FMBT3906DW1

List

FMBT3906DW1

200mA Silicon PNP Epitaxial Planar Transistor

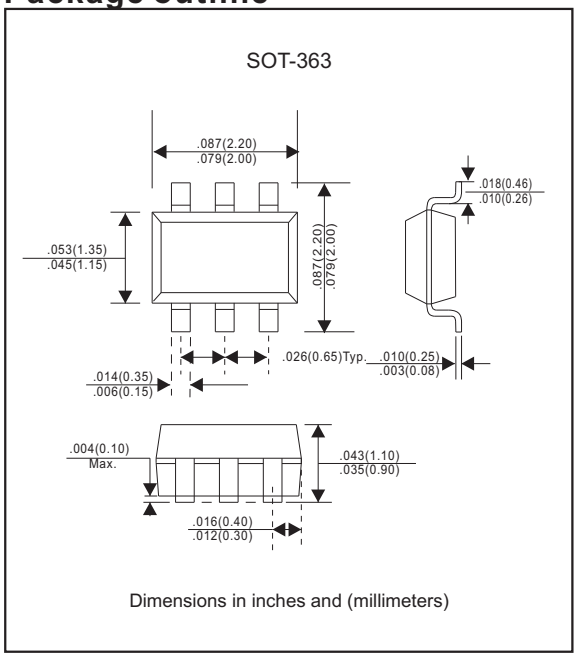
Features

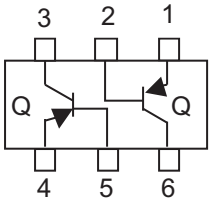
- High collector-emitterbreakdien voltage. (BV_{CEO} = -40V@I_C=-1.0mA)
- Small load switch transistor with high gain and low stauration voltage, is designed for general purpose amflifier and switching applications at collector current.
- Offer PNP+ PNP in one package recommended
- Capable of 150mW power dissipation.
- Lead-free parts for green partner, exceeds environmental standards of MIL-STD-19500 /228
- Suffix "-H" indicates Halogen-free part, ex.FMBT3906DW1-H

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-363
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : See Diagram
- Mounting Position : Any
- Weight : Approximated 0.006 gram

Package outline





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

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Collector-Base voltage		V_{CBO}			-40	V
Collector-Emitter voltage		V_{CEO}			-40	V
Emitter-Base voltage		V_{EBO}			-5.0	V
Collector current		I_C			-200	mA
Total device dissipation FR-5 board (1)	T_A = 25°C	P_D			150	mW
Thermal resistance	Junction to ambient	$R_{\theta JA}$			833	°C/W
Operating temperature		T_J	-55		+150	°C
Storage temperature		T_{STG}	-65		+150	

1.FR-5 = 1.0 X 0.75 X0.062 in.

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Characteristics (AT T_A=25°C unless otherwise noted)

Off characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Collector-Base breakdown voltage	I_c = -10uA, I_E = 0	$V_{(BR)CBO}$	-40			V
Collector-Emitter breakdown voltage(3)	I_c = -1mA, I_B = 0	$V_{(BR)CEO}$	-40			V
Emitter-Base breakdown voltage	I_c = -10uA, I_C = 0	$V_{(BR)EBO}$	-5.0			V
Base cutoff current	V_{CE} = -30Vdc, V_{EB} = -3.0Vdc	I_{BL}			-50	nA
Collector cutoff current	V_{CE} = -30Vdc, V_{EB} = -3.0Vdc	I_{CEX}			-50	

On characteristics(3)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
DC current gain	I_c = -0.1mA, V_{CE} = -1.0V	h_{FE}	60			-
	I_c = -1.0mA, V_{CE} = -1.0V		80			
	I_c = -10mA, V_{CE} = -1.0V		100		300	
	I_c = -50mA, V_{CE} = -1.0V		60			
	I_c = -100mA, V_{CE} = -1.0V		30			
Collector-Emitter saturation voltage(3)	I_c = -10mA, I_B = -1.0mA	$V_{CE(sat)}$			-0.25	Vdc
	I_c = -50mA, I_B = -5.0mA				-0.40	
Base-Emitter saturation voltage(3)	I_c = -10mA, I_B = -1.0mA	$V_{BE(sat)}$	-0.65		-0.85	Vdc
	I_c = -50mA, I_B = -5.0mA				-0.95	

3.Pulse test : pukse width ≤ 300uS, duty cycle ≤ 2.0%.

