

■ Description

The FA5304AP(S) and FA5305AP(S) are bipolar ICs for switching power supply control and can directly drive a power MOSFET. These ICs contain many functions in a small 8-pin package. With these ICs, a high-performance power supply can be created compactly because not many external components are needed.

■ Features

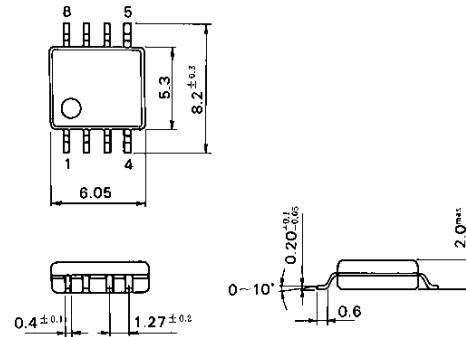
- Drive circuit for connecting a power MOS-FET ($I_o = \pm 1.5A$)
- Wide operating frequency range (5 to 600kHz)
- Pulse-by-pulse overcurrent limiting function
Positive voltage detection: FA5304AP(S)
Negative voltage detection: FA5305AP(S)
- Overload cutoff function (Latch or non-protection mode selectable)
- 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)
- Error amplifier for control by tertiary winding detection
- Low standby current ($90\mu A$ typ.)
- 8-pin package (DIP/SOP)

■ Applications

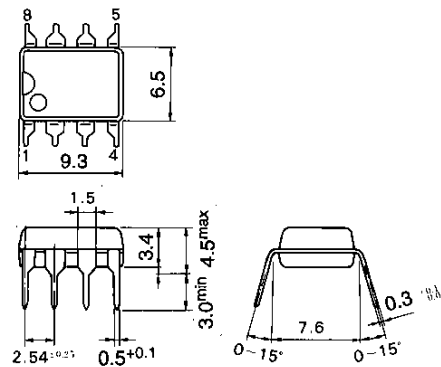
- Switching power supply for general equipment

■ Dimensions, mm

● SOP-8



● DIP-8



■ Absolute maximum ratings

Common to FA5304AP(S) and FA5305AP(S)

Item	Symbol	Rating	Unit
Supply voltage	V _{CC}	30	V
Output current	I _O	±1.5	A
Error amplifier input voltage	V _{IN}	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) *1 400 (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 FA5304AP(S) and FA5305AP(S)

Item	Symbol	Min.	Max.	Unit
Supply voltage	V _{CC}	10	30	V
Error amplifier feedback resistor	R _{NF}	100		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 : 4.0mW/°C (on PC board)

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

Oscillator section Common to FA5304AP(S) and FA5305AP(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f _{osc}	C _T = 330pF	112	135	148	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 _{dT}	T _a = -30 to +85°C		±4		%

Error amplifier section Common to FA5304AP(S) and FA5305AP(S))

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Reference voltage	V _B		1.90	2.00	2.10	V
Input bias current	I _B	V _I = 2V	-500	-50		nA
Open-loop voltage gain	A _v		80			dB
Unity-gain bandwidth	f _T			1.0		MHz
Maximum output voltage (Pin 2)	V _{OM+}	R _{NF} = 100kΩ	2.70			V
	V _{OM-}	R _{NF} = 100kΩ			200	mV
Output source current (Pin 2)	I _{MO+}	V _{OM} = 1V		-100	-50	μA

Pulse width modulation circuit section Common to FA5304AP(S) and FA5305AP(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input threshold voltage (Pin 2)	V _{TH FBO}	Duty cycle = 0%	0.80	1.00	1.20	V
	V _{TH FBM}	Duty cycle = D _{MAX}	1.70	1.90	2.10	V
Maximum duty cycle	D _{MAX}		42	45	50	%

