# MJD112
# MJD117

## Complementary power Darlington transistors

## Features

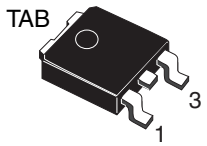
- Good $h_{FE}$ linearity
- High $f_T$ frequency
- Monolithic Darlington configuration with integrated antiparallel collector-emitter diode

## Application

- Linear and switching industrial equipment

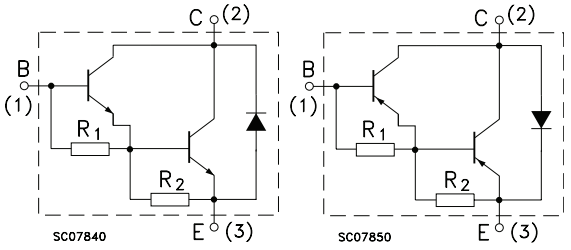
## Description

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




**TO-252**
**(DPAK)**

**Figure 1. Internal schematic diagram**




$R_1$ typ. = 15 kΩ $R_2$ typ. = 100 Ω

**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 °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

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

**Table 4. Electrical characteristics**

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

1. Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

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

## 2.1 Typical characteristic (curves)

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

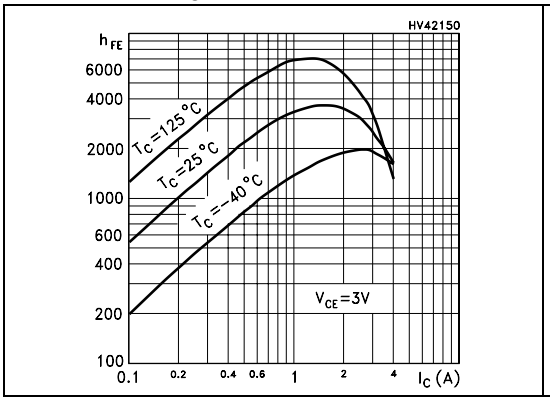



**Figure 3. DC current gain ($V_{CE}$ = - 3 V PNP)**

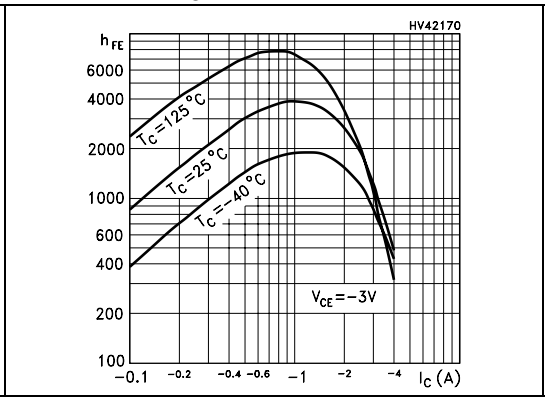



**Figure 4. DC current gain ($V_{CE}$ = 5 V NPN)**

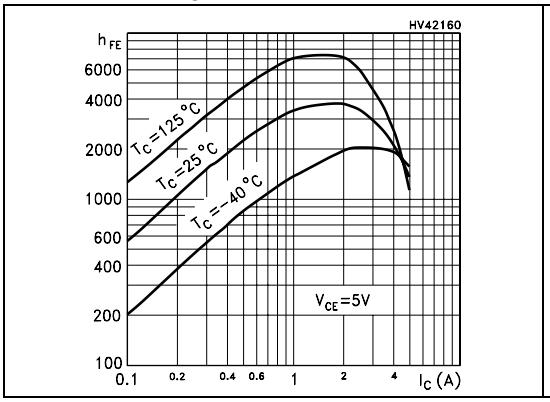



**Figure 5. DC current gain ($V_{CE}$ = - 5 V PNP)**

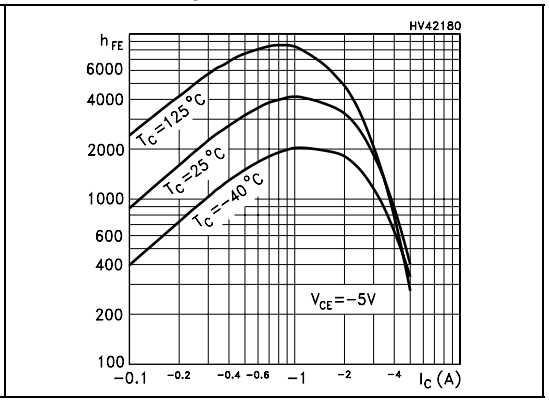



**Figure 6. Collector-emitter saturation voltage (NPN)**

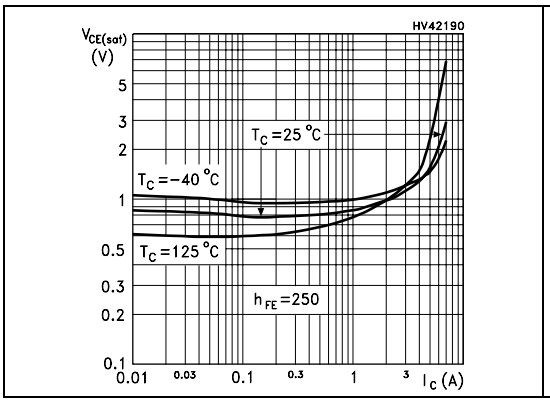



