

FMBTA44/FMBTA45**List**

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FMBTA44/FMBTA45

High-Voltage NPN Epitaxial Planar Transistor

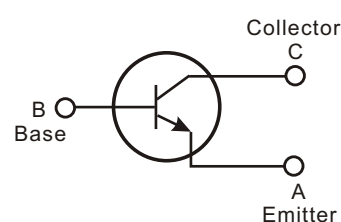
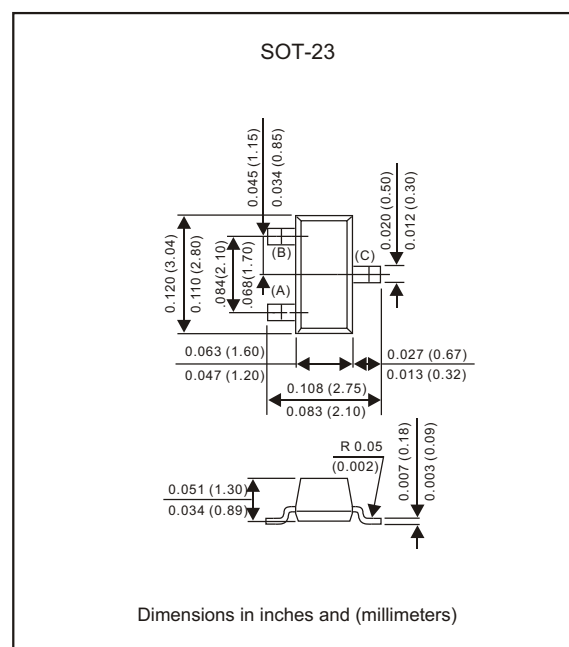
Package outline

Features

- Ideal for medium power amplification and switching
- Epitaxial planar die construction.
- High breakdown voltage
- Collector power dissipation 625mW
- Complement to Formosa FMBTA94/FMBTA93
- Lead-free parts for green partner, exceeds environmental standards of MIL-STD-19500/228

Mechanical data

- Epoxy: UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : Indicated by cathode band
- Mounting Position : Any
- Weight : Approximated 0.008 gram

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

PARAMETER	CONDITIONS	Symbol	FMBTA44	FMBTA45	UNIT
Collector-Base voltage		V_{CBO}	450	400	V_{dc}
Collector-Emitter voltage		V_{CEO}	400	350	V_{dc}
Emitter-Base voltage		V_{EBO}	6.0		V_{dc}
Collector current		I_C	300		mA_{dc}

Thermal Characteristics

Characteristics	CONDITIONS	Symbol	Maximum	UNIT
Total device dissipation FR-5 board (1)	$T_A = 25^\circ\text{C}$	P_D	225	mW
	Derate above 25°C	P_D	1.8	$\text{mW}/^\circ\text{C}$
Thermal resistance	Junction to ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total device dissipation alumina substrate (2)	$T_A = 25^\circ\text{C}$	P_D	350	mW
	Derate above 25°C	P_D	2.8	$\text{mW}/^\circ\text{C}$
Thermal resistance	Junction to ambient	$R_{\theta JA}$	357	$^\circ\text{C}/\text{W}$
Storage temperature		T_J	-55 ~ +150	$^\circ\text{C}$
Operating temperature		T_{STG}	-65 ~ +175	

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.

FMBTA44/FMBTA45**Characteristics** (AT T_A=25°C unless otherwise noted)**Off Characteristics**

