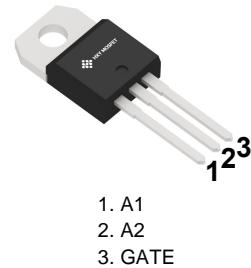




## Features

Symbol	Value	Unit
$I_{T(RMS)}$	12	A
$V_{DRM} / V_{RRM}$	600/800	V
$I_{GT(Q1)}$	50	mA



TO-220A

## Maximum Ratings (Ta=25 °C unless otherwise noted)

Symbol	Parameters			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)		$T_c = 100 \text{ }^\circ\text{C}$	12	A
			$T_c = 90 \text{ }^\circ\text{C}$		
$I_{TSM}$	Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25 °C)		$f = 50 \text{ Hz}$	$t_p = 20 \text{ ms}$	A
			$f = 60 \text{ Hz}$	$t_p = 16.7 \text{ ms}$	
$I^2t$	$I^2t$ value for fusing	$t_p = 10 \text{ ms}$		78	$\text{A}^2\text{s}$
$dl/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100 \text{ ns}$	$f = 120 \text{ Hz}$	$T_j = 125 \text{ }^\circ\text{C}$	50	$\text{A}/\mu\text{s}$
$V_{DSM}, V_{RSM}$	Non repetitive surge peak off-state voltage	$t_p = 10 \text{ ms}$	$T_j = 25 \text{ }^\circ\text{C}$	$V_{DRM}, V_{RRM} + 100$	
$I_{GM}$	Peak gate current	$t_p = 20 \mu\text{s}$	$T_j = 125 \text{ }^\circ\text{C}$	4	A
$P_{G(AV)}$	Average gate power dissipation	$T_j = 125 \text{ }^\circ\text{C}$		1	W
$T_{stg}$	Storage junction temperature range				-40 to +150 °C
$T_j$	Operating junction temperature range				-40 to +125 °C

## Electrical Characteristics (T<sub>j</sub>=25°C unless otherwise specified)

### -Snubberless™ and logic level 3 quadrants) T25

Symbol	Parameters	Quadrant		BTA12	Unit
$I_{GT}^{(1)}$	$V_D = 12 \text{ V}$ , $R_L = 33 \Omega$	I - II - III	Max.	50	mA
$V_{GT}$		I - II - III	Max.	1.3	V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3 \text{ k}\Omega$ , $T_j = 125 \text{ }^\circ\text{C}$	I - II - III	Min.	0.2	V
$I_H^{(2)}$	$I_T = 100 \text{ mA}$		Max.	50	mA
$I_L$	$I_G = 1.2 I_{GT}$		Max.	70	mA
	II	Max.	80		
$dV/dt^{(2)}$	$V_D = 67\% V_{DRM}$ gate open, $T_j = 125 \text{ }^\circ\text{C}$	Min.		1000	$\text{V}/\mu\text{s}$
$(dl/dt)c^{(2)}$	Without snubber	Min.		12	$\text{A}/\text{ms}$

1. Minimum  $I_{GT}$  is guaranteed at 5 % of  $I_{GT}$  max.

2. For both polarities of A2 referenced to A1



## Electrical Characteristics ( $T_j=25^\circ\text{C}$ unless otherwise specified)

Standard Triac( 4 quadrants )

Symbol	Parameters	Quadrant		Value	Unit
$I_{GT}^{(1)}$	$V_D = 12 \text{ V}$ , $R_L = 30 \Omega$	I - II - III	Max.	50	mA
$V_{GT}$		IV		100	
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 33 \text{ k}\Omega$ , $T_j = 125^\circ\text{C}$	All	Max.	1.3	V
$I_H^{(2)}$	$I_T = 500 \text{ mA}$		Max.	50	mA
$I_L$	$I_G = 1.2 I_{GT}$	I - III - IV	Max.	50	mA
		II	Max.	100	
$dV/dt^{(2)}$	$V_D = 67\% V_{DRM}$ gate open, $T_j = 125^\circ\text{C}$		Min.	500	V/ $\mu$ s
$(dV/dt)c^{(2)}$	$(dI/dt)c = 5.3 \text{ A/ms}$ , $T_j = 125^\circ\text{C}$		Min.	10	V/ $\mu$ s

