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## High voltage NPN Darlington transistor for ignition coil

### Features

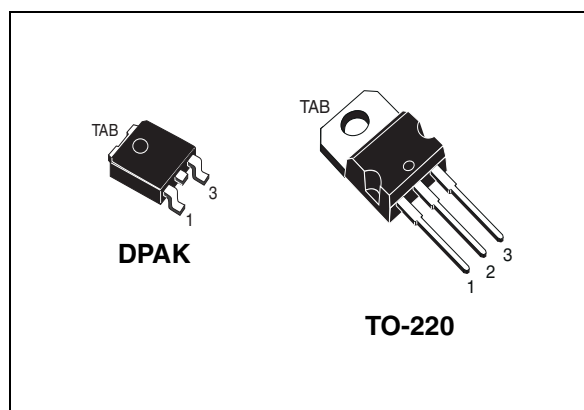
- High voltage special Darlington structure
- Very rugged bipolar technology
- High DC current gain

### Application

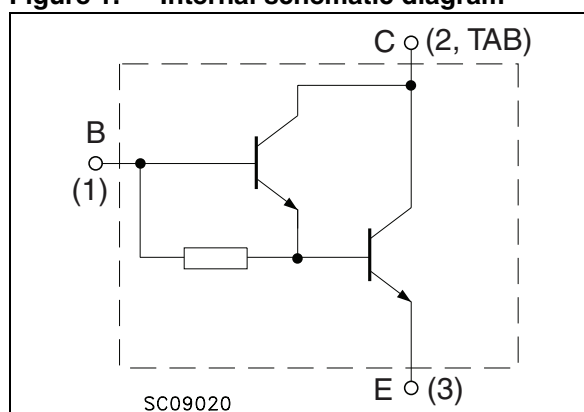
- High ruggedness electronic ignition for small engines

### Description

The device is a high voltage NPN transistor in monolithic special Darlington configuration designed for applications such as electronic ignition for small engines (scooters, lawnmowers, chainsaws).



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Packages	Packaging
ST901T	901T	TO-220	Tube
STD901T	D901T	DPAK	Tape and reel

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	500	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	350	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	5	V
$I_C$	Collector current	4	A
$I_{CM}$	Collector peak current ( $t_p < 5$ ms)	8	A
$I_B$	Base current	0.5	A
$I_{BM}$	Base peak current ( $t_p < 5$ ms)	2.5	A
$P_{tot}$	Total dissipation at $T_C = 25$ °C for ST901T	100	W
$P_{tot}$	Total dissipation at $T_C = 25$ °C for STD901T	35	W
$T_{stg}$	Storage temperature	-65 to 150	°C
$T_J$	Max. operating junction temperature	150	°C

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max for ST901T	1.25	°C/W
$R_{thj-case}$	Thermal resistance junction-case max for STD901T	3.57	°C/W

## 2 Electrical characteristics

( $T_{\text{case}} = 25^{\circ}\text{C}$  unless otherwise specified).

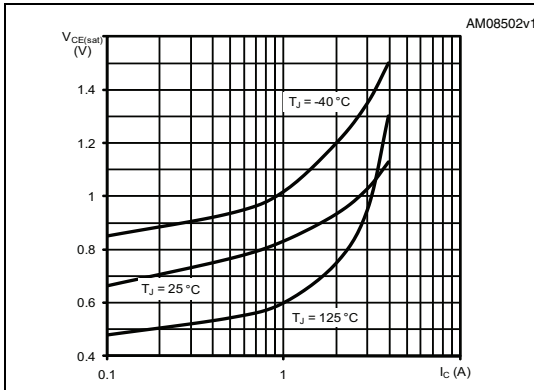
**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CE}} = 500 \text{ V}$			100	$\mu\text{A}$
		$V_{\text{CE}} = 500 \text{ V } T_{\text{case}} = 125^{\circ}\text{C}$			500	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 350 \text{ V}$			100	$\mu\text{A}$
		$V_{\text{CE}} = 350 \text{ V } T_{\text{case}} = 125^{\circ}\text{C}$			500	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5 \text{ V}$			10	$\mu\text{A}$
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10 \text{ mA}$	350			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 20 \text{ mA}$			2	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 20 \text{ mA}$			1.8	V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 2 \text{ A}$ $V_{\text{CE}} = 2 \text{ V}$	1800		3800	
		$I_{\text{C}} = 4 \text{ A}$ $V_{\text{CE}} = 2 \text{ V}$	500			
	Functional test	$V_{\text{CC}} = 24 \text{ V}$ $V_{\text{clamp}} = 350 \text{ V}$ $L = 4 \text{ mH}$	4			A
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load storage time	$V_{\text{CC}} = 12 \text{ V}$ $L = 4 \text{ mH}$ $I_{\text{C}} = 2 \text{ A}$ $V_{\text{clamp}} = 250 \text{ V}$		15		$\mu\text{s}$
	fall time	$I_{\text{B(on)}} = 20 \text{ mA}$ $V_{\text{BE(off)}} = -3 \text{ V}$		1.5		$\mu\text{s}$

