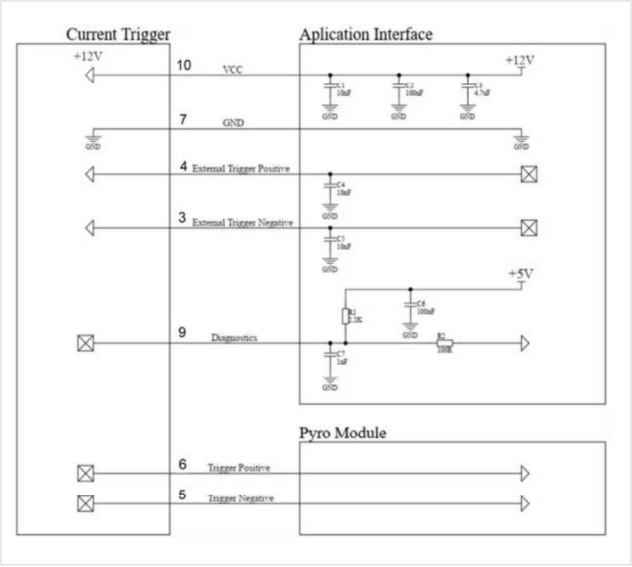
Pyro-fuse Trigger

CH1B050P

General Description

Littelfuse CH1B050P pyro-fuse trigger uses open-loop Hall technology to detect an over current condition and provide an output signal to activate a pyro module.

Typical Application Diagram



* External Trigger Positive and External Trigger Negative polarity can be switched on application interface side if needed. Defined values provided as recommendation.

Features

- Current Sensor triggers Pyro directly
- Very high fault current interruption capability
- Various trigger levels
- Asymmetric calibration possible
- External trigger signal to pyro module
- Diagnostic function
- Open-loop Hall effect
- Unipolar +12V DC power supply
- Operating temperature range:
  -40 °C< T <+85 °C
- System voltage up to 1000 VDC

Benefits

- Fast and reliable circuit protection solution
- Active protection solution
- Low power consumption
- Compact, lightweight design

Applications

- Pyro module system

Mechanical Characteristics

- Plastic: PBT-GF25
- Busbar: Cu-ETP – Ni Plating
- Mass: 60g ± 5%
- Terminals: Brass – Sn Plating

Mating Connector

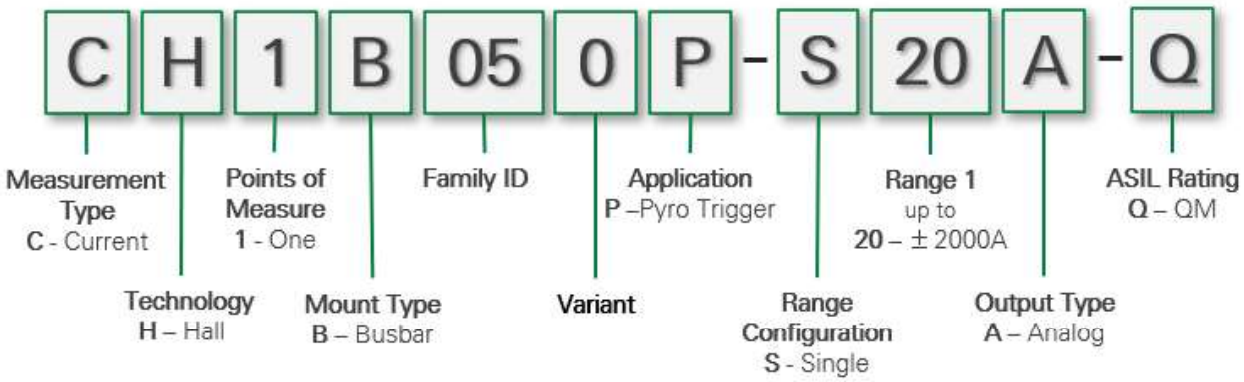
- 10-way with CPA
- Interface per TE 114-94000 rev.1
- Mating connector: TE 0-2333108-01
- Connector keying: Option A

