

**PRELIMINARY**  
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 Some parametric limits are subject to change.

# 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;

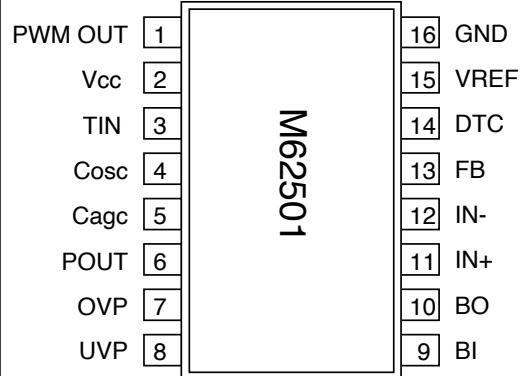
- low voltage multifunction protection circuit,
- over or under voltage protection circuit for a control line,
- soft-start function.

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)

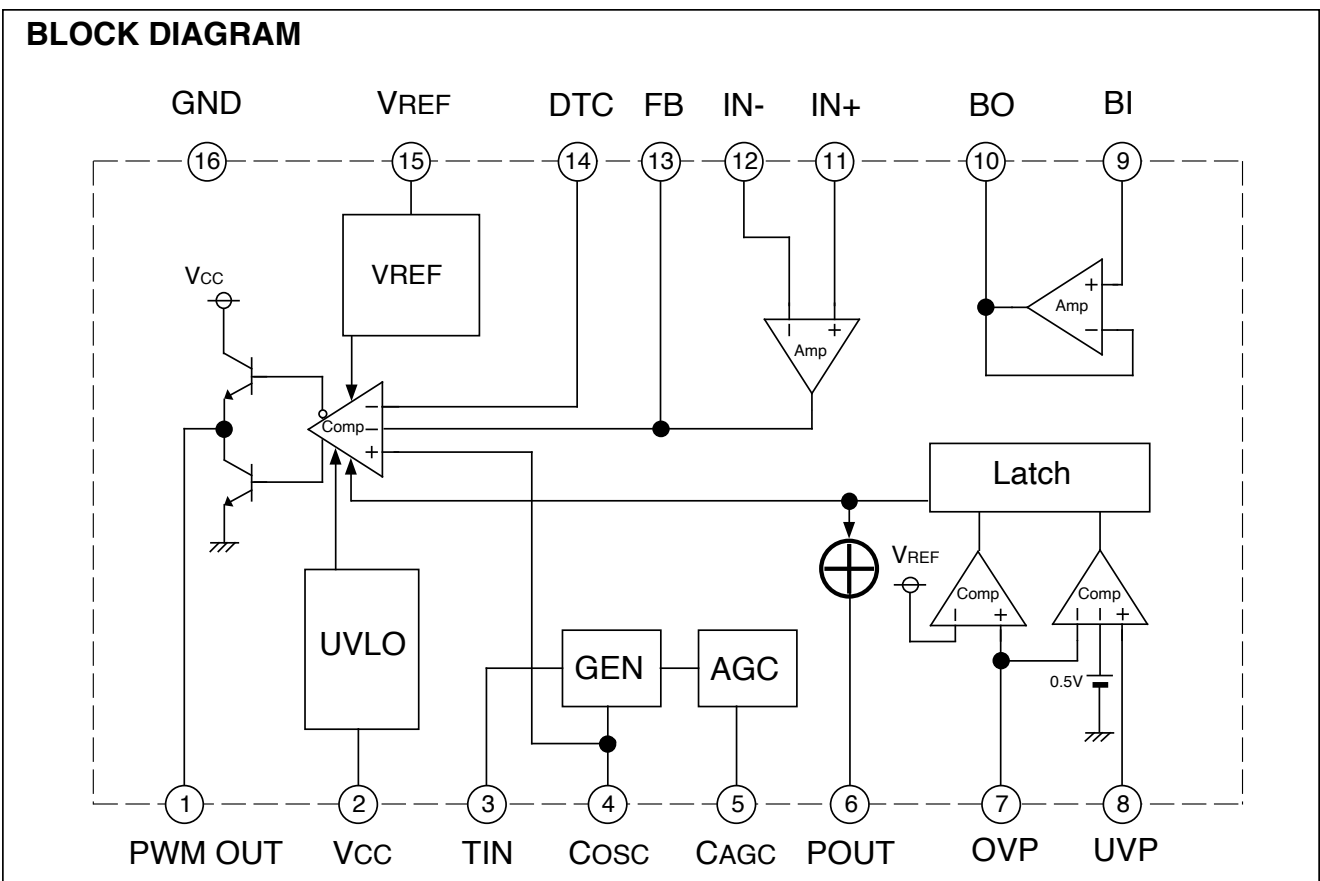


outline P: 16P4  
 FP: 16P2S

## APPLICATION

- CRT display monitor

## BLOCK DIAGRAM



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## 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
			1200	
Kθ	Thermal derating	Ta ≥ 25°C	P	mW/°C
			9.6	
Topr	Operating temperature		-20 ~ +75	°C
Tstg	Storage Temperature		-40 ~ +150	°C

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**ELECTRICAL CHARACTERISTICS (Vcc = 12V, TIN = 40kHz, Ta = 25°C, unless otherwise noted)**

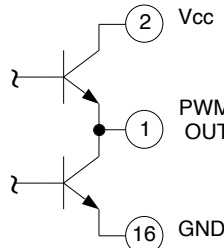
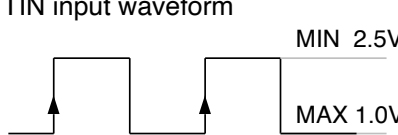
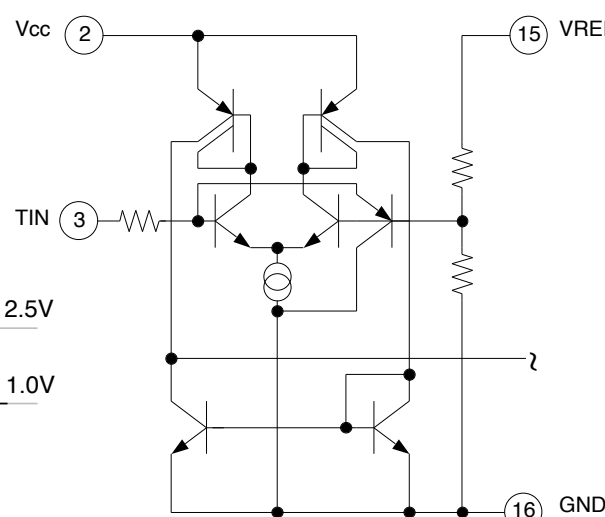
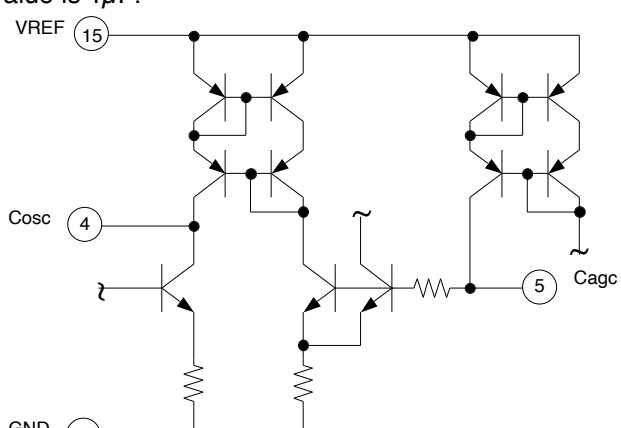
Block	Symbol	Parameter	Test conditions	Limits			Unit
				Min	Typ	Max	
All Device	Vcc	Range of power supply		VCC OFF		14	V
	ICC	Circuit current	Output off mode		20		mA
Reference voltage section	VREF	Reference voltage	IREF=-5mA	4.80	5.00	5.20	V
	Reg-in	Input regulation	Vcc=7 ~ 14V IREF=-5mA		1.0	10	mV
	Reg-L	Load regulation	IREF=0 ~ -5mA		2.0	20	mV
