



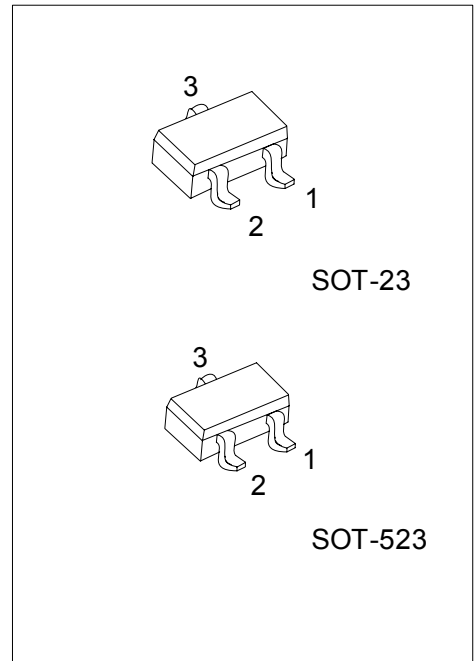
## MMBT2222A

## NPN SILICON TRANSISTOR

### NPN GENERAL PURPOSE AMPLIFIER

#### FEATURES

\* This device is for use as a medium power amplifier and switch requiring collector currents up to 500mA.



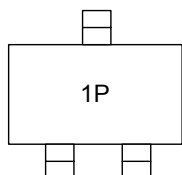
\*Pb-free plating product number:MMBT2222AL

#### ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
MMBT2222A-AE3-R	MMBT2222AL-AE3-R	SOT-23	E	B	C	Tape Reel
MMBT2222A-AN3-R	MMBT2222AL-AN3-R	SOT-523	E	B	C	Tape Reel

<p>MMBT2222AL-AE3-R</p> <p>(1)Packing Type (2)Package Type (3)Lead Plating</p>	<p>(1) R: Tape Reel (2) AE3: SOT-23, AN3: SOT-523 (3) L: Lead Free Plating, Blank: Pb/Sn</p>
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#### MARKING



# MMBT2222A

## NPN SILICON TRANSISTOR

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector-Base Voltage	V <sub>CBO</sub>	75	V
Collector-Emitter Voltage	V <sub>CEO</sub>	40	V
Emitter-Base Voltage	V <sub>EBO</sub>	6	V
Collector Current	I <sub>C</sub>	0.6	A
Power Dissipation	SOT-23	350	mW
	SOT-523	150	mW
Junction Temperature	T <sub>J</sub>	+150	
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	

Note: These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Thermal Resistance, Junction to Ambient	SOT-23	15	°C/W
	SOT-523	833	°C/W

■ ELECTRICAL CHARACTERISTICS (Ta=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	I <sub>C</sub> =10μA, I <sub>E</sub> =0	75			V
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =10mA, I <sub>B</sub> =0	40			V
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	I <sub>E</sub> =10μA, I <sub>C</sub> =0	6			V
Collector Cutoff Current	I <sub>CBO</sub>	V <sub>CB</sub> =60V, I <sub>E</sub> =0			0.01	μA
		V <sub>CB</sub> =60V, I <sub>E</sub> =0, Ta=150°C			10	μA
Emitter Cutoff Current	I <sub>EBO</sub>	V <sub>EB</sub> =3.0V, I <sub>C</sub> =0			10	nA
Base Cutoff Current	I <sub>BL</sub>	V <sub>CE</sub> =60V, V <sub>EB(OFF)</sub> =3.0V			20	nA
Collector Cutoff Current	I <sub>CEO</sub>	V <sub>CE</sub> =60V, V <sub>EB(OFF)</sub> =3.0V			10	nA
<b>ON CHARACTERISTICS</b>						
DC Current Gain	h <sub>FE</sub>	I <sub>C</sub> =0.1mA, V <sub>CE</sub> =10V	35			
		I <sub>C</sub> =1.0mA, V <sub>CE</sub> =10V	50			
		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V	75			
		I <sub>C</sub> =10mA, V <sub>CE</sub> =10V, Ta=-55°C	35			
		I <sub>C</sub> =150mA, V <sub>CE</sub> =10V*	100			300
		I <sub>C</sub> =150mA, V <sub>CE</sub> =1.0V*	50			
Collector-Emitter Saturation Voltage*	V <sub>CE(SAT)</sub>	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA			0.3	V
		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA			1.0	V
Base-Emitter Saturation Voltage*	V <sub>BE(SAT)</sub>	I <sub>C</sub> =150mA, I <sub>B</sub> =15mA	0.6		1.2	V
		I <sub>C</sub> =500mA, I <sub>B</sub> =50mA			2.0	V
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Real Part of Common-Emitter High Frequency Input Impedance	Re(h <sub>je</sub> )	I <sub>C</sub> =20mA, V <sub>CB</sub> =20V, f=300MHz			60	Ω
Transition Frequency	f <sub>T</sub>	I <sub>C</sub> =20mA, V <sub>CE</sub> =20V, f=100MHz	300			MHz
Output Capacitance	C <sub>obo</sub>	V <sub>CB</sub> =10V, I <sub>E</sub> =0, f=100kHz			8.0	pF
Input Capacitance	C <sub>ibo</sub>	V <sub>EB</sub> =0.5V, I <sub>C</sub> =0, f=100kHz			25	pF
Collector Base Time Constant	rb'Cc	I <sub>C</sub> =20mA, V <sub>CB</sub> =20V, f=31.8MHz			150	pS
Noise Figure	NF	I <sub>C</sub> =100μA, V <sub>CE</sub> =10V, R <sub>s</sub> =1.0kΩ f=1.0kHz			4.0	dB

