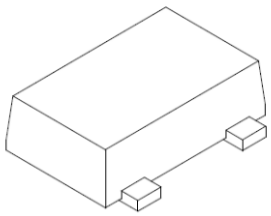
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TCS40DLR

Digital Output Magnetic Sensor

Feature

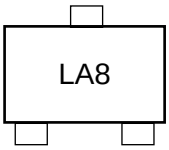
Open-Drain Output
South-Pole and North-Pole Detections



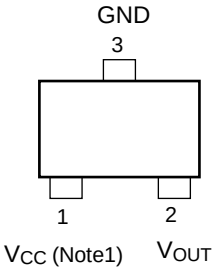
SON3-P-0203-1.90S
SOT-23F

Weight: 11.0 mg (typ.)

Marking



Pin Assignment (Top View)



Function Table

Magnetic Flux Density	Output
≥ B_{ON}	L
≤ B_{OFF}	Z (Note 2)

Note 1: A 0.47μF capacitor should be connected near the device. This condition will not guarantee successful operation. Check the performance thorough evaluation using the actual application to set the condition.

Note 2: In high impedance state.

Start of commercial production
2015-05

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply Voltage	V_{CC}	−0.5 to 6.0	V
Output Voltage	V_{OUT}	−0.5 to 6.0	V
Output Diode Current	I_{OK}	−10	mA
Output Current	I_{OUT}	5	mA
Vcc/GND Current	I_{CC}	±10	mA
Power Dissipation	P_D	1 (Note 3)	W
Storage Temperature Range	T_{stg}	−65 to 150	°C

Note**:** Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 3**:** Mounted on a FR4 board.
(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad**:** 645 mm^2)

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply Voltage	V_{CC}	2.3 to 5.5	V
Output Voltage	V_{OUT}	0 to 5.5 (Note 4)	V
Output Current	I_{OL}	1.0	mA
Operating Temperature	T_{opr}	−40 to 85	°C

Note 4**:** V_{CC} = 0 V or when output impedance is high.

DC Characteristics (Ta = 25°C)

Characteristics		Symbol	Condition	V_{CC} (V)	Min	Typ.	Max	Unit
Output Voltage	Low Level	V_{OL}	I_{OL} = 1.0 mA	2.3	—	—	0.23	V
				2.5	—	—	0.25	
				3.3	—	—	0.33	
				3.6	—	—	0.36	
				5.0	—	—	0.50	
Output Leakage Current		I_{OFF}	V_{OUT} = 5.5 V	0	—	0.5	1	μA
Supply Current	Average Current	I_{CC}	Current at pulse driving (Note 5, Fig. A)	2.3	—	7.3	13.2	μA
				2.5	—	8.5	—	
				3.3	—	12.8	—	
				5.0	—	19.0	—	
	Operating Current	$I_{CC}ON$	Peak current (Note 5, Fig. A)	2.3	—	0.7	1.1	mA
				2.5	—	0.8	—	
				3.3	—	1.2	—	
				5.0	—	1.6	—	
Operating Frequency		f_{opr}	(Fig. A)	2.3 to 5.0	—	25	—	Hz

Note 5: Supply current is pulsed periodically by internal circuit.

Magnetic Characteristics (Ta = 25°C)

Characteristics		Symbol	Condition (Note 6and 7, Fig. B)	V_{CC} (V)	Min	Typ.	Max	Unit
Magnetic Flux Density	Operating Point	$B_{ON}S$ $\lvert B_{ON}N\rvert$	When output logic turns High to Low	2.3 to 3.6	—	3.4	4.4	mT*
				5.0	—	2.8	4.4	
	Releasing Point	$B_{OFF}S$ $\lvert B_{OFF}N\rvert$	When output logic turns Low to High	2.3 to 3.6	0.9	2.0	—	
				5.0	0.4	1.5	—	
	Hysteresis	B_H	$\lvert B_{ON} - B_{OFF}\rvert$	2.3 to 5.0	—	1.4	—	

*1 mT = 10 Gauss

Note 6: Uniform magnetic field perpendicularly to the magnetic sensor.
Note 7: Output logic is High level with pull-up resistance.

