

300mW, NPN Small Signal Transistor

FEATURES

- Low power loss, high efficiency
- Ideal for automated placement
- High surge current capability
- Moisture sensitivity level: level 1, per J-STD-020
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

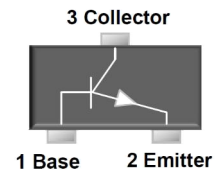
APPLICATIONS

- Switching mode power supply (SMPS)
- Adapters
- Lighting application
- On-board DC/DC converter

MECHANICAL DATA

- Case: SOT-23
- Molding compound meets UL 94 V-0 flammability rating
- Terminal: Matte tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 1A whisker test
- Weight: 8 mg (approximately)

KEY PARAMETERS		
PARAMETER	VALUE	UNIT
V_{CBO}	60	V
V_{CEO}	40	V
V_{EBO}	6	V
I_C	200	mA
h_{FE}	400	
Package	SOT-23	
Configuration	Single die	



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	MMBT3904	UNIT
Marking code on the device		1AM	
Collector-base voltage	V_{CBO}	60	V
Collector-emitter voltage	V_{CEO}	40	V
Emitter-base voltage	V_{EBO}	6	V
Collector current	I_C	200	mA
Power dissipation	P_D	300	mW
Junction temperature	T_J	-55 to +150	$^\circ\text{C}$
Storage temperature	T_{STG}	-55 to +150	$^\circ\text{C}$

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Collector-base breakdown voltage	$I_C = 10\ \mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	60	-	-	V
Collector-emitter breakdown voltage	$I_C = 1\ \text{mA}, I_B = 0$	$V_{(BR)CEO}$	40	-	-	V
Emitter-base breakdown voltage	$I_E = 10\ \mu\text{A}, I_C = 0$	$V_{(BR)EBO}$	6	-	-	V
Collector cutoff current	$V_{CB} = 60\ \text{V}, I_E = 0$	I_{CBO}	-	-	0.1	μA
Collector cutoff current	$V_{CE} = 30\ \text{V}, V_{BE(OFF)} = 3\ \text{V}$	I_{CEO}	-	-	50	nA
Emitter cutoff current	$V_{EB} = 5\ \text{V}, I_C = 0$	I_{EBO}	-	-	0.1	μA
DC current gain	$V_{CE} = 1\ \text{V}, I_C = 10\ \text{mA}$	h_{FE}	100	-	400	
	$V_{CE} = 1\ \text{V}, I_C = 50\ \text{mA}$		60	-	-	
	$V_{CE} = 1\ \text{V}, I_C = 100\ \text{mA}$		30	-	-	
Collector-emitter saturation voltage	$I_C = 50\ \text{mA}, I_B = 5\ \text{mA}$	$V_{CE(sat)}$	-	-	0.30	V
Base-emitter saturation voltage	$I_C = 50\ \text{mA}, I_B = 5\ \text{mA}$	$V_{BE(sat)}$	-	-	0.95	V
Transition frequency	$V_{CE} = 20\ \text{V}, I_C = 10\ \text{mA}, f = 100\text{MHz}$	f_T	250	-	-	MHz
Delay time	$V_{CC}=3\text{V}, V_{BE}=0.5\text{V}, I_C=10\text{mA}, I_{B1}=1\text{mA}$	t_d	-	-	35	ns
Rise time		t_r	-	-	35	ns
Storage time	$V_{CC}=3\text{V}, I_{B1}=I_{B2}=1\text{mA}, I_C=10\text{mA}$	t_s	-	-	200	ns
Fall time		t_f	-	-	50	ns

ORDERING INFORMATION

ORDERING CODE	PACKAGE	PACKING
MMBT3904 RF	SOT-23	3K / 7" Reel
MMBT3904 RFG	SOT-23	3K / 7" Reel
MMBT3904 R5	SOT-23	10K / 13" Reel
MMBT3904 R5G	SOT-23	10K / 13" Reel
MMBT3904-D0 RF	SOT-23	3K / 7" Reel
MMBT3904-D0 RFG	SOT-23	3K / 7" Reel
MMBT3904-D0 R5	SOT-23	10K / 13" Reel
MMBT3904-D0 R5G	SOT-23	10K / 13" Reel
MMBT3904-B0 RF	SOT-23	3K / 7" Reel
MMBT3904-B0 RFG	SOT-23	3K / 7" Reel
MMBT3904-B0 R5	SOT-23	10K / 13" Reel
MMBT3904-B0 R5G	SOT-23	10K / 13" Reel

CHARACTERISTICS CURVES

($T_A = 25^\circ\text{C}$ unless otherwise noted)

