# Integrated Current Sensor GXL AN series

## Description

GXL AN is a 200A range Integrated Current Sensor (ICS) built with QFN package technology, providing an excellent power density for power PCB current measurements with built in galvanic insulation. This product is a high precision integrated current sensor (ICS) from LEM, where the current goes through its primary pins and does not require a core (coreless product).

The GXL product family provides a very accurate solution for measuring DC and AC currents in all highly compact and demanding industrial and automotive applications. This product uses a very small QFN package technology with large primary pads and wettable flanks for soldering and visual inspection. It provides analog voltage output with best-in-class accuracy together with overcurrent detections (user configurable and factory set).

The current goes through the primary pins (1 to 8) which have a very low internal resistance (<0.25 mΩ). The secondary pins have 6mm distance creepage / clearance from the primary in order to ensure a good enough isolation level.

These features make the device suitable for high voltage applications requiring high precision and strong immunity against external field with its differential sensing solution.

### Main features & Advantages

- **Industrial and automotive**
- **Open loop multi-range current sensor: 200A**
- **Low electrical resistance < 0.25mΩ**
- **Dual supply voltage 5V and 3.3V**
- **User settable fast overcurrent detection**
- **Low power consumption**
- **Compact design for surface mounting on PCB**
- **High bandwidth**
- **Galvanic separation between primary and secondary with 6 mm of dCp/dCI**
- **Reinforced insulation capability**

### Typical applications

- **Drives**
- **HVAC Inverters**
- **Appliances**
- **Solar Inverters**
- **Automotive**

### Standards

- **IEC 61800-5-1: 2007**
- **IEC 62109-1: 2010**
- **IEC 62368-1: 2018 (replacing IEC 60950-1)**
- **UL 62638-1 (Pending)**
- **AEC-Q-100 Grade 0 qualified (pending)**

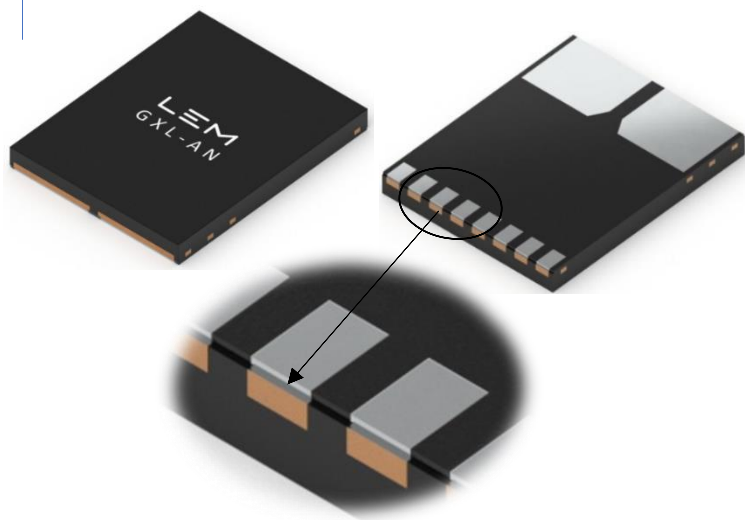



*Figure 1: GXL QFN package with wettable flanks*

# Selection guide

**GXL AN 200-80 – 50000A**

- Product revision
- Temperature range:
  0: -40 – 150°C
  1: -40 -125°C
- LEM trimming
- Output type:
  0: fixed
  1: ratiometric
- Output type:
  0: bipolar ($U_{ref}$ =Uc/2)
  1: unipolar ($U_{ref}$ =0.5V)
- Supply Voltage $U_C$:
  5: 5V
  3: 3.3V
- Full scale current – Nominal current.
- Package Type

## Standard products

| Product name | Full scale range (A peak) | Nominal current (A rms)[1] | Sensitivity (mV/A) | Supply Voltage (V) | Polarity | Output type |
|---|---|---|---|---|---|---|
| **GXL AN 125-50 30000B** | ± 125 | ± 50 | 10 | 3.3 V | Bipolar | Fixed |
| **GXL AN 200-80 30000B** | ± 200 | ± 80 | 6.25 | 3.3 V | Bipolar | Fixed |
| **GXL AN 125-50 50000B** | ± 125 | ± 50 | 16 | 5 V | Bipolar | Fixed |
| **GXL AN 200-80 50000B** | ± 200 | ± 80 | 10 | 5 V | Bipolar | Fixed |
| **GXL AN 125-50 30100B** | ± 125 | ± 50 | 10 | 3.3 V | Bipolar | Ratiometric |
| **GXL AN 200-80 30100B** | ± 200 | ± 80 | 6.25 | 3.3 V | Bipolar | Ratiometric |
| **GXL AN 125-50 50100B** | ± 125 | ± 50 | 16 | 5 V | Bipolar | Ratiometric |
| **GXL AN 200-80 50100B** | ± 200 | ± 80 | 10 | 5 V | Bipolar | Ratiometric |

*Table 1: GXL AN Products*



[1] Trimmings at LEM are done at the half of nominal current ($I_{PN}$/2)

# Pinout

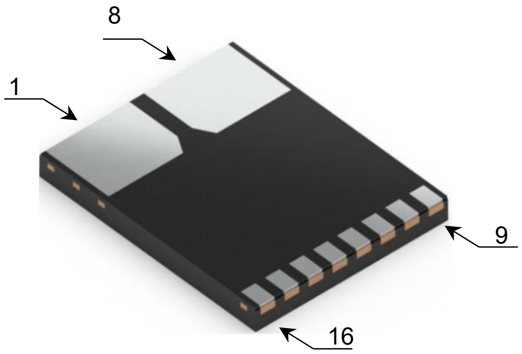



Figure 2: GXL package with pin number (bottom view)

| Pin# | Name | Type | Description |
|---|---|---|---|
| **1** | $I_P$+ | Input | Input (+) of the primary current |
| **8** | $I_P$− | Input | Input (-) of the primary current |
| **9** | $U_C$ | Power | Supply voltage |
| **10** | $UE_{OCD}$ | Input | External OCD threshold voltage terminal |
| **11** | $OCD_{INT}$ | Output | Internal OCD |
| **12** | $U_{out}$ | Output | Output voltage |
| **13** | $U_{ref}$ | Output | Reference voltage (for non-ratiometric products) |
| **14** | *NC* | N/A | Connect to GND |
| **15** | $OCD_{EXT}$ | Output | External OCD terminal |
| **16** | *GND* | Ground | Ground terminal |

Table 2: GXL AN Device Pin Function Description

# Application circuits

## Typical schematics GXL AN (ratiometric operating mode)

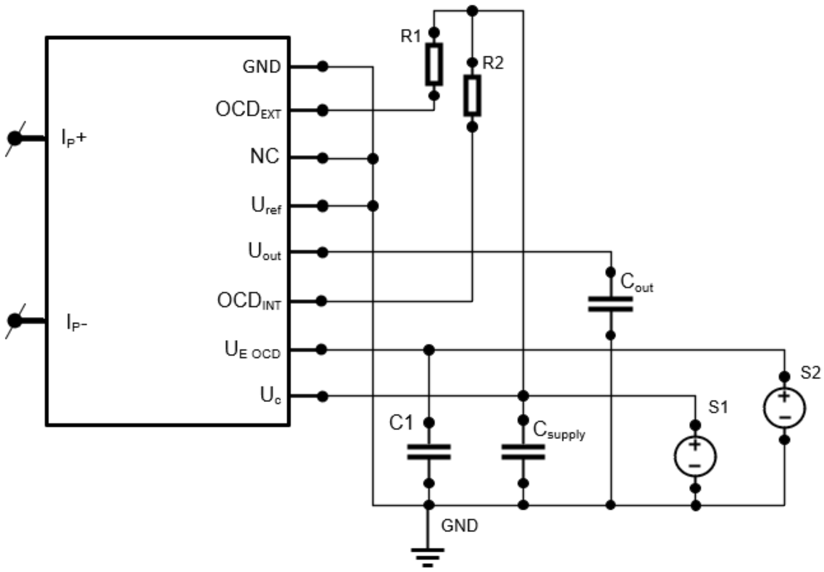



*Figure 3: Typical application schematics; GXL AN ratiometric products*

| Reference | Value | Min | Max | Unit | Comment |
|---|---|---|---|---|---|
| **Csupply** | 47 | 10 | - | nF | Decoupling capacitor. To be placed as close as possible to $U_C$ pin of the sensor |
| **Cout** | 4.7 | - | 6 | nF | Output capacitor. Ensure stable output operation on full bandwidth. To be placed as close as possible to $U_{out}$ pin of the sensor. |
| **C1** | 4.7 | | | nF | Only mounted if OCD_EXT functionality is used. This capacitor ensures a better immunity of $U_{E\ OCD}$ to noise and transients. OCD_EXT accuracy cannot be guaranteed if not mounted. To be placed as close as possible to $U_{E\ OCD}$ pin of the sensor |
| **R1** | 10 | 1 | 50 | kΩ | OCD Pull up. It must be connected to $U_C$, as close as possible to $OCD_{EXT}$ pin of the sensor. |
| **R2** | 10 | 1 | 50 | kΩ | OCD Pull up. It must be connected to $U_C$, as close as possible to $OCD_{INT}$ pin of the sensor. |
| **S1** | 5V / 3.3V | | | V | Supply voltage matching product requirements |
| **S2** | Refer to "External OCD" chapter | | | V | OCD threshold voltage source must be very stable to ensure an accurate threshold.<br>Different methods can be used to fix the OCD threshold:<br>- External source (DAC, amplifier, Zener diode…)<br>- Resistor divider, connected to Uc or Uref |

