

## Features

- High precision energy measurement
- Provide RMS voltage and RMS current
- Calculates active power and power factor
- Calculates AC frequency
- High frequency CF pulse for calibration
- Calculates total energy usage over time
- 24 seg × 4 com LCD drivers, can be switched to become I/O ports
- Supports LED driving
- Real time clock, can output second signal
- UART and I<sup>2</sup>C interfaces
- 2K\*16 bits OTP program memory, support online programming, 128 bytes data memory
- Operating voltage: energy measurement circuit 4.75 – 5.25V, rest of the IC 2.4 – 5.25V

## General Description

The SD3004 is an electric energy measurement SOC with built in MCU, energy/voltage/current measurement circuit, LCD/LED display drivers, and UART communication interface. It greatly simplifies circuit designs and reduces production costs for energy meter, metering socket, and similar products.

## Ordering Information

LQFP64-10 × 10-0.5 package



## Pin Diagram and Descriptions

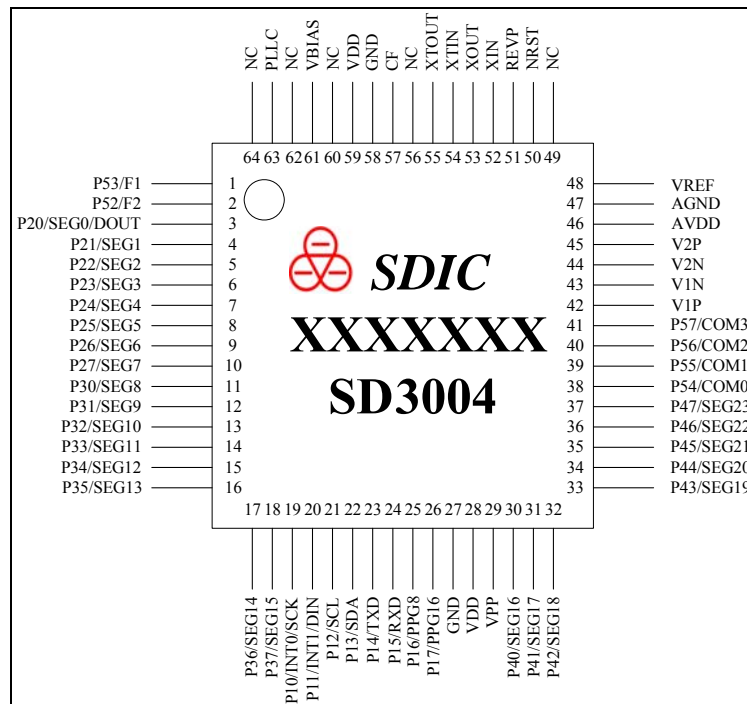


Figure 1. Pin out diagram

Table 1. Pin Descriptions

Pin No.	Pin Name	Pin Attribute	Pin Description
1	P53/F1	I/O	Port P53 or step motor drive F1
2	P52/F2	I/O	Port P52 or step motor drive F2
3-18	P20/SEG0/DOUT-- P37/SEG15	LCD driver, I/O	Port P20-P27, P30-P37, or LCD SEG0-SEG15 Pin 3 is data output DOUT during OTP programming
19	P10/INT0/SCK	I/O	Port P10 or interrupt INT0, interrupt edge selectable Clock input SCK during OTP programming
20	P11/INT1/DIN	I/O	Port P11 or interrupt INT1, interrupt edge selectable Data input DIN during OTP programming
21	P12/SCL	I/O	Port P12 or I <sup>2</sup> C clock SCL
22	P13/SDA	I/O	Port P13 or I <sup>2</sup> C data SDA
23	P14/TXD	I/O	Port P14 or UART data transmit TXD
24	P15/RXD	I/O	Port P15 or UART data receive RXD
25	P16/PPG8	I/O	Port P16 or 8 bits PPG output PPG8
26	P17/PPG16	I/O	Port P17 or 16 bits PPG output PPG16
27	GND	Ground	Digital ground
28	VDD	Power	Digital supply voltage
29	VPP	HV power	High voltage power for OTP programming
30-37	P40/SEG16-- P47/SEG23	LCD driver, I/O	Port P40-P47 or LCD SEG16-SEG23
38-41	P54/COM0-- P57/COM3	LCD driver, I/O	Port P54-P57 or LCD common COM0-COM3
42	V1P	Analog	Channel 1 (Current) positive input
43	V1N	Analog	Channel 1 (Current) negative input
44	V2N	Analog	Channel 2 (Voltage) negative input
45	V2P	Analog	Channel 2 (Voltage) positive input
46	AVDD	Power	Analog supply voltage
47	AGND	Ground	Analog ground
48	VREF	Analog	2.5V reference output
49	NC	-	No connect, can connect to supply or ground
50	NRST	I	Reset pin, active low
51	REVP	O	Goes high when phase difference between voltage and current is greater than 90 degrees. REVP updates its logic state when a CF pulse is issued.
52	XIN	Analog	3.58MHz crystal oscillator input
53	XOUT	Analog	3.58MHz crystal oscillator output
54	XTIN	Analog	32.768kHz crystal oscillator input
55	XTOUT	Analog	32.768kHz crystal oscillator output
56	NC	-	No connect, can connect to supply or ground
57	CF	O	Calibration frequency output
58	GND	Ground	Digital ground

