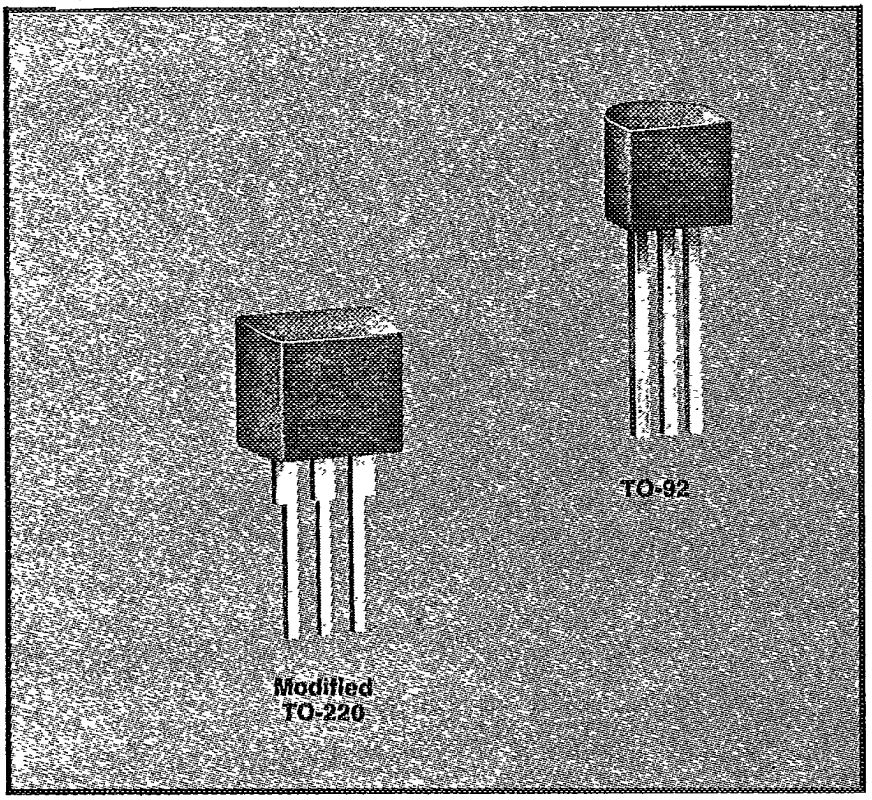
T-25-05



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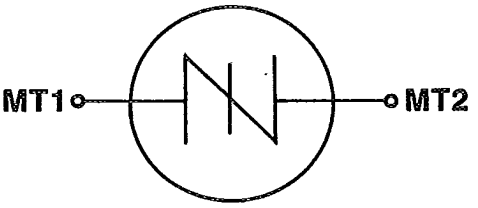


SIDACtor™ (60-660 Volts)

General Information

The Teccor SIDACtor is a transient surge protector with clamping voltage ranges of 60 to 660 Volts. The SIDACtor can also be supplied in multiple chip packages. Surge current ratings are from 150 Amps to 500 Amps (8X20μs).

Upon application of a voltage exceeding the SIDACtor breakover voltage point, the SIDACtor switches on through a negative resistance region to a low on-state voltage. Conduction will continue until the current is interrupted or drops below the minimum holding current of the device.

If your electronic equipment is being protected by zener diodes, gas discharge tubes, MOV's, or other types of protectors, you are taking unnecessary risks. The Teccor SIDACtor offers longer life and faster response than other types of protection.

The bidirectional SIDACtor is ideal for protecting electronic equipment (Telecommunications, computers, instrumentation, etc.) from lightning, line transients, and other damaging high voltage spikes. The SIDACtor can be tailored to meet specific application requirements.

The SIDACtor is normally connected between the high side of the circuit to be protected and common. As long as the voltage being monitored remains below the specified level, the SIDACtor presents a high off-state impedance (leakage current $\leq 10\mu$A).

When the monitored voltage exceeds the specified level (clamping voltage), the SIDACtor starts clamping in a nanosecond or less.

The SIDACtor is faster than other currently used devices or methods and is able to respond without voltage overshoot. Conventional gas discharge tubes, carbon arrestors, and MOV's are all slow to respond and allow significant voltage spikes above the clamping voltage before they begin to conduct. The SIDACtor is as fast as a zener diode, while offering a much lower impedance during conduction and can handle much more current and it's bidirectional!

Tape-and-reel packaging is available for both TO-92 and TO-220 packages.

