



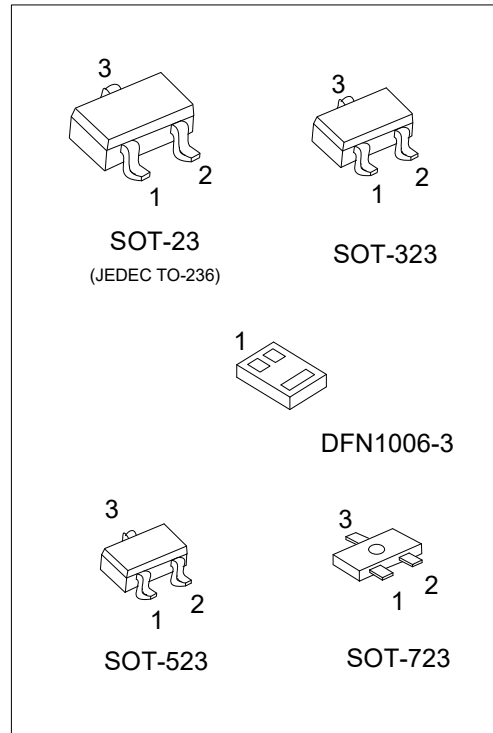
MMBT2222A

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 600mA.



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
MMBT2222AL-AE3-R	MMBT2222AG-AE3-R	SOT-23	B	E	C	Tape Reel
MMBT2222AL-AL3-R	MMBT2222AG-AL3-R	SOT-323	B	E	C	Tape Reel
MMBT2222AL-AN3-R	MMBT2222AG-AN3-R	SOT-523	B	E	C	Tape Reel
MMBT2222AL-AQ3-R	MMBT2222AG-AQ3-R	SOT-723	B	E	C	Tape Reel
MMBT2222AL-K03-1006-R	MMBT2222AG-K03-1006-R	DFN1006-3	B	E	C	Tape Reel

Note: Pin Assignment: B: Base E: Emitter C: Collector

<p>MMBT2222AG-AE3-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AE3: SOT-23, AL3: SOT-323, AN3: SOT-523 AQ3: SOT-723, K03-1006: DFN1006-3 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

SOT-23-3 / SOT-323 / SOT-523 / SOT-723	DFN1006-3
<p>L: Lead Free G: Halogen Free</p>	<p>L: Lead Free G: Halogen Free</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Base Voltage		V _{CBO}	75	V
Collector-Emitter Voltage		V _{CEO}	40	V
Emitter-Base Voltage		V _{EBO}	6	V
Collector Current		I _C	600	mA
Collector Dissipation	SOT-23	P _C	350	mW
	SOT-323		200	mW
	SOT-523		150	mW
	SOT-723		100	mW
	DFN1006-3		300	mW
Junction Temperature		T _J	+150	°C
Storage Temperature		T _{STG}	-55 ~ +150	°C

Note: Absolute maximum ratings are the values beyond which the device will be damaged permanently.

Absolute maximum ratings are only stress ratings and it is not implied for functional device operation.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-23	θ _{JA}	357	°C/W
	SOT-323		625	°C/W
	SOT-523		833	°C/W
	SOT-723		1250	°C/W
	DFN1006-3		416	°C/W

Note: Transistor mounted on an FR4 printed circuit board.

