

# M62501P,FP

PWM IC for the synchronized deflection system control

## GENERAL DESCRIPTION

The M62501P/FP is a controller for a deflection system of CRT display monitors. It performs a stable PWM control over a wide fluctuation of external signals, thanks to the built-in trigger mode oscillator. The IC is suitable for an application to a high voltage drive of monitors because of its following circuits and functions;

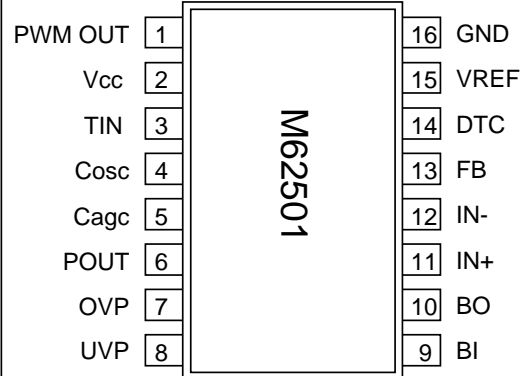
- low voltage malfunction protection circuit,
- over or under voltage protection circuit for a control line,
- soft-start function.

It is also applicable to a horizontal output correction.

## FEATURES

- PWM output synchronized with external signals
- Wide pulse width modulation control frequency  
15kHz to 150kHz
- Soft start function
- The under voltage output malfunction protection circuit  
start  $V_{cc} > 9V$  stop  $V_{cc} < 6V$
- Built-in over voltage protection (OVP) and under voltage protection (UVP) control

