

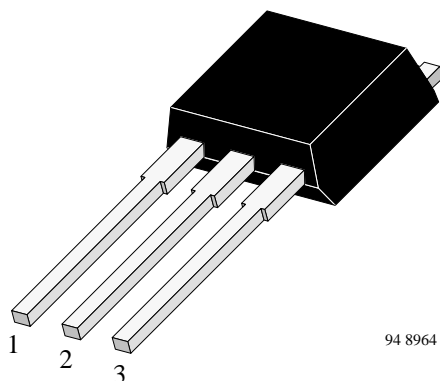
## Silicon NPN High Voltage Switching Transistor

### Features

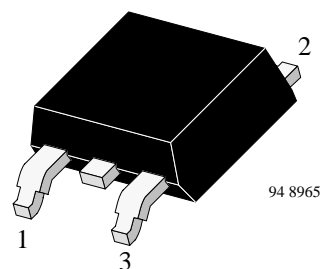
- Simple-sWitch-Off Transistor (SWOT)
- HIGH SPEED technology
- Planarpassivation
- 100 kHz switching rate
- Very low switching losses
- Very low dynamic saturation
- Very low operating temperature
- Optimized RBSOA
- High reverse voltage

### Applications

Electronic lamp ballast circuits  
Switch-mode power supplies



BUD630  
1 Base 2 Collector 3 Emitter



BUD630-SMD  
1 Base 2 Collector 3 Emitter

### Absolute Maximum Ratings

$T_{case} = 25^{\circ}C$ , unless otherwise specified

Parameter	Test Conditions	Symbol	Value	Unit
Collector-emitter voltage		$V_{CEO}$	400	V
		$V_{CEW}$	500	V
		$V_{CES}$	700	V
Emitter-base voltage		$V_{EBO}$	11	V
Collector current		$I_C$	6	A
Collector peak current		$I_{CM}$	9	A
Base current		$I_B$	3	A
Base peak current		$I_{BM}$	4.5	A
Total power dissipation	$T_{case} \cong 25^{\circ}C$	$P_{tot}$	40	W
Junction temperature		$T_j$	150	$^{\circ}C$
Storage temperature range		$T_{stg}$	-65 to +150	$^{\circ}C$

## Maximum Thermal Resistance

$T_{\text{case}} = 25^{\circ}\text{C}$ , unless otherwise specified

Parameter	Test Conditions	Symbol	Value	Unit
Junction case		$R_{\text{thJC}}$	3.12	K/W

## Electrical Characteristics

$T_{\text{case}} = 25^{\circ}\text{C}$ , unless otherwise specified

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Collector cut-off current	$V_{\text{CES}} = 700 \text{ V}$	$I_{\text{CES}}$			50	$\mu\text{A}$
	$V_{\text{CES}} = 700 \text{ V}; T_{\text{case}} = 150^{\circ}\text{C}$	$I_{\text{CES}}$			0.5	mA
Collector-emitter breakdown voltage (figure 1)	$I_{\text{C}} = 300 \text{ mA}; L = 125 \text{ mH};$ $I_{\text{measure}} = 100 \text{ mA}$	$V_{(\text{BR})\text{CEO}}$	400			V
Emitter-base breakdown voltage	$I_{\text{E}} = 1 \text{ mA}$	$V_{(\text{BR})\text{EBO}}$	11			V
Collector-emitter saturation voltage	$I_{\text{C}} = 1 \text{ A}; I_{\text{B}} = 0.25 \text{ A}$	$V_{\text{CEsat}}$			0.2	V
	$I_{\text{C}} = 3 \text{ A}; I_{\text{B}} = 1 \text{ A}$	$V_{\text{CEsat}}$			0.4	V
Base-emitter saturation voltage	$I_{\text{C}} = 1 \text{ A}; I_{\text{B}} = 0.25 \text{ A}$	$V_{\text{BEsat}}$			1	V
	$I_{\text{C}} = 3 \text{ A}; I_{\text{B}} = 1 \text{ A}$	$V_{\text{BEsat}}$			1.2	V
DC forward current transfer ratio	$V_{\text{CE}} = 2 \text{ V}; I_{\text{C}} = 10 \text{ mA}$	$h_{\text{FE}}$	15			
	$V_{\text{CE}} = 2 \text{ V}; I_{\text{C}} = 1 \text{ A}$	$h_{\text{FE}}$	15			
	$V_{\text{CE}} = 2 \text{ V}; I_{\text{C}} = 3 \text{ A}$	$h_{\text{FE}}$	7			
	$V_{\text{CE}} = 5 \text{ V}; I_{\text{C}} = 6 \text{ A}$	$h_{\text{FE}}$	4			
Collector-emitter working voltage	$V_{\text{S}} = 50 \text{ V}; L = 1 \text{ mH}; I_{\text{C}} = 6 \text{ A};$ $I_{\text{B}1} = 2 \text{ A}; -I_{\text{B}2} = 0.6 \text{ A};$ $-V_{\text{BB}} = 5 \text{ V}$	$V_{\text{CEW}}$	500			V
Dynamic saturation voltage	$I_{\text{C}} = 3 \text{ A}; I_{\text{B}} = 0.6 \text{ A}, t = 1 \mu\text{s}$	$V_{\text{CEsatdyn}}$		5	10	V
	$I_{\text{C}} = 3 \text{ A}; I_{\text{B}} = 0.6 \text{ A}, t = 3 \mu\text{s}$	$V_{\text{CEsatdyn}}$		1	2.5	V
Gain bandwidth product	$I_{\text{C}} = 200 \text{ mA}; V_{\text{CE}} = 10 \text{ V};$ $f = 1 \text{ MHz}$	$f_{\text{T}}$	4			MHz