	TCVREF	Reference voltage thermal coefficient			0.01		% / °C
	IREF MAX	Maximum reference current			-30		mA
	IS	Short-circuit current			-30		mA
Error Amp.	VIO	Input offset voltage				7	mV
	IIB	Input bias current		-100			nA
	IIO	Input offset current		-100		100	nA
	VICM	Common mode input voltage range		-0.3		VCC-2	V
	AV	Open loop transmission gain		70	110		dB
	SR	Slew rate			4		V / μs
	VOR	Output voltage range		0.3		VREF-1.5	V
	Isink	Output sink current		10			mA
	Isourse	Output source current				-10	mA
Buffer Amp.	Ib	Input bias current		-20			nA
	SR	Slew rate			4		V / μs
	VOR	Output voltage		0.3		Vcc-2.5	V
	Isink	Output sink current		2			mA
	Isourse	Output source current				-10	mA
Oscillator	fOSC	Oscillation frequency		15		150	kHz
	VOSC H	The oscillator waveform bound voltage			3.5		V
	VOSC L	The oscillator waveform lower limit voltage			1.5		V
	VTIN H	High level of TIN		2.5		VCC	V
	VTIN L	Low level of TIN				1.0	V
PWM output section	Vsat L	Output saturation voltage L	IO=100mA		0.7	1.4	V
	Vsat H	Output saturation voltage H	IO=-100mA	9.5	10.5		V
UVLO section	VTH ON	ON threshold voltage		8.0	9.0	10.0	V
	VTH OFF	OFF threshold voltage		5.4	6.0	6.6	V
OVP section	VTH OVP	OVP terminal threshold voltage		4.75	5.00	5.25	V
	IIN OVP	OVP terminal input current				1.0	μA
UVP section	VUVPO	Input offset voltage				7	mV
	IIN UVP	UVP terminal input current				1.0	μA
P.OUT section	Vsat	Output saturation voltage	IPO=10mA			0.4	V
	IL	Output leakage current	VPO=12V			1.0	μA

