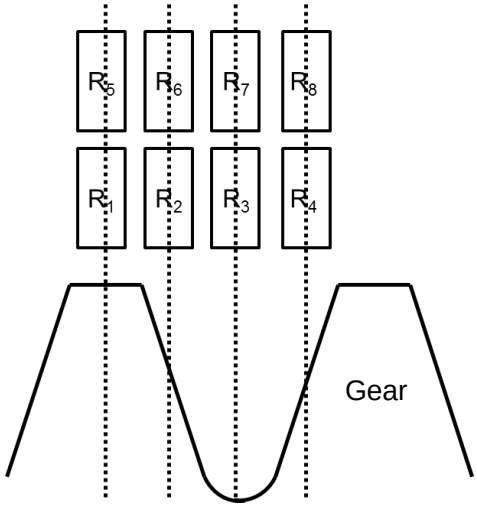
MS0043

Semiconductor Magnetoresistive Element

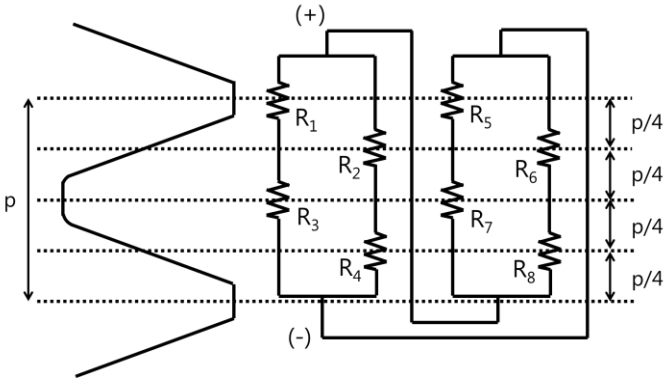
Semiconductor Magnetoresistive Element Composition

MS0043 generates differential A+/A-,B+/B- phase analog output voltages by combining module m=0.4 gear and bias magnet.



Configuration

p = m×π(m : module)



Equivalent Circuit

Application

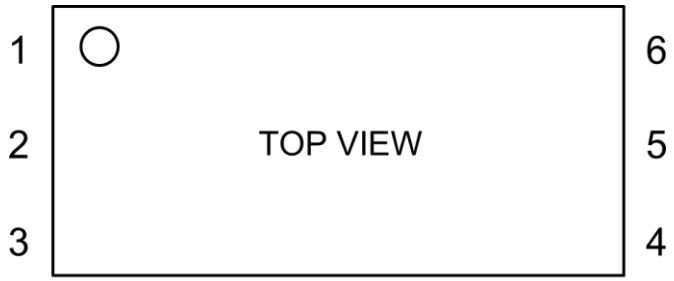
Motor control application such as AC servo motor, robot and CNC spindle motor etc.

Since the analog output voltages produced by SMRE show sine/cosine waves with little distortion corresponding to gear rotation , it is possible to transform the voltages to angle of gear rotation with high resolution over the 20bit by electrical interpolation. It is suitable for small and high accuracy motor control application and other.

Feature

- Design optimized for 32 to 64 teeth small gears with m=0.4.
  - In B=0T, $R_3<R_1$, $R_2<R_4$,$R_7<R_5$, $R_6<R_8$, offset voltage is decrease combining gear and bias magnet
- Outputs of analog voltage of ideal sine/cosine wave
- Differential outputs of A+/A- and B+/B- phase

Pin Out



1. A-
2. A+
3. VIN
4. B+
5. GND
6. B-

*A+ and A- are differential signal.
*B+ and B- are differential signal.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Notes
Junction Temperature	T_j	-50	150	°C	
Storage Temperature	T_{stg}	-50	150	°C	

WARNING: Operation beyond these limits may cause permanent damage to the device. Even if it does not lead to destruction, reliability and life may be adversely affected. Normal operation is not guaranteed at these extremes.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Temperature	T_a	-40		125	°C	
Max. Input Power	PD			450	mW	T_a=25°C

WARNING: Electrical and magnetic characteristics are not guaranteed when operated beyond these conditions.

