

# Surface Mount 18,000 W Transient Voltage Suppressor Datasheet

## 1 Product Overview

These high-power, 18 kW-rated transient voltage suppressors in a surface-mount package are provided with design features to minimize thermal resistance and cumulative heating. 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. This efficient low-profile package design is offered in standoff voltage selections ( $V_{WM}$ ) of 7 V to 200 V in either unidirectional or bidirectional construction.

### 1.1 Features

The following are key features of the MPLAD18KP7.0A—MPLAD18KP200CA devices:

- Available in both unidirectional and bidirectional construction (bidirectional with CA suffix)
- High reliability with wafer fabrication and assembly lot traceability
- All parts surge tested
- Low-profile surface mount package
- Optional upscrewing is available with various screening and conformance inspection options based on MIL-PRF-19500. Refer to [Hirel Non-Hermetic Product Portfolio](#) brochure on our website for more details on the screening options.
- Suppresses transients up to 18,000 W at 10/1000  $\mu$ s (see [Peak Pulse Power vs. Pulse Time](#) (see page 6))
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS-compliant versions are available
- 3 $\sigma$  lot norm screening performed on standby current ( $I_D$ )
- AEC-Q101 qualified

### 1.2 Applications and Benefits

The following are benefits of the MPLAD18KP7.0A—MPLAD18KP200CA devices:

- Protection from switching transients and induced RFI
- Protection from electrostatic discharge (ESD) and electrical fast transient (EFT) per IEC 61000-4-2 and IEC 61000-4-4
- Secondary lightning protection per IEC 61000-4-5 with 42  $\Omega$  source impedance:  
Class 1,2,3,4,5: MPLAD18KP7.0A to 200CA
- Secondary lightning protection per IEC 61000-4-5 with 12  $\Omega$  source impedance:  
Class 1,2,3,4: MPLAD18KP7.0A to 200CA
- Secondary lightning protection per IEC 61000-4-5 with 2  $\Omega$  source impedance:  
Class 4: MPLAD18KP5.0 to 64CA
- Pin injection protection per RTCA/DO-160G for Waveform 4 (6.4/69  $\mu$ s at 25 °C)<sup>1</sup>:  
Level 4: MPLAD18KP7.0A to 200CA  
Level 5: MPLAD18KP7.0A to 130CA
- Pin injection protection per RTCA/DO-160G for Waveform 5A (40/120  $\mu$ s at 25 °C)<sup>1</sup>:  
Level 4: MPLAD18KP7.0A to 36CA

#### Notes:

1. See MicroNote 132 for further temperature derating selection.

## 1.3 Part Nomenclature

The following table shows the part nomenclature for the MPLAD18KP7.0A—MPLAD18KP200CA devices.

**Table 1 • MPLAD18KP7.0A Part Nomenclature**

<b>M</b>	Reliability level*	M MA MX MXL *(see <a href="#">Hirel Non-Hermetic Product Portfolio</a> )
<b>PLAD</b>	Package designation	
<b>18K</b>	P <sub>PP</sub> rating (18 kW)	
<b>P</b>	Plastic	
<b>7.0</b>	Reverse standoff voltage	
<b>CA</b>	polarity	A = Unidirectional CA = Bidirectional
<b>e3</b>	RoHS compliance	e3 = RoHS compliant blank = non-RoHS compliant

## 1.4 Symbols and Definitions

The following table shows the symbols and definitions used for the MPLAD18KP7.0A—MPLAD18KP200CA devices.

**Table 2 • Symbols and Definitions**

Symbol	Value	Definition
$I_{(BR)}$	Breakdown current	The current used for measuring breakdown voltage $V_{(BR)}$ .
$I_D$	Standby current	The current through the device at rated stand-off voltage.
$I_{PP}$	Peak Impulse current	The maximum-rated random recurring peak impulse current or nonrepetitive peak impulse current that may be applied to a device. A random recurring or nonrepetitive transient current is usually due to an external cause, and it is assumed that its effect will have completely disappeared before the next transient arrives.
$V_{(BR)}$	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.
$\alpha_{V(BR)}$	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.

