

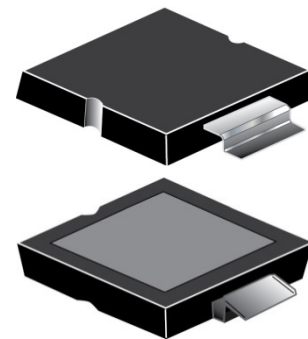
## Product Overview

These 18 kW rated transient voltage suppressors (TVS) in a surface mount PLAD package are provided with design features to minimize thermal resistance and cumulative heating. These devices have the ability to clamp dangerous high voltage, short term transients such as those produced by electrostatic discharge, radiated RFI, inductive load dumps, and the secondary effects of lightning strikes before they reach sensitive component regions of a circuit. Typical applications include lightning and automotive load dump protection. They are particularly effective at meeting the multi-stroke lightning standard RTCA DO-160, section 22 for aircraft design. The all-metal bottom of this space-efficient, low profile package provides a very low thermal impedance path for heat to escape to the mounting substrate, keeping the junction temperature low. The PLAD18KP is offered with standoff voltages ( $V_{WM}$ ) from 7.0 to 200 volts in either unidirectional or bidirectional versions. For more information on PLAD packaged products and our broad range of TVS solutions, please see our website.

### Features

- Available in both unidirectional and bidirectional construction (bidirectional with CA suffix)
- $3\sigma$  lot norm screening performed on standby current ( $I_D$ ) for all M prefix devices
- High reliability with wafer fabrication and assembly lot traceability for all M prefix devices
- 100% surge tested devices
- Suppresses transients up to 18,000 Watts at 10/1000  $\mu$ s (see [Figure 4-1](#))
- Enhanced reliability screening in reference to MIL-PRF-19500 are available. Refer to [Hi-Rel Non-Hermetic Product Portfolio](#) for more details on the screening options.
- Moisture classification is level 1 with no dry pack required per IPC/JEDEC J-STD-020F.
- RoHS compliant versions are available.

**Figure 1.** PLAD (The cathode is the metal base under the body of this device.)



Tested in accordance with the requirements of AEC-Q101

**Applications/Benefits**

- Available in working standoff voltage ( $V_{WM}$ ) range 7.0 to 200 volts
- Protection from switching transients and induced RFI
- Protection from ESD, and EFT per IEC 61000-4-2 and IEC 61000-4-4
- Secondary lightning protection per IEC 61000-4-5 with 42 Ohms source impedance:  
Class 1, 2, 3, 4: MPLAD18KP7.0A to MXLPLAD18KP200CAe3  
Class 5: MPLAD18KP7.0A to MXLPLAD18KP200CA (short distance)  
Class 5: MPLAD18KP7.0A to MXLPLAD18KP130CA (long distance)
- Secondary lightning protection per IEC 61000-4-5 with 12 Ohms source impedance:  
Class 1, 2, 3: MPLAD18KP7.0A to MXLPLAD18KP200CA  
Class 4: MPLAD18KP7.0A to MXLPLAD18KP130CA
- Secondary lightning protection per IEC 61000-4-5 with 2 Ohms source impedance:  
Class 2: MPLAD18KP7.0A to MXLPLAD18KP200CA  
Class 3: MPLAD18KP7.0A to MXLPLAD18KP130CA  
Class 4: MPLAD18KP7.0A to MXLPLAD18KP64CA
- Pin injection protection per RTCA/DO-160F for Waveform 4 (6.4/69  $\mu$ s at 25 °C)<sup>1</sup>:  
Level 4: MPLAD18KP7.0A to MXLPLAD18KP200CAe3  
Level 5: MPLAD18KP7.0A to MXLPLAD18KP130CAe3
- Pin injection protection per RTCA/DO-160F for Waveform 5A (40/120  $\mu$ s at 25 °C)<sup>1</sup>:  
Level 4: MPLAD18KP7.0A to MXLPLAD18KP36CAe3

**Note:**

1. See [MicroNote 132](#) for further temperature derating selection.

## Table of Contents

Product Overview.....	1
1. Maximum Ratings.....	4
1.1. Mechanical Packaging .....	4
2. Part Nomenclature.....	5
2.1. Symbols and Definitions.....	5
3. Electrical Characteristics.....	6
4. Graphs.....	8
5. Package Dimensions.....	11
5.1. Pad Layout.....	11
6. Revision History.....	12
Microchip Information.....	13
The Microchip Website.....	13
Product Change Notification Service.....	13
Customer Support.....	13
Microchip Devices Code Protection Feature.....	13
Legal Notice.....	13
Trademarks.....	14
Quality Management System.....	15
Worldwide Sales and Service.....	16