Small-signal characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Current-gain-bandwidth product(4)	I_C = -10mA, V_{CE} = -20V, f = 100MHz	f_T	250			MHz
Output capacitance	V_{CB} = -5.0V, I_E = 0, f = 1.0MHz	C_{obo}			4.5	pF
Input capacitance	V_{EB} = -0.5V, I_C = 0, f = 1.0MHz	C_{ibo}			1.0	pF
Input impedance	V_{CE} = -10A, I_C = -1.0mA, f = 1.0KHz	h_{ie}	2.0		12	kohms
Voltage feeback radio	V_{CE} = -10V, I_C = -1.0mA, f = 1.0KHz	h_{re}	0.1		10.0	X 10^{-4}
Small-signal current gain	V_{CE} = -10V, I_C = -1.0mA, f = 1.0KHz	h_{fe}	100		400	-
Output admittance	V_{CE} = -10V, I_C = -1.0mA, f = 1.0KHz	h_{oe}	3.0		60	umhos
Noise figure	V_{CE} = -5.0V, I_C = -100uA, RS = 1.0K ohms, f = 1.0KHZ	NF			4.0	dB

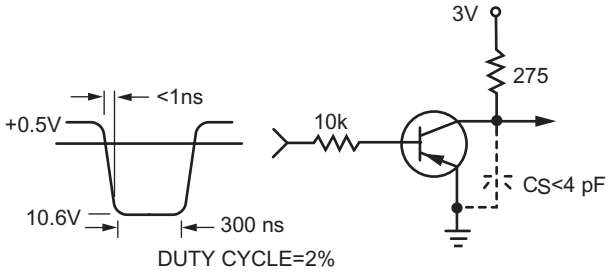
4.f_T is defined as the frequency at which h_{fe} extrapolates to unity.

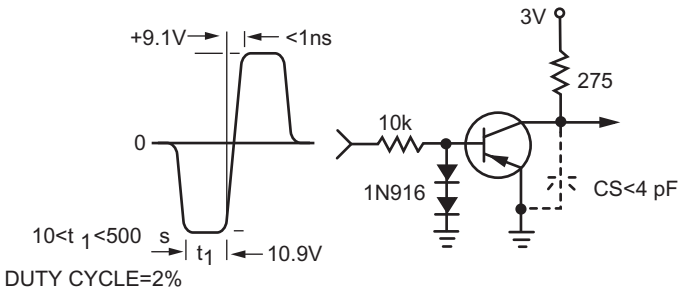
Switching characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Delay time	V_{CC} = -3.0V, V_{BE} = 0.5V, I_C = -10mA, I_{B1} = -1.0mA	td			35	ns
Rise time		tr			35	
Storage time	V_{CC} = -3.0V, I_C =-10mA, I_{B1} = I_{B2} = -1.0mA	ts			225	
Fall time		tf			75	

5. Pulse Test: Pulse Width <=300μs, Duty cycle«=2.0%

Rating and characteristic curves (FMBT3906DW1)





