Current Sensor
CF1P021N

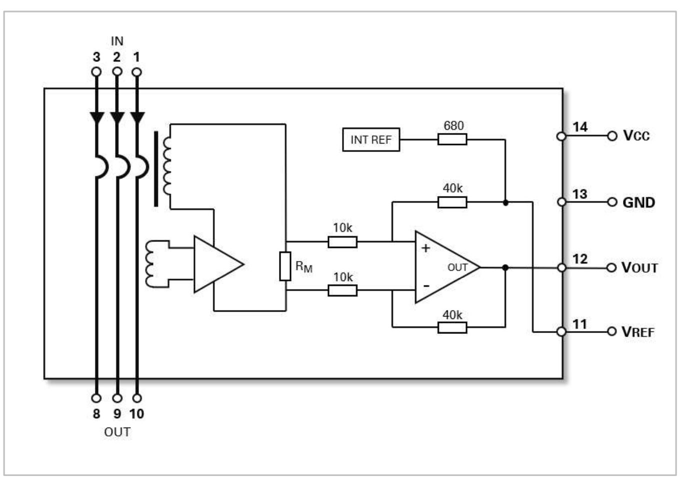
General Description

The Littelfuse CF1P021N is a high-performance current sensor based on Closed Loop Fluxgate 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

Functional Block Diagram



Features

- Closed Loop Fluxgate sensor
- 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:
  ±25A / ±50A
- Primary measuring range:
  up to: ±85A / ±150A

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
- Battery supplied applications
- Uninterruptible Power Supplies (UPS)
- Switched Mode Power Supplies (SMPS)

Revised: Rev. 1.1 12/8/25

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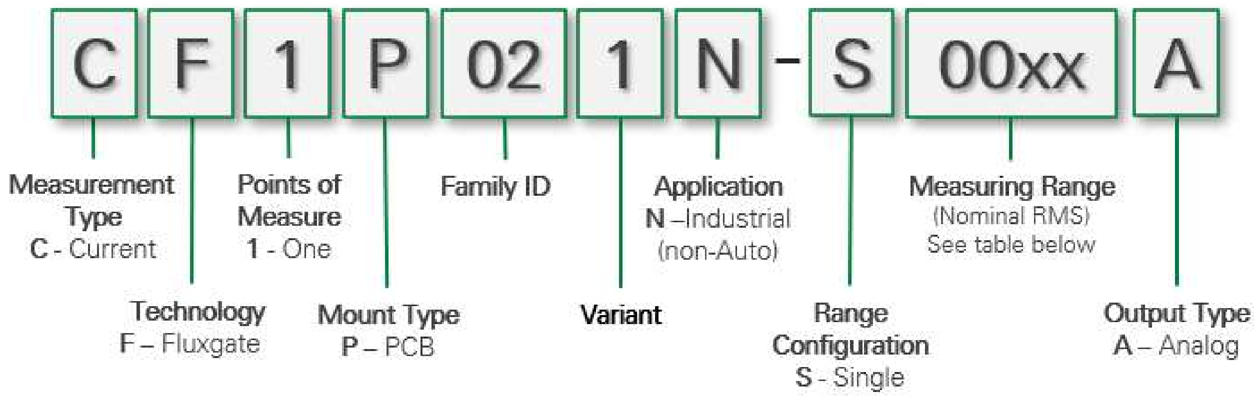
Littelfuse Current Sensor Naming Convention



Product Identification (per nominal RMS current range)

Part Name	Littelfuse Part Number	Nominal RMS Current
CF1P021N-S0025A	24947-00-01	±25 A
CF1P021N -S0050A	24947-00-02	±50 A

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
T_A	Ambient operating temperature	-40...+105	°C
T_A	Ambient storage temperature	-40...+105	°C
V_{CCMAX}	Supply Voltage	7	V
T_J	Primary conductor temperature	110	°C
I_{PMAX}	Maximum primary current	20 x I_{PN}	A
V_{ESD}	Electrostatic Discharge (ESD), Human Body Model (HBM	4	kV
m	Mass	9	g

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, 50/60 Hz, 1 minute	4.3	kV
V_W	Impulse withstand voltage 1.2/50 us	8	kV
D_{CREE}	Creepage (primary to secondary)	7.5	mm
D_{CLEA}	Clearance (primary to secondary)	7.5	mm
CTI	Comparative Tracking Index (Group IIIa)	600	V

Mechanical Properties

Symbol	Parameter	Material / Data	Comment
---	Case material	PA66	V0 per UL94
---	Busbar / Jumper	Red Cu	Ni+Sn plating
---	Terminals	Brass	Ni+Au plating
---	Mass	7.8g	±10%

