

BTA204S series B and C

Three-quadrant triacs high commutation

Rev. 03 — 24 May 2005

Product data sheet

1. Product profile

1.1 General description

Passivated high commutation triac in a SOT428 (DPAK) plastic package. Intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. These devices will commute the full rated RMS current at the maximum rated junction temperature, without the aid of a snubber.

1.2 Features

- High maximum junction temperature
- High commutation capability

1.3 Applications

- Motor control
- Industrial and domestic heating

1.4 Quick reference data

- $V_{DRM} \leq 600$ V (BTA204S-600B)
- $V_{DRM} \leq 800$ V (BTA204S-800B)
- $V_{DRM} \leq 600$ V (BTA204S-600C)
- $V_{DRM} \leq 800$ V (BTA204S-800C)
- $I_{TSM} \leq 25$ A
- $I_{T(RMS)} \leq 4$ A

2. Pinning information

Table 1: Pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1 (T1)	<p>SOT428 (DPAK)</p>	
2	main terminal 2 (T2)		
3	gate (G)		
mb	mounting base [1]		

[1] Connected to main terminal 2 (T2)

3. Ordering information

Table 2: Ordering information

Type number	Package		Version
	Name	Description	
BTA204S-600B	DPAK	plastic single-ended surface mounted package; 3 leads (one lead cropped)	SOT428
BTA204S-600C			
BTA204S-800B			
BTA204S-800C			

