

BT151S series L and R

Thyristors

Rev. 05 — 9 October 2006

Product data sheet

1. Product profile

1.1 General description

Passivated thyristors in a SOT428 plastic package.

1.2 Features

- High thermal cycling performance
- High bidirectional blocking voltage capability
- Surface-mounted package

1.3 Applications

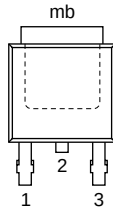
- Motor control
- Ignition circuits
- Static switching
- Protection circuits

1.4 Quick reference data

- $V_{DRM} \leq 500 \text{ V}$ (BT151S-500L/R)
- $V_{RRM} \leq 500 \text{ V}$ (BT151S-500L/R)
- $V_{DRM} \leq 650 \text{ V}$ (BT151S-650L/R)
- $V_{RRM} \leq 650 \text{ V}$ (BT151S-650L/R)
- $V_{DRM} \leq 800 \text{ V}$ (BT151S-800R)
- $V_{RRM} \leq 800 \text{ V}$ (BT151S-800R)
- $I_{TSM} \leq 120 \text{ A}$ ($t = 10 \text{ ms}$)
- $I_{T(RMS)} \leq 12 \text{ A}$
- $I_{T(AV)} \leq 7.5 \text{ A}$
- $I_{GT} \leq 5 \text{ mA}$ (BT151S series L)
- $I_{GT} \leq 15 \text{ mA}$ (BT151S series R)

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	cathode (K)		
2	anode (A)		
3	gate (G)		
mb	mounting base; connected to anode		

SOT428 (DPAK)

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BT151S-500L	DPAK	plastic single-ended surface-mounted package; 3 leads (one lead cropped)	SOT428
BT151S-500R			
BT151S-650L			
BT151S-650R			
BT151S-800R			

