CMOS Digital Integrated Circuits Silicon Monolithic

TCS30DLU

1. Functional Description

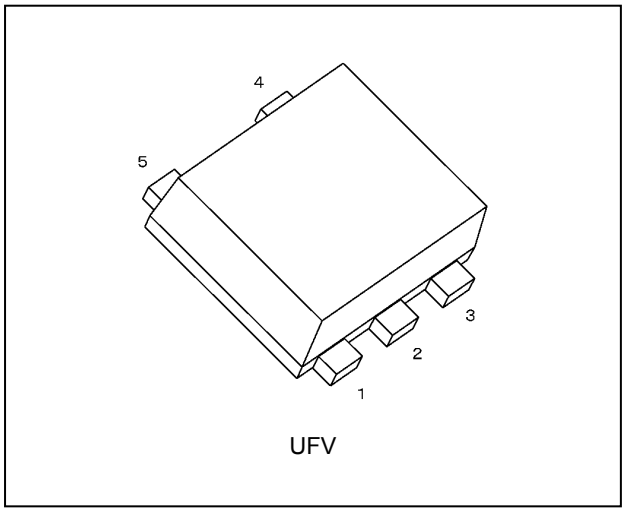
- Digital-Output Magnetic Sensor

2. Features

(1) Output configuration: Open-drain

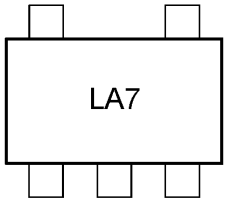
(2) Pole detected: South or north pole

3. Packaging

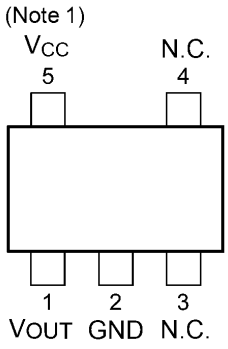


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4. Marking and Pin Assignment



Marking



Pin Assignment (top view)

Note 1: A 0.47 μF capacitor should be connected near the device.
However, this does not guarantee proper operation.
Evaluate the performance of an actual application to determine circuit conditions.

5. Function Table

Magnetic Flux Density	Output
≥ B_{ON}	L
≤ B_{OFF}	Z (Note 1)

Note 1: In the high-impedance state

Start of commercial production
2017-06

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6. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 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
V_{CC}/GND current	I_{CC}	±10	mA
Power dissipation	P_D	200	mW
Storage temperature	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.
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).

7. Operating Range

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V_{CC}		2.3 to 3.6	V
Output voltage	V_{OUT}	(Note 1)	0 to 5.5	V
Output current	I_{OL}		1.0	mA
Operating temperature	T_{opr}		-40 to 85	°C

Note 1: When V_{CC} = 0 V or when the output is in the high-impedance state

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8. Electrical Characteristics

8.1. DC Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	V_{CC} (V)	Min	Typ.	Max	Unit
Low-level output voltage	V_{OL}		I_{OL} = 1.0 mA	2.3 to 3.6	—	—	V_{CC} × 10 %	V
Output leakage current	I_{LEAK}		V_{OUT} = 5.5 V	0	—	0.5	1	μA
Average current (intermittent)	$I_{CC(AVE)}$	(Note 1)	See Fig. 8.1.1.	2.3 to 2.7	—	8.5	13.2	μA
				3.0 to 3.6	—	12.4	18.3	
Operating current (intermittent)	$I_{CC(ON)}$	(Note 1)	See Fig. 8.1.1.	2.3 to 3.6	—	0.7	1.3	mA
Operating frequency	f_{opr}		See Fig. 8.1.1.	2.3 to 3.6	—	25	—	Hz

Note 1: The supply current is pulsed periodically by internal circuitry.