## PIN CONFIGURATION(TOP VIEW)

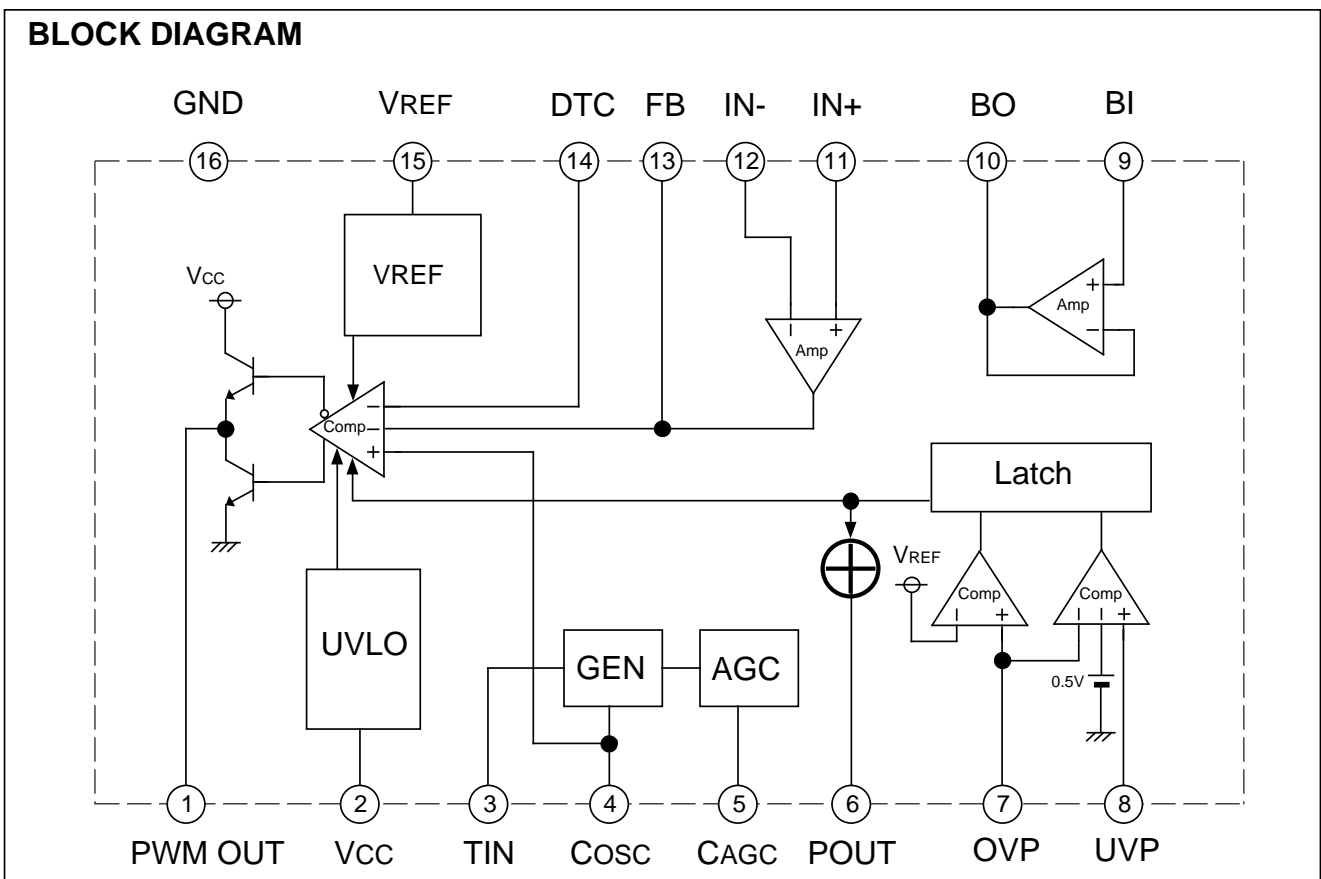


outline P: 16P4  
FP: 16P2S

## APPLICATION

- CRT display monitor

## BLOCK DIAGRAM



# M62501P,FP

PWM IC for the synchronized deflection system control

## Terminal Number and The facility

PIN No.	Symbol	Functional Description
1	PWM OUT	PWM output
2	VCC	Power supply
3	TIN	Trigger input
4	COSC	Setting oscillating frequency
5	CAGC	AGC setting
6	P.OUT	Error signal output
7	OVP	Input of over voltage protection
8	UVP	Input of under voltage protection
9	BI	Positive input of buffer Amp.
10	BO	Output of buffer Amp.
11	IN+	Positive input of Op-Amp.
12	IN-	Negative input of Op-Amp.
13	FB	Output of Op-Amp.
14	DTC	Dead time control (Soft start function)
15	VREF	Output of reference voltage (5V)
16	GND	Ground

## ABSOLUTE MAXIMUM RATINGS (Ta=25°C,unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
VCC	Supply voltage		15	V
VOUT	Output voltage		15	V
IOUT	Output current		±100	mA
VICM	Error Amplifier input common mode voltage		-0.3 ~ VCC	V
VID	Error Amplifier differential input voltage		VCC	V
Pd	Power dissipation		P	mW
			FP	
Kø	Thermal derating	Ta 25°C	P	mW/°C
			FP	
Topr	Operating temperature		-20 ~ +75	°C
Tstg	Storage Temperature		-40 ~ +150	°C

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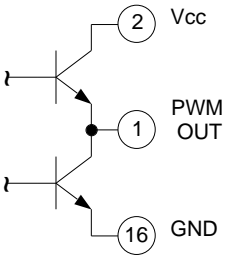
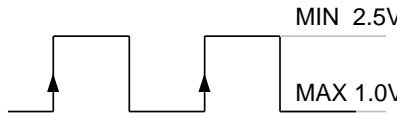
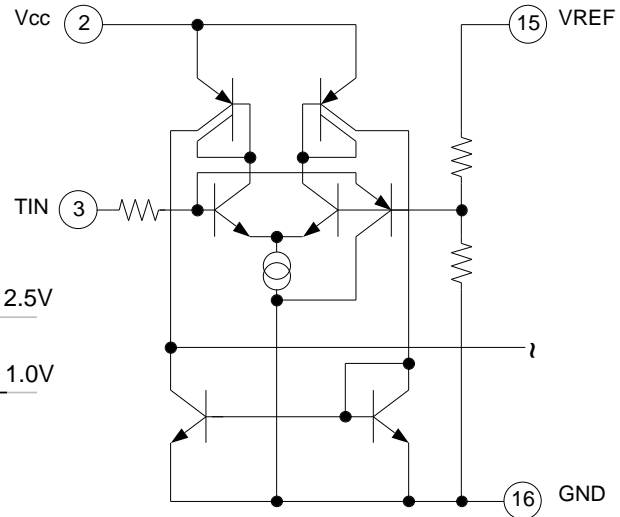
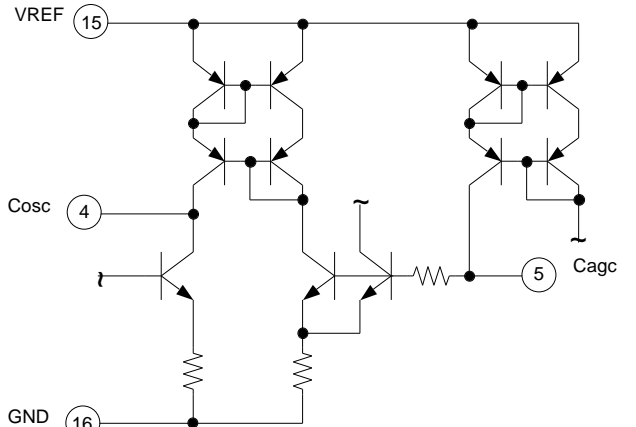
**ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 12V, T<sub>IN</sub> = 40kHz, T<sub>a</sub> = 25°C, unless otherwise noted)**

