

Current and temperature sensing



TSC2 family – bidirectional current sensing



Analog and digital temperature sensors



Current sensing

Shunt based current sensing with new TSC2 family

Bidirectional, high-side and-low side

Operating common mode from -20V up to 70V

High speed and high precision solutions

Current sensing portfolio

TSC101A
TSC101B
TSC101C

SOT23-5
operating 2.8 to 30V
AMR -0.3 to 60V
gain x20 x50 x100

TSC102

TSSOP8 SO8
operating 2.8 to 30V
AMR -16 to 60V
gain x20 adj.

TSC1021

TSSOP8 SO8
operating 2.8 to 30V
AMR -32 to 60V
gain x20 x50

TSC103
TSC1031

TSSOP8 SO8
operating 2.9 to 70V
AMR -16 to 75V
gain x50 x100

TSC2011
TSC2012

bidirectional
operating -20 to 70V
AMR -25 to 75V
Gain x60 100x

TSC213

bidirectional
operating -0.3 to 26V
gain x50
Vio max 100μV

TSC888A
TSC888B
TSC888C

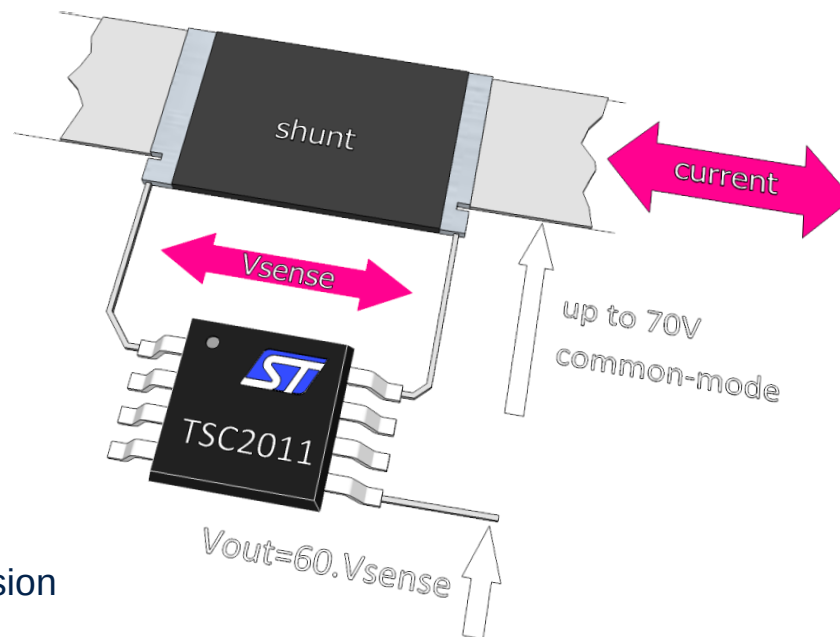
SOT23-5
operating 2.8 to 24V
AMR -0.3 to 30V
gain x20 x50 x100

TSC2010

bidirectional
operating -20 to 70V
AMR -25 to 75V
gain x20

TSC210
TSC212

bidirectional
operating -0.3 to 26V
gain x75 x100 x200 x500
x1000
Vio max 35μV



Production

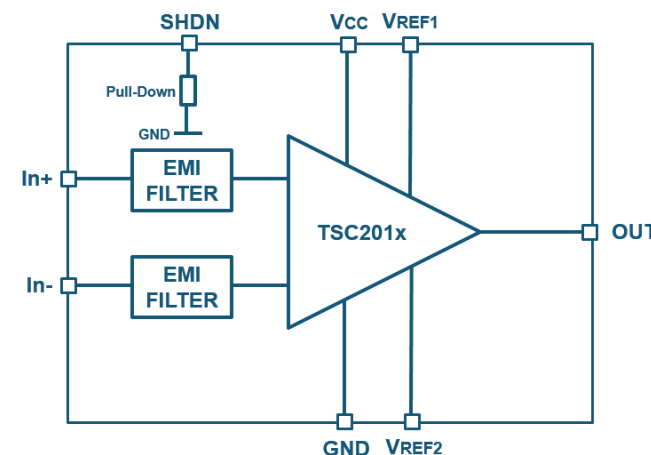
Development



TSC2010-2011-2012 bidirectional current sensing

High voltage bidirectional current sense amplifier

- V_{ICM} operating -20 to 70 V (battery reverse protection)
- V_{CC} 2.7 to 5.5 V
- V_{IO} max 200 μ V (1.1 mV @ V_{ICM} & temp) (drift max 5 μ V/ $^{\circ}$ C)
- Gain error max 0.3% (drift max 10 ppm/ $^{\circ}$ C)
- Embedded EMI filters (>85 dB from 400 MHz to 2.4 GHz)
- Shutdown pin (quiescent current 20 μ A)
- Operating temperature -40 to 125 $^{\circ}$ C
- One device fits most applications



