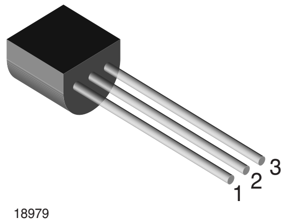
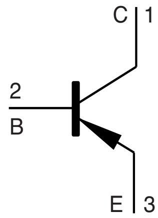
Small Signal Transistor (PNP)

Features

- PNP Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- As complementary type, the NPN transistor 2N4401 is recommended.
- On special request, this transistor is also manufactured in the pin configuration TO-18.
- This transistor is also available in the SOT-23 case with the type designation MMBT4403.





Mechanical Data

Case: TO-92 Plastic case
Weight: approx. 177 mg
Packaging Codes/Options:
BULK / 5 k per container 20 k/box
TAP / 4 k per Ammopack 20 k/box

Parts Table

Part	Type differentiation	Ordering code	Remarks
2N4403		2N4403-BULK or 2N4403-TAP	Bulk / Ammopack

Absolute Maximum Ratings

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

Parameter	Test condition	Symbol	Value	Unit
Collector - emitter voltage		$- V_{CEO}$	40	V
Collector - base voltage		$- V_{CBO}$	40	V
Emitter - base voltage		$- V_{EBO}$	5.0	V
Collector current		$- I_C$	600	mA
Power dissipation	T_A = 25 °C	P_{tot}	625	mW
	Derate above 25 °C	P_{tot}	5.0	mW/C°
	T_C = 25 °C	P_{tot}	1.5	W
	Derate above 25 °C	P_{tot}	12	mW/C°

Maximum Thermal Resistance

Parameter	Test condition	Symbol	Value	Unit
Thermal resistance junction to ambient air		$R\theta_{JA}$	200	°C/W
Thermal resistance junction to case		$R\theta_{JC}$	83.3	°C/W
Junction temperature		T_j	150	°C
Storage temperature range		T_S	- 55 to + 150	°C

Electrical DC Characteristics

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
DC current gain	$- V_{CE}$ = 1 V, $- I_C$ = 0.1 mA	h_{FE}	30			
	$- V_{CE}$ = 1 V, $- I_C$ = 1 mA	h_{FE}	60			
	$- V_{CE}$ = 1 V, $- I_C$ = 10 mA	h_{FE}	100			
	$- V_{CE}$ = 2 V, $- I_C$ = 150 mA	h_{FE}	100		300	
	$- V_{CE}$ = 2 V, $- I_C$ = 500 mA	h_{FE}	20			
Collector cut-off current	$- V_{EB}$ = 0.4 V, $- V_{CE}$ = 35 V	$- I_{CEV}$			100	nA
Base cut-off current	$- V_{EB}$ = 0.4 V, $- V_{CE}$ = 35 V	$- I_{BEV}$			100	nA
Collector - emitter saturation voltage[1)]	$- I_C$ = 150 mA, $- I_B$ = 15 mA	$- V_{CEsat}$			0.40	V
	$- I_C$ = 500 mA, $- I_B$ = 50 mA	$- V_{CEsat}$			0.75	V
Base - emitter saturation voltage[1)]	$- I_C$ = 150 mA, $- I_B$ = 15 mA	$- V_{BEsat}$	0.75		0.95	V
	$- I_C$ = 500 mA, $- I_B$ = 50 mA	$- V_{BEsat}$			1.30	V
Collector - emitter breakdown voltage	$- I_C$ = 1 mA, I_B = 0	$- V_{(BR)CEO}$	40			V
Collector - base breakdown voltage	$- I_C$ = 0.1 mA, I_E = 0	$- V_{(BR)CBO}$	40			V
Emitter - base breakdown voltage	$- I_E$ = 0.1 mA, I_C = 0	$- V_{(BR)EBO}$	5.0			V

[1)] Pulse test: Pulse width ≤ 300 µs - Duty cycle ≤ 2 %.

