

### Features

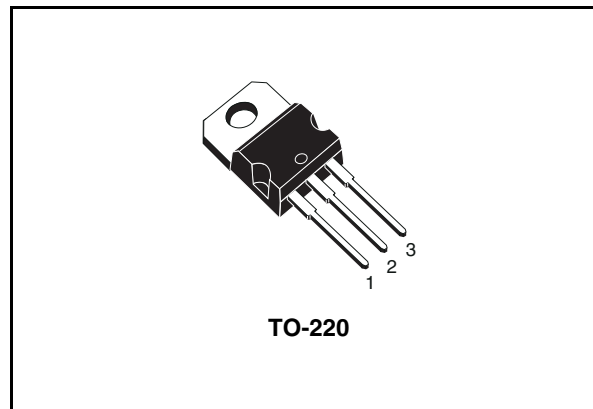
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

### Applications

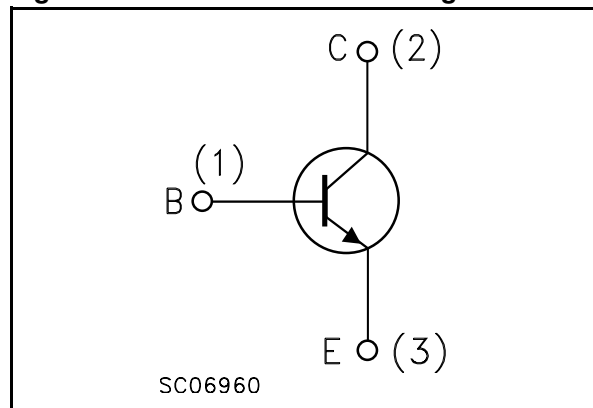
- Electronic ballast for fluorescent lighting
- Switch mode power supplies

### Description

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



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking <sup>(1)</sup>	Package	Packaging
ST13005	13005A	TO-220	Tube
ST13005	13005B	TO-220	Tube

1. Product is pre-selected in DC current gain (group A and group B). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

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# 1 Electrical ratings

**Table 2. Absolute maximum rating**

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 ( $I_C = 0$ )	9	V
$I_C$	Collector current	4	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ms}$ )	8	A
$I_B$	Base current	2	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ms}$ )	4	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	75	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

## 2 Electrical characteristics

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

**Table 3. Electrical characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 700 \text{ V}$			1	mA
		$V_{\text{CE}} = 700 \text{ V}$ $T_{\text{C}} = 125^{\circ}\text{C}$			5	mA
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 9 \text{ V}$			1	mA
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10 \text{ mA}$	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 0.2 \text{ A}$			0.5	V
		$I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 0.5 \text{ A}$			0.6	V
		$I_{\text{C}} = 4 \text{ A}$ $I_{\text{B}} = 1 \text{ A}$			1	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 0.2 \text{ A}$			1.2	V
		$I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 0.5 \text{ A}$			1.6	V
$h_{\text{FE}}^{(1)(2)}$	DC current gain	$I_{\text{C}} = 1 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$				
		Group A	15		32	
		Group B	27		45	
		$I_{\text{C}} = 2 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$	8		40	
$t_{\text{s}}$	Resistive load	$I_{\text{C}} = 2 \text{ A}$ $V_{\text{CC}} = 125 \text{ V}$				
	Storage time	$I_{\text{B1}} = - I_{\text{B2}} = 0.4 \text{ A}$	1.5		3	$\mu\text{s}$
$t_{\text{f}}$	Fall time	$t_{\text{p}} = 30 \mu\text{s}$		0.2		$\mu\text{s}$

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

2. Product is pre-selected in DC current gain (group A and group B). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

