Contents

1 Electrical ratings

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{BE} = 0)	1050	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	400	V
V_{EBO}	Emitter-base voltage (I_C = 0, I_B = 2 A, t_P < 10ms)	$V_{(BR)EBO}$	V
I_C	Collector current	2.5	A
I_{CM}	Collector peak current (t_P < 5 ms)	5	A
I_B	Base current	1.5	A
I_{BM}	Base peak current (t_P < 5ms)	3	A
P_{tot}	Total dissipation at T_c = 25 °C for TO-220	60	W
	Total dissipation at T_c = 25 °C for TO-220FP	30	
T_{stg}	Storage temperature	-65 to 150	°C
T_J	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	TO-220	TO-220FP	Unit
R_{thJC}	Thermal resistance junction-case max	2.08	4.17	°C/W

2 Electrical characteristics

T_{case} = 25 °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} = 1050 V		0.2	10	µA
I_{CEO}	Collector cut-off current (I_B = 0)	V_{CE} = 400 V		10	250	µA
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C = 0)	I_E = 1 mA	15	19	24	V
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C = 10 mA	400	450		V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 0.7 A I_B = 0.14 A I_C = 2 A I_B = 0.6 A		0.15 0.5	0.5 1.5	V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 2 A I_B = 0.6 A		1.1	1.5	V
h_{FE}	DC current gain	I_C = 0.1 A V_{CE} = 5 V I_C = 0.45 A V_{CE} = 3 V	48 25	70 35	100 50	
t_s t_f	Resistive load Storage time Fall time	V_{CC} = 125 V I_C = 1 A $I_{B(on)}$ = -$I_{B(off)}$ = 0.2 A t_p = 300 µs $V_{BB(off)}$ = - 5 V		 2.5 350	 3.5 500	 µs ns
E_{ar}	Repetitive avalanche energy	L = 2 mH C = 1.8 nF $V_{BB(off)}$ = - 5V	5			mJ