Features

- **Bidirectional Transient Voltage Protection**
- **Breakover Voltages from 60-660 Volts**
- **Clamping speed of nanoseconds**
- **Multiple Chip Packages**
- **Electrically Isolated Packages**
- **Surge Current Capabilities Up to 500 Amps**
- **Glass-Passivated Junctions**

SIDACtor™

The New Standard in Surge Protection

If your electronic equipment uses zener diodes, gas discharge tubes, MOV's, or other methods of transient surge protection, you are taking unnecessary risks.

The Teccor SIDACtor provides reliable transient surge protection for electronic equipment (telecommunications, computers, instrumentation, etc.) from lightning, line transients, and other damaging voltage spikes.

The SIDACtor is normally connected between the high side of the circuit to be protected and common. When the monitored voltage exceeds the Breakover Voltage (clamping voltage), the SIDACtor switches on through a negative resistance region to a low on-state voltage in nanoseconds.

The SIDACtor will continue to conduct until the current is interrupted or drops below the minimum holding current of the device.

The SIDACtor is faster than other currently used devices or methods and begins clamping without damaging voltage overshoot. Gas discharge, carbon arrestors and MOV's are all slow to respond and allow significant voltage spikes above the clamping voltage before they begin to conduct. The SIDACtor is as fast as a zener diode, provides a much lower impedance during conduction, handles much more current, and is bidirectional!

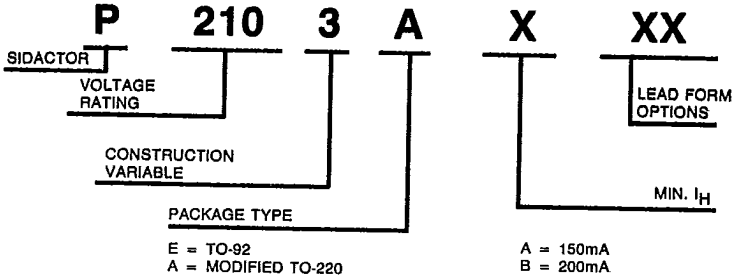
Teccor's unique multi-chip packaging* also offers complete protection of all circuit legs with a single package.

Features

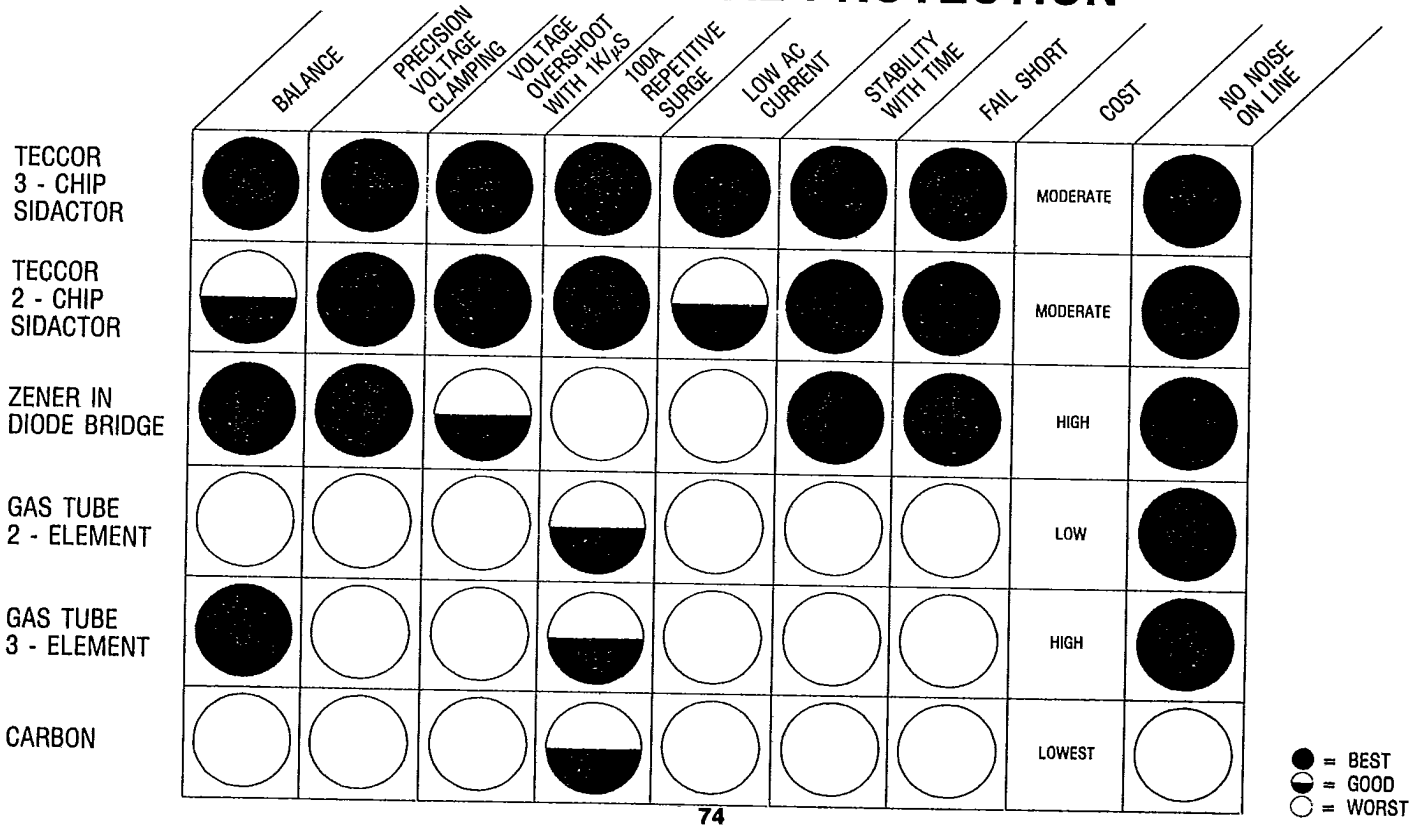
- **Bidirectional Transient Voltage Protection**
- **Breakover Voltages from 60-660 Volts**
- **Clamping speed of nano seconds**
- **Multiple Chip Packages***
- **Electrically Isolated Packages**
- **Surge Current Capabilities Up to 500 Amps**
- **Glass Passivated Junctions**

