



# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors



## 1. General description

High voltage, high speed planar passivated NPN power switching transistor in a SOT428 (DPAK) surface mountable plastic package.

## 2. Features and benefits

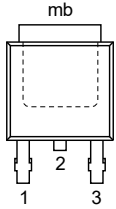
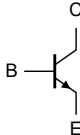
- Fast switching
- Low thermal resistance
- Surface mountable package
- Very high voltage capability
- Very low switching and conduction losses

## 3. Applications

- DC-to-DC converters
- High frequency electronic lighting ballasts
- Inverters
- Motor control systems

## 4. Pinning information

Table 1. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p><b>DPAK (SOT428)</b></p>	 <p>sym123</p>
2	C	collector <sup>[1]</sup>		
3	E	emitter		
mb	C	mounting base; connected to collector		

[1] it is not possible to make a connection to pin 2 of the SOT428 (DPAK) package.

## 5. Ordering information

Table 2. Ordering information

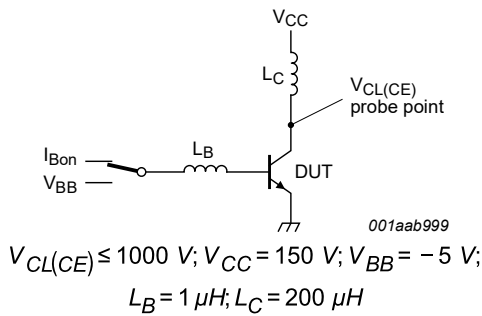
Type number	Package		
	Name	Description	Version
BUJ303AD	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 6. Limiting values

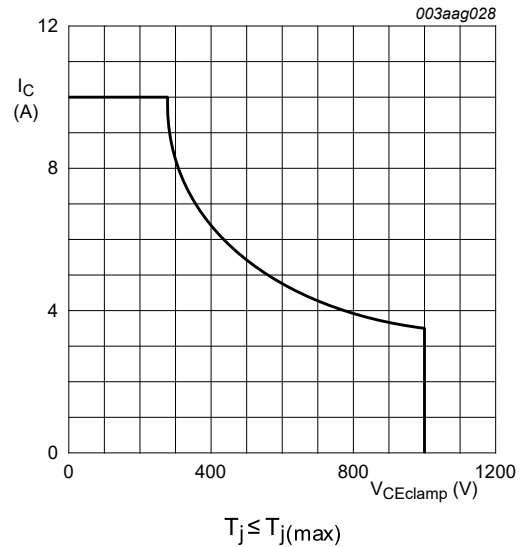
**Table 3. Limiting values**

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

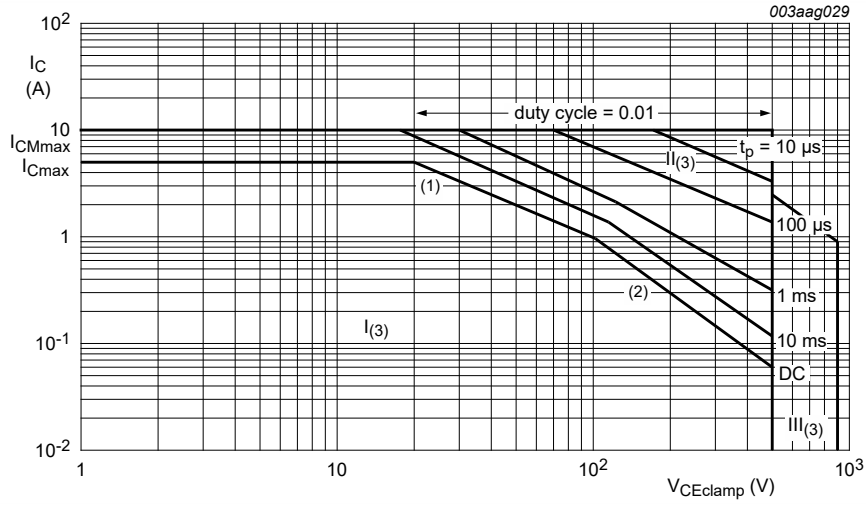
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	1000	V
$V_{CEO}$	collector-emitter voltage	$I_B = 0\text{ A}$	-	500	V
$I_C$	collector current	<a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	5	A
$I_{CM}$	peak collector current		-	10	A
$I_B$	base current		-	2	A
$I_{BM}$	peak base current		-	4	A
$P_{tot}$	total power dissipation	$T_{mb} \leq 25\text{ °C}$ ; <a href="#">Fig. 4</a>	-	80	W
$T_{stg}$	storage temperature		-65	150	°C
$T_j$	junction temperature		-	150	°C



