

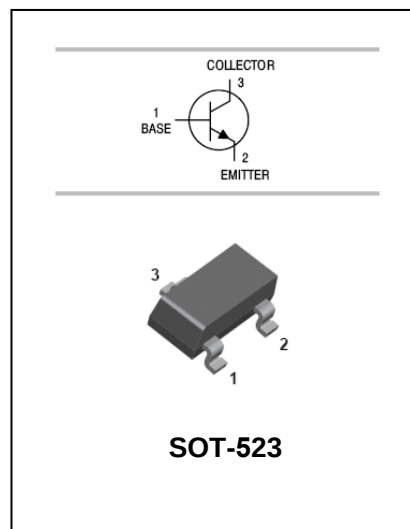
NPN SWITCHING TRANSISTOR

FEATURES

- Epitaxial planar die construction.
- Complementary PNP type available (MMBT3906).
- Collector Current Capability $I_{CM}=200\text{mA}$.
- Collector-emitter Voltage $V_{CEO}=40\text{V}$.
- MSL 3



Lead-free



APPLICATIONS

- General switching and amplification

ORDERING INFORMATION

Type No.	Marking	Package Code
MMBT3904FX	1AF	SOT-523

MAXIMUM RATING @ $T_a=25^\circ\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	Value	UNIT
V_{CBO}	collector-base voltage	open emitter	60	V
V_{CEO}	collector-emitter voltage	open base	40	V
V_{EBO}	emitter-base voltage	open collector	6	V
I_C	collector current (DC)		200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	200	mW
T_{stg}	storage temperature		-55 to +150	$^\circ\text{C}$
T_j	junction temperature		150	$^\circ\text{C}$
T_{amb}	operating ambient temperature		-55 to +150	$^\circ\text{C}$

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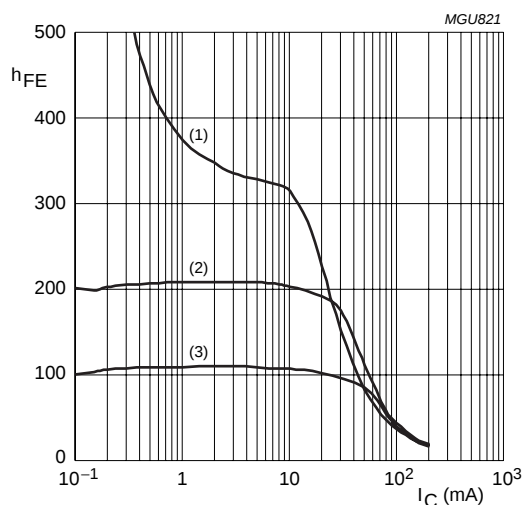
ELECTRICAL CHARACTERISTICS @ Ta=25°C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 60\text{ V}$	-	0.1	μA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 5\text{ V}$	-	0.1	μA
h_{FE}	DC current gain	$V_{CE} = 1\text{ V};$			
		$I_C = 10\text{ mA}$	100	-	
		$I_C = 50\text{ mA}$	60	300	
		$I_C = 100\text{ mA}$	30	-	
$V_{CE(sat)}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	-	200	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	-	300	mV
$V_{BE(sat)}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	650	850	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	-	950	mV
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 20\text{ V};$ $f = 100\text{ MHz}$	300	-	MHz
Switching times (between 10% and 90% levels);					
t_d	delay time	$V_{CC} = 3\text{ Vdc}, V_{BE} = -0.5\text{ Vdc}$	-	35	ns
t_r	rise time	$I_C = 10\text{ mA}, I_{B1} = 1\text{ mA}$	-	35	ns
t_s	storage time	$V_{CC} = 3\text{ Vdc}, I_C = 10\text{ mA}$	-	200	ns
t_f	fall time	$I_{B1} = I_{B2} = 1\text{ mA}$	-	50	ns

Note Pulse test: $t_p \leq 300\text{ ms}; d \leq 0.02$.