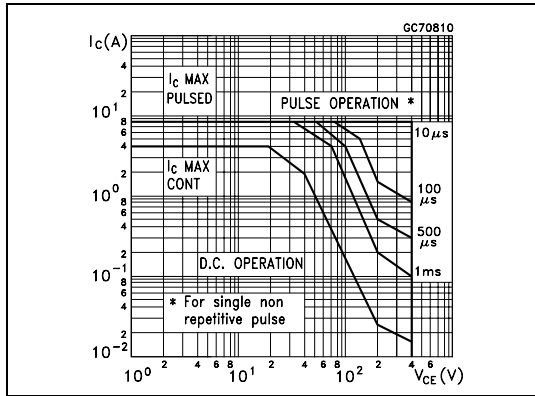


Figure 3. Derating curve

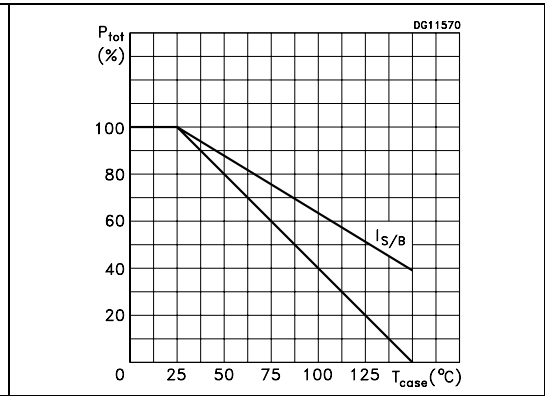


Figure 4. DC current gain

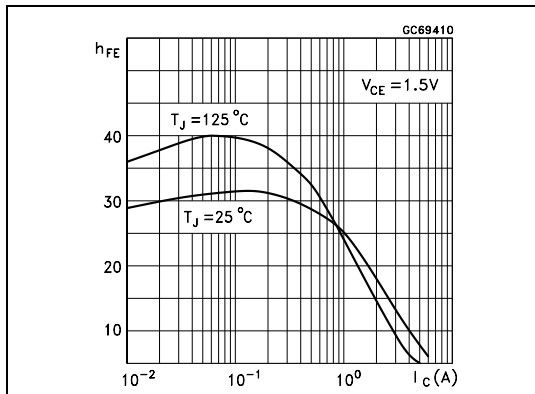


Figure 5. DC current gain

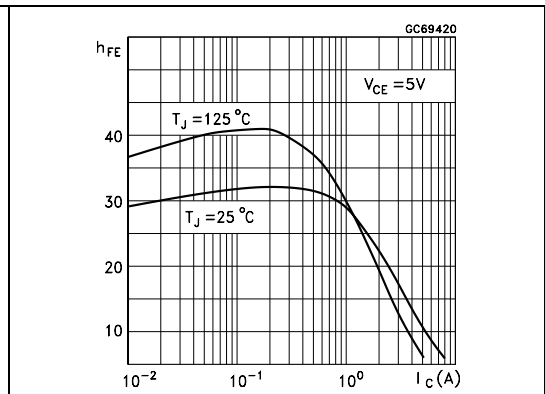


Figure 6. Collector-emitter saturation voltage

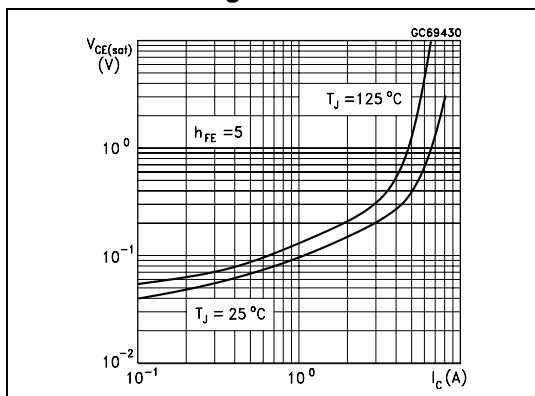


Figure 7. Base-emitter saturation voltage

