

FMBT5401DW1

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FMBT5401DW1

Dual PNP Small Signal Transistor

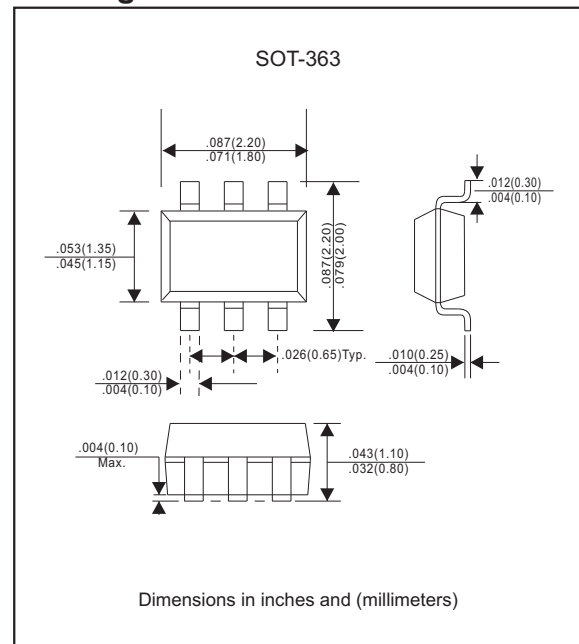
Features

- Lead-free parts meet RoHS requirements
- Suffix "-H" indicates Halogen-free part, ex.FMBT5401DW1-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 $T_A=25^\circ\text{C}$ unless otherwise noted)

PARAMETER	Symbol	Value	UNIT
Collector-base voltage	V_{CB0}	-160	Vdc
Collector-emitter voltage	V_{CE0}	-150	Vdc
Emitter-base voltage	V_{EB0}	-5.0	Vdc
Collector current -continuous	I_C	-500	mAdc

Thermal characteristics

PARAMETER	Symbol	Max	UNIT
Total device dissipation FR-5 board (1)	P_D	$T_A = 25^\circ\text{C}$ 225	mW
		Derate above 25°C 1.8	mW/ $^\circ\text{C}$
Thermal resistance	$R_{\theta JA}$	Junction to ambient 556	$^\circ\text{C}/\text{W}$
Total device dissipation alumina substrate(2)	P_D	$T_A = 25^\circ\text{C}$ 300	mW
		Derate above 25°C 2.4	mW/ $^\circ\text{C}$
Thermal resistance	$R_{\theta JA}$	Junction to ambient 417	$^\circ\text{C}/\text{W}$
Operating junction temperature range	T_J	-55 to +150	$^\circ\text{C}$
Storage temperature range	T_{STG}	-55 to +150	$^\circ\text{C}$

1.FR-5 = 1.0 X 0.75 X 0.062 in.

2.Alumina = 0.4 X 0.3 X 0.024 in. 99.5% alumina.

FMBT5401DW1**Electrical Characteristics** (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)**OFF characteristics**

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
Collector-base breakdown voltage	$I_C = -100\mu\text{A}$, $I_E = 0$	$V_{(BR)CBO}$	-160		Vdc
Collector-emitter breakdown voltage(1)	$I_C = -1.0\text{mA}$, $I_B = 0$	$V_{(BR)CEO}$	-150		Vdc
Emitter-base breakdown voltage	$I_E = -10\mu\text{A}$, $I_C = 0$	$V_{(BR)EBO}$	-5.0		Vdc
Collector cutoff current	$V_{CB} = -120\text{Vdc}$, $I_E = 0$ $V_{CB} = -120\text{Vdc}$, $I_E = 0$, $T_A = 100^{\circ}\text{C}$	I_{CBO}		-50 -50	nAdc μAdc

ON characteristics

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
DC current gain	$I_C = -1.0\text{mA}$, $V_{CE} = -5.0\text{Vdc}$ $I_C = -10\text{mA}$, $V_{CE} = -5.0\text{Vdc}$ $I_C = -50\text{mA}$, $V_{CE} = -5.0\text{Vdc}$	h_{FE}	50 60 50	- 240 -	-
Collector-emitter saturation voltage	$I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$ $I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$	$V_{CE(sat)}$		-0.2 -0.5	Vdc
Base-emitter saturation voltage	$I_C = -10\text{mA}$, $I_B = -1.0\text{mA}$ $I_C = -50\text{mA}$, $I_B = -5.0\text{mA}$	$V_{BE(sat)}$		-1.0 -1.0	Vdc

