

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-HCD" (power bipolar high current density) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage.

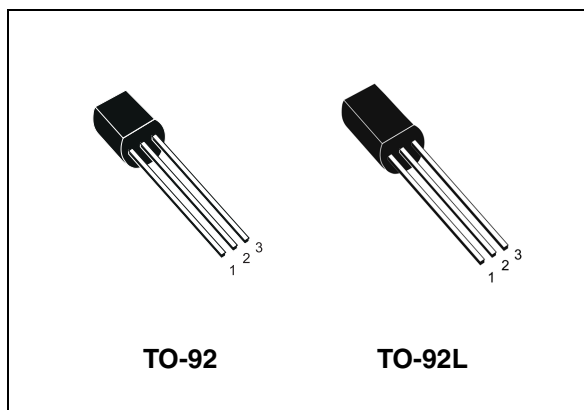


Figure 1. Internal schematic diagram

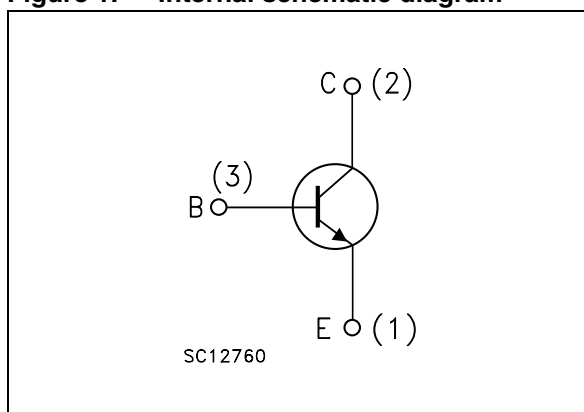


Table 1. Device summary

Order codes	Marking	Packages	Packaging
2STL1360	L1360	TO-92L	Bag
2STX1360	X1360	TO-92	Bag

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		2STX1360	2STL1360	
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	1	1.2	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
		TO-92	TO-92L	
R_{thJA}	Thermal resistance junction-ambient max	125	104	°C/W

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cut-off current ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 80\text{ V}$			100	nA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 6\text{ V}$			100	nA
$V_{\text{BE(on)}}$	Base-emitter on voltage	$V_{\text{CE}} = 2\text{ V}$ $I_{\text{C}} = 100\text{ mA}$	630	650	730	mV
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 100\text{ mA}$		130	300	mV
		$I_{\text{C}} = 3\text{ A}$ $I_{\text{B}} = 150\text{ mA}$		180	500	mV
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 100\text{ mA}$		0.9	1.2	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 0.1\text{ A}$ $V_{\text{CE}} = 2\text{ V}$	80			
		$I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 2\text{ V}$	160		400	
t_{d} t_{r} t_{s} t_{f}	RESISTIVE LOAD					
	Delay time	$V_{\text{CC}} = 10\text{ V}$ $I_{\text{C}} = 3\text{ A}$		17	20	ns
	Rise time	$I_{\text{B(on)}} = -I_{\text{B(off)}} = 300\text{ mA}$		81	100	ns
	Storage time	$V_{\text{BE(off)}} = -5\text{ V}$		620	720	ns
t_{f}	Fall time			54	65	ns
f_{T}	Transition frequency	$I_{\text{C}} = 0.1\text{ A}$ $V_{\text{CE}} = 10\text{ V}$		130		MHz

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

2.1 Electrical characteristics (curves)

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

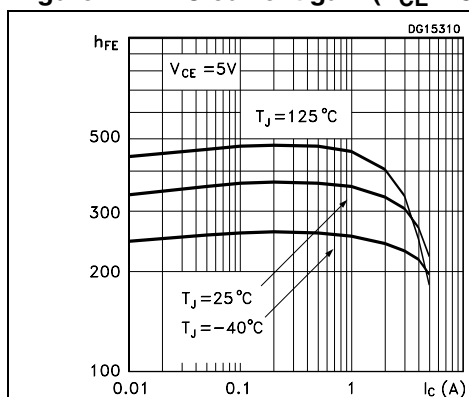


Figure 3. DC current gain ($V_{\text{CE}} = 2\text{ V}$)

