SP030A(B)(C) THRU SP345A(B)(C)

SIDAC PROTECTOR

SOLID STATE OVERVOLTAGE PROTECTOR

GENERAL DESCRIPTION

JF' SIDAC PROTECTORS (SP)are devices used to protect sensitive IC's from electrical disturbances caused by lighting and AC power cross conditions. The structure and characteristics of the thyristor are used to create an over-voltage protection device with precise and repeatable characteristics. SP have been chosen firstly in modern communications system to avoid lightning. The SP operates much like a switch. In off-state.The device presents a leakage current (I_{DRM}) less Than 2A making it invisible to the circuit it is protecting. As a transient voltage exceeds the SP V_{DRM}. the device will begin to enter its protective mode with characteristics similar to an avalanch diode. Then, once the current exceeds its switching current, its voltage decrease to turn-on voltage (V_T) with most transient current passing through this parallel circuit so the sensitive circuit is protected. After transient, the current decreases to I_H or below, the SP will reset and return to high off-state impedance. The SP turn-on voltage V_T is very smaller compared with other clipping protection device. SP can be used repeatly and can not degenerate because of no consumption.

Please consult us for more information about applications

FEATURES

The SP is the predominant choice for today's telecom needs because it offers absolute surge suppression regardless of the surge current level and rate of applied voltage(dv/dt)unlike other devices, The SP:

- Can not be damaged voltage
- Eliminates the hysteresis and heat dissipation typically found with a clamping device
- Eliminates voltage overshoot caused by fast rising transients
- Is non-degenerative
- Will no fatigue
- Has negligible capacitance making it ideal for high speed transmission equipment

APPLICATIONS

When protecting telecommunication circuits the SP is connected across the TIP-Ring interface for metallic protection and the Tip-Ring-Groind interface for longitudinal protection, typically behind some type of current limiting device such as fuse. Common applications are:

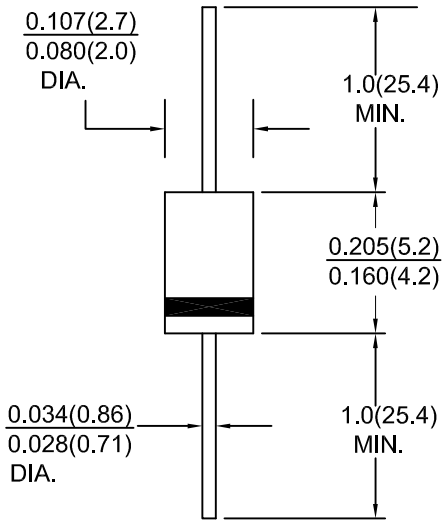
- Central office line cards.
- T-1/E-1,ISDN,and DSL transmission equipment
- Customer Premise Equipment(CPR)such as phones, modems, and caller ID adjunct boxes.
- PBX's,KSU's and other switches.
- Primary protection including main distribution frames, 5-pins modules, building entrance equipment and station protection modules

Other applications that use SP are data lines, security systems, CATV line amplifiers& power inserters. The SP is also used to protect solenoids in sprinkler systems and thyristors such as SCR's and triacs in motor speed controls. It should be noted though that when used in these applications. The short circuit AC current of the circuit being protected can not exceed the AC current ranting of the SP, and the short circuit DC current must be below the minimum holding current (I_H) of the SP(in order to reset),

SP030A THRU SP345A
SP030B THRU SP345B
SP030C THRU SP345C

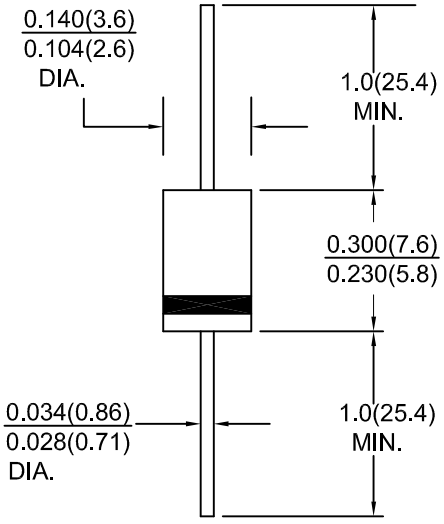
SIDAC PROTECTOR (SOLID STATE OVERVOLTAGE PROTECTOR)

