

## Single Coil Fan Motor Full Wave Driver

### ■ Features

- Compatible to a Hall element
- Operating voltage ( $V_{CC}$ ) : 4V to 20V
- Lock shutdown and automatic restart
- Speed indication output (FG) named as AP1301
- Rotation detection output (RD) named as AP1302
- Output current(AP1301/2)  $I_O=500mA_{(max)}$
- Operating temperature ( $T_{opr}$ ) : -30°C to +85°C
- SOP-8L EP package
- Include Thermal Shutdown circuit

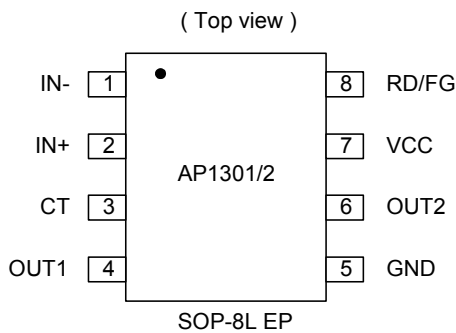
### ■ Application

- CPU cooling fans

### ■ General Description

The AP1301/2 is single phase full wave drive design, which is suited for small fans (such as CPU cooling fans). The low switching noise and effective motor drive are another advantage. All functions, including lock shutdown, automatic restart, rotation detection (RD), and speed indication output (FG) have been incorporated into one chip. When the motor is under lock condition, lock shutdown function turns off the output current. When the lock condition is removed, the IC automatically restarts and allows DC fan to run. In addition, the RD function is to detect the motor status and the FG is to provide the rotation speed.

