Silicon Surge Voltage Suppressor

5SSB ..X Series

Doc. No. 5SYA 1031-01 Nov.95

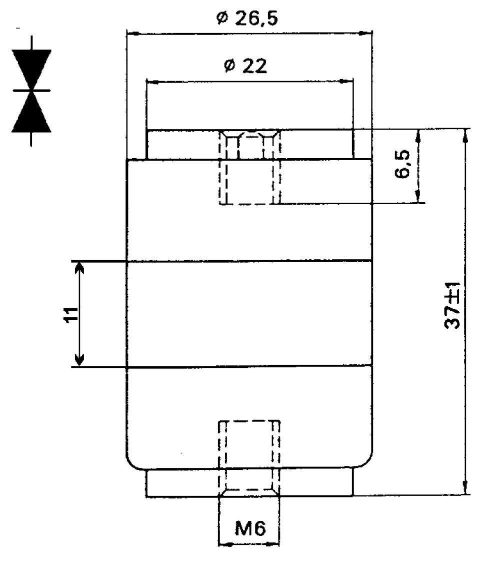
Features

The 5SSB silicon surge voltage suppressor consists of a diffused pnp-Si-wafer mounted with pressure contact in a hermetically sealed metal-ceramic-package.
5SSB silicon surge voltage suppressors are best suited to protect power thyristors against small and medium power surges (e.g. 200 kW over 10 µs). They allow the use of thyristors with lower voltage capability and much smaller snubber circuits.

Applications are e.g.:

Traction, HVDC transmission, generator excitation, transmitter power supply, high power motor controls.

Type and ordering number	V_R [V]
5SSB 50X0400	450 ± 50
5SSB 50X0500	550 ± 50
5SSB 38X0600	650 ± 50
5SSB 38X0700	750 ± 50
5SSB 30X0800	850 ± 50
5SSB 30X0900	950 ± 50
5SSB 26X1000	1050 ± 50
5SSB 26X1100	1150 ± 50
5SSB 23X1200	1250 ± 50
5SSB 23X1300	1350 ± 50
5SSB 20X1400	1450 ± 50
5SSB 20X1500	1550 ± 50
5SSB 30X1600	1650 ± 50
5SSB 30X1700	1750 ± 50
5SSB 30X1800	1850 ± 50
5SSB 30X1900	1950 ± 50
5SSB 26X2000	2050 ± 50
5SSB 26X2100	2150 ± 50
5SSB 26X2200	2250 ± 50
5SSB 26X2300	2350 ± 50
5SSB 23X2400	2450 ± 50
5SSB 23X2500	2550 ± 50
5SSB 23X2600	2650 ± 50
5SSB 23X2700	2750 ± 50
5SSB 20X2800	2850 ± 50
5SSB 20X2900	2950 ± 50
5SSB 20X3000	3050 ± 50
5SSB 20X3100	3150 ± 50



Dimensions in mm   Weight: 0.115 kg

ABB Semiconductors AG

Type and ordering number	V_R [V]	Thyristor V_{DRM} V_{RRM} [V]	I_{RM} [A] 1 x 10µs	1 x 100µs	1 x 1ms	1 x 10ms	I_{RRM} 10 x 100 µs [A]	P_{RAV} [W]	P_{RSM} 1 x 10 µs [kW]
5SSB 50X0400 5SSB 50X0500	450 ± 50 550 ± 50	500 600	500	135	33	7.5	70	30 *	350
5SSB 38X0600 5SSB 38X0700	650 ± 50 750 ± 50	700 800	380	100	25	4.5	60	30 *	350
5SSB 30X0800 5SSB 30X0900	850 ± 50 950 ± 50	900 1000	300	80	21	4	50	30 *	350
5SSB 26X1000 5SSB 26X1100	1050 ± 50 1150 ± 50	1100 1200	260	67	18	3.6	41	30 *	350
5SSB 23X1200 5SSB 23X1300	1250 ± 50 1350 ± 50	1300 1400	230	58	15	3.4	35	30 *	350
5SSB 20X1400 5SSB 20X1500	1450 ± 50 1550 ± 50	1500 1600	200	50	13	3	30	30 *	350
5SSB 30X1600 5SSB 30X1700 5SSB 30X1800 5SSB 30X1900	1650 ± 50 1750 ± 50 1850 ± 50 1950 ± 50	1800 1800 2000 2000	300	80	21	4	50	60 **	700
5SSB 26X2000 5SSB 26X2100 5SSB 26X2200 5SSB 26X2300	2050 ± 50 2150 ± 50 2250 ± 50 2350 ± 50	2200 2200 2400 2400	260	67	18	3.6	41	60 **	700
5SSB 23X2400 5SSB 23X2500 5SSB 23X2600 5SSB 23X2700	2450 ± 50 2550 ± 50 2650 ± 50 2750 ± 50	2600 2600 2800 2800	230	58	15	3.4	35	60 **	700
5SSB 20X2800 5SSB 20X2900 5SSB 20X3000 5SSB 20X3100	2850 ± 50 2950 ± 50 3050 ± 50 3150 ± 50	3000 3000 3200 3200	200	50	13	3	30	60 **	700

