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EQ-730L
Linear Hall IC

Features

- Analog output voltage proportional to the magnetic flux density
- Magnetic sensitivity 130mV/mT (typ.)
- Supply voltage from 3.0V to 5.5V at single power supply
- Operating temperature range from -40°C to 100°C
- Ratio-metric analog output
- 3pin single in-line package (SIP), Halogen free
- Quick response 2μs (typ.)
- Low output noise voltage 10mVp-p

Operational Characteristics

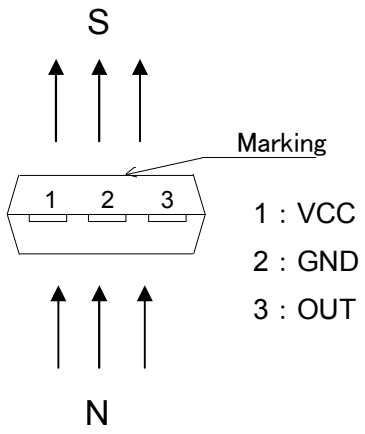


Figure 1.Definition of sensitivity direction

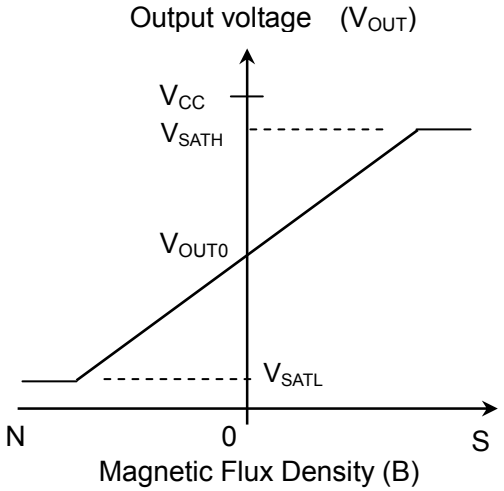


Figure 2.Output characteristics

Block Diagram

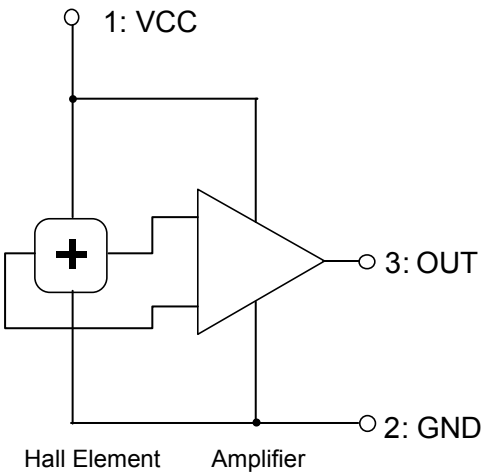


Figure 3.Block diagram

Pin/Function

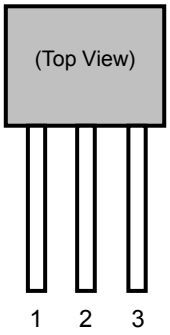


Figure 4.Pin-out diagram

Table 1. Description of pin name and function

Pin No.	Pin Name	Function
1	VCC	Power supply pin
2	GND	Ground pin
3	OUT	Output pin

Absolute Maximum Ratings

Table 2. Absolute maximum ratings (T_A = 25°C)

Parameter	Symbol	Min.	Max.	Unit
Supply voltage	V_{CC}	−0.3	+6.0	V
Output current	I_{OUT}	-1.2	+1.2	mA
Ambient temperature	T_A	−40	+100	°C
Storage temperature	T_{STG}	−40	+125	°C

Note) Stresses beyond these listed values may cause permanent damage to the device.

