

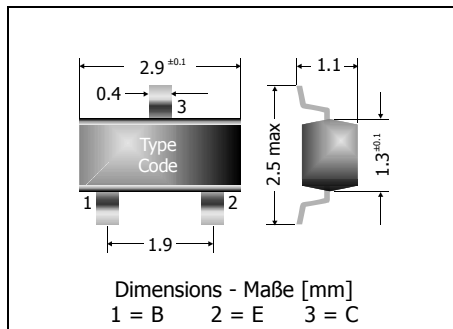
## MMBT2222 / MMBT2222A

NPN

Surface Mount Si-Epi-Planar Switching Transistors  
Si-Epi-Planar Schalttransistoren für die Oberflächenmontage

NPN

Version 2006-05-15



Power dissipation – Verlustleistung

250 mW

Plastic case  
Kunststoffgehäuse

SOT-23  
(TO-236)

Weight approx. – Gewicht ca.

0.01 g

Plastic material has UL classification 94V-0  
Gehäusematerial UL94V-0 klassifiziert

Standard packaging taped and reeled  
Standard Lieferform gegurtet auf Rolle

Maximum ratings ( $T_A = 25^\circ\text{C}$ )Grenzwerte ( $T_A = 25^\circ\text{C}$ )

			MMBT2222	MMBT2222A
Collector-Emitter-volt. – Kollektor-Emitter-Spannung	B open	$V_{CE0}$	30 V	40 V
Collector-Base-voltage – Kollektor-Basis-Spannung	E open	$V_{CBO}$	60 V	75 V
Emitter-Base-voltage – Emitter-Basis-Spannung	C open	$V_{EBO}$	5 V	6 V
Power dissipation – Verlustleistung		$P_{tot}$	250 mW <sup>1)</sup>	
Collector current – Kollektorstrom (dc)		$I_C$	600 mA	
Junction temperature – Sperrschichttemperatur		$T_j$	-55...+150°C	
Storage temperature – Lagerungstemperatur		$T_s$	-55...+150°C	

Characteristics ( $T_j = 25^\circ\text{C}$ )Kennwerte ( $T_j = 25^\circ\text{C}$ )

			Min.	Typ.	Max.
DC current gain – Kollektor-Basis-Stromverhältnis <sup>2)</sup>					
$I_C = 0.1 \text{ mA}$ , $V_{CE} = 10 \text{ V}$		$h_{FE}$	35	–	–
$I_C = 1 \text{ mA}$ , $V_{CE} = 10 \text{ V}$		$h_{FE}$	50	–	–
$I_C = 10 \text{ mA}$ , $V_{CE} = 10 \text{ V}$		$h_{FE}$	75	–	–
$I_C = 150 \text{ mA}$ , $V_{CE} = 10 \text{ V}$		$h_{FE}$	100	–	300
$I_C = 500 \text{ mA}$ , $V_{CE} = 10 \text{ V}^{2)}$	MMBT2222	$h_{FE}$	30	–	–
	MMBT2222A	$h_{FE}$	40	–	–
h-Parameters at/bei $V_{CE} = 10 \text{ V}$ , $f = 1 \text{ kHz}$ , $I_C = 1 \text{ mA} / 10 \text{ mA}$					
Small signal current gain	MMBT2222	$h_{fe}$	50	–	300
Kleinsignal-Stromverstärkung	MMBT2222A	$h_{fe}$	75	–	375
Input impedance – Eingangs-Impedanz	MMBT2222	$h_{ie}$	2 k $\Omega$	–	8 k $\Omega$
	MMBT2222A	$h_{ie}$	0.25 k $\Omega$	–	1.25 k $\Omega$
Output admittance – Ausgangs-Leitwert	MMBT2222	$h_{oe}$	5 $\mu\text{S}$	–	35 $\mu\text{S}$
	MMBT2222A	$h_{oe}$	25 $\mu\text{S}$	–	200 $\mu\text{S}$

Characteristics ( $T_j = 25^\circ\text{C}$ )Kennwerte ( $T_j = 25^\circ\text{C}$ )

