



STC03DE170

HYBRID EMITTER SWITCHED BIPOLAR TRANSISTOR ESBT™ 1700 V - 3 A - 0.55 Ω

Table 1: General Features

| $V_{CS(ON)}$ | I_C | $R_{CS(ON)}$ |
|--------------|-------|--------------|
| 1 V | 1.8 A | 0.55 Ω |

- LOW EQUIVALENT ON RESISTANCE
- VERY FAST-SWITCH, UP TO 150 kHz
- SQUARED RBSOA, UP TO 1700 V
- VERY LOW C_{ISS} DRIVEN BY $R_G = 4.7 \Omega$

APPLICATION

- AUX SMPS FOR THREE PHASE MAINS

DESCRIPTION

The STC03DE170 is manufactured in a hybrid structure, using dedicated high voltage Bipolar and low voltage MOSFET technologies, aimed to providing the best performance in ESBT topology. The STC03DE170 is designed for use in aux flyback smps for any three phase application.

Figure 1: Package

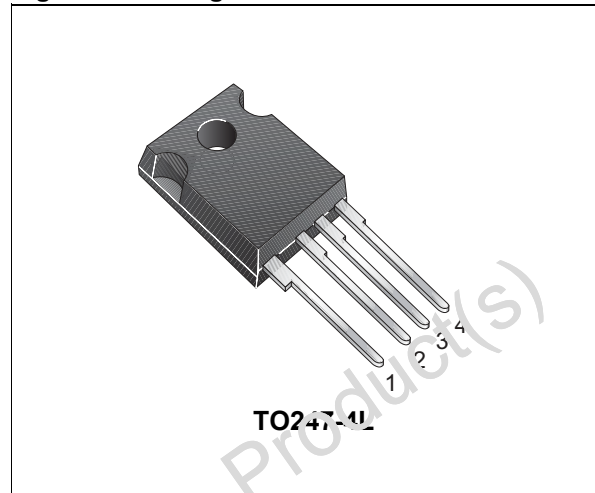


Figure 2: Internal Schematic Diagram

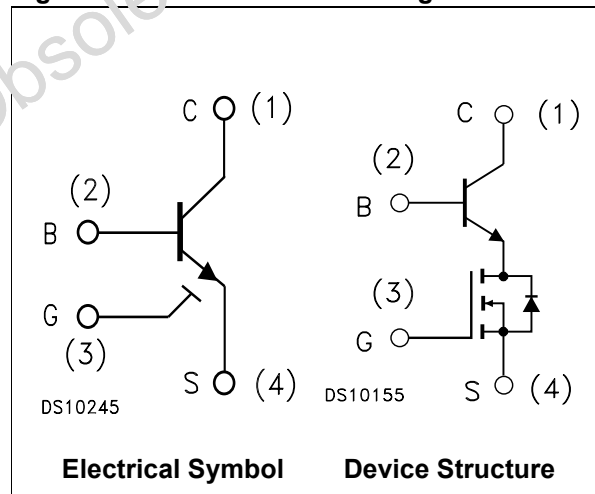


Table 2: Order Code

| Part Number | Marking | Package | Packaging |
|-------------|------------|----------|-----------|
| STC03DE170 | STC03DE170 | TO247-4L | TUBE |

Table 3: Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit |
|--------------|---|------------|------------------|
| $V_{CS(SS)}$ | Collector-Source Voltage ($V_{BS} = V_{GS} = 0\text{ V}$) | 1700 | V |
| $V_{BS(OS)}$ | Base-Source Voltage ($I_C = 0, V_{GS} = 0\text{ V}$) | 30 | V |
| $V_{SB(OS)}$ | Source-Base Voltage ($I_C = 0, V_{GS} = 0\text{ V}$) | 9 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_C | Collector Current | 3 | A |
| I_{CM} | Collector Peak Current ($t_p < 5\text{ ms}$) | 6 | A |
| I_B | Base Current | 2 | A |
| I_{BM} | Base Peak Current ($t_p < 1\text{ ms}$) | 4 | A |
| P_{tot} | Total Dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 100 | W |
| T_{stg} | Storage Temperature | -65 to 125 | $^\circ\text{C}$ |
| T_J | Max. Operating Junction Temperature | 125 | $^\circ\text{C}$ |

Table 4: Thermal Data

| Symbol | Parameter | Unit |
|----------------|--------------------------------------|----------------------|
| $R_{thj-case}$ | Thermal Resistance Junction-Case Max | 1 $^\circ\text{C/W}$ |

