CT4022 and CT4032

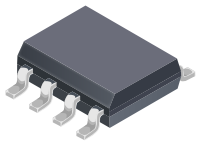
XtremeSense™ TMR Current Sensor
with High dV/dt Immunity and Common-Mode Field Rejection

FEATURES AND BENEFITS

- High operating 500 kHz bandwidth for fast control loops or where high-speed currents are monitored
- High performance for optimized energy applications
  - Ratiometric operation
  - Differential sensing rejects common-mode fields
  - No magnetic hysteresis
- 3.3 V or 5 V supply voltage variants
- Low 1 mΩ primary conductor resistance for low power dissipation and high-inrush current capability
- Optimized for high dV/dt applications
- UL 62368-1 (edition 3) certification (pending), highly isolated compact surface mount packages
- High-withstand surge power ratings
- Wide operating temperature, –40°C to 125°C
- Available in SOIC-8 (CT4022) and SOICW-16 (CT4032) packages
- AEC-Q100 Grade 1, automotive qualified (-A variants only)

PACKAGE

8-pin SOIC (SOIC-8)



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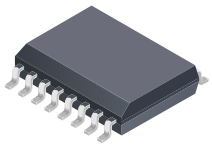
16-pin SOICW (SOICW-16)



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DESCRIPTION

The CT4022/32 is a highly linear, XtremeSense™ TMR-based current sensor. The tunneling magnetoresistive (TMR) sensor is differential, which enables common-mode field rejection to cancel out stray magnetic fields. The primary conductor resistance is only 1 mΩ, which enables the sensor to withstand high inrush current and to minimize power loss. The current applied to the pin of the primary conductor generates an internal differential magnetic field. The TMR sensor provides a proportional voltage to the differential magnetic field while rejecting common-mode stray magnetic fields.

The pins of the primary conductive path and the sensor leads are galvanically isolated. This enables high-side current sensing without the need for additional isolation techniques.

The CT4022/32 is offered in an industry-standard 8-pin small-outline integrated circuit (SOIC) package (CT4022) and a 16-pin wide SOIC (SOICW) package (CT4032). Both packages are green and RoHS compliant. The small and low-profile footprint are well-suited for space-constrained applications.

APPLICATIONS

- Motor control
- Power inverters
- Uninterruptible power supply (UPS), switched-mode power supply (SMPS), and telecom power supply
- Consumer and enterprise electronics

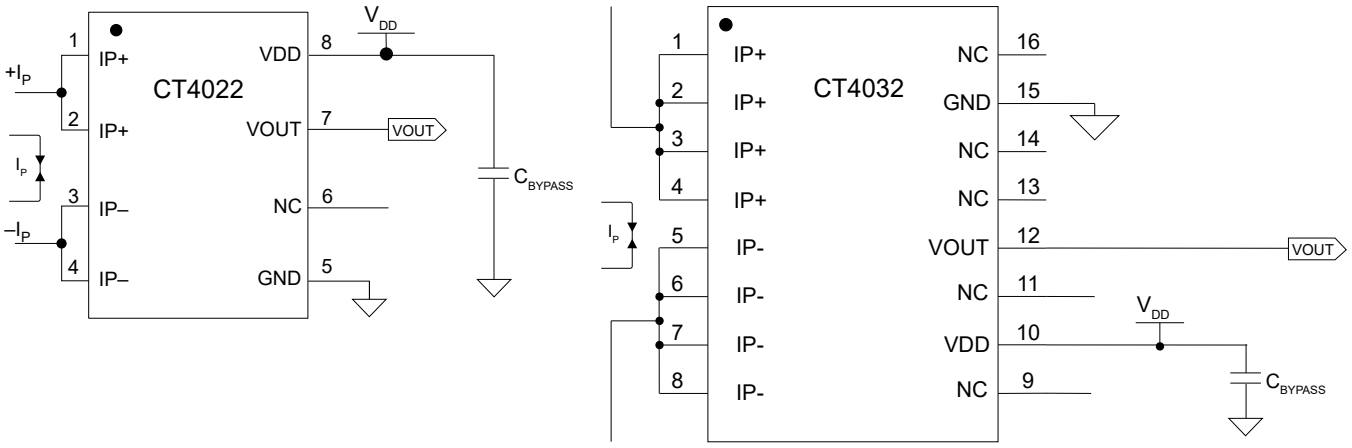


Figure 1: Typical Application Circuit of CT4022 (left) and CT4032 (right)

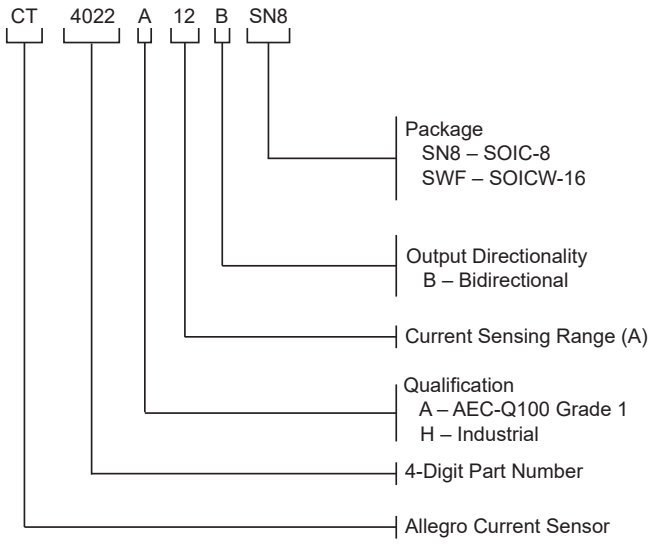
The CT4022/32 outputs an analog signal, V_{OUT}, that varies linearly with the primary current, I_P , within the specified ranges.

