

# S12MD1V/S12MD3

## Photothyristor Coupler

※ Lead forming type (I type) and taping reel type (P type) of **S12MD1V** are also available. (**S12MD1V/S12MDIP**)

### ■ Features

1. High RMS ON-state current ( $I_T$  : MAX. 200mA<sub>rms</sub>)
2. High repetitive peak OFF-state voltage ( $V_{DRM}$  : MIN. 400V)
3. Trigger current  $I_{FT}$  : MAX. 15mA at  $R_G = 20k\Omega$
4. For half-wave control ••• **S12MD1V**  
For full-wave control ••• **S12MD3**
5. Recognized by UL, file No. E64380

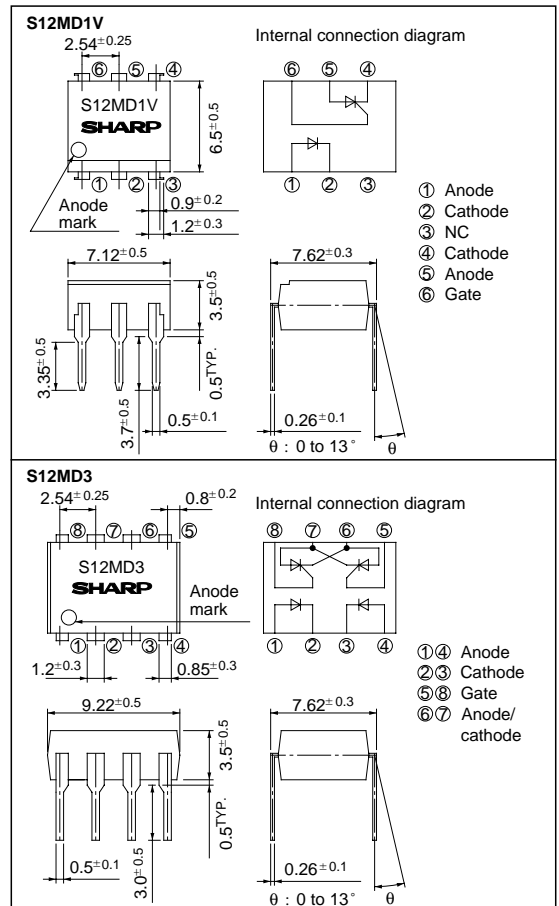
※ **S12MD1V** and **S12MD3** are for 100V line

### ■ Applications

1. ON-OFF operation for a low power load
2. For triggering high power thyristor and triac

### ■ Outline Dimensions

(Unit : mm)



## Absolute Maximum Ratings

(Ta = 25°C)

Parameter	Symbol	Rating		Unit
		S12MD1V	S12MD3	
Input	Forward current	I <sub>F</sub> = 50		mA
	Reverse voltage	V <sub>R</sub> = 6		V
Output	RMS ON-state current	I <sub>T</sub> = 200		mA <sub>rms</sub>
	*1 Peak one cycle surge current	I <sub>surge</sub> = 2		A
	*2 Repetitive peak OFF-state voltage	V <sub>DRM</sub> = 400		V
	*2 Repetitive peak reverse voltage	V <sub>RRM</sub> = 400	-	V
*3 Isolation voltage	V <sub>iso</sub>	5 000	1 500	V <sub>rms</sub>
Operating temperature	T <sub>opr</sub>	- 30 to + 100		°C
Storage temperature	T <sub>stg</sub>	- 40 to + 125		°C
*4 Soldering temperature	T <sub>sol</sub>	260		°C

