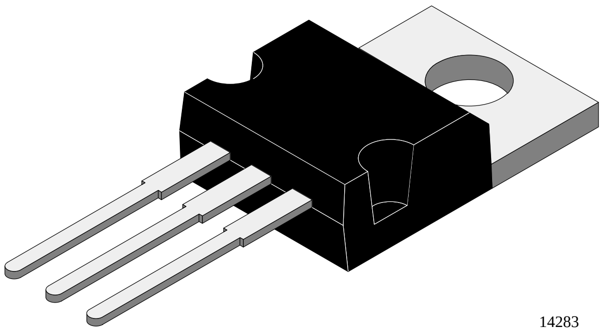
Silicon NPN High Voltage Switching Transistor

Features

- Monolithic integrated C-E-free-wheel diode
- HIGH SPEED technology
- Planar passivation
- Very short switching times
- Very low switching losses
- Very low dynamic saturation
- Very low operating temperature
- High reverse voltage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Applications

Electronic lamp ballast circuits
Switch-mode power supplies

Absolute Maximum Ratings

T_{case} = 25°C, unless otherwise specified

Parameter	Test Conditions	Type	Symbol	Value	Unit
Collector-emitter voltage		TE13004D	V_{CEO}	300	V
		TE13005D	V_{CEO}	400	V
		TE13004D	V_{CES}	600	V
		TE13005D	V_{CES}	700	V
Emitter-base voltage			V_{EBO}	9	V
Collector current			I_C	6	A
Collector peak current			I_{CM}	8	A
Base current			I_B	2	A
Base peak current			I_{BM}	4	A
Total power dissipation	$T_{case} \le 25^\circ C$		P_{tot}	57	W
Junction temperature			T_j	150	°C
Storage temperature range			T_{stg}	–65 to +150	°C

Maximum Thermal Resistance

T_{case} = 25°C, unless otherwise specified

Parameter	Test Conditions	Symbol	Value	Unit
Junction case		R_{thJC}	2.2	K/W

Electrical Characteristics

T_{case} = 25°C, unless otherwise specified

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Transistor							
Collector cut-off current	V_{CE} = 600 V	TE13004D	I_{CES}			50	μA
	V_{CE} = 700 V	TE13005D	I_{CES}			50	μA
	V_{CE} = 600 V; T_{case} = 150°C	TE13004D	I_{CES}			0.5	mA
	V_{CE} = 700 V; T_{case} = 150°C	TE13005D	I_{CES}			0.5	mA
Collector-emitter breakdown voltage (figure 1)	I_C = 100 mA; L = 125 mH; $I_{measure}$ = 100 mA	TE13004D	$V_{(BR)CEO}$	300			V
		TE13005D	$V_{(BR)CEO}$	400			V
Emitter-base breakdown voltage	I_E = 1 mA		$V_{(BR)EBO}$	9			V
Collector-emitter saturation voltage	I_C = 2 A; I_B = 0.4 A		V_{CEsat}			0.5	V
Base-emitter saturation voltage	I_C = 2 A; I_B = 0.4 A		V_{BEsat}			1.6	V
DC forward current transfer ratio	V_{CE} = 2 V; I_C = 10 mA		h_{FE}	10			
	V_{CE} = 2 V; I_C = 1 A		h_{FE}	10			
	V_{CE} = 2 V; I_C = 4 A		h_{FE}	4			
Dynamic saturation voltage	I_C = 2 A; I_B = 0.2 A; t = 1 μs		$V_{CEsatdyn}$		2.5		V
	I_C = 2 A; I_B = 0.2 A; t = 3 μs		$V_{CEsatdyn}$		0.6		V
Gain bandwidth product	V_{CE} = 10 V; I_C = 500 mA; f = 1 MHz		f_T	4			MHz
Free-wheel diode							
Forward voltage	I_F = 2 A		V_F		1.2	1.5	V
Turn-on transient peak voltage	I_F = 2 A; di_F/dt = 10 A/μs		V_{FP}		4	5	V
Reverse recovery current	I_F = 2 A; di_F/dt = 5 A/μs; V_S = 200 V		I_{RM}		4		A