PARAMETER	CONDITIONS	Symbol	Types	Min.	Max.	UNIT
Collector-Base breakdown voltage	I _C = 100μA _{dc} , I _E = 0	V _{(BR)CBO}	FMBTA44	450	-	V _{dc}
			FMBTA45	400	-	
Collector-Emitter breakdown voltage(3)	I _C = 1.0mA _{dc} , I _B = 0	V _{(BR)CEO}	FMBTA44	400	-	V _{dc}
			FMBTA45	350	-	
Emitter-Base breakdown voltage	I _E = 10μA _{dc} , I _C = 0	V _{(BR)EBO}	-	6.0	-	V _{dc}
Collector cutoff current	V _{CE} =360V _{dc} , I _B =0	I _{CES}	FMBTA44	-	0.5	μA _{dc}
	V _{CE} =320V _{dc} , I _B =0		FMBTA45	-	0.5	
Collector cutoff current	V _{CB} = 3 60V _{dc} , I _E = 0	I _{CBO}	FMBTA44	-	0.1	μA _{dc}
	V _{CB} = 320V _{dc} , I _E = 0		FMBTA45	-	0.1	
Emitter cutoff current	V _{EB} = 4.0V _{dc} , I _C = 0	I _{EBO}	-	-	0.1	μA _{dc}

On Characteristics(3)

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
DCcurrent gain	I _C = 1.0mA _{dc} , V _{CE} = 10V _{dc}	h _{FE}	40	-	-
	I _C =10mA _{dc} , V _{CE} =10V _{dc}		50	240	
	I _C =50mA _{dc} , V _{CE} =10V _{dc}		45	-	
	I _C =100mA _{dc} , V _{CE} =10V _{dc}		20	-	
Collector-Emitter saturation voltage(3)	I _C = 1.0mA _{dc} , I _B = 0.1mA _{dc}	V _{CE(sat)}	-	0.40	V _{dc}
	I _C =10mA _{dc} , I _B =1.0mA _{dc}			0.50	
	I _C =50A _{dc} , I _B =5.0mA _{dc}			0.75	
Base-Emitter saturation voltage(3)	I _C = 10mA _{dc} , V _{CE} = 1.0V _{dc}	V _{BE(sat)}	-	0.75	V _{dc}

Small Signal Characteristics

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
Current Gain Bandwidth Product (4)	I _C = 10mA _{dc} , V _{CE} = 10V _{dc} , f=100MHz	f _T	20	-	MHz
Output Capacitance	V _{CB} =20V _{dc} , I _E =0, f=1MHz	V _{Cob}	-	7	pF