1. Pulse test: pulse duration ≤300 µs, duty cycle ≤2 %

2.1 Typical characteristic

Figure 2. Safe operating area

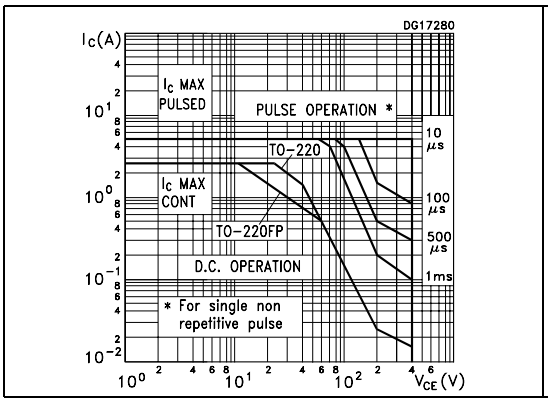


Figure 3. Derating curve

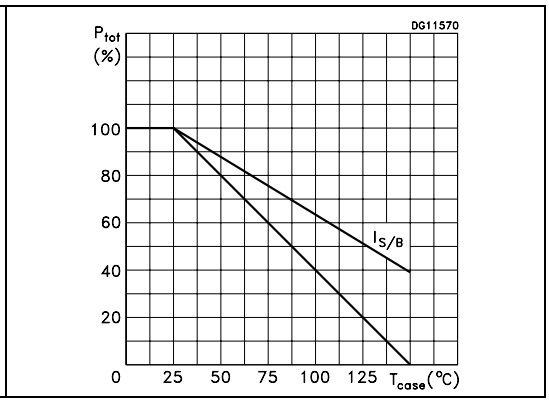


Figure 4. Output characteristics

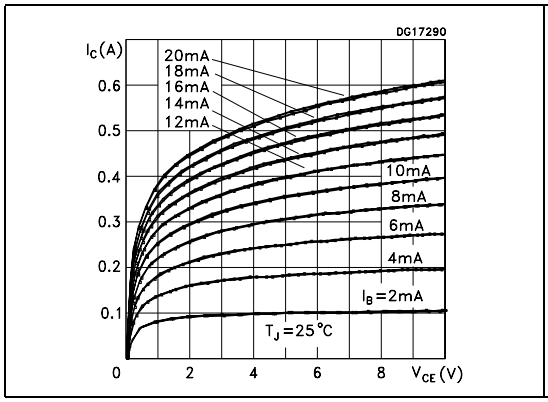


Figure 5. Reverse biased safe operating area

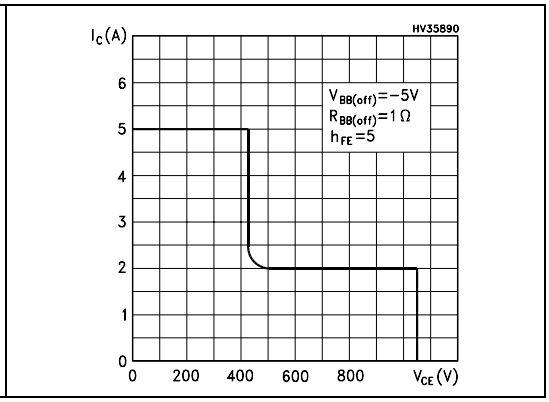


