

BT138S-800E



FOUR-QUADRANTS TRIAC

VOLTAGE: 800 Volts

CURRENT: 12 Ampers

Package: TO-252

FEATURES

- Highly di/dt For High Reliability
- Low Thermal Resistance Increases Carrying Capacity
- High Commutation Capability
- Packages Are RoHS (2011/65/EU) Compliant

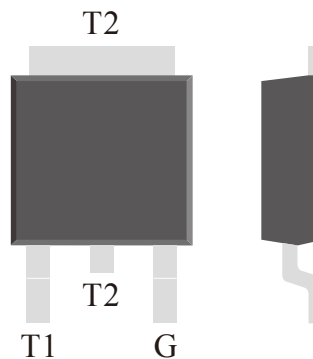
TYPICAL APPLICATIONS

- Phase Control Operation Of Light Dimmers And Motor Speed Controllers
- ON/OFF Control Operation Of Heating Regulation And Induction Motor

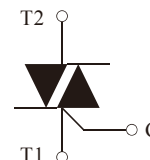
PRODUCT SUMMARY

Gear	E	Unit
$I_{GT(I-II-III)} \text{ Max.}$	10	mA
$I_{GTIV} \text{ Max.}$	25	
$V_{DRM}/V_{RRM} \text{ Min.}$	800	V
$I_{T(RMS)}$	12	A

Diagram:



Polarity:



Absolute Maximum Ratings (Ta=25°C Unless otherwise specified)

Parameter	Test Conditions	Symbol	Ratings	Unit
Repetitive Peak Off-State Voltage		V_{DRM}	800	V
Repetitive Peak Reverse Voltage		V_{RRM}	800	V
RMS On-State Current	$T_c \leq 70^\circ\text{C}$	$I_{T(RMS)}$	12	A
Non Repetitive Surge Peak On-State Current	F= 50 Hz, $T_p= 20 \text{ ms}$	I_{TSM}	95	A
	F= 50 Hz, $T_p= 16.6 \text{ ms}$		104	
I^2T Value For Fusing	$T_p= 10 \text{ ms}$	I^2t	51	A
Critical Rate Of Rise Of On-State Current	$I_G=2 \cdot I_{GT}$, $t_r \leq 100\text{ns}$ F=100Hz, $T_j=125^\circ\text{C}$	di/dt	80	A/ μs
			50	
Peak Gate Current	$T_p=20\mu\text{s}$, $T_j=125^\circ\text{C}$	I_{GM}	4	A
Average Gate Power Dissipation	$T_j= 125^\circ\text{C}$	$P_{G(AV)}$	0.5	W
Peak Gate Power Dissipation		P_{GM}	10	W

Thermal Characteristics (Ta=25°C Unless otherwise specified)

Parameter	Test Conditions	Symbol	Typ.	Unit
Operating Junction Temperature Range		T_j	-40 to 125	$^\circ\text{C}$
Storage Temperature Range		T_{STD}	-40 to 150	
Thermal Resistance Junction To Ambient With Steady-State	Still Air Environment With $T_a=25^\circ\text{C}$	$R_{\theta JA}$	100	$^\circ\text{C/W}$
Thermal Resistance Junction-Case With Steady-State	Device Mounted On 1 in2 FR-4 Board With 2oz. Copper	$R_{\theta JC}$	3.0	

BT138S-800E

FOUR-QUADRANTS TRIAC
Electrical Characteristics (Ta=25°C Unless otherwise specified)

Parameter	Test Conditions	Symbol	Quadrant	Value		Unit
				Gear	E	
Gate Trigger Current	$V_D=12V, R_L=33\Omega$	I_{GT}	I - II -III IV	Max.	10 25	mA
Max. Gate Trigger Voltage	$V_D=12V, R_L=33\Omega$	V_{GT}	ALL	Max.	1	V
Min. Gate Trigger Voltage	$V_D=V_{DRM}, T_j=125^\circ C, R_L=3.3K\Omega$	V_{GD}	ALL	Min.	0.2	V
Holding Current	$I_T=500\text{ mA}$	I_H		Max.	25	mA
Latching Current	$I_G=1.2*I_{GT}$	I_L	I -III-IV II	Max.	25 35	mA
Rise Of Off- State Voltage	$V_D=2/3V_{DRM}, T_j=125^\circ C, \text{Gate Open}$	dv/dt		Min.	150	V/us

Static Characteristics (Ta=25°C Unless otherwise specified)

