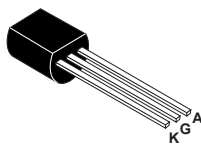
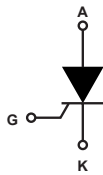


## 0.8 A 400 V high immunity sensitive SCR thyristor in TO-92



TO-92

### Features

- On-state rms current,  $I_{T(RMS)}$  0.8 A
- 125 °C max.  $T_j$
- Ultra low 1  $\mu$ A gate current
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  400 V
- ECOPACK2 compliant

### Applications

- Gate driver for large Thyristors
- Overvoltage crowbar protection
- Ground fault circuit interrupters
- Arc fault circuit interrupter
- Standby mode power supplies
- Residual current detector

### Description

Thanks to highly sensitive triggering levels, the 0.8 A P0109DA SCR thyristor is suitable for all applications where available gate current is limited.

This device offers a high blocking voltage of 400 V, ideal for applications like interrupters circuits.

The P0109DA is available in through-hole TO-92 package.

#### Product status link

[P0109DA](#)

#### Product summary

$I_{T(RMS)}$	0.8 A
$V_{DRM}/V_{RRM}$	400 V
$I_{GT}$	1 $\mu$ A
$T_{jmax.}$	125 °C

# 1 Characteristics

**Table 1. Absolute maximum ratings (limiting values)**

Symbol	Parameters		Value	Unit
$I_{T(RMS)}$	On-state RMS current (180° conduction angle)		0.8	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)			
$I_{TSM}$	Non repetitive surge peak on-state current, $T_j$ initial = 25 °C	$t_p = 8.3$ ms	8	A
		$t_p = 10$ ms		
$I^2t$	$I^2t$ value for fusing	$t_p = 10$ ms	0.24	A <sup>2</sup> s
$di/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100$ ns	F = 60 Hz	50	A/ $\mu$ s
$V_{DRM} / V_{RRM}$	Repetitive peak off-state voltage		400	V
$I_{GM}$	Peak gate current	$t_p = 20$ $\mu$ s	1	A
$P_{G(AV)}$	Average gate power dissipation		0.1	W
$T_{stg}$	Storage junction temperature range			-40 to +150 °C
$T_j$	Operating junction temperature range			-40 to +125 °C

**Table 2. Electrical characteristics ( $T_j = 25$  °C, unless otherwise specified)**

Symbol	Parameters	Value	Unit
$I_{GT}$	$V_D = 12$ V, $R_L = 33$ $\Omega$	Max. 1	$\mu$ A
$V_{GT}$		Max. 0.8	V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3$ k $\Omega$ , $R_{GK} = 1$ k $\Omega$ , $T_j = 125$ °C	Min. 0.1	V
$V_{RG}$	$I_{RG} = 10$ $\mu$ A	Min. 8	
$I_H$	$I_T = 50$ mA, $R_{GK} = 1$ k $\Omega$	Max. 5	mA
$I_L$	$I_G = 1.2 I_{GT}$ , $R_{GK} = 1$ k $\Omega$	Max. 6	mA
$dV/dt$	$V_D = 67\%$ $V_{DRM}$ , $R_{GK} = 1$ k $\Omega$ , $T_j = 125$ °C	Min. 75	V/ $\mu$ s

**Table 3. Static electrical characteristics**

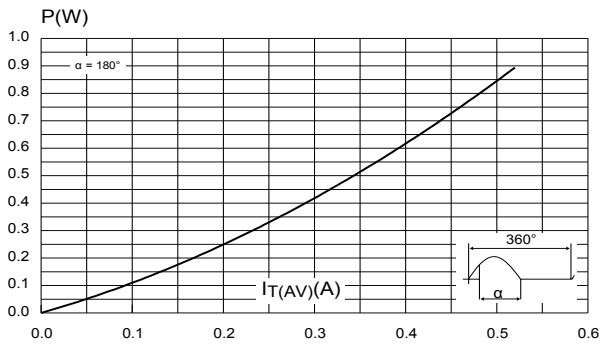
Symbol	Test conditions	$T_j$	Value	Unit
$V_T$	$I_{TM} = 1.6$ A, $t_p = 380$ $\mu$ s	25 °C	Max. 1.95	V
$V_{TO}$	Threshold on-state voltage	125 °C	Max. 0.95	V
$R_d$	Dynamic resistance	125 °C	Max. 600	m $\Omega$
$I_{DRM}$	$V_D = V_{DRM}$	25 °C	Max.	1 $\mu$ A
$I_{RRM}$	$V_R = V_{RRM}$	125 °C		0.1 mA