Electrical AC Characteristics

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
Input impedance	$- V_{CE}$ = 10 V, $- I_C$ = 1 mA, f = 1 kHz	h_{ie}	1.5		15	kΩ
Voltage feedback ratio	$- V_{CE}$ = 10 V, $- I_C$ = 1 mA, f = 1 kHz	h_{re}	0.1×10^{-4}		8×10^{-4}	
Current gain - bandwidth product	$- V_{CE}$ = 10 V, $- I_C$ = 20 mA, f = 100 MHz	f_T	200			MHz
Collector - base capacitance	$- V_{CB}$ = 10 V, f = 1.0 MHz, I_E = 0	C_{CB}			8.5	pF
Emitter - base capacitance	$- V_{EB}$ = 0.5 V, f = 1.0 MHz, I_C = 0	C_{EB}			30	pF
Small signal current gain	$- V_{CE}$ = 10 V, $- I_C$ = 1 mA, f = 1 kHz	h_{fe}	60		500	
Output admittance	$- V_{CE}$ = 10 V, $- I_C$ = 1 mA, f = 1 kHz	h_{oe}	1.0		100	µS

Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
Delay time (see fig.1)	$- I_{B1}$ = 15 mA, $- I_C$ = 150 mA, $- V_{CC}$ = 30 V, $- V_{EB}$ = 2 V	t_d			15	ns

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
Rise time (see fig.1)	$-I_{B1}$ = 15 mA, $-I_C$ = 150 mA, $-V_{CC}$ = 30 V, $-V_{EB}$ = 2 V	t_r			20	ns
Storage time (see fig.2)	$-I_{B1}$ = $-I_{B2}$ = 15 mA, $-I_C$ = 150 mA, $-V_{CC}$ = 30 V	t_s			225	ns
Fall time (see fig.2)	$-I_{B1}$ = $-I_{B2}$ = 15 mA, $-I_C$ = 150 mA, $-V_{CC}$ = 30V	t_f			30	ns

