

Hybrid emitter switched bipolar transistor ESBT® 900 V - 20 A - 0.06 Ω

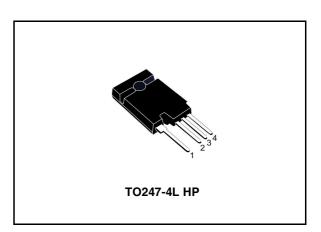
Preliminary Data

General features

Table 1. General features

V _{CS(ON)}	Ic	R _{CS(ON)}
1.2 V	20 A	0.06 Ω

- Low equivalent on resistance
- Very fast-switch, up to 150 kHz
- Squared RBSOA, up to 900 V
- Very low C_{ISS} driven by $R_G = 47 \Omega$
- In compliance with the 2002/93/EC European Directive



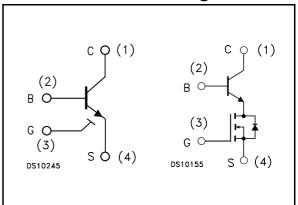
Description

The STC20DE90HP is manufactured in a hybrid structure, using dedicated high voltage Bipolar and low voltage MOSFET technologies, aimed to providing the best performance in ESBT topology. The STC20DE90HP is designed for use in power supply forward converter and three-phase power factor corrector applications.

Applications

- SMPS forward converter
- Three-phase power factor corrector

Internal schematic diagrams



Order codes

Part Number	Marking	Package	Packing	
STC20DE90HP	C20DE90HP	TO247-4L HP	Tube	

October 2006 Rev 1 1/11

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STC20DE90HP Electrical ratings

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CS(SS)}	Collector-source voltage (V _{BS} =V _{GS} =0V)	900	V
V _{BS(OS)}	Base-source voltage (I _C =0, V _{GS} =0V)	30	V
V _{SB(OS)}	Source-base voltage (I _C =0, V _{GS} =0V)	9	V
V _{GS}	Gate-source voltage	±20	V
I _C	Collector current	20	Α
I _{CM}	Collector peak current (t _P < 5ms)	60	Α
I _B	Base current	5	Α
I _{BM}	Base peak current (t _P < 1ms)	20	Α
P _{tot}	Total dissipation at T _c ≤ 25°C	46	W
T _{stg}	Storage temperature	-40 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	2.7	°C/W	

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2 Electrical characteristics

Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _{CS(SS)}	Collector-source current (V _{BS} =V _{GS} =0V)	V _{CS(SS)} =900V			100	μА
I _{BS(OS)}	Base-source current (I _C =0, V _{GS} =0V)	V _{BS(OS)} =30V			10	μΑ
I _{SB(OS)}	Source-base current (I _C =0, V _{GS} =0V)	V _{SB(OS)} =9V			100	μΑ
I _{GS(OS)}	Gate-source leakage (V _{BS} =0V)	V _{GS} = ± 20V			500	nA
V _{CS(ON)}	Collector-source ON voltage	V _{GS} =10V I _C =20A I _B =4A V _{GS} =10V I _C =10A I _B =1A		1.2 0.65		V V
h _{FE}	DC current gain	V _{CS} =1V V _{GS} =10V I _C =20A V _{CS} =1V V _{GS} =10V I _C =10A		4 12		
V _{BS(ON)}	Base-source ON voltage	V _{GS} =10V I _C =20A I _B =4A V _{GS} =10V I _C =10A I _B =1A		1.8 1.2		V V
V _{GS(th)}	Gate threshold voltage	V _{BS} =V _{GS} I _B =250μA	1.5	2.2	3	٧
C _{iss}	Input capacitance	$V_{CS} = 25V$ f = 1MHz $V_{GS} = V_{CB} = 0V$		750		pF
Q _{GS(tot)}	Gate-source Charge	V _{CS} =25V V _{GS} =10V V _{CB} =0V I _C =20A		12.5		nC
t _s	INDUCTIVE LOAD Storage time Fall time	$\begin{aligned} &V_{GS} = 10V & R_G = 47\Omega \\ &V_{Clamp} = 720V & t_p = 4\mu s \\ &I_C = 10A & I_B = 2A \end{aligned}$		775 7		ns ns
t _s	INDUCTIVE LOAD Storage time Fall time	$V_{GS} = 10V$ $R_G = 47\Omega$ $V_{Clamp} = 720V$ $t_p = 4\mu s$ $I_C = 10A$ $I_B = 1A$		510 5		ns ns
V _{CS(dyn)}	Collector-source dynamic voltage (500ns)	$\begin{aligned} &V_{CC}=&V_{Clamp}=&400V\\ &V_{GS}=&10V & I_{C}=&10A\\ &I_{B}=&2A & R_{G}=&47\Omega\\ &t_{peak}=&500ns & I_{Bpeak}=&10A \end{aligned}$		2.3		٧

