

## Complementary power Darlington transistors

### Features

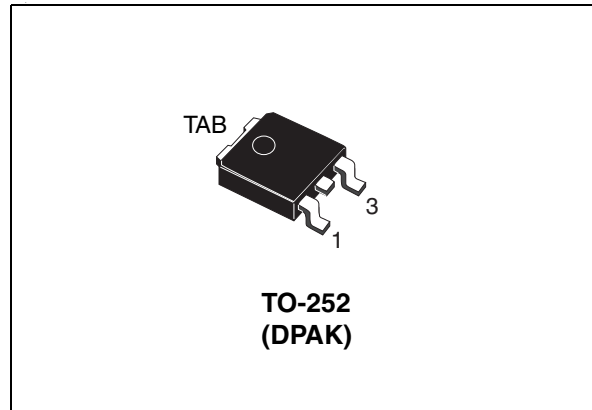
- Good  $h_{FE}$  linearity
- High  $f_T$  frequency
- Monolithic Darlington configuration with integrated antiparallel collector-emitter diode

### Application

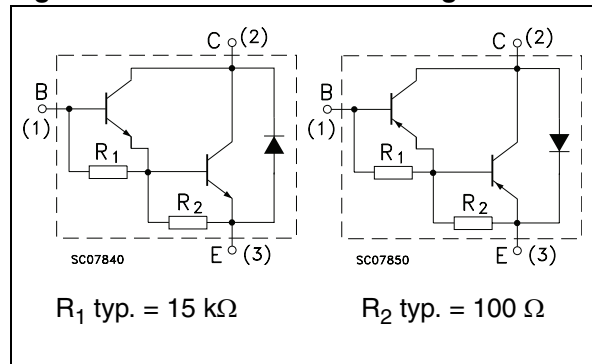
- Linear and switching industrial equipment

### 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**

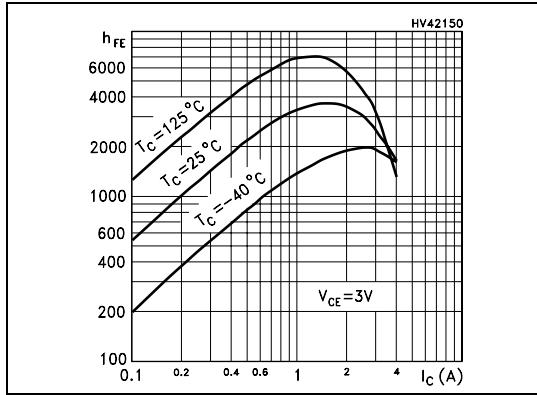
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CEV}}$	Collector cut-off current ( $V_{\text{BE}} = -1.5\text{ V}$ )	$V_{\text{CE}} = 80\text{ V}$ $V_{\text{CE}} = 80\text{ V}, T_{\text{c}} = 125\text{ °C}$		-	10 0.5	$\mu\text{A}$ $\text{mA}$
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 80\text{ V}$ $V_{\text{CB}} = 100\text{ V}$		-	10 20	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 50\text{ V}$		-	20	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5\text{ V}$		-	2	$\text{mA}$
$V_{\text{CEO(sus)}}^{(1)}$	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	-		
$f_{\text{T}}$	Transition frequency	$I_{\text{C}} = 0.75\text{ A}$ $V_{\text{CE}} = 10\text{ V}$ $f = 1\text{ MHz}$	25	-		MHz
$C_{\text{CBO}}$	Collector base capacitance ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 10\text{ V}$ $f = 0.1\text{ MHz}$ for MJD112 for MJD117		-	100 200	$\text{pF}$ $\text{pF}$

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

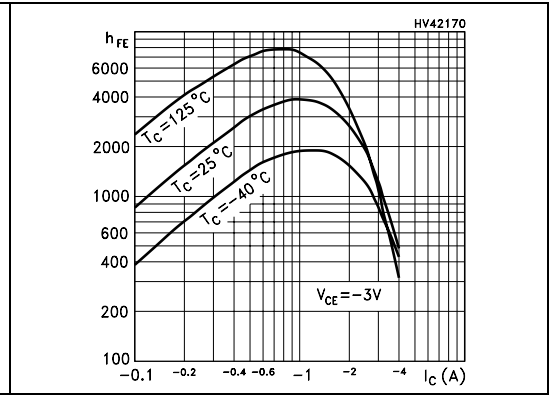
*Note:* For PNP types voltage and current values are negative.