Magnetic & Electrical Characteristics

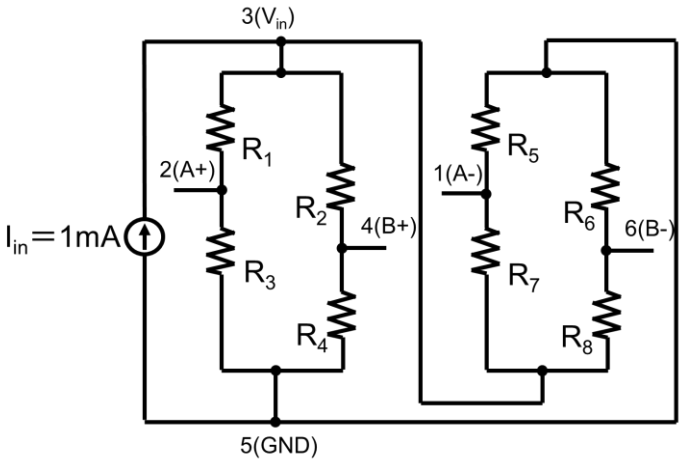
Ta=25

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Input Resistance	$R_{in}(0)$	I_{in}=1mA B=0T	275		410	Ω	*1
Input Resistance Change Ratio	$\Delta R_{in} / R_{in}$	I_{in}=1mA B=0/0.45T	130			%	*2
Phase-A+/B- Voltage	$V_{A+}(0)$ $V_{B-}(0)$	V_{in}=5V, B=0T	2.443		2.503	V	*3
Phase-A-/B+ Voltage	$V_{A-}(0)$ $V_{B+}(0)$	V_{in}=5V, B=0T	2.497		2.557	V	*3
Phase- A+/B- Voltage	$V_{A+}(B)$ $V_{B-}(B)$	V_{in}=5V, B=0.45T	2.453		2.493	V	*4
Phase- A-/B+ Voltage	$V_{A-}(B)$ $V_{B+}(B)$	V_{in}=5V, B=0.45T	2.507		2.547	V	*4

Unit T means Tesla.(1T=10kGauss)

*1 $R_{in}(0)$: Resistance between 3(V_{in}) and 5(GND) in B=0T.

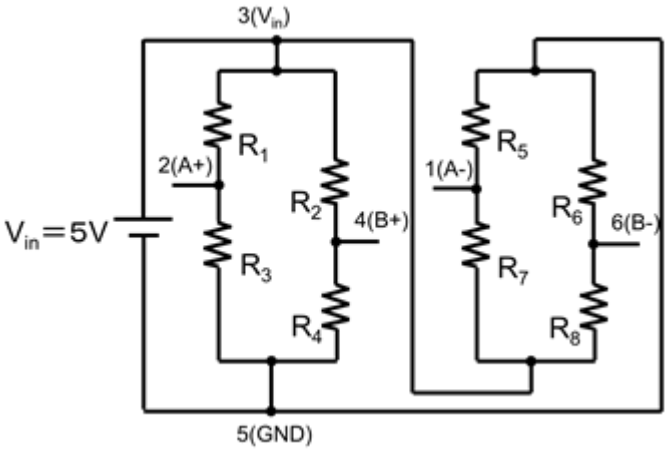
*2 $\Delta R_{in} / R_{in} = (R_{in}(B) - R_{in}(0)) / R_{in}(0)$ Rin(B) : B=0.45T



Measurement circuit of $R_{in}(0)$, $\Delta R_{in}/R_{in}$

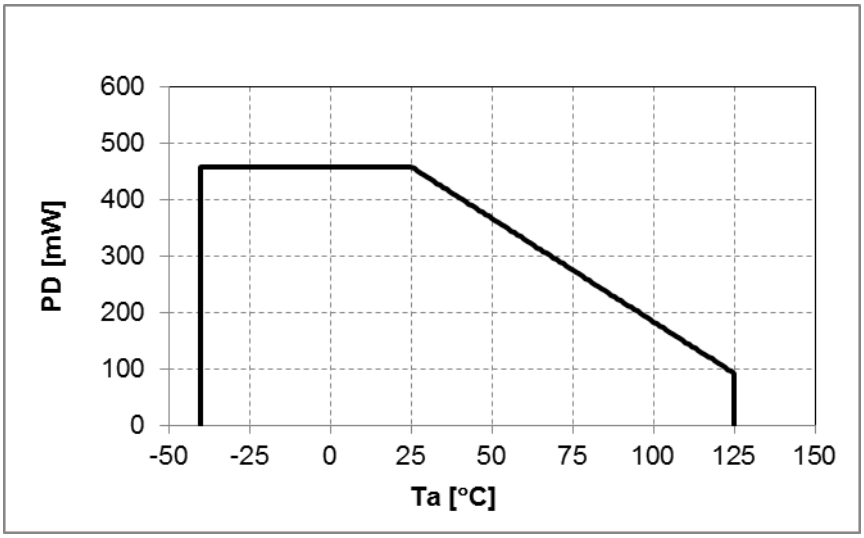
*3 $V_{A+}(0)$: Output Voltage of 2(A+) with 3(V_{in})=5V and B=0T
$V_{A-}(0)$: Output Voltage of 1(A-) with 3(V_{in}) =5V and B=0T
$V_{B+}(0)$: Output Voltage of 4(B+) with 3(V_{in}) =5V and B=0T
$V_{B+}(0)$: Output Voltage of 6(B-) with 3(V_{in}) =5V and B=0T