Recommended Operating Conditions

Table 3. Recommended operating conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	3.0	5.0	5.5	V
Output current	I_{OUT}	−1.0		1.0	mA
Load capacitance	C_L			1000	pF

Electrical & Magnetic Characteristics

Table 4. Electrical & Magnetic Characteristics (T_A = 25°C, V_{CC} = 5V unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption	I_{CC}	B = 0mT with no load		9	12	mA
Magnetic sensitivity (*1)	V_h	B = 0、±11mT with no load	110	130	150	mV/mT
Quiescent voltage	V_{OUT0}	B = 0mT	2.3	2.5	2.7	V
Linearity (*2)	ρ	B = 0mT (I_{OUT} = 0mA) B = ±13mT (I_{OUT} = ±1mA)	−0.5		0.5	%F.S.
Output saturation voltage H (*3)	V_{SATH}	I_{OUT} = −1mA	V_{CC}−0.3		V_{CC}	V
Output saturation voltage L (*3)	V_{SATL}	I_{OUT} = 1mA	0		0.3	V
Ratiometry sensitivity error (*4)	V_{h-R}	B = 0、±11mT with no load	−3		3	%
Ratiometry quiescent voltage error (*4)	V_{OUT0-R}	B = 0mT	−3		3	%

(Note: 1mT = 10G)

(*1) See Characteristic Definitions section.
(*2) See Characteristic Definitions section.
(*3) Guaranteed by design.
(*4) Specified only in case Vcc=3.0V, and 5.5V. See Characteristic Definitions section.

Input Voltage Range

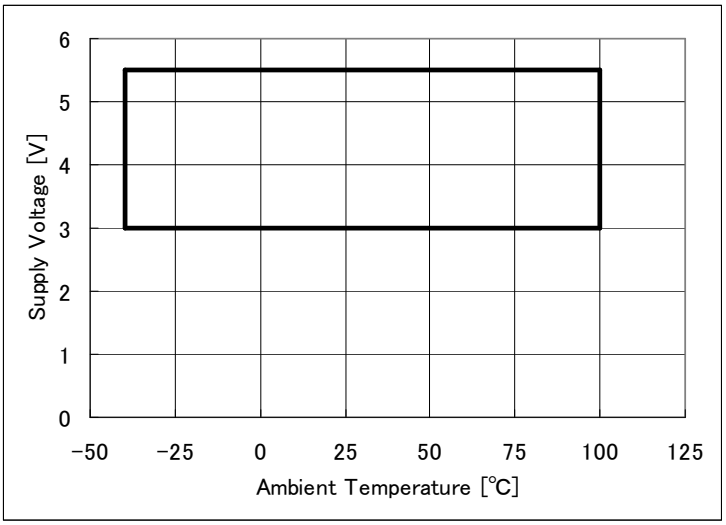


Figure 5.Input voltage range

Typical Characteristics

The following values are for reference only.

＜Electrical Characteristics＞

Table 5. Typical Electrical Characteristics (T_A = 25°C, V_{CC} = 5V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Response time	t_{RES}	Rising; Input magnetic field 90% → Output voltage 90% Falling; Input magnetic field 10% → Output voltage 10% (1~2μs Input magnetic field rising/falling) C_L = 1000pF		2		μs
Rise time	t_{RISE}	Output voltage 10% → 90% (1~2μs Input magnetic field rising/falling) C_L = 1000pF		3		μs
Fall time	t_{FALL}	Output voltage 90% → 10% (1~2μs Input magnetic field rising/falling) C_L = 1000pF				
Reaction time	t_{REAC}	Rising; Input magnetic filed 10% → Output voltage 10% Falling; Input magnetic field 90% → Output voltage 90% (1~2μs Input magnetic field rising/falling) C_L = 1000pF		0.3		μs
Bandwidth	f_T	at −3dB C_L = 1000pF		140		kHz
Output noise	V_{Np-p}			10		mVp-p

(Note: 1mT = 10G)