V_R
Symmetrical avalanche voltage at sin $\hat{I}_A$ = 20 A, t_p = 10 µs, T_{vj} = 60 ºC.

I_{RM}
Max. avalanche current for a single sine half wave pulse.

I_{RRM}
Max. avalanche current for 10 pulses of 100 µs width, repetition frequency 50 Hz.

P_{RAV}
Admissible continuous losses at $R_{thCA} \le 1$ K/W, $T_A \le 60$ ºC.
* Single side cooling
** Double side cooling

P_{RSM}
Peak power losses for a single 10 µs current surge.

T_{vj}
The initial virtual junction temperature is 60 ºC.

Thermal resistance junction-heatsink:
5SSB 50X0400 ... 20X1500: R_{th} = 0.5 K/W.
5SSB 30X1600 ... 20X3100 (double sided cooling): R_{th} = 0.25 K/W.

For single sided cooling (5SSB 50X0400 ... 20X1500) the side carrying the serial number shall be cooled.

Temperature coefficient of the avalanche voltage V_R:+ 0.11 % per degree C:
V_R (T) = V_{RO} [1 + 1.1 * 10^{-3} (T - 60 ºC)].
V_R (60 ºC) = V_{RO}; V_R (25 ºC) = 0.93* V_{RO}; V_R (125 ºC) = 1.07 * V_{RO}.

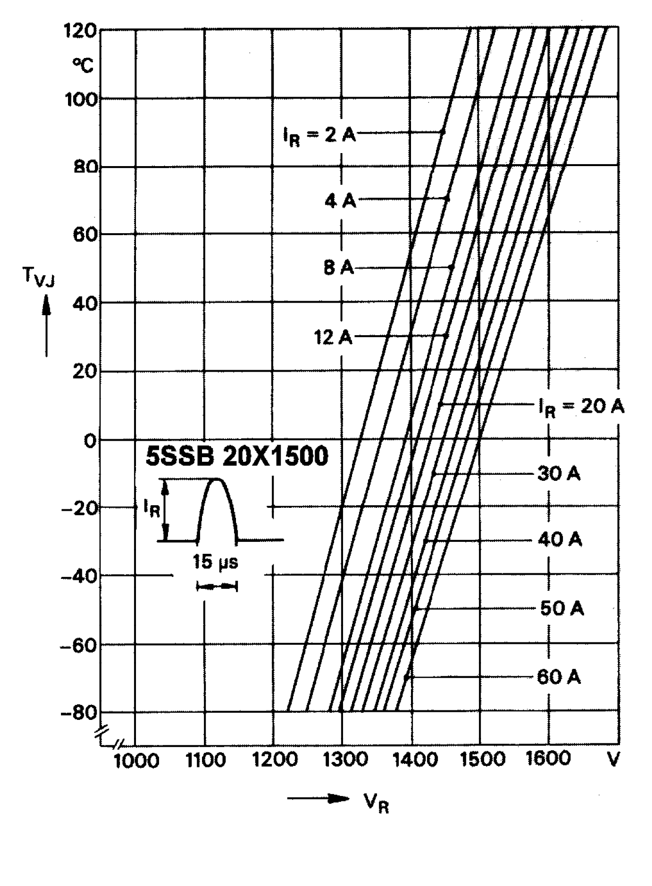
The blocking current I_R is proportional to $e^{[T(ºC)/20ºC]}$.
I_R (0.8 * V_R; T_{vj} = 45 ºC): 50 % - Value: < 4 µA; Arithm. meanvalue: < 8 µA.

