FMBT2222ADW1

List

FMBT2222ADW1

600mA Silicon NPN Epitaxial Planar Transistor

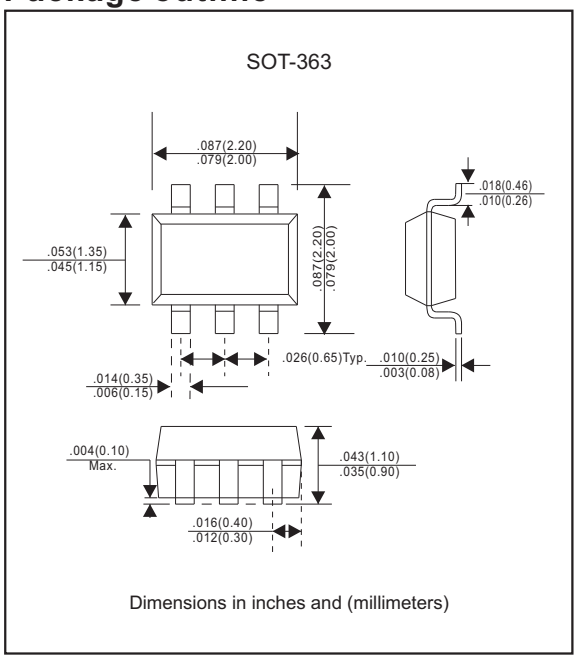
Features

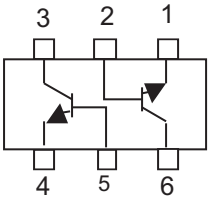
- High collector-emitterbreakdien voltage. (BV_{CEO} = 40V@I_C=10mA)
- Small load switch transistor with high gain and low stauration voltage, is designed for general purpose amflifier and switching applications at collector current.
- Offer NPN+NPN in one package
- Capable of 150mW power dissipation.
- Lead-free parts for green partner, exceeds environmental standards of MIL-STD-19500 /228
- Suffix "-H" indicates Halogen-free part, ex.FMBT2222ADW1-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}			75	V
Collector-Emitter voltage		V_{CEO}			40	V
Emitter-Base voltage		V_{EBO}			6.0	V
Collector current		I_C			600	mA
Total device dissipation(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}	-55		+150	

1.Device mounted on FR-4 glass epoxy printed circuit board using the minimum recommended footprint

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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	$V_{(BR)CBO}$	75			V
Collector-Emitter breakdown voltage(3)	I_c = 10mA, I_B = 0	$V_{(BR)CEO}$	40			V
Emitter-Base breakdown voltage	I_E = 10uA, I_C = 0	$V_{(BR)EBO}$	6.0			V
Base cutoff current	V_{CE} = 60Vdc, $V_{EB(off)}$ = 3.0Vdc	I_{BL}			20	nA
Collector cutoff current	V_{CE} = 60Vdc, $V_{EB(off)}$ = 3.0Vdc	I_{CEX}			10	nA
Collector cutoff current	V_{CB} = 60Vdc, I_E = 0	I_{CBO}			0.01	uA
	V_{CB} = 60Vdc, I_E = 0, T_A =125°C				10	
Emitter cutoff current	I_C = 0, V_{EB} = 3.0Vdc	I_{EBO}			100	nA

On characteristics(3)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
DC current gain	I_c = 0.1mA, V_{CE} = 10V	h_{FE}	35			-
	I_c = 1.0mA, V_{CE} = 10V		50			
	I_c = 10mA, V_{CE} = 10V, T_A = -55°C		75			
	I_c = 150mA, V_{CE} = 10V(3)		100		300	
	I_c = 150mA, V_{CE} = 1.0V(3)		50			
	I_c = 500mA, V_{CE} = 10V(3)		40			
Collector-Emitter saturation voltage(3)	I_c = 150mA, I_B = 15mA	$V_{CE(sat)}$			0.3	Vdc
	I_c = 500mA, I_B = 50mA				1.0	
Base-Emitter saturation voltage(3)	I_c = 150mA, I_B = 15mA	$V_{BE(sat)}$	0.60		1.2	Vdc
	I_c = 500mA, I_B = 50mA				2.0	

