



HAOPIN MICROELECTRONICS CO.,LTD.

Description

Glass passivated, sensitive gate thyristors in a plastic envelope, intended for use in general purpose switching and phase control applications. These devices are intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

<p>Symbol</p> 		<p>Simplified outline</p>  <p>TO-220</p>	
Pin	Description		
1	Cathode		
2	Anode		
3	Gate		

Applications:

- ◆ Motor control
- ◆ Industrial and domestic lighting
- ◆ Heating
- ◆ Static switching

Features

- ◆ Blocking voltage to 600 V
- ◆ On-state RMS current to 12A
- ◆ Ultra low gate trigger current

SYMBOL	PARAMETER	Value	Unit
V_{DRM}	Repetitive peak off-state voltages	600	V
$I_T (RMS)$	RMS on-state current	12	A
I_{TSM}	Non-repetitive surge peak on-state current	140	A

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
$R_{th(j-c)}$	Junction to case(DC)		-	1.3	-	°C/W
$R_{th(j-a)}$	Junction to ambient		-	60	-	°C/W

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Limiting values in accordance with the Maximum system(IEC 134)

SYMBOL	PARAMETER	CONDITIONS		MIN	Value	UNIT
V_{DRM}/V_{RRM}				-	600	V
$I_{T(RMS)}$	RMS on-state current	180°C conduction angle $T_c=105^\circ\text{C}$		-	12	A
I_{TSM}	Non repetitive surge peak on-state current		$T_j=25^\circ\text{C}$ $t_p=8.3\text{ms}$	-	-	A
			$T_j=25^\circ\text{C}$ $t_p=10\text{ms}$	-	146	A
$I_{T(AV)}$	Average on-state current	180°C conduction angle $T_c=105^\circ\text{C}$		-	-	A
I^2t	I^2t Value for fusing	$T_p=10\text{ms}$	$T_j=25^\circ\text{C}$	-	98	A^2S
DI/dt	Critical rate of rise of on-state current	$I_G=2x I_{GT}, tr \leq 100\text{ns}$	$F=60\text{Hz}$ $T_j=125^\circ\text{C}$	-	50	$\text{A}/\mu\text{s}$
I_{GM}	Peak gate current		$t_p=20\mu\text{s}$ $T_j=125^\circ\text{C}$	-	4	A
I_{DRM}	$V_{DRM}=V_{RRM}$		$T_j=25^\circ\text{C}$	-	5	μA
I_{RRM}	$V_{DRM}=V_{RRM}$		$T_j=125^\circ\text{C}$	-	2	mA
$P_{G(AV)}$	Average gate power dissipation		$T_j=125^\circ\text{C}$	-	1	W
T_{stg}	Storage junction temperature range			-40	150	$^\circ\text{C}$
T_j	Operating junction Temperature range			-40	125	$^\circ\text{C}$

$T_j=25^\circ\text{C}$ unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
Static characteristics						
I_{GT} V_{GT}		$V_D=12\text{V}; R_L=33\Omega$	0.5	-	5 1.3	mA V
I_L		$I_G=1.2I_{GT}$	-	-	30	mA
I_H		$I_T=500\text{mA}$ Gate open	-	-	15	mA
V_{GD}		$V_D=V_{DRM}$ $R_L=3.3\text{K}\Omega$ $T_j=125^\circ\text{C}$	0.2	-	-	V
dV/dt		$V_D=67\%V_{DRM}$ Gateopen; $T_j=125^\circ\text{C}$	40	-	-	$\text{V}/\mu\text{s}$

Dynamic Characteristics

V_{TM}	$I_{TM}=24\text{A}$ $t_p=380\mu\text{s}$	$T_j=25^\circ\text{C}$	-	-	1.6	V
V_{to} R_d	Threshold voltage Dynamic resistance	$T_j=125^\circ\text{C}$ $T_j=125^\circ\text{C}$	-	-	0.85 30	V $\text{m}\Omega$

Description

Fig. 1: Maximum average power dissipation versus average on-state current.

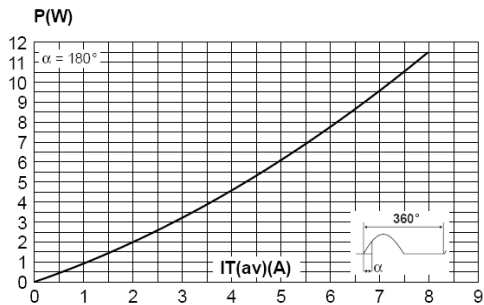


Fig. 2-1: Average and D.C. on-state current versus case temperature.