Switching Characteristics

T_{case} = 25°C, unless otherwise specified

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Resistive load (figure 3)							
Turn on time	I_C = 2 A; I_{B1} = –I_{B2} = 0.4 A; V_S = 125 V		t_{on}		0.25	0.4	µs
Storage time			t_s		1.5	2.5	µs
Fall time			t_f		0.15	0.3	µs
Inductive load (figure 4)							
Storage time	I_C = 2 A; I_{B1} = 0.4 A; L = 200 µH; V_{clamp} = 300 V; –V_{BE} = 5 V; T_{case} = 100°C		t_s		1.2	2	µs
Cross over time			t_c		0.4	0.7	µs
Free-wheel diode							
Reverse recovery time	I_F = 0.5 A; I_R = 1 A; i_R = 0.25 A		t_{rr}		0.7	1	µs
Forward recovery time	I_F = 2 A; di_F/dt = 10 A/µs		t_{fr}		0.4		µs
Reverse recovery time	I_F = 2 A; –di_F/dt = 5 A/µs		t_{rr}		1.1		µs
	I_F = 2 A; –di_F/dt = 5 A/µs		t_{IRM}		0.9		µs

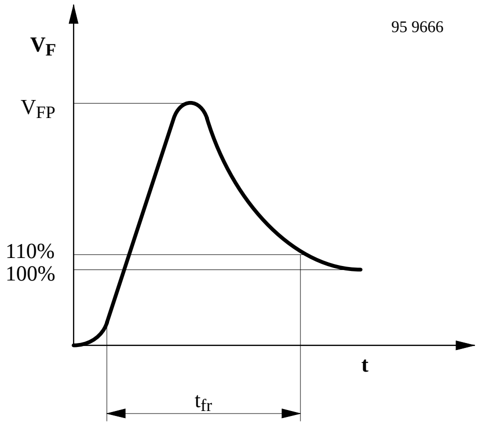


