

BT138E-600E



FOUR-QUADRANTS TRIAC

VOLTAGE: 600 Volts

CURRENT: 12 Ampers

Package: TO-251

FEATURES

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

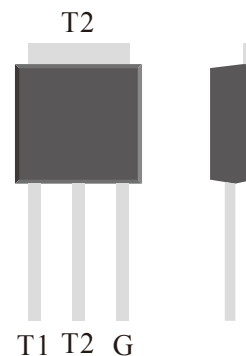
TYPICAL APPLICATIONS

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

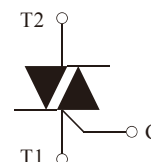
PRODUCT SUMMARY

Gear	E	Unit
$I_{GT(I-II-III)} \text{ Max.}$	10	mA
$I_{GTIV} \text{ Max.}$	25	
$V_{DRM}/V_{RRM} \text{ Min.}$	600	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}	600	V
Repetitive Peak Reverse Voltage		V_{RRM}	600	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	$I_G = 2 \cdot I_{GT}$, $t_r \leq 100 \text{ ns}$ I - II - III	di/dt	80	A/ μs
	F=100Hz, $T_j = 125^\circ\text{C}$ IV		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 75mm x 45mm x 2.5mm Alu. Heat.	$R_{\theta JC}$	3.0	

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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	$I_G=1.2 \cdot I_{GT}$	I_L	I -III-IV II	Max.	25 35	mA
Rise Of Off- State Voltage	$V_D=2/3 V_{DRM}, T_j=125^\circ C, \text{Gate Open}$	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		0.4	mA
Peak Repetitive Reverse Blocking Current	$V_R=V_{RRM}$	I_{RRM}	25°C	Max.	5	uA
	$V_R=V_{RRM}$		125°C		0.4	mA

Model and identification instructions

BT	138	E	-	600	E
Product Type BT=TRIAC					
Insulation Spec.: A=Ins.=Insulation Empty=No Ins.=No Insulation					
$I_{T(RMS)}$ Spec.: 138=12A					
Package Spec.: E=TO-251					
"-."=Connection Symbol Constant And Unchanging					
V_{DRM}/V_{RRM} Spec.: 600≅600V					
I_{GT} Spec.: E:IGT I - II -III ≅ 10mA;IGT IV ≅ 25mA					
Temperature Spec.: Empty=Standard Temperature H=high temperature					

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Typical Characteristics Curves

