

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.

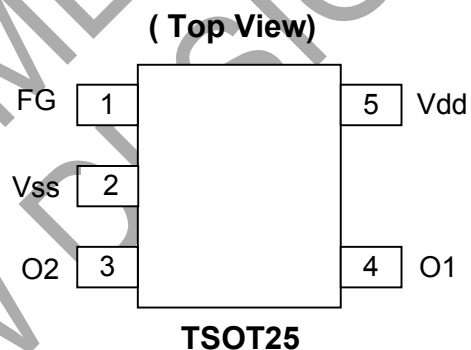
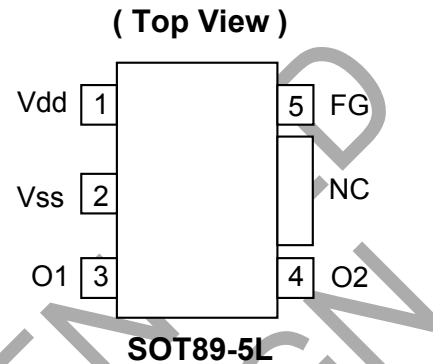
A Tachometer output is provided by open-drain Frequency Generator (FG) Pin which allows external interface to monitor motor rotation or speed. The FG output is the magnetic change frequency.

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

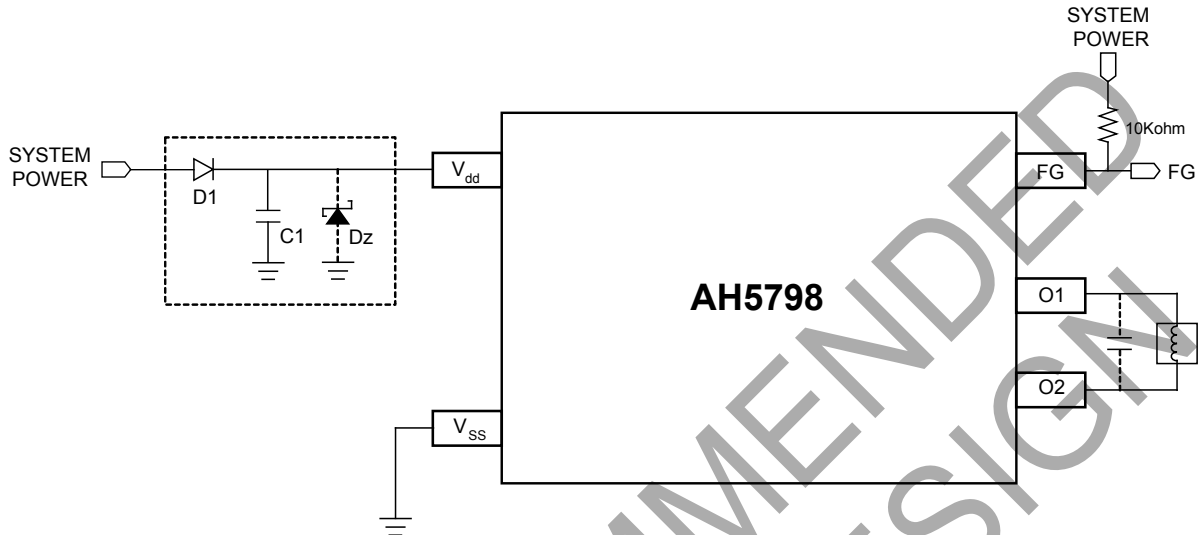
Pin Assignments



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 Vdd 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 Vdd and Vss terminal, to prevent voltage exceeding the absolute maximum rating of the device.
 - Connect a capacitor C1 between Vdd and Vss terminal, to complete the current return path to power supply.