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 = 20mA, V_{CE} = 20V, f = 100MHz	f_T	300			MHz
Output capacitance	V_{CB} = 10V, I_E = 0, f = 1.0MHz	C_{obo}			8.0	pF
Input capacitance	V_{EB} = 0.5V, I_C = 0, f = 1.0MHz	C_{ibo}			25	pF
Input impedance	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{ie}	2.0		0.8	kohms
	V_{CE} = 10V, I_C = 10mA, f = 1.0KHz		0.25		1.25	
Voltage feeback radio	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{re}			8.0	X 10^{-4}
	V_{CE} = 10V, I_C = 10mA, f = -1.0KHz				4.0	
Small-signal current gain	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{fe}	50		300	-
	V_{CE} = 10V, I_C = 10mA, f = -1.0KHz		75		375	
Output admittance	V_{CE} = 10V, I_C = 1.0mA, f = 1.0KHz	h_{oe}	5.0		35	umhos
	V_{CE} = 10V, I_C = 10mA, f = -1.0KHz		25		200	
Noise figure	V_{CB} = 20V, I_E = 20mA, f = 31.8MHz	rb, Cc			150	ps
Noise figure	V_{CE} = 10V, 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} = 30V, V_{BE} =(off) = -0.5V, I_C = 150mA, I_{B1} = 15mA	td			10	nS
Rise time		tr			25	
Storage time	V_{CC} = 30V, I_C =150mA, I_{B1} = I_{B2} = 15mA	ts			225	
Fall time		tf			60	

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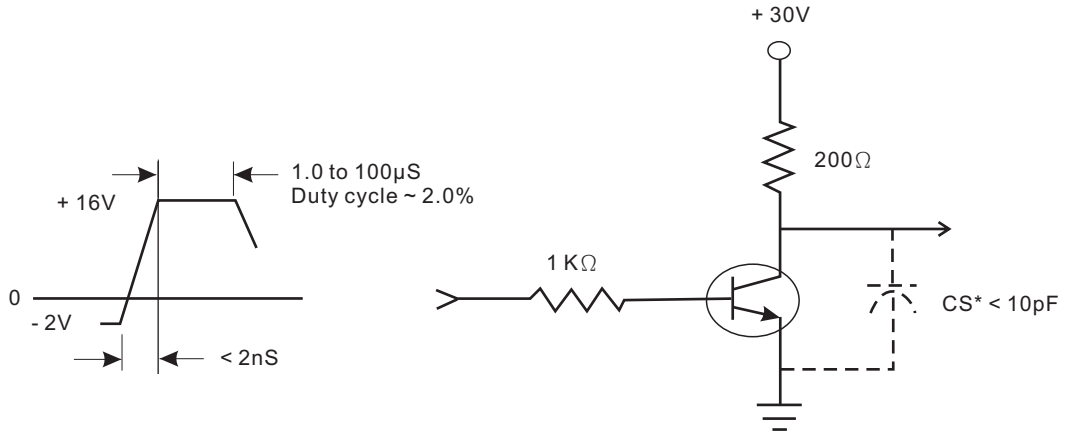
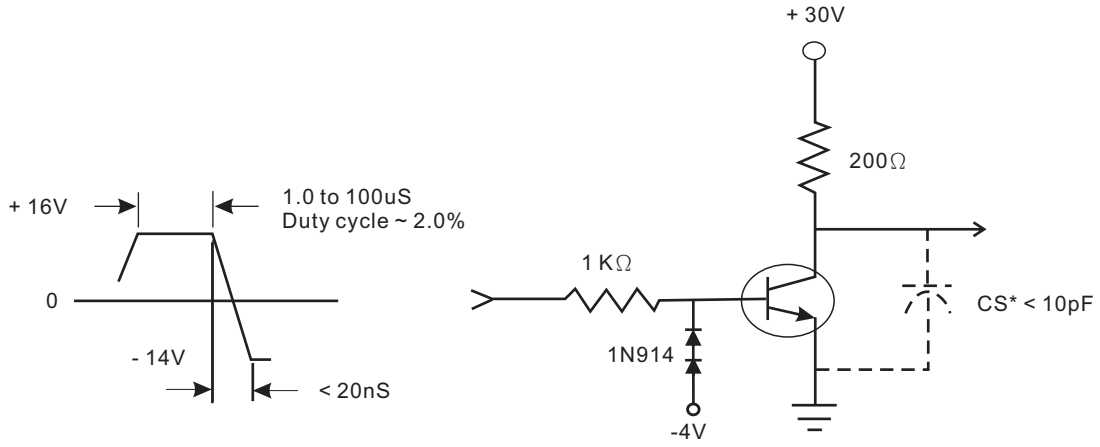
Switching time equivalent test circuits



