Protective Devices

Description

The devices M1026yxS are a family of protective interfaces for 8 input pins. They protect analog or digital circuits against high energetic pulses and electrostatic discharges as they occur in the automotive environment. The devices M1026yxS have been designed especially for the harsh environment of trucks, while the M10262xS are economic solutions for cars.

The devices in the M1026yxS family are used as its interfaces between an electrical system and 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 to energetic pulses that occur typically in the automotive environment. In addition, it protects the electronic system connected to it against damage from electrostatic discharge.

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

The devices M1026yxS have 8 channels. x of them are digital and 8-x are analog.

In the analog 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 (M10261xS) or 510 Ω (M10262xS) has to be taken into consideration.

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

The devices are protected against reverse-battery voltage.

Features

The protection of these devices is compliant to 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

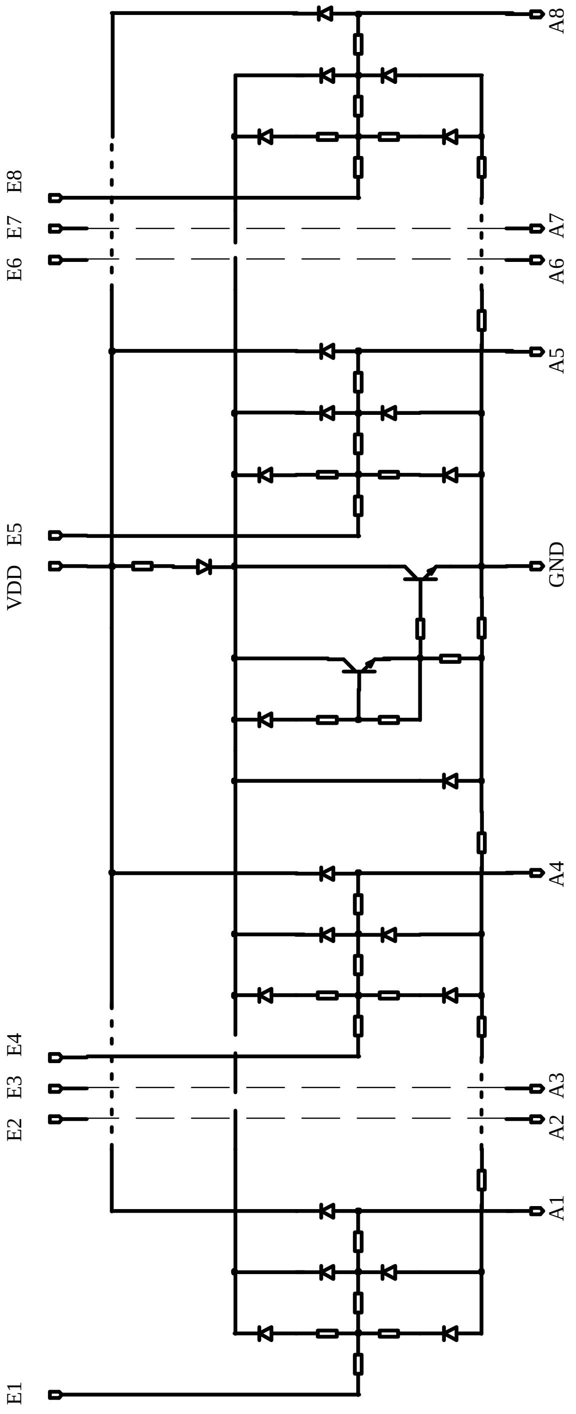
- One of these devices replaces up to 8 suppressor diodes at inputs of an electronic system.
- No further ESD protection is required.
- These devices fulfil the special requirements in the harsh environment of cars (M10262xS) and trucks (M10261xS).

