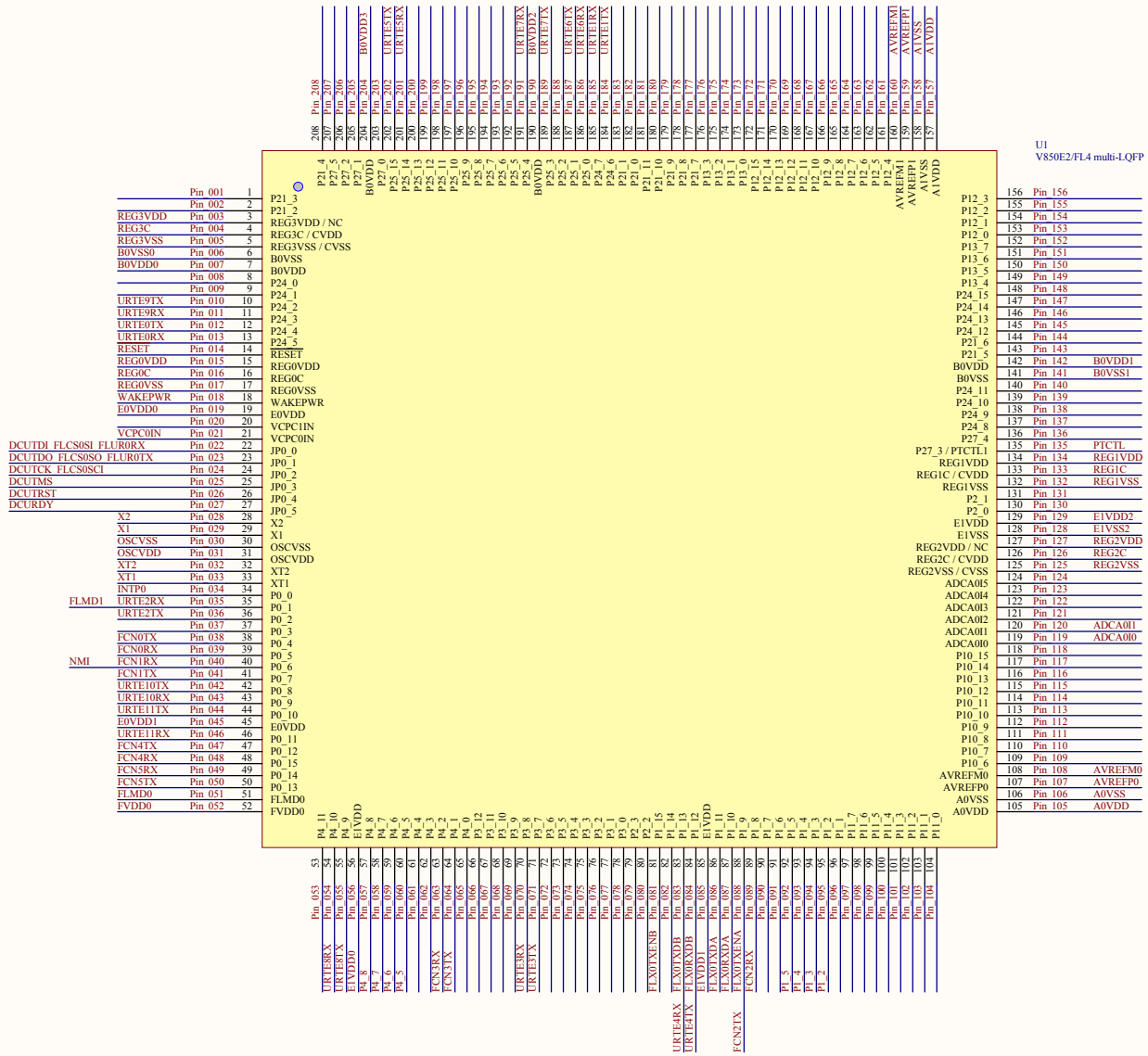
6.2 LEDs will not illuminate

Board Version and Serial Number Applicability

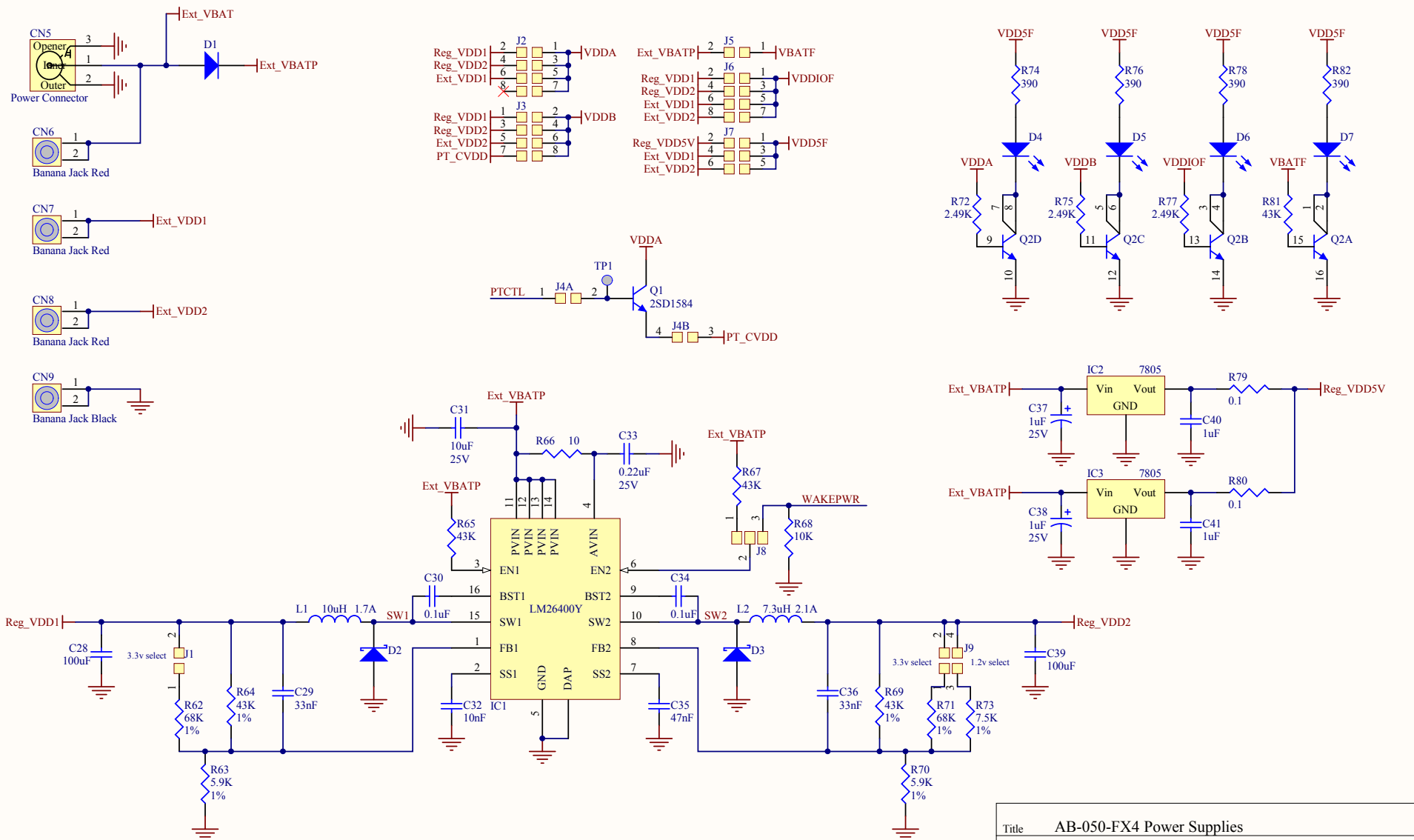
AB-050-Fx4-X-Q-NONE-V2 CA00C0071D - CA00C0100D	other
applicable	not applicable

Components Q2 and Q3 are populated with an incorrect component that prevents LEDs D4, D5, D10 and D11 from illuminating. No damage can occur as a result of an attempt to operate the LEDs. Note that indicator LEDs for power rails VDDA and VDDB (D4 and D5) will not illuminate. There is no workaround for this precaution.

7. Schematic



Title	AB-050-FX4 V850E2/FL4
Company	Renesas Electronics
Number	DADC-DT-00103
Version	v2.0
Date	4/27/2010
Sheet	1 of 8