1. Minimum  $I_{GT}$  is guaranteed at 5 % of  $I_{GT}$  max.

2. For both polarities of A2 referenced to A1

## Static electrical characteristics

Symbol		$T_j$		Value	Unit
$V_{TM}^{(1)}$	$I_{TM} = 17 \text{ A}$ , $t_p = 380 \mu\text{s}$	25 $^\circ\text{C}$	Max.	1.55	V
$V_{TO}^{(1)}$	threshold on-state voltage	125 $^\circ\text{C}$	Max.	0.85	V
$R_D^{(1)}$	Dynamic resistance	125 $^\circ\text{C}$	Max.	35	$\text{m}\Omega$
$I_{DRM}/I_{RRM}$	$V_T = V_{DRM}$ , $V_T = V_{RRM}$	25 $^\circ\text{C}$	Max.	5	$\mu\text{A}$
		125 $^\circ\text{C}$	Max.	1	mA

1. For both polarities of A2 referenced to A1

## Thermal resistance

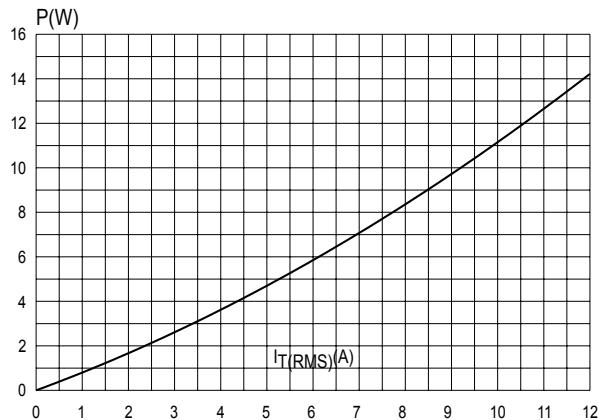
Symbol	Parameters			Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	TO-220AB insulated	Max.	2.3	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient		Typ.	60	

1. S = Copper surface under tab.

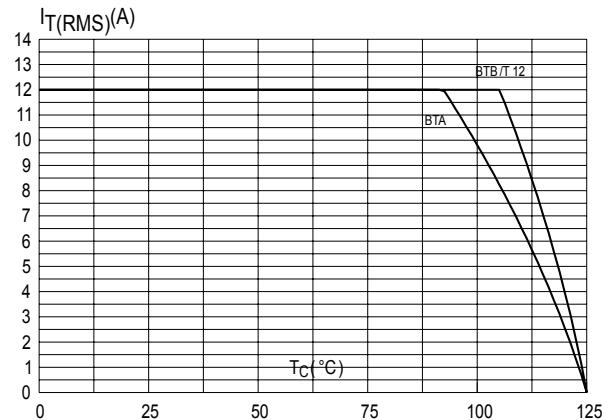


## Typical Characteristics

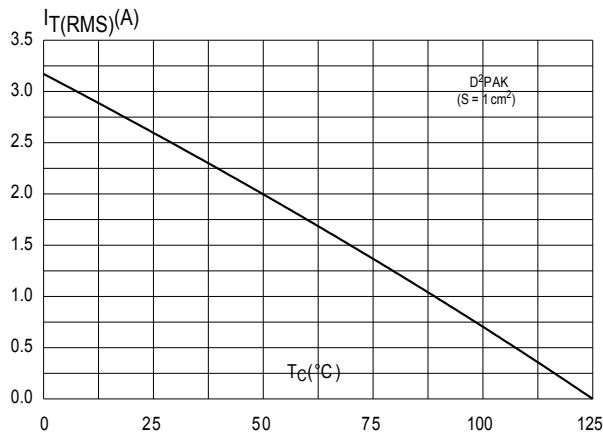
**Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)**



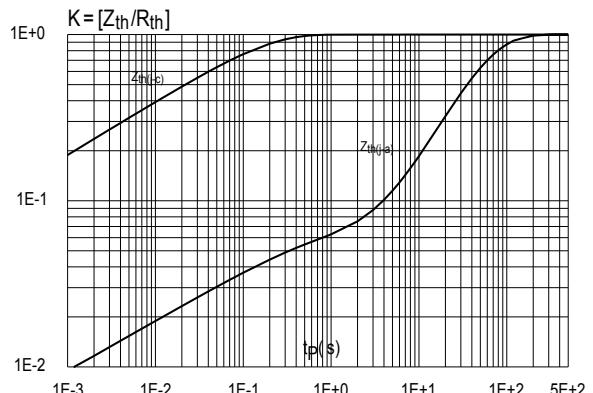
**Figure 2. RMS on-state current versus case temperature (full cycle)**



