



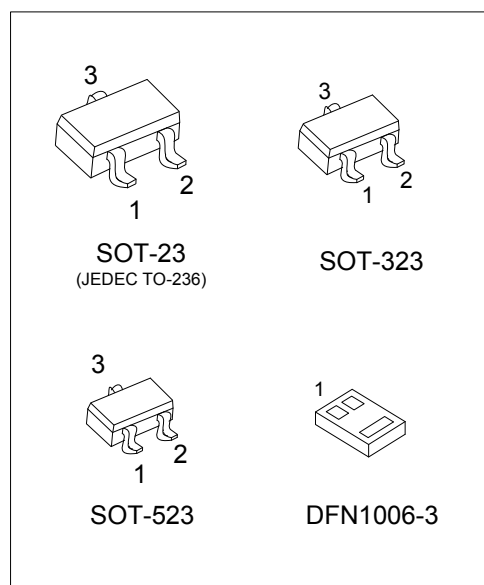
MMBT2222A

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-K03-1006-R	MMBT2222AG-K03-1006-R	DFN1006-3	B	E	C	Tape Reel

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

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

MARKING

SOT-23 / SOD-323 / SOD-523	DFN1006-3
L: Lead Free G: Halogen Free	L: Lead Free G: Halogen Free

■ **ABSOLUTE MAXIMUM RATINGS** ($T_A=25^{\circ}\text{C}$, 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	
	SOT-523		150	
	DFN1006-3		300 (Note 1)	
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature		T_{STG}	-55 ~ +150	$^{\circ}\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ **THERMAL CHARACTERISTICS**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-23	θ_{JA}	357	$^{\circ}\text{C/W}$
	SOT-323		625	
	SOT-523		833	
	DFN1006-3		416 (Note)	

Note: Transistor mounted on an FR4 printed circuit board.

■ **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			
		$I_C=150mA, V_{CE}=10V(Notes)$	100		300	
		$I_C=150mA, V_{CE}=1.0V(Notes)$	50			
		$I_C=500mA, V_{CE}=10V(Notes)$	40			
Collector-Emitter Saturation Voltage(Notes)	$V_{CE(SAT)}$	$I_C=150mA, I_B=15mA$			0.3	V
		$I_C=500mA, I_B=50mA$			1.0	V
Base-Emitter Saturation Voltage(Notes)	$V_{BE(SAT)}$	$I_C=150mA, I_B=15mA$	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	$Re(h_{ie})$	$I_C=20mA, V_{CB}=20V, f=300MHz$			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	$r_b'C_c$	$I_C=20mA, V_{CB}=20V, f=31.8MHz$			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

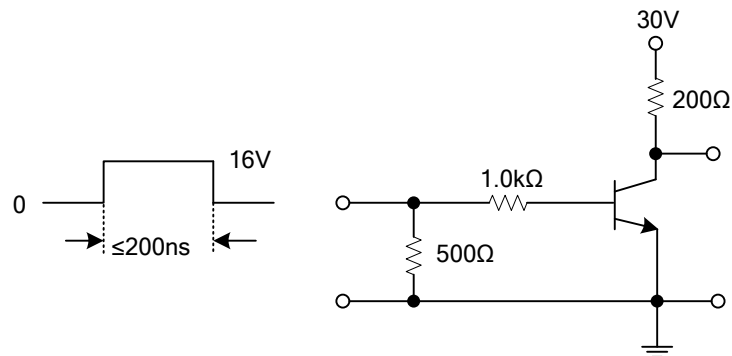


Fig 1. Saturated Turn-On Switching Time

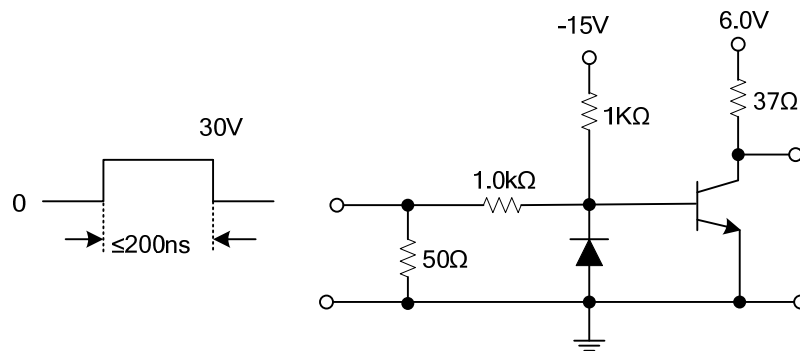
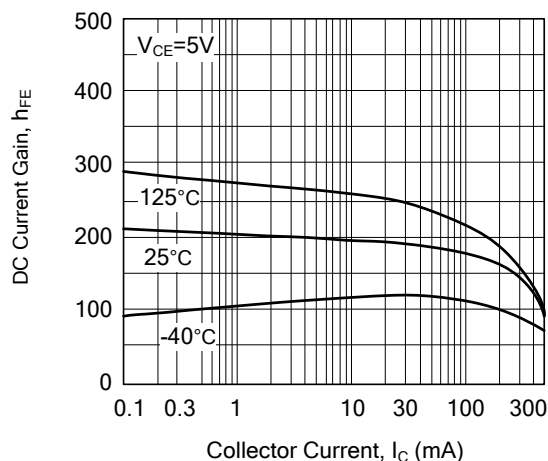


