

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 |

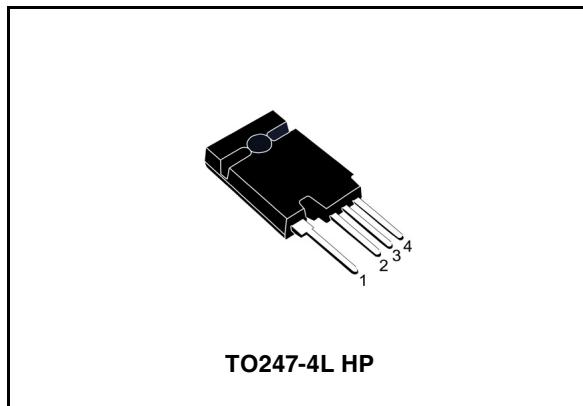
- High voltage / high current cascode configuration
- Low equivalent on resistance
- Very fast-switch, up to 150 kHz
- Squared RBSOA, up to 1700 V
- Very low C_{ISS} driven by $R_G = 47 \Omega$
- Very low turn-off cross over time
- In compliance with the 2002/93/EC European Directive

Applications

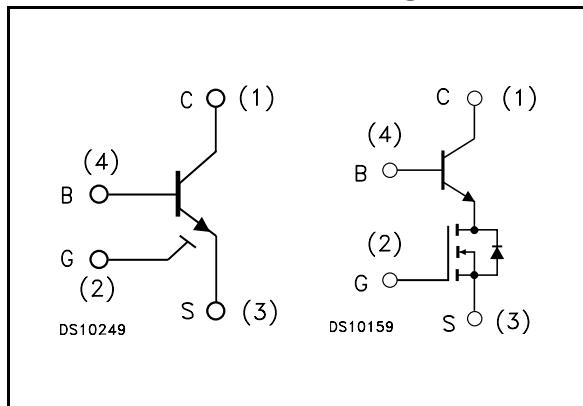
- Aux SMPS for three phase mains

Description

The STC04IE170HP 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.



Internal schematic diagrams



Order codes

| Part Number | Marking | Package | Packing |
|--------------|------------|------------|---------|
| STC04IE170HP | C04IE170HP | TO247-4LHP | Tube |

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1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|--------------|---|------------|------|
| $V_{CS(OS)}$ | 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 | ± 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 $T_c \leq 25^\circ C$ | 50 | 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 |
|----------------|----------------------------------|-------|------|
| $R_{thj-case}$ | Thermal resistance junction-case | max | °C/W |

2 Electrical characteristics

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

Table 4. Electrical characteristics

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

Table 4. Electrical characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|---|---|------|------|------|------|
| $V_{CS(dyn)}$ | Collector-source dynamic voltage (1μs) | $V_{CC} = V_{Clamp} = 400V$ $V_{GS} = 10V$ $I_C = 1.5A$ $I_B = 0.3A$ $t_{peak} = 500ns$ $R_G = 47\Omega$ $I_{Bpeak} = 3A (2I_C)$ | | 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 μs, duty cycle ≤ 1.5%