SELECTION GUIDE

Part Number	Current Sensing Range (A)	Sensitivity (mV/A)		Quiescent Voltage Output V_{QVO} (V)		Optimized Temperature Range T_A (°C)	Packing
		V_{DD} = 3.3 V	V_{DD} = 5 V	V_{DD} = 3.3 V	V_{DD} = 5 V		
CT4022 (SOIC-8 PACKAGE)							
-A VARIANT [1][2]							
CT4022-A12BSN8	±12	110	166.7	1.65	2.5	–40 to 125	2000 pieces per 13-inch reel
CT4022-A24BSN8	±24	55	83.3				
CT4022-A40BSN8	±40	33	50				
CT4022-A50BSN8	±50	26.4	40				
CT4022-A65BSN8	±65	20.3	30.8				
-H VARIANT							
CT4022-H12BSN8	±12	110	166.7	1.65	2.5	–40 to 125	2000 pieces per 13-inch reel
CT4022-H24BSN8	±24	55	83.3				
CT4022-H40BSN8	±40	33	50				
CT4022-H50BSN8	±50	26.4	40				
CT4022-H65BSN8	±65	20.3	30.8				
CT4032 (SOICW-16 PACKAGE)							
-A VARIANT [1][2]							
CT4032-A20BSWF	±20	66	100	1.65	2.5	–40 to 125	1000 pieces per 13-inch reel
CT4032-A40BSWF	±40	33	50				
CT4032-A50BSWF	±50	26.4	40				
CT4032-A65BSWF	±65	20.3	30.8				

[1] Automotive flow available October 2025
[2] AEC-Q100 Grade 1, automotive grade (-A variants only).

PART NAMING SPECIFICATION



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ABSOLUTE MAXIMUM RATINGS [1]

Characteristic	Symbol	Notes	Min.	Max.	Unit
Supply Voltage	V_{DD}		–0.3	6.0	V
Output Voltage	V_O	Applies to VOUT	–0.3	(V_{DD}+0.3)<6	V
Input Current	I_P	A current above this value can cause a permanent drift in sensitivity and quiescent output voltage beyond the limits of the datasheet.	–	150	A
Operating Ambient Temperature	T_A		–40	125	°C
Storage Temperature	T_{STG}		–65	155	°C
Junction Temperature	T_J		–	165	°C

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

PACKAGE CHARACTERISTICS

Characteristic	Symbol	Notes	Min.	Typ.	Max.	Unit
Internal Conductor Resistance	R_{IC}	T_A = 25°C, CT4022	–	1	–	mΩ
		T_A = 25°C, CT4032	–	1	–	mΩ
Internal Conductor Inductance	L_{IC}	T_A = 25°C, CT4022	–	1.7	–	nH
		T_A = 25°C, CT4032	–	5	–	nH
Moisture Sensitivity Level	MSL	Per IPC/JEDEC J-STD-020	–	3	–	–

CT4022 (SOIC-8) ISOLATION CHARACTERISTICS

Characteristic	Symbol	Notes	Rating	Unit
Withstand Voltage [1][2]	V_{ISO}	Agency rated for 60 seconds per UL 62368-1 (edition 3)	3500	V_{RMS}
Working Voltage for Basic Isolation [2]	V_{WVBI}	Maximum approved working voltage for basic (single) isolation according to UL 62368-1 (edition 3)	792	$V_{PK\ or}\ V_{DC}$
			560	V_{RMS}
Working Voltage for Reinforced Isolation [2]	V_{WVRI}	Maximum approved working voltage for reinforced isolation according to UL 62368-1 (edition 3)	396	$V_{PK\ or}\ V_{DC}$
			280	V_{RMS}
Impulse Voltage	$V_{IMPULSE}$	1.2 µs/50 µs waveform, tested in air	5000	V_{PK}
Clearance	D_{CL}	Minimum distance through air from IP leads to signal leads	4	mm
Creepage	D_{CR}	Minimum distance along package body from IP leads to signal leads	4	mm
Distance Through Insulation	DTI	Minimum internal distance through insulation	110	µm
Comparative Tracking Index	CTI	Material Group II	400 to 599	V

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

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CT4032 (SOICW-16) ISOLATION CHARACTERISTICS

Characteristic	Symbol	Notes	Rating	Unit
Withstand Voltage [1][2]	V_{ISO}	Agency rated for 60 seconds per UL 62368-1 (edition 3)	5000	V_{RMS}
Working Voltage for Basic Isolation [2]	V_{WVBI}	Maximum approved working voltage for basic (single) isolation according to UL 62368-1 (edition 3)	1550	$V_{PK\ or}\ V_{DC}$
			1097	V_{RMS}
Working Voltage for Reinforced Isolation [2]	V_{WVRI}	Maximum approved working voltage for reinforced isolation according to UL 62368-1 (edition 3)	800	$V_{PK\ or}\ V_{DC}$
			565	V_{RMS}
Impulse Voltage	$V_{IMPULSE}$	1.2 µs/50 µs waveform, tested in air	7071	V_{PK}
Clearance	D_{CL}	Minimum distance through air from IP leads to signal leads	8	mm
Creepage	D_{CR}	Minimum distance along package body from IP leads to signal leads	8	mm
Distance Through Insulation	DTI	Minimum internal distance through insulation	110	µm
Comparative Tracking Index	CTI	Material Group II	400 to 599	V

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

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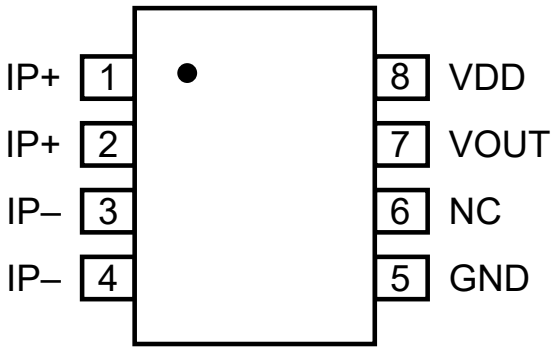
PINOUT DIAGRAM AND TERMINAL LIST TABLE

