



STC03DE220HP

Hybrid emitter switched bipolar transistor
ESBT[®] 2200 V - 3 A - 0.33 Ω

Features

Table 1. Features

$V_{CS(ON)}$	I_C	$R_{CS(ON)}$
1 V	3 A	0.33 Ω

- Low equivalent on resistance
- Very fast-switch, up to 150 kHz
- Very low C_{ISS} driven by $R_G = 4.7 \Omega$

Applications

- Aux SMPS for three phase mains

Description

The STC03DE220HP 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 STC03DE220HP is designed for use in aux flyback SMPS for any three phase application.

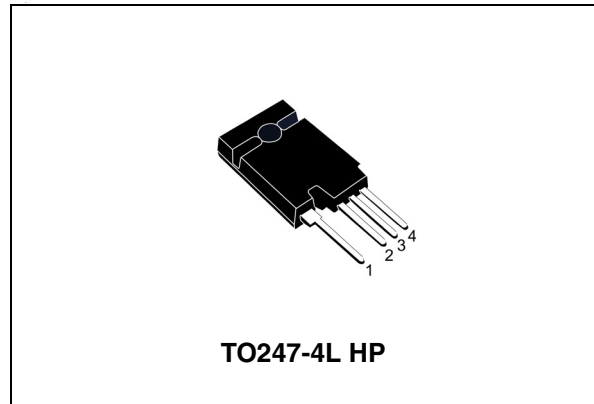


Figure 1. Internal schematic diagrams

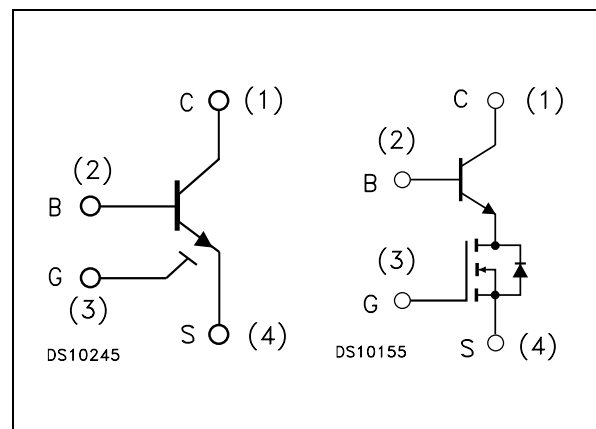


Table 2. Device summary

Order code	Marking	Package	Packaging
STC03DE220HP	C03DE220HP	TO247-4L HP	Tube

1 Electrical ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{CS(SS)}$	Collector-source voltage ($V_{BS} = V_{GS} = 0$)	2200	V
$V_{BS(OS)}$	Base-source voltage ($I_C = 0, V_{GS} = 0$)	30	V
$V_{SB(OS)}$	Source-base voltage ($I_C = 0, V_{GS} = 0$)	9	V
V_{GS}	Gate-source voltage	± 20	V
I_C	Collector current	3	A
I_{CM}	Collector peak current ($t_P < 5$ ms)	6	A
I_B	Base current	3	A
I_{BM}	Base peak current ($t_P < 1$ ms)	6	A
P_{tot}	Total dissipation at $T_c \leq 25$ °C	42	W
T_{stg}	Storage temperature	-40 to 150	°C
T_J	Max. operating junction temperature	125	°C

