PTVS24VU1UPA

300 W Transient Voltage Suppressor

27 June 2017 **Product data sheet**

1. General description

300 W unidirectional Transient Voltage Suppressor (TVS) in a DFN2020-3 (SOT1061) leadless medium power Surface-Mounted Device (SMD) plastic package, designed for transient overvoltage protection.

2. Features and benefits

- Unidirectional protection of one line
- Reverse standoff voltage range: V_{RWM} = 24 V
- Surge current for 8/20 µs pulse: I_{PPM} = 79 A (rated) / I_{PP} = 100 A (average measured)
- Surge current for 10/1000 µs pulse: I_{PPM} = 7.7 A (rated) / I_{PP} = 9.3 A (average measured)
- Reverse current: I_{RM} = 1 nA
- Very low package height: 0.65 mm
- AEC-Q101 qualified

3. Applications

- Power supply protection
- Industrial applications
- Power management

4. Quick reference data

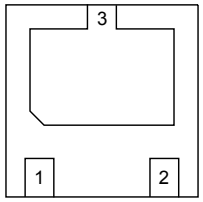
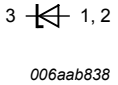
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	T_{amb} = 25 °C		-	-	24	V
I_{PPM}	rated peak pulse current	t_p = 8/20 µs	[1] [2]	-	-	79	A
		t_p = 10/1000 µs	[3] [2]	-	-	7.7	A

[1] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
[2] Measured from pin 1 and 2 to pin 3.
[3] In accordance with IEC 61643-321 (10/1000 µs current waveform).

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode	 Transparent top view **DFN2020-3 (SOT1061)**	 *006aab838*
2	A	anode		
3	K	cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PTVS24VU1UPA	DFN2020-3	plastic, thermal enhanced ultra thin small outline package; 3 terminals; 1.3 mm pitch; 2 mm x 2 mm x 0.65 mm body	SOT1061

7. Marking

Table 4. Marking codes

Type number	Marking code
PTVS24VU1UPA	D6

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
P_{PPM}	rated peak pulse power	t_p = 8/20 µs	[1] [2]	-	3500	W
		t_p = 10/1000 µs	[3] [2]	-	300	W
I_{PPM}	rated peak pulse current	t_p = 8/20 µs	[1] [2]	-	79	A
		t_p = 10/1000 µs	[3] [2]	-	7.7	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C

Symbol	Parameter	Conditions		Min	Max	Unit
ESD maximum ratings						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[4]	-	30	kV
		IEC 61000-4-2; air discharge	[4]	-	30	kV

[1] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
[2] Measured from pin 1 and 2 to pin 3.
[3] In accordance with IEC 61643-321 (10/1000 µs current waveform).
[4] Device stressed with ten non-repetitive ESD pulses.

