

## SINGLE PHASE HALL EFFECT LATCH SMART FAN MOTOR CONTROLLER

### Description

The AH5798 is a single chip solution for driving single-coil brushless direct current (BLDC) fans and motors. The integrated full-bridge driver output stage uses soft switching to minimize audible switching noise and electromagnetic interference (EMI) providing a low noise solution.

To help protect the motor coil, the AH5798 provides Rotor Lock Protection which shuts down output drive if rotor lock is detected. The device automatically re-starts when the rotor lock is removed. Over temperature shutdown provides thermal protection for the device.

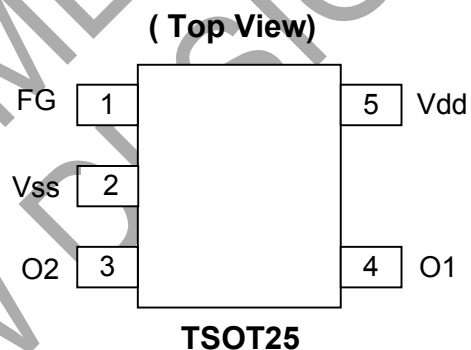
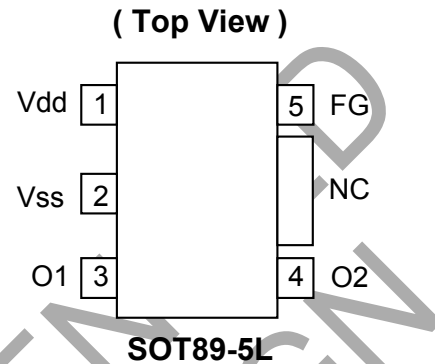
A Tachometer output is provided by open-drain Frequency Generator (FG) Pin which allows external interface to monitor motor rotation or speed. The FG output is the magnetic change frequency.

The AH5798 is available in space saving SOT89-5L and thinner TSOT25 packages.

### Features

- Supports single-coil full-wave DC fan drivers
- Built-in Hall sensor and input amplifier
- Operating Voltage: 1.8V to 5.5V
- Soft switching for low noise DC fan motor applications
- Rotor Lock Protection (Lock detection, output shutdown and automatic re-start)
- Thermal protection
- Tachometer (FG) output
- No external timing capacitor - Reduces the numbers of external components required
- Low profile packages: SOT89-5L and TSOT25
- "Green" Molding Compound