Junction capacitance at zero voltage (T_{vj} = 60 ºC);
5SSB 50X0400 ... 20X1500: 1100 pF; 5SSB 30X1600 ... 20X3100: 550 pF.

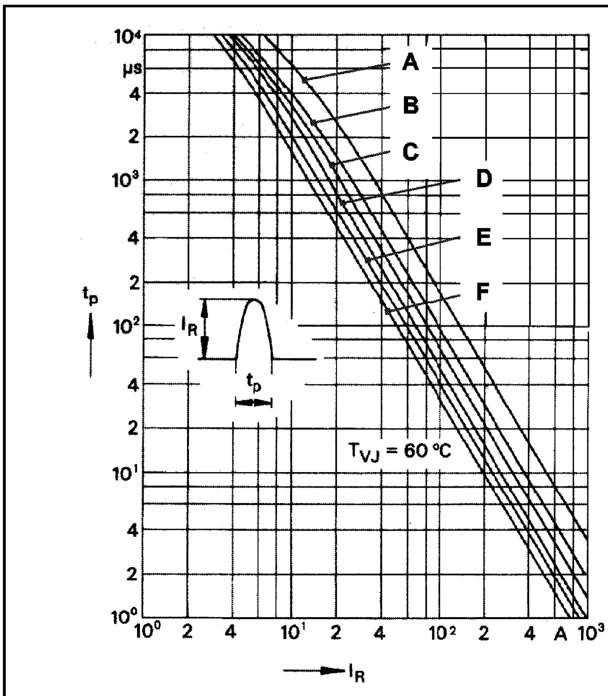
Storage temperature/max. junction temperature -40...125 ºC/125 ºC .

Admissible acceleration (vibration): 10 g.

Mounting torque: 3.5 Nm.



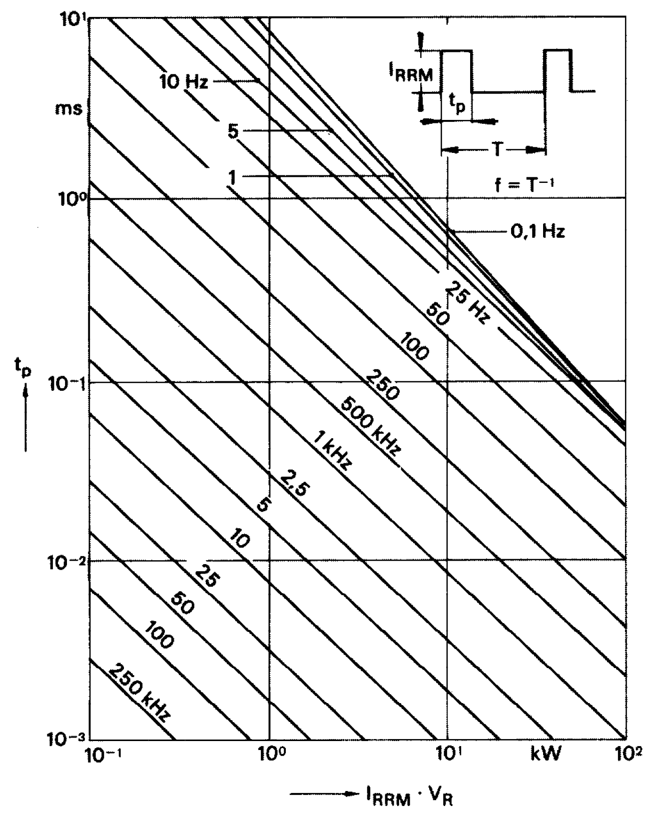
Avalanche voltage V_R vs. junction temperature T_{vj}.



