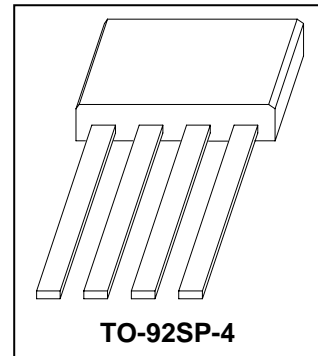# FS200

2-PHASE DC MOTOR DRIVE IC

GENERAL DESCRIPTION

The FS200, a 1-chip composed of hall sensor and output coil drivers, applied to a 2-phase DC motor. The high sensitivity of Hall effect sensor is suitable for motors from mini-type CPU coolers to blowers and DC fans. Typical operation current up to 0.45A and operating voltage range is from 2.0V ~ 20V.
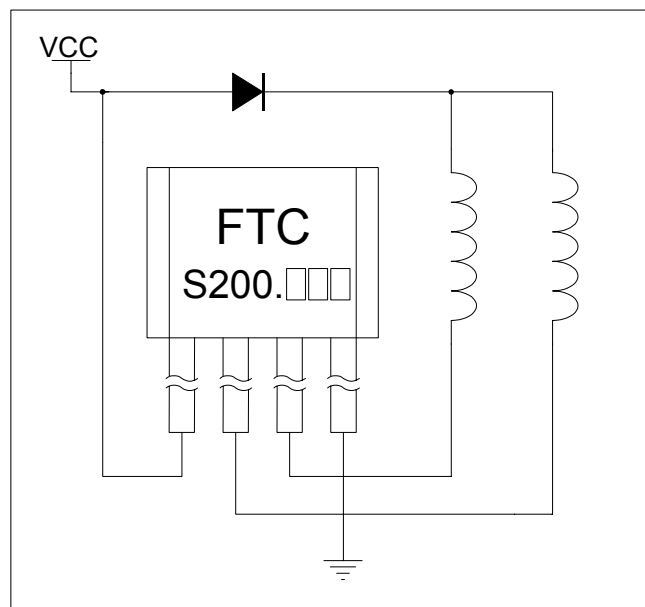
Using few external components, FS200, a high performance integrated IC, is designed for a 2-phase DC motor circuit. The circuit diagram of the typical application example is as below.
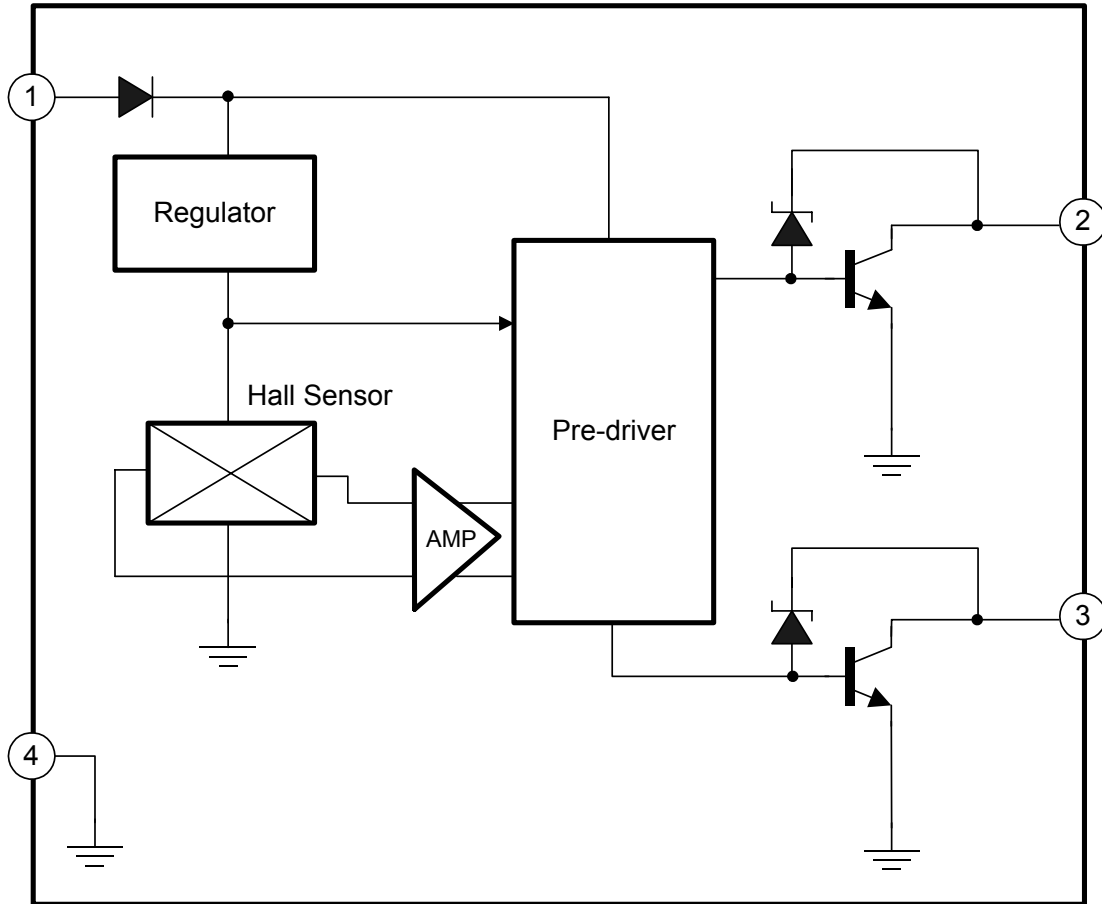
FEATURES

