

## ■ 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

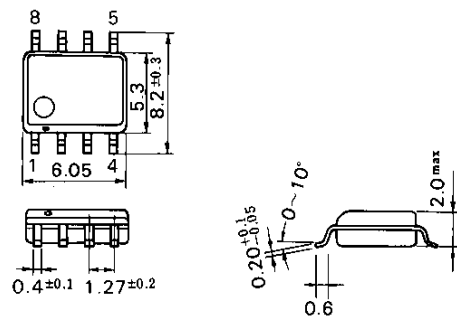
- Drive circuit for connecting a power MOS-FET ( $I_o = \pm 1.5A$ )
- Wide operating frequency range (5 to 600kHz)
- Pulse-by-pulse overcurrent limiting function
- Overload cutoff function (Latch or non-protection mode selectable)
- Output ON/OFF control function by external signals
- Overvoltage cutoff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

## ■ Applications

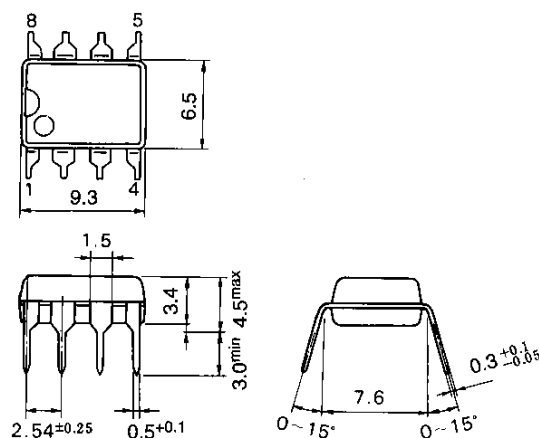
- Switching power supply for general equipment

## ■ Dimensions, mm

### ● SOP-8

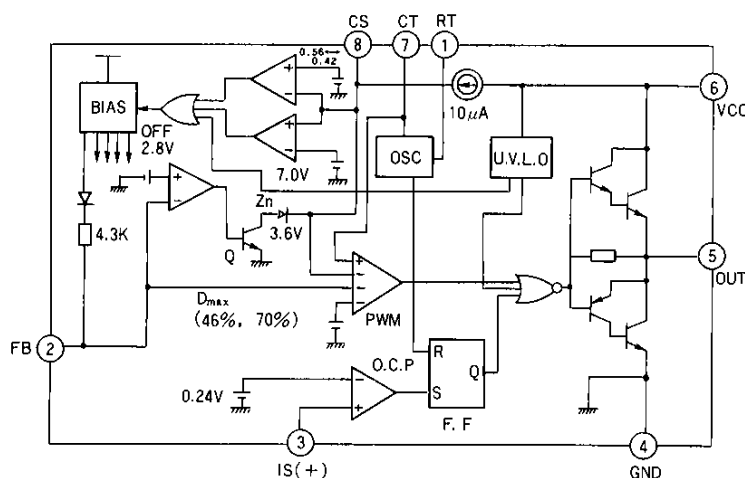


### ● DIP-8



## ■ 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 <sub>CC</sub>	31	V
Output current	I <sub>O</sub>	±1.5	A
Error amplifier input voltage	V <sub>I</sub>	4	V
Feedback terminal input voltage	V <sub>FB</sub>	4	V
Overcurrent detection terminal input voltage	V <sub>IS</sub>	-0.3 to +4	V
CS terminal input current	I <sub>CS</sub>	2	mA
Total power dissipation (T <sub>a</sub> =25°C)	P <sub>d</sub>	800 (DIP-8) *1 550 (SOP-8) *2	mW
Operating temperature	T <sub>opr</sub>	-30 to +85	°C
Storage temperature	T <sub>stg</sub>	-40 to +150	°C

