

## Low voltage fast-switching NPN power transistors

### Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast-switching speed

### Applications

- Emergency lighting
- LED
- Voltage regulation
- Relay drive

### Description

The devices are NPN transistors manufactured using new "PB-HDC" (power bipolar high density current) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage.

The complementary PNP types are the 2STD2360T4, the 2STF2360 and the 2STN2360.

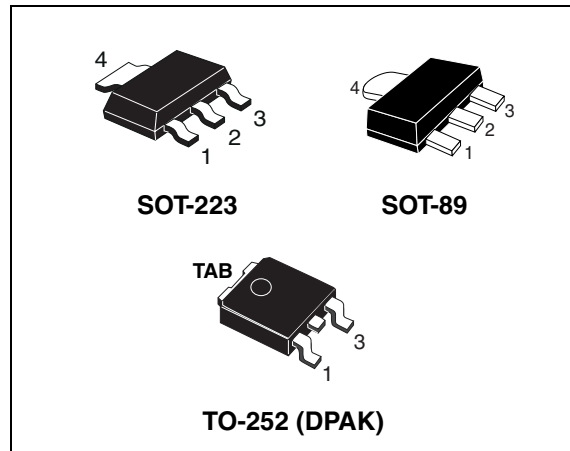


Figure 1. Internal schematic diagram

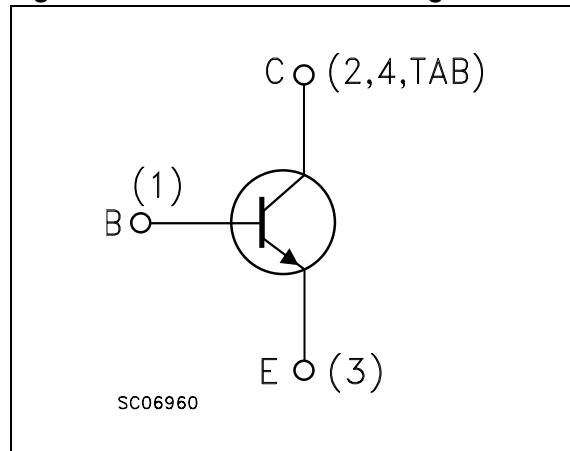


Table 1. Device summary

Order codes	Marking	Packages	Packaging
2STD1360T4	D1360	DPAK	Tape and reel
2STF1360	1360	SOT-89	Tape and reel
2STN1360	N1360	SOT-223	Tape and reel

# 1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value			Unit
		2STD1360	2STF1360	2STN1360	
		DPAK	SOT-89	SOT-223	
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	80			V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	60			V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	6			V
$I_C$	Collector current	3			A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	5			A
$I_B$	Base current	0.2			A
$I_{BM}$	Base peak current ( $t_P < 5$ ms)	0.4			A
$P_{TOT}$	Total dissipation at $T_{amb} = 25$ °C	15	1.4	1.6	W
$T_{stg}$	Storage temperature	-65 to 150			°C
$T_J$	Max. operating junction temperature	150			°C

**Table 3. Thermal data**

Symbol	Parameter		DPAK	SOT-89	SOT-223	Unit
$R_{thJA}^{(1)}$	Thermal resistance junction-ambient	Max	8.3	89	78	°C/W