## 2 Electrical Specifications

This section details the electrical specifications for the MPLAD18KP7.0A—MPLAD18KP200CA devices.

### 2.1 Maximum Ratings

**Table 3 • Absolute Maximum Ratings**

Parameter/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 at 10/1000 $\mu s^2$	$P_{PP}$	18000	W	
$t_{clamping}$ (0 V to $V_{(BR)min}$ )	Unidirectional	<100	ps	
	Bidirectional	<5	ns	
Forward clamping voltage at 500 A <sup>3</sup>	$V_{FS}$	2.0	V	
Forward surge current <sup>3</sup>	$I_{FSM}$	1500	A	
Solder temperature at 10 seconds	$T_{SP}$	260	°C	
Steady-state power dissipation <sup>5</sup>	$T_A = 25\text{ °C}$	$P_D$	2.5 <sup>1</sup>	W
	$T_c = 100\text{ °C}$		50 <sup>4</sup>	W

**Notes:**

1. When mounted on FR4 PC board (1 oz Cu) with recommended mounting pad (see pad layout).
2. Also see [Figure 1 \(see page 6\)](#) and [Figure 2 \(see page 6\)](#). With impulse repetition rate (duty factor) of 0.05% or less.
3. At 8.3 ms half-sine wave (unidirectional devices only).
4. Case temperature controlled on heat sink as specified.
5. See MicroNote 134 for derating  $P_{PP}$  when also applying steady-state power.

## 2.2 Electrical Characteristics

The following table shows the electrical characteristics of the MPLAD18KLP7.0A—MPLAD18KP200CA devices at 25 °C unless otherwise specified. Bidirectional part numbers have a "CA" suffix instead of an "A" suffix.

**Table 4 • Typical Electrical Performance**

Part Number	V <sub>WM</sub> Working Standoff Voltage <sup>1</sup>	V <sub>BR</sub> Breakdown Voltage at I <sub>BR</sub>	I <sub>BR</sub> Test Current	V <sub>c</sub> Max Clamping Voltage at I <sub>PP</sub>	I <sub>o</sub> Max Stand-by Current at V <sub>WM</sub>	I <sub>PP</sub> Max Peak Pulse Current <sup>3</sup>	α <sub>V(BR)</sub> Max Temp Coefficient
Unidirectional	(V)	Min – Max (V)	(mA)	(V)	(μA)	(A)	(mV/°C)
MPLAD18KP7.0A	7.0	7.78 – 8.60	150	12.0	3000	1500 <sup>2</sup>	5.0
MPLAD18KP7.5A	7.5	8.33 – 9.21	5	12.9	750	1396 <sup>2</sup>	6.0
MPLAD18KP8.0A	8.0	8.89 – 9.83	5	13.6	450	1324 <sup>2</sup>	6.0
MPLAD18KP8.5A	8.5	9.44 – 10.4	5	14.4	150	1250 <sup>2</sup>	7.0
MPLAD18KP9.0A	9.0	10.0 – 11.1	5	15.4	60	1169 <sup>2</sup>	8.0
MPLAD18KP10A	10	11.1 – 12.3	5	17.0	45	1059 <sup>2</sup>	9.0
MPLAD18KP11A	11	12.2 – 13.5	5	18.2	10	989	10
MPLAD18KP12A	12	13.3 – 14.7	5	19.9	10	909	11
MPLAD18KP13A	13	14.4 – 15.9	5	21.5	10	838	12
MPLAD18KP14A	14	15.6 – 17.2	5	23.2	10	776	13
MPLAD18KP15A	15	16.7 – 18.5	5	24.4	10	738	15
MPLAD18KP16A	16	17.8 – 19.7	5	26.0	10	693	16
MPLAD18KP17A	17	18.9 – 20.9	5	27.6	10	556	18
MPLAD18KP18A	18	20.0 – 22.1	5	29.2	10	617	19
MPLAD18KP20A	20	22.2 – 24.5	5	32.4	10	556	22
MPLAD18KP22A	22	24.4 – 26.9	5	35.5	10	508	24
MPLAD18KP24A	24	26.7 – 29.5	5	38.9	10	463	27
MPLAD18KP26A	26	28.9 – 31.9	5	42.1	10	428	29
MPLAD18KP28A	28	31.1 – 34.4	5	45.5	10	396	30
MPLAD18KP30A	30	33.3 – 36.8	5	48.4	10	372	35
MPLAD18KP33A	33	36.7 – 40.6	5	53.3	10	388	38
MPLAD18KP36A	36	40.0 – 44.2	5	58.1	10	310	40
MPLAD18KP40A	40	44.4 – 49.1	5	64.5	10	280	45
MPLAD18KP43A	43	47.8 – 52.8	5	69.4	10	260	49
MPLAD18KP45A	45	50.0 – 55.3	5	72.7	10	248	51
MPLAD18KP48A	48	53.3 – 58.9	5	77.4	10	233	55
MPLAD18KP51A	51	56.7 – 62.7	5	82.4	10	219	60
MPLAD18KP54A	54	60.0 – 66.3	5	87.1	10	207	64
MPLAD18KP58A	58	64.4 – 71.2	5	93.6	10	193	69