# 1. Maximum Ratings

**Table 1-1.** Maximum Ratings at 25 °C Unless Otherwise Noted

Parameters/Test Conditions	Symbol	Value	Unit
Junction and storage temperature	$T_J$ and $T_{STG}$	-55 to +150	°C
Thermal resistance junction-to-ambient <sup>1</sup>	$R_{\theta JA}$	50	°C/W
Thermal resistance junction-to-case	$R_{\theta JC}$	0.7	°C/W
Peak pulse power <sup>2</sup>	$P_{PP}$	18,000	W
$t_{clamping}$ (0 volts to $V_{(BR)}$ min)	Unidirectional	< 100	ps
	Bidirectional	< 5	ns
Forward surge current <sup>3</sup>	$I_{FSM}$	1,500	A
Solder temperature at 10 s	$T_{SP}$	260	°C
Average power dissipation <sup>5</sup>	$P_D$	$T_A = 25\text{ °C}$	2.5 <sup>(1)</sup>
		$T_C = 100\text{ °C}$	71 <sup>(4)</sup>

## Notes:

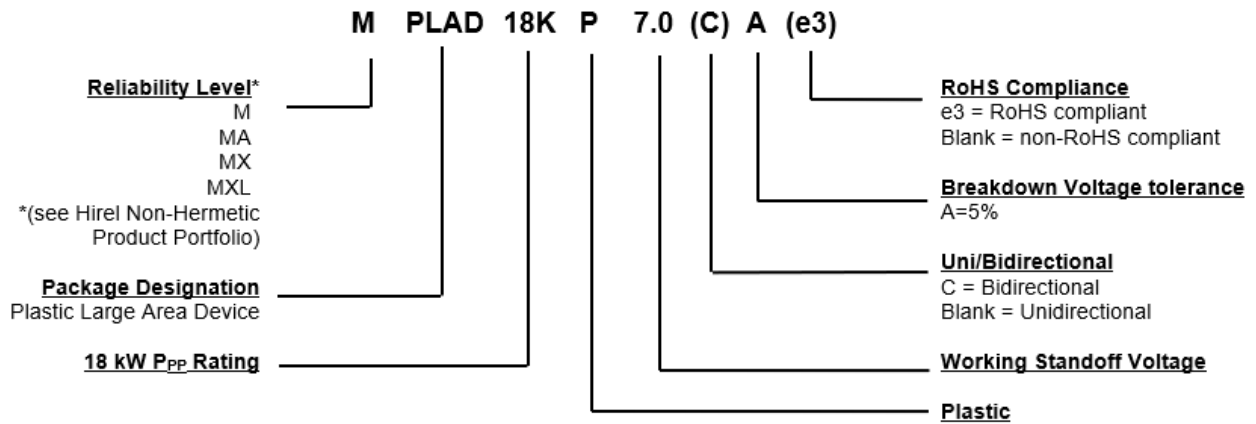
- When mounted on FR4 PC board (1 oz Cu) with recommended mounting pad (see [Pad Layout](#)).
- Also see [Figure 4-1](#) and [Figure 4-2](#). At 10/1000  $\mu$ s with impulse repetition rate (duty factor) of 0.05% or less.
- At 8.3 ms half-sine wave (unidirectional devices only).
- Case temperature controlled on heat sink as specified.
- See [MicroNote 134](#) for derating  $P_{PP}$  when also applying steady-state power.

## 1.1 Mechanical Packaging

- Case: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- Terminals: Tin-lead or RoHS compliant annealed matte-tin plating readily solderable per MIL-STD-750, method 2026
- Marking: Reliability level, part number, date code
- Polarity: Unidirectional devices include polarity symbol, the cathode is on the metal backside (package bottom)
- Available in bulk or custom tape-and-reel packaging
- Tape-And-Reel: Standard per EIA-481-B (add "TR" suffix to part number). Consult factory for quantities.
- Weight: Approximately 1 gram
- See [Package Dimensions](#)

## 2. Part Nomenclature

Figure 2-1. Part Nomenclature



### 2.1 Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
$\alpha_{V(BR)}$	Temperature coefficient of breakdown voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C.
$C_T$	Total capacitance: The total small signal capacitance between the diode terminals of a complete device.
$I_{(BR)}$	Breakdown current: The current used for measuring Breakdown Voltage $V_{(BR)}$ .
$I_D$	Standby current: The current through the device at working standoff voltage.
$I_{FSM}$	Surge peak forward current: The forward current including all nonrepetitive transient currents but excluding all repetitive transients (ref JESD282-B).
$I_{PP}$	Peak impulse current: The peak current during an impulse.
$P_{PP}$	Peak pulse power: The peak power that can be applied for a specific pulse width and waveform. The product of $I_{PP}$ and $V_C$ .
$V_{(BR)}$	Breakdown voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.
$V_C$	Clamping voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current ( $I_{PP}$ ) for a specified waveform.
$V_{WM}$	Working standoff voltage: The maximum-rated value of DC or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature.

