



## MD2103DFP

High voltage NPN power transistor for standard definition CRT display

### Features

- State-of-the-art technology:
  - Diffused collector “enhanced generation”
- Stable performance versus operating temperature variation
- Low base drive requirement
- Tight  $h_{FE}$  range at operating collector current
- Fully insulated power package UL compliant
- Integrated free wheeling diode

### Applications

- Horizontal deflection output for TV

### Description

The MD2103DFP is manufactured using diffused collector in planar technology adopting new and enhanced high voltage structure. The new MD product series show improved silicon efficiency bringing updated performance to the horizontal deflection stage.

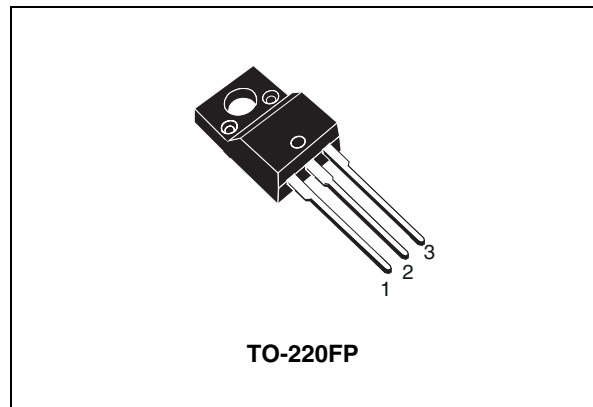


Figure 1. Internal schematic diagram

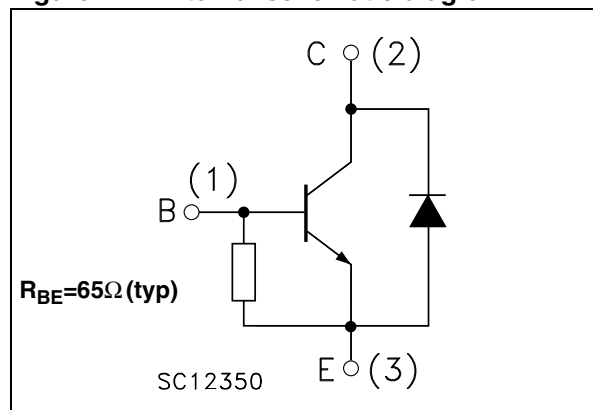


Table 1. Device summary

Order code	Marking	Package	Packing
MD2103DFP	MD2103DFP	TO-220FP	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	1500	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	700	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	7	V
$I_C$	Collector current	6	A
$I_{CM}$	Collector peak current ( $t_p < 5\text{ms}$ )	9	A
$I_B$	Base current	3	A
$P_{tot}$	Total dissipation at $T_c \leq 25^\circ\text{C}$	38	W
$V_{INS}$	Insulation withstand voltage (RMS) from all three leads to external heatsink	1500	V
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	3.3	$^\circ\text{C}/\text{W}$

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 1500\text{V}$ $V_{\text{CE}} = 1500\text{V}$ $T_{\text{C}} = 125^{\circ}\text{C}$			0.2 2	mA mA
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5\text{V}$	50		125	mA
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 700\text{mA}$		11		V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 0.75\text{A}$			1.8	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 0.75\text{A}$			1.5	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 1\text{A}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 3\text{A}$ $V_{\text{CE}} = 1\text{V}$ $I_{\text{C}} = 3\text{A}$ $V_{\text{CE}} = 5\text{V}$		17 6		
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 3\text{A}$ $f_{\text{h}} = 16\text{kHz}$ $I_{\text{B(on)}} = 0.5\text{A}$ $V_{\text{BE(off)}} = -2.7\text{V}$ $L_{\text{BB(off)}} = 6.3\mu\text{H}$ (see <a href="#">Figure 12</a> )		3.8 0.25		$\mu\text{s}$ $\mu\text{s}$
$V_{\text{F}}$	Diode forward voltage	$I_{\text{F}} = 3\text{A}$			2	V

