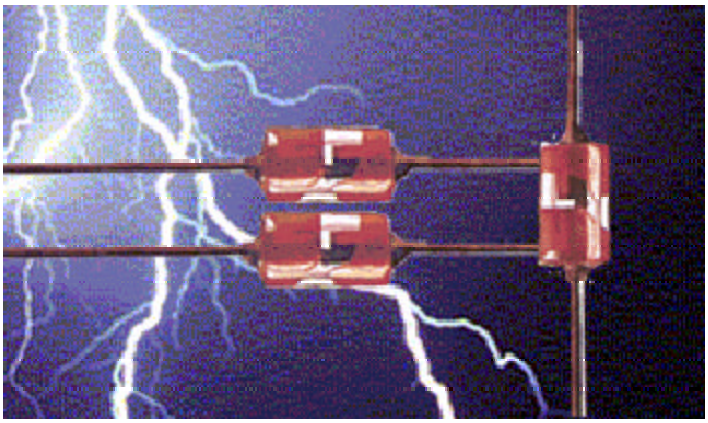
APPLICATION NOTE

PUNSUMI SURGE ABSORBERS



Punsumi Surge Absorbers (PSA) are a new generation of gas-tube surge suppressor devices (Spark Gaps) that use a Silicon Chip to provide the desired micro-gap separation in an inert gas atmosphere. The technology ensures superior V-t characteristics under standard test conditions implying effective protection against fast rising transients (normally encountered due to inductive loads and lightning strikes). The innovative use of silicon enables the PSA to repeatedly guard against astonishingly high levels of surge current.

Under normal voltage levels the PSA acts as a virtual open circuit with Insulation Resistance in excess of 1000 M Ohms, permitting only an insignificant leakage current. The PSA energises within nanoseconds of the incoming surge's exceeding the impulse breakdown voltage and shunts the potentially damaging current away from the equipment.

SALIENT FEATURES

* ***LOW IMPULSE BREAKDOWN VOLTAGE***
* ***HIGH SURGE CURRENT CAPACITY***
* ***LONG SURGE LIFE***
* ***LOW CLAMPING VOLTAGE***
* ***FAST RESPONSE***
* ***LOW CAPACITANCE***
* ***HIGH INSULATION RESISTANCE***
* ***SMALL SIZE***
* ***NO RADIO-ACTIVE SUBSTANCES***

Patents

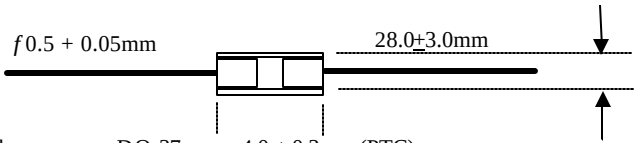
USA	No. 5,436.608
Taiwan	No. 67,998
Japan	No. 100,295
Korea	No. 93/23092
China	No. 93/105683.7
India	No. 93/8923
Germany	No. 4337928

Punsumi Surge Absorbers were designed by Kanichi Tachibana. Now a free-lance scientist, Mr Tachibana served as a design engineer at Mitsubishi Co., Japan for over 29 years. Today, he holds many patents for different Discharge Glow Elements.

PEAK IMPULSE BREAKDOWN LEVELS

Model	DC Breakdown Voltage	100 V/µs	1 KV/µs	10 KV/µs
PTB 201M	160 – 240 V	400		
PTB 201MT	160 – 240 V	360		
PTB 301L/M	255 – 345 / 240 – 360 V	480	600	840

MECHANICAL DIMENSIONS



Standard Package:

DO-37	4.0 ± 0.3mm (PTC)
DO-41	4.3 ± 0.3mm (PTB, PTHC)
DO-35	3.8 ± 0.3mm (PTA)

Product Guide

Model		DC Spark-over Voltage Vs (in Volts)	Insulation Resistance	Capac-itance	Surge Life test			Surge Current Capacity		
	201M	160-240			PTA	PTB	PTC	PTA	PTB	PTC
PTA	251M	200-300			8x20µs, 100A, 1 min. interval, 50 times	8x20µs, 100A, 30 sec interval, 300 times	8x20µs, 100A, 30 sec interval, 200 times	8x20µs, 500A 3 times, 5min. interval	8x20µs, 1.5 kA, 3 times, 5min. interval	8x20µs, 1 kA, 3 times, 5min. interval
PTB	301L	255-345	> 100 MΩ @ 100VDC							
PTC	301LS	270-360								
	301M	240-360								
	351N	280-420								
	401M	320-480			1000pF, 10KV, 0Ω, 100 times, each interval is 10 sec.		1000pF, 10KV, 0Ω, 100 times, each interval is 10 sec.			
PTB	501M	400-600	> 100 MΩ @ 250VDC	< 1pF						
PTC	701M	560-840								
	102M	800-1200			8x20µs, 100A, 1 min interval, 200 times			8x20µs, 500 Amperes		
PTHC	152M	1200-1800	> 1000 M Ω @ 500VDC							
	242M	1900 – 2900								
	302M	2400 – 3600								
	362M	2900 - 4300								