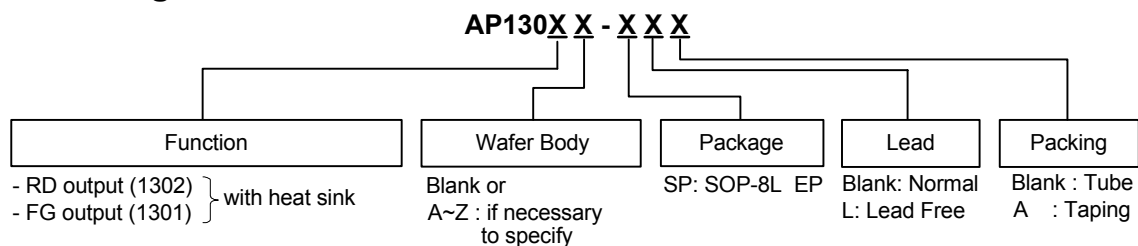
### ■ Pin Assignment



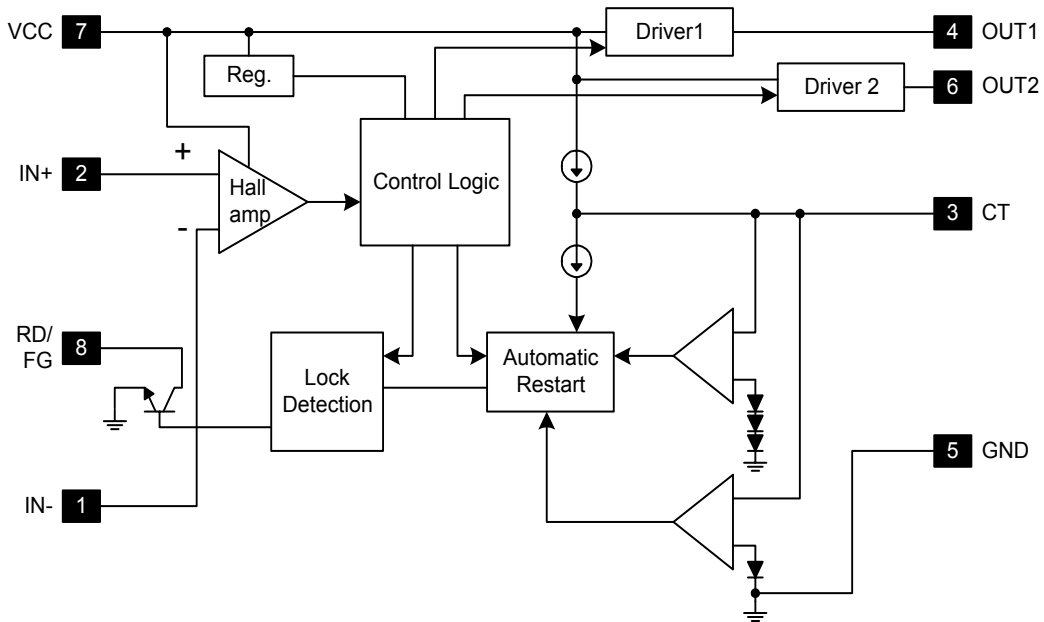
### ■ Pin Descriptions

Name	Description
VCC	Power input
IN+	Hall input
RD/FG	Rotation detection / Speed indication
IN-	Hall input
GND	Ground
CT	Timing capacitor
OUT2	Driver output
OUT1	Driver output

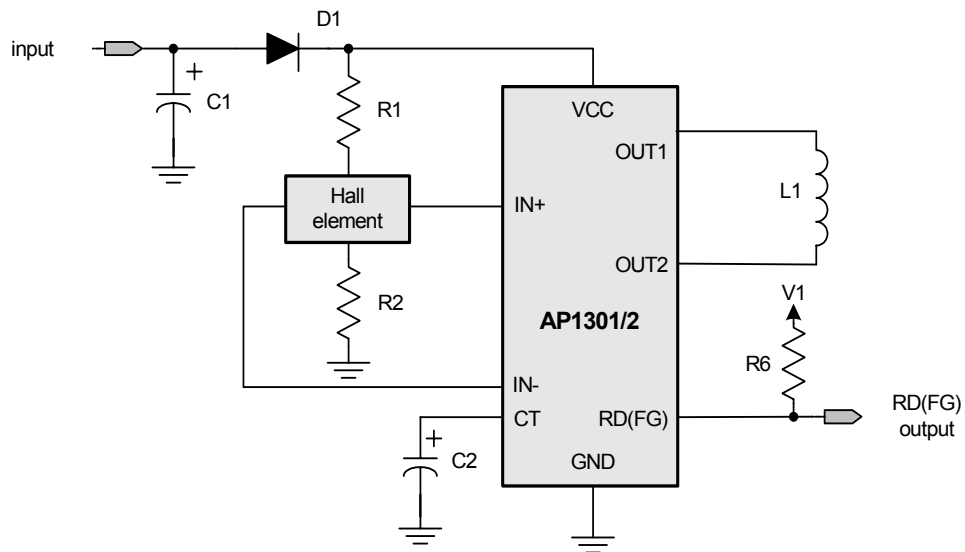
### ■ Ordering Information



### ■ Block Diagram



### ■ Application Circuit





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### ■ Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ )

Parameter	Symbol	Rating	Unit
Input Voltage	$V_{CC}$	20	V
*Output Current (Note 1)	$I_{OUT}$	AP1301/2	mA
	$I_P$	AP1301/2	
Maximum Output Withstand Voltage	$V_{out}$	20	V
RD/FG Maximum Output Withstand Voltage	$V_r/V_f$	20	V
RD/FG Maximum Output Current	$I_r/I_f$	5	mA
*Allowable Power Dissipation (Note2)	$P_D$	AP1301/2	mW
Operating Temperature	$T_{OPR}$	-30 to +85	$^{\circ}\text{C}$
Storage Temperature	$T_{STG}$	-55 to +150	$^{\circ}\text{C}$

\*Note1:  $P_d$  shall be within safety operation Area.

\*Note2:  $P_d$ =conduction power dissipation + switching power dissipation

where conduction power dissipation =  $I_{CC} \times V_{CC} + I_C \times (V_{ol}(\text{sat})+V_{oh}(\text{sat}))$ ,

$V_{ol}(\text{sat})$ : Output low side saturation voltage

$V_{oh}(\text{sat})$ : Output high side saturation voltage

Switching power dissipation is based on switching wave-form of I / V, which is related with coils and application circuit design.