Figure 6. DC current gain (V_{CE} = 3 V)

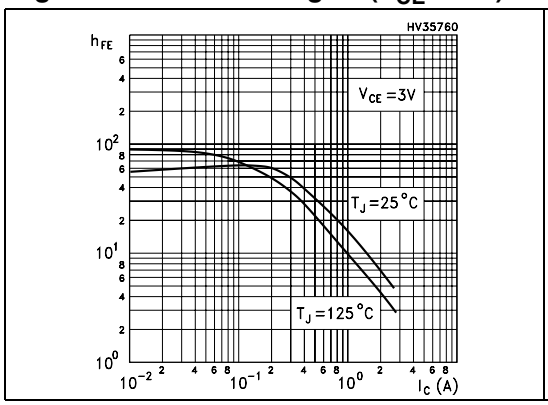


Figure 7. DC current gain (V_{CE} = 5 V)

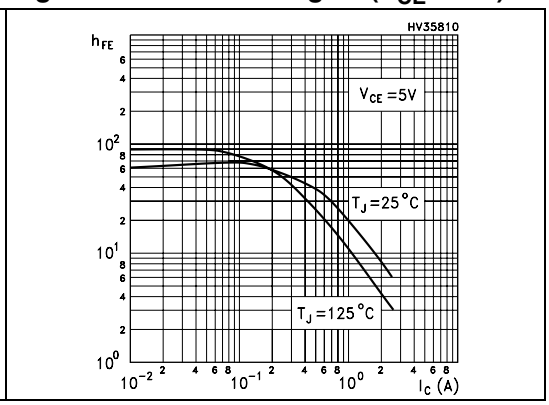


Figure 8. Base-emitter saturation voltage

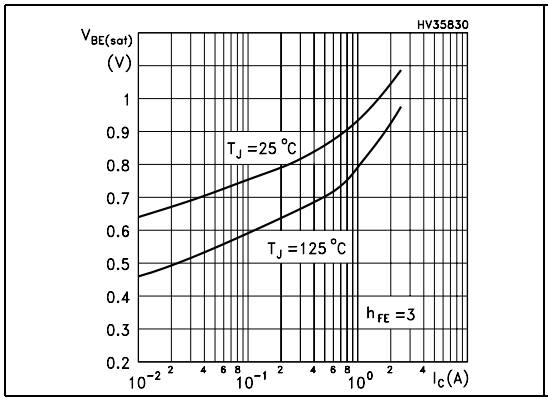


Figure 9. Collector-emitter saturation voltage

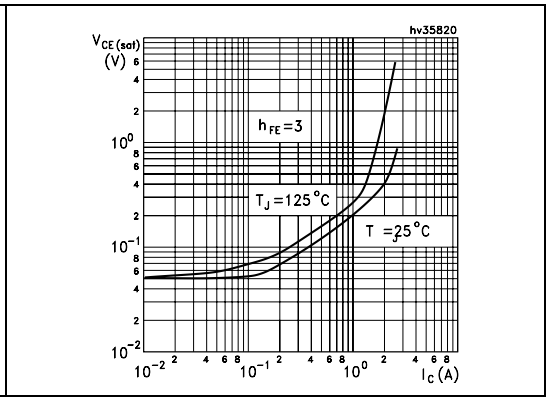


Figure 10. Resistive load switching on (h_{FE} = 5)

