



# PRODUCT/PROCESS CHANGE NOTIFICATION

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PCN IPD-DIS/13/7944  
Dated 21 Jun 2013

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**New ECOPACK2 molding compound for selected products  
housed in TO-220AB, TO-220AB insulated, TO-220AC insulated and D2PAK**

**Table 1. Change Implementation Schedule**

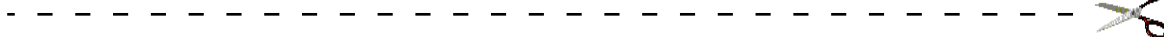
Forecasted implementation date for change	20-Sep-2013
Forecasted availability date of samples for customer	28-Jun-2013
Forecasted date for <b>STMicroelectronics</b> change Qualification Plan results availability	14-Jun-2013
Estimated date of changed product first shipment	20-Sep-2013

**Table 2. Change Identification**

Product Identification (Product Family/Commercial Product)	TO-220AB, TO-220AB ins, TO-220AC ins and D2PAK
Type of change	Package assembly material change
Reason for change	to meet the latest environmental standards
Description of the change	ST selected products housed in TO-220AB, TO-220AB insulated, TO-220AC insulated and D2PAK packages are upgraded to the ECOPACK2 level by changing its current compound to Halogen free.
Change Product Identification	internal codification, QA number, date code, marking
Manufacturing Location(s)	

**Table 3. List of Attachments**

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt		PCN IPD-DIS/13/7944
Please sign and return to STMicroelectronics Sales Office		Dated 21 Jun 2013
<input type="checkbox"/> Qualification Plan Denied <input type="checkbox"/> Qualification Plan Approved  <input type="checkbox"/> Change Denied <input type="checkbox"/> Change Approved	Name:	
	Title:	
	Company:	
	Date:	
	Signature:	
Remark ..... ..... ..... ..... ..... ..... ..... ..... ..... .....		

## DOCUMENT APPROVAL

Name	Function
Paris, Eric	Marketing Manager
Duclos, Franck	Product Manager
Cazaubon, Guy	Q.A. Manager

## PCN Product/Process Change Notification

**New ECOPACK®2 molding compound for selected products housed in TO-220AB, TO-220AB insulated, TO-220AC insulated and D2PAK**

<b>Notification number:</b>	IPD-DIS/13/7944	<b>Issue Date</b>	14/06/2013
<b>Issued by</b>	Aline AUGIS		
<b>Product series affected by the change</b>	See change implementation schedule table		
<b>Type of change</b>	Assembly package material change		

**Description of the change**

ST selected products housed in **TO-220AB, TO-220AB insulated, TO-220AC insulated and D2PAK packages** are upgraded to the **ECOPACK® 2** level by changing its current compound to Halogen free.

**Reason for change**

ST willingness is to meet the latest environmental standards and convert therefore its portfolio to the so called "Halogen-Free" requirements.

**Former versus changed product:**

The changed products do not present modified electrical, dimensional or thermal parameters, leaving unchanged the current information published in the product datasheet  
 The Moisture Sensitivity Level of the part (according to the IPC/JEDEC JSTD-020D standard) remains unchanged.  
 The footprint recommended by ST remains the same.  
 There is no change in the packing modes and the standard delivery quantities either.

**Disposition of former products**

Deliveries of former product will continue while the conversion is brought to completion and as long as former product stocks last.

**Marking and traceability**

Date code, QA number, internal codification (internal code mentioned on the label) and a letter "G" printed to the right of the "e3" symbol on the marking.



<b>Qualification complete date</b>		W23-2013	
<b>Forecasted sample availability</b>			
Product family	Sub-family	Commercial part Number	Availability date
Thyristors & AC Switches	Triacs	T1635T-6I T1650H-6I	W26
		BTA06-600CRG BTA08-300BLRG BTA08-600CRG BTA12-600BRG BTA12-600BWRG BTA12-600CRG BTA16-600BRG BTA16-600BWRG BTA16-800CWRG BTA24-400BWL BTA24-600BWRG	W33
		TN1625-1000G-TR TYN612RG TYN616RG	W45
		BTB12-600BWRG BTB16-600BWRG BTB16-600CWRG BTB16-600SWRG BTB16-700BWRG BTB16-800CWRG T1210-800G-TR T1235-800G-TR T1235H-6G-TR T1635H-6T T2050H-6T T2535-800G-TR T835-600G-TR	W46
Diodes and Rectifiers	Schottky Barrier Diodes	STPSC10TH13TI STPSC6TH13TI STPSC8TH13TI	W36
	Ultrafast Rectifiers	STTH1008DTI STTH1210DI STTH12R06DIRG STTH12T06DI STTH806DIRG STTH806DTI STTH810DI STTH812DI STTH8R04DI STTH8R06DIRG STTH8ST06DI	W36
Protection	EOS protection	RBO40-40G-TR	W34
All other devices will be available upon request.			

**Change implementation schedule**

Sales types			Estimated production start	Estimated first shipments
BTA04-xxxSRG	BTA10-xxxBWRG	T1225T-6I		
BTA04-xxxTRG	BTA10-xxxCRG	T1235H-6I		
BTA06T-xxxCWRG	BTA10-xxxCWRG	T1235T-6I		
BTA06-xxxARG	BTA10-xxxGPRG	T1250H-6I		
BTA06-xxxARG	BTA12-xxxBRG	T1610T-6I		
BTA06-xxxBRG	BTA12-xxxBWRG	T1610T-8I		
BTA06-xxxBRG	BTA12-xxxCRG	T1620T-6I		
BTA06-xxxBRG	BTA12-xxxCWRG	T1620T-8I		
BTA06-xxxBWRG	BTA12-xxxGBRG	T1625T-8I		
BTA06-xxxCRG	BTA12-xxxSWRG	T1635H-6I		
BTA06-xxxCWRG	BTA12-xxxTWRG	T1635T-6I		
BTA06-xxxGKRG	BTA16-xxxBRG	T1635T-8I		
BTA06-xxxGPRG	BTA16-xxxBWRG	T1650H-6I		
BTA06-xxxGVRG	BTA16-xxxCRG	T1650HT-6I	September 2013	September 2013
BTA06-xxxGZRG	BTA16-xxxCWRG	T2035H-6I		
BTA06-xxxSRG	BTA16-xxxSWRG	T3035H-6I		
BTA06-xxxSWRG	BTA20-xxxBWRG	T3050H-6I		
BTA06-xxxTRG	BTA20-xxxCWRG	T810T-6I		
BTA06-xxxTWRG	BTA20-xxxWH	T820T-6I		
BTA08-xxx300xx	BTA24-xxxBWL	T825T-6I		
BTA08-xxxBRG	BTA24-xxxBWLRG	T835H-6I		
BTA08-xxxBWRG	BTA24-xxxBWRG	T835T-6I		
BTA08-xxxCRG	BTA24-xxxCWRG	T850H-6I		
BTA08-xxxCWRG	BTA24-xxxGPLRG	TXDVxxxRG		
BTA08-xxxSRG	T1035H-6I	TXNxx12RG		
BTA08-xxxSWRG	T1210T-6I	TXNxx25RG		
BTA08-xxxTWRG	T1220T-6I			
BTA10-xxxBRG				