### 3. Electrical Characteristics

Table 3-1. Electrical Characteristics at 25 °C Unless Otherwise Stated<sup>1-4</sup>

Part Number	Working Standoff Voltage <sup>1</sup>	Breakdown Voltage		Maximum Clamping Voltage	Maximum Standby Current	Maximum Peak Pulse Current I <sub>PP</sub>	Maximum Temperature Coefficient
	V <sub>WM</sub>	V <sub>(BR)</sub> at I <sub>(BR)</sub>		V <sub>C</sub> at I <sub>PP</sub>	I <sub>D</sub> at V <sub>WM</sub>	(Figure 4-3)	α <sub>V(BR)</sub>
Unidirectional	Volts	Volts	mA	Volts	µA	A	mV/°C
MPLAD18KP7.0(C)A(e3)	7.0	7.78–8.60	150	12.0	3000	1500 <sup>(5)</sup>	5.0
MPLAD18KP7.5(C)A(e3)	7.5	8.33–9.21	5	12.9	750	1396 <sup>(5)</sup>	6.0
MPLAD18KP8.0(C)A(e3)	8.0	8.89–9.83	5	13.6	450	1324 <sup>(5)</sup>	6.0
MPLAD18KP8.5(C)A(e3)	8.5	9.44–10.4	5	14.4	150	1250 <sup>(5)</sup>	7.0
MPLAD18KP9.0(C)A(e3)	9.0	10.0–11.1	5	15.4	60	1169 <sup>(5)</sup>	8.0
MPLAD18KP10(C)A(e3)	10	11.1–12.3	5	17.0	45	1059 <sup>(5)</sup>	9.0
MPLAD18KP11(C)A(e3)	11	12.2–13.5	5	18.2	10	989	10
MPLAD18KP12(C)A(e3)	12	13.3–14.7	5	19.9	10	905	11
MPLAD18KP13(C)A(e3)	13	14.4–15.9	5	21.5	10	838	12
MPLAD18KP14(C)A(e3)	14	15.6–17.2	5	23.2	10	776	13
MPLAD18KP15(C)A(e3)	15	16.7–18.5	5	24.4	10	738	15
MPLAD18KP16(C)A(e3)	16	17.8–19.7	5	26.0	10	693	16
MPLAD18KP17(C)A(e3)	17	18.9–20.9	5	27.6	10	653	18
MPLAD18KP18(C)A(e3)	18	20.0–22.1	5	29.2	10	617	19
MPLAD18KP20(C)A(e3)	20	22.2–24.5	5	32.4	10	556	22
MPLAD18KP22(C)A(e3)	22	24.4–26.9	5	35.5	10	508	24
MPLAD18KP24(C)A(e3)	24	26.7–29.5	5	38.9	10	463	27
MPLAD18KP26(C)A(e3)	26	28.9–31.9	5	42.1	10	428	29
MPLAD18KP28(C)A(e3)	28	31.1–34.4	5	45.5	10	396	30
MPLAD18KP30(C)A(e3)	30	33.3–36.8	5	48.4	10	372	35
MPLAD18KP33(C)A(e3)	33	36.7–40.6	5	53.3	10	338	38
MPLAD18KP36(C)A(e3)	36	40.0–44.2	5	58.1	10	310	40
MPLAD18KP40(C)A(e3)	40	44.4–49.1	5	64.5	10	280	45
MPLAD18KP43(C)A(e3)	43	47.8–52.8	5	69.4	10	260	49
MPLAD18KP45(C)A(e3)	45	50.0–55.3	5	72.7	10	248	51
MPLAD18KP48(C)A(e3)	48	53.3–58.9	5	77.4	10	233	55
MPLAD18KP51(C)A(e3)	51	56.7–62.7	5	82.4	10	219	60
MPLAD18KP54(C)A(e3)	54	60.0–66.3	5	87.1	10	207	64
MPLAD18KP58(C)A(e3)	58	64.4–71.2	5	93.6	10	193	69
MPLAD18KP60(C)A(e3)	60	66.7–73.7	5	96.8	10	186	70
MPLAD18KP64(C)A(e3)	64	71.1–78.6	5	103	10	175	75
MPLAD18KP70(C)A(e3)	70	77.8–86.0	5	113	10	160	84
MPLAD18KP75(C)A(e3)	75	83.3–92.1	5	121	10	149	90
MPLAD18KP78(C)A(e3)	78	86.7–95.8	5	126	10	143	94
MPLAD18KP85(C)A(e3)	85	94.4–104.0	5	137	10	132	102
MPLAD18KP90(C)A(e3)	90	100–111	5	146	10	124	109
MPLAD18KP100(C)A(e3)	100	111–123	5	162	10	112	122

