



# STC04IE170HV

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

## General features

Table 1. General features

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

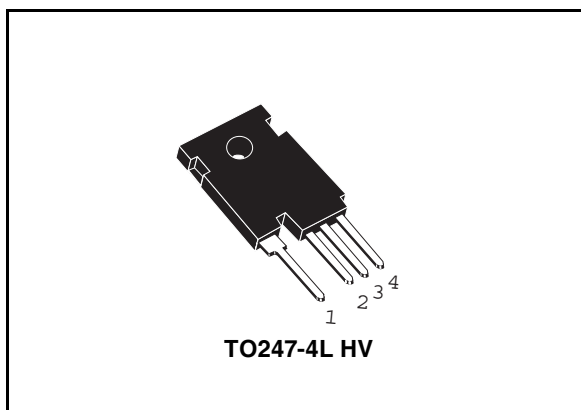
- High voltage / high current cascode configuration
- Low equivalent on resistance
- Very fast-switch, up to 150 kHz
- Squared RBSOA, up to 1700 V
- Very low  $C_{ISS}$  driven by  $R_G = 47 \Omega$
- Very low turn-off cross over time
- In compliance with the 2002/93/EC European Directive

## Description

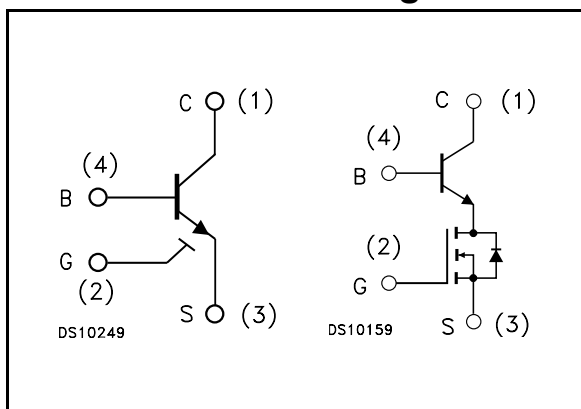
The STC04IE170HV is manufactured in Monolithic ESBT technology, aimed to provide the best performance in High Frequency / High voltage applications. It is designed for use in Gate Driven based topologies.

## Applications

- Aux SMPS for three phase mains



## Internal schematic diagrams



## Order codes

Part Number	Marking	Package	Packing
STC04IE170HV	C04IE170HV	TO247-4L HV	Tube

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## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CS(SS)}$	Collector-source voltage ( $V_{BS} = V_{GS} = 0V$ )	1700	V
$V_{BS(OS)}$	Base-source voltage ( $I_C = 0, V_{GS} = 0V$ )	30	V
$V_{SB(OS)}$	Source-base voltage ( $I_C = 0, V_{GS} = 0V$ )	17	V
$V_{GS}$	Gate-source voltage	$\pm 17$	V
$I_C$	Collector current	4	A
$I_{CM}$	Collector peak current ( $t_P < 5ms$ )	15	A
$I_B$	Base current	2	A
$I_{BM}$	Base peak current ( $t_P < 1ms$ )	4	A
$P_{tot}$	Total dissipation at $T_C \leq 25^\circ C$	178	W
$T_{stg}$	Storage temperature	-40 to 150	$^\circ C$
$T_J$	Max. operating junction temperature	150	$^\circ C$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.7	$^\circ C/W$

