

CoCo Datasheet

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Revision History

Date	Version Number	Author	Remarks
27 Dec 2012	0.1	Deepak et. al.	Draft
06 Mar 2013	0.2	Deepak et. al.	Draft
19 Apr 2013	0.3	Deepak et. al.	Draft

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CoCo IC Description

CoCo is an analog chip that can regulate the frequency of the output pulses based on the feedback and is optimized to be used in the feedback of the Cockcroft-Walton Multiplier. The CWM is used to drive the dynodes of a PMT. CoCo gives out 6.5 μ s pulses whose frequency can be regulated. The width of these pulses can also be controlled. The chip works on a single 3.3V supply and other electrical specifications are given Table 1:

Features and Advantages:

1. Frequency of the pulses adjustable.
2. Regulatable pulse frequency.
3. Current sensing integrated.
4. Available in DFN 8 (3 mm \times 3 mm) plastic package.

Applications

HV generation circuits

HV regulation circuits.

Switching regulators.

Quick Data

	Min	Typ	Max	Remarks
VDDD	3.0 V	3.3 V	3.6 V	
IDDD	0.2 mA	1 mA	2 mA	
SW	500 Hz	50 kHz	60 kHz	Frequency depends on the capacitor connected to CF (PIN1)
SW	200 ns	6.5 μ s	7.5 μ s	
CSNS	80 mV	100 mV	200 mV	

Table 1 CoCo specifications

Block Diagram

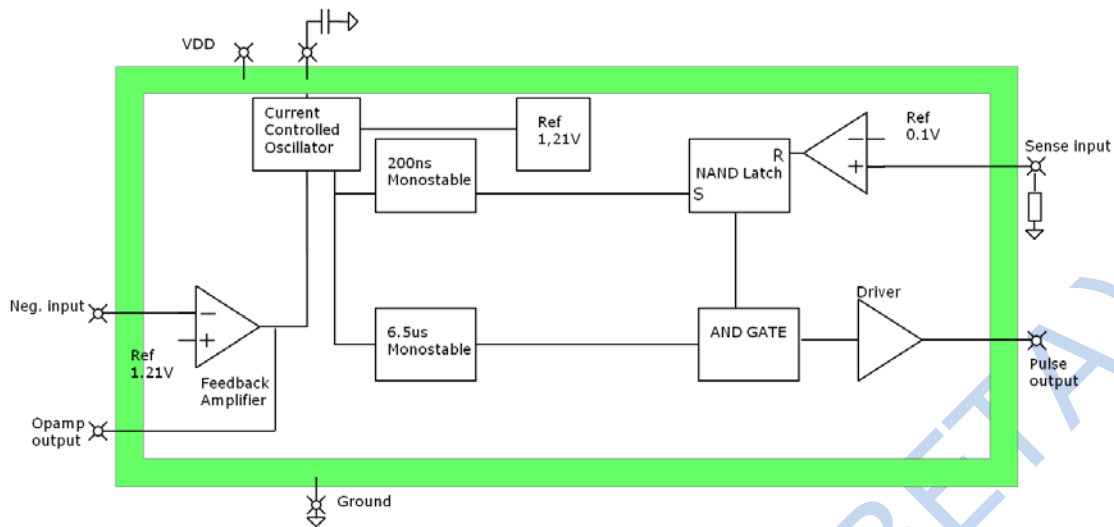


Figure 1 Block diagram of CoCo

Package pins configuration and description

Package pin description

CoCo is packaged in DFN8 (with EP) 3 mm x 3 mm plastic body. Lead pitch: 0.65 mm, package height: 0.9 mm.