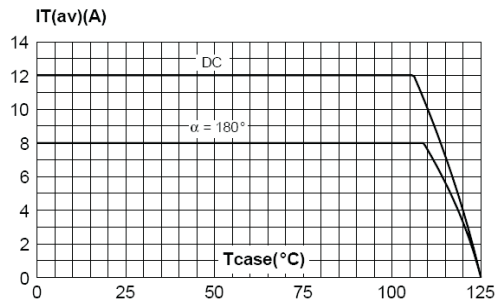


Fig. 2-2: Average and D.C. on-state current versus ambient temperature (device mounted on FR4 with recommended pad layout) (DPAK and D²PAK).

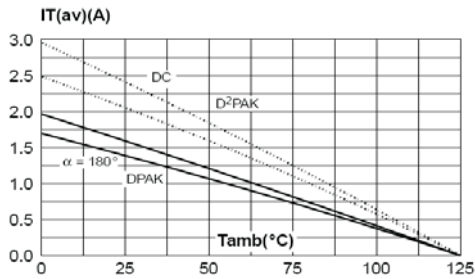


Fig. 3-1: Relative variation of thermal impedance junction to case versus pulse duration.

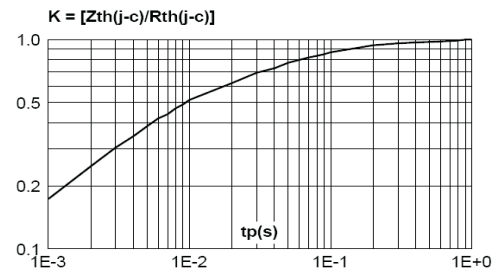


Fig. 3-2: Relative variation of thermal impedance junction to ambient versus pulse duration (recommended pad layout, FR4 PC board).

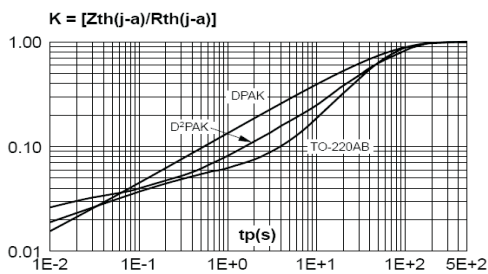
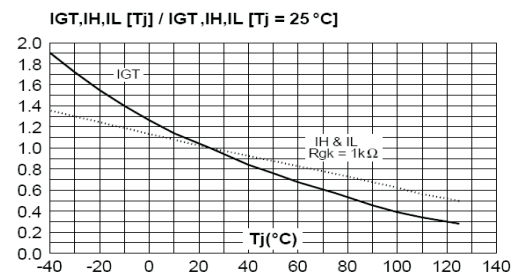


Fig. 4-1: Relative variation of gate trigger current, holding current and latching versus junction temperature for TS12 series.



Description

Fig. 4-2: Relative variation of gate trigger current, holding current and latching current versus junction temperature for TN12 & TYN series.

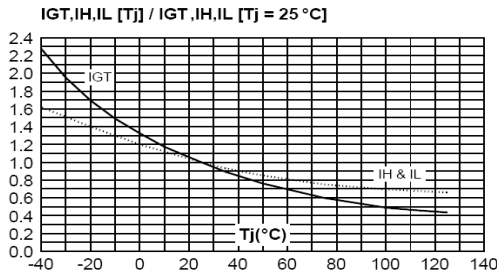


Fig. 5: Relative variation of holding current versus gate-cathode resistance (typical values) for TS12 series.

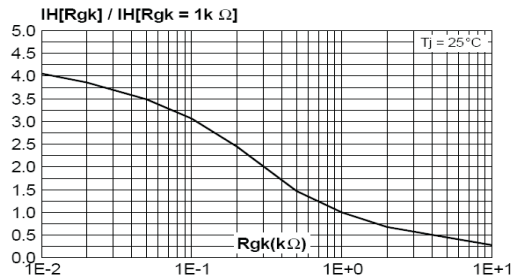


Fig. 6: Relative variation of dV/dt immunity versus gate-cathode resistance (typical values) for TS12 series.

