

HYBRID CIRCUIT FOR PROXIMITY DETECTORS

AMS8177 PNP Open Collector

GENERAL DESCRIPTION

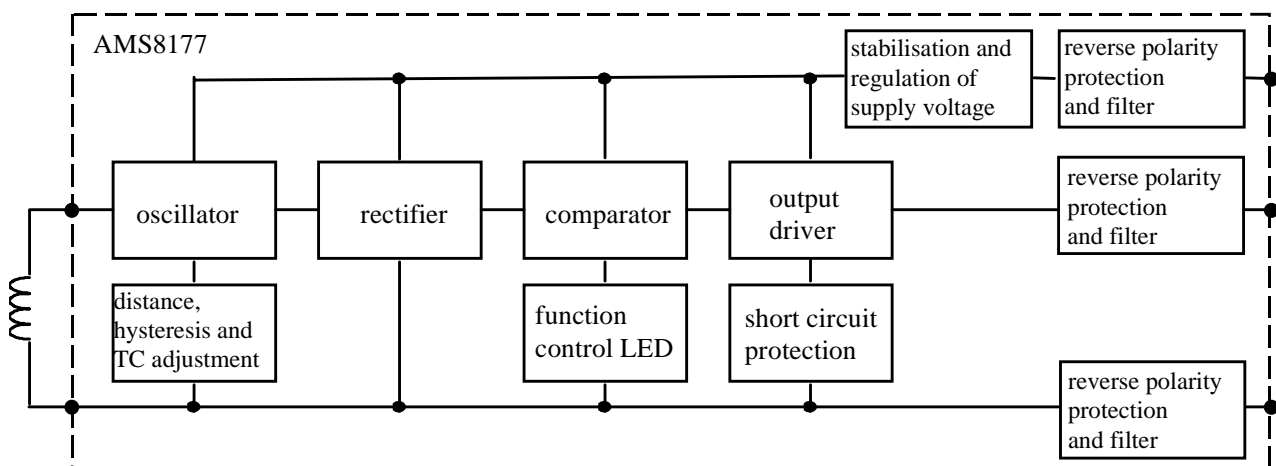
The AMS8177 is a hybrid circuit (5mm × 17mm) dedicated to tubular inductive proximity detectors, especially for small hollow stud constructions.

The module consists of the high integrated bipolar IC, PNP output buffer and industrial protection devices with discrete components. All these components are assembled using hybrid thickfilm technology (ASIC-on-hybrid) combined with surface mounted devices.

FEATURES

- Normally Open, AM8177-1 or Normally Closed, AM8177-2 option capability
- Switching distance adjustable by mounting appropriate discrete resistor
- Wide voltage supply range 7 to 35V
- Output current up to 110mA; PNP open collector
- LED for function control (LED = ON when detection occurs)
- Protection against short circuit and overload (scanning)
- Protection against open ground
- Protection against reverse polarity
- Protection of output transistor against transients by a zener diode (350mW)
- Protection against supply voltage overloads by a zener diode (350mW)
- Protection against repetitive fast electrical transients on supply voltage leads by RC-filtering
- Oscillator temperature drift adjustable by discrete resistor
- Power-on delay and level

BLOCK DIAGRAM



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FUNCTIONAL DESCRIPTION

The proximity detector AMS8177 is specially designed for mounting of \varnothing 6mm tubes or M8-M12. The proximity detector consists of an oscillator, rectifier, comparator as well as a suitability for industry protecting wiring with NPN open collector output. The detection distance is given by the resistor R_d . This trimmable resistor has to be defined and to be mounted on the hybrid by the customer.

This is also valid for the resistors R_h and R_k which have to be selected after application facts and to be mounted on the hybrid.

The bipolar coil is mounted on the capacitor C_{osc} which is able to work as a proximity detector after applying the positive supply voltage to the hybrid.

