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S1C6F632

CMOS 4-bit Single Chip Microcontroller

- ● High Performance 4-bit Core CPU S1C63000
- ● Flash EEPROM 31K × 13 bits / 4K × 4 bits
- ● Dot Matrix LCD Controller and Driver
- ● R/f Converter to Measure Temperature and Humidity
- ● Low Current Consumption
- ● Low Voltage Operation

Preliminary

■ DESCRIPTIONS

The S1C6F632 is a 4-bit microcontroller that features low-voltage operations and low-current consumption. It consists of a high-performance 4-bit core CPU S1C63000, Flash EEPROM, RAM, SVD circuit, SPI bus interface, sound generator, timers, and other functional modules.

The S1C6F632 is also equipped with a dot matrix LCD controller/driver that is capable of driving up to a 1536-dot LCD panel and an R/f converter that can be used to measure temperature and humidity by connecting sensors such as a thermistor.

The S1C6F632 is most suitable for battery driven applications with an LCD display and/or sensors, such as watches, clocks, LCD games, and thermometers.

∗ This product uses SuperFlash® Technology licensed from Silicon Storage Technology, Inc.

This product is under planning; the specifications may be changed in the release model.
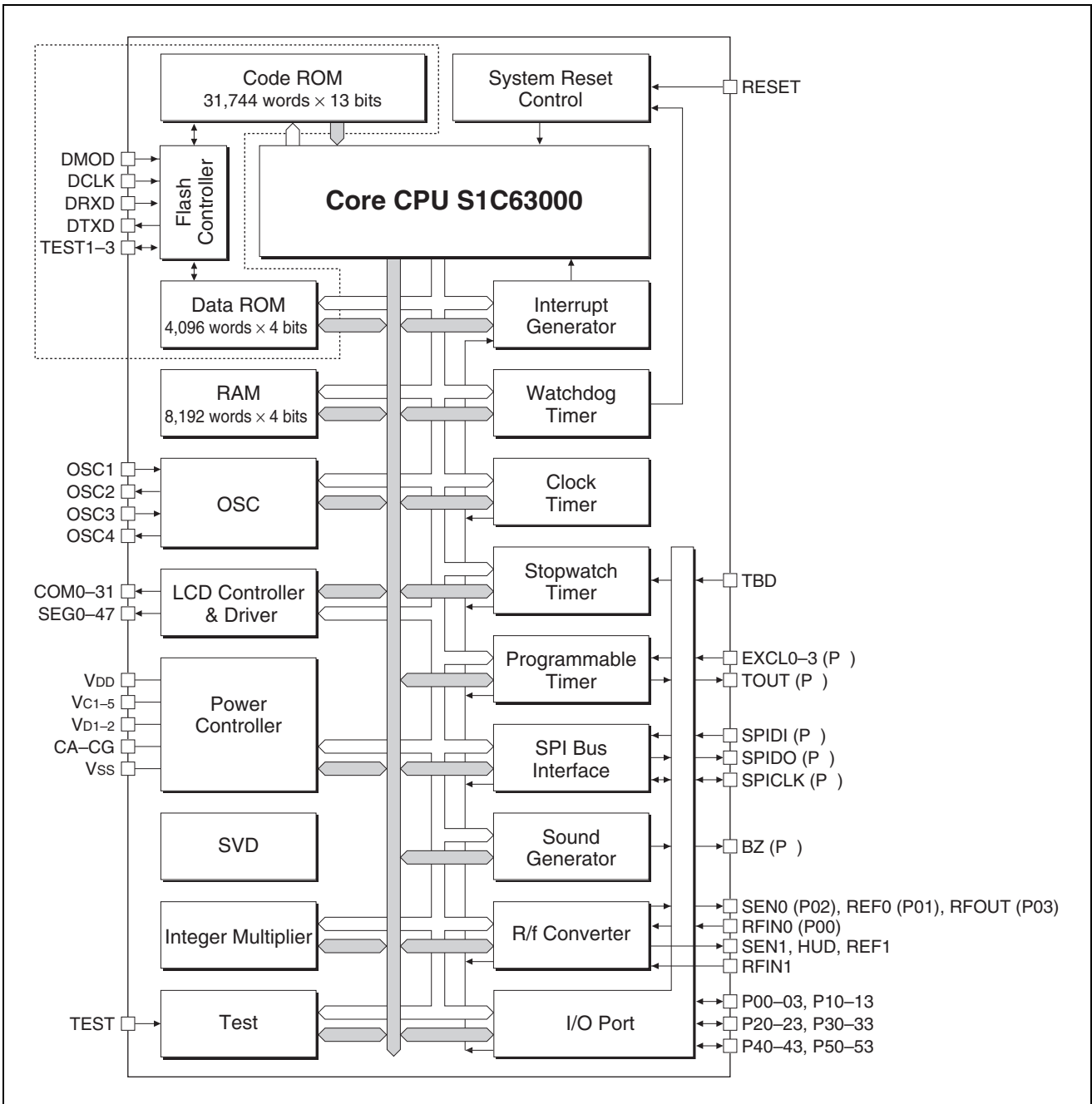
■ FEATURES