Small-Signal characteristics

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
Current-gain-bandwidth product	$I_C = -10\text{mA}$, $V_{CE} = -10\text{Vdc}$, $f = 100\text{MHz}$	f_T	100	300	MHZ
Output capacitance	$V_{CB} = -10\text{Vdc}$, $I_E = 0$, $f = 1.0\text{MHz}$	C_{obo}		6.0	pF
Small signal current gain	$I_C = -1.0\text{mA}$, $V_{CE} = -10\text{Vdc}$, $f = 1.0\text{KHz}$	h_{FE}	40	200	-
Noise figure	$I_C = -200\mu\text{A}$, $V_{CE} = -5.0\text{Vdc}$, $R_s = 10\Omega$, $f = 1.0\text{KHz}$	NF		8.0	dB

Note 1: Pulse Test: Pulse Width = 300 μs , Duty Cycle = 2.0%.

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FIG.1 DC Current Gain

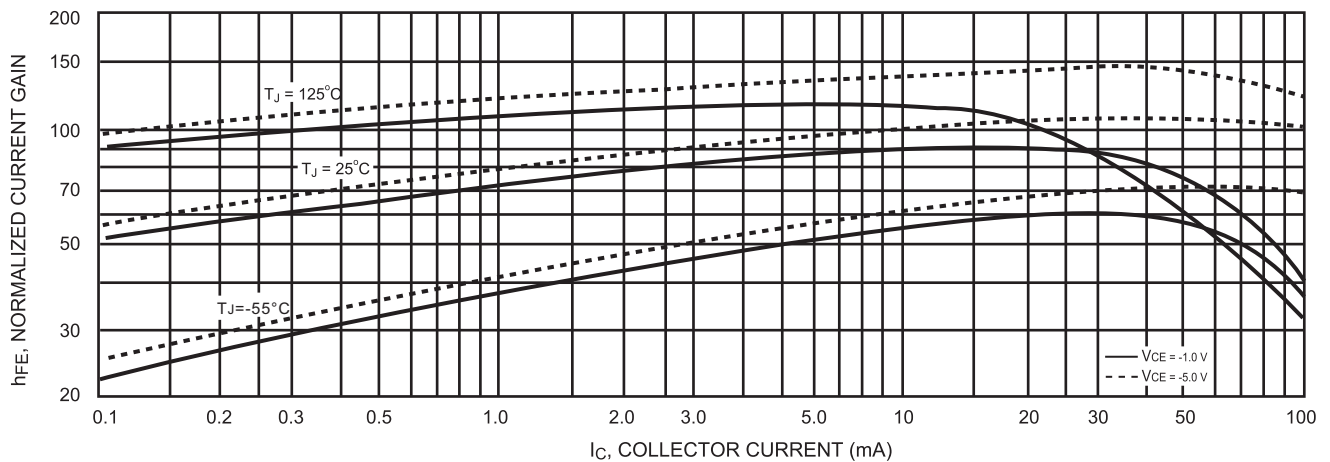


FIG.2 Collector Saturation Region

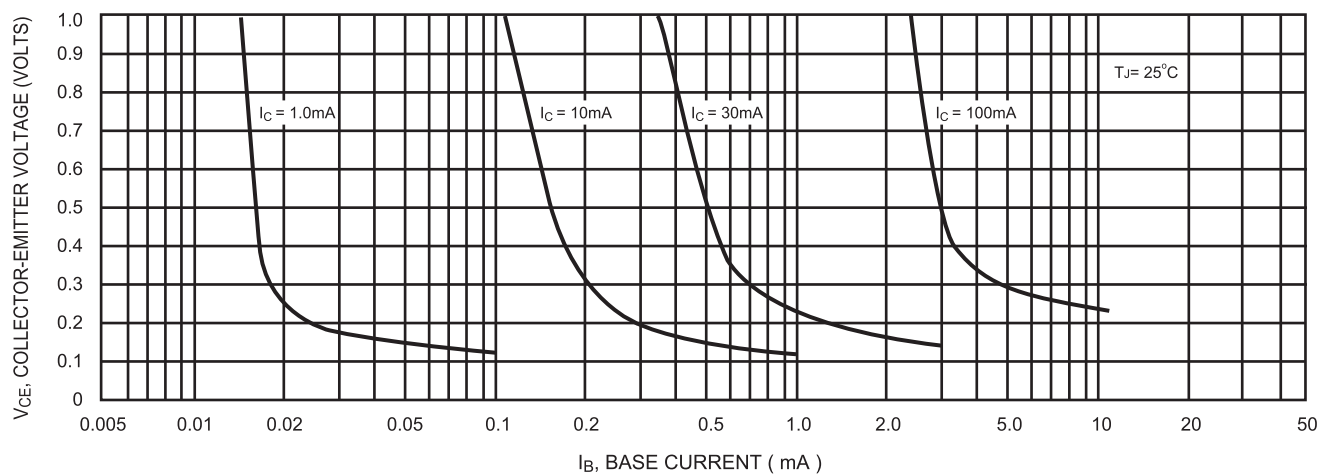


FIG.3 Temperature Coefficients

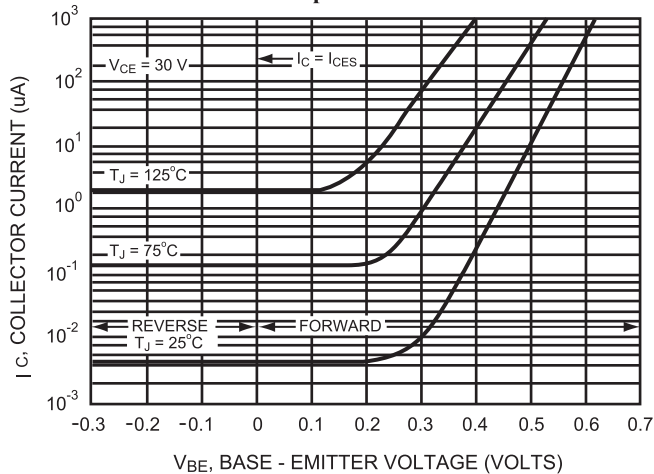
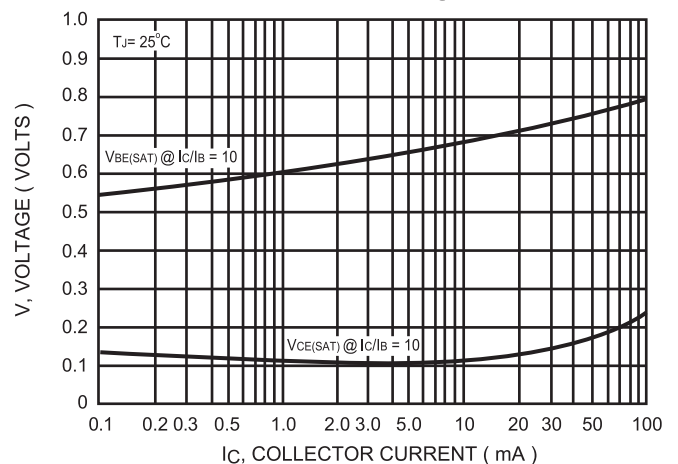


FIG.4 " On " Voltages



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FIG.5 Temperature Coefficients