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TYPICAL CHARACTERISTICS @ $T_a=25^\circ\text{C}$ unless otherwise specified



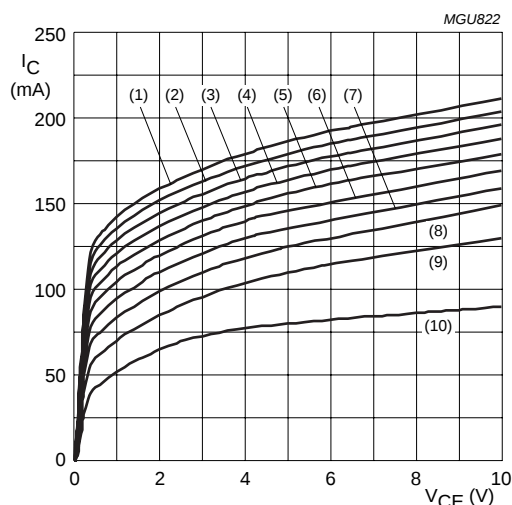
$V_{CE} = 1\text{ V.}$

(1) $T_{amb} = 150^\circ\text{C.}$

(2) $T_{amb} = 25^\circ\text{C.}$

(3) $T_{amb} = -55^\circ\text{C.}$

Fig.2 DC current gain; typical values.



$T_{amb} = 25^\circ\text{C.}$

(1) $I_B = 5\text{ mA.}$

(2) $I_B = 4.5\text{ mA.}$

(3) $I_B = 4\text{ mA.}$

(4) $I_B = 3.5\text{ mA.}$

(5) $I_B = 3\text{ mA.}$

(6) $I_B = 2.5\text{ mA.}$

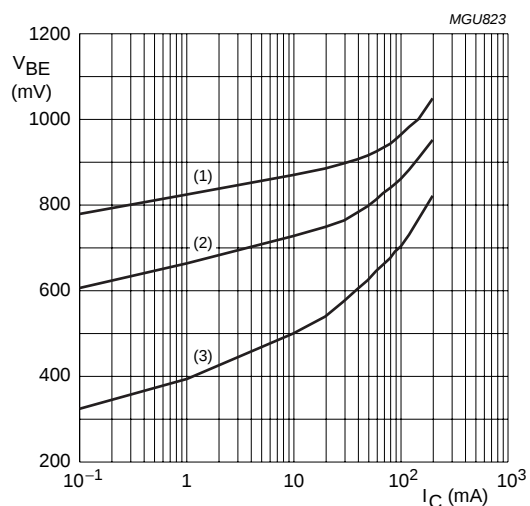
(7) $I_B = 2\text{ mA.}$

(8) $I_B = 1.5\text{ mA.}$

(9) $I_B = 1\text{ mA.}$

(10) $I_B = 0.5\text{ mA.}$

Fig.3 Collector current as a function of collector-emitter voltage.



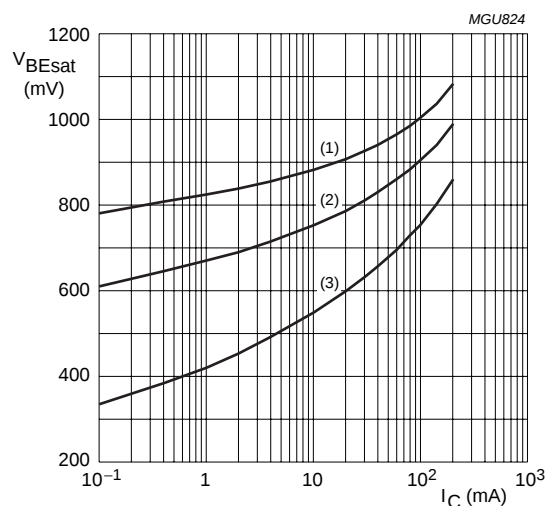
$V_{CE} = 1\text{ V.}$

(1) $T_{amb} = -55^\circ\text{C.}$

(2) $T_{amb} = 25^\circ\text{C.}$

(3) $T_{amb} = 150^\circ\text{C.}$

Fig.4 Base-emitter voltage as a function of collector current.