**Fig. 1. Test circuit for reverse bias safe operating area**

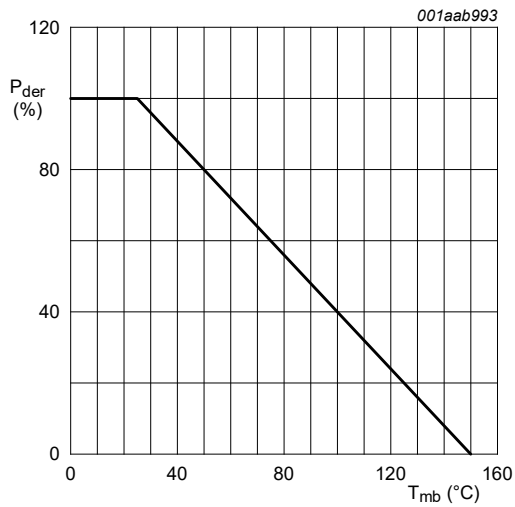


**Fig. 2. Reverse bias safe operating area**



- (1)  $P_{tot}$  maximum and  $P_{tot}$  peak maximum lines.
- (2) Second breakdown limits.
- (3) I = Region of permissible DC operation.
- II = Extension for repetitive pulse operation.
- III = Extension during turn-on in single transistor converters provided that  $R_{BE} \leq 100 \Omega$  and  $t_p \leq 0.6 \mu s$ .

Fig. 3. Forward bias safe operating area for  $T_{mb} \leq 25 \text{ }^\circ\text{C}$



$$P_{der} = \frac{P_{tot}}{P_{tot(25^\circ\text{C})}} \times 100 \%$$

Fig. 4. Normalized total power dissipation as a function of mounting base temperature

### 7. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 5</a>	-	-	1.56	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board (FR4) mounted; minimum footprint	-	75	-	K/W