1. Device mounted on a PCB area of 1 cm<sup>2</sup>

## 2 Electrical characteristics

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

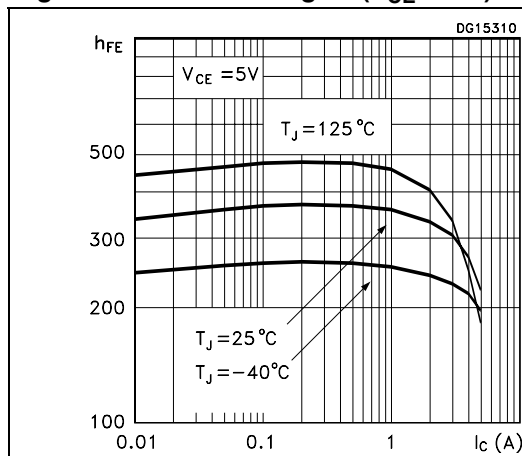
**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{CBO}$	Collector cut-off current ( $I_E = 0$ )	$V_{CB} = 80 V$			100	nA
$I_{EBO}$	Emitter cut-off current ( $I_C = 0$ )	$V_{EB} = 6 V$			100	nA
$V_{BE(on)}$	Base-emitter on voltage	$V_{CE} = 2 V$ $I_C = 100 mA$	630	650	730	mV
$V_{CE(sat)}^{(1)}$	Collector-emitter saturation voltage	$I_C = 2 A$ $I_B = 100 mA$ $I_C = 3 A$ $I_B = 150 mA$		130 180	300 500	mV
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = 2 A$ $I_B = 100 mA$		0.9	1.2	V
$h_{FE}^{(1)}$	DC current gain	$I_C = 100 mA$ $V_{CE} = 2 V$ $I_C = 1 A$ $V_{CE} = 2 V$	80 160		400	
$t_d$	Resistive load Delay time	$I_C = 3 A$ $V_{CC} = 10 V$ $I_{B(on)} = - I_{B(off)} = 300 mA$ $V_{BE(off)} = - 5 V$		17	20	ns
$t_r$	Rise time			81	100	ns
$t_s$	Storage time			620	720	ns
$t_f$	Fall time			54	65	ns
$f_T$	Transition frequency	$I_C = 0.1 A$ $V_{CE} = 10 V$		130		MHz

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

### 2.1 Typical characteristics (curves)

**Figure 2. DC current gain ( $V_{CE} = 5 V$ )**



**Figure 3. DC current gain ( $V_{CE} = 2 V$ )**

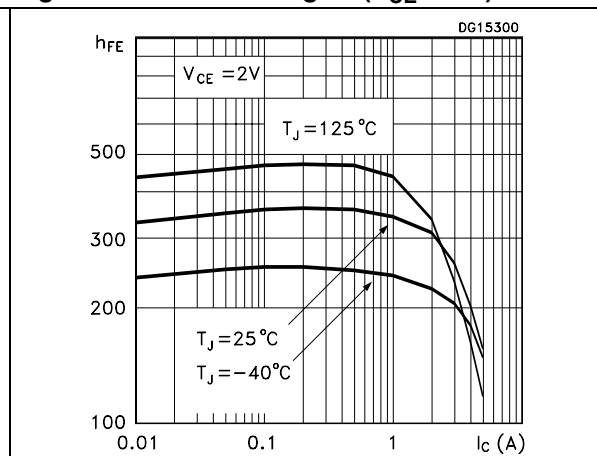


Figure 4. Collector emitter saturation voltage Figure 5. Base emitter saturation voltage