Table 4. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case	2.4	°C/W

2 Electrical characteristics

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

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CS(SS)}}$	Collector cut-off current ($V_{\text{BS}} = V_{\text{GS}} = 0$)	$V_{\text{CS}} = 2200\text{ V}$			100	μA
$I_{\text{BS(OS)}}$	Base cut-off current ($I_{\text{C}} = 0, V_{\text{GS}} = 0$)	$V_{\text{BS}} = 30\text{ V}$			10	μA
$I_{\text{SB(OS)}}$	Source cut-off current ($I_{\text{C}} = 0, V_{\text{GS}} = 0$)	$V_{\text{SB}} = 9\text{ V}$			100	μA
$I_{\text{GS(OS)}}$	Gate-source leakage current ($V_{\text{BS}} = 0$)	$V_{\text{GS}} = \pm 20\text{ V}$			500	nA
$V_{\text{CS(ON)}}$	Collector-source ON voltage	$V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 1.5\text{ A } I_{\text{B}} = 0.15\text{ A}$ $V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 3\text{ A } I_{\text{B}} = 0.6\text{ A}$		0.2 0.25		V V
h_{FE}	DC current gain	$V_{\text{CS}} = 1\text{ V } V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 1.5\text{ A}$ $V_{\text{CS}} = 1\text{ V } V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 3\text{ A}$		15 10		
$V_{\text{BS(ON)}}$	Base-source ON voltage	$V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 1.5\text{ A } I_{\text{B}} = 0.15\text{ A}$ $V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 3\text{ A } I_{\text{B}} = 0.6\text{ A}$		0.82 1		V V
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{BS}} = V_{\text{GS}} \quad I_{\text{B}} = 250\text{ }\mu\text{A}$	1.5	2.2	3	V
C_{iss}	Input capacitance ($V_{\text{GS}} = V_{\text{CB}} = 0$)	$V_{\text{CS}} = 25\text{ V } f = 1\text{ MHz}$		750		pF
$Q_{\text{GS(tot)}}$	Gate-source Charge ($V_{\text{CB}} = 0$)	$V_{\text{CS}} = 15\text{ V } V_{\text{GS}} = 10\text{ V}$ $I_{\text{C}} = 1.8\text{ A}$		12.5		nC
t_{s} t_{f}	INDUCTIVE LOAD Storage time Fall time	$V_{\text{GS}} = 10\text{ V } R_{\text{G}} = 47\text{ }\Omega$ $V_{\text{Clamp}} = 1760\text{ V } t_{\text{p}} = 4\text{ }\mu\text{s}$ $I_{\text{C}} = 1.5\text{ A } I_{\text{B}} = 0.3\text{ A}$		1040 20		ns ns
$V_{\text{CS(dyn)}}$	Collector-source dynamic voltage ($0.5\text{ }\mu\text{s}$)	$V_{\text{CC}} = V_{\text{Clamp}} = 400\text{ V}$ $V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 1.5\text{ A}$ $I_{\text{B}} = 0.3\text{ A } R_{\text{G}} = 47\text{ }\Omega$ $t_{\text{peak}} = 500\text{ ns } I_{\text{Bpeak}} = 3\text{ A}$		7.6		V
$V_{\text{CS(dyn)}}$	Collector-source dynamic voltage ($1\text{ }\mu\text{s}$)	$V_{\text{CC}} = V_{\text{Clamp}} = 400\text{ V}$ $V_{\text{GS}} = 10\text{ V } I_{\text{C}} = 1.5\text{ A}$ $I_{\text{B}} = 0.3\text{ A } R_{\text{G}} = 47\text{ }\Omega$ $t_{\text{peak}} = 500\text{ ns } I_{\text{Bpeak}} = 3\text{ A}$		5.8		V
V_{CSW}	Maximum collector-source voltage at turn-off without snubber	$R_{\text{G}} = 47\text{ }\Omega \quad h_{\text{FE}} = 5 \quad I_{\text{C}} = 3\text{ A}$	2200			V

