High-performance digital Omnipolar Hall switch IC

1. Features

- Automotive AEC-Q100 Qualified
- Omnipolar Hall sensor
- Multiple sensitivity ranges available
- High chopping frequency
- Excellent temperature stability
- Supports a wide voltage range:
  - 2.5V to 24V
- Reverse battery protection: -28V
- Wide operating temperature range:
  - -40℃ to 150℃
- Over-voltage protection at all pins
- Small package
  - 3-pin SOT23-3L (SO)

2. Applications

- Automotive
- Sun visor position switch
- Garage door opener position switch
- Proximity switch
- Cover status detection

3. Description

The SC246X series are chopper-stabilized Hall-effect sensors manufactured via BiCMOS technology, offering magnetic sensing solutions with high sensitivity, excellent temperature stability and full-range protection features.

The SC246X integrates internal circuit blocks including voltage regulator, Hall element array, amplifier circuit, Schmitt trigger and output stage. Adopting high-frequency chopper technology in the Hall signal processing path, the device minimizes offset voltage of the Hall sensing array and processing circuitry, suppresses offset drift induced by mechanical stress and temperature, and reduces the chip's system delay and output jitter to the lowest practical level. The output stage of SC246X features open-drain configuration with up to 20mA sink current capability.

SC246X An onboard regulator permits with supply voltages of 2.5 to 24V which makes the device suitable for a wide range of industrial and automotive applications

SC246X uses a 3-pin SOT23-3L package (SO). 100% lead-free matte tin-plated lead package.

SOT23-3L

Fig.1 Package Outline

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4. Terminal Configuration

3-Terminal SOT-23
SO Package
(Top View)

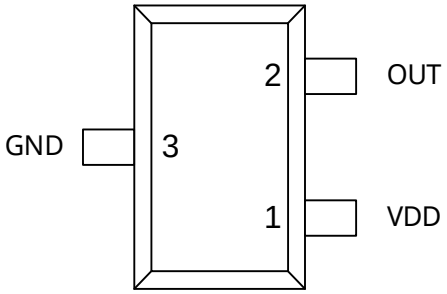


Fig.2 Terminal Configuration

Terminal		Type	Description
Name	SO		
VDD	1	Power	2.5V to 24V power supply
GND	3	Ground	Ground terminal
OUT	2	Output	Open-drain output. The open drain requires a pull-up resistor

5. Ordering Information

Ordering Information	Mark	B_{OP}(mT)	B_{RP}(mT)	Ambient, T_A(℃)	Package	Packing	Quantity
SC2462SO-TR-Q	2462	±2.5	±1.5	-40~150	SOT23-3L	Reel	3000/reel
SC2464SO-TR-Q	2464	±6.0	±5.0	-40~150	SOT23-3L	Reel	3000/reel
SC2466SO-TR-Q	2466	±16.5	±13.5	-40~150	SOT23-3L	Reel	3000/reel

Ordering Information Format

SC243XSO-TR-Q

Product Grade
Q: Automotive Product

Pack Designation
TR: Tape & Reel

Package Designation
SO: SOT23-3L

Device Family
SC246X: High-performance digital omnipolar Hall switch IC series

6. Absolute Maximum Ratings

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

Symbol	Parameter	Test Condition	Min.	Max.	Units
V_{DD}	Power supply voltage		-28	28	V
V_{OUT}	Output terminal voltage	For 5 Min. @1.2K pull-up resistor	-0.5	28	V
I_{SINK}	Output terminal current sink		0	30	mA
T_A	Operating ambient temperature		-40	150	℃
T_J	Maximum junction temperature		-55	165	℃
T_{STG}	Storage temperature		-65	175	℃

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.