	Sales types		Estimated production start	Estimated first shipments
AVSxxxx	T1035H-6T	T410-xxxT		
BTB04-xxxSAPRG	T1050H-6G	T435-xxxT		
BTB04-xxxTRG	T1050H-6T	T610H-6T		
BTB06-xxxBRG	T1205-600G-TR	T810-600G-TR		
BTB06-xxxBWRG	T1210-800G-TR	T810H-6G		
BTB06-xxxCRG	T1235-600G	T810H-6G-TR		
BTB06-xxxCWRG	T1235-600G-TR	T810H-6T		
BTB06-xxxDRG	T1235-800G-TR	T835-600G		
BTB06-xxxSWRG	T1235H-600TRG	T835-600G-TR		
BTB06-xxxTRG	T1235H-6G	T835H-6G		
BTB06-xxxTWRG	T1235H-6G-TR	T835H-6G-TR		
BTB08-xxxBRG	T1235H-6T	T835H-6T		
BTB08-xxxBWRG	T1250-600G-TR	T850H-6G		
BTB08-xxxCRG	T1250H-6G-TR	T850H-6G-TR		
BTB08-xxxCWRG	T1250H-6T	T850H-6T		
BTB08-xxxSRG	T1610-600G-TR	TB08A6C		
BTB08-xxxSWRG	T1610-800G-TR	TB12A6C		
BTB08-xxxTWRG	T1635-600G	TB16A6D		
BTB10-xxxBWRG	T1635-600G-TR	TB16A6Y		
BTB12-xxxBRG	T1635-700G-TR	TB25A6C		
BTB12-xxxBWRG	T1635-800G-TR	TB25A6D	December 2013	December 2013
BTB12-xxxCRG	T1635H-6G	TN1205H-6G		
BTB12-xxxCWRG	T1635H-6G-TR	TN1205H-6G-TR		
BTB12-xxxSWRG	T1635H-6T	TN1205H-6T		
BTB12-xxxTWRG	T1650-600G-TR	TN1215-xxxG		
BTB15-xxxBAKRG	T1650H-6G	TN1215-xxxG-TR		
BTB16-xxxBRG	T1650H-6T	TN1625-xxxG-TR		
BTB16-xxxBWRG	T2035H-6G	TN2540-xxxG-TR		
BTB16-xxxCWRG	T2035H-6G-TR	TYNx12DTRG		
BTB16-xxxDRG	T2035H-6T	TYNx16SRG		
BTB16-xxxSWRG	T2050H-6T	TYNxx10RG		
BTB16-xxxCWRG	T2535-600G	TYNxx12RG		
BTB16-xxxSWRG	T2535-600G-TR	TYNxx12TRG		
BTB24-xxxBAKRG	T2535-800G	TYNxx16RG		
BTB24-xxxBRG	T2535-800G-TR	TYNxx25RG		
BTB24-xxxBWRG	T2550H-600TRG	TYNxx40RG		
BTB24-xxxCWRG	T3035H-6T	TYNxx4RG		
T1010H-6G	T3050H-6T	TYNxx6RG		
T1010H-6T	T405-xxxT	TYNxx8BDRG		
T1035H-6G	T410H-6T	TYNxx8RG		
T1035H-6G-TR				



Sales types	Estimated production start	Estimated first shipments
RBO08-40G RBO08-40G-TR RBO40-40G RBO40-40G-TR	December 2013	December 2013
BYT08PI-400RG STPSC10TH13TI STPSC6TH13TI STPSC8TH13TI STTHxxxDTI STTHxxxTTI STTHxxxDI STTH12R06DIRG STTHxxT06DI STTH806DIRG STTH8R04DI STTH8R06DIRG STTH8ST06DI STTH8T06TI	September 2013	September 2013
TNxxxG(-TR) TNxxxT TXNxxxG TXN616B TYNxxxG	December 2013	December 2013
<b>Comments:</b>		Others products housed in D2PAK and TO220 not explicitly mentioned in this PCN are not affected by this change.
<p><b>Customer's feedback</b></p> <p>Please contact your local ST sales representative or quality contact for requests concerning this change notification.</p> <p>Absence of acknowledgement of this PCN within 30 days of receipt will constitute acceptance of the change</p> <p>Absence of additional response within 90 days of receipt of this PCN will constitute acceptance of the change</p>		
<b>Qualification program and results</b>		N° 13164QRP Attached

## External Reliability Report

*New ECOPACK®2 molding compound for selected products housed in TO-220AB, T0220AB-insulated, TO-220AC insulated and D<sup>2</sup>PAK*

General Information		Locations	
<b>Product Lines</b>	<i>AC Switches, Diodes</i>	<b>Wafer fab</b>	<i>STMicroelectronics Tours (France)</i>
<b>Products Description</b>	<i>TRIAC / SCR / Rectifier/ ASD</i>	<b>Assembly plant</b>	<i>STMicroelectronics SHENZHEN (China)</i>
<b>Product Group</b>	<i>IPD</i>	<b>Reliability Lab</b>	<i>STMicroelectronics Tours (France)</i>
<b>Product division</b>	<i>ASD&amp;IPAD</i>	<b>Reliability assessment</b>	<b>PASS</b>
<b>Package</b>	<i>TO-220AB, TO-220AB Insulated, TO-220AC-insulated, D<sup>2</sup>PAK</i>		

### DOCUMENT INFORMATION

Version	Date	Pages	Prepared by	Approved by	Comment
<b>Rev. 1</b>	June 5 <sup>th</sup> 2013	22	Gilles DUTRANNOY	Jean-Paul REBRASSE	First issue

Note: This report is a summary of the reliability trials performed in good faith by STMicroelectronics in order to evaluate the potential reliability risks during the product life using a set of defined test methods.  
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## 1 APPLICABLE AND REFERENCE DOCUMENTS

Document reference	Short description
JESD 47	Stress-Test-Driven Qualification of Integrated Circuits
MIL-STD-750C	Test method for semiconductor devices
SOP 2614	Reliability requirements for product qualification (ST internal document)
SOP 267	Product maturity levels (ST internal document)
0061692	Reliability tests and criteria for qualifications (ST internal document)
PCN reference	IPD-DIS/13/7944

## 2 GLOSSARY

BOM	Bill Of Materials
DUT	Device Under Test
F/G	Finished Good
HTRB	High Temperature Reverse Bias
PCT	Pressure Cooker Test
P/N	Part Number
RH	Relative Humidity
SS	Sample Size
TCT	Temperature Cycling Test
THB	Temperature Humidity Bias
HTS	High Temperature Storage
UPS	Uninterruptible Power Supply

## **3 RELIABILITY EVALUATION OVERVIEW**

### **3.1 Objectives**

ST products housed in **TO-220AB, T0220AB-insulated, TO-220AC insulated and D<sup>2</sup>PAK package** are upgraded to ECOPACK<sup>®</sup>2 level by changing its current compound to Halogen free.

