上海复旦微电子股份有限公司
SHANGHAI FUDAN MICROELECTRONICS CO., LTD

Single Phase Electric Power Meter Circuit FM2032

Used as an application specific integrated circuit for electronic energy meters,FM2032 has the ability to calculate bi-directional active power,and in this way has overcome the limitation of the traditional inductive energy meter that only active power of which the voltage and current must be of the same phase can be calculated;On the other hand,the electrical energy meter using this IC has several advantages such as high precision,low power consumption, high reliability,good environment suitability and low raw material consumption,therefore is now the new generation product of the traditional inductive energy meters.

FEATURES

- Prevention of power-theft,positive and negative power registering
- Ideal linearity between 5%I_b ~ 4I_b,measurement error less than 0.3%
- Fast pulse output and current direction indication are suitable for computer data processing
- Slow pulse output gives directly drive for electromechanical counter and two phase stepper motor
- Electrostatic discharge circuitry, safe under 2000V discharges
- BiCMOS process,reliable quality
- Perfect solution for household single phase energy meters

PIN FUNCTIONS

Pin	Symbol	Function Description	Pin	Symbol	Function Description
1	Vil	Current sampling signal input	11	Vss	Negative power supply(−5V)
2	Vi2	Current sampling signal input	12	GNDD	Digital ground
3	GNDA	Analog ground	13	Mo	Stepper motor drive output
4	Vv	Voltage sampling signal input	14	Mo	Stepper motor drive output
5	Vv	Internally connected with Pin4	15	Osc1	Crystal oseillator
6	Vr6	External adjustment for voltage reference	16	Osc2	Crystal oscillator
7	Vr7	External adjustment for voltage reference	17	V_{DD}	Positive power supply (+5V)
8	P8	Active power integral pulse	18	C_1	Integral capacity
9	S9	Negative power signaling	19	C_{12}	Integral capacity
10	Tc	Testing control	20	C_2	Integral capacity

ABSOLUTE MAXIMUM RATINGS (Ta=25℃)

Symbol	Parameter	Absolute value	Unit	Symbol	Parameter	Absolute value	Unit
positive power voltage	V_{DD}	+7(max)	V	entry voltage	Vi	VSS+0.5<Vi<VDD−0.5	V
negative power voltage	V_{SS}	−7(min)	V	work temp	Topr	−20 ~ +70	℃
entry voltage	V_V	Vss+0.5<Vv<VDD−0.5	V	store temp	Tstr	−55 ~ +150	℃

SPECIFICATIONS

(V_{DD}=5V,V_{SS}=−5V,f_{osc}=32.768kHz,T_a=25℃, pin8,pin9 connected to ground through 1.0kΩ)

Test item	Symbol	Test condition	Test point	Min	Typ	Max	Unit
Positive power current	Idd	V_V,Vi=0	Pin17	1.0	2.0	3	mA
Negative power current	Iss	V_V,Vi=0	Pin11	1.5	2.5	3.5	mA
Reference voltage	Vr1	V_V,Vi=0	Pin6	−1.2	−1.25	−1.3	V
Reference voltage	Vr2	V_V,Vi=0	Pin7	−0.6	−0.625	−0.65	V
Negative power indication	V9	V_V=0.65V, Vi=10mV,ø=π	Pin9			−4	V
Active power Integral pulse	V8	V_V=1V,Vi=10mV	Pin8			−4	V
Stepper−motor drive voltage	Vm	Pin13.14 400Ω	Pin13,14			−4	V
Non−linear Error%	E_{NL}	V_V=0.65 Vi=120μV ~ 12mV	Pin8			± 1.0%	

