# 200 A Ultra-Compact High-Current Sensor with Reinforced Isolation in 100 mm² Package

## FEATURES AND BENEFITS

- Low 50 µΩ primary conductor resistance for high efficiency and high inrush current capability in a thin surface-mount package with a small footprint suitable for space-constrained automotive applications
- 150 kHz analog output with a fast 4 µs response time
- High accuracy and low noise
  - ±1% sensitivity drift over temperature
  - ±7 mV offset drift over temperature
  - 3.3 V and 5 V non-ratiometric single supply operation
  - Differential sensing for common-mode field rejection
- Zero-current voltage reference output, VREF, for differential routing in noisy application environments
- Overcurrent fault output with adjustable threshold
- UL-certified, isolated, compact surface-mount package
  - 8 $kV_{PK}$ impulse withstand voltage
  - 1097 $V_{RMS}$ and 1550 $V_{DC}$ basic isolation voltage
  - 565 $V_{RMS}$ and 800 $V_{DC}$ reinforced isolation voltage
- Wide operating temperature, –40°C to 150°C
- AEC-Q100 Grade 0, automotive qualified

## PACKAGE:

8-pin flat PSOF (suffix LX)

*Not to scale*

## DESCRIPTION

The ACS37200 is a fully integrated current sensor that senses current flowing through the primary conductor of a compact 8-pin PSOF package. The LX package has very low internal conductor resistance of 50 µΩ and is designed to measure currents of up to 200 A. The current is sensed differentially via two Hall plates that provide common-mode field rejection and optimized performance in the presence of external magnetic fields.

The ACS37200 is factory calibrated for high accuracy over the entire operating temperature range. It is an automotive qualified grade 0 device capable of operating at temperatures between –40°C and 150°C. 5 V and 3.3 V supply voltage variants are available with current sensing ranges from 100 A to 200 A. The device features an overcurrent fault output, with a user-configurable threshold, and a dedicated voltage reference pin that outputs the zero-current analog signal.

The ACS37200 is a lead-free (Pb-free) device plated with 100% matte tin, compatible with standard lead-free printed circuit board assembly processes.

## TYPICAL APPLICATIONS

- Industrial Motor Control
- Solar and xEV Charging Infrastructure
- xEV On-Board Charger
- xEV DC-DC Converter

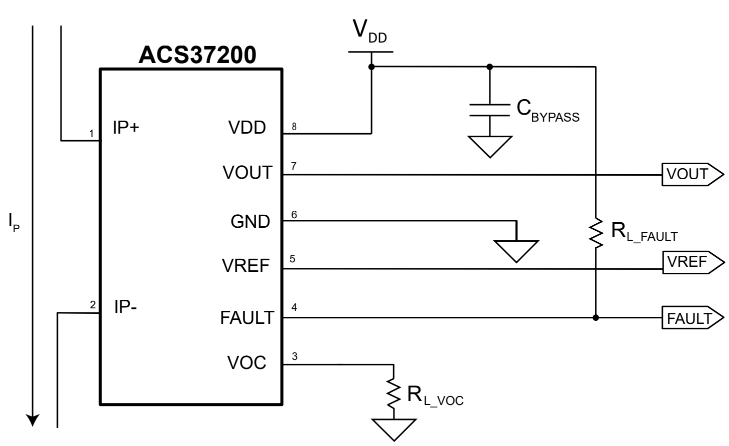


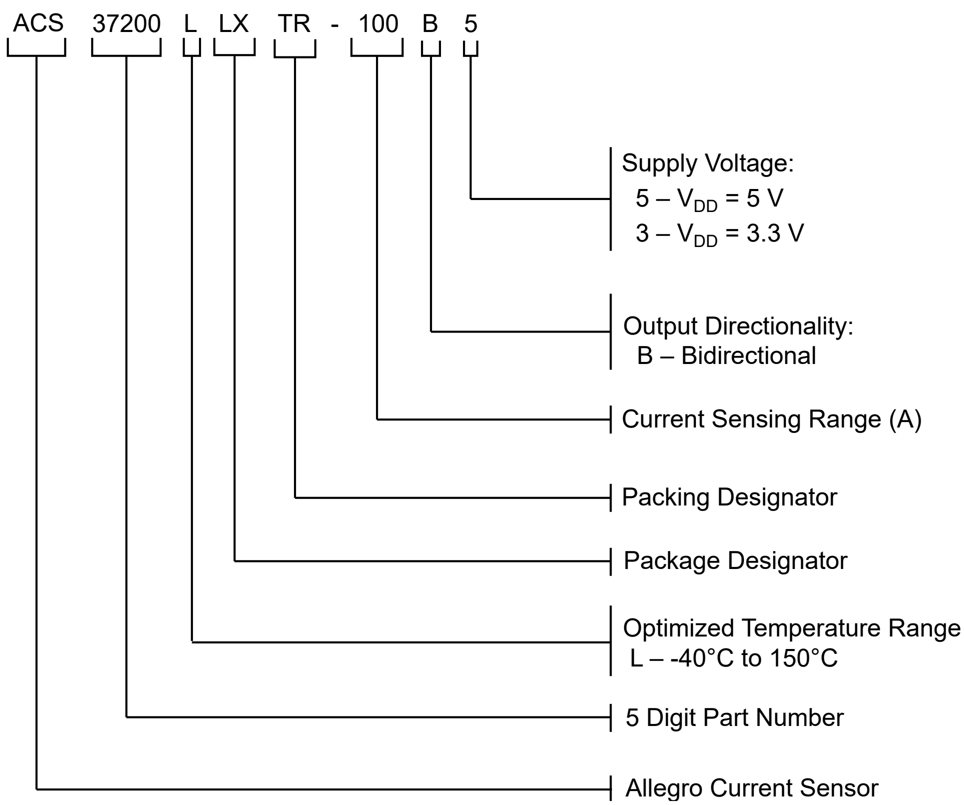

**Figure 1: Typical Application Circuit**

**The ACS37200 outputs an analog signal at VOUT that varies linearly with the primary current, $I_P$.**

## SELECTION GUIDE

| Part Number | Current Sensing Range, $I_{PR}$ (A) | Sensitivity (mV/A) | $V_{DD}$ (V) | $V_{QVO}$ (V) | Optimized Temperature Range, $T_A$ (°C) | Packing |
|---|---|---|---|---|---|---|
| ACS37200LLXTR-100B3 | ±100 | 13.2 | | | | |
| ACS37200LLXTR-150B3 | ±150 | 8.8 | 3.3 | 1.65 | | |
| ACS37200LLXTR-200B3 | ±200 | 6.6 | | | –40 to 150 | Tape and Reel, 2500 pieces per reel |
| ACS37200LLXTR-100B5 | ±100 | 20 | | | | |
| ACS37200LLXTR-150B5 | ±150 | 13.3 | 5 | 2.5 | | |
| ACS37200LLXTR-200B5 | ±200 | 10 | | | | |

## PART NAMING SPECIFICATION



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## ABSOLUTE MAXIMUM RATINGS [1]

| Characteristic | Symbol | Notes | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | | –0.5 | 6.5 | V |
| Output Voltage | $V_O$ | Applies to VOUT, VREF, VOC, and FAULT | –0.5 | ($V_{DD}$ + 0.7) < 6.5 | V |
| Operating Ambient Temperature | $T_A$ | | –40 | 150 | °C |
| Storage Temperature | $T_{stg}$ | | –65 | 165 | °C |
| Maximum Junction Temperature | $T_{J(MAX)}$ | | – | 165 | °C |

[1] Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

## ISOLATION CHARACTERISTICS

| Characteristic | Symbol | Notes | Value | Units |
|---|---|---|---|---|
| Withstand Voltage [1][2] | $V_{ISO}$ | Agency rated for 60 seconds per UL 62368-1 (edition 3) | 5656 | $V_{RMS}$ |
| Working Voltage for Basic Isolation [2] | $V_{WVBI}$ | Maximum approved working voltage for basic (single) isolation according to UL 62368-1 (edition 3) | 1550 | $V_{PK}$ or $V_{DC}$ |
| | | | 1097 | $V_{RMS}$ |
| Working Voltage for Reinforced Isolation [2] | $V_{WVRI}$ | Maximum approved working voltage for reinforced isolation according to UL 62368-1 (edition 3) | 800 | $V_{PK}$ or $V_{DC}$ |
| | | | 565 | $V_{RMS}$ |
| Impulse Withstand Voltage | $V_{IMPULSE}$ | Tested ±5 pulses at 2/minute in compliance to IEC 61000-4-5, 1.2 µs (rise) / 50 µs (width) | 8000 | $V_{PK}$ |
| Clearance | $D_{CL}$ | Minimum distance through air from IP leads to signal leads | 8 | mm |
| Creepage | $D_{CR}$ | Minimum distance along package body from IP leads to signal leads | 8 | mm |
| Distance Through Insulation | DTI | Nominal internal distance through insulation | 110 | µm |
| Comparative Tracking Index | CTI | Material Group II | 400 to 599 | V |

[1] Production tested for 1 second in accordance with UL 62368-1 (edition 3).
[2] Certification pending.

