

FMBT4403-Q1

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FMBT4403-Q1

-600mA -40V Silicon PNP Epitaxial Planar Transistor

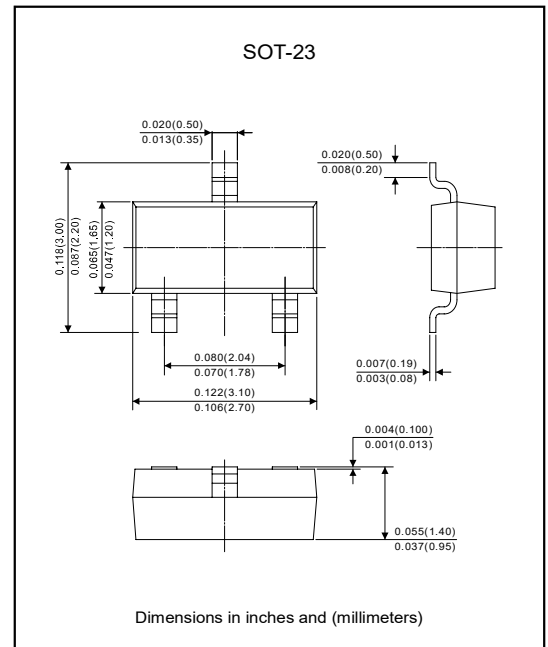
Features

- Switching transistor.
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirements.
- Suffix "-H" indicates Halogen-free part, ex. FMBT4403-Q1-H.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : Molded plastic, SOT-23.
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026.
- Mounting Position : Any.

Package outline



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

Parameter	Symbol	Ratings	Unit
Collector-base voltage	$-V_{CBO}$	40	V
Collector-emitter voltage	$-V_{CEO}$	40	V
Emitter-base voltage	$-V_{EBO}$	5	V
Collector current	$-I_C$	600	mA
Collector power dissipation	P_C	300	mW
Thermal resistance, junction to ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Operating junction temperature	T_J	+150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to +150	$^\circ\text{C}$