*Total shunt capacitance of test jig and connectors

Figure 1. Delay and Rise Time Equivalent Test Circuit

Figure . Storage and Fall Time Equivalent Test Circuit

TYPICAL TRANSIENT CHARACTERISTICS

——— T_J=25°C - - - - - T_J=125°C

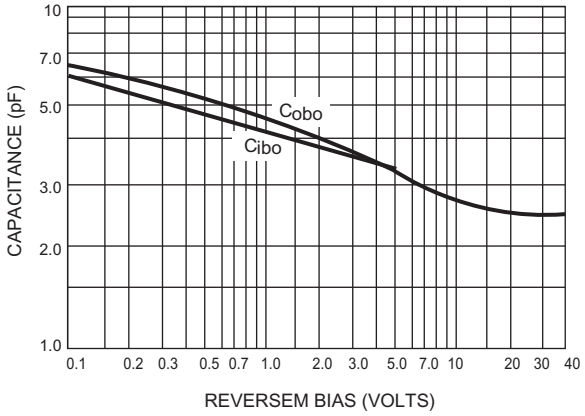


Figure 3. Capacitance

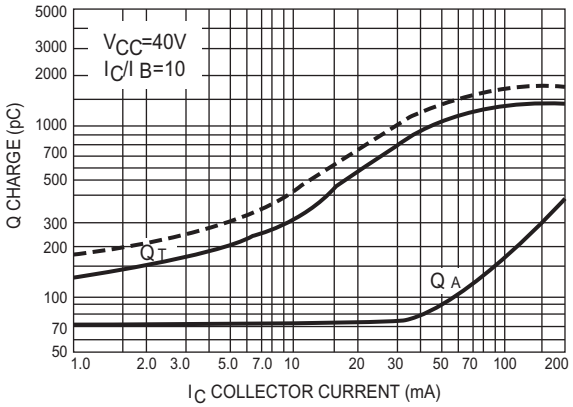


Figure 4. Charge Data

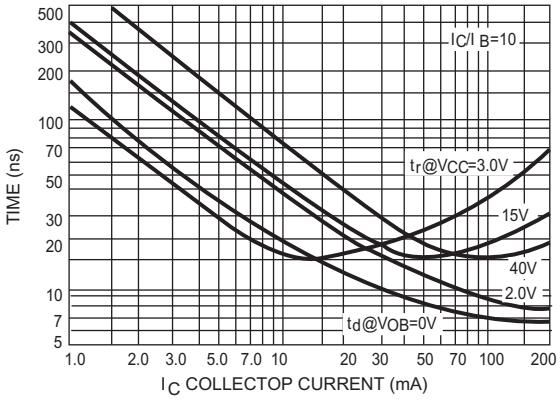


Figure 5. Turn-On Time

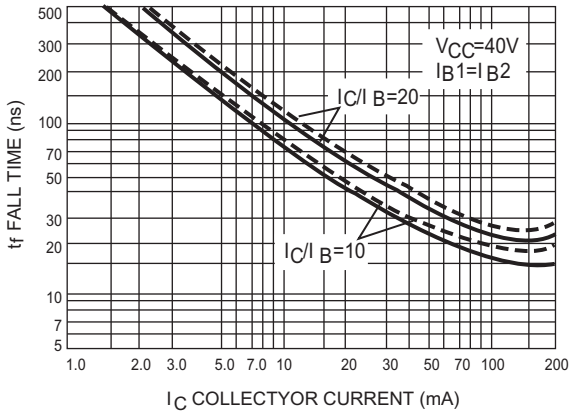


Figure 6.Fall Time

Rating and characteristic curves (FMBT3906DW1)

(V_{CE}= -5.0 Vdc, T_A= 25 °C, Bandwidth= 1.0Hz)

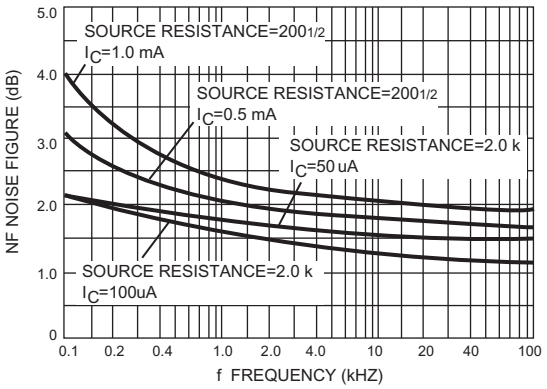


Figure 7.

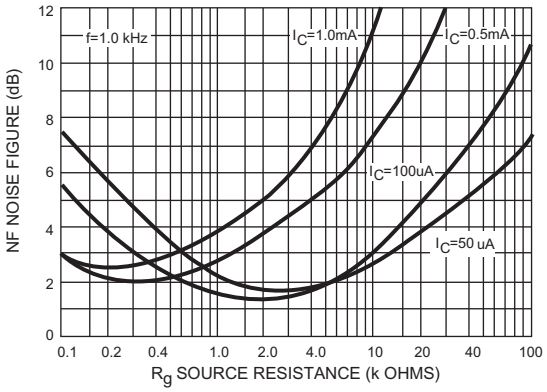


Figure 8.

h PARAMETERS (V_{CE}= -10 Vdc, f= 1.0 kHz, T_A= 25 °C)