## PACKAGE CHARACTERISTICS

| Characteristic | Symbol | Notes | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Internal Conductor Resistance | $R_{IC}$ | $T_A$ = 25°C | – | 50 | 100 | µΩ |
| Internal Conductor Inductance | $L_{IC}$ | $T_A$ = 25°C | – | 4.5 | – | nH |
| Moisture Sensitivity Level | MSL | Per IPC/JEDEC J-STD-020 | – | 3 | – | – |


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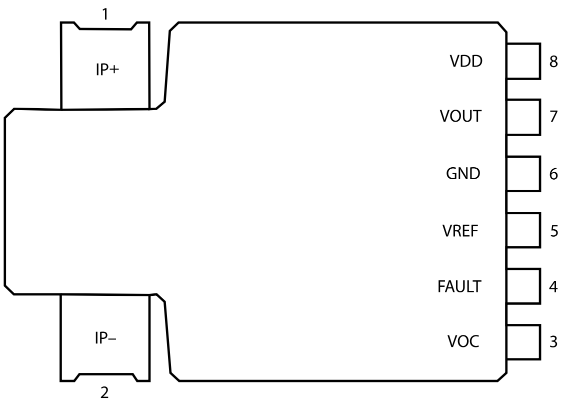


**Figure 2: LX Package, 8-Pin PSOF Pinout Diagram (top view)**

**Terminal List Table**

| Number | Name | Description |
|---|---|---|
| 1 | IP+ | Positive terminal for current being sensed |
| 2 | IP– | Negative terminal for current being sensed |
| 3 | VOC | User-configurable overcurrent fault threshold |
| 4 | FAULT | Overcurrent fault output, active low |
| 5 | VREF | Zero-current voltage reference output |
| 6 | GND | Device ground terminal |
| 7 | VOUT | Analog output |
| 8 | VDD | Device power supply terminal |

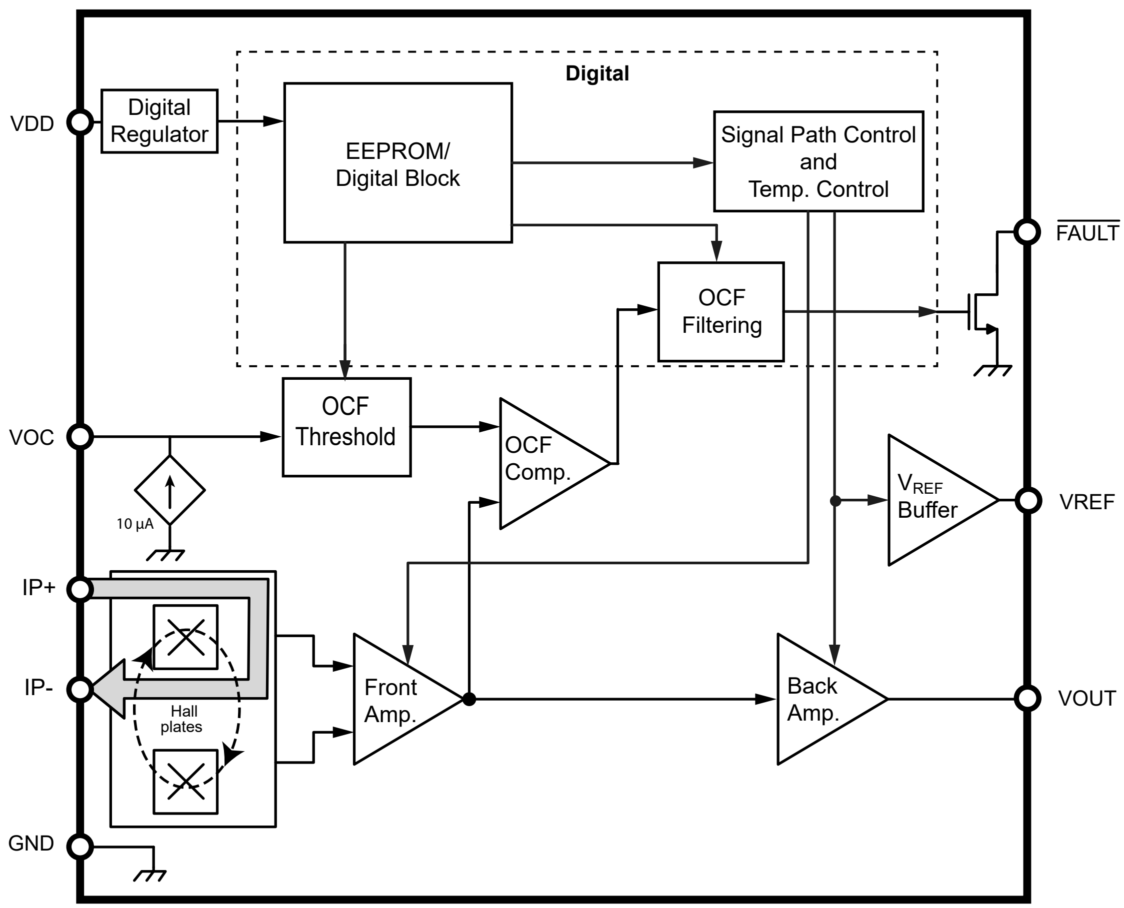


**Figure 3: Functional Block Diagram**



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**COMMON ELECTRICAL CHARACTERISTICS:** Valid through the full operating temperature range, $T_A$ = –40°C to 150°C, $C_{BYPASS}$ = 0.1µF, and $V_{DD} = V_{DD(Typ.)}$, unless specified otherwise. Minimum and maximum values are tested in production or validated by design and characterization.

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 5 V variant | 4.5 | 5 | 5.5 | V |
| | | 3.3 V variant | 3.15 | 3.3 | 3.45 | V |
| Supply Current | $I_{DD}$ | No load on VOUT, FAULT, and VOC | – | – | 21 | mA |
| Supply Bypass Capacitor | $C_{BYPASS}$ | | – | 0.1 | – | µF |
| Output Capacitive Load [1] | $C_{L\_VOUT}$ | | – | – | 4.7 | nF |
| Output Resistive Load [1] | $R_{L\_VOUT}$ | VOUT to GND, VOUT to VDD | 10 | – | – | kΩ |
| Power-On Reset Voltage | $V_{POR}$ | $T_A$ = 25°C, $V_{DD}$ rising 1 V/ms | 2.6 | – | 3 | V |
| Power-On Reset Hysteresis | $V_{POR\_HYS}$ | $T_A$ = 25°C | 150 | – | 450 | mV |
| Power-On Time | $t_{PO}$ | | – | 80 | – | µs |
| **OUTPUT SIGNAL CHARACTERISTICS (VOUT)** | | | | | | |
| Saturation Voltage [2] | $V_{SAT\_H}$ | $R_{L\_VOUT}$ = 10 kΩ, $V_{DD} = V_{DD(Typ.)}$ | $V_{DD}$ – 0.3 | – | – | V |
| | $V_{SAT\_L}$ | $R_{L\_VOUT}$ = 10 kΩ, $V_{DD} = V_{DD(Typ.)}$ | – | – | 0.2 | V |
| Short Circuit Current | $I_{SC\_VOUT}$ | VOUT to GND | – | 30 | – | mA |
| Bandwidth | BW | Small signal –3 dB, $C_{L\_VOUT}$ = 100 pF | – | 150 | – | kHz |
| Rise Time | $t_R$ | $C_{L\_VOUT}$ = 100 pF | – | 2.3 | – | µs |
| Response Time [1] | $t_{RESP}$ | $C_{L\_VOUT}$ = 100 pF | – | 3 | 4 | µs |
| Propagation Delay | $t_{PD}$ | $C_{L\_VOUT}$ = 100 pF | – | 1.6 | – | µs |
| Noise Density | $N_D$ | 5 V variant, $C_{L\_VOUT}$ = 1 nF, $T_A$ = 25°C | – | 360 | – | µA/√Hz |
| | | 3.3 V variant, $C_{L\_VOUT}$ = 1 nF, $T_A$ = 25°C | – | 590 | – | µA/√Hz |
| Common-Mode Field Rejection | CMFR | Input-referred error due to common-mode field | – | 2 | – | mA/G |
| **OVERCURRENT FAULT OUTPUT CHARACTERISTICS (FAULT)** | | | | | | |
| Overcurrent FAULT Threshold Range | $I_{OCR}$ | $T_A$ = 25°C | 50 | – | 200 | $\%I_{PR(Max.)}$ |
| VOC Input Linear Operating Range | $V_{OR\_VOC}$ | 5 V variant, $T_A$ = 25°C | 0.5 | 1 | 2 | V |
| | | 3.3 V variant, $T_A$ = 25°C | 0.33 | 0.66 | 1.32 | V |
| VOC Input Low Voltage | $V_{VOC\_L}$ | | – | 0.1 | – | V |
| Overcurrent FAULT Pull-Up Resistor | $R_{L\_FAULT}$ | | – | 10 | – | kΩ |
| Overcurrent FAULT Output Error | $E_{OC}$ | $T_A$ = 25°C | –12 | – | 12 | $\%I_{PR(Max.)}$ |
| Overcurrent FAULT Output Low Voltage | $V_{FAULT\_L}$ | $R_{L\_FAULT}$ = 10 kΩ, fault condition present | – | 0.3 | – | V |
| Overcurrent FAULT Leakage Current | $I_{FAULT\_OFF}$ | $R_{L\_FAULT}$ = 10 kΩ, no fault condition present | – | 100 | – | nA |
| Overcurrent FAULT Hysteresis | $I_{OC\_HYS}$ | $T_A$ = 25°C | 3.5 | – | – | $\%I_{PR(Max.)}$ |
| Overcurrent FAULT Response Time | $t_{OC\_RESP}$ | | – | 3 | – | µs |
| **ZERO-CURRENT VOLTAGE REFERENCE OUTPUT CHARACTERISTICS (VREF)** | | | | | | |
| VREF Resistive Load | $R_{L\_VREF}$ | | 10 | – | – | kΩ |
| VREF Capacitive Load | $C_{L\_VREF}$ | | – | – | 4.7 | nF |
| VREF Short-Circuit Current | $I_{SC\_VREF}$ | VREF shorted to GND | – | 25 | – | mA |
| | | VREF shorted to VDD | – | –2.1 | – | mA |