Soft-start circuit section Common to FA5304AP(S) and FA5305AP(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Charge current (Pin 8)	I _{CHG}	Pin 8 = 0V	-15	-10	-5	μA
Input threshold voltage (Pin 8)	V _{TH CSO}	Duty cycle = 0%	0.80	1.00	1.20	V
	V _{TH CSM}	Duty cycle = D _{MAX}	1.70	1.90	2.10	V

FA5304AP(S)/FA5305AP(S)

Overcurrent limiting circuit section

Item	Symbol	Test condition	FA5304AP(S)			FA5305AP(S)			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Input threshold voltage (Pin 3)	V _{TH IS}		0.20	0.24	0.28	-0.20	-0.17	-0.14	V
Overcurrent detection terminal source current	I _{IS}	Pin 3 = 0V	-300	-200	-100	-240	-160	-80	μA
Delay time	T _{PD IS}			150			200		ns

Latch-mode cutoff circuit section Common to FA5304AP(S) and FA5305AP(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CS terminal sink current	I _{SINK CS}	Pin 8 = 6V, Pin 2 = 1V	40	70	150	μA
Cutoff threshold voltage (Pin 8)	V _{TH CS}		6.5	7.0	7.5	V

Overload cutoff circuit section Common to FA5304AP(S) and FA5305AP(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Cutoff threshold voltage (Pin 2)	V _{TH FB}		2.5	2.7	2.9	V

Undervoltage lock-out circuit section Common to FA5304AP(S) and FA5305AP(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 FA5304AP(S) and FA5305AP(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 control circuit section Common to FA5304AP(S) and FA5305AP(S)

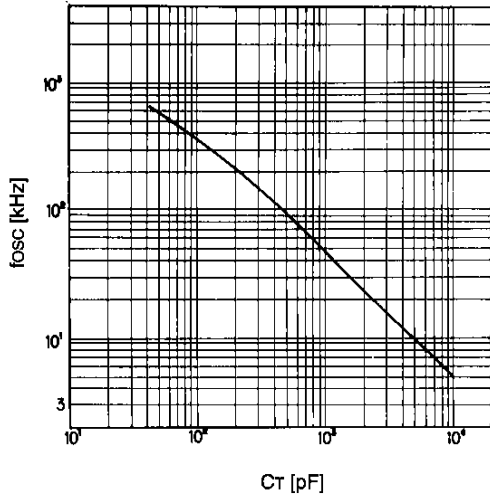
Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
CS terminal source current	I _{SOURCE CS}	Pin 8 = 0V	-15	-10	-5	μA
OFF-to-ON threshold voltage (Pin 8)	V _{TH ON}	CS pin voltage		0.56	0.76	V
ON-to-OFF threshold voltage (Pin 8)	V _{TH OFF}	CS pin voltage	0.30	0.42		V

Overall device Common to FA5304AP(S) and FA5305AP(S)

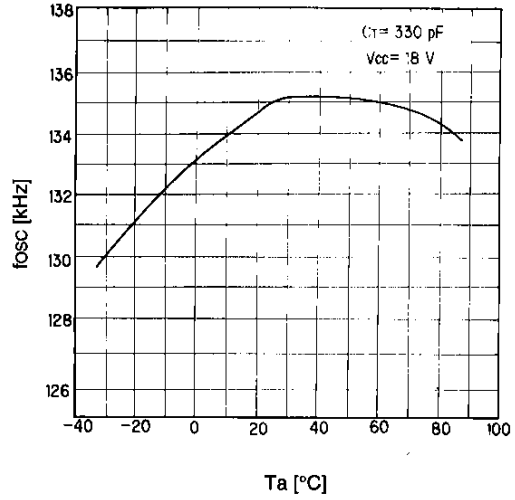
Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Standby current	I _{CC ST}	V _{CC} = 14V		90	140	μA
Operating-state supply current	I _{CC OP}			9	15	mA
OFF-state supply current	I _{CC OFF}			1.1	1.8	mA
Cutoff-state supply current	I _{CC L}			1.1	1.8	mA