Note: Note (1) Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

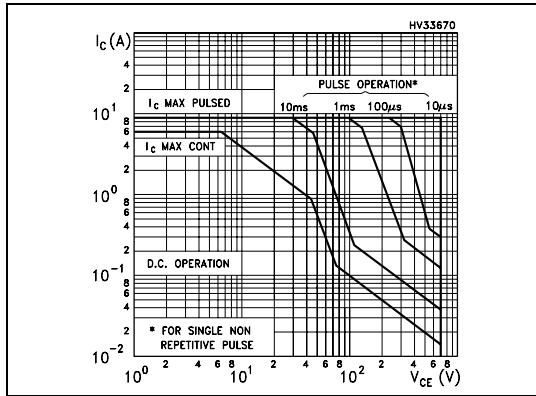


Figure 3. Derating curve

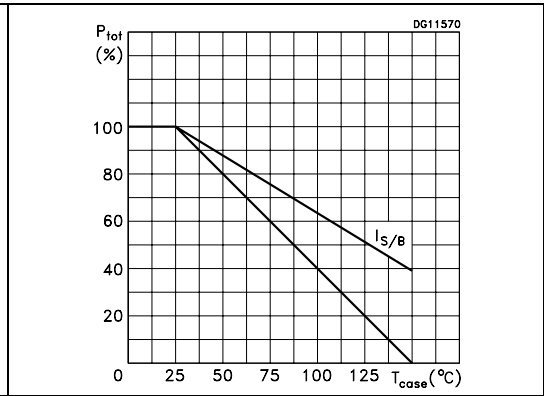


Figure 4. Output characteristics

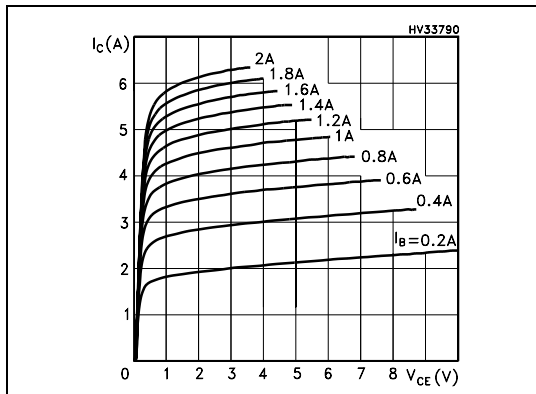


Figure 5. Reverse biased SOA

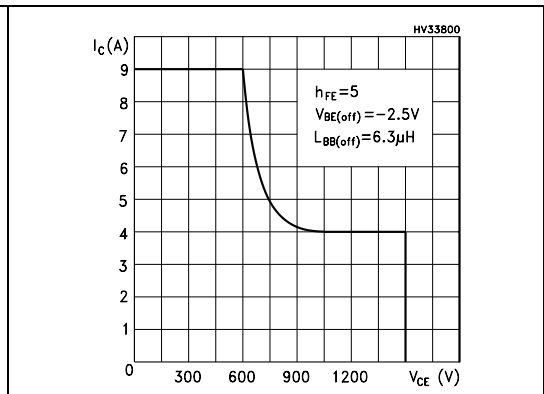


Figure 6. DC current gain

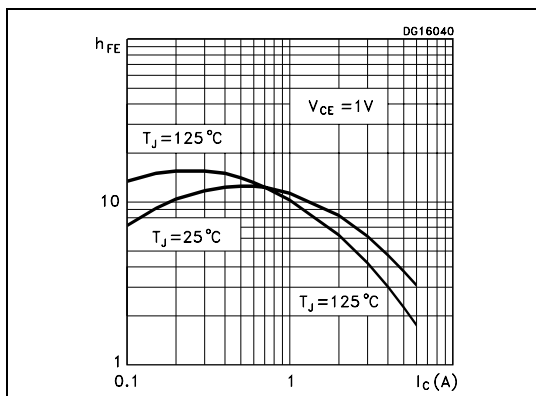


