

DATA SHEET  
WIEGAND SENSOR WS-WFS-5-U0



- ▶ Wiegand Sensor for energy harvesting multiturn encoders using the Wiegand effect to generate energy from a rotating magnetic field<sup>1</sup>
- ▶ Optimized for operation with the multiturn counter module iC-PMX from iC-Haus
- ▶ In surface mounted technology suitable for reflow process, RoHS 2 compatible
- ▶ 2,5 mm wire distance from top of seating plane
- ▶ High Pulse energy with typical 140 nJ average pulse energy
- ▶ Machine readable serial number provides perfect traceability

### 1. Signal Characteristics

Item No.	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
101	Pulse peak-voltage	$U_P$	5.3	6.5		V	Valid for each trigger configuration i (Figure 4) with $U_{Pi,Average} - 4\sigma \geq U_{P,min}$ , analysis over 4*1000 pulses @20 – 27°C @6.8 ± 1% nF
102	Pulse slew rate	$S_R$	200			V/ms	@20 – 27°C, 30% - 70% $U_P$
103	Pulse energy	$E_P$		140		nJ	@6.8 ± 1% nF
104	Temperature drift $V_{peak}$	$T_D$		-0,008		V/K	

### 2. Electrical Characteristics

Item No.	Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions
201	Coil resistance	R	250	270	290	Ω	@20 - 27°C, DC
202	Temp. Coefficient of Resistor	$TC_R$		$3,9 \cdot 10^{-3}$		1/K	
203	Coil inductance	L	10.5		14.5	mH	measured @1 kHz with magnet (polarity) parallel to wire axis.

<sup>1</sup> Devices and processes for energy harvesting by Wiegand wire within position encoders are protected by several worldwide patents (such as WO 2004/046735 A1) and require licensing by the inventors and applicants.

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### 3. Environmental

Item No.	Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions
301	Ambient operating temperature range	$T_a$	-40		+125	°C	
302	Relative humidity	rF			90%		No condensation
303	Shock Resistance	$S_r$			100	g	half sine 6 ms, EN 60068-2-27
304	Permanent shock resistance	$S_{rp}$			10	g	half sine 16 ms, EN 60068-2-29
305	Vibration Resistance	$V_f$			10	g	10 Hz-1000 Hz, EN 60068-2-6
306	Insulation Resistance	$R_{ISO}$	600			MΩ	Insulation resistance between pin and housing @ 1KV, FGluke 1577 isolation multimeter
307	Contact discharge	$D_c$			6	kV	IEC 61000-4-2
308	Air charge	$D_A$			8	kV	IEC 61000-4-2
309	Max. allowed external magnetic field to be applied to sensor not in operation	$B_{exmax}$			5	mT	e.g. important for storage and handling
310	Storage Temperature	$T_s$	-40		+85	°C	
311	Recommended Floor life				4	Wks	Equivalent to MSL2a.

### 4. Measurement Conditions

Item No.	Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions
401	Magnetic flux density at Wire	$B_w$	8.75		9.15	mT	Measured at wire axis
402	Distance magnet to wire	$W_d$	8.4	8.5	8.6	mm	Measured from wire to magnet surface, valid for FRABA magnet only!
403	x and y assembly tolerance		-0.15		0.15		Measured from sensor centre – rotational axis
404	Magnet eccentricity				0.1	mm	
405	Load capacitor	$C_L$	6.7	6.8	6.9	nF	In parallel with IC-PMX (Figure 2)
406	Magnet rotation speed	$v$		1,000		rpm	
407	Input resistance	$R_M$		10		MΩ	Measurement device
408	Input capacitance	$C_M$		12		pF	Measurement device

#### Remarks

Magnet type: Diametral magnet, SmCo, dimensions  $\varnothing 8 \times 2.5$  mm (Figure 1), article number 10034032

Data measured under ideal measuring conditions. Test setup is isolated from the external magnetic fields or other ferromagnetic components.