*4 $V_{A+}(B)$: Output Voltage of 2(A+) with 3(V_{in}) =5V and B=0.45T
$V_{A-}(B)$: Output Voltage of 1(A-) with 3(V_{in}) =5V and B=0.45T
$V_{B+}(B)$: Output Voltage of 4(B+) with 3(V_{in}) =5V and B=0.45T
$V_{B-}(B)$: Output Voltage of 6(B-) with 3(V_{in}) =5V and B=0.45T



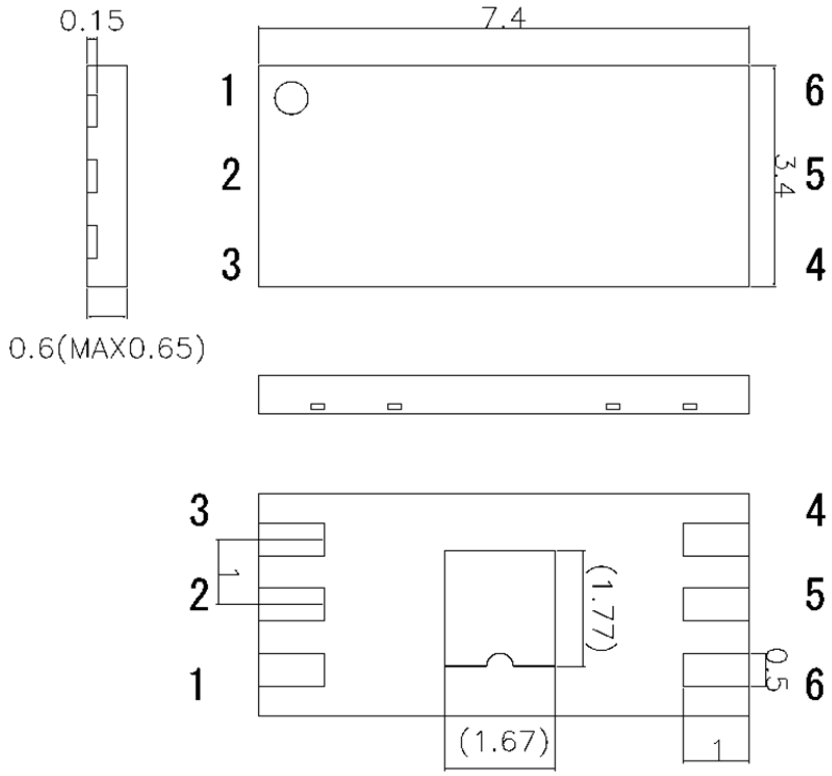
Measurement circuit of $V_{A+}(0)$, $V_{B+}(0)$, $V_{A-}(0)$, $V_{B-}(0)$, $V_{A+}(B)$, $V_{B+}(B)$, $V_{A-}(B)$, $V_{B-}(B)$

