



## 2SD1047

### High power NPN epitaxial planar bipolar transistor

#### Features

- High breakdown voltage  $V_{CEO} = 140\text{ V}$
- Typical  $f_t = 20\text{ MHz}$
- Fully characterized at  $125\text{ }^\circ\text{C}$

#### Application

- Power supply

#### Description

The device is a NPN transistor manufactured using new BiT-LA (Bipolar transistor for linear amplifier) technology. The resulting transistor shows good gain linearity behaviour.

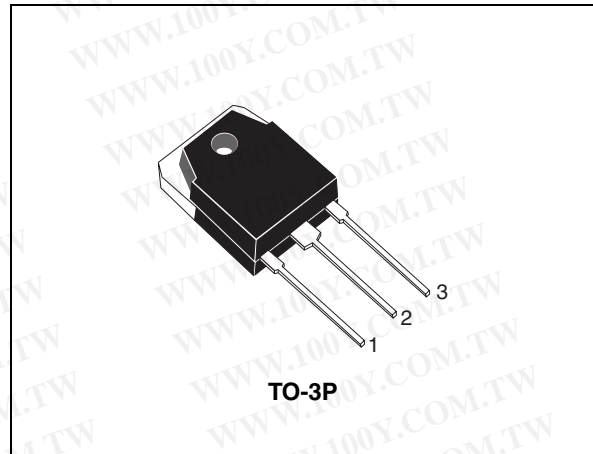


Figure 1. Internal schematic diagram

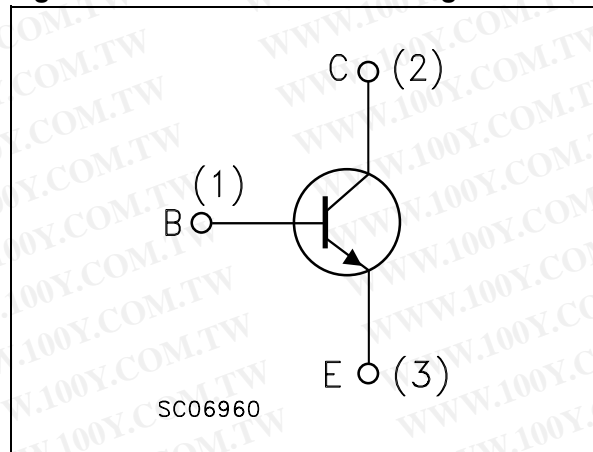


Table 1. Device summary

Order code	Marking	Package	Packaging
2SD1047	2SD1047	TO-3P	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	200	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	140	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	6	V
$I_C$	Collector current	12	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	20	A
$P_{tot}$	Total dissipation at $T_C = 25$ °C	100	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
$R_{thj-case}$	Thermal resistance junction-case max	1.25	°C/W

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 200\text{ V}$			0.1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 6\text{ V}$			0.1	$\mu\text{A}$
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 50\text{ mA}$	140			V
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage ( $I_{\text{E}} = 0$ )	$I_{\text{C}} = 100\text{ }\mu\text{A}$	200			V
$V_{(\text{BR})\text{EBO}}^{(1)}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 1\text{ mA}$	6			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 500\text{ mA}$ $I_{\text{C}} = 7\text{ A}$ $I_{\text{B}} = 700\text{ mA}$			0.5 0.7	V V
$V_{\text{BE}}$	Base-emitter voltage	$V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 5\text{ A}$			1.3	V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 4\text{ V}$	60 50		200	
$f_{\text{T}}$	Transition frequency	$I_{\text{C}} = 0.5\text{ A}$ $V_{\text{CE}} = 12\text{ V}$		20		MHz
$C_{\text{CBO}}$	Collector-base capacitance ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 10\text{ V}$ $f = 1\text{ MHz}$		150		pF
$t_{\text{on}}$	Resistive Load Turn-on time	$V_{\text{CC}} = 60\text{ V}$ $I_{\text{C}} = 5\text{ A}$		0.22		$\mu\text{s}$
$t_{\text{stg}}$	Storage time	$I_{\text{B1}} = -I_{\text{B2}} = 0.5\text{ A}$		4.3		$\mu\text{s}$
$t_{\text{f}}$	Fall time			0.5		$\mu\text{s}$

1. Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

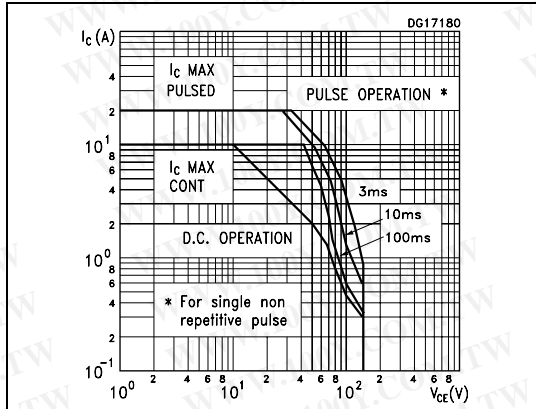


Figure 3. Output characteristics

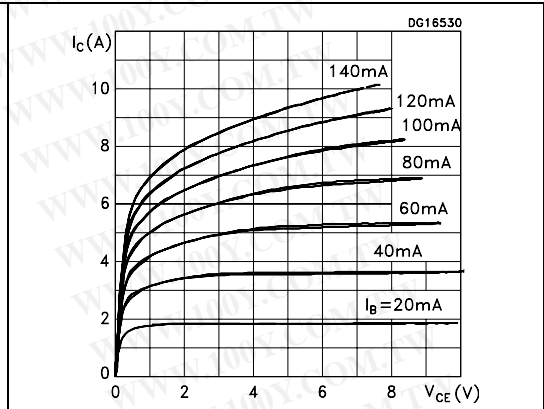


Figure 4. DC current gain

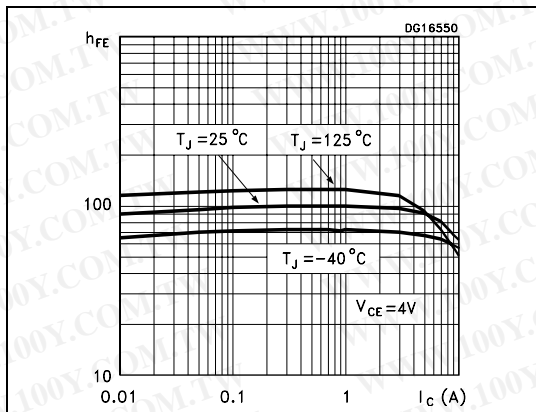


Figure 5. Collector-emitter saturation voltage

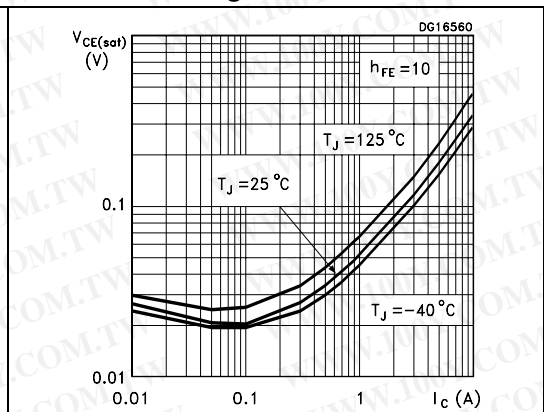


Figure 6. Base-emitter voltage

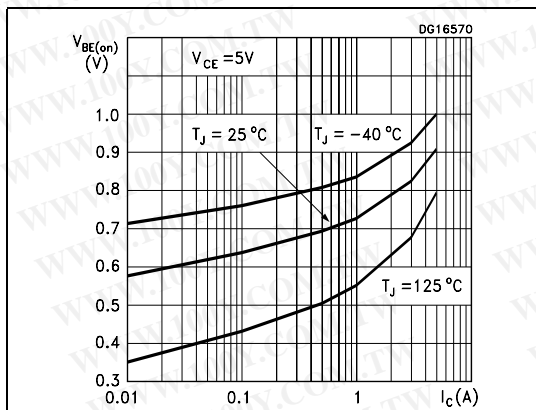
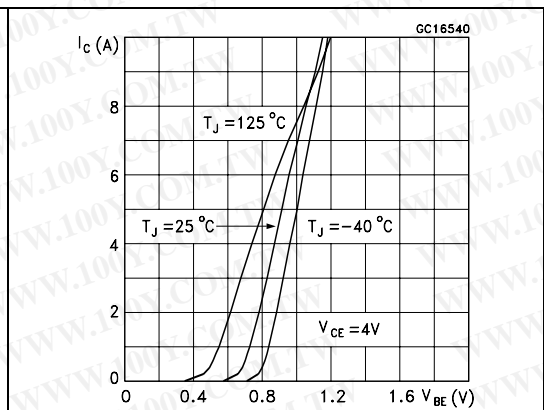


