

CURRENT SENSOR

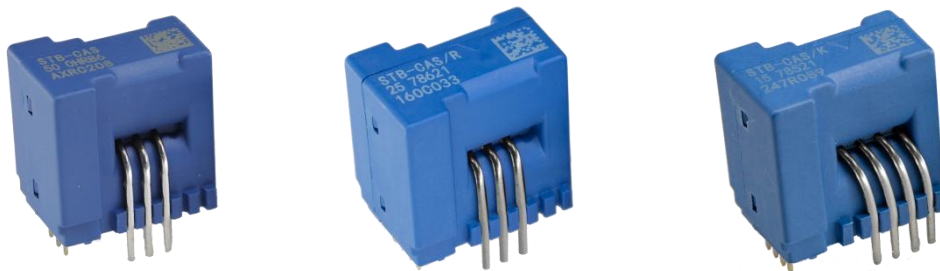
PRODUCT SERIES: STB-CAS

STB-15CAS
STB-25CAS
STB-50CAS
STB-15CAS/R
STB-25CAS/R
STB-15CAS/K
STB-25CAS/K
STB-50CAS/K
STB-75CAS/K

PRODUCT PART NUMBER: STB-50CAS/R

STB-15CAS/K
STB-25CAS/K
STB-50CAS/K
STB-75CAS/K

REVISION: Ver 5.2



Sinomags Technology Co., Ltd.

Web site: www.sinomags.com

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1. Description

STB-CAS series current sensors are based on close loop principle with TMR technology. The sensor can detect the current with DC, AC, pulse and irregular wave shape.

Typical application

- Variable frequency converter
- Uninterruptible Power Supplies (UPS)
- Solar inverters.
- Direct-current dynamo
- Switched model power supplies (SMPS)

General parameters

Parameter	Symbol	Unit	Value
Working temperature	T_A	℃	-40 ~ 105
Storage temperature	T_stg	℃	-40 ~ 105
Mass	m	g	13

Absolute parameters

Parameters	Symbol	Unit	Value
Supply voltage	V _c	V	6
ESD rating (HBM)	U_ESD	kV	4
High temperature and humidity	T_HAST	-	85℃&85%RH (1000h)

Remark: the unrecoverable damage may occur when the product works on the conditions over the absolute maximum ratings. Long-time working on the absolute maximum ratings may cause the degradation on performance and reliability.

Isolation parameters

Parameter	Symbol	Unit	Value	Remark
RMS voltage for AC test 50Hz/1 min	U _d	kV	4	
Impulse withstand voltage 1.2/50μs	Ū _w	kV	6	
Clearance distance (pri.-sec)	d _{Cl}	mm	9.5	Shortest distance through air
Creepage distance (pri.-sec)	d _{Cp}	mm	9.5	Shortest path along device body
Electrical clearance	d _{Ce}	mm	6.1 (CAS/R)	When mounted on PCB with recommended layout
			6.3 (CAS)	
			8.5 (CAS/K)	
Case material			V0 according to UL 94	
Comparative tracking index	CTI	V	600	

2. STB-15CAS parameters

Condition: $V_{cc} = 5.0\text{ V}$, $NP = 1$, $R_L = 10\text{ K}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		15		
Primary current measuring range	I_{pm}	A	-51		51	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + IP \cdot NP / NS \cdot 1000$		NS = 1200
Current turns	NP	Turn		1, 2, 3		
Offset voltage	V_{off}	V	2.48	2.5	2.52	Output @ 0 A
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 2.125$		
Theoretical sensitivity	G_{th}	mV/A		41.67		0.625V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105°C)	X_{TRange}	% of I_{pn}	-2.5 (-3)		2.5 (3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

3. STB-25CAS parameters

Condition: $V_{CC} = 5.0\text{ V}$, $NP = 1$, $R_L = 10\text{ K}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		25		
Primary current measuring range	I_{pm}	A	-85		85	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + \frac{IP \cdot NP}{NS \cdot 1000}$		NS = 1200
Current turns	NP	Turn		1, 2, 3		
Offset voltage	V_{off}	V	2.48	2.5	2.52	Output @ 0 A
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 2.125$		
Theoretical sensitivity	G_{th}	mV/A		25		0.625V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ T_A = 85°C (105°C)	X_{TRange}	% of I_{pn}	-2.5 (-3)		2.5 (3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

