

High Performance Latching Hall Switch IC

1. Features

- AEC-Q100 Grade 0
- Latch-type switch Hall
- Wide voltage range: 2.8V to 40V
- Reverse battery protection: -28V
- Current limited open drain output: 40mA
- Wide operating temperature range:
 - -40°C to 150°C
- High EMC/ESD immunity
- Optional PCB-less package
- Small package:
 - TO-92S (UA)
 - TO-92S (CUA, with capacitor)
 - SOT23-3L (SO)

2. Applications

- Automotive and Industrial
- BLDC motor commutation
- Seat motor adjuster
- Window lifter
- Sunroof/Tailgate opener
- Tachometers

3. Description

SC2498 is manufactured using advanced 60V BCD technology. It is a chopper-stabilized Hall-effect sensor that provides a magnetic sensing solution with excellent sensitivity stability and integrated protection features.

SC2498 employs dynamic offset cancellation, a technique that reduces residual offset voltage typically caused by device overmolding, temperature dependence, and thermal stress. Each device integrates a Hall voltage generator, small-signal amplifier, chopper stabilization circuit, hysteresis comparator, and current-limited output stage.

SC2498 integrates an on-chip voltage regulator, allowing a wide supply voltage range from 2.8V to 40V to meet the requirements of industrial and automotive electronic applications.

SC2498 is available in a 3-pin through-hole TO-92S package (UA) and a 3-pin surface-mount SOT23-3L package (SO). The TO-92S package also supports PCB-less construction. All packages are 100% lead-free with matte tin-plated leads.



Fig.1 Package Outline

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4. Terminal Configuration

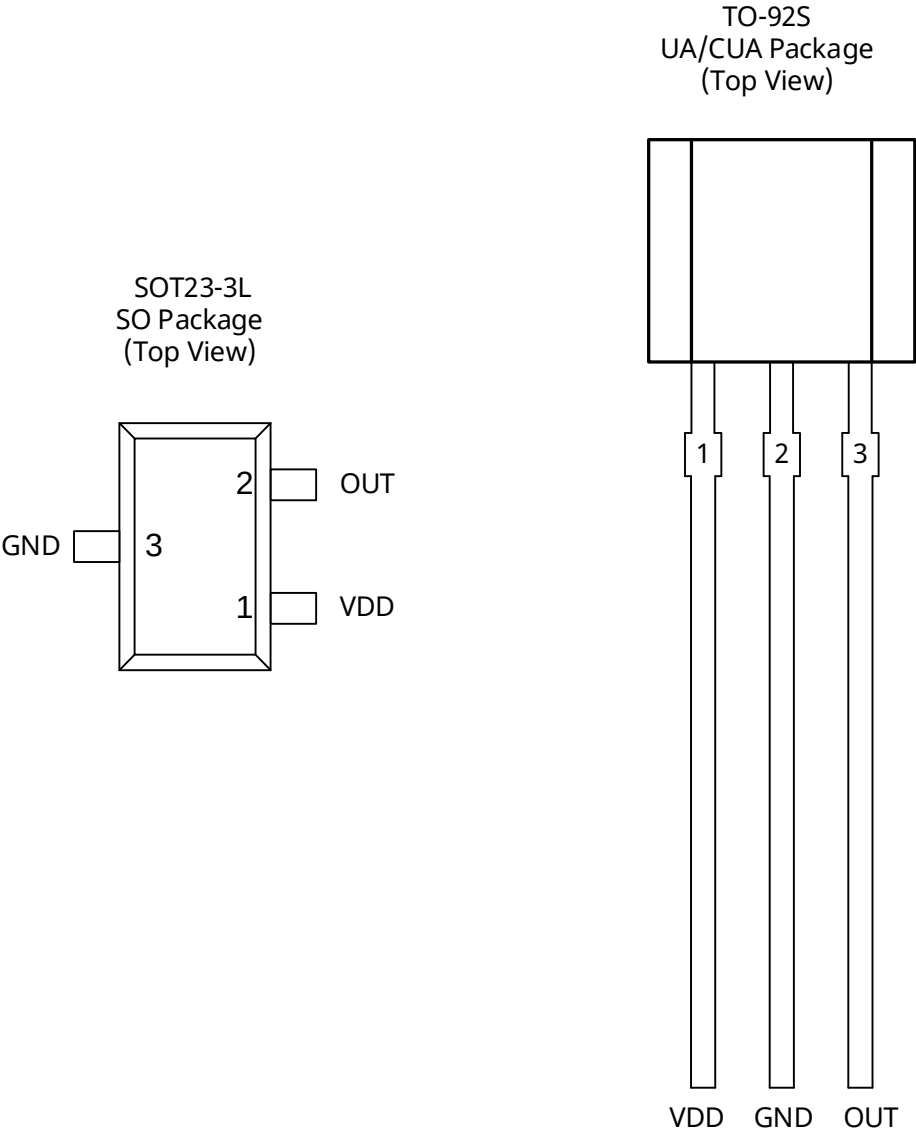


Fig.2 Pin Definition Diagram

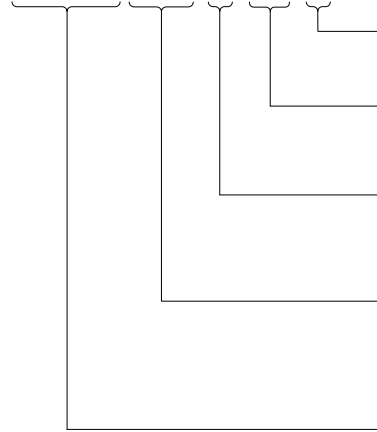
Terminal			Type	Description
Name	UA/CUA	SO		
VDD	1	1	Power	2.8V to 40V power supply
GND	2	3	Ground	Ground terminal
OUT	3	2	Output	Open-drain output. The open drain requires a pull-up resistor

