

# MMBT3904W

## NPN GENERAL PURPOSE SWITCHING TRANSISTOR

**VOLTAGE** 40 Volt **POWER** 150 mWatt

**SOT-323** Unit : inch(mm)

### FEATURES

- NPN epitaxial silicon, planar design
- Collector-emitter voltage  $V_{CE} = 40V$
- Collector current  $I_C = 200mA$
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### MECHANICAL DATA

- Case: SOT-323, Plastic
- Terminals: Solderable per MIL-STD-750, Method 2026
- Weight: 0.0001 ounce, 0.005 gram
- Marking: S1A

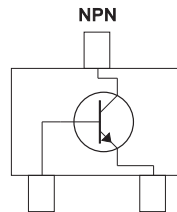
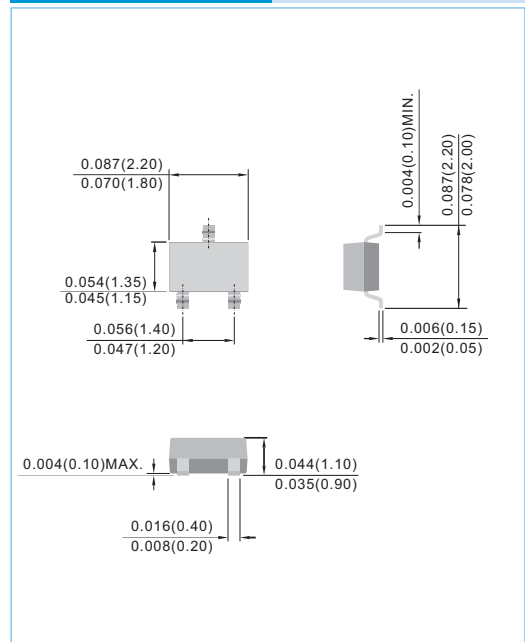


Fig.34



### ABSOLUTE RATINGS

PARAMETER	Symbol	Value	Units
Collector - Emitter Voltage	$V_{CEO}$	40	V
Collector - Base Voltage	$V_{CBO}$	60	V
Emitter - Base Voltage	$V_{EBO}$	6.0	V
Collector Current - Continuous	$I_C$	200	mA

### THERMAL CHARACTERISTICS

PARAMETER	Symbol	Value	Units
Max Power Dissipation (Note 1)	$P_{TOT}$	150	mW
Thermal Resistance , Junction to Ambient	$R_{\theta JA}$	830	$^{\circ}C/W$
Junction Temperature	$T_J$	-55 to 150	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55 to 150	$^{\circ}C$

Note 1: Transistor mounted on FR-5 board 1.0 x 0.75 x 0.062 in.

