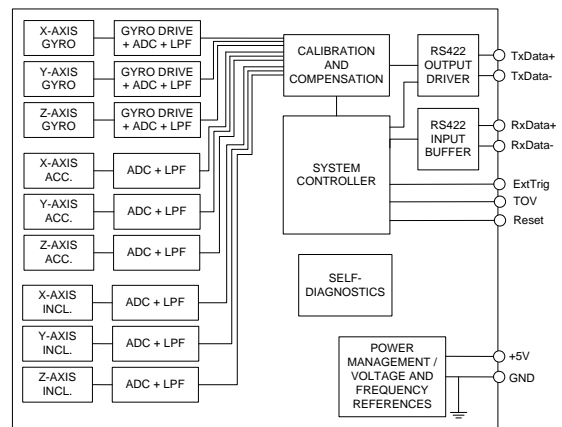# STIM318e

Inertial Measurement Unit

Other gyro ranges

FEATURES:

- o Miniature package
- o Low noise
- o Low bias instability
- o Excellent performance in vibration and shock environments
- o 9 axes offered in same package
  - o Electronically calibrated axis alignment
- o Gyros based on Safran ButterflyGyro™
  - o Single-crystal silicon technology
  - o No intrinsic wear-out effects
- o High stability accelerometers and inclinometers
- o Insensitive to magnetic fields
- o Full EMI compliance
- o Digital interface, RS422
- o Fully configurable
- o Continuous self-diagnostics
- o RoHS compatible

BLOCK DIAGRAM:

1 PURPOSE OF DOCUMENT

This document specifies the gyro performance of other gyro ranges than the 400°/s range covered by the STIM318 Datasheet.

Numbering of sections, tables, figures and equations from page 3 refers directly to the corresponding numbering in the STIM318 Datasheet.

2 TABLE OF CONTENTS

3 REFERENCE DOCUMENT

- o STIM318 Datasheet, TS1657 rev.9 and later

4 GYRO RANGES

Table 4-1: Gyro ranges not covered by STIM318 Datasheet

1200°/s	
2000°/s	

5 ABBREVIATIONS USED IN DOCUMENT

Table 5-1: Abbreviations

ABBREVIATION	FULL NAME
TBD	To Be Defined

5   SPECIFICATIONS

Table 6-1: Operating conditions

Parameter	Gyro range	Min	Nom	Max	Unit	Note
INPUT RANGE, ANGULAR RATE	1200°/s		±1200		°/s	
	2000°/s		±2000		°/s	

Table 5-3: Functional specifications, gyros

Gyro range	Full Scale (FS)[1,2]	Resolution	Non-Linearity @800°/s	Non-Linearity @FS	Bias Instability	Angular Random Walk
1200°/s	±1200°/s	0.66°/h	100ppm	TBD	0.3°/h	Ref.datasheet
2000°/s	±2000°/s	1.10°/h	100ppm	TBD	0.4°/h	0.20°/√hr

Notes:

Note 1: Output is monotonous and will saturate at maximum value according to data-format, at 28% above range
Note 2: Overload-bit will be set in STATUS-byte at 20% above range

5.3.3   Configuration datagram

Table 6-14: Specification of the Configuration datagram

15	0	0	1	0	x	x	x	x	High nibble: Gyro range, x-axis - 1200°/s
	0	1	0	0	x	x	x	x	- 2000°/s
	x	x	x	x	0	0	1	0	Low nibble: Gyro range, y-axis - 1200°/s
	x	x	x	x	0	1	0	0	- 2000°/s
16	0	0	1	0	x	x	x	x	High nibble: Gyro range, z-axis - 1200°/s
	0	1	0	0	x	x	x	x	- 2000°/s

7.4.2.2.2 Gyro output unit = Angular Rate

In the case of STIM318 being configured to output angular rate, Equation 1 shows how to convert to [°/s]. Note that the output data is represented as two's complement.

Equation 1: Converting output to [°/s]:

Gyro range	Conversion:
1200°/s	$Output[°/s] = \dfrac{(AR_1) \cdot 2^{16} + (AR_2) \cdot 2^8 + (AR_3) - (AR_{b23}) \cdot 2^{24}}{5461}$
2000°/s	$Output[°/s] = \dfrac{(AR_1) \cdot 2^{16} + (AR_2) \cdot 2^8 + (AR_3) - (AR_{b23}) \cdot 2^{24}}{3277}$

where AR_1 is the most significant byte of the 24bit output
         AR_2 is the middle byte of the 24bit output
         AR_3 is the least significant byte of the 24bit output
         AR_{b23} is the most significant bit of AR_1

Figure 7-7: Not valid

7.4.2.2.3 Gyro output unit = Incremental Angle

In the case of STIM318 being configured to output incremental angle per sample, the equations for conversion to [°/sample] can be found in Equation 2. Note that the output data is represented as two's complement.

