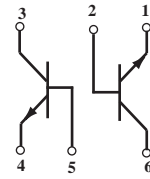


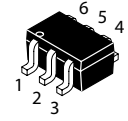
### Dual General Purpose Transistors

#### NPN+NPN Silicon

 Lead(Pb)-Free



NPN+NPN



SOT-363(SC-88)

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	40	Vdc
Collector-Base Voltage	$V_{CBO}$	75	Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current-Continuous	$I_C$	600	mAdc

#### THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Total Device Dissipation (1) $T_A=25^\circ\text{C}$	$P_D$	150	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Junction and Storage, Temperature	$T_J, T_{stg}$	-55 to+150	$^\circ\text{C}$

#### DEVICE MARKING

MBT2222ADW=XX

#### ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Min	Max	Unit
-----------------	--------	-----	-----	------

#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ( $I_C=10\text{ mAdc}, I_E=0$ )	$V_{(BR)CEO}$	40	-	Vdc
Collector-Base Breakdown Voltage ( $I_C=10\text{ }\mu\text{Adc}, I_E=0$ )	$V_{(BR)CBO}$	75	-	Vdc
Emitter-Base Breakdown Voltage ( $I_E=10\text{ }\mu\text{Adc}, I_C=0$ )	$V_{(BR)EBO}$	6.0	-	Vdc
Collector Cutoff Current ( $V_{CE}=60\text{ Vdc}, V_{EB}(\text{off})=3.0\text{ Vdc}$ )	$I_{CEX}$	-	10	nAdc
Collector Cutoff Current ( $V_{CB}=60\text{ Vdc}, I_E=0$ ) ( $V_{CB}=60\text{ Vdc}, I_E=0, T_A=125^\circ\text{C}$ )	$I_{CBO}$	-	0.01 10	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB}=3.0\text{ Vdc}, I_C=0$ )	$I_{EBO}$	-	100	nAdc
Base Cutoff Current ( $V_{CE}=60\text{ Vdc}, V_{EB}(\text{off})=3.0\text{ Vdc}$ )	$I_{BL}$	-	20	nAdc

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint

**ELECTRICAL CHARACTERISTICS** ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continued)

Characteristics	Symbol	Min	Max	Unit
-----------------	--------	-----	-----	------

**DC CHARACTERISTICS**

DC Current Gain ( $I_C=0.1\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ ) ( $I_C=1.0\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ ) ( $I_C=10\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $T_A=-55^\circ\text{C}$ ) ( $I_C=150\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ ) <sup>(2)</sup> ( $I_C=150\text{ mA}$ , $V_{CE}=1.0\text{ Vdc}$ ) <sup>(2)</sup> ( $I_C=500\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ ) <sup>(2)</sup>	$h_{FE}$	35 50 75 100	- - - 300	-
Collector-Emitter Saturation Voltage <sup>(2)</sup> ( $I_C=150\text{ mA}$ , $I_B=15\text{ mA}$ ) ( $I_C=500\text{ mA}$ , $I_B=50\text{ mA}$ )	$V_{CE(sat)}$	- -	0.3 1.0	Vdc
Base-Emitter Saturation Voltage <sup>(2)</sup> ( $I_C=150\text{ mA}$ , $I_B=15\text{ mA}$ ) ( $I_C=500\text{ mA}$ , $I_B=50\text{ mA}$ )	$V_{BE(sat)}$	0.6 -	1.2 2.0	Vdc

