

Bidirectional Transil™, transient voltage surge suppressor (TVS) array for data line protection

Datasheet — production data

Features

- High surge capability Transil array:
 $I_{PP} = 40\text{ A}$ (8/20 μs)
- Peak pulse power: 300 W (8/20 μs)
- Separated input - output
- Up to 9 bidirectional Transil functions
- Low clamping factor (V_{CL}/V_{BR}) at high current level
- Low leakage current
- ESD protection up to 15 kV

Complies with the following standards

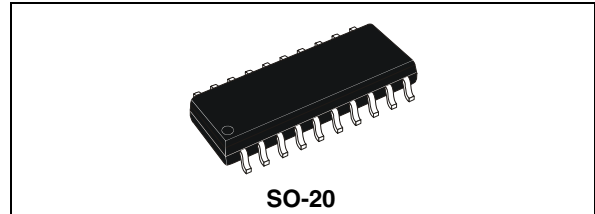
- IEC 61000-4-2 level 4
 - 15 kV (air discharge)
 - 8 kV (contact discharge)
- MIL STD 883G- Method 3015-7: class 3B
 - 25 kV (human body model)

Applications

Differential data transmission lines protection, such as:

- RS-232
- RS-423
- RS-422
- RS-485

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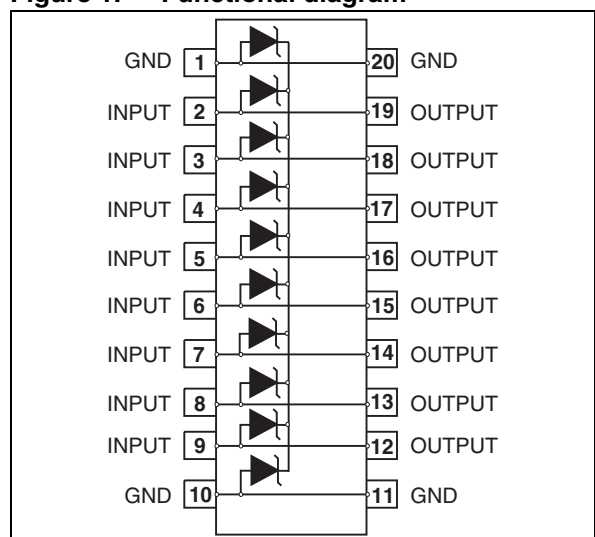
Description

Transil diode arrays provide high overvoltage protection by clamping action. Their instantaneous response to transient overvoltages makes them particularly suited to protect voltage sensitive devices such as MOS technology and low voltage supplied ICs.

The ITA series combines high surge capability against energetic pulses with high voltage performance against ESD.

The separated input/output configuration of the device ensures improved protection against very fast transient overvoltage like ESD by elimination of the spikes induced by parasitic inductances created by external wiring.

Figure 1. Functional diagram



1 Characteristics

Table 1. Absolute ratings ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Symbol	Parameter		Value	Unit
P_{PP}	Peak pulse power (8/20 μs) ⁽¹⁾	$T_j \text{ initial} = T_{amb}$	300	W
I_{PP}	Peak pulse current (8/20 μs) ⁽¹⁾	$T_j \text{ initial} = T_{amb}$	40	A
I^2t	Wire I^2t value ⁽¹⁾		0.6	A^2s
T_j	Maximum operating junction temperature		125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		-55 to +150	$^{\circ}\text{C}$
T_L	Maximum lead temperature for soldering during 10 s		260	$^{\circ}\text{C}$

1. For surges greater than the specified maximum value, the I/O will first present a short-circuit and after an open circuit caused by the wire melting.

Table 2. Electrical characteristics (definitions, $T_{amb} = 25\text{ }^{\circ}\text{C}$)

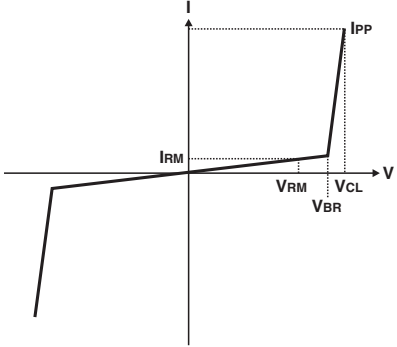
Symbol	Parameter	
V_{RM}	Stand-off voltage	
V_{BR}	Breakdown voltage	
V_{CL}	Clamping voltage	
I_{RM}	Leakage current	
I_{PP}	Peak pulse current	
αT	Voltage temperature coefficient	
V_F	Forward voltage drop	
C	Capacitance	

Table 3. Electrical characteristics (values, $T_{amb} = 25\text{ }^{\circ}\text{C}$)