7. ESD Protection

Symbol	Parameter	Test Condition	Min.	Max.	Units
V_{ESD_HBM}	HBM	According to: standard AEC-Q100-002 HBM	-4	+4	kV
V_{ESD_CDM}	CDM	According to: standard AEC-Q100-011 CDM	-750	+750	V

8. Thermal Characteristics

Symbol	Parameter	Test Conditions	Rating	Units
$R_{\theta JA}$	SO Package thermal resistance	Single-layer PCBS, JEDEC 1s0p are defined in JESD 51-3	300 (1)	℃/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)	$T_J < T_{J(Max.)}$	2.5	5.0	24	V
$I_{DD(off)}$	Operating current at Off state	V_{DD}=2.5 to 24V, T_A=25℃	1.1	1.8	2.6	mA
$I_{DD(on)}$	Operating current at On state	V_{DD}=2.5 to 24V, T_A=25℃	1.1	2.1	2.6	mA
t_{on}	Power-on time	V_{DD}≥5.0V	-	35	50	μs
I_{QL}	Off-state leakage current	Output Hi-Z	-	-	1	μA
$R_{DS(on)}$	FET on-resistance	V_{DD} =5V, I_O=10mA, T_A=25℃	-	20	-	Ω
		V_{DD} =5V, I_O=10mA, T_A=125℃	-	30	-	Ω
t_d	Output delay time	B=B_{RP} to B_{OP}	-	15	25	μs
t_r	Output rise time (10% to 90%)	R_L=1Kohm Co=50pF	-	-	0.5	μs
t_f	Output fall time (90% to 10%)	R_L=1Kohm Co=50pF	-	-	0.2	μs

Note:

(1) Typical values are defined at T_A=25°C and V_{DD}=5.0V

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

9.2. Magnetic Characteristics

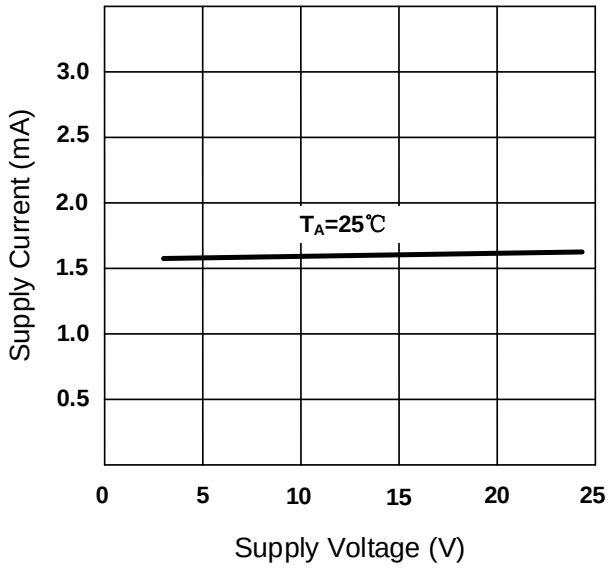
Over operating free-air temperature range, V_{DD} = 5.0V(unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
f_{BW}	BW		20	-	-	kHz
SC2462 ±2.5(1)/ ±1.5mT(2)						
B_{OP}	Operating point	T_A=25℃	±1.5	±2.5	±3.5	mT
B_{RP}	Release point		±1.0	±1.5	±3.0	mT
B_{HYS}	Hysteresis		±0.5	±1.0	±1.5	mT
SC2464 ±6.0 /±5.0 mT						
B_{OP}	Operating point	T_A=25℃	±4.5	±6.0	±7.5	mT
B_{RP}	Release point		±3.5	±5.0	±6.5	mT
B_{HYS}	Hysteresis		±0.5	±1.0	±1.5	mT
SC2466 ±16.5 /±13.5 mT						
B_{OP}	Operating point	T_A=25℃	±13.0	±16.5	±20.0	mT
B_{RP}	Release point		±10.0	±13.5	±17.0	mT
B_{HYS}	Hysteresis		±0.5	±3.0	±5.5	mT

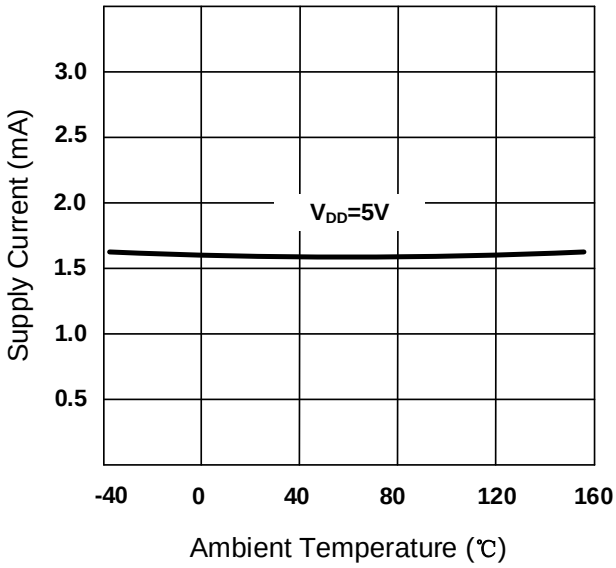
Note:
(1) Magnetic flux density, B is indicated as a negative value for North-polarity magnetic fields, and as a positive value for South-polarity magnetic fields,
(2) 1mT=10Gs