ABSOLUTE MAXIMUM RATINGS

DC supply voltage	V_+	35V
Output voltage	V_{out}	35V
Junction temperature of the output transistor	T_j	150°C
Storage temperature	T_{st}	-45 to 125°C
Operating temperature range	T_s	-40 to 85°C

PERFORMANCES

Oscillator frequency (see oscillator recommendations)	typ. 666kHz
Operating (switching) distance (see mounting recommendations) depending on magnetic environment and used materials	1.0mm
Differential travel (% of operating distance, hysteresis in switching distance), depending on magnetic environment	typ. 10%
Operating frequency (according to EN 50010), mounted, dependent on the used pot and coil	typ. 450Hz
Switching distance temperature drift, depending on magnetic environment	typ. 0.4%/°C

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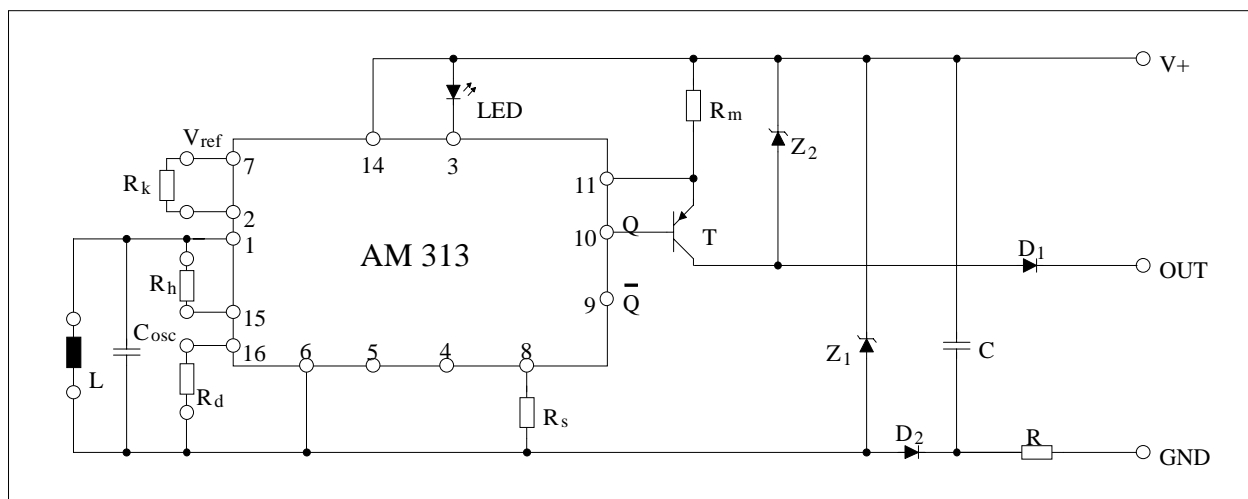
ELECTRICAL SPECIFICATIONS

$V_+ = 7$ to 35V , $T = +25^\circ\text{C}$, unless otherwise indicated
 with $R_d = 8\text{k}\Omega$, $R_h = 35\text{k}\Omega$, $R_k = 20\Omega$
 encapsulated (see mounting recommendations)

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Supply current		$T_S = -25$ to 75°C				
NO Detector	I_+	Output stage "OFF" $V_+ = 25\text{V}$	1.0	1.6	2.5	mA
		Output stage "OFF" $V_+ = 35\text{V}$			4.0	mA ¹⁾
NC Detector	I_+	Output stage "ON"	4.0	7.0	10.0	mA
		Output stage "OFF"	4.0	7.0	10.0	mA
		Output stage "ON" $V_+ = 25\text{V}$	3.0	3.3	7.8	mA
Current limit for short circuit protection	I_{out}	$T_S = -25^\circ\text{C}$		230		mA
		$T_S = 25^\circ\text{C}$	150	200	290	mA
		$T_S = 75^\circ\text{C}$		170		mA
Output voltage drop	V_{drop}	$I_{out} = 10\text{mA}$			1.0	V
		$I_{out} = 100\text{mA}$			1.9	V
		$T_S = -25$ to 75°C				
Power on delay	T_{abt}			350		μs