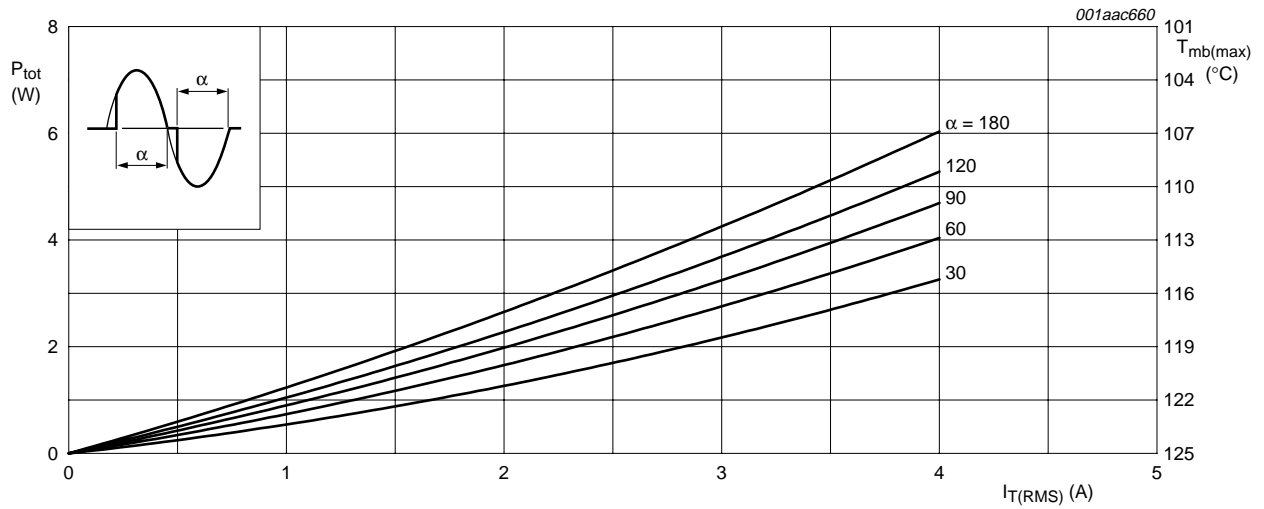
4. Limiting values

Table 3: Limiting values

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

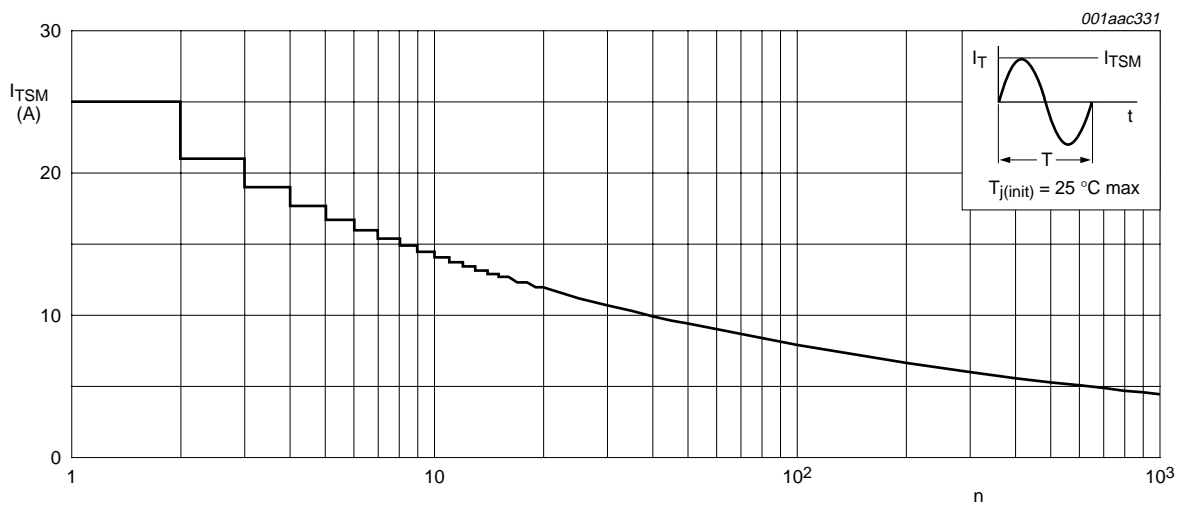
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage	BTA204S-600B; BTA204S-600C	[1] -	600	V
		BTA204S-800B; BTA204S-800C	-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 107\text{ °C}$; see Figure 4 and 5	-	4	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j}} = 25\text{ °C}$ prior to surge; see Figure 2 and 3			
		$t = 20\text{ ms}$	-	25	A
		$t = 16.7\text{ ms}$	-	27	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	3.1	A ² s
di_{T}/dt	repetitive rate of rise of on-state current after triggering	$I_{\text{TM}} = 6\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$	-	100	A/ μs
I_{GM}	peak gate current		-	2	A
V_{GM}	peak gate voltage		-	5	V
P_{GM}	peak gate power		-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period	-	0.5	W
T_{stg}	storage temperature		-40	+150	°C
T_{j}	junction temperature		-	125	°C

[1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 6 A/ μs .



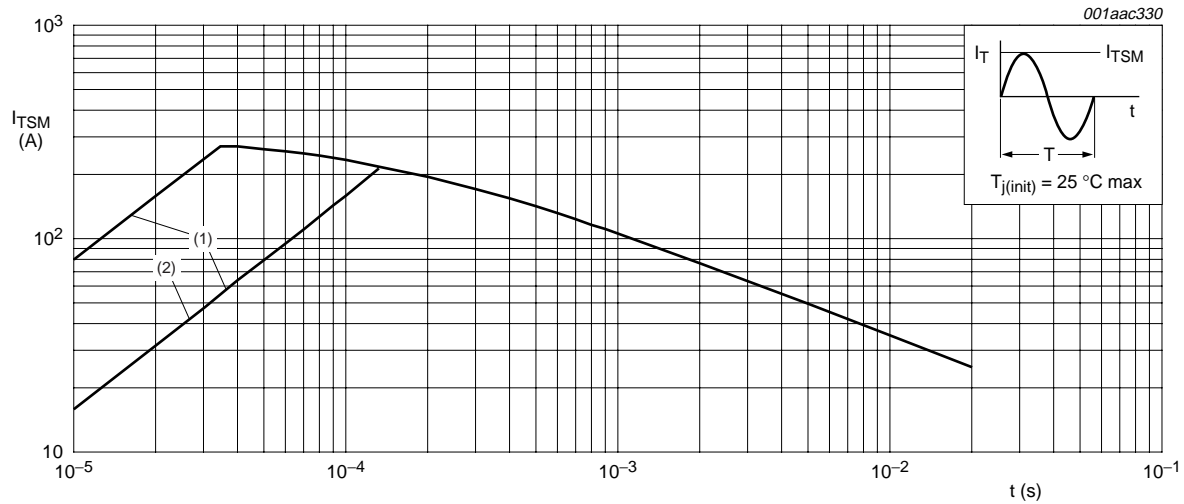
α = conduction angle

Fig 1. Total power dissipation as a function of RMS on-state current; maximum values



