

350mW, NPN Small Signal Transistor

FEATURES

- AEC-Q101 qualified
- Low power loss, high efficiency
- Ideal for automated placement
- Moisture sensitivity level: level 1, per J-STD-020
- RoHS Compliant
- Halogen-free

APPLICATIONS

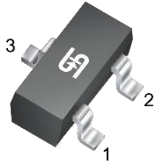
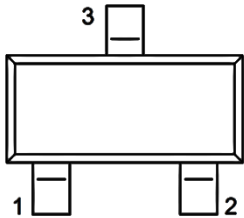
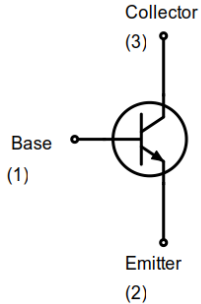
- General switching and amplification

MECHANICAL DATA

- Case: SOT-23
- Molding compound meets UL 94V-0 flammability rating
- Terminal: Matte tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Weight: 8.00mg (approximately)



KEY PARAMETERS		
PARAMETER	VALUE	UNIT
V_{CBO}	60	V
V_{CEO}	40	V
V_{EBO}	6	V
I_C	200	mA
h_{FE}	300	
Configuration	Single die	

PACKAGE: SOT-23	PIN CONFIGURATION	CIRCUIT DIAGRAM
		

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Power dissipation ⁽¹⁾	P_D	350	mW
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
Junction temperature	T_J	-55 to +150	$^\circ\text{C}$
Storage temperature	T_{STG}	-55 to +150	$^\circ\text{C}$

Note:

1. Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint

THERMAL PERFORMANCE

PARAMETER	SYMBOL	TYP	UNIT
Junction-to-ambient thermal resistance ⁽¹⁾	$R_{\theta JA}$	357	°C/W

Thermal Performance Note:

1. Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint

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

PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Collector-base breakdown voltage	$I_C = 10\mu\text{A}$, $I_E = 0\text{A}$	$V_{(BR)CBO}$	60	-	-	V
Collector-emitter breakdown voltage	$I_C = 1\text{mA}$, $I_B = 0\text{A}$	$V_{(BR)CEO}$	40	-	-	V
Emitter-base breakdown voltage	$I_E = 10\mu\text{A}$, $I_C = 0\text{A}$	$V_{(BR)EBO}$	6	-	-	V
Collector-base cut-off current	$V_{CB} = 60\text{V}$, $I_E = 0\text{A}$	I_{CBO}	-	-	0.1	μA
Collector cut-off current	$V_{CE} = 30\text{V}$, $V_{EB(off)} = 3\text{V}$	I_{CEX}	-	-	50	nA
Emitter-base cut-off current	$V_{EB} = 5\text{V}$, $I_C = 0\text{A}$	I_{EBO}	-	-	0.1	μA
DC current gain	$V_{CE} = 1\text{V}$, $I_C = 0.1\text{mA}$	h_{FE}	40	-	-	-
	$V_{CE} = 1\text{V}$, $I_C = 1\text{mA}$		70	-	-	
	$V_{CE} = 1\text{V}$, $I_C = 10\text{mA}$		100	-	300	
	$V_{CE} = 1\text{V}$, $I_C = 50\text{mA}$		60	-	-	
	$V_{CE} = 1\text{V}$, $I_C = 100\text{mA}$		30	-	-	
Collector-emitter saturation voltage	$I_C = 10\text{mA}$, $I_B = 1\text{mA}$	$V_{CE(sat)}$	-	-	0.2	V
	$I_C = 50\text{mA}$, $I_B = 5\text{mA}$		-	-	0.3	
Base-emitter saturation voltage	$I_C = 10\text{mA}$, $I_B = 1\text{mA}$	$V_{BE(sat)}$	0.65	-	0.85	V
	$I_C = 50\text{mA}$, $I_B = 5\text{mA}$		-	-	0.95	
Transition frequency	$V_{CE} = 20\text{V}$, $I_C = 10\text{mA}$, $f = 100\text{MHz}$	f_T	300	-	-	MHz
Output capacitance	$V_{CB} = 5\text{V}$, $I_E = 0\text{A}$, $f = 1\text{MHz}$	C_{obo}	-	-	4	pF
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	$V_{CC} = 3\text{V}$, $I_C = 10\text{mA}$, $I_{B1} = I_{B2} = 1\text{mA}$	t_s	-	-	200	ns
Fall time		t_f	-	-	50	ns