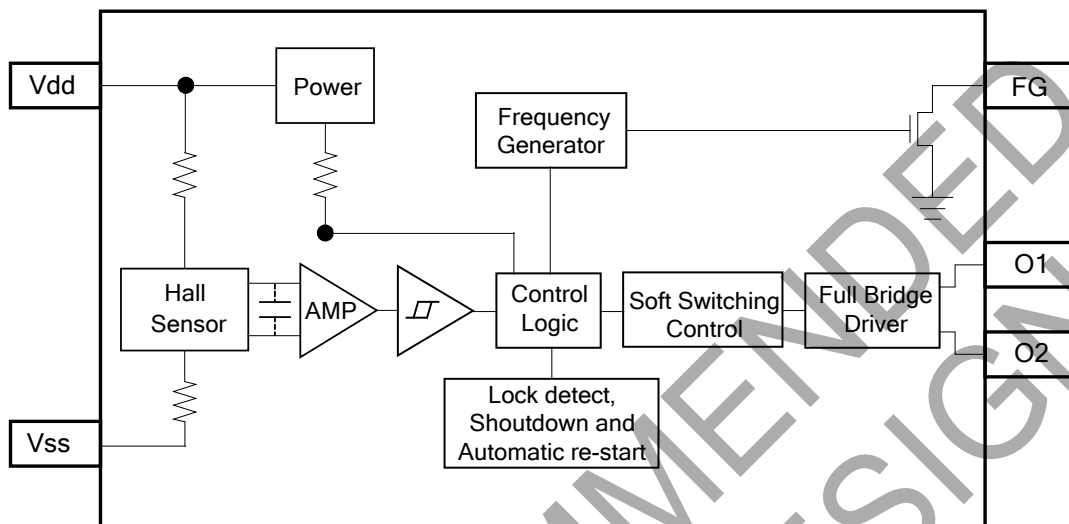
The AH5798 has an open-drain tachometer FG output that follows the magnetic change frequency. Typically, a pull-up resistor of 10kΩ is recommended from FG pin to the supply voltage.

Pin Descriptions

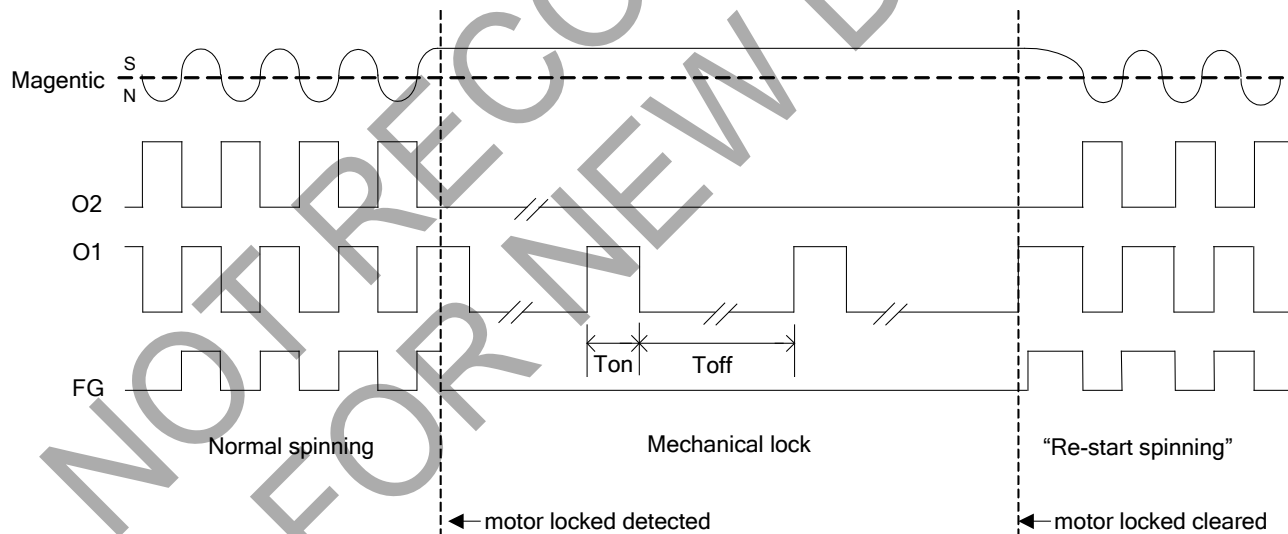
Pin Name	Description
Vdd	Power Supply Pin
Vss	Ground Pin
O1	Output Driving & Sinking Pin 1
O2	Output Driving & Sinking Pin 2
NC	No Connection
FG	Frequency Generator (Note 1)