[1] Validated by design and characterization.
[2] The sensor may continue to respond to current beyond the specified Current Sensing Range, $I_{PR}$, until the output saturates at the high or low saturation voltage; however, the linearity and performance beyond the specified Current Sensing Range are not validated.



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Manchester, NH 03103-3353 U.S.A.
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**ACS37200LLXTR-100B3 PERFORMANCE CHARACTERISTICS:** Valid through the full operating temperature range, $T_A$ = –40°C to 150°C, $C_{BYPASS}$ = 0.1 µF, and $V_{DD}$ = 3.3 V, unless specified otherwise. Minimum and maximum values are tested in production.

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **NOMINAL PERFORMANCE** | | | | | | |
| Current Sensing Range [1] | $I_{PR}$ | Limited by $T_{J(MAX)}$ = 165°C | –100 | – | 100 | A |
| Sensitivity [2] | Sens | $I_{PR(Min.)} < I_P < I_{PR(Max.)}$ | – | 13.2 | – | mV/A |
| Quiescent Voltage Output | $V_{QVO}$ | $I_P$ = 0 A | – | 1.65 | – | V |
| Overcurrent FAULT Threshold | $I_{OC}$ | $V_{VOC}$ = 0.66 V or $V_{VOC} < V_{VOC\_L}$ | – | 100 | – | $\%I_{PR}$ |
| Reference Voltage Output | $V_{REF}$ | | – | 1.65 | – | V |
| **OVERCURRENT FAULT OUTPUT** | | | | | | |
| Overcurrent FAULT Error | $I_{OC\_E}$ | $V_{VOC}$ = 0.66 V, $T_A$ = 25°C | –12 | – | 12 | A |
| **ERROR COMPONENTS** | | | | | | |
| Sensitivity Error [2] | $E_{SENS}$ | On Allegro evaluation board, $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –2 | – | 2 | % |
| Quiescent Voltage Output Error | $V_{QVO\_E}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –10 | – | 10 | mV |
| Sensitivity Temperature Drift | $E_{SENS\_T}$ | | – | ±1 | – | % |
| Quiescent Voltage Output Temperature Drift | $V_{QVO\_T}$ | | – | ±7 | – | mV |
| Offset Error | $V_{OE}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –7 | – | 7 | mV |
| Noise | N | $T_A$ = 25°C, $C_{L\_VOUT}$ = 1 nF, BW = 150 kHz | – | 2.6 | – | $mV_{RMS}$ |
| Power Supply QVO Error | $V_{QVO\_PS}$ | $V_{DD}$ = 3.15 V, $V_{DD}$ = 3.45 V | –15 | – | 15 | mV |
| Power Supply Sensitivity Error | $E_{SENS\_PS}$ | $V_{DD}$ = 3.15 V, $V_{DD}$ = 3.45 V | –2.5 | – | 2.5 | % |
| **LIFETIME DRIFT** | | | | | | |
| Sensitivity Lifetime Drift | $E_{SENS\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –1.6 | ±0.9 | 1.6 | % |
| Quiescent Voltage Output Lifetime Drift | $V_{QVO\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |
| Offset Error Lifetime Drift | $V_{OE\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |

[1] Validated by design and characterization.
[2] See the Layout Guidelines section of this datasheet.



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**ACS37200LLXTR-150B3 PERFORMANCE CHARACTERISTICS:** Valid through the full operating temperature range, $T_A$ = –40°C to 150°C, $C_{BYPASS}$ = 0.1 µF, and $V_{DD}$ = 3.3 V, unless specified otherwise. Minimum and maximum values are tested in production.

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **NOMINAL PERFORMANCE** | | | | | | |
| Current Sensing Range [1] | $I_{PR}$ | Limited by $T_{J(MAX)}$ = 165°C | –150 | – | 150 | A |
| Sensitivity [2] | Sens | $I_{PR(Min.)} < I_P < I_{PR(Max.)}$ | – | 8.8 | – | mV/A |
| Quiescent Voltage Output | $V_{QVO}$ | $I_P$ = 0 A | – | 1.65 | – | V |
| Overcurrent FAULT Threshold | $I_{OC}$ | $V_{VOC}$ = 0.66 V or $V_{VOC} < V_{VOC\_L}$ | – | 150 | – | $\%I_{PR}$ |
| Reference Voltage Output | $V_{REF}$ | | – | 1.65 | – | V |
| **OVERCURRENT FAULT OUTPUT** | | | | | | |
| Overcurrent FAULT Error | $I_{OC\_E}$ | $V_{VOC}$ = 0.66 V, $T_A$ = 25°C | –18 | – | 18 | A |
| **ERROR COMPONENTS** | | | | | | |
| Sensitivity Error [2] | $E_{SENS}$ | On Allegro evaluation board, $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –2 | – | 2 | % |
| Quiescent Voltage Output Error | $V_{QVO\_E}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –10 | – | 10 | mV |
| Sensitivity Temperature Drift | $E_{SENS\_T}$ | | – | ±1 | – | % |
| Quiescent Voltage Output Temperature Drift | $V_{QVO\_T}$ | | – | ±7 | – | mV |
| Offset Error | $V_{OE}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –7 | – | 7 | mV |
| Noise | N | $T_A$ = 25°C, $C_{L\_VOUT}$ = 1 nF, BW = 150 kHz | – | 2.2 | – | $mV_{RMS}$ |
| Power Supply QVO Error | $V_{QVO\_PS}$ | $V_{DD}$ = 3.15 V, $V_{DD}$ = 3.45 V | –15 | – | 15 | mV |
| Power Supply Sensitivity Error | $E_{SENS\_PS}$ | $V_{DD}$ = 3.15 V, $V_{DD}$ = 3.45 V | –2.5 | – | 2.5 | % |
| **LIFETIME DRIFT** | | | | | | |
| Sensitivity Lifetime Drift | $E_{SENS\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –1.6 | ±0.9 | 1.6 | % |
| Quiescent Voltage Output Lifetime Drift | $V_{QVO\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |
| Offset Error Lifetime Drift | $V_{OE\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |

[1] Validated by design and characterization.
[2] See the Layout Guidelines section of this datasheet.



