




SPECIFICATION SHEET

SPECIFICATION SHEET NO.	R0608- MMBT2222AS2S1P	
DATE	June 8, 2024	
REVISION	A2	Updated With Most Recent Data
DESCRIPTION AND MAIN PARAMETRICS	<p>SMD Plastic-Encapsulate Transistors, 3 Pads, Case SOT-23</p> <p>MMBT Series, Transistor Type NPN</p> <p>hFE Rank Range 100~300</p> <p>Collector-Base Voltage 75V Max. Collector Current 600mA Max.</p> <p>Operating Temp. Range -55°C ~+150°C</p> <p>Package in Tape/Reel, 3000pcs/Reel</p> <p>RoHS III/REACH Compliant and Halogen Free (HF)</p>	
CUSTOMER		
CUSTOMER PART NO.		
CROSS REF. PART NO.		
ORIGINAL MFG/PART NO.	MDD Diodes/MMBT2222A	
PART CODE	MMBT2222AS2S1P	

VENDOR APPROVE			
Issued/Checked/Approved			
DATE: June 8, 2024			

CUSTOMER APPROVE	
DATE:	

SMD TRANSISTORS MMBT SERIES CASE SOT-23

MAIN FEATURE

- Epoxy Meets UL-94 V-0 Flammability Rating
- Epitaxial Planar Die Construction
- Complementary PNP Type Available (Part Code: MMBT2907AS2S2F)
- Surface Mount Package Ideally Suited for Automatic Insertion
- REACH/RoHS III Complaint and Halogen Free
- Cross Main Competitor Parts in Market



APPLICATION

- For SMD application

ELECTRICAL CHARACTERISTICS

- See Page 4~ Page 5

HOW TO ORDER

- Please Follow Up Part Code Guide And Indicate Pat Code When You Order Or RFQ For Custom Specification

PART CODE GUIDE

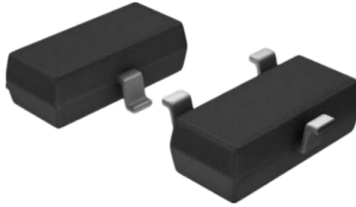
RFQ
Request For Quotation

CODE	NAME	KEY SPECIFICATION OPTION
MMBT	Product Series Code	SMD Plastic-Encapsulate Transistors MMBT series
2222A	Specification Code	For Original Part Number MMBT2222A
S2	Case Code	S2: Case SOT-23
S	Internal Control Code	Custom letter A~Z, a-z or Digits (0-9)
1P	Marking Code	Custom letter A~Z, a-z or Digits (0-9)

SMD TRANSISTORS MMBT SERIES CASE SOT-23

DIMENSION (Unit: Inch/mm)

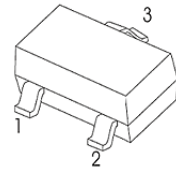
Image for reference



Marking:

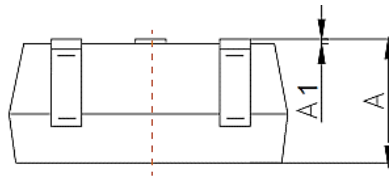
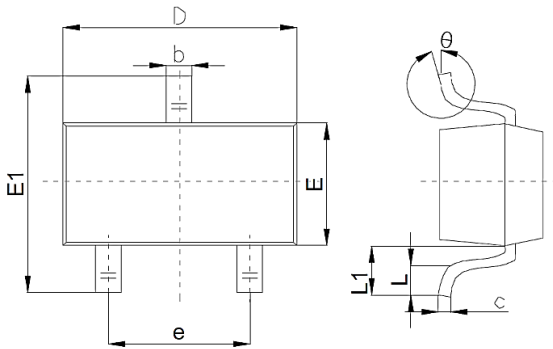
1P