10. Typical Characteristics

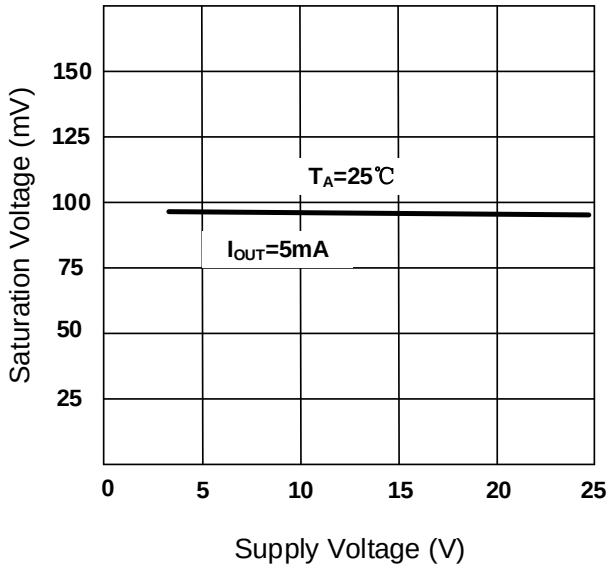
I_{DD} vs V_{DD}



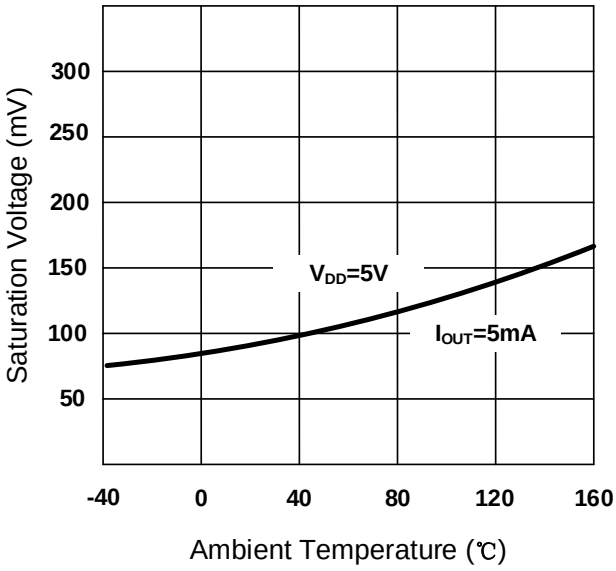
I_{DD} vs T_A



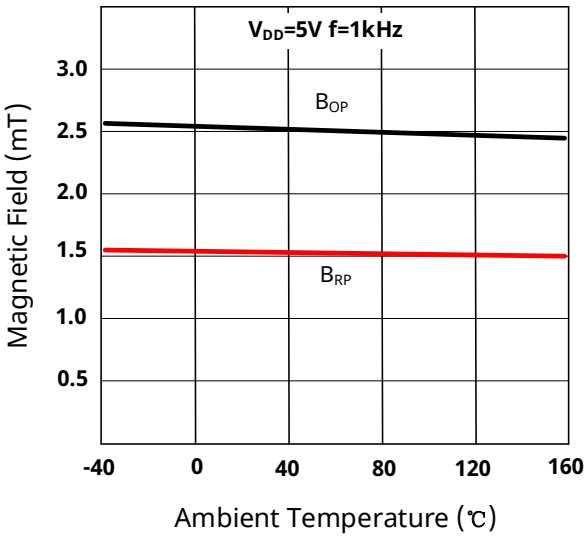
$V_{Q(sat)}$ vs V_{DD}



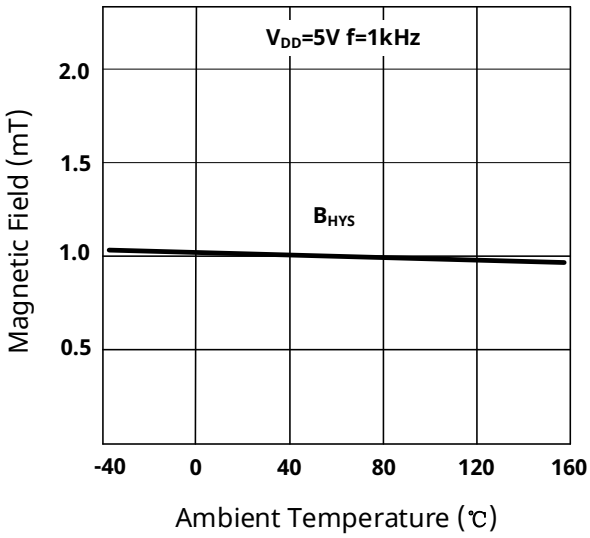
$V_{Q(sat)}$ vs T_A



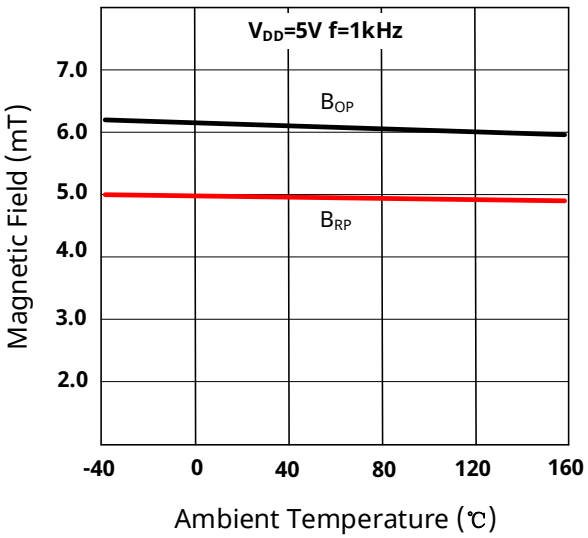
SC2462 B_{OP} and B_{RP} vs T_A



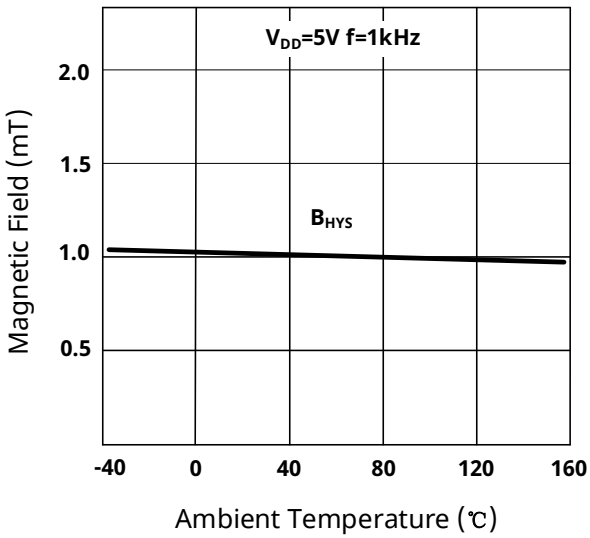
SC2462 B_{HYS} vs T_A



SC2464 B_{OP} and B_{RP} vs T_A



SC2464 B_{HYS} vs T_A



11. Block Diagram

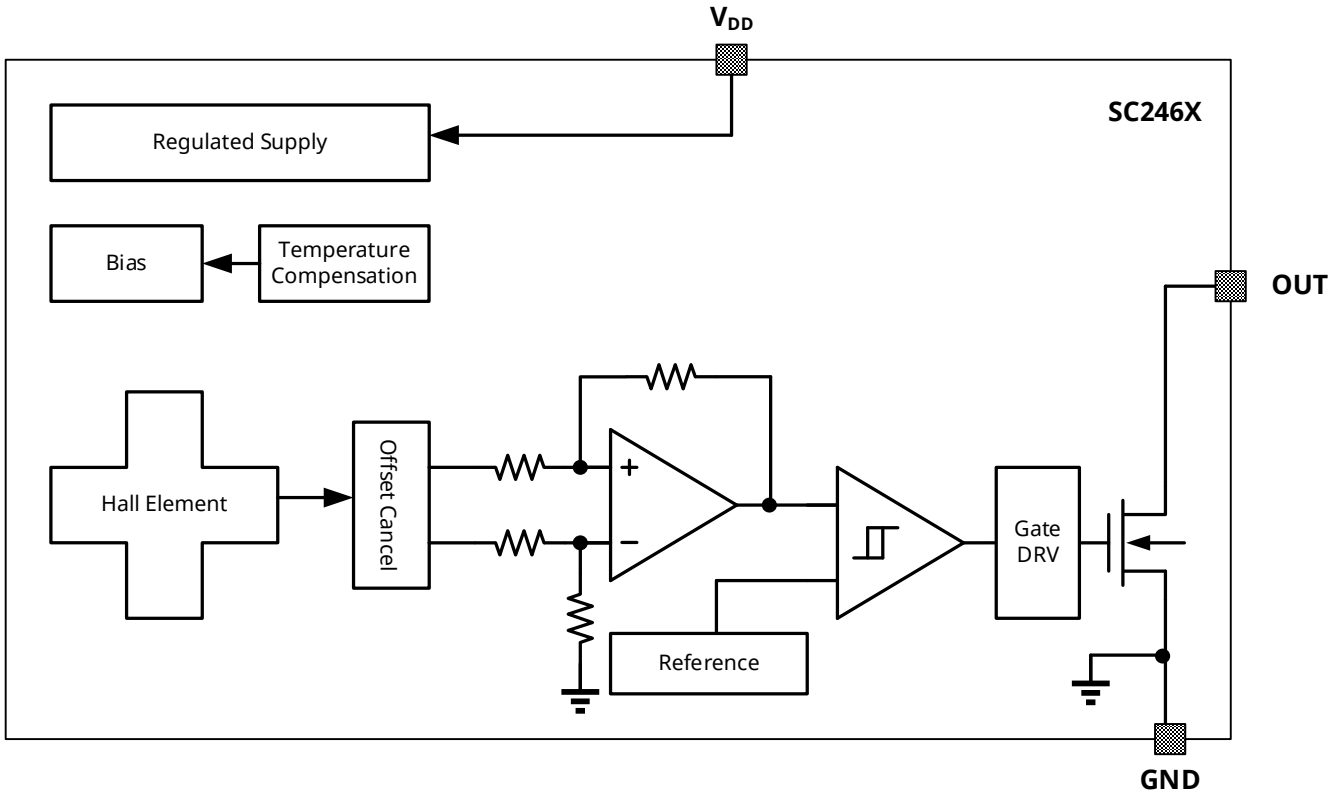


Fig.3 Function Block Diagram

12. Function Description

SC246X is an omnipolar Hall-effect sensor with digital output dedicated to magnetic field sensing applications. The device features a wide operating supply voltage ranging from 2.5 V to 24 V and can withstand reverse voltage up to −28 V, ensuring superior power supply tolerance and reliability.

outputs a low level (turns on) when a magnetic field perpendicular to the Hall element increases to the operating point B_{OP}. In the on state, the output can sink a current of 20mA, and the output voltage is $V_{Q(SAT)}$. When the magnetic field weakens to the release point B_{RP}, it outputs a high level (turns off). The difference between the magnetic field's turn-on point and turn-off point is the hysteresis of the switching point. This built-in hysteresis enables the chip to work normally under external mechanical interference and noise.

SC246X An external output pull-up resistor is required on the OUT terminal. The OUT terminal can be pulled up to V_{DD} or to a different voltage supply. It is convenient to interface with the controller.

