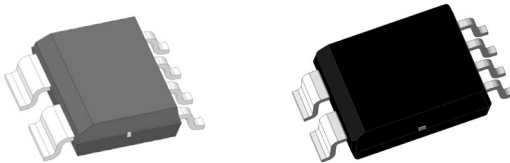


## DC to 5 MHz Bandwidth, Galvanically Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

### FEATURES AND BENEFITS

- High operating bandwidth for fast control loops or where high-speed switching currents are monitored
  - DC to 5 MHz bandwidth
  - 40 ns typical response time
- High accuracy and low noise
  - $\pm 2\%$  sensitivity error over temperature
  - $\pm 10$  mV maximum offset voltage over temperature
  - 50 mA<sub>RMS</sub> input referred noise
  - 3.3 V non-ratiometric supply operation
  - Differential sensing immune to external magnetic fields
- VREF output voltage for differential routing in noisy application environments (ACS37030)
- FAULT output for fast open drain overcurrent detection (ACS37032)
- UL-certified, highly isolated compact surface-mount packages
- Available in the 6-pin fused lead SOIC (suffix LZ) package (4 mm creepage) and the 6-pin fused-lead wide body SOIC (suffix MY) package (8 mm creepage)
- Wide operating temperature,  $-40^{\circ}\text{C}$  to  $150^{\circ}\text{C}$
- Grade 0, AEC-Q100 automotive qualified

### PACKAGE:



6-pin Fused-Lead SOIC (suffix LZ)      6-pin Fused-Lead Wide Body SOIC (suffix MY)  
*Not to Scale*

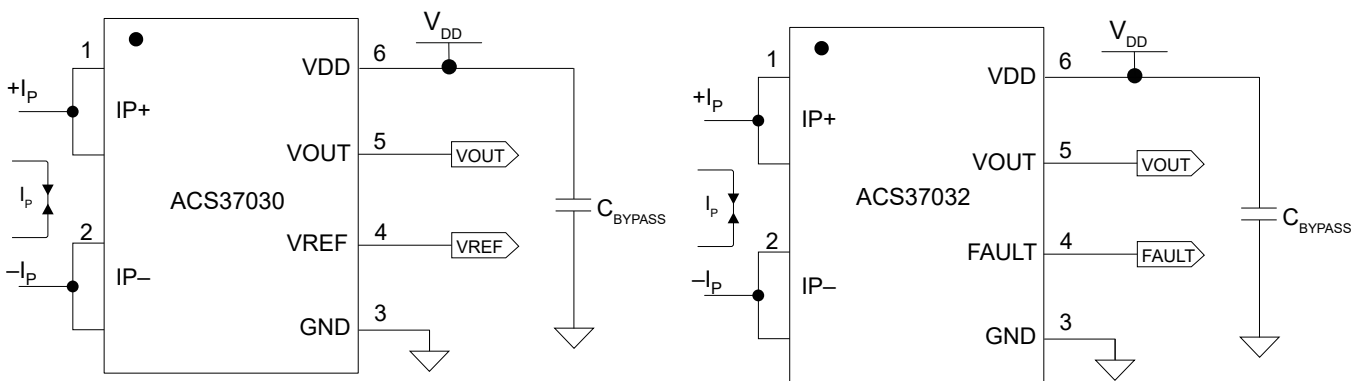
### DESCRIPTION

The ACS37030/2 is a fully integrated current sensor IC that senses current flowing through the primary conductor. Two signal paths are used: a Hall-effect element path to capture DC and low-frequency current information, and an inductive coil path to capture high-frequency current information. These two paths are summed to allow for sensing of a wide frequency band with a single device. The properties of the coil increase SNR as frequency increases, minimizing noise seen at the output.

The internal construction provides high isolation by magnetically coupling the field generated by current flow in the conductor to the fully monolithic Hall and coil IC. The current is sensed differentially by two Hall plates and two coils that subtract out interfering common-mode magnetic fields. The IC has no physical connection to the integrated current conductor and provides a 3500 V<sub>RMS</sub> (LZ package) and 4242 V<sub>RMS</sub> (MY package) isolation voltage between the primary signal leads. These high ratings provide a basic working voltage of 905 V<sub>RMS</sub> (LZ package) and 1000 V<sub>RMS</sub> (MY package) isolation voltage between the primary and secondary signal leads of the package.

Both zero current reference (ACS37030) and overcurrent fault with internal pull-up (ACS37032) options are available.

The ACS37030/32 is provided in two six-lead custom SOIC surface mount packages; these packages are low resistance,  $<1$  m $\Omega$  with fuse-lead current conductors. The LZ package has a resistance of 0.6 m $\Omega$  with a creepage/clearance of 4.1 mm, while the MY package has a resistance of 0.9 m $\Omega$  with a creepage/clearance of 8.5 mm. The leadframe is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free.



**Figure 1: Typical Application Circuit**

The device outputs an analog signal, V<sub>OUT</sub>, that varies linearly with the bidirectional AC or DC primary current, I<sub>P</sub>, within the ranges specified.

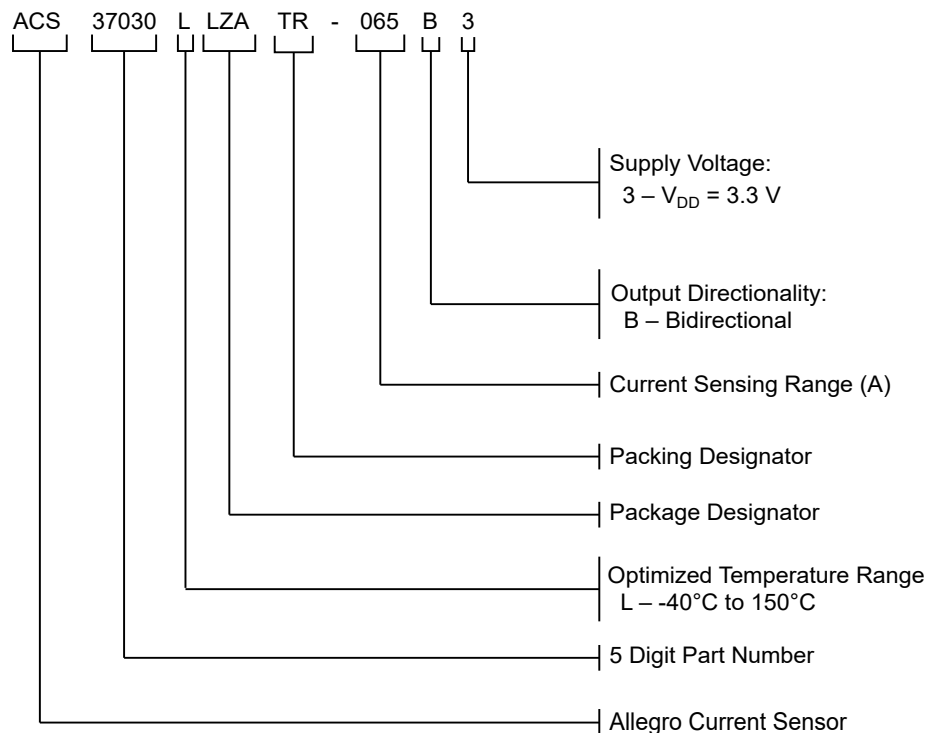
# ACS37030 and ACS37032

DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor  
IC with Reference Output (ACS37030) or Fault (ACS37032)

## SELECTION GUIDE

Part Number	Current Sensing Range, $I_{PR}$ (A)	Sensitivity (mV/A)	$V_{DD}$ (V)	$V_{QVO}$ (V)	Feature	Optimized Temperature Range $T_A$ (°C)	Packing
<b>LZ Package</b>							
ACS37030LLZATR-020B3	±20	66	3.3	1.65	VREF	-40 to 150	Tape and reel, 3000 pieces per reel
ACS37030LLZATR-040B3	±40	33					
ACS37030LLZATR-065B3	±65	20.3					
ACS37032LLZATR-020B3	±20	66			FAULT		
ACS37032LLZATR-040B3	±40	33					
ACS37032LLZATR-065B3	±65	20.3					
<b>MY Package (Wide Body)</b>							
ACS37030LMYATR-025B3	±25	52.8	3.3	1.65	VREF	-40 to 150	Tape and reel, 3000 pieces per reel
ACS37030LMYATR-040B3	±40	33					
ACS37030LMYATR-065B3	±65	20.3					
ACS37032LMYATR-025B3	±25	52.8			FAULT		
ACS37032LMYATR-040B3	±40	33					
ACS37032LMYATR-065B3	±65	20.3					

## PART NAMING SPECIFICATION



**ABSOLUTE MAXIMUM RATINGS [1]**

Characteristic	Symbol	Notes	Rating	Unit
Supply Voltage	$V_{DD}$		-0.5 to 4	V
Forward Output Voltage	$V_O$	Applies to $V_{OUT}$ , $V_{REF}$ , and FAULT	-0.5 to $V_{DD} + 0.5$ (< 3.8)	V
Operating Ambient Temperature	$T_A$	L temperature range	-40 to 150	°C
Storage Temperature	$T_{stg}$		-65 to 165	°C
Maximum Junction Temperature	$T_{JMAX}$	Sensing range of sensor is limited by $T_{JMAX} = 165^{\circ}\text{C}$	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.

