

# STC04IE170HV

## **General features**

### Table 1.General features

| V <sub>CS(ON)</sub> | ۱ <sub>C</sub> | R <sub>CS(ON)</sub> |
|---------------------|----------------|---------------------|
| 0.7V                | 4A             | 0.17Ω               |

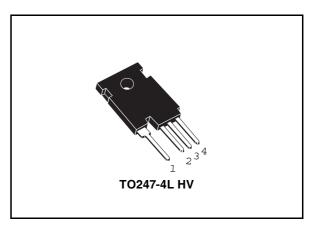
- High voltage / high current cascode configuration
- Low equivalent on resistance
- Very fast-switch, up to 150 kHz
- Squared RBSOA, up to 1700 V
- Very low  $C_{ISS}$  driven by  $R_G = 47 \Omega$
- Very low turn-off cross over time
- In compliance with the 2002/93/EC European Directive

## Description

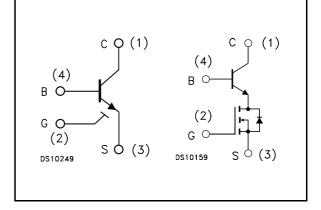
The STC04IE170HV is manufactured in Monolithic ESBT technology, aimed to provide the best performance in High Frequency / High voltage applications. It is designed for use in Gate Driven based topologies.

## Applications

■ Aux SMPS for three phase mains



### Internal schematic diagrams



### **Order codes**

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

| November | 2006 |
|----------|------|
|          |      |

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# 1 Electrical ratings

| Table 2. | Absolute maximum ratings |
|----------|--------------------------|
| Table 2. | Absolute maximum ratings |

| Symbol              | Parameter  | Value      | Unit |
|---------------------|--|------------|------|
| V <sub>CS(SS)</sub> | Collector-source voltage ( $V_{BS} = V_{GS} = 0V$ )          | 1700       | V    |
| V <sub>BS(OS)</sub> | Base-source voltage (I <sub>C</sub> =0, V <sub>GS</sub> =0V) | 30         | V    |
| V <sub>SB(OS)</sub> | Source-base voltage ( $I_C = 0$ , $V_{GS} = 0V$ )            | 17         | V    |
| V <sub>GS</sub>     | Gate-source voltage  | ± 17       | V    |
| ۱ <sub>C</sub>      | Collector current  | 4          | А    |
| I <sub>CM</sub>     | Collector peak current (t <sub>P</sub> < 5ms)                | 15         | А    |
| ۱ <sub>B</sub>      | Base current   | 2          | А    |
| I <sub>BM</sub>     | Base peak current (t <sub>P</sub> < 1ms)                     | 4          | А    |
| P <sub>tot</sub>    | Total dissipation at $T_c \le 25^{\circ}C$                   | 178        | W    |
| T <sub>stg</sub>    | Storage temperature  | -40 to 150 | °C   |
| TJ                  | Max. operating junction temperature                          | 150        | °C   |

### Table 3. Thermal data

| Symbol                | Parameter                            | Value | Unit |
|-----------------------|--------------------------------------|-------|------|
| R <sub>thj-case</sub> | Thermal resistance junction-case max | 0.7   | °C/W |

# 2 Electrical characteristics

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

| Table 4. | Electrical characteristics |
|----------|----------------------------|
|          |                            |

| Symbol                           | Parameter   | Test Conditions   | Min.   | Тур.       | Max.       | Unit     |
|----------------------------------|---|---|--------|------------|------------|----------|
| I <sub>CS(SS)</sub>              | Collector-source current $(V_{BS} = V_{GS} = 0V)$               | V <sub>CS(SS)</sub> =1700V  |        |            | 100        | μA       |
| I <sub>BS(OS)</sub>              | Base-source current<br>(I <sub>C</sub> =0, V <sub>GS</sub> =0V) | V <sub>BS(OS)</sub> =30V  |        |            | 10         | μA       |
| I <sub>SB(OS)</sub>              | Source-base current<br>(I <sub>C</sub> =0, V <sub>GS</sub> =0V) | V <sub>SB(OS)</sub> =17V  |        |            | 100        | μA       |
| I <sub>GS(OS)</sub>              | Gate-source leakage<br>(V <sub>BS</sub> =0V)                    | V <sub>GS</sub> = ± 17V   |        |            | 100        | nA       |
| V <sub>CS(ON)</sub>              | Collector-source ON voltage                                     | $V_{GS} = 10V I_C = 4A I_B = 0.8A$<br>$V_{GS} = 10V I_C = 1.5A I_B = 0.15A$                                   |        | 0.7<br>0.6 | 1.5<br>1.4 | V<br>V   |
| h <sub>FE</sub>                  | DC current gain   | $V_{CS} = 1V$ $V_{GS} = 10V$ $I_{C} = 4A$<br>$V_{CS} = 1V$ $V_{GS} = 10V$ $I_{C} = 1.5A$                      | 4<br>7 | 5.5<br>11  |            |          |
| V <sub>BS(ON)</sub>              | Base-source ON<br>voltage                                       | $V_{GS} = 10V$ $I_C = 4A$ $I_B = 0.8A$<br>$V_{GS} = 10V$ $I_C = 1.5A$ $I_B = 0.15A$                           |        | 1.3<br>0.9 | 1.5<br>1.1 | V<br>V   |
| V <sub>GS(th)</sub>              | Gate threshold voltage  | V <sub>BS</sub> =V <sub>GS</sub> I <sub>B</sub> =250μA  | 2      | 3          | 4          | V        |
| C <sub>iss</sub>                 | Input capacitance   | V <sub>CS</sub> =25V f =1MHz<br>V <sub>GS</sub> =0V   |        | 510        |            | pF       |
| Q <sub>GS(tot)</sub>             | Gate-source Charge  | V <sub>GS</sub> =10V  |        | 3.9        |            | nC       |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage time<br>Fall time                     | $V_{GS} = 10V$ $R_G = 47\Omega$ $V_{Clamp} = 1360V$ $t_p = 4\mu s$ $I_C = 2A$ $I_B = 0.4A$                    |        | 770<br>10  |            | ns<br>ns |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage time<br>Fall time                     | $V_{GS} = 10V$ $R_G = 47\Omega$ $V_{Clamp} = 1360V$ $t_p = 4\mu s$ $I_C = 2A$ $I_B = 0.2A$                    |        | 410<br>10  |            | ns<br>ns |
| V <sub>CS(dyn)</sub>             | Collector-source<br>dynamic voltage<br>(500ns)                  | $\begin{split} & V_{CC} = V_{Clamp} = \!$ |        | 5.36       |            | V        |



