

Complementary power Darlington transistors

Features

- Good h_{FE} linearity
- High f_T frequency
- Monolithic Darlington configuration with integrated antiparallel collector-emitter diode

Application

- Linear and switching industrial equipment

Description

The devices are manufactured in planar technology with “base island” layout and monolithic Darlington configuration.

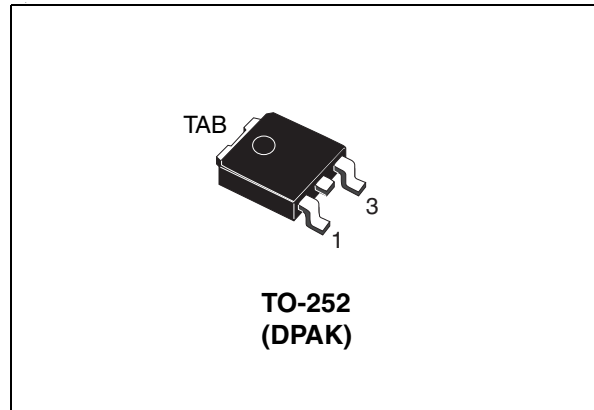


Figure 1. Internal schematic diagram

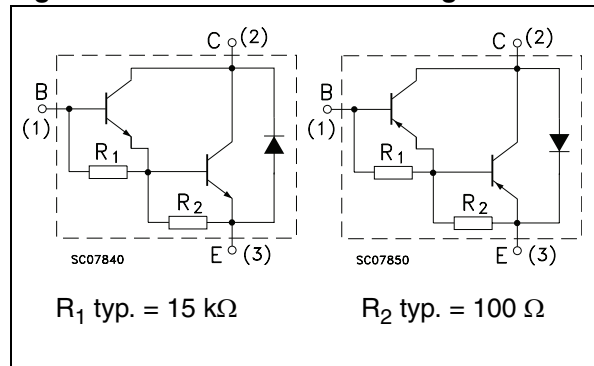


Table 1. Device summary

| Order codes | Marking | Polarity | Package | Packaging |
|-------------|---------|----------|---------|---------------|
| MJD112T4 | MJD112 | NPN | DPAK | Tape and reel |
| MJD117T4 | MJD117 | PNP | DPAK | Tape and reel |

1 Absolute maximum ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|-----------|------------------------------------------------|------------|------|
| V_{CBO} | Collector-base voltage ($I_E = 0$) | 100 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | | |
| V_{EBO} | Emitter-base voltage ($I_C = 0$) | 5 | V |
| I_C | Collector current | 2 | A |
| I_{CM} | Collector peak current | 4 | A |
| I_B | Base current | 0.05 | A |
| P_{TOT} | Total dissipation at $T_{case} = 25\text{ °C}$ | 20 | W |
| T_{STG} | Storage temperature | -65 to 150 | °C |
| T_J | Max. operating junction temperature | 150 | °C |

Note: For PNP types voltage and current values are negative.

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|---------------------------------------|-------|------|
| R_{thJC} | Thermal resistance junction-case max. | 6.25 | °C/W |

2 Electrical characteristics

$T_{\text{case}} = 25\text{ °C}$; unless otherwise specified.