* Patent Pending

PART NUMBER DEFINITION

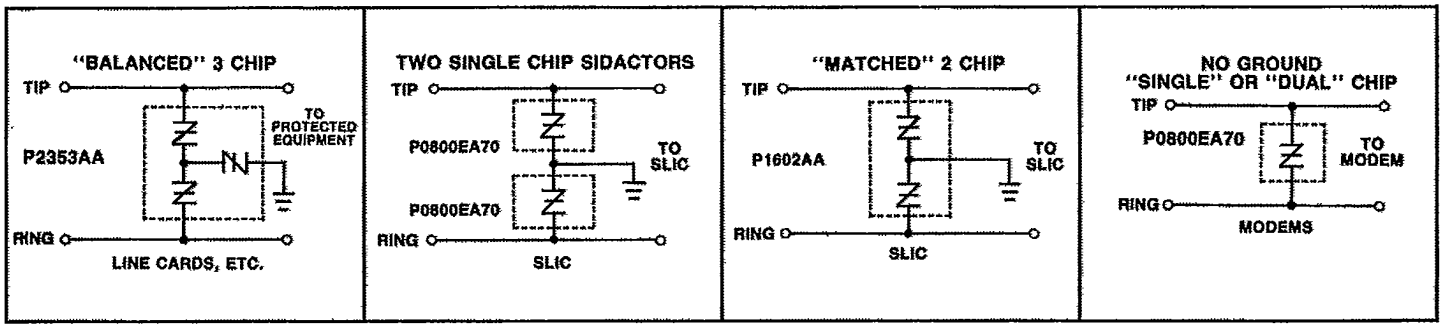


SIDACTOR VERSUS TRADITIONAL PROTECTION

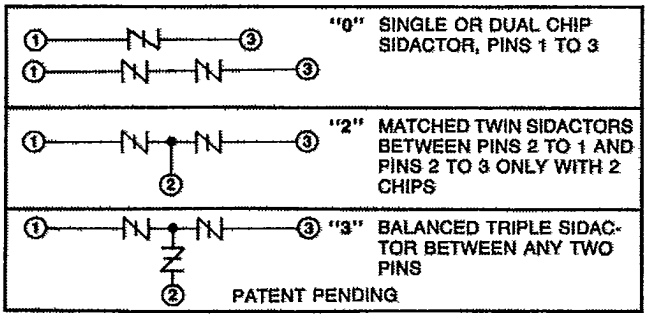


SIDACTOR™

Typical Telecommunications Applications of SIDACTORS as Transient Protection



CONSTRUCTION VARIABLE



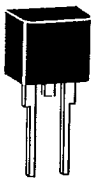
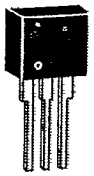
100% Testing is a constant monitor for Quality Assurance

Test Description	Condition	Comments
1. Surge (Ipp)	10 x 1000 Rated Current	Repeated four times in the normal sequence of testing.
2. Breakover Voltage (V_{BO})	V_{BO} and absolute peak in forward and reverse directions (100V/μsec load line)	All devices fully characterized on voltage to insure proper operation and reliability.
3. Holding (I_H) Current	Measured for a minimum and maximum value as rated	This insures proper delatch (turn-off) after surge current condition.
4. Peak On-State Voltage (V_{TM})	Measured with 1 Amp Peak or DC current	
5. Leakage Current	Breakover leakage and off-state leakage	These tests insure long term reliability.

