



AiP3842/3843/3844/3845

High Performance Current-Mode PWM

Controllers

Product Specification

Specification Revision History:

Version	Date	Description
2023-01-A1	2023-01	New
2023-10-A2	2023-10	Add the characteristic curve
2024-07-A3	2024-07	Modify the content



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**1、General Description**

AiP3842/AiP3843/AiP3844/AiP3845 are fixed frequency current-mode PWM controller. They are specially designed for Off-Line and DC-to-DC converter applications with minimum external components. These integrated circuits feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier. Current sensing comparator, and a high current totempole output ideally suited for driving a power MOSFET. Protection circuit Includes built in under-voltage lockout and current limiting. The AiP2842 and AiP2844 have UVLO thresholds of 16V (on) and 10V (off). The AiP2843 and AiP2845 are 8.8V (on) and 7.6V (off) .The AiP3842 and AiP3843 can operate within 100% duty cycle. The AiP3844 and AiP3845 can operate with 50% duty cycle.

Features:

- Low start-up current (<0.5mA)
- Maximum duty cycle clamp
- UVLO with hysteresis
- Operating frequency up to 500kHz
- Packaging form: SOP8/DIP8
- Operating temperatures: -40℃ to 125℃

Ordering Information:**Tube packing specifications:**

Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP3842SA8.TB	SOP8	AiP3842	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3843SA8.TB	SOP8	AiP3843	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3844SA8.TB	SOP8	AiP3844	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3845SA8.TB	SOP8	AiP3845	100 PCS/tube	100 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3842DA8.TB	DIP8	AiP3842	50 PCS/tube	40 tube/box	2000 PCS/box	Dimensions of plastic enclosure: 9.2mm×6.4mm



						Pin spacing: 2.54mm
AiP3843DA8.TB	DIP8	AiP3843	50 PCS/tube	40 tube/box	2000 PCS/box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP3844DA8.TB	DIP8	AiP3844	50 PCS/tube	40 tube/box	2000 PCS/box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm
AiP3845DA8.TB	DIP8	AiP3845	50 PCS/tube	40 tube/box	2000 PCS/box	Dimensions of plastic enclosure: 9.2mm×6.4mm Pin spacing: 2.54mm

Reel packing specifications:

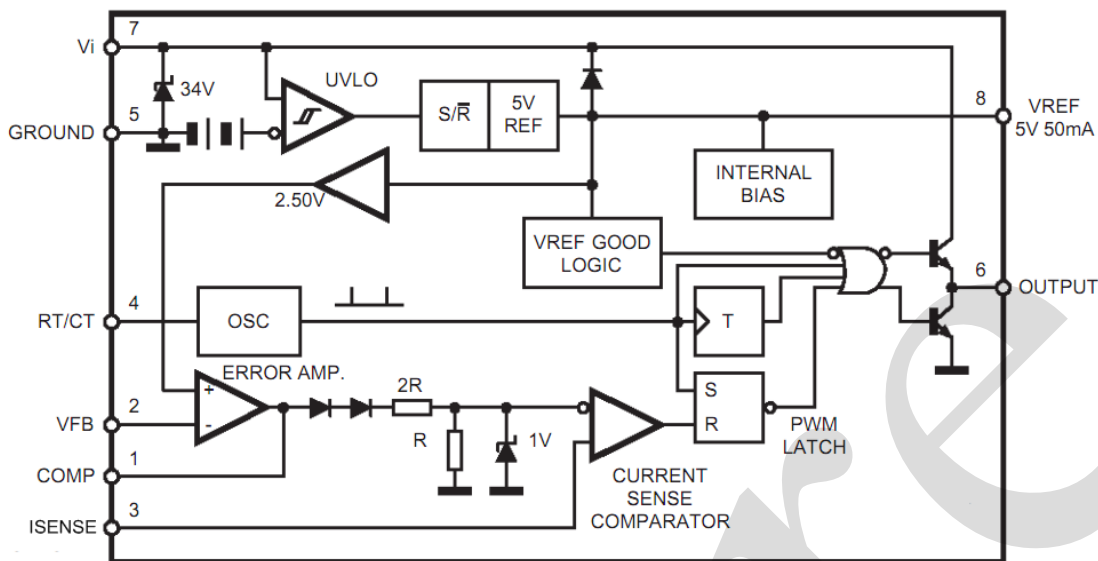
Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP3842SA8.TR	SOP8	AiP3842	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3843SA8.TR	SOP8	AiP3843	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3844SA8.TR	SOP8	AiP3844	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm
AiP3845SA8.TR	SOP8	AiP3845	4000PCS/reel	8000PCS/box	Dimensions of plastic enclosure: 4.9mm×3.9mm Pin spacing: 1.27mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