Ordering Information

Extended Type Number	Package	Remarks
M1026yxS *)	SO18	
M1026yxS-G1 *)	SO18	Tape & reel, 1000 units/reel
M1026yxS-G3 *)	SO18	Tape & reel, 4000 units/reel

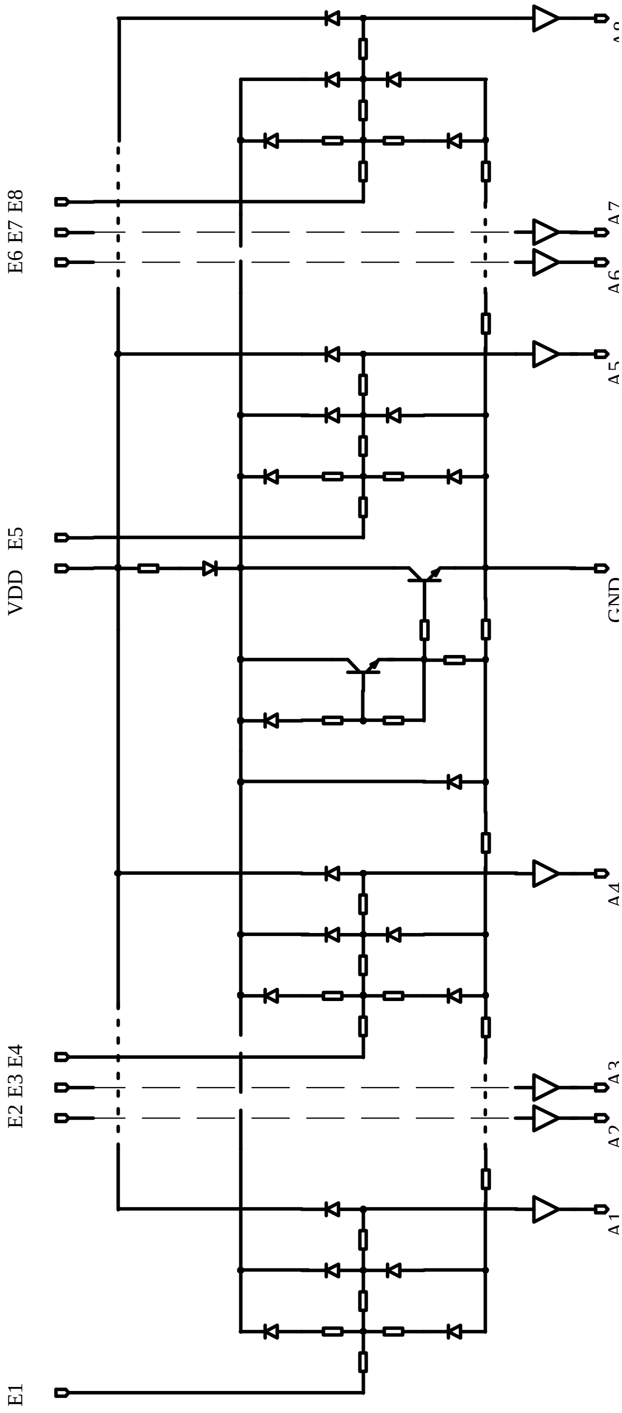
*) x to be replaced by one of the digits 0 to 8 indicating the number of digital channels per device
y to be replaced by 1 for the truck version or 2 for the car version

Block Diagram (Simplified Schematic)



M102610S, M102620S 12587

Figure 1.



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M102618S, M102628S

Figure 2.

Preliminary Information

Pin Description

Pin	Symbol	Function	Pin	Symbol	Function
1	A1	Output channel 1	10	E8	Input channel 8
2	A2	Output channel 2	11	E7	Input channel 7
3	A3	Output channel 3	12	E6	Input channel 6
4	A4	Output channel 4	13	E5	Input channel 5
5	GND	Power ground	14	V_{DD}	Power
6	A5	Output channel 5	15	E4	Input channel 4
7	A6	Output channel 6	16	E3	Input channel 3
8	A7	Output channel 7	17	E2	Input channel 2
9	A8	Output channel 8	18	E1	Input channel 1

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage	V_{DD}	– 5 to + 20	V
Input voltage at any input	V_{in}	–150 to +100	V
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	–65 to +125	°C
Soldering temperature	T_{sld}	260	°C for 10 s maximum