5. Ordering Information

Ordering Information	Marking	Option	B _{OP} (mT)	B _{RP} (mT)	Ambient, T _A (°C)	Package	Packing	Quantity
SC2498SO-TR-Q	2498	South	8.0	-8.0	-40~150	SOT23-3L	Reel	3000/reel
SC2498UA-N-BK-Q	2498	North	-8.0	8.0	-40~150	TO-92S	Bulk	1000/bag
SC2498CUA-N-BK-Q	2498C	North	-8.0	8.0	-40~150	TO-92S	Bulk	1000/bag

Ordering Information Format

SC2498CUA-N-BK-Q



Product Grade

Q: Automotive Product

Packing Designation

BK: Bulk

TR: Tape & Reel

Active Magnetic Polarity

N: North pole

Default: South pole

Package Designation

UA: TO-92S

CUA: TO-92S, with capacitor

SO: SOT23-3L

Device Family

SC2498: High Performance Latching Hall Switch IC

6. Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

Symbol	Parameter	Test Conditions	Min.	Max.	Units
V_{DD}	Power supply voltage	$R \geq 200\Omega$, not exceed 5 min	-28	60	V
V_{OUT}	Output terminal voltage	1.2 k Ω pull up resistor, not exceed 5 min	-0.5	60	V
I_{SINK}	Output terminal current sink		0	40	mA
T_A	Operating ambient temperature		-40	150 ⁽²⁾	°C
T_J	Maximum junction temperature		-40	165	°C
T_{STG}	Storage temperature		-65	175	°C

Note :

(1) Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability

(2) SC2498CUA-N-BK-Q V_{DD} integrates a capacitor, so V_{DD} voltage will derate when the temperature exceeds 125 °C. Please contact Semiment for more information

7. ESD Protection

Symbol	Parameter	Test Conditions	Min.	Max.	Units
V_{ESD_HBM}	HBM	According to: standard AEC-Q100-002 HBM	-8	+8	kV
	HBM(PCB-less)	According to: standard AEC-Q100-002 HBM	-12	+12	kV
V_{ESD_CDM}	CDM	According to: standard AEC-Q100-011 CDM	-750	+750	V

8. Thermal Characteristics

Symbol	Parameter	Test Conditions	Rating	Units
$R_{\theta ja}$	UA Package thermal resistance	Single-layer PCB, with copper limited to solder pads	200 ⁽¹⁾	°C/W
$R_{\theta ja}$	SO Package thermal resistance	Single-layer PCB, with copper limited to solder pads	300 ⁽¹⁾	°C/W

Note:

(1) Maximum voltage must be adjusted for power dissipation and junction temperature, see Thermal Characteristics

9. Operating Characteristics

9.1. Electrical Characteristics

over operating free-air temperature range $V_{DD}=5.0V$ (unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ. ⁽¹⁾	Max.	Units
V_{DD}	Operating Voltage ⁽²⁾	$T_J < T_{J(Max.)}$,	2.8	5.0	40	V
I_{DD}	Operating current	$V_{DD}=2.8$ to $40V$, $T_A=25^\circ C$,	3.5	4.1	7.0	mA
$UVLO_H$	Under Voltage Lockout High	$B > B_{OP} + 2.0mT$, V_{DD} Rising From $1.5V$	2.5	2.7	-	V
$UVLO_L$	Under Voltage Lockout Low	$B > B_{OP} + 2.0mT$, V_{DD} Decreasing From $2.5V$	2.3	2.5	-	V
$UVLO_{HYS}$	Under Voltage Hysteresis	$UVLO_H - UVLO_L$	0.1	0.2	0.4	V
t_{on}	Power-on time	$V_{DD} \geq 5V$	-	25	40	μs
I_{QL}	Off-state leakage current	Output Hi-Z	-	-	3	μA
V_{SAT}	Output saturation voltage drop	$B > B_{OP}$, $V_{DD}=5V$, $I_O=20mA$, $T_A=25^\circ C$	-	0.14	0.4	V
OCP	Overcurrent protection	Output on $V_{PULL-UP} < 30V$	-	35	50	mA
t_d	Output delay time	$B = B_{RP}$ to B_{OP}	-	15	25	μs
t_r	Output rise time (10% to 90%)	$V_{PU}=12V$, $R_{PU}^{(3)}=1k\Omega$, $C_L=50pF$	-	0.2	1	μs
t_f	Output fall time (90% to 10%)	$V_{PU}^{(3)}=12V$, $R_{PU}=1k\Omega$, $C_L=50pF$	-	0.1	1	μs

Note:

(1) Typical values are defined at $T_A=25^\circ C$, $V_{DD}=5V$

(2) Maximum voltage must be adjusted for power dissipation and junction temperature, see Thermal Characteristics

(3) R_{PU} and V_{PU} are the external pullup resistor and external pullup voltage

9.2. Magnetic Characteristics

over operating free-air temperature range, $V_{DD} = 5.0V$ (unless otherwise noted)