CT4022 (SOIC-8)

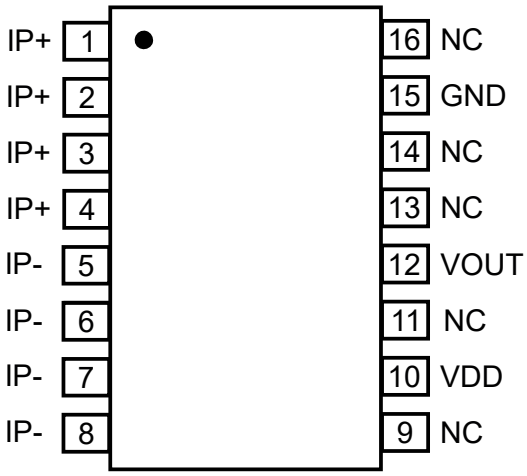
Terminal List for CT4022

Number	Name	Function
1, 2	IP+	Positive terminal for current being sensed
3, 4	IP–	Negative terminal for current being sensed
5	GND	Device ground terminal
6	NC	No connect; GND for optimal ESD performance
7	VOUT	Analog output voltage
8	VDD	Device power supply terminal



8-Pin SOIC Pinout Diagram (top-down view)

CT4032 (SOICW-16)



16-Pin SOICW Pinout Diagram (top-down view)

Terminal List for CT4032

Number	Name	Function
1, 2, 3, 4	IP+	Positive terminal for current being sensed
5, 6, 7, 8	IP–	Negative terminal for current being sensed
9	NC	No connect; GND for optimal ESD performance
10	VDD	Device power supply terminal
11	NC	No connect; GND for optimal ESD performance
12	VOUT	Analog output voltage
13, 14	NC	No connect; GND for optimal ESD performance
15	GND	Device ground terminal
16	NC	No connect; GND for optimal ESD performance

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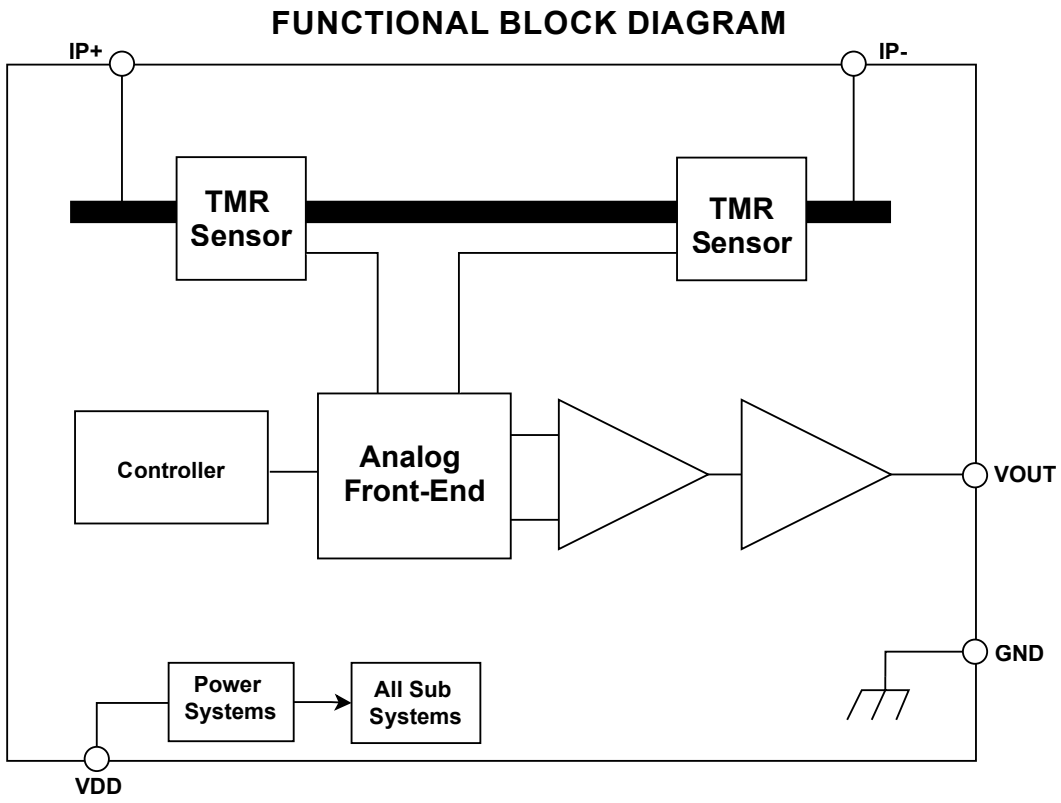