3 product families are involved in this qualification: TRIAC and SCR, RECTIFIER and PROTECTION

### **3.2 Conclusion**

Qualification Plan requirements have been fulfilled without exception. Reliability tests have shown that the devices behave correctly against environmental tests (no failure). Moreover, the stability of electrical parameters during the accelerated tests demonstrates the robustness of the product which is consequently expected during their lifetime.

## Device Characteristics

### 3.3 Device descriptions



## BTA24, BTB24, BTA25 BTA26, BTB26, T25

25 A standard and Snubberless™ triacs

#### Features

- High current triac
- Low thermal resistance with clip bonding
- High commutation (4 quadrant) or very high commutation (3 quadrant) capability
- BTA series UL1557 certified (File ref: 81734)
- Packages are RoHS (2002/95/EC) compliant

#### Applications

Applications include the ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits, etc., or for phase control operation in light dimmers, motor speed controllers, and similar.

The snubberless versions (BTA/BTB...W and T25 series) are especially recommended for use on inductive loads, due to their high commutation performances. The BTA series provides an insulated tab (rated at 2500 V<sub>RMS</sub>).

#### Description

Available either in through-hole or surface-mount packages, the BTA24, BTB24, BTA25, BTA26, BTB26 and T25 triac series is suitable for general purpose mains power AC switching.

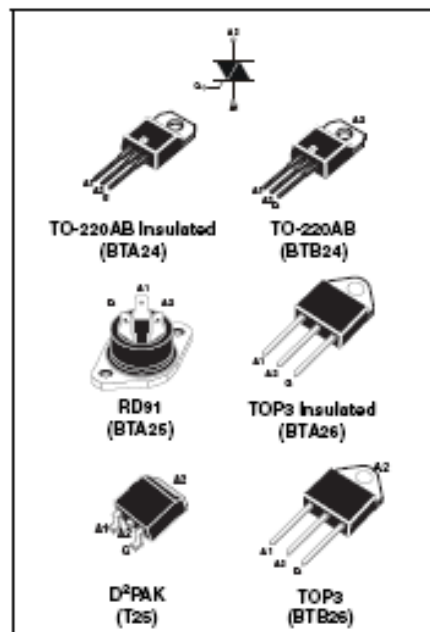


Table 1. Device summary

Symbol	Parameter	BTA24 <sup>(1)</sup>	BTB24	BTA25 <sup>(1)</sup>	BTA26 <sup>(1)</sup>	BTB26	T25	Unit
$I_{T(RMS)}$	RMS on-state current	25	25	25	25	25	25	A
$V_{DRM}/V_{RRM}$	Repetitive peak off-state voltage	600 / 800	600 / 800	600 / 800	600 <sup>(2)</sup> / 800	600	600 / 800	V
$I_{GT}$ (Snubberless)	Triggering gate current	35 / 50	35 / 50	50	35 / 50	-	35	mA
$I_{GT}$ (Standard)	Triggering gate current	-	50	50	50	50	-	mA

1. Insulated packages

2. 800 V version available only with  $I_{GT} = 50$  mA (Snubberless and Standard)

TM: Snubberless is a trademark of STMicroelectronics



## T3035H, T3050H

### Snubberless™ high temperature 30 A Triacs

#### Features

- High current Triac
- High immunity level
- Low thermal resistance with clip bonding
- RoHS (2002/95/EC) compliant package
- Very high commutation (3Q) at 150 °C capability
- UL certified (ref. file E81734)

#### Applications

Thanks to its high electrical noise immunity level and its strong current robustness, the T30xxH series is designed for the control of AC actuators in appliances and industrial systems.

#### Description

Specifically designed to operate at 150 °C, the new 30 A T30xxH Triacs provide very high dynamic performance and enhanced performance in terms of power loss and thermal dissipation. This allows optimizing the heatsink size, leading to space and cost effectiveness when compared to electro-mechanical solutions.

Based on ST Snubberless™ technology, they offer a specified minimal commutation and high noise immunity levels valid up to the  $T_j$  max.

The T30xxH series optimize safely the control of universal motors and of inductive loads found in power tools and major appliances.

By using an internal ceramic pad, the T30xxH-6I provides voltage insulation (rated at 2500 V rms).

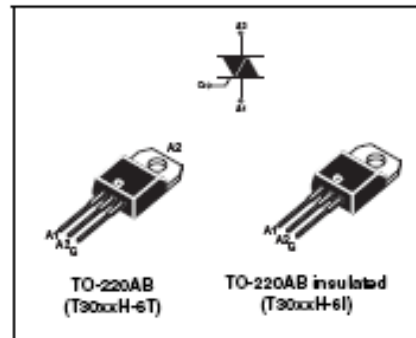


Table 1. Device summary

Symbol	Value
$I_T(\text{rms})$	30 A
$V_{\text{DRM}}/V_{\text{RRM}}$	600 V
$I_{\text{CT}}$	35 or 50 mA

TM: Snubberless is a trademark of STMicroelectronics



## T2035H, T2050H

### High temperature 20 A Snubberless™ Triacs

#### Features

- Medium current Triac
- 150 °C max.  $T_j$  turn-off commutation
- Low thermal resistance with clip bonding
- Very high 3 quadrant commutation capability
- Packages are RoHS (2002/95/EC) compliant
- UL certified (ref. file E81734)

#### Applications

Especially designed to operate in high power density or universal motor applications such as vacuum cleaner and washing machine drum motor.

#### Description

Available in through-hole and surface mount packages, the T2035H and T2050H Triac series are suitable for general purpose mains power AC switching.

These 20 A Triacs provide a very high switching capability up to junction temperatures of 150 °C.

The heatsink can be reduced, compared to traditional Triacs, according to the high performance at given junction temperatures.

By using an internal ceramic pad, the T20xxH-6I provides voltage insulation (rated at 2500 V rms).