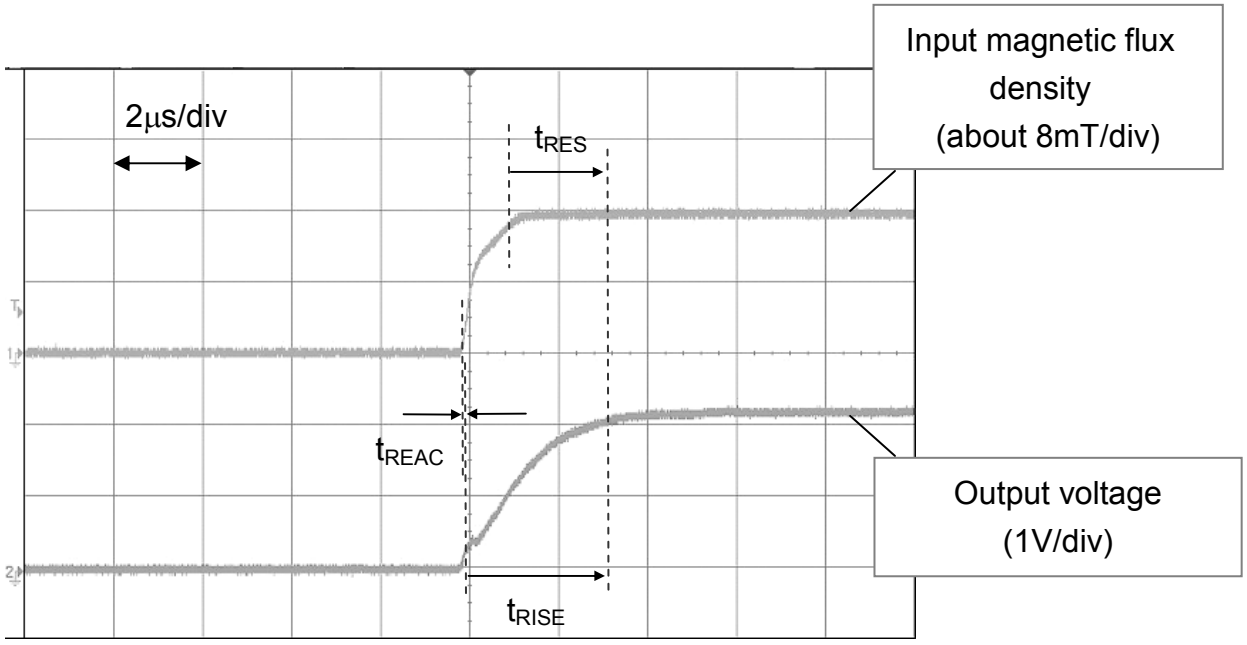


Figure 6. Example of step response

<Temperature Characteristics >

V_{CC} = 5V

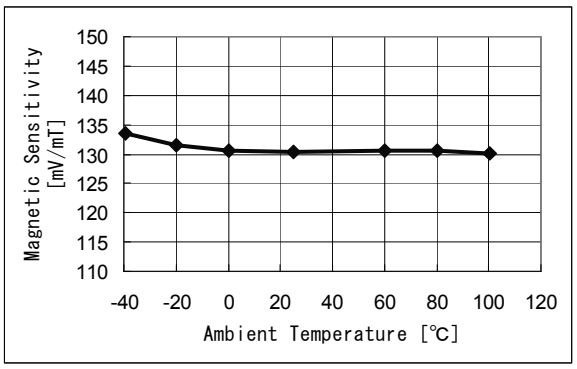


Figure 7.Magnetic sensitivity

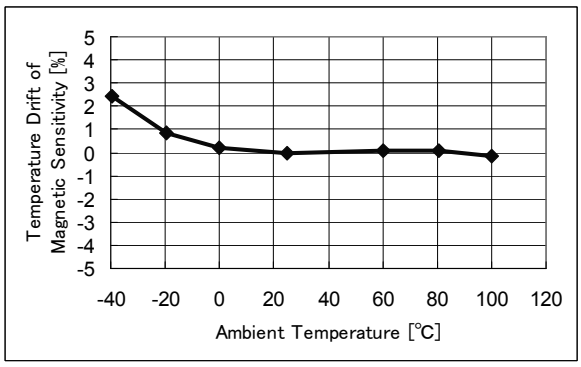
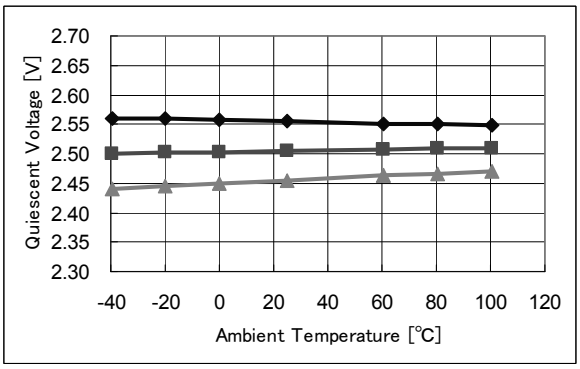
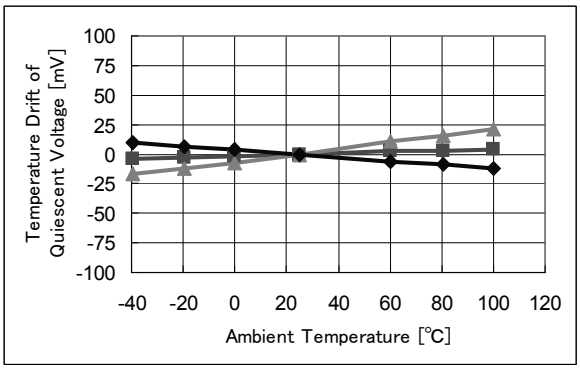


Figure 8. Temperature Drift of Magnetic Sensitivity (Based on T_A = 25°C)



n=3

Figure 9.Quiescent Voltage



n=3

Figure 10.Temperature Drift of Quiescent Voltage (Based on T_A = 25°C)

<Output Characteristics>

T_A = 25°C, V_{CC} = 5V

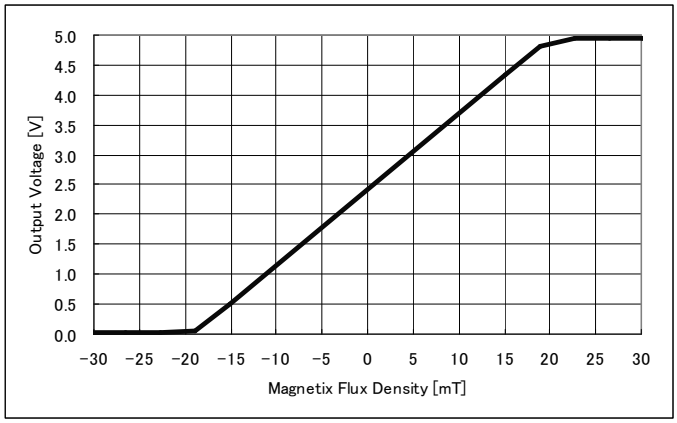


Figure 11.Output characteristics

Characteristic Definitions

(1) Magnetic sensitivity V_h (mV/mT)

Magnetic sensitivity is defined as the slope of the least square regression line of three points in magnetic-electric transformation relation; Quiescent voltage V_{OUT0}, V_{OUT} (+B), V_{OUT} (−B) (B is defined in condition in electrical characteristics table).

(2) Linearity ρ (%F.S.)

Linearity is defined as the ratio of a error voltage against full scale (F.S.). Where error voltage is calculated as the difference of three points (described below) from the straight line described in definition (1) Magnetic sensitivity. The three points are; Quiescent voltage V_{OUT0}, V_{OUT} (+B) and V_{OUT} (−B) (B is defined in condition in electrical characteristics table, and I_{OUT} for each V_{OUT} are defined in measurement condition shown below).

<Measurement Condition>

0mT applied : I_{OUT} = 0mA

+BmT applied : I_{OUT} = +1.0mA（Flow out from output ）

−BmT applied : I_{OUT} = −1.0mA（Flow into output）

$$\rho = \frac{Vout(B) - \{Vh \times B + Vint\}}{Vout(+B) - Vout(-B)} \times 100$$

Where full scale (F.S.) is defied as V_{OUT} (+B) − V_{OUT} (−B), and V_{int} is y-intercept of the line described in definition (1) Magnetic sensitivity.

