

FA7610P(N)/FA7612P(N)

Bipolar IC
For Switching Power Supply Control

■ Description

The FA7610P(N) and FA7612P(N) are bipolar ICs containing basic circuits necessary for PWM-type switching power supply control.

To minimize the number of external discrete components, the FA7610P(N) is provided for a flyback or step-up power-supply circuit and the FA7612P(N) for a step-down power-supply circuit.

■ Features

FA7610P(N)

- For flyback transformer-type or step-up power-supply circuit (maximum output duty = 64% typical)
- Totem-pole predriver
- PWM-type switching power supply control
- Low-voltage operation ($V_{CC} = 3.6$ to $22V$)
- Latch-mode short-circuit protection function (no malfunction by noise)
- Soft-start function
- Undervoltage lock-out function
- One capacitor shared for short circuit protection and for soft-start to minimize the number of external discrete components

FA7612P(N)

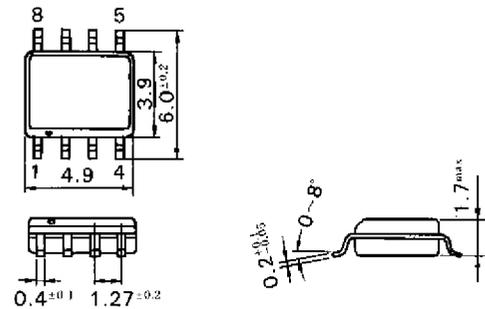
- For step-down power-supply circuit (maximum output duty = up to 100%)
- Open collector output
- PWM-type switching power supply control
- Low-voltage operation ($V_{CC} = 3.6$ to $22V$)
- Latch-mode short-circuit protection function (no malfunction by noise)
- Soft-start function
- Undervoltage lock out function
- One capacitor shared for short circuit protection and for soft-start to minimize the number of external discrete components

■ Applications

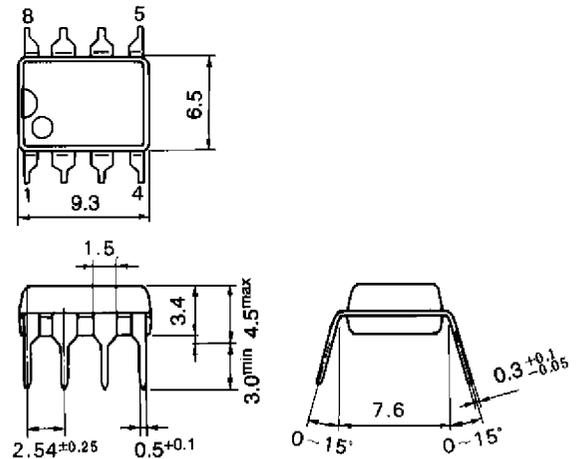
- Battery power supply for portable equipment

■ Dimensions, mm

• SOP-8



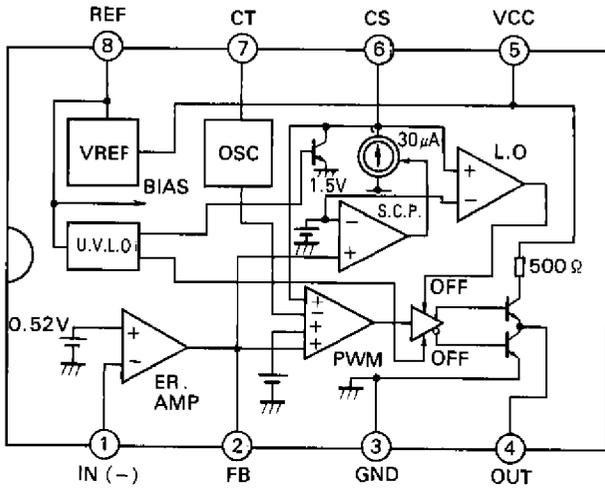
• DIP-8



FA7610P(N)/FA7612P(N)

