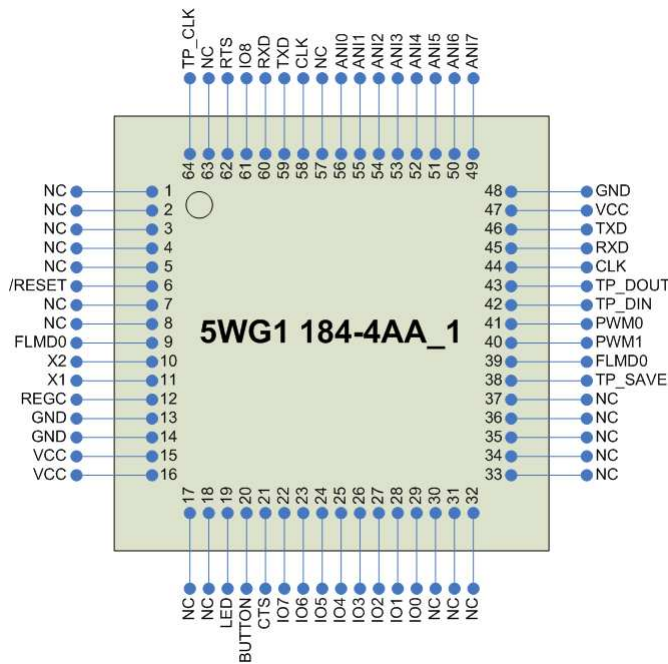TECHNICAL DATA

KNX-Processor
78F0534/2.5, 78F0535/2.5 and 78F0537/2.5

Features

- KNX Bus Processor for use on the application PCB for high volume production.
- Renesas 78K0/Kx2 microcontroller, contains the KNX System 2.5 stack.
- Processor to be connected to TPUART
- PEI (Physical External Interface), 8 A//D converter inputs, one 8-bit I/O port and two PWMs for application available
- User Flash memory
- User RAM
- KNX certified stack
- Lead (Pb)-free device

Description

The Renesas 78K0/Kx2 microcontroller family provides state of the art flash memory technology. This enables the application designer to utilize a modern tool chain including debug tools leading to shorter software development times.

