

MMBZxxVCL-Q1 Dual Channel ESD Protection

1 Features

- IEC 61000-4-2 ESD protection:
 - $\pm 30\text{kV}$ contact discharge
 - $\pm 30\text{kV}$ air-gap discharge
- IEC 61643-321 surge protection:
 - Up to 1.9A (10/1000 μs)
- Low leakage current: 50nA (max)
- Temperature range: -55°C to $+150^{\circ}\text{C}$
- Leadless packages used for automatic optical inspection (AOI)
- AEC-Q101 Qualified

2 Applications

- Industrial overvoltage protection
- CAN/LIN transient suppression
- Dual channel unidirectional or single channel bidirectional

3 Description

The MMBZxxVCL-Q1 is a dual channel unidirectional or single channel bidirectional ESD in common cathode configuration. The device's low capacitance and low leakage features enable use in high speed applications. The low dynamic resistance allows low clamping voltage to help protect systems against transient events.

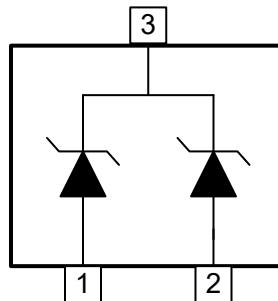
The MMBZxxVCL-Q1 is packaged in the SOT-23, providing two channels of robust transient protection in one space-efficient form factor.

Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾
MMBZxxVCL-Q1	DBZ (SOT-23, 3)	2.92mm × 2.37mm

(1) For more information, see [Section 8](#).

(2) The package size (length × width) is a nominal value and includes pins, where applicable.



Functional Diagram



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4 Pin Configuration and Functions

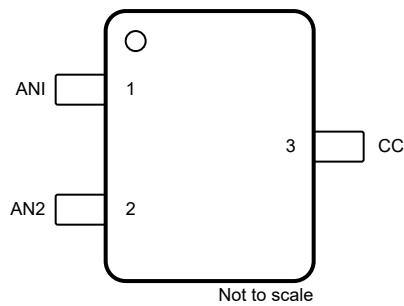


Figure 4-1. DBZ Package, 3-Pin SOT-23 (Top View)

Pin Functions

PIN NO.	DESCRIPTION
1	Anode of diode 1
2	Anode of diode 2
3	Common Cathode

5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
Peak pulse	MMBZ15VCL-Q1 - IEC 61643-321 Power (tp = 10/1000µs) at 25°C		40	W
Peak pulse	MMBZ15VCL-Q1 - IEC 61643-321 Current (tp = 10/1000µs) at 25°C		1.9	A
Peak pulse	MMBZ27VCL-Q1 - IEC 61643-321 Power (tp = 10/1000µs) at 25°C		35	W
Peak pulse	MMBZ27VCL-Q1 - IEC 61643-321 Current (tp = 10/1000µs) at 25°C		1	A
P _{tot}	Total Power Dissipation (T _{amb} ≤ 25 °C)		500	mW
T _A	Operating free-air temperature	-55	150	°C
T _{stg}	Storage temperature	-65	155	°C

- (1) Stresses beyond those listed under *Absolute Maximum Rating* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Condition*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5.2 ESD Ratings - AEC Specification

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per AEC Q101-001	± 2500	V
		Charged device model (CDM), per AEC Q101-005	± 1000	

5.3 ESD Ratings - IEC Specification

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	IEC 61000-4-2 Contact Discharge, all pins	±30000	V
		IEC 61000-4-2 Air-gap Discharge, all pins	±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

5.5 Thermal Information

THERMAL METRIC ⁽¹⁾		MMBZxxVCL-Q1	UNIT
		DBZ (SOT-23)	
		3 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	190.5	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	129.3	°C/W
R _{θJB}	Junction-to-board thermal resistance	79.2	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	50.9	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	78.4	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application note.