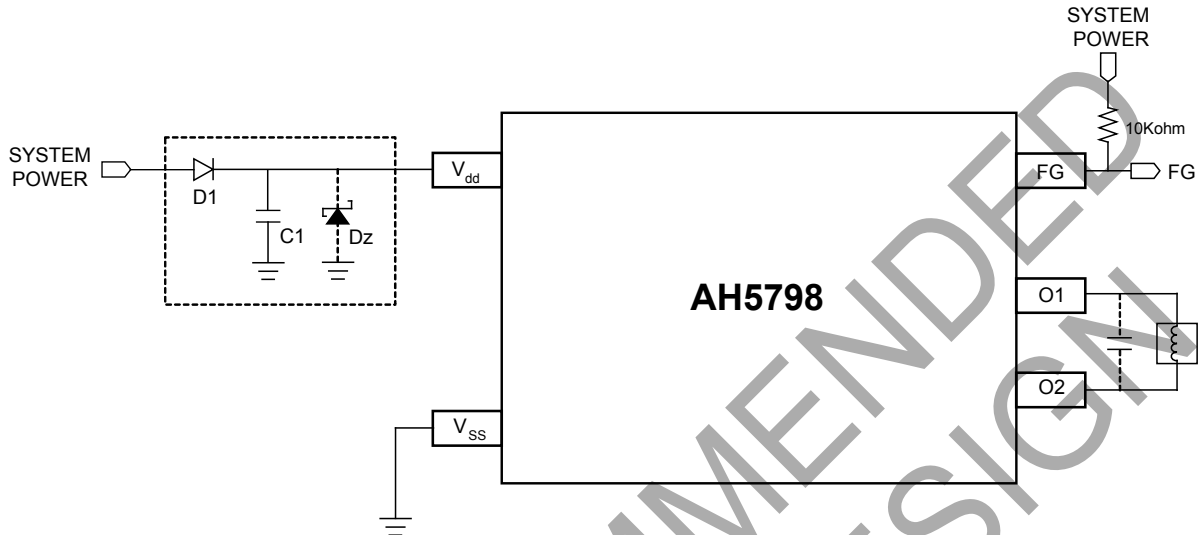
### Pin Assignments



### Applications

- 3.3V / 5V Min. BLDC Cooling Fans
- Netbook/ Notebook BLDC fans
- Low Voltage/ Low Power BLDC Motors

**Typical Application Circuit**



- \* Reverse connection of power supply may damage the device. To prevent reverse power damage, a protection (reverse blocking) Diode D1 is needed between power supply and V<sub>dd</sub> terminal. If a reverse power protection diode D1 is used, there is no current return path to power supply, so it is necessary to follow measures such as below.
- Connect Dz (Zener diode) between V<sub>dd</sub> and V<sub>ss</sub> terminal, to prevent voltage exceeding the absolute maximum rating of the device.
  - Connect a capacitor C1 between V<sub>dd</sub> and V<sub>ss</sub> terminal, to complete the current return path to power supply.

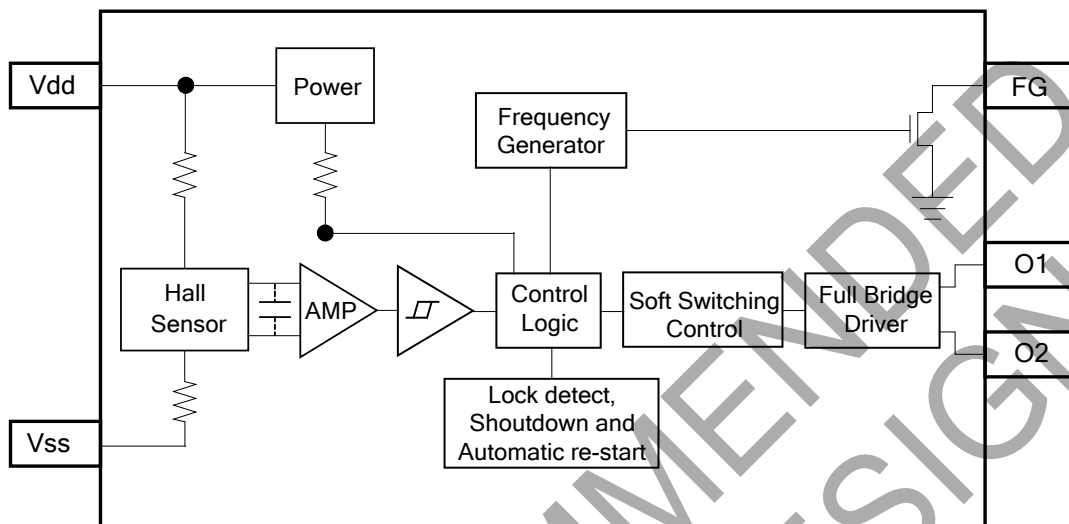
The AH5798 has an open-drain tachometer FG output that follows the magnetic change frequency. Typically, a pull-up resistor of 10kΩ is recommended from FG pin to the supply voltage.