Pin Function



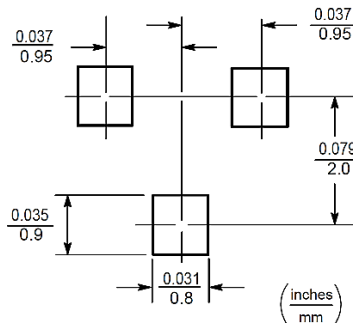
1. Base
2. Emitter
3. Collector

SOT-23



Symbol	Value (mm)		
	Min.	Typ.	Max.
A	0.9		1.4
A1			0.10
b	0.30		0.50
c	0.08		0.20
D	2.80	2.90	3.10
E	1.20		1.60
E1	2.25		2.80
e	1.8	1.9	2.00
L	0.10		0.50
L1	0.40		
θ	0°		10°

Recommend Pad Layout



SMD TRANSISTORS MMBT SERIES CASE SOT-23
CLASSIFICATION OF hFE

PART CODE	RANK CODE	RANK RANG	MARKING
MMBT2222AS2S1P	L	100~ 200	1P
	H	200~ 300	

MAXIMUM RATINGS - @ 25 °C

PARAMETER	SYMBOLS	VALUE	UNITS
Collector-Base Voltage	V _{CB0}	75	Volts
Collector-Emitter Voltage	V _{CEO}	40	Volts
Emitter-Base Voltage	V _{EB0}	6	Volts
Collector Current -Continuous	I _C	600	mA
Collector Power Dissipation	P _C	300	mW
Thermal Resistance From Junction To Ambient	R _{θJA}	417	°C/W
Junction Temperature	T _J	+150	°C
Storage Temperature Range	T _{STG}	-55 ~ +150	°C

SMD TRANSISTORS MMBT SERIES CASE SOT-23
ELECTRICAL CHARACTERISTICS- @ 25 °C

PARAMETER	SYMBOLS	VALUE			UNIT	TEST CONDITION
		MIN.	TYP.	MAX.		
Collector-base Breakdown Voltage	$V_{(BR)CBO}$	75			V	$I_C = 10\mu A, I_E = 0$
Collector-emitter Breakdown Voltage, See Note 1 for Symbol *	$V_{(BR)CEO} *$	40			V	$I_C = 10mA, I_B = 0$
Emitter-base Breakdown Voltage	$V_{(BR)EBO}$	6			V	$I_E = 10\mu A, I_C = 0$
Collector Base Cut-off Current	I_{CBO}			0.01	μA	$V_{CB} = 60V, I_E = 0$
Collector Cut-off Current	I_{CEX}			0.01	μA	$V_{CE} = 30V, V_{BE(off)} = 3V$
Emitter Base Cut-off Current	I_{EBO}			0.10	μA	$V_{EB} = 3V, I_C = 0$
DC Current Gain, See Note 1 for Symbol *	$h_{FE(1)} *$	100		300		$V_{CE} = 10V, I_C = 150mA$
	$h_{FE(2)}$	40				$V_{CE} = 10V, I_C = 0.1mA$
	$h_{FE(3)} *$	42				$V_{CE} = 10V, I_C = 500mA$
Collector-emitter Saturation Voltage, See Note 1 for Symbol *	$V_{CE(sat)} *$			1	V	$I_C = 500mA, I_B = 50mA$
				0.3	V	$I_C = 150mA, I_B = 15mA$
Base-emitter Saturation Voltage See Note 1 for Symbol *	$V_{BE(sat)} *$			2.0	V	$I_C = 500mA, I_B = 50mA$
				1.2	V	$I_C = 150mA, I_B = 15mA$
Transition Frequency	f_T	300			MHz	$V_{CE} = 20V, I_C = 20mA,$ $f = 100MHz$
Delay Time	t_d			10	ns	$V_{CC} = 30V, V_{BE(off)} = -0.5V$ $I_C = 150mA, I_{B1} = 15mA$
Rise Time	t_r			25	ns	
Storage Time	t_s			225	ns	$V_{CC} = 30V, I_C = 150mA$
Fall Time	t_f			60	ns	$I_{B1} = -I_{B2} = 15mA$

Note: 1) *pulse test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2.0\%$.