DO-41



Suffix"A" for DO-41

DO-15



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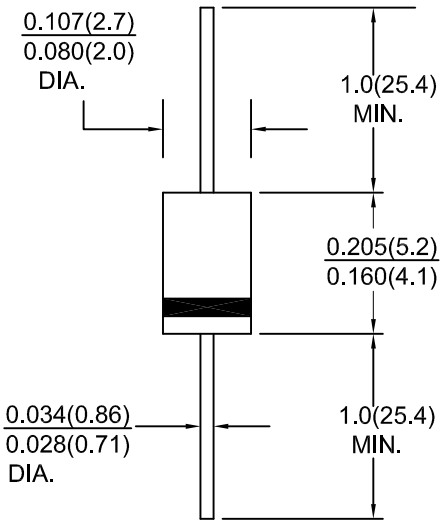
DO-204AL(DO-41)



Suffix"C" for DO-201AD

Dimensions in inches and (millimeters)

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Rating at 25° C ambient temp. unless otherwise specified.

Single phase, half sine wave, 60 Hz, resistive or inductive load.

For capacitive load, derate current by 20 %.

Characteristic	Symbol	SP 030A	SP 064A	SP 100A	SP 120A	SP 120A	SP 150A	SP 220A	SP 240A	SP 270A	SP 320A	Units
		SP 030A	SP 064A	SP 100A	SP 120A	SP 120A	SP 150A	SP 220A	SP 240A	SP 270A	SP 320A	
		SP 030A	SP 064A	SP 100A	SP 120A	SP 120A	SP 150A	SP 220A	SP 240A	SP 270A	SP 320A	
Breakover Voltage Max. (Instantaneous Clamping Voltage)	V_{BO}	27	58	90	120	135	170	190	220	275	300	Volts
Breakover Voltage Mini. (Instantaneous Clamping Voltage)	V_{BO}	36	70	125	145	165	225	265	300	350	400	Volts
Minimum Blocking Voltage	$V_{DRM.}$	20	50	75	95	110	140	160	180	200	240	Volts
Maximum Peak off - stat Current at V_{DRM}	$I_{DRM.}$	2.0										mAmps
Maximum Continue off - stat DC or RMS Current	I_T	0.1										Amps
Minimum Holding Current	I_H	150										mAmps
Peak on - stat Current at I_T=1A	V_{TM}	5.0										Volts
Typical Switching Current	I_S	250										mAmps
Typical Junction Capacitance	C_O	100	60		30		40					PF
Maximum Peak Pulse Current 10x160ms ($T_J \leqq 150$ ℃)	I_{PP}	100(SPXXXA)			150(SPXXXA)			200(SPXXXA)				Amps
Maximum Peak Pulse Current 10x560ms ($T_J \leqq 150$ ℃)	I_{PP}	50(SPXXXA)			100(SPXXXA)			150(SPXXXA)				Amps
Maximum Peak Pulse Current 10x1000ms ($T_J \leqq 150$ ℃)	I_{PP}	50(SPXXXA)			60(SPXXXA)			90(SPXXXA)				Amps
Peak one Cycle Sin Surge Current 50Hz/60Hz	I_{TSM}	16.7/20(SPXXXA) 25/30(SPXXXB) 50/60(SPXXXC)										Amps
Maxmum Cirtical Rate of Rise of on-state Current A / mA	DI/dt	100										
Operating Junction temperature range	T_J	-40 to+150										℃
Storage temperature range	Tstg	-65 to+150										℃

