STC20DE90HP

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

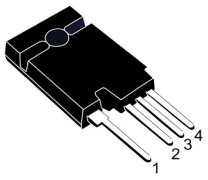
Preliminary Data

General features

Table 1. General features

$V_{CS(ON)}$	I_C	$R_{CS(ON)}$
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 Ω
- In compliance with the 2002/93/EC European Directive

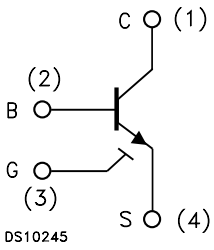


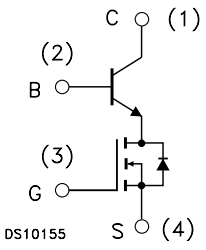
TO247-4L HP

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.

Internal schematic diagrams





Applications

- SMPS forward converter
- Three-phase power factor corrector

Order codes

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

Contents

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	A
I_{CM}	Collector peak current (t_P < 5ms)	60	A
I_B	Base current	5	A
I_{BM}	Base peak current (t_P < 1ms)	20	A
P_{tot}	Total dissipation at $T_c \leq 25°C$	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
$R_{thj\text{-}case}$	Thermal resistance junction-case	max	2.7	°C/W

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CS(SS)}$	Collector-source current (V_{BS} =V_{GS} =0V)	$V_{CS(SS)}$ =900V			100	µA
$I_{BS(OS)}$	Base-source current (I_C =0, V_{GS} =0V)	$V_{BS(OS)}$ =30V			10	µA
$I_{SB(OS)}$	Source-base current (I_C =0, V_{GS} =0V)	$V_{SB(OS)}$ =9V			100	µA
$I_{GS(OS)}$	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	V
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 t_f	INDUCTIVE LOAD Storage time Fall time	V_{GS} =10V R_G =47Ω V_{Clamp} =720V t_p =4µs I_C =10A I_B =2A		775 7		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 =10A I_B =1A		510 5		ns ns
$V_{CS(dyn)}$	Collector-source dynamic voltage (500ns)	V_{CC} =V_{Clamp} =400V V_{GS} =10V I_C =10A I_B = 2A R_G =47Ω t_{peak} =500ns I_{Bpeak} =10A		2.3		V

Table 4. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CS(dyn)}$	Collector-source dynamic voltage (1µs)	V_{CC} =V_{Clamp} =400V V_{GS} =10V I_C =10A I_B = 2A R_G =47Ω t_{peak} =500ns I_{Bpeak} =10A		1		V
V_{CSW}	Maximum collector-source voltage switched without snubber	R_G =47Ω h_{FE} =5 I_C =20A	900			V