Environmental and life tests are constantly being performed on the Sidactor to confirm long-term reliability. Listed below are some of these tests.

Test Description	Conditions	Comments
1. High Temperature Storage	+150°C for 250 hrs., no bias, post tested to confirm 25°C electrical specifications.	The epoxy encapsulated Sidactors are transfer molded making them extremely tough and durable.
2. Temperature Cycling	- 40°C to +125°C, 30 minute dwell at all extremes with 40 minute transfer time, for 500 cycles, no bias, post tested to confirm initial 25°C electrical specifications.	Exceeds normal telecommunication's temperature requirements.
3. Thermal Shock (Liquid to Liquid)	0°C to +100°C, 15 seconds dwell time at extremes.	
4. Blocking (Off-State) Voltage Test	+125°C for 500 hours minimum with 80% of rated V_{BO} supplied as bias then post tested to confirm initial 25°C electrical specifications.	Teccor's glass passivated junctions insure long term blocking capability.
5. Flammability	The epoxy encapsulated body passes U.L. 94VO requirements.	The epoxy used in the molded Sidactor is U.L. recognized.
6. High Voltage, High Current Life Testing (Power Burn-In)	Repeated surging of devices at rated V_{BO} discharging capacitors (I_{pp}) for ≥10K surge cycles.	This is a repetitive surge current and voltage life test where often devices are tested for ≥50K surges.
7. Humidity Life Test	85% RH, +85°C for 100 hrs. minimum post tested to confirm initial 25°C electrical specifications.	Industry standard test for molded epoxy package devices.
8. Highly Accelerated Stress Testing (HAST)	Autoclave for 2 hours at +121°C. Post tested to confirm initial 25°C electrical specifications	This is a pressure cooker or "steam-bomb" test to further show integrity of the epoxy packages.

SIDACtor™ Electrical Specifications

Package TYPE	Package	Part Number	V_{BO} Breakover Voltage (Instantaneous Clamping Voltage) (1) (5) PINS 1 to 3 Volts MIN	V_{BO} MAX	V_{BO} Breakover Voltage (Instantaneous Clamping Voltage) (1) (5) PINS 2 to 3 PINS 2 to 1 Volts MIN	V_{BO} MAX	I_{BO} Breakover Current 60Hz Sine Wave μAmps MAXIMUM	V_{DRM} Repetitive Peak Off-State Voltage (2) (4) (6) PINS 1 to 3 Volts MINIMUM	I_{PP} Repetitive Peak Pulse Current $T_J \leq 125°C$ (7) (12) Amps 8x20μS MAX	10x160μS MAX	10x1000μS MAX	I_{TS} Peak Cyc (Sinus Surge ((1(Am 60Hz
E TYPE 70	 TO-92 (Isolated)	P0800EA70	60	95			200	± 50	200	150	75	30
		P1100EA70	90	125			200	± 75	150	100	50	30
		P1300EA70	120	145			200	± 95	150	100	50	30
		P1500EA70	135	165			200	±110	150	100	50	30
A TYPE 61	 Modified TO-220 (Isolated)	P2000AA61	190	215			200	±150	150	100	50	30
		P2200AA61	205	230			200	±165	150	100	50	30
		P2400AA61	220	250			200	±175	150	100	50	30
		P2500AA61	240	280			200	±190	150	100	50	30
		P3000AA61	270	330			200	±215	150	100	50	30
		P3300AA61	300	360			200	±240	150	100	50	30
A	 Modified TO-220 (Isolated)	P1602AA	120	190	60	95	200	± 50 (10)	400 (9)	300 (9)	150 (9)	30
		P2202AA	190	250	95	125	200	± 75 (10)	300 (9)	200 (9)	100 (9)	30
		P2702AA	240	300	120	150	200	± 95 (10)	300 (9)	200 (9)	100 (9)	30
		P3002AA	280	320	140	160	200	±110 (10)	300 (9)	200 (9)	100 (9)	30
		P1602AB	120	200	60	100	200	± 50 (10)	500 (9)	300 (9)	200 (9)	60
		P2202AB	190	250	95	125	200	± 75 (10)	500 (9)	300 (9)	200 (9)	60
		P2702AB	240	300	120	150	200	± 95 (10)	500 (9)	300 (9)	200 (9)	60
		P3002AB	280	320	140	160	200	±110 (10)	500 (9)	300 (9)	200 (9)	60
		P4802AB (13)	440	520	220	260(13)	200	±175 (10)	500 (9)	300 (9)	200 (9)	60
		P6002AB (13)	540	660	270	330(13)	200	±215 (10)	500 (9)	300 (9)	200 (9)	60
		P1553AA	140	170	140	170	200	±110 (10)	400 (9)	300 (9)	150 (9)	30
		P2103AA	180	240	180	240	200	±145 (10)	300 (9)	200 (9)	100 (9)	30
		P2353AA	210	265	210	265	200	±170 (10)	300 (9)	200 (9)	100 (9)	30
		P2703AA	240	300	240	300	200	±190 (10)	300 (9)	200 (9)	100 (9)	30
		P1553AB	140	170	140	170	200	±110 (10)	500 (9)	300 (9)	200 (9)	60
		P2103AB	180	240	180	240	200	±145 (10)	500 (9)	300 (9)	200 (9)	60
		P2353AB	210	265	210	265	200	±170 (10)	500 (9)	300 (9)	200 (9)	60
		P2703AB	240	300	240	300	200	±190 (10)	500 (9)	300 (9)	200 (9)	60
		P3403AB	300	380	300	380	200	±240 (10)	500 (9)	300 (9)	200 (9)	60

