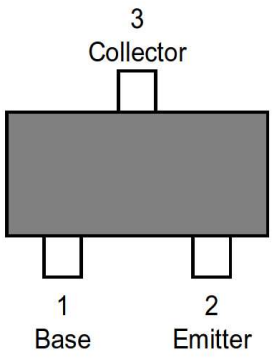
MMBT3904W
SOT-323 Silicon General Purpose Transistor (NPN)

General description
SOT-323 Silicon General Purpose Transistor (NPN)

FEATURES
- Simplifies Circuit Design
- RoHS Compliant
- Green EMC
- Matte Tin(Sn) Lead Finish
- Weight: approx. 0.001g

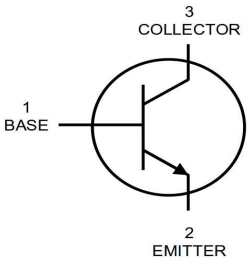
Top View



Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage	60	V
V_{CEO}	Collector-Emitter Voltage	40	V
V_{EBO}	Emitter-Base Voltage	6	V
I_C	Collector Current	200	mA
P_D	Power Dissipation (FR-4 Board – minimum pad)	150	mW
$R_{\theta JA}$	Thermal Resistance from Junction to Ambient	833	°C /W
T_J T_{STG}	Junction & Storage Temperature Range	-55 to +150	°C

Electrical Symbol:



. **Off Characteristics**

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 1)	I_C =1mA, I_B =0A	40	-	Volts
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C =10uA, I_E =0A	60	-	Volts
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E =10uA, I_B =0A	6	-	Volts
I_{BL}	Base Cutoff Current	V_{CE} =30V, V_{EB} =3V	-	50	nA
I_{CEX}	Collector Cutoff Current	V_{CE} =30V, V_{EB} =3V	-	50	nA

Note 1: Pulse Test. Pulse width <300us, Duty cycle < 2.0%

On Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
H_{FE}	DC Current Dain	I_C =0.1mA, V_{CE} =1V	40	-	-
		I_C =1.0mA, V_{CE} =1V	70	-	
		I_C =10mA, V_{CE} =1V	100	300	
		I_C =50mA, V_{CE} =1V	60	-	
		I_C =100mA, V_{CE} =1V	30	-	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=10mA, I_B=1mA	-	0.2	Volts
		I_C=50mA, I_B=5mA	-	0.3	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C=10mA, I_B=1mA	0.65	0.85	Volts
		I_C=50mA, I_B=5mA	-	0.95	

Small-signal Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
f_T	Current-Gain-Bandwidth Product	I_C =10mA, V_{CE} =20V, f = 100MHz	200	-	MHz
C_{obo}	Output Capacitance	V_{CB} =5V, I_E =0A, f = 1.0MHz	-	4	pF
C_{ibo}	Input Capacitance	V_{BE} =0.5V, I_C =0A, f = 1.0MHz	-	8	pF
h_{ie}	Input Impedancen	V_{CE} =10V, I_C =1mA, f = 1.0kHz	1	10	pF
h_{re}	Voltage Feedback Ratio	V_{CE} =10V, I_C =1mA, f = 1.0kHz	0.5	8	$X10^{-4}$
h_{fe}	Small-signal Current Gain	V_{CE} =10V, I_C =1mA, f = 1.0kHz	100	400	-
h_{oe}	Output Admittance	V_{CE} =10V, I_C =1mA, f = 1.0kHz	1	40	θ mhos
NF	Noise Figure	V_{CE} =5V, I_C =100uA Rs=1.0kΩ f = 1.0kHz		5	dB

Switching Characteristics

Symbol	Parameter	Test Condition	Limits		Unit
			Min	Max	
t_d	Delay Time	V_{CC} =3V, V_{BE} =0.5V,	-	35	nS
t_r	Rise Time	I_C =10mA, I_{B1} =1mA	-	35	
t_s	Storage Time	V_{CC} =3V, I_C =10mA,	-	200	nS
t_f	Fall Time	I_{B1} = I_{B2} =1mA	-	50	

