400 kHz, High Accuracy Current Sensor

with Pin-Selectable Gains and Adjustable Overcurrent Fast Fault in SOICW-16 Package

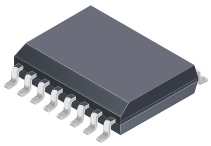
FEATURES AND BENEFITS

- High operating bandwidth for fast control loops or for applications where high-speed currents are monitored
  - □ 400 kHz bandwidth
  - □ 1.1 µs typical response time
- High accuracy
  - □ ±1% maximum sensitivity error over temperature (K series)
  - □ ±8 mV maximum offset voltage over temperature
  - □ Nonratiometric operation with V_{REF} output
  - □ Low-noise LA package
    - ◊ 160 mV_{RMS} for 3.3 V supply
    - ◊ 124 mV_{RMS} for 5 V supply
  - □ Differential sensing for high immunity to external magnetic fields
  - □ Absence of magnetic hysteresis
- Adjustable fast overcurrent fault
  - □ 1 µs typical response time
  - □ Pin-adjustable threshold
- Externally configurable gain settings using two logic pins
  - □ Four adjustable gain levels for increased design flexibility

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PACKAGE: 16-Pin SOICW (suffix MA/LA)

Not to scale



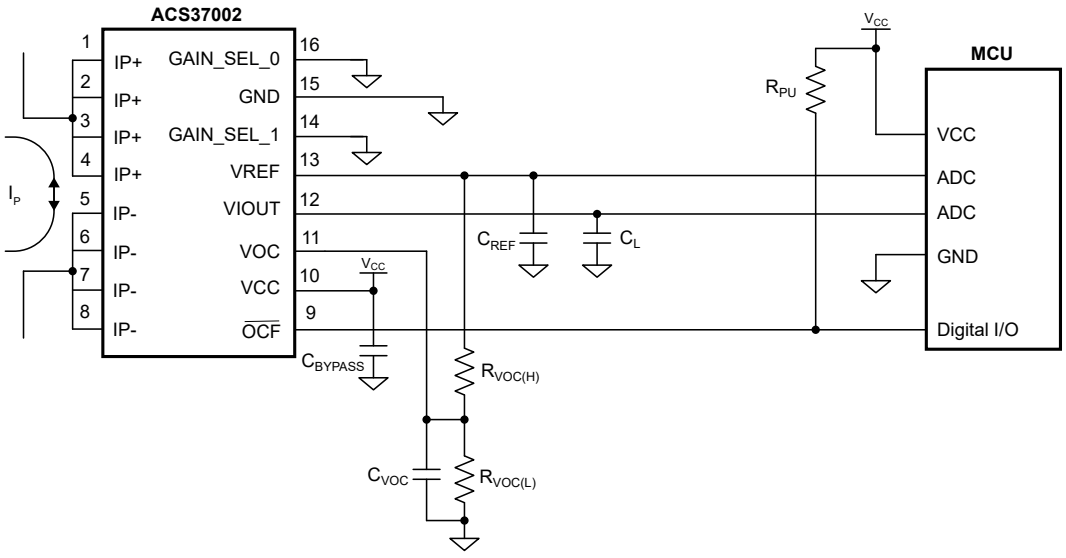
DESCRIPTION

The ACS37002 is a fully integrated Hall-effect current sensor in an SOICW-16 package that is factory-trimmed to provide high accuracy over the entire operating range without the need for customer programming. The current is sensed differentially by two Hall plates that subtract the interfering external common-mode magnetic fields.

The package construction provides high isolation by magnetically coupling the field generated by the current in the conductor to the monolithic Hall sensor integrated circuit (IC), which does not have a physical connection to the integrated current conductor. The MA package is optimized for higher isolation, with dielectric withstand voltage (V_{RMS}) of 5000 V and conductor resistance of 0.85 mΩ. The LA package is optimized for lower noise with V_{RMS} of 4242 V and conductor resistance of 1 mΩ.

The ACS37002 has functional features that are externally configurable and robust without the need for programming. Two logic gain selection pins can be used to configure the device to one of four defined sensitivities and corresponding current ranges. A fast overcurrent fault output provides short-circuit detection for system protection with a fault threshold that is proportional to the current range and can be set with an analog input. The reference pin provides a stable voltage that corresponds to the 0 A output voltage. This reference voltage allows for differential measurements as well as a device-referred voltage to set the overcurrent fault threshold.

Devices are RoHS compliant and lead (Pb) free with 100% matte-tin-plated leadframes.



For more application circuits, refer to the Application and Theory section.

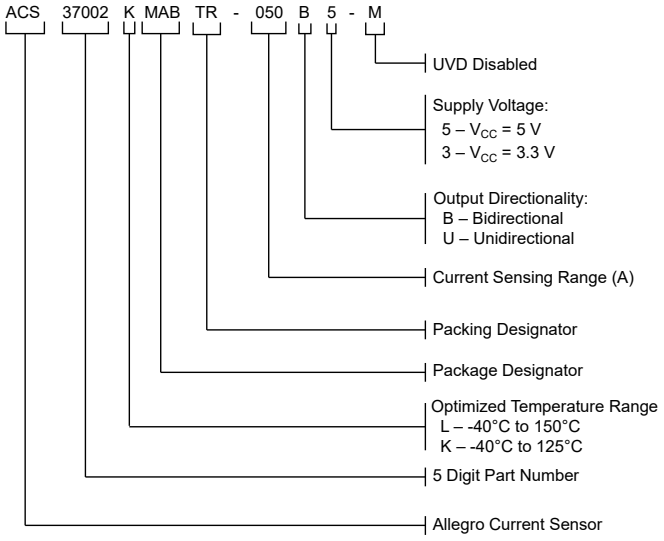
Figure 1: Typical Bidirectional Application Showing 00 Gain-Select Configuration

FEATURES AND BENEFITS (continued)

- □ Enabling measurement ranges from 10 to 133 A in both unidirectional and bidirectional modes
- Low internal primary conductor resistance 0.85 mΩ (MA package) and 1 mΩ (LA package) for better power efficiency
- UL 62368-1:2014 (edition 3) certification, highly isolated compact SOICW-16 surface-mount package (MA package)
  - □ 5000 V_{RMS} rated dielectric withstand voltage
  - □ 1097 V_{RMS} / 1550 V_{DC} basic insulation voltages
  - □ 565 V_{RMS} / 800 V_{DC} reinforced insulation voltages
- Wide operating temperature, –40°C to 150°C
- AEC-Q100 Grade 0, automotive qualified

MA Only

CB Certificate number:
US-32210-M3-UL
US-36315-UL



SELECTION GUIDE

Part Number [1]	Current Sensing Range, I_{PR} (A)	Sensitivity [2] (mV/A)	Nominal V_{CC} (V)	Optimized Temp. Range T_A (°C)	Packing [3]
MA Package, 16-Pin SOICW					
ACS37002LMABTR-050B5-M	±33, ±40, ±50, ±66	60, 50, 40, 30	5	–40 to 150	1000 pieces per 13-inch reel
ACS37002LMABTR-066B5-M	±66, ±80 ±100, ±133	30, 25, 20, 15			
ACS37002LMABTR-050U5-M	33, 40, 50, 66	120, 100, 80, 60			
ACS37002LMABTR-066U5-M	66, 80, 100, 133	60, 50, 40, 30			
ACS37002LMABTR-050B3	±33, ±40, ±50, ±66	39.6, 33, 26.4, 19.8	3.3		
ACS37002LMABTR-066B3	±66, ±80, ±100, ±133	19.8, 16.5, 13.2, 9.9			
ACS37002LMABTR-050U3	33, 40, 50, 66	79.2, 66, 52.8, 39.6			
ACS37002LMABTR-066U3	66, 80, 100, 133	39.6, 33, 26.4, 19.8			
ACS37002KMABTR-050B5-M	±33, ±40, ±50, ±66	60, 50, 40, 30	5	–40 to 125 [3]	
ACS37002KMABTR-050B3	±33, ±40, ±50, ±66	39.6, 33, 26.4, 19.8	3.3		
LA Package, 16-Pin SOICW					
ACS37002LLAATR-015B5	±10, ±12, ±15, ±20	200,166.6,133.3,100	5	–40 to 150	1000 pieces per 13-inch reel
ACS37002LLAATR-025B5	±25, ±30, ±37.5, ±50	80, 66.6, 53.3, 40			
ACS37002LLAATR-015B3	±10, ±12, ±15, ±20	132, 110, 88, 66	3.3		
ACS37002LLAATR-025U3	25, 30, 37.5, 50	105.6, 88, 70.4, 52.8			

[1] All parts have UVD functionality disabled.
[2] For the GAIN_SEL configuration, refer to the relevant part-specific section of the Performance Characteristics table.
[3] Device performance is optimized from –40°C to 125°C; however, the device can operate to an ambient temperature of 150°C. The device shares the same qualifications as the -L temperature devices, unless stated otherwise.

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ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Notes	Rating	Unit
Forward Supply Voltage	V_{FCC}		6.5	V
Reverse Supply Voltage	V_{RCC}		–0.5	V
Forward Output Voltage	V_{FIOUT}	Applies to V_{IOUT}, V_{OCF}, and V_{REF}	$(V_{CC} + 0.7) \le 6.5$	V
Reverse Output Voltage	V_{RIOUT}	Applies to V_{IOUT}, V_{OCF}, and V_{REF}	–0.5	V
Forward Input Voltage	V_{FI}	Applies to GAIN_SEL_0, GAIN_SEL_1, and VOC	$(V_{CC} + 0.7) \le 6.5$	V
Reverse Input Voltage	V_{RI}	Applies to GAIN_SEL_0, GAIN_SEL_1, and VOC	–0.5	V
Operating Ambient Temperature	T_A		–40 to 150	°C
Storage Temperature	T_{stg}		–65 to 165	°C
Maximum Junction Temperature	$T_{J(max)}$		165	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Notes	Value	Unit
MA Package, 16-Pin SOICW				
Package Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$	Mounted on the standard MA/LA Current Sensor Evaluation Board (ACSEVB-MA16-LA16)	20	°C/W
Package Thermal Metric (Junction to Top)	Ψ_{JT}		2.4	°C/W
Package Thermal Resistance (Junction to Case)	$R_{\theta JC}$	Simulated per the methods in JESD51-1	14	°C/W
Package Thermal Resistance (Junction to Board)	$R_{\theta JB}$	Simulated per the methods in JESD51-8	14	°C/W
LA Package, 16-Pin SOICW				
Package Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$	Mounted on the standard MA/LA Current Sensor Evaluation Board (ACSEVB-MA16-LA16)	16	°C/W
Package Thermal Characterization (Junction to Top)	Ψ_{JT}		–1.7	°C/W
Package Thermal Resistance (Junction to Case)	$R_{\theta JC}$	Simulated per the methods in JESD51-1	10	°C/W
Package Thermal Resistance (Junction to Board)	$R_{\theta JB}$	Simulated per the methods in JESD51-8	8	°C/W

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ISOLATION AND PACKAGE CHARACTERISTICS

Characteristic	Symbol	Notes	Rating	Unit
Dielectric Surge Voltage	V_{SURGE}	Tested in oil, ±5 pulses at 2/minute in compliance with IEC 61000-4-5 1.2 µs (rise) / 50 µs (width)	10	kV
Moisture Sensitivity Level	MSL	Per IPC/JEDEC J-STD-020	3	–

MA PACKAGE-SPECIFIC PERFORMANCE

Characteristic	Symbol	Notes	Rating	Unit
Withstand Voltage [1][2]	V_{ISO}	Agency rated for 60 seconds per UL 62368-1 (edition 3) [1][2]	5000	V_{RMS}
Working Voltage for Basic Insulation [2]	V_{WVBI}	Maximum approved working voltage for basic insulation according to UL 62368-1 (edition 3)	1550	V_{PK} or V_{DC}
			1097	V_{RMS}
Working Voltage for Reinforced Insulation [2]	V_{WVRI}	Maximum approved working voltage for reinforced insulation according to UL 62368-1 (edition 3)	800	V_{PK} or V_{DC}
			565	V_{RMS}
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	Minimum internal distance through insulation	90	µm
Comparative Track 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.

LA PACKAGE-SPECIFIC PERFORMANCE

Characteristic	Symbol	Notes	Rating	Unit
Withstand Voltage [1][2]	V_{ISO}	Agency rated for 60 seconds per UL 62368-1 (edition 3) [1][2]	4242	V_{RMS}
Working Voltage for Basic Insulation [2]	V_{WVBI}	Maximum approved working voltage for basic insulation according to UL 62368-1 (edition 3)	1414	V_{PK} or V_{DC}
			1000	V_{RMS}
Working Voltage for Reinforced Insulation [2]	V_{WVRI}	Maximum approved working voltage for reinforced insulation according to UL 62368-1 (edition 3)	707	V_{PK} or V_{DC}
			500	V_{RMS}
Impulse Withstand Voltage [1]	$V_{IMPULSE}$	Tested in air, ±5 pulses at 2/minute in compliance with IEC 61000-4-5 1.2 µs (rise) / 50 µs (width)	6000	V_{PK}
Clearance	D_{cl}	Minimum distance through air from IP leads to signal leads	7.9	mm
Creepage	D_{cr}	Minimum distance along package body from IP leads to signal leads	7.9	mm
Distance Through Insulation	DTI	Minimum internal distance through insulation	59	µm
Comparative Track 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.