4. STB-50CAS parameters

Condition: $V_{CC} = 5.0\text{ V}$, $N_P = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		50		
Primary current measuring range	I_{pm}	A	-150		150	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + \frac{I_P \cdot N_P}{N_S} \cdot 1000$		$N_S = 1200$
Current turns	N_P	Turn		1, 2, 3		
Offset voltage	V_{off}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 1.875$		
Theoretical sensitivity	G_{th}	mV/A		12.5		0.625V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105 °C)	X_{TRange}	% of I_{pn}	-2.5(-3)		2.5 (3)	-40°C ~ 105°C

5. STB-15CAS/R parameters

Condition: $V_{CC} = 5.0\text{ V}$, $N_P = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		15		
Primary current measuring range	I_{pm}	A	-51		51	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + \frac{IP \cdot NP}{NS \cdot 1000}$		NS = 1200
Current turns	N_P	Turn		1、2、3		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 2.125$		
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref}@ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		41.667		0.625 V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105°C)	X_{TRange}	% of I_{pn}	-1.15 (-1.5)		1.15 (1.5)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

6. STB-25CAS/R parameters

Condition: $V_{CC} = 5.0\text{ V}$, $N_P = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		25		
Primary current measuring range	I_{pm}	A	-85		85	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + \frac{IP \cdot NP}{NS \cdot 1000}$		NS = 1200
Current turns	N_P	Turn		1、2、3		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 2.125$		
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref}@ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		25		0.625 V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105 °C)	X_{TRange}	% of I_{pn}	-1.15 (-1.3)		1.15 (1.3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

7. STB-50CAS/R parameters

Condition: $V_{cc} = 5.0\text{ V}$, $NP = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		50		
Primary current measuring range	I_{pm}	A	-150		150	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + IP \cdot NP / NS \cdot 1000$		NS = 1200
Current turns	NP	Turn		1、2、3		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 1.875$		
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref} @ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		12.5		0.625 V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105°C)	X_{TRange}	% of I_{pn}	-1.1 (-1.3)		1.1 (1.3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

8. STB-15CAS/K parameters

Condition: $V_{CC} = 5.0\text{ V}$, $N_P = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		15		
Primary current measuring range	I_{pm}	A	-51		51	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + \frac{IP \cdot NP}{NS \cdot 1000}$		NS = 1200
Current turns	N_P	Turn		1, 2, 4		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 2.125$		
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref}@ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		41.67		0.625 V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105 °C)	X_{TRange}	% of I_{pn}	-1.15 (-1.3)		1.15 (1.3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

9. STB-25CAS/K parameters

Condition: $V_{CC} = 5.0\text{ V}$, $N_P = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		25		
Primary current measuring range	I_{pm}	A	-85		85	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + \frac{IP \cdot NP}{NS \cdot 1000}$		NS = 1200
Current turns	NP	Turn		1, 2, 4		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 2.125$		
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref}@ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		25		0.625 V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105 °C)	X_{TRange}	% of I_{pn}	-1.15 (-1.3)		1.15 (1.3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

10. STB-50CAS/K parameters

Condition: $V_{cc} = 5.0\text{ V}$, $NP = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		50		
Primary current measuring range	I_{pm}	A	-150		150	
Supply voltage	V_c	V	4.75	5	5.25	
Consumption current	I_c	mA		$15 + IP \cdot NP / NS \cdot 1000$		NS = 1200
Current turns	NP	Turn		1, 2, 4		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.625$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 1.875$		
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref} @ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		12.5		0.625 V @ I_{pn}
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105 °C)	X_{TRange}	% of I_{pn}	-1.1 (-1.3)		1.1 (1.3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

11. STB-75CAS/K parameters

Condition: $V_{CC} = 5.0\text{ V}$, $NP = 1$, $R_L = 10\text{ k}\Omega$, $T_A = 25^\circ\text{C}$, unless specified.

