

## High voltage fast-switching NPN power transistor

### Features

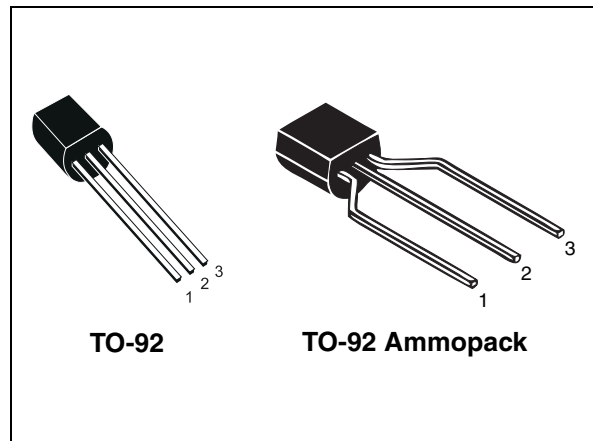
- High voltage capability
- Very high switching speed

### Applications

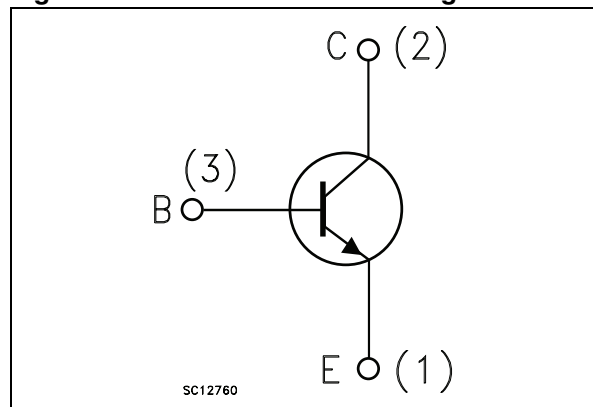
- Compact fluorescent lamps (CFLs)
- SMPS for battery charger

### Description

This device is manufactured using high voltage multi epitaxial planar technology for high switching speeds and high voltage capability. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order codes	Marking	Package	Packaging
STX0560	X0560	TO-92	Bag
STX0560-AP	X0560	TO-92AP	Ammopack

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	800	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	600	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	7	V
$I_C$	Collector current	1	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	2	A
$I_B$	Base current	0.5	A
$I_{BM}$	Base peak current ( $t_P < 5$ ms)	1	A
$P_{TOT}$	Total dissipation at $T_a = 25$ °C	1.5	W
$T_{stg}$	Storage temperature	-65 to 150	°C
$T_J$	Max. operating junction temperature	150	

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJa}$	Thermal resistance junction-ambient max	83	°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
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 800\text{ V}$			10	$\mu\text{A}$
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{ mA}$	7			V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{ mA}$	600			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 100\text{ mA}$			1	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 100\text{ mA}$			1	V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 5\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 20\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$	70	90		
$t_{\text{r}}$	Rise time	$V_{\text{CC}}=200\text{ V}$ , $I_{\text{C}}=0.3\text{ A}$ $I_{\text{B1}}=60\text{ mA}$ , $I_{\text{B2}}=-120\text{ mA}$ $T_{\text{p}}=30\text{ }\mu\text{s}$		140		ns
$t_{\text{s}}$	Storage time			4.4		$\mu\text{s}$
$t_{\text{f}}$	Fall time			220		ns