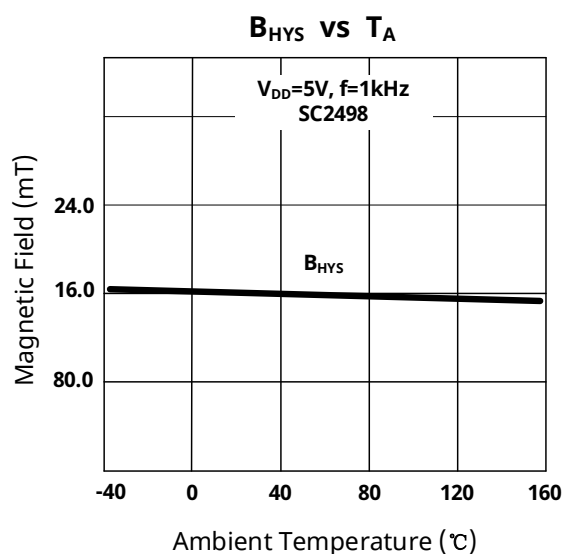
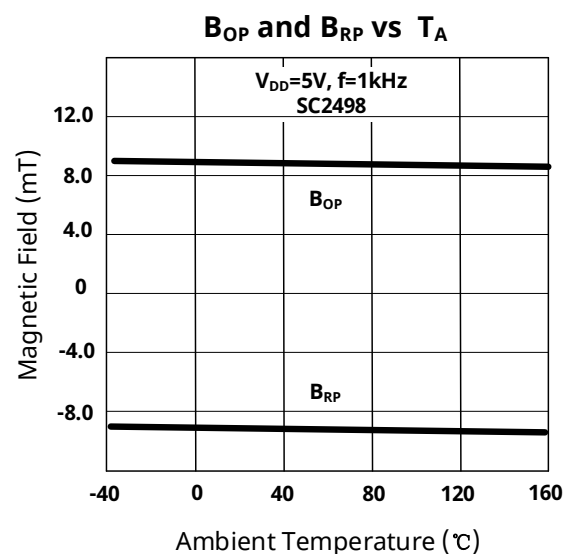
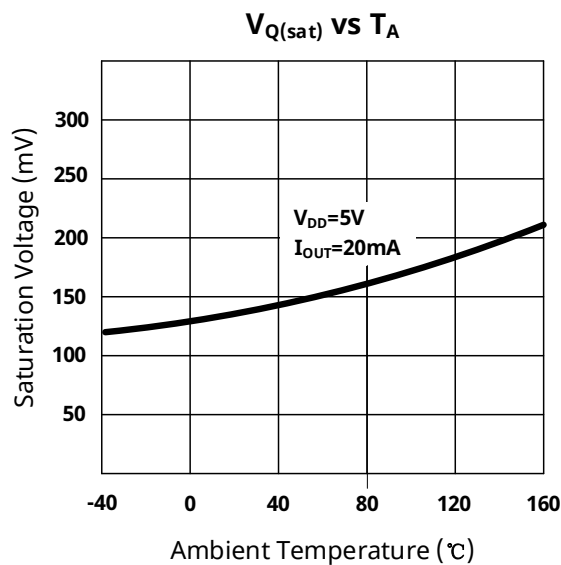
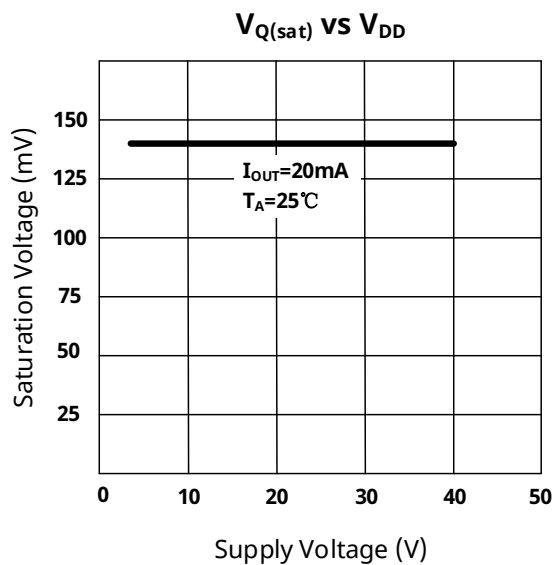
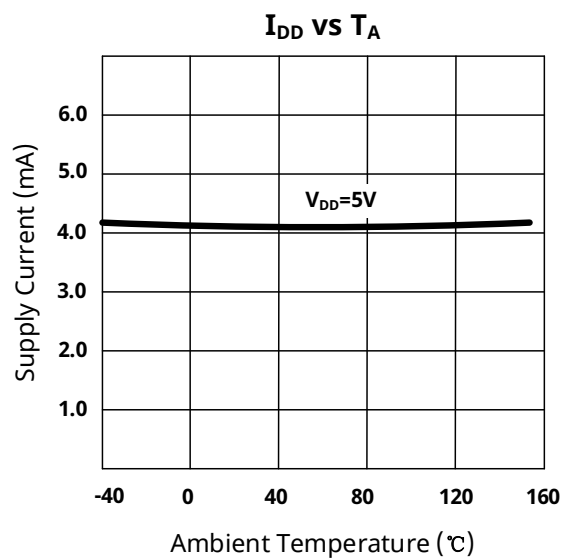
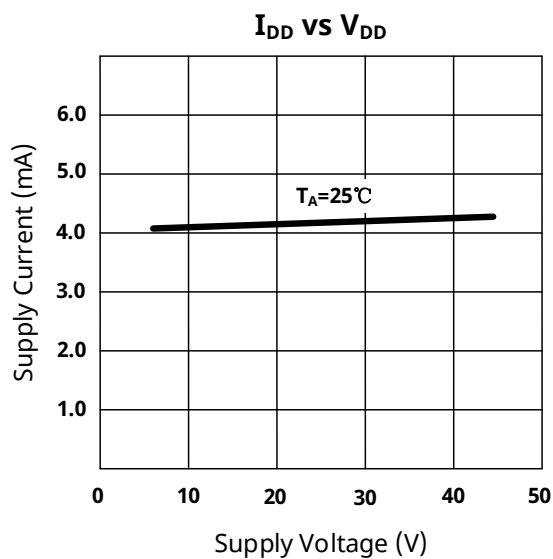
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
f_{BW}	BW		20	-	-	kHz
SC2498 8.0/-8.0mT						
B_{OP}	Operated point	$T_A = 25^\circ C$	6.0	8.0	10.0	mT
B_{RP}	Release point		-10.0	-8.0	-6.0	mT
B_{HYS}	Hysteresis		12.0	16.0	20.0	mT

