Protective Devices

Description

The devices M10261xS are protective interfaces for 8 input pins. They protect analogue or digital circuits against high-energetic pulses and electrostatic discharges, as they typically occur in the automotive environment.

The devices M10261xS are used as interfaces between an electrical system and it's remote sensors. They can also be employed as interfaces between two systems which are separated from each other and connected by cables that are susceptible to interference.

Each input of the interface device is immune against energetic pulses that typically occur in the automotive environment. In addition it protects the electronic system connected to it against damage by electrostatic discharge.

The energy of the interference pulses is bypassed to ground and therefore can no longer damage the subsequent circuits.

The devices M10261xS have 8 channels. x of them are digital and 8-x are analogue.

In the analogue channels, signal and noise is limited to a maximum voltage of 5 V. Input signals within the supply voltage range are transferred from the input to the output without distortion. An equivalent series resistance of approximately 2 kΩ has to be taken into consideration.

In the digital channels, the signal outputs are buffered with CMOS drivers, which in case of no connection are pulled to ground by a pull-down resistor.

The devices are protected against reverse battery voltage.

Features

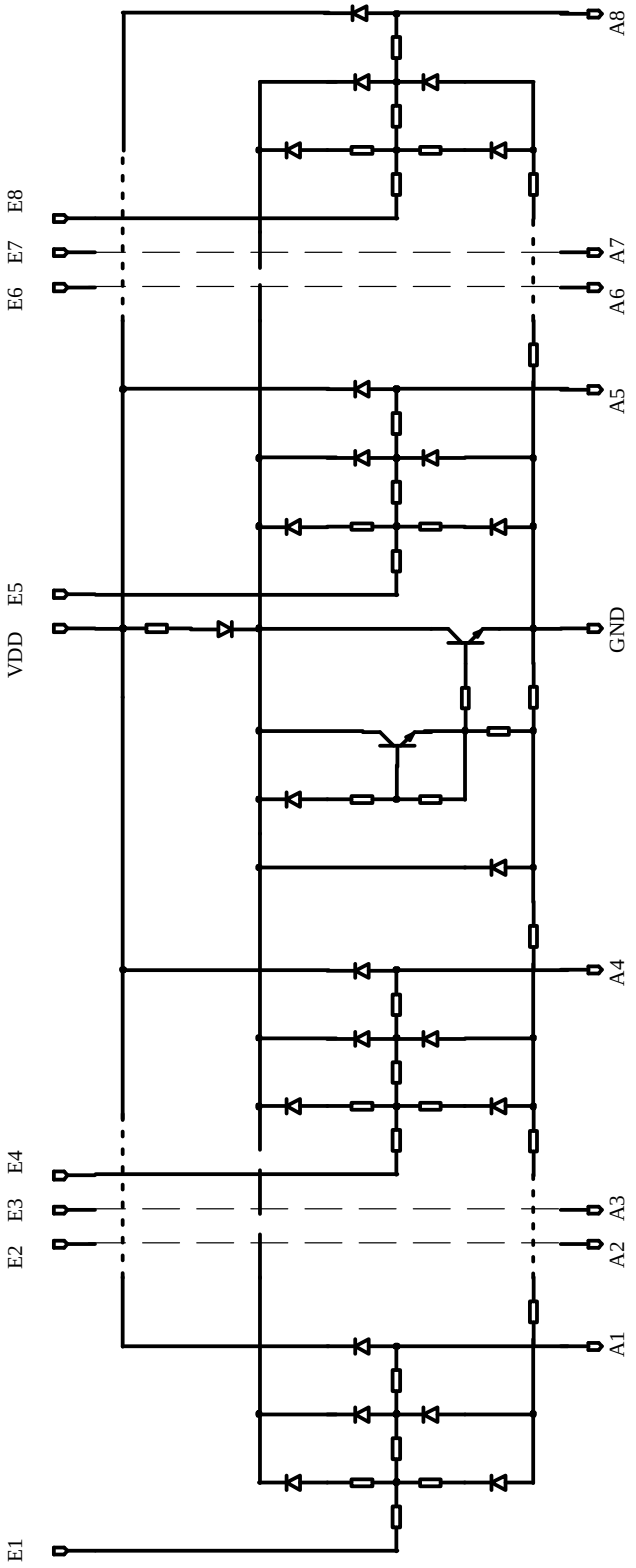
The protection of these devices is compliant with the regulations in the test procedure worked out by Mercedes-Benz for energetic pulses and interference. The protection is also in compliance with the specifications