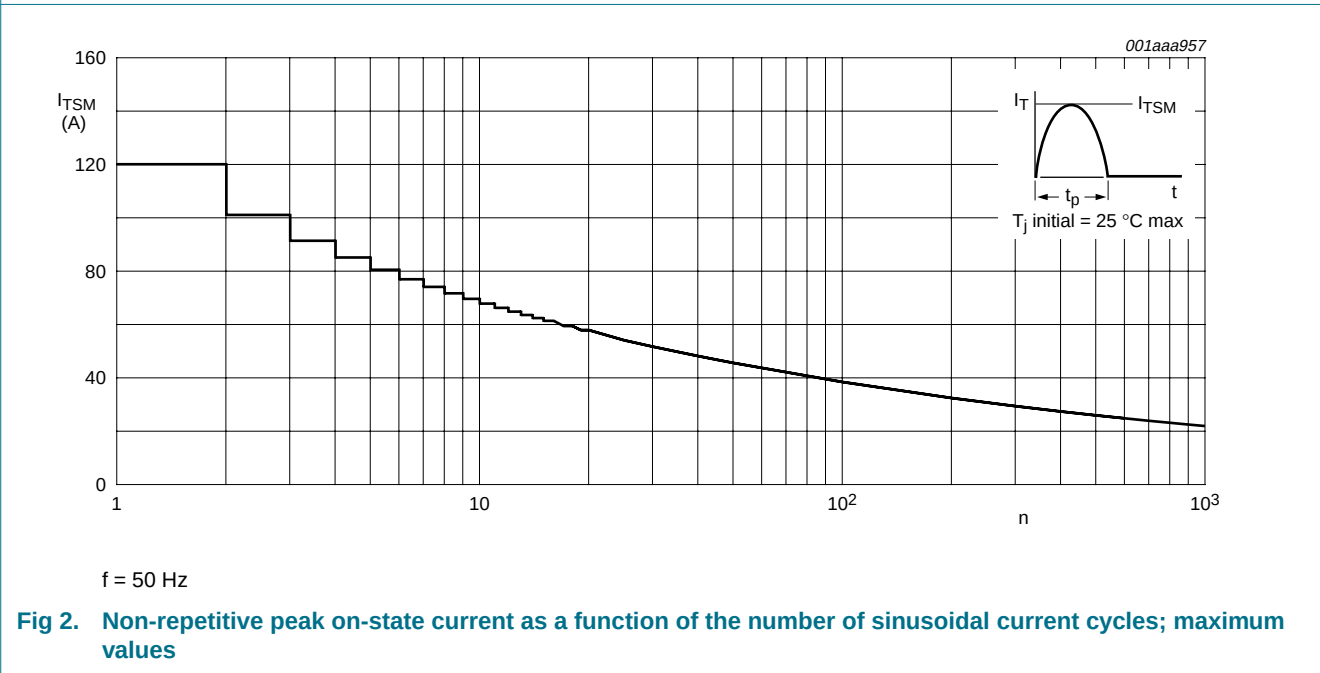
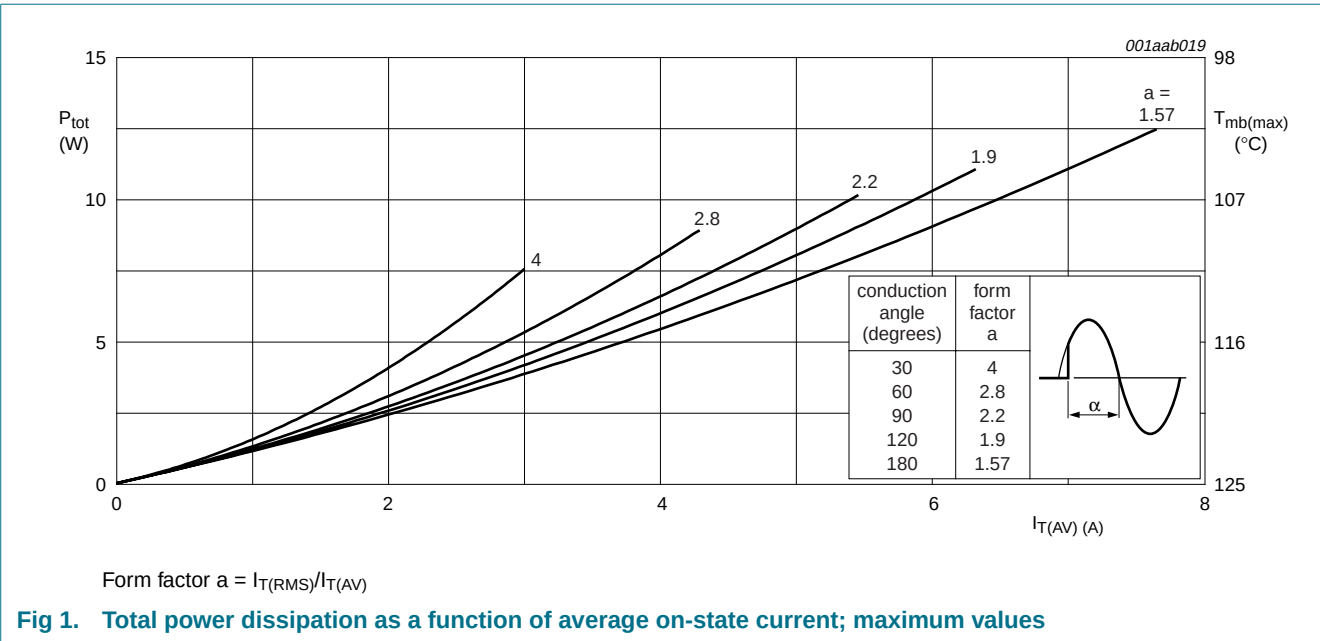
4. Limiting values