Notes:
1.All measurements are at 60Hz with resistive load at ambient temperature of+25 C unless otherwise specified.
2.Storage temperature range(T_{STG}) is -65°C to +150 C
3.Junction temperature range(T_J) is -40 C to +150 C
4.Lead solder temperature is a maximum of the +230 C for 10 seconds , 0.375"(9.5mm)lead length
5.All SP's are bidirectional and all electrical parameters apply to both the forward and reverse polarities
6.All SP's meet the surge requirements of the following standards

CCITTK17-20	10/700mA	1.5KV
	5/310mA	38A
VDE0433	10/700mA	2KV
	5/200mA	50A
CENT	0.5/700mA	1.5KV
	0.2/310mA	38A

QUALITY ASSURANCE

Test Description	Conditions	Comments
Surge (Ipp)	Rated Current	Repeated 2 times in the normal sequence of testing
Breakover Voltage(V_{BO})	V_{BO} in forward and reverse directions	All devices fully characterized on voltage to ensure proper operation and reliability
Holding Current(I_H)	Measured for the rated minimum value	Measured for the rated minimum value
Peak On-state Voltage(V_T)	Measured with 1 amp RMS or DC current	Measured with 1 amp RMS or DC current
Leakage Current(I_{DRM})	Measured at 80% of Rated V_{BO}	Measured at 80% of Rated V_{BO}

FIG.1A-Pulse WaveForm (10X1000 ms)

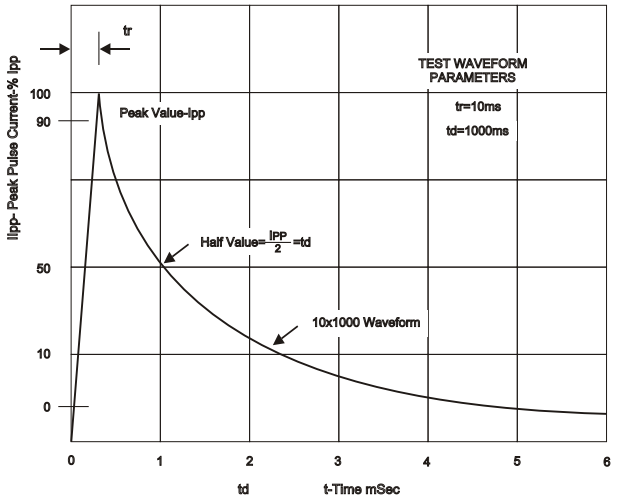


FIG.1B-Pulse Wave Form (10X560 ms)

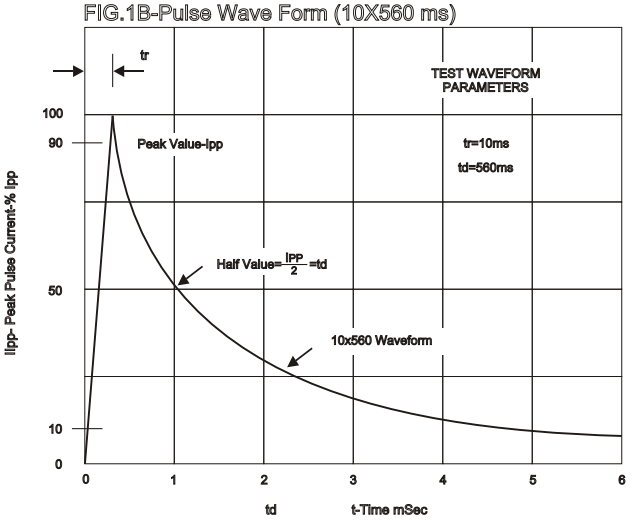


FIG.1C-Pulse WaveForm (10X160 ms)

