Current Sensor
CC1P031N

CE cULus RoHS

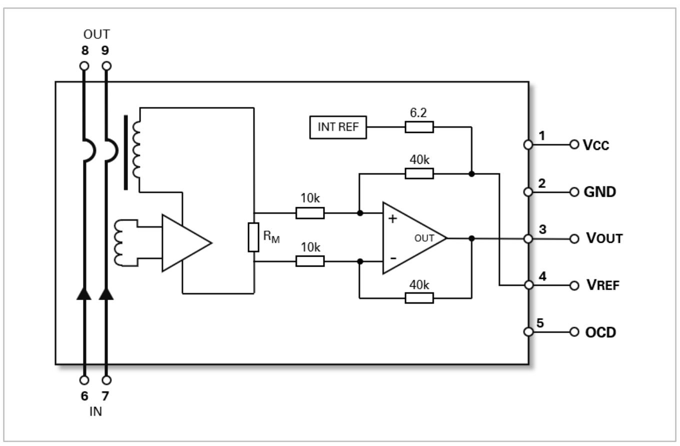
General Description

The Littelfuse CC1P031N is a high-performance current sensor based on Closed Loop technology. The high linear output characteristics and high accuracy across the operating temperature range plus the small package size and PCB mounting capability make it an excellent solution for a wide range of applications.

Standards

- EN50178: 1997
- IEC61010-1: 2010
- UL 508: 2013
- IEC62109-1: 2010

Functional Block Diagram



Features

- Closed Loop sensor
- Integrated current jumpers
- Single +5V power supply
- Voltage output
- Wide measuring range
- PCB through-hole mounting
- Operating temperature range:
  -40 °C< T <+105 °C
- Primary nominal RMS current:
  ±100A / ±150A / ±200A / ±250A / ±300A

Benefits

- Very small package size
- Easy mounting via automated handling
- Low offset current
- High immunity to external interference
- Low Temperature coefficient
- Short response time
- Wide frequency bandwidth

Applications

- Static Converters for DC motor drives
- Solar inverters
- AC variable speed drives
- Servo motor drives
- Uninterruptible Power Supplies (UPS)
- Switched Mode Power Supplies (SMPS)
- Power supplies for welding applications

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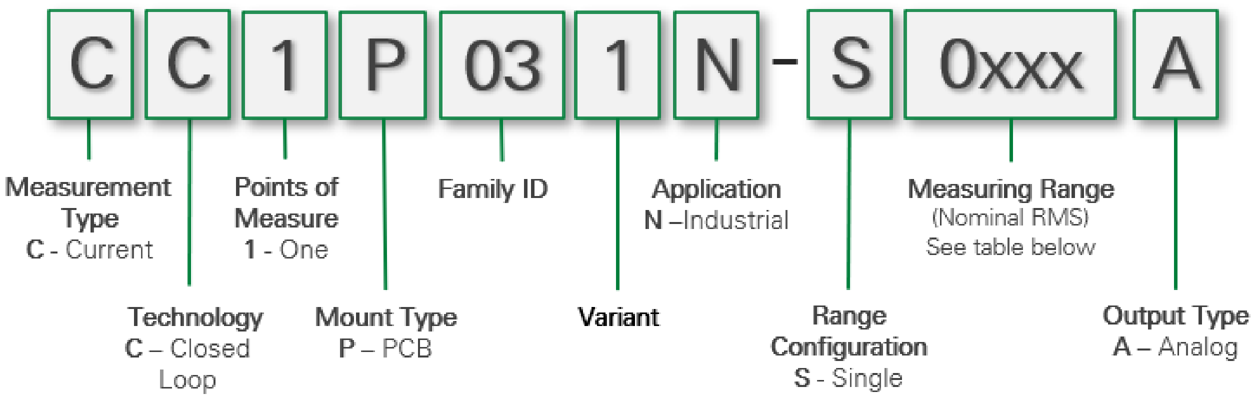
Littelfuse Current Sensor Naming Convention



Product Identification (per nominal RMS current range)