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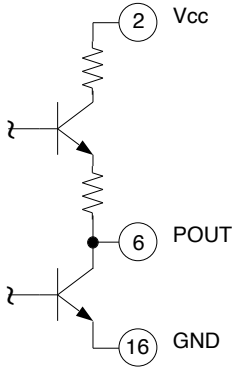
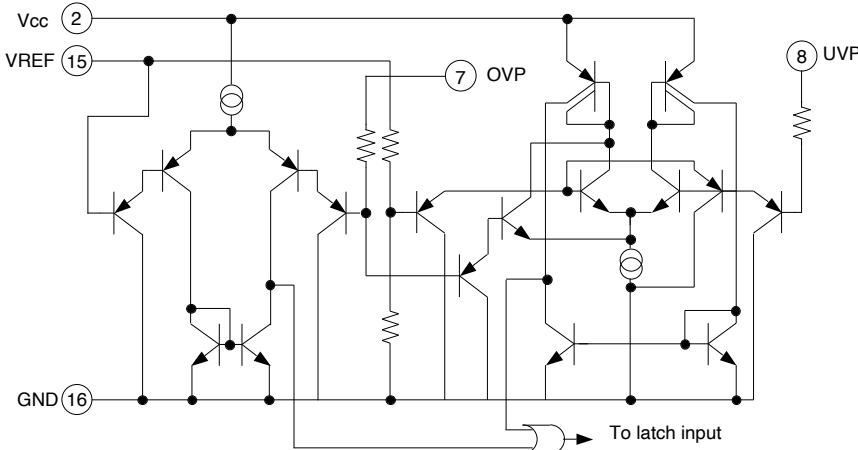
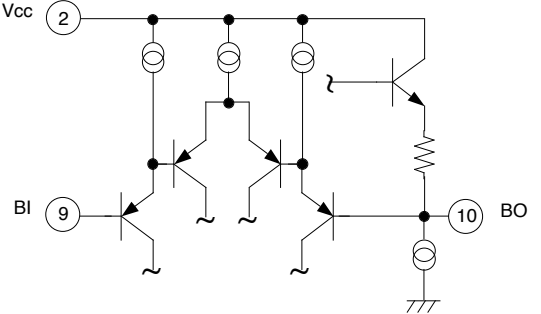
## Terminal functional description and equivalent circuit