Fig. 1 Typical Pulsed Current Gain VS. Collector Current

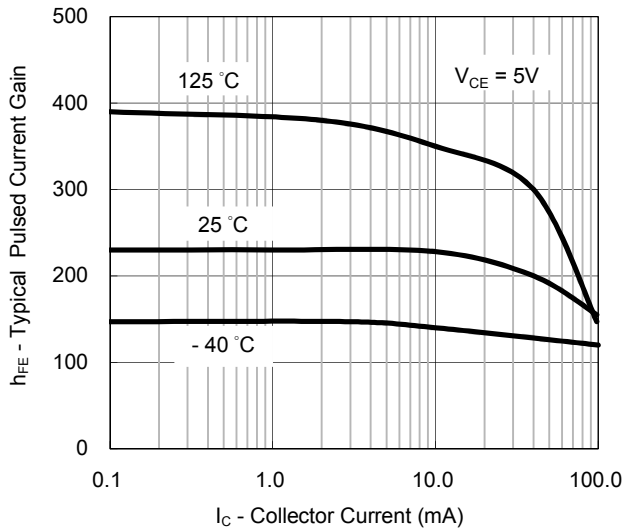


Fig.2 Collector-Emitter Saturation Voltage VS. Collector Current

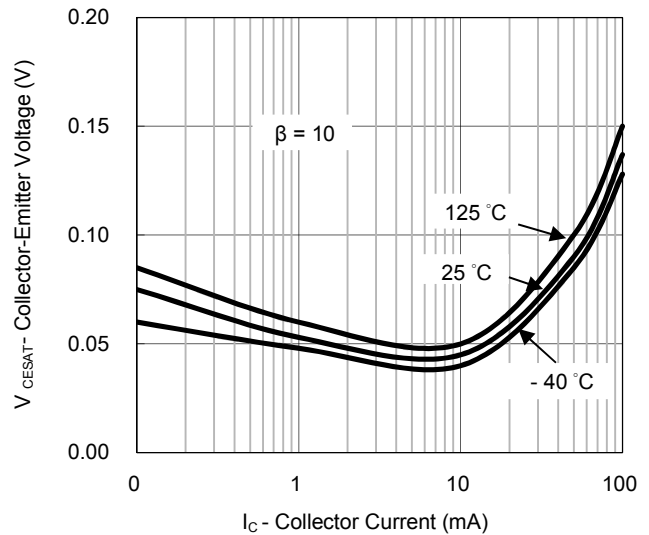


Fig.3 Base-Emitter Saturation Voltage VS. Collector Current

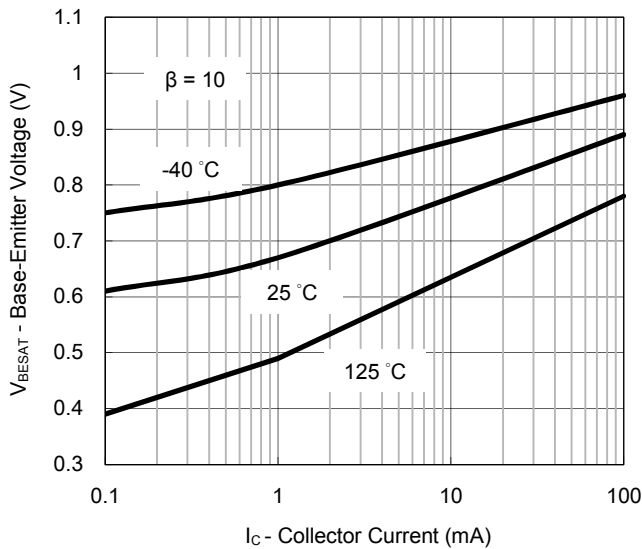
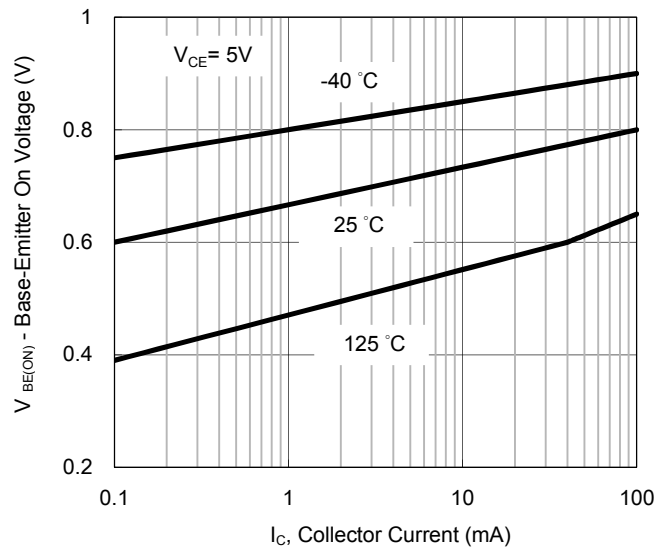


Fig.4 Base-Emitter On Voltage VS. Collector Current



CHARACTERISTICS CURVES

($T_A = 25^\circ\text{C}$ unless otherwise noted)