Parameter	Test Conditions	Symbol	T_j	Value		Unit
Peak On-State Voltage	$I_T=15\text{ A}$	V_{TM}	25°C	Max.	1.6	V
Threshold Voltage		V_{TO}	125°C	Max.	0.8	V
Dynamic resistance		R_D	125°C	Max.	41	mΩ
Peak Repetitive Forward Blocking Current	$V_D=V_{DRM}$	I_{DRM}	25°C	Max.	5	uA
	$V_D=V_{DRM}$		125°C		0.5	mA
Peak Repetitive Reverse Blocking Current	$V_R=V_{RRM}$	I_{RRM}	25°C	Max.	5	uA
	$V_R=V_{RRM}$		125°C		0.5	mA

Model and identification instructions

BT	138	S	-	800	E
Product Type BT=TRIAC					
Insulation Spec.: A=Ins.=Insulation Empty=No Ins.=No Insulation					
$I_{T(RMS)}$ Spec.: 138=12A					
Package Spec.: S=TO-252					
"-"=Connection Symbol Constant And Unchanging					
V_{DRM}/V_{RRM} Spec.: 800≅800V					
I_{GT} Spec.: E:IGT I - II -III ≅ 10mA;IGT IV ≅ 25mA					
Temperature Spec.: Empty=Standard Temperature H=high temperature					