1) not tested but guaranteed by design

CIRCUIT DIAGRAM



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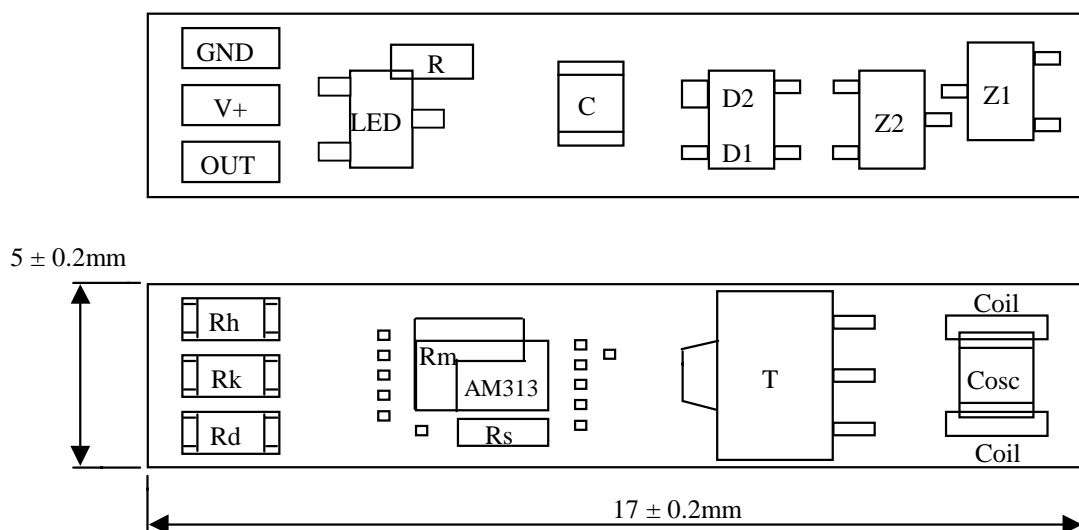
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EXTERNAL COMPONENTS

Symbol	Value	Description
R_d	8k Ω (typical)	Operating distance adjust (SMD resistor 0805)
R_h	35k Ω (typical)	Differential hysteresis adjust (SMD resistor 0805)
R_k	20 Ω (typical)	Oscillator temperature drift adjust (SMD resistor 0805)
C_{osc}	1nF (NPO)	Oscillator capacitor
R_m	1.2 Ω (typical)	Maximum output current limitation resistor
R_s	100 Ω (typical)	Output transistor base current adjust
D_1, D_2	BAS 28	Protection against reverse polarity
Z_1	BZX 84 C 39	Protection against supply overloads
Z_2	BZX 84 C 39	Protection against transients
R	100 Ω (typical)	Voltage supply filter
C	47nF (X7R)	Voltage supply filter
T	BCX 52-16 (1W)	Discrete output power PNP transistor
LED	LYS 260	Function control display (yellow)
L	Application dependent	External coil (see recommendations)

OUTLINE AND CONNECTIONS

R , R_m and R_s are thickfilm screen printed resistors.
 R_d , R_h and R_k have to be mounted by the customer.
 Coil connections are located on each extremity of C_{osc} .
 NC (normally closed) is identified with a red dot.



Order No: AMS8177 NO (normally open) 8177-1
 AMS8177 NC (normally closed) 8177-2

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MOUNTING RECOMMENDATIONS

If a protective capacitor is mounted on the coil, it should be as thin as possible, because its thickness forms part of the operating distance.

The stud wall should not extend beyond the potcore.

The exact value of the operating distance with its tolerance is determined by:

- the values of the adjustment resistors (R_d , R_h , R_k)
- the oscillator coil
- the ferrite potcore
- the metal of the actuator
- the material and shape of the housing

Handle with care to avoid damage by electrostatic discharge.

OSCILLATOR RECOMMENDATIONS

Potcore SIFFERIT (Siemens) \varnothing 5.8mm, K1 material

Coil $N = 70$ Thermofix S (Isolawerke) \varnothing Cu 0.080mm

Coil $L = 57\mu\text{H}$ embedded in NiCr steel tube

SOLDERING RECOMMENDATIONS

To solder the external connection pads it is necessary to preheat the substrate to 120...150°C and use solder type Sn-Pb-Ag 62-36-2 (2% silver).

POTTING RECOMMENDATIONS

First cover the hybrid circuit with about 0.5mm of silicone coating, let it harden and with the parts inserted in the housing, fill with epoxy resin.