

■ Description

The FA5310P(S) and FA5311P(S) are bipolar ICs for switching power supply control that can directly drive a power MOSFET.

These ICs contain many functions in a small 8-pin package. With these ICs, a high-performance and compact power supply can be created because not many external discrete components are needed.

■ Features

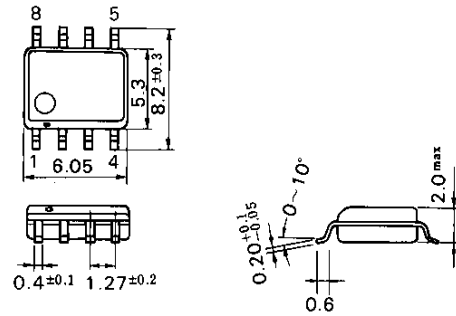
- Drive circuit for connecting a power MOS-FET ($I_o = \pm 1.5A$)
- Wide operating frequency range (5 to 600kHz)
- Pulse-by-pulse overcurrent limiting function
- Overload cutoff function (Latch or non-protection mode selectable)
- Output ON/OFF control function by external signals
- Overvoltage cutoff function in latch mode
- Undervoltage malfunction prevention function (ON at 16V and OFF at 8.7V)
- Low standby current (90 μA typical)
- Exclusive choices by circuits
Forward type: FA5310 ($D_{max} = 46\%$)
Flyback type: FA5311 ($D_{max} = 70\%$)
- 8-pin package (DIP/SOP)

■ Applications

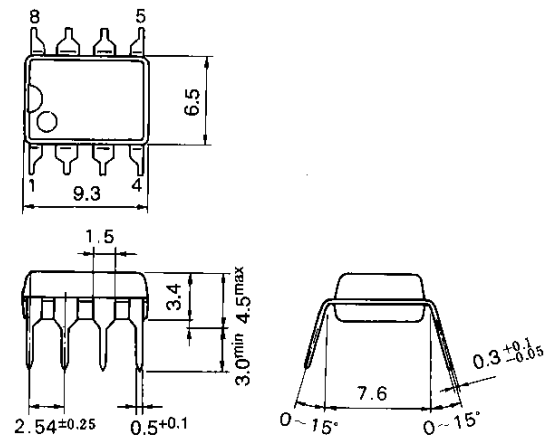
- Switching power supply for general equipment

■ Dimensions, mm

● SOP-8

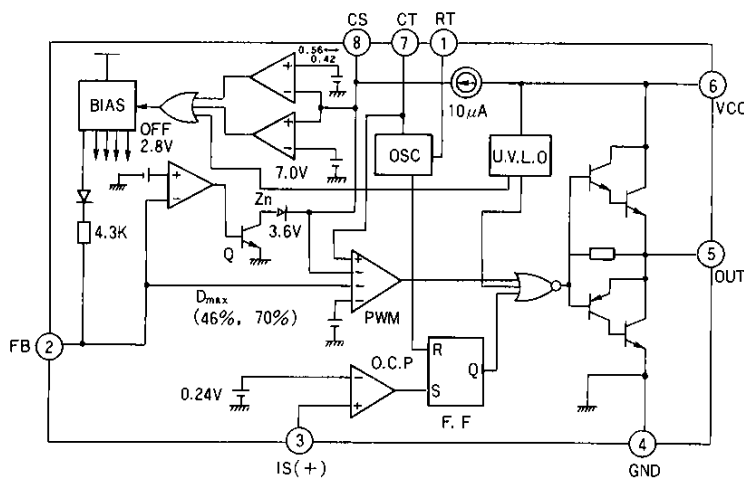


● DIP-8



■ Block diagram

● FA5310P(S)/FA5311P(S)



Pin No.	Pin symbol	Description
1	RT	Oscillator timing resistor
2	FB	Feedback
3	IS (+)	Overcurrent (+) detection
4	GND	Ground
5	OUT	Output
6	VCC	Power supply
7	CT	Oscillator timing capacitor
8	CS	Soft-start and ON/OFF control

■ Absolute maximum ratings

Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Rating	Unit
Supply voltage	V _{CC}	31	V
Output current	I _O	±1.5	A
Error amplifier input voltage	V _I	4	V
Feedback terminal input voltage	V _{FB}	4	V
Overcurrent detection terminal input voltage	V _{IS}	-0.3 to +4	V
CS terminal input current	I _{CS}	2	mA
Total power dissipation (T _a =25°C)	P _d	800 (DIP-8) *1 550 (SOP-8) *2	mW
Operating temperature	T _{opr}	-30 to +85	°C
Storage temperature	T _{stg}	-40 to +150	°C