■ Characteristic curves (Ta = 25°C)

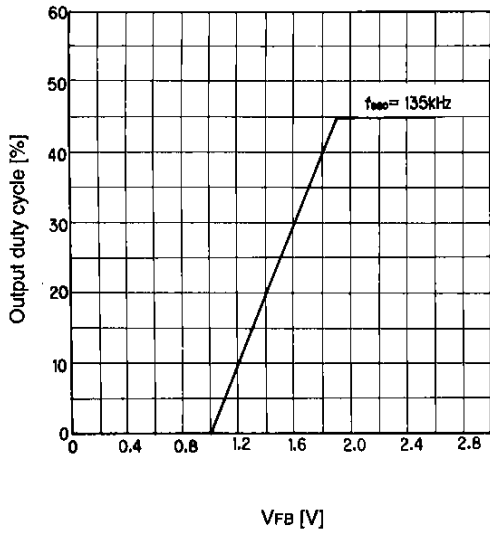
Oscillation frequency (fosc) vs. timing capacitor capacitance (CT)



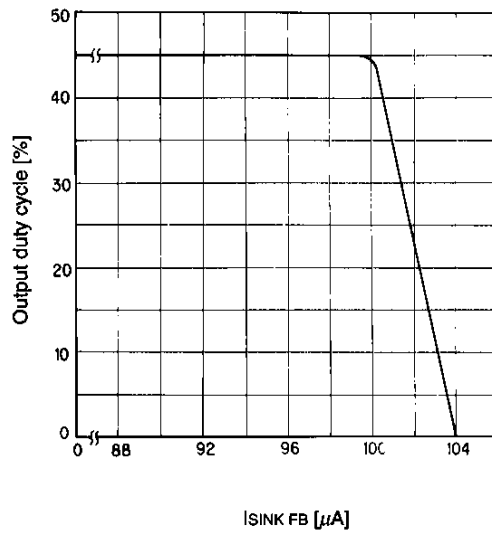
Oscillation frequency (fosc) vs. ambient temperature (Ta)



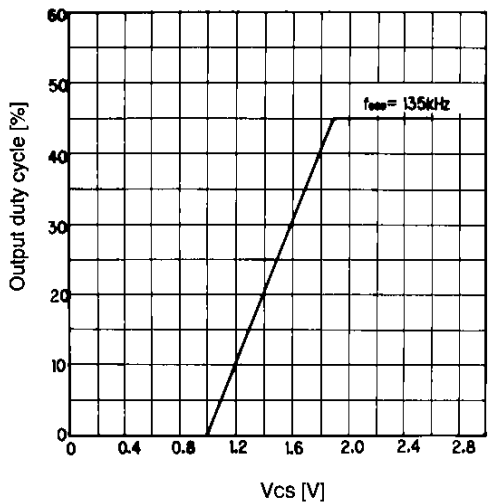
Output duty cycle vs. FB terminal voltage (VFB)



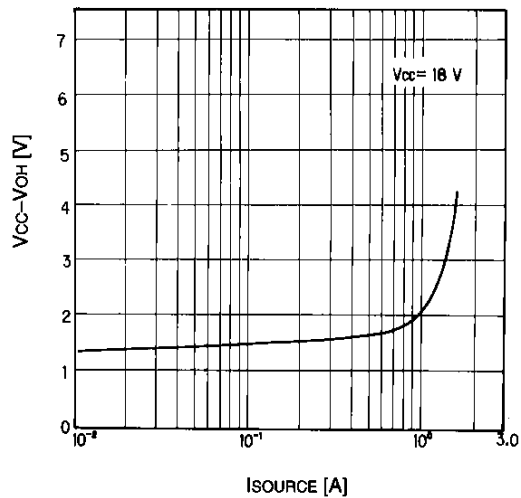
Output duty cycle vs. FB terminal sink current (ISINK)