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CS(SS)}}$	Collector-source current ( $V_{\text{BS}} = V_{\text{GS}} = 0\text{V}$ )	$V_{\text{CS(SS)}} = 1700\text{V}$			100	$\mu\text{A}$
$I_{\text{BS(OS)}}$	Base-source current ( $I_{\text{C}} = 0, V_{\text{GS}} = 0\text{V}$ )	$V_{\text{BS(OS)}} = 30\text{V}$			10	$\mu\text{A}$
$I_{\text{SB(OS)}}$	Source-base current ( $I_{\text{C}} = 0, V_{\text{GS}} = 0\text{V}$ )	$V_{\text{SB(OS)}} = 17\text{V}$			100	$\mu\text{A}$
$I_{\text{GS(OS)}}$	Gate-source leakage ( $V_{\text{BS}} = 0\text{V}$ )	$V_{\text{GS}} = \pm 17\text{V}$			100	nA
$V_{\text{CS(ON)}}$	Collector-source ON voltage	$V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 4\text{A}$ $I_{\text{B}} = 0.8\text{A}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 1.5\text{A}$ $I_{\text{B}} = 0.15\text{A}$		0.7 0.6	1.5 1.4	V V
$h_{\text{FE}}$	DC current gain	$V_{\text{CS}} = 1\text{V}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 4\text{A}$ $V_{\text{CS}} = 1\text{V}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 1.5\text{A}$	4 7	5.5 11		
$V_{\text{BS(ON)}}$	Base-source ON voltage	$V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 4\text{A}$ $I_{\text{B}} = 0.8\text{A}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 1.5\text{A}$ $I_{\text{B}} = 0.15\text{A}$		1.3 0.9	1.5 1.1	V V
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{BS}} = V_{\text{GS}}$ $I_{\text{B}} = 250\mu\text{A}$	2	3	4	V
$C_{\text{iss}}$	Input capacitance	$V_{\text{CS}} = 25\text{V}$ $f = 1\text{MHz}$ $V_{\text{GS}} = 0\text{V}$		510		pF
$Q_{\text{GS(tot)}}$	Gate-source Charge	$V_{\text{GS}} = 10\text{V}$		3.9		nC
$t_{\text{s}}$ $t_{\text{f}}$	INDUCTIVE LOAD Storage time Fall time	$V_{\text{GS}} = 10\text{V}$ $R_{\text{G}} = 47\Omega$ $V_{\text{Clamp}} = 1360\text{V}$ $t_{\text{p}} = 4\mu\text{s}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.4\text{A}$		770 10		ns ns
$t_{\text{s}}$ $t_{\text{f}}$	INDUCTIVE LOAD Storage time Fall time	$V_{\text{GS}} = 10\text{V}$ $R_{\text{G}} = 47\Omega$ $V_{\text{Clamp}} = 1360\text{V}$ $t_{\text{p}} = 4\mu\text{s}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.2\text{A}$		410 10		ns ns
$V_{\text{CS(dyn)}}$	Collector-source dynamic voltage (500ns)	$V_{\text{CC}} = V_{\text{Clamp}} = 400\text{V}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 1.5\text{A}$ $I_{\text{B}} = 0.3\text{A}$ $t_{\text{peak}} = 500\text{ns}$ $R_{\text{G}} = 47\Omega$ $I_{\text{Bpeak}} = 3\text{A}$ ( $2I_{\text{C}}$ )		5.36		V

Table 4. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CS(dyn)}$	Collector-source dynamic voltage (1 $\mu$ s)	$V_{CC} = V_{Clamp} = 400V$ $V_{GS} = 10V$ $I_C = 1.5A$ $I_B = 0.3A$ $t_{peak} = 500ns$ $R_G = 47\Omega$ $I_{Bpeak} = 3A (2I_C)$		4.32		V
$V_{CSW}$	Maximum collector-source voltage switched without snubber	$R_G = 47\Omega$ $h_{FE} = 5$ $I_C = 4A$	1700			V