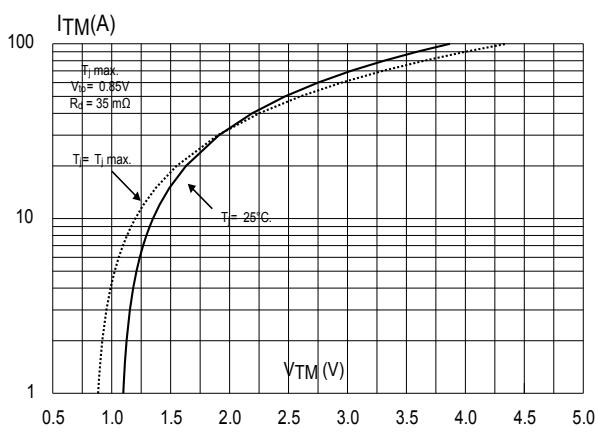
**Figure 3. RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35 µm) (full cycle)**



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



**Figure 5. On-state characteristics (maximum values)**



**Figure 6. Surge peak on-state current versus number of cycles**

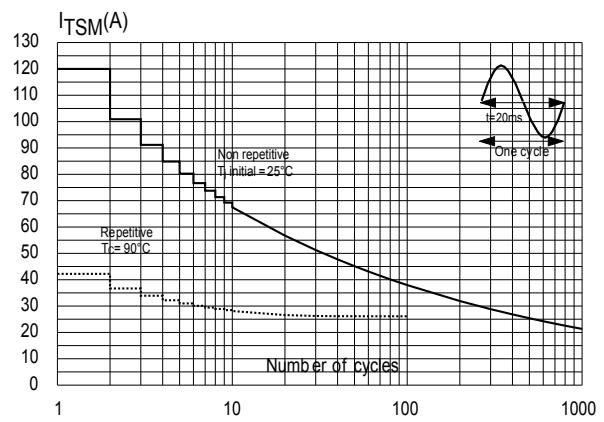




Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse

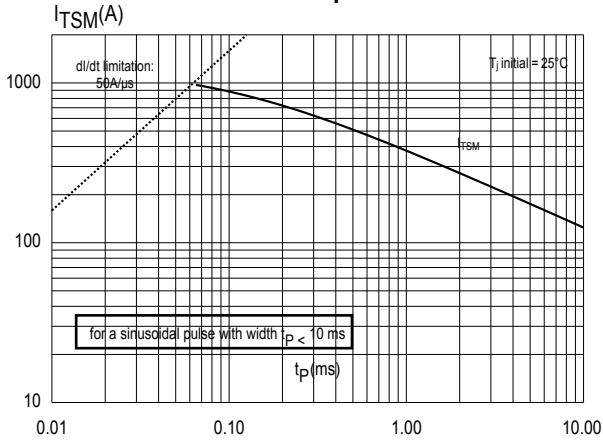


Figure 9. Relative variation of critical rate of decrease of main current versus  $(dV/dt)c$  (typical values)

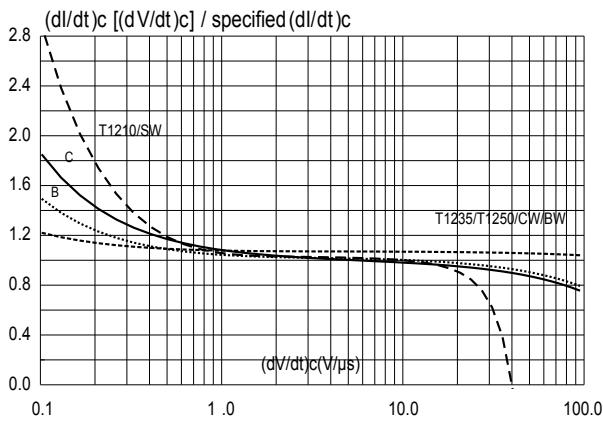


Figure 11. Relative variation of critical rate of decrease of main current versus junction temperature

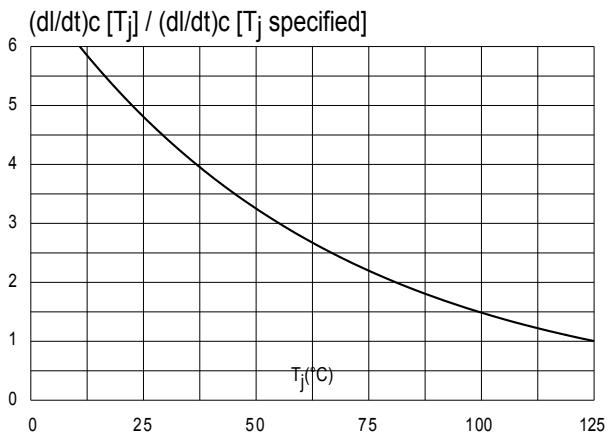


Figure 8. Relative variation of gate trigger current holding current and latching current versus junction temperature (typical values)

