

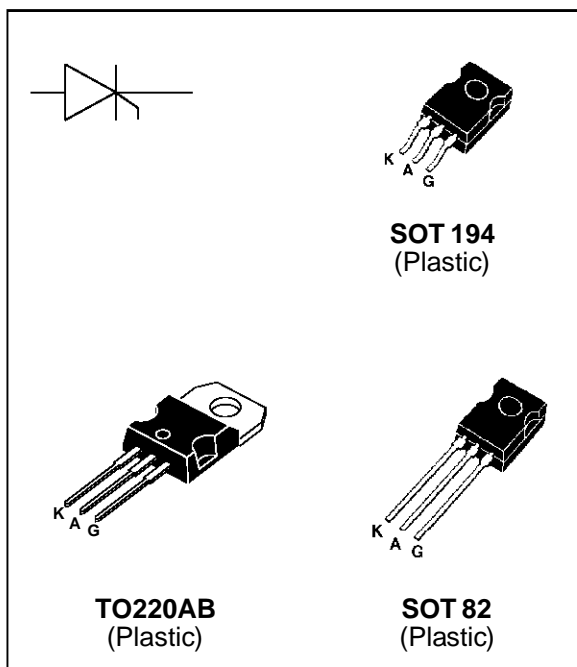
**STARTLIGHT**
**FEATURES**

- $V_{BR}$  : 1200 - 1500V and 1000 - 1600V versions
- $I_H > 175$  mA
- $I_{GT} < 1.5$  mA

**DESCRIPTION**

The TN22 is an high performance asymmetrical SCR in high voltage PNP diffused planar technology.

Package either in TO220AB, SOT 82 or SOT 194, these parts are intended for use in electronic


**ABSOLUTE RATINGS** (limiting values)

Symbol	Parameter		Value	Unit
$V_{DRM}$	Repetitive peak off-state voltage	$T_j = 110^\circ\text{C}$	400	V
$I_{T(RMS)}$	RMS on-state current Full sine wave (180° conduction angle)	$T_c = 95^\circ\text{C}$	2	A
$I_{T(AV)}$	Mean on-state current Full sine wave (180° conduction angle)	$T_c = 95^\circ\text{C}$	1.8	A
$I_{TSM}$	Non repetitive surge peak on-state current ( $T_j$ initial = 25°C)	$t_p = 8.3\text{ms}$	22	A
		$t_p = 10\text{ms}$	20	
$I^2t$	$I^2t$ Value for fusing	$t_p = 10\text{ms}$	2	$\text{A}^2\text{s}$
$di/dt$	Critical rate of rise of on-state current $I_G = 5$ mA $dI_G/dt = 70$ mA/ $\mu\text{s}$ .		50	A/ $\mu\text{s}$
$T_{stg}$ $T_j$	Storage and operating junction temperature range		- 40 to + 150 - 40 to + 110	$^\circ\text{C}$
TI	Maximum lead temperature for soldering during 10s at 4.5mm from case		260	$^\circ\text{C}$

## TN22

### THERMAL RESISTANCES

Symbol	Parameter		Value	Unit
Rth(j-a)	Junction to ambient	TO220AB	60	°C/W
		SOT 82 / SOT 194	100	
Rth(j-c)	Junction to case		3	°C/W

### GATE CHARACTERISTICS (maximum values)

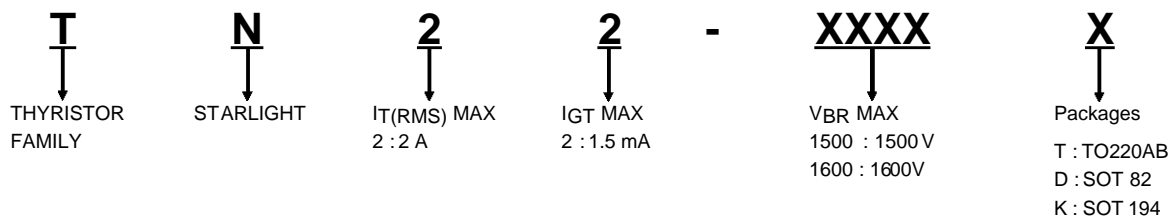
$P_{G(AV)} = 300 \text{ mW}$   $P_{GM} = 2 \text{ W}$  ( $t_p = 20 \mu\text{s}$ )  $I_{FGM} = 1 \text{ A}$  ( $t_p = 20 \mu\text{s}$ )  $V_{RGM} = 6 \text{ V}$