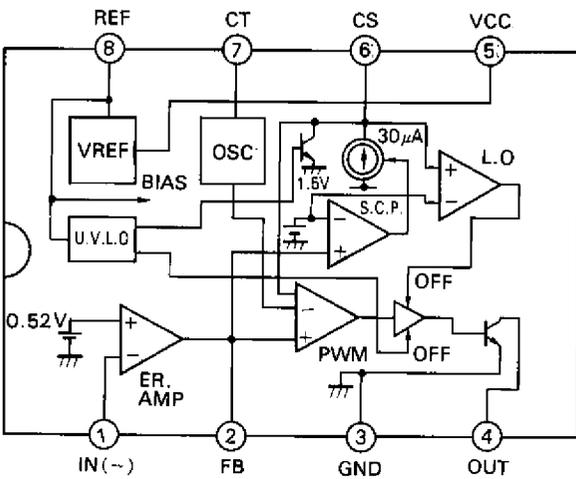
■ Block diagram

● FA7610P(N)



Pin No.	Pin symbol	Description
1	IN (-)	Inverting input to error amplifier
2	FB	Error amplifier output
3	GND	Ground
4	OUT	Output
5	VCC	Power supply
6	CS	Capacitor for soft-start, short-circuit protection and delay
7	CT	Oscillator timing capacitor
8	REF	Reference voltage output (2.5V)

● FA7612P(N)



Pin No.	Pin symbol	Description
1	IN (-)	Inverting input to error amplifier
2	FB	Error amplifier output
3	GND	Ground
4	OUT	Output
5	VCC	Power supply
6	CS	Capacitor for soft-start, short-circuit protection and delay
7	CT	Oscillator timing capacitor
8	REF	Reference voltage output (2.5V)

■ Absolute maximum ratings (Ta = 25°C)

Item	Symbol	Rating		Unit
		FA7610P(N)	FA7612P(N)	
Supply voltage	V _{CC}	22	22	V
Reference voltage output current	I _{OR}	5	5	mA
Output current	I _O	±50	80	mA
Total power dissipation	P _d	400	400	mW
Operating temperature	T _{opr}	-20 to +85	-20 to +85	°C
Storage temperature	T _{stg}	-40 to +150	-40 to +150	°C

■ Recommended operating conditions

Item	Symbol	FA7610P(N)		FA7612P(N)		Unit
		Min.	Max.	Min.	Max.	
Supply voltage	V _{CC}	3.6	20	3.6	20	V
Feedback resistance	R _{NF}	100		100		kΩ
Oscillator timing capacitor	C _T	220	22,000	220	22,000	pF
Oscillator timing resistance	R _T	10	100	10	100	kΩ
Oscillation frequency	f _{OSC}	5	200	5	500	kHz

■ Electrical characteristics (Ta = 25°C, V_{CC} = 6V, R_T = 33kΩ, C_T = 1000pF)

Reference voltage section Common to FA7610P(N) and FA7612P(N)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Output voltage	V _{REF}	I _{OR} = 1mA	2.38	2.50	2.62	V
Line regulation	LINE	V _{CC} = 3.6 to 20V		4	12	mV
Load regulation	LOAD	I _{OR} = 0.1 to 1mA		1	6	mV
Output voltage variation due to temperature change	V _{TC1}	T _a = -20 to +25°C	-1		1	%
	V _{TC2}	T _a = +25 to +85°C	-1		1	%

Oscillator section Common to FA7610P(N) and FA7612P(N)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f _{OSC}	C _T = 1000pF, R _T = 33kΩ	85	105	125	kHz
Frequency variation 1 (due to supply voltage change)	f _{ΔV}	V _{CC} = 3.6 to 20V		1		%
Frequency variation 2 (due to temperature change)	f _{ΔT}	T _a = -20 to +85°C		5		%

