

A. ECAD Design Information

This appendix contains information that supports the development of the PCB ECAD model for this device. It is intended to be used by PCB designers.

A.1 Part Number Indexing

Orderable Part Number	Number of Pins	Package Type	Package Code/POD Number
R5F523E5ADFL#10	48	LFQFP	PLQP0048KB-B
R5F523E5ADFL#30	48	LFQFP	PLQP0048KB-B
R5F523E5ADNF#20	40	HWQFN	PWQN0040KD-A
R5F523E5AGFL#10	48	LFQFP	PLQP0048KB-B
R5F523E5AGFL#30	48	LFQFP	PLQP0048KB-B
R5F523E5AGNF#20	40	HWQFN	PWQN0040KD-A
R5F523E5SDFL#10	48	LFQFP	PLQP0048KB-B
R5F523E5SDFL#30	48	LFQFP	PLQP0048KB-B
R5F523E5SDNF#20	40	HWQFN	PWQN0040KD-A
R5F523E5SGFL#10	48	LFQFP	PLQP0048KB-B
R5F523E5SGFL#30	48	LFQFP	PLQP0048KB-B
R5F523E5SGNF#20	40	HWQFN	PWQN0040KD-A
R5F523E6ADFL#10	48	LFQFP	PLQP0048KB-B
R5F523E6ADFL#30	48	LFQFP	PLQP0048KB-B
R5F523E6ADNF#20	40	HWQFN	PWQN0040KD-A
R5F523E6AGFL#10	48	LFQFP	PLQP0048KB-B
R5F523E6AGFL#30	48	LFQFP	PLQP0048KB-B
R5F523E6AGNF#20	40	HWQFN	PWQN0040KD-A
R5F523E6SDFL#10	48	LFQFP	PLQP0048KB-B
R5F523E6SDFL#30	48	LFQFP	PLQP0048KB-B
R5F523E6SDNF#20	40	HWQFN	PWQN0040KD-A
R5F523E6SGFL#10	48	LFQFP	PLQP0048KB-B
R5F523E6SGFL#30	48	LFQFP	PLQP0048KB-B
R5F523E6SGNF#20	40	HWQFN	PWQN0040KD-A

A.2 Symbol Pin Information

A.2.1 48-LFQFP

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
1	AIN10	I/O	AN004/IEXC0 to IEXC3
2	AIN11	I/O	AN005/IEXC0 to IEXC3
3	AVSS0	Power	-
4	AVCC0	Power	-
5	\RES	Input	-
6	P37	I/O	XTAL
7	VSS	Power	-
8	P36	I/O	EXTAL
9	VCC	Power	-
10	VCL	Power	-
11	MD	I/O	FINED
12	P35	Input	NMI
13	P31	I/O	MTIOC1A/MTIOC4D/TMO3/CTS1#/RTS1#/SS1#/IRQ1
14	P30	I/O	MTIOC0A/MTIOC4B/TMC13/POE8#/RXD1/SMISO1/SSCL1/IRQ0
15	P27	I/O	MTIOC2B/MTIOC4A/TMRI3/SCK1/IRQ3
16	P26	I/O	MTIOC2A/MTIOC4C/TMO0/TXD1/SMOSI1/SSDA1/IRQ2
17	P17	I/O	MTIOC3A/MTIOC3B/TMO1/POE8#/SCK1/MISOA/SDA/IRQ7
18	P16	I/O	MTIOC3C/MTIOC3D/TMO2/TXD1/SMOSI1/SSDA1/MOSIA/SCL/IRQ6/ADTRG0#
19	P15	I/O	MTIOC0B/MTCLKB/TMC12/RXD1/SMISO1/SSCL1/SSLA1/CRXD0/IRQ5