### ELECTRICAL CHARACTERISTICS

Symbol	Test Conditions		Type	Value	Unit
$I_{GT}$	$V_D = 12 \text{ V (DC)}$ $R_L = 33 \Omega$	$T_j = 25^\circ\text{C}$	MAX	1.5	mA
$V_{GT}$	$V_D = 12 \text{ V (DC)}$ $R_L = 33 \Omega$ $R_{GK} = 1 \text{ K}\Omega$	$T_j = 25^\circ\text{C}$	MAX	3	V
$I_H$	$V_{GK} = 0 \text{ V}$	$T_j = 25^\circ\text{C}$	MIN	175	mA
$V_{TM}$	$I_{TM} = 2 \text{ A}$ $t_p = 380 \mu\text{s}$	$T_j = 25^\circ\text{C}$	MAX	3.1	V
$I_{DRM}$	$V_{DRM}$ Rated	$T_j = 25^\circ\text{C}$	MAX	0.1	mA
dV/dt	Linear slope up to $V_D = 67\% V_{DRM}$ $V_{GK} = 0 \text{ V}$	$T_j = 110^\circ\text{C}$	MIN	500	V/ $\mu\text{s}$

Symbol	Test Conditions		Suffix		Unit
			TN22-1500	TN22-1600	
$V_{BR}$	$I_D = 5 \text{ mA}$ $V_{GK} = 0 \text{ V}$ $T_j = 25^\circ\text{C}$	MIN	1200	1000	V
		MAX	1500	1600	V

### ORDERING INFORMATION



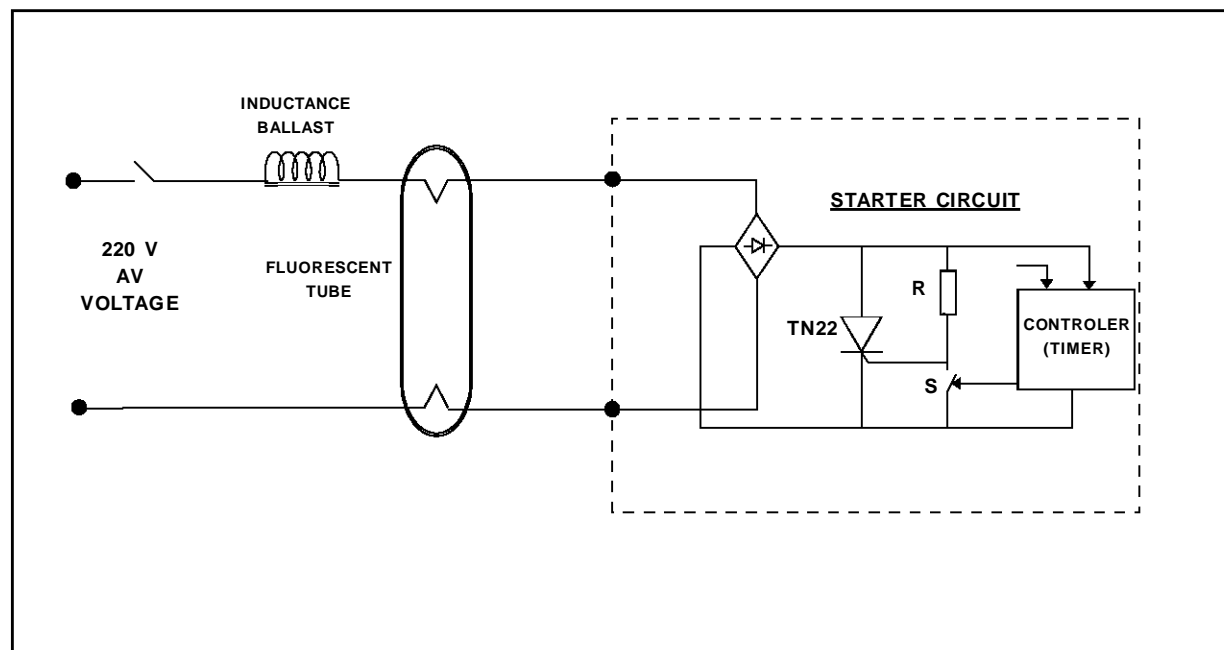
This thyristor has been designed for use as a fluorescent tube starter switch.