- ISO DP7637/1 and 2
- SAE J1113
- DIN 40839–T3 (without load dump)
- MIL–STD–883C/3015.7/cl. 3

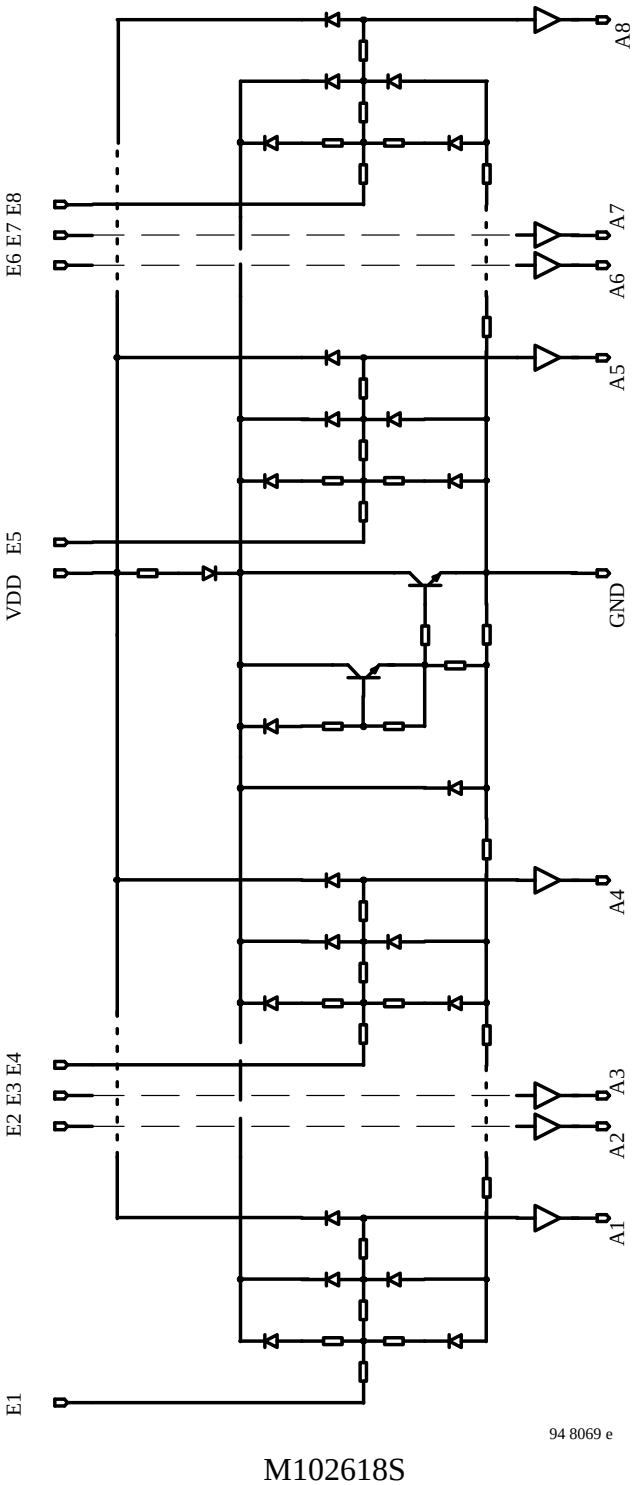
Benefits

- One of these devices replaces up to 8 suppressor diodes at inputs of an electronic system.
- No further ESD protection required.

Block Diagram (Simplified Schematic)



M102610S



M102618S

Pinout / Package Options

18-lead SOIC (SO18), small outline gull-wing

Pin Description

Pin	Symbol	Function
1	A1	Output
2	A2	Output
3	A3	Output
4	A4	Output
5	GND	Power
6	A5	Output
7	A6	Output
8	A7	Output
9	A8	Output

Pin	Symbol	Function
10	E8	Input
11	E7	Input
12	E6	Input
13	E5	Input
14	V_{DD}	Power
15	E4	Input
16	E3	Input
17	E2	Input
18	E1	Input

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage	V_{DD}	–100 to +100	V
Input voltage at any input	V_{in}	– 5 to + 20	
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	–65 to +125	°C
Soldering temperature	T_{sol}	260	°C for 10 s maximum

Operating Conditions

Parameters	Symbol	Maximum	Unit
Supply voltage	V_{DD}	4.5 to 6.0	V
Input voltage of analogue channel	V_{in}	0 to 6.0	V
Input voltage of digital channel	V_{in}	–0.5 to +6.0	V
Supply current	I_{DD}	0.5	mA
Operating temperature	T_{amb}	–55 to +100	°C

