



## 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

### Application

- Battery charger

### Description

The device is manufactured using high voltage multi-epitaxial planar technology for high switching speeds and high voltage capability.

Thanks to an increased intermediate layer, it has an intrinsic ruggedness which enables the transistor to withstand a high collector current level during breakdown condition, without using the transil protection usually necessary in typical converters for lamp ballast.

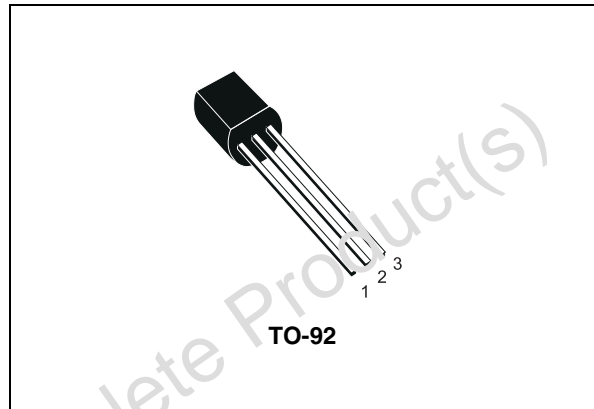


Figure 1. Internal schematic diagram

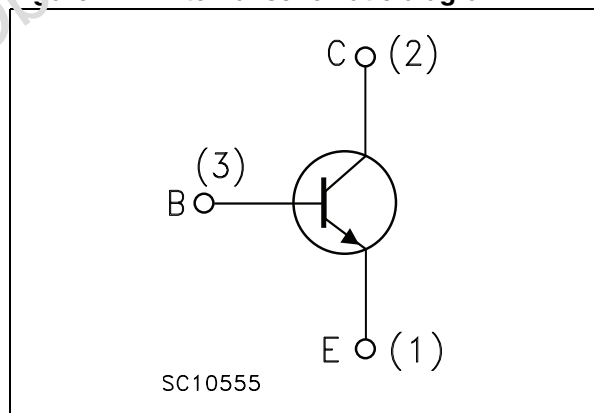


Table 1. Device summary

Order code	Marking	Package	Packaging
STX1F10	X1F10	TO-92	Box

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	980	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	15	V
$I_C$	Collector current	1.5	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	3	A
$I_B$	Base current	0.5	A
$I_{BM}$	Base peak current ( $t_P < 5$ ms)	1	A
$P_{tot}$	Total dissipation at $T_C = 25$ °C	2.8	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
$R_{thJC}$	Thermal resistance junction-case max	44.6	°C/W

## 2 Electrical characteristics

( $T_{case} = 25^{\circ}C$  unless otherwise specified)

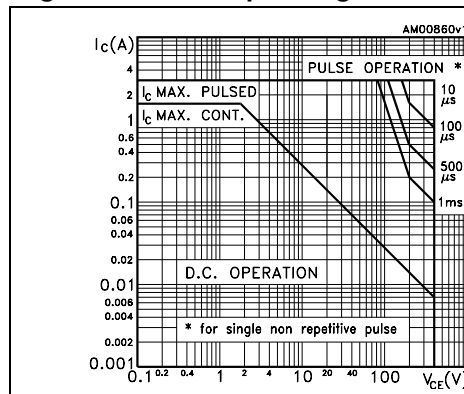
**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector cut-off current ( $V_{BE} = 0$ )	$V_{CE} = 980 V$ $V_{CE} = 980 V; T_C = 125^{\circ}C$			50 0.5	$\mu A$ mA
$I_{CEO}$	Collector cut-off current ( $I_B = 0$ )	$V_{CE} = 400 V$			250	$\mu A$
$V_{(BR)EBO}$	Emitter-base breakdown voltage ( $I_C = 0$ )	$I_E = 1 mA$	15			V
$V_{CEO(sus)}^{(1)}$	Collector-emitter sustaining voltage ( $I_B = 0$ )	$I_C = 10 mA$	40			V
$V_{CE(sat)}^{(1)}$	Collector-emitter saturation voltage	$I_C = 0.3 A$ $I_B = 60 mA$ $I_C = 1 A$ $I_B = 0.2 A$		0.15 0.3	0.5 1	V V
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = 1 A$ $I_B = 0.2 A$		1.1	1.5	V
$h_{FE}$	DC current gain	$I_C = 500 \mu A$ $V_{CE} = 2 V$ $I_C = 0.45 A$ $V_{CE} = 5 V$ $I_C = 1 A$ $V_{CE} = 5 V$	15 30 14	40 20	61 28	
$t_s$ $t_f$	Resistive load Storage time Fall time	$V_{CC} = 125 V$ $I_C = 1 A$ $I_{B(on)} = -I_{B(off)} = 200 mA$ $t_p = 300 \mu s$ $V_{BE(off)} = -5 V$		2.5 350		$\mu s$ ns

