

**PRELIMINARY**  
 Notices: This is not a final specification.  
 Some parametric limits are subject to change.

MITSUBISHI (Dig./Ana. INTERFACE)

# M62502FP

PWM IC for the synchronized deflection system control

## GENERAL DESCRIPTION

The M62502 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 and a horizontal output correction of CRT monitors because of its following circuits and functions;

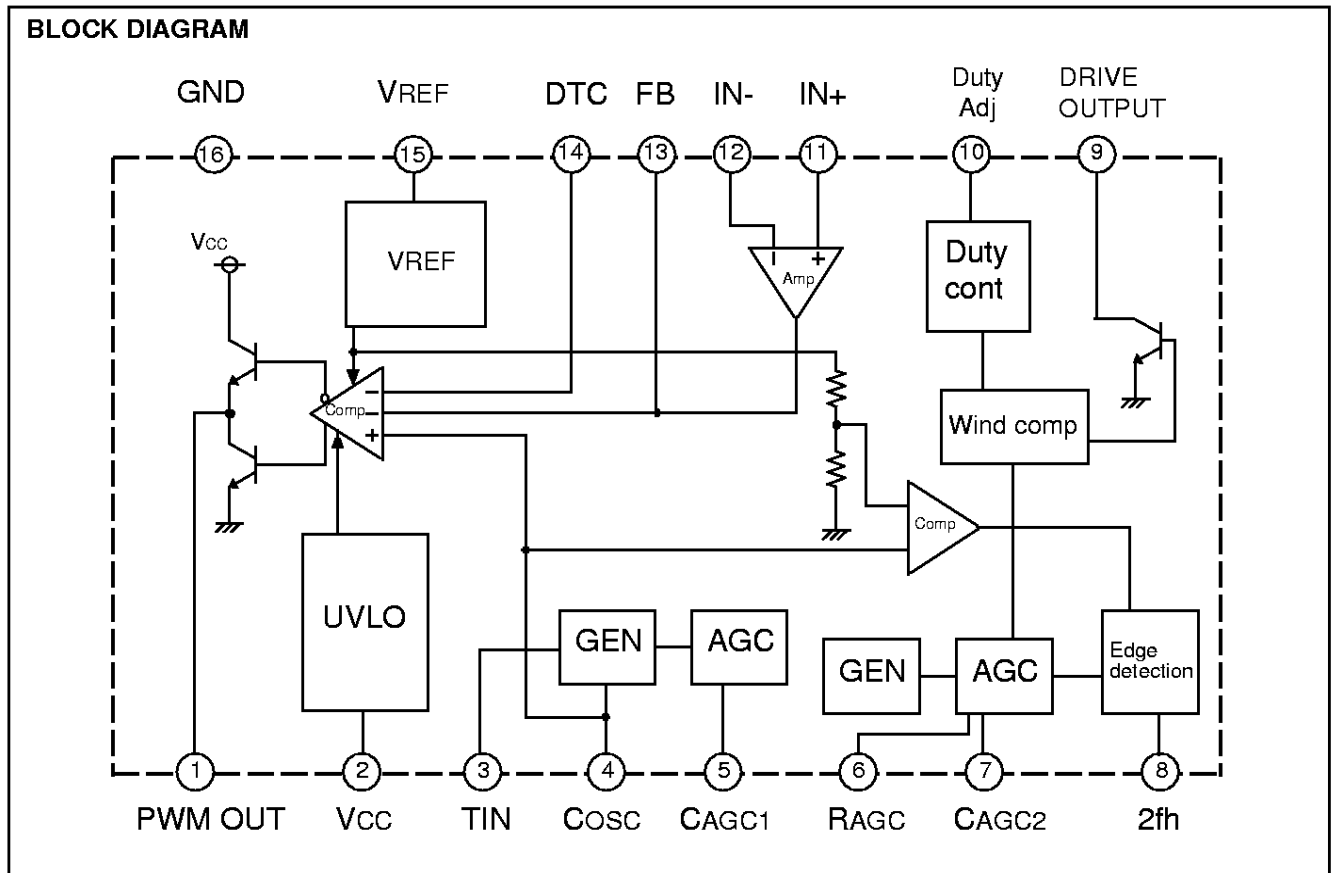
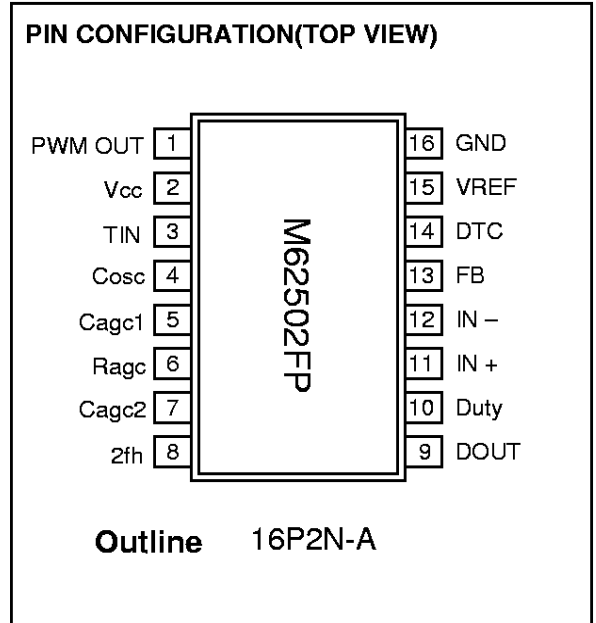
- Under Voltage Lock Out circuit (UVLO)
- Soft-start function