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PINOUT DIAGRAM AND TERMINAL LIST TABLE

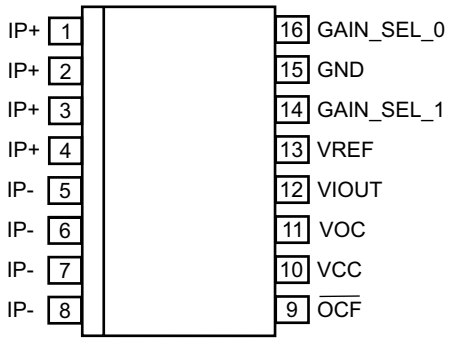


Figure 2: MA/LA Pinout Diagram

Terminal List Table

Number	Name	Description
1, 2, 3, 4	IP+	Terminals for current being sensed; fused internally
5, 6, 7, 8	IP-	Terminals for current being sensed; fused internally
9	$\overline{OCF}$	Overcurrent fault, open-drain
10	VCC	Device power supply terminal
11	VOC	Overcurrent fault operation point input
12	VIOUT	Analog output representing the current flowing through I_P
13	VREF	Zero-current voltage reference
14	GAIN_SEL_1	Gain selection bit 1
15	GND	Device ground terminal
16	GAIN_SEL_0	Gain selection bit 0

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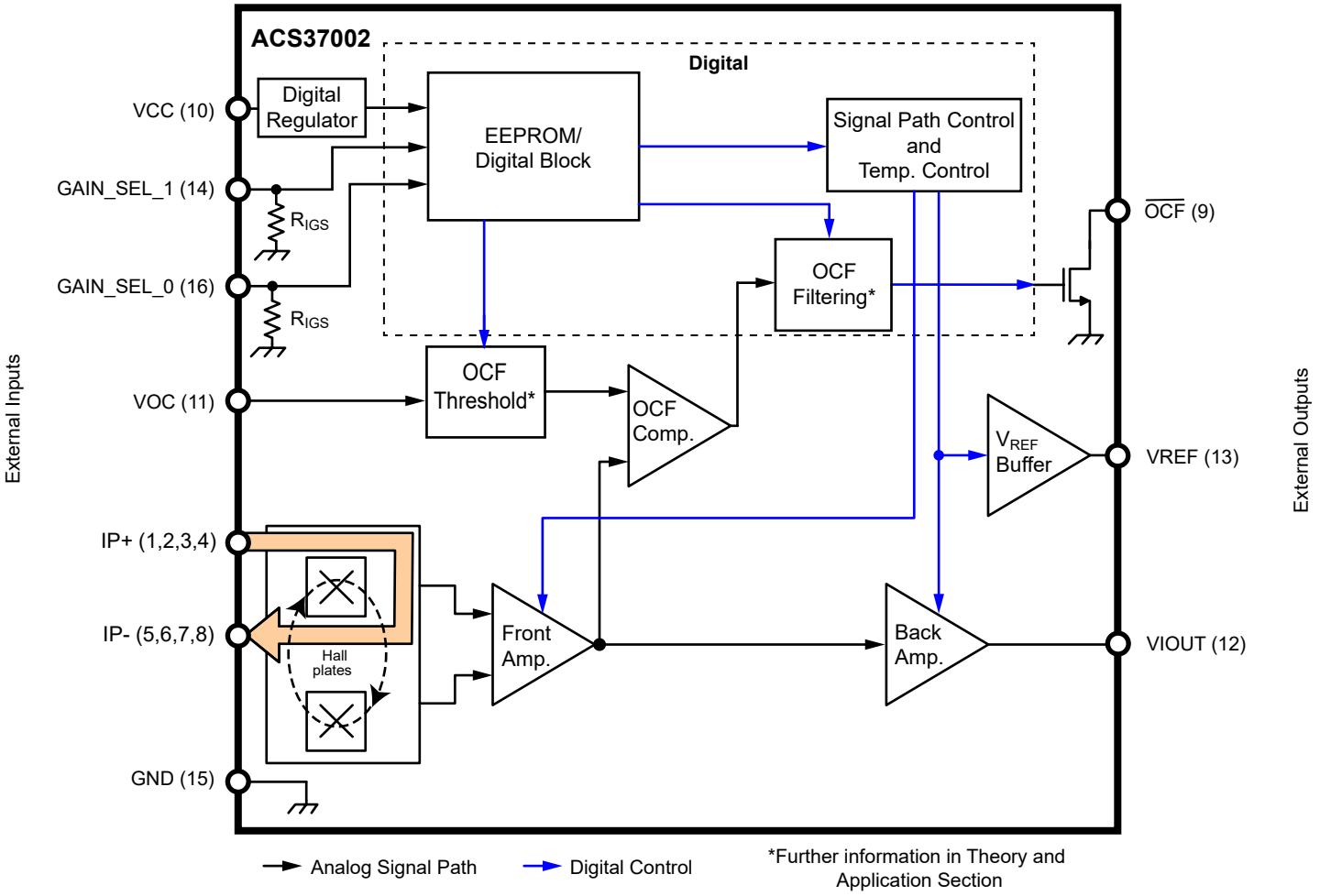


Figure 3: Functional Block Diagram

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COMMON ELECTRICAL CHARACTERISTICS: Valid through full operating temperature range, T_A = – 40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V or 3.3 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	5 V devices only	4.5	5	5.5	V
		3.3 V devices only	3.15	3.3	3.6	V
Supply Current	I_{CC}	Load not present on VIOUT or VREF; V_{CC} = 5 V	–	13	18	mA
		Load not present on VIOUT or VREF; V_{CC} = 3.3 V	–	12	15	mA
Supply Bypass Capacitor	C_{BYPASS}	VCC to GND recommended	0.1	–	–	µF
Output Resistive Load	R_L	VIOUT to GND, VIOUT to VCC	10	–	–	kΩ
Output Capacitive Load	C_L	VIOUT to GND	–	1	6	nF
Reference Resistive Load	R_{VREF}	VREF to GND (recommended to supply VOC); VREF to VCC	10	–	–	kΩ
Reference Capacitive Load	C_{VREF}	VREF to GND	–	–	6	nF
Fault Pull-Up Resistance	R_{PU}		4.7	–	500	kΩ
Primary Conductor Resistance	R_{IP}	MA, T_A = 25°C	–	0.85	–	mΩ
		LA, T_A = 25°C	–	1	–	mΩ
Primary Conductor Inductance	L_{IP}	MA package	–	4.2	–	nH
		LA package	–	5	–	nH
Output Buffer Resistance	R_{OUT}	Internal output buffer resistance on VIOUT and VREF	–	7	–	Ω
Power-On Reset Voltage	$V_{POR(H)}$	V_{CC} rising [1]	2.6	2.9	3.1	V
	$V_{POR(L)}$	V_{CC} falling [1]	2.2	2.5	2.8	V
POR Hysteresis	$V_{POR(HYS)}$		250	–	–	mV
Power-On Time	t_{POD}	Time from V_{CC} rising ≥ $V_{POR(H)}$ after a POR event until power-on; VREF, OCF, VIOUT	100	–	–	µs
Overvoltage Detection (OVD) Threshold	$V_{OVD(H)}$	T_A = 25°C, V_{CC} rising [1]	6.1	6.5	6.8	V
	$V_{OVD(L)}$	T_A = 25°C, V_{CC} falling [1]	5.6	5.85	6.1	V
Overvoltage Detection Hysteresis	$V_{OVD(HYS)}$		–	650	–	mV
OVD Delay Time	$t_{dOVD(E)}$	Time from V_{CC} rising ≥ $V_{OVD(EN)}$ until OVD asserts	35	90	120	µs
	$t_{dOVD(D)}$	Time from V_{CC} falling ≤ $V_{OVD(DIS)}$ until OVD clears	–	7	–	µs

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Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Units
OUTPUT SIGNAL CHARACTERISTICS (V_{IOUT})							
Saturation Voltage	$V_{SAT(H)}$	R_L = 10 kΩ to GND		V_{CC} – 0.25	–	–	V
	$V_{SAT(L)}$	R_L = 10 kΩ to V_{CC}		–	–	0.15	V
Output Operating Range	V_{OOR}	5 V linear operating range		0.5	–	4.5	V
		3.3 V linear operating range		0.3	–	3	V
Output Current Limit	$I_{OUT(src)}$	V_{IOUT} shorted to GND		–	25	–	mA
	$I_{OUT(snk)}$	V_{IOUT} shorted to V_{CC}		–	25	–	mA
Bandwidth	BW	Small signal –3 dB, C_L = 6 nF		–	400	–	kHz
Rise Time	t_R	T_A = 25°C, C_L = 6 nF		–	0.7	2.5	µs
Response Time	$t_{RESPONSE}$	T_A = 25°C, C_L = 6 nF		–	1.1	2.5	µs
Propagation Delay	t_{pd}	T_A = 25°C, C_L = 6 nF		–	0.7	2	µs
Noise Density	I_{ND}	Input-referenced noise density; T_A = 25°C, C_L = 6 nF; V_{CC} = 5 V	MA package	–	350	–	µA/√Hz
			LA package	–	155	–	µA/√Hz
		Input-referenced noise density; T_A = 25°C, C_L = 6 nF; V_{CC} = 3.3 V	MA package	–	450	–	µA/√Hz
			LA package	–	200	–	µA/√Hz
Noise	I_N	Input-referenced noise at 400 kHz; T_A = 25°C, C_L = 6 nF; V_{CC} = 5 V	MA package	–	277	–	mA_{RMS}
			LA package	–	124	–	mA_{RMS}
		Input-referenced noise at 400 kHz; T_A = 25°C, C_L = 6 nF; V_{CC} = 3.3 V	MA package	–	357	–	mA_{RMS}
			LA package	–	160	–	mA_{RMS}
Nonlinearity	E_{LIN}			–	±0.75	–	%
Power Supply Rejection Ratio Offset	$PSRR_O$	T_A = 25°C, DC to 1 kHz, 100 mV pk-pk ripple around V_{CC} = $V_{CC(typ)}$, I_P = 0 A		–	–40	–	dB
		T_A = 25°C, 1 to 100 kHz, 100 mV pk-pk ripple around V_{CC} = $V_{CC(typ)}$, I_P = 0 A		–	–30	–	dB
Power Supply Rejection Ratio Sens	$PSRR_S$	T_A = 25°C, DC to 1 kHz, 100 mV pk-pk ripple around V_{CC} = $V_{CC(typ)}$, I_P = $I_{PR(MAX)}$		–	–15	–	dB
		T_A = 25°C, 1 to 100 kHz, 100 mV pk-pk ripple around V_{CC} = $V_{CC(typ)}$, I_P = $I_{PR(MAX)}$		–	–6	–	dB
Power Supply Offset Error	$V_{OE(PS)}$	3.3 V variant, bidirectional; V_{CC} @ 3.15 V or 3.45 V		–10	±1	10	mV
		5 V variant, bidirectional; V_{CC} @ 4.5 V or 5.5 V		–10	±1	10	mV
		3.3 V variant, unidirectional; V_{CC} @ 3.15 V or 3.45 V		–18	±1	18	mV
		5 V variant, unidirectional; V_{CC} @ 4.5 V or 5.5 V		–18	±1	18	mV
Power Supply Sensitivity Error	$E_{SENS(PS)}$	3.3 V variant, V_{CC} @ 3.15 V or 3.45 V	–1.5	±0.3	1.5	%	%
		5 V variant, V_{CC} @ 4.5 V or 5.5 V	–1.5	±0.3	1.5	%	
Common-Mode Field Rejection	CMFR	Input-referred error due to common-mode field		–	4	–	mA/G

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COMMON PERFORMANCE CHARACTERISTICS (VREF, FAULT, GAIN_SEL): Valid through full operating temperature range, T_A = – 40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V or 3.3 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
REFERENCE OUTPUT CHARACTERISTICS (VREF)						
Zero-Current Reference Voltage	$V_{REF(BI)}$	Bidirectional; V_{CC} = 5 V	2.49	2.5	2.51	V
		Bidirectional; V_{CC} = 3.3 V	1.64	1.65	1.66	V
	$V_{REF(UNI)}$	Unidirectional; V_{CC} = 5 V	0.49	0.5	0.51	V
		Unidirectional; V_{CC} = 3.3 V	0.32	0.33	0.34	V
Reference Source Current Limit	$I_{REF(SRC)}$	Maximum current V_{REF} can passively source	–	25	–	mA
	$I_{REF(SNK)}$	Maximum current V_{REF} can passively sink	–	–25	–	mA
Reference Slew Rate	SR_{REF}	C_{VREF} = 0 nF, R_{VREF} = 0 Ω	0.8	–	–	V/µs
OVERCURRENT FAULT CHARACTERISTICS (OCF)						
OCF On Voltage [3]	$V_{FAULT-ON}$	R_{PU} = 4.7 kΩ, under fault condition	–	0.07	0.4	V
OCF Sink Current [3]	$I_{OCF(SNK)}$	Fault not asserted	–	100	–	nA
		Fault asserted	0.01	–	1.1	mA
VOC Operating Voltage Range	V_{VOC}	V_{CC} = 5 V	0.5	–	2	V
		V_{CC} = 3.3 V	0.33	–	1.32	V
Fault Error	E_{OCF}		–10	±3	10	$\%I_{OCF-OP}$
OCF Hysteresis	$I_{OCF(HYS)}$	V_{CC} = 5 V	–	6	–	%FS
		V_{CC} = 3.3 V	–	9	–	%FS
OCF Reaction Time [3]	t_{OCF-R}	Time from I_{OCF-OP}, with a 1.2 × I_{OCF-OP} until fault asserts	–	1	1.5	µs
OCF Mask [3]	$t_{OCF-MASK}$	Time I_{OCF-OP} must be present after t_{OCF-R} for fault assertion [3]	0	0	3	µs
OCF Response Time [3]	t_{OCF}	$t_{OCF-MASK}$ = 0 µs	–	1	1.5	µs
OCF Hold Time [3]	$t_{OCF-HOLD}$	Minimum duration of fault assertion [2]	0	0	5	ms
GAIN SELECTION PIN CHARACTERISTICS (GAIN_SEL_0, GAIN_SEL_1)						
Gain Select Internal Resistor	R_{GSint}		–	1	–	MΩ
GAIN_SEL Logic Input Voltage	$V_{H(SEL)}$	V_{CC} = 5 V	3.75	–	–	V
		V_{CC} = 3.3 V	2.25	–	–	V
	$V_{L(SEL)}$		–	–	0.5	V
Leakage Current [3]	$I_{SEL(SNK)}$		–	–	±10	µA

[1] V_{CC} rate +1 V/ms, for best accuracy.
[2] Typical value is factory default.
[3] Guaranteed by design and bench validated.