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**ACS37200LLXTR-200B3 PERFORMANCE CHARACTERISTICS:** Valid through the full operating temperature range, $T_A$ = –40°C to 150°C, $C_{BYPASS}$ = 0.1 µF, and $V_{DD}$ = 3.3 V, unless specified otherwise. Minimum and maximum values are tested in production.

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **NOMINAL PERFORMANCE** | | | | | | |
| Current Sensing Range [1] | $I_{PR}$ | Limited by $T_{J(MAX)}$ = 165°C | –200 | – | 200 | A |
| Sensitivity [2] | Sens | $I_{PR(Min.)} < I_P < I_{PR(Max.)}$ | – | 6.6 | – | mV/A |
| Quiescent Voltage Output | $V_{QVO}$ | $I_P$ = 0 A | – | 1.65 | – | V |
| Overcurrent FAULT Threshold | $I_{OC}$ | $V_{VOC}$ = 0.66 V or $V_{VOC} < V_{VOC\_L}$ | – | 100 | – | $\%I_{PR}$ |
| Reference Voltage Output | $V_{REF}$ | | – | 1.65 | – | V |
| **OVERCURRENT FAULT OUTPUT** | | | | | | |
| Overcurrent FAULT Error | $I_{OC\_E}$ | $V_{VOC}$ = 0.66 V, $T_A$ = 25°C | –24 | – | 24 | A |
| **ERROR COMPONENTS** | | | | | | |
| Sensitivity Error [2] | $E_{SENS}$ | On Allegro evaluation board, $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –2 | – | 2 | % |
| Quiescent Voltage Output Error | $V_{QVO\_E}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –10 | – | 10 | mV |
| Sensitivity Temperature Drift | $E_{SENS\_T}$ | | – | ±1 | – | % |
| Quiescent Voltage Output Temperature Drift | $V_{QVO\_T}$ | | – | ±7 | – | mV |
| Offset Error | $V_{OE}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –7 | – | 7 | mV |
| Noise | N | $T_A$ = 25°C, $C_{L\_VOUT}$ = 1 nF, BW = 150 kHz | – | 1.7 | – | $mV_{RMS}$ |
| Power Supply QVO Error | $V_{QVO\_PS}$ | $V_{DD}$ = 3.15 V, $V_{DD}$ = 3.45 V | –15 | – | 15 | mV |
| Power Supply Sensitivity Error | $E_{SENS\_PS}$ | $V_{DD}$ = 3.15 V, $V_{DD}$ = 3.45 V | –2.5 | – | 2.5 | % |
| **LIFETIME DRIFT** | | | | | | |
| Sensitivity Lifetime Drift | $E_{SENS\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –1.6 | ±0.9 | 1.6 | % |
| Quiescent Voltage Output Lifetime Drift | $V_{QVO\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |
| Offset Error Lifetime Drift | $V_{OE\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |

[1] Validated by design and characterization.
[2] See the Layout Guidelines section of this datasheet.



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**ACS37200LLXTR-100B5 PERFORMANCE CHARACTERISTICS:** Valid through the full operating temperature range, $T_A$ = –40°C to 150°C, $C_{BYPASS}$ = 0.1 µF, and $V_{DD}$ = 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **NOMINAL PERFORMANCE** | | | | | | |
| Current Sensing Range [1] | $I_{PR}$ | Limited by $T_{J(MAX)}$ = 165°C | –100 | – | 100 | A |
| Sensitivity [2] | Sens | $I_{PR(Min.)} < I_P < I_{PR(Max.)}$ | – | 20 | – | mV/A |
| Quiescent Voltage Output | $V_{QVO}$ | $I_P$ = 0 A | – | 2.5 | – | V |
| Overcurrent FAULT Threshold | $I_{OC}$ | $V_{VOC}$ = 1 V or $V_{VOC} < V_{VOC\_L}$ | – | 100 | – | %$I_{PR}$ |
| Reference Voltage Output | $V_{REF}$ | | – | 2.5 | – | V |
| **OVERCURRENT FAULT OUTPUT** | | | | | | |
| Overcurrent FAULT Error | $I_{OC\_E}$ | $V_{VOC}$ = 1 V, $T_A$ = 25°C | –12 | – | 12 | A |
| **ERROR COMPONENTS** | | | | | | |
| Sensitivity Error [2] | $E_{SENS}$ | On Allegro evaluation board, $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –2 | – | 2 | % |
| Quiescent Voltage Output Error | $V_{QVO\_E}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –10 | – | 10 | mV |
| Sensitivity Temperature Drift | $E_{SENS\_T}$ | | – | ±1 | – | % |
| Quiescent Voltage Output Temperature Drift | $V_{QVO\_T}$ | | – | ±7 | – | mV |
| Offset Error | $V_{OE}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –7 | – | 7 | mV |
| Noise | N | $T_A$ = 25°C, $C_{L\_VOUT}$ = 1 nF, BW = 150 kHz | – | 2.4 | – | $mV_{RMS}$ |
| Power Supply QVO Error | $V_{QVO\_PS}$ | $V_{DD}$ = 4.5 V, $V_{DD}$ = 5.5 V | –15 | – | 15 | mV |
| Power Supply Sensitivity Error | $E_{SENS\_PS}$ | $V_{DD}$ = 4.5 V, $V_{DD}$ = 5.5 V | –2.5 | – | 2.5 | % |
| **LIFETIME DRIFT** | | | | | | |
| Sensitivity Lifetime Drift | $E_{SENS\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –1.6 | ±0.9 | 1.6 | % |
| Quiescent Voltage Output Lifetime Drift | $V_{QVO\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |
| Offset Error Lifetime Drift | $V_{OE\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |

[1] Validated by design and characterization.
[2] See the Layout Guidelines section of this datasheet.



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**ACS37200LLXTR-150B5 PERFORMANCE CHARACTERISTICS:** Valid through the full operating temperature range, $T_A$ = –40°C to 150°C, $C_{BYPASS}$ = 0.1 µF, and $V_{DD}$ = 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **NOMINAL PERFORMANCE** | | | | | | |
| Current Sensing Range [1] | $I_{PR}$ | Limited by $T_{J(MAX)}$ = 165°C | –150 | – | 150 | A |
| Sensitivity [2] | Sens | $I_{PR(Min.)} < I_P < I_{PR(Max.)}$ | – | 13.3 | – | mV/A |
| Quiescent Voltage Output | $V_{QVO}$ | $I_P$ = 0 A | – | 2.5 | – | V |
| Overcurrent FAULT Threshold | $I_{OC}$ | $V_{VOC}$ = 1 V or $V_{VOC} < V_{VOC\_L}$ | – | 150 | – | $\%I_{PR}$ |
| Reference Voltage Output | $V_{REF}$ | | – | 2.5 | – | V |
| **OVERCURRENT FAULT OUTPUT** | | | | | | |
| Overcurrent FAULT Error | $I_{OC\_E}$ | $V_{VOC}$ = 1 V, $T_A$ = 25°C | –18 | – | 18 | A |
| **ERROR COMPONENTS** | | | | | | |
| Sensitivity Error [2] | $E_{SENS}$ | On Allegro evaluation board, $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –2 | – | 2 | % |
| Quiescent Voltage Output Error | $V_{QVO\_E}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –10 | – | 10 | mV |
| Sensitivity Temperature Drift | $E_{SENS\_T}$ | | – | ±1 | – | % |
| Quiescent Voltage Output Temperature Drift | $V_{QVO\_T}$ | | – | ±7 | – | mV |
| Offset Error | $V_{OE}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –7 | – | 7 | mV |
| Noise | N | $T_A$ = 25°C, $C_{L\_VOUT}$ = 1 nF, BW = 150 kHz | – | 2.4 | – | $mV_{RMS}$ |
| Power Supply QVO Error | $V_{QVO\_PS}$ | $V_{DD}$ = 4.5 V, $V_{DD}$ = 5.5 V | –15 | – | 15 | mV |
| Power Supply Sensitivity Error | $E_{SENS\_PS}$ | $V_{DD}$ = 4.5 V, $V_{DD}$ = 5.5 V | –2.5 | – | 2.5 | % |
| **LIFETIME DRIFT** | | | | | | |
| Sensitivity Lifetime Drift | $E_{SENS\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –1.6 | ±0.9 | 1.6 | % |
| Quiescent Voltage Output Lifetime Drift | $V_{QVO\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |
| Offset Error Lifetime Drift | $V_{OE\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |

[1] Validated by design and characterization.
[2] See the Layout Guidelines section of this datasheet.