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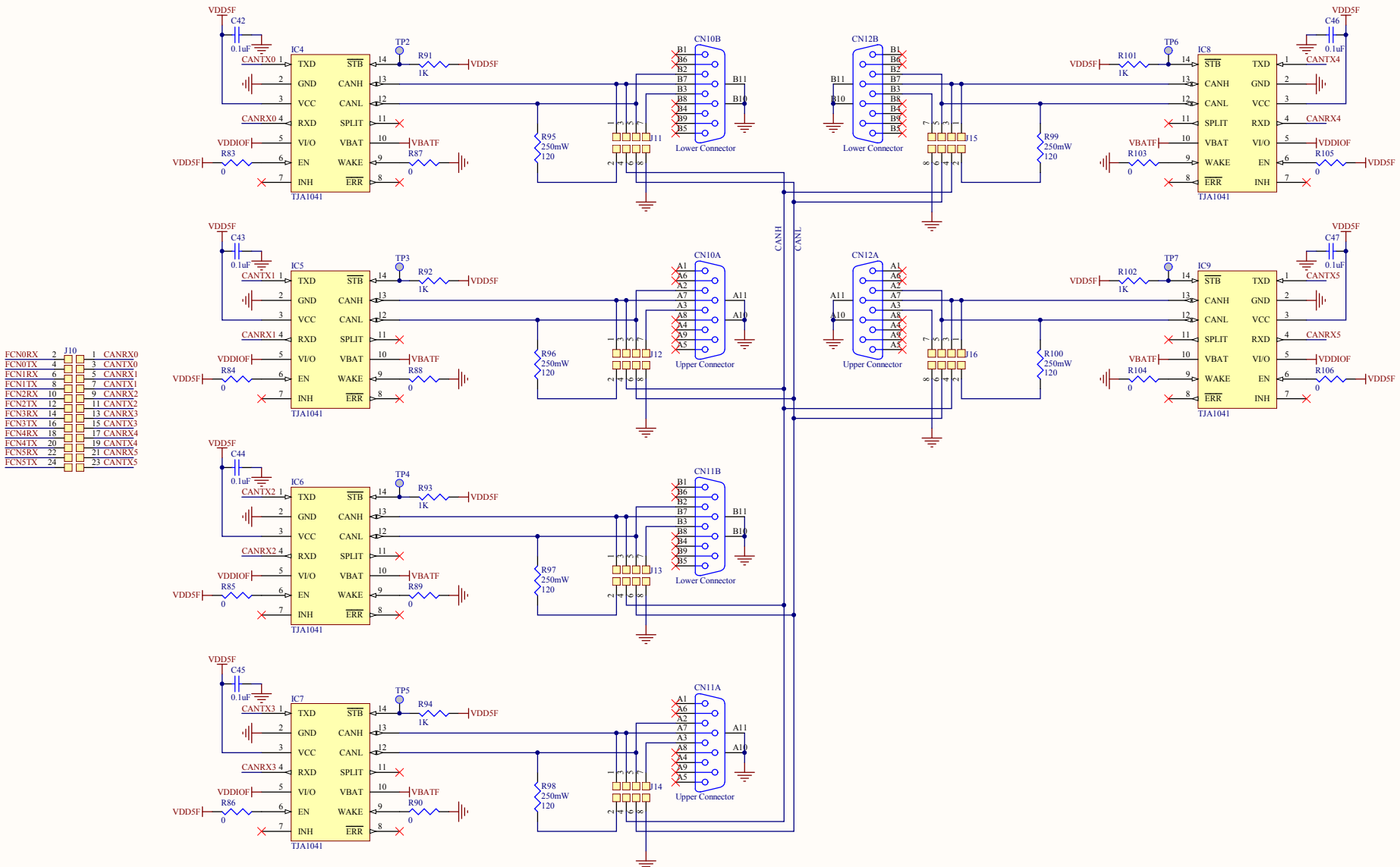
Company	Renesas Electronics		
Number	DADC-DT-00103		
Version	v2.0	Date 4/27/2010	Sheet 2 of 8