SMD TRANSISTORS MMBT SERIES CASE SOT-23

TYPICAL CHARACTERISTIC CURVES - For Reference Only

Fig.1 Static characteristics

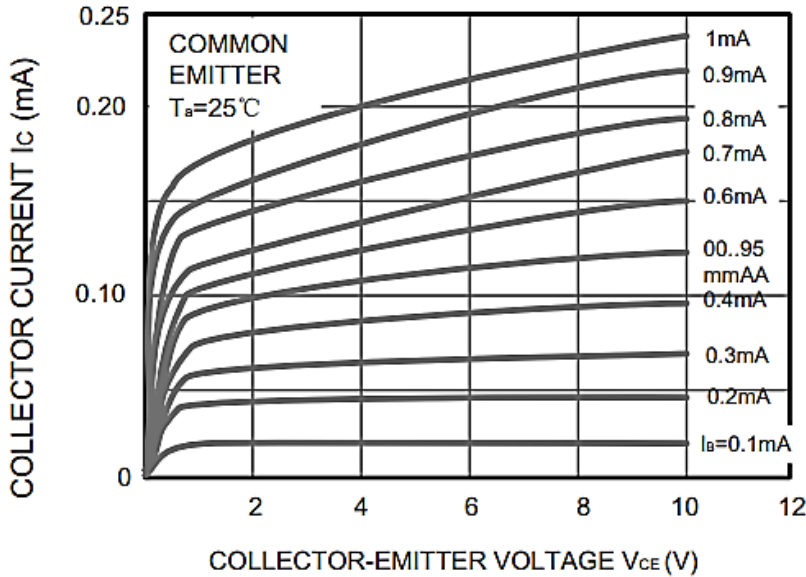
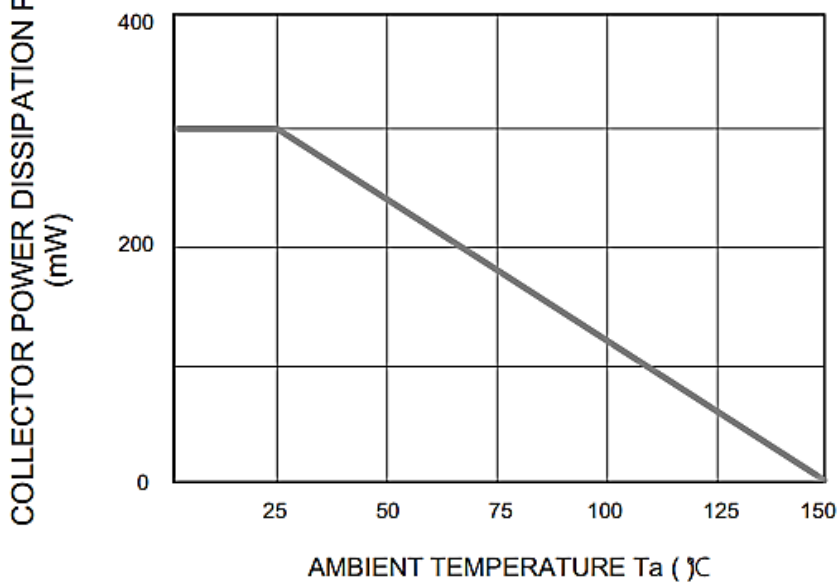
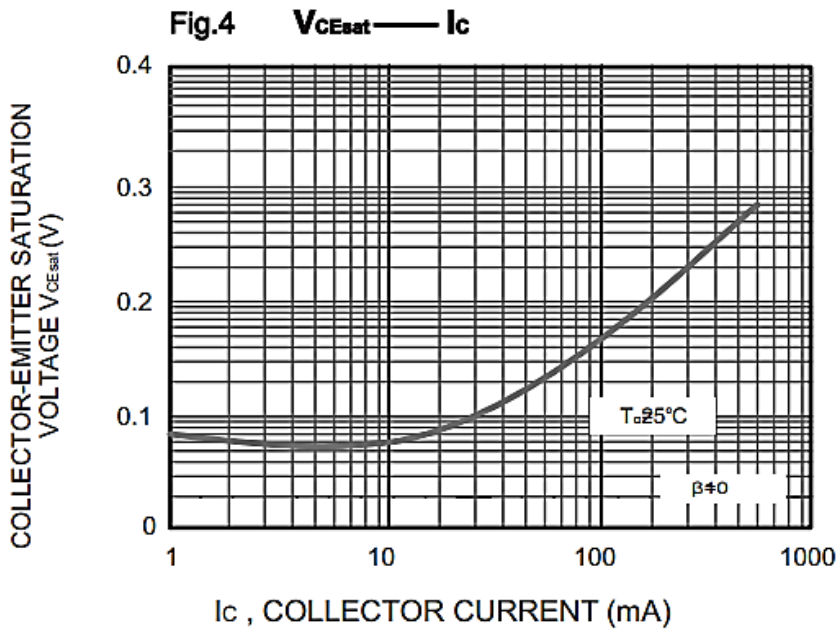
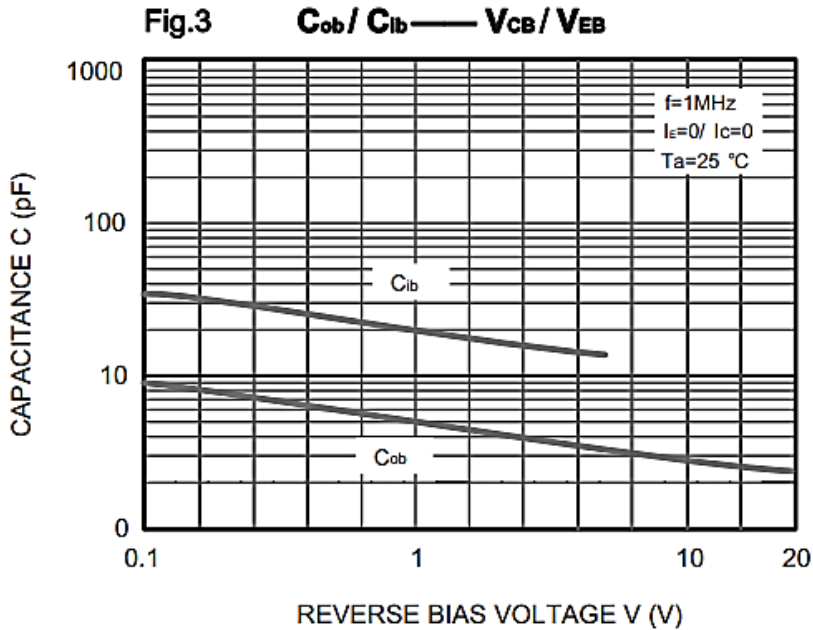