GENERAL NOTES

- All measurements are made at 60Hz with a resistive load at an ambient temperature of +25°C unless otherwise specified.
- Storage temperature range (T_S) is -65°C to + 150°C.
- The case temperature (T_C) is measured as shown on the dimensional outline drawings. See "package dimensions" section.
- Junction temperature range (T_J) is -40°C to + 125°C.
- Lead solder temperature is a maximum of + 230°C to 10 seconds maximum: ≥ 1/16" from case.

ELECTRICAL ISOLATION

Teccor's electrically isolated TO-92 and modified TO-220 Sidactor will withstand a high potential test of 1600 VAC RMS from leads to case over the operating temperature range.

SIDACtor™ Electrical Specifications

²t	I_T	I_H		V_{TM}	V_{TM}	t_C	C_O	dv/dt	R θ jC	R θ jA	di/dt
Surge :petitive) ı Current 'eriod of sec for sing	Continuous On-State DC or RMS Current (8)	Holding Current (3) (11)		Peak On-State Voltage I_T = 1 Amp PINS 1 to 3 (14)	Peak On-State Voltage I_T = 1 Amp PINS 2 TO 3 PINS 2 TO 1 (14)	Clamping Speed (11)	Off-State Capacitance @IKHz 1v with 50 Vdc Bias PINS 1 to 3	Critical Rate of Rise of Off-State Voltage @Rated $V_{DRM}T_J \leq 125°C$	Thermal Resistance Junction To Case	Thermal Resistance Junction To Ambient	Critical Rate of Rise of On-State Current
s²Sec	Amps	mAmps		Volts	Volts	nSec	pF	Volts/μS	°C/Watt	°C/Watt	Amps/μS
	MAXIMUM	MIN	MAX	MAXIMUM	MAXIMUM	TYPICAL	TYPICAL	MINIMUM	MAXIMUM	MAXIMUM	MAXIMUM
.7	1.0	150	750	1.5		1	40	2500	50	105	150
.7	1.0	150	750	1.5		1	40	2500	50	105	100
.7	1.0	150	750	1.5		1	40	2500	50	105	100
.7	1.0	150	750	1.5		1	40	2500	50	105	100
.7	1.0	150	750	3.0		1	30	2500	12	65	100
.7	1.0	150	750	3.0		1	30	2500	12	65	100
.7	1.0	150	750	3.0		1	30	2500	12	65	100
3.7	1.0	150	750	3.0		1	30	2500	12	65	100
3.7	1.0	150	750	3.0		1	30	2500	12	65	100
3.7	1.0	150	750	3.0		1	30	2500	12	65	100
3.7	1.0	150	750	3.0	1.5	1	30	2500	12	65	150
3.7	1.0	150	750	3.0	1.5	1	30	2500	12	65	150
3.7	1.0	150	750	3.0	1.5	1	30	2500	12	65	150
3.7	1.0	150	750	3.0	1.5	1	30	2500	12	65	150
3.7	1.0	200(15)	750	3.0	1.5	1	60	5000	12	65	200
3.7	1.0	200(15)	750	3.0	1.5	1	60	5000	12	65	200
3.7	1.0	200(15)	750	3.0	1.5	1	60	5000	12	65	200
3.7	1.0	200(15)	750	3.0	1.5	1	60	5000	12	65	200
3.7	1.0	200(15)	750	3.0	1.5	1	60	5000	12	65	100
3.7	1.0	200(15)	750	3.0	1.5	1	60	5000	12	65	100
3.7	1.0	150	750	3.0	3.0	1	30(11)	2500	12	65	150
3.7	1.0	150	750	3.0	3.0	1	30(11)	2500	12	65	150
3.7	1.0	150	750	3.0	3.0	1	30(11)	2500	12	65	150
3.7	1.0	150	750	3.0	3.0	1	30(11)	2500	12	65	150
3.7	1.0	200(15)	750	3.0	3.0	1	40(11)	5000	12	65	200
3.7	1.0	200(15)	750	3.0	3.0	1	40(11)	5000	12	65	200
3.7	1.0	200(15)	750	3.0	3.0	1	40(11)	5000	12	65	200
3.7	1.0	200(15)	750	3.0	3.0	1	40(11)	5000	12	65	200
3.7	1.0	200(15)	750	3.0	3.0	1	40(11)	5000	12	65	200

