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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.

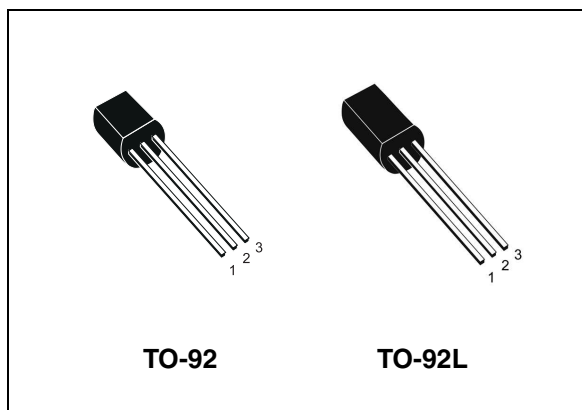


Figure 1. Internal schematic diagram

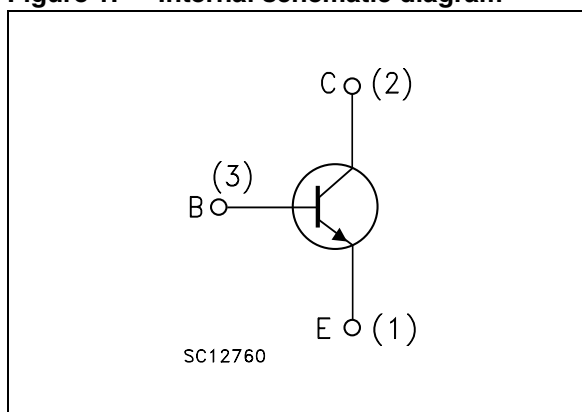


Table 1. Device summary

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

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

Table 4. Electrical characteristics

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

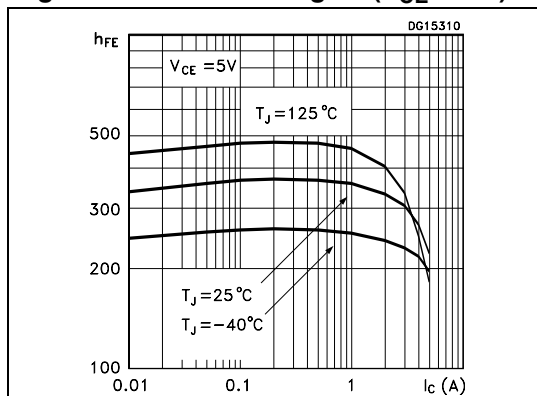


Figure 3. DC current gain ($V_{CE} = 2\text{ V}$)