Pin Name	Type	Purpose	Pin No.
CF	Analog IO	220pF to GND (load); Sawtooth signal (Triangular waveform); Ampl = 1.0V; DC shifted by 1.0V;	1
CSNS	Analog Input	Analog signal Tr = 10ns, Ampl = 50mV – 150mV	2
SW	Analog Output	100ns for 1pF cap load; 6.5us wide pulses (220 pF load on CF) in the frequency range = 500Hz – 50kHz; regulated by FB_IN	3
GND	Analog Ground	Analog Ground	4
VDD	Analog Power	Analog Power (2mA max.)	5

OPAMP_OUT	Analog Output	Part of regulation loop; 10M Ω to FB_IN	6
FB_IN	Analog IO	Part of regulation loop; 10M Ω to a supply (1.2V – 2.4 V)	7
GND	Analog Ground	Analog Ground	8

Table 2 Package pin configuration and description

Absolute Maximum Ratings

Symbol	Pin	Parameter	Min	Max	Unit
CF	1		0.8	1.6	V
CSNS	2		0.75	2.45	V
SW	3		0	3.3	V
VDD	5		3.0	3.6	V
OPAMP_OUT	6		0	3.3	V
FB_IN	7		0	3.3	V
P _D		Total Power Dissipation	1	2	mW
T _j		Junction temperature	0	85	°C

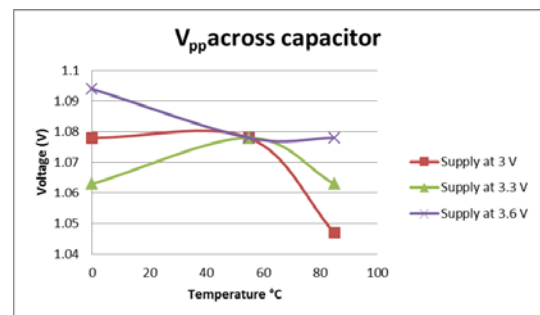
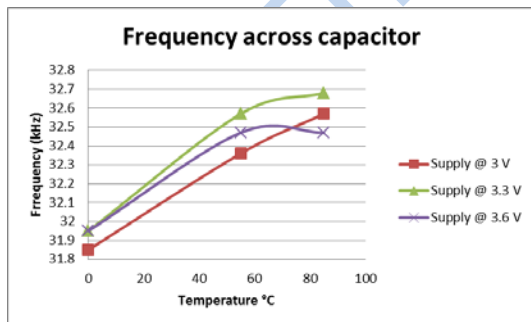
Table 3: Absolute Maximum Rating

Electrical Specifications

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
IC Supply Voltage						
VDD	Operating range	Device operational	3.0	3.3	3.6	V
Supply Current						
I _q	Quiescent current	Device on, Standby		0.5	0.6	mA
I _{op}	Operational current	Device on, Clock off		0.7	1	mA
Oscillator stage						

Cin	Input capacitor	Device on	200	220		pF
Freq.	Internal Clock frequency	Device operational with a 220 pF capacitor on Cin	0.4		50	kHz
Output SW Stage						
t1b	Leading edge blanking time	Device operational		200		ns
tpul	Pulse width of the signal on SW	Current sense input is below 0.1 V	200	6500		ns
Freq.	Frequency of the output pulses	Device operational with a 220 pF capacitor on Cin	0.4		50	kHz
Current sense comparator						
Vsns	Threshold value of the sense comparator	Single photoelectron charge		100		mV
Feedback amplifier						
Vfbias	Bias on the positive terminal of the opamp	Device operational		1.2		V

