SMA6F33A-Q1 Automotive TVS Protection Diode

1 Features

- 100% Pb-free TVS diode
- 600W Peak Pulse Power (10/1000µs)
- Excellent clamping capability
- IEC 61000-4-2 ESD protection:
  - ±30kV contact discharge
  - ±30kV air gap discharge
- SMAF low profile package: < 1.1mm
- Footprint compatible with standard SMAJ
- Fully ROHS compliant without exceptions
- AEC-Q101 Qualified

2 Applications

- Power supply protection
- Factory Automation & Control
- Energy & Grid Infrastructure
- Medical Systems
- Industrial Power & Tools
- Automotive Electronics

3 Description

The SMA6F33A-Q1 series is a 600W transient voltage suppressor designed to protect senstive equipment against electrostatic discharges according to IEC 61000-4-2 and surge transient events (IEC 61643-321).

The SMAF is a low profile package with the same power performance as the SMAJ. The low-profile SMAF package delivers high surge capability in a compact 4.2mm × 2.5mm footprint with a maximum height of 1.1mm, enabling space-efficient protection with footprint compatibility to standard SMA.

The device offers suitable clamping performance, low leakage current, and is appropriate for a wide range of applications including power supplies, telecom, computing, industrial, and consumer electronics.

Package Information

PART NUMBER	PACKAGE (1)	PACKAGE SIZE (2)
SMA6F33A-Q1	DYP (SMAF, 2)	4.2mm × 2.5mm

(1) For more information, see Section 8.
(2) The package size (length × width) is a nominal value and does not include pins, where applicable.



Functional Block Diagram

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4 Pin Configuration and Functions



Figure 4-1. DYP Package, 2-Pin SMAF (Top View)

Table 4-1. Pin Functions

PIN		DESCRIPTION
NO.	NAME	
1	K	Cathode
2	A	Anode

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
P_{PP}	Peak Pulse Power, t_p = 10/1000µs		600	W
T_A	Ambient Operating Temperature	-55	150	°C
T_{stg}	Storage Temperature	-65	150	°C

(1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

5.2 ESD Ratings - AEC Specifications

Parameter		Test Conditions	VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per AEC Q101-001 (1)	±2500	V
		Charged device model (CDM), per AEC Q101-005 (2)	±1000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5.3 ESD Ratings - IEC Specifications

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	IEC 61000-4-2 contact discharge	±30000	V
		IEC 61000-4-2 air-gap discharge	±30000	

5.4 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
T_A	Operating free-air temperature	-55		150	°C

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5.5 Electrical Characteristics

At T_A = 25°C (unless otherwise noted)

Part Number	Reverse Stand off Voltage V_{RWM} (V)	Breakdown Voltage V_{BR} (V) at I_T		Test Current I_T (mA)	Clamping Voltage V_{CL} (V) at I_{PP}	Peak Pulse Current I_{PP} (A)	Reverse Leakage at V_{RWM} I_{LEAK} (µA)
		MIN	MAX		MAX	MAX	MAX
SMA6F5A-Q1	5	6.40	7.0	1	9.2	65	700.0
SMA6F7A-Q1	7	7.78	8.6	1	12	50	200.0
SMA6F8.5A-Q1	8.5	9.44	10.4	1	14.4	42	20.0
SMA6F13A-Q1	13	14.4	15.9	1	21.5	28	0.7
SMA6F14A-Q1	14	15.6	17.2	1	23.2	26	0.7
SMA6F15A-Q1	15	16.7	18.5	1	24.4	25	0.7
SMA6F17A-Q1	17	18.9	20.9	1	27.6	22	0.7
SMA6F20A-Q1	20	22.2	24.5	1	32.4	19	0.7
SMA6F26A-Q1	26	28.9	31.9	1	42	15	0.7
SMA6F28A-Q1	28	31.1	34.3	1	45.4	13.0	0.7
SMA6F30A-Q1	30	33.3	36.8	1	48.4	12.5	0.7
SMA6F33A-Q1	33	36.7	40.6	1	53.0	11.5	0.7

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6 Device and Documentation Support

