

## High voltage fast-switching NPN power transistor

### Features

- High voltage capability
- High DC current gain
- Minimum lot-to-lot spread for reliable operation
- Wide safe operating areas (forward and reverse biased)

### Applications

- Switching mode power supplies

### Description

The STW3040 is manufactured using diffused collector in planar technology adopting base island layout. The device is designed for use in SMPS and desktop power supply.

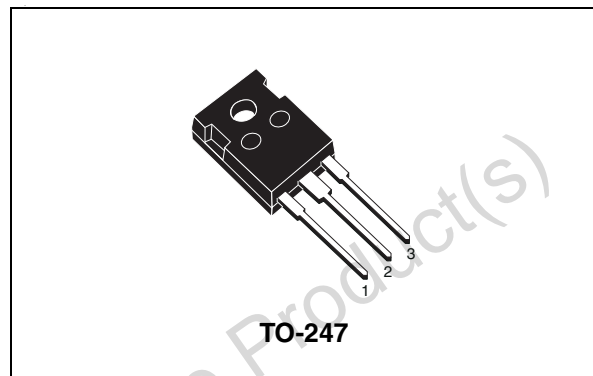


Figure 1. Internal schematic diagram

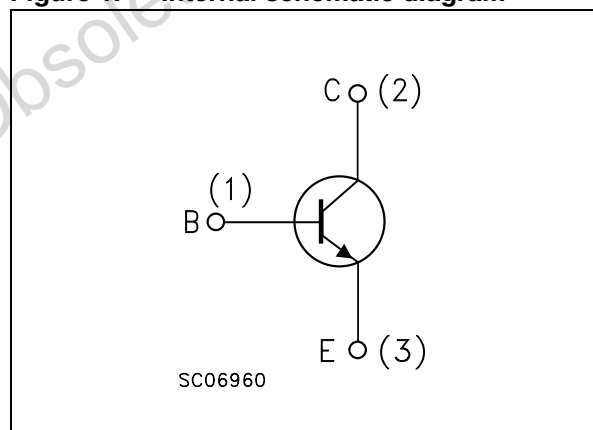


Table 1. Device summary

Order code	Marking	Package	Packaging
STW3040	W3040	TO-247	Tube

# 1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{CE} = 0$ )	700	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	9	V
$I_C$	Collector current	30	A
$I_{CM}$	Collector peak current	50	A
$I_B$	Base current	10	A
$I_{BM}$	Base peak current	15	A
$P_{TOT}$	Total dissipation at $T_c = 25^\circ\text{C}$	160	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 3. Thermal data**

Symbol	Parameters	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.78	$^\circ\text{C}/\text{W}$

## 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 ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 700 \text{ V}$			1	mA
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 9 \text{ V}$			1	mA
$V_{(\text{BR})\text{CEO}}$	Collector-emitter breakdown ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10 \text{ mA}$	400			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 6 \text{ A}$ $I_{\text{B}} = 1.2 \text{ A}$		0.1		V
		$I_{\text{C}} = 20 \text{ A}$ $I_{\text{B}} = 4 \text{ A}$		0.4	0.8	V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 6 \text{ A}$ $I_{\text{B}} = 1.2 \text{ A}$			1.2	V
		$I_{\text{C}} = 20 \text{ A}$ $I_{\text{B}} = 4 \text{ A}$			1.5	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10 \text{ mA}$ $V_{\text{CE}} = 5 \text{ V}$	10	30	40	
		$I_{\text{C}} = 6 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$	18			
		$I_{\text{C}} = 20 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$	10			
$t_{\text{on}}$	Resistive load Turn-on time	$I_{\text{C}} = 20 \text{ A}$ $V_{\text{CC}} = 200 \text{ V}$			0.5	$\mu\text{s}$
$t_{\text{s}}$	Storage time	$I_{\text{b}(\text{on})} = 4 \text{ A}$ $I_{\text{b}(\text{off})} = -8 \text{ A}$			2.5	$\mu\text{s}$
$t_{\text{f}}$	Fall time				0.3	$\mu\text{s}$