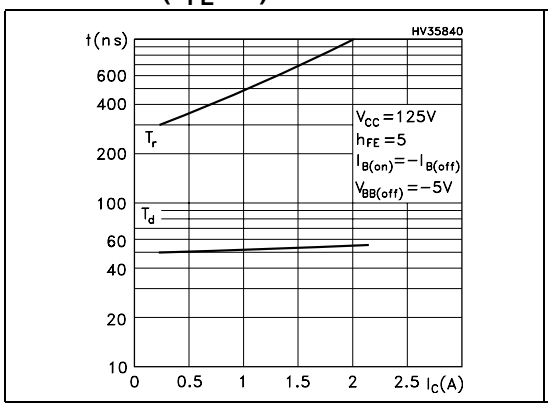


Figure 11. Resistive load switching on (h_{FE} = 10)

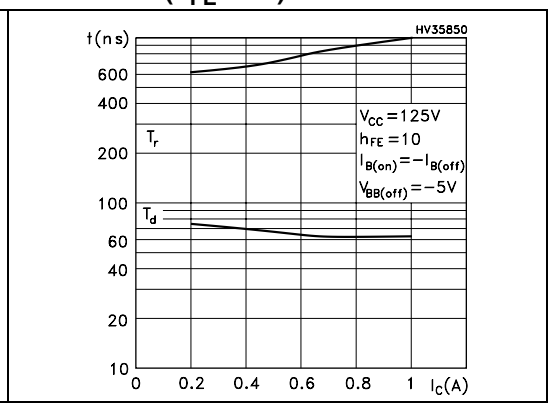


Figure 12. Resistive load switching off (h_{FE} = 5)

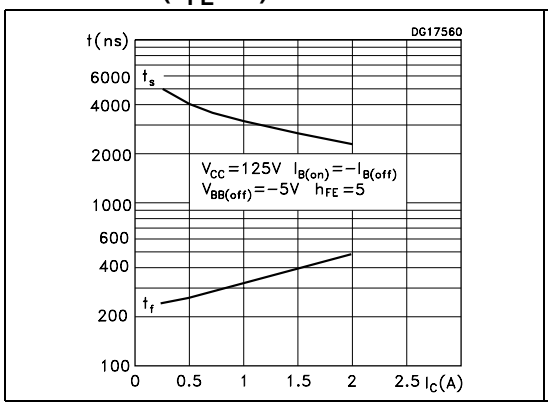
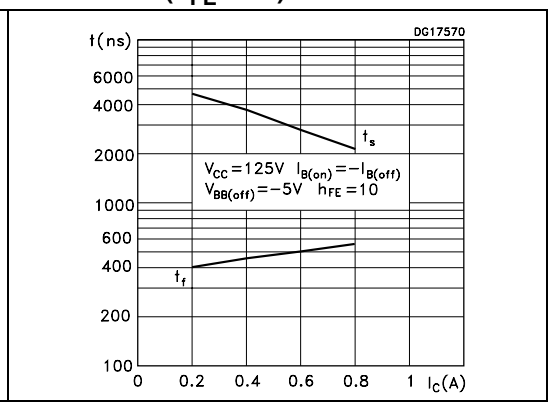
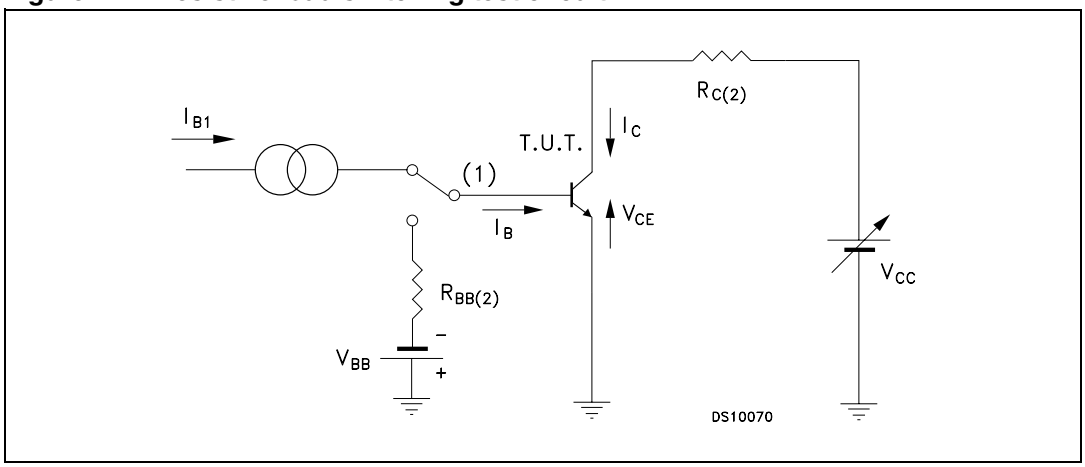