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

Functional Block Diagram



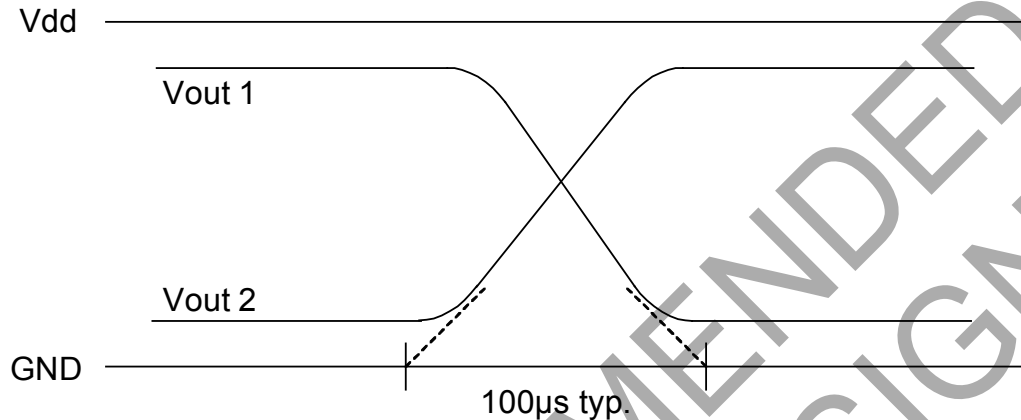
Operating



- 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.

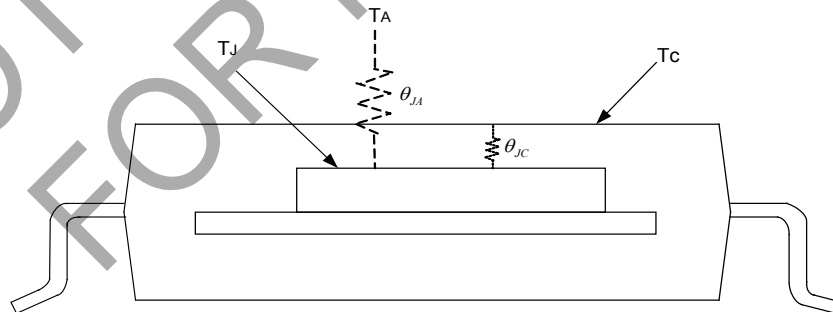
Soft Switching

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



Absolute Maximum Ratings (T_A = 25°C, unless otherwise noted)

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



Notes: 5. θ_{JA} should be confirmed with heat sink thermal resistance. If there is no heat sink contact, θ_{JA} will almost be the same as θ_{JC}.

Recommended Operating Conditions (T_A = 25°C)

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DD}	Supply Voltage	Operating	1.8	5.5	°C
T _A	Operating Ambient Temperature Range	Operating	-40	105	V

Electrical Characteristics (T_A = 25°C, V_{dd} = 5V)

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

Magnetic Characteristics (T_A = 25°C, V_{dd} = 1.8V~5V, Note 6)