Static Characteristics

V_{DD} = 5 V, T_{amb} = 25°C, unless otherwise specified

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
Input low voltage (digital)	V_{DD} = 6 V	V_{IL}	0		0.8	V
Input high voltage (digital)	V_{IL} = 6 V	V_{IH}	3.0		6.0	V
Output low voltage (digital)	I_{OL} = 1 mA, V_{DD} = 6 V	V_{OL}	0		0.4	V
Output high voltage (digital)	V_{in} = –1 mA, V_{DD} = 6 V	I_{OH}	2.4		6.0	V
Input leakage current low (digital)	V_{in} = 0, V_{DD} = 6 V	I_{IL}	–50		0	µA
Input leakage current high (digital)	V_{in} = 6 V, V_{DD} = 6 V	I_{IH}	0		300	µA
Leakage current low (analogue)	V_{in} = 0	I_{IL}	–50		0	µA
Leakage current high (analogue)	V_{in} = 6 V	I_{IH}	0		300	µA
Input impedance (analogue)		R_i	1.6		2.4	kΩ

AC Characteristics

V_{DD} = 5 V, T_{amb} = 25°C, unless otherwise specified

Parameters	Test Conditions / Pin	Symbol	Min	Typ	Max	Unit
3 dB cut-off frequency (analogue)	C_L = 30 pF	f_T	1			MHz
20 dB cut-off frequency (analogue)	C_L = 30 pF	f_T	20			MHz
Bit rate for digital outputs	C_L = 15 pF C_L = 2 pF	b	4 20			Mb/s Mb/s
Delay time (digital)	C_L = 2 pF	t_{pd}			50	ns

Protection against Conducted Electromagnetic Interferences

Pulse Type	Min	Conditions
Pulse type 1 (figure 1)	5000 pulses	U_S = –100 V, t_r = 1 µs, t_d = 2 ms, t_1 = 0.5 s t_2 = 200 ms, $t_3 \leq$ 100 µs, R_i = 4 Ω
Pulse type 2 (figure 2)	5000 pulses	U_S = +100 V, t_r = 1 µs, t_d = 2 ms, t_1 = 0.5 s t_2 = 200 ms, R_i = 4 Ω
Pulse type 3a and 3b (figure 3)	1 hour	U_S = –150 V (pulse 3a), U_S = +100 V (pulse 3b) t_r = 5 ns, t_d = 100 ns, t_1 = 100 µs, t_4 = 10 ms t_3 = 90 ms, R_i = 50 Ω
Pulse type 6 (figure 1)	1 pulse	U_S = –150 V, t_r = 1 µs, t_d = 200 ms, t_1 = 0.5 s t_2 = 200 ms, $t_3 \leq$ 100 µs, R_i = 4 Ω