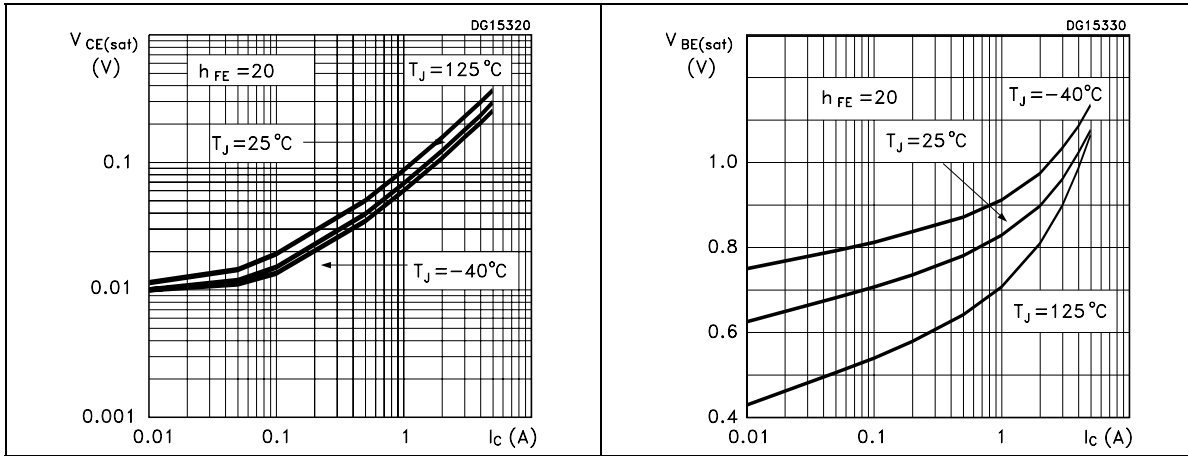


Figure 6. Resistive load switching on Figure 7. Resistive load switching off

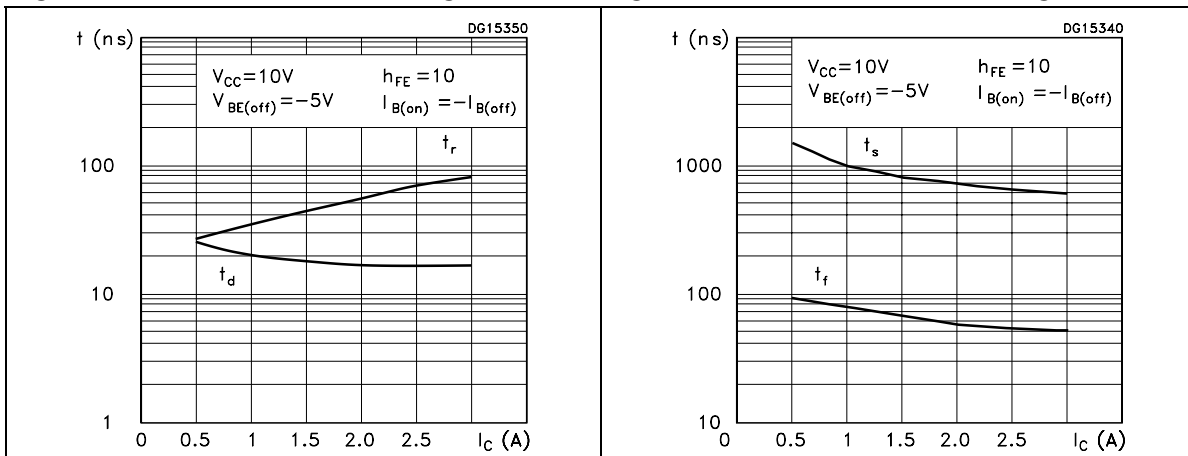
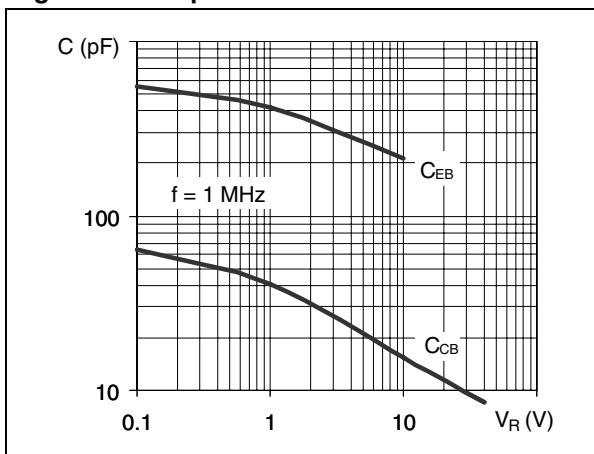
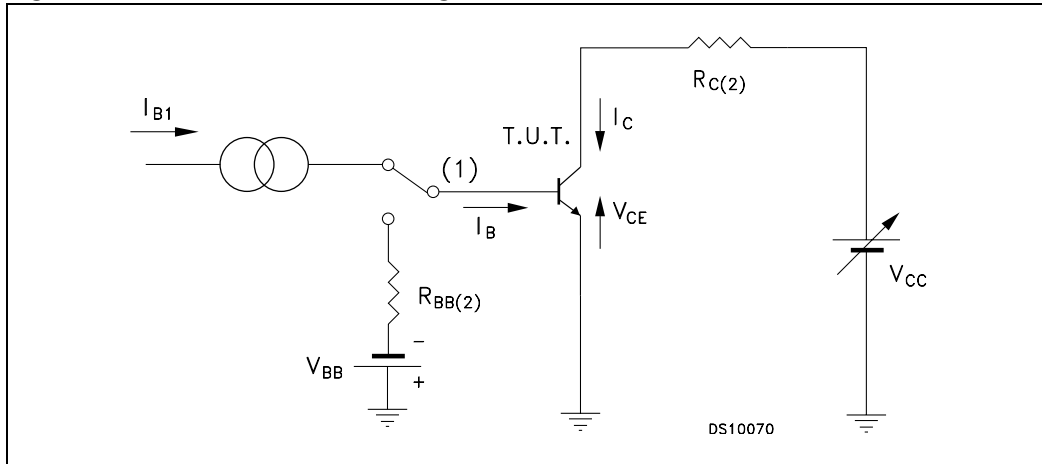