## FEATURES

- PWM output synchronized with external signals
- Wide PWM control frequency  
15kHz to 150kHz
- Soft start function
- Low voltage malfunction protection circuit  
start  $V_{cc} > 9V$   
stop  $V_{cc} < 6V$

## APPLICATION

- C R T display monitor



**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	Cagc1	AGC setting
6	RAGC	AGC Current setting resistor connected to this terminal
7	Cagc2	AGC setting
8	2fh	Double velocity reshuffle
9	DOUT	Drive output
10	Duty	Duty regulation
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 Rating (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
Vd	Drive output voltage		15	V
Id	Drive output current		20	mA
VICM	Error amplifier input common mode voltage range		-0.3 to VCC	V
VID	Error amplifier input common mode voltage		VCC	V
Pd	Power dissipation		650	mW
Kθ	Thermal derating ratio	Ta>25°C	5.2	mW/°C
Topr	Operating ambient temperature		-20 to +75	°C
Tstg	Storage temperature		-40 to +150	°C

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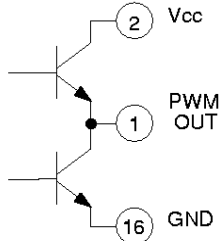
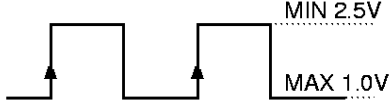
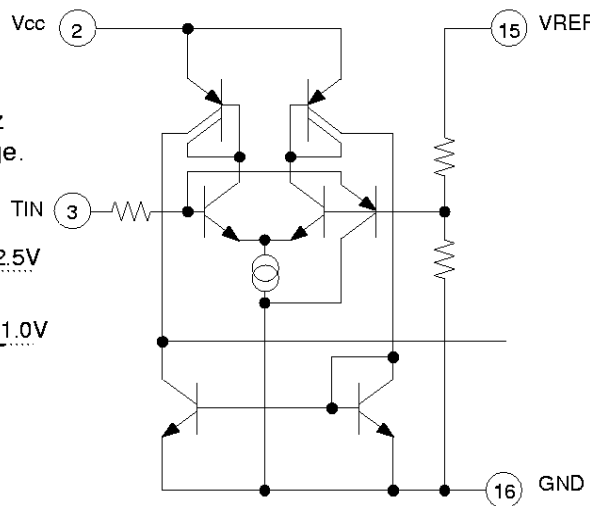
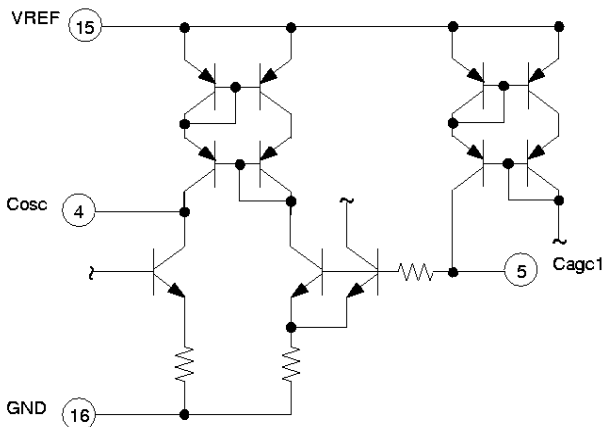
**ELECTRICAL CHARACTERISTICS (Vcc=12V, TIN=40kHz, Ta=25°C, unless otherwise noted)**