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	BT151S-500L; BT151S-500R	[1] -	500	V
		BT151S-650L; BT151S-650R	[1] -	650	V
		BT151S-800R	-	800	V
V_{RRM}	repetitive peak reverse voltage	BT151S-500L; BT151S-500R	[1] -	500	V
		BT151S-650L; BT151S-650R	[1] -	650	V
		BT151S-800R	-	800	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 103\text{ °C}$; see Figure 1	-	7.5	A
$I_{T(RMS)}$	RMS on-state current	all conduction angles; see Figure 4 and 5	-	12	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_j = 25\text{ °C}$ prior to surge; see Figure 2 and 3			
		$t = 10\text{ ms}$	-	120	A
		$t = 8.3\text{ ms}$	-	132	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	72	A ² s
di_T/dt	rate of rise of on-state current	$I_{TM} = 20\text{ A}$; $I_G = 50\text{ mA}$; $di_G/dt = 50\text{ mA}/\mu\text{s}$	-	50	A/ μs
I_{GM}	peak gate current		-	2	A
V_{RGM}	peak reverse gate voltage		-	5	V
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		-	125	°C

- [1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15A/ μs .



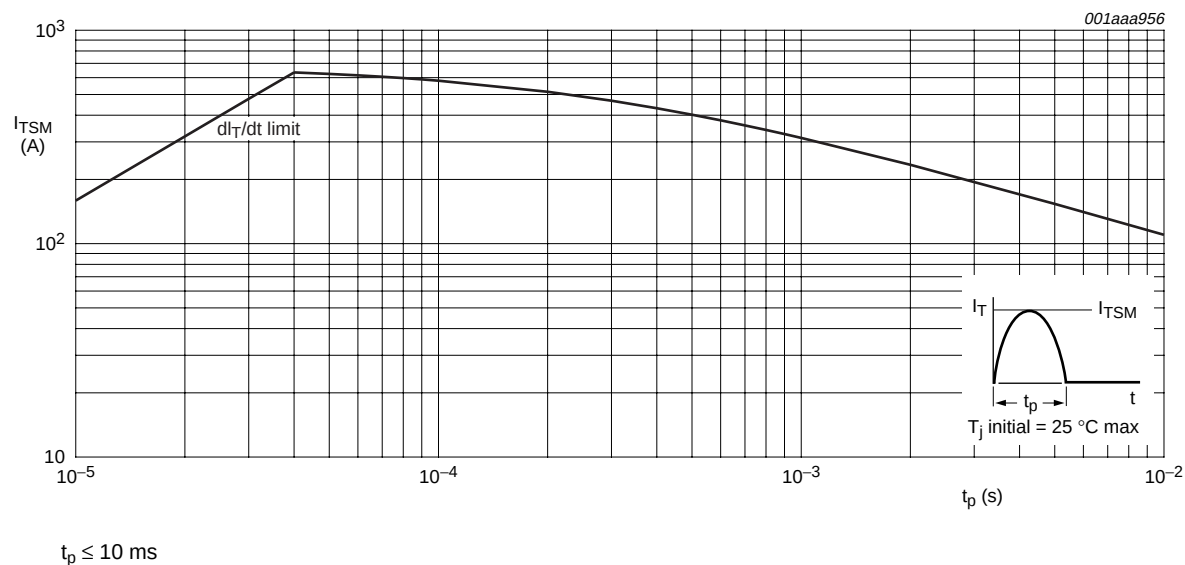


Fig 3. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

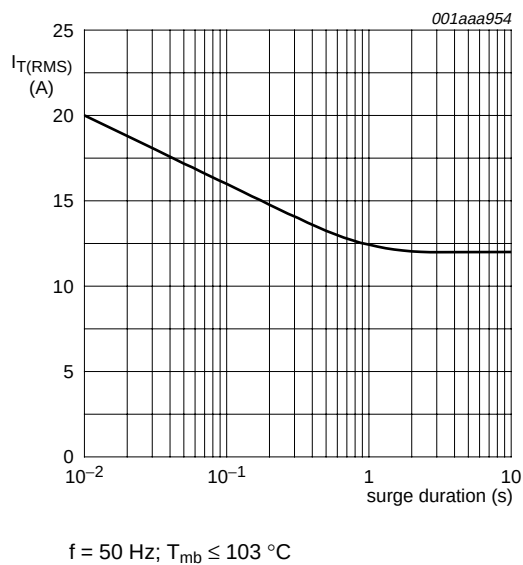


Fig 4. RMS on-state current as a function of surge duration; maximum values

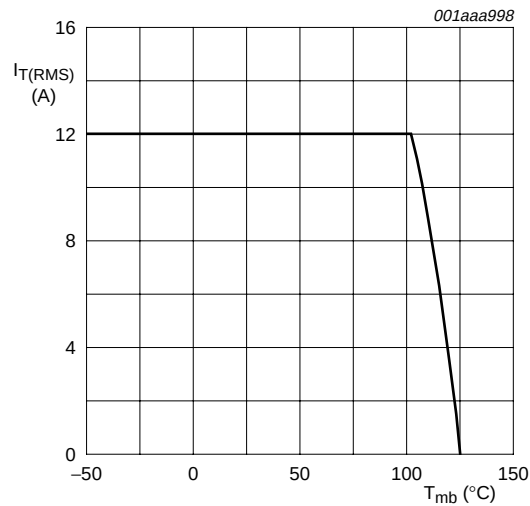


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values

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	see Figure 6	-	-	1.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on an FR4 printed-circuit board; see Figure 14	-	75	-	K/W

