

FMBZT5302D

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FMBZT5302D

Medium Power NPN Transistors

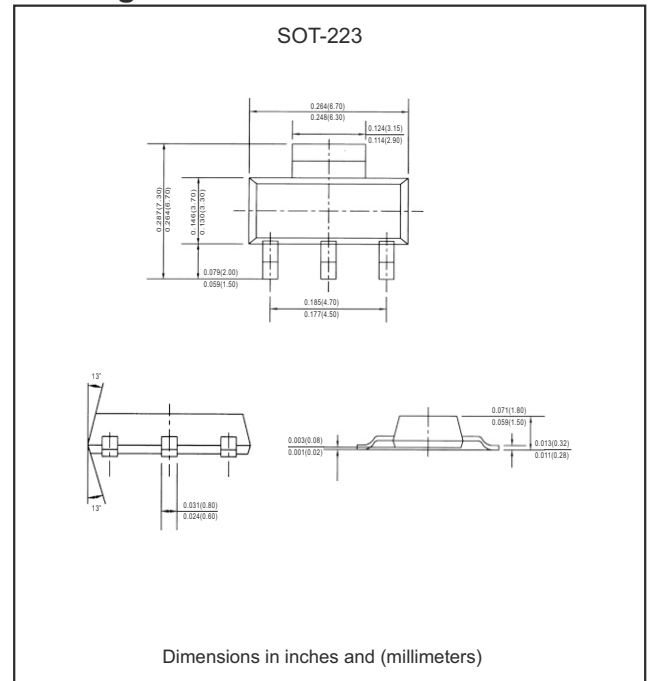
Features

- Internal free-wheeling diode.
- Makes efficient anti-saturation operation.
- Low variable storage-time spread.
- Low base drive.
- Very suitable for half bridge light ballast application.
- ESD Protected $\pm 8\text{KV}$ HBM.
- Moisture sensitivity level : Per J-STD-020 Level 3
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex.FMBZT5302D-H.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-223
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any
- Weight : Approximated 0.3256 gram

Package outline



Maximum ratings ($T_A=25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector to base voltage	V_{CBO}	800	V
Collector to Emitter Voltage	V_{CEO}	400	V
Emitter to base voltage	V_{EBO}	10	V
Collector current	I_C	2	A
Collector peak current ($t_p < 5\text{ms}$)	I_{CM}	4	A
Base current	I_B	1	A
Base peak current ($t_p < 5\text{ms}$)	I_{BM}	2	A
Total power dissipation ($T_c \leq 25^\circ\text{C}$)	P_D	1	W
Junction temperature	T_j	+150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-65 ~ +150	$^\circ\text{C}$
junction to ambient	$R\theta_{JA}$	175	$^\circ\text{C/W}$
junction to case	$R\theta_{JC}$	125	$^\circ\text{C/W}$

