# ACTIVE / ELECTRONICALLY PROTECTED BARRIERS

## ACTIVE / ELECTRONICALLY PROTECTED BARRIERS

The following barriers have built-in overvolt protection, allowing their use with unregulated power supplies. In many applications, eg, sensor inputs or controller outputs, there is insufficient power available to blow the barrier fuse and this additional protection is not necessary. However, where the barrier is connected to a power supply, eg, for energising transmitters, switches, solenoids or local alarms, overvolt protection allows the barriers to be used with unregulated supplies and also gives protection against faulty wiring during commissioning.

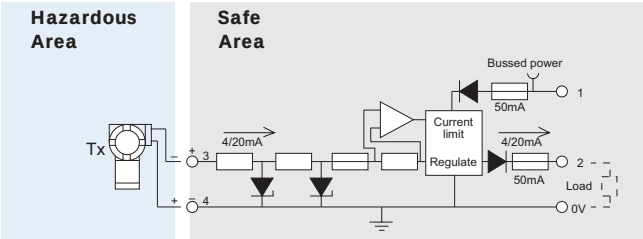
## MTL7706+ for 'smart' 2-wire 4/20mA transmitters

The MTL7706+ is a 1-channel shunt-diode safety barrier, with built-in electronic overvolt protection, for energising a 2-wire, 4/20mA transmitter in a hazardous area. It is powered from a positive supply of 20–35V dc and delivers a 4/20mA signal into an earthed load in the safe area. It is proof against short circuits in the field and in the safe area and is extremely accurate. The MTL7706+ will pass incoming communication signals up to 10kHz from a 'smart' transmitter, while in the outgoing direction it will pass signals of any frequency likely to be encountered.

Since the MTL7706+ has no return channel for energising the load, the entire output of the single '28V' channel is available to power the transmitter, providing high output capability. This channel is negatively polarised, and the safe-area signal is in fact the very current that returns through it from the hazardous area, the novel circuit being energised by a built-in floating dc supply derived from the external dc source of power.

To prevent any leakage through the zener diodes and maximise the output voltage available at 20mA, the floating supply is given a rising voltage/current characteristic. A separate circuit limits the current to protect the fuse in the event of a short circuit in the hazardous area. With a 20V supply, the barrier will deliver 16.2V minimum at 20mA for the transmitter and lines and consumes typically 45mA at 24V operation.

### BASIC CIRCUIT




### ADDITIONAL SPECIFICATION

**Safety description**
28V 300Ω 93mA

**Supply voltage**
20 to 35V dc w.r.t earth

**Output current**
4 to 20 mA

**Voltage available to transmitter and lines**
16.2V @ 20mA with 250Ω load (negative w.r.t. earth)
11.0V @ 20mA with 500Ω load (negative w.r.t. earth)

**Accuracy**
±2µA under all conditions

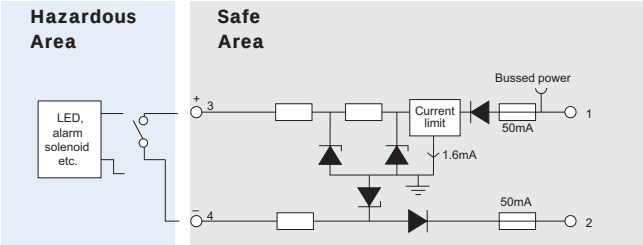
**Safe-area load resistance**
0 to 500Ω

**Supply current**
45mA typical at 20mA and 24V supply
60mA maximum at 20mA and 20V supply

## MTL7707+ for switch inputs and switched outputs

The MTL7707+ is a 2-channel shunt-diode safety barrier similar to the MTL7787+ but with built-in electronic overvolt protection. It is intended primarily for safeguarding a hazardous-area switch controlling a relay, opto-coupler or other safe-area load from an unregulated dc supply in the safe area.
The outgoing channel accepts supply voltages up to +35V and is protected against reverse voltages: the return channel is unaffected by voltages up to +250V.
In normal operation the protection circuit introduces only a small voltage drop and shunts less than 1mA to earth, so its overall effect is minimal. If the supply voltage exceeds about 27V, however, causing the Zener diodes to conduct – or if the safe-area load has a very low resistance – the supply current is limited automatically to 50mA, protecting the fuse and power supply and enabling the loop to continue working.

### BASIC CIRCUIT




### ADDITIONAL SPECIFICATION

**Safety description**
28V 300Ω 93mA, terminals 1 to 3
28V Diode, terminals 2 -4

**Supply voltage**
10 to 35V dc with respect to earth

**Output current**
Up to 35mA available

**Maximum voltage drop (at 20ºC, current not limited)**
Iout x 345Ω + 0.3V, terminals 1 to 3
Iout x 25Ω + 0.9V, terminals 4 to 2