Revised: Rev. 0.6 02/17/25

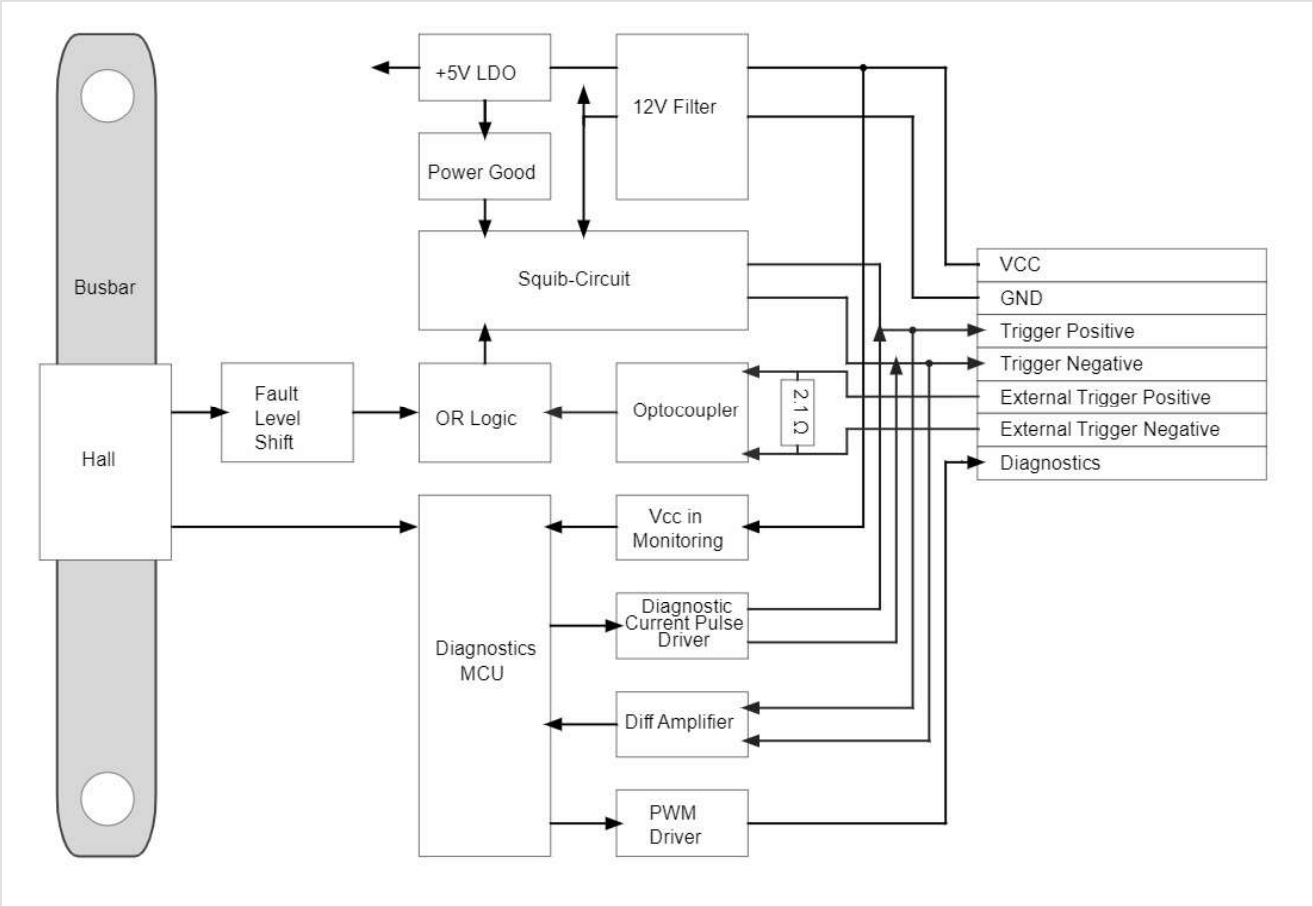
Pyro-fuse Trigger

CH1B050P

Littelfuse Current Sensor Part Naming Convention



