

## High voltage fast-switching NPN power transistor

### Features

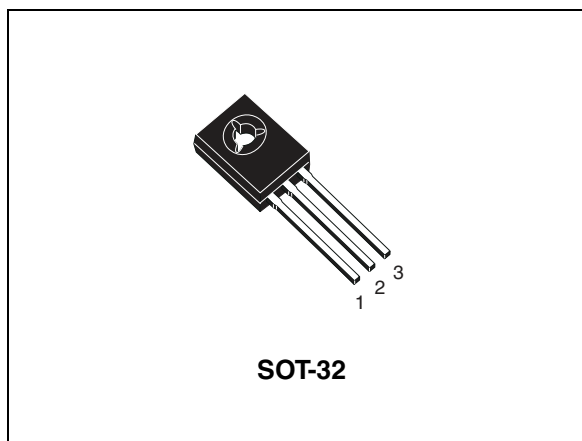
- High voltage capability
- Low spread of dynamic parameters
- Very high switching speed

### Application

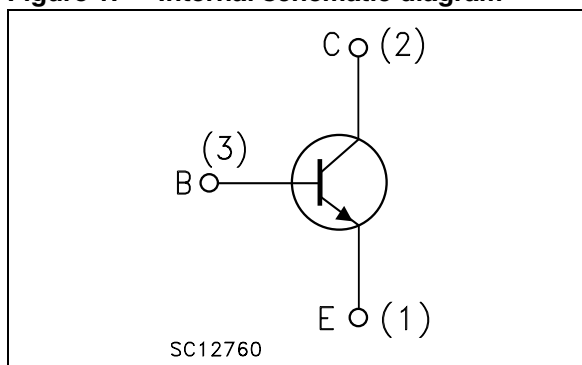
- Compact fluorescent lamps (CFLs)

### Description

The device is manufactured using high voltage multi epitaxial planar technology for high switching speeds and high voltage capability. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
ST13003N	13003N	SOT-32	BAG

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	700	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Collector-base voltage ( $I_C = 0$ )	9	V
$I_C$	Collector current	1	A
$I_{CM}$	Collector peak current ( $t_p < 5$ ms)	2	A
$I_B$	Base current	0.5	A
$I_{BM}$	Base peak current ( $t_p < 5$ ms)	1	A
$P_{TOT}$	Total dissipation at $T_c = 25$ °C	20	W
$T_{STG}$	Storage temperature	-55 to 150	°C
$T_J$	Max. operating junction temperature	150	

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case	6.25	°C/W

## 2 Electrical characteristics

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

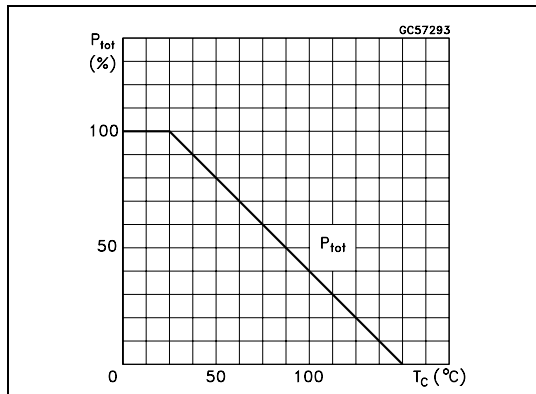
**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector cut-off current ( $V_{BE} = 0$ )	$V_{CE} = 700\text{ V}$			1	mA
		$V_{CE} = 700\text{ V}$ $T_C = 125\text{ }^{\circ}\text{C}$			5	mA
$I_{EBO}$	Emitter cut-off current ( $I_C = 0$ )	$V_{EB} = 9\text{ V}$			1	mA
$V_{CEQ(sus)}^{(1)}$	Collector-emitter sustaining voltage ( $I_B = 0$ )	$I_C = 10\text{ mA}$	400			V
$V_{CE(sat)}^{(1)}$	Collector-emitter saturation voltage	$I_C = 0.5\text{ A}$ $I_B = 125\text{ mA}$			0.7	V
		$I_C = 1\text{ A}$ $I_B = 330\text{ mA}$			1.2	V
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = 0.5\text{ A}$ $I_B = 125\text{ mA}$			1.2	V
		$I_C = 1\text{ A}$ $I_B = 330\text{ mA}$			1.3	V
$h_{FE}$	DC current gain	$I_C = 0.5\text{ A}$ , $V_{CE} = 2\text{ V}$	6		18	
		$I_C = 1\text{ A}$ $V_{CE} = 10\text{ V}$	5		15	
$t_s$ $t_f$	Inductive Load Storage time Fall time	$I_C = 0.4\text{ A}$ $V_{clamp} = 300\text{ V}$		2.5		$\mu\text{s}$
		$I_{B(on)} = -I_{B(off)} = 80\text{ mA}$ $V_{BB(off)} = -5\text{ V}$ <i>Figure 8</i>		180		ns