**LZ PACKAGE ISOLATION CHARACTERISTICS**

Characteristic	Symbol	Notes	Value	Units
Withstand Strength [1][2]	$V_{ISO}$	Agency rated for 60 seconds per UL 62368-1 (edition 3)	3500	$V_{RMS}$
Working Voltage for Basic Isolation [2]	$V_{WVBI}$	Maximum approved working voltage for basic (single) isolation according to UL 62368-1 (edition 3)	1188	$V_{PK}$ or $V_{DC}$
			840	$V_{RMS}$
Working Voltage for Reinforced Isolation [2]	$V_{WVRI}$	Maximum approved working voltage for reinforced isolation according to UL 62368-1 (edition 3)	594	$V_{PK}$ or $V_{DC}$
			420	$V_{RMS}$
Surge Voltage	$V_{SURGE}$	1.2/50 $\mu\text{s}$ waveform, tested in dielectric fluid to determine the intrinsic surge immunity of the isolation barrier	13000	$V_{PK}$
Impulse Withstand	$V_{IMPULSE}$	1.2/50 $\mu\text{s}$ waveform, tested in air	5000	$V_{RMS}$
Clearance	$D_{CL}$	Minimum distance through air from IP leads to signal leads	4.1	mm
Creepage	$D_{CR}$	Minimum distance along package body from IP leads to signal leads	4.1	mm
Distance Through Insulation	DTI	Minimum internal distance through insulation	54	$\mu\text{m}$
Comparative Tracking Index	CTI	Material Group I	>600	V

[1] Production tested in accordance UL 62368-1 (edition 3).

[2] Certification pending.

**MY PACKAGE ISOLATION CHARACTERISTICS**

Characteristic	Symbol	Notes	Value	Units
Withstand Strength [1][2]	$V_{ISO}$	Agency rated for 60 seconds per UL 62368-1 (edition 3)	4242	$V_{RMS}$
Working Voltage for Basic Isolation [2]	$V_{WVBI}$	Maximum approved working voltage for basic (single) isolation according to UL 62368-1 (edition 3)	1414	$V_{PK}$ or $V_{DC}$
			1000	$V_{RMS}$
Working Voltage for Reinforced Isolation [2]	$V_{WVRI}$	Maximum approved working voltage for reinforced isolation according to UL 62368-1 (edition 3)	707	$V_{PK}$ or $V_{DC}$
			500	$V_{RMS}$
Surge Voltage	$V_{SURGE}$	1.2/50 $\mu\text{s}$ waveform, tested in dielectric fluid to determine the intrinsic surge immunity of the isolation barrier	10000	$V_{PK}$
Impulse Withstand	$V_{IMPULSE}$	1.2/50 $\mu\text{s}$ waveform, tested in air	6000	$V_{RMS}$
Clearance	$D_{CL}$	Minimum distance through air from IP leads to signal leads	8.5	mm
Creepage	$D_{CR}$	Minimum distance along package body from IP leads to signal leads	8.5	mm
Distance Through Insulation	DTI	Minimum internal distance through insulation	54	$\mu\text{m}$
Comparative Tracking Index	CTI	Material Group II	400 to 599	V

[1] Production tested in accordance UL 62368-1 (edition 3).

[2] Certification pending.

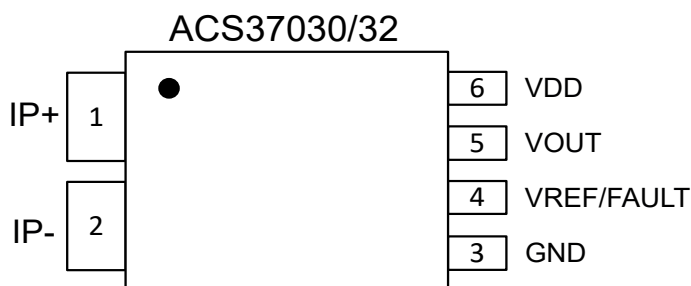
**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Notes	Value	Unit
Package Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$	LZ package; mounted on the standard LZ Current Sensor Evaluation Board (ACSEVB-LC8-LZ6)	16	$^{\circ}\text{C}/\text{W}$
		MY package; mounted on the standard MY Current Sensor Evaluation Board (ACSEVB-MZ6-MY6)	17	$^{\circ}\text{C}/\text{W}$
Package Thermal Metric (Junction to Top)	$\Psi_{JT}$	LZ package; mounted on the standard LZ Current Sensor Evaluation Board (ACSEVB-LC8-LZ6)	0	$^{\circ}\text{C}/\text{W}$
		MY package; mounted on the standard MY Current Sensor Evaluation Board (ACSEVB-MZ6-MY6)	-3	$^{\circ}\text{C}/\text{W}$
Package Thermal Resistance (Junction to Case)	$R_{\theta JC}$	LZ package; simulated per the methods in JESD51-1	23	$^{\circ}\text{C}/\text{W}$
		MY package; simulated per the methods in JESD51-1	26	$^{\circ}\text{C}/\text{W}$
Package Thermal Resistance (Junction to Board)	$R_{\theta JB}$	LZ package; simulated per the methods in JESD51-8	12	$^{\circ}\text{C}/\text{W}$
		MY package; simulated per the methods in JESD51-8	7	$^{\circ}\text{C}/\text{W}$

**PACKAGE CHARACTERISTICS**

Characteristic	Symbol	Notes	Min.	Typ.	Max.	Unit
Internal Conductor Resistance	$R_{IC}$	$T_A = 25^{\circ}\text{C}$ , LZ	-	0.68	-	m $\Omega$
		$T_A = 25^{\circ}\text{C}$ , MY	-	0.9	-	m $\Omega$
Internal Conductor Inductance	$L_{IC}$	$T_A = 25^{\circ}\text{C}$ , LZ	-	2.2	-	nH
		$T_A = 25^{\circ}\text{C}$ , MY	-	4.4	-	nH
Moisture Sensitivity Level	MSL	Per IPC/JEDEC J-STD-020	-	2	-	-

**PINOUT DIAGRAM AND TERMINAL LIST TABLE**



**Figure 2: Package Pinout Diagram**

**Terminal List**

Number	Name	Description
1	IP+	Positive terminal for current being sensed
2	IP-	Negative terminal for current being sensed
3	GND	Device ground terminal
4	VREF/FAULT	Reference or overcurrent fault output
5	VOUT	Analog output signal
6	VDD	Device power supply terminal