Note:

(1) Magnetic flux density, B is indicated as a negative value for North-polarity magnetic fields, and as a positive value for South-polarity magnetic fields

(2) $1mT = 10Gs$

10. Characteristic Curves



11. Block Diagram

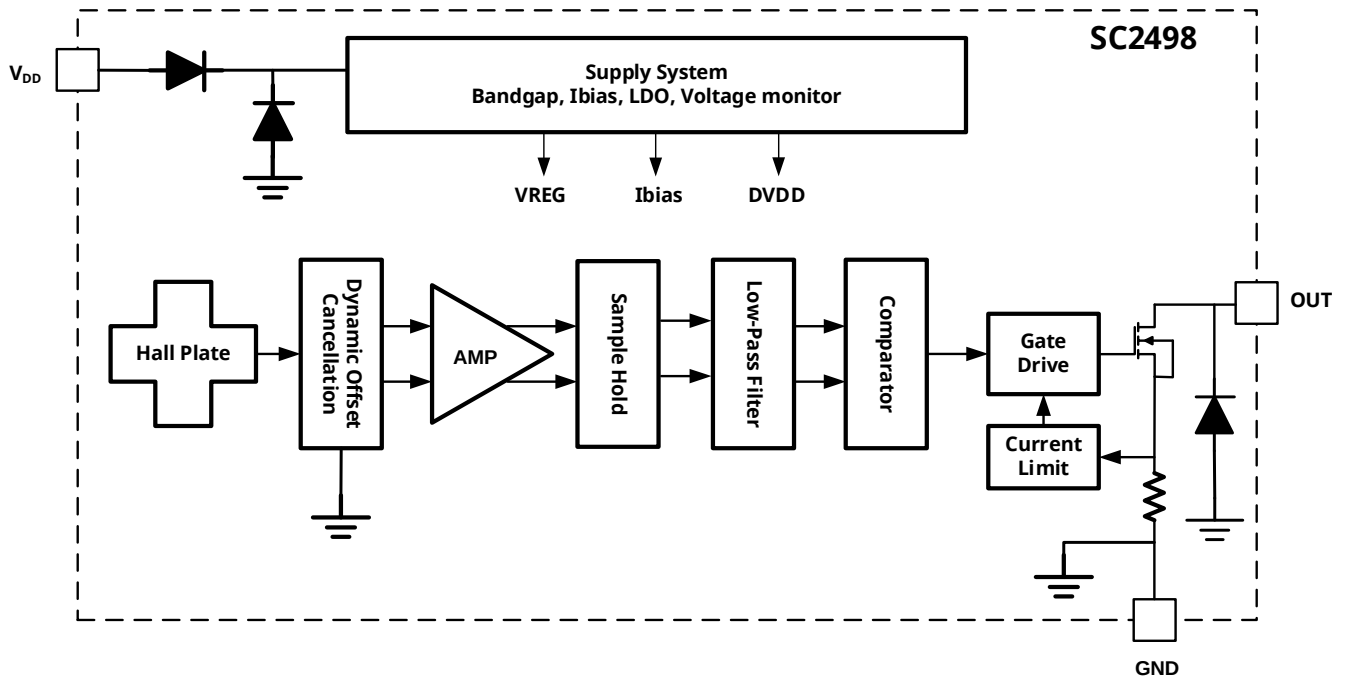


Fig. 3 Functional block diagram

12. Function Description

SC2498 is a chopper-stabilized latching Hall-effect sensor designed for magnetic field sensing applications. The device operates over a supply voltage range of 2.8V to 40V and can continuously withstand a reverse supply voltage of -28V.

When the absolute value of the magnetic field intensity applied perpendicularly to the Hall element exceeds the operating point (B_{OP}) threshold, the SC2498 outputs a low level (ON state), with the output capable of sinking up to 40 mA at the saturation voltage $V_{Q(sat)}$. When the magnetic field intensity decreases below the absolute value of the release point (B_{RP}), the device outputs a high level (OFF state). The difference between the magnetic operating point and the release point is the magnetic hysteresis (B_{HYS}) of the device. This internal hysteresis makes the device immune to external mechanical vibrations and electrical noise interference.

12.1. Magnetic Field Direction Definition

A positive magnetic field is defined as the magnetic South pole facing the marked side of the package.

