

# 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.

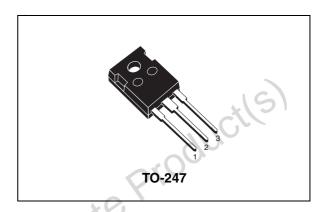


Figure 1. Internal schematic diagram

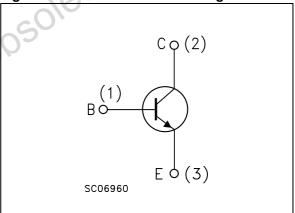


Table 1. Device summary

Order code	Marking	Package	Packaging
STW3040	W3040	TO-247	Tube

# 1 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-emitter voltage (V <sub>CE</sub> = 0)	700	V
V <sub>CEO</sub>	Collector-emitter voltage (I <sub>B</sub> = 0)	400	V
V <sub>EBO</sub>	Emitter-base voltage ( $I_C = 0$ )	9	V
I <sub>C</sub>	Collector current	30	Α
I <sub>CM</sub>	Collector peak current	50	Α
I <sub>B</sub>	Base current	10	Α
I <sub>BM</sub>	Base peak current	15	Α
P <sub>TOT</sub>	Total dissipation at T <sub>c</sub> = 25°C	160	W
T <sub>stg</sub>	Storage temperature	-65 to 150	°C
T <sub>J</sub>	Max. operating junction temperature	150	°C

Table 3. Thermal data

	Symbol	Parameters		Value	Unit
	R <sub>thj-case</sub>	Thermal resistance junction-case max		0.78	°C/W
R <sub>thj-case</sub> Thermal resistance junction-case					

## 2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I <sub>CES</sub>	Collector cut-off current (V <sub>BE</sub> = 0)	V <sub>CE</sub> = 700 V			1	mA
I <sub>EBO</sub>	Emitter cut-off current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 9 V			1	mA
V <sub>(BR)CEO</sub>	Collector-emitter breakdown (I <sub>B</sub> = 0)	I <sub>C</sub> = 10 mA	400	(		V
v (1)	Collector-emitter	$I_C = 6 A$ $I_B = 1.2 A$		0.1		V
V <sub>CE(sat)</sub> <sup>(1)</sup>	saturation voltage	$I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$	14O	0.4	8.0	V
), (1)	Base-emitter saturation	$I_C = 6 A$ $I_B = 1.2 A$			1.2	V
V <sub>BE(sat)</sub> <sup>(1)</sup>	voltage	$I_C = 20 \text{ A}$ $I_B = 4 \text{ A}$			1.5	V
		$I_C = 10 \text{ mA}$ $V_{CE} = 5 \text{ V}$	10			
h <sub>FE</sub> <sup>(1)</sup>	DC current gain	$I_C = 6 A$ $V_{CE} = 5 V$	18	30	40	
		$I_C = 20 \text{ A}$ $V_{CE} = 5 \text{ V}$	10			
	Resistive load					
t <sub>on</sub>	Turn-on time	$I_C = 20 \text{ A}$ $V_{CC} = 200 \text{ V}$			0.5	μs
t <sub>s</sub>	Storage time	$I_{b(on)} = 4 \text{ A}$ $I_{b(off)} = -8 \text{ A}$			2.5	μs
t <sub>f</sub>	Fall time				0.3	μs

<sup>1.</sup> Pulse duration = 300 ms, duty cycle ≤1.5 %

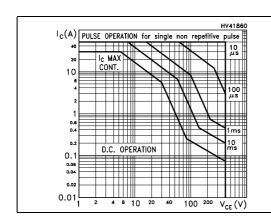
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Electrical characteristics STW3040

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

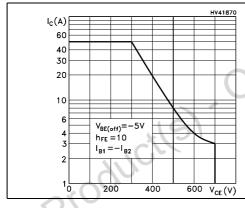
Figure 3. Derating curve



P<sub>tot</sub> (%)
100
50
P<sub>tot</sub>
0 50 100 T<sub>C</sub> (°C)