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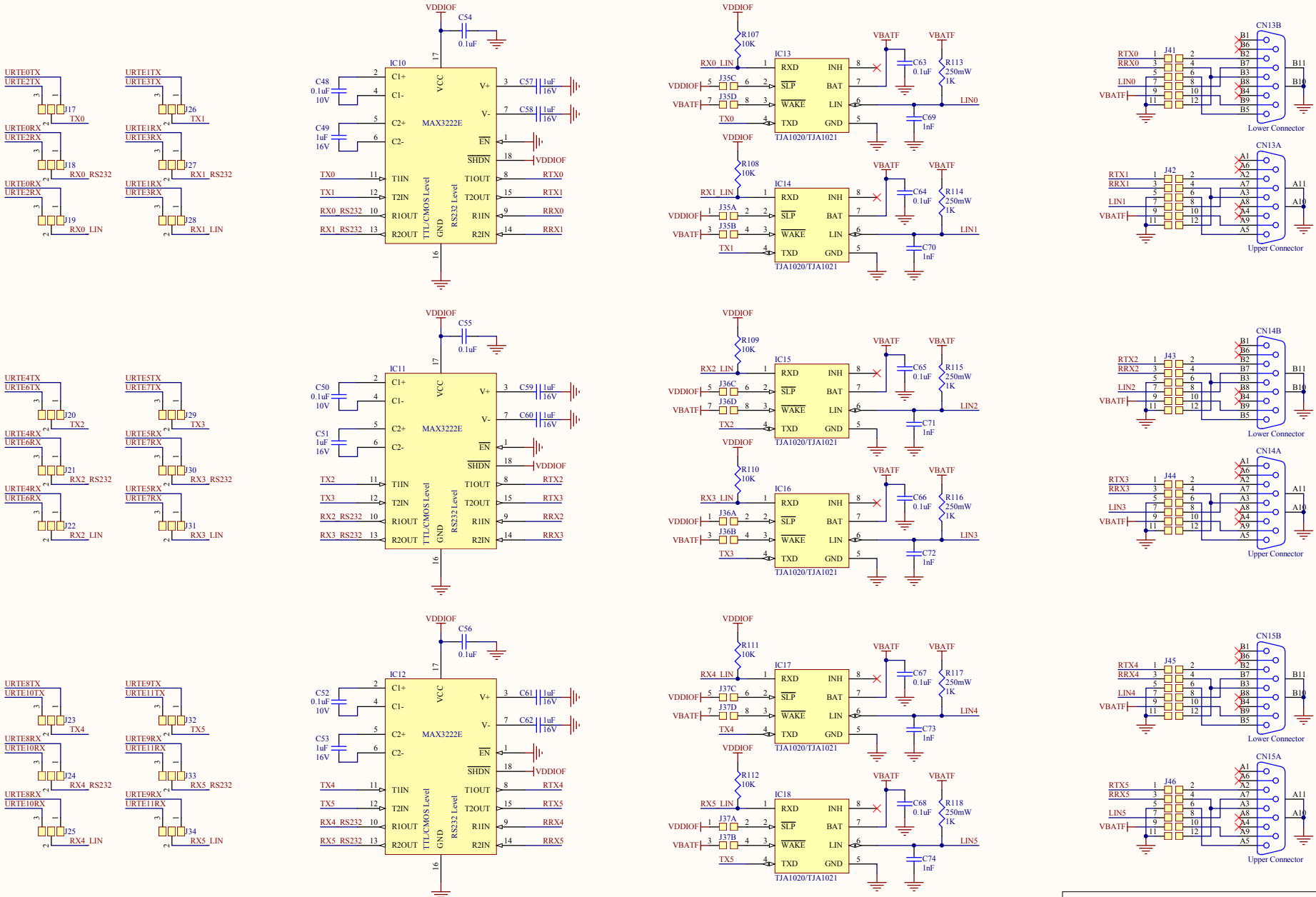
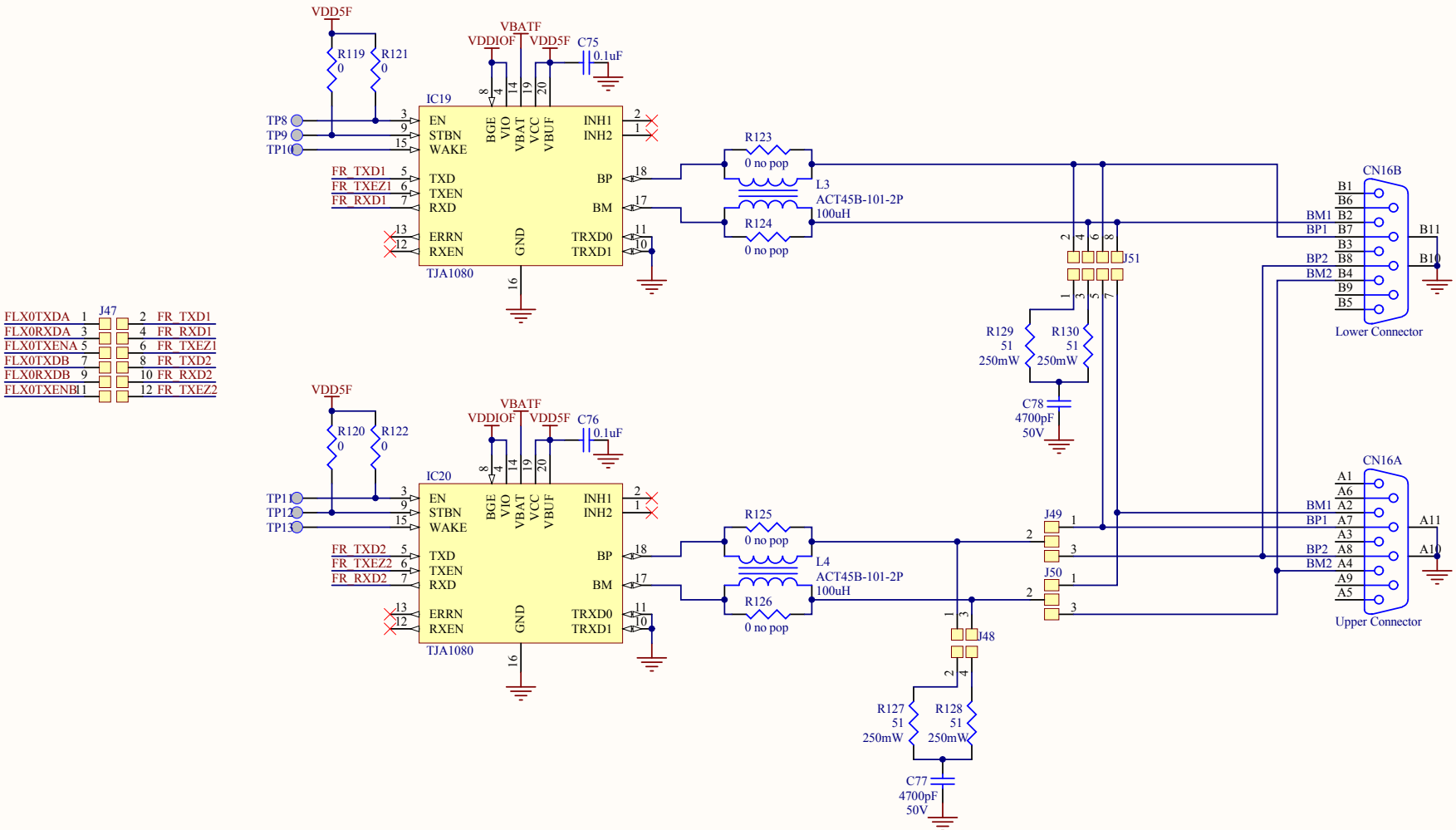