6.1 Documentation Support

6.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *Diodes Packaging and Layout Guide*
- Texas Instruments, *Diodes Layout Guide User's Guide*
- Texas Instruments, *Generic Evaluation Module User's Guide*

6.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

6.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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6.4 Trademarks

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6.5 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

6.6 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

7 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
September 2026	*	Initial Release

8 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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PACKAGE OPTION ADDENDUM

PACKAGING INFORMATION

Orderable part number	Status(1)	Material type(2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/Ball material(4)	MSL rating/Peak reflow(5)	Op temp (°C)	Part marking(6)
SMA6F33ADYPRQ1	Preview	Preproduction	DYP | 2	3000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	SMAF33

(1) **Status:** For more details on status, see our product life cycle.
(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.
(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.
(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.
(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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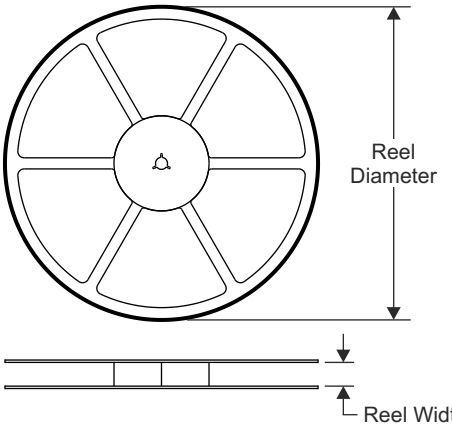
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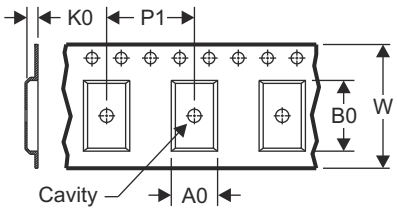
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8.1 Tape and Reel Information

REEL DIMENSIONS

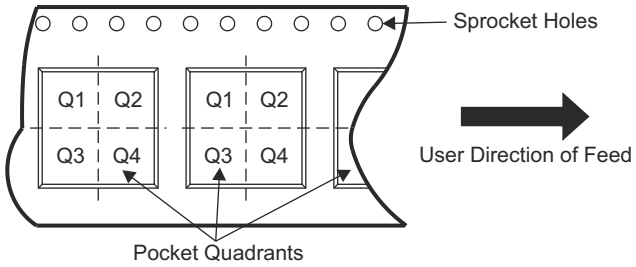


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



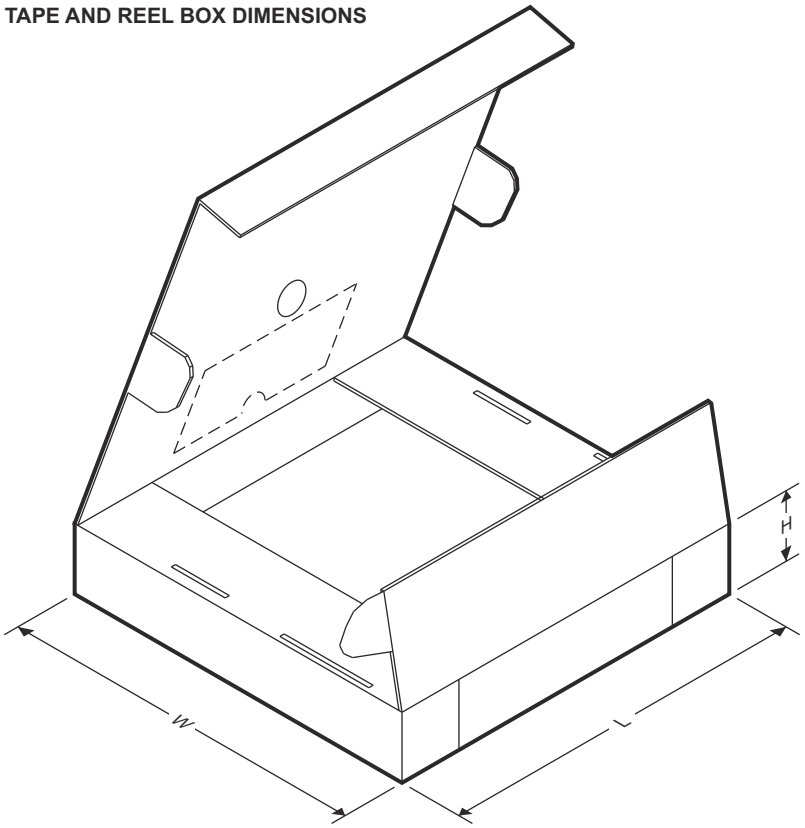
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SMA6F33ADYPRQ1	DO-221AC	DYP	2	3000	177.8	12.4	2.7	5.5	1.3	4	12	Q1

