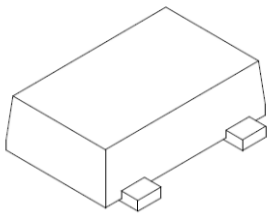
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TCS40DPR

Digital Output Magnetic Sensor

Feature

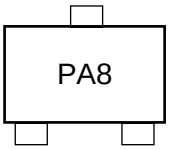
Push-Pull Output
South-Pole and North-Pole Detection



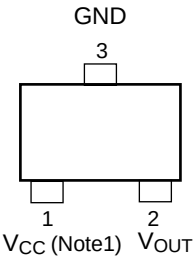
SON3-P-0203-1.90S
SOT-23F

Weight: 11.0 mg (typ.)

Marking



Pin Assignment (Top View)



Function Table

Magnetic Flux Density	Output
≥ B_{ON}	L
≤ B_{OFF}	H

Note 1: A 0.47 μF 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.

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 2)	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 2: 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 V_{CC}	V
Output Current	I_{OH} / I_{OL}	±1.0	mA
Operating Temperature	T_{opr}	−40 to 85	°C

DC Characteristics (Ta = 25°C)

Characteristics		Symbol	Condition	V_{CC} (V)	Min	Typ.	Max	Unit
Output Voltage	High Level	V_{OH}	I_{OH} = −1.0 mA	2.3	2.0	—	—	V
				2.5	2.2	—	—	
				3.3	2.9	—	—	
				3.6	3.2	—	—	
				5.0	4.5	—	—	
	Low Level	V_{OL}	I_{OL} = 1.0 mA	2.3	—	—	0.23	
				2.5	—	—	0.25	
				3.3	—	—	0.33	
				3.6	—	—	0.36	
				5.0	—	—	0.50	
Supply Current	Average Current	I_{CC}	Current at pulse driving (Note 3, 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 3, 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 3: Supply current is pulsed periodically by internal circuit.

Magnetic Characteristics (Ta = 25°C)

Characteristics		Symbol	Condition (Note 4, Fig. B)	V_{CC} (V)	Min	Typ.	Max	Unit
Magnetic Flux Density, B	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 4: Uniform magnetic field perpendicularly to the magnetic sensor.

Note: Direction of Magnetic field

Magnetic Field, B

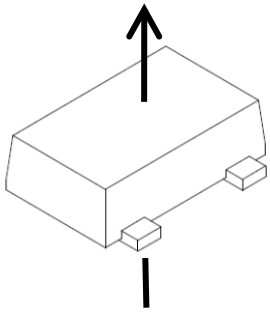


Fig. A: I_{CC} Characteristics

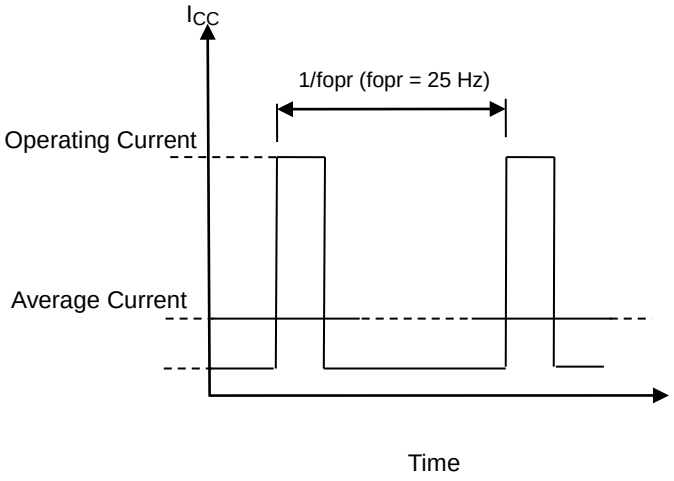
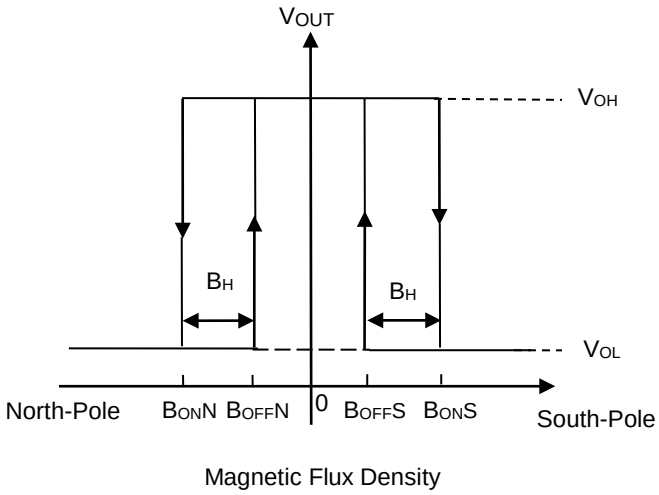