Functional Block Diagram



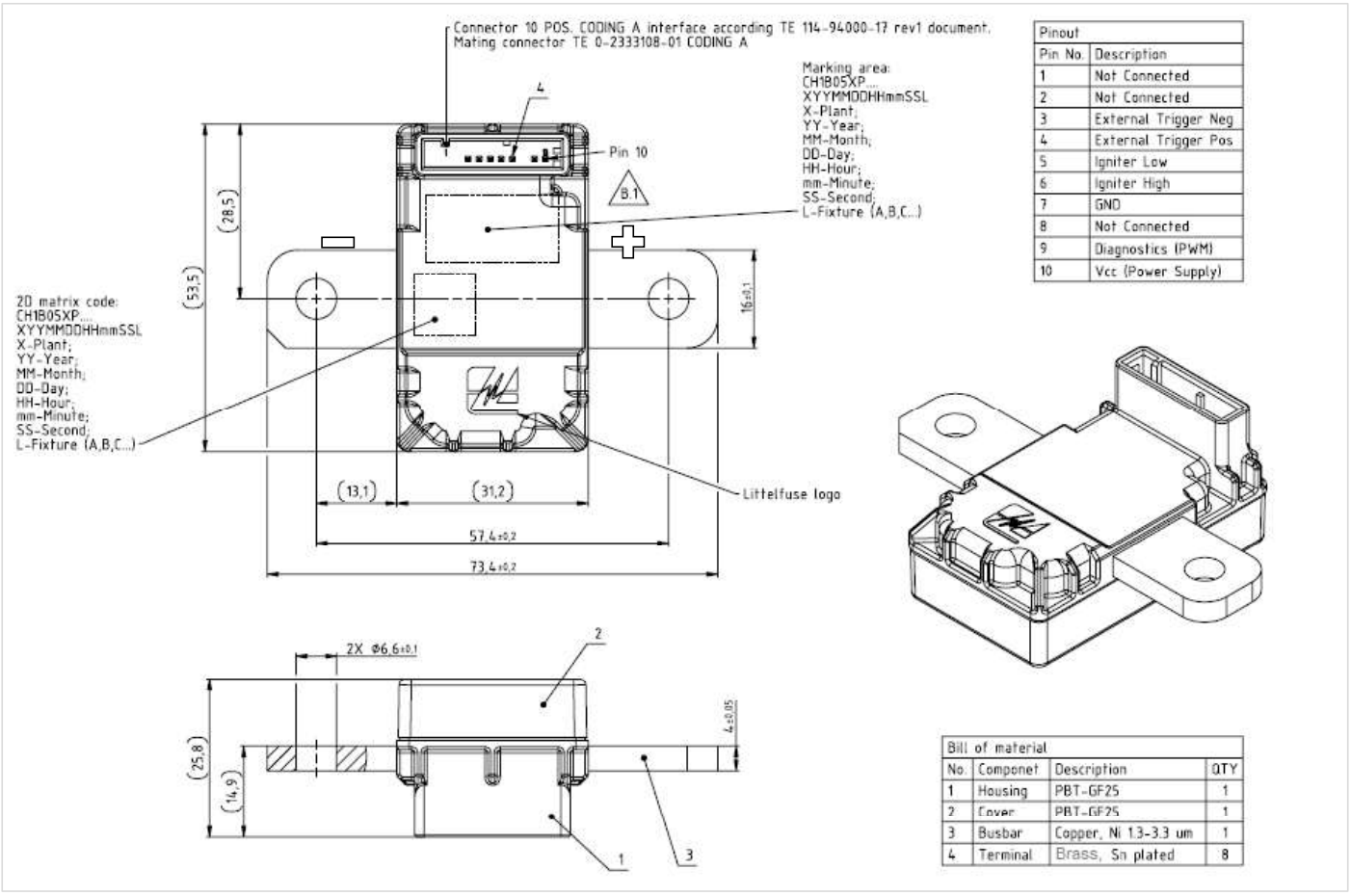
Revised: Rev. 0.6 02/17/25

Pyro-fuse Trigger

CH1B050P

Current Sensor Dimensions (in mm)