2.1 Electrical characteristics (curves)

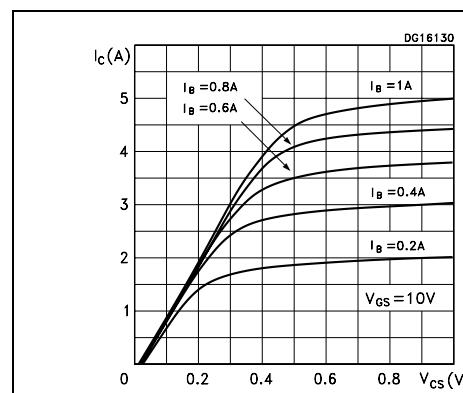
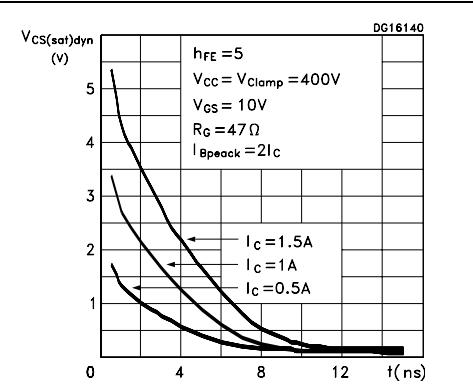
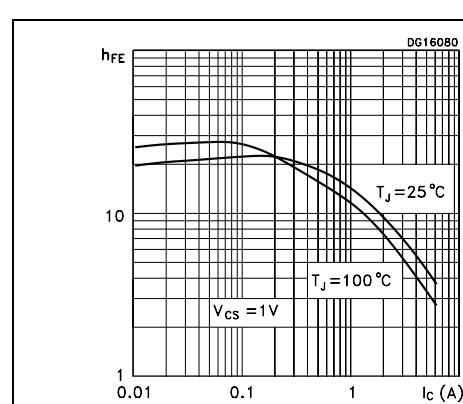
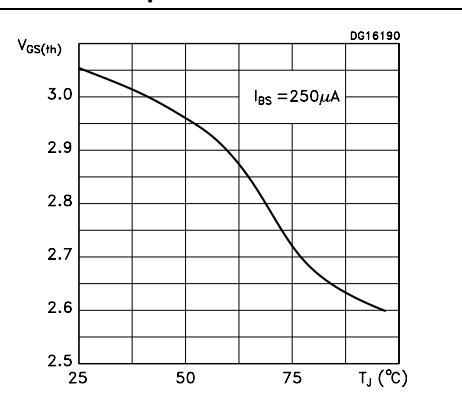
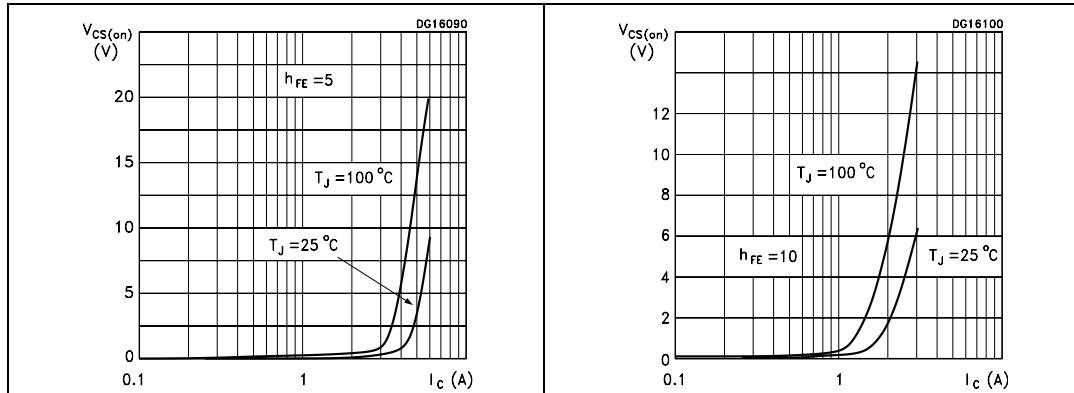
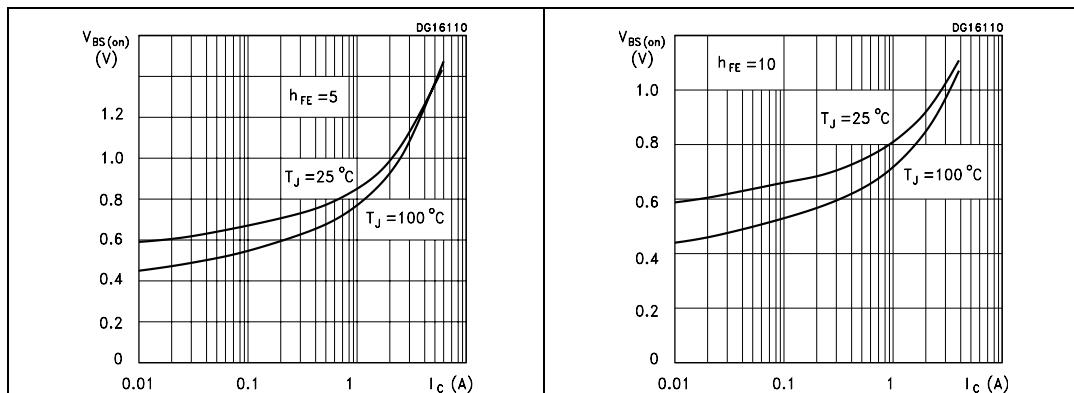
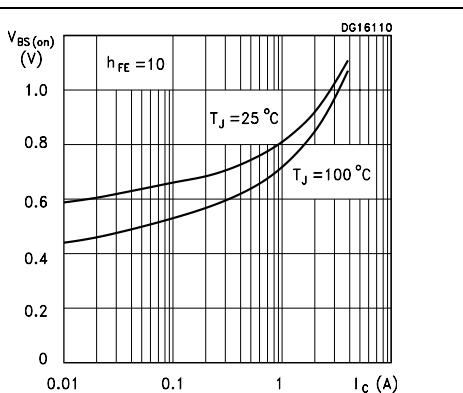
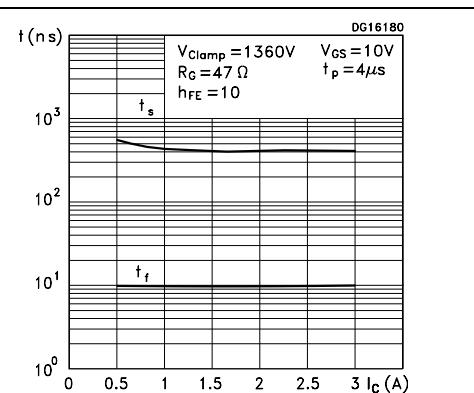
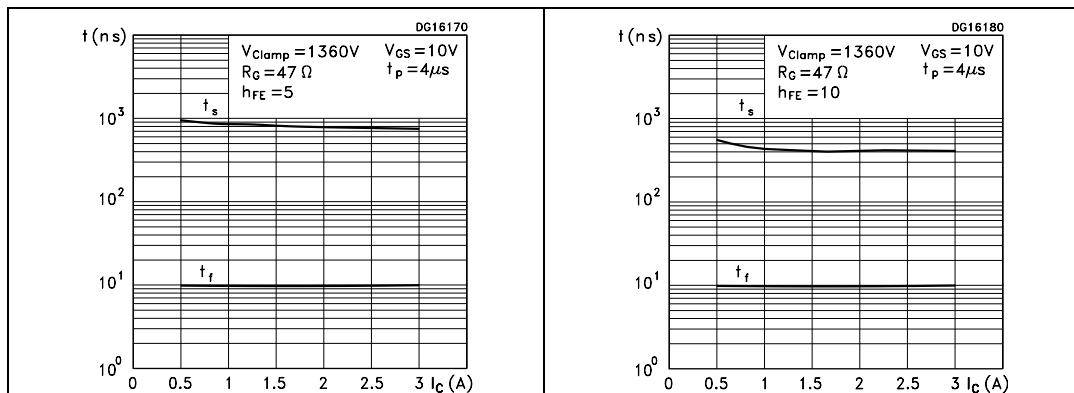
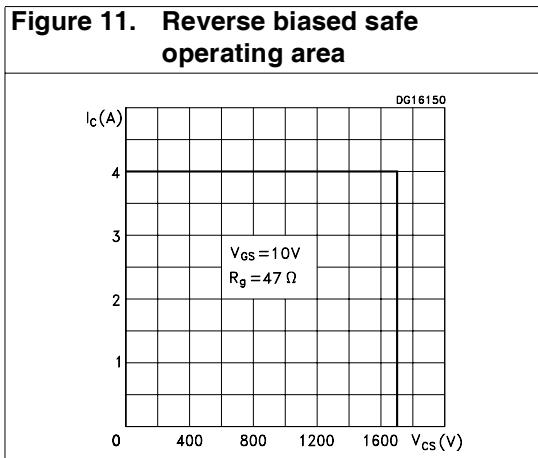
Figure 1. Output characteristics**Figure 2. Dynamic collector-source saturation voltage****Figure 3. DC current gain****Figure 4. Gate threshold voltage vs temperature**

