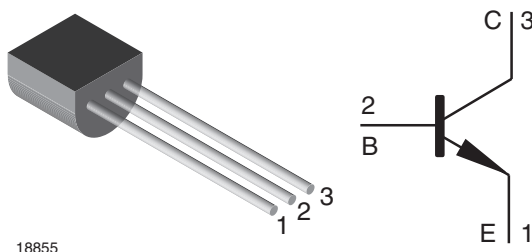


Small Signal Transistor (NPN)

Features

- NPN Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- 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 MMBT2222A.



Mechanical Data

Case: TO-92 Plastic case

Weight: approx. 177 mg

Packaging Codes/Options:

E6/Bulk - 5 K per container, 20 K/box

E7/4 K per Ammo mag., 20 K/box

Parts Table

Part	Ordering code	Remarks
MPS2222A	MPS2222A-BULK or MPS2222A-TAP	Bulk / Ammopack

Absolute Maximum Ratings

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

Parameter	Test condition	Symbol	Value	Unit
Collector - base voltage		V_{CBO}	75	V
Collector - emitter voltage		V_{CEO}	40	V
Emitter - base voltage		V_{EBO}	6.0	V
Collector current		I_C	600	mA
Power dissipation	$T_A = 25\text{ }^{\circ}\text{C}$	P_{tot}	625	mW
	Derate above 25 $^{\circ}\text{C}$	P_{tot}	5.0	mW/ $^{\circ}\text{C}$
	$T_C = 25\text{ }^{\circ}\text{C}$	P_{tot}	1.5	W
	Derate above 25 $^{\circ}\text{C}$	P_{tot}	12	mW/ $^{\circ}\text{C}$

Maximum Thermal Resistance

Parameter	Test condition	Symbol	Value	Unit
Thermal resistance junction to ambient air		$R_{\theta JA}$	200	$^{\circ}\text{C/W}$
Thermal resistance junction to case		$R_{\theta JC}$	83.3	$^{\circ}\text{C/W}$
Junction temperature		R_j	150	$^{\circ}\text{C}$
Storage temperature range		T_S	- 55 to + 150	$^{\circ}\text{C}$

Electrical DC Characteristics

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
DC current gain	$V_{CE} = 10\text{ V}, I_C = 0.1\text{ mA}$	h_{FE}	35			
	$V_{CE} = 10\text{ V}, I_C = 1\text{ mA}$	h_{FE}	50			
	$V_{CE} = 10\text{ V}, I_C = 10\text{ mA}$	h_{FE}	75			
		h_{FE}	35			
	$V_{CE} = 10\text{ V}, I_C = 150\text{ mA}^{1)}$	h_{FE}	100		300	
	$V_{CE} = 1.0\text{ V}, I_C = 150\text{ mA}^{1)}$	h_{FE}	50			
	$V_{CE} = 10\text{ V}, I_C = 500\text{ mA}^{1)}$	h_{FE}	40			
Collector - base breakdown voltage	$I_C = 10\text{ }\mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	75			V
Collector - emitter breakdown voltage ¹⁾	$I_C = 10\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	40			V
Emitter - base breakdown voltage	$I_E = 10\text{ }\mu\text{A}, I_C = 0$	$V_{(BR)EBO}$	6.0			V
Collector - emitter saturation voltage ¹⁾	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$	V_{CEsat}			0.3	V
	$I_C = 500\text{ mA}, I_B = 50\text{ mA}$	V_{CEsat}			1.0	V
Base - emitter saturation voltage	$I_C = 150\text{ mA}, I_B = 15\text{ mA}$	V_{BEsat}	0.6		1.2	V
	$I_C = 500\text{ mA}, I_B = 50\text{ mA}$	V_{BEsat}			2.0	V
Collector-emitter cut-off current	$V_{EB} = 3\text{ V}, V_{CE} = 60\text{ V}$	I_{CEV}			10	nA
Collector-base cut-off current	$V_{CB} = 60\text{ V}, I_E = 0$	I_{CBO}			0.01	μA
	$V_{CB} = 50\text{ V}, I_E = 0, T_A = 125\text{ }^\circ\text{C}$	I_{CBO}			10	μA
Emitter-base cut-off current	$V_{EB} = 3\text{ V}, I_C = 0$	I_{EBO}			100	nA
Base cut - off current	$V_{CE} = 60\text{ V}, V_{EB} = 3.0\text{ V}$	I_{BL}			20	nA

