Aerovox Corp.®

Type RBPS IGBT Snubber Capacitor Modules

Direct Mount and Board Level IGBT Capacitor Modules — RoHS Compliant

Type RBPS IGBT snubber capacitor modules for power electronics can be mounted directly onto the IGBT or mounted as a board level product for protection against transient voltages caused by the high di/dt that occurs at gate turn off.

Highlights

- Low inductance to 12 nH
- High DV/DT
- Low ESR
- UL 94 V-0 flame retardant case & resin
- Wide selection of terminal options
- Low loss polypropylene dielectric

Specifications

Capacitance Range: 0.1 to 3.0 µF

Voltage Range: 630, 1000, 1250, 1600 Vdc

Capacitance Tolerance: ±10%

Operating Temperature Range: –40 °C to +85 °C

Dissipation Factor (DF): < 0.1% at 1 kHz @ 25 °C

Insulation Resistance (IR): > 100,000 mΩ x µF @ 100 Vdc after 2 minutes

Dielectric Strength: 1.6 x rated for 60 sec.

Equivalent Series Inductance (ESL):

Equivalent Series Inductance (ESL)

Terminal Description	Terminal Style	Maximum Inductance (nH)
Radial Lead	2L	30
Circuit Mounted, 2 pins per side	2P	15
Circuit Mounted, 3 pins per side	3P	15
Circuit Mounted, 4 pins per side	4P	15
Direct Mounted, 22 to 31 mm Centers	B1	20
Direct Mounted, 39 to 48 mm Centers	B2	20

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Resistance to Solder Heat:

Test Conditions

Solder Temperature	260°C ±5.0°C
Test Duration	10 seconds ±1 s

Performance Requirements:

Capacitance	Delta of < 2.0%

Accelerated Pulse Handling Capability:

Test Conditions:

A capacitor under test will be charged through an impedance of a magnitude greater than the discharging impedance. The capacitor under test will be charged to the rated DC voltage and discharged through an impedance capable of producing a minimum voltage gradient with time (DV/DT). The test will be performed in accordance with the requirements for the voltage gradient multiplier and charge and discharge cycles as listed below.

Voltage Gradient Multiplier	Test Cycles
6x	100
4x	1000
2x	1 million

Example:

An RBPS part rated 1.0 uF 1,000 VDC has a DV/DT rating of 600 volts per microsecond. This part would be capable of withstanding 100 cycles at a minimum of 3,600 volts/microsecond, 1000 cycles at 2,400 volts/microsecond, or 1 million cycles at 1,200 volts/microsecond.

Performance Criteria After Testing

Capacitance	Delta < 3%
ESR	Absolute value < 150% of original measured value

General Description

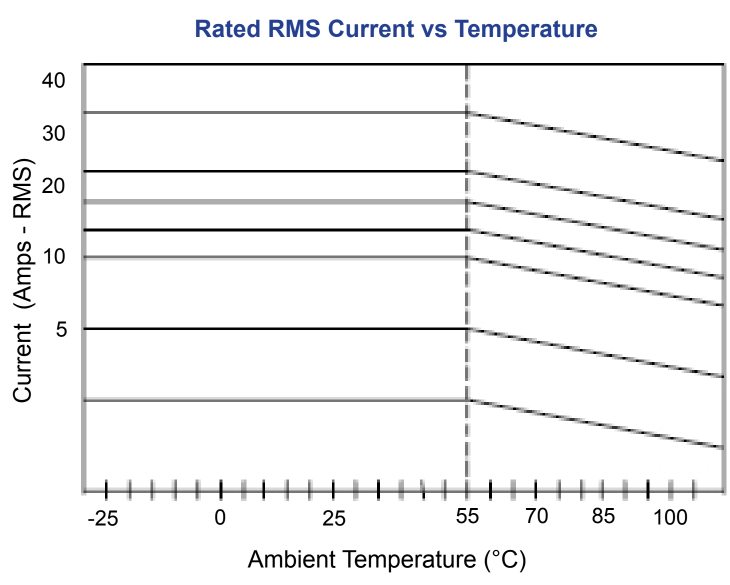
Dielectric: Polypropylene film with self-healing dual metallized electrodes.

Enclosure: UL 94V-0 flame-retardant plastic case and resin.

