STW2040

High voltage fast-switching NPN power transistor

Features

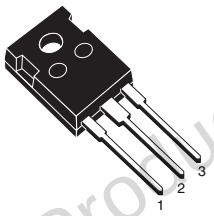
- High voltage capability
- High DC current gain
- Minimum lot to lot spread for reliable operation

Application

- Switching mode power supplies

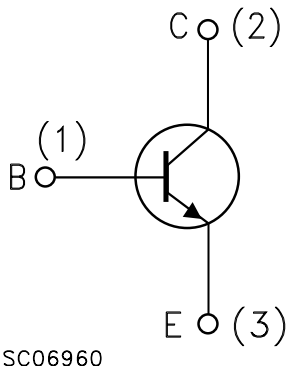
Description

The STW2040 is manufactured using diffused collector in planar technology adopting base island layout.



TO-247

Figure 1. Internal schematic diagram



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Table 1. Device summary

Order code	Marking	Package	Packaging
STW2040	W2040	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)	500	V
V_{EBO}	Emitter-base voltage (I_C = 0)	9	V
I_C	Collector current	20	A
I_{CM}	Collector peak current	30	A
I_B	Base current	7	A
I_{BM}	Base peak current	10	A
P_{TOT}	Total dissipation at T_c = 25 °C	125	W
T_{stg}	Storage temperature	-65 to 150	°C
T_J	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max	1	°C/W

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2 Electrical characteristics

(T_{case} = 25 °C; unless otherwise specified)

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current (V_{BE} = 0)	V_{CE} = 700 V			250	µA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 9 V			1	mA
$V_{(BR)CEO}$	Collector-emitter breakdown voltage (I_B = 0)	I_C = 10 mA	500			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 6 A I_B = 1.2 A I_C = 12 A I_B = 2.4 A I_C = 20 A I_B = 4 A		0.2 0.3 0.6	0.5	V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 6 A I_B = 1.2 A I_C = 12 A I_B = 2.4 A			1.2 1.5	V V
h_{FE} (1)	DC current gain	I_C = 10 mA V_{CE} = 5 V I_C = 6 A V_{CE} = 5 V I_C = 12 A V_{CE} = 5 V	8 15 10	21	27	
t_{on} t_f t_s	Resistive load Turn-on time Fall time Storage time	V_{CC} = 200 V $V_{BE(off)}$ = -5 V I_C = 7.5 A $I_{B(on)}$ = 1.5 A $I_{B(off)}$ = -3 A		 140 100 1.6		 ns ns µs
t_s t_f	Inductive load Storage time Fall time	V_{CL} = 250 V $V_{BE(off)}$ = -5 V I_C = 7.5 A $I_{B(on)}$ = 1.5 A $I_{B(off)}$ = -3 A		 1.8 30		 µs ns

1. Pulsed duration = 300 µs, duty cycle ≤ 1.5 %

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2.1 Electrical characteristic (curves)