1. Pulse duration = 300 ms, duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

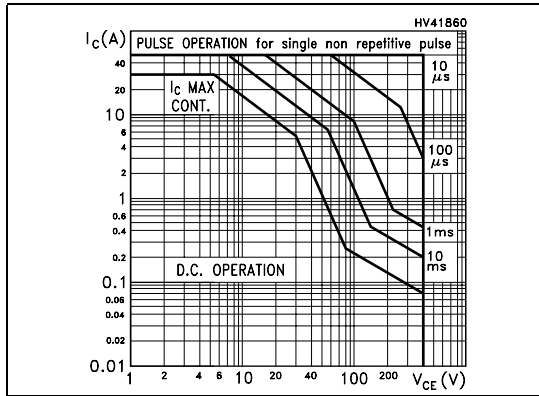


Figure 3. Derating curve

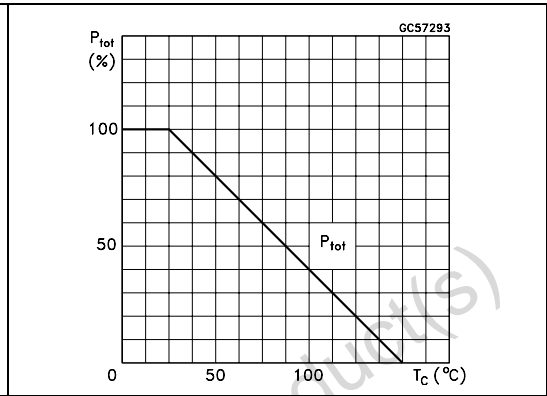


Figure 4. Reverse biased safe operating area

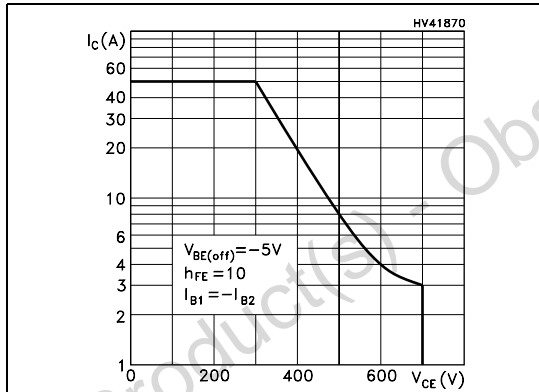


Figure 5. Output characteristics

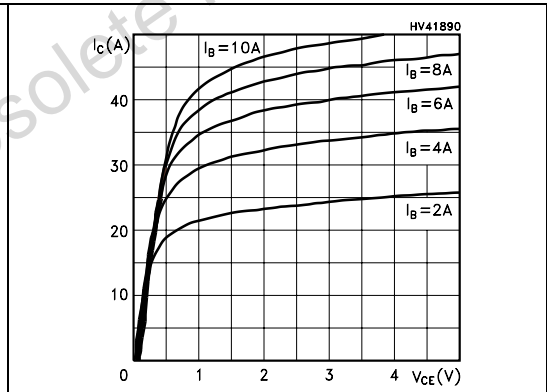


Figure 6. DC current gain

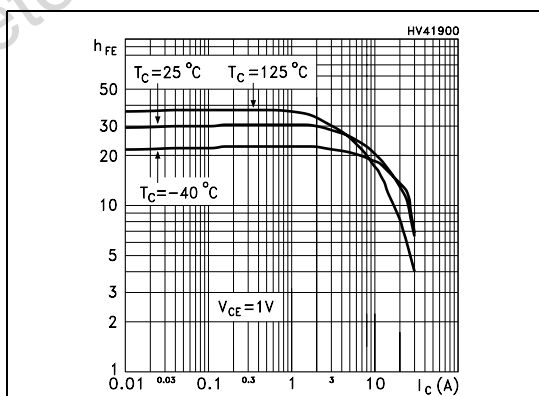
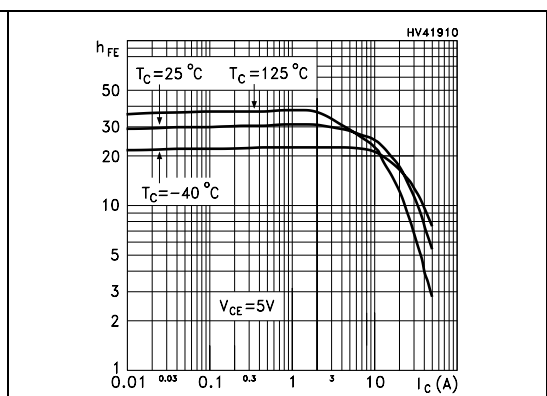
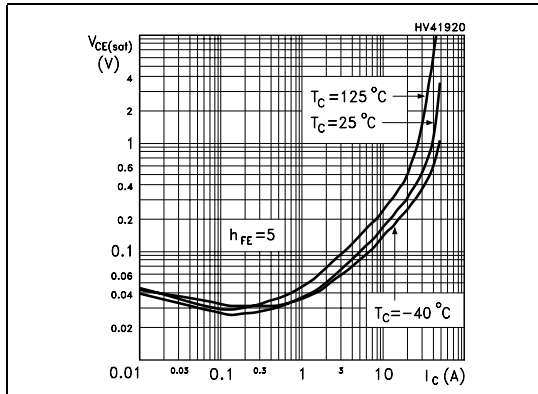


