



# STC12IE90HV

## Emitter Switched Bipolar Transistor ESBT® 900 V - 12 A - 0.083 Ω

Preliminary Data

### General features

$V_{CS(ON)}$	$I_C$	$R_{CS(ON)}$
1V	12A	0.083 Ω

- High voltage / high current Cascode configuration
- Low equivalent on resistance
- Very fast-switch up to 150 kHz
- Squared RBSOA up to 900V
- Very low  $C_{iss}$  driven by  $R_G = 47\Omega$
- Very low turn-off cross over time

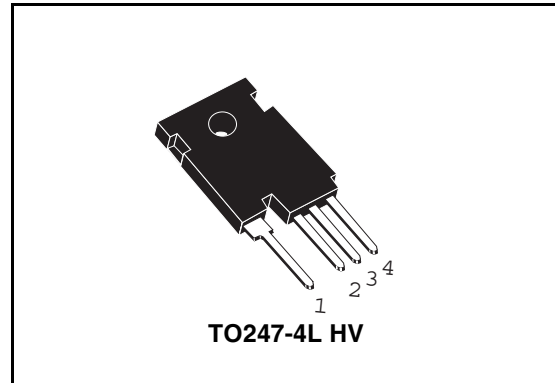
### Applications

- Aux Smps For Three Phase Mains

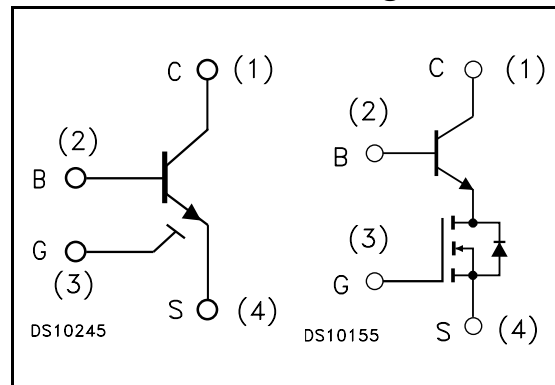
### Description

The STC12IE90HV is manufactured in Monolithic ESBT Technology, aimed to provide best performances in high frequency / high voltage applications.

It is designed for use in Gate Driven based topologies.



### Internal schematic diagrams



### Order codes

Part Number	Marking	Package	Packaging
STC12IE90HV	C12IE90HV	TO247-4L HV	Tube

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## Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CS(SS)}$	Collector-source voltage ( $V_{BS} = V_{GS} = 0\text{ V}$ )	900	V
$V_{BS(OS)}$	Base-source voltage ( $I_C = 0, V_{GS} = 0\text{ V}$ )	30	V
$V_{SB(OS)}$	Source-base voltage ( $I_C = 0, V_{GS} = 0\text{ V}$ )	17	V
$V_{GS}$	Gate-source voltage	$\pm 17$	V
$I_C$	Collector current	12	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ ms}$ )	36	A
$I_B$	Base current	6	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ ms}$ )	10	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	208	W
$T_{stg}$	Storage temperature	-40 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.6	$^\circ\text{C/W}$