Figure 2. Safe operating area

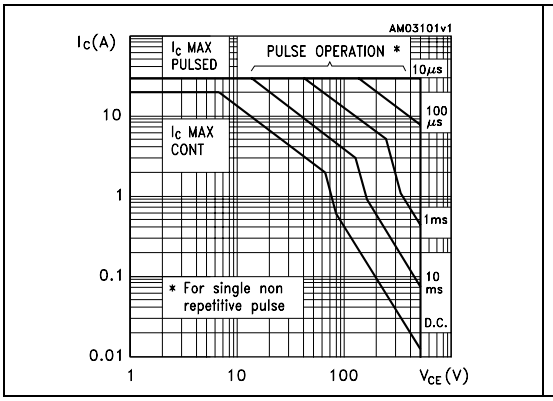


Figure 3. Derating curve

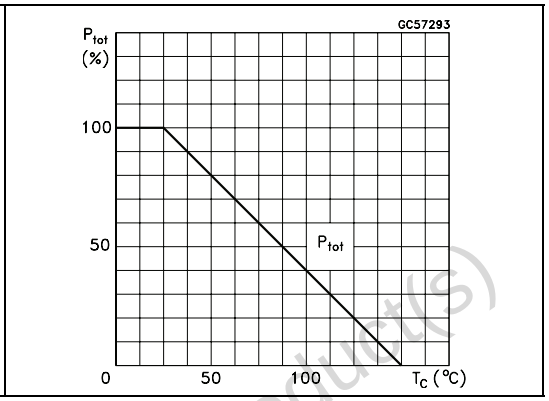


Figure 4. Reverse biased safe operating area

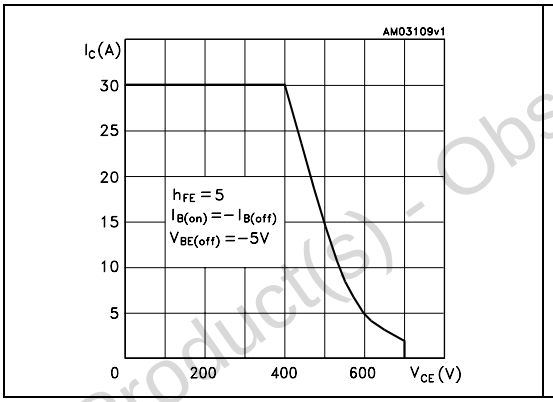


Figure 5. Output characteristics

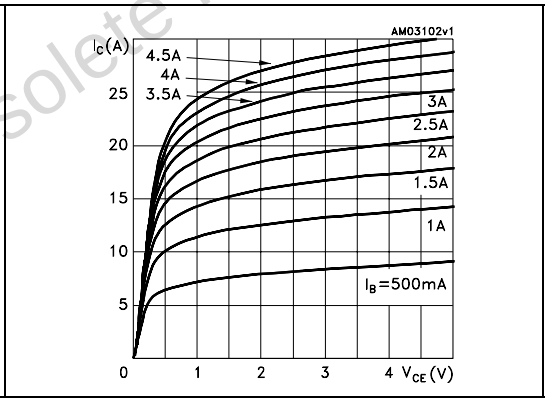


Figure 6. DC current gain (V_{CE} = 1 V)

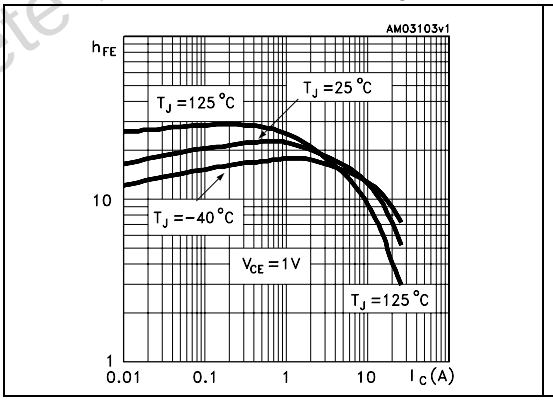
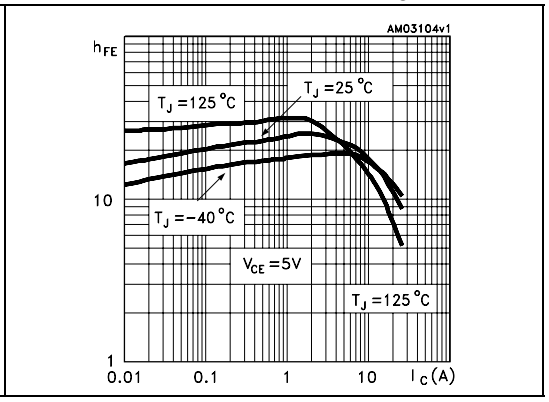


Figure 7. DC current gain (V_{CE} = 5 V)



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Figure 8. Collector-emitter saturation voltage