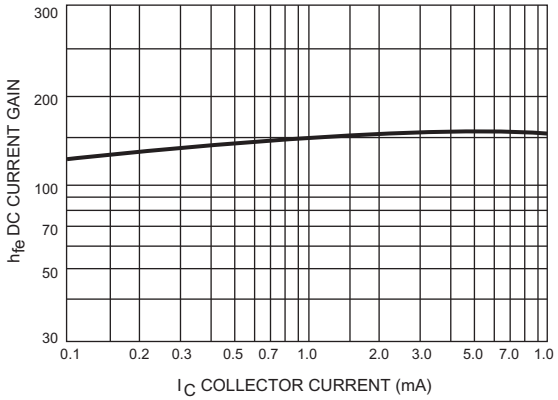


Figure 9. Current Gain

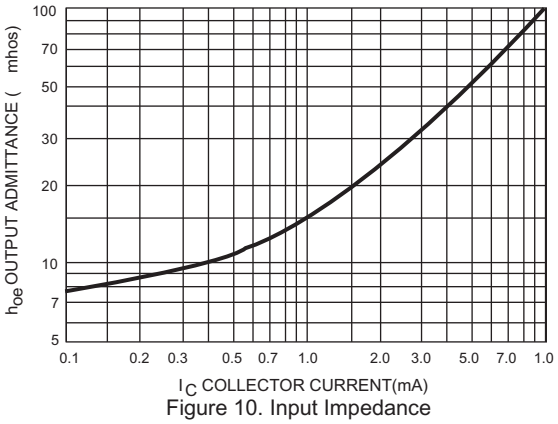


Figure 10. Input Impedance

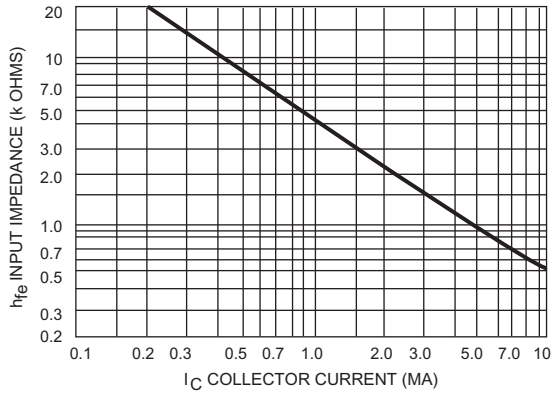


Figure .11 Input Impedance

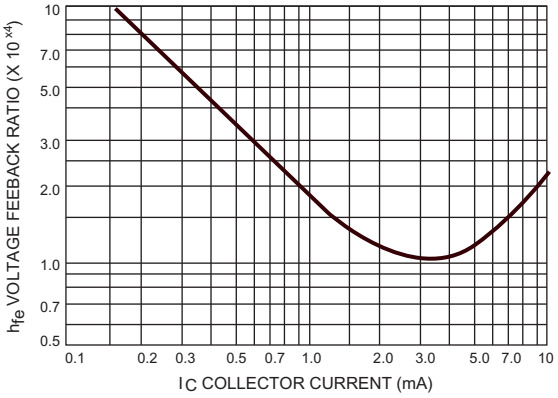
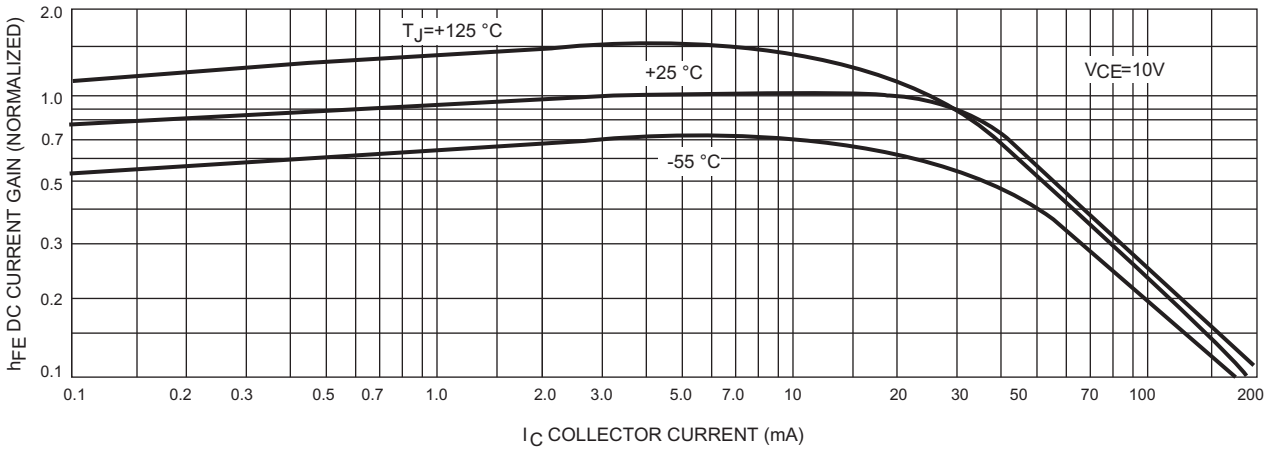