Block	Symbol	Parameter	Test conditions	Limits			Unit
				Min	Typ	Max	
All Device	V <sub>CC</sub>	Range of power supply		VCC OFF		14	V
	I <sub>CC</sub>	Circuit current	Output off mode		20		mA
Reference voltage section	V <sub>REF</sub>	Reference voltage	I <sub>REF</sub> =-5mA	4.80	5.00	5.20	V
	Reg-in	Input regulation	V <sub>CC</sub> =7 ~ 14V I <sub>REF</sub> =-5mA		1.0	10	mV
	Reg-L	Load regulation	I <sub>REF</sub> =0 ~ -5mA		2.0	20	mV
	TCV <sub>REF</sub>	Reference voltage thermal coefficient			0.01		% / °C
	I <sub>REF MAX</sub>	Maximum reference current			-30		mA
	I <sub>S</sub>	Short-circuit current			-30		mA
Error Amp.	V <sub>IO</sub>	Input offset voltage				7	mV
	I <sub>IB</sub>	Input bias current		-100			nA
	I <sub>IO</sub>	Input offset current		-100		100	nA
	V <sub>ICM</sub>	Common mode input voltage range		-0.3		V <sub>CC</sub> -2	V
	A <sub>V</sub>	Open loop transmission gain		70	110		dB
	S <sub>R</sub>	Slew rate			4		V / μs
	V <sub>OR</sub>	Output voltage range		0.3		V <sub>REF</sub> -1.5	V
	I <sub>SINK</sub>	Output sink current		10			mA
	I <sub>SOURCE</sub>	Output source current			-10	mA	
Buffer Amp.	I <sub>B</sub>	Input bias current		-20			nA
	S <sub>R</sub>	Slew rate			4		V / μs
	V <sub>OR</sub>	Output voltage		0.3		V <sub>CC</sub> -2.5	V
	I <sub>SINK</sub>	Output sink current		2			mA
	I <sub>SOURCE</sub>	Output source current				-10	mA
Oscillator	f <sub>OSC</sub>	Oscillation frequency		15		150	kHz
	V <sub>OSC H</sub>	The oscillator waveform bound voltage			3.5		V
	V <sub>OSC L</sub>	The oscillator waveform lower limit voltage			1.5		V
	V <sub>TIN H</sub>	High level of T <sub>IN</sub>		2.5		V <sub>CC</sub>	V
	V <sub>TIN L</sub>	Low level of T <sub>IN</sub>				1.0	V
PWM output section	V <sub>SAT L</sub>	Output saturation voltage L	I <sub>O</sub> =100mA		0.7	1.4	V
	V <sub>SAT H</sub>	Output saturation voltage H	I <sub>O</sub> =-100mA	9.5	10.5		V
UVLO section	V <sub>TH ON</sub>	ON threshold voltage		8.0	9.0	10.0	V
	V <sub>TH OFF</sub>	OFF threshold voltage		5.4	6.0	6.6	V
OVP section	V <sub>TH OVP</sub>	OVP terminal threshold voltage		4.75	5.00	5.25	V
	I <sub>IN OVP</sub>	OVP terminal input current				1.0	μA
UVP section	V <sub>UVPO</sub>	Input offset voltage				7	mV
	I <sub>IN UVP</sub>	UVP terminal input current				1.0	μA
P.OUT section	V <sub>SAT</sub>	Output saturation voltage	I <sub>PO</sub> =10mA			0.4	V
	I <sub>L</sub>	Output leakage current	V <sub>PO</sub> =12V			1.0	μA