**SMALL-SIGNAL CHARACTERISTICS**

Current-Gain-Bandwidth Product <sup>(3)</sup> ( $I_C=20\text{ mA}$ , $V_{CE}=20\text{ Vdc}$ , $f=100\text{ MHz}$ )	$f_T$	300	-	MHz
Output Capacitance ( $V_{CB}=10\text{ Vdc}$ , $I_E=0$ , $f=1.0\text{ MHz}$ )	$C_{obo}$	-	8.0	pF
Input Capacitance ( $V_{EB}=0.5\text{ Vdc}$ , $I_C=0$ , $f=1.0\text{ MHz}$ )	$C_{ibo}$	-	25	pF
Input Impedance ( $I_C=1.0\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ ) ( $I_C=10\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ )	$h_{ie}$	2.0 0.25	0.8 1.25	$k\Omega$
Voltage Feedback Ratio ( $I_C=1.0\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ ) ( $I_C=10\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ )	$h_{re}$	-	8.0 4.0	$\times 10^{-4}$
Small-Signal Current Gain ( $I_C=1.0\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ ) ( $I_C=10\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ )	$h_{fe}$	50 75	300 375	-
Output Admittance ( $I_C=1.0\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ ) ( $I_C=10\text{ mA}$ , $V_{CE}=10\text{ Vdc}$ , $f=1.0\text{ kHz}$ )	$h_{oe}$	5.0 25	35 200	$\mu\text{mhos}$
Collector Base Time Constant ( $I_E=20\text{ mA}$ , $V_{CB}=20\text{ Vdc}$ , $f=31.8\text{ MHz}$ )	$r_b, C_c$	-	150	ps
Noise Figure ( $I_C=100\text{ }\mu\text{A}$ , $V_{CE}=10\text{ Vdc}$ , $R_S=1.0k\Omega$ , $f=1.0\text{ kHz}$ )	NF	-	4.0	dB

## ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ unless otherwise noted) (Continued)

Characteristics	Symbol	Min	Max	Unit
-----------------	--------	-----	-----	------

### SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC}=30\text{ Vdc}, V_{BE}(\text{off})=-0.5\text{Vdc}, I_C=150\text{ mAdc}, I_{B1}=15\text{ mAdc})$	$t_d$	-	10	ns
Rise Time		$t_r$	-	25	
Storage Time	$(V_{CC}=30\text{ Vdc}, I_C=150\text{ mAdc}, I_{B1}=I_{B2}=15\text{ mAdc})$	$t_s$	-	225	ns
Fall Time		$t_f$	-	60	

2. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

3.  $f_T$  is defined as the frequency at which  $|h_{fe}|$  extrapolates to unity.