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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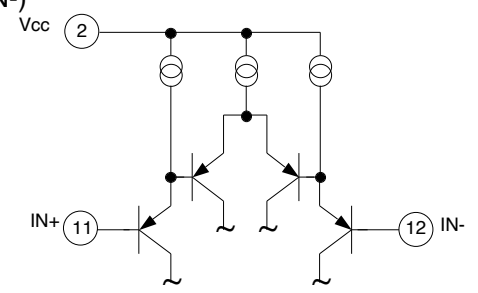
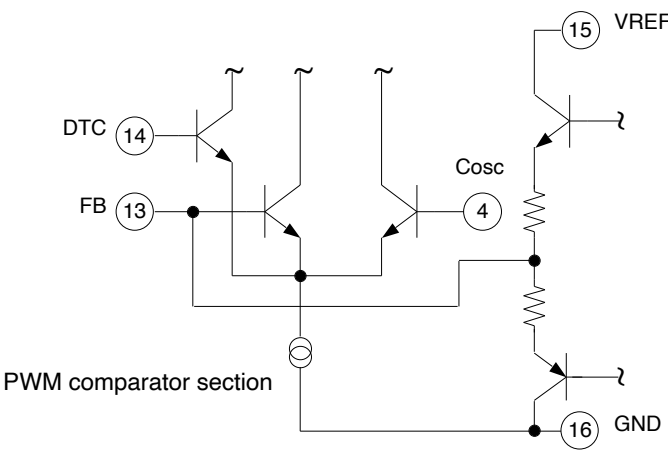
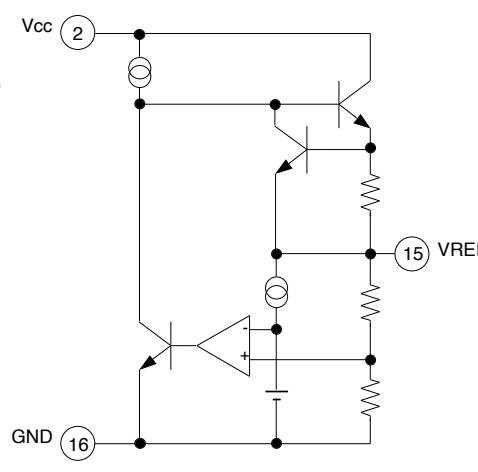
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Terminal No.	Symbol	Function and terminal circumscription circuitry
6	POUT	<ul style="list-style-type: none"> <li>•The abnormal state detection output terminal</li> <li>•The output becomes "H" from "L" when an abnormality is detected in the OVP or 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 8	OVP UVP	<ul style="list-style-type: none"> <li>•Over voltage protection of the control line (OVP)</li> <li>•Setting terminal voltage ;  <math>GND \leq VOVP &lt; VREF</math></li> <li>•Under voltage protection