BT138S-800E

FOUR-QUADRANTS TRIAC



Typical Characteristics Curves

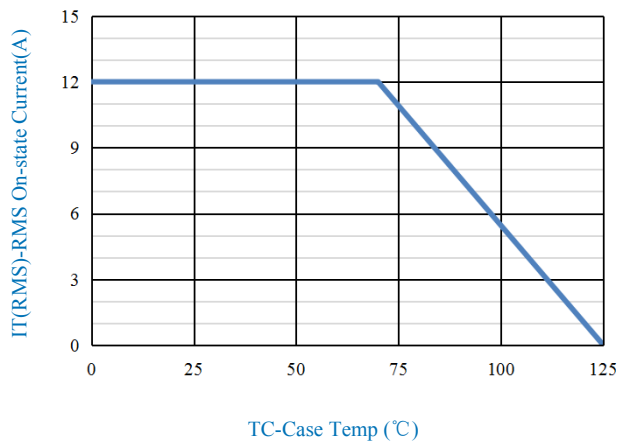


Fig.1-RMS on-state current vs. case temperature

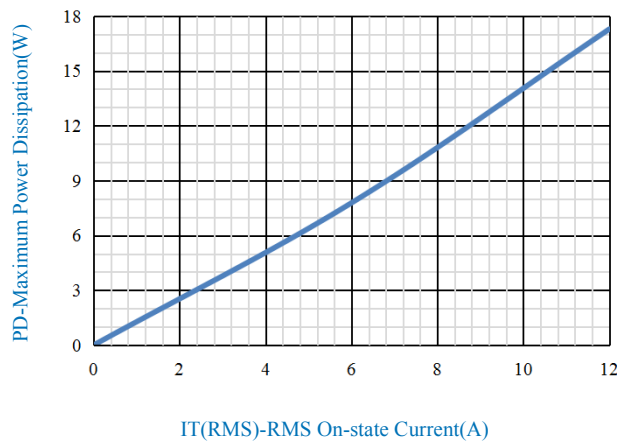


Fig.2- Maximum Power Dissipation Vs. on-state current

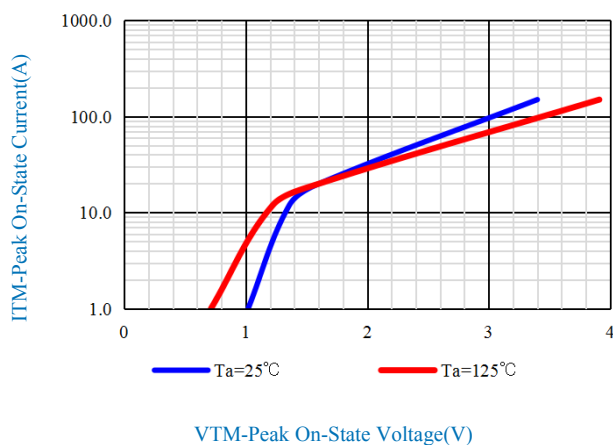


Fig.3-On-State Characteristics

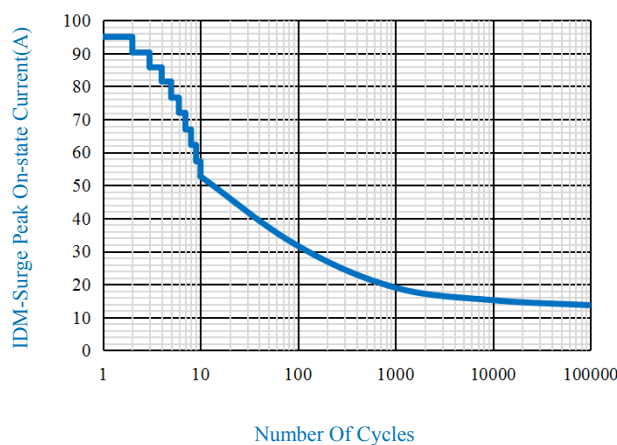


Fig.4- Surge Peak On-state Current Vs. Number Cycles

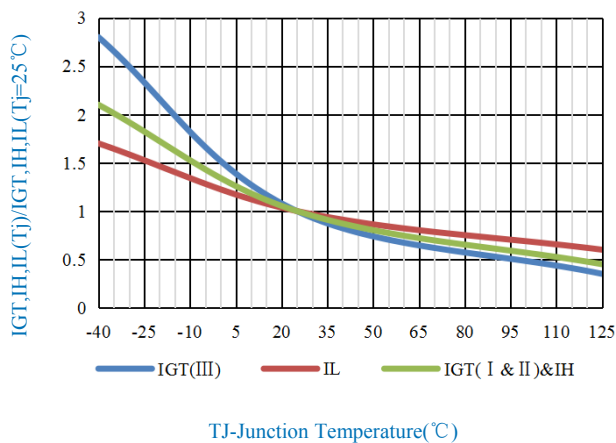


Fig.5- Relative Variation Of Gate Trigger Current , Holding Current And Latching Current Versus Junction Temperature (Typical Value)

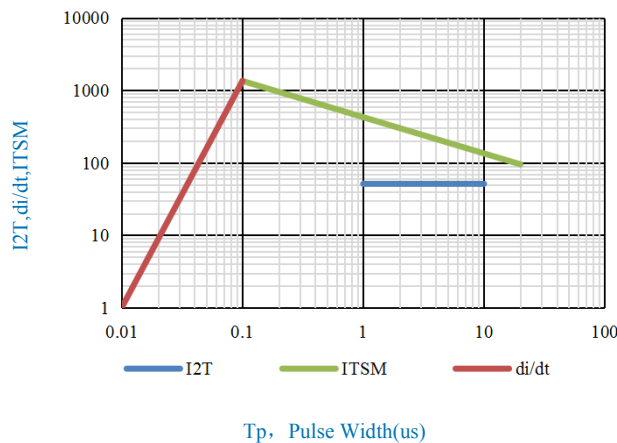


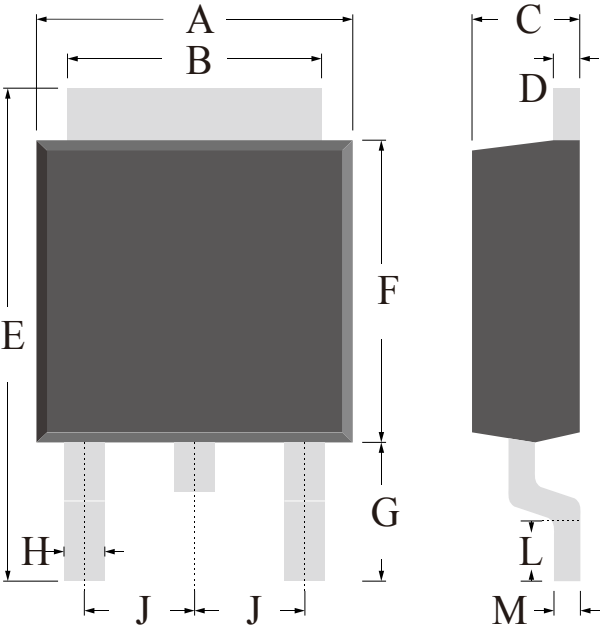
Fig.6- Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 20\text{ms}$, and corresponding value of I_2t ($di/dt < 50\text{A}/\mu\text{s}$)

BT138S-800E



FOUR-QUADRANTS TRIAC

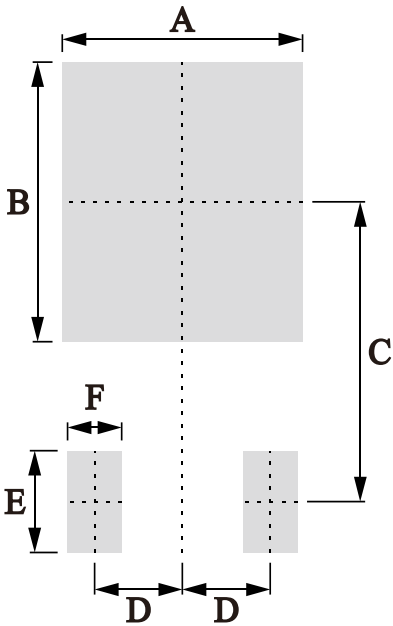
OUTLINE DRAWINGS



TO-252

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.10	-	7.10	0.2402	-	0.2795
B	4.80	-	5.80	0.1890	-	0.2283
C	1.95	-	2.55	0.0768	-	0.1004
D	0.35	-	0.75	0.0138	-	0.0295
E	9.25	-	10.75	0.3642	-	0.4232
F	5.60	-	6.60	0.2205	-	0.2598
G	2.50	-	3.10	0.0984	-	0.1220
H	0.55	-	0.85	0.0217	-	0.0335
J	2.10	-	2.50	0.0827	-	0.0984
L	1.00	-	1.40	0.0394	-	0.0551
M	0.35	-	0.75	0.0138	-	0.0295