### ■ Recommended operating conditions

Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Min.	Max.	Unit
Supply voltage	V <sub>CC</sub>	10	30	V
Oscillator timing resistance	R <sub>T</sub>	3.3	10	kΩ
Soft-start capacitor	C <sub>s</sub>	0.1	1	μF
Oscillation frequency	f <sub>osc</sub>	5	600	kHz

Notes:

\*1 Derating factor T<sub>a</sub> > 25°C : 8.0mW/°C (on PC board)\*2 Derating factor T<sub>a</sub> > 25°C : 5.5mW/°C (on PC board)

### ■ Electrical characteristics (T<sub>a</sub> = 25°C, V<sub>CC</sub> = 18V, f<sub>osc</sub> = 135kHz)

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

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Oscillation frequency	f <sub>osc</sub>	C <sub>T</sub> = 330pF	125	135	145	kHz
Frequency variation 1 (due to supply voltage change)	f <sub>dv</sub>	V <sub>CC</sub> = 10 to 30V		±1		%
Frequency variation 2 (due to temperature change)	f <sub>dr</sub>	T <sub>a</sub> = -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 <sub>FB</sub>	V <sub>FB</sub> = 0	-660	-800	-960	-660	-800	-900	μA
Input threshold voltage (Pin 2)	V <sub>TH FBO</sub>	Duty cycle = 0%		0.75			0.75		V
	V <sub>TH FBM</sub>	Duty cycle = D <sub>MAX</sub>		1.80			2.30		V
Maximum duty cycle	D <sub>MAX</sub>		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 <sub>CHG</sub>	Pin 8 = 0V	-15	-10	-5	-15	-10	-5	μA
Input threshold voltage (Pin 8)	V <sub>TH CSO</sub>	Duty cycle = 0%		0.90			0.90		V
	V <sub>TH CSM</sub>	Duty cycle = D <sub>MAX</sub>		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 <sub>TH IS</sub>		0.21	0.24	0.27	V
Overcurrent detection terminal source current	I <sub>IS</sub>	Pin 3 = 0V	-300	-200	-100	μA
Delay time	T <sub>PD IS</sub>			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	$\mu$ A
Cutoff threshold voltage (Pin 8)	V <sub>TH</sub> 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 <sub>TH</sub> 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 <sub>TH</sub> ON		15.5	16.0	16.5	V
ON-to-OFF threshold voltage	V <sub>TH</sub> OFF		8.20	8.70	9.20	V
Voltage hysteresis	V <sub>HYS</sub>			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 <sub>OL</sub>	I <sub>O</sub> = 100mA		1.30	1.80	V
H-level output voltage	V <sub>OH</sub>	I <sub>O</sub> = -100mA, V <sub>CC</sub> = 18V	16.0	16.5		V
Rise time	t <sub>r</sub>	No load		50		ns
Fall time	t <sub>f</sub>	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	$\mu$ A
OFF-to-ON threshold voltage (Pin 8)	V <sub>TH</sub> ON	CS terminal voltage OFF→ON		0.56		V
ON-to-OFF threshold voltage (Pin 8)	V <sub>TH</sub> OFF	CS terminal voltage ON→OFF		0.42		V

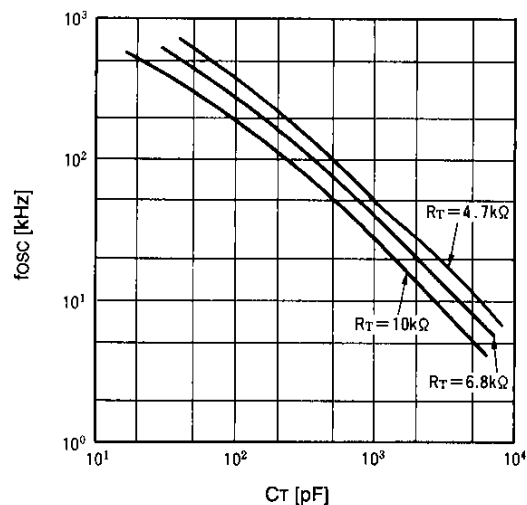
### Overall device Common to FA5310P(S) and FA5311P(S)