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## Terminal functional description and equivalent circuit

Terminal No.	Symbol	Function and terminal circumscription circuitry
1	PWM OUT	<ul style="list-style-type: none"> <li>•PWM output terminal</li> <li>•The PWM output synchronized with the TIN input.</li> <li>•Output "H" level = 10.5V typ (The output load current:-100mA,Vcc=12V)</li> <li>•Output "L" level = 0.7V Typ (The output load current:+100mA,Vcc=12V)</li> </ul> 
2	Vcc	Power supply terminal
3	TIN	<ul style="list-style-type: none"> <li>•Trigger input terminal</li> <li>•Frequency range 15kHz ~ 150kHz</li> <li>•It takes in a start edge.</li> </ul> <p>TIN input waveform</p>  
4	Cosc	<ul style="list-style-type: none"> <li>•Cosc terminal</li> <li>•It generates a saw wave by connecting capacitor between 4pin and GND.</li> <li>•Recommended capacitor value is 1000pF.</li> </ul>
5	Cagc	<ul style="list-style-type: none"> <li>•Cagc terminal</li> <li>•It sets up sensitivity of AGC by connecting capacitor between 5pin and GND.</li> <li>•Recommended capacitor value is 1μF.</li> </ul> 

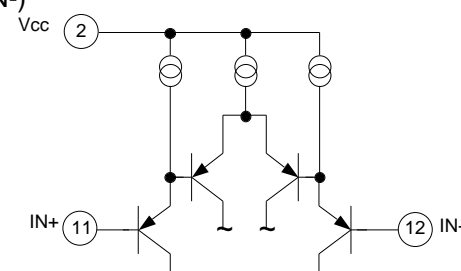
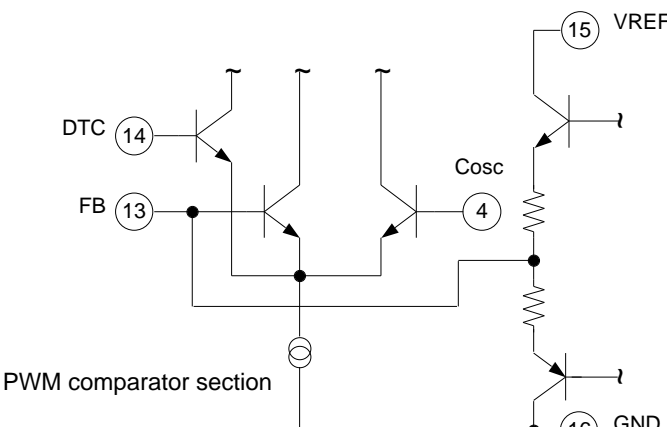
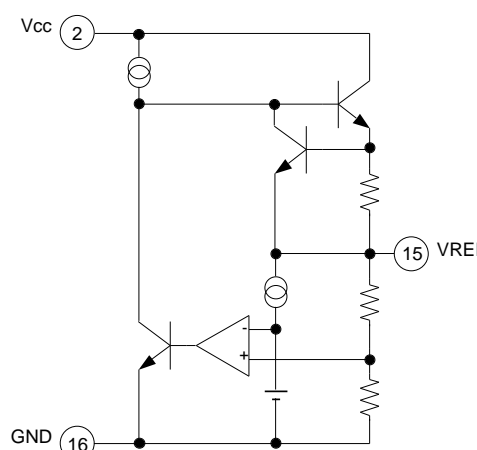
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Terminal No.	Symbol	Function and terminal circumscription circuitry
6	POUT	<ul style="list-style-type: none"> <li>•The abnormal state detection output terminal</li> <li>•The output becomes "H" from "L" when an abnormality is detected in the OVP or UVP terminal. Then the PWM output terminal becomes "H" settlement, too.</li> <li>•Do OFF of power supply (Vcc) to remove latch of abnormal state.</li> <li>•In abnormal state detection ;                      Output "H" level = 10.5V typ                      (The output load current : no-load, Vcc=12V)                      Output "L" level = 1.5V typ                      (The output load current : -1mA, Vcc=12V)</li> <li>•In normal state ;                      Output "L" level = 0.4V typ                      (The output load current : +10mA, Vcc=12V)</li> </ul>
7	OVP	<ul style="list-style-type: none"> <li>•Over voltage protection of the control line (OVP)</li> <li>•Setting terminal voltage ;  <math>GND \quad VOVP &lt; VREF</math></li> <li>•Under voltage protection of the control line (UVP)</li> <li>•Setting terminal voltage ;  <math>GND \quad VUVP &lt; VOVP</math></li> </ul> <p>Note:It is connected to GND when the abnormal detection terminal is not used.</p>
9	BI	<ul style="list-style-type: none"> <li>•The input terminal of a buffer Amp. (BI)</li> <li>•The output terminal of a buffer Amp. (BO)</li> </ul>

