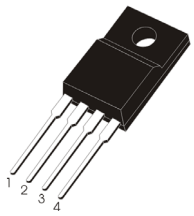
STP12IE90F4

Emitter Switched Bipolar Transistor
ESBT® 900 V - 12 A - 0.083 Ω

General features

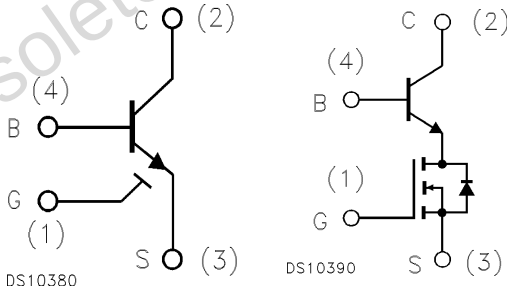
$V_{CS(ON)}$	I_C	$R_{CS(ON)}$
1V	12A	0.083 Ω

- High voltage / high current Cascode configuration
- Low equivalent on resistance
- Very fast-switch up to 150 kHz
- Squared RBSOA up to 900V
- Very low C_{iss} driven by R_G = 47Ω
- Very low turn-off cross over time



TO220FP-4L

Internal schematic diagrams



Applications

- Flyback SMPS for adapter
- Flyback / forward SMPS for desktop

Description

The STP12IE90F4 is manufactured in Monolithic ESBT Technology, aimed to provide best performances in high frequency / high voltage applications.

It is designed for use in Gate Driven based topologies.

Order codes

Part Number	Marking	Package	Packing
STP12IE90F4	P12IE90F4	TO220FP-4L	Tube

Contents

1 Electrical ratings

Table 1. Absolute maximum rating

Symbol	Parameter	Value	Unit
$V_{CS(SS)}$	Collector-source voltage (V_{BS} = V_{GS} = 0 V)	900	V
$V_{BS(OS)}$	Base-source voltage (I_C = 0, V_{GS} = 0 V)	30	V
$V_{SB(OS)}$	Source-base voltage (I_C = 0, V_{GS} = 0 V)	17	V
V_{GS}	Gate-source voltage	± 17	V
I_C	Collector current	12	A
I_{CM}	Collector peak current (t_P < 5ms)	36	A
I_B	Base current	6	A
I_{BM}	Base peak current (t_P < 5ms)	10	A
P_{tot}	Total dissipation at T_c = 25°C	21	W
T_{stg}	Storage temperature	-40 to 150	°C
T_J	Max. operating junction temperature	150	°C

Table 2. Thermal data

Symbol	Parameter		Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	max	6	°C/W

2 Electrical characteristics

(T_{case} = 25°C unless otherwise specified)

Table 3. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CS(SS)}$	Collector-source current (V_{BS} = V_{GS} = 0)	V_{CE} = 900V			100	µA
$I_{BS(OS)}$	Base-source current (I_C = 0, V_{GS} = 0)	$V_{BS(OS)}$ = 30V			10	µA
$I_{SB(OS)}$	Source-base current (I_C = 0, V_{GS} = 0)	$V_{SB(OS)}$ = 17V			100	µA
$I_{GS(OS)}$	Gate-source leakage	V_{GS} = ± 17V			100	nA
$V_{CS(ON)}$	Collector-source ON voltage	V_{GS} = 10V I_C = 12A I_B = 2.4A V_{GS} = 10V I_C = 6A I_B = 0.6A		1 0.6		V V
h_{FE}	DC current gain	V_{GS} = 10V I_C = 12A V_{CS} = 1V V_{GS} = 10V I_C = 6A V_{CS} = 1V		5 15		
$V_{BS(ON)}$	Base Source ON voltage	V_{GS} = 10V I_C = 12A I_B = 2.4A V_{GS} = 10V I_C = 6A I_B = 0.6A		1.5 1.2		V V
$V_{GS(th)}$	Gate threshold voltage	V_{BS} = V_{GS} I_B = 250µA	2	3	4	V
C_{iss}	Input capacitance	V_{CS} =25V f =1MHz V_{GS}=0V		520		pF
$Q_{GS(tot)}$	Gate-source Charge	V_{CS}=25V V_{GS}=10V V_{CB}=0V I_C =4A		21.3		nC
t_s t_f	INDUCTIVE LOAD Storage time Fall time	V_{GS} =10V R_G =47Ω V_{Clamp} =720V t_p =4µs I_C =6A I_B =1.2A		610 10		ns ns
t_s t_f	INDUCTIVE LOAD Storage time Fall time	V_{GS} =10V R_G =47Ω V_{Clamp} =720V t_p =4µs I_C =6A I_B =0.6A		360 10		ns ns
V_{CSW}	Maximum collector-source voltage switched without snubber	R_G =47Ω h_{FE} =5 I_C = 12A	900			V