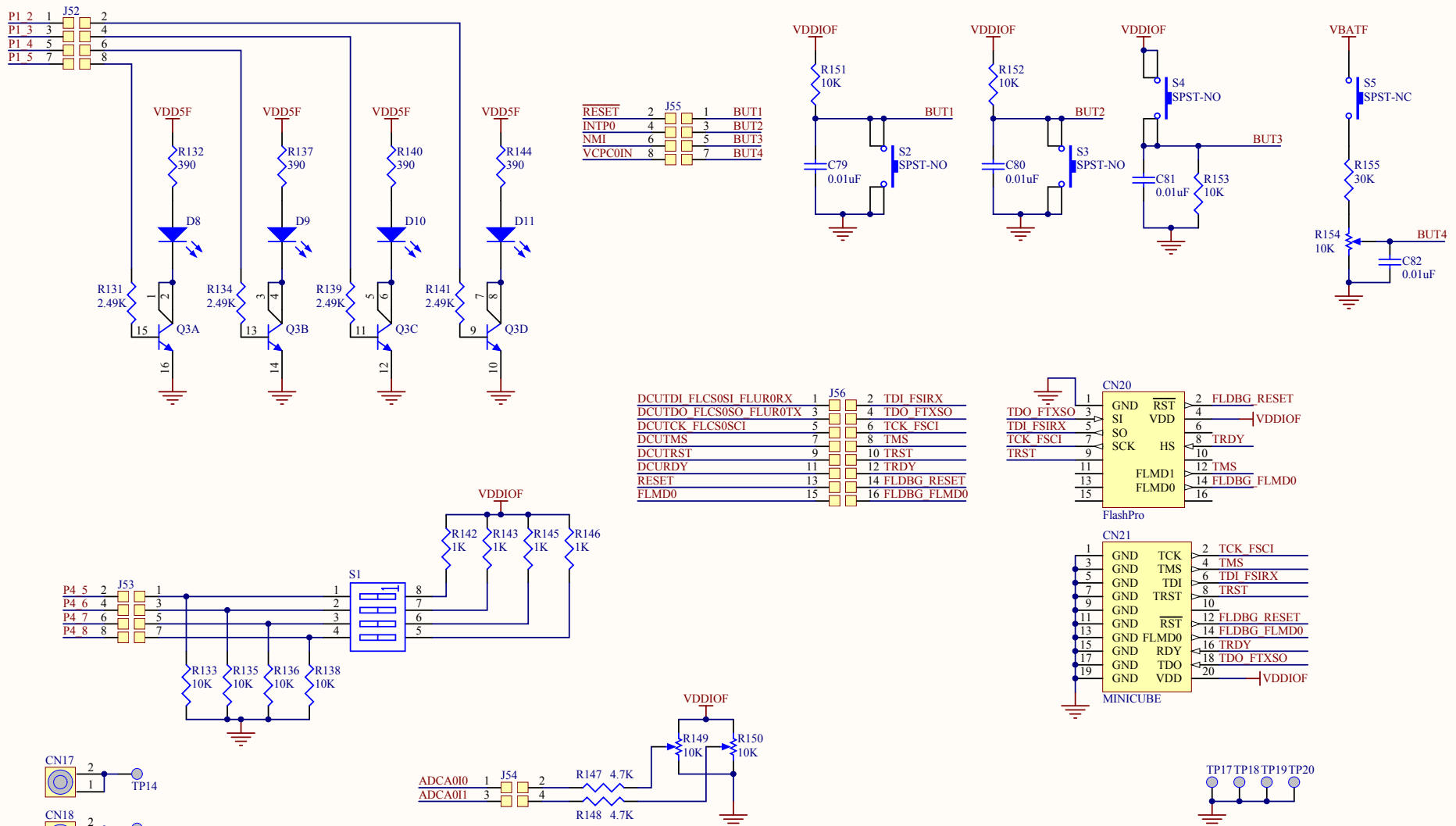
Company	Renesas Electronics
Number	DADC-DT-00103
Version	v2.0
Date	4/27/2010
Sheet	3 of 8