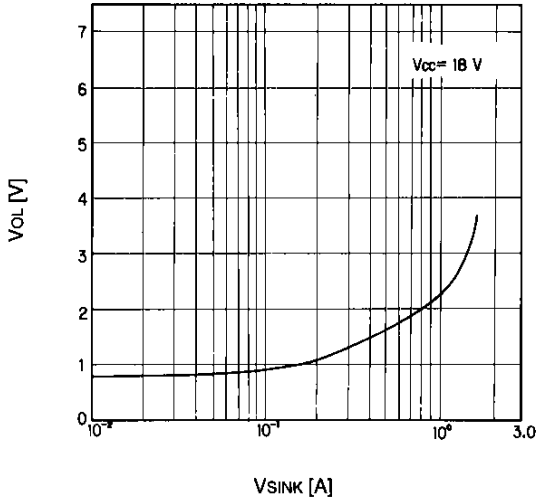
Output duty cycle vs. CS terminal voltage (Vcs)



H-level output voltage (VOH) vs. output source current (ISOURCE)

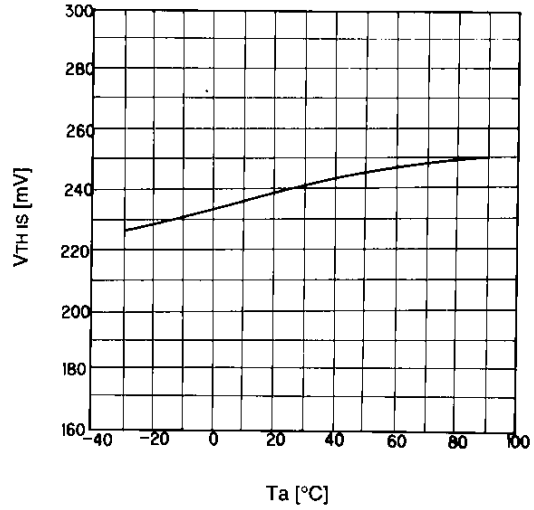


L-level output voltage (VOL) vs. output sink current (VSINK)



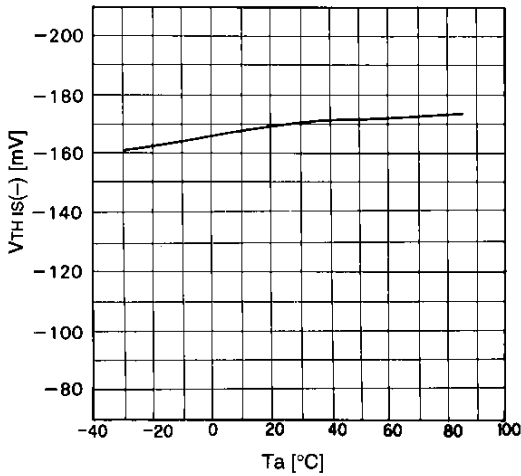
IS (+) terminal threshold voltage (VTH IS(+)) vs. ambient temperature (Ta)

FA5304AP(S)



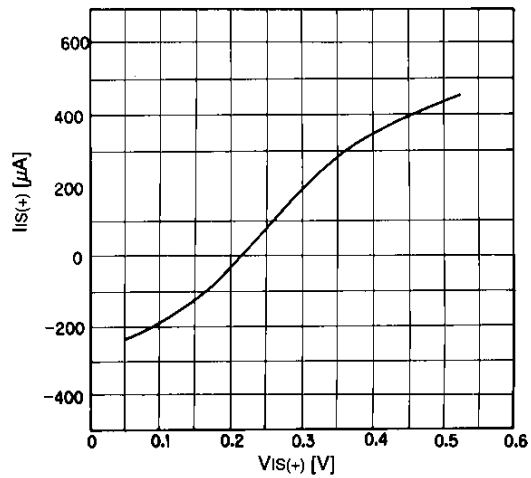
IS (-) terminal threshold voltage (VTH IS(-)) vs. ambient temperature (Ta)