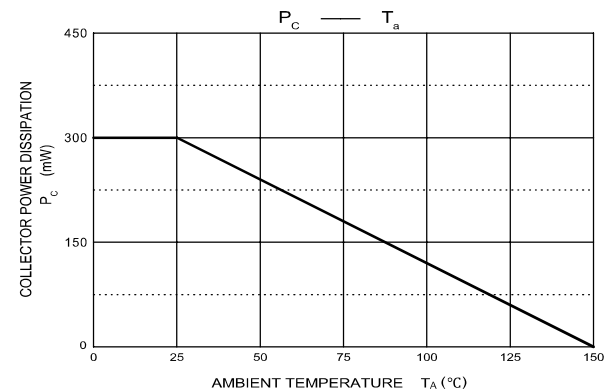
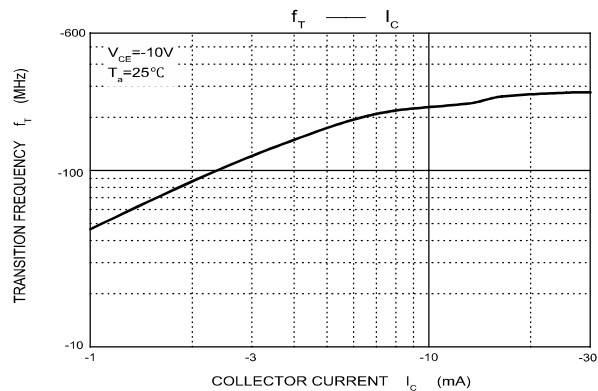
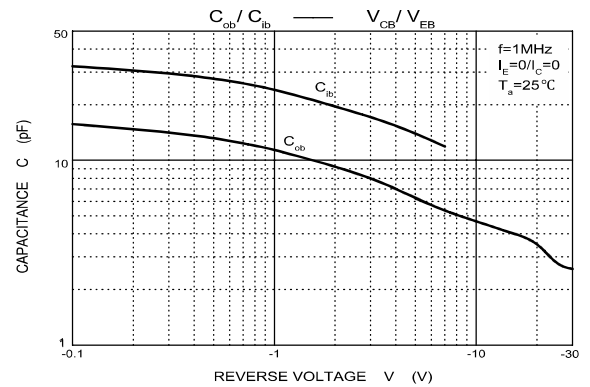
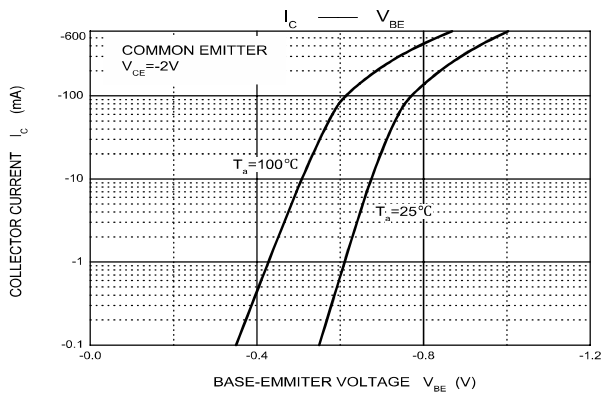
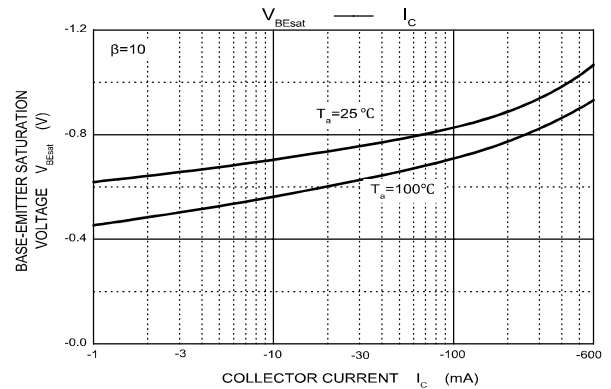
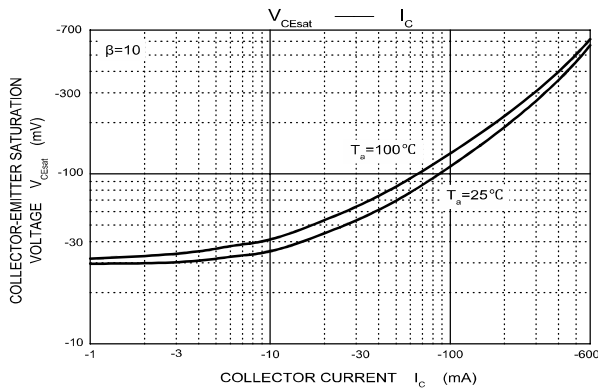
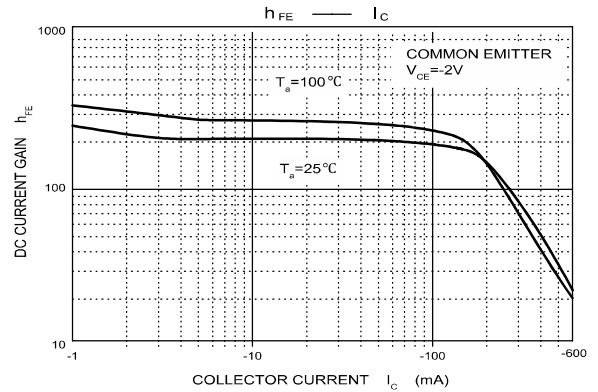
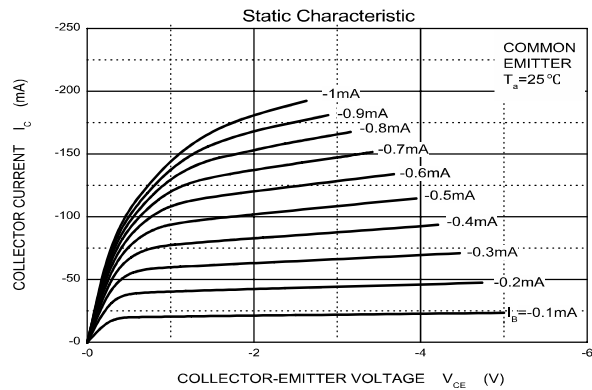
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Electrical characteristics (At $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector-base breakdown voltage	$-I_C=100\mu\text{A}$, $I_E=0$	$-BV_{CBO}$	40			V
Collector-emitter breakdown voltage	$-I_C=1\text{mA}$, $I_B=0$	$-BV_{CEO}$	40			V
Emitter-base breakdown voltage	$-I_E=100\mu\text{A}$, $I_C=0\text{V}$	$-BV_{EBO}$	5			V
Collector-base cut-off current	$-V_{CB}=35\text{V}$, $I_E=0$	$-I_{CBO}$			0.1	μA
Collector-emitter cut-off current	$-V_{CE}=35\text{V}$, $V_{BE}=0.4\text{V}$	$-I_{CEX}$			0.1	μA
Emitter-base cut-off current	$-V_{EB}=4\text{V}$, $I_C=0$	$-I_{EBO}$			0.1	μA