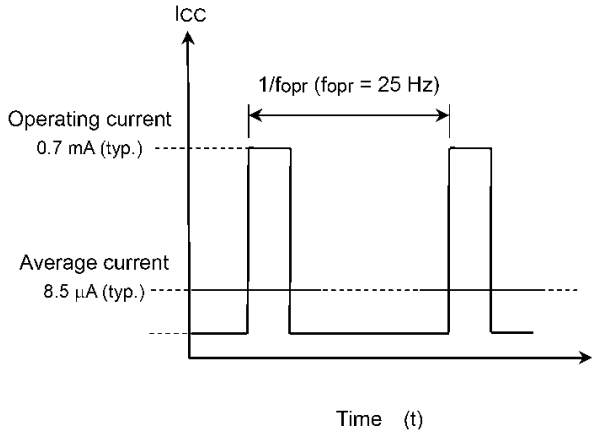


Fig. 8.1.1 I_{CC} Characteristics During Intermittent Operation

8.2. Magnetic Characteristics (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Test Condition	V_{CC} (V)	Min	Typ.	Max	Unit
South pole operating magnetic flux density	$B_{ON}S$		$V_{OUT} = V_{OL}$ See Fig. 8.2.1, 8.2.2.	2.3 to 3.6	—	1.8	2.5	mT
North pole operating magnetic flux density	$B_{ON}N$				-2.5	-1.8	—	
South pole operating magnetic flux density	$B_{OFF}S$	(Note 1)	V_{OUT} = Z See Fig. 8.2.1, 8.2.2.	2.3 to 3.6	0.3	0.8	—	mT
North pole operating magnetic flux density	$B_{OFF}N$				—	-0.8	-0.3	
Hysteresis magnetic flux density	B_H		$\lvert B_{ON} - B_{OFF} \rvert$ See Fig. 8.2.1, 8.2.2.	2.3 to 3.6	—	1.0	—	mT

Note: Uniform magnetic field perpendicular to the magnetic sensor.
Note 1: In the high-impedance state

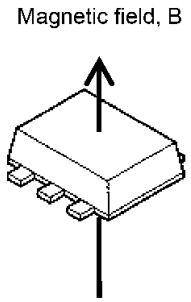


Fig. 8.2.1 Magnetic Field Direction

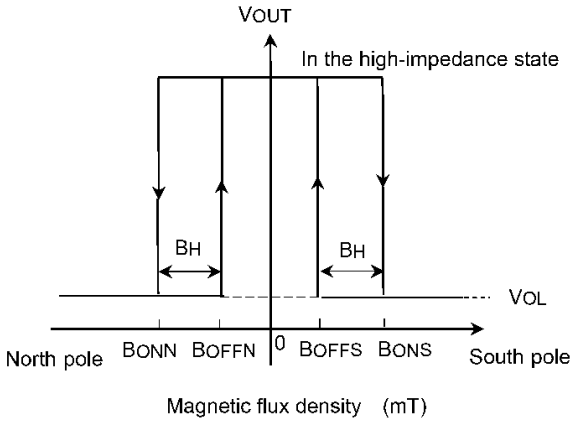
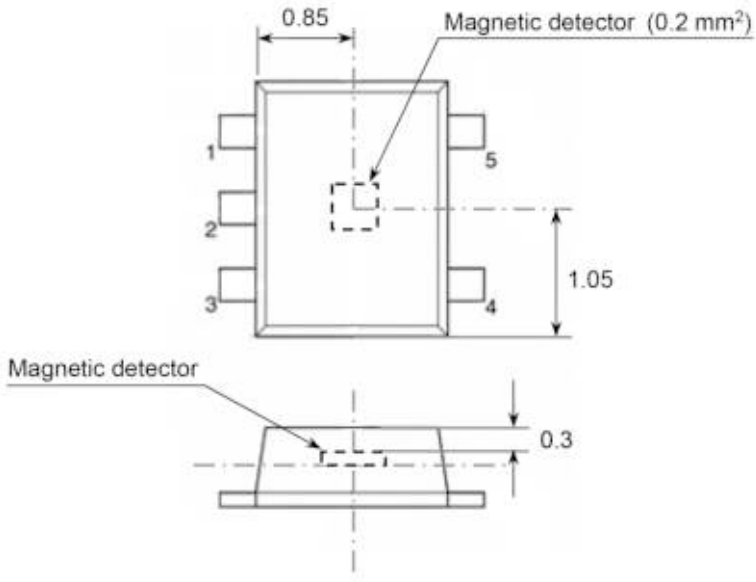


