

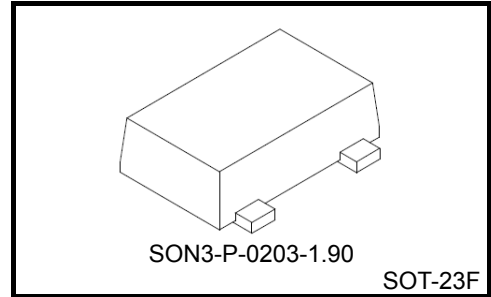
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TCS20DLR

Digital Output Magnetic Sensor

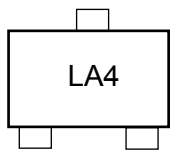
**Feature**

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

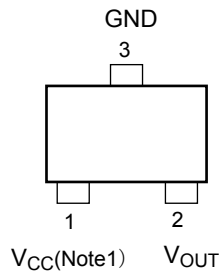


Weight: 11.0 mg (typ.)

**Marking**



**Pin Assignment (Top View)**



**Function Table**

Magnetic Flux Density	Output
$\geq B_{ON}$	L
$\leq B_{OFF}$	Z(Note 2)

Note 1 : A 0.47 $\mu$ F 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  
2010-03

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply Voltage	V <sub>CC</sub>	-0.5 to 6.0	V
Output Voltage	V <sub>OUT</sub>	-0.5 to 6.0	V
Output Diode Current	I <sub>OK</sub>	-10	mA
Output Current	I <sub>OUT</sub>	5	mA
V <sub>CC</sub> /GND Current	I <sub>CC</sub>	±10	mA
Power Dissipation	P <sub>D</sub>	1 (Note 3)	W
Storage Temperature Range	T <sub>stg</sub>	-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<sup>2</sup>)

## Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply Voltage	V <sub>CC</sub>	2.3 to 5.5	V
Output Voltage	V <sub>OUT</sub>	0 to 5.5 (Note 4)	V
Output Current	I <sub>OL</sub>	1.0	mA
Operating Temperature	T <sub>opr</sub>	-40 to 85	°C

Note 4: V<sub>CC</sub> = 0 V or when output impedance is high.

## DC Characteristics (Ta = 25°C)

Characteristics		Symbol	Condition	V <sub>CC</sub> (V)	Min	Typ.	Max	Unit
Output Voltage	Low Level	V <sub>OL</sub>	I <sub>OL</sub> = 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 <sub>OFF</sub>	V <sub>OUT</sub> = 5.5V	0	—	0.5	1	μA
Supply Current	Average Current	I <sub>CC</sub>	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 <sub>CCON</sub>	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 <sub>opr</sub>	(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 6 and 7, Fig. B)	V <sub>CC</sub> (V)	Min	Typ.	Max	Unit	
Magnetic Flux Density	Operating Point	B <sub>ONS</sub>  B <sub>ONN</sub>	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 <sub>OFFS</sub>  B <sub>OFFN</sub>	When output logic turns Low to High	2.3 to 3.6	0.9	2.0	—		
				5.0	0.4	1.5	—		
	Hysteresis		B <sub>H</sub>	B <sub>ON</sub> - B <sub>OFF</sub>	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