Parameters	Symbol	Unit	Min.	Typ.	Max.	Remark
Primary nominal rms current	I_{pn}	A		75		
Primary current measuring range	I_{pm}	A	-220		220	With $U_C = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 10\text{ k}\Omega$.
Primary current measuring range	I_{pm}	A	-180		180	With $U_C = 4.75\text{ V}$, $T_A = 85^\circ\text{C}$, $R_L = 10\text{ k}\Omega$.
Supply voltage	V_C	V	4.75	5	5.25	
Consumption current	I_C	mA		$15 + \frac{IP \cdot NP}{NS \cdot 800}$		$NS = 960$
Current turns	NP	Turn		1, 2, 4		
Reference voltage	V_{ref}	V	2.48	2.5	2.52	
Output voltage @ I_{pn}	V_{FS}	V		$V_{off} \pm 0.46875$		
Output voltage @ I_{pm}	V_{FSM}	V		$V_{off} \pm 1.125$		With $U_C = 4.75\text{ V}$, $T_A = 85^\circ\text{C}$, $R_L = 10\text{ k}\Omega$.
Electrical offset voltage	V_{OE}	mV		5		100 % tested $V_{out} - V_{ref} @ 0\text{ A}$
Theoretical sensitivity	G_{th}	mV/A		6.25		$0.4685\text{ V} @ I_{pn}$
Linearity error 0 ~ I_{pn}	ξ_L	% of I_{pn}		0.3		Tested @ 25°C
Reaction time @ 10 % of I_{PN}	t_{ra}	μs		0.3		
Step response time @ 90 % of I_{pn}	t_r	μs		0.3		
-3 dB band width	BW	kHz		400		
Noise DC ~ 10 kHz DC ~ 100 kHz	V_{noise}	mVpp		5 6		
Accuracy @ RT	X	% of I_{pn}	-0.8		0.8	@ 25°C
Accuracy @ $T_A = 85^\circ\text{C}$ (105°C)	X_{TRange}	% of I_{pn}	-1.1 (-1.3)		1.1 (1.3)	$-40^\circ\text{C} \sim 105^\circ\text{C}$

