

## High voltage fast-switching NPN power transistor

### Features

- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- Integrated antiparallel collector-emitter diode

### Applications

- Electronic ballast for fluorescent lighting

### Description

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

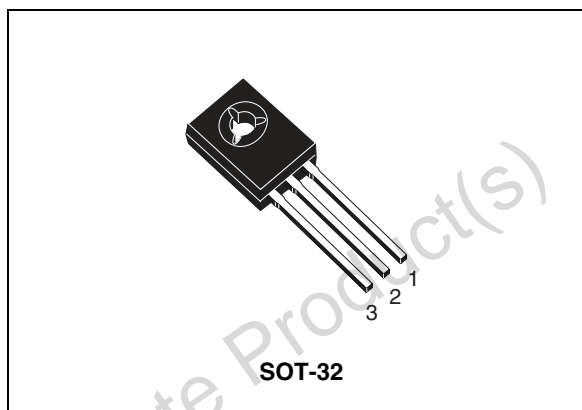


Figure 1. Internal schematic diagram

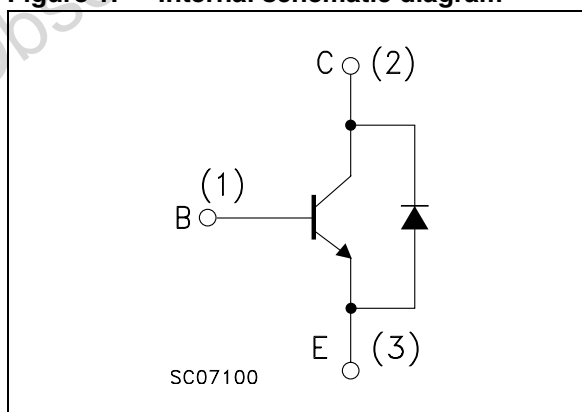


Table 1. Device summary

Order code	Marking	Package	Packaging
ST13003D-K	13003D	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
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ , $I_B = 0.75$ A, $t_P < 10$ $\mu$ s)	$V_{(BR)EBO}$	V
$I_C$	Collector current	1.5	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	3	A
$I_B$	Base current	0.75	A
$I_{BM}$	Base peak current ( $t_P < 5$ ms)	1.5	A
$P_{TOT}$	Total dissipation at $T_C = 25$ °C	40	W
$T_{STG}$	Storage temperature	-55 to 150	°C
$T_J$	Max. operating junction temperature	150	°C

## 2 Electrical characteristics

$T_{\text{case}} = 25\text{ °C}$  unless otherwise specified

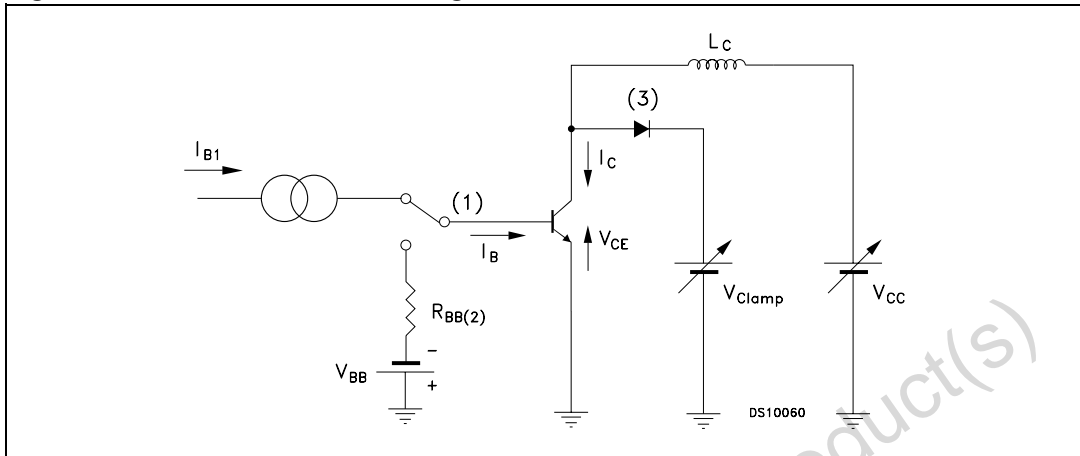
**Table 3. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 700\text{ V}$ $V_{\text{CE}} = 700\text{ V}$ $T_{\text{c}} = 125\text{ °C}$			1 5	mA mA
$V_{(\text{BR})\text{EBO}}$	Emitter-Base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{ mA}$	9		18	V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{ mA}$	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 0.25\text{ A}$ $I_{\text{C}} = 1.5\text{ A}$ $I_{\text{B}} = 0.5\text{ A}$			0.5 1 3	V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 0.25\text{ A}$			1 1.2	V V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 0.5\text{ A}$ $V_{\text{CE}} = 2\text{ V}$ $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 2\text{ V}$	8 5		20 25	
$t_{\text{r}}$ $t_{\text{s}}$ $t_{\text{f}}$	Resistive load Rise time Storage time Fall time	$V_{\text{CC}} = 125\text{ V}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B1}} = 0.2\text{ A}$ $I_{\text{B2}} = -0.2\text{ A}$ $T_{\text{p}} = 25\text{ }\mu\text{s}$			1 4 0.7	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_{\text{s}}$	Inductive load Storage time	$I_{\text{C}} = 1\text{ A}$ $I_{\text{B1}} = 0.2\text{ A}$ $V_{\text{BE}} = -5\text{ V}$ $L = 50\text{ mH}$ $V_{\text{Clamp}} = 300\text{ V}$		0.8		$\mu\text{s}$
$V_{\text{F}}$	Diode forward voltage	$I_{\text{F}} = 0.5\text{ A}$			1.5	V