**Pin Descriptions**

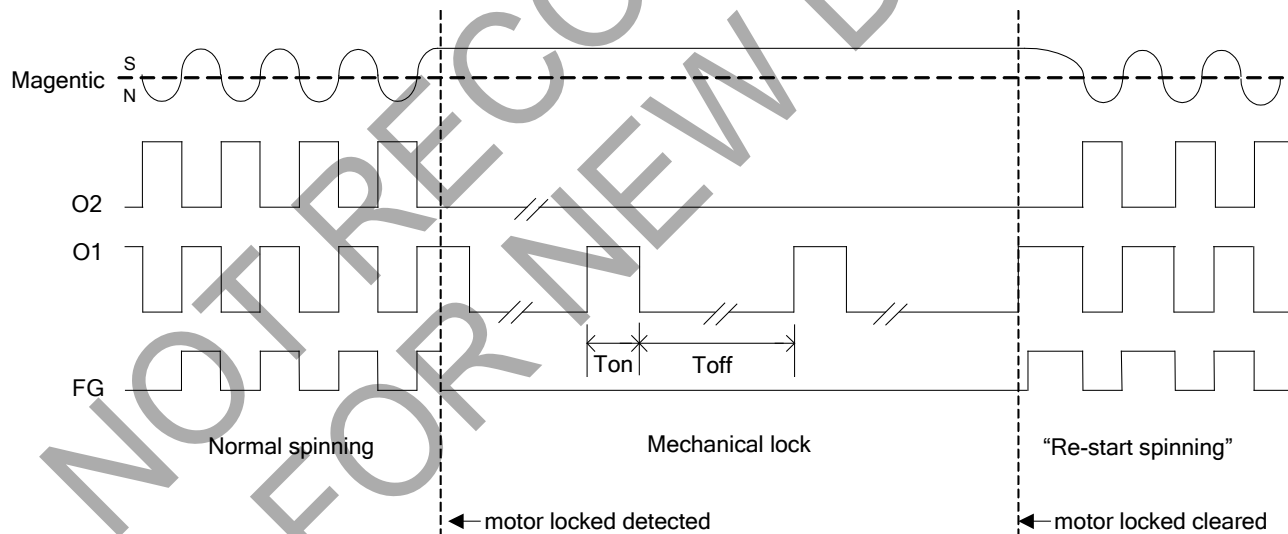
Pin Name	Description
V <sub>dd</sub>	Power Supply Pin
V <sub>ss</sub>	Ground Pin
O1	Output Driving & Sinking Pin 1
O2	Output Driving & Sinking Pin 2
NC	No Connection
FG	Frequency Generator (Note 1)

Notes: 1. The FG is the same as the magnetic change frequency.

**Functional Block Diagram**



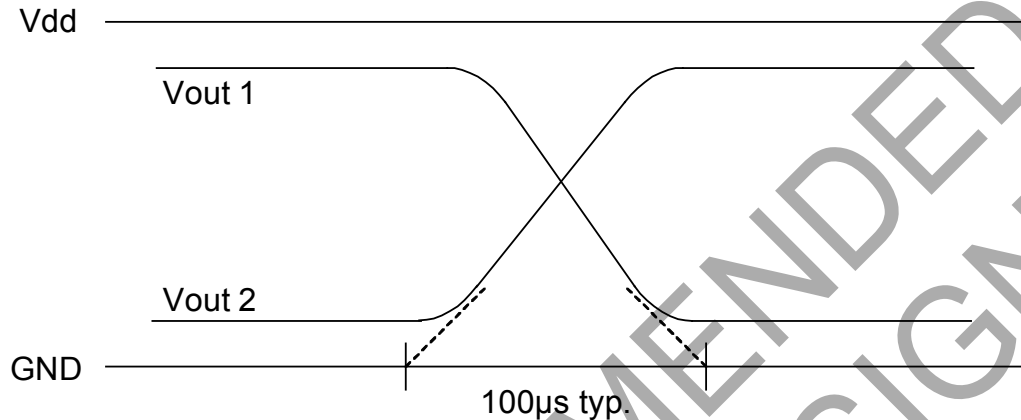
**Operating**



- Notes:
2. In "Normal spinning", the FG changes its state at each rising edge of O1.
  3. When the motor locks with South pole at the Hall element, O2 is kept on "L" and O1 is a clock with Ton/Toff ratio. When motor locks with North pole at the Hall element, O1 is kept on "L", O2 is a clock with Ton/Toff ratio.
  4. When "Re-start spinning" occurs, the motor speed ramps up to the "Normal Spinning" speed from zero. Speed ramp-up profile depends on motor characteristics.