**Table 4. Thermal resistance**

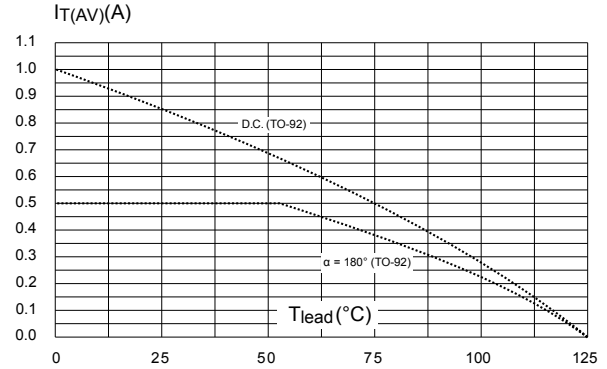
Symbol	Parameters	Max. value	Unit
$R_{th(j-l)}$	Junction to lead (DC)	80	°C/W
$R_{th(j-a)}$	Junction to ambient (DC)	150	

## 1.1 Characteristics (curves)

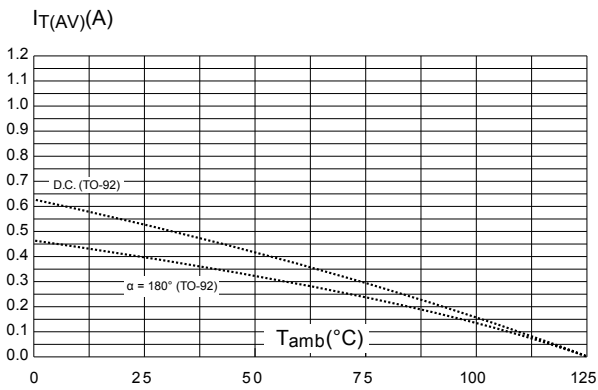
**Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)**



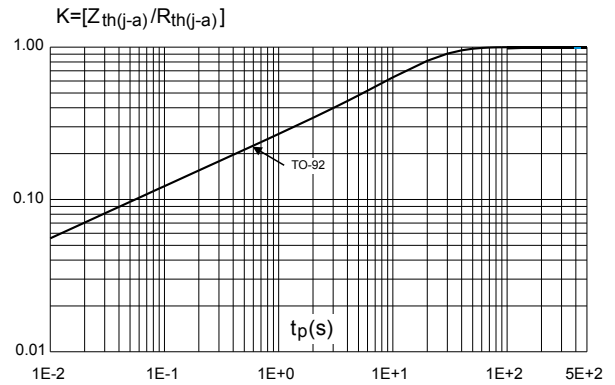
**Figure 2. Average and DC on-state current versus lead temperature**



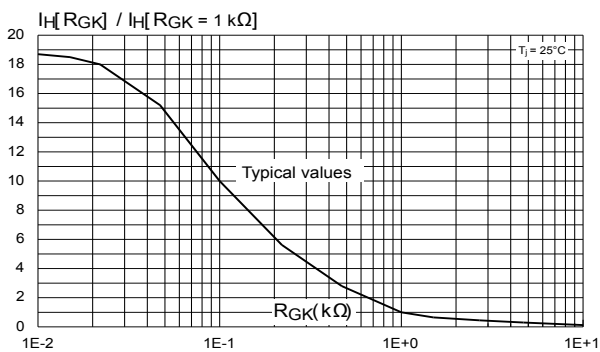
**Figure 3. Average and DC on-state current versus ambient temperature**



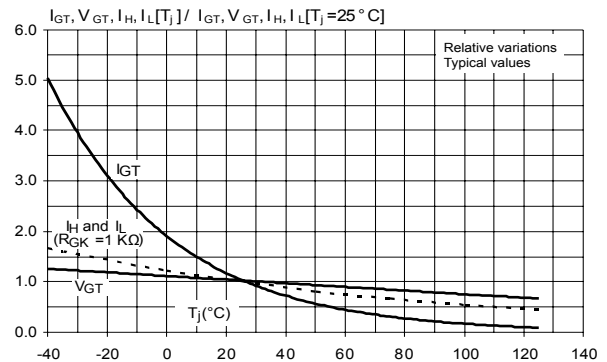
**Figure 4. Relative variation of thermal impedance versus pulse duration**