**Fig. 5 Collector-Cutoff Current
VS. Ambient Temperature**

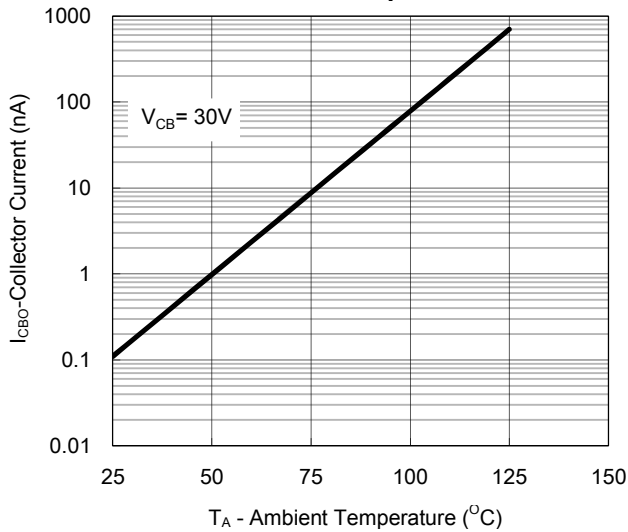
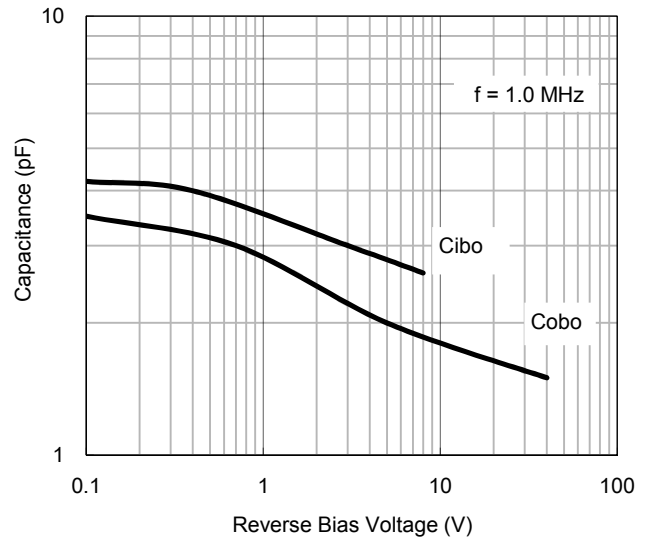
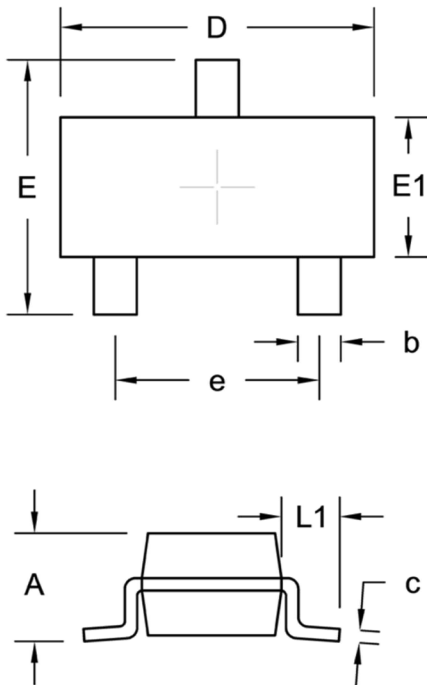


Fig. 6 Capacitance VS. Reverse Bias Voltage



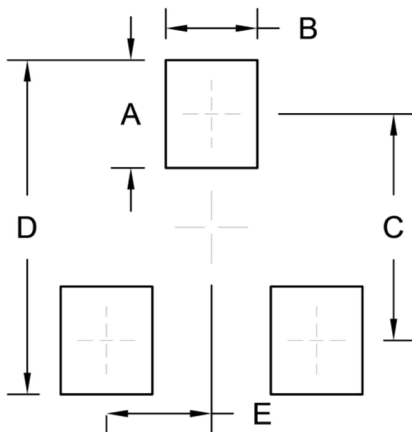
PACKAGE OUTLINE DIMENSION

SOT-23



DIM.	Unit (mm)		Unit (inch)	
	Min.	Max.	Min.	Max.
A	0.89	1.12	0.035	0.044
b	0.30	0.50	0.012	0.020
c	0.08	0.20	0.003	0.008
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.083	0.104
E1	1.20	1.40	0.047	0.055
e	1.90 BSC		0.075 BSC	
L1	0.54 REF.		0.021 REF.	

SUGGESTED PAD LAYOUT



Symbol	Unit (mm)	Unit (inch)
A	1.00	0.039
B	0.85	0.033
C	2.10	0.083
D	3.10	0.122
E	0.98	0.039

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