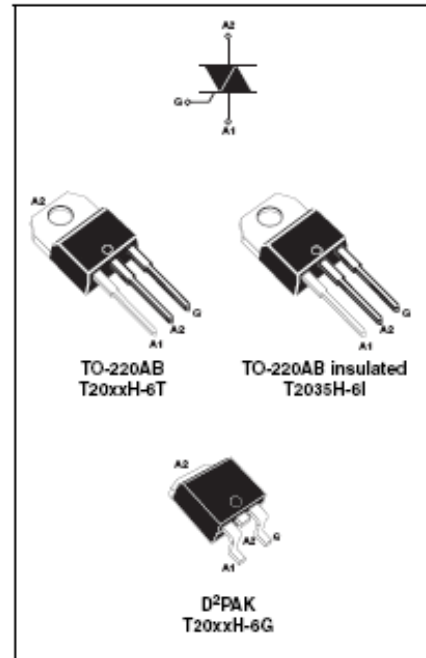


Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	20	A
$V_{DRM}/V_{FRM}$	600	V
$I_{GT}$	35 or 50	mA

TM: Snubberless is a trademark of STMicroelectronics





Application Specific Discretes  
 A.S.D.™

## RBO40-40G/T

### REVERSED BATTERY AND OVERVOLTAGE PROTECTION

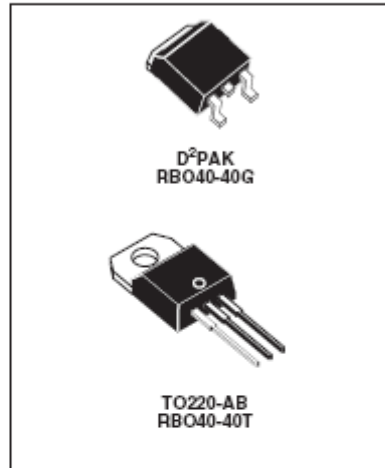
#### FEATURES

- PROTECTION AGAINST "LOAD DUMP" PULSE
- 40A DIODE TO GUARD AGAINST BATTERY REVERSAL
- MONOLITHIC STRUCTURE FOR GREATER RELIABILITY
- BREAKDOWN VOLTAGE : 24 V min.
- CLAMPING VOLTAGE : ± 40 V max.
- COMPLIANT WITH ISO / DTR 7637

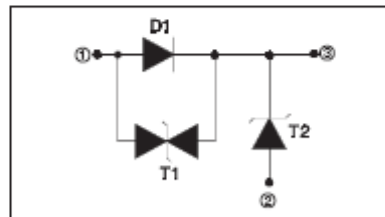
#### DESCRIPTION

Designed to protect against battery reversal and load dump overvoltages in automotive applications, this monolithic component offers multiple functions in the same package :

D1 : reversed battery protection  
 T1 : clamping against negative overvoltages  
 T2 : Transil function against "load dump" effect.



#### FUNCTIONAL DIAGRAM



TM : TRANSIL and ASD are trademarks of STMicroelectronics.

September 2005 - Ed:6

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## STTH812

### Ultrafast recovery - 1200 V diode

#### Main product characteristics

$I_{F(AV)}$	8 A
$V_{RRM}$	1200 V
$T_j$	175° C
$V_F$ (typ)	1.25 V
$t_{rr}$ (typ)	50 ns

#### Features and benefits

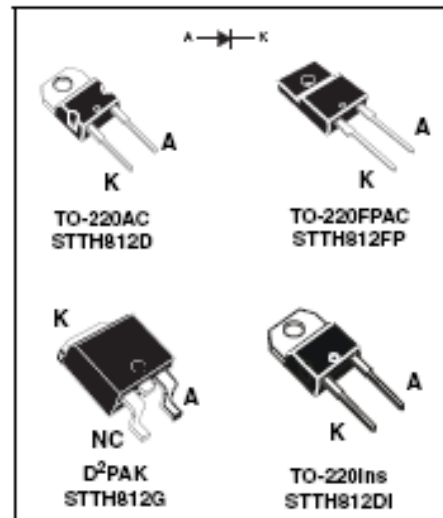
- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated packages:
  - TO-220Ins  
Electrical insulation = 2500 V<sub>RMS</sub>  
Capacitance = 7 pF
  - TO-220FPAC  
Electrical insulation = 2000 V<sub>RMS</sub>  
Capacitance = 12 pF

#### Description

The high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

Such demanding applications include industrial power supplies, motor control, and similar mission-critical systems that require rectification and freewheeling. These diodes also fit into auxiliary functions such as snubber, bootstrap, and demagnetization applications.

The improved performance in low leakage current, and therefore thermal runaway guard band, is an immediate competitive advantage for this device.



#### Order codes

Part Number	Marking
STTH812D	STTH812D
STTH812G	STTH812G
STTH812G-TR	STTH812G
STTH812FP	STTH812FP
STTH812DI	STTH812DI

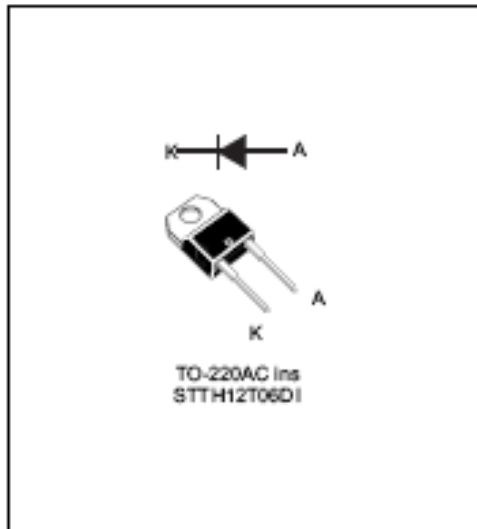


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	12 A
$V_{RRM}$	600 V
$t_{tr}$ (typ)	15 ns
$I_{RM}$ (typ)	2.3 A
$V_F$ (typ)	2.05 V
$I_{FRM}$	65 A
$T_J$ (max)	175 °C

## Features

- High voltage rectifier
- Tandem diodes in series
- Very low switching losses
- Insulated device with internal ceramic
- Equal thermal conditions for both 300 V diodes
- Static and dynamic equilibrium of internal diodes are warranted by design
- Insulated package:
  - Capacitance: 7 pF
  - Insulated voltage: 2500 V rms

## Description

This device is part of ST's second generation of 600 V tandem diodes. It has ultralow switching losses with a minimized  $Q_{RR}$  (6.5 nC) that makes it perfect for use in circuits working in hard-switching mode. In particular the  $V_F/Q_{RR}$  trade-off positions this device between standard ultrafast diodes and silicon-carbide Schottky rectifiers in terms of price/performance ratio.

The device offers a new positioning giving more flexibility to power-circuit designers looking for good performance while still respecting cost constraints.

Featuring ST's Turbo 2 600 V technology, the device is particularly suited as a boost diode in continuous conduction mode power factor correction circuits.