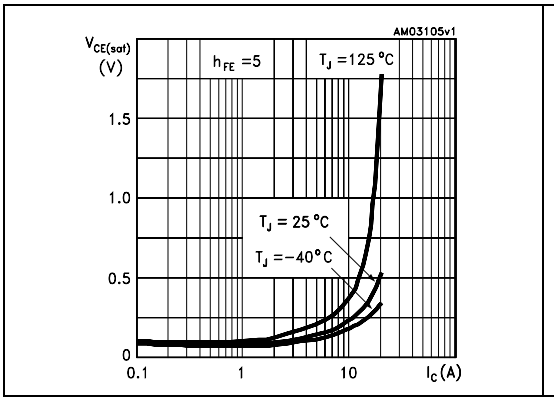


Figure 9. Base-emitter saturation voltage

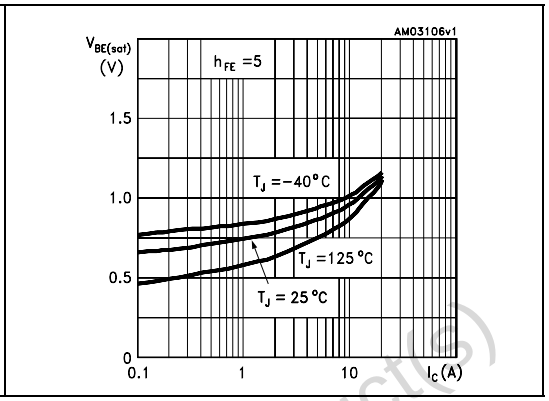


Figure 10. Inductive load switching time

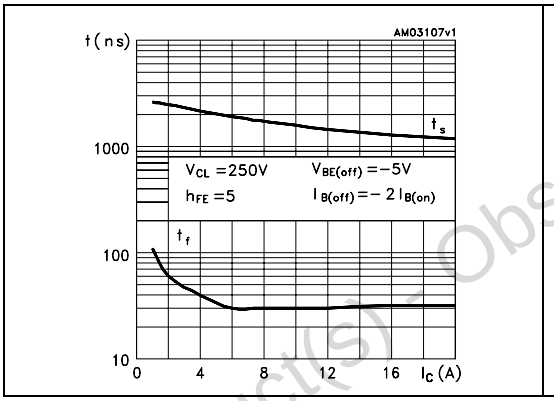
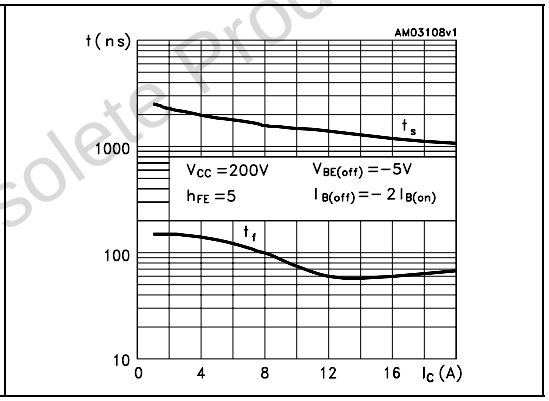
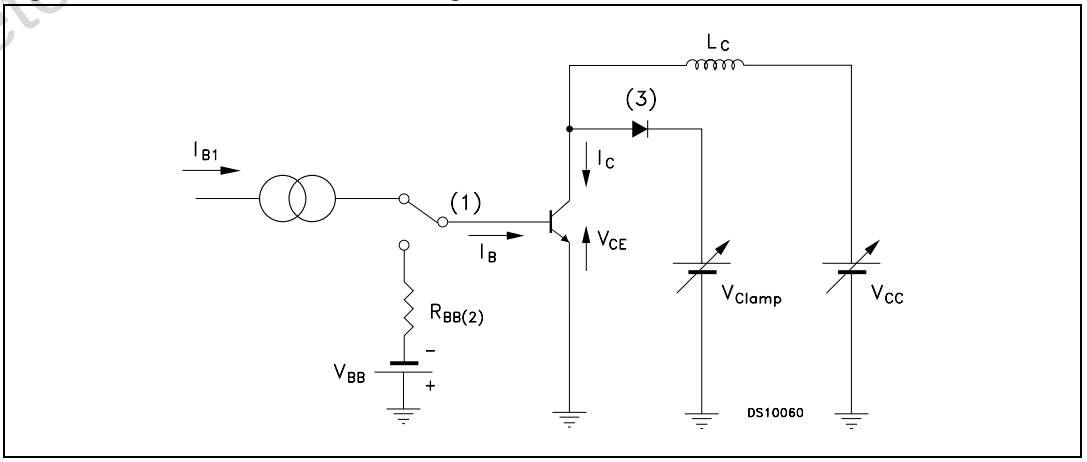