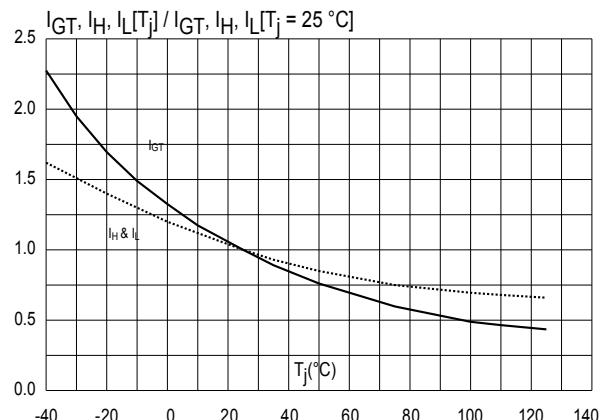


Figure 10. Relative variation of critical rate of decrease of main current versus  $(dV/dt)c$  (typical values)(TW)

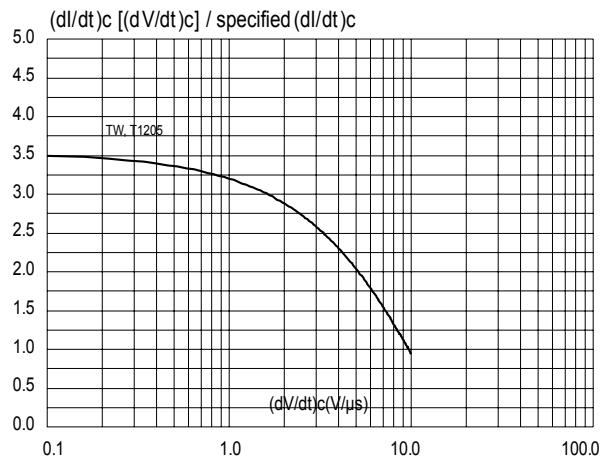
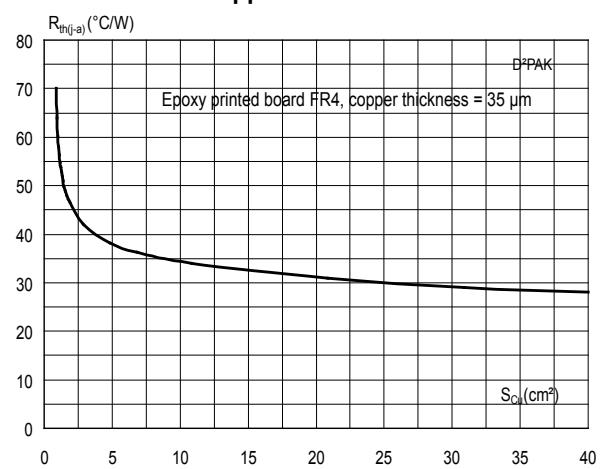
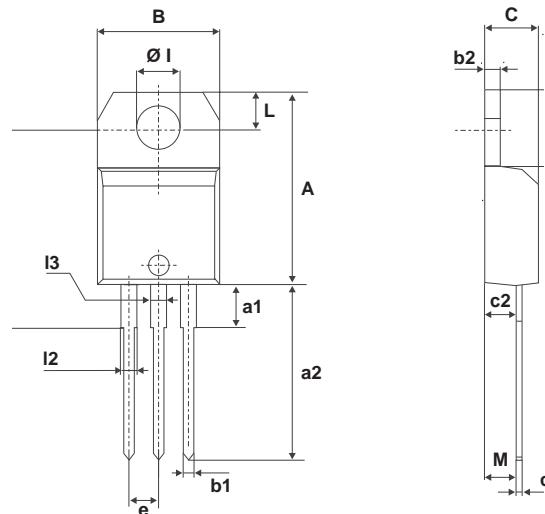


Figure 12. D<sup>2</sup>PAK thermal resistance junction to ambient versus copper surface under tab





**Package Information**  
**TO-220A**



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
Øl	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	



### Attention

- Any and all HUA XUAN YANG ELECTRONICS products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your HUA XUAN YANG ELECTRONICS representative nearest you before using any HUA XUAN YANG ELECTRONICS products described or contained herein in such applications.
- HUA XUAN YANG ELECTRONICS assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein.
- Specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- HUA XUAN YANG ELECTRONICS CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all HUA XUAN YANG ELECTRONICS products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of HUA XUAN YANG ELECTRONICS CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. HUA XUAN YANG ELECTRONICS believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the HUA XUAN YANG ELECTRONICS product that you intend to use.