Scope rise < 4 ns
*Total shunt capacitance of testjig, connectors, and cilloscope.

Fig. 1 Delay and rise time equivalent test circuit



Scope rise < 4 ns
*Total shunt capacitance of testjig, connectors, and cilloscope.

Fig. 2 Storage and fall time equivalent test circuit

Rating and characteristic curves (FMBT2222ADW1)

Fig. 3 DC Current Gain

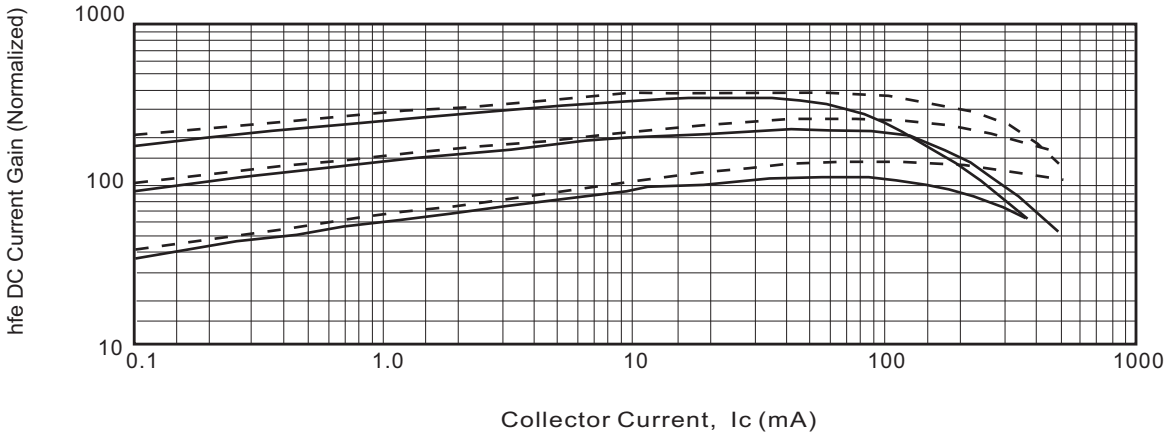


Fig. 4 Collect Saturation Region

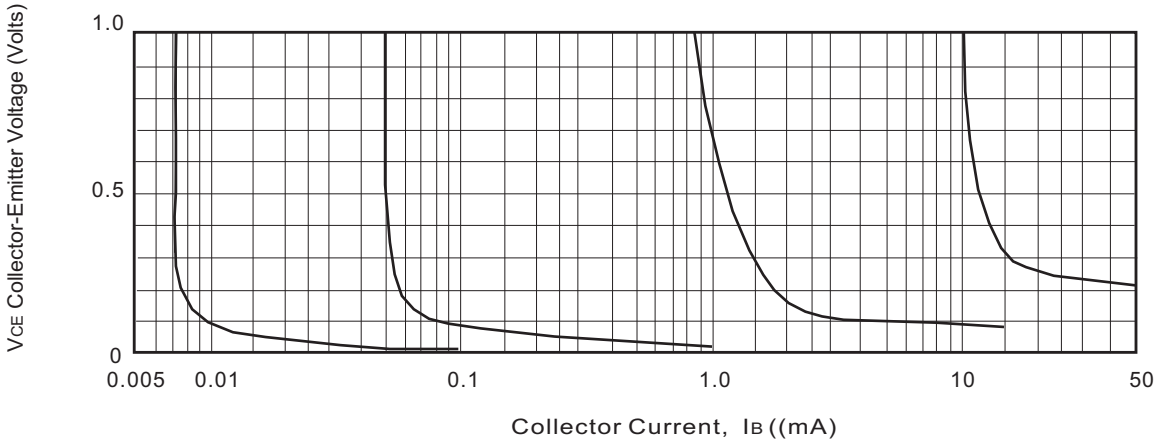


Fig. 5 Turn-On Time vs Collector Current

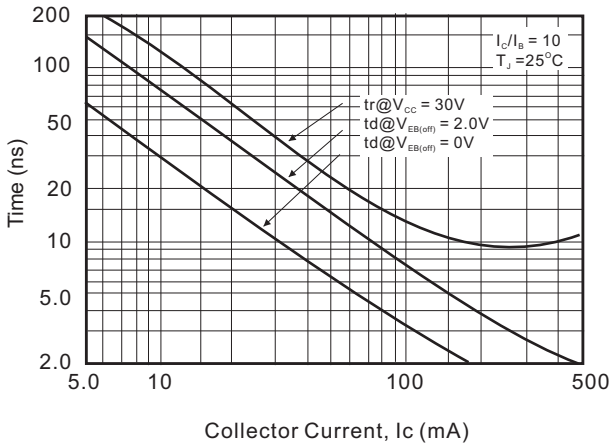
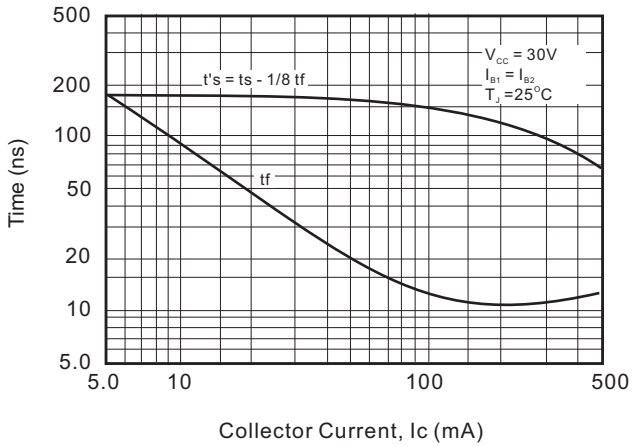


Fig. 6 Turn-Off Time vs Collector Current



Rating and characteristic curves (FMBT2222ADW1)