| Symbol               | Parameter  | Test Conditions   | Min. | Тур. | Max. | Unit |
|----------------------|--|---|------|------|------|------|
| V <sub>CS(dyn)</sub> | Collector-source<br>dynamic voltage<br>(1µs)                     | $\begin{split} & V_{CC} = V_{Clamp} = \!$ |      | 4.32 |      | v    |
| V <sub>CSW</sub>     | Maximum collector-<br>source voltage switched<br>without snubber | $R_{G} = 47\Omega$ $h_{FE} = 5$ $I_{C} = 4A$  | 1700 |      |      | V    |

 Table 4.
 Electrical characteristics

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

**Output characteristics** 

## 2.1 Electrical characteristics (curves)

Figure 1.

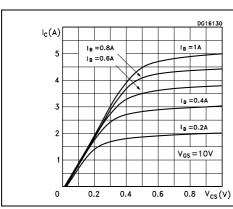


Figure 3. DC current gain

nain **r**i

Figure 2. Dynamic collector-source saturation voltage

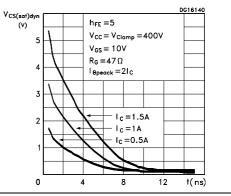
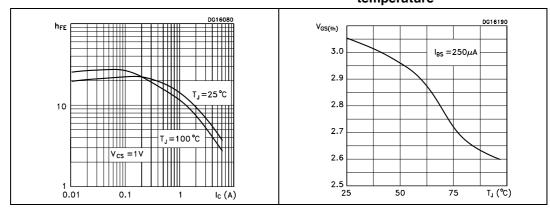


Figure 4. Gate threshold voltage vs temperature



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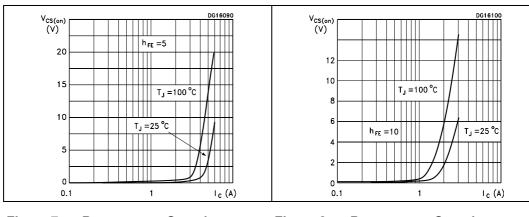
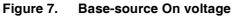
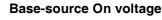


Figure 5. Collector-source On voltage Figure 6. **Collector-source On voltage** 







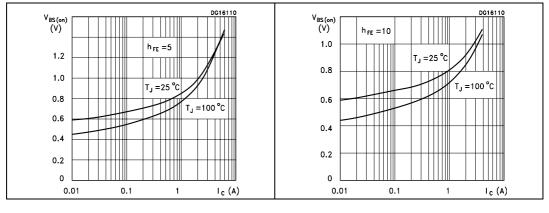
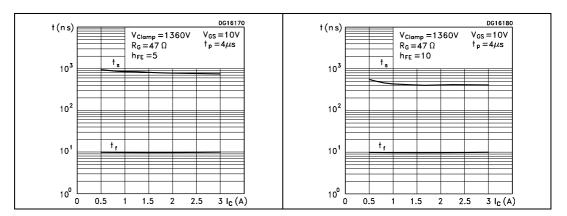


Figure 9. Inductive load switching time Figure 10. Inductive load switching time



| Figure 11.         | Reverse biased safe<br>operating area |                     |       | e    |                     |
|--------------------|---------------------------------------|---------------------|-------|------|---------------------|
|                    |                                       |                     |       | D    | G16150              |
| I <sub>c</sub> (A) |                                       |                     |       |      |                     |
| 4                  |                                       |                     |       |      |                     |
| 3                  |                                       | V <sub>GS</sub> = 1 | ov    |      |                     |
| 2                  |                                       | R <sub>g</sub> = 47 | Ω<br> |      |                     |
| 1                  |                                       |                     |       |      |                     |
| 0                  | 400                                   | 800                 | 1200  | 1600 | V <sub>cs</sub> (V) |



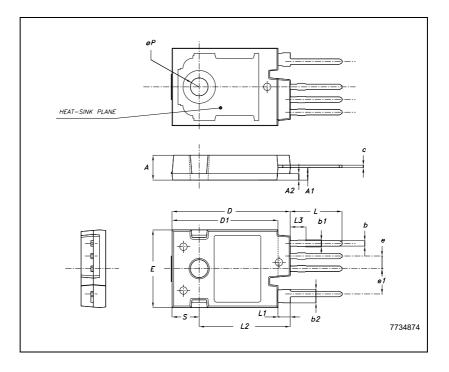
## 3 Package mechanical data

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



| DIM. |       | mm.   |       |
|------|-------|-------|-------|
|      | MIN.  | TYP   | MAX.  |
| А    | 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  |
| С    | 0.40  |       | 0.80  |
| D    | 23.85 | 24    | 24.15 |
| D1   |       | 21.50 |       |
| E    | 15.45 | 15.60 | 15.75 |
| е    | 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  |       |

#### TO247-4L HV MECHANICAL DATA



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# 4 Revision history

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



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