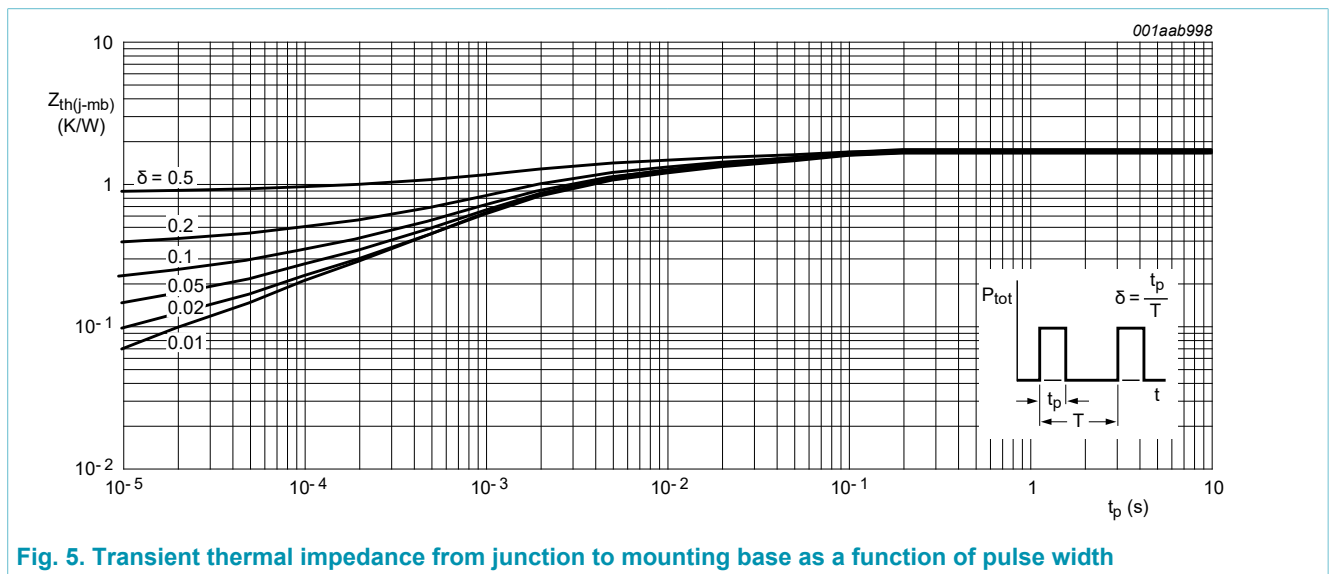


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse width

## 8. Characteristics

Table 5. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Static characteristics</b>							
$I_{CES}$	collector-emitter cut-off current (base shorted)	$V_{BE} = 0\text{ V}; V_{CE} = 1000\text{ V}$	[1]	-	-	1	mA
		$V_{BE} = 0\text{ V}; V_{CE} = 1000\text{ V}; T_j = 125\text{ °C}$	[1]	-	-	2	mA
$I_{CBO}$	collector-base cut-off current (emitter open)	$V_{CB} = 1000\text{ V}; I_E = 0\text{ A}; T_{mb} = 25\text{ °C}$	[1]	-	-	1	mA
$I_{CEO}$	collector-emitter cut-off current (base open)	$V_{CE} = 500\text{ V}; I_B = 0\text{ A}; T_{mb} = 25\text{ °C}$	[1]	-	-	0.1	mA
$I_{EBO}$	emitter-base cut-off current (collector open)	$V_{EB} = 9\text{ V}; I_C = 0\text{ A}; T_{mb} = 25\text{ °C}$		-	-	0.1	mA
$V_{CE0sus}$	collector-emitter sustaining voltage (base open)	$I_B = 0\text{ A}; I_C = 100\text{ mA}; L_C = 25\text{ mH}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 6</a> ; <a href="#">Fig. 7</a>		500	-	-	V
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 3\text{ A}; I_B = 0.6\text{ A}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 8</a> ; <a href="#">Fig. 9</a>		-	0.25	1.5	V
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 3\text{ A}; I_B = 0.6\text{ A}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 10</a>		-	0.97	1.3	V
$h_{FE}$	DC current gain	$I_C = 5\text{ mA}; V_{CE} = 5\text{ V}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 11</a>		10	22	30	
		$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 11</a>		14	25	35	
$h_{FEsat}$	DC saturation current gain	$I_C = 2.5\text{ A}; V_{CE} = 5\text{ V}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 11</a>		10	13.5	17	
		$I_C = 3\text{ A}; V_{CE} = 5\text{ V}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 11</a>		-	12	-	
<b>Dynamic characteristics (switching times - resistive load)</b>							
$t_s$	storage time	$I_C = 2.5\text{ A}; I_{B0n} = 0.5\text{ A}; I_{B0ff} = -0.5\text{ A}; R_L = 75\text{ }\Omega; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 12</a> ; <a href="#">Fig. 13</a>		-	3.4	4	$\mu\text{s}$
$t_f$	fall time			-	0.33	0.45	$\mu\text{s}$
<b>Dynamic characteristics (switching times - inductive load)</b>							
$t_s$	storage time	$I_C = 2.5\text{ A}; I_{B0n} = 0.5\text{ A}; V_{BB} = -5\text{ V}; L_B = 1\text{ }\mu\text{H}; T_{mb} = 25\text{ °C};$ <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>		-	1.4	1.6	$\mu\text{s}$
				-	1.7	1.9	$\mu\text{s}$
$t_f$	fall time	$I_C = 2.5\text{ A}; I_{B0n} = 0.5\text{ A}; V_{BB} = -5\text{ V}; L_B = 1\text{ }\mu\text{H}; T_j = 100\text{ °C};$ <a href="#">Fig. 14</a> ; <a href="#">Fig. 15</a>		-	145	160	ns
				-	160	200	ns

[1] Measured with half-sine wave voltage (curve tracer).