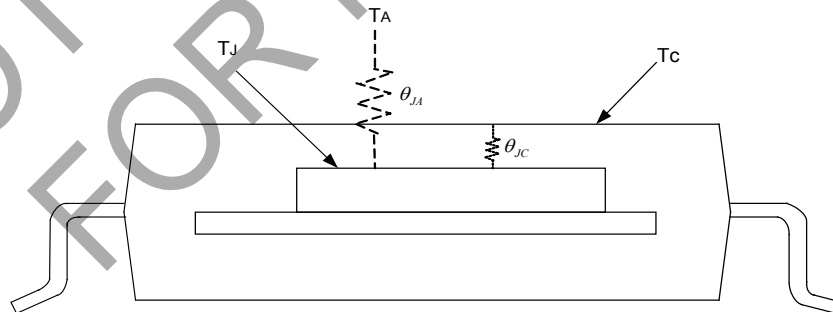
### Soft Switching

AH5798 employs soft switching of output drive at commutation to reduce audible noise and EMI for low noise applications.



### Absolute Maximum Ratings (T<sub>A</sub> = 25°C, unless otherwise noted)

Symbol	Parameter	Rating	Unit
V <sub>DD</sub>	Supply voltage	6	V
I <sub>O(PEAK)</sub>	Maximum Output Current (Peak)	800	mA
P <sub>D</sub>	Power Dissipation	SOT89-5L	800
		TSOT25	520
T <sub>ST</sub>	Storage Temperature Range	-65 ~ 150	°C
θ <sub>JA</sub>	Thermal Resistance Junction-to-Ambient (Note 5)	SOT89-5L	156
		TSOT25	240



Notes: 5. θ<sub>JA</sub> should be confirmed with heat sink thermal resistance. If there is no heat sink contact, θ<sub>JA</sub> will almost be the same as θ<sub>JC</sub>.

### Recommended Operating Conditions (T<sub>A</sub> = 25°C)

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DD</sub>	Supply Voltage	Operating	1.8	5.5	°C
T <sub>A</sub>	Operating Ambient Temperature Range	Operating	-40	105	V

### Electrical Characteristics (T<sub>A</sub> = 25°C, V<sub>dd</sub> = 5V)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
I <sub>dd</sub>	Supply Current	No Load	-	5	-	mA
V <sub>OH</sub>	Output Voltage High	I <sub>OUT</sub> = 300mA	4.4	4.65	-	V
V <sub>OL</sub>	Output Voltage Low	I <sub>OUT</sub> = 300mA	-	0.35	0.6	V
T <sub>SW</sub>	Output Switching Slope Duration	50Ω load on out1/out2	-	100	-	μs
I <sub>LEAK</sub>	FG Output Leakage Current		-	-	5	μA
V <sub>FGOL</sub>	FG Output Voltage Low	I <sub>FG</sub> = 5mA	-	-	0.4	V
T <sub>ON</sub>	On Time		350	500	650	ms
R <sub>DR</sub>	Duty Ratio	T <sub>OFF</sub> / T <sub>ON</sub>	-	10	-	

