Elektronische Bauelemente

MMBT3906

-200 mA, -40 V

PNP Plastic Encapsulated Transistor

RoHS Compliant Product
A suffix of "-C" specifies halogen and lead free

FEATURES

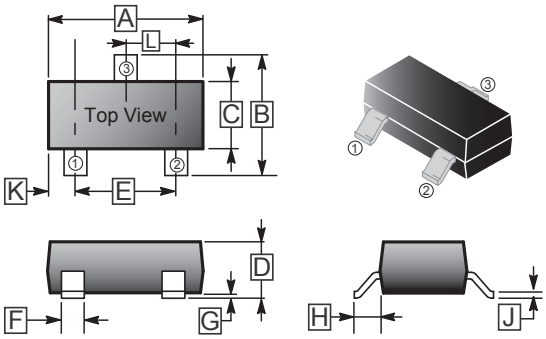
- Collector current capability I_C=-200mA
- Collector-emitter voltage V_{CEO}=-40V.

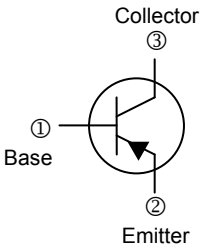
SOT-23

APPLICATION

- General switching and amplification.

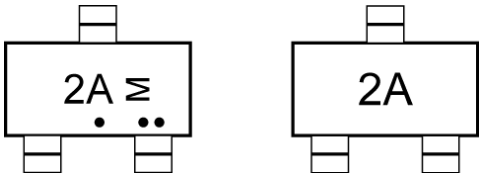
PACKAGING DIMENSION





REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.80	3.00	G	0.10 REF.	
B	2.25	2.55	H	0.55 REF.	
C	1.20	1.40	J	0.08	0.15
D	0.90	1.15	K	0.5 REF.	
E	1.80	2.00	L	0.95 TYP.	
F	0.30	0.50			

MARKING



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

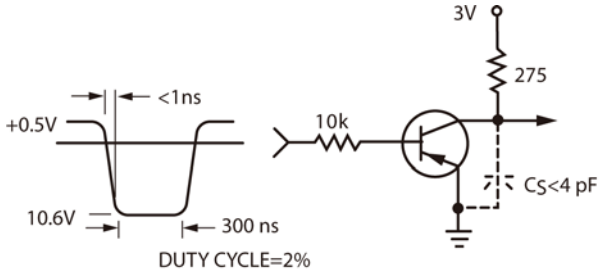
PARAMETER	SYMBOL	RATINGS	UNIT
Collector - Emitter Voltage	V_{CEO}	-40	Vdc
Collector - Base Voltage	V_{CBO}	-40	Vdc
Emitter - Base Voltage	V_{EBO}	-5.0	Vdc
Collector Current - Continuous	I_C	-200	mAdc
Total Device Dissipation FR-5 Board(1), T_A=25°C	P_D	225	mW
Total Device Dissipation FR-5 Board, Derate above 25°C		1.8	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C / W
Total Device Dissipation Alumina Substrate(2), T_A=25°C	P_D	300	mW
Total Device Dissipation Alumina Substrate, Derate above 25°C		2.4	mW/°C
Thermal Resistance, Junction to Ambien	$R_{\theta JA}$	417	°C / W
Junction, Storage Temperature	T_J, T_{STG}	-55 ~ +150	°C