.....continued

Part Number	Working Standoff Voltage <sup>1</sup>	Breakdown Voltage		Maximum Clamping Voltage	Maximum Standby Current	Maximum Peak Pulse Current I <sub>PP</sub>	Maximum Temperature Coefficient
	V <sub>WM</sub>	V <sub>(BR)</sub> at I <sub>(BR)</sub>		V <sub>C</sub> at I <sub>PP</sub>	I <sub>D</sub> at V <sub>WM</sub>	(Figure 4-3)	α <sub>V(BR)</sub>
Unidirectional	Volts	Volts	mA	Volts	μA	A	mV/°C
MPLAD18KP110(C)A(e3)	110	122-135	5	177	10	102	132
MPLAD18KP120(C)A(e3)	120	133-147	5	193	10	94	145
MPLAD18KP130(C)A(e3)	130	144-159	5	209	10	87	157
MPLAD18KP150(C)A(e3)	150	167-185	5	243	10	75	183
MPLAD18KP160(C)A(e3)	160	178-197	5	259	10	70	195
MPLAD18KP170(C)A(e3)	170	189-209	5	275	10	66	207
MPLAD18KP180(C)A(e3)	180	200-221	5	291	10	62	219
MPLAD18KP200(C)A(e3)	200	222-245	5	322	10	56	243

**Notes:**

1. Normal selection criteria for TVS devices is by working standoff voltage (V<sub>WM</sub>) and should be equal or greater than DC or continuous peak operating voltage.
2. TVS devices are tested to maximum peak pulse current (I<sub>PP</sub>) with clamping voltage monitored. This surge capability is one of the most significant electrical characteristics of the device and should be considered as part of customer quality inspections.
3. For bidirectional parts, the capacitance will be half that shown in [Figure 4-2](#) for zero bias.
4. For unidirectional parts, the forward voltage (V<sub>F</sub>) is 2.0 volts maximum at 500 amps peak for 8.3 ms half-sine wave.
5. Surge Testing is performed to 1000 amps due to equipment limitations.

## 4. Graphs

Figure 4-1. Peak Pulse Power Vs. Pulse Time (to 50% of Exponentially Decaying Pulse)

