

## High voltage fast-switching NPN power transistor

Preliminary data

### 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
- Electronic transformer for halogen lamps

### Description

This device is an NPN power transistor manufactured using high voltage multi epitaxial planar technology for high switching speeds. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining a satisfactory RBSOA.

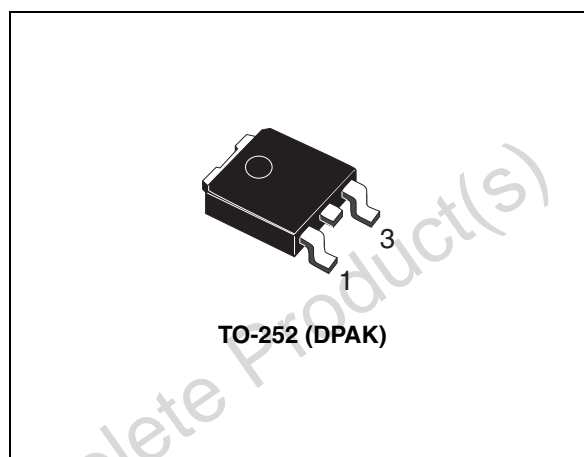


Figure 1. Internal schematic diagram

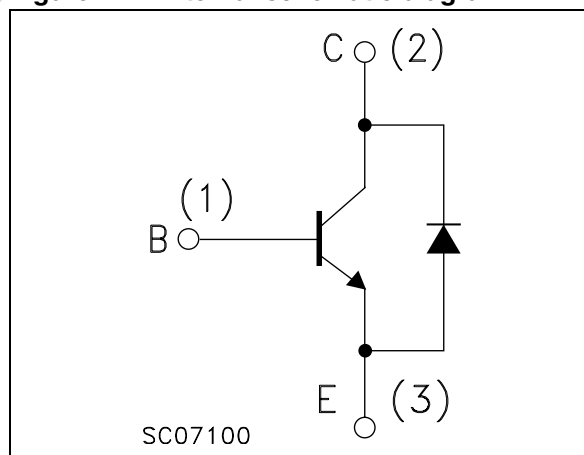


Table 1. Device summary

Part number	Marking	Package	Packaging
TRD236DT4	TRD236D	TO-252	Tape and reel

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# 1 Electrical ratings

**Table 2. Absolute maximum rating**

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 ( $I_C = 0, I_B = 2 \text{ A}, t_p < 10 \mu\text{s}$ )	$V_{(BR)EBO}$	V
$I_C$	Collector current ( $I_C = 0$ )	4	A
$I_{CM}$	Collector peak current ( $t_p < 5 \text{ ms}$ )	8	A
$I_B$	Base current	2	A
$I_{BM}$	Base peak current ( $t_p < 5 \text{ ms}$ )	4	A
$P_{tot}$	Total dissipation at $T_c \leq 25 \text{ }^\circ\text{C}$	35	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

## 2 Electrical characteristics

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

**Table 3. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector cut-off current ( $V_{BE} = 0$ )	$V_{CE} = 700\text{ V}$			0.1	mA
		$V_{CE} = 700\text{ V}$ $T_C = 125\text{ °C}$			0.5	mA
$I_{CEO}$	Collector cut-off current ( $I_B = 0$ )	$V_{CE} = 400\text{ V}$			0.25	mA
$V_{(BR)EBO}$	Emitter-base breakdown voltage ( $I_C = 0$ )	$I_E = 10\text{ mA}$	9		18	V
$V_{CEO(sus)}^{(1)}$	Collector-emitter sustaining voltage ( $I_B = 0$ )	$I_C = 10\text{ mA}$	400			V
$V_{CE(sat)}^{(1)}$	Collector-emitter saturation voltage	$I_C = 0.8\text{ A}$ $I_B = 0.1\text{ A}$			1.1	V
		$I_C = 2.5\text{ A}$ $I_B = 0.6\text{ A}$			1.3	V
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$			1.2	V
		$I_C = 2.5\text{ A}$ $I_B = 0.5\text{ A}$			1.3	V
$h_{FE}$	DC current gain	$I_C = 10\text{ mA}$ $V_{CE} = 5\text{ V}$	10			
		$I_C = 2.5\text{ A}$ $V_{CE} = 5\text{ V}$	8		28	
$t_s$ $t_f$	Inductive load Storage time Fall time	$V_{CC} = 200\text{ V}$ $I_C = 2\text{ A}$ $I_{B1} = 0.4\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 0\text{ }\Omega$ $L = 200\text{ }\mu\text{H}$ (see <a href="#">Figure 13</a> )		0.6		$\mu\text{s}$
				0.1		$\mu\text{s}$
$V_F$	Diode forward voltage	$I_F = 2\text{ A}$			2.5	V