■ Recommended operating conditions

Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Min.	Max.	Unit
Supply voltage	V _{CC}	10	30	V
Oscillator timing resistance	R _T	3.3	10	kΩ
Soft-start capacitor	C _s	0.1	1	μF
Oscillation frequency	f _{osc}	5	600	kHz

Notes:

*1 Derating factor T_a > 25°C : 8.0mW/°C (on PC board)*2 Derating factor T_a > 25°C : 5.5mW/°C (on PC board)

■ Electrical characteristics (T_a = 25°C, V_{CC} = 18V, f_{osc} = 135kHz)

Oscillator section Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f _{osc}	C _T = 330pF	125	135	145	kHz
Frequency variation 1 (due to supply voltage change)	f _{dv}	V _{CC} = 10 to 30V		±1		%
Frequency variation 2 (due to temperature change)	f _{dr}	T _a = -30 to +85°C		±1.5		%

Pulse width modulation circuit section

Item	Symbol	Test condition	FA5310P (S)			FA5311P (S)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Feedback terminal source current	I _{FB}	V _{FB} = 0	-660	-800	-960	-660	-800	-900	μA
Input threshold voltage (Pin 2)	V _{TH FBO}	Duty cycle = 0%		0.75			0.75		V
	V _{TH FBM}	Duty cycle = D _{MAX}		1.80			2.30		V
Maximum duty cycle	D _{MAX}		43	46	49	66	70	74	%

Soft-start circuit section

Item	Symbol	Test condition	FA5310P(S)			FA5311P(S)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Charge current (Pin 8)	I _{CHG}	Pin 8 = 0V	-15	-10	-5	-15	-10	-5	μA
Input threshold voltage (Pin 8)	V _{TH CSO}	Duty cycle = 0%		0.90			0.90		V
	V _{TH CSM}	Duty cycle = D _{MAX}		1.90			2.40		V

Overcurrent limiting circuit section Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input threshold voltage (Pin 3)	V _{TH IS}		0.21	0.24	0.27	V
Overcurrent detection terminal source current	I _{IS}	Pin 3 = 0V	-300	-200	-100	μA
Delay time	T _{PD IS}			150		ns

FA5310P(S)/FA5311P(S)**Latch-mode cutoff circuit section** Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CS terminal sink current	ISINK CS	Pin 8 = 6V, Pin 2 = 1V	25	45	65	μ A
Cutoff threshold voltage (Pin 8)	V _{TH} CS		6.5	7.0	7.5	V

Overload cutoff circuit section Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Cutoff-state supply voltage (Pin 2)	V _{TH} FB		2.6	2.8	3.1	V

Undervoltage lockout circuit Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF-to-ON threshold voltage	V _{TH} ON		15.5	16.0	16.5	V
ON-to-OFF threshold voltage	V _{TH} OFF		8.20	8.70	9.20	V
Voltage hysteresis	V _{HYS}			7.30		V

Output section Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
L-level output voltage	V _{OL}	I _O = 100mA		1.30	1.80	V
H-level output voltage	V _{OH}	I _O = -100mA, V _{CC} = 18V	16.0	16.5		V
Rise time	t _r	No load		50		ns
Fall time	t _f	No load		50		ns

Output ON/OFF circuit section Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CS terminal source current	ISOURCE CS	Pin 8 = 0V	-15	-10	-5	μ A
OFF-to-ON threshold voltage (Pin 8)	V _{TH} ON	CS terminal voltage OFF→ON		0.56		V
ON-to-OFF threshold voltage (Pin 8)	V _{TH} OFF	CS terminal voltage ON→OFF		0.42		V