Note: Direction of Magnetic field

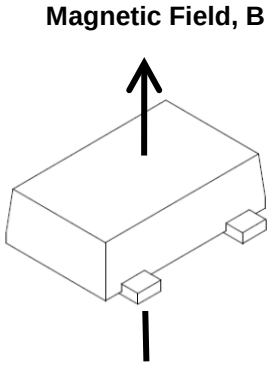


Fig. A: I_{CC} Characteristics

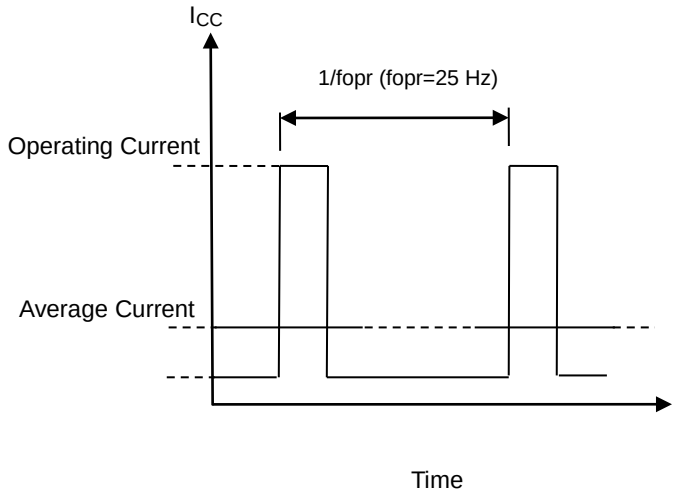
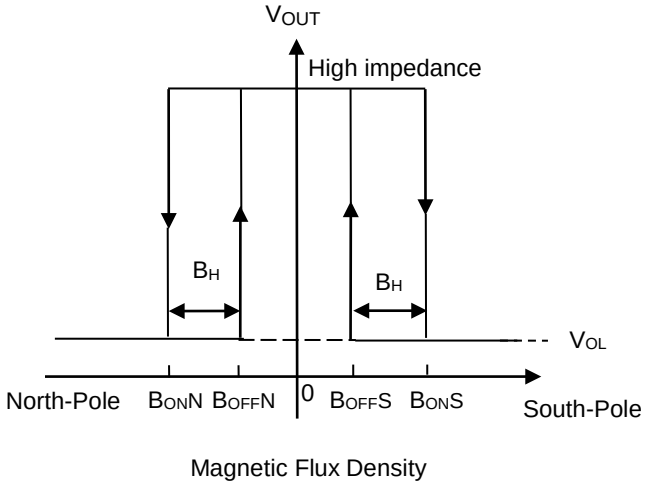