DC current gain	$-V_{CE}=1\text{V}$, $-I_C=0.1\text{mA}$	h_{FE1}	30			
	$-V_{CE}=1\text{V}$, $-I_C=1\text{mA}$	h_{FE2}	60			
	$-V_{CE}=1\text{V}$, $-I_C=10\text{mA}$	h_{FE3}	100			
	$-V_{CE}=2\text{V}$, $-I_C=150\text{mA}$	h_{FE4}	100		300	
	$-V_{CE}=2\text{V}$, $-I_C=500\text{mA}$	h_{FE5}	20			
Collector-emitter saturation voltage	$-I_C=150\text{mA}$, $-I_B=15\text{mA}$	$-V_{CE(sat)}$			0.4	V
	$-I_C=500\text{mA}$, $-I_B=50\text{mA}$				0.75	
Base-emitter saturation voltage	$-I_C=150\text{mA}$, $-I_B=15\text{mA}$	$-V_{BE(sat)}$			0.95	V
	$-I_C=500\text{mA}$, $-I_B=50\text{mA}$				1.3	
Current gain bandwidth product	$V_{CE}=10\text{V}$, $I_C=20\text{mA}$, $f=100\text{MHz}$	f_T	200			MHZ
Delay time	$-V_{CC}=30\text{V}$, $-V_{BE(off)}=0.5$, $-I_C=150\text{mA}$, $-I_{B1}=15\text{mA}$	t_d			15	ns
Rise time		t_r			20	ns
Storage time	$-V_{CC}=30\text{V}$, $-I_C=150\text{mA}$, $I_{B1}=I_{B2}=-15\text{mA}$	t_s			225	ns
Fall time		t_f			60	ns