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Electrical Data

CF1P021N-S00**25**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		25		A
I_{PM}	Maximum measuring range	-85		85	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		19+I_P/N_S* 1000 $N_S = 1731$	25+I_P/N_S* 1000 $N_S = 1731$	mA
V_{ref}	Internal reference voltage @I_P=0	2.49	2.5	2.51	V
V_{ref}	External reference voltage	0		4	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	-1.35		1.35	mV $V_{out} - V_{ref}$
G_{th}	Sensitivity (theoretical)		25		mV $625V/I_{PN}$
E_G	Sensitivity error @ I_{PN}	-0.7		0.7	%
E_L	Linearity error @ I_{PN}	-0.1		0.1	%
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0		±1.4	±4	ppm/°C
TCG	Temperature coefficient of Gain			±40	ppm/°C
t_{ra}	Reaction time @ 10% of I_{PN}			0.3	µs
t_r	Step response time @ 90% of I_{PN}			0.3	µs
BW	Frequency bandwidth (-3 db)	300			kHz
V_{no}	Output RMS noise Voltage (DC ~10kHz)		3		mVpp
	Output RMS noise Voltage (DC ~100kHz)		6		
	Output RMS noise Voltage (DC ~1MHz)		25		
X	Accuracy @ I_{PN}, +25°C			0.8	% of I_{PN}
	Accuracy @ I_{PN}, +85°C			1.15	
	Accuracy @ I_{PN}, +105°C			1.25	

Current Sensor
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Electrical Data

CF1P021N-S00**50**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		50		A
I_{PM}	Maximum measuring range	-150		150	A
V_{CC}	Supply voltage	4.75	5	5.25	V
I_C	Current consumption @I_P		19+I_P/N_S* 1000 $N_S=966$	25+I_P/N_S* 1000 $N_S=966$	mA
V_{ref}	Internal reference voltage @I_P=0	2.49	2.5	2.51	V
V_{ref}	External reference voltage	0		4	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	-1.0		1.0	mV $V_{out}-V_{ref}$
G_{th}	Sensitivity (theoretical)		12.5		mV $625V/I_{PN}$
E_G	Sensitivity error @ I_{PN}	-0.7		0.7	%
E_L	Linearity error @ I_{PN}	-0.1		0.1	% of I_{PN}
TCV_{OUT}	Temperature coefficient of V_{OUT}@I_{PN}=0		±0.7	±3	ppm/°C
TCG	Temperature coefficient of Gain			±40	ppm/°C
t_{ra}	Reaction time @ 10% of I_{PN}			0.3	μs
t_r	Step response time @ 90% of I_{PN}			0.3	μs
BW	Frequency bandwidth (-3 db)	300			kHz
V_{no}	Output RMS noise Voltage (DC ~10kHz)		3		mVpp
	Output RMS noise Voltage (DC ~100kHz)		6		
	Output RMS noise Voltage (DC ~1MHz)		25		
X	Accuracy @ I_{PN}, +25°C			0.8	% of I_{PN}
	Accuracy @ I_{PN}, +85°C			1.1	
	Accuracy @ I_{PN}, +105°C			1.3	

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Current Sensor Dimensions (in mm)