- ● Core CPU...4-bit CMOS core CPU S1C63000
- ● OSC1 oscillation circuit ....32.768 kHz (Typ.) crystal oscillation circuit
- ● OSC3 oscillation circuit ....4 MHz (Typ.) ceramic or 1.8 MHz (Typ.) CR oscillation circuit (∗1)
- ● Instruction set ....Basic instruction: 47 types (411 instructions with all)
  Addressing mode: 8 types
- ● Instruction execution time.......................During operation at 32.768 kHz: 61 µsec   122 µsec   183 µsec
  During operation at 4 MHz: 0.5 µsec   1.0 µsec   1.5 µsec
- ● Flash EEPROM capacity.........................Code ROM: 31,744 words × 13 bits
  Data ROM: 4,096 words × 4 bits
- ● RAM capacity...Data memory: 8,192 words × 4 bits
  Display memory: 192 words × 4 bits (TBD)
- ● LCD driver ....48 segments × 32 commons,
  56 segments × 24 commons or
  64 segments × 16 commons (∗2)
- ● I/O port ....24 bits, shared with the peripheral I/O
  Pull-down resistors may be supplemented. (∗1)
- ● SPI bus interface ....1 channel
- ● Time base counter ....Clock timer
  Stopwatch timer
- ● Programmable timer.................................16-bit timer × 4 channels
  Each 16-bit timer can be used as 8-bit timer × 2 channels. (∗2)
- ● Watchdog timer..Built-in
- ● Sound generator ....With envelope and 1-shot output functions
- ● R/f converter..2 channels, CR oscillation type, 20-bit counter
  Supports resistive humidity sensors.
- ● Integer multiplier ....8-bit accumulator × 1 channel
  Multiplication: 8 bits × 8 bits → 16-bit product
  Division: 16 bits ÷ 8 bits → 8-bit quotient and 8-bit remainder
- ● Supply voltage detection (SVD) circuit...10 detection voltage values are configurable. (∗2)