$f = 50$ Hz

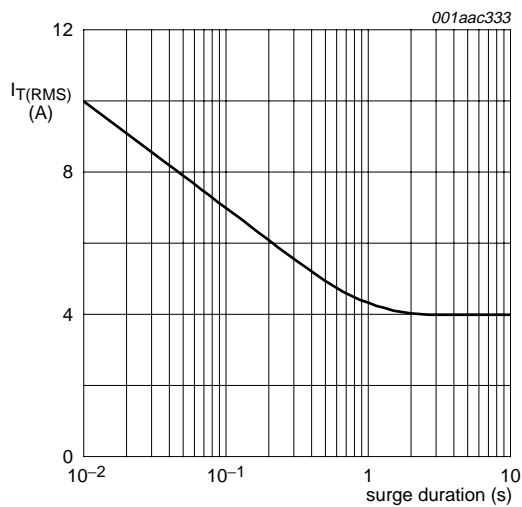
Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal cycles; maximum values



$t_p \leq 20\text{ ms}$

- (1) dI_T/dt limit
- (2) T2- G+ quadrant

Fig 3. Non-repetitive peak on-state current as a function of pulse width; maximum values



$f = 50\text{ Hz}; T_{mb} \leq 107\text{ °C}$

Fig 4. RMS on-state current as a function of surge duration; maximum values

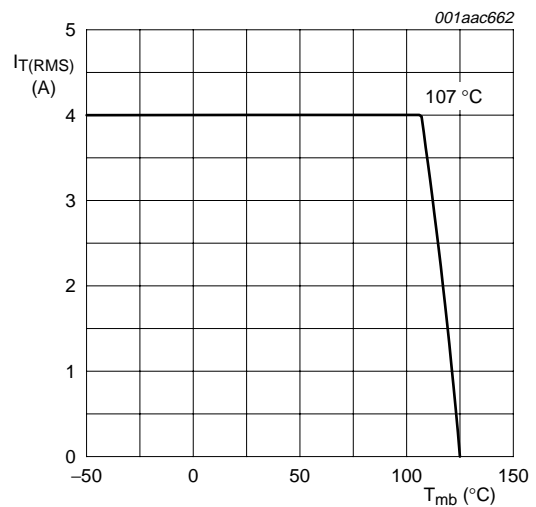
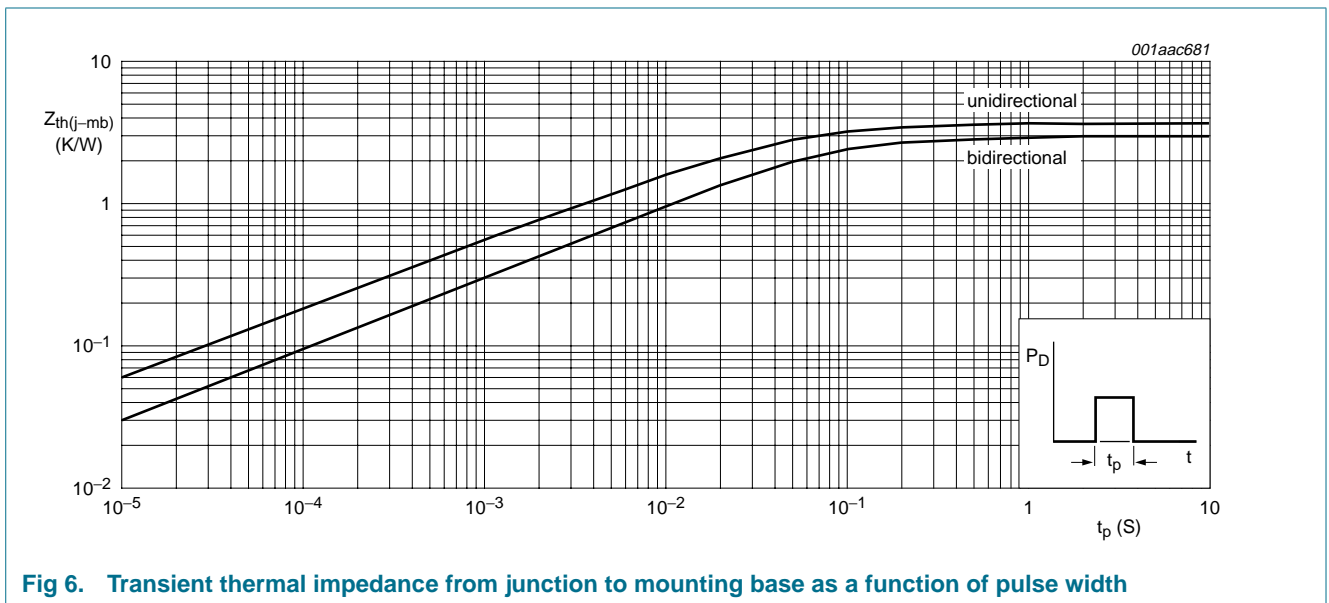


