BTA316-600BT

3Q Hi-Com Triac

Rev. 02 — 30 November 2010 | Product data sheet

1. Product profile

1.1 General description

Planar passivated high commutation three quadrant triac in a SOT78 plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series BT" triac will commutate the full RMS current at the maximum rated junction temperature without the aid of a snubber where "high junction operating temperature capability" is required

1.2 Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High junction operating temperature capability
- High voltage capability
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only

1.3 Applications

- Applications subject to high temperature
- Electronic thermostats (heating and cooling)
- High power motor controls e.g. washing machines and vacuum cleaners
- Rectifier-fed DC inductive loads e.g. DC motors and solenoids

1.4 Quick reference data

Table 1. Quick reference data

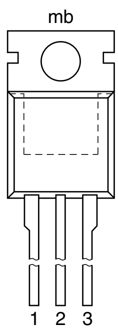
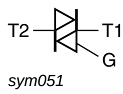
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; see Figure 4; see Figure 5	-	-	140	A
T_j	junction temperature		-	-	150	°C
$I_{T(RMS)}$	RMS on-state current	full sine wave; T_{mb} ≤ 126 °C; see Figure 3; see Figure 1; see Figure 2	-	-	16	A

Table 1. Quick reference data *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 7	2	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 7	2	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 7	2	-	50	mA

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 SOT78 (TO-220AB)	
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BTA316-600BT	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 126$ °C; see Figure 3; see Figure 1; see Figure 2	-	16	A
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	-	140	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	-	150	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	98	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 20$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/µs	-	100	A/µs
I_{GM}	peak gate current		-	2	A
P_{GM}	peak gate power		-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.5	W
T_{stg}	storage temperature		-40	150	°C
T_j	junction temperature		-	150	°C

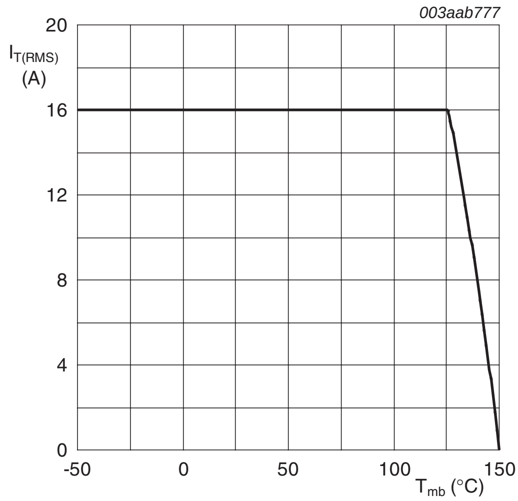


Fig 1. RMS on-state current as a function of mounting base temperature; maximum values

