FMBT4401-Q1

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FMBT4401-Q1

600mA 40V Transistor NPN Silicon

Features

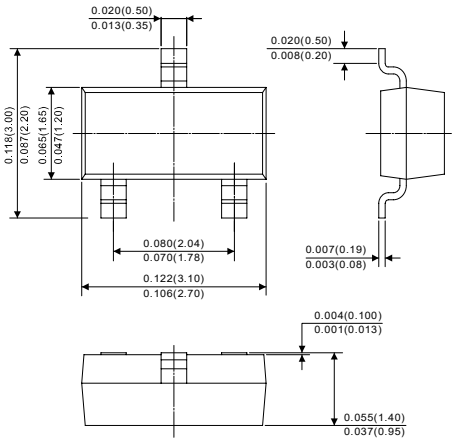
- Switching transistor.
- Qualified to AEC-Q101 standards for high reliability.
- Lead-free parts meet RoHS requirments.
- Suffix "-H" indicates Halogen-free part, ex.FMBT4401-Q1-H.

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

SOT-23



Dimensions in inches and (millimeters)

Maximum ratings (At T_A=25°C unless otherwise noted)

Parameter	Symbol	Ratings	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	600	mA
Collector power dissipation	P_C	300	mW
Thermal resistance, junction to ambient	$R_{\theta JA}$	357	°C/W
Operating junction temperature	T_J	+150	°C
Storage temperature range	T_{stg}	-55 to +150	°C

Electrical characteristics (At T_A=25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector-base breakdown voltage	I_C=100μA, I_E=0	BV_{CBO}	60			V
Collector-emitter breakdown voltage	I_C=1mA, I_B=0	BV_{CEO}	40			V
Emitter-base breakdown voltage	I_E= 100μA, I_C=0V	BV_{EBO}	6			V
Collector-base cut-off current	V_{CB}=50V, I_E=0	I_{CBO}			0.1	μA
Collector-emitter cut-off current	V_{CE}=30V, I_B=0	I_{CEO}			0.1	μA
Emitter-base cut-off current	V_{EB}=5V, I_C=0	I_{EBO}			0.1	μA
DC current gain	V_{CE}=1V, I_C=150mA	h_{FE}	100	300		
Collector-emitter saturation voltage	I_C=150mA, I_B=15mA	$V_{CE(sat)}$			0.4	V
Base-emitter saturation voltage	I_C=150mA, I_B=15mA	$V_{BE(sat)}$			0.95	V
Current gain bandwidth product	V_{CE}=10V, I_C=20mA, f=100MHz	f_T	250			MHZ

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Rating and characteristic curves