Table 4. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------|------|------------|---------------------|
| I_{CEV} | Collector cut-off current ($V_{\text{BE}} = -1.5\text{ V}$) | $V_{\text{CE}} = 80\text{ V}$ $V_{\text{CE}} = 80\text{ V}, T_{\text{c}} = 125\text{ °C}$ | | - | 10 0.5 | μA mA |
| I_{CBO} | Collector cut-off current ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 80\text{ V}$ $V_{\text{CB}} = 100\text{ V}$ | | - | 10 20 | μA |
| I_{CEO} | Collector cut-off current ($I_{\text{B}} = 0$) | $V_{\text{CE}} = 50\text{ V}$ | | - | 20 | μA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 5\text{ V}$ | | - | 2 | mA |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter sustaining voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = 30\text{ mA}$ | 100 | - | | V |
| $V_{\text{CE(sat)}}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 8\text{ mA}$ | | - | 2 | V |
| | | $I_{\text{C}} = 4\text{ A}$ $I_{\text{B}} = 40\text{ mA}$ | | - | 3 | |
| $V_{\text{BE(sat)}}^{(1)}$ | Base-emitter saturation voltage | $I_{\text{C}} = 4\text{ A}$ $I_{\text{B}} = 40\text{ mA}$ | | - | 4 | V |
| $V_{\text{BE(on)}}$ | Base-emitter on voltage | $I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 3\text{ V}$ | | - | 2.8 | V |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = 0.5\text{ A}$ $V_{\text{CE}} = 3\text{ V}$ | 500 | - | | |
| | | $I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 3\text{ V}$ | 1000 | - | 12000 | |
| | | $I_{\text{C}} = 4\text{ A}$ $V_{\text{CE}} = 3\text{ V}$ | 200 | - | | |
| f_{T} | Transition frequency | $I_{\text{C}} = 0.75\text{ A}$ $V_{\text{CE}} = 10\text{ V}$ $f = 1\text{ MHz}$ | 25 | - | | MHz |
| C_{CBO} | Collector base capacitance ($I_{\text{E}} = 0$) | $V_{\text{CB}} = 10\text{ V}$ $f = 0.1\text{ MHz}$ for MJD112 for MJD117 | | - | 100 200 | pF pF |

1. Pulse test: pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

Note: For PNP types voltage and current values are negative.

2.1 Typical characteristic (curves)

Figure 2. DC current gain ($V_{CE} = 3\text{ V NPN}$)

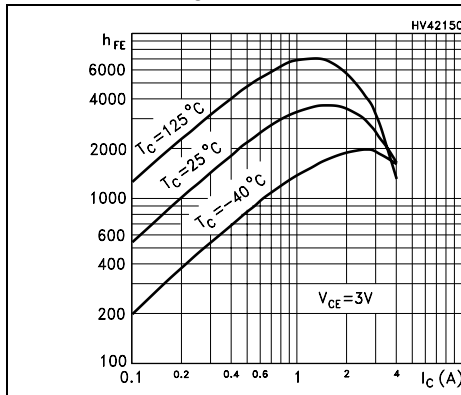


Figure 3. DC current gain ($V_{CE} = -3\text{ V PNP}$)

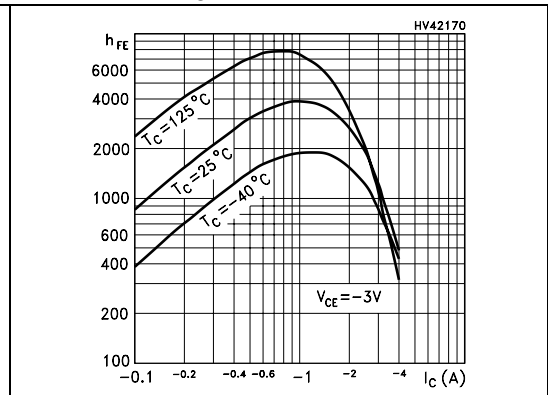


Figure 4. DC current gain ($V_{CE} = 5\text{ V NPN}$)

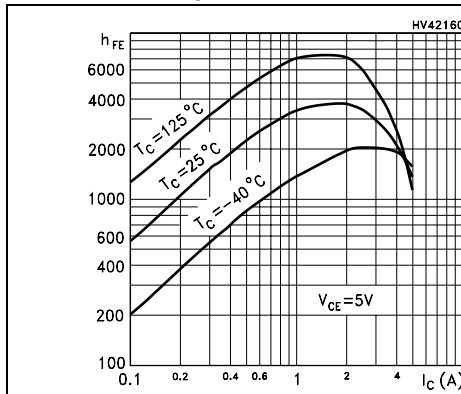


Figure 5. DC current gain ($V_{CE} = -5\text{ V PNP}$)