*Table 3: Typical recommended components GXL AN ratiometric products*

## Typical schematics GXL AN (fixed operating mode)

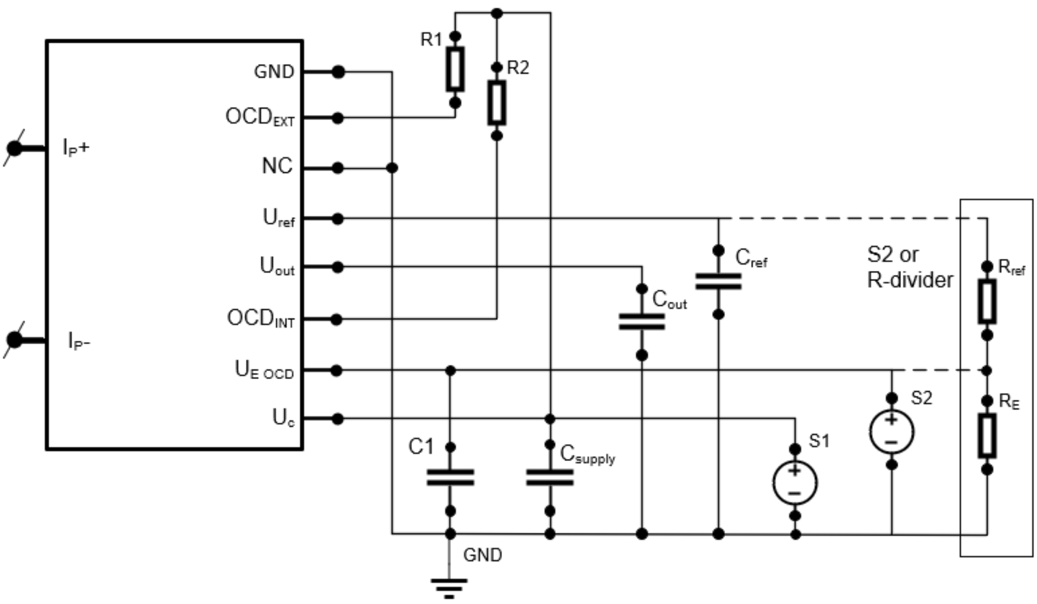



*Figure 4: Typical application schematics; GXL AN fixed products*

| Reference | Value | Min | Max | Unit | Comment |
|---|---|---|---|---|---|
| **Csupply** | 47 | 10 | - | nF | Decoupling capacitor. To be placed as close as possible to $U_C$ pin of the sensor |
| **Cout** | 4.7 | - | 6 | nF | Output capacitor. Ensure stable output operation on full bandwidth. To be placed as close as possible to $U_{out}$ pin of the sensor. |
| **C1** | 4.7 | | | nF | Only mounted if OCD_EXT functionality is used. This capacitor ensures a better immunity of $U_{E\ OCD}$ to noise and transients. OCD_EXT accuracy cannot be guaranteed if not mounted. To be placed as close as possible to $U_{E\ OCD}$ pin of the sensor |
| **Cref** | 4.7 | - | 6 | nF | Output capacitor on reference pin. Insure stable output operation on full bandwidth. To be placed as close as possible to $U_{ref}$ pin of the sensor. |
| **R1** | 10 | 1 | 50 | kΩ | OCD Pull up. It must be connected to $U_C$, as close as possible to $OCD_{EXT}$ pin of the sensor. |
| **R2** | 10 | 1 | 50 | kΩ | OCD Pull up. It must be connected to $U_C$, as close as possible to $OCD_{INT}$ pin of the sensor. |
| **$R_{ref}$** | 47 | 4.7 | - | kΩ | Refer to “External OCD” chapter |
| **$R_E$** | 47 | 4.7 | - | kΩ | |
| **S1** | 5V / 3.3V | | | V | Supply voltage matching product requirements |
| **S2** | Refer to “External OCD” chapter | | | V | OCD threshold voltage source must be very stable to ensure an accurate threshold.<br>Different methods can be used to fix the OCD threshold:<br>- External source (DAC, amplifier, Zener diode…)<br>- Resistor divider, connected to Uc or Uref |

*Table 4: Typical recommended components GXL AN fixed products*

For more details, please read “ICS Products Schematics” application note available on LEM website.

# Block diagram

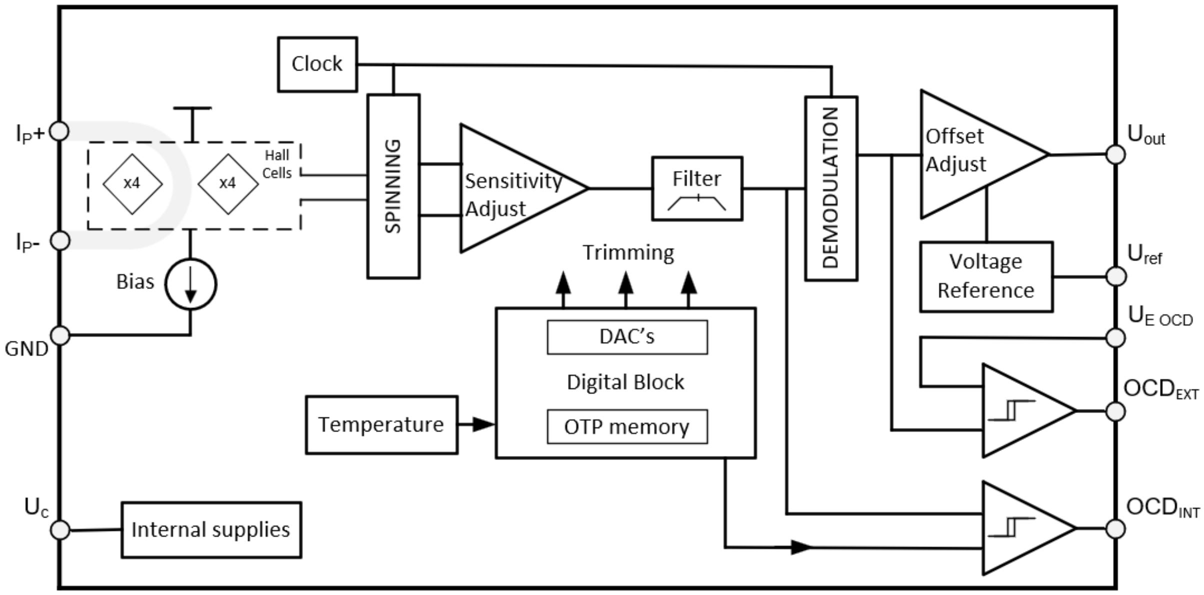



*Figure 5: Block diagram GXL AN*

# Absolute maximum ratings

| Parameter | Symbol | Unit | Value |
|---|---|---|---|
| **Maximum supply voltage** | $U_{C\ max}$ | V | 7.5 |
| **Maximum voltage on other pins** | $U_{max}$ | V | 7.5 |
| **Electrostatic discharge voltage (HBM - Human Body Model)** | $U_{ESD\ HBM}$ | kV | 2 |
| **Electrostatic discharge voltage (CDM - Charged Device Model)** | $U_{ESD\ CDM}$ | V | 500 |
| **Maximum junction temperature** | $T_{J\ max}$ | °C | 165 |

*Table 5*

Absolute maximum ratings apply at 25 °C unless otherwise noted.

Stresses above these ratings may cause permanent damage.

Exposure to absolute maximum ratings for extended periods may degrade reliability.

# Environmental and mechanical characteristics

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Ambient operating temperature** | $T_A$ | °C | -40 | | 150 | |
| **Ambient storage temperature** | $T_{A\ st}$ | °C | -55 | | 165 | |
| **Thermal resistance junction to case** | $R_{th\ JC}$ | K/W | | 18 | | TBC |
| **Thermal resistance junction to ambient** | $R_{th\ JA}$ | K/W | | 9 | | |
| **Mass** | $m$ | g | | 1.4 | | TBC |

*Table 6*

# Insulation characteristics GXL

| Parameter | Symbol | Unit | Value | Comment |
|---|---|---|---|---|
| **RMS voltage for AC insulation test, 50Hz, 1min** | $U_d$ | kV | 4.53[2] | According to IEC 62368-1 |
| **Impulse withstand voltage 1.2/50 µs** | $U_{NI}$ | kV | 6.40 | According to IEC 62109-1, IEC 61800-5-1 |
| **RMS recurring peak voltage (Partial discharge test)** | $U_{PD}$ | V | 933 | According to IEC 62109-1, IEC 61800-5-1 |
| **RMS inception voltage (Partial discharge test)** | $U_{t\ inception}$ | V | 1238 | According to IEC 62109-1, IEC 61800-5-1 |
| **RMS extinction voltage (Partial discharge test)** | $U_{t\ extinction}$ | V | 990 | According to IEC 62109-1, IEC 61800-5-1 |
| **Clearance (pri. -sec.)** | $d_{Cl}$ | mm | 6 | Shortest distance through air |
| **Creepage distance (pri. -sec.)** | $d_{Cp}$ | mm | 6 | Shortest path along device body |
| **Case material** | | | V0 | According to UL94, flammability |
| **Comparative tracking index** | *CTI* | | 600 | Grade requirements mass compound |

*Table 7*

## Working voltage according to IEC 62368-1

| Working voltage | | PD 2 | Standards |
|---|---|---|---|
| **Basic insulation** | RMS voltage (V) | 1192 | IEC 62368-1 (replacing IEC 60950-1) |
| **Reinforced insulation** | RMS voltage (V) | 593 | |

*Table 8*

## Rated insulation voltage according to IEC 61800-5-1

| Rated insulation voltage | | OV II / PD 2 | OV III/ PD 2 | Standards |
|---|---|---|---|---|
| **Basic isolation** | RMS voltage (V) | 1104 | 600 | IEC 61800-5-1 |
| **Reinforced isolation** | RMS voltage (V) | 593 | 300 | |

*Table 9*

## Rated insulation voltage according to IEC 62109-1

| Rated insulation voltage | | OV II / PD 2 | OV III/ PD 2 | Standards |
|---|---|---|---|---|
| **Basic isolation** | RMS voltage (V) | > 1000 | 600 | IEC 62109-1 |
| **Reinforced isolation** | RMS voltage (V) | 593 | 300 | |

*Table 10*

[2] 100% tested in production at 4.07 kV level.