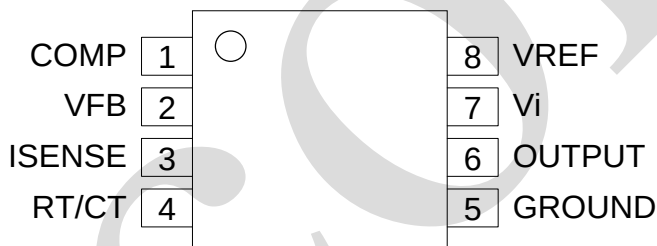


2、Block Diagram And Pin Description

2.1、Block Diagram



2.2、Pin Configurations



2.3、Pin Description

Pin No.	Pin Name	Description
1	COMP	This pin is the Error Amplifier output and is made available for loop compensation.
2	VFB	This is the inverting input of the Error Amplifier. It is normally connected to the switching power supply output through a resistor divider.
3	ISENSE	A voltage proportional to inductor current is connected to this input. The PWM uses this information to terminate the output switch conduction.
4	RT/CT	The oscillator frequency and maximum Output duty cycle are programmed by connecting resistor RT to VREF and capacitor CT to ground. Operation to 500kHz is possible.
5	GROUND	This pin is the combined control circuitry and power ground.
6	OUTPUT	This output directly drives the gate of a power MOSFET. Peak currents up to 1A are sourced and sunk by this pin.
7	Vi	This pin is the positive supply of the control IC.
8	VREF	This is the reference output. It provides charging current for capacitor CT through resistor RT



3、Electrical Parameter

3.1、Absolute Maximum Ratings

(T_{amb}=25℃, unless otherwise specified)

Characteristic		Symbol	Conditions	Value	Unit
Supply voltage (low impedance source)		V _i	-	30	V
Output current		I _O	-	±1	A
Power dissipation		P _D	-	1	W
Error amplifier output sink current		I _{sink} (EA)	-	10	mA
Analog input voltage		V _{in} (EA)	-	-0.3 to +6.3	V
Thermal resistance (Note 1, 2)	DIP8	θ _{JA}	-	110	℃/W
	SOP8		-	160	
Operating temperature		T _{amb}	-	-40 to 125	℃
Storage temperature		T _{stg}	-	-65 to 150	℃
Soldering temperature		T _L	10s	DIP8 250	℃
				SOP8 260	

Note:

1. Thermal resistance is tested in accordance with the JEDEC 2S2P.
2. The maximum power dissipation can be calculated using the following formula:

$$P_D = (T_j - T_A) / \theta_{JA}$$

Where T_J=junction temperature, T_A=ambient temperature

3.2、Electrical Characteristics

3.2.1、Electrical Parameters 1

(T_{amb}=-40 to 85℃, V_i=15V (Note 3), R_T=10kΩ, C_T=3.3nF, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reference Section						
VREF output voltage	VREF	I _O =1mA,	4.90	5.00	5.10	V
Line regulation	ΔVREF	12V≤V _i ≤25V	-	2	20	mV
Load regulation	ΔVREF	1≤I _O ≤20mA	-	3	25	mV
Temperature drift	ΔVREF/ΔT	(Note 4)	-	0.2	-	mV/℃
Total output variation	-	line, load, temperature	4.82	-	5.18	V
Equivalent output noise voltage	eN	10Hz≤f≤10KHz, T _j =25℃	-	50	-	uV
Output short-circuit current	I _{SC}	(Note 4)	-30	-100	-180	mA
Oscillator Section						
Oscillator frequency	f _{OSC} (Note 7)	T _j =25℃	49	52	55	kHz
		T _{amb} =-40~85℃	48	-	56	kHz
		T _j =25℃ (R _T =6.2kΩ, C _T =1nF)	225	250	275	kHz
Frequency voltage stability	Δf _{OSC} /ΔV	V _i =12V to 25V	-	0.2	1	%
Frequency temperature stability	Δf _{OSC} /ΔT	T _{amb} =-40 to 85℃ (Note 4)	-	0.5	-	%