The application interface includes the PEI, Reset, two PWMs, 8 A/D converter ports and one 8-bit processor port. Additional pins to connect the external programming button and LED are available. The KNX-Processor contains the KNX certified System 2.5 stack.
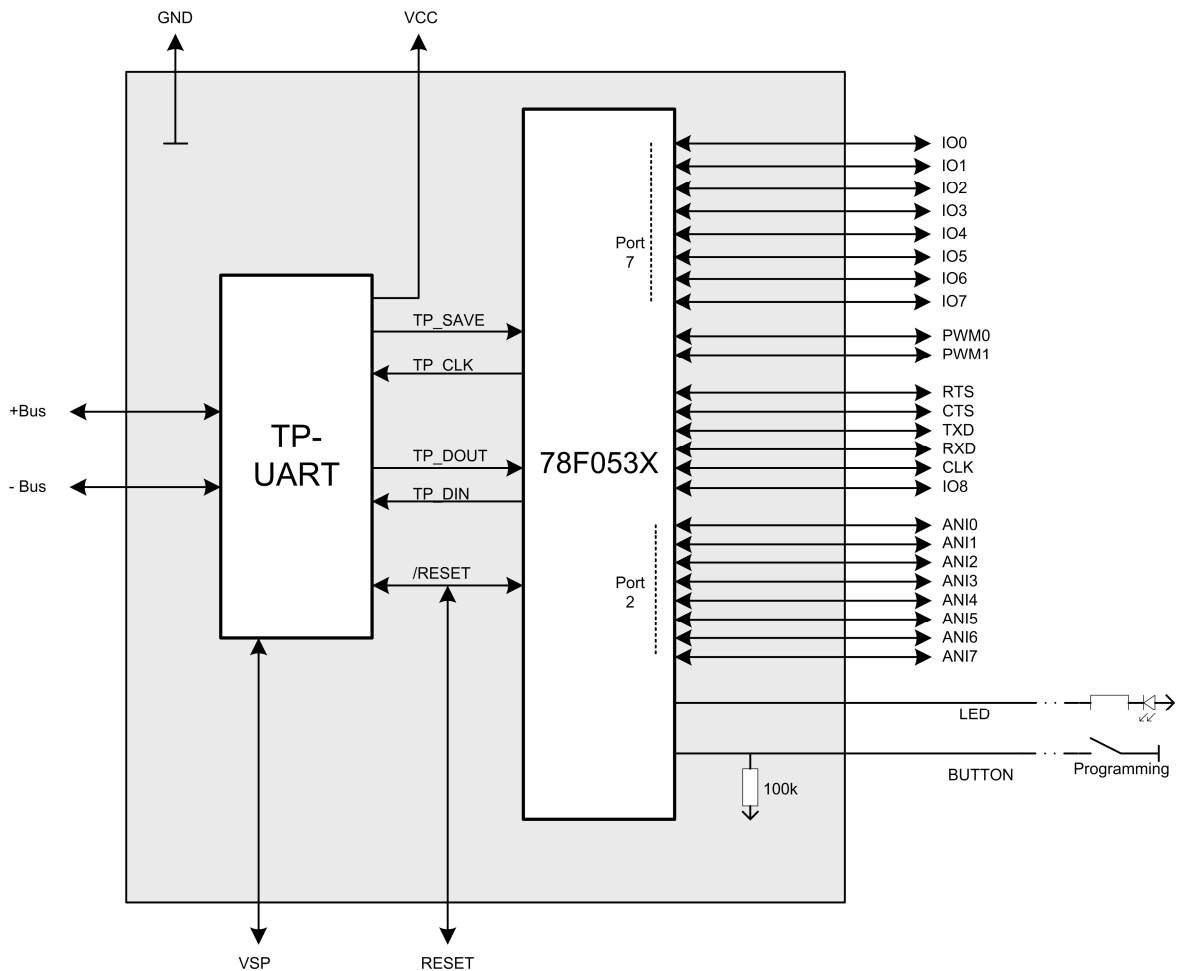
Order Numbers

Device	Order Number	User Flash	User RAM
78F0534/2.5	5WG1 184-8AA01	8 kbytes	200 bytes
78F0535/2.5	5WG1 184-8AA11	16 kbytes	1.2 kbytes
78F0537/2.5	5WG1 184-8AA21	48kbytes	5.2 kbytes

Technical data of the controller

- CPU Renesas 78K0/KE2

- 8-Bit A/D-converter API

- Two 8-Bit pulse length modulator (PLM/PWM)