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ACS37002LMABTR-050B5-M

ACS37002LMABTR-050B5-M GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	40	50
	0	1	50	40
	1	0	60	33.3
	1	1	30	66.7

ACS37002LMABTR-050B5-M PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–50	–	–	–	50	A
		GAIN_SEL 01	–40	–	–	–	40	A
		GAIN_SEL 10	–33.3	–	–	–	33.3	A
		GAIN_SEL 11	–66.7	–	–	–	66.7	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	40	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	50	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	60	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	30	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50	–	100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	–	2.5	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–8	–	8	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LMABTR-066B5-M

ACS37002LMABTR-066B5-M GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	30	66.7
	0	1	25	80
	1	0	20	100
	1	1	15	133.3

ACS37002LMABTR-066B5-M PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–66.7	–	–	–	66.7	A
		GAIN_SEL 01	–80	–	–	–	80	A
		GAIN_SEL 10	–100	–	–	–	100	A
		GAIN_SEL 11	–133.3	–	–	–	133.3	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	30	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	25	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	20	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	15	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50	–	100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	–	2.5	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LMABTR-050U5-M

ACS37002LMABTR-050U5-M GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Unidirectional**
Selection Combination	0	0	80	50
	0	1	100	40
	1	0	120	33.3
	1	1	60	66.7

ACS37002LMABTR-050U5-M PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	0	–	–	–	50	A
		GAIN_SEL 01	0	–	–	–	40	A
		GAIN_SEL 10	0	–	–	–	33.3	A
		GAIN_SEL 11	0	–	–	–	66.7	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	80	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	100	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	120	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	60	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	25	–	50	–	100	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Unidirectional; I_P = 0 A, T_A = 25°C	–	–	0.5	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LMABTR-066U5-M

ACS37002LMABTR-066U5-M GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Unidirectional**
Selection Combination	0	0	60	66.7
	0	1	50	80
	1	0	40	100
	1	1	30	133.3

ACS37002LMABTR-066U5-M PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	0	–	–	–	66.7	A
		GAIN_SEL 01	0	–	–	–	80	A
		GAIN_SEL 10	0	–	–	–	100	A
		GAIN_SEL 11	0	–	–	–	133.3	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	60	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	50	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	40	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	30	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	25	–	50	–	100	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Unidirectional; I_P = 0 A, T_A = 25°C	–	–	0.5	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LMABTR-050B3

ACS37002LMABTR-050B3 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	26.4	50
	0	1	33	40
	1	0	39.6	33.3
	1	1	19.8	66.7

ACS37002LMABTR-050B3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–50	–	–	–	50	A
		GAIN_SEL 01	–40	–	–	–	40	A
		GAIN_SEL 10	–33.3	–	–	–	33.3	A
		GAIN_SEL 11	–66.7	–	–	–	66.7	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	26.4	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	33	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	39.6	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	19.8	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50	–	100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	–	1.65	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LMABTR-066B3

ACS37002LMABTR-066B3 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	19.8	66.7
	0	1	16.5	80
	1	0	13.2	100
	1	1	9.9	133.3

ACS37002LMABTR-066B3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–66.7		–	–	66.7	A
		GAIN_SEL 01	–80		–	–	80	A
		GAIN_SEL 10	–100		–	–	100	A
		GAIN_SEL 11	–133.3		–	–	133.3	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–		19.8	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–		16.5	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–		13.2	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–		9.9	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50		100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–		1.65	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)} \times I_{PR} + V_{REF}$)) / ($Sens_{(IDEAL)} \times I_{PR}$) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
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ACS37002LMABTR-050U3

ACS37002LMABTR-050U3 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Unidirectional**
Selection Combination	0	0	52.8	50
	0	1	66	40
	1	0	79.2	33.3
	1	1	39.6	66.7

ACS37002LMABTR-050U3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	0		–	–	50	A
		GAIN_SEL 01	0		–	–	40	A
		GAIN_SEL 10	0		–	–	33.3	A
		GAIN_SEL 11	0		–	–	66.7	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–		52.8	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–		66	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–		79.2	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–		39.6	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	25		50	–	100	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Unidirectional; I_P = 0 A, T_A = 25°C	–		0.33	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
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ACS37002LMABTR-066U3

ACS37002LMABTR-066U3 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Unidirectional**
Selection Combination	0	0	39.6	66.7
	0	1	33	80
	1	0	26.4	100
	1	1	19.8	133.3

ACS37002LMABTR-066U3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	0	–	–	–	66.7	A
		GAIN_SEL 01	0	–	–	–	80	A
		GAIN_SEL 10	0	–	–	–	100	A
		GAIN_SEL 11	0	–	–	–	133.3	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	39.6	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	33	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	26.4	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	19.8	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	25	–	50	–	100	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Unidirectional; I_P = 0 A, T_A = 25°C	–	–	0.33	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–1.5	–1.1	–	1.1	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.6	–2.8	–	2.8	3.6	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C or –40°C to 25°C	–3.4	–2.6	–	2.6	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002KMABTR-050B5-M

AACS37002KMABTR-050B5-M GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	40	50
	0	1	50	40
	1	0	60	33.3
	1	1	30	66.7

ACS37002KMABTR-050B5-M PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–50	–	–	–	50	A
		GAIN_SEL 01	–40	–	–	–	40	A
		GAIN_SEL 10	–33.3	–	–	–	33.3	A
		GAIN_SEL 11	–66.7	–	–	–	66.7	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	40	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	50	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	60	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	30	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50	–	100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	–	2.5	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR}+V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR})× 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C, T_A = –40°C to 25°C	–1	–0.9	–	0.9	1	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1][2]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.4	–2.8	–	2.8	3.4	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C or –40°C to 25°C	–3.2	–2.6	–	2.6	3.2	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002KMABTR-050B3

ACS37002KMABTR-050B3 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	26.4	50
	0	1	33	40
	1	0	39.6	33.3
	1	1	19.8	66.7

ACS37002KMABTR-050B3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–50	–	–	–	50	A
		GAIN_SEL 01	–40	–	–	–	40	A
		GAIN_SEL 10	–33.3	–	–	–	33.3	A
		GAIN_SEL 11	–66.7	–	–	–	66.7	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	26.4	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	33	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	39.6	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	19.8	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50	–	100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	–	1.65	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$	–1.75	–1.1	–	1.1	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C, T_A = –40°C to 25°C	–1	–0.9	–	0.9	1	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–5	–	5	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–8	–5	–	5	8	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–8	–4	–	4	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–8	–	8	10	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$	–3.4	–2.8	–	2.8	3.4	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C or –40°C to 25°C	–3.2	–2.6	–	2.6	3.2	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–7	–	7	10	mV
		$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–10	–7	–	7	10	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–4	–	4	10	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–14	–10	–	10	14	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–10	–7	–	7	10	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LLAATR-015B5

ACS37002LLAATR-015B5 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	133.3	15
	0	1	166.6	12
	1	0	200	10
	1	1	100	20

ACS37002LLAATR-015B5 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–15	–	–	–	15	A
		GAIN_SEL 01	–12	–	–	–	12	A
		GAIN_SEL 10	–10	–	–	–	10	A
		GAIN_SEL 11	–20	–	–	–	20	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	133.3	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	166.6	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	200	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	100	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50	–	100	–	200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	–	2.5	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–1.75	–1.2	–	1.2	1.75	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–1.75	–1.4	–	1.4	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–1.5	–1.2	–	1.2	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–3	–	3	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–8	–5	–	5	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.7	–2.5	–	2.5	3.7	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.5	–2.4	–	2.4	3.5	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.5	–2.4	–	2.4	3.5	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.4	–2.3	–	2.3	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–15	–9	–	9	15	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–17	–9	–	9	17	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–14	–8	–	8	14	mV

[1][1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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ACS37002LLAATR-025B5

ACS37002LLAATR-025B5 GAIN_SEL Pin Performance Key

				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	80	25
	0	1	66.6	30
	1	0	53.3	37.5
	1	1	40	50

ACS37002LLAATR-025B5 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 5 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–25		–		25	A
		GAIN_SEL 01	–30		–		30	A
		GAIN_SEL 10	–37.5		–		37.5	A
		GAIN_SEL 11	–50		–		50	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–		80		–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–		66.6		–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–		53.3		–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–		40		–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50		100		200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–		2.5		–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–1.75	–1.2	–	1.2	1.75	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–1.75	–1.4	–	1.4	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–1.5	–1.2	–	1.2	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–3	–	3	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–8	–5	–	5	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [1]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.7	–2.5	–	2.5	3.7	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.5	–2.4	–	2.4	3.5	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.5	–2.4	–	2.4	3.5	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.4	–2.3	–	2.3	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–15	–9	–	9	15	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–17	–9	–	9	17	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–14	–8	–	8	14	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Bidirectional**
Selection Combination	0	0	88	15
	0	1	110	12
	1	0	132	10
	1	1	66	20

ACS37002LLAATR-015B3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	–15		–		15	A
		GAIN_SEL 01	–12		–		12	A
		GAIN_SEL 10	–10		–		10	A
		GAIN_SEL 11	–20		–		20	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–		88		–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–		110		–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–		132		–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–		66		–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	50		100		200	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–		1.65		–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)} – (Sens_{(IDEAL)} × I_{PR} + V_{REF})) / (Sens_{(IDEAL)} × I_{PR}) × 100$ AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–1.75	–1.2	–	1.2	1.75	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–1.75	–1.4	–	1.4	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–1.5	–1.2	–	1.2	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–3	–	3	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–8	–5	–	5	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [2][3]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.7	–2.5	–	2.5	3.7	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.5	–2.4	–	2.4	3.5	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.5	–2.4	–	2.4	3.5	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.4	–2.3	–	2.3	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–15	–9	–	9	15	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–17	–9	–	9	17	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–14	–8	–	8	14	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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				Selection Identifier
Parameter (Units)	**GAIN_SEL_1 (Boolean)**	**GAIN_SEL_0 (Boolean)**	**Sens (mV/A)**	**Max IP (A)**
Type	**Digital Input**	**Digital Input**	**Calculation**	**Unidirectional**
Selection Combination	0	0	105.6	25
	0	1	88	30
	1	0	70.4	37.5
	1	1	52.8	50

ACS37002LLAATR-025U3 PERFORMANCE CHARACTERISTICS: Valid through full operating temperature range, T_A = –40°C to 150°C, C_{BYPASS} = 0.1 µF, and V_{CC} = 3.3 V, unless otherwise specified

			Minimum			Maximum		
Characteristic	**Symbol**	**Test Conditions**	**Absolute Min. [1]**	**–3σ [2]**	**Typ.**	**+3σ [2]**	**Absolute Max. [1]**	**Units**
NOMINAL PERFORMANCE								
Current Sensing Range	I_{PR}	GAIN_SEL 00	0	–	–	–	25	A
		GAIN_SEL 01	0	–	–	–	30	A
		GAIN_SEL 10	0	–	–	–	37.5	A
		GAIN_SEL 11	0	–	–	–	50	A
Sensitivity	Sens	GAIN_SEL 00; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	105.6	–	–	mV/A
		GAIN_SEL 01; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	88	–	–	mV/A
		GAIN_SEL 10; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	70.4	–	–	mV/A
		GAIN_SEL 11; $I_{PR(min)} < I_P < I_{PR(max)}$	–	–	52.8	–	–	mV/A
Overcurrent Fault Operating Range	I_{OCF-OR}	Typ. = factory-programmed default, FS = full-scale	25	–	50	–	100	%FS
Zero-Current Output Voltage	$V_{IOUT(Q)}$	Unidirectional; I_P = 0 A, T_A = 25°C	–	–	0.33	–	–	V
TOTAL ERROR ($V_{IOUT(ACTUAL)}$ – ($Sens_{(IDEAL)}$ × I_{PR} + V_{REF})) / ($Sens_{(IDEAL)}$ × I_{PR}) × 100 AND TOTAL ERROR COMPONENTS								
Total Error	E_{TOT}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–1.75	–1.2	–	1.2	1.75	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–1.75	–1.4	–	1.4	1.75	%
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–1.5	–1.2	–	1.2	1.5	%
Zero-Current Reference Error	V_{RE}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–3	–	3	10	mV
Offset Error	V_{OE}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–8	–5	–	5	8	mV
QVO Error	V_{QE}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 150°C, T_A = –40°C to 25°C	–10	–5	–	5	10	mV
TOTAL ERROR AND TOTAL ERROR COMPONENTS INCLUDING LIFETIME DRIFT [2][3]								
Total Error Including Lifetime Drift	E_{TOT_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.7	–2.5	–	2.5	3.7	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.5	–2.4	–	2.4	3.5	%
Sensitivity Error Including Lifetime Drift	E_{SENS_LTD}	$I_P = I_{PR(max)}$, T_A = 25°C to 150°C	–3.5	–2.4	–	2.4	3.5	%
		$I_P = I_{PR(max)}$, T_A = –40°C to 25°C	–3.4	–2.3	–	2.3	3.4	%
Zero-Current Reference Error Including Lifetime Drift	V_{RE_LTD}	$V_{REFactual} – V_{REFideal}$, I_P = 0 A, T_A = 25°C to 125°C, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
Offset Error Including Lifetime Drift	V_{OE_LTD}	$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = 25°C to 125°C	–15	–9	–	9	15	mV
		$V_{IOUT(Q)} – V_{REF}$, I_P = 0 A, T_A = –40°C to 25°C	–11	–7	–	7	11	mV
QVO Error Including Lifetime Drift	V_{QE_LTD}	$V_{IOUT(Q)}$, I_P = 0 A, T_A = 25°C to 125°C	–17	–9	–	9	17	mV
		$V_{IOUT(Q)}$, I_P = 0 A, T_A = –40°C to 25°C	–14	–8	–	8	14	mV

[1] Absolute minimum (min) and absolute maximum (max) are the production limits that the device must not exceed.
[2] –3σ and +3σ are mean ± 3σ values and are determined such that 99.73% of devices lie within the interval during initial characterization.
[3] Lifetime drift characteristics are based on a statistical combination of production distributions and worst-case distribution of parametric drift of individuals observed during AEC-Q100 qualification.