· 1 chip hall sensor / drivers

· Wide operating voltage range: 2.0V~20V

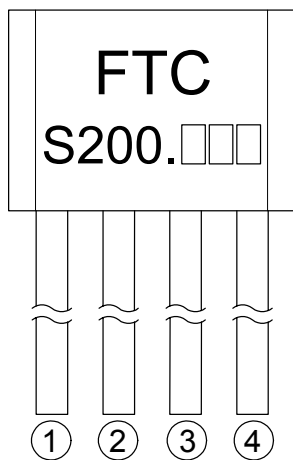· Output sink current up to 0.45A

· Package : TO-92SP-4

TO-92SP-4

TYPICAL APPLICATION CIRCUIT

FUNCTIONAL BLOCK DIAGRAM

MARK VIEW

FTC
S200.☐☐☐

① ② ③ ④

PIN DESCRIPTION

NAME	NO.	STATUS	DESCRIPTION
VCC	1	P	IC Power Supply
NO	2	O	Coil driver output It is low state during the N magnetic field.
SO	3	O	Coil driver output It is low state during the S magnetic field.
GND	4	P	IC Ground

ABSOLUTE MAXIMUM RATINGS

Zener Breakdown Voltage (Vz) -- 35V

NO/SO Pin Voltage -- 30V

VCC Pin Voltage -- 20V

Peak Sink Current (Io)

      Peak Current -- 1A≦ 100us

      Hold Current -- 700mA

      Continuous Current -- 450mA

Power Dissipation

      Ta=25 ^{o}C -- 700mW

      Ta=85 ^{o}C -- 450mW

Thermal Resistance

      Θ_{ja}= -- 0.15 ^{o}C/mW

Operating Temperature Range -- -20 ^{o}C ~ +85 ^{o}C

Storage Temperature Range -- -65 ^{o}C ~ +150 ^{o}C

Junction Temperature -- +150 ^{o}C

Lead Temperature (Soldering, 10 sec) -- +260 ^{o}C

Soldering Condition

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Minimum Operating Voltage	V_{CC}	No use pin is open (Fig1)		2.0		V
Maximum Operating Voltage	V_{CC}	$I_{cc} < 20mA$ No use pin is open (Fig1)		20.0		V
Quiescent Supply current	I_{CC}	No use pin is open V_{cc} : 2.0V ~ 20V (Fig1)	4	16	20	mA
NO/SO Saturation Voltage	V_{SAT}	Io = 450mA (Fig1)			1.1	V
Note: Fig1 The IC output state is under N magnetic field.						