- A pre-heating period during which a heating current is applied to the cathode heaters.

An electronic starter circuit provides :

- One or several high voltage striking pulses across the lamp.

**BASIC APPLICATION DIAGRAM**



**PRINCIPLE OF OPERATION**

1/ Pre-heating

At rest the switch S is opened and when the mains voltage is applied across the circuit a full wave rectified current flows through the resistor R and the TN22 gate : At every half-cycle when this current reaches the gate triggering current ( $I_{GT}$ ) the thyristor turns on.

When the device is turned-on the heating current, limited by the ballast choke, flows through the tube heaters.

The pre-heating time is typically 2 or 3 seconds.

2/ Pulsing

At the end of the pre-heating phase the switch S is turned on. At this moment :

If the current through the devices is higher than the holding current ( $I_H$ ) the thyristor remains on until the current falls (below  $I_H$ ). Then the thyristor turns off.

If the current is equal or lower than the holding current the thyristor turns off the instantaneously.

When the thyristor turns off the current flowing through the ballast choke generates a high voltage

pulse. This overvoltage is clamped by the thyristor avalanche characteristic ( $V_{BR}$ ).

If the lamp is not struck after the first pulse, the system starts a new ignition sequence again.

3/ Steady state

When the lamp is on the running voltage is about 150V and the starter switch is in the off-state.

**IMPLEMENTATION**

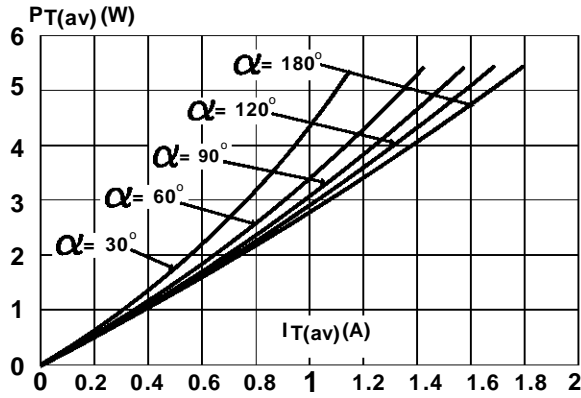
The resistor R must be chosen to ensure a proper triggering in the worst case (minimum operating temperature) according to the specified gate triggering current and the peak line voltage.

Switch S : This function can be realized with a gate sensitive SCR type : P0130AA...

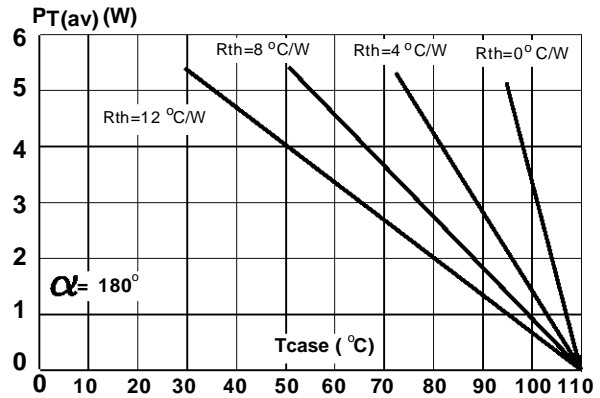
This component is a low voltage device (< 50V) and the maximum current sink through this switch can reach the level of the thyristor holding current.

The pre-heating period can be determined by the time constant of a capacitor-resistor circuit charged by the voltage drop of diodes used in series in the thyristor cathode.

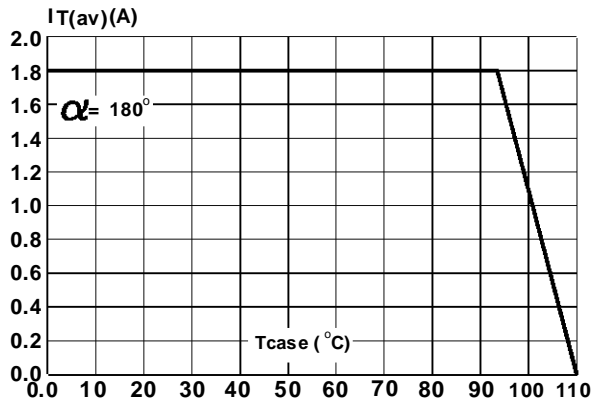
**Fig.1 :** Maximum average power dissipation versus average on-state current (rectified full sine wave).