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

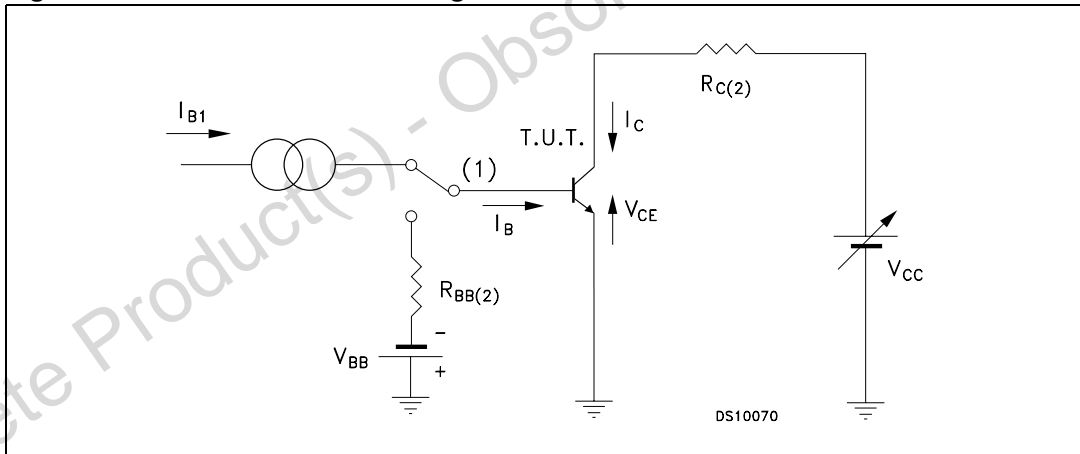
## 2.1 Test circuits

**Figure 2. Inductive load switching test circuit**



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

**Figure 3. Resistive load switching test circuit**



1. Fast electronic switch
2. Non-inductive resistor

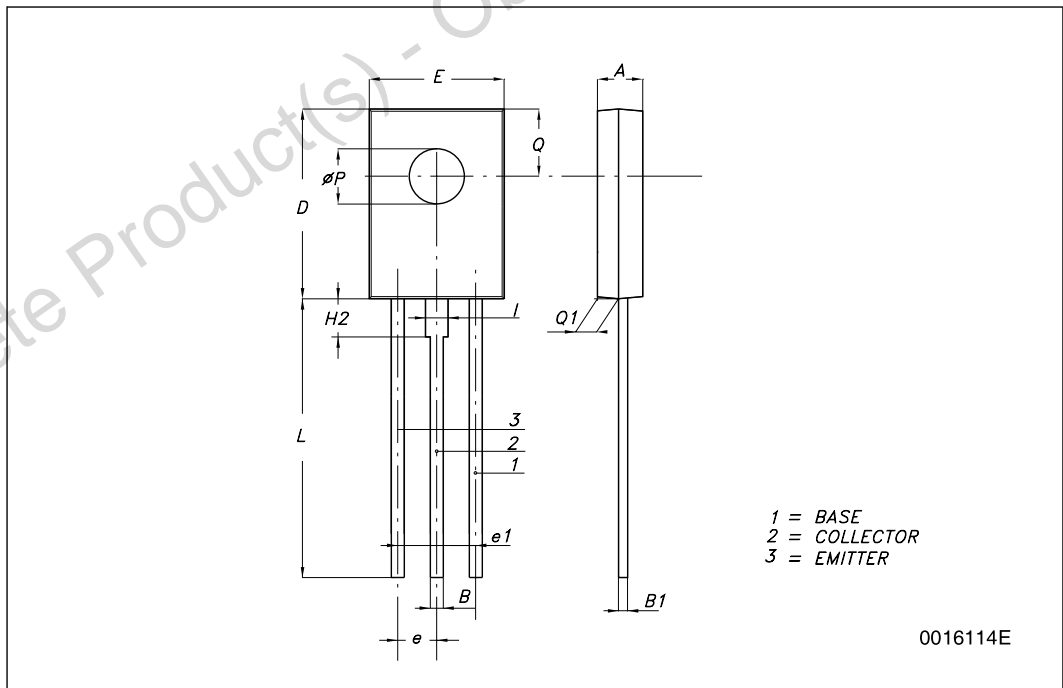
### 3 Package mechanical data

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**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 4. Document revision history**

Date	Revision	Changes
15-Nov-2007	1	Initial release.
08-Sep-2009	2	Updated packaging information <a href="#">Table 1 on page 1</a> .

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