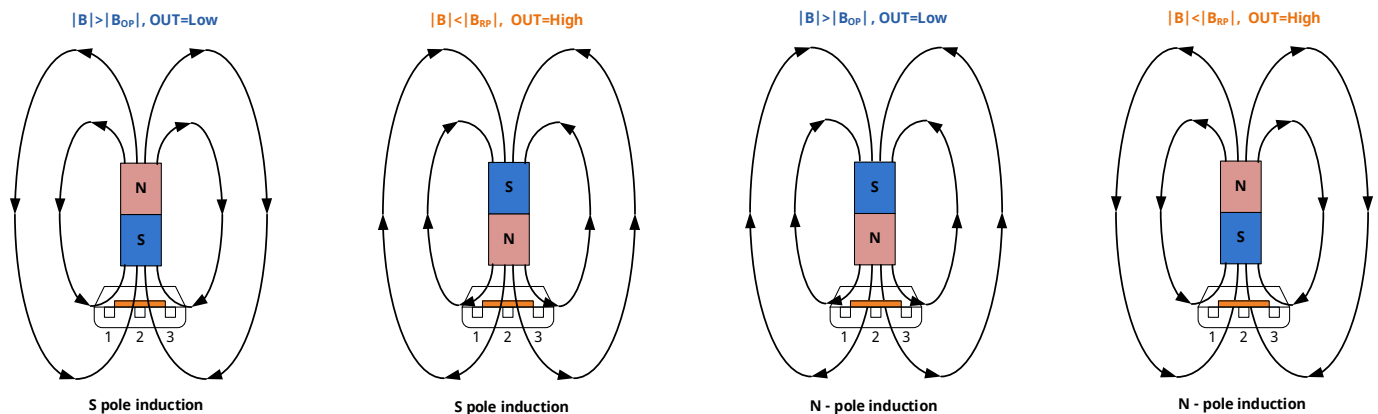


Fig.4 Magnetic Field Direction Definition

12.2. Transfer Function

Powering-on the device in the hysteresis region, less than B_{OP} and higher than B_{RP} , allows an indeterminate output state. The correct state is attained after the first excursion beyond B_{OP} or B_{RP} . If the field strength is greater than B_{OP} , then the output is pulled low. If the field strength is less than B_{RP} , the output is released.

B_{OP} —magnetic threshold for activation of the device output, turning in ON (low) state

B_{RP} —magnetic threshold for release of the device output, turning in OFF (high) state.