Error amplifier section Common to FA7610P(N) and FA7612P(N)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Reference voltage	V _B		0.47	0.52	0.57	V
Input bias current	I _B			5	100	nA
Open-loop voltage gain	A _V		70			dB
Unity-gain bandwidth	G _B			0.6		MHz
Maximum output voltage (Pin 2)	V _{OM+}	R _{NF} = 100kΩ	V _{REF} -0.2			V
	V _{OM-}	R _{NF} = 100kΩ			200	mV
Output source current (Pin 2)	I _{OM+}	V _{OM} = 1V	40	85	200	μA

PWM comparator section

Item	Symbol	Test condition	FA7610P(N)			FA7612P(N)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input threshold voltage (pin 2)	V _{TH0}	Duty cycle = 0%		0.85	0.95		0.85	0.95	V
Input threshold voltage (pin 2)	V _{TH50}	Duty cycle = 50%		1.1			1.1		V
Maximum duty cycle	α _M	(Pin 2 = 1.2V)	55	64	85		100		%

FA7610P(N)/FA7612P(N)

Soft-start circuit Common to FA7610P(N) and FA7612P(N)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input bias current (Pin 6)	I _B CS			80	300	nA
Input threshold voltage (Pin 6)	V _{TH} CS0	Duty cycle = 0%		0.22	0.32	V
Input threshold voltage (Pin 6)	V _{TH} CS50	Duty cycle = 50%		0.46		V

Short-circuit protection circuit section Common to FA7610P(N) and FA7612P(N)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input threshold voltage (Pin 2)	V _{TH} PC		1.20	1.50	1.80	V
Charge current (Pin 6)	I _{CHG}	Pin 6 = 0V, Pin 2 = 2V	10	30	50	μA
Latch-mode threshold voltage (Pin 6)	V _{TH} LA		1.20	1.50	1.80	V

Undervoltage lockout circuit section Common to FA7610P(N) and FA7612P(N)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF-to-ON threshold voltage	V _{TH} ON			2.70		V
ON-to-OFF threshold voltage	V _{TH} OFF			2.52		V
Voltage hysteresis	V _{HYS}		60	180		mV

Output section

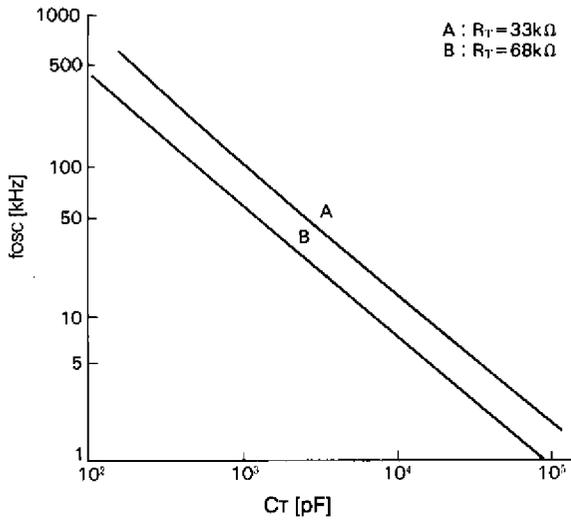
Item	Symbol	Test condition	FA7610P(N)			FA7612P(N)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
H-level output voltage (Pin 4)	V _{OH}	R _L = 10kΩ	3.5	4.0		—	—	—	V
L-level output voltage (Pin 4)	V _{OL}	Output sink current = 20mA		0.25	0.65		0.9	1.5	V
Output source current (Pin 4)	I _{SOURCE}	Pin 4 = 0V	8	11	14	—	—	—	mA