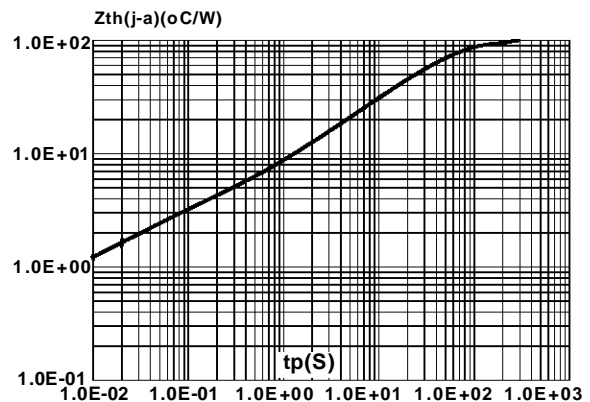
**Fig.2 :** Correlation between maximum average power dissipation and maximum allowable temperature ( $T_{amb}$  and  $T_{case}$ ) for different thermal resistances heatsink + contact.



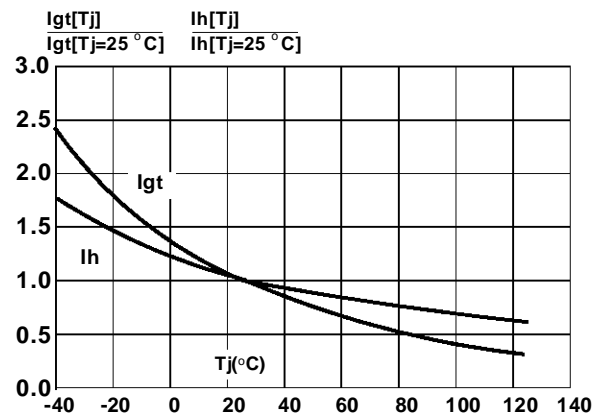
**Fig.3 :** Average on-state current versus case temperature (rectified full sine wave).



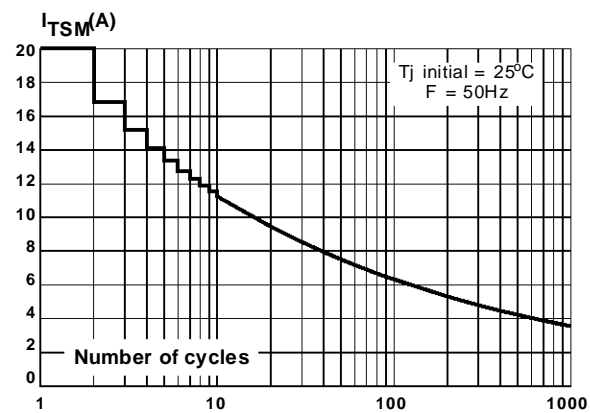
**Fig.4 :** Thermal transient impedance junction to ambient versus pulse duration.



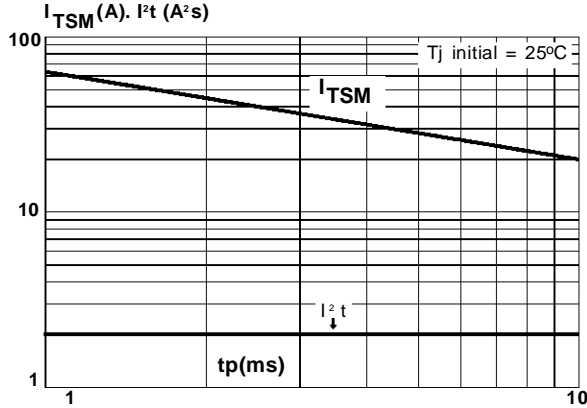
**Fig.5 :** Relative variation of gate trigger current and holding current versus junction temperature.