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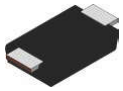
TAPE AND REEL BOX DIMENSIONS



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SMA6F33ADYPRQ1	DO-221AC	DYP	2	3000	208	191	35

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8.2 Mechanical Data

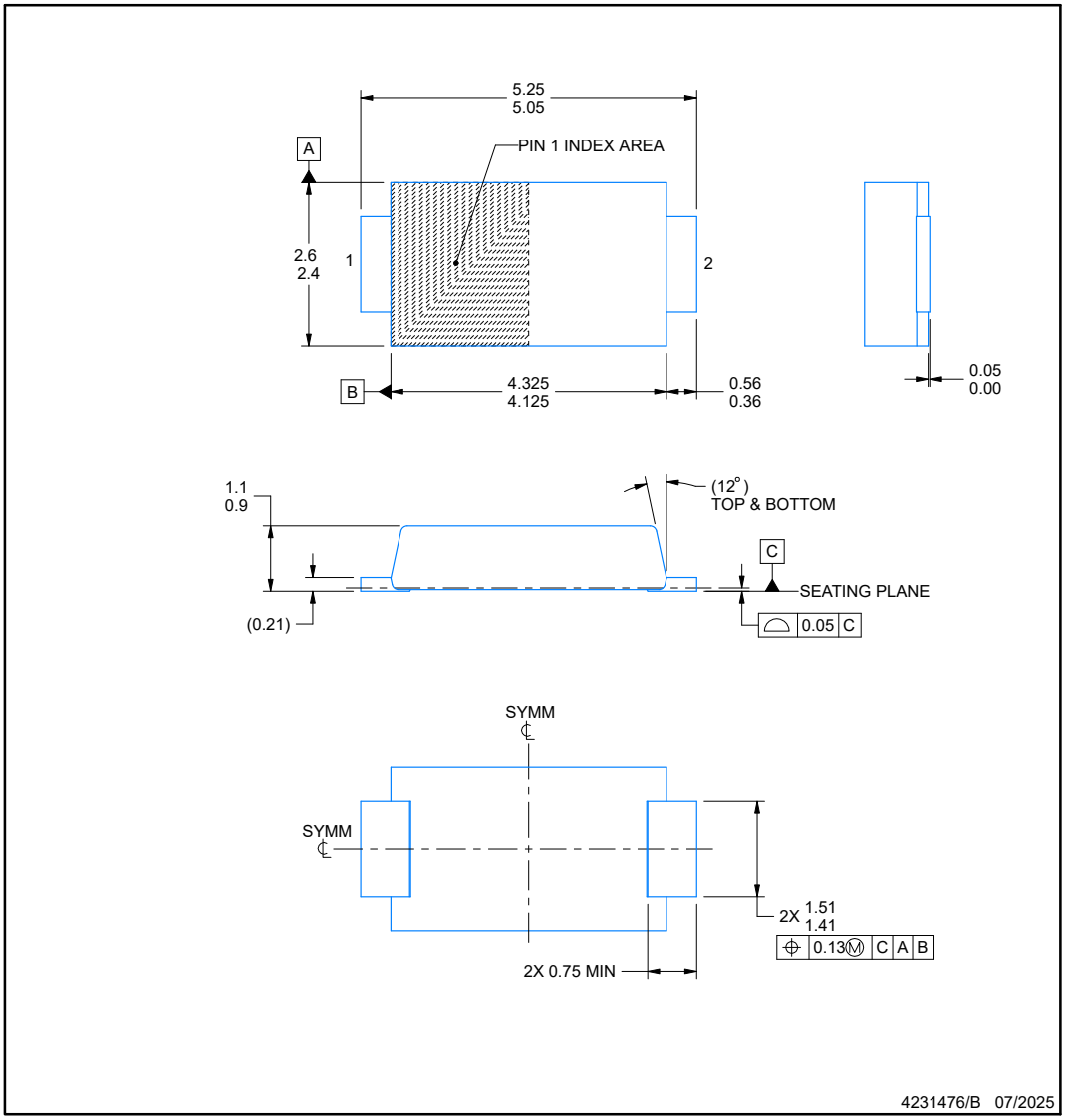


PACKAGE OUTLINE

DYP0002A

SOT - 1.1 mm max height

SMALL OUTLINE TRANSISTOR



NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

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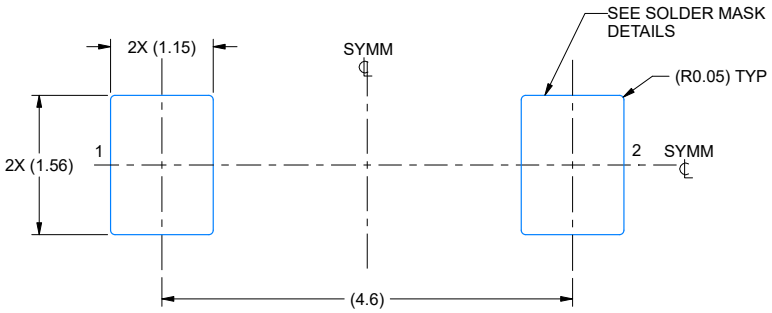
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EXAMPLE BOARD LAYOUT

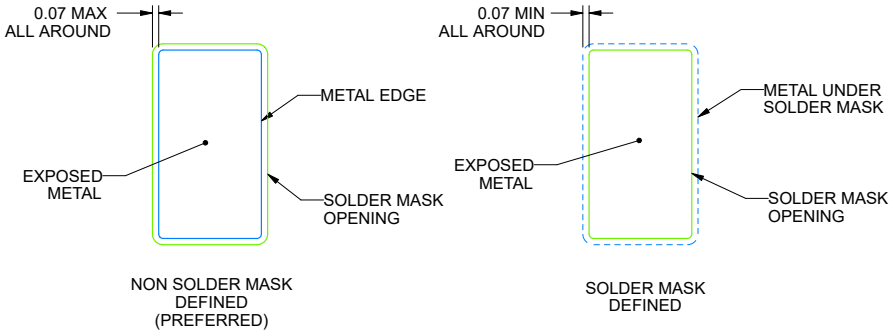
DYP0002A

SOT - 1.1 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE 15X



SOLDER MASK DETAILS

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NOTES: (continued)

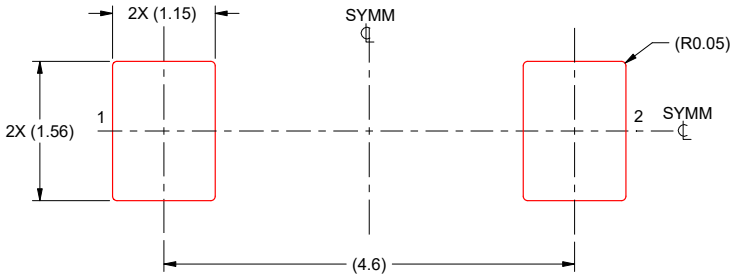
3. Publication IPC-7351 may have alternate designs.
4. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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EXAMPLE STENCIL DESIGN

DYP0002A **SOT - 1.1 mm max height**

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE: 15X

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NOTES: (continued)

5. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
6. Board assembly site may have different recommendations for stencil design.

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PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
PSMA6F33ADYPRQ1	Active	Preproduction	SOT (DYP) | 2	3000 | LARGE T&R	-	Call TI	Call TI	-55 to 150	

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

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OTHER QUALIFIED VERSIONS OF SMA6F33A-Q1 :

- Catalog : SMA6F33A

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

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