



## MD2009DFX

High voltage NPN Power transistor for standard definition CRT display

### General features

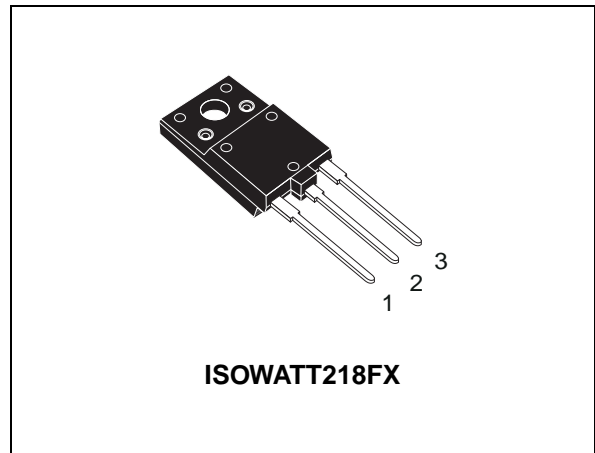
- State-of-the-art technology:
  - diffused collector “enhanced generation”
- More stable performance versus operating temperature variation
- Low base drive requirement
- Tighter  $h_{FE}$  range at operating collector current
- Fully insulated power package U.L. compliant
- Integrated free wheeling diode
- In compliance with the 2002/93/EC European directive

### Applications

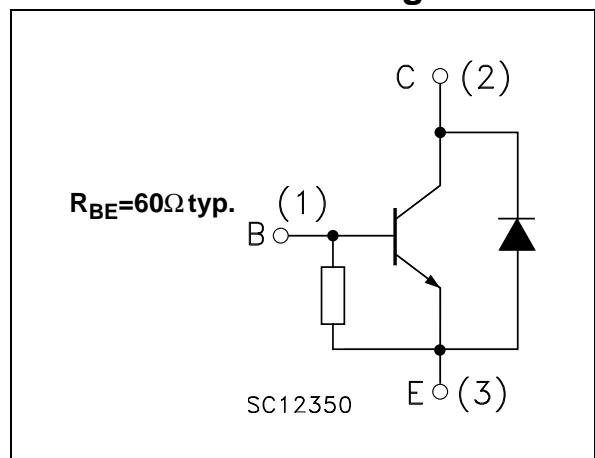
- Horizontal deflection output for TV

### 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.



### Internal schematic diagram



### Order codes

Part number	Marking	Package	Packaging
MD2009DFX	MD2009DFX	ISOWATT218FX	Tube

# 1 Electrical ratings

**Table 1. 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	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ms}$ )	16	A
$I_B$	Base current	6	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	58	W
$V_{isol}$	Insulation withstand voltage (RMS) from all three leads to external heatsink	2500	V
$T_{stg}$	Storage temperature	-65 to 150 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature		

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.15	$^\circ\text{C/W}$

## 2 Electrical characteristics

(T<sub>case</sub> = 25°C unless otherwise specified)

**Table 3. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector cut-off current ( $V_{BE} = 0$ )	$V_{CE} = 1500V$ $V_{CE} = 1500V, T_c = 125^\circ C$			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	$I_C = 1A$ , $V_{CE} = 5V$ $I_C = 5.5A$ , $V_{CE} = 1V$ $I_C = 5.5A$ , $V_{CE} = 5V$	5	18 4.7	7	
$V_f$	Diode forward voltage	$I_F = 5.5 A$			1.6	V
$t_s$ $t_f$	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	$\mu s$ $\mu s$