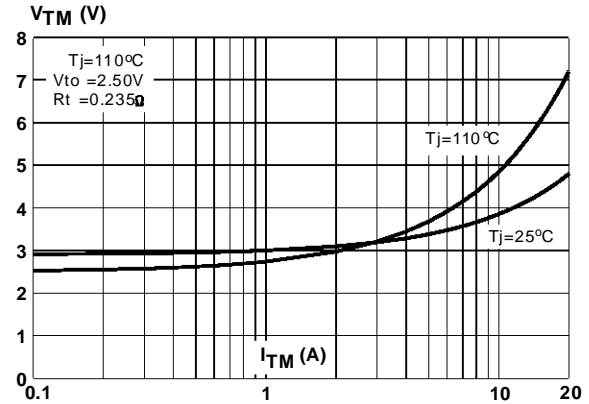
**Fig.6 :** Non repetitive surge peak on-state current versus number of cycles.



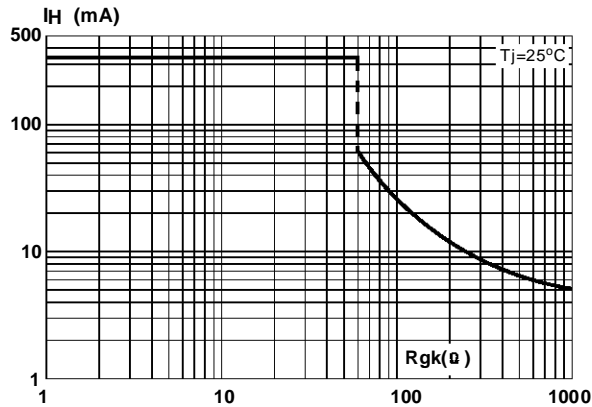
**Fig.7 :** Non repetitive surge peak on-state current for a sinusoidal pulse with width :  $t_p \leq 10\text{ms}$ , and corresponding value of  $I^2t$ .



**Fig.8 :** On-state characteristics (maximum values).

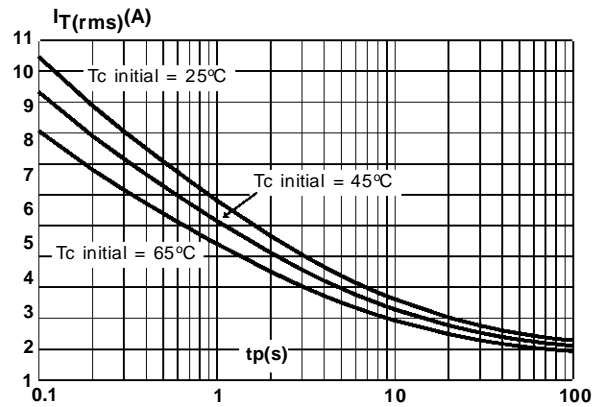


**Fig.9 :** Relative variation of holding current versus gate-cathode resistance (typical values).



**Fig.10 :** Maximum allowable RMS current versus time conduction and initial case temperature (Package : SOT 82).

Note : Calculation made for  $T_j \text{ max} = 135^\circ\text{C}$  (the failure mode will be short circuit)



## TN22

### PACKAGE MECHANICAL DATA TO220AB (Plastic)

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	10.0	10.4	0.393	0.409
B	15.2	15.9	0.598	0.626
C	13	14	0.511	0.551
D	6.2	6.6	0.244	0.260
E	16.4 typ.		0.645 typ.	
F	3.5	4.2	0.137	0.165
G	2.65	2.95	0.104	0.116
H	4.4	4.6	0.173	0.181
I	3.75	3.85	0.147	0.151
J	1.23	1.32	0.048	0.051
K	1.27 typ.		0.050 typ.	
L	0.49	0.70	0.019	0.027
M	2.4	2.72	0.094	0.107
N	4.95	5.15	0.194	0.203
N1	2.40	2.70	0.094	0.106
O	1.14	1.70	0.044	0.067
P	0.61	0.88	0.024	0.034

Cooling method : C  
Marking : Type number  
Weight : 2 g

Recommended torque values : 5.5 m.N.  
Maximum torque values : 0.70 m.N.

