

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.

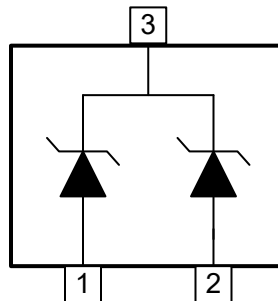
The MMBZxxVCL-Q1 is packaged in the SOT-23, providing two channels of robust transient protection in one space-efficient form factor.

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



Table of Contents

1 Features	1	5.7 Typical Characteristics.....	5
2 Applications	1	6 Device and Documentation Support	6
3 Description	1	6.1 Documentation Support.....	6
4 Pin Configuration and Functions	3	6.2 Receiving Notification of Documentation Updates.....	6
5 Specifications	4	6.3 Support Resources.....	6
5.1 Absolute Maximum Ratings.....	4	6.4 Trademarks.....	6
5.2 ESD Ratings - AEC Specification.....	4	6.5 Electrostatic Discharge Caution.....	6
5.3 ESD Ratings - IEC Specification.....	4	6.6 Glossary.....	6
5.4 Recommended Operating Conditions.....	4	7 Revision History	6
5.5 Thermal Information	4	8 Mechanical, Packaging, and Orderable Information	6
5.6 Electrical Characteristics.....	5		

4 Pin Configuration and Functions

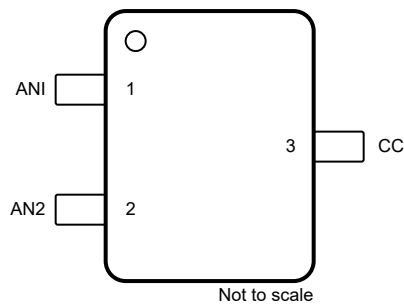


Figure 4-1. DBZ Package, 3-Pin SOT-23 (Top View)

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 (Tamb ≤ 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

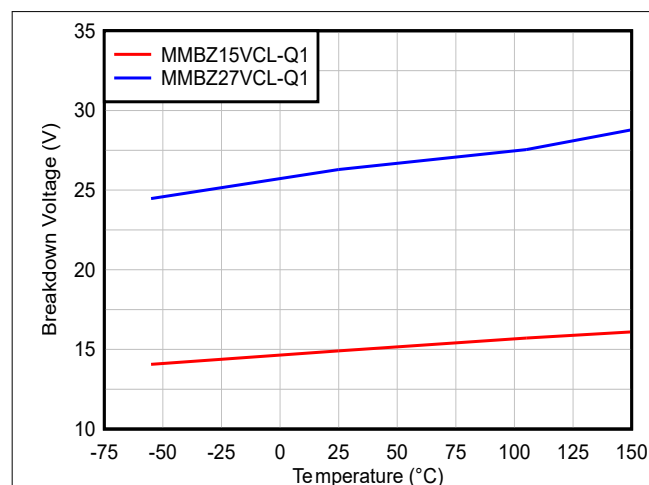


Figure 5-1. Breakdown Voltage vs Temperature

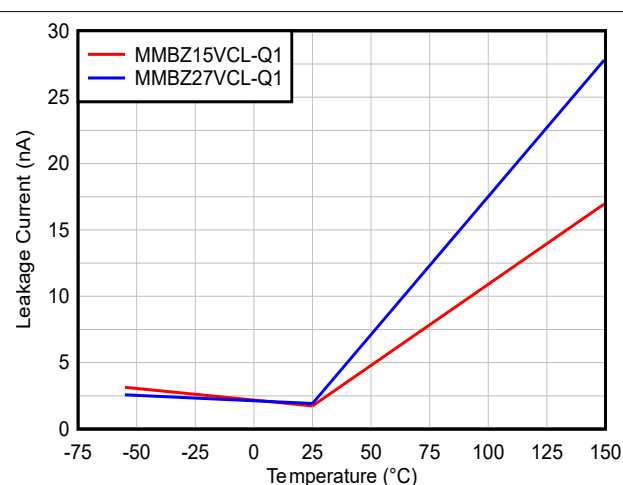


Figure 5-2. Leakage Current vs Temperature

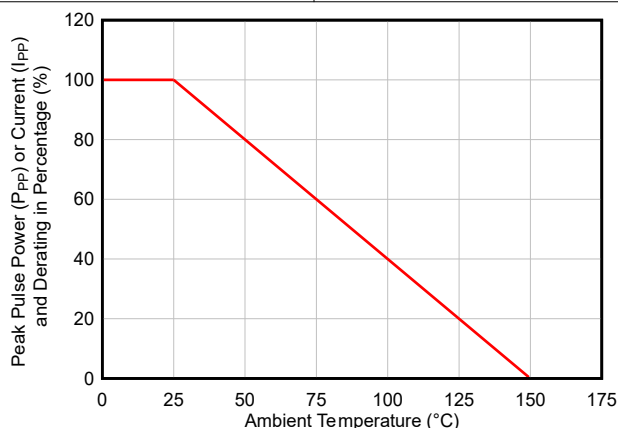


Figure 5-3. Peak Pulse Power Derating Curve

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.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

6.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

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.