Overall device

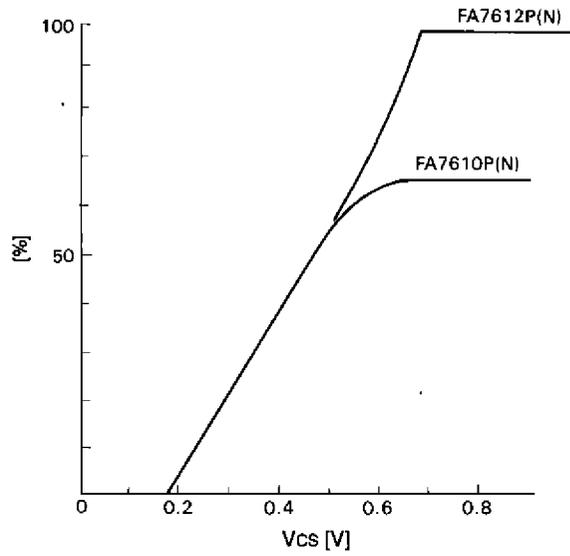
Item	Symbol	Test condition	FA7610P(N)			FA7612P(N)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Supply current	I _{CC} LA	Latch mode		1.6	2.2		1.5	2.2	mA
Operating-state supply current	I _{CC} AV	R _L = ∞ Duty cycle = 50%		2.6	3.8		1.8	3.0	mA

■ Characteristic curves (Ta = 25°C)

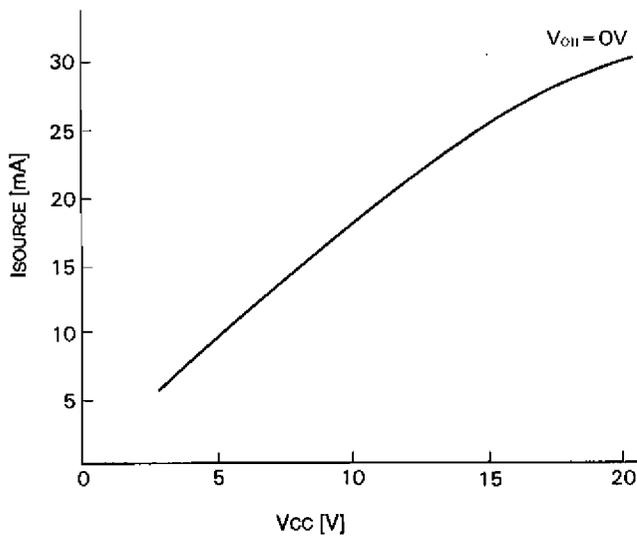
Oscillation frequency (fosc) vs. timing capacitor capacitance (Ct)



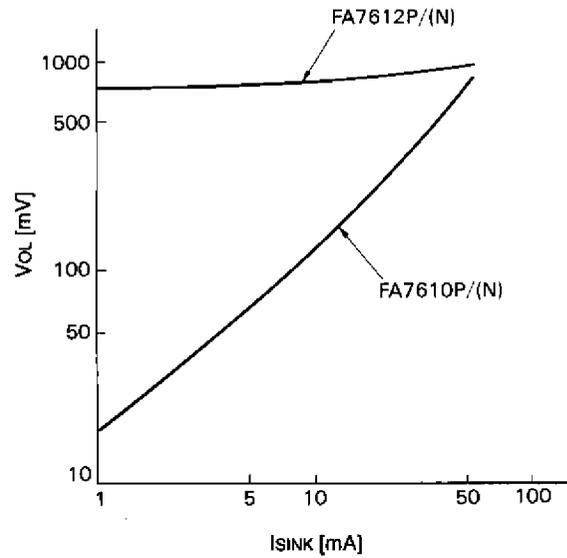
Output duty cycle vs. CS terminal voltage (Vcs)