Table 5: Electrical Characteristics ($T_{case} = 25\text{ }^\circ\text{C}$ unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|---|--|----------|----------|------------|---------------|
| $I_{CS(SS)}$ | Collector-Source Current ($V_{BS} = V_{GS} = 0\text{ V}$) | $V_{CS(SS)} = 1700\text{ V}$ | | | 100 | μA |
| $I_{BS(OS)}$ | Base-Source Current ($I_C = 0, V_{GS} = 0\text{ V}$) | $V_{BS(OS)} = 30\text{ V}$ | | | 10 | μA |
| $I_{SB(OS)}$ | Source-Base Current ($I_C = 0, V_{GS} = 0\text{ V}$) | $V_{SB(OS)} = 9\text{ V}$ | | | 100 | μA |
| $I_{GS(OS)}$ | Gate-Source Leakage | $V_{GS} = \pm 20\text{ V}$ | | | 500 | nA |
| $V_{CS(ON)}$ | Collector-Source ON Voltage | $V_{GS} = 10\text{ V } I_C = 1.8\text{ A } I_B = 0.36\text{ A}$ $V_{GS} = 10\text{ V } I_C = 0.7\text{ A } I_B = 70\text{ mA}$ | | 1 1 | 1.5 1.3 | V V |
| h_{FE} | DC Current Gain | $I_C = 1.8\text{ A } V_{CS} = 1\text{ V } V_{GS} = 10\text{ V}$ $I_C = 0.7\text{ A } V_{CS} = 1\text{ V } V_{GS} = 10\text{ V}$ | 3.5 6 | 5 10 | | |
| $V_{BS(ON)}$ | Base-Source ON Voltage | $V_{GS} = 10\text{ V } I_C = 1.8\text{ A } I_B = 0.36\text{ A}$ $V_{GS} = 10\text{ V } I_C = 0.7\text{ A } I_B = 70\text{ mA}$ | | 1 0.8 | 1.2 1 | V V |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{BS} = V_{GS} \quad I_B = 250\text{ }\mu\text{A}$ | 1.5 | 2.2 | 3 | V |
| C_{iss} | Input Capacitance | $V_{CS} = 25\text{ V} \quad f = 1\text{ MHz}$ $V_{GS} = V_{CB} = 0$ | | 750 | | pF |
| $Q_{GS(tot)}$ | Gate-Source Charge | $V_{CS} = 15\text{ V} \quad V_{GS} = 10\text{ V}$ $V_{CB} = 0 \quad I_C = 1.8\text{ A}$ | | 12.5 | | nC |
| t_s | INDUCTIVE LOAD Storage Time | $V_{GS} = 10\text{ V}$ $R_G = 47\text{ }\Omega \quad V_{Clamp} = 1200\text{ V}$ | | 760 | | ns |
| t_f | Fall Time | $t_p = 4\text{ }\mu\text{s} \quad I_C = 1.8\text{ A } I_B = 0.36\text{ A}$ | | 14 | | ns |

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------|---|---|------|-----------|------|----------|
| t_s t_f | INDUCTIVE LOAD Storage Time Fall Time | $V_{GS} = 10\text{ V}$ $R_G = 47\ \Omega$ $t_p = 4\ \mu\text{s}$ $V_{Clamp} = 1200\text{ V}$ $I_C = 0.7\text{ A}$ $I_B = 70\text{ mA}$ | | 690 32 | | ns ns |
| V_{CSW} | Maximum Collector-Source Voltage without Snubber | $R_G = 47\ \Omega$ $h_{FE} = 5\text{ A}$ $I_C = 3\text{ A}$ | 1500 | | | V |
| $V_{CS(dyn)}$ | Collector-Source Dynamic Voltage (500 ns) | $V_{CC} = V_{Clamp} = 400\text{ V}$ $R_G = 47\ \Omega$ $I_B = 0.1\text{ A}$ $t_{peak} = 500\text{ ns}$ $V_{GS} = 10\text{ V}$ $I_C = 0.5\text{ A}$ $I_{Bpeak} = 1\text{ A}$ | | 3.9 | | V |
| $V_{CS(dyn)}$ | Collector-Source Dynamic Voltage (1 μs) | $V_{CC} = V_{Clamp} = 400\text{ V}$ $R_G = 47\ \Omega$ $I_B = 0.1\text{ A}$ $t_{peak} = 500\text{ ns}$ $V_{GS} = 10\text{ V}$ $I_C = 0.5\text{ A}$ $I_{Bpeak} = 1\text{ A}$ | | 2.2 | | V |

