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
R5F113GKCKFB#15	48	LFQFP	PLQP0048KF-A
R5F113GKCKFB#55	48	LFQFP	PLQP0048KF-A
R5F113GKCLFB#15	48	LFQFP	PLQP0048KF-A
R5F113GKCLFB#55	48	LFQFP	PLQP0048KF-A
R5F113GKKNA#G5	48	HVQFN	PVQN0048KG-A
R5F113GKKNA#W5	48	HVQFN	PVQN0048KG-A
R5F113GKLNA#G5	48	HVQFN	PVQN0048KG-A
R5F113GKLNA#W5	48	HVQFN	PVQN0048KG-A
R5F113GLCKFB#15	48	LFQFP	PLQP0048KF-A
R5F113GLCKFB#35	48	LFQFP	PLQP0048KF-A
R5F113GLCKFB#55	48	LFQFP	PLQP0048KF-A
R5F113GLCLFB#15	48	LFQFP	PLQP0048KF-A
R5F113GLCLFB#35	48	LFQFP	PLQP0048KF-A
R5F113GLCLFB#55	48	LFQFP	PLQP0048KF-A
R5F113GLKNA#G5	48	HVQFN	PVQN0048KG-A
R5F113GLKNA#U5	48	HVQFN	PVQN0048KG-A
R5F113GLKNA#W5	48	HVQFN	PVQN0048KG-A
R5F113GLLNA#G5	48	HVQFN	PVQN0048KG-A
R5F113GLLNA#U5	48	HVQFN	PVQN0048KG-A
R5F113GLLNA#W5	48	HVQFN	PVQN0048KG-A

A.2 Symbol Pin Information

A.2.1 48-LFQFP

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
1	P120	I/O	ANI25/TI07/TO07/TRDIOD0/SO01/INTP4
2	P41	I/O	TI10/TO10/TRJIO0/VCOUT0/SNZOUT2
3	P40	I/O	TOOL0
4	\RESET	Input	-
5	XT2	Input	P124/EXCLKS
6	XT1	Input	P123
7	P137	Input	INTP0
8	X2	Input	P122/EXCLK
9	X1	Input	P121
10	REGC	Power	-
11	VSS	Power	-
12	VDD	Power	-
13	P60	I/O	(SCK00#)/(SCL00)/CRXD1/IERXD#
14	P61	I/O	(SI00)/(SDA00)/(RXD0)/CTXD1/IETXD#
15	P62	I/O	(SO00)/(TXD0)/SCLA0
16	P63	I/O	(SSI00#)/SDAA0
17	P00	I/O	(TI05)/(TO05)/INTP9
18	P140	I/O	PCLBUZ0
19	RESOUT	Output	P130
20	P73	I/O	KR3/(CRXD0)/SSI11#/SNZOUT7
21	P72	I/O	ANI28/KR2/(CTXD0)/SO11/SNZOUT6
22	P71	I/O	ANI27/KR1/TI17/TO17/INTP6/SCK11#/SCL11/SNZOUT5
23	P70	I/O	ANI26/KR0/TI15/TO15/INTP8/SI11/SDA11/SNZOUT4
24	P32	I/O	TI16/TO16/INTP7

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
25	P30	I/O	TI01/TO01/TRDIOD1/SSI00#/INTP2/SNZOUT0
26	P17	I/O	TI00/TO00/TRDIOB1/SCK00#/SCL00/INTP3
27	P16	I/O	TI02/TO02/TRDIOC1/SI00/SDA00/RXD0/TOOLRXD
28	P15	I/O	TI05/TO05/TRDIOA1/(TRDIOA0)/(TRDCLK0)/SO00/TXD0/TOOLTXD/RTC1HZ
29	P31	I/O	TI14/TO14/STOPST/(INTP2)
30	P14	I/O	TI06/TO06/TRDIOC0/SCK01#/SCL01/LRXD0
31	P13	I/O	TI04/TO04/TRDIOA0/TRDCLK0/SI01/SDA01/LTXD0
32	P12	I/O	TI11/TO11/(TRDIOD0)/INTP5/SO10/TXD1/SNZOUT3
33	P11	I/O	TI12/TO12/(TRDIOB0)/SI10/SDA10/RXD1/LRXD1/CRXD0
34	P10	I/O	TI13/TO13/TRJO0/SCK10#/SCL10/LTXD1/CTXD0
35	P33	I/O	AVREFP/ANI0
36	P34	I/O	AVREFM/ANI1
37	P80	I/O	ANI2/ANO0
38	P81	I/O	ANI3/IVCMP00
39	P82	I/O	ANI4/IVCMP01
40	P83	I/O	ANI5/(KR0)/IVCMP02
41	P84	I/O	ANI6/(KR1)/IVCMP03
42	P85	I/O	ANI7/(KR2)/IVREF0
43	P86	I/O	ANI8/(KR3)
44	P87	I/O	ANI9/(KR4)
45	P90	I/O	ANI10/(KR5)
46	P91	I/O	ANI11/(KR6)
47	P92	I/O	ANI12/(KR7)
48	P125	I/O	ANI24/TI03/TO03/TRDIOB0/SSI01#/INTP1/SNZOUT1

