

MD2009DFX

High voltage NPN power transistor for CRT TV

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 isolated power package UL compliant
- Integrated free wheeling diode

Application

■ Horizontal deflection output for CRT TV

Description

The MD2009DFX 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.

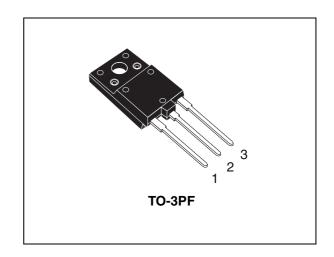


Figure 1. Internal schematic diagram

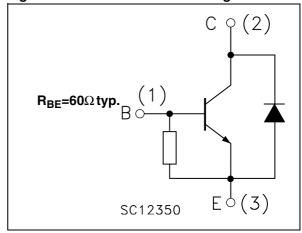


Table 1. Device summary

Order code	Marking	Package	Packaging
MD2009DFX	MD2009DFX	TO-3PF	Tube

Electrical ratings MD2009DFX

1 Electrical ratings

Table 2. Absolute maximum ratings

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}	Base-emitter voltage (I _C = 0)	7	V
I _C	Collector current	10	Α
I _{CM}	Collector peak current (t _P < 5ms)	16	Α
I _B	Base current	6	Α
P _{TOT}	Total dissipation at T _c = 25°C	58	W
V _{ISO}	Isolation withstand voltage (RMS) from all three leads to external heatsink		V
T _{stg}	Storage temperature	-65 to 150	°C
TJ	Max. operating junction temperature	150	

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R _{thj-case}	Thermal resistance junction-case max	2.15	°C/W

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{CES}	Collector cut-off current (V _{BE} = 0)	V _{CE} = 1500V V _{CE} = 1500V, T _c = 125°C			0.2 2	mA mA
I _{EBO}	Emitter cut-off current (I _C = 0)	V _{EB} = 5V	40		120	mA
V _{(BR)EBO}	Emitter-base breakdown voltage (I _C = 0)	I _E = 700mA	10			V
V _{CE(sat)} ⁽¹⁾	Collector-emitter saturation voltage	$I_C = 5.5A$, $I_B = 1.4A$			2.8	V
V _{BE(sat)} ⁽¹⁾	Base-emitter saturation voltage	$I_C = 5.5A$, $I_B = 1.4A$			1.3	V
h _{FE} ⁽¹⁾	DC current gain	$\begin{split} I_{C} &= 1 \text{A}, & V_{CE} &= 5 \text{V} \\ I_{C} &= 5.5 \text{A}, & V_{CE} &= 1 \text{V} \\ I_{C} &= 5.5 \text{A}, & V_{CE} &= 5 \text{V} \end{split}$	5	18 4.7	7	
V _F ⁽¹⁾	Diode forward voltage	I _F = 5.5 A			1.6	V
t _s	Inductive load Storage time Fall time	$I_{C} = 5A$, $f_{h} = 16KHz$ $I_{B(on)} = 1.5A$, $V_{BE(off)} = -2.7V$ $L_{BB(off)} = 6.2\mu H$		4.5 0.3	6 0.6	μs μs

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

Electrical characteristics MD2009DFX

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Derating curve

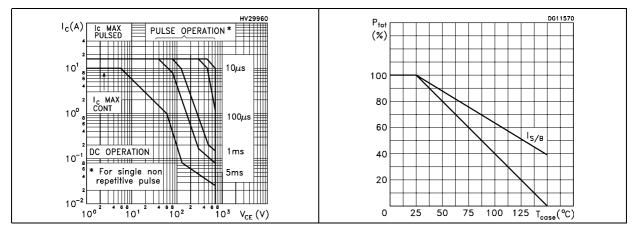


Figure 4. Output characterisics

Figure 5. Reverse biased SOA

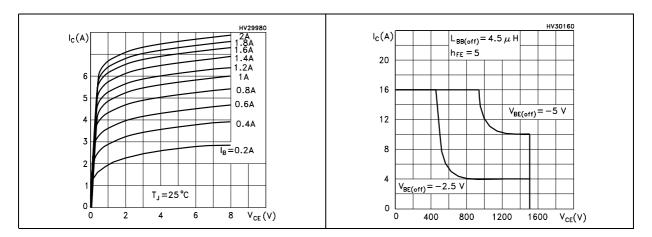


Figure 6. DC current gain $(V_{CE} = 1 V)$

Figure 7. DC current gain $(V_{CE} = 5 V)$

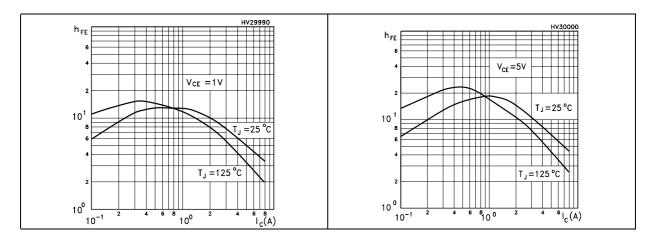


Figure 8. Collector-emitter saturation voltage Figure 9. Base-emitter saturation voltage