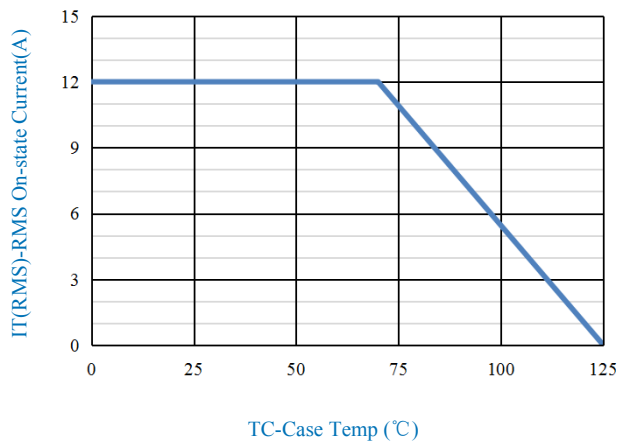


Fig.1-RMS on-state current vs. case temperature

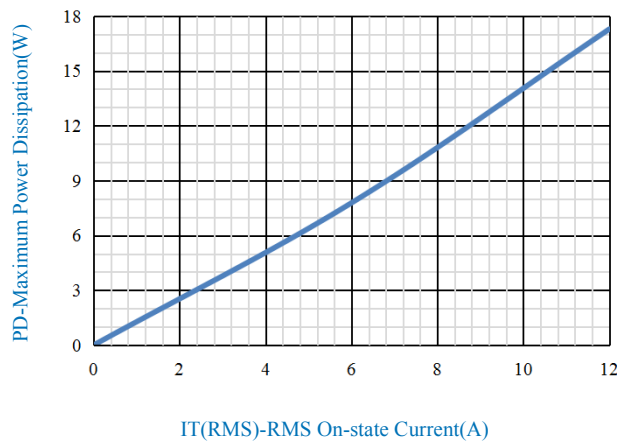


Fig.2- Maximum Power Dissipation Vs. on-state current

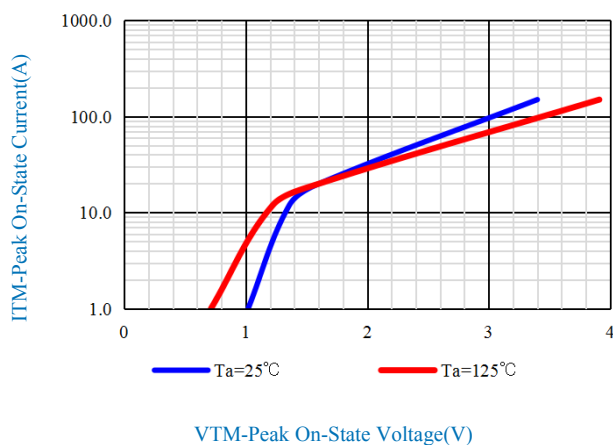


Fig.3-On-State Characteristics

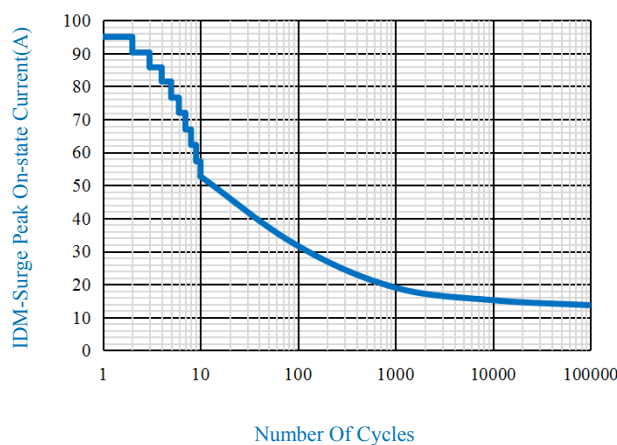


Fig.4- Surge Peak On-state Current Vs. Number Cycles

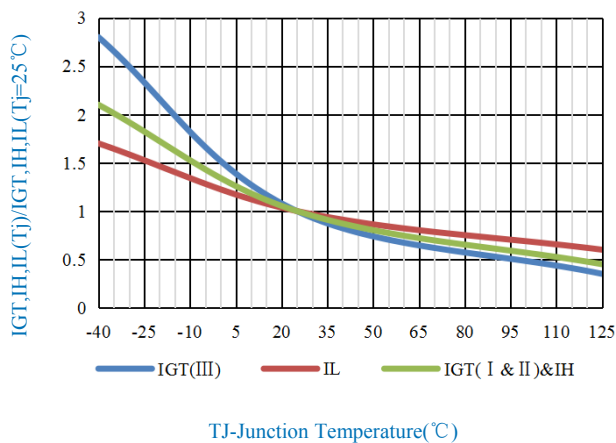


Fig.5- Relative Variation Of Gate Trigger Current , Holding Current And Latching Current Versus Junction Temperature (Typical Value)