12.1. Magnetic Field Direction Definition

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

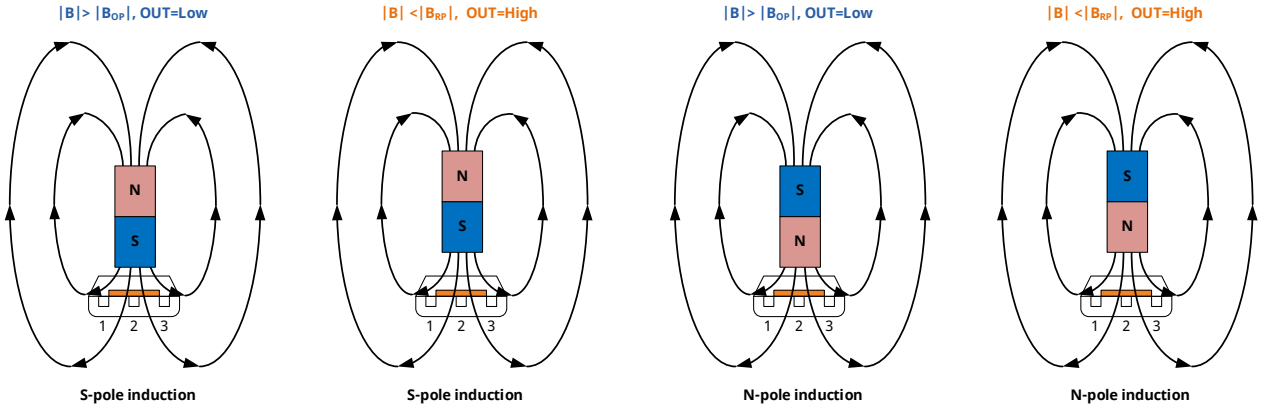


Fig.4 Magnetic Field Direction Definition

12.2. Transfer Function

SC246X is an omnipolar Hall-effect sensor with digital output that responds to both north and south magnetic poles. This characteristic enables the device to directly detect the presence or absence of a magnetic field without requiring pole discrimination.

When power is applied within the hysteresis region with magnetic flux density lower than BOP and higher than BRP, undefined output states are permitted. Correct output status is established after the magnetic field first exceeds either BOP or BRP. The output is pulled low when magnetic flux density surpasses BOP, and released when magnetic flux density falls below BRP.

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.