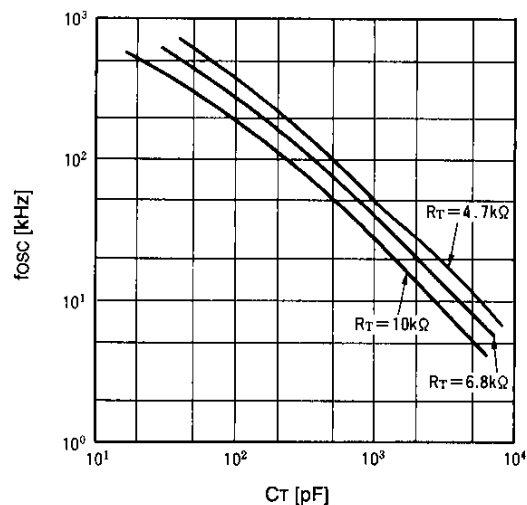
Overall device Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Standby current	I _{CC} ST	V _{CC} = 14V		90	150	μ A
Operating-state supply current	I _{CC} OP			9	15	mA
OFF-state supply current	I _{CC} OFF			1.1	1.8	mA
Cutoff-state supply current	I _{CC} L			1.1	1.8	mA

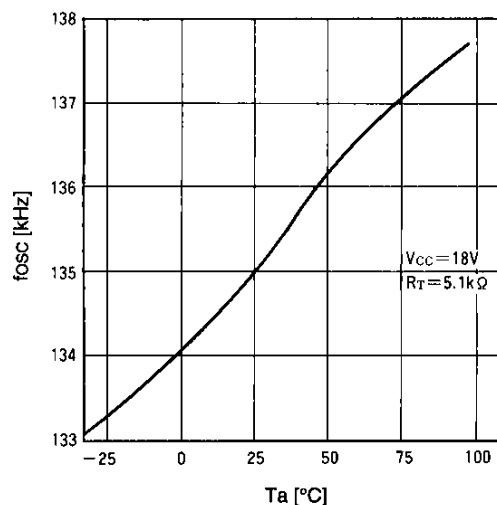
The ratings and pin numbers given in the tables are applicable for DIP-8 and SOP-8 packages.

■ Characteristic curves ($T_a = 25^\circ\text{C}$)

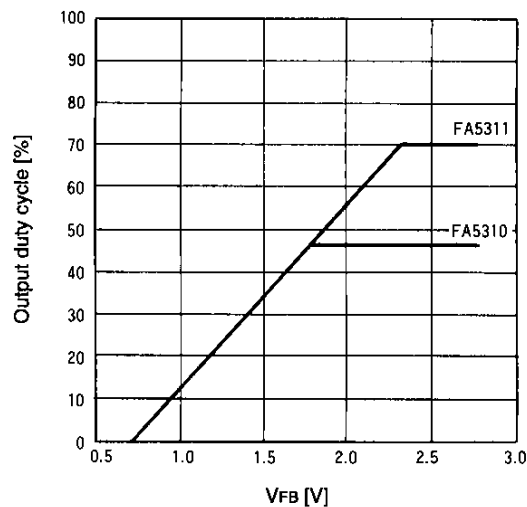
Oscillation frequency (f_{osc}) vs.
timing capacitor capacitance (R_T)



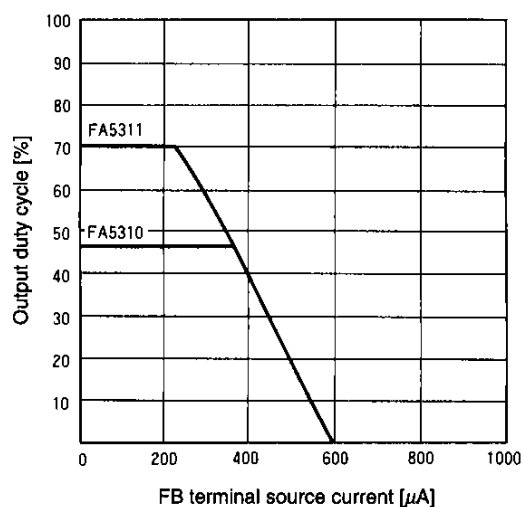
Oscillation frequency (f_{osc}) vs. ambient temperature (T_a)



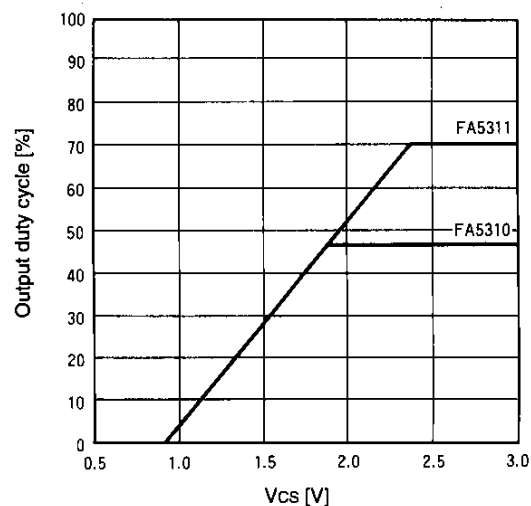
Output duty cycle vs. FB terminal voltage (V_{FB})