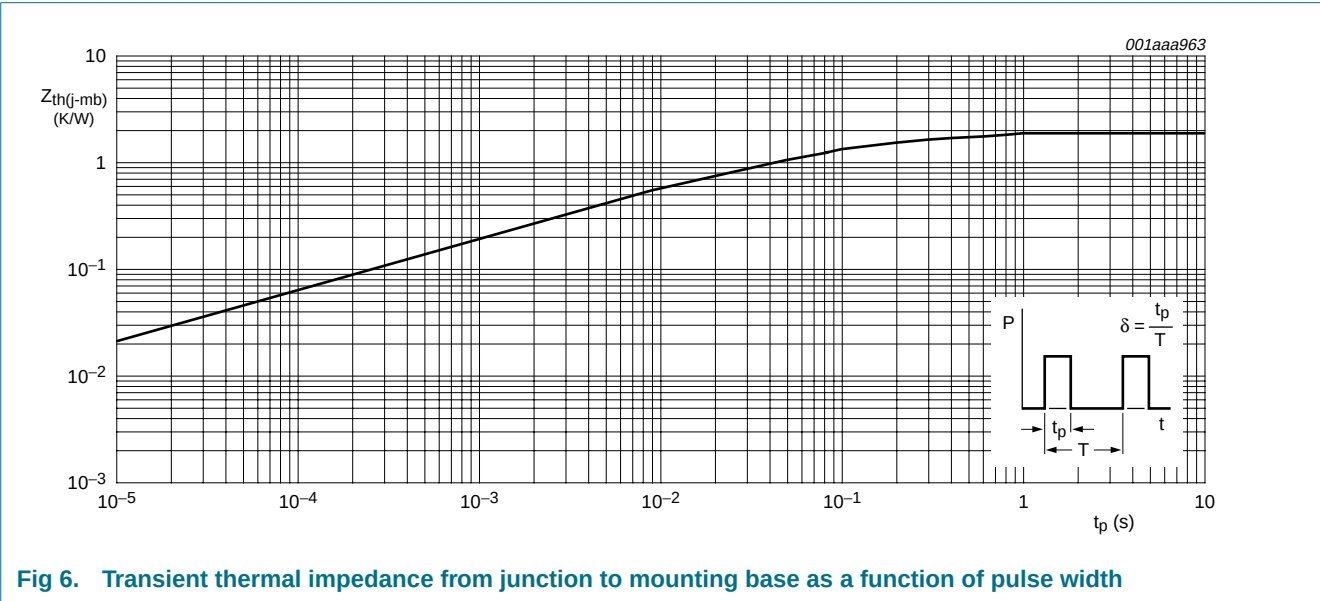


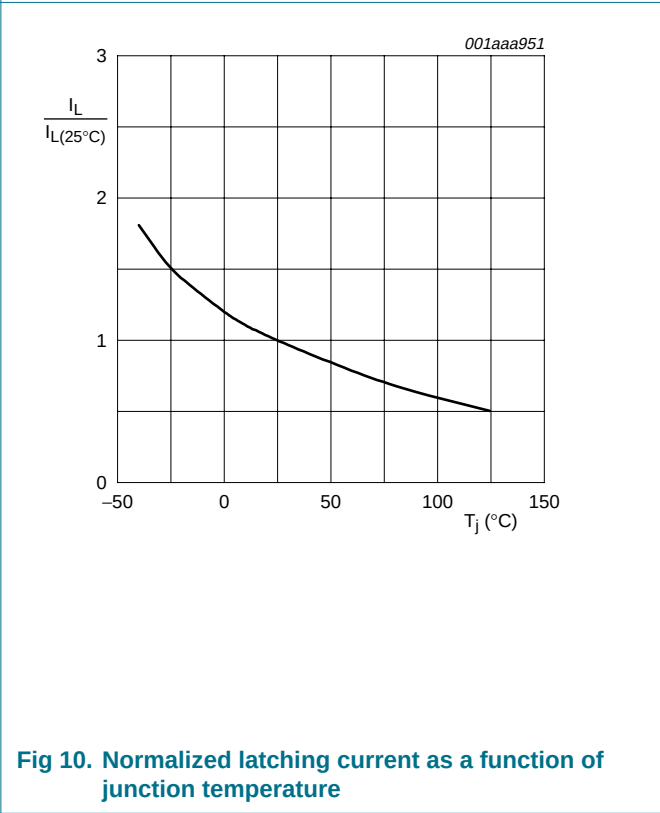
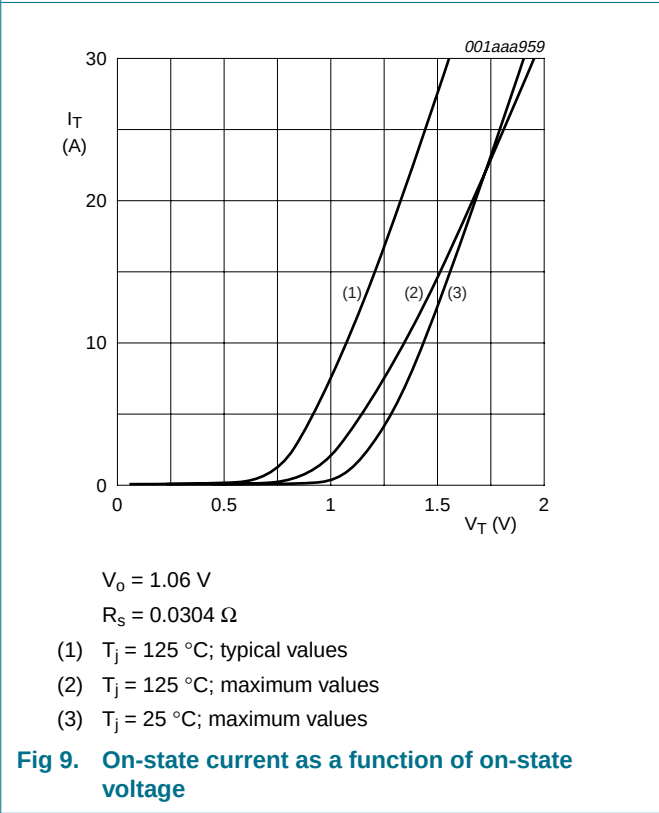
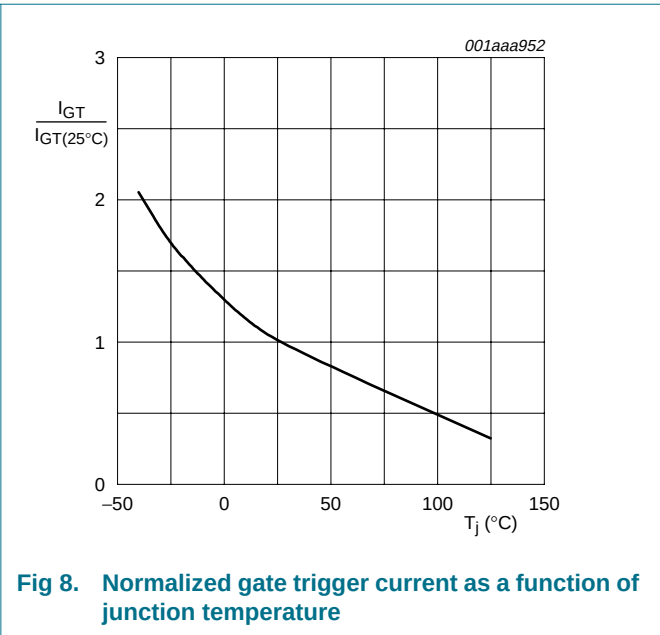
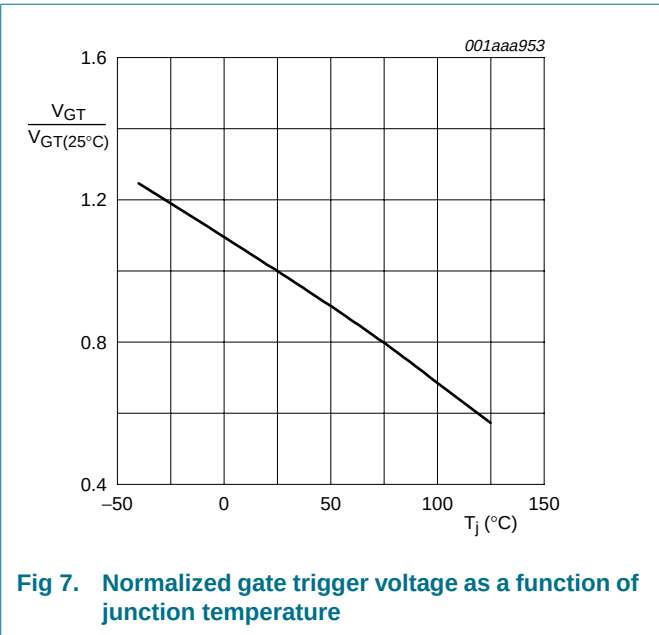
Fig 6. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 5. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 100\text{ mA}$; see Figure 8				
		BT151S-500L	-	2	5	mA
		BT151S-500R	-	2	15	mA
		BT151S-650L	-	2	5	mA
		BT151S-650R	-	2	15	mA
		BT151S-800R	-	2	15	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 100\text{ mA}$; see