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)
MMBZ15VCLDBZRQ1	Active	Production	SOT-23 (DBZ) 3	3000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	3Q5G
MMBZ27VCLDBZRQ1	Active	Production	SOT-23 (DBZ) 3	3000 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	3N3G

⁽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.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF MMBZ15VCL-Q1, MMBZ27VCL-Q1 :

- Catalog : [MMBZ15VCL](#), [MMBZ27VCL](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION



*All dimensions are nominal

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
MMBZ15VCLDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
MMBZ27VCLDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS

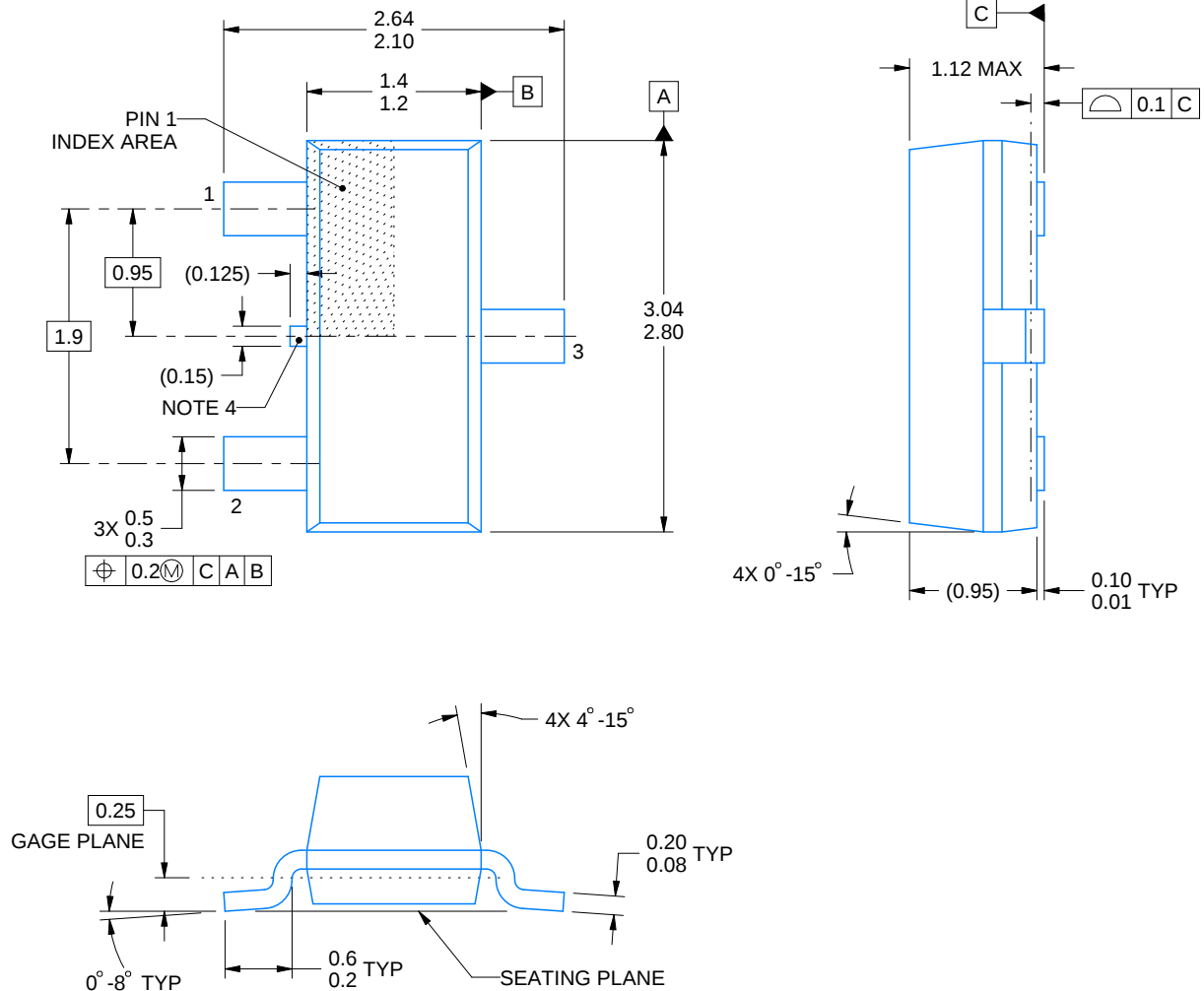


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
MMBZ15VCLDBZRQ1	SOT-23	DBZ	3	3000	210.0	185.0	35.0