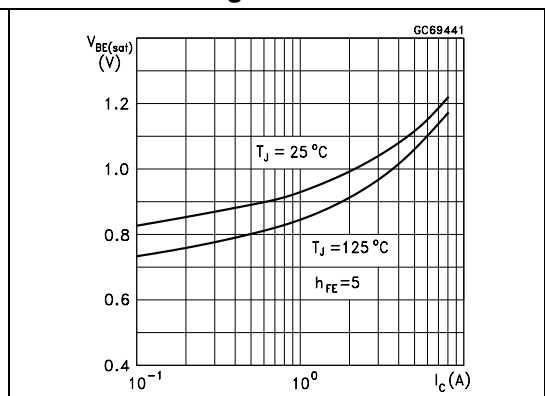


Figure 8. Inductive load fall time

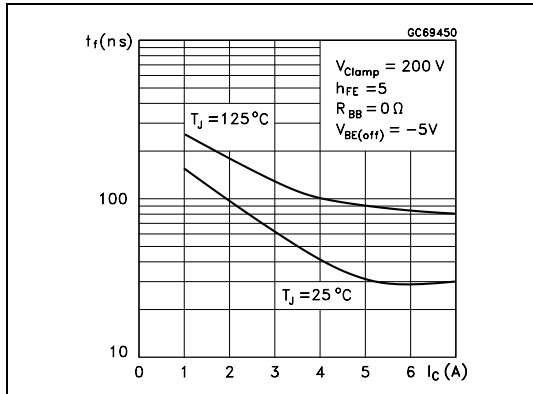


Figure 9. Inductive load storage time

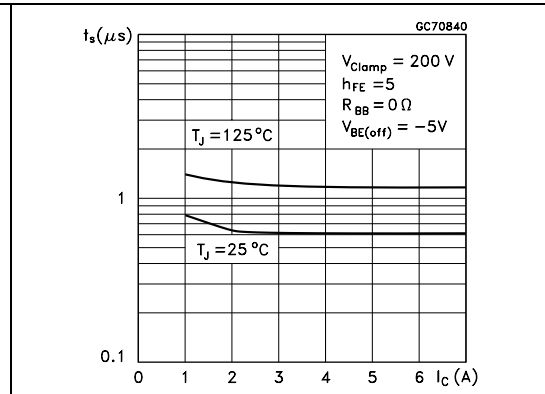


Figure 10. Resistive load fall time

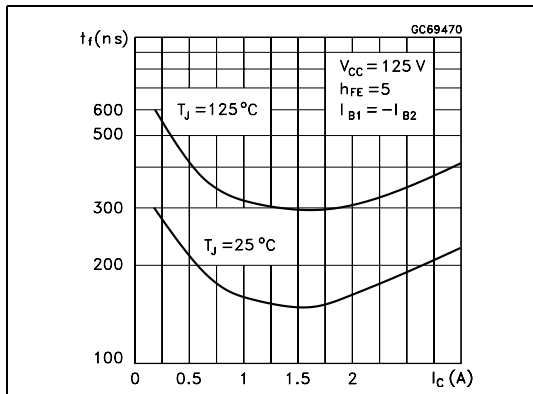


Figure 11. Resistive load storage time

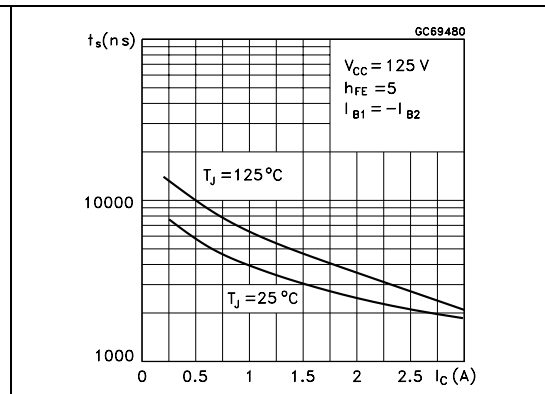
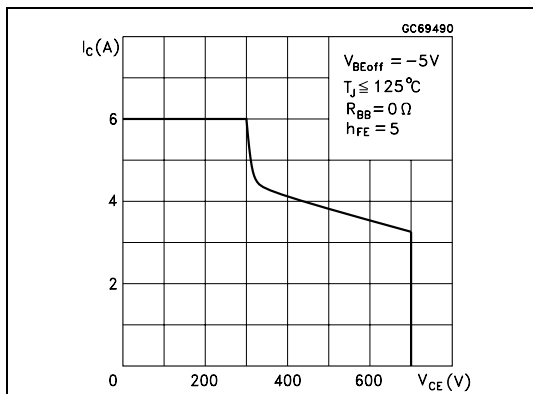


