
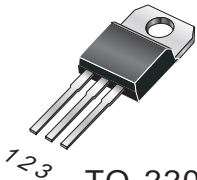


HAOPIN MICROELECTRONICS CO.,LTD.

Description

Standard gate triggering SCR is fully isolated package suitable for the application where requiring high bidirectional blocking voltage capability and also suitable for over voltage protection ,motor control circuit in power tool, inrush current limit circuit and heating control system.

<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 20 A

SYMBOL	PARAMETER	Value	Unit
V_{DRM}	Repetitive peak off-state voltages	600	V
$I_T (RMS)$	RMS on-state current (full sine wave)	20	A
I_{TSM}	Surge on-state current	220	A

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
$R_{th(j-c)}$	Thermal resistance Junction to Case		-	-	1.1	°C/W
$R_{th(j-a)}$	Thermal resistance 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}	Repetitive peak off-state Voltages		-	600	V
$I_{T(AV)}$	Average On-state current	Half sine wave; $T_c=102^\circ\text{C}$	-	13	A
$I_{T(RMS)}$	RMS on-state current	180°C conduction angle	-	20	A
I_{TSM}	Surge On-state current	1/2Cycle.sine wave 60 Hz, Non-Repetitive	-	220	A
I^2t	I^2t for fusing	$T=8.3\text{ms}$	-	242	A^2S
di/dt	Critical rate of rise of on-state current		-	50	$\text{A}/\mu\text{s}$
I_{FGM}	Forward peak gate current		-	5	A
V_{RGM}	Reverse peak gate voltage		-	5	V
P_{GM}	Peak gate power		-	20	W
$P_{G(AV)}$	Average gate power		-	1	W
T_{stg}	Storage temperature		-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}	Gate trigger current	$V_{AK}=6\text{V(DC)}$; $RL=10\Omega$	-	-	15	mA	
I_{DRM}	Peak Re[etotove off-state current	$V_{AK}=V_{DRM}$		$T_c=25^\circ\text{C}$	-	10	μA
				$T_c=125^\circ\text{C}$	-	200	
I_H	Holding current	$I_T=100\text{mA}$, Gate Open	$T_c=25^\circ\text{C}$	-	20	mA	
V_{TM}	Peak forward on-state voltage	$I_{TM}=40\text{A}$	$T_p=380\mu\text{s}$	-	1.6	V	
V_{GT}	Gate trigger voltage	$V_D=6\text{V(DC)}$; $RL=10\Omega$	$T_c=25^\circ\text{C}$	-	1.5	V	
V_{GD}	Non-Trigger voltage	$V_{AK}=6\text{V}$; $RL=100\Omega$	$T_c=125^\circ\text{C}$	0.2	-	V	

Dynamic Characteristics

D_v/dt	Critical rate of rise of Off-state voltage	$V_D=67\%$ of Rated V_{DRM} , $T_j=125^\circ\text{C}$ Exponential waveform;	200	-	-	$\text{V}/\mu\text{s}$
t_{gt}	Gate controlled turn-on time	$I_{TM}=16\text{A}$; $V_D=\text{Rated } V_{DRM}$; $I_G=2\text{mA}$	-	-	-	μs
t_g	Crcuit commutated tum-off time		-	-	-	μs