\*1 50Hz, sine wave      \*3 40 to 60% RH, AC for 1 minute

\*2 R<sub>G</sub> = 20kΩ

\*4 For 10 seconds

## Electro-optical Characteristics

(Ta = 25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V <sub>F</sub> = 30mA	-	1.2	1.4	V
	Reverse current	I <sub>R</sub> = 3V	-	-	10 <sup>-5</sup>	A
Output	Repetitive peak OFF-state current	I <sub>DRM</sub> = V <sub>DRM</sub> = Rated, R <sub>G</sub> = 20kΩ	-	-	10 <sup>-6</sup>	A
	*5 Repetitive peak reverse current	I <sub>RRM</sub> = V <sub>RRM</sub> = Rated, R <sub>G</sub> = 20kΩ	-	-	10 <sup>-6</sup>	A
	ON-state voltage	V <sub>T</sub> = I <sub>T</sub> = 200mA	-	1.0	1.4	V
	Holding current	I <sub>H</sub> = V <sub>D</sub> = 6V, R <sub>G</sub> = 20kΩ	-	0.3	1	mA
	Critical rate of rise of OFF-state voltage	dV/dt = V <sub>DRM</sub> = 1/√2 Rated, R <sub>G</sub> = 20kΩ	3	-	-	V/μs
Transfer-characteristics	Minimum trigger current	I <sub>FT</sub> = V <sub>D</sub> = 6V, R <sub>L</sub> = 100Ω, R <sub>G</sub> = 20kΩ	-	-	15	mA
	Isolation resistance	R <sub>ISO</sub> = DC500V, 40 to 60% RH	5 x 10 <sup>10</sup>	10 <sup>11</sup>	-	Ω
	Turn-on time	t <sub>on</sub> = V <sub>D</sub> = 6V, I <sub>F</sub> = 30mA, R <sub>G</sub> = 20kΩ, R <sub>L</sub> = 100Ω	-	10	60	μs