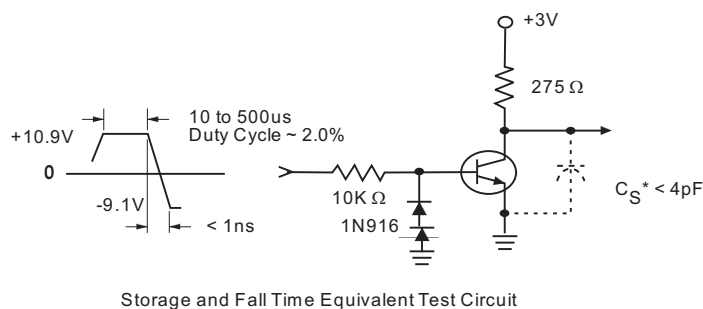
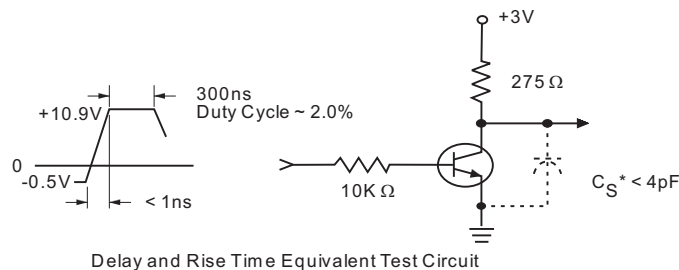
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## ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Condition	MIN.	TYP.	MAX.	Units
Collector - Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=1.0mA, I_B=0$	40	-	-	V
Collector - Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=10\mu A, I_E=0$	60	-	-	V
Emitter - Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=10\mu A, I_C=0$	6.0	-	-	V
Base Cutoff Current	$I_{BL}$	$V_{CE}=30V, V_{EB}=3.0V$	-	-	50	nA
Collector Cutoff Current	$I_{CEX}$	$V_{CE}=30V, V_{EB}=3.0V$	-	-	50	nA
DC Current Gain (Note 2)	$h_{FE}$	$I_C=0.1mA, V_{CE}=1.0V$ $I_C=1.0mA, V_{CE}=1.0V$ $I_C=10mA, V_{CE}=1.0V$ $I_C=50mA, V_{CE}=1.0V$ $I_C=100mA, V_{CE}=1.0V$	40 70 100 60 30	- - - - -	- - 300 - -	-
Collector - Emitter Saturation Voltage (Note 2)	$V_{CE(SAT)}$	$I_C=10mA, I_B=1.0mA$ $I_C=50mA, I_B=5.0mA$	-	-	0.2 0.3	V
Base - Emitter Saturation Voltage (Note 2)	$V_{BE(SAT)}$	$I_C=10mA, I_B=1.0mA$ $I_C=50mA, I_B=5.0mA$	0.65 -	- -	0.85 0.95	V
Collector - Base Capacitance	$C_{CBO}$	$V_{CB}=5V, I_E=0, f=1MHz$	-	-	4.0	pF
Emitter - Base Capacitance	$C_{EBO}$	$V_{EB}=0.5V, I_C=0, f=1MHz$	-	-	8.0	pF
Delay Time	$t_d$	$V_{CC}=3V, V_{BE}=0.5V,$ $I_C=10mA, I_B=1.0mA$	-	-	35	ns
Rise Time	$t_r$	$V_{CC}=3V, V_{BE}=0.5V,$ $I_C=10mA, I_B=1.0mA$	-	-	35	ns
Storage Time	$t_s$	$V_{CC}=3V, I_C=10mA$ $I_{B1}=I_{B2}=1.0mA$	-	-	200	ns
Fall Time	$t_f$	$V_{CC}=3V, I_C=10mA$ $I_{B1}=I_{B2}=1.0mA$	-	-	50	ns

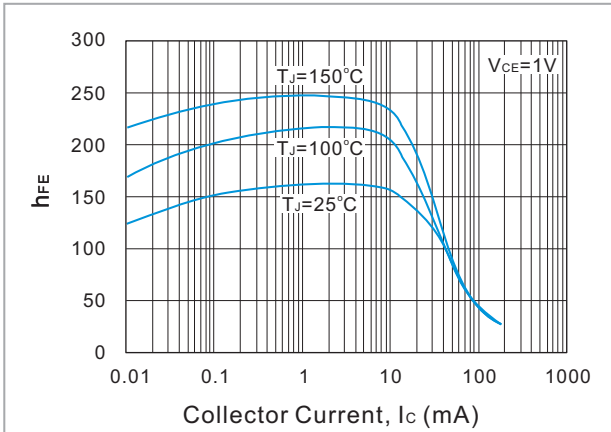
Note 2: Pulse Test: Pulse Width < 300 us, Duty Cycle < 2.0%.

### SWITCHING TIME EQUIVALENT TEST CIRCUITS

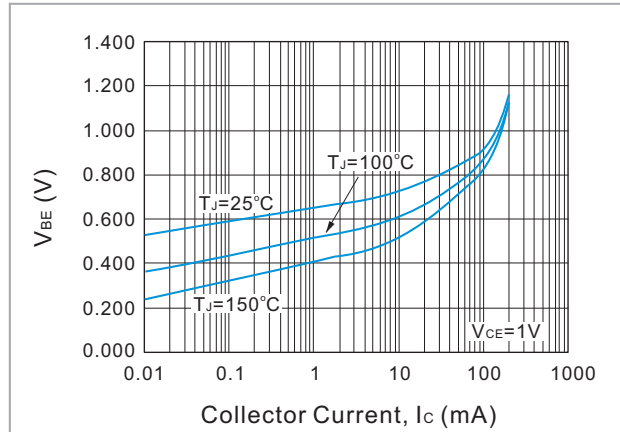


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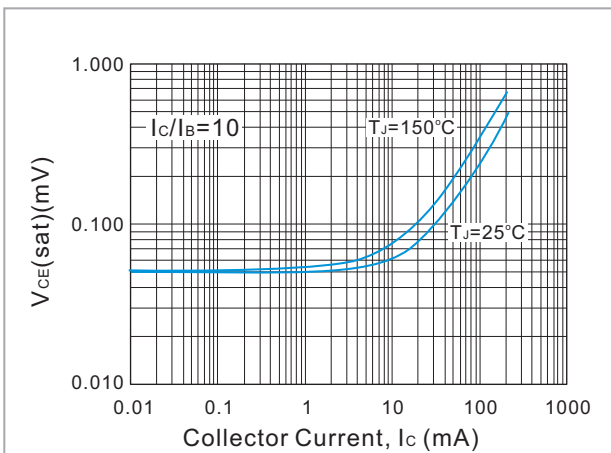
## ELECTRICAL CHARACTERISTICS CURVE