**Supply current**
Iout + 1.6mA, supply <26V
Limited to 50mA, supply >28V or low load resistance

## MTL7707P+ for switch inputs and switched outputs, 2W Transmitters (IIB gases)

The MTL7707P+ is a two-channel shunt-diode safety barrier similar to the MTL7787P+, but is designed for use with group IIB gases and features built-in electronic overvolt protection allowing use with unregulated power supplies up to 35V dc. It is intended primarily as a low cost solution for driving IIB certified 2-wire 4/20mA transmitters, but can also be used with controller outputs with current monitoring, solenoid valves and switches. To protect the fuse and enable the loop to continue working, the supply current is limited automatically at 50mA should the output be short-circuited or excess voltage applied.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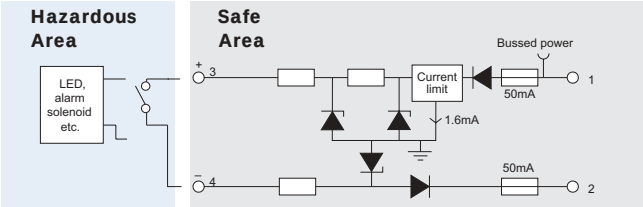
## BASIC CIRCUIT



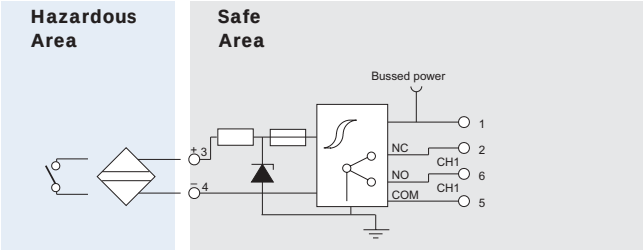

## ADDITIONAL SPECIFICATION

**Safety description**
28V 164Ω 171mA, terminals 1 to 3
28V Diode, terminals 4 to 2
**Supply voltage**
10 to 35V dc with respect to earth
**Output current**
Up to 35mA available
**Maximum voltage drop (at 20ºC, current not limited)**
Iout x 218Ω + 0.3V, terminals 1 to 3
Iout x 20.1Ω + 0.9V, terminals 4 to 2
**Supply current**
Iout + 1.6mA, supply <26V
Limited to 50mA, supply >28V or low load resistance

## MTL7741 proximity sensor or switch input and relay output

The MTL7741 is a single channel switch/prox input barrier with changeover relay contacts acting as the safe area interface. Relay contacts provide a universal interface capable of switching a wide range of signals including ac, low level and high level voltages. Phase reversal is achieved by connecting the normally open or normally closed contacts as required. The power bus terminal may be used to connect the module to a power source.

## BASIC CIRCUIT




## ADDITIONAL SPECIFICATION

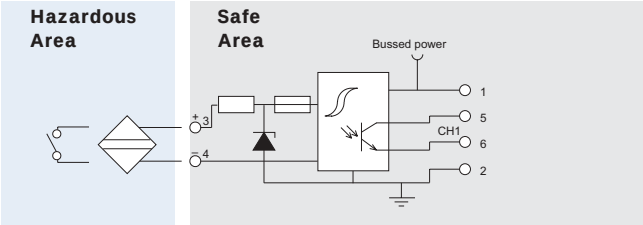
**Safety description**
10V 19mA
**Supply voltage**
22.9 to 30V dc with respect to earth
**Input characteristics**
Relay energised if input >2.1mA(<2kΩ)
Relay de-energised if input <1.2mA(>10kΩ)
**Relay Contacts**
*125V ac 0.5A. Resistive
30V dc, 1A. Resistive
**Supply current**
26mA maximum @ 24V
**Response time**
<10ms

** There are limitations for use above 50V. Please refer to the Instruction Manual INM7700.*

## MTL7742 proximity sensor or switch input with solid state output

The MTL7742 is a single channel switch/prox input barrier with an open collector solid state interface to the safe area equipment. The solid state switch is especially useful for high frequency switching apparatus including pulse and rotational sensors. The power bus terminal can be used to connect power to the module and the input power supply range makes the module suitable for use with unregulated supplies

## BASIC CIRCUIT




## ADDITIONAL SPECIFICATION

**Safety description**
10V 19mA
**Supply voltage**
20 to 35V dc with respect to earth
**Input characteristics**
Output energised if input >2.1mA(<2kΩ)
Output de-energised if input <1.2mA(>10kΩ)
**Output characteristics**

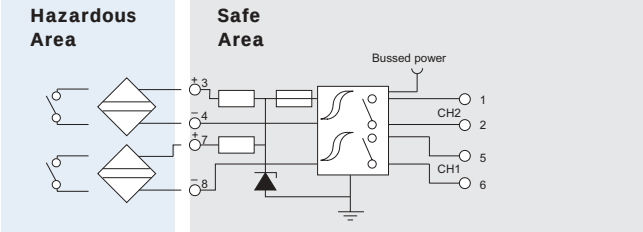
| | |
|---|---|
| Operating frequency | dc to 2.5kHz |
| Max off-state voltage | 35V |
| Max off-state leakage | 10µA |
| Max on-state voltage drop | <1.41V @ 50mA |
| | <1.22V @ 2mA |
| | typically <1V |
| Max on-state current | 50mA |

**Supply current**
20mA maximum @ 24V

## MTL7743 2 channel proximity sensor or switch input and relay outputs

The MTL7743 is a dual channel switch/prox sensor input barrier with a relay interface. This module is ideal for applications where high channel packing densities are required for digital inputs. Power is connected using the power bus terminal.