### ■ Recommended Operation Condition ( $T_A=25^{\circ}\text{C}$ )

Parameter	Symbol	Conditions	Rating	Unit
Supply Voltage	$V_{CC}$	Operation	4 to 20	V

### ■ Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ , $V_{CC}=5\text{V}$ , unless otherwise noted)

Parameter	Symbol	Conditions	Rating			Unit
			Min.	Typ.	Max.	
Hall Input Voltage (DC+AC)	$V_{BH}$	Includes the amplitude of signal	0.2	--	$V_{CC}-1.5$	V
Supply Current	$I_{CC}$	The output is off	--	6.5	10	mA
Charge Current	$I_{CHG}$	$V_{CT} = 1.5\text{V}$	1.9	2.8	3.7	$\mu\text{A}$
Discharge Current	$I_{DHG}$	$V_{CT} = 1.5\text{V}$	0.32	0.46	0.60	$\mu\text{A}$
Charge/Discharge Ratio	$R_{CD}$	$I_{GHG}/I_{DCHG}$	5.0	6.0	7.0	--
Output Low Level Voltage	$V_{ol}$	$I_o=200\text{mA}$ ; both of $V_{CC}=12\text{V}$ and 5V	--	0.2	0.3	V
Output High Level Voltage	$V_{oh}$	$I_o=200\text{mA}$ ; both of $V_{CC}=12\text{V}$ and 5V	3.9	4.1	--	V
Hall Input Sensitivity	$V_{HN}$	Zero peak value (including offset and hysteresis)		7	15	mV
RD/FG Pin Output Low	$V_{RDL}, V_{fgl}$	$I_{RD}, I_{fg} = 5\text{mA}$	--	0.1	0.3	V
RD/FG Output Pin Leakage Current	$I_{rdl}, I_{fgl}$	$V_{rd}, V_{fg}=15\text{V}$	--	--	30	$\mu\text{A}$
Thermal Resistance of Junction to Case , with Copper Area of 114.3mm*76.2mm*1.5mm	$\theta_{JC}$	SOP-8L EP	--	40	--	$^{\circ}\text{C}/\text{W}$
Thermal Resistance of Junction to Ambient	$\theta_{JA}$	SOP-8L SOP-8L EP	--	125	--	$^{\circ}\text{C}/\text{W}$

### Truth Table

IN-	IN+	CT	OUT1	OUT2	RD	FG	Mode
H	L	L	H	L	L	L	Rotating
L	H	L	L	H	L	H	Rotating
-	-	H	off	off	off	-	Lockup protection activated

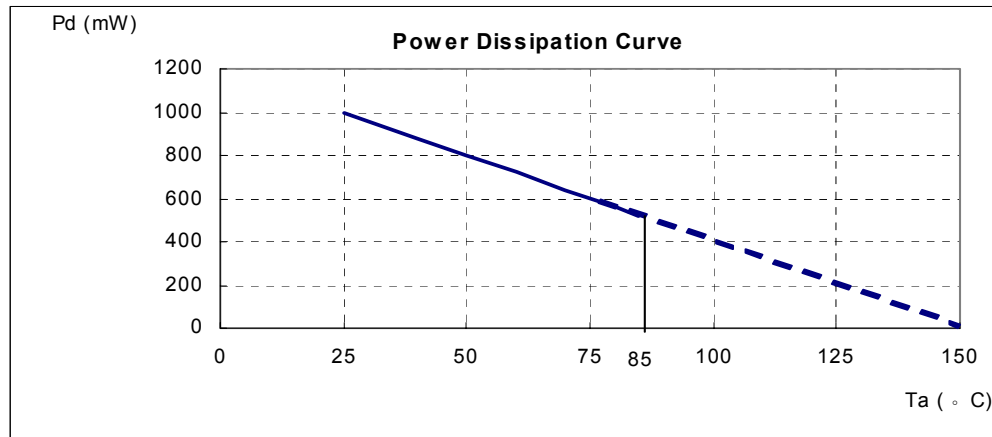
Latch-type RD output is low during rotation and high during stop