1. Pulsed duration = 300 ms, duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

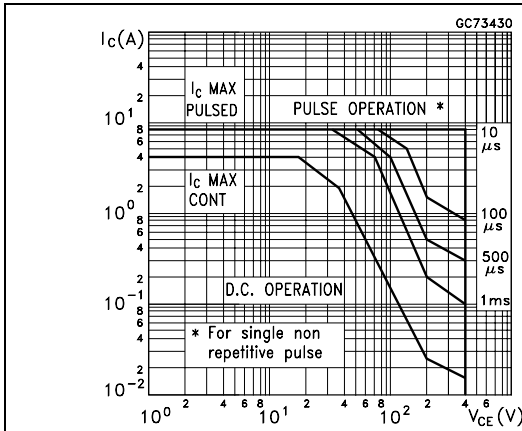


Figure 3. Derating curve

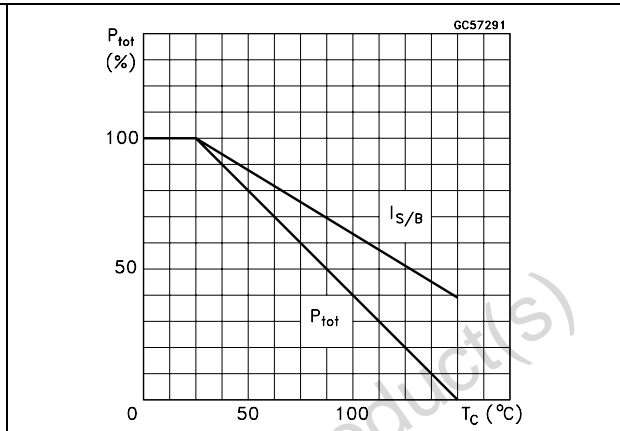


Figure 4. DC current gain ( $V_{CE} = 1.5 V$ )

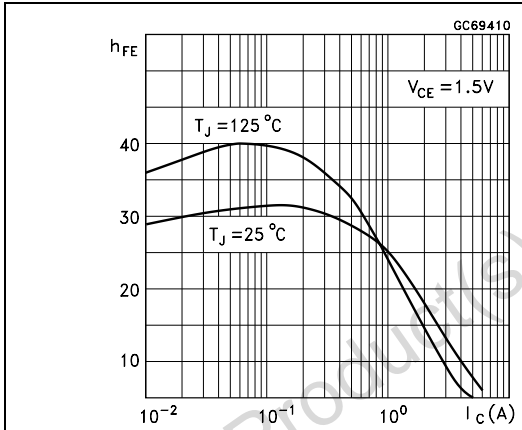


Figure 5. DC current gain ( $V_{CE} = 5 V$ )

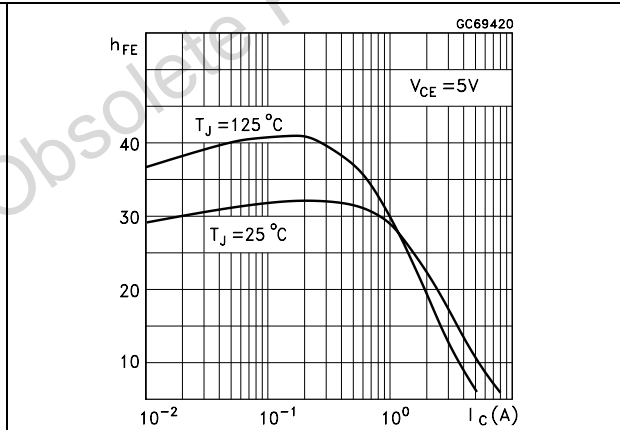


Figure 6. Collector-emitter saturation voltage Figure 7. Base-emitter saturation voltage