12. Frequency band width

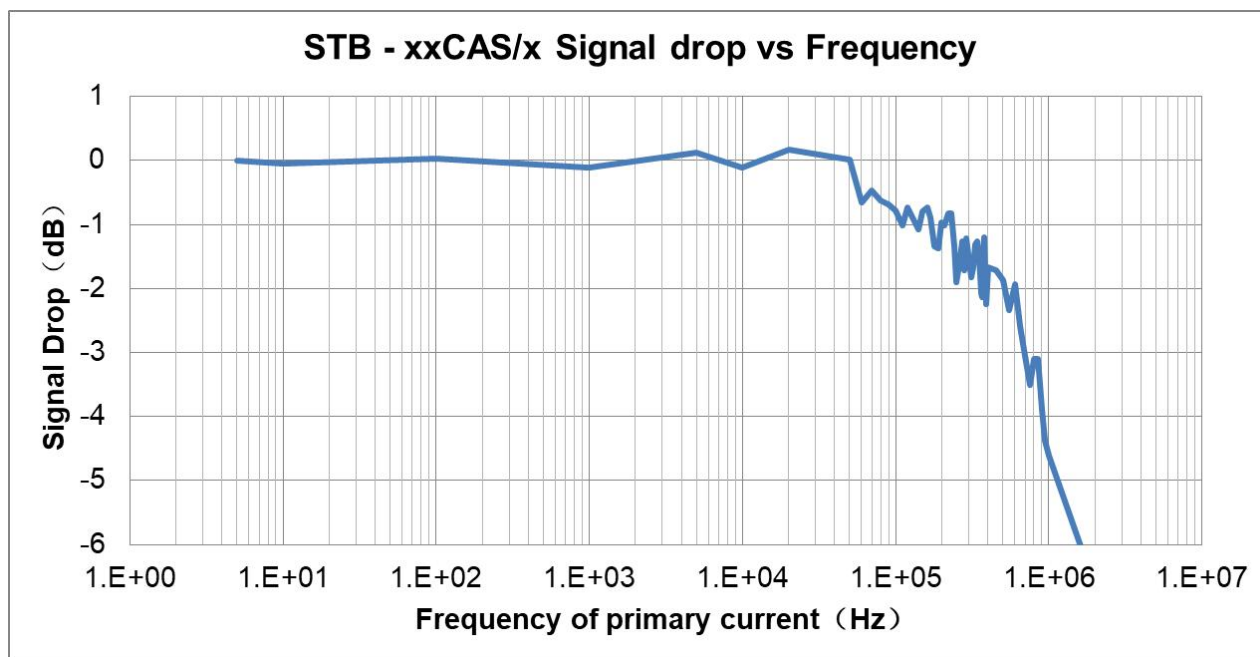


Fig.1 the band width of STB-xxCAS/x series current sensors. The bandwidth was tested after differential amplification with 1x magnification.

13. Step response time

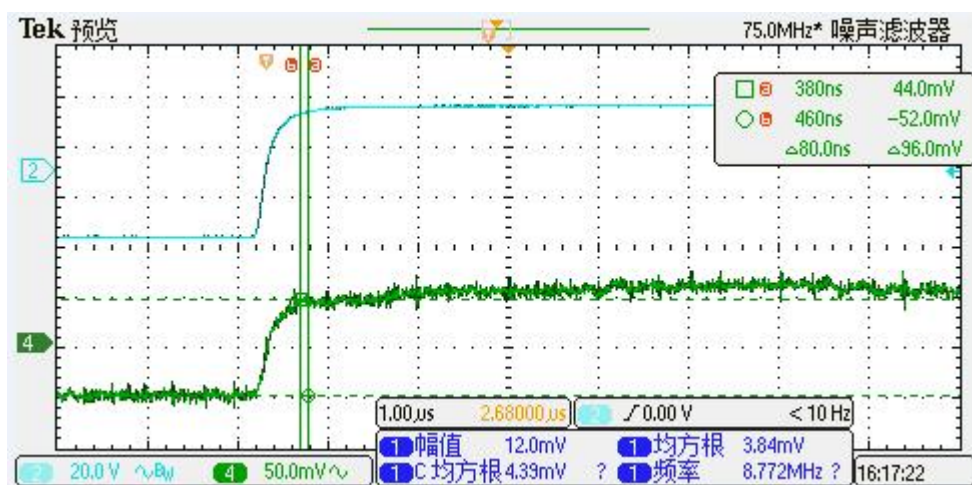


Fig.2 the step response time of STB-xxCAS current sensors. The blue is primary current, while the green is output signal of current sensor. The step response time is less than 0.3 μs.

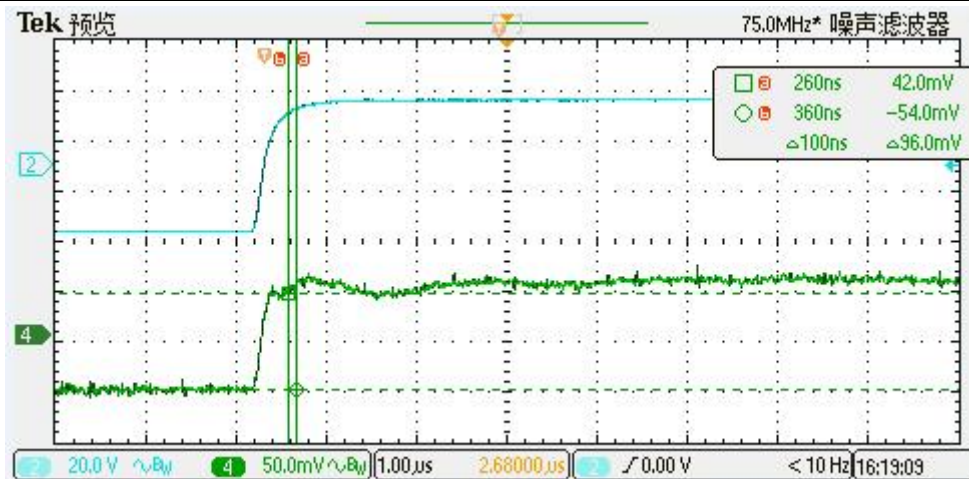


Fig.4 the step response time of STB-xxCAS/R & STB-xxCAS/K current sensors. The blue line is primary current, while the green line is output signal of current sensor. The step response time is less than 0.3 μ s.