Figure 2: Functional Block Diagram

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COMMON ELECTRICAL CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 5 V, unless specified otherwise. Minimum and maximum values are tested in production or validated by design and characterization.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	V_{DD}		3	–	5.5	V
Supply Current	I_{DD}	VOUT open	–	–	9	mA
Supply Bypass Capacitor	C_{BYPASS}		–	1	–	µF
Output Resistive Load [1]	R_{L_VOUT}	Resistance between VOUT and GND	4.7	–	–	kΩ
Output Capacitive Load [1]	C_{L_VOUT}	Capacitance between VOUT and GND	–	–	10	nF
Power-On Reset Voltage	V_{POR}	T_A = 25°C, V_{DD} rising 1 V/ms	–	2.6	–	V
Power-On Reset Hysteresis	V_{POR_HYS}	T_A = 25°C	–	100	–	mV
Power-On Delay	t_{PO}	V_{DD} = 5 V	–	2	–	µs
		V_{DD} = 3.3 V	–	1.52	–	µs
OUTPUT SIGNAL CHARACTERISTICS (VOUT)						
Saturation Voltage [2]	V_{SAT_H}	T_A = 25°C	0.9 × V_{DD}	–	–	V
	V_{SAT_L}	T_A = 25°C	–	–	0.1 × V_{DD}	V
Short Circuit Current	I_{SC_VOUT}	VOUT to GND	–	18	–	mA
Bandwidth	BW	Small signal –3 dB, C_{L_VOUT} = 1 nF	–	500	–	kHz
Rise Time	t_R	I_P = 8 A_{PK}, V_{DD} = 5 V, C_{L_VOUT} = 10 nF	–	310	–	ns
		I_P = 8 A_{PK}, V_{DD} = 3.3 V, C_{L_VOUT} = 10 nF	–	350	–	ns
Response Time	t_{RESP}	I_P = 8 A_{PK}, V_{DD} = 5 V, C_{L_VOUT} = 10 nF	–	540	–	ns
		I_P = 8 A_{PK}, V_{DD} = 3.3 V, C_{L_VOUT} = 10 nF	–	600	–	ns
Propagation Delay	t_{PD}	I_P = 8 A_{PK}, V_{DD} = 5 V, C_{L_VOUT} = 10 nF	–	370	–	ns
		I_P = 8 A_{PK}, V_{DD} = 3.3 V, C_{L_VOUT} = 10 nF	–	390	–	ns

[1] Validated by design and characterization.

[2] The sensor might continue to respond to current beyond the specified current sensing range, I_{PR}, until the output saturates at the high or low saturation voltage; however, the linearity and performance beyond the specified current sensing range are not validated.

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CT4022-x12BSN8 PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–12	–	12	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	166.7	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	110	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–3	–	3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–3	–	3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–10	–	10	mV
		I_P = 0 A, T_A = 25°C to 125°C	–25	–	25	mV
		I_P = 0 A, T_A = 25°C to –40°C	–25	–	25	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	2.8	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	3.6	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4022-x24BSN8 PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–24	–	24	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	83.3	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	55	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–3	–	3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–3	–	3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–20	–	20	mV
		I_P = 0 A, T_A = 25°C to –40°C	–20	–	20	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	3.1	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	4.1	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4022-x40BSN8 PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–40	–	40	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	50	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	33	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–3	–	3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–3	–	3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–20	–	20	mV
		I_P = 0 A, T_A = 25°C to –40°C	–20	–	20	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	4.1	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	5.7	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4022-x50BSN8 PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–50	–	50	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	40	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	26.4	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–3	–	3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–3	–	3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–17	–	17	mV
		I_P = 0 A, T_A = 25°C to –40°C	–17	–	17	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	4.7	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	6.6	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4022-x65BSN8 PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–65	–	65	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	30.8	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	20.3	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–3	–	3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–3	–	3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–15	–	15	mV
		I_P = 0 A, T_A = 25°C to –40°C	–15	–	15	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	5.6	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	8.1	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4032-x20BSWF PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–20	–	20	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	100	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	66	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–2.3	–	2.3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–2.3	–	2.3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–25	–	25	mV
		I_P = 0 A, T_A = 25°C to –40°C	–25	–	25	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	3.1	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	4.1	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–40	–	40	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	50	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	33	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–2.3	–	2.3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–2.3	–	2.3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–20	–	20	mV
		I_P = 0 A, T_A = 25°C to –40°C	–20	–	20	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	4.1	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	5.7	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4032-x50BSWF PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–50	–	50	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	40	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	26.4	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–2.3	–	2.3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–2.3	–	2.3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–17	–	17	mV
		I_P = 0 A, T_A = 25°C to –40°C	–17	–	17	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	4.7	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	6.6	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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CT4032-x65BSWF PERFORMANCE CHARACTERISTICS: Valid through the full operating temperature range, T_A = –40°C to 125°C, C_{BYPASS} = 1 µF, and V_{DD} = 3.3 V or 5 V, unless specified otherwise. Minimum and maximum values are tested in production.

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NOMINAL PERFORMANCE						
Current Sensing Range	I_{PR}	Limited by T_{JMAX} = 165°C	–65	–	65	A
Sensitivity	Sens	$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 5 V	–	30.8	–	mV/A
		$I_{PR(min)} < I_P < I_{PR(max)}$, V_{DD} = 3.3 V	–	20.3	–	mV/A
Quiescent Voltage Output	V_{QVO}	I_P = 0 A	–	V_{DD}/2	–	V
ERROR COMPONENTS						
Sensitivity Error	E_{SENS}	$I_P = I_{PR(max)}$, T_A = 25°C to 125°C	–2.3	–	2.3	%
		$I_P = I_{PR(max)}$, T_A = 25°C to –40°C	–2.3	–	2.3	%
Quiescent Voltage Output Error	V_{QVO_E}	I_P = 0 A, T_A = 25°C	–7	–	7	mV
		I_P = 0 A, T_A = 25°C to 125°C	–15	–	15	mV
		I_P = 0 A, T_A = 25°C to –40°C	–15	–	15	mV
Noise [1]	N	T_A = 25°C, BW = 100 kHz, V_{DD} = 5 V, I_P = 0 A	–	5.6	–	mA_{RMS}
		T_A = 25°C, BW = 100 kHz, V_{DD} = 3.3 V, I_P = 0 A	–	8.1	–	
LIFETIME DRIFT [2]						
Sensitivity Error Lifetime Drift	E_{SENS_LT}	$I_P = I_{PR(max)}$, DC, T_A = –40°C to 125°C	–	0.5	–	%
Quiescent Voltage Error Lifetime Drift	V_{QVO_LT}	I_P = 0 A, T_A = –40°C to 125°C	–	2	–	mV

[1] Validated by design and characterization.
[2] Lifetime drift is the mean drift of worst-case distribution observed after AEC-Q100 qualification stresses.