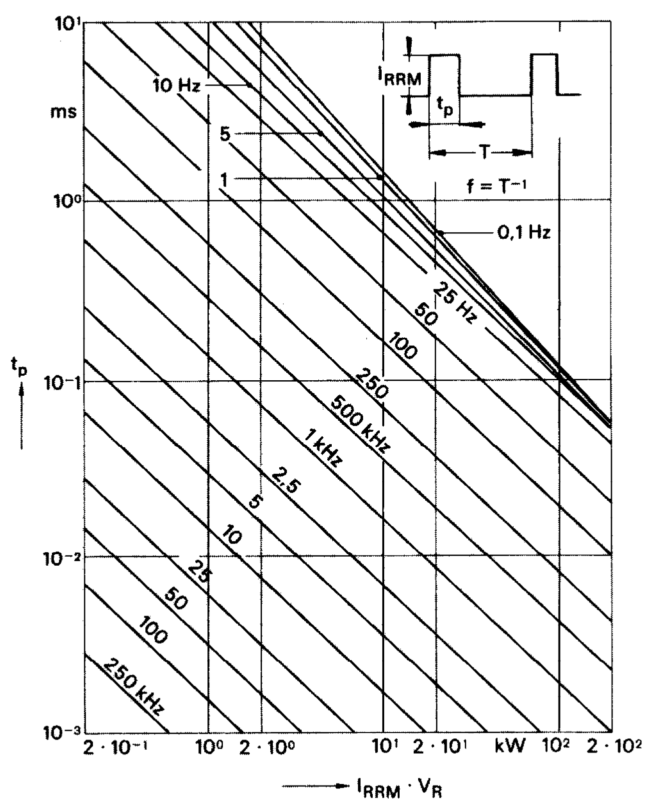
A 5SSB 50X0400 5SSB 50X0500	B 5SSA 38X0600 5SSB 38X0700		
C 5SSB 30X0800 5SSB 30X0900 5SSB 30X1600 5SSB 30X1700 5SSB 30X1800 5SSB 30X1900	D 5SSB 26X1000 5SSB 26X1100 5SSB 26X2000 5SSB 26X2100 5SSB 26X2200 5SSB 26X2300	E 5SSB 23X1200 5SSB 23X1300 5SSB 23X2400 5SSB 23X2500 5SSB 23X2600 5SSB 23X2700	F 5SSB 20X1400 5SSB 20X1500 5SSB 20X2800 5SSB 20X2900 5SSB 20X3000 5SSB 20X3100

Max. admissible current peak I_R vs. base width t_p.