- Serial asynchronous communication

- Serial synchronous communication in software

- Input capture interrupt available

- Output compare interrupt available

- Application watch dog

- One 8-bit timer

- One 16-bit timer

Interface block diagram

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Example schematic for the use of the chipset
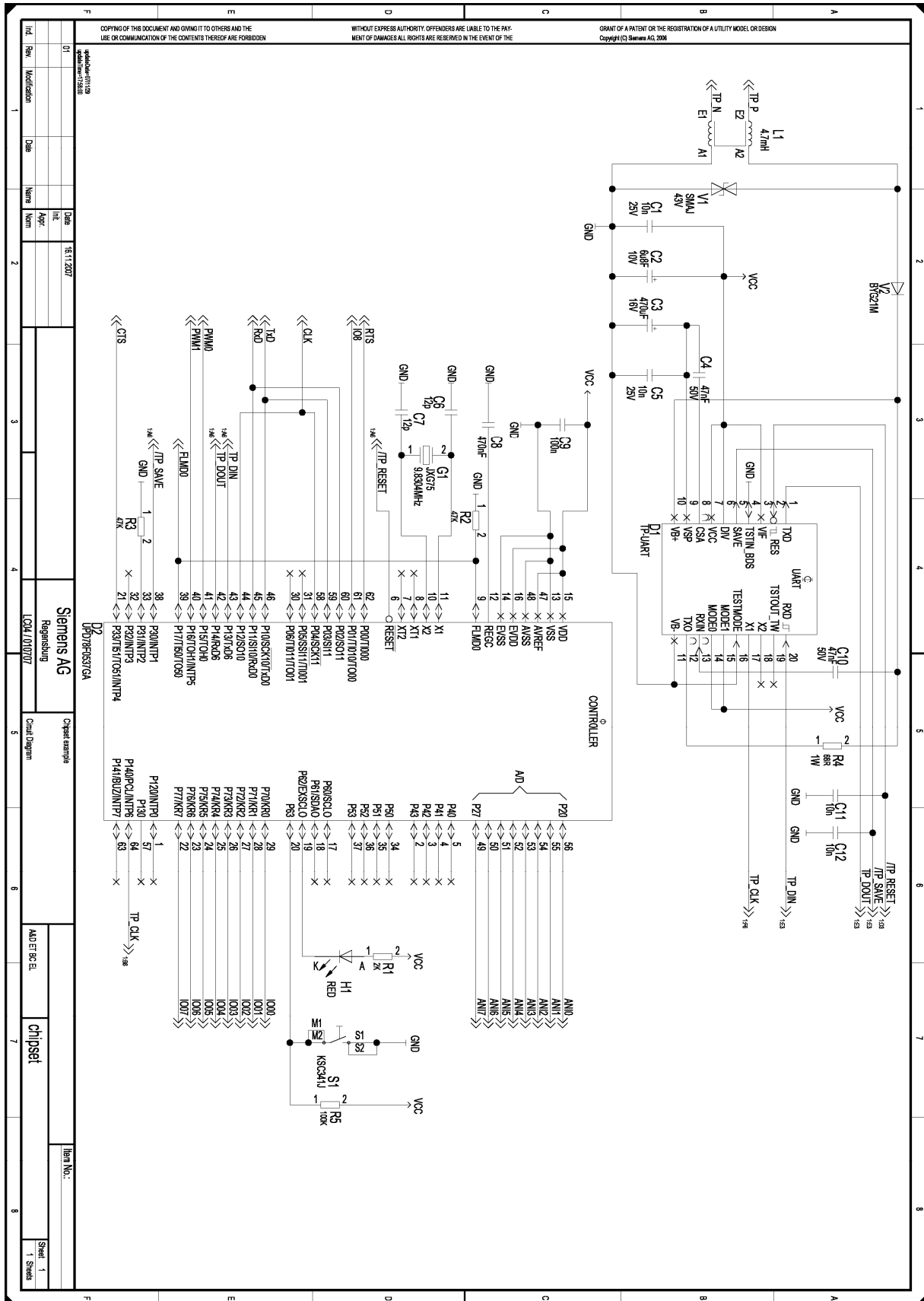
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Partlist

Reference	Component	Type/Value	Remarks
C2	Capacitor	6u8F	6,3V/+-20%, Electrolytic
C3	Capacitor	470uF	16V/+-20%, Electrolytic. Value depends on desired save time
C4,C10	Capacitor	47nF	50V,/+-5%, Ceramic
C6,C7	Capacitor	12p	Ceramic
C8	Capacitor	470nF	Ceramic (see [2])
C1,C5	Capacitor	10nF	50V/+-10%, Ceramic
C1,C12	Capacitor	10nF	Ceramic
C9	Capacitor	100n	Ceramic
D1	IC	TP-UART-IC	
D2	IC	KNX-Processor	
G1	Crystal	9830400Hz	Q 9,8304MHz-JXG75P2-12pF-30/30 or 9,8304MHz-JXG75P2-12-30/50-T1-LF
H1	LED	LST67K	
L1	Choke	B82793 / 4.7mH	
R1	Resistor	2K	
R2,R3	Resistor	47K	
R4	Resistor	68R	+-5%/1W
R5	Resistor	100K	
S1	Push Button	KSC341J	
V1	Supressor Diode	SMAJ43CA	Manufacturer: General Semiconductor
V2	Rectifier Diode	BYG21M	Fast rectifier, Manufacturer: Vishay, Temic

See TP-UART Datasheet [1] for more information on the TP-UART basic schematic.