FA5305AP(S)



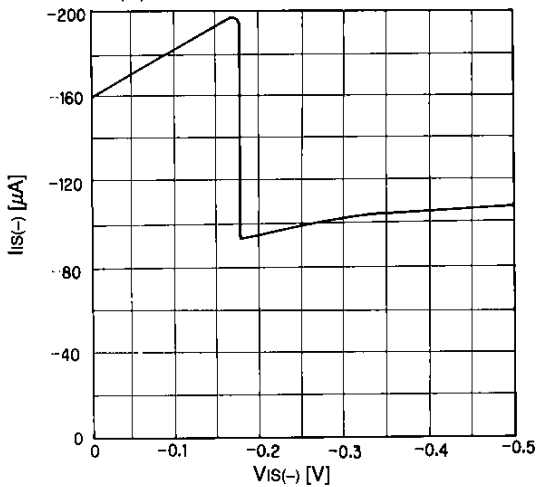
IS (+) terminal current (IIS(+)) vs. IS (+) terminal voltage (VIS(+))

FA5304AP(S)

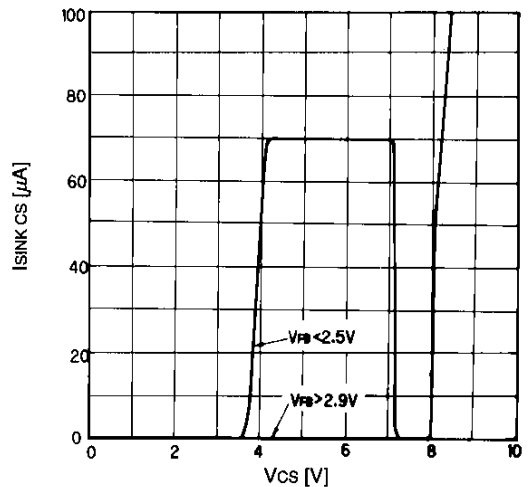


IS (-) terminal current (IIS(-)) vs. IS (-) terminal voltage (VIS(-))

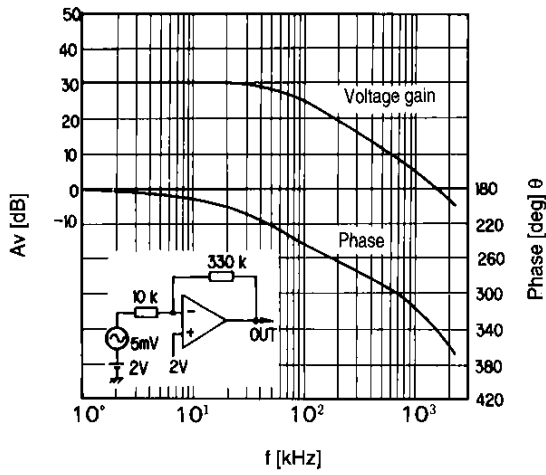
FA5305AP(S)



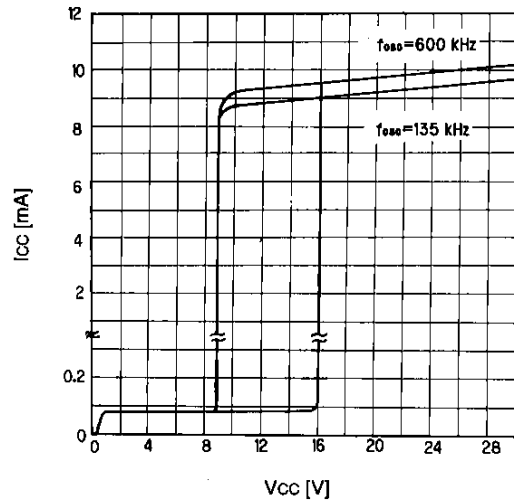
CS terminal sink current (ISINK CS) vs. CS terminal voltage (VCS)