2.1 Electrical characteristics (curves)

Figure 2. DC current gain

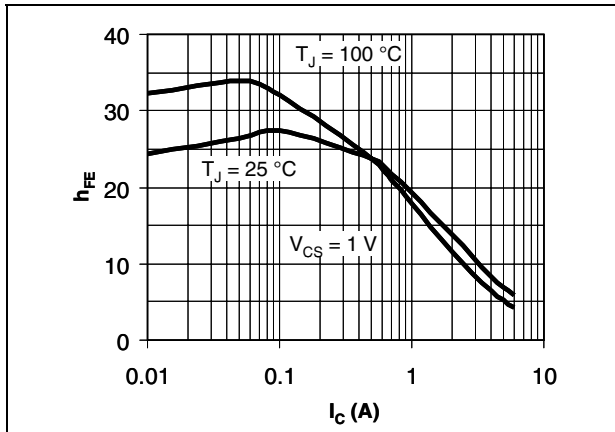


Figure 3. Base-source ON voltage

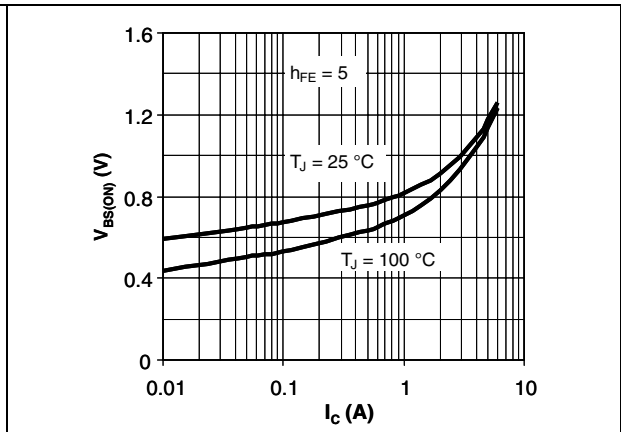


Figure 4. Collector-source ON voltage

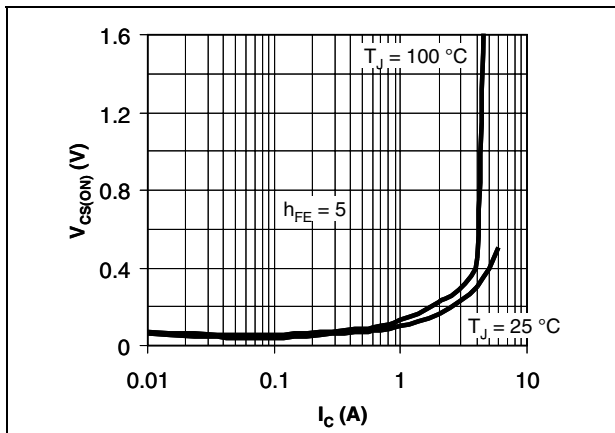


Figure 5. Collector-source dynamic voltage

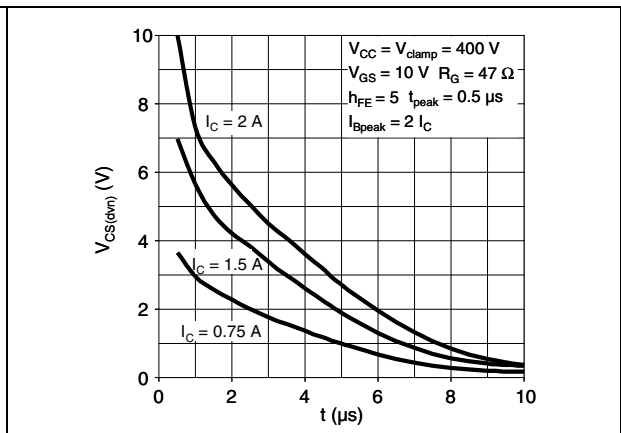


Figure 6. Inductive load switching off ($T_C = 25^\circ\text{C}$)

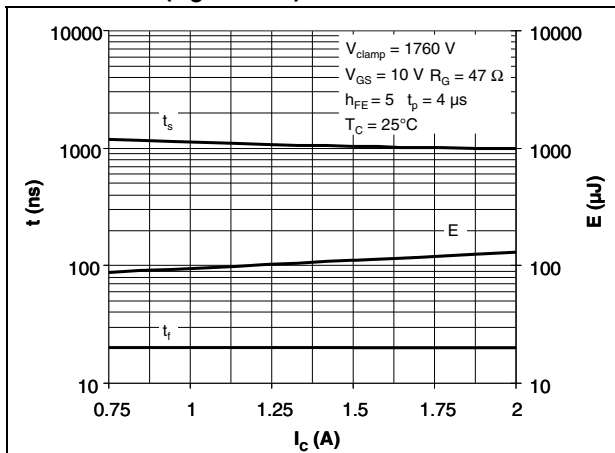


Figure 7. Inductive load switching off ($T_C = 100^\circ\text{C}$)