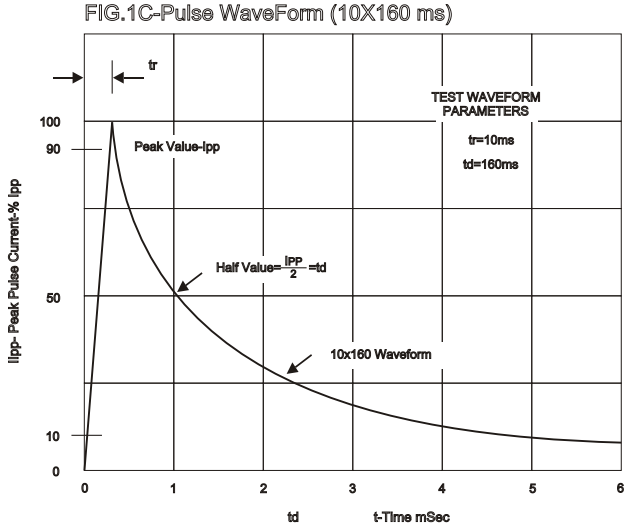


FIG.2-Normalized DC Holding Current vs Case Temperature

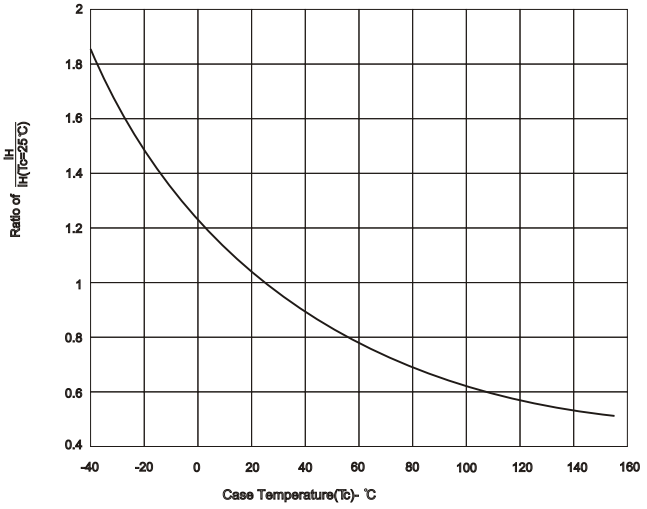


FIG.3A-V-I Characteristics of Devices with Negative Resistance

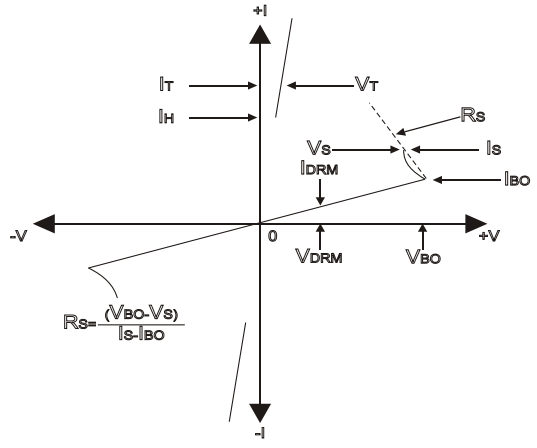


FIG.3B-V-I Characteristics of Devices with Positive Resistance

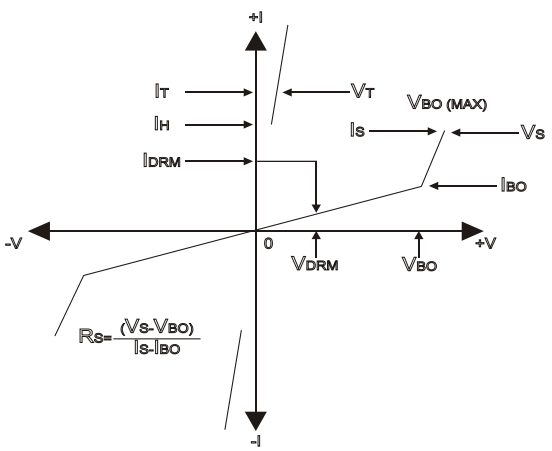