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FUNCTIONAL DESCRIPTION

Power-On Reset Operation

The descriptions in this section assume: temperature = 25°C, with the labeled test conditions. The provided graphs in this section show V_{IOUT} moving with V_{CC}. The voltage of V_{IOUT} during a high-impedance (high-Z) state is most consistent with a known load (R_L, C_L).

POWER-ON/POWER-OFF

As V_{CC} ramps up, the V_{IOUT} and V_{REF} outputs are high impedance until V_{CC} reaches and surpasses $V_{POR(H)}$ [1] in Figure 4. V_{REF} and V_{IOUT} continue to report until V_{CC} is less than $V_{POR(L)}$ [5] in Figure 4, at which point V_{REF} and V_{IOUT} go to the high-Z state.

NOTE: The time it takes for the output to reach a steady state depends on the external circuitry used.

POWER-ON DELAY (t_{POD})

When the supply ramps to $V_{POR(H)}$ [2] in Figure 4, the device requires a finite duration to power its internal components before the outputs are released from the high-z state and can respond to an input magnetic field. Power-on time, t_{POD}, is defined as the time it takes for the output voltage to settle to within ±10% of its steady-state value under an applied magnetic field, which can be observed in Figure 5 as the duration from [1] until [A]. After this delay, the output quickly approaches $V_{IOUT(IP)} = Sens \times IP + V_{REF}$.

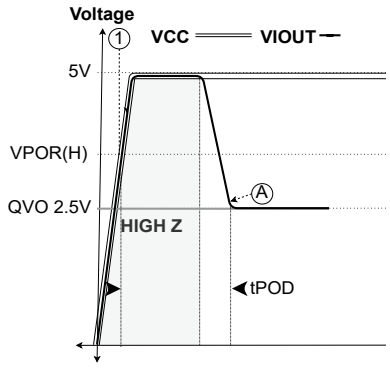


Figure 5: t_{POD}, R_L = Pull-Up

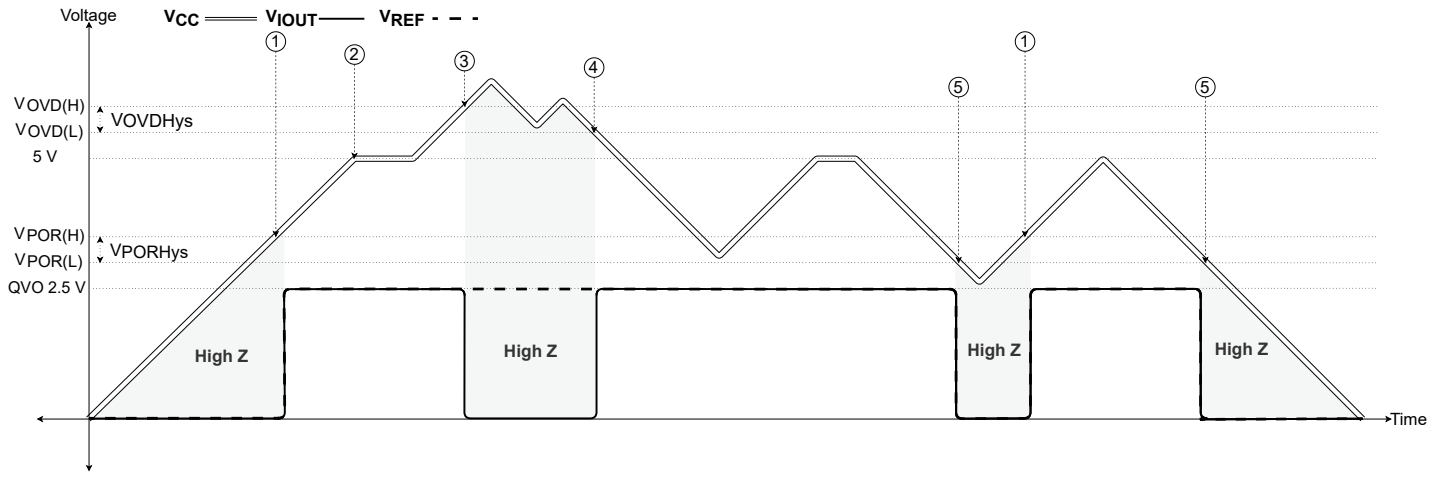


Figure 4: Power States Thresholds with V_{IOUT} Behavior for 5 V Device, R_L = Pull-Down

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Overvoltage Detection (OVD)

To ensure that the device output reports accurately, the device contains an overvoltage detection flag. This flag on V_{IOUT} can be used to alert the system that the supply voltage is not within the operational limits. When V_{CC} increases to greater than $V_{OVD(H)}$ ([3] in Figure 6), V_{IOUT} goes to the high-Z state, and the load resistor pulls V_{IOUT} to V_{CC} or GND. V_{REF} continues to output as per typical operations.

To reduce nuisance flagging and clears, hysteresis is included between the OVD enable and disable thresholds.

The enable time for OVD, $t_{OVD(E)}$, is the duration from $V_{OVD(H)}$ ([4] in Figure 6) until the OVD flag ([B] in Figure 6). The enable flag for OVD has a counter to reduce transients faster than 64 µs from triggering nuisance flags.

The disable time for OVD, $t_{OVD(D)}$, is the duration from $V_{OVD(L)}$ ([5] in Figure 6) until the device returns to typical operation ([C] in Figure 6). The OVD disable time does not have a counter.

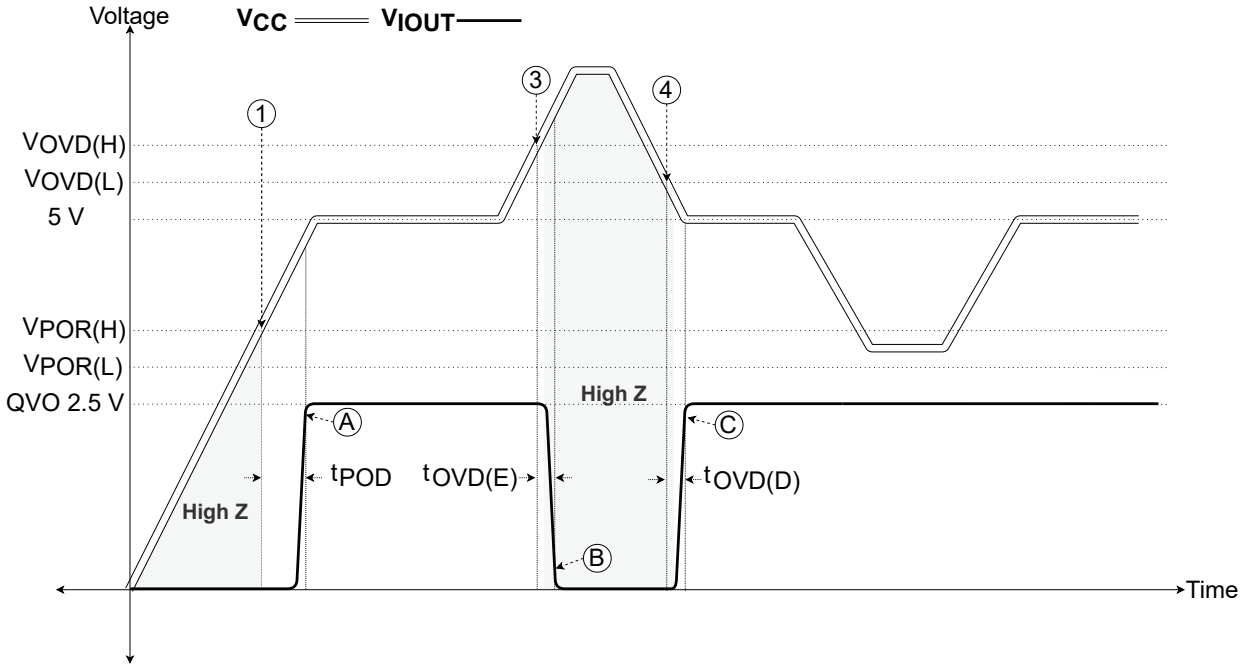


Figure 6: t_{POD} and $t_{OVD(E/D)}$ with R_L = Pull-Up

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Absolute Maximum Ratings

These are the maximum application or environmental conditions that the device can withstand before damage might occur.

SUPPLY ZENER CLAMP VOLTAGES

If the voltage applied to the device increases to greater than the overvoltage detection, there is a point at which the Zener diodes turns on. These internal diodes are in place to protect the device from short-duration high-voltage or electrostatic discharge (ESD) events and should not be used as a feature to reduce the voltage on a line. Continued exposure to voltages that exceed the typical operating voltage, V_{CC}, can weaken or damage the Zener diodes, which has the potential to damage the part.

FORWARD AND REVERSE SUPPLY VOLTAGES

The forward and reverse supply voltages are the largest voltage magnitudes that can be supplied to V_{CC} from GND during programming or transient switching. These voltages should not be used as a DC voltage bias for an extended duration.

FORWARD AND REVERSE OUTPUT VOLTAGES

The forward output voltage, V_{FIOUT}, cannot exceed V_{CC} + 0.5, up to 6.5 V; this is the highest voltage that can be used during programming or transient switching to bias the output from GND. During programming or transient switching, the reverse output voltage, V_{RIOUT}, should not reduce to less than –0.5 V. These voltages should not be used as a DC voltage bias for an extended duration.

FORWARD AND REVERSE REFERENCE/FAULT VOLTAGES

The forward reference/fault voltage, $V_{F\text{-}RF}$, cannot exceed V_{CC} + 0.5, up to 6.5 V; this is the highest voltage that can be used during programming or transient switching to bias V_{REF} and V_{OCF} from GND. During programming or transient switching, the reverse output voltage, $V_{R\text{-}RF}$, should not reduce to less than –0.5 V. These voltages should not be used as a DC voltage bias for an extended duration.

OUTPUT SOURCE AND SINK CURRENT

This is the maximum current that V_{IOUT} can passively sink or source before damage might occur.

AMBIENT TEMPERATURE (T_A)

This is the ambient temperature of the device. The operating ambient temperature range is the ambient temperature range for which the common electrical and common performance characteristics limits are valid. The optimized ambient temperature range is the ambient temperature range for which the device-specific performance characteristics limits are valid. ACS37002L devices have optimized performance in the –40°C to 150°C (“L” temperature) range. ACS37002K devices have optimized performance in the –40°C to 125°C (“K” temperature) range. The –40°C to 125°C (“K” temperature) range devices have device-specific performance optimized within the –40°C to 125°C temperature range but continue to operate in the –40°C to 150°C (“L” temperature) range.

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DEFINITIONS OF OPERATING AND PERFORMANCE CHARACTERISTICS

Zero-Current Voltage Output ($V_{IOUT(Q)}$, QVO)

Zero-current voltage output, $V_{IOUT(Q)}$ (also called QVO), is defined as the voltage on the output, V_{IOUT} when zero amperes are applied through I_P.

QVO Temperature Drift (V_{QE})

QVO temperature drift, V_{QE}, is defined as the drift of QVO from room to hot or room to cold (25°C to 125°C/150°C or 25°C to –40°C, respectively). To improve overtemperature performance, the temperature drift is compensated with Allegro factory trim to remain within the limits across temperature.

Reference Voltage (V_{REF})

The voltage reference output, (V_{REF}), on the ACS37002 reports the zero-current voltage for the output channel, V_{IOUT}, to allow for a differential measurement and a device-referred supply for the VOC pin.

Reference Voltage Temperature Drift (V_{RE})

Reference voltage temperature drift, V_{RE}, is defined as the drift of V_{REF} from room to hot or room to cold (25°C to 125°C/150°C or 25°C to –40°C, respectively).