Fig.2 P_c — T_a



SMD TRANSISTORS MMBT SERIES CASE SOT-23

TYPICAL CHARACTERISTIC CURVES - For Reference Only



SMD TRANSISTORS MMBT SERIES CASE SOT-23

TYPICAL CHARACTERISTIC CURVES - For Reference Only

Fig.5 $h_{FE} \rightarrow I_c$

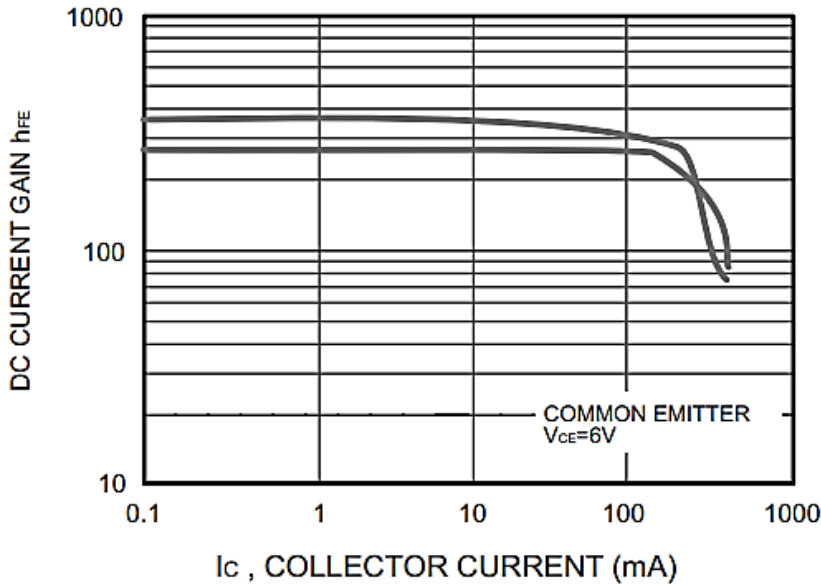
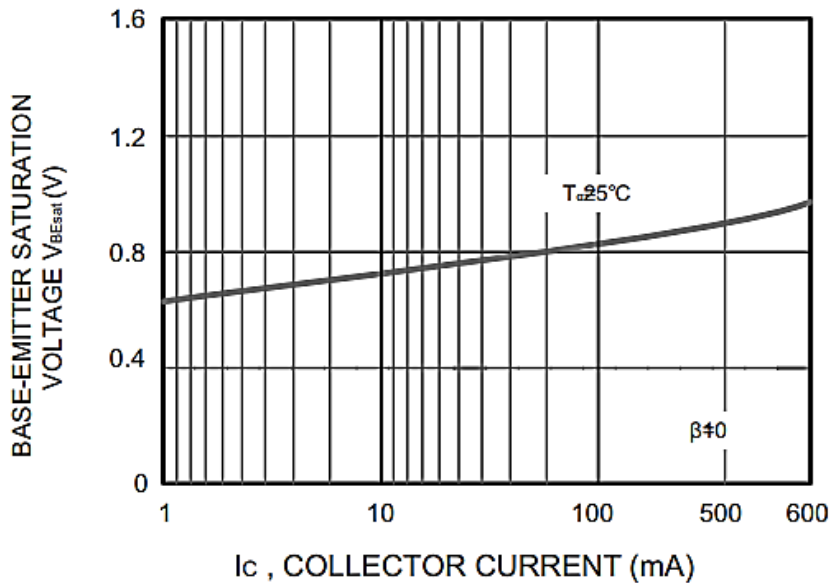
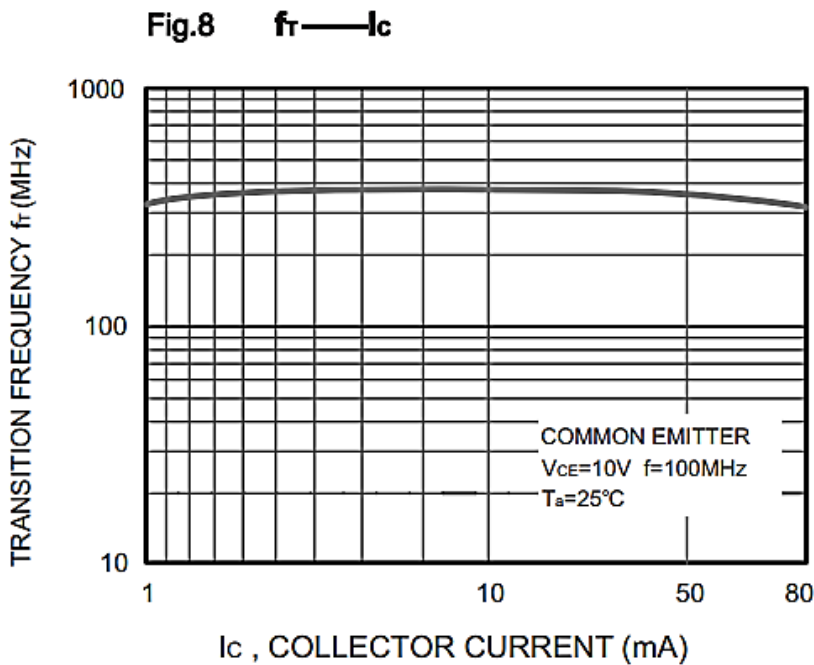
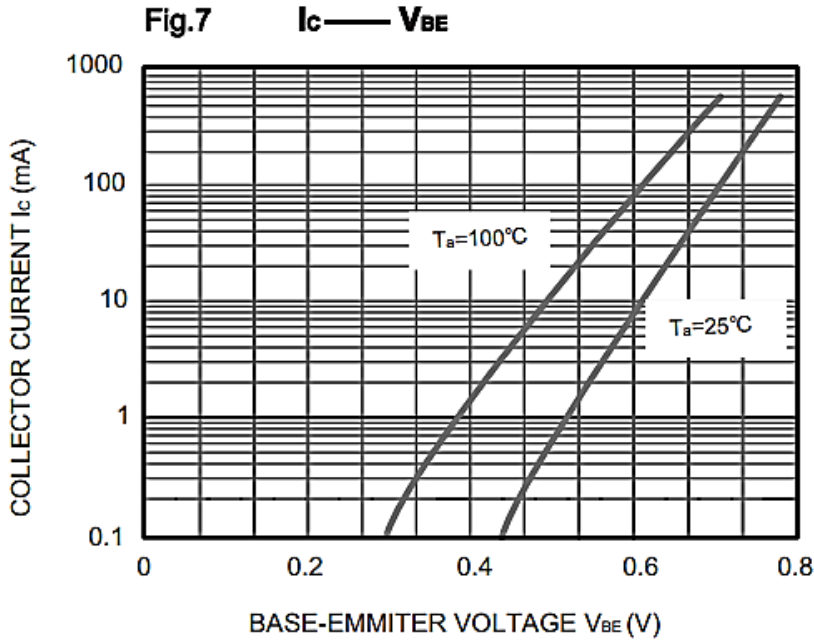