## 2 Electrical characteristics

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

**Table 3. Electrical characteristics**

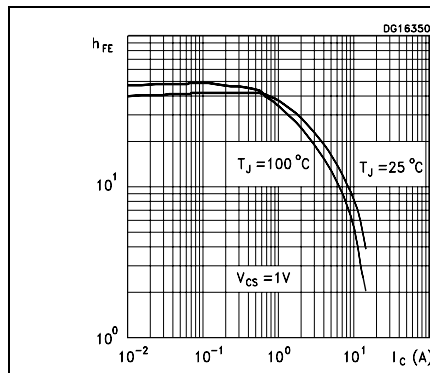
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CS(SS)}}$	Collector-source current ( $V_{\text{BS}} = V_{\text{GS}} = 0$ )	$V_{\text{CE}} = 900\text{V}$			100	$\mu\text{A}$
$I_{\text{BS(OS)}}$	Base-source current ( $I_{\text{C}} = 0, V_{\text{GS}} = 0$ )	$V_{\text{BS(OS)}} = 30\text{V}$			10	$\mu\text{A}$
$I_{\text{SB(OS)}}$	Source-base current ( $I_{\text{C}} = 0, V_{\text{GS}} = 0$ )	$V_{\text{SB(OS)}} = 17\text{V}$			100	$\mu\text{A}$
$I_{\text{GS(OS)}}$	Gate-source leakage	$V_{\text{GS}} = \pm 17\text{V}$			100	nA
$V_{\text{CS(ON)}}$	Collector-source ON voltage	$V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 12\text{A}$ $I_{\text{B}} = 2.4\text{A}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 6\text{A}$ $I_{\text{B}} = 0.6\text{A}$		1 0.6		V V
$h_{\text{FE}}$	DC current gain	$V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 12\text{A}$ $V_{\text{CS}} = 1\text{V}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 6\text{A}$ $V_{\text{CS}} = 1\text{V}$		5 15		
$V_{\text{BS(ON)}}$	Base Source ON voltage	$V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 12\text{A}$ $I_{\text{B}} = 2.4\text{A}$ $V_{\text{GS}} = 10\text{V}$ $I_{\text{C}} = 6\text{A}$ $I_{\text{B}} = 0.6\text{A}$		1.5 1.2		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	$V_{\text{CS}} = 25\text{V}$ $f = 1\text{MHz}$ $V_{\text{GS}} = 0\text{V}$		520		pF
$Q_{\text{GS(tot)}}$	Gate-source Charge	$V_{\text{CS}} = 25\text{V}$ $V_{\text{GS}} = 10\text{V}$ $V_{\text{CB}} = 0\text{V}$ $I_{\text{C}} = 4\text{A}$		21.3		nC
$t_{\text{s}}$ $t_{\text{f}}$	INDUCTIVE LOAD Storage time Fall time	$V_{\text{GS}} = 10\text{V}$ $R_{\text{G}} = 47\Omega$ $V_{\text{Clamp}} = 720\text{V}$ $t_{\text{p}} = 4\mu\text{s}$ $I_{\text{C}} = 6\text{A}$ $I_{\text{B}} = 1.2\text{A}$		610 10		ns ns
$t_{\text{s}}$ $t_{\text{f}}$	INDUCTIVE LOAD Storage time Fall time	$V_{\text{GS}} = 10\text{V}$ $R_{\text{G}} = 47\Omega$ $V_{\text{Clamp}} = 720\text{V}$ $t_{\text{p}} = 4\mu\text{s}$ $I_{\text{C}} = 6\text{A}$ $I_{\text{B}} = 0.6\text{A}$		360 10		ns ns
$V_{\text{CSW}}$	Maximum collector-source voltage switched without snubber	$R_{\text{G}} = 47\Omega$ $h_{\text{FE}} = 5$ $I_{\text{C}} = 12\text{A}$	900			V

**Table 3. Electrical characteristics**

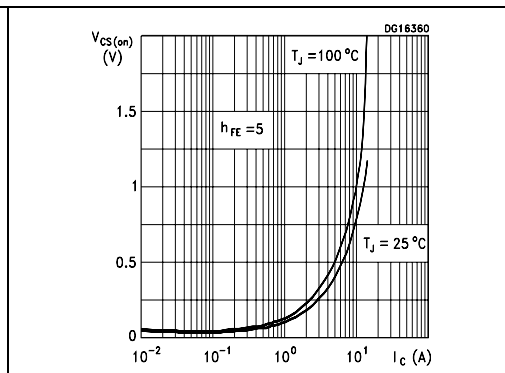
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{CS(dyn)}$	Collector-source dynamic voltage (500ns)	$V_{CC} = V_{Clamp} = 400V$ $V_{GS} = 10V$ $I_C = 6A$ $I_B = 1.2A$ $t_{peak} = 500ns$ $R_G = 47\Omega$ $I_{Bpeak} = 6A (I_C)$		3.37		V
$V_{CS(dyn)}$	Collector-source dynamic voltage (1 $\mu$ s)	$V_{CC} = V_{Clamp} = 400V$ $V_{GS} = 10V$ $I_C = 6A$ $I_B = 1.2A$ $t_{peak} = 500ns$ $R_G = 47\Omega$ $I_{Bpeak} = 6A (I_C)$		1.75		V