(3) Ratiometry sensitivity error $V_{h\text{-}R}$ (%) **and Ratiometry quiescent voltage error** $V_{OUT0\text{-}R}$ (%)

Ratiometry error is defined as the ratio of the variation of magnetic sensitivity and quiescent voltage at 3V and 5V as shown in following equations.

$$V_{h\text{-}R} = \frac{\frac{Vh(V_{CC}=3V)}{Vh(V_{CC}=5V)} - \frac{3}{5}}{\frac{3}{5}} \times 100 \qquad V_{OUT0\text{-}R} = \frac{\frac{V_{OUT0}(V_{CC}=3V)}{V_{OUT0}(V_{CC}=5V)} - \frac{3}{5}}{\frac{3}{5}} \times 100$$

(4) Response time t_{RES} (μs)

Response time is defined as the time from 90% reach point of input magnetic field in rise up (10% reach point in fall down) to the 90% reach point of output voltage in rise up (10% reach point in fall down), under a pulse magnetic field input (see Figure .12).

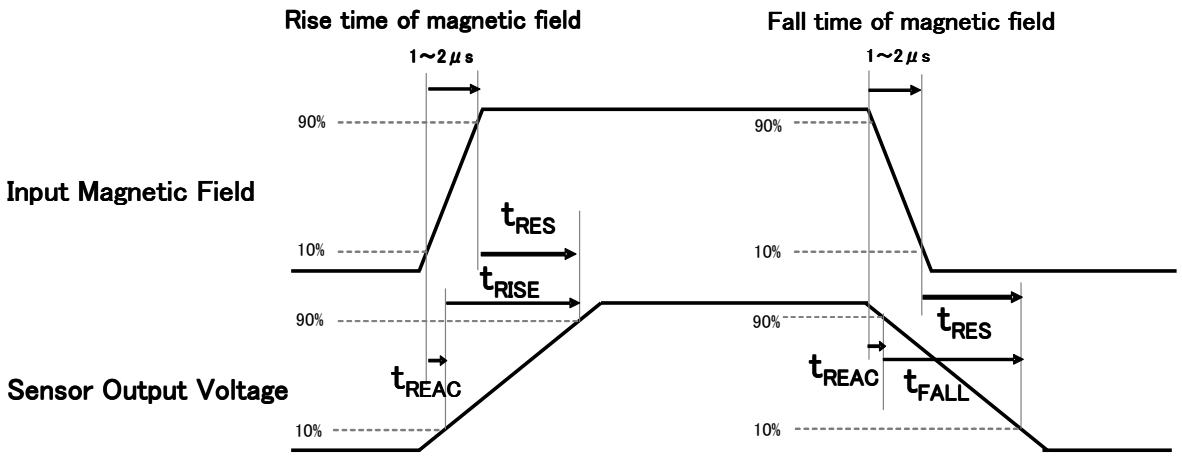
(5) Rise time t_{RISE} **and Fall time** t_{FALL} (μs)

Rise time is defined as the time from 10% reach point to 90% reach point of output voltage, under a pulse magnetic field input (see Figure .12).

Fall time is defined as the time from 90% reach point to 10% reach point of output voltage, under a pulse magnetic field input (see Figure .12).

(6) Reaction time t_{REAC} (μs)

Response time is defined as the time from 10% reach point of input magnetic field in rise up (90% reach point in fall down) to 10% reach point of output voltage in rise up (90% reach point in fall down), under a pulse magnetic field input (see Figure .12).



Note) Rise time and fall time of input pulse magnetic field is 1~2μs.