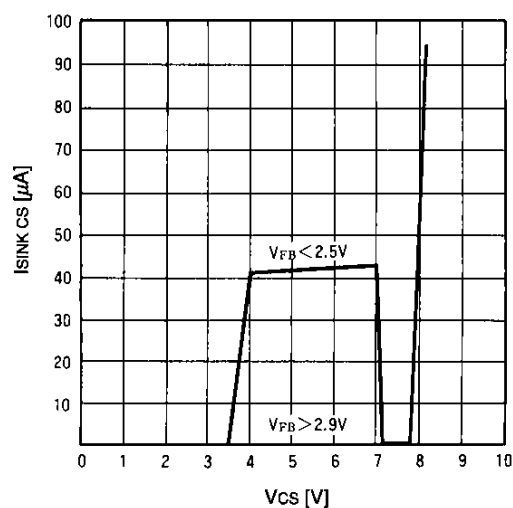
Output duty cycle vs. FB terminal source current (I_{SOURCE})



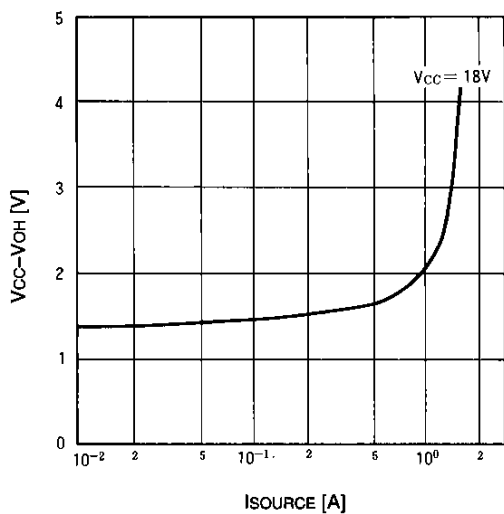
Output duty cycle vs. CS terminal voltage (V_{CS})



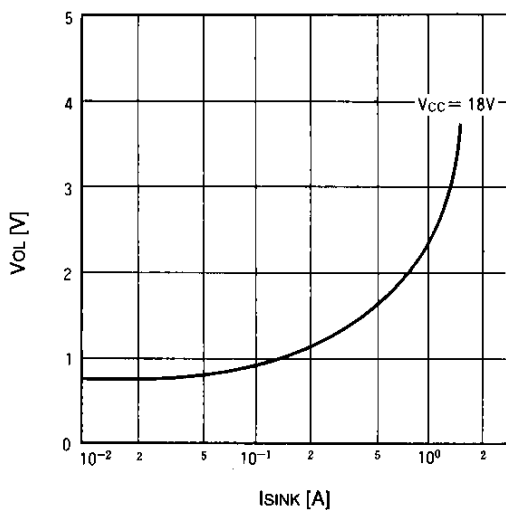
CS terminal sink current ($I_{SINK\ CS}$) vs.
CS terminal voltage (V_{CS})



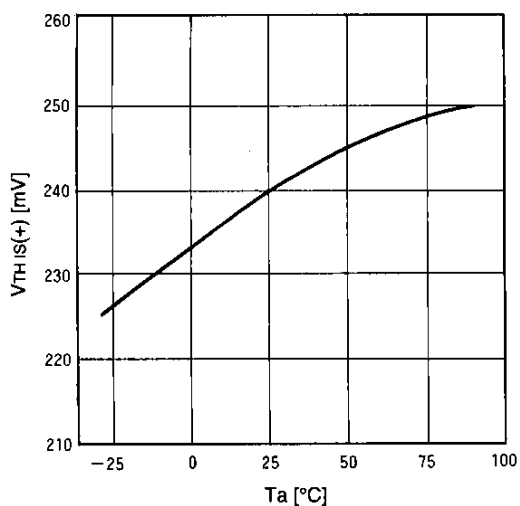
H-level output voltage (V_{OH}) vs.
output source current (I_{SOURCE})