### SWITCHING TIME EQUIVALENT TEST CIRCUITS

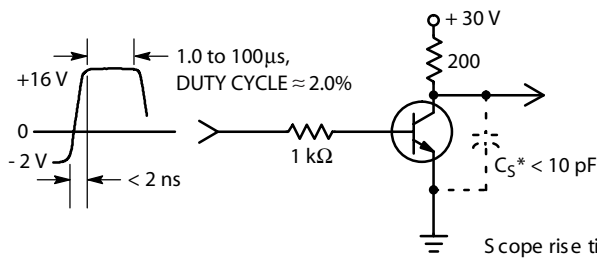


Figure 1. Turn-On Time

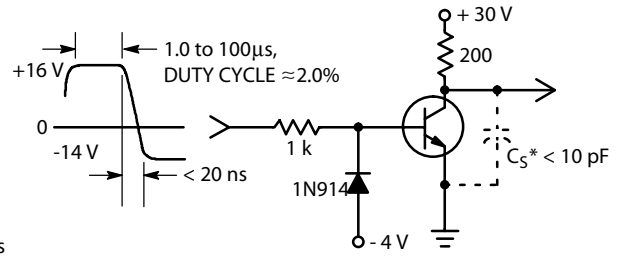


Figure 2. Turn-Off Time

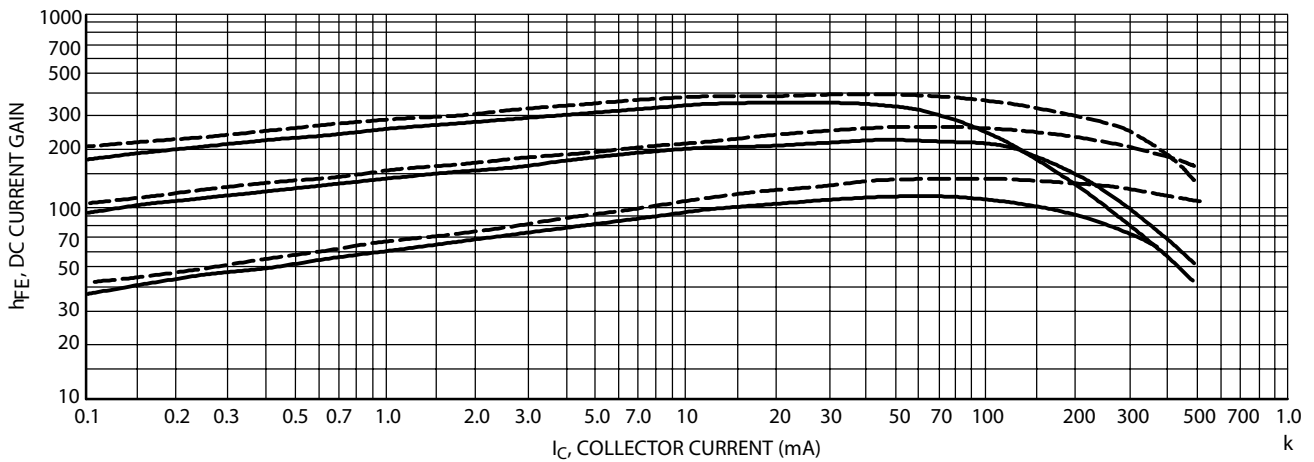


Figure 3. DC Current Gain

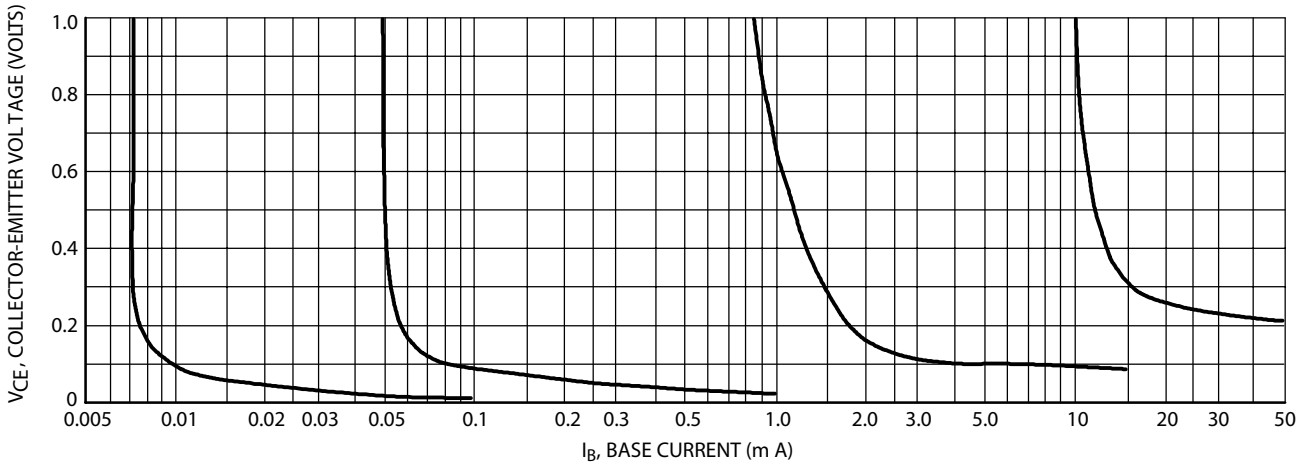


Figure 4. Collector Saturation Region

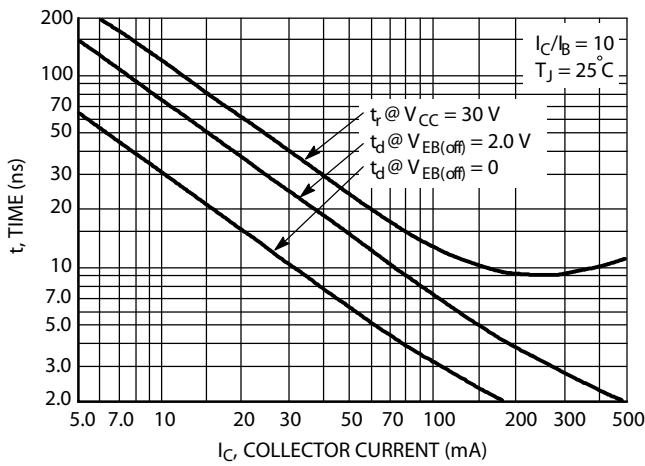


Figure 5. Turn-On Time