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

## 2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

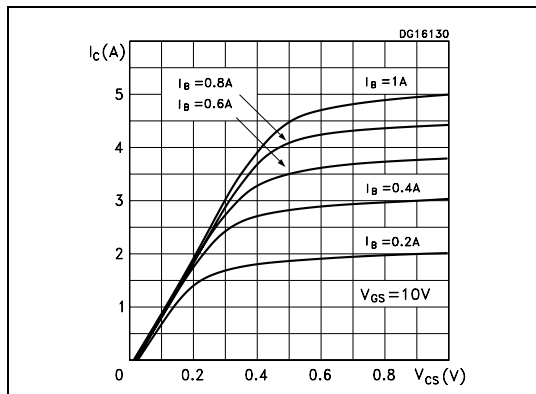


Figure 2. Dynamic collector-source saturation voltage

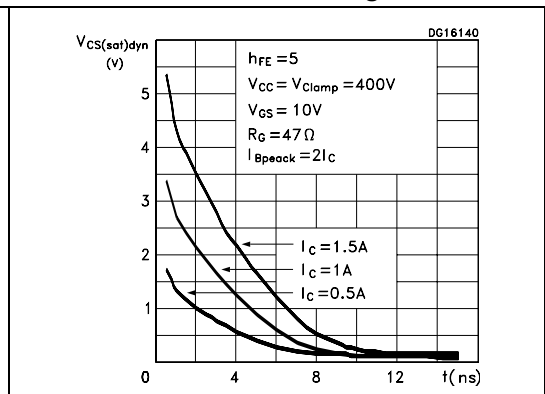


Figure 3. DC current gain

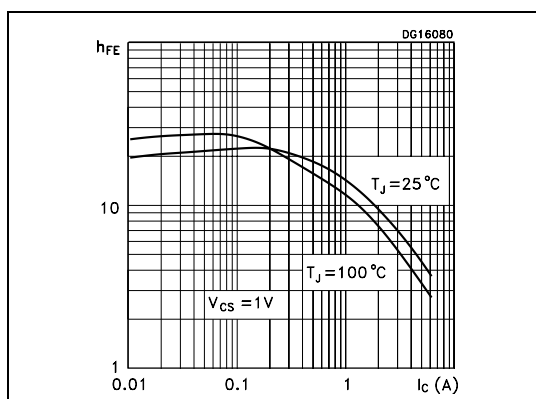


Figure 4. Gate threshold voltage vs temperature

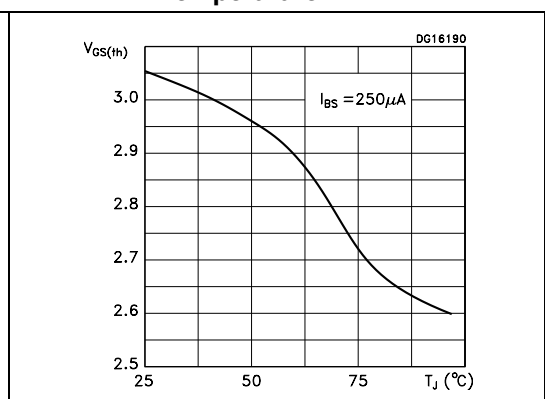


Figure 5. Collector-source On voltage Figure 6. Collector-source On voltage

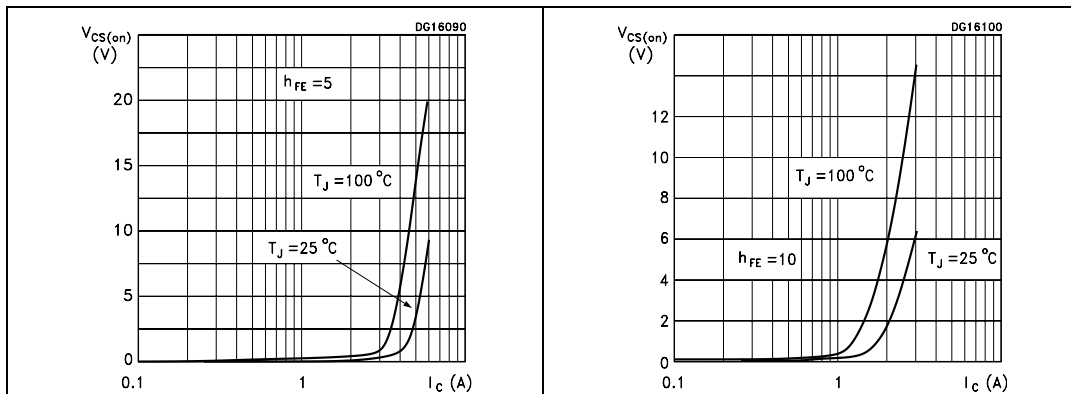


Figure 7. Base-source On voltage Figure 8. Base-source On voltage

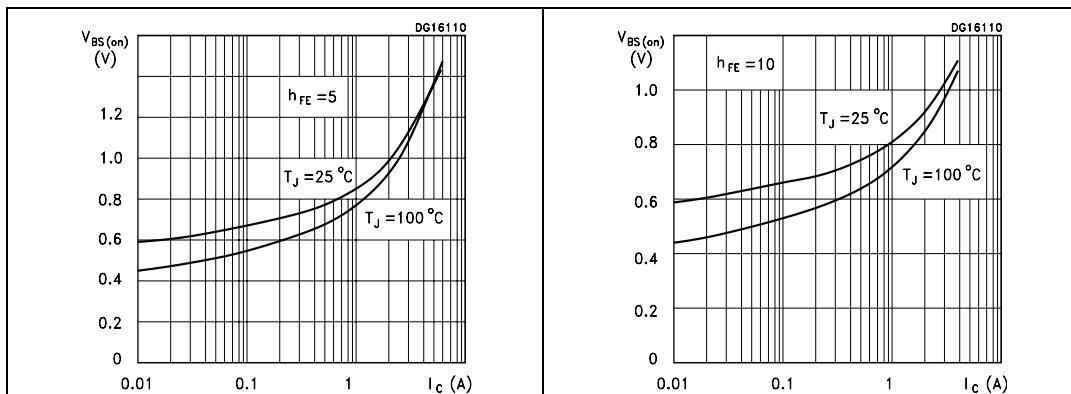