FUNCTIONAL BLOCK DIAGRAM

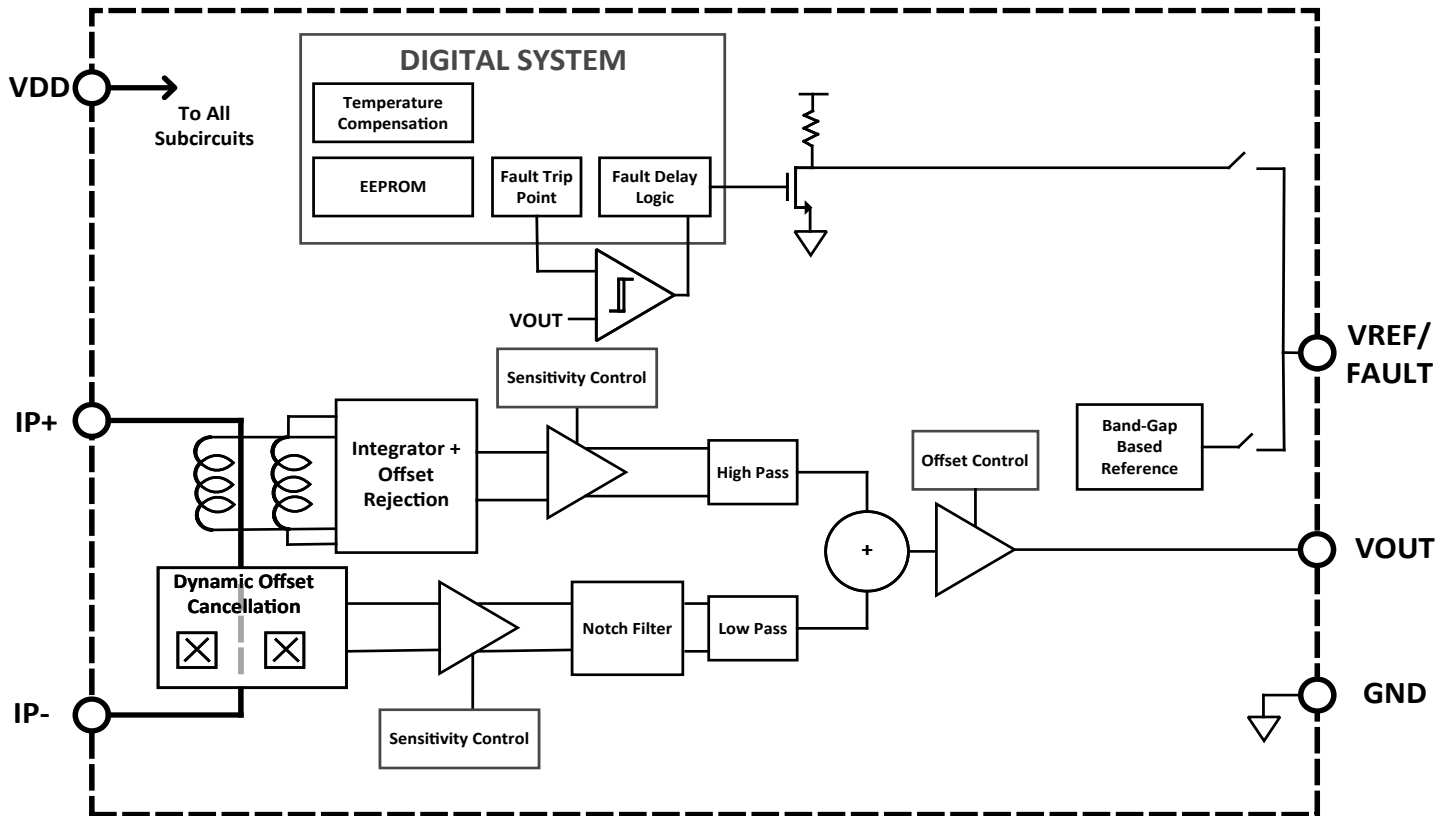


Figure 3: Functional Block Diagram

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**COMMON ELECTRICAL CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	$V_{\text{DD}}$		3	3.3	3.6	V
Supply Current	$I_{\text{DD}}$	No load on $V_{\text{OUT}}$ or $V_{\text{REF}}$	–	20	30	mA
Supply Bypass Capacitor [1]	$C_{\text{BYPASS}}$		0.1	–	–	$\mu\text{F}$
Output Resistive Load [1]	$R_{\text{L\_VOUT}}$		50	–	–	k $\Omega$
Output Capacitive Load	$C_{\text{L\_VOUT}}$		–	–	100	pF
Power-On Reset Voltage	$V_{\text{POR}}$	$T_A = 25^\circ\text{C}$ , $V_{\text{DD}}$ rising 1 V/ms	2.6	2.9	3	V
POR Hysteresis	$V_{\text{POR\_HYS}}$		200	250	–	mV
Power-On Time	$t_{\text{PO}}$		–	2	4	ms
<b>OUTPUT SIGNAL CHARACTERISTICS (VOUT)</b>						
Saturation Voltage [2]	$V_{\text{SAT\_H}}$	$R_{\text{L}} = 50 \text{ k}\Omega$ to GND	3	–	–	V
	$V_{\text{SAT\_L}}$	$R_{\text{L}} = 50 \text{ k}\Omega$ to $V_{\text{DD}}$	–	–	0.15	V
VOUT Short Circuit Current	$I_{\text{SC\_VOUT}}$	$T_A = 25^\circ\text{C}$ , VOUT to GND	–	25	–	mA
Bandwidth	BW	Small signal –3 dB, $C_{\text{L\_VOUT}} = 100 \text{ pF}$	–	5	–	MHz
Rise Time	$t_{\text{R}}$	$T_A = 25^\circ\text{C}$ , $C_{\text{L\_VOUT}} = 100 \text{ pF}$	–	40	–	ns
Response Time	$t_{\text{RESP}}$	$T_A = 25^\circ\text{C}$ , $C_{\text{L\_VOUT}} = 100 \text{ pF}$	–	40	–	ns
Propagation Delay	$t_{\text{PD}}$	$T_A = 25^\circ\text{C}$ , $C_{\text{L\_VOUT}} = 100 \text{ pF}$	–	30	–	ns
Noise	$I_{\text{N}}$	BW = 5 MHz, $T_A = 25^\circ\text{C}$ , $C_{\text{L\_VOUT}} = 100 \text{ pF}$	–	50	–	$\text{mA}_{\text{RMS}}$
Common-Mode Field Rejection	CMFR	Input-referred error due to a common-mode field	–	1.6	–	$\text{mA/G}$
<b>REFERENCE OUTPUT CHARACTERISTICS (VREF, ACS37030 only)</b>						
Reference Resistive Load	$R_{\text{L\_VREF}}$		50	–	–	k $\Omega$
Reference Capacitive Load	$C_{\text{L\_VREF}}$		–	–	100	pF
Reference Source/Sink Current Limit	$I_{\text{REF}}$	Maximum current $V_{\text{REF}}$ can passively source	–	25	–	mA
<b>FAULT OUTPUT CHARACTERISTICS (FAULT, ACS37032 only)</b>						
Overcurrent Operating Range	$I_{\text{OCR}}$		90	100	110	%
Internal Overcurrent FAULT Pull-Up Resistance	$R_{\text{L\_IFault}}$		–	10	–	k $\Omega$
Overcurrent FAULT Error	$E_{\text{OC}}$	$T_A = 25^\circ\text{C}$	–10	–	10	% $I_{\text{OCR}}$ [3]
Overcurrent FAULT Output Low Voltage	$V_{\text{FAULT\_L}}$	$R_{\text{L\_FAULT}} = 50 \text{ k}\Omega$ , fault condition present	–	0.1	0.4	V
Overcurrent FAULT Leakage Current	$I_{\text{FAULT\_OFF}}$	$R_{\text{L\_FAULT}} = 50 \text{ k}\Omega$ , no fault condition present	–	100	500	nA
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		–	6	10	% $I_{\text{PR}}$
Overcurrent Response Time [2]	$t_{\text{OC\_RESP}}$		–	150	–	ns
Overcurrent Hold Time [2]	$t_{\text{OC\_HLD}}$		–	0.1	–	ms

[1] Validated by design and characterization.

[2] The sensor may continue to respond to current beyond the specified Current Sensing Range,  $I_{\text{PR}}$ , 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.

[3] Where  $I_{\text{OCR}}$  is the specific point at which the overcurrent FAULT trigger will occur.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37030LLZATR-020B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-20	-	20	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	66	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Reference Voltage Output	$V_{\text{REF}}$		-	1.65	-	V
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Offset Error	$V_{\text{OE}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Reference Voltage Output Error	$V_{\text{REF\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-3.5	-	3.5	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-3.75	-	3.75	%
Offset Error Including Lifetime Drift	$V_{\text{OE\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV
Reference Voltage Error Including Lifetime Drift	$V_{\text{REF\_LT}}$	$T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift minimum/maximum values are  $\pm 3$  sigma, and are based on a statistical combination of production distributions and worst-case drift distributions observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37030LLZATR-040B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-40	-	40	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	33	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Reference Voltage Output	$V_{\text{REF}}$		-	1.65	-	V
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Offset Error	$V_{\text{OE}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Reference Voltage Output Error	$V_{\text{REF\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-3.5	-	3.5	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-3.75	-	3.75	%
Offset Error Including Lifetime Drift	$V_{\text{OE\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV
Reference Voltage Error Including Lifetime Drift	$V_{\text{REF\_LT}}$	$T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift minimum/maximum values are  $\pm 3$  sigma, and are based on a statistical combination of production distributions and worst-case drift distributions observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37030LLZATR-065B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-65	-	65	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	20.3	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Reference Voltage Output	$V_{\text{REF}}$		-	1.65	-	V
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Offset Error	$V_{\text{OE}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Reference Voltage Output Error	$V_{\text{REF\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-3.5	-	3.5	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-3.75	-	3.75	%
Offset Error Including Lifetime Drift	$V_{\text{OE\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV
Reference Voltage Error Including Lifetime Drift	$V_{\text{REF\_LT}}$	$T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift minimum/maximum values are  $\pm 3$  sigma, and are based on a statistical combination of production distributions and worst-case drift distributions observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37032LLZATR-020B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-20	-	20	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	66	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Overcurrent FAULT Threshold	$I_{\text{OC}}$		-	100	-	$\%I_{\text{PR}}$
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		-	1.2	-	A
<b>FAULT ERROR</b>						
Overcurrent Fault Error	$I_{\text{OC\_E}}$		-2	-	2	A
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-3.5	-	3.5	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-3.75	-	3.75	%
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift minimum/maximum values are  $\pm 3$  sigma, and are based on a statistical combination of production distributions and worst-case drift distributions observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37032LLZATR-040B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-40	-	40	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	33	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Overcurrent FAULT Threshold	$I_{\text{OC}}$		-	100	-	% $I_{\text{PR}}$
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		-	2.4	-	A
<b>FAULT ERROR</b>						
Overcurrent Fault Error	$I_{\text{OC\_E}}$		-4	-	4	A
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-3.5	-	3.5	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-3.75	-	3.75	%
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift minimum/maximum values are  $\pm 3$  sigma, and are based on a statistical combination of production distributions and worst-case drift distributions observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37032LLZATR-065B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. <sup>[1]</sup>	Typ.	Max. <sup>[1]</sup>	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range	$I_{\text{PR}}$		-65	-	65	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	20.3	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Overcurrent FAULT Threshold	$I_{\text{OC}}$		-	100	-	% $I_{\text{PR}}$
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		-	3.9	-	A
<b>FAULT ERROR</b>						
Overcurrent Fault Error	$I_{\text{OC\_E}}$		-6.5	-	6.5	A
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = 40 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT <sup>[2][3]</sup></b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = 40 \text{ A}$ , DC	-3.5	-	3.5	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-3.75	-	3.75	%
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$	-10	-	10	mV