Mini SO8

TSC2012
100x, 390kHz
TSC2011
60x, 600kHz
TSC2010*
20x, (~800kHz)

*To be developed

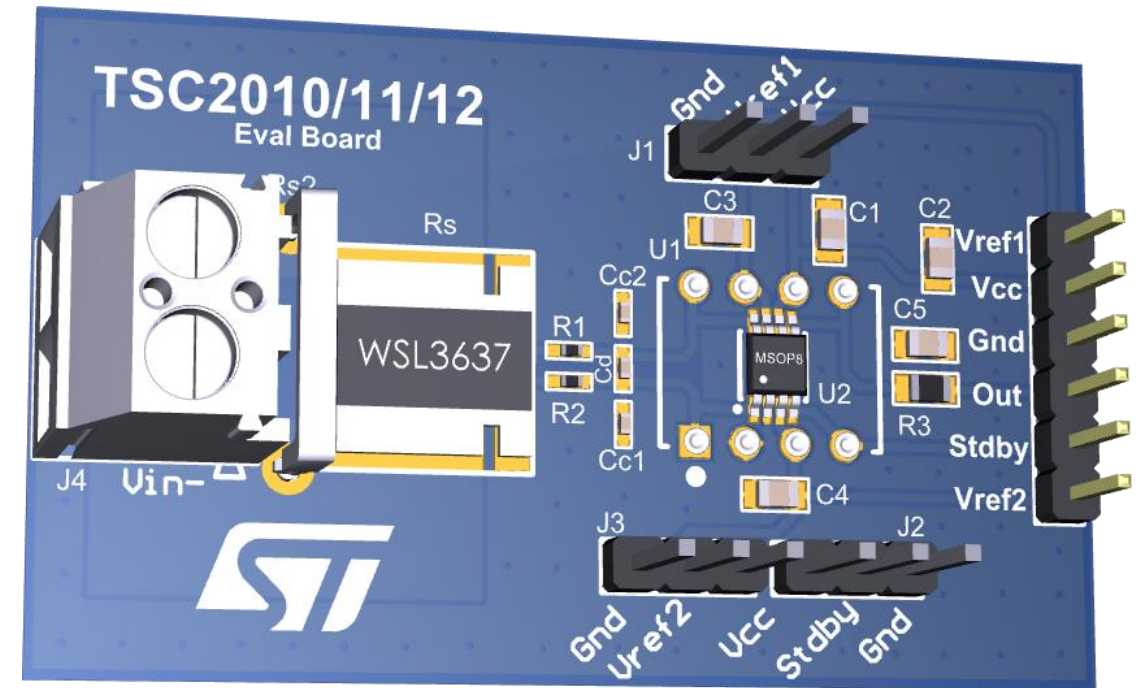




STEVAL-AETKT1V1 evaluation kit

The simplest bidirectional current sensing setup

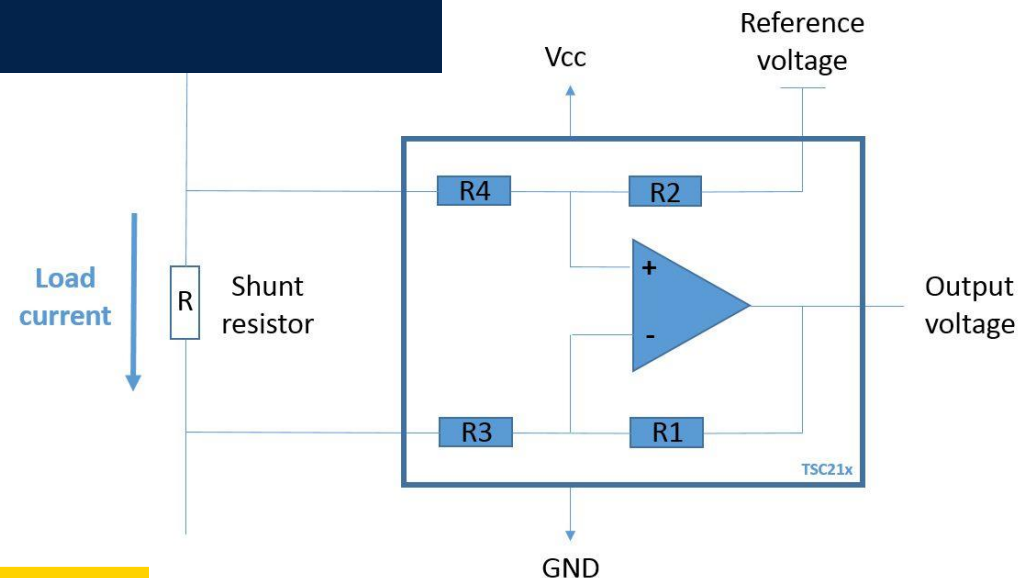
- Can host different types of shunts
 - Both SMD and THT
- Allows simple setting of VREF and standby pin by jumpers
- Embeds RC filter
- External wire connection
- TSC2010-2011-2012 on daughterboard