NOTES TO ELECTRICAL SPECIFICATIONS

(1) See Figure 4 for V_{BO} change vs junction temperature.
(2) See Figure 5 for I_{DRM} vs junction temperature.
(3) See Figure 2 for I_H vs case temperature.
(4) Can also be known as "Stand-Off Voltage"
(5) All devices have a negative resistance slope unless otherwise noted.
(6) I_{DRM} = 10μAmps at rated V_{DRM}.
(7) See Figure 1 (A,B,C) for Pulse Wave Form.
(8) Maximum TC is 75°C for TO-92 and 95°C for TO-220.
(9) Surge rating when two circuits (pins) are in parallel (simultaneous operation) with respect to Pin 2 in a two or three chip constructed sidactor. Rating is 0.5X for only one circuit (pin) with respect to Pin 2.
(10) Between Pins 2 to 1 and Pins 2 to 3.
(11) Between any two pins.
(12) The virtual front duration is 1.25X rise time from 10% to 90% of crest. Virtual zero is defined as the intersection with zero axis of a straight line drawn through points on the front of the current wave of 10% and 90% crest.
(13) These devices have a positive slope prior to switching with a absolute peak breakover of 30 Volts ≥ V_{BO} maximum with a 100 Volts/μS maximum rate of rise voltage. See Figure 3B for V-I characteristics.
(14) Minimum switching resistance is 100Ω. For best Sidactor operation, the load impedance should be near or less than switching resistance.
(15) 260mA minimum I_H is available from the factory on special request.
(16) For more than one full cycle rating, see Figure 8.

SIDACTOR™

Options - Contact your Teccor Sales Representative for additional information

Package Description	Conditions and Figurations
1. Lead-Form TO-92/TO-220	Several standard types of lead-forms are available. Custom lead-forms can also be supplied.
2. Tape & Reel Packing TO-92/TO-220	The Sidactor can be supplied on radial tape and reel. Additionally, the TO-92 may be ammo packed on radial tape.
3. Magazine or Tube Packing Modified TO-220	Each clear plastic magazine or tube holds 50 Sidactors.
4. Fail Safe Mechanism Modified TO-220	Teccor can supply a fail safe mechanism for most short continuous heavy current applications.

FIGURE 1A — Pulse Wave Form (10x1000)

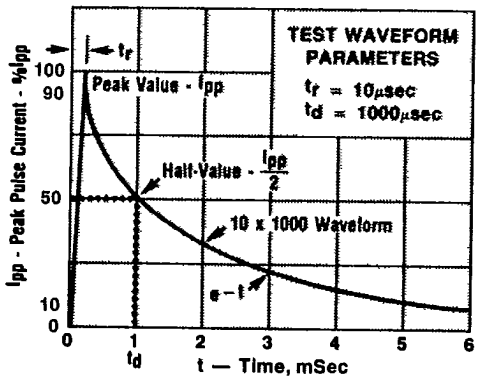


FIGURE 1B — Pulse Wave Form (8x20)

