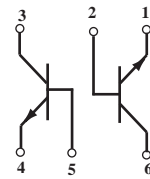


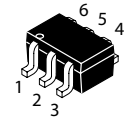
Dual General Purpose Transistors

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

SMALL-SIGNAL CHARACTERISTICS

| | | | | |
|--|------------|-------------|-------------|------------------|
| Current-Gain-Bandwidth Product ⁽³⁾ ($I_C=20\text{ mA}$, $V_{CE}=20\text{ Vdc}$, $f=100\text{ MHz}$) | 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 Ω |
| 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 | μmhos |
| 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 ($I_C=100\text{ }\mu\text{A}$, $V_{CE}=10\text{ Vdc}$, $R_S=1.0\text{ k}\Omega$, $f=1.0\text{ kHz}$) | 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

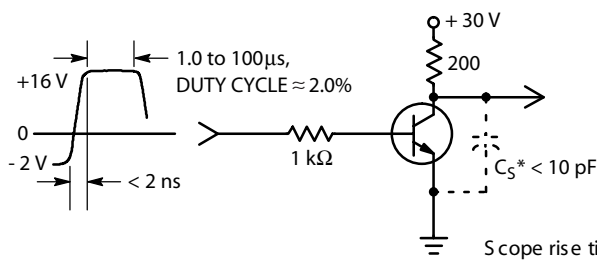


Figure 1. Turn-On Time

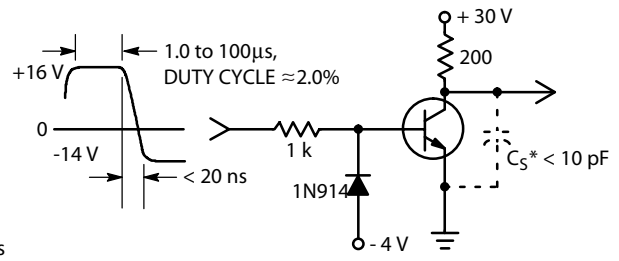


Figure 2. Turn-Off Time

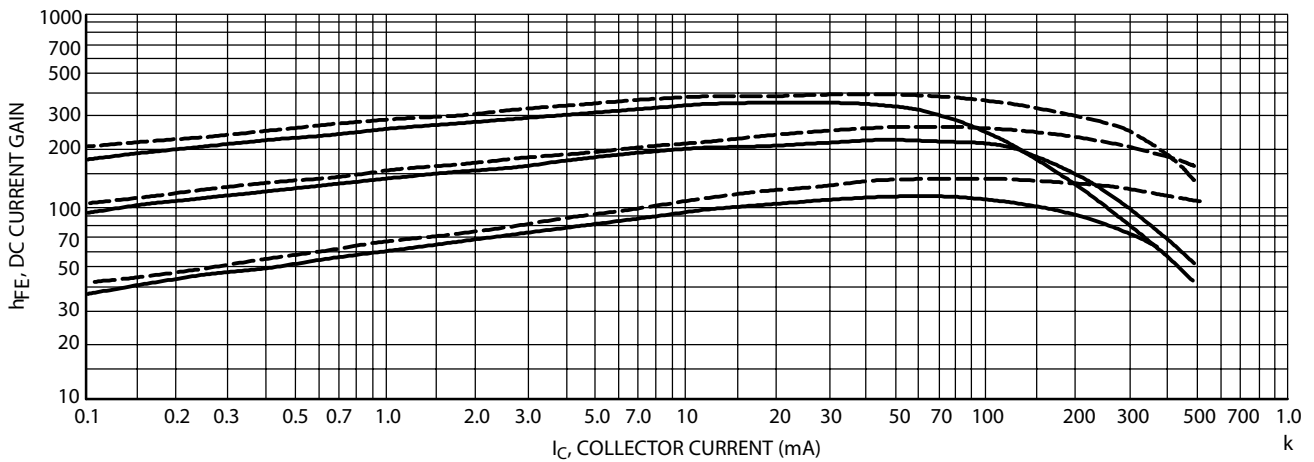


Figure 3. DC Current Gain

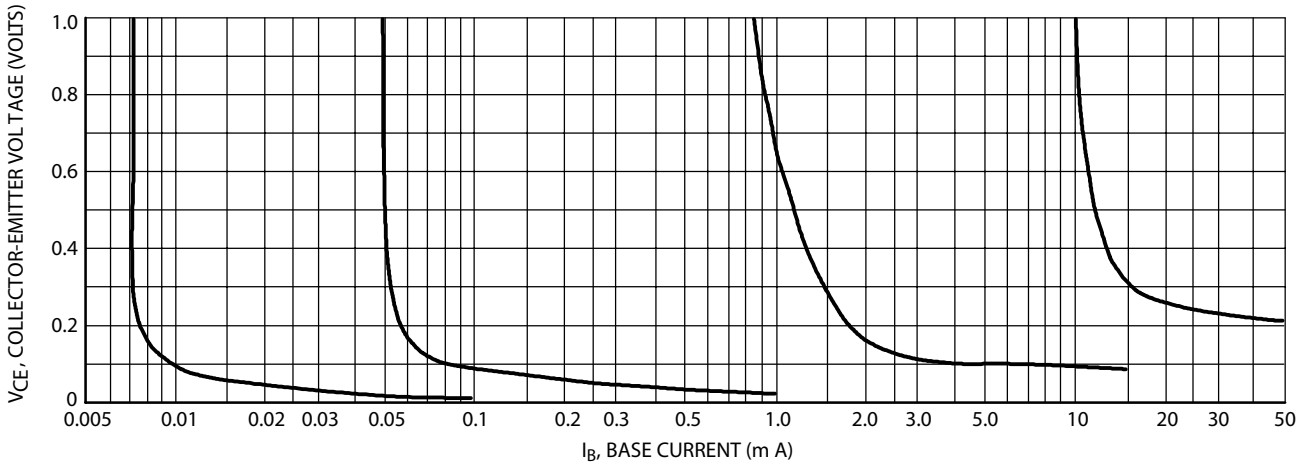


Figure 4. Collector Saturation Region

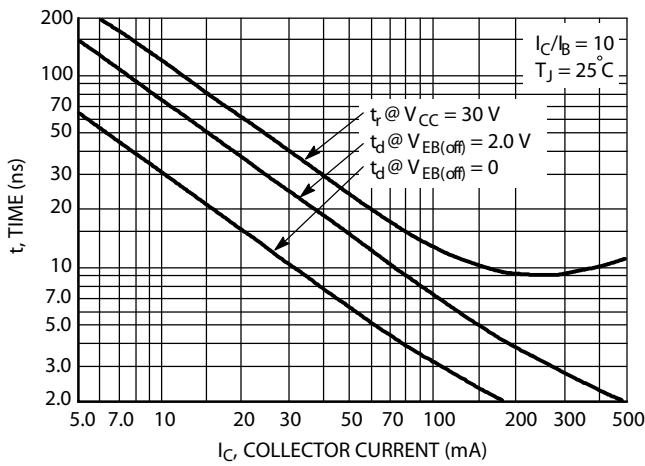


Figure 5. Turn-On Time

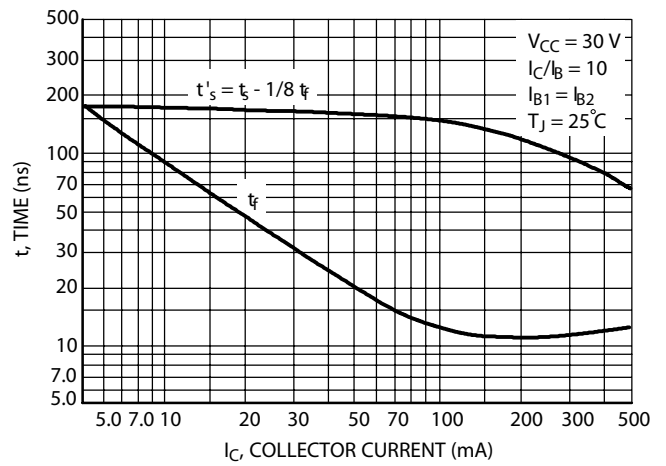


Figure 6. Turn-Off Time

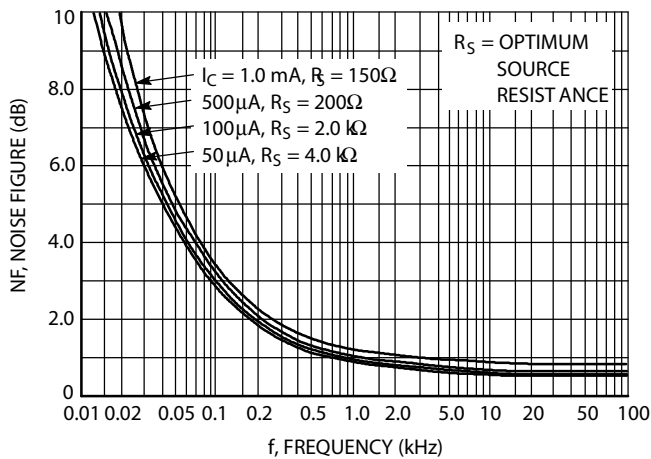