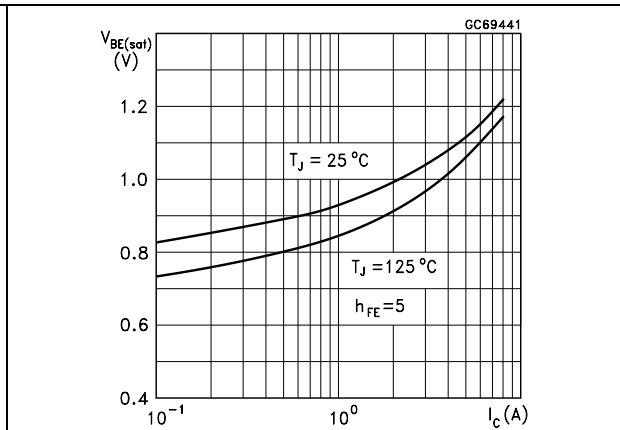
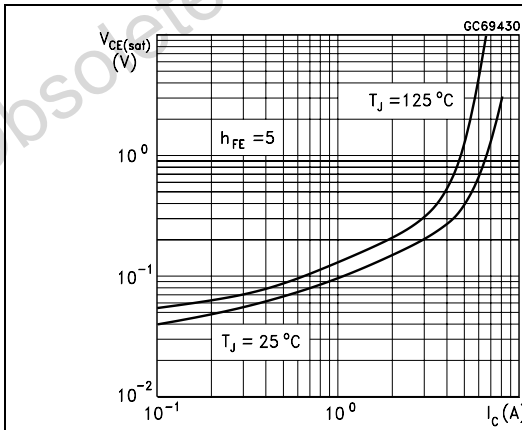