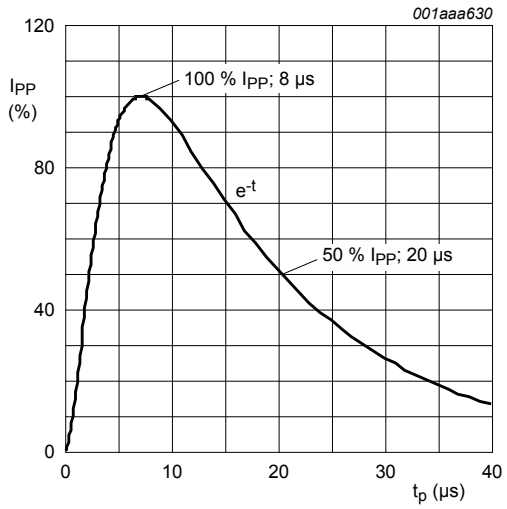


Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5

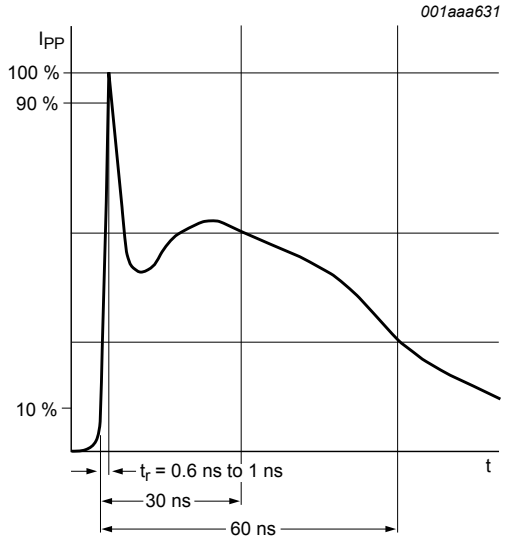


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

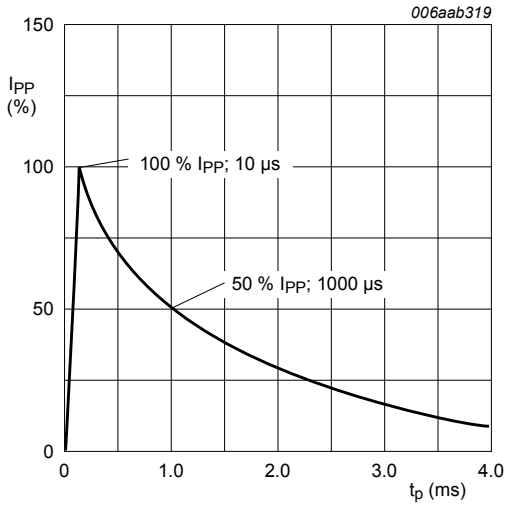


Fig. 3. 10/1000 µs pulse waveform according to IEC 61643-321

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	T_{amb} = 25 °C		-	-	24	V
V_{BR}	breakdown voltage	I_R = 1 mA; T_{amb} = 25 °C		26.7	28.1	29.5	V
I_{RM}	reverse leakage current	V_R = 24 V; T_{amb} = 25 °C		-	1	50	nA
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; T_{amb} = 25 °C		-	650	-	pF
V_{CL}	clamping voltage	I_{PPM} = 79 A; t_p = 8/20 µs; T_{amb} = 25 °C	[1] [2]	-	38.5	44.2	V
		I_{PPM} = 7.7 A; t_p = 10/1000 µs; T_{amb} = 25 °C	[3] [2]	-	-	38.8	V

[1] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
[2] Measured from pin 1 and 2 to pin 3.
[3] In accordance with IEC 61643-321 (10/1000 µs current waveform).