Order code	$V_{BR}^{(1)}$ @ I_R		I_{RM} @ V_{RM}		$V_{CL}^{(1)}$ @ I_{PP}		$V_{CL}^{(1)}$ @ I_{PP}		αT	$C^{(2)}$
	min.		max.		max. 8/20 μs		max. 8/20 μs		max.	max.
	V	mA	μA	V	V	A	V	A	$10^{-4}/^{\circ}\text{C}$	pF
ITA6V5B3	6.5	1	10	5	9.5	10	12.1	25	4	1100
ITA18B3	18	1	4	15	21	10	26	25	9	500
ITA25B3	25	1	4	24	31	10	36	25	12	420

1. Between I/O pin and ground.
 2. Between two input pins at 0 V Bias, $F = 1\text{ MHz}$.

Figure 2. Pulse waveform

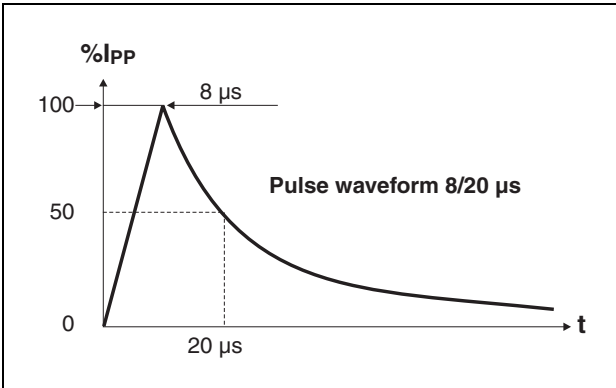


Figure 3. Typical peak pulse power versus exponential pulse duration

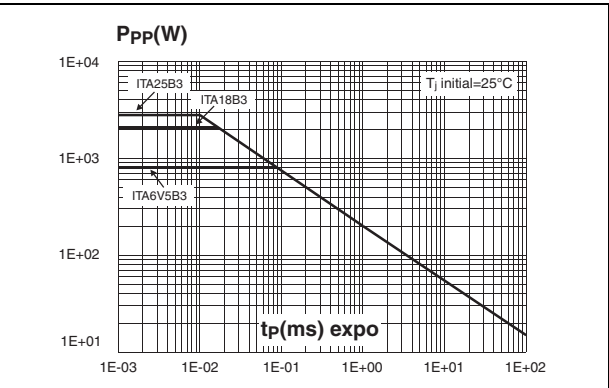


Figure 4. Clamping voltage versus peak pulse current (exponential waveform 8/20 μs)

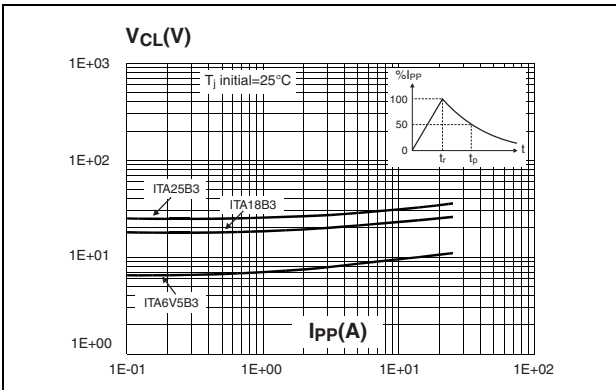


Figure 5. Peak current I_{DC} inducing open circuit of the wire for one input/output versus pulse duration

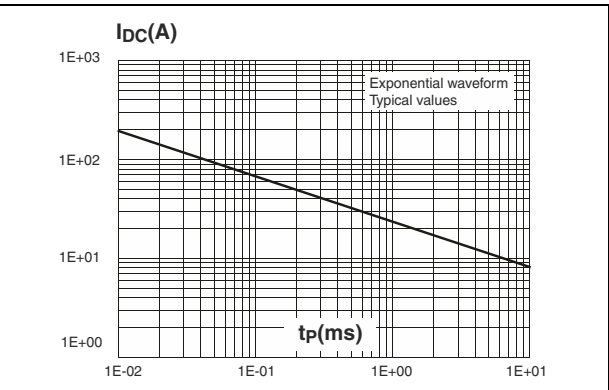


Figure 6. Junction capacitance versus reverse applied voltage for one input/output (typical values)