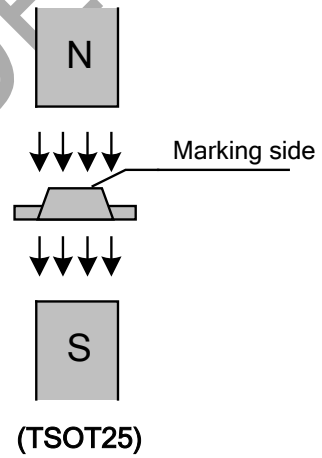
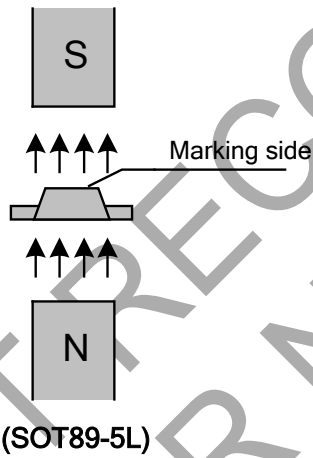
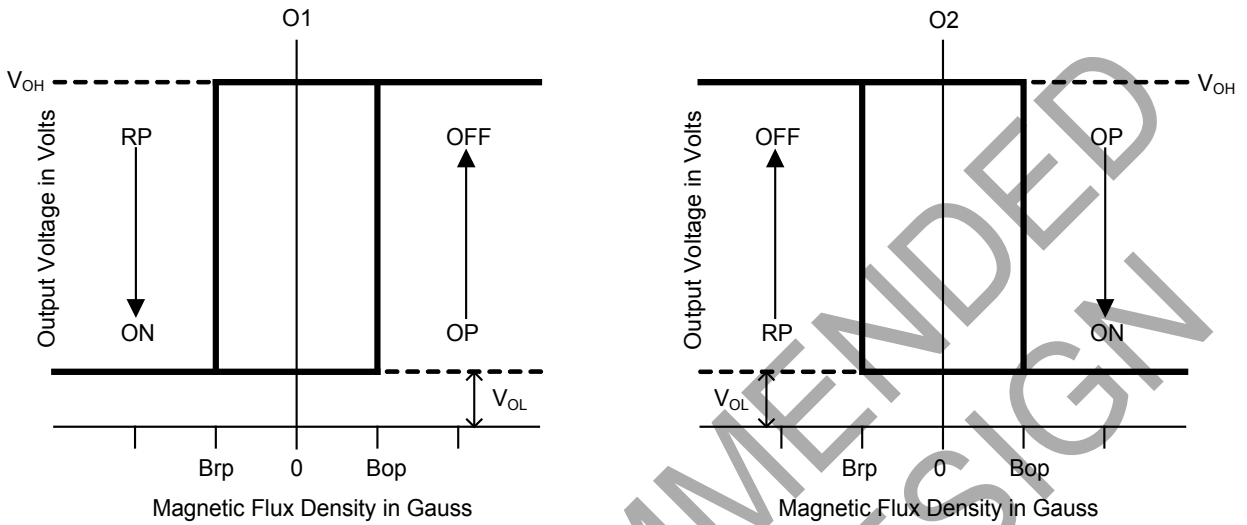
(1mT = 10 G)

Symbol	Parameter	Min	Typ.	Max	Unit
B _{op}	Operate Point	10	25	50	G
B _{rp}	Release Point	-50	-25	-10	G
B _{hy}	Hysteresis	-	50	-	G

