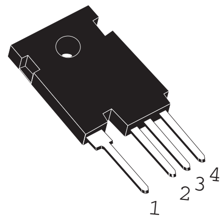
STC03DE220HV

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

Features

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

- Low equivalent on-resistance
- Very fast switching, up to 150 kHz
- Very low C_{ISS} driven by R_G = 4.7 Ω



TO247-4L HV

Application

- Aux SMPS for 3-phase mains

Description

The STC03DE220HV is manufactured using a hybrid structure, with dedicated high voltage bipolar and low voltage MOSFET technology, aimed at providing the best performance in an ESBT topology.

The STC03DE220HV is designed for use in an aux. flyback SMPS for any 3-phase application.

Figure 1. Internal schematic diagrams

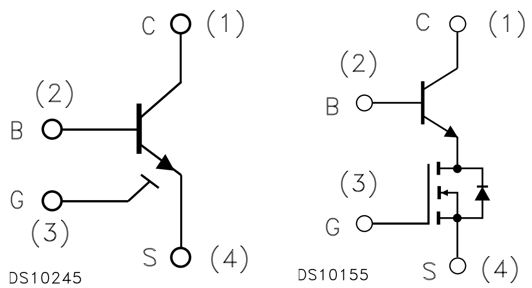


Table 1. Device summary

Order code	Marking	Package	Packaging
STC03DE220HV	C03DE220HV	TO247-4L HV	Tube

1 Electrical ratings

Table 2. 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	166	W
T_{stg}	Storage temperature	-40 to 150	°C
T_J	Max. operating junction temperature	125	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case	0.6	°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 cut-off current (V_{BS} =V_{GS} = 0)	V_{CS} = 2200 V			100	µA
$I_{BS(OS)}$	Base cut-off current (I_C = 0, V_{GS} = 0)	V_{BS} = 30 V			10	µA
$I_{SB(OS)}$	Source cut-off current (I_C = 0, V_{GS} = 0)	V_{SB} = 9 V			100	µA
$I_{GS(OS)}$	Gate-source leakage current (V_{BS} = 0)	V_{GS} = ± 20 V			500	nA
$V_{CS(ON)}$	Collector-source ON voltage	V_{GS} = 10 V I_C = 1.5 A I_B = 0.15 A V_{GS} = 10 V I_C = 3 A I_B = 0.6 A		0.2 0.25		V V
h_{FE}	DC current gain	V_{CS} = 1 V V_{GS} = 10 V I_C = 1.5 A V_{CS} = 1 V V_{GS} = 10 V I_C = 3 A		15 10		
$V_{BS(ON)}$	Base-source ON voltage	V_{GS} = 10 V I_C = 1.5 A I_B = 0.15 A V_{GS} = 10 V I_C = 3 A I_B = 0.6 A		0.82 1		V V
$V_{GS(th)}$	Gate threshold voltage	V_{BS} = V_{GS} I_B = 250 µA	1.5	2.2	3	V
C_{iss}	Input capacitance (V_{GS} = V_{CB} = 0)	V_{CS} = 25 V f = 1 MHz		750		pF
$Q_{GS(tot)}$	Gate-source charge (V_{CB} = 0)	V_{CS} = 15 V V_{GS} = 10 V I_C = 1.8 A		12.5		nC
 t_s t_f	Inductive load Storage time Fall time	V_{GS} = 10 V R_G = 47 Ω V_{Clamp} = 1760 V t_p = 4 µs I_C = 1.5 A I_B = 0.3 A		 1040 20		 ns ns
$V_{CS(dyn)}$	Collector-source dynamic voltage (0.5 µs)	V_{CC} = V_{Clamp} = 400 V V_{GS} = 10 V I_C = 1.5 A I_B = 0.3 A R_G = 47 Ω t_{peak} = 500 ns I_{Bpeak} = 3 A		7.6		V
$V_{CS(dyn)}$	Collector-source dynamic voltage (1 µs)	V_{CC} = V_{Clamp} = 400 V V_{GS} = 10 V I_C = 1.5 A I_B = 0.3 A R_G = 47 Ω t_{peak} = 500 ns I_{Bpeak} = 3 A		5.8		V
V_{CSW}	Maximum collector-source voltage at turn-off without snubber	R_G = 47 Ω h_{FE} = 5 I_C = 3 A	2200			V