Fig. 1 Max power dissipation vs. ambient temperature

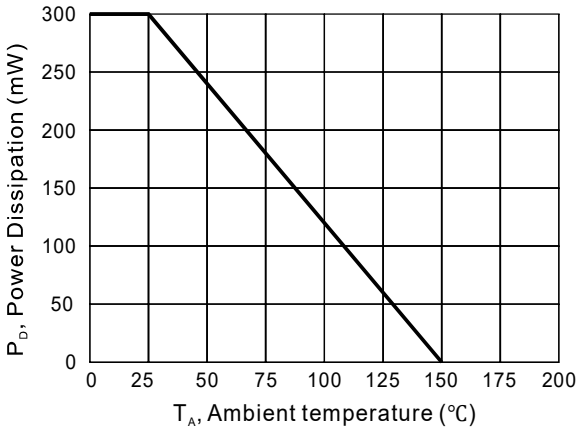


Fig. 2 Typical DC current gain vs. Collector current

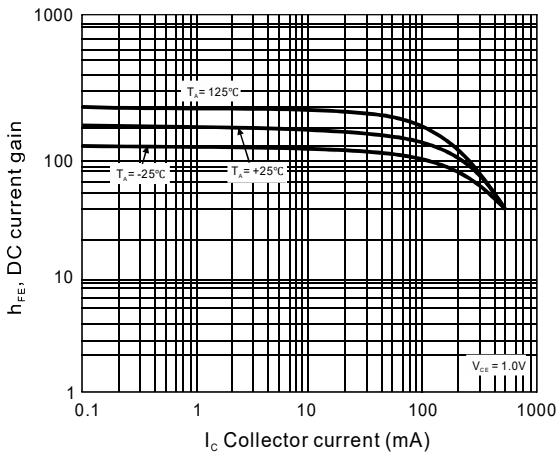


Fig. 3 Typical capacitance

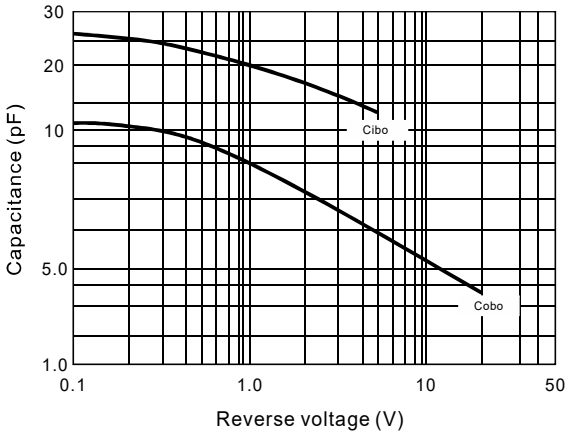


Fig. 4 Typical collector saturation region

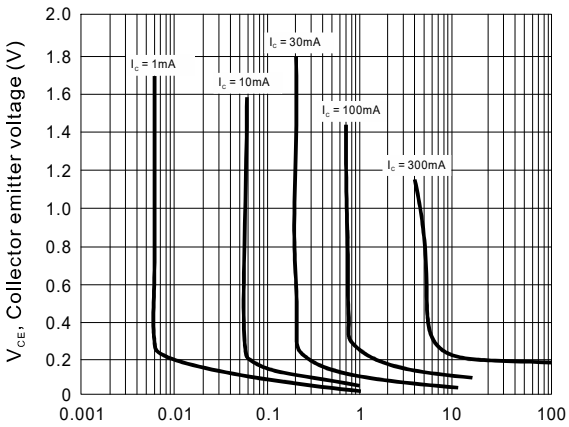


Fig. 5 Collector emitter saturation voltage vs. Collector current

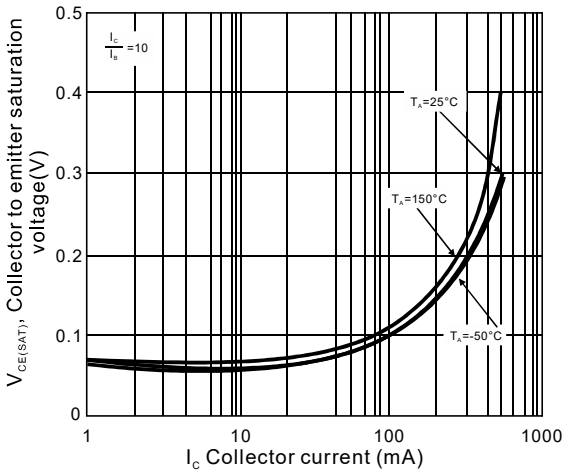
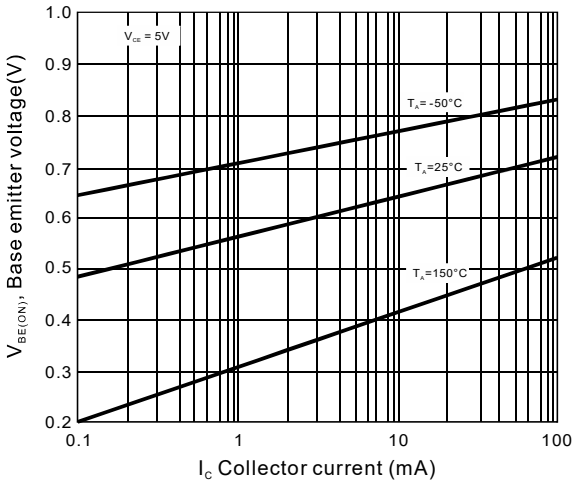
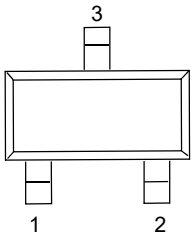
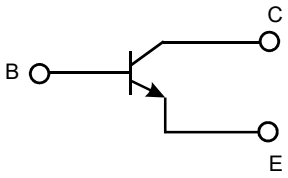