Description

Fig 1. Gate Characteristics

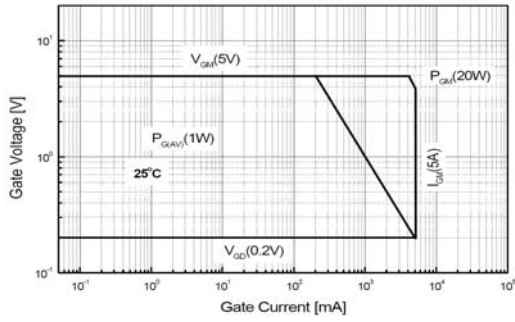


Fig 2. Maximum Case Temperature

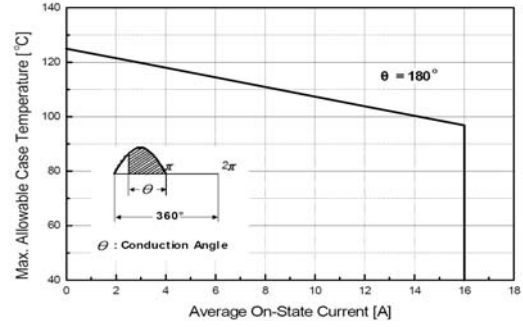


Fig 3. Typical Forward Voltage

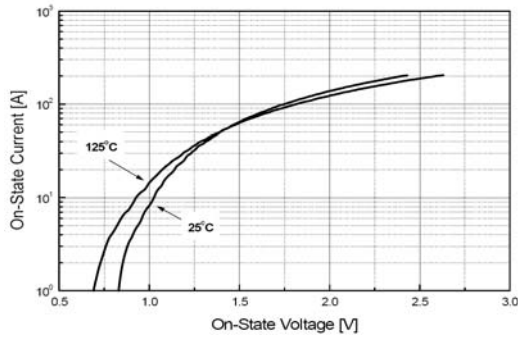


Fig 4. Thermal Response

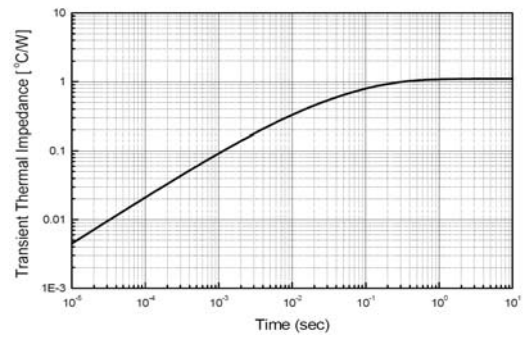


Fig 5. Typical Gate Trigger Voltage vs. Junction Temperature

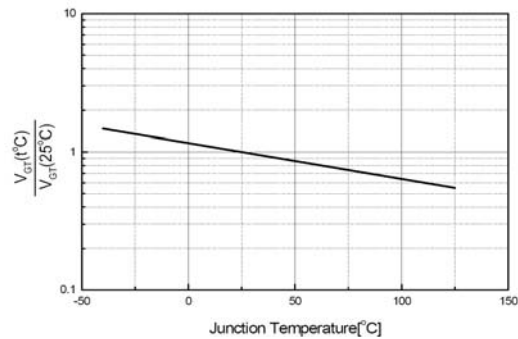
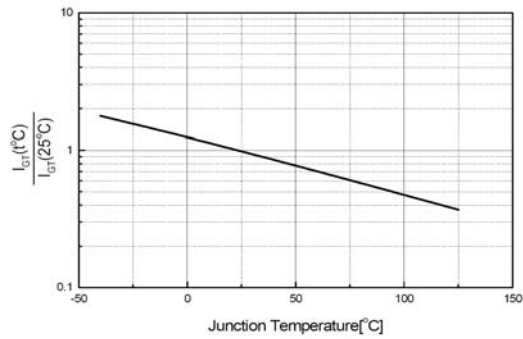
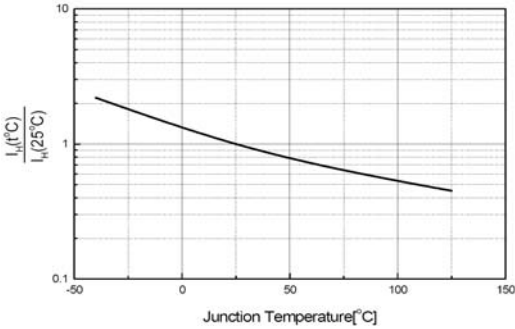
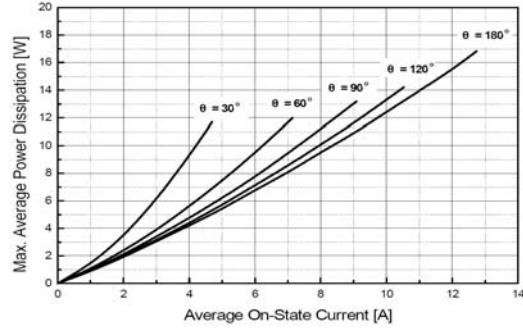