2.1 Electrical characteristics (curves)

Figure 2. DC current gain

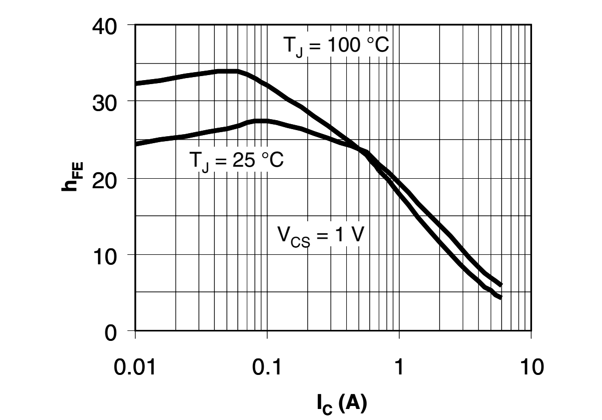


Figure 3. Base-source ON voltage

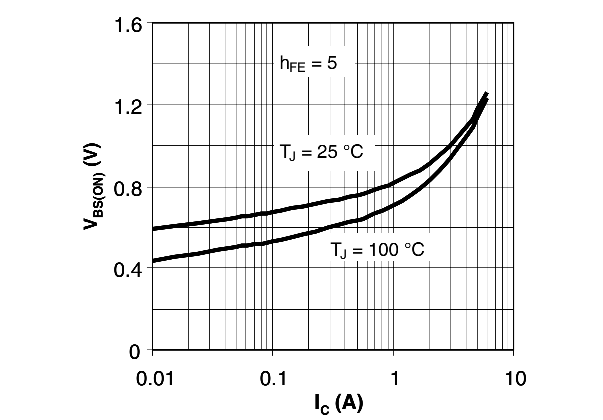


Figure 4. Collector-source ON voltage

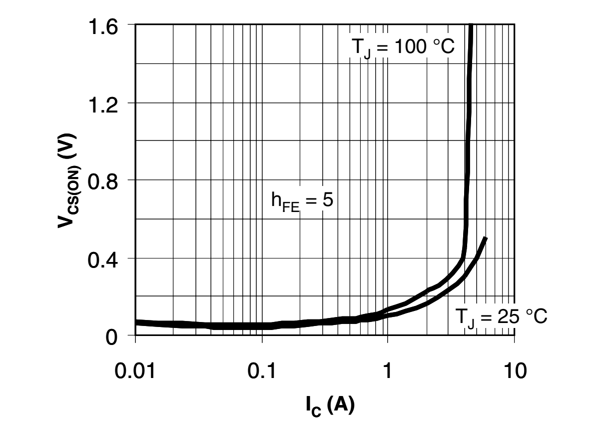


Figure 5. Collector-source dynamic voltage

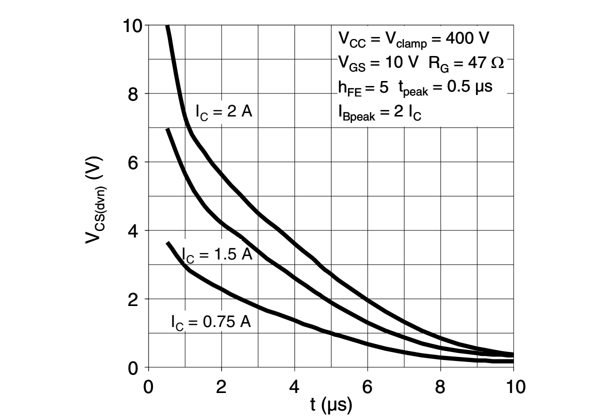


Figure 6. Inductive load switching off (T_C = 25 °C)