## Single Coil Fan Motor Full Wave Driver

### ■ Performance Characteristics

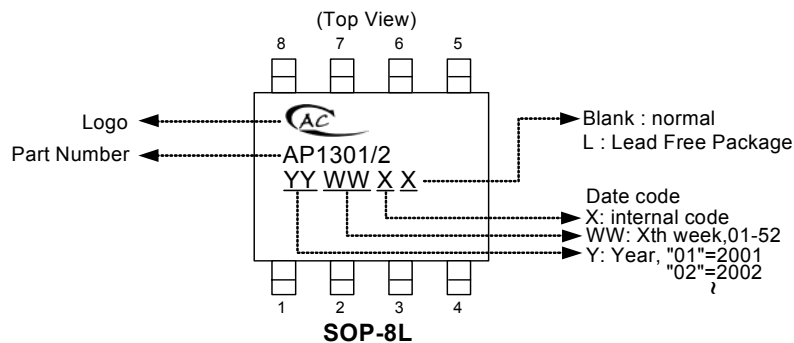
(with heat sink copper 114.3mm\*76.2mm\*1.5mm area AP1301/2)

Ta (°C)	25	40	50	60	70	80	85	90	95	100
Pd (mW)	1000	880	800	720	640	560	520	480	440	400
Ta (°C)	105	110	115	120	125	130	135	140	145	150
Pd (mW)	360	320	280	240	200	160	120	80	40	0



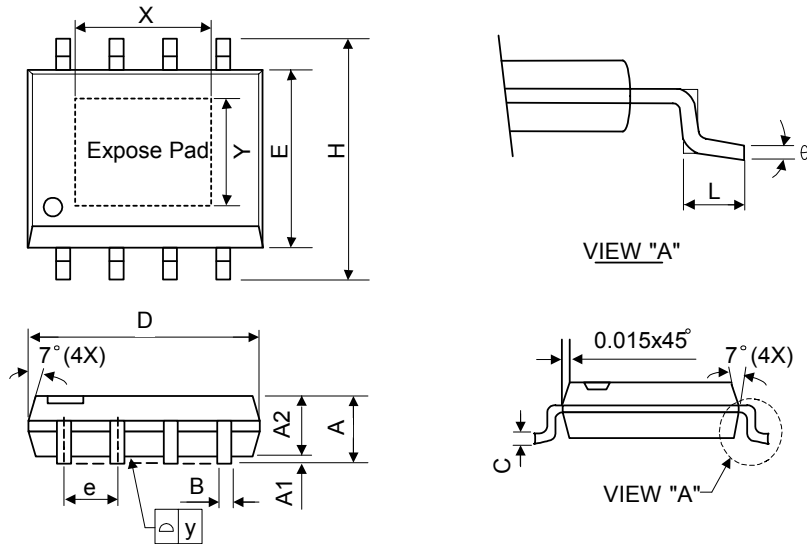
Note : SOP-8L EP package.

### ■ Marking Information



### ■ Package Information

Package Type: SOP-8L ( Normal / Expose Pad )



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.60	1.75	0.055	0.063	0.069
A1	0.10	-	0.25	0.040	-	0.100
A2	1.30	1.45	1.50	0.051	0.057	0.059
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.010
D	4.80	5.05	5.30	0.189	0.199	0.209
E	3.70	3.90	4.10	0.146	0.154	0.161
e	-	1.27	-	-	0.050	-
H	5.79	5.99	6.20	0.228	0.236	0.244
L	0.38	0.71	1.27	0.015	0.028	0.050
y	-	-	0.10	-	-	0.004
θ	0°	-	8°	0°	-	8°
<b>(Expose pad)</b>						
X	-	2.92	-	-	0.115	-
Y	-	2.34	-	-	0.092	-