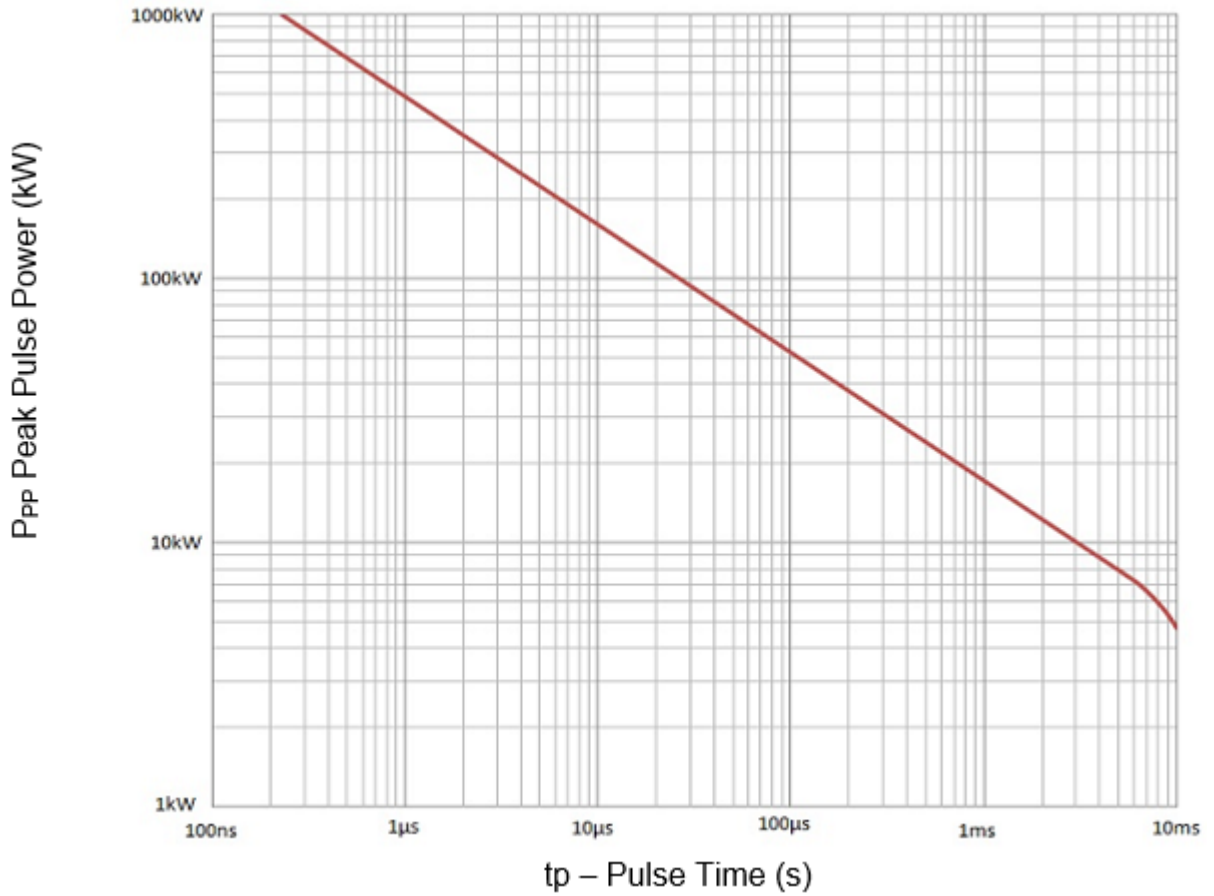
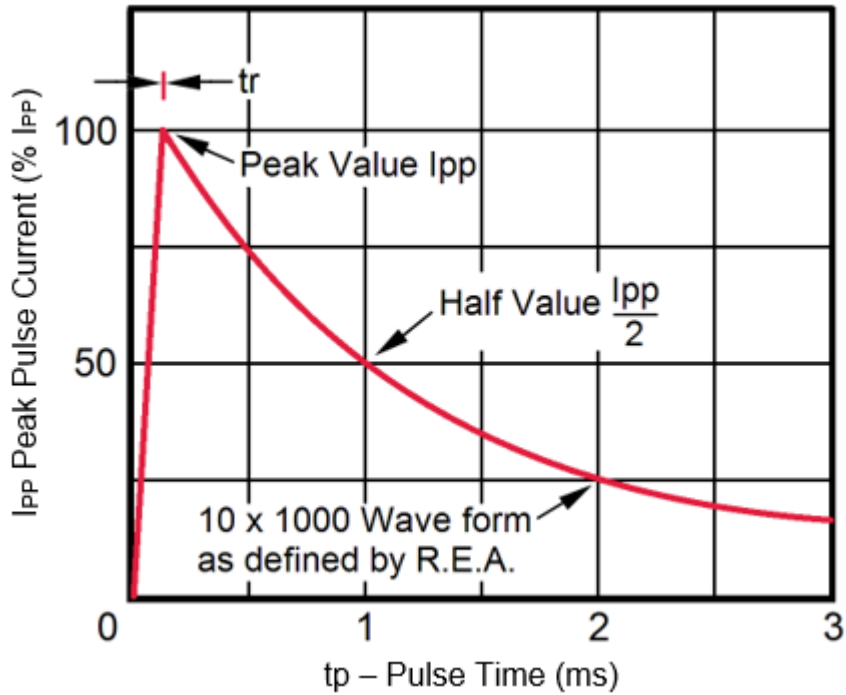
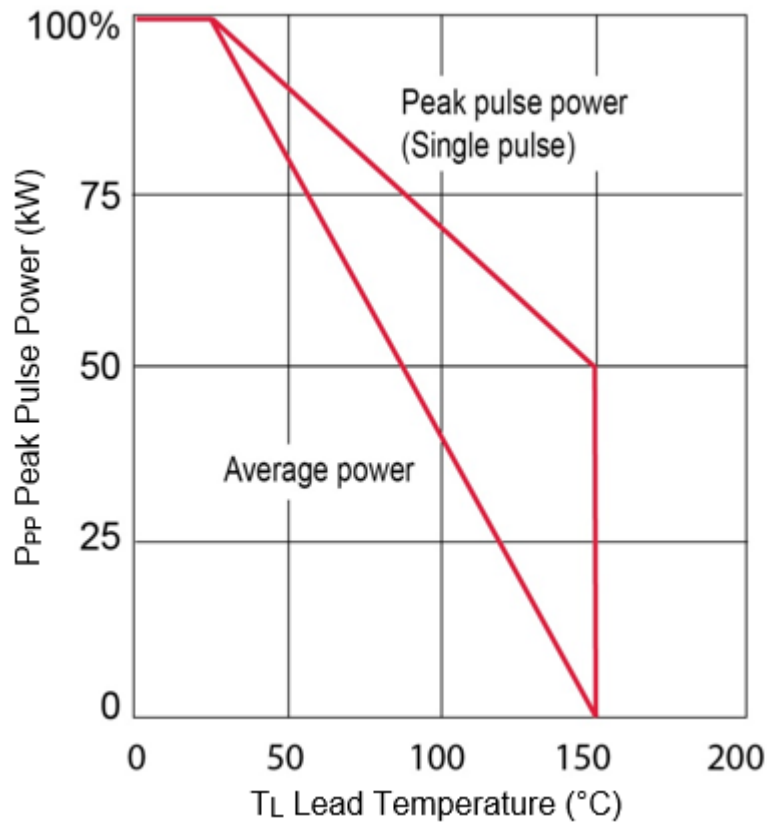