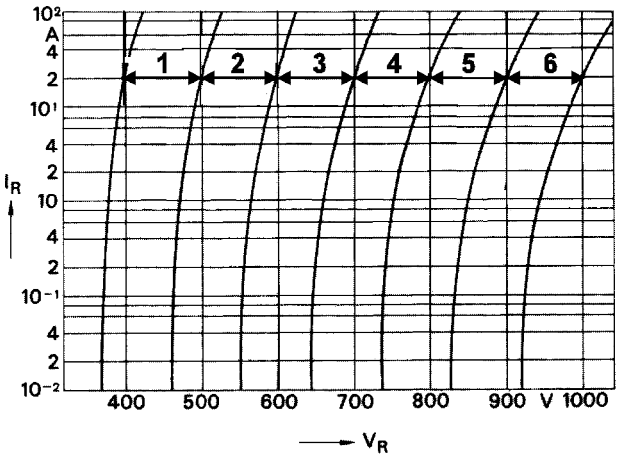
5SSB 50X0400 - 5SSB 20X1500



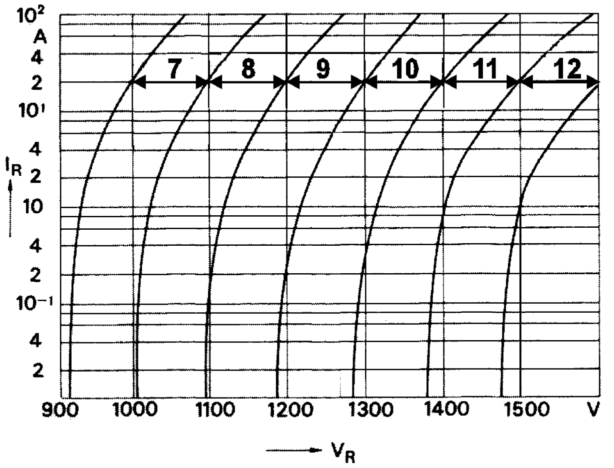
5SSB 30X1600 - 5SSB 20X3100



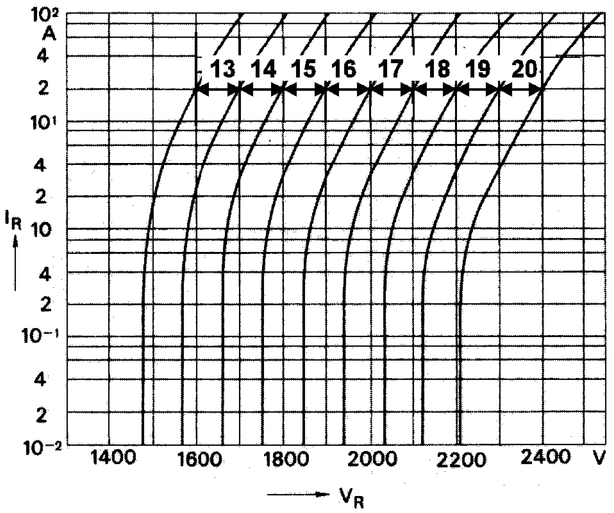
Product of max. admissible square wave current I_{RRM} and avalanche voltage V_R in function of pulse width t_p; parameter is the repetition frequency. Case temperature $T_c \leq 60$ °C.



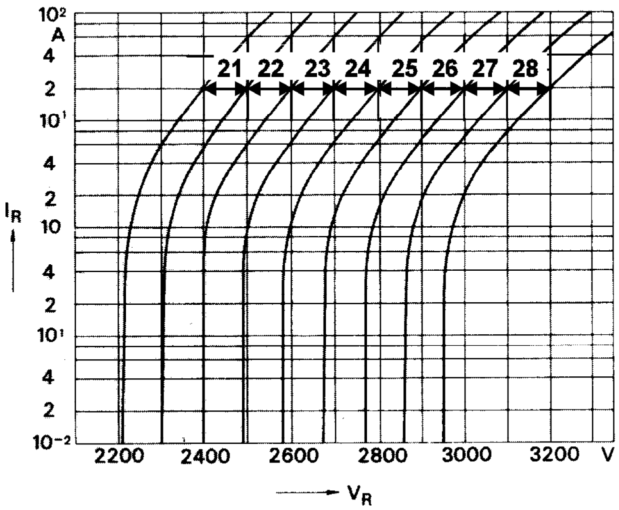
1 5SSB 50X0400
2 5SSB 50X0500
3 5SSB 38X0600
4 5SSB 38X0700
5 5SSB 30X0800
6 5SSB 30X0900