Figure 7. Frequency Effects

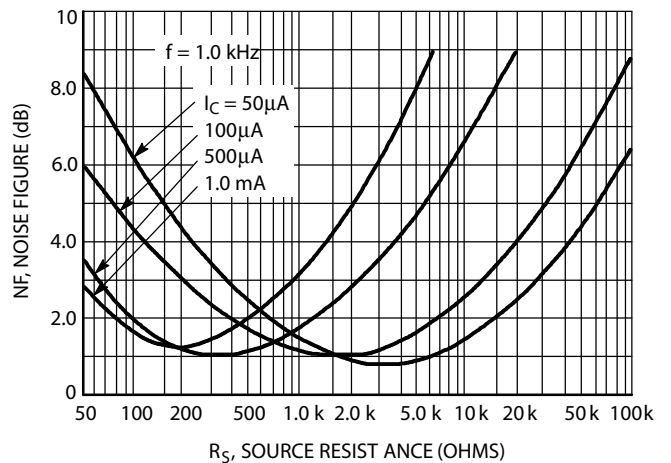


Figure 8. Source Resistance Effects

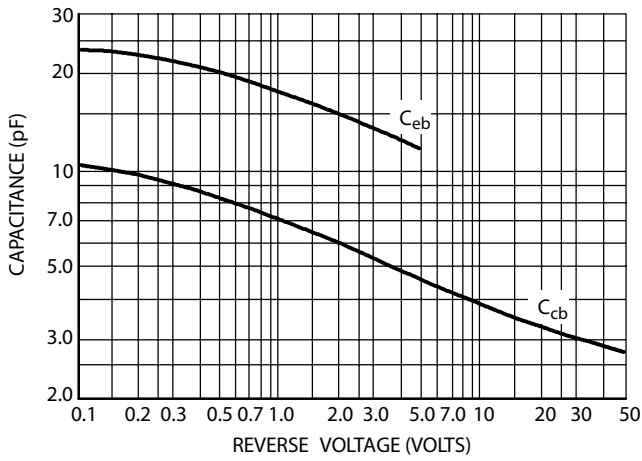


Figure 9. Capacitances

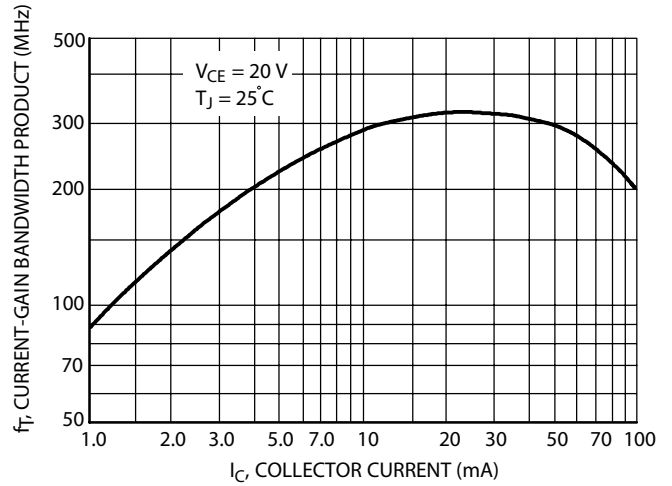


Figure 10. Current Gain Bandwidth Product

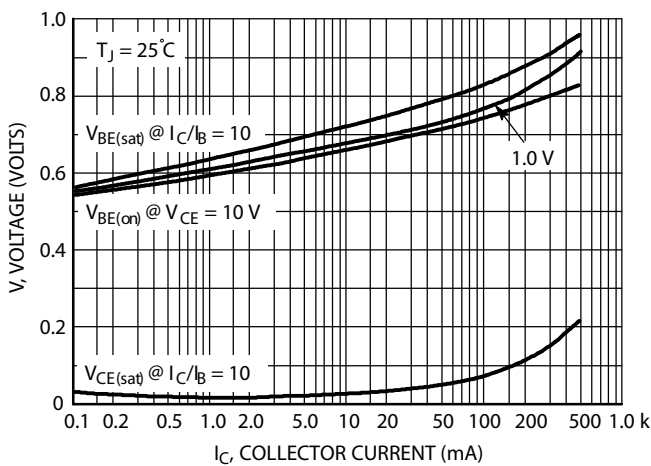


Figure 11. "On" Voltages

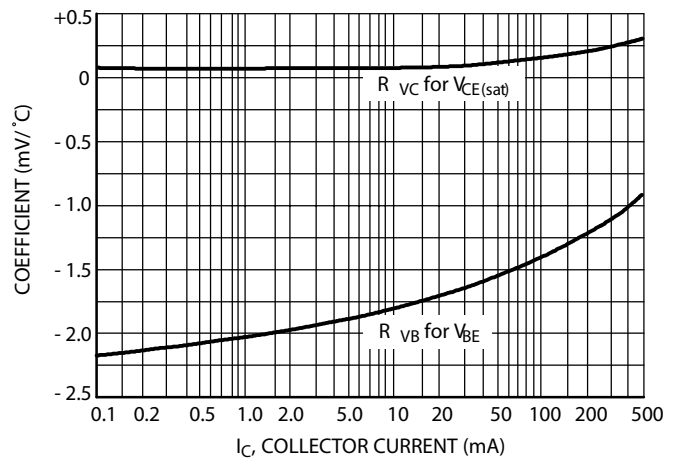
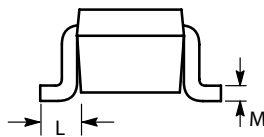
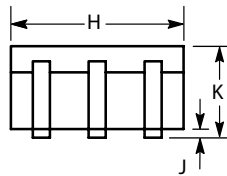
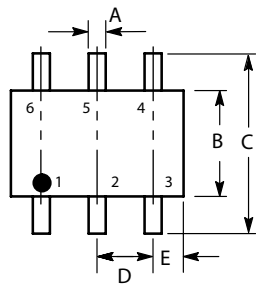


Figure 12. Temperature Coefficients

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 |