Part Number	V <sub>WM</sub> Working Standoff Voltage <sup>1</sup>	V <sub>BR</sub> Breakdown Voltage at I <sub>BR</sub>	I <sub>BR</sub> Test Current	V <sub>c</sub> Max Clamping Voltage at I <sub>PP</sub>	I <sub>o</sub> Max Stand-by Current at V <sub>WM</sub>	I <sub>PP</sub> Max Peak Pulse Current <sup>3</sup>	α <sub>V(BR)</sub> Max Temp Coefficient
Unidirectional	(V)	Min – Max (V)	(mA)	(V)	(μA)	(A)	(mV/°C)
MPLAD18KP60A	60	66.7 – 73.7	5	96.8	10	186	70
MPLAD18KP64A	64	71.1 – 78.6	5	103	10	175	75
MPLAD18KP70A	70	77.8 – 86.0	5	113	10	160	84
MPLAD18KP75A	75	83.3 – 92.1	5	121	10	149	90
MPLAD18KP78A	78	86.7 – 95.8	5	126	10	143	94
MPLAD18KP85A	85	94.4 – 104.0	5	137	10	132	102
MPLAD18KP90A	90	100 – 111	5	146	10	124	109
MPLAD18KP100A	100	111 – 123	5	162	10	112	122
MPLAD18KP110A	110	122 – 135	5	177	10	102	132
MPLAD18KP120A	120	133 – 147	5	193	10	94	145
MPLAD18KP130A	130	144 – 159	5	209	10	87	157
MPLAD18KP150A	150	167 – 185	5	193	10	75	183
MPLAD18KP160A	160	178 – 197	5	259	10	70	195
MPLAD18KP170A	170	189 – 209	5	275	10	66	207
MPLAD18KP180A	180	200 – 221	5	291	10	62	219
MPLAD18KP200A	200	222 – 245	5	322	10	56	243