## Switching Characteristics

$T_{case} = 25^{\circ}C$ , unless otherwise specified

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Resistive load (figure 2)						
Turn on time	$I_C = 1\text{ A}; I_{B1} = 0.25\text{ A}; -I_{B2} = 0.5\text{ A}; V_S = 250\text{ V}$	$t_{on}$		0.15	0.25	$\mu s$
Storage time		$t_s$		2.2	3	$\mu s$
Fall time		$t_f$		0.3	0.4	$\mu s$
Turn on time	$I_C = 3\text{ A}; I_{B1} = 0.6\text{ A}; -I_{B2} = 1.5\text{ A}; V_S = 250\text{ V}$	$t_{on}$		0.35	0.5	$\mu s$
Storage time		$t_s$		1.2	2	$\mu s$
Fall time		$t_f$		0.1	0.15	$\mu s$
Inductive load (figure 3)						
Storage time	$I_C = 1\text{ A}; I_{B1} = 0.25\text{ A}; -I_{B2} = 0.5\text{ A}; V_{clamp} = 300\text{ V}; L = 200\text{ }\mu H$	$t_s$		2.3	3	$\mu s$
Fall time		$t_f$		0.2	0.3	$\mu s$
Storage time	$I_C = 3\text{ A}; I_{B1} = 0.6\text{ A}; -I_{B2} = 1.5\text{ A}; V_{clamp} = 300\text{ V}; L = 200\text{ }\mu H$	$t_s$		1.3	2	$\mu s$
Fall time		$t_f$		0.1	0.15	$\mu s$

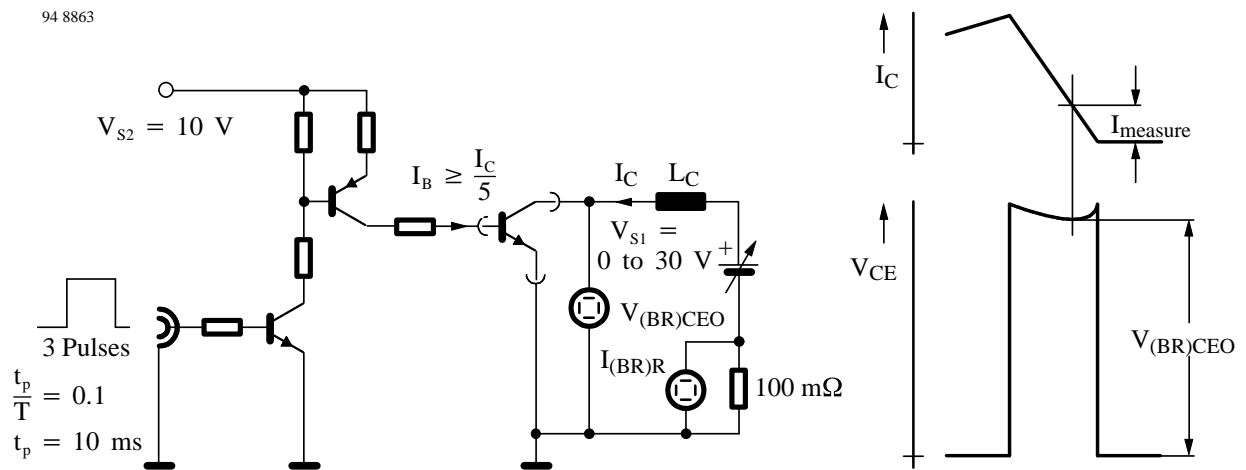
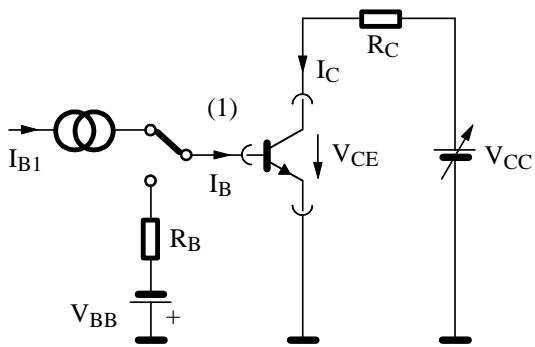