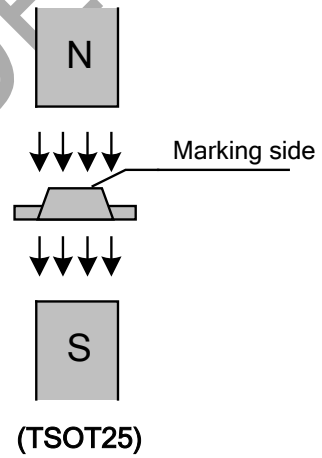
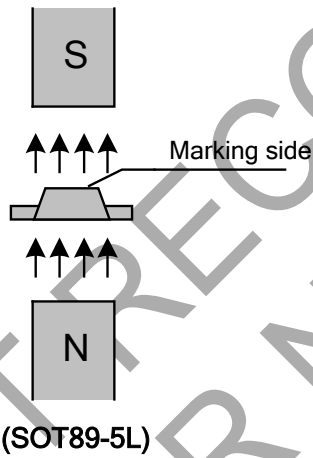
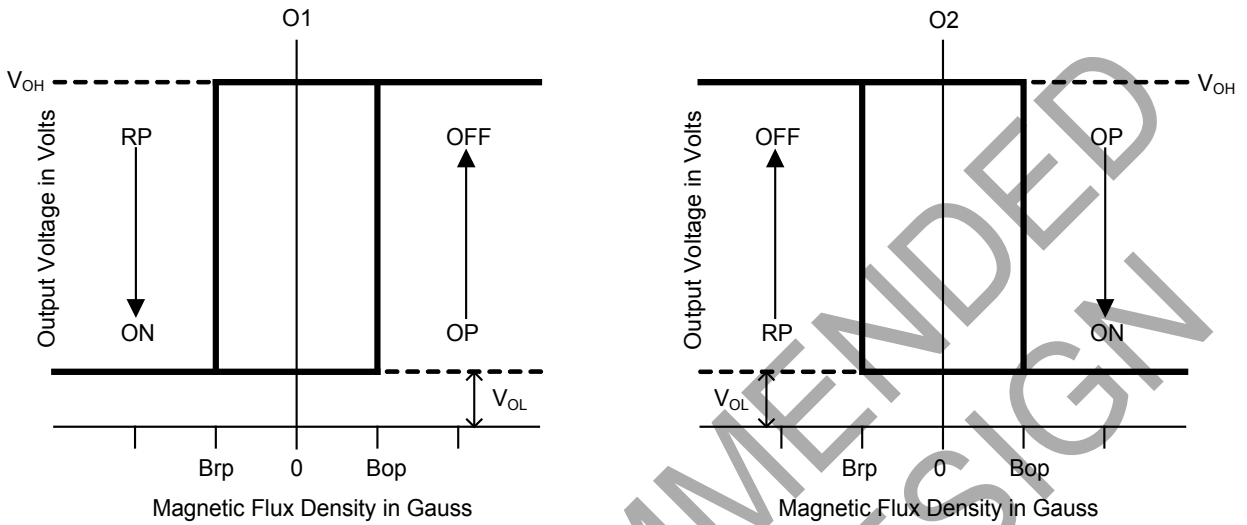
### Magnetic Characteristics (T<sub>A</sub> = 25°C, V<sub>dd</sub> = 1.8V~5V, Note 6)

(1mT = 10 G)

Symbol	Parameter	Min	Typ.	Max	Unit
B <sub>op</sub>	Operate Point	10	25	50	G
B <sub>rp</sub>	Release Point	-50	-25	-10	G
B <sub>hy</sub>	Hysteresis	-	50	-	G

Notes: 6. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.