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| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **NOMINAL PERFORMANCE** | | | | | | |
| Current Sensing Range [1] | $I_{PR}$ | Limited by $T_{J(MAX)}$ = 165°C | –200 | – | 200 | A |
| Sensitivity [2] | Sens | $I_{PR(Min.)} < I_P < I_{PR(Max.)}$ | – | 10 | – | mV/A |
| Quiescent Voltage Output | $V_{QVO}$ | $I_P$ = 0 A | – | 2.5 | – | V |
| Overcurrent FAULT Threshold | $I_{OC}$ | $V_{VOC}$ = 1 V or $V_{VOC} < V_{VOC\_L}$ | – | 100 | – | $\%I_{PR}$ |
| Reference Voltage Output | $V_{REF}$ | | – | 2.5 | – | V |
| **OVERCURRENT FAULT OUTPUT** | | | | | | |
| Overcurrent FAULT Error | $I_{OC\_E}$ | $V_{VOC}$ = 1 V, $T_A$ = 25°C | –24 | – | 24 | A |
| **ERROR COMPONENTS** | | | | | | |
| Sensitivity Error [2] | $E_{SENS}$ | On Allegro evaluation board, $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –2 | – | 2 | % |
| Quiescent Voltage Output Error | $V_{QVO\_E}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –10 | – | 10 | mV |
| Sensitivity Temperature Drift | $E_{SENS\_T}$ | | – | ±1 | – | % |
| Quiescent Voltage Output Temperature Drift | $V_{QVO\_T}$ | | – | ±7 | – | mV |
| Offset Error | $V_{OE}$ | $I_P$ = 0 A; $T_A$ = 25°C, $T_A$ = –40°C, $T_A$ = 150°C | –7 | – | 7 | mV |
| Noise | N | $T_A$ = 25°C, $C_{L\_VOUT}$ = 1 nF, BW = 150 kHz | – | 1.5 | – | $mV_{RMS}$ |
| Power Supply QVO Error | $V_{QVO\_PS}$ | $V_{DD}$ = 4.5 V, $V_{DD}$ = 5.5 V | –15 | – | 15 | mV |
| Power Supply Sensitivity Error | $E_{SENS\_PS}$ | $V_{DD}$ = 4.5 V, $V_{DD}$ = 5.5 V | –2.5 | – | 2.5 | % |
| **LIFETIME DRIFT** | | | | | | |
| Sensitivity Lifetime Drift | $E_{SENS\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –1.6 | ±0.9 | 1.6 | % |
| Quiescent Voltage Output Lifetime Drift | $V_{QVO\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |
| Offset Error Lifetime Drift | $V_{OE\_LT}$ | Based on six-sigma drift of worst-case distribution observed after AEC-Q100 qualification stresses | –11 | ±6 | 11 | mV |

[1] Validated by design and characterization.
[2] See the Layout Guidelines section of this datasheet.



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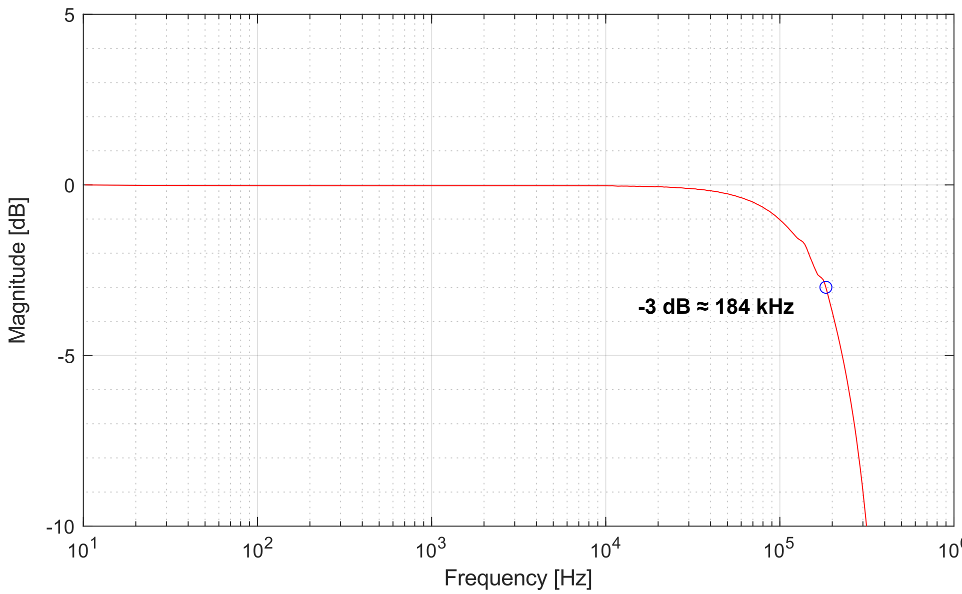
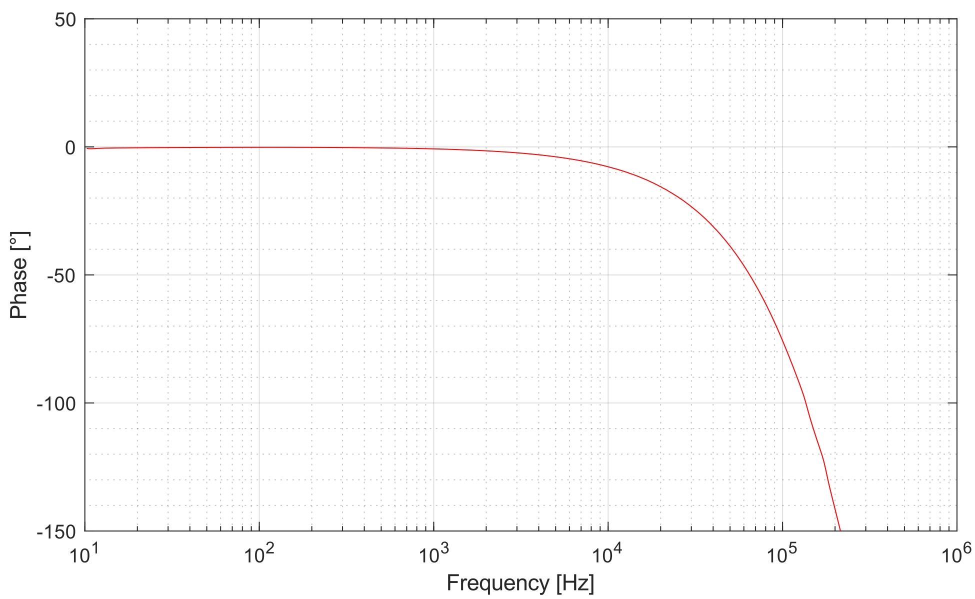
## ACS37200 TYPICAL FREQUENCY RESPONSE



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## RESPONSE CHARACTERISTICS DEFINITIONS AND PERFORMANCE DATA

### Response Time ($t_{RESP}$)

The time interval between a) when the sensed input current reaches 90% of its full-scale value, and b) when the sensor output, $V_{OUT}$, reaches 90% of its full-scale output value.

### Propagation Delay ($t_{PD}$)

The time interval between a) when the sensed input current reaches 20% of its full-scale value, and b) when the sensor output, $V_{OUT}$, reaches 20% of its full-scale output value.

### Rise Time ($t_R$)

The time interval between a) when the sensor output, $V_{OUT}$, reaches 10% of its full-scale value, and b) when the sensor output, $V_{OUT}$, reaches 90% of its full-scale value.

