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BT136-600E 4Q Triac



BT136-600E

4Q Triac

Rev. 04 — 1 April 2011 Product data sheet

1. Product profile

1.1 General description

Planar passivated sensitive gate four quadrant triac in a SOT78 plastic package intended for use in general purpose bidirectional switching and phase control applications. This sensitive gate "series E" triac is intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

1.2 Features and benefits

- Direct triggering from low power drivers and logic ICs
- High blocking voltage capability
- Low holding current for low current loads and lowest EMI at commutation
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate
- Triggering in all four quadrants

1.3 Applications

- General purpose motor control
- General purpose switching

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; see Figure 4; see Figure 5	-	-	25	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq$ 107 °C; see Figure 1; see Figure 2; see Figure 3	-	-	4	A

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TO-220AB

BT136-600E
4Q Triac
Rev. 04 -- 1 April 2011

Product data sheet

1. Product profile

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loads and lowest EMI at commutation

Planar passivated for voltage ruggedness and reliability

Sensitive gate Triggering in all four quadrants

1.3 Applications

General purpose motor control

General purpose switching

1.4 Quick reference data

Table 1. Symbol VDRM ITSM
IT(RMS)

Quick reference data

Parameter

Conditions

repetitive peak off-state voltage

non-repetitive peak on-state current
RMS on-state current

full sine wave; Tj(init) = 25 C; tp = 20 ms; see Figure 4; see Figure 5
full sine wave; Tmb 107 C; see Figure 1; see Figure 2; see Figure 3

Min Typ Max Unit

-

-

600 V

-

-

25 A

-

-

4

A

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BT136-600E
4Q Triac

Table 1. Quick reference data ...continued

Symbol Parameter

Conditions

Static characteristics

IGT

gate trigger

VD = 12 V; IT = 0.1 A; T2+ G+;

current

Tj = 25 C; see Figure 7

VD = 12 V; IT = 0.1 A; T2+ G-; Tj = 25 C; see Figure 7

VD = 12 V; IT = 0.1 A; T2- G-; Tj = 25 C; see Figure 7

VD = 12 V; IT = 0.1 A; T2- G+; Tj = 25 C; see Figure 7

IH

holding current VD = 12 V; Tj = 25 C;

see Figure 9

Min Typ Max Unit

-

2.5 10 mA

-

4 10 mA

-

5 10 mA

-

11 25 mA

-

2.2 15 mA

2. Pinning information

Table 2. Pin 1 2 3 mb

Pinning information

Symbol Description

Simplified outline

T1

main terminal 1

mb

T2

main terminal 2

G

gate

T2

mounting base; main terminal 2

Graphic symbol

T2

T1

G

sym051

3. Ordering information

123

SOT78 (TO-220AB)

Table 3. Ordering information

Type number

Package

Name

BT136-600E

TO-220AB

BT136-600E/L01

TO-220AB

Description
plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB
plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

Version SOT78
SOT78

BT136-600E
Product data sheet

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4. Limiting values

Table 4. Limiting values In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions
VDRM	repetitive peak off-state voltage	
IT(RMS)	RMS on-state current	full sine wave; Tmb 107 C; see Figure 1; see Figure 2; see

Figure 3

ITSM
I2t dIT/dt

non-repetitive peak on-state current
I2t for fusing rate of rise of on-state current

full sine wave; Tj(init) = 25 C; tp = 20 ms; see Figure 4; see Figure 5
full sine wave; Tj(init) = 25 C; tp = 16.7 ms; see Figure 5; see Figure 4
tp = 10 ms; sine-wave pulse
IT = 6 A; IG = 0.2 A; dIG/dt = 0.2 A/s; T2+ G+