Fig.6 $V_{BEsat} \rightarrow I_c$



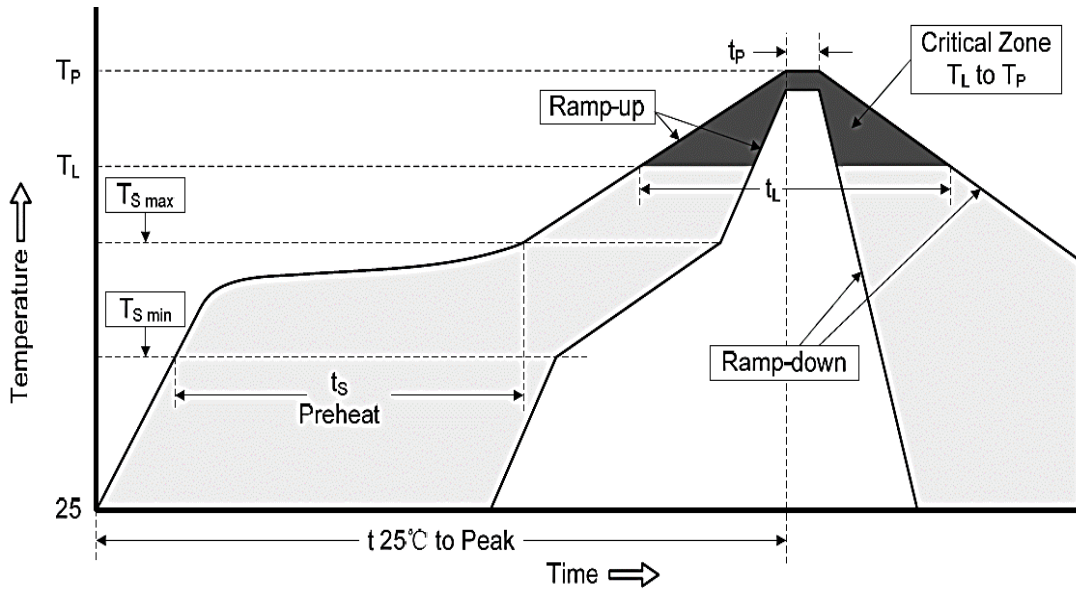
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TYPICAL CHARACTERISTIC CURVES - For Reference Only