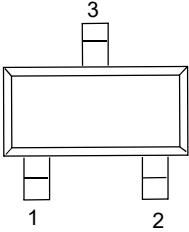
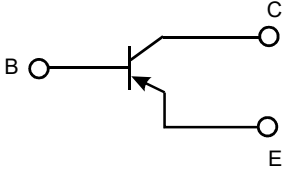
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Rating and characteristic curves



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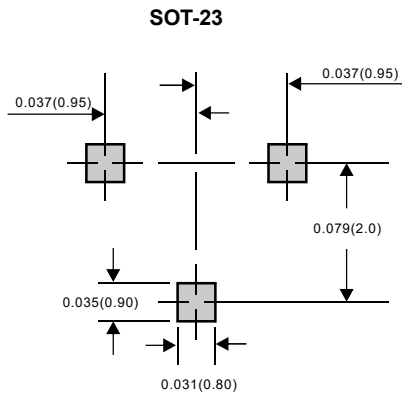
Pinning information

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

Marking

Type Number	Marking Code
FMBT4403-Q1	2T

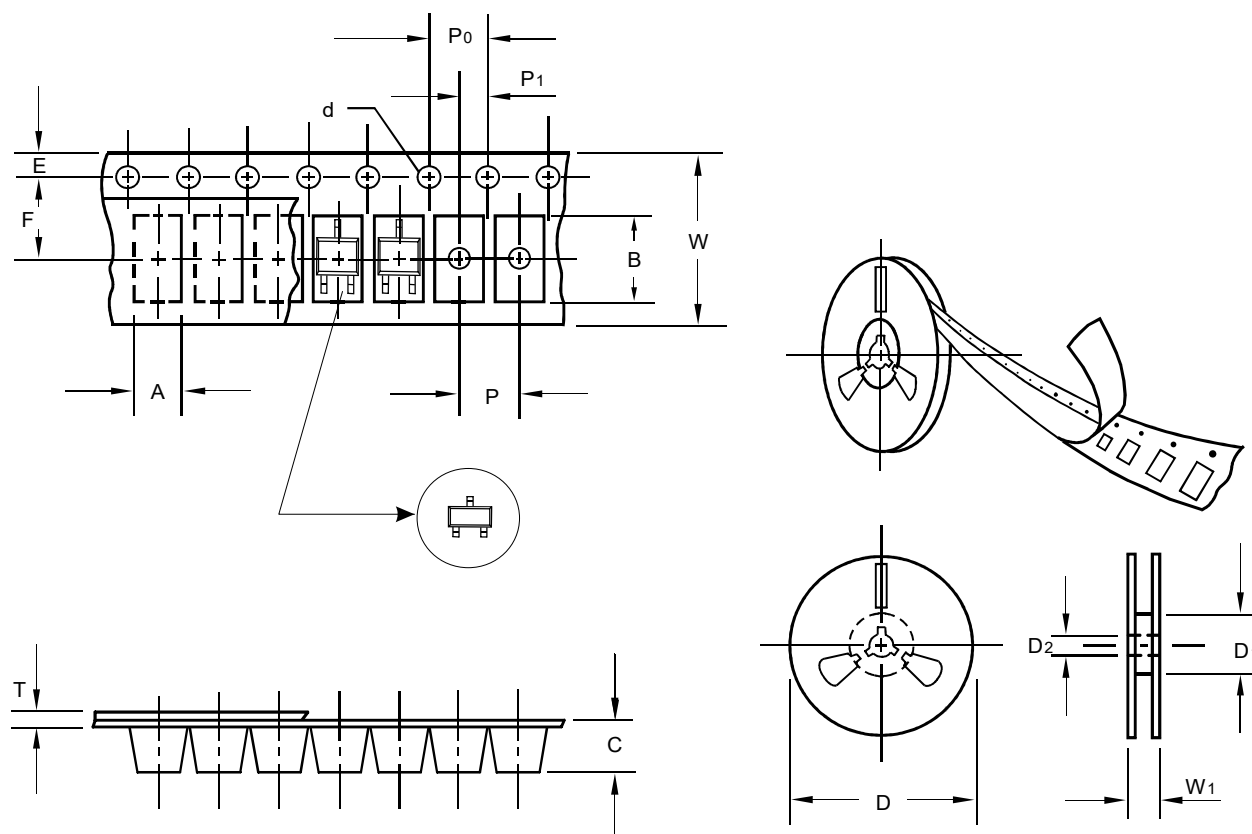
Suggested solder pad layout



Dimensions in inches and (millimeters)

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Packing information



unit:mm

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	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	54.40
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	0.23
Tape width	W	0.3	8.00
Reel width	W1	1.0	11.40