Power Dissipation



Package Information

Unit: mm

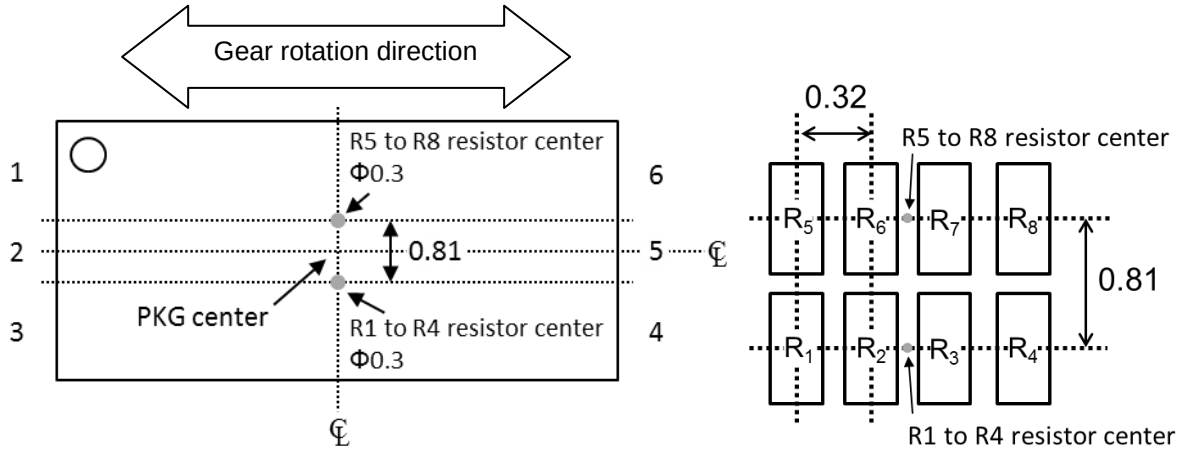


Material of terminals: Copper alloy
Material of plating: Sn 100%
*Halogen free

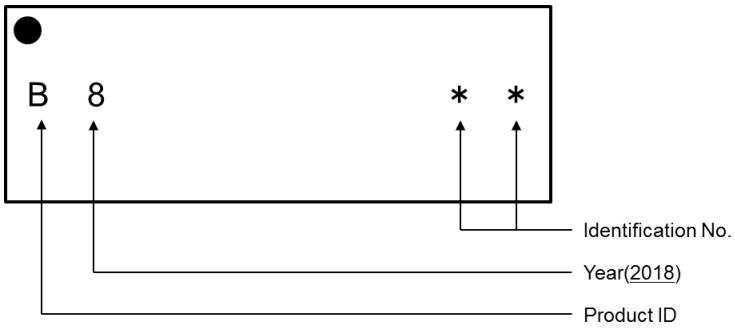
Note1) The tolerance of dimensions with no mention is ±0.1mm.
Note2) The metal portions on the package side (support lead) and the center metal area (1.77mm×1.67mm) on the package bottom should be isolated from the external circuit and the other support lead. Also, soldering is prohibited.

Resistor Positioning and Alignment (reference)

Unit: mm



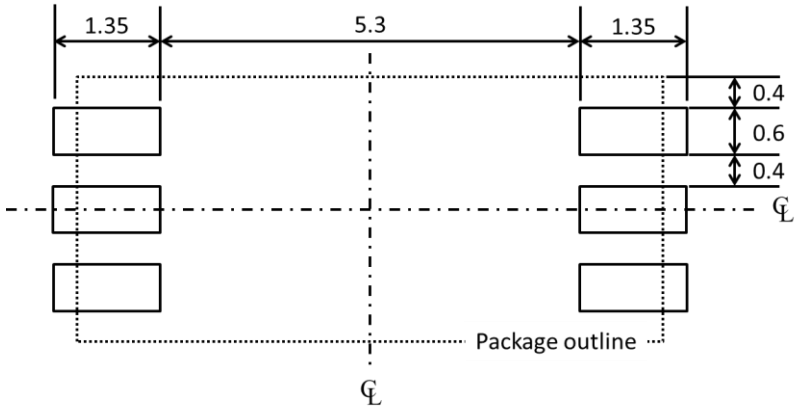
Marking



Mark	Product ID	Mark	Corresponding Year
1		0	2020
2		1	2021
3		2	2022
4		3	2023
5		4	2024
6		5	2025
7		6	2026
8		7	2027
9		8	2018
0		9	2019
A			
B	MS0043		

Recommended Land Pattern (reference)

Unit: mm



RoHS Compliance

MS0043 is compliant with RoHS Directive 2002/95/EC.

Revision History

Date (Y/M/D)	Revision	Reason	Page	Contents
2018/06/15	00			First edition

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