## 4 TESTS RESULTS SUMMARY

### 4.1 Test vehicles

TRIAC: 7 test vehicles were chosen:

- BTA24-800BWRG
- BTB24-600BWRG
- BTB24-800BWRG
- T2050H-6T
- T2535-600G
- T2035H-6G

RECTIFIER: 2 test vehicles were chosen:

- STTH812DI
- STTH12T06DI

Lot #	Part Number	Process/ Package	Comments
LOT 1	BTA24-800BWRG	TO-220AB Insulated	Qualification lot
LOT 2	BTA24-800BWRG	TO-220AB Insulated	Qualification Lot
LOT 3	BTB24-600BWRG	TO-220AB None Insulated	Qualification Lot
LOT 4	BTB24-800BWRG	TO-220AB None Insulated	Qualification Lot
LOT 5	T3035-450I	TO-220AB Insulated	Qualification Lot
LOT 6	T2050H-6T	TO-220AB None Insulated	Qualification Lot
LOT 7	T2050H-6T	TO-220AB None Insulated	Qualification Lot
LOT 8	T2035H-6G	D <sup>2</sup> PAK	Qualification Lot
LOT 9	T2035H-6G	D <sup>2</sup> PAK	Qualification Lot
LOT 10	T2535-600G	D <sup>2</sup> PAK	Qualification Lot
LOT 11	STTH12T06DI	TO-220AC Insulated	Qualification Lot
LOT 12	STTH812DI	TO-220AC Insulated	Qualification Lot

## 4.2 Test plan and result summary

### BTA24-800BWRG

TEST	STD ref.	Conditions	SS	Steps	LOT 1	LOT 2
HTRB	JESD22 A-108	T <sub>j</sub> = 125 °C V = VDRM rated (AC peak)	77	168 h	0/77	-
	MIL-STD-750C method 1040			500 h	0/77	-
				1000 h	0/77	-
THB	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 200 V 1000 h	50	168 h	0/25	0/25
				500 h	0/25	0/25
				1000 h	0/25	0/25
TC	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	50	500 cycles	0/25	0/25
Solderability	J STD-002	Steam aging bath SnAgCu 245°C	20	8 hours	0/20	-
Solderability	J STD-002	Steam aging bath SnPb-220°C	20	8 hours	0/20	-
RSH	JESD22 B-106-A	260°C 10S 2 immersions	12	2 dipping	0/12	-
Screwing	ST 0063378	Torque 0.5 N.m/20µm	10	1 Torque	0/10	-

### BTA24-600BWRG

TEST	STD ref.	Conditions	SS	Steps	LOT 3
HTRB	JESD22 A-108	T <sub>j</sub> = 125 °C V = VDRM rated (AC peak)	77	168 h	0/77
	MIL-STD-750C method 1040			500 h	0/77
				1000 h	0/77
THB	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 200 V 1000 h	25	168 h	0/25
				500 h	0/25
				1000 h	0/25
TC	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	25	500 cycles	0/25
Screwing	ST 0063378	Torque 0.5 N.m/20µm	10	1 Torque	0/10

**BTB24-800BWRG**

TEST	STD ref.	Conditions	SS	Steps	LOT 4
HTRB	JESD22 A-108	$T_j = 125\text{ }^\circ\text{C}$ $V = \text{VDRM rated (AC peak)}$	77	168 h	0/77
	MIL-STD-750C method 1040			500 h	0/77
				1000 h	0/77
THB	JESD22 A-101	$85\text{ }^\circ\text{C}$ $85\% \text{ RH}$ $V_r = 200\text{ V}$ $1000\text{ h}$	25	168 h	0/25
				500 h	0/25
				1000 h	0/25
TC	JESD22 A-104	$-65\text{ }^\circ\text{C}/+150\text{ }^\circ\text{C}$ $2\text{ cycles/h}$ $500\text{ cycles}$	25	500 cycles	0/25
Solderability	J STD-002	Steam aging bath SnAgCu 245°C	20	8 hours	0/20
Solderability	J STD-002	Steam aging bath SnPb-220°C	20	8 hours	0/20
RSH	JESD22 B-106-A	$260\text{ }^\circ\text{C}$ 10S $2\text{ immersions}$	12	2 dipping	0/12

**T3035-450I**

TEST	STD ref.	Conditions	SS	Steps	LOT 5
HTRB	JESD22 A-108	$T_j = 150\text{ }^\circ\text{C}$ $V = \text{VDRM rated (AC peak)}$	77	168 h	0/77
	MIL-STD-750C method 1040			500 h	0/77
				1000 h	0/77

**T2050H-6T**

TEST	STD ref.	Conditions	SS	Steps	LOT 6	LOT 7
<b>HTRB</b>	JESD22 A-108	T <sub>j</sub> = 150 °C V = VDRM rated (AC peak)	117	168 h	0/77	0/40
	MIL-STD-750C method 1040			500 h	0/77	0/40
				1000 h	0/77	0/40
<b>THB</b>	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 200 V 1000 h	50	168 h	0/25	0/25
				500 h	0/25	0/25
				1000 h	0/25	0/25
<b>TC</b>	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	50	500 cycles	0/25	0/25

**T2035H-6G**

TEST	STD ref.	Conditions	SS	Steps	LOT 8	LOT 9
<b>MSL Evaluation</b>	J-STD-020D.01	MSL1 85 °C,85% RH 168 h MSL3 30 °C60% RH 192 h	50	168 h	0/25	0/25
				192 h	0/25	0/25
<b>PC + THB</b>	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 200 V 1000 h	50	168 h	0/25	0/25
				500 h	0/25	0/25
				1000 h	0/25	0/25
<b>PC + TC</b>	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	50	500 cycles	0/25	0/25
<b>Solderability</b>	J STD-002	Dry aging bath SnAgCu 245°C	10	16 hours	0/10	-
<b>Solderability</b>	J STD-002	Steam aging bath SnAgCu-245°C	10	8 hours	0/10	-
<b>Solderability</b>	J STD-002	Dry aging bath SnPb 220°C	10	16 hours	0/10	-
<b>Solderability</b>	J STD-002	Steam aging bath SnPb-220°C	10	8 hours	0/10	-
<b>RSH</b>	JESD22 B-106-A	260°C 10S 2 immersions	12	2 dipping	-	0/12

**T2535-600G/7**

TEST	STD ref.	Conditions	SS	Steps	LOT 10
MSL Evaluation	J-STD-020D.01	MSL1 85 °C,85% RH	50	168 h	0/25
		MSL3 30 °C60% RH		192 h	0/25
PC + THB	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 200 V 1000 h	25	168 h	0/25
				500 h	0/25
				1000 h	0/25
PC + TC	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	50	500 cycles	0/25

