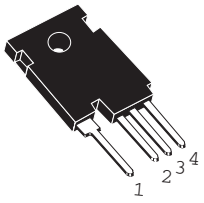
STC04IE170HV

Monolithic emitter switched bipolar transistor
ESBT® 1700 V - 4 A - 0.17 Ω

Features

$V_{CS(ON)}$	I_C	$R_{CS(ON)}$
0.7 V	4 A	0.17 Ω

- High voltage / high current cascode configuration
- Low equivalent ON resistance
- Very fast-switch: up to 150 kHz
- Squared RBSOA: up to 1700 V
- Very low C_{ISS} driven by R_G = 47 Ω
- Very low turn-off cross over time



TO247-4L HV

Application

- Aux SMPS for three-phase mains

Description

The STC04IE170HV is manufactured in monolithic ESBT technology, aimed at providing the best performance in high frequency / high voltage applications. It is designed for use in gate driven based topologies.

Figure 1. Internal schematic diagrams

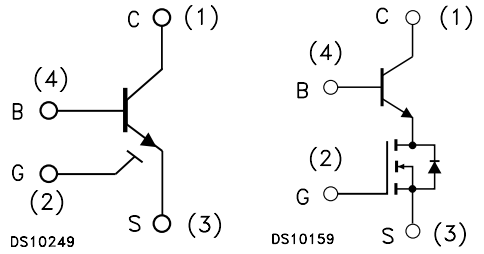


Table 1. Device summary

Order code	Marking	Package	Packing
STC04IE170HV	C04IE170HV	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)	1700	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)	17	V
V_{GS}	Gate-source voltage	± 17	V
I_C	Collector current	4	A
I_{CM}	Collector peak current (t_P < 5 ms)	8	A
I_B	Base current	4	A
I_{BM}	Base peak current (t_P < 1 ms)	8	A
P_{tot}	Total dissipation at $T_c \leq 25$ °C	178	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_{thJC}	Thermal resistance junction-case	0.7	°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 cut-off current (V_{BS} = V_{GS} = 0)	V_{CS} = 1700 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} = 17 V			100	µA
$I_{GS(OS)}$	Gate-source leakage current (V_{BS} = 0)	V_{GS} = ± 17 V			100	nA
$V_{CS(ON)}$	Collector-source ON voltage	V_{GS} = 10 V I_C = 4 A I_B = 0.8 A V_{GS} = 10 V I_C = 1.5 A I_B = 0.15 A		0.7 0.6	1.5 1.4	V V
h_{FE} (1)	DC current gain	V_{CS} = 1 V V_{GS} = 10 V I_C = 4 A V_{CS} = 1 V V_{GS} = 10 V I_C = 1.5 A	4 7	5.5 11		
$V_{BS(ON)}$	Base-source ON voltage	V_{GS} = 10 V I_C = 4 A I_B = 0.8 A V_{GS} = 10 V I_C = 1.5 A I_B = 0.15 A		1.3 0.9	1.5 1.1	V V
$V_{GS(th)}$	Gate threshold voltage	V_{BS} = V_{GS} I_B = 250 µA	2	3	4	V
C_{iss}	Input capacitance (V_{GS} = V_{CB} = 0)	V_{CS} = 25 V f = 1 MHz		510		pF
$Q_{GS(tot)}$	Gate-source charge (V_{CB} = 0)	V_{GS} = 10 V		3.9		nC
t_s t_f	Inductive load Storage time Fall time	V_{GS} = 10 V R_G = 47 Ω V_{Clamp} = 1360 V t_p = 4 µs I_C = 2 A I_B = 0.4 A		 770 10		 ns ns
t_s t_f	Inductive load Storage time Fall time	V_{GS} =10 V R_G = 47 Ω V_{Clamp} = 1360 V t_p = 4 µs I_C = 2 A I_B = 0.2 A		 410 10		 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 t_{peak} = 500 ns R_G = 47 Ω I_{Bpeak} = 3 A (2I_C)		5.36		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 t_{peak} = 500 ns R_G = 47 Ω I_{Bpeak} = 3 A (2I_C)		4.32		V
V_{CSW}	Maximum collector-source voltage at turn-off without snubber	R_G = 47 Ω h_{FE} = 5 I_C = 4 A	1700			V

