



# STX13005

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- n HIGH VOLTAGE CAPABILITY
- n LOW SPREAD OF DYNAMIC PARAMETERS
- n MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- n VERY HIGH SWITCHING SPEED

### APPLICATION

- n COMPACT FLUORESCENT LAMPS (CFLS)
- n SWITCH MODE POWER SUPPLIES (AC / DC CONVERTERS)

### DESCRIPTION

The 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: Package

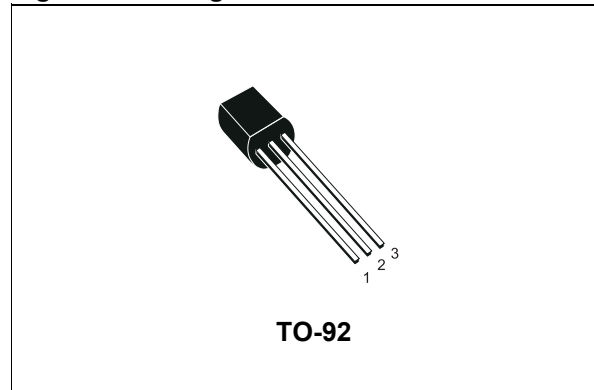


Figure 2: Internal Schematic Diagram

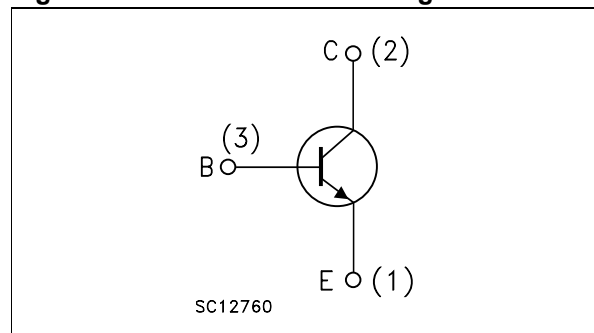


Table 1: Order Code

Part Number	Marking	Package	Packaging
STX13005	X13005	TO-92	Bulk
STX13005-AP	X13005	TO-92 AP	Ammopack

Table 2: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	700	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ , $I_B = 1.5$ A, $t_p < 10$ ms)	$V_{(BR)EBO}$	V
$I_C$	Collector Current	3	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	6	A
$I_B$	Base Current	1.5	A
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	3	A
$P_{tot}$	Total Dissipation at $T_C = 25$ °C	2.8	W

## STX13005

Symbol	Parameter	Value	Unit
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_J$	Max. Operating Junction Temperature	150	°C

**Table 3: Thermal Data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal Resistance Junction-Case Max	44.6	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	150	°C/W

**Table 4: Electrical Characteristics ( $T_{case} = 25\text{ °C}$  unless otherwise specified)**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 700\text{ V}$			1	mA
		$V_{CE} = 700\text{ V}$ $T_J = 125\text{ °C}$			5	mA
$I_{CEO}$	Collector Cut-off Current ( $I_B = 0$ )	$V_{CE} = 400\text{ V}$			1	mA
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ( $I_C = 0$ )	$I_E = 10\text{ mA}$ $L = 25\text{ mH}$	9		18	V
$V_{CE(sus)}^*$	Collector-Emitter Sustaining Voltage ( $I_B = 0$ )	$I_C = 10\text{ mA}$	400			V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 200\text{ mA}$			0.5	V
		$I_C = 2\text{ A}$ $I_B = 500\text{ mA}$			0.6	V
		$I_C = 3\text{ A}$ $I_B = 750\text{ mA}$			5	V
$V_{BE(sat)}^*$	Base-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 200\text{ mA}$			1.2	V
		$I_C = 2\text{ A}$ $I_B = 500\text{ mA}$			1.6	V
$h_{FE}^*$	DC Current Gain	$I_C = 1\text{ A}$ $V_{CE} = 5\text{ V}$	10		30	
		$I_C = 2\text{ A}$ $V_{CE} = 5\text{ V}$	8		24	
$t_s$ $t_f$	RESISTIVE LOAD	$I_C = 2\text{ A}$ $V_{CC} = 125\text{ V}$ $I_{B1} = -I_{B2} = 400\text{ mA}$ $t_p = 30\text{ }\mu\text{s}$ (see figure 16)		1.65 260		$\mu\text{s}$ ns
	INDUCTIVE LOAD	$I_C = 1\text{ A}$ $V_{Clamp} = 300\text{ V}$ $I_{B1} = 200\text{ mA}$ $V_{BE(off)} = -5\text{ V}$ $L = 50\text{ mH}$ $R_{BB} = 0$ (see figure 15)		0.8 150		$\mu\text{s}$ ns

\* Pulsed: Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$ .