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

NOT RECOMMENDED FOR NEW DESIGN

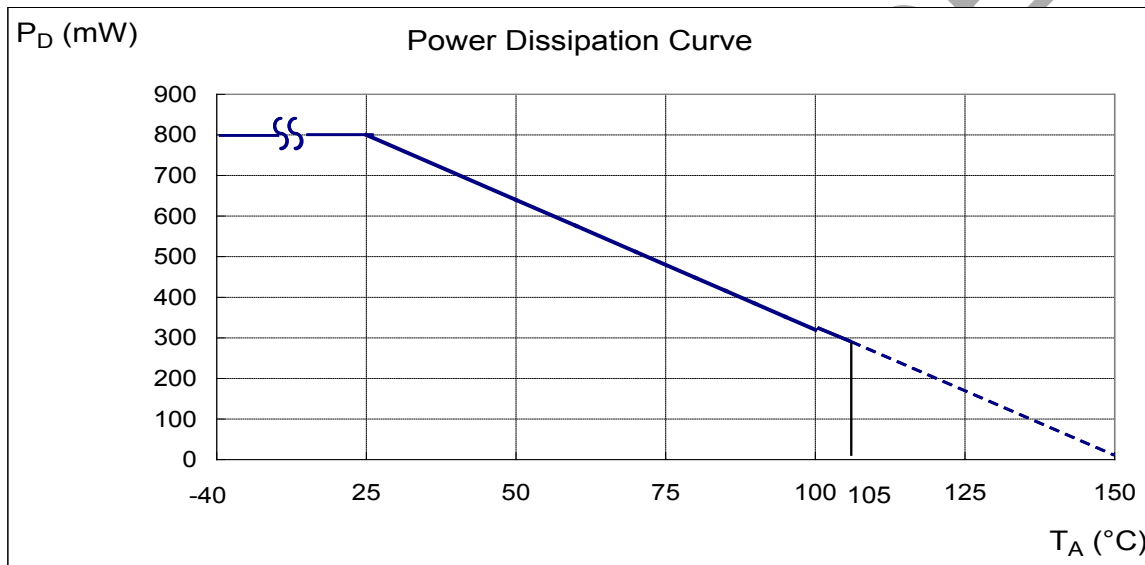
Operating Characteristics



Performance Characteristics

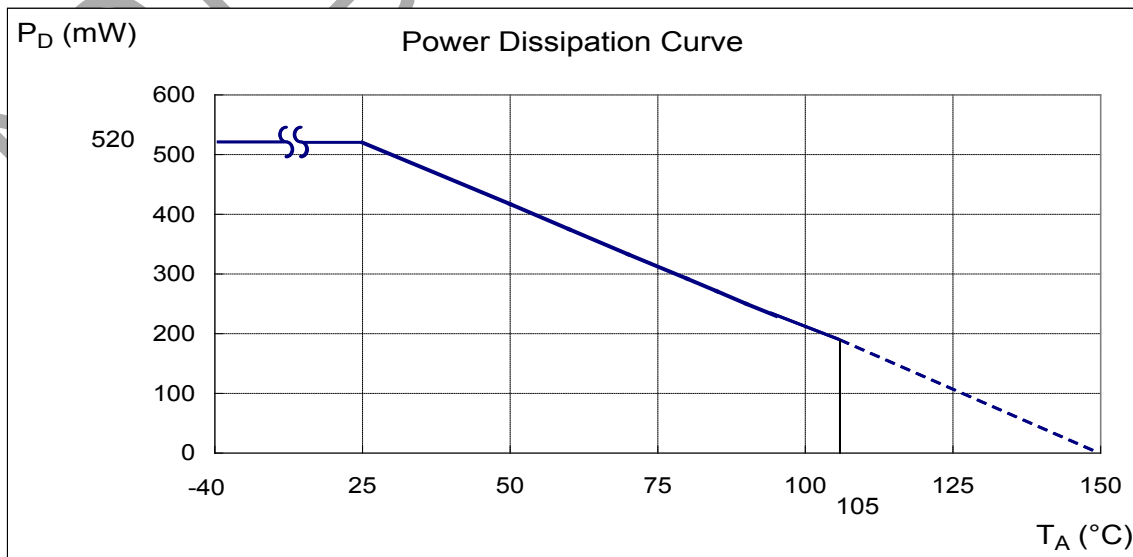
(1) SOT89-5L

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

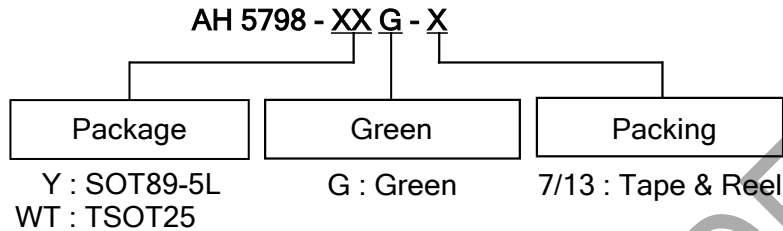


(2) TSOT25

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



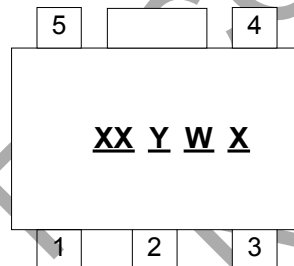
Device	Package Code	Packaging (Note 7 & 8)	7"/13" Tape and Reel	
			Quantity	Part Number Suffix
AH5798-YG-13	Y	SOT89-5L	2500/Tape & Reel	-13