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FREQUENCY RESPONSE PERFORMANCE DATA

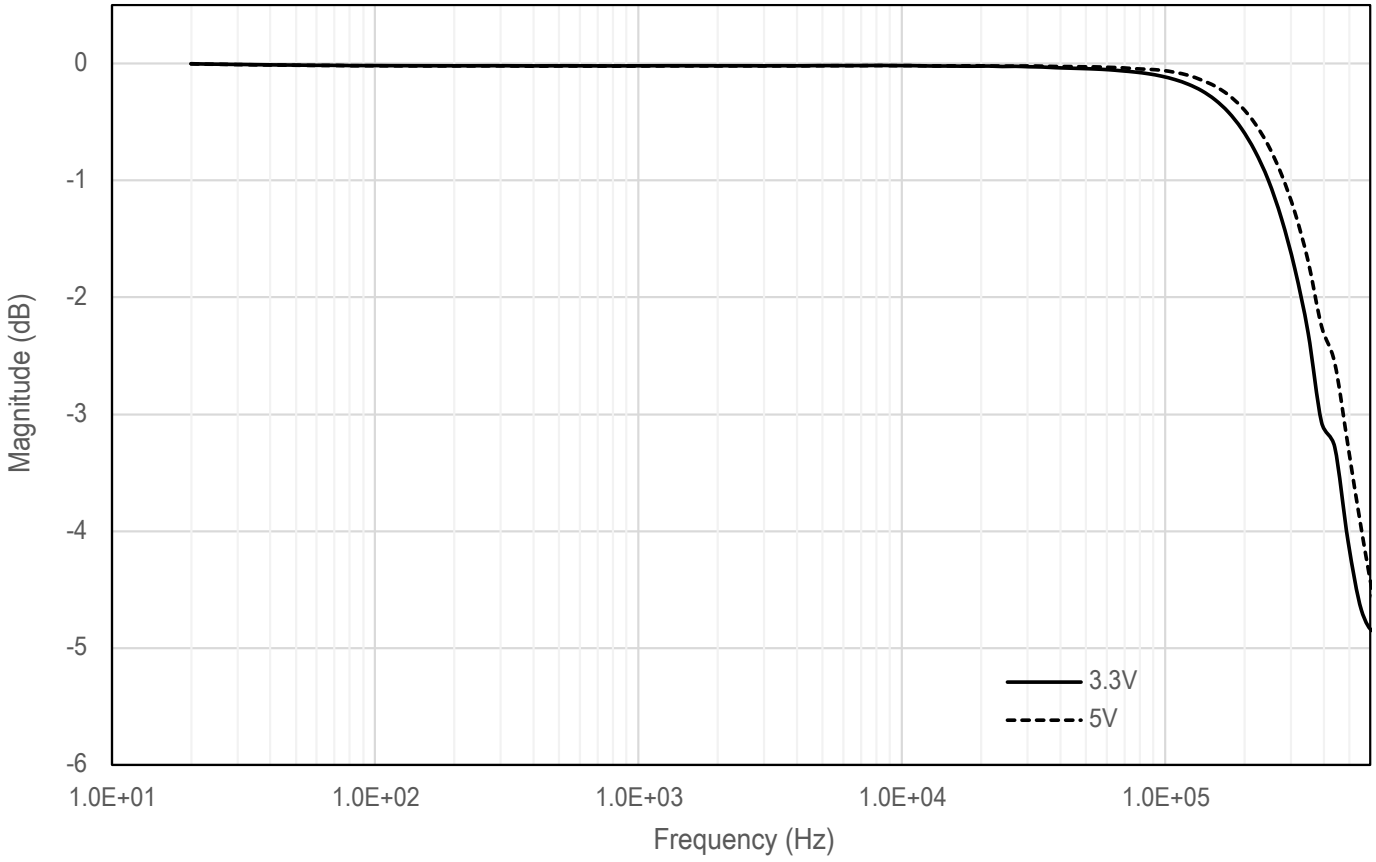

Figure 3: CT4022/CT4032 Typical Frequency Response with C_{L_VOUT} = 47 pF

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RESPONSE CHARACTERISTICS DEFINITIONS AND PERFORMANCE DATA

Response Time (t_{RESP})

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

Propagation Delay (t_{PD})

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

Rise Time (t_R)

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

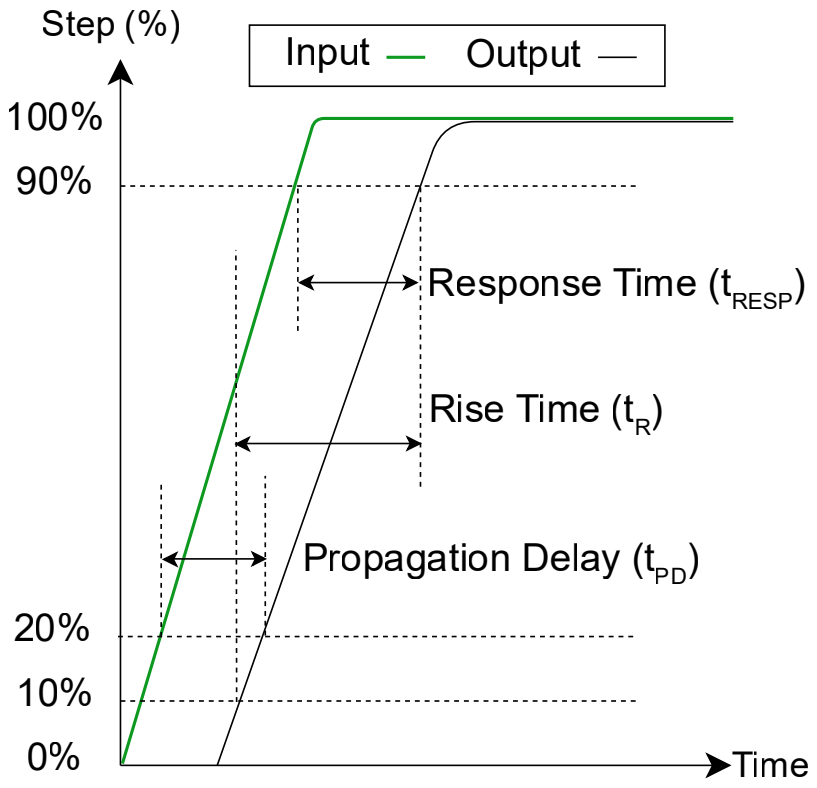

Figure 4: Step Response Characteristics

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FUNCTIONAL DESCRIPTION OF POWER ON/OFF OPERATION

Introduction

The graphs in this section show the behavior of V_{OUT} as V_{DD} increases to greater than, or reduces to less than, the required power-on voltage. The same labeling convention for different voltage thresholds is used in Figure 5 and Figure 6. In this section, bracketed references ("[ ]") are valid for each of these graphs.