# Common electrical data (independent of sensitivity)

At $T_A$ = 25°C, $U_C$ = +5 V, $R_L$ = 100 kΩ, unless otherwise noted

## Supply characteristics and consumption

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **DC supply voltage** | $U_C$ | V | 4.5 | 5 | 5.5 | 5V versions |
| **DC supply voltage** | $U_C$ | V | 3.135 | 3.3 | 3.465 | 3V3 versions |
| **DC Current consumption** | $I_C$ | mA | | 20 | 26 | |
| **Start-up time** | $T_{start}$ | ms | | 3 | | |

Table 11

## Primary characteristics

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Resistance of the primary** | $R_P$ | mΩ | | <0.25 | | $T_A$ = 25°C |
| **Primary resistance drift** | $TcR_P$ | µΩ/°C | | 0.95 | | |

Table 12

## Output characteristics

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Output voltage range** | $U_{out}$-$U_{ref}$ | V | -2 | | 2 | 5V versions<br>$U_C \geq$ 4.6 V ,@ $I_{PM}$ |
| **Output voltage range** | $U_{out}$-$U_{ref}$ | V | -1.25 | | 1.25 | 3V3 versions @ $I_{PM}$ |
| **Output internal resistance of Uout** | $R_{out}$ | Ω | | 1 | | |
| **Maximum output current source of Uout** | $I_{Omax}$ | mA | 20 | | | |
| **Maximum input current sink of Uout** | $I_{Imax}$ | mA | 20 | | | |
| **Load capacitance on Uout** | $C_L$ | nF | 0 | 4.7 | 6 | |
| **Delay time (slope of $I_{PN}$ = 20A/µs)** | $t_{D10}$ | µs | | 1.3 | | @ 10 % of $I_{PN}$ |
| | $t_{D90}$ | µs | | 1.6 | | @ 90 % of $I_{PN}$ |
| **Frequency bandwidth** | $BW$ | kHz | | 300 | | @ -3dB |

Table 13

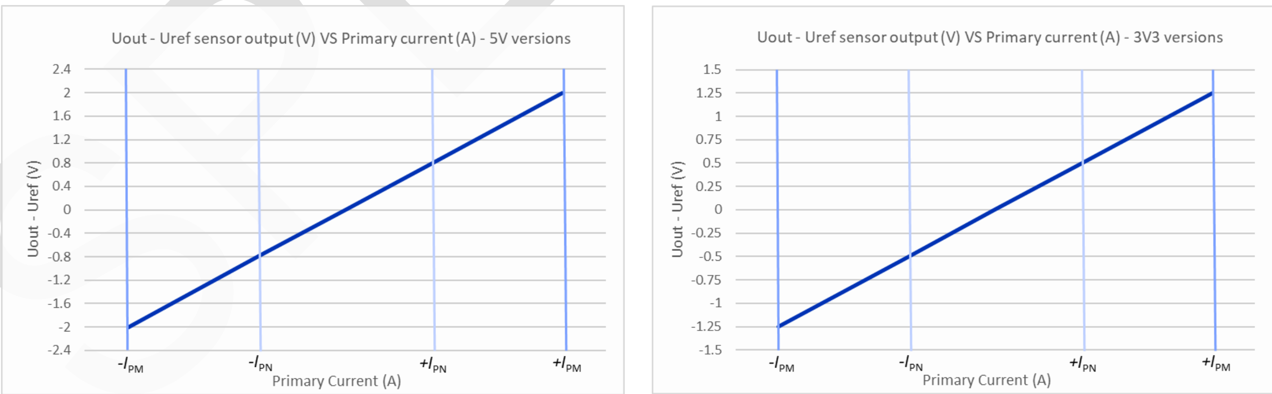



*Figure 6 & 7: Sensor output voltage referred to Uref.*

## Internal reference characteristics

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Internal reference voltage @ $I_P$ = 0 A** | $U_{\text{Iref}}$ | V | 2.48 | 2.5 | 2.52 | 5V versions |
| **Internal reference voltage @ $I_P$ = 0 A** | $U_{out}$-$U_{ref}$ | V | 1.64 | 1.65 | 1.66 | 3V3 versions |
| **Temperature coefficient of $U_{ref}$** | $TCU_{ref}$ | ppm/K | -220 | ±75 | 220 | $T_A$ = −40°C ÷ 150°C |
| **Output internal resistance of Uref** | $R_{ref}$ | Ω | | 5 | | |
| **Maximum output current source of Uref** | $I_{Omax}$ | mA | | 0.5 | 1 | |
| **Maximum input current sink of Uref** | $I_{Imax}$ | mA | | 0.5 | 1 | |

Table 14

## Lifetime parameters

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Sensitivity error drift after ageing** | $\varepsilon_S$ | % | | TBD | | TBC based on characterization after qualification. |
| **Offset drift after ageing** | $U_{OE}$ | mV | | TBD | | TBC based on characterization after qualification. |
| **Total accuracy over temp** | $\varepsilon_{tot}$ | % | | TBD | | TBC based on characterization after qualification. |
| **Total accuracy over lifetime** | $\varepsilon_{tot}$ | % | | TBD | | TBC based on characterization after qualification. |

Table 15





## Electrical data GXL AN 125-50 30000B

At $T_A$ = 25 °C, $U_C$ = +3.3 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 50 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −125 | | 125 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 10 | | 500 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{Iref}$ @ $U_{Iref}$ =1.65V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | μV/Hz$^{1/2}$ | | 5.1 | | $U_{out}$-$U_{ref}$ |
| **Linearity error 0 ... ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 ... ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |

*Table 16*

## Electrical data GXL AN 200-80 30000B

At $T_A$ = 25 °C, $U_C$ = +3.3 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 80 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −200 | | 200 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 6.25 | | 500 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{Iref}$ @ $U_{Iref}$ =1.65V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | μV/Hz$^{1/2}$ | | 3.7 | | $U_{out}$-$U_{ref}$ |
| **Linearity error 0 ... ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 ... ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |

*Table 17*

## Electrical data GXL AN 125-50 50000B

At $T_A$ = 25 °C, $U_C$ = +5 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 50 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −125 | | 125 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 16 | | 800 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{ref}$ @ $U_{ref}$ =2.5 V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | µV/Hz$^{1/2}$ | | 5.7 | | $U_{out}$-$U_{ref}$ |
| **Linearity error 0 ... ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 ... ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |

*Table 18*

## Electrical data GXL AN 200-80 50000B

At $T_A$ = 25 °C, $U_C$ = +5 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 80 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −200 | | 200 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 10 | | 800 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{ref}$ @ $U_{ref}$ =2.5 V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | µV/Hz$^{1/2}$ | | 3.6 | | $U_{out}$-$U_{ref}$ |
| **Linearity error 0 ... ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 ... ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |

*Table 19*

## Electrical data GXL AN 125-50 30100B

At $T_A$ = 25 °C, $U_C$ = +3.3 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 50 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −125 | | 125 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 10 | | 500 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{lref}$ @ $U_{lref}$ =1.65V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | µV/Hz$^{1/2}$ | | 5.5 | | $U_{out}$-GND |
| **Linearity error 0 ... ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 ... ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |
| **Ratiometricity Error (sensitivity)** | $\varepsilon_R$ | % | | ±0.5 | | $T_A$ = −40°C ÷ 150°C – TBC<br>$U_c$ = 3.15 ÷ 3.45V |
| **Ratiometricity Error (offset)** | $\varepsilon_{RO}$ | mV | -10 | | 10 | $T_A$ = −40°C ÷ 150°C |

*Table 20*

## Electrical data GXL AN 200-80 30100B

At $T_A$ = 25 °C, $U_C$ = +3.3 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 80 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −200 | | 200 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 6.25 | | 500 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{lref}$ @ $U_{lref}$ =1.65V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | µV/Hz$^{1/2}$ | | 3.7 | | $U_{out}$-GND |
| **Linearity error 0 ... ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 ... ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |
| **Ratiometricity Error (sensitivity)** | $\varepsilon_R$ | % | | ±0.5 | | $T_A$ = −40°C ÷ 150°C – TBC<br>$U_c$ = 3.15 ÷ 3.45V |
| **Ratiometricity Error (offset)** | $\varepsilon_{RO}$ | mV | -10 | | 10 | $T_A$ = −40°C ÷ 150°C |

*Table 21*

## Electrical data GXL AN 125-50 50100B

At $T_A$ = 25 °C, $U_C$ = +5 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 50 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −125 | | 125 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 16 | | 800 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{lref}$ @ $U_{lref}$ =2.5V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | µV/Hz$^{1/2}$ | | 5.7 | | $U_{out}$-GND |
| **Linearity error 0 … ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 … ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |
| **Ratiometricity Error (sensitivity)** | $\varepsilon_R$ | % | | ±0.5 | | $T_A$ = −40°C ÷ 150°C – TBC<br>$U_c$ = 4.5 ÷ 5.5V |
| **Ratiometricity Error (offset)** | $\varepsilon_{RO}$ | mV | -10 | | 10 | $T_A$ = −40°C ÷ 150°C |