Figure 3: Safe Operating Area

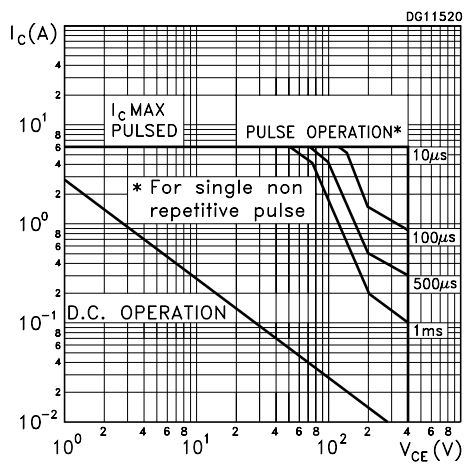


Figure 4: Output Characteristics

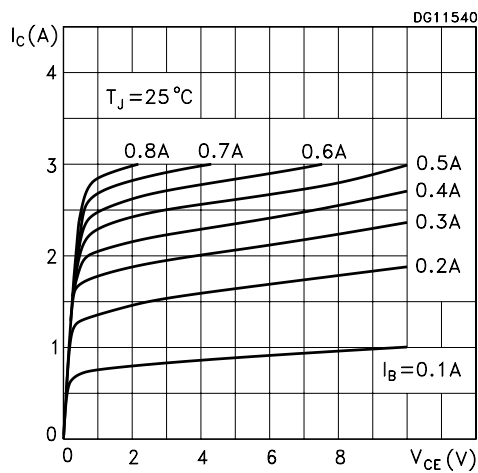


Figure 5: DC Current Gain

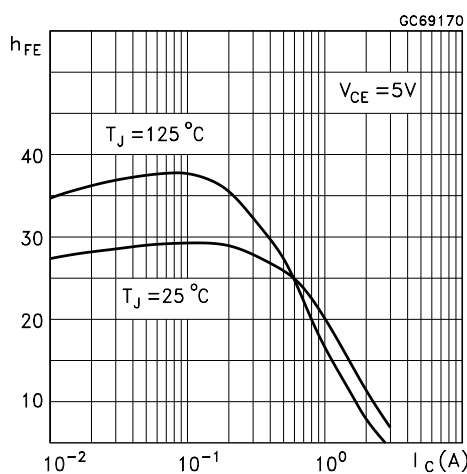


Figure 6: Derating Curve

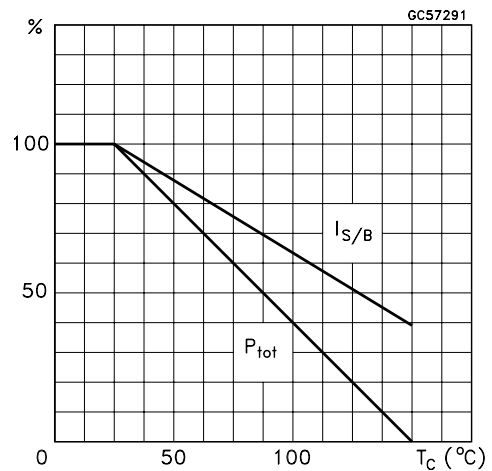