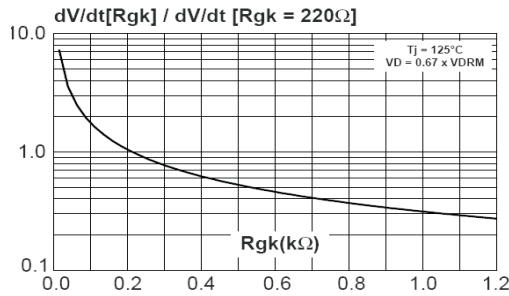


Fig. 7: Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values) for TS12 series.

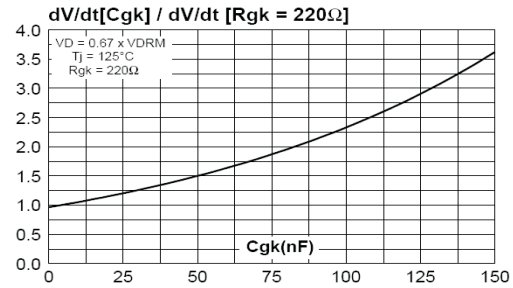


Fig. 8: Surge peak on-state current versus number of cycles (TS12/TN12/TYN).

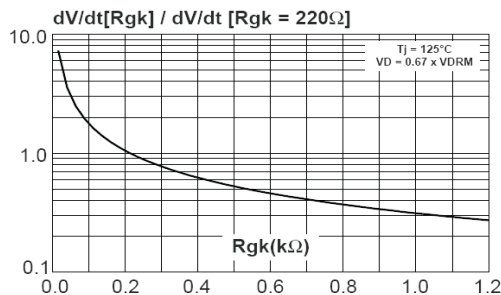
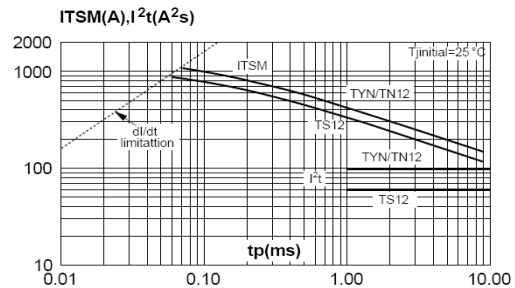


Fig. 9: Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms, and corresponding values of I^2t .



Description

Fig. 10: On-state characteristics (maximum values).

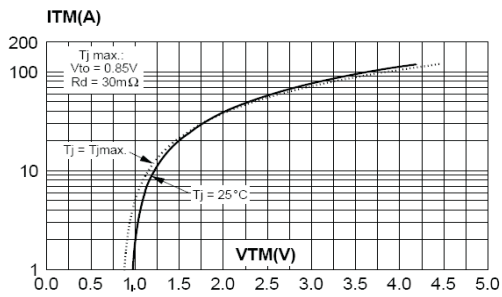
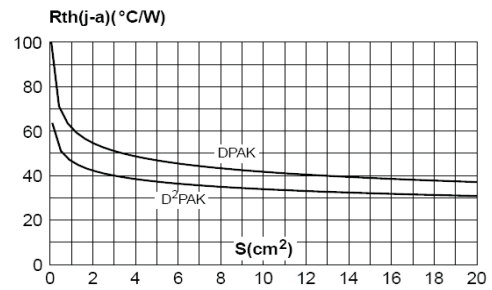
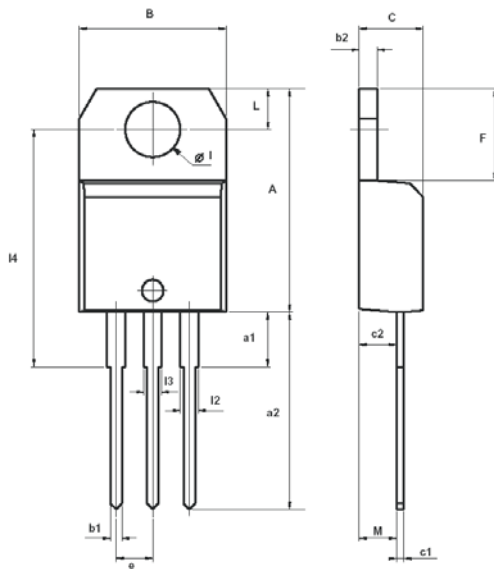


Fig. 11: Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, copper thickness: 35 μm).



MECHANICAL DATA

Dimensions in mm
 Net Mass: 2 g
 TO-220AB



REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
I	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	