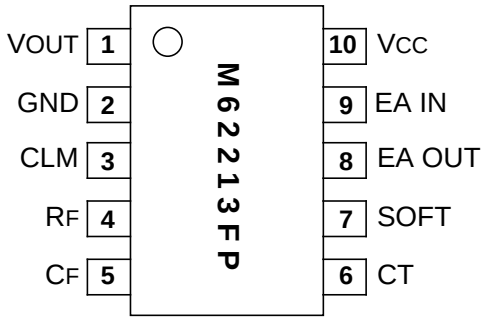
M62213FP

GENERAL PURPOSE HIGH SPEED PWM CONTROL IC

GENERAL DESCRIPTION

The M62213FP is a general purpose high-speed PWM control IC. This IC, housed in small 10-pin package contains many functions and protection circuits which allow to simplify peripheral circuits and design a compact set.
It can be operated with high speed switching (700kHz Max) in a high speed PWM comparator and current limiting circuit.

PIN CONFIGURATION (TOP VIEW)



OUTLINE 10P2N-A

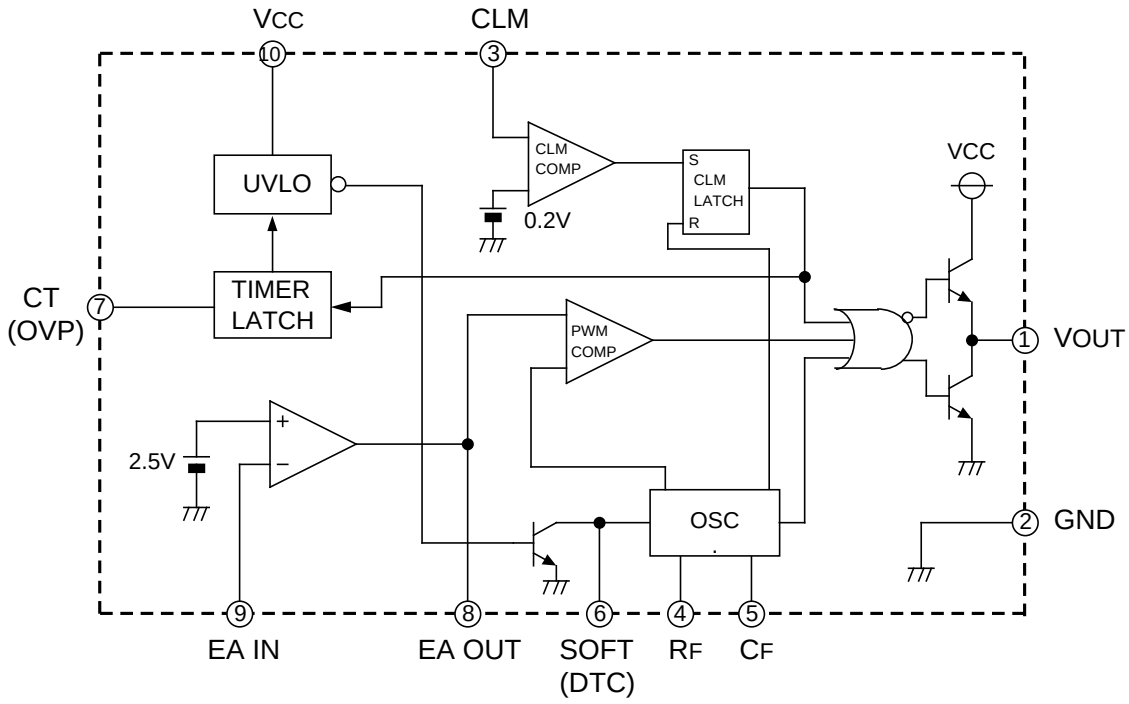
FEATURES

- 700kHz-operation to MOS- FET
  - Output current Io = ±1A
  - Totem pole output circuit
- Timer type latch protection circuit with OVP
- Soft start operation (with dead time control)
- Built-in OP-Amp for feedback control
  (photo coupler can be driven)
- High speed pulse-by-pulse current limiting
- Small 10-pin SOP package

APPLICATION

- Switching Regulator
- DC-DC Converter

BLOCK DIAGRAM



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

Symbol	Parameter	Condition		Rating	Unit
Vcc	Supply voltage			36	V
IOUT	Output terminal current		Continuous	150	mA
			Peak	1.0	A
VCT	CT terminal supply voltage			36	V
VEA IN	EA IN terminal supply voltage			10	V
VCLM	CLM terminal supply voltage			-0.3 to 4.0	V
Pd	Power dissipation			440	mW
Ktheta	Thermal derating	Ta ≥ 25°C		3.52	mW/°C
Topr	Operating temperature			–20 to 85	°C
Tstg	Storage temperature			–40 to 150	°C
Tj	Junction temperature			150	°C