Figure 8. Capacitance



## 2.2 Test circuits

Figure 9. Resistive load switching



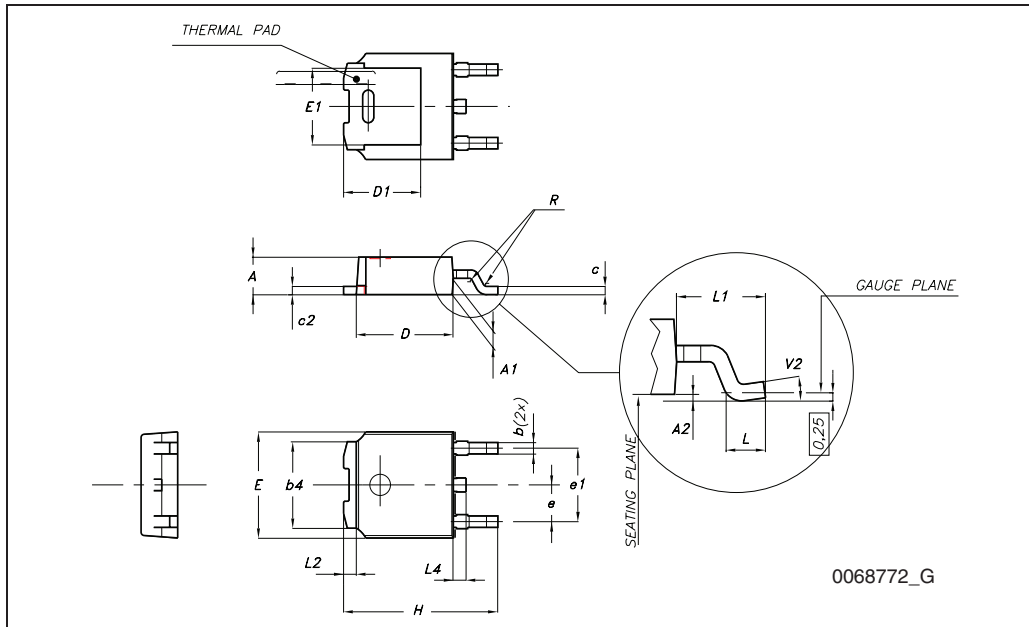
1. Fast electronic switch
2. Non-inductive resistor