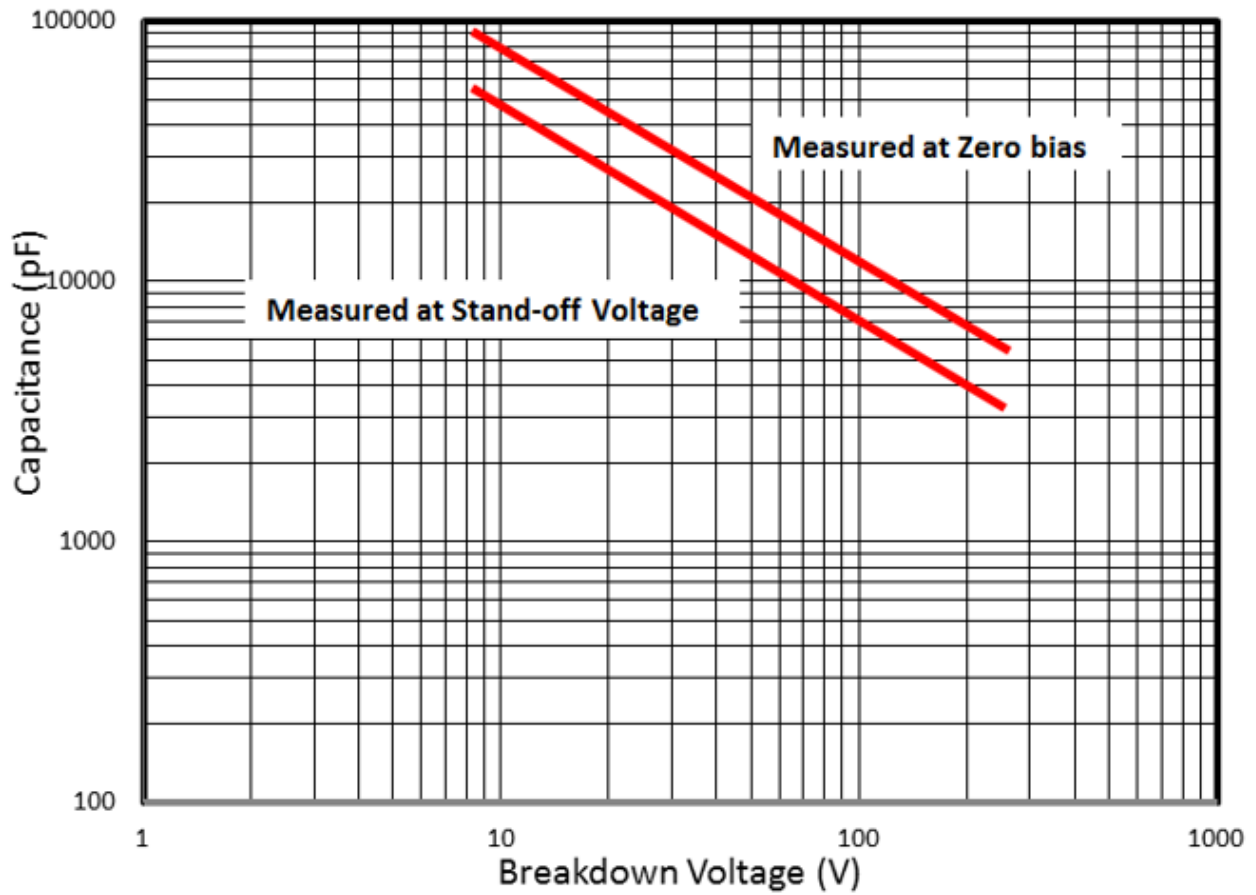
Figure 4-2. Pulse Waveform



Test waveform parameters: t<sub>r</sub> = 10 μs, t<sub>p</sub> = 1000 μs

Figure 4-3. Derating Curve

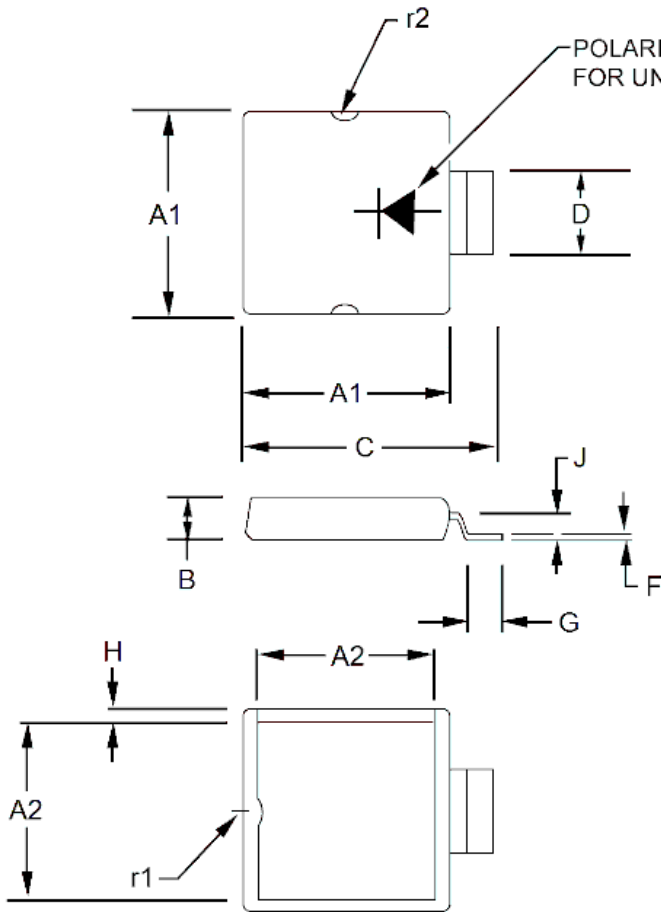


**Figure 4-4.** Typical Capacitance Vs. Breakdown Voltage (Unidirectional Configuration)

Bidirectional capacitance is half that shown at zero volts.