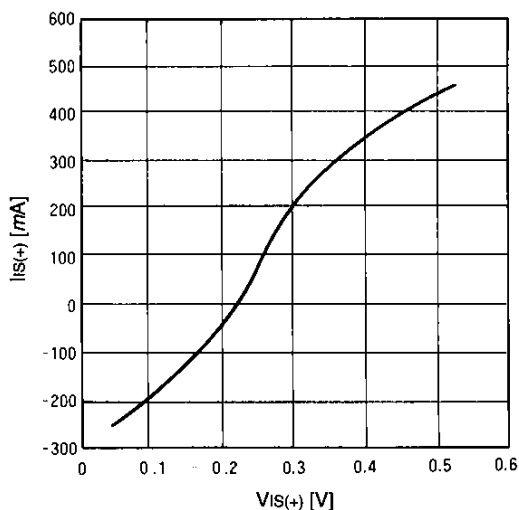
L-level output voltage (V_{OL}) vs. output sink current (I_{SINK})



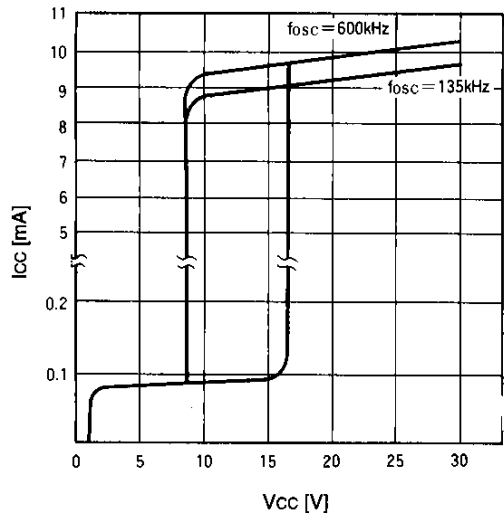
IS (+) terminal threshold voltage ($V_{TH IS(+)}$) vs.
ambient temperature (T_a)



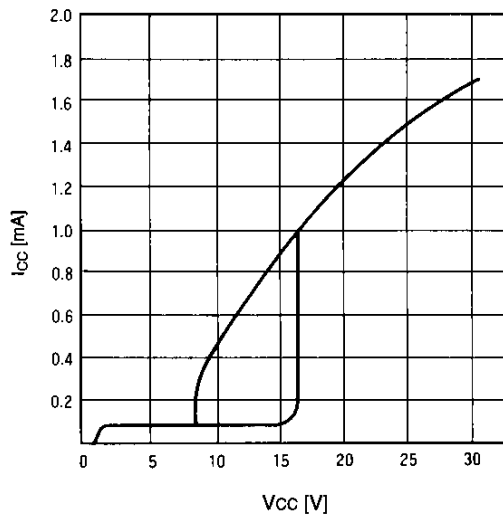
IS (+) terminal current ($I_{IS(+)}$) vs.
IS (+) terminal voltage ($V_{IS(+)}$)



