

60V, NPN General-Purpose Transistor

FEATURES

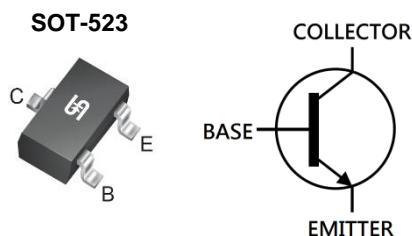
- Complementary PNP Type: MMBT3906T
- Epitaxial Planar Type
- $V_{CE0} > 40V$
- $I_C = 200mA$ Collector Current
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT	
V_{CBO}	60	V	
V_{CEO}	40	V	
I_C	200	mA	
$V_{CE(sat)}$	$I_C = 10mA, I_B = 1mA$	0.2	V

APPLICATION

- Consumer electronics
- Low frequency amplifier
- Driver



Notes: MSL 1 (Moisture Sensitivity Level) per J-STD-020

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ C$ unless otherwise noted)

PARAMETER	SYMBOL	VALUE	UNIT
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	150	mW
Junction temperature	T_J	-55 to +150	$^\circ C$
Storage temperature	T_{STG}	-55 to +150	$^\circ C$

THERMAL PERFORMANCE

PARAMETER	SYMBOL	TYP	UNIT
Junction-to-ambient thermal resistance	$R_{\theta JA}$	397	$^\circ C/W$

Thermal Performance Note: Units mounted on PCB (10mm x 5mm Cu pad test board)

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static⁽¹⁾						
Collector-Emitter Breakdown Voltage	$I_C = 1.0\text{mA}, I_B = 0\text{A}$	$V_{(BR)CEO}$	40	-	-	V
Collector-Base Breakdown Voltage	$I_C = 10\mu\text{A}, I_E = 0\text{A}$	$V_{(BR)CBO}$	60	-	-	V
Emitter-Base Breakdown Voltage	$I_E = 10\mu\text{A}, I_C = 0\text{A}$	$V_{(BR)EBO}$	6	-	-	V
Emitter Cut-Off Current	$V_{CB} = 30\text{V}, I_E = 0\text{A}$	I_{CBO}	-	-	50	nA
Collector Cut-Off Current	$V_{EB} = 5\text{V}, I_E = 0\text{A}$	I_{EBO}	-	-	50	nA
Collector-Emitter Saturation Voltage	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$	$V_{CE(sat)}$	-	-	0.2	V
	$I_C = 50\text{mA}, I_B = 5.0\text{mA}$		-	-	0.3	V
Base-Emitter Saturation Voltage	$I_C = 10\text{mA}, I_B = 1.0\text{mA}$	$V_{BE(sat)}$	0.65	-	0.85	V
	$I_C = 50\text{mA}, I_B = 5.0\text{mA}$		-	-	0.95	V
Output Capacitance	$V_{CB} = 5.0\text{V}, I_E = 0, f = 1\text{MHz}$	C_{obo}	-	-	4	pF
Input Capacitance	$V_{EB} = 0.5\text{V}, I_C = 0, f = 1\text{MHz}$	C_{ibo}	-	-	8	pF
DC Current Gain	$I_C = 0.1\text{mA}, V_{CE} = 1.0\text{V}$	h_{FE}	40	-	-	-
	$I_C = 1.0\text{mA}, V_{CE} = 1.0\text{V}$		70	-	-	
	$I_C = 10\text{mA}, V_{CE} = 1.0\text{V}$		100	-	300	
	$I_C = 50\text{mA}, V_{CE} = 1.0\text{V}$		60	-	-	
	$I_C = 100\text{mA}, V_{CE} = 1.0\text{V}$		30	-	-	
Dynamic⁽²⁾						
Transition Frequency	$I_C = 10\text{mA}, V_{CE} = 20\text{V}, f = 100\text{MHz}$	f_T	300	-	-	MHz
Delay Time	$V_{CC} = 3.0\text{V}, V_{BE(OFF)} = -0.5\text{V}, I_C = 10\text{mA}, I_{B1} = 1.0\text{mA}$	t_d	-	-	35	ns
Rise Time		t_r	-	-	35	ns
Storage Time	$V_{CC} = 3.0\text{V}, I_C = 10\text{mA}$	t_s	-	-	200	ns
Fail Time	$I_{B1} = I_{B2} = 1.0\text{mA}$	t_f	-	-	50	ns

Notes:

1. Pulse test: $\leq 380\mu\text{s}$, duty cycle $\leq 2\%$
2. For DESIGN AID ONLY, not subject to production testing

ORDERING INFORMATION		
ORDERING CODE	PACKAGE	PACKING
MMBT3904T RSG	SOT-523	3,000 / 7" Tape & Reel

CHARACTERISTICS CURVES

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

Fig.1 Collector-Emitter Saturation Voltage vs. Collector Current

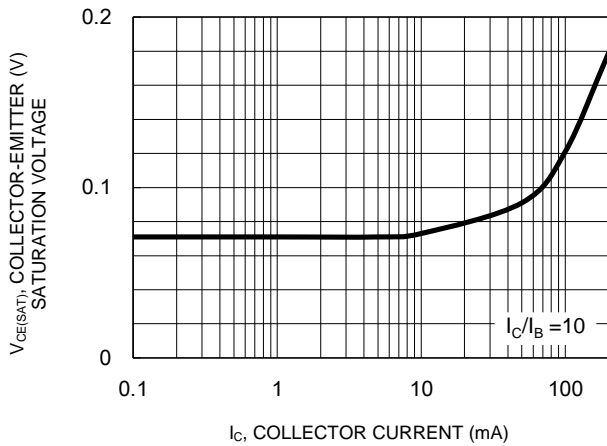


Fig.2 Base-Emitter Saturation Voltage vs. Collector Current

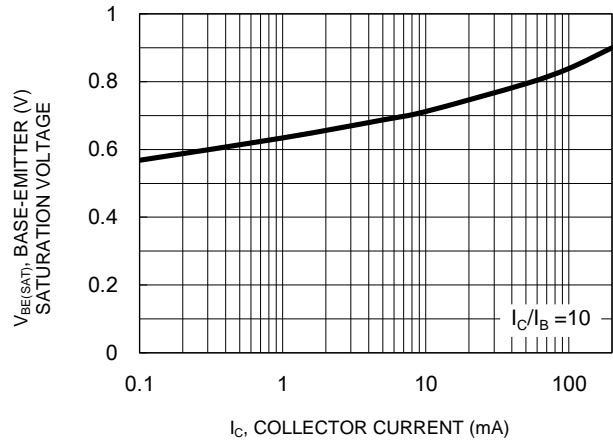


Fig.3 DC Current Gain vs. Collector Current

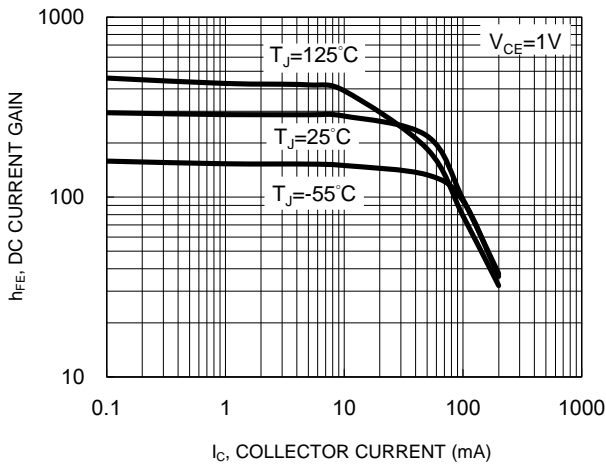


Fig.4 Input and Output Capacitance vs. Bias Voltage