Figure 1. Turn on transient peak voltage

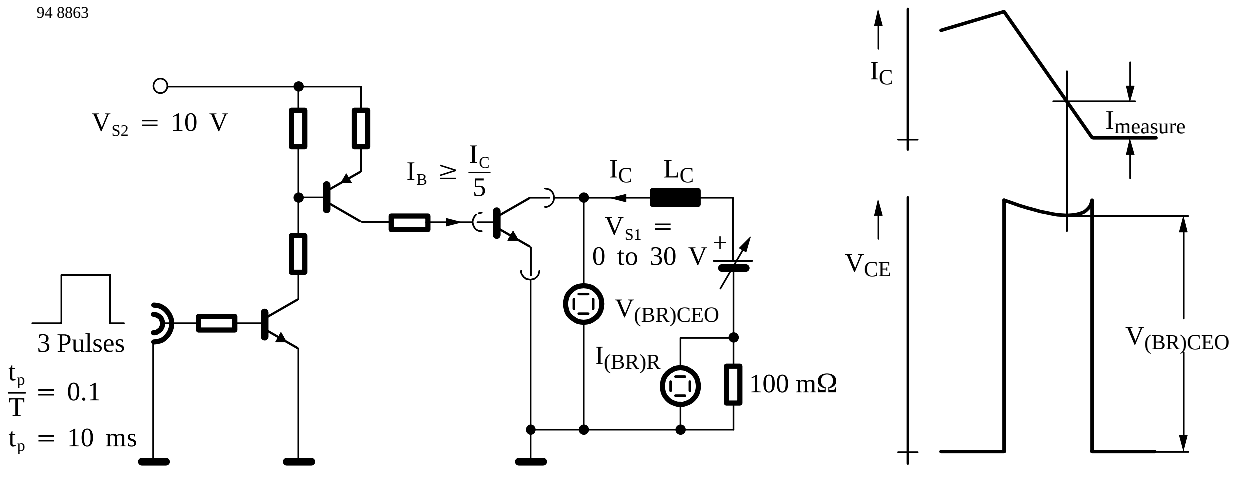


Figure 2. Test circuit for $V_{(BR)CE0}$

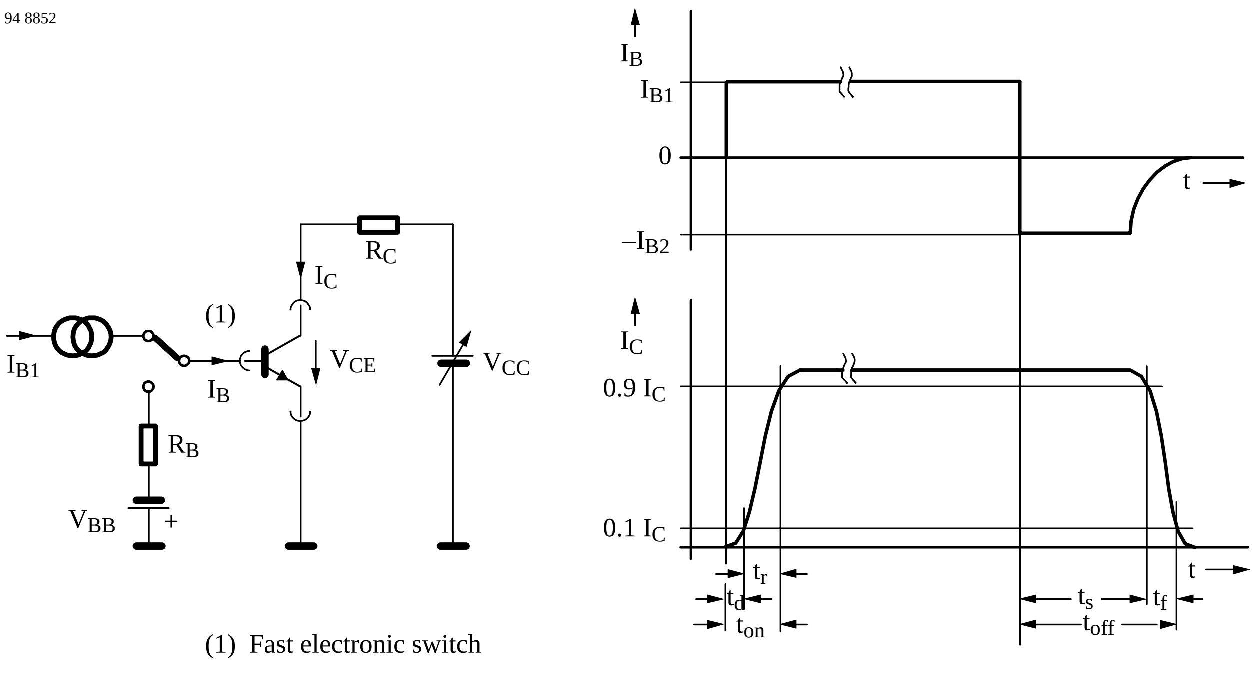


Figure 3. Test circuit for switching characteristics – resistive load

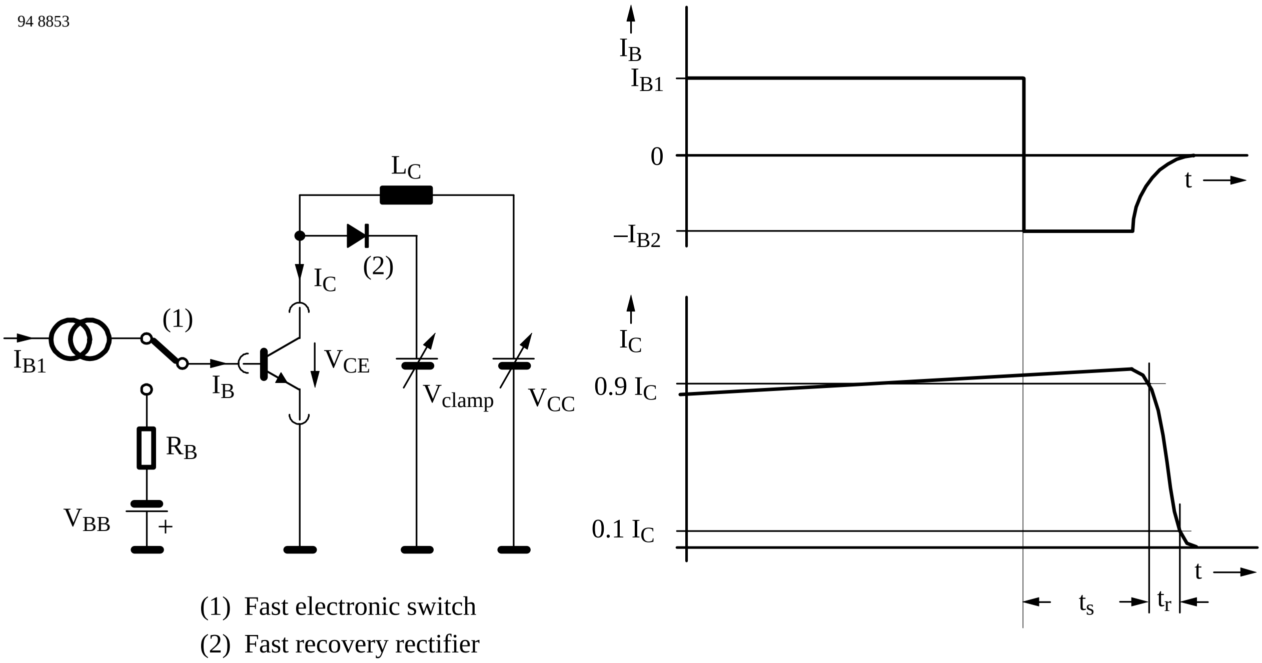


Figure 4. Test circuit for switching characteristics – inductive load

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

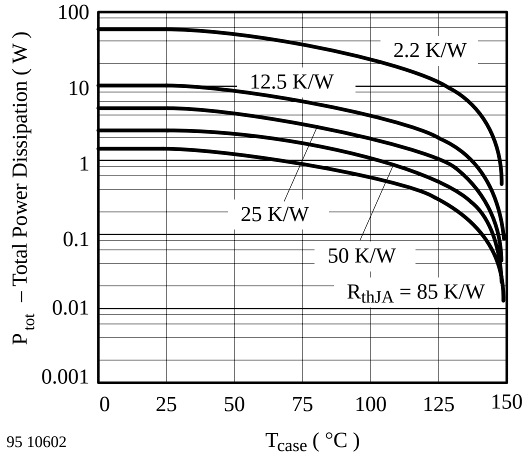