Figure 12.Relations of the input magnetic field and t_{RES}、t_{RISE}、t_{FALL}、t_{REAC}

Package Outline

（Unit：mm）

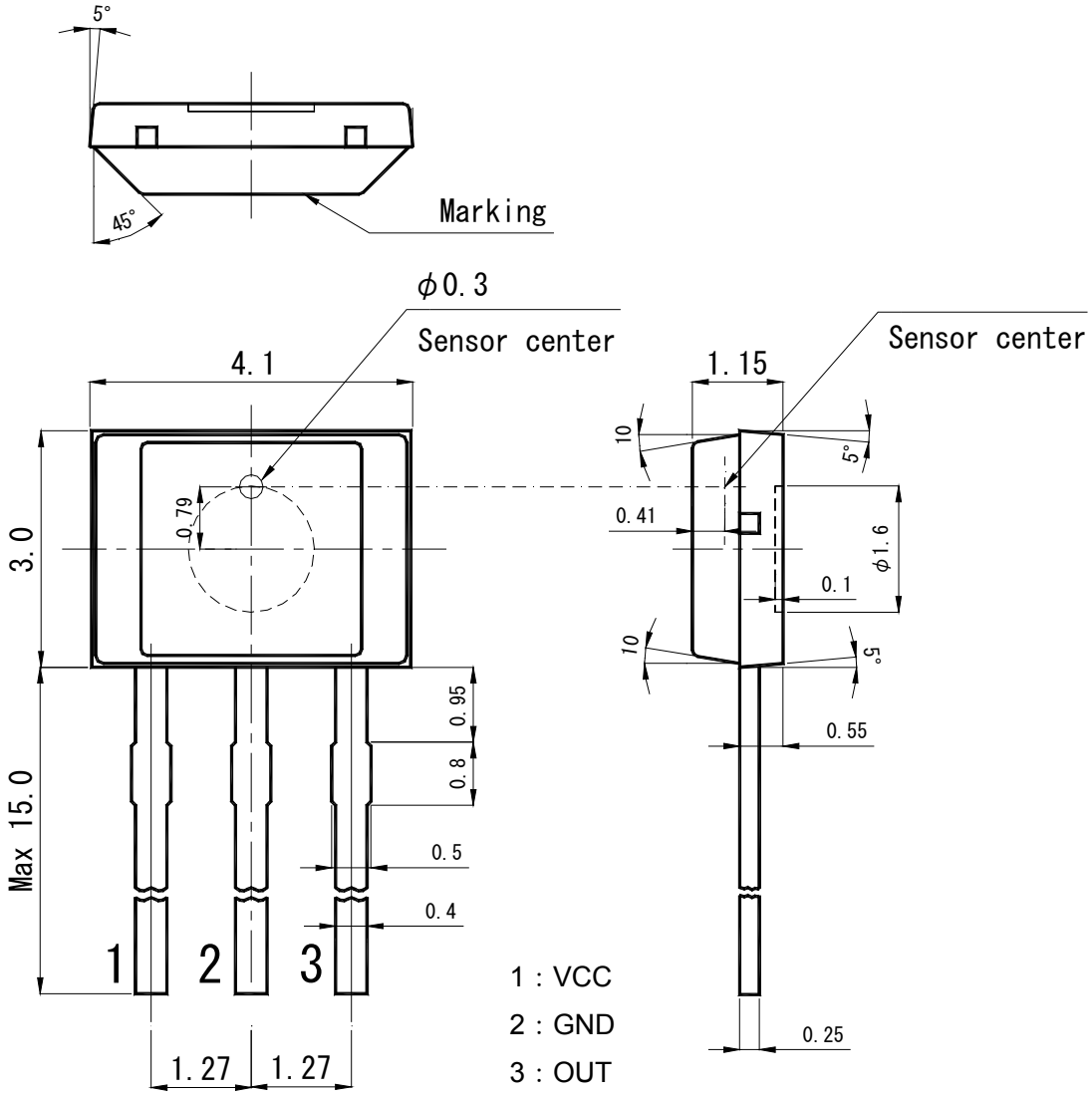


Figure 13.Package outline

Note 1) The center of the sensor is located within the ϕ0.3mm circle.
Note 2) Tolerances of dimension otherwise noted is ±0.1mm.
Note 3) The metal portions on the package side (support lead) are connected to the internal circuits. The support lead should be isolated from the external circuit and the other support lead.

Package type	:	SIP
Material of terminals	:	Cu
Material of plating for terminals	:	Sn 100%
Plating thickness	:	10μm (typ.)