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5. Magnet System

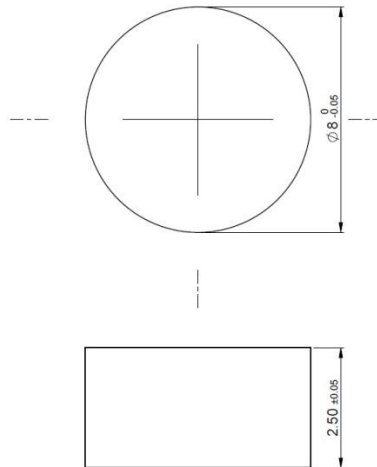


Figure 1

6. Test Circuit

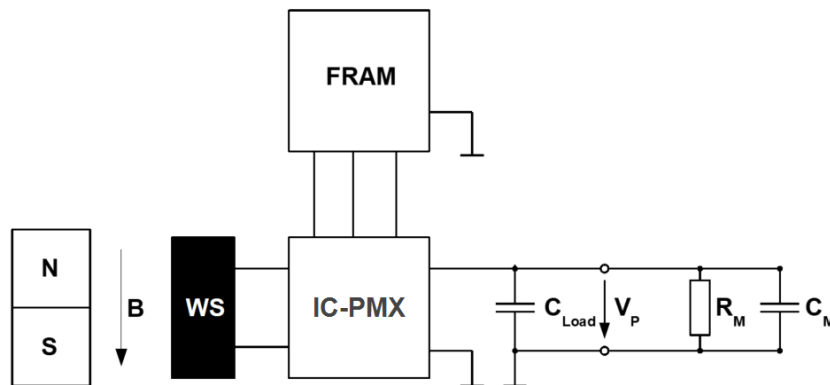


Figure 2

### 7. Typical Signal Wave

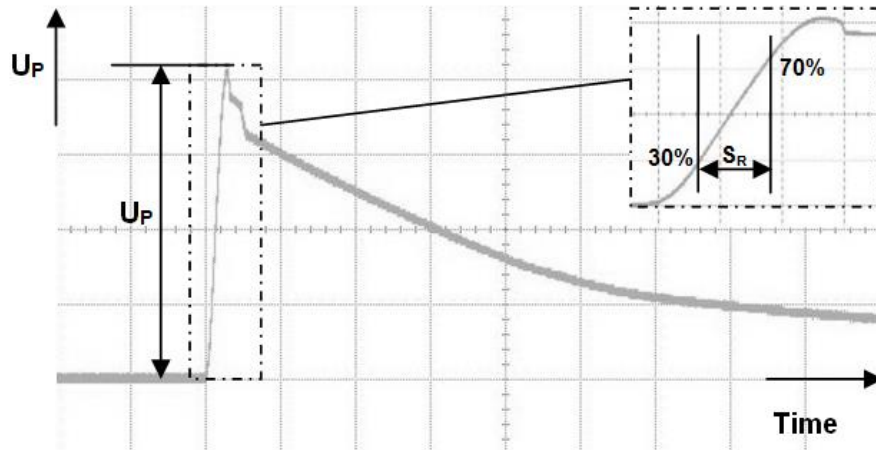


Figure 3

### 8. Declaration Trigger Point

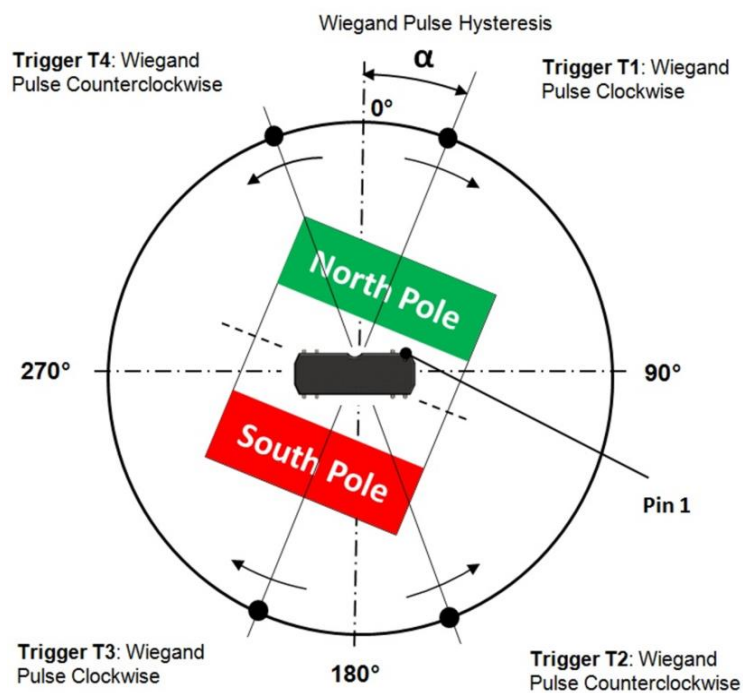
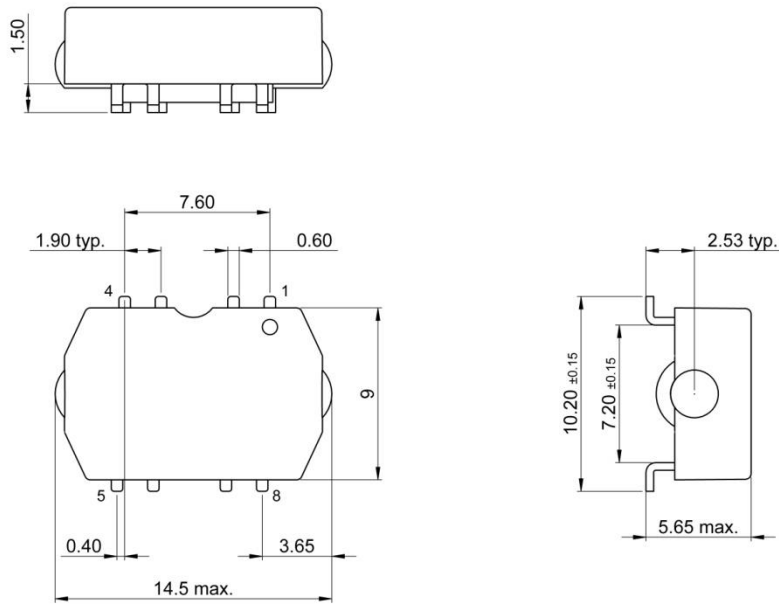


Figure 4

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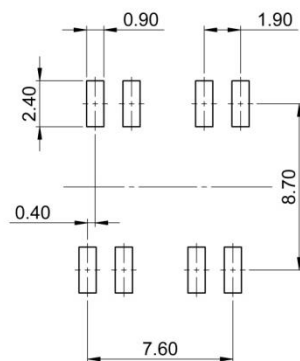
9. Component Dimension Type: WFS



Coplanarity tolerance of leads 0.1 mm.  
All dimension in mm.