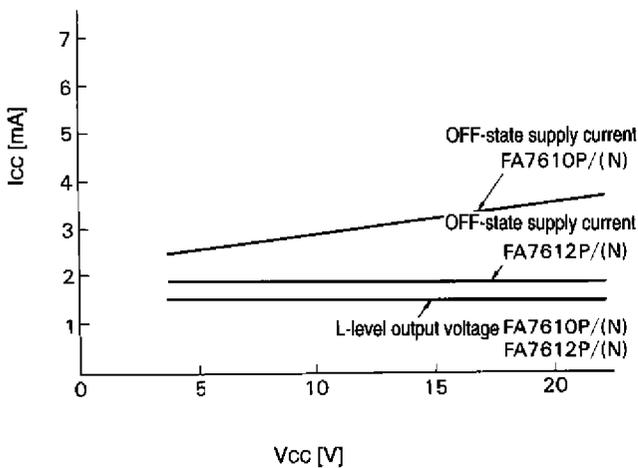
Output source current (Isource) vs. supply voltage (Vcc)



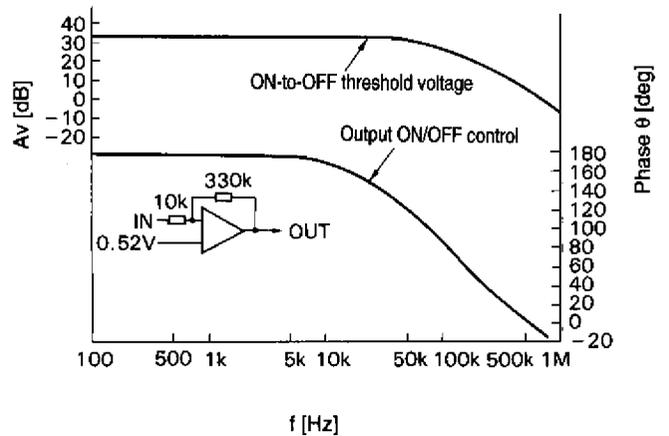
L-level output voltage (VOL) vs. output sink current (ISINK)



Supply current (Icc) vs. supply voltage (Vcc)



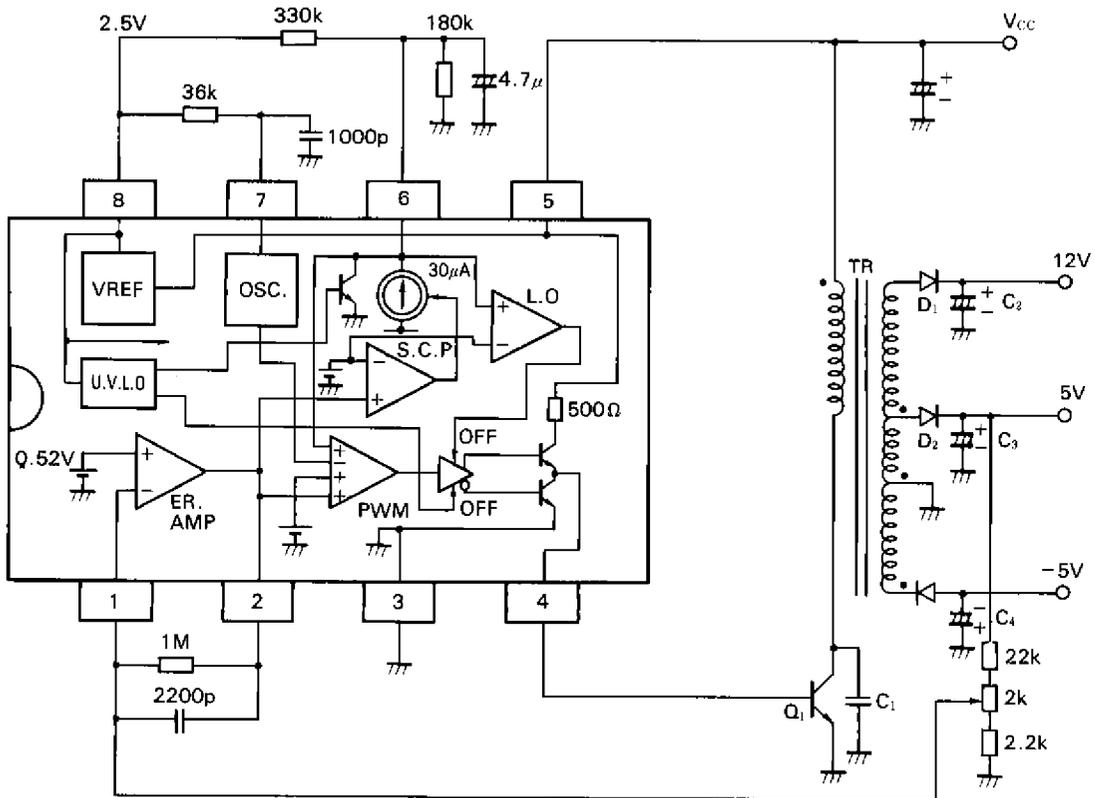
Error amplifier frequency (f) vs. voltage gain (Av) / phase