$I_C/I_B = 10.$

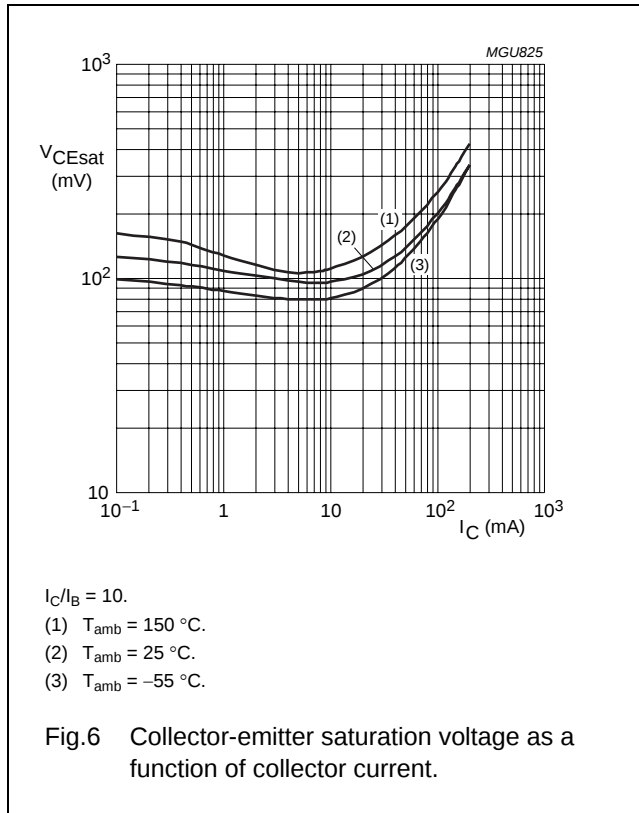
(1) $T_{amb} = -55^\circ\text{C.}$

(2) $T_{amb} = 25^\circ\text{C.}$

(3) $T_{amb} = 150^\circ\text{C.}$

Fig.5 Base-emitter saturation voltage as a function of collector current.

NPN SWITCHING TRANSISTOR

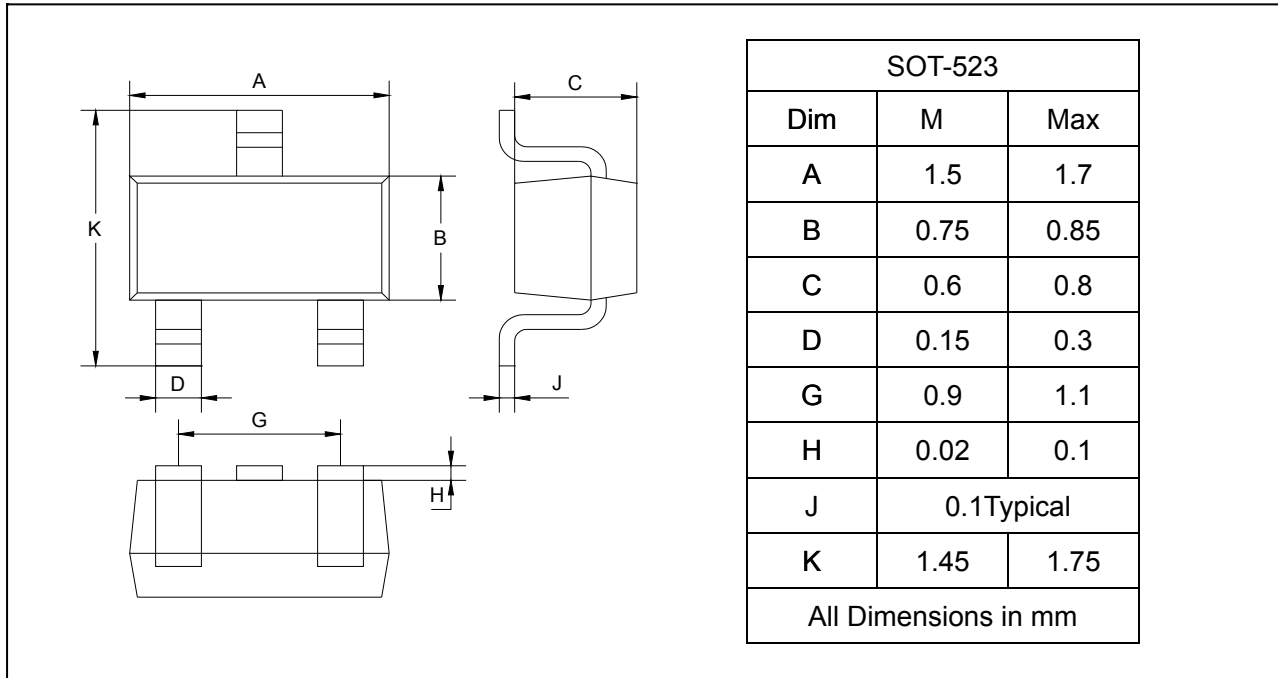


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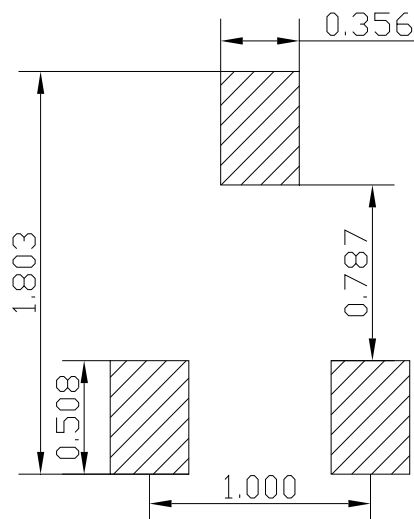
PACKAGE OUTLINE