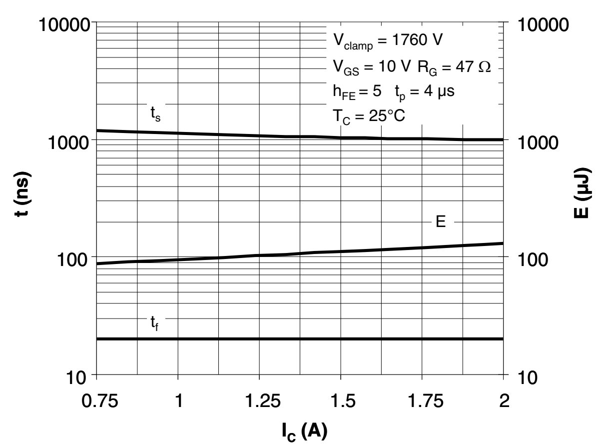


Figure 7. Inductive load switching off (T_C = 100 °C)

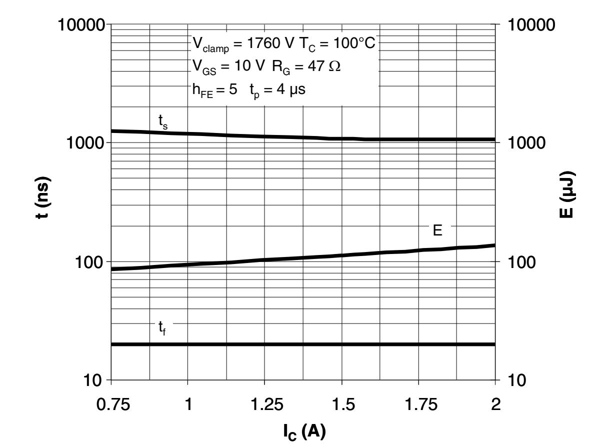
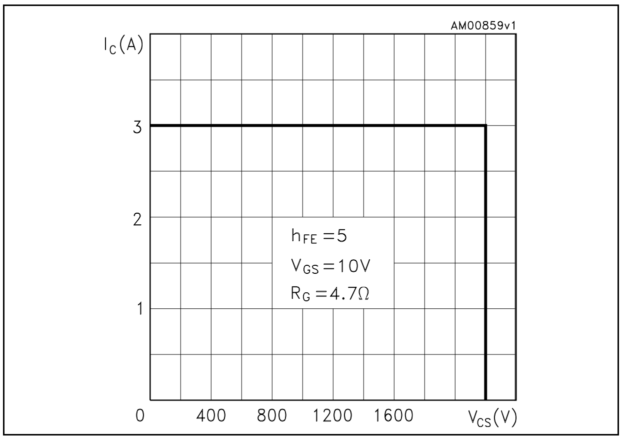


Figure 8. Reverse biased safe operating area



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.