Offset Voltage (V_{OE})

Offset voltage, V_{OE}, is defined as the difference between QVO and V_{REF} (see Figure 7). V_{OE} includes the drift of QVO minus V_{REF} from room to hot or room to cold (25°C to 125°C/150°C or 25°C to –40°C, respectively).

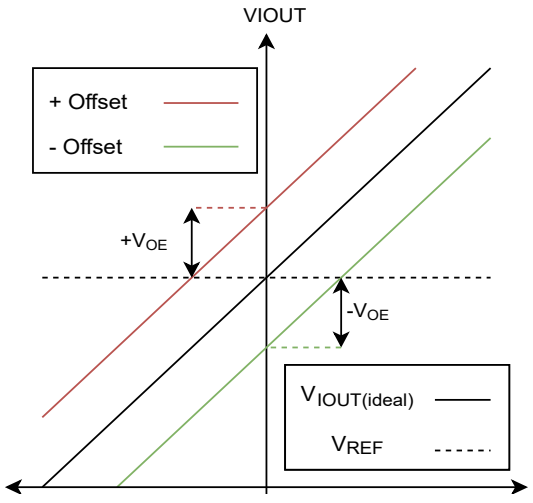


Figure 7: Offset (V_{OE}) Between V_{IOUT} and V_{REF}

Output Saturation Voltage ($V_{SAT(HIGH/LOW)}$)

Output saturation voltage, V_{SAT}, is defined as the voltage that the V_{IOUT} does not pass as a result of an increasing magnitude of current. The highest voltage to which the output can drive is $V_{SAT(HIGH)}$; the lowest is $V_{SAT(LOW)}$. This can be observed in Figure 8.

NOTE: A change in sensitivity does not change the V_{SAT} points.

OUTPUT VOLTAGE OPERATING RANGE (V_{OOR})

The output voltage operating range, V_{OOR}, is the functional range for linear performance of V_{IOUT} and its related datasheet parameters. This can be observed in Figure 8. The V_{OOR} is the output region in which the performance accuracy parameters are valid. It is possible for the output to report beyond these voltages until V_{SAT}, but certain parameters cannot be guaranteed. The output performance is demonstrated in Figure 8 through and beyond the V_{OOR}.

Voltage Output Operating Range for V_{CC} and Output Modes, $V_{OOR(Vcc, Mode)}$		
V_{CC} (V)	Bidirectional	Unidirectional
3.3	±1.32	+2.64
5	±2	+4

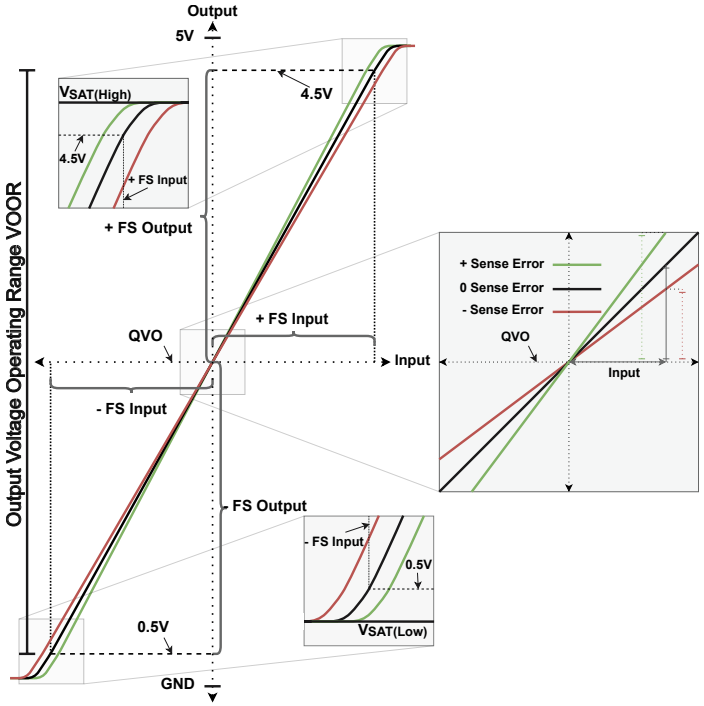


Figure 8: V_{OOR}, V_{SAT} and SENS with Full Scale

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Sensitivity (Sens)

Sensitivity, or Sens, is the ratio of the output swing versus the applied current through the primary conductor, I_P. This current causes a voltage deviation away from QVO on the V_{IOUT} output until V_{SAT}. The magnitude and direction of the output voltage swing is proportional to the magnitude and direction of the applied current. This proportional relationship between output and input is sensitivity, defined as:

$$Sens = \frac{V_{IOUT(I1)} - V_{IOUT(I2)}}{I_1 - I_2}$$

where I_1 and I_2 are two different currents, and $V_{IOUT(I1)}$ and $V_{IOUT(I2)}$ are the voltages of the device at the applied currents. V_{IOUT}, I_1, or I_2 can be QVO with zero current.

Sensitivity Error (E_{Sens})

Sensitivity temperature drift, or E_{Sens}, is the drift of Sens from room to hot or room to cold (25°C to 125°C/150°C or 25°C to –40°C, respectively). Trimming/Programming is not needed because temperature drift is compensated with Allegro factory trim.

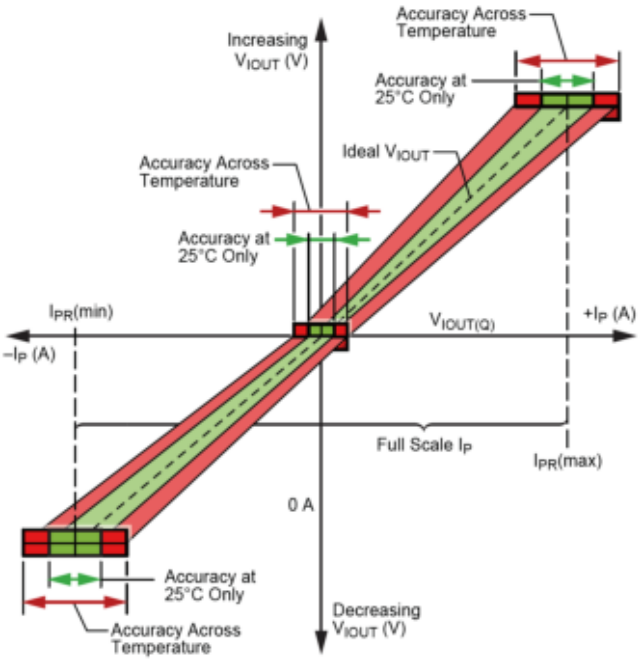


Figure 9: Output Accuracy Pocket for Room and Across Temperature

Gain Selection Pins

The ACS37002 features external gain selection pins that configure the device sensitivity. The gain-select logic is latched based on the pin voltage at startup. Either pin can be shorted directly to VCC or GND, which is logic 1 or 0 respectively. Both pins include an internal 1 MΩ pull-down resistor to GND. Externally floating pins are interpreted as logic 0; if both pins are floating, the device is in the 00 configuration. Specific gain-select performance can be found in the device-specific Performance Characteristics table. To change the gain of the device, refer to Figure 18 in the Application and Theory section.

Full Scale (FS)

Full scale, FS, is a method to relate an input and/or output to the maximum input and/or output of the device. For example, 50%FS of a 10 A sensor is 5 A, or 50% of its maximum input current. The 50% input of 5 A causes the output to move 50%, or 50%FS. FS is used interchangeably to refer to input and output deviations when discussing input steps, fault trip thresholds, and input to output performance. FS_{INPUT} is the input bias that results in FS_{OUTPUT}, and these two parameters are directly related by the actual sensitivity of the device. Both FS input and output can be observed in Figure 8, labeled as positive or negative FS input and FS output. The equation for input-referred FS for a 5 V bidirectional device is:

$$FS = \frac{V_{OOR(5V,Bi)}}{Sens_{Actual}} = \pm\frac{2V}{Sens_{Actual}}$$

NOTE: A percentage change in FS_{INPUT} is equivalent to a resultant percentage change in FS_{OUTPUT}, and *vice versa*.

Nonlinearity (E_{LIN})

As the amount of field applied to the part changes, the sensitivity of the device can also change slightly. This is referred to as linearity error, E_{LIN} (see Figure 10). Consider two currents, I_1 (1/2 FS) and I_2 (FS). Ideally, the sensitivity of the device is the same for both fields. Linearity error is calculated as the percent of change in sensitivity from one field to another. Error is calculated separately for positive ($E_{LIN(+)}$) and negative ($E_{LIN(-)}$) currents, and the percent errors are defined as:

$$E_{LIN(\pm)} = \left(1 - \frac{Sense_{I2\pm}}{Sens_{I1\pm}}\right) \times 100\%$$

where:

- $Sens_{IX+} = \frac{V_{IOUT(IX+)} - V_{REF}}{I_{X+}}$,
- $Sens_{IX-} = \frac{V_{IOUT(IX-)} - V_{REF}}{I_{X-}}$, and
- Ix are positive and negative currents through I_P, such that $|I_{+2}| = 2 \times |I_{+1}|$, and $|I_{-2}| = 2 \times |I_{-1}|$. $E_{LIN} = \max(E_{LIN(+)}, E_{LIN(-)})$.

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Total Output Error (E_{TOT})

The total output error is the current measurement error from the sensor IC as a percentage of the actual applied current. This is equivalent to the difference between the ideal output voltage and the actual output voltage, divided by the ideal sensitivity, relative to the current applied to the device, or simplified to:

$$E_{TOT} = \frac{V_{IOUT(ACTUAL)} - (Sens_{(IDEAL)} \times I_{PR} + V_{REF})}{(Sens_{(IDEAL)} \times I_{PR})} \times 100$$

Total output error incorporates all sources of error and is a function of current. At relatively high currents, total output error is mostly due to sensitivity error. At relatively low inputs, total output error is mostly due to offset voltage (V_{OE}). At I = 0 A, total output error approaches infinity due to the offset. An example of total error at FS can be observed in Figure 10.

NOTE: Total output error approaches infinity as the amount of applied field approaches 0 A.

Power Supply Offset Error (V_{PS})

Power supply offset error or $V_{OE(PS)}$ is defined as the offset error in mV between V_{CC} and V_{CC} ±10% V_{CC}. For a 5 V device, this is 5 to 4.5 V and 5 to 5.5 V. For a 3.3 V device, this is 3.3 to 3 V and 3.3 to 3.6 V.

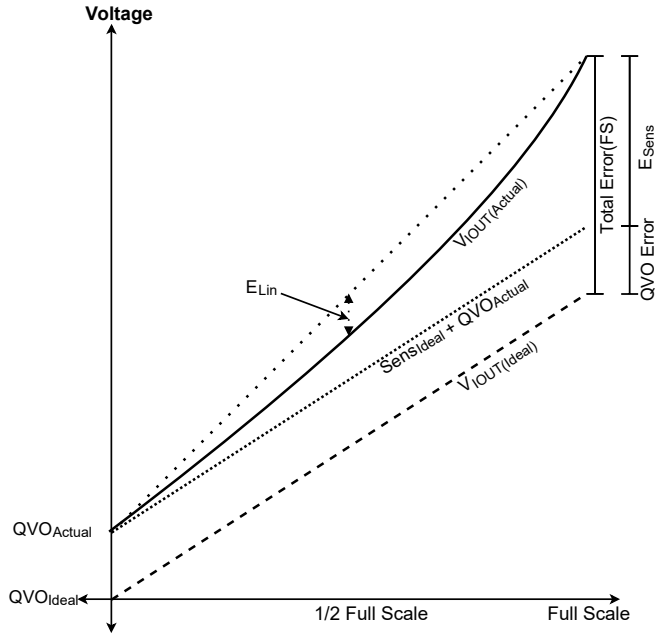


Figure 10: Accuracy Error

Offset Power Supply Rejection Ratio ($PSRR_O$)

The offset power supply rejection ratio, $PSRR_O$, is defined as 20 × log of the ratio of the change of QVO in volts over a ±100 mV variable AC V_{CC} centered at 5 V, reported as dB in a specified frequency range. This is an AC version of the $V_{OE(PS)}$ parameter. The equation is:

$$PSRR_O = 20 \times \log\left(\frac{\Delta QVO}{\Delta V_{CC}}\right)$$

Power Supply Sensitivity Error (E_{PS})

Power supply sensitivity error, $E_{Sens(PS)}$, is defined as the percentage of sensitivity error measured between V_{CC} and V_{CC} ±10%. For a 5 V device, this is 5 to 4.5 V and 5 to 5.5 V. For a 3.3 V device, this is 3.3 to 3 V and 3.3 to 3.6 V.

Sensitivity Power Supply Rejection Ratio ($PSRR_S$)

The sensitivity power supply rejection ratio, $PSRR_S$, is defined as 20 × log of the ratio of the percentage of change in sensitivity over the percentage of change in V_{CC} (±100 mV variable AC V_{CC} centered at 5 V), reported as dB in a specified frequency range. This is the AC version of the $E_{Sens(PS)}$ parameter. The equation is:

$$PSRR_S = 20 \times \log\left(\frac{\Delta\%Sens}{\Delta V_{CC}}\right)$$

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FAULT BEHAVIOR

Overcurrent Fault (OCF)

As the output swings, if the sensed current exceeds its comparator threshold, the overcurrent fault pin triggers with an active low flag. This is internally compared with either the factory-programmed thresholds or the VOC voltage when $V_{VOC} > 0.1$ V. This flag trips symmetrically for the positive and negative OCF operating point.