AH5798-WTG-7	WT	TSOT25	3000/Tape & Reel	-7

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

Marking Information

(1) SOT89-5L

(Top View)

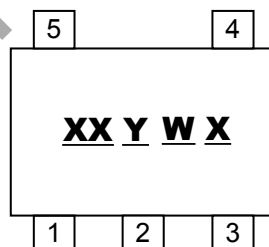


XX : Identification code
Y : Year : 0~9
W : Week : A~Z : 1~26 week;
 a~z : 27~52 week;
 z represents 52 and 53 week
X : Internal code
 A~Z : Green

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

(2) TSOT25

(Top View)

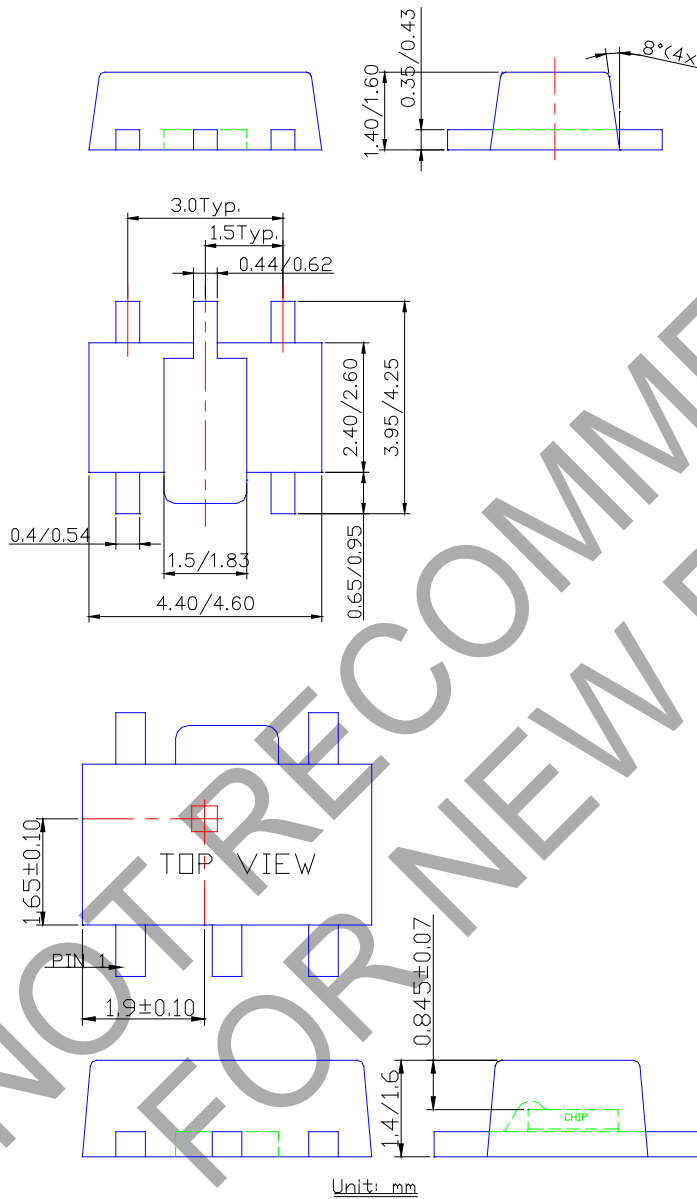


XX : Identification code
Y : Year 0~9
W : Week : A~Z : 1~26 week;
 a~z : 27~52 week;
 z represents 52 and 53 week
X : A~Z : Green