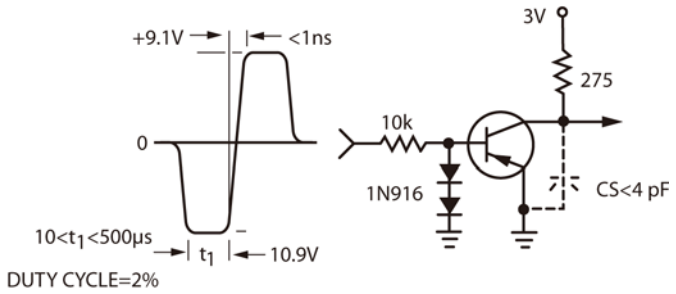
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage[3]	$V_{(BR)CEO}$	-40	-	Vdc	I_C= -1mAdc, I_B=0
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-40	-	Vdc	I_C = -10μAdc, I_E = 0
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	-5.0	-	Vdc	I_E = -10μAdc, I_C=0
Base Cut-Off Current	I_{BL}	-	-50	nAdc	V_{CE}= -30Vdc, V_{EB}= -3.0Vdc
Collector Cut-Off Current	I_{CEX}	-	-50	nAdc	V_{CE}= -30Vdc, V_{EB}= -3.0Vdc
ON CHARACTERISTICS[3]					
DC Current Gain	$h_{FE(1)}$	60	-		I_C= -0.1mAdc, V_{CE}= -1Vdc
	$h_{FE(2)}$	80	-		I_C= -1.0mAdc, V_{CE}= -1Vdc
	$h_{FE(3)}$	100	300		I_C= -10mAdc, V_{CE}= -1Vdc
	$h_{FE(4)}$	60	-		I_C= -50mAdc, V_{CE}= -1Vdc
	$h_{FE(5)}$	30	-		I_C= -100mAdc, V_{CE}= -1Vdc
Collector-Emitter Saturation Voltage[3]	$V_{CE(sat)}$	-	-0.25	Vdc	I_C= -10mAdc, I_B = -1mAdc
		-	-0.4		I_C = -50mAdc, I_B = -5mAdc
Base-Emitter Saturation Voltage[3]	$V_{BE(sat)}$	-0.65	-0.85	Vdc	I_C= -10mAdc, I_B = -1mAdc
		-	-0.95		I_C = -50mAdc, I_B = -5mAdc
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product	f_T	250	-	MHz	I_C= -10mAdc, V_{CE}= -20Vdc, f=100MHz
Output Capacitance	C_{obo}	-	4.5	pF	V_{CB}= -5.0Vdc, I_E=0, f=1.0MHz
Input Capacitance	C_{ibo}	-	10	pF	V_{EB}= -0.5Vdc, I_C=0, f=1.0MHz
Input Impedance	h_{ie}	2.0	12	kΩ	V_{CE}= -10 Vdc, I_C= -1.0mAdc, f=1.0kHz
Voltage Feedback Radio	h_{re}	0.1	10	x 10^{-4}	V_{CE}= -10 Vdc, I_C= 1.0mAdc, f=1.0kHz
Small-Signal Current Gain	h_{fe}	100	400		V_{CE}= -10 Vdc, I_C= 1.0mAdc, f=1.0kHz
Output Admittance	H_{oe}	3.0	60	μmhos	V_{CE}= -10 Vdc, I_C= 1.0mAdc, f=-1.0kHz
Noise Figure	NF	-	4.0	dB	V_{CE}= -5.0 Vdc, I_C= -100μAdc, R_S=1.0KΩ, f=1.0kHz
SWITCHING CHARACTERISTICS					
Delay Time	td	-	35	nS	V_{CC}=-3Vdc,V_{BE}=0.5Vdc
Rise Time	tr	-	35		I_C=-10mAdc, I_{B1} =-1mAdc
Storage Time	ts	-	225		V_{CC}=-3Vdc,
Fall Time	tf	-	75		I_C=-10mAdc,I_{B1}= I_{B2}=-1mAdc

NOTE:

1. FR-5=1.0 x 0.75 x 0.062 in.
2. Alumina=0.4 x 0.3 x 0.024 in. 99.5% alumina.
3. Pulse Test: Pulse Width ≦ 300μS, Duty Cycle ≦ 2.0%