Figure 12. Votage Feeback Ratio

Rating and characteristic curves (FMBT3906DW1)

TYPICAL STATIC CHARACTERISTICS



Figurer 13. DC Current Gain

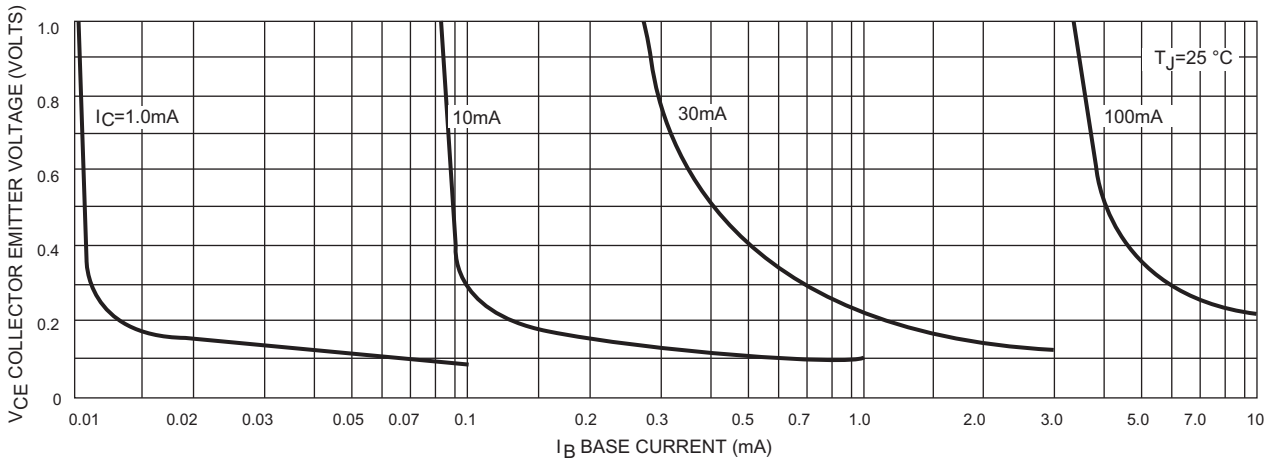


Figure 14. Collector Saturation Region

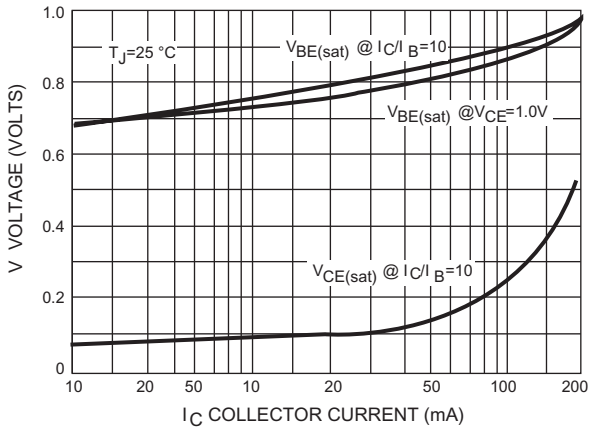


Figure 15. "ON" Voltages

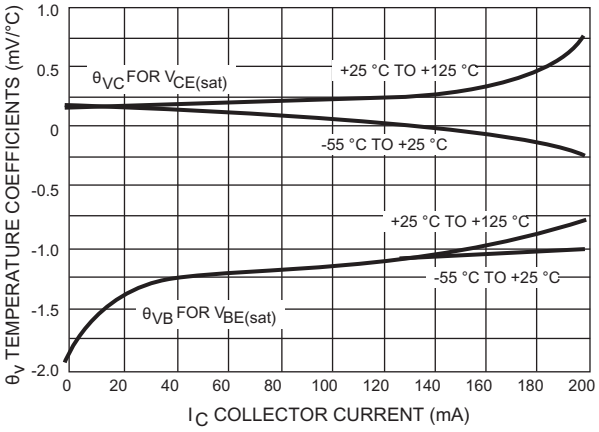


Figure 16.Temperature Coefficients