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Collector-Base Breakdown Voltage	BV_{CBO}	$I_C=10\mu A, I_E=0$	75			V
Collector-Emitter Breakdown Voltage	BV_{CEO}	$I_C=10mA, I_B=0$	40			V
Emitter-Base Breakdown Voltage	BV_{EBO}	$I_E=10\mu A, I_C=0$	6			V
Collector Cutoff Current	I_{CBO}	$V_{CB}=60V, I_E=0$			0.01	μA
		$V_{CB}=60V, I_E=0, T_a=150^\circ C$			10	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=3.0V, I_C=0$			10	nA
Base Cutoff Current	I_{BL}	$V_{CE}=60V, V_{EB(OFF)}=3.0V$			20	nA
Collector Cutoff Current	I_{CEX}	$V_{CE}=60V, V_{EB(OFF)}=3.0V$			10	nA
ON CHARACTERISTICS						
DC Current Gain	h_{FE}	$I_C=0.1mA, V_{CE}=10V$	35			
		$I_C=1.0mA, V_{CE}=10V$	50			
		$I_C=10mA, V_{CE}=10V$	75			
		$I_C=10mA, V_{CE}=10V, T_a=-55^\circ C$	35			
		$I_C=150mA, V_{CE}=10V$ (Note)	100		300	
		$I_C=150mA, V_{CE}=1.0V$ (Note)	50			
Collector-Emitter Saturation Voltage(Note)	$V_{CE(SAT)}$	$I_C=150mA, I_B=15mA$			0.3	V
		$I_C=500mA, I_B=50mA$			1.0	V
Base-Emitter Saturation Voltage(Note)	$V_{BE(SAT)}$	$I_C=150mA, I_B=15mA$	0.6		1.2	V
		$I_C=500mA, I_B=50mA$			2.0	V
SMALL SIGNAL CHARACTERISTICS						
Real Part of Common-Emitter High Frequency Input Impedance	$Re(h_{je})$	$I_C=20mA, V_{CB}=20V, f=300MHz$			60	Ω
Transition Frequency	f_T	$I_C=20mA, V_{CE}=20V, f=100MHz$	300			MHz
Output Capacitance	C_{obo}	$V_{CB}=10V, I_E=0, f=100kHz$			8.0	pF
Input Capacitance	C_{ibo}	$V_{EB}=0.5V, I_C=0, f=100kHz$			25	pF
Collector Base Time Constant	$rb'C_c$	$I_C=20mA, V_{CB}=20V, f=31.8MHz$			150	pS
Noise Figure	NF	$I_C=100\mu A, V_{CE}=10V, R_s=1.0k\Omega, f=1.0kHz$			4.0	dB
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

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

■ TEST CIRCUITS

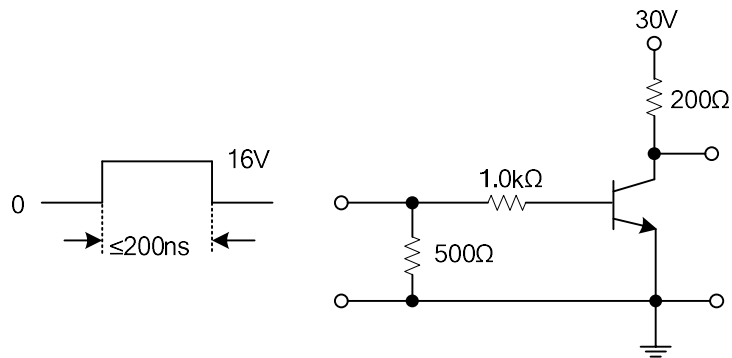


Fig 1. Saturated Turn-On Switching Time

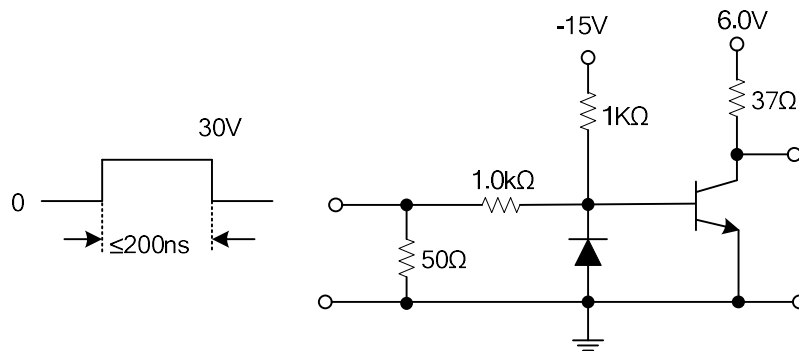
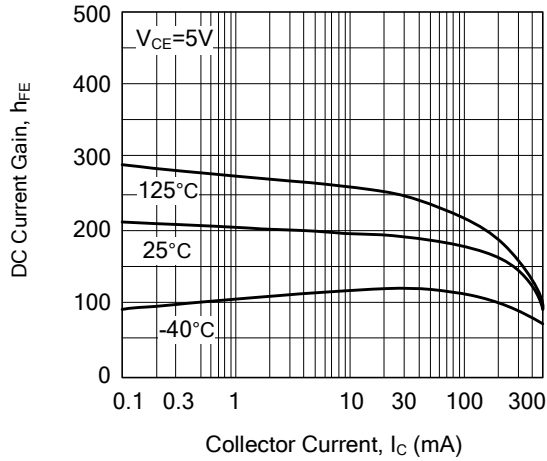