Item	Symbol	Test condition	Min.	Typ.	Max.	Unit
Standby current	I <sub>CC</sub> ST	V <sub>CC</sub> = 14V		90	150	$\mu$ A
Operating-state supply current	I <sub>CC</sub> OP			9	15	mA
OFF-state supply current	I <sub>CC</sub> OFF			1.1	1.8	mA
Cutoff-state supply current	I <sub>CC</sub> CL			1.1	1.8	mA

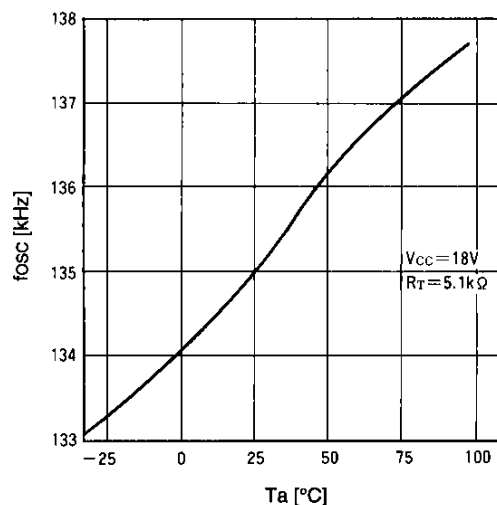
The ratings and pin numbers given in the tables are applicable for DIP-8 and SOP-8 packages.

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

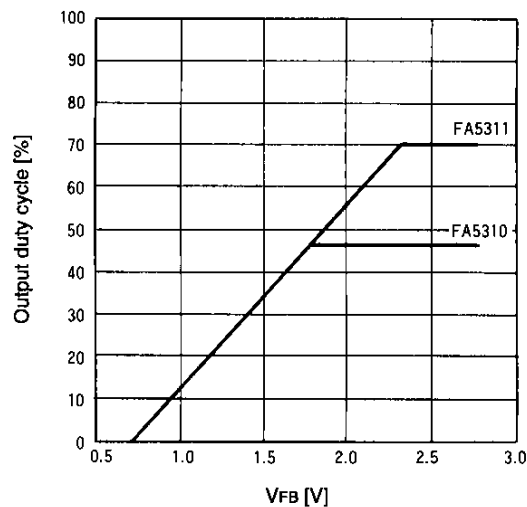
Oscillation frequency ( $f_{osc}$ ) vs.  
timing capacitor capacitance ( $R_T$ )



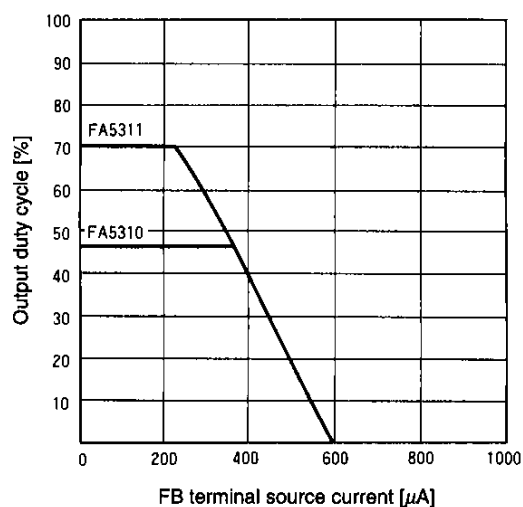
Oscillation frequency ( $f_{osc}$ ) vs. ambient temperature ( $T_a$ )



