

## High power NPN epitaxial planar bipolar transistor

### Features

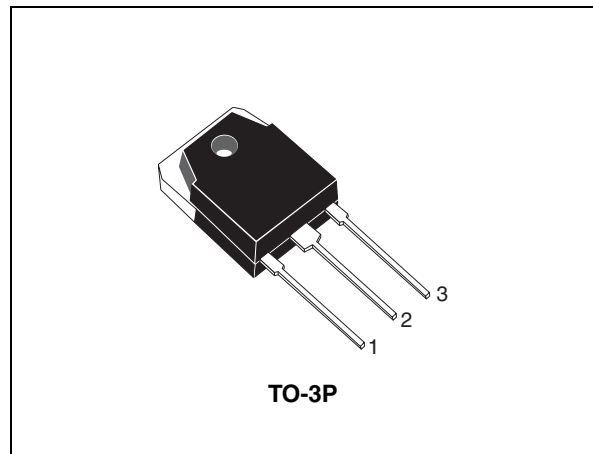
- High breakdown voltage  $V_{CE0} = 140\text{ V}$
- Typical  $f_t = 20\text{ MHz}$
- Fully characterized at  $125\text{ }^\circ\text{C}$

### Application

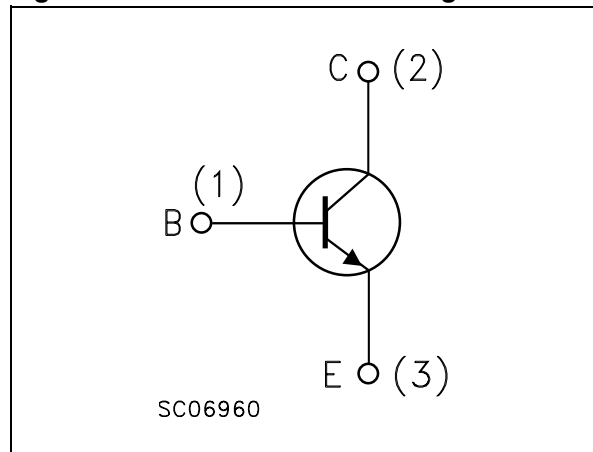
- Power supply

### 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
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 500\text{ mA}$			0.5	V
		$I_{\text{C}} = 7\text{ A}$ $I_{\text{B}} = 700\text{ mA}$			0.7	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	$I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 5\text{ V}$	60		200	
		$I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 4\text{ V}$	50			
$f_{\text{T}}$	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
$t_{\text{on}}$ $t_{\text{stg}}$ $t_{\text{f}}$	Resistive Load					
	Turn-on time	$V_{\text{CC}} = 60\text{ V}$ $I_{\text{C}} = 5\text{ A}$		0.22		$\mu\text{s}$
	Storage time	$I_{\text{B1}} = -I_{\text{B2}} = 0.5\text{ A}$		4.3		$\mu\text{s}$
	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