The implementation for the OCF circuitry is accurate over temperature and does not require further temperature compensation because it is dependent on the Sens and V_{OFF} parameters that are factory-trimmed flat over temperature.

OVERCURRENT FAULT OPERATING RANGE/POINT (I_{OCF-OR}, I_{OCF-OP})

Overcurrent fault operating range is the functional range in which the OCF thresholds can be set in terms of percentage of full-scale output swing. The overcurrent fault operating point is the specific point at which the OCF trigger occurs, and it is set by either V_{VOC} or the factory default setting. The I_{OCF-OP} can be observed in Figure 11 as [9] along with the fault pin functionality.

OVERCURRENT FAULT HYSTERESIS ($I_{OCF-HYST}$)

Overcurrent fault hysteresis, $I_{OCF-HYST}$, is defined as the magnitude of the percentage of FS that must be reduced before a fault assertion is cleared. This can be observed as the separation between voltages [9] and [10] in Figure 11.

NOTE: The mask and hold functions are independent of each other. The ACS37002 comes standard with an OCF_{HYS} of 120 mV (on the output), or 6%FS for a 5 V device and 9%FS for a 3.3 V device.

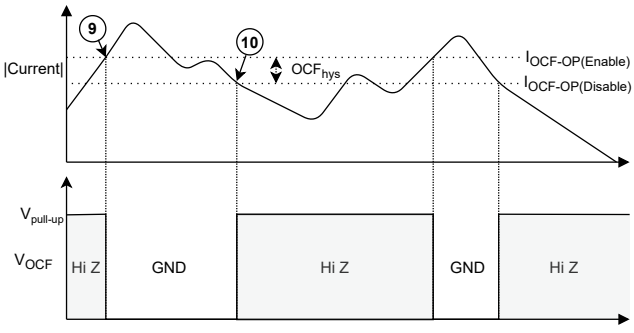


Figure 11: Fault Thresholds and OCF Pin Functionality

VOLTAGE OVERCURRENT PIN (VOC)

The fault trip points can be set using the VOC pin as the direct analog input for the fault trip point. For bidirectional devices, the VOC pin voltage can be set using resistor dividers from V_{REF}. The fault performance is valid when V_{VOC} is within the VOC operating voltage range or < 0.1 V. If voltage is beyond the defined valid performance region, the device responds with varied results. For a 5 V bidirectional device: If the VOC pin is set to 0.5 V, the minimum trip point, $I_{FAULT(min)}$, is selected; if the VOC pin is set to 2 V, the maximum trip point, $I_{FAULT(max)}$, is selected, as defined in the Performance Characteristic table. All voltages between 0.5 and 2 V for the 5 V option, and between 0.33 and 1.321 V for the 3.3 V option, can be used to linearly select a trip point between the minimum and maximum levels, as shown in Figure 12. When $V_{OC} < 0.1$ V, the internal EEPROM fault level is used.

The resulting equation for the fault is:

$$OCF_{\%FS}\,[\%] = \frac{V_{OC(V_{CC})}\,[V]}{V_{OC(V_{CC})100\%}\,[V]} \times 100\,[\%]$$

$$I_{OCF}\,[A] = OCF_{\%FS}\,[\%] \times I_{PR}\,[A]$$

Table 1: $V_{OC(Vcc)}$ Thresholds and Corresponding Percentage of the Full-Scale Output for Bidirectional and Unidirectional Operational Modes

$V_{OC(3.3V)}$ (V)	$V_{OC(5\ V)}$ (V)	Fault Operation Point %FS	
		Bidirectional	Unidirectional
<0.1		100% (factory default)	50% (factory default)
0.330	0.5	50%	25%
0.466	0.75	75%	37.5%
0.661	1	100%	50%
0.826	1.25	125%	62.5%
0.991	1.5	150%	75%
1.156	1.75	175%	85%
1.321	2	200%	100%

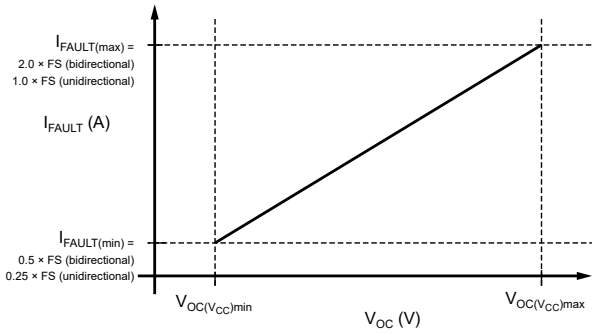


Figure 12: VOC Functional Range

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OVERCURRENT FAULT ERROR (E_{OCF})

Fault error, E_{OCF}, is the error between $I_{OCF\text{-}OP(actual)}$ and $I_{OCF\text{-}OP(ideal)}$.

OVERCURRENT FAULT RESPONSE TIME (t_{OCF})

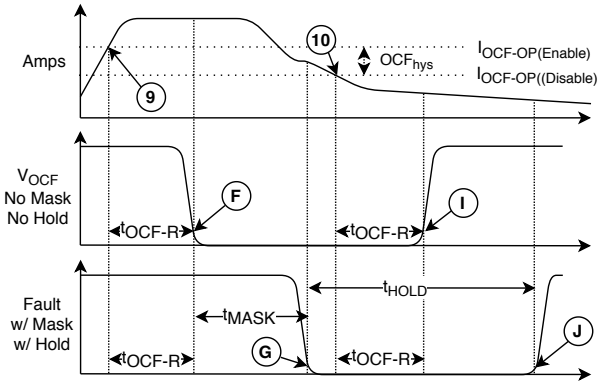
Overcurrent fault response time, t_{OCF}, is defined as the duration from when the input reaches the operating point [9] (see Figure 13), until the OCF pin reduces to less than the $V_{FAULT\text{-}ON}$ point [G]. If the OCF mask is disabled, t_{OCF} is equal to $t_{OCF\text{-}R}$, which is the duration from [9] until [F].

OVERCURRENT FAULT REACTION TIME ($t_{OCF\text{-}R}$)

Overcurrent reaction time, $t_{OCF\text{-}R}$, is defined as the duration from when the current input increases to greater than the $I_{OCF\text{-}OP}$ point [9] (see Figure 13), until the OCF pin reaches the $V_{OCF\text{-}ON}$ point [F] with the OCF mask disabled. This is the time required for the device to recognize and clear the fault, which is the duration from [10] until [I].

OVERCURRENT FAULT MASK TIME ($t_{OCF\text{-}MASK}$)

Overcurrent fault mask time, $t_{OCF\text{-}MASK}$, is defined as the additional duration the OCF must be present beyond the $t_{OCF\text{-}R}$ time (see Figure 13, from [F] until [G]). The purpose is to reduce nuisance tripping of the fault pin. If an OCF occurs but does not persist beyond $t_{OCF\text{-}R}$ + $t_{OCF\text{-}MASK}$, it is not reported by the device (see Figure 14). This prevents short transient spikes from causing an erroneous OCF flag. The factory default setting is $t_{OCF\text{-}MASK}$ = 0 µs.



NOTE: Mask and hold function independent of each other.

Figure 13: General Fault Timing

OVERCURRENT FAULT HOLD TIME ($t_{OCF\text{-}HOLD}$)

Overcurrent fault hold time, $t_{OCF\text{-}HOLD}$, is defined as the minimum OCF flag assertion duration after a sufficient OCF event. After the hold time is reached: If the OCF condition has ended (see Figure 13, from [G] until [J]), the OCF releases; if the OCF condition remains present (see Figure 15, from [G] until [J]), the fault persists. The factory default is 0 ms.

OVERCURRENT FAULT PERSIST

If a flag occurs and the fault-persist option is selected, the OCF flag is maintained until a POR event.

OCF DISABLE

If the disable overcurrent fault function is disabled, the OCF pin remains in the high-Z state.

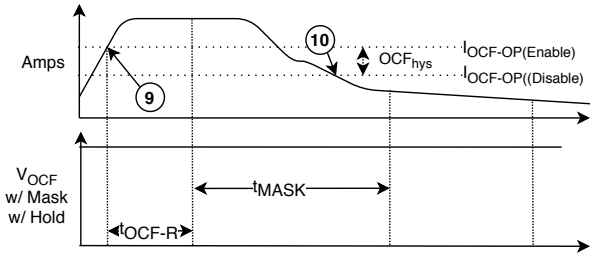


Figure 14: Fault Condition Clearing Before Mask Time Is Reached

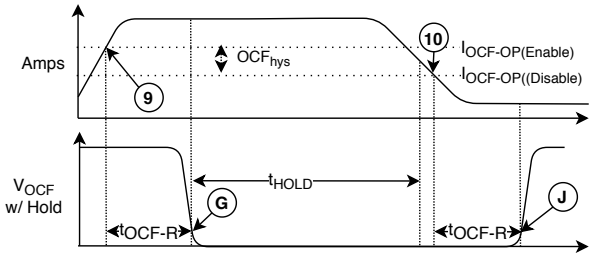


Figure 15: Fault Hold with Clear Fault After Hold Time

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RESPONSE CHARACTERISTICS DEFINITIONS AND PERFORMANCE DATA

Response Time ($t_{RESPONSE}$)

The time interval between a) when the sensed input current reaches 90% of its final value, and b) when the sensor output 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 reaches 20% of its full-scale value.

Rise Time (t_r)

The time interval between a) when the sensor reaches 10% of its full-scale value, and b) when the sensor reaches 90% of its full-scale value.

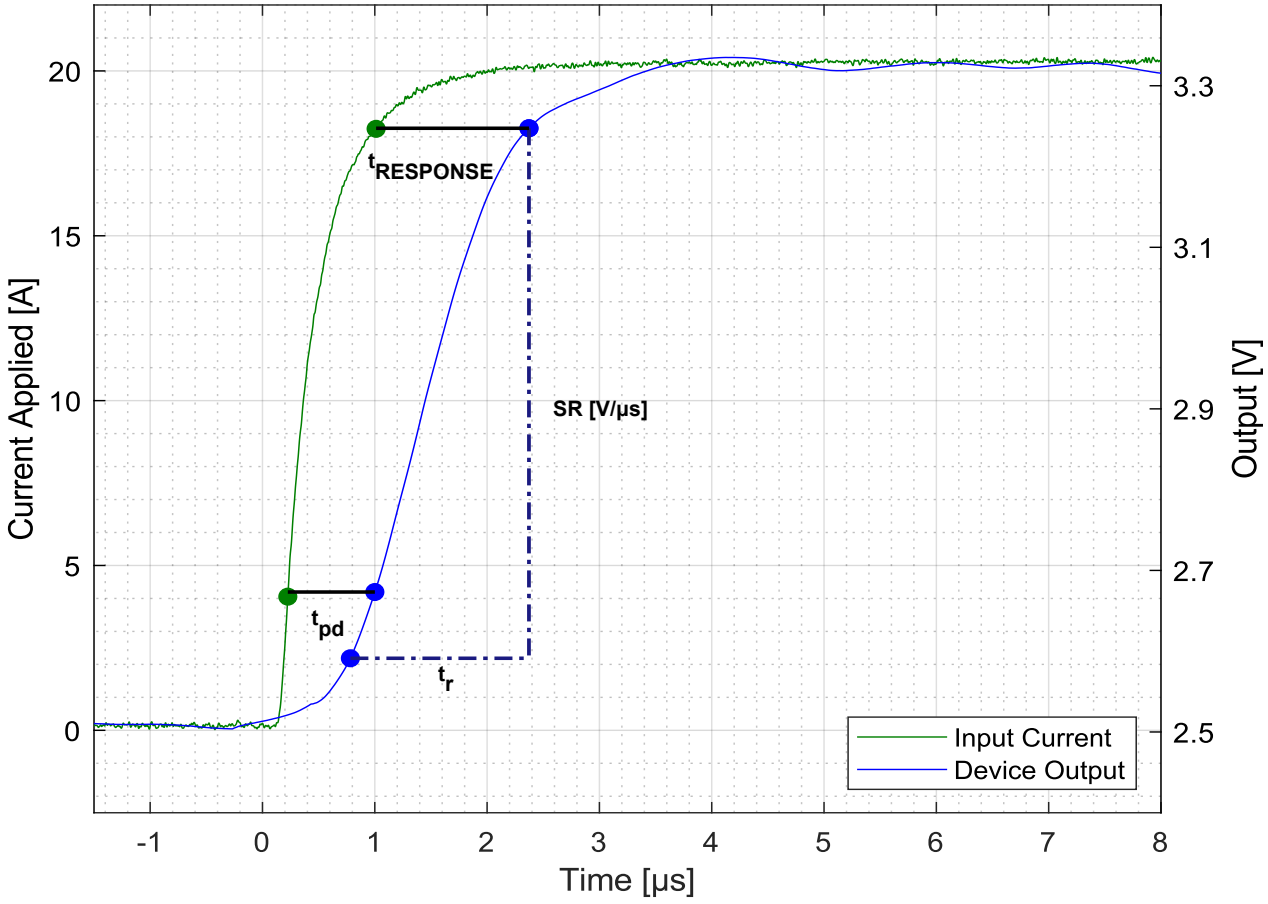
Output Slew Rate (SR)

The rate of change [V/µs] in the output voltage from a) when the sensor reaches 10% of its full-scale value, and b) when the sensor reaches 90% of its full-scale value.

