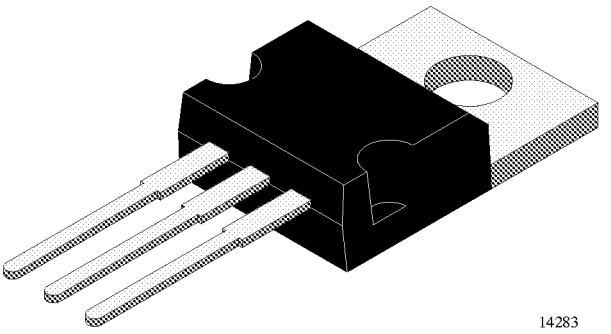
Silicon NPN High Voltage Switching Transistor

Features

- Simple-sWitch-Off Transistor (SWOT)
- HIGH SPEED technology
- Planar passivation
- 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

Absolute Maximum Ratings

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

Parameter	Test Conditions	Type	Symbol	Value	Unit
Collector-emitter voltage		BUF646	V_{CEO}	400	V
		BUF646A	V_{CEO}	450	V
		BUF646	V_{CES}	850	V
		BUF646A	V_{CES}	1000	V
Emitter-base voltage			V_{EBO}	9	V
Collector current			I_C	7	A
Collector peak current			I_{CM}	14	A
Base current			I_B	3	A
Base peak current			I_{BM}	5	A
Total power dissipation	$T_{case} \leq 25°C$		P_{tot}	70	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}	1.78	K/W

Electrical Characteristics

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

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Collector cut-off current	V_{CE} = 850 V	BUF646	I_{CES}			100	µA
	V_{CE} = 1000 V	BUF646A	I_{CES}			100	µA
	V_{CE} = 850 V; T_{case} = 150°C	BUF646	I_{CES}			0.5	mA
	V_{CE} = 1000 V; T_{case} = 150°C	BUF646A	I_{CES}			0.5	mA
Collector-emitter breakdown voltage (figure 1)	I_C = 500 mA; L = 125 mH; $I_{measure}$ = 100 mA	BUF646	$V_{(BR)CEO}$	400			V
		BUF646A	$V_{(BR)CEO}$	450			V
Emitter-base breakdown voltage	I_E = 1 mA		$V_{(BR)EBO}$	9			V
Collector-emitter saturation voltage	I_C = 2.5 A; I_B = 0.4 A		V_{CEsat}		0.25	0.50	V
	I_C = 4 A; I_B = 0.8 A		V_{CEsat}		0.40		V
	I_C = 5 A; I_B = 1 A		V_{CEsat}		1.00		V
Base-emitter saturation voltage	I_C = 2.5 A; I_B = 0.4 A		V_{BEsat}		0.90	1.10	V
	I_C = 4 A; I_B = 0.8 A		V_{BEsat}		1.00		V
	I_C = 5 A; I_B = 1 A		V_{BEsat}		1.30		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	20		
	V_{CE} = 2 V; I_C = 4 A		h_{FE}	5			
Collector-emitter working voltage	V_S = 50 V; L = 1.0 mH; T_{case} = 125°C; I_C = 2.5 A; I_{B1} = 0.25 A; R_{BB} = 2.4 Ω; $-V_{BB}$ = 5 V	BUF646A	V_{CEW}	500			V
	V_S = 50 V; L = 1.0 mH; T_{case} = 125°C; I_C = 2.5 A; I_{B1} = 0.25 A; R_{BB} = 0.6 Ω; $-V_{BB}$ = 0 V	BUF646A	V_{CEW}	500			V
	V_S = 50 V; L = 1.0 mH; T_{case} = 125°C; I_C = 4 A; I_{B1} = 0.8 A; R_{BB} = 2.4 Ω; $-V_{BB}$ = 5 V	BUF646A	V_{CEW}	500			V
	V_S = 50 V; L = 1.0 mH; T_{case} = 125°C; I_C = 4 A; I_{B1} = 0.8 A; R_{BB} = 0.6 Ω; $-V_{BB}$ = 0	BUF646A	V_{CEW}	500			V
	V_S = 50 V; L = 1.0 mH; T_{case} = 125°C; I_C = 7.5 A; I_{B1} = 1.50 A; R_{BB} = 2.4 Ω; $-V_{BB}$ = 5 V	BUF646A	V_{CEW}	400			V
Dynamic saturation voltage	I_C = 4 A; I_B = 0.8 A; t = 3 µs		$V_{CEsatdyn}$		3.7		V
	I_C = 4 A; I_B = 0.8 A; t = 5 µs		$V_{CEsatdyn}$		1.7		V
Gain bandwidth product	I_C = 500 mA; V_{CE} = 10 V; f = 1 MHz		f_T		9		MHz