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Figure 3: Safe Operating Area

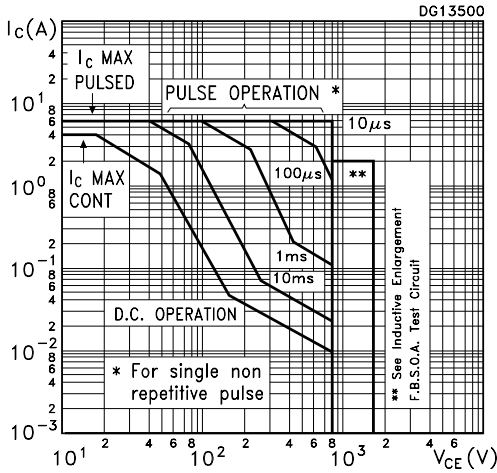


Figure 4: Reverse Biased Safe Operating Area

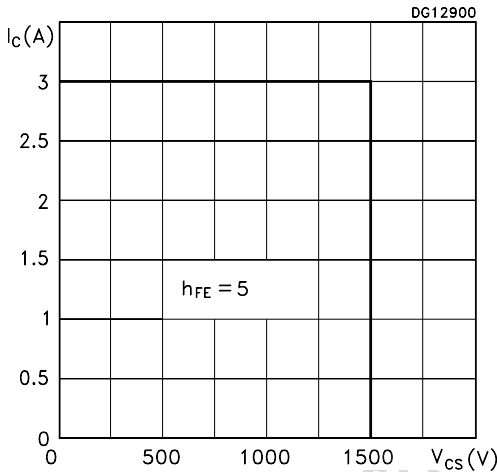


Figure 5: DC Current Gain

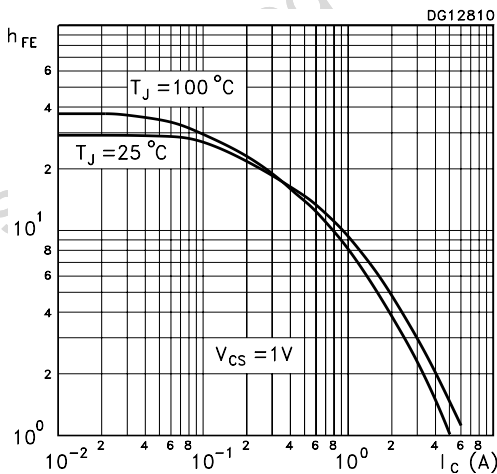


Figure 6: Output Characteristics

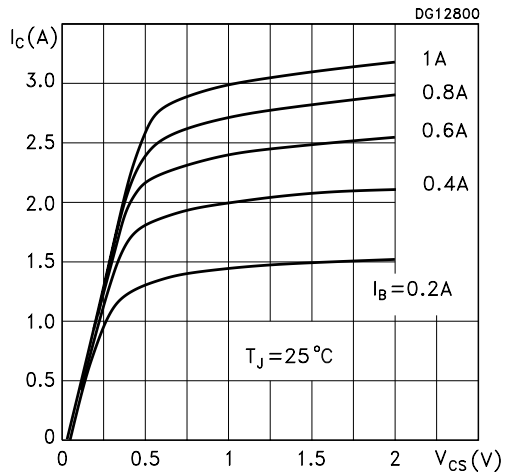


Figure 7: Gate Threshold Voltage vs Temperature

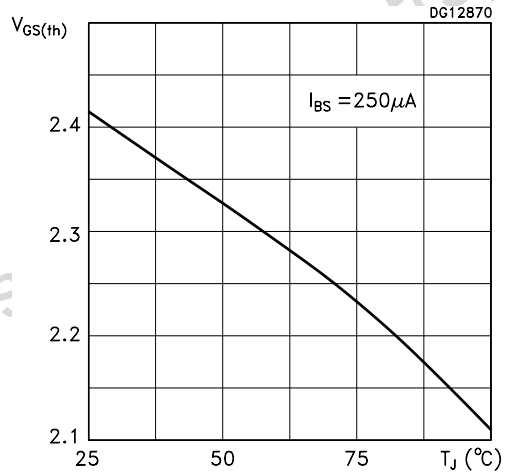


Figure 8: DC Current Gain

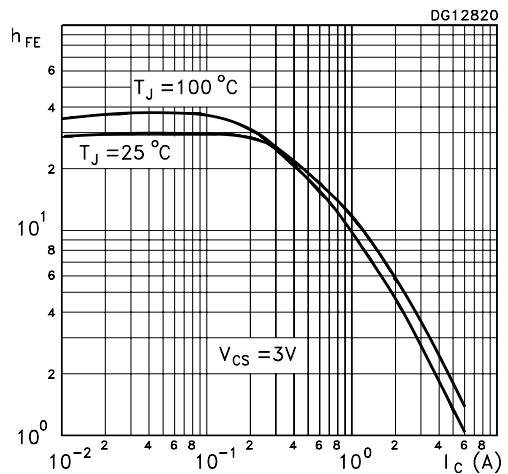