CH1B050P



Pinout	
Pin No.	Description
1	Not Connected
2	Not Connected
3	External Trigger Neg
4	External Trigger Pos
5	Igniter Low
6	Igniter High
7	GND
8	Not Connected
9	Diagnostics (PWM)
10	Vcc (Power Supply)

Bill of material			
No.	Componet	Description	QTY
1	Housing	PBT-GF25	1
2	Cover	PBT-GF25	1
3	Busbar	Copper, Ni 1.3-3.3 um	1
4	Terminal	Brass, Sn plated	8

Pyro-fuse Trigger

CH1B050P

Absolute Maximum Ratings (non-operating)

Parameter	Symbol	Min	Typ.	Max	Units	Comments
Maximum Supply Voltage	U_{CMAX}	-16		24	V	28V for 1 minute
Maximum Supply Current	I_{CMAX}			200	mA	In measurement mode
Maximum Supply Current	I_{CMAXt}			10	A	for 2 ms during triggering
Storage Temperature	T_{ST}	-40		+85	$°C$	
Insulation Resistance	R_{INS}	50			MΩ	3000V DC, 60s.
Leakage Current (Due to dielectric Voltage)	I_{LEAK}			1	mA	3 kV AC, 50Hz, 60s.
Creepage distance	D_{CREE}		14.98		mm	
Clearance	D_{CLEA}		8.44		mm	
Comparative tracking index	CTI		PLC3			

Mechanical Product Properties

Parameter	Symbol	Level	Standard	Comments
Flammability Class		V0	UL94	
Protection Degree		IP 41	IEC 60529	

Revised: Rev. 0.6 02/17/25

Pyro-fuse Trigger

CH1B050P

Common Characteristics (normal operation)

Parameter	Symbol	Min	Typ.	Max	Units	Comments
Supply Voltage	U_C	9	12	16	V	
Current Consumption	I_C		35	100	mA	RMS current: 29 mA @ 9V U_C 35 mA @ 12V U_C 40 mA @ 16V U_C
Maxim current consumption				10	A	for 2ms during triggering
Operating Temperature	T_A	-40		+85	°C	Ambient
Positive trigger level		1800	1900	2000	A	customer selectable
Negative trigger level		-1800	-1900	-2000	A	customer selectable
Trigger output signal positive			U_C-1.1		V	until power restart
Trigger output signal negative			+0.5		V	until power restart
Trigger output signal		1.75			A	until ignitor is burned open
Power-on Time	t_{po}		100		ms	
Over Current triggering time	t_{OCD}	15	40	200	µs	@ 5 … 25 µH main circuit
Overcurrent glitch immunity			15.2		µs	Minimum overcurrent event duration

Diagnostic

Parameter	Min.	Typ.	Max.	Units	Comment
Output signal		PWM			
Typical Diagnostic Response Time*		80		ms	
Output signal frequency		1		KHz	±5%
No error / Duty cycle	45	50	55	%	Diagnostic error priority 6
Igniter open / Duty cycle	15	20	25	%	Diagnostic error priority 4
Igniter short / Duty cycle	30	35	40	%	Diagnostic error priority 5
Hall broken / Short GND to U_C	60	65	70	%	Diagnostic error priority 3
Supply Voltage out of range	75	80	85	%	Diagnostic error priority 2
Diagnostic pin short to power supply	95		100	%	Diagnostic error priority 1
Diagnostic pin Short GND	0		5	%	Diagnostic error priority 1

* Typical Value is considered for most common situations: Ignitor resistance change from nominal value to ignitor open. This condition will occur after a pyro module triggering event. For other diagnostic cases, the typical response time may be up to 700ms.