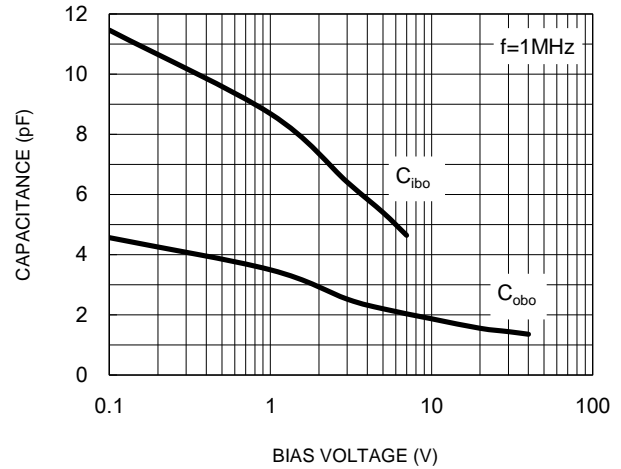
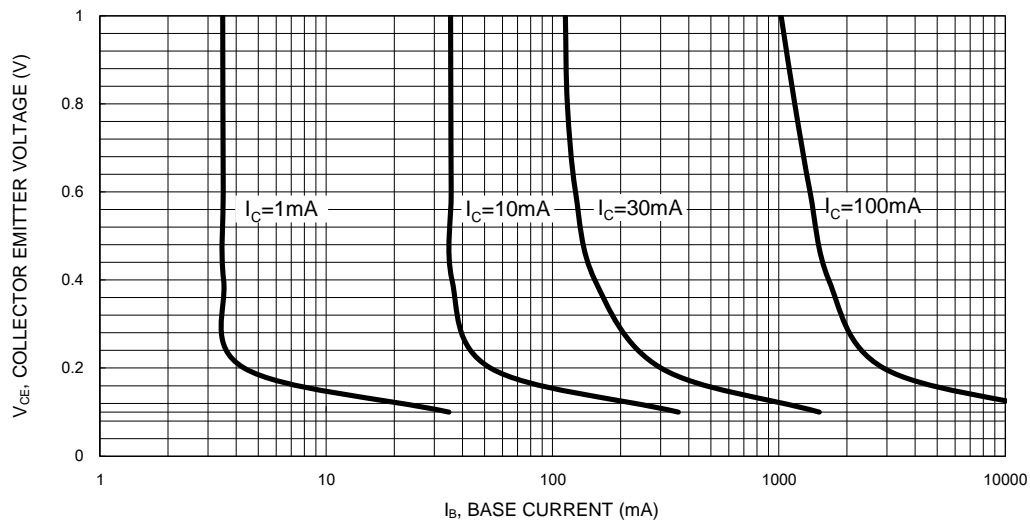
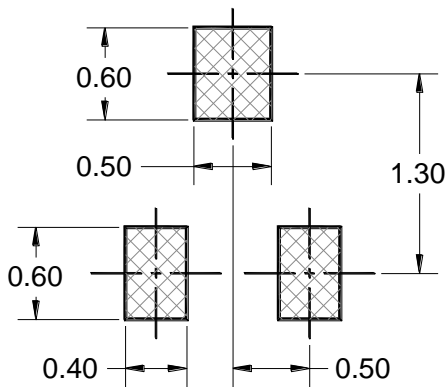
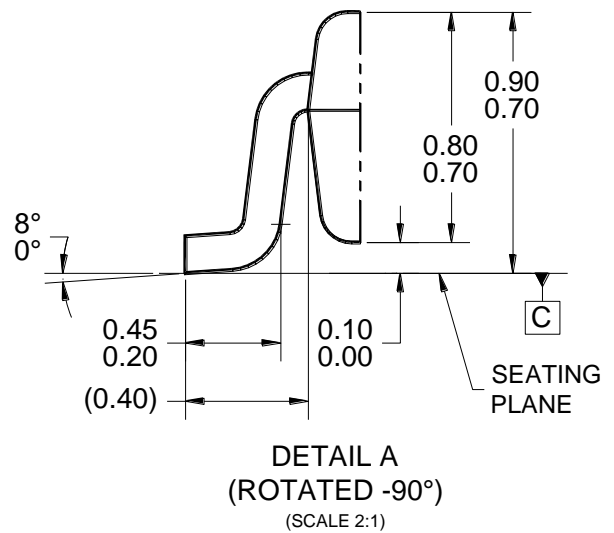
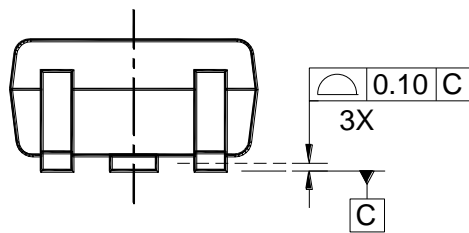
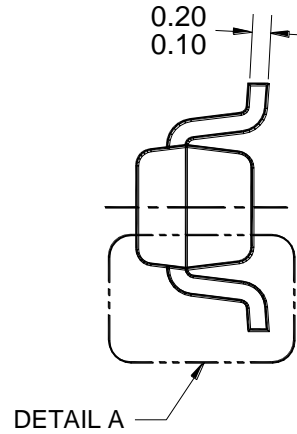
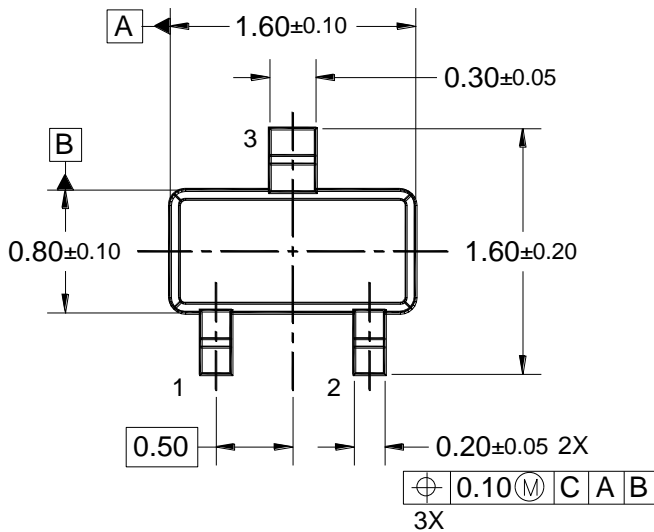


Fig.5 Collector Saturation Region



PACKAGE OUTLINE DIMENSIONS

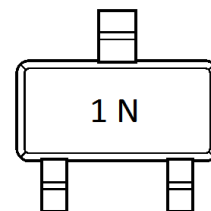
SOT-523



SUGGESTED PAD LAYOUT

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: EIAJ ED-7500A, SC-75.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-SOT523-029 REV A.



MARKING DIAGRAM

1N = MARKING CODE

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