Figure 12. Reverse biased operating area



### 3 Test circuit

Figure 13. Inductive load switching test circuit

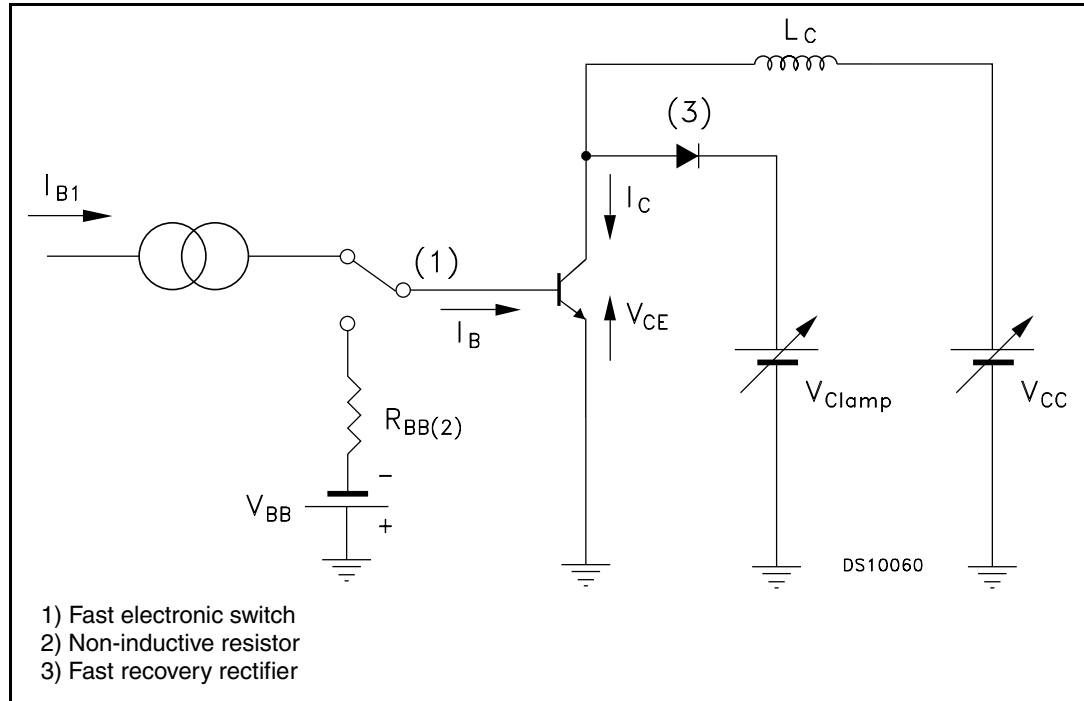
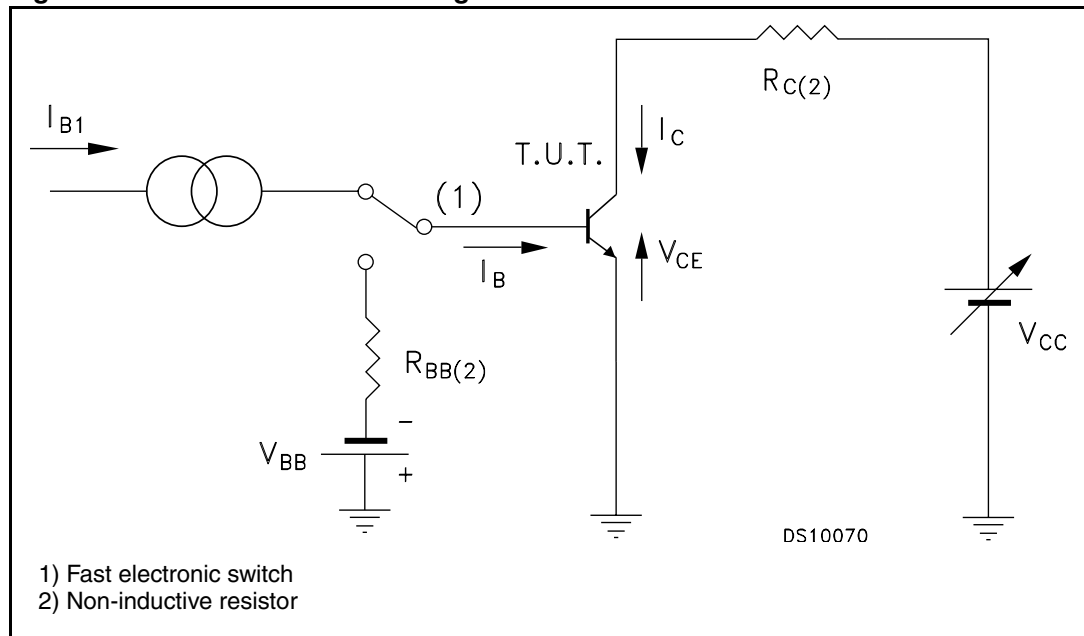