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
20	P14	I/O	MTIOC3A/MTCLKA/TMRI2/CTS1#/RTS1#/SS1#/SSLA3/CTXD0/IRQ4
21	PH3	I/O	MTIC5W/MTCLKB/TMCI0/POE2#/CTS6#/RTS6#/SS6#/RSPCKA
22	PH2	I/O	MTIC5V/MTCLKA/TMRI0/SCK5/MOSIA/IRQ1
23	PH1	I/O	MTIC5U/MTCLKD/TMO0/POE2#/TXD5/SMOSI5/SSDA5/SSLA0/IRQ0/CLKOUT
24	PH0	I/O	MTIOC0D/MTCLKC/TMRI0/CACREF/RXD5/SMISO5/SSCL5/SSLA2
25	PC7	I/O	MTIOC3A/MTCLKB/TMO2/CACREF/TXD6/SMOSI6/SSDA6/MISOA
26	PC6	I/O	MTIOC3C/MTCLKA/TMCI2/RXD6/SMISO6/SSCL6/MOSIA
27	PC5	I/O	MTIOC3B/MTCLKD/TMRI2/SCK5/SCK6/SCK12/RSPCKA
28	PC4	I/O	MTIOC3D/MTCLKC/TMCI1/POE0#/CTS5#/RTS5#/SS5#/CTS12#/RTS12#/SS12#/SSLA0
29	PB1	I/O	MTIOC1B/MTIOC2A/TMRI1/POE1#/TXD12/TXDX12/SIOX12/SMOSI12/SSDA12
30	VCC	Power	-
31	PB0	I/O	MTIOC0C/TMCI0/POE3#/RXD12/RXDX12/SMISO12/SSCL12/IRQ4
32	VSS	Power	-
33	AVCC0	Power	-
34	AVSS0	Power	-
35	REFOUT	Power	-
36	LSW	Output	-
37	REF0N	Input	-
38	REF0P	Input	-
39	AIN0	I/O	IEXC0 to IEXC3
40	AIN1	I/O	IEXC0 to IEXC3
41	AIN2	I/O	IEXC0 to IEXC3
42	AIN3	I/O	IEXC0 to IEXC3
43	AIN4	I/O	IEXC0 to IEXC3/REF1N
44	AIN5	I/O	IEXC0 to IEXC3/REF1P
45	AIN6	I/O	AN000/IEXC0 to IEXC3
46	AIN7	I/O	AN001/IEXC0 to IEXC3
47	AIN8	I/O	VREFL0/AN002/IEXC0 to IEXC3
48	AIN9	I/O	VREFH0/AN003/IEXC0 to IEXC3

A.2.2 40-HWQFN

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
1	AVSS0	Power	-
2	AVCC0	Power	-
3	\RES	Input	-
4	P37	I/O	XTAL
5	VSS	Power	-
6	P36	I/O	EXTAL
7	VCC	Power	-
8	VCL	Power	-
9	MD	I/O	FINED
10	P35	Input	NMI
11	P31	I/O	MTIOC1A/MTIOC4D/TMO3/CTS1#/RTS1#/SS1#/IRQ1
12	P30	I/O	MTIOC0A/MTIOC4B/TMCI3/POE8#/RXD1/SMISO1/SSCL1/IRQ0
13	P27	I/O	MTIOC2B/MTIOC4A/TMRI3/SCK1/IRQ3
14	P26	I/O	MTIOC2A/MTIOC4C/TMO0/TXD1/SMOSI1/SSDA1/IRQ2
15	P17	I/O	MTIOC3A/MTIOC3B/TMO1/POE8#/SCK1/MISOA/SDA/IRQ7
16	P16	I/O	MTIOC3C/MTIOC3D/TMO2/TXD1/SMOSI1/SSDA1/MOSIA/SCL/IRQ6/ADTRG0#
17	P15	I/O	MTIOC0B/MTCLKB/TMCI2/RXD1/SMISO1/SSCL1/SSLA1/CRXD0/IRQ5
18	P14	I/O	MTIOC3A/MTCLKA/TMRI2/CTS1#/RTS1#/SS1#/SSLA3/CTXD0/IRQ4
19	PH1	I/O	MTCLKD/TMO0/POE2#/TXD5/SMOSI5/SSDA5/SSLA0/IRQ0/CLKOUT
20	PH0	I/O	MTIOC0D/MTCLKC/TMRI0/CACREF/RXD5/SMISO5/SSCL5/SSLA2
21	PC5	I/O	MTIOC3B/MTCLKD/TMRI2/SCK5/SCK12/RSPCKA
22	PC4	I/O	MTIOC3D/MTCLKC/TMCI1/POE0#/CTS5#/RTS5#/SS5#/CTS12#/RTS12#/SS12#/SSLA0
23	PB1	I/O	MTIOC1B/MTIOC2A/TMRI1/POE1#/TXD12/TXDX12/SIOX12/SMOSI12/SSDA12
24	VCC	Power	-
25	PB0	I/O	MTIOC0C/TMCI0/POE3#/RXD12/RXDX12/SMISO12/SSCL12/IRQ4

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
26	VSS	Power	-
27	AVCC0	Power	-
28	AVSS0	Power	-
29	REFOUT	Power	-
30	LSW	Output	-
31	REF0N	Input	-
32	REF0P	Input	-
33	AIN0	I/O	IEXC0 to IEXC3
34	AIN1	I/O	IEXC0 to IEXC3
35	AIN4	I/O	IEXC0 to IEXC3/REF1N
36	AIN5	I/O	IEXC0 to IEXC3/REF1P
37	AIN6	I/O	AN000/IEXC0 to IEXC3
38	AIN7	I/O	AN001/IEXC0 to IEXC3
39	AIN8	I/O	VREFL0/AN002/IEXC0 to IEXC3
40	AIN9	I/O	VREFH0/AN003/IEXC0 to IEXC3
EPAD41	EPAD	Power	-