Response Time, Propagation Delay, Rise Time, and Output Slew Rate

Applied current step with 10% – 90% rise time = 1 µs

Test Conditions: T_A = 25°C, C_{BYPASS} = 0.1 µF, C_L = 6 nF



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Temperature Compensation

To help compensate for the effects of temperature on performance, the ACS37002 has an integrated internal temperature sensor. This sensor and compensation algorithms help to standardize device performance over the full range of optimized temperatures. This allows for room-temperature system calibration and validation of end-of-line modules.

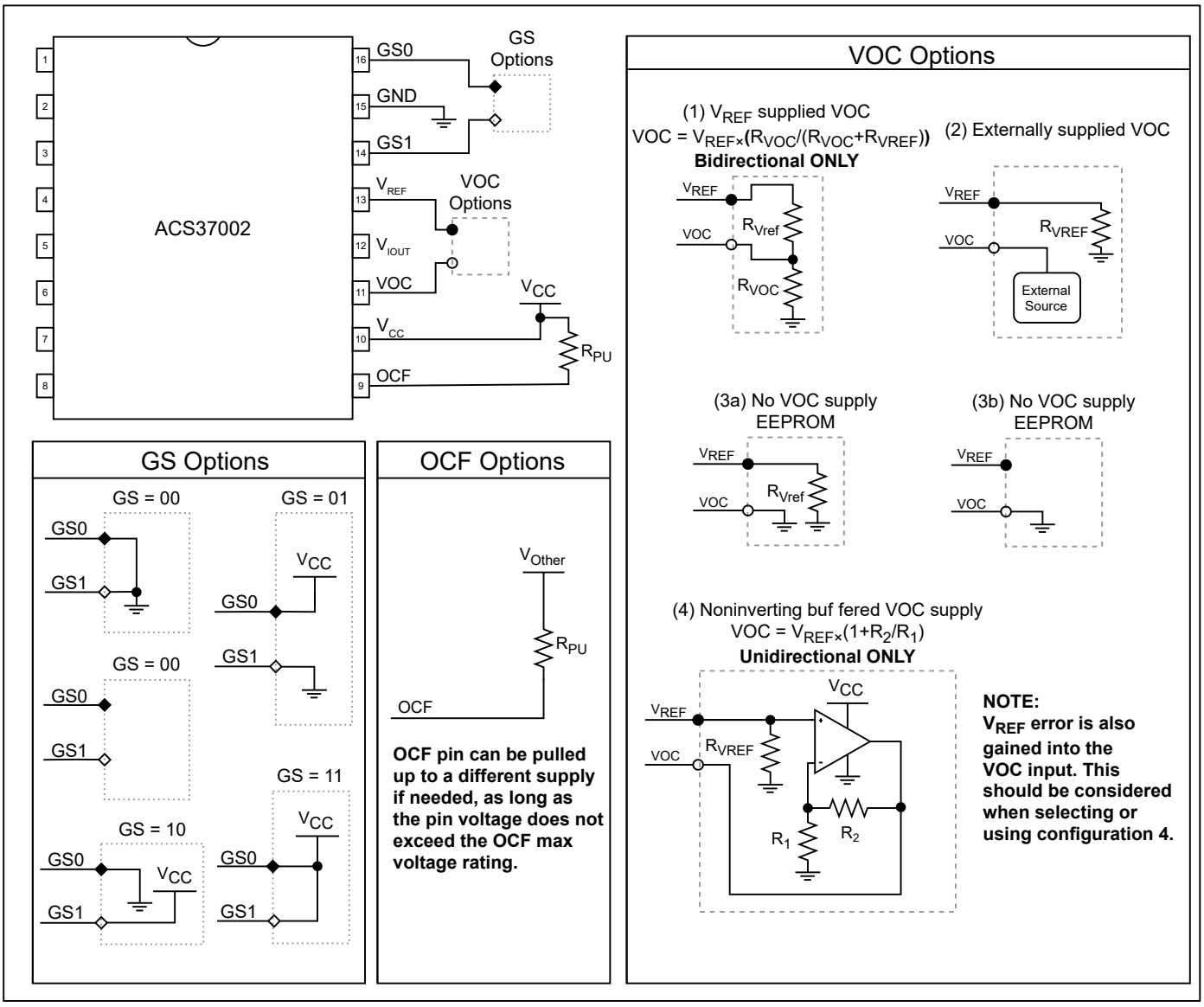
Temperature Compensation Update Rate

A valid temperature-compensated output requires an update duration of 8 ms; that is, temperature compensations are calculated and applied every 8 ms.

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APPLICATION AND THEORY

Application Circuits



These configurations are simplified to the network required for functionality.
For best performance, bypass and load capacitors are recommended.

Figure 16: Applications Circuits for GAIN_SEL (GSx), VOC, and Fault Pins

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Theory and Functionality—VOC and OCF

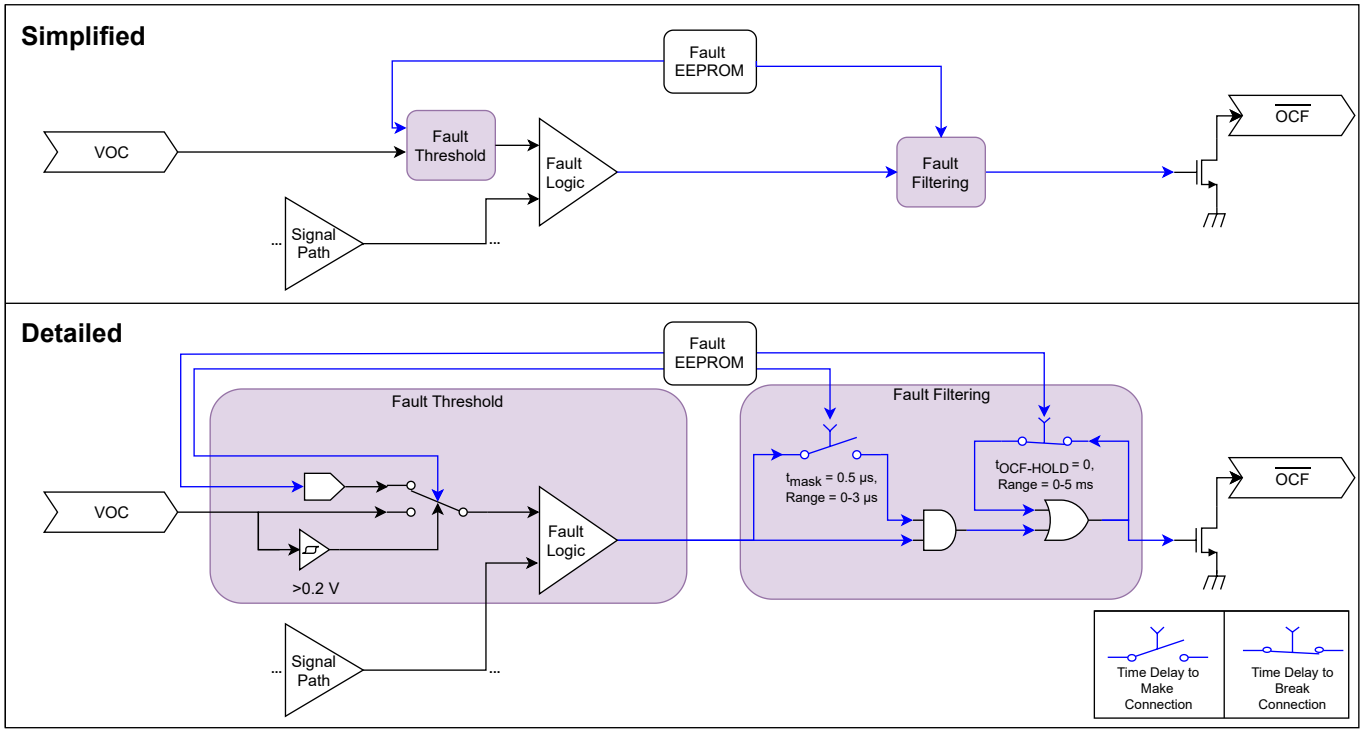


Figure 17: OCF Signal Path Simplified and Detailed Blocks of Functionality

VOC DRIVEN BY NONINVERTING BUFFERED V_{REF}

If the VOC pin is driven by a noninverted buffered V_{REF}, it is important to consider that any error from the V_{REF} pin is gained as well. For instance, if V_{REF} error is +10 mV and gain = 4 for the noninverting operational amplifier, the VOC pin is 40 mV from the expected target. For unidirectional devices, OCF is subjected to an additional 4% error due to the error propagation from V_{REF} through the gain stage.

POWER SUPPLY DECOUPLING CAPACITOR AND OUTPUT CAPACITIVE LOADS

To maintain performance, the higher the capacitive load on the outputs (V_{REF} and V_{IOUT}), the larger the decoupling capacitor should be on the power supply (V_{CC}).

C_{LOAD}	C_{BYPASS}
0 nF	>100 nF
1 nF	>100 nF
3 nF	>1 µF
6 nF	>10 µF

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Dynamically Changing Gain in a System

The ACS37002 has GAIN_SEL pins that are used to change the gain of the device on startup. If a more-dynamic gain is desired, reduce V_{CC} to less than $V_{POR(L)}$, and restart the device by returning V_{CC} to the nominal voltage with the new desired GAIN_SEL configuration. To successfully change the device gain, the GAIN_SEL pin voltage must exceed the desired configuration voltage ($V_{H(SEL)}$ or $V_{L(SEL)}$) at or before $V_{CC} > V_{POR(H)}$. The GAIN_SEL pin voltage is latched at startup. After the device V_{IOUT} exits the high-Z state, a change to the pin voltage does not affect gain. The cycle time to complete this operation is up to 2 × t_{POD}.

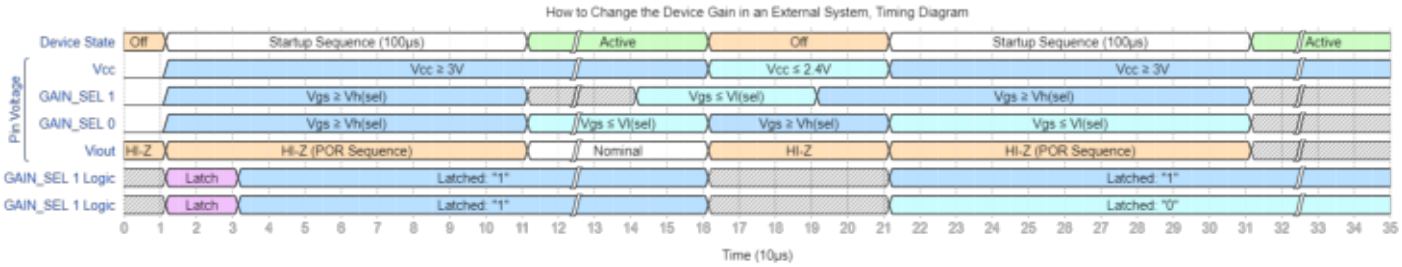


Figure 18: GAIN_SEL Dynamic Gain Changing Timing Diagram

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THERMAL PERFORMANCE

Thermal Rise vs. Primary Current

Self-heating due to the flow of current should be considered during the design of any current-sensing system. As current moves through the system, the sensor, printed circuit board (PCB), and contacts to the PCB generate heat.

The thermal response is highly dependent on the PCB layout, copper thickness, cooling techniques, and profile of the injected current. The current profile includes peak current, current on-time, and duty cycle. While the data presented in this section were collected with direct current (DC), the values presented in this section can be used to approximate thermal response for both AC signals and current pulses.

The measured rise in steady-state die temperature of the ACS37002 versus continuous current at an ambient temperature, T_A, of 25 °C is shown in Figure 19. The thermal offset curves can be applied directly to other values of T_A. Conversely, the maximum continuous current at a given T_A is shown in Figure 20. The device can withstand a surge beyond the maximum current listed in Figure 21 only if such a surge does not cause the maximum junction temperature, $T_{J(MAX)}$ (165°C), to be exceeded.

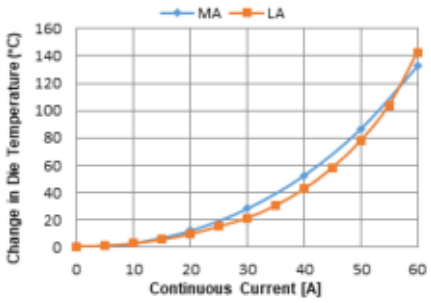


Figure 19: Self-Heating Due to Current Flow in MA and LA Packages

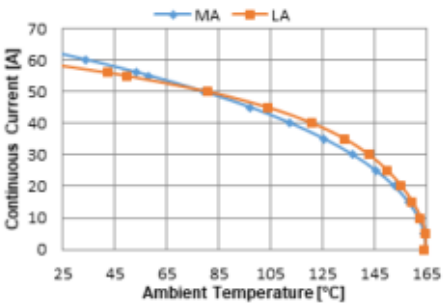


Figure 20: Maximum Continuous Current at Given T_A

The thermal capacity of the ACS37002 should be verified by the end user and is specific to the application. The maximum junction temperature, $T_{J(MAX)}$ (165°C), should not be exceeded. Further information about this application testing is available in the DC and Transient Current Capability application note on the Allegro website (https://www.allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/dc-and-transient-current-capability-fuse-characteristics).

Evaluation Board Layout

Thermal data collected using the ASEK37002 Evaluation Board (TED-0002825) is shown in Figure 19 and Figure 20. This board includes 750 mm^2 of 4 oz. copper (0.1388 mm) connected to pins 1 through 4, and to pins 5 through 8, with thermal vias connecting the layers. The top and bottom layers of the PCB are shown in Figure 21.