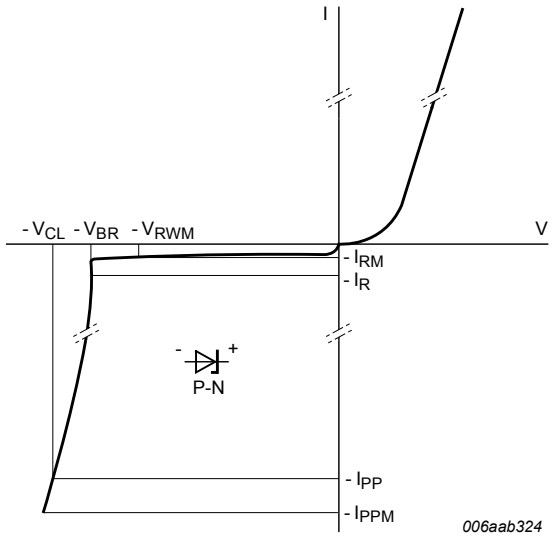


Fig. 4. V-I characteristics for a unidirectional TVS protection diode

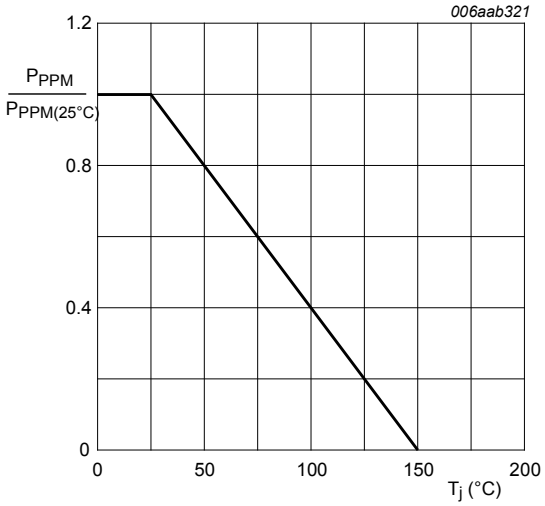
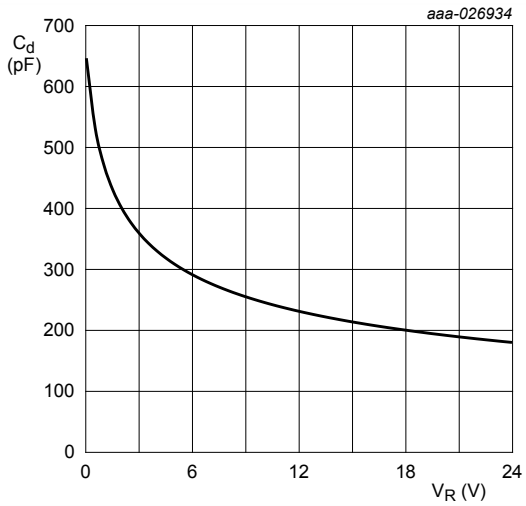


Fig. 5. Relative variation of rated peak pulse power as a function of junction temperature; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig. 6. Diode capacitance as a function of reverse voltage; typical values

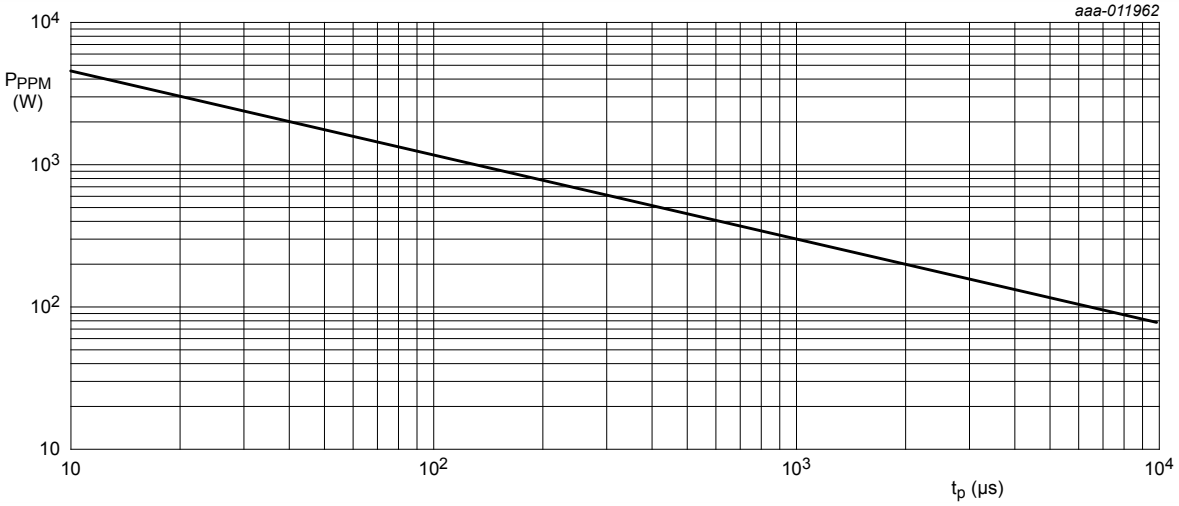
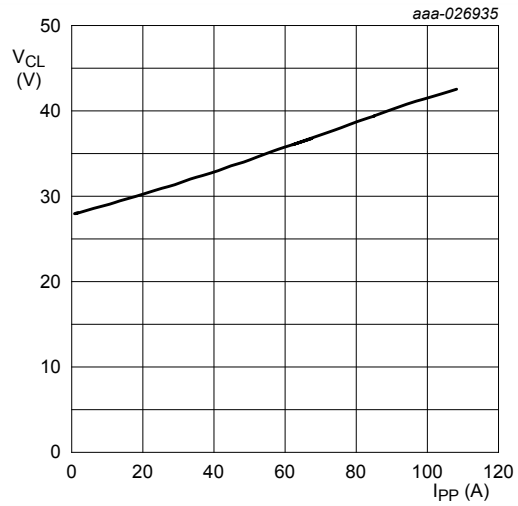
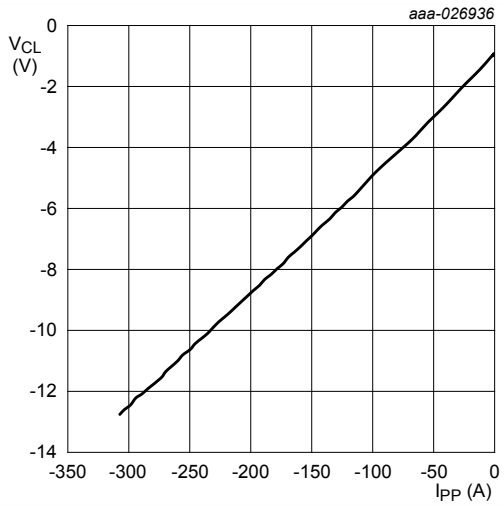