## BASIC CIRCUIT




## ADDITIONAL SPECIFICATION

**Safety description**
10V 19mA
10V 19mA
**Supply voltage**
22.9 to 30V dc with respect to earth
**Input characteristics**
Relay energised if input >2.1mA(<2kΩ)
Relay de-energised if input <1.2mA(>10kΩ)
**Relay Contacts**
*125V ac 0.5A. Resistive
30V dc, 1A. Resistive
**Supply current**
45mA maximum @ 24V
**Response time**
<10ms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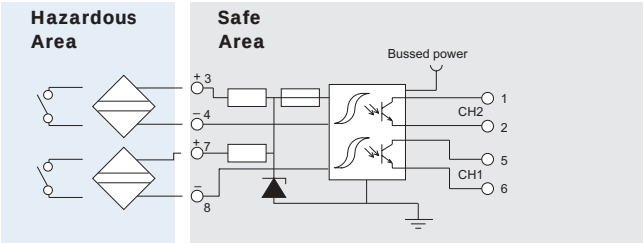
## MTL7744 2 channel proximity sensor or switch inputs with solid state outputs

A dual channel version of the MTL7742. This module provides two solid state interfaces for prox/switch inputs. Power is connected via the power bus.

### BASIC CIRCUIT




### ADDITIONAL SPECIFICATION

**Safety description**
10V 19mA
10V 19mA

**Supply voltage**
20 to 35V dc with respect to earth

**Input characteristics**
Output energised if input >2.1mA(<2kΩ)
Output de-energised if input <1.2mA(>10kΩ)

**Output characteristics**

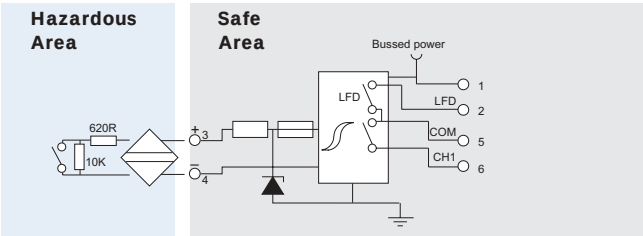
| | |
|---|---|
| Operating frequency | dc to 2.5kHz |
| Max off-state voltage | 35V |
| Max off-state leakage | 10µA |
| Max on-state voltage drop | 1.41V @ 50mA |
| | 1.22V @ 2mA |
| | typically <1V |
| Max on-state current | 50mA |

**Supply current**
29mA maximum @ 24V

## MTL7745 proximity sensor or switch input with relay output and line fault detect

The MTL7745 is a single channel switch/prox input barrier providing line fault detection. Proximity detectors or switches fitted with end-of-line resistors may be connected. Short circuit or open ciruit conditions in the field wiring will generate an alarm condition. The LFD relay contacts close when a fault is detected allowing the contacts to be connected in parallel to provide a common alarm. The power bus terminal can be used to connect power to this module.

### BASIC CIRCUIT




### ADDITIONAL SPECIFICATION

**Safety description**
10V 19mA

**Supply voltage**
22.9 to 30V dc with respect to earth

**Input characteristics**
Output energised if input >2.1mA(<2kΩ)
Output de-energised if input <1.2mA(>10kΩ)

**LFD relay + Red LED**
Energised if input <50µA or <100Ω

**Relay contacts**
*125V ac 0.5A. Resistive
30V dc, 1A. Resistive

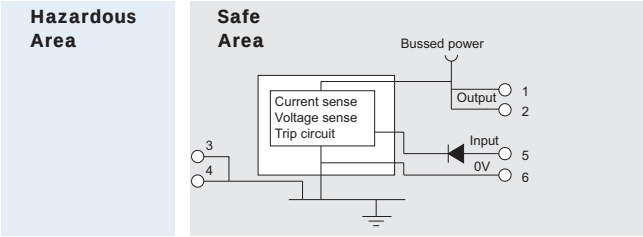
**Supply current**
38mA maximum @ 24V

**Response time**
<10ms

## MTL7798 Power feed and protection module

The MTL7798 power feed module incorporates both voltage and current sense mechanisms to protect barrier circuits by activating a solid state trip mechanism when fault or overload conditions occur in the power source circuit. Resetting the module after tripping is achieved by interupting the supply to the unit. A red LED indicates a circuit trip condition and a green LED the availability of power at the outputs. Bussed power for other modules is sourced from the top of the unit using the Bus Power Link BPL7700 or via terminals 1 and 2.

### BASIC CIRCUIT




### ADDITIONAL SPECIFICATION

**Input voltage range (terminals 5&6)**
20 to 26.8V

**Maximum input voltage capability**
45V

**Power source requirements**
>1.8A

**Trip mechanism**
Minimum trip 26.8V @ 20°C (+18mV/°C)

**Output current range**
0 to 800mA

**Maximum voltage drop**
20mV @ 0mA, 1.0V @ 800mA load

** There are limitations for use above 50V. Please refer to the Instruction Manual INM7700.*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