

**FEATURES**

- Epitaxial planar die construction
- Complementary NPN Type available(MMBT2222A)
- Marking: 2F

**MAXIMUM RATINGS (Ta=25°C unless otherwise noted)**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-Base Voltage	-60	V
$V_{CEO}$	Collector-Emitter Voltage	-60	V
$V_{EBO}$	Emitter-Base Voltage	-5	V
$I_C$	Collector Current -Continuous	-600	mA
$P_C$	Collector Dissipation	300	mW
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	417	°C/W
$T_J, T_{stg}$	Operation Junction and Storage Temperature Range	-55~+150	°C

**SOT-23**

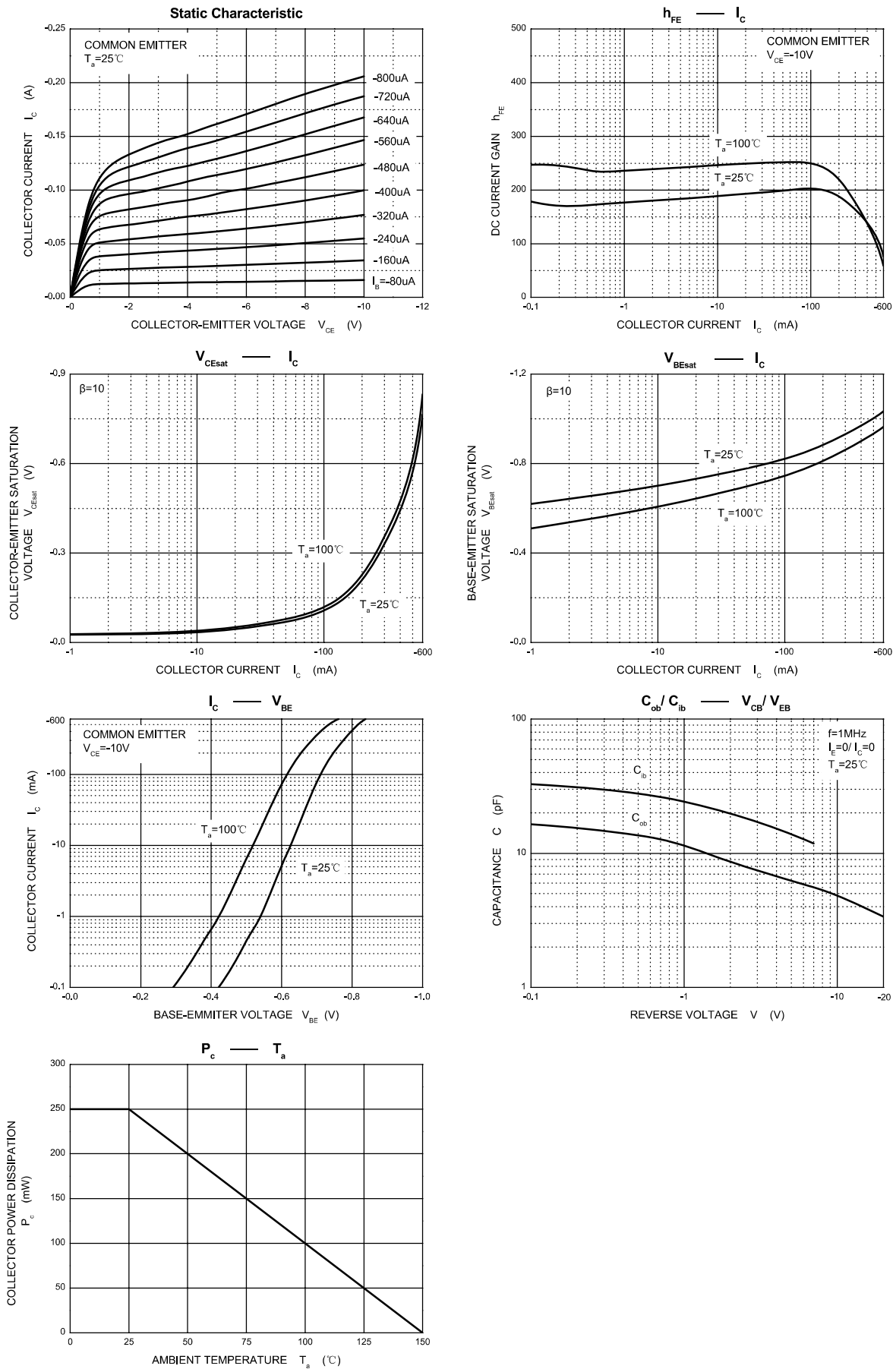

1. BASE
2. EMITTER
3. COLLECTOR

**ELECTRICAL CHARACTERISTICS (Ta=25°C unless otherwise specified)**

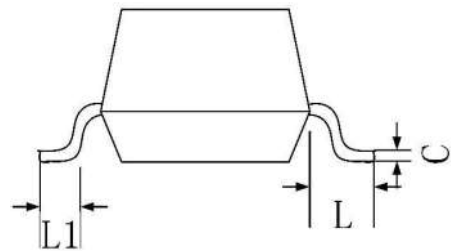
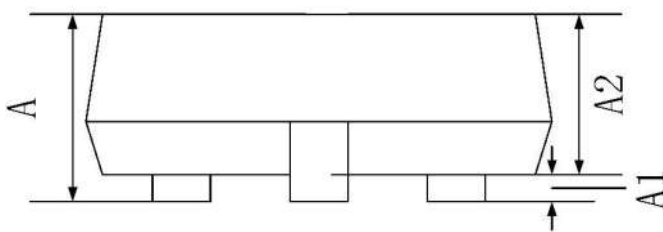
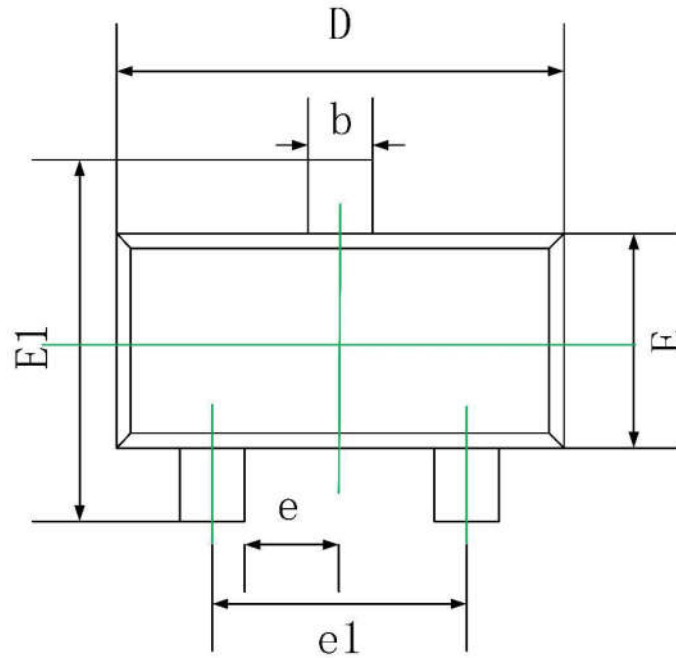
Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = -10\mu A, I_E = 0$	-60			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}^*$	$I_C = -10mA, I_B = 0$	-60			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = -10\mu A, I_C = 0$	-5			V