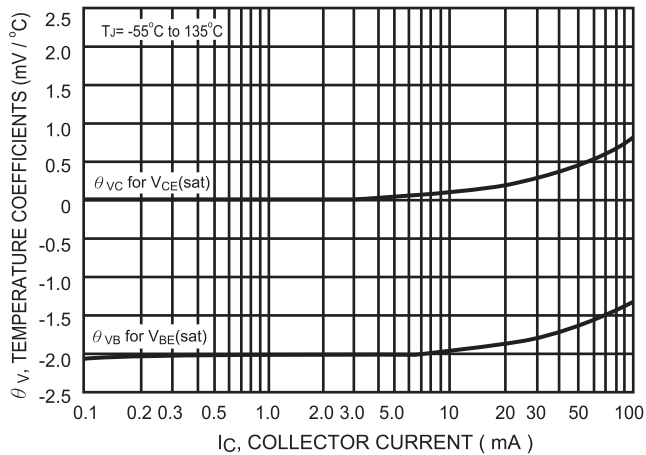


FIG.6 Switching Time Test Circuit

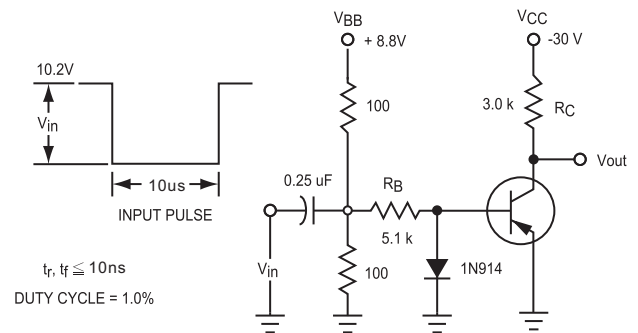
VALUES SHOWN ARE FOR $I_C @ 10 mA$

FIG.7 Capacitances

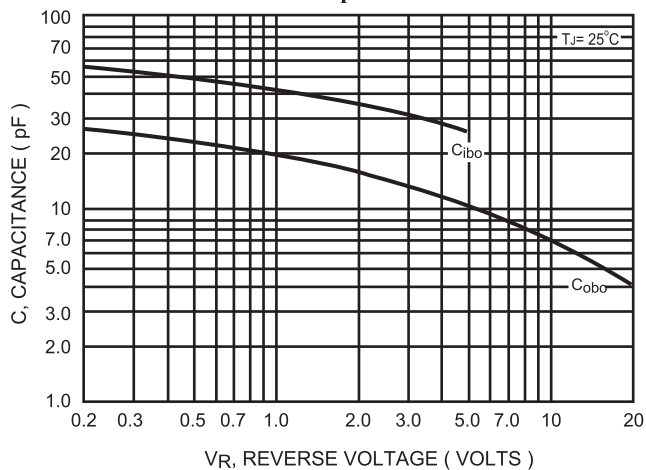


FIG.8 Turn - On Time

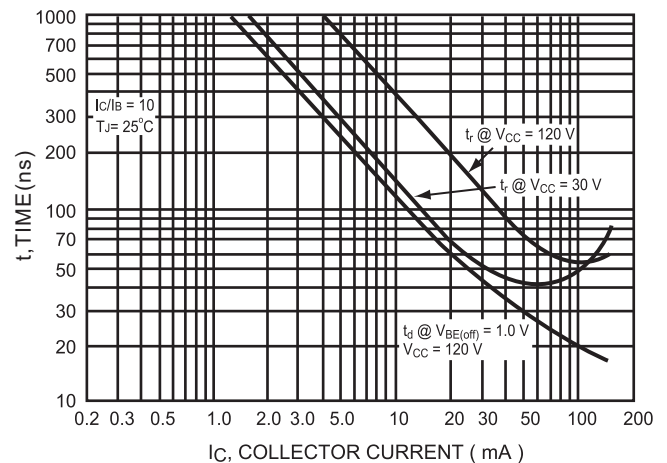
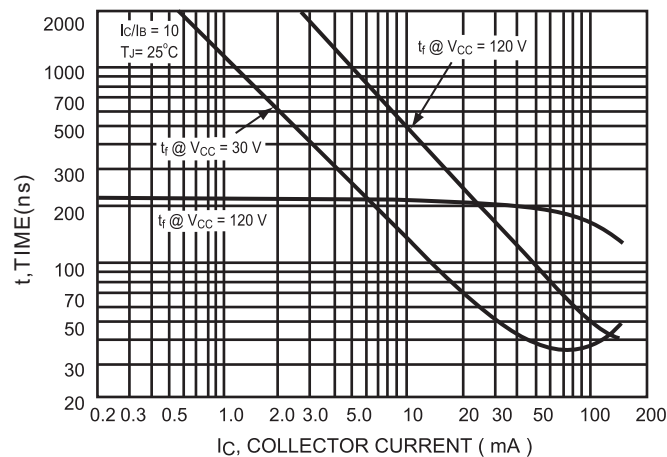
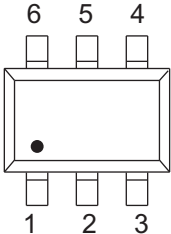
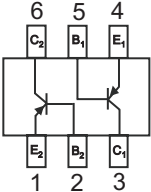