Equation 2: Converting output to [°/sample]

Gyro range	Conversion:
1200°/s	$Output[°/sample] = \dfrac{(IA_1) \cdot 2^{16} + (IA_2) \cdot 2^8 + (IA_3) - (IA_{b23}) \cdot 2^{24}}{699051}$
2000°/s	$Output[°/sample] = \dfrac{(IA_1) \cdot 2^{16} + (IA_2) \cdot 2^8 + (IA_3) - (IA_{b23}) \cdot 2^{24}}{419430}$

where IA_1 is the most significant byte of the 24bit output
         IA_2 is the middle byte of the 24bit output
         IA_3 is the least significant byte of the 24bit output
         IA_{b23} is the most significant bit of IA_1

Figure 7-8: Not valid

7.4.2.2.5 Gyro output unit = Integrated Angle

In the case of STIM318 being configured to output integrated angle, the transmitted data will be the continuously integrated angle since power-on or reset. The integrated angle takes values in the interval:

  ±1200°/s: [-12°, 12°>

  ±2000°/s: [-20°, 20°>

and will naturally wrap-around with no error-message indication in the Status-byte.

Conversion to [°] is the same as for incremental angle and is described in Equation 2.

The STIM318 will be delivered according to the configuration code as shown below. All configuration parameters can be changed later in Service Mode, ref. section 8.4.3. A full list of configurable parameters can be found in Table 6-9.

Configuration parameters in **bold** letters show the standard option.

Range		Measurement							Output/RS422		
Prod_ID	-	**Sample rate**	**Filter band-width**	**Gyro output unit**	**Acc. output unit**	**Incl. output unit**	**Gyro g-comp**	-	**Datagram**	**Bit-rate**	**Termination**

Range STIM318e

Prod_ID	Gyro	Acc
85084	**1200°/s**	**10g**
85085	**1200°/s**	**30g**
85089	**1200°/s**	**80g**

Sample rate:
0 = 125 samples/s
1 = 250 samples/s
2 = 500 samples/s
3 = 1000 samples/s
4 = 2000 samples/s
5 = External Trigger

Filter bandwidth:
0 = 16Hz
1 = 33Hz
2 = 66Hz
3 = 131Hz
4 = 262Hz

Gyro output unit:
0 = Angular Rate [°/s]
1 = Incremental Angle [°/sample]
2 = Average Angular Rate [°/s]
3 = Integrated Angle [°]
8 = Angular Rate [°/s] – delayed
9 = Incremental Angle [°/sample] – delayed
a = Average Angular Rate [°/s] – delayed
b = Integrated Angle [°] - delayed

Acc. output unit:
0 = Acceleration [g]
1 = Incremental Velocity [m/s/sample]
2 = Average Acceleration [g]
3 = Integrated Velocity [gs]

Incl. output unit:
0 = Acceleration [g]
1 = Incremental Velocity [m/s/sample]
2 = Average Acceleration [g]
3 = Integrated Velocity [gs]

Gyro g-comp

	Bias		Scale-factor	
	Source	0.01Hz-filter	Source	0.01Hz-filter
0	**OFF**	**-**	**OFF**	**-**
1[1]	OFF	-	ACC	OFF
2	OFF	-	ACC	ON
3[1]	ACC	OFF	OFF	-
4	ACC	ON	OFF	-
7[1]	ACC	OFF	ACC	OFF
8[1]	ACC	ON	ACC	OFF
b	ACC	ON	ACC	ON

Datagram

		Included data			
		Rate	Acceleration	Inclination	Temperature
0		YES	NO	NO	NO
1		YES	YES	NO	NO
2		YES	NO	YES	NO
3		**YES**	**YES**	**YES**	**NO**
4		YES	NO	NO	YES
5		YES	YES	NO	YES
6		YES	NO	YES	YES
7		YES	YES	YES	YES

Bit-rate:
0 = 374400 bits/s
1 = 460800 bits/s
2 = 921600 bits/s
3 = 1843200 bits/s [2+3)]
f = User-defined [3)]

Termination

	Line	Datagram
0	OFF	None
1	**ON**	**None**
2	OFF	<CR><LF>
3	ON	<CR><LF>

RS422 data configuration

#Start bit	1
#Data bits	8
#Stop bits	1[4)]
Parity	None[4)]

[1] Delayed gyro output unit should be selected with this option
[2] USB-based evaluation kit works at bit-rates $\leq$ 1.5Mbit/s + 2Mbit/s and 3Mbits/s
[3] Bit-rate must be specified. See section 9.5 for limitations
[4] Configuration can be changed in SERVICEMODE. See section 9.5

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