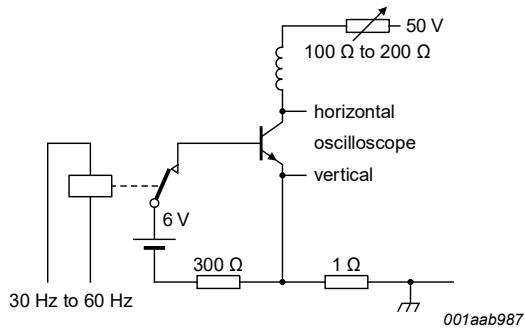


Fig. 6. Test circuit for collector-emitter sustaining voltage

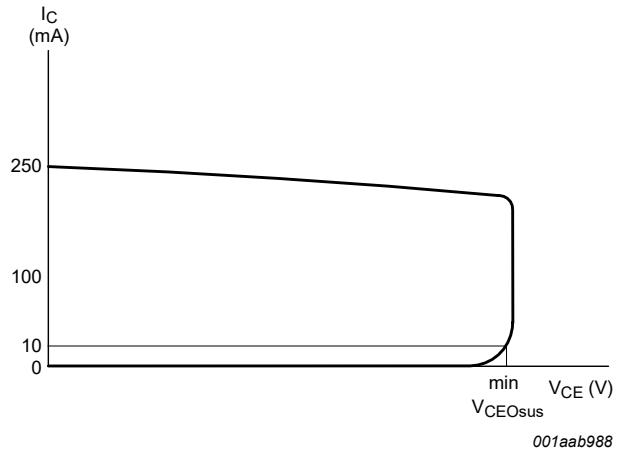


Fig. 7. Oscilloscope display for collector-emitter sustaining voltage test waveform

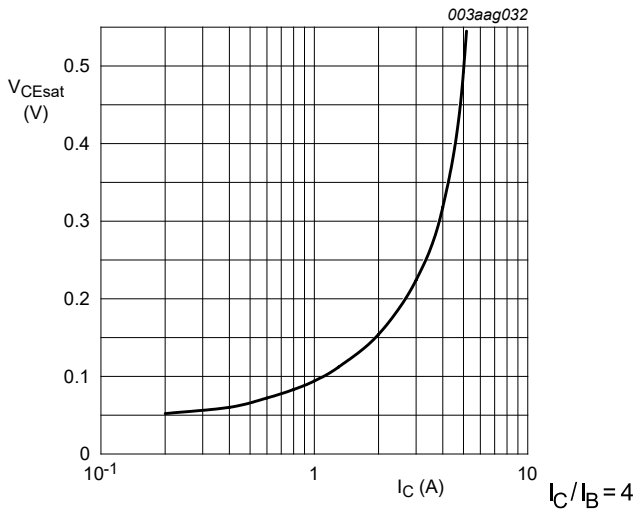


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

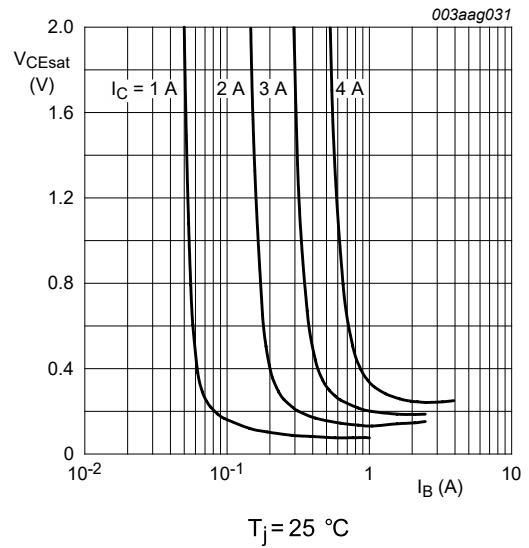


Fig. 9. Collector-emitter saturation voltage as a function of base current; typical values



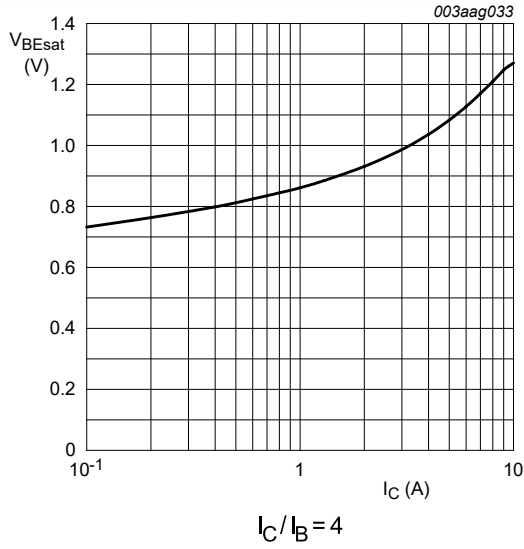


Fig. 10. Base-emitter saturation voltage as a function of collector current; typical values