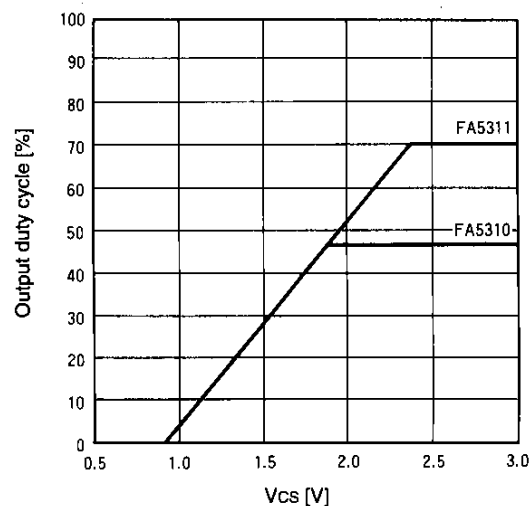
Output duty cycle vs. FB terminal voltage ( $V_{FB}$ )



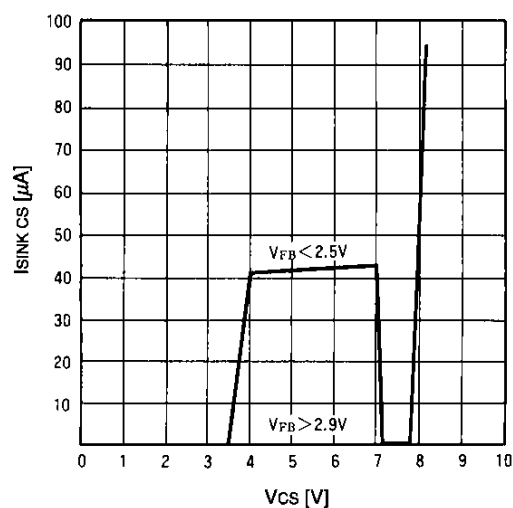
Output duty cycle vs. FB terminal source current ( $I_{SOURCE}$ )



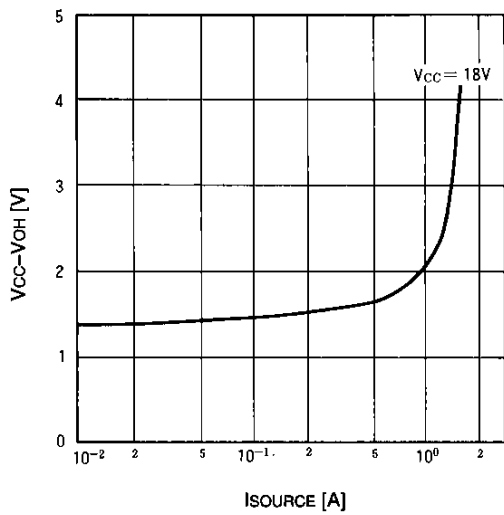
Output duty cycle vs. CS terminal voltage ( $V_{CS}$ )



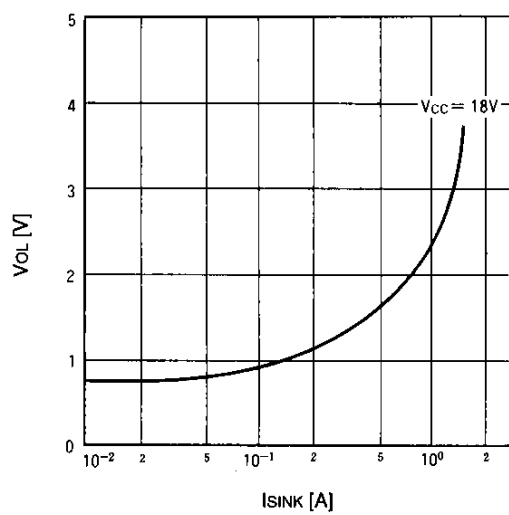
CS terminal sink current ( $I_{SINK\ CS}$ ) vs.  
CS terminal voltage ( $V_{CS}$ )