URTE0TX
URTE2TX
J17
TX0
URTE0RX
URTE2RX
J18
RX0_RS232
URTE0RX
URTE2RX
J19
RX0_LIN
URTE1TX
URTE3TX
J26
TX1
URTE1RX
URTE3RX
J27
RX1_RS232
URTE1RX
URTE3RX
J28
RX1_LIN
VDDIOF
C54
0.1uF
IC10
MAX3222E
C48
0.1uF
10V
C49
1uF
16V
C57 1uF 16V
C58 1uF 16V
TX0
TX1
RX0_RS232
RX1_RS232
RTX0
RTX1
RRX0
RRX1
VDDIOF
TTL/CMOS Level
RS232 Level
R107
10K
R108
10K
IC13
IC14
TJA1020/TJA1021
VBATF
C63
0.1uF
C64
0.1uF
R113
250mW
1K
R114
250mW
1K
C69
1nF
C70
1nF
LIN0
LIN1
RX0_LIN
RX1_LIN
TX0
TX1
CN13B
CN13A
Lower Connector
Upper Connector
URTE4TX
URTE6TX
J20
TX2
URTE4RX
URTE6RX
J21
RX2_RS232
URTE4RX
URTE6RX
J22
RX2_LIN
URTE5TX
URTE7TX
J29
TX3
URTE5RX
URTE7RX
J30
RX3_RS232
URTE5RX
URTE7RX
J31
RX3_LIN
C55
0.1uF
IC11
C50
0.1uF
10V
C51
1uF
16V
C59 1uF 16V
C60 1uF 16V
TX2
TX3
RX2_RS232
RX3_RS232
RTX2
RTX3
RRX2
RRX3
R109
10K
R110
10K
IC15
IC16
C65
0.1uF
C66
0.1uF
R115
250mW
1K
R116
250mW
1K
C71
1nF
C72
1nF
LIN2
LIN3
RX2_LIN
RX3_LIN
TX2
TX3
CN14B
CN14A
URTE8TX
URTE10TX
J23
TX4
URTE8RX
URTE10RX
J24
RX4_RS232
URTE8RX
URTE10RX
J25
RX4_LIN
URTE9TX
URTE11TX
J32
TX5
URTE9RX
URTE11RX
J33
RX5_RS232
URTE9RX
URTE11RX
J34
RX5_LIN
C56
0.1uF
IC12
C52
0.1uF
10V
C53
1uF
16V
C61 1uF 16V
C62 1uF 16V
TX4
TX5
RX4_RS232
RX5_RS232
RTX4
RTX5
RRX4
RRX5
R111
10K
R112
10K
IC17
IC18
C67
0.1uF
C68
0.1uF
R117
250mW
1K
R118
250mW
1K
C73
1nF
C74
1nF
LIN4
LIN5
RX4_LIN
RX5_LIN
TX4
TX5
CN15B
CN15A
Title AB-050-Fx4 UART/LIN
Company Renesas Electronics
Number DADC-DT-00103
Version v2.0
Date 4/27/2010
Sheet 4 of 8