14. Frequency delay performance

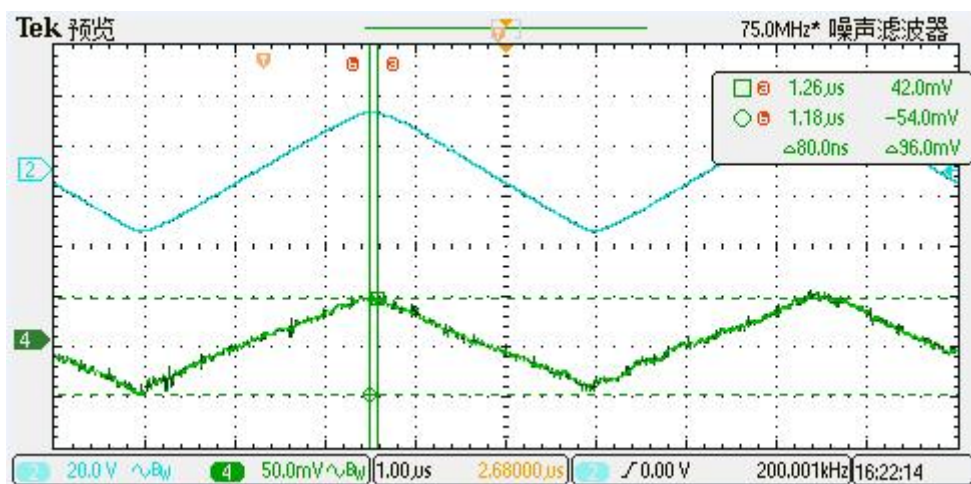