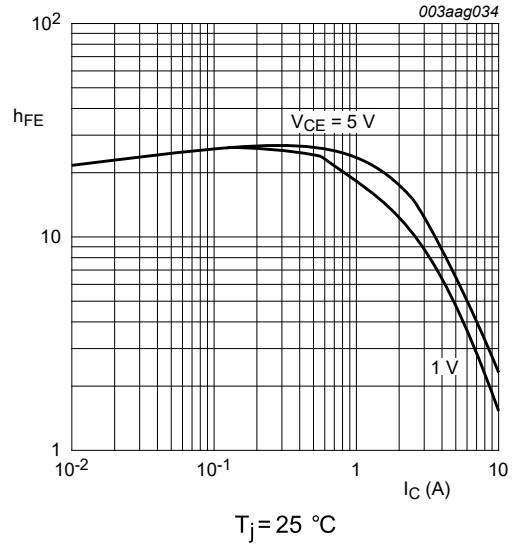
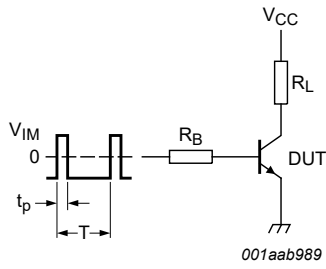


Fig. 11. DC current gain as a function of collector current; typical values



$V_{IM} = -6$  to  $+8\text{ V}$ ;  $V_{CC} = 250\text{ V}$ ;  $t_p = 20\text{ }\mu\text{s}$ ;  $\delta = \frac{t_p}{T} = 0.01$   
 $R_B$  and  $R_L$  calculated from  $I_{Con}$  and  $I_{Bon}$  requirements.

Fig. 12. Test circuit for resistive load switching

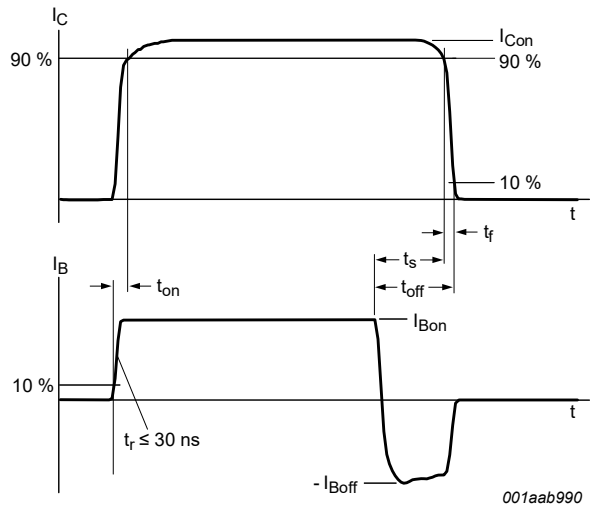
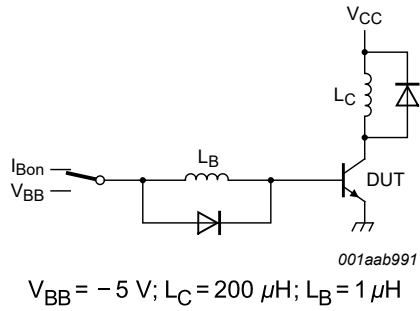
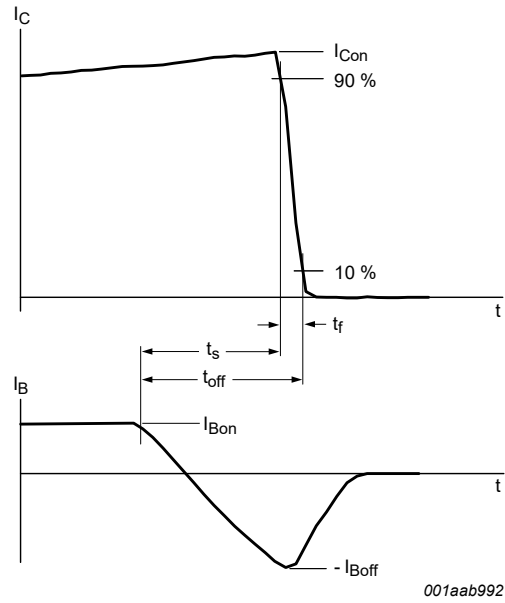