Supply current (I_{CC}) vs. supply voltage (V_{CC})
Ordinary operation

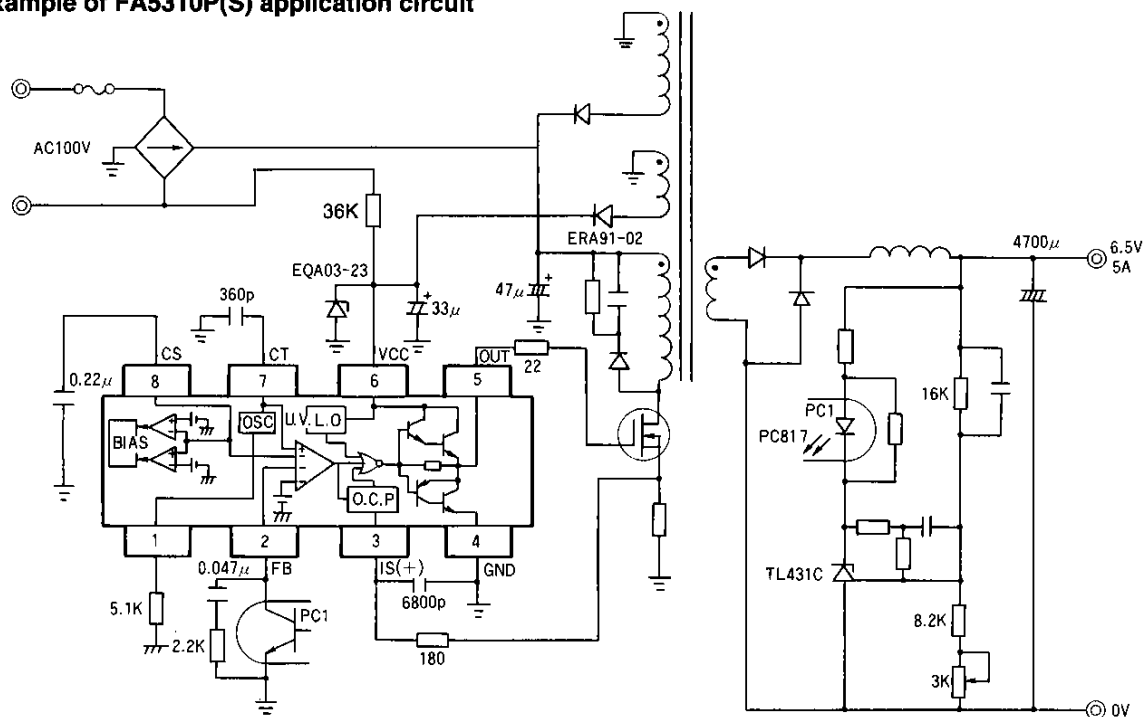


Supply current (I_{CC}) vs. supply voltage (V_{CC})
OFF or OFF latch mode

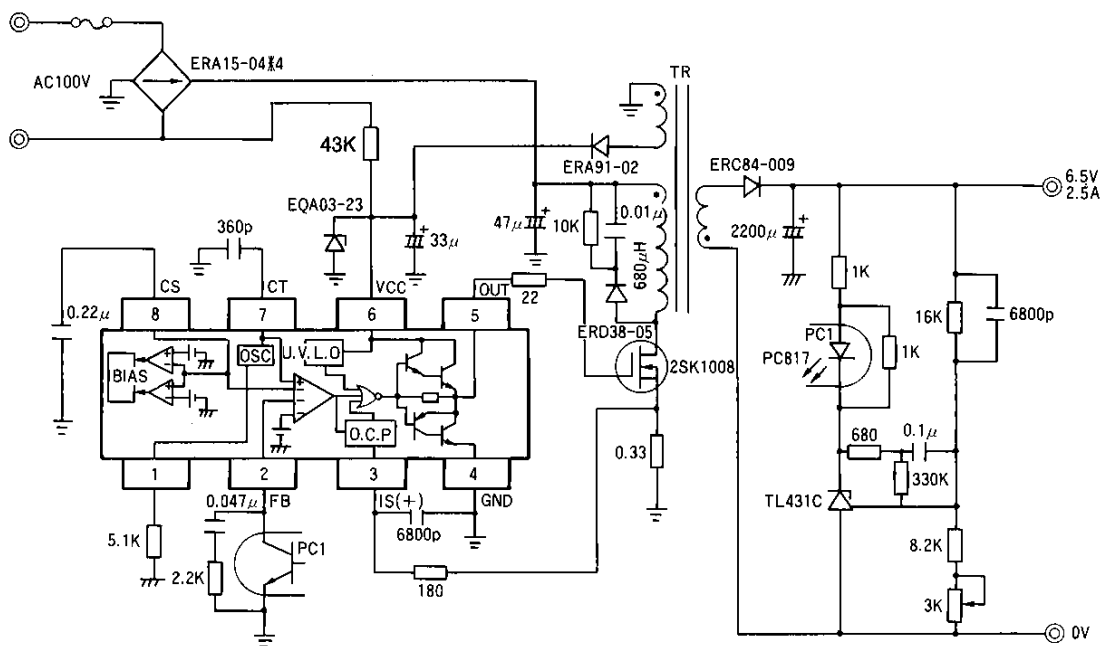


■ Application circuit

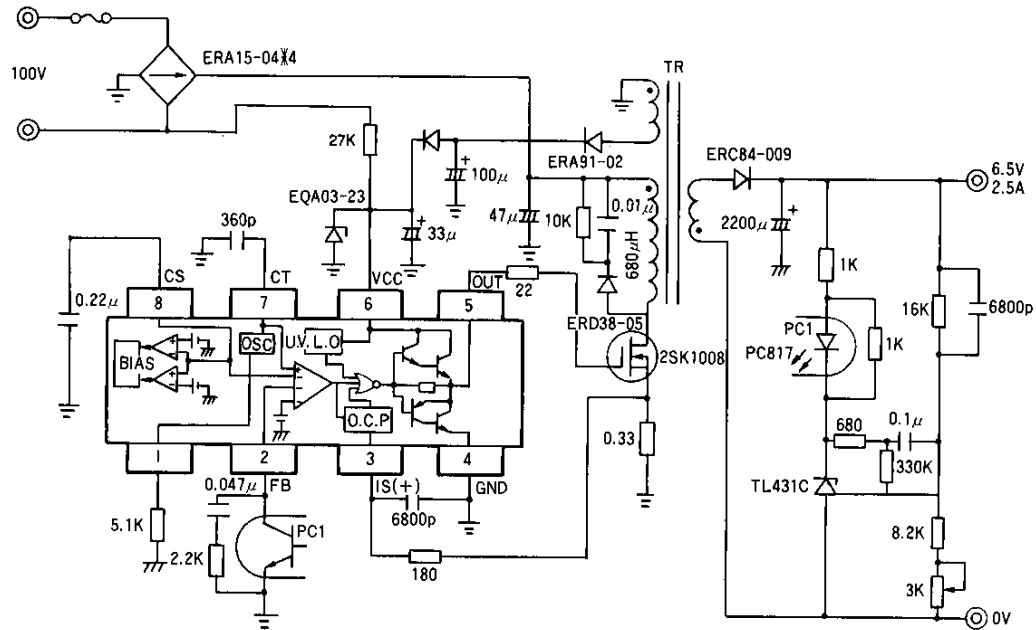
● Example of FA5310P(S) application circuit