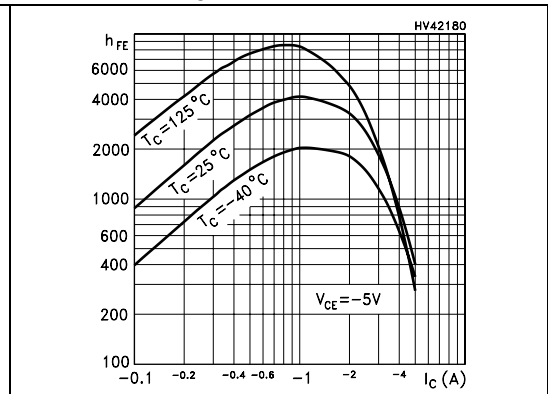


Figure 6. Collector-emitter saturation voltage (NPN)

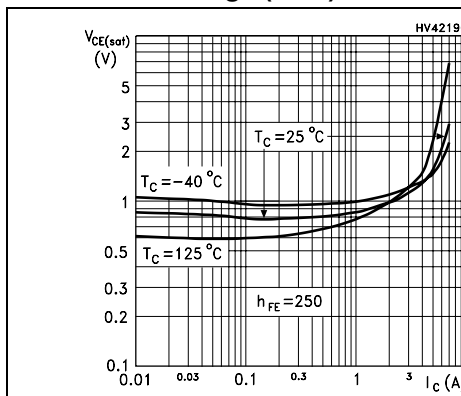


Figure 7. Collector-emitter saturation voltage (PNP)

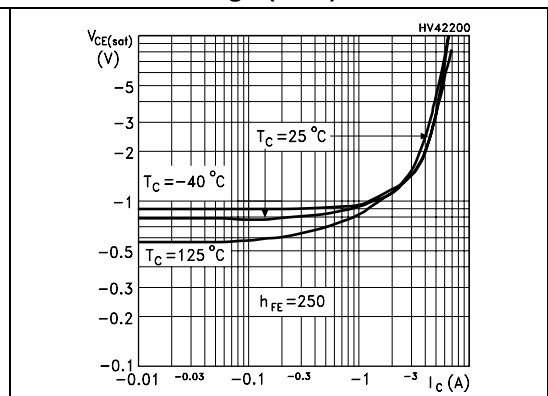


Figure 8. Base-emitter saturation voltage (NPN)

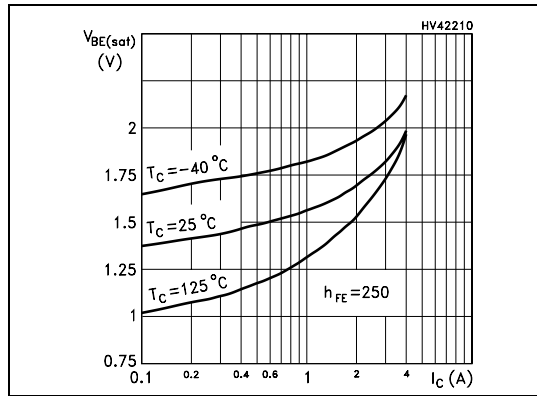


Figure 9. Base-emitter saturation voltage (PNP)

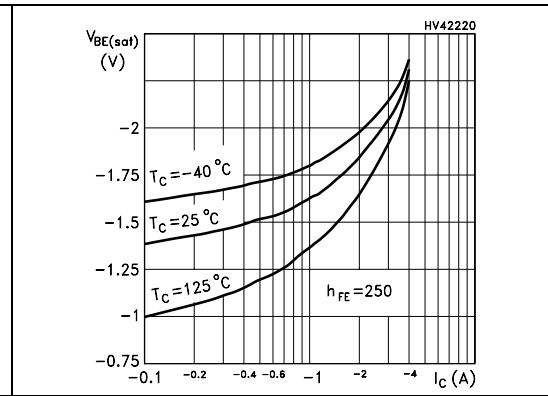


Figure 10. Base-emitter on voltage (NPN)

