

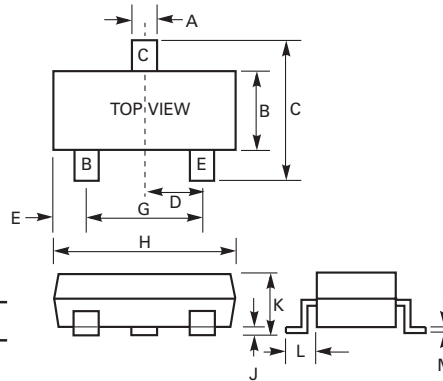
### Features

- Epitaxial Planar Die Construction
- Available in Both Through-Hole and Surface Mount Packages
- Suitable for Switching and Amplifier Applications
- Complementary NPN Types Available (2N3904/MMBT3904)

### Mechanical Data

- Case: TO-92/SOT-23, Molded Plastic
- Leads/Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking: TO-92 Type Number  
SOT-23 2A, 3N, R2A, K3N
- Approx Weight: TO-92 0.18 grams  
SOT-23 0.008 grams

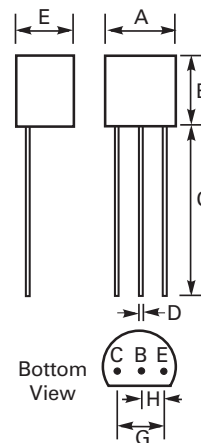
MMBT3906



SOT-23		
Dim	Min	Max
A	0.37	0.51
B	1.19	1.40
C	2.10	2.50
D	0.89	1.05
E	0.45	0.61
G	1.78	2.05
H	2.65	3.05
J	0.013	0.15
K	0.89	1.10
L	0.45	0.61
M	0.076	0.178

All Dimensions in mm

2N3906



TO-92		
Dim	Min	Max
A	4.32	4.83
B	4.32	4.78
C	12.50	15.62
D	0.36	0.56
E	3.15	3.94
G	2.29	2.79
H	1.14	1.40

All Dimensions in mm

### Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CB0}$	-40	V
Collector-Emitter Voltage	$V_{CE0}$	-40	V
Emitter-Base Voltage	$V_{EB0}$	-5.0	V
Collector Current - Continuous	$I_C$	-100	mA
Collector Current - Peak	$I_{CM}$	-200	mA
Power Dissipation TO-92 (2N3906) (Note 1) SOT-23 (MMBT3906) (Note 2) $T_{SB} = 50^\circ\text{C}$	$P_d$	500 300	mW
Operating and Storage Temperature Range	$T_j, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
1. Leads maintained at a distance of 2.0mm from body at specified ambient temperature (TO-92).
  2. Device mounted on ceramic substrate  $0.7\text{mm} \times 2.5\text{cm}^2$  area (SOT-23).
  3. Pulse test: Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