Figure 7. DC current gain

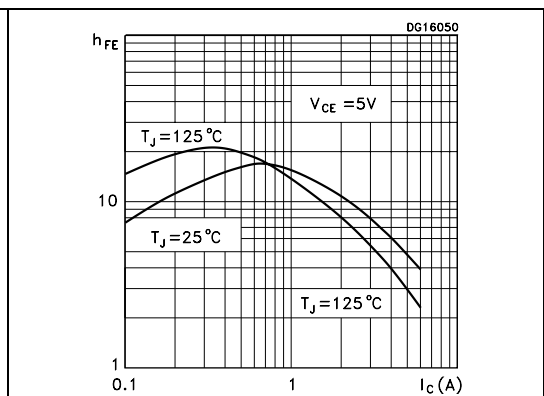


Figure 8. Collector-emitter saturation voltage

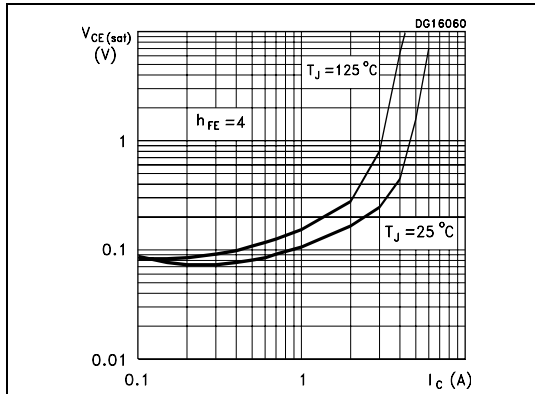


Figure 9. Base-emitter saturation voltage

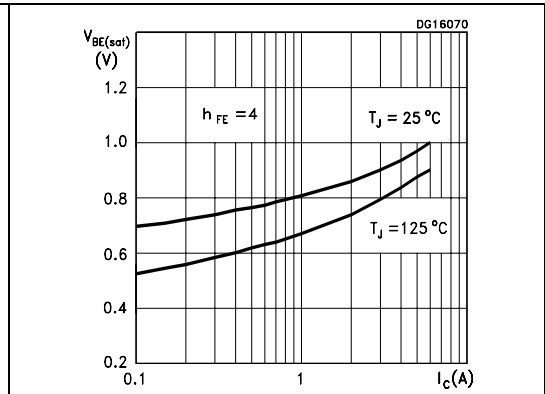


Figure 10. Power losses

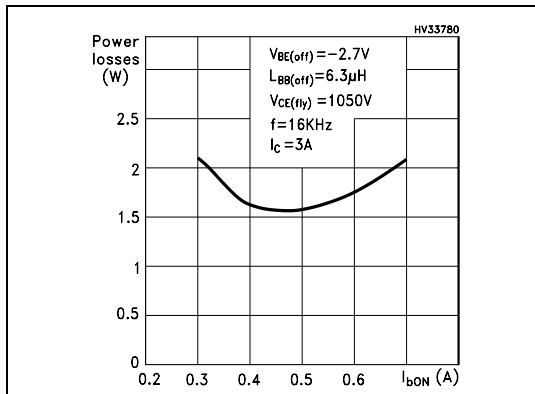
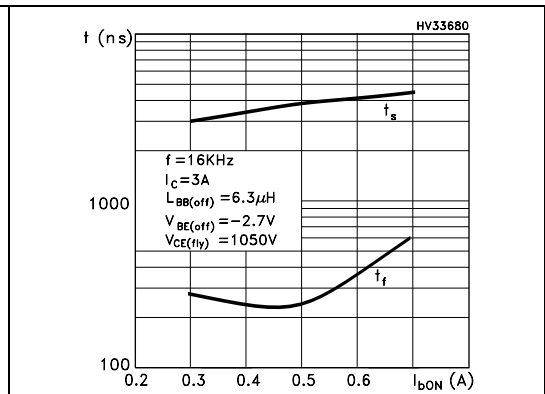
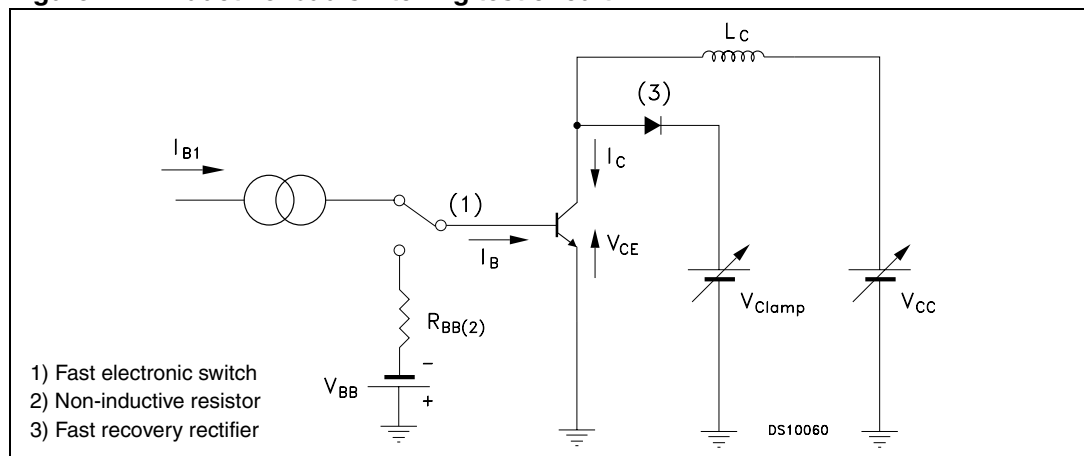