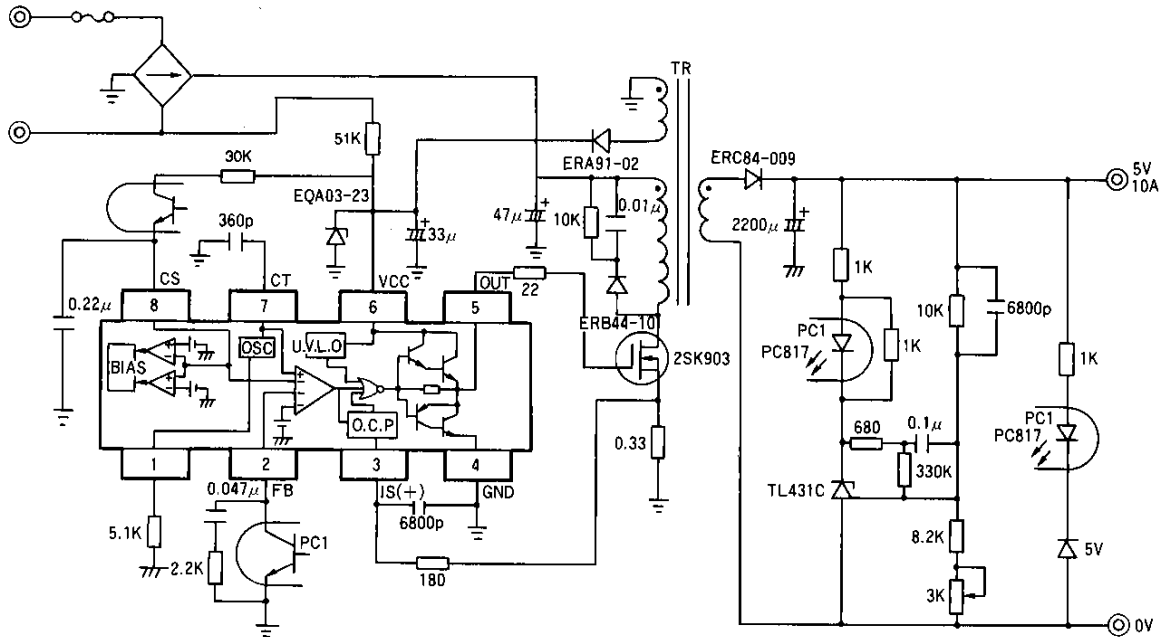
● Example of FA5310P(S) / FA5311P(S) application circuit (1)



• Example of FA5310P(S) / FA5311P(S) application circuit (2)



• Example of FA5310P(S) / FA5311P(S) application circuit (3)



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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