Plastic surface mounted package

SOT-523



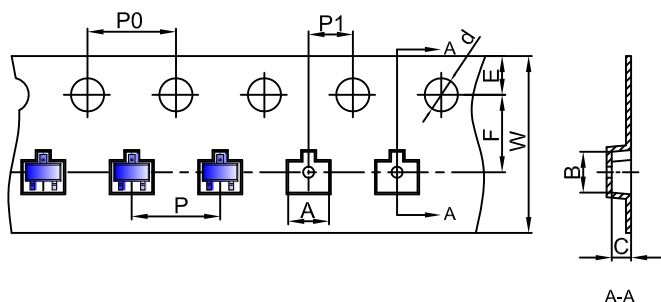
SOLDERING FOOTPRINT



Unit : mm

NPN SWITCHING TRANSISTOR

SOT-523 Embossed Carrier Tape

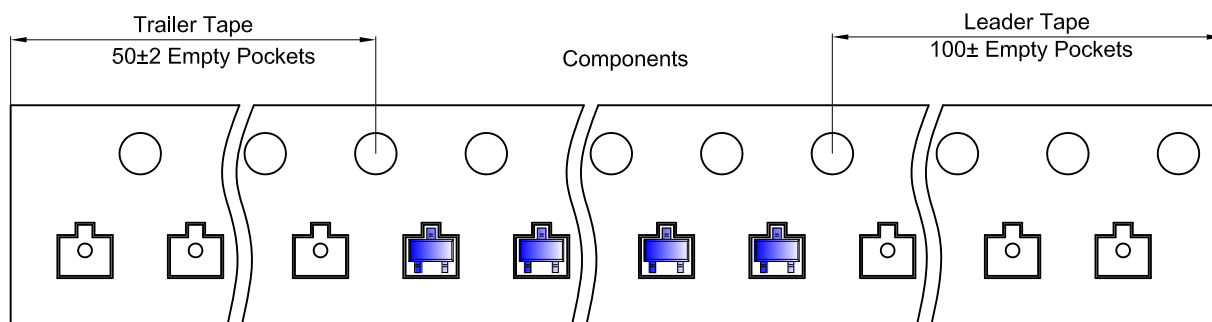


Packaging Description:

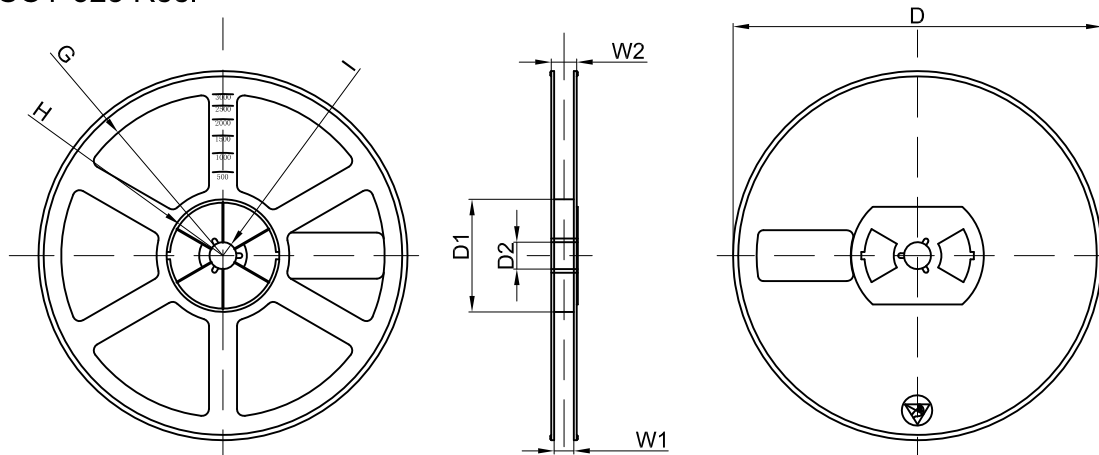
SOT-523 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-523	1.85	1.85	0.875	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-523 Tape Leader and Trailer



SOT-523 Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30