Typical characteristics

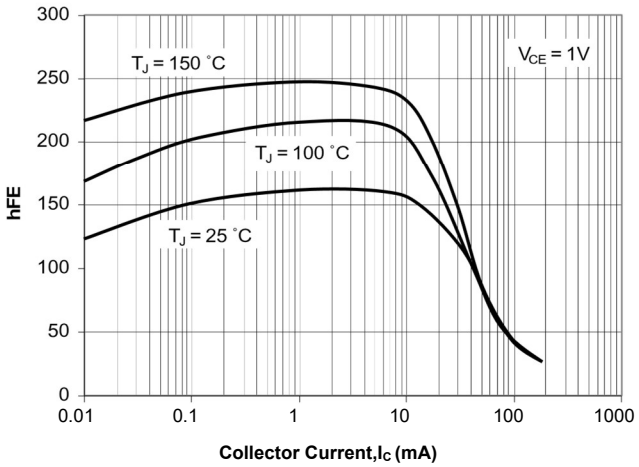


Fig. 1. Typical h_{FE} vs Collector Current

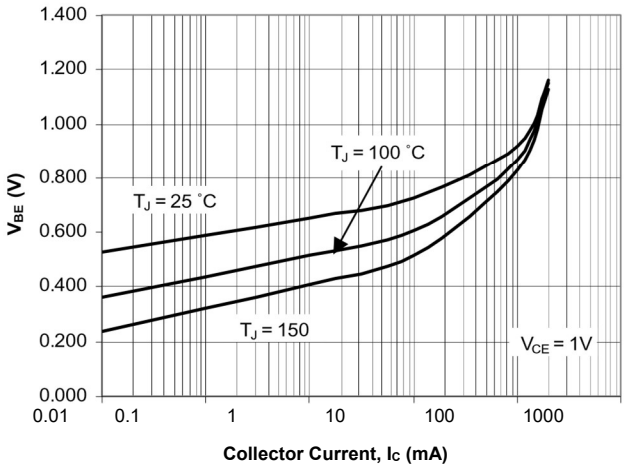


Fig. 2. Typical V_{BE} vs Collector Current

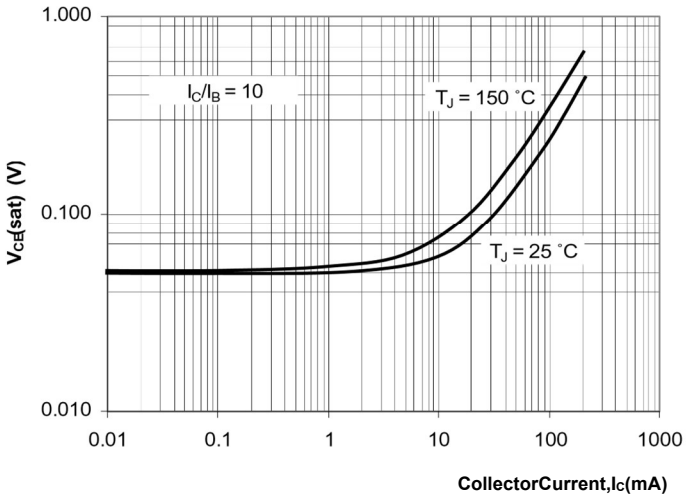


Fig. 3. Typical VCE (sat) vs Collector Current

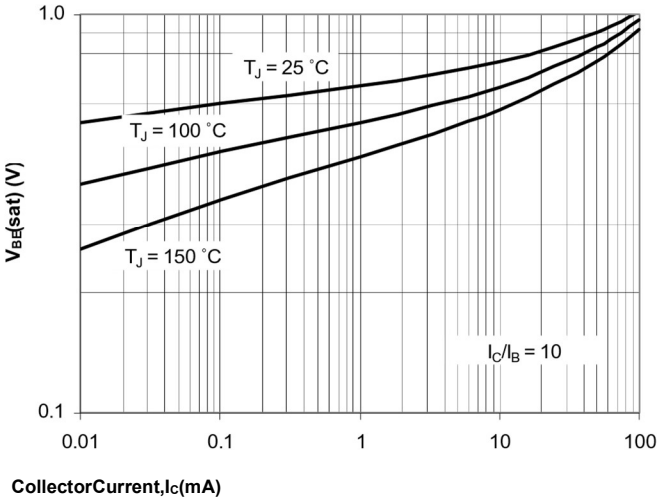


Fig. 4. Typical VBE (sat) vs Collector Current

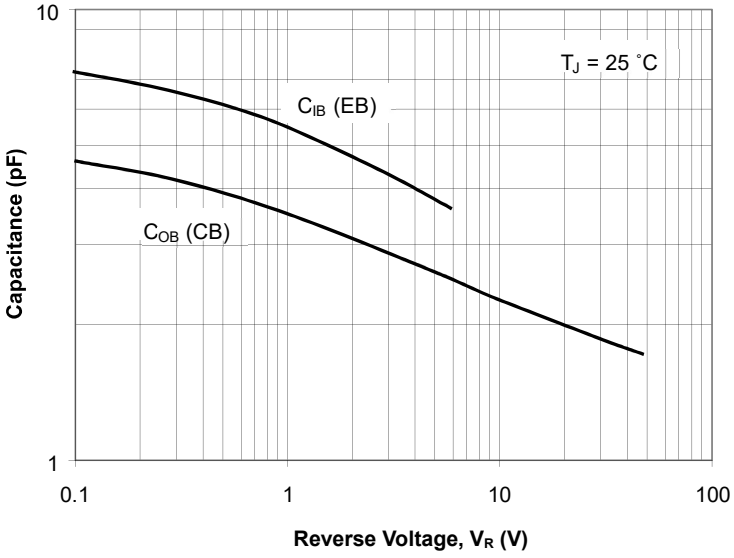
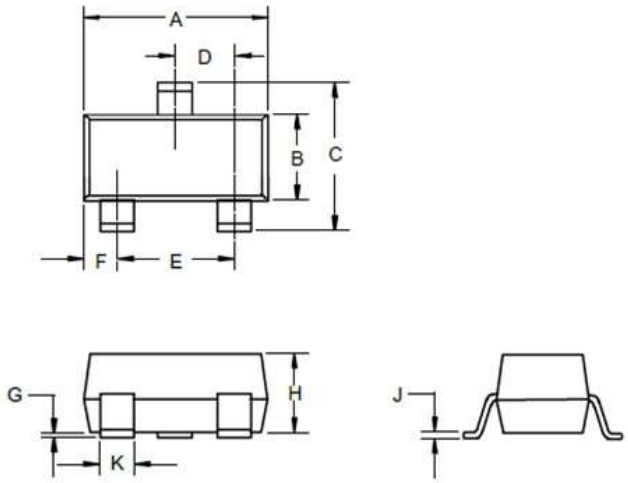