Fig 5. RMS on-state current as a function of mounting base temperature

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle	-	-	3.0	K/W
		half cycle	-	-	3.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	printed-circuit board (FR4) mounted as in Figure 13	-	75	-	K/W

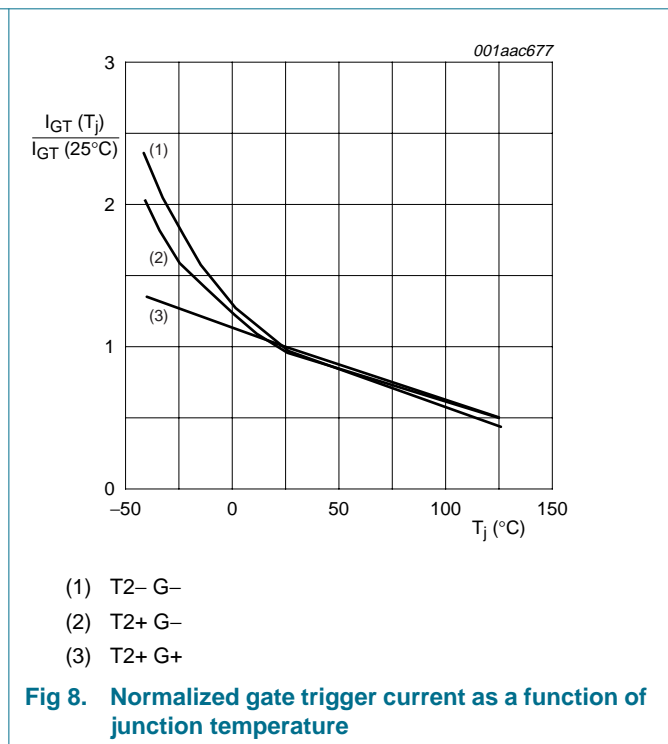
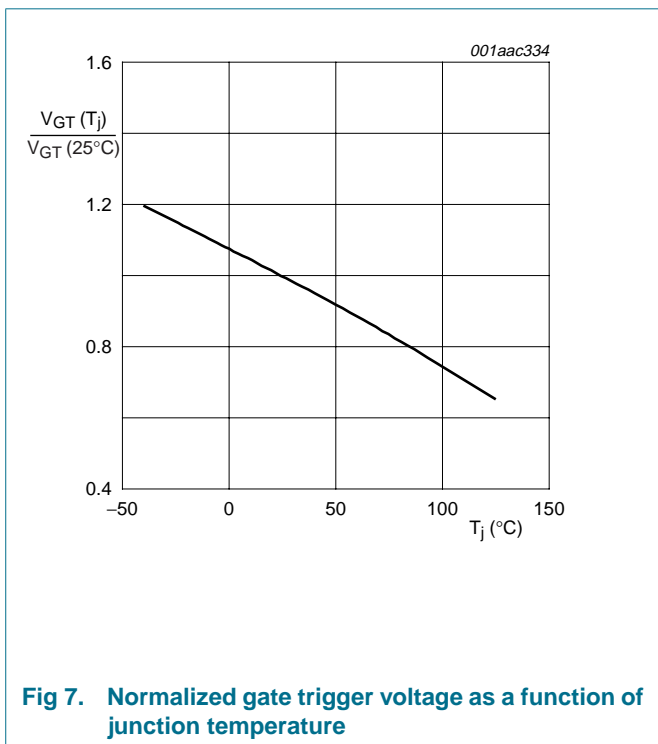