Oscillation amplitude	V _{OSC}	(peak to peak)	-	1.6	-	V
discharge current (V _{OSC} =2V)	I _{dischg}	T _j =25℃	7.8	8.3	8.8	mA
Error AMP Section						
Input voltage	V ₂	V _{PIN1} =2.5V	2.42	2.50	2.58	V
Input bias current	I _b	V _{FB} =5V	-	-0.1	-2	uA
Open-loop voltage gain	A _{VOL}	2V≤V _o ≤4V	65	90	-	dB
Unity gain bandwidth	BW	T _j =25℃ (Note 4)	0.7	1	-	MHz
Power supply rejection ratio	PSRR	12V≤V _i ≤25V	60	70	-	dB
Output sink current	I _O	V _{PIN2} =2.7V, V _{PIN1} =1.1V	2	12	-	mA
Output source current	I _O	V _{PIN2} =2.3V, V _{PIN1} =5V	-0.5	-1	-	mA
Output High level voltage	V _{OUT} High	V _{PIN2} =2.3V; R _L =15KΩ to ground	5	6.2	-	V
Output Low level voltage	V _{OUT} Low	V _{PIN2} =2.7V; R _L =15KΩ to PIN 8	-	0.8	1.1	V
Current Sense Section						
Gain	G _V	(Note 5, 6)	2.85	3	3.15	V/V
Maximum input signal	V ₃	V _{PIN1} =5V (Note 5)	0.9	1	1.1	V
Supply voltage rejection	SVR	12V≤V _i ≤25V (Note 5)	-	-	70	dB
Input bias current	I _b	-	-	-2	-10	uA
Propagation delay	-	(Note 4)	-	150	300	ns
Output Section						
Output Low level voltage	V _{OL}	(I _{sink} =20mA)	-	0.1	0.4	V
		(I _{sink} =200mA)	-	1.6	2.2	V
Output High level voltage	V _{OH}	(I _{source} =20mA)	13	13.5	-	V
		(I _{source} =200mA)	12	13.5	-	V
UVLO saturation dropout voltage	V _{OLS}	V _i =6V, I _{SINK} =1mA	-	0.1	1.1	V
Rise time	t _r	C _L =1nF (Note 4)	-	50	150	ns
Fall time	t _f	C _L =1nF (Note 4)	-	50	150	
Under-voltage Lockout Section						
Start threshold voltage	V _{TH(ST)}	AiP3842/4	14.5	16	17.5	V
		AiP3843/5	7.8	8.8	9.4	V
Minimum operating voltage	V _{OPR(MIN)}	AiP3842/4	8.5	10	11.5	V
		AiP3843/5	7.0	7.6	8.2	V
PWM Section						
Maximum duty cycle	-	AiP3842/3	95	97	100	%
		AiP3844/5	47	48	50	%
Minimum duty cycle	-	-	-	-	0	%
Total current						
Start-up current	I _{st}	V _i =6.5V, AiP3843/5	-	0.3	0.9	mA
		V _i =14V, AiP3842/4	-	0.3	0.9	mA
Operating supply	I _i	V _{PIN2} =V _{PIN3} =0V	-	12	20	mA