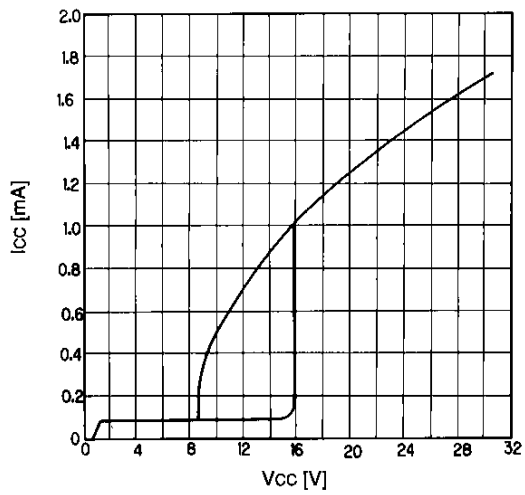
Error amplifier frequency (f) vs. voltage gain (Av) /phase



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

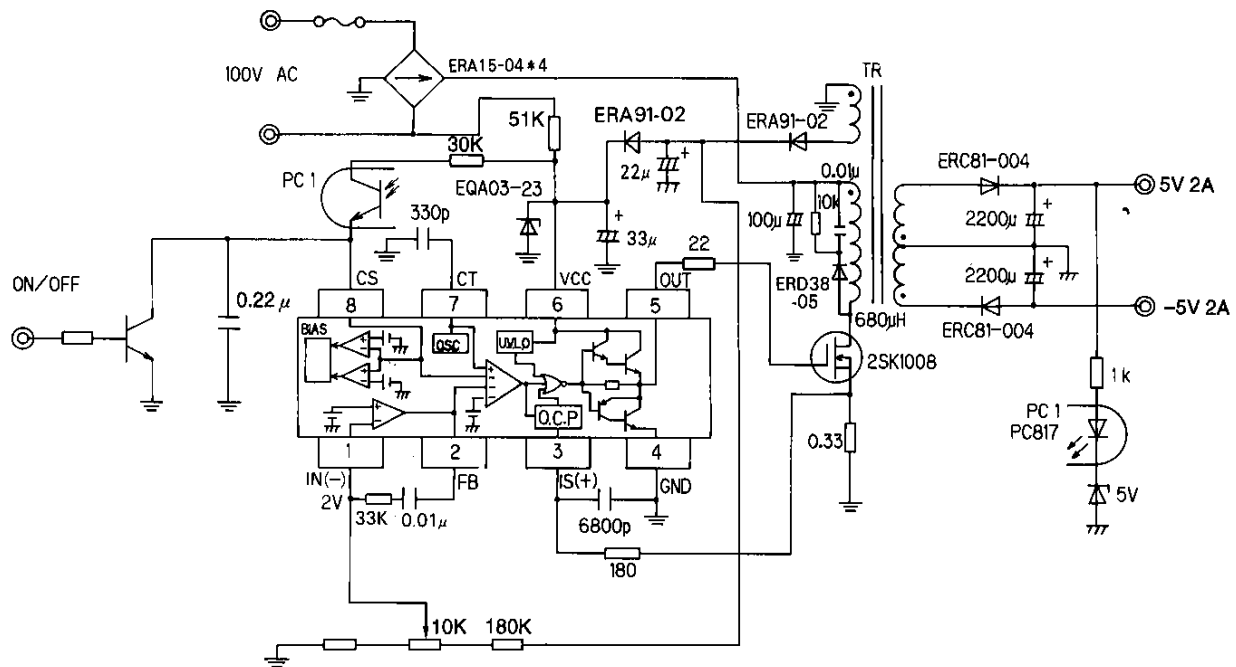