■ Application circuit

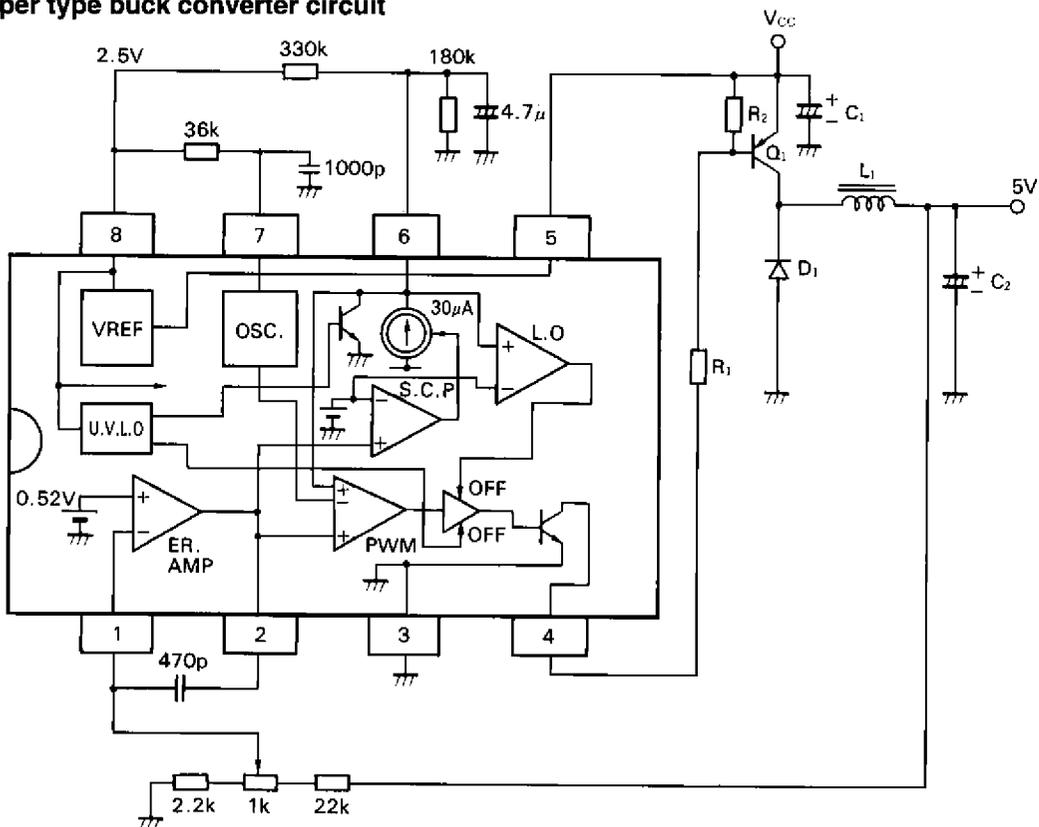
● FA7610P(N)

Flyback-transformer type converter circuit



● FA7612P(N)

Chopper type buck converter circuit



Parts tolerances characteristics are not defined in the circuit design sample shown above. When designing an actual circuit for a product, you must determine parts tolerances and characteristics for safe and economical operation.

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