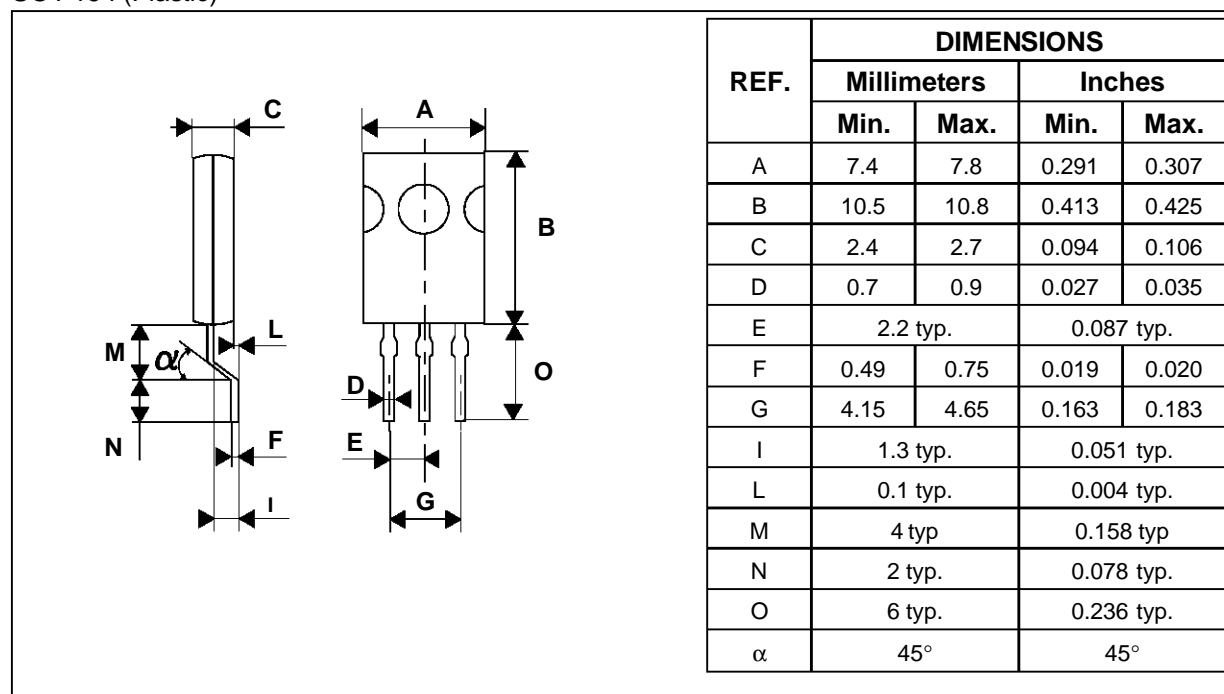
### PACKAGE MECHANICAL DATA SOT 82 (Plastic)

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	7.4	7.8	0.291	0.307
B	10.5	10.8	0.413	0.425
C	2.4	2.7	0.094	0.106
D	0.7	0.9	0.027	0.035
E	2.2 typ.		0.087 typ.	
F	0.49	0.75	0.019	0.029
G	4.15	4.65	0.163	0.183
H (1)		2.54		0.100
L	15.7 typ.		0.618 typ.	
M	1.0	1.3	0.039	0.051

(1) Within this region the cross-section of the leads is uncontrolled

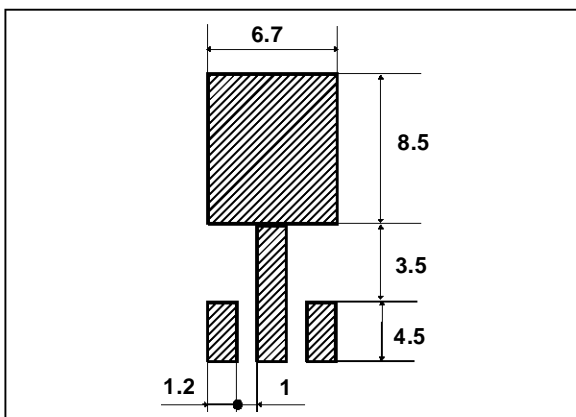
Marking : Type number  
Weight : 0.72 g

**PACKAGE MECHANICAL DATA**  
SOT 194 (Plastic)



Marking : Type number  
Weight : 0.68 g

**FOOT PRINT**



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