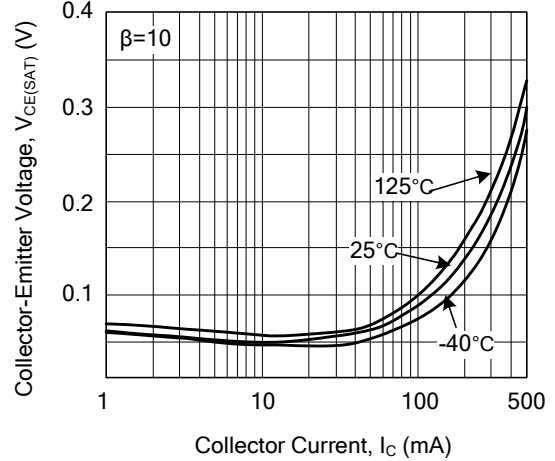
Fig 2. Saturated Turn-Off Switching Time

TYPICAL CHARACTERISTICS

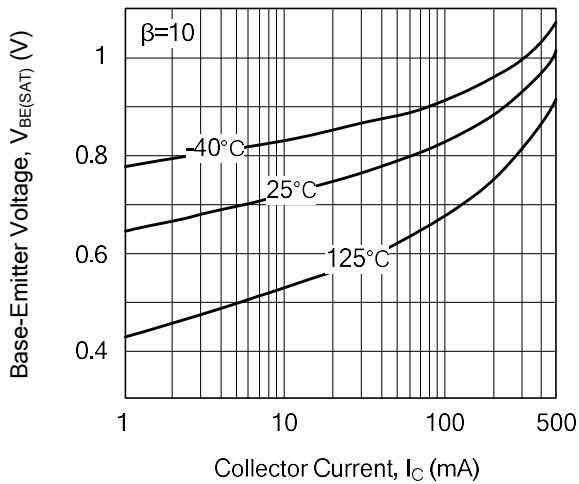
DC Current Gain vs. Collector Current



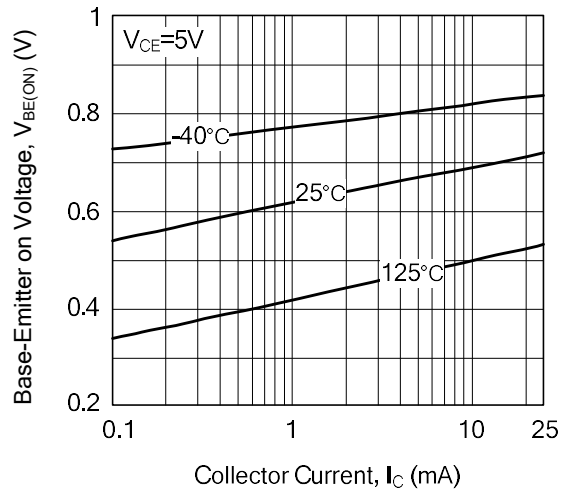
Collector-Emitter Saturation Voltage vs. Collector Current



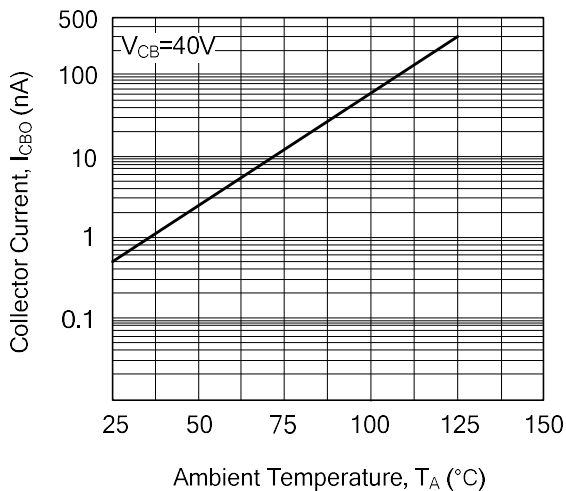
Base-Emitter Saturation Voltage vs. Collector Current