Figure 1. Test circuit for  $V_{(BR)CEO}$

94 8852



(1) Fast electronic switch

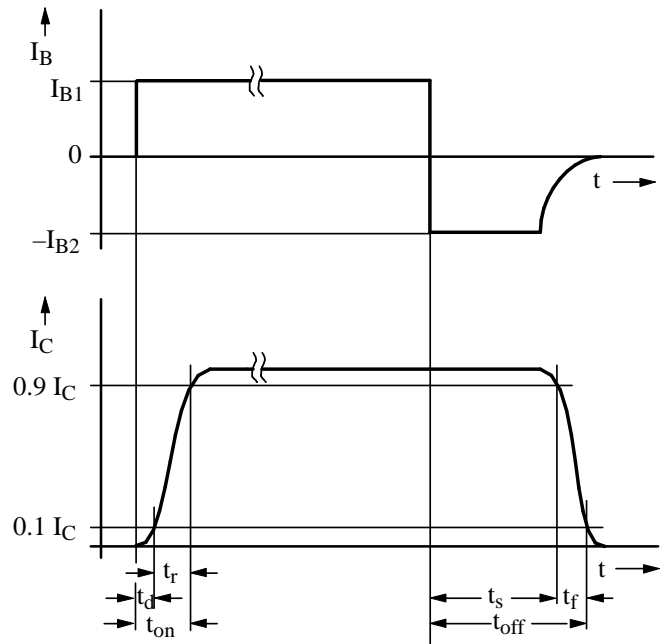
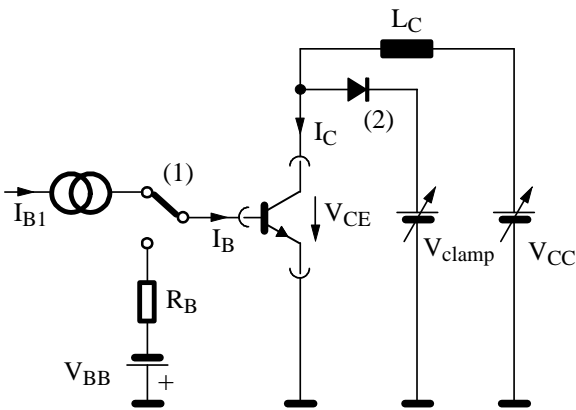


Figure 2. Test circuit for switching characteristics – resistive load

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(1) Fast electronic switch  
(2) Fast recovery rectifier