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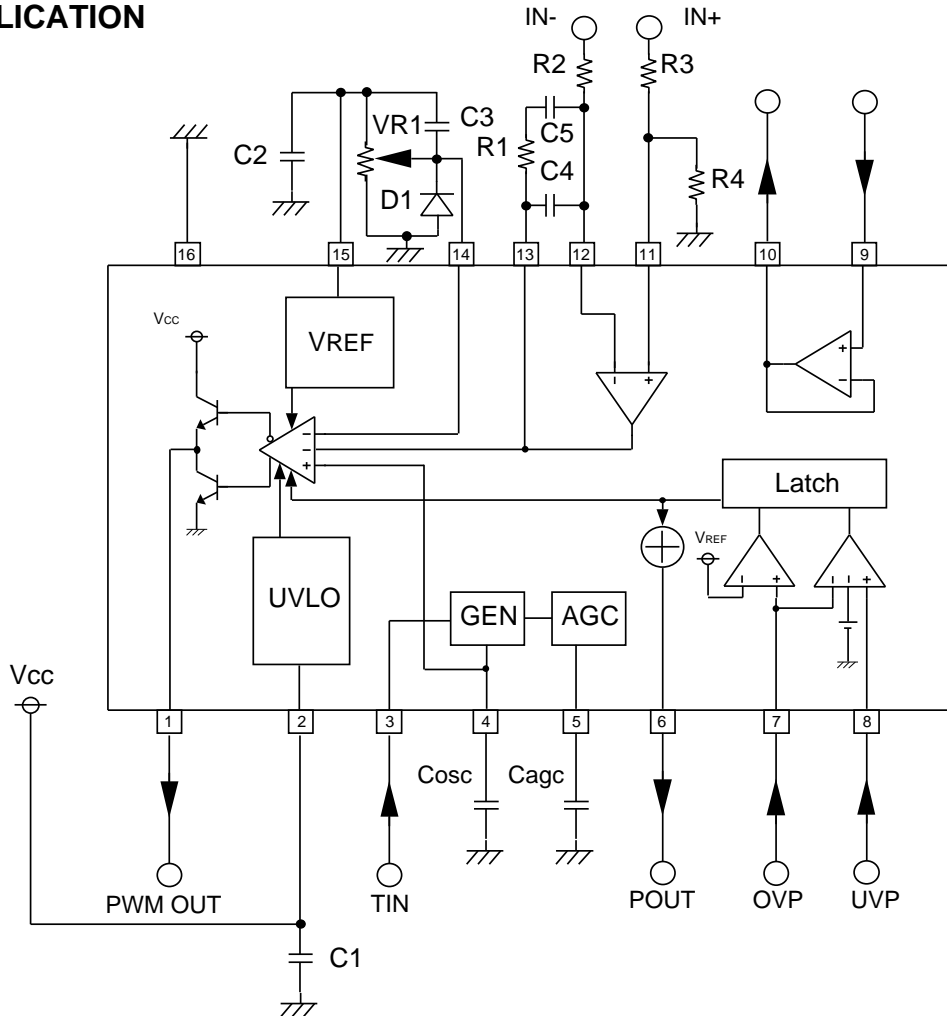
PWM IC for the synchronized deflection system control