FIG.4-Normalized VBO Change Junction Temperature

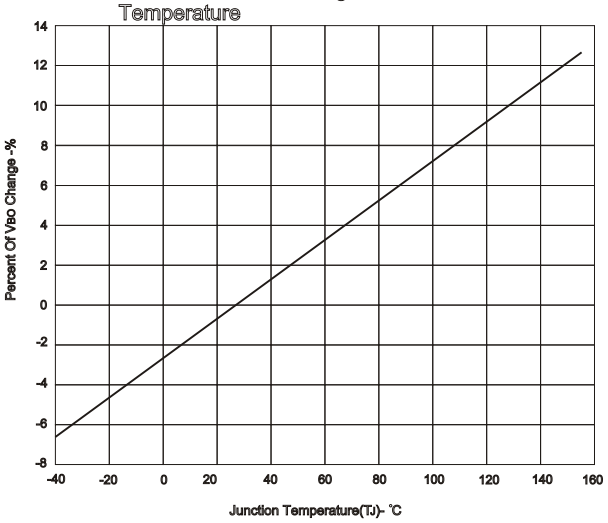


FIG.5-Normalized Repetitive Peak Off-State (Leakage)Current Vs Junction Temperature

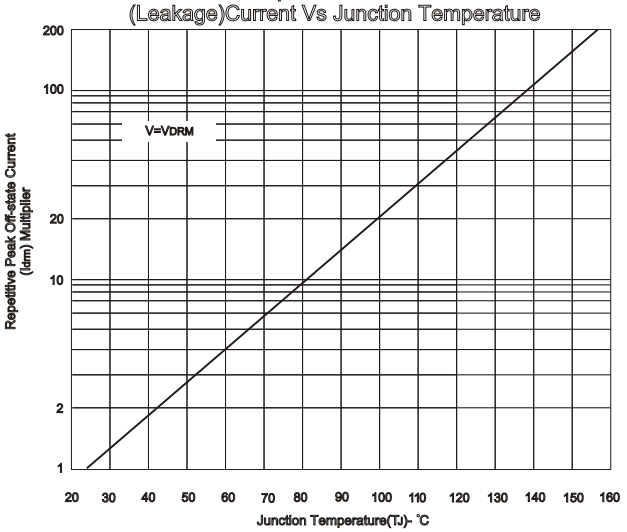


FIG.6-Peak On-State Voltage Vs Peak On-State Current

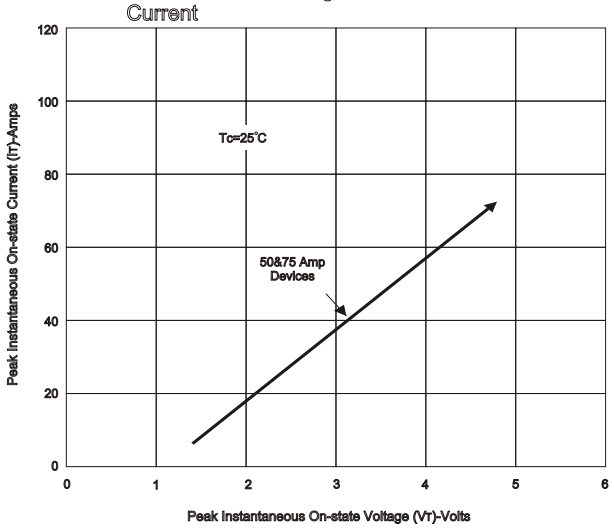
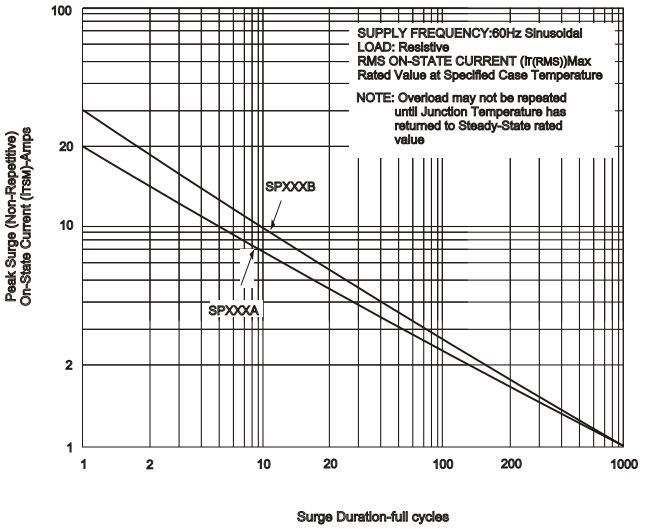