Fig. 6 Base emitter voltage vs. collector current



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Pinning information

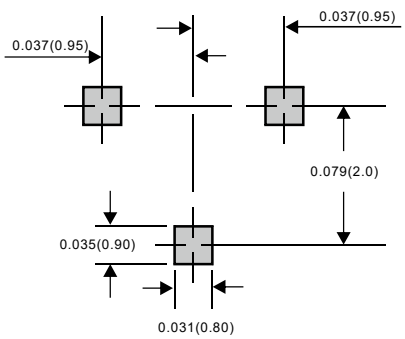
Pin	Simplified outline	Symbol
Pin 1 Base Pin 2 Emitter Pin 3 Collector		

Marking

Type Number	Marking Code
FMBT4401-Q1	2X

Suggested solder pad layout

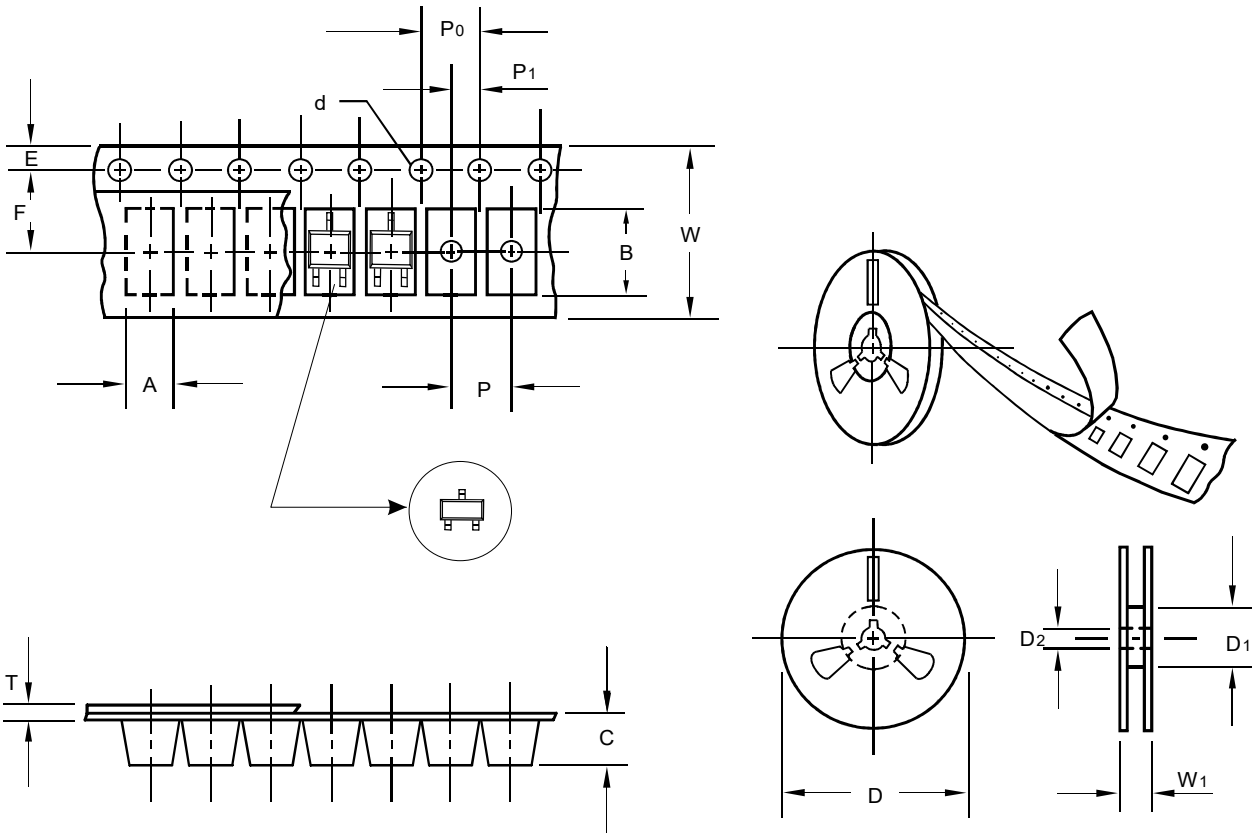
SOT-23



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	D_1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D_1	min	54.40
Feed hole diameter	D_2	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	P_0	0.1	4.00
Embossment center	P_1	0.1	2.00