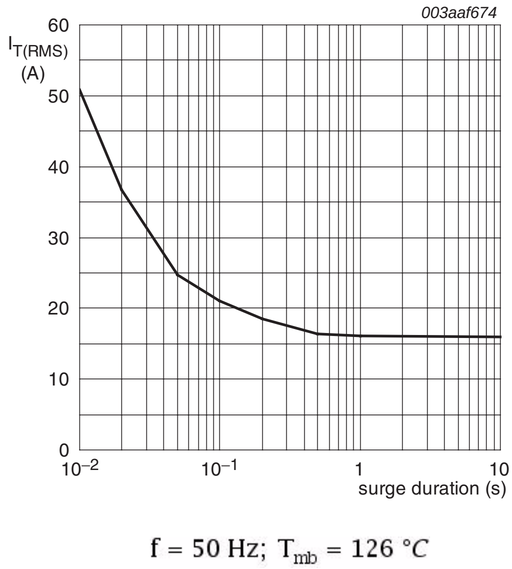
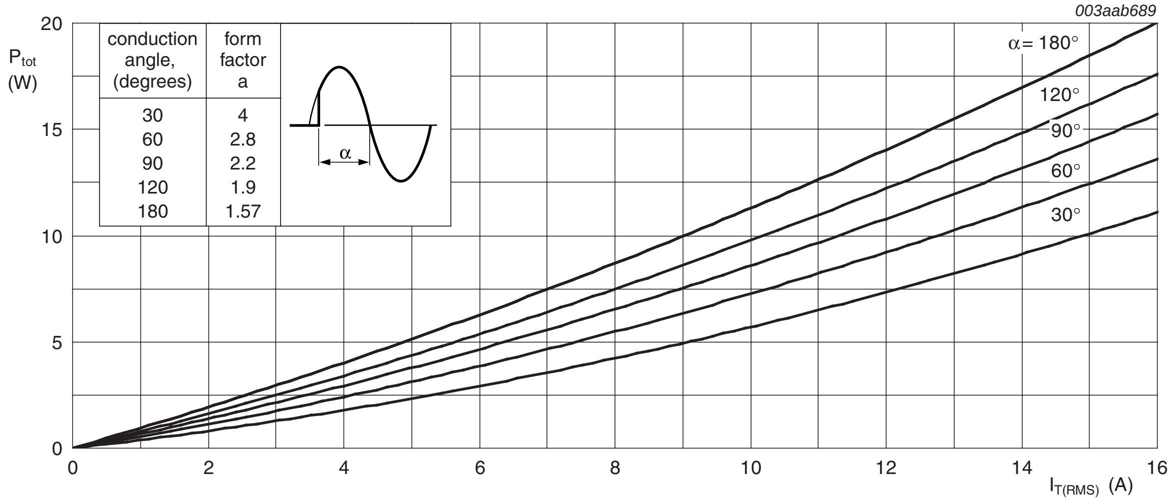
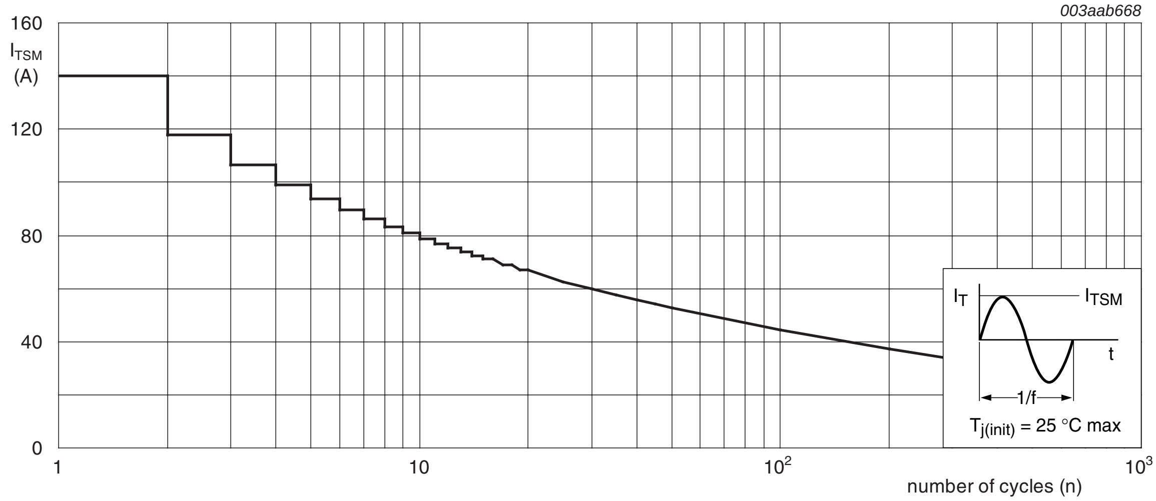