Figure 11. Inductive load switching time



## 2.2 Test circuits

Figure 12. Inductive load switching test circuit

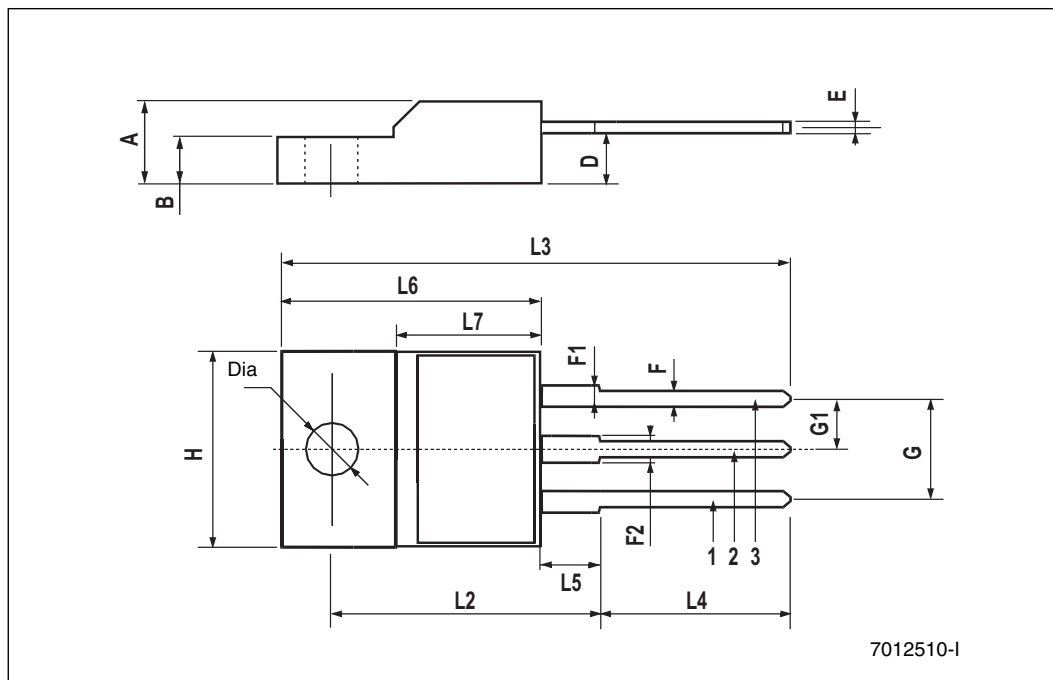


### 3 Package mechanical data

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](http://www.st.com)

## TO-220FP mechanical data

Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.70	0.017		0.027
F	0.75		1.00	0.030		0.039
F1	1.15		1.50	0.045		0.067
F2	1.15		1.50	0.045		0.067
G	4.95		5.20	0.195		0.204
G1	2.40		2.70	0.094		0.106
H	10		10.40	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.80		10.60	0.385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.90		16.40	0.626		0.645
L7	9		9.30	0.354		0.366
Dia	3		3.2	0.118		0.126



## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
27-May-2008	1	First release



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