5.6 Electrical Characteristics

Part Number	V_{RWM}	V_{BR} (V) at I_T				$V_{Clamp}^{(1)}$ V_C (V) at I_{PP}		Reverse Leakage Current I_R (nA) at V_{RWM}	Temperature Coefficient S_Z (mV/C) at I_T		Capacitance C_D (pF)
	Volts	MIN	TYP	MAX	I_T (mA)	MAX	I_{PP} (A)	MAX	TYP	I_T (mA)	MAX
MMBZxxVCL-Q1	12	14.3	15	15.8	1	21	1.9	50	11	1	137
MMBZxxVCL-Q1	22	25.65	27	28.35	1	38	1	50	23	1	90

(1) Device stressed with 10/1000 μ s exponential decay waveform according to IEC 61643-321

5.7 Typical Characteristics

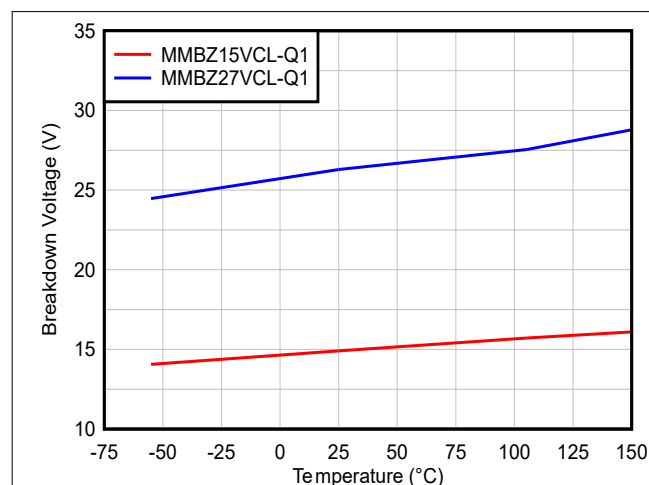


Figure 5-1. Breakdown Voltage vs Temperature

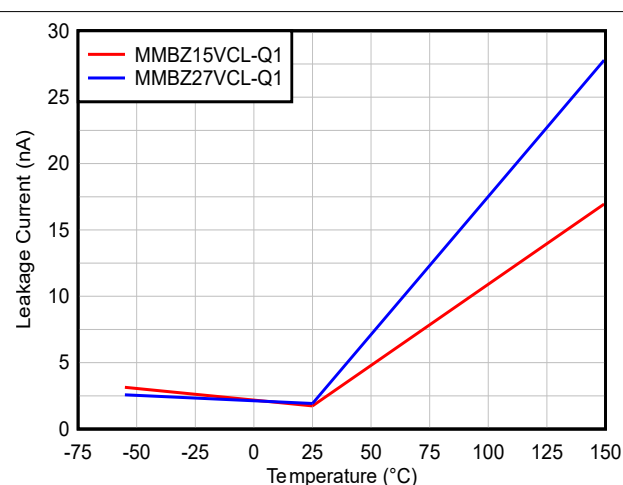


Figure 5-2. Leakage Current vs Temperature

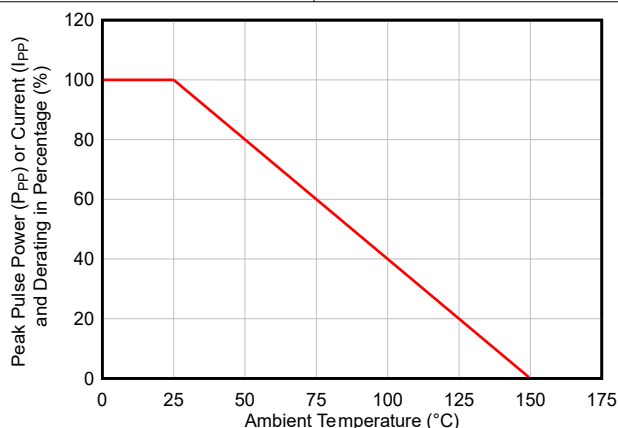


Figure 5-3. Peak Pulse Power Derating Curve

6 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

6.1 Documentation Support

6.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [ESD Layout Guide application reports](#)
- Texas Instruments, [Generic ESD Evaluation Module user's guide](#)
- Texas Instruments, [Picking ESD Diodes for Ultra High-Speed Data Lines application reports](#)
- Texas Instruments, [Reading and Understanding an ESD Protection data sheet](#)

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
December 2025	*	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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