<sup>[1]</sup> Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

<sup>[2]</sup> Validated by design and characterization

<sup>[3]</sup> Lifetime drift minimum/maximum values are  $\pm 3$  sigma, and are based on a statistical combination of production distributions and worst-case drift distributions observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37030LMYATR-025B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-25	-	25	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	52.8	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Reference Voltage Output	$V_{\text{REF}}$		-	1.65	-	V
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Offset Error	$V_{\text{OE}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Reference Voltage Output Error	$V_{\text{REF\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-	$\pm 1.6$	-	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-	$\pm 1$	-	%
Offset Error Including Lifetime Drift	$V_{\text{OE\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 0.35$	-	mV
Reference Voltage Error Including Lifetime Drift	$V_{\text{REF\_LT}}$	$T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1$	-	mV
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1.65$	-	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

**ACS37030LMYATR-040B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-40	-	40	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	33	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Reference Voltage Output	$V_{\text{REF}}$		-	1.65	-	V
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Offset Error	$V_{\text{OE}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Reference Voltage Output Error	$V_{\text{REF\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-	$\pm 1.6$	-	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-	$\pm 1$	-	%
Offset Error Including Lifetime Drift	$V_{\text{OE\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 0.35$	-	mV
Reference Voltage Error Including Lifetime Drift	$V_{\text{REF\_LT}}$	$T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1$	-	mV
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1.65$	-	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37030LMYATR-065B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-65	-	65	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	20.3	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Reference Voltage Output	$V_{\text{REF}}$		-	1.65	-	V
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Offset Error	$V_{\text{OE}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Reference Voltage Output Error	$V_{\text{REF\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-	$\pm 1.6$	-	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-	$\pm 1$	-	%
Offset Error Including Lifetime Drift	$V_{\text{OE\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 0.35$	-	mV
Reference Voltage Error Including Lifetime Drift	$V_{\text{REF\_LT}}$	$T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1$	-	mV
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1.65$	-	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37032LMYATR-025B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-25	-	25	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	52.8	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Overcurrent FAULT Threshold	$I_{\text{OC}}$		-	100	-	% $I_{\text{PR}}$
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		-	1.2	-	A
<b>FAULT ERROR</b>						
Overcurrent Fault Error	$I_{\text{OC\_E}}$		-2	-	2	A
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-	$\pm 1.6$	-	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-	$\pm 1$	-	%
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1.65$	-	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37032LMYATR-040B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

Characteristic	Symbol	Test Conditions	Min. [1]	Typ.	Max. [1]	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range [2]	$I_{\text{PR}}$	Limited by $T_{\text{JMAX}} = 165^\circ\text{C}$	-40	-	40	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	33	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Overcurrent FAULT Threshold	$I_{\text{OC}}$		-	100	-	% $I_{\text{PR}}$
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		-	2.4	-	A
<b>FAULT ERROR</b>						
Overcurrent Fault Error	$I_{\text{OC\_E}}$		-4	-	4	A
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT [2][3]</b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = I_{\text{PR}(\text{max})}$ , DC	-	$\pm 1.6$	-	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-	$\pm 1$	-	%
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1.65$	-	mV

[1] Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

[2] Validated by design and characterization

[3] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

# ACS37030 and ACS37032

## DC to 5 MHz Bandwidth, Isolated, High-Accuracy Current Sensor IC with Reference Output (ACS37030) or Fault (ACS37032)

**ACS37032LMYATR-065B3 PERFORMANCE CHARACTERISTICS:** Valid through full operating temperature range,  $T_A = -40^\circ\text{C}$  to  $150^\circ\text{C}$ ,  $C_{\text{BYPASS}} = 0.1 \mu\text{F}$ , and  $V_{\text{DD}} = 3.3 \text{ V}$ , unless otherwise specified

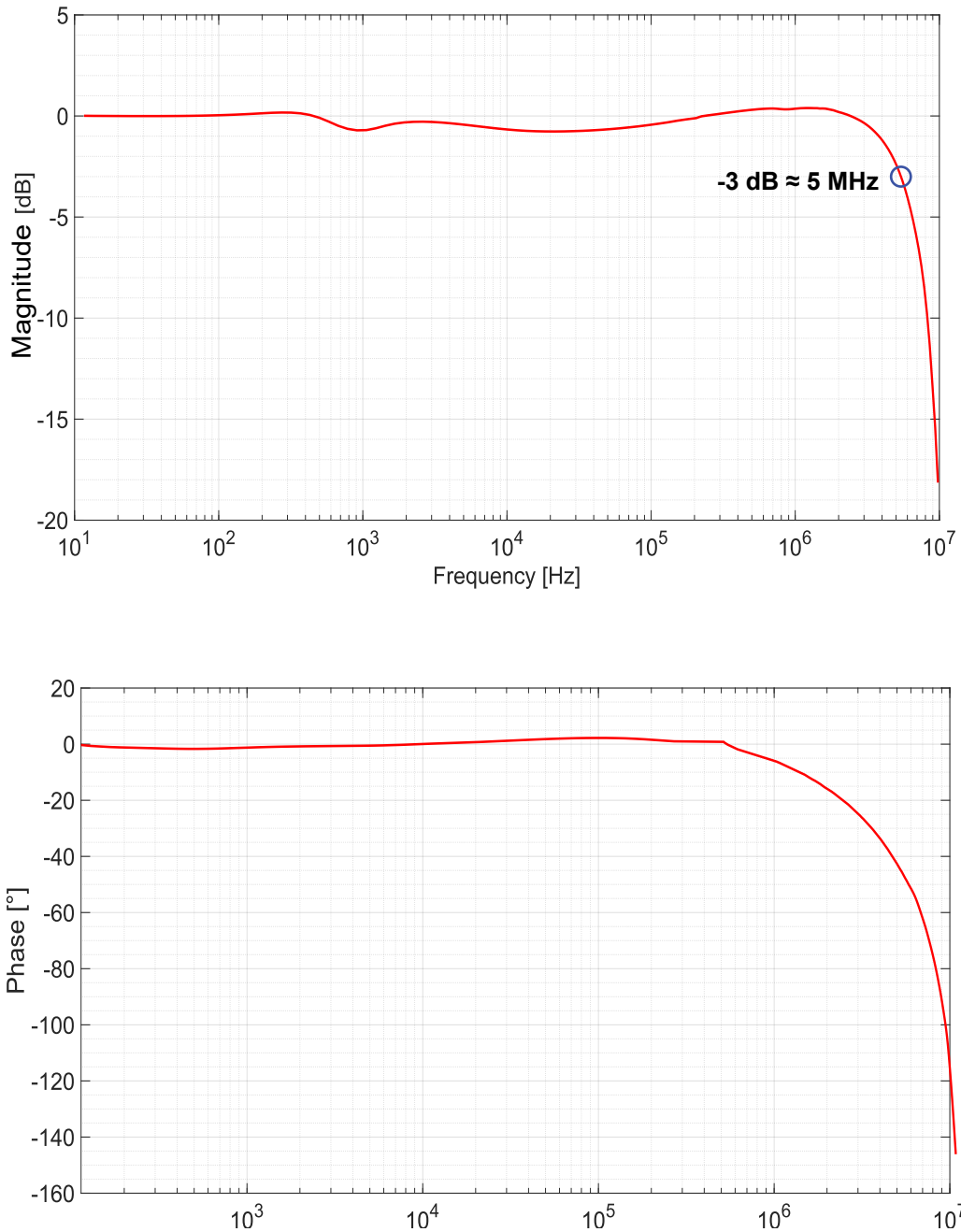
Characteristic	Symbol	Test Conditions	Min. <sup>[1]</sup>	Typ.	Max. <sup>[1]</sup>	Units
<b>NOMINAL PERFORMANCE</b>						
Current Sensing Range	$I_{\text{PR}}$		-65	-	65	A
Sensitivity	Sens	$I_{\text{PR}(\text{min})} < I_{\text{P}} < I_{\text{PR}(\text{max})}$	-	20.3	-	mV/A
Quiescent Voltage Output	$V_{\text{QVO}}$	$I_{\text{P}} = 0 \text{ A}$	-	1.65	-	V
Overcurrent FAULT Threshold	$I_{\text{OC}}$		-	100	-	% $I_{\text{PR}}$
Overcurrent FAULT Hysteresis	$I_{\text{OC\_HYS}}$		-	3.9	-	A
<b>FAULT ERROR</b>						
Overcurrent Fault Error	$I_{\text{OC\_E}}$		-6.5	-	6.5	A
<b>ERROR COMPONENTS</b>						
Sensitivity Error	$E_{\text{SENS}}$	$I_{\text{P}} = 40 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , DC	-2	$\pm 1$	2	%
		$I_{\text{P}} = 7 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$ , 500 kHz	-	$\pm 2$	-	%
Quiescent Voltage Output Error	$V_{\text{QVO\_E}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$	-10	$\pm 5$	10	mV
Power Supply Offset Error	$V_{\text{OE\_PS}}$	$V_{\text{DD}(\text{min})}$ to $V_{\text{DD}(\text{max})}$	-5	$\pm 3$	5	mV
Power Supply Sensitivity Error	$E_{\text{SENS\_PS}}$	$V_{\text{DD}(\text{min.})}$ to $V_{\text{DD}(\text{max})}$	-1.5	$\pm 1$	1.5	%
<b>ERROR INCLUDING LIFETIME DRIFT <sup>[2][3]</sup></b>						
Hall Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_H\_LT}}$	$I_{\text{P}} = 40 \text{ A}$ , DC	-	$\pm 1.6$	-	%
Coil Path Sensitivity Error Including Lifetime Drift	$E_{\text{SENS\_C\_LT}}$	$I_{\text{P}} = 7 \text{ A}$ , AC	-	$\pm 1$	-	%
Quiescent Voltage Error Including Lifetime Drift	$V_{\text{QVO\_LT}}$	$I_{\text{P}} = 0 \text{ A}$ , $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$	-	$\pm 1.65$	-	mV