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

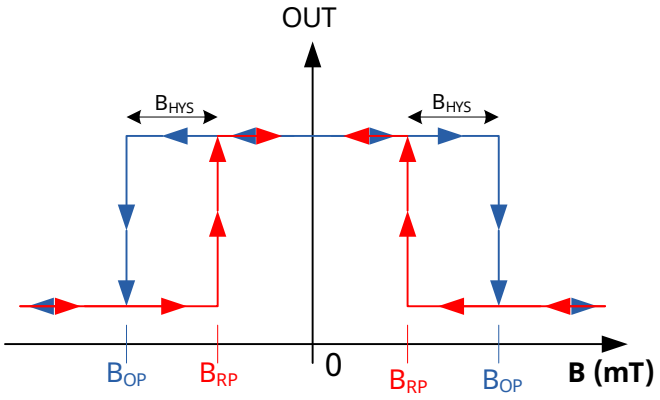


Fig.5 Magnetic Transfer Function

13. Typical Application

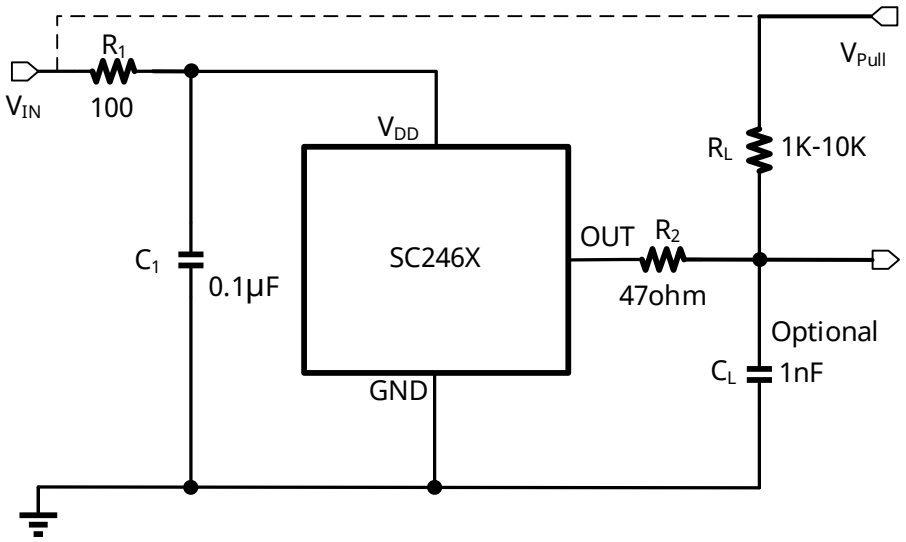


Fig.6 Typical Application Circuit

The SC246X contains an on-chip voltage regulator and can operate over a wide supply voltage range. In applications that operate the device from an unregulated power supply, transient protection must be added externally. For applications using a regulated line, EMI/RFI protection may still be required. It is recommended to shunt C_1 capacitors to the ground near the chip V_{DD} power supply, with a typical value of 0. 1μF.At the same time in the external optional series resistor R_1 their typical values for 100Ω.The output capacitor C_L is used as the output filter, typically 1nF.

The output stage of the SC246X device is a drain open-circuit NMOS tube, which provides a load capacity of 20mA. Adjust the pull-up resistor R_L to make it work properly. The R_L provides a high level for the leak-opening output. In general, less current is better, but faster transient response and bandwidth are required, with a smaller resistor R_L for faster switching.

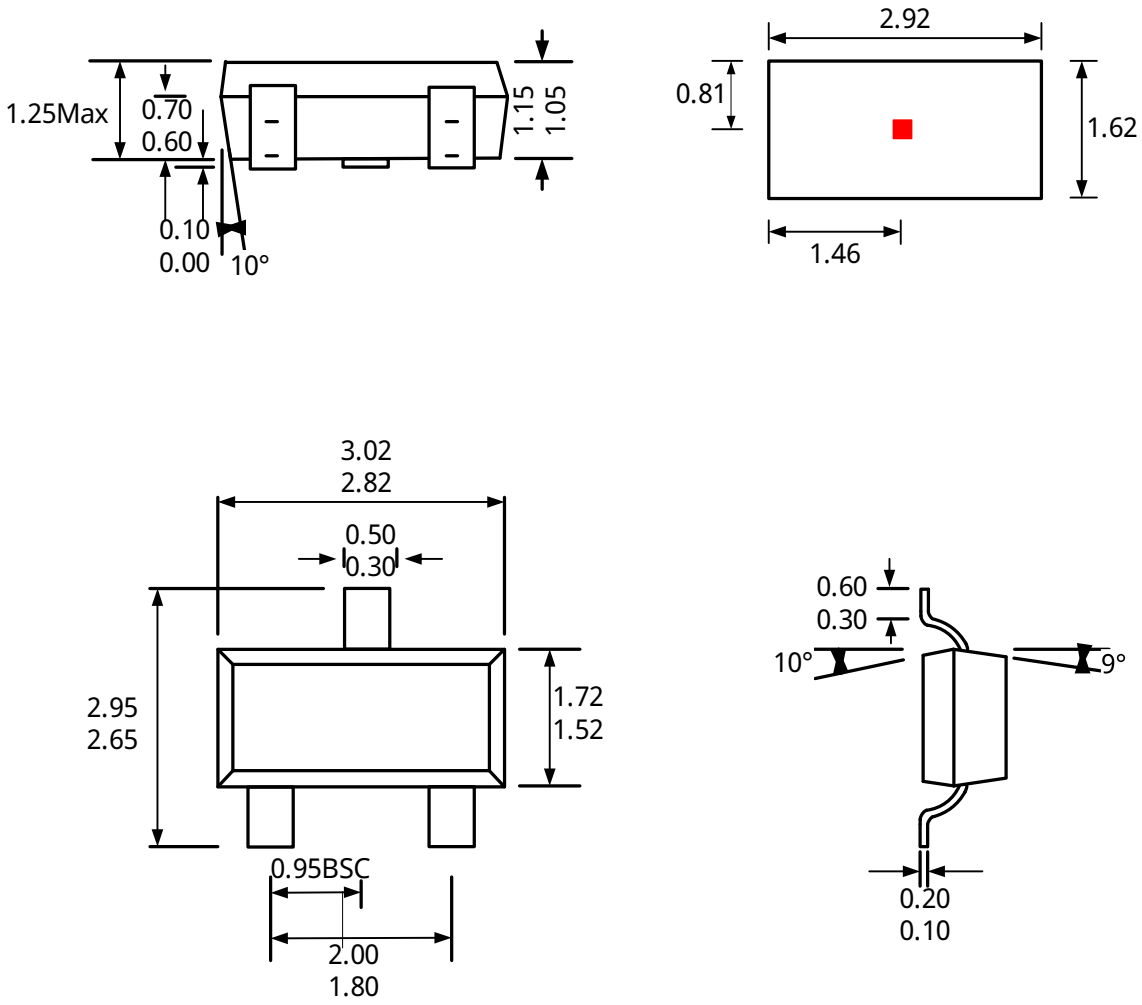
Select a value for C_L based on the system bandwidth specifications such as:

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

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 SO

SOT23-3L Package Outline Dimensions

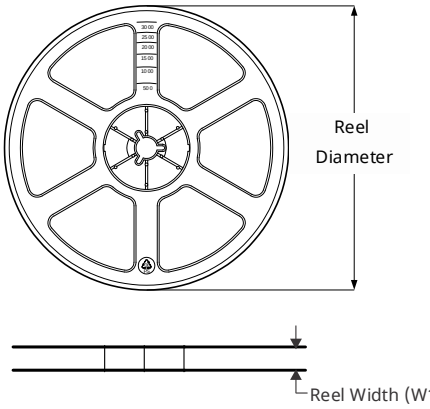


Notes:
(1)All unit in mm.
(2)Dimension does not include mold flash , protrusions or gate burrs.
(3)Allowable dambar protrusion shall be in excess at maximum material condition.

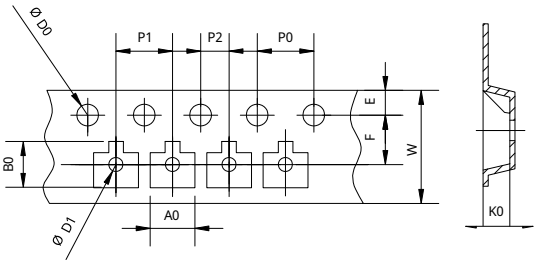
If no tolerance is specified , the dimension shall be theoretical reference value and shall not represent the exact dimension for actual measurement.

15. Tape&Reel Information

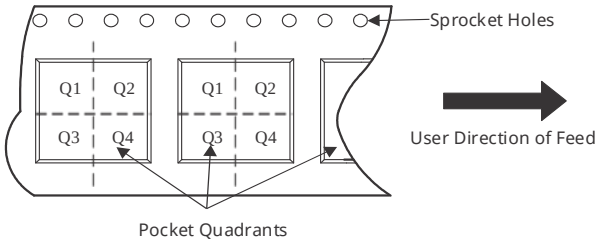
TAPE REEL DIMENSIONS



TAPE DIMENSIONS



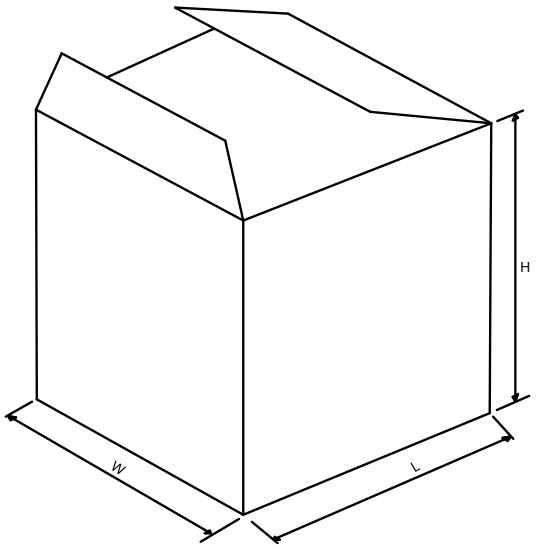
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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

16. Tape&Reel Box Dimensions



*All dimensions are nominal

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

17. Revision History

Revision	Date	Description
Rev0.1	2016-08-19	Preliminary datasheet
Rev2.3	2018-05-06	Final Revision No. of Previous Datasheet
Rev.V1.0	2020-11-19	Format revision
Rev.V1.1	2025-09-07	Unify Datasheet Format
Rev.V1.2	2026-04-01	Add packaging information and statements

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