$$B_{HYS} = B_{OP} - B_{RP}$$

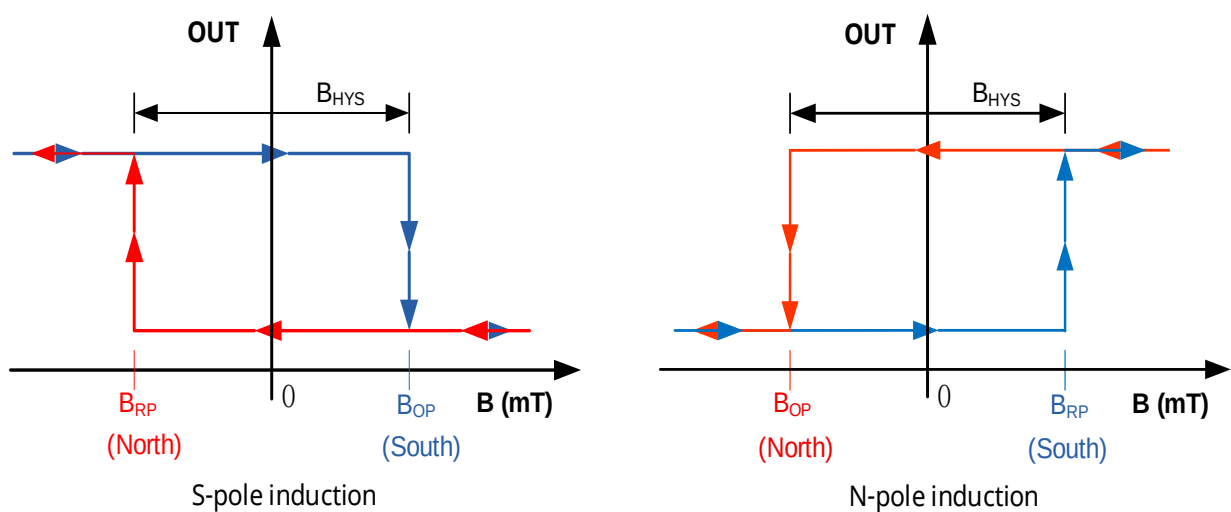


Fig.5 Transfer Characteristic Curve

13. Typical Application

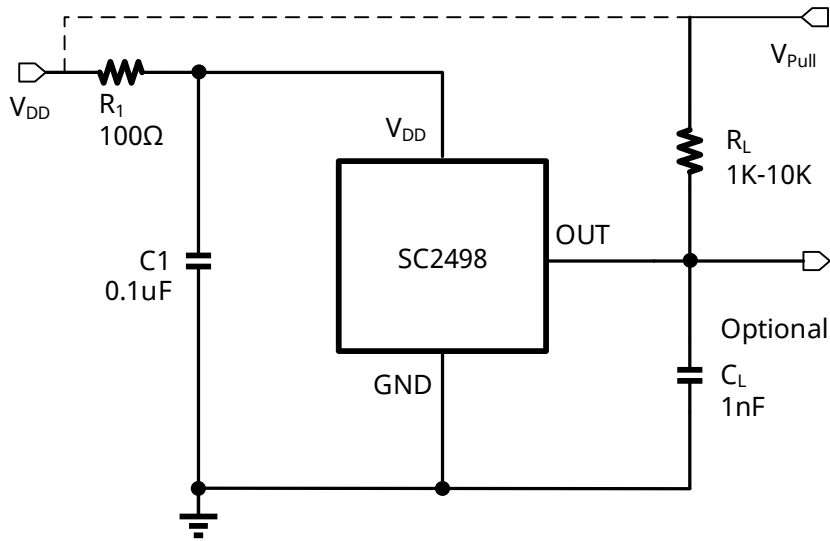


Fig.6 Typical Application Circuit

The SC2498 contains an on-chip voltage regulator which makes the device operate over a wide supply voltage range. In the applications that operate on an unregulated power supply, the external line protection should be added. And the applications using a regulated line, for the EMI/RFI protection purpose, to connect the shunt C_1 capacitors which typically is $0.1\mu\text{F}$ to the ground near the chip V_{DD} power supply as close as possible and the 100Ω external optional series resistor R_1 . The output capacitor C_L used as the output filter is typically 1nF .

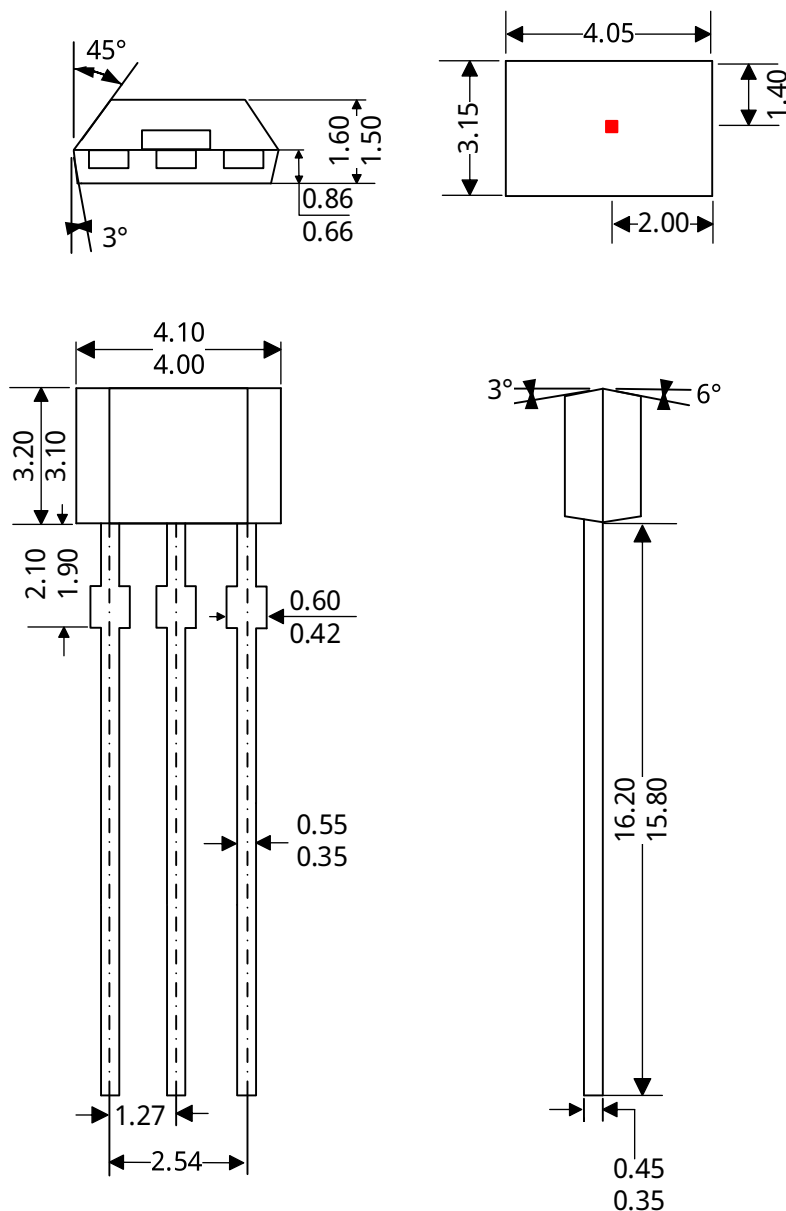
Select a value for C_L based on the system bandwidth specification as follow:

$$C_L < \frac{1}{2\pi \times R_L \times 2 \times f_{BW}(\text{Hz})}$$

V_{PULL} is not restricted to V_{DD} and could be connected to other voltage power supply. The allowable voltage range of this terminal is specified in the Absolute Maximum Ratings.

14. Package Information UA

TO-92S Package Outline Dimensions



Notes:

(1) All unit in mm.