**STTH812DI**

TEST	STD ref.	Conditions	SS	Steps	LOT 11
HTRB	JESD22 A-108	T <sub>j</sub> = 150 °C VR = 960V 500 h	77	168 h	0/77
	MIL-STD-750C method 1040			500 h	0/77
THB	JESD22 A-101	85 °C 85% RH V <sub>r</sub> = 100 V 1000 h	25	168 h	0/25
				500 h	0/25
				1000 h	0/25
TC	JESD22 A-104	-65 °C/+150 °C 2 cycles/h 500 cycles	25	500 cycles	0/25
AC	JESD22 A-102	121°C, 2,05 bars	25	96 h	0/25
RSH	JESD22 B-106-A	260°C 10S 2 immersions	12	2 dipping	0/12



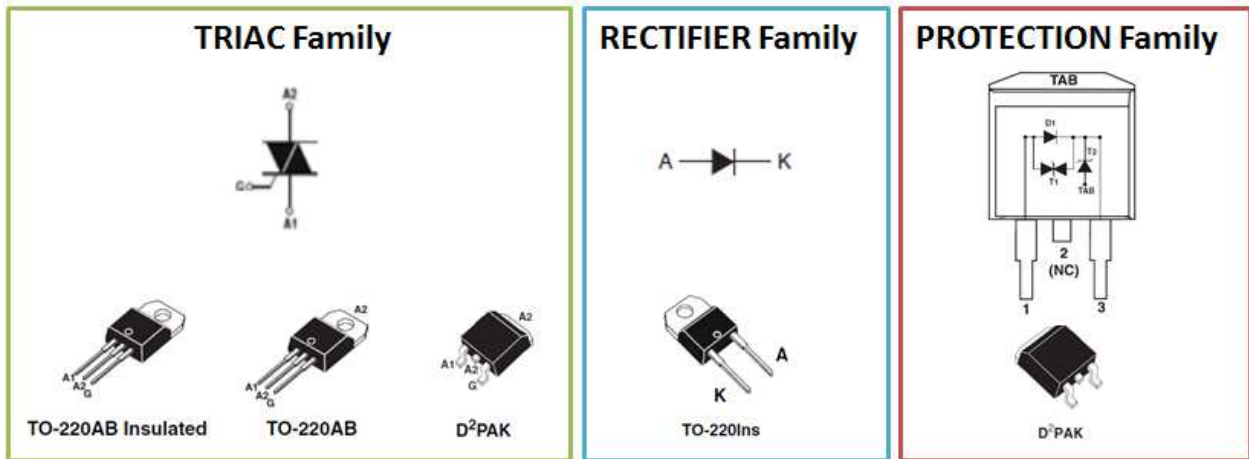
**STTH12T06DI**

TEST	STD ref.	Conditions	SS	Steps	LOT 12
HTRB	JESD22 A-108	$T_j = 150\text{ }^\circ\text{C}$ $V = 80\% \text{ VBR}$	77	168 h	0/77
	MIL-STD-750C method 1040			500 h	0/77
THB	JESD22 A-101	$85\text{ }^\circ\text{C}$ 85% RH $V_r = 100\text{ V}$ 1000 h	25	168 h	0/25
				500 h	0/25
				1000 h	0/25
TC	JESD22 A-104	$-65\text{ }^\circ\text{C}/+150\text{ }^\circ\text{C}$ 2 cycles/h 500 cycles	25	500 cycles	0/25
AC	JESD22 A-102	121°C, 2,05 bars	25	96 h	0/25
RSH	JESD22 B-106-A	$260\text{ }^\circ\text{C}$ 10S 2 immersions	12	2 dipping	0/12

## 5 APPENDIX

### 5.1 Device details

#### 5.1.1 Pin connection



#### 5.1.2 Package outline/Mechanical data

##### TRIAC

##### TRIAC & PROTECTION families

TO-220AB	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	
ØI	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		

D²PAK	REF.	DIMENSIONS					
		Millimeters			Inches		
		Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.169		0.181	
A1	2.49		2.69	0.098		0.106	
A2	0.03		0.23	0.001		0.009	
B	0.70		0.93	0.027		0.037	
B2	1.25	1.40		0.048	0.055		
C	0.45		0.60	0.017		0.024	
C2	1.21		1.36	0.047		0.054	
D	8.95		9.35	0.352		0.368	
E	10.00		10.28	0.393		0.405	
G	4.88		5.28	0.192		0.208	
L	15.00		15.85	0.590		0.624	
L2	1.27		1.40	0.050		0.055	
L3	1.40		1.75	0.055		0.069	
R		0.40			0.016		
V2	0°		8°	0°		8°	

**RECTIFIER family**

TO-220AC	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	4.80		5.40	0.189		0.212	
F	6.20		6.60	0.244		0.259	
ØI	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	
M		2.60			0.102		

## 5.2 Test Descriptions

Test name	Description	Purpose
<b>Die-oriented test</b>		
<b>HTRB (AC mode)</b> High Temperature Reverse Bias	The device is stressed here in AC mode, trying to satisfy as much as possible the following conditions: - Low power dissipation. - Peak supply voltage compatible with diffusion process and internal circuitry limitations.	To determine the effects of bias conditions and temperature on solid state devices over time. It simulates the devices operating condition in an accelerated way.  To maximize the electrical field across either reverse-biased junctions or dielectric layers, in order to investigate the failure modes linked to mobile contamination, oxide aging, layout sensitivity to surface effects.
<b>HTRB</b> High Temperature Reverse Bias	The device is stressed in static configuration, trying to satisfy as much as possible the following conditions: low power dissipation;  max. supply voltage compatible with diffusion process and internal circuitry limitations;	To determine the effects of bias conditions and temperature on solid state devices over time. It simulates the devices operating condition in an accelerated way.  To maximize the electrical field across either reverse-biased junctions or dielectric layers, in order to investigate the failure modes linked to mobile contamination, oxide ageing, layout sensitivity to surface effects.
<b>Die and Package-oriented test</b>		
<b>THB</b> Temperature Humidity Bias	The device is biased in static configuration minimizing its internal power dissipation, and stored at controlled conditions of ambient temperature, and relative humidity.	To evaluate the package moisture resistance with electrical field applied, both electrolytic and galvanic corrosion are put in evidence.
<b>TC</b> Temperature Cycling	The device is submitted to cycled temperature excursions, between a hot and a cold chamber in air atmosphere.	To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.
<b>PC</b> Preconditioning	The device is submitted to a typical temperature profile used for surface mounting devices, after a controlled moisture absorption.	As stand-alone test: to investigate the moisture sensitivity level. As preconditioning before other reliability tests: to verify that the surface mounting stress does not impact on the subsequent reliability performance. The typical failure modes are "pop corn" effect and delamination.
<b>SD</b> Solderability	The device is aged in a wet and dry bath of solder. A preconditioning test is included in this test method, which degrades the termination finish to provide a guard band against marginal finish.	To test whether the packaging materials and processes used during the manufacturing operations process produce a component that can be successfully soldered to the next level assembly using tin lead eutectic solder.
<b>AC</b> Autoclave	The device is stored in saturated steam, at fixed and controlled conditions of pressure and temperature.	To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.
<b>RSH</b> Resistance to Solder Heat	The device is submitted to a dipping in a solder bath at 260 °C with a dwell time of 10 s.	This test is used to determine whether solid state devices can withstand the effects of the temperature to which they will be subjected during soldering of their leads. The heat is conducted through the leads into the device package from solder heat at the reverse side of the board. This procedure does not simulate wave soldering or reflow heat exposure on the same side of the board as the package body.