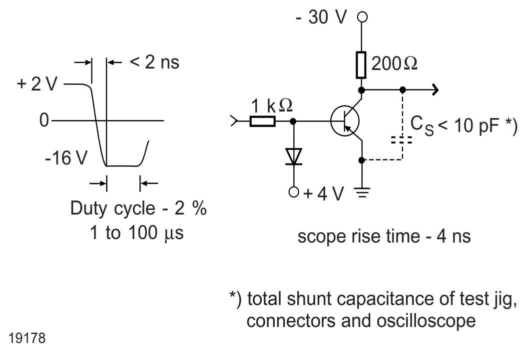


Figure 1. Turn-On Time

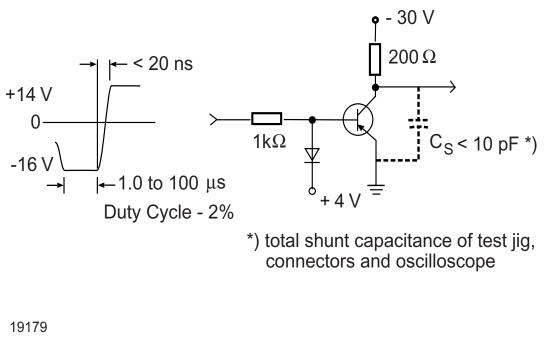
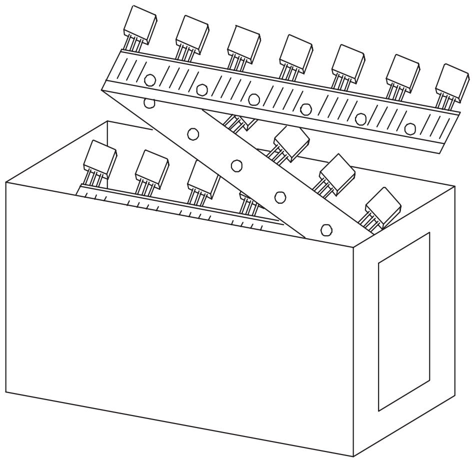
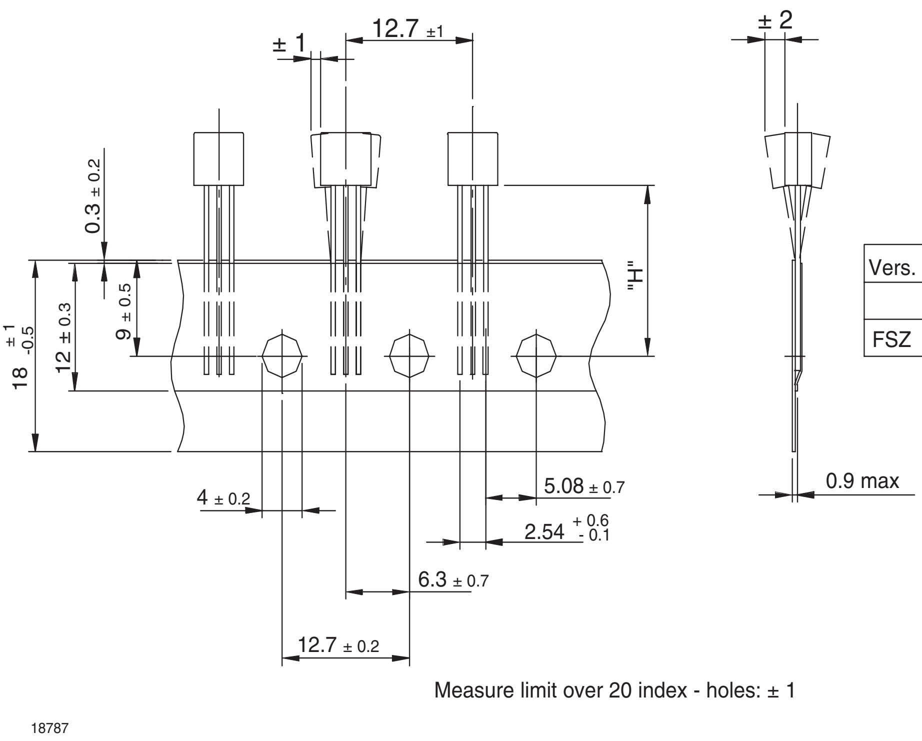


Figure 2. Turn-Off Time

Packaging for Radial Taping

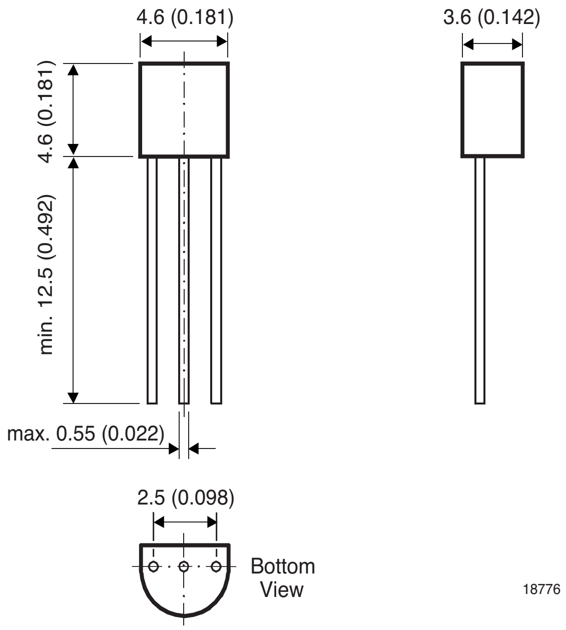
Dimensions in mm





Vers.	Dim. "H"
FSZ	27 ± 0.5

Package Dimensions in mm (Inches)



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 operatingsystems 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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423

Document Number 85131
Rev. 1.2, 15-Oct-04