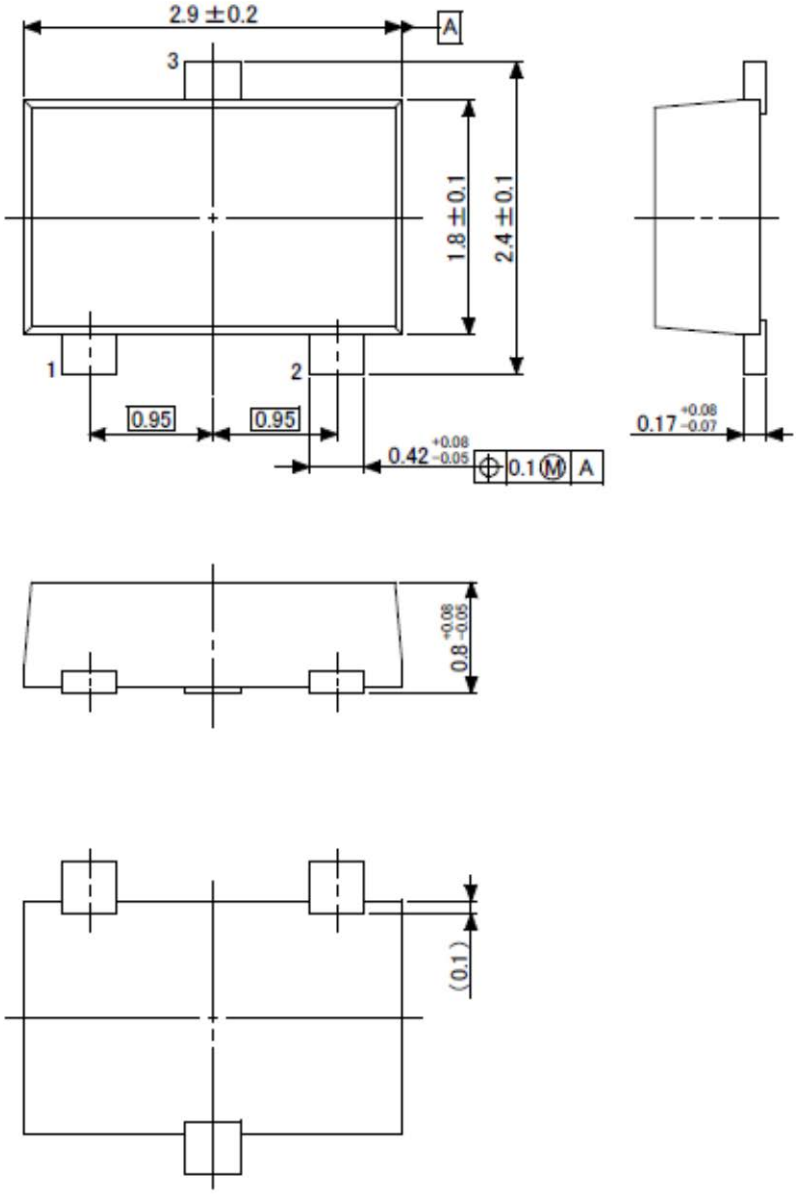
Fig. B: Operating Characteristics



Package Dimension

SON3-P-0203-1.90S

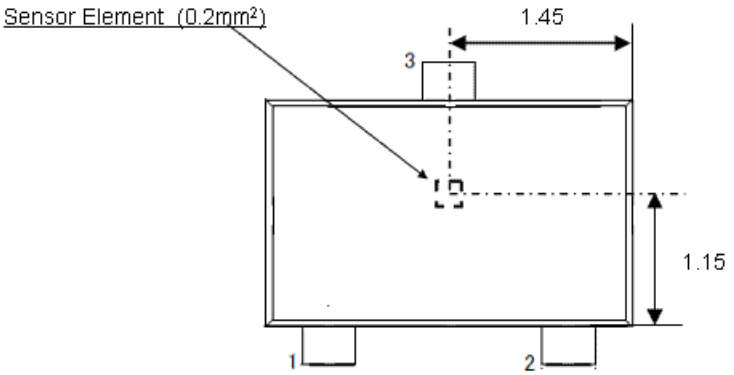
Unit: mm

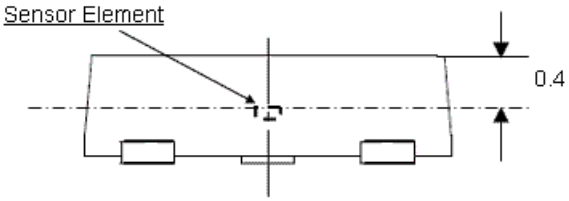


Weight: 11.0 mg (Typ.)

Layout of Sensor Element

Unit: mm





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

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