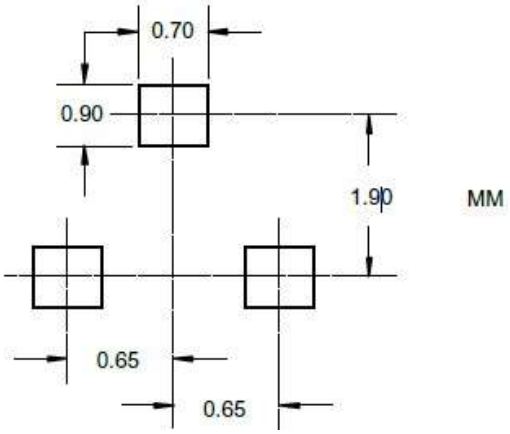
Fig. 5. Typical Capacitances vs Reverse Voltage

SOT-323 Package information



DIMENSIONS					
	INCHES		MM		
DIM	MIN	MAX	MIN	MAX	NOTE
A	.071	.087	1.80	2.20	
B	.045	.053	1.15	1.35	
C	.083	.096	2.10	2.45	
D	.026 Nominal		0.65Nominal		
E	.047	.055	1.20	1.40	
F	.012	.016	.30	.40	
G	.000	.004	.000	.100	
H	.035	.039	.90	1.00	
J	.004	.010	.100	.250	
K	.006	.016	.15	.40	

Suggested Pad Layout



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