Table 3. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CS(dyn)}$	Collector-source dynamic voltage (500ns)	V_{CC} =V_{Clamp} =400V V_{GS} =10V I_C = 6A I_B = 1.2A t_{peak} =500ns R_G =47Ω I_{Bpeak} = 6A (I_C)		3.37		V
$V_{CS(dyn)}$	Collector-source dynamic voltage (1µs)	V_{CC} =V_{Clamp} =400V V_{GS} =10V I_C = 6A I_B = 1.2A t_{peak} =500ns R_G =47Ω I_{Bpeak} = 6A (I_C)		1.75		V

2.1 Electrical characteristics (curves)

Figure 1. DC current gain

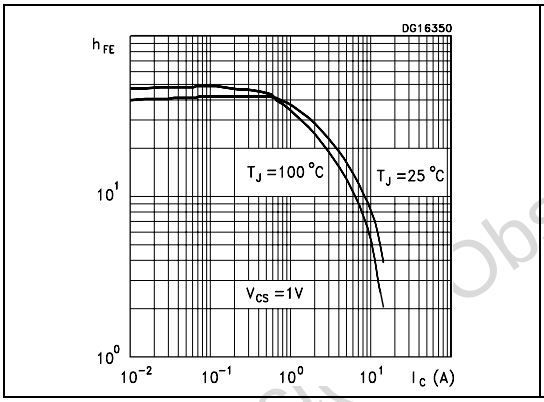