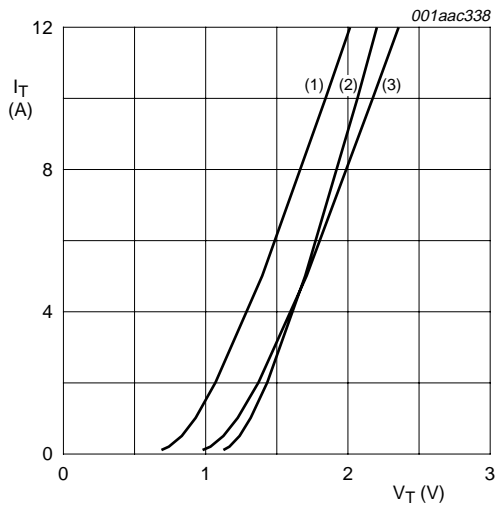
6. Static characteristics

Table 5: Static characteristics
 $T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	BTA204S-600B BTA204S-800B			BTA204S-600C BTA204S-800C			Unit
			Min	Typ	Max	Min	Typ	Max	
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$ see Figure 8 ^[1]							
		T2+ G+	-	-	50	-	-	35	mA
		T2+ G-	-	-	50	-	-	35	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 10							
		T2+ G+	-	-	30	-	-	20	mA
		T2+ G-	-	-	45	-	-	30	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; see Figure 11	-	-	30	-	-	20	mA
		T2- G-	-	-	30	-	-	20	mA
		T2- G+	-	-	30	-	-	20	mA
V_T	on-state voltage	$I_T = 5\text{ A}$; see Figure 9	-	1.4	1.7	-	1.4	1.7	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; see Figure 7	-	0.7	1.5	-	0.7	1.5	V
		$V_D = 400\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 125\text{ }^\circ\text{C}$	0.25	0.4	-	0.25	0.4	-	V
I_D	off-state leakage current	$V_D = V_{DRM(max)}$; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	-	0.1	0.5	mA

[1] Device does not trigger in the T2- G+ quadrant.





$V_O = 1.27 \text{ V}; R_S = 0.091 \Omega$

- (1) $T_j = 125 \text{ }^\circ\text{C}$; typical values
- (2) $T_j = 25 \text{ }^\circ\text{C}$; maximum values
- (3) $T_j = 125 \text{ }^\circ\text{C}$; maximum values