- 1 Mounted on P.C. board with 3 mm<sup>2</sup> copper pad at each terminal  
Montage auf Leiterplatte mit 3 mm<sup>2</sup> Kupferbelag (Löt-pad) an jedem Anschluss
- 2 Tested with pulses  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$  – Gemessen mit Impulsen  $t_p = 300 \mu\text{s}$ , Schaltverhältnis  $\leq 2\%$

			Min.	Typ.	Max.
Collector-Emitter saturation voltage – Kollektor-Sättigungsspannung <sup>2)</sup>					
I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA	MMBT2222	V <sub>CEsat</sub>	–	–	0.4 V
	MMBT2222A	V <sub>CEsat</sub>	–	–	0.3 V
I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA	MMBT2222	V <sub>CEsat</sub>	–	–	1.6 V
	MMBT2222A	V <sub>CEsat</sub>	–	–	1.0 V
Base-Emitter saturation voltage – Basis-Sättigungsspannung <sup>2)</sup>					
I <sub>C</sub> = 150 mA, I <sub>B</sub> = 15 mA	MMBT2222	V <sub>BEsat</sub>	–	–	1.3 V
	MMBT2222A	V <sub>BEsat</sub>	0.65 V	–	1.2 V
I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA	MMBT2222	V <sub>BEsat</sub>	–	–	2.6 V
	MMBT2222A	V <sub>BEsat</sub>	–	–	2.0 V
Collector-Base cutoff current – Kollektor-Basis-Reststrom					
V <sub>CB</sub> = 50 V, (E open)	MMBT2222	I <sub>CBO</sub>	–	–	10 nA
	MMBT2222A	I <sub>CBO</sub>	–	–	10 nA
V <sub>CB</sub> = 50 V, T <sub>j</sub> = 125°C, (E open)	MMBT2222	I <sub>CBO</sub>	–	–	10 µA
	MMBT2222A	I <sub>CBO</sub>	–	–	10 µA
Emitter-Base cutoff current – Emitter-Basis-Reststrom					
V <sub>EB</sub> = 3 V, (C open)	MMBT2222A	I <sub>EB0</sub>	–	—	100 nA
Gain-Bandwidth Product – Transitfrequenz					
V <sub>CE</sub> = 20 V, I <sub>C</sub> = 20 mA, f = 100 MHz		f <sub>T</sub>	250 MHz	–	–
Collector-Base Capacitance – Kollektor-Basis-Kapazität					
V <sub>CB</sub> = 10 V, I <sub>E</sub> = i <sub>e</sub> = 0, f = 1 MHz		C <sub>CBO</sub>	–	–	8 pF
Emitter-Base Capacitance – Emitter-Basis-Kapazität					
V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = i <sub>c</sub> = 0, f = 1 MHz		C <sub>EBO</sub>	–	–	25 pf
Noise figure – Rauschzahl					
V <sub>CE</sub> = 10 V, I <sub>C</sub> = 100 µA, R <sub>G</sub> = 1 kΩ, f = 1 kHz	MMBT2222A	F	–	–	4 dB
Switching times – Schaltzeiten (between 10% and 90% levels)					
delay time	V <sub>CC</sub> = 3 V, V <sub>BE</sub> = 0.5 V	t <sub>d</sub>	–	–	10 ns
rise time	I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15mA	t <sub>r</sub>	–	–	25 ns
storage time	V <sub>CC</sub> = 3 V, I <sub>C</sub> = 150 mA,	t <sub>s</sub>	–	–	225 ns
fall time	I <sub>B1</sub> = I <sub>B2</sub> = 15 mA	t <sub>f</sub>	–	–	60 ns
Thermal resistance junction to ambient air Wärmewiderstand Sperrschicht – umgebende Luft		R <sub>thA</sub>	< 420 K/W <sup>1)</sup>		
Recommended complementary PNP transistors Empfohlene komplementäre PNP-Transistoren			MMBT2709 / MMBT2709A		
Marking - Stempelung			MMBT2222 = 1B MMBT2222A = M1P		

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