of the control line (UVP)</li> <li>•Setting terminal voltage ;  <math>GND \leq VUVP &lt; VOVP</math></li> </ul>  <p>Note: It is connected to GND when the abnormal detection terminal is not used.</p>
9 10	BI BO	<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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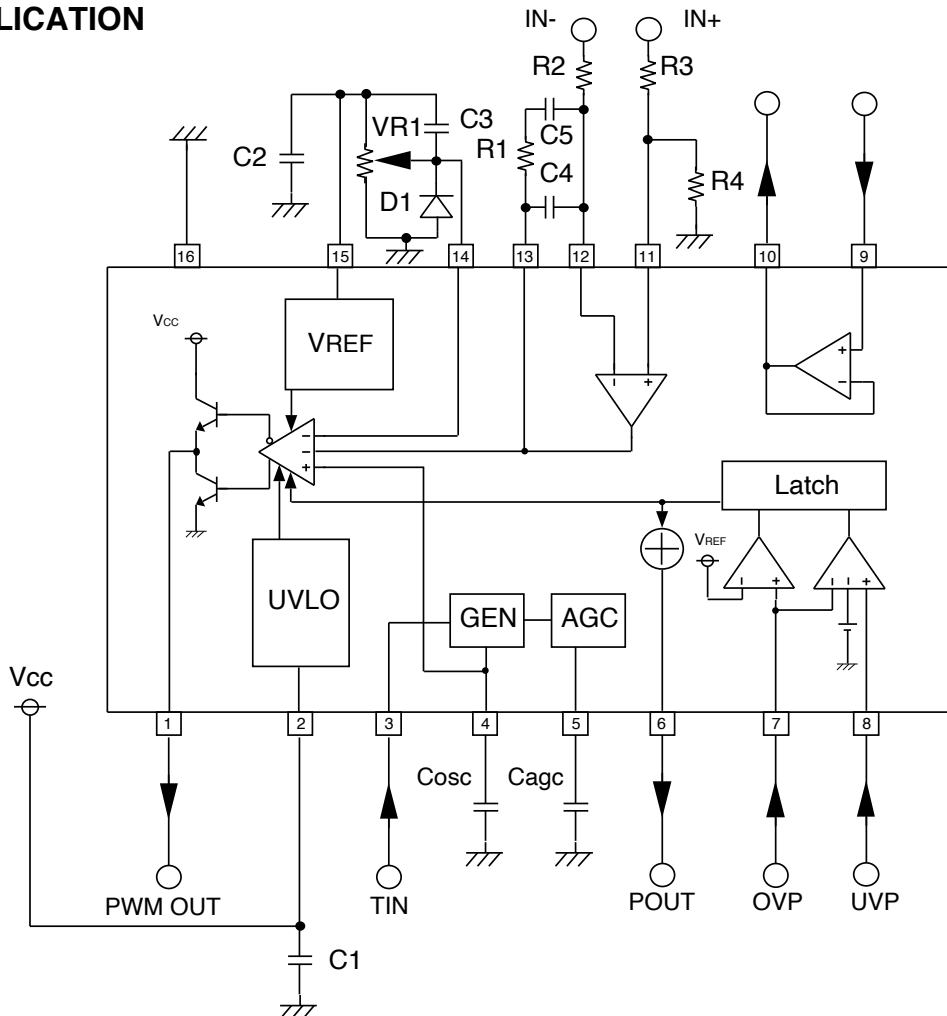
Terminal No.	Symbol	Function and terminal circumscription circuitry
11	IN+	<ul style="list-style-type: none"> <li>•Positive input terminal of an Op-Amp. (IN+)</li> <li>•Negative input terminal of an Op-Amp. (IN-)</li> </ul> 
12	IN-	
13	FB	<ul style="list-style-type: none"> <li>•Output terminal of an 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> 
14	DTC	
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	•Ground terminal