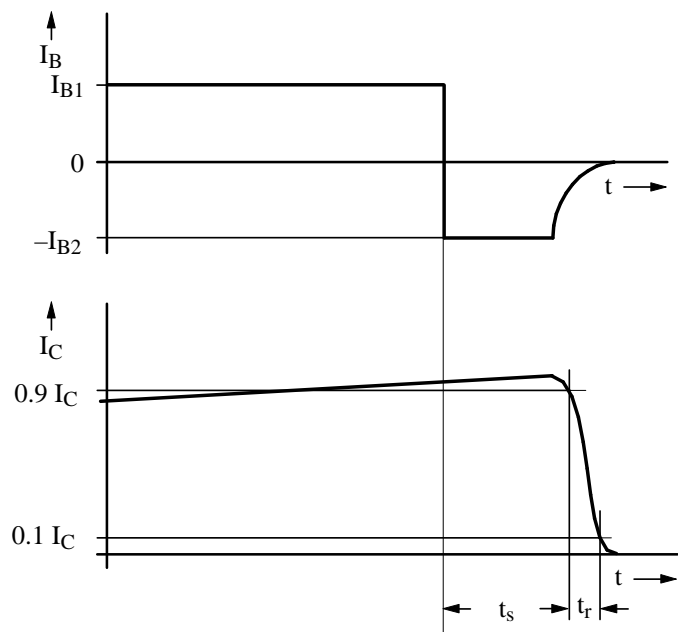


Figure 3. Test circuit for switching characteristics – inductive load

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

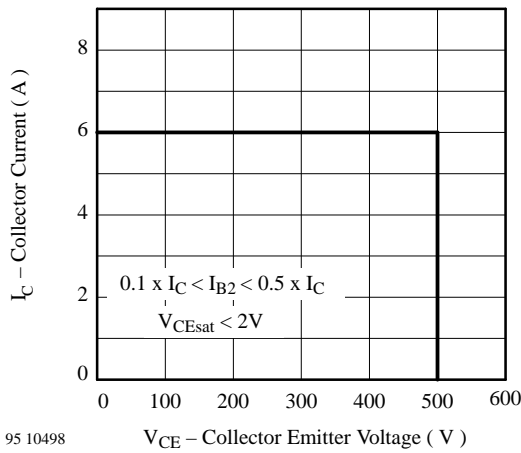


Figure 4.  $V_{\text{CEW}}$  - Diagram

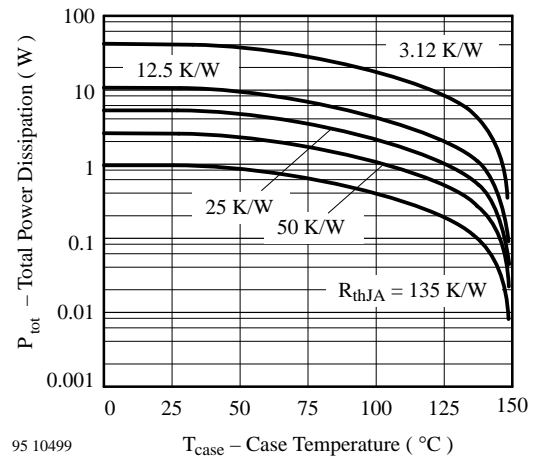


Figure 7.  $P_{\text{tot}}$  vs.  $T_{\text{case}}$

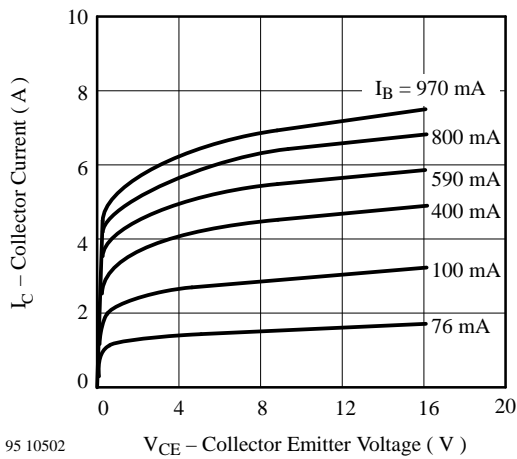


Figure 5.  $I_{\text{C}}$  vs.  $V_{\text{CE}}$

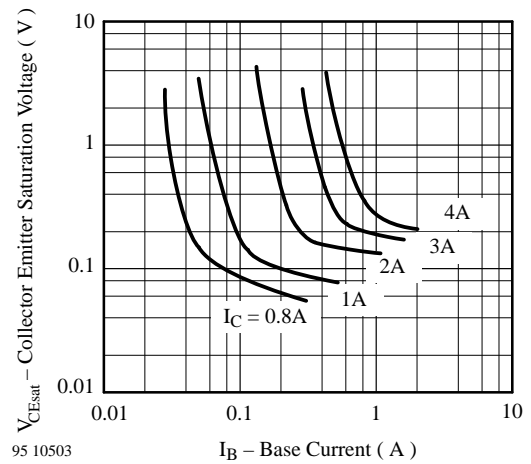