7 5SSB 26X1000
8 5SSB 26X1100
9 5SSB 23X1200
10 5SSB 23X1300
11 5SSB 20X1400
12 5SSB 20X1500

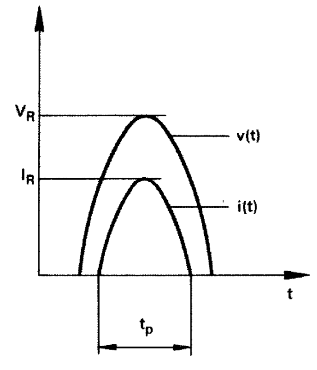


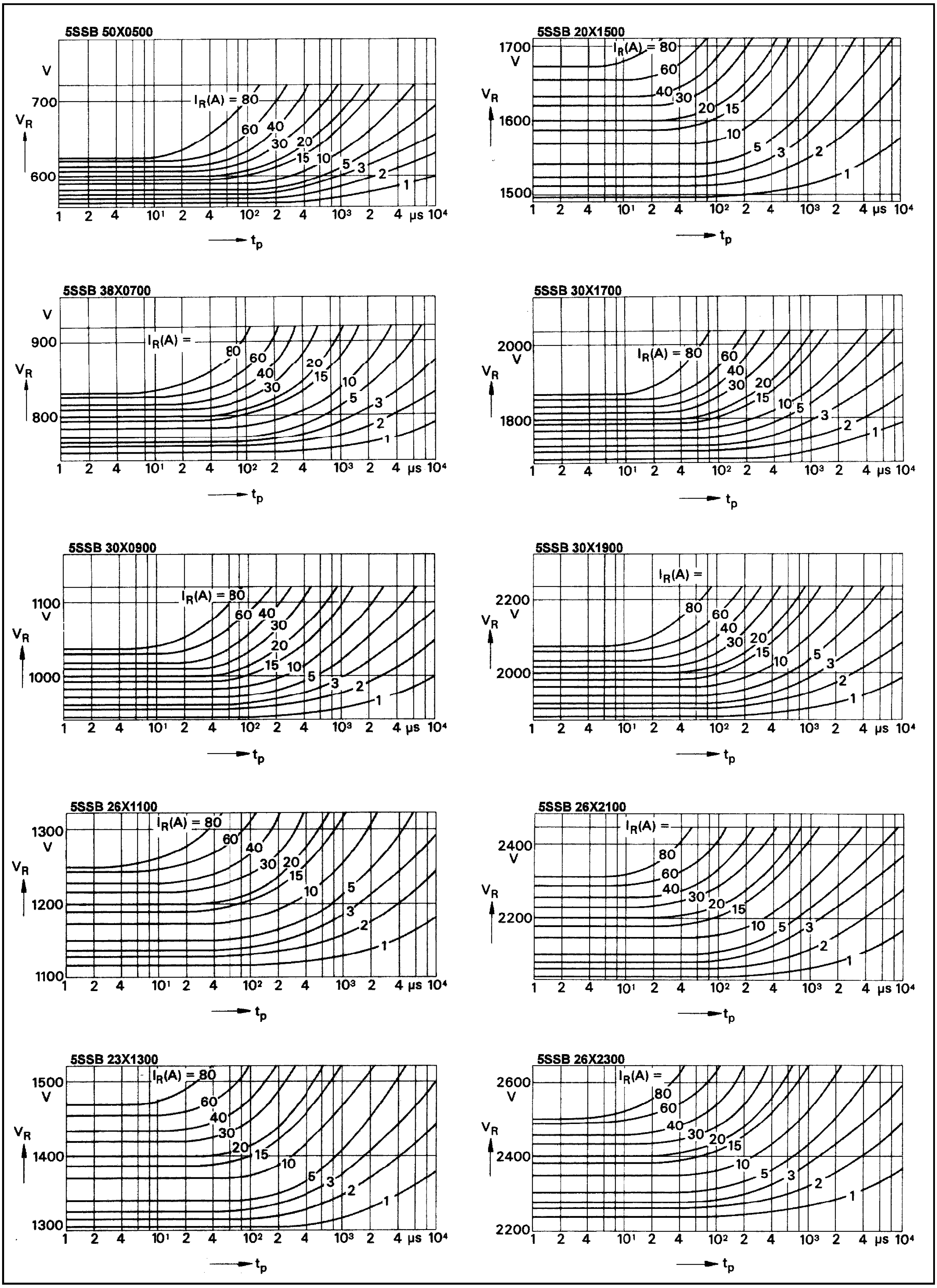
13 5SSB 30X1600
14 5SSB 30X1700
15 5SSB 30X1800
16 5SSB 30X1900
17 5SSB 26X2000
18 5SSB 26X2100
19 5SSB 26X2200
20 5SSB 26X2300