A.2.2 48-HVQFN

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
1	P120	I/O	ANI25/TI07/TO07/TRDIOD0/SO01/INTP4
2	P41	I/O	TI10/TO10/TRJIO0/VCOUT0/SNZOUT2
3	P40	I/O	TOOL0
4	\RESET	Input	-
5	XT2	Input	P124/EXCLKS
6	XT1	Input	P123
7	P137	Input	INTP0
8	X2	Input	P122/EXCLK
9	X1	Input	P121
10	REGC	Power	-
11	VSS	Power	-
12	VDD	Power	-
13	P60	I/O	(SCK00#)/(SCL00)/CRXD1/IERXD#
14	P61	I/O	(SI00)/(SDA00)/(RXD0)/CTXD1/IETXD#
15	P62	I/O	(SO00)/(TXD0)/SCLA0
16	P63	I/O	(SSI00#)/SDAA0
17	P00	I/O	(TI05)/(TO05)/INTP9
18	P140	I/O	PCLBUZ0
19	RESOUT	Output	P130
20	P73	I/O	KR3/(CRXD0)/SSI11#/SNZOUT7
21	P72	I/O	ANI28/KR2/(CTXD0)/SO11/SNZOUT6
22	P71	I/O	ANI27/KR1/TI17/TO17/INTP6/SCK11#/SCL11/SNZOUT5
23	P70	I/O	ANI26/KR0/TI15/TO15/INTP8/SI11/SDA11/SNZOUT4
24	P32	I/O	TI16/TO16/INTP7
25	P30	I/O	TI01/TO01/TRDIOD1/SSI00#/INTP2/SNZOUT0
26	P17	I/O	TI00/TO00/TRDIOB1/SCK00#/SCL00/INTP3
27	P16	I/O	TI02/TO02/TRDIOC1/SI00/SDA00/RXD0/TOOLRXD
28	P15	I/O	TI05/TO05/TRDIOA1/(TRDIOA0)/(TRDCLK0)/SO00/TXD0/TOOLTXD/RTC1HZ
29	P31	I/O	TI14/TO14/STOPST/(INTP2)
30	P14	I/O	TI06/TO06/TRDIOC0/SCK01#/SCL01/LRXD0
31	P13	I/O	TI04/TO04/TRDIOA0/TRDCLK0/SI01/SDA01/LTXD0
32	P12	I/O	TI11/TO11/(TRDIOD0)/INTP5/SO10/TXD1/SNZOUT3

Pin Number	Primary Pin Name	Primary Electrical Type	Alternate Pin Name(s)
33	P11	I/O	TI12/TO12/(TRDIOB0)/SI10/SDA10/RXD1/LRXD1/CRXD0
34	P10	I/O	TI13/TO13/TRJO0/SCK10#/SCL10/LTXD1/CTXD0
35	P33	I/O	AVREFP/ANI0
36	P34	I/O	AVREFM/ANI1
37	P80	I/O	ANI2/ANO0
38	P81	I/O	ANI3/IVCMP00
39	P82	I/O	ANI4/IVCMP01
40	P83	I/O	ANI5/(KR0)/IVCMP02
41	P84	I/O	ANI6/(KR1)/IVCMP03
42	P85	I/O	ANI7/(KR2)/IVREF0
43	P86	I/O	ANI8/(KR3)
44	P87	I/O	ANI9/(KR4)
45	P90	I/O	ANI10/(KR5)
46	P91	I/O	ANI11/(KR6)
47	P92	I/O	ANI12/(KR7)
48	P125	I/O	ANI24/TI03/TO03/TRDIOB0/SSI01#/INTP1/SNZOUT1
49	EPAD	Power	-

A.3 Symbol Parameters

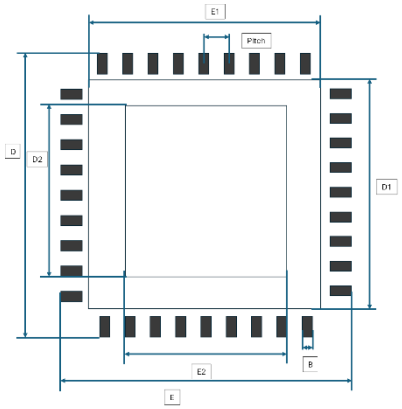
Orderable Part Number	Min Input Voltage	Max Input Voltage	Max Output Frequency	Min Operating Temperature	Max Operating Temperature	RAM Size	Memory Size	Interface	Number of ADC Channels	Number of I2C Channels	Number of SPI Channels	Number of UART Channels	Number of Timers/Counters
R5F113GKCKFB#15	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKCKFB#55	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKCLFB#15	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKCLFB#55	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKKNA#G5	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKKNA#W5	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKLNA#G5	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GKLNA#W5	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLCKFB#15	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLCKFB#35	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLCKFB#55	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch

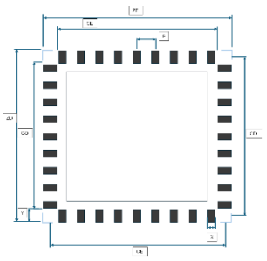
Orderable Part Number	Min Input Voltage	Max Input Voltage	Max Output Frequency	Min Operating Temperature	Max Operating Temperature	RAM Size	Memory Size	Interface	Number of ADC Channels	Number of I2C Channels	Number of SPI Channels	Number of UART Channels	Number of Timers/Counters
R5F113GLCLFB#15	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLCLFB#35	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLCLFB#55	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLKNA#G5	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLKNA#U5	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLKNA#W5	2.7 V	5.5 V	24 MHz	–40 °C	+125 °C	26 KB	384 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLLNA#G5	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLLNA#U5	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch
R5F113GLLNA#W5	2.7 V	5.5 V	32 MHz	–40 °C	+105 °C	32 KB	512 KB	SCI, SPI, I2C, UART, LIN, CAN	10-bit X 15-Ch	5	4	4	16-bit X 19-Ch

A.4 Footprint Design Information

A.4.1 48-LFQFP

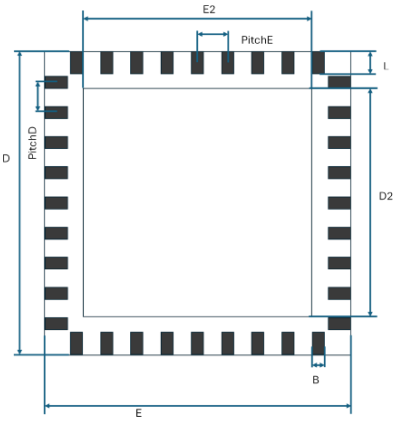
IPC Footprint Type	Package Code/ POD number	Number of Pins
QFP	PLQP0048KF-A	48

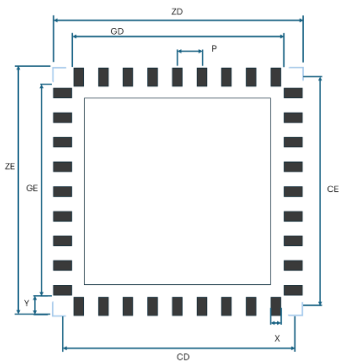
Description	Dimension	Value (mm)	Diagram
Minimum lead span (vertical side)	Dmin	8.8	
Maximum lead span (vertical side)	Dmax	9.2	
Minimum lead span (horizontal side)	Emin	8.8	
Maximum lead span (horizontal side)	Emax	9.2	
Minimum body span (vertical side)	D1min	6.8	
Maximum body span (vertical side)	D1max	7.2	
Minimum body span (horizontal side)	E1min	6.8	
Maximum body span (horizontal side)	E1max	7.2	
Minimum Lead Width	Bmin	0.17	
Maximum Lead Width	Bmax	0.27	
Minimum Lead Length	Lmin	0.45	
Maximum Lead Length	Lmax	0.75	
Maximum Height	Amax	1.6	
Minimum Standoff Height	A1min	0.05	
Minimum Lead Thickness	cmin	-	
Maximum Lead Thickness	cmax	-	
Number of pins (vertical side)	PinCountD	12	
Number of pins (horizontal side)	PinCountE	12	
Distance between the center of any two adjacent pins	Pitch	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	-	
Maximum thermal pad size (vertical side)	D2max	-	
Minimum thermal pad size (horizontal side)	E2min	-	
Maximum thermal pad size (horizontal side)	E2max	-	

Recommended Land Pattern (NSMD Design)			
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	-	

A.4.1 48-HVQFN

IPC Footprint Type	Package Code/ POD number	Number of Pins
QFN	PVQN0048KG-A	48

Description	Dimension	Value (mm)	Diagram
Minimum body span (vertical side)	Dmin	6.95	
Maximum body span (vertical side)	Dmax	7.05	
Minimum body span (horizontal side)	Emin	6.95	
Maximum body span (horizontal side)	Emax	7.05	
Minimum Lead Width	Bmin	0.2	
Maximum Lead Width	Bmax	0.3	
Minimum Lead Length	Lmin	0.3	
Maximum Lead Length	Lmax	0.5	
Maximum Height	Amax	0.9	
Minimum Standoff Height	A1min	0.05	
Minimum Lead Thickness	cmin	0.19	
Maximum Lead Thickness	cmax	0.21	
Number of pins (vertical side)	PinCountD	12	
Number of pins (horizontal side)	PinCountE	12	
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	5.4	
Maximum thermal pad size (vertical side)	D2max	5.4	
Minimum thermal pad size (horizontal side)	E2min	5.4	
Maximum thermal pad size (horizontal side)	E2max	5.4	

Recommended Land Pattern (NSMD Design)			
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	-	