Table 4. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{CS(dyn)}	Collector-source dynamic voltage (1µs)	$\begin{aligned} &V_{CC} = &V_{Clamp} = &400 V \\ &V_{GS} = &10 V &I_{C} = &10 A \\ &I_{B} = &2 A &R_{G} = &47 \Omega \\ &t_{peak} = &500 ns &I_{Bpeak} = &10 A \end{aligned}$		1		V
V _{CSW}	Maximum collector- source voltage switched without snubber	$R_G = 47\Omega$ $h_{FE} = 5$ $I_C = 20A$	900			V

Note (1) Pulsed duration = 300 μ s, duty cycle \leq 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

Figure 2. Dynamic collector-source saturation voltage

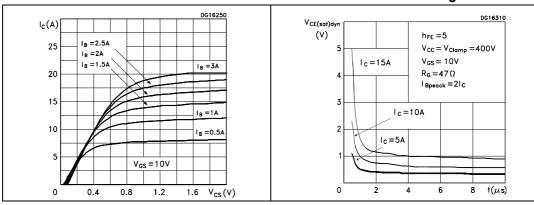
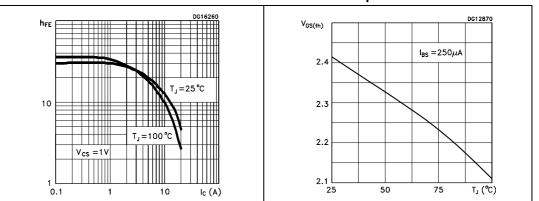


Figure 3. DC current gain

Figure 4. Gate threshold voltage vs temperature



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Figure 5. Collector-source On voltage Figure 6. Collector-source On voltage

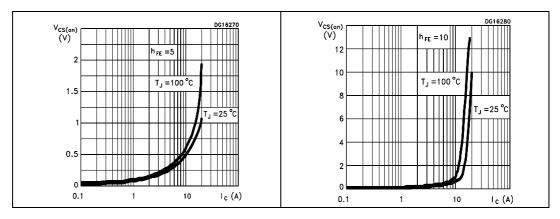


Figure 7. Base-source On voltage

Figure 8. Base-source On voltage

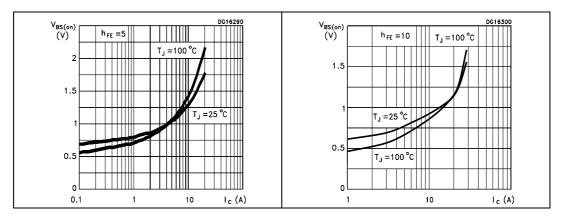
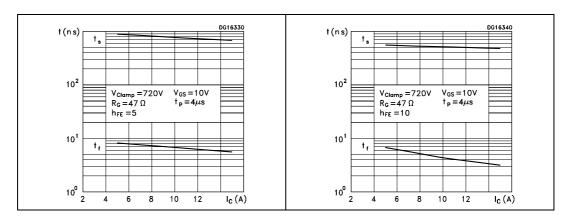
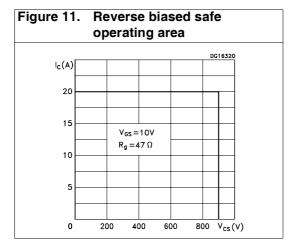


Figure 9. Inductive load switching time Figure 10. Inductive load switching time



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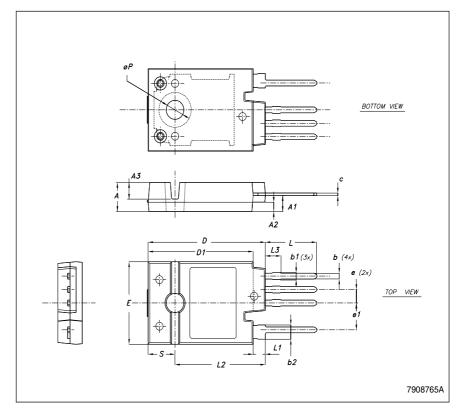
3 Package mechanical data

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

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TO247-4LHP MECHANICAL DATA

DIM.		mm.	
DIWI.	MIN.	TYP	MAX.
Α	5.50	5.65	5.80
A1	2.85	3.15	3.25
A2		1.92	
A3		3.18	
b	0.95	1.10	1.30
b1	1.10		1.50
b2	2.50		2.90
С	0.40		0.80
D	23.85	24	24.15
D1		21.50	
E	15.45	15.60	15.75
е	2.54		
e1		5.08	
L	10.20		10.80
L1	2.20	2.50	2.80
L2		18.50	
L3		3	
øΡ	3.55		3.65
S		5.50	



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Revision history STC20DE90HP

4 Revision history

Table 5. Revision history

Date	Revision	Changes
10-Oct-2006	1	First release.



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