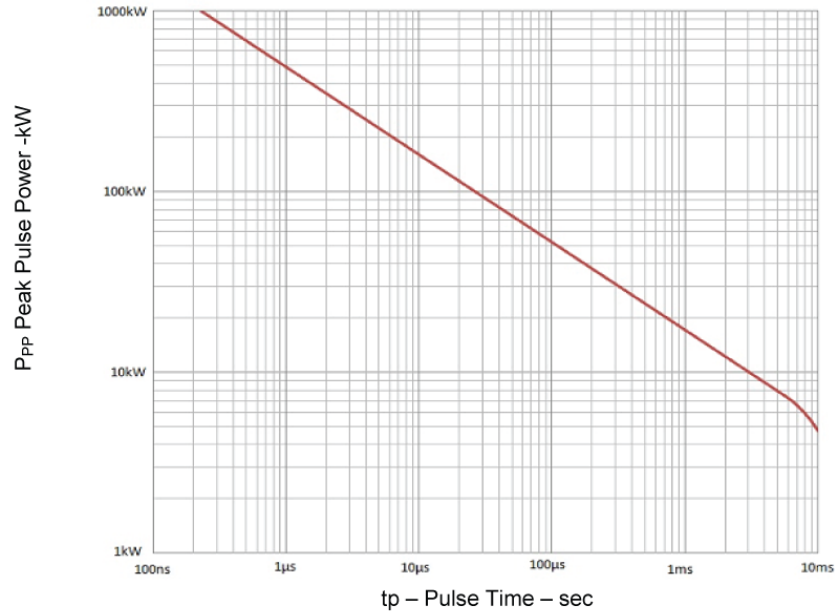
**Notes:**

1. Transient voltage suppressors are normally selected with reverse standoff voltage V<sub>WM</sub>, which should be equal to or greater than the peak operating voltage.
2. Surge testing is performed to 1000 A due to equipment limitations.
3. See [Figure 3 \(see page 7\)](#).

## 2.3 Typical Performance Curves

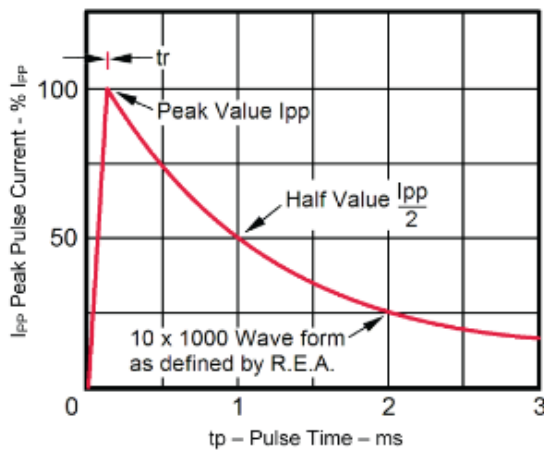
This section details the typical performance curves of the MPLAD18KLP7.0A–MPLAD18KP200CA devices. The following graph shows peak pulse power versus pulse time (to 50% of exponentially decaying pulse).

**Figure 1 • Peak Pulse Power vs. Pulse Time (to 50% of exponentially decaying pulse)**



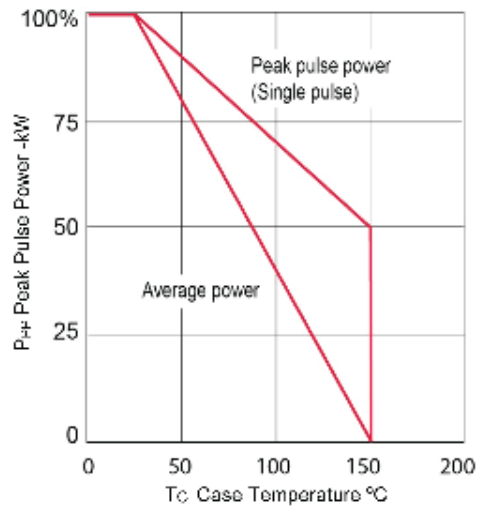
The following graph shows the pulse waveform with these parameters:  $t_r = 10 \mu\text{s}$  and  $t_p = 1000 \mu\text{s}$ .