3. Pulse test: pulse width ≥300μs, duty cycle ≤2.0%

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

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FIG.1 DC Current Gain

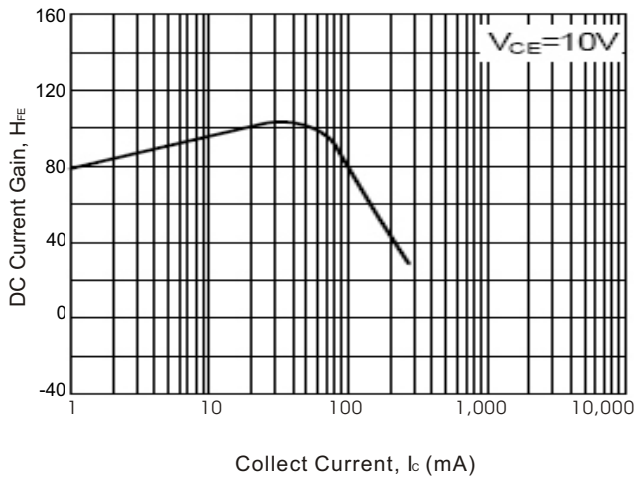


FIG.2 Turn-on Switching Times

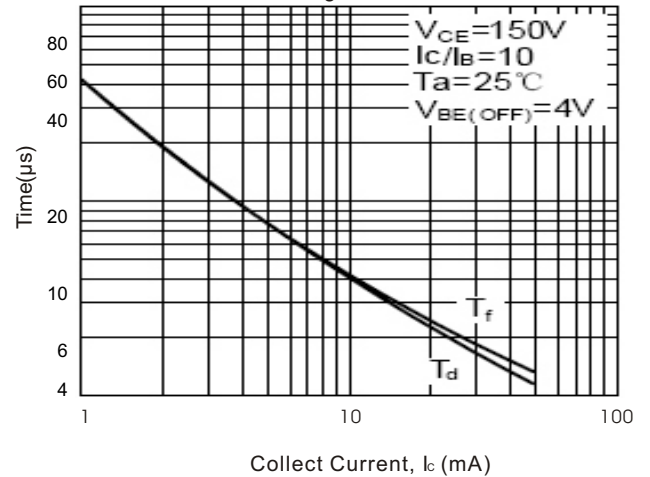


FIG.3 Turn-off switching times

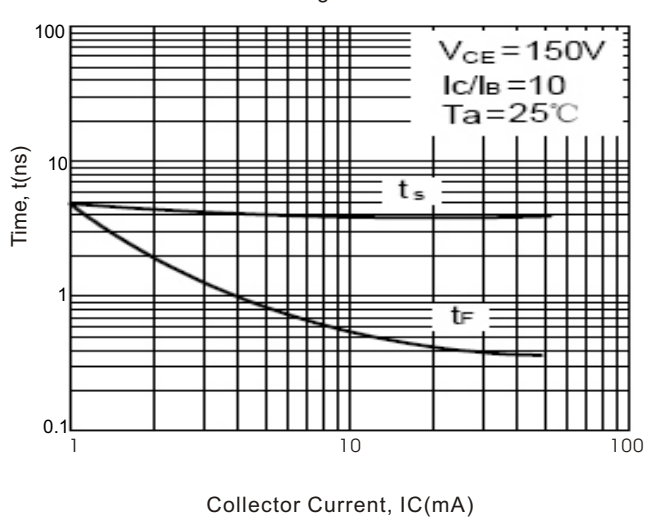


FIG.4 Capacitance

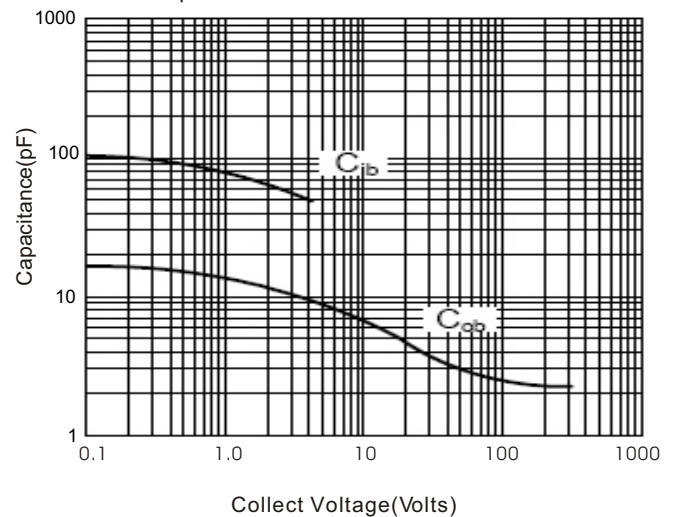


FIG.5 "On" Voltage

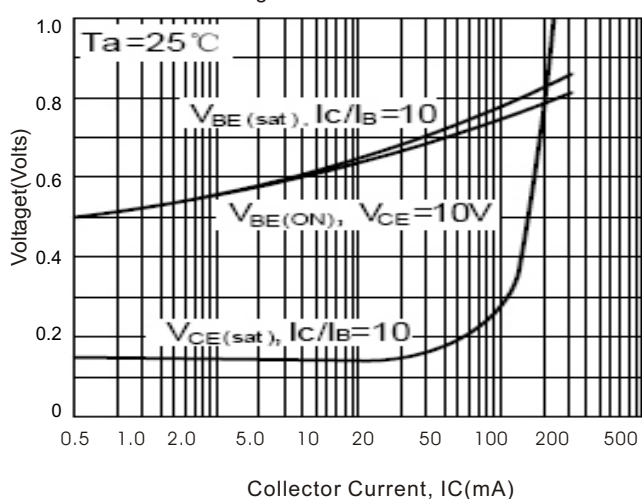
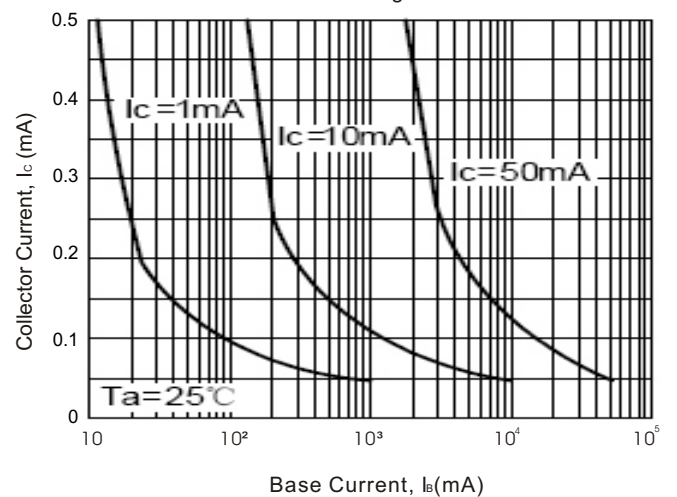