### 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.

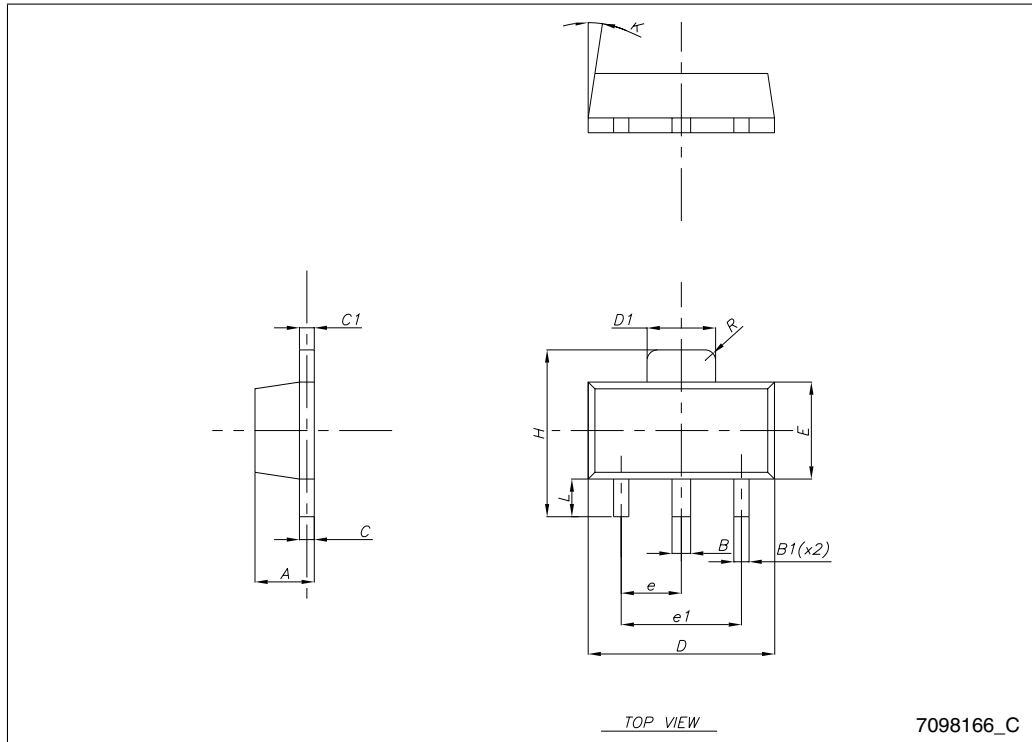
TO-252 (DPAK) mechanical data

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°



**SOT-89 mechanical data**

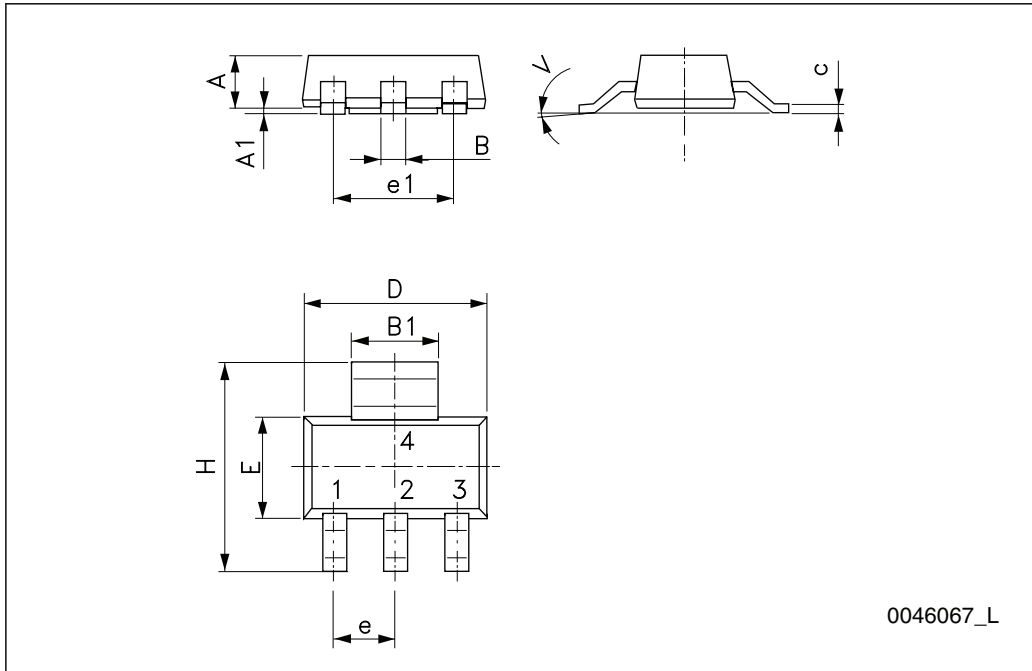
Dim.	mm		
	Min.	Typ.	Max.
A	1.40		1.60
B	0.44		0.56
B1	0.36		0.48
C	0.35		0.44
C1	0.35		0.44
D	4.40		4.60
D1	1.62		1.83
E	2.29		2.60
e	1.42		1.57
e1	2.92		3.07
H	3.94		4.25
K	1°		8°
L	0.89		1.20
R		0.25	





**SOT-223 mechanical data**

DIM.	mm.		
	min.	typ	max.
A			1.80
A1	0.02		0.1
B	0.60	0.70	0.85
B1	2.90	3.00	3.15
c	0.24	0.26	0.35
D	6.30	6.50	6.70
e		2.30	
e1		4.60	
E	3.30	3.50	3.70
H	6.70	7.00	7.30
V			10°



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## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
21-Nov-2005	1	Initial release
09-Oct-2009	2	Added 2STD1360T4 in TO-252 (DPAK) package

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