Marking

Marking is performed by laser.

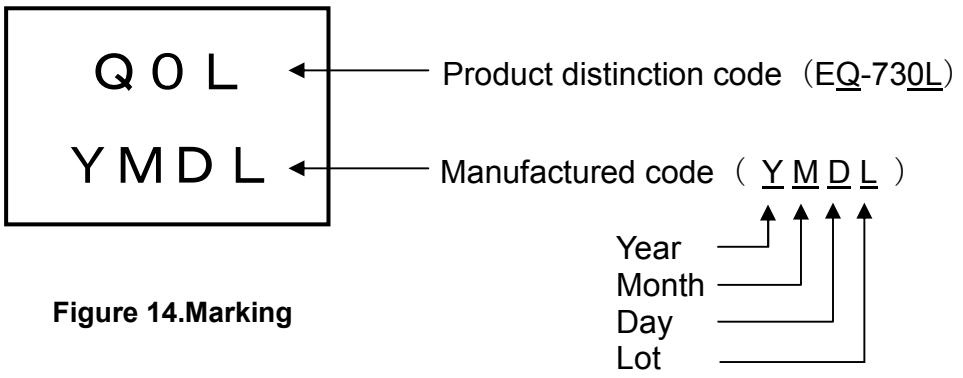


Figure 14.Marking

Recommended External Circuit

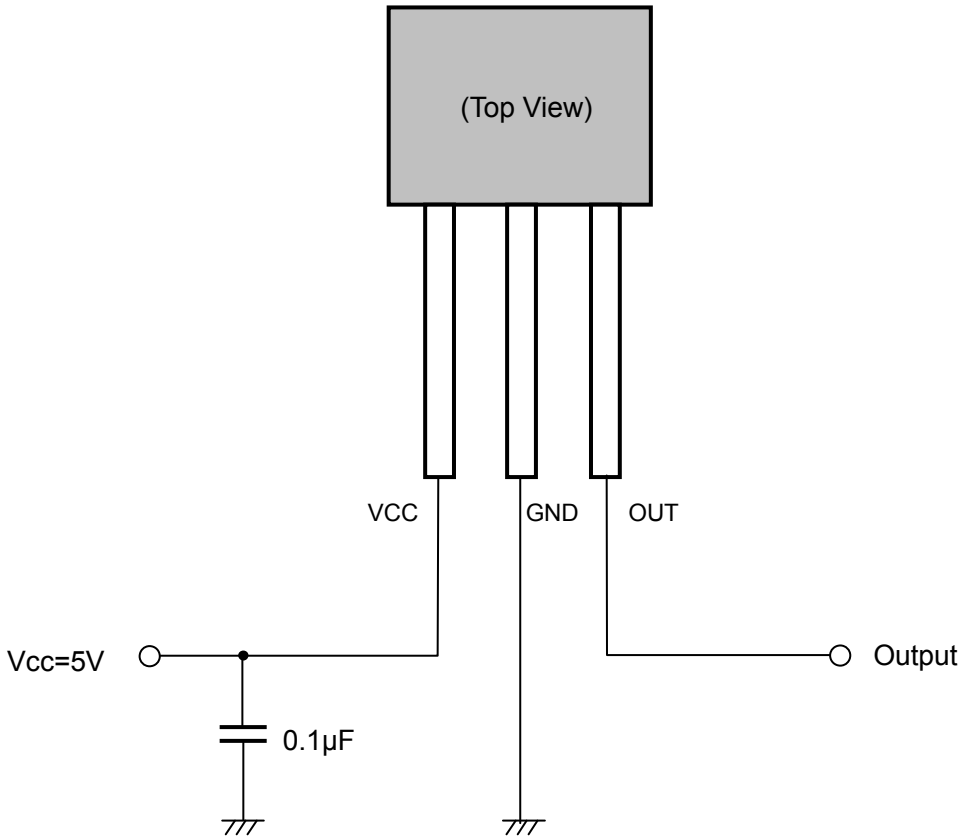


Figure 15.Recommended external circuit

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