Figure 8.  $V_{\text{CEsat}}$  vs.  $I_{\text{B}}$

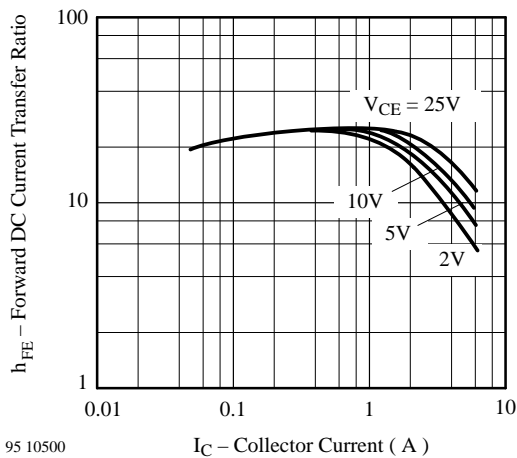


Figure 6.  $h_{\text{FE}}$  vs.  $I_{\text{C}}$

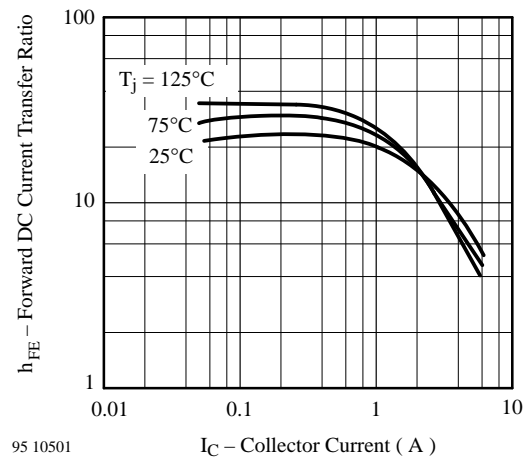


Figure 9.  $h_{\text{FE}}$  vs.  $I_{\text{C}}$

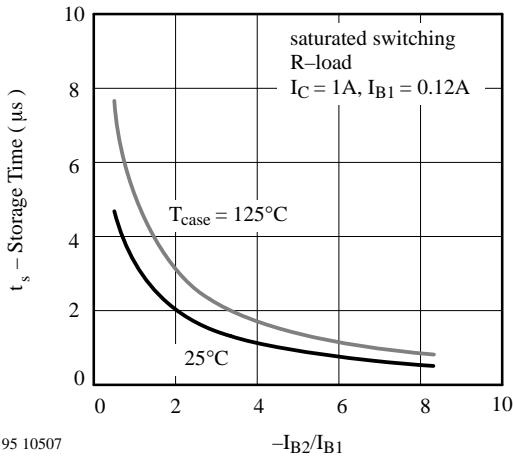


Figure 10.  $t_s$  vs.  $-I_{B2}/I_{B1}$

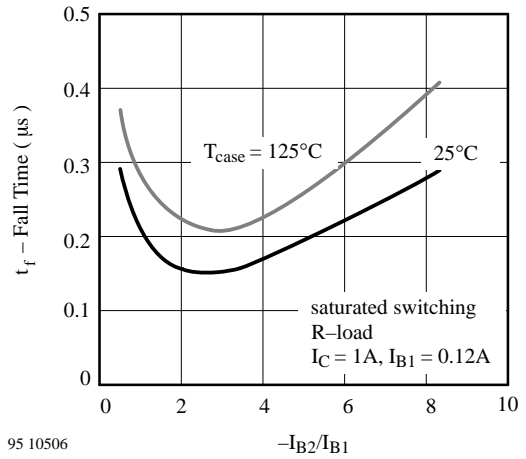


Figure 12.  $t_f$  vs.  $-I_{B2}/I_{B1}$

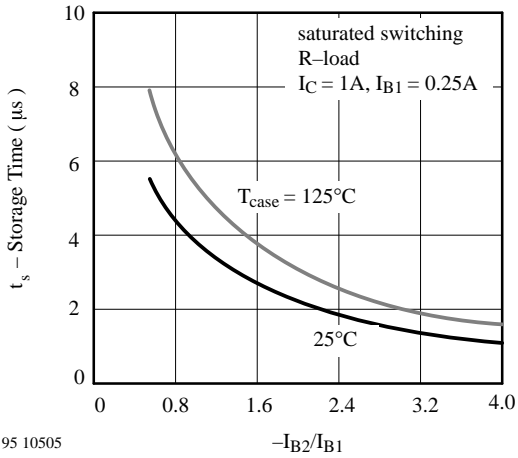


Figure 11.  $t_s$  vs.  $-I_{B2}/I_{B1}$

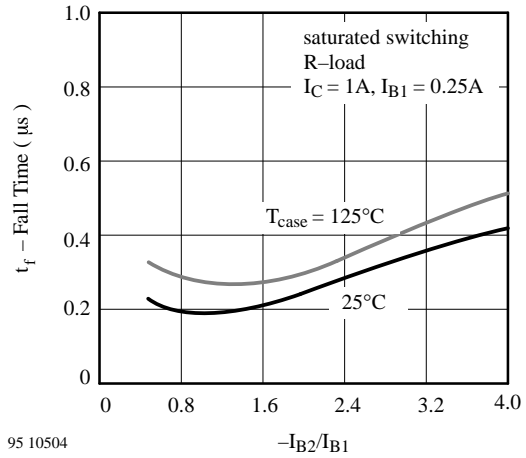