Fig 9. On-state current as a function of on-state voltage; typical values

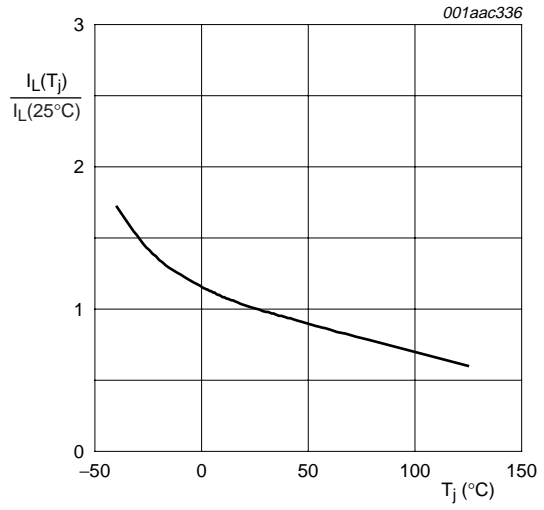


Fig 10. Normalized latching current as a function of junction temperature

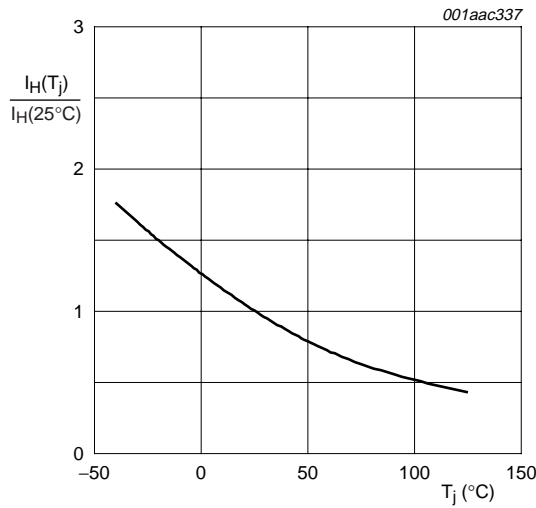


Fig 11. Normalized holding current as a function of junction temperature

7. Dynamic characteristics

Table 6: Dynamic characteristics

$T_j = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	BTA204S-600B BTA204S-800B			BTA204S-600C BTA204S-800C			Unit
			Min	Typ	Max	Min	Typ	Max	
dV_D/dt	critical rate of rise of off-state voltage	$V_{DM} = 0.67V_{DRM(max)}$; $T_j = 125\text{ °C}$; exponential waveform; gate open circuit	1000	-	-	1000	-	-	V/ μ s
dI_{com}/dt	critical rate of change of commutating current	$V_{DM} = 400\text{ V}$; $T_j = 125\text{ °C}$; $I_{T(RMS)} = 4\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; gate open circuit	6	-	-	3	-	-	A/ms
t_{gt}	gate controlled turn-on time	$I_{TM} = 12\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 0.1\text{ A}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	-	2	-	μ s

8. Package information

Refer to mounting instructions for SOT428 (DPAK) package.

Plastic meets requirements of UL94 V-0 at $1/8$ inch.

9. Package outline

Plastic single-ended surface mounted package (DPAK); 3 leads (one lead cropped)