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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 10kΩ.

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 kΩ to dozens of kΩ 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 kΩ to several hundreds kΩ.

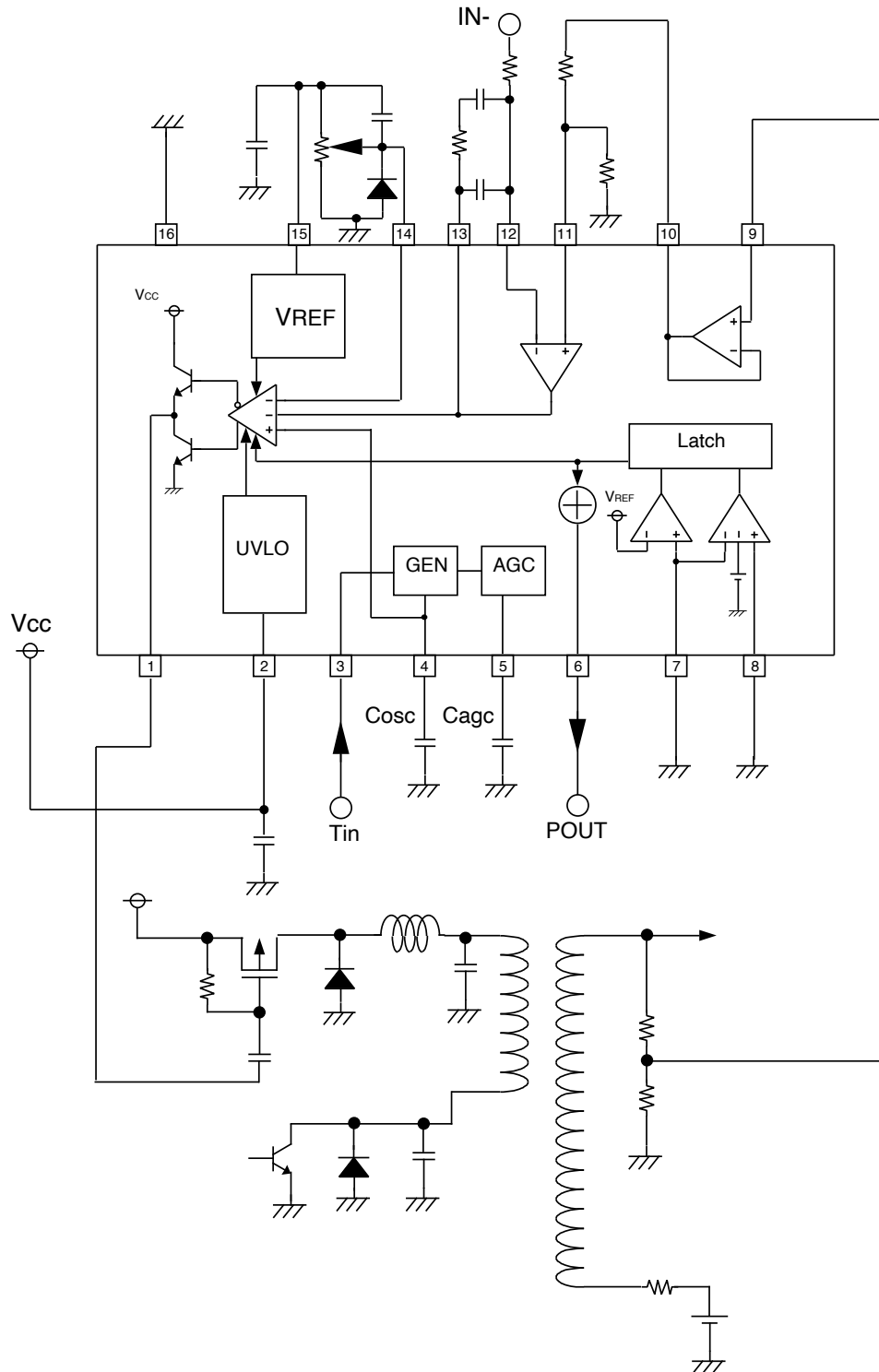
\*Annotation: Connect 7pin and 8pin terminal to GND when don't use under voltage protection (UVP).

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**EXAMPLE OF APPLICATION CIRCUIT**



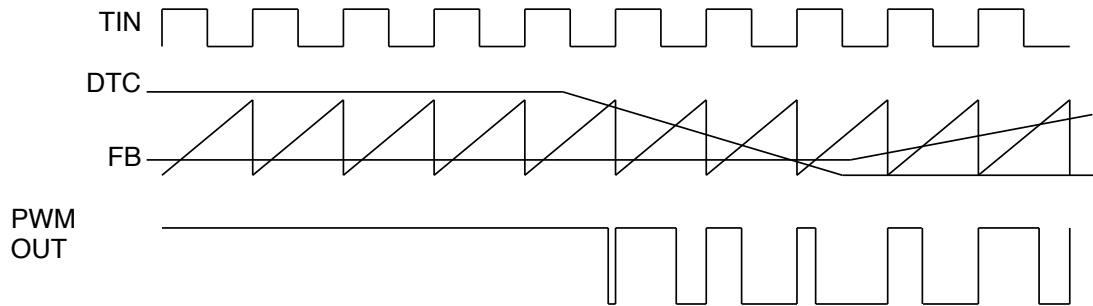


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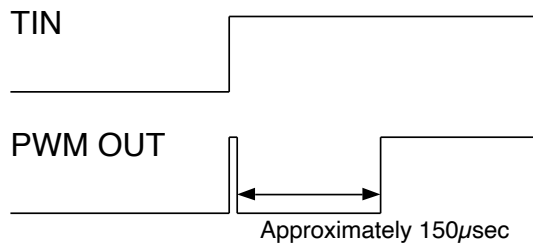
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## Timing chart



- 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".)