Block	Symbol	Parameter	Test conditions	Limits			Unit
				Min	Typ	Max	
	VCC	Range of power supply		VCC OFF		14	V
	ICC	Circuit current	Output off mode		25		mA
Reference voltage section	VREF	Reference voltage		4.80	5.00	5.20	V
	Reg-in	Input regulation			1.0	10	mV
	Reg-L	Load regulation			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
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
Duty adj section	IDuty	Input current	VDuty=2.5V	-6.5	-1.3	-	μA
	Duty max	Maximum ON duty	VDuty=3V		5.0		μsec
UVP section	VUVPO	Input offset voltage	Id=10mA			0.4	V
	IIN UVP	UVP terminal input current	VDO=12V			1.0	μA
fh reshuffle section	I <sub>fh</sub>	fh terminal current	V <sub>fh</sub> =5V	-	330	430	μA
	V <sub>fh</sub>	fh reshuffle voltage		0.4VREF	0.5VREF	0.6VREF	V

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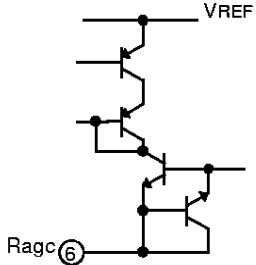
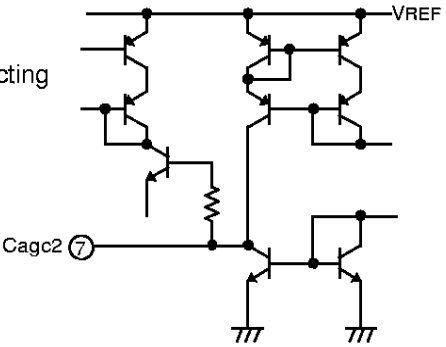
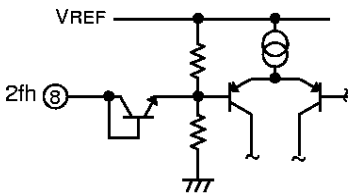
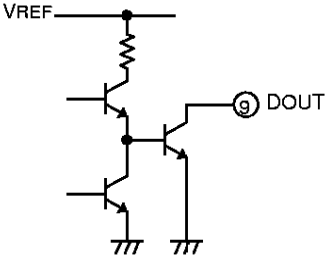
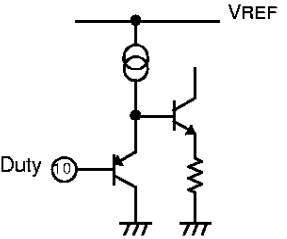
## Terminal functional description and equivalent circuit