Title	AB-050-FX4 FlexRay		
Company	Renesas Electronics		
Number	DADC-DT-00103		
Version	v2.0	Date 4/27/2010	Sheet 5 of 8



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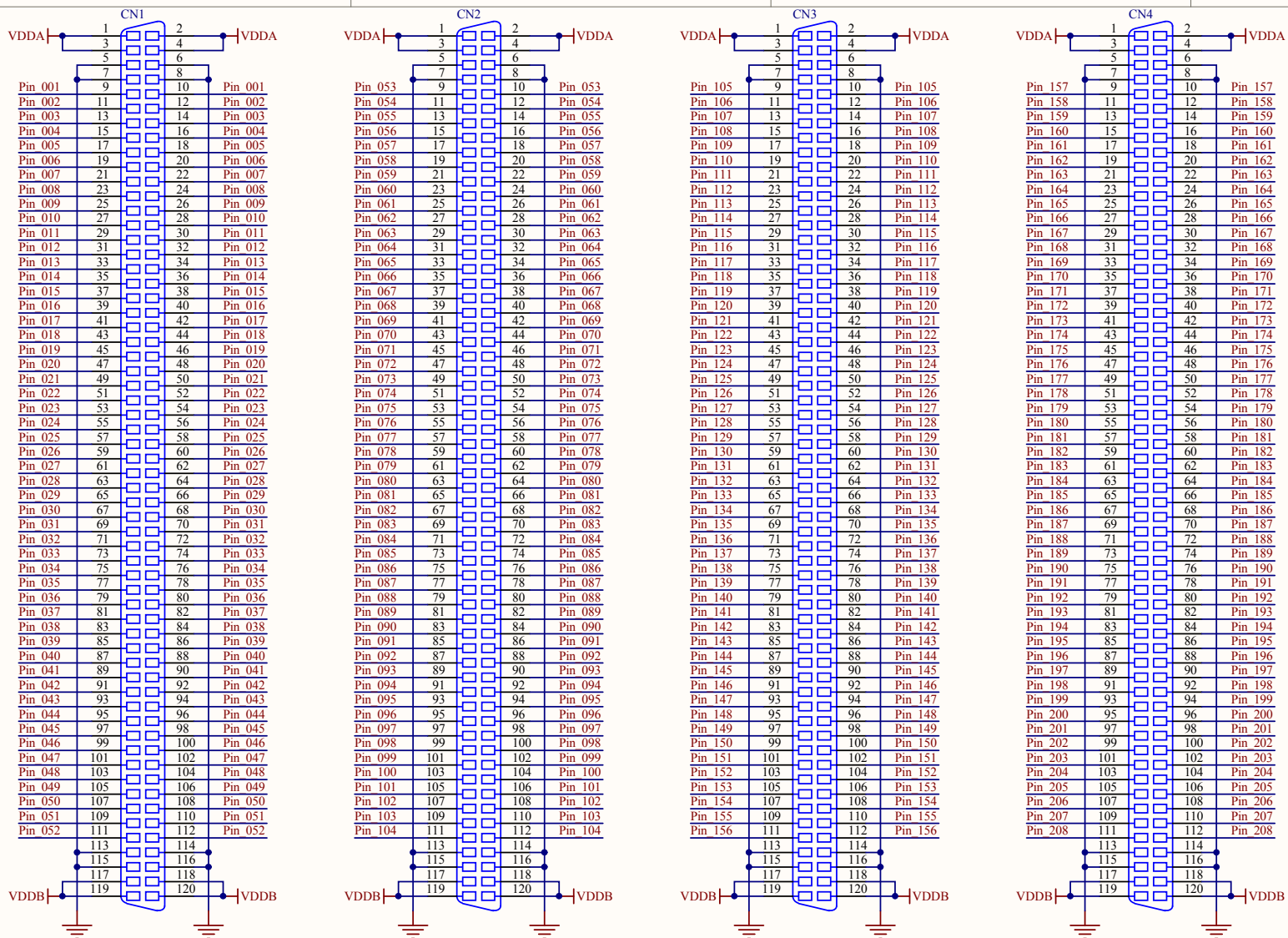
Company	Renesas Electronics		
Number	DADC-DT-00103		
Version	v2.0	Date 4/27/2010	Sheet 6 of 8