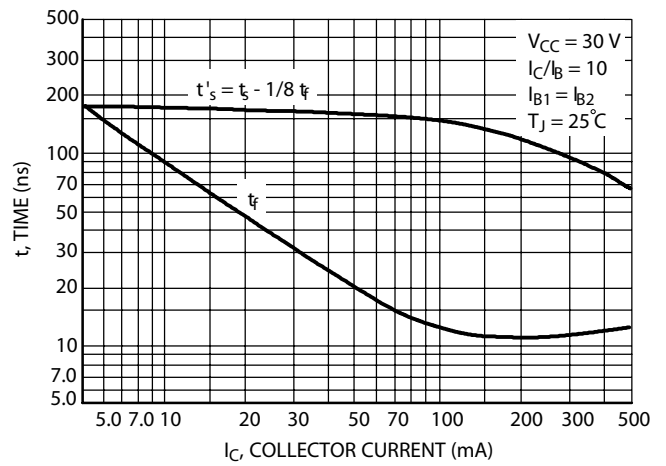


Figure 6. Turn-Off Time

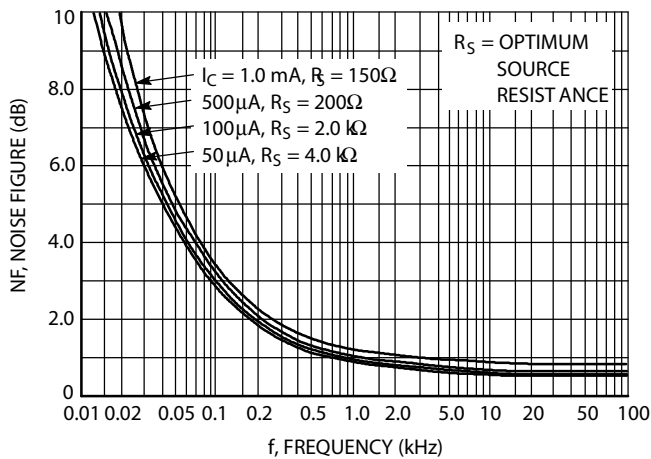


Figure 7. Frequency Effects

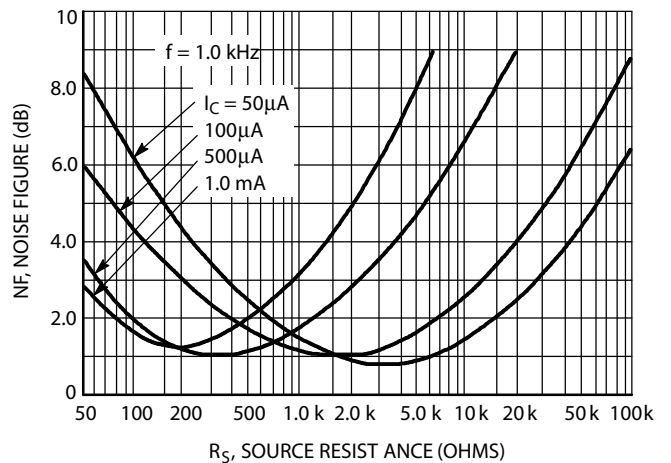


Figure 8. Source Resistance Effects

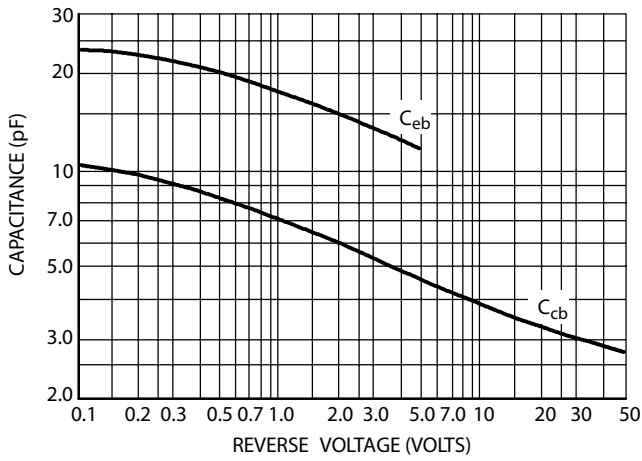


Figure 9. Capacitances

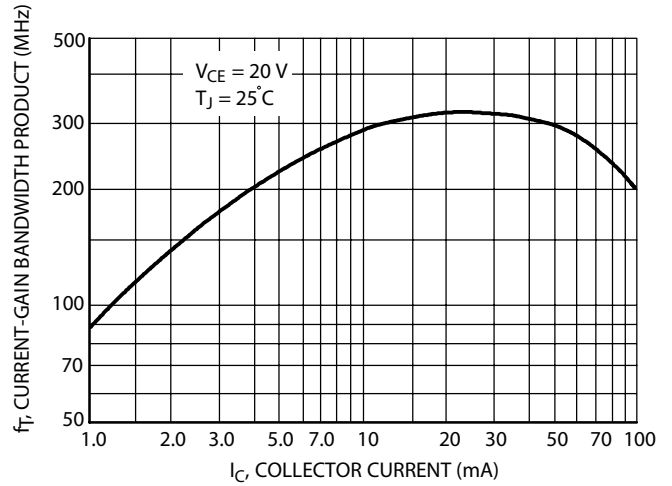


Figure 10. Current Gain Bandwidth Product

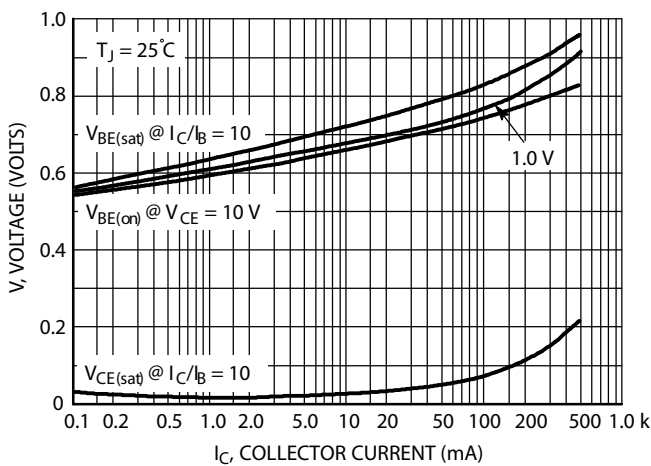