Terminal No	Symbol	Function and internal circuit
1	PWM OUT	<p>PWM output</p> <ul style="list-style-type: none"> <li>• PWM output synchronized with the TIN input is available.</li> <li>• Output "H" level = 10.5V typ (The output current: -100mA, Vcc=12V)</li> <li>• Output "L" level = 0.7V Typ (The output current: +100mA, Vcc=12V)</li> </ul> 
2	Vcc	Power supply
3	TIN	<p>Trigger input</p> <ul style="list-style-type: none"> <li>• Frequency range 15kHz to 150kHz</li> <li>• It is taken on a leading edge.</li> </ul> <p>TIN input waveform</p>  
4	Cosc	<p>A saw-wave oscillator timing setting (Cosc)</p> <ul style="list-style-type: none"> <li>• A saw-wave is generated by connecting the capacitor between pin4 and GND.</li> <li>• Recommended capacitor value is 1000pF.</li> </ul> <p>Setting AGC sensitivity (Cagc1)</p> <ul style="list-style-type: none"> <li>• The sensitivity of AGC circuit is set by connecting the capacitor between pin5 and GND.</li> <li>• Recommended capacitor value is 1μF.</li> </ul> 
5	Cagc1	

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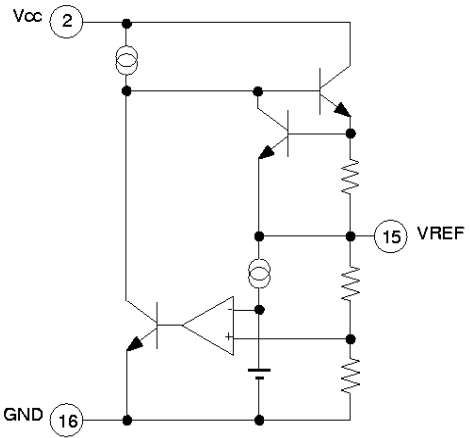
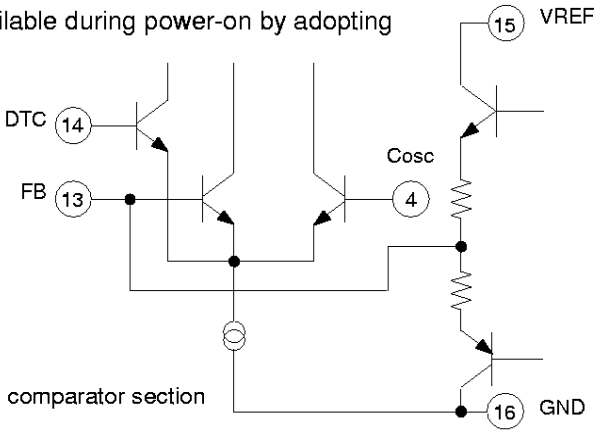
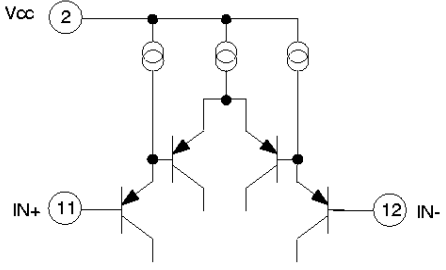
Terminal No	Symbol	Function and internal circuit
6	Ragc	<p>AGC current setting</p> <ul style="list-style-type: none"> <li>The resistor is connected between pin6 and GND for setting AGC current flowing in DOUT circuit.</li> </ul> 
7	Cagc2	<p>Setting AGC sensitivity</p> <ul style="list-style-type: none"> <li>The sensitivity of AGC is set by connecting the capacitor between pin7 and GND.</li> <li>Recommended capacitor value is 1<math>\mu</math>F.</li> </ul> 
8	2fh	<p>Frequency selection</p> <ul style="list-style-type: none"> <li>The frequency of drive output is alternated between just(fh) and doubled(2fh) one.</li> </ul> <p>OPEN, GND : fh  VREF : 2fh</p> 
9	DOUT	<p>Drive output</p> <ul style="list-style-type: none"> <li>Open collector circuit.</li> </ul> 
10	Duty	<p>The duty adjustment of drive output</p> 