Part Name	Littelfuse Part Number	Nominal RMS Current
CC1P031N-S0100A	24942-00-01	±100 A
CC1P031N-S0150A	24942-00-02	±150 A
CC1P031N-S0200A	24942-00-03	±200 A
CC1P031N-S0250A	24942-00-04	±250 A
CC1P031N-S0300A	24942-00-05	±300 A

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
T_A	Ambient operating temperature	-40...+85	°C
T_A	Ambient storage temperature	-45...+105	°C
V_{CCMAX}	Supply Voltage	7	V
T_J	Primary conductor temperature	110	°C
I_{PMAX}	Maximum primary current	10 x I_{PN}*	A
V_{ESD}	Electrostatic Discharge (ESD), Human Body Model (HBM	4	kV

Prolonged exposure of the device to absolute maximum values may result in degraded performance. Exposure of the device to conditions in excess of values listed, for any period of time, may result in permanent damage.

Isolation Parameters

Symbol	Parameter	Data	Units
V_d	RMS Voltage for AC insulation test, 50 Hz, 1 minute	4	kV
V_W	Impulse withstand voltage 1.2/50 us	8	kV
D_{CREE}	Creepage (primary to secondary)	12.2	mm
D_{CLEA}	Clearance (primary to secondary)	12.2	mm
CTI	Comparative Tracking Index (Group 2 @UL)	600	V
---	Application example: Reinforced Insulation CAT III, PD2 non-uniform field	600	V
---	Application example: Reinforced Insulation CAT III, PD2 non-uniform field	1000	V

Mechanical Properties

Symbol	Parameter	Material / Data	Comment
---	Case material	PA66	V0 per UL 94
---	Busbar / Jumper	Red Cu	Ni+Sn plating
---	Terminals	Brass	Ni+Au plating
m	Mass	70g	±10%

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Current Sensor
CC1P031N

Electrical Data

CC1P031N-S0100A

Unless otherwise noted: T_A=25°C, V_{CC}=5V, RL=10kΩ

Symbol	Parameter	Min.	Typ.	Max.	Units
I_{PN}	Primary nominal RMS current		100		A
I_{PM}	Maximum measuring range	-300		300	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		20+I_P/N_S *1000 $N_s = 1500$		mA
V_{ref}	Internal reference voltage @I_P=0	2.485	2.5	2.515	V
V_{out}	Output voltage range @ I_P=0, T_A=25°C		V_{ref}		V
V_{OE}	Offset voltage @ I_P=0, T_A=25°C	-2		2	mV $V_{out} - V_{ref}$
G_{th}	Sensitivity (theoretical)		6.250		mV $625V/I_{PN}$
X	Accuracy @ I_{PN}, T_A=25°C	-0.8		0.8	% of I_{PN}
E_L	Linearity error @ I_{PN}	-0.2		0.2	% of I_{PN}
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0			±50	ppm/°C $V_{ref} = 2.5V$ -40…85°C
TCG	Temperature coefficient of X			±70	ppm/°C
t_r	Step response time @ 90% of I_{PN}		2		µs
BW	Frequency bandwidth (-3 db)		200		kHz

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Current Sensor
CC1P031N

Electrical Data

CC1P031N-S0150A

Unless otherwise noted: T_A=25°C, V_{CC}=5V, RL=10kΩ

Symbol	Parameter	Min.	Typ.	Max.	Units
I_{PN}	Primary nominal RMS current		150		A
I_{PM}	Maximum measuring range	-450		450	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		20+I_P/N_S *1000 $N_s = 1500$		mA
V_{ref}	Internal reference voltage @I_P=0	2.485	2.5	2.515	V
V_{out}	Output voltage range @ I_P=0, T_A=25°C		V_{ref}		V
V_{OE}	Offset voltage @ I_P=0, T_A=25°C	-2		2	mV $V_{out} - V_{ref}$
G_{th}	Sensitivity (theoretical)		4.167		mV $625V/I_{PN}$
X	Accuracy @ I_{PN}, T_A=25°C	-0.8		0.8	% of I_{PN}
E_L	Linearity error @ I_{PN}	-0.2		0.2	% of I_{PN}
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0			±50	ppm/°C $V_{ref} = 2.5V$ -40…85°C
TCG	Temperature coefficient of X			±70	ppm/°C
t_r	Step response time @ 90% of I_{PN}		2		µs
BW	Frequency bandwidth (-3 db)		200		kHz