Fig. 7. Rated peak pulse power as a function of a pulse duration; typical values



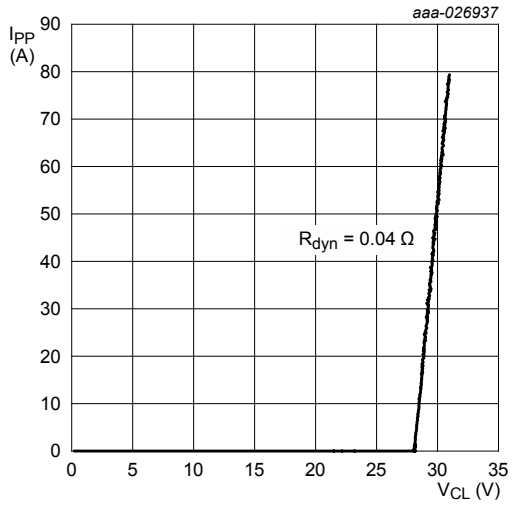
t_p = 8/20 µs; according to IEC 61000-4-5

Fig. 8. Positive clamping voltage (8/20 µs pulse); typical values



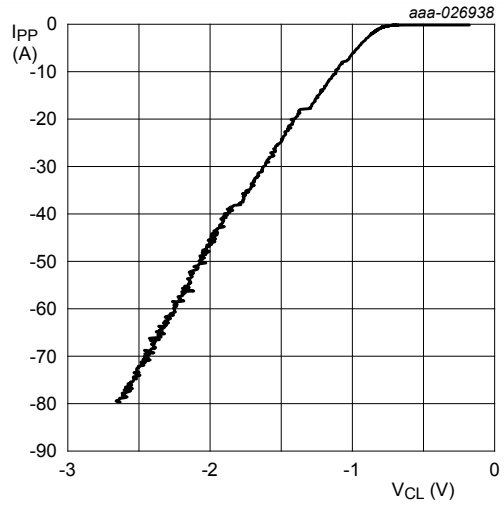
t_p = 8/20 µs; according to IEC 61000-4-5

Fig. 9. Negative clamping voltage (8/20 µs pulse); typical values



t_p = 100 ns; Transmission Line Pulse (TLP)

Fig. 10. Dynamic resistance with positive clamping voltage; typical value



t_p = 100 ns; Transmission Line Pulse (TLP)