*Table 22*

## Electrical data GXL AN 200-80 50100B

At $T_A$ = 25 °C, $U_C$ = +5 V, $R_L$ = 100 kΩ, unless otherwise noted

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **Primary nominal current** | $I_{PN}$ | A | | 80 | | |
| **Primary current, measuring range** | $I_{PM}$ | A | −200 | | 200 | |
| **Nominal sensitivity** | $S_N$ | mV/A | | 10 | | 800 mV @ $I_{PN}$ |
| **Sensitivity error @35°C** | $\varepsilon_S$ | % | −0.5 | | 0.5 | $T_A$ = 35°C |
| **Sensitivity error @35°C-150°C** | $\varepsilon_{SHOT}$ | % | -2.1 | | 2.1 | $T_A$ = 35°C ÷ 150°C |
| **Sensitivity error @-40°C-35°C** | $\varepsilon_{SCOLD}$ | % | -2.3 | | 2.3 | $T_A$ = −40°C ÷ 35°C |
| **Sum of sensitivity and linearity error** | $\varepsilon_{SL25}$ | % of $I_{PM}$ | -0.7 | | 0.7 | $T_A$ = 35°C |
| **Electrical offset voltage** | $U_{OE}$ | mV | -5 | | 5 | $U_{out}$-$U_{lref}$ @ $U_{lref}$ =2.5V |
| **Electrical offset error @35°C-150°C** | $U_{OEHOT}$ | mV | -7 | | 7 | $U_{out}$-$U_{ref}$ |
| **Electrical offset error @-40°C-35°C** | $U_{OECOLD}$ | mV | -6.5 | | 6.5 | $U_{out}$-$U_{ref}$ |
| **Noise voltage spectral density** | $U_{no}$ | µV/Hz$^{1/2}$ | | 3.9 | | $U_{out}$-GND |
| **Linearity error 0 … ±$I_{PN}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PN}$ |
| **Linearity error 0 … ±$I_{PM}$** | $\varepsilon_L$ | % | −0.5 | | 0.5 | Referred to $I_{PM}$ - TBC |
| **Total error at $I_{PN}$** | $\varepsilon_{tot}$ | % of $I_{PN}$ | -1 | | 1 | $T_A$ = −40°C ÷ 150°C |
| **Ratiometricity Error (sensitivity)** | $\varepsilon_R$ | % | | ±0.5 | | $T_A$ = −40°C ÷ 150°C – TBC<br>$U_c$ = 4.5 ÷ 5.5V |
| **Ratiometricity Error (offset)** | $\varepsilon_{RO}$ | mV | -10 | | 10 | $T_A$ = −40°C ÷ 150°C |

*Table 23*

# Overcurrent detection (OCD)

Overcurrent detection is a feature included on GXL AN product to detect high peaks of currents happening during operation. Two overcurrent detection types are included in this product:
Internal OCD which offers the fastest reaction time and External OCD with a user settable threshold.

## Internal overcurrent detection (OCD_INT pin)

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **OCD_INT detection threshold** | $I_{I\ OCD\ Th}$ | A | | 3 x ±$I_{PN}$ | | 1.5 to 5 x ±$I_{PN}$ available. Contact LEM for more options |
| **OCD_INT threshold error** | $\varepsilon_{I\ OCD\ Th}$ | % | | ±9 | | $U_c$ = 5V |
| **OCD_INT threshold error** | $\varepsilon_{I\ OCD\ Th}$ | % | | ±15 | | $U_c$ = 3.3V |
| **OCD_INT output on resistance to GND** | $R_{on\ I\ OCD}$ | Ω | | 11 | 46 | Open drain output, active low |
| **OCD_INT output on sink capability** | $I_{I\ OCDmax}$ | mA | 16 | 20 | | |
| **OCD_INT output hold time** | $t_{hold\ I\ OCD}$ | µs | 8 | 10 | 12 | |
| **OCD_INT delay time** | $t_{D\ I\ OCD}$ | µs | | | 0.5 | |

*Table 24*

### Overcurrent Detection Behavior

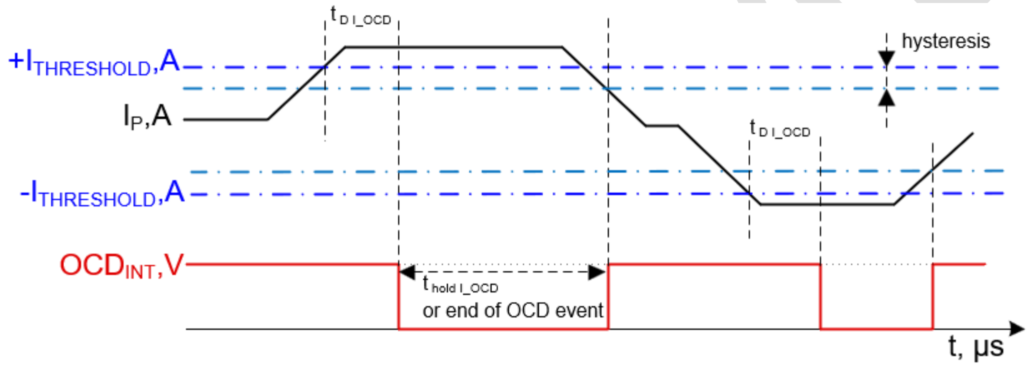



*Figure 8: Internal OCD behavior*

## External overcurrent detection (OCD_EXT pin)

| Parameter | Symbol | Unit | Min | Typ | Max | Comment |
|---|---|---|---|---|---|---|
| **OCD_EXT threshold error (3 x ±$I_{PN}$)** | $\varepsilon_{E\ OCD\ Th}$ | % | | ±6.8 | | $U_c$ = 5V, bipolar |
| **OCD_EXT threshold error (3 x ±$I_{PN}$)** | $\varepsilon_{E\ OCD\ Th}$ | % | | ±11.5 | | $U_c$ = 3.3V, bipolar |
| **OCD_EXT output on resistance to GND** | $R_{on\ E\ OCD}$ | Ω | | 11 | 46 | Open drain output, active low |
| **OCD_EXT output on sink capability** | $I_{E\ OCDmax}$ | mA | 16 | 20 | | |
| **OCD_EXT delay time** | $t_{D\ E\ OCD}$ | µs | | 1.5 | 2 | |

*Table 25*

### Overcurrent Detection (OCD) Threshold Selection

The input OCD threshold voltage must be very stable to ensure the selected threshold accuracy. There are different methods to provide voltage on $U_{E\ OCD}$ pin: external source, resistor divider connected to reference voltage or supply voltage. The threshold current is defined based on the equation:

$I_{\mathrm{THRESHOLD}} = -6.5 * U_{\mathrm{E\ OCD}} + 7.8125$ – **Eqn1**. External OCD Current Threshold (5V versions)

$I_{\mathrm{THRESHOLD}} = -10 * U_{\mathrm{E\ OCD}} + 12.5$ – **Eqn2**. External OCD Current Threshold (3.3V versions)

$U_{E\,OCD} = \frac{R_E}{R_E+R_{ref}} * U_{ref}$ – **Eqn3**. External OCD Voltage from reference pin (refer to figure 4)

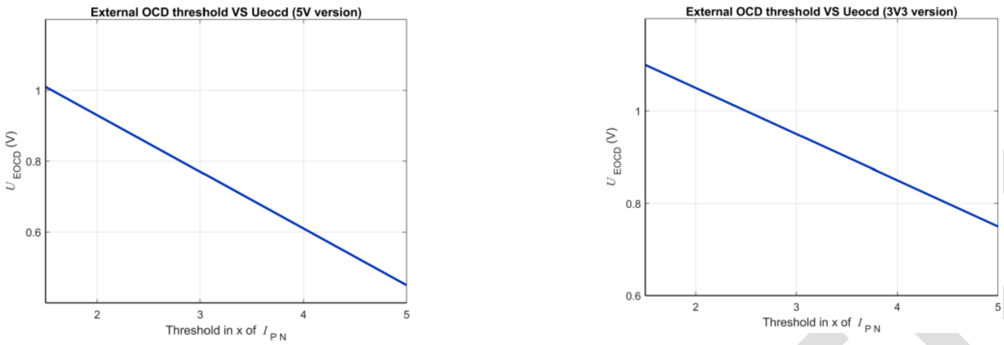



*Figure 9 & 10: OCD level threshold for 5V and 3.3V versions*

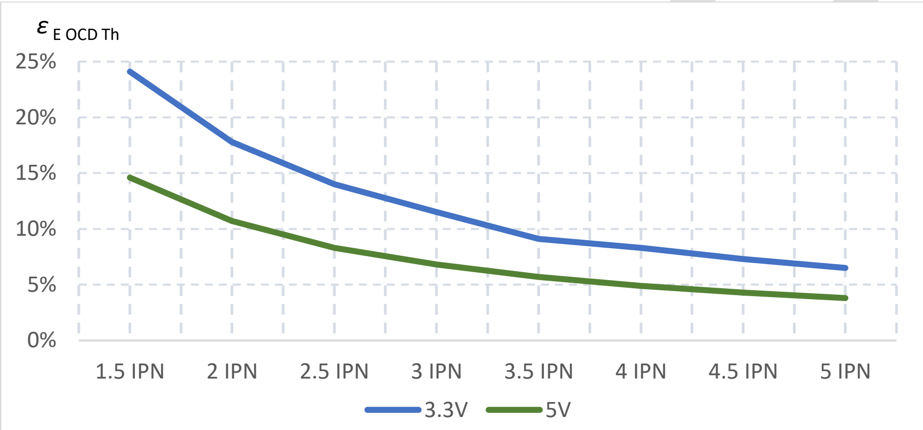



*Figure 11: OCD threshold error according to the selected current for 5V and 3.3V versions*