Fig. 7 Frequency Effects

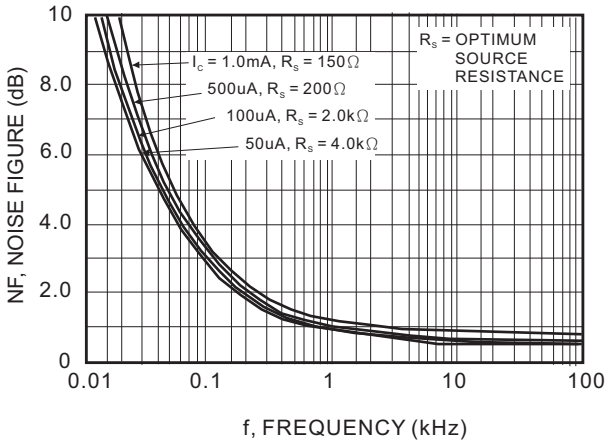


Fig. 8 Source Resistance Effects

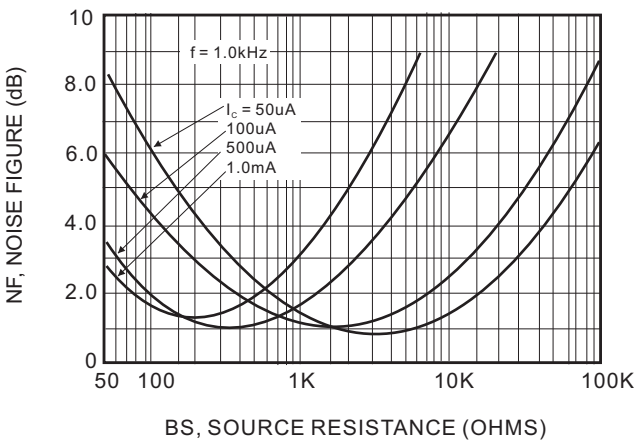


Fig. 9Capacitances

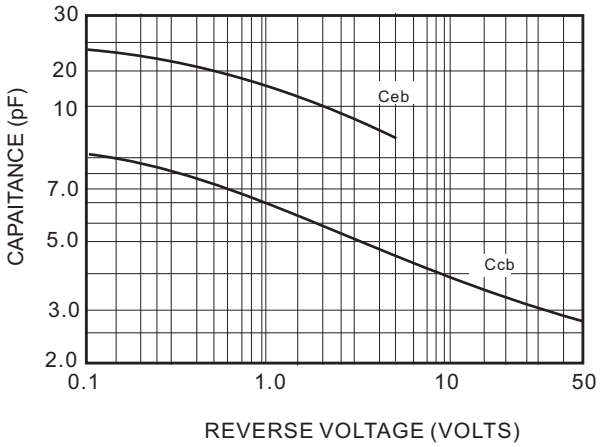


Fig. 10 Current-Gain Bandwidth Product

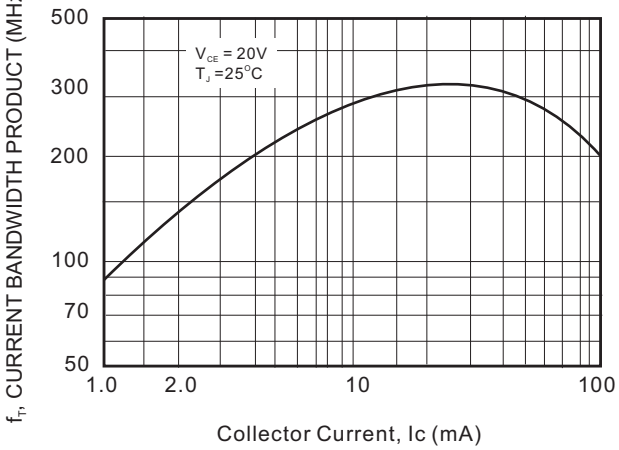


Fig. 11 "On" Voltage

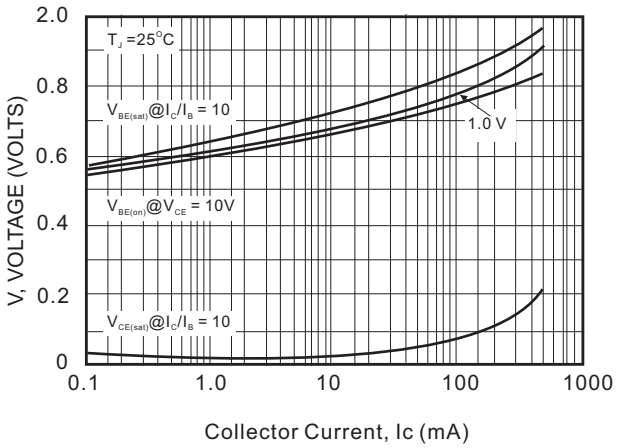
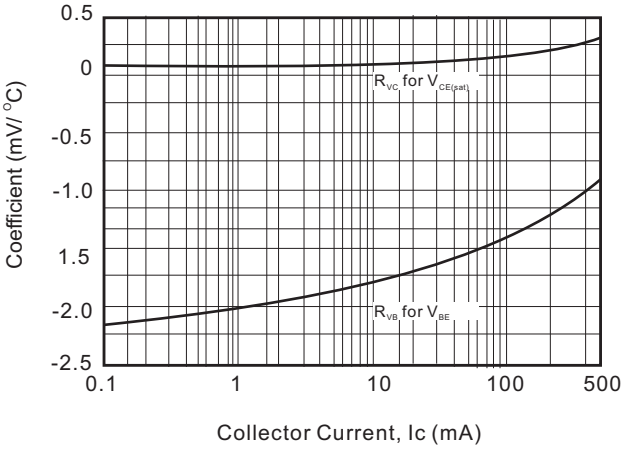