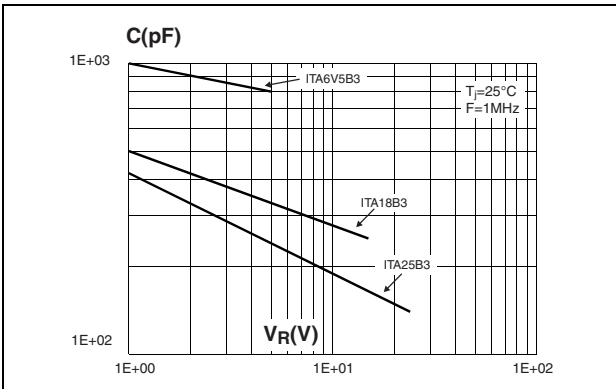
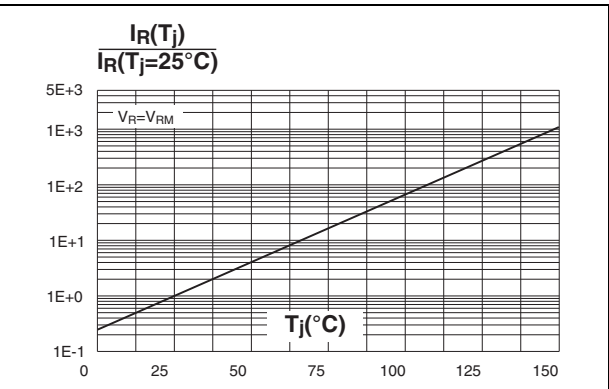


Figure 7. Relative variation of leakage current versus junction temperature



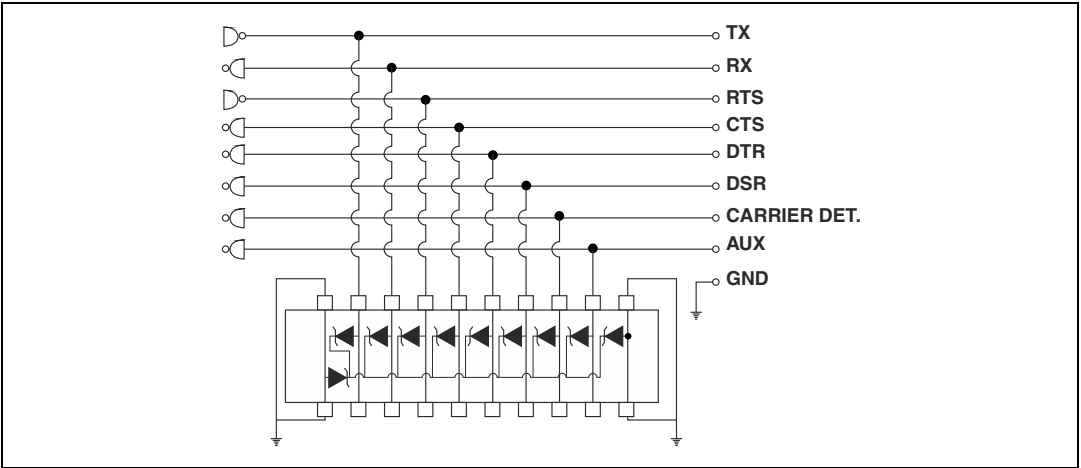
2 Application information

This monolithic Transil array is based on 10 unidirectional Transils with a common cathode and can be configured to offer up to 9 bidirectional functions. This imposes a maximum differential voltage between 2 input pins (see [Table 4](#)).

Table 4. Maximum differential voltages

Order code	Maximum differential voltage between two input pins at 25°C
ITA6V5B3	$\pm 3.5\text{ v}$
ITA18B3	$\pm 9.0\text{ v}$
ITA25B3	$\pm 12.5\text{ v}$

Figure 8. RS-232 junction (typical application)



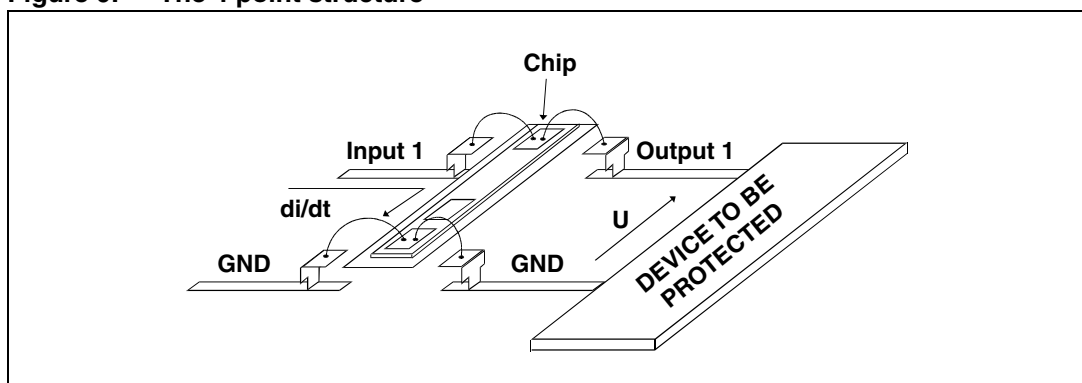
2.1 Design advantage of ITAxxB3 used with 4-point structure

The ITAxxB3 has been designed with a 4-point structure (separated Input/output) to efficiently protect against disturbances with very high di/dt rates, such as ESD. The purpose of this 4-point structure is to eliminate the overvoltage introduced by the parasitic inductances of the wiring (Ldi/dt).