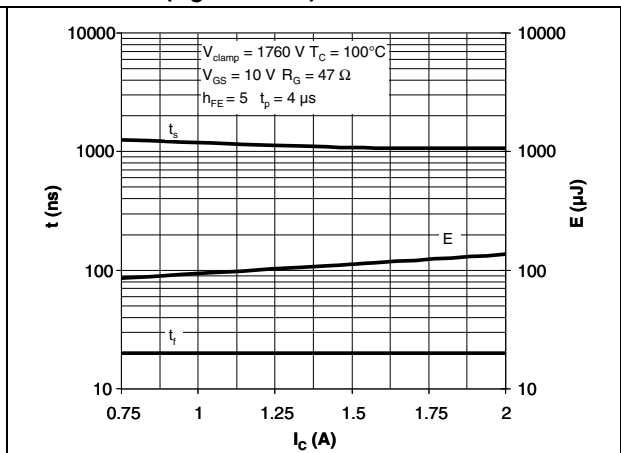
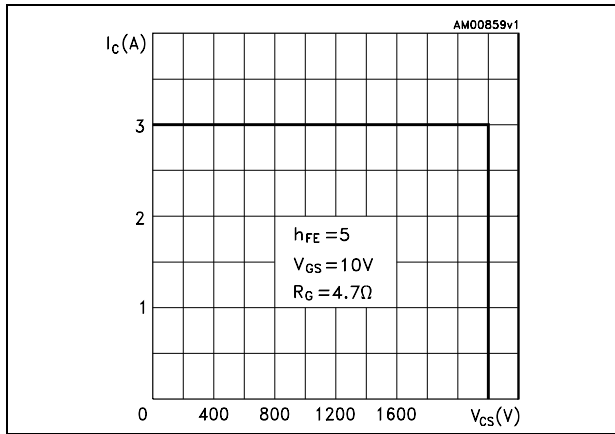


Figure 8. Reverse biased safe operating area

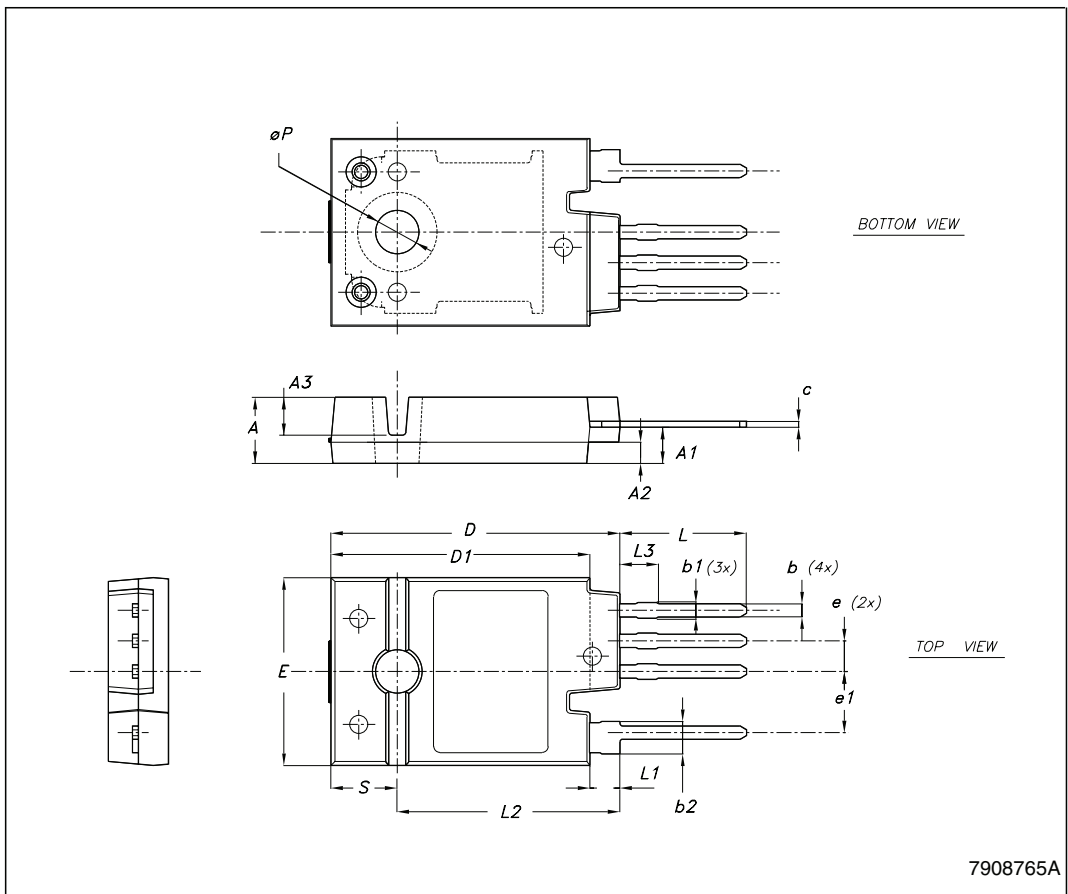


3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

TO247-4L HP 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 6. Document revision history

Date	Revision	Changes
19-May-2008	1	First release.
05-Jun-2009	2	Added Section 2.1: Electrical characteristics (curves) on page 4.

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