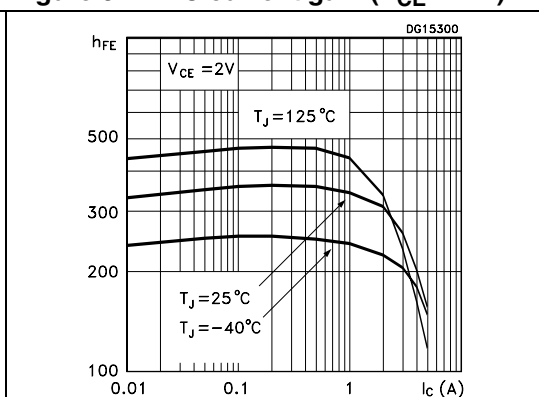


Figure 4. Collector-emitter saturation voltage

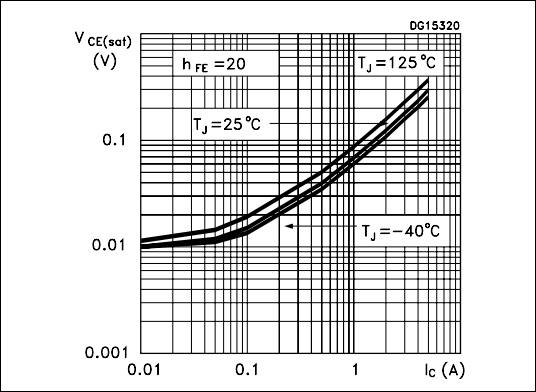


Figure 5. Base-emitter saturation voltage

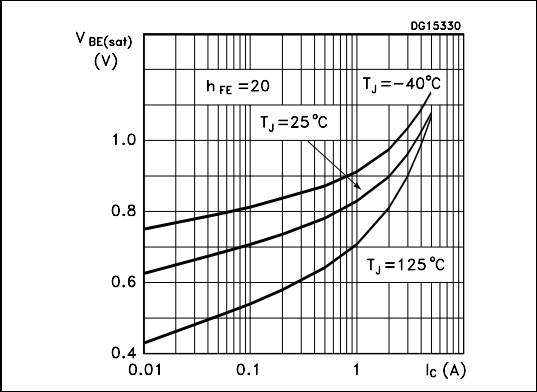


Figure 6. Resistive load switching time

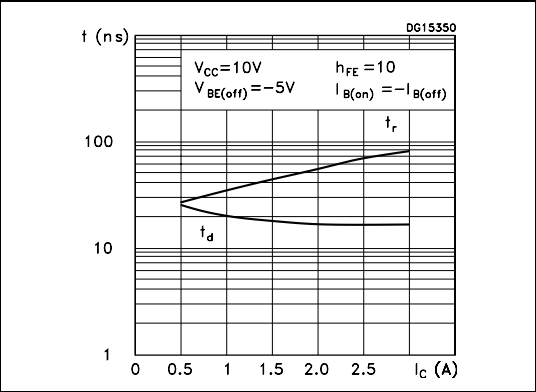


Figure 7. Resistive load switching time

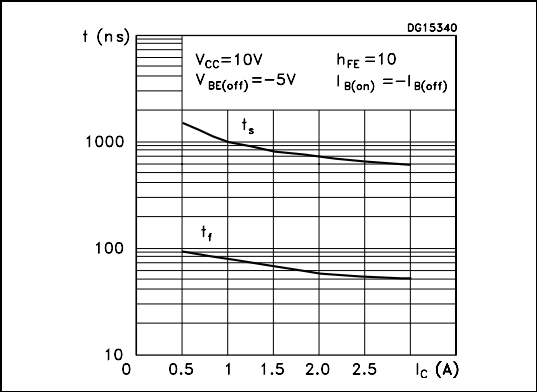
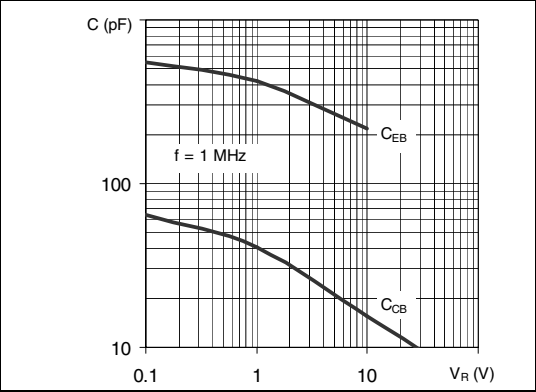
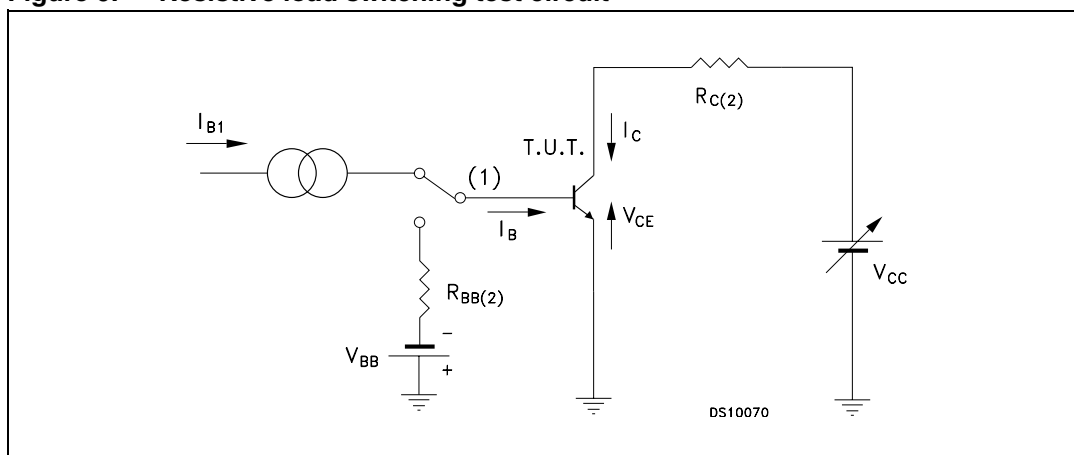