Part Number	Package	Identification Code
AH5798-WTG	TSOT25	K4

Package Outline Dimensions (All Dimensions in mm)

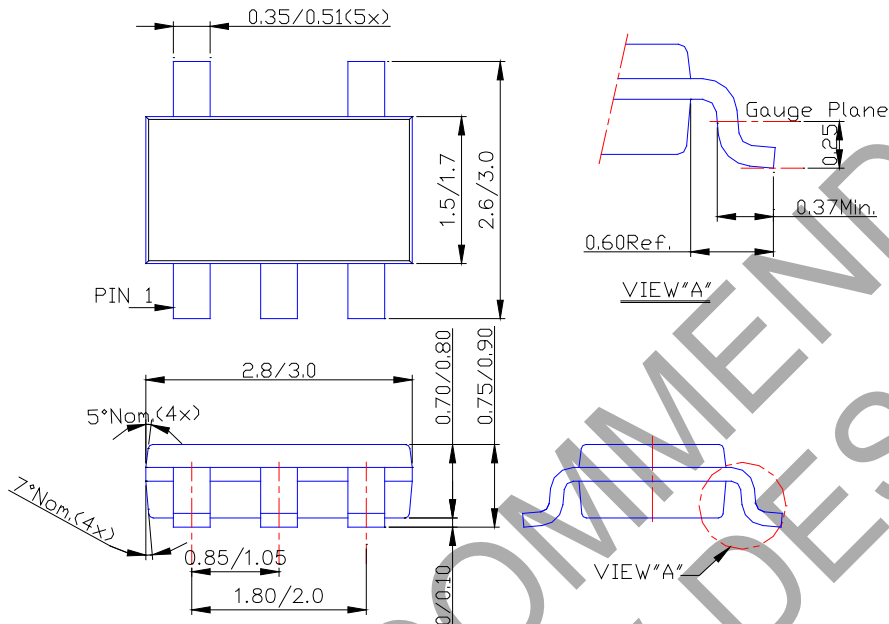
(1) Package type: SOT89-5L



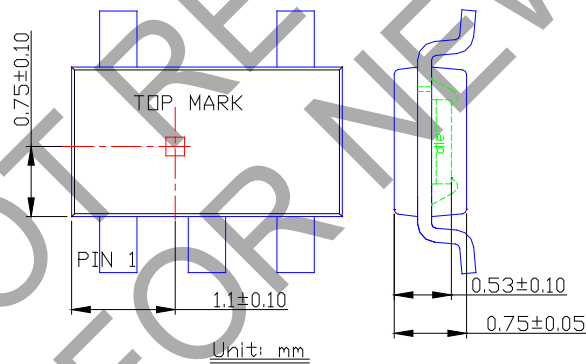
Sensor Location

Package Outline Dimensions (Continued)

(2) Package type: TSOT25



TSOT25L Package



Sensor Location

SINGLE PHASE HALL EFFECT LATCH SMART FAN MOTOR CONTROLLER

IMPORTANT NOTICE

1. DIODES INCORPORATED AND ITS SUBSIDIARIES (“DIODES”) MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).
2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes products. Diodes products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of the Diodes products for their intended applications, (c) ensuring their applications, which incorporate Diodes products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.
3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes’ websites, harmless against all damages and liabilities.
4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes’ website) under this document.
5. Diodes products are provided subject to Diodes’ Standard Terms and Conditions of Sale (<https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/>) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.
6. Diodes products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.
7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.
8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.

Copyright © 2021 Diodes Incorporated

www.diodes.com