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

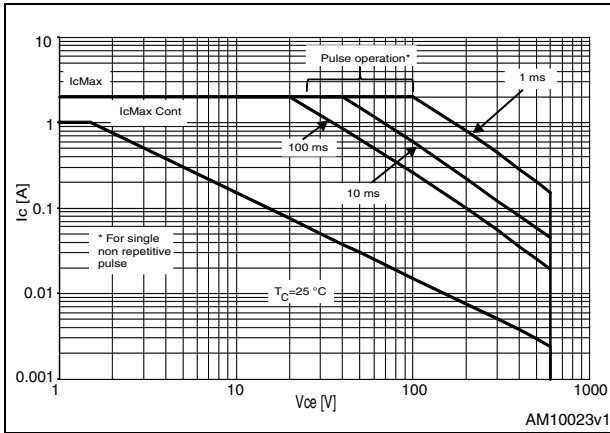


Figure 3. Derating curve

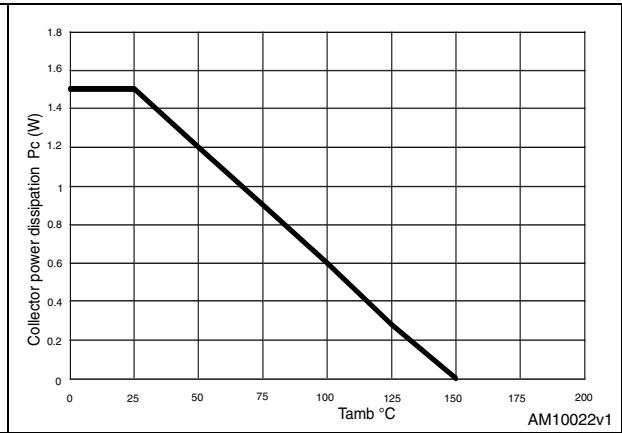


Figure 4. Output curves up to  $V_{CE} = 2 V$

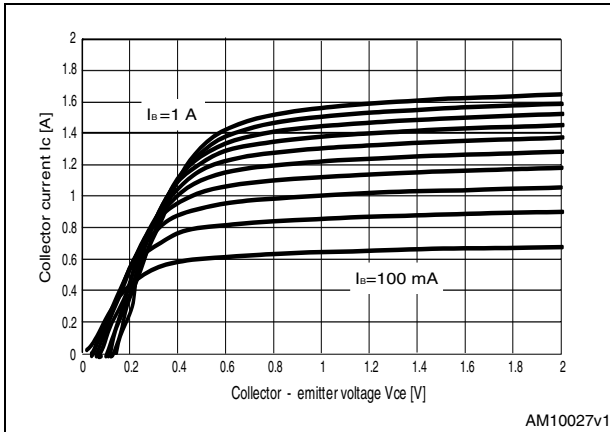


Figure 5. Output curves up to  $V_{CE} = 10 V$

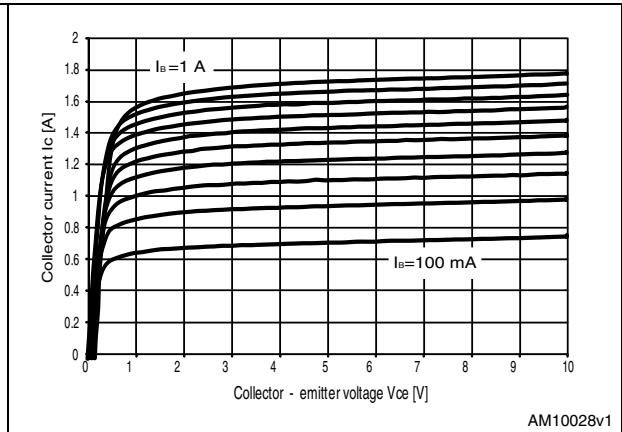


Figure 6. DC current gain ( $V_{CE} = 1 V$ )

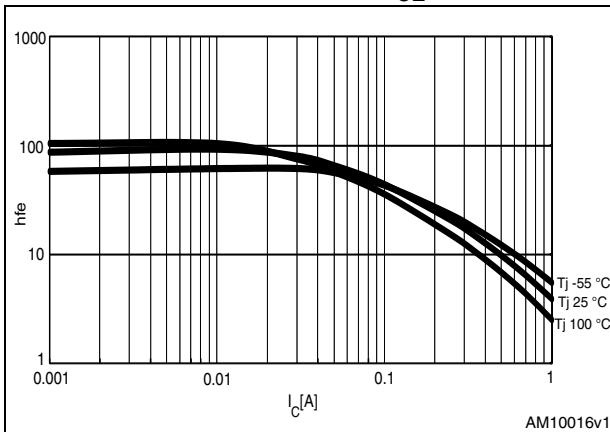


Figure 7. DC current gain ( $V_{CE} = 5 V$ )