Figure 8. Capacitance



2.2 Test circuit

Figure 9. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

3 Package mechanical data

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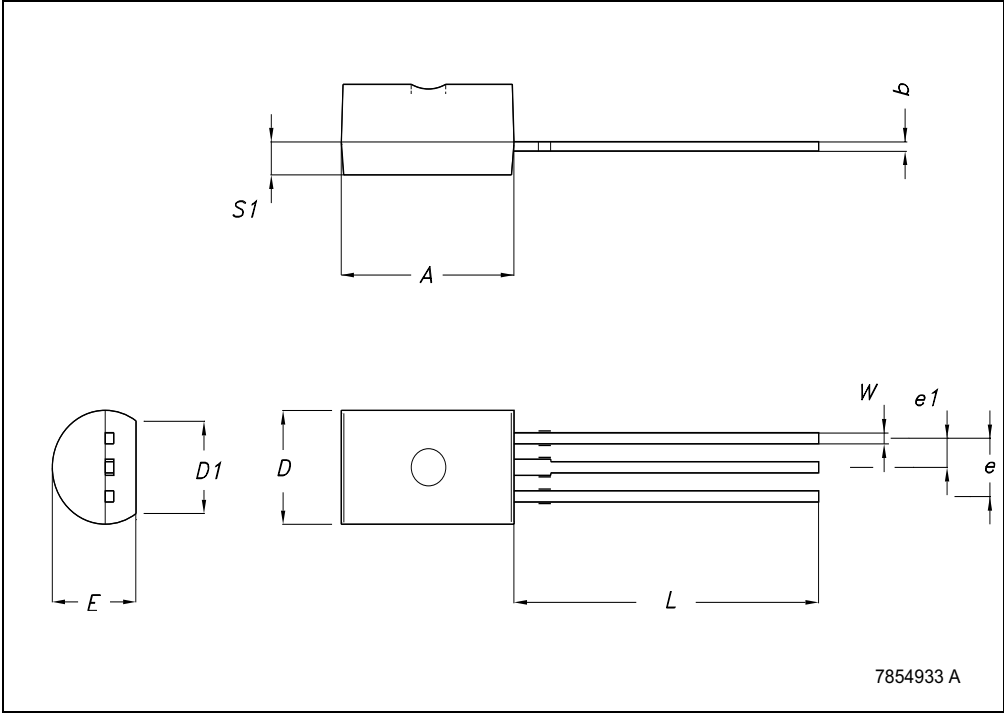
TO-92 bulk shipment mechanical data			
DIM.	mm.		
	MIN.	TYP	MAX.
A	4.32		4.95
b	0.36		0.51
D	4.45		4.95
E	3.30		3.94
e	2.41		2.67
e1	1.14		1.40
L	12.70		15.49
R	2.16		2.41
S1	0.92		1.52
W	0.41		0.56
V		5°	

The diagram illustrates the mechanical specifications of a TO-92 package through three views: a top view, a side view, and a front view. The top view shows the width (A) and the distance from the base to the top of the package (S1). The side view shows the height (D) and the distance from the base to the top of the package (E). The front view shows the length (L), the distance from the base to the top of the package (R), the distance from the base to the top of the package (V), the distance from the base to the top of the package (W), the distance from the base to the top of the package (e1), and the distance from the base to the top of the package (e). The package is shown with a standard TO-92 footprint, including a central circular pad and four side pads.

0102782 D

TO-92L MECHANICAL DATA

DIM.	mm.		
	MIN.	TYP	MAX.
A	7.80		8.20
b	0.35		0.45
D	4.70		5.10
D1		4	
E	3.70		4.10
e	2.44		2.64
e1		1.27	
L	13.30		14.30
S1	1.28		1.58
W	0.35		0.55



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
20-Oct-2006	1	Initial release
16-Jul-2007	2	Added figures 2, 3, 4, 5, 6, 7 and 8
29-Oct-2009	3	Updated Figure 8 on page 4 and TO-92 package mechanical data

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