<sup>[1]</sup> Absolute minimum (Min. or min) and absolute maximum (Max. or max) are the production limits that the device must not exceed.

<sup>[2]</sup> Validated by design and characterization

<sup>[3]</sup> Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

**ACS37030/2 TYPICAL FREQUENCY RESPONSE**



**RESPONSE CHARACTERISTICS DEFINITIONS AND PERFORMANCE DATA**

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

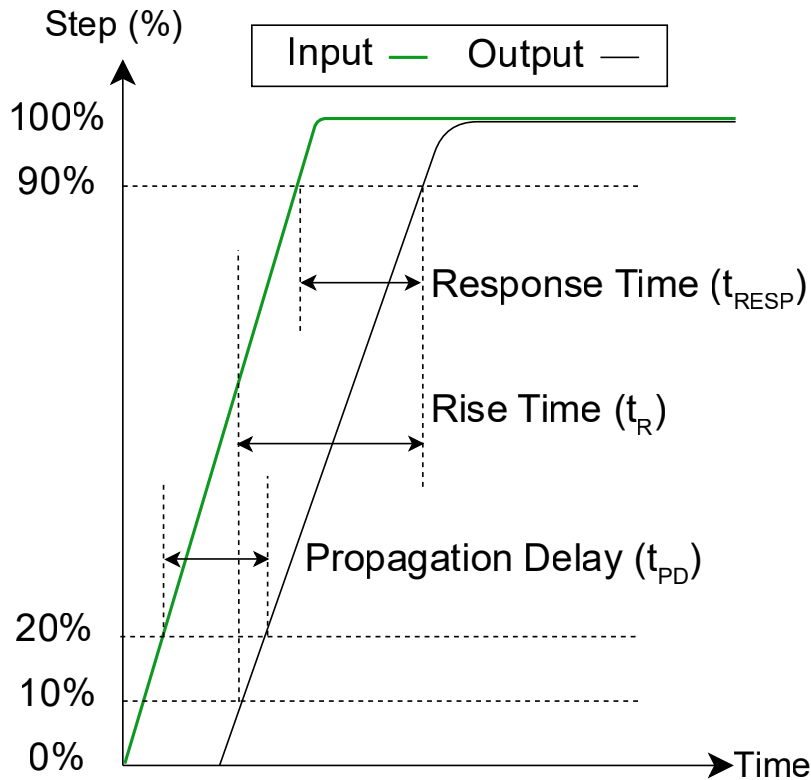
The time interval between a) when the sensed input current reaches 90% of its full-scale value, and b) when the sensor output,  $V_{OUT}$ , reaches 90% of its full-scale output value.

**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.

**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.



**Figure 4: Step Response Characteristics**

## 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  $V_{OUT}$  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,  $I_P$ .

### POWER-OFF OPERATION

As  $V_{DD}$  drops below  $V_{POR} - V_{POR\_HYS}$ , the outputs enter 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.

### Voltage Thresholds

#### POWER-ON RESET RELEASE VOLTAGE ( $V_{POR}$ )

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  $t_{PO}$ .

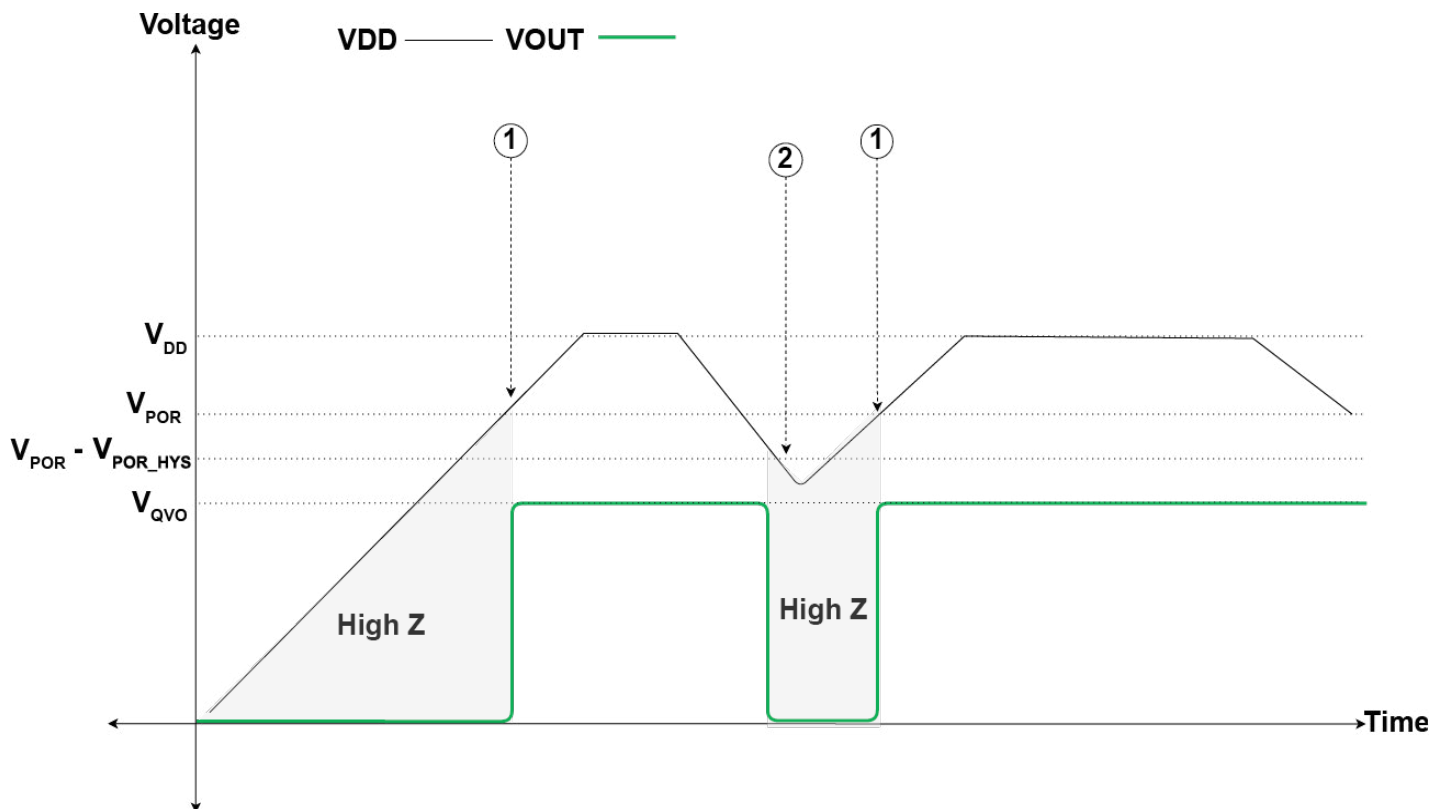


Figure 5: Power-On And Power-Off Operation

## Timing Thresholds

### 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  $\pm 10\%$  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.