Figure 7. Base-emitter voltage



## 2.2 Test circuit

Figure 8. Resistive load switching test circuit

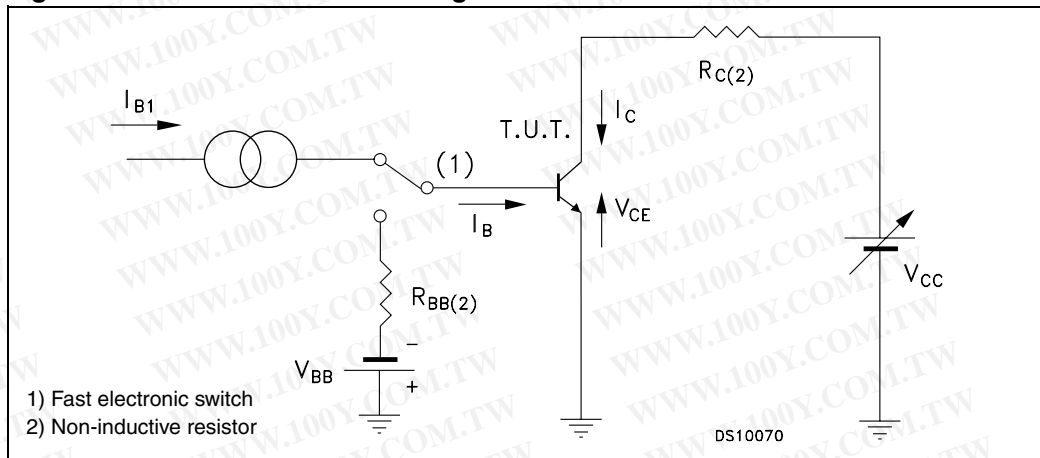
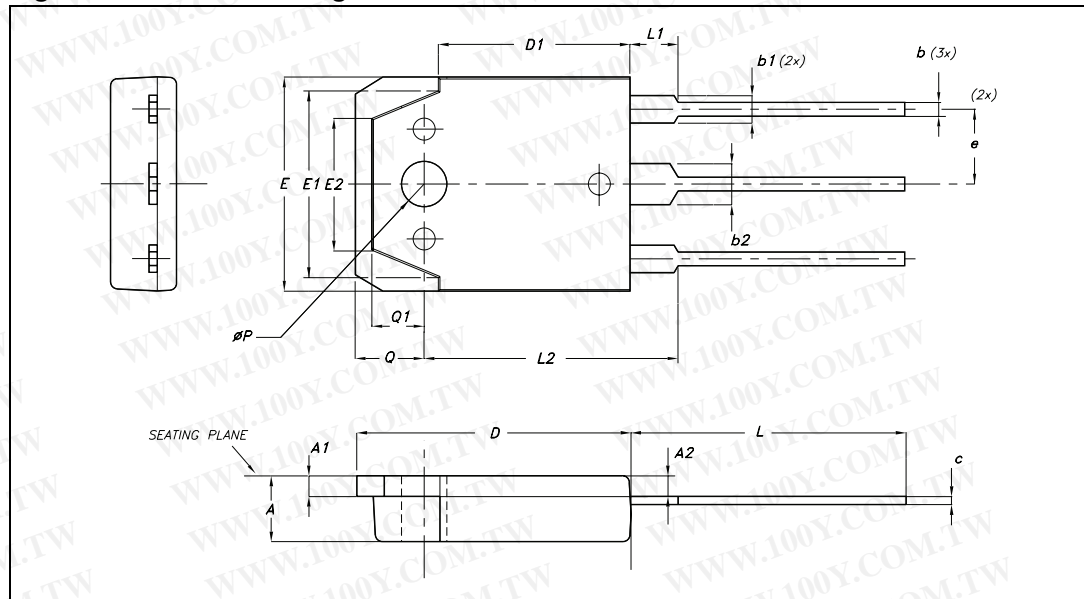


Table 5. TO-3P mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.6		5
A1	1.45	1.50	1.65
A2	1.20	1.40	1.60
b	0.80	1	1.20
b1	1.80		2.20
b2	2.80		3.20
c	0.55	0.60	0.75
D	19.70	19.90	20.10
D1		13.90	
E	15.40		15.80
E1		13.60	
E2		9.60	
e	5.15	5.45	5.75
L	19.50	20	20.50
L1		3.50	
L2	18.20	18.40	18.60
P	3.10		3.30
Q		5	
Q1		3.80	

Figure 9. TO-3P drawings



### 3 Package mechanical data

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## 4 Revision history

**Table 6. Document revision history**

Date	Revision	Changes
12-Apr-2011	1	Initial release.

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