Operating Conditions

Parameters	Symbol	Value	Unit
Supply voltage	V_{DD}	4.5 to 6.0	V
Input voltage of analog 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, Pins 10 to 13, 15 to 18	V_{IL}	0		0.8	V
Input high voltage (digital)	V_{IL} = 6 V, Pins 10 to 13, 15 to 18	V_{IH}	3.0		6.0	V
Output low voltage (digital)	I_{OL} = 1 mA, V_{DD} = 6 V, Pins 1 to 4, 6 to 9	V_{OL}	0		0.4	V
Output high voltage (digital)	V_{in} = –1 mA, V_{DD} = 6 V, Pins 1 to 4, 6 to 9	I_{OH}	2.4		6.0	V
Input leakage current low (digital)	V_{in} = 0, V_{DD} = 6 V, Pins 10 to 13, 15 to 18	I_{IL}	–50		0	µA
Input leakage current high (digital)	M10261xS V_{in} = 6 V, V_{DD} = 6 V, Pins 10 to 13, 15 to 18	I_{IH}	0		300	µA
Input leakage current high (digital)	M10262xS V_{in} = 6 V, V_{DD} = 6 V, Pins 10 to 13, 15 to 18	I_{IH}	0		50	µA
Leakage current low (analog)	V_{in} = 0, Pins 10 to 13, 15 to 18	I_{IL}	–50		0	µA
Leakage current high (analog)	M10261xS V_{in} = 6 V Pins 10 to 13, 15 to 18	I_{IH}	0		300	µA
Leakage current high (analog)	M10262xS V_{in} = 6 V Pins 10 to 13, 15 to 18	I_{IH}	0		50	µA
Input impedance (analog)	M10261xS Pins 10 to 13, 15 to 18	R_i	1.6		2.4	kΩ
Input impedance (analog)	M10262xS Pins 10 to 13, 15 to 18	R_i	400		610	Ω

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	C_L = 30 pF, Pins 1 to 4, 6 to 9	f_T	1			MHz
20 dB cut-off frequency	C_L = 30 pF, Pins 1 to 4, 6 to 9	f_T	20			MHz
Bit rate for digital outputs	C_L = 15 pF, Pins 1 to 4, 6 to 9 C_L = 2 pF, Pins 1 to 4, 6 to 9	b	4 20			Mb/s Mb/s
Delay time	C_L = 2 pF, Pins 1 to 4, 6 to 9	t_{pd}			50	ns

Protection against Conducted Electromagnetic Interferences

Pulse Type	Min	Conditions
Pulse type 1 (figure 3)	5000 pulses	V_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 4)	5000 pulses	V_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 5a and 5b (figure 5)	1 hour	M10261xS V_S = –150 V (pulse 3a), V_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 5a and 5b (figure 5)	1 hour	M1026yxS V_S = –150 V (pulse 3a), V_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 3)	1 pulse	M10261xS V_S = –150 V, t_r = 1 µs, t_d = 200 µs, t_1 = 0.5 s t_2 = 200 ms, $t_3 \leq$ 100 µs, R_i = 4 Ω
Pulse type 6 (figure 3)	1 pulse	M1026yxS V_S = –150 V, t_r = 1 µs, t_d = 200 µs, t_1 = 0.5 s t_2 = 200 ms, $t_3 \leq$ 100 µs, R_i = 4 Ω