*Total shunt capacitance of test jig and connectors

FIG.1 Delay and Rise Time Equivalent Test Circuit

FIG.2 Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

——— T_J=25 °C - - - - T_J=125 °C

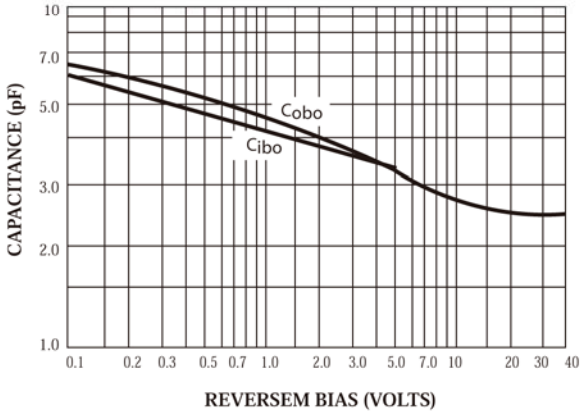


FIG.3 Capacitance

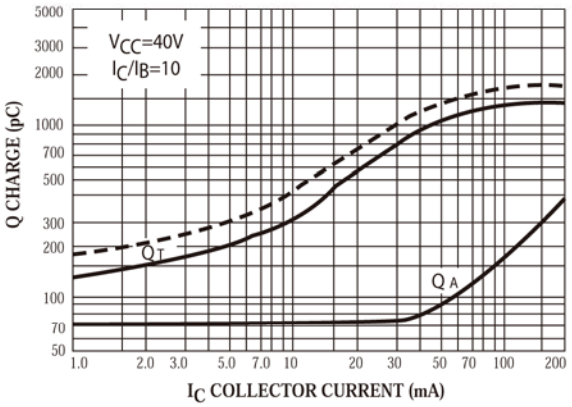


FIG.4 Charge Data

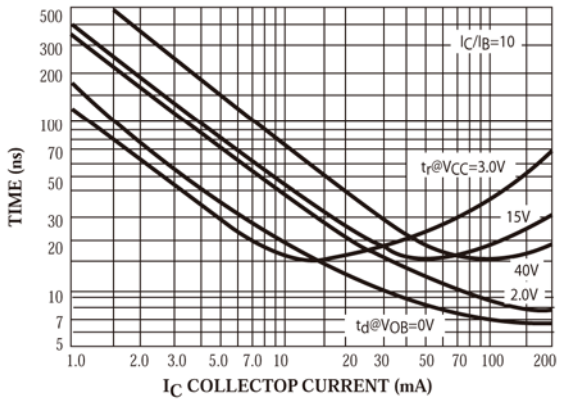


FIG.5 Turn-On Time

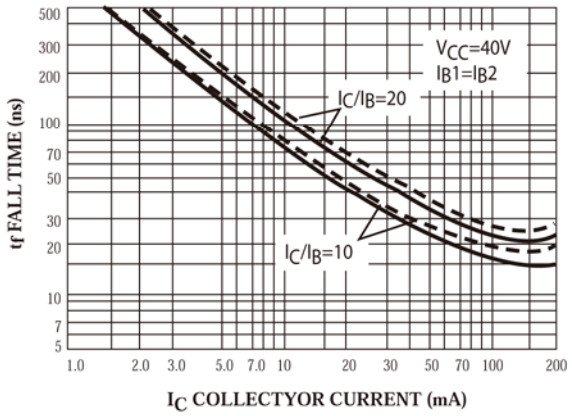


FIG.6 Fall Time

TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

(V_{CE}= -5.0 Vdc, T_A= 25°C, Bandwidth= 1.0Hz)

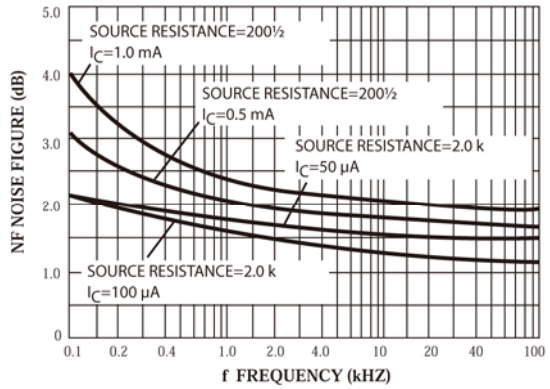


FIG.7

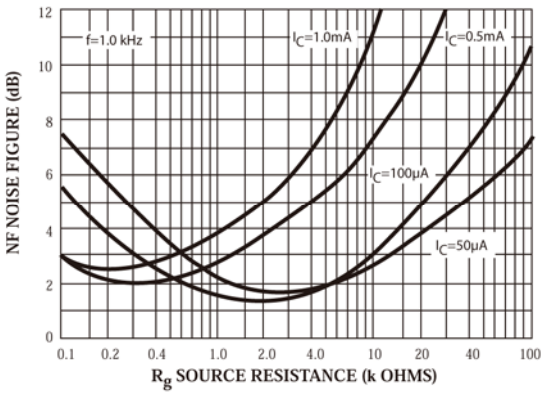


FIG.8

h PARAMETERS (V_{CE}= -10 Vdc, f= 1.0 kHz, T_A= 25°C)