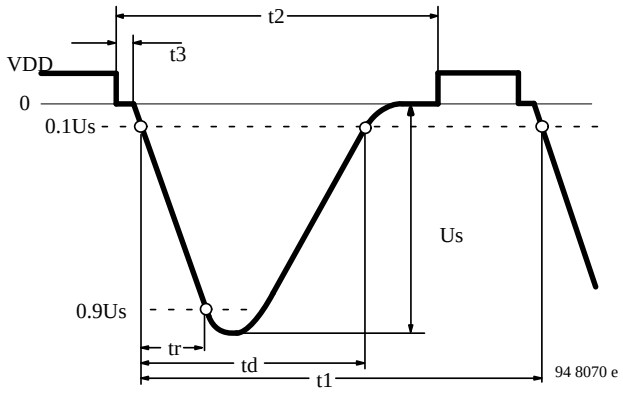


Figure 1. Pulse types 1 and 6

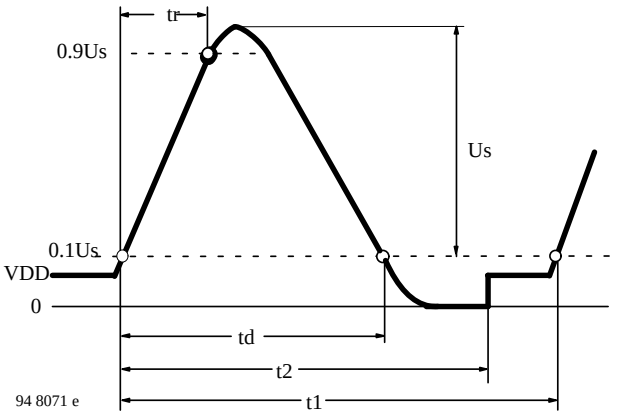


Figure 2. Pulse type 2

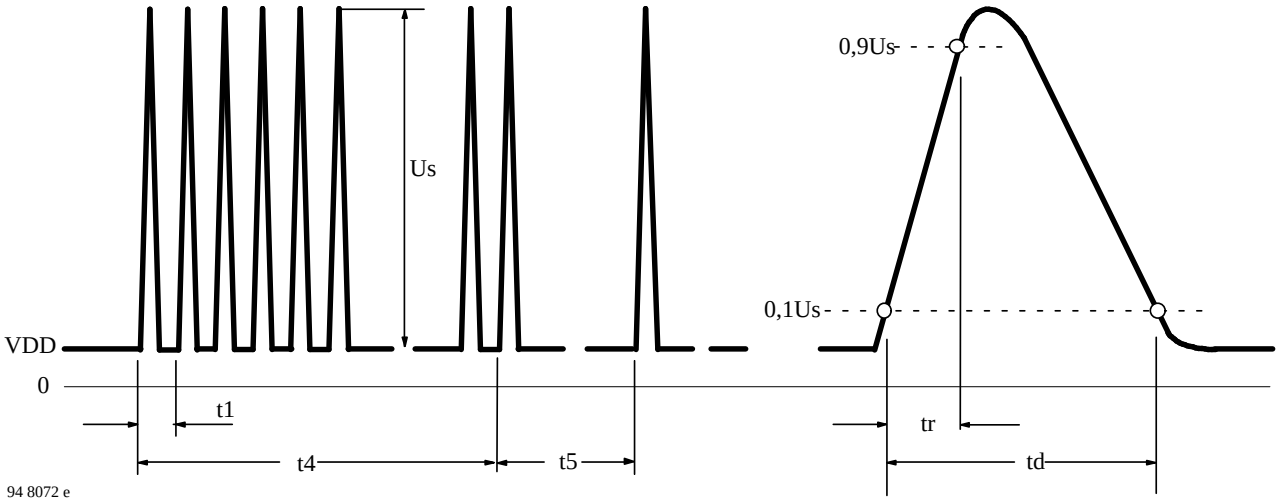
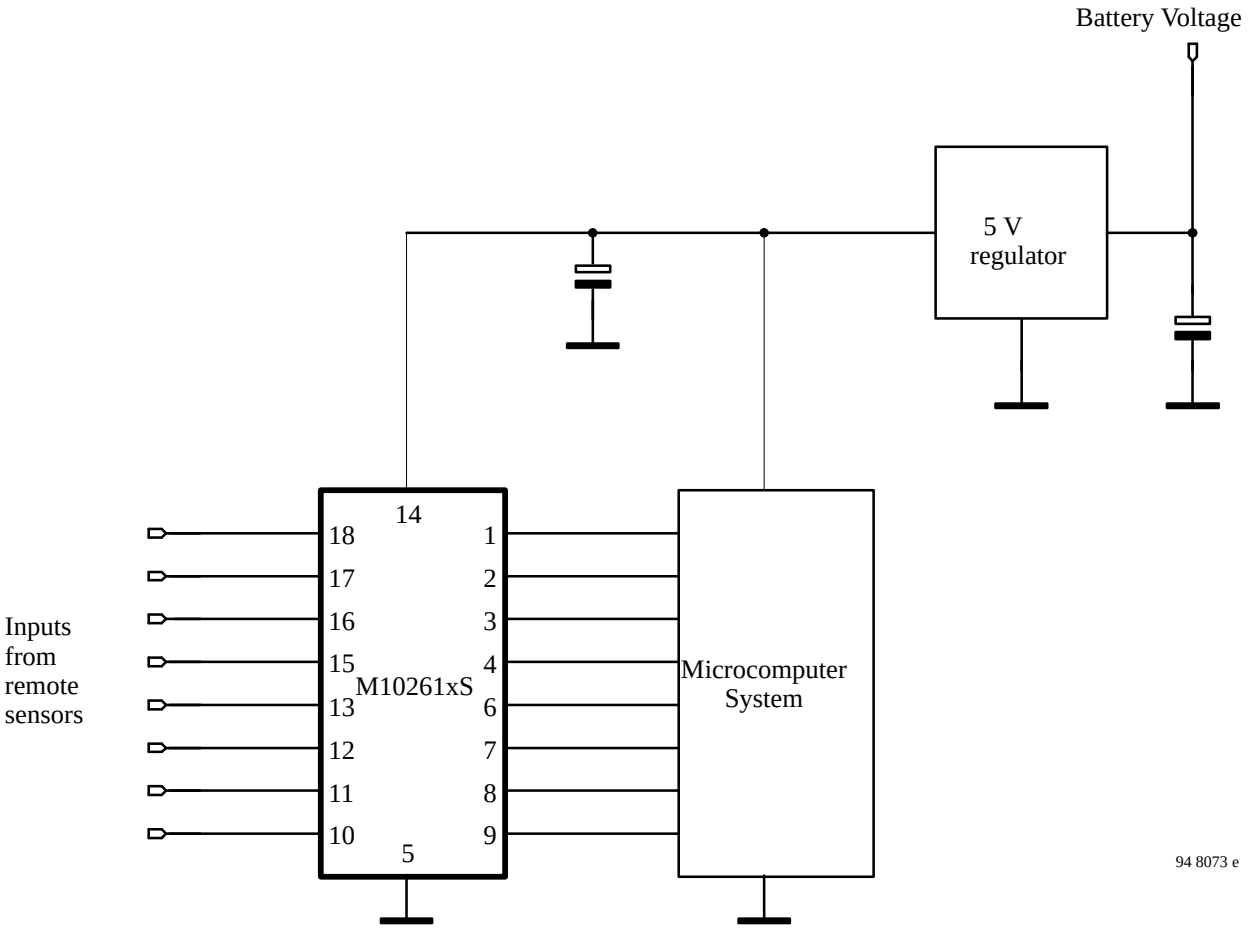