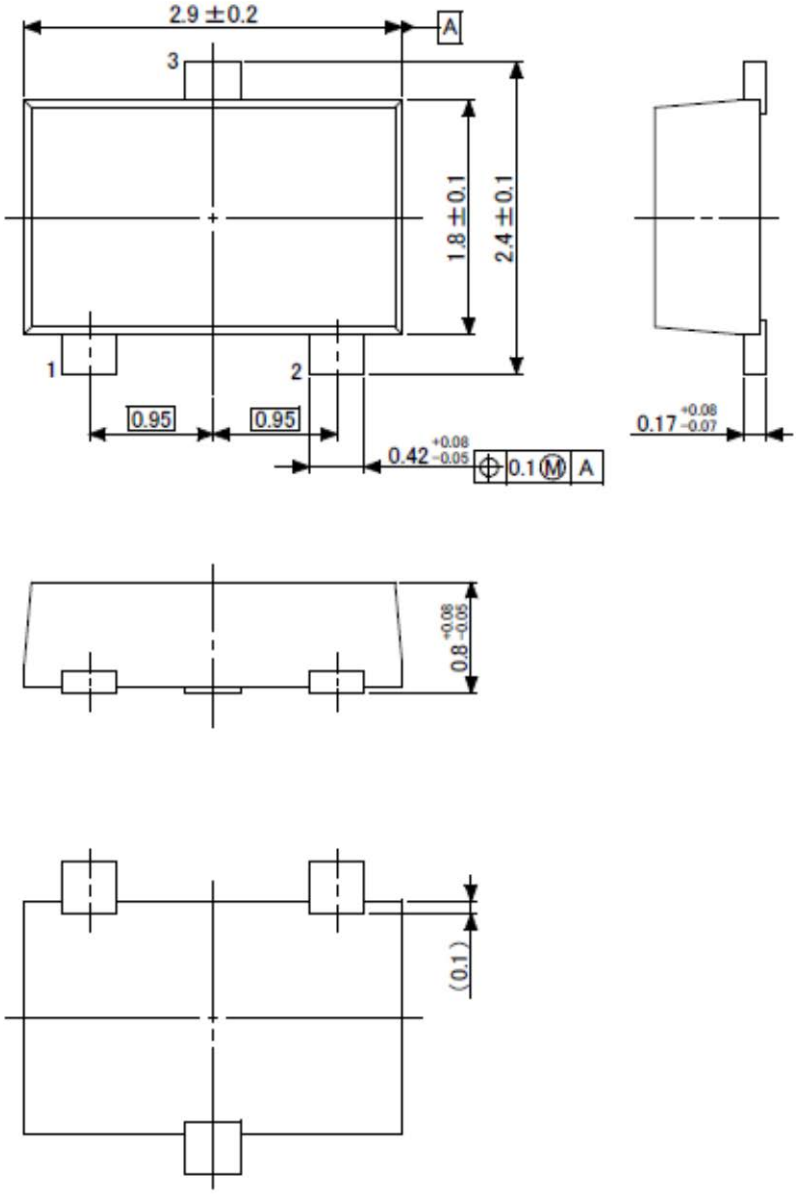
Fig. B: Operating Characteristics



Package Dimension

SON3-P-0203-1.90S

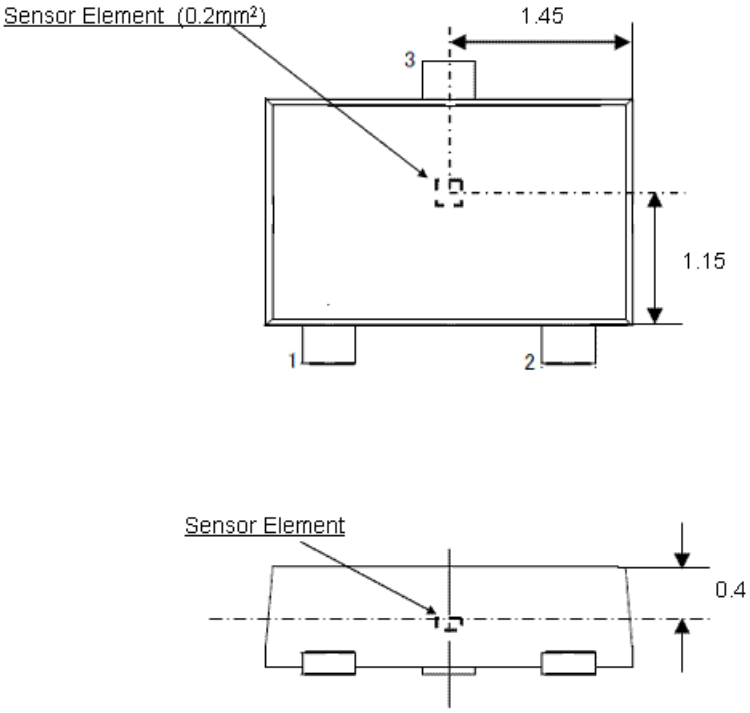
Unit: mm



Weight: 11.0 mg (Typ.)

Layout of Sensor Element

Unit: mm



Note: Dimensional tolerances are ±0.1 mm, unless otherwise specified.

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