POWER-ON OPERATION

As V_{DD} ramps up, the VOUT pin is in a high-impedance (high-Z) state until V_{DD} increases to greater than V_{POR} [1]. Once V_{DD} exceeds V_{POR} [1], V_{OUT} enters typical operation and begins to respond to applied current, I_P.

POWER-OFF OPERATION

As V_{DD} reduces to less than $V_{POR} - V_{POR\_HYS}$, the output enters a high-Z state. The hysteresis on the power-on voltage prevents noise on the supply line from causing V_{OUT} to repeatedly enter and exit the high-Z state at approximately the V_{POR} level.

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

Voltage Thresholds

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

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

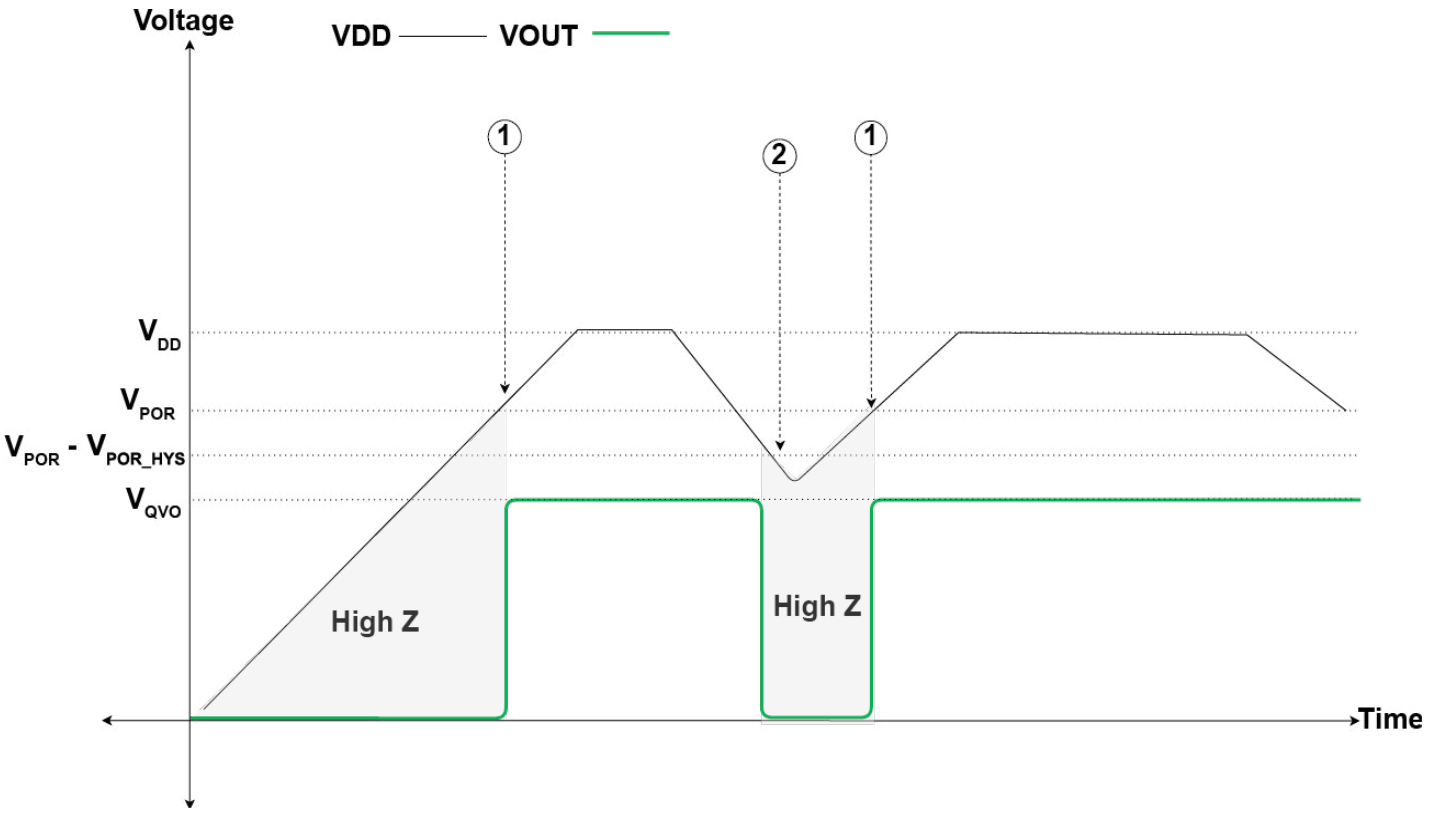

Figure 5: Power-On And Power-Off Operation

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Timing Thresholds

POWER-ON DELAY (t_{PO})