Table 4: Absolute Maximum Ratings



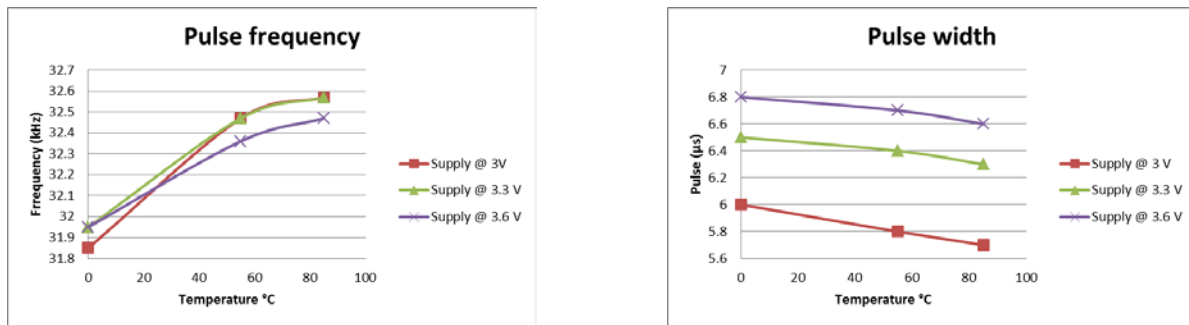


Figure 2 Typical Performance characteristics depending on temperature and power supply variations.

Functionality Description

Feedback Amplifier

A feedback amplifier, biased at 1.2 V on the positive terminal is present. According to requirements, the feedback can be designed externally using the opamp output and the negative terminal.

Current Controlled Oscillator

A simple current controlled oscillator is integrated in CoCo. Based on the voltage output of the feedback amplifier, the voltage is converted to current by a resistor. This current is used to charge and discharge a capacitor connected external to the chip. This charging and discharging provides a triangular wave which can be used to generate the clock signal. The amount of current determines the frequency. So, when the feedback voltage is reaching the set value, the frequency is low and when it is far from the set value, the frequency is high.

Monostable Multivibrator

A 6.5 µs monostable multivibrator provides a pulse at the positive edge of each clock cycle. Another monostable circuit does the leading edge blanking for 200 ns.

Current Sense Circuit

A comparator with a threshold of 0.1 V on the positive input acts as a current sense circuit. If the voltage on CSNS goes above 0.1 V then the pulse width on SW is shortened. The minimum pulse width on SW is 200 ns.

Typical Application and Layout Guidelines

The board needs a single 3.3 V supply. The chip needs a 220pF capacitor on CF (PIN1). Connect 10MΩ between FB_IN (PIN7) and OPAMP_OUT (PIN6). Connect 10MΩ between FB_IN (PIN7) and a source (that can vary between 1.2 V and 2.4 V) to form a resistive feedback network between FB_IN (PIN7) and OPAMP_OUT (PIN6) and the supply. A test-board schematic is shown in Figure 3.