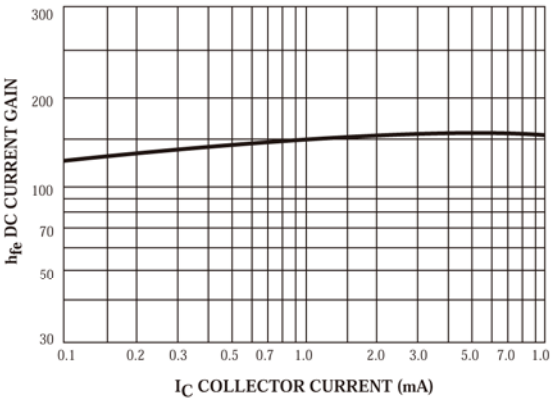


FIG.9 Current Gain

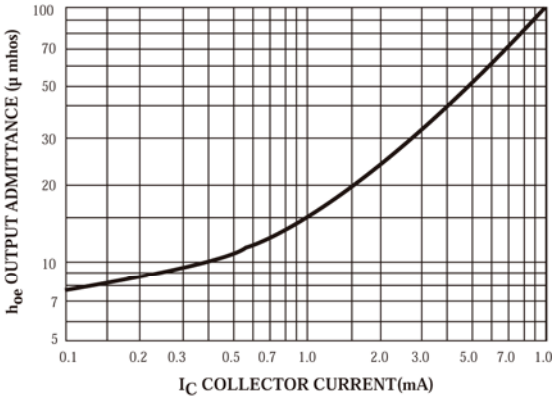


FIG.10 Input Impedance

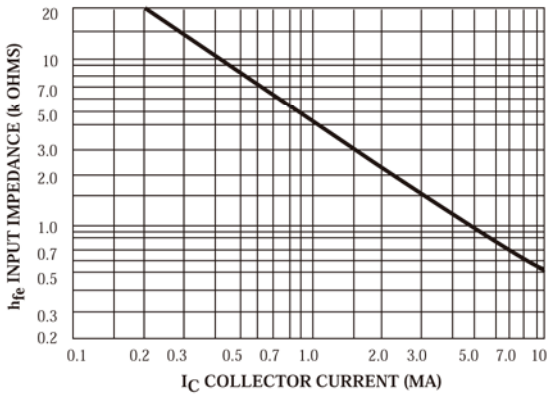


FIG.11 Input Impedance

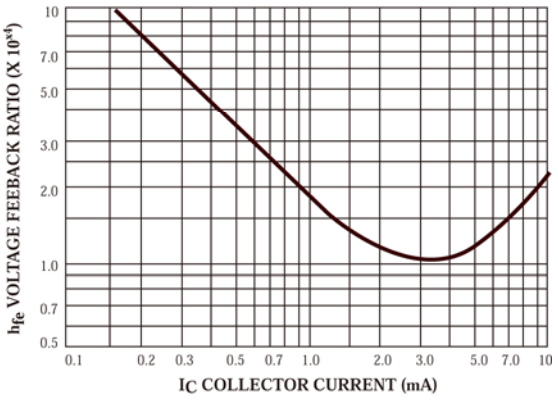


FIG.12 Votage Feeback Ratio

TYPICAL STATIC CHARACTERISTICS