Collector cut-off current	$I_{CBO}$	$V_{CB} = -50V, I_E = 0$			-20	nA
Base cut-off current	$I_{EBO}$	$V_{EB} = -3V, I_C = 0$			-10	nA
Collector cut-off current	$I_{CEX}$	$V_{CE} = -30V, V_{BE(off)} = -0.5V$			-50	nA
DC current gain	$h_{FE(1)}$	$V_{CE} = -10V, I_C = -150mA$	100		300	
	$h_{FE(2)}$	$V_{CE} = -10V, I_C = -0.1mA$	75			
	$h_{FE(3)}$	$V_{CE} = -10V, I_C = -1mA$	100			
	$h_{FE(4)}$	$V_{CE} = -10V, I_C = -10mA$	100			
	$h_{FE(5)}$	$V_{CE} = -10V, I_C = -500mA$	50			
Collector-emitter saturation voltage	$V_{CE(sat)}^*$	$I_C = -150mA, I_B = -15mA$			-0.4	V
	$V_{CE(sat)}^*$	$I_C = -500mA, I_B = -50mA$			-1.6	V
Base-emitter saturation voltage	$V_{BE(sat)}^*$	$I_C = -150mA, I_B = -15mA$			-1.3	V
	$V_{BE(sat)}^*$	$I_C = -500mA, I_B = -50mA$			-2.6	V
Transition frequency	$f_T$	$V_{CE} = -20V, I_C = -50mA, f = 100MHz$	200			MHz
Delay time	$t_d$	$V_{CE} = -30V, I_C = -150mA, I_{B1} = -15mA$			10	ns
Rise time	$t_r$				25	ns
Storage time	$t_s$	$V_{CE} = -6V, I_C = -150mA, I_{B1} = -I_{B2} = -15mA$			225	ns
Fall time	$t_f$				60	ns