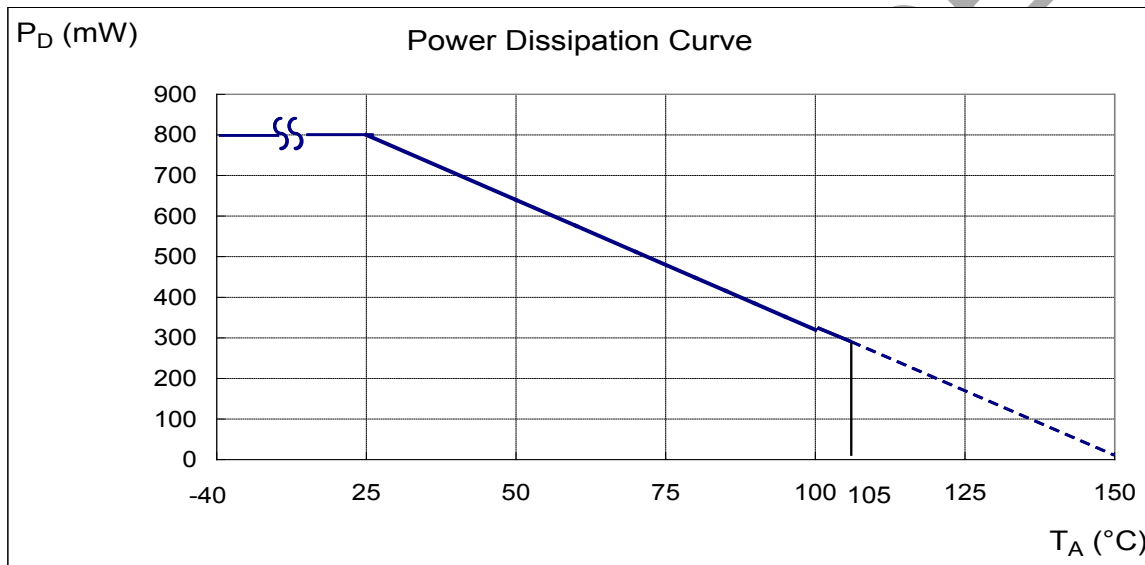
**Operating Characteristics**



**Performance Characteristics**

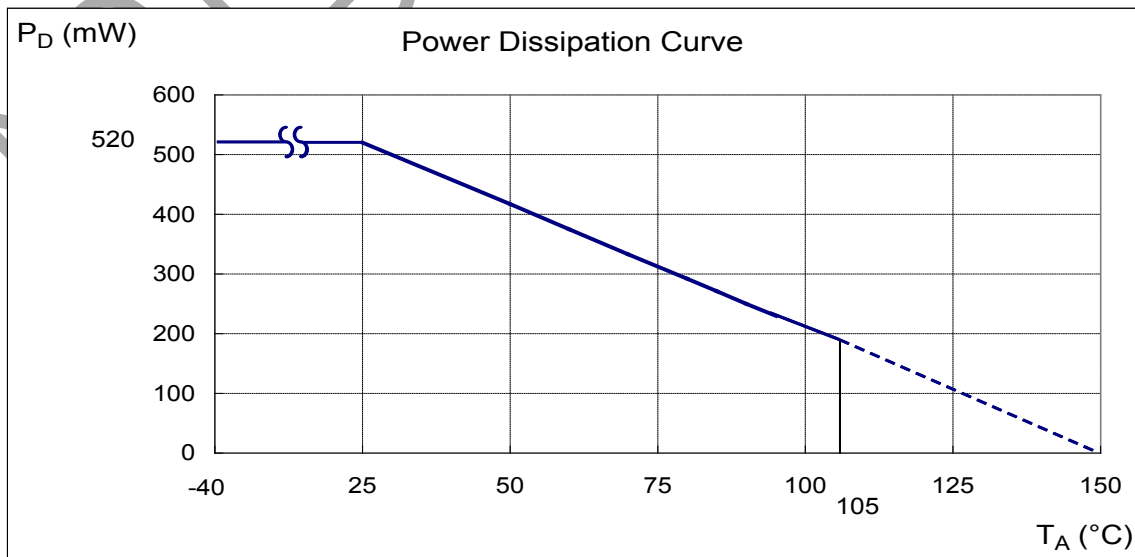
**(1) SOT89-5L**

$T_A$ (°C)	25	50	60	70	75	80	85	90	95	100
$P_D$ (mW)	800	640	576	512	480	448	416	384	352	320
$T_A$ (°C)	105	110	115	120	125	130	135	140	145	150
$P_D$ (mW)	288	256	224	192	160	128	96	64	32	0