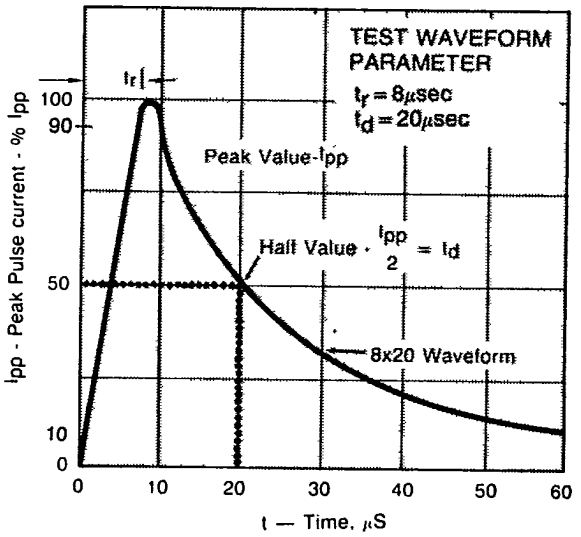


FIGURE 1C — Pulse Wave Form (10x160)

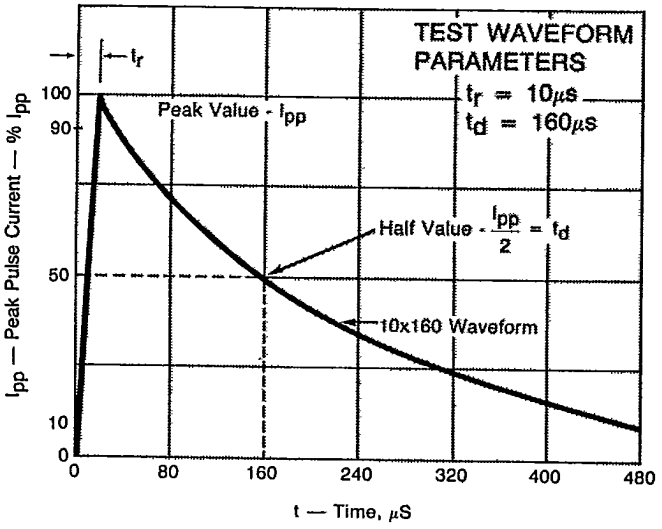
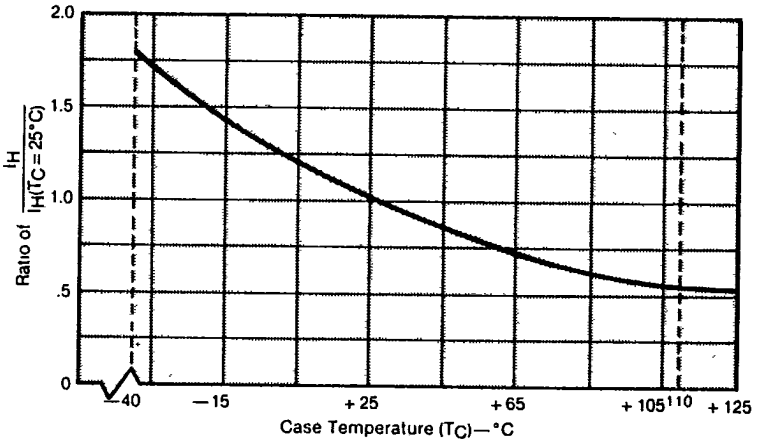


