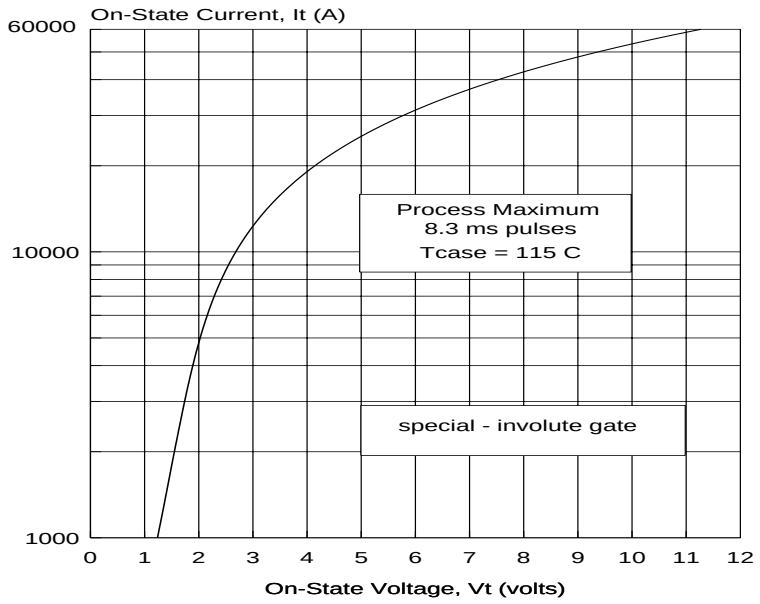
# SPT402 125mm THYRISTOR
# 5000V 4600A

The SPT402 thyristor features a multi-arm involute gate which can be triggered with 5 - 10 A gate pulses by means of an integrated pilot gate or directly fired using 50 - 100A gate pulses. The involute pattern affords full area conduction in minimum time while a corresponding high di/dt rating depends on the choice of gating method. The factory setting for either pilot triggered or gate triggered version, internal to the package, is an option when ordering by keying it to the model number code. The design utilizes a new termination technique, SPCO's revolutioary Light Silicon Sandwich, **LSS** technology, which eliminates heavy refractory metal as a substrate while retaining the alloyed anode interface necessary for high surge current duty. This thyristor is supplied in a **reliable plastic light weight package** allowing the insertion of liquid cooled chillers. Solid copper inserts can be ordered for adjoining air cooled heat dissipators using commercially available clamping hardware.

## ON-STATE CHARACTERISTIC
## Process Maximum

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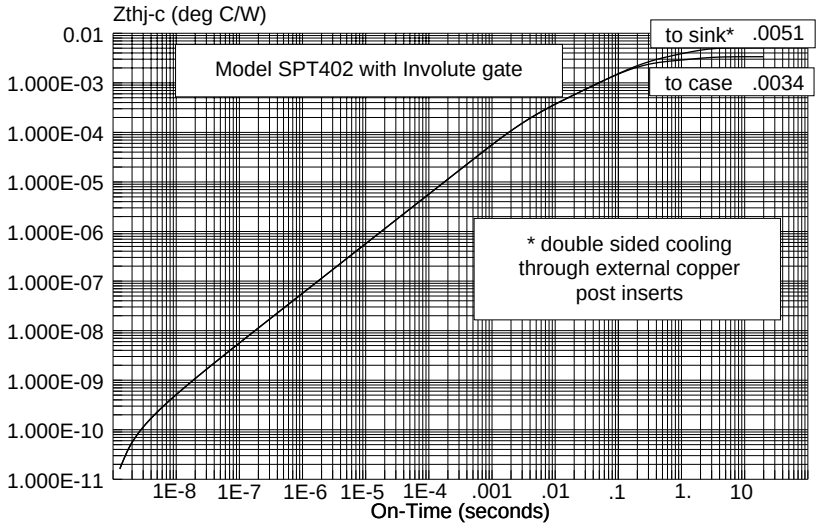
THERMAL IMPEDANCE vs. ON-TIME

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## Maximum Off-State & Reverse Blocking Voltage Ratings

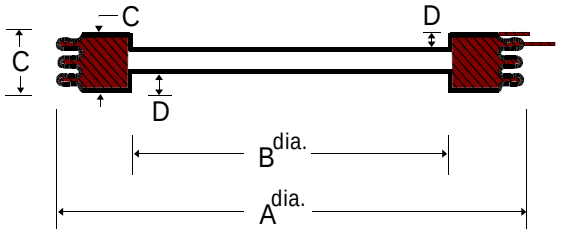
$T_J$ = 0 to 115°C

| | $V_{DRM}$ (volts) | $V_{RRM}$ |
|---|---|---|
| SPT402_HT | 5000 | 5000 |
| SPT402_HS | 4900 | 4900 |
| SPT402_HR | 4800 | 4800 |
| SPT402_HP | 4700 | 4700 |
| SPT402_HM | 4600 | 4600 |
| SPT402_HK | 4500 | 4500 |

Internal gate connection:
Pilot SPT402A (see page 2 for gate drive)
Direct SPT402B " "

External clamping force
25000 lb minimum

Optional external posts drw. # 0215B8315
Ni plated copper, 0.35" thick each
Compressed thickness including external posts
0.87" - 0.88"
Weight: 18oz without posts
3 lb 10 oz with posts




Nominal Dimensions

| | inch | mm |
|---|---|---|
| A dia. | 6 13/32 | 162.7 |
| B dia. | 4 3/16 | 106.4 |
| C | 51/64 | 20.24 |
| D | 0.3061 | 7.77 |