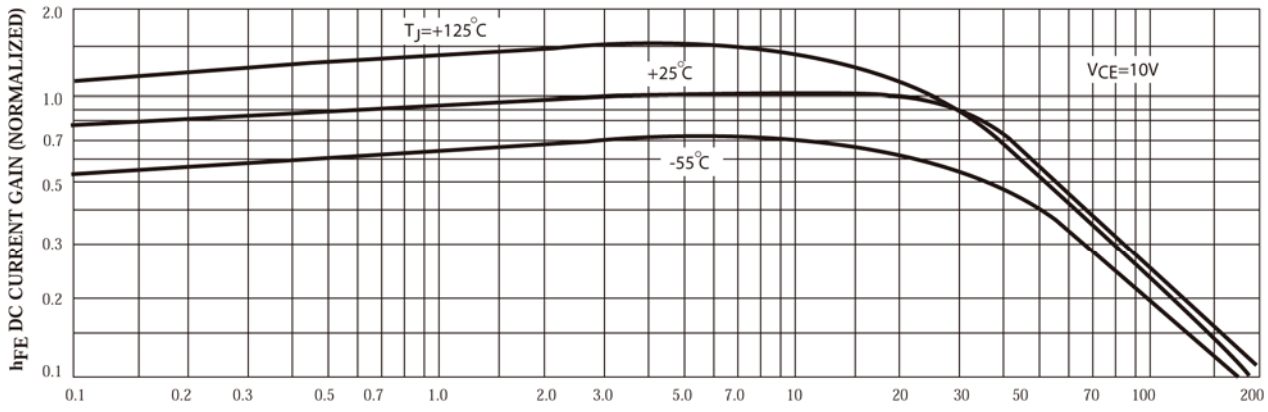


FIG.13 DC Current Gain

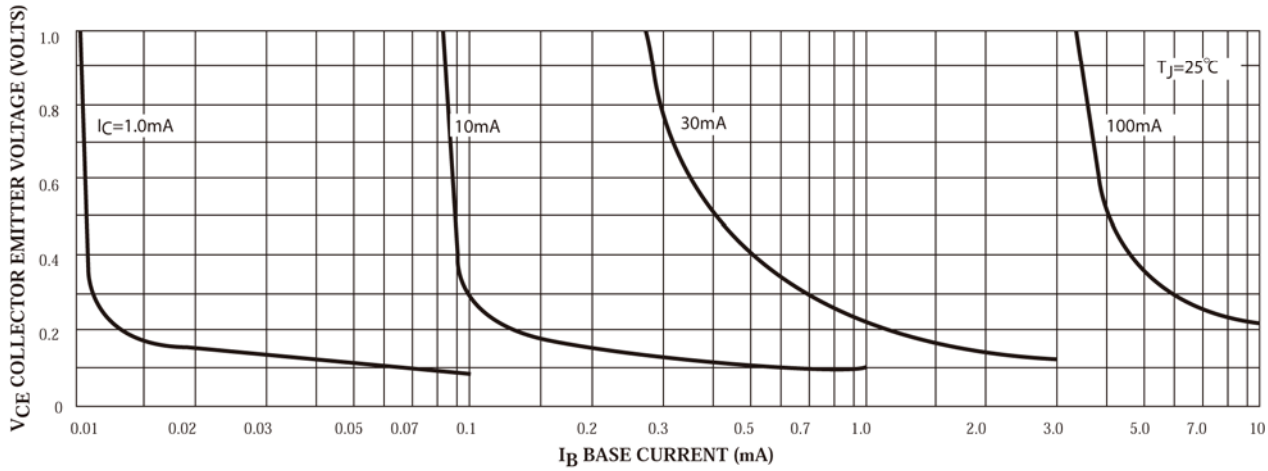


FIG.14 Collector Saturation Region

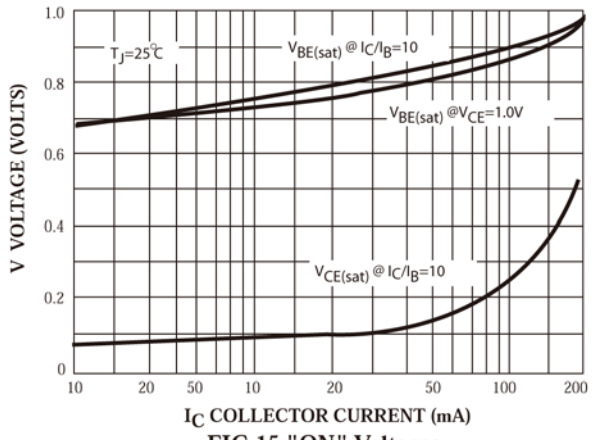


FIG.15 "ON" Voltages

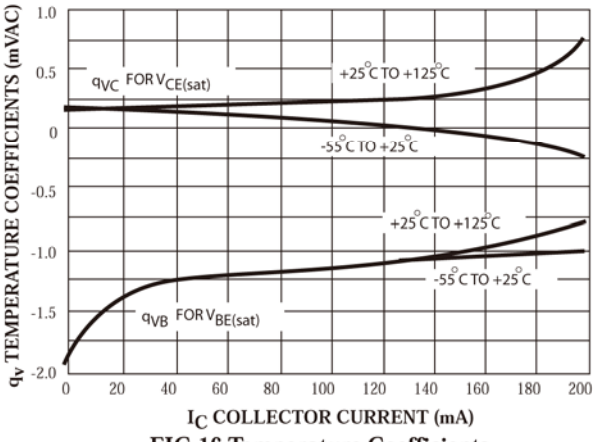


FIG.16 Temperature Coefficients