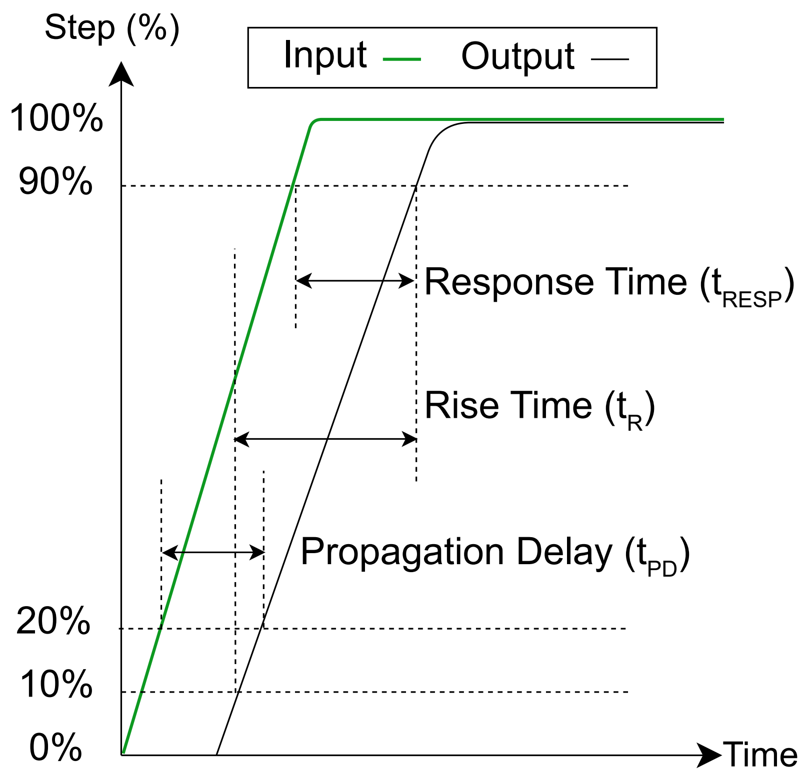


**Figure 4: Step Response Characteristics**



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## FUNCTIONAL DESCRIPTION OF POWER ON/OFF OPERATION

### Introduction

The graphs in this section show the behavior of $V_{OUT}$ as $V_{DD}$ reaches or falls below the required power-on voltage. Figure 5 and Figure 6 use the same labeling convention for different voltage thresholds. References in brackets "[ ]" are valid for each of these graphs.

#### POWER-ON OPERATION

As $V_{DD}$ ramps up, the VOUT pin is in a high-impedance (high-Z) state until $V_{DD}$ reaches and passes $V_{POR}$ [1]. Once $V_{DD}$ has passed $V_{POR}$ [1], $V_{OUT}$ enters normal operation and starts responding to applied current, $I_P$.

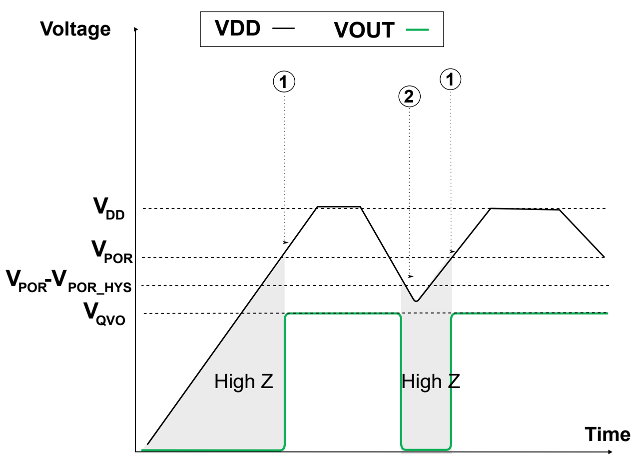


**Figure 5: Power-On And Power-Off Operation**

#### POWER-OFF OPERATION

As $V_{DD}$ drops below $V_{POR} - V_{POR\_HYS}$ the outputs enters a high-Z state. The hysteresis on the power-on voltage prevents noise on the supply line from causing $V_{OUT}$ to repeatedly enter and exit the high-Z state around the $V_{POR}$ level.

NOTE: Because the device is entering a high-Z state and not driving the output, the time it takes the output to reach a steady state depends on the external circuitry.

#### POWER-ON RESET RELEASE VOLTAGE

If $V_{DD}$ falls below $V_{POR} - V_{POR\_HYS}$ [2] while the sensor is in operation, the digital circuitry turns off and the output re-enters a high-Z state. After $V_{DD}$ recovers and exceeds $V_{POR}$ [1], the output enters normal operation after a delay of $t_{PO}$.

#### POWER-ON DELAY ($t_{PO}$)

When the supply voltage reaches $V_{POR}$ [1], the device requires a finite time to power its internal components before the outputs are released from the high-impedance state and start responding to the measured current, $I_P$. Power-On Time, $t_{PO}$, is defined as the time it takes for the output voltage to settle within ±10% of its steady-state value under an applied current, $I_P$, which can be seen as the time from [1] to [A] in Figure 6.

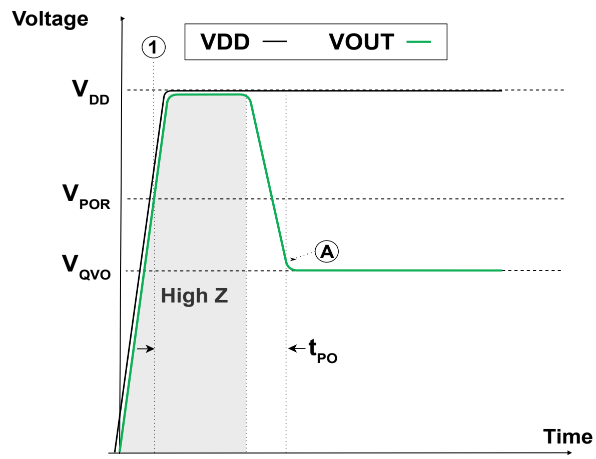


**Figure 6: Power-On Delay, $t_{PO}$**


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## DEFINITIONS OF OPERATING AND PERFORMANCE CHARACTERISTICS

### Quiescent Voltage Output ($V_{QVO}$)

Quiescent Voltage Output, $V_{QVO}$, is defined as the voltage on the output, $V_{OUT}$, when no current is applied, $I_P = 0$.

### Quiescent Voltage Output Error ($V_{QVO\_E}$)

Quiescent Voltage Output Error, $V_{QVO\_E}$, is defined as the deviation of $V_{QVO}$ from the nominal target zero-current output value in production testing.

### Quiescent Voltage Output Temperature Drift ($V_{QVO\_T}$)

Quiescent Voltage Output Temperature Drift, $V_{QVO\_T}$, is defined as the expected deviation of $V_{QVO}$ from its value at $T_A$= 25°C over the temperature range $T_A$= –40 to 150°C, based on observed three-sigma temperature drifts.

### Offset Error ($V_{OE}$)

The Offset Error, $V_{OE}$, is the difference between the Quiescent Voltage Output, $V_{QVO}$ ,and the voltage at the zero-current voltage output pin VREF, $V_{OE} = V_{REF} - V_{QVO}$.

### Output Saturation Voltage ($V_{SAT\_H}$ and $V_{SAT\_L}$)

Output Saturation Voltage, $V_{SAT}$, is defined as the low or high voltage that $V_{OUT}$ does not exceed. $V_{SAT\_H}$ is the highest voltage the output can reach, while $V_{SAT\_L}$ is the lowest. Note that changing the sensitivity does not change the $V_{SAT}$ points.

### Sensitivity (Sens)

Sensitivity, or Sens, is defined as the ratio of the $V_{OUT}$ swing and the current through the primary conductor, $I_P$. The current causes a voltage change on $V_{OUT}$ away from $V_{QVO}$ until $V_{SAT}$. The magnitude and direction of the output voltage is proportional to the magnitude and direction of the current, $I_P$. The proportional relationship between output voltage and current is Sensitivity, defined as:

$$Sens = [\, V_{OUT}(I_{P1}) - V_{OUT}(I_{P2})\, ] \,/\, [\, I_{P1} - I_{P2}\, ]$$

where $I_{P1}$ and $I_{P2}$ are two different currents, and $V_{OUT}(I_{P1})$ and $V_{OUT}(I_{P2})$ are the respective output voltages, at VOUT, at those currents.

### Sensitivity Error ($E_{SENS}$)

Sensitivity Error, $E_{SENS}$, is the deviation of Sensitivity from the nominal sensitivity target value in production testing.

### Sensitivity Temperature Drift ($E_{SENS\_T}$)

Sensitivity Temperature Drift, $E_{SENS\_T}$, is defined as the expected deviation of Sens from its value at $T_A$= 25°C over the temperature range $T_A$= –40 to 150°C, based on observed three-sigma temperature drifts.

### Lifetime Drift ($E_{SENS\_LT}$ , $V_{QVO\_LT}$ , and $V_{OE\_LT}$)

Sensitivity Lifetime Drift, $E_{SENS\_LT}$, Quiescent Voltage Output Lifetime Drift, $V_{QVO\_LT}$, and Offset Error Lifetime Drift, $V_{OE\_LT}$, are derived from the worst-case distribution observed during population testing under AEC-Q100 qualification stresses at $T_A$= 25°C, $T_A$= –40°C and $T_A$= 150°C. Lifetime drift is the change of Sens, $V_{QVO}$, or $V_{OE}$ from the pre-stress value. The minimum and maximum limits are population mean ±6 sigma, and the typical specification is mean ±3 sigma.

### Power Supply Sensitivity Error ($E_{SENS\_PS}$)

Power Supply Sensitivity Error, $E_{SENS\_PS}$, is defined as the percent change in Sens when $V_{DD}$ varies within the specified test voltages.