FIG.6 Collector Saturation Region



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FIG.8 Base-Emitter Temperature Coefficient

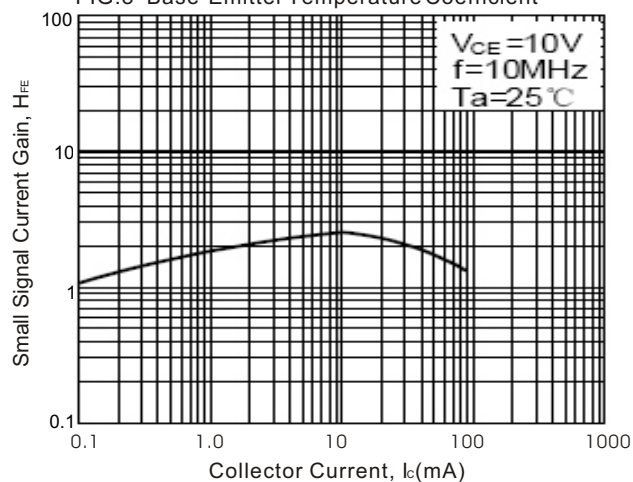
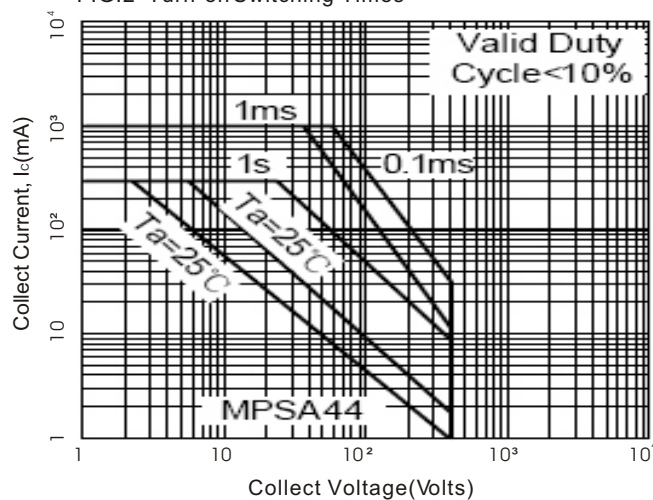