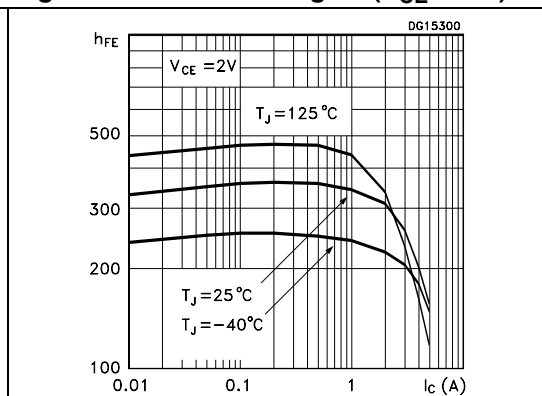


Figure 4. Collector-emitter saturation voltage

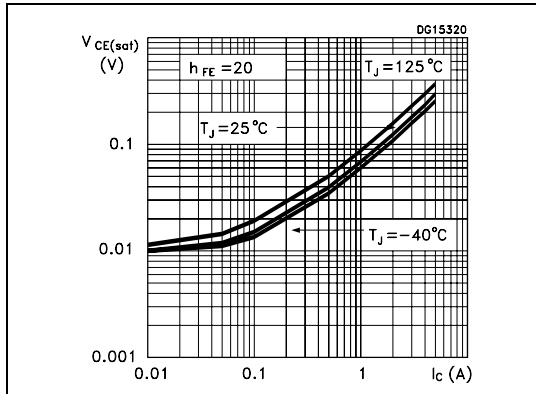


Figure 5. Base-emitter saturation voltage

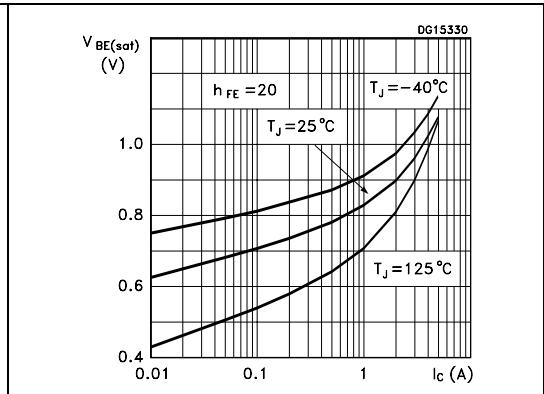


Figure 6. Resistive load switching time

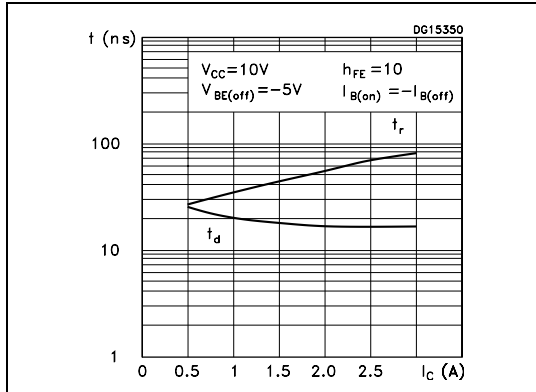


Figure 7. Resistive load switching time

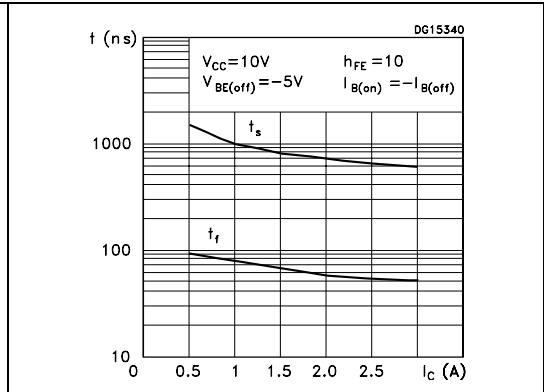
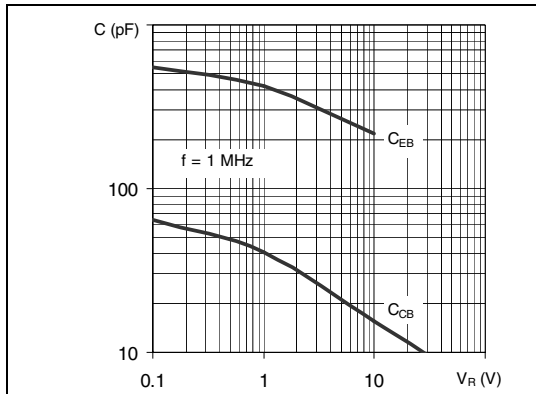
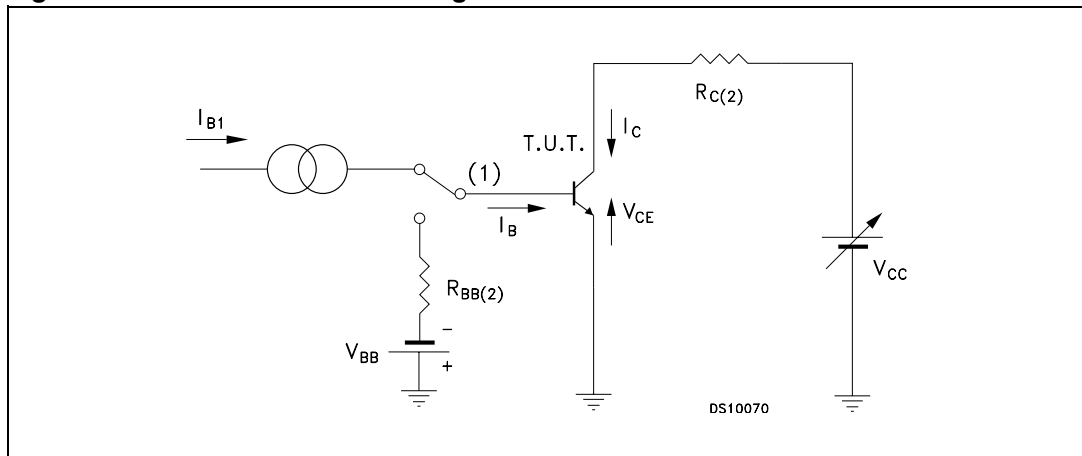