Microcontroller ports for internal connections

Pin number TQFP	µC pin name	µC pin alternate function	BIM pin number	Functioality	Initialisation	Intitialisation mode	Remark
47	AVREF			VCC	PWR		Reference for ad converter
48	AVSS		C1	GND	PWR		
16	EVDD			VCC	PWR		On BIM: VCCINT is not VCC (D2)
14	EVSS		C1	GND	PWR		
9	FLMD0			FLMD0	FLMD0		
31	P05	SSI11/TI0001		NC	OS	OUT(0)	
30	P06	TI011/TO01		NC	OS	OUT(0)	
43	P13	TxD6		TP_DIN	OS	TXD	Connected to TPUART
42	P14	RxD6		TP_DOUT	OS	RXD	Connected to TPUART
38	P30	INTP1		TP_SAVE	OS	INPUT	Connected to TPUART

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Pin number TQFP	µC pin name	µC pin alternate function	BIM pin number	Functio ality	Initialisation	Inititialisation mode	Remark
33	P31	INTP2		NC	OS	SYSINIT	Connected with resistor to GND
32	P32	INTP3		NC	OS	OUT(0)	P3.2 should not be used (OCD)
5	P40			NC	OS	OUT(0)	
4	P41			NC	OS	OUT(0)	
3	P42			NC	OS	OUT(0)	
2	P43			NC	OS	OUT(0)	
34	P50			NC	OS	OUT(0)	
35	P51			NC	OS	OUT(0)	
36	P52			NC	OS	OUT(0)	
37	P53			NC	OS	OUT(0)	
17	P60	SCL0		NC	OS	OUT(0)	
18	P61	SDA0		NC	OS	OUT(0)	
12	REGC			Regulator	PWR		Connected to 470nF capacitor for regulator
6	RESET		A1	RESET	OS		Connected to TPUART
15	VDD			VCC	PWR		On BIM: VCCINT is not VCC (D2)
13	VSS		C1	GND	PWR		
1	P120	INTP0		NC	OS	OUT(0)	
11	P121	X1		Crystal	OS	XTAL	Connected to crystal with 9803400Hz
10	P122	X2		Crystal	OS	XTAL	Connected to crystal with 9803400Hz
8	P123	XT1		NC	OS	OUT(0)	
7	P124	XT2		NC	OS	OUT(0)	
57	P130			NC	OS	OUT(0)	
64	P140	PCL/INTP6		TP_CLK	OS	OUT(CLK)	Connected to TPUART
63	P141	BUZ/INTP7		NC	OS	OUT(0)	

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Microcontroller ports available for application

Pin number TQFP	µC pin name	µC pin alternate function	BIM pin number	BIM pin function	Initialisation	Intitialisation mode	Remark
62	P00	TI000	D5	RTS	HS	OUT(RTS)	
61	P01	TI010/TO00	B6	IO8			
60	P02	SO11	D4	RXD	FT12/HS/SPI	INPUT	
59	P03	SI11	D3	TXD	FT12/HS/SPI	INPUT	
58	P04	SCK11	C3	CLK	SPI	OUT(CLK)	
46	P10	SCK10/TxD0	D3	TXD	FT12/HS/SPI	OUT(TXD)	
45	P11	SI10/RxD0	D4	RXD	FT12/HS/SPI	INPUT(RXD)	
44	P12	SO10	C3	CLK	SPI	INPUT	ISP programming through SO10
41	P15	TOH0	B1	PWM0	PWM	OUTPUT	
40	P16	TOH1/INTP5	D6	PWM1	PWM	OUTPUT	
39	P17	TI50/TO50		FLMD0	OS	OUTPUT	Connection to FLMD0
56	P20	A0	B1	PWM0	ADC	INPUT	P2.0 to P2.7 should be set to input
55	P21	A1	B6	IO8	ADC	INPUT	P2.0 to P2.7 should be set to input
54	P22	A2	D5	RTS	ADC	INPUT	P2.0 to P2.7 should be set to input
53	P23	A3	C4	CTS	ADC	INPUT	P2.0 to P2.7 should be set to input
52	P24	A4			ADC	INPUT	P2.0 to P2.7 should be set to input
51	P25	A5	D3	TXD	ADC	INPUT	P2.0 to P2.7 should be set to input
50	P26	A6	C3	CLK	ADC	INPUT	P2.0 to P2.7 should be set to input
49	P27	A7	D4	RXD	ADC	INPUT	P2.0 to P2.7 should be set to input
21	P33	TI51/TO5/INTP4	C4	CTS	HS	INPUT	
19	P62	EXSCL0	C6	LED	OS	OUT(1)	Dedicated for system function LED
20	P63		C2	BUTTON	OS	INPUT	Dedicated for system function BUTTON
29	P70	KR0	B5	IO0			
28	P71	KR1	A6	IO1			
27	P72	KR2	B4	IO2			