¹⁾ Pulse test: pulse width $\leq 300\text{ }\mu\text{s}$, cycle $\leq 2\%$

Electrical AC Characteristics

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
Input impedance	$V_{CE} = 10\text{ V}, I_C = 1\text{ mA}, f = 1\text{ kHz}$	h_{ie}	2.0		8.0	$\text{k}\Omega$
	$V_{CE} = 10\text{ V}, I_C = 10\text{ mA}, f = 1\text{ kHz}$	h_{ie}	0.25		1.25	$\text{k}\Omega$
Voltage feedback ratio	$V_{CE} = 10\text{ V}, I_C = 1\text{ mA}, f = 1\text{ kHz}$	h_{re}			8×10^{-4}	
	$V_{CE} = 10\text{ V}, I_C = 10\text{ mA}, f = 1\text{ kHz}$	h_{re}			4×10^{-4}	
Current gain - bandwidth product	$V_{CE} = 20\text{ V}, I_C = 20\text{ mA}, f = 100\text{ MHz}$	f_T	300			MHz
Output capacitance	$V_{CB} = 10\text{ V}, f = 1\text{ MHz}, I_E = 0$	C_{OBO}			8.0	pF
Input capacitance	$V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}, I_C = 0$	C_{IBO}			25	pF
Output admittance	$V_{CE} = 10\text{ V}, I_C = 1\text{ mA}, f = 1\text{ kHz}$	h_{oe}	5.0		35	μS
	$V_{CE} = 10\text{ V}, I_C = 10\text{ mA}, f = 1\text{ kHz}$	h_{oe}	25		200	μS
Small signal current gain	$V_{CE} = 10\text{ V}, I_C = 1\text{ mA}, f = 1\text{ kHz}$	h_{fe}	50		300	
	$V_{CE} = 10\text{ V}, I_C = 10\text{ mA}, f = 1\text{ kHz}$	h_{fe}	75		375	
Collector base time constant	$I_E = 20\text{ mA}, V_{CB} = 20\text{ V}, f = 31.8\text{ MHz}$	$rb'C_C$			150	ps
Noise figure	$V_{CE} = 10\text{ V}, I_C = 100\text{ }\mu\text{A}, R_S = 1\text{ k}\Omega, f = 1\text{ kHz}$	NF			4.0	dB

Switching Characteristics

Parameter	Test condition	Symbol	Min	Typ	Max	Unit
Delay time (see fig.1)	$I_{B1} = 15 \text{ mA}$, $I_C = 150 \text{ mA}$, $V_{CC} = 30 \text{ V}$, $V_{BE} = -0.5 \text{ V}$	t_d			10	ns
Rise time (see fig.1)	$I_{B1} = 15 \text{ mA}$, $I_C = 150 \text{ mA}$, $V_{CC} = 30 \text{ V}$, $V_{BE} = -0.5 \text{ V}$	t_r			25	ns
Storage time (see fig.2)	$I_{B1} = I_{B2} = 15 \text{ mA}$, $I_C = 150 \text{ mA}$, $V_{CC} = 30 \text{ V}$	t_s			225	ns
Fall time (see fig.2)	$I_{B1} = I_{B2} = 1 \text{ mA}$, $I_C = 10 \text{ mA}$, $V_{CC} = 30 \text{ V}$	t_f			60	ns