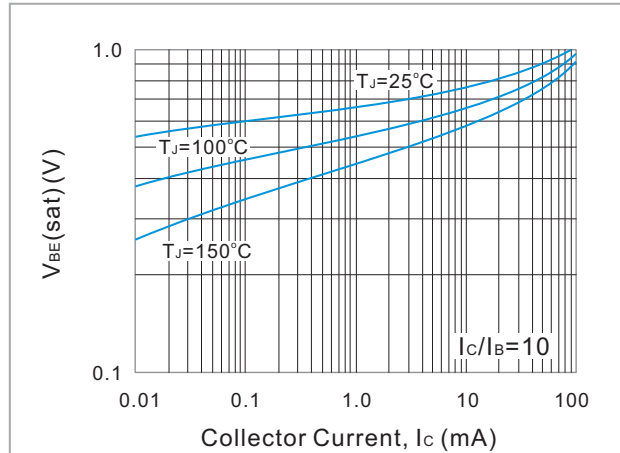
**Fig. 1. Typical  $h_{FE}$  vs. Collector Current**



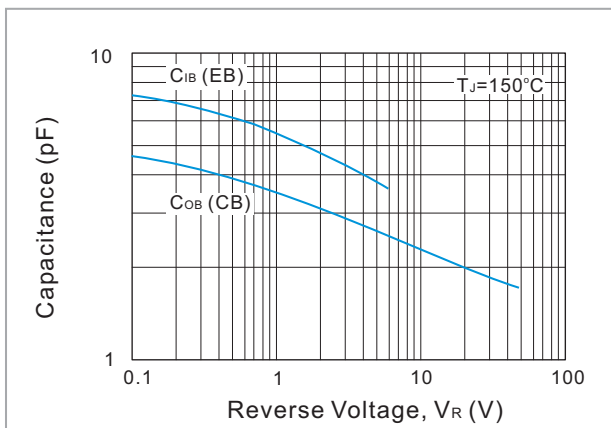
**Fig. 2. Typical  $V_{BE}$  vs. Collector Current**



**Fig. 3. Typical  $V_{CE(sat)}$  vs. Collector Current**



**Fig. 4. Typical  $V_{BE(sat)}$  vs Collector Current**



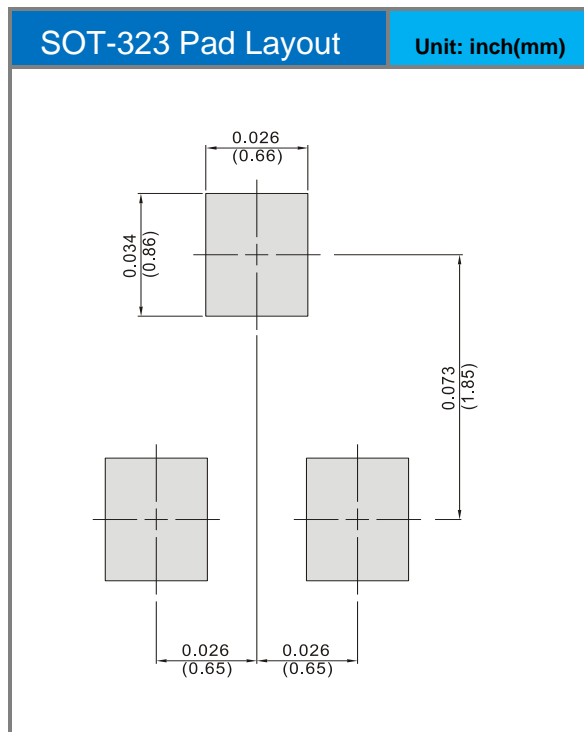
**Fig. 5. Typical Capacitances vs. Reverse Voltage**

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## Product and Packing Information

Part No.	Package Type	Packing Type	Marking
MMBT3904W	SOT-323	3K pcs / 7" reel	S1A
MMBT3904W	SOT-323	12K pcs / 13" reel	S1A

## Mounting Pad Layout



## MMBT3904W

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