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Current Sensor
CC1P031N

Electrical Data

CC1P031N-S0200A

Unless otherwise noted: T_A=25°C, V_{CC}=5V, RL=10kΩ

Symbol	Parameter	Min.	Typ.	Max.	Units
I_{PN}	Primary nominal RMS current		200		A
I_{PM}	Maximum measuring range	-600		600	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		20+I_P/N_S *1000 $N_s = 1500$		mA
V_{ref}	Internal reference voltage @I_P=0	2.485	2.5	2.515	V
V_{out}	Output voltage range @ I_P=0, T_A=25°C		V_{ref}		V
$V_{O\ E}$	Offset voltage @ I_P=0, T_A=25°C	-2		2	mV $V_{out} - V_{ref}$
G_{th}	Sensitivity (theoretical)		3.125		mV $625V/I_{PN}$
X	Accuracy @ I_{PN}, T_A=25°C	-0.8		0.8	% of I_{PN}
E_L	Linearity error @ I_{PN}	-0.2		0.2	% of I_{PN}
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0			±50	ppm/°C $V_{ref} = 2.5V$ -40…85°C
TCG	Temperature coefficient of X			±70	ppm/°C
t_r	Step response time @ 90% of I_{PN}		2		µs
BW	Frequency bandwidth (-3 db)		200		kHz

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Current Sensor
CC1P031N

Electrical Data

CC1P031N-S0**250**A

Unless otherwise noted: T_A=25°C, V_{CC}=5V, RL=10kΩ

Symbol	Parameter	Min.	Typ.	Max.	Units
I_{PN}	Primary nominal RMS current		250		A
I_{PM}	Maximum measuring range	-450		450	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		20+I_P/N_S *1000 $N_s = 1500$		mA
V_{ref}	Internal reference voltage @I_P=0	2.485	2.5	2.515	V
V_{out}	Output voltage range @ I_P=0, T_A=25°C		V_{ref}		V
$V_{O\,E}$	Offset voltage @ I_P=0, T_A=25°C	-2		2	mV $V_{out} - V_{ref}$
G_{th}	Sensitivity (theoretical)		2.5		mV $625V/I_{PN}$
X	Accuracy @ I_{PN}, T_A=25°C	-0.8		0.8	% of I_{PN}
E_L	Linearity error @ I_{PN}	-0.2		0.2	% of I_{PN}
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0			±50	ppm/°C $V_{ref} = 2.5V$ -40…85°C
TCG	Temperature coefficient of X			±70	ppm/°C
t_r	Step response time @ 90% of I_{PN}		2		µs
BW	Frequency bandwidth (-3 db)		200		kHz

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Current Sensor
CC1P031N

Electrical Data

CC1P031N-S0300A

Unless otherwise noted: T_A=25°C, V_{CC}=5V, RL=10kΩ

Symbol	Parameter	Min.	Typ.	Max.	Units
I_{PN}	Primary nominal RMS current		300		A
I_{PM}	Maximum measuring range	-450		450	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		20+I_P/N_S *1000 $N_s = 1500$		mA
V_{ref}	Internal reference voltage @I_P=0	2.485	2.5	2.515	V
V_{out}	Output voltage range @ I_P=0, T_A=25°C		V_{ref}		V
$V_{O\ E}$	Offset voltage @ I_P=0, T_A=25°C	-2		2	mV $V_{out} - V_{ref}$
G_{th}	Sensitivity (theoretical)		2.083		mV $625V/I_{PN}$
X	Accuracy @ I_{PN}, T_A=25°C	-0.8		0.8	% of I_{PN}
E_L	Linearity error @ I_{PN}	-0.2		0.2	% of I_{PN}
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0			±50	ppm/°C $V_{ref} = 2.5V$ -40…85°C
TCG	Temperature coefficient of X			±70	ppm/°C
t_r	Step response time @ 90% of I_{PN}		2		µs
BW	Frequency bandwidth (-3 db)		200		kHz