IT = 6 A; IG = 0.2 A; dIG/dt = 0.2 A/s; T2+ G-

IT = 6 A; IG = 0.2 A; dIG/dt = 0.2 A/s; T2- G-

IT = 6 A; IG = 0.2 A; dIG/dt = 0.2 A/s; T2- G+

IGM VGM PGM PG(AV) Tstg Tj

peak gate current peak gate voltage peak gate power average gate power storage temperature junction temperature

over any 20 ms period

Min Max Unit

-

600 V

-

4

A

-

25 A

-

27 A

-

3.1 A2s

-

50 A/s

-

50 A/s

-

50 A/s

-

10 A/s

-

2

A

-

5

V

-

5

W

-

0.5 W

-40 150 C

-

125 C

5 IT(RMS)
(A) 4
3
2
1

003aae828

12 IT(RMS)
(A) 10
8
6
4
2

003aae830

0

-50

0

50

100

150

Tmb (C)

Fig 1. RMS on-state current as a function of mounting base temperature; maximum values

0 10-2

10-1

1

10

surge duration (s)

Fig 2.

f = 50 Hz Tmb 107 C
RMS on-state current as a function of surge duration; maximum values

BT136-600E
Product data sheet

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8 conduction form

Ptot

angle factor

(W) (degrees) a

30

4

6

60

2.8

90

2.2

120

1.9

180 1.57

4

2

003aae827
 = 180 120 90 60 30

0

0

1

2

3

4

5

IT(RMS) (A)

Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

30 ITSM (A)

25

003aae831

20

15

10

IT

ITSM

t

5 1/f

Tj(init) = 25 C max

0

1

10

102

103

104

number of cycles

f = 50 Hz

Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

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103

ITSM (A)

102

003aae829

IT

ITSM

t

tp Tj(init) = 25 C max

(1) (2)

10 10-5

10-4

10-3

10-2

tp (s)

10-1

tp 20 ms

(1) dIT/dt limit

(2) T2- G+ quadrant limit

Fig 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

5. Thermal characteristics

Table 5. Symbol Rth(j-mb)
Rth(j-a)

Thermal characteristics

Parameter

Conditions

thermal resistance from half cycle; see Figure 6 junction to mounting base full cycle; see Figure 6

thermal resistance from in free air junction to ambient

Min Typ Max Unit

-

-

3.7 K/W

-

-

3

K/W

-

60 -

K/W

10

Zth(j-mb) (K/W)

1

unidirectional

bidirectional

003aae836

10-1

P

10-2 10-5

10-4

10-3

10-2

10-1

tp

t

1

10

tp (s)

Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

BT136-600E
Product data sheet

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6. Characteristics

Table 6. Characteristics

Symbol

Parameter

Conditions

Static characteristics

IGT

gate trigger current

VD = 12 V; IT = 0.1 A; T2+ G+;

Tj = 25 C; see Figure 7

VD = 12 V; IT = 0.1 A; T2+ G-; Tj = 25 C; see Figure 7

VD = 12 V; IT = 0.1 A; T2- G-; Tj = 25 C; see Figure 7

VD = 12 V; IT = 0.1 A; T2- G+; Tj = 25 C; see Figure 7

IL

latching current

VD = 12 V; IG = 0.1 A; T2+ G+;

Tj = 25 C; see Figure 8

VD = 12 V; IG = 0.1 A; T2+ G-; Tj = 25 C; see Figure 8

VD = 12 V; IG = 0.1 A; T2- G-; Tj = 25 C; see Figure 8

VD = 12 V; IG = 0.1 A; T2- G+; Tj = 25 C; see Figure 8

IH

holding current

VD = 12 V; Tj = 25 C; see Figure 9

VT

on-state voltage

IT = 5 A; Tj = 25 C; see Figure 10

VGT

gate trigger voltage

VD = 12 V; IT = 0.1 A; Tj = 25 C;

see Figure 11

VD = 400 V; IT = 0.1 A; Tj = 125 C; see Figure 11

ID

off-state current

Dynamic characteristics

VD = 600 V; Tj = 125 C

dVD/dt

rate of rise of off-state VDM = 402 V; Tj = 125 C; exponential

voltage

waveform; gate open circuit

tgt

gate-controlled turn-on ITM = 6 A; VD = 600 V; IG = 0.1 A;

time

dIG/dt = 5 A/s

BT136-600E

4Q Triac

Min Typ Max Unit

-

2.5 10 mA

-

4

10 mA

-

5

10 mA

-

11

25

mA

-

3

15 mA

-

10

20

mA

-

2.5 15 mA

-

4

20 mA

-

2.2 15 mA

-

1.4 1.7 V

-

0.7 1.5 V

0.25 0.4 -

V

-

0.1 0.5 mA

-

50

-

V/s

-

2

-

s

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3 IGT IGT (25 C)
(1) (2)
2
(3) (4)
1