### 5.3 List of products involved in this qualification

List 1/3

Parts	Case	Function	Parts	Case	Function	Parts	Case	Function
AVSxxxx	TO-220	Triac	BTA10-xxxCWRG	TO-220 insulated	Triac	BTB06-xxxTRG	TO-220	Triac
BTA04-xxxSRG	TO-220 insulated	Triac	BTA10-xxxGPRG	TO-220 insulated	Triac	BTB06-xxxTWRG	TO-220	Triac
BTA04-xxxTRG	TO-220 insulated	Triac	BTA12-xxxBRG	TO-220 insulated	Triac	BTB08-xxxBRG	TO-220	Triac
BTA06T-xxxCWRG	TO-220 insulated	Triac	BTA12-xxxBWRG	TO-220 insulated	Triac	BTB08-xxxBWRG	TO-220	Triac
BTA06-xxxARG	TO-220 insulated	Triac	BTA12-xxxCRG	TO-220 insulated	Triac	BTB08-xxxCRG	TO-220	Triac
BTA06-xxxARG	TO-220 insulated	Triac	BTA12-xxxCWRG	TO-220 insulated	Triac	BTB08-xxxCWRG	TO-220	Triac
BTA06-xxxBRG	TO-220 insulated	Triac	BTA12-xxxGBRG	TO-220 insulated	Triac	BTB08-xxxSRG	TO-220	Triac
BTA06-xxxBRG	TO-220 insulated	Triac	BTA12-xxxSWRG	TO-220 insulated	Triac	BTB08-xxxSWRG	TO-220	Triac
BTA06-xxxBWRG	TO-220 insulated	Triac	BTA12-xxxTWRG	TO-220 insulated	Triac	BTB08-xxxTWRG	TO-220	Triac
BTA06-xxxCRG	TO-220 insulated	Triac	BTA16-xxxBRG	TO-220 insulated	Triac	BTB10-xxxBWRG	TO-220	Triac
BTA06-xxxCWRG	TO-220 insulated	Triac	BTA16-xxxBWRG	TO-220 insulated	Triac	BTB12-xxxBRG	TO-220	Triac
BTA06-xxxGKRG	TO-220 insulated	Triac	BTA16-xxxCRG	TO-220 insulated	Triac	BTB12-xxxBWRG	TO-220	Triac
BTA06-xxxGPRG	TO-220 insulated	Triac	BTA16-xxxCWRG	TO-220 insulated	Triac	BTB12-xxxCRG	TO-220	Triac
BTA06-xxxGVRG	TO-220 insulated	Triac	BTA16-xxxSWRG	TO-220 insulated	Triac	BTB12-xxxCWRG	TO-220	Triac
BTA06-xxxGZRG	TO-220 insulated	Triac	BTA20-xxxBWRG	TO-220 insulated	Triac	BTB12-xxxSWRG	TO-220	Triac
BTA06-xxxSRG	TO-220 insulated	Triac	BTA20-xxxCWRG	TO-220 insulated	Triac	BTB12-xxxTWRG	TO-220	Triac
BTA06-xxxSWRG	TO-220 insulated	Triac	BTA20-xxxWH	TO-220 insulated	Triac	BTB15-xxxBAKRG	TO-220	Triac
BTA06-xxxTRG	TO-220 insulated	Triac	BTA24-xxxBWL	TO-220 insulated	Triac	BTB16-xxxBRG	TO-220	Triac
BTA06-xxxTWRG	TO-220 insulated	Triac	BTA24-xxxBWLRG	TO-220 insulated	Triac	BTB16-xxxBWARG	TO-220	Triac
BTA08-xxx300xx	TO-220 insulated	Triac	BTA24-xxxBWRG	TO-220 insulated	Triac	BTB16-xxxBWRG	TO-220	Triac
BTA08-xxxBRG	TO-220 insulated	Triac	BTA24-xxxCWRG	TO-220 insulated	Triac	BTB16-xxxCRG	TO-220	Triac
BTA08-xxxBWRG	TO-220 insulated	Triac	BTA24-xxxGPLRG	TO-220 insulated	Triac	BTB16-xxxCWRG	TO-220	Triac
BTA08-xxxCRG	TO-220 insulated	Triac	BTB04-xxxSAPRG	TO-220	Triac	BTB16-xxxSWRG	TO-220	Triac
BTA08-xxxCWRG	TO-220 insulated	Triac	BTB04-xxxTRG	TO-220	Triac	BTB24-xxxBAKRG	TO-220	Triac
BTA08-xxxSRG	TO-220 insulated	Triac	BTB06-xxxBRG	TO-220	Triac	BTB24-xxxBRG	TO-220	Triac
BTA08-xxxSWRG	TO-220 insulated	Triac	BTB06-xxxBWRG	TO-220	Triac	BTB24-xxxBWRG	TO-220	Triac
BTA08-xxxTWRG	TO-220 insulated	Triac	BTB06-xxxCRG	TO-220	Triac	BTB24-xxxCWRG	TO-220	Triac
BTA10-xxxBRG	TO-220 insulated	Triac	BTB06-xxxCWRG	TO-220	Triac	T1010H-6G	D <sup>2</sup> PAK	Triac
BTA10-xxxBWRG	TO-220 insulated	Triac	BTB06-xxxDRG	TO-220	Triac	T1010H-6T	TO-220	Triac
BTA10-xxxCRG	TO-220 insulated	Triac	BTB06-xxxSWRG	TO-220	Triac	T1035H-6G	D <sup>2</sup> PAK	Triac