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Pin number TQFP	µC pin name	µC pin alternate function	BIM pin number	BIM pin function	Initialisation	Intitialisation mode	Remark
26	P73	KR3	A5	IO3			
25	P74	KR4	B3	IO4			
24	P75	KR5	A4	IO5			
23	P76	KR6	B2	IO6			
22	P77	KR7	A3	IO7			

Initialisation abbreviations:

OS: operating system, pin is initialised by the system at system startup.
PWR: power, pins used for supply voltage.
HS: Handshake, pins are initialised at call of handshake API.
FT12: pins are initialised at call of the FT1.2-API.
ADC: pins are initialised at call of the ADC-API.
SPI: pins are initialised at call of the SPI-API.

Software

The microcontroller contains a KNX certified System 2 stack in flash memory.

An application program may be loaded via the bus. The development environment

supports application software to be written in the C programming language. Note that application

code written for 68HC05B6 and 68HC05BE12 cannot be used on this processor.

The available Flash and RAM space for the application program in the different processors are:

5WG1 184-4AA01: 8 kbyte flash and 200 byte application and object ram

5WG1 184-4AA11: 16 kbyte flash and 1.2 kbyte application and object ram

5WG1 184-4AA21: 48 kbyte flash (banked) and 5.2 kbyte application and object ram

Note: The necessary space for code with same functionality as in 68HC05B6 or 68HC05BE12 may

vary because a microcontroller with a new architecture is used and the programming language is C

instead of assembler.

Programming methods of the microcontroller

The microcontroller is shipped with the operation system programmed. There are two ways to transfer

the application to the processor. First you can use the KNX bus to load the application after

manufacturing. Second the application can be programmed through the ISP interface of the processor

during manufacturing.

The PG-FP4 or PG-FP5 device from Renesas Electronics can be used to program the chipset.

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PG-FP4, 16-pin connector		Target hardware	Remark
pin number	function	Signal	
1	VCC	VCC	Used for reference by the PG-FP4 or PG-FP5
3	SCK	TxD (P10/SCK10)	
4	SI	CLK (P12/SO10)	
5	SO	RxD (P11/SI10)	
6	FLMD0	FLMD0	connect through 1k resistor
9	Reset	TPRESET	
10	GND	GND	

Table 1 Connection for the PG-FP4

The Device is usually powered through the TP-UART during the programming phase. Set the PG-FP4 or PG-FP5 to "On Target" and "VDD monitoring". Please check for problems with any application hardware connected to processor pins used during programming.

For more information about in system programming see "User Manual PG-FP4 or PG-FP5" [3].

Devices 78F0534A, 78F0535A and 78F0537A

The newer devices 78F0534A, 78F0535A or 78F0537A are also be used. No recompilation or modifications on existing programs are needed. If programming the chip with PG-FP4 or PG-FP5 it is necessary to change the chip configuration file to enable the communication of the programmer with the microcontroller. See documentation of the flash programmer for further details.

It is not recommended to use the extended features of the A-types to ensure compatibility with none A-types.

Bibliography

[1] TP-UART Datasheet, Siemens, 25.15.10.41.33a
[2] 78K0/Kx2 User´s Manual, Renesas Electronics, (R01UH0008EJ0401)
[3] User Manual PG-FP4, Renesas Electronics, (U15260EE3V1UM00)
    User Manual PG-FP5, Renesas Electronics, (R20UT0008EJ0400)

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