Note (1) Pulsed duration = 300 µs, duty cycle ≤1.5%

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

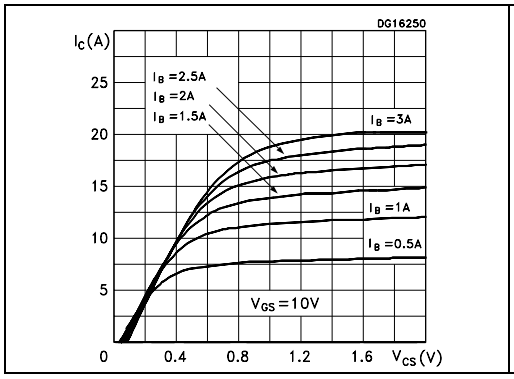


Figure 2. Dynamic collector-source saturation voltage

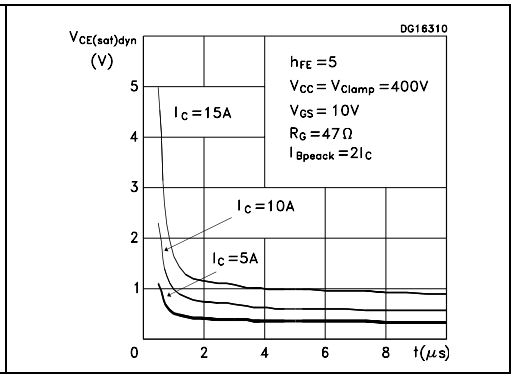


Figure 3. DC current gain

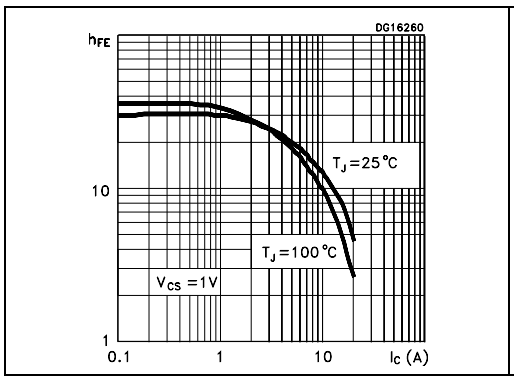


Figure 4. Gate threshold voltage vs temperature

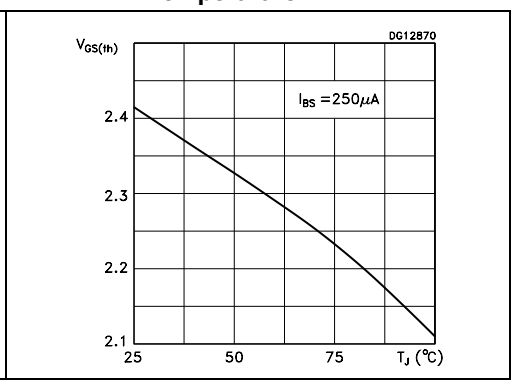


Figure 5. Collector-source On voltage

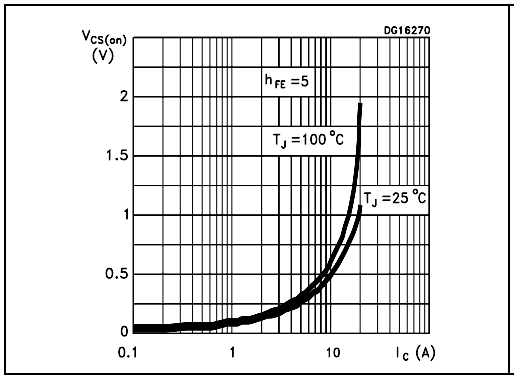


Figure 6. Collector-source On voltage

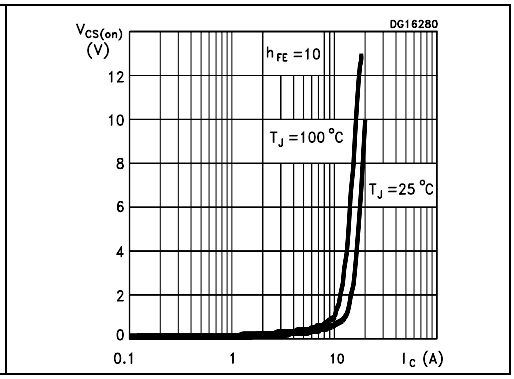


Figure 7. Base-source On voltage

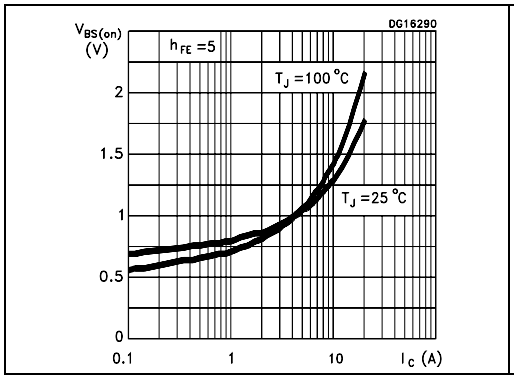


Figure 8. Base-source On voltage

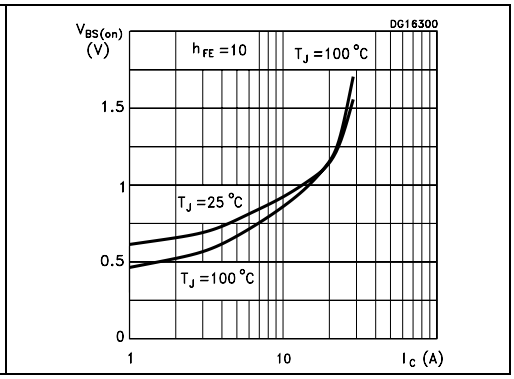


Figure 9. Inductive load switching time