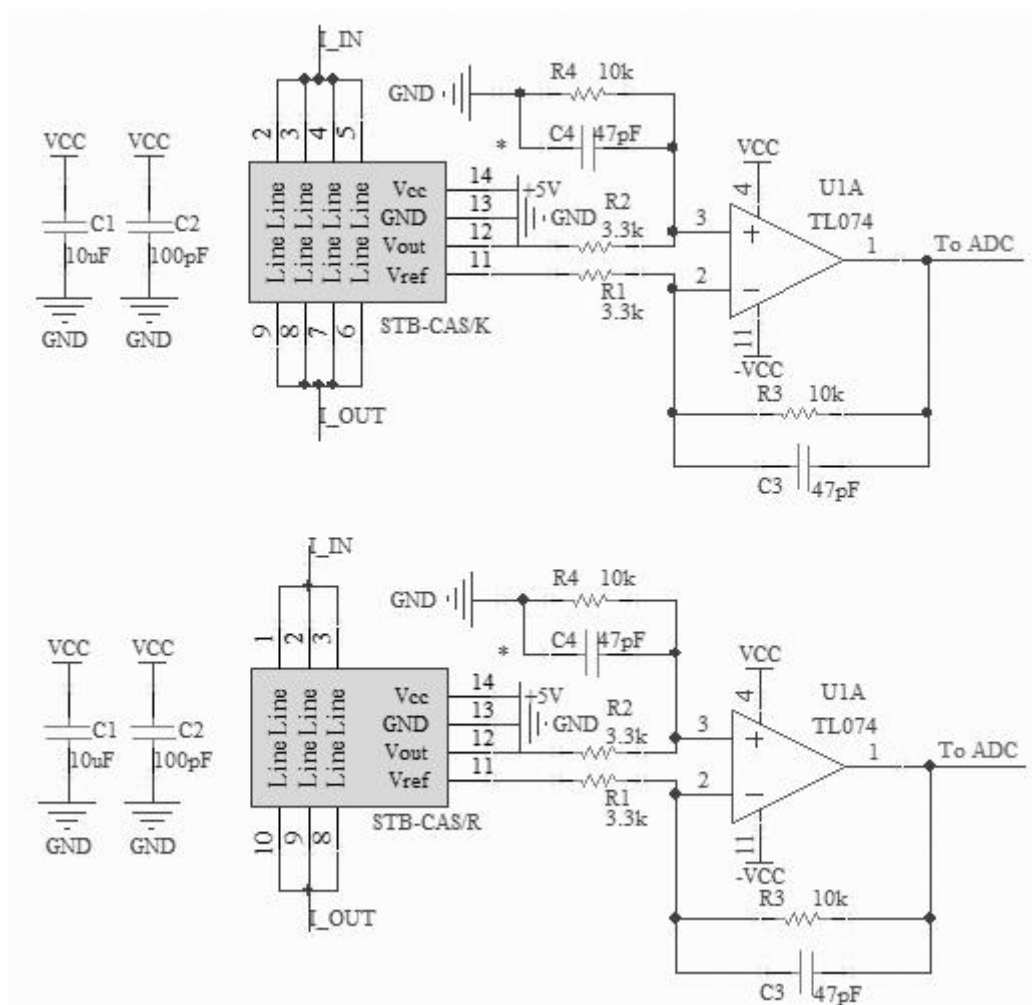
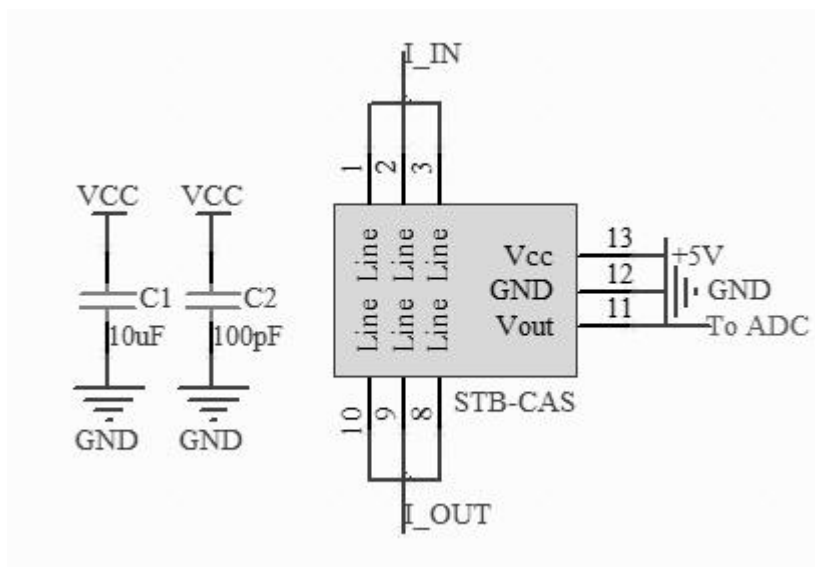