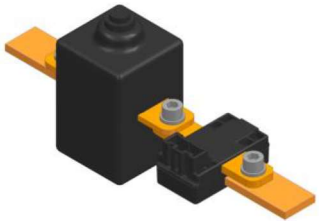
Revised: Rev. 0.6 02/17/25

Pyro-fuse Trigger

CH1B050P

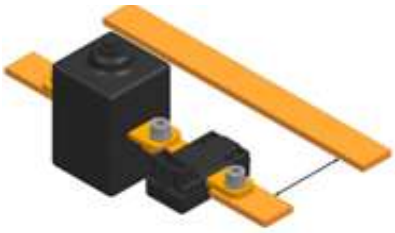
Setup Recommendation

Busbar Mounting:



- Current trigger shall be mounted in the system with pyro module.
- M6 screw mounted with flat/spring washer or flanged, serrated screw is recommended.
- Assembly torque: 7 N·m ± 10%
- Recommended mating busbar cross section: 4x20 mm

Adjacent Busbar Spacing:



- The distance between sensor busbar and adjacent busbar is recommended to be more than 20 mm @500A
- Busbar should not pass directly above or below sensor housing.
- Busbar layout should be reviewed with Littelfuse for compatibility.

Wiring to Pyro Fuse:

- Shortest achievable wire length is recommended (≤10cm)
- Wire bundle should be twisted.
- Avoid routing wires near busbars.

Handling

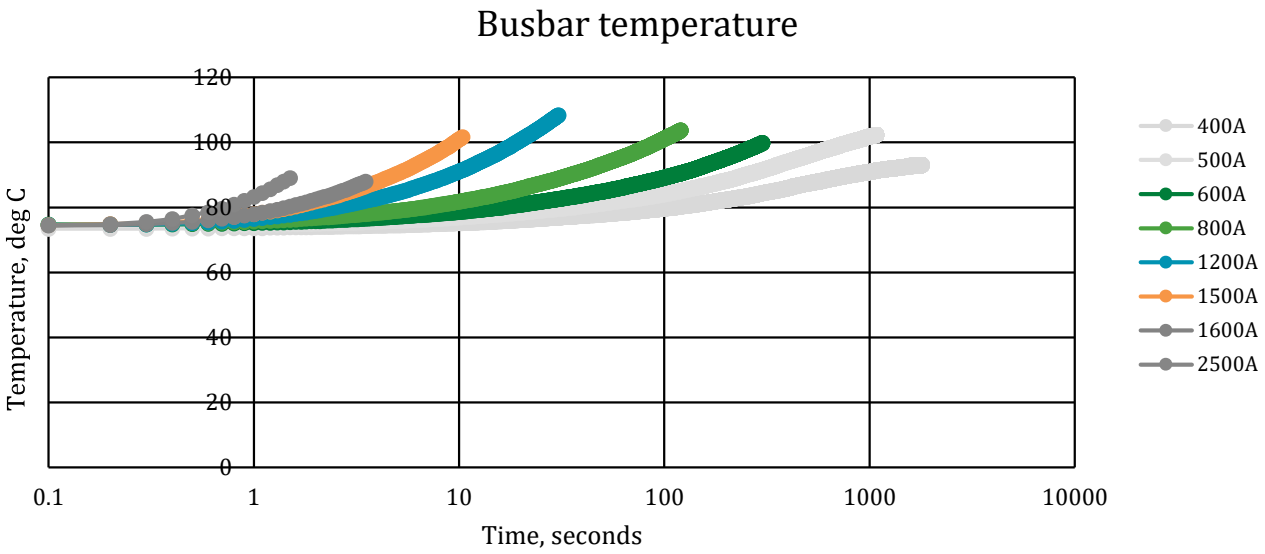
- Handling of sensors should be minimized by maintaining parts within packaging until point of assembly.
- Contact with sensor terminals should be avoided.
- To avoid potential damage, adherence to ESD handling best practices is recommended.
- Dropped parts should be scrapped regardless of evidence of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