SMD TRANSISTORS MMBT SERIES CASE SOT-23
RELIABILITY

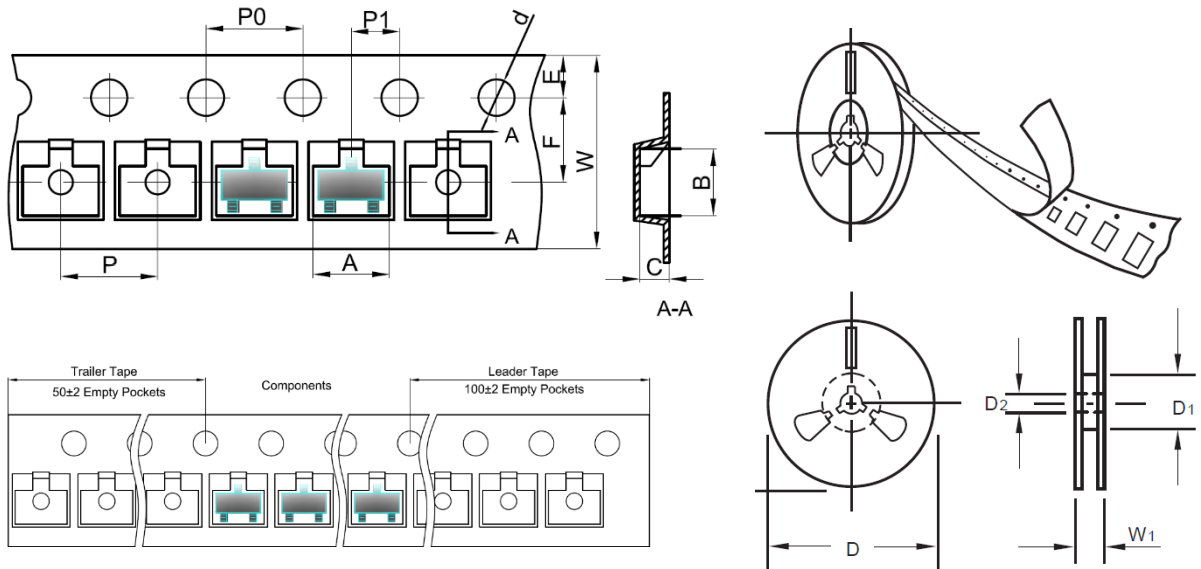
Number	Experiment Items	Experiment Method And Conditions	Reference Documents
1	Solder Resistance Test	Test 260°C± 5°C for 10 ± 2 sec. Immerse body into solder 1/16" ± 1/32"	MIL-STD-750D METHOD-2031.2
2	Solderability Test	230°C ±5°C for 5 sec.	MIL-STD-750D METHOD-2026.1 0
3	Pull Test	1 kg in axial lead direction for 10 sec.	MIL-STD-750D METHOD-2036.4
4	Bend Test	0.5Kg Weight Applied To Each Lead, Bending Arcs 90 °C ± 5 °C For 3 Times	MIL-STD-750D METHOD-2036.4
5	High Temperature Reverse Bias Test	TA=100°C for 1000 Hours at VR=80% Rated VR	MIL-STD-750D METHOD-1038.4
6	Forward Operation Life Test	TA=25°C Rated Average Rectified Current	MIL-STD-750D METHOD-1027.3
7	Intermittent Operation Life Test	On state: 5 min with rated IRMS Power Off state: 5 min with Cool Forced Air. On and off for 1000 cycles.	MIL-STD-750D METHOD-1036.3
8	Pressure Cooker Test	15 PSIG, TA=121°C, 4 hours	MIL-S-19500 APPENOIXC
9	Temperature Cycling Test	-55°C~+125°C; 30 Minutes For Dwelled Time 5 minutes for transferred time. Total: 10 cycles.	MIL-STD-750D METHOD-1051.7
10	Thermal Shock Test	0°C for 5 minutes., 100°C for 5minutes, Total: 10 cycles	MIL-STD-750D METHOD-1056.7
11	Forward Surge Test	8.3ms Single Sale Sine-wave One Surge.	MIL-STD-750D METHOD-4066.4
12	Humidity Test	TA=65°C, RH=98% for 1000 hours.	MIL-STD-750D METHOD-1021.3
13	High Temperature Storage life Test	150°C for 1000 Hours	MIL-STD-750D METHOD-1031.5