**Figure 2 • Pulse Waveform**



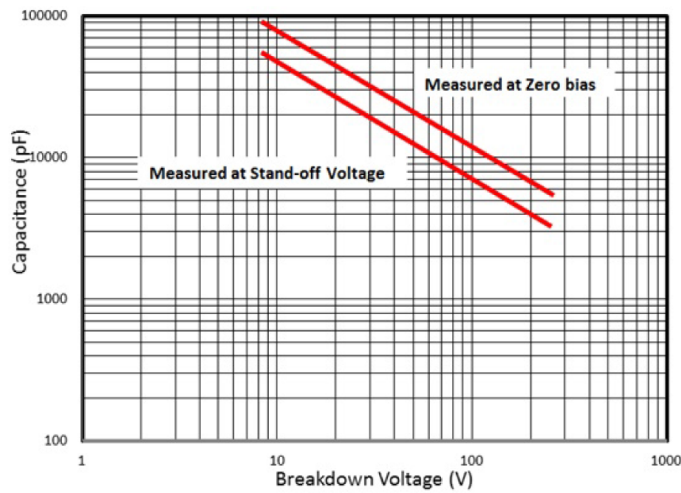
The following graph shows the derating curve.

**Figure 3 • Derating Curve**



The following graph shows the typical capacitance versus the breakdown voltage. Note that the bidirectional capacitance is half that shown at 0 V.

**Figure 4 • Typical Capacitance vs. Breakdown Voltage (Unidirectional Configuration)**

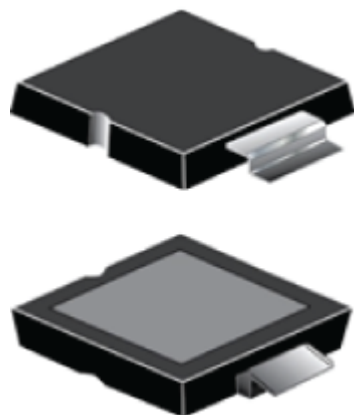


### 3 Package Specification

The following illustration is the MPLAD18KP7.0A—MPLAD18KP200CA package.

The cathode is the metal base under the body of this device.

**Figure 5 • PLAD Package**



The following table lists mechanical and packaging information for the MPLAD18KP7.0A—MPLAD18KP200CA devices.

**Table 5 • Mechanical and Packaging**

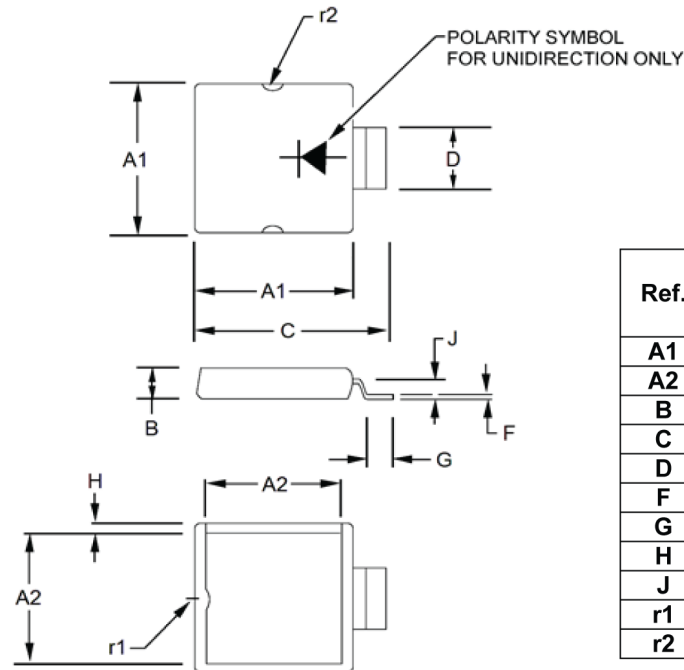
Component	Description
Case	Void-free transfer molded thermosetting epoxy body meeting UL94V-0
Terminals	Tin-lead or RoHS-compliant annealed matte-tin plating readily solderable per MIL-STD-750, method 2026.
Marking	Body marked with part number
Polarity	For unidirectional devices, the cathode is on the metal backside (package bottom)
Packaging	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 g
See <a href="#">Package Dimensions</a> on last page.	



### 3.1 Package Dimensions

The following illustration shows the package dimensions for the MPLAD18KP7.0A—MPLAD18KP200CA devices.