Figure 3. Pulse types 3a and 3b



ESD Protection

These devices are compliant with the specification MIL-STD-883C, method 3015.7, class 3.

The ESD protection test is based on the “human body” model using a discharge capacitance of 150 pF and a discharge resistance of 10 kΩ.

The discharge voltage is

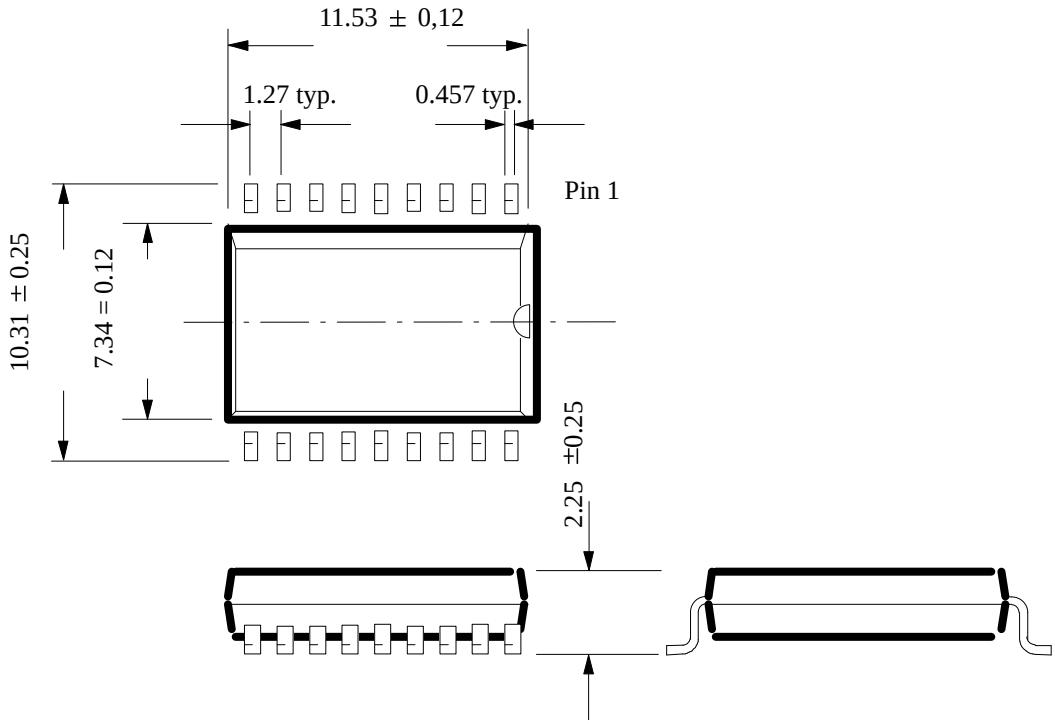
18 kV	via air gap
6 kV	with shortcut between input and discharge resistance

Simulators for electrostatic discharge are suitable test equipment for proof of these requirements. For instance the simulators Schaffner NSG 432 or EMTEST ESD 30 can be used.

Applications Information

The figure shows a typical application as an interface between remote sensors and a microcomputer system, thus replacing two suppressor diodes in each input to protect the microcontroller’s inputs.

Dimensions in mm



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