## Overcurrent Detection Behavior

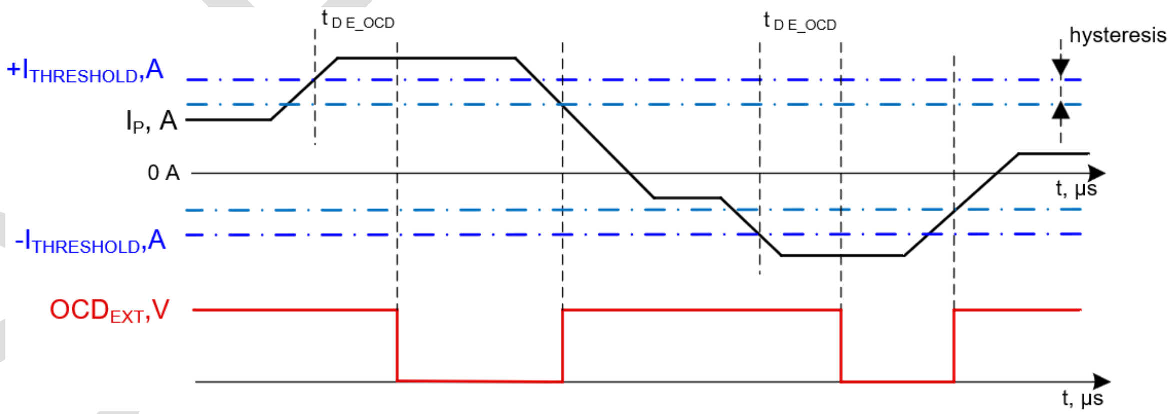



*Figure 12: External OCD behavior*

# Electrical plots

## Bandwidth

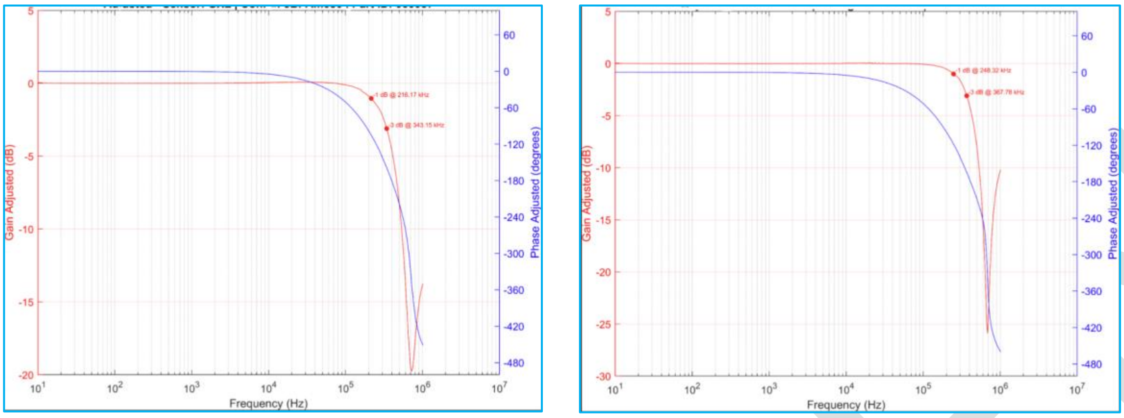



*Figure 13: BW for 5V and 3.3V versions*

## Delay Time

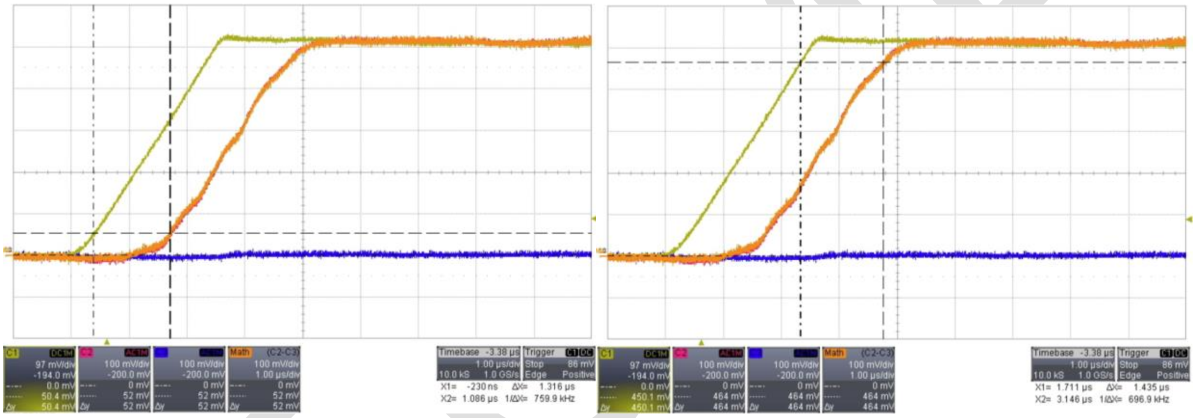


*Figure 14: Delay time @10% & @90% of the signal, 3.3V version*

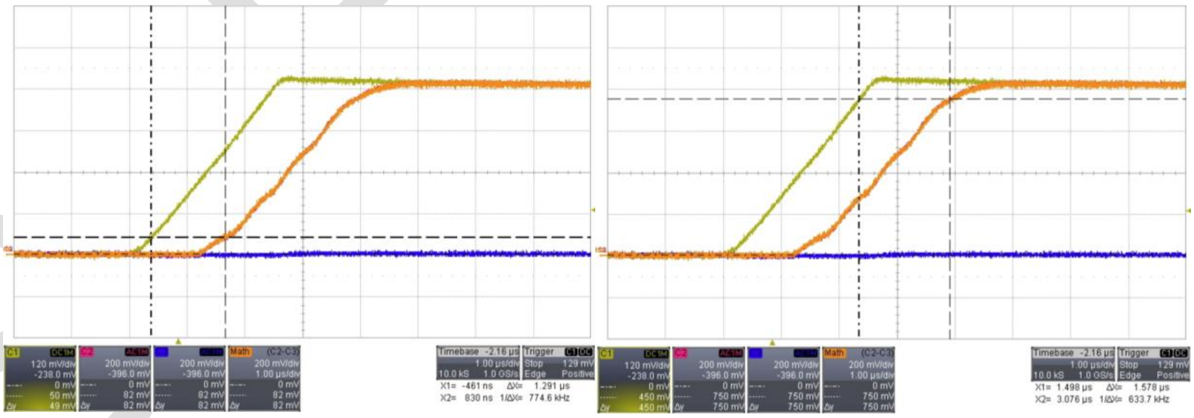


*Figure 15: Delay time @10% & @90% of the signal, 5V version*

# Thermal characteristics

When designing a system containing a current sensor, self-heating due to the flow of the current should be considered. When a current passes through, the sensor's temperature will increase, and this may affect its performance. This change in temperature will depend on the current profile, PCB layout, cooling techniques and copper thickness. The following plots show an example of different thermal responses of the GXL AN sensor when used on an evaluation LEM board.

Figure 16 shows the continuous RMS current that GXL AN can measure depending on the maximum expected temperature of the system.