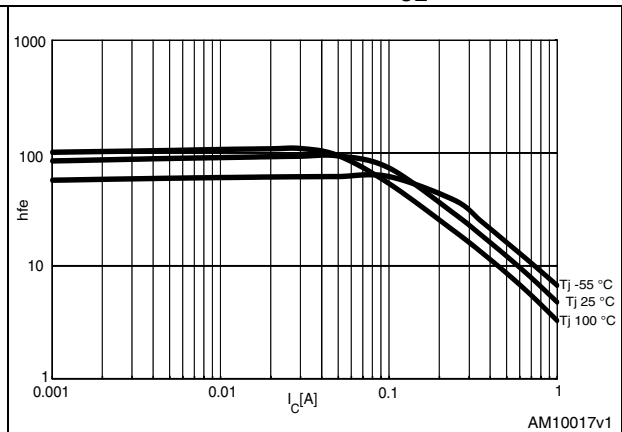


Figure 8. Collector-emitter saturation voltage Figure 9. Base-emitter saturation voltage

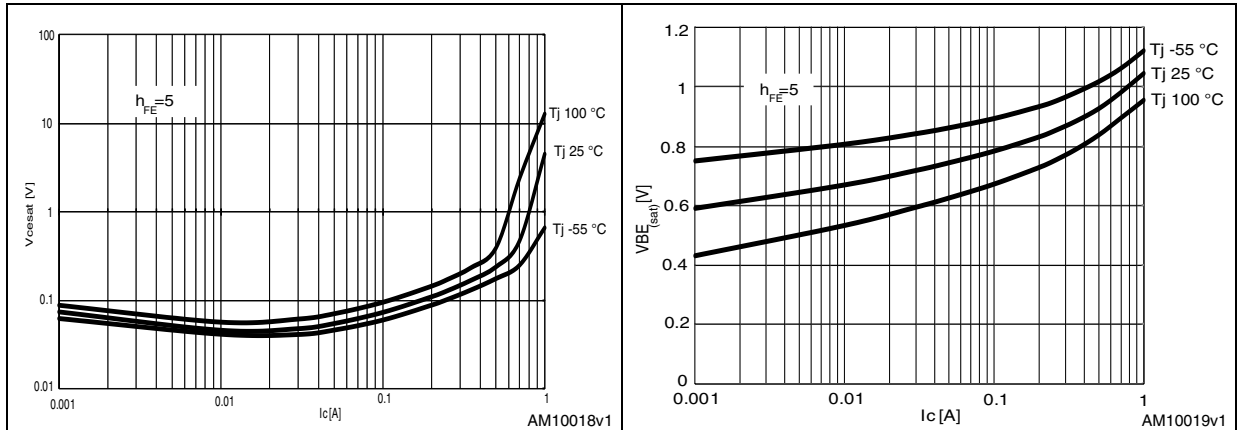


Figure 10. Base-emitter on voltage

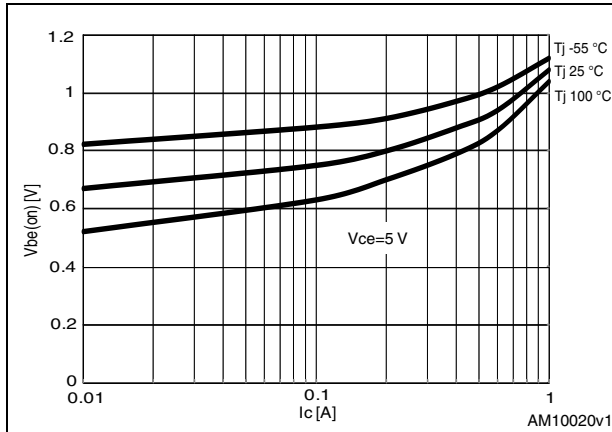


Figure 11. Capacitance variation