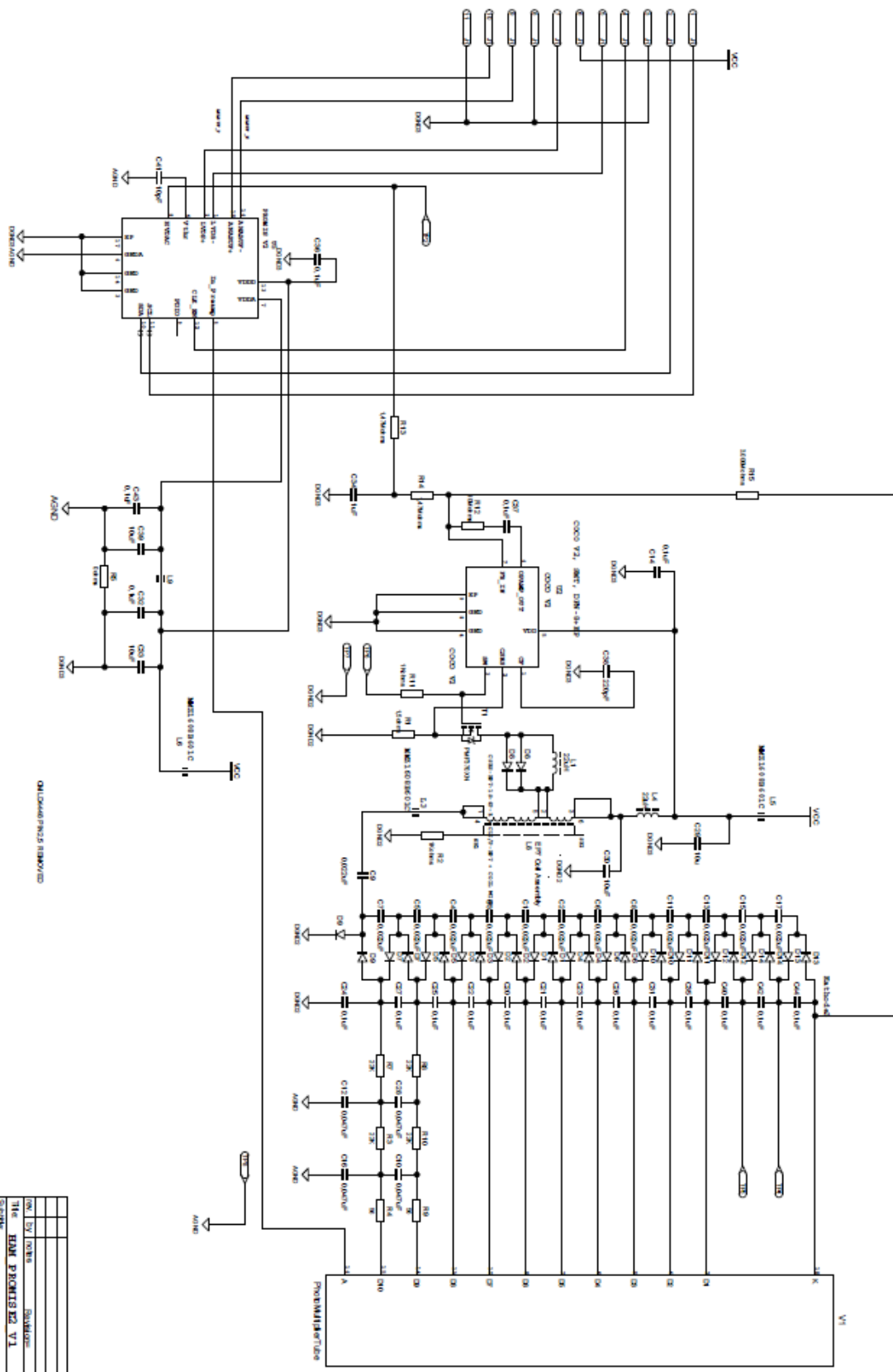


Figure 3 PMT Base schematic. CoCo is used to pump energy into Cockcroft-Walton circuit and also regulate the circuit.

Package Dimensions

PACKAGE OUTLINE DRAWING

POD IN SIDE VIEW

POD IN BOTTOM VIEW

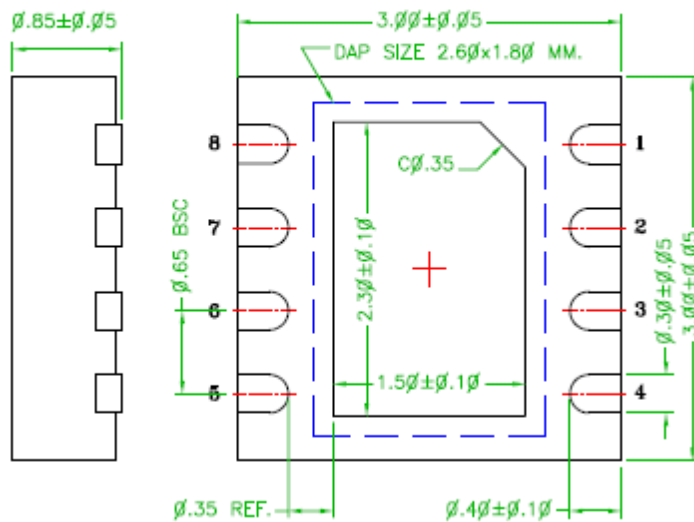


Figure 4 CoCo available in DFN8 plastic package. All dimensions in mm.

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