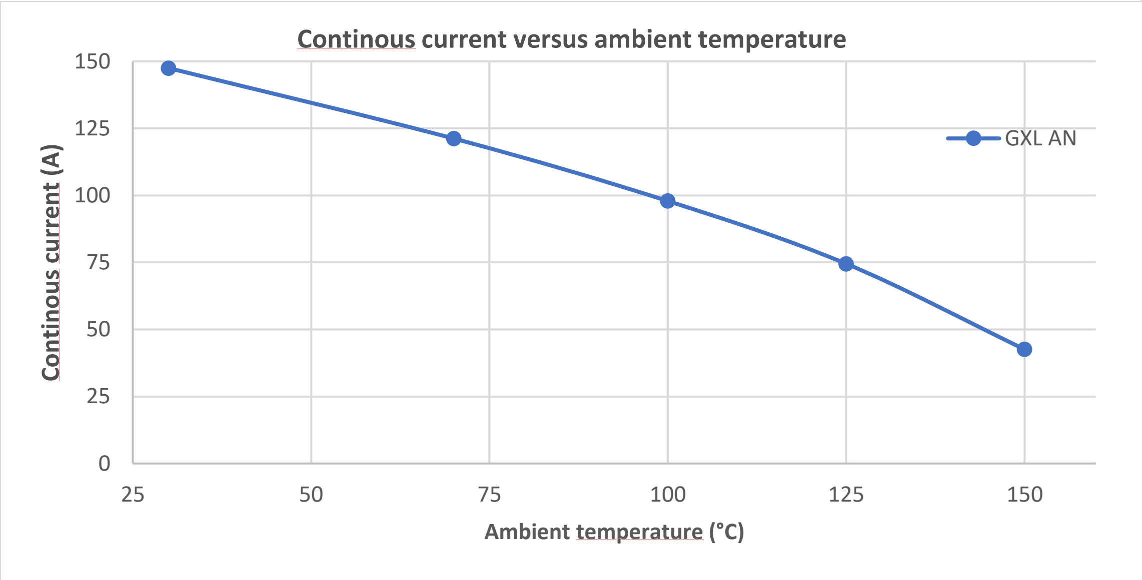



*Figure 16: Measuring range vs temperature*

Figure 17 represents the primary resistance variation with temperature

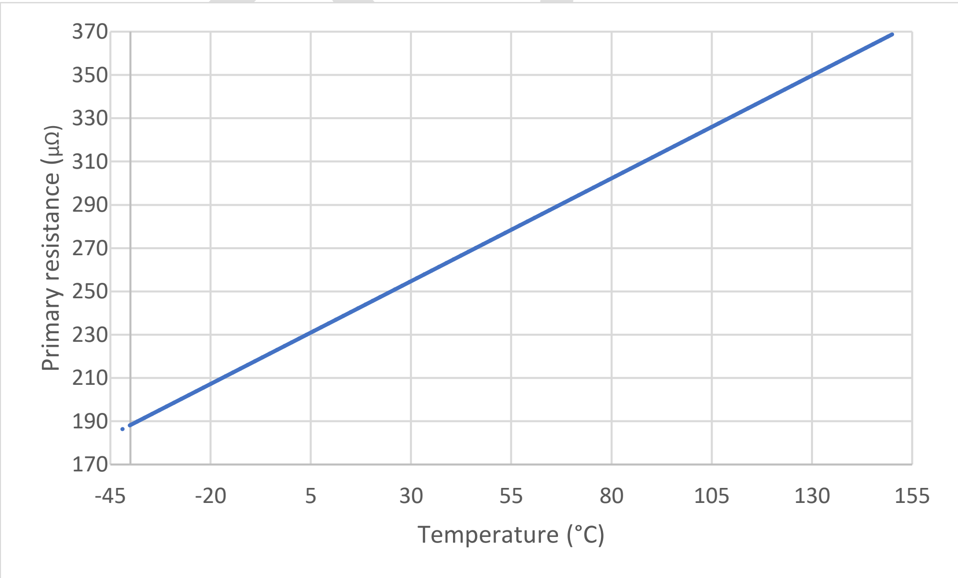



*Figure 17: Primary resistance variation vs temperature*

Figure 18 represents the duration of current pulse that could be applied before the primary conductor fuse.
This is not representative of repeated pulse capability.

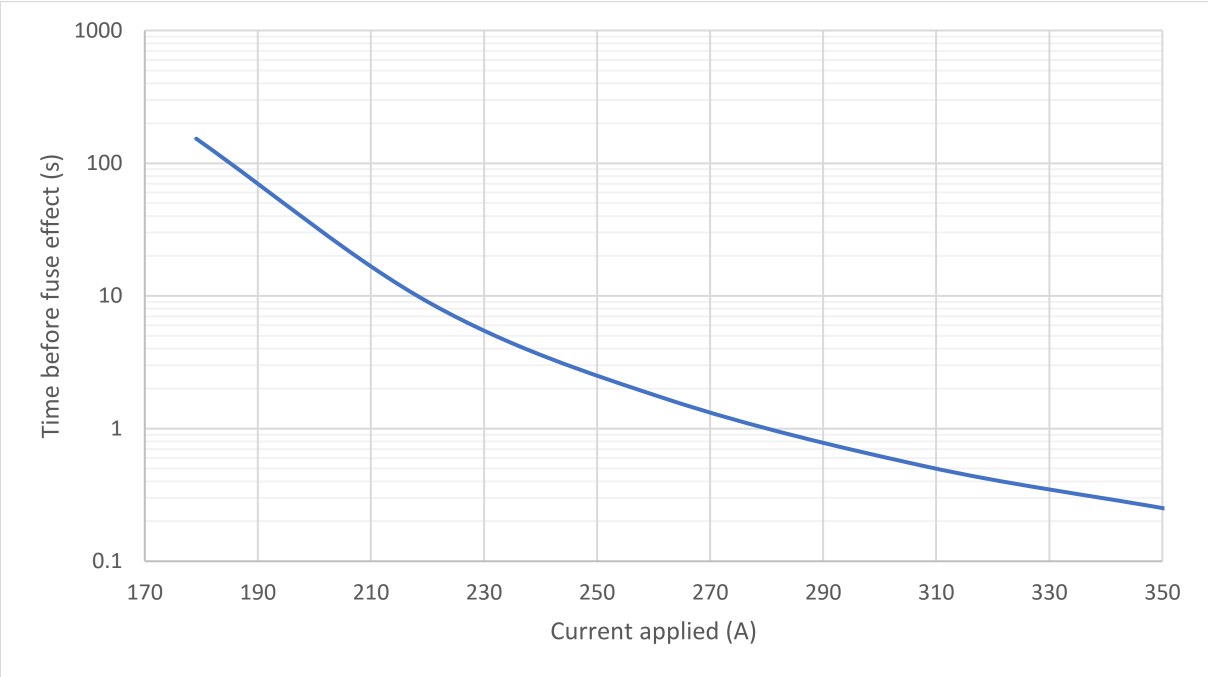



*Figure 18: Fuse effect*

NOTE:

The maximum temperature should be evaluated on the final system where the current sensor is integrated on the real application. This temperature should never exceed the maximum junction temperature as shown on the previous paragraphs.

# Application Information

GXL-AN series supports a broad range of high-current automotive, industrial, and renewable-energy applications, including traction systems such as forklifts, golf carts, and power tools that require accurate, isolated current sensing with low loss and strong magnetic immunity. These same device characteristics also extend naturally to AC and DC power-conversion equipment, such as solar inverters, where **the device's >5 kA surge withstand capability** provides additional robustness against grid-fault and transient AC-side events. GXL-AN sensors deliver the precise AC current measurement needed for power regulation, grid synchronization, overcurrent protection, and compliance with power-quality and safety requirements.

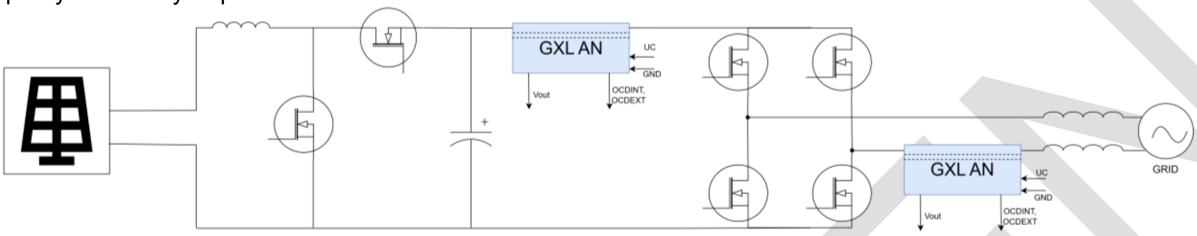



*Figure 19: Typical solar application*

## Application feature highlights

**High Power Density:** Unlike traditional Hall-effect current sensors, the GXL AN uses a QFN package. To manage the thermal load of 200A, the PCB must utilize multiple layers of 2oz or 3oz copper connected through thermal vias to the primary pads (Pins 1-8). For detailed information refer to Layout section and **figure 16** showing continuous current capability of 200A $I_{PN}$ version.

**Surge Robustness:** Solar installations are prone to indirect lightning strikes and grid transients. The GXL AN's 5kA surge rating ensures the sensor remains operational after a transient event, eliminating the need for oversized external shunt resistors or bulky CTs (Current Transformers).

**Magnetic Immunity:** In the dense electromagnetic environment of an inverter, strong stray magnetic fields generated by high-current conductors and power-stage magnetics can introduce measurement errors. The GXL's differential sensing architecture provides high rejection of external magnetic fields (CMFR), ensuring the AC waveform remains undistorted for accurate THD compliance.

**Fixed mode (Non-Ratiometric mode):** For applications with stable ADC reference and sensor supply, fixed mode sensors provide a better solution.

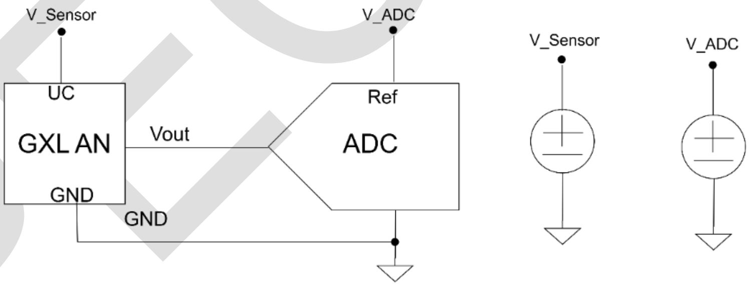



*Figure 20: Simplified fixed mode interface with different supply to sensor and ADC*

In applications where the sensor supply has a lower tolerance or varies considerably, the ratiometric sensors provide a better solution.

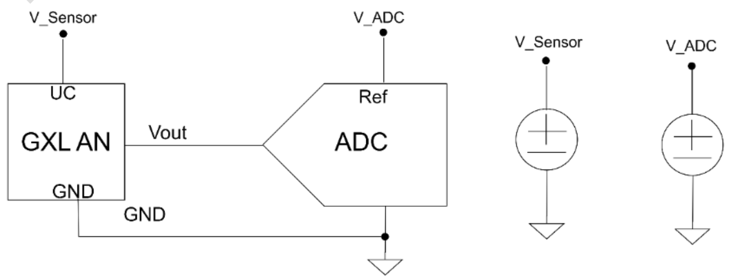



*Figure 21: Simplified ratiometric mode sensor interface to ADC with same supply to ADC and sensor*

# Evaluation board PCB 2731

All the above results are based on a LEM evaluation board.
This evaluation board is available at our distributors or direct sales (please contact us).
Gerber files are available on LEM's website.