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

### 2.1 Electrical characteristics (curves)

**Figure 2. Derating curve**



**Figure 3. DC current gain ( $V_{CE} = 3\text{ V}$ )**

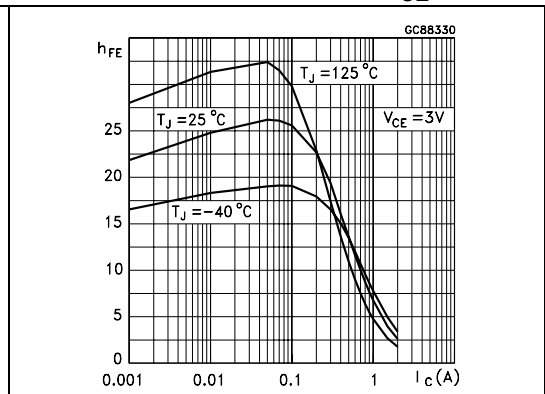


Figure 4. DC current gain ( $V_{CE} = 5\text{ V}$ )

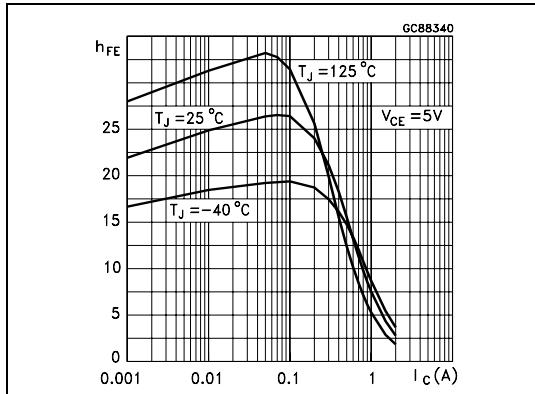


Figure 5. Collector-emitter saturation voltage

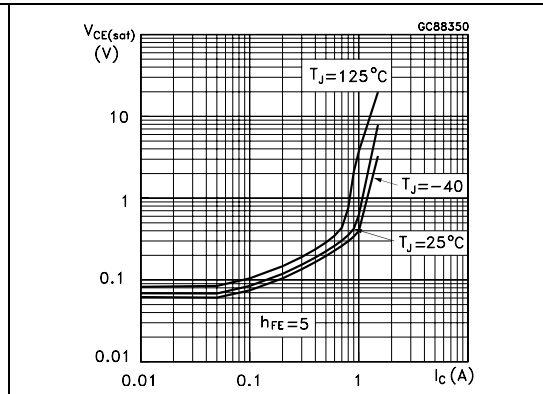


Figure 6. Base-emitter saturation voltage

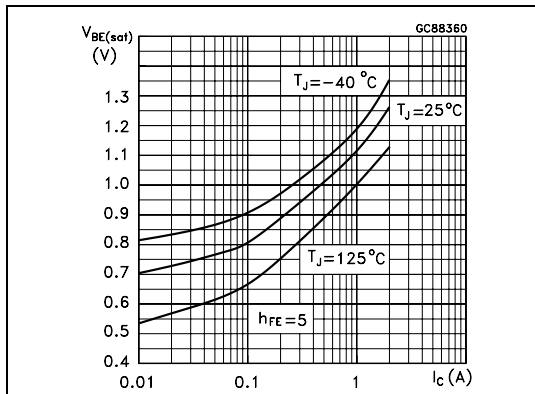
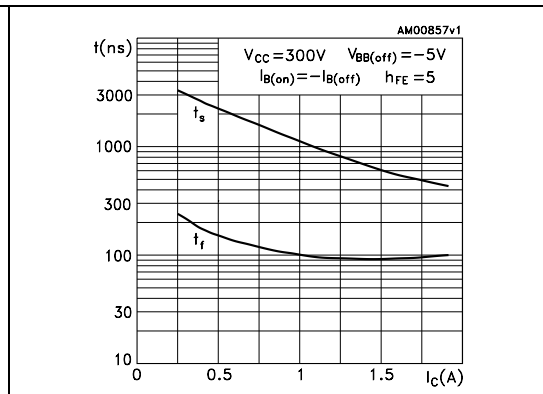
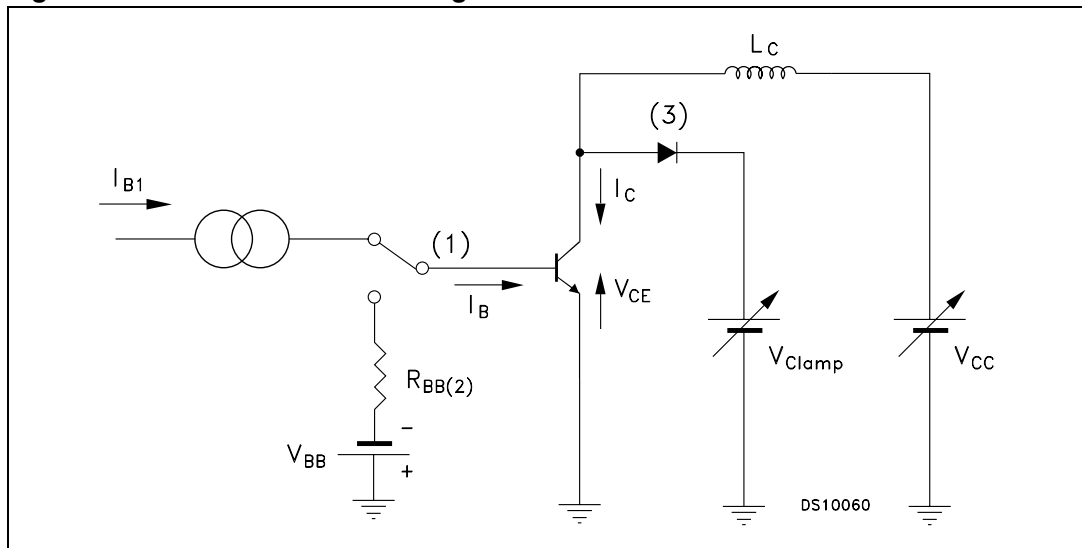