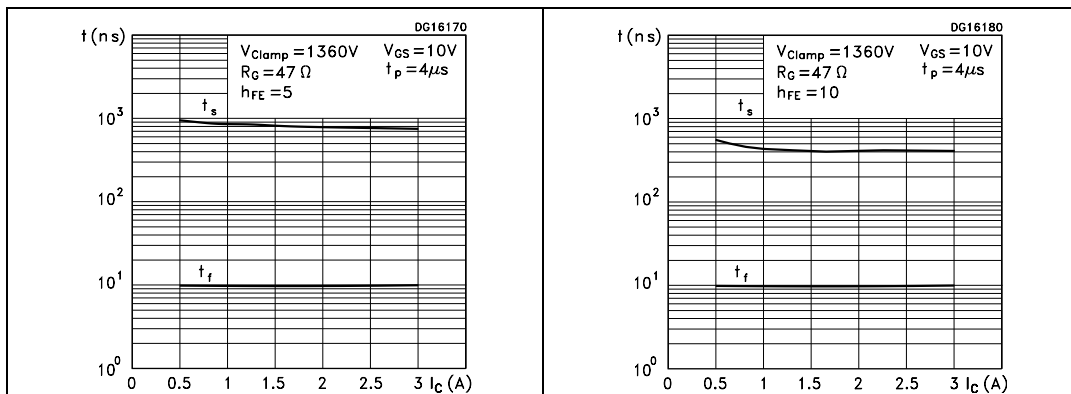
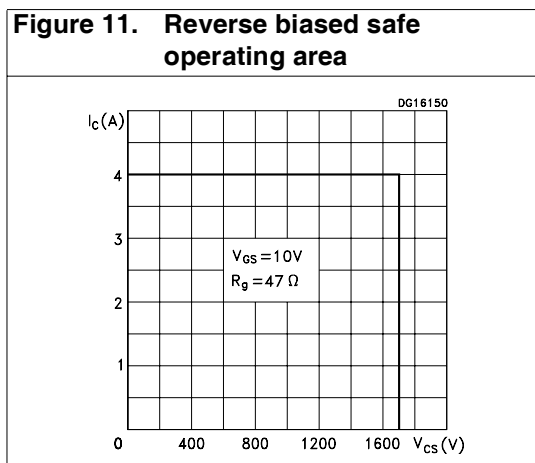


Figure 9. Inductive load switching time Figure 10. Inductive load switching time





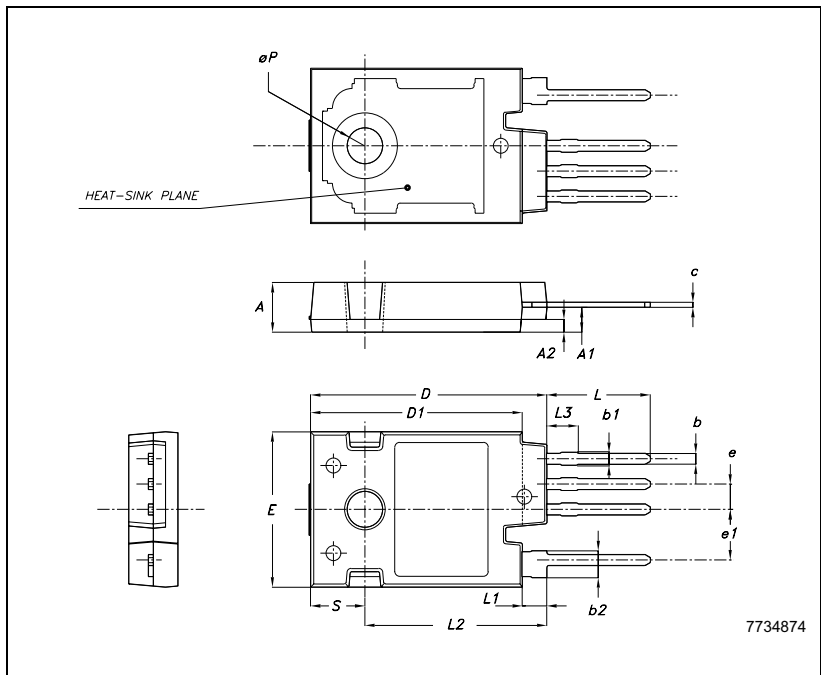
### 3 Package mechanical data

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](http://www.st.com)



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
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	



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## 4 Revision history

**Table 5. Revision history**

Date	Revision	Changes
11-Sep-2006	1	First release.
21-Nov-2006	2	Improved application target.

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