## Description:

Evaluation board is based on 6 x 105 µm (3oz) copper layers. 6 x 500 sq.mm copper stitched on primary side.
This layout improves thermal performances of the transducer.

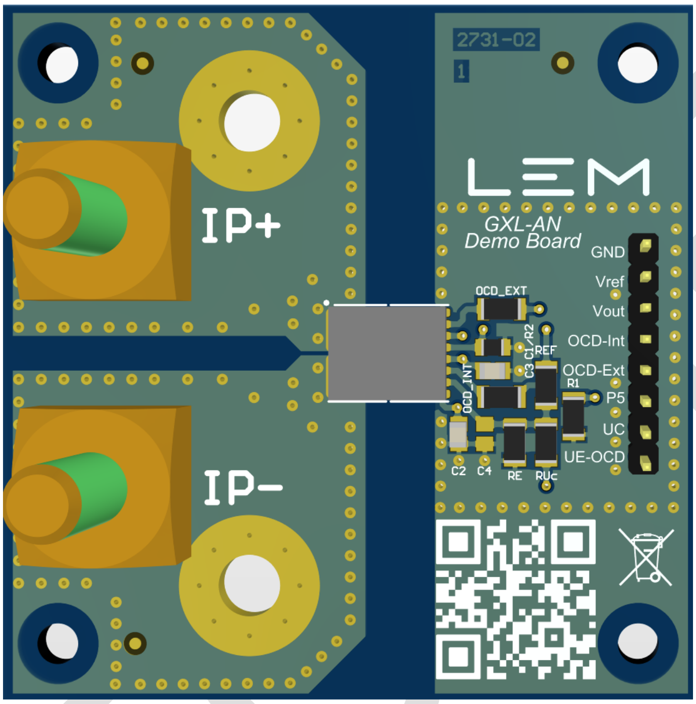



*Figure 22: GXL AN demoboard*

# Terms and definitions

## Definition of typical, minimum and maximum values

Minimum and maximum values for specified limiting and safety conditions have to be understood as such as well as values shown in “typical” graphs.
On the other hand, measured values are part of a statistical distribution that can be specified by an interval with upper and lower limits and a probability for measured values to lie within this interval.
Unless otherwise stated (e.g. “100 % tested”), the LEM definition for such intervals designated with “min” and “max” is that the probability for values of samples to lie in this interval is 99.73 %.
For a normal (Gaussian) distribution, this corresponds to an interval between −3 sigma and +3 sigma. If “typical” values are not obviously mean or average values, those values are defined to delimit intervals with a probability of 68.27 %, corresponding to an interval between −sigma and +sigma for a normal distribution.
Typical, maximal and minimal values are determined during the initial characterization of the product.

## Total error referred to primary

The total error $\varepsilon_{tot}$ is the error at $\pm I_{PN}$, relative to the FS (Full Scale). It includes all errors mentioned below:

- the electrical offset $U_{OE}$
- the sensitivity error $\varepsilon_S$
- the linearity error $\varepsilon_L$ (to $I_{PN}$)

$$\varepsilon tot = \frac{U_{out} + U_{out\,TH}}{S_N * I_{PN}} * \frac{100}{I_{PN}}, \%$$

## Electrical offset

The electrical offset voltage $U_{OE}$ is the residual output when the input current is zero (open circuit).

$$U_{OE} = \frac{U_{out(3)} + U_{out(5)}}{2}$$

It is measured using the current cycle shown in figure 35

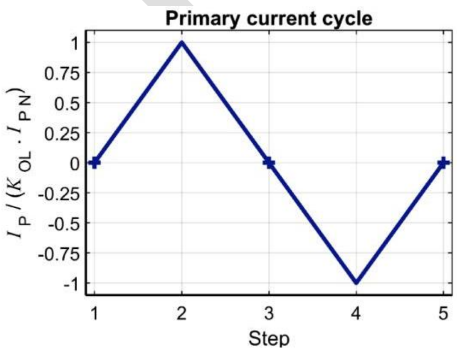



*Figure 23: Current cycle used to measure offset (product supplied)*

$K_{OL}$: Overload factor

## Sensitivity and sensitivity error

To measure sensitivity, the primary current (DC) is cycled from 0 to $I_{PN}$, then to $-I_{PN}$ and back to 0.
Sensitivity S is defined as a slope of the line connecting product output at $-I_{PN}$ with product output at $+I_{PN}$.
The sensitivity error $\varepsilon_S$ is defined as the error between the measured sensitivity and the theorical sensitivity $S_{TH}$

$$\varepsilon_S = \frac{S - S_{TH}}{S_{TH}} * 100, \%$$

## Linearity and linearity error

To measure linearity, the primary current (DC) is cycled from 0 to $I_{PN}$, then to $-I_{PN}$ and back to 0 (equally spaced $I_{PN}/10$ steps). The linearity error $\varepsilon_L$ is the maximum positive or negative difference between the measured points and the linear regression line, expressed in % of $I_{PN}$.

## Delay times

The delay time $t_{D\,10}$ @ 10 % and the delay time $t_{D\,90}$ @ 90 % with respect to the primary are shown in the next figure.
Both slightly depend on the primary current di/dt.
They are measured at nominal current.

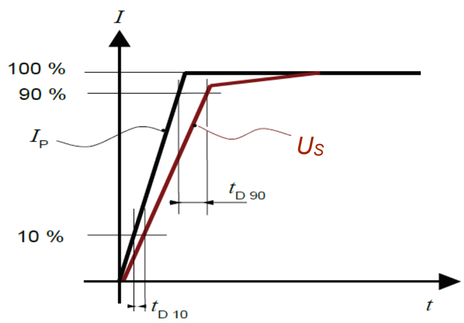



*Figure 24: Delay times*

# PCB footprint (in mm)

## GXL solder pads layout:

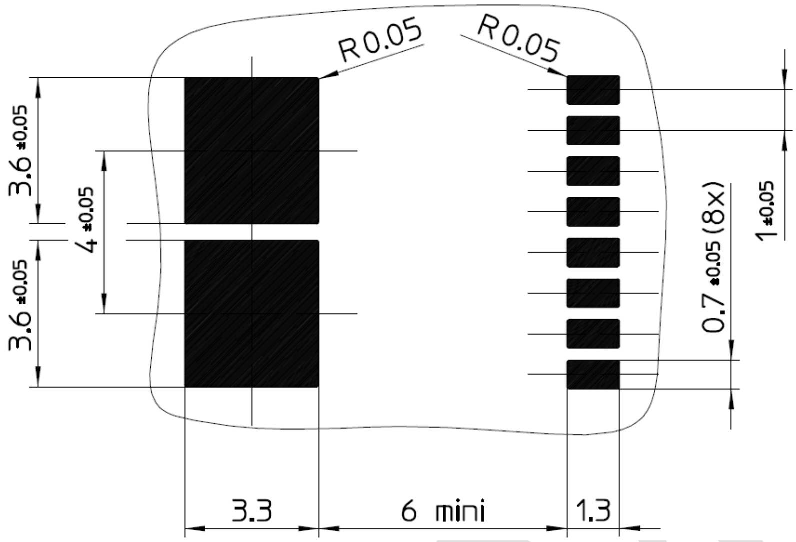


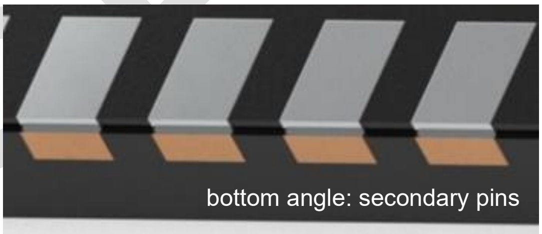

*Figure 25: GXL AN PCB footprint*

## GXL QFN package with wettable flanks

The product leads are developed with special shape, due to soldering specifics of quad-flat no lead package (QFN). The usage of wettable flanks on QFN package provides good and stable soldering process during the assembly on PCB.


*Figure 26: Standard vs wettable QFN*

The package is cut on steps and plated with tin on bottom pad's side and partially sidewall. The change of exposed cooper edge to the terminals with side fillet provide the ability of solder joint to extend from the pad on bottom side up to sidewall. It enhances the solder joint between the sensor and the board and is important for ensuring reliable soldering.