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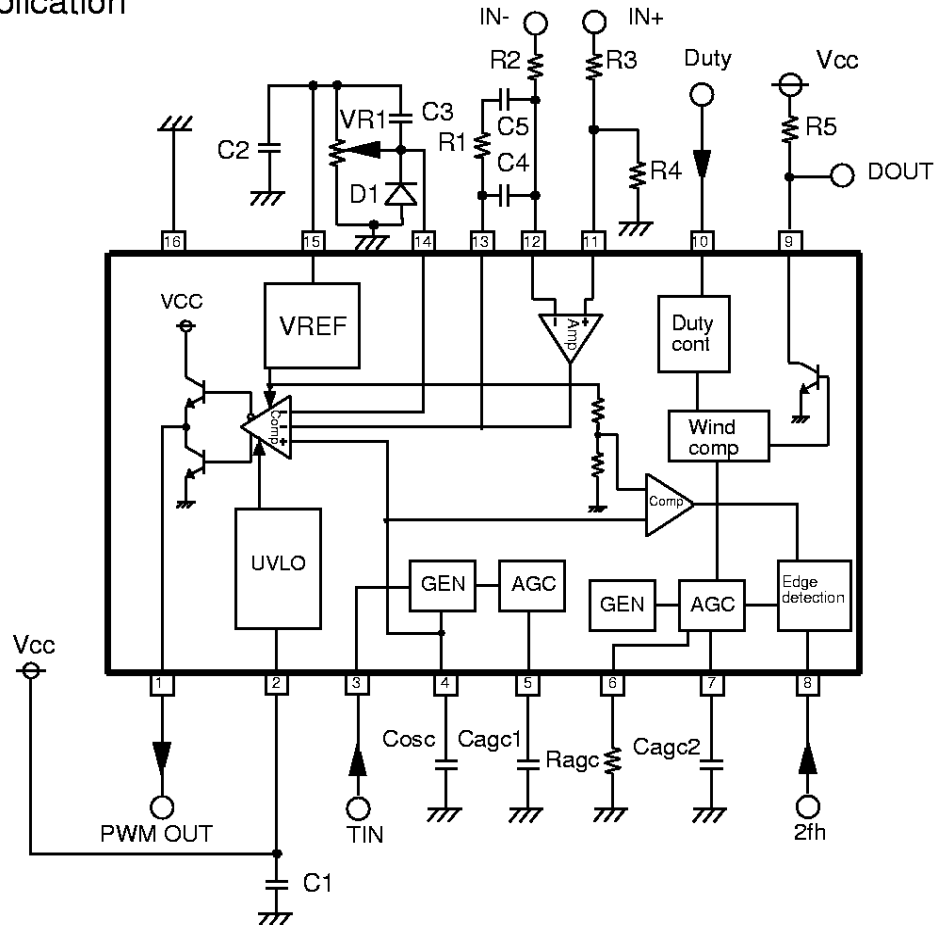
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Terminal No	Symbol	Function and internal circuit
11	IN+	Positive input of Op-Amp (IN+)
12	IN-	Negative input of OP Amp (IN-)
13	FB	Output of Op-Amp (FB)
14	DTC	Dead time control (DTC) • A soft start function is available during power-on by adopting a time constant.
15	VREF	Reference voltage terminal • 5V is output via this terminal. A current capability is 5mA.
16	GND	• Ground



M62502 application



- C1,C2 ----- These capacitors are for stabilization of Vcc and VREF.
- VR1 ----- It is decided considering a current capability of VREF. (The capability is about 5mA.) Recommended value is around 10kΩ
- C3,D1 ----- They are for a soft start function. A time constant is decided considering VR1.
- Cagc1,2 ----- These capacitors are for stabilization of AGC circuit. A larger capacitor improves a stability of the system, however a system response is degraded. Recommended capacitor value is around 1μF.
- Cosc ----- This capacitor is for the saw-wave generation. Recommended capacitor value is around 1000pF.
- R1,R2,R3,R4 ----- They are for the gain setting of the error Amp. R2 should be several kΩ to dozens of kΩ to set a voltage gain 20dB to 40dB 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.
- Ragc ----- This resistor is for the AGC setting of DOUT. Recommended value is 27kΩ.
- R5 ----- It is a pull-up resistor of DOUT output, because DOUT is configured by the open collector circuit. Recommended value is several kΩ.