NO/SO Saturation Voltage Vs. Output Current(Io)   Vcc=5V, Temp.=25 °C

Output Current (Io), unit:mA	Saturation Voltage Unit:V	Note
250	0.37	
300	0.48	
350	0.55	
400	0.65	
450	0.76	
500	0.86	

AC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Rise time	(t_r)	RL=100 (5w) CL=20pF (Fig1)			10	uS
Fall time	(t_f)	RL=100 (5w) CL=20pF (Fig1)			300	nS

MAGNETIC CHARACTERISTICS

FS200LF-A	Ta=-20 ^{o}C ~ +85 ^{o}C		
PARAMETER	**MIN**	**MAX**	**UNIT**
Bop	+5	+65	G
Brp	-65	-5	G
Bhys	10	130	G

FS200LF-B	Ta=-20 ^{o}C ~ +85 ^{o}C		
PARAMETER	**MIN**	**MAX**	**UNIT**
Bop	+5	+80	G
Brp	-80	-5	G
Bhys	10	160	G

FS200LF-Bu	Ta=-20 ^{o}C ~ +85 ^{o}C		
PARAMETER	**MIN**	**MAX**	**UNIT**
Bop		+80	G
Brp	-80		G
Bhys		160	G

FS200LF-C	Ta=-20 ^{o}C ~ +85 ^{o}C		
PARAMETER	**MIN**	**MAX**	**UNIT**
Bop		+100	G
Brp	-100		G
Bhys		200	G

FS200 HYSTERESIS CHARACTERISTICS

V_{NO}

V_{SO}


```
( -80  ,  +80  )        ( -80  ,  +80  )
( -100 ,  +100 )        ( -100 ,  +100 )
    NO    PIN               SO    PIN
```
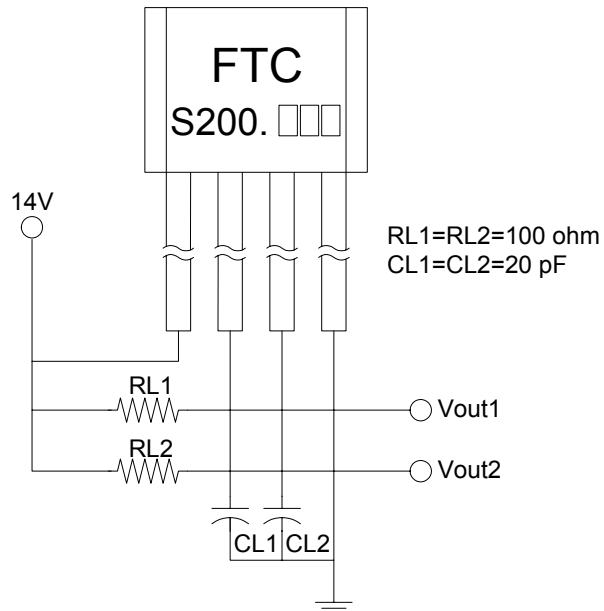
TEST CIRCUITS:
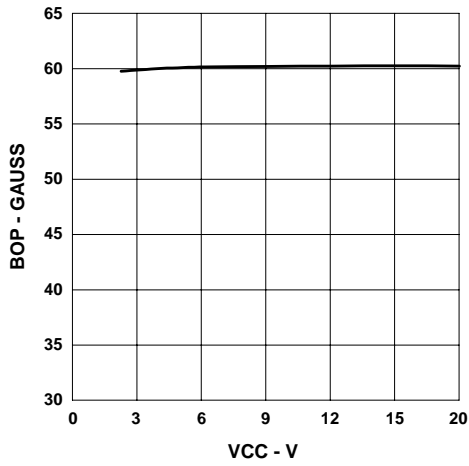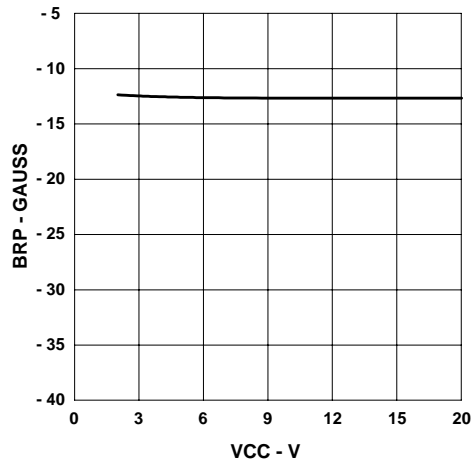