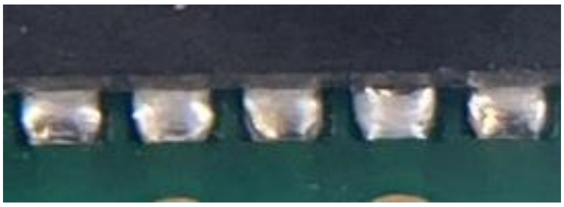



*Figure 27: QFN with wettable flanks soldered on PCB*

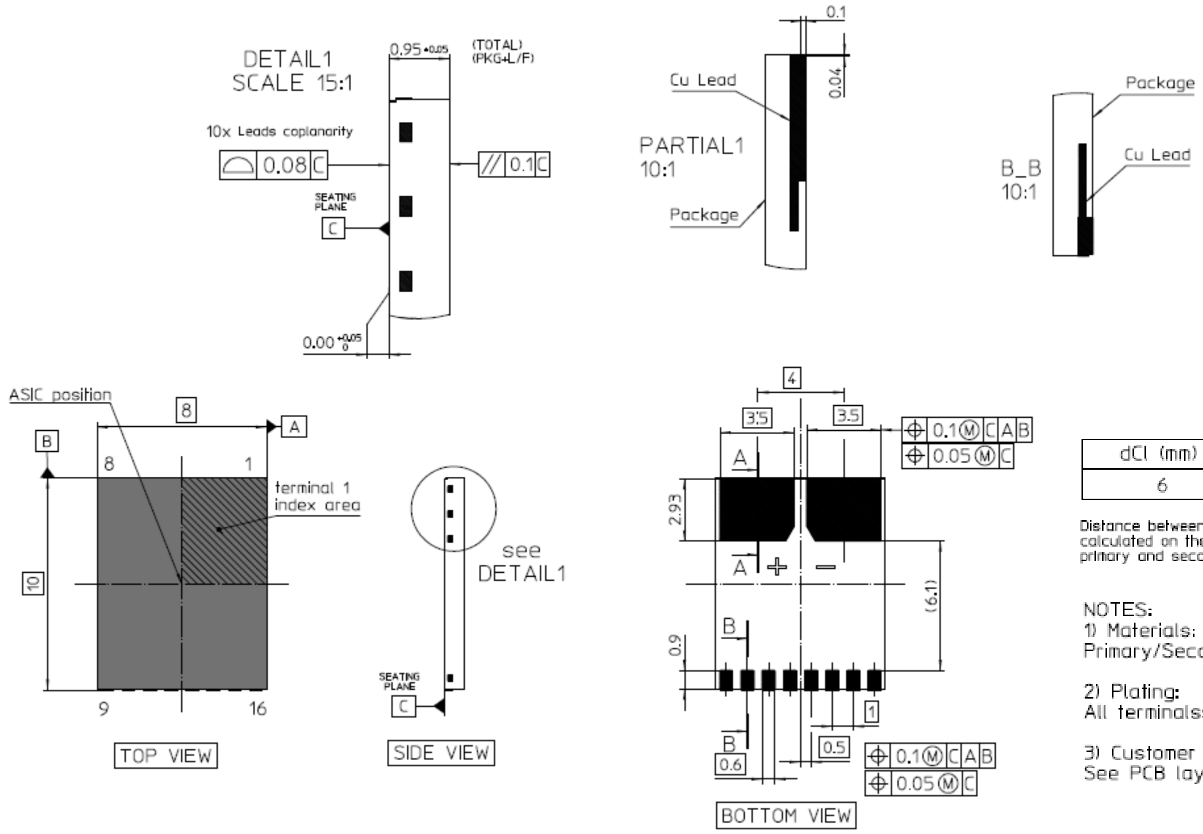
# Soldering on PCB

**Soldering remarks:**

- GXL is targeted to be qualified MSL3 for storage and mounting purposes.
- Per JEDEC J-STD-020E for packages less than 1.6 mm thick per table 4.2 (Pb-Free Process) of the specification.
- Best practice is to use 7 zones or greater conventional reflow system, limiting the time at reflow temperature as indicated in profile above.
- Rework not recommended.

# Dimensions (in mm)

## GXL drawings:




| dCl (mm) | dCp (mm) |
|---|---|
| 6 | 6 |

Distance between Primary ans Secondary calculated on the customer pcb and between primary and secondary terminals

NOTES:
1) Materials:
Primary/Secondary: copper

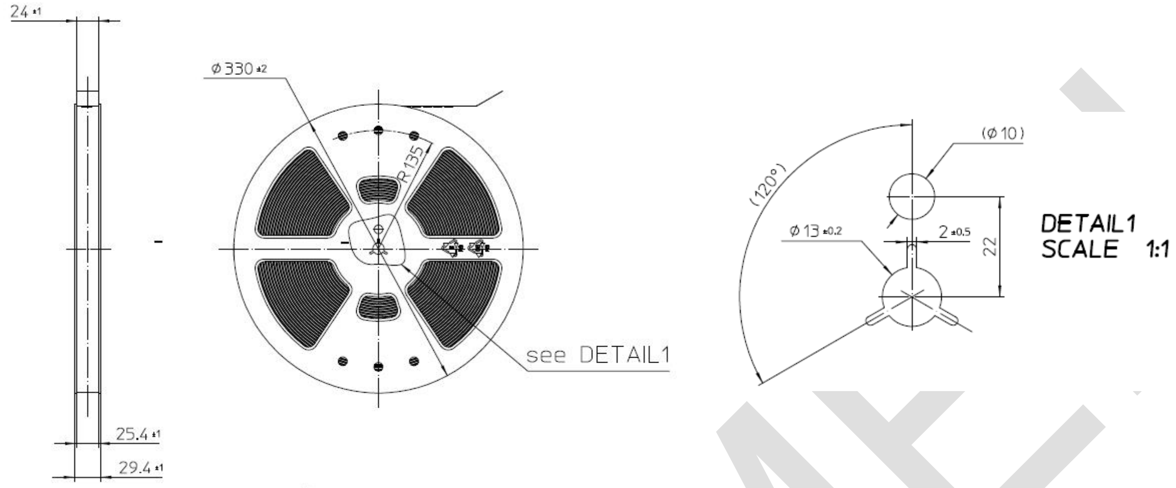
2) Plating:
All terminals: Tin

3) Customer mounting:
See PCB layout recommendations

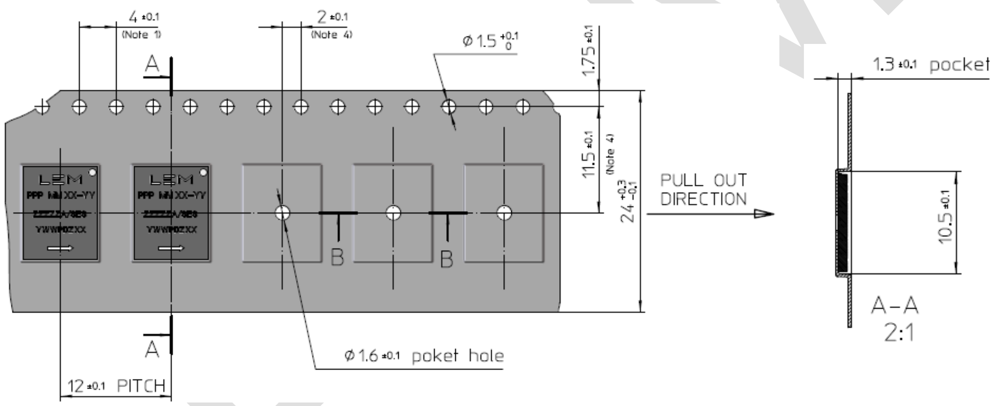
**Mechanical characteristics:** General tolerance ±0.15 mm
**Remark:** $U_{out} - U_{ref}$ is positive when $I_P$ flows in the direction of arrow (pin 1 to pin 8).

# Tape and Reel (in mm)

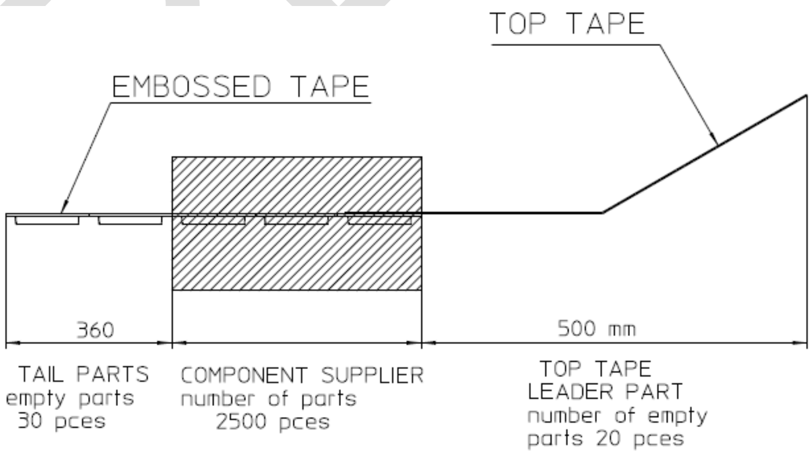
## Plastic Reel Data:




## Carrier Tape Data:




## Leader and Trailer:



# Safety

Caution

This transducer must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer’s operating instructions.

Caution, risk of electrical shock

This transducer must be used in limited-energy secondary circuits according to IEC 62368-1.
When operating the transducer, certain parts of the module can carry hazardous voltages and high currents (e.g. power supply, primary conductor). Ignoring this warning can lead to injury and or/or cause serious damage.
This transducer is a build-in device, whose hazardous live parts must be inaccessible after installation. A protective enclosure or additional shield could be used. Main supply must be able to be disconnected.

Although LEM applies utmost care to facilitate compliance of end products with applicable regulations during LEM product design, use of this part may need additional measures on the application side for compliance with regulations regarding EMC and protection against electric shock. Therefore, LEM cannot be held liable for any potential hazards, damages, injuries or loss of life resulting from the use of this product.

ESD susceptibility

This product is susceptible to be damaged from an ESD event and the personnel and workspace should be grounded when handling it.

c US Underwriters Laboratory Inc. recognized component

# Revision history

| Version | Date | Description |
|---|---|---|
| 0.1 | 15th of February 2024 | Initial Release – target datasheet |
| 0.4 | 27th of September 2024 | 8 products listed, performance update based on measurements, minor cosmetics improvements. |
| 0.5 | 8th of January 2025 | Correction on Total Error referred to IPM (previous version referring to Ipn) |
| 0.6 | 6th of March 2025 | New legal page added at the end of the document. UL added on safety page. |
| 0.7 | 19th of May 2026 | New Thermal characteristics, Electrical plots, Application Information, Tape and reel, Updated Parameters table, Application schematic, Block diagram, Terms and definitions |

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