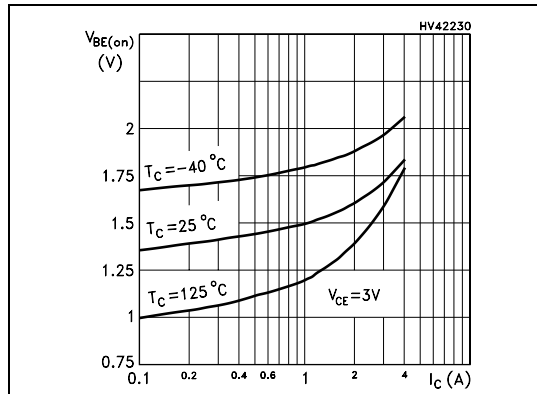


Figure 11. Base-emitter on voltage (PNP)

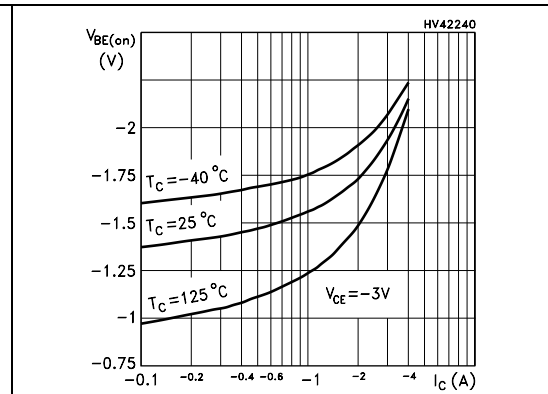


Figure 12. Resistive load switching time (NPN, on)

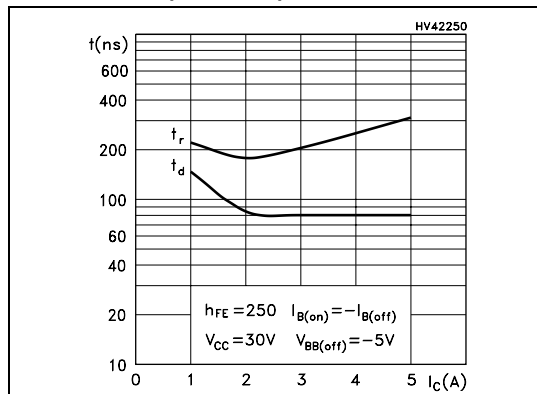


Figure 13. Resistive load switching time (PNP, on)

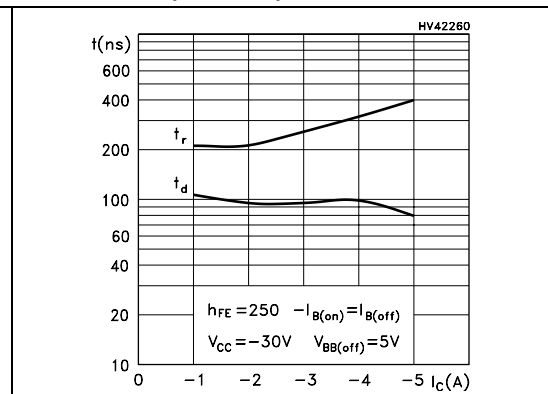
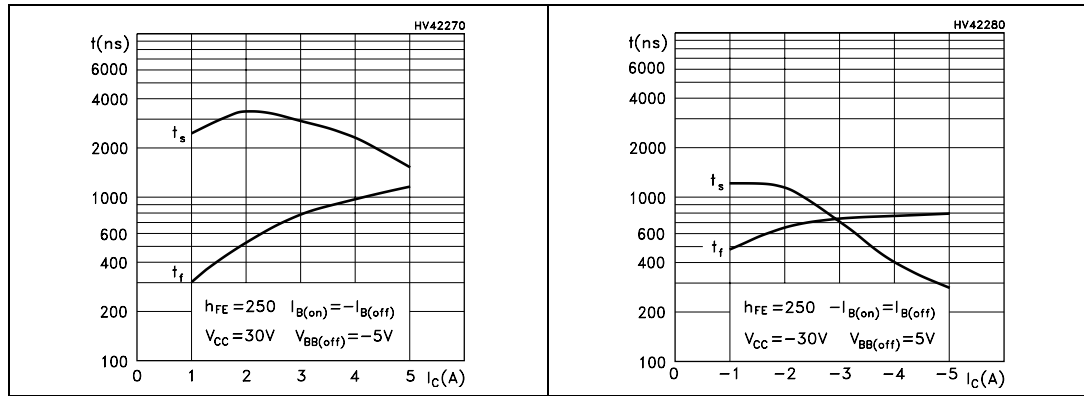