Figure 5. P_{tot} vs. T_{case}

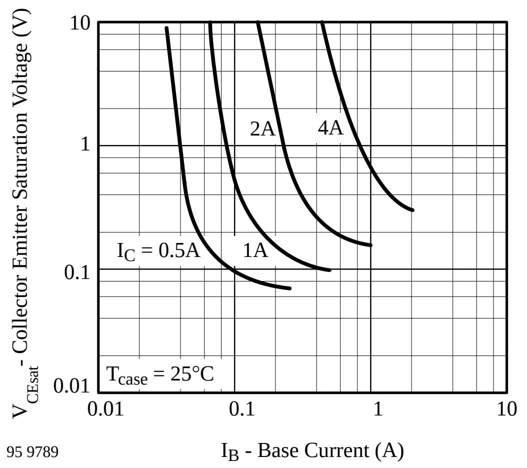


Figure 6. V_{CEsat} vs. I_B

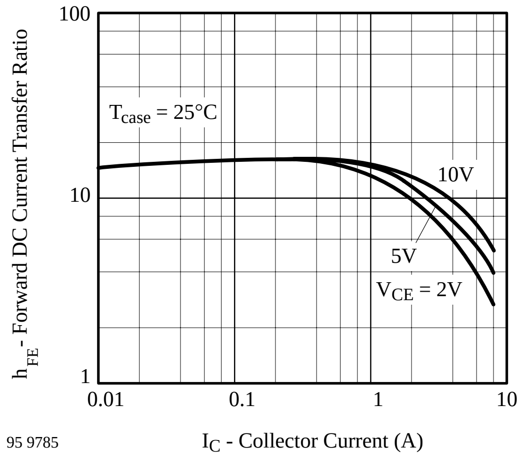


Figure 7. h_{FE} vs. I_C

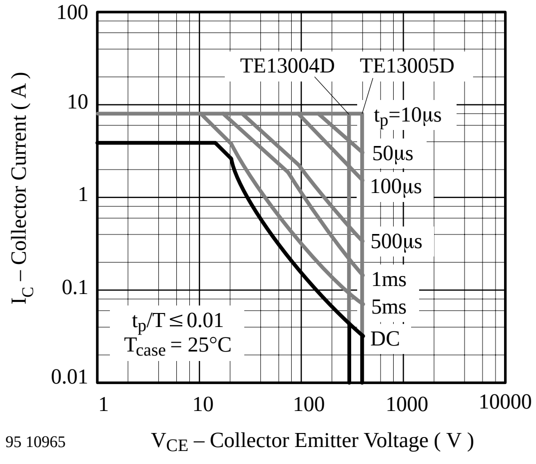


Figure 8. I_C vs. V_{CE}

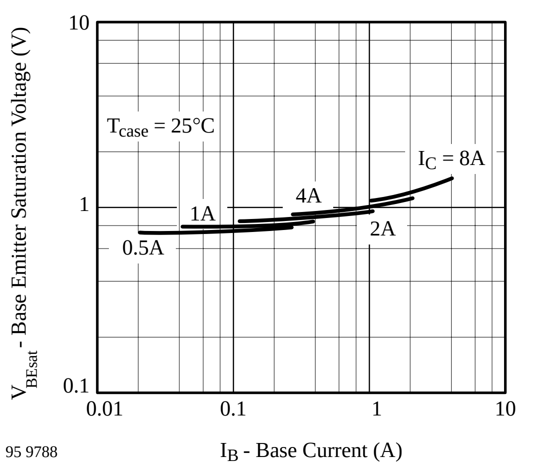


Figure 9. V_{BEsat} vs. I_B

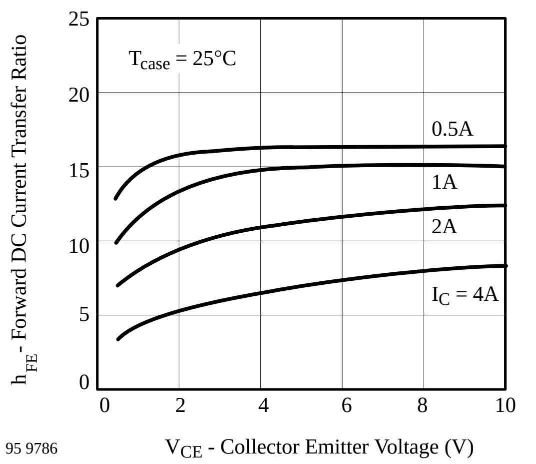


Figure 10. h_{FE} vs. V_{CE}