Figure 8. Inductive load fall time

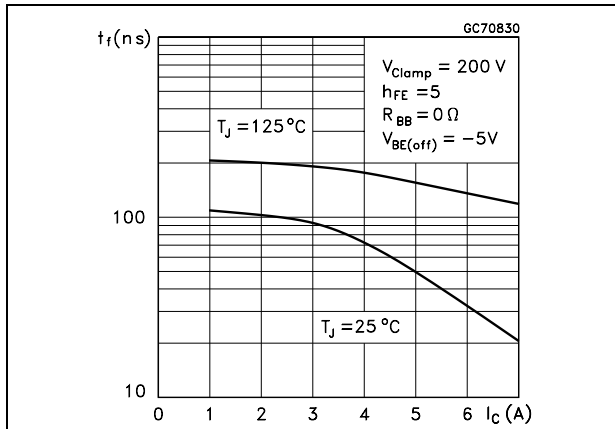


Figure 9. Inductive load storage time

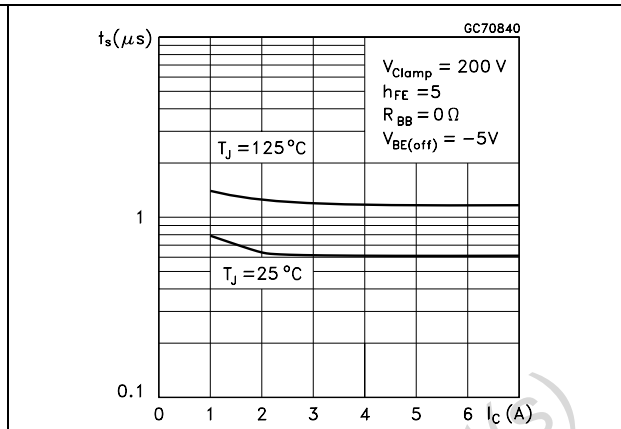


Figure 10. Resistive load fall time

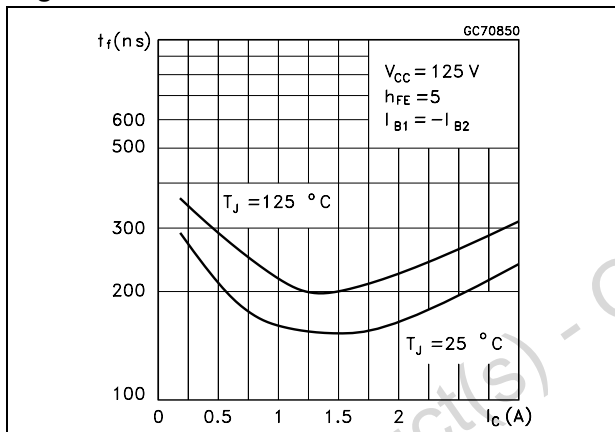


Figure 11. Resistive load storage time

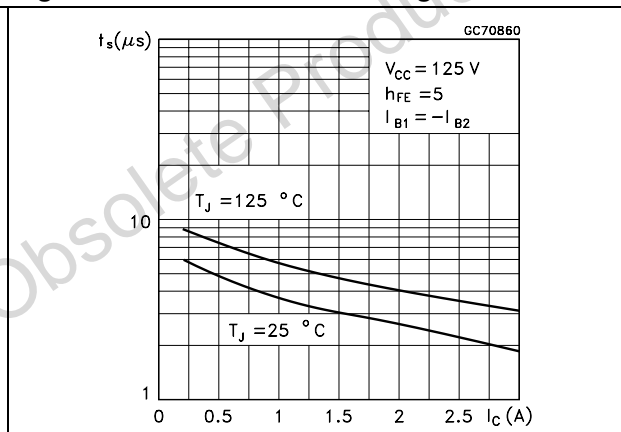
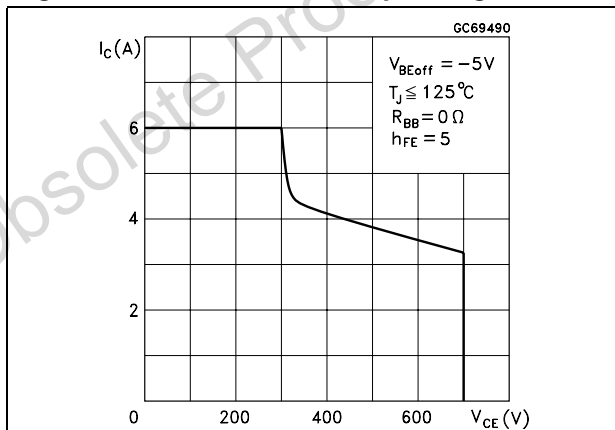
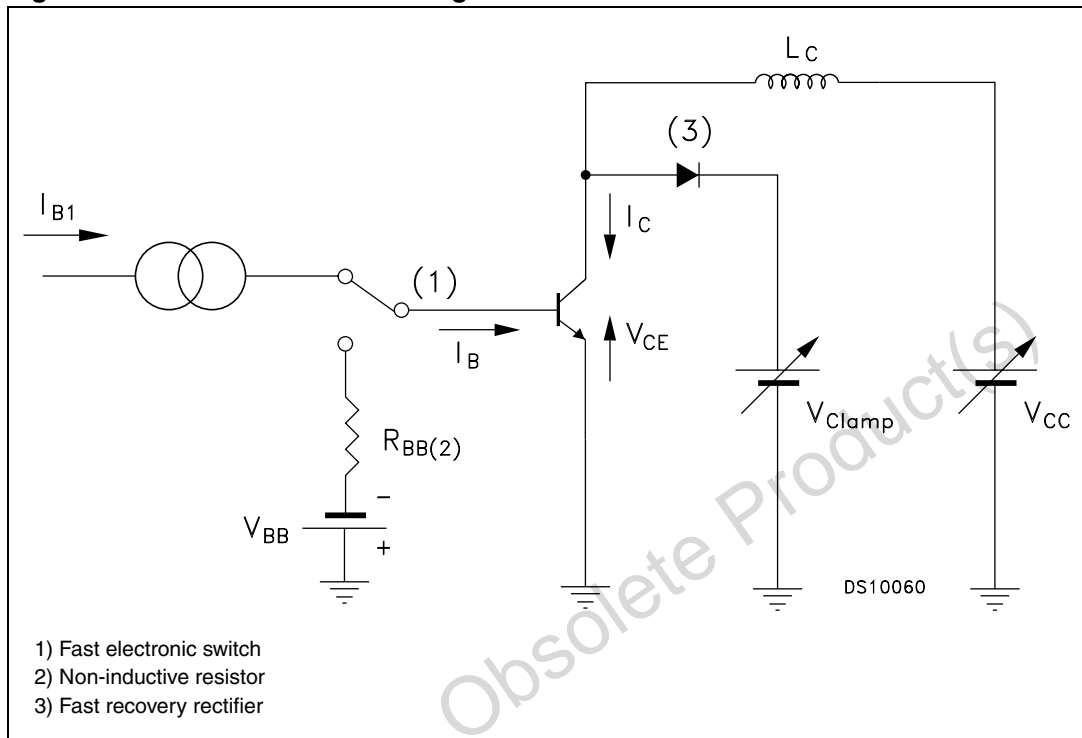