Figure 8. Capacitance



2.2 Test circuit

Figure 9. Resistive load switching test circuit



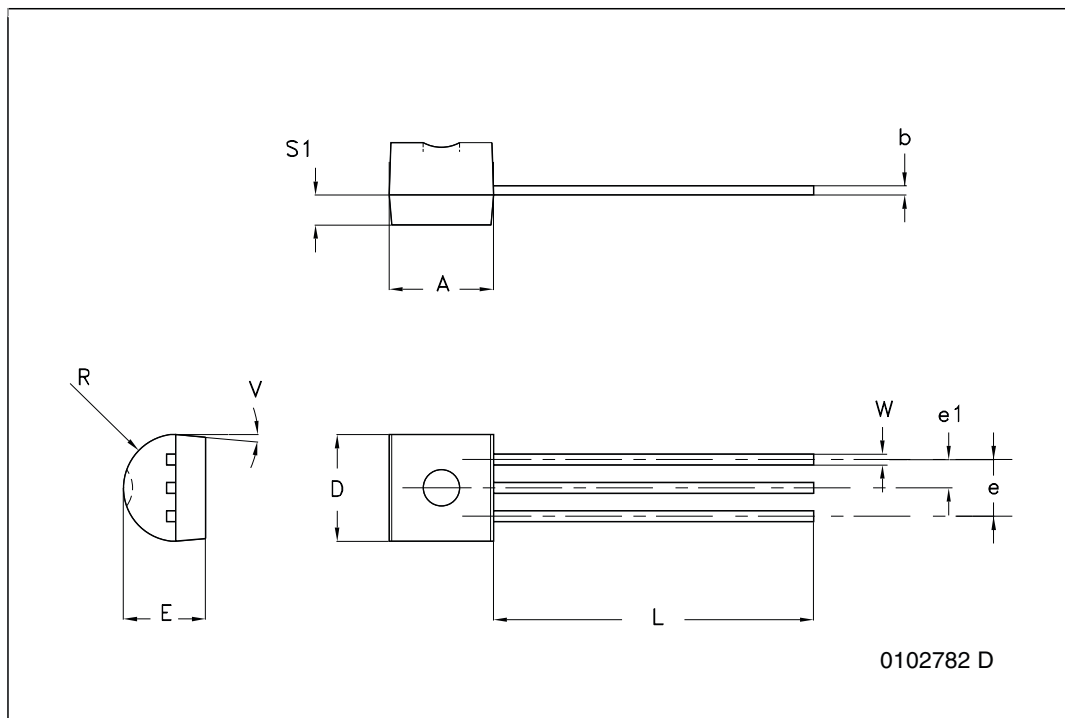
1. Fast electronic switch
2. Non-inductive resistor

3 Package mechanical data

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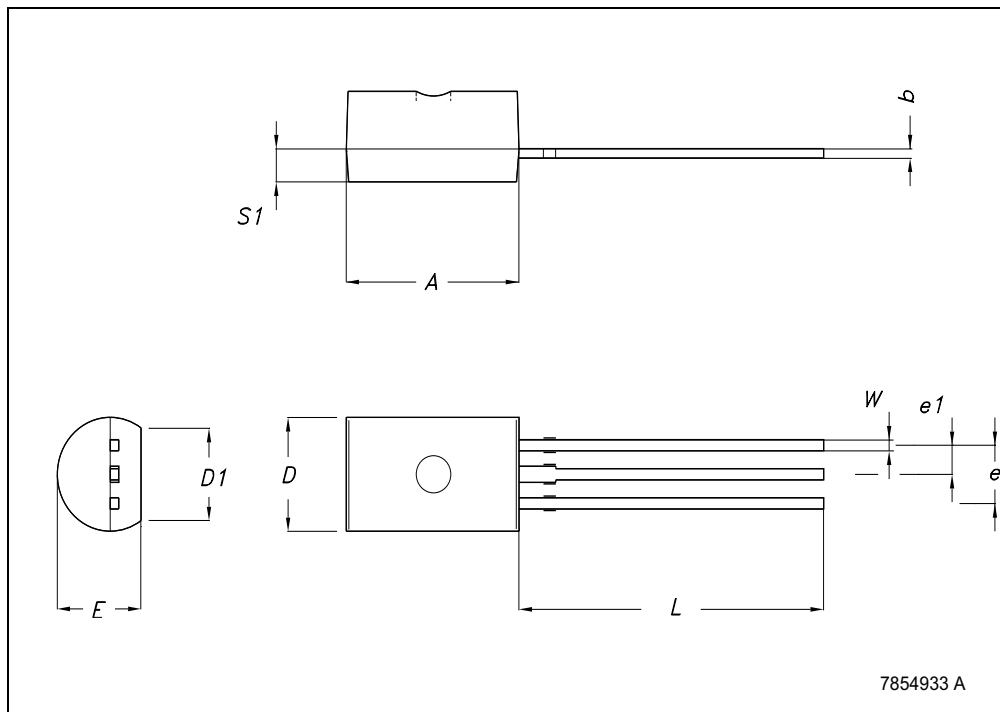
TO-92 bulk shipment mechanical data

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°	



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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