Figure 10	-	10	40	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 100\text{ mA}$; see Figure 11	-	7	20	mA
V_T	on-state voltage	$I_T = 23\text{ A}$; see Figure 9	-	1.4	1.75	V
V_{GT}	gate trigger voltage	$I_T = 100\text{ mA}$; $V_D = 12\text{ V}$; see Figure 7	-	0.6	1.5	V
		$I_T = 100\text{ mA}$; $V_D = V_{DRM(max)}$; $T_j = 125\text{ °C}$	0.25	0.4	-	V
I_D	off-state current	$V_D = V_{DRM(max)}$; $T_j = 125\text{ °C}$	-	0.1	0.5	mA
I_R	reverse current	$V_R = V_{RRM(max)}$; $T_j = 125\text{ °C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 0.67 \times V_{DRM(max)}$; $T_j = 125\text{ °C}$; exponential waveform; see Figure 12				
		$R_{GK} = 100\text{ }\Omega$	200	1000	-	V/ μ s
		gate open circuit	50	130	-	V/ μ s
t_{gt}	gate-controlled turn-on time	$I_{TM} = 40\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 100\text{ mA}$; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	μ s
t_q	commutated turn-off time	$V_{DM} = 0.67 \times V_{DRM(max)}$; $T_j = 125\text{ °C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK} = 100\text{ }\Omega$	-	70	-	μ s