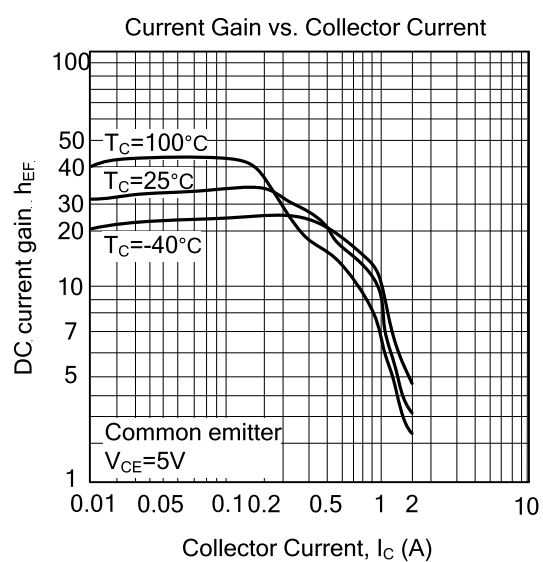
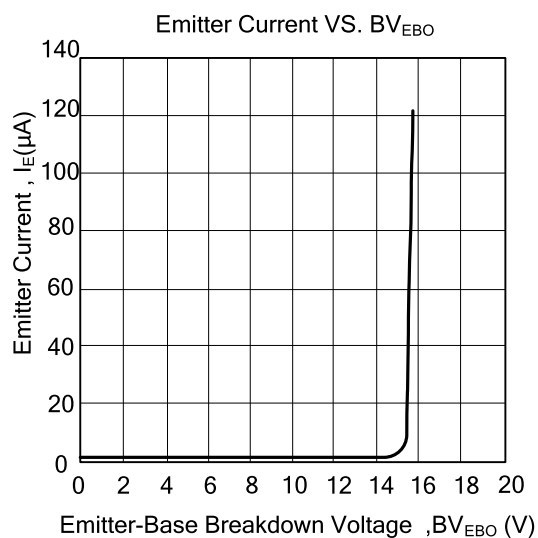
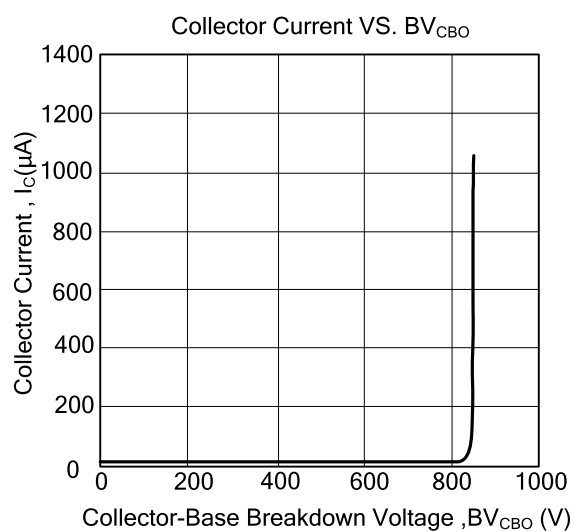
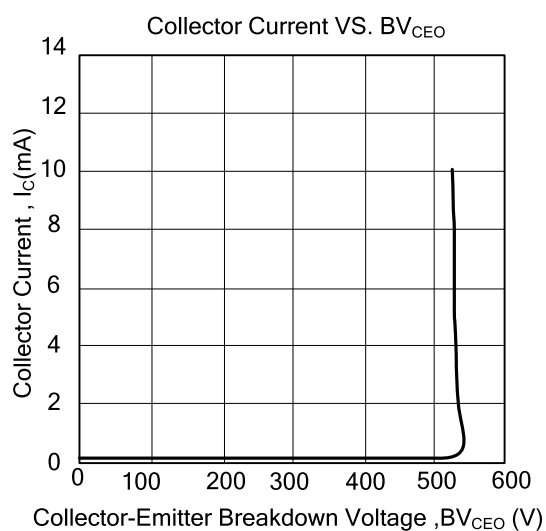
Note : Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

FMBZT5302D**Electrical characteristics** (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Off characteristics						
Collector cut off current	$V_{CB} = 800V, I_E=0$	I_{CBO}			1	μA
Emitter cut off current	$V_{EB} = 9V, I_C=0$	I_{EBO}			1	μA
Collector-emitter breakdown voltage	$I_C = 10mA, I_E = 0mA$ (Note)	BV_{CEO}	400			V
Collector-base breakdown voltage	$I_C = 1mA, I_B = 0mA$	BV_{CBO}	800			V
Emitter base breakdown voltage	$I_E = 1mA, I_C = 0V$	BV_{EBO}	10			V
On characteristics						
DC current gain 1	$V_{CE}=5V, I_C=10mA$	h_{FE1}	10			
DC current gain 2	$V_{CE}=5V, I_C=400mA$	h_{FE2}	10		40	
DC current gain 3	$V_{CE}=5V, I_C=1A$	h_{FE3}	5			
Collector-emitter saturation Voltage	$I_C = 0.5A, I_B = 0.1A$ (Note)	$V_{CE(sat1)}$			0.5	V
	$I_C = 1.0A, I_B = 0.25A$ (Note)	$V_{CE(sat2)}$		1.1	1.5	
Base-emitter saturation voltage	$I_C = 0.5A, I_B = 0.1A$ (Note)	$V_{BE(sat3)}$			1.1	V
	$I_C = 1.0A, I_B = 0.25A$ (Note)	$V_{BE(sat4)}$			1.2	
Switching characteristics						
Turn on time	$V_{CC} = 250V, I_C = 1A$ $I_{B1} = I_{B2} = 0.2A, t_p=25\mu s$ Duty cycle < 1%	t_{on}		0.15	0.3	μs
Fall time		t_f		0.2	0.4	μs
Storage time		t_{stg}		0.5	0.9	μs
Diode						
Forward voltage drop	$I_C = 1A$	V_F			1.4	V
Fall time	$I_C = 1A$	t_F			800	μs

Note : pulsed duration = 300 μs , Duty cycle $\leq 2\%$

Rating and characteristic curves (FMBZT5302D)



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Pinning information

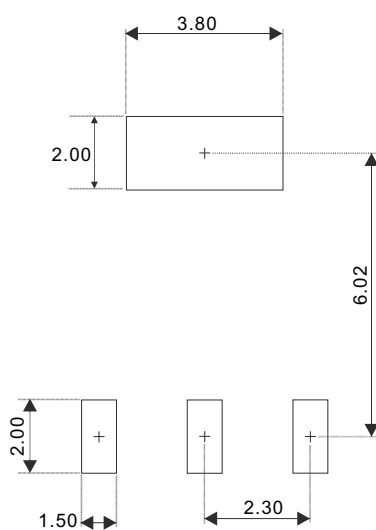
Pin	Simplified outline	Symbol
Pin 1 Base Pin 2, 4 Collector Pin 3 Emitter		