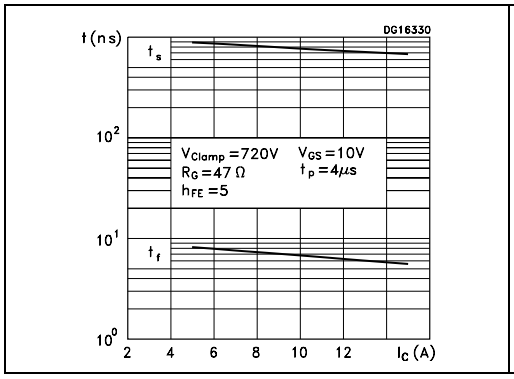


Figure 10. Inductive load switching time

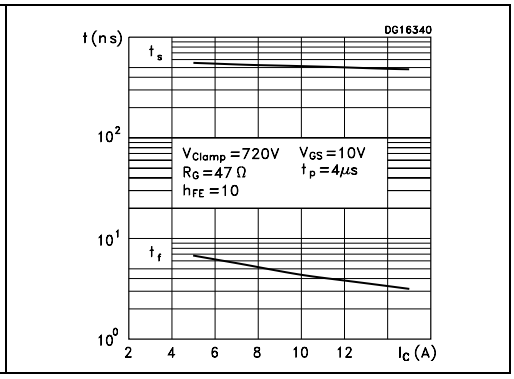
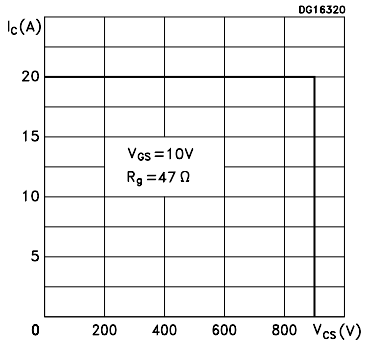


Figure 11. Reverse biased safe operating area

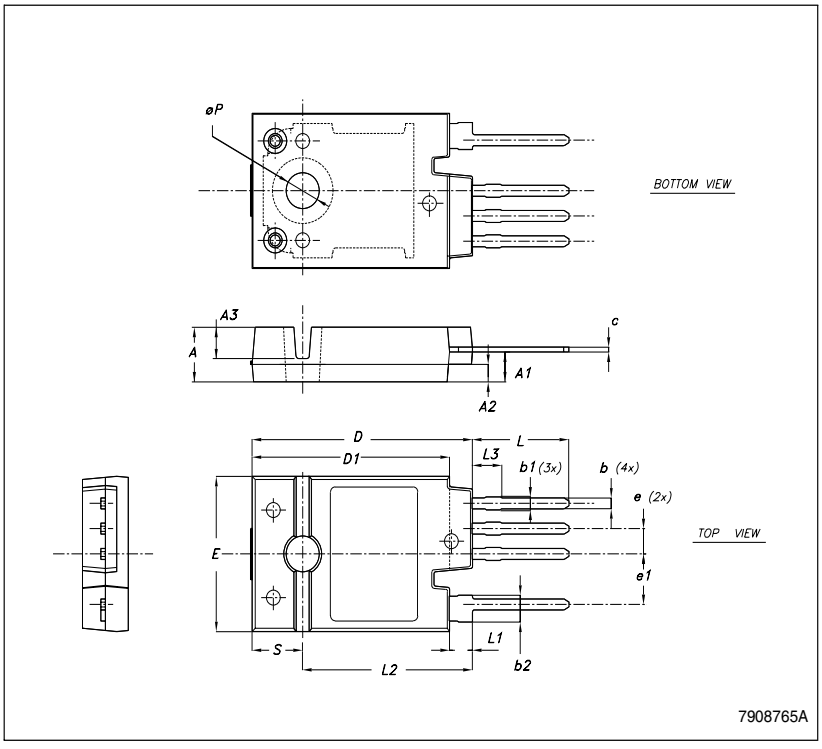


3 Package mechanical data

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

TO247-4LHP MECHANICAL DATA

DIM.	mm.		
	MIN.	TYP	MAX.
A	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
c	0.40		0.80
D	23.85	24	24.15
D1		21.50	
E	15.45	15.60	15.75
e	2.54		
e1		5.08	
L	10.20		10.80
L1	2.20	2.50	2.80
L2		18.50	
L3		3	
øP	3.55		3.65
S		5.50	



4 Revision history

Table 5. Revision history

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

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