Figure 2. Collector-source On voltage

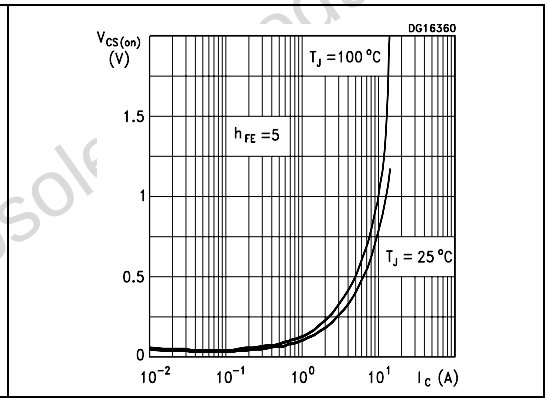


Figure 3. Collector-source On voltage

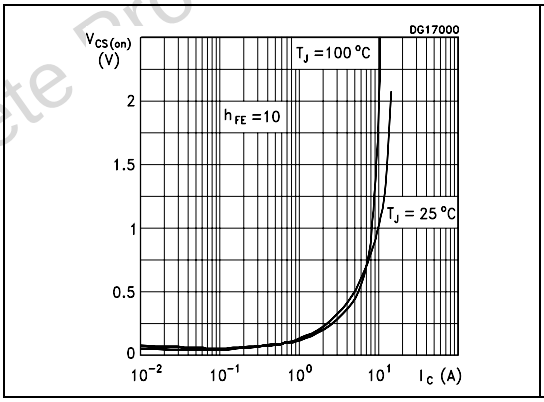


Figure 4. Base-source On voltage

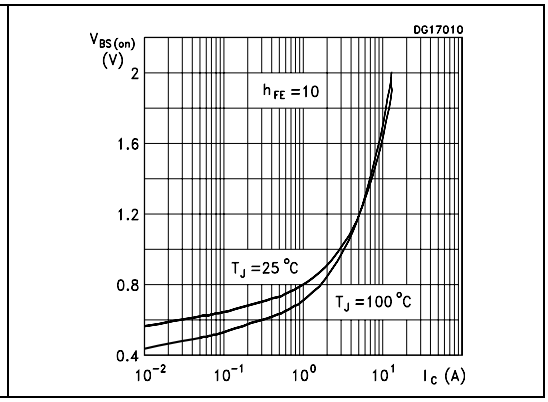


Figure 5. Reverse biased SOA

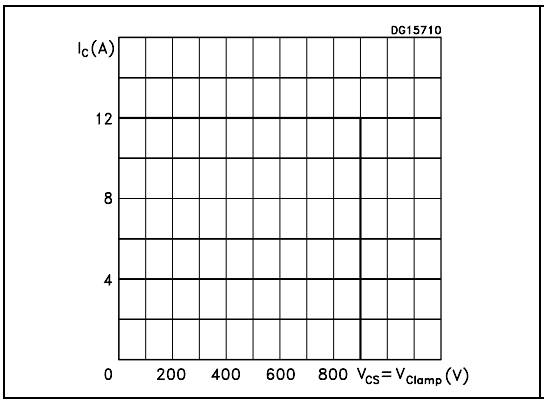


Figure 6. Dynamic collector-emitter voltage

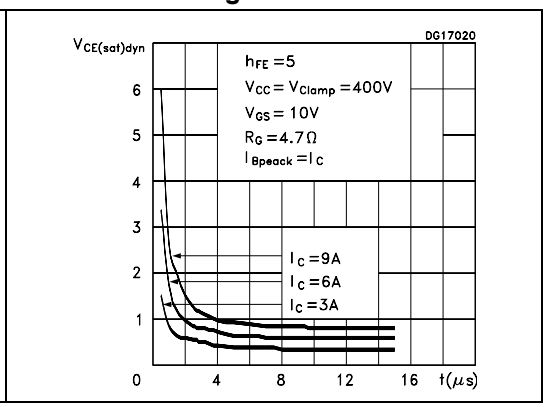


Figure 7. Inductive load switching time

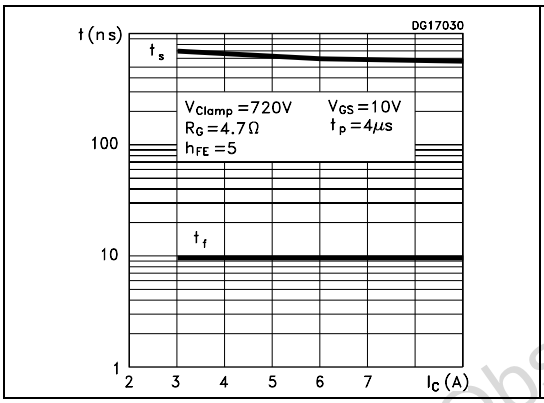
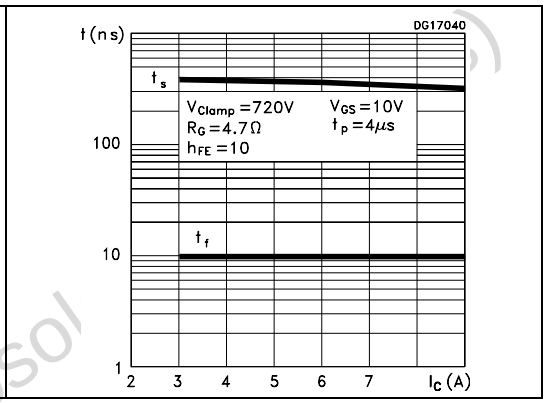