Fig.12 TEMPERATURE COFFICIENTS



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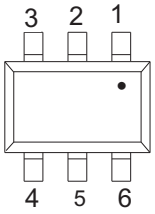
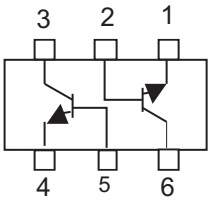
Pinning information

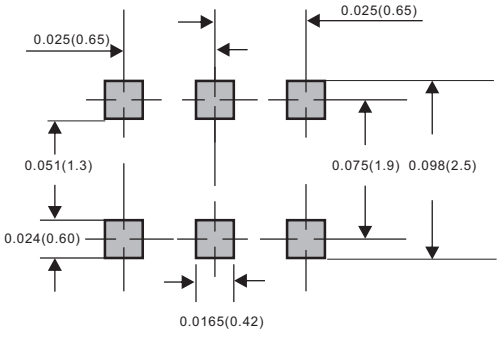
Pin	Simplified outline	Symbol
FMBT2222ADW1		

Marking

Type number	Marking code
FMBT2222ADW1	XX

Suggested solder pad layout

SOT-363



Dimensions in inches and (millimeters)

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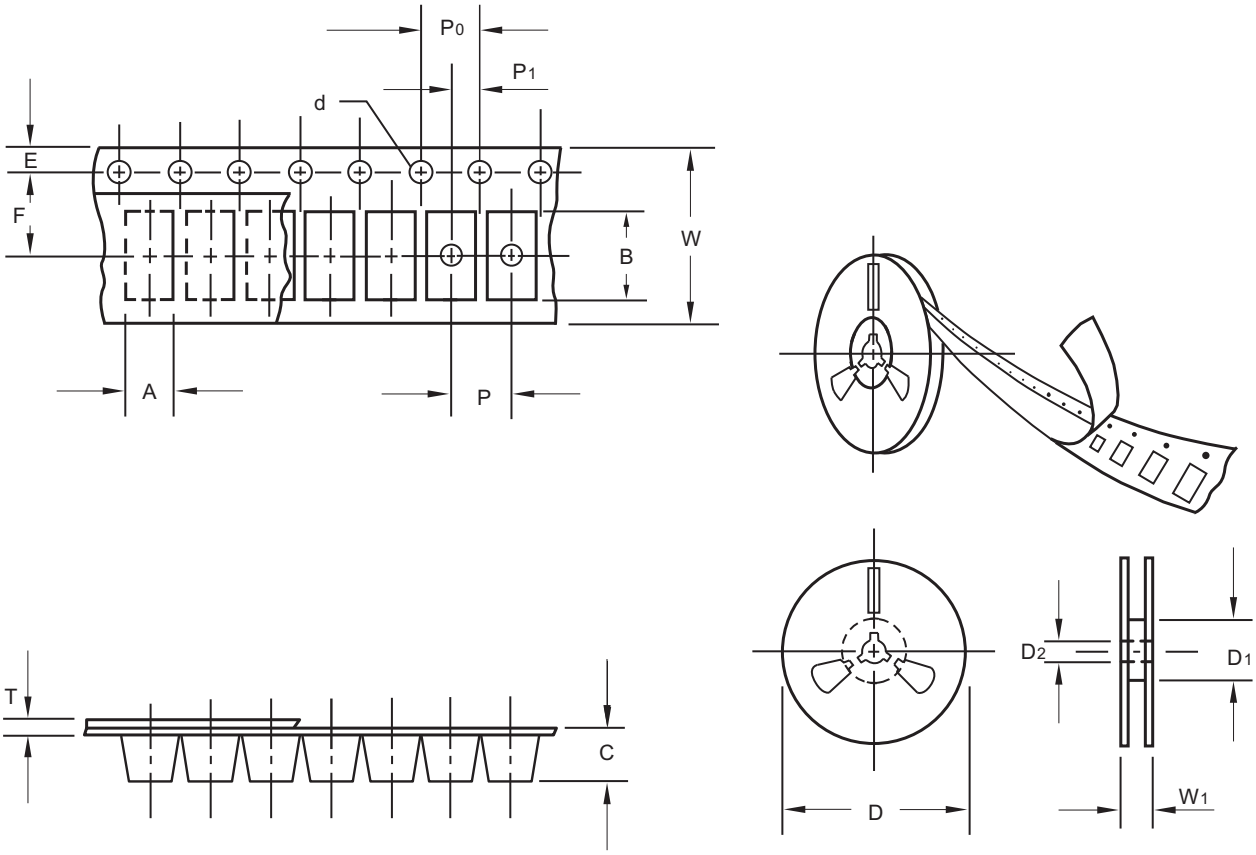
Packing information