Terminal No.	Symbol	Function and terminal circumscription circuitry
11	IN+	<ul style="list-style-type: none"> <li>•Positive input terminal of an Op-Amp. (IN+)</li> <li>•Negative input terminal of an Op-Amp. (IN-)</li> </ul> 
13	FB	<ul style="list-style-type: none"> <li>•Output terminal of an Op-Amp. (FB)</li> <li>•Dead time control terminal (DTC)</li> <li>•It can do soft start during power-on under keeping time constant.</li> </ul> 
15	VREF	<ul style="list-style-type: none"> <li>•Reference voltage terminal</li> <li>•5V output voltage (The terminal can begin to take outside connected load 5mA.)</li> </ul> 
16	GND	<ul style="list-style-type: none"> <li>•Ground terminal</li> </ul>

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## M62501 APPLICATION



C1,C2 Stabilization capacitors of Vcc and VREF.

VR1 It is decided considering a load capacity of VREF.  
(A load capacity is approximately 5mA.)  
Recommended value is around 10k .

C3,D1 They are for the soft start function. A time constant is decided considering VR1.

Cagc This capacitor is for stabilization of AGC. A larger capacitor improves a stability of the system, however a system response is degraded.  
Recommended value is around 1μF.

Cosc This capacitor is for a saw wave generation. Recommended value is around 1000pF.

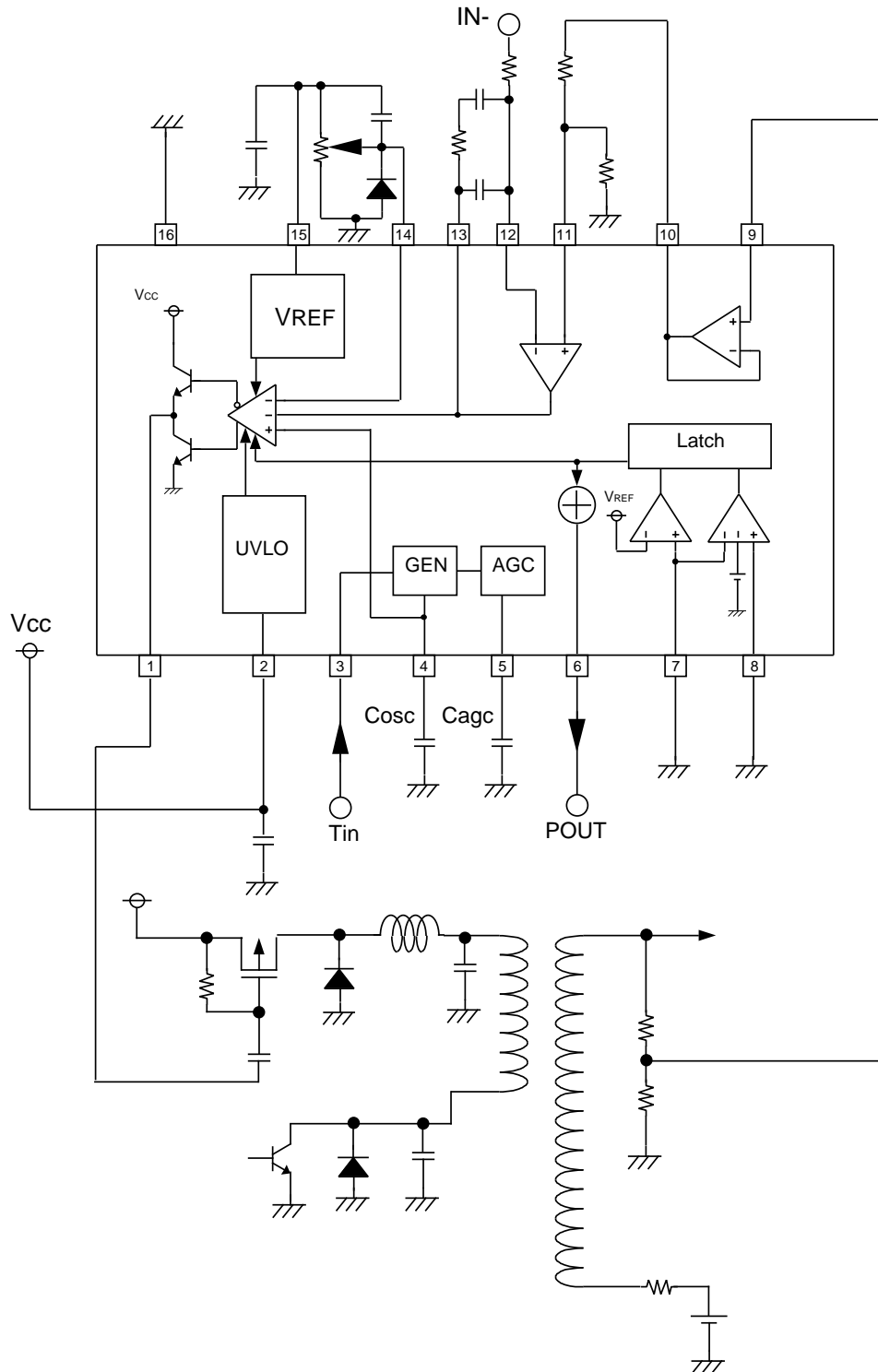
R1,R2,R3,R4 They are for a gain setting of the error Amp. R2 should be several k to dozens of k to set a voltage gain 20dB to 40 dB at f = 1kHz, so that the feed back loop is stable.  
When the voltage gain is too low, it causes jitter.  
Recommended values of C4, C5 and R1 are ;  
C4 = dozens of pF to several hundreds pF  
C5 = several thousands pF to tens of thousands pF  
R1 = dozens of k to several hundreds k .