RL1=RL2=100 ohm
CL1=CL2=20 pF
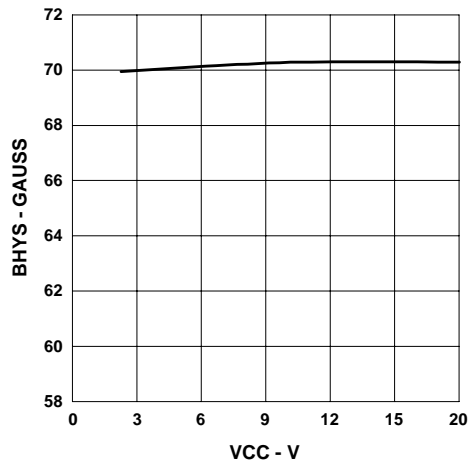
Fig 1

TYPICAL CHARACTERISTICS
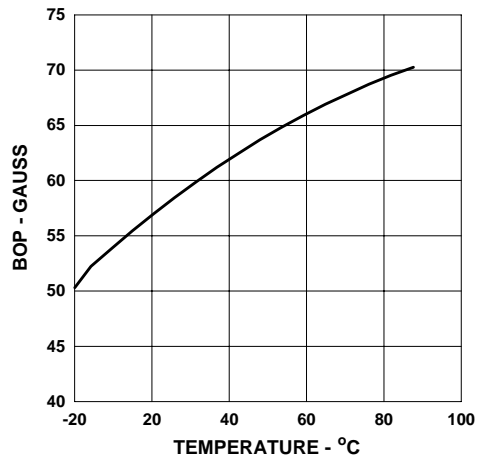

Figure 1

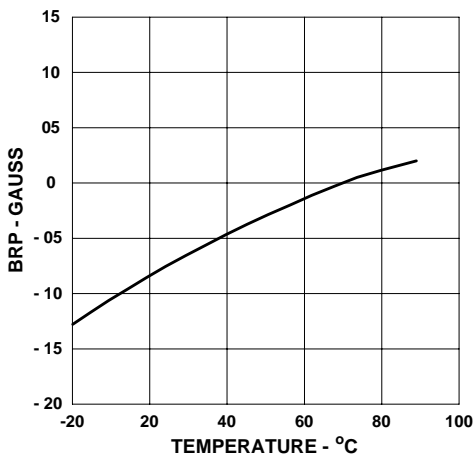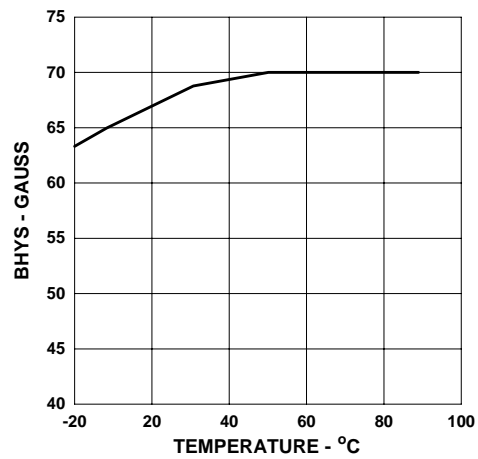Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