Supply current (Icc) vs. supply voltage (Vcc)
OFF or OFF latch mode

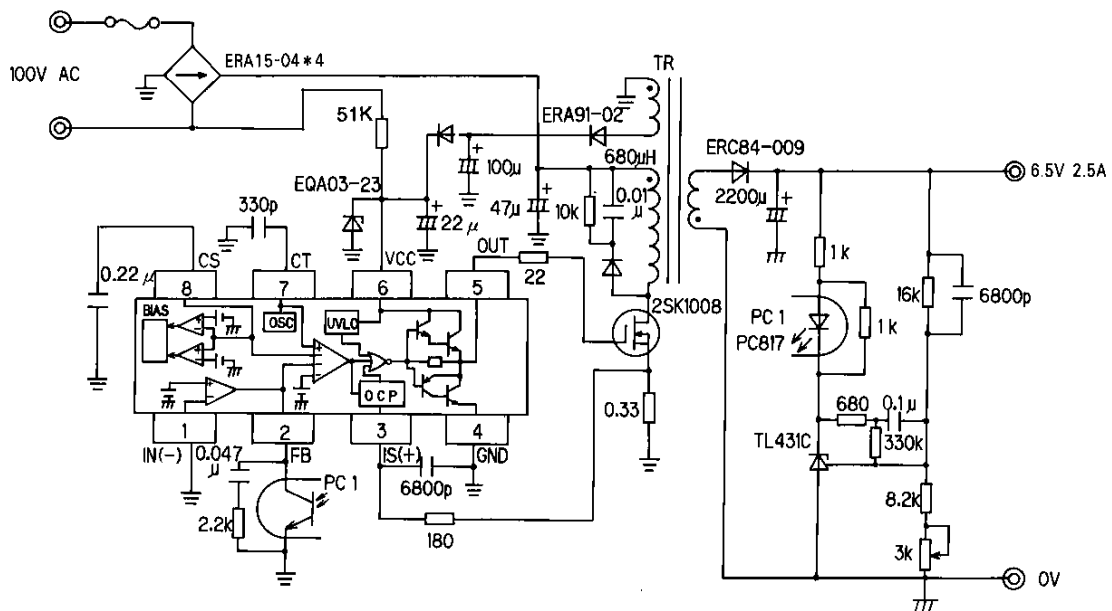


■ Application circuit

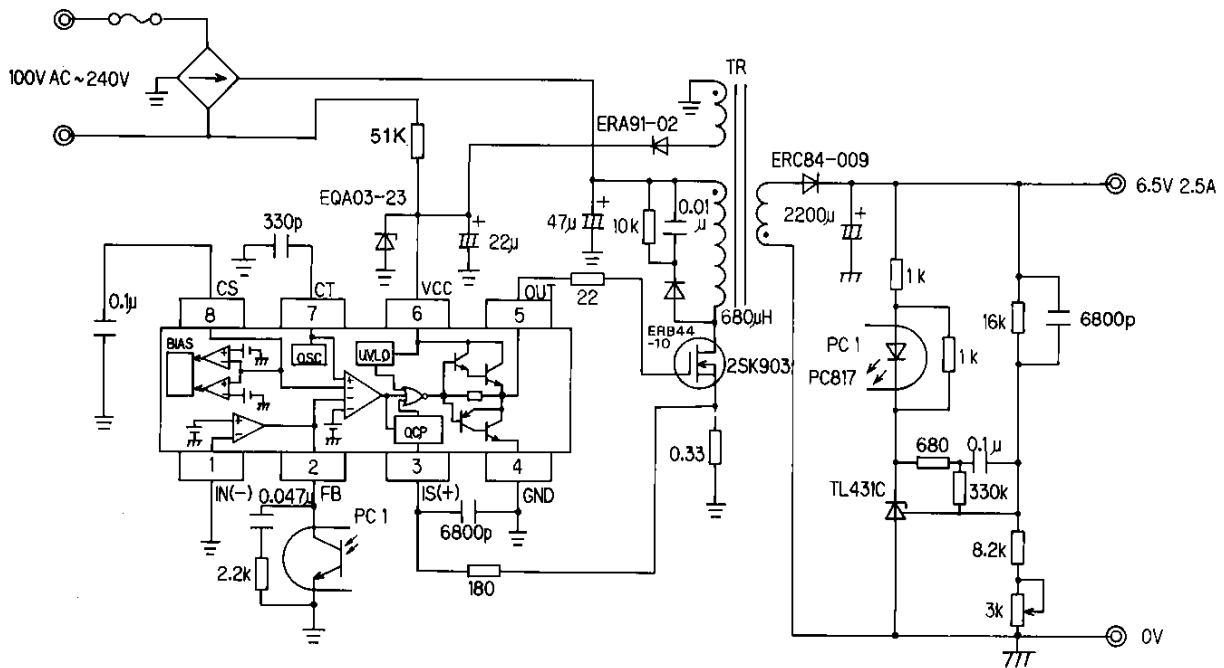
● Example of FA5304AP(S) application circuit (1)