■ ELECTRICAL CHARACTERISTICS(Cont.)

SWITCHING CHARACTERISTICS						
Delay Time	$t_D$	$V_{CC}=30V, V_{BE(OFF)}=0.5V,$			10	ns
Rise Time	$t_R$	$I_C=150mA, I_{B1}=15mA$			25	ns
Storage Time	$t_S$	$V_{CC}=30V, I_C=150mA$			225	ns
Fall Time	$t_F$	$I_{B1}= I_{B2}=15mA$			60	ns

\*Pulse test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2.0\%$

### ■ TEST CIRCUITS

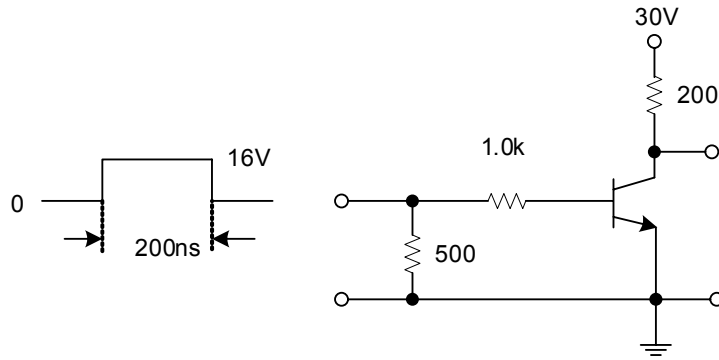


FIG.1 Saturated Turn-On Switching Time

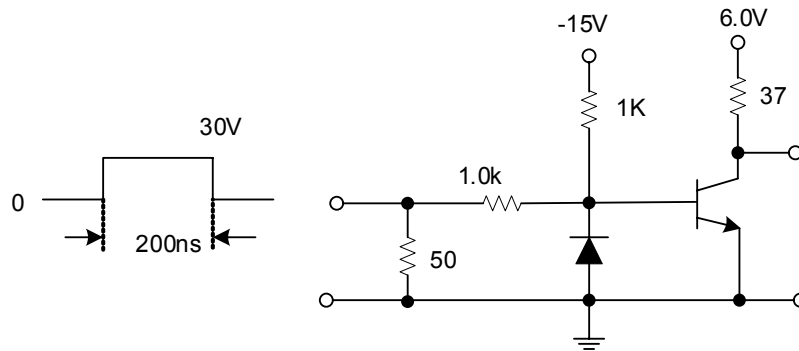
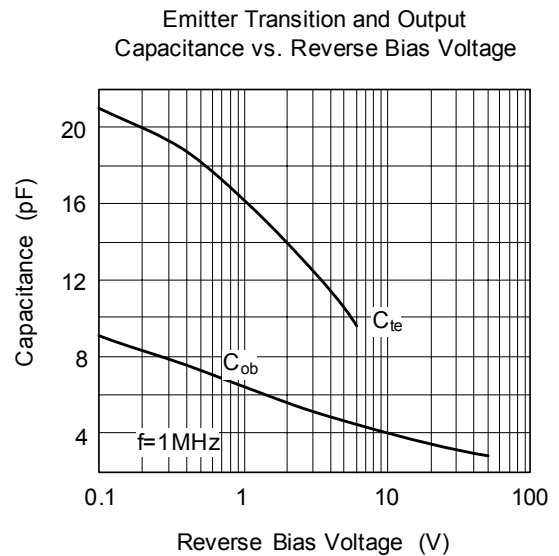
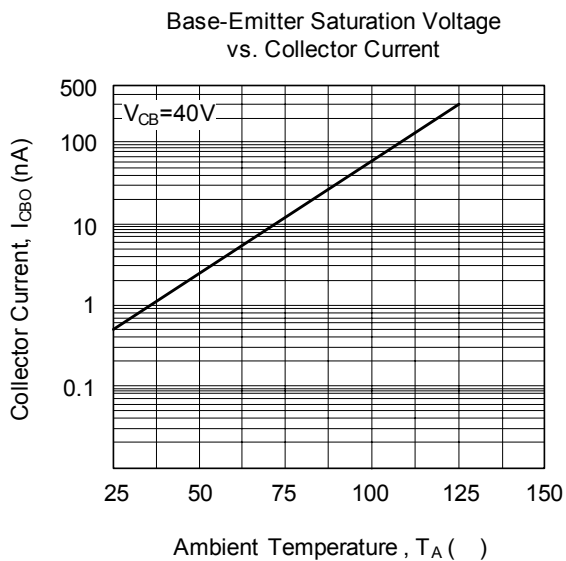
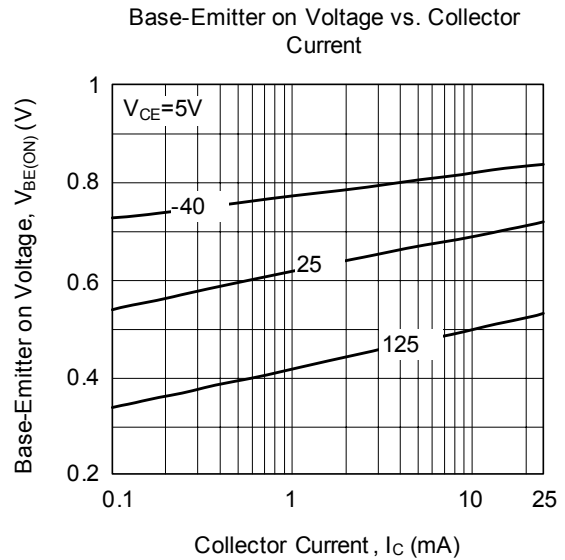
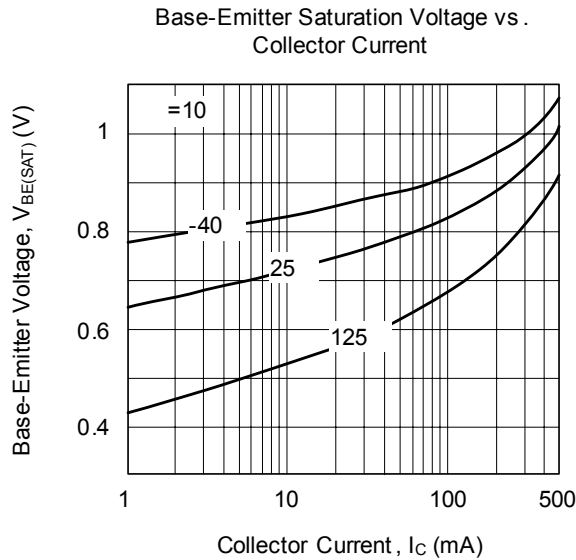
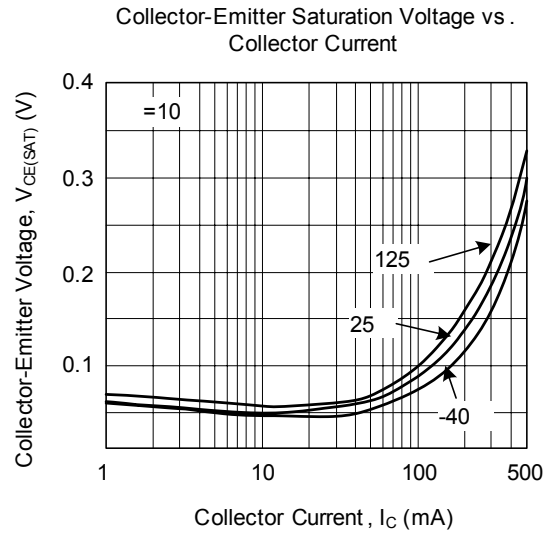