Figure 7: DC Current Gain

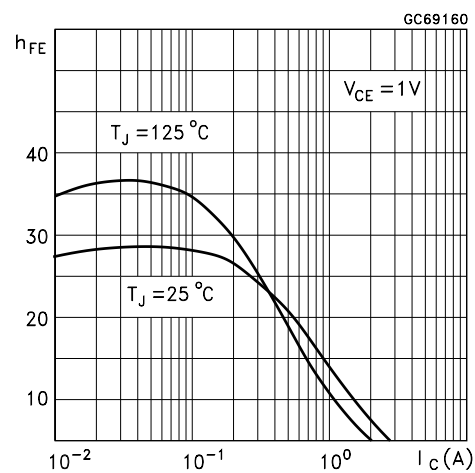


Figure 8: Collector-Emitter Saturation Voltage

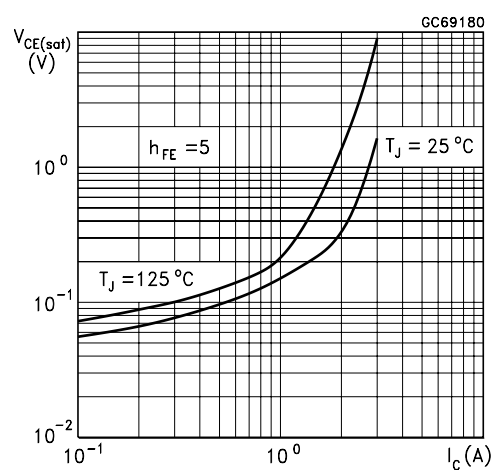


Figure 9: Base-Emitter Saturation Voltage

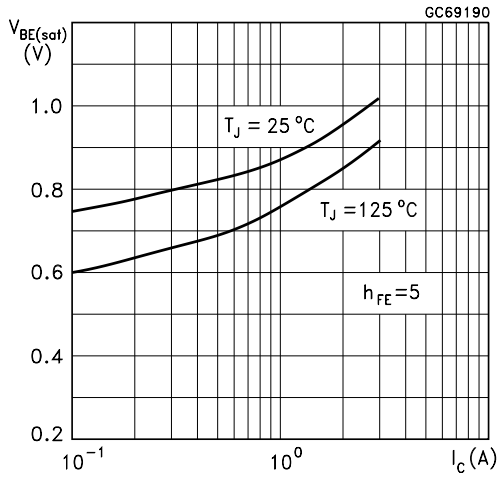


Figure 10: Resistive Load Fall Time