Figure 14. Resistive load switching time (NPN, off) Figure 15. Resistive load switching time (PNP, off)

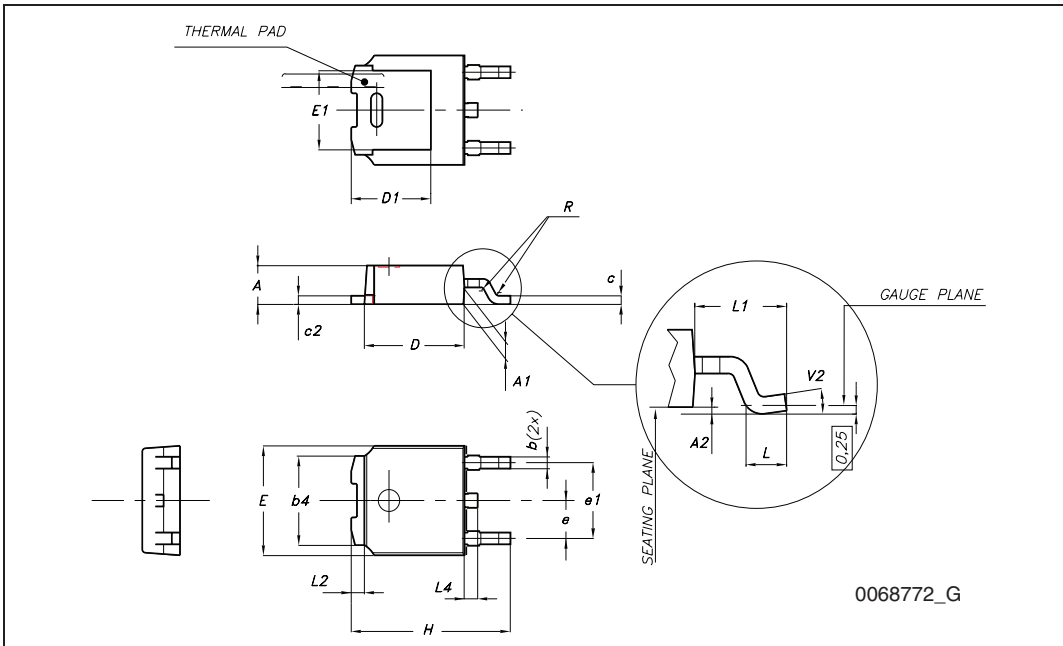


3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

TO-252 (DPAK) mechanical data

| DIM. | mm. | | |
|------|------|------|-------|
| | min. | typ | max. |
| A | 2.20 | | 2.40 |
| A1 | 0.90 | | 1.10 |
| A2 | 0.03 | | 0.23 |
| b | 0.64 | | 0.90 |
| b4 | 5.20 | | 5.40 |
| c | 0.45 | | 0.60 |
| c2 | 0.48 | | 0.60 |
| D | 6.00 | | 6.20 |
| D1 | | 5.10 | |
| E | 6.40 | | 6.60 |
| E1 | | 4.70 | |
| e | | 2.28 | |
| e1 | 4.40 | | 4.60 |
| H | 9.35 | | 10.10 |
| L | 1 | | |
| L1 | | 2.80 | |
| L2 | | 0.80 | |
| L4 | 0.60 | | 1 |
| R | | 0.20 | |
| V2 | 0° | | 8° |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|-----------------|-----------------------------------------|
| 21-Jun-2004 | 2 | Document migration, no content change. |
| 21-Jan-2010 | 3 | Modified TO-252 (DPAK) mechanical data. |

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