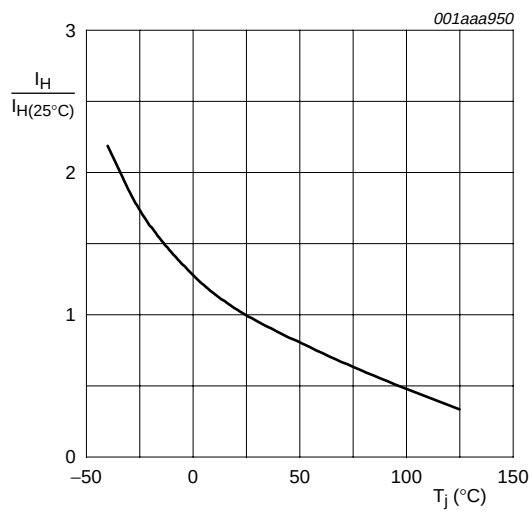
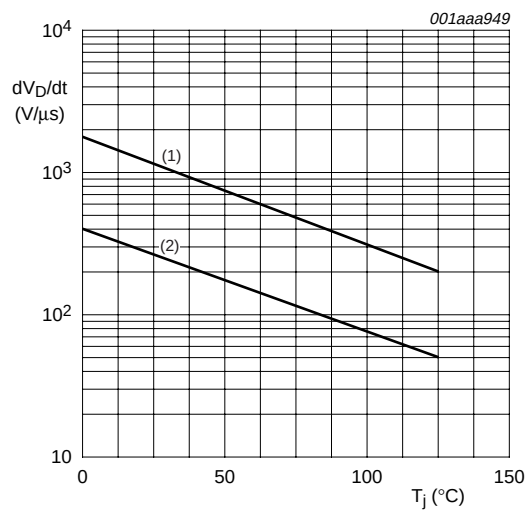