A.3 Symbol Parameters

Orderable Part Number	Min Input Voltage	Max Input Voltage	Max Output Frequency	Min Operating Temperature	Max Operating Temperature	RAM Size	Memory Size	Interface	Number of ADC Channels	Number of I2C Channels	Number of SPI Channels	Number of UART Channels	Number of Timers/Counters
R5F523E5ADF L#10	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5ADF L#30	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5AD NF#20	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5AGF L#10	1.8 V	5.5 V	32 MHz	-40° C	+105° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5AGF L#30	1.8 V	5.5 V	32 MHz	-40° C	+105° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5AG NF#20	1.8 V	5.5 V	32 MHz	-40° C	+105° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5SDF L#10	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5SDF L#30	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5SD NF#20	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5SGF L#10	1.8 V	5.5 V	32 MHz	-40° C	+105° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E5SGF L#30	1.8 V	5.5 V	32 MHz	-40° C	+105° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch

Orderable Part Number	Min Input Voltage	Max Input Voltage	Max Output Frequency	Min Operating Temperature	Max Operating Temperature	RAM Size	Memory Size	Interface	Number of ADC Channels	Number of I2C Channels	Number of SPI Channels	Number of UART Channels	Number of Timers/Counters
R5F523E5SG NF#20	1.8 V	5.5 V	32 MHz	-40° C	+105° C	16 KB	128 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6ADF L#10	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6ADF L#30	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6AD NF#20	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6AGF L#10	1.8 V	5.5 V	32 MHz	-40° C	+105° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6AGF L#30	1.8 V	5.5 V	32 MHz	-40° C	+105° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6AG NF#20	1.8 V	5.5 V	32 MHz	-40° C	+105° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6SDF L#10	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6SDF L#30	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6SD NF#20	1.8 V	5.5 V	32 MHz	-40 °C	+85° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6SGF L#10	1.8 V	5.5 V	32 MHz	-40° C	+105° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch
R5F523E6SGF L#30	1.8 V	5.5 V	32 MHz	-40° C	+105° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 6ch	1(4 configurabl e)	1(4 configurabl e)	4 configurabl e	8-bit x 4-ch, 16-bit x 9-ch

Orderable Part Number	Min Input Voltage	Max Input Voltage	Max Output Frequency	Min Operating Temperature	Max Operating Temperature	RAM Size	Memory Size	Interface	Number of ADC Channels	Number of I2C Channels	Number of SPI Channels	Number of UART Channels	Number of Timers/Counters
R5F523E6SG NF#20	1.8 V	5.5 V	32 MHz	-40° C	+105° C	32 KB	256 KB	SCI,SPI,I2C, CAN	12- bit x 4ch	1 (3 configurabl e)	1 (3 configurabl e)	3 configurabl e	8-bit x 4-ch, 16-bit x 9-ch

A.4 Footprint Design Information

A.4.1 40-HWQFN

IPC Footprint Type	Package Code/ POD number	Number of Pins
QFN	PWQN0040KD-A	40

Description	Dimension	Value (mm)	Diagram
Minimum body span (vertical side)	Dmin	6	
Maximum body span (vertical side)	Dmax	6	
Minimum body span (horizontal side)	Emin	6	
Maximum body span (horizontal side)	Emax	6	
Minimum Lead Width	Bmin	0.18	
Maximum Lead Width	Bmax	0.3	
Minimum Lead Length	Lmin	0.3	
Maximum Lead Length	Lmax	0.5	
Maximum Height	Amax	0.8	
Minimum Standoff Height	A1min	0	
Minimum Lead Thickness	cmin	-	
Maximum Lead Thickness	cmax	-	
Number of pins (vertical side)	PinCountD	10	
Number of pins (horizontal side)	PinCountE	10	
Distance between the center of any two adjacent pins (vertical side)	PitchD	0.5	
Distance between the center of any two adjacent pins (horizontal side)	PitchE	0.5	
Location of pin 1; S2 = corner of D side, C1 = center of E side	Pin1	S2	
Minimum thermal pad size (vertical side)	D2min	4.45	
Maximum thermal pad size (vertical side)	D2max	4.55	
Minimum thermal pad size (horizontal side)	E2min	4.45	
Maximum thermal pad size (horizontal side)	E2max	4.55	

Recommended Land Pattern			
Description	Dimension	Value (mm)	Diagram
Distance between left pad toe to right pad toe (horizontal side)	ZE	-	
Distance between top pad toe to bottom pad toe (vertical side)	ZD	-	
Distance between left pad heel to right pad heel (horizontal side)	GE	-	
Distance between top pad heel to bottom pad heel (vertical side)	GD	-	
Pad Width	X	-	
Pad Length	Y	-	