current						
Zener voltage	V _{IZ}	I _I =25mA	30	36	-	V

3.2.2、Electrical Parameters 2

(T_{amb}=-40 to 8=125℃, V_I=15V (Note 3), R_T=10kΩ, C_T=3.3nF, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Reference Section						
VREF output voltage	VREF	I _O =1mA, T _J =25℃	4.90	5.00	5.10	V
Line regulation	ΔVREF	12V≤V _I ≤25V	-	2	20	mV
Load regulation	ΔVREF	1≤I _O ≤20mA	-	3	25	mV
Temperature drift	ΔVREF/ΔT	(Note 4)	-	0.25	-	mV/℃
Total output variation	-	line, load, temperature	4.7	-	5.3	V
Equivalent output noise voltage	eN	10Hz≤f≤10KHz, T _J =25℃	-	50	-	μV
Output short-circuit current	I _{SC}	(Note 4)	-30	-100	-180	mA
Oscillator Section						
Oscillator frequency	f _{OSC} (Note 7)	T _J =25℃ (Note 7)	49	52	55	kHz
		T _{amb} =-40 to 125℃	47	-	57	kHz
		T _J =25℃ (R _T =6.2kΩ, C _T =1nF)	225	250	275	kHz
Frequency voltage stability	Δf _{OSC} /ΔV	V _I =12V to 25V	-	0.2	1	%
Frequency temperature stability	Δf _{OSC} /ΔT	T _{amb} =-40 to 125℃ (Note 4)	-	0.55	-	%
Oscillation amplitude	V _{OSC}	(peak to peak)	-	1.6	-	V
discharge current (V _{OSC} =2V)	I _{dischg}	T _J =25℃	7.6	8.3	9	mA
Error AMP Section						
Input voltage	V _I	V _{PIN1} =2.5V	2.42	2.50	2.58	V
Input bias current	I _b	V _{FB} =5V	-	-0.1	-2	μA
Open-loop voltage gain	A _{VOL}	2V≤V _O ≤4V	65	90	-	dB
Unity gain bandwidth	BW	T _J =25℃ (Note 4)	0.7	1	-	MHz
Power supply rejection ratio	PSRR	12V≤V _I ≤25V	60	70	-	dB
Output sink current	I _O	V _{PIN2} =2.7V, V _{PIN1} =1.1V	2	12	-	mA
Output source current	I _O	V _{PIN2} =2.3V, V _{PIN1} =5V	-0.5	-1	-	mA
Output High level voltage	V _{OUT} High	V _{PIN2} =2.3V; R _L =15KΩ to ground	5	6.2	-	V
Output Low level voltage	V _{OUT} Low	V _{PIN2} =2.7V; R _L =15KΩ to PIN 8	-	0.8	1.1	V
Current Sense Section						
Gain	G _V	(Note 5, 6)	2.85	3	3.15	V/V
Maximum input signal	V _I	V _{PIN1} =5V (Note 5)	0.9	1	1.1	V
Supply voltage	SVR	12V≤V _I ≤25V (Note 5)	-	-	70	dB