59	VDD	Power	Digital supply voltage
60	NC	-	No connect, can connect to supply or ground
61	VBIAS	Analog	LCD bias voltage, adjustable through external resistor
62	NC	-	No connect, can connect to supply or ground
63	PLLC	Analog	External capacitor for PLL
64	NC	-	No connect, can connect to supply or ground

### Typical Application

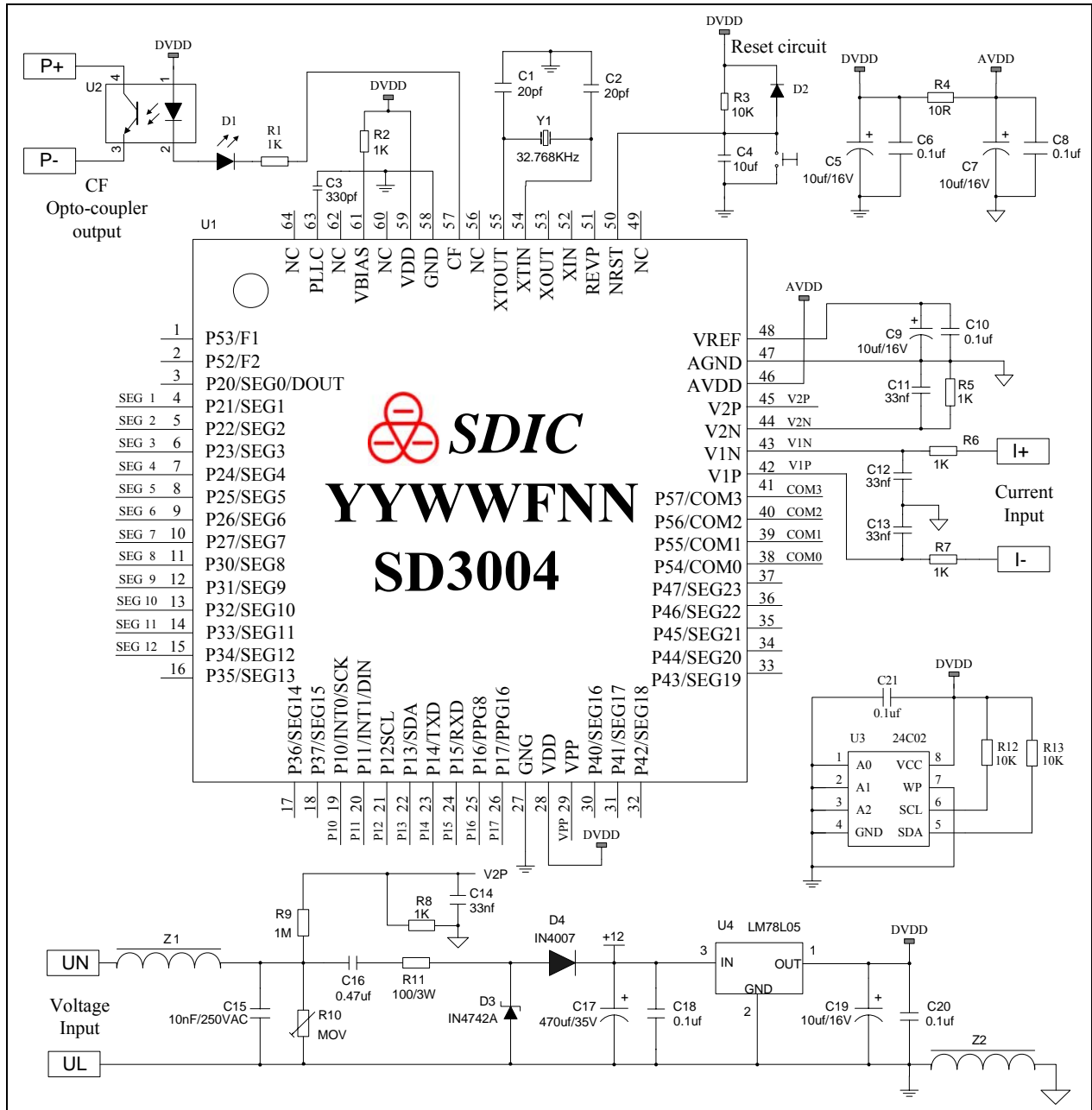


Figure 2. Typical application diagram

## Electrical Specifications

Table 2. Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit
$T_A$	Operating temperature	-40	+85	°C
$T_S$	Storage temperature	-55	+150	°C
$V_{DD}$	Supply voltage	-0.2	+7.0	V
$V_{pp}$	Programming voltage	-0.2	+13	V
$V_{IN}, V_{OUT}$	Digital input/output voltage	-0.2	$V_{DD}+0.3$	V
$T_L$	Reflow temperature profile	Per IPC/JEDECJ-STD-020C		°C