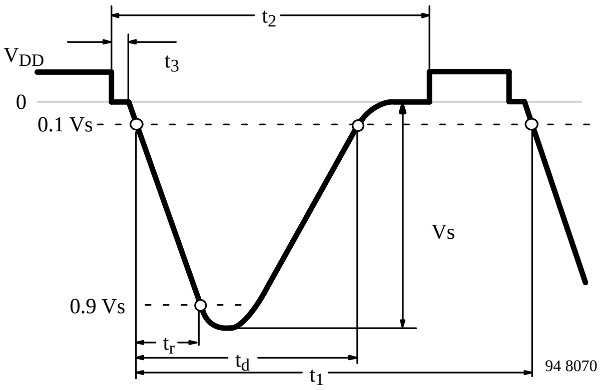


Figure 3. Pulse types 1 and 6

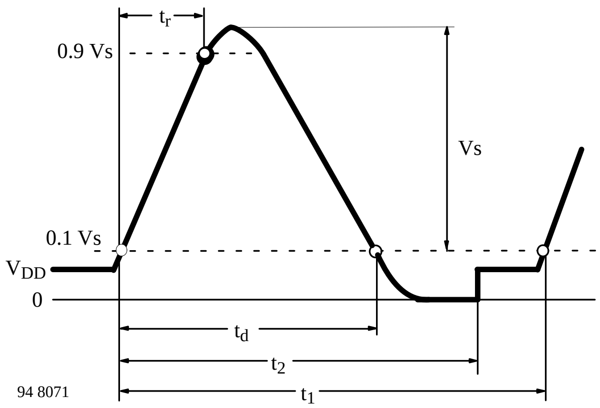


Figure 4. Pulse type 2

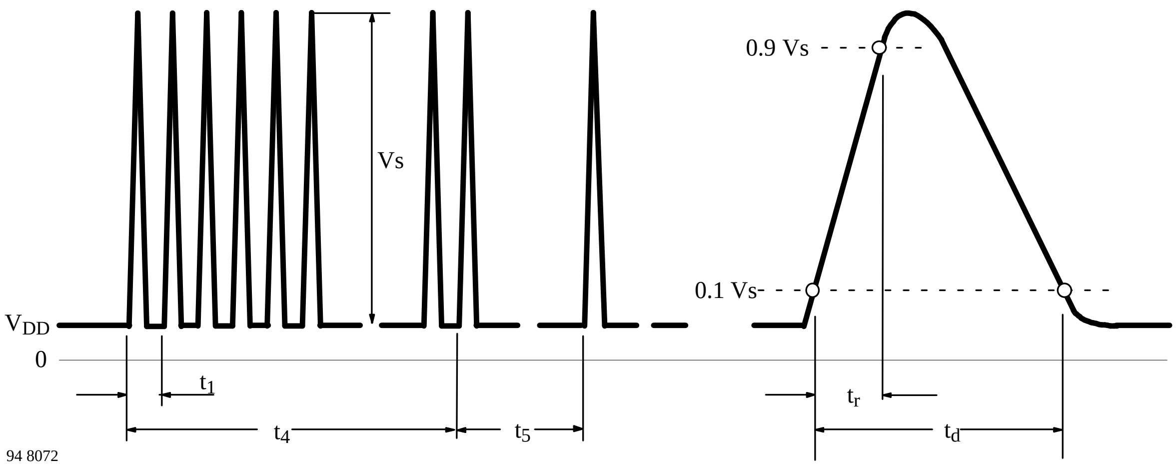


Figure 5. Pulse types 3a and 3b

Preliminary Information

Application$_S$ Information

Figure 6 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.