Figure 9: Collector-Source On Voltage

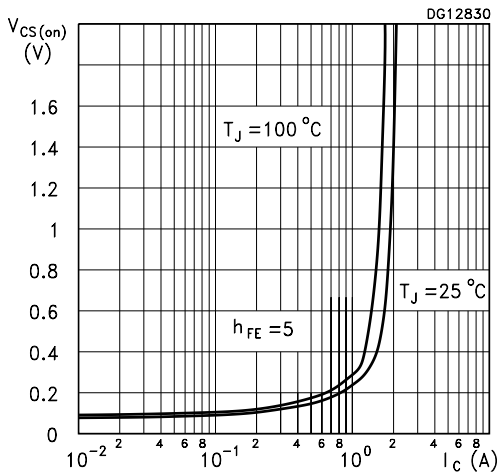


Figure 10: Base-Source On Voltage

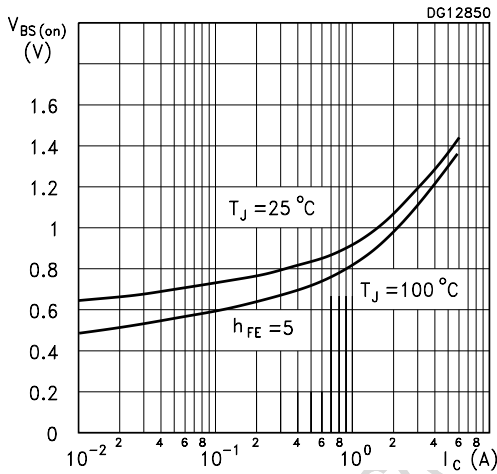


Figure 11: Inductive Load Switching Time

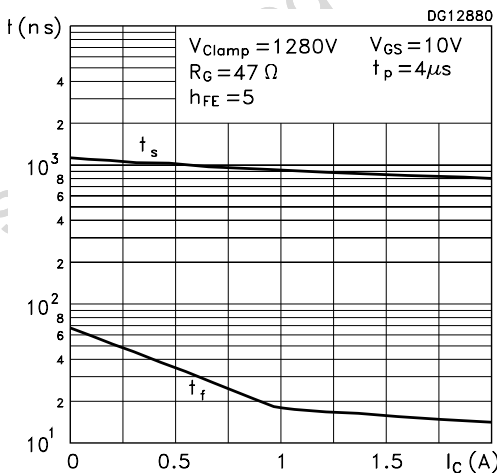


Figure 12: Collector-Source On Voltage

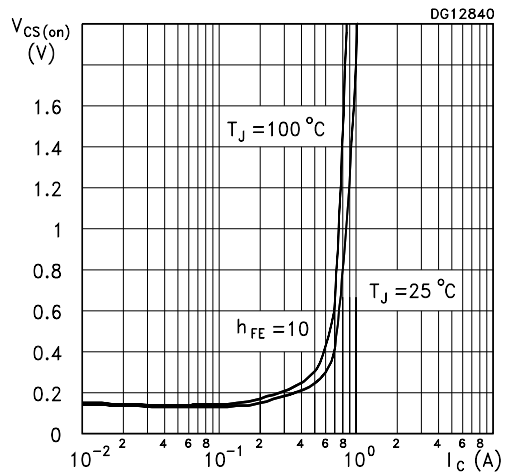


Figure 13: Base-Source On Voltage

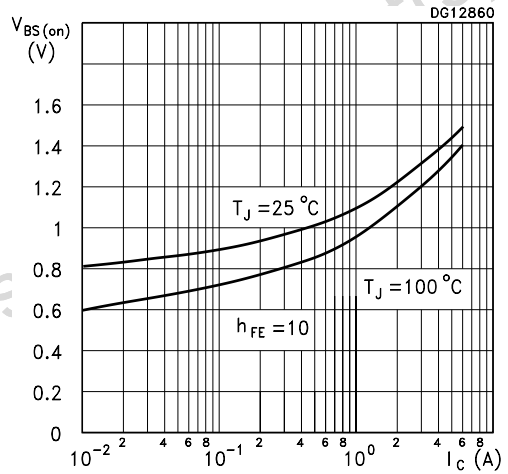


Figure 14: Inductive Load Switching Time

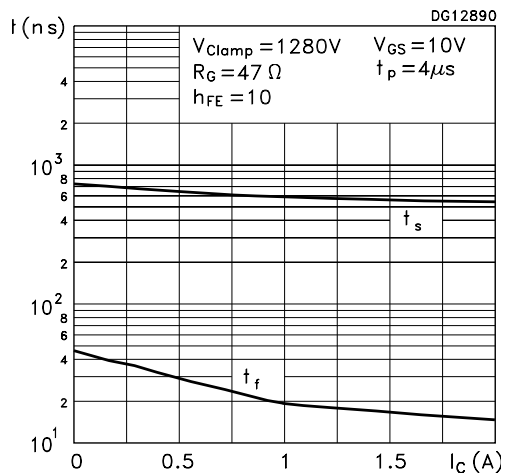