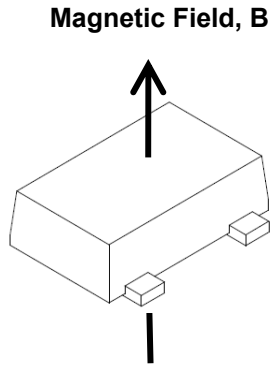


Fig. A :  $I_{CC}$  Characteristics

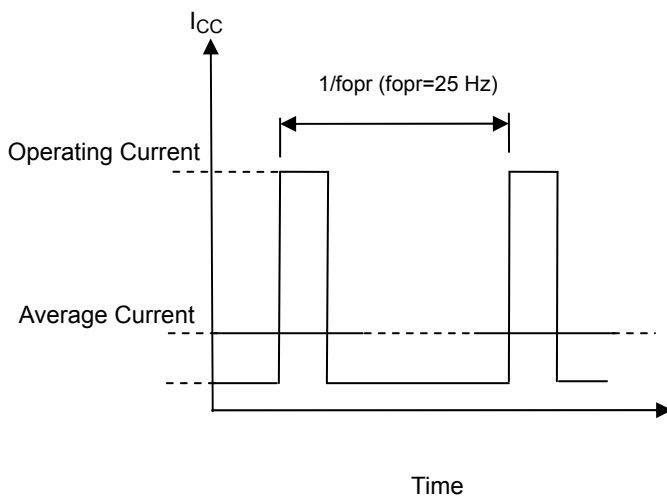
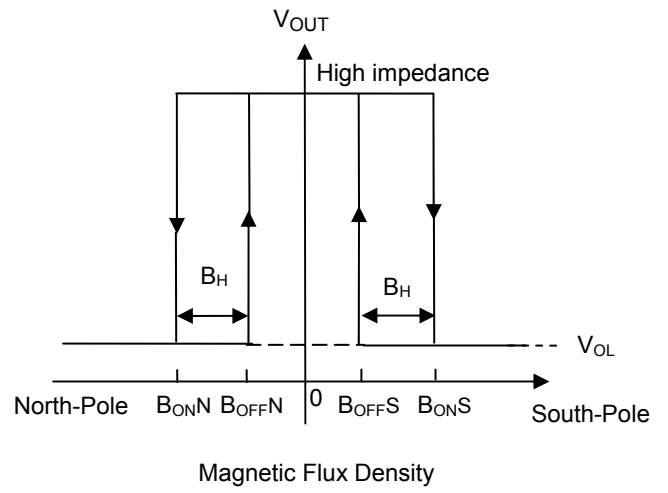
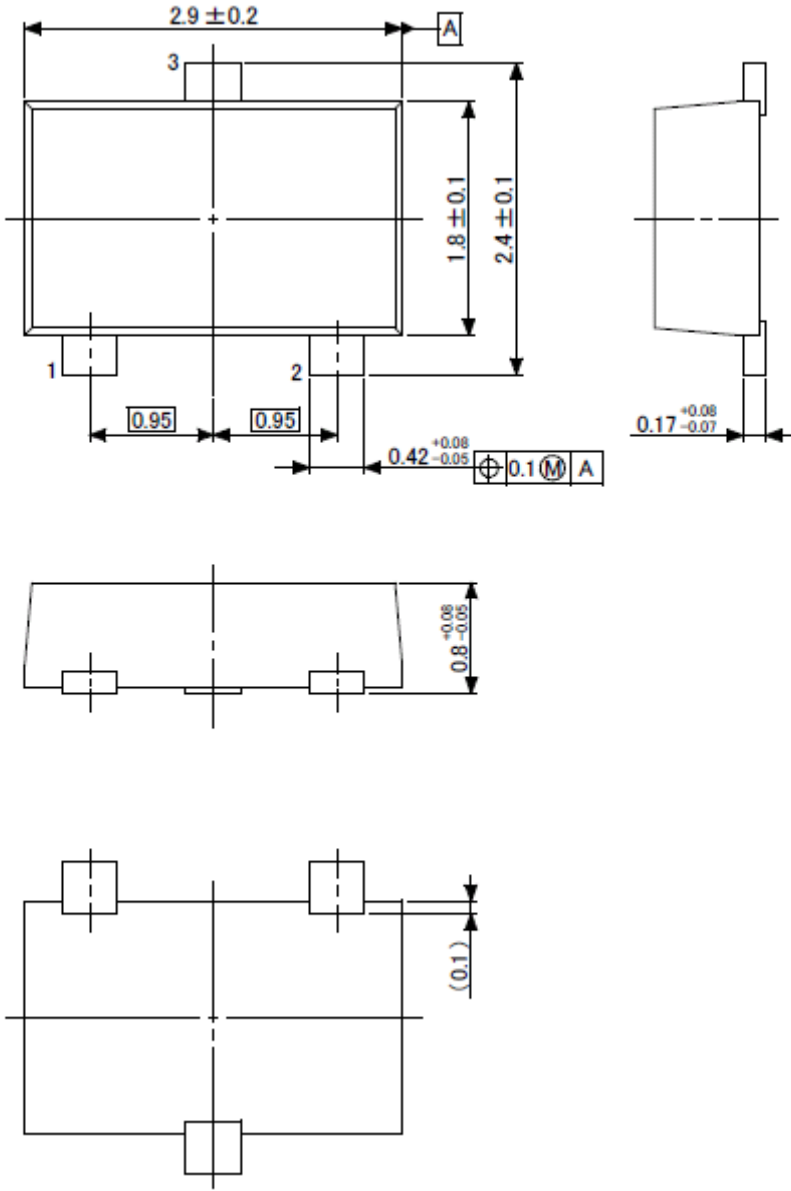


Fig. B : Operating Characteristics



Package Dimension

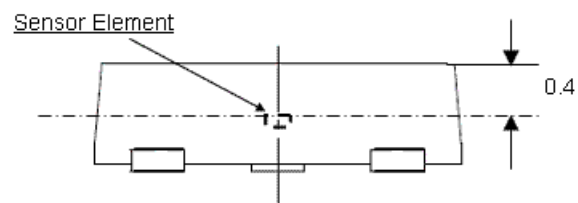
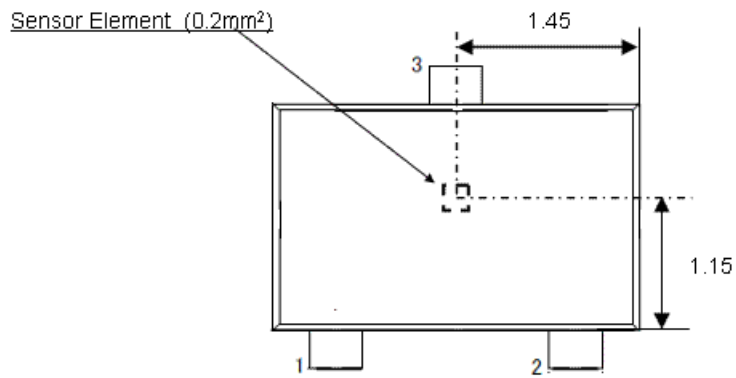
Unit: mm



Weight: 11.0 mg (Typ.)

## Layout of Sensor Element

Unit: mm



Note: Dimensional tolerances are  $\pm 0.1$  mm, unless otherwise specified.

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