FUNCTION DESCRIPTIONS

HALL SENSOR LOCATION

The Fig 2 is the hall sensor location, where marks the IC number.   The best sensitivity, which can be intensified as much as possible, depends on the vertical distance and position between magnetic pole and the hall sensor (Fig 3).   For the single-phase motor, this design is very important.
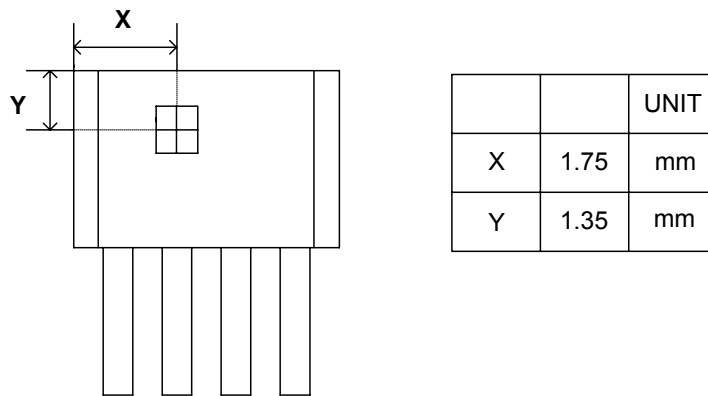
		UNIT
X	1.75	mm
Y	1.35	mm

Fig 2.   FS200 Hall Sensor Location
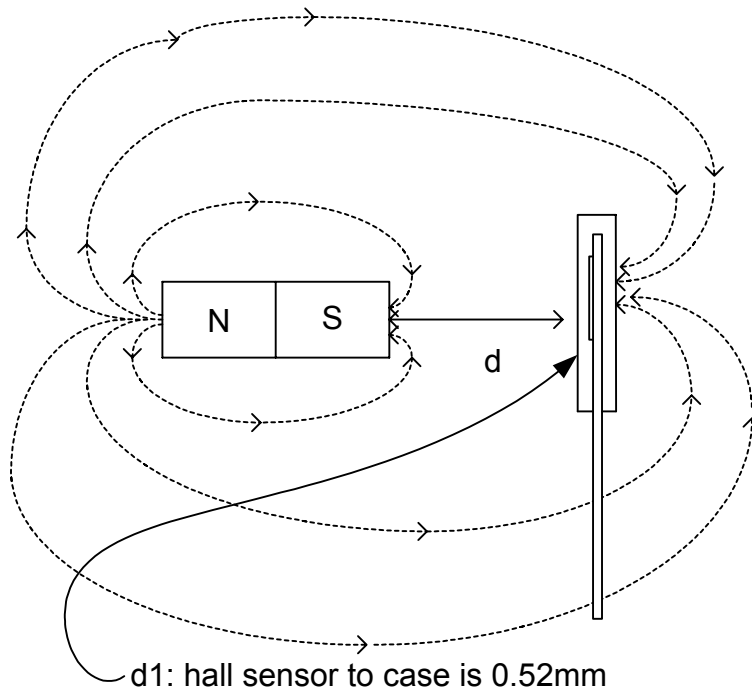
d1: hall sensor to case is 0.52mm

Fig 3.   Magnetic Distribution and Z-axis position

APPLICATION NOTE

The Example of Typical Application Circuit

Fig 5 is the example of typical application circuit. The red, yellow, and black wires are the input points of the motor system: red, the input of power supply; yellow, the output of FG; black, the ground signal. R_C is an external pull-up resistance for the use of measuring FG signal. In view of the design, the value of R_C could be decided by the transistor saturation voltage (V_{ON}), sink current (I_C), and off-level voltage (V_C).

The formula is: $R_C = \dfrac{V_{C} - V_{ON}}{I_C}$

For example:

V_C = +5V for TTL level.

I_C = 10mA at 0.2V saturation voltage

The safety value of R_C = 470

D1 is the reverse protection diode. As if the red and black wires reversely connect with the power source, the current will flow through the ground via IC and coils L1 and L2 to power supply.   Under such kind of circumstances, the IC and coils are easy to be burned out. Therefore, D1, the reverse protection diode, is necessary for the design.   However, D1 will also cause an extra voltage drop on the supply voltage.