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

### 2.1 Typical characteristic

**Figure 2. Safe operating area**



**Figure 3. Derating curve**

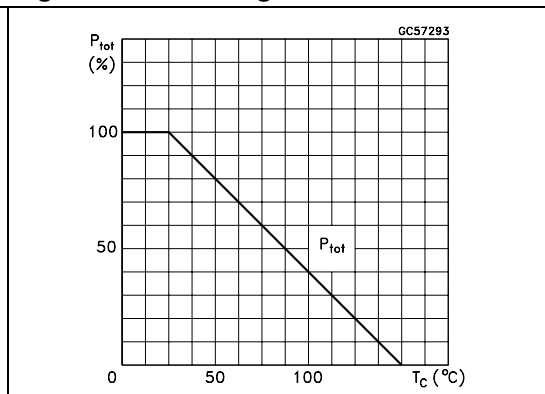


Figure 4. Output characteristics

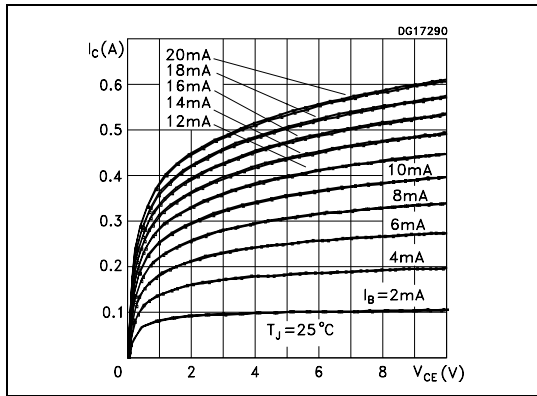


Figure 5. Reverse biased safe operating area

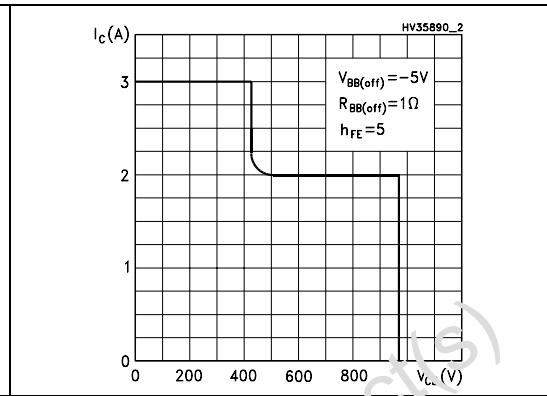


Figure 6. DC current gain ( $V_{CE} = 3\text{ V}$ )

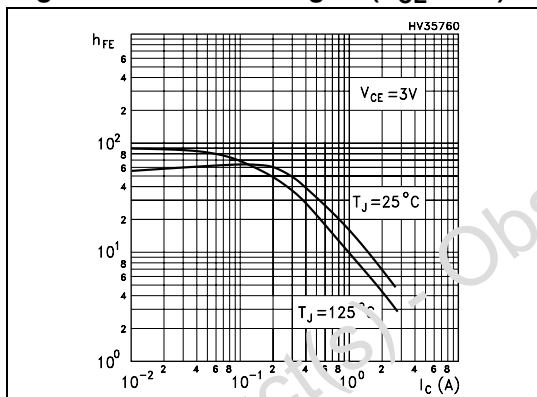


Figure 7. DC current gain ( $V_{CE} = 5\text{ V}$ )