Figure 4. Reverse biased safe operating area

Figure 5. Output characteristics



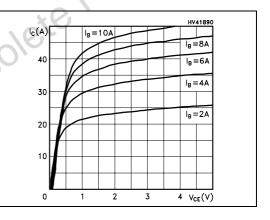
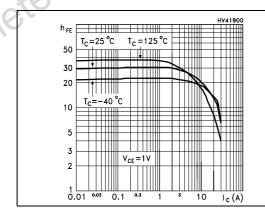


Figure 6. DC current gain

Figure 7. DC current gain



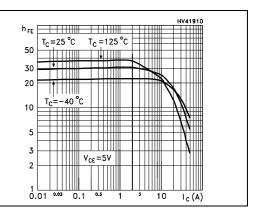


Figure 8. Collector-emitter saturation Figure 9. Base-emitter saturation voltage voltage

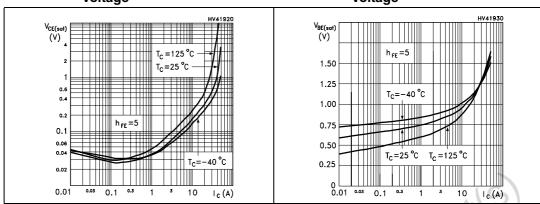
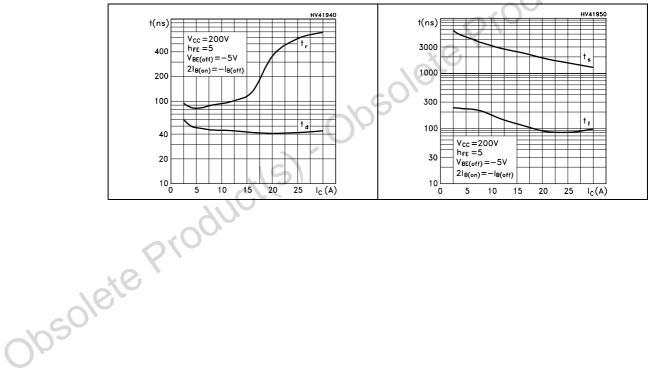


Figure 10. Resistive load switching on Figure 11. Resistive load switching off time



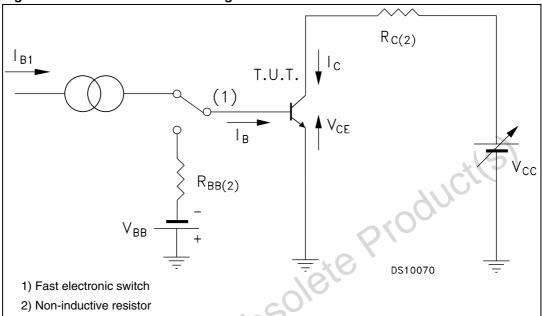
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Test circuit STW3040

## 3 Test circuit

Obsolete Product(s)

Figure 12. Resistive load switching test circuit



## 4 Package mechanical data

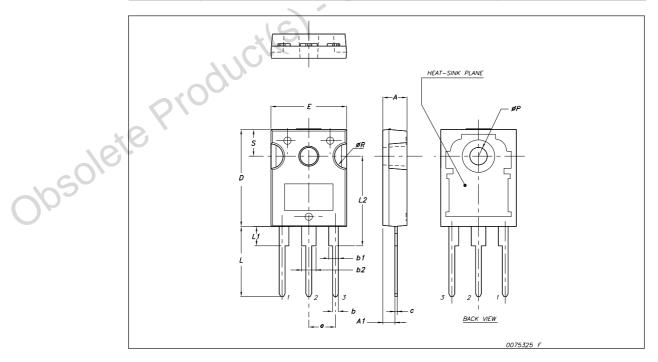
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: <a href="https://www.st.com">www.st.com</a>

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#### **TO-247 Mechanical data**

Dim.	mm.				
	Min.	Тур	Max.		
Α	4.85		5.15		
A1	2.20		2.60		
b	1.0		1.40		
b1	2.0		2.40		
b2	3.0		3.40		
С	0.40		0.80		
D	19.85		20.15		
Е	15.45		15.75		
е		5.45	( O O		
L	14.20		14.80		
L1	3.70	*6	4.30		
L2		18.50			
øΡ	3.55	60/	3.65		
øR	4.50	103	5.50		
S		5.50			



STW3040 Revision history

# 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 <sub>CE(sat)</sub> in <i>Table 4</i>

Obsolete Product(s)

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