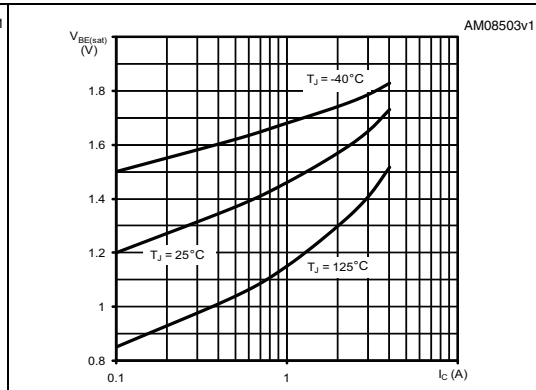
1. Pulse test: pulse duration  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$

## 2.1 Electrical characteristics (curves)

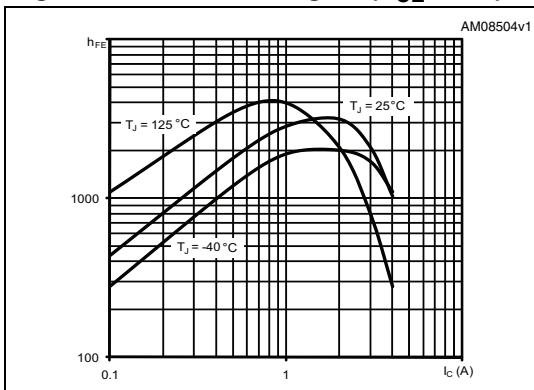
**Figure 2. Collector-emitter saturation voltage ( $h_{FE} = 100$ )**



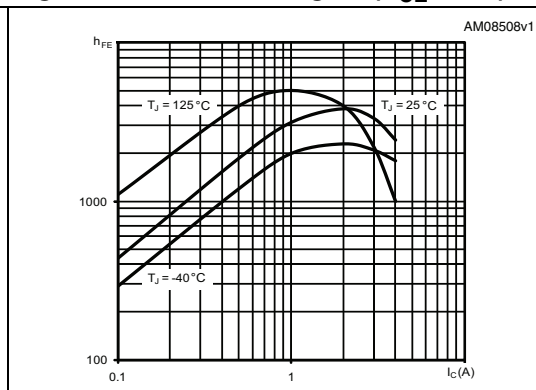
**Figure 3. Base-emitter saturation voltage ( $h_{FE} = 100$ )**