MARKING: PRINTING

Example:

Type	Period of Manufacture	Print (on glass sleeve)
PTA 201M	Jan	201M M1
PTA 301M	Apr	301M M4

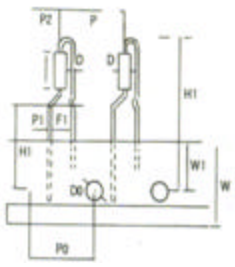
Date Code

M1: Jan - Mar
M4: Apr - Jun
M7: Jul - Sep
M10: Oct - Dec

PACKING

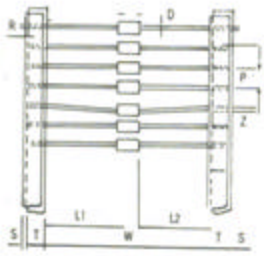
Available in Bulk, Radial and Axial Taping. Qty: 3000 Pcs/box (Bulk: 10 pouches/box, 300pcs/pouch)

RADIAL TAPING



Symbol	Dimensions (mm)
P	12.7 + 1.0
P0	12.7 ± 0.3
P1	3.85 ± 0.5
P2	6.35 ± 1.3
F1	5.0 ± 0.5
W	18.0 +1.0 – 0.5
W1	9.0 ± 0.5
H1	16.0 ± 0.5
H2	32.25 max
D	ƒ 2.6 ± 0.3
D0	ƒ 4.0 ± 0.2
D1	ƒ 0.5 + 0.05
L	4.0 ± 0.3

AXIAL TAPING



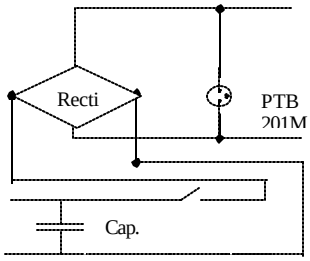
Symbol	Dimensions (mm)
W	65.0
P	5.0 ± 0.5
T	6.0 ± 1.0
Z	1.2 max
S	0.8 max
D	ϕ 0.5 ± 0.05
D1:	ϕ 2.6 + 0.4
L	4.0 ± 0.3
The leads must not protrude from the tape.	