MMBZ27VCLDBZRQ1	SOT-23	DBZ	3	3000	210.0	185.0	35.0

DBZ0003A**PACKAGE OUTLINE****SOT-23 - 1.12 mm max height**

SMALL OUTLINE TRANSISTOR



4214838/F 08/2024

NOTES:

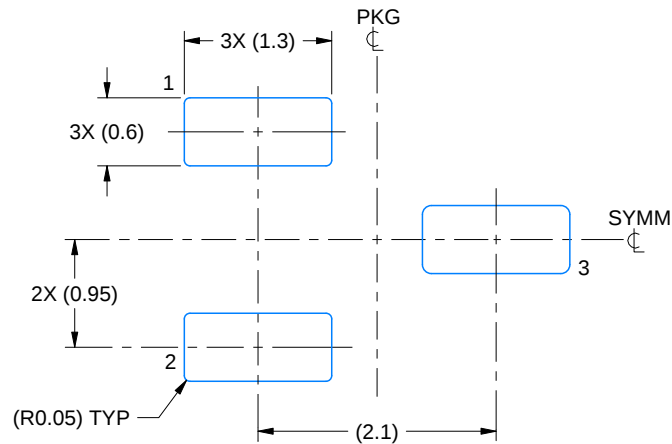
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.
4. Support pin may differ or may not be present.
5. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side

EXAMPLE BOARD LAYOUT

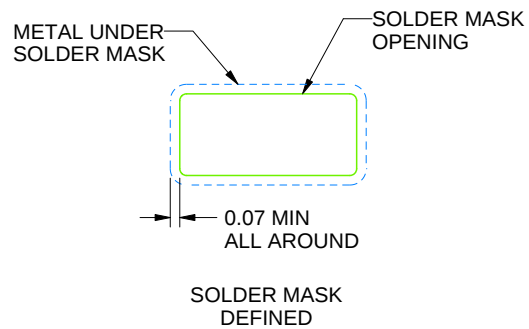
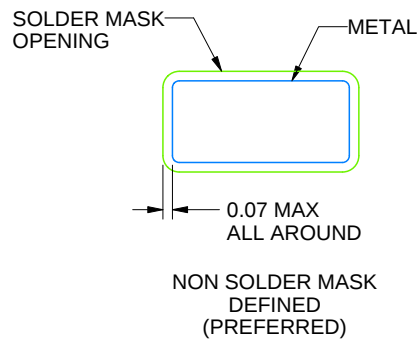
DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
SCALE:15X



SOLDER MASK DETAILS

4214838/F 08/2024

NOTES: (continued)

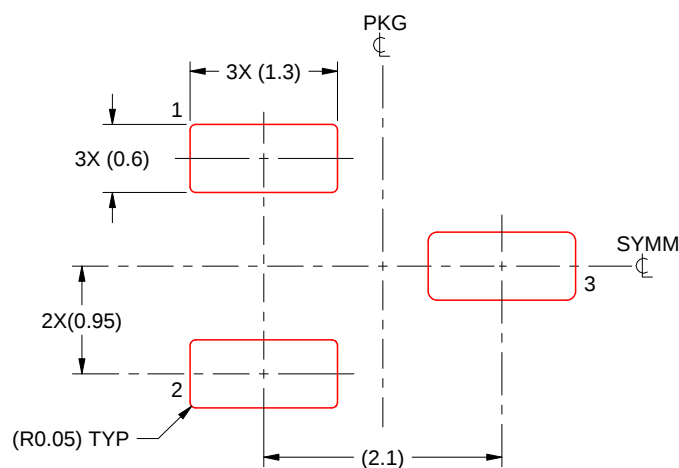
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:15X

4214838/F 08/2024

NOTES: (continued)

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

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025