C1 is a capacitor to reduce the ripple noise caused during the transient of the output stages. The volume of the ripple noise depends on the coil impedance and characteristics.
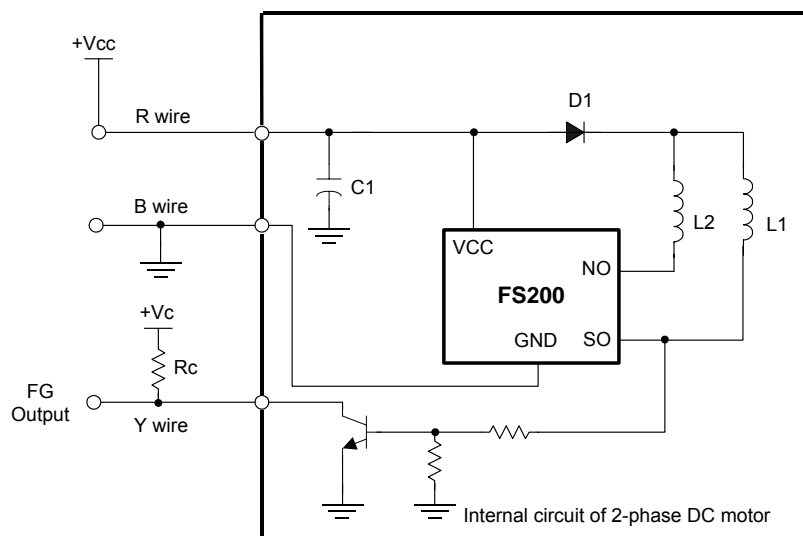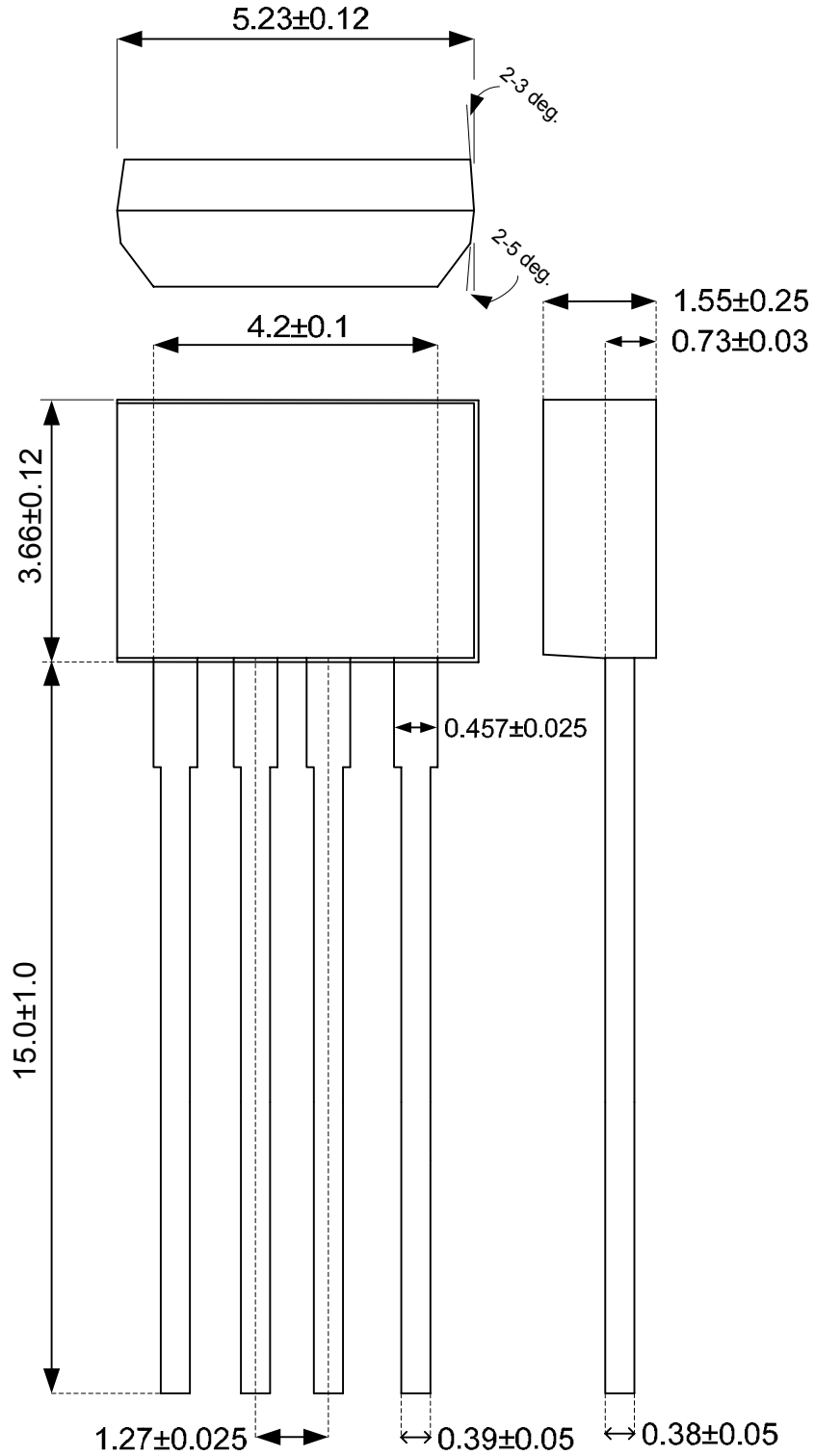