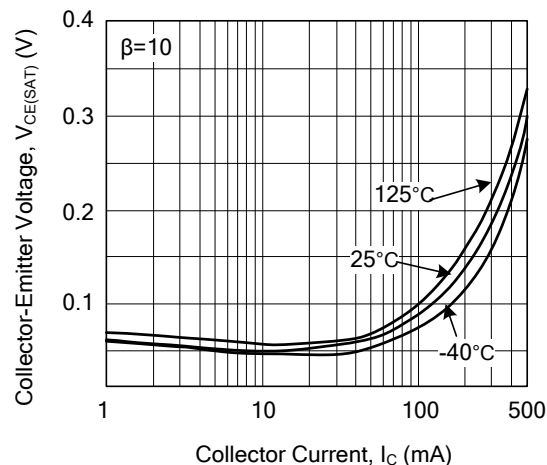
Fig 2. Saturated Turn-Off Switching Time

■ TYPICAL CHARACTERISTICS

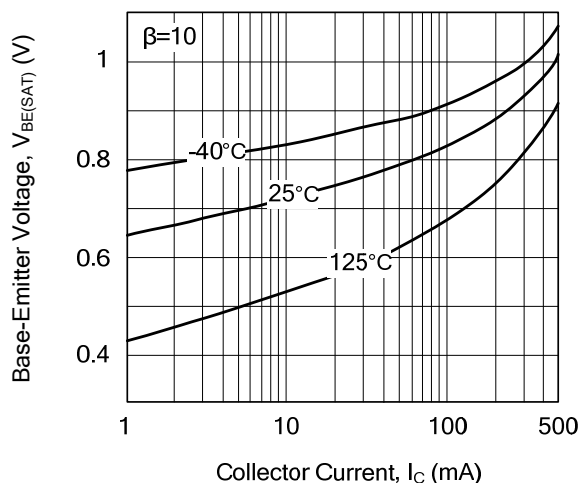
DC Current Gain vs. Collector Current



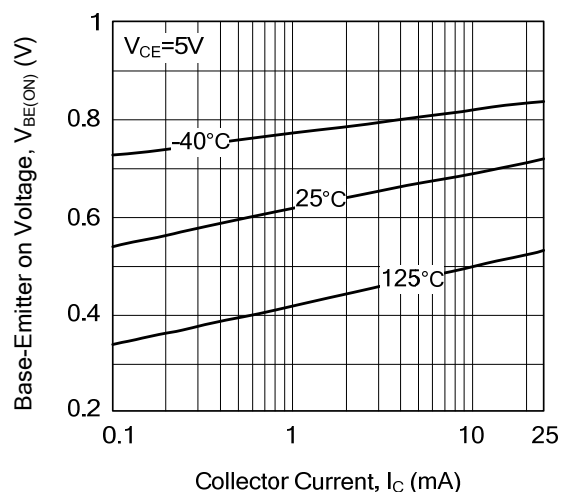
Collector-Emitter Saturation Voltage vs. Collector Current



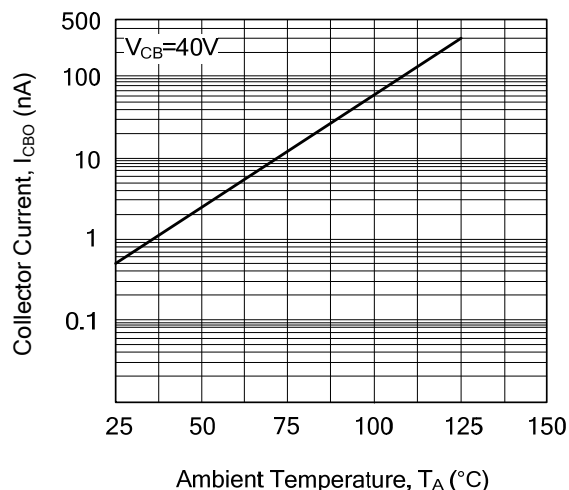
Base-Emitter Saturation Voltage vs. Collector Current