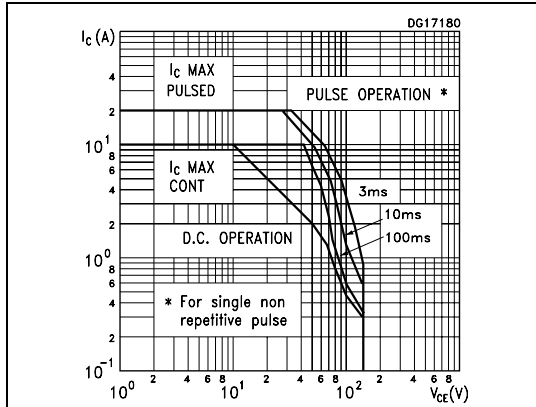


Figure 3. Output characteristics

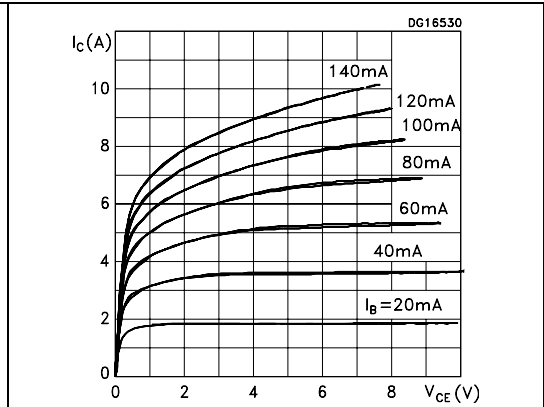


Figure 4. DC current gain

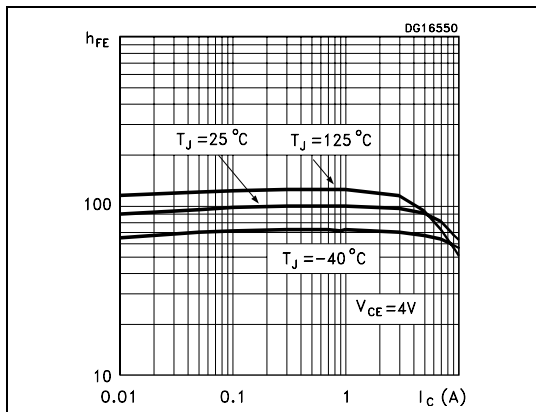


Figure 5. Collector-emitter saturation voltage

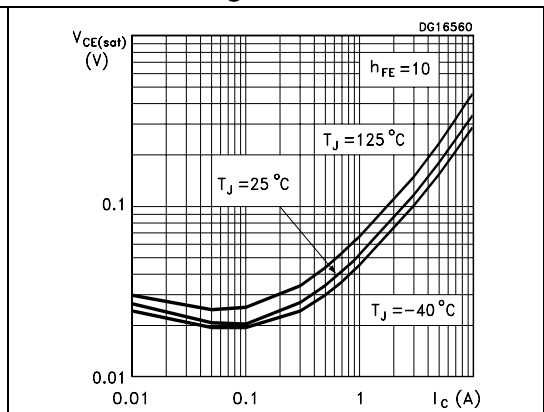


Figure 6. Base-emitter voltage

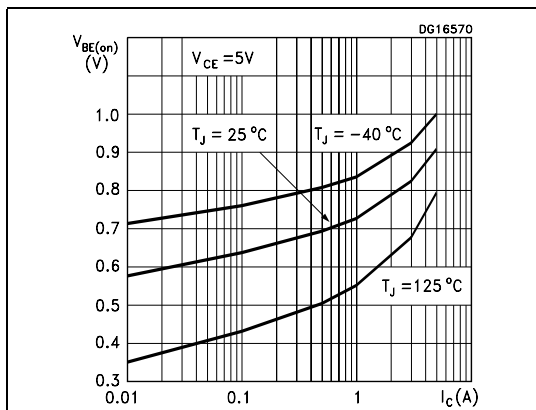
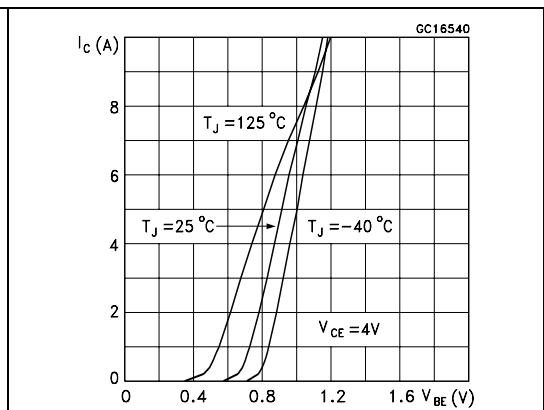


Figure 7. Base-emitter voltage



## 2.2 Test circuit

Figure 8. Resistive load switching test circuit

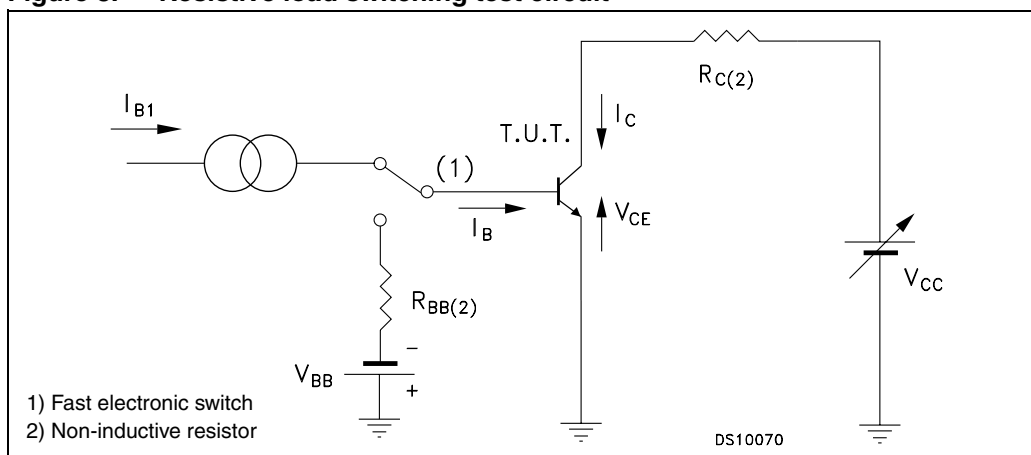
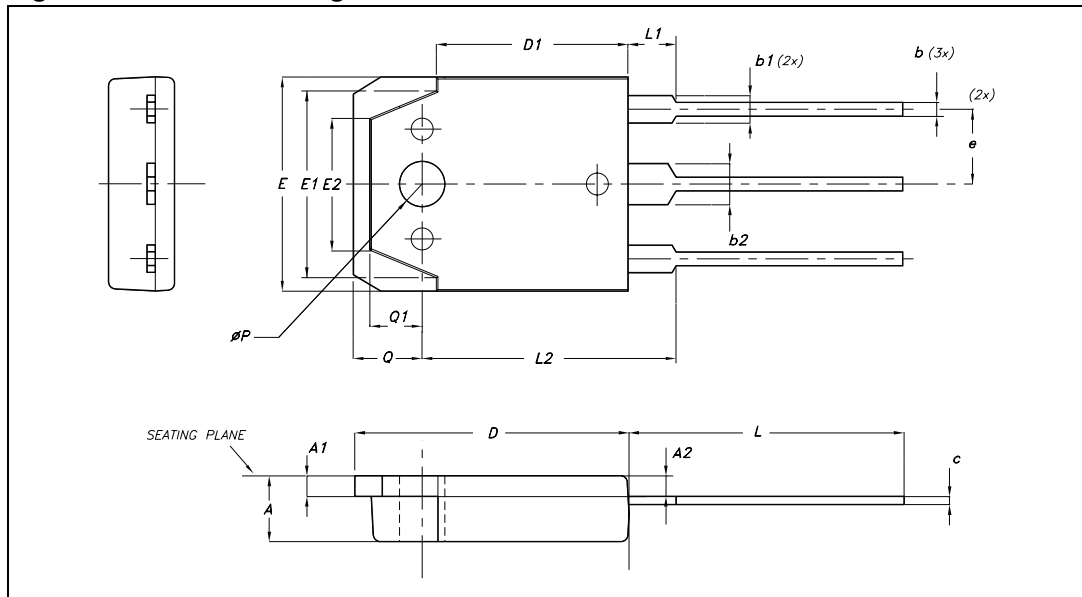


Table 5. TO-3P mechanical data

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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