Switching Characteristics

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

Parameter	Test Conditions	Type	Symbol	Min	Typ	Max	Unit
Inductive load (figure 2)							
Storage time	I_C = 2.5 A; I_{B1} = 0.4 A; V_{clamp} = 300 V; L = 1 mH; $-V_{BB}$ = 0; R_{BB} = 0.6 Ω		t_s		2.2	3	µs
Fall time			t_f		0.22	0.4	µs
Cross over time			t_c		0.4	0.8	µs
Storage time	I_C = 2.5 A; I_{B1} = 0.4 A; $-I_{B2}$ = 1.25 A; V_{clamp} = 300 V; L = 1 mH; $-V_{BB}$ = 5 V; T_{case} = 100°C		t_s		2.3	3	µs
Fall time			t_f		0.12	0.25	µs
Cross over time			t_c		0.25	0.5	µs
Storage time	I_C = 4 A; I_{B1} = 0.8 A; V_{clamp} = 300 V; L = 200 µH; $-V_{BB}$ = 0; R_{BB} = 0.6 Ω		t_s		2	3	µs
Fall time			t_f		0.22	0.4	µs
Cross over time			t_c		0.5	0.8	µs
Storage time	I_C = 4 A; I_{B1} = 0.8 A; $-I_{B2}$ = 2.0 A; V_{clamp} = 300 V; L = 200 µH; $-V_{BB}$ = 5 V; T_{case} = 100°C		t_s		2.5	3.5	µs
Fall time			t_f		0.15	0.4	µs
Cross over time			t_c		0.4	0.8	µs

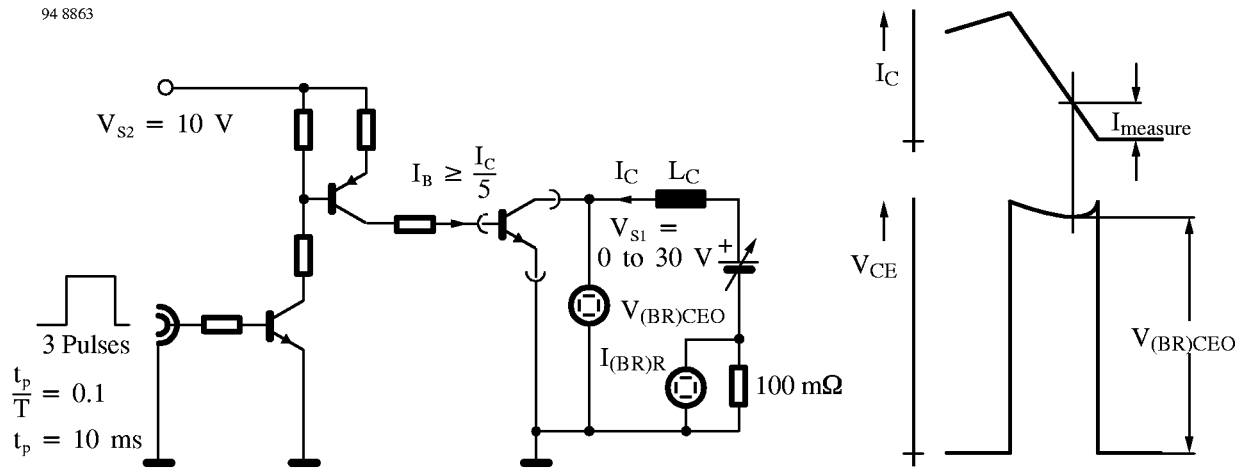
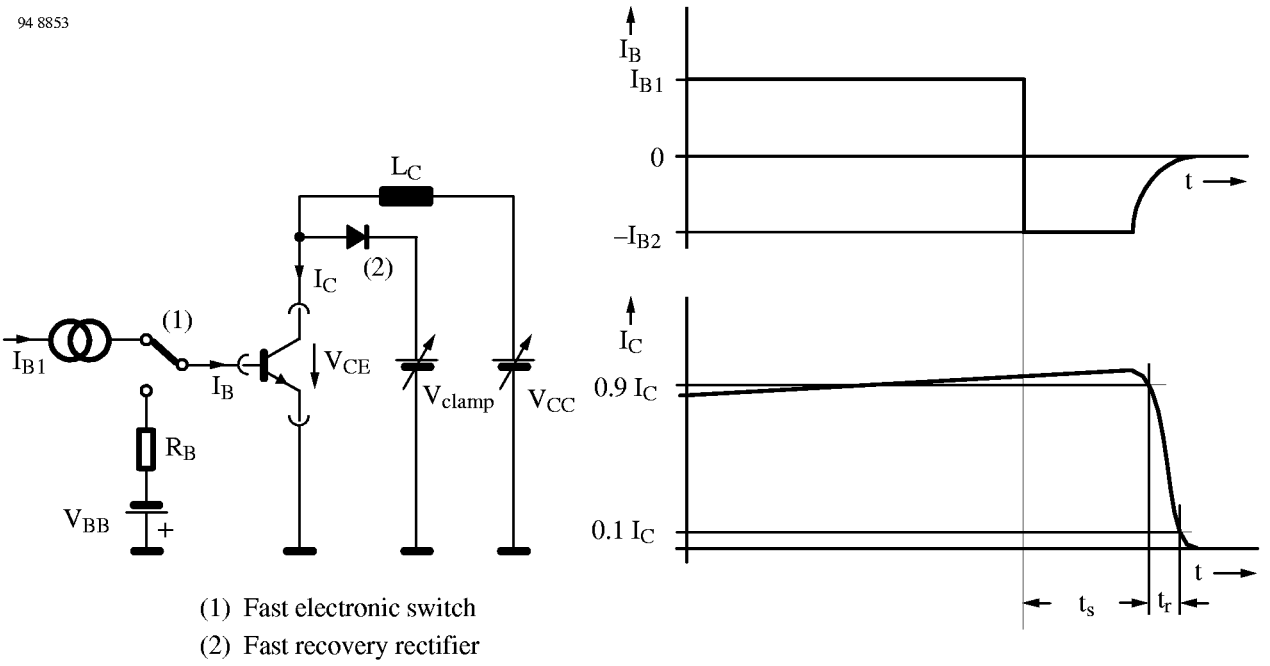