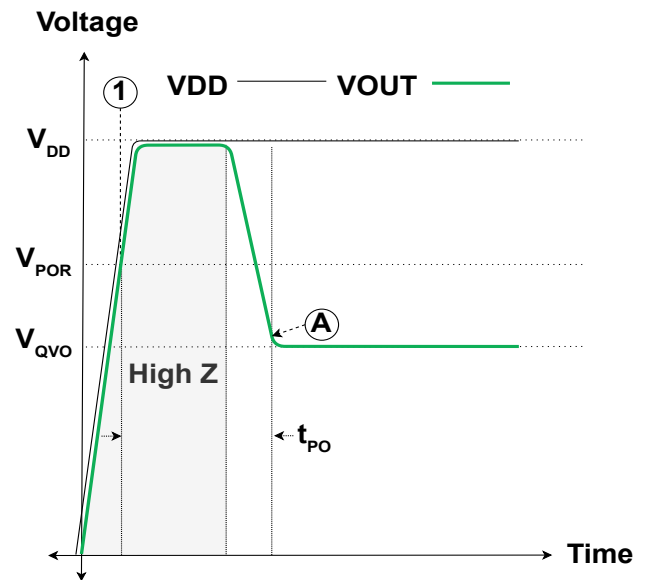


Figure 6: Power-On Delay,  $t_{PO}$

## 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,  $I_P = 0$ .

$$V_{QVO} = V_{OUT\_@0A} [mV]$$

### 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 value in production testing.

$$V_{QVO\_E} = V_{QVO\_MEASURED} - V_{QVO\_IDEAL} [mV]$$

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

Power Supply Offset Error,  $V_{OE\_PS}$ , is defined as the change in  $V_{QVO}$  due to variations in the power supply voltage at a specific temperature. The Power Supply Offset Error is defined as the change in offset measured between the nominal supply voltage ( $V_{DD}$ ) and  $V_{DD} \pm E\%$ , where E is the difference between  $V_{DD}$  and  $V_{DD(MAX)}$  in percent. The error is expressed in mV to indicate how much the offset deviates from its ideal value due to changes in the supply voltage.

$$V_{OE\_PS} = V_{QVO@VDD \pm E\%, T_A} - V_{QVO@VDD, T_A} [mV]$$

### 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:

$$Sens = \frac{V_{OUT\_IP1} - V_{OUT\_IP2}}{I_{P1} - I_{P2}} [mV/A]$$

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  $V_{OUT}$ , 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.

$$E_{SENS} = \frac{SENS_{MEASURED} - SENS_{IDEAL}}{SENS_{IDEAL}} \times 100 [\%]$$

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

Power Supply Sensitivity Error,  $E_{SENS\_PS}$ , is a measure of the change in sensitivity due to variations in the power supply voltage at a specific temperature. The Power Supply Sensitivity Error is defined as the percentage change in sensitivity measured between the nominal supply voltage ( $V_{DD}$ ) and  $V_{DD} \pm E\%$ , where E is the difference between  $V_{DD}$  and  $V_{DD(MAX)}$  in percent. The error is expressed as a percentage to indicate how much the sensitivity deviates from its ideal value due to changes in the supply voltage.

$$E_{SENS\_PS} = \frac{SEN@VDD \pm E\%, T_A - SEN@VDD, T_A}{SENS@VDD, T_A} \times 100 [\%]$$

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

Output Saturation Voltage,  $V_{SAT}$ , is defined as the minimum and maximum voltages the  $V_{OUT}$  output buffer can drive.  $V_{SAT\_H}$  is the highest voltage the output can reach, while  $V_{SAT\_L}$  is the lowest. In other states, the  $V_{OUT}$  pin may be pulled outside of  $V_{SAT\_L}$  and  $V_{SAT\_H}$ . Note that changing the sensitivity does not change the  $V_{SAT}$  points.

### Error Including Lifetime Drift ( $E_{SENS\_LT}$ and $V_{QVO\_LT}$ )

Lifetime drift characteristics are based on the mean drift of the worst-case distribution observed during AEC-Q100 qualification stresses.

**OVERCURRENT FAULT (OCF) BEHAVIOR**

The overcurrent fault function (ACS37032 only) pulls the open-drain FAULT pin low when the applied current exceeds a preset threshold ( $I_{OCR}$ ). On the ACS37032, this threshold is internally set to 100% of the full-scale rated current. This flag trips symmetrically for positive and negative applied currents.

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

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

**OVERCURRENT FAULT HYSTERESIS ( $I_{OC\_HYS}$ )**

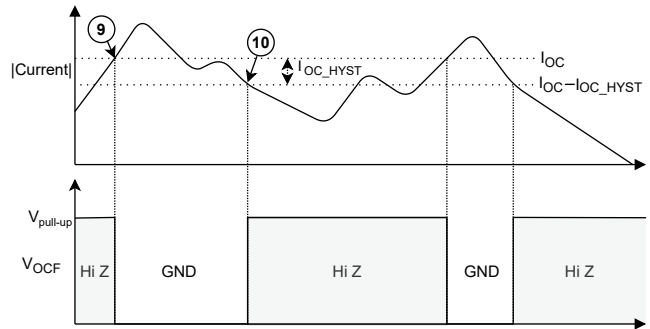
Overcurrent Hysteresis, or  $I_{OC\_HYS}$ , is defined as the magnitude of current in percentage of the FS that must drop before a fault assertion will be cleared. This can be seen as the separation between the voltages [9] to [10] in Figure 7 and Figure 8.

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

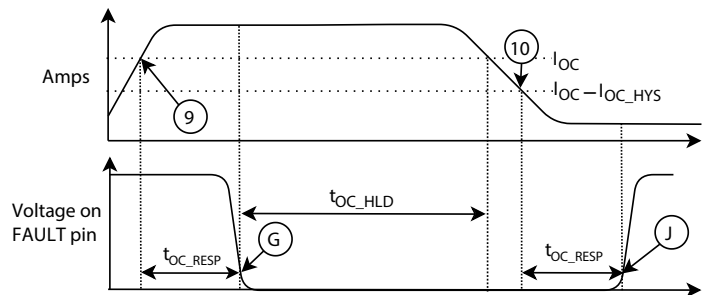
Overcurrent Response Time, or  $t_{OC\_RESP}$ , is defined as the time from when the input reaches the operating point [9] until the OCF pin falls below  $V_{FAULT\_L}$  [G].

**OVERCURRENT FAULT HOLD TIME ( $t_{OC\_HLD}$ )**

Overcurrent Hold Time, or  $t_{OC\_HLD}$ , is defined as the minimum time the OCF flag will be asserted after an OCF event. After the hold time has been reached, the OCF will release if the OCF condition has ended ([G] until [J] in Figure 8) or persist if the OCF condition is still present. Factory default is 0.1 ms.



**Figure 7: Fault Thresholds and OCF Pin Functionality**



**Figure 8: Fault Hold with Clear Fault After Hold Time**

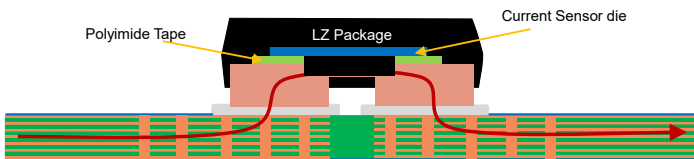
**THERMAL PERFORMANCE**

**Thermal Rise vs. Primary Current**

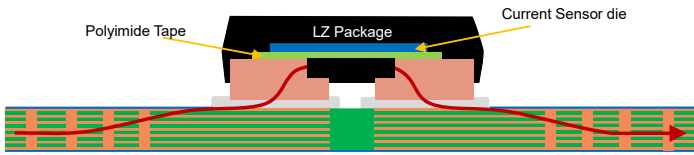
Resistive heating due to the flow of electrical current in the package should be considered during the thermal design of the application. The sensor, PCB, and PCB terminals generate heat and act as a heat sink.