Fig 2. RMS on-state current as a function of surge duration; maximum values



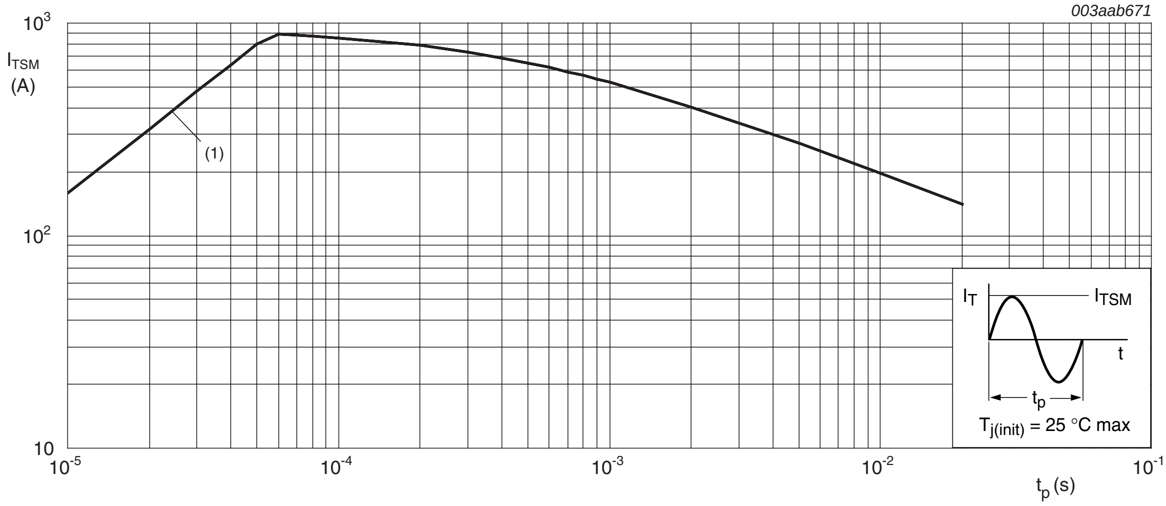
α = conduction angle

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



f = 50 Hz

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



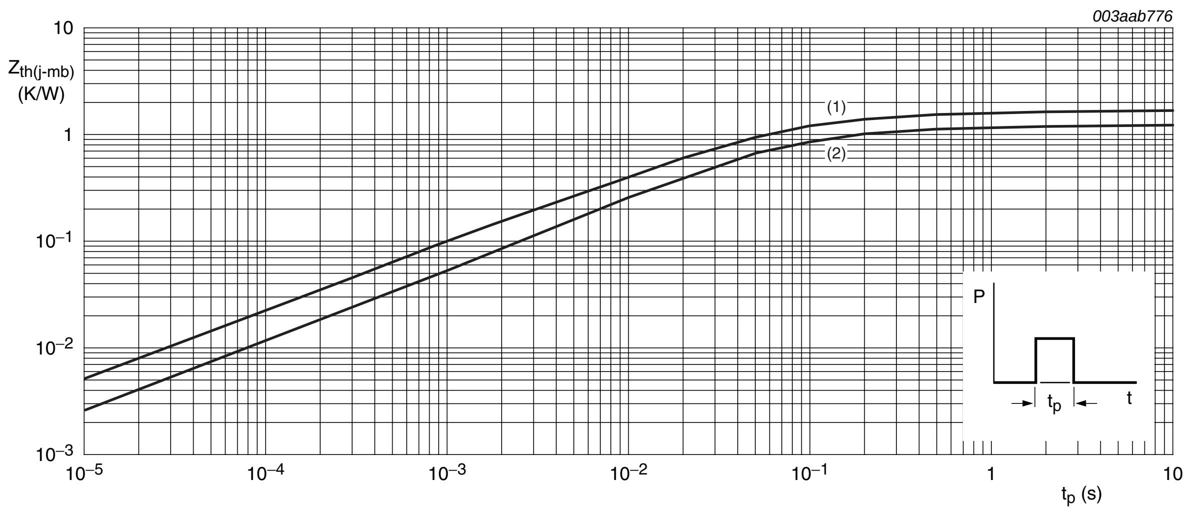
$t_p \leq 20$ ms; (1) dI_T/dt limit

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

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; see Figure 6	-	-	1.2	K/W
		half cycle; see Figure 6	-	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