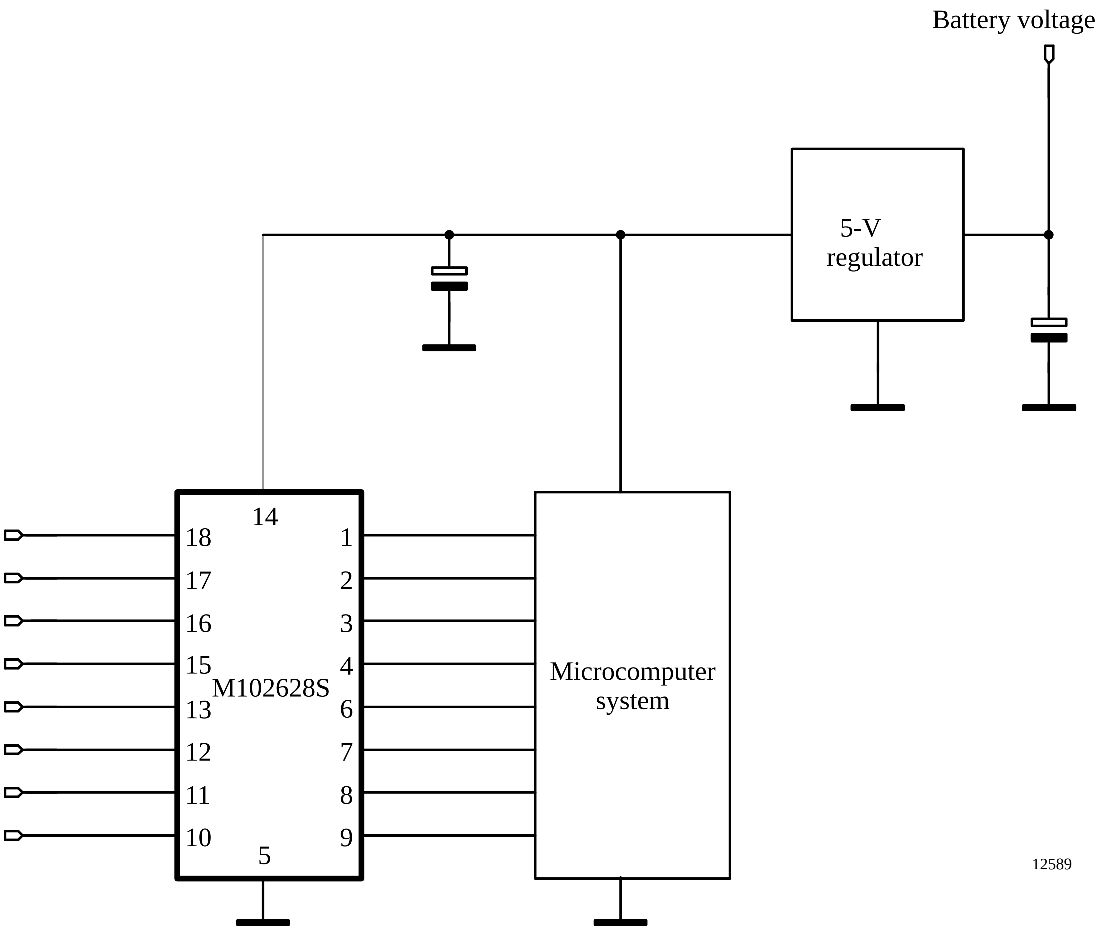


Figure 6.

ESD Protection

These devices are compliant to 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.

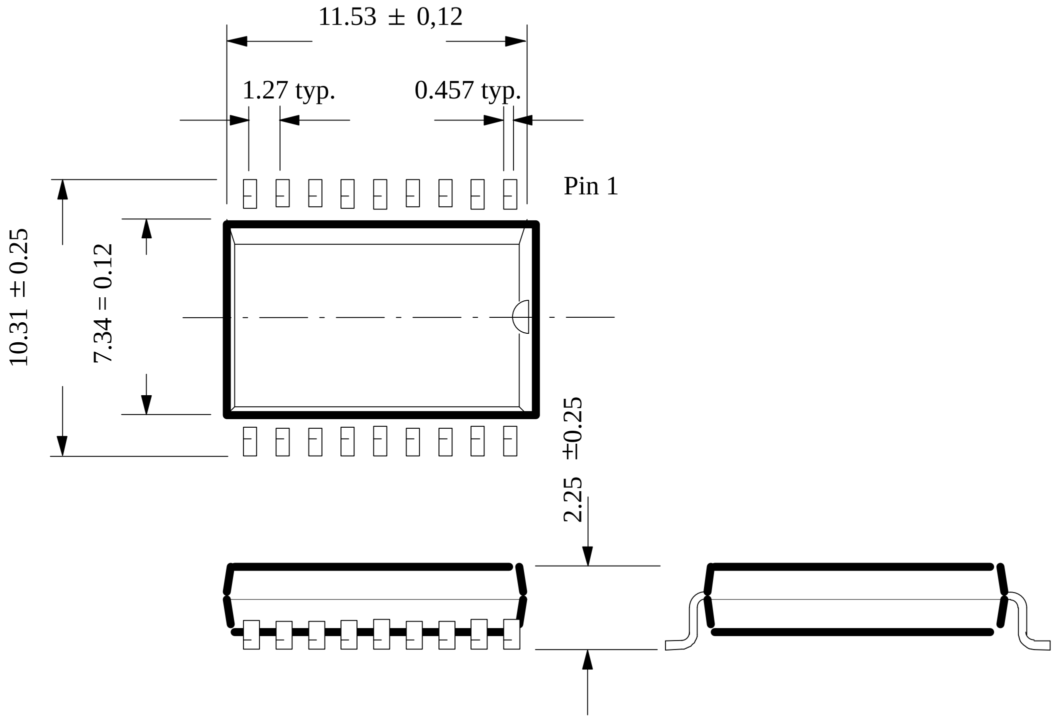
The discharge voltage is

- 18 kV via air gap
- 6 kV with short cut between input and discharge resistance

Simulators for electrostatic discharge are a suitable test equipment for proof of these requirements. The simulators Schaffner NSG 432 or EMTEST ESD 30, for example, can be used.

Dimensions in mm

Package: SO18



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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