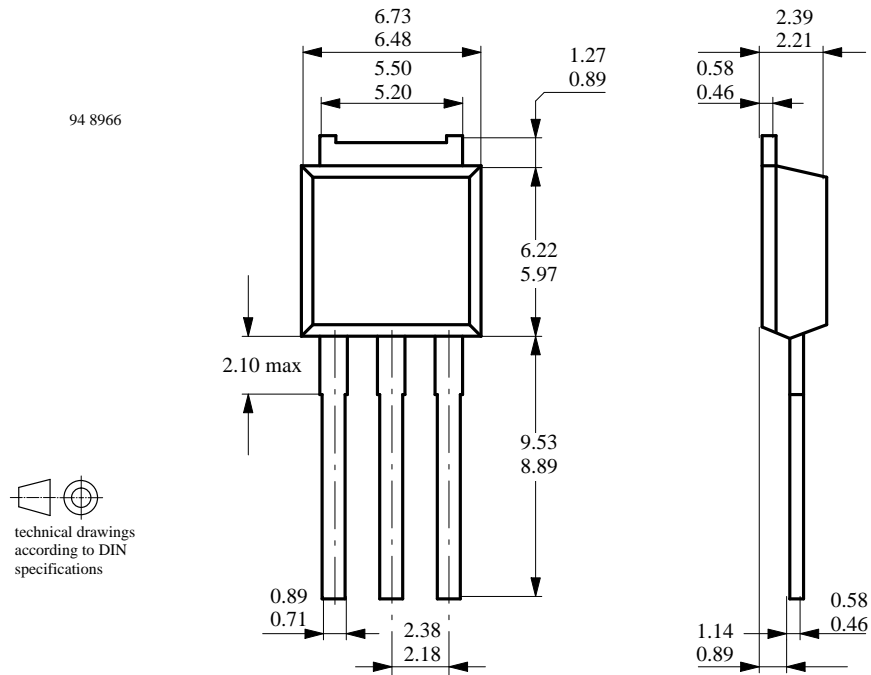


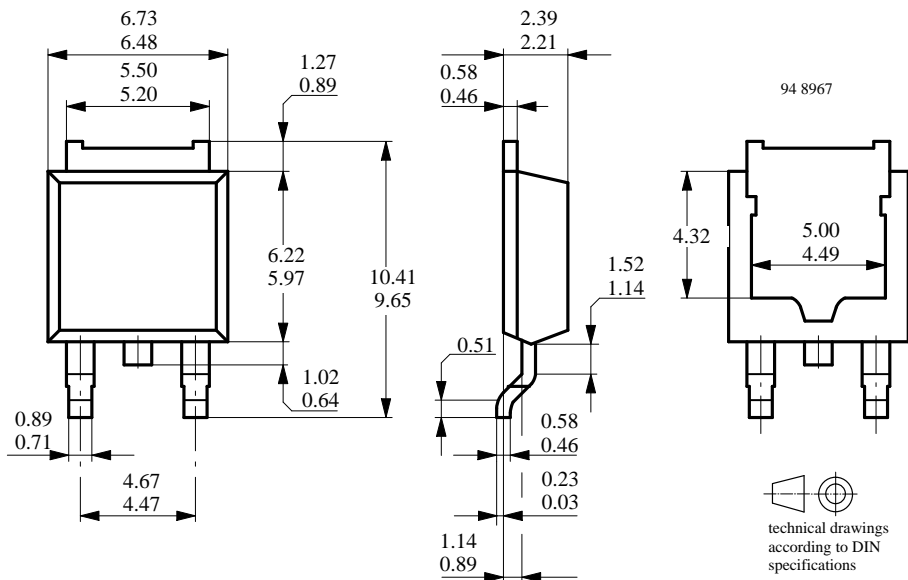
Figure 13.  $t_f$  vs.  $-I_{B2}/I_{B1}$

## Dimensions in mm

TO251



TO252



For ordering TO 252 add SMD to the type number (i.e. BUD630 -SMD)

## Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

**TEMIC TELEFUNKEN microelectronic GmbH** semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

**TEMIC** can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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