Marking: Ink stamped with Aerovox, part number, capacitance value, nominal DC voltage, and date code, at a minimum.

Terminals: Tinned copper, terminal sizes and styles are specified in outline drawings on page 4.

Ripple Current: The Maximum Rms current is the maximum current flowing through the capacitor at



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Why Use Snubber Capacitors?

RoHS Compliant

With the evolution of power technology, new higher speed Insulated Gate Bipolar Transistors (IGBTs) make it possible for high power converters to operate up to 10 kHz or more. IGBTs are replacing the slower Darlington transistors, simplifying circuit design and reducing cost. IGBT power modules are now being designed into AC and DC motor drive inverters, uninterruptible power systems, electric vehicles and alternate energy production systems.

Power systems containing IGBTs must be designed so the transient voltages caused by the hi di/dt that occurs at gate turn off is minimized. Left uncontrolled, this transient voltage can exceed the blocking voltage rating of the IGBT and cause it to fail. To reduce the transient voltage, either di/dt or the parasitic DC bus inductance of the power circuit must be reduced. This is best achieved by decoupling the parasitic bus inductance using a non-inductive wound film capacitor mounted as near as possible to the IGBT module terminals.

Snubber capacitors, constructed of polypropylene film dielectric and dual metallized film electrodes, are the optimal capacitor design for IGBT applications. While film/foil capacitors are often used because of their superior current carrying capability, they fail in a short circuit mode, which may cause damage to the IGBT module. Aerovox's snubber capacitors combine high current carrying capability with low inductance, low dielectric losses and capacitance stability across a wide frequency range. They offer the self-healing property of metallized film (not failing in a short circuit mode) with the high peak current carrying capability (dv/dt) of film/foil construction.

Aerovox's snubber capacitors, manufactured with polypropylene fim and dual metallized electrodes, available with direct IGBT module terminals, radial wire leads, or a unique printed circuit board dual in-line pin mount, provide the highest electrical performance of any snubber capacitors currently available.

Ratings

Cap (µF)	Cap Code	Case Code	DV/DT (V/µ sec)	I_{peak} (A)	Irms @ 55 °C (A max)	ESR Max @ 100 kHz (mΩ)	Terminal Codes
Voltage Code 63 - 630 Vdc (400 Vac @ 60 Hz)							
.33	334	C7	600	200	10.9	9	B,G,I,J
.39	394	C7	600	235	11.5	9	B,G,I,J
.47	474	B7	550	235	12.2	8	B,G,I,J
.56	564	B7	500	280	13.0	8	B,G,I,J
.68	684	A7	450	300	14.0	8	B,G,I,J
.75	754	A7	400	300	15.0	8	B,G,I,J
.82	824	A7	400	330	16.0	8	B,G,I,J
1.00	105	A7	400	400	18.0	7	B,G,I,J
1.20	125	A7	400	480	19.0	7	B,G,I,J
1.50	155	A7	400	600	12.0	7	C,G,I,J
1.75	175	A7	400	700	21.0	7	C,G,I,J
2.00	205	A7	400	800	22.0	7	C,G,I,J
2.20	225	R4	280	615	24.0	7	C,G,H
2.50	255	R4	250	625	26.0	7	C,G,H
3.00	305	R4	250	750	28.0	7	C,G,H
4.00	405	R5	250	1000	30.0	6	D,G,H
5.00	505	R5	250	1250	35.0	6	D,G,H

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Ratings

RoHS Compliant

Cap (μF)	Cap Code	Case Code	DV/DT (V/μ sec)	I_{peak} (A)	Irms @ 55 °C (A max)	ESR Max @ 100 kHz (mΩ)	Terminal Codes
Voltage Code 91 - 1000 Vdc (530 Vac @ 60 Hz)							
.22	224	C7	1000	220	6.6	12	A
.27	274	C7	700	245	10.0	12	B,G
.33	334	C7	700	300	10.9	10	B,G
.39	394	C7	700	310	11.5	9	B,G
.47	474	C7	700	375	12.2	8	B,G
.56	564	B7	700	450	14.0	8	C,G
.68	684	B7	700	450	15.0	8	C,G
.75	754	B7	700	525	15.0	8	C,G
.82	824	A7	600	490	17.2	8	C,G
1.00	105	A7	600	600	18.4	7	C,G
1.20	125	A4	500	600	18.5	7	C,G,H
1.50	155	R4	500	750	21.7	7	C,G,H
1.75	175	R4	500	875	22.0	7	C,G,H
2.00	205	R4	450	900	22.5	7	D,G,H
2.20	225	R5	450	990	26.0	7	D,G,H
2.50	255	R5	400	1000	27.0	7	D,G,H
3.00	305	R5	400	1200	30.0	6	D,G,H