**Figure 4. DC current gain ( $V_{CE} = 2\text{ V}$ )**



**Figure 5. DC current gain ( $V_{CE} = 5\text{ V}$ )**



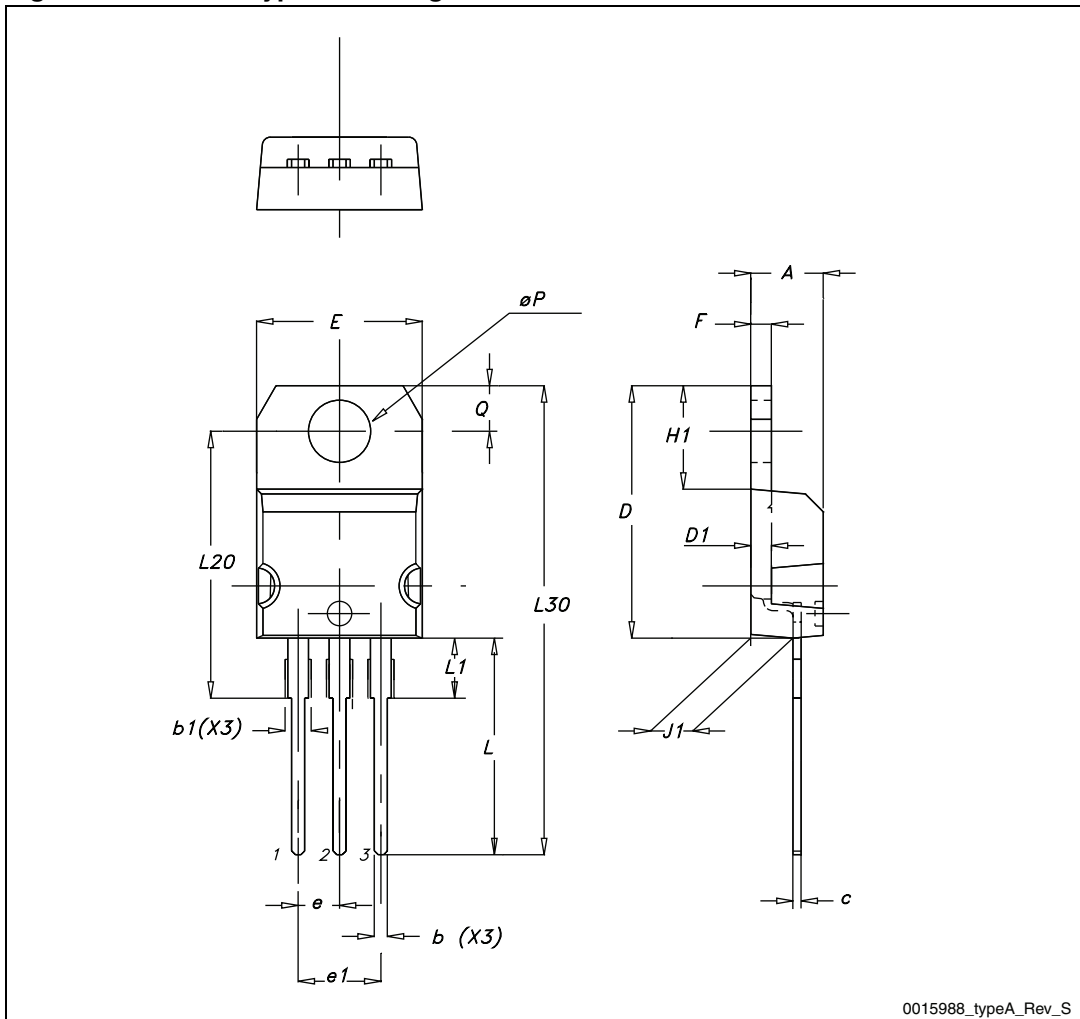
### 3 Package mechanical data

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Table 5. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Figure 6. TO-220 type A drawing

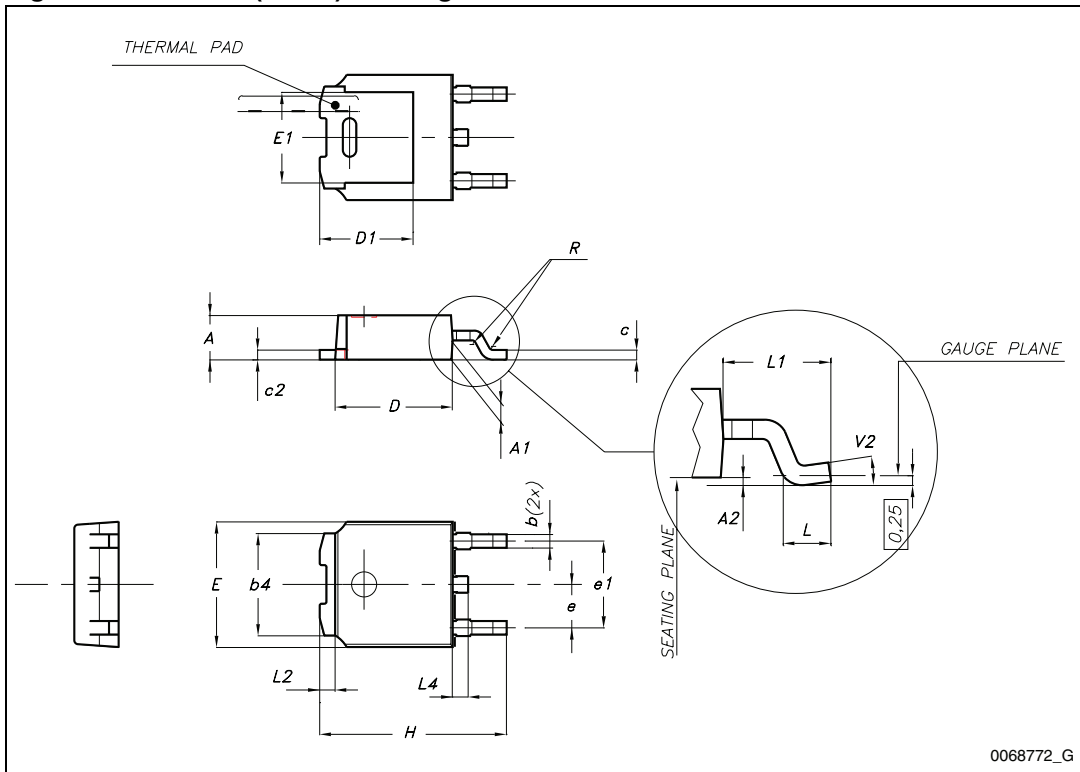


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Table 6. DPAK (TO-252) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 7. TO-252 (DPAK) drawings



## 4 Revision history

**Table 7. Document revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
14-Oct-2004	1	First release.
15-Jan-2005	2	DC current gain range has been modified.
25-Feb-2005	3	Added four drawings on page 3.
13-Oct-2005	4	Updated package mechanical data
11-Feb-2011	5	Inserted new order code STD901T

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