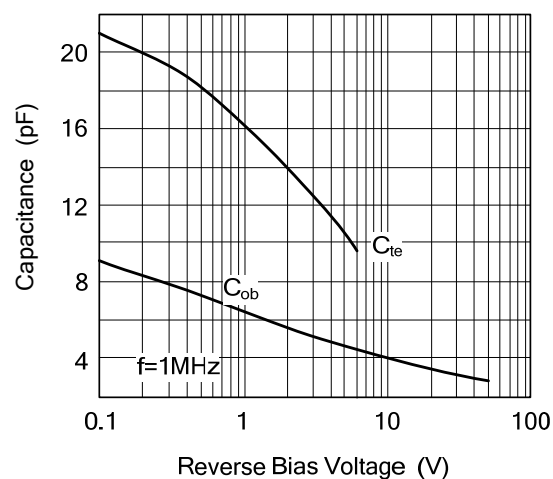
Base-Emitter on Voltage vs. Collector Current



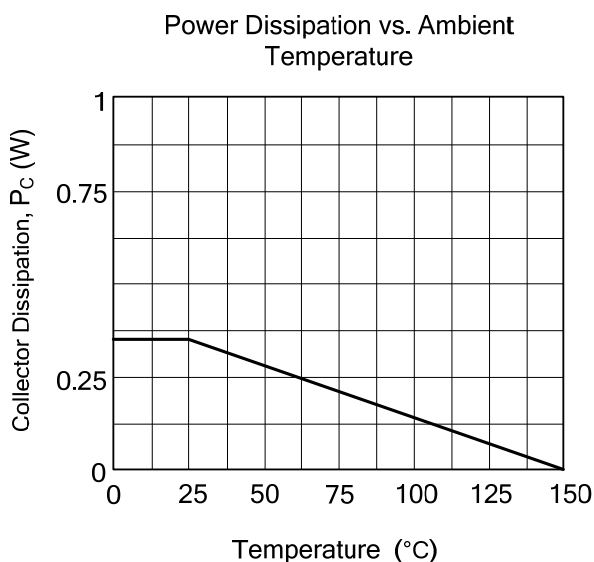
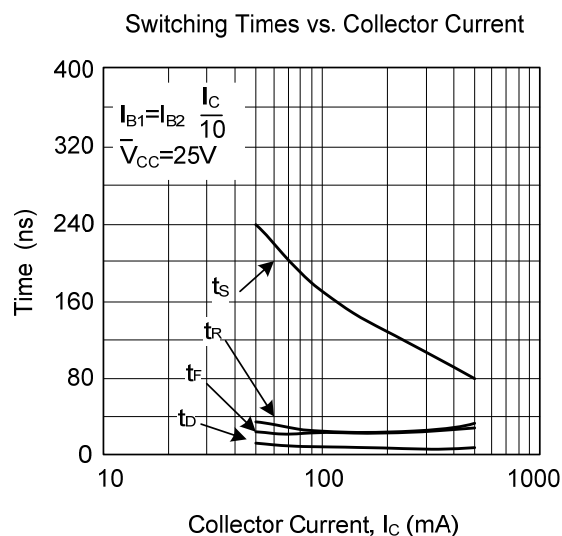
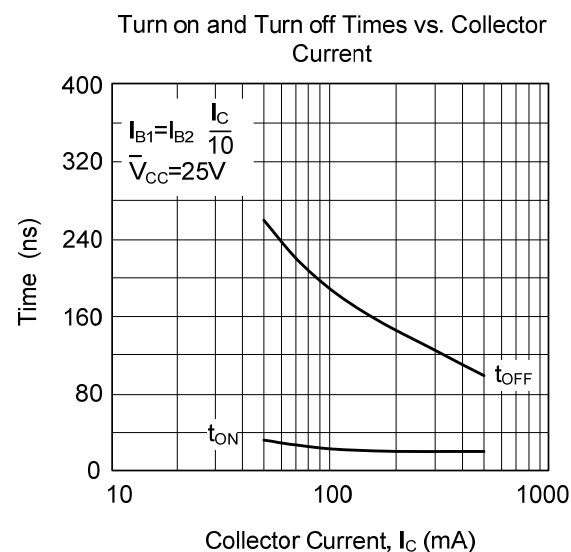
Base-Emitter Saturation Voltage vs. Collector Current



Emitter Transition and Output Capacitance vs. Reverse Bias Voltage



■ TYPICAL CHARACTERISTICS(Cont.)



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.