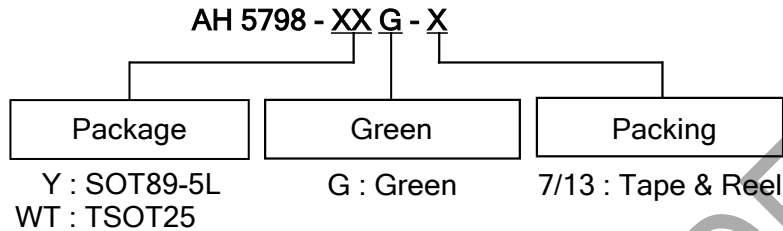


**(2) TSOT25**

$T_A$ (°C)	25	50	60	70	75	80	85	90	95	100
$P_D$ (mW)	520	417	375	333	313	292	271	250	230	208
$T_A$ (°C)	105	110	115	120	125	130	135	140	145	150
$P_D$ (mW)	188	167	146	125	104	83	63	42	21	0



### Ordering Information



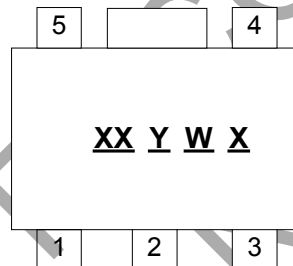
Device	Package Code	Packaging (Note 7 & 8)	7"/13" Tape and Reel	
			Quantity	Part Number Suffix
AH5798-YG-13	Y	SOT89-5L	2500/Tape & Reel	-13
AH5798-WTG-7	WT	TSOT25	3000/Tape & Reel	-7

Notes: 7. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>  
 8. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html)

### Marking Information

#### (1) SOT89-5L

(Top View)

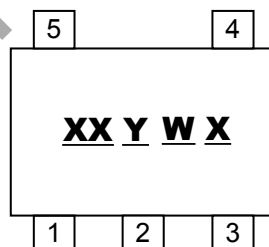


**XX** : Identification code  
**Y** : Year : 0~9  
**W** : Week : A~Z : 1~26 week;  
 a~z : 27~52 week;  
 z represents 52 and 53 week  
**X** : Internal code  
 A~Z : Green

Part Number	Package	Identification Code
AH5798-YG	SOT89-5L	K4

#### (2) TSOT25

(Top View)



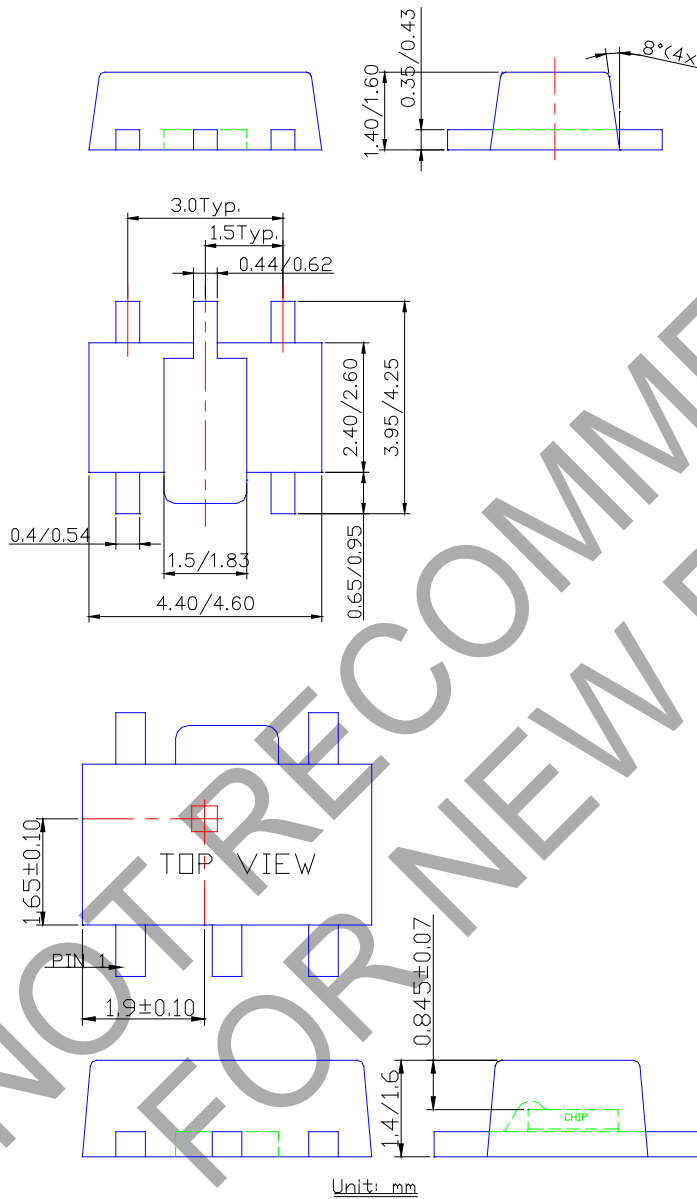
**XX** : Identification code  
**Y** : Year 0~9  
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 a~z : 27~52 week;  
 z represents 52 and 53 week  
**X** : A~Z : Green