\*Annotation:Connect 7pin and 8pin terminal to GND when don't use under voltage protection (UVP).

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## EXAMPLE OF APPLICATION CIRCUIT

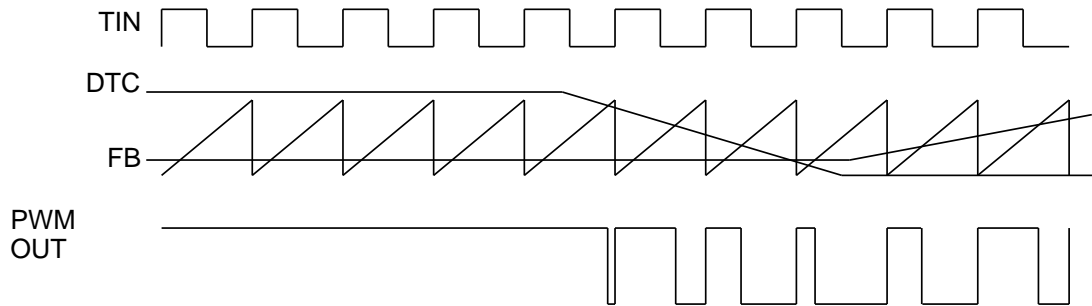




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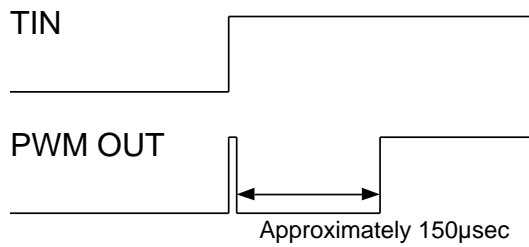
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## Timing chart

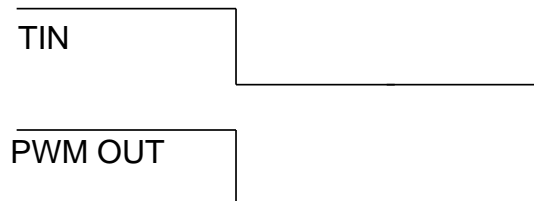


- PWM OUT ON Duty is fixed in the voltage of higher one between DTC terminal and FB terminal voltage.

- Waveform at "H" was taken from "L", and having put TIN up (PWM output is fixed in "H", too when fix TIN terminal in "H".)



- Waveform at "L" was taken from "H", and having put TIN up (PWM output is fixed in "L", too when fix TIN terminal in "L".)



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