Fig. 8.2.2 Operating Characteristics

9. Magnetic Detector Layout (Note)

Unit: mm

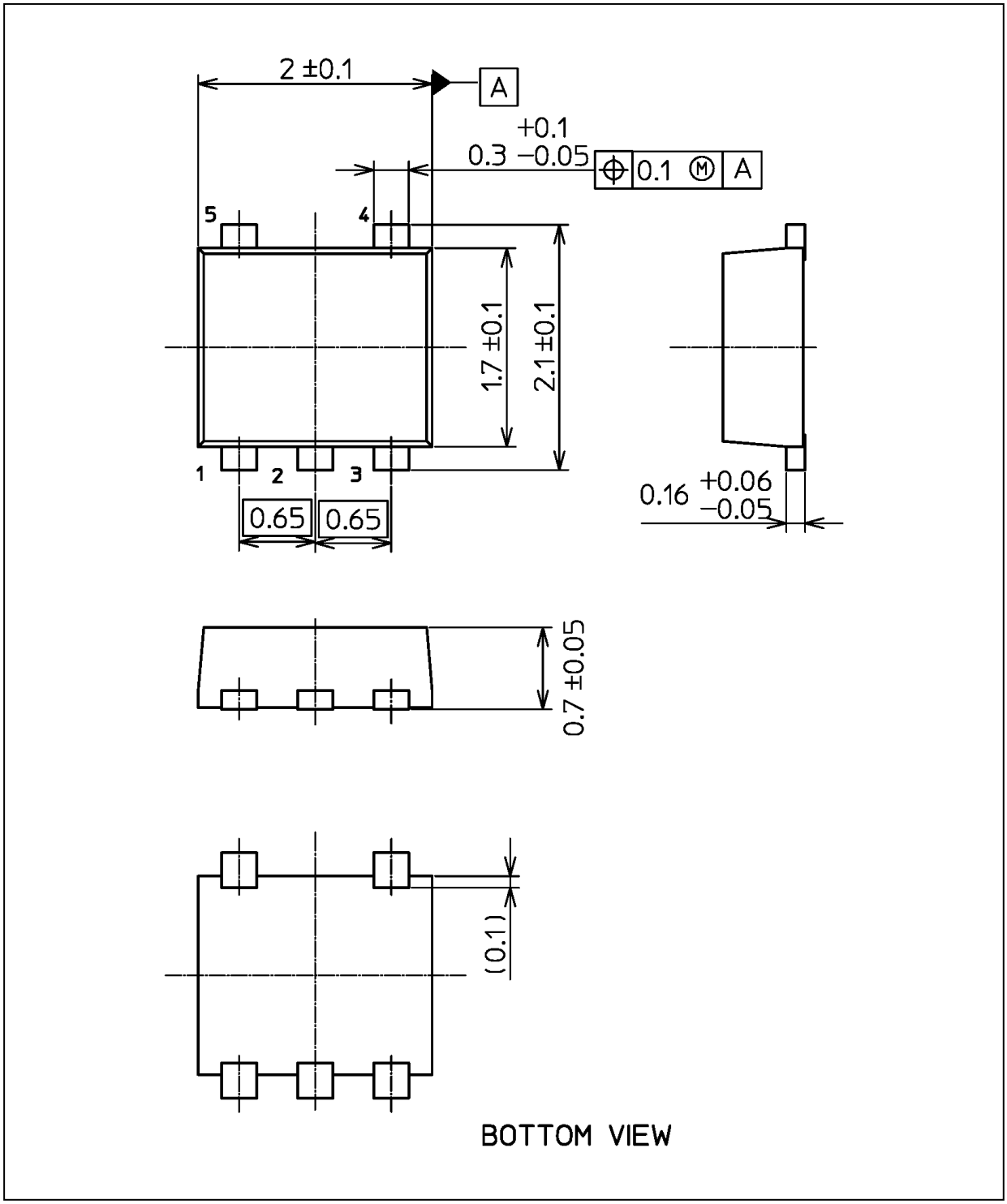


Note: Dimensional tolerances are ±0.1 mm, unless otherwise specified.

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Package Dimensions

Unit: mm



Weight: 7.0 mg (typ.)

Package Name(s)
Nickname: UFV

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