FIGURE 2 — Normalized DC Holding Current vs Case Temperature



SIDACtor™

FIGURE 3A — V-I Characteristics of Devices with Negative Resistance

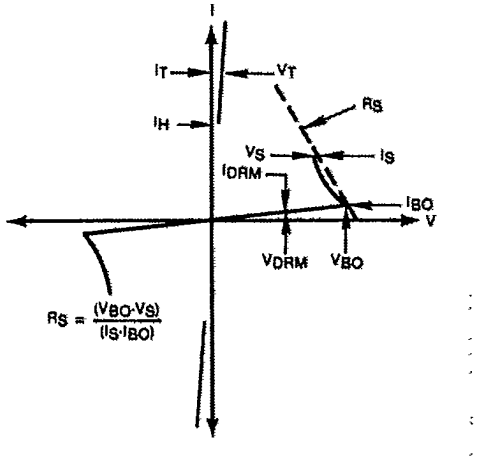


FIGURE 3B — V-I Characteristics of Devices with Positive Switching Slope

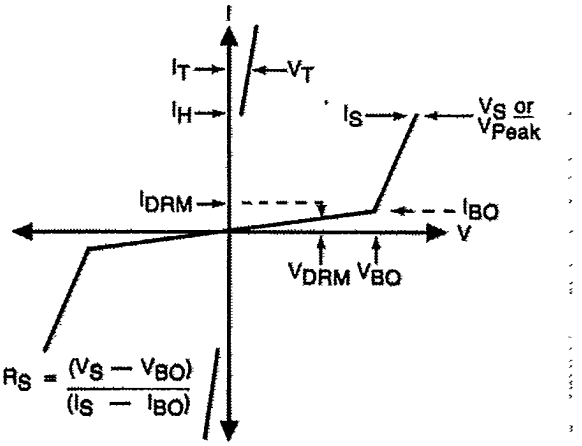


FIGURE 4 — Normalized V_{BO} Change vs Junction Temperature

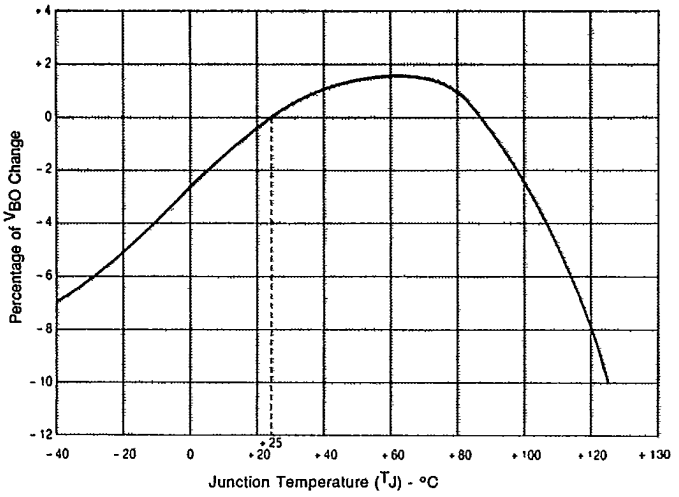


FIGURE 5 — Normalized Repetitive Peak Off-State Current vs Junction Temperature

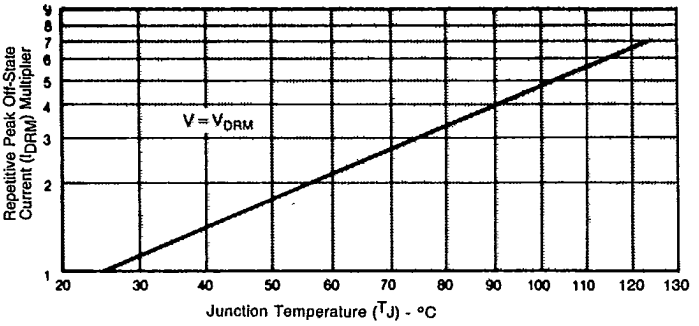


FIGURE 6 — Peak On-State Voltage vs. Peak On-State Current To-92 Sidactors (Typical)

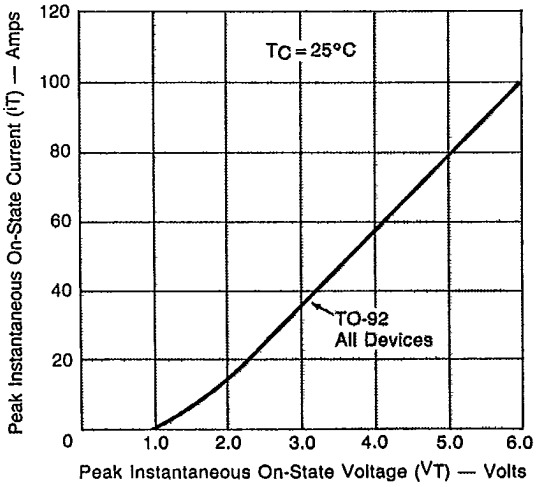
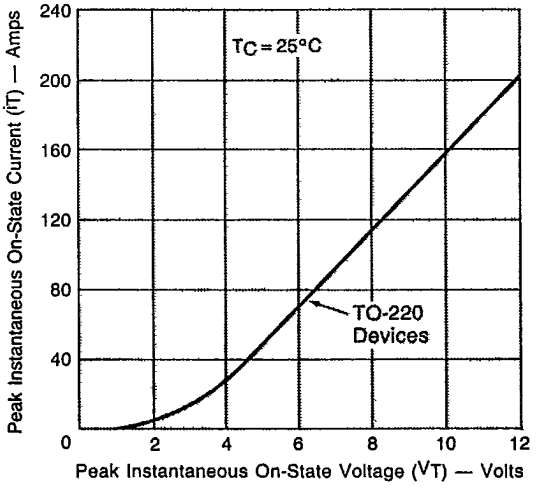


FIGURE 7 — Peak On-State Voltage vs. Peak On-State Current and Multi Chip Sidactors (Typical)



SIDACtor™

FIGURE 8 — Peak Surge On-State Current vs Surge Current Duration