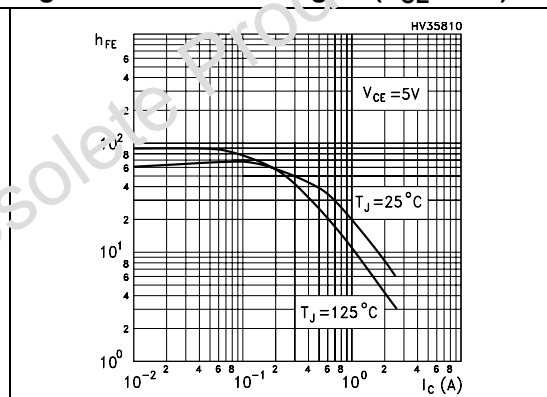


Figure 8. Base-emitter saturation voltage

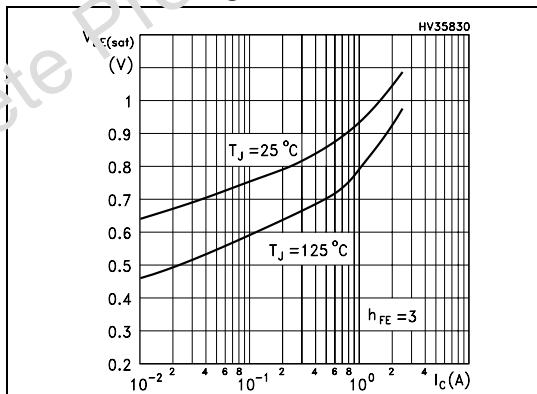
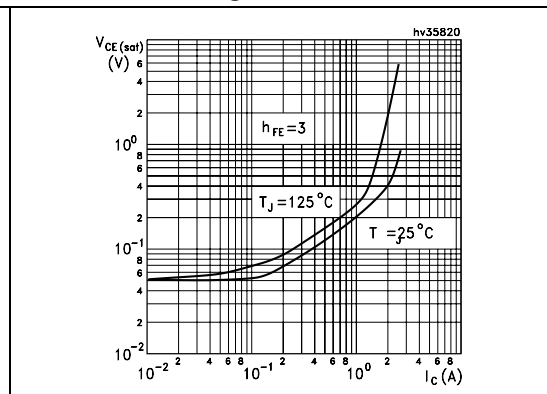
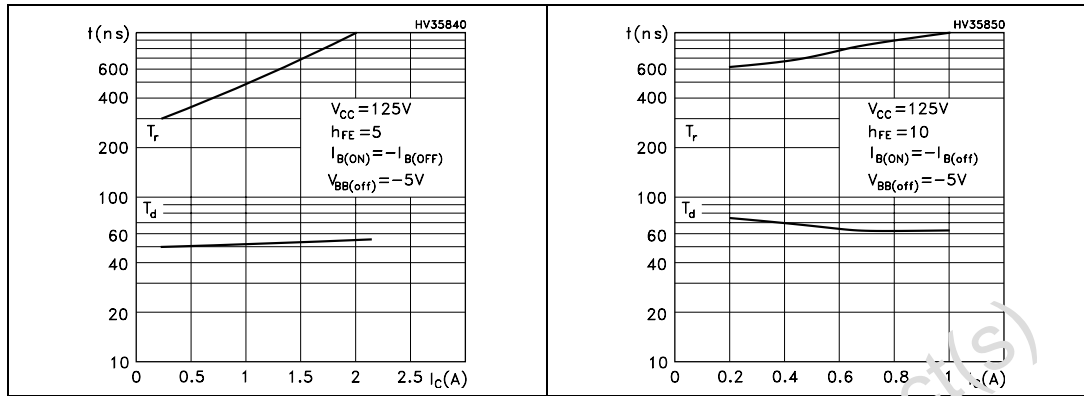


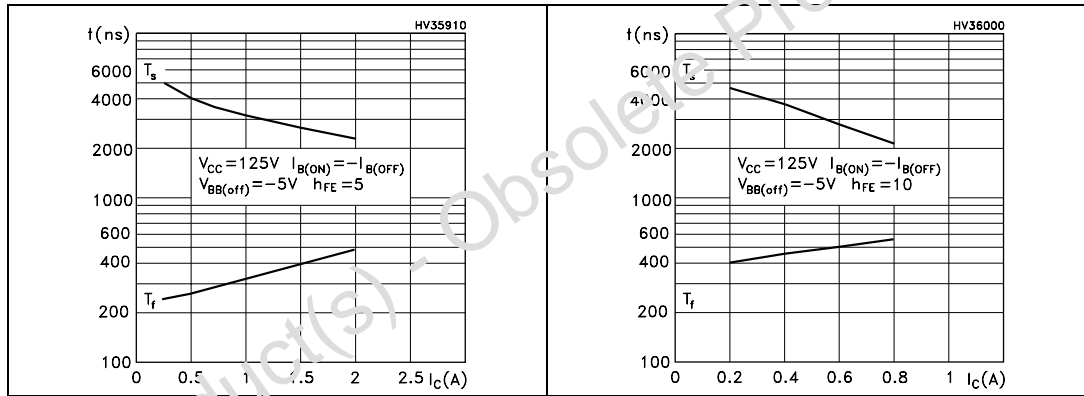
Figure 9. Collector-emitter saturation voltage



**Figure 10. Resistive load switching time (turn-on,  $h_{FE} = 5$ )** **Figure 11. Resistive load switching time (turn-on,  $h_{FE} = 10$ )**