1. Pulsed duration = 300 µs, duty cycle ≤ 1.5%.

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

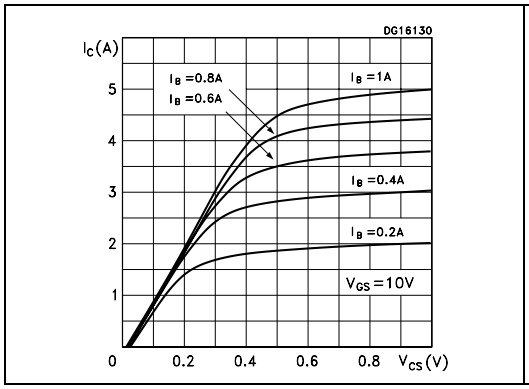


Figure 3. Collector-source dynamic voltage

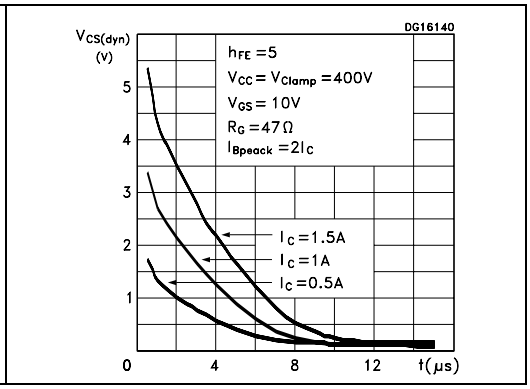


Figure 4. DC current gain

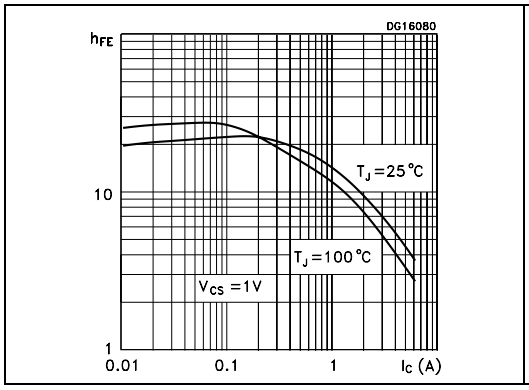


Figure 5. Gate threshold voltage vs. temperature

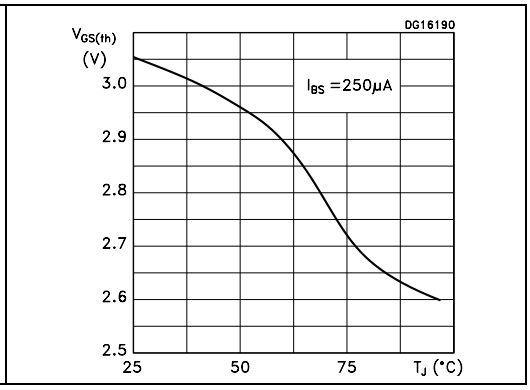


Figure 6. Collector-source ON voltage (h_{FE} = 5)

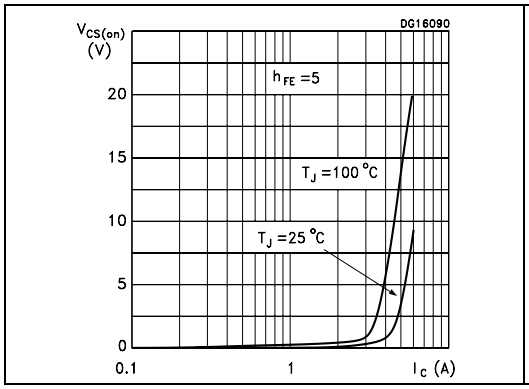


Figure 7. Collector-source ON voltage (h_{FE} = 10)

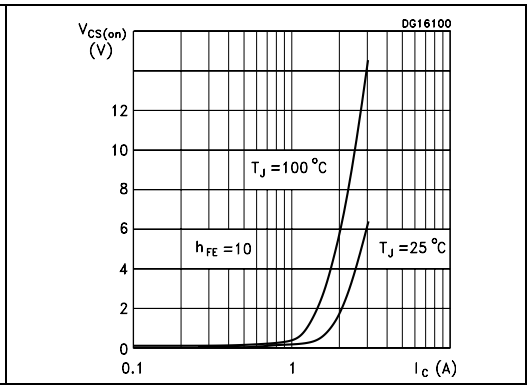


Figure 8. Base-source ON voltage (h_{FE} = 5)

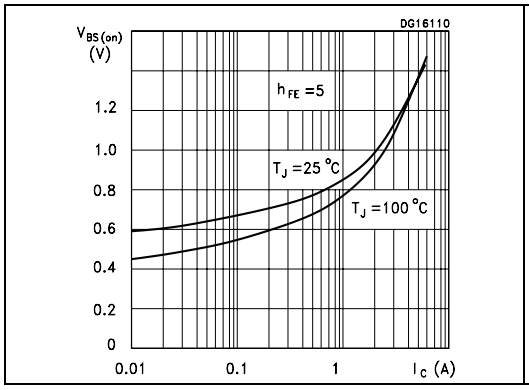


Figure 9. Base-source ON voltage (h_{FE} = 10)