FIG.9 Turn - Off Time



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Pinning information

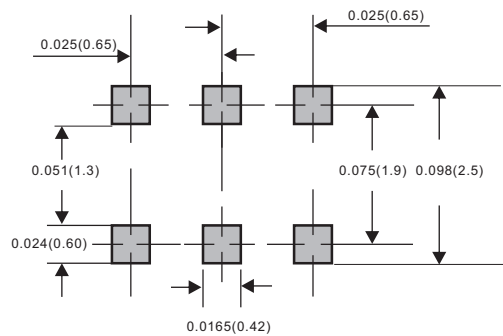
Pin	Simplified outline	Symbol
Pin1 Emitter2 Pin2 Base2 Pin3 Collector1 Pin4 Emitter1 Pin5 Base1 Pin6 Collector2		

Marking

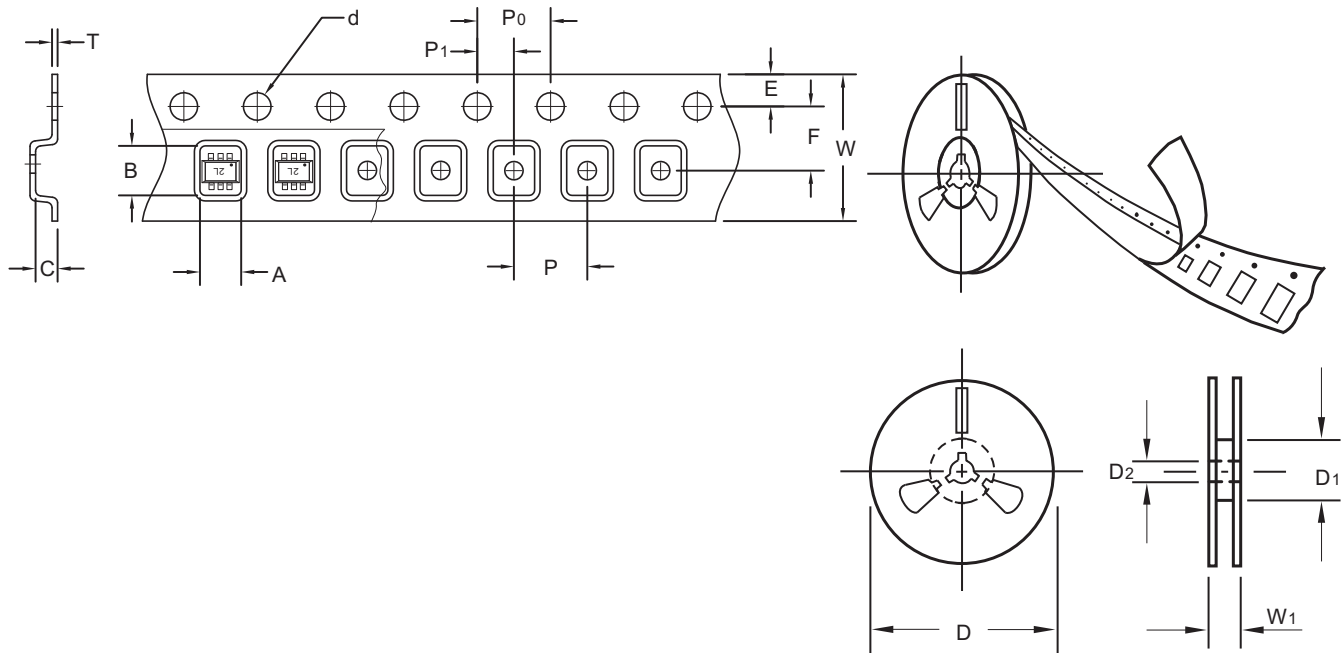
Type number	Marking code
FMBT5401DW1	2L

Suggested solder pad layout

SOT-363



Dimensions in inches and (millimeters)

FMBT5401DW1**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 accordance with EIA standard RS-481-A and specifications listed above.