**Electrical Characteristics** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic	Symbol	Min	Max	Unit	Test Condition
DC Current Gain	$h_{FE}$	50 70 100 60 30	— — 300 — —	—	$-V_{CE} = 1.0\text{V}, -I_C = 0.1\text{mA}$ $-V_{CE} = 1.0\text{V}, -I_C = 1.0\text{mA}$ $-V_{CE} = 1.0\text{V}, -I_C = 10\text{mA}$ $-V_{CE} = 1.0\text{V}, -I_C = 50\text{mA}$ $-V_{CE} = 1.0\text{V}, -I_C = 100\text{mA}$
Collector Saturation Voltage	$V_{CE(SAT)}$	—	0.25 0.40	V	(Note 3) $-I_C = 10\text{mA}, -I_B = 1.0\text{mA}$ $-I_C = 50\text{mA}, -I_B = 5.0\text{mA}$
Base Saturation Voltage	$V_{BE(SAT)}$	—	0.85 0.95	V	(Note 3) $-I_C = 10\text{mA}, -I_B = 1.0\text{mA}$ $-I_C = 50\text{mA}, -I_B = 5.0\text{mA}$
Collector Cutoff Current	$I_{CEX}$	—	50	nA	$-V_{EB} = 3.0\text{V}, -V_{CE} = 30\text{V}$
Emitter Cutoff Current	$I_{BL}$	—	50	nA	$-V_{EB} = 3.0\text{V}, -V_{CE} = 30\text{V}$
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	40	—	V	$-I_C = 10\mu\text{A}, -I_E = 0$
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	40	—	V	$-I_C = 1.0\text{mA}, -I_B = 0$ (Note 3)
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	5.0	—	V	$-I_E = 10\mu\text{A}, -I_C = 0$
Gain Bandwidth Product	$f_T$	250	—	MHz	$-V_{CE} = 20\text{V}, -I_C = 10\text{mA},$ $f = 100\text{MHz}$
Collector-Base Capacitance	$C_{CBO}$	—	4.5	pF	$-V_{CB} = 5.0\text{V}, -I_E = 0, f = 100\text{kHz}$
Emitter-Base Capacitance	$C_{EBO}$	—	10	pF	$-V_{EB} = 0.5\text{V}, -I_C = 0, f = 100\text{kHz}$
Noise Figure	NF	—	5.0	dB	$-V_{CE} = 5.0\text{V}, -I_C = 100\mu\text{A},$ $R_G = 1.0\text{k}\Omega, f = 10$ to $15000\text{Hz}$
Delay Time	$t_d$	—	35	ns	$-I_{B1} = 1.0\text{mA}, -I_C = 10\text{mA},$ $V_{CC} = 3.0\text{V}, V_{BE(off)} = 0.5\text{V}$
Rise Time	$t_r$	—	35	ns	$-I_{B1} = 1.0\text{mA}, -I_C = 10\text{mA},$ $-V_{CC} = 3.0\text{V}, -V_{BE(off)} = 0.5\text{V}$
Storage Time	$t_s$	—	225	ns	$-I_{B1} = -I_{B2} = 1.0\text{mA},$ $-I_C = 10\text{mA}, -V_{CC} = 3.0\text{V}$
Fall Time	$t_f$	—	75	ns	$-I_{B1} = -I_{B2} = 1.0\text{mA},$ $-I_C = 10\text{mA}, -V_{CC} = 3.0\text{V}$
Thermal Resistance, Junction to Ambient TO-92, (2N3906) SOT-23, (MMBT3906)	$R_{\theta JA}$	—	250 625	K/W	Note 1 Note 2

- Notes:
1. Leads maintained at a distance of 2.0mm from body at specified ambient temperature (TO-92).
  2. Device mounted on ceramic substrate 0.7mm x 2.5 cm<sup>2</sup> area (SOT-23).
  3. Pulse test: Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