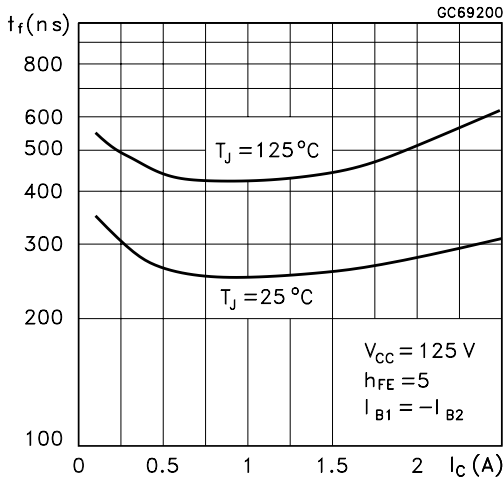


Figure 11: Inductive Load Fall Time

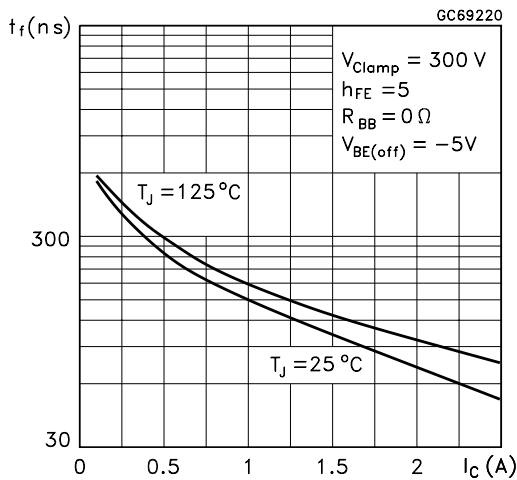


Figure 12: Resistive Load Storage Time

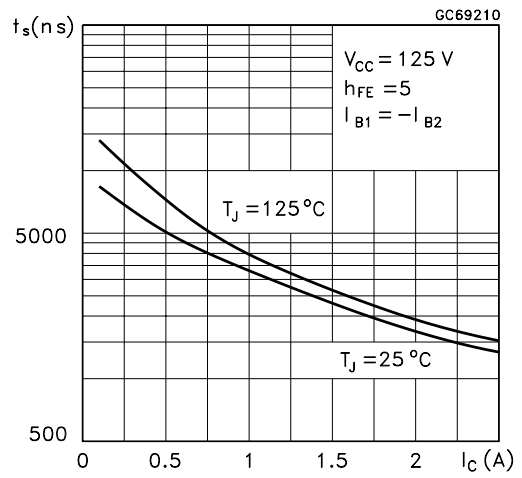


Figure 13: Inductive Load Storage Time

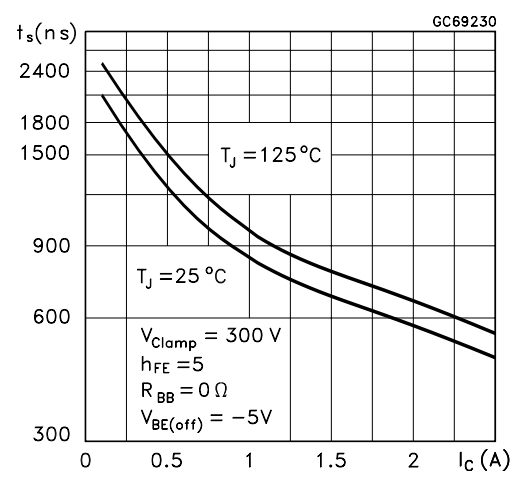