## 2.1 Electrical characteristics (curves)

**Figure 1. DC current gain**



**Figure 2. Collector-source On voltage**



**Figure 3. Collector-source On voltage** **Figure 4. Base-source On voltage**

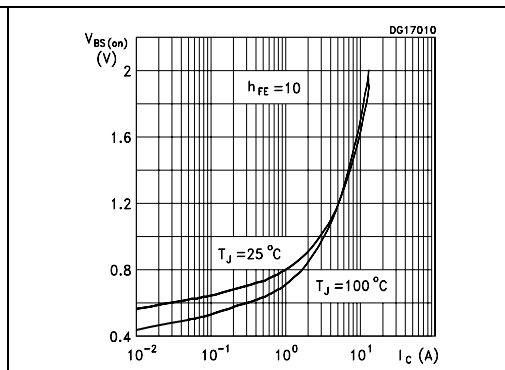
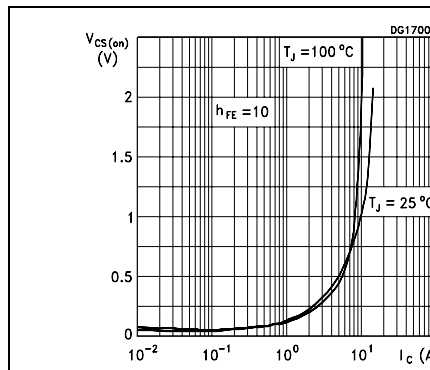


Figure 5. Reverse biased SOA

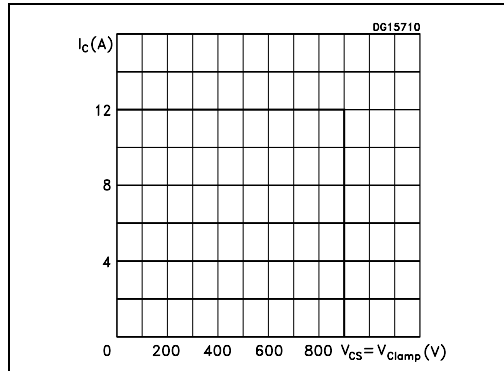


Figure 6. Dynamic collector-emitter voltage

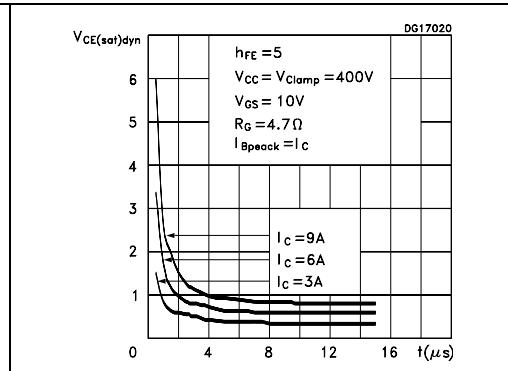


Figure 7. Inductive load switching time

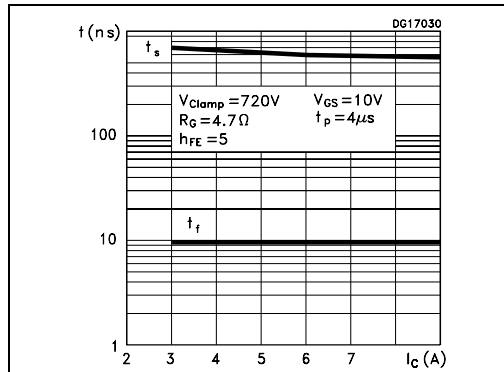
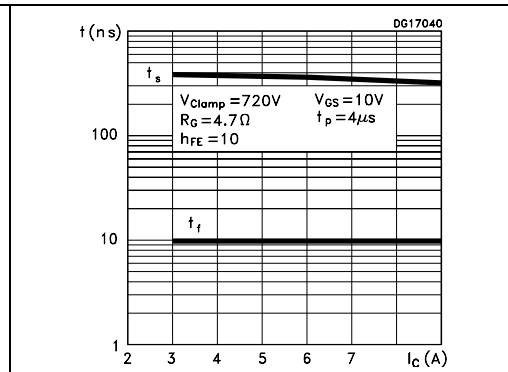