SOT428

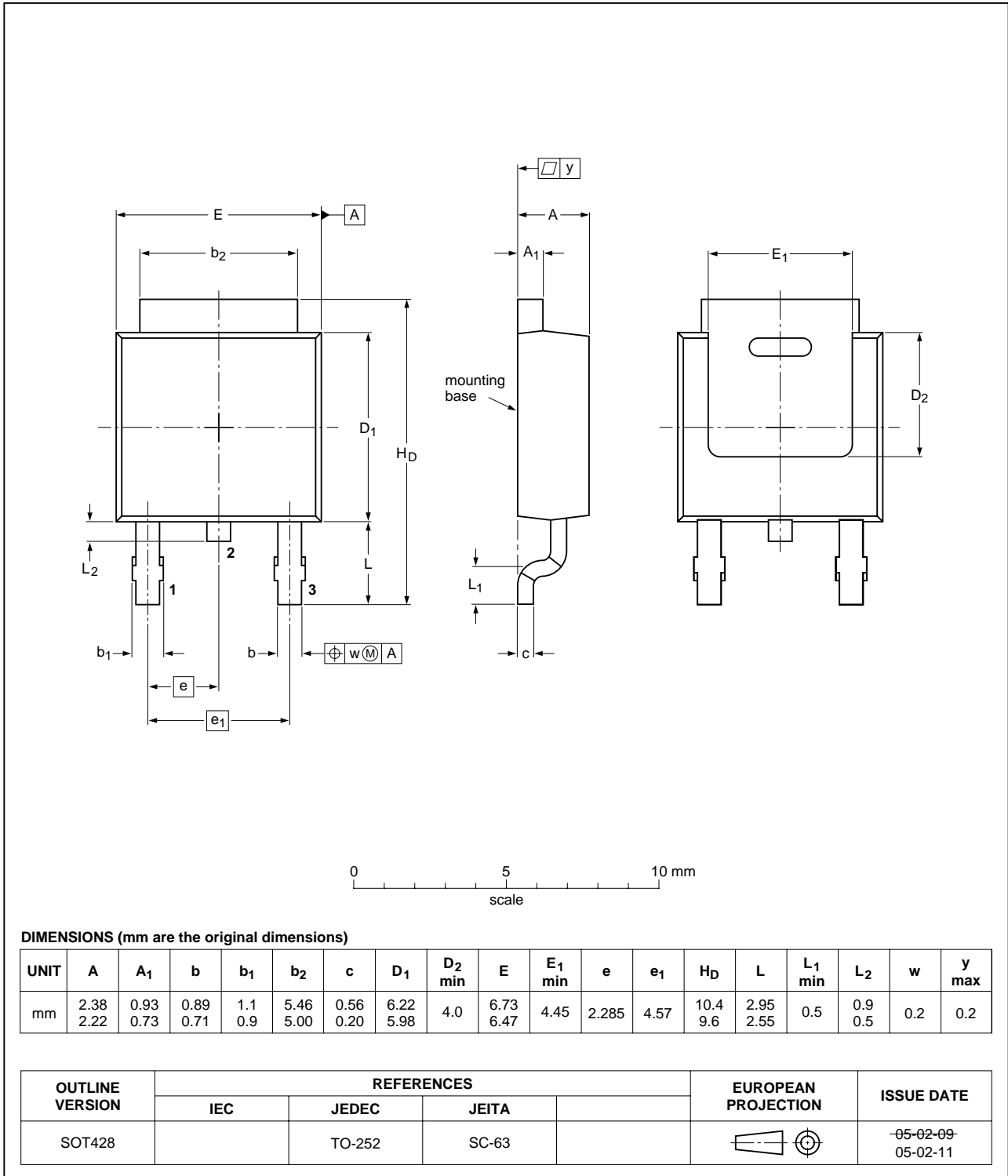
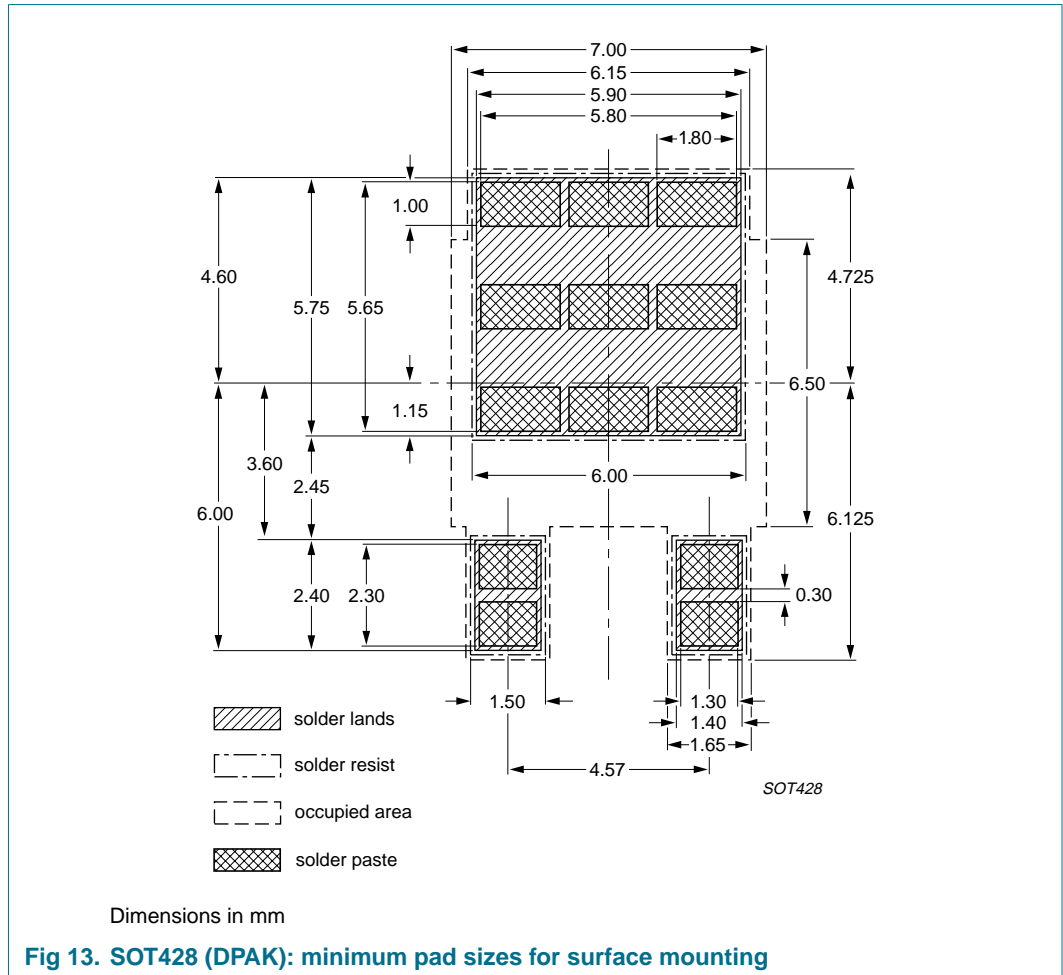


Fig 12. Package outline SOT428 (DPAK)

10. Mounting



11. Revision history

Table 7: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BTA204S_SER_B_C_3	20050524	Product data sheet	-	9397 750 14862	BTA204S_SERIES_B_C_2
Modifications:			<ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors• 500 V types removed• Alternative pinning types removed		
BTA204S_SERIES_B_C_2	19981201	Product specification	-	n.a.	BTA204S_SERIES_B_C_1
BTA204S_SERIES_B_C_1	19971001	Objective specification	-	n.a.	-

12. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definition
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