Fig. 11. Dynamic resistance with negative clamping voltage; typical value

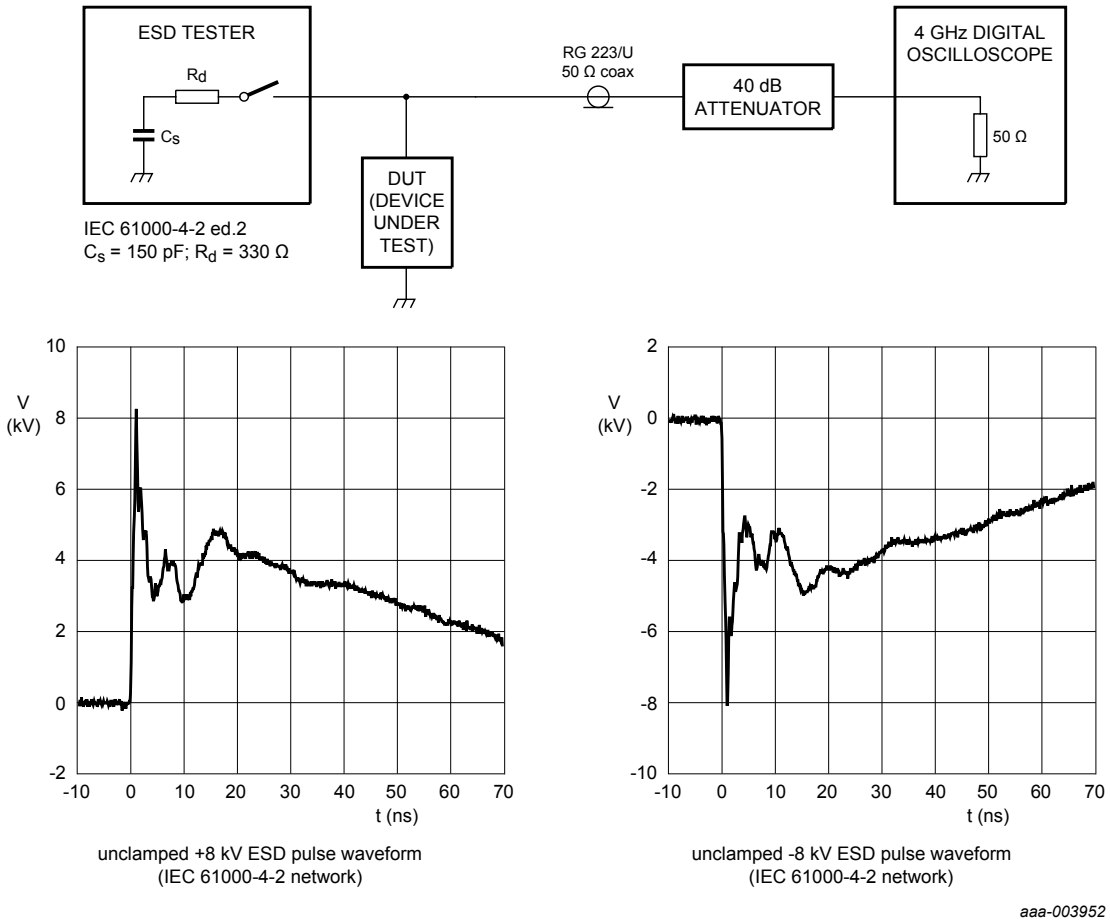


Fig. 12. ESD clamping test setup and waveforms

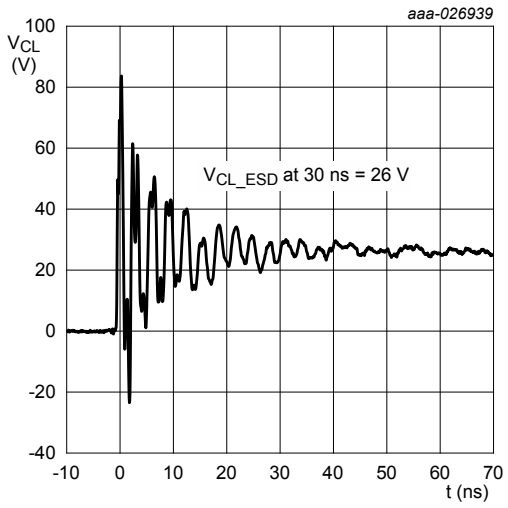


Fig. 13. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

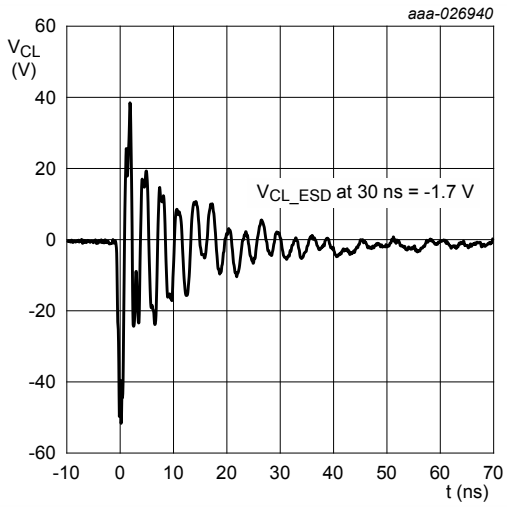


Fig. 14. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)

10. Application information

The device is designed for the protection of one unidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are either positive or negative with respect to ground.