SEIKO EPSON CORPORATION

S1C6F632

- ● External interrupt .... Input interrupt: 2 systems
- ● Internal interrupt....................................... Clock timer interrupt: 7 systems
  - Stopwatch timer interrupt: 3 systems
  - Programmable timer interrupt: 8 systems
  - SPI bus interface interrupt: 1 system
  - R/f converter interrupt: 2 systems
- ● Power supply voltage .... 1.8 to 3.6 V
- ● Operating temperature range.................. -20 to 70°C
- ● Current consumption (Typ.)..................... During HALT: TBD μA
  - During operation: TBD μA
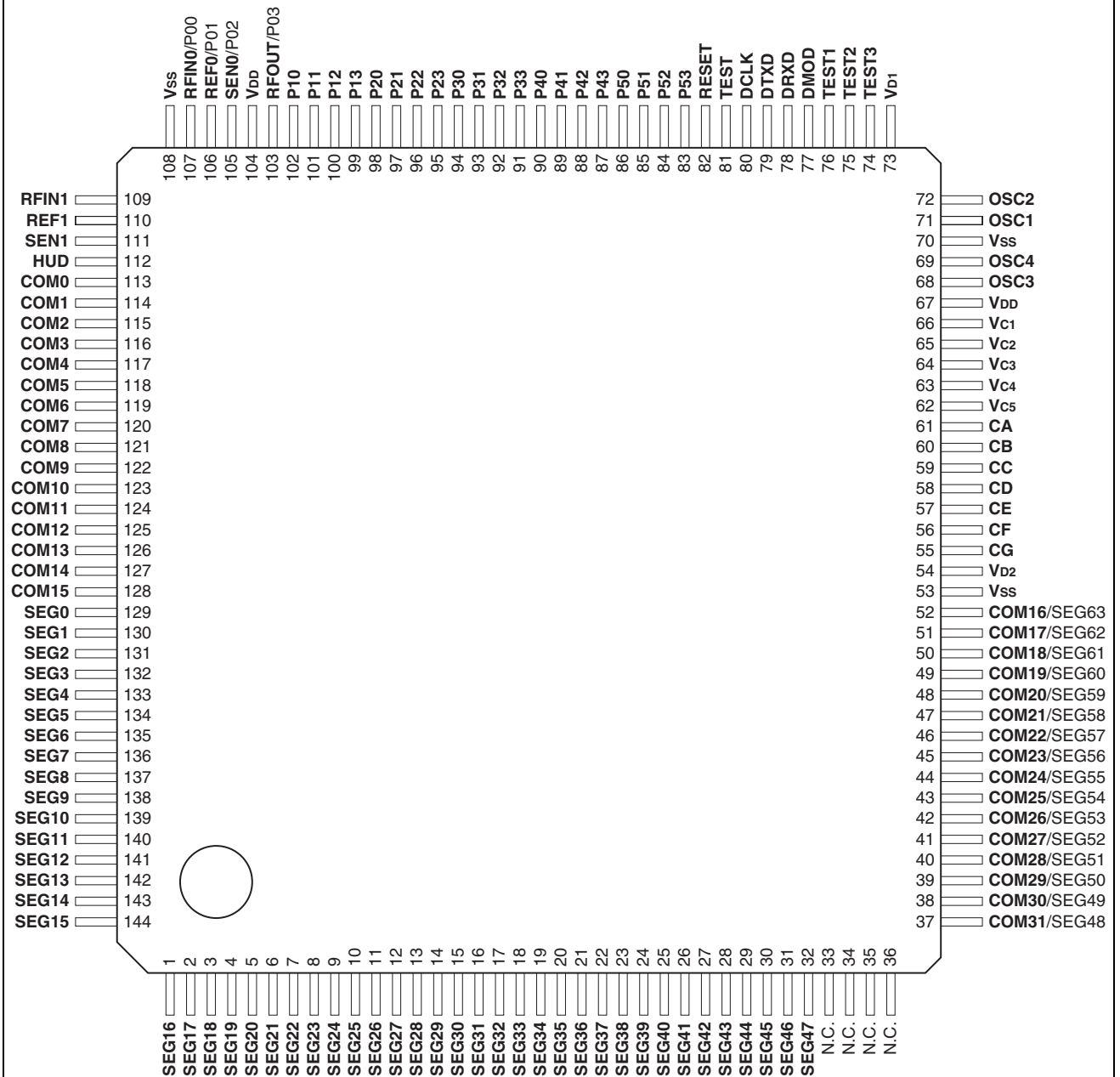- ● Shipping form... QFP20-144pin (plastic), PFBGA (TBD) or chip