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W_1	1.0	11.40

Note:Devices are packed in accor dance with EIA standar RS-481-A and specifications listed above.

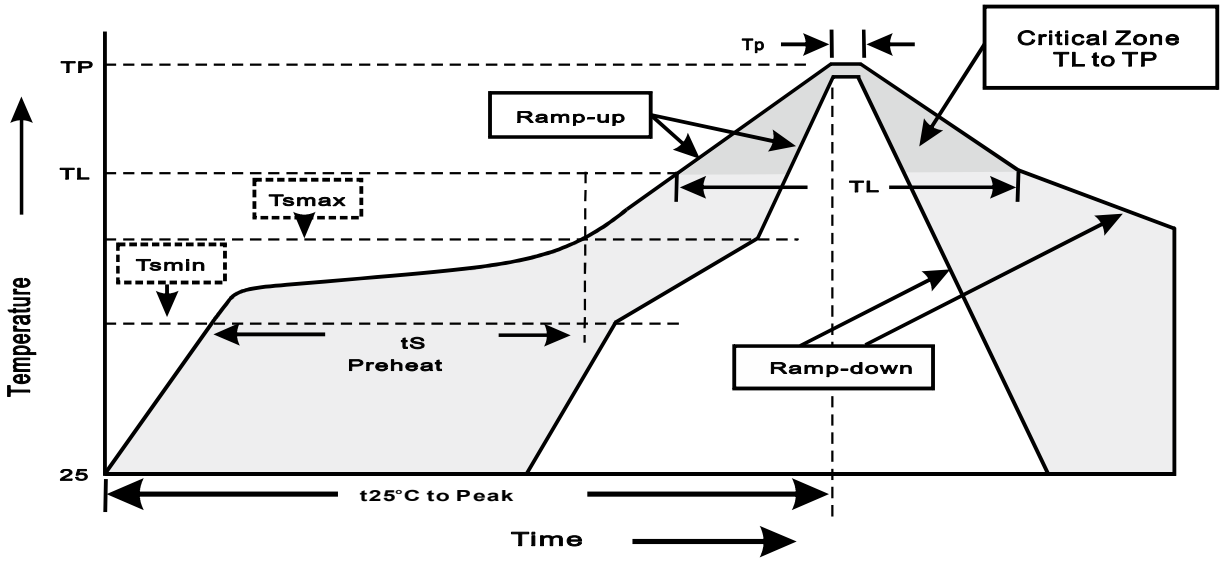
FMBT4401-Q1

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(Tsmin) -Temperature Max(Tsmax) -Time(min to max)(t_s)	 150°C 200°C 60~120sec
Tsmax 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, ΔTj⩾100°C On/Off=2min Test Duration:1000hrs	MIL-STD-750E METHOD 1037
3. High Temperature Reverse Bias	V_{CE}=80%B_{VCEO} (T_J=T_J 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, V_{CE}=80%B_{VCEO} Test Duration: 1000hrs	JESD22-A101