(All dimensions are before soldering) Figure 5

10. Land Pattern Dimensions



All dimension in mm.

Figure 6

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Item No.	Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions
1001	Sensor terminals			Pin 1 / Pin 2 and Pin 5 / Pin 6			Pin 1 / Pin2: coil-winding start Pin 5 / Pin 6: coil-winding end Pin 3,4,7,8 not used
1002	Sensor mass			1.17		g	

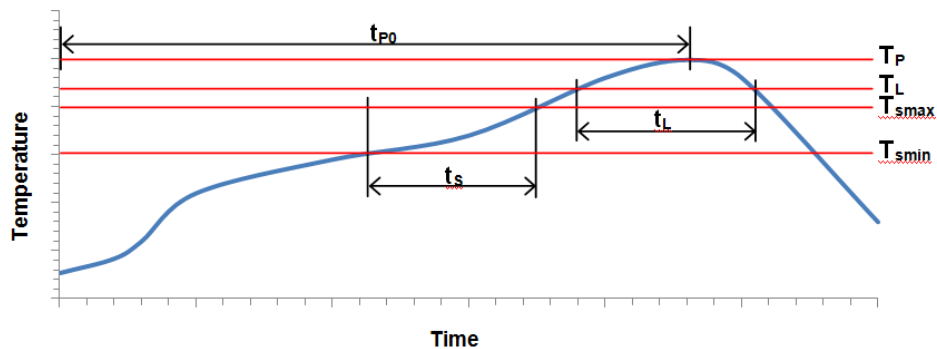
#### Remarks

Pin material Cu, mass 0.029 g, results in a theoretical thermal energy surge of  $\Delta Q \approx 2$  W for each contact pin (390 W/(kg\*K) and  $\Delta T_{\text{reflow}}$  of 170 K.