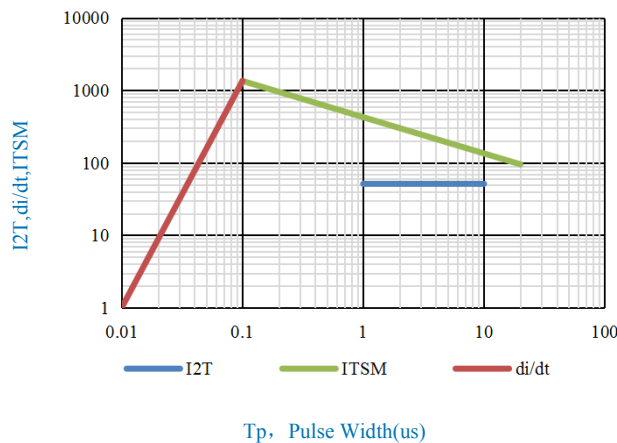


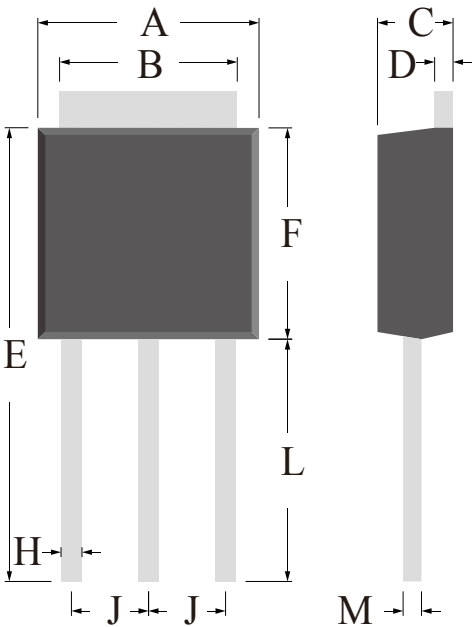
Fig.6- Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 20\text{ms}$, and corresponding value of I_2t ($di/dt < 50\text{A}/\mu\text{s}$)

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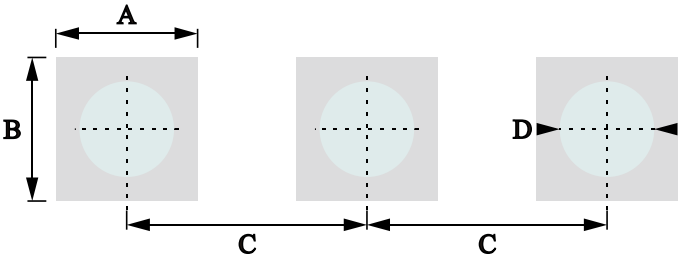
OUTLINE DRAWINGS



TO-251

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	13.50	-	15.00	0.5315	-	0.5906
F	5.60	-	6.60	0.2205	-	0.2598
H	0.40	-	0.85	0.0157	-	0.0335
J	2.10	-	2.50	0.0827	-	0.0984
L	6.00	-	8.00	0.2362	-	0.3150
M	0.35	-	0.75	0.0138	-	0.0295

RECOMMEDND LAYOUT DRAWINGS



TO-251

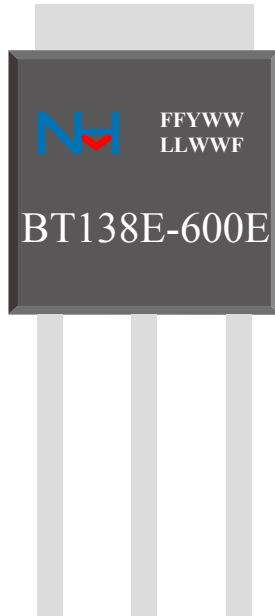
OUTLINE DIMENSIONS						
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	1.60	-	-	0.0630	-
B	-	1.60	-	-	0.0630	-
C	-	2.30	-	-	0.0906	-
D	-	0.90	-	-	0.0354	-

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MARKING INFORMATION



MARKING INSTRUCTIONS

NH=Niuhan Trademark
FF=Product Line Code,According To Actual Changes
YWW=Date Code,According To Actual Changes
LLWWF=Inernal Code,According To Actual Changes
BT138E-600E=Model

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-251	P1	0.361	Tube	50	4000	20000

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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 (tp)	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.

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Specification Revision History

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