**Figure 7. Collector-emitter saturation voltage (PNP)**

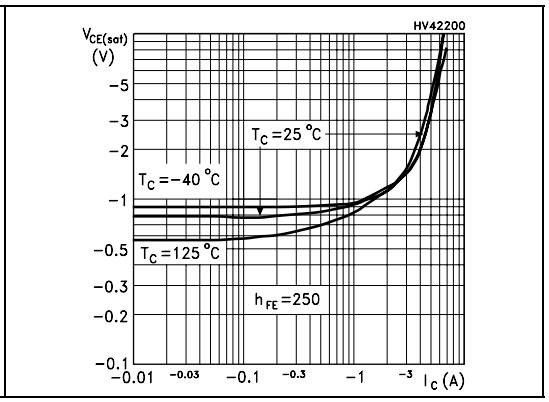


**Figure 8. Base-emitter saturation voltage (NPN)**

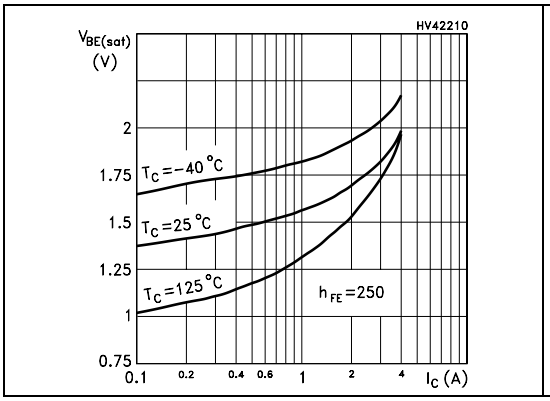



**Figure 9. Base-emitter saturation voltage (PNP)**

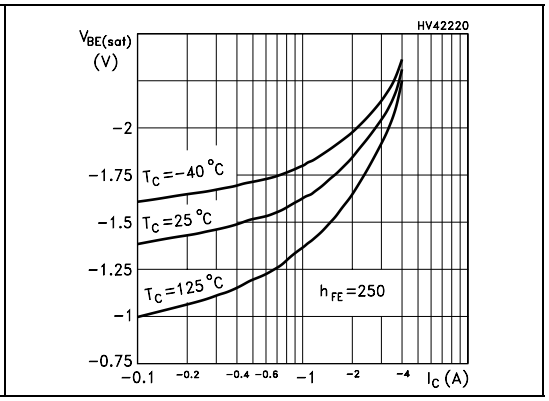



**Figure 10. Base-emitter on voltage (NPN)**

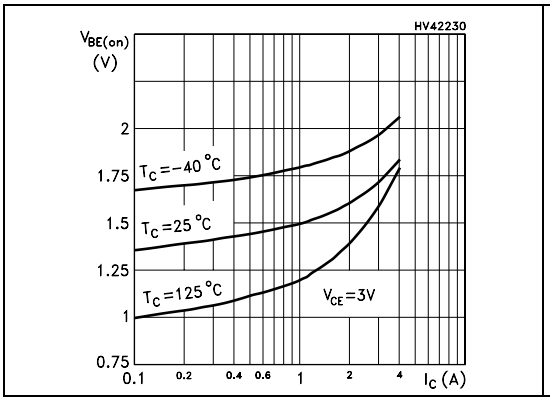



**Figure 11. Base-emitter on voltage (PNP)**

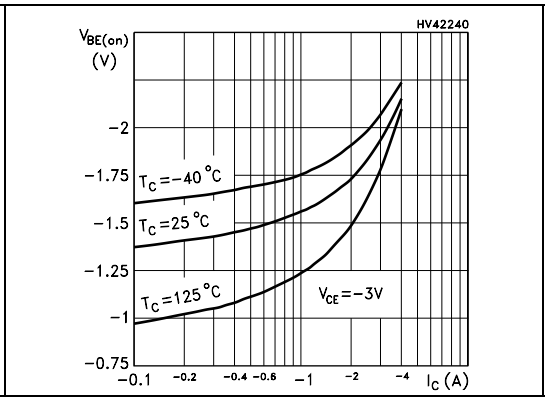



**Figure 12. Resistive load switching time (NPN, on)**

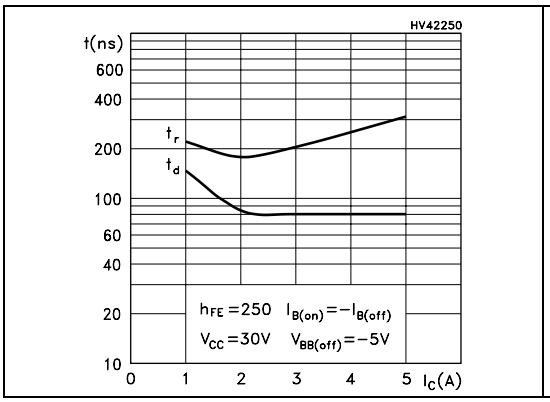



**Figure 13. Resistive load switching time (PNP, on)**

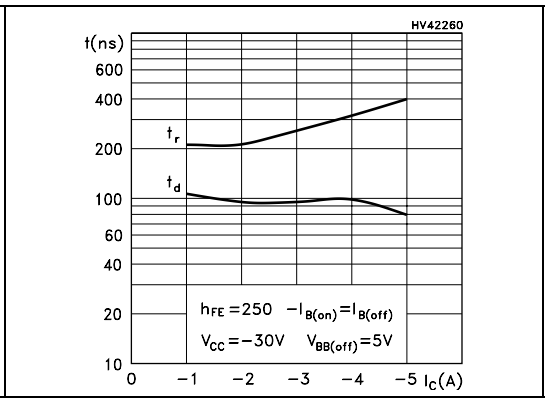