Figure 14: Reverse Biased Safe Operating Area

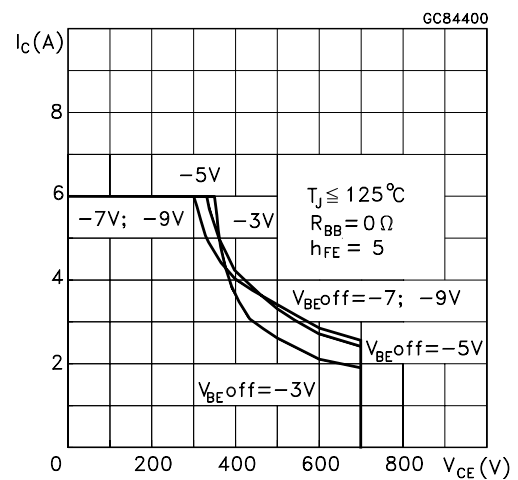


Figure 15: Inductive Load Switching Test Circuit

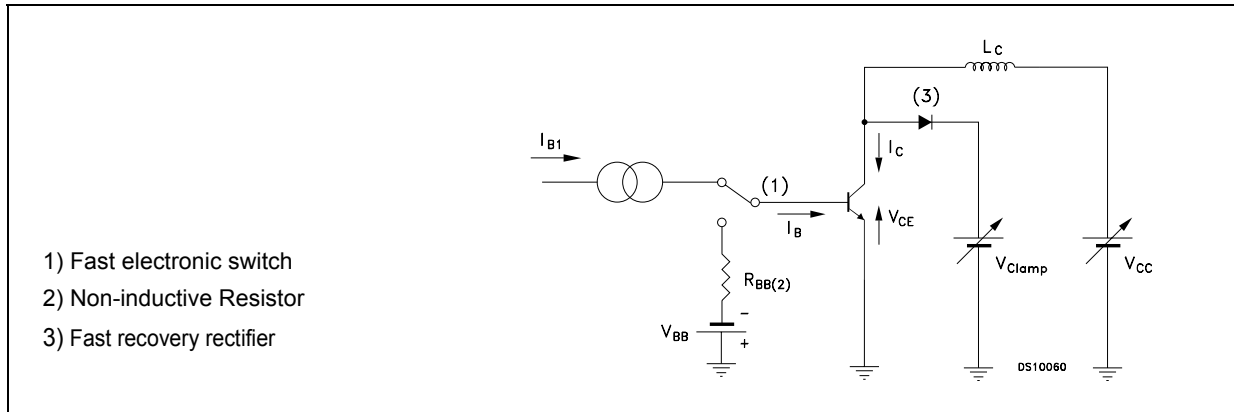
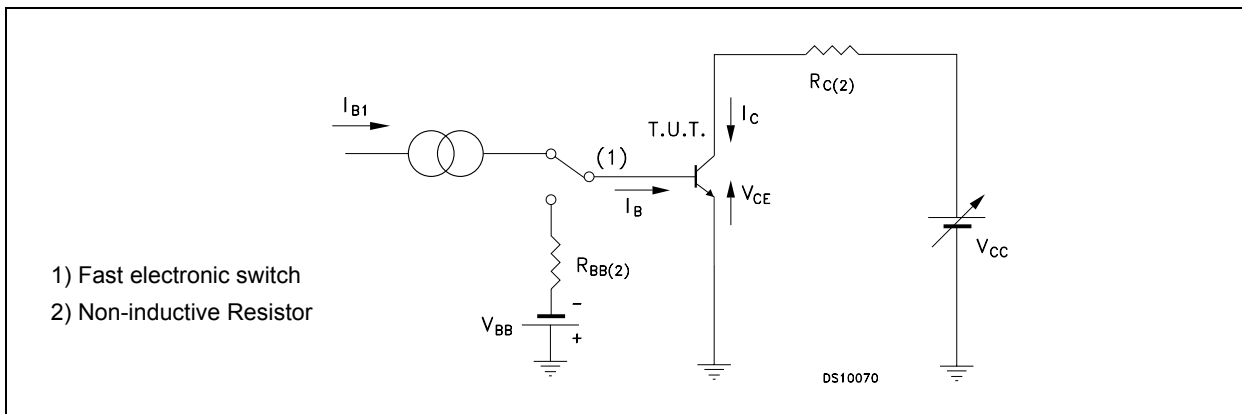
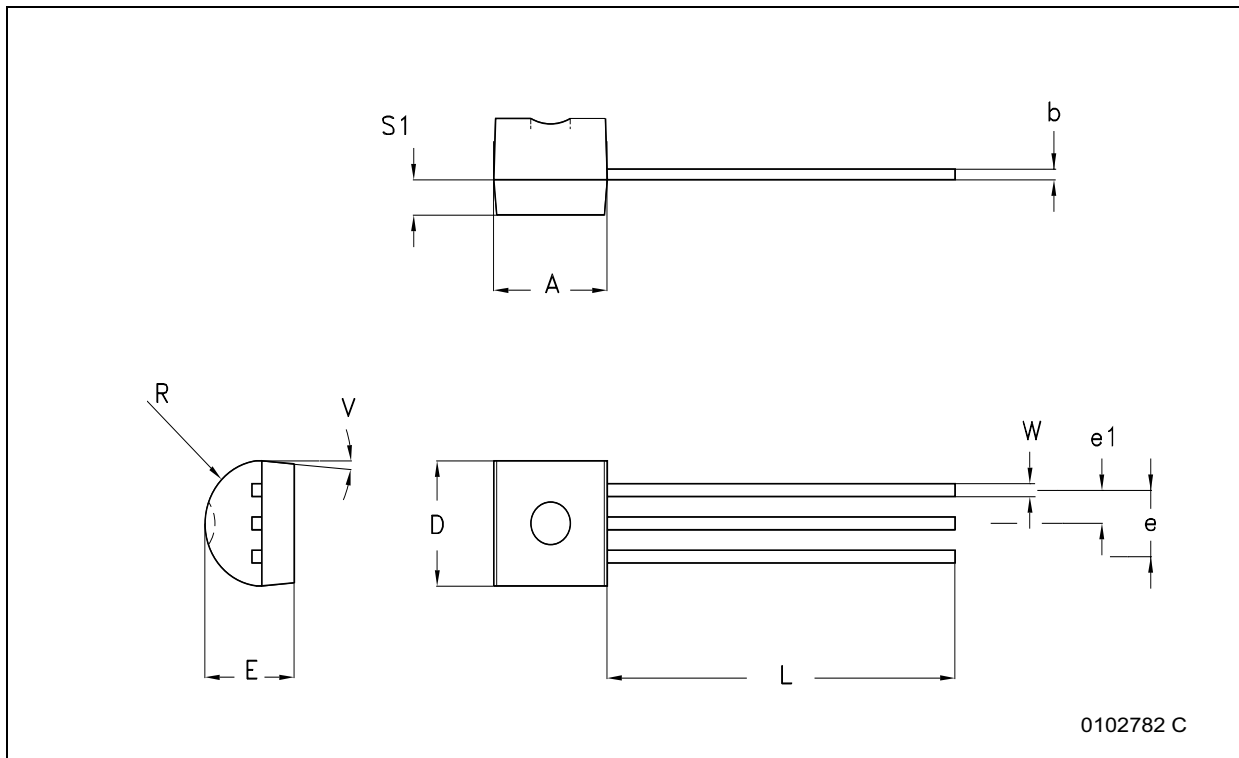