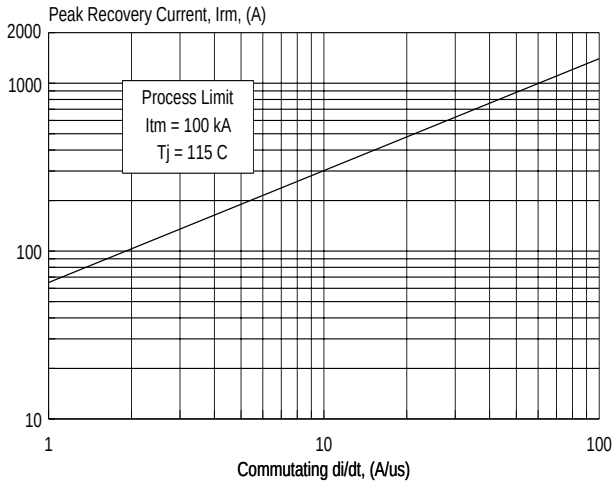
rev 4 2/10/2000

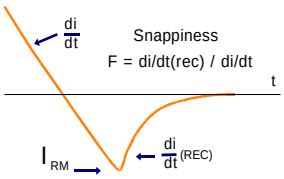
175 GREAT VALLEY PKWY. MALVERN, PA 19355
USA

## LIMITING CHARACTERISTICS AND RATINGS

| | | | | |
|---|---|---|---|---|
| Repetitive peak off-state & reverse volts | $V_{DRM}$ $V_{RRM}$ | $T_J$=0 to 115°C | up to 5000 | V |
| Repetitive working crest voltage | $V_{DWM}$ $V_{RWM}$ | $T_J$=0 to 115°C | 0.8$V_{DRM}$ 0.8$V_{RRM}$ | V |
| Repetitive peak off-state & reverse current | $I_{DWM}$ $I_{RWM}$ | $T_J$=0 to 115°C | 250 100 | ma |
| Average on-state current | $I_{T(AV)}$ | $T_{case}$= 70°C | 4600 | A |
| Peak half-cycle non-rep surge current | $I_{TSM}$ | 8.3 ms 1.5 ms $T_J$=115°C | 60 100 | kA |
| On-state voltage | $V_{TM}$ | $I_T$=4000A $t_P$=8.3ms $T_J$=115°C | 1.90 | V |
| Critical gate trigger current / voltage | $I_{GT}$ $V_{GT}$ | $V_D$ = 12 V $T_J$ = 25°C | 150 5.0 | ma V |
| Non-trigger gate current | $I_{GD}$ $V_{GD}$ | $V_D$ = 2000V $T_J$= 115°C | 15 0.8 | ma V |
| Maximum peak recovery current | $I_{RM}$ | di/dt = 2 A/us $T_J$ = 115°C | 110 snappiness | A F = 2-3 |
| Critical rate of rise of on-state current | di/dt rep | $T_J$=115°C 60 Hz incl. 60A snubber discharge | SPT402A 100 SPT402B 4000 | A/us |
| Critical rate of rise of off-state voltage | dv/dt | $T_J$=115°C $V_D$= 67% $V_{DRM}$ | 1000 | V/us |
| Turn-on delay | $t_d$ | $V_D$= 50%$V_{DRM}$ $T_J$=115°C | 4 | us |
| Turn-off time | $T_{off}$ | 5A/us, -100V 20V/us to 2000V | 400 | us |

Peak Recovery Current Relationship with Commutating di/dt

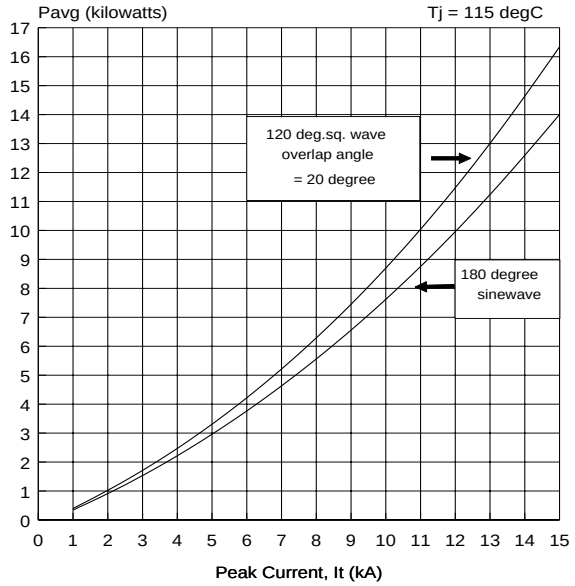



Gate Pulse: 15us duration / 0.5us rise time

| | SPT402A | SPT402B | |
|---|---|---|---|
| di/dt | <=100A/us | <1000A/us | 1000-4000A/us |
| $V_{OC}$ | 50 V | 100 V | 100 V |
| $I_{SS}$ | 5 A | 200 A | 400 A |

FULL CYCLE AVERAGE POWER LOSS versus PEAK CURRENT at 50/60 Hz
(plasma spreading and conduction loss)




**FULL CYCLE AVERAGE POWER LOSS**
**50 / 60 Hz $T_J$ = 115°C**

| $I_T$ (peak) | half-sine 180° | 3ph 120° |
|---|---|---|
| amperes | watts | watts |
| 1000 | 369 | 424 |
| 2000 | 921 | 1035 |
| 3000 | 1547 | 1727 |
| 4000 | 2233 | 2493 |
| 5000 | 2978 | 3331 |
| 6000 | 3783 | 4246 |
| 7000 | 4650 | 5241 |
| 8000 | 5580 | 6319 |
| 9000 | 6577 | 7483 |
| 10000 | 7641 | 8735 |
| 11000 | 8775 | 10078 |
| 12000 | 9981 | 11516 |
| 13000 | 11259 | 13048 |
| 14000 | 12612 | 14679 |
| 15000 | 14042 | 16408 |