Figure 13. Resistive load switching off (h_{FE} = 10)



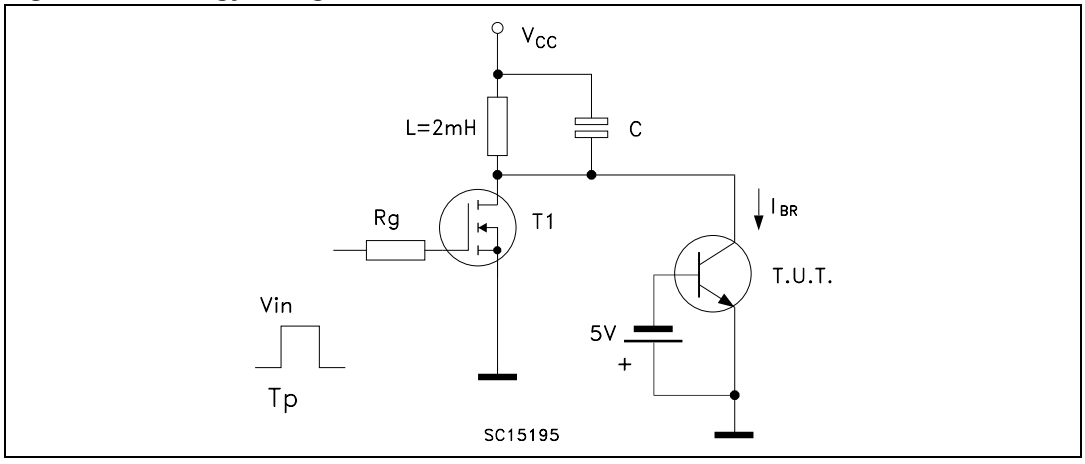
2.2 Test circuits

Figure 14. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

Figure 15. Energy rating test circuit



3 Package mechanical data

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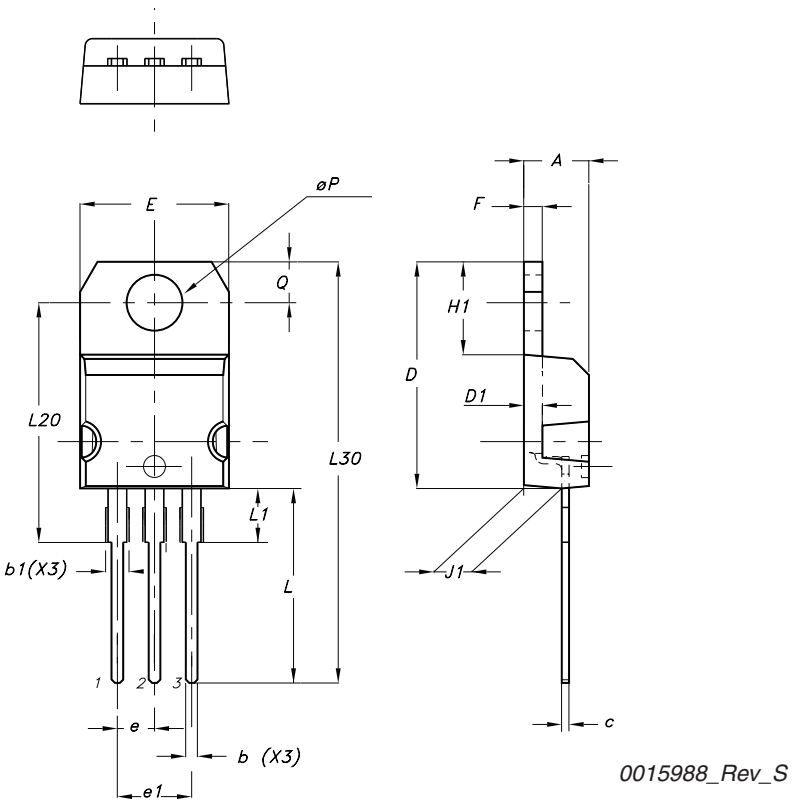
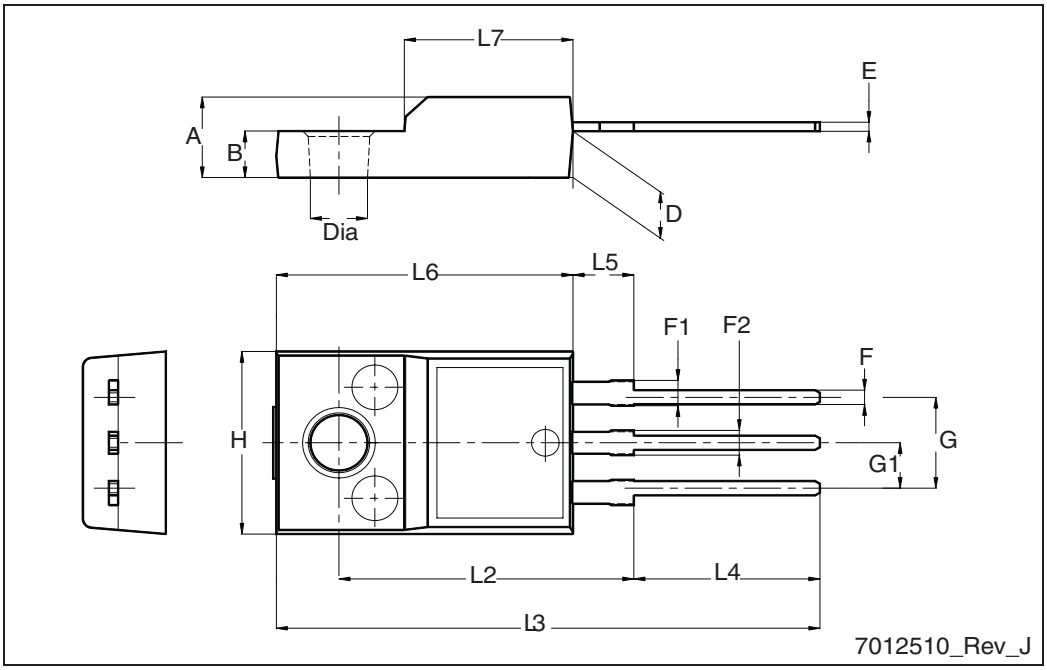
TO-220 type A mechanical data

Dim	mm		
	Min	Typ	Max
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95



TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.5
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
11-Apr-2007	1	Initial release.
10-Jul-2007	2	Figure 12 and 13 have been updated.
18-Aug-2009	3	Added new package TO-220FP and mechanical data.

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