Remarks:

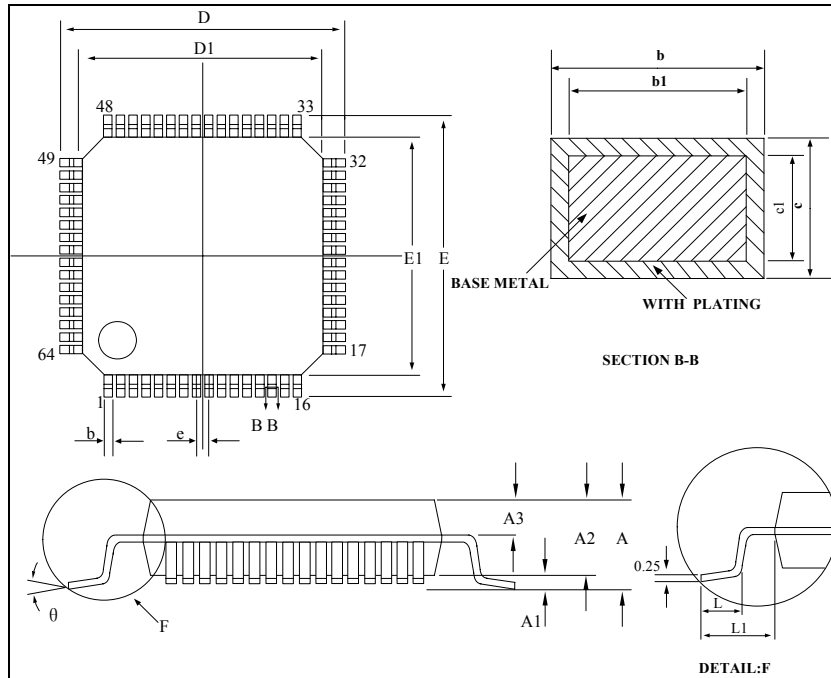
1. CMOS device can easily be damaged by electrostatics. It must be stored in conductive foam, and careful not to exceed the operating voltage range.
2. Turn off power before insert or remove the device.

 Table 3. Electrical Specifications ( $V_{DD}=5V$ ,  $AV_{DD}=5V$ )

Symbol	Parameter	Minimum	Typical	Maximum	Unit	Conditions/Remarks
PLLOSC	Operating frequency 1	--	3.604	--	MHz	PLL clock
OSC32K	Operating frequency 2	--	32.768	--	kHz	External crystal oscillator
HOSC	Operating frequency 3	--	3.58	--	MHz	External high frequency crystal oscillator
RC32K	Operating frequency 4	16	--	--	kHz	Internal RC oscillator
FOSC	Operating frequency	--	3.58	--	MHz	Operating frequency 1-4 or a selectable frequency derived from them
VDD	Digital power supply	2.4		5.25	V	
AVDD	Analog power supply	4.75	5	5.25	V	
IDD1	Operating current 1	--	5	--	mA	3.58MHz clock, MCU active, energy measuring, LCD displaying
IDD2	Operating current 2	--	15	30	uA	32.768KHz clock, MCU sleep, energy measuring stops, LCD displaying
IDD3	Operating current 3	--	--	1	uA	All oscillators stop, MCU stops
VIL	Digital input low voltage	--	--	0.3VDD		PORT2/PORT3/PORT4/PORT5
		--	--	0.2VDD		PORT1
		--	--	0.2VDD		NRST
VIH	Digital input high voltage	0.7VDD	--	--		PORT2/PORT3/PORT4/PORT5
		0.8VDD	--	--		PORT1
		0.8VDD	--	--		NRST
Rpu	Pull up resistance	50K	--	100K	Ω	PORT1/NRST
VOL	Digital output low voltage	--	--	0.3VDD	V	
VOH	Digital output high voltage	0.7VDD	--	--	V	
VPP	Programming voltage	11.75	12	12.25	V	

VREF	Reference value	2.3	2.5	2.7	V	
T_VREF	Reference TC		30	60	ppm/°C	-40°C~85°C
I_ACCU	Measurement accuracy	--	0.5	1	%FSR	Voltage/current channels
RANGE1	Channel 1 input signal range	--	--	450	mV	Current input, 50/60 Hz
RANGE2	Channel 2 input signal range	--	--	650	mV	Voltage input, 50/60 Hz
CMR	Common mode range	0		2.7	V	Channel 1 and channel 2

### Packaging Information



Dimensions: mm

Symbol	Min.	Nom.	Max.
A	—	—	1.60
A1	0.05	—	0.20
A2	1.35	1.40	1.45
A3	0.59	0.64	0.69
b	0.19	—	0.27
b1	0.18	0.20	0.23
c	0.13	—	0.18
c1	0.12	0.13	0.14
D	11.80	12.00	12.20
D1	9.90	10.00	10.10
E	11.80	12.00	12.20
E1	9.90	10.00	10.10
e	0.50BSC		
L	0.45	—	0.75
L1	1.00BSC		
$\theta$	0	—	7

Figure 3. Mechanical specification