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

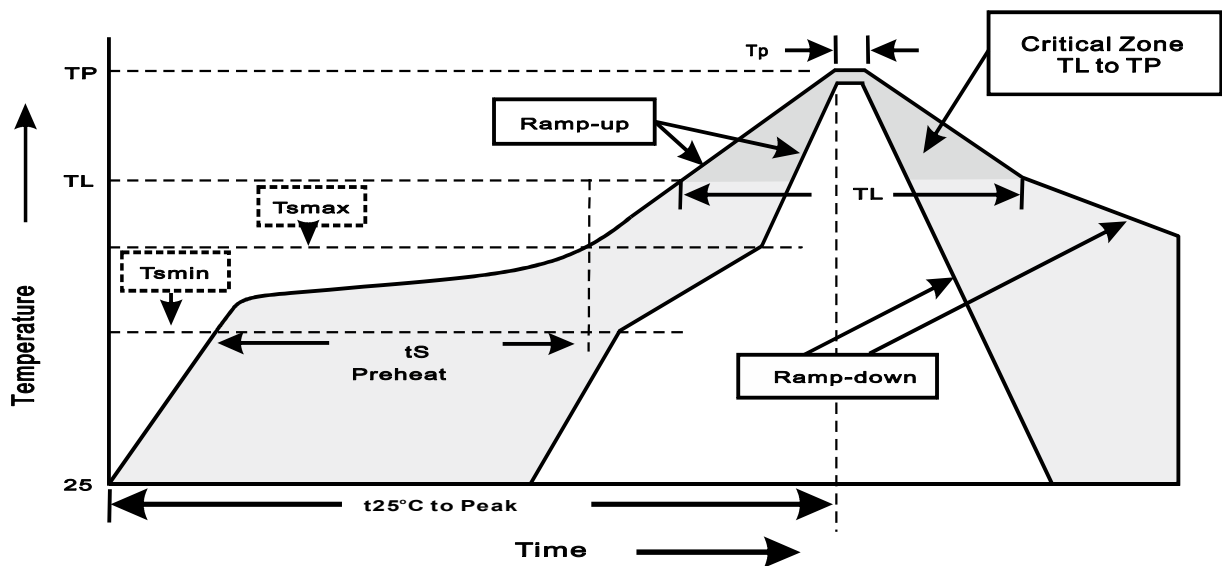
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Reel packing

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)	APPROX. GROSS WEIGHT (kg)
SOT-23	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000	11.6

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°C/sec
Preheat -Temperature Min(T _{smmin}) -Temperature Max(T _{smmax}) -Time(min to max)(t _s)	150°C 200°C 60~120sec
T _{smmax} to T _L -Ramp-upRate	<3°C/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°C/sec
Time 25°C to Peak Temperature	<6minutes

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High reliability test capabilities

Item Test	Conditions	Reference
1. MSL Preconditioning	24hr bake@125°C+168hrs@85°C /85%RH+3xIR@260°C+1flux immersion+alcohol+DI H2O rinse	JESD22-A113
2. Intermittent Operating Life	Ta=25°C, $\Delta T_j \geq 100^\circ\text{C}$ On/Off=2min Test Duration:1000hrs	MIL-STD-750E METHOD 1037
3. High Temperature Reverse Bias	VCE=80%BVCEO (Tj=Tj max.)Test Duration:1000hrs	JESD22-A108
4. High Temperature Storage Life	Ta=150°C Test Duration:1000hrs	JESD22 A-103
5. Temperature Cycle	-55°C(15min) to 150°C(15min)Test Cycles:1000cycles	JESD22 A-104
6. Autoclave	P=2atm Ta=121°C RH=100% Test Duration:96hrs	JESD22 A-102
7. Solderability	245±5°C for 5sec	J-STD-002
8. Moisture Resistance	Ta=85°C/85%Relative humidity Test Duration:1000hrs	MIL-STD-750E METHOD 1021.2
9. Resistance To Solder Heat	260±5°C for 10sec	JESD22 B-106
10. High Temperature High Humidity Reverse Bias	Ta=85°C, 85%RH, VCE=80%BVCEO Test Duration: 1000hrs	JESD22-A101