Marking

Type number	Marking code
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Suggested solder pad layout

SOT-223

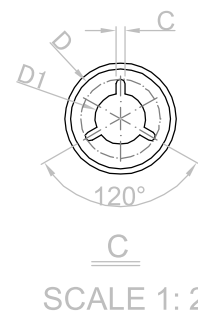
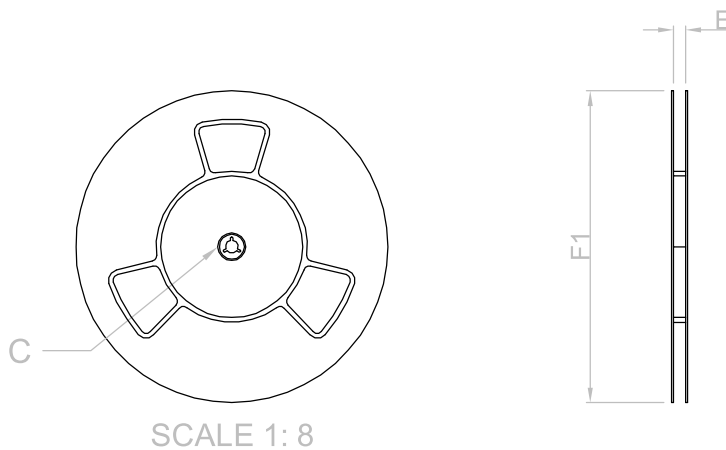
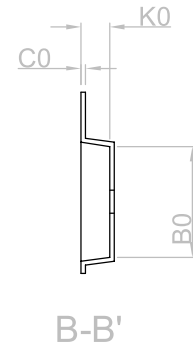
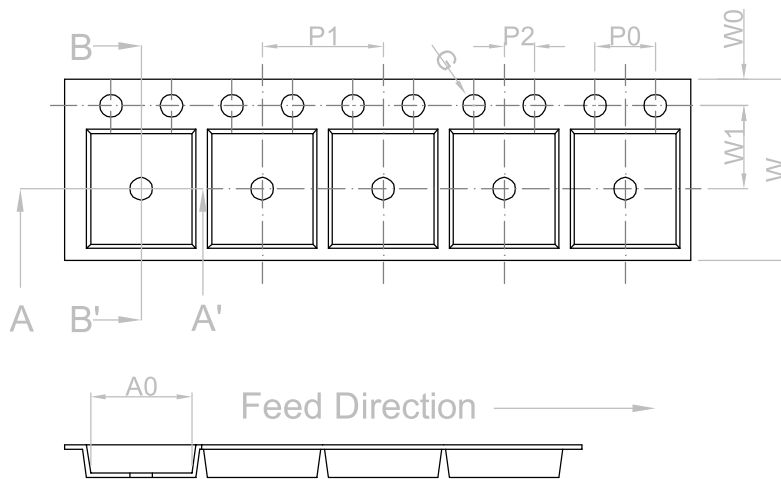


Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ± 0.050 mm.
3. The pad layout is for reference purposes only.

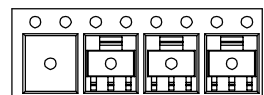
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Packing information



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A0	6.70	7.10	0.264	0.280
B0	7.25	7.52	0.285	0.296
C0	0.20	0.35	0.008	0.014
K0	1.80	2.10	0.071	0.083
W0	1.65	1.85	0.065	0.073
W1	5.45	5.55	0.215	0.219
W	11.90	12.30	0.469	0.484
P0	3.90	4.10	0.154	0.161
P1	7.90	8.10	0.311	0.319
P2	1.95	2.05	0.077	0.081
G	1.50	1.60	0.059	0.063
C	1.50	3.00	0.059	0.118
D	20.70	21.30	0.815	0.839
D1	12.80	13.40	0.504	0.528
E	12.20	13.50	0.480	0.531
F1	328.00	332.00	12.913	13.071