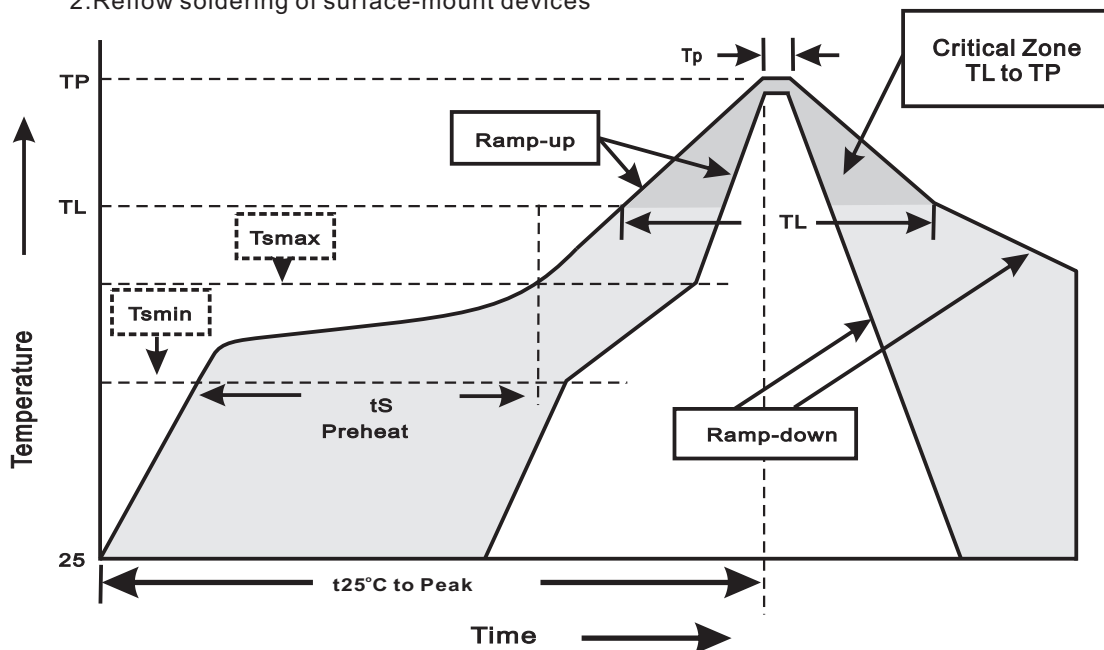
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Reel packing

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-363	7"	3,000	4.0	30,000	183*123*183	178	382*257*387	240,000	9.50

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
1. Steady State Operating Life	$T_A=25^{\circ}\text{C}$ $P_D=225\text{mW}$ Test Duration:1000hrs
2. High Temperature Reverse Bias	$T_J=150^{\circ}\text{C}$, $V_{CE}=80\%$ related volage, Test Duration:1000hrs
3. Temperature Cycle	-55°C (15min) to 150°C (15min) Air to Air Transition Time<20sec Test Cycles: 1000cycle
4. Autoclave	$P=2\text{atm}$ $T_a=121^{\circ}\text{C}$ $\text{RH}=100\%$ Test Duration: 96hrs
5. High Temperature Storage Life	$T_a=150^{\circ}\text{C}$ Test Duration: 1000hrs
6. Solderability	245°C ,Test Duration: 5sec
7. High Temperature High Humidity Reverse Bias	$T_a=85^{\circ}\text{C}$, 85%RH, $V_{CE}=80\%$ related volage, Test Duration: 1000hrs
8. Resistance to Soldering Heat	260°C ,Test Duration: 10sec