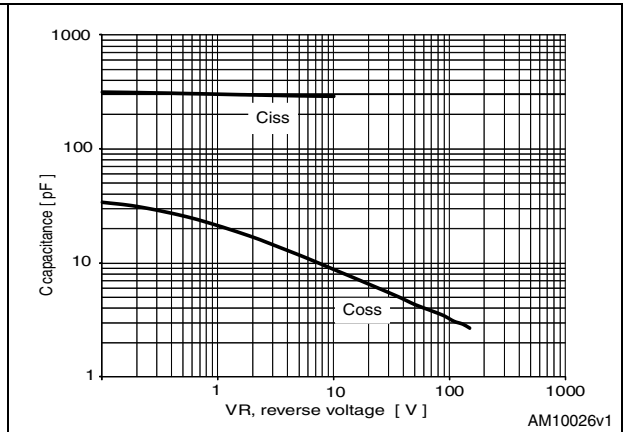


Figure 12. Resistive switching time

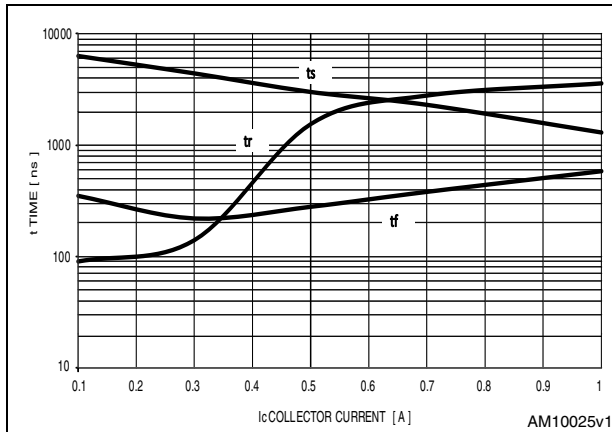


Figure 13.  $V_{be(sat)}$  vs.  $I_c$

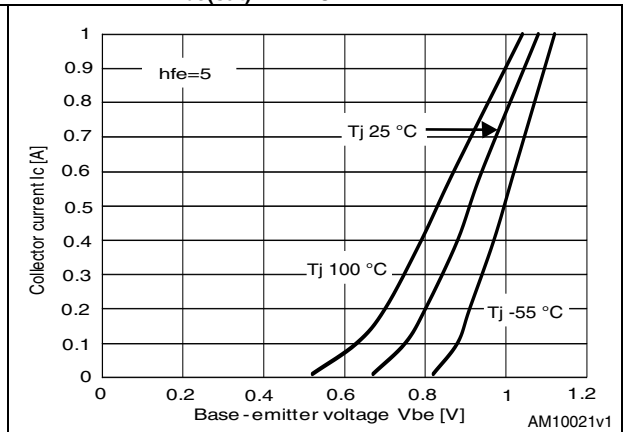
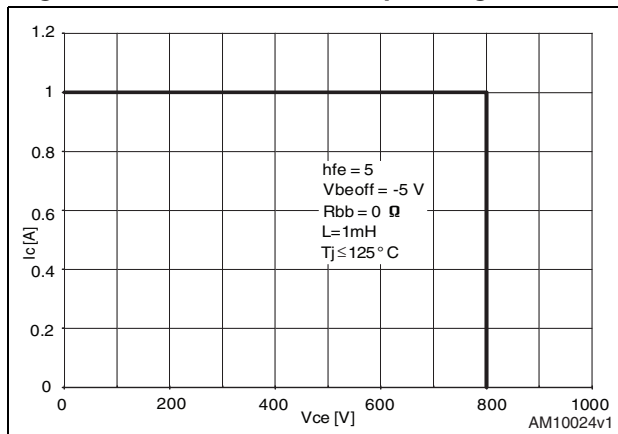
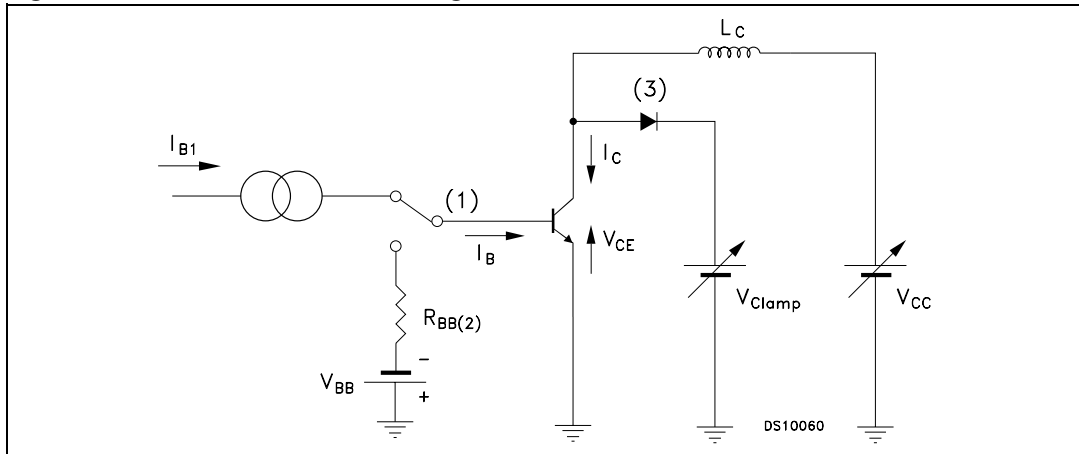