Figure 14. Resistive load switching test circuit



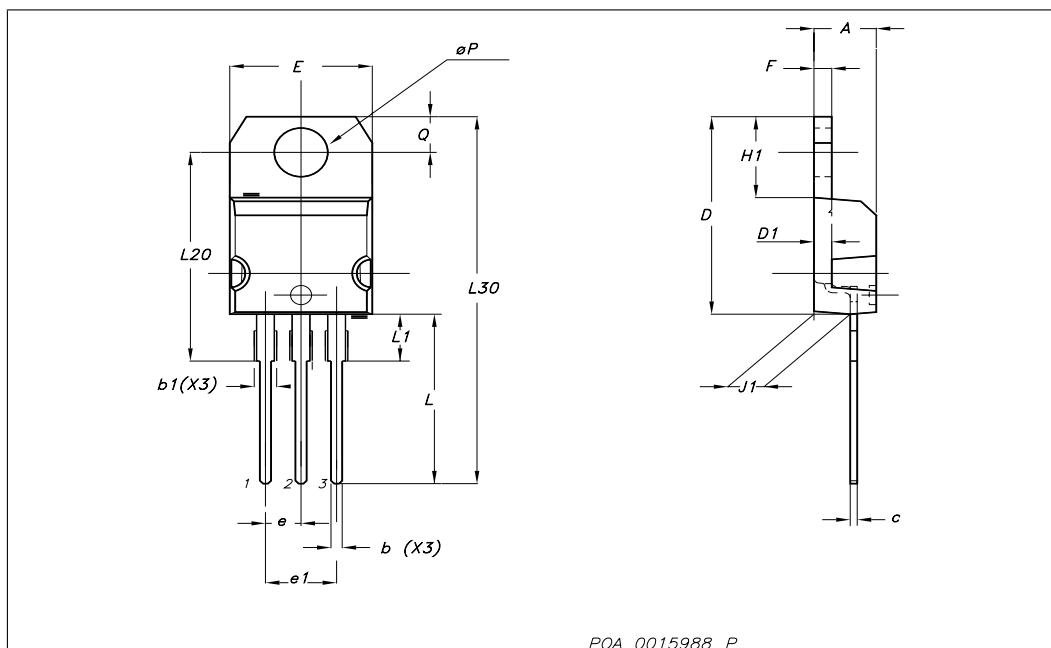
## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)