Fig 11. Normalized holding current as a function of junction temperature



- (1) $R_{GK} = 100 \Omega$
- (2) Gate open circuit

Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values

7. Package outline

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

SOT428

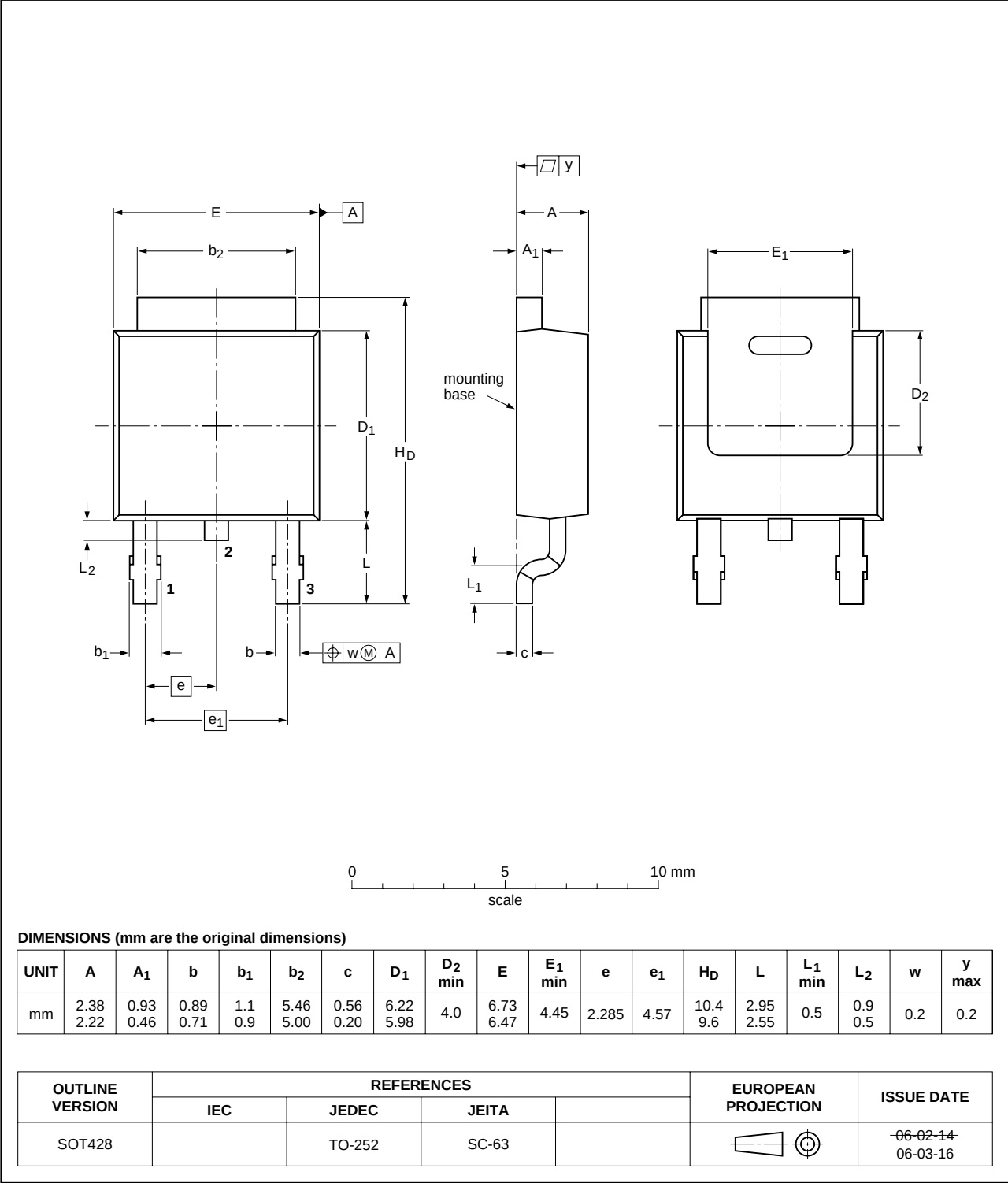
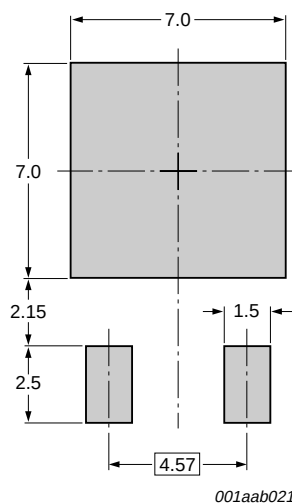


Fig 13. Package outline SOT428 (DPAK)

8. Mounting



Plastic meets requirements of UL94 V-O at 3.175 mm

Fig 14. SOT428: minimum pad size for surface-mounting

9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT151S_SER_L_R_5	20061009	Product data sheet	-	BT151S_SERIES_4
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Added type numbers BT151S-500L and BT151S-650L			
BT151S_SERIES_4 (9397 750 13161)	20040609	Product specification	-	BT151S_SERIES_3
BT151S_SERIES_3	20020101	Product specification	-	BT151S_SERIES_2
BT151S_SERIES_2	19990601	Product specification	-	BT151S_SERIES_1
BT151S_SERIES_1	19970901	Product specification	-	-

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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.

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

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