Figure 14. Reverse biased operating area



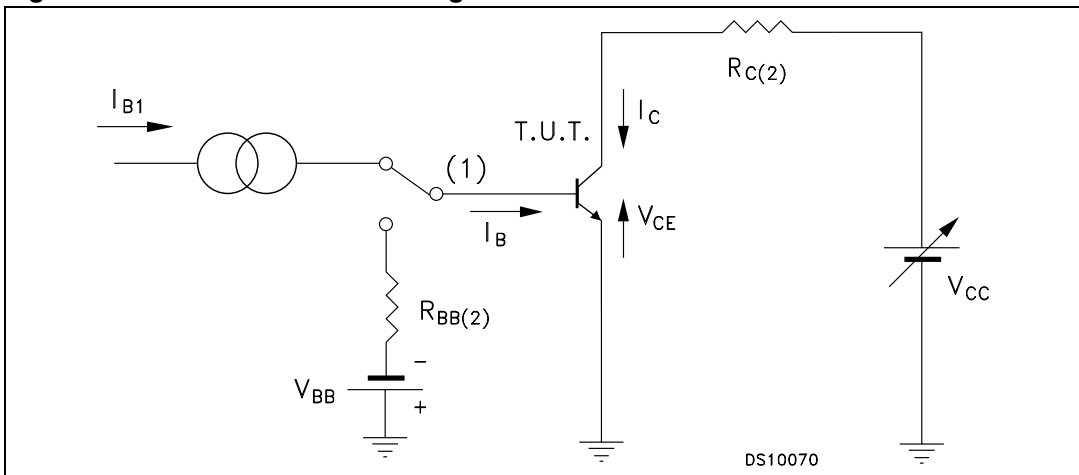
## 2.2 Test circuits

**Figure 15. Resistive load switching test circuit**



1. Fast electronic switch
2. Non-inductive resistor

**Figure 16. Inductive load switching test circuit**



1. Fast electronic switch
2. Non-inductive resistor
3. Fast recovery rectifier

### 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.



Table 5. TO-92 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°	

Figure 17. TO-92 drawing

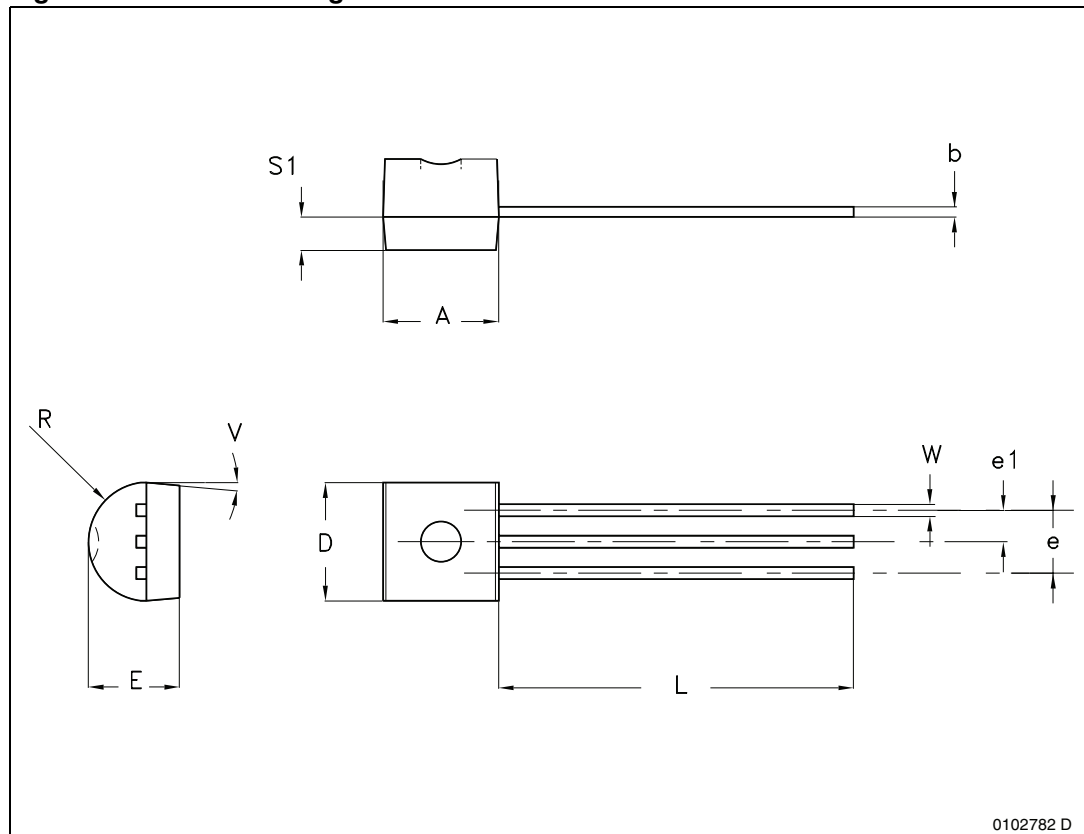
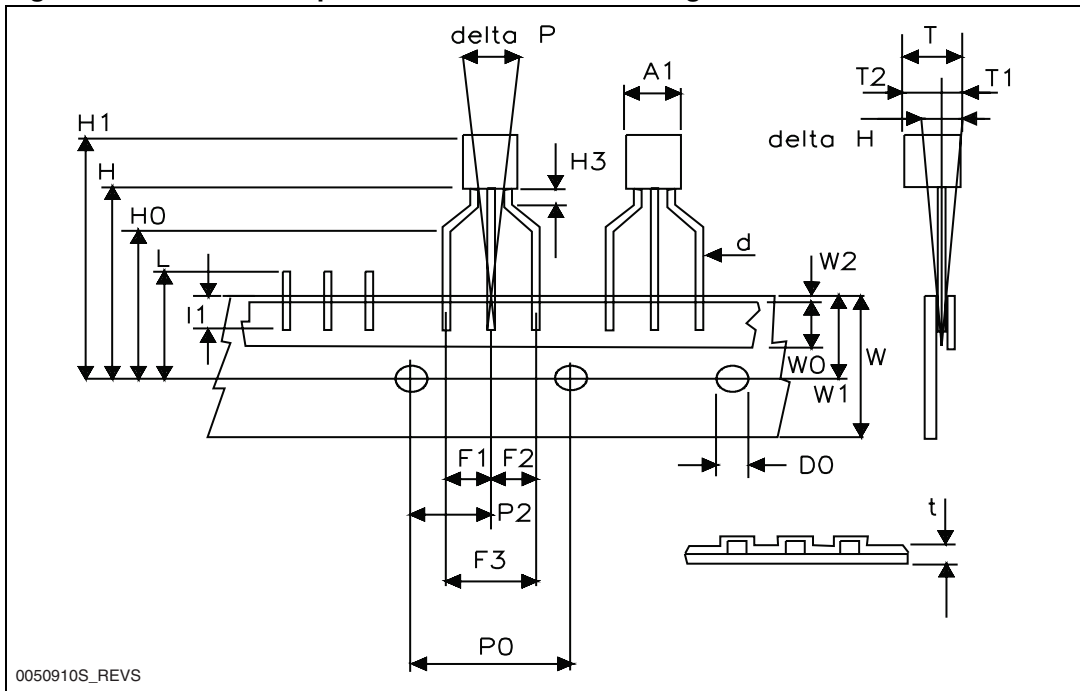


Table 6. TO-92 ammopack mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A1			4.80
T			3.80
T1			1.60
T2			2.30
d			0.48
P0	12.50	12.70	12.90
P2	5.65	6.35	7.05
F1, F2	2.44	2.54	2.94
F3	4.98	5.08	5.48
delta H	-2.00		2.00
W	17.50	18.00	19.00
W0	5.70	6.00	6.30
W1	8.50	9.00	9.25
W2			0.50
H	18.50		20.50
H3	0.5	1	1.5
H0	15.50	16.00	16.50
H1			25.00
D0	3.80	4.00	4.20
t			0.90
L			11.00
l1	3.00		
delta P	-1.00		1.00

Figure 18. TO-92 ammopack mechanical data drawing



## 4 Revision history

**Table 7. Document revision history**

Date	Revision	Changes
15-Dec-2010	1	Initial release.
20-Jul-2011	2	Removed: TO-92 Ammopak package
13-Feb-2012	3	Added: TO-92 Ammopak package

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