## 2.1 Typical characteristic (curves)

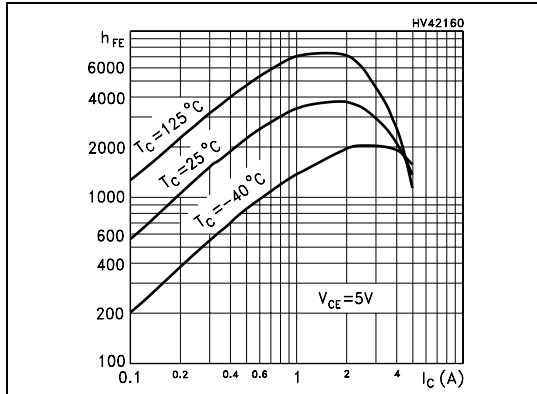
**Figure 2. DC current gain ( $V_{CE} = 3\text{ V NPN}$ )**



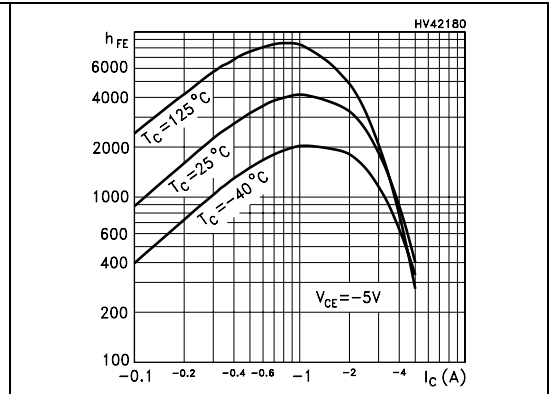
**Figure 3. DC current gain ( $V_{CE} = -3\text{ V PNP}$ )**



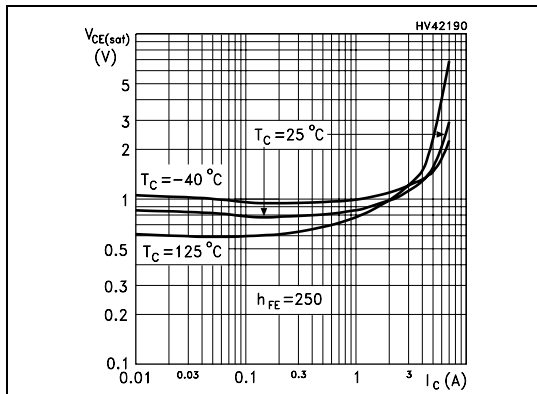
**Figure 4. DC current gain ( $V_{CE} = 5\text{ V NPN}$ )**



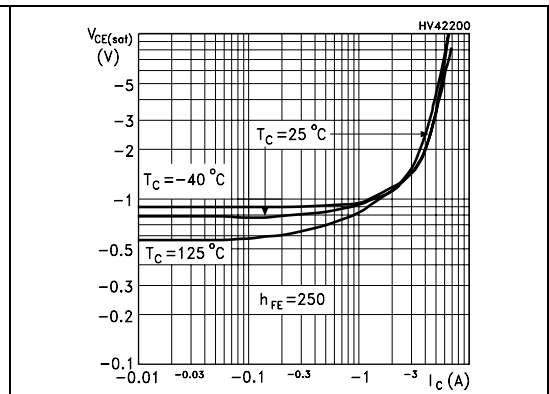
**Figure 5. DC current gain ( $V_{CE} = -5\text{ V PNP}$ )**



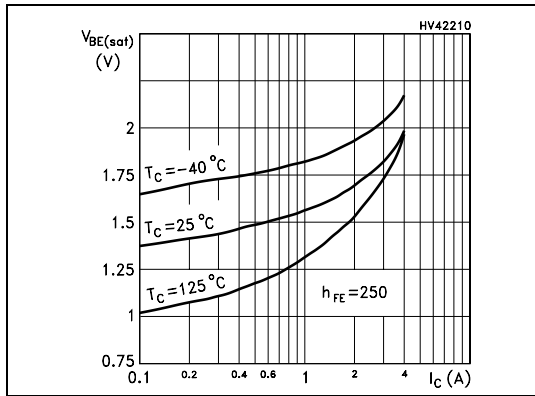
**Figure 6. Collector-emitter saturation voltage (NPN)**