Figure 1. Test circuit for $V_{(BR)CE0}$



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

Figure 2. Test circuit for switching characteristics – inductive load

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

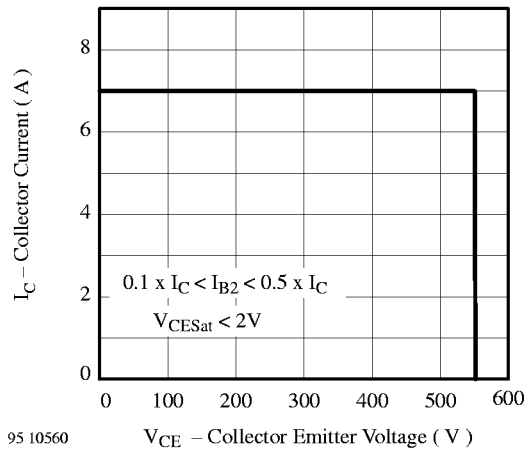


Figure 3. V_{CEW} – Diagram

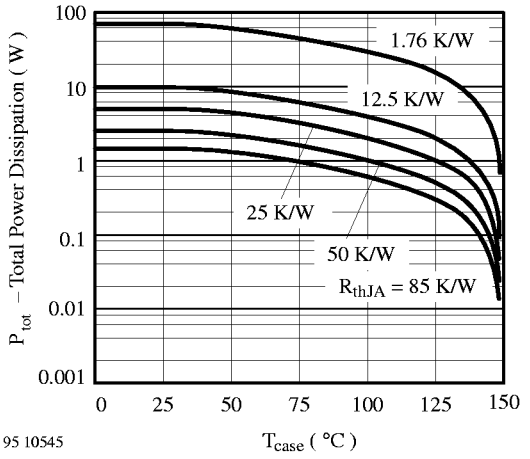