Fig 6. Typical Gate Trigger Current vs. Junction Temperature

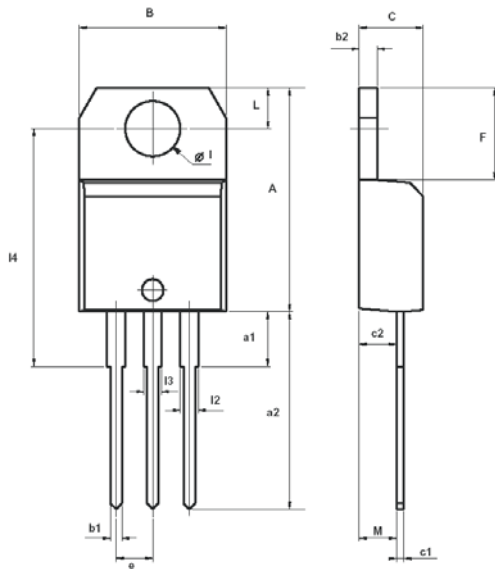


Description

<p>Fig 7. Typical Holding Current</p>  <p>The graph shows the ratio of holding current at a given temperature to the holding current at 25°C. The y-axis is logarithmic, ranging from 0.1 to 10. The x-axis is linear, ranging from -50°C to 150°C. The curve shows a steady decrease in the ratio as temperature increases.</p> <table border="1"> <caption>Approximate data for Fig 7</caption> <thead> <tr> <th>Junction Temperature [°C]</th> <th>$\frac{I_H(T)}{I_H(25^\circ\text{C})}$</th> </tr> </thead> <tbody> <tr><td>-50</td><td>2.5</td></tr> <tr><td>0</td><td>1.5</td></tr> <tr><td>50</td><td>0.8</td></tr> <tr><td>100</td><td>0.5</td></tr> <tr><td>150</td><td>0.3</td></tr> </tbody> </table>	Junction Temperature [°C]	$\frac{I_H(T)}{I_H(25^\circ\text{C})}$	-50	2.5	0	1.5	50	0.8	100	0.5	150	0.3	<p>Fig 8. Power Dissipation</p>  <p>The graph plots maximum average power dissipation in Watts against average on-state current in Amperes for four different conduction angles: 30°, 60°, 90°, and 180°. The y-axis ranges from 0 to 20 W, and the x-axis ranges from 0 to 14 A. Power dissipation increases with both current and conduction angle.</p> <table border="1"> <caption>Approximate data for Fig 8</caption> <thead> <tr> <th>Average On-State Current [A]</th> <th>Max. Average Power Dissipation [W] ($\theta = 30^\circ$)</th> <th>Max. Average Power Dissipation [W] ($\theta = 60^\circ$)</th> <th>Max. Average Power Dissipation [W] ($\theta = 90^\circ$)</th> <th>Max. Average Power Dissipation [W] ($\theta = 180^\circ$)</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>4</td><td>10</td><td>6</td><td>4</td><td>3</td></tr> <tr><td>8</td><td>18</td><td>12</td><td>8</td><td>6</td></tr> <tr><td>12</td><td>25</td><td>18</td><td>12</td><td>9</td></tr> </tbody> </table>	Average On-State Current [A]	Max. Average Power Dissipation [W] ($\theta = 30^\circ$)	Max. Average Power Dissipation [W] ($\theta = 60^\circ$)	Max. Average Power Dissipation [W] ($\theta = 90^\circ$)	Max. Average Power Dissipation [W] ($\theta = 180^\circ$)	0	0	0	0	0	4	10	6	4	3	8	18	12	8	6	12	25	18	12	9
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4	10	6	4	3																																		
8	18	12	8	6																																		
12	25	18	12	9																																		

MECHANICAL DATA

Dimensions in mm
 Net Mass: 2 g
 TO-220



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	