The thermal response is highly dependent on the PCB layout, copper thickness, cooling method, and the profile of the injected current (including peak current, current on-time, and duty cycle).

In-pad vias help improve thermal performance. Placing vias under the copper pads of the board reduces electrical resistance and improves heat conduction to the PCB (Figure 9 and Figure 10). The ACSEVB-LZ8-LZ6 and ACSEVB-MZ8-MY6 evaluation boards include in-pad vias and is recommended to improve thermal performance.



**Figure 9: Vias Under Copper Pads, LZ Package**



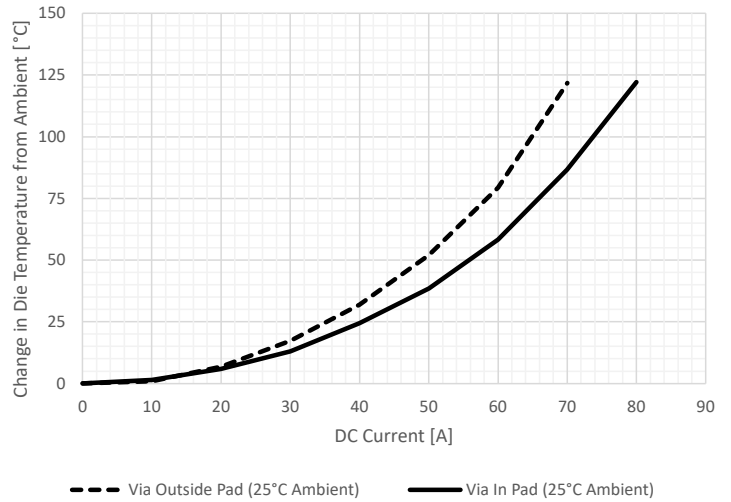
**Figure 10: No Vias Under Copper Pads, LZ Package**

The plot in Figure 11 shows the measured rise in steady-state die temperature of the LZ package versus DC continuous current at an ambient temperature,  $T_A$ , of 25°C for two board designs: filled vias under copper pads and no vias under copper pads (vias outside pad). Note the thermal offset curves may be directly applied to other values of  $T_A$ . Using in-pad vias has better thermal performance than no in-pad vias.

The plot in Figure 12 shows the measured rise in steady-state die temperature of the MY package versus DC continuous current at an ambient temperature of 25°C and an ambient temperature of 125°C. The plot in Figure 13 shows the measured rise in steady-state die temperature of the MY package versus DC continuous current at an ambient temperature of 25°C and an ambient temperature of 125°C. These evaluation boards used filled vias under the copper pads.

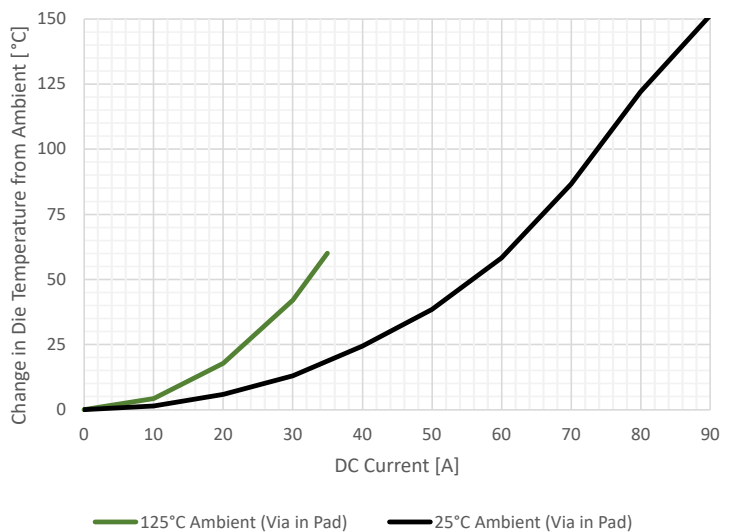
The thermal capacity of the ACS37030-32 in the LZ and MY packages should be verified by the end user in the application-specific conditions. The maximum junction temperature,  $T_{JMAX}$  (165°C), should not be exceeded.

**LZ Package, Vias in Pad vs. Vias Outside Pad at 25°C**

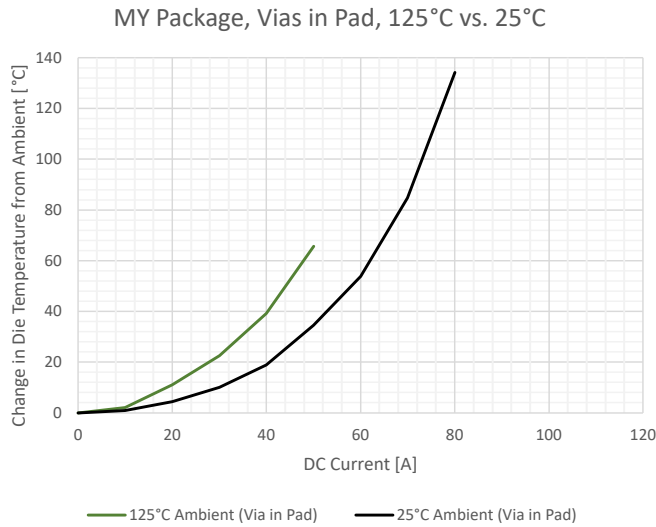


**Figure 11: LZ Package Comparison with and without In-Pad Vias at Ambient Temp**

**LZ Package, Vias in Pad, 125°C vs. 25°C**



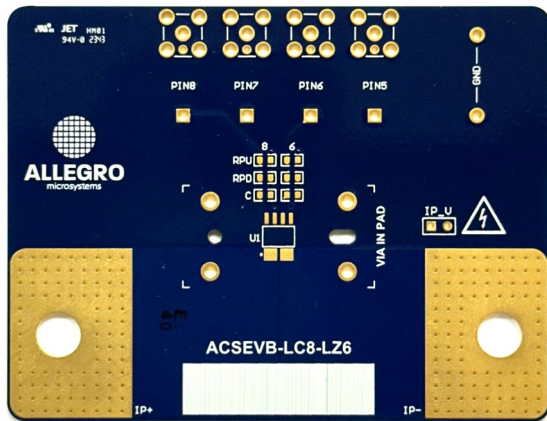
**Figure 12: LZ Package Comparison at 125°C and 25°C, Vias in-Pad**



**Figure 13: MY Package Comparison at 125°C and 25°C, Vias in-Pad**

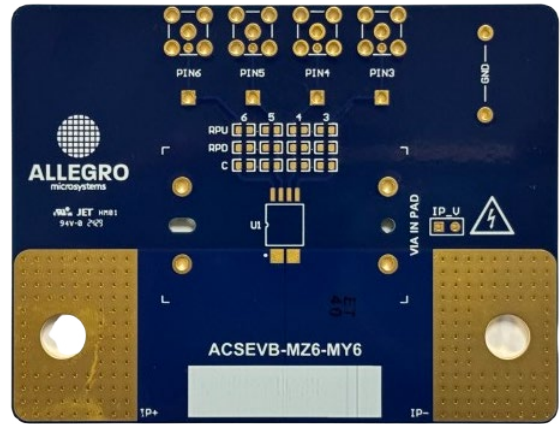
**Evaluation Board Layout**

Thermal data shown in Figure 11 and Figure 12 was collected using the LC/LZ Current Sensor Evaluation Board (ACSEVB-LC8-LZ6, TED-0004110). This board includes six layers and the evaluation board is shown in Figure 14.



**Figure 14: LZ Package Allegro Evaluation Board**

Thermal data shown in Figure 15 was collected using the MZ/ MY Current Sensor Evaluation Board (ACSEVB-MZ6-MY6, TED-0004281). This board includes six layers and the evaluation board is shown in Figure 15.



**Figure 15: MY Package Allegro Evaluation Board**

Design support files for the ACSEVB-LC8-LZ6 and ACSEVB-MZ6-MY6 evaluation boards are available for download from the Allegro website. See the technical documents section of the ACS37030-32 webpage for more information.