Figure 11. "On" Voltages

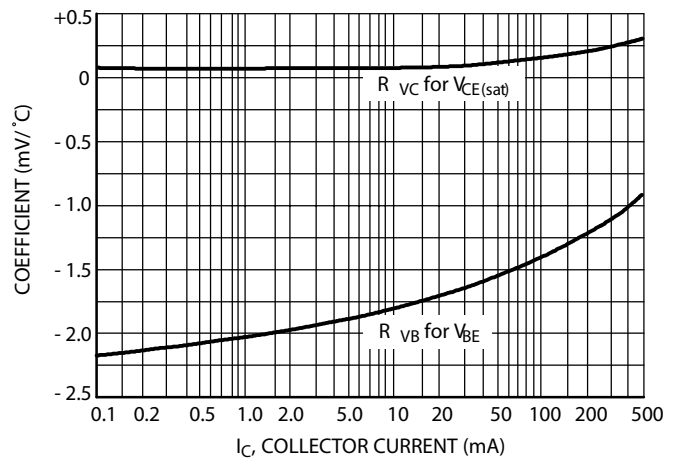
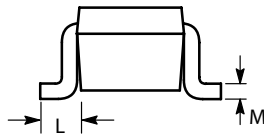
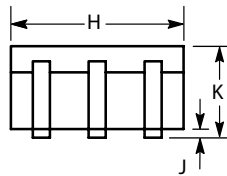
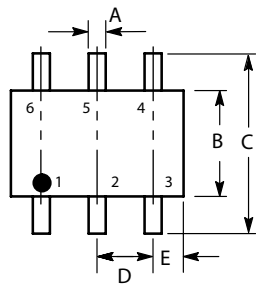


Figure 12. Temperature Coefficients

**SOT-363 Package Outline Dimensions**

Unit:mm



SOT-363		
Dim	Min	Max
A	0.10	0.30
B	1.15	1.35
C	2.00	2.20
D	0.65 REF	
E	0.30	0.40
H	1.80	2.20
J	-	0.10
K	0.80	1.10
L	0.25	0.40
M	0.10	0.25