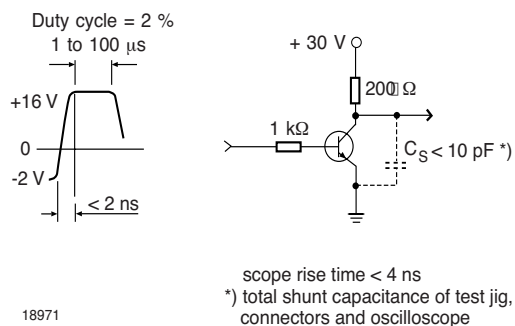


Figure 1. Turn-On Time

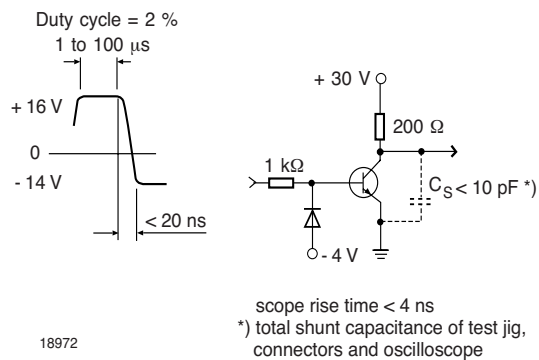
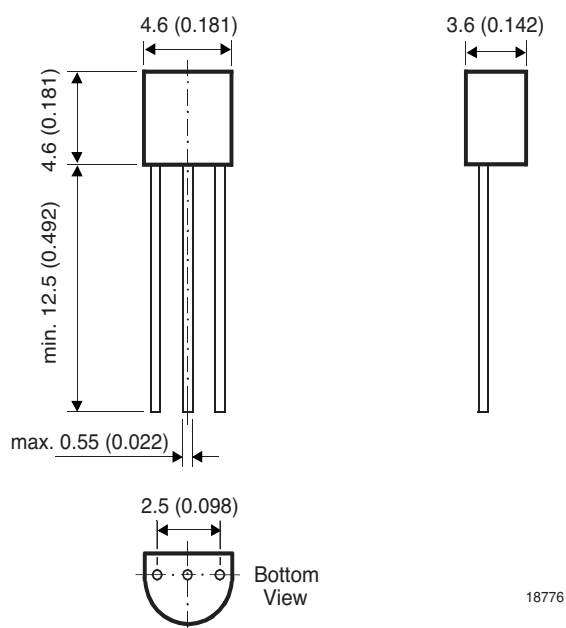


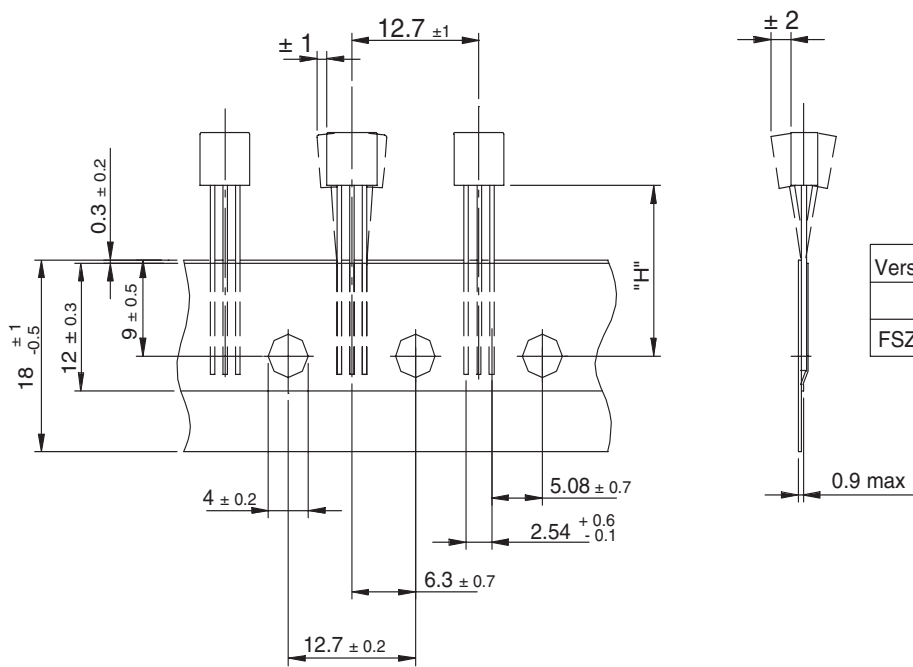
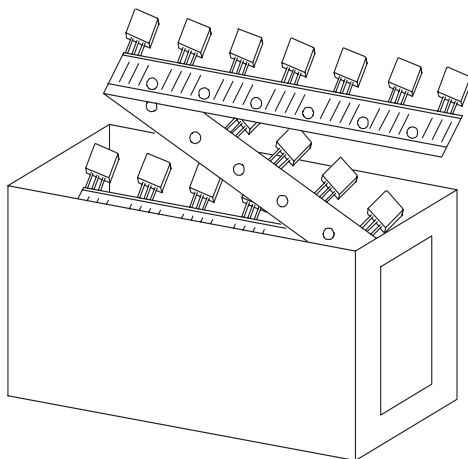
Figure 2. Turn-Off Time

Package Dimensions in mm (Inches)



Packaging for Radial Taping

Dimensions in mm



Vers.	Dim. "H"
FSZ	27 ± 0.5

Measure limit over 20 index - holes: ± 1

18787

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.

We reserve the right to make changes to improve technical design
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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