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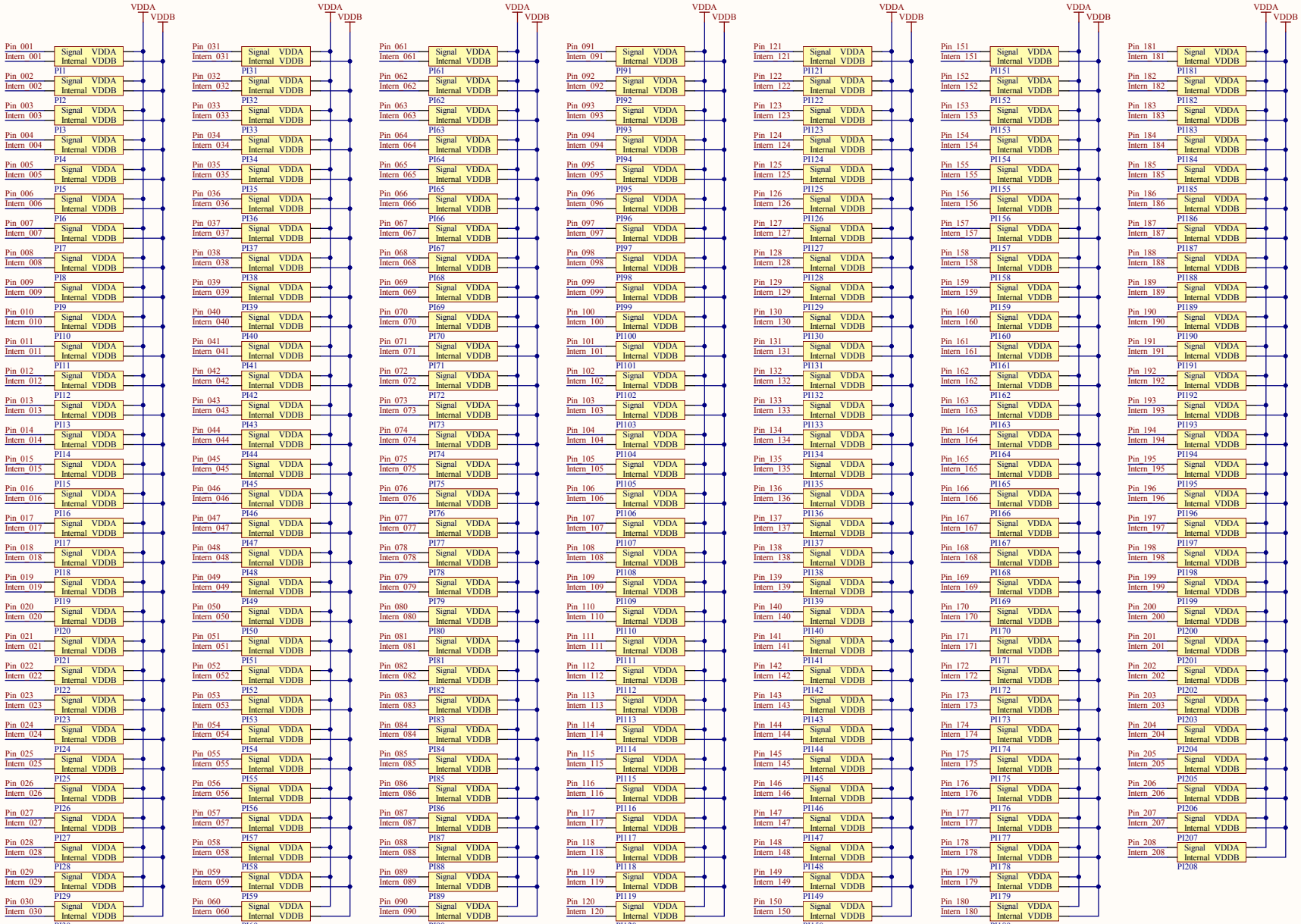
Company	Renesas Electronics		
Number	DADC-DT-00103		
Version	v2.0	Date 4/27/2010	Sheet 7 of 8



Title	AB-050-FX4 Pin Interfaces		
Company	Renesas Electronics		
Number	DADC-DT-00103		
Version	v2.0	Date 4/27/2010	Sheet 8 of 8

REVISION HISTORY	V850E2/Fx4 Application Board User's Manual: Hardware

Rev.	Date	Description	
		Page	Summary
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1.01	Aug 10, 2010	7	Corrected CN4 label in table
		23	Added Precautions Section
1.02	Jan 13, 2010	23	Added precaution 6.2
1.03	May 21, 2012	1, 4, 6	Added board version information

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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130
Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220
Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900
Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327
Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679
Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898
Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044
Renesas Electronics Taiwan Co., Ltd.
7F, No. 363 Fu Shing North Road Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670
Renesas Electronics Singapore Pte. Ltd.
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001
Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510
Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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