1. Pulsed duration = 300 ms, duty cycle  $\leq 5\%$ .

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

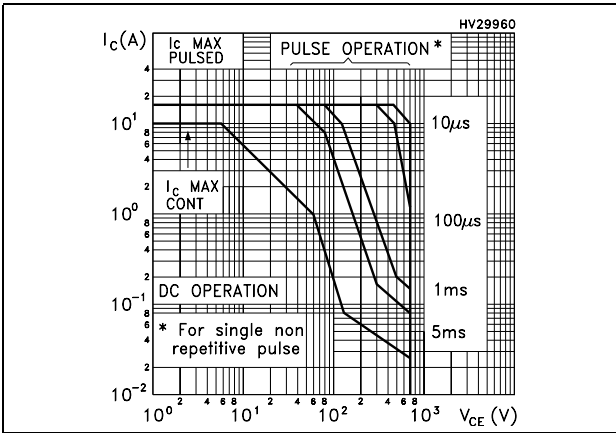


Figure 2. Derating curve

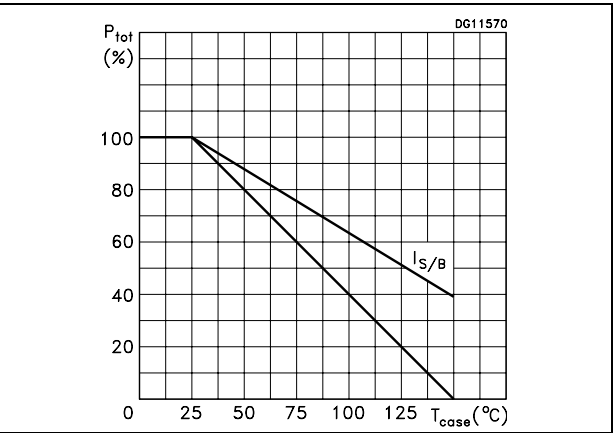


Figure 3. Output characteristics

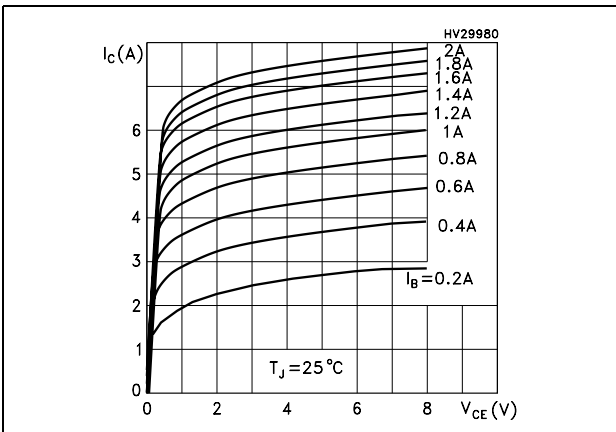


Figure 4. Reverse biased SOA

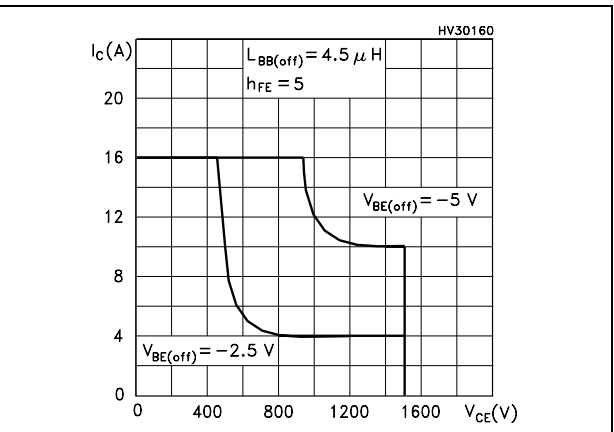


Figure 5. DC current gain

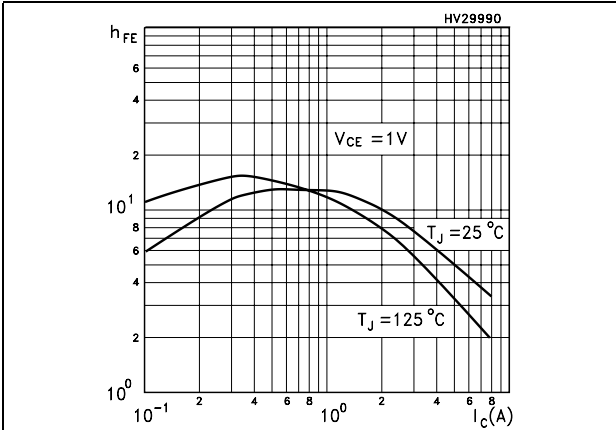


Figure 6. DC current gain

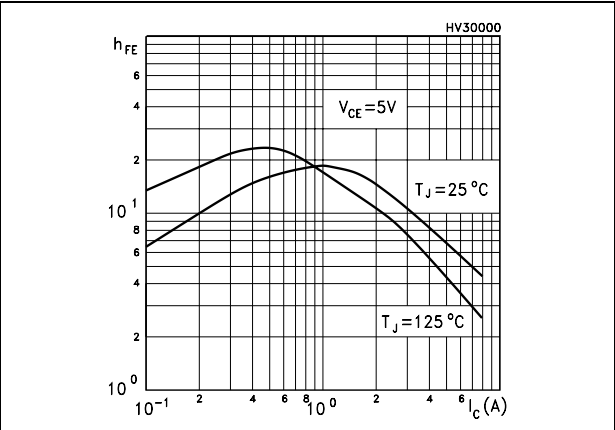


Figure 7. Collector-emitter saturation voltage