Figure 12. Reverse biased operating area



## 2.2 Test circuits

Figure 13. Inductive load switching test circuit



### 3 Package mechanical data

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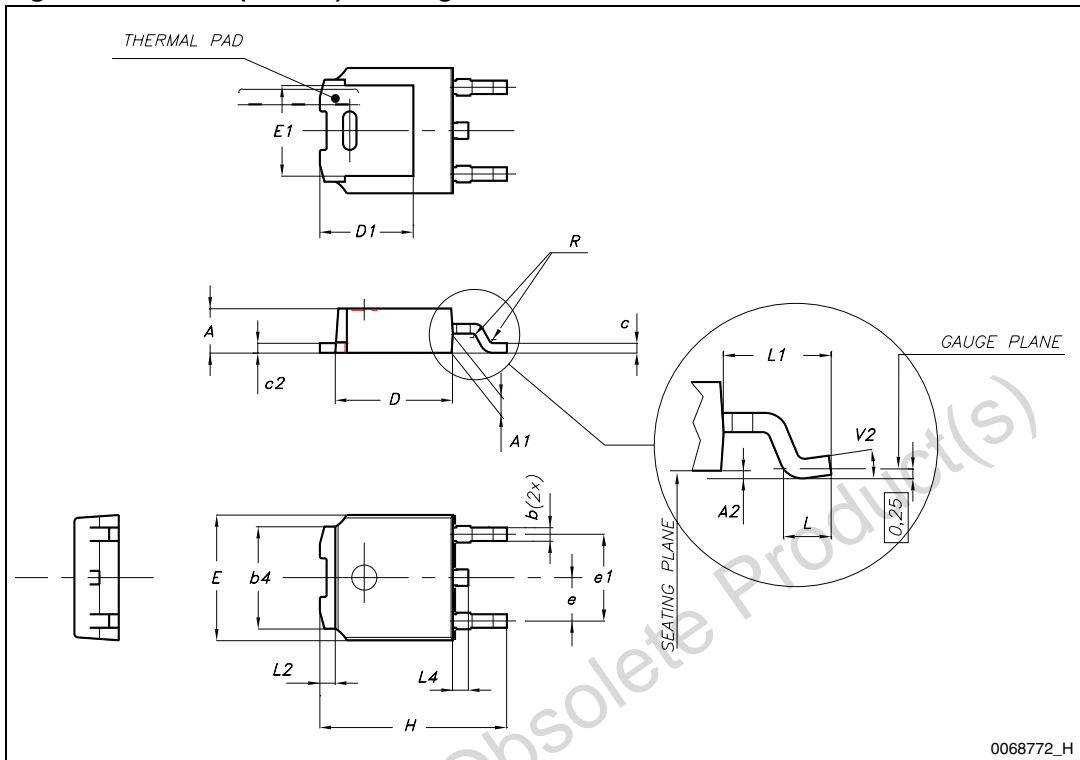
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Table 4. DPAK (TO-252) mechanical data

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		1.50
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 14. DPAK (TO-252) drawing



## 4 Revision history

Table 5. Document revision history

Date	Revision	Changes
28-Jun-2011	1	First release

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