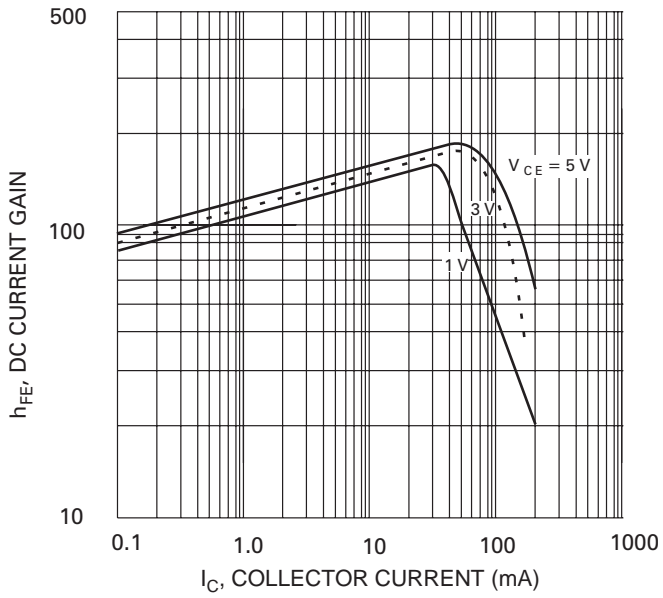


Fig. 1, DC Current Gain vs Collector Current

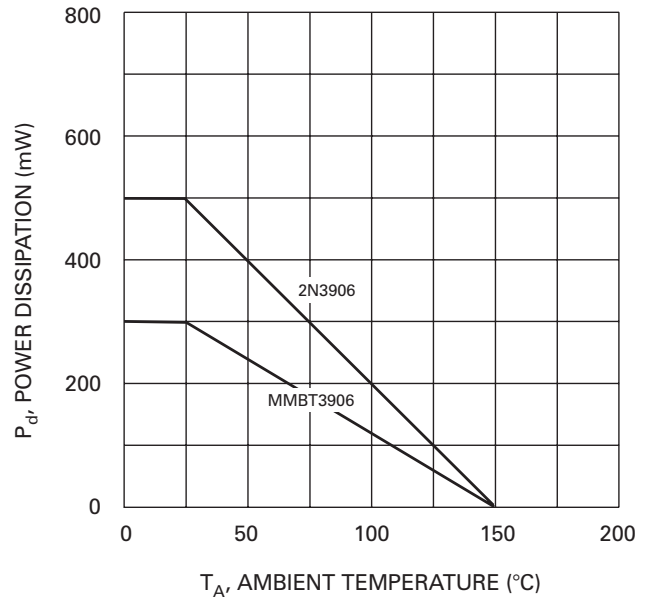


Fig. 2, Max Power Dissipation vs Ambient Temperature

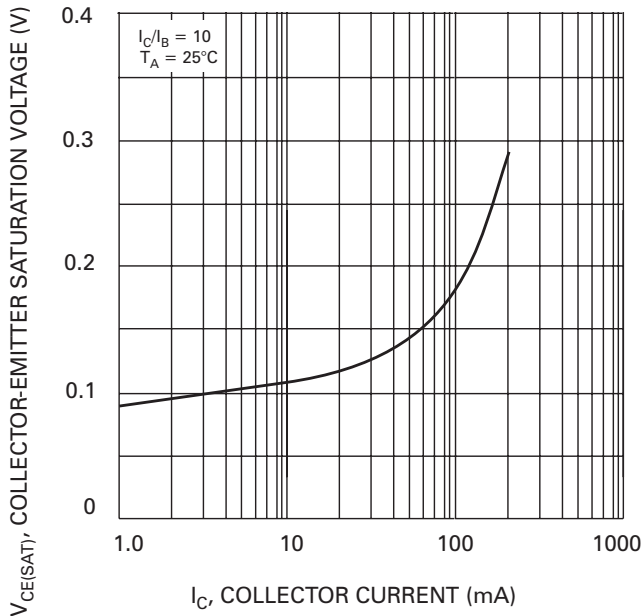


Fig. 3, Collector-Emitter Sat Voltage vs Collector Current

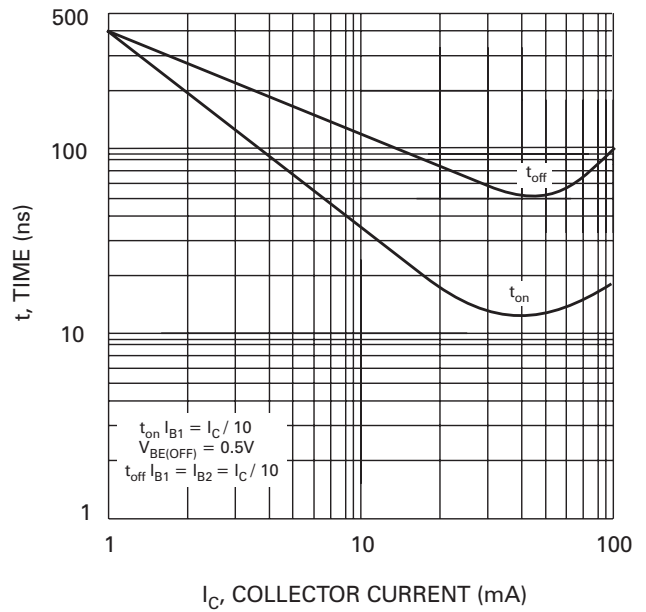


Fig. 4, Turn-On & Turn-Off Times vs Collector Current