Figure 15: Dynamic Collector-Emitter Saturation Voltage

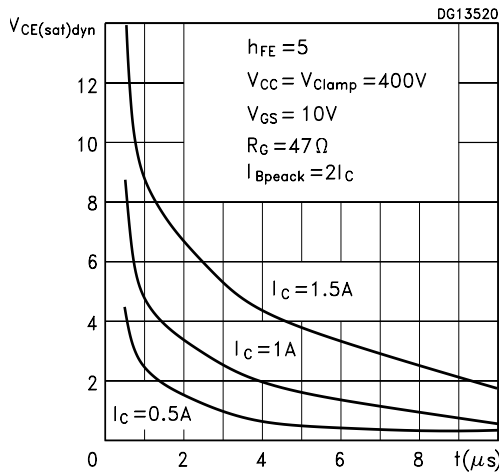


Figure 16: Inductive Load Enlargement FBSOA Circuit

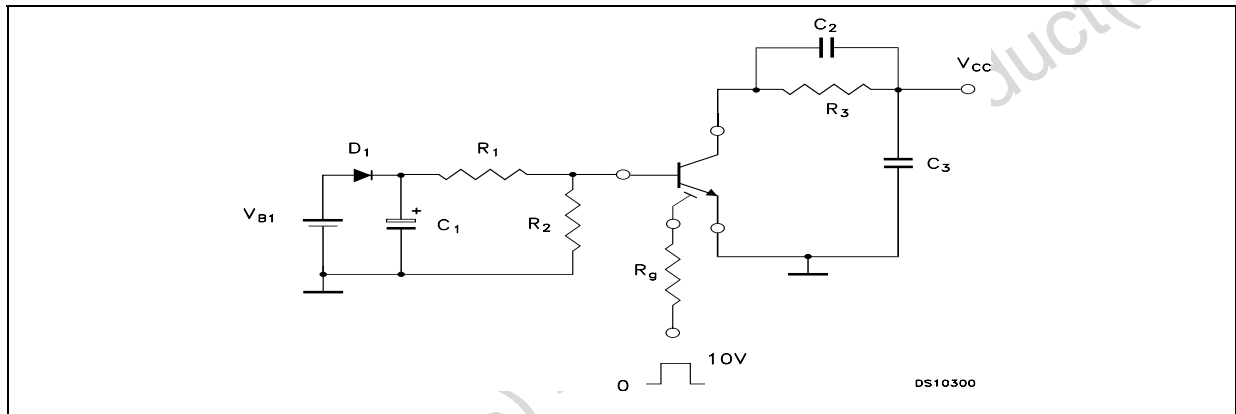


Table 6: Components, Values

| | |
|-------------------------|------------------------|
| $V_{B1} = 4.16 V$ | $C_1 = 220 nF$ |
| $D_1 = BA157$ | $C_2 \leq 70 pF$ |
| $R_1 = 1 \Omega$ | $C_3 = 50 nF$ |
| $R_2 = 100 \Omega$ | $V_g = 10 V$ |
| $R_3 = V_{CC} / I_{Cn}$ | Pulse Time = $5 \mu s$ |
| $R_g = 47 \Omega$ | |