RECOMMEDND LAYOUT DRAWINGS



TO-252

OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	6.09	-	-	0.2398	-
B	-	7.57	-	-	0.2980	-
C	-	6.64	-	-	0.2614	-
D	-	2.30	-	-	0.0906	-
E	-	2.76	-	-	0.1087	-
F	-	1.42	-	-	0.0559	-

BT138S-800E

FOUR-QUADRANTS TRIAC



MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhan Trademark

FF=Product Line Code,According To Actual Changes

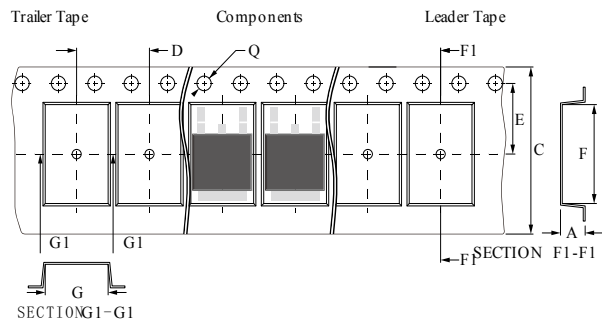
YWW=Date Code,According To Actual Changes

LLWWF=Internal Code,According To Actual Changes

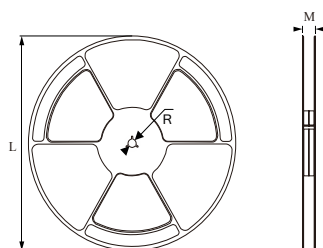
BT138S-800E=Model

PACKAGING

TAPE



REEL



TO-252

OUTLINE DIMENSIONS

Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
TAPE						
A	2.60	-	2.80	0.1024	-	0.1102
C	15.60	-	16.40	0.6142	-	0.6457
D	7.70	-	8.30	0.3031	-	0.3268
E	7.30	-	7.70	0.2874	-	0.3031
F	10.20	-	10.80	0.4016	-	0.4252
G	6.70	-	7.10	0.2638	-	0.2795
Q Φ	1.40	-	1.60	0.0551	-	0.0630
REEL						
L	328.00	-	332.00	12.913	-	13.071
R	12.00	-	14.00	0.4724	-	0.5512
M	19.40	-	23.40	0.7638	-	0.9213

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
TO-252	P1	0.321	13" Reel	2500	5000	30000
TO-252	P2	0.321	13" Reel	2500	2500	25000

BT138S-800E



FOUR-QUADRANTS TRIAC

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow

	Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
	Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
	Preheat-Temperature Min (T _S min) -Temperature Max (T _S max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
	Time maintained above: -Temperature (T _L) - Time (t _L)	183°C 60-150 seconds	217°C 60-150 seconds
	Peak Temperature(T _P)	240 +0/-5 °C	260 +0/-5 °C
	Time within 5°C of actual peak temperature (t _p)	10-30 seconds	20-40 seconds
	Ramp down rate	6°C/second max.	6°C/second max.
	Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

Disclaimer

- Reproducing and modifying information of the document is prohibited without permission from Niuhang Electronics Technology Co., LTD
- Niuhang Electronics Technology Co., LTD. reserves the rights to make changes of the content herein the document anytime without notification.
- Niuhang Electronics Technology Co., LTD. disclaims any and all liability arising out of the application or use of any product including damages incidentally and consequentially occurred.
- Niuhang Electronics Technology Co., LTD. does not assume any and all implied warranties,including warranties of fitness for particular purpose,non-infringement and merchantability.
- Applications shown on the herein document are examples of standard use and operation.Customers are responsible in comprehending the suitable use in particular applications.Niuhang Electronics Technology Co., LTD.makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.
- The products shown herein are not designed and authorized for equipments requiring high level of reliability or relating to human life and for any applications concerning life-saving or life-sustaining,such as medical instruments,transportation equipment,aerospae machinery et cetera.Customers usin or selling these products for use in such applications do so at their own rish and agree to fully indemnify Niuhang Electronics Technology Co., LTD.for any damages resulting resulting from such improper use or sale.
- When the appearance of the product and chip size does not change, in order to product the customer. quality, change the internal structure and the production process Niuhang can not notify

BT138S-800E

FOUR-QUADRANTS TRIAC



Specification Revision History

Rev.	Date	Changed Items	Pre-Changed Content	Changed Content
A/1	2014-10-20	First Issue		
Blank Below				