Figure 11. Resistive load switching time



2.2 Test circuits

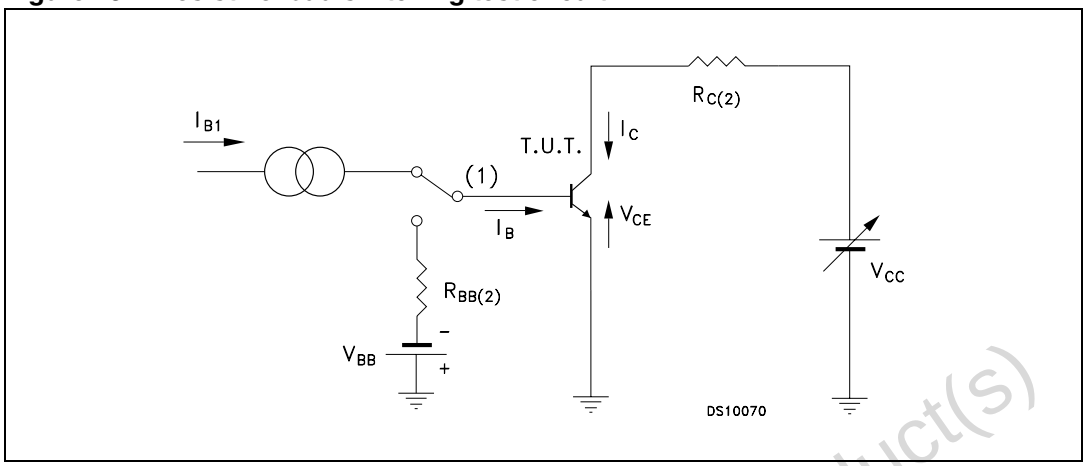
Figure 12. Inductive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor
3. Fast recovery rectifier

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Figure 13. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

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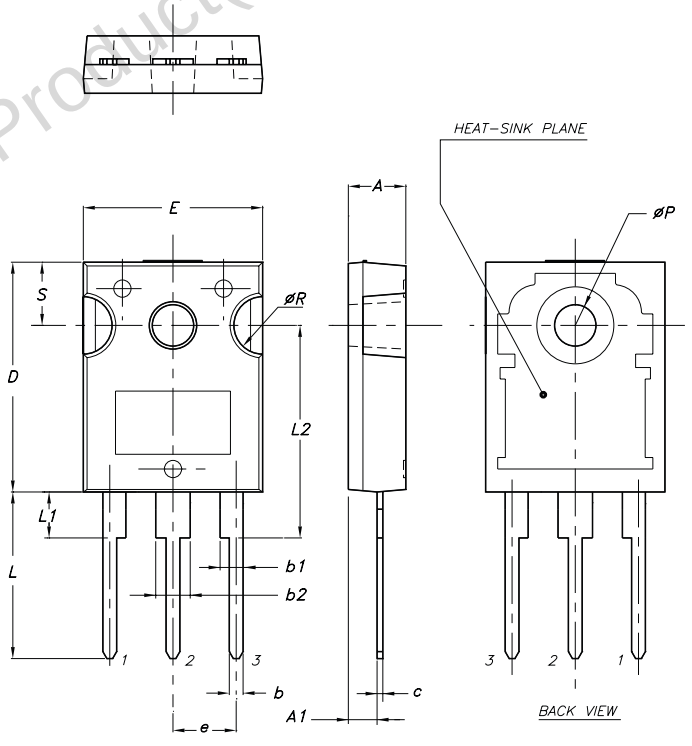
3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.
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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	



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4 Revision history

Table 5. Document revision history

Date	Revision	Changes
07-Nov-2008	1	Initial release.
10-Jun-2009	2	Document status promoted from preliminary data to datasheet.

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