Figure 8. Inductive load switching time



## 2.2 Test circuits

Figure 9. Static  $V_{CS(ON)}$  test circuits

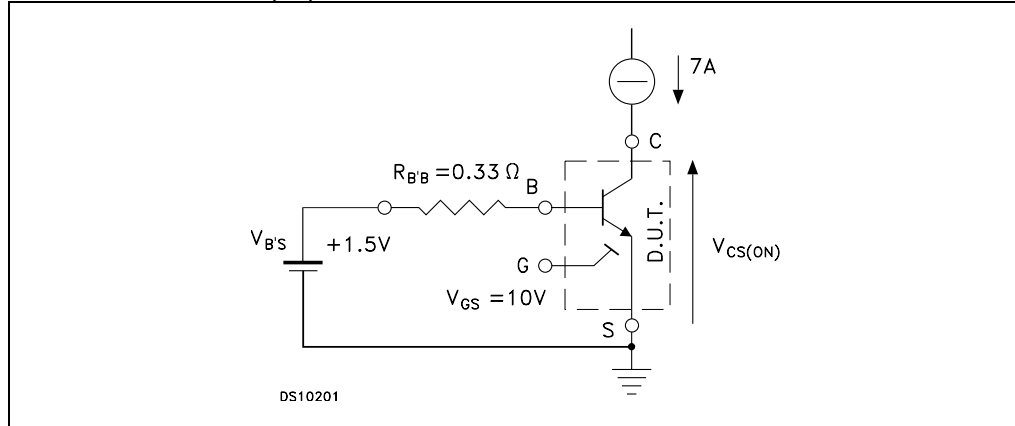
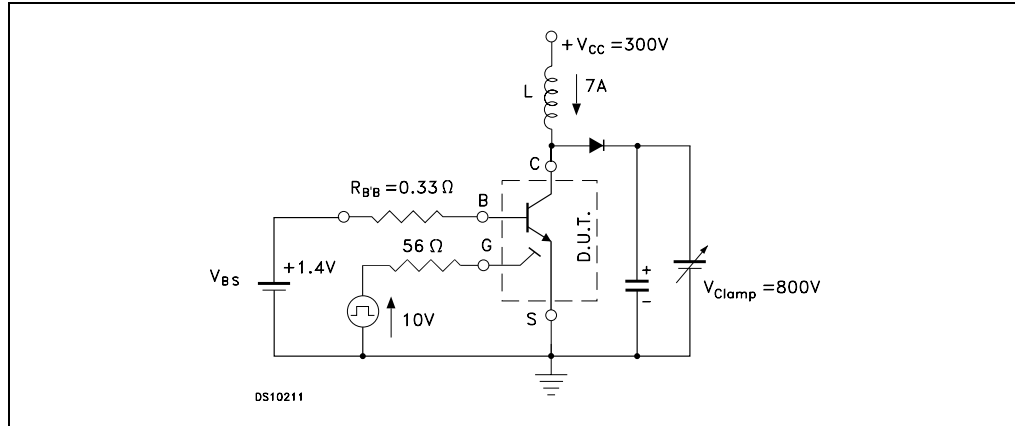


Figure 10. Inductive load switching and RBSOA test circuit



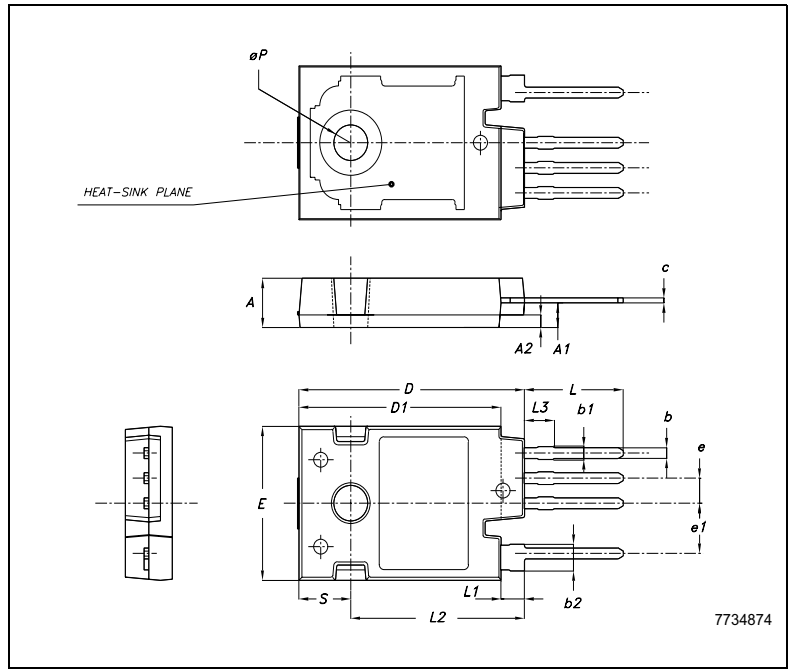
### 3 Package mechanical data

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	



## 4 Revision history

**Table 4. Revision history**

Date	Revision	Changes
16-Jan-2007	1	Initial release.

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