Fig. 13. Switching times waveforms for resistive load



**Fig. 14. Test circuit for inductive load switching**

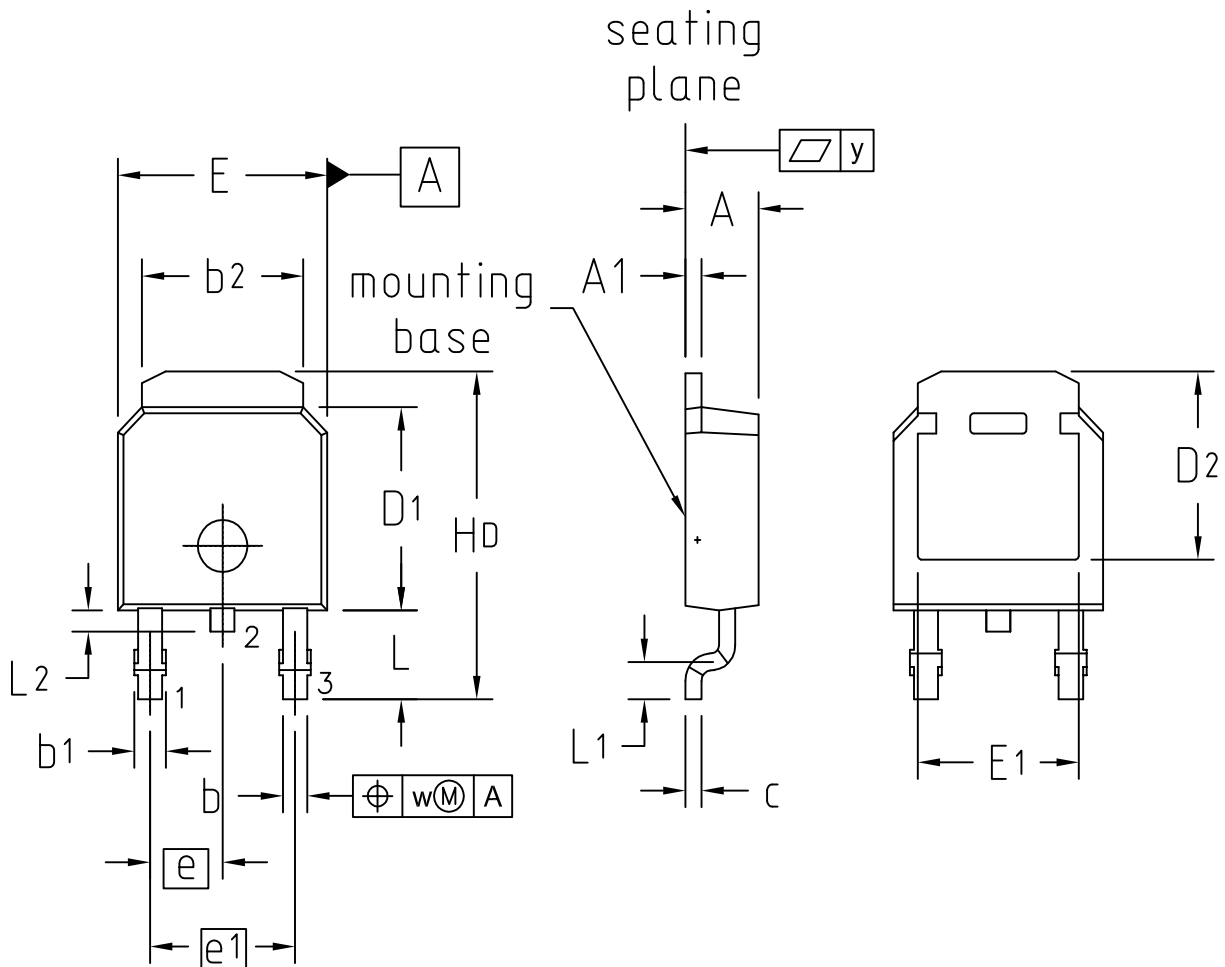


**Fig. 15. Switching times waveforms for inductive load**

9. Package outline

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

SOT428



UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sub>1</sub>	D <sub>2</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	H <sub>d</sub>	L	L <sub>1</sub>	L <sub>2</sub>	w	y
mm	2.38	0.93	0.89	1.1	5.46	0.56	6.22	4.00	6.73	4.45	2.285	4.57	10.40	2.95	0.5	0.90	0.2	0.20
	2.22	0.46	0.71	0.9	5.00	0.20	5.98	min.	6.47	min.			9.60	2.55	min.	0.50	0.2	max.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT428		TO-252				

Fig. 16. Package outline DPAK (SOT428)

## 10. Legal information

### Data sheet status

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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