FIG.7-Peak Surge On-State Current Vs Surge Current Duration



APPLICATIONS NOTES:

1.HOW TO CHOICE A SIDAC PROTECTOR

When selecting a SIDAC PROTECTOR, The following criteria should be used:

(1)Off-state voltage(V_{DRM})

The V_{DRM} of the SP must be greater than maximum operating voltage of circuit that SP is protecting.

For example: a POTS (Plain Old Telephone Service) application, convert the maximum operating ring(150VEMS)to a peak voltage and add the maximum DC bias of the central office battery,

$$V_{DRM} > 268.8V$$

(2)Switching voltage(Vs)

The Vs of the SP should be equal to or less than the instantaneous peak voltage rating of the component it protecting.

For example: $V_S \leq V_{relay\ breakdown}$

(3)Peak Pulse Current (I_{PP})

For circuits that do not require additional series the surge current rating(I_{PP})of the SP should be greater than or equal to the surge current associated with the lightning tests of the applicable Regulatory requirement(I_{PK})

$$I_{PP} \geq I_{PK}$$

For circuits that utilize additional series resistance , the surge current ratings(I_{PP})of the SP should be greater than or equal to the available surge currents associated with the lightning immunity tests of the applicable Regulatory requirement($I_{PK(available)}$)

$$I_{PP} \geq I_{PK\ (available)}$$

The maximum available surge current is calculated by dividing the peak surge voltage(V_{PK})by the total circuit impedance(R_{TOTAL})

$$I_{PK(available)}=V_{PK}/R_{TOTAL}$$

For longitudial surges(TIP-GND,RING-GND), R_{TOTAL} is calculated for both TIP and RING

$$R_{source}=V_{PK}/I_{PK}$$

$$R_{TOTAL}=R_{TIP}+R_{source}$$

$$R_{TOTAL}=R_{RING}+R_{source}$$

For metallic surges(TIP-RING):

$$R_{source}=V_{PK}/I_{PK}$$

$$R_{TOTAL}=R_{TIP}+R_{source}+R_{RING}$$

For example 1: the type A surge requirement of bellcore 1089 with 30 W on Tip and 30 W on ring,

I_{PK}=100A, 10X1000 mS

For example 2: The surge requirement of bellcore 1089 with 30 W on Tip and 30 W on ring,

I_{PK}=100A, 10X1000 mS

V_{PK}=1000V

$R_{source}=V_{pk}/I_{pk}=\Omega$

$R_{TOTAL}=R_{TIP}+R_{source}=\Omega$

$I_{PK(available)}=V_{PK}/R_{TOTAL}=1000V/40 \quad =25A$

$I_{PP}>25A$

4.Holding Current(I_H)

Because FCC Part 68.306.A.8.iii specifies that registered terminal equipment not exceed 140mA of DC current per conductor under short circuit conditions. The holding current of the SP is set at 150mA.

For special design criteria , The holding current (IH) of the SP must be greater than the DC current that can be supplied during an operational and short circuit condition.

5.Off-state Capacitance(Co)

Assuming that the criteria point of insertion loss is 70% of the original signal level value, The SP can be used in most applications with transmission speeds of up 30MHz. If transmission speeds greater than 30MHz, a compensation circuit may be required.

2.The response speed comparison between Gas Discharge Tubes(GDTs), MOV's TVS diodes and SIDAC PROTECTOR (SP)

The axial represents the dv/dt(rise in voltage with respect to time) applied to each protector, and the Y axial represents the maximum voltage drop across each protector (A norminal stand-off voltage ratings of 230V is supposed)