### Power Supply QVO Error ($V_{QVO\_PS}$)

Power Supply QVO Error, $V_{QVO\_PS}$, is defined as the change in $V_{QVO}$ when $V_{DD}$ varies within the specified test voltages.



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## OVERCURRENT FAULT FUNCTION

The Overcurrent Fault function pulls the open-drain FAULT pin low when the applied current, $I_P$, exceeds a set threshold, $I_{OC}$. The threshold $I_{OC}$ is adjustable via the VOC pin. Overcurrent FAULT activates symmetrically for positive and negative applied currents.

### VOLTAGE OVERCURRENT PIN (VOC)

The VOC pin is a voltage input that is used to set the Overcurrent FAULT Threshold, $I_{OC}$. There are two ways to set the threshold: 1) via a resistor, $R_{L\_VOC}$, between VOC and GND, or 2) by an external low-impedance voltage source connected to the VOC pin.

The ACS37200 has an internal factory-calibrated 10 µA current source at VOC. Connecting a resistor between VOC and GND sets the voltage at VOC via $V_{VOC}\,[V] = R_{L\_VOC}\,[\Omega] \times 10^{-5}\,[A]$. $R_{L\_VOC}$ must be chosen such that $V_{VOC}$ is between 0.5 V and 2 V for 5 V supply variants, or between 0.33 V and 1.32 V for 3.3 V supply variants. The relationship between $V_{VOC}$ and $I_{OC}$ is shown in Table 1. $I_{OC}$ is set as a percentage of the full-scale sensing range of the device, $I_{P(Max)}$, and can be between 50% $I_{P(Max)}$ and 200% $I_{P(Max)}$.

Additionally, the VOC pin has an internal voltage comparator and when $V_{VOC} < V_{VOC\_L}$, the device internally sets $I_{OC} = 100\%\ I_{P(Max)}$.

The voltage at VOC can also be set using an external low-impedance voltage source that overdrives the pin's internal 10 µA current source.

**Table 1: Overcurrent FAULT Threshold, $I_{OC}$, as set by $V_{VOC}$**

| $V_{VOC}$ (V) | | $I_{OC}$ (%$I_{P(Max)}$) |
|---|---|---|
| 5 V variants | 3.3 V variants | |
| < $V_{VOC\_L}$ | | 100 |
| 0.5 | 0.33 | 50 |
| 0.75 | 0.495 | 75 |
| 1 | 0.66 | 100 |
| 1.25 | 0.825 | 125 |
| 1.5 | 0.99 | 150 |
| 1.75 | 1.155 | 175 |
| 2 | 1.32 | 200 |

### VOC INPUT LINEAR OPERATING RANGE ($V_{OR\_VOC}$)

VOC Input Linear Operating Range, $V_{OR\_VOC}$, is the voltage range for $V_{VOC}$ in which the Overcurrent FAULT Threshold, $I_{OC}$, varies linearly with $V_{VOC}$. $I_{OC}$ can be set between 50% $I_{P(Max)}$ and 200% $I_{P(Max)}$ within the VOC Input Linear Operating Range.

### VOC INPUT LOW VOLTAGE ($V_{VOC\_L}$)

VOC Input Low Voltage, $V_{VOC\_L}$, is defined as the voltage at the VOC pin below which the Overcurrent FAULT Threshold is internally set to $I_{OC}$ = 100% $I_{P(Max)}$.

### OVERCURRENT FAULT OUTPUT ERROR ($E_{OC}$)

Overcurrent FAULT Error, $E_{OC}$, is defined as the difference between the set threshold, $I_{OC}$, and the measured current, $I_P$, at which Overcurrent FAULT activates.

### OVERCURRENT FAULT HYSTERESIS ($I_{OC\_HYST}$)

Overcurrent FAULT Hysteresis, $I_{OC\_HYST}$, is defined as the required decrease of $I_P$ below $I_{OC}$ before assertion at the FAULT pin is cleared. This can be seen as the difference between the levels [9] and [10] in Figure 7.

### OVERCURRENT FAULT RESPONSE TIME ($t_{OC\_RESP}$)

Overcurrent FAULT Response Time, $t_{OC\_RESP}$, is defined as the time between the current reaching the set threshold $I_{OC}$ and the FAULT pin falling below $V_{FAULT\_L}$.

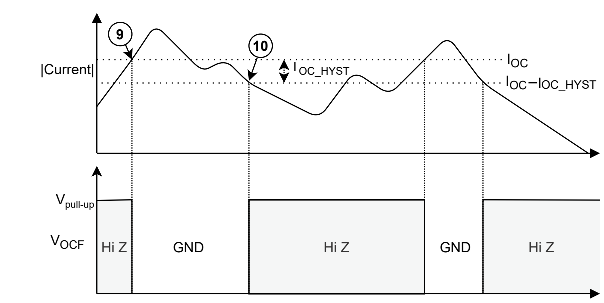


**Figure 7: Overcurrent FAULT Hysteresis**

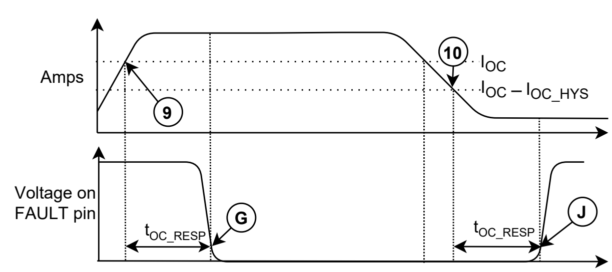


**Figure 8: Fault Timing Diagram**



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## LAYOUT GUIDELINES

### Introduction

The ACS37200 is factory calibrated to achieve the specified typical sensitivity when placed on the ACS37200 evaluation board (ACSEVB-LX8). Using the sensor on a PCB with substantially different layout, or layer stack-up, than the ACSEVB-LX8 can lead to systemic shifts of the typical value for sensitivity, Sens, specified in this datasheet. Design support files for the ACSEVB-LX8 are available for download from the Allegro website.

When the sensor is mounted on a PCB, three important factors might cause a shift in the typical value for Sens:

- PCB layer stack-up
- Trace layout for the measured current
- Thickness of the solder layer

Design support files to minimize sensitivity shifts due to PCB layout and solder variability will be available for download from the Allegro website. For more information, check the technical documents section of the ACS37200 website.

### Solder Stencil Grid and Voids

Voids in the solder on pins 1 and 2 (IP+ and IP–) increase the resistance of the solder joints and reduce heat conduction to the PCB. Voids can develop from solder flux outgassing. Trapped gas requires escape routes under the package during reflow soldering. To help create a path for outgassing, a grid can be added in the solder stencil. For an example solder stencil, see Figure 12.

### PCB Layout and Stack-Up

To minimize PCB layout-induced sensitivity shifts, it is recommended to use the general trace layout for the measured current as in the ACSEVB-LX8 evaluation board. See Figure 9 and check for design support document on how to minimize sensitivity shifts due to PCB layout in the technical documents section of the ACS37200 website.

### Evaluation Board Layout

The reported thermal performance and typical sensitivity are based on data collected using the LX Package Allegro Evaluation Board (ACSEVB-LX8) shown in Figure 10. Design support files are available for download from the Allegro website.