## 5. Package Dimensions

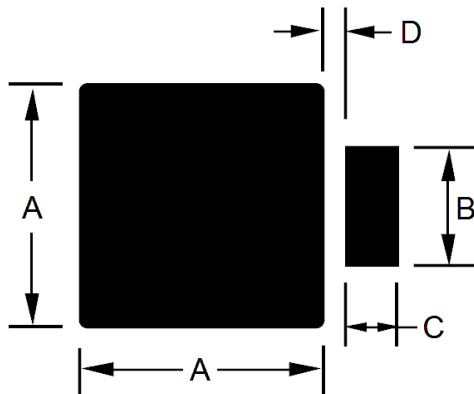
Figure 5-1. Package Dimensions



Ref.	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A1	0.485	0.495	12.32	12.57
A2	0.415	0.425	10.54	10.80
B	0.145	0.155	3.68	3.94
C	0.585	0.595	14.86	15.11
D	0.200	0.210	5.08	5.33
F	0.008	0.013	0.20	0.33
G	0.055	0.065	1.40	1.65
H	0.015	0.025	0.38	0.64
J	0.062 TYP		1.57 TYP	
r1	0.030 TYP		0.76 TYP	
r2	0.045 TYP		1.14 TYP	

### 5.1 Pad Layout

Figure 5-2. Pad Layout



Ref.	Dimensions	
	Inch	Millimeters
	Typical	Typical
A	0.470	11.94
B	0.230	5.85
C	0.100	2.44
D	0.045	1.15

## 6. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	02/2024	Initial revision.

## Microchip Information

### The Microchip Website

Microchip provides online support via our website at [www.microchip.com/](http://www.microchip.com/). This website is used to make files and information easily available to customers. Some of the content available includes:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user’s guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

### Product Change Notification Service

Microchip’s product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to [www.microchip.com/pcn](http://www.microchip.com/pcn) and follow the registration instructions.

### Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: [www.microchip.com/support](http://www.microchip.com/support)

### Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright Act.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is “unbreakable”. Code protection is constantly evolving. Microchip is committed to continuously improving the code protection features of our products.

### Legal Notice

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application. Use of this information in any other manner violates these terms. Information regarding device applications is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure

that your application meets with your specifications. Contact your local Microchip sales office for additional support or, obtain additional support at [www.microchip.com/en-us/support/design-help/client-support-services](http://www.microchip.com/en-us/support/design-help/client-support-services).

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, OR CONSEQUENTIAL LOSS, DAMAGE, COST, OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION.

Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

## Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, CryptoMemory, CryptoRF, dsPIC, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, ClockWorks, The Embedded Control Solutions Company, EtherSynch, Flashtec, Hyper Speed Control, HyperLight Load, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, TimeCesium, TimeHub, TimePictra, TimeProvider, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, Augmented Switching, BlueSky, BodyCom, Clockstudio, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, EyeOpen, GridTime, IdealBridge, IGaT, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, IntelliMOS, Inter-Chip Connectivity, JitterBlocker, Knob-on-Display, MarginLink, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mSiC, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, Power MOS IV, Power MOS 7, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SmartHLS, SMART-I.S., storClad, SQI, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, Trusted Time, TSHARC, Turing, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2024, Microchip Technology Incorporated and its subsidiaries. All Rights Reserved.

ISBN: 978-1-6683-4000-4

## **Quality Management System**

For information regarding Microchip's Quality Management Systems, please visit [www.microchip.com/quality](http://www.microchip.com/quality).