Part Numbering System

RBPS	105	91	K	A7	G
Type	Capacitance	Voltage	Tolerence	Case Code	Terminal Code
RBPS	334 = .33 μF 105 = 1.0 μF	63 = 630 Vdc 91 = 1000 Vdc	K = ±10%	See Ratings	See Outline Drawings

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Ratings

RoHS Compliant

Cap (µF)	Cap Code	Case Code	DV/DT (V/µ sec)	I_{peak} (A)	Irms @ 55 °C (A max)	ESR Max @ 100 kHz (mΩ)	Terminal Codes
Voltage Code 92 - 1250 Vdc (550 Vac @ 60 Hz)							
.10	104	W0	1200	120	5.7	16	B,G,I,J
.15	154	C7	1000	150	8.9	15	B,G,I,J
.22	224	C7	1000	220	10.0	12	B,G,I,J
.27	274	C7	900	245	11.0	12	B,G,I,J
.33	334	C7	800	265	12.0	10	B,G,I,J
.39	394	B7	770	300	14.0	9	B,G,I,J
.47	474	B7	650	305	17.0	8	B,G,I,J
.56	564	A7	650	365	17.5	8	C,G,I,J
.68	684	A7	650	440	20.0	8	C,G,I,J
.75	754	A7	650	490	20.0	8	C,G,I,J
.82	824	A7	650	530	21.0	8	C,G,I,J
1.00	105	A7	650	650	22.0	7	C,G,I,J
1.20	125	R4	550	660	25.0	7	C,G,H
1.50	155	R4	500	750	26.0	7	C,G,H
1.75	175	R5	500	875	27.0	7	D,G,H
2.00	205	R5	475	950	28.0	7	C,G,H
2.20	225	R5	475	1045	30.0	6	C,G,H
Voltage Code 96 - 1600 Vdc (550 Vac @ 60 Hz)							
.10	104	W0	1200	120	5.7	16	A
.15	154	C7	1000	150	8.9	15	B,G
.22	224	C7	1000	220	10.0	12	B,G
.27	274	B7	850	230	12.0	12	B,G
.33	334	B7	850	280	13.4	10	B,G
.39	394	A7	850	330	16.0	9	C,G
.47	474	A7	850	400	17.2	8	C,G
.56	564	A7	850	475	17.5	8	C,G
.68	684	R4	700	475	20.0	8	C,G,H
.75	754	R4	600	450	20.5	8	C,G,H
.82	824	R4	600	490	21.0	8	C,G,H
1.00	105	R4	600	600	21.7	7	C,G,H
1.20	125	R4	600	720	26.0	7	D,G,H
1.50	155	R5	600	900	28.0	7	D,G,H

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Case Codes and Dimensions

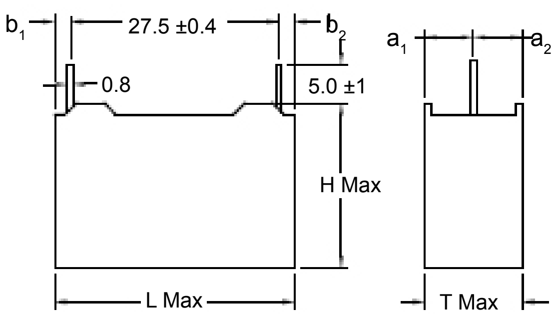
RoHS Compliant

Case Code	T	H	L	P	Case Code	T	H	L	P
W	13.0	22.0	32.1	27.5	A7	28.2	37.3	42.7	35.0
C7	17.0	28.0	42.7	35.0	R4	29.2	41.2	58.5	52.0
B7	22.1	30.1	42.7	35.0	R5	46.0	36.0	58.7	52.0