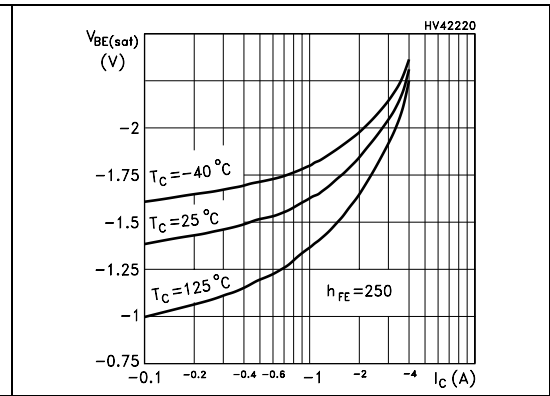
**Figure 7. Collector-emitter saturation voltage (PNP)**



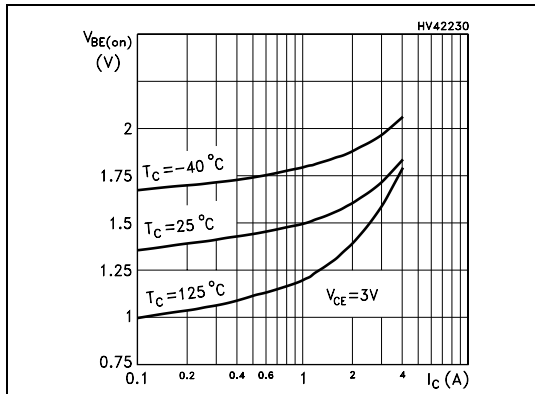
**Figure 8. Base-emitter saturation voltage (NPN)**



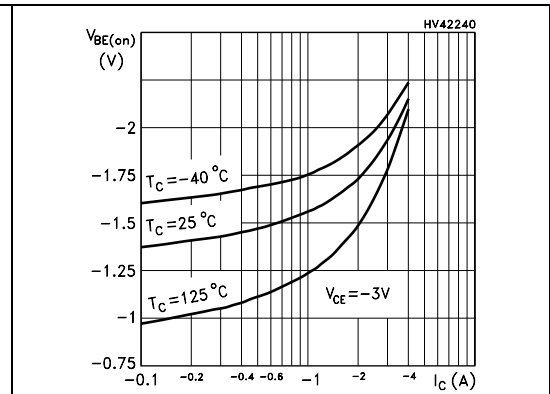
**Figure 9. Base-emitter saturation voltage (PNP)**



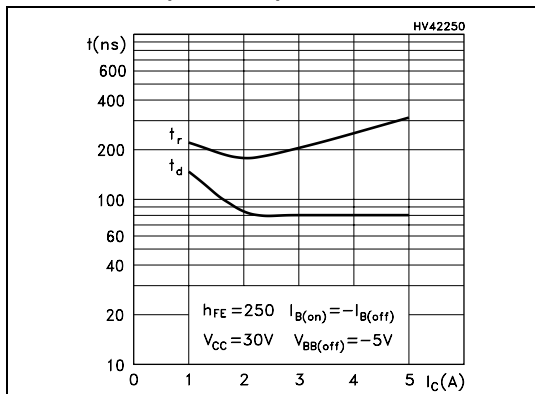
**Figure 10. Base-emitter on voltage (NPN)**



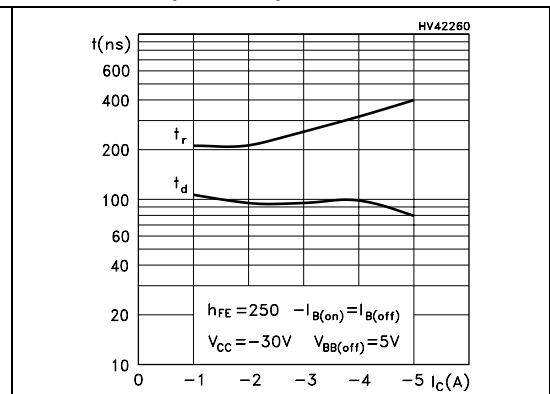
**Figure 11. Base-emitter on voltage (PNP)**