SMD package, suitable for reflow process

RoHS 2 Compatible

## 11. Reflow Profile



Item No.	Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions
1101	Liquidous temperature	$T_L$		217		°C	Soldering paste material: Sn95.5Ag4Cu0.5
1102	Time maintained above $T_L$	$t_L$		60		s	
1103	Peak package body temperature	$T_p$		249		°C	
1104	Time 25 °C to $T_p$	$t_{p0}$		230		s	
1105	Preheat / Soak temperature min	$T_{smin}$		150		°C	
1106	Preheat / Soak temperature max	$T_{smax}$		200		°C	
1107	Time from $T_{smin}$ to $T_{smax}$	$t_s$		70		s	
1108	Ramp-up rate ( $T_L$ to $T_p$ )			0.9	3	K / s	
1109	Ramp-down rate ( $T_p$ to $T_L$ )			1.3	6	K / s	
1110	Reflow soldering speed	$v_s$		1000.0		mm / min	reflow soldering machine: Linie VX-nitro-3500 (Type 734)

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### 12. Labeling Information

Laser-marked on top surface

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Type and Serial Number

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In human and machine-readable (Aztec or QR code) format



### 13. Packaging Information

Carrier tape (10054370) on 13-inch reel (10034119), in vacuum-sealed ESD bag

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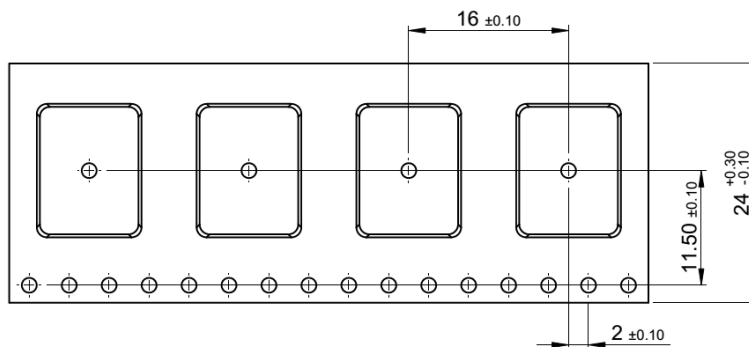
Standard packing quantity 700 pcs./reel

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Connectors across to reel.

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The packaging method may be different for non-standard quantities.





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**14. Ordering Information**

<b>Article Name</b>	<b>Article Number</b>
WS-Sensor-WS-WFS-5-U0 on Reel	10053592
WS-Sensor-WS-WFS-5-U0-QR on Reel	10053593
WS-Sensor-WS-WFS-5-U0 (Samples Purposes Only)	10056019





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**15. Revision History**

Rev.:	Date	BY	Remarks
2.0	02.27.2018	MFO	Created UBITO standard product data sheet, copy from WFS-0-U0
2.1	19.10.2017	MFO	Updated Product Pictures
2.2	20.10.2017	MFO	Minor corrections: Title chapter 9 Label on product pictures
2.3	29.06.2018	TBE	Updated 203 Coil inductance and clarified conditions to "measured @10 kHz with magnet (polarity) parallel to wire axis." 309 "Max. magnetic field exposure" wording changed to "Max. allowed external magnetic field to be applied to sensor not in operation" Added tray packing details Contact address for technical support team updated 403 definition changed to "x and y assembly tolerance"
2.4	20.12.2019	TBE	Title Changed 'Wiegand wire sensor' to 'Wiegand sensor' 101 Increased pulse count evaluation from 500 to 1000 Fig5 Added word 'All dimensions before soldering' 1002 Added 'Sensor Mass' to datasheet 311 added "Recommended floor life" to datasheet 309 maximum storage field strength reduced to 5mT Labelling Information image and Ordering Information updated.
2.5	21.04.2022	EKE	Updated logo. Page 1 picture changed from label version to laser-marked Section 12 wording updated. Section 13 wording updated, tray packaging removed. Section 14 article numbers updated. Section 16 details updated.

Editor: EKE

Reviewer: TBE

Date: 8 July 2022

Module Type: WS-WFS-5-U0



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**16. Technical Information**

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All dimension in [inch] mm. This drawing and the information contained is for general presentation purposes only. Please refer to the "Download" section for detailed technical drawings.

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