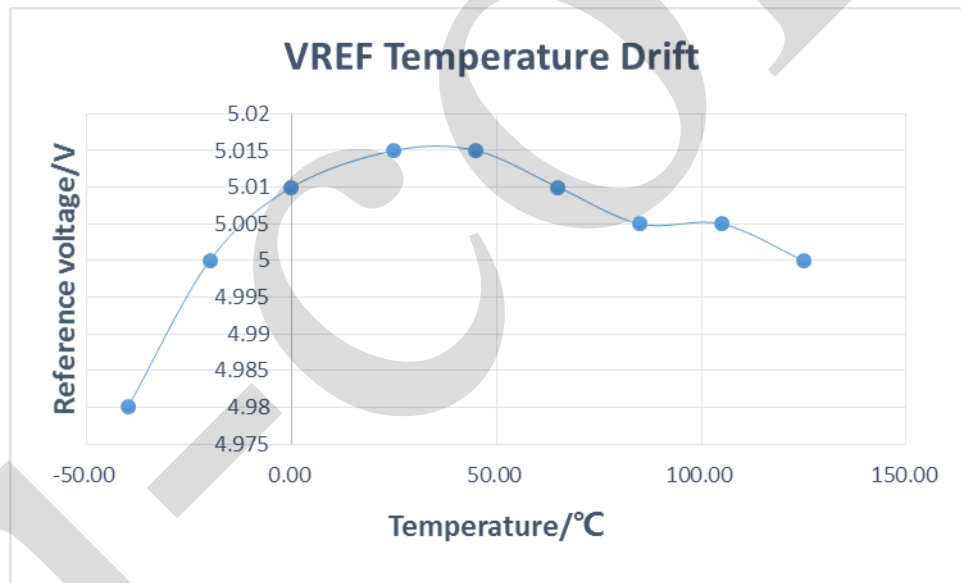
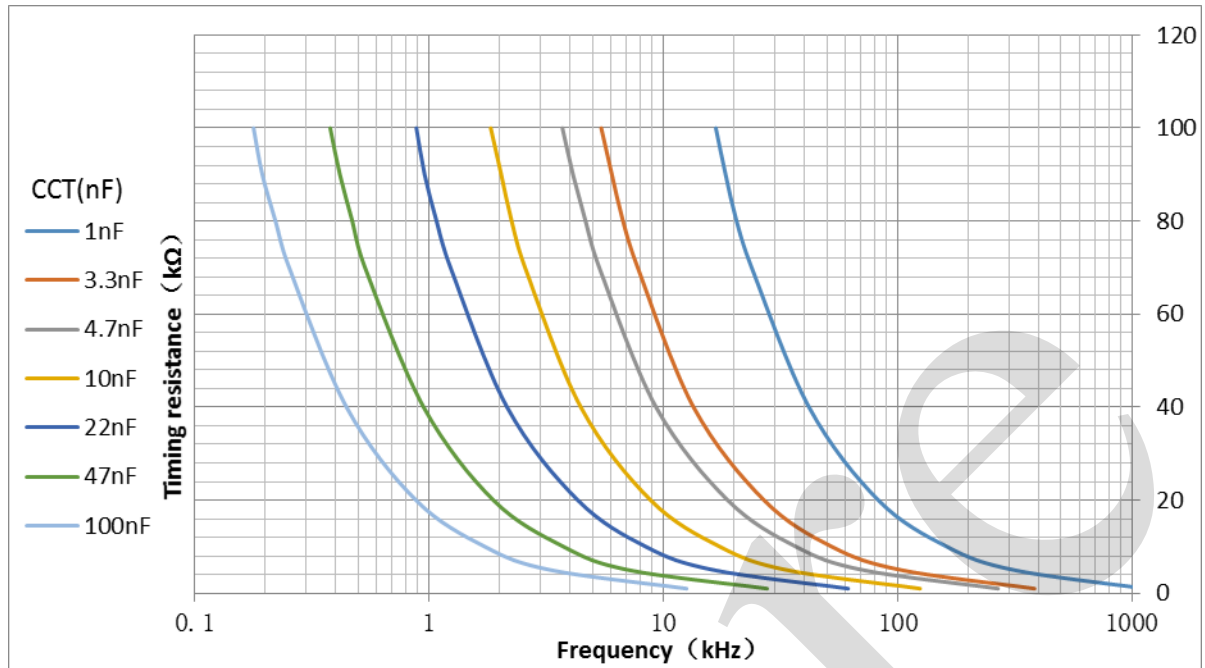
rejection						
Input bias current	I _b	-	-	-2	-10	uA
Propagation delay	-	(Note 4)	-	150	300	ns
Output Section						
Output Low level voltage	V _{OL}	(Isink=20mA)	-	0.1	0.4	V
		(Isink=200mA)	-	1.6	2.2	V
Output High level voltage	V _{OH}	(Isource=20mA)	13	13.5	-	V
		(Isource=200mA)	12	13.5	-	V
UVLO saturation dropout voltage	V _{OLS}	V _i =6V, I _{SINK} =1mA	-	0.1	1.1	V
Rise time	t _r	C _L =1nF (Note 4)	-	50	150	ns
Fall time	t _f	C _L =1nF (Note 4)	-	50	150	
Under-voltage Lockout Section						
Start threshold voltage	V _{TH(ST)}	AiP3842/4	14.5	16	17.5	V
		AiP3843/5	7.8	8.8	9.5	V
Minimum operating voltage	V _{OPR(MIN)}	AiP3842/4	8.5	10	11.5	V
		AiP3843/5	7.0	7.6	8.4	V
PWM Section						
Maximum duty cycle	-	AiP3842/3	95	97	100	%
		AiP3844/5	47	48	50	%
Minimum duty cycle	-	-	-	-	0	%
Total current						
Start-up current	I _{st}	V _i =6.5V, AiP3843/5	-	0.3	1	mA
		V _i =14V, AiP3842/4	-	0.3	1	mA
Operating supply current	I _i	V _{PIN2} =V _{PIN3} =0V	-	12	20	mA
Zener voltage	V _{iz}	I _i =25mA	30	36	-	V