Table 16: Resistive Load Switching Test Circuit



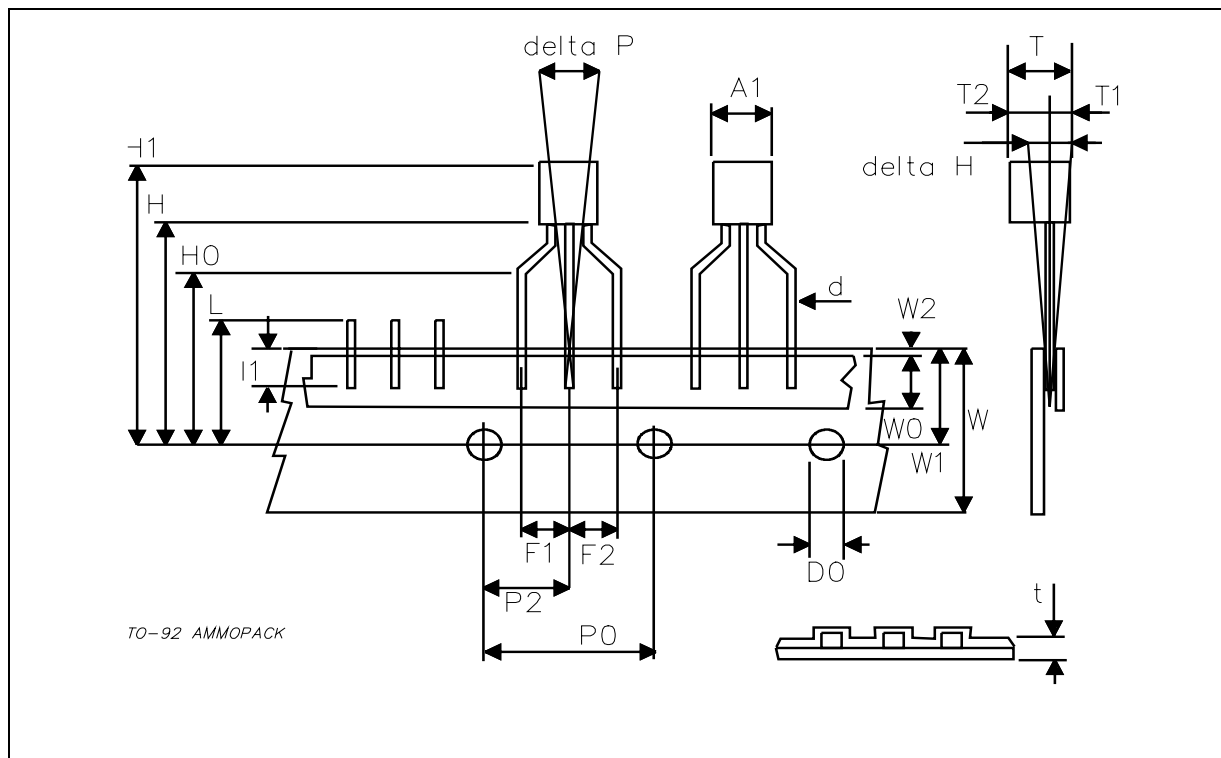
**TO-92 BULK SHIPMENT MECHANICAL DATA**

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-92 AMMOPACK SHIPMENT (Suffix"-AP") 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
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
H0	15.50	16.00	16.50
H1			25.00
D0	3.80	4.00	4.20
t			0.90
L			11.00
I1	3.00		
delta P	-1.00		1.00



**Table 5: Revision History**

<b>Date</b>	<b>Release</b>	<b>Change Designator</b>
01-Jul-2004	1	First Release.
11-Feb-2005	2	New table on page 1.



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