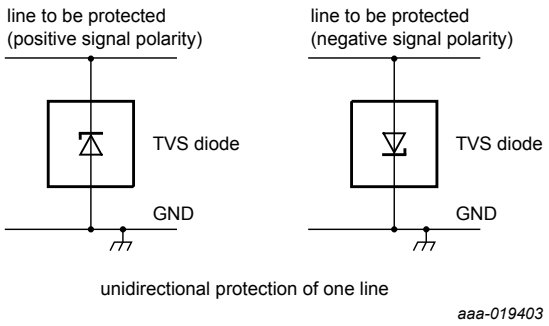


Fig. 15. Application diagram

Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
6. Minimize the length of the transient return path to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Use ground planes whenever possible. For multilayer PCBs, use ground vias.

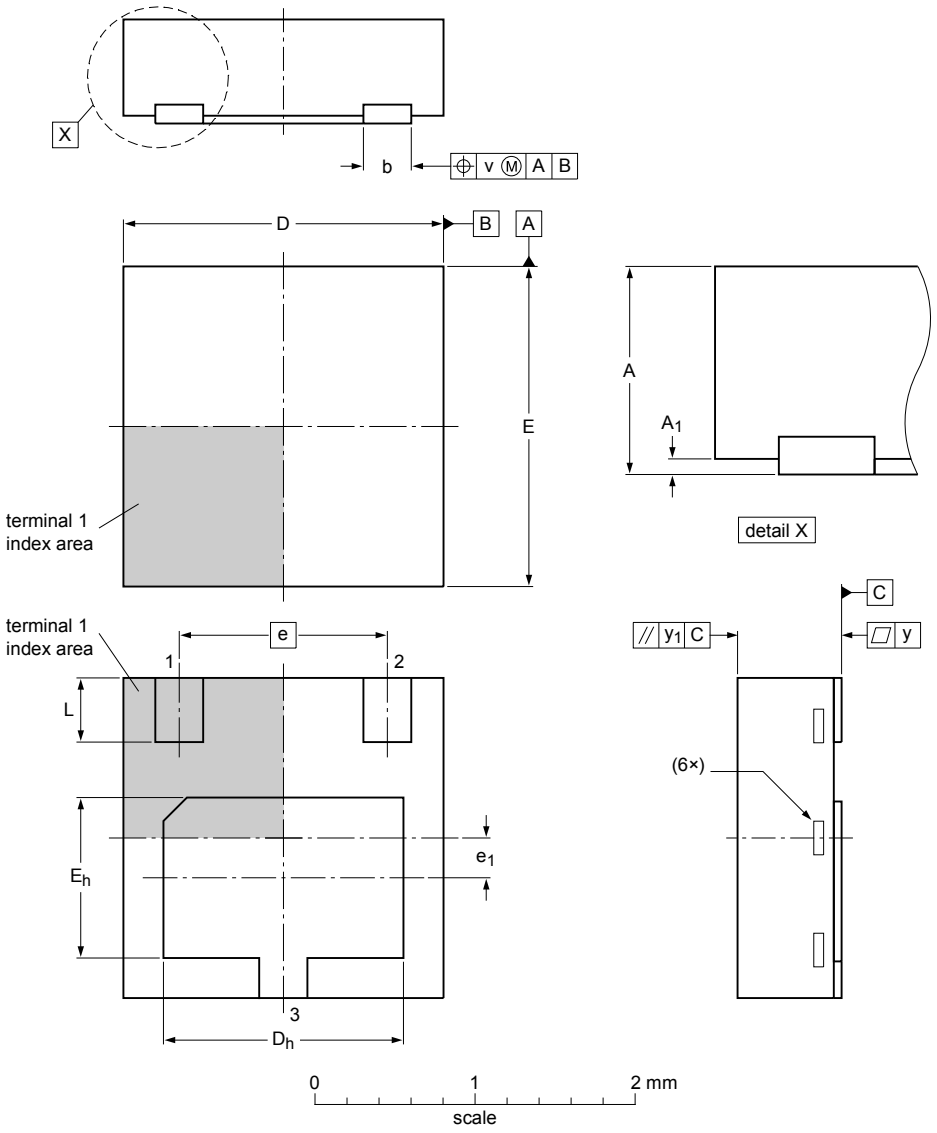
11. Test information

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

HUSON3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm **SOT1061**



Dimensions

Unit		A(1)	A1	b	D	Dh	E	Eh	e	e1	L	v	y	y1
mm	max	0.65	0.04	0.35	2.1	1.6	2.1	1.1		0.3	0.45			
	nom				2.0		2.0		1.3			0.1	0.05	0.05