Fig.5 when detection the primary current with a frequency of 200 kHz. The delay time from primary current (blue) to the output of the sensor (green) is less than 0.3 μ s.

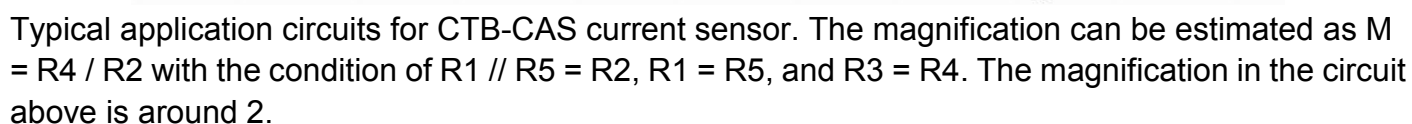
15. Typical application circuits



Typical application circuits for STB-CAS/K & STB-CAS/R current sensor. The magnification can be estimated as $M = R4 / R2$ with the condition of $R1 = R2$, and $R3 = R4$. The magnification in the circuit above is around 3.

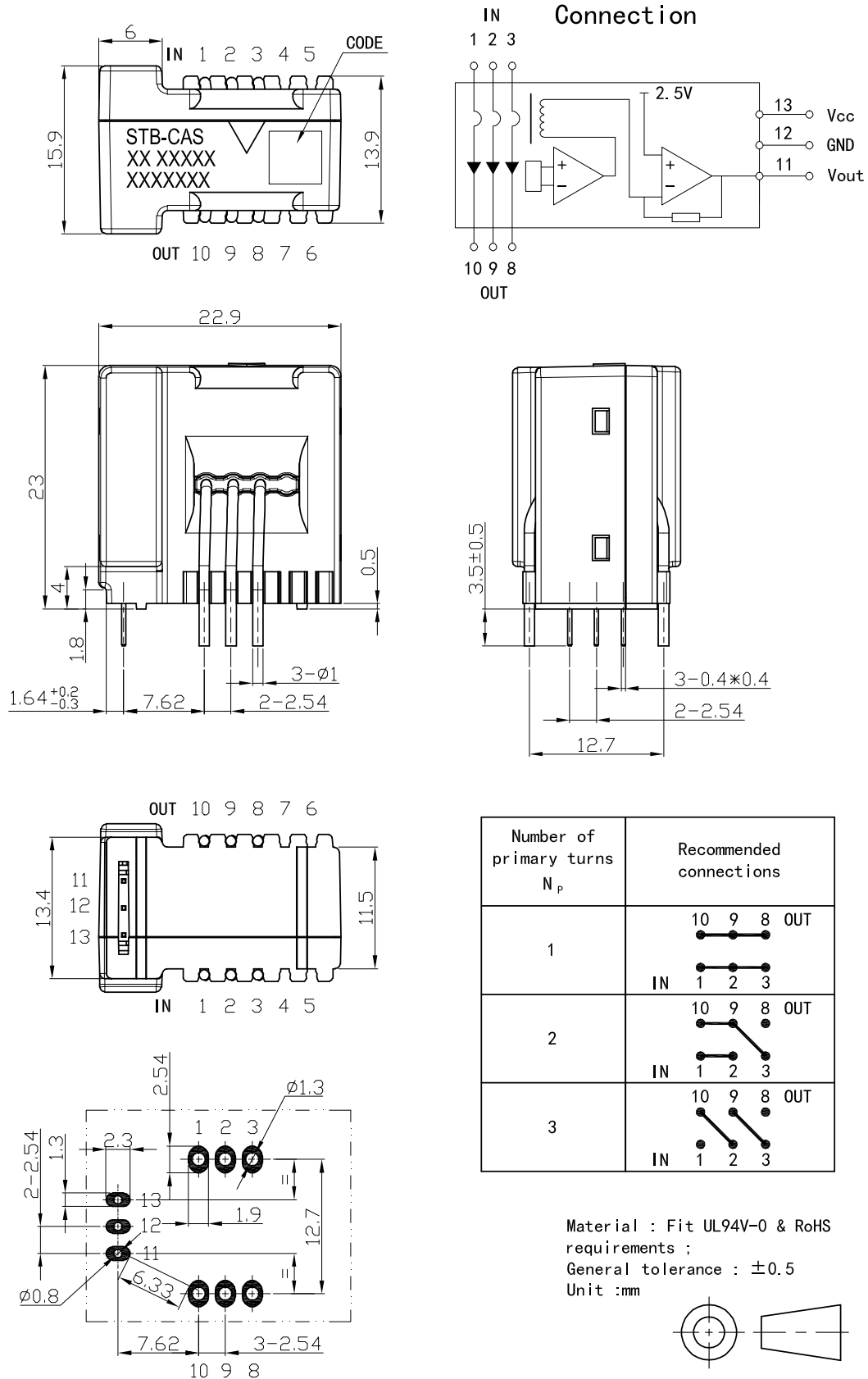


Typical application circuits for STB-CAS current sensor. The output and reference voltage can directly input to the ADC.

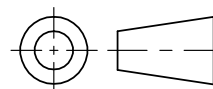


The frequency characteristics of STB-CAS/X series current sensor are not affected by the R-C setting (according to recommended R-C setting), therefore the active filter circuit or R-C circuit can be applied to modulate the sensor's frequency characteristics.

16. Dimensions: STB-CAS



Connection



18. Dimensions: STB-CAS/K