TO247-4L MECHANICAL DATA

| DIM. | mm | | |
|------|-------|-------|-------|
| | MIN. | TYP. | MAX. |
| A | 4.85 | | 5.15 |
| A1 | 2.20 | | 2.60 |
| b | 0.95 | 1.10 | 1.30 |
| b1 | 1.30 | | 1.70 |
| b2 | 2.50 | | 2.90 |
| c | 0.40 | | 0.80 |
| D | 19.85 | | 20.15 |
| E | 15.45 | | 15.75 |
| e | | 2.54 | |
| e1 | | 5.08 | |
| L | 14.20 | | 14.80 |
| L1 | 3.70 | | 4.30 |
| L2 | | 18.50 | |
| ØP | 3.55 | | 3.65 |
| ØR | 4.50 | | 5.50 |
| S | | 5.50 | |

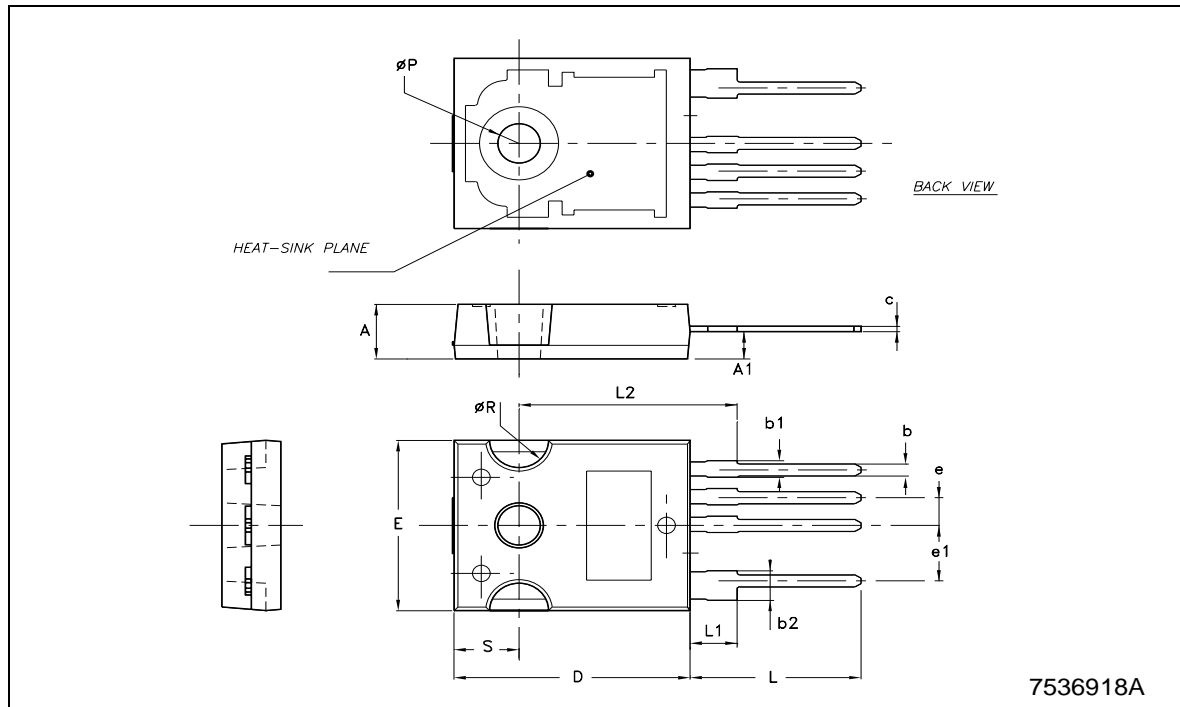


Table 7: Revision History

| Date | Release | Change Designator |
|-------------|---------|---------------------------------------|
| 13-Sep-2004 | 1 | First Release. |
| 04-Oct-2004 | 2 | Figure 15 has been updated on page 6. |

Obsolete Product(s) - Obsolete Product(s)

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