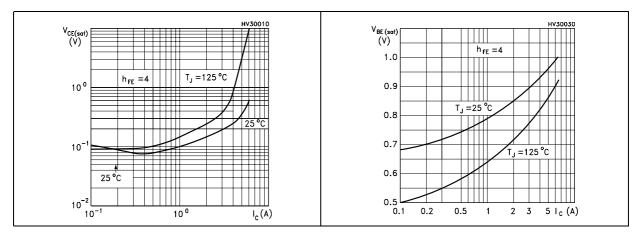
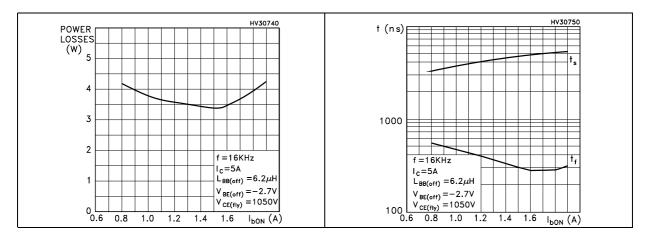


Figure 10. Power losses

Figure 11. Inductive load switching time



Test circuits MD2009DFX

3 Test circuits

Figure 12. Power losses and inductive load switching test circuit

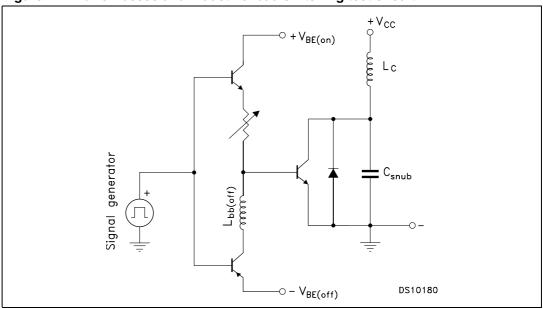
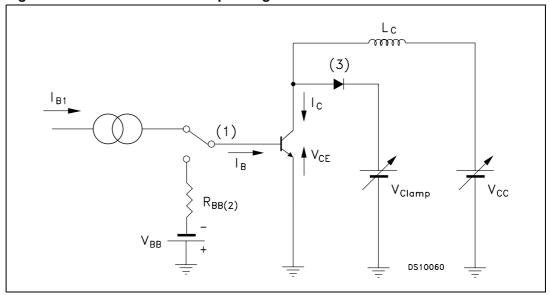


Figure 13. Reverse biased safe operating area test circuit



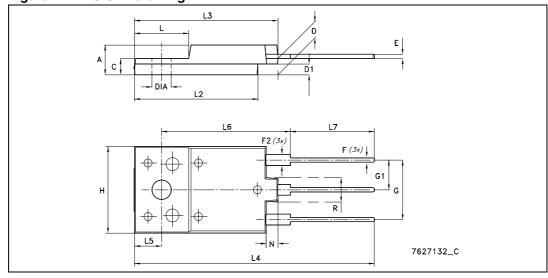
4 Package mechanical data

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Table 5. TO-3PF package mechanical data

Dim. min. typ. max. A 5.30 5.70 C 2.80 3.20 D 3.10 3.50 D1 1.80 2.20 E 0.80 1.10 F 0.65 0.95 F2 1.80 2.20 G 10.30 11.50					
min. typ. max. A 5.30 5.70 C 2.80 3.20 D 3.10 3.50 D1 1.80 2.20 E 0.80 1.10 F 0.65 0.95 F2 1.80 2.20	mm.				
C 2.80 3.20 D 3.10 3.50 D1 1.80 2.20 E 0.80 1.10 F 0.65 0.95 F2 1.80 2.20					
D 3.10 3.50 D1 1.80 2.20 E 0.80 1.10 F 0.65 0.95 F2 1.80 2.20					
D1 1.80 2.20 E 0.80 1.10 F 0.65 0.95 F2 1.80 2.20					
E 0.80 1.10 F 0.65 0.95 F2 1.80 2.20					
F 0.65 0.95 F2 1.80 2.20					
F2 1.80 2.20					
G 10.30 11.50					
G1 5.45					
H 15.30 15.70					
L 9.80 10 10.20					
L2 22.80 23.20					
L3 26.30 26.70					
L4 43.20 44.40					
L5 4.30 4.70					
L6 24.30 24.70					
L7 14.60 15					
N 1.80 2.20					
R 3.80 4.20					
Dia 3.40 3.80					

Figure 14. TO-3PF drawing



MD2009DFX Revision history

5 Revision history

Table 6. Document revision history

Date	Revision	Changes
27-Feb-2006	1	First release
28-Mar-2006	2	New curves 9 and 10 inserted
22-May-2006	3	Values changed on Table 2 and Table 4
20-Oct-2006	4	New hFE limits shown on <i>Table 4</i>
10-Aug-2009	5	Update mechanical data Document reformatted, no content change

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