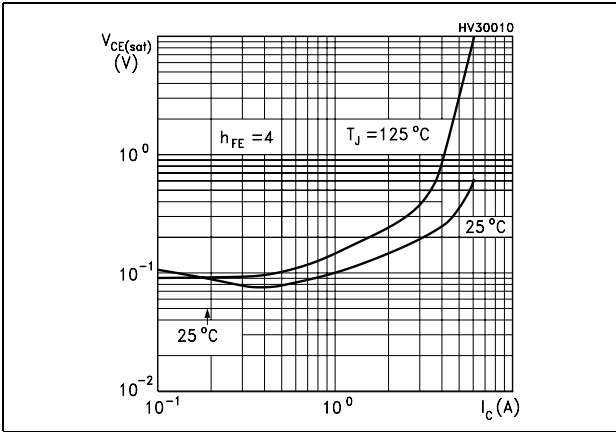


Figure 8. Base-emitter saturation voltage

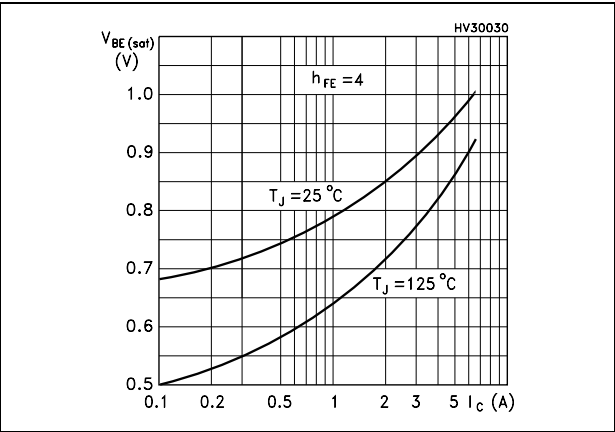


Figure 9. Power losses

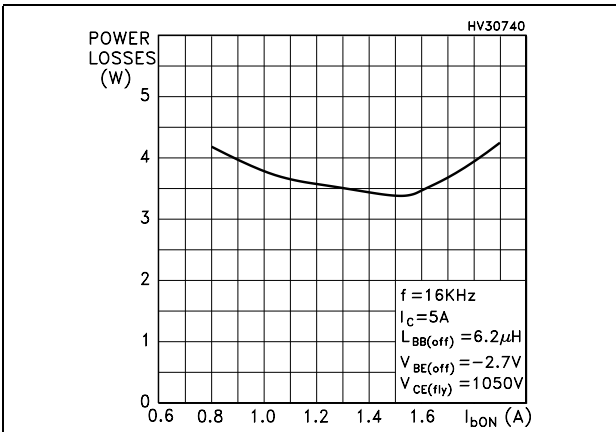
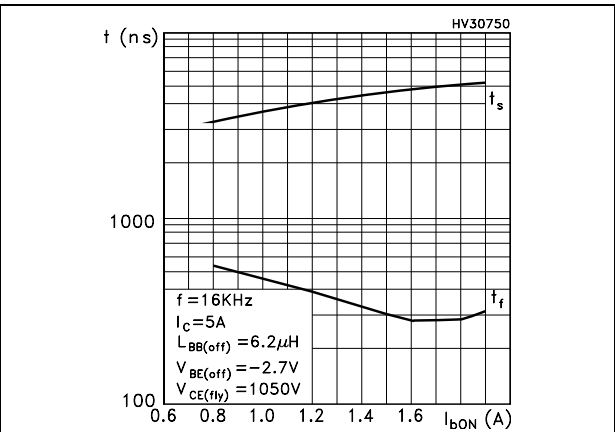
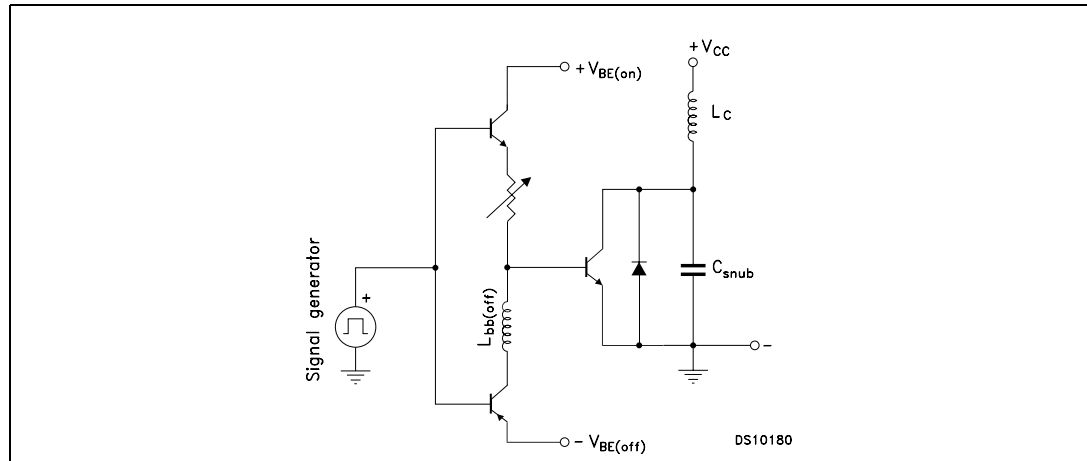


Figure 10. Inductive load switching time

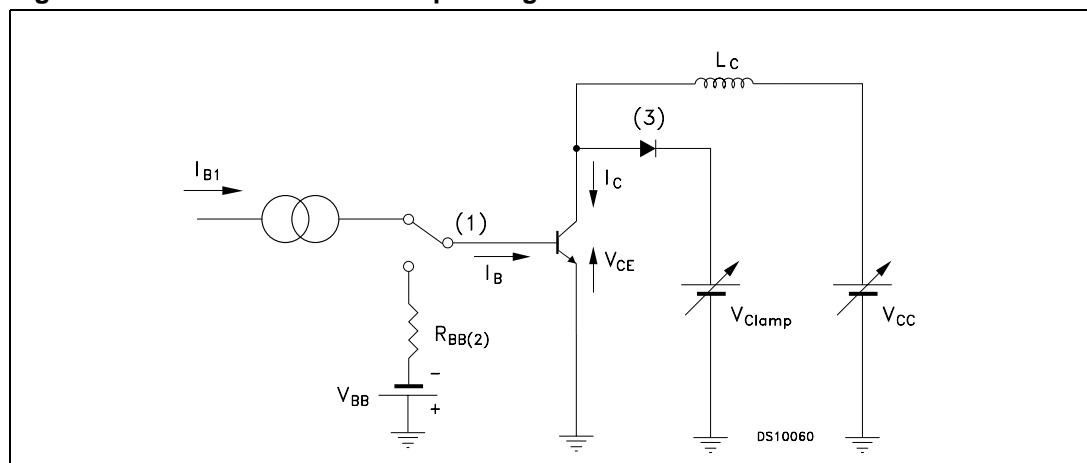


### 3 Test circuits

**Figure 11. Power losses and inductive load switching test circuit**



**Figure 12. Reverse biased safe operating area test circuit**

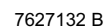


## 4 Package mechanical data

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)

## ISOWATT218FX MECHANICAL DATA

DIM.	mm.		
	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
G1		5.45	
H	15.30		15.70
L	9		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





## 5 Revision history

**Table 4. 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 <a href="#">Table 1</a> and <a href="#">Table 3</a>
20-Oct-2006	4	New hFE limits shown on <a href="#">Table 3</a>

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