Non-linear Error%	E_{NL}	V_V=0.65 Vi=60μV-12mV	Pin8			| ± 1.5% |	
Start-up current	I_{STAR}	ø=0 V_V=0.65V	Pin8	0.4%I_b			A
Negative active power error %	E_{NP}	V_V=0.65V Vi=120 μV-12mV ø=0 ø=π	Pin8			| ± 1.5% |	
Output frequency Of pin13.14overpin8	f_m/f_8	V_V=0.65V Vi=10mV	Pin13,14 Pin8		1:16		
Leak current of pin8	I_{18}	V_VVi=0V,V8=0V	Pin8		-100		μA
Leak current of pin9	I_{19}	V_VVi=0V,V9=0V	Pin9		-100		μA
Leak current of pin13.14	$I_{13.14}$	V_VVi=0V $V_{13.14}$=0V			-100		μA

1)non-linear error%. No compensation is added on Pin1 and Pin2,V_V,the alternative current voltage between Pin4 ~ Pin3,is 0.65v,power factor cosø=1
e_{NL}%=[large signal (4I_b)error%-small signal(5%I_b) error%]*100%
2)start-up current .When I_b*C=16000(C is meter constant,I_b is basic current),cosø=1,V_V=0.65V,the smallest alternative current that can make Pin8 give output
3)negative active power error%
same as 1)* *Note:It is recommended that user measure under positive power.

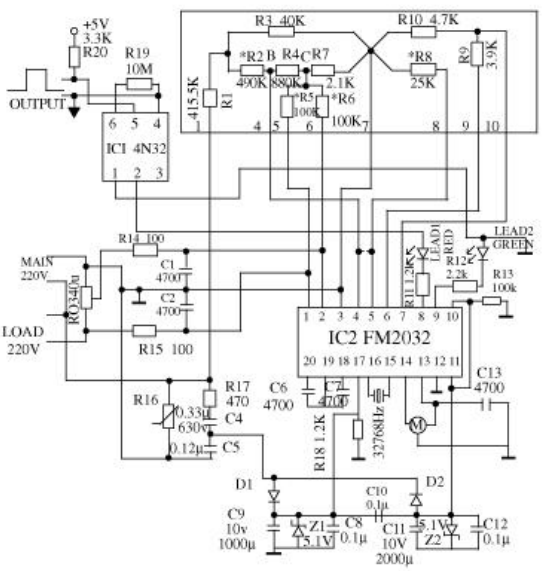
APPLICATION INFORMATION

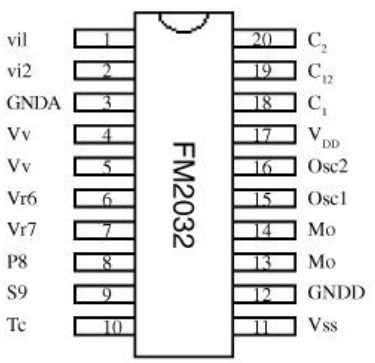
The relationship between pin10、input power (positive/negative) and Pin8、Pin9、Pin13、Pin14

Pin10(IN)	Input power	Pin8(OUT)	Pin9(OUT)	Pin13(OUT)	Pin14(OUT)
GND	Positive	Negative modulated power pulse(0-5V)	0V(DC)	Negative pulse of 250ms width,1/16 of Pin8 freq.	Negative pulse of 250ms width,1/16 of Pin8 freq.
GND	Negative	Same as above	-5V(DC)	Same as above	Same as above
-5V	Positive	Power pulse(0-5V)	0V(DC)	Same as above	Same as above
-5V	Negative	Same as above	Power pulse (0-5V)	Same as above	Same as above

1)Input power(positive/negative)is defined as the product of V_V,the voltage sampling signal between Pin4~Pin3 and V_I,the current sampling signal between Pin2~Pin1.Sign of Vv*Vi*cosø determines that of the input power ,i.e., if bigger than zero then positive,if lower,negative.
2)The output pulses of Pin13 and Pin14 are located in the mid points of the other's period,therefore the combined output frequency of Pin13,Pin14 is 1/8 that of Pin8.

APPLICATION CIRCUIT(Ib=5A,c=3200p/kwh)





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