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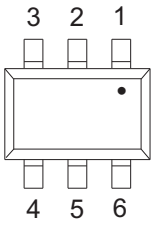
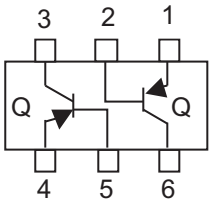
Pinning information

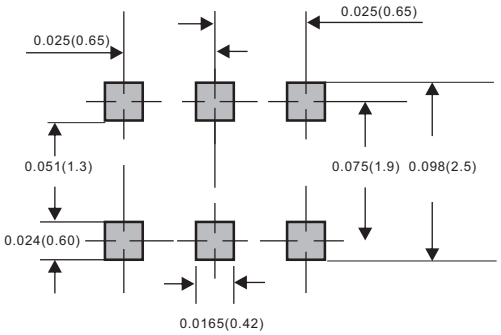
Pin	Simplified outline	Symbol
FMBT3906DW1		

Marking

Type number	Marking code
FMBT3906DW1	A2

Suggested solder pad layout

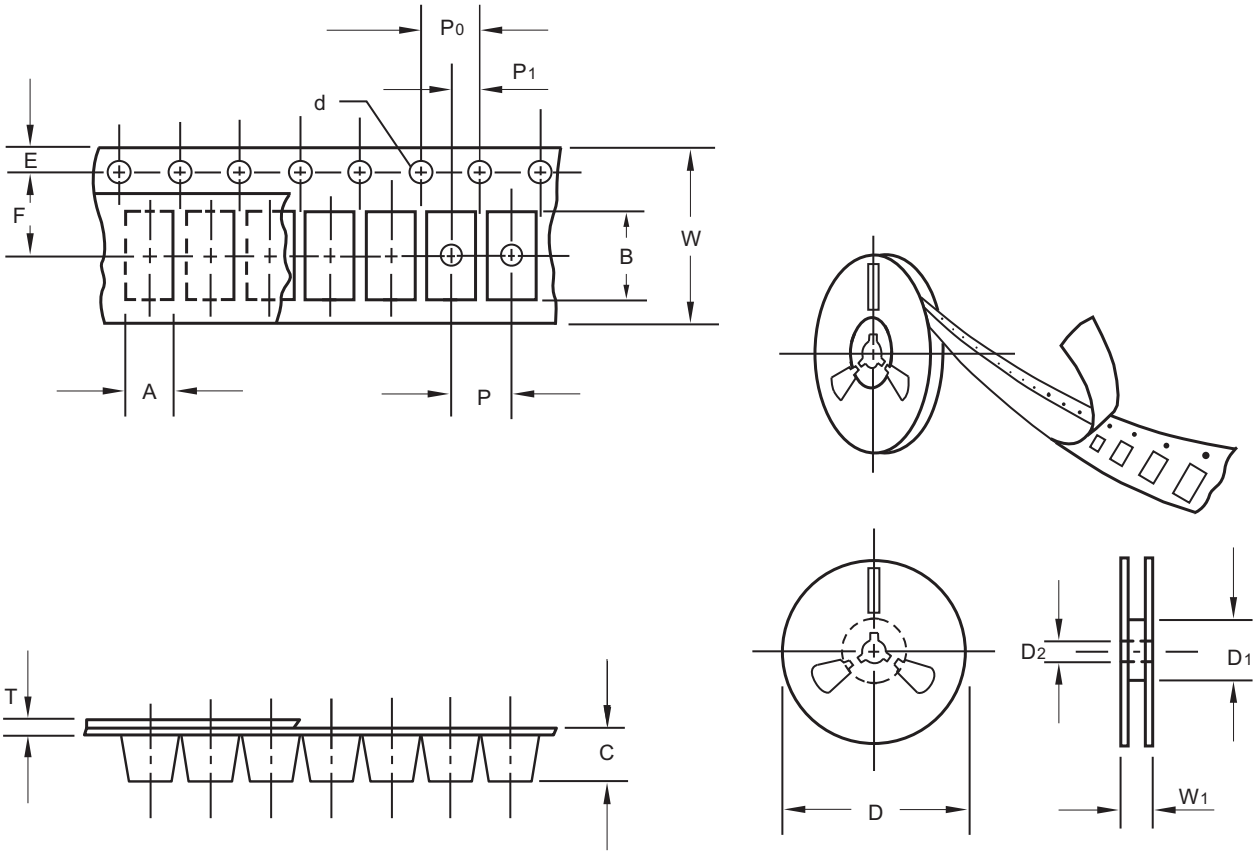
SOT-363



Dimensions in inches and (millimeters)