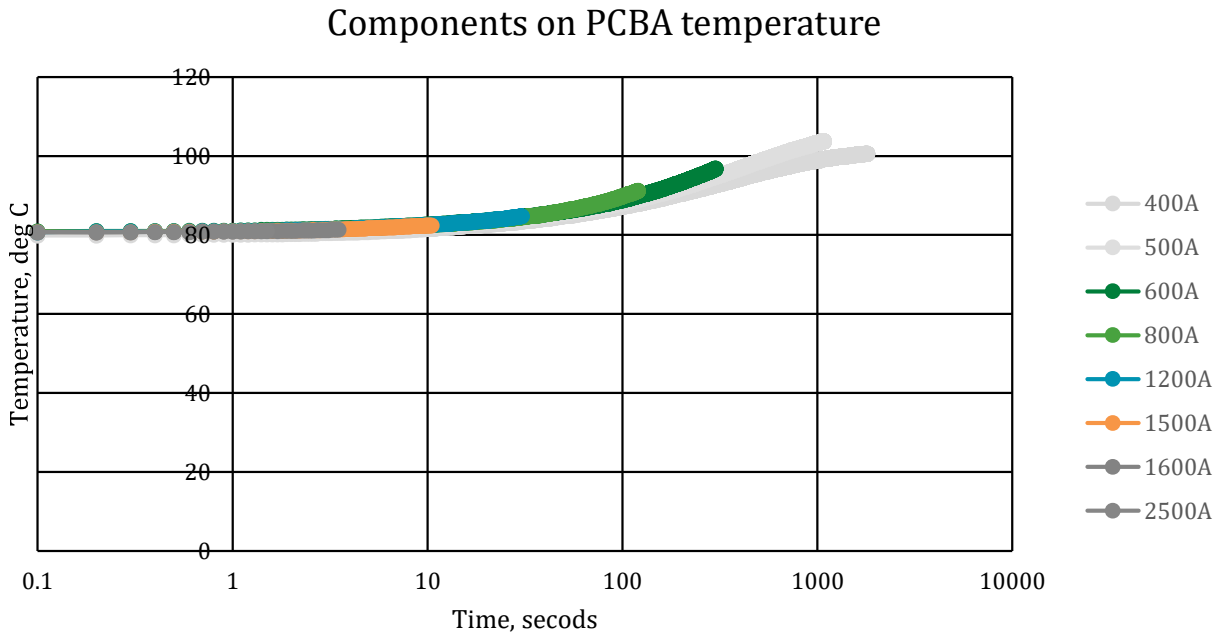
Revised: Rev. 0.6 02/17/25

Pyro-fuse Trigger

CH1B050P

Continuous Current Performance (Busbar Heating)





*This test is started from 75°C ambient temperature for each current. Parts were functioning during the test.

Revised: Rev. 0.6 02/17/25

Pyro-fuse Trigger

CH1B050P

Trigger Pulse

External trigger

External triggering function allows for triggering of pyro device by providing current signal to PIN 3 and PIN 4. External Trigger Negative (PIN 3) and External Trigger Positive (PIN 4) polarity may be interchanged.

External Trigger Pulse Characteristics in Normal Range

Parameter	Symbol	Min	Typ.	Max	Units	Comments
External trigger activation voltage	U_{Extg_en}	2.6			V	
External trigger activation current	I_{Extg_en}	1.20			A	@ 2 ms
External trigger activation current	I_{Extg_en}	1.75			A	@ 0.5 ms
External trigger no-fire pulse				4	µs	
External trigger delay			50		µs	Until current pulse
External trigger simulated ignitor resistance			2.1		Ω	

Pyro-fuse Trigger
CH1B050P

Validation Test Specification

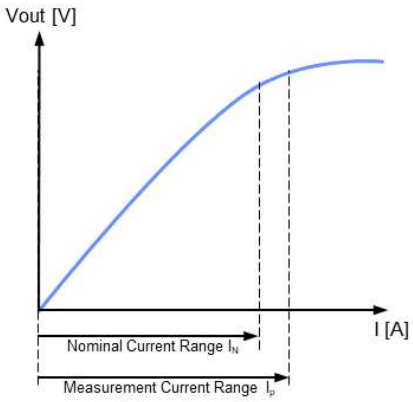
Test Groups	Reference	Test Condition
Environmental		
Temperature step test	ISO 16750-4 5.2	
Thermal shock	ISO16750-4 5.3.2	
Temperature Humidity Cycle	IEC 60068-2-38	
High Temperature – High Humidity Endurance	IEC 60068-2-78	
High Temperature Endurance	IEC 60068-2-2:2007	
Temperature cycle	ISO 16750-4 5.3.1 IEC 60068-2-14	
Mechanical		
Random Vibration	ISO 16750-3 4.1.2.4	
Mechanical Shock	ISO 16750-3 4.2.2.2	
Free-Fall	ISO 16750-3 4.3	
Dust ingress	ISO 20653	
Water ingress	IEC 60529	
Electrical		
Overvoltage	ISO 16750-2 4.3	
Reversed voltage	ISO 16750-2 4.7	
Withstand voltage	ISO 16750-2 4.11	
Insulation resistance	ISO 16750-2 4.12	
EMC		
Power line transients	ISO7637-2	
Signal line transients	ISO7637-3	
Immunity ALSE	ISO-11452 - 2	
Immunity BCI	ISO-11452 - 4	
Immunity Magnetic field	ISO-11452 - 8	
Emissions test	CISPR 25	
ESD Handling	ISO-10605	
Connector		
Connector Mating Force	SAE USCAR-2 5.4.2.3	
Disengagement / Retention Force	SAE USCAR-2 5.4.2.3	
Lock Deflection Force	SAE USCAR-2 5.4.2.3	