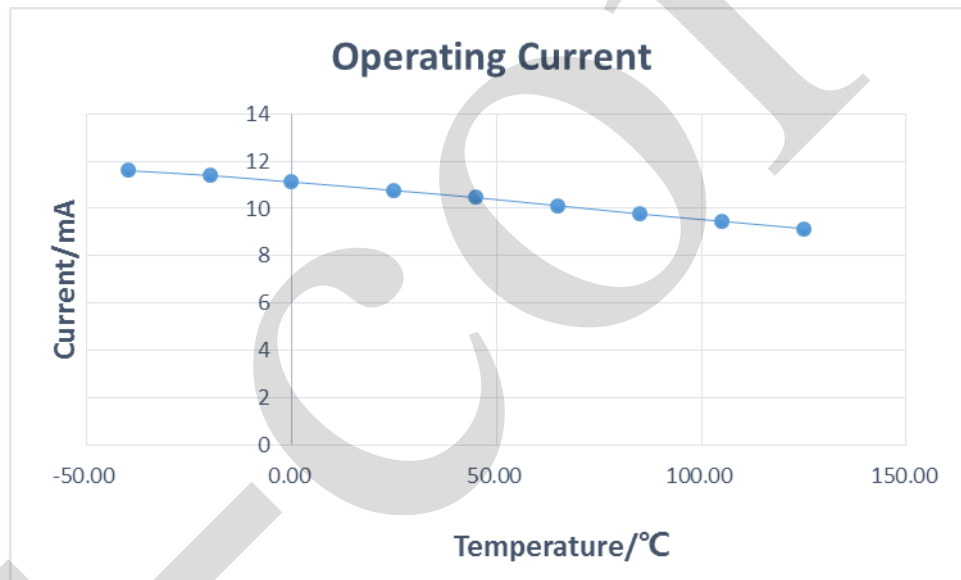
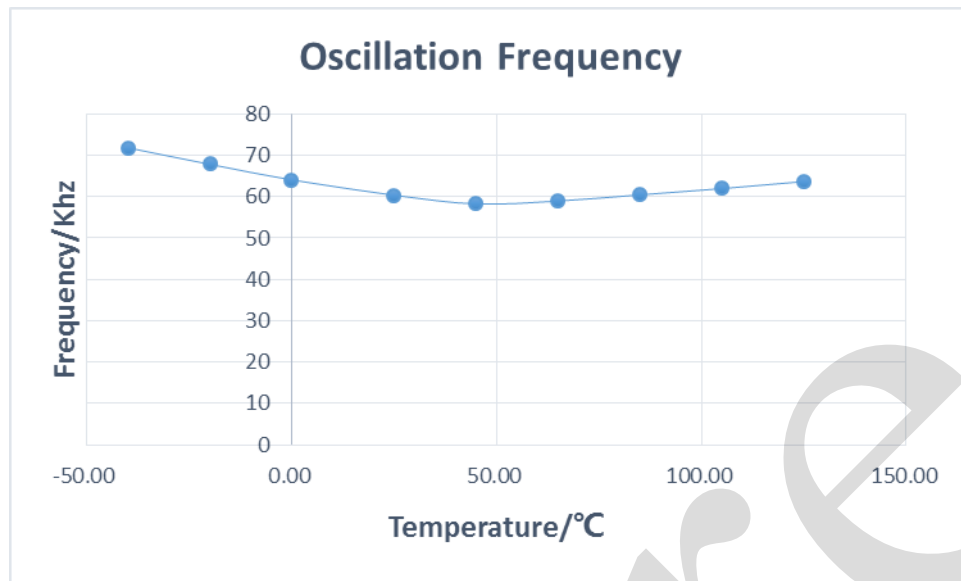
Note:

3. First adjust the supply voltage V_i to be high than the start threshold, then set it to 15V.
4. The above parameters are not test results for 100% of products, but they are typical.
5. When testing the trigger point of the latch, $V_{PIN2}=0$.
6. Gain defined as: $A=\Delta V_{PIN1}/\Delta V_{PIN3}$ and $0 \leq V_{PIN3} \leq 0.8V$.
7. $R_t > 5k\Omega$, $f \approx 1.76/(RT \cdot CT)$



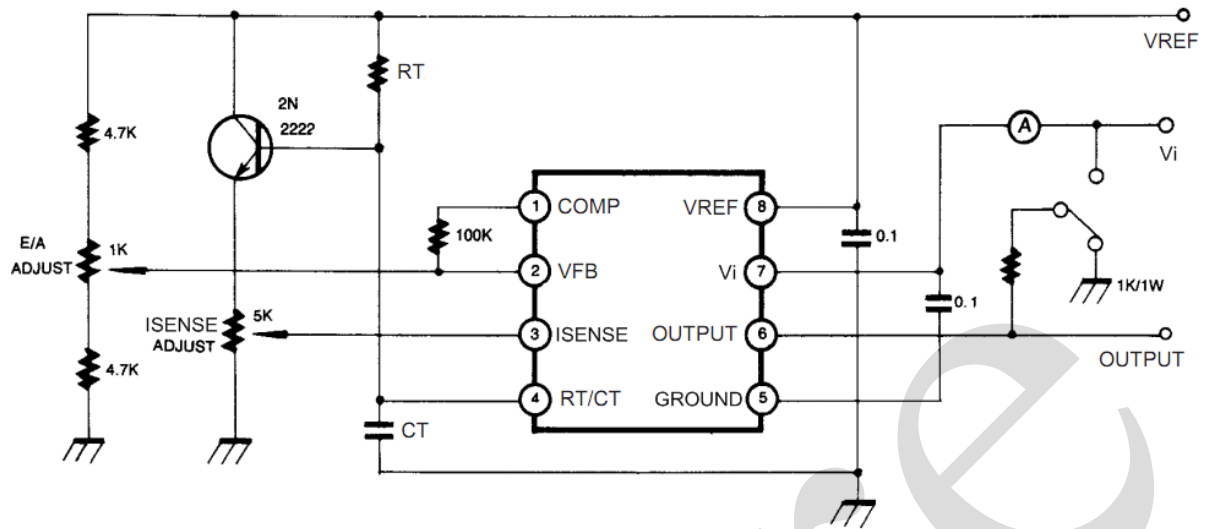
4、Characteristic Curve

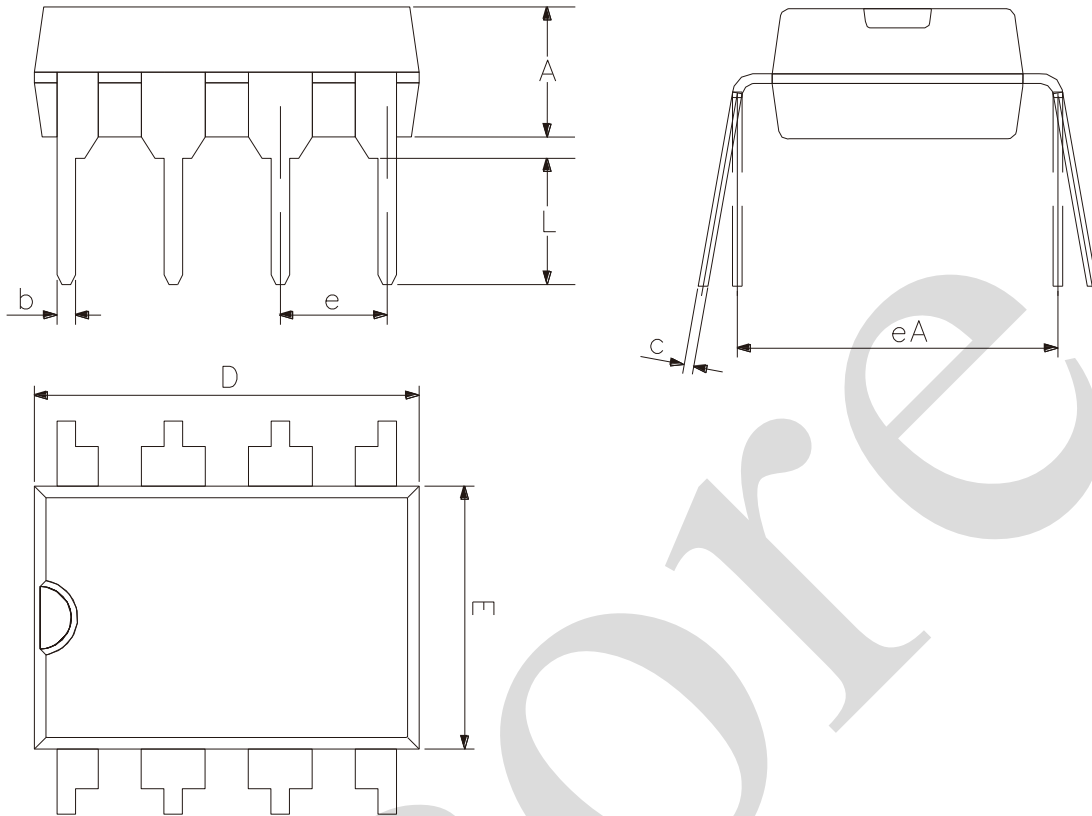






5、Typical Application Circuit And Application Note

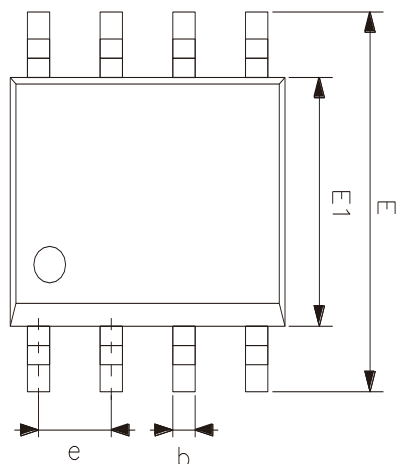
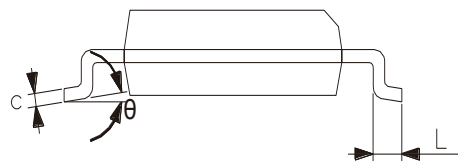
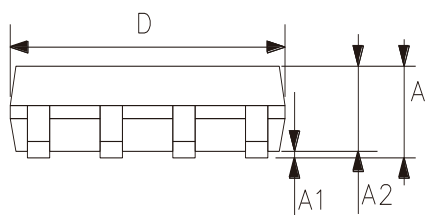


**6、Package Information****6.1、DIP8**

2023/12/A	Dimensions In Millimeters	
Symbol	Min	Max
A	3.00	3.60
b	0.36	0.56
c	0.20	0.36
D	9.00	9.45
E	6.15	6.60
e	2.54	
eA	7.62	9.30
L	3.00	—



6.2、SOP8



2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	1.35	1.80
A1	0.05	0.25
A2	1.25	1.55
D	4.70	5.10
E	5.80	6.30
E1	3.70	4.10
b	0.306	0.51
c	0.19	0.25
e	1.27	
L	0.40	0.89
θ	0°	8°



7、Statements And Notes

7.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

7.2、Notes

We recommend you to read this chapter carefully before using this product.

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