Part Number	Package	Identification Code
AH5798-WTG	TSOT25	K4



**Package Outline Dimensions (All Dimensions in mm)**

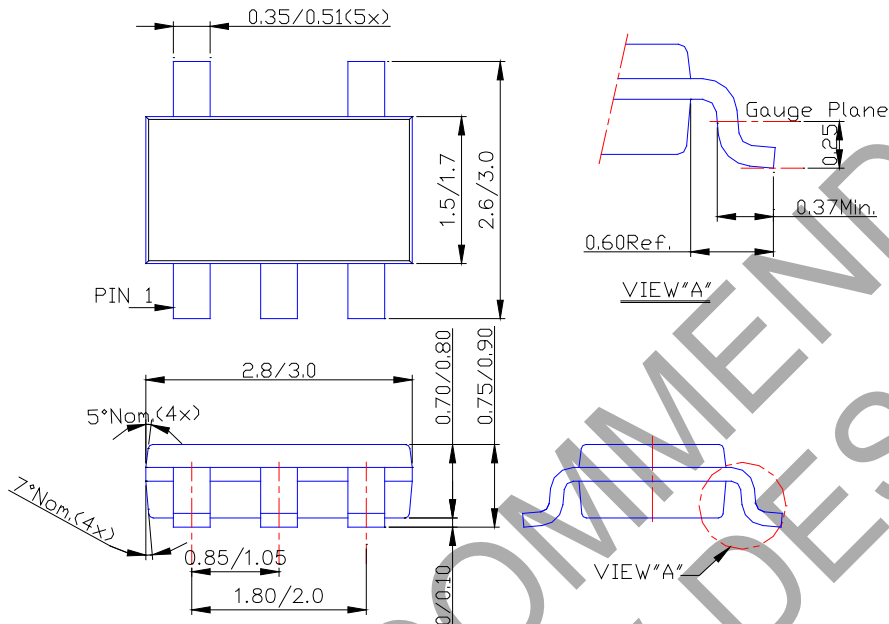
(1) Package type: SOT89-5L



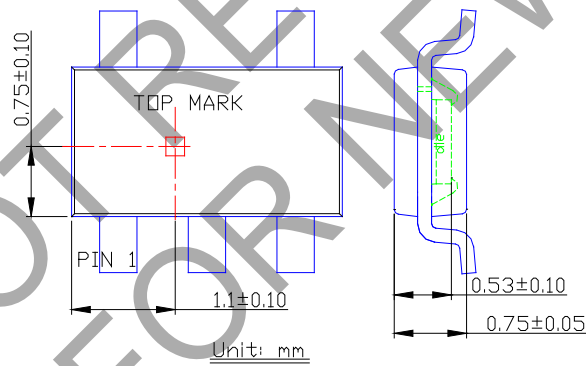
**Sensor Location**

**Package Outline Dimensions (Continued)**

**(2) Package type: TSOT25**



TSOT25L Package



**Sensor Location**

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