Pyro-fuse Trigger

CH1B050P

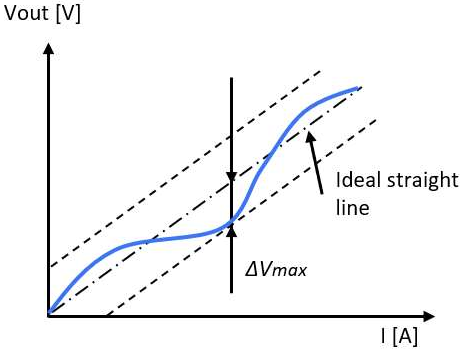
Performance Parameter Definitions

Primary current definition (I_N, I_M)



Linearity error (ε_L)

The maximum positive or negative discrepancy with a reference straight line $V_{out} = f(I_p)$.



$$\varepsilon_L = \pm \frac{\Delta L_{max}}{Y_{F.S.}} \times 100\%$$

Offset error (ε_O)

The voltage drift of the measured sensor output V_{out} at 0A compared to the ideal value 2.5V is called the total offset voltage error. This offset error can be attributed to the electrical offset, magnetic offset and related drift over temperature.

$$\varepsilon_O = \pm \frac{V_{out} - V_O}{Y_{F.S.}} \times 100\%$$

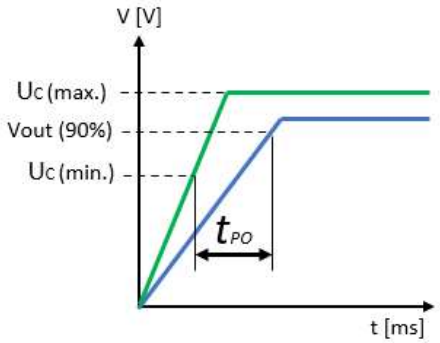
Sensitivity error (ε_S)

The sensor sensitivity error is the drift of sensor's ideal sensitivity.

$$\varepsilon_S = \pm \frac{G - G_{th}}{G_{th}} \times 100\%$$

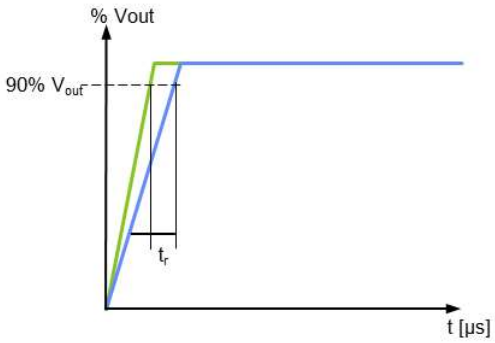
Power-on time (t_{po})

The Power-on time is the duration from V_{DD}(min.) to 90% of Vout.



Response time (t_r)

The time between the primary current signal and the output signal reaching at 90% of its final value.



Pyro-fuse Trigger
CH1B050P

Contact

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

Littelfuse

Website: www.littelfuse.com
Sales Support: ALL_Autosensors_Sales@littelfuse.com
Technical Support: ALL_Autosensors_Tech@littelfuse.com

Document version: Rev. 0.6
Date of print: 17FEB2025