\*Pulse test:  $t_p \leq 300\mu s, \delta \leq 0.02$ .

Typical Characteristics



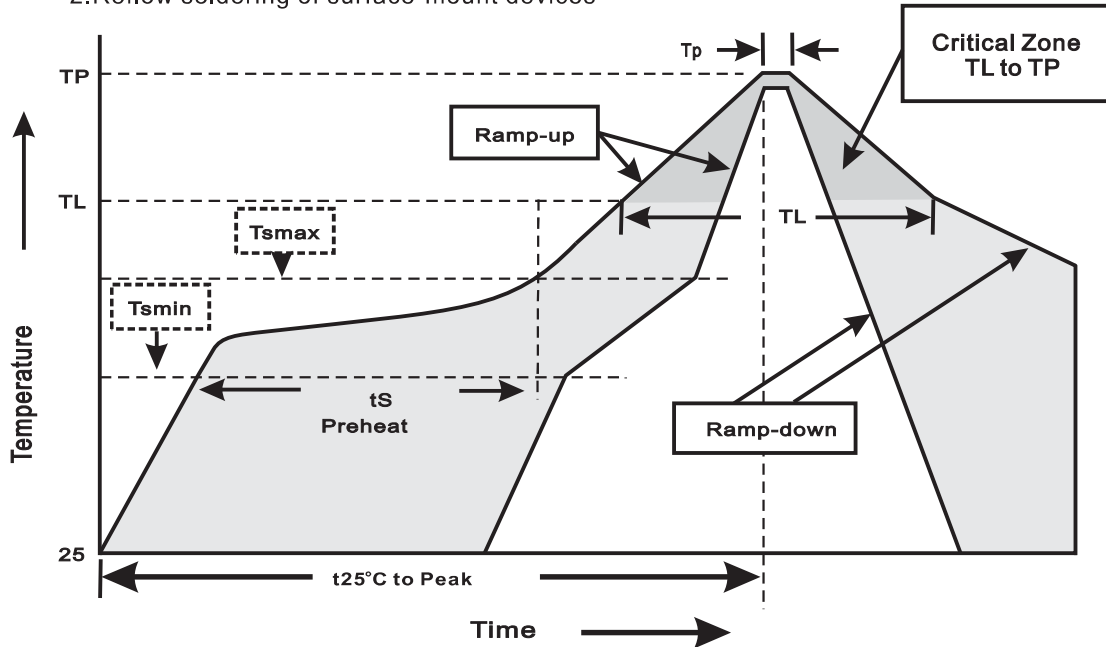
**SOT-23 Package Information**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020

**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 <sub>L</sub> to T <sub>P</sub> )	<3°C/sec
Preheat -Temperature Min(T <sub>smin</sub> ) -Temperature Max(T <sub>smax</sub> ) -Time(min to max)(t <sub>s</sub> )	150°C 200°C 60~120sec
T <sub>smax</sub> to T <sub>L</sub> -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T <sub>L</sub> ) -Time(t <sub>L</sub> )	217°C 60~260sec
Peak Temperature(T <sub>P</sub> )	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t <sub>P</sub> )	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes

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