Technical Specifications

Item		Test Conditions	Requirement
Surge Characteristics	Surge Life Test	Apply standard Impulse Short Circuit Wave form: 8X20µs, 100A at intervals of 30 sec – # of times as specified in document PL0201. The unit shall then be visually examined and measurements of Vs , IR and C shall be made.	ΔVs/Vs shall not exceed ±30% IR and C to meet specified value.
	Surge Current Capacity Test	Apply standard Short Circuit Current Wave form: 8x20µs, 3 times at an interval of 5 minutes. The device shall then be visually examined and should be judged to be unharmed.	PTA 500A PTB 1500A PTC 1000A
Mechanical Characteristics	Vibration	Subjected to an amplitude of 1.5mm maximum total displacement - within limits of 10-55 Hz. The frequency range shall be traversed in 1 min. This motion shall be applied repeatedly for a period of one hour in the X, Y and Z directions. Thereafter the unit shall be visually examined and the Vs, IR and Capacitance shall be measured.	No Visual Damage. Vs, IR and Capacitance to meet specified value.
	Lead Wire Pull Strength	Gradually apply a load of 25 N (2.5kgf) and keep the unit fixed for 30 sec. Thereafter, the unit shall be visually examined and Vs, IR and Capacitance shall be measured	The lead wire should not appear pulled out and should not break
	Lead Wire Bending Strength	The unit shall first be secured in a position such that the lead wires are vertical and a weight of 25N shall be applied axially. The lead wire shall then be bent by 900 in one direction at a point of 3mm from the body along the radius of curvature and then back again to the original position. This procedure shall be repeated twice for 30 seconds. Thereafter, the unit shall be visually examined and Vs, IR and Capacitance shall be measured	There should be no visible damage and the electrical characteristics should not exceed specified value.
Environmental Characteristics	Cold Resistance	The specimen shall be subjected to -55 ± 3^0 for 1000Hr without load and then stored at room temperature for 4 hr. Thereafter, the Vs, IR and Capacitance shall be measured	The characteristics should not exceed specified value.
	Heat Resistance	The specimen shall be stored at 125 ± 2^0 for 1000Hr without load and then stored at room temperature and humidity for 4 hr. Thereafter, the Vs, IR and Capacitance shall be measured.	The characteristics should not exceed specified value.
	Humidity	The specimen shall be subjected to 85 ± 2^0 C, 85% R.H. for 1000Hr and then stored at room temperature and humidity for 4 Hr. Thereafter, the Vs, IR and Capacitance shall be measured.	The characteristics should not exceed specified value.
	Temperature Cycle Test	The temperature cycle shown below shall be repeated 10 times and then the sample will be stored at room temp. and humidity for 4 hr. The unit shall then be examined visually and characteristics of Vs. IR and Capacitance shall be measured	Step / Temp / Period 1 / -40^0C / 30 min 2 / Room / 2 min 3 / 125^0C / 30 min
Solderability	Solderability	After dipping the lead wire to a depth of about 3mm from the body in a solder bath of temp 235 ± 5^0C for 5 ± 0.5 second .examine the lead wire visually	Over 90% of the lead wire should be covered with new solder
	Resistance to Soldering Heat	After dipping the lead wire to a depth of about 3mm from the body in a solder bath of temp 350 ± 10^0C for 5 ± 1 sec., measure the Vs, IR and Capacitance	The characteristics should not exceed specified value.

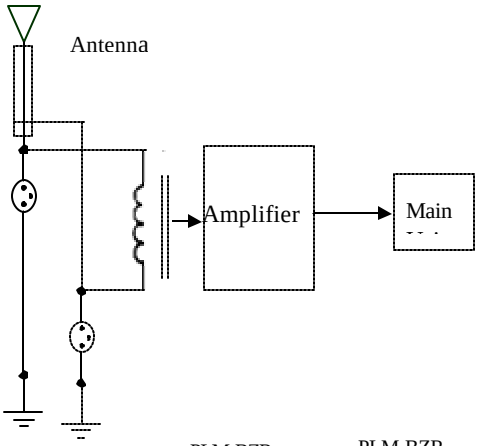
Applications of Punsumi Surge Absorbers

1 Telephone Instrument protection



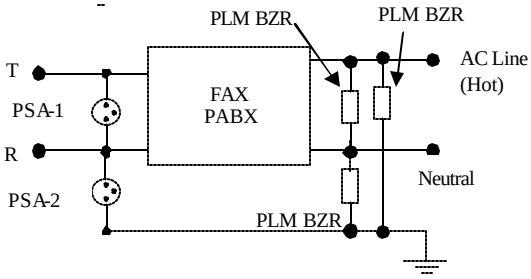
Most designers and manufacturers recommend the above protection configuration as a superior option to the 95V MOV used. The MOV can be directly replaced by the PTB 201M.

2 Antenna Protection with PTB 201M



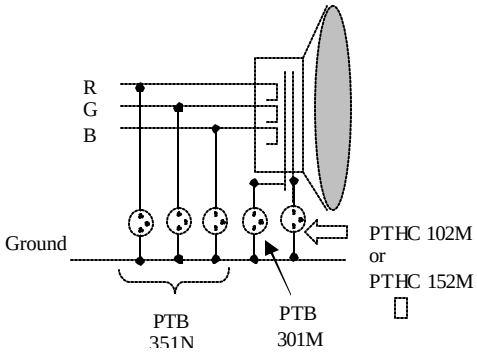
The PSA protects the processing circuits and amplifiers against static surge energies in the vicinity of the antenna and also from ESD from human contact. This configuration can be used for Car Receivers, Tuner-Cassette recorders, Wireless Communication, Satellite Receivers etc.

3 Protection for Communication Lines



Surges on telephone lines on subscriber premises are frequently responsible for damaged instruments and equipment. This problem is exacerbated by faulty grounding in communication line circuits – a protection configuration as shown in adjoining figure can provide effective protectio

4 Protection of Video Amplifiers from CRTs



High voltage spikes returning from the CRT display are frequently known to damage controlling circuits including expensive video amplifiers – this problem is further compounded by the use of higher energization voltage in Flat CRTs. The PSA can provide an excellent, long-lasting and cost effective solution.