003aae833
(1) (2) (3) (4)

3 IL IL(25C)
2
1

003aae835

0

-60

-10

40

90

140

Tj (C)

(1) T2- G+ (2) T2- G(3) T2+ G(4) T2+ G+

Fig 7. Normalized gate trigger current as a function of junction temperature

0

-60

-10

40

90

140

Tj (C)

Fig 8. Normalized latching current as a function of junction temperature

2.0 IH IH(25C)
1.5

003aae837

12
IT (A)
8

003aae834

1.0

4
0.5
(1) (2) (3)

0

-60

-10

40

90

140

Tj (C)

Fig 9. Normalized holding current as a function of junction temperature

0

0

1

2

3

VT (V)

Vo = 1.27 V Rs = 0.091 (1) Tj = 125 C; typical values (2) Tj = 125 C; maximum values (3) Tj = 25 C; maximum values

Fig 10. On-state current as a function of on-state voltage

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1.6 VGT VGT (25 C)

1.2

003aae832

0.8

0.4

0

-60

-10

40

90

140

Tj (C)

Fig 11. Normalized gate trigger voltage as a function of junction temperature

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4Q Triac

BT136-600E
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7. Package outline
Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

BT136-600E
4Q Triac
SOT78

E

A

p

A1

q

mounting

D1

base

D

L1(1)

b1(2)

L

(3)

b2(2) (2)

L2(1)

1

2

3

ee

b(3)

Q c

0

5

10 mm

scale

DIMENSIONS (mm are the original dimensions)

UNIT A

A1

b b1(2) b2(2) c

D D1 E

e

L

L1(1)

L2(1) max.

p

q

Q

mm

4.7 1.40 0.9 4.1 1.25 0.6

1.6 1.0

1.3 1.0

0.7 0.4

16.0 15.2

6.6 5.9

10.3 9.7

2.54

15.0 12.8

3.30 2.79

3.0

3.8 3.5

3.0 2.7

2.6 2.2

Notes 1. Lead shoulder designs may vary. 2. Dimension includes excess dambar.

OUTLINE

VERSION

IEC

REFERENCES

JEDEC

JEITA

EUROPEAN PROJECTION

SOT78

3-lead TO-220AB

SC-46

Fig 12. Package outline SOT78 (TO-220AB)

ISSUE DATE
08-04-23 08-06-13

BT136-600E
Product data sheet

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8. Revision history

Table 7. Revision history

Document ID

Release date

Data sheet status

BT136-600E v.4 Modifications:

20110401

Product data sheet

Various changes to content.

BT136-600E v.3

20100831

Product data sheet

Change notice -
-

Supersedes BT136-600E v.3
BT136_SERIES_E v.2

BT136-600E
Product data sheet

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10 of 13

NXP Semiconductors

BT136-600E
4Q Triac

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Product status [3] Development Qualification Production

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BT136-600E
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BT136-600E

Product data sheet

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11. Contents

1

Product profile . . . . . .
. . . .1

1.1

General description . . . . . .
.1

1.2

Features and benefits . . . . . .
.1

1.3

Applications . . . . . .

. . .1

1.4

Quick reference data . . . . . .
.1

2

Pinning information . . . . . .
. .2

3

Ordering information . . . . . .
.2

4

Limiting values. . . . . .
. . .3

5

Thermal characteristics 5

6

Characteristics . . . . . .
. . . .6

7

Package outline . . . . . .
. . .9

8

Revision history . . . . . .
. .10

9

Legal information. . . . . .
. 11

9.1

Data sheet status . . . . . .
. 11

9.2

Definitions . . . . . .
. . . . 11

9.3

Disclaimers . . . . . .
. . . 11

9.4

Trademarks. . . . . .
. .12

10

Contact information. . . . . .
.12

BT136-600E
4Q Triac

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