\*5 Applies only to S12MD1V

Fig. 1 RMS ON-state Current vs. Ambient Temperature

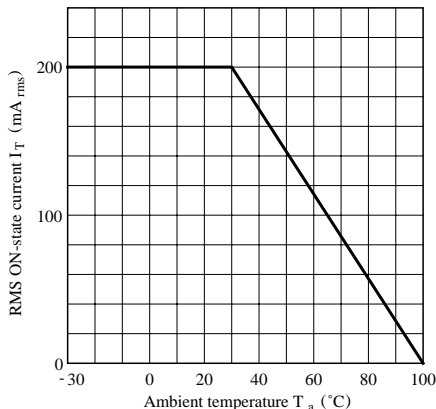


Fig. 2 Forward Current vs. Ambient Temperature

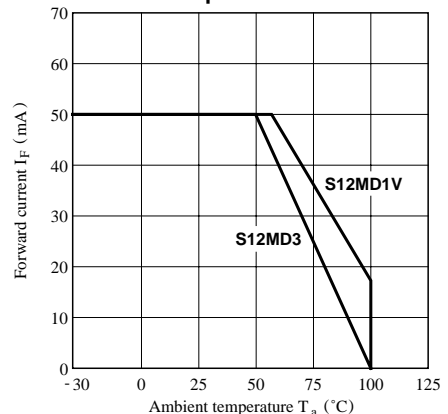


Fig. 3 Forward Current vs. Forward Voltage

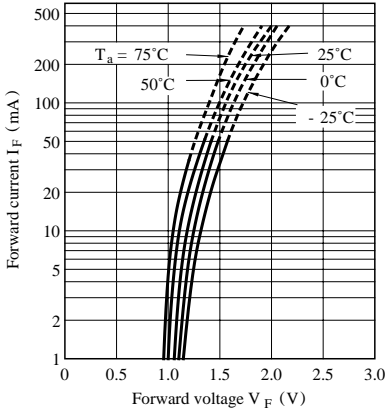


Fig. 4 Minimum Trigger Current vs. Ambient Temperature

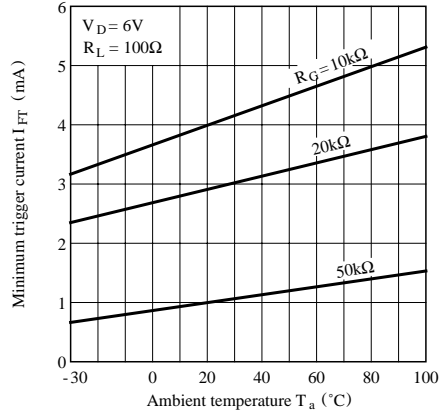


Fig. 5 Minimum Trigger Current vs. Gate Resistance

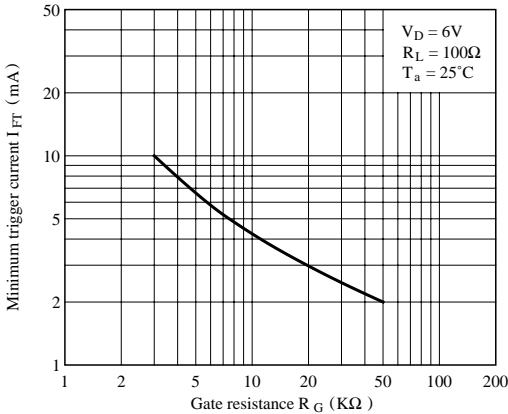


Fig. 6 Break Over Voltage vs. Ambient Temperature

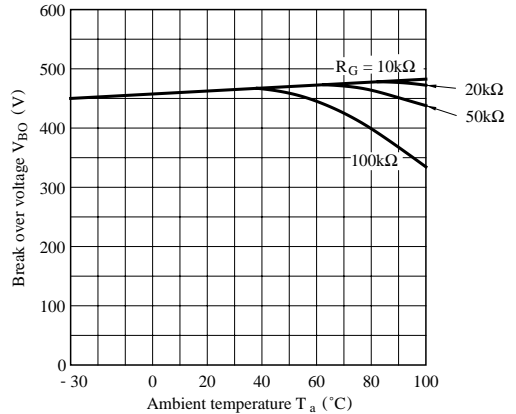


Fig. 7 Critical Rate of Rise of OFF-state Voltage vs. Ambient Temperature

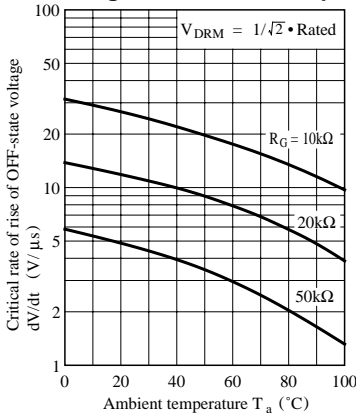
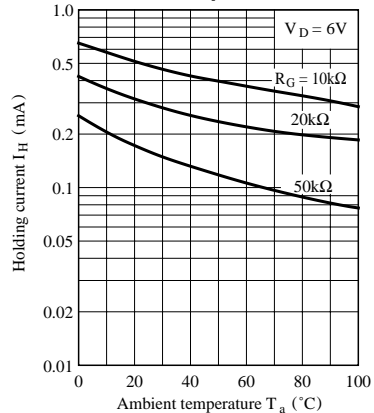
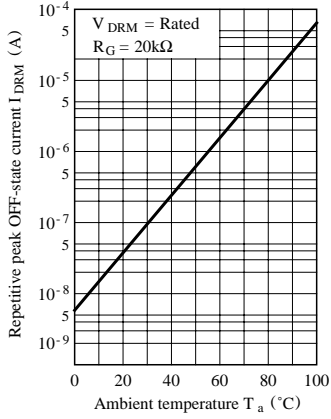