Figure 8. Inductive load switching time



2.2 Test circuits

Figure 9. Static $V_{CS(ON)}$ test circuits

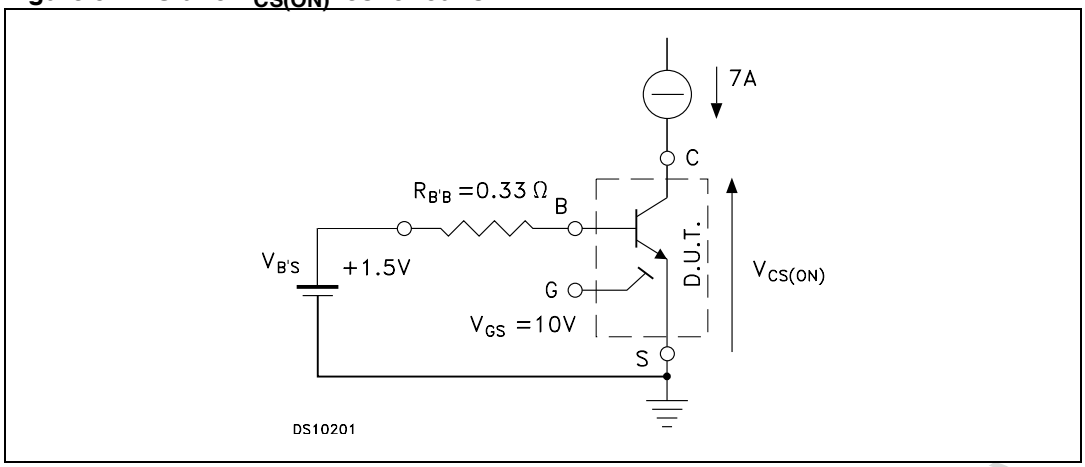
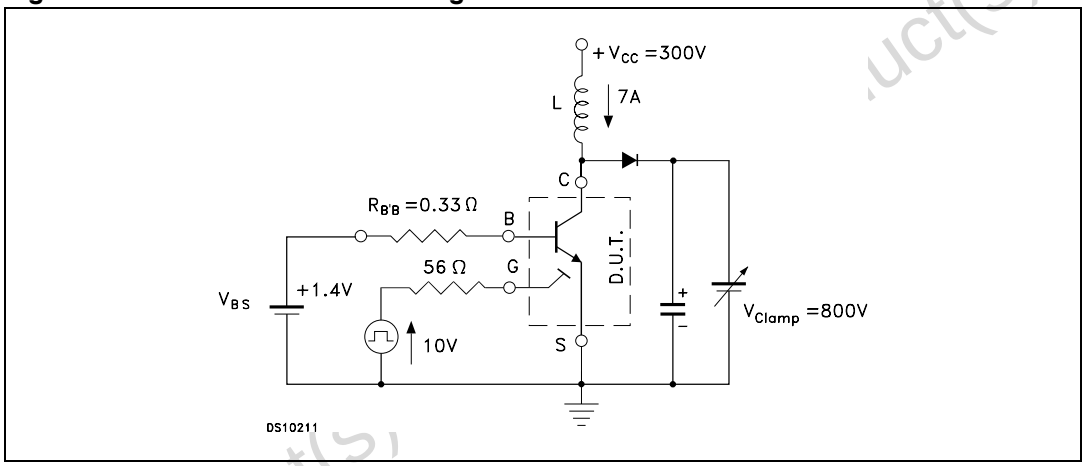


Figure 10. Inductive load switching and RBSOA test circuit

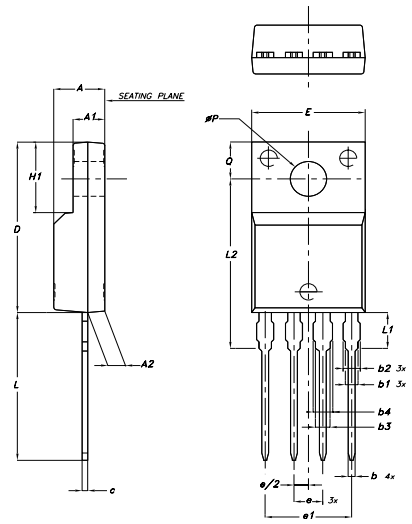


3 Package mechanical data

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

TO220FP-4L MECHANICAL DATA

DIM.	mm.		
	MIN.	TYP	MAX.
A	4.30		4.70
A1	2.60		3
A2	1.30	1.50	1.70
b	0.50		0.70
b1	1.05		
b2			1.30
b3	1.25		
b4			1.50
c	0.45	0.50	0.60
D	15.50		15.90
E	9.80		10.20
e	2.29	2.54	2.79
e1		7.62	
H1	6.30		6.70
L		13.60	
L1		3.30	
L2	15.40		15.80
Dia P	3		3.40
Q	3.30		3.50



4 Revision history

Table 4. Revision history

Date	Revision	Changes
28-Jul-2006	1	Initial release.
16-Jan-2007	2	New graphics

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