Dimensions in mm

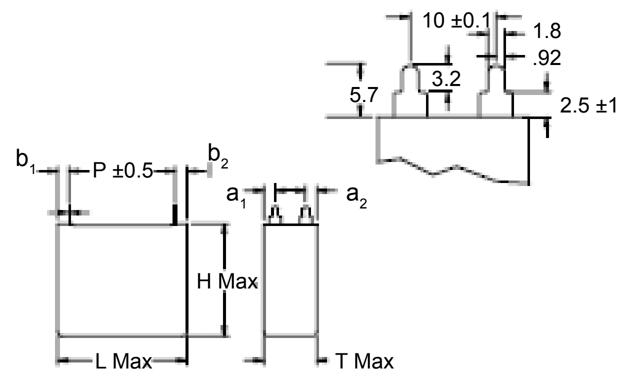
Outline Drawings

PN Code A
Style 2L
Cases VO, WO



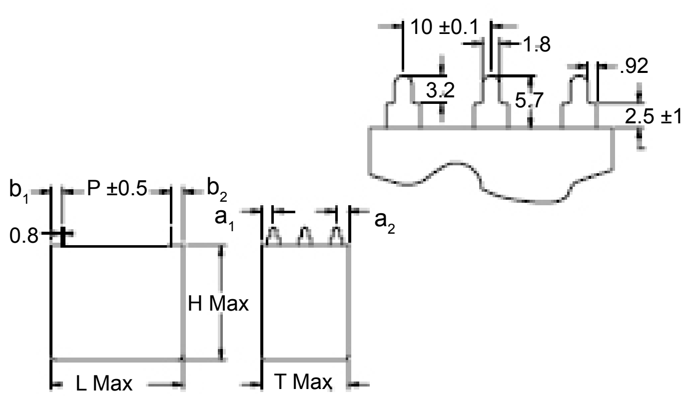
$|a_1 - a_2|$ <0.4
$|b_1 - b_2|$ <0.6

PN Code B
Style 2P
Cases C7, B7



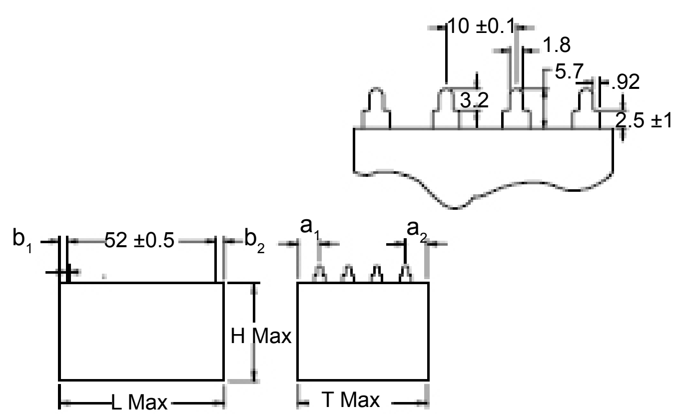
$|a_1 - a_2|$ <0.4
$|b_1 - b_2|$ <0.6

PN Code C
Style 3P
Case A7, P = 35
Case R4. P = 52



$|a_1 - a_2|$ <0.4
$|b_1 - b_2|$ <0.6

PN Code D
Style 4P
Case R5



$|a_1 - a_2|$ <0.4
$|b_1 - b_2|$ <0.6

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Case Codes and Dimensions

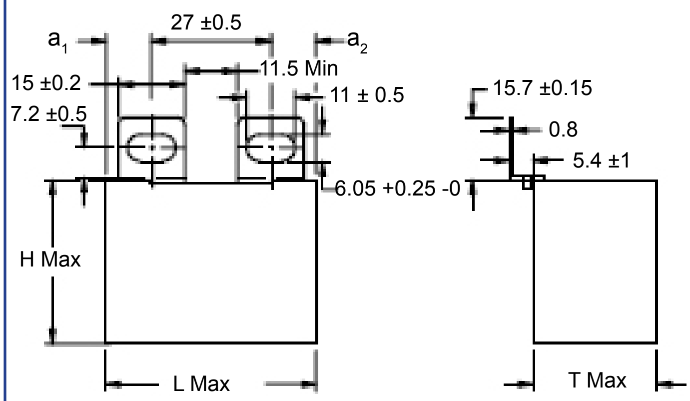
RoHS Compliant

Case Code	T	H	L	P	Case Code	T	H	L	P
W	13.0	22.0	32.1	27.5	A7	28.2	37.3	42.7	35.0
C7	17.0	28.0	42.7	35.0	R4	29.2	41.2	58.5	52.0
B7	22.1	30.1	42.7	35.0	R5	46.0	36.0	58.7	52.0