Figure 7. Switching time inductive load



## 2.2 Test circuit

Figure 8. Inductive load switching test circuit



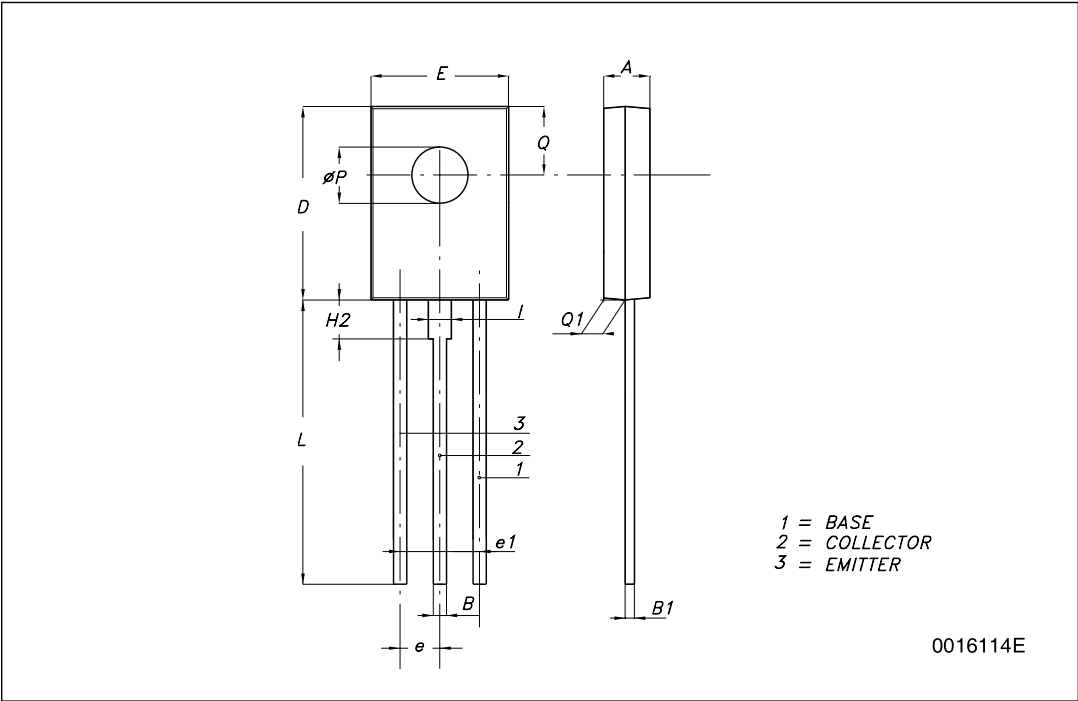
1. Fast electronic switch
2. Non-inductive resistor
3. Fast recovery rectifier

### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**SOT-32 (TO-126) MECHANICAL DATA**

DIM.	mm.		
	MIN.	TYP	MAX.
A	2.4		2.9
B	0.64		0.88
B1	0.39		0.63
D	10.5		11.05
E	7.4		7.8
e	2.04	2.29	2.54
e1	4.07	4.58	5.08
L	15.3		16
P	2.9		3.2
Q		3.8	
Q1	1		1.52
H2		2.15	
I		1.27	



## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
26-May-2009	1	First release.
25-Feb-2010	2	Updated <i>Figure 1 on page 1</i> .



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