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc=14V, unless otherwise noted)

Block	Symbol	Parameter	Test condition	Limits			Unit
				Min	Typ	Max	
All device	Vcc	Supply voltage range		Vcc (STOP)	——	35	V
	Vcc(START)	Operation start-up voltage		11.5	12.5	13.5	V
	Vcc(STOP)	Operation stop voltage		7.6	8.3	9.0	V
	ΔVcc	Start-up and stop voltage difference		3.5	4.2	5.1	V
	IccL	Stand-by current	VCC=10V		130		µA
	Icco	Operating current			13		mA
CT	VTHCTH	CT term. "H" threshold voltage			4.0		V
	VTHCTL	CT term. "L" threshold voltage			0.7		V
	ITIMEOFFIN	CT term. input current (timer off mode)			100		µA
	ITIMEOFFOUT	CT term. output current (timer off mode)			-15.0		µA
Error Amp	VB	Reference voltage		2.4	2.5	2.6	V
	IB	Input bias current			-100		nA
	AV	Open loop gain			70		dB
	fT	Unity gain bandwidth			1		MHz
	IOS	Output source current	When VEAIN=0V		100		µA
	VOm+	Output voltage (High condition)			5.25		V
	VOm-	Output voltage (Low condition)			0.10		V
CLM	VTHCLM	CLM term. threshold voltage			200		mV
	IOUTCLM	CLM term. output current	When VCLM=0V		-200		µA
	TPDCLM	CLM term. delay time	Delay time to output		90		nS

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc=14V, unless otherwise noted)

Block	Symbol	Parameter	Test condition	Limits			Unit
				Min	Typ	Max	
SOFT	VSOFT(0%)	Input voltage range at 0% duty	Soft term. voltage range to set 0% duty	0		0.5	V
	VSOFT(50%)	Input. voltage at 50% duty	Soft term. voltage at 50% duty		2.7		V
	Duty Max	Maximum duty			90		%
	ISOFT	Soft term. input current			-50		μA
OSC.	fOSCmax	Maximum oscillation frequency				700	KHz
	fOSC	Oscillation frequency	CF=270pF , RF=62 kΩ		200		KHz
OUTPUT	VOL1	Output low voltage	Vcc=14V,Io=10mA		0.05	0.4	V
	VOL2		Vcc=14V,Io=100mA		0.7	1.4	V
	VOH1	Output high voltage	Vcc=14V,Io=-10mA	12.0	12.5		V
	VOH2		Vcc=14V,Io=-100mA	11.5	12.0		V
	TRISE	Output voltage rise time	No load		50		nS
	TFALL	Output voltage fall time	No load		35		nS

FUNCTIONAL DESCRIPTION AND APPLICATION

(1) EA IN, EA OUT TERMINAL

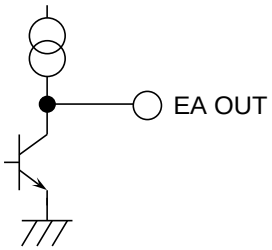
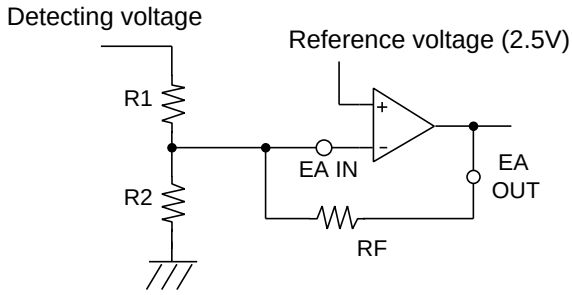


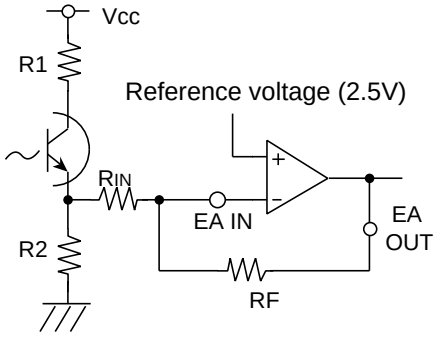
Fig.1 Circuit diagram of EAOUT terminal

Peripheral circuit of Error Amp



An operating point is set by R1 and R2 and a voltage gain is set by a ratio among R1, R2 and RF.