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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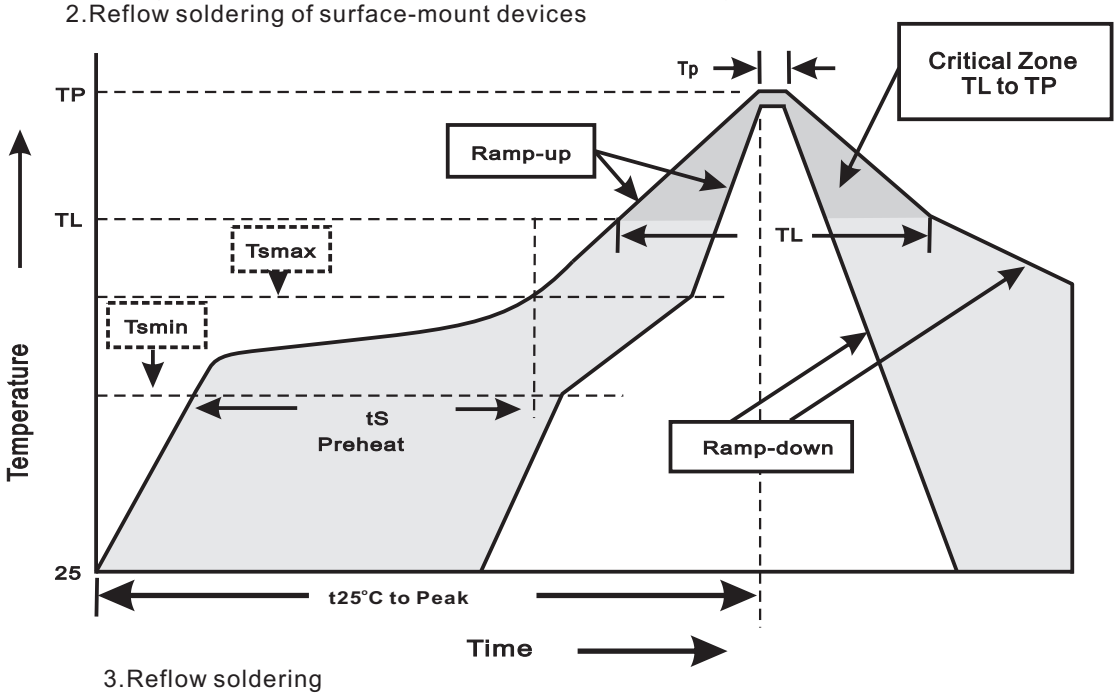
Reel packing

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"	3,000	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	P_D=150mW Test Duration:1000hrs
2. High Temperature Reverse Bias	Tj=150℃, V_{CE}=80% related volage, 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℃,5sec
7. High Temperature High Humidity Reverse Bias	Ta=85℃, 85%RH, V_{CE}=80% related volage, 1000hrs
8. Resistance to Soldering Heat	260℃,10sec