Figure 6 • Package Outline Drawing

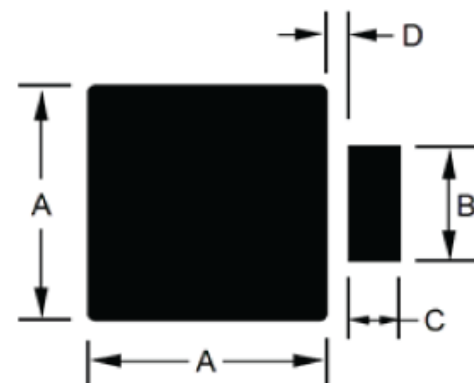


Ref.	Dimensions			
	Inch		Millimeters	
	Min	Max	Min	Max
A1	0.485	0.495	12.32	12.57
A2	0.415	0.425	10.54	10.80
B	0.145	0.155	3.68	3.94
C	0.585	0.595	14.86	15.11
D	0.200	0.210	5.08	5.33
F	0.008	0.013	0.20	0.33
G	0.045	0.055	1.14	1.40
H	0.015	0.025	0.38	0.64
J	0.062 TYP		1.57 TYP	
r1	0.030 TYP		0.76 TYP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

### 3.2 Pad Layout

The following illustration shows the pad layout for the MPLAD18KP7.0A – MPLAD18KP200CA devices

Figure 7 • 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

**Microsemi Headquarters**

One Enterprise, Aliso Viejo,  
CA 92656 USA

Within the USA: +1 (800) 713-4113

Outside the USA: +1 (949) 380-6100

Sales: +1 (949) 380-6136

Fax: +1 (949) 215-4996

Email: [sales.support@microsemi.com](mailto:sales.support@microsemi.com)

[www.microsemi.com](http://www.microsemi.com)

© 2018 Microsemi. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.

Microsemi, a wholly owned subsidiary of Microchip Technology Inc. (Nasdaq: MCHP), offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees globally. Learn more at [www.microsemi.com](http://www.microsemi.com).

RF01215

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [ESD Suppressors / TVS Diodes](#) category:*

*Click to view products by [Microsemi](#) manufacturer:*

Other Similar products are found below :

[60KS200C](#) [D12V0H1U2WS-7](#) [D18V0L1B2LP-7B](#) [82356050220](#) [D5V0M5U6V-7](#) [NTE4902](#) [P4KE27CA](#) [P6KE11CA](#) [P6KE39CA-TP](#)  
[P6KE8.2A](#) [SA110CA](#) [SA60CA](#) [SA64CA](#) [SMBJ12CATR](#) [SMBJ8.0A](#) [SMLJ30CA-TP](#) [ESD112-B1-02EL](#) [E6327](#)  
[ESD119B1W01005E6327XTSA1](#) [ESD5V0J4-TP](#) [ESD5V0L1B02VH6327XTSA1](#) [ESD7451N2T5G](#) [19180-510](#) [CPDT-5V0USP-HF](#)  
[3.0SMCJ33CA-F](#) [3.0SMCJ36A-F](#) [HSPC16701B02TP](#) [D3V3Q1B2DLP3-7](#) [D55V0M1B2WS-7](#) [DESD5V0U1BL-7B](#) [DRTR5V0U4SL-7](#)  
[SCM1293A-04SO](#) [ESD203-B1-02EL](#) [E6327](#) [SM12-7](#) [SMF8.0A-TP](#) [SMLJ45CA-TP](#) [CEN955 W/DATA](#) [82350120560](#) [82356240030](#)  
[VESD12A1A-HD1-GS08](#) [CPDUR5V0R-HF](#) [CPDUR24V-HF](#) [CPDQC5V0U-HF](#) [CPDQC5V0USP-HF](#) [CPDQC5V0-HF](#) [D1213A-01LP4-7B](#)  
[D1213A-02WL-7](#) [ESDLIN1524BJ-HQ](#) [5KP100A](#) [5KP15A](#) [5KP18A](#)