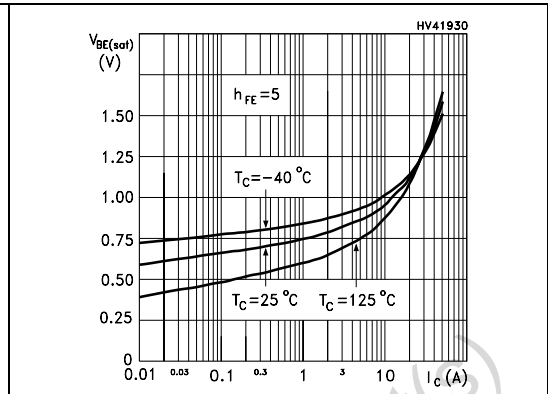
Figure 7. DC current gain



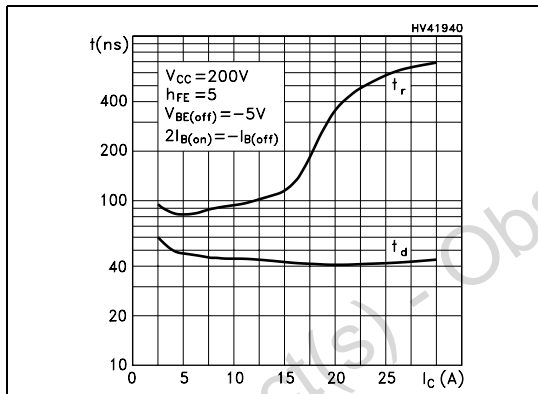
**Figure 8. Collector-emitter saturation voltage**



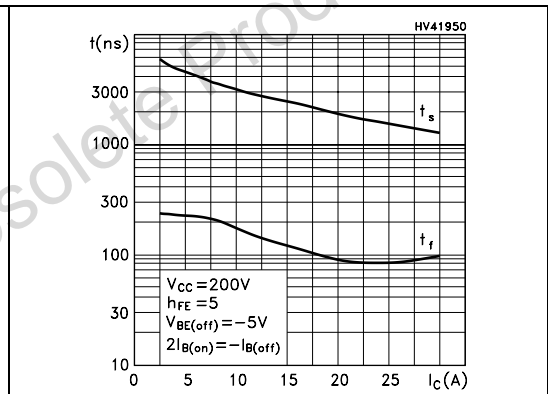
**Figure 9. Base-emitter saturation voltage**