Efficient protection depends not only on the component itself, but also on the circuit layout. [Figure 9](#) shows the layout to be used to take advantage of the 4-point structure of the ITAxxB3.

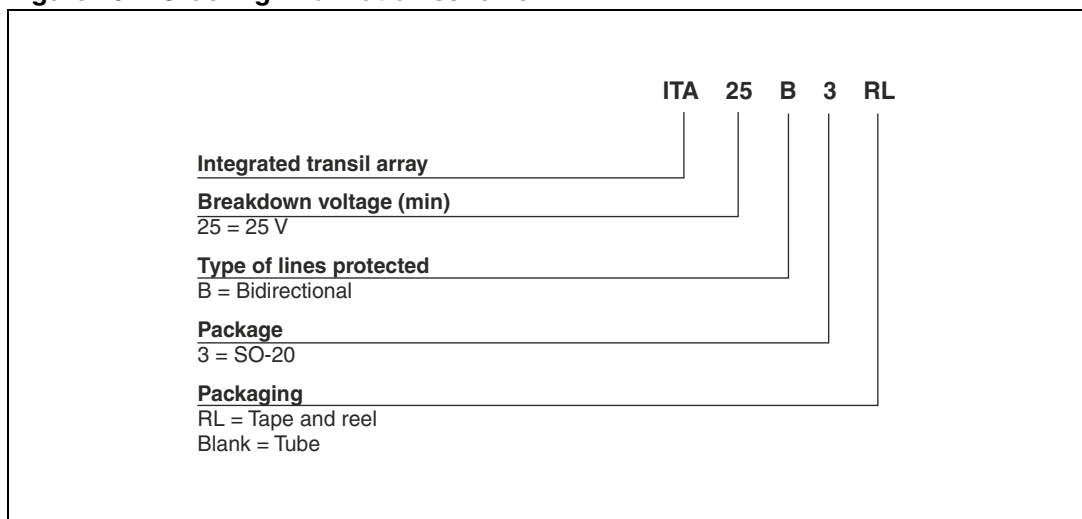
With this layout, each line to be protected passes through the protection device. This approach provides a highly effective interface between the data line and the circuit to be protected, guaranteeing an isolation between its inputs and outputs.

Figure 9. The 4 point structure



3 Ordering information scheme

Figure 10. Ordering information scheme



4 Package information

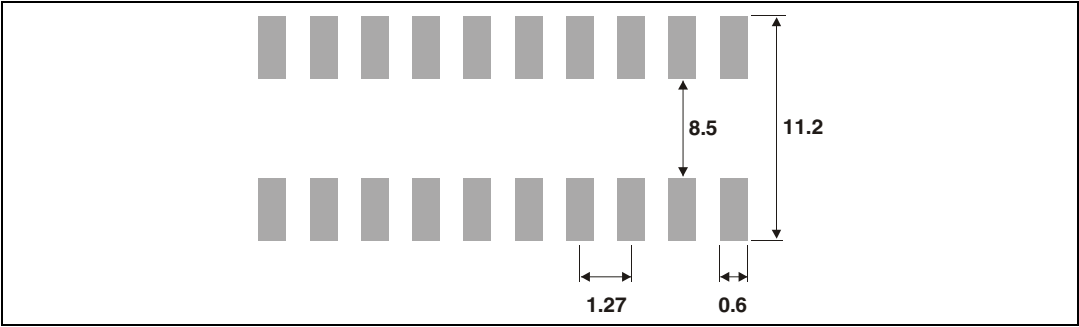
- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 5. SO-20 dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.35		2.65	0.092		0.104
A1	0.10		0.30	0.004		0.008
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	12.6		13.0	0.484		0.512
E	7.40		7.60	0.291		0.299
e		1.27			0.050	
H	10.0		10.65	0.394		0.419
h	0.25		0.75	0.010		0.029
L	0.40		1.27	0.016		0.050
K	8° (max)					

Figure 11. SO-20 footprint (dimensions in mm)



5 Ordering Information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
ITA6V5B3	ITA6V5B3	SO-20	0.55 g	1000	Tube
ITA18B3	ITA18B3			1000	Tube
ITA18B3RL	ITA18B3			1000	Tape and reel
ITA25B3	ITA25B3			1000	Tube
ITA25B3RL	ITA25B3			1000	Tape and reel

6 Revision history

Table 7. Document revision history

Date	Revision	Changes
13-Dec-2004	1	Initial release.
07-Nov-2007	2	Reformatted to current standards. Updated leakage current values in Table 2 Updated pulse waveform parameters in Figure 2 .
09-Oct-2012	3	Updated Table 3 and resized text in Figure 8 for readability.

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