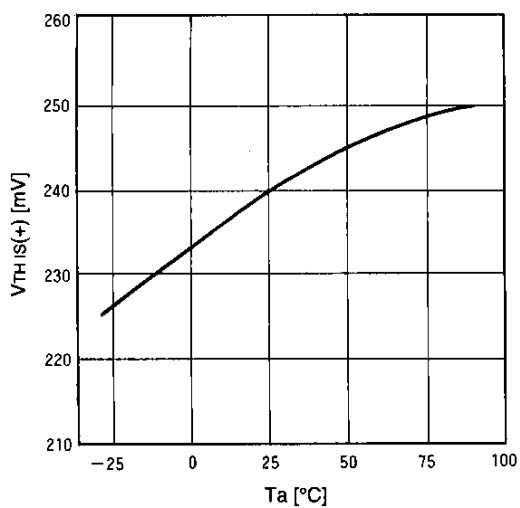
H-level output voltage ( $V_{OH}$ ) vs.  
output source current ( $I_{SOURCE}$ )



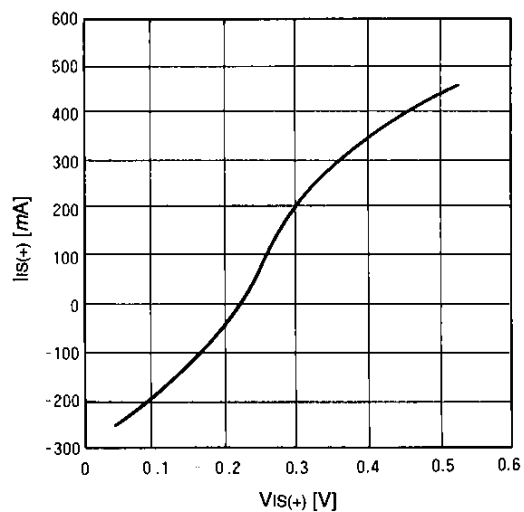
L-level output voltage ( $V_{OL}$ ) vs. output sink current ( $I_{SINK}$ )



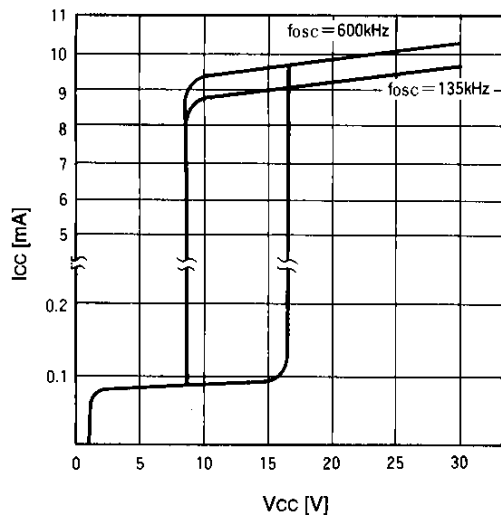
IS (+) terminal threshold voltage ( $V_{TH IS(+)}$ ) vs.  
ambient temperature ( $T_a$ )



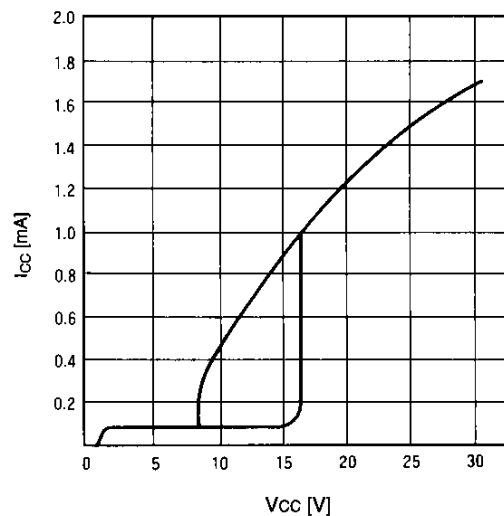
IS (+) terminal current ( $I_{IS(+)}$ ) vs.  
IS (+) terminal voltage ( $V_{IS(+)}$ )



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







## CAUTION

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