ORDERING AND MARKING INFORMATION

ORDERING CODE	PACKAGE	PACKING
MMBT3904H RFG	SOT-23	3,000 / 7" Tape & Reel

CHARACTERISTICS CURVES

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

Fig.1 Power Dissipation Curve

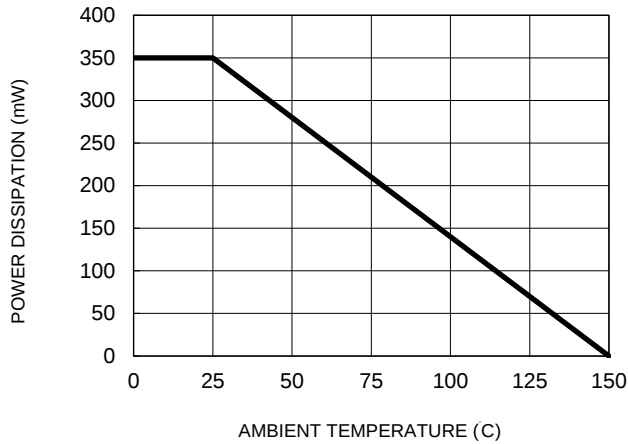


Fig.2 Typical Capacitance Characteristics

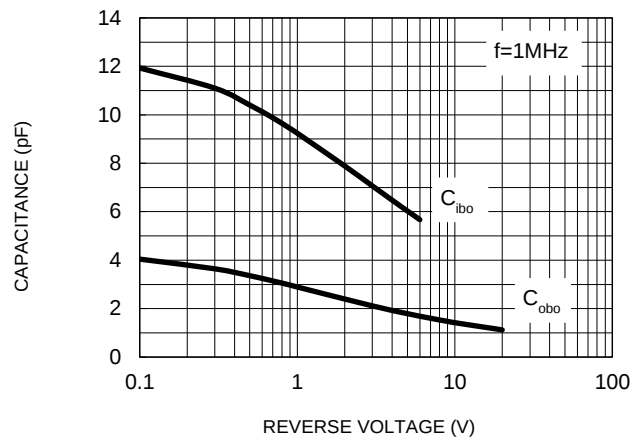


Fig.3 DC Current Gain vs. Collector Current

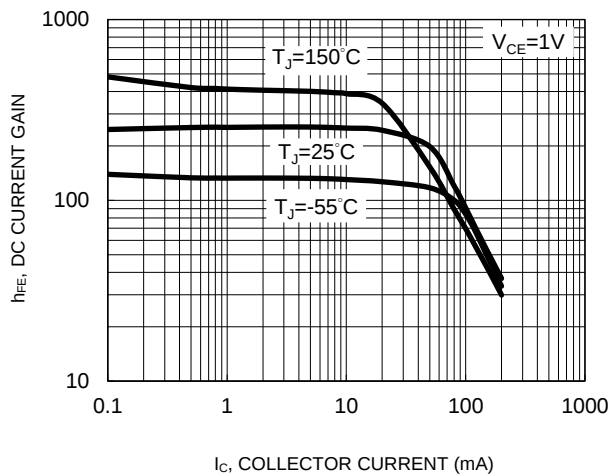


Fig.4 Collector-Emitter Saturation Voltage vs. Collector Current

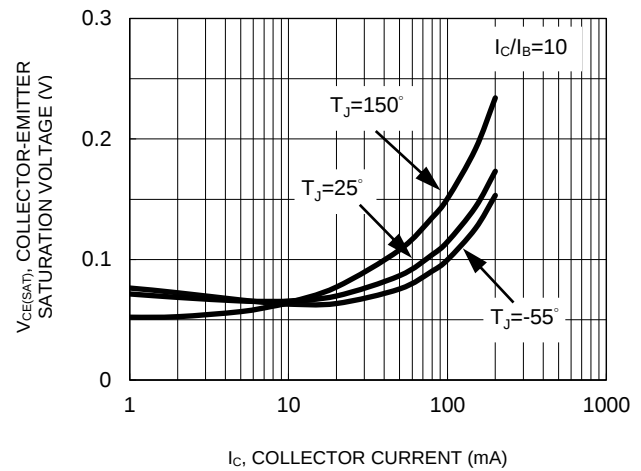


Fig.5 Base-Emitter Saturation Voltage vs. Collector Current

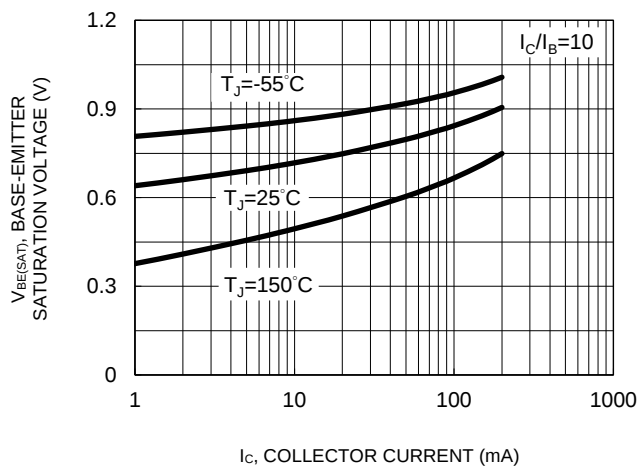
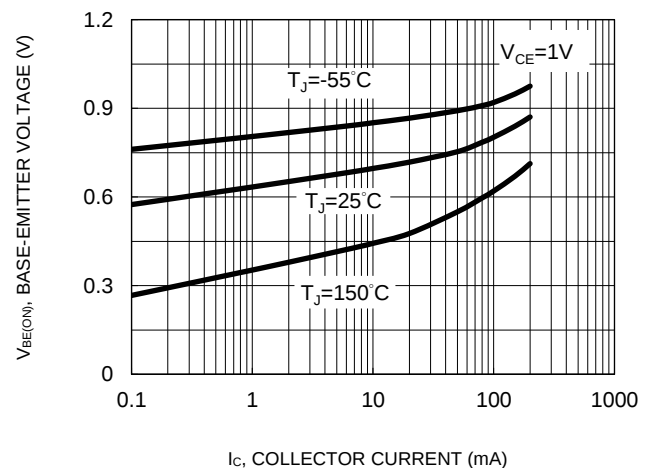
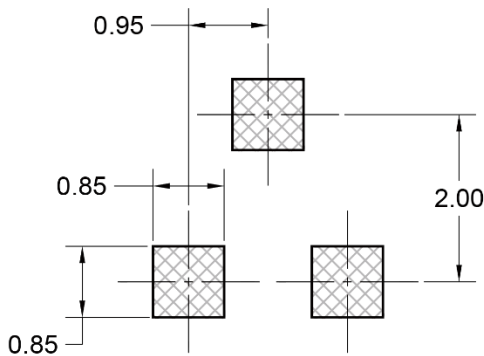
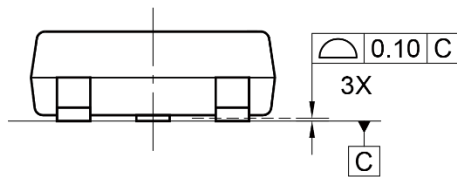