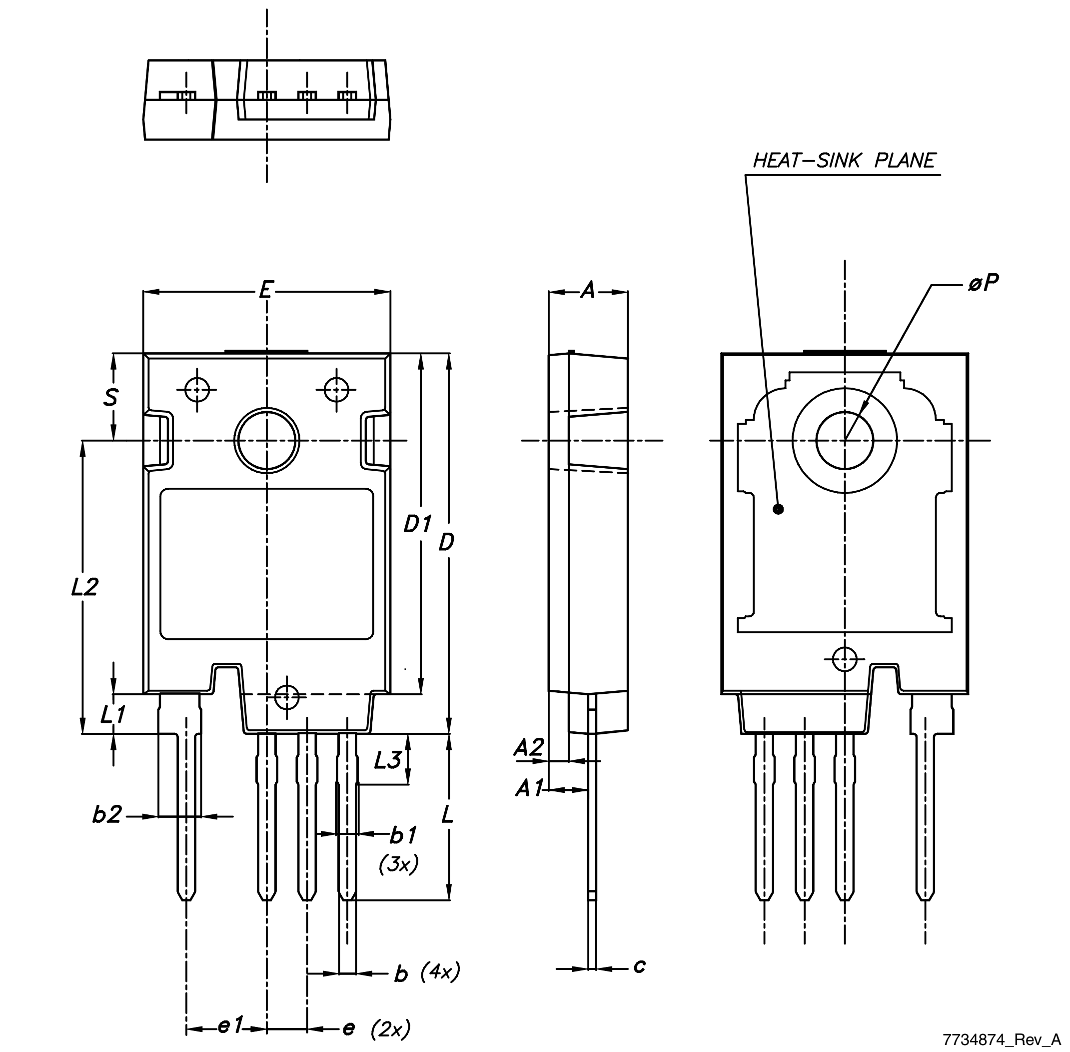
Table 5. TO-247-4L mechanical data

Dim.	mm.			Notes
	Min.	Typ.	Max.	
A	4.85		5.15	
A1	2.20	2.50	2.60	
A2			1.27	
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	5
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		
∅P	3.55		3.65	4
S		5.50		

General package performance

1. The lead size is comprehensive of the thickness of the leads finishing material.
2. The leads must be covered with soldered alloy up to 1,3 mm from the plastic package.
3. Package outline exclusive of any mold flash dimensions and metal burrs.
4. Resin thickness around the mounting hole must not be less than 0,9 mm.
5. “D” dimension plus gate protrusion, must not exceed 24,5 mm.
6. Package backside planarity: the level of the resin surrounding the heatsink must not be higher than 30 microns versus the heatsink plan.
7. Torque force (through hole package): recommended: 0,55 Nm // maximum: 1 Nm.
8. The maximum bent leads allowed, in any direction, is: # 2° if the devices are packed in tube.
9. Package weight: 4,78 g / unit (typ.).

Figure 9. TO-247-4L drawing



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
27-Nov-2006	1	First release.
19-May-2008	2	Document status promoted from preliminary data to datasheet.
10-Jun-2009	3	Added *Section 2.1: Electrical characteristics (curves) on page 4*.
25-Jan-2012	4	Mechanical data updated