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

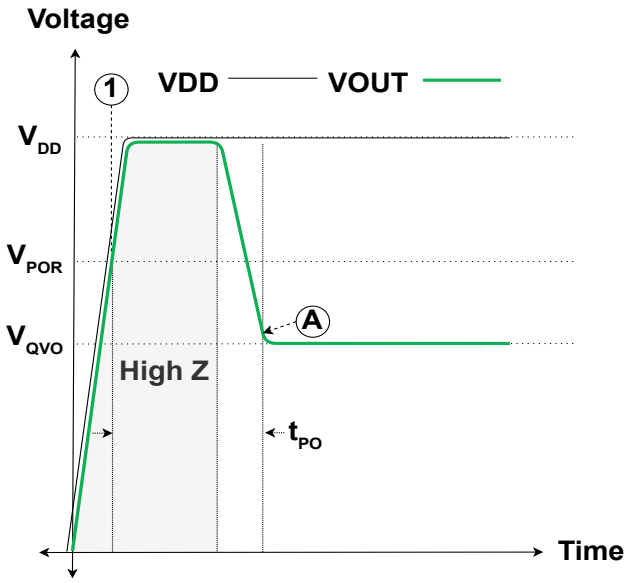

Figure 6: Power-On Delay, t_{PO}

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DEFINITIONS OF OPERATING AND PERFORMANCE CHARACTERISTICS

Quiescent Voltage Output (V_{QVO})

Quiescent voltage output, V_{QVO}, is defined as the voltage on the output, V_{OUT}, when current is not applied, $I_P = 0$.

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

Quiescent Voltage Output Error (V_{QVO_E})

Quiescent voltage output error, V_{QVO_E}, is defined as the deviation of V_{QVO} from the nominal target value in production testing.

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

Power Supply Offset Error (V_{OE_PS})

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

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

Sensitivity (Sens)

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

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

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

Sensitivity Error (E_{SENS})

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

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

Power Supply Sensitivity Error (E_{SENS_PS})

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

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

Output Saturation Voltage (V_{SAT_H} and V_{SAT_L})

Output saturation voltage, V_{SAT}, is defined as the minimum and maximum voltages the VOUT output buffer can drive. V_{SAT_H} is the highest voltage the output can reach, while V_{SAT_L} is the lowest. In other states, the VOUT pin might be pulled beyond V_{SAT_L} and V_{SAT_H}.

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

Error Including Lifetime Drift (E_{SENS_LT} and V_{QVO_LT})

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

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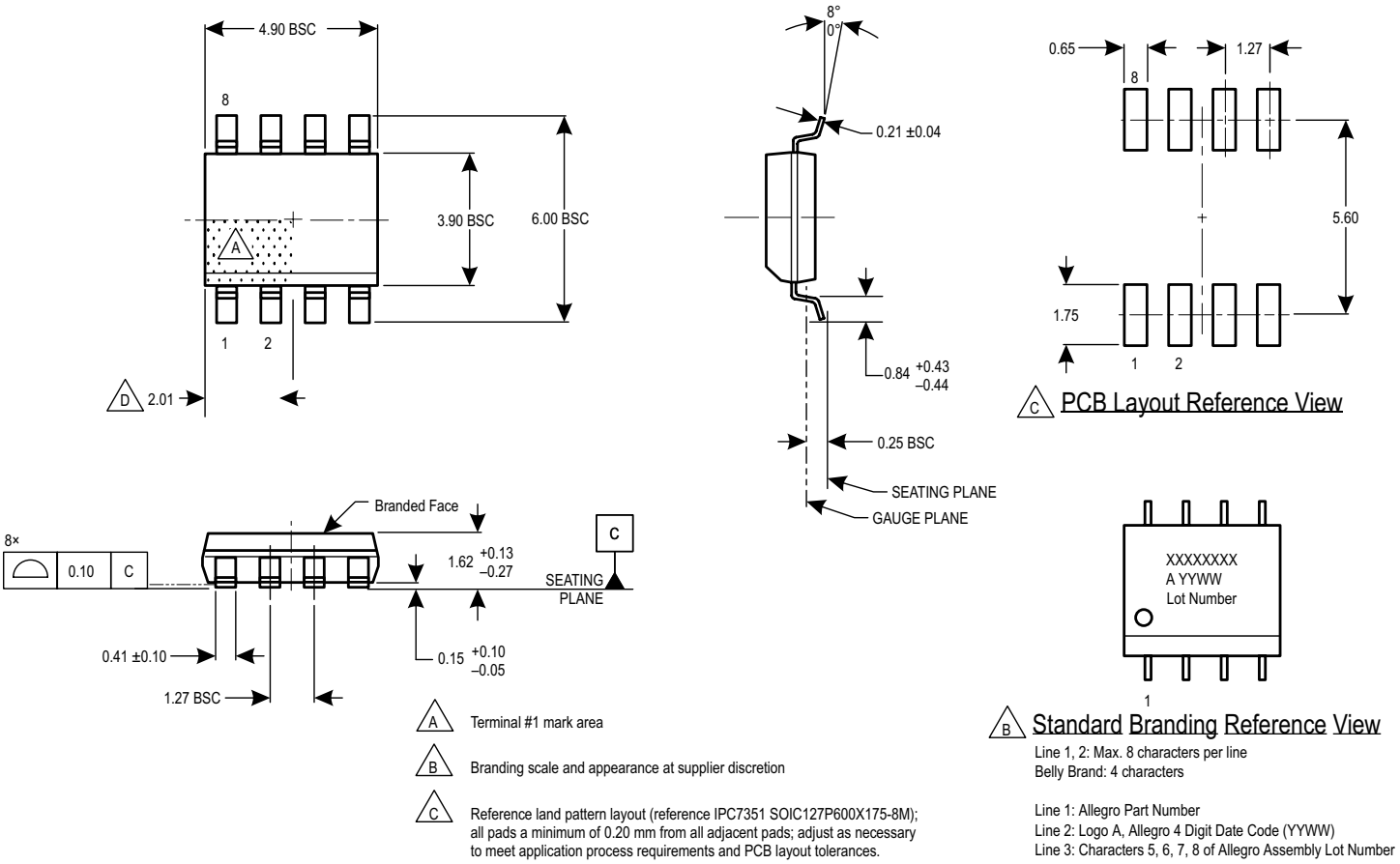
PACKAGE OUTLINE DRAWING

For Reference Only – Not for Tooling Use

(reference Allegro DWG-0000385, Rev. 2 or JEDEC MS-012AA)
Dimensions in millimeters – NOT TO SCALE
Dimensions exclusive of mold flash, gate burrs, and dambar protrusions
Exact case and lead configuration at supplier discretion within limits shown



A Terminal #1 mark area

B Branding scale and appearance at supplier discretion

C Reference land pattern layout (reference IPC7351 SOIC127P600X175-8M); all pads a minimum of 0.20 mm from all adjacent pads; adjust as necessary to meet application process requirements and PCB layout tolerances.