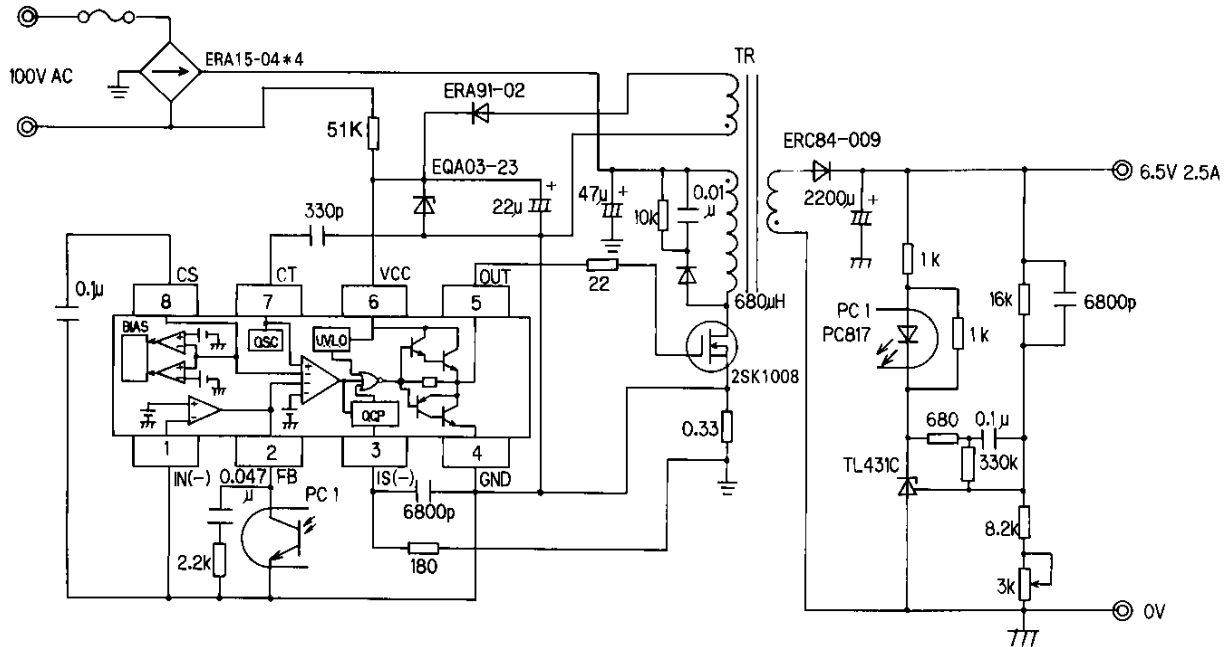
● Example of FA5304AP(S) application circuit (2)



• Example of FA5304AP(S) application circuit (3)



• Example of FA5305AP(S) application 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.

CAUTION

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