SMD TRANSISTORS MMBT SERIES CASE SOT-23
SUGGESTED REFLOW PROFILE - For Reference Only


PROFILE FEATURE		PB-FREE ASSEMBLY
Average Ramp-up Rate (Ts Max to Tp)		3°C/second Max
Preheat	Temperature Min (Ts Min.)	150°C
	Temperature Max (Ts Max.)	200°C
	Time (ts Min. to ts Max.)	60 ~ 180 seconds
Time maintained above	Temperature (Tl)	217°C
	Time (tl)	60 ~ 150 seconds
Peak/Classification Temperature (Tp)		260 °C
Time within 5°C of actual Peak Temperature (tp)		20 ~ 40 seconds
Ramp-down rate		6 °C /Second Max.
Time 25 °C to Peak Temperature		8 minutes Max.
Suggest reflow times		3 Times Max.

SMD TRANSISTORS MMBT SERIES CASE SOT-23
TAPE/REEL - Unit: mm

All Devices are packed in accordance with EIA standard RS-481-A and specifications.



ITEM	SYMBOL	TOLERANCE	SOT-23
Carrier width	A	0.1	3.15
Carrier Length	B	0.1	2.77
Carrier Depth	C	0.1	1.22
Sprocket hole	d	0.05	1.55
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	Min.	54.4
Feed hole diameter	D2	0.5	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.50
Punch hole pitch	P	0.1	4.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Overall tape thickness	T	0.1	0.25
Tape width	W	0.3	8.00
Reel width	W1	1.0	19.50
MPQ/Reel	3000pcs/Reel		

SMD TRANSISTORS MMBT SERIES CASE SOT-23

IMPORTANT NOTES AND DISCLAIMER

1. **ROHS COMPLIANCE:** The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU RoHS Directive (EU) 2015/863 EC (RoHS3). RoHS Test Report for this product can be obtained at Download Center.
2. **REACH COMPLIANCE:** REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, REACH Test Report for this product can be obtained at Download Center.
3. All Product parametric performance is indicated in the Electrical Characteristics for the listed herein test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
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8. *NextGen* requires that customers first obtain an RMA (Returned Merchandise Authorization) number prior to returning any products. Returns must be made within 30 days of the date of invoice, be in the original packaging, unused and like-new condition. At the time of quoting or purchasing, a product may say that it is Non-Cancelable/ Non-Returnable (NCNR). These products are not returnable and not refundable.