# Worldwide Sales and Service

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
<p><b>Corporate Office</b> 2355 West Chandler Blvd. Chandler, AZ 85224-6199 Tel: 480-792-7200 Fax: 480-792-7277 Technical Support: <a href="http://www.microchip.com/support">www.microchip.com/support</a> Web Address: <a href="http://www.microchip.com">www.microchip.com</a></p> <p><b>Atlanta</b> Duluth, GA Tel: 678-957-9614 Fax: 678-957-1455</p> <p><b>Austin, TX</b> Tel: 512-257-3370</p> <p><b>Boston</b> Westborough, MA Tel: 774-760-0087 Fax: 774-760-0088</p> <p><b>Chicago</b> Itasca, IL Tel: 630-285-0071 Fax: 630-285-0075</p> <p><b>Dallas</b> Addison, TX Tel: 972-818-7423 Fax: 972-818-2924</p> <p><b>Detroit</b> Novi, MI Tel: 248-848-4000</p> <p><b>Houston, TX</b> Tel: 281-894-5983</p> <p><b>Indianapolis</b> Noblesville, IN Tel: 317-773-8323 Fax: 317-773-5453 Tel: 317-536-2380</p> <p><b>Los Angeles</b> Mission Viejo, CA Tel: 949-462-9523 Fax: 949-462-9608 Tel: 951-273-7800</p> <p><b>Raleigh, NC</b> Tel: 919-844-7510</p> <p><b>New York, NY</b> Tel: 631-435-6000</p> <p><b>San Jose, CA</b> Tel: 408-735-9110 Tel: 408-436-4270</p> <p><b>Canada - Toronto</b> Tel: 905-695-1980 Fax: 905-695-2078</p>	<p><b>Australia - Sydney</b> Tel: 61-2-9868-6733</p> <p><b>China - Beijing</b> Tel: 86-10-8569-7000</p> <p><b>China - Chengdu</b> Tel: 86-28-8665-5511</p> <p><b>China - Chongqing</b> Tel: 86-23-8980-9588</p> <p><b>China - Dongguan</b> Tel: 86-769-8702-9880</p> <p><b>China - Guangzhou</b> Tel: 86-20-8755-8029</p> <p><b>China - Hangzhou</b> Tel: 86-571-8792-8115</p> <p><b>China - Hong Kong SAR</b> Tel: 852-2943-5100</p> <p><b>China - Nanjing</b> Tel: 86-25-8473-2460</p> <p><b>China - Qingdao</b> Tel: 86-532-8502-7355</p> <p><b>China - Shanghai</b> Tel: 86-21-3326-8000</p> <p><b>China - Shenyang</b> Tel: 86-24-2334-2829</p> <p><b>China - Shenzhen</b> Tel: 86-755-8864-2200</p> <p><b>China - Suzhou</b> Tel: 86-186-6233-1526</p> <p><b>China - Wuhan</b> Tel: 86-27-5980-5300</p> <p><b>China - Xian</b> Tel: 86-29-8833-7252</p> <p><b>China - Xiamen</b> Tel: 86-592-2388138</p> <p><b>China - Zhuhai</b> Tel: 86-756-3210040</p>	<p><b>India - Bangalore</b> Tel: 91-80-3090-4444</p> <p><b>India - New Delhi</b> Tel: 91-11-4160-8631</p> <p><b>India - Pune</b> Tel: 91-20-4121-0141</p> <p><b>Japan - Osaka</b> Tel: 81-6-6152-7160</p> <p><b>Japan - Tokyo</b> Tel: 81-3-6880-3770</p> <p><b>Korea - Daegu</b> Tel: 82-53-744-4301</p> <p><b>Korea - Seoul</b> Tel: 82-2-554-7200</p> <p><b>Malaysia - Kuala Lumpur</b> Tel: 60-3-7651-7906</p> <p><b>Malaysia - Penang</b> Tel: 60-4-227-8870</p> <p><b>Philippines - Manila</b> Tel: 63-2-634-9065</p> <p><b>Singapore</b> Tel: 65-6334-8870</p> <p><b>Taiwan - Hsin Chu</b> Tel: 886-3-577-8366</p> <p><b>Taiwan - Kaohsiung</b> Tel: 886-7-213-7830</p> <p><b>Taiwan - Taipei</b> Tel: 886-2-2508-8600</p> <p><b>Thailand - Bangkok</b> Tel: 66-2-694-1351</p> <p><b>Vietnam - Ho Chi Minh</b> Tel: 84-28-5448-2100</p>	<p><b>Austria - Wels</b> Tel: 43-7242-2244-39 Fax: 43-7242-2244-393</p> <p><b>Denmark - Copenhagen</b> Tel: 45-4485-5910 Fax: 45-4485-2829</p> <p><b>Finland - Espoo</b> Tel: 358-9-4520-820</p> <p><b>France - Paris</b> Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79</p> <p><b>Germany - Garching</b> Tel: 49-8931-9700</p> <p><b>Germany - Haan</b> Tel: 49-2129-3766400</p> <p><b>Germany - Heilbronn</b> Tel: 49-7131-72400</p> <p><b>Germany - Karlsruhe</b> Tel: 49-721-625370</p> <p><b>Germany - Munich</b> Tel: 49-89-627-144-0 Fax: 49-89-627-144-44</p> <p><b>Germany - Rosenheim</b> Tel: 49-8031-354-560</p> <p><b>Israel - Ra'anana</b> Tel: 972-9-744-7705</p> <p><b>Italy - Milan</b> Tel: 39-0331-742611 Fax: 39-0331-466781</p> <p><b>Italy - Padova</b> Tel: 39-049-7625286</p> <p><b>Netherlands - Drunen</b> Tel: 31-416-690399 Fax: 31-416-690340</p> <p><b>Norway - Trondheim</b> Tel: 47-72884388</p> <p><b>Poland - Warsaw</b> Tel: 48-22-3325737</p> <p><b>Romania - Bucharest</b> Tel: 40-21-407-87-50</p> <p><b>Spain - Madrid</b> Tel: 34-91-708-08-90 Fax: 34-91-708-08-91</p> <p><b>Sweden - Gothenberg</b> Tel: 46-31-704-60-40</p> <p><b>Sweden - Stockholm</b> Tel: 46-8-5090-4654</p> <p><b>UK - Wokingham</b> Tel: 44-118-921-5800 Fax: 44-118-921-5820</p>