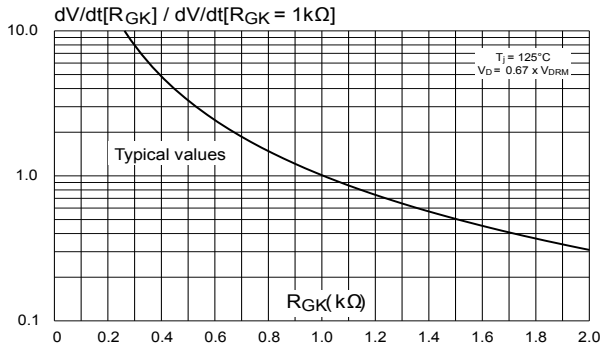
**Figure 5. Relative variation of holding current versus gate-cathode resistance**



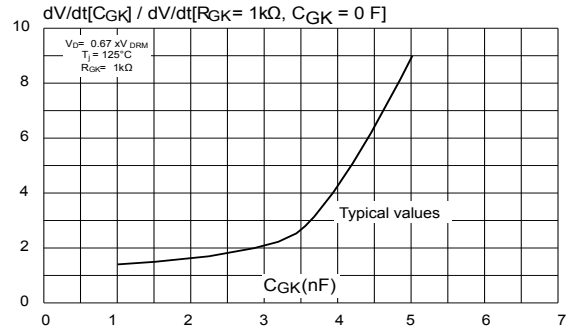
**Figure 6. Relative variation of gate voltage and gate, holding and latching current versus junction temperature**



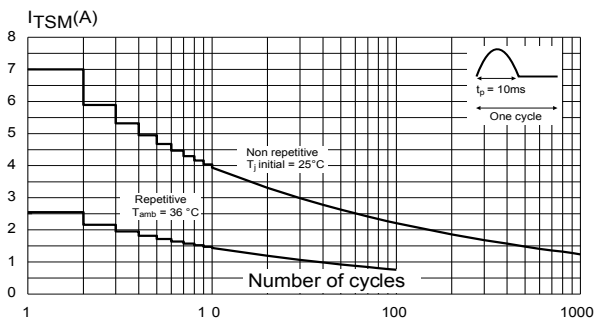
**Figure 7. Relative variation of static dV/dt immunity versus gate-cathode resistance**



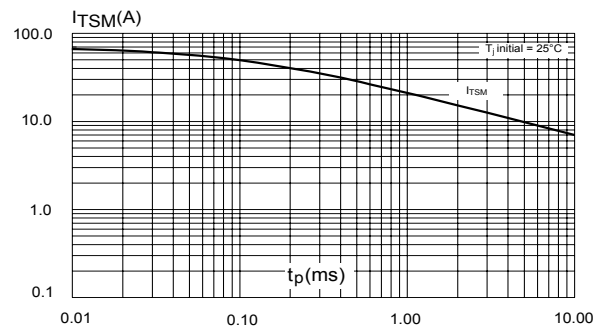
**Figure 8. Relative variation of dV/dt immunity versus gate-cathode capacitance**



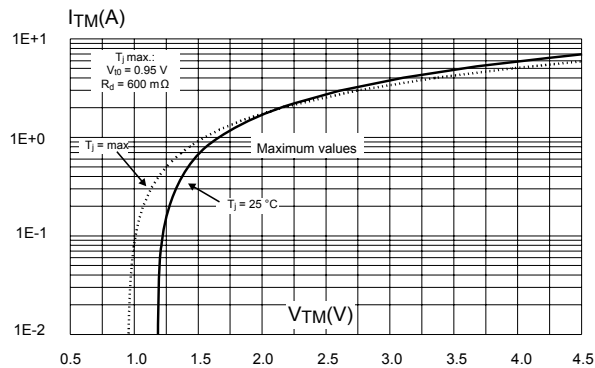
**Figure 9. Surge peak on-state current versus number of cycles**



**Figure 10. Non-repetitive surge peak on-state current for sinusoidal pulse ( $t_p < 10$  ms)**



**Figure 11. On-state characteristics (maximum values)**



## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 TO-92 package information