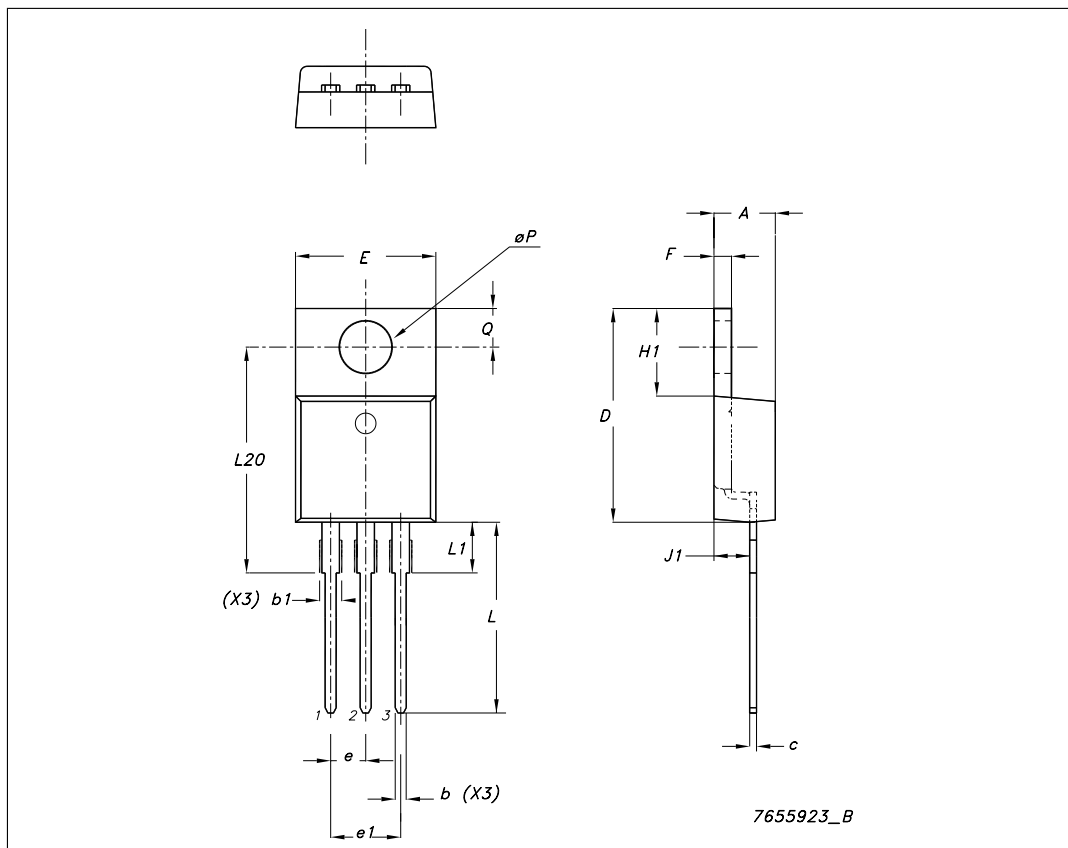
## TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



TO-220 (option 1) mechanical data

Dim	mm		
	Min	Typ	Max
A	4.47		4.67
b	0.70		0.91
b1	1.17		1.37
c	0.31		0.53
D	14.60		15.70
E	9.96		10.36
e		2.54	
e1	4.98	5.08	5.18
F	1.17		1.37
H1	6.10		6.80
J1	2.52		2.82
L	12.70		13.80
L1	3.20		3.96
L20	15.21		16.77
øP	3.73		3.94
Q	2.59		2.89



## 5 Revision history

**Table 4. Document revision history**

Date	Revision	Changes
21-Jun-2004	6	
22-Aug-2007	7	Updated mechanical data <a href="#">on page 10</a> according to PCN APM-PWR/07/2804
12-Oct-2007	8	Updated marking in <a href="#">Table 1</a>

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