Figure 6. P_{tot} vs. T_{case}

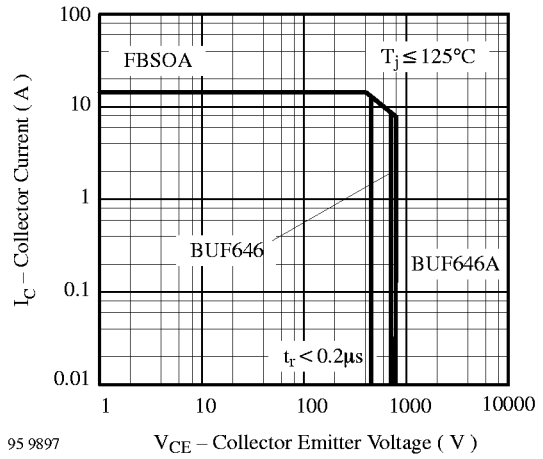


Figure 4. I_C vs. V_{CE}

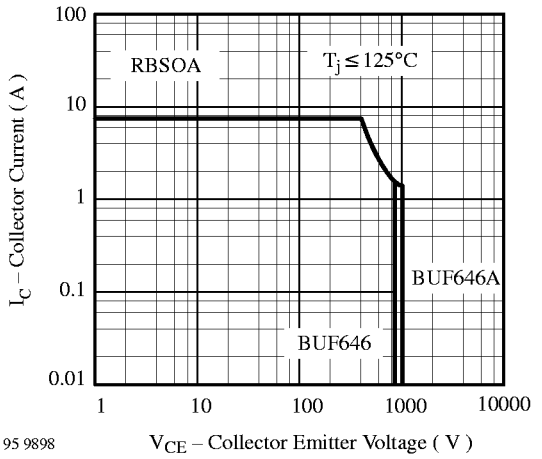


Figure 7. I_C vs. V_{CE}

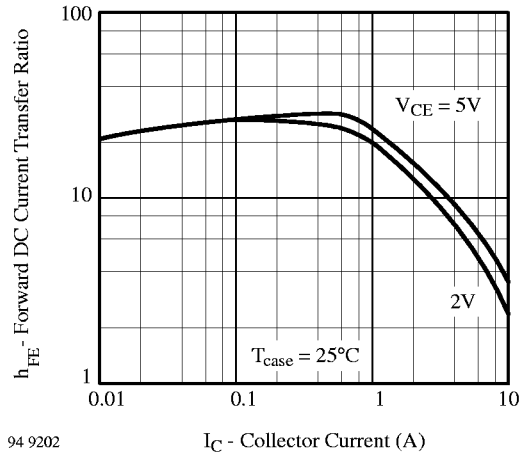


Figure 5. h_{FE} vs. I_C

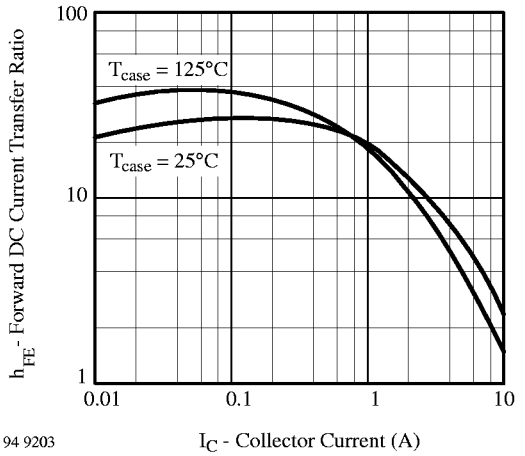


Figure 8. h_{FE} vs. I_C

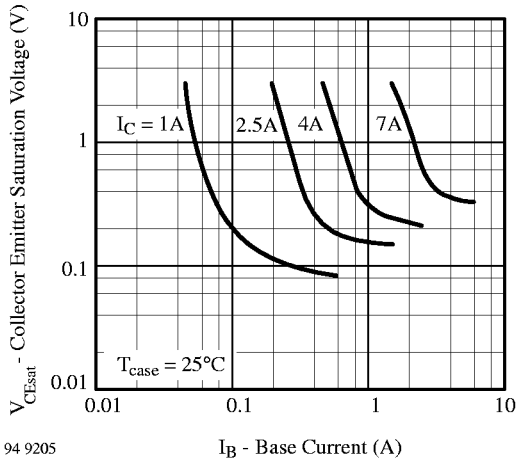