Fig 5 Application Circuit

Package Outline (LEAD FREE)   Unit:mm

5.23±0.12

2-3 deg.

2-5 deg.

1.55±0.25
0.73±0.03

4.2±0.1

3.66±0.12

0.457±0.025

15.0±1.0

1.27±0.025   0.39±0.05   0.38±0.05

FS200

PACKING SPECIFICATIONS
BAG & BOX DIMENSION

160 mm

200 mm

BAG LABEL

BAG

100 mm

FTC Logo

630 mm

BOX LABEL

190 mm

INSIDE BOX

400mm

650mm

240mm

CARTON LABEL

FTC Logo

CARTON

PACKING QUANTITY SPECIFICATIONS

1000 EA / 1 BAG

25 BAGS / 1 INSIDE BOX

4 INSIDE BOXES / 1 CARTON

LABEL SPECIFICATIONS

```
                        7.5 cm

          ┌─────────────────────────────────┐
          │  Feeling Technology Corp.       │
          │                                 │
          │  Product Type:   FS200LF- X     │
          │  Lot No:         A3603C89D      │
  5.5 cm  │  Date Code:      3Ub            │
          │  Package Type:   SIP- 4L        │
          │  Marking Type:   XXXXX  ┌──────┐│
          │  Tatal Q'ty:     XXXXX  │ Lead ││
          │                         │ Free ││
          └─────────────────────────┴──────┘┘
```
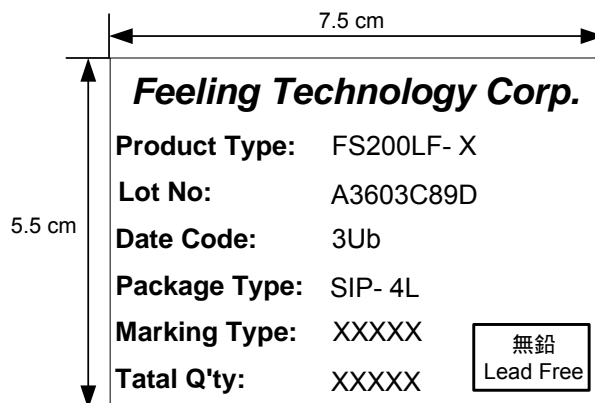
BAG LABEL, INSIDE BOX & CARTON LABEL

ORDER INFORMATION

Part Number	Operating Temperature	Package	Description
FS200LF-A	-20°C ~ +85°C	TO-92SP-4	±65G (B)
FS200LF-B	-20°C ~ +85°C	TO-92SP-4	±80G (B)
FS200LF-Bu	-20°C ~ +85°C	TO-92SP-4	±80G (B)
FS200LF-C	-20°C ~ +85°C	TO-92SP-4	±100G (B)