FMBT3906DW1

Packing information



unit:mm

Item	Symbol	Tolerance	SOT-363
Carrier width	A	0.1	2.36
Carrier length	B	0.1	2.40
Carrier depth	C	0.1	1.20
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	62.00
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.

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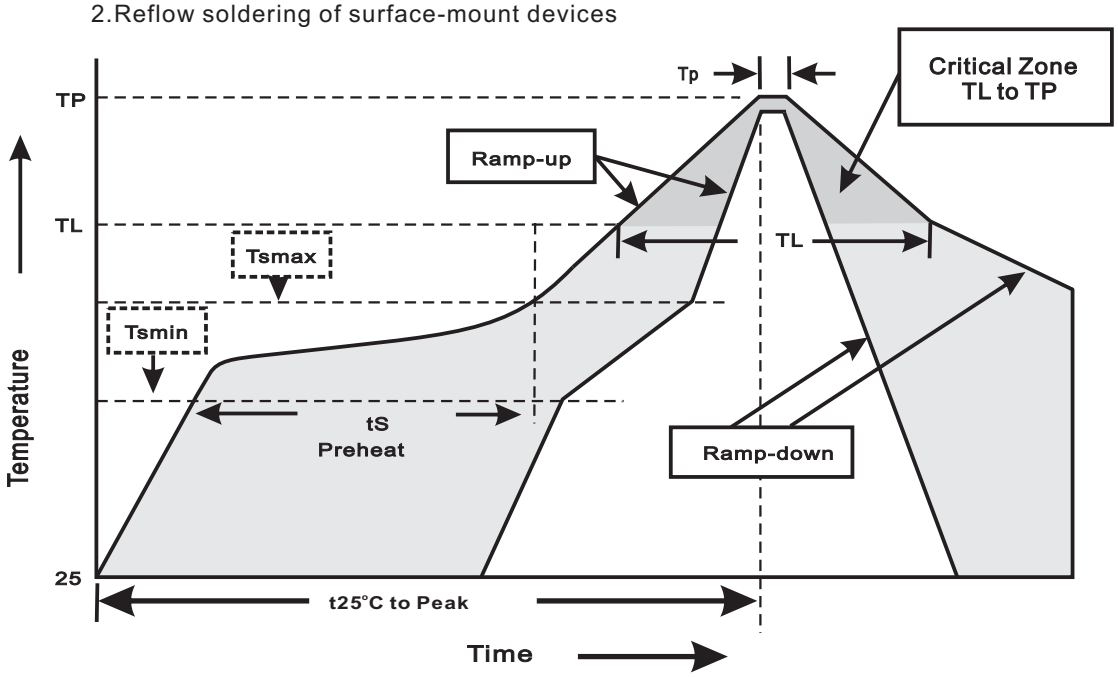
Reel packing

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-363	7"	3000	4.0	30,000	183*183*123	178	382*262*387	240,000	9.5

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
1. Steady State Operating Life	TA=25°C P_D=150mW Test Duration:1000hrs
2. High Temperature Reverse Bias	Tj=150℃, V_{CE}=80% related volage, Test Duration:1000hrs
3. Temperature Cycle	-55℃(15min) to 150℃(15min)Air to Air Transition Time<20sec Test Cycles:1000cycle
4. Autoclave	P=2atm Ta=121℃ RH=100% Test Duration:96hrs
5. High Temperature Storage Life	Ta=150℃ Test Duration:1000hrs
6. Solderability	245℃,Test Duration:5sec
7. High Temperature High Humidity Reverse Bias	Ta=85℃, 85%RH, V_{CE}=80% related volage, Test Duration:1000hrs
8. Resistance to Soldering Heat	260℃,Test Duration:10sec