- Lead free plating + halogen-free molding resin
- Epoxy meets UL94, V0

Figure 12. TO-92 package outline

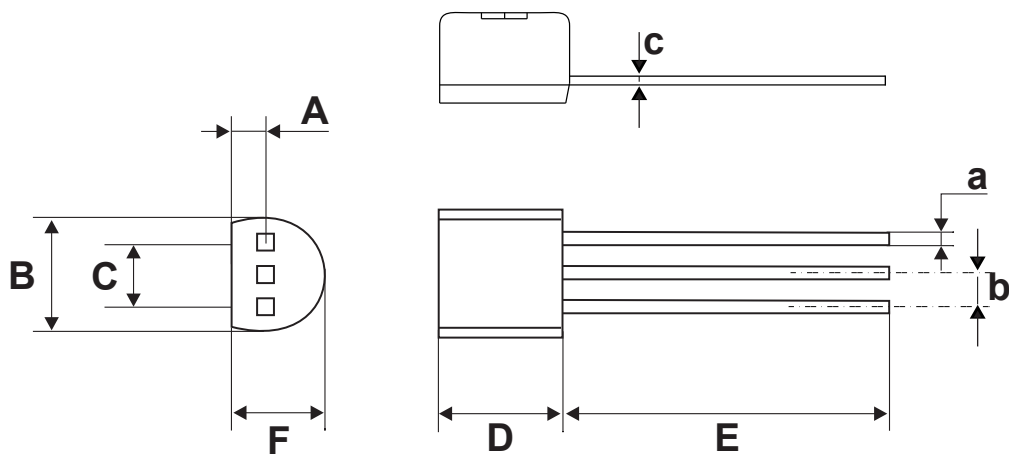


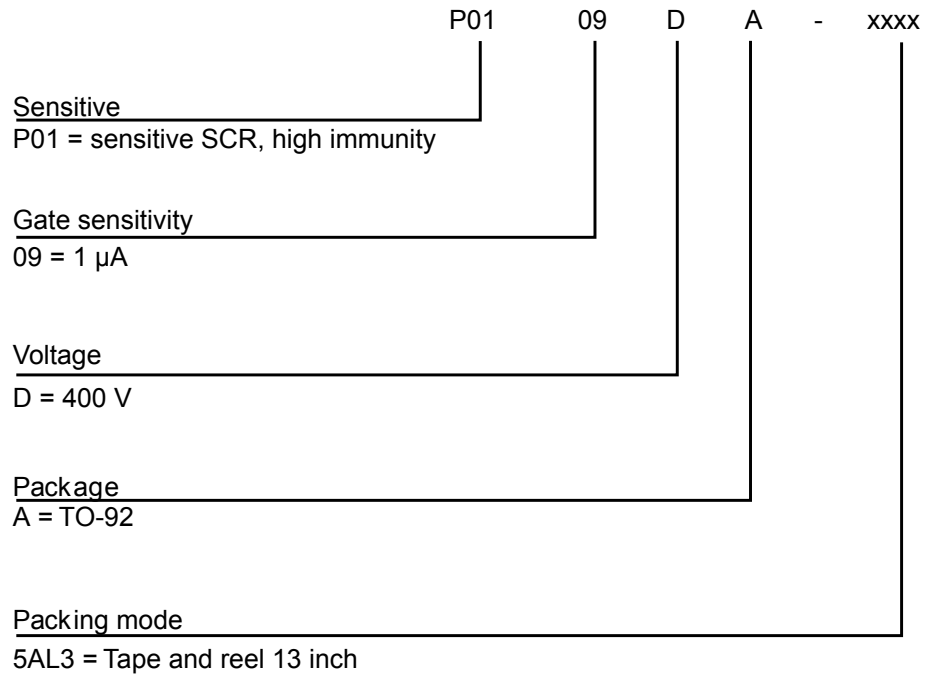
Table 5. TO-92 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		1.35			0.0531	
B			4.70			0.1850
C		2.54			0.1000	
D	4.40			0.1732		
E	12.70			0.5000		
F			3.70			0.1457
a			0.50			0.0197
b		1.27			0.0500	
c			0.48			0.0189

1. Inches dimensions given for information

### 3 Ordering information

**Figure 13. Ordering information scheme**



**Table 6. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
P0109DA 5AL3	P0109 DA	TO-92	0.22 g	2000	Tape and reel 13"

## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
20-Jan-2020	1	Initial release.
16-Jun-2020	2	Updated Section Cover image.