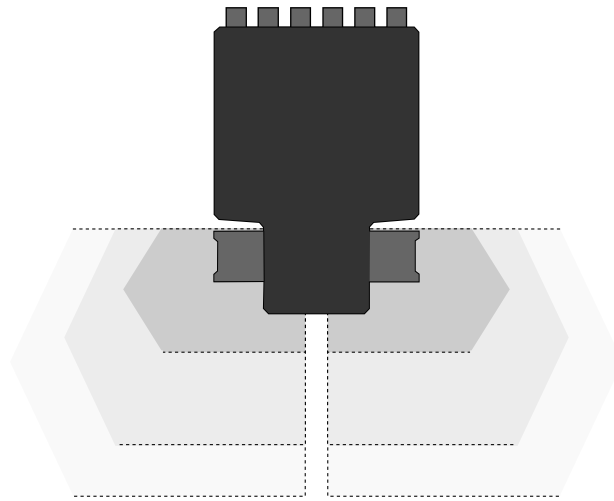

**Figure 9: Recommended Trace Layout for Pins 1 and 2 (IP+ and IP–)**

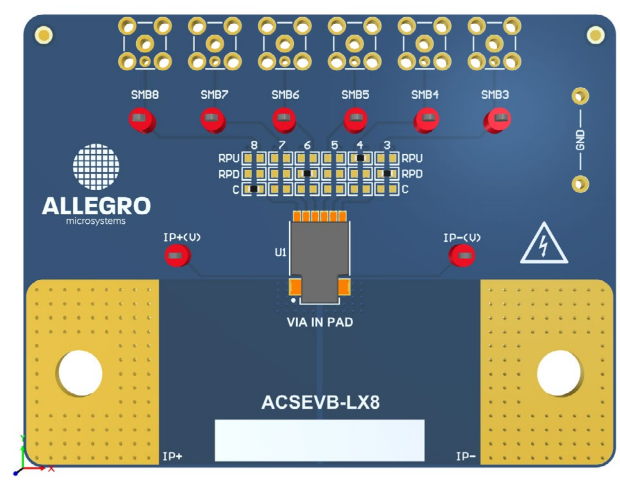


**Figure 10: LX Package Allegro Evaluation Board**



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## PACKAGE OUTLINE DRAWING

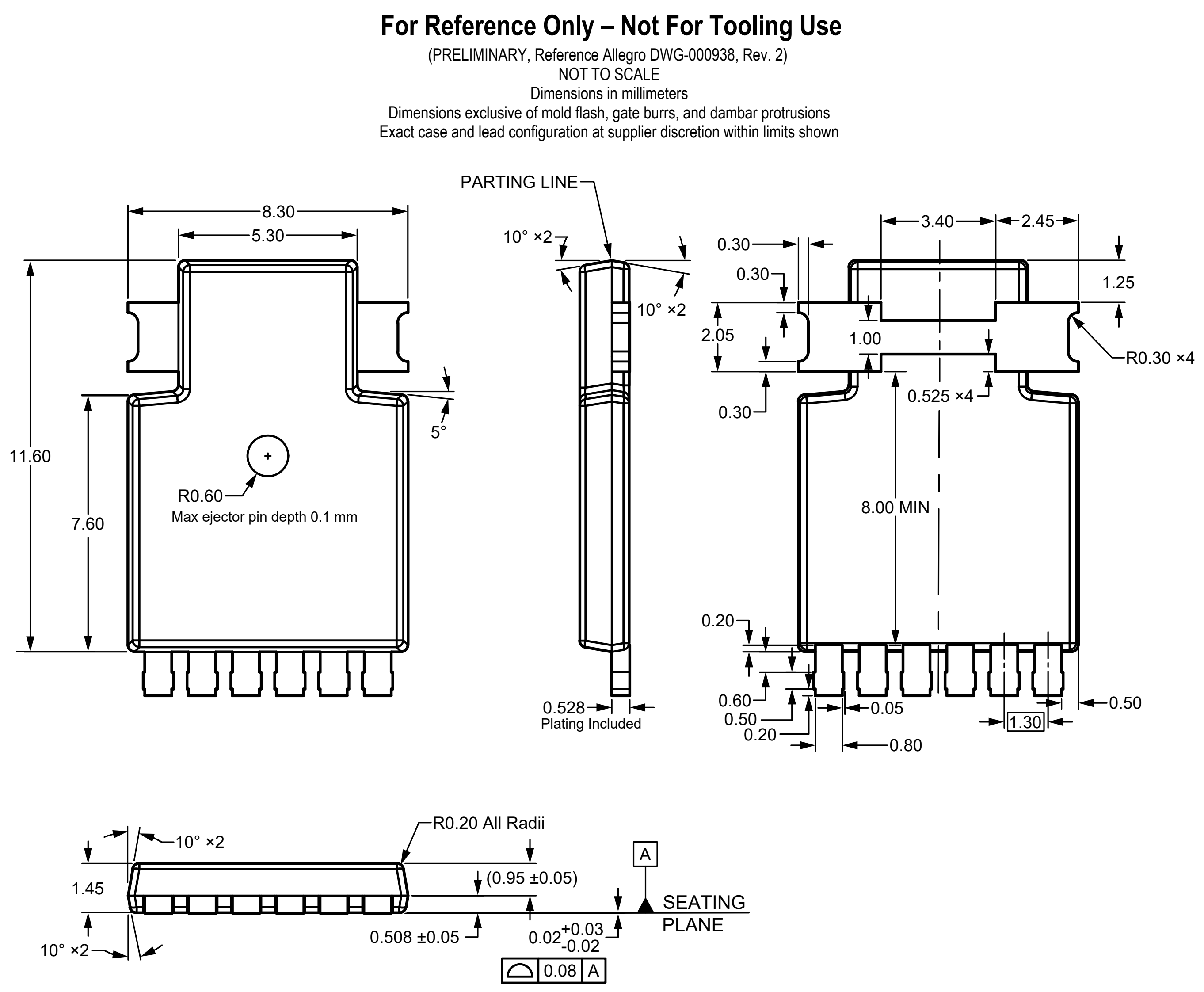


**Figure 11: LX Package, 8-pin flat PSOF**



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### LAND PATTERN AND SOLDER STENCIL

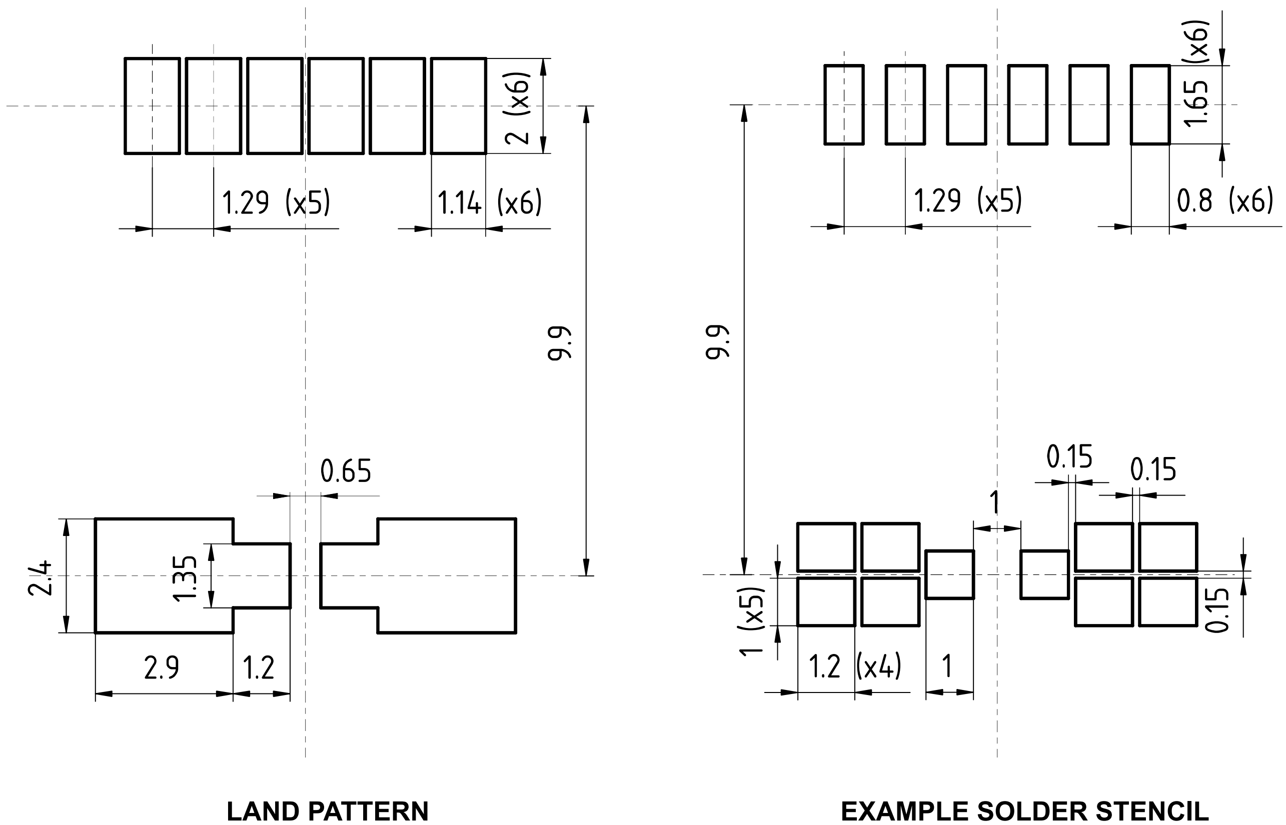


**Figure 12: LX Package Land Pattern And Example Solder Stencil. All dimensions are in mm.**



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## Revision History

| Number | Date | Description |
|---|---|---|
| – | March 12, 2026 | Initial release |



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