Line 1, 2: Max. 8 characters per line
Belly Brand: 4 characters

Line 1: Allegro Part Number
Line 2: Logo A, Allegro 4 Digit Date Code (YYWW)
Line 3: Characters 5, 6, 7, 8 of Allegro Assembly Lot Number

Figure 7: SOIC-8 Package Drawing and Dimensions

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For Reference Only – Not for Tooling Use
(Reference MS-013AA)
Dimensions in millimeters
Dimensions exclusive of mold flash, gate burrs, and dambar protrusions
Exact case and lead configuration at supplier discretion within limits shown

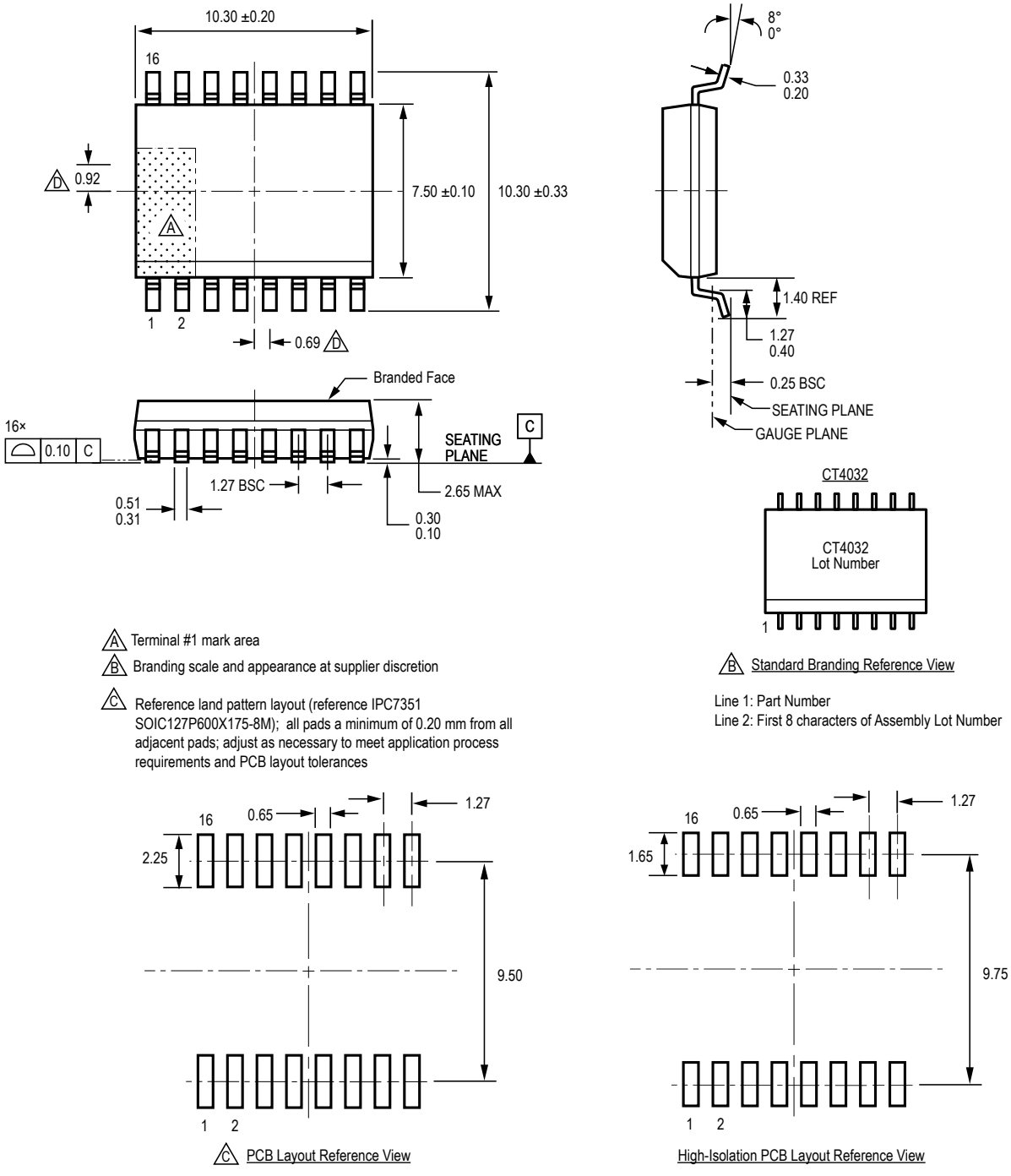

Figure 8: SOICW-16 Package Drawing and Dimensions

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Revision History

Number	Date	Description
–	March 18, 2025	Initial release
1	March 25, 2025	Changed Features and Benefits (page 1), Absolute Maximum Ratings table (page 3), Isolation tables (page 3 and 4), Pinout Diagrams (page 5) and Performance Characteristics tables (page 8 to 16).
2	March 27, 2025	Updated selection guide (page 2)
3	June 4, 2025	Updated CT4022 package characteristics (page 3)
4	July 9, 2025	Removed Limited Distribution banner (all pages)

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