**Figure 10. Resistive load switching on time**

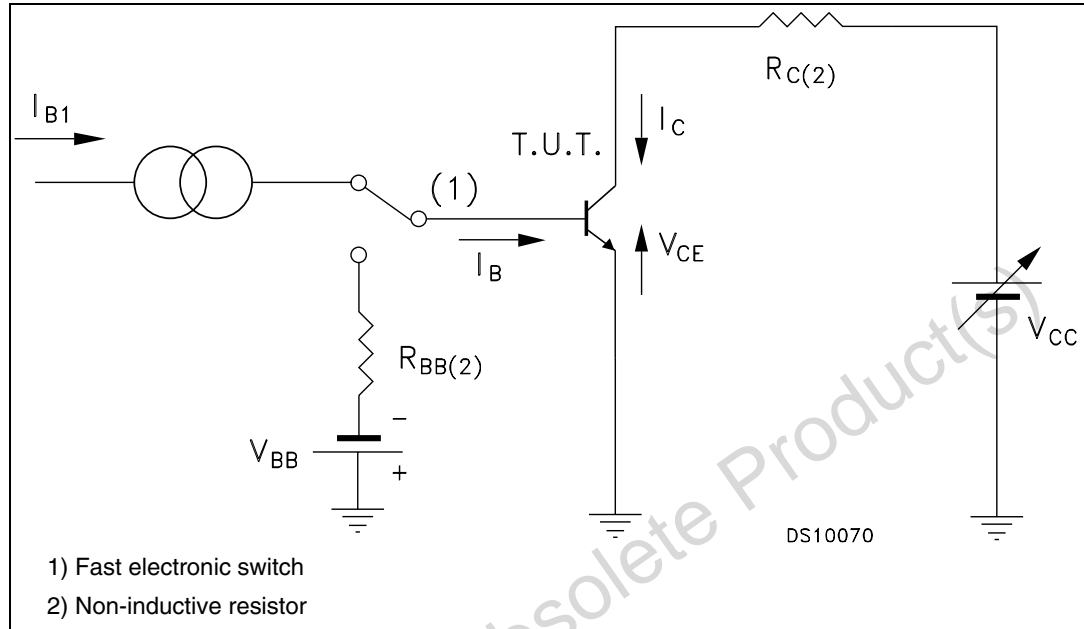


**Figure 11. Resistive load switching off time**



### 3 Test circuit

Figure 12. Resistive load switching test circuit



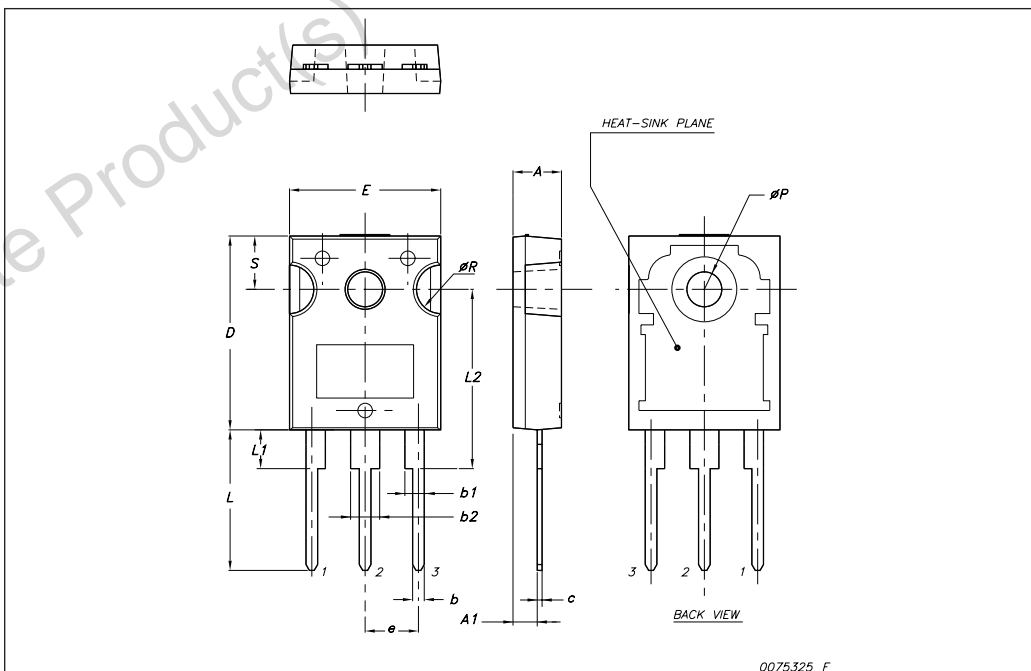
## 4 Package mechanical data

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)

Obsolete Product(s) - Obsolete Product(s)

**TO-247 Mechanical data**

Dim.	mm.		
	Min.	Typ	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	





## 5 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
12-Dec-2007	1	Initial release
09-Oct-2008	2	Document status promoted from preliminary data to datasheet
23-Oct-2008	3	Test conditions changed for $V_{CE(sat)}$ in <a href="#">Table 4</a>

Obsolete Product(s) - Obsolete Product(s)

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