SOT-223



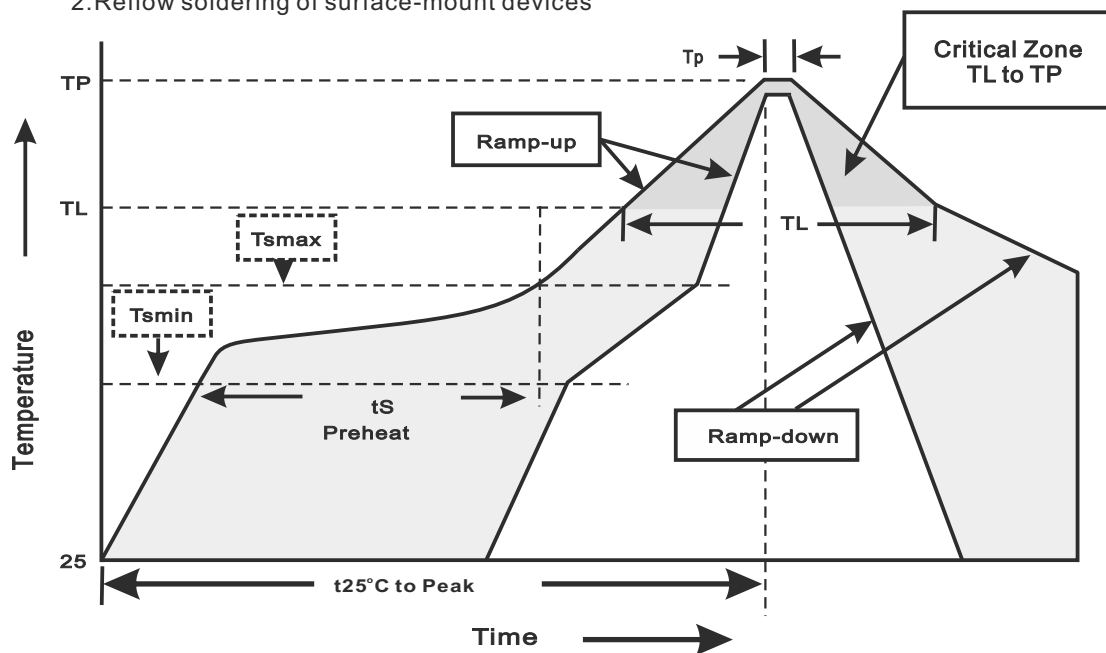
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Reel packing

PACKAGE	REEL SIZE	REEL (pcs)	COMPONENT SPACING (m/m)	BOX (pcs)	INNER BOX (m/m)	REEL DIA, (m/m)	CARTON SIZE (m/m)	CARTON (pcs)
SOT-223	13"	2,500	8.0	5,000	335*335*38	330	350*330*360	40,000

Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



3.Reflow soldering

Profile Feature	Soldering Condition
Average ramp-up rate(T_L to T_P)	$<3^{\circ}\text{C}/\text{sec}$
Preheat -Temperature Min(T_{smin}) -Temperature Max(T_{smax}) -Time(min to max)(t_s)	150°C 200°C 60~120sec
T_{smax} to T_L -Ramp-upRate	$<3^{\circ}\text{C}/\text{sec}$
Time maintained above: -Temperature(T_L) -Time(t_L)	217°C 60~260sec
Peak Temperature(T_P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t_P)	10~30sec
Ramp-down Rate	$<6^{\circ}\text{C}/\text{sec}$
Time 25°C to Peak Temperature	$<6\text{minutes}$

FMBZT5302D**High reliability test capabilities**

TEST ITEM	STANDARD	TEST CONDITION	Failure/ Sample Size
MSL 3 Test	J-STD-020	Bake : <u>125 °C / 24 Hrs</u> Soak : <u>60 °C,60%RH / 40 Hrs</u> Reflow : <u>260C x 3 times</u>	0 / 135
High Temperature Reverse Bias	JESD22-A108	BVDSS : <u>650 V</u> VR : <u>80 %</u> Temperature : <u>150 °C</u> Test Time : <u>168 hours</u>	0 / 45
High Temperature Storage Test	JESD22-A103	Temperature : <u>150 °C</u> Test Time : <u>500 hours</u>	0 / 45
Temperature Cycle Test	JESD22-A104	High Temp. : <u>150 +/- 5 °C</u> Low Temp. : <u>-65 +/- 5 °C</u> Dwell Time : <u>30 min (High Temp.)</u> <u>30 min (Low Temp.)</u> Duration : <u>500 Cycles</u>	0 / 45
Pressure Cooker Test	JESD22-A102	Temperature : <u>121±2 °C</u> Humidity : <u>100 %RH</u> Vapor Pressure : <u>2 ATM</u> Test Time : <u>96 hours</u>	0 / 45
Soldering Heat Test	JESD22-B106	Temp. : <u>270 ± 5 °C</u> Dwell Time : <u>7 +2/-0 Sec</u>	0 / 45
Solderability	JESD22-B102	Temp. : <u>245 ± 5 °C</u> Dwell Time : <u>5 ± 0.5 Sec</u>	0 / 10