List 2/3

Parts	Case	Function	Parts	Case	Function	Parts	Case	Function
T1035H-6G-TR	D <sup>2</sup> PAK	Triac	T1635-600G	D <sup>2</sup> PAK	Triac	T410H-6T	TO-220	Triac
T1035H-6I	TO-220 insulated	Triac	T1635-600G-TR	D <sup>2</sup> PAK	Triac	T410-xxxT	TO-220	Triac
T1035H-6T	TO-220	Triac	T1635-700G-TR	D <sup>2</sup> PAK	Triac	T435-xxxT	TO-220	Triac
T1050H-6G	D <sup>2</sup> PAK	Triac	T1635-800G-TR	D <sup>2</sup> PAK	Triac	T610H-6T	TO-220	Triac
T1050H-6T	TO-220	Triac	T1635H-6G	D <sup>2</sup> PAK	Triac	T810-600G-TR	D <sup>2</sup> PAK	Triac
T1205-600G-TR	D <sup>2</sup> PAK	Triac	T1635H-6G-TR	D <sup>2</sup> PAK	Triac	T810H-6G	D <sup>2</sup> PAK	Triac
T1210-800G-TR	D <sup>2</sup> PAK	Triac	T1635H-6I	TO-220 insulated	Triac	T810H-6G-TR	D <sup>2</sup> PAK	Triac
T1210T-6I	TO-220 insulated	Triac	T1635H-6T	TO-220	Triac	T810H-6T	TO-220	Triac
T1220T-6I	TO-220 insulated	Triac	T1635T-6I	TO-220 insulated	Triac	T810T-6I	TO-220 insulated	Triac
T1225T-6I	TO-220 insulated	Triac	T1635T-8I	TO-220 insulated	Triac	T820T-6I	TO-220 insulated	Triac
T1235-600G	D <sup>2</sup> PAK	Triac	T1650-600G-TR	D <sup>2</sup> PAK	Triac	T825T-6I	TO-220 insulated	Triac
T1235-600G-TR	D <sup>2</sup> PAK	Triac	T1650H-6G	D <sup>2</sup> PAK	Triac	T835-600G	D <sup>2</sup> PAK	Triac
T1235-800G-TR	D <sup>2</sup> PAK	Triac	T1650H-6I	TO-220 insulated	Triac	T835-600G-TR	D <sup>2</sup> PAK	Triac
T1235H-600TRG	TO-220	Triac	T1650H-6T	TO-220	Triac	T835H-6G	D <sup>2</sup> PAK	Triac
T1235H-6G	D <sup>2</sup> PAK	Triac	T1650HT-6I	TO-220 insulated	Triac	T835H-6G-TR	D <sup>2</sup> PAK	Triac
T1235H-6G-TR	D <sup>2</sup> PAK	Triac	T2035H-6G	D <sup>2</sup> PAK	Triac	T835H-6I	TO-220 insulated	Triac
T1235H-6I	TO-220 insulated	Triac	T2035H-6G-TR	D <sup>2</sup> PAK	Triac	T835H-6T	TO-220	Triac
T1235H-6T	TO-220	Triac	T2035H-6I	TO-220 insulated	Triac	T835T-6I	TO-220 insulated	Triac
T1235T-6I	TO-220 insulated	Triac	T2035H-6T	TO-220	Triac	T850H-6G	D <sup>2</sup> PAK	Triac
T1250-600G-TR	D <sup>2</sup> PAK	Triac	T2050H-6T	TO-220	Triac	T850H-6G-TR	D <sup>2</sup> PAK	Triac
T1250H-6G-TR	D <sup>2</sup> PAK	Triac	T2535-600G	D <sup>2</sup> PAK	Triac	T850H-6I	TO-220 insulated	Triac
T1250H-6I	TO-220 insulated	Triac	T2535-600G-TR	D <sup>2</sup> PAK	Triac	T850H-6T	TO-220	Triac
T1250H-6T	TO-220	Triac	T2535-800G	D <sup>2</sup> PAK	Triac	TB08A6C	TO-220	Triac
T1610-600G-TR	D <sup>2</sup> PAK	Triac	T2535-800G-TR	D <sup>2</sup> PAK	Triac	TB08C6CM	TO-220 insulated	Triac
T1610-800G-TR	D <sup>2</sup> PAK	Triac	T2550H-600TRG	TO-220	Triac	TB12A6C	TO-220	Triac
T1610T-6I	TO-220 insulated	Triac	T3035H-6I	TO-220 insulated	Triac	TB12C6CM	TO-220 insulated	Triac
T1610T-8I	TO-220 insulated	Triac	T3035H-6T	TO-220	Triac	TB16A6D	D <sup>2</sup> PAK	Triac
T1620T-6I	TO-220 insulated	Triac	T3050H-6I	TO-220 insulated	Triac	TB16A6Y	TO-220	Triac
T1620T-8I	TO-220 insulated	Triac	T3050H-6T	TO-220	Triac	TB16C6C	TO-220 insulated	Triac
T1625T-8I	TO-220 insulated	Triac	T405-xxxT	TO-220	Triac	TB16C6CM	TO-220 insulated	Triac

List 3/3

Parts	Case	Function
TB25A6C	TO-220	Triac
TB25A6D	D <sup>2</sup> PAK	Triac
TB25C6CM	TO-220 insulated	Triac
TXDVxxxRG	TO-220 insulated	Triac
TN1205H-6G	D <sup>2</sup> PAK	Scr
TN1205H-6G-TR	D <sup>2</sup> PAK	Scr
TN1205H-6T	TO-220	Scr
TN1215-xxxG	D <sup>2</sup> PAK	Scr
TN1215-xxxG-TR	D <sup>2</sup> PAK	Scr
TN1625-xxxG-TR	D <sup>2</sup> PAK	Scr
TN2540-xxxG-TR	D <sup>2</sup> PAK	Scr
TXNxx12RG	TO-220 insulated	Scr
TXNxx25RG	TO-220 insulated	Scr
TYNx12DTRG	TO-220	Scr
TYNx16SRG	TO-220	Scr
TYNxx10RG	TO-220	Scr
TYNxx12RG	TO-220	Scr
TYNxx12TRG	TO-220	Scr
TYNxx16RG	TO-220	Scr
TYNxx25RG	TO-220	Scr
TYNxx40RG	TO-220	Scr
TYNxx4RG	TO-220	Scr
TYNxx6RG	TO-220	Scr
TYNxx8BDRG	TO-220	Scr
TYNxx8RG	TO-220	Scr

BYT08PI-400RG	D <sup>2</sup> PAK	Rectifier
STPSC10TH13TI	TO-220 insulated	Rectifier
STPSC6TH13TI	TO-220 insulated	Rectifier
STPSC8TH13TI	TO-220 insulated	Rectifier
STTHxxxDTI	TO-220 insulated	Rectifier
STTHxxxTTI	TO-220 insulated	Rectifier
STTHxxxDI	TO-220 insulated	Rectifier
STTH12R06DIRG	TO-220 insulated	Rectifier
STTHxxT06DI	TO-220 insulated	Rectifier
STTH806DIRG	TO-220 insulated	Rectifier
STTH8R04DI	TO-220 insulated	Rectifier
STTH8R06DIRG	TO-220 insulated	Rectifier
STTH8ST06DI	TO-220 insulated	Rectifier
STTH8T06TI	TO-220 insulated	Rectifier

RBO08-40G	D <sup>2</sup> PAK	ASD
RBO08-40G-TR	D <sup>2</sup> PAK	ASD
RBO40-40G	D <sup>2</sup> PAK	ASD
RBO40-40G-TR	D <sup>2</sup> PAK	ASD

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