Applicable for all current range variants

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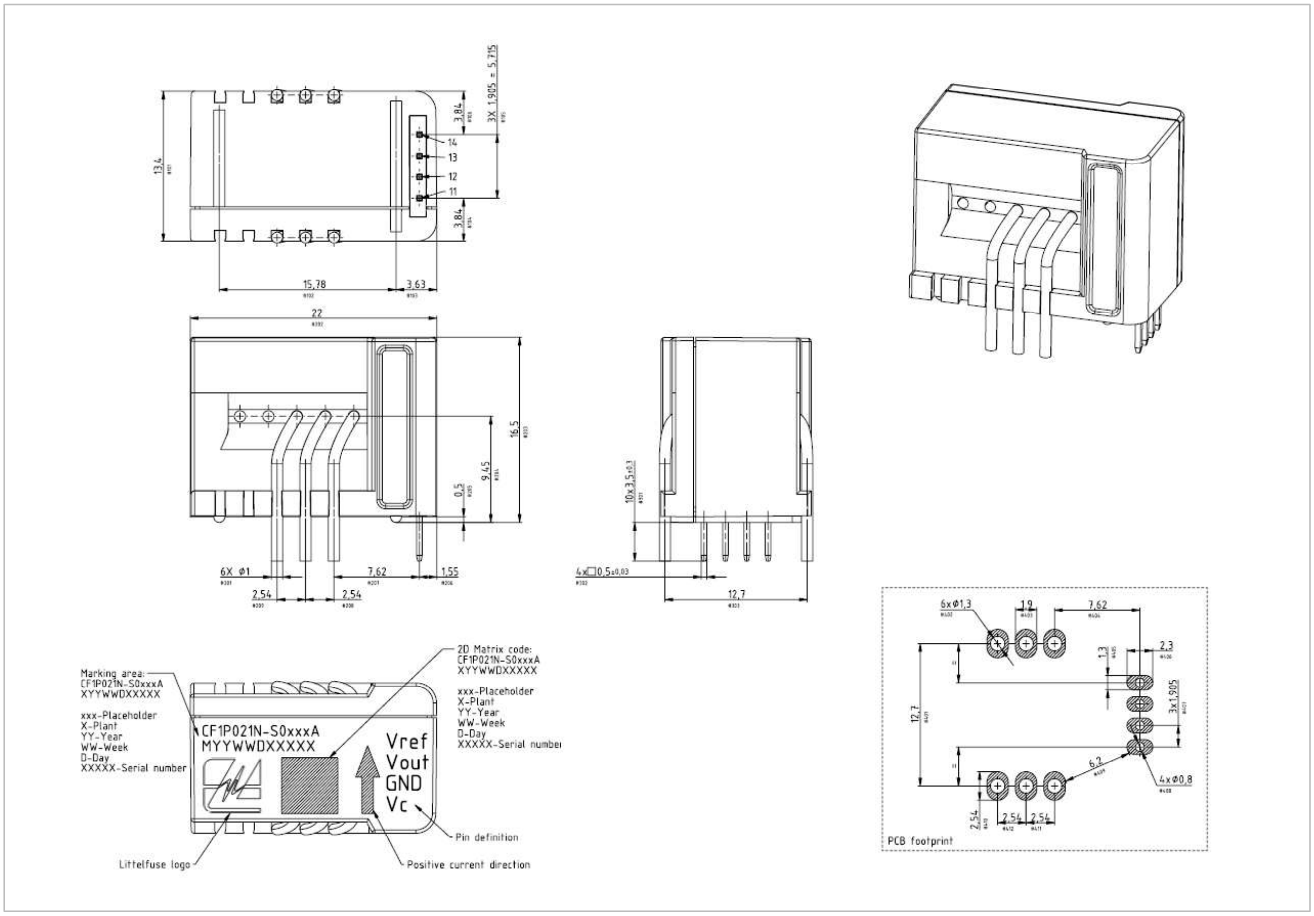

Pinout

Primary Current Jumper Connections		
Pin	**Sym.**	**Description**
1	I_P	Primary current - IN
2	I_P	Primary current - IN
3	I_P	Primary current - IN
8	I_P	Primary current - OUT
9	I_P	Primary current - OUT
10	I_P	Primary current - OUT

Signal Connections		
Pin	**Sym.**	**Description**
11	V_{ref}	Reference Voltage
12	V_{out}	Output Voltage
13	GND	Ground
14	V_{CC}	Power supply Voltage

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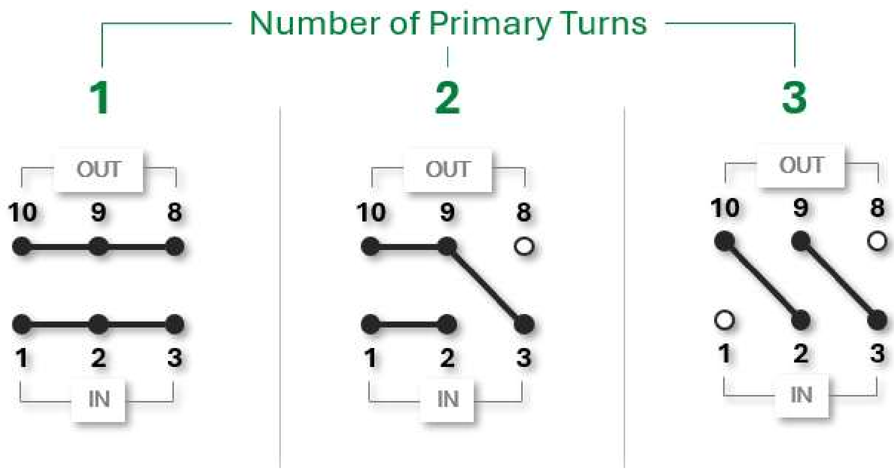
Primary Current Application

Recommended jumper combinations to create multiple turns of primary current through the device.



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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Document version: Rev. 1.1
Date of print: 12DEC2025