FIG.2 Turn-on Switching Times



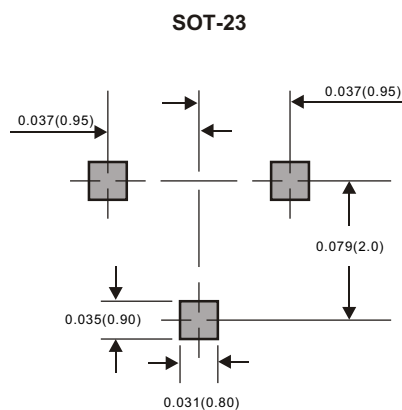
Pinning information

Pin	Simplified outline	Symbol
PinB Base PinC Collector PinE Emitter		

Marking

Type number	Marking code
FMBTA44	3D
FMBTA45	3D

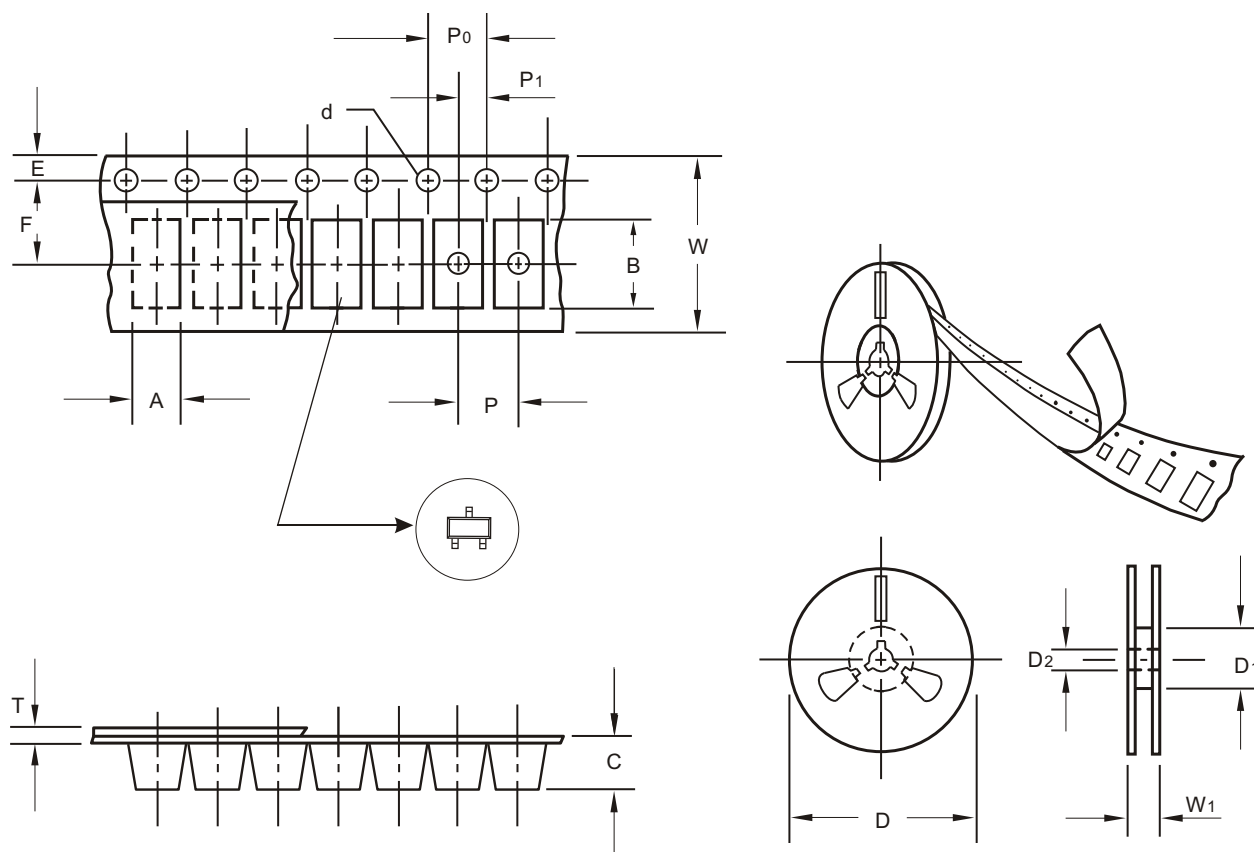
Suggested solder pad layout



Dimensions in inches and (millimeters)

FMBTA44/FMBTA45

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	55.00
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	12.0