TSC21X bidirectional current sensing

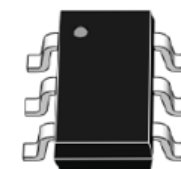
High precision bidirectional current sense amplifier

- Input voltage range from GND up to 26 V
- Supply voltage from 2.7 to 26 V
- Input offset voltage: max 35 μV / 100 μV
- Input offset voltage drift: 0.05 $\mu\text{V}/^\circ\text{C}$ (max 0.3 $\mu\text{V}/^\circ\text{C}$)
- High precision: 0.3% max gain accuracy
- Bandwidth: 100 kHz for gain 50 V/V
- -40 up to +125 $^\circ\text{C}$ operating range
- Typical applications
 - Power management and battery chargers



TSC213
50x, 100 kHz
TSC212*
1000x, 6 kHz
TSC210*
200x, 25 kHz

*To be developed



Analog and digital temperature sensing

Wide offer of temperature sensing ICs

Low power solutions ($< 2 \mu\text{A}$)

Products with accuracy $\pm 0.5^\circ\text{C}$

STTS22H – New SMBus 3.0 compatible

Temperature sensor portfolio

Analog output

- Very **low current consumption**
- **Predictable curvature error**

STLM20W87F

Temp. range: -55°C / +130°C
SOT323-5L (1.8 x 1.15 x 0.8mm)
Accuracy: ±0.5°C @ 25°C (typ), ±2.5°C @ 130°C (max)



STLM20DD9F

Vcc: 2.4V - 5.5V
Temp. range: -40°C / +85°C
Accuracy: ±0.5°C @ 25°C (typ), ±2.1°C @ 85°C (max)
Iq: 4.8uA
UDFN-4L (1.0 x 1.3 x 0.5mm)



LM135

Temp. range: -55°C / +150°C
Accuracy: ±0.5°C (typ), ±1.5°C (max)



LM235

Temp. range: -40°C / +120°C
Accuracy: ±0.5°C (typ), ±1.5°C (max)



LM335

Temp. range: -40°C / +100°C
Accuracy: ±0.5°C (typ), ±1.0°C (max)
I_R: 450uA to 5mA
To-92 (3.7 x 5.03mm)
SO-8 (4.8 x 3.9 x 1.75mm)



- **Accuracy flat** across the whole operating range
- **Up to 200°C** operating temp. (non continuous)

Temperature sensor portfolio

Digital output

- I²C / SMBus 2.0 output with selectable address (up to 4)
- Programmable temp. conversion rate
- One shot reading for current saving
- Pin for interrupt generation with programmable threshold and hysteresis

STTS751

Vcc: 2.25 V – 3.6 V
Idd: 20 uA (typ @ 1 conv/s)
Temp. range: -40°C / +125°C
Accuracy: ±1.0°C @ 25°C (typ), ±2.5°C @ 125°C (max)
Resolution: prg 9 – 12 bit
Conversion time: 14 – 112ms (max)
UDFN-6L (1.0 x 1.3 x 0.5mm)



STTS75

Idd: 75 uA (typ)
Resolution: prg 9 – 12 bit

STDS75

Resolution: prg 9 – 12 bit
Conversion time: 150 – 1200ms (max)