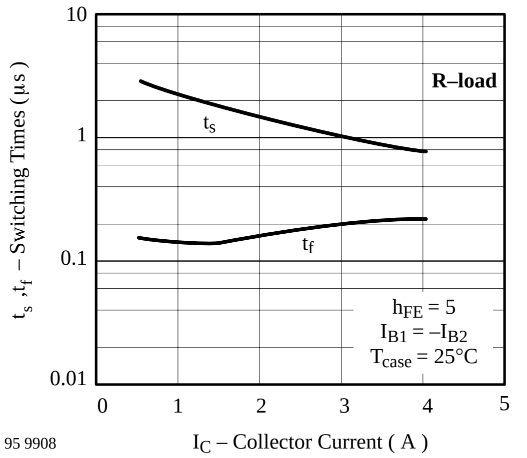


Figure 11. t_S, t_f vs. I_C

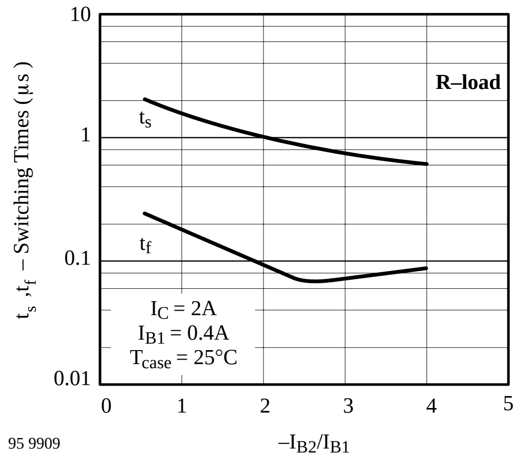


Figure 14. t_S, t_f vs. –I_{B2}/I_{B1}

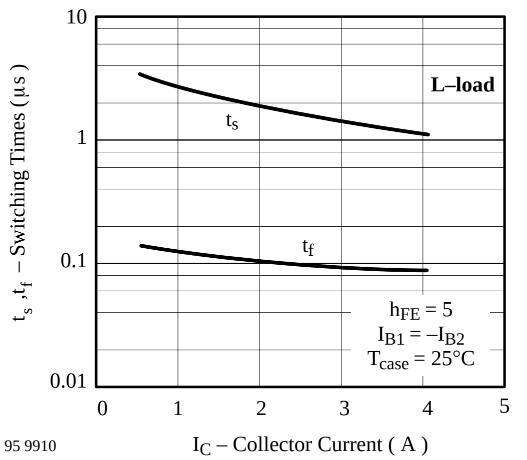


Figure 12. t_S, t_f vs. I_C

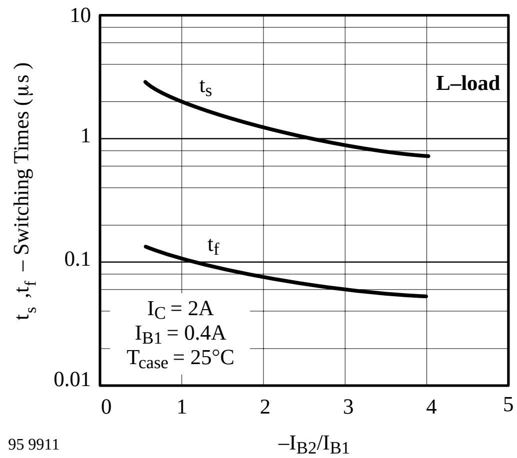


Figure 15. t_S, t_f vs. –I_{B2}/I_{B1}

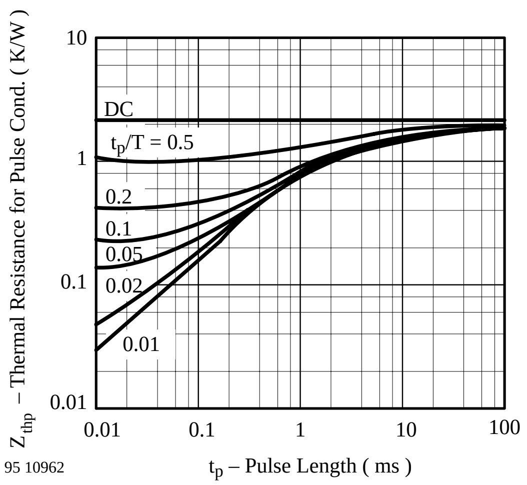
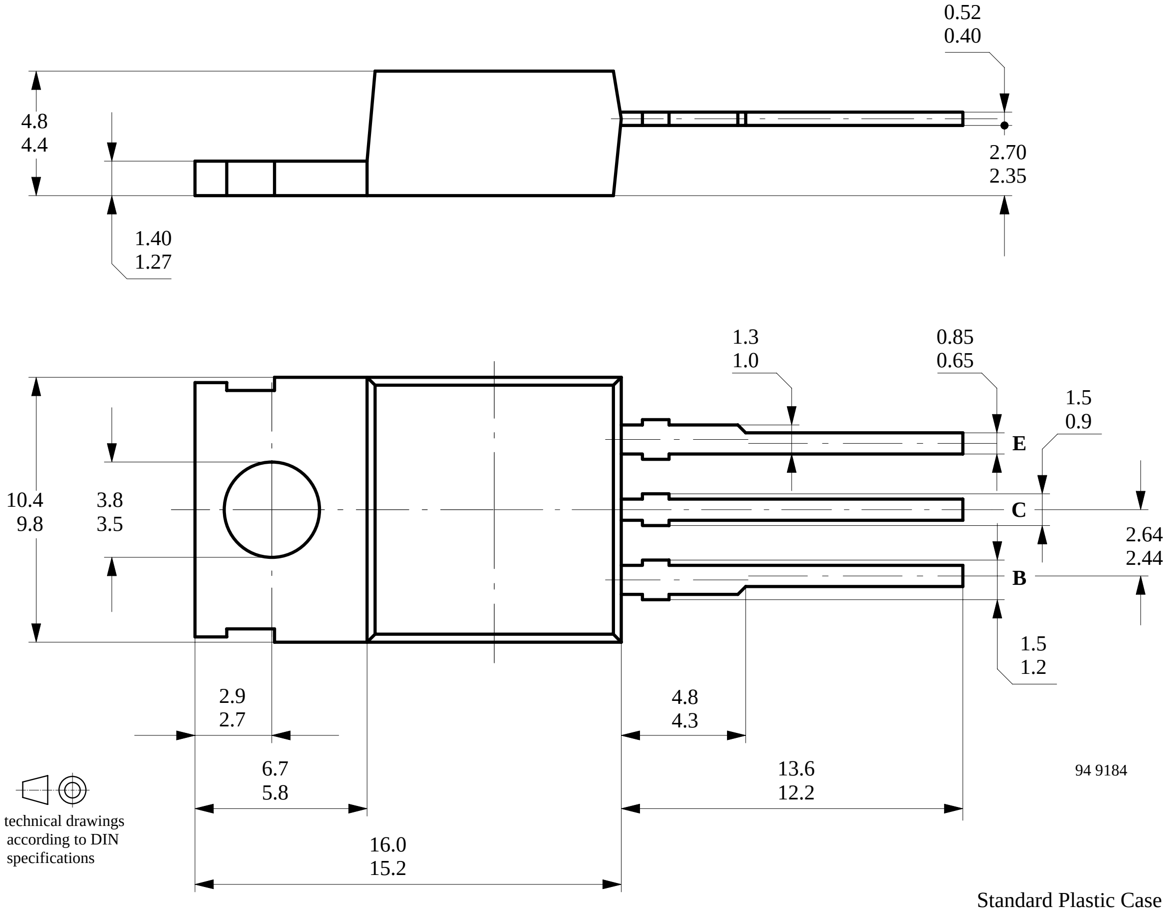


Figure 13.

Dimensions in mm



Standard Plastic Case
14A 3 DIN 41 869
JEDEC TO 220

Collector connected with metallic surface

Ozone Depleting Substances Policy Statement

It is the policy of **Vishay Semiconductor 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.

Vishay Semiconductor GmbH 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.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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