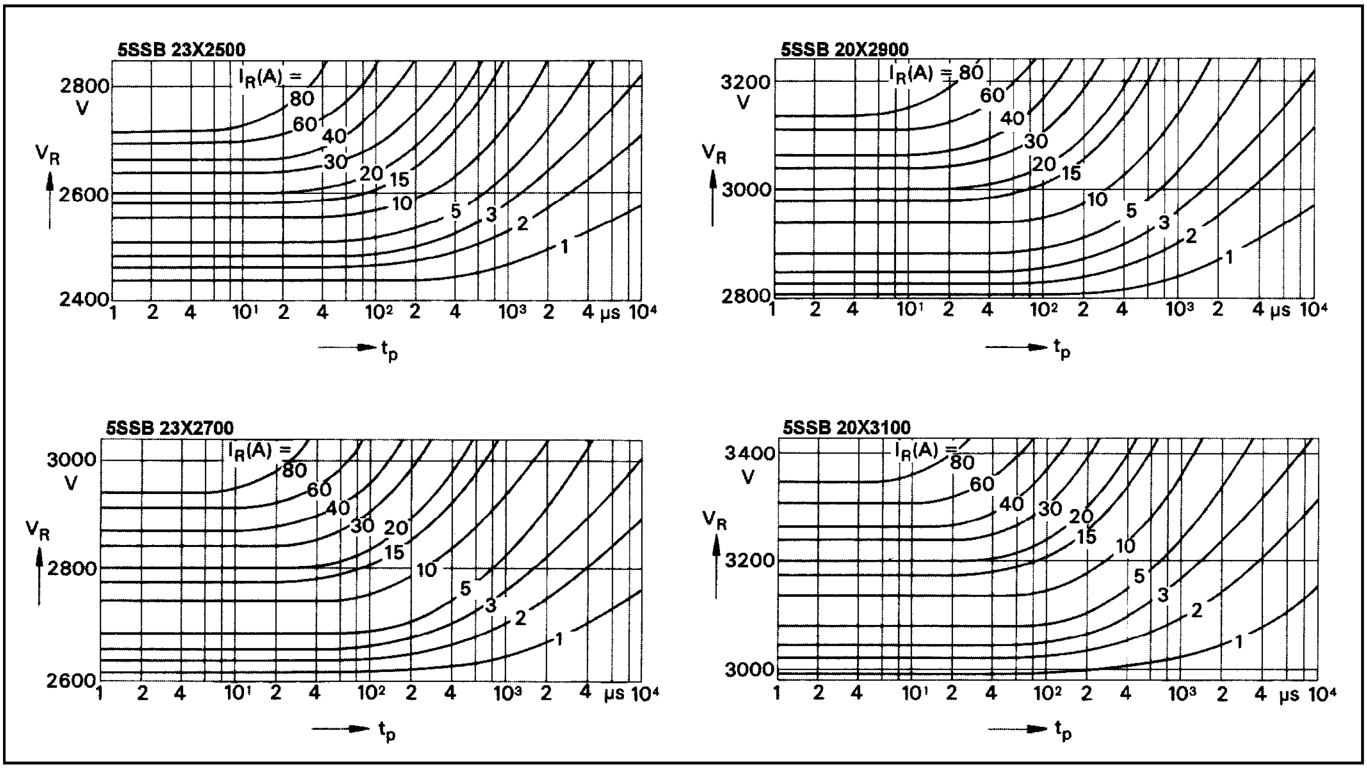
21 5SSB 23X2400
22 5SSB 23X2500
23 5SSB 23X2600
24 5SSB 23X2700
25 5SSB 20X2800
26 5SSB 20X2900
27 5SSB 20X3000
28 5SSB 20X3100

Avalanche current I_R in function of the avalanche voltage V_R for single sine wave pulses of base width $t_p \leq 20\mu s$. T_{vj} = 60 ºC.





Avalanche voltage V_R vs. base width t_p for a single sine half wave current with peak I_R as parameter. T_{vj} = 60 ºC.



Avalanche voltage V_R vs. base width t_p for a single sine half wave current with peak I_R as parameter. T_{vj} = 60 ºC.

Advantages of the 5SSB ..R Surge Voltage Suppressors:

- Sharp avalanche-knee: small safety factor (≤ 1.2) for the protected thyristor required, very small leakage currents at 0.8 x V_R; that means higher operating voltages or cost reduction by using thyristors with lower blocking voltage.
- Immediate «turn-on», no dangerous overshoot as seen e.g. with varistors, thereby clear and safe protection against overvoltages. RC-snubber can be smaller (smaller losses, cheaper), approx. 50-100 nF/100 Ω, to damp RFI oscillations. By using 5SSB, a matching of power thyristors can in most cases be avoided.
- 5SSB can be heat sunk and is therefore ideal to protect against repetitive surges. There is no aging, e.g. as compared to varistors (limited number of surges, deterioration of electrical data). The temperature coefficient is the same for both 5SSB and protected thyristor.
- In case of a thermal overload, the 5SSB produces always a short circuit, thus still protecting the thyristor.

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