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Current Sensor Dimensions (in mm)

Applicable for all current range variants

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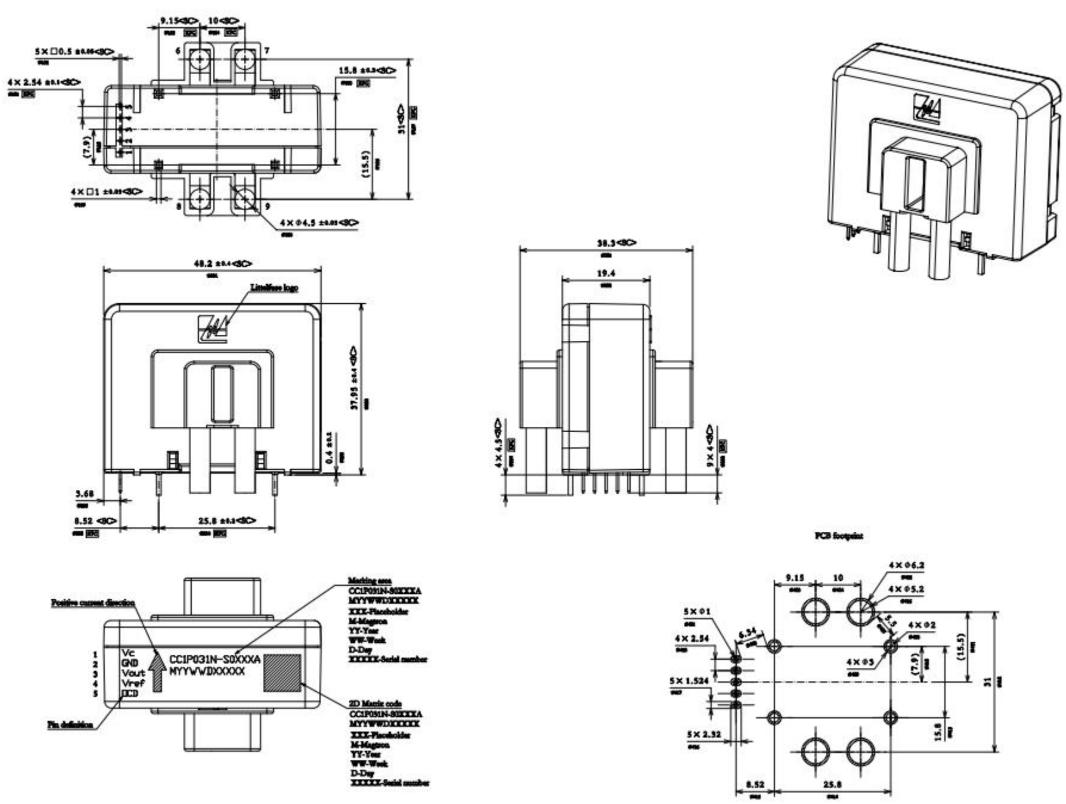

Pinout

Signal Connections		
Pin	Sym.	Description
1	V_{CC}	Power supply Voltage
2	GND	Ground
3	V_{out}	Output Voltage
4	V_{ref}	Reference Voltage
5	OCD	Over Current Detection

Primary Current Jumper Connections		
Pin	Sym.	Description
6	I_P+	Primary current - IN
7	I_P+	Primary current - IN
8	I_P-	Primary current - OUT
9	I_P-	Primary current - OUT

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Handling

- Handling of sensors should be minimized by maintaining parts within packaging until point of assembly.
- Contact with sensor terminals should be avoided.
- To avoid potential damage, adherence to ESD handling best practices is recommended.
- Dropped parts should be scrapped regardless of evidence of external damage.

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Contact

Custom electrical and environmental specifications can be designed to meet any need, please contact Littelfuse Engineering for details.

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