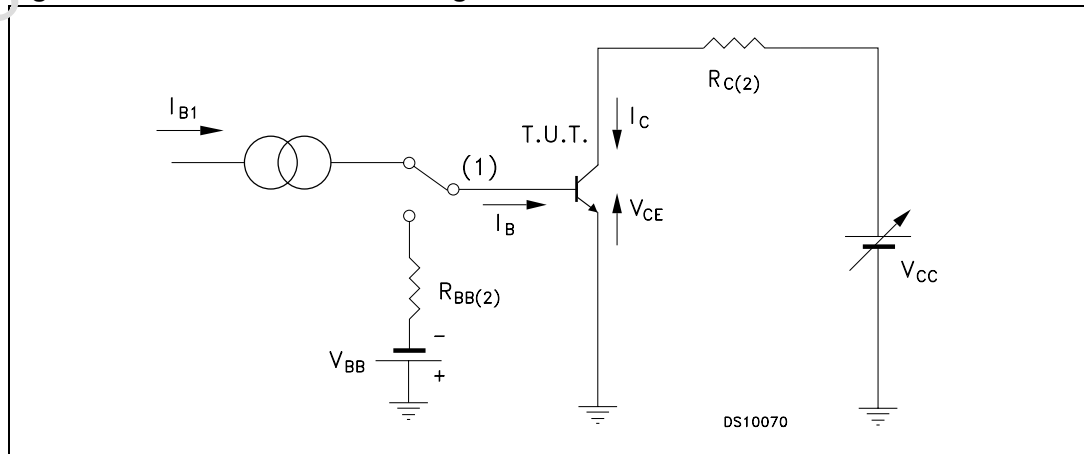


**Figure 12. Resistive load switching time (turn-off,  $h_{FE} = 5$ )** **Figure 13. Resistive load switching time (turn-off,  $h_{FE} = 10$ )**



**2.2 Test circuits**

**Figure 14. Resistive load switching test circuit**



- 1. Fast electronic switch
- 2. Non-inductive resistor

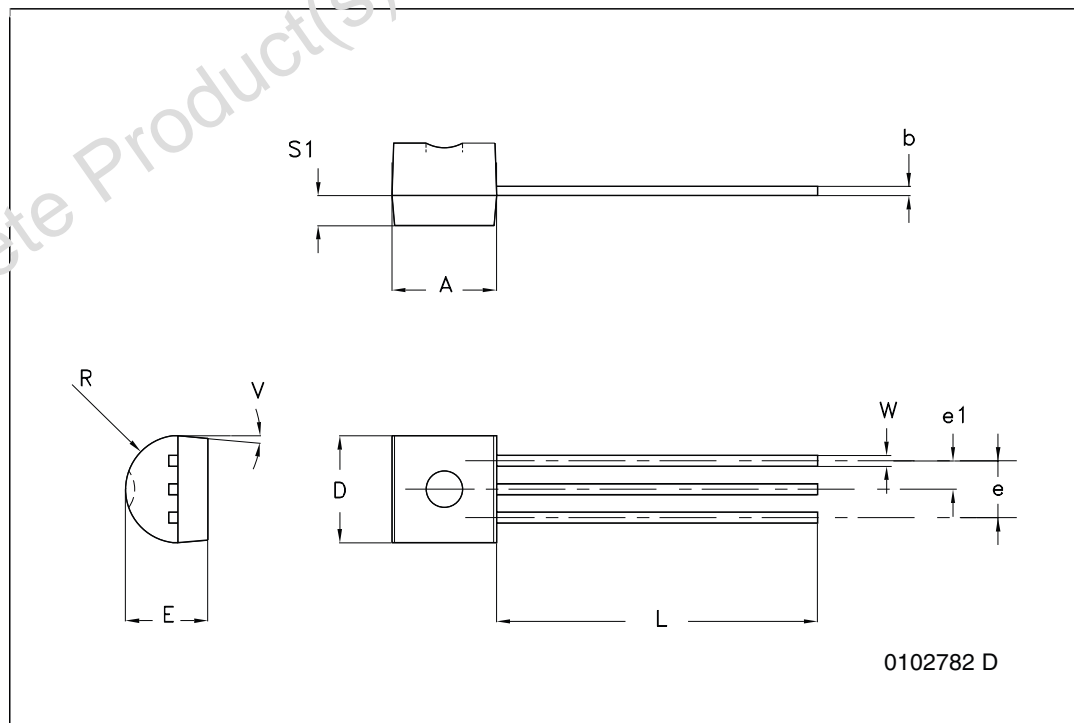
### 3 Package mechanical data

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Obsolete Product(s) - Obsolete Product(s)

**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°	



## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
18-Jun-2009	1	Initial release.

Obsolete Product(s) - Obsolete Product(s)

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