	min			0.25	1.9	1.4	1.9	0.9		0.2	0.35			

Note
1. Including plating thickness

sot1061_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1061		- - -				~~08-02-04~~ 08-10-07

Fig. 16. Package outline DFN2020-3 (SOT1061)

13. Soldering

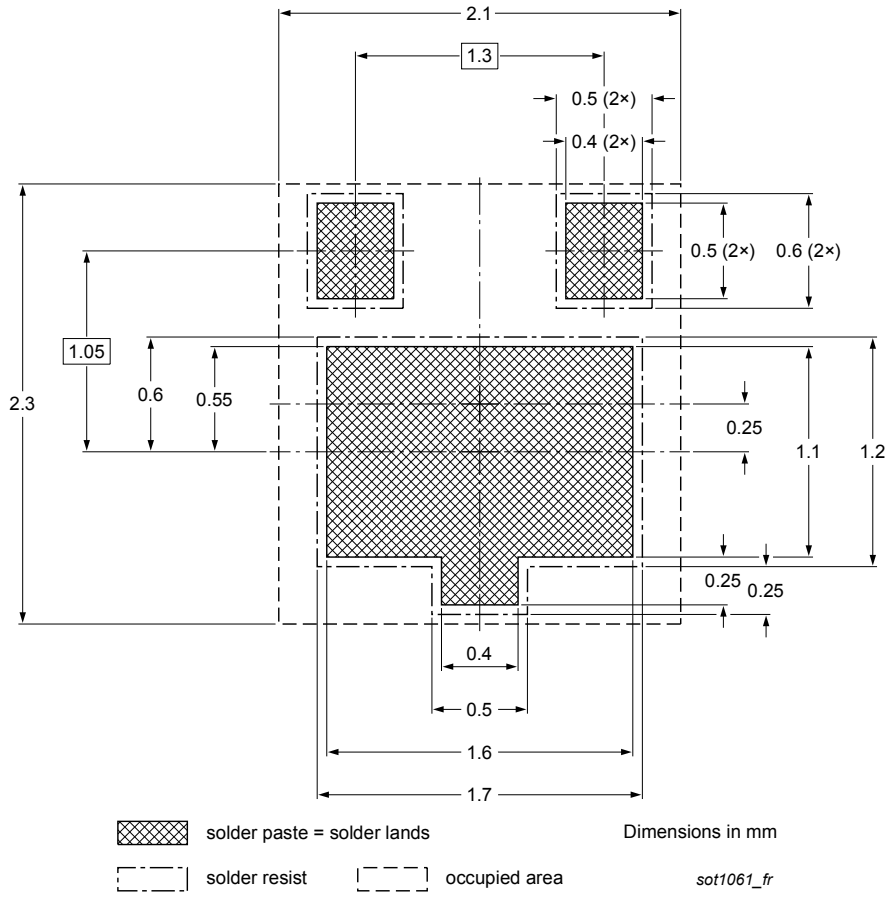


Fig. 17. Reflow soldering footprint for DFN2020-3 (SOT1061)

14. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PTVS24VU1UPA v.1	20170627	Product data sheet	-	-

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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16. Contents

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