STLM75

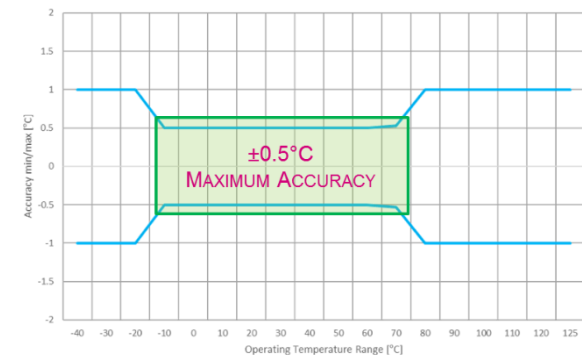
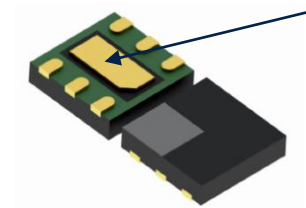
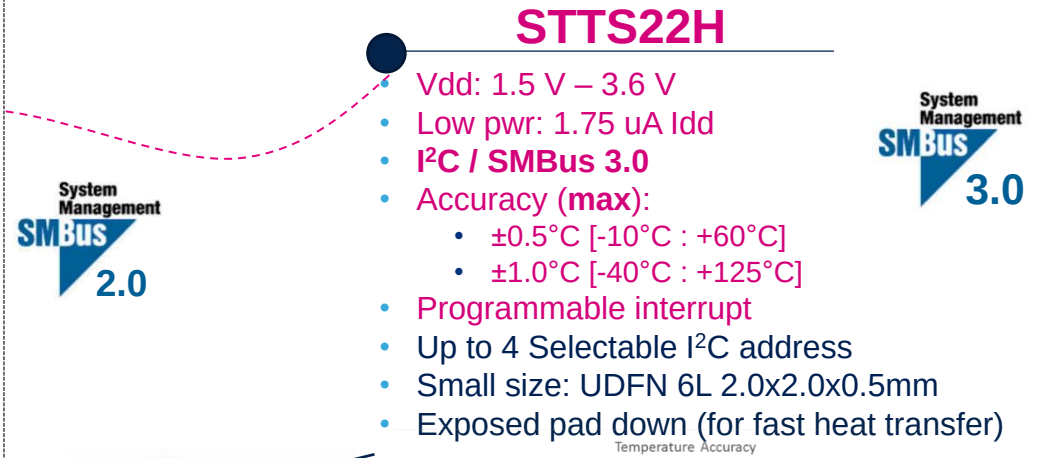
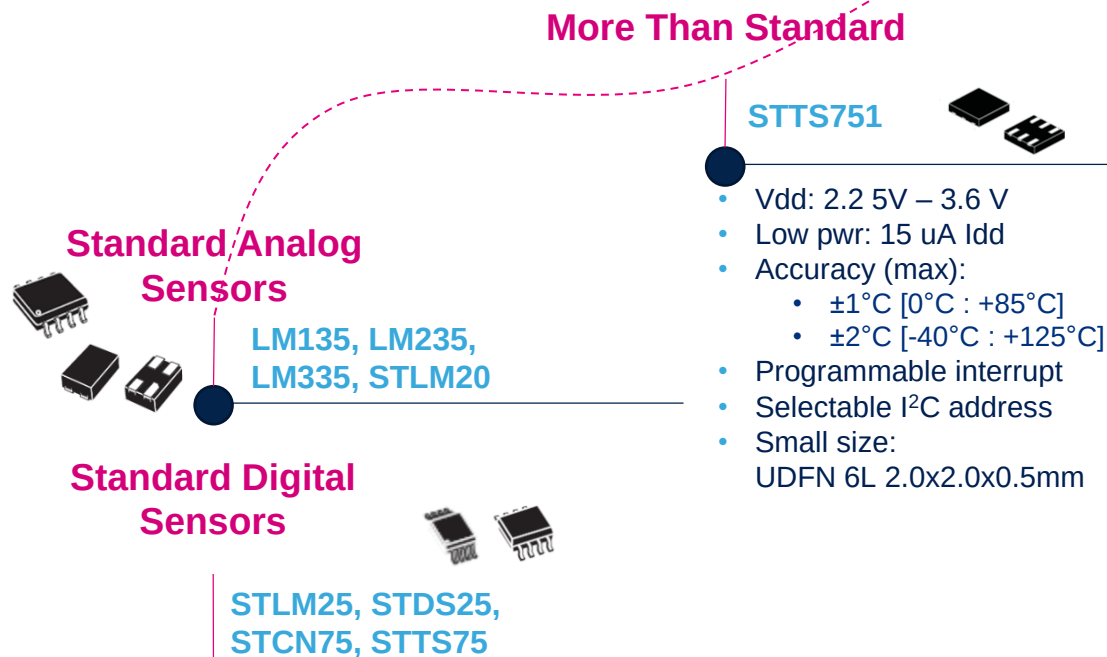
Vcc: 2.7 V - 5.5 V
Idd: 125 uA (typ)
Temp. range: -55°C / +125°C
Accuracy: ±0.5°C (typ), ±3.0°C (max)
Resolution: 9 bit
Conversion time: 150ms (max)
MSOP-8 (3.0 x 3.0 x 1.1mm)
SO-8 (4.9 x 3.9 x 1.75mm)



- Accuracy flat (typ) across the whole operating range
- I²C / SMBus output with selectable address (up to 8)
- One shot reading for current saving
- Dedicated pin for interrupt or thermostat/comparator function
- Programmable threshold with hysteresis

Standalone temperature sensor STTS22H

Technology evolution



AN5449 Temperature sensors: guidelines for system integration