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**

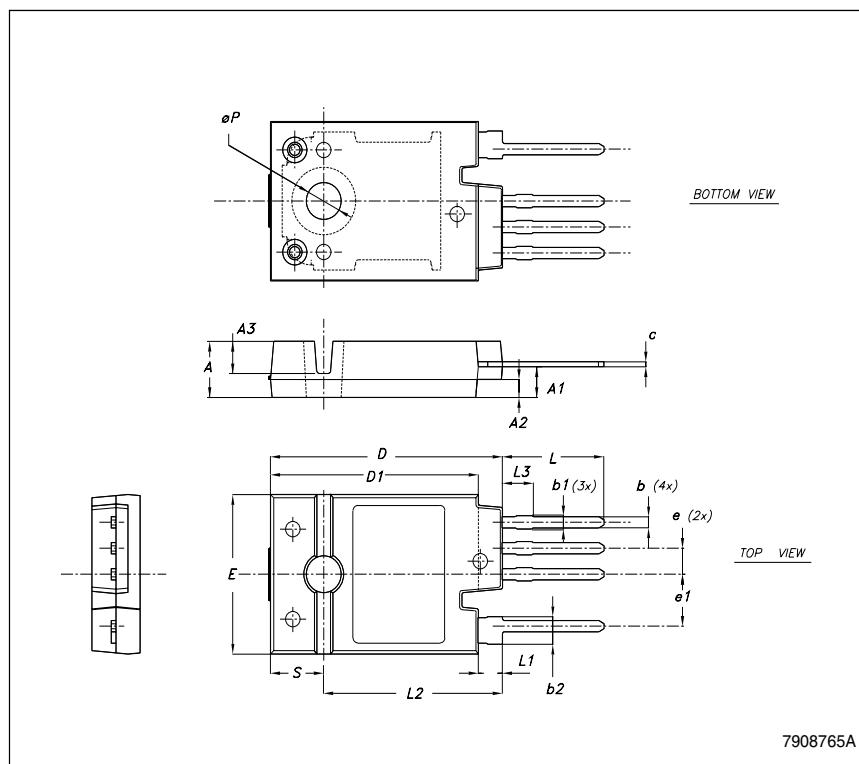


3 Package mechanical data

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

TO247-4LHP MECHANICAL DATA

| DIM. | mm. | | |
|----------|-------|-------|-------|
| | MIN. | TYP. | MAX. |
| A | 5.50 | 5.65 | 5.80 |
| A1 | 2.85 | 3.15 | 3.25 |
| A2 | | 1.92 | |
| A3 | | 3.18 | |
| 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 | |
| ϕP | 3.55 | | 3.65 |
| S | | 5.50 | |



4 Revision history

Table 5. Revision history

| Date | Revision | Changes |
|-------------|----------|------------------------------|
| 27-Sep-2006 | 1 | First release. |
| 21-Nov-2006 | 2 | Improved application target. |

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