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

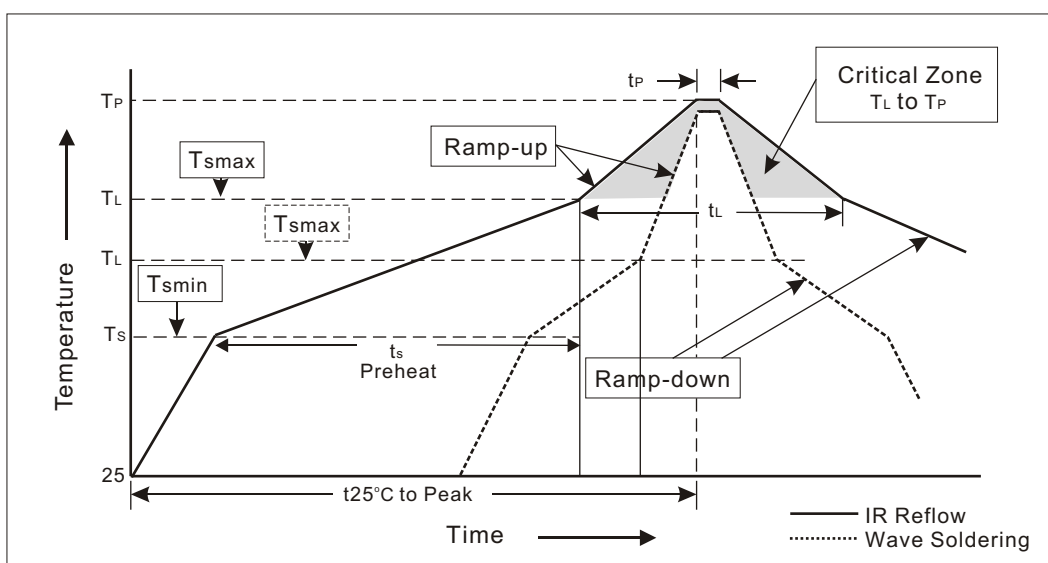
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Reel packing

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"	3000	4.0	15,000	185*180*65	178	405*375*405	300,000	12.4

Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=10°C~35°C Humidity=65%±15%
- 2.Reflow soldering of surface-mount devices



3.Flow (wave)soldering (solder dipping)

Profile Feature	Soldering Condition
Average ramp-up rate(T_L to T_P)	$<3^\circ\text{C/sec}$
Preheat -Temperature Min(T_{smin}) -Temperature Max(T_{smax}) -Time(min to max)(t_s)	100°C 150°C 60~120sec
T_{smax} to T_L -Ramp-upRate	$<3^\circ\text{C/sec}$
Time maintained above: -Temperature(T_L) -Time(t_L)	183°C 60~150sec
Peak Temperature(T_P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t_P)	10~30sec
Ramp-down Rate	$<6^\circ\text{C/sec}$
Time 25°C to Peak Temperature	$<6\text{minutes}$

FMBTA44/FMBTA45**High reliability test capabilities**

Item Test	Conditions	Reference
1. Solder Resistance	at $260\pm5^{\circ}\text{C}$ for $10\pm2\text{sec.}$ immerse body into solder $1/16''\pm1/32''$	
2. Solderability	at $245\pm5^{\circ}\text{C}$ for 5 sec.	
3. High Temperature Reverse Bias	$V_{CB}=0.8 \times V_{CBO}$, V_{BE} open at $T_A=150^{\circ}\text{C}$ for 168 hrs.	
4. Operation Life Test	Continuous operation at max rated $T_A=25^{\circ}\text{C}$, $P_C=P_{C(max)}$ for 500 hrs.	
5. Pressure Cooker	$15P_{SIG}$ at $T_A=121^{\circ}\text{C}$ for 4 hrs.	
6. Temperature Cycling	-55°C to $+125^{\circ}\text{C}$ dwelled for 30 min. and transferred for 5 min. total 10 cycles.	
7. Thermal Shock	0°C for 5 min. rise to 100°C for 5 min. total 10 cycles.	
8. Humidity	at $T_A=65^{\circ}\text{C}$, RH=98% for 1000 hrs.	
9. High Temperature Storage Life	at 175°C for 1000 hrs.	
10. Solvent Resistance	Dip into Freon at 25°C for 1 min.	