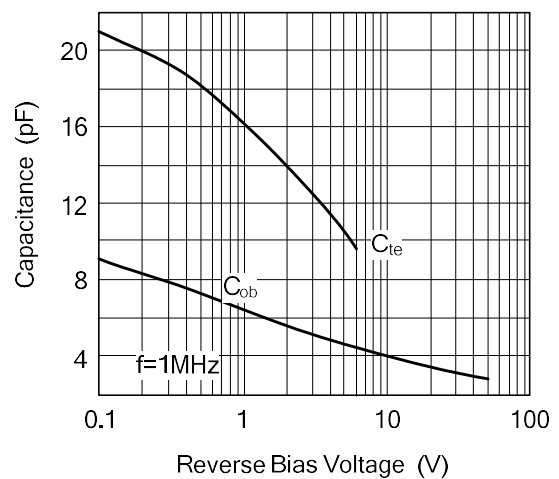
Base-Emitter on Voltage vs. Collector Current



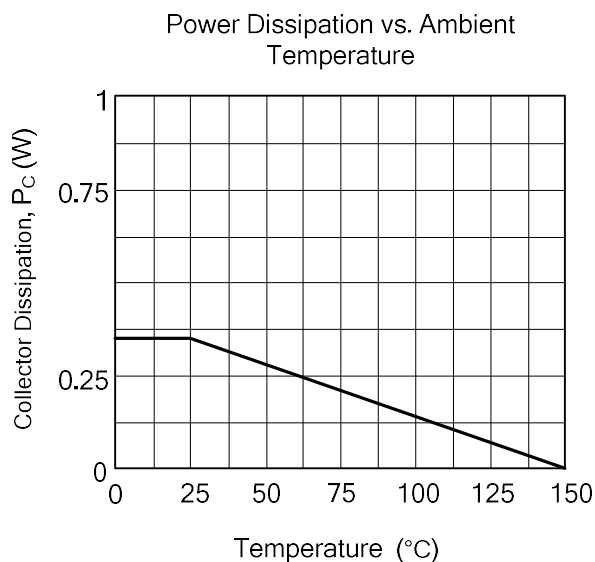
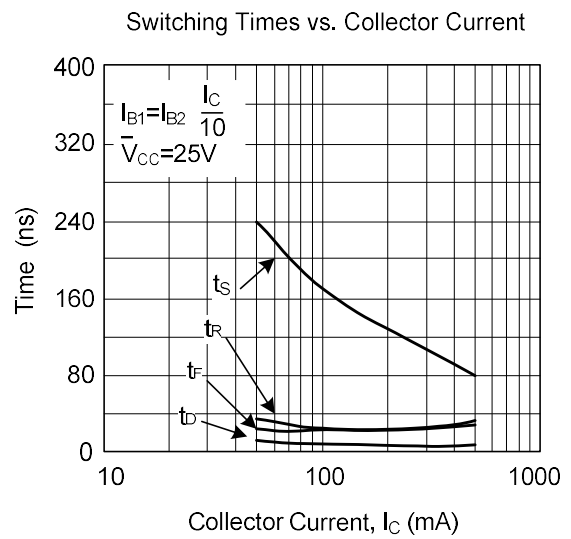
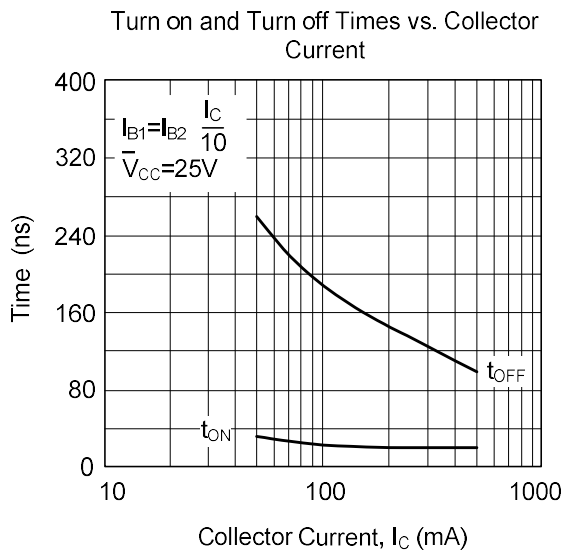
Base-Emitter Saturation Voltage vs. Collector Current



Emitter Transition and Output Capacitance vs. Reverse Bias Voltage



■ TYPICAL CHARACTERISTICS(Cont.)



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