**Figure 14. Resistive load switching time (NPN, off)**

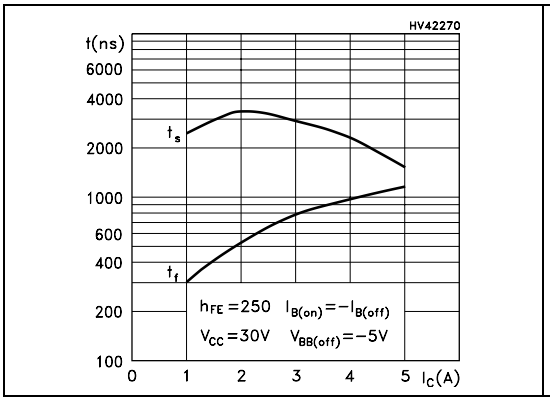
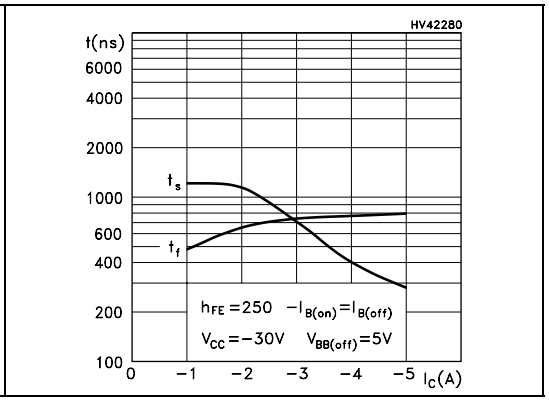



**Figure 15. Resistive load switching time (PNP, off)**



# 3 Package mechanical data

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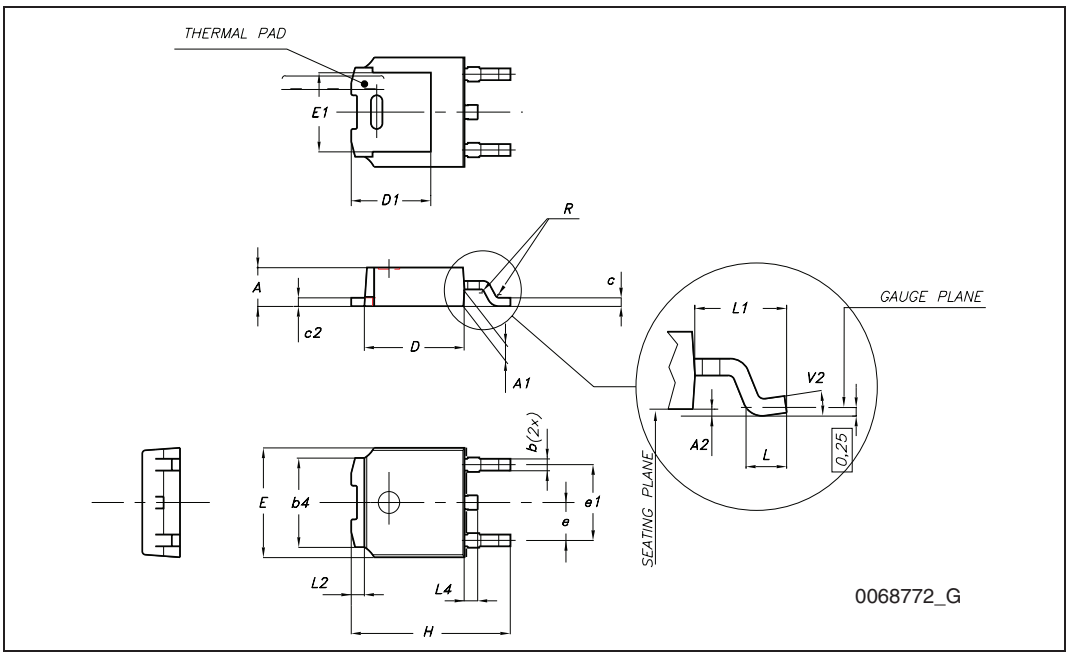
| TO-252 (DPAK) mechanical data | | | |
|---|---|---|---|
| DIM. | mm. | | |
| | min. | typ | max. |
| A | 2.20 | | 2.40 |
| A1 | 0.90 | | 1.10 |
| A2 | 0.03 | | 0.23 |
| b | 0.64 | | 0.90 |
| b4 | 5.20 | | 5.40 |
| c | 0.45 | | 0.60 |
| c2 | 0.48 | | 0.60 |
| D | 6.00 | | 6.20 |
| D1 | | 5.10 | |
| 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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