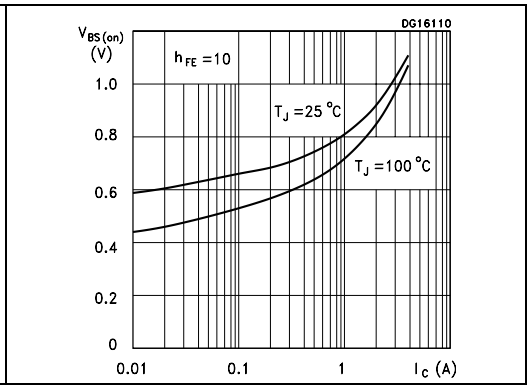


Figure 10. Inductive load switching time (h_{FE} = 5)

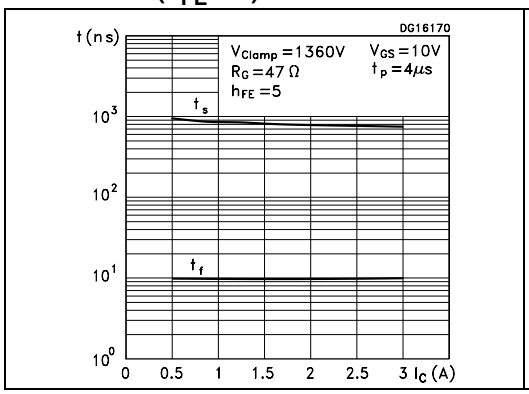


Figure 11. Inductive load switching time (h_{FE} = 10)

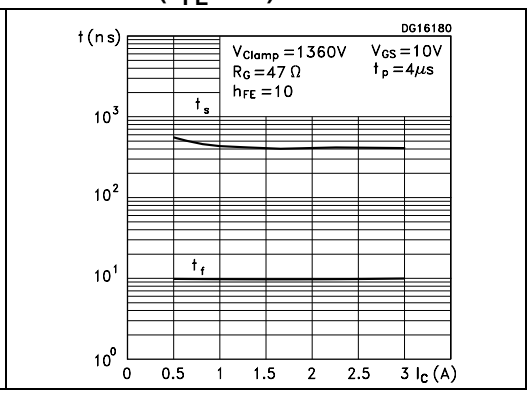
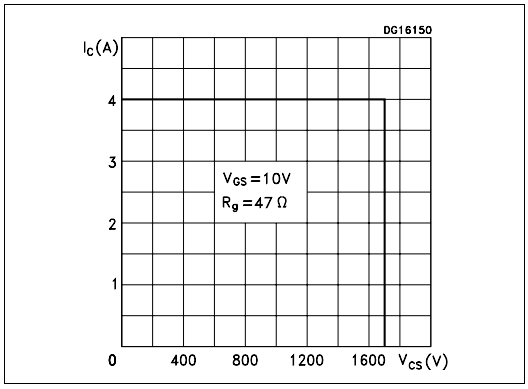


Figure 12. Reverse biased safe operating area

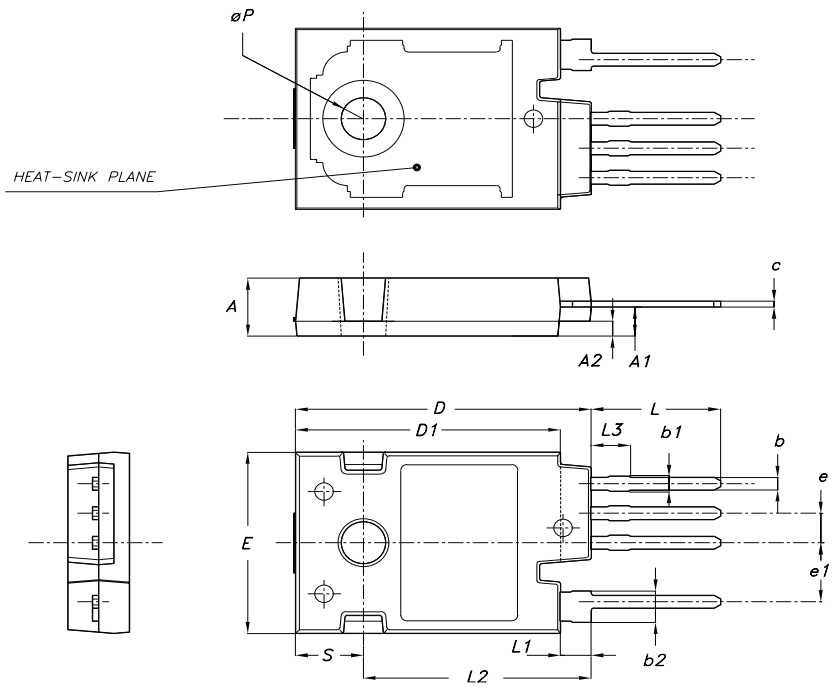


3 Package mechanical data

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 HV mechanical data

DIM.	mm.		
	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
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. Document revision history

Date	Revision	Changes
11-Sep-2006	1	First release.
21-Nov-2006	2	Improved application target.
16-Jun-2009	3	Updated *Figure 2 on page 4* and mechanical data.

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