Gerber files for the ASEK37002 evaluation board are available for download from the Allegro website. See the Design Tools section of the ACS37002 webpage (https://www.allegromicro.com/en/products/sense/current-sensor-ics/zero-to-fifty-amp-integrated-conductor-sensor-ics/acs37002).

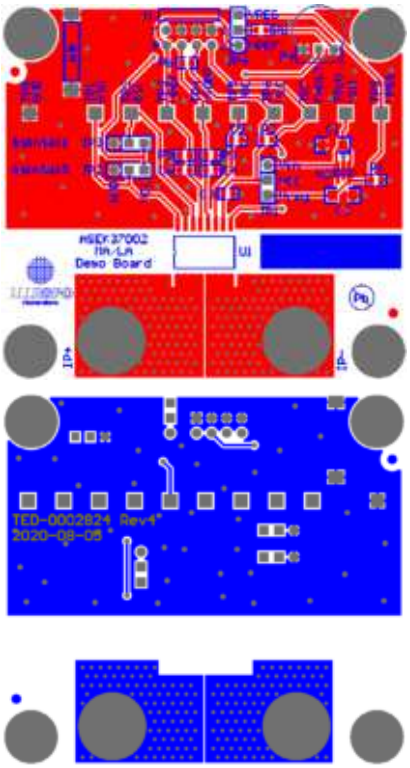


Figure 21: Top and Bottom Layers of ASEK37002 Evaluation Board

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PACKAGE OUTLINE DRAWINGS

For Reference Only – Not for Tooling Use

(Reference MS-013AA)
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

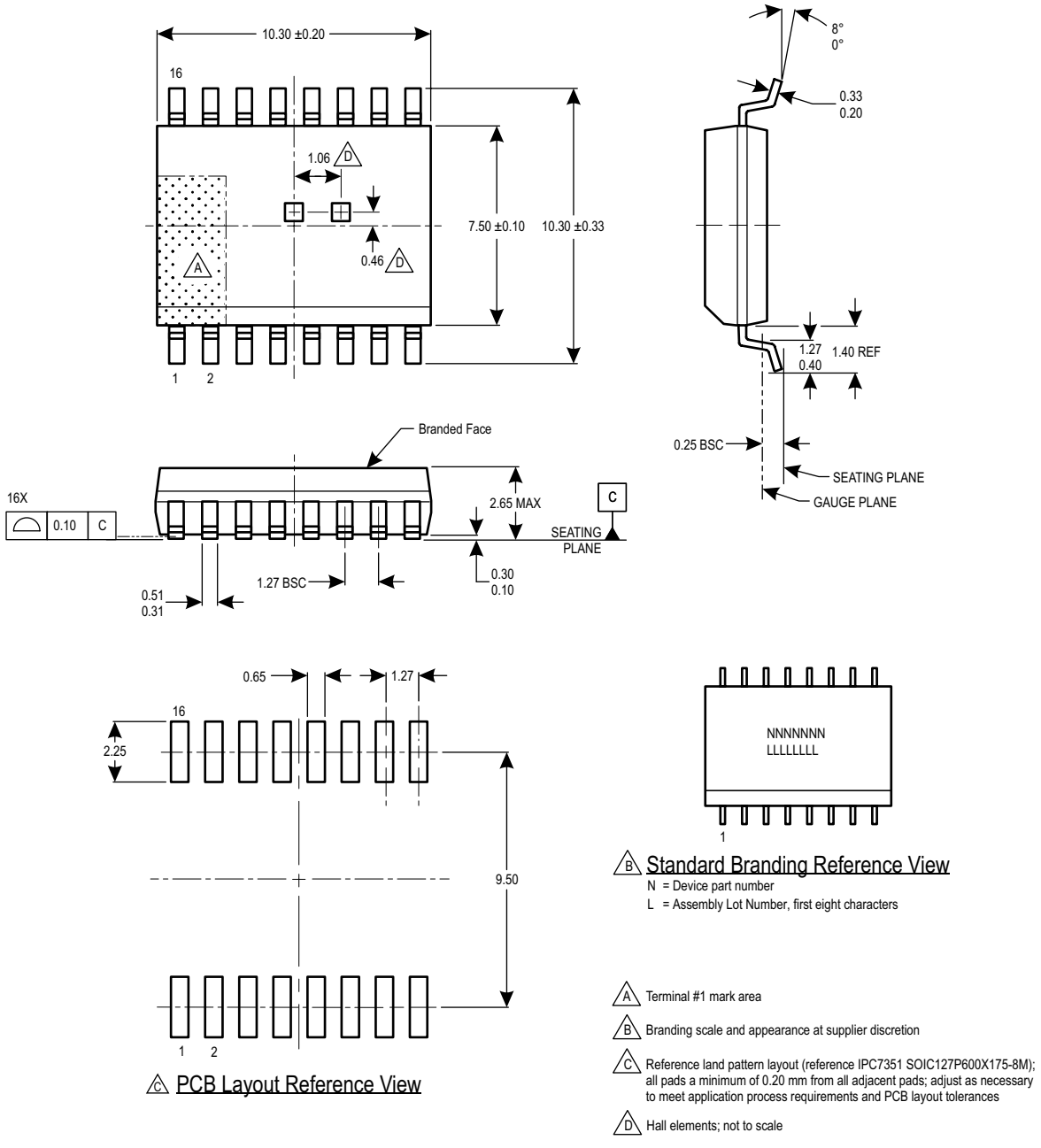


Figure 22: Package MA, 16-Pin SOICW

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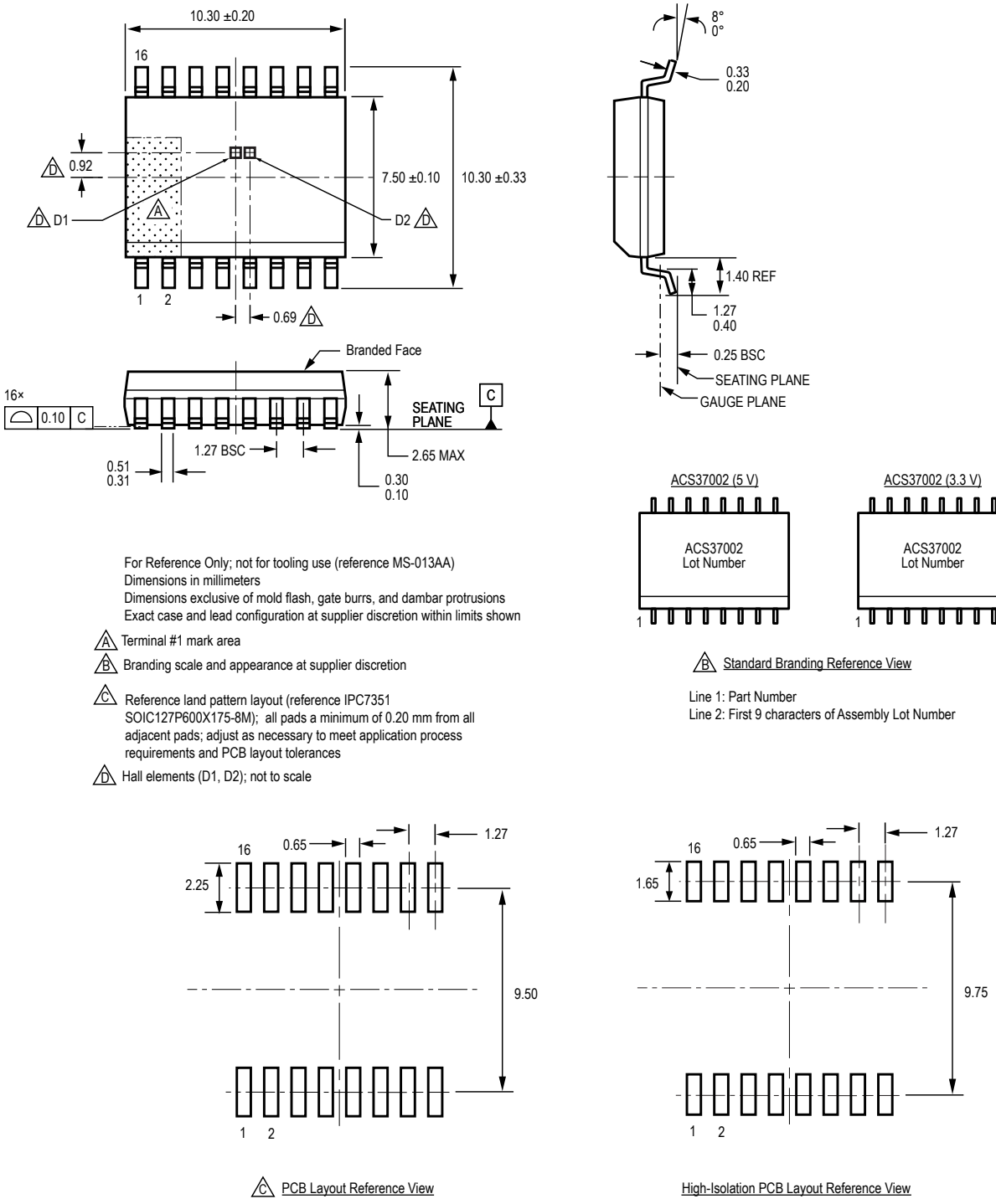


Figure 23: Package LA, 16-Pin SOICW

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Revision History

Number	Date	Description
–	June 24, 2020	Initial release
1	July 8, 2020	Updated Features and Benefits, Selection Guide (page 2), Working Voltage values (page 4), Footnote 2 (pages 10-19), Voltage Overcurrent Pin section (page 30), and Branding (page 38)
2	October 16, 2020	Updated Features and Benefits, Description, and Figure 1 (page 1); added UL certification (page 2); updated Selection Guide table (page 2), Forward Output Voltage and Reverse Output Voltage symbols (page 3), Isolation Characteristics and MA Package Specific Performance tables (page 4), Supply Voltage, Supply Bypass Capacitor, Primary Conductor Resistance, Power-On Reset Voltage, Power-On Time, Undervoltage and Undervoltage Detection Threshold (page 7), Rise Time, Response Time, Propagation Delay Time, Noise Density (page 8), VOC Operating Voltage Range, OCF Reaction Time, OCF Mask, OCF Response Time (page 9); added footnote 4 (page 9); Performance Characteristic tables (pages 10-19); updated Current Sensing Range and Sensitivity values (pages 21-23); added Functional Description (pages 24-27), Definitions of Operating and Performance Characteristics (pages 28-32); updated Figure 20 (page 34),Theory and Functionality (pages 35-36).
3	December 16, 2020	Updated UVD and OVD Threshold test conditions (page 7); removed Overshoot and Settling Time sections and Figure 19 (page 33); fixed Figure 18 (page 33) graphical issue; updated Figure 19 (page 34), and other minor editorial updates.
4	May 14, 2021	Updated Features and Benefits, Description, Figure 1 caption (pages 1-2), Table of Contents (page 3); added Maximum Continuous Current (page 4), MSL Rating (page 5); updated Dielectric Strength Test Voltage (page 5), Reference Resistive Load, Primary Conductor Inductance, Typical Buffer Resistance (page 8), Internal Bandwidth, Rise Time, Response Time, Propagation Delay, Noise Density, Noise, Power Supply Rejection Ratio Offset, and Power Supply Rejection Ratio Sens test conditions (page 9), OCF Response Time test conditions and footnote 2 (page 10), Zero Current Output Voltage (page 23), Current Sensing Range, Overcurrent Fault Operating Range, and Zero Current Output Voltage (page 24), Functional Description Diagrams (pages 25-29), Definition of Operating and Performance Characteristics diagrams and equations (pages 30-32), Fault Behavior Diagrams (page 34), Response Characteristics Definitions and Performance Data section (pages 35-36), Application and Theory diagram (page 38), Thermal Performance diagram (page 40), and other minor editorial updates.
5	June 24, 2021	UVD functionality disabled (all pages); updated part numbers (pages 2, 11-14, 19); updated Isolation and Package Characteristics tables (page 5)
6	September 14, 2021	Updated part numbering schematic (page 2) and other minor editorial updates (pages 2, 4, 9, 38)
7	November 10, 2021	Removed footnote 4 (page 2); updated Power Supply Offset Error (page 9), Total Error and Total Error Components and Total Error and Total Error Components Including Lifetime Drifts values and footnotes (pages 21-24); updated Total Output Error equation (page 30), and package drawing (page 40).
8	January 19, 2024	Added Thermal Characteristics (page 4); updated MA and LA Isolation Characteristics tables (page 5); removed Output Drive characteristic (page 9); added mean ±3 sigma values to Performance Characteristics tables (pages 11-24); updated Selection Guide (page 2); removed Maximum Continuous Current from Absolute Maximum Ratings table (page 3); minor editorial updates (all pages)
9	August 6, 2024	Updated Output Buffer Resistance in Common Electrical Characteristics table (page 8)
10	February 6, 2025	Corrected withstand voltages (pages 1 and 2), corrected UL62368-1:2014 edition (changed edition 2 to edition 3, page 2), corrected descriptions of hot and cold conditions for sensitivity error (page 29), and made minor editorial changes
11	August 14, 2025	Updated DTI (page 5), Power Supply Offset Error, Power Supply Sensitivity Error, OVD Threshold and Hysteresis (page 8), Power Supply Offset Error and Power Supply Sensitivity Error test conditions (page 9), and Sensitivity Error values (pages 19-20)

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