∗1: Can be selected with mask option   ∗2: Can be selected with software

■ BLOCK DIAGRAM
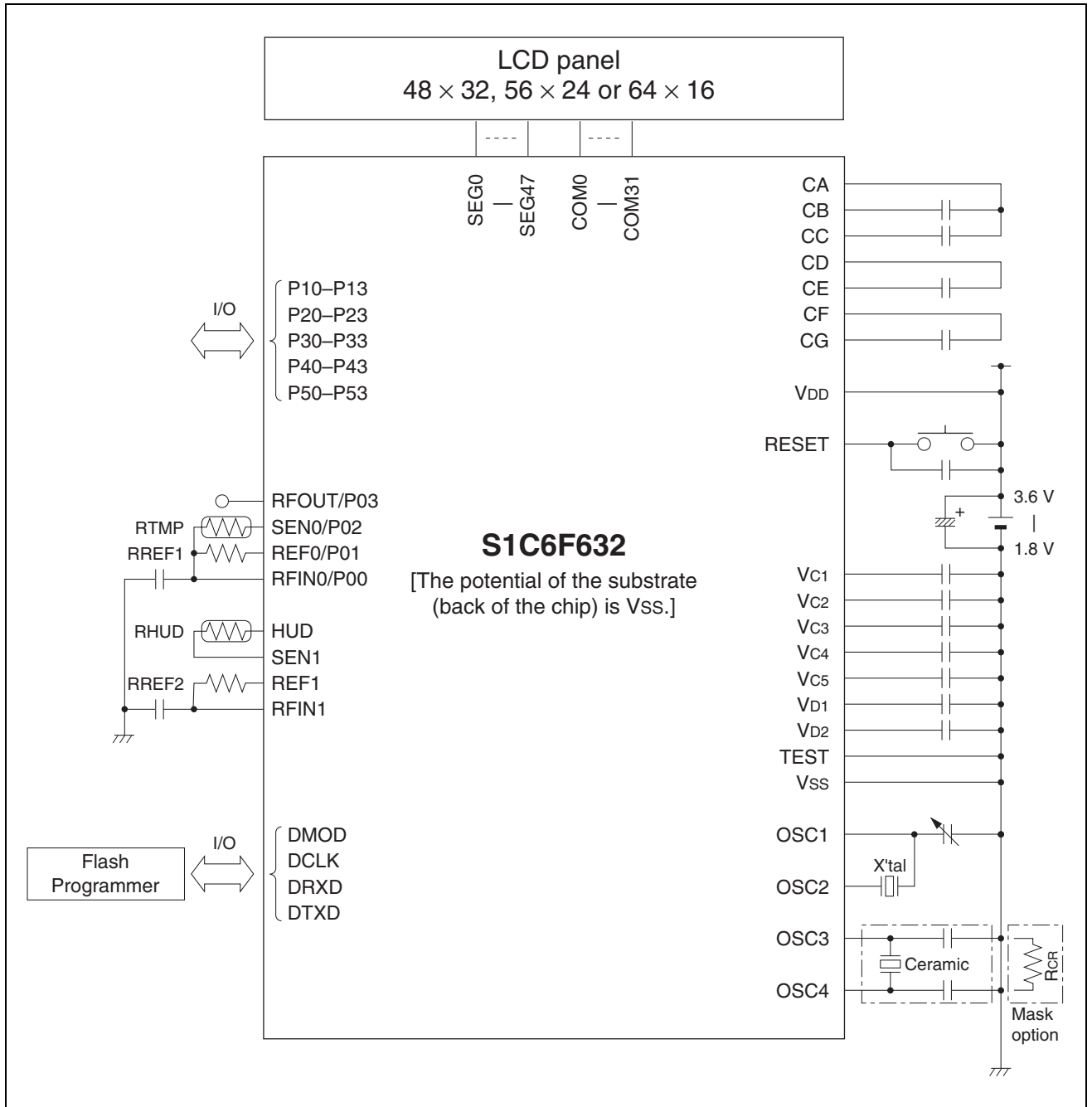
■ PIN LAYOUT DIAGRAM

QFP20-144pin

Left side (top to bottom):
- RFIN1 — 109
- REF1 — 110
- SEN1 — 111
- HUD — 112
- COM0 — 113
- COM1 — 114
- COM2 — 115
- COM3 — 116
- COM4 — 117
- COM5 — 118
- COM6 — 119
- COM7 — 120
- COM8 — 121
- COM9 — 122
- COM10 — 123
- COM11 — 124
- COM12 — 125
- COM13 — 126
- COM14 — 127
- COM15 — 128
- SEG0 — 129
- SEG1 — 130
- SEG2 — 131
- SEG3 — 132
- SEG4 — 133
- SEG5 — 134
- SEG6 — 135
- SEG7 — 136
- SEG8 — 137
- SEG9 — 138
- SEG10 — 139
- SEG11 — 140
- SEG12 — 141
- SEG13 — 142
- SEG14 — 143
- SEG15 — 144

Right side (top to bottom):
- 72 — OSC2
- 71 — OSC1
- 70 — V_{SS}
- 69 — OSC4
- 68 — OSC3
- 67 — V_{DD}
- 66 — V_{C1}
- 65 — V_{C2}
- 64 — V_{C3}
- 63 — V_{C4}
- 62 — V_{C5}
- 61 — CA
- 60 — CB
- 59 — CC
- 58 — CD
- 57 — CE
- 56 — CF
- 55 — CG
- 54 — V_{D2}
- 53 — V_{SS}
- 52 — COM16/SEG63
- 51 — COM17/SEG62
- 50 — COM18/SEG61
- 49 — COM19/SEG60
- 48 — COM20/SEG59
- 47 — COM21/SEG58
- 46 — COM22/SEG57
- 45 — COM23/SEG56
- 44 — COM24/SEG55
- 43 — COM25/SEG54
- 42 — COM26/SEG53
- 41 — COM27/SEG52
- 40 — COM28/SEG51
- 39 — COM29/SEG50
- 38 — COM30/SEG49
- 37 — COM31/SEG48