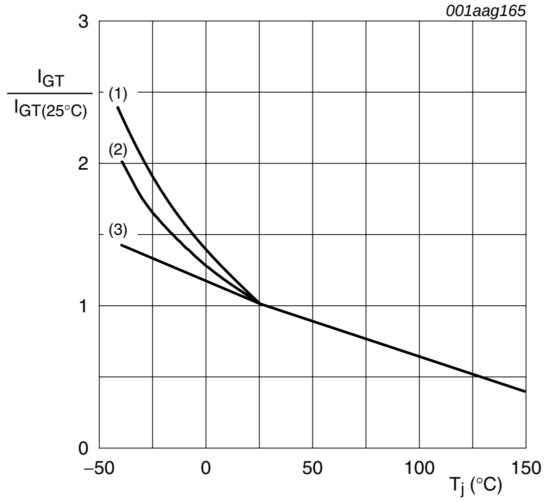
(1) Unidirectional (half cycle); (2) Bidirectional (full cycle)

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

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 7	2	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 7	2	-	50	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 7	2	-	50	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 8	-	-	60	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 8	-	-	90	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; see Figure 8	-	-	60	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 9	-	-	60	mA
V_T	on-state voltage	I_T = 18 A; T_j = 25 °C; see Figure 10	-	1.3	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; see Figure 11	-	0.8	1.5	V
		V_D = 400 V; I_T = 0.1 A; T_j = 150 °C; see Figure 11	0.25	0.4	-	V
I_D	off-state current	V_D = 600 V; T_j = 150 °C	-	0.24	1.2	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 150 °C; exponential waveform; gate open circuit	600	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; "without snubber" condition; gate open circuit	8	-	-	A/ms
t_{gt}	gate-controlled turn-on time	I_{TM} = 20 A; V_D = 600 V; I_G = 0.1 A; dI_G/dt = 5 A/µs	-	2	-	µs



(1) T2 − G − (2) T2+G − (3) T2+G+

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

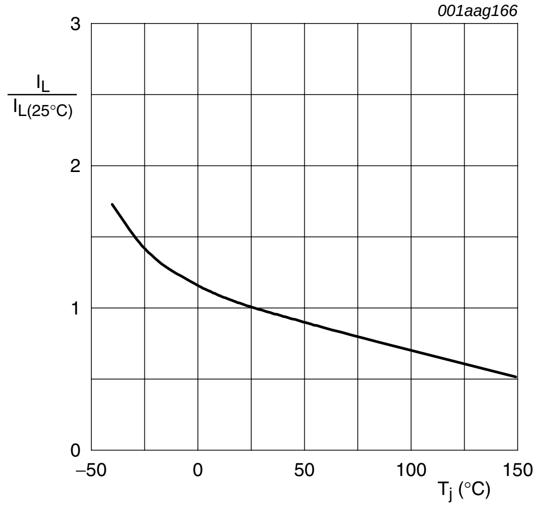


Fig 8. Normalized latching current as a function of junction temperature

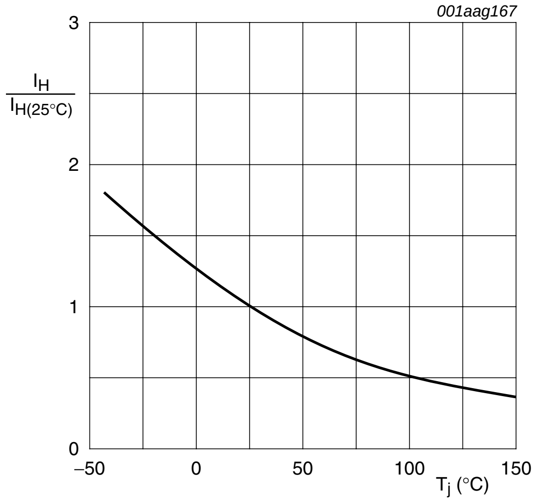
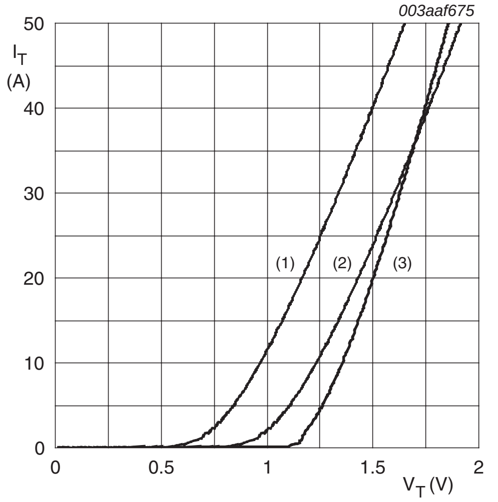