Fig. 8 Holding Current vs. Ambient Temperature



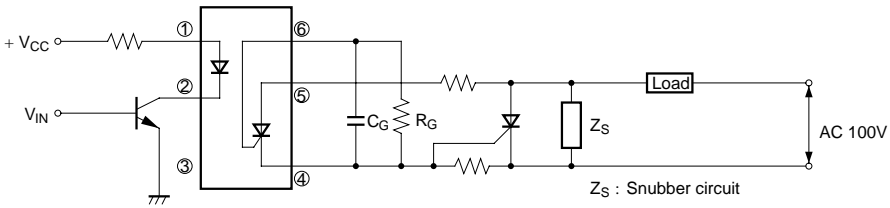
**Fig. 9 Repetitive Peak OFF-state Current vs. Ambient Temperature**



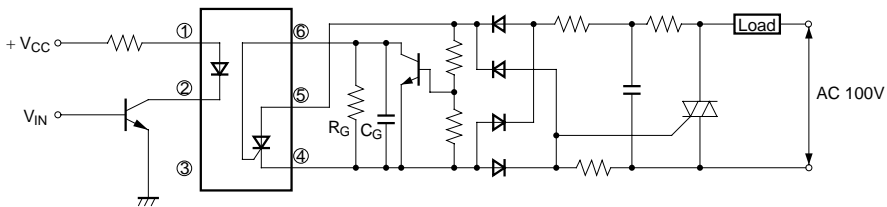
■ **Basic Operation Circuit**

● **S12MD1V**

**Medium/High Power Thyristor Drive Circuit**

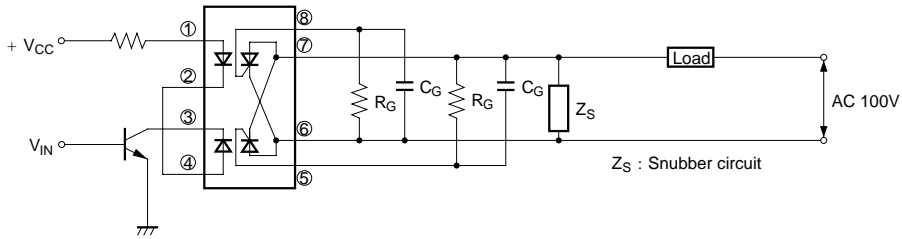


**Medium/High Power Triac Drive Circuit (Zero-cross Operation)**

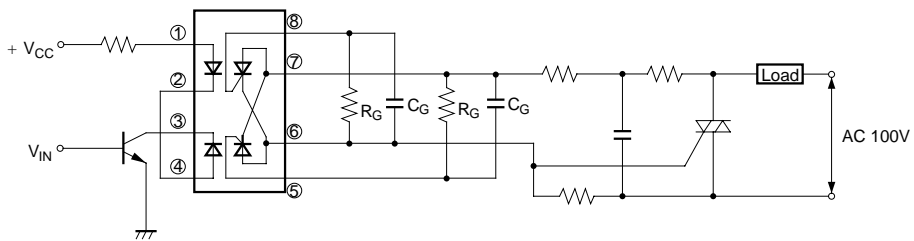


## ● S12MD3

## Low Power Load Drive Circuit



## Medium/High Power Triac Drive Circuit



- Please refer to the chapter “Precautions for Use” (Page 78 to 93).

### NOTICE

- The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.
- Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.
- Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:
  - (i) The devices in this publication are designed for use in general electronic equipment designs such as:
    - Personal computers
    - Office automation equipment
    - Telecommunication equipment [terminal]
    - Test and measurement equipment
    - Industrial control
    - Audio visual equipment
    - Consumer electronics
  - (ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
    - Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
    - Traffic signals
    - Gas leakage sensor breakers
    - Alarm equipment
    - Various safety devices, etc.
  - (iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
    - Space applications
    - Telecommunication equipment [trunk lines]
    - Nuclear power control equipment
    - Medical and other life support equipment (e.g., scuba).
- Contact a SHARP representative in advance when intending to use SHARP devices for any "specific" applications other than those recommended by SHARP or when it is unclear which category mentioned above controls the intended use.
- If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Control Law of Japan, it is necessary to obtain approval to export such SHARP devices.
- This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.
- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.