**PACKAGE OUTLINE DRAWING**

**For Reference Only – Not for Tooling Use**

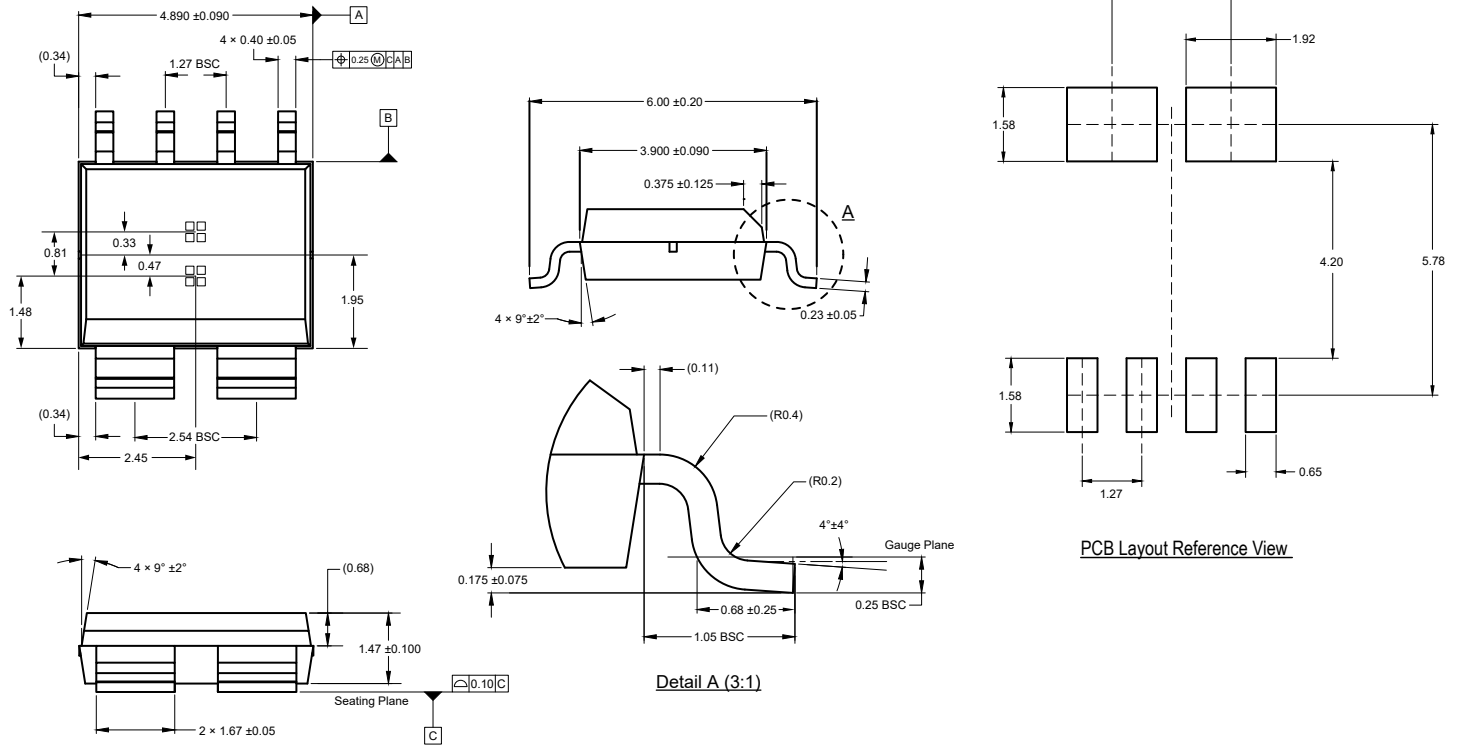
(Reference DWG-0000385, Rev. 1)

PRELIMINARY

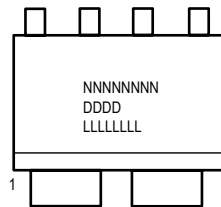
NOT TO SCALE

Dimensions in millimeters

Dimensions exclusive of mold flash, gate burrs, and dambar protrusions  
Exact case and lead configuration at supplier discretion within limits shown



**Figure 16: Custom 6-Pin SOIC (Suffix LZ)**



**Standard Branding Reference View**

N = Device Part Number  
D = Date Code  
L = Assembly Lot Number

**Figure 17: LZ Package Branding**

**PACKAGE OUTLINE DRAWING**

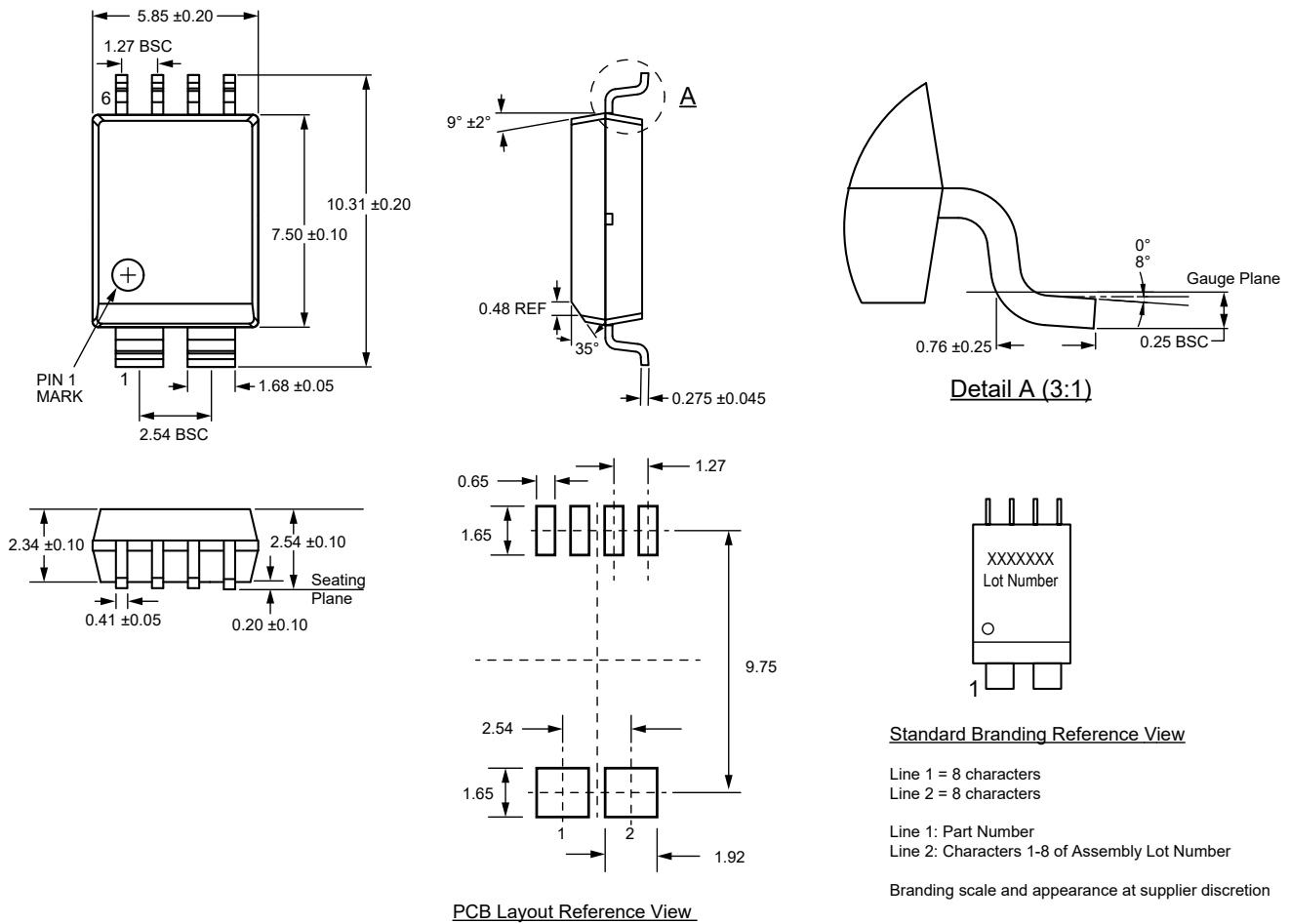
**For Reference Only – Not for Tooling Use**

(Reference Allegro DWG-0000388, Rev. 4)

NOT TO SCALE

Dimensions in millimeters

Dimensions exclusive of mold flash, gate burrs, and dambar protrusions  
Exact case and lead configuration at supplier discretion within limits shown



**Figure 18: Custom 6-Pin SOIC (Suffix MY)**

All pads a minimum of 0.20 mm from all adjacent pads;  
adjust as necessary to meet application process  
requirements and PCB layout tolerances

**Revision History**

Number	Date	Description
–	November 29, 2023	Initial release
1	January 18, 2024	Added UL Number (page 1); removed "certification pending" footnote from Isolation Characteristics table (page 3); updated Sensitivity Error and Coil Path Sensitivity Error test conditions (pages 6-11); updated Thermal Performance section (pages 18-19)
2	June 12, 2024	Added output resistive load characteristic (page 5)
3	March 14, 2025	Added MY package variants and overhauled datasheet for MY package variants (all pages)
4	May 21, 2025	Corrected Figure 1 pinout numbering (page 1); updated LZ PACKAGE Isolation Characteristics (page 3); updated typical value for Common-Mode Field Rejection and Overcurrent Response Time (page 6)
5	July 29, 2025	Updated Features and Benefits (page 1), updated MY Package Drawing (page 28)

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- ✓ Obsolete Management
- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management