Fig 9. Normalized holding current as a function of junction temperature



V_o = 1.024 V

R_s = 0.021 Ω

(1) T_j = 150 °C; typical values

(2) T_j = 150 °C; maximum values

(3) T_j = 25 °C; maximum values

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

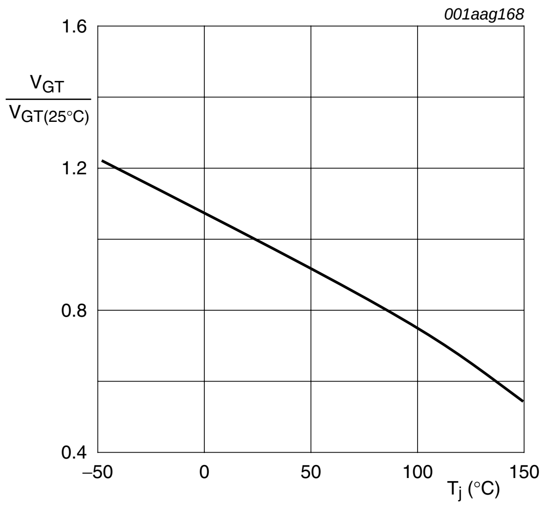
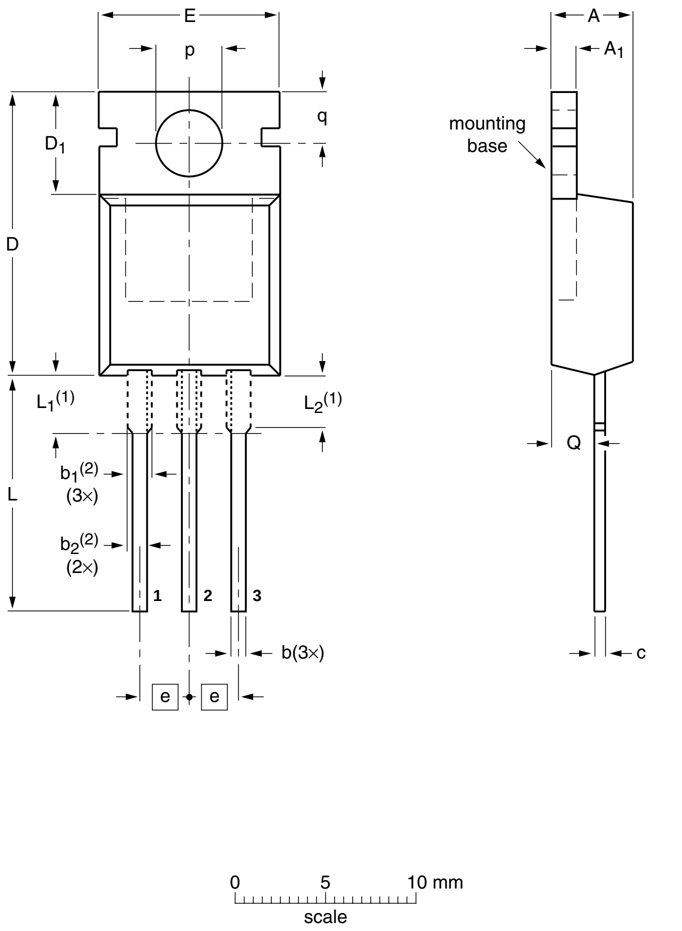


Fig 11. Normalized gate trigger voltage as a function of junction temperature

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1(2)	b_2(2)	c	D	D_1	E	e	L	L_1(1)	L_2(1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 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	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~08-04-23~~ 08-06-13

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

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BTA316-600BT v.2	20101130	Product data sheet	-	BTA316_SER_BT v.1
Modifications:	• Various changes to content.			
BTA316_SER_BT v.1	20070503	Product data sheet	-	-

9. Legal information

9.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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11. Contents

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