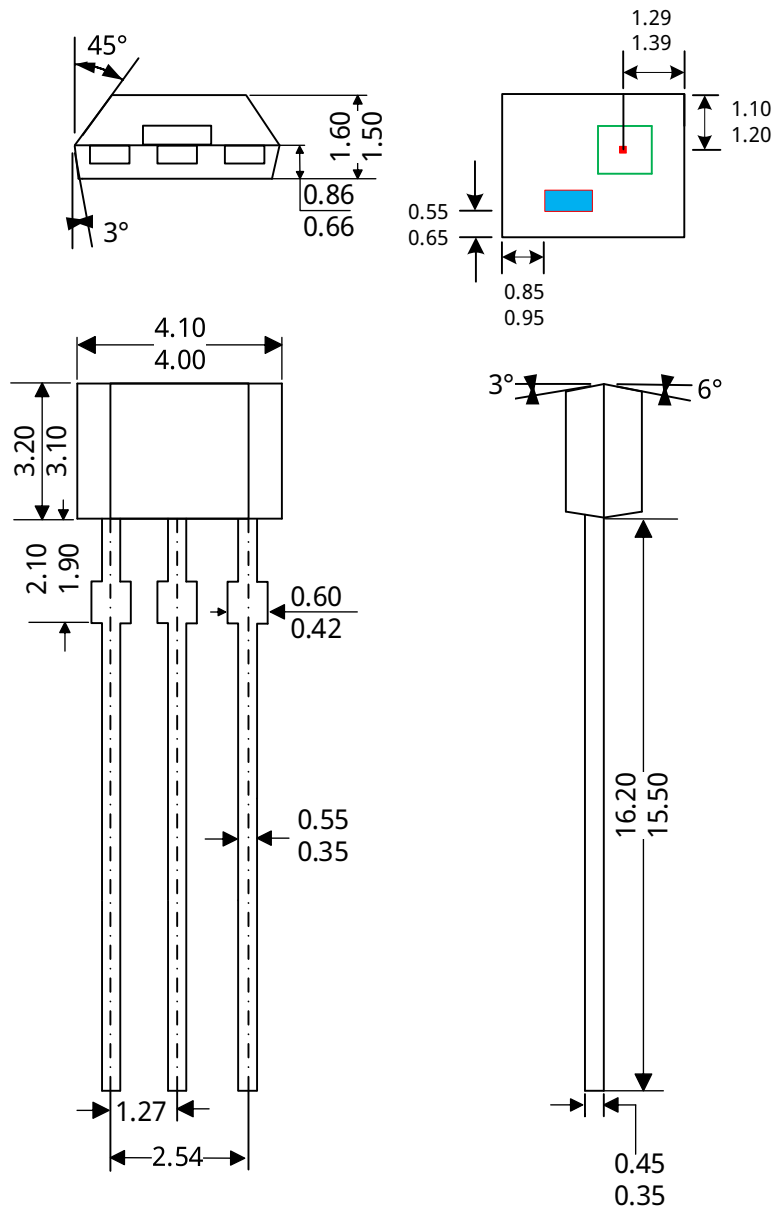
(2) Dimension does not include mold flash, protrusions or gate burrs.

(3) Allowable dambar protrusion shall be in excess at maximum material condition.

If no tolerance is specified, the dimension shall be theoretical reference value and shall not represent the exact dimension for actual measurement.

15. Package Information CUA

TO-92S(PCB-less) Package Outline Dimensions



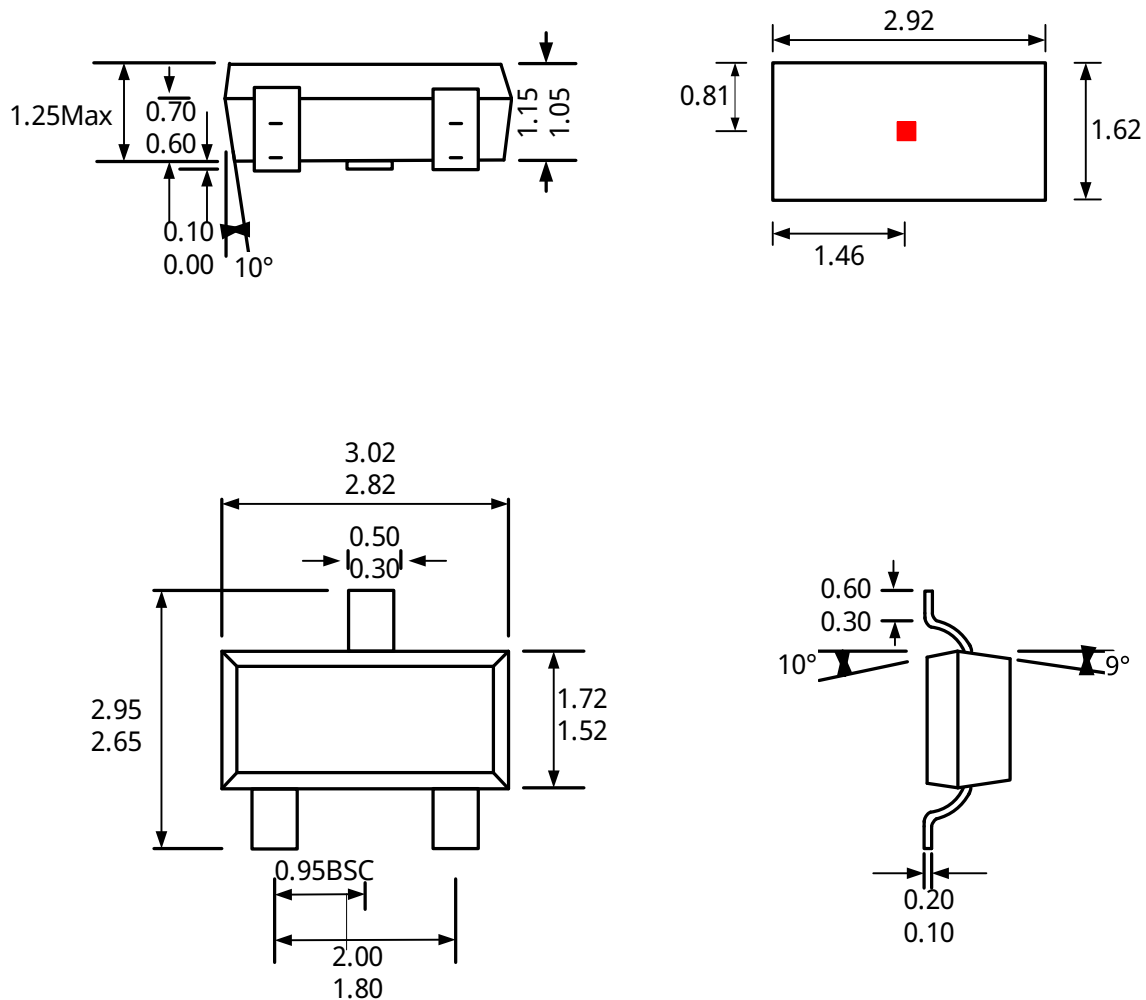
Notes:

- (1) All unit in mm.
- (2) Dimension does not include mold flash , protrusions or gate burrs.
- (3) Green is Die; Red is Hall plate; Blue is Cap.
- (4) Die Size: 1.14mm*1.02mm*0.3mm; Cap Size: 1.0mm*0.5mm*0.5mm.
- (5) Allowable dambar protrusion shall be in excess at maximum material condition.

If no tolerance is specified , the dimension shall be theoretical reference value and shall not represent the exact dimension for actual measurement.

16. Package Information SO

SOT23-3L Package Outline Dimensions



Notes:

(1) All unit in mm.

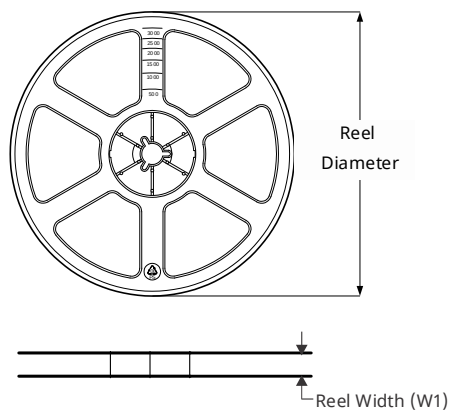
(2) Dimension does not include mold flash, protrusions or gate burrs.

(3) Allowable dambar protrusion shall be in excess at maximum material condition.

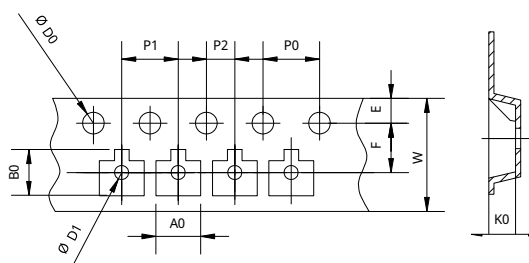
If no tolerance is specified, the dimension shall be theoretical reference value and shall not represent the exact dimension for actual measurement.

17. Tape&Reel Information

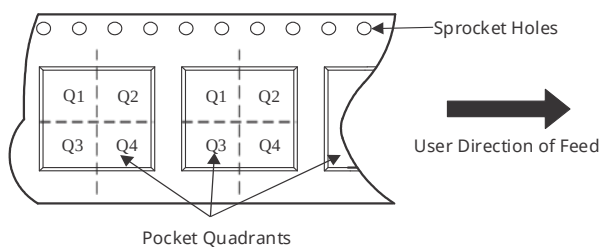
TAPE REEL DIMENSIONS



TAPE DIMENSIONS



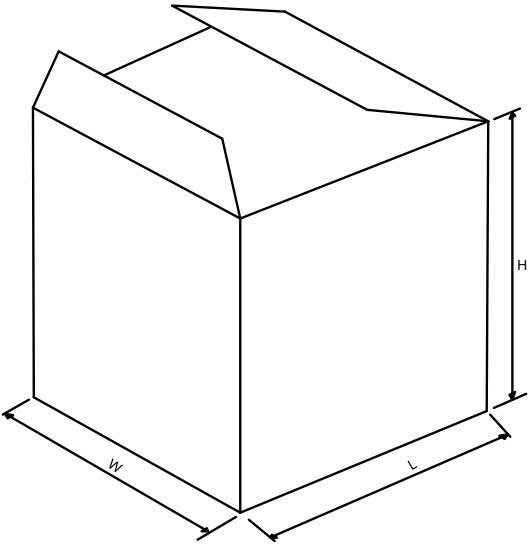
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Package Type	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	W (mm)	Pin1 Quadrant
SOT23-3L	3000	180	8.4	4.00	4.00	2.00	3.18	3.28	1.32	8.00	Q3

18. Tape&Reel Box Dimensions



*All dimensions are nominal

Package Type	SPQ	Length (mm)	Width (mm)	Height (mm)
SOT23-3L	3000ea*10tape	210	210	210

19. Revision History

Revision	Date	Description
Rev.E0.1	2022-1-08	Preliminary datasheet
Rev.V1.0	2023-08-10	Uniform format update
Rev.V1.1	2024-05-12	Update EMC table
Rev.V1.2	2024-06-27	1.Add SC2498CUA-N part 2.Add ordering, ESD, EMC table
Rev.V1.3	2025-02-14	Update ordering information
Rev.V1.4	2025-03-12	Update EC table of Magnetic Characteristics
Rev.V1.5	2026-04-01	Add packaging specifications and declarations

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