Dimensions in mm

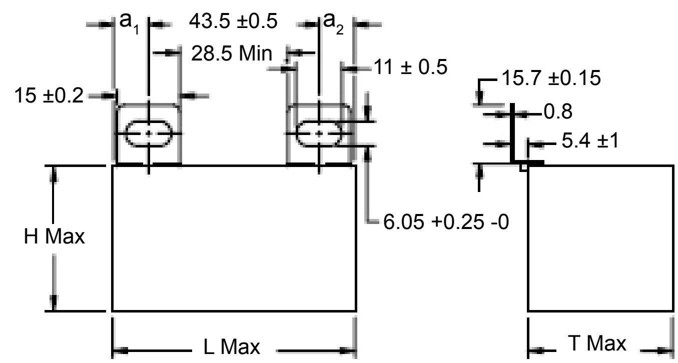
Outline Drawings

PN Code G
Style B1
Cases A7, B7, C7, R4, R5



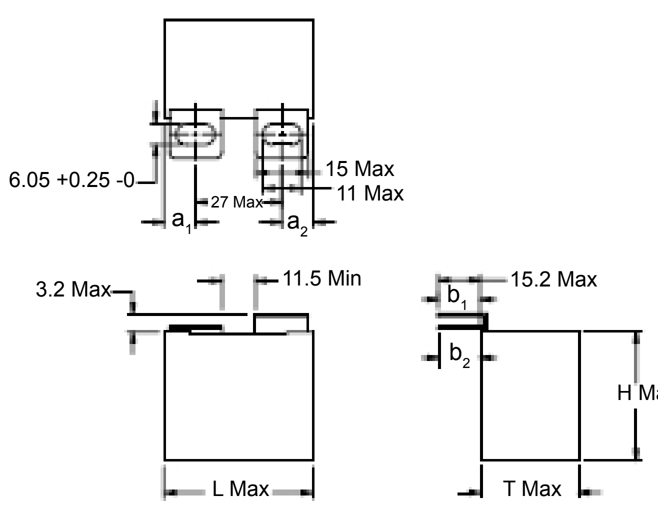
$|a_1-a_2| < 0.5$

PN Code H
Style B2
Cases R4, R5



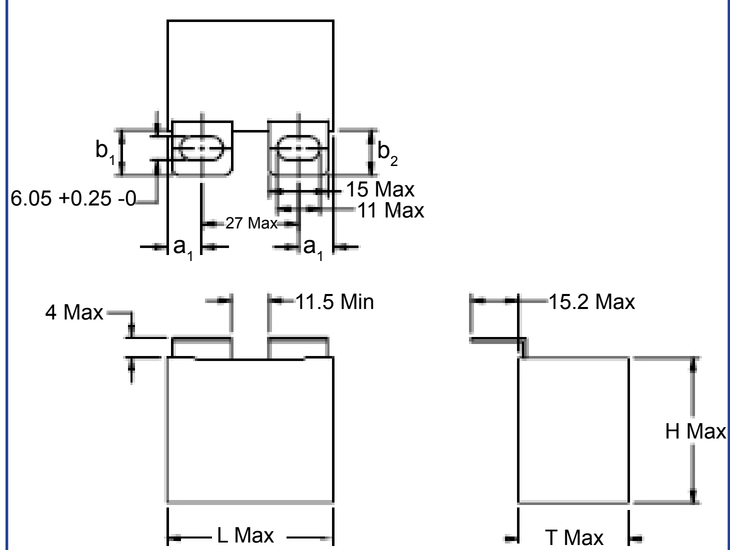
$|a_1-a_2| < 0.5$

PN Code I
Style B3
Cases A7, B7



$|a_1-a_2| < 1$
$|b_1-b_2| < 0.5$

PN Code J
Style B4
Cases A7, B7



$|a_1-a_2| < 1$
$|b_1-b_2| < 0.5$