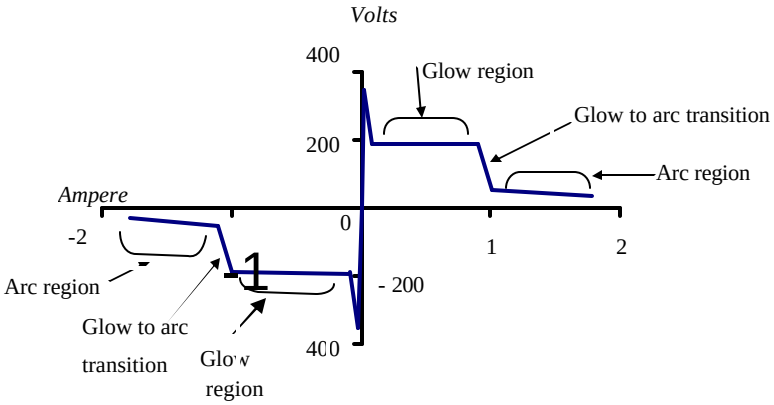
PSA vs MOV: Illustration with Telephone Instruments

Most telephone instrument manufacturers use a 95 V dc MOV as protection against surges and spikes. The Clamping Voltage of this configuration at 25A (surge current) is 200V. This high clamping voltage of 200V implies that the subsequent components in the circuit are subjected to at least 200V in case of an impending surge of 25A magnitude. Real-life surges generally have amplitudes of about 500A in domestic electricity and communication line circuits.

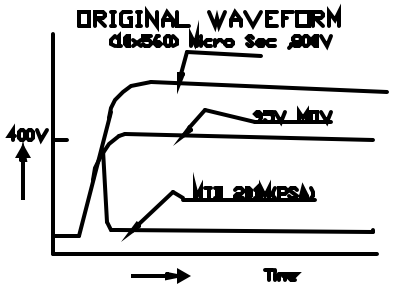
The MOVs in general suffer from the following problems:

- **Higher Clamping Voltage**
- **Thermal Runaway**
- **High Capacitance**
- **Degradation with Use**
- **High Capacitance**

To overcome this problem Punsumi suggests **PTB 201M (PSA)** . A PSA will stay in conduction mode as long as the original surge is able to maintain sufficient current through and the Clamping Voltage at 25A is 30Volt. After the passage of the surge the PSA will revert back to non-conduction mode but the MOV will continue to conduct the follow-on current thereby developing a potential across itself and exposing the equipment or components to .harmful energy.



V I Characteristics of PSA MOV

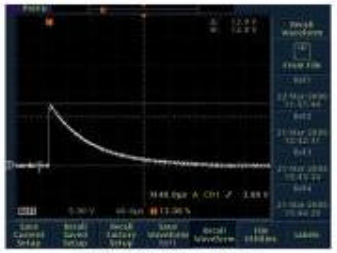


(95V) Vs PSA (MTB 201M)

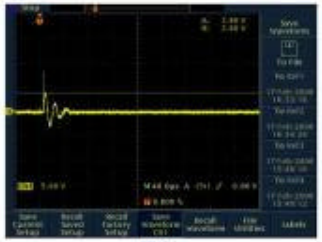
Advantage of PSA Over MOV

Characteristics	PUNSUMI	MOVS
Clamping Voltage	20-30V in Arc region	Much higher – depends on Varistor rating.
Thermal Runaway	No Thermal Runaway	YES
Life	No degradation	Degrades with use
Capacitance	< 1pF	500 pF (typically)
Insulation Resistance	> 100 M Ohms	> 100 M Ohms
Surge Current Capacity	8x20µs, 1.5kA, 5 minutes interval, 3 times (PTB)	8x20µs, 3kA (max) – depends on MOV size
Response Time	< 1ns	<1ns

Comparative Performance between Punsumi and other brands.



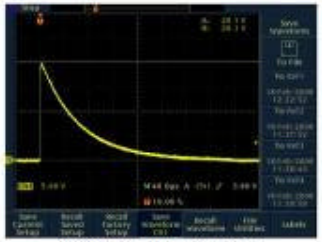
1.2/50-1200 Volt waveform



PTB1

SMART1

MITSUBHISHI-1



ORIGIONAL 2000V WAVEFORM

PTB-4, 2KV

SMART-1, 2KV

MITSUBHISHI-1,2KV