Fig.2-1 Method to detect the primary side voltage



An operating point is set by R1 and R2 and a voltage gain is set by a ratio among RIN and RF.

Fig.2-2 Method to use photo-coupler

(2) CT TERMINAL

Constant charge current to the capacitor flows out from the CT terminal when CLM is active in the timer type latch circuit. When the voltage level of CT terminal is over "H" threshold, the latch will start to operate and then the function of this IC will be stopped.
Without the timer type latch function, this IC will stop to operate when the voltage level of CT terminal is over "H" threshold. So, CT terminal can use OVP function.
Only use the OVP function, to connect resister between CT terminal and GND.
In this case, voltage level of CT terminal can't reach "H" threshold level, and only charge current of the capacitor flows out.

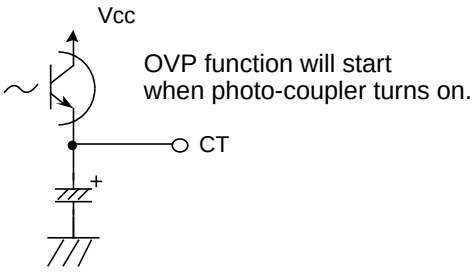


Fig.3-1 Method to use timer type latch and OVP

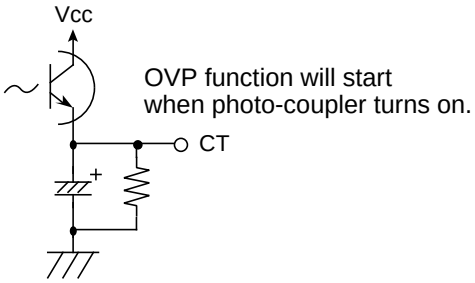


Fig.2-2 Method to use only OVP

(3) SOFT(DUTY SET-UP) TERMINAL

The voltage of SOFT terminal sets the maximum duty. And it can easily set the maximum duty by connecting the resistor between the SOFT terminal and GND (shown in Fig 4), because the constant current that is assured in a temperature characteristics flows out from the SOFT terminal.
It can operate SOFT start function as increase the duty step by step when start-up, by connecting the capacitor between SOFT terminal and GND.
This including circuit of SOFT start terminal has a discharge circuit that operate when star-up mode. It can operate SOFT start function certainly.

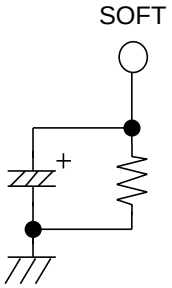


Fig.4
Method to set-up duty
and SOFT start function.

(4) CLM TERMINAL

This terminal detect the over-current using pulse-by-pulse current limiting.
This current limiting circuit is the same as that of M51995.
If the detect voltage is too large, the voltage is divided by resistors (refer to fig.5-2).

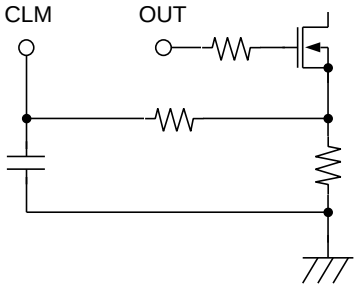


Fig. 5-1 Standard application

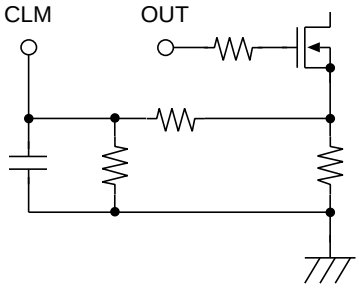


Fig. 5-2 Method to large input voltage

(5) CF, RF TERMINAL

These terminals fix the oscillation frequency by connecting a resistor to RF and a capacitor to CF.
The resistor connected to RF fixes the charge and discharge current for the capacitor connected to CF.

(6) Attention for the heat generation

The maximum ambient temperature of the M62213FP is +85°C, however, the ambient temperature in vicinity of the IC is not uniform and varies place by place, as the amount of power dissipation is fairly large and a heat generation is concentrated locally in the switching regulator.
So, it is one of the good idea to check the IC package temperature. The temperature difference between the IC junction and the surface if IC package is 30°C or less, when the IC junction temperature is measured by temperature dependency of forward voltage of pn junction, and IC package temperature is measured by "thermo-viewer", and also the IC is mounted on the "phenol-base" PC board in normal atmosphere.
So it is concluded that the maximum case temperature (surface temperature of IC) rating is 100°C with adequate margin.

M62213 APPLICATION CIRCUIT (FLY-BACK)