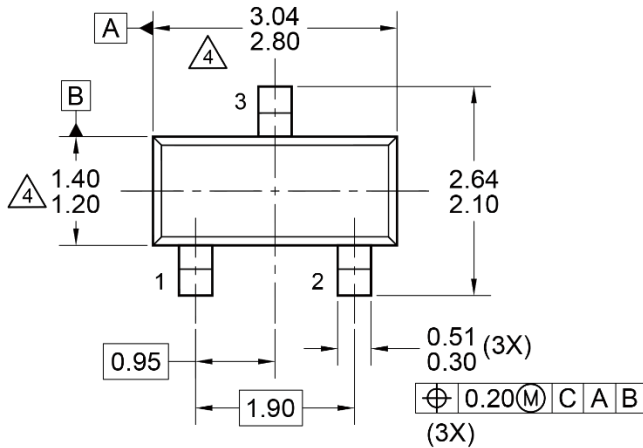


Fig.6 Base-Emitter Voltage vs. Collector Current

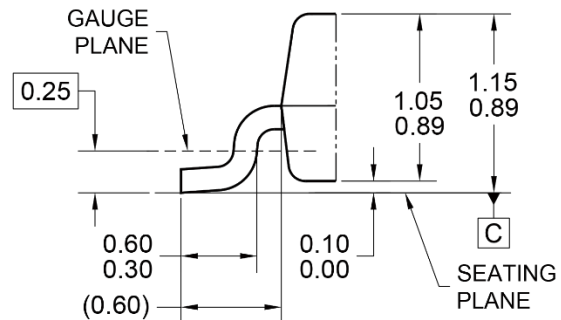
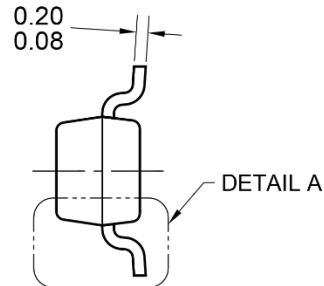


PACKAGE OUTLINE DIMENSIONS

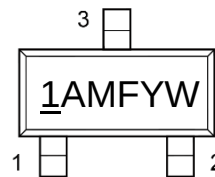
SOT-23



SUGGESTED PAD LAYOUT



DETAIL A, ROTATED -90°
(SCALE 2:1)



MARKING DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED

- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- PACKAGE OUTLINE REFERENCE: JEDEC TO-236, ISSUE H, VARIATION AA.
- MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
- DWG NO. REF: HQ2SD07-SOT23JEDEC-104 REV B.

- 1AM = Device marking
F = Factory code
Y = Year code
W = Bi-Week code (A~Z)

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