Top side (pins 108 to 73):
- 108 — V_{SS}
- 107 — RFIN0/P00
- 106 — REF0/P01
- 105 — SEN0/P02
- 104 — V_{DD}
- 103 — RFOUT/P03
- 102 — P10
- 101 — P11
- 100 — P12
- 99 — P13
- 98 — P20
- 97 — P21
- 96 — P22
- 95 — P23
- 94 — P30
- 93 — P31
- 92 — P32
- 91 — P33
- 90 — P40
- 89 — P41
- 88 — P42
- 87 — P43
- 86 — P50
- 85 — P51
- 84 — P52
- 83 — P53
- 82 — RESET
- 81 — TEST
- 80 — DCLK
- 79 — DTXD
- 78 — DRXD
- 77 — DMOD
- 76 — TEST1
- 75 — TEST2
- 74 — TEST3
- 73 — V_{D1}

Bottom side (pins 1 to 36):
- 1 — SEG16
- 2 — SEG17
- 3 — SEG18
- 4 — SEG19
- 5 — SEG20
- 6 — SEG21
- 7 — SEG22
- 8 — SEG23
- 9 — SEG24
- 10 — SEG25
- 11 — SEG26
- 12 — SEG27
- 13 — SEG28
- 14 — SEG29
- 15 — SEG30
- 16 — SEG31
- 17 — SEG32
- 18 — SEG33
- 19 — SEG34
- 20 — SEG35
- 21 — SEG36
- 22 — SEG37
- 23 — SEG38
- 24 — SEG39
- 25 — SEG40
- 26 — SEG41
- 27 — SEG42
- 28 — SEG43
- 29 — SEG44
- 30 — SEG45
- 31 — SEG46
- 32 — SEG47
- 33 — N.C.
- 34 — N.C.
- 35 — N.C.
- 36 — N.C.

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■ PIN DESCRIPTION

Pin name	Pin No.	I/O	Function
V_{DD}	67, 104	–	Power (+) supply pins
V_{SS}	53, 108	–	Power (-) supply pins
V_{D1}	73	–	Internal logic system regulated voltage output pin
V_{D2}	54	–	LCD power voltage booster output pin
V_{C1}–V_{C5}	66–62	–	LCD system power supply pins (1/5 or 1/4 bias generated internally)
CA–CG	61–55	–	LCD system boosting/reducing capacitor connection pins
OSC1	71	I	Crystal oscillation input pin
OSC2	72	O	Crystal oscillation output pin
OSC3	68	I	Ceramic or CR oscillation input pin
OSC4	69	O	Ceramic or CR oscillation output pin
P10–P13	102–99	I/O	I/O port pins
P20–P23	98–95	I/O	I/O port pins
P30–P33	94–91	I/O	I/O port pins
P40–P43	90–87	I/O	I/O port pins
P50–P53	86–83	I/O	I/O port pins
COM0–COM15	113–128	O	LCD common output pins
COM16–COM31/ SEG63–SEG48	52–37	O	LCD common output pins (Can be switched to the SEG output pins with software.)
SEG0–SEG47	129–144, 1–32	O	LCD segment output pins
SEN0 (P02)	105	O	R/f converter Ch. 0 CR oscillation output pin (Can be switched to the P02 I/O port pin with software.)
SEN1	111	O	R/f converter Ch. 1 CR oscillation output pin
REF0 (P01)	106	O	R/f converter Ch. 0 reference resistor CR oscillation output pin (Can be switched to the P01 I/O port pin with software.)
REF1	110	O	R/f converter Ch. 1 reference resistor CR oscillation output pin
HUD	112	O	R/f converter AC-bias oscillation output pin for humidity sensor
RFIN0 (P00)	107	I	R/f converter Ch. 0 CR oscillation input pin (Can be switched to the P00 I/O port pin with software.)
RFIN1	109	I	R/f converter Ch. 1 CR oscillation input pin
RFOUT (P03)	103	O	R/f converter oscillation frequency output pin (Can be switched to the P03 I/O port pin with software.)
RESET	82	I	Initial reset input pin
TEST	81	I	Test pin
DMOD	77	I	Flash EEPROM programming control pin
DCLK	80	I	Clock input pin for Flash EEPROM programming
DRXD	78	I	Serial data input pin for Flash EEPROM programming
DTXD	79	O	Serial data output pin for Flash EEPROM programming
TEST1–TEST3	76–74	I/O	Test pins

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■ BASIC EXTERNAL CONNECTION DIAGRAM

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