Figure 9. V_{CEsat} vs. I_B

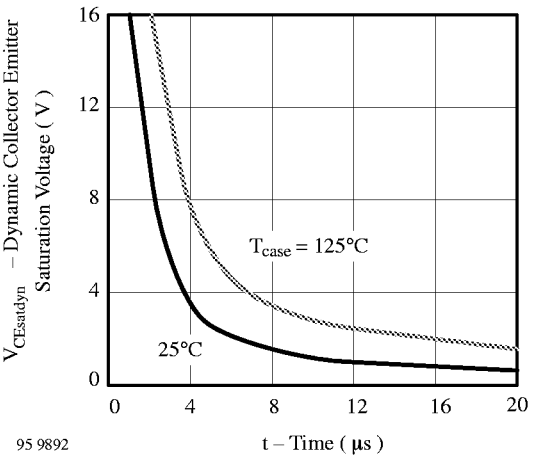


Figure 11. $V_{CEsatdyn}$ vs. t

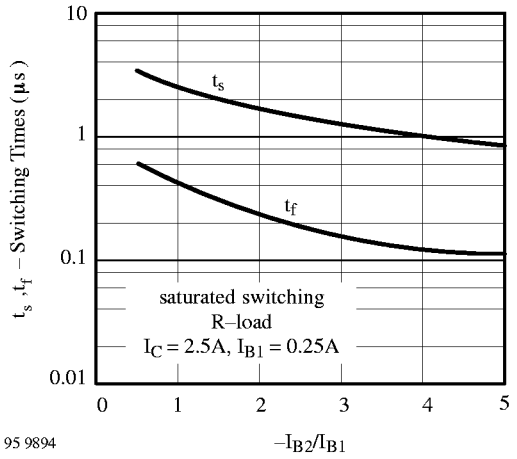
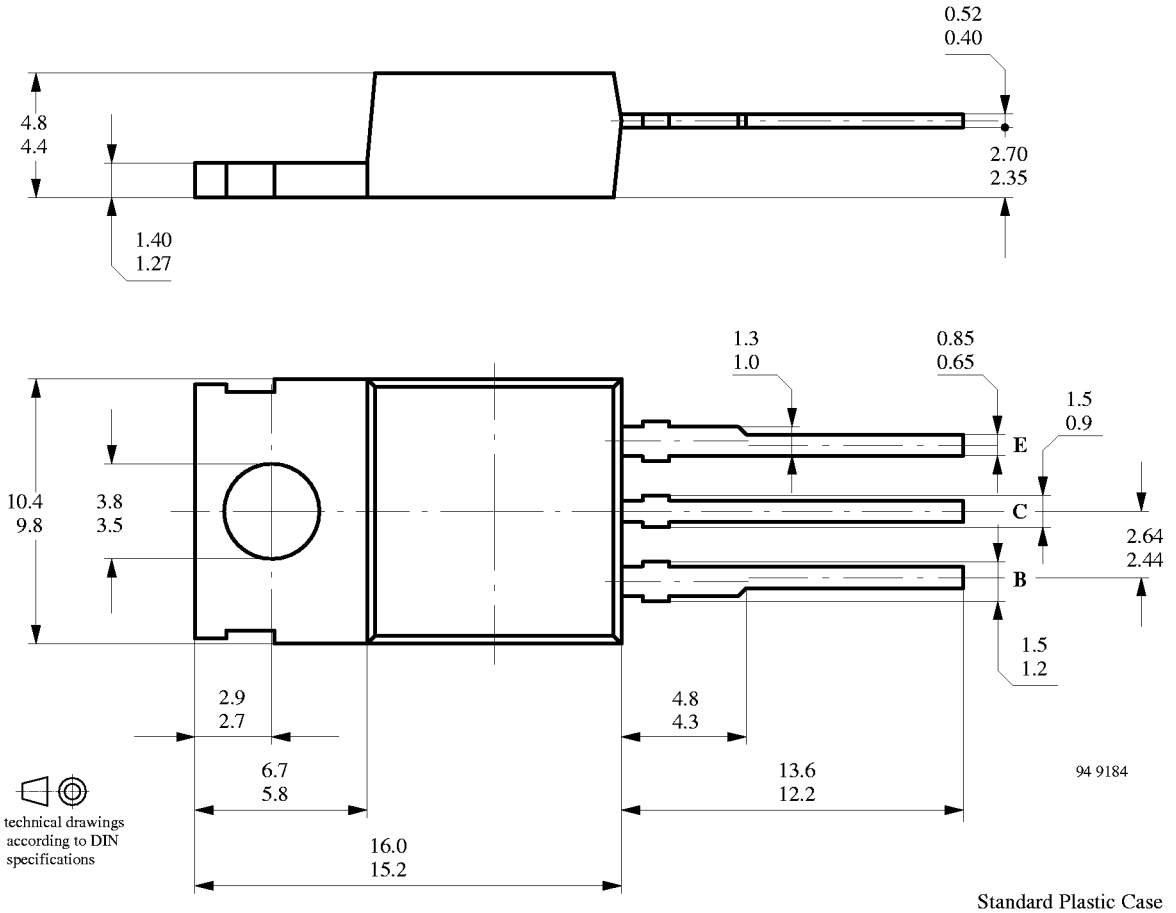


Figure 10. t_s, t_f vs. $-I_{B2}/I_{B1}$

Dimensions in mm



Collector connected with metallic surface

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