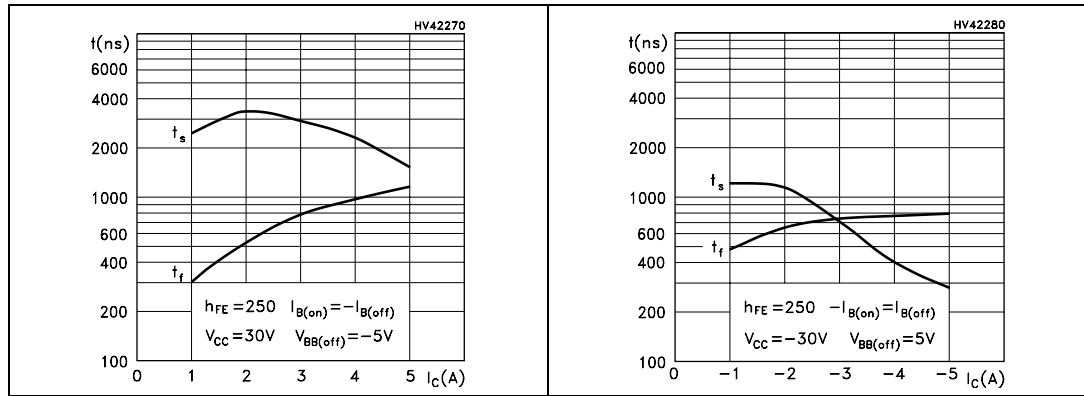
**Figure 12. Resistive load switching time (NPN, on)**



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



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

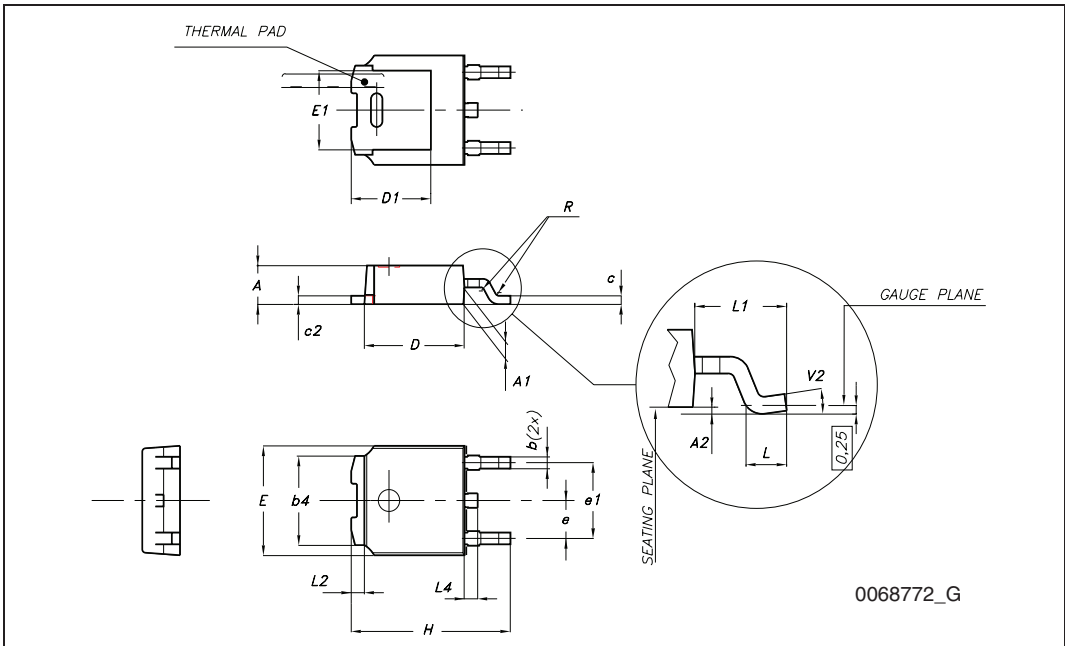


### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> 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.