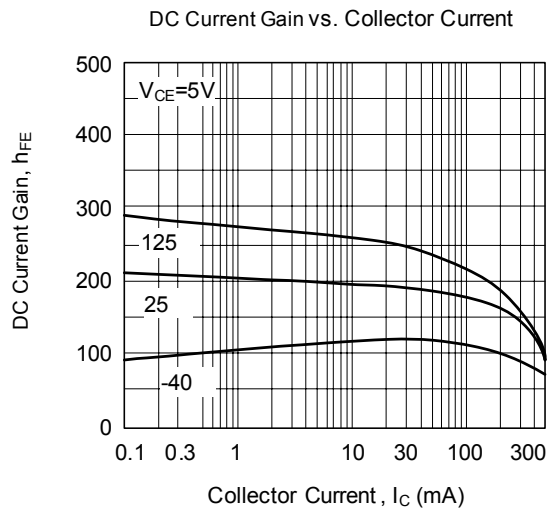
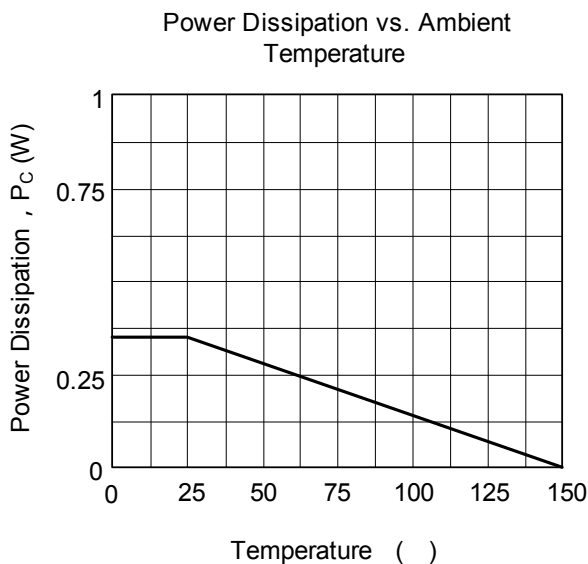
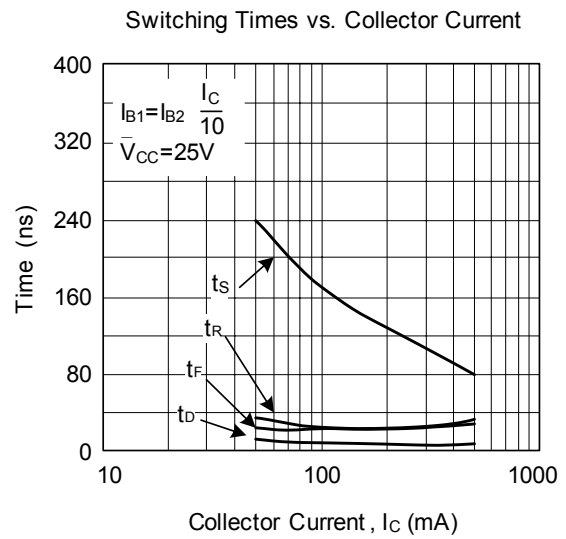
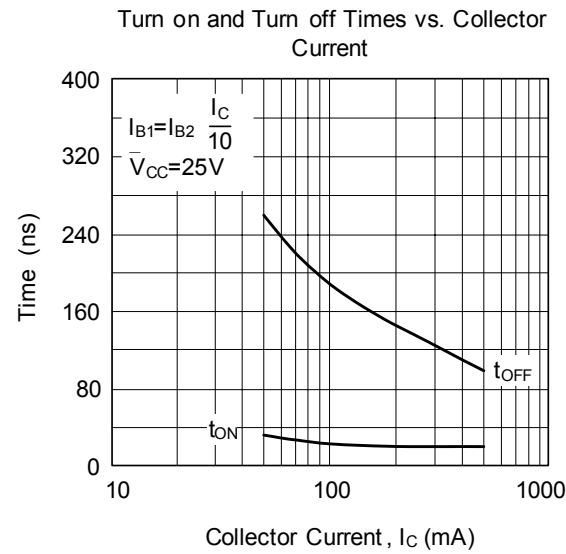


FIG.2 Saturated Turn-Off Switching Time

### TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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